Santa Fe River Field Trip
Alachua, Columbia, and Gilchrist Counties, Florida

June 8, 2014
Guidebook Number 61
The Southeastern Geological Society (SEGS)

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Field Trip Itinerary

Time	Objective / Discussion Topics
0815	Meet at Adventure Outpost Canoe Rental 30 NW 1st Avenue, High Springs, Florida
0815 - 0900	Rent canoes, travel to launch point
0900 – 0930	Launch canoes from Hwy 27 landing
0930 – 1600	Canoe trip with possible stops at The Crack, Poe Spring, Lilly Springs 'Group', Rum Island, Rum Island Spring, Blue Springs, Devils Ear, Devils Eye, Little Devils, Ginnie Springs (lunch stop), Big Awesome Suck, Little Awesome Suck, Camp Spring/Rise, Tract One Siphon, Siphon Creek Rise, Myrtles Fissure and related cracks
1600 – 1630	Take out canoes at Santa Fe River County Park and shuttle back to launch point

Dress Suggestions:

- *Appropriate clothing for canoeing, along with entering the water*
- *Comfortable walking/water shoes with good soles that will get wet, no flip-flops*
- *Sunscreen*
- *Just in Case …*
  - *Rain jacket*
  - *Extra set of dry clothes for the drive home*

Orientation Map

Potential Field Trip Stops

1) *Canoe Launch (Hwy 27 landing – Alligator Rise)*
2) *The Crack*
3) *Poe Spring*
4) *Lilly Springs 'Group'*
5) *Rum Island, Rum Island Spring*
6) *Blue Springs*
7) *Devils Ear, Devils Eye, Little Devils*
8) *Turkey Roost Pavilion (lunch & restrooms available)*
9) *Ginnie Springs*
10) *Dogwood, Twin, Sawdust and Deer Springs*
11) *Big Awesome Suck, Little Awesome Suck*
12) *Camp Spring/Rise & Tract One Siphon*
13) *Siphon Creek Rise*
14) *Myrtles Fissure and related cracks*
10) *Canoe take-out (Santa Fe River County Park)*

Introduction *(Courtesy of Todd R. Kincaid, Ph.D., Geohydros, LLC.)*

What Makes the Santa Fe River Basin Special?

The Santa Fe River Basin (SFRB) occupies approximately 3,500 km^2 of north central Florida and is a major tributary basin of the Suwannee River. The basin is made hydrogeologically interesting by the fact that it has been extensively karstified, spans part of a transition zone between confined and unconfined regions of the Floridan aquifer system, and contains numerous opportunities to observe and study the effect of karstification and confinement on groundwater / surface water exchange. More generally however, the SFRB is a unique and, many would say, “special” place because of the number of often crystal clear springs that discharge along its western reach between the River Rise and the confluence with the Suwannee River.

The Santa Fe River (SFR) generally flows from east to west. It originates in Northern and Central Highlands of the eastern part of the basin where the Floridan aquifer system is confined and overlain by clay and limestone sediments of the Hawthorn Group that create an intermediate aquifer system and upper confining unit, and variably thick sands that create a discontinuous surficial aquifer system. From there, it flows onto the Gulf Coastal Lowlands where the Floridan aquifer system is unconfined and either exposed at the land surface or overlain only by variably thick sands. Evidence of karstification becomes significantly more apparent in the transition zone, where the SFR and all of the River’s mapped tributaries disappear underground, and in the western section of the basin, which contains several resurgences including that of the SFR, numerous springs and sinkholes, many dry and saturated (underwater) caves, and a marked decrease in overland drainage. Within this one basin, it is therefore possible to observe numerous examples of karstic controls on groundwater flow and recharge and how the localization of the karst features is effected by the presence, thickness, and integrity of the Hawthorn semi-confining layer.

Problems Confronting the Basin

Like most of Florida, the SFRB is experiencing environmental problems associated with land use changes and population growth. The area that, until recently, was occupied by relatively disperse low-intensity agriculture and rural populations, is becoming increasingly urbanized, encroached upon by suburban sprawl from Gainesville, and increasingly utilized for higher-intensity agricultural operations including confined animal feeding operations (CAFOs). One result of these land-use changes has been increased nutrient loading in groundwater and surface waters that correlates to increased algae and decreased water clarity in the once crystal-clear SFR springs. Contributions from agriculture are particularly exacerbated because the Department of Environmental Protection (DEP) has limited jurisdiction over agricultural operations. The DEP has therefore encouraged landowners to implement “Best Management Practices” (BMPs) that are designed to reduce nutrient loading to groundwater through a voluntary approach.

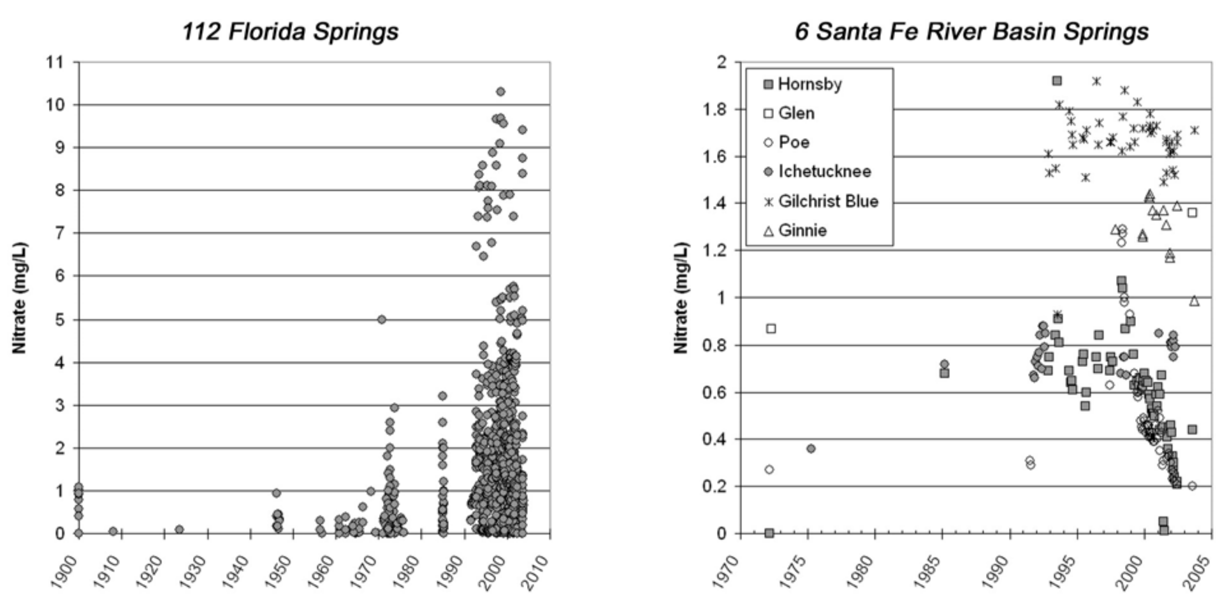


Figure 1. Nitrate concentrations in Florida springs. Data compiled by Strong (2004).

In addition to the water quality impacts, population growth, intensified agricultural activities, and a growing water bottling industry are placing increasing demands on groundwater supplies. All of these users withdraw water from the basin's water budget much like one withdraws money from a bank account. If the rate of withdrawal exceeds the rate of replenishment then the account will be diminished and some or all users will suffer shortages. In this light, the springs can be thought of as simply one of the user groups that withdraw water from the aquifer to create their flows.

If we broaden the concept of the "basin" to include the region contributing all water (surface water and groundwater) to the SFR, then the total available water to all users is the amount of rainfall in the basin minus the amount that evaporates back into the atmosphere. Some of this water flows overland into the creeks, streams, and rivers that drain into the SFR and some of it infiltrates through the ground to provide recharge to the Floridan aquifer system from which the springs receive their water. Ultimately all of the water flows to the SFR, which empties into the Suwannee River and leaves the basin. This process is described as the hydrologic cycle, which reflects the fact that the total available water is that which is constantly flowing from input as rainfall to output as river discharge.

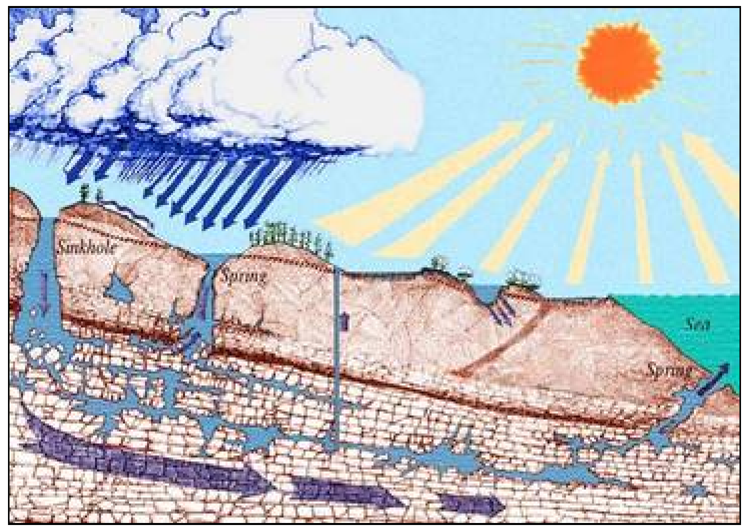


Figure 2. Hydrologic cycle in a hypothetical karst setting such as the Santa Fe and Suwannee River Basins.

All of the springs in the basin collectively collect and discharge the majority of the groundwater flow into the SFR. Because of this, any groundwater extractions in the basin will reduce the spring flows by an amount essentially equal to the total withdrawal minus any water that is returned to aquifer. For instance, extractions for public and private water supplies return water to the system through sewage and septic discharges. Agricultural extractions return water to the system via irrigation that is not utilized by the crops. Though both of these returns present problems for water quality management, their returns significantly reduce the impact of the usage on groundwater supplies and thus spring flows. The fundamental problem therefore lies in knowing the available water budget, how much each usage extracts from the system, and how much it returns. Currently, we have a very poor understanding of any of those three variables despite exponential increases in demand.

Purpose

The purpose of this field trip and field guide is primarily to elevate public awareness of the significant hydrologic features in the SFRB and their vulnerability to contamination and water level decline associated with irresponsible development within the basin boundaries. This guide is designed to provide an overview of the hydrogeologic setting in which the SFRB is located and the key features that control groundwater / surface water interactions and groundwater flow patterns. Of particular interest is the western section of the SFRB between O'leno Sink and Ginnie Springs and the transition zone between that region and the eastern part of the basin where the Floridan aquifer system is confined or partially confined by the Hawthorn Group. Special focus on these regions stems from the density of springs and siphons along that section of the river, and the effect of the confining layer on aquifer recharge and groundwater / surface water exchange. Not all of the features and locations described in the guide will be visited on the field trip but maps and references are provided at the end of the document to direct interested readers to more in-depth discussions of the region and its hydrologic processes and to some of the significant features that cannot be visited due to time constraints.

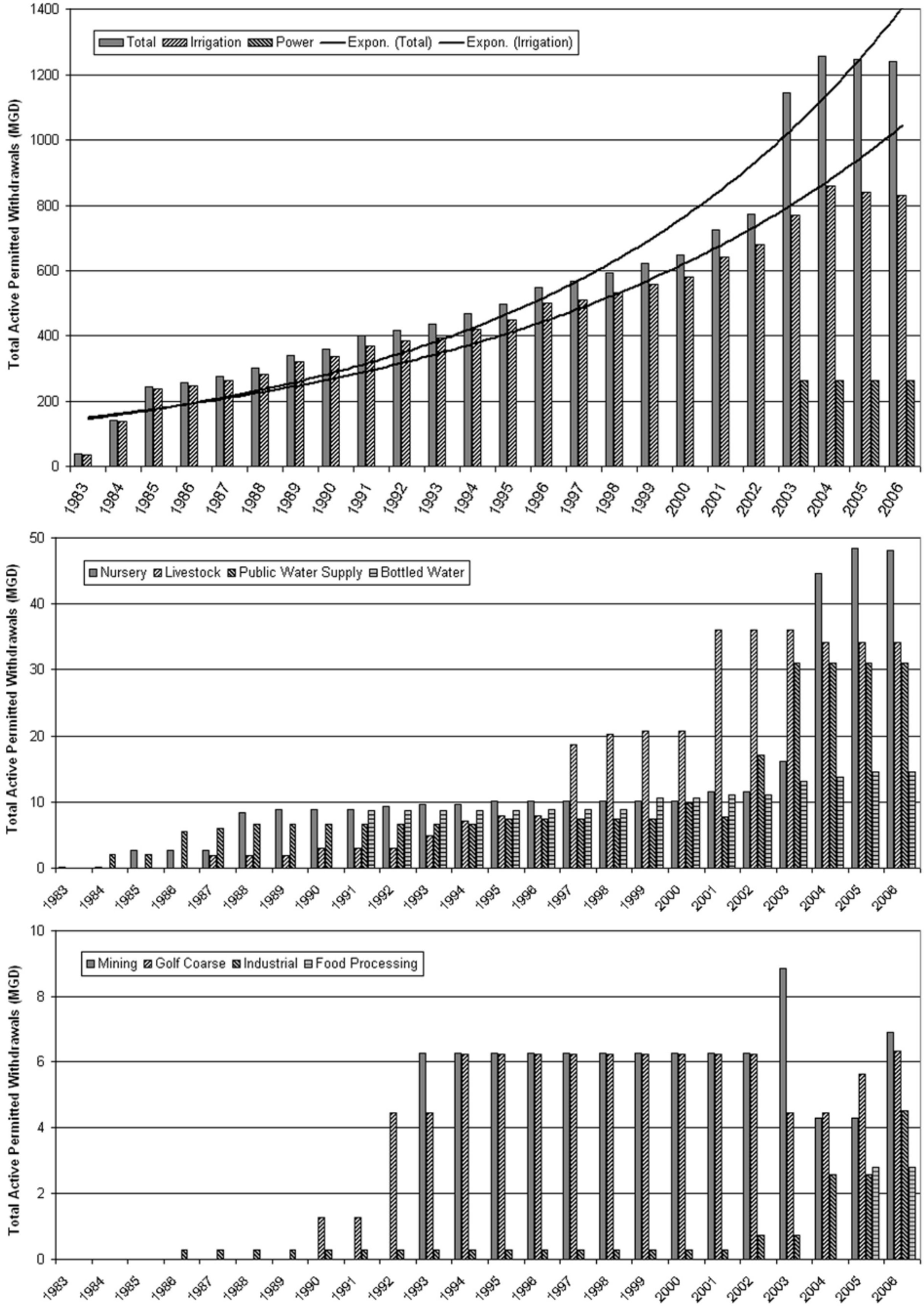


Figure 3. Groundwater usage in the Santa Fe River Basin between 1983 and 2006 compiled from data provided by the Suwannee River Water Management District.

Hydrogeologic Setting

Floridan Aquifer System

The Floridan aquifer system is aerially extensive underlying all of Florida, nearly half of Georgia and South Carolina, and part of Alabama and is regarded as one of the most productive aquifers in the United States. In the SFRB, the Floridan aquifer system consists of several hundred meters of limestone and dolostone but only the upper 100 - 250 m yield potable water (Hunn and Slack, 1983). The stratigraphic units constituting the upper part of the aquifer are, from oldest to youngest, the: Eocene Ocala Limestone, the Oligocene Suwannee Limestone, and the limestones at the base of the Miocene Hawthorn Group (Figure 4). The Hawthorn Group is significant to the hydrogeology because, where present (in the eastern part of the SFRB), thick sequences of clay form a confining layer that inhibits recharge except where it is breached by sinkholes or fractures. Variably thick carbonate lenses interbedded within the clays create a moderately productive intermediate aquifer that can provide adequate private water supplies (Hunn and Slack, 1983). Variably thick surficial sediments cap the sequence throughout most of the basin and are sufficiently thick in the eastern part of the basin to create a surficial aquifer. Figures 4 and 5 provide a stratigraphic sequence and geologic cross-section that mark the relationship of these units in the SFRB.

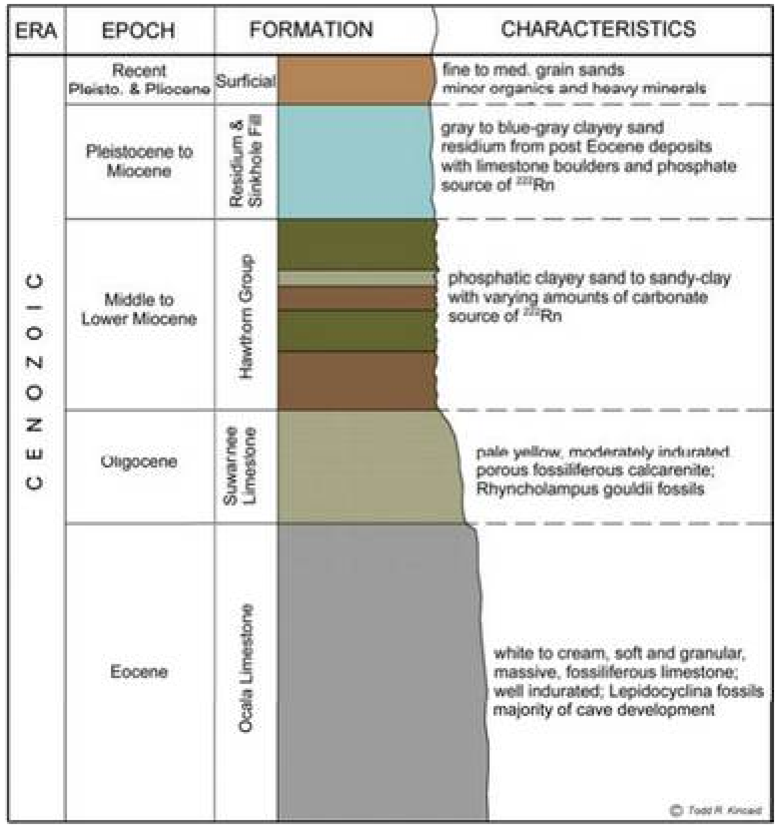


Figure 4. Stratigraphic sequence underlying the Santa Fe River Basin, north-central Florida.

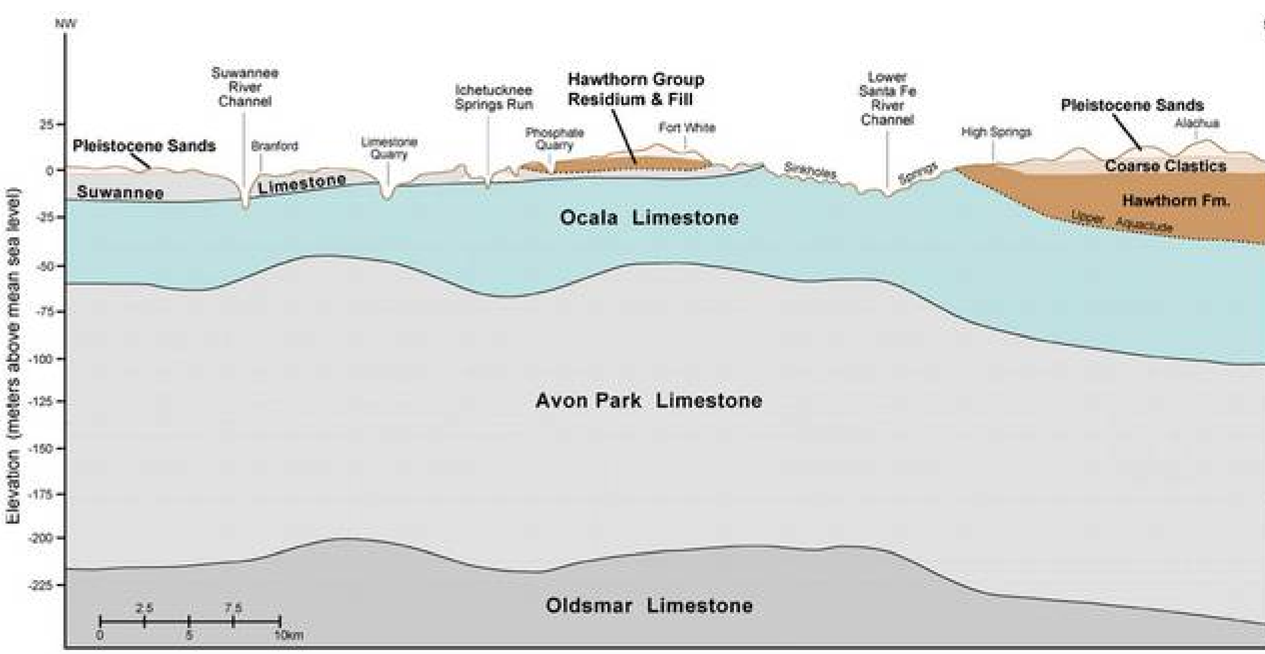


Figure 5. Geologic cross-section across the Santa Fe River Basin from northwest to southwest.

The Hawthorn Group is thought to have once covered much of the Florida platform (Scott, 1988) but has been eroded off from the west leaving a fairly pronounced topographic scarp along the present-day western margin. The eastern side of the margin is characterized as highlands (the Northern Highlands) with topographic elevations that range from 45 – 60 m. By contrast, the western side of the margin is characterized as lowlands (the Gulf Coastal Lowlands) with topographic elevations averaging about 15 m or less. From a hydrogeologic perspective, the margin itself is a transition zone that separates confined and unconfined regions of the Floridan aquifer system. The position of the margin and the thickness of the clay sediments behind it create one of the most important variables controlling aquifer vulnerability because of the resulting influence on aquifer recharge.

In the SFRB, the erosional boundary of the Hawthorn Group coincides with the topographically defined Cody Scarp (Puri and Vernon, 1964; White, 1970; Crane, 1986), which has given rise to an association between the Cody Scarp and the hydrogeologic transition zone. That correlation does not hold however in other parts of Florida because the Cody Scarp was defined on a purely topographic rather than a geologic or hydrogeologic basis. In some regions, such as the Woodville Karst Plain, that association has led to significant confusion regarding the variables controlling aquifer vulnerability.

The Floridan aquifer system is highly productive as is demonstrated by more than 300 springs that discharge an average of 360 m^3/sec to Florida's major rivers (Fernald and Patton, 1984). Of the 78 largest springs on the North American continent, 27 discharge more than 272 m^3/sec from the Floridan aquifer system (Lane, 1986). Within the SFRB, spring discharges reach as much as 10 m^3/sec (Scott et al, 2004; SWRMD, 1998). Pumping tests have revealed transmissivities that range from 3,000 - 50,000 m^2/day, and well yields range between 0.1 – 0.3 m^3/sec (Hunn and Slack, 1983).

Karstification

Karstification is ubiquitous in the limestones that comprise the Floridan aquifer system wherein sinkholes, such as the famous Winter Park sinkhole in central Florida are the most common surface expressions. Many of these sinkholes have at least partially filled with water and constitute most of the over 7,700 freshwater lakes in Florida that are larger than 40,000 m^2 (Spangler, 1981). In terms of hydrogeology, karstification becomes significantly more pervasive and exerts a stronger control on groundwater flow patterns throughout the unconfined section of the aquifer that arcs from the Gulf Coast near Tampa up through the peninsula and terminates in the panhandle near Tallahassee. The region is termed the "*karst belt*" of Florida (Figure 6) because pervasive sinkholes and caves characterize the region.

Sinkholes, swallets, springs, dry caves, and underwater caves are all common in the western part of the SFRB but become progressively less common moving east across the transition zone into the confined section of the aquifer.

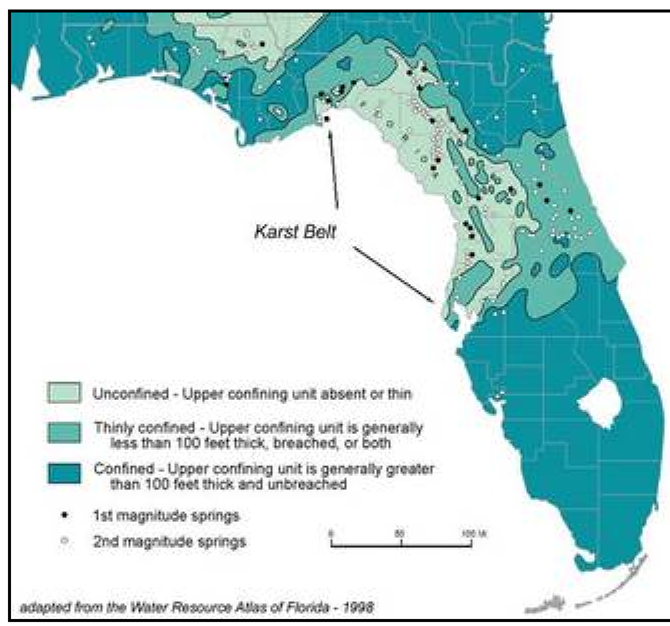


Figure 6. Distribution of confining layers over the Floridan aquifer and the location of 1st and 2nd magnitude springs.

Dry caves such as those found in Florida Caverns State Park in Marianna, Florida are exposed in regions where the limestones and dolostones are unsaturated and facilitate infiltration to the water table. Warren Cave and Bat Cave are two of the most well-known dry caves in the SFRB. Much more significant are the regionally extensive cave systems that occur in the limestones beneath the water table. These saturated cave systems are of particular hydrogeologic interest because they collect and transmit large quantities of water to springs in Florida's major rivers such as the Suwannee, St. Johns, Santa Fe, Oklawaha, and Withlacoochee. All of the 27 first magnitude springs (discharge >= 2.8 m^3/sec) in Florida discharge from saturated cave systems. The ground water discharge from these springs is, in each case, between one and three orders of magnitude greater than the largest well yields. The distribution and magnitude of these spring discharges demonstrate that saturated karst conduits provide the major ground water flow pathways in the

Floridan aquifer system. Devil's Ear, Old Bellamy, Hornsby, Ginnie and Blue Hole are the most well-known saturated caves in the basin.

Sinkholes and swallets provide point sources of aquifer recharge where swallets are typically sinkholes that receive all or part of a stream's flow and direct it into saturated caves or smaller saturated conduits. Sinkholes distant from streams are not necessarily connected to caves or conduits, which can be seen by evaluating water temperatures in the sinkholes during cold winter periods. Those that are readily connected to conduits will contain water at or near the regional groundwater temperature (~21°C) whereas those that are not will contain significantly colder water. Though they receive rainfall and sheet-flow during floods, not all sinkholes therefore provide point sources of elevated recharge and the overall distribution of sinkholes is not necessarily demonstrative of underlying conduit formation or trends.

Recharge

Aquifer recharge in the SFRB occurs through diffusive infiltration through the sediments covering the limestones that comprise the aquifer and through swallets that deliver runoff and stream flow directly into the aquifer. As such, the swallets are points where the aquifer is extremely vulnerable to contamination. Swallet-spring connections are most readily marked by tea-colored discharge during high flow periods. Inflow rates through the swallets are determined by the size of the connecting conduits and can be inferred by the magnitude of water level fluctuations in the swallet basins and their drainage rates. Table 1 provides a list of the major swallets in the basin and an estimate of their drainage area and inflow rates.

Table 1. Major swallets in the Santa Fe River Basin.

Swallet	Drainage Area (km^2)	Inflow Rate (m^3/sec)
Rose Creek Complex		
Alligator Lake	24	0.8
Rose Sink	70	2.8
Clay Hole Sinks	67	2.8
San Felasco Complex		
Mill Sink	36	2.8
Lee Sink		0.4
Burnetts Lake	28	0.6
Turkey Creek	32	0.4
Blues Creek	20	0.4

Discharge

Springs constitute the primary form and locations of groundwater discharge in the SFRB. Table 2 lists all springs in the basin documented by the Suwannee River Water Management District along with their location and maximum recorded discharge. Note that there are nine springs that rank as first magnitude (discharge > 2.8 m^3/sec). In order to use the flow data to determine the groundwater budget however, the challenge is to determine for each spring how much of the flow is attributable to groundwater flow and how much is attributable to swallet recharge. That remains an important task to tackle.

Table 2. Springs in the Santa Fe River Basin documented by the Suwannee River Water Management District.

Spring	County	Lat (DD)	Lon (DD)	Flow (m3/sec)	Spring	County	Lat (DD)	Lon (DD)	Flow (m3/sec)
Santa Fe Rise	Columbia	29.8739	82.5916	12.52	COL1012971	Columbia	29.8569	82.7300	0.42
ALA112971	Alachua	29.8547	82.6029	11.50	GIL729971	Gilchrist	29.8894	82.8750	0.38
GIL1012973	Gilchrist	29.8562	82.7329	10.48	COL930971	Columbia	29.8312	82.6567	0.38
Hornsby	Alachua	29.8504	82.5932	9.97	Pickard	Gilchrist	29.8305	82.6621	0.33
Columbia	Columbia	29.8541	82.6120	8.66	COL1012972	Columbia	29.8565	82.7317	0.29
Devil's Ear	Gilchrist	29.8353	82.6966	5.85	COL101974	Columbia	29.8340	82.6767	0.28
COL61981	Columbia	29.9344	82.5306	4.25	Grassy Hole	Columbia	29.9681	82.7598	0.28
July	Columbia	29.8362	82.6964	3.31	COL917971	Columbia	29.9248	82.7720	0.27
Blue Hole	Columbia	29.9805	82.7584	3.01	Trail	Gilchrist	29.8984	82.8667	0.27
Mission	Columbia	29.9762	82.7579	2.40	GIL101971	Gilchrist	29.8323	82.6784	0.23
Gilchrist Blue	Gilchrist	29.8299	82.6829	2.26	GIL1012972	Gilchrist	29.8560	82.7327	0.23
ALA930972	Alachua	29.8447	82.6309	1.98	GIL99972	Gilchrist	29.9309	82.8024	0.20
GIL1012974	Gilchrist	29.8645	82.7401	1.98	Sawdust	Columbia	29.8400	82.7035	0.19
Rum Island	Columbia	29.8335	82.6798	1.72	COL101972	Columbia	29.8336	82.6753	0.17
Devil's Eye	Suwannee	29.8352	82.6966	1.70	Deer	Gilchrist	29.8412	82.7073	0.14
Ginnie	Gilchrist	29.8363	82.7001	1.65	GIL99974	Gilchrist	29.9186	82.7717	0.14
Poe	Alachua	29.8257	82.6490	1.43	COL928971	Columbia	29.8862	82.7515	0.14
Sunbeam	Columbia	29.9281	82.7698	1.29	Jamison	Columbia	29.9258	82.7701	0.12

Spring	County	Lat (DD)	Lon (DD)	Flow (m^3/sec)	Spring	County	Lat (DD)	Lon (DD)	Flow (m^3/sec)
Ichetuckenee	Columbia	29.9842	82.7619	1.20	SUW917971	Suwannee	29.9324	82.8008	0.08
Devil's Eye	Gilchrist	29.8352	82.6966	1.17	Coffee	Suwannee	29.9595	82.7753	0.08
Lilly	Gilchrist	29.8297	82.6612	1.12	COL101971	Columbia	29.8322	82.6694	0.07
Wilson	Columbia	29.9001	82.7585	1.10	Betty	Suwannee	29.9148	82.8400	0.07
GIL107971	Gilchrist	29.8910	82.8742	0.85	COL428981	Columbia	29.8535	82.6055	0.07
GIL107972	Gilchrist	29.8990	82.8663	0.85	Little Devil	Gilchrist	29.8346	82.6970	0.06
COL428982	Columbia	29.8273	82.6460	0.71	GIL917971	Gilchrist	29.9114	82.8424	0.05
Mill Pond	Columbia	29.9667	82.7600	0.65	GIL928971	Gilchrist	29.8756	82.7519	0.03
Dogwood	Gilchrist	29.8381	82.7018	0.58	Oasis	Gilchrist	29.9258	82.7804	0.03
ALA930971	Alachua	29.8279	82.6408	0.57	COL61982	Columbia	29.9383	82.5304	0.03
GIL1012971	Gilchrist	29.8559	82.7322	0.57	GIL928972	Gilchrist	29.8805	82.7533	0.02
SUW107971	Suwannee	29.9129	82.8452	0.57	COL101975	Columbia	29.8338	82.6782	0.02
Twin	Gilchrist	29.8400	82.7058	0.55	GIL99971	Gilchrist	29.9213	82.8241	0.01
COL928972	Columbia	29.8578	82.7339	0.49	GIL729973	Gilchrist	29.9134	82.8367	0.01
Cedar Head	Columbia	29.9833	82.7587	0.47	GIL729972	Gilchrist	29.9128	82.8368	0.01
Darby	Alachua	29.8526	82.6060	0.42	SUW917972	Suwannee	30.0327	83.0135	0.00

Saturated Caves

Saturated caves in the SFRB can be classified by the recharge mechanism responsible for delivering water to the caves. Caves that receive water primarily from the aquifer matrix (autogenic recharge) consistently deliver crystal clear water to the springs at a relatively constant rate. They tend to be smaller in diameter and trend up-gradient into the aquifer from the springs to which they connect in a dendritic or braided pattern. Caves that primarily receive water from sinking streams (allogenic recharge) on the other hand carry water of varying clarity at highly variable flow rates. They tend to be larger in diameter and longer and connect the springs to which they connect to one or more swallets and sinkholes in a dendritic pattern. A third type of system includes caves that have developed parallel or sub-parallel to the Santa Fe River and circulate water between springs and siphons in the river channel. Table 3 lists six of the best known caves in the SFRB that represent each of the three types.

Table 3. Majors caves in the Santa Fe River Basin

Cave	Type	Length (m)
Old Bellamy	Allogenic	15,387
Devil’s Ear	River	7,179
Hornsby	Allogenic	5,680
Rose Sink	Allogenic	1,299
Mill Creek	Autogenic	1,115
Ginnie	Autogenic	348

Groundwater / Surface Water Exchange

The Santa Fe River provides one of the best localities in the world to observe and study groundwater / surface water interactions. In this region, the river is actually the top of the Floridan aquifer system, that is, there is no confining layer separating the aquifer from the land surface and the rocks beneath the river are completely saturated. Groundwater and surface water are readily exchanging (aquifer – river – aquifer) along the entire reach of the Santa Fe down to its confluence with the Suwannee River.

Beyond the obvious groundwater inputs at the numerous springs along the trip from the HWY 27 bridge to the HWY 47 bridge, there are also several points where the river loses water to the aquifer via well-developed cave systems. There are two basic mechanisms for the river water intrusion. Where the aquifer is confined or partially confined, rising river stages drive water into the aquifer through the spring vent. (Figure 7, A & B). This is the situation at most of the springs along the Suwannee River.

The second mechanism is active in regions where the aquifer is unconfined and the river forms the top of the aquifer (Figure 7, C & D). In these regions, rising river stage drives river water into the aquifer directly along the river floor causing an increase in spring discharge, albeit dark water. This is the situation at most of the Santa Fe River springs. One place where this is happening is Columbia spring, which is actually a resurgence of river water that sinks approximately 100 yards upstream at a siphon often strong enough to hold a canoe in place. Another, better known point of exchange is the Devil’s Ear cave system (Table 3), which is an anastomosing network of underwater conduits that trend parallel and sub-parallel to the river. The main conduit in the cave system trends east for over 4,500 ft upstream from the entrance at Devil’s Ear spring at a depth of approximately 30 m below the water surface. Three springs (July, Devil’s Eye, and Devil’s Ear) discharge water from the cave to the river that consists of groundwater (autogenic recharge) and recirculated river water. Water clarity in the conduits is typically clear but becomes turbid during higher stages of the river or after flood events. During periods of turbid water discharge at the three springs, cave divers report that clear water enters the main passage from the northern conduits and mixes with turbid water from the southern conduits producing the turbid water discharge visible at the surface. Reverse flow, a common situation at many springs in Florida where spring discharge is reversed and river water flows into a cave system through the spring opening, has never been reported at the Devil's Ear cave system.

Figure 8 is a map of Devil's Ear cave colored to reflect the results of sampling experiments carried out by the author between 1991 and 1993 (Kincaid, 1994; Kincaid, 1998). In short, numerous water samples were collected from points throughout the cave system and measured for Radon gas, which emanates from the rocks that comprise the aquifer but is almost immediately lost to the atmosphere once the water discharges. Water samples with high Radon concentrations are indicative of groundwater from the aquifer whereas water samples with low Radon concentrations are indicative of surface water. Using a two-component mixing model, the measured concentrations were converted to the relative percentages of river water shown on the map.

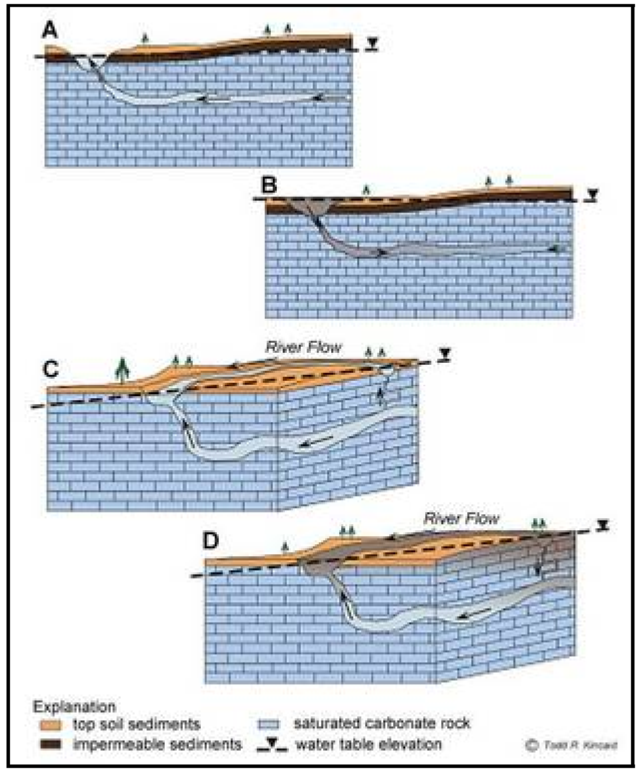


Figure 7. Mechanisms for river water intrusion to spring cave systems in the Santa Fe and Suwannee River Basins.

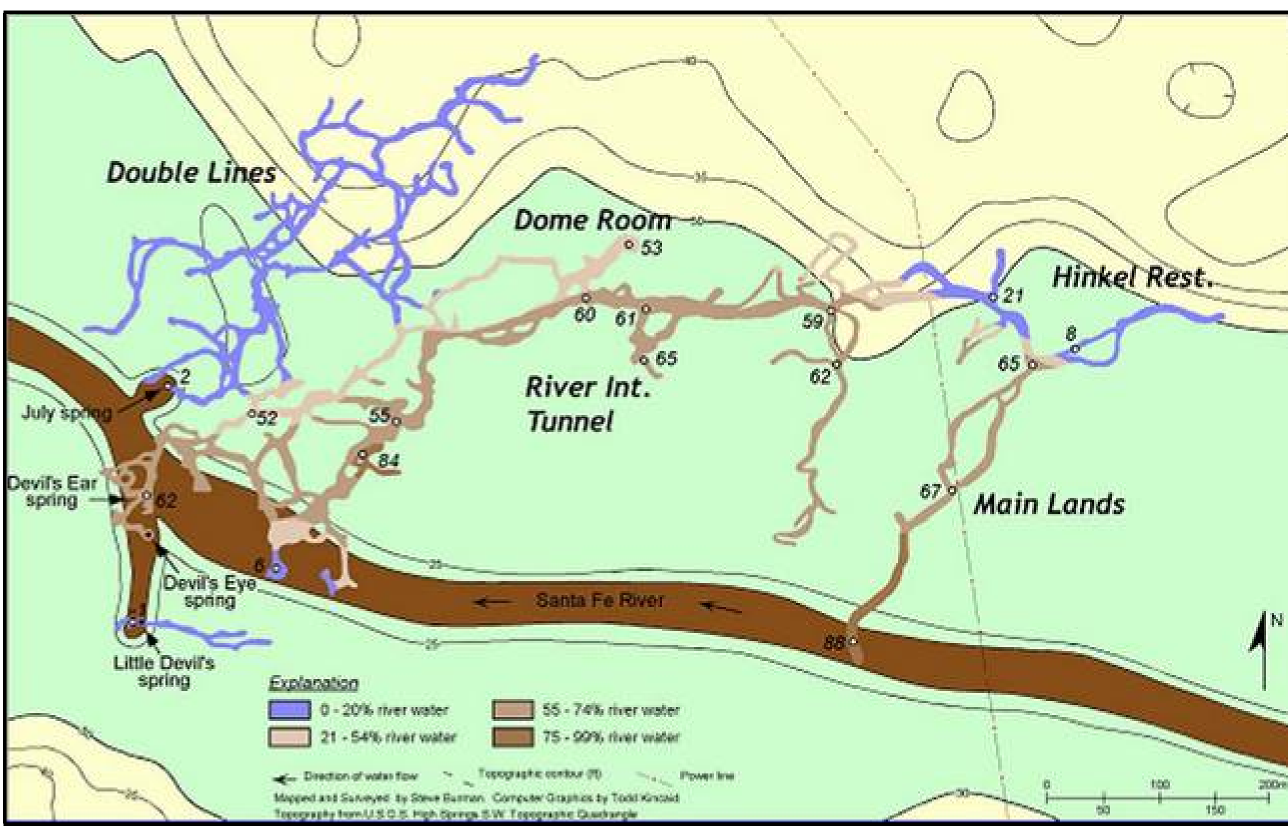


Figure 8. Map of the Devil's Ear cave system showing the conduits colored to reflect the relative percentage of groundwater and recirculated river water flowing toward the springs.

As expected, water samples collected from points directly beneath the river have higher river water percentages than samples collected from the upstream sections of the cave north of the river. However, samples collected during the lower flow stage unexpectedly revealed higher percentages of river water. Comparison to local and regional rainfall data revealed that, rather than being controlled by river stage, the quantity of river water intrusion is controlled by the magnitude and distribution of recharge.

When precipitation is concentrated on the Northern Highlands where the Santa Fe River is not in hydraulic connection with the Floridan aquifer, the water accumulates in the river as overland flow and the flood pulse moves downstream onto the unconfined part of the aquifer. The subsequent increase in river stage produces a downward hydraulic gradient causing large amounts of river water to invade the cave (See A at Right). Observations of water clarity reductions in the cave after large flood events originating in the highlands of the upper SFR reveal that river water intrusion to the aquifer can occur in as little as one or two days.

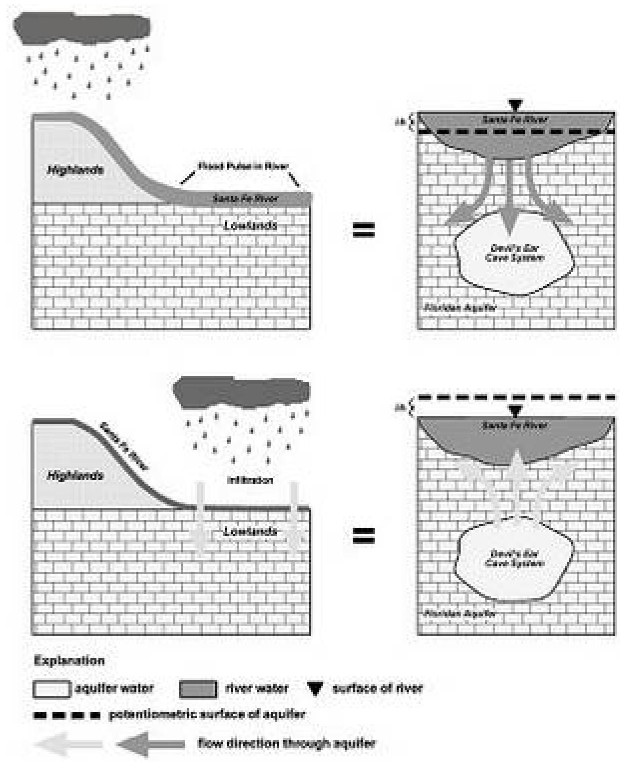


Figure 9. Rainfall mechanisms responsible for river water intrusion to the Devil's Ear cave system.

Conversely, when precipitation is concentrated over the lowland regions where the Floridan aquifer system is unconfined, recharge to the aquifer results from direct infiltration with no resulting flood wave in the river. The hydraulic head in the cave rises above that of the river where a rising river stage is caused only by increased spring discharge. The resulting upward hydraulic gradient results in flow from the cave to the river (See B at Right). The water in the cave will clear as the tannin surface water from the Santa Fe River is flushed up and out through the aquifer.

Field Trip

Background

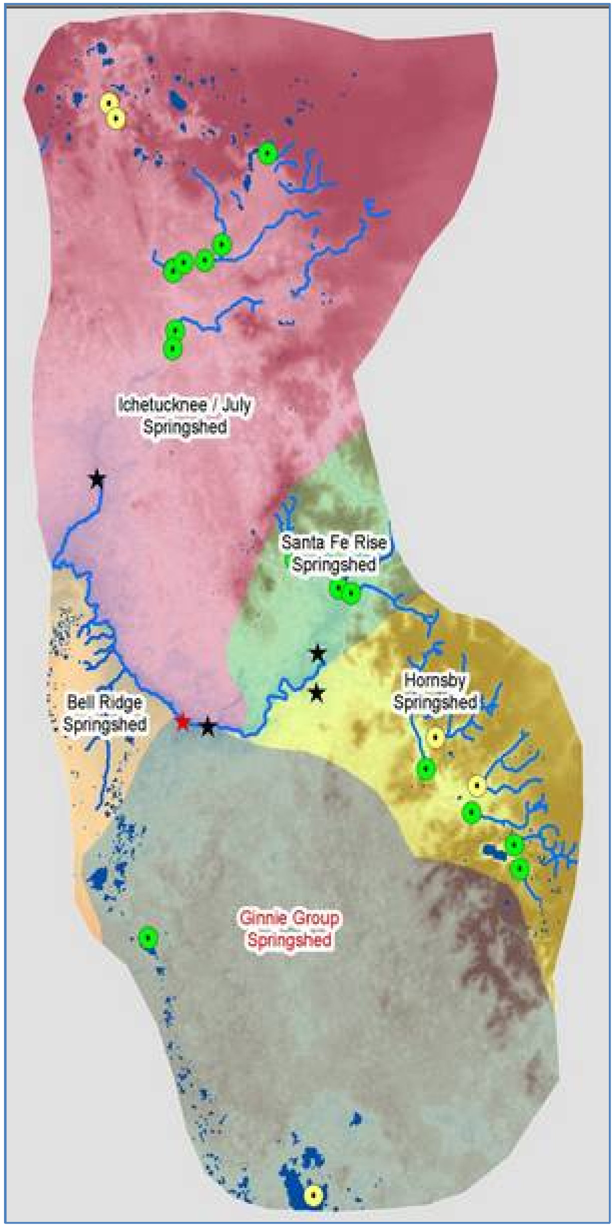
For its first eighteen miles, the Santa Fe River is a tiny meandering stream that is not navigable. At Worthington Springs it becomes minimally canoeable for the very determined, and at S.R. 241, just a few miles above O'Leno State Park, it becomes a pleasant stream for even the novice paddler. At O'Leno, the river goes underground in a lazy whirlpool and follows subterranean passageways for some three miles to River Rise State Preserve. When the Santa Fe returns, it is as a generously sized river some 75 to 100 feet wide. From there to the confluence of the Suwannee, the Santa Fe is said to have over three-dozen springs, many of them of the first magnitude.

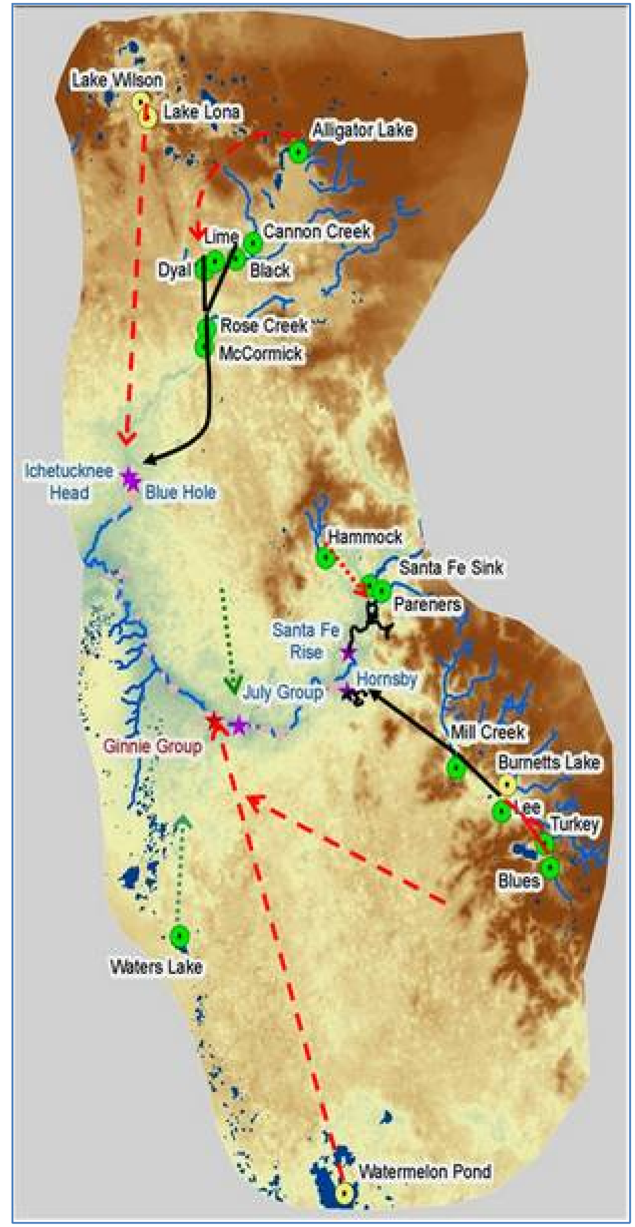
Trip Description

This section of the river is very popular with canoeists and divers because of the vast array of beautiful springs. The river is occasionally shallow and the occurrence of rocky shoals makes it undesirable for large motorboats. In addition, low swampy terrain makes it unsuitable for housing developments and, for the time being, it is one of the loveliest spots in Florida.

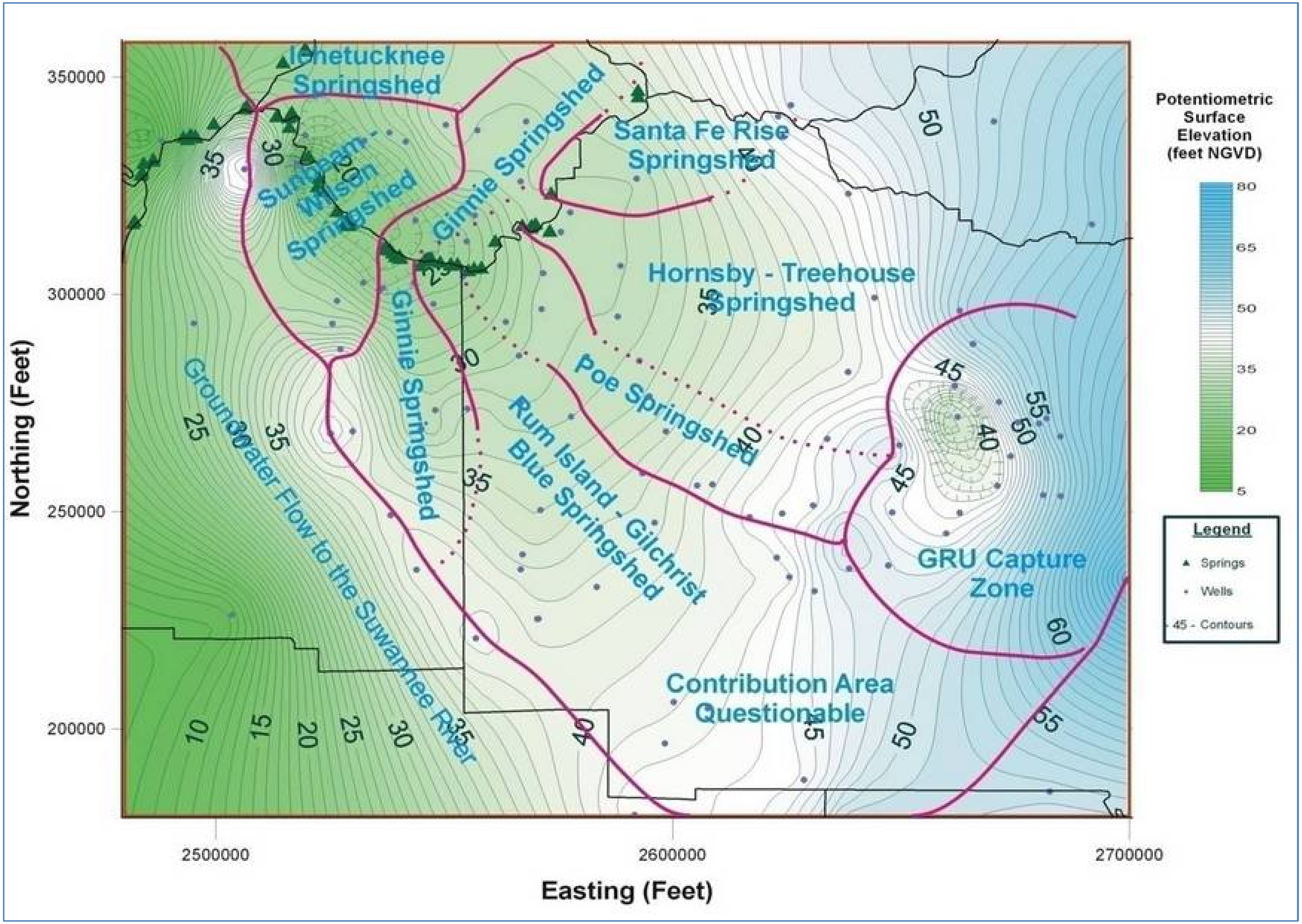
Alligator Siphon and Rise

The Alligator Siphon is located in a small cove, about 25 feet in diameter. It is in the right bank of the Santa Fe River about 5600 feet upstream of the Highway 27 bridge. It is prominently labeled on the USGS map as



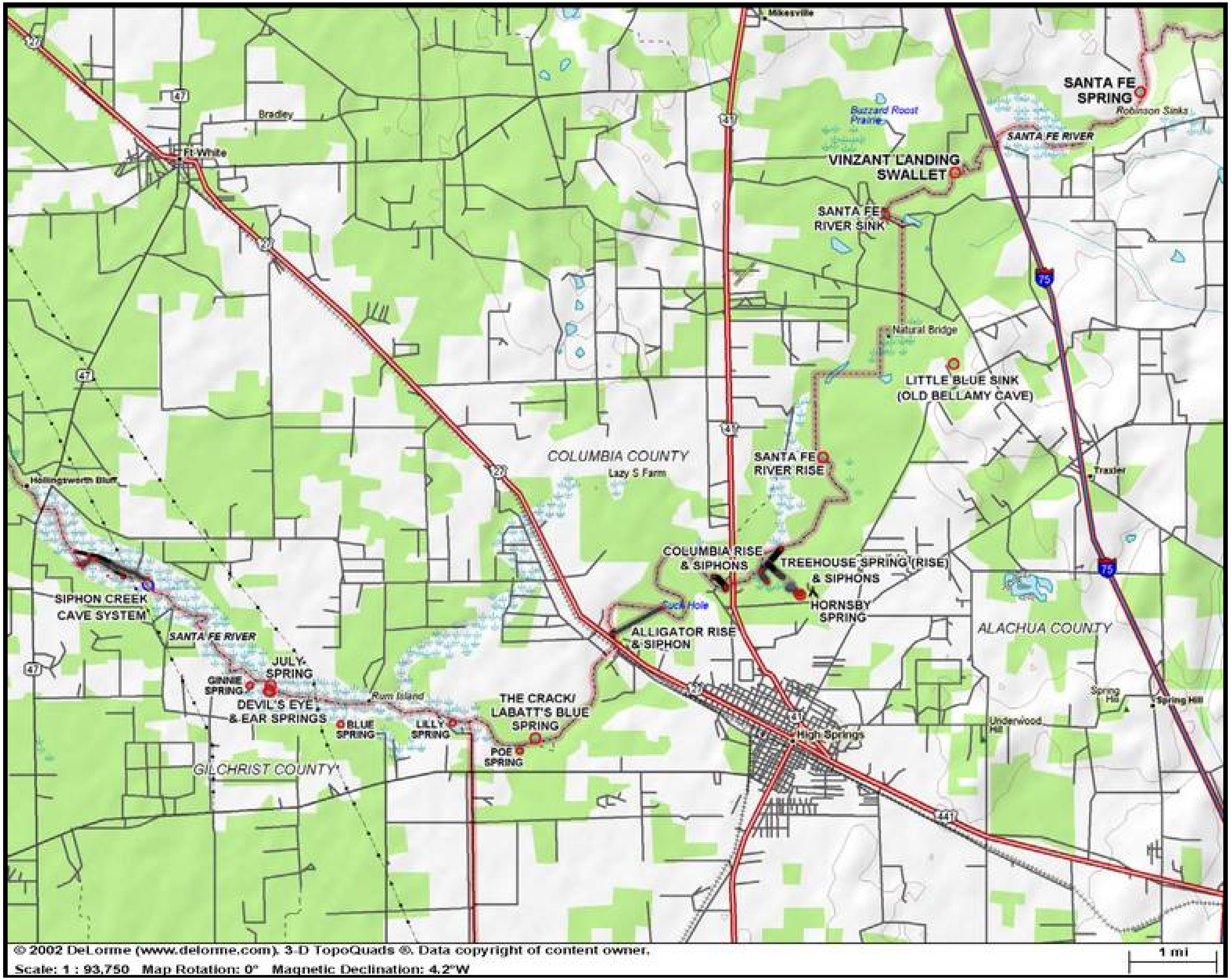


Maps of springsheads and flow paths in Santa Fe River basin (Courtesy of Todd R. Kincaid, Ph.D., Geohydros, LLC. Modeling project funded by Coca-Cola North America.)



From 'Springsheds of the Santa Fe River Basin' (Upchurch, et al, 2008).

Santa Fe River HWY27 – Santa Fe River County Park/HWY 47



Map of the Lower Santa Fe River, showing swallet and rise connections.

"Suck Hole". A significant amount of the Santa Fe River is diverted into Alligator Rise Cave at this siphon. The SRWMD once estimated that Alligator Siphon was taking in about 200 cfs. The cave is at least 3600 feet long.

Alligator Rise is located about 750 feet upstream of the Highway 27 bridge. It is about 150 feet upstream of the Columbia County public boat ramp. The rise discharges from a large opening in the rocky bed of the Santa Fe River at a depth of about 20 feet. The water discharging here is river water that was diverted underground at the Alligator Siphon, which is located about 4900 feet upstream. The Alligator Rise cave averages about 100 feet deep. The cave passes under a small sinkhole about 200 feet upstream of the rise.

The Crack/Labatt's Blue Spring, Fenceline Spring, and Rapids

Just over one mile downstream of the Highway 27 bridge, the SFR makes a turn to the left, where Fenceline Spring is located on the left bank. The river then flows through a narrower channel with houses perched high upon the left bank. It then opens wide to an area of rapids, with the 'The Crack' Spring on the right bank.

The Crack/Labatt's Blue Spring is a deep fissure that intersects with an upstream-downstream cave passage at its bottom. Depending on the prevailing groundwater and river levels, The Crack can either discharge as a spring when high groundwater levels are high or receive water from the river as a siphon if both groundwater and river levels are low.

At low river levels, water in the upstream passage typically continues into the downstream passage and also discharges from the spring. Other observations within the cave indicate the possibility (as yet unconfirmed) that at times of high river stage, the upstream tunnel may reverse, with river water entering both sides of the cave. The downstream passage appears to always take water in a route sub-parallel below the river, and downstream to one or more probable discharge points. The rise (or rises) is as yet unidentified, but could be one or more of several springs, including Poe, Watermelon I and II, Seven Sisters, Lilly and Pickard Springs. The relationship of features in this area of the river is not yet completely understood, and further study of groundwater pathways here is needed.

Poe Springs, Watermelon Springs I and II

Below the rapids is Poe Springs. A large spring boil flowing from a horizontal cavern with several smaller boils nearby, this spring forms a circular pool about 90 feet in diameter. It is connected to the river by a 175 foot run. Poe Springs typically has a greenish cast to its waters. In the last several years, the discharge of Poe Springs had dropped to a trickle at one point, and then had a significant flow reversal when the river rose during the next flood event. Watermelon Spring I is a pool with a long run parallel to the SFR in the woods along the left bank. Watermelon Spring II is visible as a pronounced boil along the left bank of the SFR just below the Poe Run/SFR confluence.

At one time there was commercial development here but no evidence of it remains. It is now an Alachua County Park and popular swimming and picnicking spot. Poe Spring marks the beginning of lowland and swampy areas along the banks that are spotted with small springs. Numerous turtle studies have been conducted here.

Lilly/Pickard Springs, Seven Sisters Run

On the right bank below Poe Springs, there is a run, sometimes dry, that is the discharge for a group of springs in the bottomland woods there called the Seven Sisters. Remnants of an old wooden control structure can be seen there at low water.

Lilly Springs is located less than a mile from Poe Spring on the left bank. There is a run into the main spring, where one can often meet and chat with local personality and springs caretaker Naked Ed. Additional vents for Lilly Springs can be observed along the bank and on the river bottom. The pool for Pickard Spring is also on the left bank just a few yards downstream of Lilly, and it discharges directly into the SFR.

Rum Island and Spring Area

Several small springs lie along and in the SFR on its right bank just above Rum Island. These include Kelly, Hog, and a significant as-yet un-named vent. Jonathan Spring is on the right bank just before reaching an island in the river.

The SFR splits into two channels at Rum Island; most river navigation takes the left channel as it has the higher flow. Rum Island is surrounded by a series of small spring vents. The right channel runs along Rum Island (Columbia) County Park, which has a boat ramp. On the right bank at the downstream end of the park is Rum Island Spring. This spring lies directly along the river, and has some smaller vents that extend out into the channel

Blue Springs Group

The Blue Springs Group begins on the left bank near Rum Island with the run for Johnson Spring. Just below Rum Island Spring on the left bank, the Blue Spring run joins the SFR. One will need to paddle about one-quarter mile up the run to Blue Spring and Naked Spring. Nearby Little Blue Spring is the fourth main member of this spring group. Blue Spring is a privately owned recreation and camping park with admission fees. Unless paying to enter the park, stay in boats and the water, and do not use the boardwalk that extends along the run to the SFR.

Devil's Eye/Ear Group

Downstream of Blue Springs are July Spring on the right bank and Devil's Eye and Devil's Ear springs on the left. The Devil's Ear cave system is the largest on this part of the river with more than 10,000 feet of underwater passages. Devil's Eye and Devil's Ear are connected with July Spring across the river. Little Devil's Spring lies at the end of the Devil's Eye Run, but is not connected to the Eye/Ear Cave System; it's waters appear to be related to those of Ginnie Springs. The land area here is within the Ginnie Springs Outdoors private park.

Devil's Eye/Ear Cave System

The Devil's Eye/Ear Cave System is located upstream of Ginnie Springs and downstream of Blue Springs and runs sub-parallel to the Santa Fe River It flows in the same general direction. It has three principle points of discharge; July Spring, Devil's Ear Spring, and Devil's Eye Spring. A very small fourth point of discharge is "Lightning Spring", a small vent located off the right bank immediately upstream of the July Spring cove. It is often associated with July Spring. In the section of cave north of July Spring, cave divers have documented numerous passages that transmit water into "siphon" passages that have no known surface discharge points. This cave system is extremely popular among cave divers. The system varies in depth, but it is typically between 70 and 110 feet deep.

July Spring

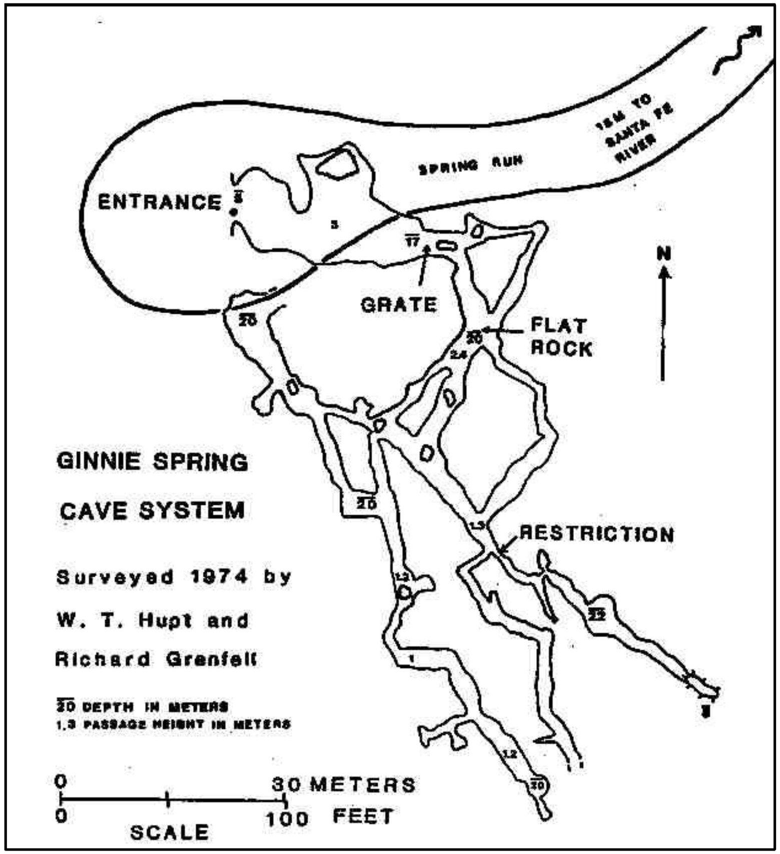
July Spring is located within a cove on the right bank of the Santa Fe River in Columbia County. It is the most upstream discharge point of the cave relative to the cave system passages. It consists of several powerful vents along a fracture in the limestone. Divers regularly visit this location having entered through the Devil's Ear or Devil's Eye Spring. The opening is narrow enough that a diver cannot pass in or out of this spring, but at a depth of 60 feet directly below one of its vents, daylight can be observed. July Spring is fed with water from one of the main trunk passages of the cave, known to cave divers as the "Hill 400 Line" tunnel. This spring is located about 850 feet upstream of the Devil's Ear Spring vent via cave passage. The direct linear distance between these two features on the land surface is about 350 feet.

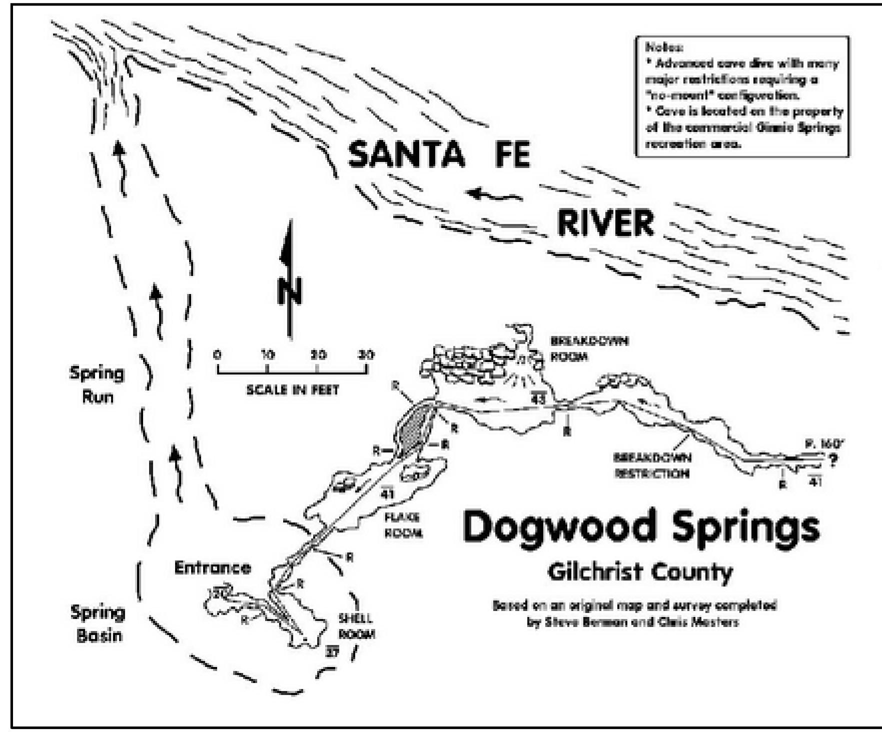
Devils Ear and Eye Springs

Devils Ear and Eye Springs are the terminal discharge points for the water that does not discharge at July Spring or flow into the siphon passages described above. The Devil's Eye Spring lies within a cove on the left bank of the river in Gilchrist County. Directly north of the Eye and out in the river is the Devil's Ear Spring. They are connected by a short section of cave passage, with the Devil's Eye Spring generally considered to be the most downstream opening, relative to cave passage. Due to their proximity and their positions within the cave, Devil's Eye/Ear and July Spring should always be considered together when considering the discharge of this cave.

Ginnie Springs and Associated Springs

Downstream on the left bank is Ginnie Spring, with its basin and run, and connected to an extensive cave system with some 1,000 feet of passages, though a grate installed in the cavern in the 70's prevents diver access. Ginnie Springs is within the Ginnie Springs Outdoors private park, and there is an extensive





Maps of Ginnie Springs and Dogwood Springs cave systems.

private campground, decks, and facilities for swimmers, tubers, scuba divers, and cave divers. Dogwood Springs lies just downstream from Ginnie Spring on the left bank. It has a significant discharge, and over 150 feet of explored cave passage. Two more smaller springs, Twin and Deer, lie in the park along the left bank just downstream. Sawdust Spring is located on the right bank just upstream from Twin Spring, and is privately owned.

USGS Gaging Station and Rapids

About 1.5 miles downstream of Deer Springs, the USGS Fort White SFR Gauge Station can be seen on the left bank. Immediately below the gauge, there is a rapid, or shoals, where river elevation changes significantly. Historically, this was the site of Dunegin's Mill dam in the 1800's; the mill races are still visible. This rapids marks a change between the various springs groups upstream and the swallet- and rise-dominated cave systems that begin just downstream. Below the private property at the rapids/shoals, all land on the left bank is part of the 47 Bridge Tract owned by the Suwannee River Water Management District, and is designated a primitive recreation area.

Siphon Creek Cave System

The Siphon Creek Cave System is located along and beneath the Santa Fe River between the area known as the Ginnie Springs Group and the Highway 47 bridge. It begins as a split in the river about 1300 feet downstream of a shallow, fast water section known locally as the "Shoals". The most downstream feature of this cave system is about 3900 feet upstream of the Highway 47 bridge.

Although the various surface features of this cave would have been long known to local residents, systematic exploration of the Siphon Creek Cave System was begun in earnest during the low and clear river water periods of 1985-86. The system is described as a "sub- parallel river cave system". The underground routes of the passages follow the strong structural influences (fractures, fissures, and bedding planes) of the local geology and these routes do not conform to or directly follow the surface pattern of the river. At points during exploration, dive teams were as far as a thousand feet or more north of the north river bank.

The system is considered by cave divers to be a "braided" cave of multiple, parallel passages that often intersect. The system consists of three significant siphons (also referred to as swallets) that intake water directly from the river and at least four named discharge points, or rises, of the river. Numerous additional sinkhole openings into the system are all on the Columbia County side of the river. Over 20,000 feet of cave passage connects these features.

The siphons in this system are known as Big Awesome Suck, Little Awesome Suck, and Tract One Siphon. Little Awesome Suck is high on the bank and the only one that will become isolated from river inflow during periods of very low water levels; the other two are formed in the river bottom and always take in river water.

The rises are known as Camp Spring, Whynameit Spring (COL10129720), Siphon Creek Rise, and Myrtles Crack. Camp Spring and the Siphon Creek Rise always discharge significant quantities of water. Whynameit Spring is a small rise that discharges from the passage between Tract One Siphon and the Rise. Myrtles Crack ceases to flow during periods of low river water. It is possible that some of these features could intake water during periods of extremely high river levels, but this has never been observed.

In summary, under normal and low water level conditions, Big Awesome Suck and Tract One Siphon always take river water underground, and Camp Spring and Siphon Creek Rise always discharge water. No known comprehensive quantitative study of water intake and discharge of the Siphon Creek Cave System has been made.

Also located in the Siphon Creek Cave System area are the Gilchrist S6 Swallet and the GIL1012971 Spring. These features lie within the Gilchrist County Side of the river and south of the Siphon Creek Cave System. They have not yet been found to connect to that system, and they may represent openings to a separate, parallel system.

Big Awesome Suck

This feature is the most upstream of the Siphon Creek Cave System features, and lies at the bottom of a deep hole formed in the bottom of the channel that flows between an island and the right bank. It begins along the base of a steep wall at about 15 feet of depth. It always receives flow from the river. The SRWMD once estimated that Big Awesome Suck was taking in about 150 cfs.

Little Awesome Suck

This feature is located on the right bank about 1500 feet downstream of Big Awesome Suck. When actively taking river water, it will often have an obvious whirlpool, and contain floating vegetation. This feature becomes isolated from the river during periods of very low water levels. The SRWMD once estimated that Little Awesome Suck was taking in about 50 cfs.

Camp Spring (Rise)

This feature is located on the right bank about 1950 feet downstream of Little Awesome Suck. It has a surface pool that has two discharge channels to the river. The most upstream of these channels extends back from the river as a long crack discharging from under a limestone ledge. This feature always discharges water.

Tract One Siphon

This siphon feature is located on the right bank about 350 feet downstream of Camp Spring and directly beneath a rock outcrop that angles perpendicular to the oncoming flow of the river. The opening to the cave here is large. Based on the relative sizes of the river channel above and below it, the siphon appears to be taking in a significant portion of the river's flow. The cave here drops quickly to over 90 feet deep. It always receives flow from the river.

Most of the water entering Tract One Siphon moves through the passage that leads downstream to the Siphon Creek Rise, with some water discharging at Whynameit Spring. One smaller passage branches off to the northwest. This passage runs below an opening to the surface, the Tract One Crack, about 300 feet to the northwest. This passage then connects near Porta-Potty Sink with another passage bringing water from the swallets upstream. It then continues west to Myrtle's Crack.

Siphon Creek Rise

This feature is located on the left bank about 900 feet downstream of Tract One Siphon. It has a large opening with considerable discharge. The back side of the large entrance cavern drops vertically to over 90 feet deep and then continues upstream to the Tract One Siphon. This cave passage has jagged walls due to the solution of the limestone by the aggressive river water and strong water velocities. This feature always discharges water. A small vent on the left bank just upstream of the main vent, GIL1012972, discharges water through the roof of the large cavern. This feature is also referred to as the Siphon Creek Resurgence by cave divers.

Myrtle's Crack

This discharge feature is located on the right bank about 750 feet downstream of the Siphon Creek Rise. Myrtle's Crack is a long, vertical crack set back about 60 feet from and parallel to the river. It drops straight down to a depth of 90 feet. Two similar water-filled cracks are located immediately to the east of this feature. Myrtle's Crack becomes progressively isolated from the river as water levels drop in dry periods. Discharge diminishes, eventually ceasing, until water levels rise. Myrtle's Crack is the most known downstream feature of the Siphon Creek Cave System.

Gilchrist S6 Swallet

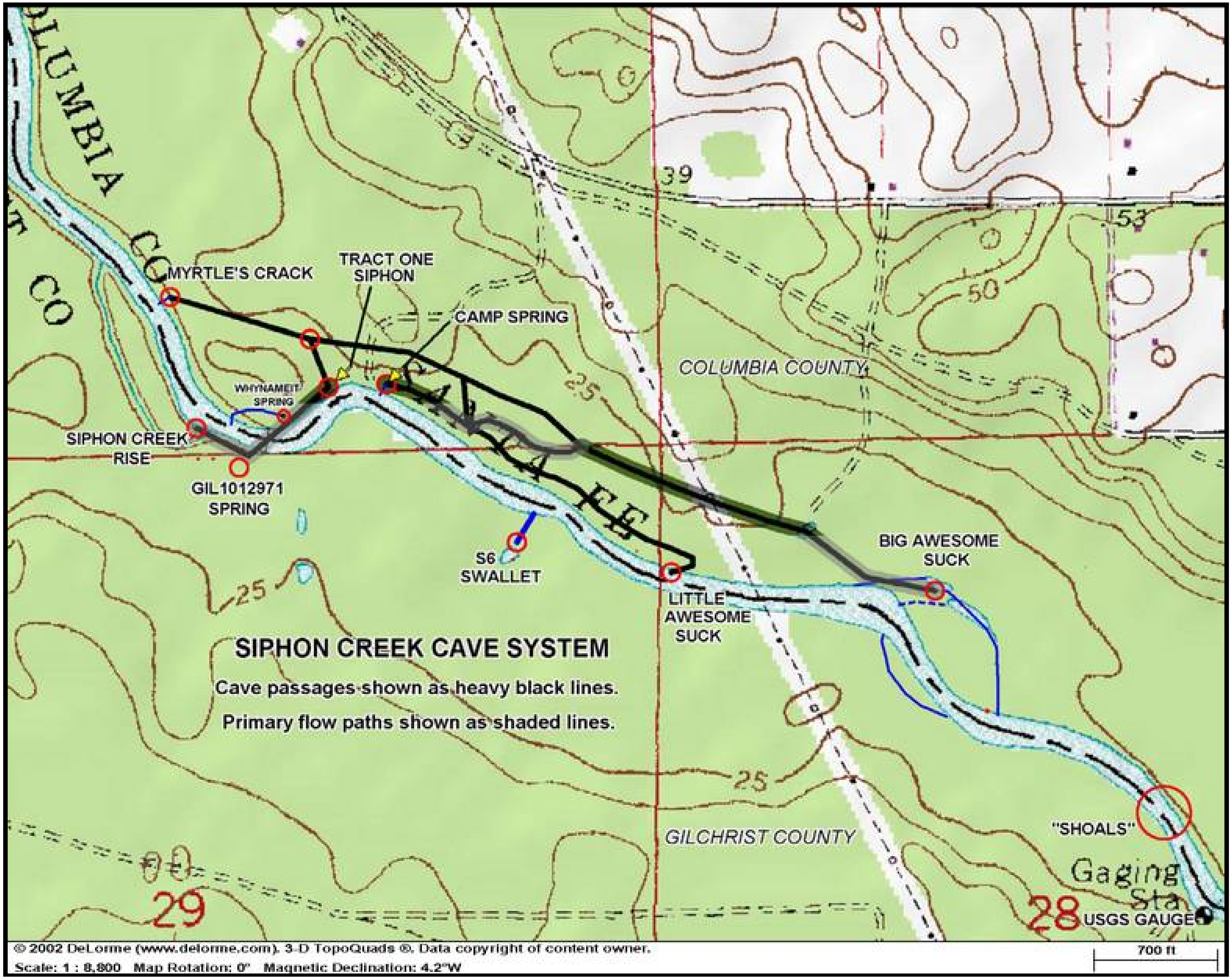
This feature is located on the right bank about 750 feet downstream of the Siphon Creek Rise. It actively takes in water from the Santa Fe River, but as exploration at this site has been minimal, the ultimate destination of that water remains unknown. It is not known to be connected to the Siphon Creek Cave System. It is speculated that this swallet connects to the GIL1012971 Spring located downstream and to the west. Numerous other water filled features, some connecting to caves, are located on the floodplain between these two features.

GIL1012971 Spring

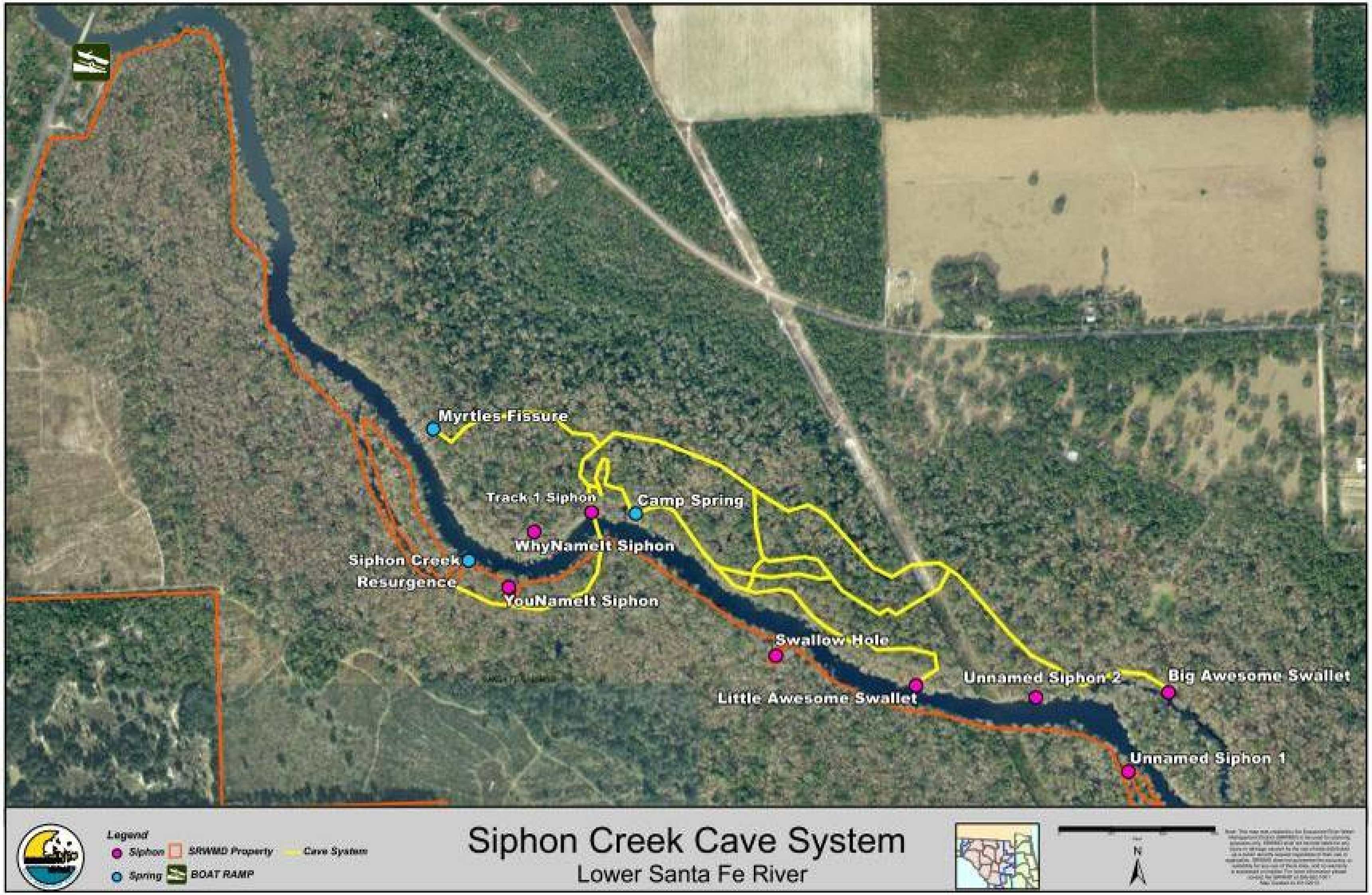
This feature is located on the left bank about 1600 feet west and downstream of the Gilchrist S6 Swallet and near the Siphon Creek Rise. It has typically been observed to be discharging dark water, most probably river water. It is not known to be connected to the Siphon Creek Cave System. Here again, as exploration at this site has been minimal, the ultimate source of that water remains unknown. It is speculated that the Gilchrist S6 Swallet is a source. Further exploration and dye tracing could help to establish the relationship of these two features.

Below the Siphon Creek Cave System Features to the Take-out at Santa Fe River County Park

Below the most downstream features associated with the Siphon Creek Cave System to the 47 Bridge, the SFR has no more significant karst hydrogeological features, but contains interesting canyons on the river bottom, and scenic banks. The SRWMD 47 Bridge Tract extends to the Santa Fe River County Park, a popular SFR access point on the left bank. Just below the 47 Bridge, there is a spring in the middle of the river. Another popular access point, the Hollingsworth Bluff Ramp, lies just downstream on the right bank.



Map of the Siphon Creek Cave System and Santa Fe River, showing known flow connections.



Aerial with cave map of the Siphon Creek Cave System and Santa Fe River. Prepared by Suwannee River Water Management District.

Big Awesome Suck.

Little Awesome Suck.

Camp Spring.

Tract One Siphon.

Siphon Creek Rise.

Myrtle's Crack.

SWALLET/RESURGENCE RELATIONSHIPS ON THE LOWER SANTA FE RIVER, FLORIDA									
RELEVANT FEATURES AND GPS POSITIONS: LOWER PORTION OF STUDY AREA									
	Hand-Held GPS Coordinates							**SRWMD Coordinates**	
	DECIMAL MINUTES		GPS	**SRWMD**	**Bank Side**	**County**		**DECIMAL MINUTES**	
SITE NAME:	**LATITUDE**	**LONGITUDE**	+/-	**Name/Number**	**Position**			**LATITUDE**	**LONGITUDE**
ALLIGATOR RISE AREA									
Alligator Swallet	N 29° 50.940'	W 82° 37.300'	(from	S3	Right	Columbia		N 29° 50.917'	W 82° 37.317'
Alligator Rise	N 29° 50.677'	W 82° 37.858'	map)	ALA930972	Left	Alachua		N 29° 50.663'	W 82° 37.865'
POE SPRINGS AREA									
The Crack/Labatt's Blue Spring	N 29° 49.643'	W 82° 38.756'	-	COL428982	Right	Columbia		N 29° 49.633'	W 82° 38.750'
DEVIL'S EYE/EAR CAVE									
Devils Eye Spring	N 29° 50.114'	W 82° 41.807'	20	Devil's Ear	Left	Gilchrist		N 29° 50.100'	W 82° 41.800'
Devils Ear Spring	N 29° 50.107'	W 82° 41.790'	20	Devil's Eye	Left	Gilchrist		N 29° 50.083'	W 82° 41.800'
July Spring	N 29° 50.174'	W 82° 41.784'		July	Right	Columbia		N 29° 50.150'	W 82° 41.783'
SIPHON CREEK CAVE SYSTEM									
Island upstream point at river split	N 29° 51.115'	W 82° 43.136'	20	(for reference only)	Right	Columbia			
Big Awesome Suck (south side)	N 29° 51.227'	W 82° 43.192'	18	S4	Right	Columbia		N 29° 51.200'	W 82° 43.183'
Little Awesome Suck	N 29° 51.244'	W 82° 43.475'	21.8	S5	Right	Columbia		N 29° 51.217'	W 82° 43.467'
Camp Spring (Rise)	N 29° 51.420'	W 82° 43.781'	13	COL1012971	Right	Columbia		N 29° 51.400'	W 82° 43.783'
Tract One Siphon	N 29° 51.417'	W 82° 43.843'	23	-	Right	Columbia			
Tract One Crack ("river" end)	N 29° 51.462'	W 82° 43.863'	16	-	Right	Columbia			
Whynameit Spring	-	-		COL1012972	Right	Columbia		N 29° 51.367'	W 82° 43.900'
Siphon Creek Rise	N 29° 51.379'	W 82° 43.985'	16.5	GIL1012973	Left	Gilchrist		N 29° 51.350'	W 82° 43.983'
				GIL1012972	Left	Gilchrist		N 29° 51.350'	W 82° 43.967'
Myrtle's Crack	N 29° 51.501'	W 82° 44.013'	17.2	COL928972	Right	Columbia		N 29° 51.467'	W 82° 44.033'
Gilchrist S6 Swallet	N 29° 51.272'	W 82° 43.641'	FGS	S6	Left	Gilchrist		N 29° 51.317'	W 82° 43.933'
GIL1012971 Spring	N 29° 51.342'	W 82° 43.939'	-	GIL1012971	Left	Gilchrist		N 29° 51.250'	W 82° 43.633'
Notes:	WGS84 Map Datum								

SWALLET/RESURGENCE RELATIONSHIPS ON THE LOWER SANTA FE RIVER, FLORIDA					APRIL, 2007		
TABLE OF SWALLET/RESURGENCE CONNECTIONS AND COORDINATES							
SWALLET/FEATURE NAME:	**GPS COORDINATES***		**CONNECTS TO:**	**RESURGENCE NAME:**	**GPS COORDINATES***		
	DECIMAL DEGREES		(Straightline distance		DECIMAL DEGREES		CONNECTION
	LATITUDE	LONGITUDE	estimated in feet)		LATITUDE	LONGITUDE	CONFIRMED BY:
SANTA FE RIVER SITES							
Santa Fe Spring/Columbia Blue	N 29.93445°	W 82.53055°	?	**Unknown**	-	-	(limited dive recons only)
(COL61981) (RB)							
(Siphon conditions have been reported)							
Vinzant Landing Swallet (RB)	N 29.92108°	W 82.56584°	?	**Unknown**	-	-	(limited dive recons only)
Santa Fe River Sink	N 29.91400°	W 82.57930°	2.9 miles	**Santa Fe River Rise**	N 29.87390°	W 82.59103°	Dye, Diving (partial)
Little Blue Sink; Old Bellamy Cave	N 29.88938°	W 82.56612°	1.85 miles	**Santa Fe River Rise**	N 29.87390°	W 82.59103°	Diving
TREEHOUSE SPRING (RISE) AREA							
RRSP Suck (S1) (LB)	N 29.85717°	W 82.59902°	1870	**Treehouse Spring (Rise)** (ALA112971)	N 29.85488°	W 82.60292°	Diving
				(aka "Blackman's Hole") (LB)			
Hornsby Run Swallet (LB)	N 29.85372°	W 82.60123°	660	**Treehouse Spring (Rise)** (ALA112971)	N 29.85488°	W 82.60292°	Diving
(Receives water from Hornsby Spring Run)							
Treehouse Swallet (LB)	N 29.85112°	W 82.59533°	2770	**Treehouse Spring (Rise)** (ALA112971)	N 29.85488°	W 82.60292°	Diving:partial,
(Receives water from Hornsby Spring Run)							not yet fully confirmed.
COLUMBIA SPRING (RISE) AREA							
Columbia Swallet-Right Bank (S2)	N 29.85258°	W 82.60967°	900	**Columbia Spring (Rise)** (RB)	N 29.85417°	W 82.61185°	Diving
Columbia Swallet-Left Bank	N 29.85220°	W 82.60962°	1100	**Columbia Spring (Rise)** (RB)	N 29.85417°	W 82.61185°	Diving
ALLIGATOR RISE AREA							
Alligator Swallet	N 29.84900°	W 82.62167°	3350	**Alligator Rise**	N 29.84462°	W 82.63097°	Diving
(S3) (RB)				(ALA930972) (LB)			
Notes:							
RB,LB = Right Bank, Left Bank	*GPS coordinates from handheld receivers, and from FGS and SRWMD sources. Converted to decimal degrees.						Page 1 of 2

SWALLET/RESURGENCE RELATIONSHIPS ON THE LOWER SANTA FE RIVER, FLORIDA					**APRIL, 2007**		
TABLE OF SWALLET/RESURGENCE CONNECTIONS AND COORDINATES (Continued)							
SWALLET/FEATURE NAME:	**GPS COORDINATES***		**CONNECTS TO:**	**RESURGENCE NAME:**	**GPS COORDINATES***		
	DECIMAL DEGREES		(Straightline distance estimated in feet)		DECIMAL DEGREES		CONNECTION
	LATITUDE	LONGITUDE			LATITUDE	LONGITUDE	CONFIRMED BY:
POE SPRINGS AREA							
The Crack/Labatt's Blue "Spring"	N 29.82738°	W 82.64593°	?	**Unknown**	-	-	(limited dive recons only)
(COL428982) (RB)							
SIPHON CREEK CAVE SYSTEM							
Big Awesome Suck (S4) (RB)	N 29.85378°	W 82.71987°	3330	**Camp Spring (Rise)** (COL1012971) (RB)	N 29.85700°	W 82.72968°	Diving
Big Awesome Suck (S4) (RB)	N 29.85378°	W 82.71987°	4650	**Myrtle's Crack** (COL928972) (RB)	N 29.85835°	W 82.73355°	Diving
Little Awesome Suck (S5) (RB)	N 29.85407°	W 82.72458°	1950	**Camp Spring (Rise)** (COL1012971) (RB)	N 29.85700°	W 82.72968°	Diving
Tract One Siphon (RB)	N 29.85695°	W 82.73072°	300	**Tract One Crack** (RB)	N 29.85770°	W 82.73105°	Diving
Tract One Siphon (RB)	N 29.85695°	W 82.73072°	300	**Whynameit Spring** (COL1012972) (RB)	N 29.85612°	W 82.73167°	Diving
Tract One Siphon (RB)	N 29.85695°	W 82.73072°	800	**SFR cavern vent** (GIL1012972) (LB)	N 29.85583°	W 82.73278°	Diving
Tract One Siphon (RB)	N 29.85695°	W 82.73072°	780	**Siphon Creek Rise** (GIL1012973) (LB)	N 29.85632°	W 82.73308°	Diving
Tract One Siphon (RB)	N 29.85695°	W 82.73072°	1040	**Myrtle's Crack** (COL928972) (RB)	N 29.85835°	W 82.73355°	Diving
Siphon S6 (LB)	N 29.85417°	W 82.72722°	?	**Unknown**	-	-	**-**
Unknown	-	-	?	**Spring GIL1012971**	N 29.85528°	W 82.73222°	**-**
Notes:							
RB,LB = Right Bank, Left Bank	*GPS coordinates from handheld receivers, and from FGS and SRWMD sources. Converted to decimal degrees.						Page 2 of 2

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Map of the Lower Santa Fe River, showing springs, swallet and rises. Prepared by Alachua County Environmental Protection Department.