FLORIDA STATE UNIVERSITY

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DYE TRACING INVESTIGATES CONDUIT CONNECTIONS BETWEEN LOST CREEK SWALLET, SPRING CREEK SPRINGS AND THE LEON SINKS – WAKULLA CAVE SYSTEM

By

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This work is dedicated to my parents, wife, daughters and my unborn son whose arrival we joyfully await early March 2016.

My parents instilled in me a respect, honor and love of nature. They taught me that nature sustains us, therefore we are to be good stewards, not wasteful or glutinous with the bounty of natural resources by which we are blessed. Daddy led by example, while we were in the woods he always managed to pick up debris, waste or garbage. He took pride in leaving places we would visit in a better condition than we found it. Daddy respected the land, the game that inhabited it, the laws that governed it and the landowners whom shared their special places. Mom, you taught me how to love, think, work, communicate and apply myself to something that was meaningful not only to me, but to others as well. My parents imparted on me the importance of being respectful and grateful for the people in my life, things I had, privileges I enjoyed and the opportunities before me. Thank you for the sacrifices you made on my behalf that provided me with so many life choices and opportunities. I love you.

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I would additionally like to dedicate this thesis to the Spears brothers, Lee Nell and "Doodle Bug", their wives, and children of Spring Creek, Wakulla, County, Florida. The Spears are direct descendants of early settlers to Spring Creek shortly after the Civil War. Thanks to these gentlemen and their ancestors, Spring Creek and the historical way of life it supported are still with us today. Had it not been for the Spears' family, Spring Creek would have become another Shell Point decades ago. Thank you for sharing your historical perspective and anecdotal observations of Spring Creek Springs. I greatly appreciate your support of my work, your protection and above all the friendship we have developed. I respect and appreciate you both.

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To the private landowners who granted access to your property – Thank You!! For the sake of your anonymity I decided not to mention you by name. Know that by granting access to your property, you have made an indelible mark on karst hydrology in Wakulla, County. Your property has proven to be a unique and intricate feature in the complexity of the Wakulla, County conduit system.

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ABSTRACT

Lane (2001) proposed that the flow from Lost Creek contributed to the discharge of Spring Creek Springs via an unverified conduit system similar to the verified conduit system that contributes flow to Wakulla Spring. In order to investigate this hypothesis two separate dye trace studies were conducted in 2008 and 2009 at Lost Creek swallet. Fluorescent dye was pumped by a peristaltic pump through tubing anchored below the surface of the water (15 meters in 2008 and 27 meters in 2009) directly into the throat of the Lost Creek swallet. Dye tracer sampling was conducted within the study area at select karst windows that had confirmed conduit access 38 meters to 68 meters below land surface. Sampling was also conducted at Wakulla Spring and Spring Creek Springs. Sampling at the karst windows was accomplished via pumps, timers and tubing to ensure that water samples were acquired from water within the conduits. In preparation for the 2009 Lost Creek swallet dye trace an array of water level elevation stations were established at seven selected karst windows along a north-south transect through the study area.

The 2008 dye trace confirmed that flows from Lost Creek swallet contributed to discharge at Spring Creek Springs and Wakulla Spring. The velocities for first detection at Spring Creek Springs and Wakulla Spring were 2,235 m/d and 255 m/d respectively. These linear velocities confirmed a conduit connection between Lost Creek swallet, Spring Creek Springs and Wakulla Spring. The 2008 trace also confirmed detections at Revell Sink, a karst window, equidistant between Lost Creek swallet, Wakulla Spring and Spring Creek Springs. The 2009 dye trace confirmed that flows from Lost Creek swallet contributed to the discharge at three separate spring vents in the Spring Creek Springs with linear velocities of 248 m/d to 313 m/d. In 2009 tracer detections confirmed conduit connections at Revell Sink and Punchbowl Sink (two karst

windows) along the water level elevation monitoring transect. The combined results of the 2008 and 2009 tracer tests confirmed that Lost Creek swallet and Spring Creek Springs are an extension of the Leon Sinks – Wakulla Spring cave system.

The water level elevation data demonstrated reversals of the hydraulic gradient and reversals of groundwater flow between Wakulla Spring and Spring Creek Springs. Statistical analysis of the water level elevation data at the karst window stations revealed two primary groups of behavior among the karst window stations. The analysis also revealed behavior that supports the conclusion that during negative discharge conditions at Spring Creek Springs the karst windows stations responded as if they were connected to a unified conduit system. Whereas, during positive flow conditions at Spring Creek Springs the karst windows stations revealed water level elevation behavior that indicated there may be two sets of conduits that together form a basin wide unified conduit system.

CHAPTER 1

INTRODUCTION

Overview

Wakulla Springs, Spring Creek Springs and the Lost Creek swallet are situated on the coastal karst region of Wakulla County, Florida. The springs are classified as first magnitude springs, demonstrating a discharge greater than 2.8 m^3 (Scott et al., 2002). Wakulla Spring is located about 17 km inland from the Spring Creek Springs (Figure 1.1), which are located in an estuary along the southern coast of Wakulla County (Lane, 2001). The discharges of Wakulla Spring and Spring Creek Springs have been observed to vary significantly (Davis et al., 2010). The variations in discharge of the spring systems can take place over short intervals of time and this behavior can be described as "flashy". Although the discharge of the Spring Creek Springs has been known to be highly variable, it was not until approximately 1995 that Spring Creek's discharge was reported to reverse and actually siphon seawater from the estuary (Lane, 2001). The siphoning of Spring Creek Springs presents obvious questions and concerns regarding changes to the hydrological regime and the potential for salt water intrusion into the southern reaches of Wakulla County.

Flow into the Lost Creek swallet is mainly derived from precipitation draining from within the Apalachicola Coastal Lowlands in the western portions of Wakulla and Leon Counties. Lost Creek flows southward to the western margin of the Woodville Karst Plain and drains into Lost Creek swallet. The flow of Lost Creek can vary from a trickle to 56.6 m^3/s. Lane (2001) was the first to formally hypothesize that Lost Creek flow draining into Lost Creek swallet was a primary contributor to the discharge of Spring Creek Springs. Worthington (2015) noted that channel networks in unconfined carbonate aquifers have fractal-like properties, which result in dendritic networks merging into a limited number or single master underground channels. Given the extensive karstification of the area exemplified by springs, sinkholes, swallets and previously mapped conduits, there is justification for the speculation that Lost Creek swallet is connected to Spring Creek Springs and possibly Wakulla Spring via an, as of yet, unverified conduit connection.

Hypothesis

Previous research (Kincaid et al., 2012) conducted in the northern and central extent of the Woodville Karst Plain has demonstrated that Wakulla Spring discharges water derived from multiple conduit systems flowing from the northern portion of the Wakulla County. A network of minor conduits converging into a primary or master conduit (Kincaid et al., 2012) like those described by Worthington (2015) has been demonstrated to exist. At least one of the conduits has been shown to be supplied with surface flow from swallets along the western edge of the exposed aquifer unit. A similar scenario has been proposed for the Spring Creek Springs (Lane, 2001). Lane (2001) postulated that the surface water draining into Lost Creek swallet contributes significantly to the discharge of Spring Creek Springs. The existence of a conduit connection between Lost Creek swallet, Spring Creek Springs and the known Wakulla Spring conduit system has not been firmly established and warrants verification.

This study will attempt to determine if: 1) Lost Creek flow contributes to the discharge of Spring Creek Springs,2) a conduit between Lost Creek swallet and Spring Creek Springs can be verified, 3) a conduit between Lost Creek swallet and Spring Creek Springs is connected to the Leon Sinks – Wakulla Cave system 4) the water level elevations at karst windows in the area of investigation reveal changes in flow regime within the Wakulla Spring and Spring Creek Springs springshed.

Area of Investigation

The area of investigation (Figure 1.1) lies within the Woodville Karst Plain of southern Leon County and central Wakulla County, Florida. This area encompasses the western, central portion of the Woodville Karst Plain in Wakulla County. Wakulla Spring is situated in the center of the study area and Spring Creek Springs occupies the southern limit. Lost Creek swallet is positioned on the western margin of the Woodville Karst Plain about equidistant between the two spring systems which are the subject of this study. Karst windows (sinkholes and swallets that connect to the conduit system and extend to the main groundwater table) were selected for monitoring water-level elevations and dye detection stations. The selected locations are positioned along a north - south transect, just west of a center line of the study area connecting Wakulla Spring and Spring Creek Springs. This defined area and the instrumented sites were chosen because they offer an ideal setting in which to monitor and investigate the possibility of conduit connections between two first magnitude springs and swallets that permit surface water inflow into to the underground conduit systems.

Overview of Research

This study will examine the possibility of a conduit connection between the Lost Creek swallet, Spring Creek Springs and Wakulla Spring systems by analyzing the results of a dye trace conducted May - July of 2008 and a second trace conducted July - October of 2009. Any detection and the resulting break through curves from detection sampling stations will be utilized to test for evidence of conduit connections between injection at Lost Creek swallet and sampling stations at and between Spring Creek Springs and Wakulla Spring. This study will also collect, plot, and analyze discharge data for Lost Creek, Wakulla Spring and Spring Creek Springs for the time frame of the 2008 and 2009 dye traces of Lost Creek swallet. Water level elevation data from sampling stations established at karst windows through the study area will be utilized to study groundwater gradients for the period of December 2008 through March of 2010.

Significance of Research

Coastal karst systems are utilized for freshwater resources in many locales around the world. In many locations, the occurrence of sea level changes and salt water intrusion are a concern (Panagopoulos and Lambrakis, 2006; Fleury et al., 2007; Bonacci and Roje-Bonacci, 1997). Studies evaluated by the Intergovernmental Panel of Climate Change indicate the possibility that a 0.5 – 2.0 meter rise in sea level within the next one hundred years could produce dramatic effects on coastal water resources (Barker, 2007). To better manage our coastal karst systems, a more thorough understanding of the different components of groundwater flow in coastal karst is required. The Woodville Karst Plain is an exceptional laboratory for the study of coastal karst systems. The development of an applicable conceptual model for the conduit system in the Wakulla Spring and Spring Creek Springs' springshed would facilitate the efforts of researchers and resource managers alike to understand, model and ultimately protect this vital water resource.

The Florida Legislature enacted the Water Resources Act to protect and conserve our vital water resources. The Water-Resources Act contains the statutory directive for the establishment of minimum flows and levels (MFLs). Section 373.042, F.S., directs water management districts to establish MFLs for surface water bodies, watercourses, and aquifers within their respective jurisdictions. Northwest Florida Water Management District is in the process of establishing an MFL for water bodies within the area of investigation. The Northwest Florida Water Management District has supplied equipment, consultation and data for this research. The results of the dye traces performed during this research has influenced the conceptual models and the work plan of the Northwest Florida Water Management District in establishing their MFL for the Wakulla County portion of the Woodville Karst Plain.

The spring systems in the Wakulla County portion of the Woodville Karst Plain are currently being utilized to develop numeric models to understand groundwater flow in a low gradient, karst system (Loper et al., 2005; Chicken et al., 2007; Faulkner et al., 2009; Gallegos et al., 2013; Davis and Verdi, 2013; Xu et al., 2015). A significant limiting factor in these models is the determination of the importance of conduit systems in the models – their total extent, interconnectivity and flux of water transported by the conduits. This study will provide some of the critical information necessary to provide a more realistic model for karst flow dynamics. The ultimate goal of this study is to enable the protection and conservation of karstic coastal water resources present in the Wakulla County portion of the Woodville Karst Plain.

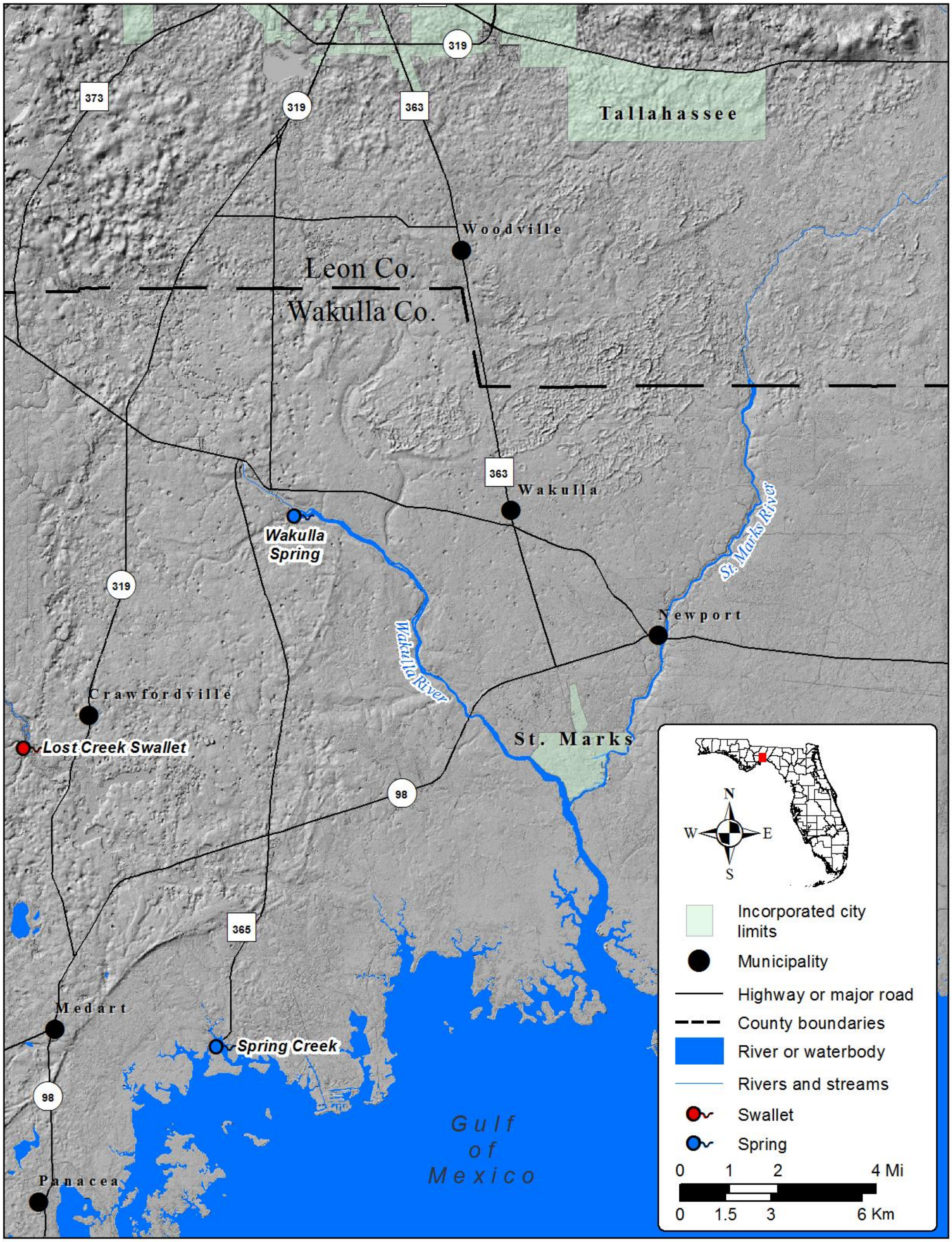


Figure 1.1: Area of investigation.

CHAPTER 2

GEOLOGICAL SETTING

Physiography

Wakulla Springs, the Lost Creek swallet and the Spring Creek Springs are located in the Woodville Karst Plain (Hendry and Sproul, 1966). The western extent of Woodville Karst Plain is situated in Wakulla County in the north Florida panhandle, south of Tallahassee, Florida. Hendry and Sproul (1966) divided the originally defined Gulf Coastal Lowlands of Puri and Vernon (1964) into the two separate physiographic units based on topography and designated them as the Apalachicola Coastal Lowlands and the Woodville Karst Plain (Figure 2.1). Hendry and Sproul (1966) documented that the Woodville Karst Plain had a lower elevation and consisted of a thin veneer of sands underlain by limestone bedrock, whereas, the Apalachicola Coastal Lowlands had a higher elevation with a sandy surface underlain by thick clastic deposits. Hendry and Sproul (1966) observed that both physiographic divisions were genetically related and stated that they may have resulted from similar environmental conditions of the Pleistocene Epoch.

The Apalachicola Coastal Lowlands occupies roughly all of Wakulla County west of U.S. Highway 319 along a north-south line between Crawfordville and Panacea (Rupert and Spencer, 1988). Although the topography of the Apalachicola Coastal Lowlands remains virtually flat west of U.S. Highway 319, the Apalachicola Coastal Lowlands reaches elevations of approximately 45 meters in the northwest corner of Wakulla County (Rupert and Spencer, 1988). The low permeability near-surface sands and clays of the Apalachicola Coastal Lowlands thicken westward toward the Ochlocknee River and are characterized as densely wooded, swamp-like areas, poorly defined creeks and a shallow water table (Rupert and Spencer, 1988). The thickening, low permeability surface sediments of the Apalachicola Coastal Lowlands produce characteristically wet, locally swampy areas especially during the rainy seasons. Despite these conditions, however, lakes within the Apalachicola Coastal Lowlands are noticeably absent (Hendry and Sproul, 1966). A study was conducted by the U.S.Geological Survey in the Bradwell Bay Wilderness Area of the western Apalachicola Coastal Lowlands. The study reported the area to be a flat terrace deposit underlain by as much as 9 meters of low permeability sands, clay, peat and muck of Pleistocene to Holocene age overlying Miocene age limestones (Cameron and Mory, 1977). Numerous creeks, most of which have poorly defined channels, drain the bays (swamp-like areas) and serve as tributaries for larger streams. Three major streams of the Apalachicola Coastal Lowlands are the Ochlocknee River, the Sopchoppy River and Lost Creek (Rupert and Spencer, 1988).

The Woodville Karst Plain encompasses the eastern portion of Wakulla County and continues eastward around the Big Bend of Florida to the Steinhatchee River (Werner, 2001). The topography of the Woodville Karst Plain is virtually flat with a thin surface of undifferentiated Pleistocene quartz sands (generally less than 7 meters deep) overlying the Saint Marks Formation and Suwannee Limestone (Rupert and Spencer, 1988). The porous and permeable surface sediments of the Woodville Karst Plain permit local precipitation and allogenic recharge from the Apalachicola Coastal Lowlands to the west and Tallahassee Hills from the north to percolate rapidly into the underlying soluble limestone. As a result, extensive karstification is apparent by the numerous sinkholes, karst windows, sinking streams, and springs. The topographic slope of the Woodville Karst Plain is approximately 0.76 m/km to the south. Elevations range from 0 to 10.7 meters above mean sea level. The terrain is one of paleo-sand dunes, sinkholes and limited surface drainage features.

The Tallahassee Hills physiographic province, a topographically high area characterized by hilly topography and several large, internally drained lakes, lies north of the Woodville Karst Plain in Leon County and extend north into Georgia. The topography is considerably higher than the Woodville Karst Plain reaching elevations of 80 meters and characterized by relief of up to 37 meters (Hendry and Sproul, 1966). The resulting slopes, crests and hills were attributed by Hendry and Sproul (1966) to giving the area a mature, gentle and moderate appearance. The hills are comprised of yellow-orange clays, silts, and sands that are poorly cemented. The loamy soils support lush, natural vegetation, and the impermeable sediments have given rise to small, wet weather ponds and lakes in the southern portion of the hills (Hendry and Sproul, 1966). The boundary between the Woodville Karst Plain and the Tallahassee Hills is an abrupt east-west trending escarpment (relief of up to 31 meters) in southern Leon County named the Cody Scarp (Puri and Vernon, 1964; Hendry and Sproul, 1966). The Cody Scarp was attributed by Hendry and Sproul (1966) to possibly represent a Pleistocene-Okefenokee shoreline evidenced elsewhere throughout the state. Possible relict marine terraces in the Woodville Karst Plain include the Wicomico, the Penholoway, the Talbot, the Pimlico and the Silver Bluff (Rupert and Spencer, 1988; Randazzo, 1997). The terraces, including the Cody Scarp, are attributed to near shore erosional or depositional surfaces resulting from Pleistocene regression and transgression of the Gulf of Mexico.

There are four geomorphic subdivisions within the Woodville Karst Plain (Figure 2.1): the Lake Munson Hills, the Wakulla Sand Hills, the River Valley Lowlands (Rupert and Spencer, 1988; Hendry and Sproul, 1966) and the Coastal Marsh Belt (Rupert and Spencer, 1988; Puri and Vernon, 1964).

The Lake Munson Hills located along the western edge of the Woodville Karst Plain were described by Hendry and Sproul (1966) as being paleo-dunes and bars that are 9 to 15 meters higher than the eastern Woodville Karst Plain and contain circular, depression-type lakes not present elsewhere in the Woodville Karst Plain. The silts and clays present in the Apalachicola Coastal Lowlands are believed to have inter-fingered with the sands of the eastern Woodville Karst Plain resulting in lower permeability, less downward percolation of groundwater and less dissolution of the bedrock (Hendry and Sproul, 1966). They speculated that this western portion of the Woodville Karst Plain nearly represented the original depositional surface and elevation of the Woodville Karst Plain and that the sands were probably bars of the offshore area of the Wicomico sea stand.

The Wakulla Sand Hills are in southern Leon County adjacent to the St. Marks River and are attributed to the Pamlico shoreline (Rupert and Spencer, 1988; Hendry and Sproul, 1966). The elevation of these hills, which trend southwest from southern Leon County into Wakulla County and terminate near the Pamlico shoreline, reaches 15 meters above mean sea level. Hendry and Sproul (1966) proposed that these barchan-type dunes have an orientation that suggests a northeast paleo-wind.

The River Valley Lowlands contain the two major streams of the Woodville Karst Plain: The Saint Marks and The Wakulla Rivers. The area is low, swampy and less than 3 meters in elevation (Rupert and Spencer, 1988). The Coastal Marsh Belt, located along the southern edge of the Woodville Karst Plain from the Jefferson County line to nearly Panacea, FL, is attributed to the seaward edge of the Silver Bluff shoreline at an inland elevation of 1.5 meters (Rupert and Spencer, 1988). Sediments along the belt consist of mud and silt, and were probably associated with a marshy, low energy environment (Rupert and Spencer, 1988).

Stratigraphy

The area of investigation within the Woodville Karst Plain is underlain by sedimentary rocks, which range in age from the Paleozoic to Holocene (Rupert and Spencer, 1988). The Cenozoic stratigraphy of this area is presented in Figure 2.2. Most of the sedimentary units are carbonate rocks that dip at very gentle angle to the south (Miller, 1986; Werner, 2001). The lowermost Cenozoic unit, the Paleocene Clayton Formation consists of low-permeability, massive, calcareous marine clay (Miller, 1986).

Eocene sediments, all permeable limestones, listed in order of oldest to the youngest are the Oldsmar Formation, Avon Park Formation and the Ocala Limestone. The Oldsmar Formation consists of permeable limestones, which are located beneath Wakulla, Leon, Jefferson and Madison counties, Florida (Miller, 1986; Davis, 1996). West of Wakulla County the Oldsmar Formation is less permeable as it transitions to an argillaceous unit and interfingers with calcareous clastic rock. The Oldsmar Formation becomes less permeable to the north as it grades from limestone to an argillaceous limestone. The permeable portion of the Oldsmar Formation is approximately 150 meters thick, and ranges in elevation between 515 meters to more than 760 meters below mean sea level (Miller, 1986; Davis, 1996).

Overlying the Oldsmar Formation is the Avon Park Limestone (Miller, 1986; Davis 1996). Davis (1996) reported that like the Oldsmar Formation, the Avon Park Limestone's purity and permeability are restricted to several counties of north central Florida; Wakulla, Leon, Jefferson, Taylor and Madison Counties. Within these counties, Davis (1996) described the limestone as being cream to tan or light brown, soft to well indurated, pelleted limestone with a local micritic nature. Like the Oldsmar Formation, north and west of the immediate study area, the Avon Park Formation grades into less permeable, more argillaceous limestone which grades further updip into calcareous, micritic, glauconitic, shelly, sand and clay beds. The thickness of the unit is approximately 90 meters near the Florida Georgia state line and thickens to approximately 360 meters in the southern portion of the Woodville Karst Plain (Miller, 1986; Davis 1996). The elevation reported by Davis (1996) for the permeable portion of the Avon Park is from 240 meters to 305 meters below sea level.

The youngest Eocene unit underlying the study area is the permeable Ocala Limestone (Miller, 1986; Rupert and Spencer, 1988; Davis, 1996). The thickness of the Ocala Limestone ranges from 60 meters outside and north of the study area to about 152 meters thick along the southern boundary of the Wakulla County Woodville Karst Plain. The elevation range given by Davis (1996) for the top of the Ocala Limestone is approximately 60 meters above sea level near the Florida Georgia state line and to 150-300 meters below mean sea level in the southern portion of the study area. Davis (1996) stated that the upper and lower Ocala Limestone has two distinct lithologies. The upper Ocala is a white, soft, friable coquina containing foraminifera, bryozoans and echinoids (Davis, 1996). The lower Ocala is a cream to white, fine grained, soft to moderately indurated micritic limestone with plentiful miliolids and large foraminifera.

Although Eocene units are very important to the deeper groundwater flow of the Upper Floridian Aquifer in the vicinity of the Woodville Karst Plain, it is the younger units of the Oligocene and Miocene formations that demonstrate the most significant influence on the near-surface and shallow groundwater flow regimes of the within the study area. Werner (2001) noted that karst conduit development within the study area was restricted to Oligocene and Miocene units. The carbonate units within this interval are characterized by a high degree of permeability.

The Oligocene Suwannee Limestone, is generally permeable to very permeable (Miller, 1986). Davis (1996) reported that the Suwannee Limestone reaches a maximum thickness of approximately 180 meters southwest of the area of investigation and thins to less than 30 meters in the southeast portion of the area of investigation. The elevation of the Suwannee Limestone reaches depths of 100 meters below mean sea level in western Wakulla County, and rises to about 7 meters below sea level in northeastern Wakulla County (Rupert and Spencer, 1988). Outcrops are reportedly sporadic in southeast Wakulla County and consist of dolostone and silicified limestone boulders (Rupert and Spencer, 1988). Rupert and Spencer (1988) note that in cores and well cuttings from Wakulla County, the Suwannee Limestone tends to be white to light-tan, cream or brown recrystallized calcarenitic limestone, often dolomitic and moderately fossiliferous.

The Saint Marks Formation and the Chattahoochee Formations of the Lower Miocene age overlie the Suwannee Limestone and are the uppermost lithologically distinguishable units within the area of investigation. The Saint Marks and the Chattahoochee Formations interfinger in the west and northwest of Wakulla County (Rupert and Spencer, 1988). Rupert and Spencer (1988) describe the Chattahoochee Formation as being the updip, silty, clayey facies, and the Saint Marks Formation as the calcareous downdip facies. Exposures of the Saint Marks Formation are located throughout much of eastern Wakulla County, particularly along the southeast coast of the county (Rupert and Spencer, 1988). The Saint Marks Formation pinches out just east of Wakulla County in Jefferson County and thickens to more than 60 meters to the west in Gulf County. Rupert and Spencer (1988) note that the type locality for the Saint Marks Formation is in a sink about 3.2 km south of Crawfordville in central-west Wakulla County. The Saint Marks Formation in Wakulla County is typically a pale orange, light gray or white calcarenitic limestone that is recrystallized, silty to sandy, highly fossiliferous, well-indurated and is often dolomitized (Hendry and Sproul, 1966; Rupert and Spencer 1988; Werner, 2001).

North and west of the area of investigation the Saint Marks Formation is overlain by the Upper Miocene Hawthorn Group (Hendry and Sproul, 1966; Rupert and Spencer, 1988; Scott, 2001). Traditionally the Hawthorn Group was restricted to sediments overlying the Saint Marks Formation and underlying the sediments of Choctawhatchee or younger sediments (Hendry and Sproul, 1966). Scott (2001) noted that the upper Lower Miocene Torreya Formation entirely comprises the Hawthorn Group in the eastern panhandle. Rupert and Spencer (1988) noted the presence of the Torreya Formation in western Wakulla County drill cores. Scott (1988) divided the Torreya Formation into a lower carbonate unit and an upper siliciclastic unit. The carbonate sediments are a white to light-olive gray, poorly indurated, sandy clayey, limestone (mudstone and wackestone) containing molds and casts of mollusks. The siliciclastic unit can be white to light-olive gray, unconsolidated to poorly indurated, clayey sands, phosphatic and contain variably silty clay. Rupert and Spencer (1988) also described the Torreya Formation as being a siliciclastic unit of very-fine-to-medium grained clayey sands to sandy, silty clays containing variable amounts limestone, dolomite and minor phosphates. The areal extent of the Torreya Formation in Wakulla County is not fully documented, but probably underlies much of western portion of the county, pinching out near the western boundary of the study area near Crawfordville and Panacea (Rupert and Spencer, 1988).

The Pliocene Miccosukee Formation overlies the Hawthorn Group (Hendry and Sproul, 1966) north of the Cody Scarp and is responsible for the elevated, rolling topography of the Tallahassee Hills. Scott (2001) noted that the Miccosukee Formation was also present from Gadsden County to Madison County, Florida. Hendry and Sproul (1966) described the formation as being comprised of continental sediments of inter-bedded and cross-bedded clays, silts, and sands of varying coarseness with a predominantly grayish-orange to grayish-red, frequently mottled color. In Leon County the preserved thickness of the formation ranges from 25-30 meters (Hendry and Sproul, 1966). Both Davis (2010) and Scott (2001) noted that the formation has a low permeability. Davis (2010) also described the Miccosukee Formation as a low-permeability hydrogeological unit. The contrast of the low permeability Miccosukee Formation and the Hawthorn Group north of the Cody Scarp, and the highly permeable Saint Marks Formation exposed south of the Cody Scarp has allowed surface water flows across the scarp to play an important role in the degree of karstification in the Wakulla County portion of the Woodville Karst Plain.

Structure

Several regional geologic structures in the vicinity of the Woodville Karst Plain have played an important role in the geologic history and the resulting karstic nature of the Woodville Karst Plain (Figure 2.3). The primary structures adjacent to and influencing the development of the Woodville Karst Plain are the Apalachicola Embayment, the Gulf Trough and the Ocala Platform (Rupert and Spencer, 1988; Schmidt, 1984; Scott 2001; Werner, 2001). All three structures have resulted in conditions suitable for carbonate deposition and the subsequent karst development within the Woodville Karst Plain.

The Apalachicola Embayment is a deep sedimentary basin situated along the western edge of Wakulla County (Schmidt 1984; Rupert, 1986). Schmidt's (1984) study examined the lithological character and explained the basins' history as a Mesozoic to Cenozoic depositional basin, downwarped to the south-southwest and infilled primarily with clastic sediments approximately 4,500 meters thick and 77,700 km^2. Shallow carbonate units within the

Woodville Karst Plain, the Ocala Limestone, Suwannee Limestone and the Saint Marks Formation continue westward and deepen and thicken within the embayment (Schmidt, 1984). However, the carbonate sediments have increased clastic components and therefore lower permeability. The Neogene to recent surface sediments of the embayment overlying these carbonate units truncate to the east as the carbonates approach their shallowest depths within the Woodville Karst Plain of Wakulla County (Schmidt, 1984). The point of truncation marks the eastern extent of the embayment and occurs in western Wakulla County, along the margin of the Apalachicola Coastal Lowlands and the Woodville Karst Plain. The low permeability of these sediments produces limited groundwater infiltration, and shunts surface water runoff into four major swallets located along the western margin of the Woodville Karst Plain.

The Gulf Trough or Channel, which Scott (2001) interpreted as a Miocene expression of the older Suwannee Strait, extends from the Southeast Georgia Embayment south-west to the Apalachicola Embayment. Scott (2001) suggested that the trough separated the siliciclastic facies to the north from the carbonate environments to the south through the Late Oligocene and Early Miocene. As the trough filled during this period, more and more siliciclastic sediments were then transported and deposited in the carbonate environments. This introduction of clastic sediments south of the Gulf Trough allowed for the deposition and formation of the sedimentary units comprising the Tallahassee Hills physiographic province.

The Ocala Platform, east of the Woodville Karst Plain, extends into the northern and central portion of the peninsula of Florida. The Ocala Platform is a structural high on which carbonate units underlying the Woodville Karst Plain, the Avon Park Formation and Ocala Limestone, on lap and are exposed (Rupert and Spencer, 1986). Other carbonate units underlying the area of investigation, the Suwannee Limestone and Saint Marks Formation, truncate or pinch out east of the area of investigation and are not exposed on the Ocala Platform. The elevated potentiometric surface along the western side of the Ocala Platform compared to the lower potentiometric surface to the west imparts a westerly regional groundwater flow toward the area of investigation on the eastern fringe of the Woodville Karst Plain.

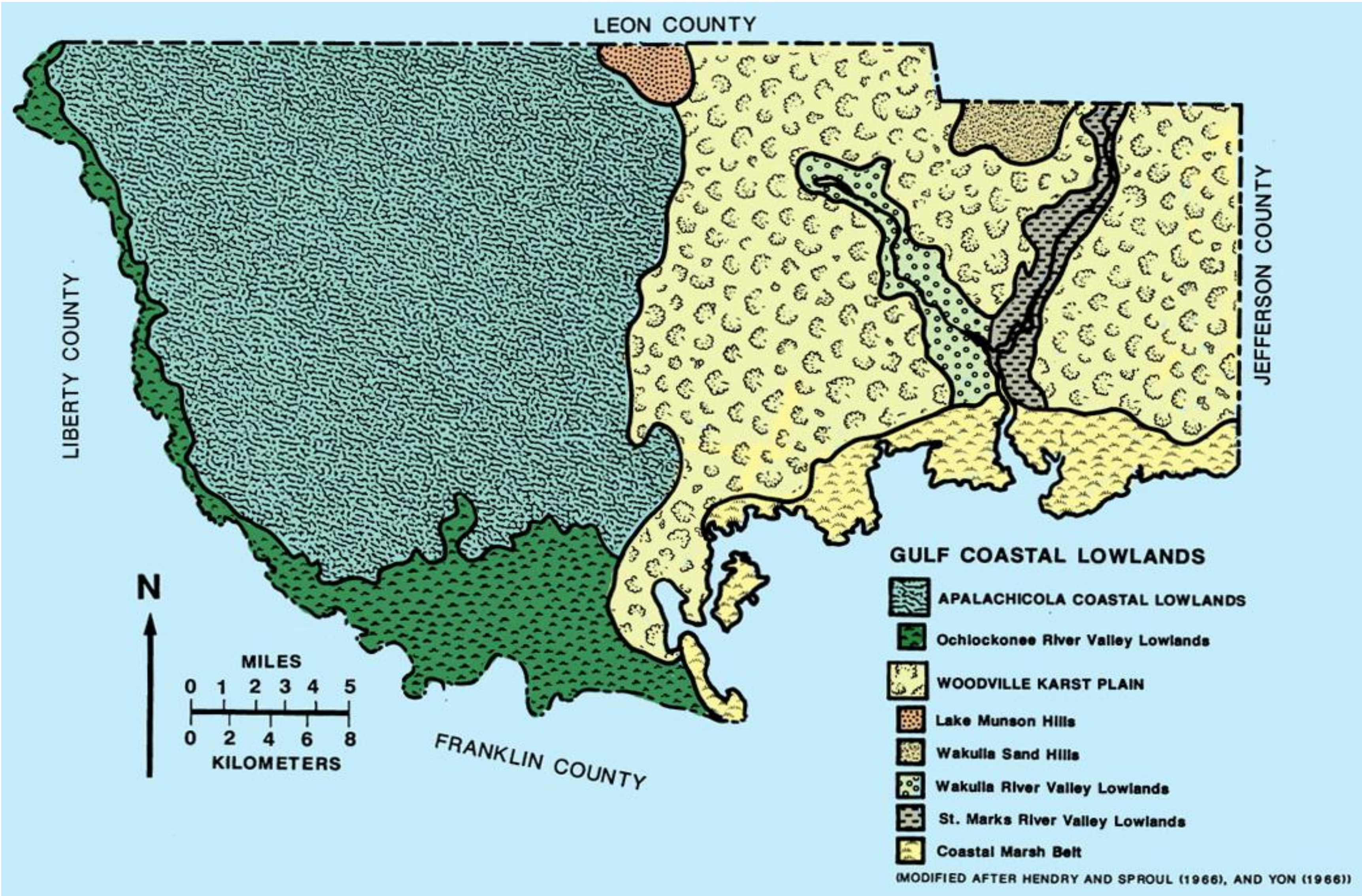


Figure 2.1: Physiography and geomorphology of Wakulla County, FL. Modified from Rupert and Spencer, 1988.

SYSTEM	SERIES	GEOLOGIC UNIT	HYDROGEOLOGIC UNIT
QUATERNARY	HOLOCENE	Undifferentiated deposits	Water-table aquifer
	PLEISTOCENE	Undifferentiated terrace and shallow marine deposits	
TERTIARY	PLIOCENE	Miccosukee Formation	
	MIOCENE	Hawthorn Group	Hawthorn Clays
		Chattahoochee and St. Marks Formations	Upper Floridan aquifer
	OLIGOCENE	Suwannee Limestone	
	EOCENE	Ocala Limestone	
		Avon Park Formation	
		Oldsmar Formation	
	PALEOCENE	Clayton Formation	Low-permeability sediments

Figure 2.2: Geologic and hydrologic units of the area of investigation. Modified from Davis et al., 2010.

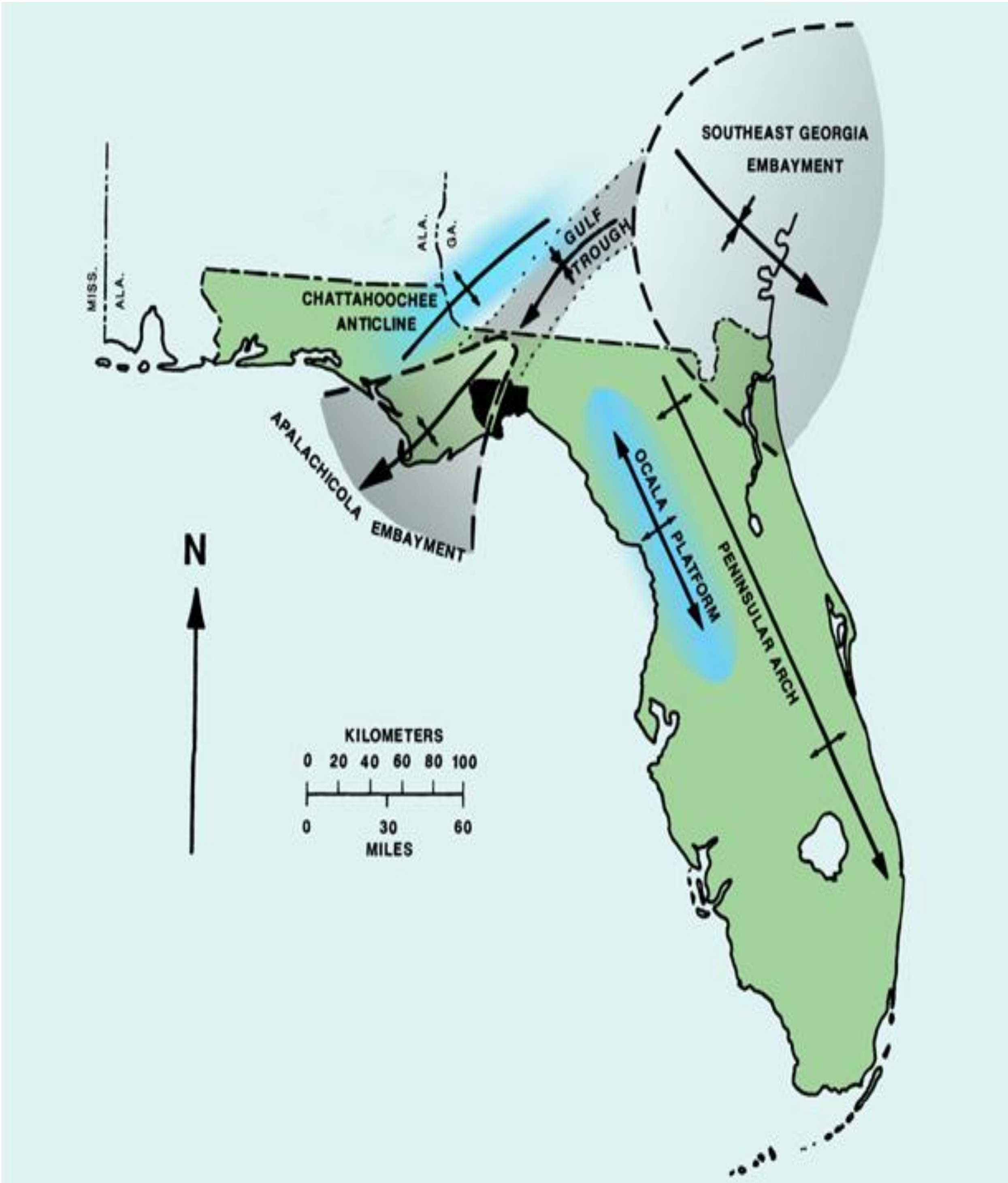


Figure 2.3: Principal subsurface structures of north Florida. Modified from Puri and Vernon, 1964, and Schmidt, 1984.

CHAPTER 3

HYDROGEOLOGIC SETTING

Overview

The hydrology of the Woodville Karst Plain is multifaceted and highly-interactive. The karstic nature of the area allows rapid interaction of every aspect of the hydrological cycle. The atmospheric, surface and sub-surface hydrologic interchange is rapid and pervasive. The highly porous nature of the limestone bedrock, the thin layer of, permeable surface sediments and the warm, humid environment have collectively enabled the karstification of the Woodville Karst Plain to not only develop, but to propagate at an increasing rate. These conditions facilitate intermixing of the surface waters, with groundwater within the surficial aquifer and the Upper Floridan Aquifer within the Woodville Karst Plain of Wakulla County.

Floridan Aquifer System

The Floridan aquifer system, the dominant aquifer in the Woodville Karst Plain, is one of the most extensive, productive and exploited aquifers within the continental United States (Miller, 1986). From a regional perspective, the Floridan Aquifer system occurs in Florida, parts of Georgia, South Carolina and Alabama. Miller's (1986) study identified two distinct water bearing units for much of the southeastern United States, a surficial aquifer system and the Floridan aquifer system. Miller (1986) and Davis (1996) described the Floridan Aquifer system as a vertically continuous sequence of carbonate rocks of high permeability, that are connected in varying degrees and whose permeability can be several orders of magnitude greater than the rocks that confine portions of system. The Floridan Aquifer system was divided by Miller (1986) into hydrostratigraphic units; the surficial aquifer, an upper confining unit, the upper

Floridan aquifer, a middle confining unit, the lower Floridan aquifer, and a lower confining unit (Miller, 1986; Johnston, 1988; Fetter, 2001). Williams et al., (2015) has recently reviewed the pivotal work of Miller (1986) and Johnston (1988) and revised the Floridan Aquifer system throughout its extent in Florida and Georgia. Although the hydrologic subdivisions have been updated, the original framework established by the U.S. Geological Survey during the 1980s is still in common use. The broad-spectrum revisions by Williams et al., (2015) include: revised boundaries of the Floridan Aquifer system, adjustments to the internal boundaries of the Upper and Lower Floridan aquifers including the varying permeability zones therein, substantial changes to the middle confining units and their naming convention, additional zones within the aquifer have been incorporated and the extent and elevation of the freshwater-saltwater interfaces have been adjusted.

The surficial aquifer system and the Floridan Aquifer system are typically separated by the upper confining unit. The low-permeability siliciclastic rocks of the upper confining unit are absent in the Wakulla County portion of the Woodville Karst Plain. To the west and north of the Wakulla County, the confining unit is present in varying degrees. The surficial aquifer system is generally composed of poorly to unconsolidated clastic rocks and sediments where water generally occurs in unconfined conditions (Miller, 1986; Werner, 2001). Within the confines of the Woodville Karst Plain in Wakulla County the surficial aquifer system is absent. The surficial aquifer system is present in varying thickness along the western and northern margins of the Woodville Karst Plain in Wakulla County. The surficial aquifer system is comprised of locally permeable carbonate or sandy units within the Miocene Torreya Formation (Hawthorn Group) and Pliocene Miccosukee Formation, which normally act as confining units.

Upper Floridan Aquifer

The portion of the Floridan Aquifer system of interest to this study is the Upper Floridian Aquifer. The Upper Floridan Aquifer in Wakulla County is comprised of Tertiary carbonates of the Eocene, Oligocene and Miocene series; the Oldsmar Formation, Avon Park Formation, Ocala Limestone, Suwannee Limestone, Chattahoochee Formation, and the St. Marks Formation. Figure 3.1 from Davis (1996) offers a generalized hydrogeological cross section of the geologic formations along a north-south transect through Leon and Wakulla Counties. Wakulla County is adjacent to and due south of Leon County depicted in figure 3.1.

Groundwater moves through an aquifer via water bearing openings. Groundwater movement is propelled by the intrinsic forces of energy encompassed in hydraulic head; gravity, external pressure, and molecular attraction (Fetter, 2001). Fetter (2001) defines hydraulic head as the sum of the elevation head, the pressure head, and the velocity head at a given point in an aquifer. Water will move from one point of a higher hydraulic head to a point of lower hydraulic head by means of the water-bearing openings. Groundwater present in an aquifer operates in a condition referred to as dynamic equilibrium; where the amount of recharge to the aquifer is balanced by the amount of discharge (Fetter, 2001). Dynamic equilibrium is in constant flux seeking the equilibrium of recharge and discharge of water to and from the system. Water levels elevations, the resulting hydraulic heads and the amount of water available for natural discharge are constantly responding to the conditions present within the aquifer. Inputs of water in one area, and withdrawals of water from another are systematically balanced and a new or modified state of dynamic equilibrium is obtained.

Water level elevations (hydraulic head) within an aquifer are portrayed as isopleths on a "potentiometric" surface map for a particular hydrogeologic unit (Fetter, 2001). In a confined aquifer, the potentiometric surface is the level or elevation to which water would rise in a tightly cased well. In the case of a surficial aquifer, the potentiometric surface is commonly referred to as the water table and is the elevation at which the pore water pressure is equal to atmospheric pressure (Fetter, 2001). In both cases the level or elevation is relative to a specified vertical datum, generally mean sea level or in more recent studies a national wide datum (NAVD 1988 – North American Vertical Datum 1988). Water level elevations are transformed into a contour map of water level elevation in the hydrogeologic unit. Most previous studies in the Woodville Karst Plain refer to the groundwater surface as a “potentiometric surface” (e.g. Davis, 2010). However, the Floridan Aquifer is largely unconfined within the Wakulla County portion of the Woodville Karst Plain. The confined portion of the aquifer is restricted to areas north of the Cody Scarp and western Wakulla County. For the purpose of conformity with other studies the term potentiometric map is used in this study (Figures 3.5 and 3.6).

Two vital characteristics of the Upper Floridan Aquifer of the Woodville Karst Plain that influence its high productivity and enable the aquifer to maintain dynamic equilibrium are its permeability and transmissivity (Davis, 2010). Permeability refers to a rock or formation’s ability to transmit a fluid and transmissivity refers to the rate at which water is transmitted through an aquifer (Jackson, 1997). Davis (1996) attributed the high permeability of the Upper Floridan Aquifer in the Wakulla County to the presence of one or more of the following water-bearing openings; openings in loosely cemented fossil hash similar to interstices of sand, mosaics of fractures and solution-widened joints, and solution cavities that range in size from less than 0.30 meters to several meters or more. White (2007) similarly characterized the extreme permeability of karst aquifers as “triple porosity” reflecting matrix, fracture and conduit permeability.

Permeability and transmissivity of the Upper Floridan Aquifer is strongly related to the thickness and the lithology of any overlying, less permeable or confining sediments (Johnston et al., 1988; Davis, 1996; Davis et al., 2010). When the overlying sediments are thin, absent or more permeable, infiltration rates increase, greater dissolution of the underlying limestone occurs and the permeability and transmissivity is enhanced. According to Johnston et al., (1988) the factors most affecting an aquifers transmissivity is the degree of solution development and the thickness of the aquifer. The removal of the low-permeable sediments from the surface of the Woodville Karst Plain during the Pleistocene left the underlying carbonate units exposed or minimally covered. As a result, the Upper Floridan Aquifer is unconfined in Wakulla County (Figure 3.2) and a high degree of dissolution has occurred. The thickness of the Upper Floridan Aquifer in Wakulla County originally reported by Miller (1986) was refined by Davis et al., (2010). Davis et al., (2010) refined the depth of the base of the Upper Floridan Aquifer in Wakulla County based on boring data from a particular well in the study area. The thickness of the Upper Floridan Aquifer was refined to be approximately 153 meters uniformly from the eastern to west-central portion of Wakulla County. Along the western margin of the Wakulla County the base of the Upper Floridan Aquifer dips westward to a depth of approximately 520 meters, see Figure 3.3. Davis et al., (2010) attributed this elevation change to a paleochannel that existed during the early Tertiary. Transmissivity values for the Upper Floridan Aquifer proximal to the area of investigation are highly variable, ranging from 120.8 m^2/d to 120.8 x 10^3 m^2/d (Davis, 1996). Johnston et al., (1988) reported similar transmissivity values, see Figure 3.4.

Based on potentiometric surface mapping, groundwater recharge for the study area encompasses all or portions of Wakulla, Leon, Jefferson and Gadsden counties in Florida and Thomas, Grady, Colquitt, Mitchell and Decatur Counties in Georgia (Davis, 1996; Werner, 2001; Chelette et al., 2002; Davis et al., 2010). In Figure 3.5, the regional groundwater flow pattern, demonstrated by flow lines, is generally southward and convergent toward Wakulla County (Davis, 1996). The potentiometric surface slopes gently to the south and south-east and is reflective of the high permeability due to dissolution of the Saint Marks Formation and Suwannee Limestone (Davis et al., 2010). Based on the Davis and Katz (2010) potentiometric surface (Figure 3.6), the groundwater surface gradient from where the mapped submerged caves cross the Leon and Wakulla County line to Spring Creek Springs is merely 9.82×10^{-5}. Davis et al., (2010) reports that there are seasonal variations and yearly fluctuations in the potentiometric surface resulting from variations in rainfall, but there appear to have not been a significant decline since 1980. Davis et al., (2010) interprets this to demonstrate that the amount of water flowing southward toward the Wakulla County is presumed to have remained relatively constant for the last thirty years. Over the decades highly generalized potentiometric maps encompassing Wakulla County have been produced. The potentiometric maps produced do not offer a fine resolution representation of the groundwater surface elevations of the unconfined portion of the study area in central Wakulla County. A previously unpublished groundwater surface elevation map of the study area in central Wakulla County will be presented in the discussion section of this study.

A key characteristic of potentiometric maps for the study area of the Woodville Karst Plain is the saddle and wrapping of the potentiometric contours around a potentiometric low in central Wakulla County, see fig. 3.5. Another notable characteristic is that the potentiometric contour lines are more tightly spaced to the north of the Cody Scarp and especially to the west (fig. 3.6) where the Upper Floridan Aquifer is either partially confined or well confined respectively. The wrapping of the contour lines and the flattening of the potentiometric surface corresponds with the location of the mapped conduits and Wakulla Spring. Werner (2002) postulated that the absence of the upper confining unit within central Wakulla County causes a convergent regional flow line pattern toward the south-central portion of the county. Werner (2002) also suggested that the potentiometric low within central Wakulla County results from large conduits transporting significant volumes of water efficiently to the coast and thereby lowering the local potentiometric surface. Chelette et al., (2002) indicated that the wrapping, flattening and lower potentiometric surface of central Wakulla County indicates an eight to ten mile wide highly transmissive lithological band within the Upper Floridan Aquifer of central Wakulla County. Chelette et al., (2002) observed that the presumed high transmissivity and conductivity zone perturbs the north to south flow to such an extent that it funnels water to Wakulla Spring form the northwest, north and northeast. An additional observation not in the literature, but believed to be significant, is that the potentiometric contour wrapping around the study area of central Wakulla County (Figure 3.5 and 3.6) coincides with the thinning of the Upper Floridan Aquifer around and toward the unconfined portion of the central Wakulla County (Figure 3.3). An investigation of this lithological change coinciding with the groundwater elevation of central Wakulla county is beyond the scope of this study but worthy of further consideration.

Hydrometeorology and Groundwater Recharge

Replenishment of groundwater to an aquifer is referred to as recharge. Recharge to the Upper Floridan Aquifer in Wakulla County occurs by means of regional groundwater flow, precipitation and contributions from surface water features. Direct recharge by precipitation and surface features that allow direct inflow into the aquifer are important to understanding the components of flow and response to and maintenance of the aquifers state of dynamic equilibrium.

The climate of the study area is sub-tropical, humid, generally warm to hot with limited days below freezing. Precipitation occurs as a result of frontal masses moving through the area as well as from convection rain events during the summer months. The region receives the majority of its precipitation from mid-May to mid-September, moderate rain December through April, and the least rain during May, June, October and November. Chelette et al., (2002) reported a 50-year (1951-2000) average annual rainfall at the Tallahassee Regional airport of 159cm, and a 10-year (1991-2000) average annual rainfall of 152.4cm. The Climate Center of Florida State University reported a 25-year (1990-2014) average annual rainfall of 147.9cm at the Tallahassee Regional Airport. There is an apparent decline in the reported average annual rainfall reported by these three sources, but may also reflect significant prolonged drought during the period 1998-2002 (Verdi et al., 2006). Figure 3.7 offers a comparison of the monthly rainfall for 2008 and 2009 (the period of this study) to the monthly 25 year average (1990-2014), and a comparison of the 2008 and 2009 annual rainfall to the 25 year average annual rainfall (1990-2014). The high rainfall for 2008 is in part associated with tropical storm Fay (August 2008) which produced up to 42 cm of rainfall in the Big Bend region.

The water available for groundwater recharge derived from precipitation is in part limited by water loss due to evapotranspiration. The specific evapotranspiration of a region is controlled by several factors including; permeability of surface sediments, types of vegetation and surface water cover, and general weather conditions such as relative humidity, air temperature and winds. The rate of evapotranspiration normally follows the number of daylight hours in a month, with peak evapotranspiration taking place in June and minimum values in December. Estimated evapotranspiration in the Wakulla County can be approximated based upon adjusted pan evaporation measurements collected near Woodruff Dam, approximately 65 km northwest of Wakulla County (Farnsworth and Thompson, 1982). Based upon the measurements of this study, the annual evapotranspiration for the region is estimated to be 115 cm/year resulting in a net water flux into the local aquifers of 38 cm for 2008 and 33 cm for 2009.

Surface Waters

In the highly karstified Woodville Karst Plain of central Wakulla County, precipitation, surface streams and flow within unconfined portion of the Upper Floridan Aquifer are directly connected. Precipitation readily percolates through the thin surface sediments and directly recharges to the Upper Floridan Aquifer. Surface stream networks within the study area are poorly developed and limited to the margins of the karst plain. There are only two major streams – the Wakulla River and the Saint Marks River in the basin (Lane, 2001; Chelette et al., 2010). Both of these streams are discharge streams with flow originating from spring systems. Secondary and minor streams include: Lost Creek, Jump Creek, Black Creek, Fisher Creek and Munson Slough (Lane, 2001; Chelette et al., 2010; Davis et al., 2010). Figure 3.6 and Figure 3.8 depict the surface streams present in the study area. All of secondary and minor streams, except for Munson Slough, are associated with drainage for the Apalachicola Coastal Lowlands. There is a peculiar absence of lakes and ponds. The only closed basin surface waters features are the hundreds of ephemeral or perennially water filled sinkholes, swallets and karst windows (Kincaid, 2008).

The scarcity of surface drainage systems within the central Wakulla County Woodville Karst Plain is a direct consequence of the thin, highly permeable, siliciclastic Pleistocene surface sediments immediately overlying the Upper Floridan Aquifer that allow direct vertical recharge.

A number of surface stream systems of the neighboring physiographic provinces terminate at the margin of the Woodville Karst Plain of Wakulla County and provide allogenic recharge via swallets directly to the Upper Floridan Aquifer of Wakulla County. Allogenic recharge is defined by Jackson (1997) as water that collects on non-soluble rocks or sediments and feeds sinking streams in adjacent karst.

Substantial surface waters originating outside the study area as precipitation in the Apalachicola Coastal Lowlands and the Tallahassee Hills traverse via surface drainage systems eastward and southward respectively into the central Wakulla County. Upon arrival into the Wakulla County portion of the Woodville Karst Plain, these surface water flows provide allogenic recharge directly into the Upper Floridan Aquifer through a specific type of sinkhole called a swallet. The surface flow of the drainage basins terminates at the swallet, the water drains into the subsurface and directly recharges the Upper Floridan Aquifer. Swallets are directly connected to the unconfined Upper Floridan Aquifer of central Wakulla County by conduits, large cavities, or other large area subsurface karst portals. The water level elevation of a swallet is approximately equal to the water level elevation of the Upper Floridan Aquifer at that location at that moment in time. During periods of very high rainfall and the surface runoff capacity of the swallet to accept inflow may be exceeded ant the swallet may overflow (drown) and may even drain into a second swallet down gradient from the primary drain.

Kincaid (2008) identified the five most significant sinking streams in the western portion of the Woodville Karst Plain according to average flow as: Lost Creek, Fisher Creek, Munson Slough, Black Creek and Jump Creek. These streams (except Munson Slough) have a dark, tea color that demonstrates their high humic content derived from the organics along their traverse through the Apalachicola National Forest. Munson Slough (Ames Sink) flow is largely comprised of storm water run-off from the southern portion of the City of Tallahassee (Chelette et al., 2002). These five streams are depicted in Figures 3.6 and 3.8. Allogenic recharge to the Upper Floridan Aquifer from the sinking streams is variable. During periods of low precipitation, the flows are low to dry; during periods of high precipitation the flows can be rather intense and drown the swallets (Chelette et al., (2002).

Lost Creek is a secondary stream that flows southeast over the Apalachicola Coastal Lowlands and into the western margin of the area of investigation southwest of Crawfordville, Florida. Once the surface flow of Lost Creek traverses the Apalachicola Coastal Lowlands and enters the highly karstified, permeable, unconfined, western fringe of the Woodville Karst Plain, the water drains into Lost Creek swallet (Lane, 2001). Lost Creek's recharge and the location of resurgence and natural discharge within the study area are pivotal to the hypothesis of this study. Lost Creek swallet during low stage is shown in Figure 3.9. The debris mat seen floating on the water becomes more tightly organized and circulates uniformly while the swallet recharges water into the aquifer. The U.S. Geological Survey reports Lost Creek to have a basin area of about 183 km^2 and a mean daily flow of 1.7m^3/s for the water year 1999. The U.S. Geological Survey median water flow values for Lost Creek during the period 1999-2010 is 5.4 m^3/s. Earlier flow values reported by Davis (1996) were approximately 8.7 m^3/s.

Fisher Creek and Black Creek also flow over the Apalachicola Coastal Lowlands and drain into swallets along the western edge of the study area and directly recharge the unconfined Upper Floridan Aquifer. Fisher Creek and Black Creek have basin areas of about 69 km^2 and 24 km^2, and estimated average flow of about 0.6 m^3/s and 0.2 m^3/s respectively (Chelette et al., 2002). There has been a lack of continuous measurements and the above rates are estimates based on sparse, sporadic measurements conducted from water years 1982 – 2000.

Munson Slough is a storm water drain for the City of Tallahassee. Surface flows via Munson Slough begin as flow through Lake Munson and continue to and through Eightmile Pond, ultimately discharging to Ames Sink (Chelette et al., 2002). Chelette et al., (2002) reports and estimated effective basin and flow of 133.5 km^2 and .85 m^3/s. Along its route to Ames Sink, an estimated 88 percent of Munson Slough's flow is lost by evapotranspiration or infiltration before reaching its terminal swallet. Ames Sink, a swallet at the terminus of Munson Slough, is the point at which the remaining water drains directly into the unconfined Upper Floridan Aquifer along the northern margin of the study area in northern Wakulla County.

Springshed

The region drained by, or contributing water to, a stream, lake or other body of water is defined by Jackson (1997) as a watershed. In this case, the body of water is a spring(s). The term springshed has been applied and is widely used in place of watershed when discussing the area or region that contributes water to the discharge of a spring. There are important differences between the two terms. Watersheds are controlled by surface topography, while springsheds are controlled by the configuration of the groundwater table ("potentiometric surface") enclosed within a "groundwater basin." To avoid the use of the ambiguous term watershed, the term springshed is more applicable when discussing the recharge area and the components of water contributing to spring flow.

In karst terrains it is difficult to be able to precisely draw lines on a map that definitively bound a particular spring's springshed. In the case of the Woodville Karst Plain of central Wakulla County, a coastal karst aquifer, where the Gulf of Mexico is its fixed southern boundary, there are numerous springs functioning in close proximity, relatively low groundwater elevations and a particularly low hydraulic gradient. The springs are down gradient of convergent regional flow patterns and surface recharge varies significantly spatially. Flow direction under these circumstances can be multi-dimensional and the system and its interior springshed boundaries are in constant flux maintaining a state of dynamic equilibrium contingent on the hydrological regime driving the system at any given time. When defining the individual recharge areas or springsheds within the Wakulla County Woodville Karst Plain, it is important to be mindful, that on a large scale, Wakulla Spring, Spring Creek Springs, and other springs within the groundwater basin are more correctly viewed as behaving as a composite springshed rather than having single, physically separable springsheds. Figure 3.6 has an inset image depicting Wakulla Spring, Spring Creek Springs and St. Marks Spring as having a composite springshed. Figure 3.8 and 3.10 depict a unified springshed for Wakulla Spring and Spring Creek Springs that excludes St. Marks Spring. The unified springshed for Wakulla Spring and Spring Creek Springs (Figure 3.10) is bounded to the east by the Saint Marks Springshed and to the west by a groundwater divide located in the vicinity of the Ochlocknee River. To the north, the springshed tapers to a point just across the Florida-Georgia State line (Davis et al., 2010). Davis et al., (2013) reports that the area for the unified springshed of Wakulla Spring and Spring Creek Springs is approximately 3000 km^2.

Springs

Discharge of groundwater by means of springs in the Woodville Karst Plain of Wakulla County occurs at numerous locations. Scott et al., (2004) identified fourteen springs ranging from first magnitude (2.83 m^3/s or more) to third magnitude (0.0283 to 0.283 m^3/s) or smaller within Wakulla County. Of the fourteen springs identified, three are first magnitude springs; Wakulla Spring, the Saint Marks River springs and the Spring Creek Springs (Scott et al., 2004;

Davis et al., 2010). These springs are regional groundwater discharge points for the Upper Floridan Aquifer of northern Florida and southern Georgia (Davis et al., 2010).

As Werner (2002) explained, the absence of a confining unit allows groundwater flow to emerge at an elevation less than or equivalent to the pressure produced by its hydraulic head; commonly referred to as artesian flow. Therefore, groundwater flow within the counties surrounding Wakulla County that is confined by the Miccosukee Formation and the Hawthorn Group emerges in the unconfined Woodville Karst Plain as artesian flow at these well-known springs. The large number of springs in a relatively small area is an extraordinary illustration of the quantity of groundwater naturally discharged within Wakulla County.

Johnston et al., 1988 pointed out in their study that the portions of the Upper Floridan Aquifer that are unconfined have a high degree of spring flow and discharge of groundwater relative to the spatial area they encompassed. Figure 3.11 from the Johnston et al., 1988 study demonstrates the quantity and thereby the prominence of natural groundwater spring-type discharge in the area of investigation. According to Johnston et al., (1988), the percentage of spring flow and discharge to surface water bodies in the vicinity of Wakulla County during the early 1980's was 88% of the groundwater area's total discharge and a remarkable 16% of the total regional discharge for the Upper Floridan Aquifer. If Johnston et al., (1988) estimations are correct, the magnitude of the discharge by springs in the study area in terms of groundwater discharge from the Upper Floridan Aquifer are very significant. The necessity to understand, competently manage and safeguard the groundwater system in the study area is self-evident.

Wakulla Spring

Wakulla Spring is one of Florida's largest and prolific springs (Figure 3.12). Scott et al., (2004) describes the spring as having a roughly circular spring pool whose diameter from north to south is approximately 96 meters and a maximum depth of about 56 meters. The actual vent opening was described as being elliptical in shape measuring 15 meters by 25 meters. The Wakulla Spring system and the subordinate springs along the upper reaches of the Wakulla River discharge to form the Wakulla River, which flows 14.5 km to the southeast ultimately converging with the St. Marks River and discharging into the Gulf of Mexico (Chelette et al., 2002; Scott et al., 2004).

Given Wakulla Spring's preeminence as a spring system, it has received significant attention and has been more thoroughly monitored than the other springs of the Woodville Karst Plain and most of the springs of Florida. Discharge measurements for Wakulla Spring have been reported by several sources in the literature and vary depending on the period of record and author. Chelette et al., (2002) reported an average discharge of 9.6 m^3/s for 1906 – 2000; lowest measured discharge of 0.71 m^3/s on June 18, 1931 and highest measured discharge of 54 m^3/s on April, 11 1973. Scott et al., (2004) reported an average discharge from 1907 – 1974 of 11 m^3/s. Davis (2010) reported an average discharge of 19.7 m^3/s for 1929 – 2008. Based on U.S. Geological Survey data, the daily average discharge for Wakulla Spring during this study period of January, 1 2008 – March 31, 2010 was 20.4 m^3/s. The discharge for Wakulla Spring varies greatly and is responsive to precipitation events, producing a "flashy" hydrographic behavior.

Conduit Exploration

Groundwater flows to Wakulla Springs vent via an extensive network of underground conduits for which the geometry is not completely known (Davis et al., 2010). The conduits act as centralized or master drains transmitting large volumes of water at high velocities (Davis, 1996; Werner, 2002; Kincaid et al., 2008). Cave diver exploration has demonstrated that a least four major conduits converge proximal to the main springhead that branch outward and upstream in a dendritic configuration into the northern and southern quadrants of the basin. Cave diver observations and dye tracing activities have confirmed that one or more of the main conduits convey stream-swallet derived water from subordinate conduits ("tannic tunnel") in the western reaches of the Woodville Karst Plain; while other principal conduits transport clear water, presumably older groundwater, from deeper zones of the Upper Floridan Aquifer.

In 1955 Stanley Olsen, paleontologist with the Florida Geological Survey, and six scuba divers conducted the first organized exploration of Wakulla Spring (Olsen, 1958). Their exploration penetrated approximately 335 meters into the main spring vent to depths of over 61 meters and established that the conduit for the spring had a diameter exceeding 15.3 meters.

In October of 1987, the United States Deep Caving Team conducted the first documented deep penetration explorations into Wakulla Spring (Stone, 1989). The team mapped approximately 3.22 km of cave passages. Their mapping (Figure 3.13) established that the main spring head or vent tunnel extended 152.4 meters to a major bifurcating point, the Grand Junction, from there the system divides into four main conduits; A and C to the south-west and south-east and B and D to the north-east and north-west respectively. Flow within the conduits converge and ultimately discharge to the north via the main vent in a northward flow direction that is in contrast to the local hydrological gradient (Rupert and Spencer, 1988). The water comprising the main conduits is described by (Rupert and Spencer, 1988) to have different characteristics: B, C and D have "air clear" water, while A had recent surface-water characteristics of tannic or "tea colored" water.

By far the most extensive exploration of the conduits of the Woodville Karst Plain has been accomplished by the Woodville Karst Plain Project, a non-profit affiliate of Global Underwater Explorers. This organization was founded in October of 1987. They are the primary dive team conducting deep cave diving exploration within the basin. Their work has amassed the comprehensive knowledge of the basin's mapped network of conduits and karst window connections; their work is definitively attributed as having established the known actualities of the conduit system that converges on Wakulla Spring. Their dive explorations over their first two decades of formal dive exploration and mapping slowly assembled a picture of the underwater conduit systems of Wakulla Spring and those near the Leon-Wakulla county line ("Leon Sinks"). They successfully connected and mapped the conduit system southward from Leon-Sinks approximately 16 km to Turner Sink. They simultaneously explored the conduit system surrounding Wakulla Spring and toward Turner Sink. In December of 2007, Casey McKinlay and Jarrod Jablonski of the Woodville Karst Plain Project traversed from Turner Sink to Wakulla Spring covering a distance of 11 km. This particular dive provided the missing link in conduit mapping that enabled the Woodville Karst Plain Project to formally connect the Leon Sinks conduit system to the Wakulla Spring conduit system.

As of December 2007 the Woodville Karst Plain Project had extensively mapped and established a direct, continuous and swimmable connection of conduits from Leon Sinks in southern Leon County to the main vent of Wakulla Spring (Figure 3.14). This is recognized as the longest explored under water cave in the United States and ranks 4th in the world (McKinlay and Wisenbaker, 2015). The Woodville Karst Plain Project exploration has proceeded south from Wakulla Springs toward the coastal boundary of the basin. Their furthest penetration south of Wakulla Springs during the summer 2008 took them approximately 6.3 km southward in the "Q tunnel" in the direction of the Spring Creek Springs. Their pursuit of a continuously mapped conduit connection southward from Wakulla Spring toward the Spring Creek Springs has been inhibited by poor visibility in the southern reaches of Wakulla County. The poor visibility is believed to be the consequence of the hydrological conditions examined as part of this study. The Woodville Karst Plain Project has generously and skillfully conducted the necessary deep diving reconnaissance and exploration required to conduct this study. Every sampling site included in this study was confirmed by their exploration to offer access to a verified conduit. They labored to equip the area of investigation with scientific devices, communication cables and tubing used in the investigations undertaken in this study.

Fluorescent Dye Tracer Test

The use of tracer tests for characterizing unconfined aquifers is readily available in karst hydrological literature. White (2007) noted that dye tracing underground waters and identifying their emergent springs have been used since the 19th Century. Aspects more commonly measured by the use of tracer test include groundwater velocities, travel time, residence times and flow pathways (Worthington, 2007). Both environmental (natural components of surface and groundwater such as isotopes and DOC) and injected fluorescent tracers have been used in unconfined carbonate aquifers (Worthington, 2007). Advancements in dye tracing technology include charcoal dye receptors, quantitative fluorescence spectroscopy, and automatic water samplers, allow for the detection of very low concentrations dye, with detection limits currently in the parts per trillion level (Rosenberry and LaBaugh, 2008). White (2007) considers dye tracing to be one of the more powerful tools for a karst hydrogeologist.

Much of the work for this study will make use of dye tracing conducted in the Woodville Karst Plain using modern fluorescent dyes such as Eosine, Rhodamine, Phloxine-B, Uranine and high sensitivity scanning spectrofluorophotometers. The use of these instruments to perform analysis on water samples collected at discrete times allows researcher to produce “breakthrough curves” or “tracer recovery curves” of dye detection for a particular site. A breakthrough curve is a plot of dye concentration detected at a particular location over time. The curve of increasing concentration and subsequent decreasing concentration documents the plume of dye's arrival and departure at a particular sampling point.

Prior to this study, dye tracing was restricted to conduits north of Wakulla Springs. Tracing studies conducted in 2002 and 2003 established a direct connection between Sullivan Sink, Fisher Creek and Black Hole sinks with the western conduit of the Leon Sinks cave system (Figure 3.15). In the same study, partial breakthrough curves were also detected south bound through the conduit system of Leon-Sinks cave system at Turner Sink and Wakulla Springs (Loper, 2004; Kincaid and Werner, 2008).

In 2004, fluorescent dye was injected at the Emerald Sink detection point of the 2003 study. Detection of the dye resulted in complete breakthrough curves at Upper River Sink, Turner Sink, Wakulla Springs K conduit, Wakulla A/K conduit and the main vent of Wakulla Springs (Loper, 2004; Davies et al., 2004). Additional dye tracing was conducted in 2004-2006 from Ames Sink, Kelly Sink and Indian Springs. The results of these three dye traces established connections (Figure 3.15) in the known and suspected conduit systems north of the Wakulla Spring. The Ames and Kelly Sink injections were positively detected (Figure 3.15) at Indian Springs Cave System and Wakulla Springs. The Indian Springs to Wakulla Spring connection was inferred to be via the Leon Sinks Cave System rather than Sally Ward due to travel times and detection at the Wakulla K and D-conduits (Kincaid et al., 2007). The pathways confirmed by dye tracing studies from 2004-2006 are shown in Figure 3.15.

During 2006 and 2007 an additional dye trace was performed from the City of Tallahassee Municipal Sewage Treatment Spray Field to test for a connection with Wakulla Springs. The municipal spray field is northeast of Wakulla Springs and the Leon Sinks Cave

System is northwest of Wakulla Springs. The relevance of the trace was that inferred pathways (Figure 3.15) were established from the spray field to the main spring vent of Wakulla Springs and B-conduit and the trace established connections with locations of previous trace studies from the Leon Sinks Cave system; Sally Ward Springs and Indian Springs (Kincaid et al., 2007; Kincaid et al., 2012).

In April of 2007 dye was injected into the downstream (south bound) conduit of Turner Sink. Sampling for tracer detections were conducted at Wakulla Spring main vent, Wakulla K conduit, Revell Sink and five of the Spring Creek Springs vents. The dye was detected at the Wakulla Spring main vent, Wakulla K conduit and Revell Sink. At the time of this particular trace, the conduit connecting Wakulla Spring and Turner Sink had not been discovered or explored by the Woodville Karst Plain Project divers (Kincaid, 2008). This trace firmly established the direct connection between Wakulla Spring conduit system and the Leon Sinks conduit system which included Turner Sink (Kincaid, 2008). This trace was significant in that this was the first dye trace conducted in the study area that was detected south (Revell Sink) of the conduits proximal to Wakulla Spring. Kincaid (2008) noted that the Woodville Karst Plain Project divers had observed unexplored conduits trending toward Revell and Spring Creek Springs during their connection dives between Wakulla Spring and Turner Sink.

During the period 2008-2009 two dye tracing studies were conducted in the southern portion of the Woodville Karst Plain of Wakulla County. For the first time, dye was injected south of Wakulla Spring at the Lost Creek swallet. The results of those studies are a major portion of this study and will be discussed in the remainder of this study.

Results of the dye tracing activities from 2002-2007 presented in Table 3.1, combined with the cave and conduit exploration of the past 60 years confirm that a major connected conduit system exists in the northern and central portion of the area of investigation. The results of the 2008-2009 dye tracing studies, one of the primary parts of this study, demonstrate that conduit connectivity continues south of Wakulla Springs, but in a more complex geometry than has been previous proposed by earlier studies.

Spring Creek Springs

The Spring Creek System, located in a coastal estuary, 18 km south of Wakulla Springs, is an assemblage of up to thirteen vents that form a major first order spring system (Figure 13.16 and 13.17). Discharge for the aggregate spring flow has been measured to be up to 56 m^3/s (Rosenau et al., 1977). This value is similar to the high discharge values for the Wakulla Springs system. Distinctive “boils” of water are often observed at the discharge locations of the spring vents (Lane, 2001). The discharge of the springs are highly variable and within the last 20 years the springs have been observed to “siphon” or take in water, especially during high tide conditions, periods of storm surge and periods of low inland groundwater levels (Lane, 2001). Davis and Verdi (2013) noted that the spring group had the characteristics of a type 2 submarine springs as described by Fleury et al., (2007). These characteristics include: (1) an extensive network of conduits, (2) conduits are large compared to the available flow of fresh water, resulting in a low hydraulic head, which allows inflow of sea water, (3) a well-developed conduit networks that drains a large recharge areas. The network allows significant amounts of water storage, and (4) the discharge rate can be high – in part controlled by seasonal variations in precipitation; the salinity of the discharge is low during high flow and rises as discharge decreases. Lane proposed, based upon liniment analysis (Lane, 2001) a significant portion of the discharge from Spring Creek Springs may originate from fracture-controlled flow from the Lost Creek swallet, located 10 km northwest of Spring Creek Springs. Lane also proposed that regional groundwater flows from unmapped conduits supplied the remainder of the spring flow. Lane's hypothesis has been incorporated into several groundwater models, in part utilizing observed stream and spring discharge histories of Lost Creek and Spring Creek Springs (Davis and Verdi, 2013). Confirmation of this hypothesis rests, in part, upon a physical confirmation of the proposed relationships. Establishing a connection through underwater exploration by divers is not possible at the present time. This study will utilize dye tracing techniques to evaluate the proposed relationship. Preliminary results of this study are currently being used for several modeling studies of the Spring Creek Springs system.

Table 3.1: Summary of dye traces investigations north of Wakulla Spring 2002 – 2006.

Trace	Injection Date	Distance (m)	Travel Time (days)	Velocity (m/day)
Fisher Creek to Emerald Sink	5/22/2003	1900	2.37	801
Black Creek to Emerald Sink	11/19/2003	2,600	3.17	820
Emerald Sink to Wakulla Spring	2/5/2004	17,100	7.1	2,394
Ames Sink to Indian Springs	8/11/2004	8,000	16	500
Ames Sink to Sally Ward Spring	8/11/2004	8,600	17.6	489
Ames Sink to Wakulla Spring	8/11/2004	9,300	22.2	419
Kelly Sink to Indian Springs	4/30 – 5/01/05 several traces performed	8,400	13.5	608
Indian Springs to Wakulla Spring	Inferred from the Kelly Sink traces	8,600	5.9	1,490
Southeast Spray Field to Wakulla Spring	January and March of 2006.	16,800	60 – 65 days	258
Turner Sink to Wakulla Spring	4/28/2007	5,000	13 days	386
Turner Sink to Revell Sink	4/28/2007	9,300	40 days	233

Sources: Loper, D. E., 2004, Davies et al., 2004, Kincaid et al., 2007, Kincaid et al., 2012, Kincaid, 2008

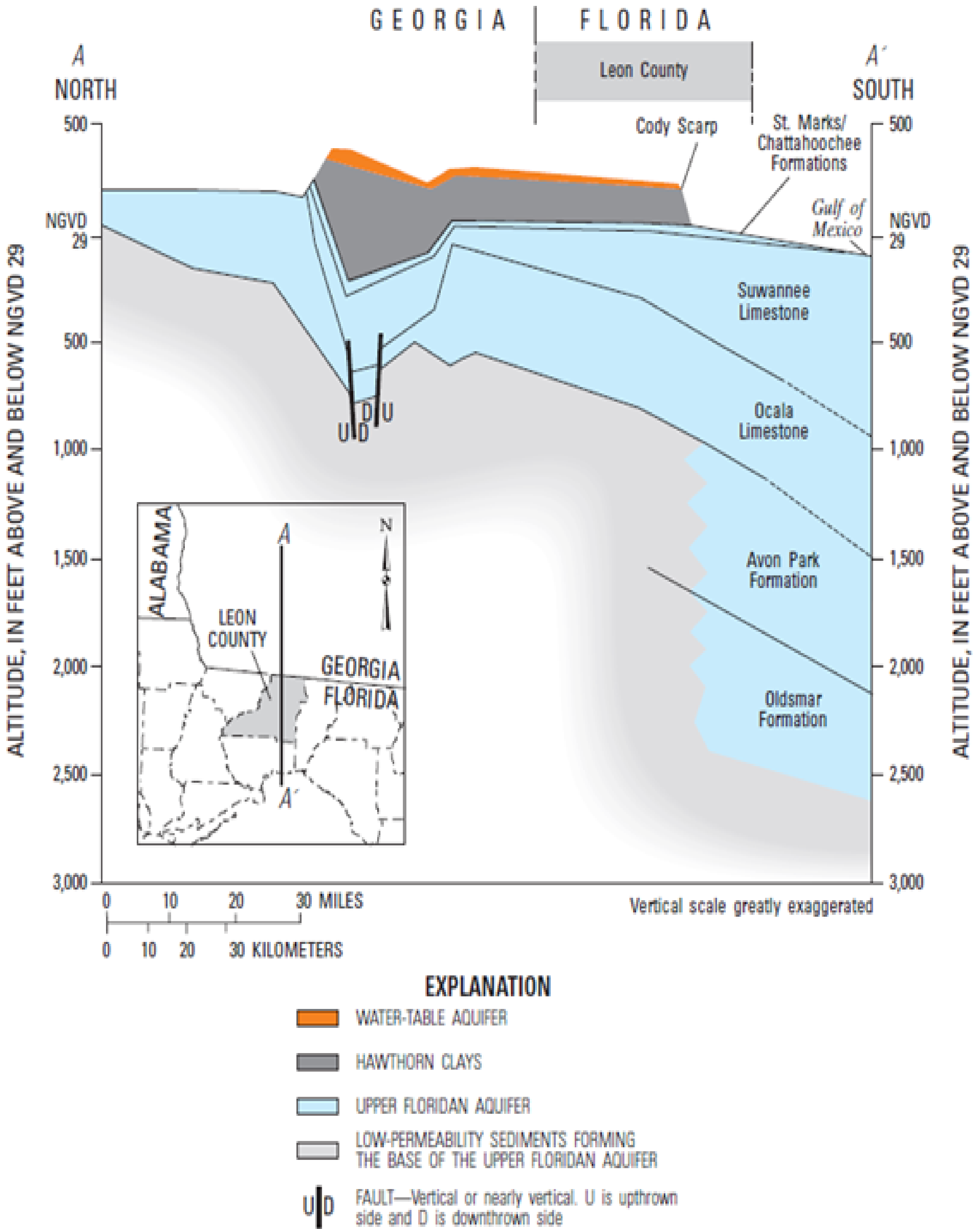


Figure 3.1: Generalized hydrogeologic section showing aquifer and geologic formations of the Upper Floridan aquifer in north-central Florida and southwestern Georgia (Davis et al., 2007).

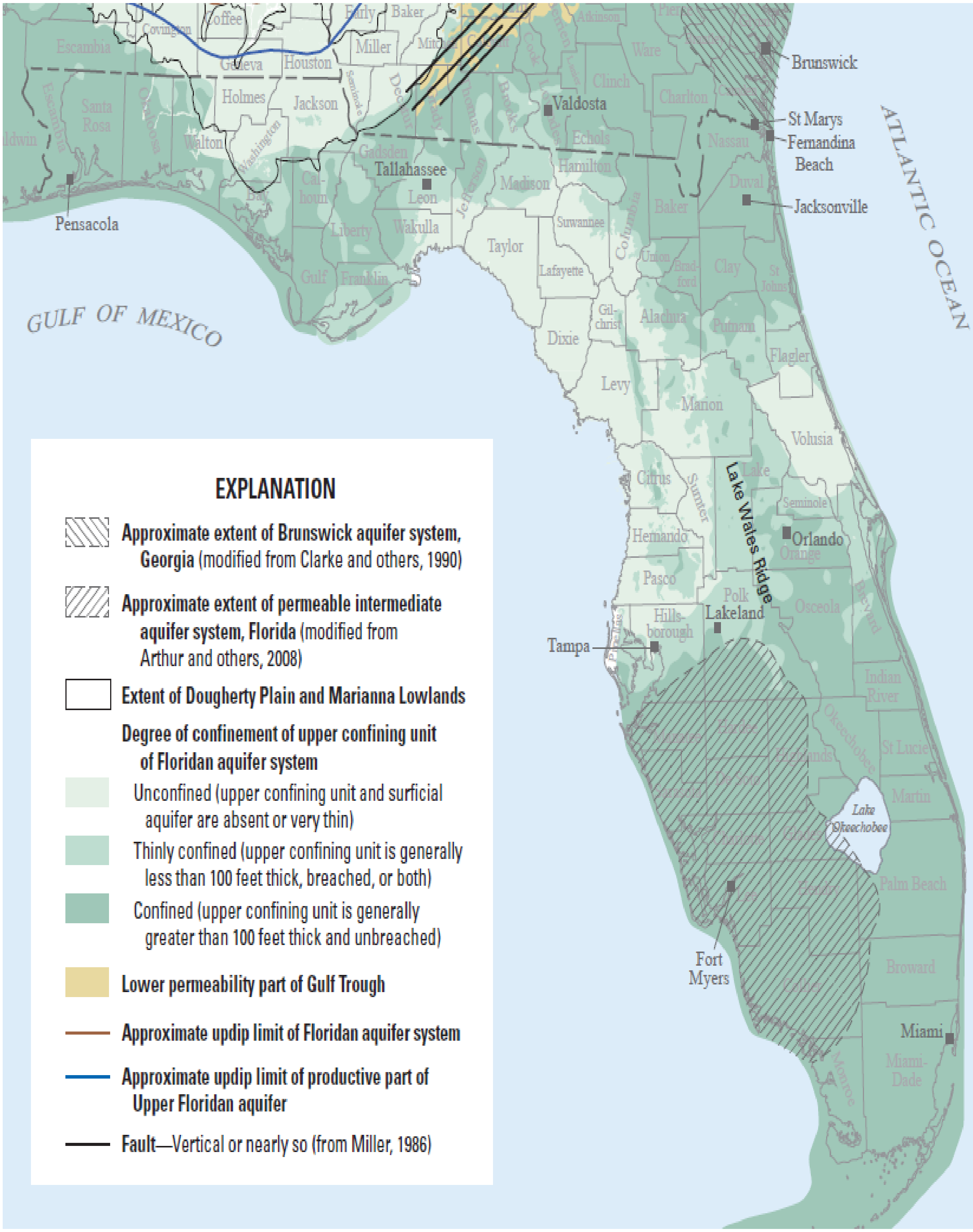


Figure 3.2: Relative degree of confinement of the Upper Floridan aquifer (Williams, L., and Kuniannsky, E., 2015).

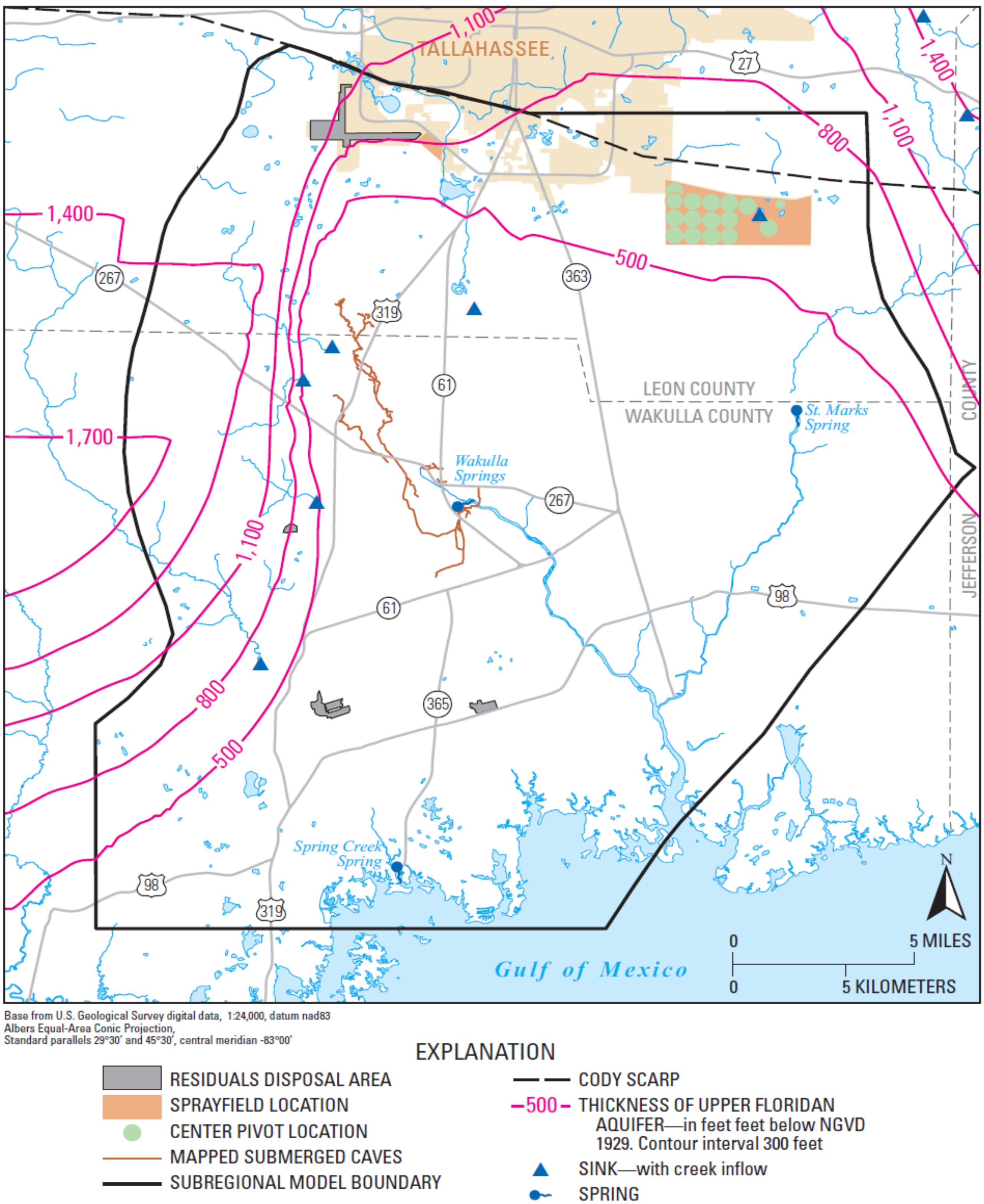


Figure 3.3: Thickness of the Upper Floridan aquifer in Wakulla County Florida (Davis et al., 2010).

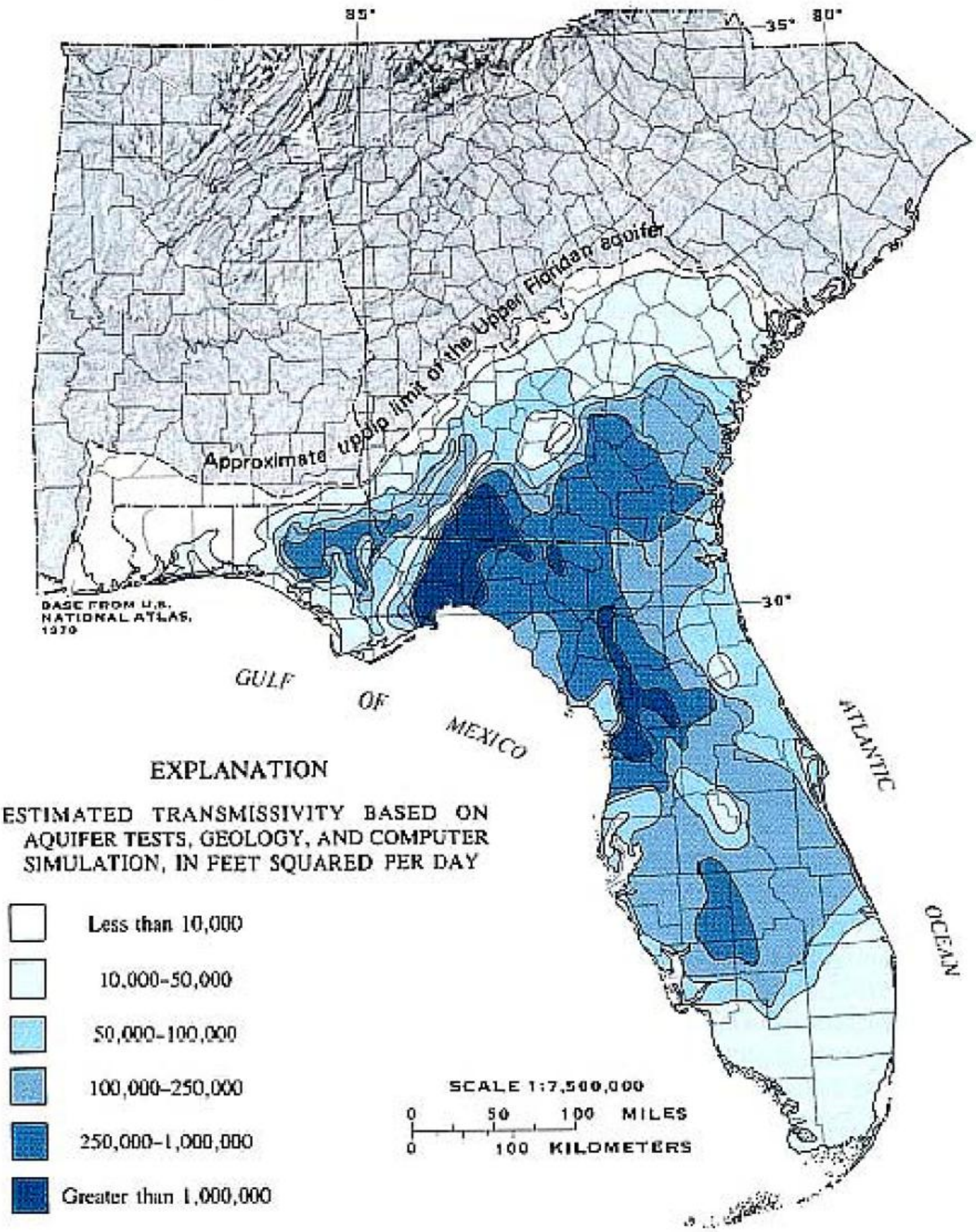


Figure 3.4: Transmissivity values for the Upper Floridan Aquifer (Johnston et al., 1988).

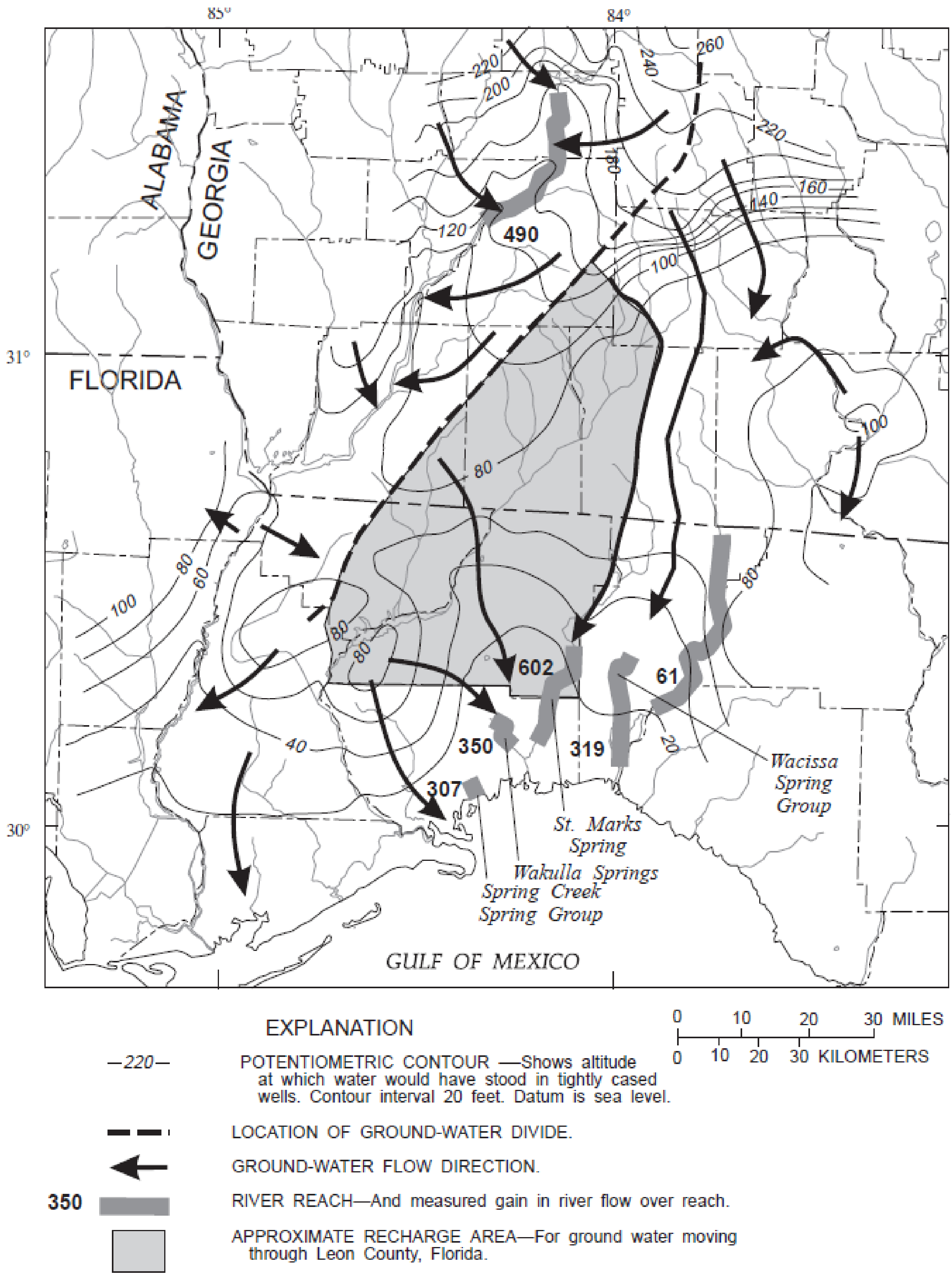


Figure 3.5: Groundwater recharge area for the Woodville Karst Plain in Wakulla County (Davis, 1996).

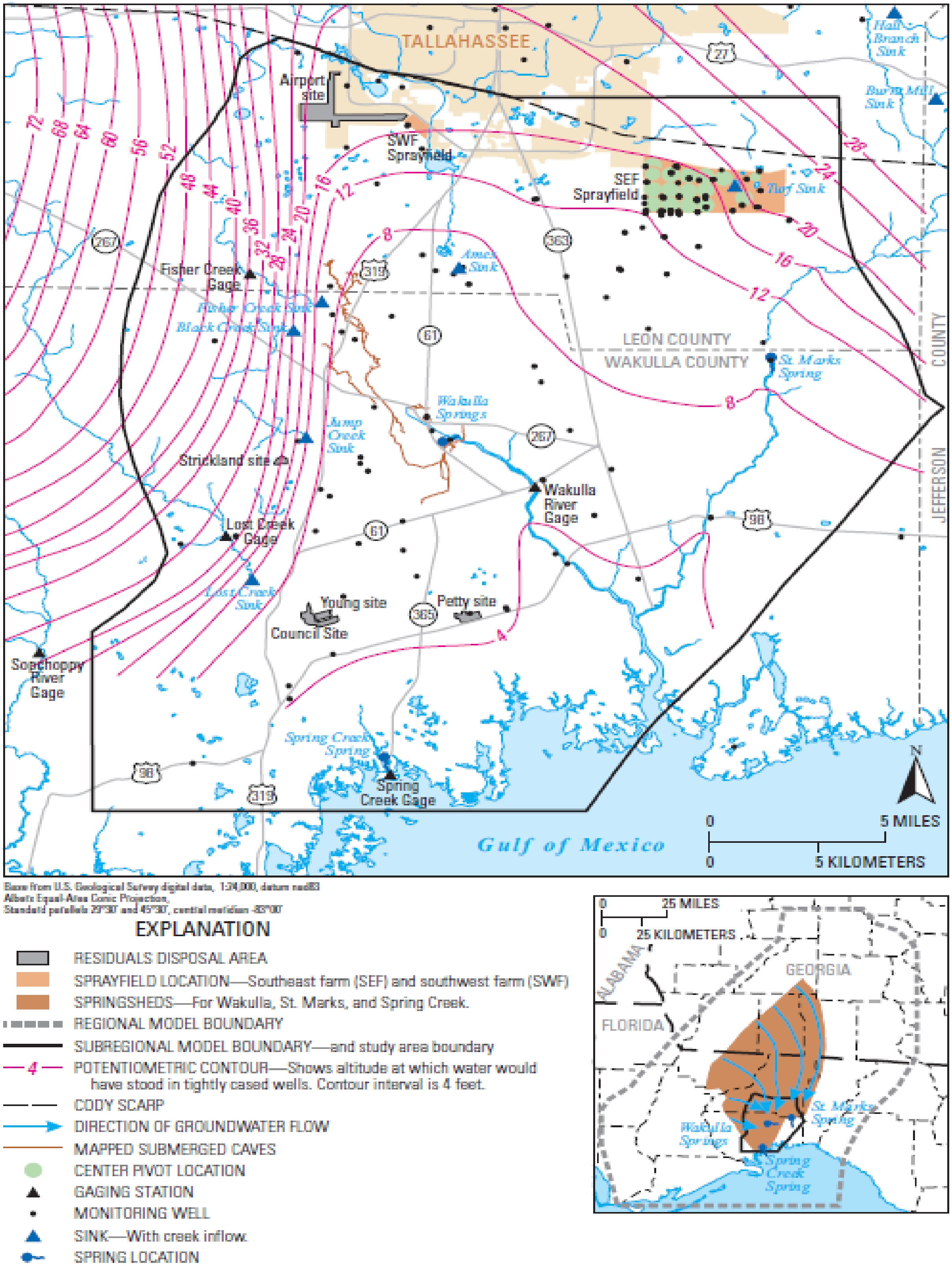
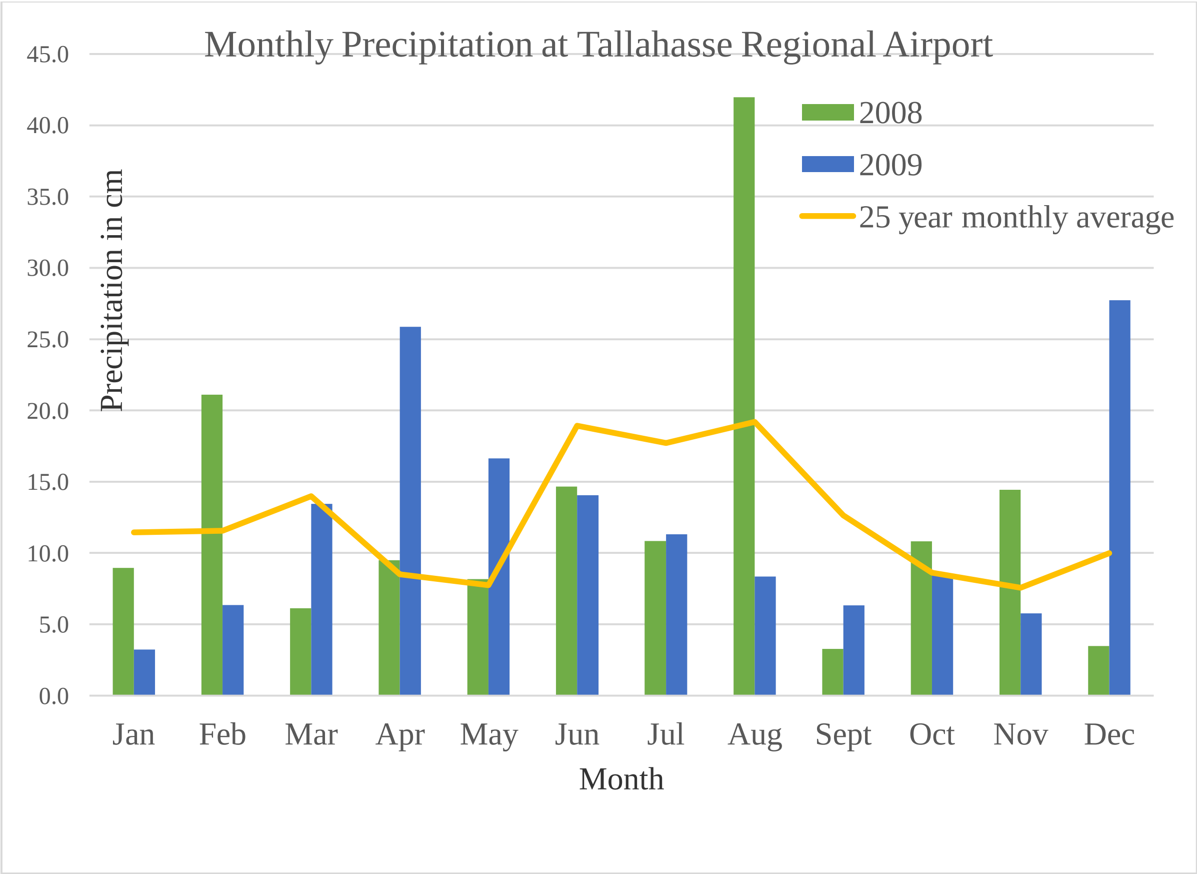


Figure 3.6: Study area and potentiometric surface of the Upper Floridan Aquifer late May and early June 2006 (Davis et al., 2010).



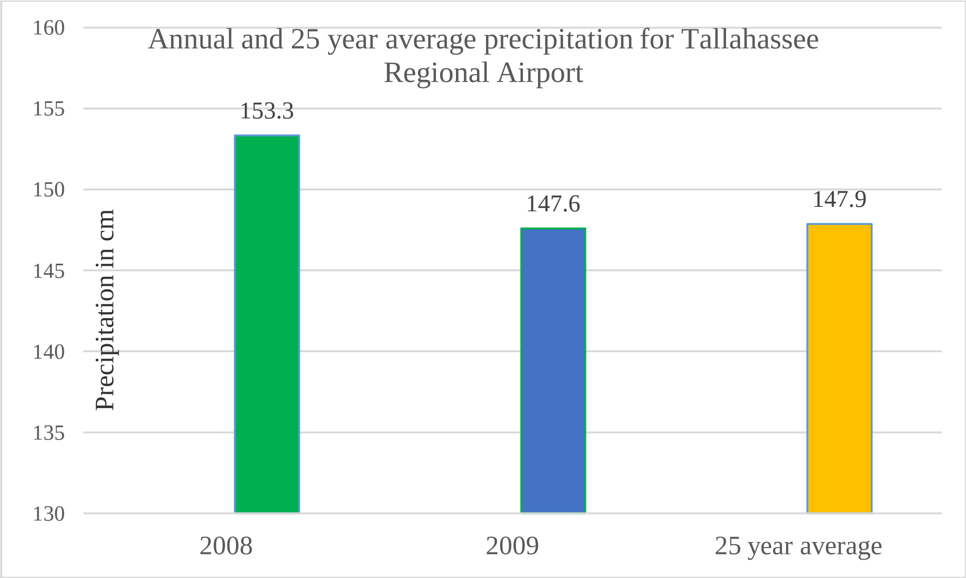


Figure 3.7: Monthly and annual precipitation for Tallahassee 2008 and 2009 and 25 year averages.

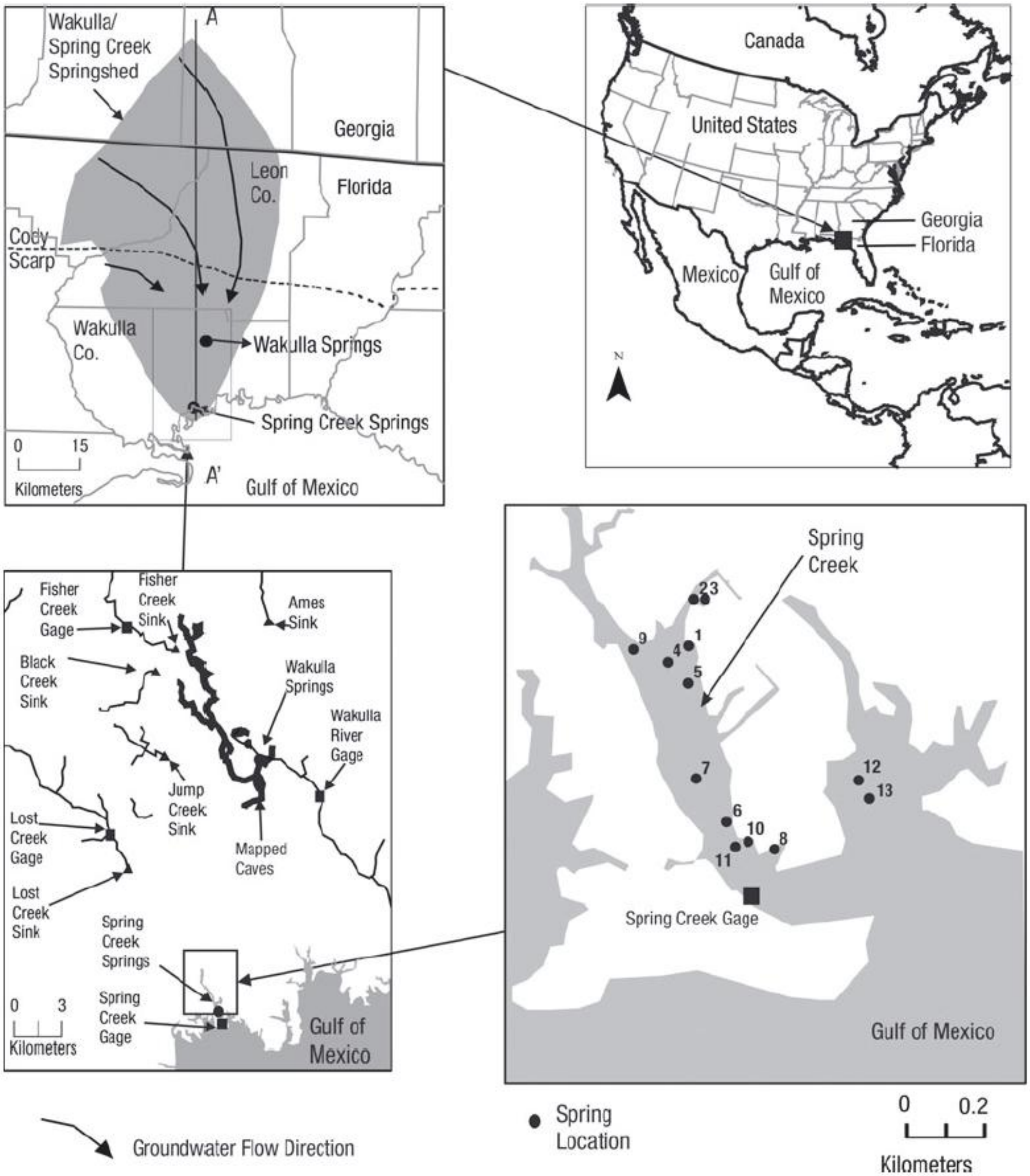


Figure 3.8: Wakulla Spring and Spring Creek Springs springsheds, surface streams, and the individually identified spring vents within the Spring Creek Springs group (Davis and Veridi, 2013).

Figure 3.9: North-easterly view of Lost Creek swallet from the bluff on the south-western rim during low stage. Photo courtesy of Cal Jamison.

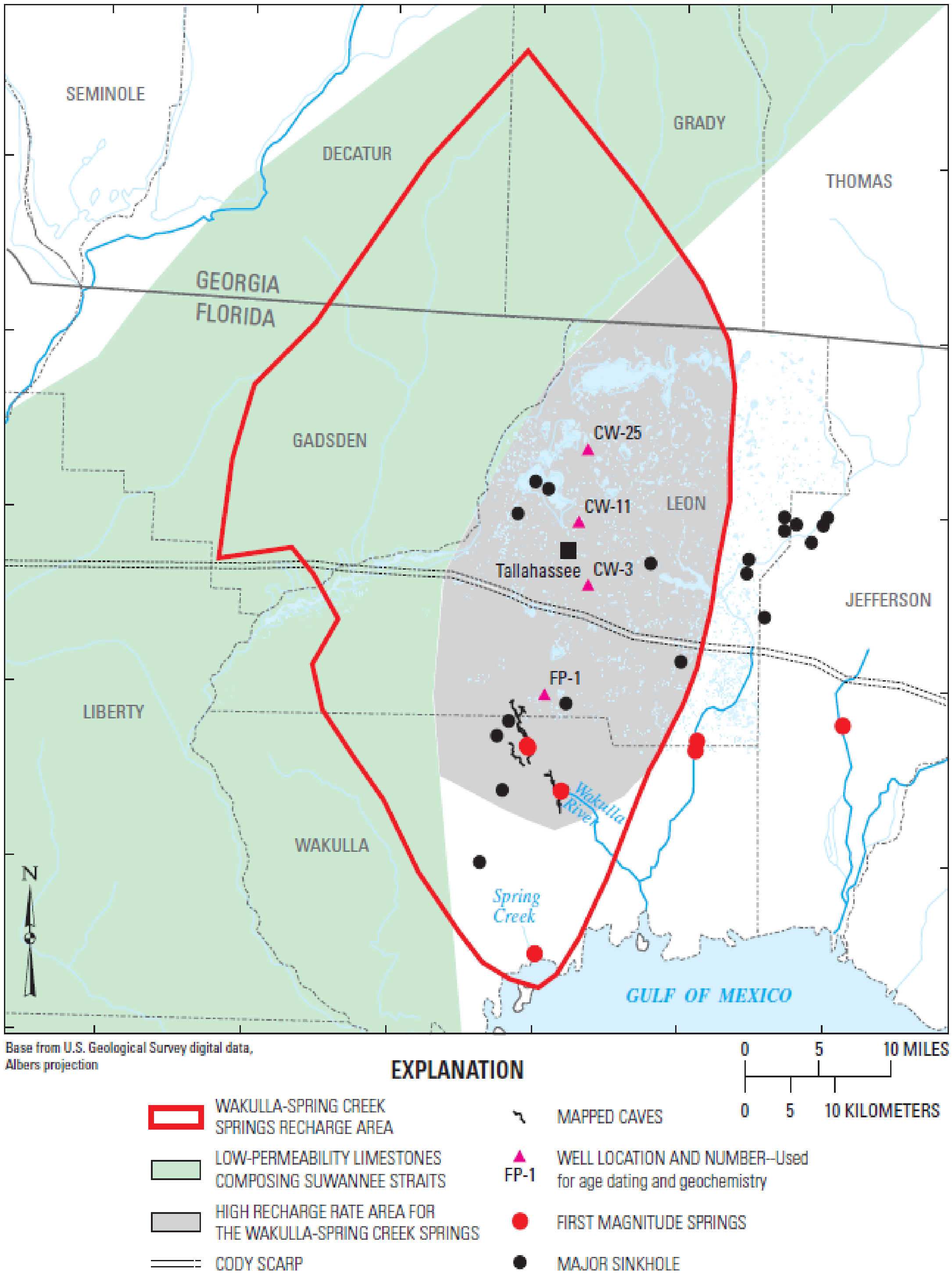


Figure 3.10: Wakulla Spring and Spring Creek Springs' springshed, karst features, springs, permeability and recharge for Wakulla County of the Woodville Karst Plain (Davis et al., 2007).

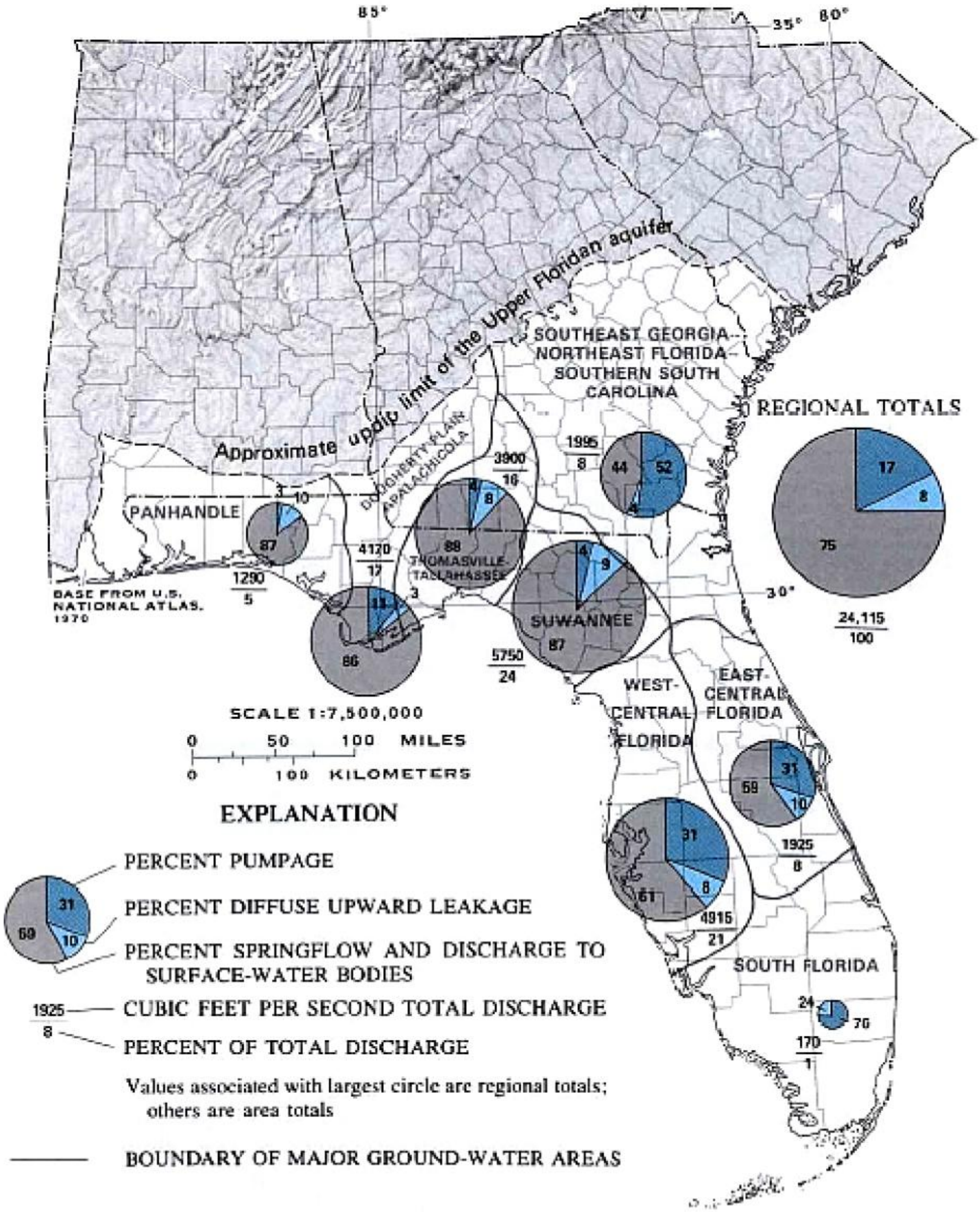


Figure 3.11: Estimated early 1980's discharge from major ground-water areas of the UFA (Johnston et al., 1988).

Figure 3.12: Wakulla Spring March 11, 2011. Photo courtesy of Florida Geological Survey.

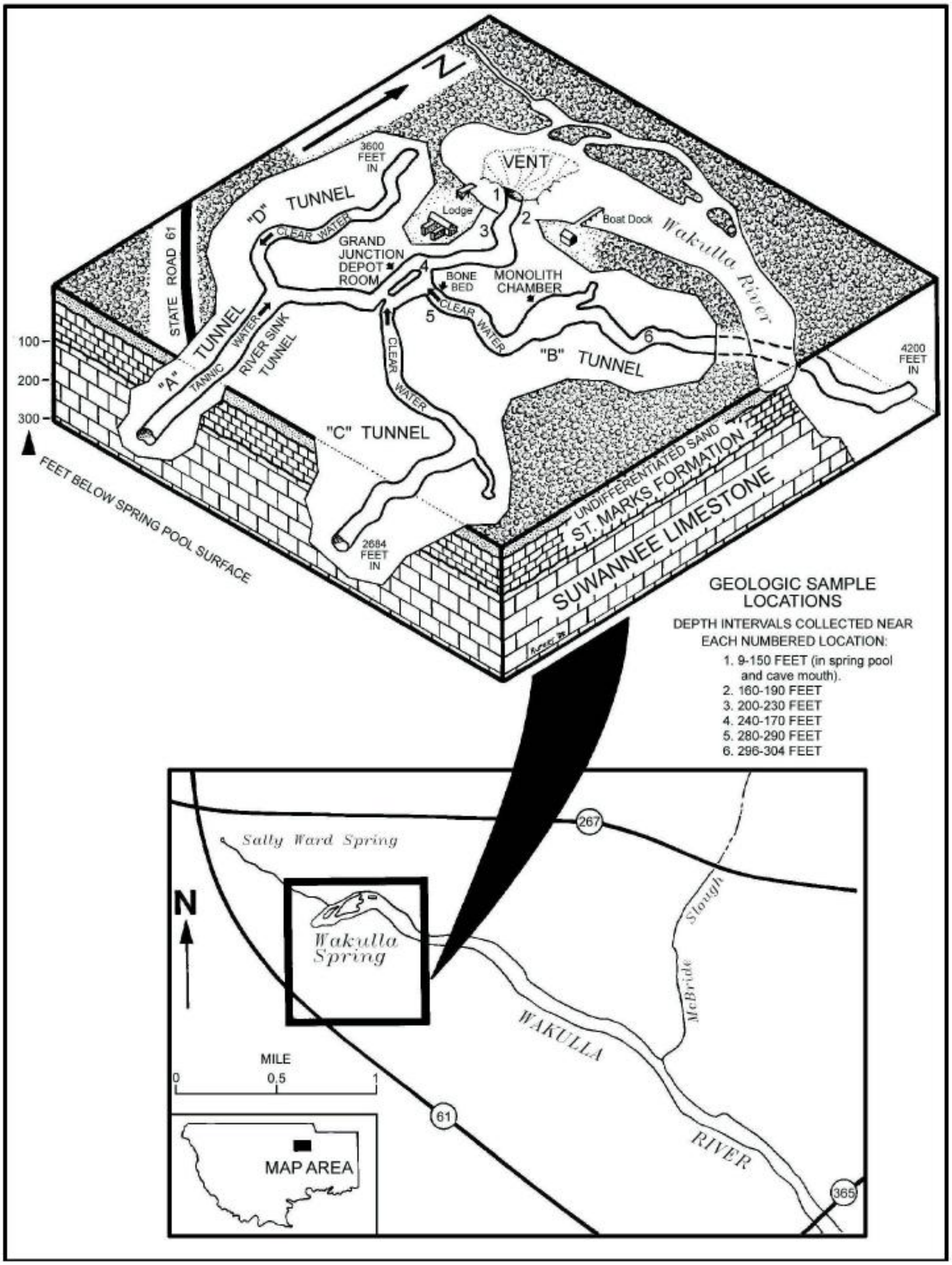


Figure 3.13: Block diagram of the Wakulla Springs conduit system (Lane, 2001).

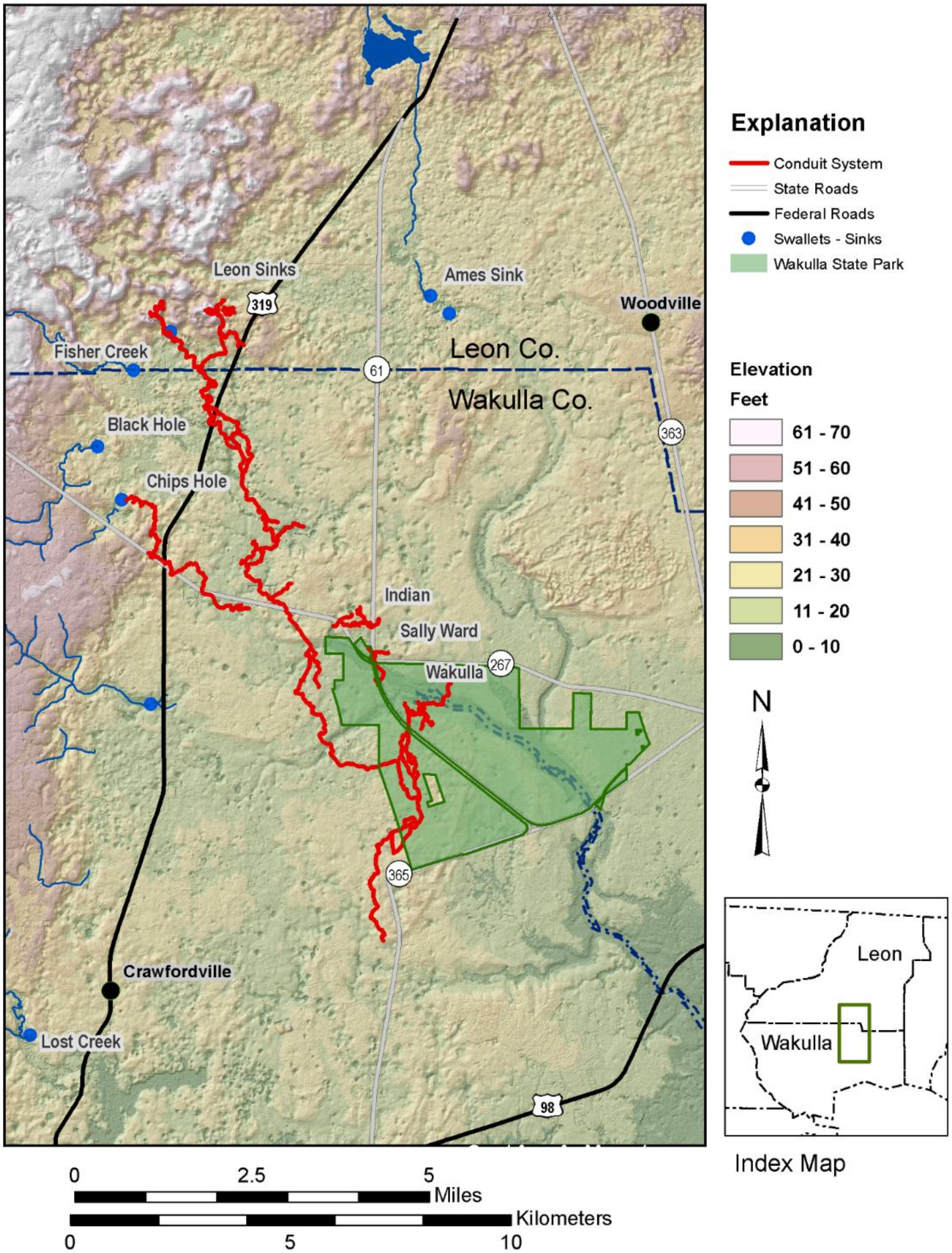


Figure 3.14: Map view of the continuous conduit system established by the Woodville Karst Plain Project. Cartography by Dr. Stephen Kish, PhD.

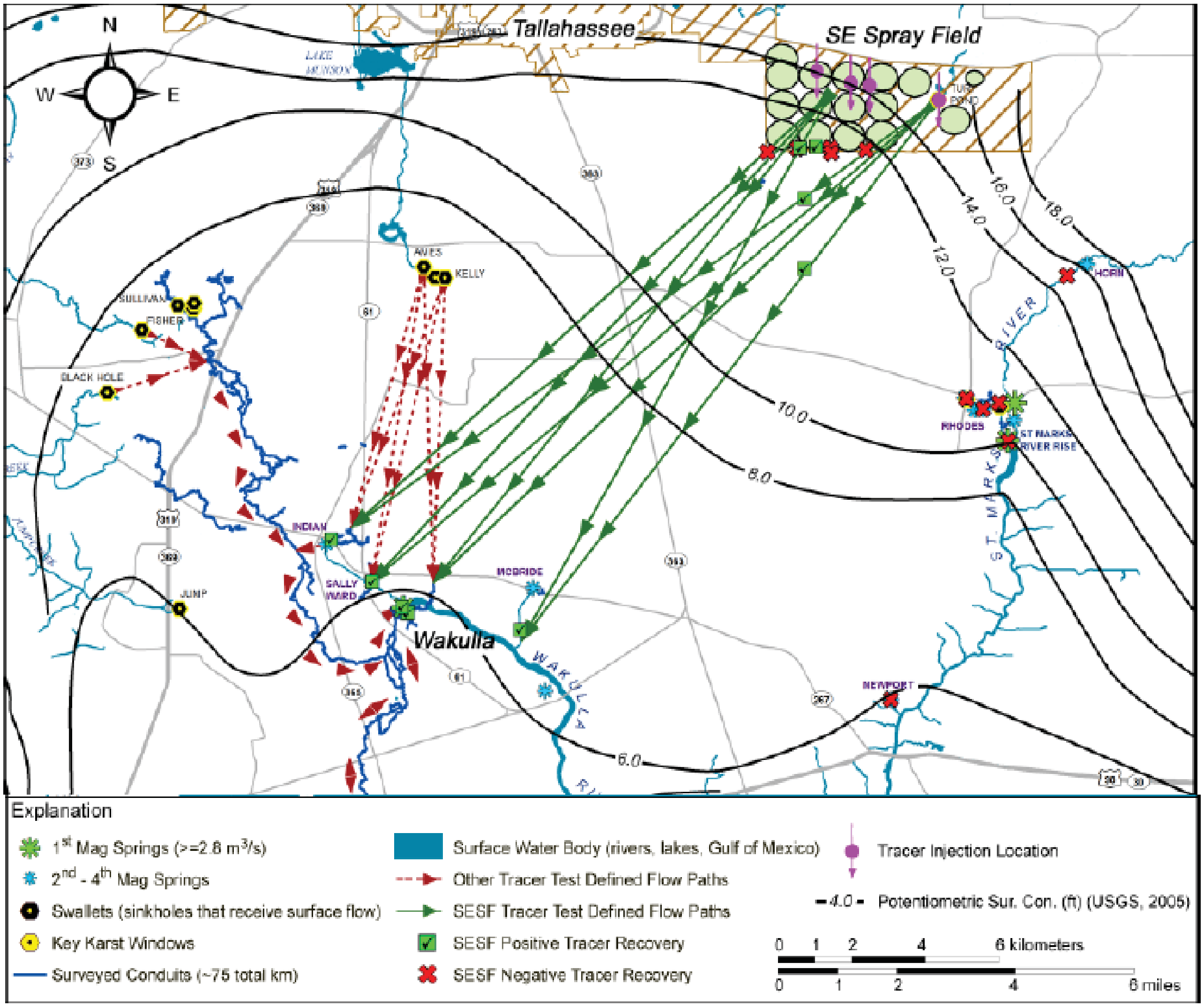


Figure 3.15: Combined results of the 2002-2006 dye traces in the Woodville Karst Plain. (Modified from Kincaid et al., 2012).

Figure 3.16: Spring Creek Springs March 11, 2011. Photo courtesy of Florida Geological Survey.

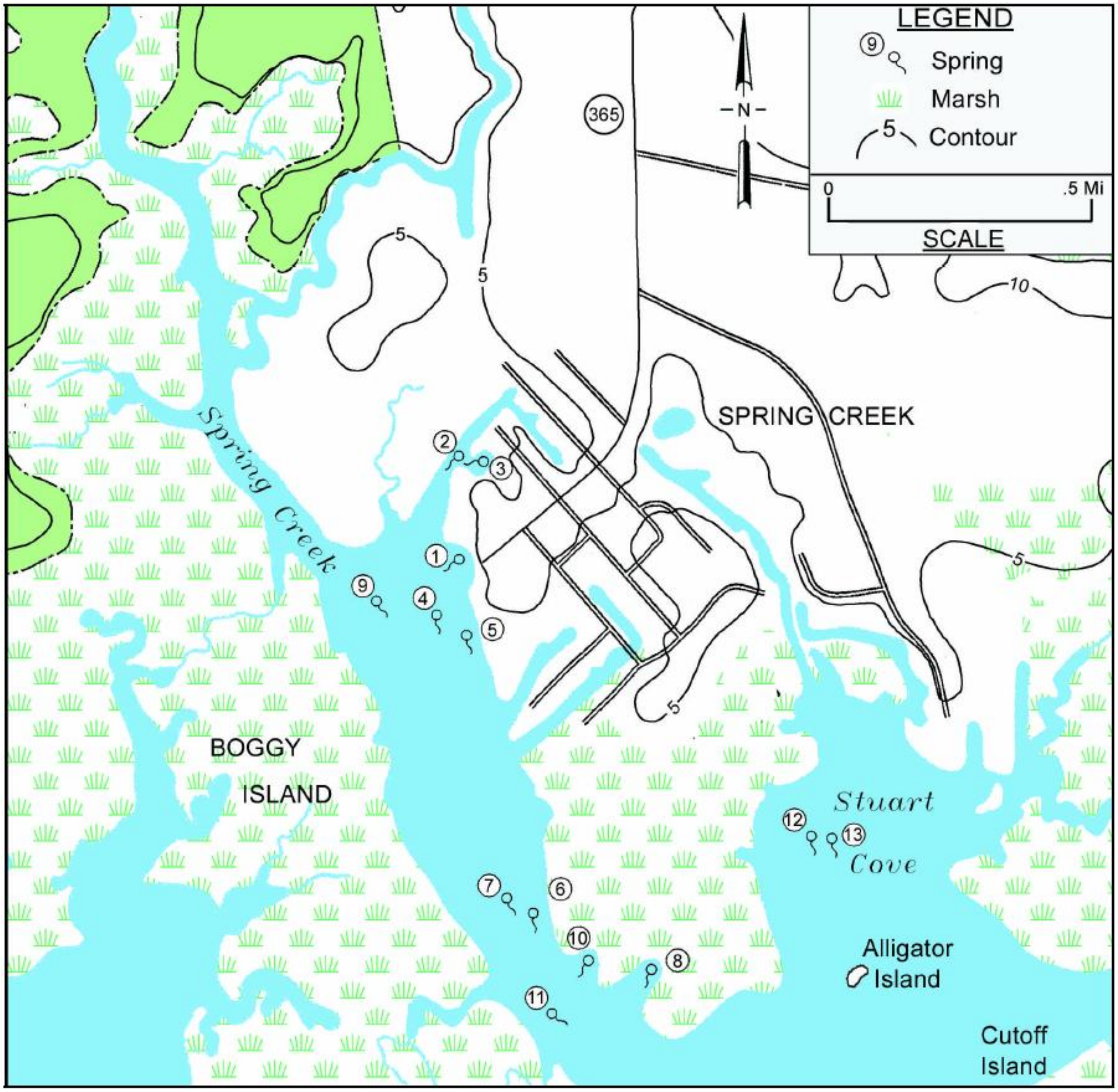


Figure 3.17: Location of numbered submarine springs in the Spring Creek Springs group. (Modified from Lane, 2001 and Rosenau, 1977).

CHAPTER 4

FIELD METHODS

Overview

In 2008 and 2009 the research presented in this study of the Woodville Karst Plain in Wakulla County was focused on the southern extent of the springshed. A collaborative research effort by federal and state environmental agencies, contracted consultants, scientific explorers, academic researchers and volunteers focused southward from Wakulla Spring to the coastline at Spring Creek Springs.

There was broad agreement among the group that a dye trace of Lost Creek swallet would advance the conceptualization and understanding of the Woodville Karst Plain hydrological regime. The primary goal of a Lost Creek swallet dye trace was to test Lane's (2001) hypothesis that Lost Creek swallet recharge contributed to the discharged from Spring Creek Springs system. The first dye trace was conducted May-August of 2008 and a second was conducted in July-October of 2009. Two separate dye traces were conducted in order to confirm the 2008 trace results and to expand sampling locations and utilize additional hydrological monitoring during the 2009 trace. These dye trace studies were one of the primary research objectives of this study.

The methodology implemented for the 2008 and 2009 Lost Creek swallet dye-traces was based on the proven practices of previous (2002 – 2007) dye-traces conducted in the northern extent of the Woodville Karst Plain (Kincaid and Werner, 2008; Kincaid et al., 2012). The Lost Creek swallet dye traces were funded through grants obtained by the Florida Geological Survey, and conducted by contracted consultants (Hazlet-Kincaid, Inc., H2H Consultants, LLC and Cambrian Ground Water Company) and Florida Geological Survey staff (including this investigator). Field reconnaissance and site consideration was conducted by Florida Geological Survey staff, contractors to the project and supported by the volunteer efforts of the Woodville Karst Plain Project (cave divers) and the Springs Ambassador of Wakulla Springs (Cal Jamison). The methods implemented conformed to recommendations of specialists in dye trace methodology; regulatory agencies, U.S. Geological Survey, Ozark Underground Laboratory and experienced karst researchers (Quinlan, 1989; Aley, T., 2002; White, 2002; White, 2007; Rosenberry and LaBaugh, 2008). The methodology for executing a successful dye-trace involves three broad categorical tasks: design, injection and monitoring. The primary goal of any dye-tracer test is to create a detectable fluorescent signal that can be identified as originating from a known location of an injected tracer and interpreted to achieve the goals and objectives of the dye-trace test (Rosenberry and LaBaugh, 2008). Objectives of the 2008 and 2009 Lost Creek swallet dye traces were to: determine the resurgence point(s) of Lost Creek swallet recharge, test for evidence (linear flow velocity) of a conduit(s) connecting Lost Creek swallet to Spring Creek Springs, test for conduit connectivity (linear flow velocity) between Lost Creek swallet and karst windows (i.e. Revell Sink and Punchbowl Sink), measure the underground flow velocity between injection and detection locations and improve conceptualization of the conduit flow regime in the southern extent of the springshed. Careful planning and execution are required so that the results of a dye-trace can be interpreted, understandable and successful (Quinlan, 1989).

Dye-trace Design

It was decided that a semi-quantitative dye-trace would be performed. A fully quantitative dye-trace was not possible as continuous flow measurements were not feasible at all the spring vents and karst windows that were to be sampled for dye detection. A concerted effort was made to consider all pertinent hydrological information available for the study area;

meteorological data, groundwater levels, local flow direction and hydraulic gradients, spring and karst window maps, stream and spring stage, velocity and discharge data, relating results of previous dye-traces to the planned dye traces, cave diver observations and reports, and the anticipated flow dynamics (high flow versus low flow conditions) for the time frame for which the dye-trace was planned.

Having considered the pertinent hydrological information for the basin it was decided that the dye-trace of Lost Creek swallet could be conducted with reasonable certainty of success. The most convincing observation for the connectivity of Lost Creek swallet to a principal discharge conduit was the regular siphoning of Lost Creek swallet during periods of high flow. Lost Creek swallet provided an ideal location by which dye-tracer could be injected directly into the conduit system. Injection directly into the conduit system during a recharge event would ensure that the dye entered the conduit system as concentrated "slug" over a short defined duration of time. A key component of the sampling plan was to select sampling sites that were either a spring or a karst window (swallet) that offered direct access to the conduit system.

Liquid sodium fluorescein (also known as uranine, AY73) dye was selected for the Lost Creek swallet dye-traces. This dye was selected as it meets the recommended criteria for water tracer: easily introduced, travels at or near the velocity of water, conservative-not easily lost to sorption, stable with regard to water chemistry and has little to no toxicity or long-term threat to the environment (Rosenberry and LaBaugh, 2008). The dyes used in this study were approved by the Environmental Protection Agency as biodegradable. Advantages to the use of sodium fluorescein dye versus other fluorescent dyes for our application was (1)high magnitude of fluorescence intensity, (2) low detection limits (0.0005 ppb), (3) resistance to adsorption onto minerals (specifically carbonates) and (4) resistance to adsorption onto inorganic matter.

Tracer Detection Stations

For the 2008 Lost Creek swallet dye-trace, six tracer sampling stations were established and equipped with ISCO Auto Samplers: Spring Creek vent 3, Spring Creek vent 10, Shepherd Spring, Revell Sink, Wakulla K-conduit, and Wakulla Spring main vent. Grab samples were to be taken on a weekly basis from Spring Creek Springs' vents 1, 2, 8 and 11. Table 4.1 summarizes the tracer sampling stations, station ID(s), sample type and planned sampling interval for the 2008 dye-trace.

For the 2009 Lost Creek swallet dye-trace, seven tracer stations were established and equipped with ISCO Auto Samplers: Spring Creek vent 1, Spring Creek vent 2, and Spring Creek vent 10, Sheppard Spring, Revell Sink, Wakulla K-conduit and the Wakulla Spring boat dock 200 meters downstream from the main Wakulla Spring vent. An additional karst window, Punchbowl Sink, identified by Cal Jamison and verified by the Woodville Karst Plain Project divers to have access to conduits, was selected for intermittent grab sampling. Grab samples were to be taken on a weekly basis from Spring Creek Springs' vents 3, 8 and 11. Sampling began at the above stations approximately two (2) weeks prior to injection. Table 4.2 summarizes the tracer sampling stations, station ID(s), sample type and sampling interval for the 2009 dye-trace. Figure 4.1 and Figure 4.2 depict the area of investigation, injection station and tracer sampling stations for the 2008 and 2009 dye-traces. For the remainder of this document, the station ID(s) in tables 4.1 and 4.2 will be utilized when referring to and discussing the stations involved in this investigations study.

Sampling for both dye-traces was conducted by automated water sampling devices and hand samples ("grab samples"). The automated samplers deployed were ISCO model 3700 samplers manufactured by Teledyne ISCO. ISCO samplers are self-contained, programmable units powered by standard 12V deep cell battery that contain an internal peristaltic pump and a distributor that dispenses samples into a carousel of plastic bottles (24 per unit). Sampling routines can be programmed to take samples at designated time intervals and quantities of water (solution). The programmability of the sampler allows flexibility to accommodate nearly any sampling regime. The ISCO unit's capacity of 24 bottles/samples required a sample retrieval routine that allowed for collection of the acquired samples and redeployment prior to the next round interval sampling.

The ISCO sampler's internal peristaltic pump retrieved the sample via polyethylene tubing from the source. When the programmed interval for taking a sample is prompted, the peristaltic pump engages and purges the line, takes the sample, and then purges the line again. This ensures the sample taken is obtained from the source (spring boil) at that time and free of any residual from the previous sample interval. When samples were to be retrieved from a source that exceeded the head or distance capacity of the peristaltic pump, a secondary pump powered by 12V deep cell batteries was deployed. The secondary pumps were connected to tubing installed by divers at depth in the source (conduit or throat of spring vent) to be sampled. The secondary pumps, initiated by programmable timers, were utilized to pump water from the source (deep conduit or distant spring) to a 5 gallon bucket at the surface. The 5 gallon buckets served as a temporary basin from which the ISCO sampler could assuredly acquire the desired interval sample. The 5 gallon buckets were perforated so that in between sample intervals the water from the previous sample interval would drain away. In addition, the secondary pumps ran at a flow rate and an interval that preceded the programmed sample interval of the ISCO sampler to ensure the secondary pump had purged the tubing and was supplying water from the source that coincided with the sample interval desired.

Tracer Sample Collection

The samples collected for dye tracer analysis from the ISCO automatic samplers were collected in sequential rounds. Each round of samples was collected at an interval frequency of time related to the elapsed time from the dye injection event. The intervals for sampling were related to the number 24: intervals of 8 hour, 12 hour or 24 hour. The commencement for the first sample in each round and the interval of time utilized for each round of sampling was carefully tracked. When a round of samples was collected the individual samples within each round were stored in a new 10ml borosilicate glass test tube and sealed with a screw on cap. Each individual sample within the round was labeled according to its sequential position in the sequence of samples collected for the particular round. Each round of samples was clearly labeled by station name, the round number, the time the first sample was taken, and the interval of time which elapsed between each sample. Each round of samples was labeled and packaged separately by station and round number. The samples were then stored immediately in a dark environment, packaged securely and prepared for shipment.

Grab samples taken by hand from a flowing spring run or by peristaltic pump from a subsurface feature (conduit) were handled in a similar manner. Grab samples taken via a peristaltic pump and tubing from a subsurface conduit at karst window stations (Revell Sink, Punchbowl, Wakulla K-conduit) were taken after the tubing was purged to ensure the sample collected was from the source at the time the sample was taken. Each grab sample taken was packaged separately and labeled with the station name, date and time of sample.

On a weekly basis all samples taken were packaged securely and forwarded for analysis. A sample tracking document was created to record, track and monitor the samples taken and shipped for analysis. The sample tracking document was a continuous document to which each shipment of samples was added to the previously documented samples. This document proved to be indispensable in tracking, monitoring and ensuring the detection station, round of samples, number of samples, sequence of sampling, date and time for each sample was known. The sample tracing sheet was forwarded by email weekly at the time of shipment to the lab conducting the analysis.

Tracer Analysis

Fluorometric analysis of the discrete water samples collected was conducted by Cambrian Ground Water Co. utilizing a Shimadzu RF5000U scanning spectrofluorophotometer. Fluorometric analysis by a scanning spectrofluorophotometer was desired because of the exceptional sensitivity of the instruments. These instruments can detect dyes in the parts-per-trillion and enable precise characterization of the various sources of fluorescence in a sample (Rosenberry and LaBaugh, 2008).

Dye Injection

The Lost Creek swallet 2008 dye injection was performed on May 29, 2008, between 9:49 AM and 12:30 PM. The injection was performed following a small rainstorm that had re-established flow in Lost Creek. Three carboys (18.14 kg each, 54.42 kg total) containing 35 percent by weight of liquid sodium fluorescein (uranine, AY73) solubilized in water were injected into Lost Creek swallet by means of a peristaltic pump and polyethylene tubing. The total weight of sodium fluorescein (uranine, AY73) injected was 19.05 kg. The end of the tubing was anchored approximately 15.25 meters below water surface in the throat of Lost Creek swallet. The dye was pumped directly from the manufacturer’s carboys until each carboy was empty. Each carboy was then filled with water from Lost Creek swallet and the rinse water was likewise pumped into the swallet.

In 2009 the dye injection at Lost Creek swallet was conducted on July 14, 2009, between 10:30 AM and 12:08 PM. As in 2008, a relatively small rain storm was targeted as an ideal injection event. The flow in Lost Creek resulting from the rain was sufficient to entrain the dye into the flow draining into Lost Creek swallet. For the 2009 injection the amount of dye injected was increased by one carboy (18.14 kg). This was done in order to possibly increase the concentration of any detections and to compensate for the possible bifurcation of flow observed in the 2008 Lost Creek swallet dye trace. Four carboys (18.14 kg each, 72.56 kg total) containing 35 percent by weight of liquid sodium fluorescein (uranine, AY73) solubilized in water were injected into Lost Creek swallet by means of a peristaltic pump and polyethylene tubing. The total weight of sodium fluorescein (uranine, AY73) injected was 25.40 kg. The end of the tubing was anchored approximately 27.43 meters below water surface in the throat of Lost Creek swallet. The dye was pumped directly from the manufacturer's carboys until each was empty. Each carboy was then filled with water from Lost Creek swallet and the rinse water was likewise pumped into the swallet.

Water Level Elevation Stations

During the fall of 2008 an array of water level monitoring stations were installed along a north – south transect through the west – central Woodville Karst Plain. An additional water level monitoring station was installed at the Lost Creek swallet where the dye was to be injected on the western margin of the area of investigation. Water level elevation stations were established to facilitate a gradient analysis across the basin and to enhance interpretation of the planned 2009 Lost Creek swallet dye trace. These devices were installed in karst windows that were known or presumed to be directly connected to the previously (2002 – 2007) traced and mapped conduit system extending from Leon Sinks to the diver explored reaches of conduit Q south of Wakulla Springs. Figure 4.3 shows the location of the monitoring stations located within the area of investigation. Table 4.3 provides details as to precise location, benchmarks and elevation details.

Un-vented In-situ Level Troll 500™ and vented Global WL16™ logger devices were installed in PVC stilling wells. In order to obtain absolute water level elevations, all logger stations were surveyed relative to NAVD88 vertical datum. Differential GPS surveying and conventional leveling surveying to the location of stilling wells was performed from existing benchmarks or benchmarks were established using GPS leveling equipment. The accuracy of GPS elevation measurements is approximately ± 2-4 centimeters. The top of casing elevations for each station was determined by closed loop survey leveling methods. The depth of deployment for the transducer of each water level logging device from the top of casing was measured and recorded. The top of casing elevation minus the depth of transducer deployment provided an absolute elevation of the transducer for each station. The un-vented devices were deployed synchronously at 15 minute intervals. The pressure data obtained from the un-vented devices was then converted to a daily average pressure (psi). Daily average barometric pressure was obtained from the NOAA weather station located at the Tallahassee Regional airport, approximately 25 kilometers north of the instrument locations. The daily average barometric pressure (psi) data from NOAA was subtracted from the daily average pressure (psi) of the un-vented devices from each station. This correction allowed the calculation of the actual daily average pressure (psi) of the water column at each location. The daily average pressure (psi) of the water column for each station was then converted to the actual depth of water column based on freshwater density. The daily average depth of the water column was then added to the transducer elevation to obtain the daily average water level elevation for each station. The

Global WL16™ devices were vented and did not require any barometric pressure manipulations. The water level elevation throughout the area of investigation would be useful and pertinent to assessing the gradients prevalent in the conduit system during the movement of the injected dye.

Figure 4.4 is an image of Revell Sink water level elevation station. The image is offered to help visualize the equipment and station geometries involved in monitoring and calculating the water level elevations. The image on the left is in deployed mode; the un-vented In-situ Level Troll 500™ is inside the PVC stilling well. The "Top of Casing" elevation noted in Table 4.3 is the surveyed elevation to the bolt in top of white cap. The "Depth of Transducer" noted in Table 4.3 is the length of wire (right hand image) from the bolt in the white cap to the transducer at bottom of logger. "Transducer Elevation" noted in Table 4.3 is the elevation of the transducer while in deployed mode (left hand image). The logger devices were deployed at a surveyed elevation so that the water level elevation at each station could be calculated.

Meteorological Observations

It was decided that precipitation data for Tallahassee, Florida, Wakulla Springs State Park and St. Marks, Florida would be collect. Precipitation data from three locations traversing the extent of the study area was desired to in order to provide a more complete perspective of precipitation impacting the study area. Precipitation data for Tallahassee, Florida was acquired from NOAA. Precipitation data for Wakulla Spring State Park and St. Marks, Florida was acquired from Northwest Florida Water Management District (NWFWMD). Barometric pressure data for the Tallahassee Regional Airport was acquired from NOAA. Precipitation and barometric data are presented and discussed in more detail in the following Results section of this study.

Stream Flow, Spring Discharge, and Gage

Primary hydrological data for the area of investigation was acquired from the U.S. Geological Survey. Stations of interest to the dye trace and basin characterization were Wakulla Spring, Lost Creek and Spring Creek Springs. Data obtained from U.S. Geological Survey: spring discharge and gage for Wakulla Spring and Spring Creek Springs, and stream discharge and for gage Lost Creek. Elevations for gaging stations are reported relative to the NGVD29 vertical datum for Wakulla Springs and Lost Creek for historical continuity. The gaging station for Spring Creek Springs is reported relative to NAVD88. In this portion of Florida the difference between the two datums is approximately -0.2 meters between the old and new datums. This hydrological data was collected from the U.S. Geological Survey online data portal. Spring and stream discharge and gage data are presented and discussed in more detail in the following Results section of this study.

Table 4.1: 2008 Tracer sampling stations, station ID, type of sample and sampling interval.

Tracer Sampling Station	Station ID	Type of Sample	Sample Interval
Spring Creek Vent 1	SC01	Grab Sample	Weekly
Spring Creek Vent 2	SC02	Grab Sample	Weekly
Spring Creek Vent 3	SC03	ISCO Automatic Sampler	Every 8 hours
Spring Creek Vent 8	SC08	Grab Sample	Weekly
Spring Creek Vent 10	SC10	ISCO Automatic Sampler	Every 8 hours
Spring Creek Vent 11	SC11	Grab Sample	Weekly
Shepherd Spring	SHEP	ISCO Automatic Sampler	Every 8 hours
Revell Sink	REV	ISCO Automatic Sampler	Every 8 hours
Wakulla K Conduit	WSK	ISCO Automatic Sampler	Every 8 hours
Wakulla Main Vent	WSV	ISCO Automatic Sampler	Every 8 hours

Table 4.2: 2009 Tracer sampling stations, station ID, type of sample and sample interval.

Tracer Sampling Station	Station ID	Type of Sample	Sample Interval
Spring Creek Vent 1	SC01	ISCO Automatic Sampler	Every 8 hours
Spring Creek Vent 2	SC02	ISCO Automatic Sampler	Every 8 hours
Spring Creek Vent 3	SC03	Grab Samples	Weekly
Spring Creek Vent 8	SC08	Grab Samples	Weekly
Spring Creek Vent 10	SC10	ISCO Automatic Sampler	Every 8 hours
Spring Creek Vent 11	SC11	Grab Samples	Weekly
Shepherd Spring	SHEP	ISCO Automatic Sampler	Every 12 hours
Punchbowl Sink 1	PUN	Grab Sample	Several times weekly
Revell Sink	REV	ISCO Automatic Sampler	Every 12 hours
Wakulla K Conduit	WSK	ISCO Automatic Sampler	Every 12 hours
Wakulla Boat Dock	WSV	ISCO Automatic Sampler	Every 12 hours

Table 4.3: Water level elevation station location benchmarks and pertinent elevation details.

	Sullivan Sink	Turner Sink	Wakulla Dock	Revell Sink	Lost Creek	Tobacco Sink	Punchbowl Sink 1	Punchbowl Sink 2
UTM (m) North [1]	3,355,997	3,351,177	3,347,955	3,342,040	3,340,263	3,336,273	3,335,773	3,335,951
UTM (m) East [1]	753,868	755,781	759,697	757,175	750,966	758,354	755,802	755,636
Bench Mark Identifier	BM002	BM006	FHOT001	RS01	LC01	TSNK	Sea Boat	Sea Boat
Bench Mark Elevation [2] (m)	4.73	3.70	2.45	5.69	5.49	4.32	3.93	3.93
Bench Mark Source[3]	1	1	3	2	2	2	4	4
Top Of Casing Elevation (m)	3.05	2.83	3.22	2.51	5.62	2.32	3.49	2.28
Transducer Depth (m)	1.78	1.78	2.37	1.78	5.49	1.78	2.99	2.14
Transducer Elevation (m)	1.27	1.05	0.85	0.73	0.12	0.54	0.50	0.14

1. Horizontal position reported in UTM Zone 16 North; Horizontal Datum NAD83

2. Vertical elevations reported in feet NAVD88 and then converted to meter (m).

3. (1) HAS Consulting; (2) FSU; (3) National Geodetic Survey (NOAA); (4) Property Owner/Metric Engineering

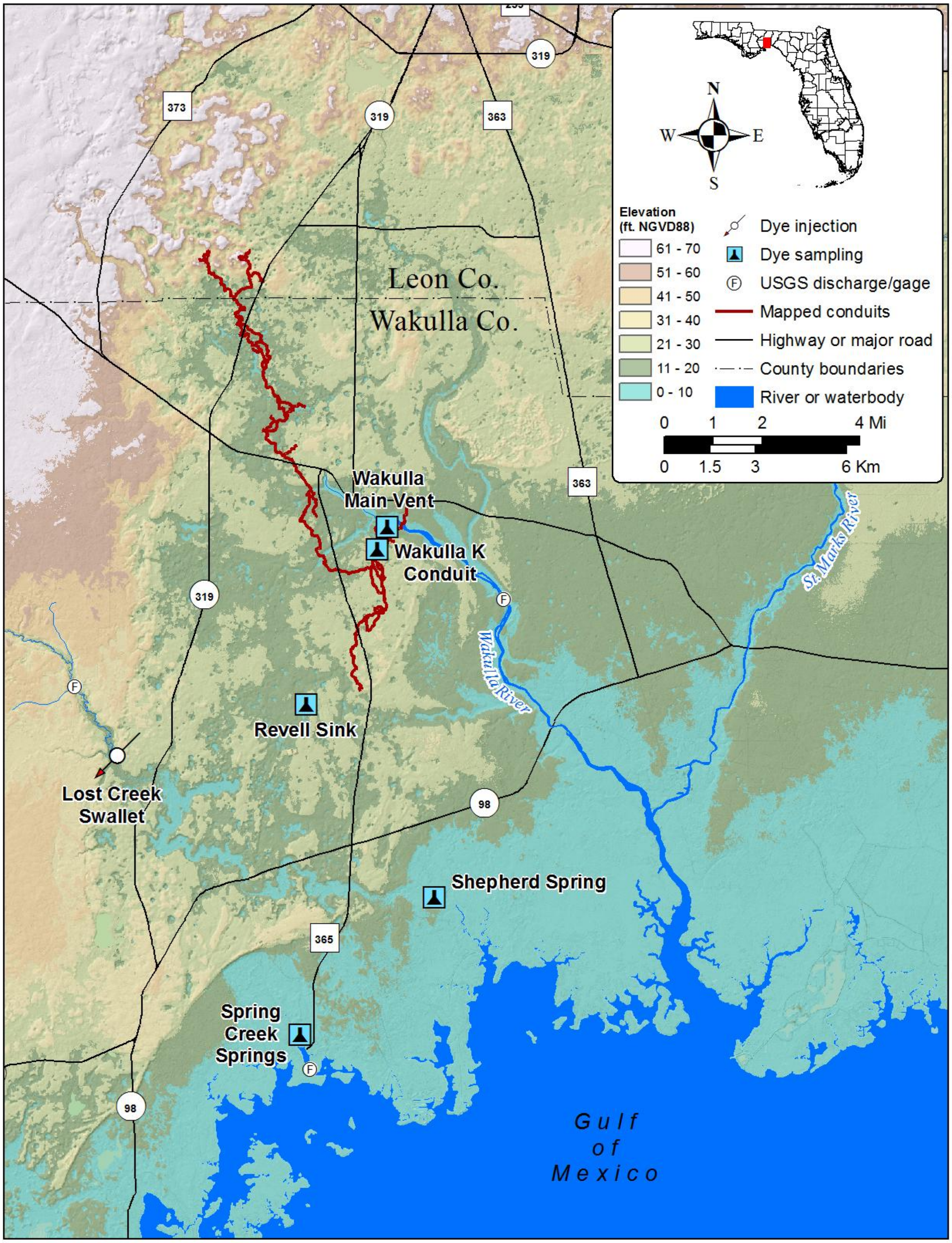


Figure 4.1: 2008 Lost Creek dye-trace area injection and sampling stations. Cartography by Seth Bassett.

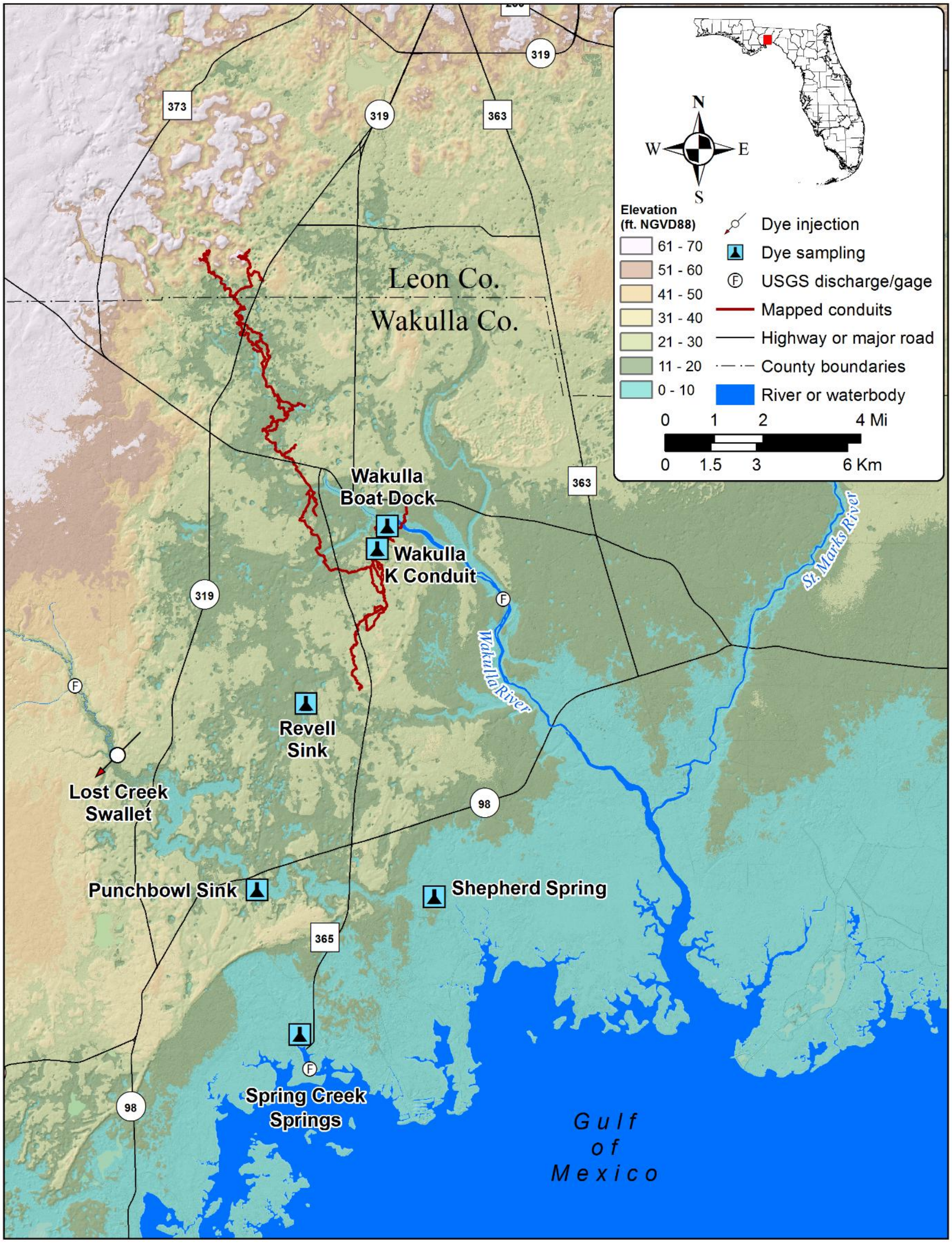


Figure 4.2: 2008 Lost Creek dye-trace area injection and sampling stations. Cartography by Seth Bassett.

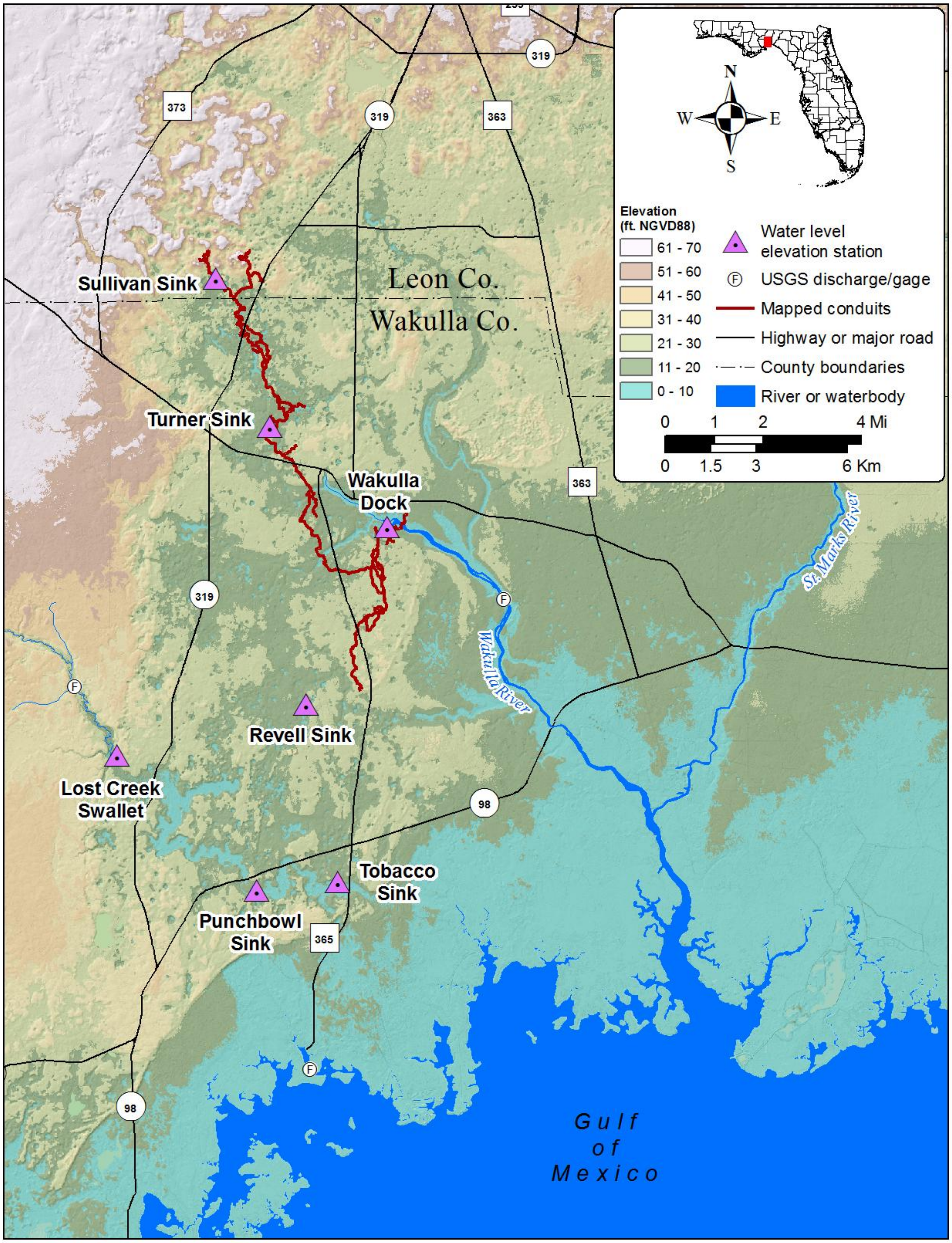


Figure 4.3: Water level elevation stations within the area of investigation. Cartography by Seth Bassett.

Figure 4.4: Revell Sink water level elevation station; left view, level logger in deployed mode; right view, level logger removed for perspective of top of casing, depth of deployment, and transducer elevation.

CHAPTER 5

RESULTS

Overview

The field methods outlined in the previous chapter for the 2008 and 2009 Lost Creek dye trace(s) were conducted. Background meteorological and hydrological conditions for the area of investigation were acquired for the period of study (January 1, 2008 – March 3, 2010) from online digital files (USGS and NOAA), direct data requests to the Northwest Florida Management District and data collected as part of this study. Sampling preparations for both dye traces were performed and a successful dye injection for each trace was executed. Tracer sample collections were implemented and the sample analysis were performed. The results of the 2008 and 2009 Lost Creek dye traces are outlined in the remainder of this section.

Meteorological Observations

Daily precipitation data for Tallahassee Regional Airport, Wakulla Springs State Park and Saint Marks, Florida were obtained for the period of study. Barometric pressure measurements for the period of study are based upon measurements made at the Tallahassee Regional Airport. The barometric measurements were used to adjust water level logger data to calculate water elevation at each station. Both the precipitation and barometric data for the period of study is presented in Appendix A.

The daily precipitation values for the three stations are shown in Figure 5.1. The overall frequency and magnitude of precipitation at the three stations were similar. Precipitation data for the Saint Marks, Florida station was not available for January 1, 2008 – April 21, 2008. For the period of January1, 2008 – March 31, 2010, Wakulla Springs State Park and the Tallahassee

Regional Airport accumulated precipitation amounts of 368.8 cm and 341.0 cm respectively. For the period of April 22, 2008 – March 31, 2010, Wakulla Spring State Park, Tallahassee Regional Airport and Saint Marks, Florida accumulated 333.6 cm, 297.3 cm and 285.0 cm of precipitation respectively. For both date ranges, Wakulla Spring State Park accumulated slightly more rainfall. Together, the three stations offer a perspective of the precipitation north of, central to and south-east of the area of investigation. For the study period, the precipitation station at Wakulla Spring State Park received more rain than the Tallahassee Regional Airport to the north, and Saint Marks, Florida station to the south-east. The yearly annual rainfall reported by the Tallahassee Regional Airport station for the year 2009 (147.6 cm) was slightly lower than the last 30 year average (1981-2010) for the station (150.4 cm).

Spring and Stream Discharge

Discharge data (measured by gaging and stream stage) for Wakulla Spring and Spring Creek Springs and flow data for Lost Creek stream were acquired for the study period to enable an understanding of the hydrological circumstances active during the dye traces. Gage data for the same locations and period of time were also obtained. Suitable interpretations of dye trace results are dependent on information for the flow regime functioning concurrently to dye trace investigations. The discharge and gage data for Wakulla Spring, Spring Creek Springs and Lost Creek are reported in Appendix B.

Discharge data for Wakulla Spring, Spring Creek Springs and the flow data for Lost Creek stream are shown in Figure 5.2. The discharge and flow plots of the three features demonstrate that they all have a wide range in discharge in response to precipitation events. Wakulla Spring's wide range in discharge from 5.69 m^3/s to 66.55 m^3/s is relatively stable in comparison to the fluctuation in discharge of Lost Creek and Spring Creek Springs. Lost

Creek's flows varies from near zero to 81.28 m^3/s consisting of sustained periods of flow at or near zero punctuated by brief episodes of noteworthy flow associated with precipitation from major storms. Spring Creek Springs demonstrated the widest range of discharge from -51.26 m^3/s to 69.37 m^3/s. The fact that Spring Creek Springs syphons estuarine water is pivotal to the flow regimes examined in this study.

Gage data for Wakulla Spring, Spring Creek Springs and Lost Creek are plotted in Figure 5.3. Lost Creek has the largest range in gage measurements of 3.92 m to 8.17 m. The gage measurements are reflective of the extreme flow variability previously discussed for Lost Creek. The fact that measurements of gage and flow at Lost Creek relate to precipitation events defines this stream's flashy hydrological character. Spring Creek Springs' gage varied from -0.95 m to 0.84 m. The gage measurements at Spring Creek Springs vary relatively quickly but not at the magnitude of Lost Creek. The overall pattern of gage measurements at Spring Creek Springs is rather sinusoidal and indicative of the tidal influences on this submarine spring system. Gage measurements for Wakulla Spring varied the least of the three features having a range of 0.41 m to 1.68 m. Like Lost Creek, Wakulla Spring gage measurements appear to correlate with the discharge fluctuations resulting from precipitation events. The apparent correlation of discharge and gage of Lost Creek and Wakulla Spring are discernable and have a complex relationship that is discussed further in the discussion section of this paper.

Karst Window Water Level Elevations

The seven karst window water level elevation stations (Figure 4.3) established in the area of investigation were maintained, monitored, and data downloads were conducted regularly December 15, 2008 – March 3, 2010. The water level elevation data generated by the stations is presented in Appendix C. A graphical representation of the data plotted over the time period is depicted in Figure 5.4.

The water level elevations along the north to south transect have the expected negative gradient southward with the exception of approximately June 15, 2009 – December 15, 2009. This period coincides with the dates during which Spring Creek Springs was reported to have had negative discharge (Figure 5.2). This anomaly will be examined further in the discussion section of this manuscript. There is strong agreement and apparent correlation of the water level elevations between the four northern most stations (Sullivan, Turner, Wakulla, Revell) for the entire period. A characteristic gradient (.45 m/14.5 km, August 17, 2009) between these stations (Sullivan and Revell) is typical of the flat gradient that generally persists within conduits of karstified coastal springsheds. The two southern most stations (Tobacco and Punchbowl) have sharp elevation fluctuations and appear to be in relative agreement to one another. Lost Creek swallet's water level elevation demonstrated extreme fluctuations as those observed in Figure 5.3. The U.S. Geological Survey gaging station data for Lost Creek (Figure 5.3) and the Lost Creek swallet water level elevation station data (Figure 5.4) have a noticeable discrepancy in elevations. This is due to the fact the two stations are in different locations (USGS station well up gradient) and the two stations have different vertical gage datums. More importantly, the U.S. Geological Survey Lost Creek gaging station is indicative of stream stage (elevation) and the Lost Creek swallet station is indicative of groundwater elevations. The maximum elevation obtained by Lost Creek swallet station is likely to be indicative of the maximum recharge capacity of the Lost Creek swallet. During the storm event that produced Lost Creek swallet's highest water level elevation, the swallet was documented to have overflowed southward into the swampy areas south of Crawfordville, FL.

2008 Lost Creek Dye Trace

As a result of extensive planning, thorough field reconnaissance and effective sampling, the Lost Creek swallet dye trace of 2008 was highly successful. The dye injected at Lost Creek swallet was detected at four sampling stations and Lost Creek swallet flow was confirmed to emerge at Spring Creek Springs. The results of the 2008 Lost Creek dye trace are recorded in Appendix D and graphed in Figure 5.5. Table 5.1 summarizes key tracer detection events as they occurred through the duration of the trace.

As postulated by Lane (2001), Lost Creek swallet flows are a component of flow at Spring Creek Springs. The tracer was positively detected at one of the thirteen vents in the Spring Creek Springs. The tracer was also detected at Revell Sink, Wakulla K conduit and the main spring vent at Wakulla Spring. These results indicate a more complex flow regime than had been previously hypothesized. A detailed analysis of the 2008 Lost Creek swallet dye trace follows in the Discussion section of this manuscript.

2009 Lost Creek Dye Trace

The complex results of the 2008 Lost Creek swallet dye traces necessitated that a second dye trace of the Lost Creek swallet be conducted. The 2009 Lost Creek swallet dye trace included additional sampling stations and a longer sampling duration. The results of the 2009 Lost Creek dye trace are recorded in Appendix E and graphed in Figure 5.6. Table 5.2 summarizes important tracer detection events as they occurred for the period of the trace.

The 2009 Lost Creek swallet dye trace confirmed that Lost Creek swallet flows emerge at Spring Creek Springs as confirmed by the 2008 tracer test. The 2009 tracer test additionally confirmed that recharge via Lost Creek swallet contribute to the discharge of at least three of the thirteen vents within the Spring Creek Springs. The 2009 tracer test provided a more comprehensive understanding of the flow regimes functioning in the southern portion of the basin and the control Spring Creek Springs exerts.

Table 5.1: Elapsed time table for significant events during the 2008 Lost Creek dye trace.

Date and Time	Elapsed Time, Days	Elapsed Time, Hours	Event
5/29/2008 14:00			Injection
6/3/2008 23:59	5.42	129.98	**First detection SC10 ****
6/23/2008 8:00	24.75	594.00	**Last Detection SC10**
6/26/2008 16:00	28.08	674.00	**First Detection REV**
7/9/2008 23:59	41.42	993.98	**First Peak REV**
7/13/2008 20:00	45.25	1086.00	**First Detection WSK**
7/13/2008 20:00	45.25	1086.00	**First Detection WSV**
7/22/2008 4:00	53.58	1286.00	**Maximum Detection Peak WSV**
7/25/2008 16:00	57.08	1370.00	**Frist Peak WSK**
7/29/2008 4:00	60.58	1454.00	**Last Detection WSV**
7/30/2008 16:00	62.08	1490.00	**Maximum Detection Peak REV**
8/9/2008 23:59	72.42	1737.98	**Maximum Detection Peak WSK**
8/13/2008 16:00	76.08	1826.00	**Third Peak REV**
8/14/2008 8:00	76.75	1842.00	**Last Detection WSK**
8/14/2008 16:00	77.08	1850.00	**Last Detection REV**

** First detection on downward limb of tracer break through curve constrains travel time to lower limits.

Table 5.2: Elapsed time table for significant events during the 2009 Lost Creek dye trace.

Date and Time	Elapsed Time, Days	Elapsed Time, Hours	Event
7/14/2009 11:00			**Injection**
8/6/2009 6:00	22.79	547.00	**First Detection REV**
8/14/2009 12:00	31.04	745.00	**First Detection PUN**
8/19/2009 6:00	35.79	859.00	**First Peak REV**
8/21/2009 18:00	38.29	919.00	**Maximum Detection Peak REV**
8/21/2009 3:00	37.67	904.00	**First Detection SC01**
8/22/2009 14:00	39.13	939.00	**First Detection SC10**
8/23/2009 18:00	40.29	967.00	**Third Peak REV**
8/24/2009 15:25	41.18	988.42	**First Peak PUN**
8/29/2009 1:00	45.58	1094.00	**First Detection SC02**
9/1/2009 13:55	49.12	1178.92	**Maximum Detection Peak PUN**
9/1/2009 15:00	49.17	1180.00	**Maximum Detection Peak SC02**
9/3/2009 3:00	50.67	1216.00	**First Peak SC01**
9/3/2009 3:00	50.67	1216.00	**First Peak SC10**
		0.00	
9/11/2009 2:00	58.63	1407.00	**Maximun Detection Peak SC10**
9/14/2009 15:00	62.17	1492.00	**Maximum Detection Peak SC01**
9/18/2009 12:20	66.06	1585.33	**Third Peak PUN**
9/24/2009 13:00	72.08	1730.00	**Next to the Last Peak SC02**
9/24/2009 14:00	72.13	1731.00	**Last Peak SC10**
9/25/2009 6:00	72.79	1747.00	**Last Detection REV**
9/25/2009 12:25	73.06	1753.42	**Last Detection PUN**
9/26/2009 3:00	73.67	1768.00	**Next to the Last Peak SC01**
10/3/2009 1:00	80.58	1934.00	**Last Detection SC02**
10/7/2009 3:00	84.67	2032.00	**Last Detection SC01**
10/8/2009 2:00	85.63	2055.00	**Last Detection SC10**

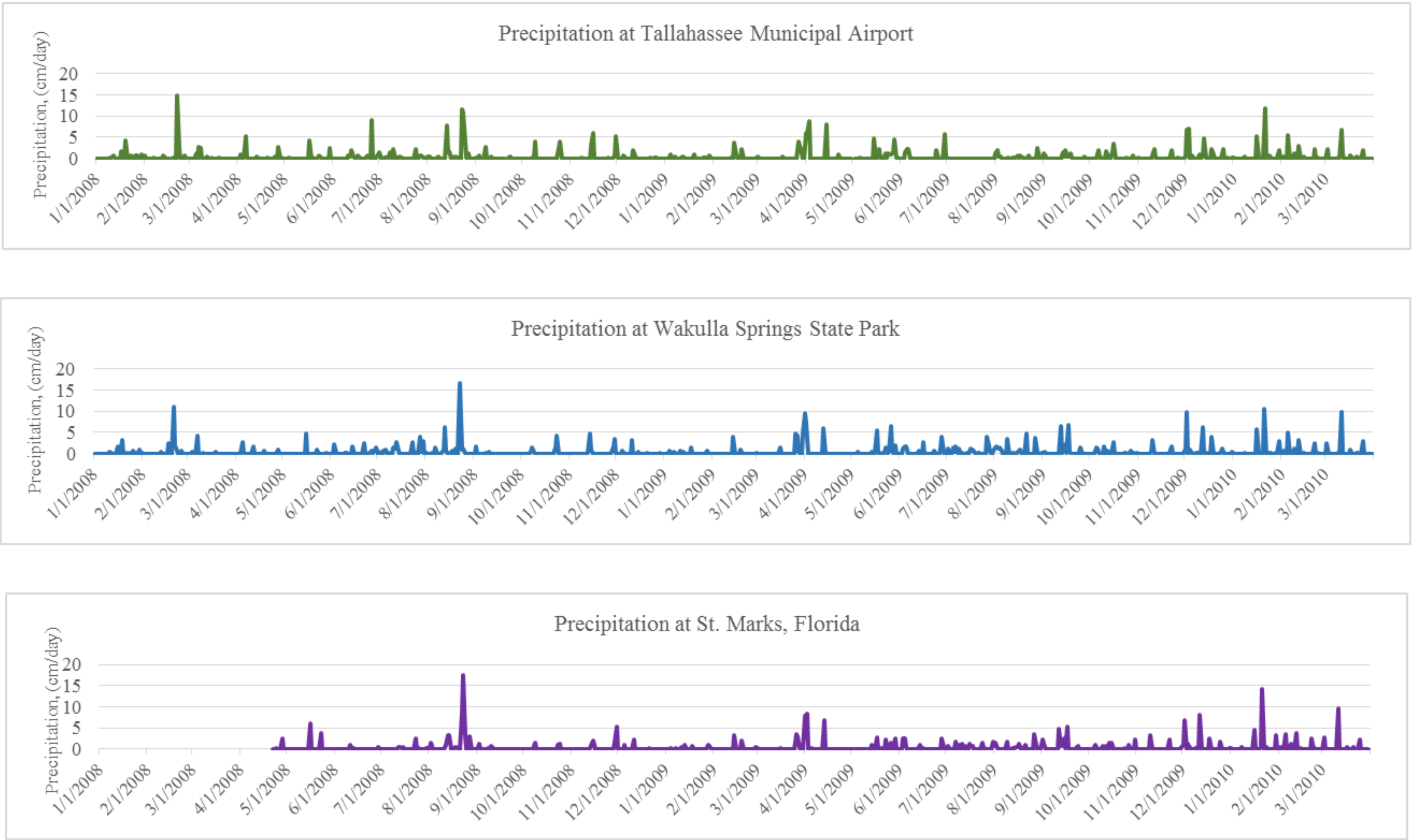


Figure 5.1: Precipitation measurements at three stations across the area of investigation.

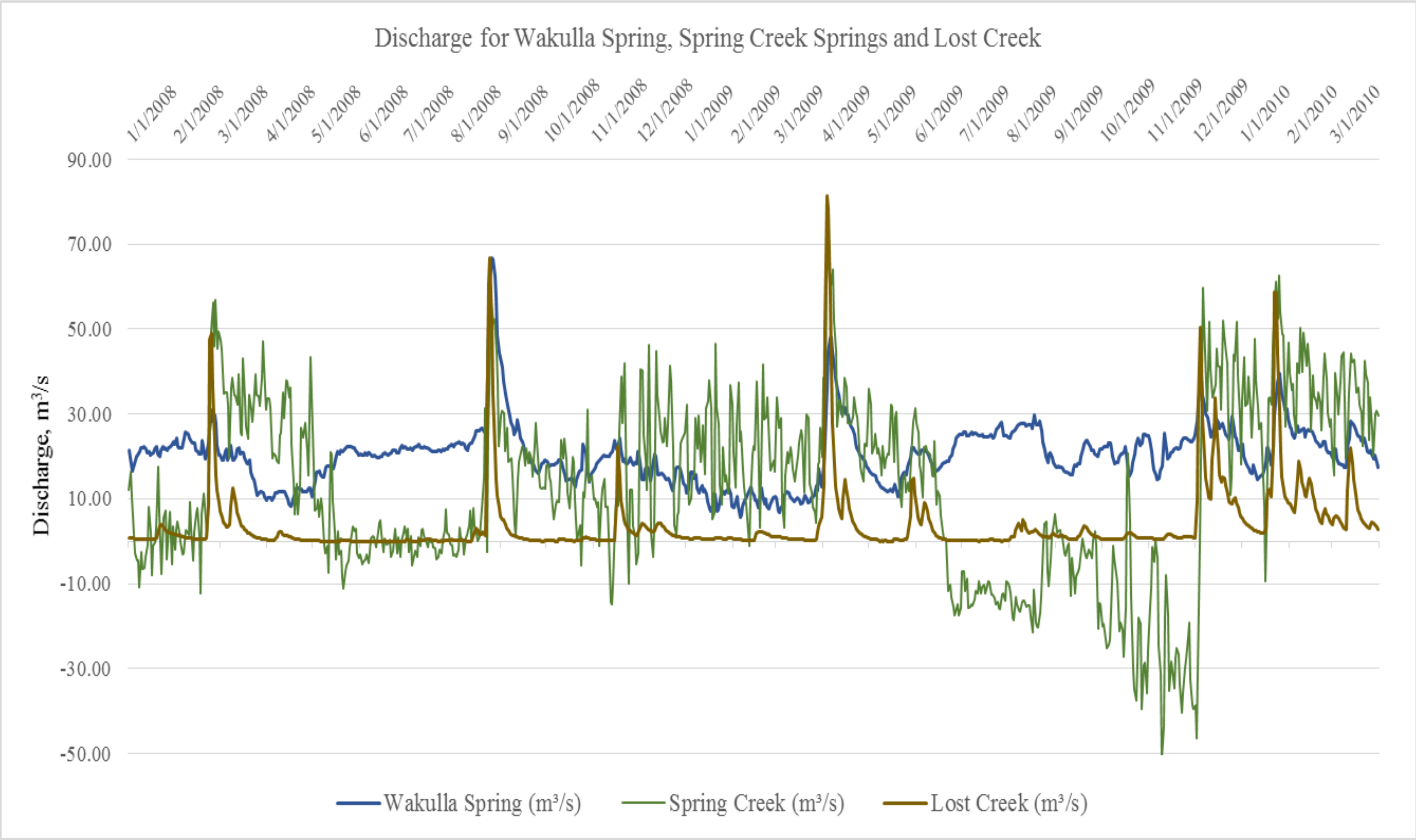


Figure 5.2: Discharge for Wakulla Spring, Spring Creek Springs and Lost Creek.

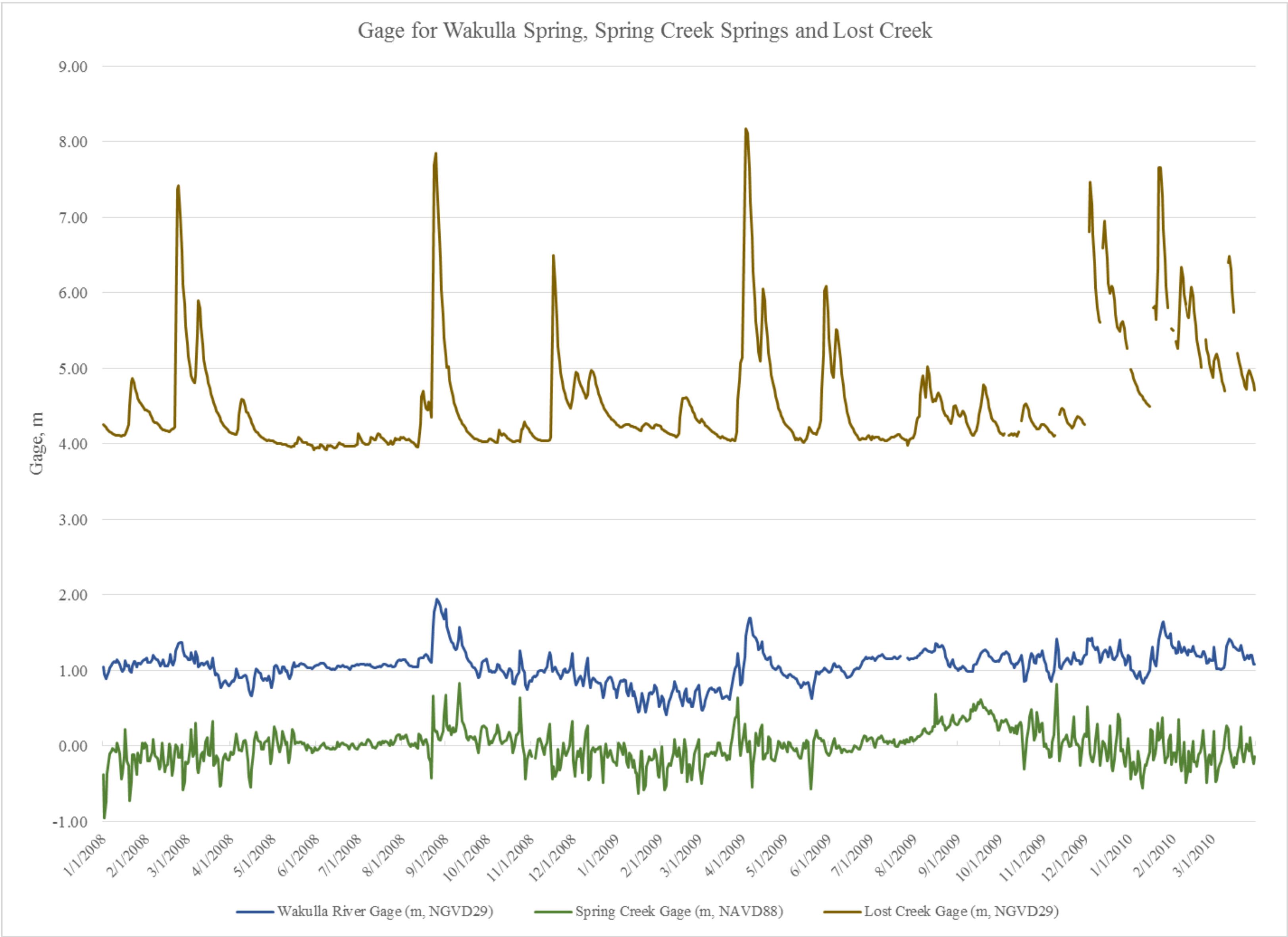


Figure 5.3: Gage for the Wakulla River, Spring Creek Springs and Lost Creek.

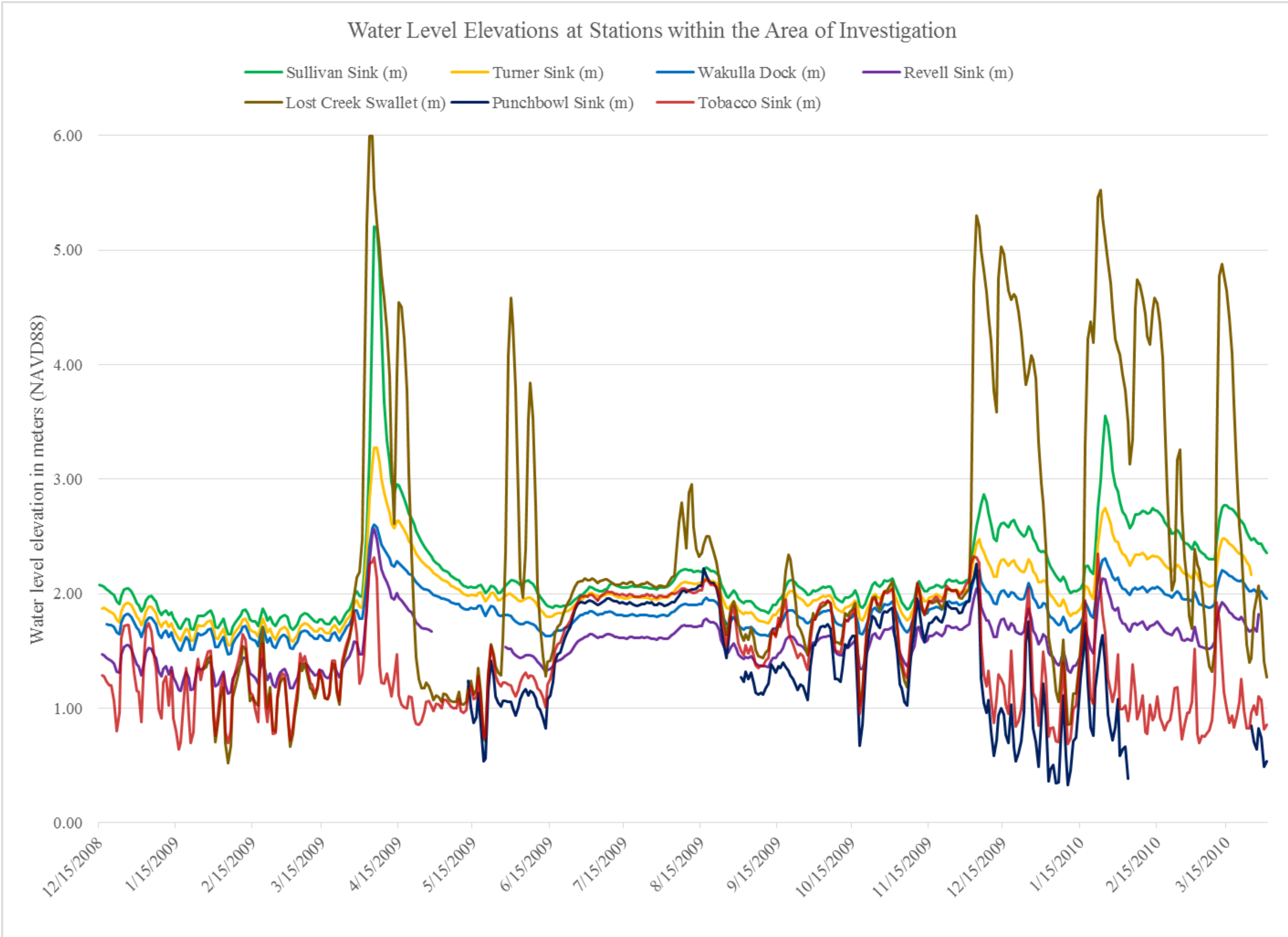


Figure 5.4: Water level elevations at stations within the area of investigation.

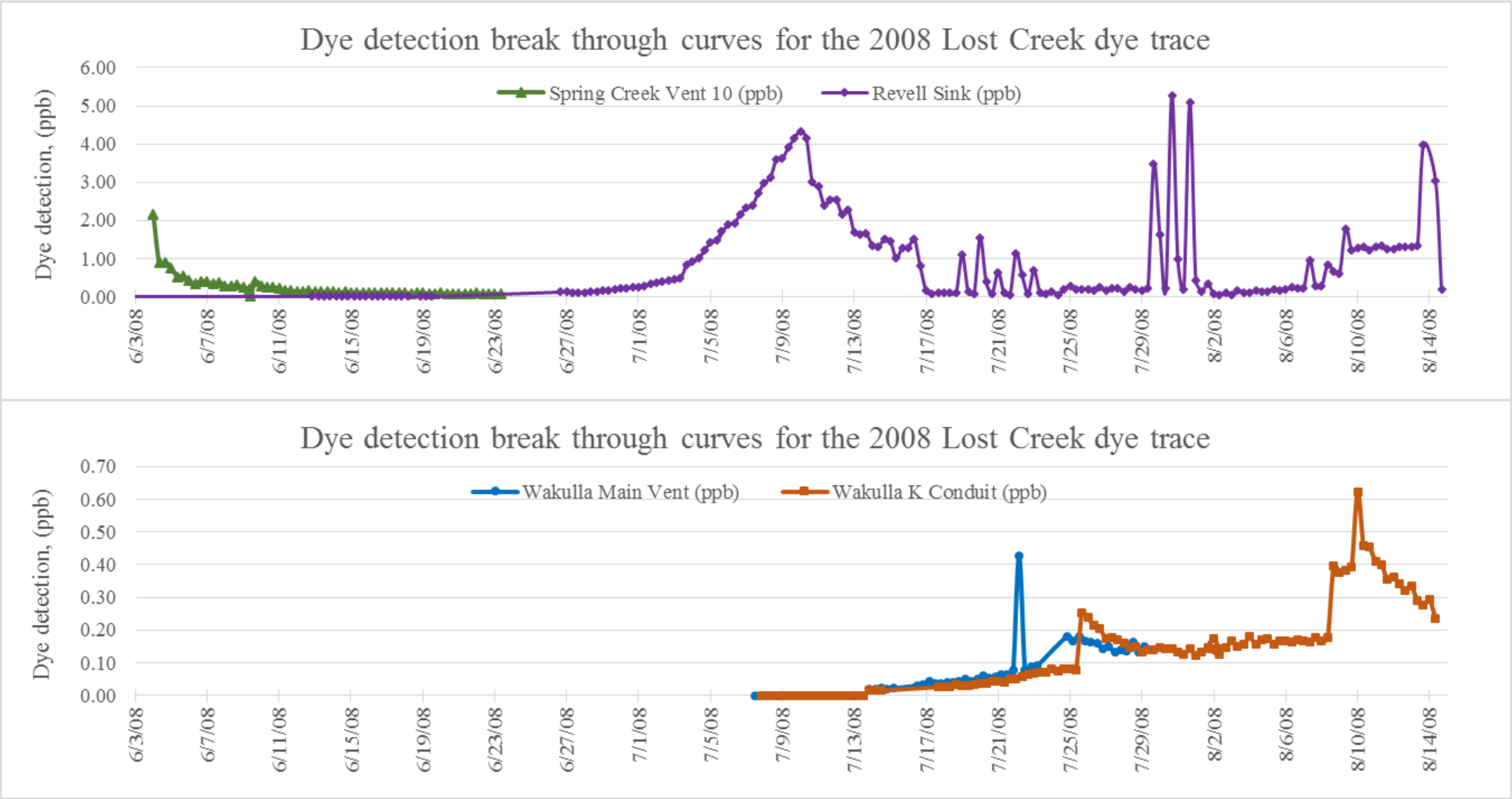
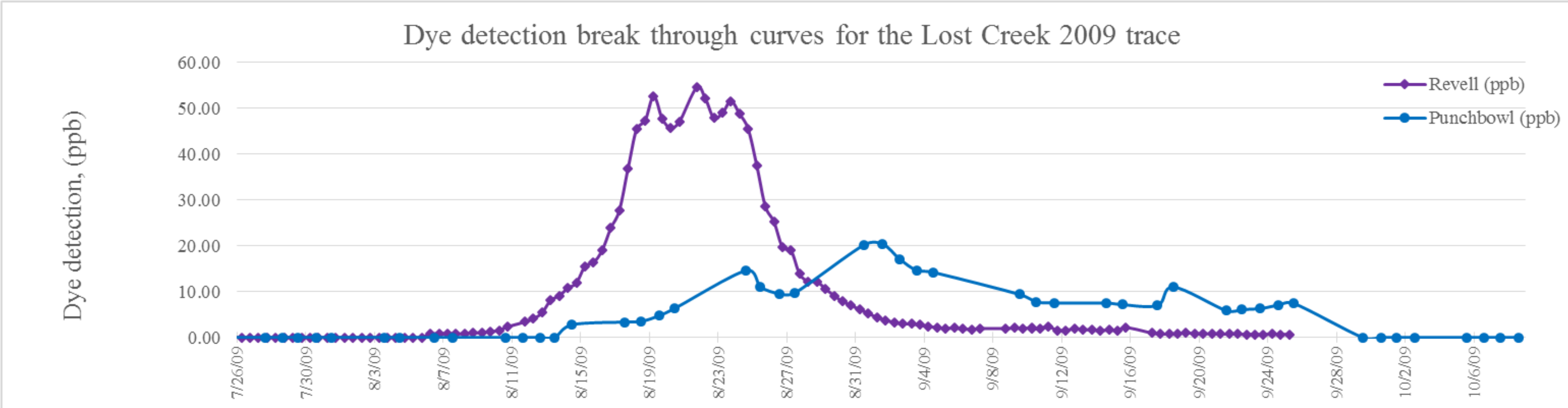


Figure 5.5: Dye tracer break through curves for the 2008 Lost Creek dye trace.



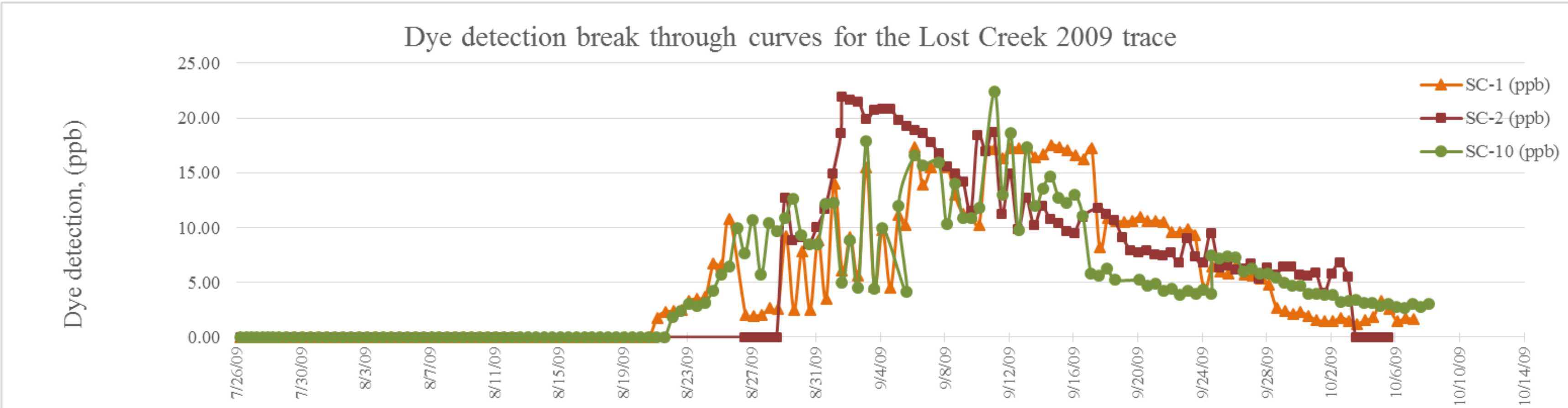


Figure 5.6: Dye tracer break through curves for the 2009 Lost Creek dye trace.

CHAPTER 6

DISCUSSION

Overview

The definitive goal beyond the specific objectives of this study defined below is to further the endeavors of future hydrologist, researchers and resource managers to characterize, quantify, numerically model and to ultimately preserve the hydrological resources of the Woodville Karst Plain in Wakulla County, Florida. The results and discussions of the qualitative dye traces undertaken by this study are intended to provide the necessary information to empower the efforts of those who are confronting the more difficult and skillful efforts to quantify, numerically model and manage the resource.

The primary objectives of this study were to determine if the flows into Lost Creek swallet contributed to the discharge of Spring Creek Springs and to provide quantitative evidence that the flow from Lost Creek swallet to Spring Creek Springs was conveyed via a conduit. The secondary objective was to verify if a conduit(s) connecting Lost Creek swallet and Spring Creek Springs were connected to or an extension of the Leon Sinks - Wakulla Spring cave system. The third objective was to determine if the water level elevations measured in select karst windows exhibit changes in the flow regime within the Wakulla Spring and Spring Creek Springs' springshed.

In order to examine the primary and secondary objectives two dye trace studies of Lost Creek swallet were conducted. The results of the 2008 and 2009 Lost Creek swallet dye trace(s) provided in the previous section (Table 5.1, Table 5.2, Figure 5.5 and Figure 5.6) will be further examined in this section. In both the 2008 and 2009 dye traces, Lost Creek swallet was demonstrated to contribute significant quantities of dye to sites at Spring Creek Springs and

Revell Sink. This establishes an interconnection between these sites. The 2008 trace also verified a connection(s) between Lost Creek swallet, Wakulla K conduit and the main spring vent of Wakulla Spring. The 2009 trace additionally verified a connection between Lost Creek swallet and Punchbowl Sink. The 2008 and 2009 Lost Creek swallet dye traces decisively verified that Lost Creek swallet contributes to the discharge of Spring Creek Springs and that Lost Creek swallet, Spring Creek Springs, Revell Sink and Punchbowl Sink are not only connected to but an extension of the Leon Sinks - Wakulla Spring conduit system.

The third objective of this study is examined by an analysis of the water level elevations at karst windows along a north-south transect. Spring Creek Springs' discharge data (Figure 5.2) demonstrates that the group of springs cycle between periods of positive discharge and periods of negative discharge. Later in this section the observations of karst window water level elevations will be shown to demonstrate a particular behavior that reflect the alternating flow regime occurring at Spring Creek Springs.

Qualitative Fluorescent Dye Tracing

One of the best field methods available to hydrologist for investigating a karst aquifer is qualitative and quantitative dye trace testing. Fluorescent dye tracing allows the hydrologist to nearly replicate the movement of water through an aquifer (Quinlan, 1989; Taylor and Greene, 2001, White, 2007; Rosenberry and LaBaugh, 2008). Qualitative dye traces are very effective in determining groundwater flow paths, delineating springsheds, confirming point to point recharge and discharge, defining potential points of resurgence and developing a more complete familiarity of a particular karst study area. A qualitative dye trace is recommended as one of the first steps in the characterization of a karst aquifer (Aley, 2002; Taylor and Greene, 2001, Rosenberrry and LaBaugh, 2008). The knowledge gained from one qualitative trace improves the bearing and effectiveness of any future characterization, quantitative tracing, data acquisition, and numerical modeling undertaken.

Quantitative Methods

Basic quantitative methods have been employed in this study to evaluate the flow behavior (velocity) between dye injection and monitoring sites. In the discussion to follow seepage velocity and linear velocity will be calculated. Simple matrix flow in an aquifer can be calculated by seepage velocity. Fetter (2001) defines seepage velocity as a velocity representing the average rate at which water moves between two points in porous media. Seepage velocity is based on Darcian principals and is used to describe flow in a porous media aquifer with specified hydrological parameters. **Seepage velocity** ($\tilde{V}$) is fundamental to hydrology and included in all basic hydrology textbooks:

$$\tilde{V} = - K/N_e(\Delta h/\Delta l)$$

K is hydraulic conductivity (m/d)

N_e is the effective porosity (unit less)

$\Delta h/\Delta l$ is the hydraulic gradient (unit less)

The linear velocity equation being utilized in this study is a basic mathematical equation that does not include hydrological principals or parameters. Linear velocity is being used in this study as indicative of conduit flow. **Linear velocity** (V) calculations for this study are simply the distance between two points divided by the time required to travel between the two points:

$$V = D / T$$

D is the distance between two points (m)

T is the elapsed time between injection and detection (d)

The above linear velocity equation is being utilized to approximate the velocity of flow in the conduits between the point of injection (throat of Lost Creek swallet conduit) and the tracer sampling locations (conduits accessible via karst windows). A more accurate calculation of conduit flow velocity between the injection point and the sampling locations is not possible due to the lack of measured discharge data, actual conduit geometry and the cross sectional area at both locations.

The calculations conducted in this study are not an attempt to accurately quantify the mass transport of a solute (fluorescent dye). The above equations are being utilized to provide approximations by which the movement of the dye can be broadly categorized as either by porous media flow or conduit flow. The velocities of porous media flow and conduit flow are orders of magnitudes apart. Worthington (2009) advises that in carbonate aquifers, the self-organizing channels network have rapid groundwater flow that often exceed 100 m/day. To fully quantify the flow of a solute the processes of diffusion, advection and dispersion would have to be accounted for. Quantifying flow under the influence of all these additional processes in both a porous media and open conduit flow to make the determination as to whether the 2008 and 2009 dye was transported by conduit or porous media is mathematically well beyond the scope and objectives of this study.

In the discussion to follow seepage velocity and linear velocity as defined above will be calculated for the first detection and peak detection times for each of the tracer breakthrough curves for the 2008 and 2009 Lost Creek swallet dye traces. A comparison of the two velocities will provide a metric by which the seepage velocity and linear velocities can be used to conclude if the dye plume’s transport (flow) was more likely conducted through porous media (seepage velocity) or a conduit (linear velocity).

The values substituted into the seepage velocity equation are as described below. The hydraulic conductivity (3048 m/d) employed for calculations in this discussion are from Davis' (2010) effort to numerical modeling the same area of investigation. The effective porosity (0.3) applied was chosen from a range (0.0 – 0.36) of widely published and generally accepted effective porosity values for limestone. Given the extensive karstification of the study area, a higher end member value was selected.

The groundwater elevations used to calculate the hydraulic gradient between the point of injection and the tracer sampling stations for the 2008 tracer test were derived from the groundwater elevations from a previously unpublished potentiometric map (Figure 6.1) provided by K. Barrios, Northwest Florida Water Management District 2015. The tracer injection station and the tracer sampling stations for this investigation were projected to Universal Transverse Mercator (16N) and placed on the potentiometric map (Figure 6.1) based on latitude and longitude coordinates (NAD83) taken in the field. The groundwater elevation measurements for the potentiometric map were taken October 14-15, 2008. This potentiometric map is unique and specifically applicable to this study due to the higher well point density utilized for groundwater elevations within the area of investigation and the higher contour resolution of this particular map provides compared to the potentiometric maps previously discussed (Figure 3.5 and Figure 3.6).

For the 2009 Lost Creek swallet trace, the groundwater elevations used to calculate the hydraulic gradient between the point of injection and tracer sampling stations were taken from the water level elevation data generated by this study (Appendix A.3 and Figure 6.8). Water level elevations utilized for the gradient calculations were those reported for July 14, 2009 the date the dye was injected into Lost Creek swallet. The distances between the point of injection and the tracer sampling stations (Figure 4.1 and Figure 4.2) used in gradient calculations for the 2008 and 2009 Lost Creek swallet trace are straight line distances measured between the two points on Google Earth Pro©.

The distances and time values substituted into the linear velocity equation are directly derived from the tracer test results and from distances measurements made from satellite imagery. Given the tortuosity of conduits, the straight line distances are minimum travel distances and result in minimum linear velocities. No tortuosity factor was applied. This was purposely done to reduce and normalize the linear velocities and not introduce non-quantified parameters into the calculation with a derived factor. The time values utilized in calculating linear velocity are the elapsed time from the time of injection to the time stamp for the samples correspond to tracer peak detections of both the 2008 and 2009 Lost Creek swallet tracer breakthrough curves.

It is important to understand that the discharge for Spring Creek Springs system reported by U.S. Geological Survey (A.2, Figure 5.2, 6.3 and 6.7)) is an aggregate of flow for twelve spring vents that together comprise the Spring Creek Springs system. It is also important to understand that this discharge is the reported flow of water out of the Spring Creek Springs system. It is equally important to understand that negative discharge is roughly equivalent to the flow of water siphoned into the Spring Creek Springs system. In the discussion to follow, flow at Spring Creek Springs can be demonstrated to alternate or fluctuate between discharge and negative discharge. The term flow reversal will be used to describe times when the flow alternates from discharge to negative discharge. The occurrence of flow reversals at the Spring Creek Springs system is crucial to understanding the complex hydrological dynamics occurring in the area of investigation and the Woodville Karst Plain in Wakulla County, Florida.

2008 Lost Creek Dye Trace Overview

The dye injected for the 2008 dye trace of Lost Creek swallet emerged as discharge at Spring Creek Springs verifying the primary objectives that flow into Lost Creek swallet contributes to the discharge at Spring Creek Springs. The linear velocities calculated from the various tracer breakthrough curves for 2008 Lost Creek swallet trace are within the range of velocities (2,394 – 233 m/d) indicative of conduit transport reported for previous traces (Table 3.1) conducted in the northern portion of the study area. The 2008 Lost Creek swallet trace was successful in confirming the secondary objective that Lost Creek swallet and sites verified to be connected by conduits in the southern extent of the study area are connected to the Leon Sinks – Wakulla cave system. The 2008 Lost Creek swallet trace also confirmed that Lost Creek swallet is connected to Revell Sink. Revell Sink was previously confirmed in 2007 to be connected to Turner Sink which is included in the Leon Sinks – Wakulla cave system. The connection of Lost Creek swallet to Revell Sink verifies that Lost Creek swallet is connected to and an extension of the Leon Sinks – Wakulla cave system. A more detailed discussion of the tracer detections and the resulting tracer breakthrough curves for the 2008 trace follows.

Hydrologic Conditions during 2008 Lost Creek Swallet Trace

The hydrologic conditions spanning the time period of the 2008 Lost Creek swallet trace were a period of calm in regards to normal regional precipitation, gage and discharge. The singular hydrological event that occurred during the 2008 trace that affected the results was the reversal of flow at Spring Creek Springs. The discharge and gage data for Wakulla Spring and Spring Creek Springs are illustrated in Figure 6.3. Spring Creek Springs was positively discharging prior to and at the time of the injection (May 29, 2008). Within a week after the dye injection Spring Creek Springs flows reversed from discharge to negative discharge. Spring

Creek Springs alternated between discharge and negative discharge for the duration of the trace. The discharge for Wakulla Spring registered an increase from late April to mid-May that coincided with the reversal of flow at Spring Creek Springs (Figure 6.3). The discharge for Wakulla Spring remained relatively constant and Spring Creek Springs continued to alternate between discharge and negative discharge until mid-August 2008. Presumably in response to precipitation events beginning August 11, 2008 (Appendix A.1, Figure 6.2), Spring Creek Springs began to discharge consistently and Wakulla Spring's discharged increased. The gage data (Figure 6.3) for the duration of the trace was flat and uneventful reflecting the near absence of precipitation other than a substantial storm that occurred around August 14, 2008 and a more significant precipitation event on August 22, 2008. The rainfall for the two months prior to the injection were normal compared to the 25 year average (Figure 3.7). No significant rain event occurred during the trace that may have adversely influenced the trace. The rain event August 22, 2008 is believed to have flushed the dye out of Wakulla Spring and Spring Creek Springs after the cessation of sampling.

2008 Tracer Breakthrough Curve Analysis for Spring Creek Vent 10

The dye tracer injected May 29, 2008 at Lost Creek swallet was first detected at Spring Creek vent 10 approximately 5 days after injection. The first detection (2.16 ppb) was on June 3, 2008 and subsequent detections decreasing in concentration were obtained every eight hours through June 23, 2008 (Appendix A.4 and Figure 6.4). The downward limb of the tracer breakthrough curve for Spring Creek vent 10 and the discharge reported by the U.S. Geological Survey for the Spring Creek Springs system are depicted in Figure 6.4. Due to property access issues sampling at Spring Creek vent 10 began June 3, 2008 at 23:59 hours. Had the sampler at Spring Creek vent 10 been active from the time of injection a complete breakthrough curve may have been obtained. A complete tracer breakthrough curve for Spring Creek vent 10 with a first detection on the upward limb and a peak detection would enable calculating a more accurate travel time and linear flow velocity between Lost Creek swallet and Spring Creek vent 10. Since an incomplete breakthrough curve had to be utilized, the travel time and velocity presented in Table 6.1 represent slower times of travel and the lower bounds of linear velocity between Lost Creek swallet and Spring Creek Springs. The linear velocity between Lost Creek swallet and Spring Creek vent 10 clearly signifies a velocity not possible via porous media flow. The extremely high linear velocity between Lost Creek swallet and Spring Creek vent 10 exceeds 2.2 km/day and verifies conduit flow between Lost Creek swallet and Spring Creek Springs.

No other detections occurred at the Spring Creek Springs sampling stations during the 2008 Lost Creek swallet trace. The reversal of flow at Spring Creek Springs' beginning May 29, 2008 (Figure 6.2) may have ceased the tracer's movement southward and possibly redirected the tracer plume north and east toward Revell Sink and Wakulla Spring. Detections at Revell Sink and Wakulla Spring sampling stations are shown graphically and discussed in the remainder of this section.

The lack of a complete breakthrough curve at Spring Creek vent 10 coupled with no other detections at Spring Creek Springs during the 2008 Lost Creek swallet trace necessitated the 2009 Lost Creek swallet trace. Later in this section the 2009 Lost Creek swallet trace will be discussed. Multiple detections at Spring Creek Springs (including Spring Creek vent 10) and complete tracer breakthrough curves were obtained from the 2009 Lost Creek swallet trace and legitimize the partial detection at Spring Creek vent 10 during the 2008 Lost Creek swallet trace.

2008 Tracer Breakthrough Curve Analysis for Revell Sink

The 2008 Lost Creek swallet dye trace verified that Lost Creek swallet was directly connected to the conduit at Revell Sink. The tracer was first detected (0.12 ppb) on June 26, 2008 and detected continuously thereafter until the cessation of sampling August 14, 2008 (Appendix A.4 and Figure 6.4). Higher concentrations were detected on July 9, 2008 (4.15 ppb) and July 7, 2008 (5.28 ppb). Had there not been a sampler failure between June 19, 2008 and June 26, 2008 an earlier detection was probable. The tracer breakthrough curve for Revell Sink is illustrated in Figure 6.4. The velocities calculated for the first detection on June 26, 2008 and the first peak detection on July 9, 2008 are provided in Table 6.1. The linear velocity (230 m/d) of the dye plumes' first detection at Revell Sink and the linear velocity (156 m/d) of the first peak detection are both plainly in the realm of conduit velocities. Both of these velocities exceed the seepage velocities for slower, lower magnitude velocities of porous media flow by a several orders of magnitude.

The twenty-three day difference in arrival between the first detections at Spring Creek vent 10 and Revell Sink (Figure 6.2) could be explained by several interpretations. Such an in-depth analysis, interpretation and verification would require additional data and is beyond the scope of this study. Two likely, broad interpretations for the sake of discussion are offered: 1) a bifurcation of the flow (separate or multiple conduits) from Lost Creek swallet to Spring Creek Springs and Revell Sink, 2) flow reversal at Spring Creek Springs redirected the plume north and east via conduits connecting Lost Creek swallet, Spring Creek Springs and Revell Sink.

A noteworthy observation is that there are multiple peaks along the breakthrough curve for Revell Sink from mid-July 2008 to end of the sampling period (Figure 6.4). These peaks may be indicative of multiple conduits (Rosenberry and LaBaugh, 2008) connecting Lost Creek swallet and Revell Sink. The sharp peaks in detections may also support a hypothesis that there is at least one conduit connecting Revell Sink and Spring Creek Springs. Through such a conduit(s) a dye plume redirected by flow reversals at Spring Creek Springs may have oscillated away from and toward Revell Sink resulting in the tightly spaced peaks and lows detections of the Revell Sink trace breakthrough curve. The fluctuations of discharge for Spring Creek Springs and the sharp peaks of detection at Revell Sink seen in Figure 6.4 seem to have some level of correspondence. A third interpretation of multiple peaks is that the initial tracer breakthrough curve (June 26, 2008 through July 16, 2008) at Revell Sink represents the tracer plume passing through the conduit at Revell Sink possibly flowing northward toward Wakulla Spring. This interpretation is possible given the tracer results at Wakulla Spring tracer sampling stations discussed later in this section. The predominance of recharge occurring at Spring Creek Springs between July 5, 2008 and July 25, 2008 could have influenced the tracer's migration northward.

The secondary objective of this study was to determine if Lost Creek swallet was connected via a conduit to the known conduits of the Leon Sinks - Wakulla cave system. The Turner trace (Table 3.1) in 2007 established that a conduit connection existed between Turner Sink and Revell Sink. The results of the 2008 Lost Creek swallet dye trace have confirmed a conduit connection between Lost Creek swallet and Revell Sink. The combined results of the 2007 Turner Sink trace and the 2008 Lost Creek swallet trace verify that Lost Creek swallet is connected via conduit(s) at Revell Sink to the Leon Sinks – Wakulla cave system. Additional verification of the Lost Creek swallet to Revell Sink conduit connection will be presented in the discussion of the 2009 Lost Creek swallet trace. Further verification of the Turner Sink and Revel Sink conduit connection will also be presented in a later section of this study that examines the karst window water level elevation stations (Table 4.3, Figure 4.3, Appendix A.3 and Figure 5.4) established as part of this study.

2008 Tracer Breakthrough Curve Analysis for Wakulla Spring

The tracer injected at Lost Creek swallet was detected at the Wakulla K Conduit and the Wakulla Springs main vent sampling stations. The tracer breakthrough curves are depicted in Figure 6.5 and the calculated linear velocities are presented in Table 6.1. The first tracer detections occurred at both stations on July 13, 2008. Subsequent detections were verified every eight hours at the Wakulla K Conduit station July 13, 2008 through August 14. 2008 and every eight hours at the Wakulla Main Vent station July 13, 2008 through July 29, 2008 (Appendix A.4 and Figure 6.5). The concentration levels detected are well above the detection limits of 0.0005 ppb for Liquid sodium fluorescein (also known as uranine, AY73).

The first detection at Wakulla K Conduit produced a calculated linear velocity of 241 m/d. The first peak detection at Wakulla K Conduit yields produced a linear velocity of 191 m/d. The maximum detection peak at Wakulla K Conduit yields a linear velocity of 151 m/d. The linear velocities of the dye plume are verifiably symptomatic of conduit flow as opposed to lower seepage velocities (Table 6.1).

The first detection of the tracer at Wakulla Main Vent produced a calculated linear velocity of 255 m/d. The outlier peak detection registered July 22, 2008 was not utilized in velocity calculations. Instead, the peak detection obtained July, 24, 2009 which is more indicative of a tracer breakthrough curve was used to calculate a linear velocity of 205 m/d. When compared to the expected seepage velocity of porous media (Table 6.1) the dye clearly traveled too fast to have occurred by means of porous media flow. The linear velocities observed are indicative of conduit flow and verify transport of the dye plume by means of a conduit connection between Lost Creek swallet and Wakulla Spring.

There is no definitive data to confirm the exact route the dye traversed to the Wakulla Main Vent and Wakulla K Conduit sampling stations. This could be evidence of a conduit connection directly between Lost Creek swallet and Wakulla Spring. Another interpretation could be the dye tracer traveled via a conduit(s) from Lost Creek swallet to Revell Sink and then further northward to Wakulla Spring. As Spring Creek Springs' discharge alternated between positive discharge and negative discharge between June 30, 2008 and July 27, 2008 the detection concentrations rose and fell at Revell Sink (Figure 6.4). The northward flow of estuarine negative discharged water into the Spring Creek Springs system could have directed the dye plume from Revell Sink northward toward Wakulla Spring. The first detections of the dye plume at the Wakulla Spring sampling stations occur during a period in which concentration levels fall at Revell Sink and recharge of Spring Creek Springs' increased. Although there is not sufficient data to confirm such an analysis, the detections at Revell Sink, Wakulla K Conduit and the Wakulla Main Vent stations seem to have similarities to the discharge fluctuations at Spring Creek Springs. Both interpretations would require additional data to be conclusive. What is conclusive is that the Lost Creek swallet, Revell Sink, and Wakulla Spring are connected by single or multiple geometrical configurations of conduits and that Lost Creek swallet and Revell Sink are part of the Leon Sinks – Wakulla cave system.

The 2008 Lost Creek swallet dye trace not only verified that Lost Creek swallet flows contribute to the discharge of Spring Creek Springs, but also verified that Lost Creek swallet flows contribute to the discharge of Wakulla Spring. The confirmation of conduit flow between Lost Creek swallet, Spring Creek Springs, Revell Sink and Wakulla Spring soundly satisfied the principal objectives of the 2008 Lost Creek swallet trace. The fact that the tracer travel both northeast (to Wakulla Spring) and southeast (to Spring Creek Springs) within a springshed that was presumed to have a south to southeast groundwater flow was illuminating. The 2008 Lost Creek swallet dye trace documented alternating flows regimes not previously verified in the southern reaches of the Woodville Karst Plain of Wakulla County.

2009 Lost Creek Dye Trace Overview

The results of the 2009 Lost Creek swallet trace are reported in temporal order. The dye injected July 14, 2009 for the 2009 dye trace of Lost Creek swallet emerged as discharge at Spring Creek Springs verifying that flow into Lost Creek swallet does contributes to the discharge at Spring Creek Springs and provides a more quantified set of travel times between Lost Creek swallet and the Spring Creek Springs system. The emergence of the dye at Spring Creek Springs during the 2009 trace was more definitive than in 2008 because the dye emerged at three separate vents within the Spring Creek Springs system. The hydrological conditions discussed in the following section are believed to have reduced the velocity of the tracer's plume traverse through the conduit system and caused the plume of dye to pause or stagnate in the lower reaches of the basin prior to being discharged at Spring Creek Springs. The resulting linear velocities calculated from the various tracer breakthrough curves for 2009 Lost Creek swallet trace were on the lower end of the range of velocities (233 - 2,394 m/d) yet still indicative of conduit velocities (Table 3.1) reported for previous traces conducted in the northern portion of the study area. The 2009 Lost Creek swallet trace was successful in confirming the primary and secondary objectives of this study. The 2009 Lost Creek swallet trace resulted in complete breakthrough curves at Revell Sink, Punchbowl Sink, and three vents in Spring Creek

Springs. A more detailed discussion of the tracer detections and the resulting tracer breakthrough curves follows below.

Hydrologic Conditions during 2009 Lost Creek Swallet Trace

The hydrological conditions during the 2009 Lost Creek swallet trace were different than those encountered in 2008. The tracer injection during 2008 was conducted while Spring Creek Springs was discharging which allowed for rapid transport to Spring Creek Springs from the injection site. In 2009 the tracer was injected (July, 14 2008) while Spring Creek Springs was experiencing negative discharge. The lack of discharge and near continuous negative discharge at Spring Creek Springs was the driving hydrological condition that most influenced the 2009 trace (Figure 6.7). Spring Creek Springs had been discharging continuously since before the beginning of 2009 (Figure 5.2). The discharge at Spring Creek Springs remained positive until June 21, 2009 (Figure 6.7) at which time the Spring Creek Springs group discharge reversed and the system began to display negative discharge. The negative discharge conditions at Spring Creek Springs persisted until the end of 2009. There was a period between the later part August 2009 and the end of September 2009 (Figure 6.7) when the negative discharge at Spring Creek Springs decreased significantly in magnitude. It was during the reduced negative discharge period of mid-August 2009 - September 2009 that the tracer study was conducted. The reduced negative discharge conditions are believed to have permitted the tracer's emergence at Spring Creek Springs and influence the tracer results. Had this brief period of lower magnitude negative discharge with an occasional day or two of positive discharge not occurred, the dye tracer may not have emerged from Spring Creek Springs until the beginning of 2010 when positive discharge at Spring Creek Springs was reestablished.

Precipitation for 2009 as a whole was below the 25 year monthly averages (Figure 3.7). Precipitation June 15, 2009 through November 1, 2009 is illustrated in Figure 6.6. Several key precipitation events affected the 2009 Lost Creek swallet trace: 1) rainfall clustered around July 30, 2009, 2) larger intermittent events mid-late August, 3) a second cluster of rainfall around September 13, 2009. These precipitation events resulted in ample flow at Lost Creek swallet (Figure 6.7) to convey the dye plume toward Revell Sink and Punchbowl Sink. The combined recharge via Lost Creek swallet over this date range was also sufficient to have provided some discharge at Spring Creek Springs and contributed to the reduction of negative discharge at Spring Creek Springs between August 2009 and September 2009.

The water level elevations utilized for the 2009 dye trace were generated by the karst window groundwater level monitoring stations established in 2008 (Appendix A.3 and Figure 4.3). The groundwater level elevations at pertinent karst window stations for the period of June 1, 2009 through October 15, 2009 in are illustrated in Figure 6.8. It is important to note that these stations were both groundwater level monitoring sites and tracer detection sampling locations for the Lost Creek swallet traces conducted in both 2008 and 2009. As depicted in Figure 6.8, the water level elevations rose sharply beginning June 13, 2009. This rise in water level elevation occurred shortly before the flow reversal from discharge to negative discharge at Spring Creek Springs on June 21, 2009. The water level elevations remained stable until shortly after the rain events clustered around July 30, 2009. Following the July 30, 2009 cluster of rains the water level elevations gradually rose until August 20, 2009. The water level elevations dropped significantly after August 20, 2009 which coincided with the period of reduced negative discharge (mid-August 2009 - September 2009) at Spring Creek Springs.

2009 Tracer Breakthrough Curve Analysis for Revell Sink

The dye injected at Lost Creek swallet on July 14, 2009 was first detected at Revell Sink on August 6, 2009. The dye was continuously detected every twelve hours through the end of sampling September 25, 2009. The tracer breakthrough curve at Revell Sink and the discharge reported by the U.S. Geological Survey for the Spring Creek Springs system are depicted in Figure 6.9. The concentration of the dye plume increased steadily from its first detection (0.79 ppb) up to its maximum detection (54.51 ppb) August 21, 2009 and then decreased uniformly until the cessation of sampling. The bell shape of the tracer breakthrough curve is typical and conclusive of a dye plumes passage through the Revell Sink conduit. The linear velocity (Table 6.2) for the tracers' first detection was 283 m/day, and the velocity for its maximum detection was 168 m/d. The seepage velocity calculation (Table 6.2) for porous media having the gradient and specified parameters of the study area yielded a velocity of 0.740 m/day. The linear velocity of the tracer breakthrough was more than two orders of magnitude greater than that of porous media clearly indicating the traverse of the dye plume was conveyed from Lost Creek swallet to Revell Sink via a conduit.

The tracer breakthrough curve at Revell Sink contains three tightly spaced peaks with two alternating lower peaks between them over a five day period of August 19, 2008 - August 23, 2009. One interpretation may be that the multiple peaks as evidence for multiple conduits intersecting near the conduit sampled at Revell Sink. An alternate interpretation based on the similarity of Spring Creek Springs discharge curve which fluctuates similarly between August 14, 2009 and August 22, 2009 is that there exists a conduit(s) between the Spring Creek Springs and Revell Sink. The similarity and timing of the signals on the curves representing both stations could demonstrate water oscillating (north-south flow reversal) between the two stations.

The fluctuations of negative discharge rates at Spring Creek Springs may be reflected in the fluctuations of dye concentration at Revell Sink. Dye laden water oscillating within the conduit(s) between Spring Creek Springs and Revell Sink could produce such a signal. The interpretation that fluctuations in the negative discharge rates at Spring Creek Springs being emulated in detection concentrations at Revell Sink as verification for conduit connection between Spring Creek Springs and Revell Sink will be strengthened by the occurrence of this pattern at other detection stations and their respective breakthrough curves.

2009 Tracer Breakthrough Curve Analysis for Punchbowl Sink

The dye injected at Lost Creek swallet on July 14, 2009 was first detected at Punchbowl Sink on August 14, 2009. The dye was detected in every grab sample taken through September 25, 2009. The first detection had a concentration of 2.78 ppb, the maximum detection (September 1, 2009) was 20.39 ppb and the final detection at the time of discontinuing sampling on September 25, 2009 concentration was 7.43 ppb. The tracer breakthrough curve at Punchbowl Sink and the aggregate discharge reported by the U.S. Geological Survey for the Spring Creek Springs system are depicted in Figure 6.9. The shape of the tracer detection curve is in part affected by the lack of continuous sampling by an automated sampler configured to a sequential programmed sampling interval. The shape is also believed to have been affected by the discharge patterns prevalent at Spring Creek Springs. Although the tracer breakthrough curve is not uniformly bell shaped it is conclusive of the tracers' passage through the Punchbowls Sinks conduit. The linear velocity (Table 6.2) for the tracers' first detection was 203 m/day, and the velocity for its maximum detection was 128 m/d. The seepage velocity calculation (Table 6.2) for porous media having the gradient and specified parameters of the study area yielded a velocity of 0.274 m/day. The linear velocity of the tracer detections are between two and three orders of magnitude greater than that of porous media velocity indicating the dye plume was conveyed from Lost Creek swallet to Punchbowl Sink via a conduit.

Beginning approximately August 14, 2009 through approximately the end of September 28, 2009 Spring Creek Springs' fluctuations between negative discharge and discharge increased in magnitude and lengthened in duration. During this period the overall negative discharge through the Spring Creek Springs system was reduced. This period of change in the discharge and negative discharge regime of Spring Creek Springs is the period of "reduced negative discharge" discussed earlier in the hydrologic conditions for the 2009 Lost Creek swallet trace section of this discussion. The similarities between the Spring Creek Springs discharge/negative discharge curve and the tracer breakthrough curve at Punchbowl Sink are evident. The tracer breakthrough curve for Punchbowl Sink has five principal peaks: August 14, 2009, August 24, 2009, August 31, 2009, September 18, 2009 and September 25, 2009. These dates align with peaks in the Spring Creek Springs' discharge/negative discharge curve. The duplication of Spring Creek Springs' alternating discharge/negative discharge behavior is reflected in the tracer breakthrough curve at Punchbowl Sink. The alternating high magnitude negative discharge and low positive discharges is believed to have lengthened the tracer's breakthrough curve at Punchbowl Sink. If Spring Creek Springs' discharge had remained positive for any extended period of time the tracer breakthrough curve at Punchbowl Sink may have occurred earlier, been more bell shaped and concentrations may have been increased.

2009 Tracer Breakthrough Curve Analysis for Spring Creek Vents 1, 2, and 10

The dye injected at Lost Creek swallet on July 14, 2009 was detected at three vents within the Spring Creek Springs system: Spring Creek Springs vent 1, Spring Creek Springs vent 2 and Spring Creek Springs vent 10. The three 2009 tracer breakthrough curves for Spring

Creek Springs vents 1, 2 and 10 depicted in Figure 5.6 are stacked upon one another due the similar timing of the tracers' arrival at the three vents. In the discussion to follow the curves will be plotted separately to allow a better reconciliation of each breakthrough curve. The emergence of the dye at Spring Creek Springs verified that flows into Lost Creek swallet contribute to the discharge of Spring Creek Springs. The linear velocities of flow detailed below confirm the flow transport between Lost Creek swallet and Spring Creek Springs was conveyed via conduits. The 2009 Lost Creek swallet trace verified the weak results of the 2008 Lost Creek swallet that pertained to the connection between Lost Creek swallet and Spring Creek Springs trace previously discussed. The emergence of Lost Creek swallet flows as discharge at Spring Creek Springs and the conveyance of the dye tracer via conduits connecting Lost Creek swallet to Spring Creek Springs accomplished the objectives of this study outlined in the second paragraph of this chapter.

The first tracer detection at Spring Creek vent 01 was on August 21, 2009 at a concentration of 1.79 ppb. The dye was detected in every continuous twelve hour sample taken between August 21, 2009 and October 7, 2009 (Appendix A.5). The tracer breakthrough curve of Spring Creek vent 01, the tracer breakthrough curve of Punchbowl Sink (previously discussed) and the discharge for Spring Creek Springs is illustrated in Figure 6.10. The Punchbowl breakthrough curve is included in the supporting graphs for the tracer breakthrough curves for all detection at Spring Creek Springs in 2009 as a time reference. The maximum detection occurred on September 6, 2009 at a concentration of 17.37 ppb and the last detection at the cessation of sampling was on October 7, 2009 of 1.62 ppb. The linear velocity of the first detection and the maximum detection was 304 m/day and 184 m/day respectively (Table 6.2). The seepage velocity calculated for porous media transport was 1.854 m/day. The linear velocity calculated between Lost Creek swallet and Spring Creek vent 01 was between two and three orders of magnitude higher than the seepage velocity indicating transport flow via a conduit.

The first tracer detection at Spring Creek vent 10 was on August 22, 2009 at a concentration of 1.84 ppb. The dye was detected in every continuous twelve hour sample obtained between August 21, 2009 and October 7, 2009 (Appendix A.5). The tracer breakthrough curve of Spring Creek vent 10, the tracer breakthrough curve of Punchbowl Sink and the discharge for Spring Creek Springs is illustrated in Figure 6.11. The maximum detection occurred on September 11, 2009 at a concentration of 22.41 ppb and the last detection at the cessation of sampling was on October 8, 2009 of 3.02 ppb. The linear velocity of the first detection and the maximum detection was 313 m/day and 206 m/day respectively (Table 6.2). The seepage velocity calculated for porous media transport was 1.754 m/day. The linear velocity for transport to Spring Creek vent 10 was slightly faster than that of Spring Creek vent 01. The linear velocity calculated for the transport to Spring Creek vent 10 approached three orders of magnitude higher than the seepage velocity and confirms transport flow through a conduit.

The first tracer detection at Spring Creek vent 2 was on August 29, 2009 at a concentration of 12.68 ppb. The dye was detected in every continuous twelve hour sample obtained between August 29, 2009 and October 3, 2009 (Appendix A.5). The tracer breakthrough curve of Spring Creek vent 2, the tracer breakthrough curve of Punchbowl Sink and the discharge for Spring Creek Springs is illustrated in Figure 6.12. The maximum detection occurred on September 1, 2009 at a concentration of 21.93 ppb and the last detection at the cessation of sampling was on October 3, 2009 of 5.56 ppb. The linear velocity of the first detection and the maximum detection was 248 m/day and 230 m/day respectively (Table 6.2). The seepage velocity calculated for porous media transport was 1.877 m/day. The linear velocity for transport to Spring Creek vent 2 was slightly faster than that of Spring Creek vent 01. The linear velocity calculated for the transport to Spring Creek vent 2 was also between two and three orders of magnitude higher than the seepage velocity and conforms to the velocities of flow transport via a conduit.

The shape and timing of the three tracer breakthrough curves are very similar. The time span between when the dye arrives and ceases to be detected at all three vents fall within the data range of August 21, 2009 and October 8, 2009. The first arrivals of the tracer at Spring Creek vent 01 and Spring Creek vent 10 are only a day apart. The first arrival of the dye tracer at Spring Creek vent 02 was seven days later than that of Spring Creek vent 01. Although the dye tracer arrived later at Spring Creek vent 02, the maximum detection at Spring Creek vent 02 was detected ten days earlier than that of Spring Creek vent 1 and five days earlier than that of Spring Creek vent 10. Interpretations as to the relationships that may exist between individual vents and there flow characteristics are beyond the scope of this qualitative tracer analysis. Additional data regarding each vents specific discharge characteristics would be required to investigate such relationships. Given the data available to this study it is safe to state that under the hydrological circumstances of the 2009 Lost Creek swallet trace the three vents at which the tracer was detected are consistent within the group.

The occurrence of the three tracer breakthrough curves described above all transpire within the time period (August of 20009 and October 6, 2009) of discharge at Spring Creek Springs that was previously referred in the discussion of the Revell Sink and Punchbowl tracer breakthrough as the period of reduced negative discharge. A comparison of the tracer breakthrough curves for Spring Creek vent 01, Spring Creek vent 10, and Spring Creek vent 03 to the fluctuations in the Spring Creek Springs discharge curve clearly demonstrate similarities to the discharge rates at Spring Creek Springs in the tracer concentration detections at the individual vents.

The similarities of the tracer breakthrough curves at Revell Sink, Punchbowl Sink and the separate vents at Spring Creek Springs to the discharge curve for Spring Creek Springs is evident. It is also notable that the peaks and lows in concentration are of less magnitude the further the distance from Spring Creek Springs.

The 2009 Lost Creek swallet dye trace verified that Lost Creek swallet flows contribute to the discharge of Spring Creek Springs. The 2009 Lost Creek swallet trace additionally confirmed Lost Creek swallet conduit connection to Revell Sink, Punchbowl Sink, and Spring Creek Springs vents 01, 02 and 10. The 2009 trace also demonstrated that flow reversals at Spring Creek Springs are transmitted or influence flow regimes well into the southern reaches of the area of investigation.

Water Level Elevation Responses to Alternating Flow Regimes

The third objective of this study was to determine if the water level elevations at the karst windows stations indicate or reveal changes in the flow regime in the Wakulla Spring and Spring Creek Springs' springshed. The water level elevation stations established as part of the field work for this study (Figure 4.3) and the data generated (Appendix A.3) were previously illustrated in Figure 5.4. A cursory statistical review of the data is presented in this section that demonstrates relationships and varying correlations among the stations and their respective water level elevation in response to alternating positive and negative discharge at Spring Creek Springs. The water level elevation data demonstrates a unified response among the monitoring stations groups to the changes in salinity levels (Appendix A.2) resulting from positive and negative discharge at Spring Creek Springs.

Hal Davis of the U.S. Geological Survey provided consultation and advisement on the field work and the dye traces presented in this study. During 2008 and 2009 the U.S. Geological Survey was likewise conducting field work and data collection in the study area for their investigation that culminated in Davis and Verdi (2014). Their investigation and results offer an excellent interpretation of the alternating flow regimes at Spring Creek Springs.

A pivotal concept explored in the Davis and Verdi (2013) investigation was the calculation and application of an equivalent effective fresh water head at Spring Creek Springs. Their investigation (Davis and Verdi, 2014) can provide a more complete explanation of the method used to calculate the equivalent fresh water head and the implications of this numerically derived head measurement to the flow regimes that exist between Wakulla Spring and Spring Creek Springs. Wakulla Spring and Spring Creek Springs are in a common springshed and therefore compete for groundwater (Davis and Verdi, 2014). As the gradient between locations changes, so too will the flow of groundwater. The hydraulic head difference between Wakulla Spring and Spring Creek Springs defines the gradient between the two springs and the groundwater flows in the direction of the steepest negative gradient. The principal underlying the equivalent fresh water head is that salt water has a higher density than freshwater. One vertical foot of freshwater is not equivalent in weight and the pressure it exerts as one foot of salt water. Therefore, it is inaccurate to compare fresh water hydraulic head to that of a saltwater hydraulic head. Davis and Verdi (2014) utilized the Ghyben-Herzberg equation to convert the gage measurements and salinity measurements recorded at the U.S. Geological Survey monitoring station for Spring Creek Springs into an equivalent fresh water head for Spring Creek Springs (Appendix A.2). In the discussion to follow the Davis and Verdi (2014) equivalent fresh water head values will be include in some analyses.

Cursory Statistics of Water Level Elevations

Due to the flat hydrological gradient across the study area, plotting the water level elevations curves for the stations together results in a clustering of elevation curves that are tightly grouped and often stacked upon one another. In order to lessen the crowding among the elevation curves the stations have been separated into a northern group and a southern group: 1) Sullivan Sink, Turner Sink, Wakulla Dock and Revell Sink, 2) Lost Creek swallet, Punchbowl Sink, Tobacco Sink and Spring Creek Springs.

Graphing the water level elevation values for the stations in two groups (Figure 6.13 and Figure 6.14) reveals relationships among the members of the groups that were not as clear when graphed together. Clearly the northern stations reacted in unison throughout the period of analysis (Figure 6.13). There are observable relationships in the southern group (Figure 6.14) as well. Among the members of the southern group Tobacco Sink, Punchbowl Sink and the equivalent fresh water head for Spring Creek Springs demonstrate strong agreement. Lost Creek swallet at times radically departs from the norms of the group due to drastic variations in flow and the resulting water level elevations. The Spring Creek Springs gage lacks the common responses of its group members because it is dominated by tidal influences not conduit conditions.

The distribution analysis of the water level elevation data was conducted on my behalf in R (open source statistical software) by Seth Bassett of the Florida Geological Survey. The distribution of the water level elevation values (Table 6.3) for the karst window stations and the U.S. Geological Survey measurements (Appendix A.2) for Spring Creek Springs are illustrated in Figure 6.15. The box and whisker plots demonstrate commonalities within the respective groups. The northern group members have a tighter distribution and a corresponding narrow range of interquartile values. With the exception of the Spring Creek Springs gage, the members of the southern group demonstrate a broader distribution and a wider range of interquartile values.

The uniformity in water level elevation responses among the respective group members is interpreted to demonstrate that they are uniformly responding to head conditions driven by pressure within a common conduit system. The lack of complete conformity between the two groups may signify that the groups are representative of two subsets of conduit systems that together form the expansive conduit system that dominates flow in the Wakulla Spring and Spring Creek Springs springshed.

Kendal Correlation Analysis of the Water Level Elevations

A Kendal correlation analysis was performed to test for connectivity (via conduits) of the water level elevation monitoring stations. The correlation analysis was performed for the date range of January 1, 2009 – March 31, 2010. To conduct the analysis the water level elevation data was divided into periods of time. In order to maintain objectivity the water level elevation data was divided into periods of time based on observations made from other hydrological parameters that were recorded during the same date range. Discharge observations of Spring Creek Springs and Wakulla Spring were chosen as the other hydrological parameter by which to determine the periods of time. The January 1, 2009 – March 31, 2010 discharge data for Spring Creek Springs and Wakulla Spring (Figure 5.2 and Appendix A.2) were divided into date ranges when Spring Creek Springs' discharge was greater than Wakulla Spring's discharge and when Spring Creek Springs' discharge was less than Wakulla Spring's discharge. The resulting periods or date ranges that apply are: Period One, January 1, 2009 – June 14, 2009; Period Two, June 15, 2009 – December 5, 2009 and Period Three, January 6, 2009 – March 31, 2010. The water level elevation and gage data was then divided into these respective periods or date ranges and the Kendal correlation analysis was performed. The Kendal correlation coding and compilation of the statistical results was performed by Marc Orndorf, a Ph.D. candidate at Florida State University, in the open source R software. Figure 6.16 is a graphical representation of the water level elevation and gage data divided into the statistical periods as denoted by the hashed vertical lined. Table 6.4 contains the Kendal correlation values between the water level elevation monitoring stations. Figures 6.17 – 6.19 are station to station correlation plots that graphically present the relationships discussed hereafter. Please note, the date range stated in figure 6.17 should read as January 1, 2009 – June 14, 2009.

A review of the correlations reveals that during period one and three (positive discharge at Spring Creek Springs), there is a strong correlation among northern group of stations and a low to no correlation between the northern and southern groups. Whereas in period two (negative discharge at Spring Creek Springs), there is a strong correlation among the northern stations and a reasonable correlation between the northern and southern groups. This suggests that during negative discharge conditions at Spring Creek Springs all stations in both groups are responding similarly as if they are part of a singular unified conduit system. Whereas when Spring Creek Springs is under positive flow conditions (period one and three), the stations respond as if there is a detachment or a subset of conduits in the northern and southern portion of the study area.

The low to modest correlations between Spring Creek Springs gage data, Punchbowl Sink and Tobacco Sink during period one and three (positive discharge at Spring Creek Springs) suggests some level of conduit connectivity with Spring Creek Springs. Had the analysis been conducted using the equivalent fresh water head of Spring Creek Springs instead of the Spring

Creek Springs gage it is believe that a stronger correlation is likely to have existed. In all three periods the Spring Creek Springs gage station has no to poor correlations with the northern stations. The lack of any strong correlations between Spring Creek Springs gage and any of the karst monitoring stations is understandable as the gage at Spring Creek Springs is measuring tidal fluctuations not water level elevation in the conduits that conveying discharge at Spring Creek Springs.

It is notable that the 2009 Lost Creek swallet trace was conducted during period two. During period two there is strong to moderate correlation between Lost Creek swallet, Revell Sink and Punchbowl Sink. The moderate to strong correlations between Lost Creek swallet, Revell Sink and Punchbowl Sink support the conclusion of a conduit between these locations established during the 2009 Lost Creek swallet dye trace analysis. Additionally, Lost Creek swallet has a strong to moderate correlation with Revell Sink during all three periods. Strong to moderate correlations between Lost Creek swallet and Revell Sink during all three periods suggests that regardless of the flow conditions at Spring Creek Springs, Lost Creek swallet and Revell Sink demonstrate conduit connectivity.

Water Level Elevations during Negative Flow at Spring Creek Springs

Spring Creek Springs has been shown to fluctuate between positive discharge and negative discharge (Figure 5.2). During periods of positive discharge the salinity measured at Spring Creek Springs (Appendix A.2) is low, while during periods of negative discharge the salinity at Spring Creek Springs is high (Figure 6.20). During periods when Spring Creek Springs was under negative discharge conditions (high salinity) the water level elevation at the monitoring stations increased (Figure 6.16 and Figure 6.20). The water level elevation at every station increased during the negative discharge of Spring Creek Springs. The southern stations proximal to Spring Creek Springs had greater increases in water level elevations than the northern stations. Following discussions with my colleague, Seth Bassett, regarding this observation he suggested an analysis of the water level elevation data and the salinity values at Spring Creek Springs. The Salinity values were categorized into three ranges: (0. 10] ppt, (10, 20] ppt and > 20 ppt. The water level elevation measurements were then factored or pair with their respective measured salinity. The probability distributions of the water level elevations factored by salinity (Table 6.5) are illustrated in Figure 6.21. As demonstrated in previous analyses, the northern group and the southern group demonstrate differing group characteristics. Within each group the members demonstrate cohesive characteristics. Both groups' water elevations changed during negative discharge and the corresponding high salinity. The southern group had a more significant difference in high salinity elevations as compared to low salinity elevations.

During negative discharge at Spring Creek Springs the water level elevations at Tobacco Sink, Punchbowl Sink and the equivalent fresh water head at Spring Creek Springs actually exceed the water level elevations of Revell Sink and Wakulla Spring from mid-June to mid-December of 2009 (Figure 6.22). These circumstances document a reversal of the gradient between Spring Creek Springs, Revell Sink and Wakulla Spring. The southward flow toward Spring Creek Springs would have reversed to a northerly flow toward Revell Sink and Wakulla Spring. Northerly groundwater flow would have prevailed from approximately June 16, 2009 - December 15, 2009. Such a reversal of flow is suspected to have occurred during the 2008 dye trace which enabled the dye detection at the Wakulla Springs' main vent and Wakulla K conduit tracer monitoring stations.

Figure 6.23 offers a water level elevation profile factored by salinity along the north to south transect formed by the karst window water level elevation monitoring stations and Spring Creek Springs. This illustration (Figure 6.23) depicts the reversal in the gradient that occurred when the equivalent fresh water head at Spring Creek Springs exceeded the water level elevation at Revel Sink and Wakulla Spring. The area between the light red ribbon plot and the light blue ribbon plot is representative cross sectional view of the volume of water that was stored between Revell Sink and Spring Creek Springs during the flow reversal at Spring Creek Springs.

Table 6.1: 2008 Elapsed time, detection events, water level elevations, gradients and resulting velocity (m/day) calculations.

Date and Time	Elapsed Time, Days	Elapsed Time, Hours	Event[1]	Groundwater elevation (NAVD88) per 2008 Barrios Potentiometric Map, meters	Gradient between Lost Creek Swallet and Sampling Station	Linear distance from Lost Creek swallet, meters	Linear Velocity = Distance / Elapsed Time (m/day)	Seepage Velocity[2] = Ꝁ(-Gradient) / Ne, (m/day)
5/29/2008 14:00			Injection of dye at Lost Creek swallet	2.9				
6/3/2008 23:59	5.42	129.98	FD Spring Creek vent 10**	0.0	-0.0002	12,105	2235	2.430
6/23/2008 8:00	24.75	594.00	LD Spring Creek vent 10	0.0	-0.0002	12,105	489	2.430
6/26/2008 16:00	28.08	674.00	FD Revell Sink	1.6	-0.0002	6,450	230	2.017
7/9/2008 23:59	41.42	993.98	FP Revell Sink	1.6	-0.0002	6,450	156	2.017
7/13/2008 20:00	45.25	1,086.00	FD Wakulla K Conduit	1.7	-0.0001	10,900	241	1.136
7/13/2008 20:00	45.25	1,086.00	FD Wakulla Main Vent	1.6	-0.0001	11,540	255	1.127
7/24/2008 20:00	56.25	1,350.00	PD Wakulla Main Vent	1.6	-0.0001	11,540	205	1.127
7/25/2008 16:00	57.08	1,370.00	FP Wakulla K Conduit	1.7	-0.0001	10,900	191	1.136
8/9/2008 23:59	72.42	1,737.98	MD Wakulla K Conduit	1.7	-0.0001	10,900	151	1.136

1. FD = first detection, LD = last detection, FP = first peak, PD = peak detection, MD = maximum detection.

2. Formula per Fetter (2001); Hydraulic Conductivity (Ꝁ) =3048 m/d per Davis et al., 2010, Effective Porosity (Ne) = 0.3 assumed.

** First detection on downward limb of tracer break through curve constrains travel time to lower limits.

Table 6.2: 2009 Elapsed time, detection events, water level elevations, gradients and resulting velocity (m/day) calculations.

Date and Time	Elapsed Time, Days	Elapsed Time, Hours	Event	Groundwater elevation (NAVD88) per Karst window stations 7/14/09, meters	Gradient between Lost Creek swallet and Sampling Station, 7/14/09	Linear distance from Lost Creek swallet, meters	Linear Velocity = Distance / Elapsed Time (m/day)	Seepage Velocity[2] = Ꝁ(-Gradient) / Ne, (m/day)
7/14/2009 11:00			Injection of dye at Lost Creek swallet	2.09				
8/6/2009 6:00	22.79	547.00	FD Revell Sink	1.62	-0.0001	6,450	283	0.740
8/14/2009 12:00	31.04	745.00	FD Punchbowl Sink	1.92	-0.00003	6,300	203	0.274
8/21/2009 18:00	38.29	919.00	MD Revell Sink	1.62	-0.0001	6,450	168	0.740
8/21/2009 3:00	37.67	904.00	FD Spring Creek vent 01	0	-0.0002	11,455	304	1.854
8/22/2009 2:00	38.63	927.00	FD Spring Creek vent 10	0	-0.0002	12,105	313	1.754
8/29/2009 1:00	45.58	1094.00	FD Spring Creek vent 02	0	-0.0002	11,315	248	1.877
9/1/2009 13:55	49.12	1178.92	MD Punchbowl Sink	1.92	-0.00003	6,300	128	0.274
9/1/2009 15:00	49.17	1180.00	MD Spring Creek vent 02	0	-0.0002	11,315	230	1.877
9/11/2009 2:00	58.63	1407.00	MD Spring Creek vent 10	0	-0.0002	12,105	206	1.754
9/14/2009 15:00	62.17	1492.00	MD Spring Creek vent 01	0	-0.0002	11,455	184	1.854

1. FD = first detection and MD = maximum detection.

2. Formula per Fetter (2001); Hydraulic Conductivity (Ꝁ) =3048 m/d per Davis et al., 2010, Effective Porosity (Ne) = 0.3 assumed.

** First detection after one week without samples, therefore transit time constrained to lower limits.

Table 6.3: Statistical results for the water level elevations at monitoring stations within the area of investigation.

Water Level Elevation Station	Minimum Value	Lower Quartile	Median	Mean	Upper Quartile	Maximum Value
Sullivan Sink	1.65	1.93	2.06	2.18	2.36	5.20
Turner Sink	1.55	1.83	1.97	2.01	2.12	3.27
Wakulla Dock	1.47	1.71	1.82	1.85	1.95	2.61
Revell Sink	1.13	1.42	1.59	1.57	1.70	2.56
Lost Creek Swallet	0.52	1.43	1.94	2.29	2.61	6.00
Punchbowl Sink	0.33	1.05	1.38	1.40	1.88	2.26
Tobacco Sink	0.64	1.06	1.35	1.41	1.83	2.34
Spring Creek Springs gage	-0.62	-0.14	-0.01	0.01	0.13	0.82
Spring Creek Springs equivalent fresh water head	-0.44	0.2675	0.65	0.8201	1.47	2.17

Table 6.4: Heat map presentation of Kendal correlation values for the water level elevations and gage data.

Period		Sullivan Sink	Turner Sink	Wakulla Dock	Revell Sink	Lost Creek swallet	Punchbowl Sink	Tobacco Sink	Spring Creek Springs
P1	Sullivan Sink	1.000							
P1	Turner Sink	0.946	1.000						
P1	Wakulla Dock	0.883	0.937	1.000					
P1	Revell Sink	0.854	0.897	0.972	1.000				
P1	Lost Creek swallet	0.485	0.468	0.459	0.766	1.000			
P1	Punchbowl Sink	~~0.199~~	~~0.156~~	~~0.116~~	~~0.286~~	~~0.242~~	1.000		
P1	Tobacco Sink	~~0.119~~	~~0.133~~	0.186	0.403	0.509	0.861	1.000	
P1	Spring Creek Springs	0.341	0.360	0.383	0.440	0.340	0.453	0.400	1.000
P2	Sullivan Sink	1.000							
P2	Turner Sink	0.897	1.000						
P2	Wakulla Dock	0.819	0.873	1.000					
P2	Revell Sink	0.832	0.910	0.905	1.000				
P2	Lost Creek swallet	0.621	0.683	0.598	0.675	1.000			
P2	Punchbowl Sink	0.558	0.626	0.575	0.671	0.802	1.000		
P2	Tobacco Sink	0.673	0.718	0.707	0.786	0.725	0.820	1.000	
P2	Spring Creek Springs	~~0.041~~	~~0.032~~	~~0.018~~	~~0.000~~	~~-0.029~~	~~-0.066~~	~~-0.055~~	1.000
P3	Sullivan Sink	1.000							
P3	Turner Sink	0.891	1.000						
P3	Wakulla Dock	0.786	0.910	1.000					
P3	Revell Sink	0.760	0.843	0.855	1.000				
P3	Lost Creek swallet	0.605	0.579	0.500	0.588	1.000			
P3	Punchbowl Sink	~~0.217~~	~~0.237~~	0.275	0.363	0.351	1.000		
P3	Tobacco Sink	~~0.177~~	0.197	0.226	0.349	0.317	0.879	1.000	
P3	Spring Creek Springs	~~0.120~~	~~0.142~~	0.187	0.268	~~0.153~~	0.573	0.584	1.000

1. Strike through script denotes P value > 0.05.

Table 6.5: Statistical results for the water level elevations factored or pair with their respective salinity measured at Spring Creek Springs.

Station	Salinity Factor	Number of observations	Minimum (m)	Q1	Median (m)	Mean (m)	Q3	Maximum (m)
Lost Creek Swallet	(0,10] ppt	211	0.52	1.21	2.30	2.69	4.21	6.00
Punchbowl Sink	(0,10] ppt	96	0.33	0.70	0.94	0.91	1.11	1.64
Revell Sink	(0,10] ppt	200	1.13	1.40	1.63	1.61	1.76	2.56
Spring Creek (USGS)	(0,10] ppt	226	-0.62	-0.23	-0.10	-0.09	0.04	0.61
Spring Creek EFWH (USGS)	(0,10] ppt	181	-0.44	0.09	0.26	0.31	0.51	1.38
Sullivan Sink	(0,10] ppt	226	1.65	2.04	2.35	2.37	2.63	5.20
Tobacco Sink	(0,10] ppt	225	0.64	0.91	1.05	1.11	1.22	2.34
Turner Sink	(0,10] ppt	219	1.55	1.90	2.11	2.12	2.31	3.27
Wakulla Dock	(0,10] ppt	225	1.47	1.74	1.93	1.91	2.04	2.61
Lost Creek Swallet	(10,20] ppt	97	0.93	1.31	1.47	1.65	1.70	5.20
Punchbowl Sink	(10,20] ppt	56	0.71	1.14	1.26	1.29	1.47	1.88
Revell Sink	(10,20] ppt	116	1.22	1.36	1.42	1.44	1.49	2.04
Spring Creek (USGS)	(10,20] ppt	123	-0.40	-0.11	-0.03	0.05	0.21	0.63
Spring Creek EFWH (USGS)	(10,20] ppt	105	0.03	0.63	0.84	0.91	1.18	1.84
Sullivan Sink	(10,20] ppt	123	1.71	1.83	1.90	1.94	2.02	2.70
Tobacco Sink	(10,20] ppt	123	0.90	1.28	1.43	1.44	1.59	2.27
Turner Sink	(10,20] ppt	123	1.60	1.74	1.81	1.84	1.89	2.48
Wakulla Dock	(10,20] ppt	121	1.55	1.65	1.70	1.73	1.79	2.21

Table 6.5 - continued

Station	Salinity Factor	Number of observations	Minimum (m)	Q1	Median (m)	Mean (m)	Q3	Maximum (m)
Lost Creek Swallet	>20 ppt	93	1.67	1.96	2.07	2.15	2.11	5.30
Punchbowl Sink	>20 ppt	93	1.37	1.82	1.91	1.87	1.93	2.26
Revell Sink	>20 ppt	94	1.44	1.61	1.63	1.64	1.69	2.05
Spring Creek (USGS)	>20 ppt	94	-0.26	0.04	0.10	0.12	0.18	0.52
Spring Creek EFWH (USGS)	>20 ppt	84	1.14	1.74	1.79	1.78	1.87	2.17
Sullivan Sink	>20 ppt	94	1.89	2.04	2.06	2.08	2.11	2.59
Tobacco Sink	>20 ppt	94	1.59	1.94	1.98	1.97	2.01	2.32
Turner Sink	>20 ppt	94	1.83	1.96	1.98	1.99	2.02	2.43
Wakulla Dock	>20 ppt	94	1.69	1.81	1.83	1.85	1.90	2.19
Lost Creek Swallet	No Data	29	1.59	1.79	1.93	1.99	2.13	2.50
Punchbowl Sink	No Data	26	1.23	1.61	1.77	1.78	2.04	2.22
Revell Sink	No Data	29	1.43	1.54	1.62	1.61	1.71	1.78
Spring Creek (USGS)	No Data	29	-0.20	0.15	0.28	0.27	0.34	0.82
Spring Creek EFWH (USGS)	No Data	2	1.47	1.62	1.76	1.76	1.91	2.05
Sullivan Sink	No Data	29	1.92	2.00	2.05	2.07	2.15	2.23
Tobacco Sink	No Data	29	1.46	1.69	1.89	1.87	2.06	2.13
Turner Sink	No Data	29	1.82	1.90	1.97	1.98	2.06	2.14
Wakulla Dock	No Data	29	1.69	1.77	1.86	1.84	1.92	1.96

1. Equivalent fresh water head as calculated by Davis and Verdi (2014).

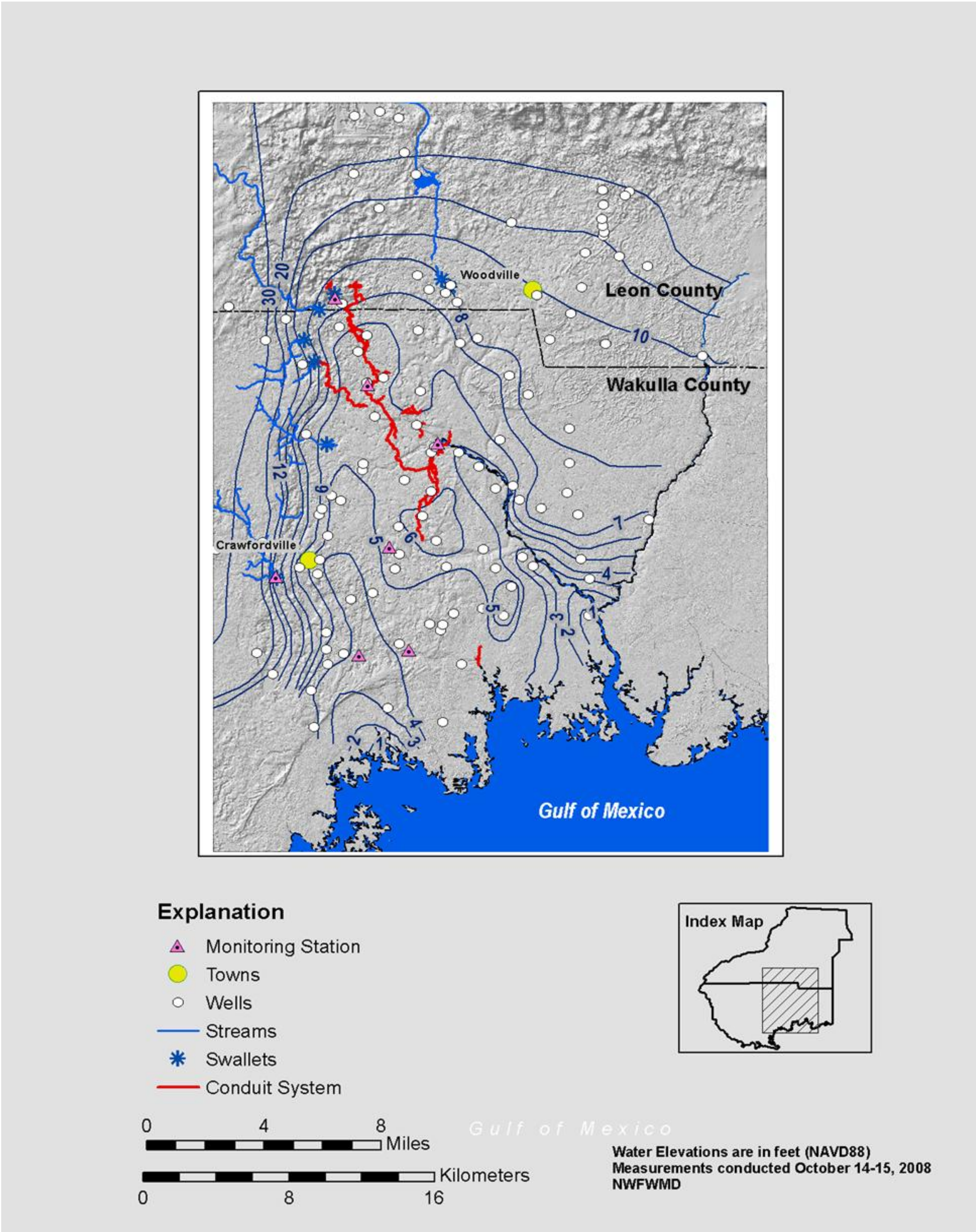


Figure 6.1: Groundwater elevations (NAVD88) according to NWFWMD potentiometric map data collected in 2008. Modified from unpublished works by K. Barrios 2015.

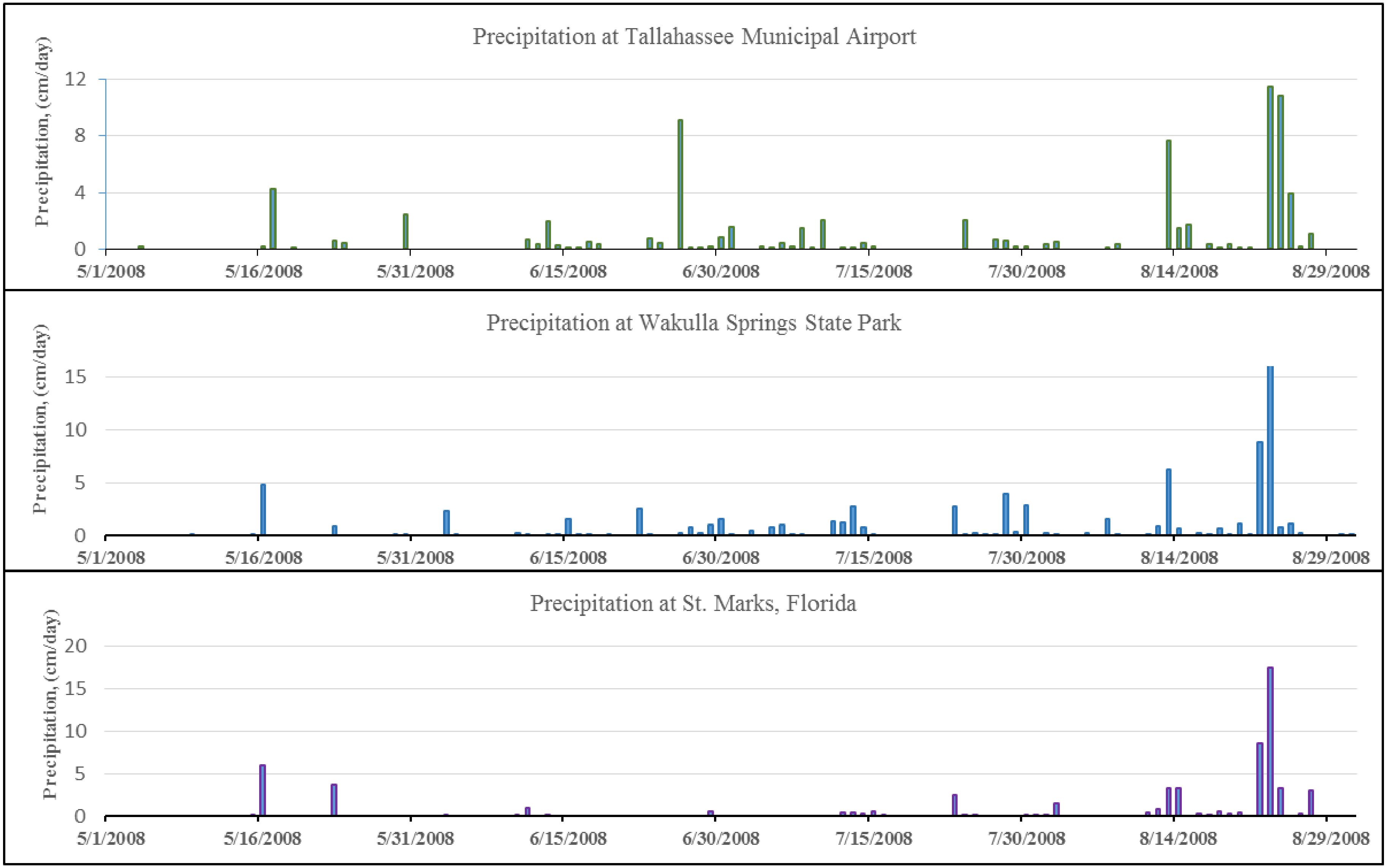
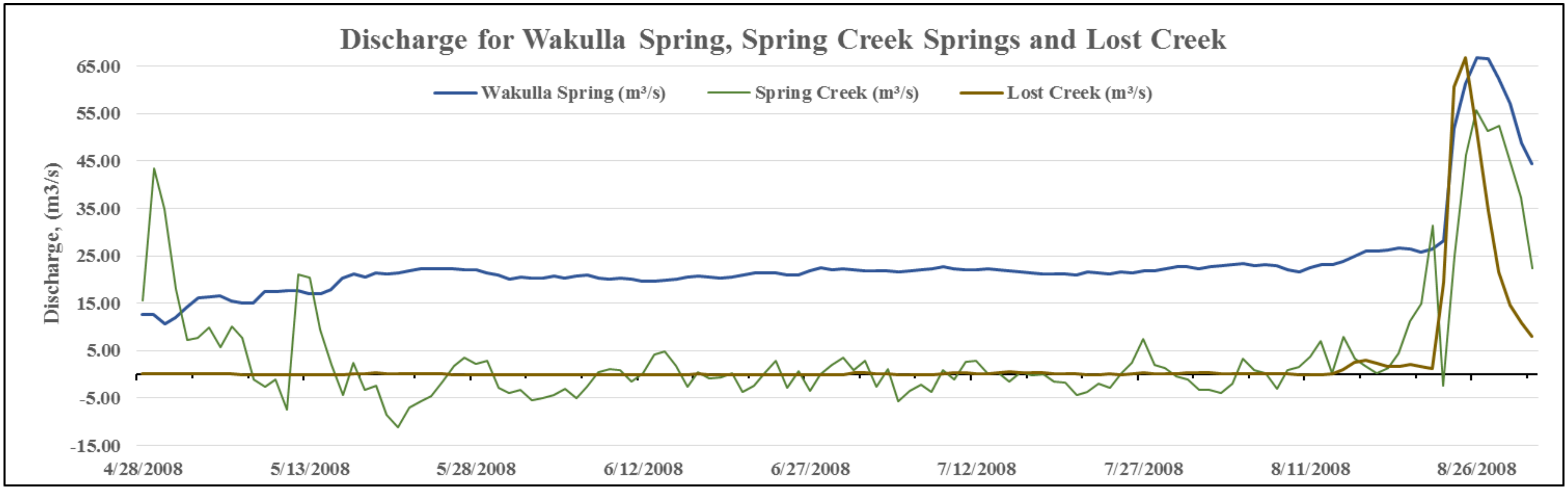


Figure 6.2: Precipitation for duration of 2008 Lost Creek swallet dye trace.



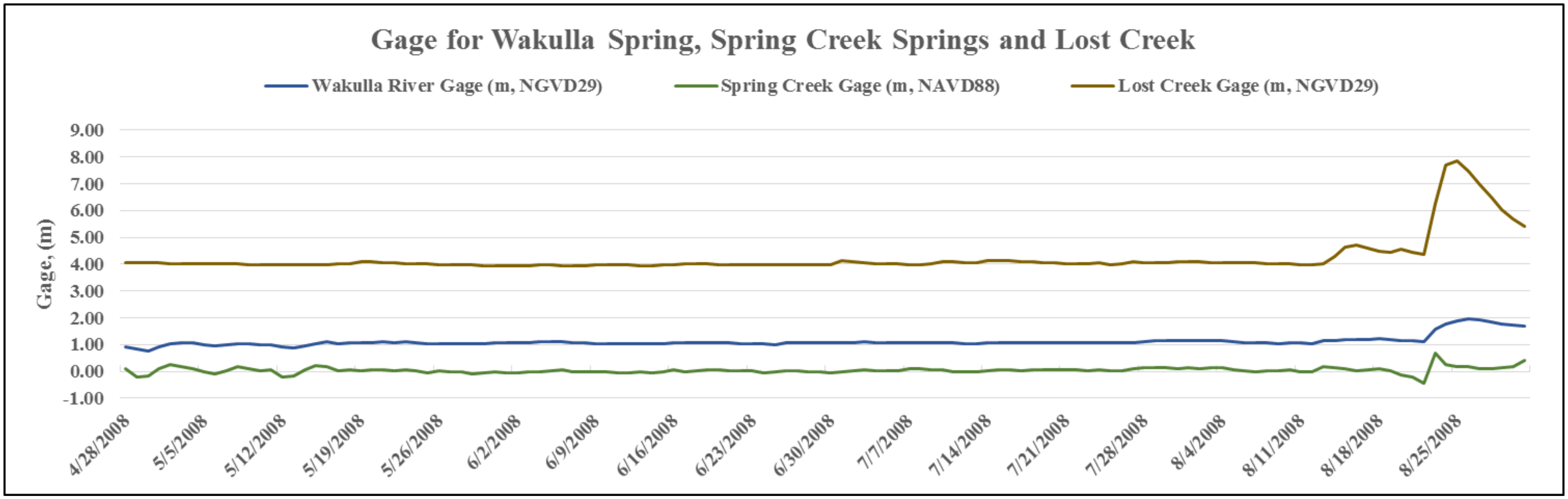


Figure 6.3: Discharge and gage for Wakulla Spring, Spring Creek Springs and Lost Creek swallet for duration of the 2008 Lost Creek swallet trace.

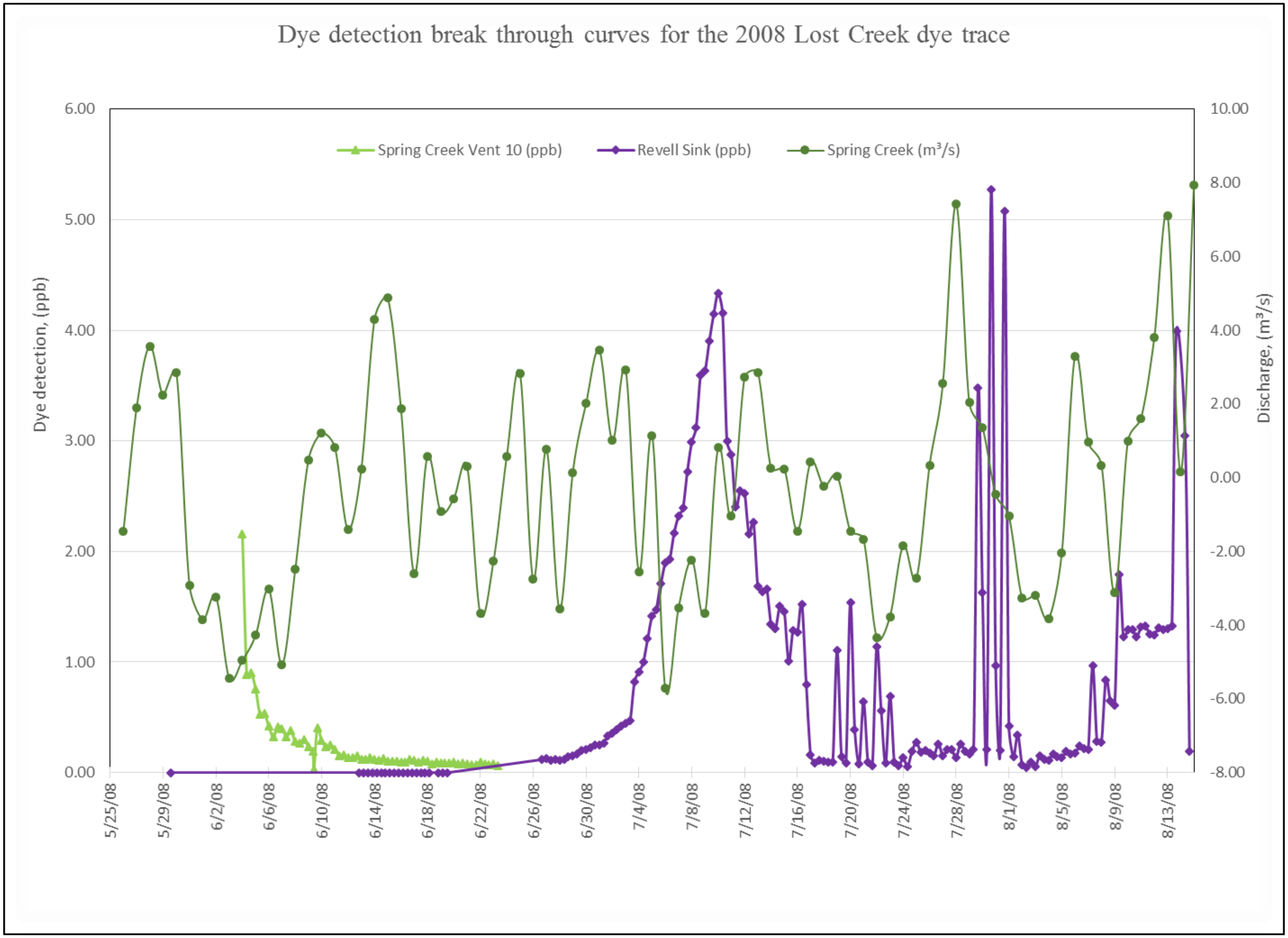


Figure 6.4: Tracer breakthrough curves for Spring Creek vent 10 and Revell Sink plotted with the discharge for Spring Creek Springs.

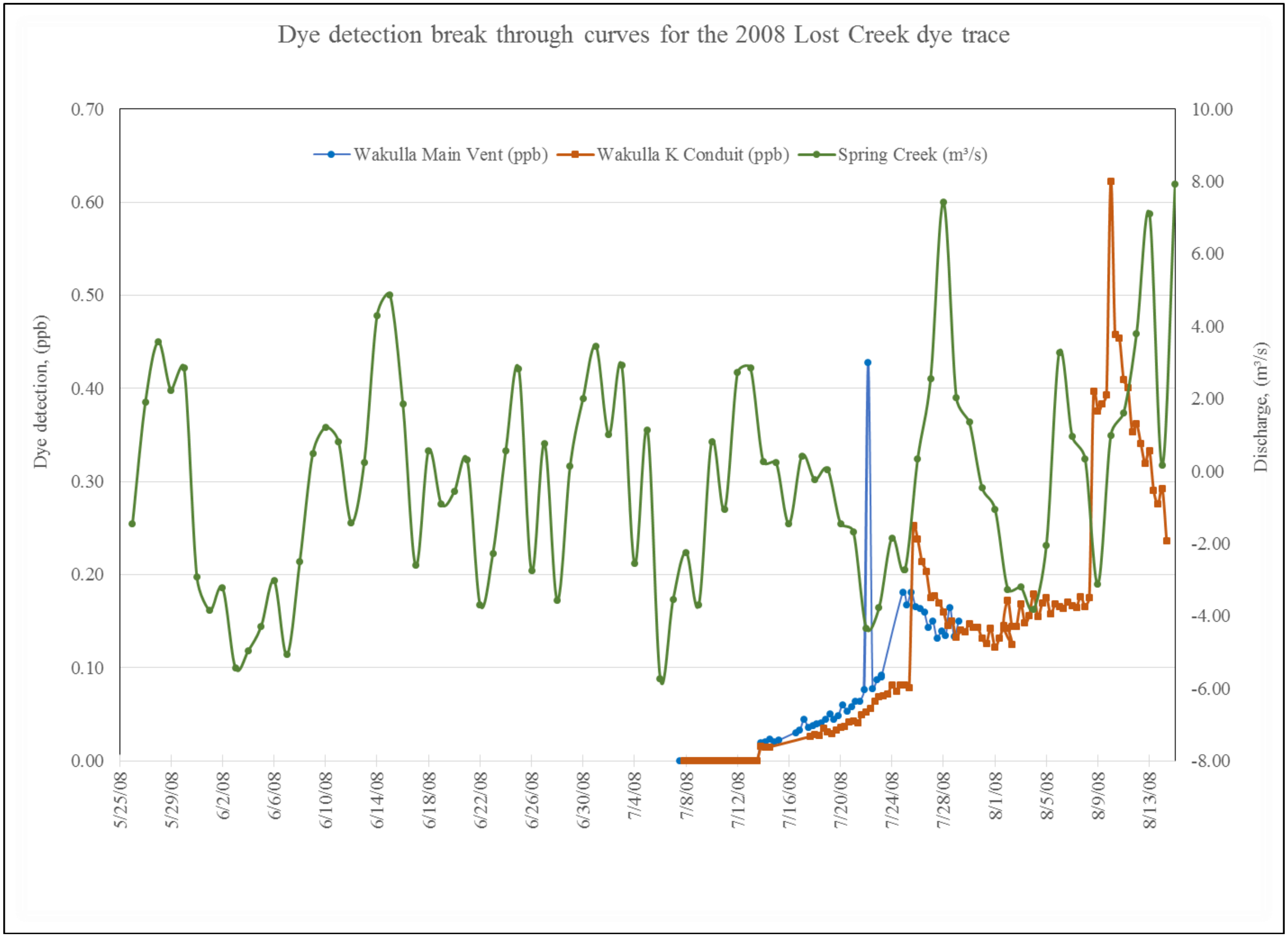


Figure 6.5: Tracer breakthrough curves for Wakulla Spring main vent and Wakulla K Conduit plotted with discharge for Spring Creek Springs.

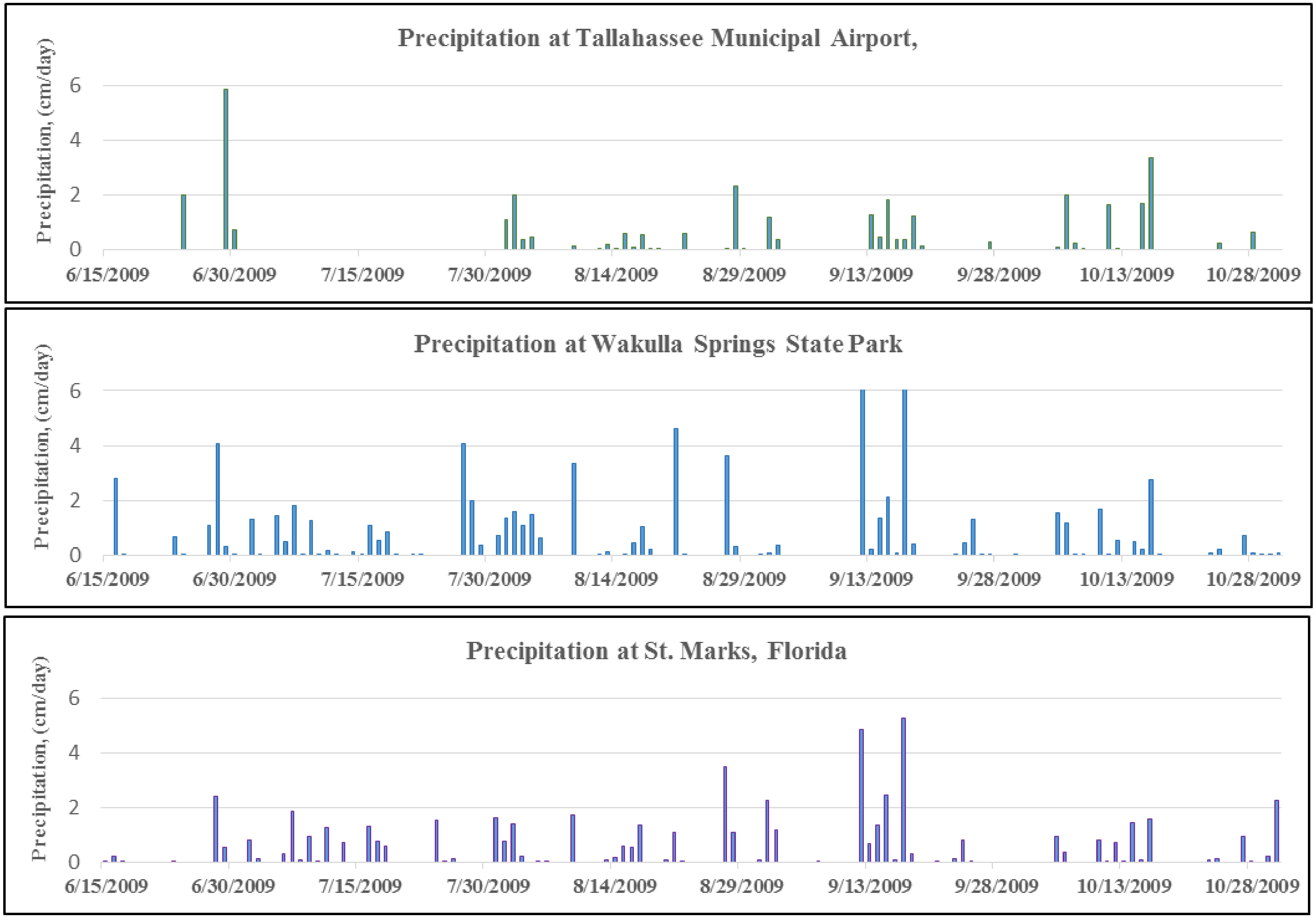


Figure 6.6: Precipitation for duration of 2009 Lost Creek swallet dye trace.

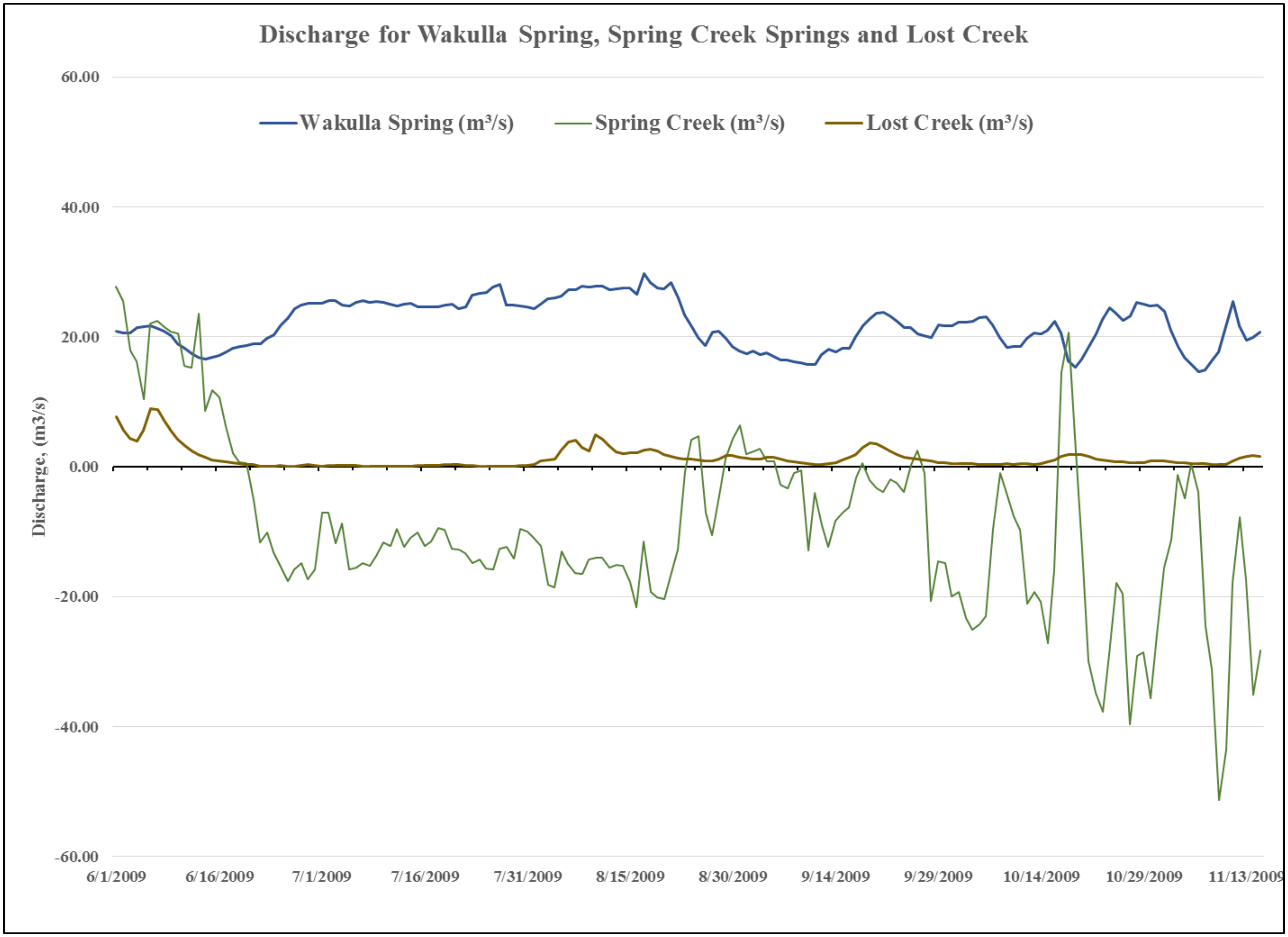


Figure 6.7: Discharge for Wakulla Spring, Spring Creek Springs and Lost Creek swallet for duration of the 2009 Lost Creek swallet trace.

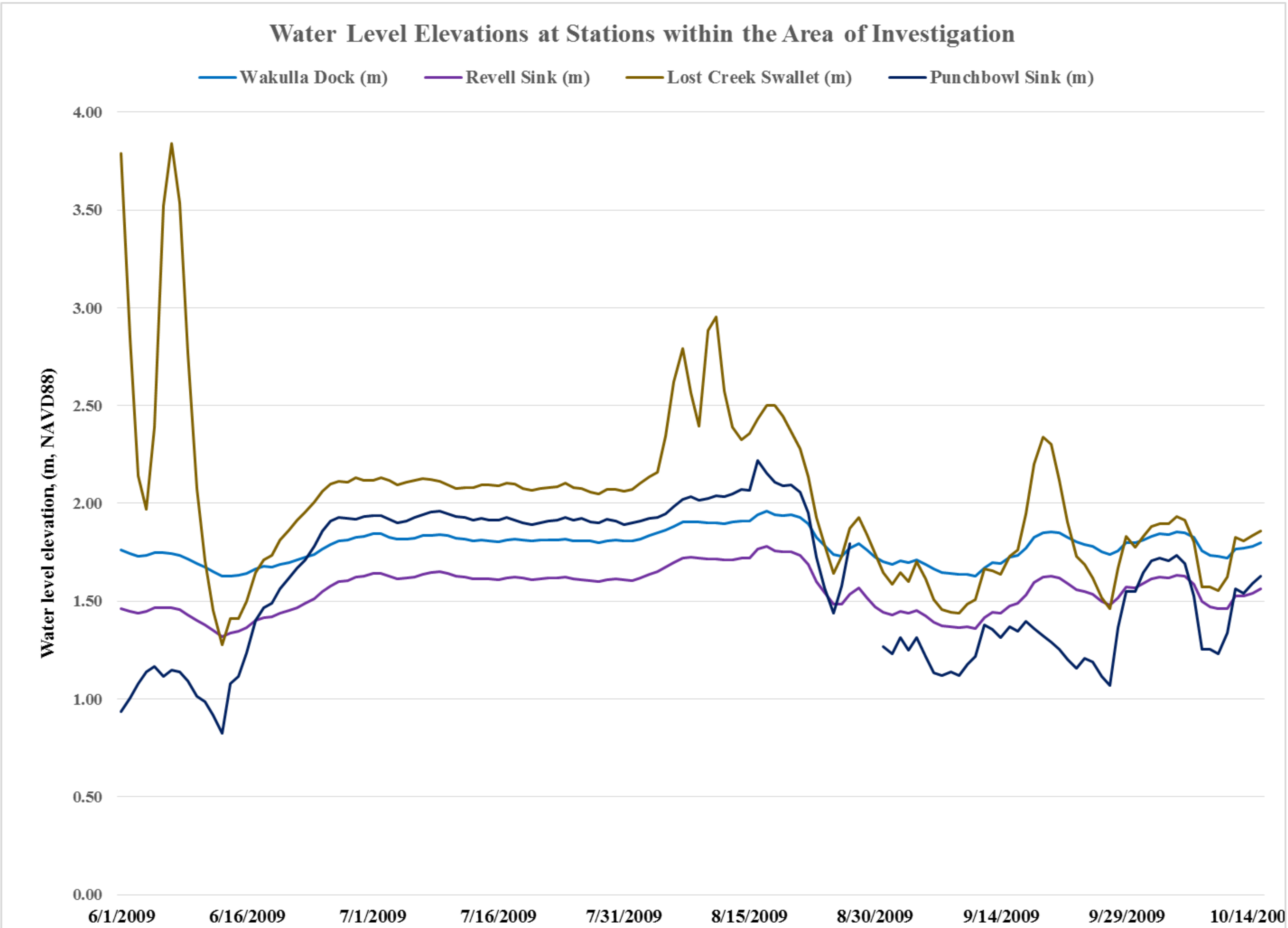


Figure 6.8: Water level elevations at karst window stations/tracer sampling stations during the 2009 Lost Creek swallet trace.

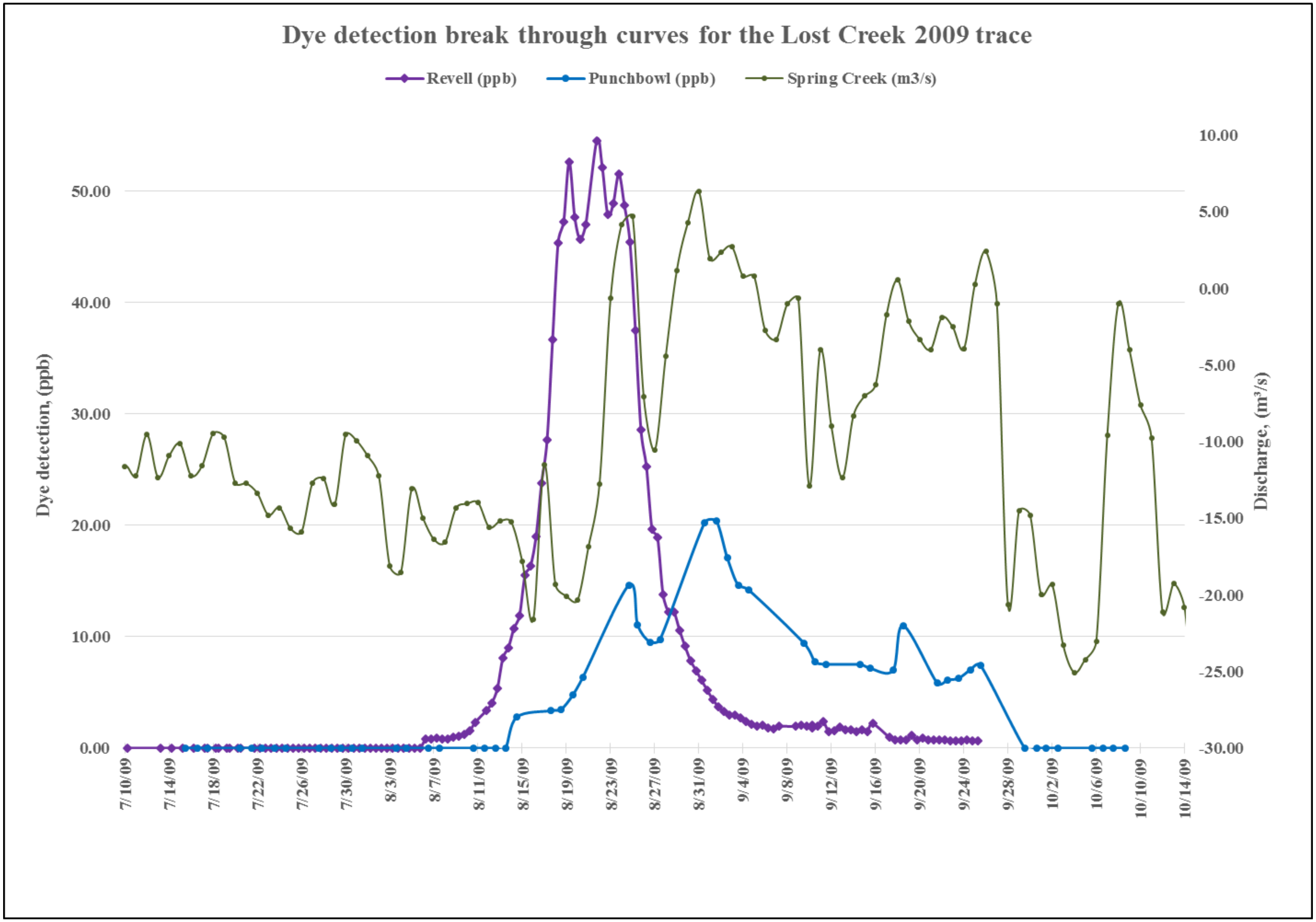


Figure 6.9: Tracer breakthrough curves for Revell Sink and Punchbowl Sink plotted with Spring Creek Springs discharge.

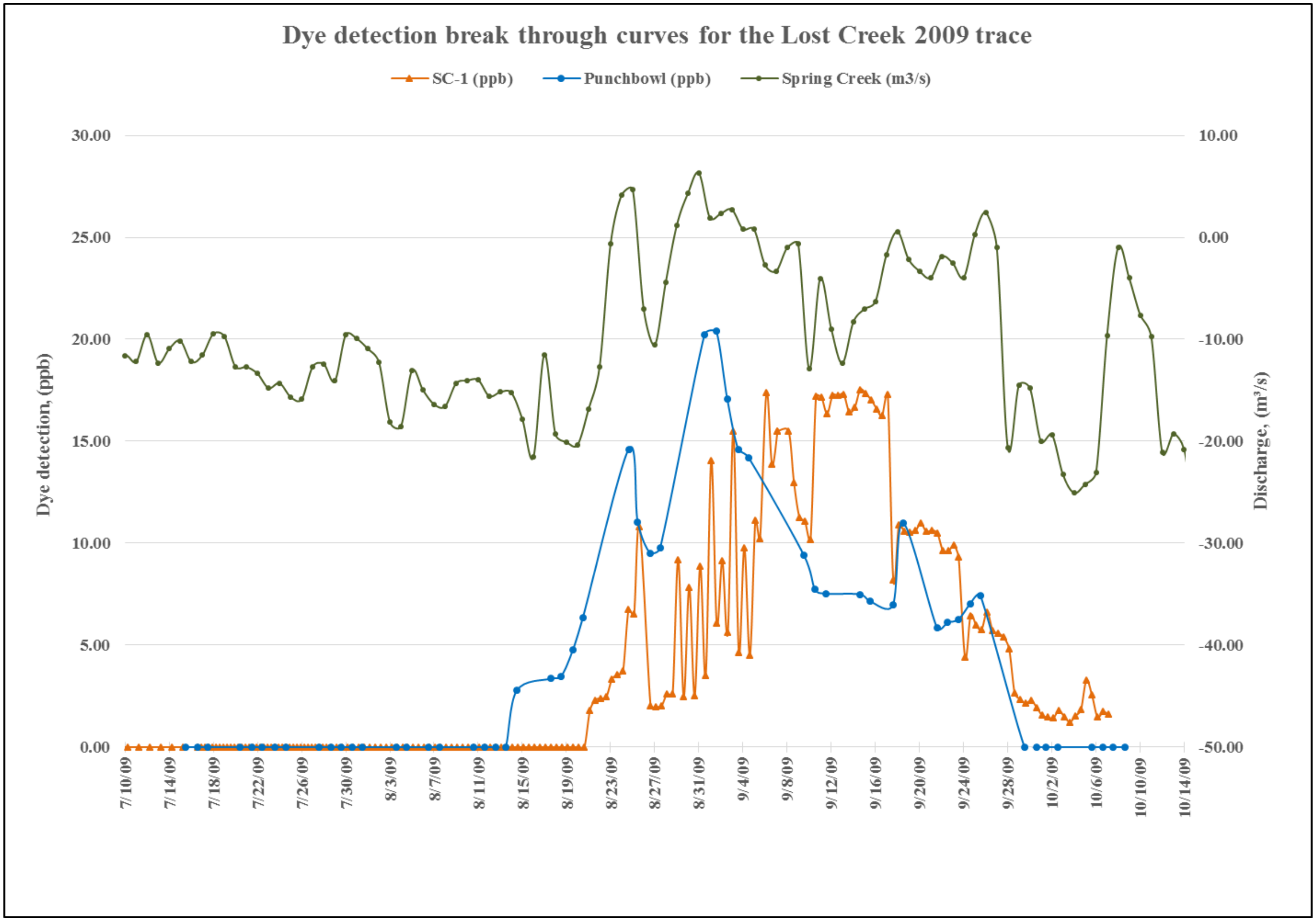


Figure 6.10: Tracer breakthrough curves for Punchbowl Sink and Spring Creek Springs vent 1 plotted with Spring Creek Springs discharge.

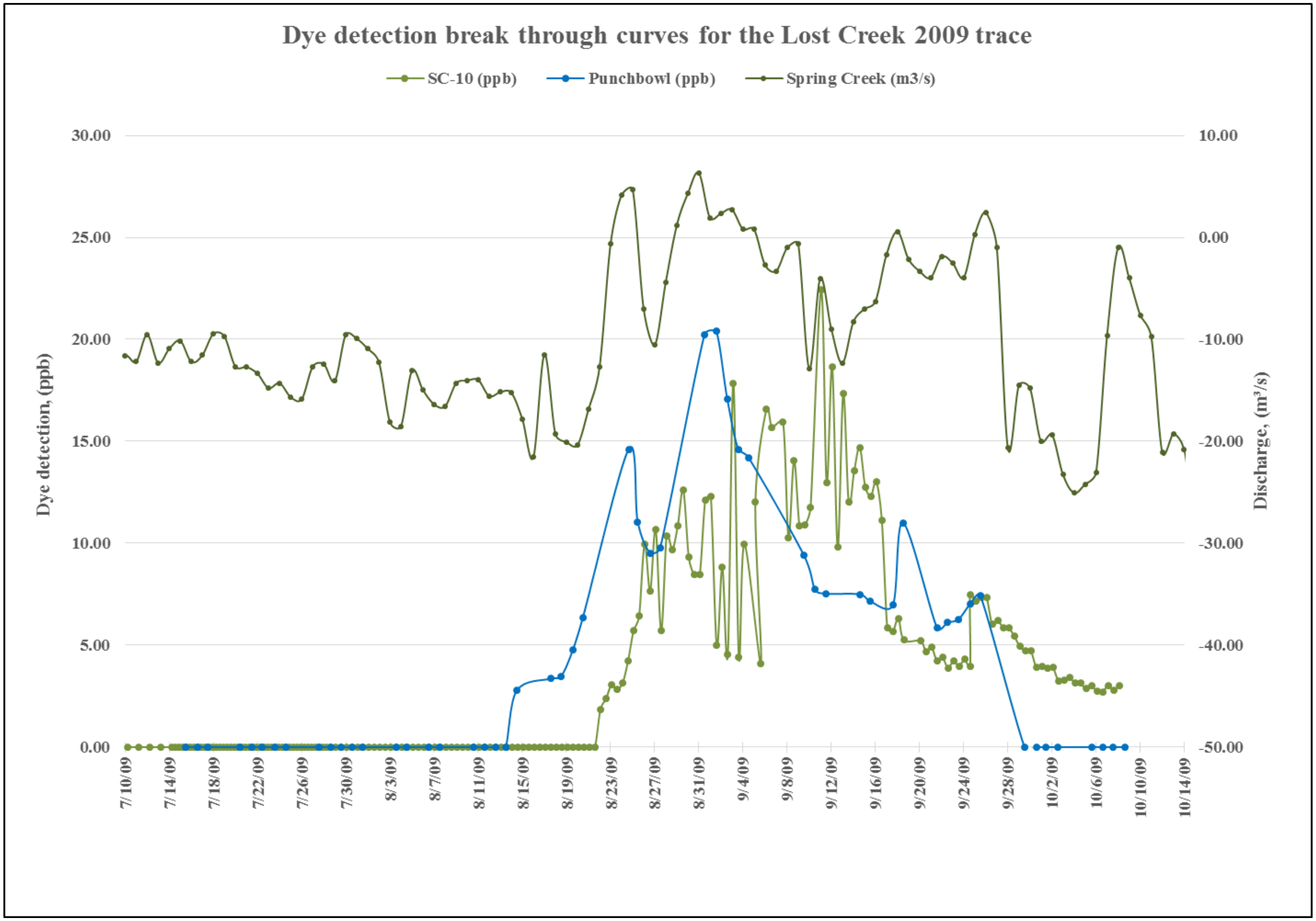


Figure 6.11: Tracer breakthrough curves for Punchbowl Sink and Spring Creek Springs vent 10 plotted with Spring Creek Springs discharge.

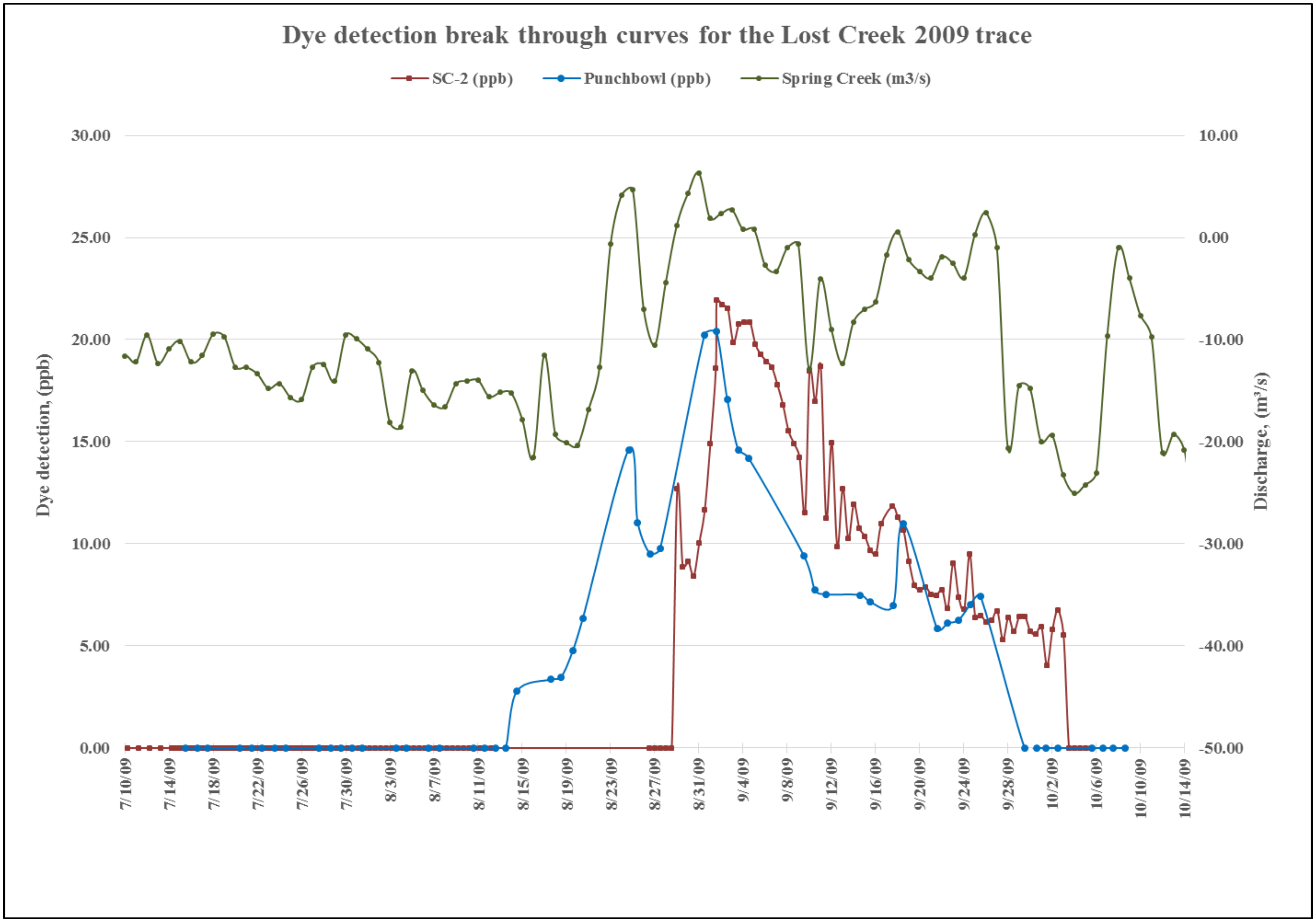


Figure 6.12: Tracer breakthrough curves for Punchbowl Sink and Spring Creek Springs vent 2 plotted with Spring Creek Springs discharge.

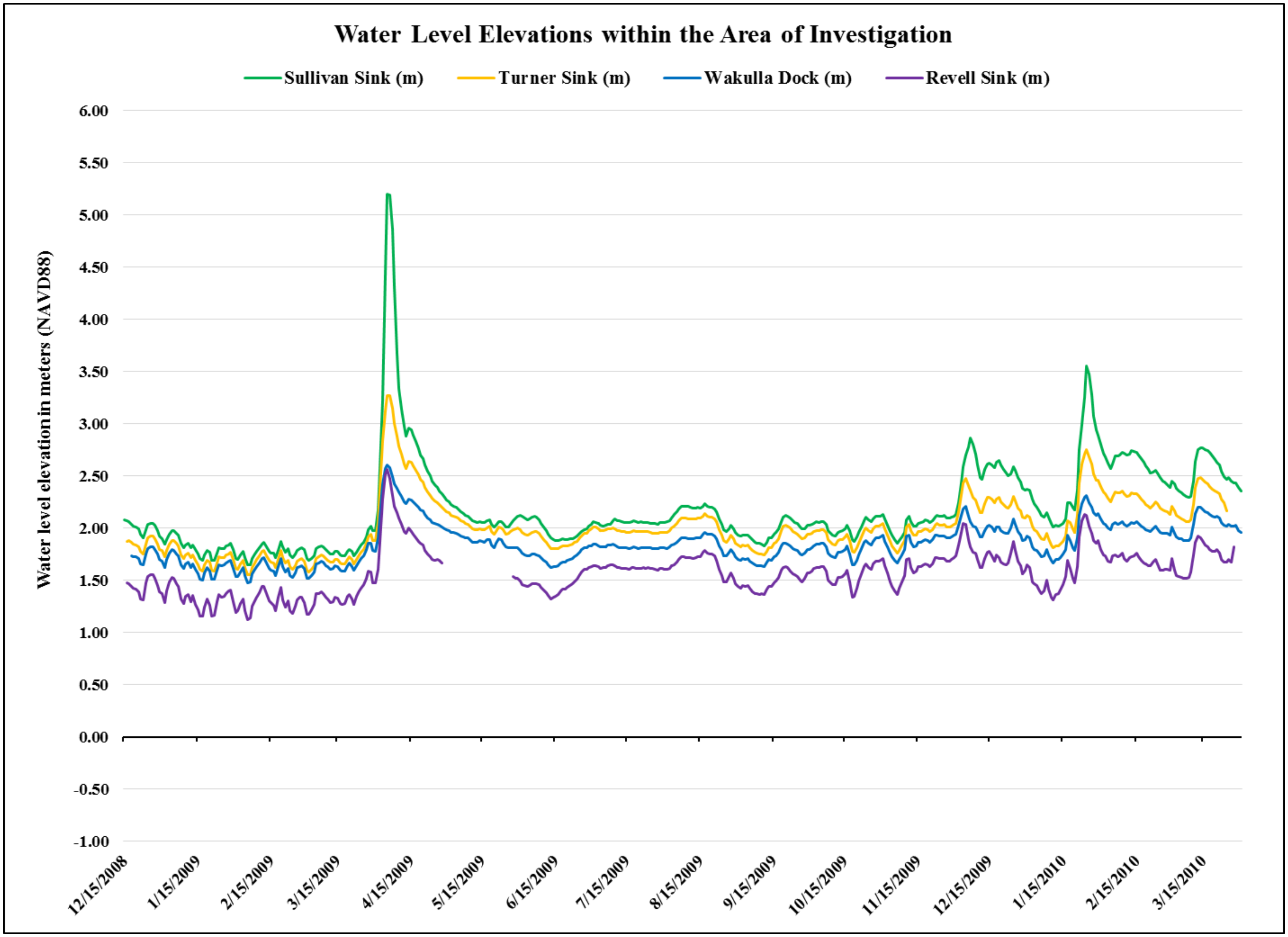


Figure 6.13: Water level elevations at the northern stations within the area of investigation.

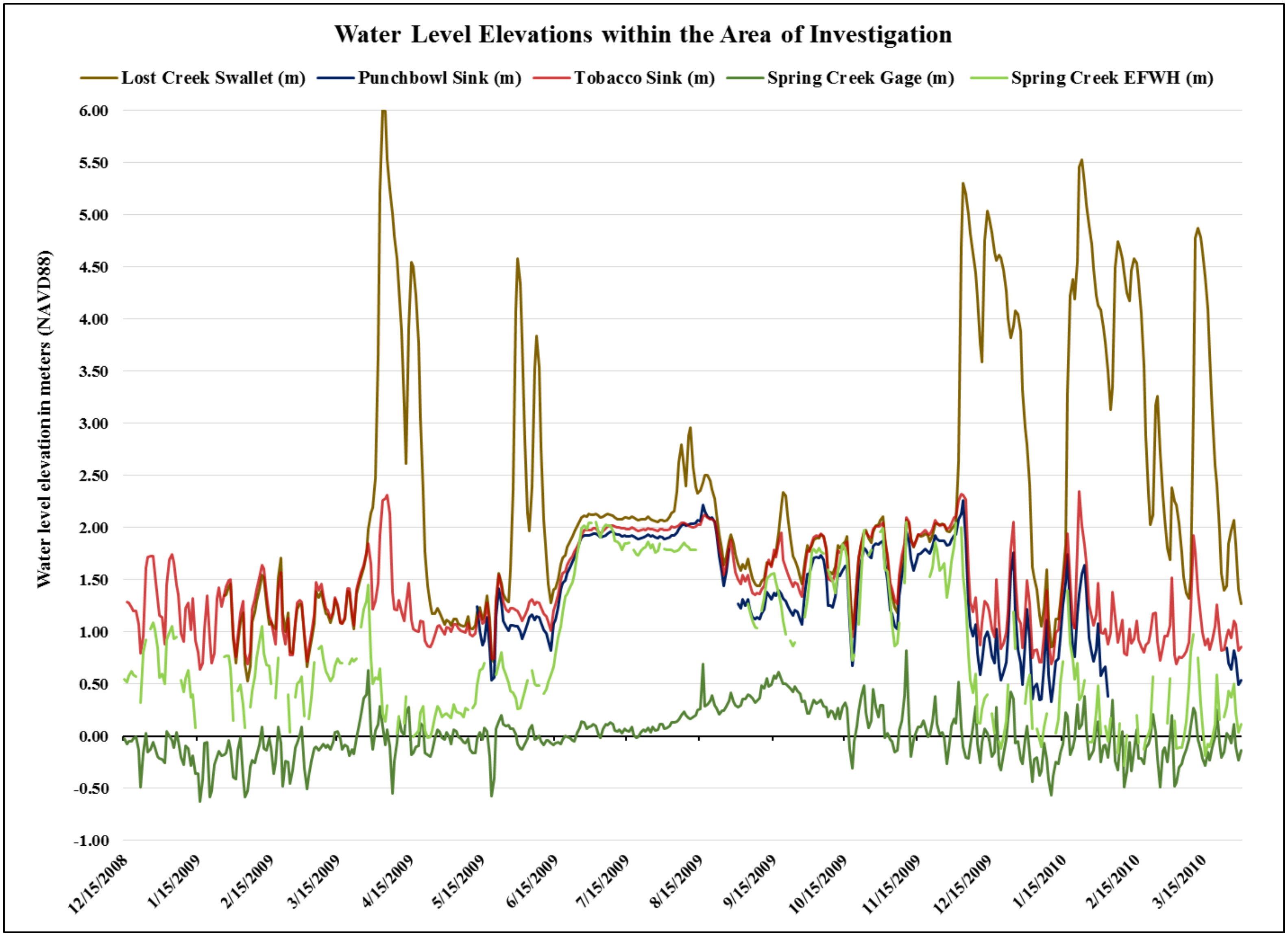


Figure 6.14: Water level elevations at the southern stations within the area of investigation.

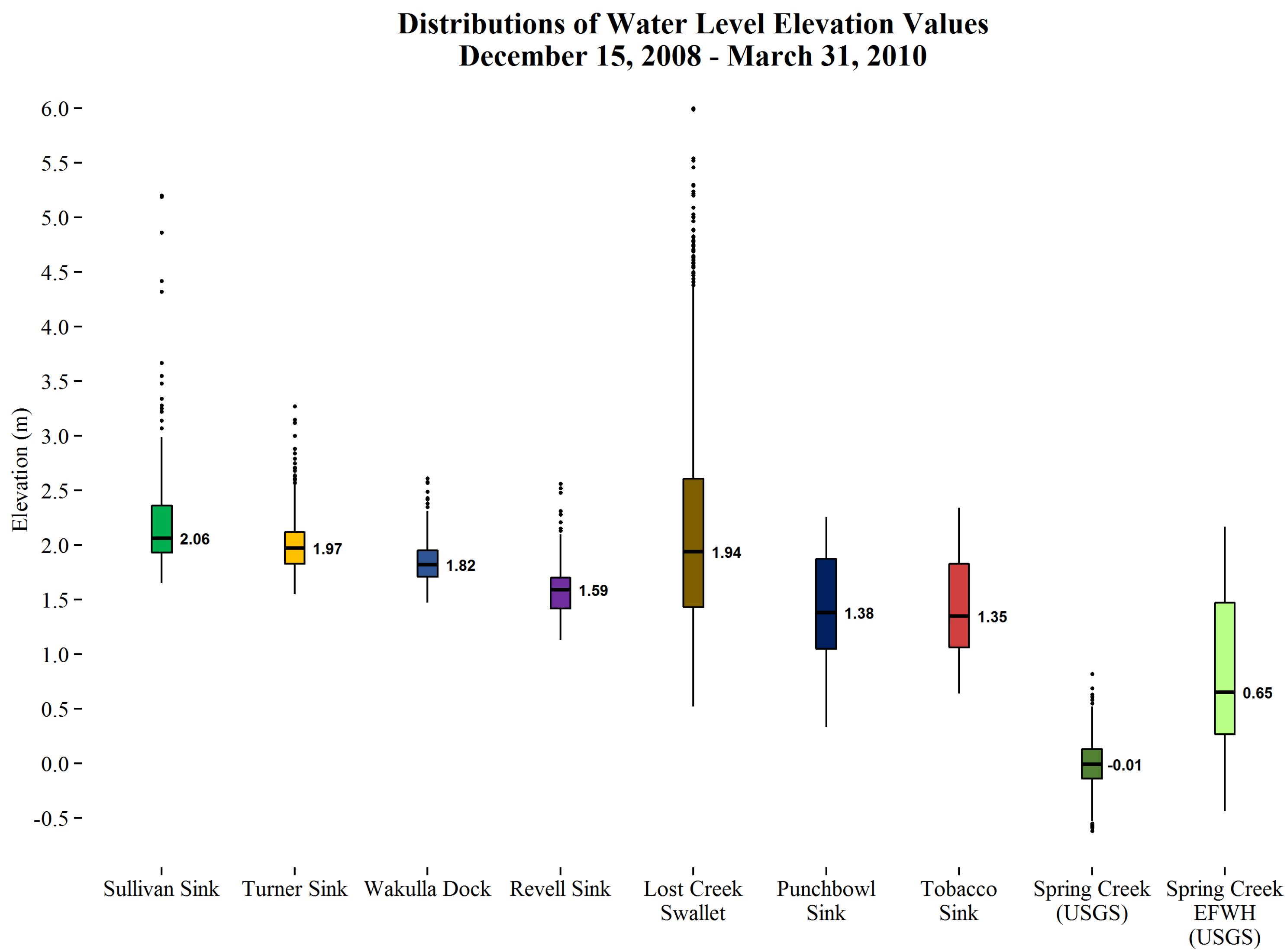


Figure 6.15: Distribution of water level elevations by monitoring station. Graphic representation by Seth Bassett.

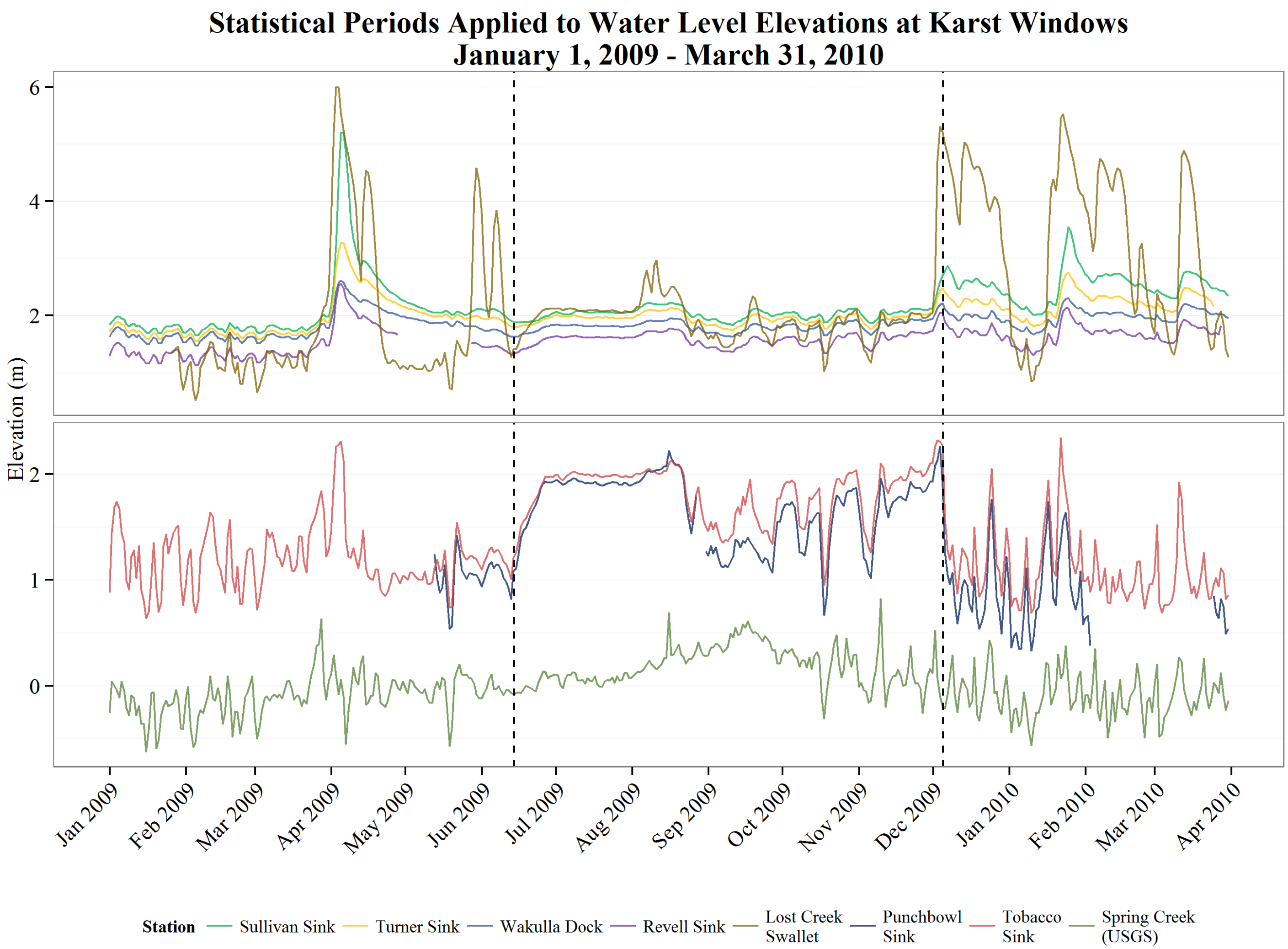


Figure 6.16: Periods of time that apply to the 2009 Kendal correlation analysis of the water level elevation and gage data. Graphical representation by Seth Bassett.

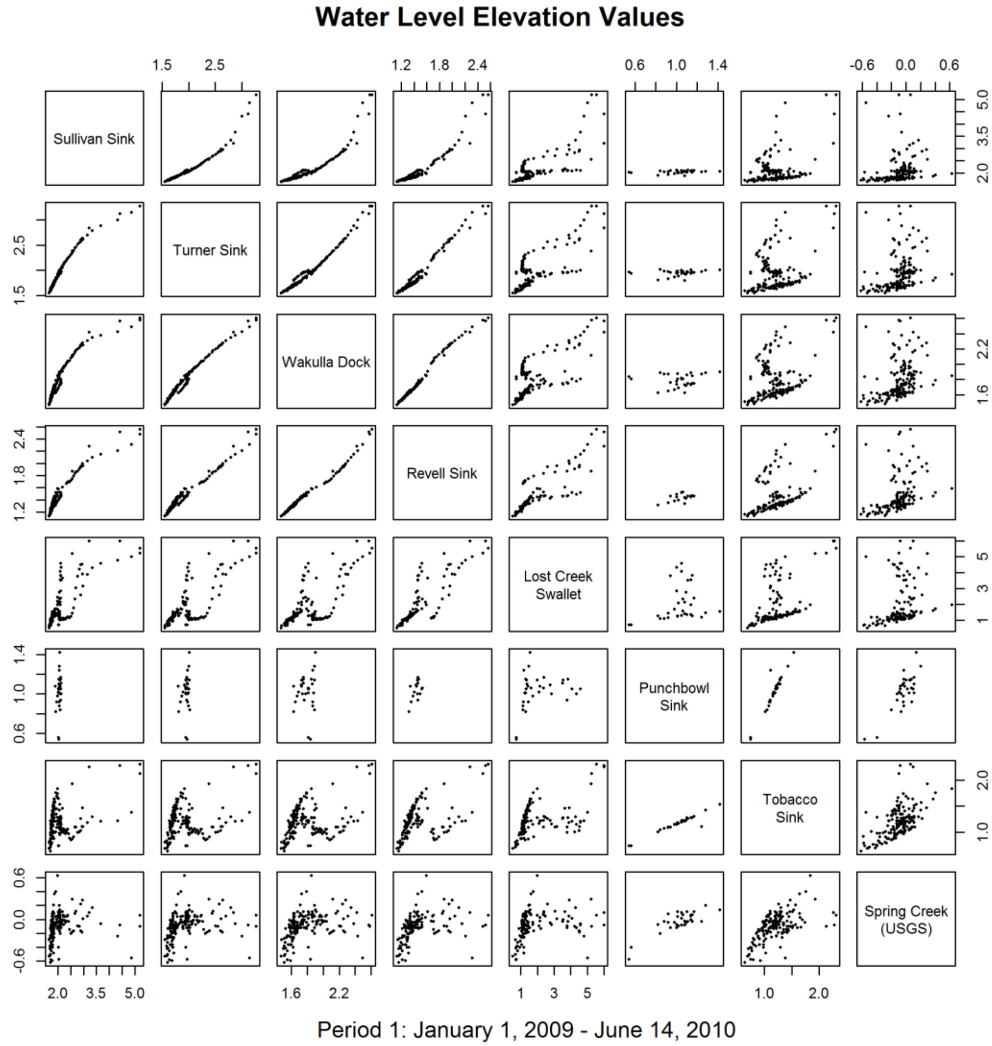


Figure 6.17: One to one correlation plots for period one of the Kendal analysis. Date range in figure should read 1/1/2009 – 6/14/2009. Graphical representation by Seth Bassett.

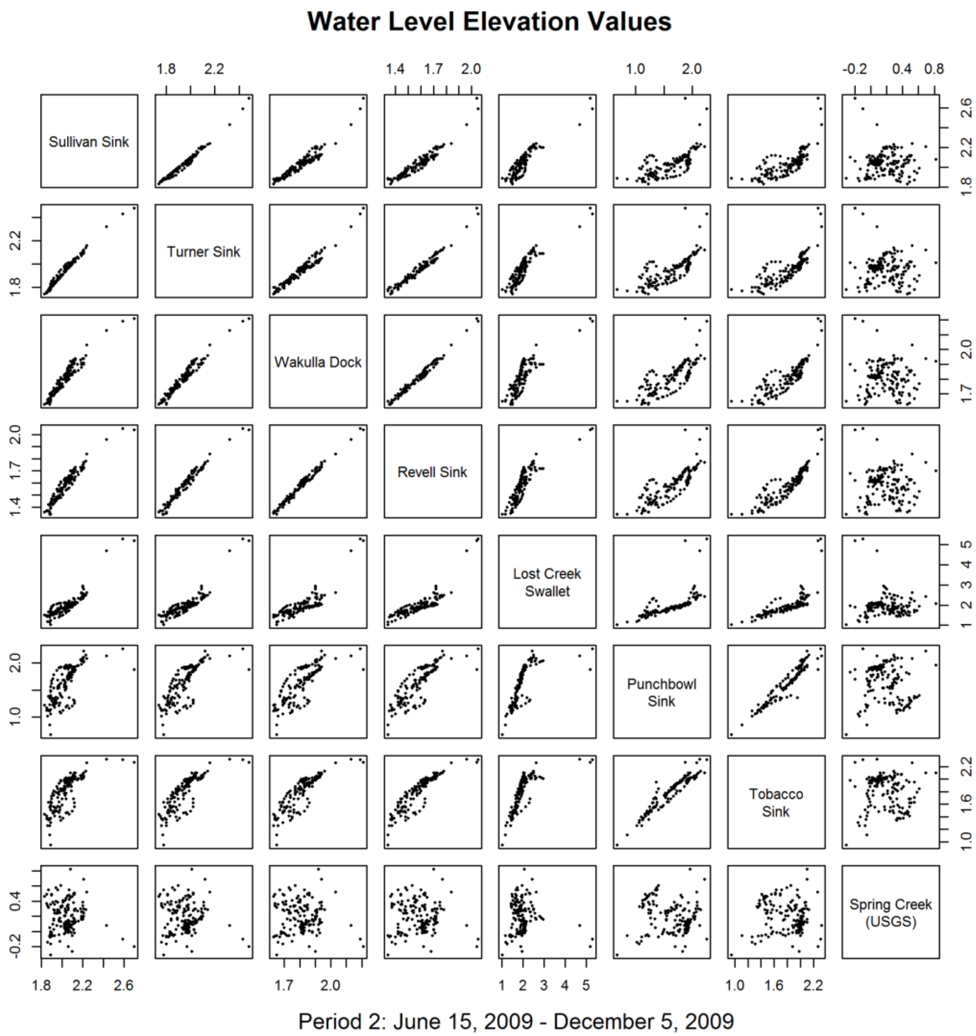


Figure 6.18: One to one correlation plots for period two of the Kendal analysis. Graphical representation by Seth Bassett.

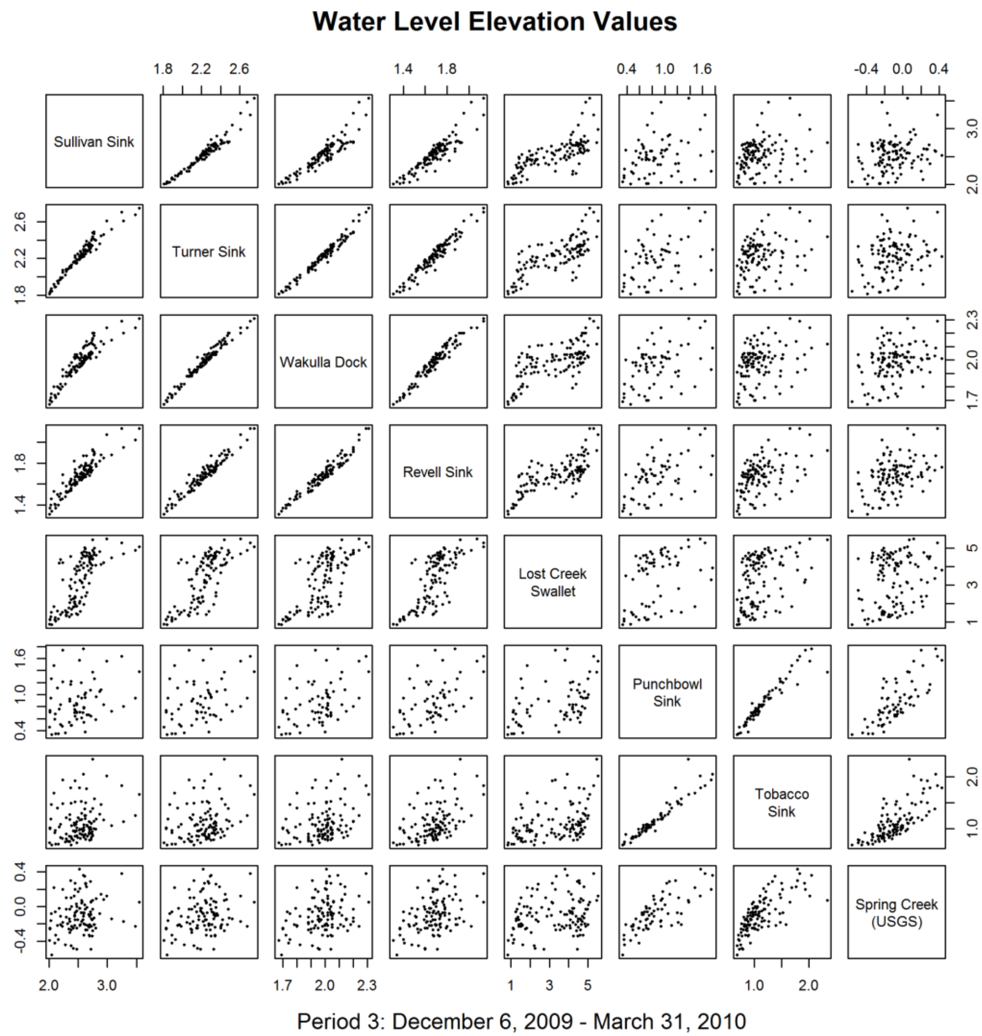


Figure 6.19: One to one correlation plots for period three of the Kendal analysis. Graphical representation by Seth Bassett.

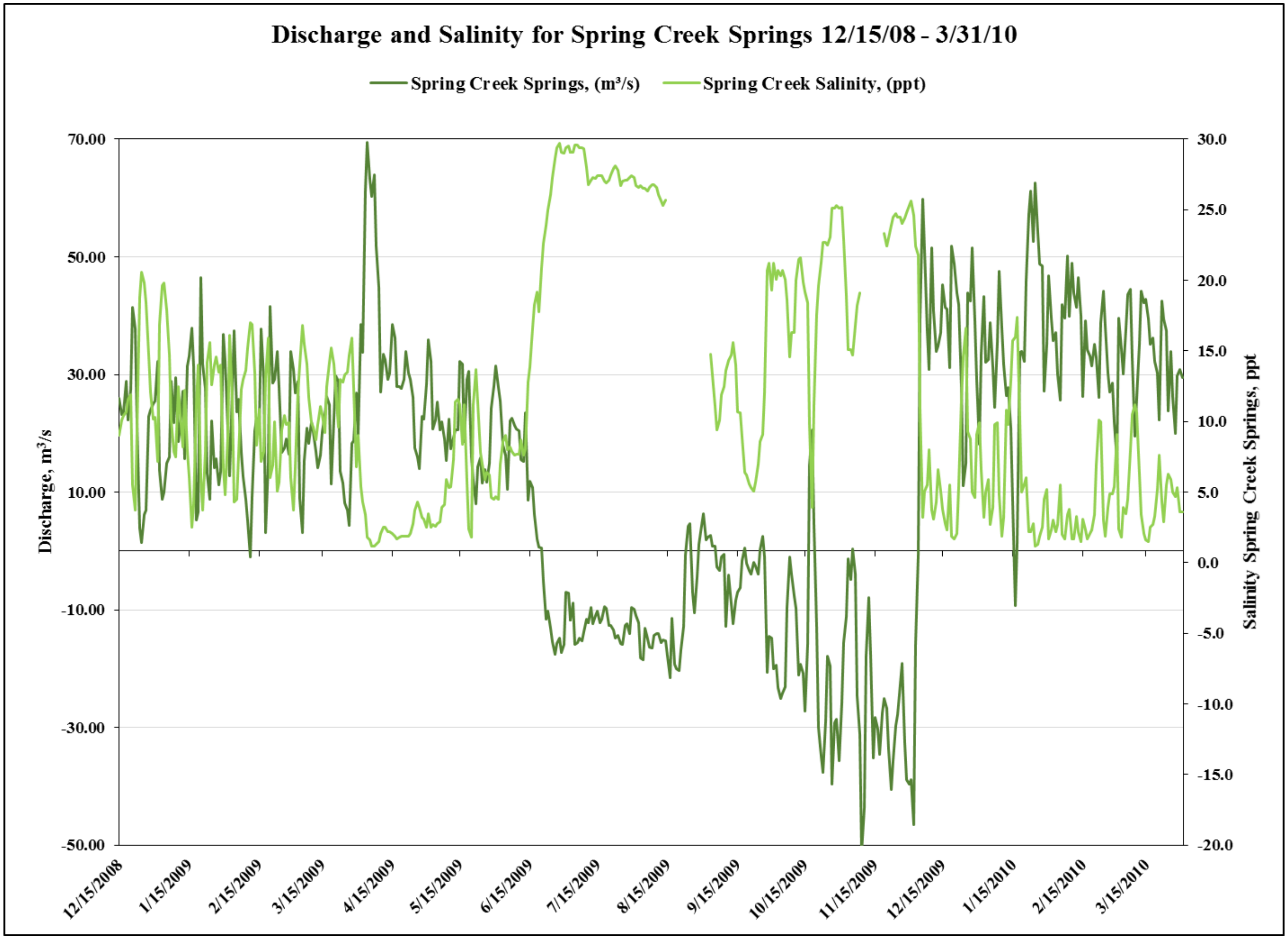


Figure 6.20: The relationship of discharge and salinity at Spring Creek Springs.

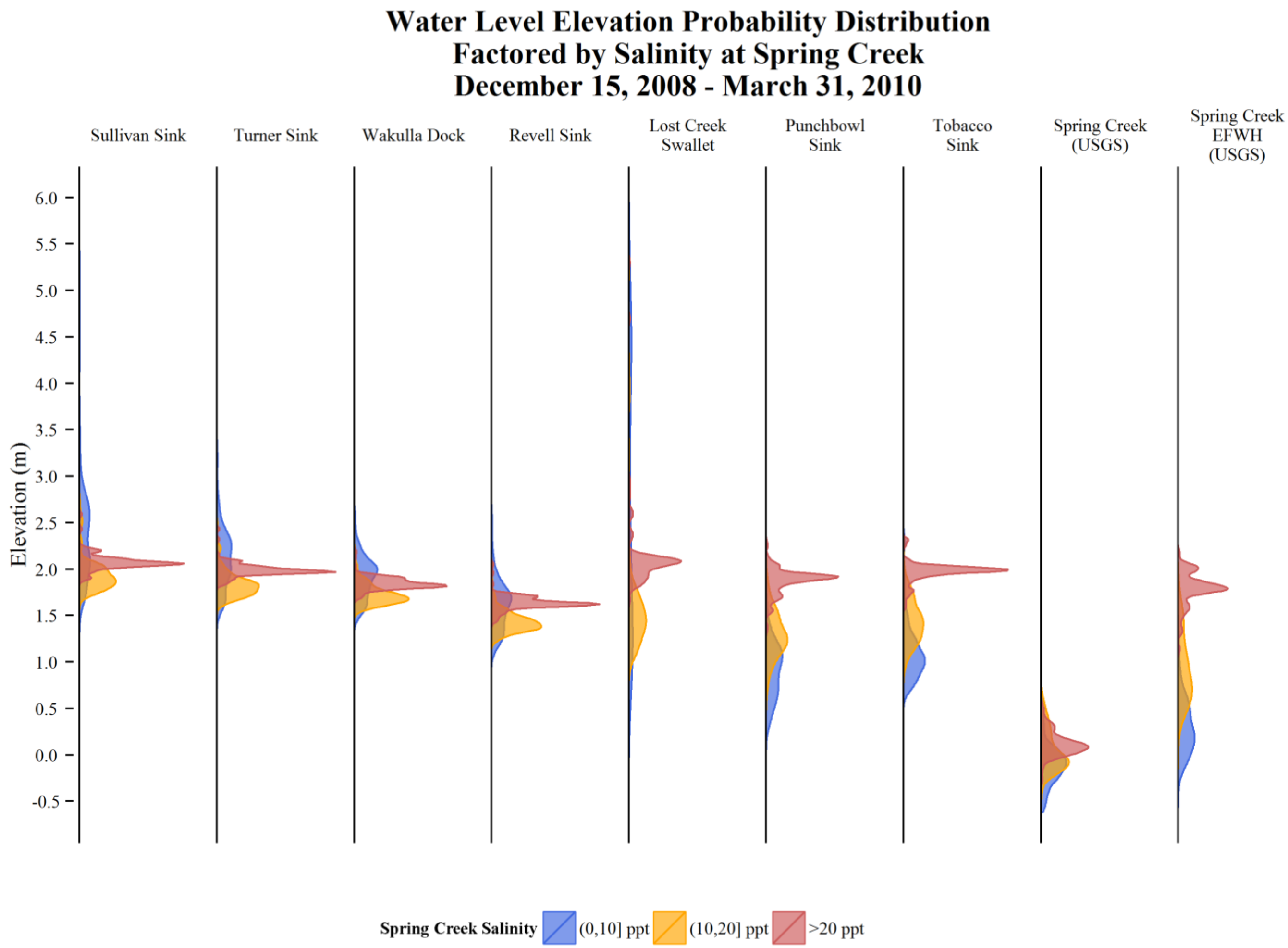


Figure 6.21: Water level elevation and equivalent fresh water head distributions factored by salinity measurements at Spring Creek Springs. Graphical representation by Seth Bassett.

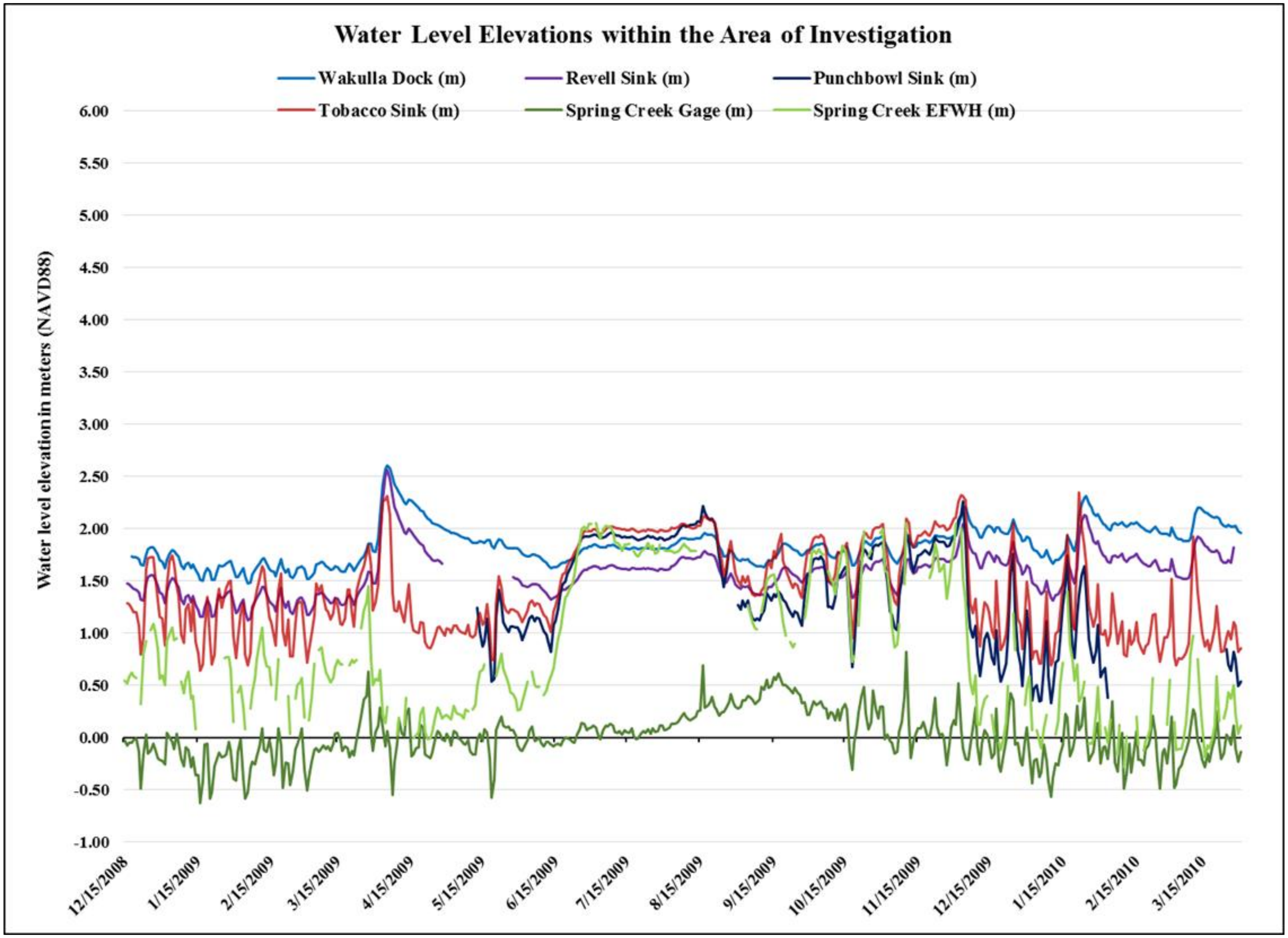


Figure 6.22: Water level elevations documenting a flow reversal at Spring Creek Springs.

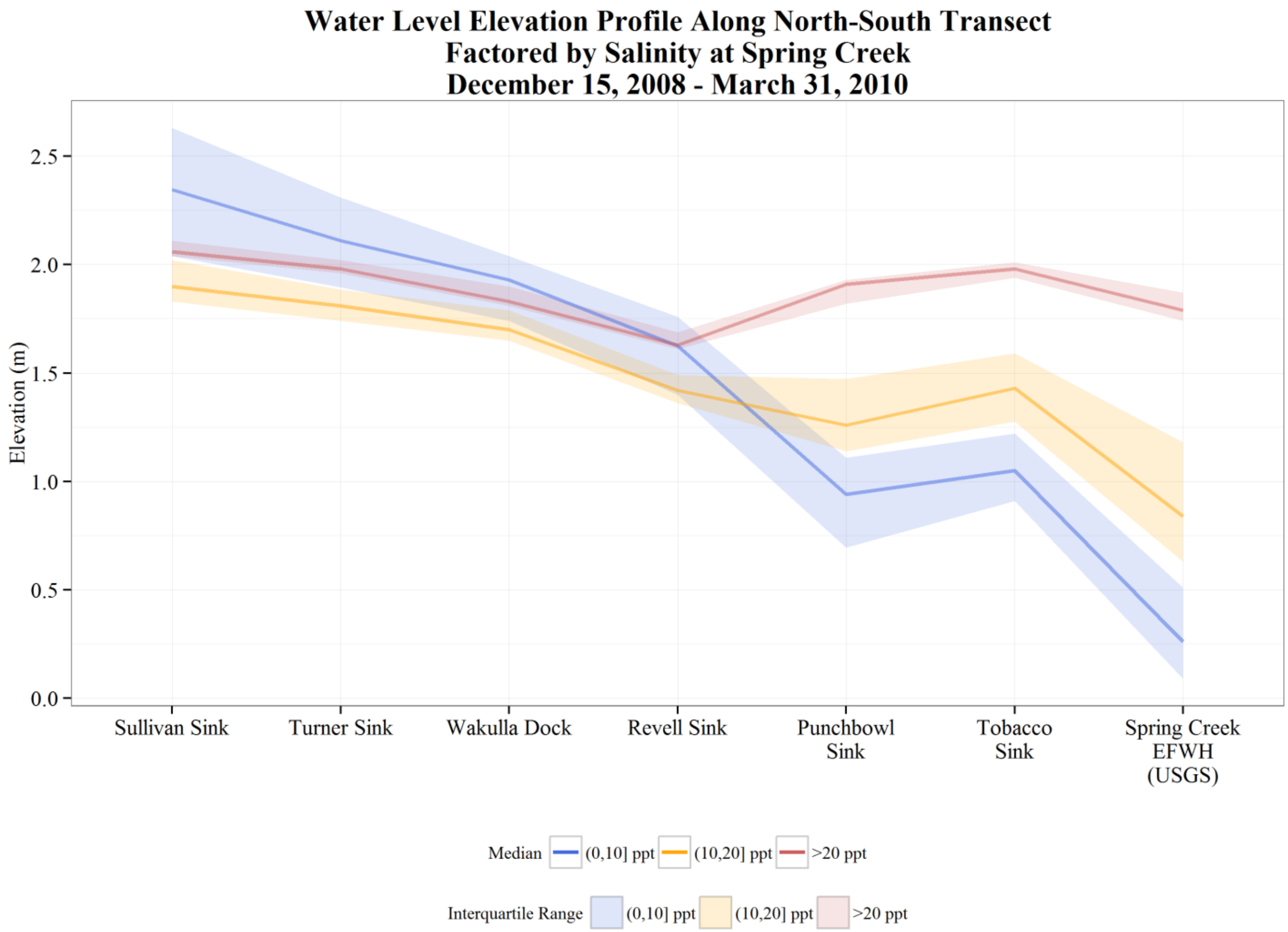


Figure 6.23: Water level elevation profile factored by salinity along the north to south transect formed by the karst window water level elevation monitoring stations and Spring Creek Springs. Graphical representation by Seth Bassett.

CHAPTER 7

CONCLUSION

Conclusion

The 2008 Lost Creek swallet dye trace verified the primary tests of this study's hypothesis: 1) that Lost Creek swallet flows contribute to the discharge of Spring Creek Springs, 2) to quantitatively demonstrate that Lost Creek swallet is connected by conduit(s) to Spring Creek Springs. The contribution of Lost Creek swallet flow to the discharge at Spring Creek Springs was demonstrated by the detection of the tracer injected at Lost Creek swallet in water discharged at Spring Creek Springs' vent 01. The quantitative evidence of flow between Lost Creek swallet and Spring Creek Springs by means of a conduit was the linear velocity (2,235 m/d) of the tracers' traverse (Table 6.1) from Lost Creek swallet to Spring Creek Springs.

The 2008 Lost Creek swallet dye trace verified the secondary test of this study's hypothesis; to establish that a conduit(s) connection between Lost Creek swallet and Spring Creek Springs was connected to or an extension of the Leon Sinks – Wakulla Spring cave system (Figure 7.1). The evidence that establishes the connection to and the extension of the Leon Sinks – Wakulla Spring cave systems to include Lost Creek swallet and Spring Creek Springs is the verification of a conduit(s) connection between Lost Creek swallet, Wakulla Spring and Revell Sink. A conduit connection between Lost Creek swallet and Wakulla Spring was demonstrated by the detection and the linear velocity measurement of the tracer injected at Lost Creek swallet at Wakulla main Vent (255 m/d, Table 6.1) and Wakulla K Conduit (241 m/d, Table 6.1). A conduit connection between Lost Creek swallet and Revell Sink was demonstrated by the detection and the linear velocity (230 m/d, Table 6.1) of the tracer injected at Lost Creek swallet at Revell Sink.

The 2009 Lost Creek swallet dye trace also verified the primary tests of this study's hypothesis: 1) that Lost Creek swallet flows contribute to the discharge of Spring Creek Springs, 2) to quantitatively demonstrate that Lost Creek swallet is connected by conduit(s) to Spring Creek Springs. The contribution of Lost Creek swallet flow to the discharge at Spring Creek Springs was demonstrated by the detection of the tracer injected at Lost Creek swallet in water discharged at Spring Creek Springs' vent 01, vent 02 and vent 10. The quantitative evidence of flow between Lost Creek swallet and multiple vents at Spring Creek Springs by means of a conduit was the linear velocity (304 m/d, 248 m/d and 313 m/d, Table 6.2) of the tracers' traverse from Lost Creek swallet to Spring Creek Springs vent 01, vent 02 and vent 10 respectively.

The 2009 Lost Creek swallet dye trace verified the secondary objective of this study's hypothesis; to verify that a conduit(s) connection between Lost Creek swallet and Spring Creek Springs was connected to or an extension of the Leon Sinks – Wakulla Spring cave system. The evidence that establishes the connection to and the extension of the Leon Sinks – Wakulla Spring cave systems to include Lost Creek swallet and Spring Creek Springs is the verification of a conduit between Lost Creek swallet and Revell Sink. A conduit connection between Lost Creek swallet and Revell Sink was demonstrated by the detection and the linear velocity (283 m/d, Table 6.2) of the tracer injected at Lost Creek swallet at Revell Sink.

The water level elevation analysis presented in this study confirmed the third objective of this study's hypothesis; that the water level elevation data reveals changes in the flow regimes within the combined springshed of Wakulla Spring and Spring Creek Springs. The analysis of the water level elevation data revealed that the water level monitoring stations can be divided into a northern group and a southern group based on responses to hydrological conditions present in the study area. Within each group, the members were shown to exhibit mutual group characteristics: distribution of water level elevation values (Figure 6.15), distinctive Kendal correlation values (Table 6.4) and collective group responses to flow reversals at Spring Creek Springs (Figure 6.19 and 6.20). The distinction between the behaviors of the respective groups was shown to demonstrate that there are two sets of conduits (northern and southern) that together comprise the collective conduit system extending throughout the area of investigation. The behavior of the two groups revealed distinctive group responses to the flow reversals that occurred at Spring Creek Springs June 15, 2009 – December 15, 2009.

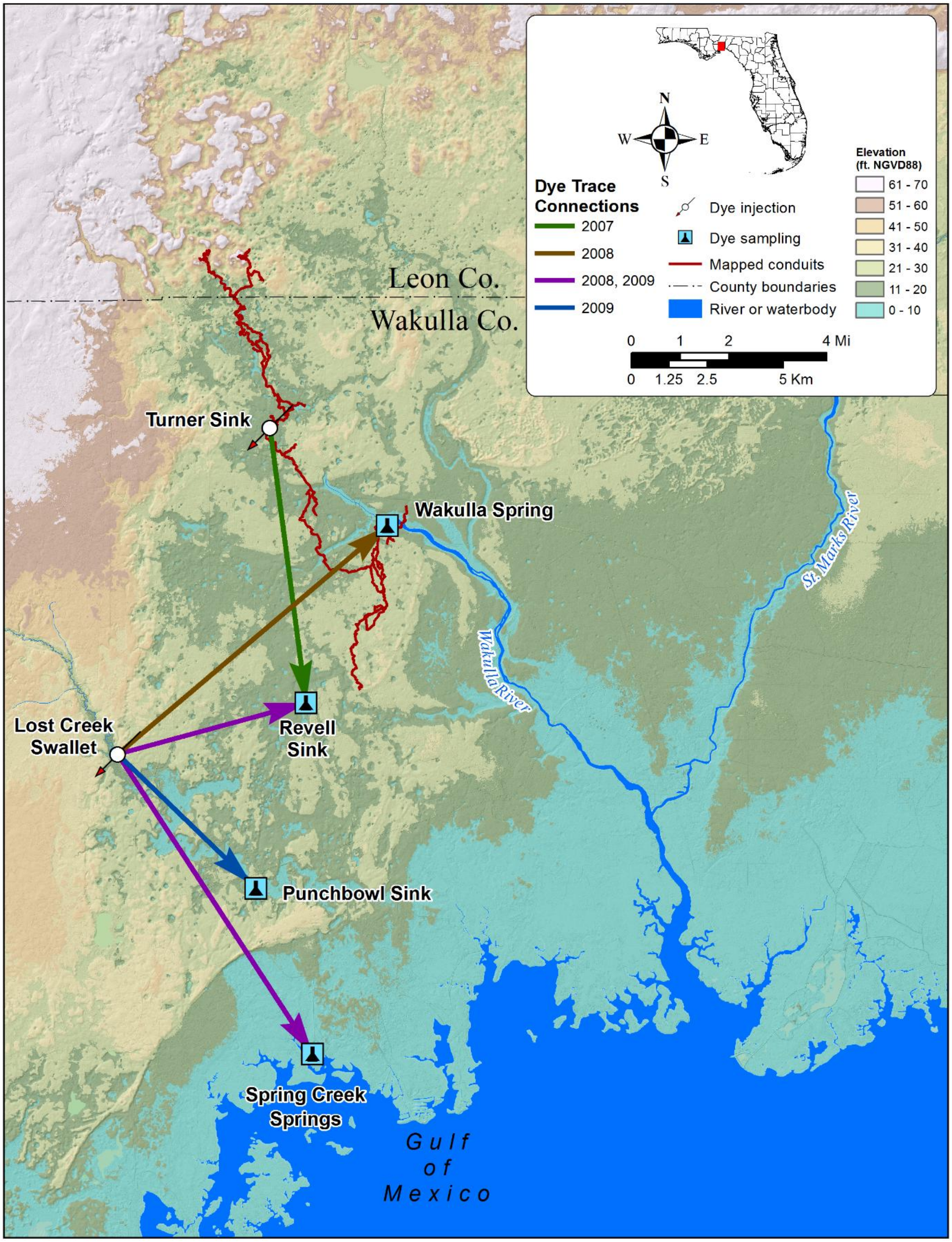


Figure 7.1: Established conduit connections by dye tracing in 2007, 2008, and 2009. Cartography by Seth Bassett.

APPENDIX A

PRECIPITATION AND BAROMETRIC PRESSURE

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
1/1/2008	0	0	NA	30.26	14.86
1/2/2008	0	0	NA	30.52	14.99
1/3/2008	0	0	NA	30.71	15.08
1/4/2008	0	0	NA	30.62	15.04
1/5/2008	0	0	NA	30.4	14.93
1/6/2008	0	0	NA	30.3	14.88
1/7/2008	0	0	NA	30.29	14.88
1/8/2008	0	0	NA	30.21	14.84
1/9/2008	0	0	NA	30.12	14.79
1/10/2008	0.01	0.01	NA	30.03	14.75
1/11/2008	0.04	0.18	NA	29.87	14.67
1/12/2008	0.29	0.02	NA	29.93	14.70
1/13/2008	0.01	0	NA	29.98	14.72
1/14/2008	0	0	NA	30.21	14.84
1/15/2008	0	0	NA	30.2	14.83
1/16/2008	0	0.64	NA	30.08	14.77
1/17/2008	0.63	0.01	NA	29.94	14.70
1/18/2008	0	0	NA	30.13	14.80
1/19/2008	0.3	1.24	NA	30.03	14.75
1/20/2008	1.7	0	NA	30.42	14.94
1/21/2008	0	0	NA	30.5	14.98
1/22/2008	0	0.04	NA	30.26	14.86
1/23/2008	0.25	0	NA	30.11	14.79
1/24/2008	0	0.03	NA	30.16	14.81
1/25/2008	0	0	NA	30.39	14.92
1/26/2008	0.24	0.31	NA	30.23	14.85
1/27/2008	0.21	0.01	NA	30.2	14.83
1/28/2008	0	0	NA	30.19	14.83
1/29/2008	0	0	NA	30.02	14.74
1/30/2008	0.32	0.36	NA	30.05	14.76
1/31/2008	0	0	NA	30.11	14.79
2/1/2008	0.24	0.1	NA	30.13	14.80
2/2/2008	0	0	NA	30.25	14.86
2/3/2008	0	0	NA	30.21	14.84
2/4/2008	0	0	NA	30.18	14.82
2/5/2008	0	0	NA	30.12	14.79
2/6/2008	0	0	NA	29.94	14.70
2/7/2008	0.1	0	NA	30	14.73
2/8/2008	0	0	NA	30.03	14.75
2/9/2008	0	0	NA	30.09	14.78
2/10/2008	0	0	NA	30.28	14.87
2/11/2008	0	0	NA	30.26	14.86
2/12/2008	0	0.01	NA	30	14.73
2/13/2008	0.29	0.12	NA	29.86	14.66
2/14/2008	0.01	0	NA	30.24	14.85
2/15/2008	0	0	NA	30.27	14.87
2/16/2008	0	0	NA	30.14	14.80
2/17/2008	0	0.06	NA	29.92	14.69

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
2/18/2008	-999	1.01	NA	29.93	14.70
2/19/2008	0.05	0	NA	30.25	14.86
2/20/2008	0	0	NA	30.21	14.84
2/21/2008	0	4.37	NA	30.06	14.76
2/22/2008	5.83	0.77	NA	29.92	14.69
2/23/2008	0.96	0.23	NA	29.99	14.73
2/24/2008	0	0.01	NA	30.08	14.77
2/25/2008	0	0	NA	30.01	14.74
2/26/2008	0	0.28	NA	29.79	14.63
2/27/2008	0.22	0	NA	30.09	14.78
2/28/2008	0	0	NA	30.35	14.90
2/29/2008	0	0	NA	30.4	14.93
3/1/2008	0	0	NA	30.28	14.87
3/2/2008	0	0	NA	30.19	14.83
3/3/2008	0	0	NA	30.09	14.78
3/4/2008	0	0.18	NA	29.86	14.66
3/5/2008	0.43	0.01	NA	30	14.73
3/6/2008	0	0	NA	30	14.73
3/7/2008	1.09	1.63	NA	30.04	14.75
3/8/2008	0.96	0	NA	30.08	14.77
3/9/2008	0	0	NA	30.36	14.91
3/10/2008	0	0	NA	30.13	14.80
3/11/2008	0	0.03	NA	30.09	14.78
3/12/2008	0.17	0.01	NA	30.02	14.74
3/13/2008	0	0	NA	30.03	14.75
3/14/2008	0	0.01	NA	29.87	14.67
3/15/2008	0.02	0.01	NA	29.78	14.62
3/16/2008	0	0	NA	30.05	14.76
3/17/2008	0	0	NA	30.25	14.86
3/18/2008	0	0	NA	30.14	14.80
3/19/2008	0	0.14	NA	29.9	14.68
3/20/2008	0.09	0	NA	30.12	14.79
3/21/2008	0	0	NA	30.2	14.83
3/22/2008	0	0	NA	30.03	14.75
3/23/2008	0	0	NA	30.04	14.75
3/24/2008	0	0	NA	30.24	14.85
3/25/2008	0	0	NA	30.38	14.92
3/26/2008	0	0	NA	30.32	14.89
3/27/2008	0	0	NA	30.15	14.81
3/28/2008	0	0	NA	30.08	14.77
3/29/2008	0	0	NA	30.11	14.79
3/30/2008	0	0	NA	30.2	14.83
3/31/2008	0	0	NA	30.2	14.83
4/1/2008	0	0	NA	30.13	14.80
4/2/2008	0	0	NA	30.15	14.81
4/3/2008	0.37	0	NA	30.11	14.79
4/4/2008	0.01	0.04	NA	29.99	14.73
4/5/2008	0.05	1.07	NA	29.9	14.68
4/6/2008	2.02	0.03	NA	29.94	14.70
4/7/2008	0.07	0	NA	29.98	14.72
4/8/2008	0	0.01	NA	30.06	14.76
4/9/2008	0	0	NA	30.09	14.78
4/10/2008	0	0	NA	30.04	14.75
4/11/2008	0	0	NA	29.97	14.72

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
4/12/2008	0	0.66	NA	29.93	14.70
4/13/2008	0.13	0	NA	30.01	14.74
4/14/2008	0.01	0	NA	30.07	14.77
4/15/2008	0	0	NA	30.18	14.82
4/16/2008	0	0	NA	30.23	14.85
4/17/2008	0	0	NA	30.2	14.83
4/18/2008	0	0	NA	30.11	14.79
4/19/2008	0	0.24	NA	29.97	14.72
4/20/2008	0.08	0	NA	29.96	14.71
4/21/2008	0	0	NA	29.94	14.70
4/22/2008	0	0	0	29.96	14.71
4/23/2008	0	0	0	30.04	14.75
4/24/2008	0	0	0.08	30.08	14.77
4/25/2008	0.14	0.01	0.01	30.08	14.77
4/26/2008	0	0	0	30.07	14.77
4/27/2008	1.03	0	0	30.02	14.74
4/28/2008	0.03	0.38	0.94	29.93	14.70
4/29/2008	0.08	0	0	30.05	14.76
4/30/2008	0	0	0	30.09	14.78
5/1/2008	0	0	0	30.01	14.74
5/2/2008	0	0	0	29.98	14.72
5/3/2008	0	0	0	29.93	14.70
5/4/2008	0.07	0	0	29.93	14.70
5/5/2008	0	0	0	29.93	14.70
5/6/2008	0	0	0	29.93	14.70
5/7/2008	0	0	0	29.91	14.69
5/8/2008	0	0	0	29.82	14.64
5/9/2008	0	0.01	0	29.76	14.62
5/10/2008	0	0	0	29.79	14.63
5/11/2008	0	0	0	29.67	14.57
5/12/2008	0	0	0	29.8	14.63
5/13/2008	0	0	0	29.95	14.71
5/14/2008	0	0	0	30.01	14.74
5/15/2008	0	0.03	0.02	29.91	14.69
5/16/2008	0.06	1.9	2.35	29.83	14.65
5/17/2008	1.68	0	0	29.84	14.65
5/18/2008	0	0	0	29.75	14.61
5/19/2008	0.01	0	0	29.77	14.62
5/20/2008	0	0	0	29.73	14.60
5/21/2008	0	0	0	29.67	14.57
5/22/2008	0	0	0	29.76	14.62
5/23/2008	0.22	0.37	1.47	29.85	14.66
5/24/2008	0.18	0	0	29.85	14.66
5/25/2008	0	0	0	29.91	14.69
5/26/2008	0	0	0	29.96	14.71
5/27/2008	0	0	0	29.98	14.72
5/28/2008	0	0	0	29.97	14.72
5/29/2008	0	0.08	0	29.99	14.73
5/30/2008	0.97	0.01	0	30.01	14.74
5/31/2008	0	0	0	29.98	14.72
6/1/2008	0	0	0	29.93	14.70
6/2/2008	0	0	0	29.9	14.68
6/3/2008	0	0.9	0.03	29.88	14.67
6/4/2008	0	0.02	0	29.89	14.68

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
6/5/2008	0	0	0	29.96	14.71
6/6/2008	0	0	0	30.05	14.76
6/7/2008	0	0	0	30.06	14.76
6/8/2008	0	0	0	29.99	14.73
6/9/2008	0	0	0	29.95	14.71
6/10/2008	0	0.09	0.06	29.95	14.71
6/11/2008	0.25	0.04	0.39	29.95	14.71
6/12/2008	0.15	0	0	30.01	14.74
6/13/2008	0.78	0.01	0.06	30.03	14.75
6/14/2008	0.11	0.01	0	29.96	14.71
6/15/2008	0.05	0.64	0	29.86	14.66
6/16/2008	0.02	0.01	0	29.85	14.66
6/17/2008	0.21	0.01	0	29.83	14.65
6/18/2008	0.13	0	0	29.77	14.62
6/19/2008	0	0.01	0	29.82	14.64
6/20/2008	0	0	0	29.92	14.69
6/21/2008	0	0	0	29.96	14.71
6/22/2008	0	1.01	0	29.93	14.70
6/23/2008	0.29	0.02	0	29.97	14.72
6/24/2008	0.16	0	0	30.09	14.78
6/25/2008	0	0	0	30.12	14.79
6/26/2008	3.58	0.09	0	30.06	14.76
6/27/2008	0.01	0.3	0	30.03	14.75
6/28/2008	0.03	0.1	0	30.05	14.76
6/29/2008	0.06	0.41	0.21	30.04	14.75
6/30/2008	0.32	0.6	0	29.99	14.73
7/1/2008	0.6	0.01	0	30.03	14.75
7/2/2008	0	0	0	30.06	14.76
7/3/2008	0	0.18	0	30.09	14.78
7/4/2008	0.06	0	0	30.08	14.77
7/5/2008	0.01	0.31	0	30.04	14.75
7/6/2008	0.16	0.39	0	30.04	14.75
7/7/2008	0.07	0.07	0	30.09	14.78
7/8/2008	0.58	0.02	0	30.1	14.78
7/9/2008	0.02	0	0	30.1	14.78
7/10/2008	0.81	0	0	30.11	14.79
7/11/2008	0	0.55	0	30.12	14.79
7/12/2008	0.02	0.49	0.17	30.05	14.76
7/13/2008	0.02	1.07	0.18	29.91	14.69
7/14/2008	0.17	0.3	0.13	29.86	14.66
7/15/2008	0.06	0.01	0.22	29.94	14.70
7/16/2008	0	0	0.01	30.03	14.75
7/17/2008	0	0	0	30.01	14.74
7/18/2008	0	0	0	29.99	14.73
7/19/2008	0	0	0	30.02	14.74
7/20/2008	0	0	0	30.05	14.76
7/21/2008	0	0	0	30.01	14.74
7/22/2008	0	0	0	30.02	14.74
7/23/2008	0	1.11	0.99	30.03	14.75
7/24/2008	0.81	0.01	0.01	30.04	14.75
7/25/2008	0	0.1	0.05	30.07	14.77
7/26/2008	0	0.08	0	30.01	14.74
7/27/2008	0.27	0.01	0	29.92	14.69
7/28/2008	0.22	1.55	0	29.92	14.69

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
7/29/2008	0.06	0.14	0	29.97	14.72
7/30/2008	0.07	1.15	0.07	29.96	14.71
7/31/2008	0	0	0.06	29.93	14.70
8/1/2008	0.13	0.09	0.06	29.86	14.66
8/2/2008	0.19	0.01	0.62	29.85	14.66
8/3/2008	0	0	0	29.88	14.67
8/4/2008	0	0	0	29.95	14.71
8/5/2008	0	0.1	0	29.99	14.73
8/6/2008	0	0	0	29.96	14.71
8/7/2008	0.05	0.6	0	29.88	14.67
8/8/2008	0.13	0.01	0	29.78	14.62
8/9/2008	0	0	0	29.8	14.63
8/10/2008	0	0	0	29.82	14.64
8/11/2008	0	0.02	0.16	29.83	14.65
8/12/2008	0	0.37	0.35	29.8	14.63
8/13/2008	3.01	2.47	1.32	29.73	14.60
8/14/2008	0.57	0.28	1.29	29.79	14.63
8/15/2008	0.69	0	0	29.91	14.69
8/16/2008	0	0.09	0.11	29.93	14.70
8/17/2008	0.12	0.01	0.05	29.88	14.67
8/18/2008	0.02	0.26	0.23	29.85	14.66
8/19/2008	0.12	0.01	0.11	29.83	14.65
8/20/2008	0.05	0.46	0.17	29.83	14.65
8/21/2008	0.01	0.01	0	29.83	14.65
8/22/2008	0	3.49	3.4	29.65	14.56
8/23/2008	4.53	6.61	6.92	29.57	14.52
8/24/2008	4.26	0.34	1.27	29.79	14.63
8/25/2008	1.53	0.46	0	29.78	14.62
8/26/2008	0.07	0.1	0.1	29.76	14.62
8/27/2008	0.42	0	1.21	29.8	14.63
8/28/2008	0	0	0	29.8	14.63
8/29/2008	0	0	0	29.8	14.63
8/30/2008	0	0.01	0	29.85	14.66
8/31/2008	0	0.01	0	29.83	14.65
9/1/2008	0.01	0	0	29.84	14.65
9/2/2008	0	0.68	0.45	29.88	14.67
9/3/2008	0.24	0.01	0.01	29.85	14.66
9/4/2008	0	0	0	29.81	14.64
9/5/2008	0	0	0	29.73	14.60
9/6/2008	0	0	0	29.83	14.65
9/7/2008	1.09	0	0.01	29.94	14.70
9/8/2008	0.01	0.06	0.07	29.95	14.71
9/9/2008	0	0.01	0.01	29.9	14.68
9/10/2008	0	0.13	0.25	29.89	14.68
9/11/2008	0.12	0.03	0.06	29.93	14.70
9/12/2008	0	0	0	29.96	14.71
9/13/2008	0	0	0	29.92	14.69
9/14/2008	0	0	0	29.89	14.68
9/15/2008	0	0	0	29.91	14.69
9/16/2008	0	0	0	29.94	14.70
9/17/2008	0	0	0	29.96	14.71
9/18/2008	0	0	0	29.98	14.72
9/19/2008	0	0	0	30.01	14.74
9/20/2008	0	0	0	30	14.73

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
9/21/2008	-999	0	0	30.01	14.74
9/22/2008	0.01	0	0	30.06	14.76
9/23/2008	0.16	0	0	30.06	14.76
9/24/2008	0	0	0	30.03	14.75
9/25/2008	0	0	0	29.93	14.70
9/26/2008	0	0	0	29.83	14.65
9/27/2008	0	0	0	29.85	14.66
9/28/2008	0	0	0	29.91	14.69
9/29/2008	0	0	0	29.9	14.68
9/30/2008	0	0	0	29.83	14.65
10/1/2008	0	0	0	29.77	14.62
10/2/2008	0	0	0	29.85	14.66
10/3/2008	0	0	0	29.96	14.71
10/4/2008	0	0	0	30.04	14.75
10/5/2008	0	0	0	30.07	14.77
10/6/2008	0	0	0	30.03	14.75
10/7/2008	0	0.12	0.01	30.03	14.75
10/8/2008	0.27	0.56	0.63	29.9	14.68
10/9/2008	1.57	0.16	0.11	29.8	14.63
10/10/2008	0	0	0	29.88	14.67
10/11/2008	0	0	0	29.96	14.71
10/12/2008	0	0	0	30.01	14.74
10/13/2008	0	0	0	30.1	14.78
10/14/2008	0	0	0	30.09	14.78
10/15/2008	0	0	0	30.06	14.76
10/16/2008	0	0	0	30.05	14.76
10/17/2008	0	0	0	30	14.73
10/18/2008	0	0	0	29.95	14.71
10/19/2008	0	0	0	30.1	14.78
10/20/2008	0	0	0	30.16	14.81
10/21/2008	0	0	0	30.1	14.78
10/22/2008	0	0	0	30.06	14.76
10/23/2008	0	0.54	0.37	30.1	14.78
10/24/2008	1	1.63	0.47	29.89	14.68
10/25/2008	1.59	0.01	0.01	29.91	14.69
10/26/2008	0	0	0	29.99	14.73
10/27/2008	0	0	0	30.06	14.76
10/28/2008	0	0	0	30.24	14.85
10/29/2008	0	0	0	30.24	14.85
10/30/2008	0	0	0	30.32	14.89
10/31/2008	0	0	0	30.38	14.92
11/1/2008	0	0	0	30.24	14.85
11/2/2008	0	0	0	30.14	14.80
11/3/2008	0	0	0	30.08	14.77
11/4/2008	0	0	0	30.04	14.75
11/5/2008	0	0	0	29.98	14.72
11/6/2008	0	0	0	29.98	14.72
11/7/2008	0	0	0	29.93	14.70
11/8/2008	0.02	0	0	29.88	14.67
11/9/2008	0	0	0	29.92	14.69
11/10/2008	0	0	0	30.04	14.75
11/11/2008	0	0	0	30.08	14.77
11/12/2008	0	0.01	0.01	29.98	14.72
11/13/2008	0	0.2	0.04	29.88	14.67

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
11/14/2008	1.16	1.82	0.55	29.8	14.63
11/15/2008	2.31	0.39	0.77	29.8	14.63
11/16/2008	0	0.01	0	30.11	14.79
11/17/2008	0	0	0	30.19	14.83
11/18/2008	0	0	0	30.21	14.84
11/19/2008	0	0	0	30.26	14.86
11/20/2008	0	0	0	30.08	14.77
11/21/2008	0	0	0	30.19	14.83
11/22/2008	0	0	0	30.44	14.95
11/23/2008	0	0	0	30.35	14.90
11/24/2008	0	0	0	30.19	14.83
11/25/2008	0.03	0	0	30.06	14.76
11/26/2008	0	0	0	30.11	14.79
11/27/2008	0	0	0	30.07	14.77
11/28/2008	0	0.14	0.04	29.93	14.70
11/29/2008	0.27	0.65	0.68	29.75	14.61
11/30/2008	2.09	1.4	2.07	29.49	14.48
12/1/2008	0.06	0.05	0.02	29.85	14.66
12/2/2008	0	0	0	30.21	14.84
12/3/2008	0	0.01	0	30.25	14.86
12/4/2008	0	0	0	30.15	14.81
12/5/2008	0.21	0.24	0.4	30.14	14.80
12/6/2008	0.04	0	0	29.99	14.73
12/7/2008	0	0	0	30.11	14.79
12/8/2008	0	0	0	30.17	14.82
12/9/2008	0	0	0	30.04	14.75
12/10/2008	0	0.01	0.02	29.89	14.68
12/11/2008	0.76	1.3	0.87	29.65	14.56
12/12/2008	0.29	0.01	0	29.98	14.72
12/13/2008	0	0	0	30.23	14.85
12/14/2008	0	0	0	30.2	14.83
12/15/2008	0	0.13	0	30.19	14.83
12/16/2008	0	0.01	0	30.16	14.81
12/17/2008	0	0	0	30.15	14.81
12/18/2008	0	0	0	30.19	14.83
12/19/2008	0	0	0	30.12	14.79
12/20/2008	0	0	0	29.99	14.73
12/21/2008	0	0.09	0.07	29.95	14.71
12/22/2008	0.06	0	0	30.28	14.87
12/23/2008	0	0	0	30.34	14.90
12/24/2008	0	0	0	30.22	14.84
12/25/2008	0.01	0	0	30.2	14.83
12/26/2008	0.01	0	0	30.21	14.84
12/27/2008	0	0.01	0	30.18	14.82
12/28/2008	0	0	0	30.14	14.80
12/29/2008	0	0.05	0.01	30.11	14.79
12/30/2008	0	0	0.01	30.09	14.78
12/31/2008	0	0	0	29.99	14.73
1/1/2009	0	0	0	30.13	14.80
1/2/2009	0	0	0	30	14.73
1/3/2009	0	0	0	30.01	14.74
1/4/2009	0.34	0.23	0.08	30.05	14.76
1/5/2009	0	0	0	30.02	14.74
1/6/2009	0	0	0	29.81	14.64

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
1/7/2009	0.16	0.21	0.11	29.7	14.59
1/8/2009	0	0	0	29.89	14.68
1/9/2009	0	0	0	30.1	14.78
1/10/2009	0	0	0	30.09	14.78
1/11/2009	0.03	0.31	0.15	29.98	14.72
1/12/2009	0.14	0	0.01	30.11	14.79
1/13/2009	0.02	0.2	0.42	30.01	14.74
1/14/2009	0	0	0.01	30.18	14.82
1/15/2009	0	0	0	30.31	14.89
1/16/2009	0	0	0	30.48	14.97
1/17/2009	0	0	0	30.37	14.91
1/18/2009	0	0.53	0.24	29.93	14.70
1/19/2009	0.32	0.02	0.02	29.72	14.60
1/20/2009	0	0	0	29.86	14.66
1/21/2009	0	0	0	30.15	14.81
1/22/2009	0	0	0	30.19	14.83
1/23/2009	0	0	0	30.16	14.81
1/24/2009	0	0	0	30.07	14.77
1/25/2009	0.01	0	0.01	30.08	14.77
1/26/2009	0.03	0	0.01	30.17	14.82
1/27/2009	0.07	0	0	30.17	14.82
1/28/2009	0	0.28	0.42	29.98	14.72
1/29/2009	0.24	0.11	0.27	29.95	14.71
1/30/2009	0	0	0	30.06	14.76
1/31/2009	0	0	0	30.19	14.83
2/1/2009	0	0	0	30.14	14.80
2/2/2009	0	0.01	0	29.91	14.69
2/3/2009	0	0	0.01	30.03	14.75
2/4/2009	0	0	0	30.27	14.87
2/5/2009	0	0	0	30.48	14.97
2/6/2009	0	0	0	30.45	14.95
2/7/2009	0	0	0	30.42	14.94
2/8/2009	0	0	0	30.35	14.90
2/9/2009	0	0	0	30.23	14.85
2/10/2009	0	0	0	30.17	14.82
2/11/2009	0	0	0	30.04	14.75
2/12/2009	0.01	0	0	30.07	14.77
2/13/2009	0	0	0	30.05	14.76
2/14/2009	1.43	1.52	1.27	29.92	14.69
2/15/2009	0.31	0.01	0	29.95	14.71
2/16/2009	0.03	0.01	0.01	30.1	14.78
2/17/2009	0	0	0	30.16	14.81
2/18/2009	0	0.04	0.17	29.91	14.69
2/19/2009	0.83	0.39	0.76	29.83	14.65
2/20/2009	0	0	0	30.14	14.80
2/21/2009	0	0	0	30.17	14.82
2/22/2009	0	0	0	30.17	14.82
2/23/2009	0	0	0	30.32	14.89
2/24/2009	0	0	0	30.25	14.86
2/25/2009	0	0	0	30.22	14.84
2/26/2009	0	0	0	30.19	14.83
2/27/2009	0	0	0	30.04	14.75
2/28/2009	0	0.01	0.16	29.87	14.67
3/1/2009	0.16	0.05	0.06	29.83	14.65

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
3/2/2009	0.01	0	0	30.05	14.76
3/3/2009	0	0	0	30.22	14.84
3/4/2009	0	0	0	30.32	14.89
3/5/2009	0	0	0	30.32	14.89
3/6/2009	0	0	0	30.29	14.88
3/7/2009	0	0	0	30.23	14.85
3/8/2009	0	0	0	30.14	14.80
3/9/2009	0	0	0.01	30.11	14.79
3/10/2009	0	0	0	30.09	14.78
3/11/2009	0	0	0	30.1	14.78
3/12/2009	0	0	0	30.08	14.77
3/13/2009	0	0	0	30.03	14.75
3/14/2009	0	0	0	30	14.73
3/15/2009	0	0	0	30.02	14.74
3/16/2009	0	0.53	0.12	30.09	14.78
3/17/2009	0.14	0	0	30.06	14.76
3/18/2009	0	0	0	30.09	14.78
3/19/2009	0	0	0	30.02	14.74
3/20/2009	0	0	0	30.03	14.75
3/21/2009	0	0	0	30.19	14.83
3/22/2009	0	0	0	30.24	14.85
3/23/2009	0	0	0	30.14	14.80
3/24/2009	0	0	0	30.11	14.79
3/25/2009	0	0	0	30.06	14.76
3/26/2009	0	1.87	1.4	29.92	14.69
3/27/2009	1.59	1.65	1.16	29.75	14.61
3/28/2009	1.16	0.16	0.13	29.65	14.56
3/29/2009	0.87	0.01	0.01	29.76	14.62
3/30/2009	0	0	0	29.94	14.70
3/31/2009	0	1.95	1.58	29.88	14.67
4/1/2009	2.35	3.74	3.07	29.82	14.64
4/2/2009	2.4	2.87	3.28	29.67	14.57
4/3/2009	3.46	0	0.02	29.63	14.55
4/4/2009	0	0	0	29.88	14.67
4/5/2009	0	0	0.06	29.82	14.64
4/6/2009	0	0	0	29.73	14.60
4/7/2009	0	0	0	29.96	14.71
4/8/2009	0	0	0	30.01	14.74
4/9/2009	0	0	0	29.96	14.71
4/10/2009	0	0	0	29.95	14.71
4/11/2009	0	0	0	29.93	14.70
4/12/2009	0	0	0	29.98	14.72
4/13/2009	0	2.34	2.73	29.88	14.67
4/14/2009	3.17	0.03	0.02	29.73	14.60
4/15/2009	0	0	0	29.93	14.70
4/16/2009	0	0	0	30.02	14.74
4/17/2009	0	0	0	30.14	14.80
4/18/2009	0	0	0	30.09	14.78
4/19/2009	0	0	0	29.97	14.72
4/20/2009	0	0	0	29.8	14.63
4/21/2009	0	0	0	29.88	14.67
4/22/2009	0.31	0.01	0	30.01	14.74
4/23/2009	0	0.01	0	30.09	14.78
4/24/2009	0	0	0	30.17	14.82

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
4/25/2009	0	0	0	30.21	14.84
4/26/2009	0	0	0	30.21	14.84
4/27/2009	0	0	0	30.22	14.84
4/28/2009	0	0	0	30.22	14.84
4/29/2009	0	0	0	30.16	14.81
4/30/2009	0	0	0	30.14	14.80
5/1/2009	-999	0	0	30.09	14.78
5/2/2009	0	0	0	30	14.73
5/3/2009	0	0	0	29.94	14.70
5/4/2009	0	0	0	29.93	14.70
5/5/2009	0	0.13	0	29.95	14.71
5/6/2009	0.02	0	0	29.95	14.71
5/7/2009	0	0	0	29.92	14.69
5/8/2009	0	0	0	29.91	14.69
5/9/2009	0	0	0	29.95	14.71
5/10/2009	0	0	0	29.98	14.72
5/11/2009	0	0	0	29.95	14.71
5/12/2009	0	0	0	29.98	14.72
5/13/2009	0	0	0	30.03	14.75
5/14/2009	0	0.19	0.36	30.05	14.76
5/15/2009	1.85	0	0	30.03	14.75
5/16/2009	0	0.27	0	29.98	14.72
5/17/2009	0.03	2.18	1.08	29.91	14.69
5/18/2009	0.86	0.08	0.11	29.95	14.71
5/19/2009	0.02	0.03	0.05	30.03	14.75
5/20/2009	0.03	0.01	0	29.93	14.70
5/21/2009	0	0.08	0.06	29.88	14.67
5/22/2009	0.43	0.04	0	29.87	14.67
5/23/2009	0.1	0.52	0.89	29.84	14.65
5/24/2009	0.46	0.06	0.01	29.85	14.66
5/25/2009	0.33	0.17	0.01	29.83	14.65
5/26/2009	0.32	2.6	0.54	29.8	14.63
5/27/2009	0.6	0.36	0.11	29.8	14.63
5/28/2009	1.79	0.11	0.01	29.79	14.63
5/29/2009	0.02	0.74	0.97	29.8	14.63
5/30/2009	0.06	0	0	29.82	14.64
5/31/2009	0	0	0	29.87	14.67
6/1/2009	0	0	0	29.91	14.69
6/2/2009	0	0	0	29.95	14.71
6/3/2009	0	0.5	0.99	29.93	14.70
6/4/2009	0.52	0.67	1.01	29.83	14.65
6/5/2009	0.81	0.64	0.14	29.72	14.60
6/6/2009	0.82	0	0	29.81	14.64
6/7/2009	0	0	0	29.88	14.67
6/8/2009	0	0	0	29.88	14.67
6/9/2009	0	0	0	29.88	14.67
6/10/2009	0	0	0	29.86	14.66
6/11/2009	0	0	0	29.83	14.65
6/12/2009	0	0	0	29.84	14.65
6/13/2009	0	0.29	0.15	29.88	14.67
6/14/2009	0	0.01	0.41	29.91	14.69
6/15/2009	0	0	0.01	29.9	14.68
6/16/2009	0	1.1	0.09	29.89	14.68
6/17/2009	0	0.01	0.01	29.91	14.69

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
6/18/2009	0	0	0	29.87	14.67
6/19/2009	0	0	0	29.85	14.66
6/20/2009	0	0	0	29.83	14.65
6/21/2009	0	0	0	29.78	14.62
6/22/2009	0	0	0	29.71	14.59
6/23/2009	0	0.26	0.02	29.65	14.56
6/24/2009	0.79	0.01	0	29.72	14.60
6/25/2009	0	0	0	29.79	14.63
6/26/2009	0	0	0	29.8	14.63
6/27/2009	0	0.42	0	29.82	14.64
6/28/2009	0	1.61	0.95	29.78	14.62
6/29/2009	2.3	0.13	0.21	29.67	14.57
6/30/2009	0.29	0.01	0	29.67	14.57
7/1/2009	0	0	0	29.74	14.61
7/2/2009	0	0.51	0.32	29.86	14.66
7/3/2009	0	0.01	0.06	29.93	14.70
7/4/2009	0	0	0	29.93	14.70
7/5/2009	0	0.56	0	29.87	14.67
7/6/2009	0	0.2	0.13	29.82	14.64
7/7/2009	0	0.71	0.73	29.78	14.62
7/8/2009	0	0.02	0.03	29.8	14.63
7/9/2009	0	0.5	0.38	29.9	14.68
7/10/2009	0	0.01	0.01	30.04	14.75
7/11/2009	0	0.07	0.5	30.09	14.78
7/12/2009	0	0.01	0	30.04	14.75
7/13/2009	0	0	0.28	29.92	14.69
7/14/2009	0	0.05	0	29.93	14.70
7/15/2009	0	0.01	0	30.01	14.74
7/16/2009	0	0.42	0.51	29.98	14.72
7/17/2009	0	0.22	0.31	29.91	14.69
7/18/2009	0	0.33	0.24	29.93	14.70
7/19/2009	0	0.02	0	29.99	14.73
7/20/2009	0	0	0	29.95	14.71
7/21/2009	0	0.02	0	29.93	14.70
7/22/2009	0	0.02	0	29.92	14.69
7/23/2009	0	0	0	29.9	14.68
7/24/2009	0	0	0.6	29.9	14.68
7/25/2009	0	0	0.02	29.94	14.70
7/26/2009	0	0	0.05	29.97	14.72
7/27/2009	0	1.6	0	29.97	14.72
7/28/2009	0	0.78	0	29.96	14.71
7/29/2009	0	0.14	0	29.94	14.70
7/30/2009	0	0	0	29.97	14.72
7/31/2009	0	0.29	0.65	30.01	14.74
8/1/2009	0.43	0.54	0.31	30.03	14.75
8/2/2009	0.78	0.62	0.55	29.98	14.72
8/3/2009	0.15	0.42	0.09	29.97	14.72
8/4/2009	0.18	0.58	0	29.97	14.72
8/5/2009	0	0.24	0.01	29.94	14.70
8/6/2009	0	0	0.01	29.92	14.69
8/7/2009	0	0	0	29.98	14.72
8/8/2009	0	0	0	30.07	14.77
8/9/2009	0.05	1.32	0.68	30.09	14.78
8/10/2009	0	0	0	30.05	14.76

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
8/11/2009	0	0	0	29.96	14.71
8/12/2009	0.02	0.02	0	29.9	14.68
8/13/2009	0.07	0.05	0.04	29.91	14.69
8/14/2009	0.02	0	0.07	29.96	14.71
8/15/2009	0.24	0.02	0.23	29.98	14.72
8/16/2009	0.04	0.18	0.21	29.99	14.73
8/17/2009	0.21	0.4	0.53	30.04	14.75
8/18/2009	0.01	0.08	0	30.02	14.74
8/19/2009	0.01	0	0	29.96	14.71
8/20/2009	0	0	0.03	29.94	14.70
8/21/2009	0	1.82	0.43	29.93	14.70
8/22/2009	0.23	0.01	0.01	29.83	14.65
8/23/2009	0	0	0	29.85	14.66
8/24/2009	0	0	0	29.92	14.69
8/25/2009	0	0	0	29.95	14.71
8/26/2009	0	0	0	29.97	14.72
8/27/2009	0.01	1.42	1.37	29.94	14.70
8/28/2009	0.92	0.13	0.42	29.83	14.65
8/29/2009	0.02	0	0	29.82	14.64
8/30/2009	0	0	0	29.88	14.67
8/31/2009	0	0.02	0.03	29.93	14.70
9/1/2009	0.47	0.03	0.89	29.95	14.71
9/2/2009	0.15	0.14	0.46	29.93	14.70
9/3/2009	0	0	0	29.89	14.68
9/4/2009	0	0	0	29.91	14.69
9/5/2009	0	0	0	29.98	14.72
9/6/2009	0	0	0	29.99	14.73
9/7/2009	0	0	0.01	29.95	14.71
9/8/2009	0	0	0	29.91	14.69
9/9/2009	0	0	0	29.91	14.69
9/10/2009	0	0	0	29.95	14.71
9/11/2009	0	0	0	29.96	14.71
9/12/2009	0	2.54	1.91	29.84	14.65
9/13/2009	0.51	0.08	0.26	29.81	14.64
9/14/2009	0.18	0.53	0.54	29.88	14.67
9/15/2009	0.72	0.84	0.97	29.85	14.66
9/16/2009	0.15	0.04	0.04	29.85	14.66
9/17/2009	0.15	2.64	2.07	29.88	14.67
9/18/2009	0.49	0.16	0.12	29.91	14.69
9/19/2009	0.06	0	0	29.96	14.71
9/20/2009	0	0	0	29.98	14.72
9/21/2009	0	0	0.01	29.96	14.71
9/22/2009	0	0	0	29.97	14.72
9/23/2009	0	0.01	0.06	29.96	14.71
9/24/2009	0	0.17	0.32	29.95	14.71
9/25/2009	0	0.52	0.01	29.96	14.71
9/26/2009	0	0.01	0	29.91	14.69
9/27/2009	0.11	0.01	0	29.8	14.63
9/28/2009	0	0	0	29.83	14.65
9/29/2009	0	0	0	29.88	14.67
9/30/2009	0	0.01	0	29.93	14.70
10/1/2009	0	0	0	29.93	14.70
10/2/2009	0	0	0	29.85	14.66
10/3/2009	0	0	0	29.85	14.66

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
10/4/2009	0	0	0	29.91	14.69
10/5/2009	0.03	0.6	0.38	29.85	14.66
10/6/2009	0.79	0.47	0.15	29.87	14.67
10/7/2009	0.09	0.01	0	29.94	14.70
10/8/2009	0.01	0.01	0	30.01	14.74
10/9/2009	0	0	0	29.94	14.70
10/10/2009	0	0.65	0.32	29.91	14.69
10/11/2009	0.65	0.01	0.01	30	14.73
10/12/2009	0.02	0.22	0.29	29.98	14.72
10/13/2009	0	0	0.01	30.01	14.74
10/14/2009	0	0.2	0.58	29.9	14.68
10/15/2009	0.66	0.09	0.04	29.74	14.61
10/16/2009	1.32	1.09	0.62	29.72	14.60
10/17/2009	0	0.01	0	29.98	14.72
10/18/2009	0	0	0	30.13	14.80
10/19/2009	0	0	0	30.17	14.82
10/20/2009	0	0	0	30.14	14.80
10/21/2009	0	0	0	30.08	14.77
10/22/2009	0	0	0	29.95	14.71
10/23/2009	0	0.03	0.03	29.8	14.63
10/24/2009	0.09	0.08	0.05	29.8	14.63
10/25/2009	0	0	0	29.93	14.70
10/26/2009	0	0	0	29.95	14.71
10/27/2009	0	0.29	0.37	29.82	14.64
10/28/2009	0.26	0.04	0.01	29.87	14.67
10/29/2009	0	0.02	0	29.95	14.71
10/30/2009	0	0.01	0.09	29.93	14.70
10/31/2009	0	0.03	0.9	29.86	14.66
11/1/2009	0.1	0.01	0	29.96	14.71
11/2/2009	0	0	0	30.01	14.74
11/3/2009	0	0	0	30.06	14.76
11/4/2009	0	0	0	30.14	14.80
11/5/2009	0	0	0	30.18	14.82
11/6/2009	0	0	0	30.19	14.83
11/7/2009	0	0.01	0	30.14	14.80
11/8/2009	0	0	0	30.11	14.79
11/9/2009	0	0.15	0.15	30.04	14.75
11/10/2009	0.25	1.31	1.33	29.8	14.63
11/11/2009	0.87	0	0	29.68	14.58
11/12/2009	0.01	0.01	0	29.79	14.63
11/13/2009	0	0	0	29.8	14.63
11/14/2009	0	0	0	29.88	14.67
11/15/2009	0	0	0	29.93	14.70
11/16/2009	0	0	0	29.95	14.71
11/17/2009	0	0	0	29.91	14.69
11/18/2009	0	0	0	29.98	14.72
11/19/2009	0	0	0.01	30.04	14.75
11/20/2009	0	0	0	30.01	14.74
11/21/2009	0	0.02	0	29.95	14.71
11/22/2009	0.74	0.66	0.93	29.86	14.66
11/23/2009	0.07	0.01	0	29.99	14.73
11/24/2009	0	0	0	30.03	14.75
11/25/2009	0	0	0	29.96	14.71
11/26/2009	0.01	0	0.02	29.93	14.70

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
11/27/2009	0	0	0	30.06	14.76
11/28/2009	0	0	0	30.03	14.75
11/29/2009	0	0	0	30.01	14.74
11/30/2009	0	0.08	0.14	29.92	14.69
12/1/2009	0.2	0.45	0.34	29.9	14.68
12/2/2009	2.69	3.85	2.72	29.66	14.57
12/3/2009	2.72	0	0	29.86	14.66
12/4/2009	0	0.32	0.49	30.03	14.75
12/5/2009	0.28	0.18	0.31	29.97	14.72
12/6/2009	0.01	0.01	0	30.14	14.80
12/7/2009	0	0	0	30.09	14.78
12/8/2009	0	0.03	0	29.95	14.71
12/9/2009	0	0.04	0.13	29.72	14.60
12/10/2009	0.32	0.04	0.04	29.97	14.72
12/11/2009	0	0	0.01	30.25	14.86
12/12/2009	0.24	2.42	3.15	30.23	14.85
12/13/2009	1.83	0.1	0.02	30.06	14.76
12/14/2009	0.05	0	0.01	30.01	14.74
12/15/2009	0.01	0.02	0.02	30.02	14.74
12/16/2009	0	0	0	30.16	14.81
12/17/2009	0	0	0	30.11	14.79
12/18/2009	0.85	1.58	1.02	29.62	14.55
12/19/2009	0.38	0	0	29.78	14.62
12/20/2009	0	0	0	30.08	14.77
12/21/2009	0	0	0	30.19	14.83
12/22/2009	0	0	0	30.14	14.80
12/23/2009	0	0	0	30.06	14.76
12/24/2009	0	0.19	0.03	29.88	14.67
12/25/2009	0.88	0.44	0.66	29.75	14.61
12/26/2009	0	0	0	30.01	14.74
12/27/2009	0	0	0	30.04	14.75
12/28/2009	0.01	0	0	30.09	14.78
12/29/2009	0	0	0	30.22	14.84
12/30/2009	0	0	0	30.21	14.84
12/31/2009	0.09	0.14	0.1	30.03	14.75
1/1/2010	0.09	0.1	0.06	30.03	14.75
1/2/2010	0	0	0	30.15	14.81
1/3/2010	0	0	0	30.12	14.79
1/4/2010	0	0	0	30.09	14.78
1/5/2010	0	0	0	30.17	14.82
1/6/2010	0	0	0	30.18	14.82
1/7/2010	0	0	0	30.11	14.79
1/8/2010	0.11	0.09	0.14	30.04	14.75
1/9/2010	0	0	0	30.21	14.84
1/10/2010	0	0	0	30.35	14.90
1/11/2010	0	0	0	30.37	14.91
1/12/2010	0	0	0	30.24	14.85
1/13/2010	0	0	0	30.27	14.87
1/14/2010	0	0	0	30.21	14.84
1/15/2010	0	0	0	30.15	14.81
1/16/2010	2.04	2.27	1.78	29.96	14.71
1/17/2010	0.02	0.03	0	29.74	14.61
1/18/2010	0	0.01	0	29.98	14.72
1/19/2010	0	0	0.01	30.01	14.74

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
1/20/2010	0.1	0.26	0.19	29.93	14.70
1/21/2010	4.66	4.13	5.61	29.68	14.58
1/22/2010	0	0.01	0	29.73	14.60
1/23/2010	0	0	0	29.88	14.67
1/24/2010	0.27	0.08	0.15	29.68	14.58
1/25/2010	0.01	0.02	0.01	29.73	14.60
1/26/2010	0	0	0	30.03	14.75
1/27/2010	0	0	0	30.19	14.83
1/28/2010	0	0.04	0	30.21	14.84
1/29/2010	0.04	0.06	0.07	30.01	14.74
1/30/2010	0.75	1.12	1.29	29.75	14.61
1/31/2010	0	0	0	30.06	14.76
2/1/2010	0	0	0.03	30.1	14.78
2/2/2010	0.18	0.24	0.17	29.94	14.70
2/3/2010	0	0.01	0	30.06	14.76
2/4/2010	0	0	0	30.03	14.75
2/5/2010	2.13	1.93	1.39	29.67	14.57
2/6/2010	0	0.01	0	29.72	14.60
2/7/2010	0	0	0	29.95	14.71
2/8/2010	0	0	0	29.99	14.73
2/9/2010	0.47	0.51	0.48	29.83	14.65
2/10/2010	0	0	0	30.01	14.74
2/11/2010	0.01	0.01	0	29.99	14.73
2/12/2010	1.19	1.31	1.52	29.78	14.62
2/13/2010	0	0	0	29.91	14.69
2/14/2010	0	0	0	29.99	14.73
2/15/2010	0.12	0.08	0.12	29.88	14.67
2/16/2010	0	0	0	29.98	14.72
2/17/2010	0	0.01	0	29.99	14.73
2/18/2010	0	0	0	30.08	14.77
2/19/2010	0	0.01	0	30.09	14.78
2/20/2010	0	0	0	30.06	14.76
2/21/2010	0	0	0	29.97	14.72
2/22/2010	0.82	0.95	1	29.7	14.59
2/23/2010	0	0	0	29.71	14.59
2/24/2010	0.05	0.11	0.07	29.8	14.63
2/25/2010	0	0.01	0.01	29.98	14.72
2/26/2010	0	0	0	29.98	14.72
2/27/2010	0	0	0	29.83	14.65
2/28/2010	0	0	0	29.91	14.69
3/1/2010	0	0	0	29.9	14.68
3/2/2010	0.85	0.97	1.12	29.55	14.51
3/3/2010	0	0	0	29.83	14.65
3/4/2010	0	0	0	30.01	14.74
3/5/2010	0	0	0	30.08	14.77
3/6/2010	0	0	0	30.14	14.80
3/7/2010	0	0	0	30.16	14.81
3/8/2010	0	0	0	30.06	14.76
3/9/2010	0.01	0.03	0.02	29.95	14.71
3/10/2010	0.04	0	0	29.85	14.66
3/11/2010	2.62	3.88	3.75	29.65	14.56
3/12/2010	0.42	0.16	0.04	29.54	14.51
3/13/2010	0	0	0	29.56	14.52
3/14/2010	0	0	0	29.72	14.60

Date	Tallahassee Municipal Airport, (in/d)	Wakulla Springs State Park, (in/d)	St. Marks, Florida [1], (in/d)	Pressure, (in Hg)	Pressure, (PSI) [2]
3/15/2010	0	0	0	29.84	14.65
3/16/2010	0	0	0	29.95	14.71
3/17/2010	0.28	0.33	0.21	29.91	14.69
3/18/2010	0.01	0	0	29.89	14.68
3/19/2010	0	0.01	0	29.96	14.71
3/20/2010	0	0	0	29.99	14.73
3/21/2010	0.11	0.11	0.22	29.82	14.64
3/22/2010	0.02	0.03	0	29.84	14.65
3/23/2010	0	0	0	29.97	14.72
3/24/2010	0	0	0	30.03	14.75
3/25/2010	0.75	1.13	0.85	29.88	14.67
3/26/2010	0	0.01	0	29.78	14.62
3/27/2010	0	0	0	29.96	14.71
3/28/2010	0	0	0.03	29.85	14.66
3/29/2010	0	0	0.01	29.72	14.60
3/30/2010	0	0.01	0	29.89	14.68
3/31/2010	0	0	0	30.01	14.74

Precipitation data for Wakulla Springs and St. Marks provided by Northwest Florida Water Management District.

Precipitation and daily average of Barometric Pressure data for Tallahassee Municipal Airport provided by NOAA.

1 Precipitation data for St. Marks, FL not available (NA) prior to 4/22/08.
2 Pressure reported in inches Hg converted to PSI; 1 inch Hg = 0.4911 PSI conversion factor.

APPENDIX B

DISCHARGE AND GAGE FOR WAKULLA SPRING, LOST CREEK, AND SPRING CREEK SPRINGS

Date	Wakulla Springs, Discharge (cfs)	Data Value[1]	Wakulla Springs, Gage (ft)	Data Value[1]	Lost Creek, Discharge (cfs)	Data Value[1]	Lost Creek, Gage (ft)	Data Value[1]	Spring Creek, (cfs)	Data Value[1]	Spring Creek, Gage (ft)	Data Value[1]	Spring Creek, Salinity, (ppt)	Data Value[1]
1/1/2008	758	A	3.43	A	31	A	2.89	A	428	A	-1.24	A	30.7	A
1/2/2008	695	A	3.11	A	29	A	2.84	A	578	A	-3.12	A	29.6	A
1/3/2008	585	A	2.93	A	25	A	2.74	A	366	A	-2.41	A	28.3	A
1/4/2008	611	A	3.04	A	22	A	2.66	A	55	A	-1.21	A	28.3	A
1/5/2008	672	A	3.24	A	20	A	2.6	A	-101	A	-0.63	A	29.6	A
1/6/2008	708	A	3.41	A	19	A	2.56	A	-161	A	-0.35	A	30.1	A
1/7/2008	716	A	3.51	A	17	A	2.52	A	-159	A	-0.22	A	30.6	A
1/8/2008	749	A	3.59	A	16	A	2.47	A	-385	A	-0.09	A	30.9	A
1/9/2008	781	A	3.66	A	15	A	2.44	A	-89	A	-0.17	A	31.1	A
1/10/2008	774	A	3.63	A	14	A	2.42	A	-229	A	-0.26	A	31	A
1/11/2008	790	A	3.76	A	14	A	2.39	A	-219	A	0.12	A	31.1	A
1/12/2008	765	A	3.65	A	13	A	2.39	A	-128	A	-0.16	A	30.7	A
1/13/2008	734	A	3.57	A	13	A	2.39	A	-24	A	-0.35	A	30.7	A
1/14/2008	743	A	3.31	A	13	A	2.38	A	281	A	-1.43	A	30.4	A
1/15/2008	717	A	3.25	A	14	A	2.4	A	62	A	-1.22	A	30.2	A
1/16/2008	722	A	3.34	A	14	A	2.41	A	-278	A	-0.46	A	30.2	A
1/17/2008	739	A	3.72	A	15	A	2.46	A	-42	A	0.72	A	30.6	A
1/18/2008	768	A	3.49	A	21	A	2.63	A	-8.5	A	-0.67	A	29.9	A
1/19/2008	788	A	3.5	A	29	A	2.87	A	117	A	-0.84	A	29.5	A
1/20/2008	730	A	3.26	A	67	A	3.7	A	622	A	-2.37	A	28	A
1/21/2008	707	A	3.18	A	128	A	4.71	A	231	A	-1.54	A	27.8	A
1/22/2008	754	A	3.46	A	140	A	4.89	A	-270	A	-0.36	A	28.6	A
1/23/2008	790	A	3.67	A	126	A	4.68	A	-18	A	-0.37	A	28.4	A
1/24/2008	770	A	3.69	A	111	A	4.45	A	197	A	-0.66	A	28.6	A
1/25/2008	779	A	3.45	A	96	A	4.23	A	259	A	-1.25	A	27.5	A
1/26/2008	753	A	3.58	A	82	A	4.01	A	-154	A	-0.28	A	27.7	A
1/27/2008	776	A	3.61	A	74	A	3.87	A	125	A	-0.55	A	27.9	A
1/28/2008	785	A	3.54	A	70	A	3.81	A	249	A	-0.74	A	28.2	A
1/29/2008	792	A	3.68	A	64	A	3.71	A	-186	A	0.15	A	29	A
1/30/2008	826	A	3.76	A	58	A	3.59	A	119	A	-0.11	A	28.7	A
1/31/2008	804	A	3.73	A	55	A	3.52	A	-74	A	0.14	A	29.1	A

Date	Wakulla Springs, Discharge (cfs)	Data Value[1]	Wakulla Springs, Gage (ft)	Data Value[1]	Lost Creek, Discharge (cfs)	Data Value[1]	Lost Creek, Gage (ft)	Data Value[1]	Spring Creek, (cfs)	Data Value[1]	Spring Creek, Gage (ft)	Data Value[1]	Spring Creek, Salinity, (ppt)	Data Value[1]
2/1/2008	860	A	3.81	A	54	A	3.51	A	90	A	0.02	A	29.2	A
2/2/2008	789	A	3.64	A	52	A	3.48	A	163	A	-0.66	A	28.7	A
2/3/2008	772	A	3.63	A	49	A	3.41	A	75	A	-0.64	A	28.9	A
2/4/2008	777	A	3.65	A	44	A	3.29	A	-7.2	A	-0.5	A	28.7	A
2/5/2008	781	A	3.73	A	39	A	3.16	A	-109	A	-0.27	A	28.9	A
2/6/2008	855	A	3.94	A	34	A	3.03	A	-99	A	0.31	A	29.4	A
2/7/2008	908	A	3.83	A	31	A	2.96	A	89	A	-0.42	A	29.1	A
2/8/2008	897	A	3.74	A	31	A	2.95	A	83	A	-0.5	A	29.1	A
2/9/2008	888	A	3.73	A	30	A	2.92	A	53	A	-0.55	A	28.9	A
2/10/2008	859	A	3.58	A	27	A	2.85	A	328	A	-0.99	A	28.1	A
2/11/2008	832	A	3.49	A	24	A	2.77	A	110	A	-0.87	A	27.4	A
2/12/2008	820	A	3.65	A	21	A	2.69	A	-157	A	0.13	A	28.1	A
2/13/2008	814	A	3.73	A	19	A	2.64	A	69	A	-0.32	A	28	A
2/14/2008	757	A	3.48	A	18	A	2.63	A	233	A	-1.12	A	27.9	A
2/15/2008	751	A	3.48	A	18	A	2.62	A	275	A	-0.9	A	26.9	A
2/16/2008	725	A	3.49	A	18	A	2.61	A	31	A	-0.81	A	26.9	A
2/17/2008	724	A	3.68	A	16	A	2.57	A	-429	A	0.1	A	27.2	A
2/18/2008	839	A	3.98	A	18	A	2.62	A	226	A	-0.06	A	27.3	A
2/19/2008	789	A	3.6	A	19	A	2.66	A	399	A	-1.29	A	26.7	A
2/20/2008	683	A	3.51	A	20	A	2.68	A	298	A	-1.03	A	25.3	A
2/21/2008	720	A	3.75	A	23	A	2.77	A	51	A	-0.23	A	24.8	A
2/22/2008	822	A	4.15	A	305	A	6.44	A	215	A	0.04	A	23.2	A
2/23/2008	919	A	4.32	A	1680	A	13.09	A	951	A	-0.08	A	19.9	A
2/24/2008	1090	A	4.47	A	1730	A	13.25	A	1740	A	-0.49	A	8.9	A
2/25/2008	1000	A	4.49	A	1280	A	11.99	A	1990	A	-0.48	A	4.3	A
2/26/2008	1050	A	4.51	A	823	A	10.38	A	1620	A	0.05	A	3.3	A
2/27/2008	983	A	4.19	A	539	A	8.96	A	2010	A	-1.91	A	2.5	A
2/28/2008	800	A	3.92	A	426	A	8.11	A	1600	A	-1.55	A	2.3	A
2/29/2008	719	A	3.89	A	320	A	7.17	A	1740	A	-0.7	A	4.5	A
3/1/2008	716	A	3.83	A	245	A	6.39	A	1670	A	-0.75	A	4.6	A
3/2/2008	674	A	3.73	A	196	A	5.81	A	1590	A	-0.71	A	4.4	A
3/3/2008	671	A	3.73	A	161	A	5.36	A	1230	A	-0.05	A	5.9	A
3/4/2008	744	A	4.05	A	137	A	5.01	A	1240	A	0.74	A	6.4	A
3/5/2008	767	A	3.78	A	123	A	4.81	A	1240	A	-0.45	A	4.3	A
3/6/2008	673	A	3.61	A	115	A	4.68	A	1130	A	-0.28	A	4.2	A
3/7/2008	712	A	4.11	A	137	A	5	A	686	A	0.99	A	6.7	A
3/8/2008	800	A	3.87	A	289	A	6.81	A	1280	A	-0.96	A	4.8	A

Date	Wakulla Springs, Discharge (cfs)	Data Value[1]	Wakulla Springs, Gage (ft)	Data Value[1]	Lost Creek, Discharge (cfs)	Data Value[1]	Lost Creek, Gage (ft)	Data Value[1]	Spring Creek, (cfs)	Data Value[1]	Spring Creek, Gage (ft)	Data Value[1]	Spring Creek, Salinity, (ppt)	Data Value[1]
3/9/2008	678	A	3.42	A	445	A	8.27	A	1360	A	-1.15	A	2.7	A
3/10/2008	678	A	3.52	A	400	A	7.9	A	1220	A	-0.66	A	3.4	A
3/11/2008	702	A	3.59	A	313	A	7.1	A	1210	A	-0.39	A	4.1	A
3/12/2008	767	A	3.61	A	239	A	6.32	A	1140	A	-0.27	A	6.3	A
3/13/2008	779	A	3.53	A	189	A	5.72	A	1390	A	-0.66	A	4.2	A
3/14/2008	729	A	3.61	A	156	A	5.28	A	900	A	0.17	A	6.3	A
3/15/2008	733	A	3.67	A	133	A	4.95	A	884	A	0.36	A	8.5	A
3/16/2008	739	A	3.51	A	116	A	4.7	A	1520	A	-0.37	A	7.7	A
3/17/2008	693	A	3.34	A	100	A	4.45	A	1190	A	-0.41	A	6.2	A
3/18/2008	652	A	3.41	A	85	A	4.21	A	950	A	0.15	A	4.3	A
3/19/2008	648	A	3.83	A	72	A	3.99	A	850	A	1.09	A	6	A
3/20/2008	677	A	3.49	A	63	A	3.82	A	1220	A	-0.86	A	4.4	A
3/21/2008	573	A	3.08	A	54	A	3.64	A	1100	A	-0.74	A	3.6	A
3/22/2008	522	A	3.14	A	47	A	3.48	A	990	A	-0.41	A	5	A
3/23/2008	518	A	3.09	A	40	A	3.33	A	1110	A	-0.58	A	5.8	A
3/24/2008	470	A	2.71	A	35	A	3.18	A	1390	A	-1.76	A	3	A
3/25/2008	379	A	2.53	A	30	A	3.05	A	1220	A	-1.73	A	2.5	A
3/26/2008	394	A	2.67	A	26	A	2.93	A	1210	A	-0.7	A	4.9	A
3/27/2008	407	A	2.76	A	22	A	2.85	A	1130	A	-0.5	A	7.3	A
3/28/2008	412	A	2.85	A	20	A	2.77	A	1360	A	-0.33	A	9.5	A
3/29/2008	397	A	2.77	A	17	A	2.7	A	1660	A	-0.55	A	8.3	A
3/30/2008	373	A	2.64	A	15	A	2.64	A	1270	A	-0.6	A	4.5	A
3/31/2008	343	A	2.59	A	13	A	2.57	A	1100	A	-0.62	A	6.6	A
4/1/2008	361	A	2.74	A	11	A	2.52	A	1190	A	-0.25	A	10	A
4/2/2008	364	A	2.83	A	9.9	A	2.49	A	1190	A	-0.38	A	8.1	A
4/3/2008	362	A	2.81	A	8.8	A	2.47	A	1120	A	-0.34	A	6.8	A
4/4/2008	345	A	3.01	A	8.1	A	2.44	A	693	A	0.21	A	5.9	A
4/5/2008	374	A	3.34	A	8.5	A	2.44	A	727	A	0.51	A	6.4	A
4/6/2008	403	A	3.12	A	18	A	2.67	A	708	A	0.04	A	5.1	A
4/7/2008	399	A	2.95	A	42	A	3.3	A	673	A	-0.19	A	7.9	A
4/8/2008	408	A	2.95	A	67	A	3.83	A	647	A	-0.18	A	7.2	A
4/9/2008	415	A	2.98	A	76	A	3.98	A	878	A	-0.2	A	8	A
4/10/2008	407	A	3.06	A	73	A	3.93	A	902	A	0.2	A	9.8	A
4/11/2008	409	A	3.09	A	61	A	3.68	A	1240	A	0.25	A	8.3	A
4/12/2008	407	A	3.03	A	49	A	3.43	A	1020	A	0.06	A	6.3	A
4/13/2008	391	A	2.73	A	47	A	3.38	A	1340	A	-0.64	A	7.1	A
4/14/2008	348	A	2.47	A	43	A	3.28	A	1330	A	-1.34	A	3.4	A

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4/15/2008	307	A	2.2	A	37	A	3.11	A	1200	A	-1.8	A	2.7	A
4/16/2008	286	A	2.19	A	32	A	2.96	A	1280	A	-1.02	A	4.1	A
4/17/2008	307	A	2.58	A	26	A	2.8	A	805	A	-0.29	A	12.3	A
4/18/2008	353	A	2.96	A	22	A	2.66	A	502	A	0.24	A	14.2	A
4/19/2008	406	A	3.37	A	19	A	2.58	A	227	A	0.59	A	14	A
4/20/2008	439	A	3.27	A	17	A	2.51	A	480	A	0.27	A	13.8	A
4/21/2008	440	A	3.21	A	16	A	2.46	A	223	A	0.21	A	14	A
4/22/2008	432	A	3.16	A	13	A	2.38	A	462	A	0.18	A	14.8	A
4/23/2008	432	A	2.97	A	11	A	2.32	A	941	A	-0.16	A	13.6	A
4/24/2008	416	A	2.86	A	8.1	A	2.27	A	861	A	-0.13	A	14.4	A
4/25/2008	416	A	2.91	A	6.7	A	2.23	A	921	A	0.13	A	14.2	A
4/26/2008	414	A	2.92	A	5.4	A	2.2	A	983	A	0.22	A	14.4	A
4/27/2008	408	A	2.86	A	4.5	A	2.18	A	741	A	0.2	A	14.7	A
4/28/2008	447	A	3.03	A	4.9	A	2.19	A	549	A	0.38	A	14.7	A
4/29/2008	443	A	2.73	A	4.3	A	2.17	A	1530	A	-0.75	A	12.1	A
4/30/2008	373	A	2.52	A	4.4	A	2.18	A	1230	A	-0.57	A	9.4	A
5/1/2008	421	A	2.93	A	3.5	A	2.15	A	634	A	0.29	A	13.8	A
5/2/2008	504	A	3.43	A	2.8	A	2.12	A	254	A	0.83	A	14.9	A
5/3/2008	573	A	3.53	A	2.1	A	2.09	A	273	A	0.61	A	15.2	A
5/4/2008	575	A	3.47	A	1.8	A	2.07	A	348	A	0.31	A	15.8	A
5/5/2008	585	A	3.29	A	1.6	A	2.06	A	204	A	-0.11	A	16.6	A
5/6/2008	549	A	3.14	A	1.4	A	2.05	A	357	A	-0.26	A	15.7	A
5/7/2008	532	A	3.2	A	1.2	A	2.04	A	271	A	0.1	A	15.9	A
5/8/2008	534	A	3.42	A	1	A<	2.02	A	-37	A	0.63	A	17.5	A
5/9/2008	617	A	3.43	A	1	A<	2.01	A	-95	A	0.37	A	18.2	A
5/10/2008	620	A	3.25	A	1	A<	2.01	A	-39	A	0.06	A	19.7	A
5/11/2008	622	A	3.28	A	1	A<	1.98	A	-258	A	0.17	A	20.5	A
5/12/2008	627	A	3	A	1	A<	1.95	A	742	A	-0.74	A	19.9	A
5/13/2008	604	A	2.91	A	1	A<	1.95	A	722	A	-0.54	A	19.5	A
5/14/2008	603	A	3.11	A	1	A<	1.91	A	335	A	0.23	A	18.5	A
5/15/2008	633	A	3.39	A	1	A<	1.93	A	69	A	0.73	A	21.1	A
5/16/2008	717	A	3.63	A	1	A<	1.95	A	-150	A	0.52	A	21.9	A
5/17/2008	746	A	3.42	A	1.5	A	2.06	A	87	A	0.08	A	22.3	A
5/18/2008	724	A	3.46	A	1.3	A	2.04	A	-113	A	0.18	A	23.4	A
5/19/2008	752	A	3.48	A	13	A	2.34	A	-83	A	0.12	A	24.2	A
5/20/2008	748	A	3.56	A	8.7	A	2.27	A	-303	A	0.18	A	25.1	A
5/21/2008	755	A	3.58	A	5.2	A	2.2	A	-393	A	0.16	A	26	A

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5/22/2008	771	A	3.55	A	3.2	A	2.14	A	-248	A	0.08	A	26.7	A
5/23/2008	787	A	3.57	A	2.4	A	2.1	A	-196	A	0.15	A	26.7	A
5/24/2008	789	A	3.53	A	2.1	A	2.09	A	-163	A	0.02	A	26.8	A
5/25/2008	787	A	3.42	A	2.1	A	2.09	A	-51	A	-0.18	A	27	A
5/26/2008	786	A	3.41	A	1	A	2.01	A	67	A	0.07	A	27.5	A
5/27/2008	781	A	3.39	A	1	A<	2.01	A	126	A	-0.07	A	27.8	A
5/28/2008	775	A	3.38	A	1	A<	1.98	A	79	A	-0.1	A	28.1	A
5/29/2008	754	A	3.34	A	1	A<	1.96	A	101	A	-0.28	A	28.2	A
5/30/2008	739	A	3.42	A	1	A<	1.76	A	-103	A	-0.2	A	28.6	A
5/31/2008	711	A	3.49	A	1	A<	1.86	A	-136	A	-0.05	A	29.1	A
6/1/2008	724	A	3.5	A	1	A<	1.85	A	-114	A	-0.18	A	29.4	A
6/2/2008	717	A	3.5	A	1	A<	1.88	A	-192	A	-0.18	A	29.7	A
6/3/2008	718	A	3.54	A	1	A<	1.87	A	-175	A	-0.11	A	29.7	A
6/4/2008	731	A	3.58	A	1	A<	2.01	A	-151	A	-0.01	A	29.9	A
6/5/2008	719	A	3.59	A	1	A<	1.98	A	-107	A	0.04	A	30.1	A
6/6/2008	731	A	3.6	A	1	A<	1.88	A	-179	A	0.13	A	30.4	A
6/7/2008	739	A	3.54	A	1	A<	1.83	A	-88	A	0	A	30.5	A
6/8/2008	719	A	3.44	A	1	A<	1.78	A	17	A	-0.12	A	30.6	A
6/9/2008	708	A	3.4	A	1	A<	1.96	A	43	A	-0.05	A	30.6	A
6/10/2008	718	A	3.38	A	1	A<	1.93	A	29	A	-0.12	A	30.5	A
6/11/2008	708	A	3.35	A	1	A<	1.96	A	-50	A	-0.15	A	29.9	A
6/12/2008	694	A	3.33	A	1	A<	1.93	A	8.6	A	-0.16	A	29.7	A
6/13/2008	696	A	3.37	A	1	A<	1.88	A	152	A	-0.07	A	30	A
6/14/2008	704	A	3.33	A	1	A<	1.87	A	172	A	-0.16	A	30	A
6/15/2008	707	A	3.39	A	1	A<	1.91	A	66	A	-0.07	A	30.1	A
6/16/2008	728	A	3.48	A	1	A	1.99	A	-92	A	0.16	A	30.1	A
6/17/2008	735	A	3.47	A	2.2	A	2.09	A	20	A	-0.02	A	30.2	A
6/18/2008	726	A	3.45	A	1.2	A	2.04	A	-32	A	0.05	A	30.4	A
6/19/2008	714	A	3.48	A	1	A<	2.03	A	-20	A	0.15	A	30.5	A
6/20/2008	721	A	3.5	A	1	A<	2	A	11	A	0.14	A	30.6	A
6/21/2008	738	A	3.45	A	1	A<	1.95	A	-130	A	0.07	A	30.7	A
6/22/2008	756	A	3.43	A	1	A<	1.92	A	-80	A	0.04	A	30.1	A
6/23/2008	759	A	3.42	A	1	A<	1.94	A	20	A	0.03	A	29.8	A
6/24/2008	755	A	3.34	A	1	A<	1.93	A	100	A	-0.13	A	29.9	A
6/25/2008	738	A	3.3	A	1	A<	1.92	A	-97	A	-0.04	A	30.1	A
6/26/2008	737	A	3.46	A	1	A<	1.92	A	27	A	0.1	A	30.4	A
6/27/2008	771	A	3.48	A	1	A<	1.94	A	-126	A	0.11	A	30.7	A

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6/28/2008	793	A	3.48	A	1	A<	1.94	A	5	A	-0.08	A	30.5	A
6/29/2008	781	A	3.52	A	1	A<	1.97	A	71	A	-0.11	A	30.5	A
6/30/2008	788	A	3.55	A	1	A<	2	A	122	A	-0.16	A	29.7	A
7/1/2008	777	A	3.52	A	16	A	2.47	A	36	A	-0.05	A	29.4	A
7/2/2008	769	A	3.56	A	12	A	2.34	A	103	A	0.05	A	29.6	A
7/3/2008	769	A	3.57	A	4.2	A	2.17	A	-90	A	0.13	A	30	A
7/4/2008	774	A	3.56	A	2.2	A	2.09	A	40	A	0.05	A	30.2	A
7/5/2008	760	A	3.54	A	1.1	A	2.04	A	-202	A	0.06	A	30.2	A
7/6/2008	772	A	3.51	A	1	A	2.03	A	-125	A	0.07	A	30	A
7/7/2008	782	A	3.54	A	1	A<	2.01	A	-79	A	0.26	A	30	A
7/8/2008	790	A	3.51	A	1	A<	2.01	A	-130	A	0.3	A	30.3	A
7/9/2008	804	A	3.54	A	3.1	A	2.1	A	29	A	0.2	A	30.5	A
7/10/2008	786	A	3.49	A	13	A	2.34	A	-37	A	0.15	A	30.7	A
7/11/2008	778	A	3.44	A	9.1	A	2.28	A	96	A	-0.05	A	30.7	A
7/12/2008	778	A	3.41	A	4.9	A	2.19	A	101	A	-0.07	A	30.7	A
7/13/2008	785	A	3.39	A	6.2	A	2.22	A	9.2	A	-0.12	A	30.6	A
7/14/2008	777	A	3.45	A	15	A	2.4	A	8.5	A	0.03	A	30.3	A
7/15/2008	772	A	3.45	A	17	A	2.48	A	-51	A	0.15	A	30.3	A
7/16/2008	765	A	3.49	A	16	A	2.43	A	15	A	0.19	A	30.6	A
7/17/2008	757	A	3.45	A	12	A	2.33	A	-8	A	0.05	A	30.8	A
7/18/2008	748	A	3.52	A	9.7	A	2.29	A	1.8	A	0.2	A	31.1	A
7/19/2008	744	A	3.54	A	7.8	A	2.25	A	-51	A	0.13	A	31.2	A
7/20/2008	749	A	3.55	A	4.2	A	2.17	A	-59	A	0.2	A	31.3	A
7/21/2008	743	A	3.53	A	2.2	A	2.09	A	-153	A	0.17	A	31.3	A
7/22/2008	760	A	3.49	A	1	A<	2.02	A	-133	A	0.13	A	31.4	A
7/23/2008	759	A	3.46	A	1.2	A	2.04	A	-65	A	0.03	A	31.3	A
7/24/2008	747	A	3.5	A	3.7	A	2.15	A	-96	A	0.25	A	31.1	A
7/25/2008	765	A	3.45	A	1	A<	2.01	A	12	A	0.05	A	31.2	A
7/26/2008	758	A	3.44	A	2.2	A	2.05	A	90	A	0.09	A	30.9	A
7/27/2008	771	A	3.49	A	10	A	2.3	A	262	A	0.27	A	31.1	A
7/28/2008	770	A	3.6	A	6.3	A	2.22	A	72	A	0.42	A	31.4	A
7/29/2008	783	A	3.71	A	7.2	A	2.24	A	48	A	0.49	A	31.7	A
7/30/2008	801	A	3.75	A	5.4	A	2.2	A	-16	A	0.48	A	31.8	A
7/31/2008	805	A	3.71	A	12	A	2.33	A	-37	A	0.29	A	31.6	A
8/1/2008	786	A	3.74	A	10	A	2.3	A	-115	A	0.39	A	31.5	A
8/2/2008	805	A	3.73	A	11	A	2.32	A	-113	A	0.35	A	31.1	A
8/3/2008	813	A	3.73	A	8.4	A	2.26	A	-135	A	0.45	A	31.1	A

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8/4/2008	815	A	3.69	A	5.5	A	2.2	A	-72	A	0.47	A	31.3	A
8/5/2008	823	A	3.61	A	5.7	A	2.21	A	116	A	0.22	A	31.3	A
8/6/2008	810	A	3.52	A	6.9	A	2.23	A	34	A	0.08	A	31.4	A
8/7/2008	819	A	3.47	A	4.7	A	2.18	A	12	A	-0.04	A	31.5	A
8/8/2008	811	A	3.48	A	2.8	A	2.12	A	-110	A	0.09	A	31.5	A
8/9/2008	781	A	3.42	A	2	A	2.08	A	35	A	0.02	A	31.5	A
8/10/2008	760	A	3.44	A	1	A<	2.02	A	57	A	0.13	A	31.7	A
8/11/2008	795	Ae	3.44	A	1	A<	1.94	A	134	A	-0.03	A	31.8	A
8/12/2008	819	A	3.43	A	1	A<	1.91	A	251	A	-0.1	A	31.7	A
8/13/2008	819	A	3.8	A	4.7	A	2.12	A	5.7	A	0.53	A	30.9	A
8/14/2008	840	A	3.81	A	34	A	2.91	A	280	A	0.44	A	29.6	A
8/15/2008	878	A	3.83	A	91	A	4.08	A	119	A	0.27	A	29	A
8/16/2008	915	A	3.82	A	106	A	4.31	A	61	A	0.06	A	29.1	A
8/17/2008	916	A	3.91	A	83	A	3.96	A	5.8	A	0.23	A	29.4	A
8/18/2008	923	A	3.97	A	62	A	3.58	A	45	A	0.3	A	29.6	A
8/19/2008	938	A	3.92	A	59	A	3.52	A	157	A	0.03	A	29.6	A
8/20/2008	935	A	3.77	A	78	A	3.87	A	395	A	-0.5	A	29.2	A
8/21/2008	913	A	3.69	A	59	A	3.53	A	527	A	-0.7	A	28.3	A
8/22/2008	934	A	3.62	A	43	A	3.19	A	1110	A	-1.4	A	24.8	A
8/23/2008	993	A	5.2	A	688	A	9.44	A	-87	A	2.18	A	23.4	A
8/24/2008	1830	A	5.84	A	2140	A	14.17	A	883	A	0.78	A	19.4	A
8/25/2008	2160	A	6.14	A	2360	A	14.68	A	1630	A	0.61	A	9.3	A
8/26/2008	2360	A	6.37	A	1810	A	13.44	A	1970	A	0.63	A	4.4	A
8/27/2008	2350	A	6.28	A	1220	A	11.79	A	1810	A	0.3	A	3.2	A
8/28/2008	2200	A	6.05	A	767	A	10.15	A	1850	A	0.27	A	2.7	A
8/29/2008	2020	A	5.83	A	514	A	8.72	A	1570	A	0.41	A	3.3	A
8/30/2008	1720	A	5.65	A	383	A	7.6	A	1320	A	0.63	A	3.8	A
8/31/2008	1570	A	5.51	A	283	A	6.63	A	793	A	1.35	A	4.6	A
9/1/2008	1530	A	5.94	A	214	A	5.87	A	1040	A	2.21	A	8.5	A
9/2/2008	1440	A	5.22	A	174	A	5.37	A	1090	A	0.87	A	3.7	A
9/3/2008	1330	A	4.92	A	175	A	5.38	A	1070	A	0.67	A	3.2	A
9/4/2008	1220	A	4.78	A	135	A	4.82	A	748	A	0.87	A	3.2	A
9/5/2008	1170	A	4.55	A	109	A	4.42	A	943	A	0.49	A	3.1	A
9/6/2008	1080	A	4.44	A	89	A	4.11	A	657	A	0.81	A	4.5	A
9/7/2008	1040	A	4.31	A	72	A	3.83	A	677	A	0.61	A	5.5	A
9/8/2008	985	A	4.18	A	61	A	3.63	A	687	A	0.66	A	9.5	A
9/9/2008	953	A	4.21	A	52	A	3.45	A	539	A	0.96	A	10.7	A

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9/10/2008	891	A	4.61	A	45	A	3.28	A	143	A	2.15	A	12.4	A
9/11/2008	933	A	5.16	A	40	A	3.17	A	39	A	2.74	A	14.1	A
9/12/2008	1010	A	4.72	A	36	A	3.05	A	511	A	1.57	A	10	A
9/13/2008	917	A	4.39	A	31	A	2.92	A	664	A	1.07	A	7	A
9/14/2008	854	A	4.22	A	28	A	2.82	A	744	A	0.92	A	6.1	A
9/15/2008	830	A	4.07	A	24	A	2.72	A	785	A	0.65	A	5.8	A
9/16/2008	798	A	3.87	A	20	A	2.61	A	795	A	0.36	A	5.5	A
9/17/2008	743	A	3.7	A	17	A	2.54	A	631	A	0.26	A	6.6	A
9/18/2008	716	A	3.67	A	16	A	2.48	A	772	A	0.42	A	7.9	A
9/19/2008	698	A	3.58	A	13	A	2.4	A	649	A	0.42	A	9.3	A
9/20/2008	676	A	3.47	A	9.7	A	2.35	A	737	A	0.36	A	10.3	A
9/21/2008	657	A	3.39	A	7	A	2.3	A	684	A	0.28	A	10.5	A
9/22/2008	647	A	3.38	A	5.1	A	2.26	A	543	A	0.4	A	12.8	A
9/23/2008	623	A	3.22	A	4.3	A	2.23	A	798	A	0.1	A	11.6	A
9/24/2008	599	A	2.98	A	3.4	A	2.2	A	980	A	-0.31	A	7.1	A
9/25/2008	578	A	3.02	A	2.8	A	2.18	A	831	A	0.07	A	10.6	A
9/26/2008	565	A	3.35	A	2.2	A	2.15	A	557	A	0.68	A	13.3	A
9/27/2008	618	A	3.62	A	2	A	2.14	A	450	A	0.83	A	13.7	A
9/28/2008	642	A	3.71	A	1.5	A	2.12	A	437	A	0.89	A	14.6	A
9/29/2008	657	A	3.7	A	1.5	A	2.12	A	451	A	0.83	A	16.1	A
9/30/2008	676	A	3.77	A	2	A	2.14	A	438	A	0.78	A	17.6	A
10/1/2008	669	A	3.59	A	1.9	A	2.13	A	627	A	0.45	A	17.4	A
10/2/2008	654	A	3.24	A	5.1	A	2.25	A	635	A	0.05	A	17.2	A
10/3/2008	623	A	3.27	A	4.8	A	2.25	A	529	A	0.23	A	18.8	A
10/4/2008	636	A	3.2	A	3.1	A	2.19	A	500	A	0.14	A	18.8	A
10/5/2008	635	A	3.23	A	2.6	A	2.17	A	270	A	0.35	A	19.7	A
10/6/2008	630	A	3.21	A	1.7	A	2.13	A	187	A	0.46	A	20.5	A
10/7/2008	647	A	3.32	A	1.2	A	2.1	A	302	A	0.57	A	20.6	A
10/8/2008	657	A	3.54	A	1.3	A	2.1	A	337	A	0.93	A	19.9	A
10/9/2008	674	A	3.51	A	20	A	2.63	A	325	A	0.59	A	21.4	A
10/10/2008	672	A	3.37	A	17	A	2.54	A	556	A	0.31	A	20.4	A
10/11/2008	654	A	3.29	A	14	A	2.42	A	840	A	0.11	A	16.5	A
10/12/2008	615	A	3.18	A	16	A	2.49	A	695	A	0.17	A	14.5	A
10/13/2008	554	A	3.12	A	14	A	2.43	A	856	A	0.2	A	11.5	A
10/14/2008	499	A	2.98	A	11	A	2.37	A	680	A	0.27	A	11.2	A
10/15/2008	511	A	3.1	A	7.2	A	2.3	A	409	A	0.37	A	14.8	A
10/16/2008	516	A	3.36	A	5.2	A	2.26	A	274	A	0.62	A	15.8	A

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10/17/2008	519	A	3.35	A	3.5	A	2.21	A	414	A	0.52	A	16.7	A
10/18/2008	526	A	3.23	A	2.8	A	2.18	A	697	A	0.16	A	14.9	A
10/19/2008	470	A	2.72	A	1.5	A	2.12	A	658	A	-0.29	A	13.2	A
10/20/2008	455	A	2.7	A	1.6	A	2.12	A	350	A	0	A	17.3	A
10/21/2008	515	A	3	A	2.2	A	2.15	A	16	A	0.48	A	20.8	A
10/22/2008	559	A	3.1	A	2.4	A	2.16	A	51	A	0.48	A	21.6	A
10/23/2008	581	A	3.21	A	2.8	A	2.18	A	133	A	0.64	A	19.7	A
10/24/2008	591	A	4.13	A	2.9	A	2.13	A	-197	A	2.08	A	21.7	A
10/25/2008	811	A	3.66	A	22	A	2.68	A	409	A	0.51	A	21.5	A
10/26/2008	755	A	3.35	A	22	A	2.67	A	366	A	0.03	A	22.1	A
10/27/2008	740	A	3.21	A	33	A	2.99	A	670	A	-0.42	A	21.3	A
10/28/2008	609	A	2.66	A	29	A	2.87	A	1100	A	-1.42	A	10.7	A
10/29/2008	491	A	2.46	A	26	A	2.77	A	502	A	-0.59	A	11.7	A
10/30/2008	548	A	2.75	A	21	A	2.66	A	518	A	-0.28	A	18.2	A
10/31/2008	575	A	2.83	A	18	A	2.55	A	550	A	-0.19	A	18.7	A
11/1/2008	587	A	2.82	A	15	A	2.48	A	345	A	-0.45	A	19.2	A
11/2/2008	610	A	2.98	A	13	A	2.42	A	357	Ae	NA		NA	
11/3/2008	644	A	3.04	A	9.5	A	2.34	A	286	Ae	NA		NA	
11/4/2008	663	A	3	A	6.4	A	2.28	A	326	A	-0.52	A	22.2	A
11/5/2008	671	A	3.07	A	5.4	A	2.26	A	-34	A	0.02	A	24.1	A
11/6/2008	690	A	3.22	A	3.7	A	2.21	A	316	A	0.29	A	24.5	A
11/7/2008	709	A	3.28	A	3	A	2.19	A	441	A	0.34	A	24.9	A
11/8/2008	711	A	3.27	A	2.7	A	2.18	A	517	A	0.09	A	24.6	A
11/9/2008	709	A	3.26	A	2.7	A	2.18	A	286	A	-0.11	A	25.1	A
11/10/2008	702	A	3.19	A	2.2	A	2.15	A	290	A	-0.39	A	25.2	A
11/11/2008	707	A	3.31	A	2.5	A	2.17	A	39	A	-0.02	A	26	A
11/12/2008	727	A	3.44	A	2.6	A	2.17	A	-503	A	0.14	A	27	A
11/13/2008	748	A	3.7	A	2.1	A	2.15	A	-527	A	0.49	A	27.8	A
11/14/2008	785	A	4.05	A	4.1	A	2.22	A	-364	A	0.96	A	28.1	A
11/15/2008	833	A	3.92	A	9.3	A	2.34	A	173	A	-0.06	A	26.7	A
11/16/2008	763	A	3.23	A	336	A	6.74	A	351	A	-1.42	A	26.6	A
11/17/2008	779	A	3.33	A	783	A	10.23	A	294	A	-0.9	A	26.2	A
11/18/2008	856	A	3.44	A	547	A	8.99	A	911	A	-1.31	A	22.9	A
11/19/2008	763	A	3.22	A	344	A	7.38	A	1370	A	-1.07	A	9.6	A
11/20/2008	670	A	3.17	A	235	A	6.26	A	979	A	-0.14	A	15	A
11/21/2008	685	A	3.06	A	178	A	5.57	A	1480	A	-1.06	A	11.9	A
11/22/2008	652	A	2.94	A	144	A	5.1	A	918	A	-0.9	A	9.6	A

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11/23/2008	643	A	3.07	A	120	A	4.74	A	359	A	-0.31	A	19.1	A
11/24/2008	657	A	3.26	A	102	A	4.46	A	-354	A	0.15	A	21.9	A
11/25/2008	692	A	3.35	A	86	A	4.22	A	425	A	-0.33	A	20.6	A
11/26/2008	662	A	3.21	A	73	A	4	A	424	A	-0.4	A	19.7	A
11/27/2008	631	A	3.2	A	63	A	3.82	A	124	A	-0.2	A	20.2	A
11/28/2008	653	A	3.31	A	56	A	3.67	A	47	A	0	A	20.4	A
11/29/2008	649	A	3.49	A	51	A	3.57	A	-195	A	0.48	A	20.4	A
11/30/2008	741	A	4.04	A	72	A	3.98	A	-100	A	1.09	A	20.7	A
12/1/2008	726	A	3.39	A	92	A	4.31	A	730	A	-0.67	A	18.8	A
12/2/2008	598	A	2.83	A	130	A	4.9	A	1430	A	-1.32	A	6.4	A
12/3/2008	511	A	2.63	A	148	A	5.16	A	1420	A	-0.68	A	6.7	A
12/4/2008	514	A	2.79	A	142	A	5.08	A	886	A	-0.23	A	15	A
12/5/2008	601	A	2.92	A	125	A	4.83	A	669	A	-0.47	A	16.7	A
12/6/2008	610	A	3.03	A	111	A	4.6	A	429	A	-0.11	A	18.1	A
12/7/2008	600	A	2.82	A	100	A	4.43	A	1630	A	-1.17	A	8.2	A
12/8/2008	506	A	2.61	A	92	A	4.32	A	902	A	-0.51	A	8.1	A
12/9/2008	552	A	3.07	A	83	A	4.17	A	63	A	0.35	A	15.3	A
12/10/2008	623	A	3.45	A	74	A	4.02	A	-128	A	0.65	A	17.1	A
12/11/2008	726	A	3.83	A	85	A	4.19	A	117	A	0.87	A	17	A
12/12/2008	707	A	3.1	A	118	A	4.71	A	1580	A	-1.49	A	9.1	A
12/13/2008	556	A	2.52	A	145	A	5.13	A	1220	A	-1.32	A	4.2	A
12/14/2008	555	A	2.81	A	152	A	5.22	A	1030	A	-0.23	A	8	A
12/15/2008	565	A	2.96	A	146	A	5.14	A	914	A	-0.08	A	9	A
12/16/2008	559	A	2.87	A	131	A	4.91	A	821	A	-0.25	A	10.1	A
12/17/2008	540	A	2.82	A	114	A	4.64	A	834	A	-0.15	A	10.4	A
12/18/2008	525	A	2.75	A	98	A	4.4	A	1020	A	-0.16	A	10.7	A
12/19/2008	512	A	2.71	A	85	A	4.2	A	787	A	-0.07	A	11.6	A
12/20/2008	521	A	2.74	A	74	A	4.02	A	969	A	-0.02	A	11.9	A
12/21/2008	506	A	2.6	A	65	A	3.86	A	1460	A	-0.45	A	5.5	A
12/22/2008	441	A	2.08	A	58	A	3.72	A	1330	A	-1.6	A	3.7	A
12/23/2008	417	A	2.22	A	52	A	3.58	A	763	A	-0.52	A	9.4	A
12/24/2008	524	A	2.76	A	46	A	3.45	A	138	A	0.08	A	18.8	A
12/25/2008	600	A	2.88	A	42	A	3.35	A	52	A	-0.5	A	20.6	A
12/26/2008	619	A	2.96	A	38	A	3.26	A	219	A	-0.42	A	19.8	A
12/27/2008	617	A	3.02	A	35	A	3.19	A	244	A	-0.18	A	18.4	A
12/28/2008	604	A	2.98	A	33	A	3.13	A	807	A	-0.35	A	14.7	A
12/29/2008	536	A	2.73	A	31	A	3.07	A	844	A	-0.65	A	12.1	A

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12/30/2008	487	A	2.5	A	29	A	3.02	A	881	A	-0.71	A	10.2	A
12/31/2008	461	A	2.47	A	27	A	2.95	A	899	A	-0.73	A	10.3	A
1/1/2009	400	A	2.11	A	24	A	2.88	A	1140	A	-0.84	A	7.2	A
1/2/2009	436	A	2.58	A	22	A	2.82	A	483	A	0.14	A	16.9	A
1/3/2009	529	A	2.79	A	20	A	2.76	A	308	A	0	A	19.6	A
1/4/2009	578	A	2.86	A	19	A	2.75	A	354	A	-0.13	A	19.8	A
1/5/2009	570	A	2.81	A	21	A	2.79	A	524	A	-0.36	A	17.9	A
1/6/2009	526	A	2.89	A	22	A	2.82	A	562	A	0.13	A	14.7	A
1/7/2009	552	A	2.85	A	24	A	2.87	A	1020	A	-0.17	A	10.1	A
1/8/2009	447	A	2.38	A	24	A	2.89	A	771	A	-0.68	A	7.9	A
1/9/2009	404	A	2.19	A	24	A	2.87	A	1040	A	-0.91	A	7.5	A
1/10/2009	428	A	2.47	A	23	A	2.86	A	655	A	-0.3	A	12.5	A
1/11/2009	460	A	2.71	A	21	A	2.81	A	760	A	-0.4	A	10.5	A
1/12/2009	416	A	2.19	A	21	A	2.8	A	962	A	-0.93	A	8.2	A
1/13/2009	435	A	2.38	A	20	A	2.76	A	556	A	-0.61	A	12.2	A
1/14/2009	392	A	2.06	A	19	A	2.76	A	1110	A	-1.17	A	7.9	A
1/15/2009	334	A	1.87	A	18	A	2.72	A	1170	A	-1.18	A	6.1	A
1/16/2009	270	A	1.47	A	17	A	2.68	A	1340	A	-2.05	A	2.5	A
1/17/2009	253	A	1.5	A	16	A	2.63	A	1110	A	-1.37	A	4.2	A
1/18/2009	305	A	1.98	A	15	A	2.61	A	187	A	-0.23	A	11.2	A
1/19/2009	391	A	2.28	A	19	A	2.74	A	232	A	-0.2	A	14	A
1/20/2009	390	A	1.95	A	22	A	2.82	A	1640	A	-1.92	A	6	A
1/21/2009	252	A	1.48	A	26	A	2.93	A	1120	A	-1.72	A	3.7	A
1/22/2009	263	A	1.66	A	25	A	2.91	A	974	A	-0.9	A	7.8	A
1/23/2009	346	A	2.04	A	23	A	2.86	A	467	A	-0.64	A	14.2	A
1/24/2009	409	A	2.3	A	22	A	2.82	A	308	A	-0.47	A	15.6	A
1/25/2009	412	A	2.33	A	20	A	2.76	A	783	A	-0.62	A	12.6	A
1/26/2009	388	A	2.26	A	18	A	2.72	A	501	A	-0.6	A	14	A
1/27/2009	420	A	2.37	A	19	A	2.73	A	551	A	-0.53	A	14.6	A
1/28/2009	425	A	2.64	A	22	A	2.82	A	396	A	-0.13	A	13.5	A
1/29/2009	447	A	2.53	A	23	A	2.86	A	476	A	-0.41	A	14	A
1/30/2009	394	A	2.05	A	23	A	2.85	A	1300	A	-1.3	A	6.7	A
1/31/2009	291	A	1.7	A	22	A	2.82	A	1140	A	-1.35	A	4.8	A
2/1/2009	281	A	1.9	A	20	A	2.78	A	745	A	-0.44	A	8.9	A
2/2/2009	313	A	2.16	A	18	A	2.69	A	451	A	-0.04	A	16.1	A
2/3/2009	374	A	2.01	A	16	A	2.65	A	967	A	-1.3	A	11.5	A
2/4/2009	294	A	1.63	A	15	A	2.6	A	1320	A	-1.91	A	4.3	A

Date	Wakulla Springs, Discharge (cfs)	Data Value[1]	Wakulla Springs, Gage (ft)	Data Value[1]	Lost Creek, Discharge (cfs)	Data Value[1]	Lost Creek, Gage (ft)	Data Value[1]	Spring Creek, (cfs)	Data Value[1]	Spring Creek, Gage (ft)	Data Value[1]	Spring Creek, Salinity, (ppt)	Data Value[1]
2/5/2009	201	A	1.35	A	13	A	2.55	A	834	A	-1.73	A	4.5	A
2/6/2009	219	A	1.58	A	12	A	2.52	A	912	A	-0.96	A	7.6	A
2/7/2009	291	A	1.93	A	9.8	A	2.49	A	590	A	-0.76	A	12.3	A
2/8/2009	339	A	2.14	A	8.3	A	2.45	A	444	A	-0.84	A	13	A
2/9/2009	355	A	2.28	A	7.8	A	2.44	A	310	A	-0.6	A	13.6	A
2/10/2009	393	A	2.49	A	6.9	A	2.41	A	180	A	-0.28	A	15.2	A
2/11/2009	411	A	2.81	A	6.1	A	2.39	A	-36	A	0.29	A	17	A
2/12/2009	452	A	2.57	A	4.4	A	2.34	A	327	A	-0.38	A	16.9	A
2/13/2009	411	A	2.36	A	5	A	2.35	A	722	A	-0.46	A	13.4	A
2/14/2009	385	A	2.39	A	11	A	2.47	A	795	A	-0.08	A	8.3	A
2/15/2009	345	A	2.15	A	37	A	3.18	A	759	A	-0.37	A	10.9	A
2/16/2009	339	A	1.89	A	64	A	3.76	A	1330	A	-1.18	A	7.2	A
2/17/2009	279	A	1.76	A	78	A	4.02	A	1030	A	-0.85	A	7.9	A
2/18/2009	340	A	2.3	A	79	A	4.02	A	108	A	0.28	A	13.1	A
2/19/2009	447	A	2.51	A	80	A	4.04	A	526	A	-0.23	A	15.9	A
2/20/2009	386	A	2	A	79	A	4.01	A	1470	A	-1.57	A	6	A
2/21/2009	315	A	1.9	A	71	A	3.87	A	1010	A	-0.8	A	6.9	A
2/22/2009	351	A	2.07	A	65	A	3.75	A	1030	A	-0.81	A	10	A
2/23/2009	291	A	1.72	A	59	A	3.61	A	1200	A	-1.49	A	5.1	A
2/24/2009	269	A	1.71	A	53	A	3.48	A	982	A	-1.08	A	5.7	A
2/25/2009	300	A	2.09	A	46	A	3.34	A	594	A	-0.35	A	9.4	A
2/26/2009	345	A	2.36	A	41	A	3.2	A	617	A	-0.22	A	10.4	A
2/27/2009	363	A	2.5	A	36	A	3.07	A	674	A	0.03	A	9.8	A
2/28/2009	368	A	2.63	A	33	A	2.98	A	583	A	0.28	A	9.9	A
3/1/2009	365	A	2.2	A	33	A	2.97	A	1200	A	-1.01	A	6	A
3/2/2009	254	A	1.6	A	39	A	3.12	A	1090	A	-1.65	A	3.7	A
3/3/2009	236	A	1.55	A	36	A	3.05	A	946	A	-1.25	A	6.7	A
3/4/2009	269	A	1.76	A	33	A	2.95	A	1020	A	-0.76	A	12.1	A
3/5/2009	296	A	1.98	A	30	A	2.85	A	316	A	-0.38	A	14	A
3/6/2009	369	A	2.23	A	27	A	2.78	A	109	A	-0.33	A	16.8	A
3/7/2009	398	A	2.35	A	26	A	2.74	A	544	A	-0.45	A	15.5	A
3/8/2009	407	A	2.5	A	23	A	2.66	A	738	A	-0.34	A	14.1	A
3/9/2009	400	A	2.55	A	21	A	2.6	A	646	A	-0.26	A	11.7	A
3/10/2009	371	A	2.46	A	20	A	2.56	A	778	A	-0.35	A	9.9	A
3/11/2009	351	A	2.45	A	19	A	2.53	A	715	A	-0.27	A	9.6	A
3/12/2009	336	A	2.32	A	19	A	2.5	A	596	A	-0.41	A	8.7	A
3/13/2009	329	A	2.37	A	17	A	2.45	A	498	A	-0.18	A	9.8	A

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3/14/2009	348	A	2.51	A	15	A	2.37	A	574	A	0.12	A	11.1	A
3/15/2009	362	A	2.54	A	14	A	2.33	A	715	A	0.15	A	10.5	A
3/16/2009	345	A	2.32	A	13	A	2.3	A	817	A	-0.09	A	9.2	A
3/17/2009	315	A	2.05	A	15	A	2.35	A	925	A	-0.42	A	12.5	A
3/18/2009	321	A	2.08	A	14	A	2.3	A	876	A	-0.28	A	14.2	A
3/19/2009	348	A	2.15	A	13	A	2.29	A	404	A	-0.34	A	15.2	A
3/20/2009	378	A	2.18	A	10	A	2.24	A	792	A	-0.61	A	14.1	A
3/21/2009	356	A	2.15	A	9.1	A	2.21	A	1050	A	-0.42	A	12.2	A
3/22/2009	318	A	2.01	A	9.2	A	2.21	A	1020	A	-0.57	A	9.6	A
3/23/2009	327	A	2.28	A	7.8	A	2.17	A	476	A	-0.05	A	13	A
3/24/2009	366	A	2.71	A	9.7	A	2.23	A	410	A	0.37	A	12.8	A
3/25/2009	375	A	2.98	A	7.1	A	2.2	A	289	A	0.68	A	13.3	A
3/26/2009	383	A	3.36	A	4.1	A	2.16	A	246	A	1.2	A	13.5	A
3/27/2009	466	A	3.53	A	20	A	2.58	A	156	A	1.32	A	14.7	A
3/28/2009	425	A	4.01	A	79	A	3.92	A	643	A	2.08	A	15.9	A
3/29/2009	604	A	3.3	A	133	A	4.8	A	662	A	0.11	A	12.4	A
3/30/2009	496	A	2.63	A	183	A	5.53	A	946	A	-0.42	A	6.8	A
3/31/2009	456	A	2.76	A	202	A	5.79	A	698	A	0.17	A	9	A
4/1/2009	646	A	3.31	A	459	A	8.14	A	1360	A	0.37	A	5.4	A
4/2/2009	821	A	3.88	A	1780	A	13.28	A	1190	A	0.95	A	4.3	A
4/3/2009	1270	A	4.78	A	2870	A	15.73	A	2160	A	0.32	A	3.4	A
4/4/2009	1580	A	5.24	A	2770	A	15.52	A	2450	A	-0.27	A	1.8	A
4/5/2009	1690	A	5.57	A	2050	A	14	A	2230	A	0.21	A	1.6	A
4/6/2009	1700	A	5.54	A	1470	A	12.55	A	2130	A	-0.33	A	1.2	A
4/7/2009	1580	A	5.06	A	982	A	11	A	2260	A	-1.8	A	1.2	A
4/8/2009	1440	A	4.81	A	630	A	9.5	A	1830	A	-0.8	A	1.3	A
4/9/2009	1350	A	4.73	A	451	A	8.3	A	1580	A	-0.19	A	1.5	A
4/10/2009	1250	A	4.71	A	341	A	7.36	A	952	A	0.57	A	2.1	A
4/11/2009	1220	A	4.48	A	266	A	6.6	A	1180	A	0.16	A	2.5	A
4/12/2009	1110	A	4.2	A	212	A	6	A	1150	A	0.03	A	2.5	A
4/13/2009	1060	A	4.25	A	184	A	5.64	A	1030	A	0.71	A	2.2	A
4/14/2009	1110	A	4.53	A	360	A	7.53	A	1070	A	0.91	A	2.2	A
4/15/2009	1110	A	4.07	A	509	A	8.75	A	1360	A	-0.58	A	2.1	A
4/16/2009	1060	A	3.9	A	445	A	8.25	A	1280	A	-0.52	A	1.9	A
4/17/2009	1050	A	3.8	A	344	A	7.38	A	987	A	-0.33	A	1.7	A
4/18/2009	994	A	3.74	A	268	A	6.63	A	984	A	-0.3	A	1.8	A
4/19/2009	950	A	3.82	A	209	A	5.96	A	978	A	0.41	A	1.9	A

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4/20/2009	938	A	3.85	A	170	A	5.46	A	1030	A	0.31	A	1.9	A
4/21/2009	889	A	3.55	A	140	A	5.04	A	1200	A	-0.53	A	1.9	A
4/22/2009	819	A	3.4	A	116	A	4.68	A	1070	A	-0.6	A	1.9	A
4/23/2009	777	A	3.34	A	95	A	4.36	A	1030	A	-0.65	A	2.1	A
4/24/2009	742	A	3.32	A	78	A	4.08	A	919	A	-0.47	A	2.8	A
4/25/2009	714	A	3.39	A	63	A	3.82	A	616	A	-0.09	A	3.7	A
4/26/2009	705	A	3.48	A	53	A	3.6	A	565	A	0.21	A	4.3	A
4/27/2009	688	A	3.38	A	44	A	3.42	A	493	A	0.15	A	3.9	A
4/28/2009	662	A	3.22	A	38	A	3.26	A	807	A	-0.05	A	3.2	A
4/29/2009	627	A	3.13	A	32	A	3.11	A	792	A	-0.12	A	3.1	A
4/30/2009	608	A	3.1	A	28	A	2.99	A	1000	A	0.12	A	2.5	A
5/1/2009	587	A	3.04	A	24	A	2.88	A	1270	A	-0.03	A	3.5	A
5/2/2009	577	A	2.96	A	21	A	2.8	A	1140	A	-0.24	A	2.5	A
5/3/2009	556	A	3.09	A	19	A	2.75	A	732	A	0.19	A	2.7	A
5/4/2009	553	A	3.12	A	17	A	2.69	A	787	A	0.14	A	2.6	A
5/5/2009	539	A	3.1	A	16	A	2.65	A	895	A	-0.02	A	2.8	A
5/6/2009	508	A	3.02	A	12	A	2.53	A	728	A	-0.09	A	2.9	A
5/7/2009	483	A	2.99	A	6.4	A	2.41	A	775	A	-0.19	A	3.9	A
5/8/2009	464	A	2.91	A	1	A<	2.22	A	674	A	-0.22	A	4.1	A
5/9/2009	446	A	2.94	A	2.1	A	2.28	A	545	A	-0.09	A	5.9	A
5/10/2009	447	A	2.74	A	1	A<	2.22	A	789	A	-0.41	A	5.3	A
5/11/2009	428	A	2.66	A	3.1	A	2.28	A	613	A	-0.52	A	5.4	A
5/12/2009	420	A	2.53	A	2.1	A	2.25	A	676	A	-0.53	A	7.3	A
5/13/2009	413	A	2.65	A	1	A<	2.13	A	727	A	-0.09	A	11.4	A
5/14/2009	424	A	2.75	A	1	A<	2.08	A	725	A	0.12	A	11.6	A
5/15/2009	427	A	2.67	A	1	A<	2.2	A	1140	A	-0.1	A	11.2	A
5/16/2009	407	A	2.73	A	1.2	A	2.24	A	1120	A	0.27	A	8.4	A
5/17/2009	444	A	2.78	A	12	A	2.53	A	655	A	0.16	A	11.2	A
5/18/2009	471	A	2.6	A	19	A	2.74	A	1030	A	-0.64	A	5.8	A
5/19/2009	409	A	2.21	A	16	A	2.65	A	1080	A	-1.88	A	2.4	A
5/20/2009	372	A	2.05	A	13	A	2.55	A	562	A	-1.31	A	1.8	A
5/21/2009	429	A	2.61	A	9.3	A	2.49	A	422	A	0.22	A	11.2	A
5/22/2009	527	A	3.01	A	8.4	A	2.47	A	282	A	0.47	A	13.7	A
5/23/2009	560	A	3.24	A	7.5	A	2.46	A	505	A	0.67	A	11.3	A
5/24/2009	576	A	3.21	A	16	A	2.67	A	558	A	0.37	A	7.8	A
5/25/2009	557	A	3.12	A	18	A	2.71	A	406	A	0.33	A	7	A
5/26/2009	617	A	3.24	A	32	A	3.06	A	489	A	0.35	A	5.9	A

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5/27/2009	642	A	3.25	A	98	A	4.4	A	415	A	0.22	A	6.4	A
5/28/2009	700	A	3.33	A	207	A	5.9	A	528	A	0.24	A	6.2	A
5/29/2009	778	A	3.41	A	503	A	8.68	A	854	A	0.06	A	4.6	A
5/30/2009	778	A	3.31	A	528	A	8.88	A	994	A	-0.26	A	4.5	A
5/31/2009	757	A	3.23	A	388	A	7.75	A	1110	A	-0.39	A	4.7	A
6/1/2009	738	A	3.2	A	273	A	6.62	A	981	A	-0.41	A	4.5	A
6/2/2009	727	A	3.23	A	197	A	5.74	A	902	A	-0.24	A	7	A
6/3/2009	728	A	3.31	A	153	A	5.15	A	633	A	-0.08	A	8.6	A
6/4/2009	757	A	3.54	A	139	A	4.93	A	574	A	0.21	A	9	A
6/5/2009	759	A	3.61	A	196	A	5.66	A	369	A	0.35	A	8	A
6/6/2009	767	A	3.43	A	316	A	7.02	A	779	A	-0.1	A	8.2	A
6/7/2009	752	A	3.43	A	311	A	6.96	A	795	A	-0.09	A	7.9	A
6/8/2009	735	A	3.47	A	253	A	6.35	A	756	A	0.01	A	7.6	A
6/9/2009	712	A	3.38	A	194	A	5.66	A	734	A	-0.15	A	7.7	A
6/10/2009	668	A	3.26	A	149	A	5.07	A	723	A	-0.29	A	7.7	A
6/11/2009	645	A	3.24	A	115	A	4.55	A	549	A	-0.14	A	8.7	A
6/12/2009	615	A	3.18	A	85	A	4.1	A	539	A	-0.13	A	7.6	A
6/13/2009	596	A	3.06	A	64	A	3.72	A	831	A	-0.22	A	8.1	A
6/14/2009	584	A	2.98	A	49	A	3.41	A	303	A	-0.27	A	12.8	A
6/15/2009	592	A	3	A	38	A	3.15	A	418	A	-0.23	A	13.9	A
6/16/2009	605	A	3.02	A	31	A	2.96	A	378	A	-0.2	A	16.6	A
6/17/2009	622	A	3.09	A	25	A	2.8	A	218	A	-0.24	A	18.3	A
6/18/2009	641	A	3.22	A	21	A	2.67	A	73	A	-0.1	A	19.2	A
6/19/2009	654	A	3.3	A	17	A	2.56	A	25	A	0	A	17.8	A
6/20/2009	657	A	3.35	A	14	A	2.46	A	19	A	-0.03	A	20.9	A
6/21/2009	667	A	3.38	A	10	A	2.4	A	-184	A	-0.06	A	22.6	A
6/22/2009	668	A	3.37	A	3.7	A	2.25	A	-410	A	-0.14	A	23.9	A
6/23/2009	698	A	3.41	A	2.7	A	2.21	A	-359	A	-0.15	A	25	A
6/24/2009	716	A	3.54	A	4.3	A	2.26	A	-464	A	0.09	A	26.1	A
6/25/2009	764	A	3.67	A	4.9	A	2.28	A	-543	A	0.27	A	27.3	A
6/26/2009	804	A	3.76	A	3.6	A	2.24	A	-621	A	0.45	A	28.6	A
6/27/2009	859	A	3.86	A	3.8	A	2.25	A	-557	A	0.42	A	29.4	A
6/28/2009	879	A	3.8	A	7.9	A	2.34	A	-523	A	0.22	A	29.7	A
6/29/2009	886	A	3.82	A	11	A	2.41	A	-612	A	0.28	A	29.1	A
6/30/2009	889	A	3.81	A	6.6	A	2.32	A	-559	A	0.32	A	29	A
7/1/2009	888	A	3.8	A	2.9	A	2.22	A	-248	A	0.37	A	29.4	A
7/2/2009	905	A	3.86	A	8.3	A	2.36	A	-250	A	0.32	A	29.5	A

Date	Wakulla Springs, Discharge (cfs)	Data Value[1]	Wakulla Springs, Gage (ft)	Data Value[1]	Lost Creek, Discharge (cfs)	Data Value[1]	Lost Creek, Gage (ft)	Data Value[1]	Spring Creek, (cfs)	Data Value[1]	Spring Creek, Gage (ft)	Data Value[1]	Spring Creek, Salinity, (ppt)	Data Value[1]
7/3/2009	904	A	3.8	A	5	A	2.29	A	-415	A	0.03	A	29.1	A
7/4/2009	878	A	3.71	A	5.7	A	2.31	A	-311	A	-0.06	A	29.1	A
7/5/2009	874	A	3.81	A	5.8	A	2.31	A	-560	A	0.24	A	29.6	A
7/6/2009	892	A	3.9	A	7.2	A	2.34	A	-548	A	0.37	A	29.6	A
7/7/2009	905	A	3.91	A	4	A	2.26	A	-525	A	0.34	A	29.4	A
7/8/2009	892	A	3.94	A	2.8	A	2.22	A	-538	A	0.44	A	29.4	A
7/9/2009	896	A	3.98	A	2.9	A	2.23	A	-484	A	0.38	A	29.3	A
7/10/2009	895	A	3.87	A	2.2	A	2.19	A	-410	A	0.17	A	28	A
7/11/2009	884	A	3.82	A	2	A	2.18	A	-431	A	0.16	A	26.8	A
7/12/2009	874	A	3.8	A	1.5	A	2.16	A	-337	A	0.21	A	27.1	A
7/13/2009	882	A	3.77	A	2.9	A	2.22	A	-435	A	0.08	A	27.3	A
7/14/2009	886	A	3.8	A	3.7	A	2.25	A	-386	A	0.23	A	27.2	A
7/15/2009	870	A	3.78	A	6.3	A	2.32	A	-358	A	0.17	A	27.4	A
7/16/2009	870	A	3.78	A	6.4	A	2.32	A	-431	A	0.14	A	27.4	A
7/17/2009	871	A	3.86	A	5.9	A	2.31	A	-408	A	0.29	A	27.4	A
7/18/2009	870	A	3.85	A	9.3	A	2.38	A	-334	A	0.03	A	27	A
7/19/2009	877	A	3.8	A	12	A	2.42	A	-343	A	-0.04	A	26.9	A
7/20/2009	884	A	3.79	A	14	A	2.46	A	-448	A	-0.02	A	27.1	A
7/21/2009	860	A	3.86	A	12	A	2.43	A	-449	A	0.13	A	27.5	A
7/22/2009	868	A	3.9	A	9.2	A	2.38	A	-472	A	0.21	A	27.9	A
7/23/2009	930	Ae			5.6	A	2.3	A	-522	A	0.15	A	28.1	A
7/24/2009	940	Ae			3.8	A	2.24	A	-505	A	0.26	A	27.8	A
7/25/2009	946	A	3.81	A	2.8	A	2.2	A	-553	A	0.11	A	26.7	A
7/26/2009	975	Ae			3.5	A	2.2	A	-561	A	0.29	A	27	A
7/27/2009	992	A	3.81	A	1	A<	1.98	A	-448	A	0.17	A	27.1	A
7/28/2009	877	A	3.76	A	2.6	A	2.21	A	-438	A	0.19	A	27.1	A
7/29/2009	878	A	3.8	A	3.5	A	2.24	A	-498	A	0.38	A	27.3	A
7/30/2009	873	A	3.8	A	5.4	A	2.3	A	-337	A	0.38	A	27.4	A
7/31/2009	869	A	3.8	A	5.3	A	2.3	A	-351	A	0.23	A	27.3	A
8/1/2009	857	A	3.81	A	14	A	2.5	A	-386	A	0.27	A	26.7	A
8/2/2009	884	A	3.84	A	32	A	2.98	A	-432	A	0.33	A	26.6	A
8/3/2009	911	A	3.92	A	38	A	3.15	A	-640	A	0.42	A	26.7	A
8/4/2009	919	A	3.96	A	41	A	3.23	A	-655	A	0.42	A	26.5	A
8/5/2009	929	A	4.02	A	92	A	4.17	A	-462	A	0.46	A	26.5	A
8/6/2009	961	A	4.08	A	133	A	4.83	A	-529	A	0.52	A	26.3	A
8/7/2009	964	A	4.16	A	144	A	4.99	A	-578	A	0.67	A	26.6	A
8/8/2009	979	A	4.22	A	103	A	4.37	A	-585	A	0.78	A	26.8	A

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8/9/2009	978	A	4.21	A	84	A	4.07	A	-506	A	0.65	A	26.8	A
8/10/2009	982	A	4.15	A	174	A	5.4	A	-496	A	0.58	A	26.6	A
8/11/2009	981	A	4.12	A	147	A	5.04	A	-494	A	0.54	A	26.1	A
8/12/2009	963	A	4.11	A	109	A	4.47	A	-550	A	0.6	A	25.6	A
8/13/2009	968	A	4.08	A	81	A	4.02	A	-536	A	0.66	A	25.3	A
8/14/2009	970	A	4.12	A	70	A	3.84	A	-538	A	0.84	A	25.7	A
8/15/2009	970	A	4.15	A	77	A	3.97	A	-629	A	0.86	A		
8/16/2009	937	A	4.45	A	74	A	3.9	A	-762	A	2.27	A		
8/17/2009	1050	A	4.43	A	90	A	4.17	A	-406	A	0.94	A		
8/18/2009	1000	A	4.29	A	96	A	4.26	A	-682	A	1	A		
8/19/2009	972	A	4.31	A	84	A	4.08	A	-709	A	1.1	A		
8/20/2009	968	A	4.37	A	68	A	3.8	A	-719	A	1.27	A		
8/21/2009	1000	A	4.32	A	55	A	3.54	A	-595	A	0.97	A		
8/22/2009	916	A	4.15	A	46	A	3.35	A	-450	A	0.87	A		
8/23/2009	823	A	3.87	A	42	A	3.25	A	-23	A	0.69	A		
8/24/2009	760	A	3.71	A	41	A	3.22	A	147	A	0.81	A		
8/25/2009	701	A	3.5	A	36	A	3.1	A	166	A	0.81	A		
8/26/2009	657	A	3.42	A	32	A	3	A	-249	A	0.93	A		
8/27/2009	730	A	3.61	A	30	A	2.93	A	-373	A	1.12	A		
8/28/2009	738	A	3.73	A	42	A	3.25	A	-155	A	1.36	A		
8/29/2009	696	A	3.57	A	60	A	3.65	A	42	A	1.08	A		
8/30/2009	653	A	3.38	A	63	A	3.71	A	152	A	0.96	A		
8/31/2009	629	A	3.34	A	52	A	3.47	A	223	A	0.91	A		
9/1/2009	612	A	3.28	A	44	A	3.31	A	68	A	0.96	A		
9/2/2009	629	A	3.39	A	40	A	3.21	A	83	A	1.17	A		
9/3/2009	610	A	3.36	A	43	A	3.28	A	96	A	1.17	A	14.8	A
9/4/2009	617	A	3.46	A	51	A	3.47	A	28	A	1.3	A	13.3	A
9/5/2009	600	A	3.45	A	50	A	3.44	A	28	A	1.28	A	11.1	A
9/6/2009	580	A	3.36	A	41	A	3.24	A	-96	A	1.18	A	9.4	A
9/7/2009	578	A	3.27	A	32	A	2.99	A	-117	A	1.06	A	10.1	A
9/8/2009	569	A	3.23	A	25	A	2.8	A	-36	A	1.11	A	11.9	A
9/9/2009	564	A	3.25	A	20	A	2.65	A	-22	A	1.2	A	12.5	A
9/10/2009	557	A	3.23	A	16	A	2.53	A	-455	A	1.6	A	13.6	A
9/11/2009	555	A	3.22	A	13	A	2.42	A	-142	A	1.5	A	14.3	A
9/12/2009	609	A	3.5	A	13	A	2.41	A	-317	A	1.81	A	14.7	A
9/13/2009	637	A	3.56	A	19	A	2.57	A	-436	A	1.56	A	15.6	A
9/14/2009	624	A	3.54	A	21	A	2.61	A	-293	A	1.62	A	14	A

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9/15/2009	642	A	3.75	A	34	A	2.95	A	-248	A	1.91	A	10.7	A
9/16/2009	645	A	3.84	A	50	A	3.32	A	-222	A	1.81	A	10.6	A
9/17/2009	709	A	4.03	A	67	A	3.65	A	-60	A	2.01	A	8.9	A
9/18/2009	765	A	4.12	A	103	A	4.22	A	20	A	1.8	A	6.4	A
9/19/2009	807	A	4.14	A	129	A	4.62	A	-75	A	1.65	A	6.2	A
9/20/2009	833	A	4.18	A	122	A	4.49	A	-117	A	1.66	A	5.6	A
9/21/2009	838	A	4.15	A	104	A	4.21	A	-140	A	1.6	A	5.3	A
9/22/2009	818	A	4.05	A	86	A	3.94	A	-67	A	1.5	A	5.1	A
9/23/2009	791	A	3.92	A	67	A	3.62	A	-89	A	1.38	A	5.7	A
9/24/2009	758	A	3.88	A	53	A	3.36	A	-139	A	1.55	A	7	A
9/25/2009	754	A	3.83	A	44	A	3.16	A	9	A	1.43	A	8.6	A
9/26/2009	724	A	3.72	A	39	A	3.05	A	86	A	1.34	A	9.1	A
9/27/2009	713	A	3.66	A	37	A	3	A	-34	A	1.08	A	12	A
9/28/2009	703	A	3.66	A	32	A	2.93	A	-728	A	1.11	A	20.7	A
9/29/2009	771	A	3.71	A	22	A	2.74	A	-513	A	0.7	A	21.2	A
9/30/2009	767	A	3.69	A	21	A	2.59	A	-522	A	0.7	A	19.3	A
10/1/2009	768	A	3.83	A	17	A	2.47	A	-706	A	0.97	A	21.2	A
10/2/2009	784	A	3.96	A	17	A	2.47	A	-683	A	1.13	A	20.1	A
10/3/2009	787	A	4.01	A	15	A	2.41	A	-822	A	1.02	A	20.7	A
10/4/2009	788	A	3.99	A	16	A	2.47	A	-885	A	1.07	A	20.3	A
10/5/2009	812	A	4.1	A	14	Ae			-855	A	1.15	A	20.7	A
10/6/2009	814	A	4.03	A	12	Ae			-814	A	0.94	A	20.1	A
10/7/2009	770	A	3.99	A	13	A	2.41	A	-339	A	0.9	A	18.6	A
10/8/2009	702	A	3.68	A	14	A	2.44	A	-35	A	0.59	A	14.6	A
10/9/2009	646	A	3.59	A	15	A	2.48	A	-141	A	0.8	A	16.3	A
10/10/2009	651	A	3.57	A	12	A	2.39	A	-269	A	0.78	A	16.3	A
10/11/2009	655	A	3.4	A	15	A	2.47	A	-344	A	0.55	A	20	A
10/12/2009	699	A	3.58	A	15	A	2.45	A	-746	A	0.87	A	21.5	A
10/13/2009	727	A	3.55	A	12	A	2.38	A	-680	A	0.54	A	21.6	A
10/14/2009	722	A	3.69	A	18	A	2.56	A	-736	A	0.92	A	19.9	A
10/15/2009	742	A	3.84	A	25	Ae			-961	A	1.04	A	19.2	A
10/16/2009	791	A	3.95	A	36	A	3.04	A	-558	A	0.87	A	18.4	A
10/17/2009	729	A	3.4	A	55	A	3.51	A	515	A	-0.43	A	9.8	A
10/18/2009	575	A	2.81	A	65	A	3.7	A	729	A	-1.02	A	3.9	A
10/19/2009	539	A	2.83	A	68	A	3.77	A	159	A	-0.15	A	11.2	A
10/20/2009	587	A	3.12	A	65	A	3.7	A	-453	A	0.33	A	17.6	A
10/21/2009	654	A	3.39	A	54	A	3.49	A	-1060	A	0.8	A	19.6	A

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10/22/2009	723	A	3.71	A	43	A	3.24	A	-1230	A	1.28	A	21.3	A
10/23/2009	798	A	4.01	A	35	A	3.03	A	-1330	A	1.58	A	22.7	A
10/24/2009	862	A	3.92	A	31	A	2.92	A	-1020	A	0.73	A	22.7	A
10/25/2009	833	A	3.63	A	28	A	2.83	A	-632	A	0.27	A	22.5	A
10/26/2009	797	A	3.58	A	25	A	2.76	A	-690	A	0.48	A	23.1	A
10/27/2009	819	A	3.9	A	23	A	2.69	A	-1400	A	1.47	A	25.1	A
10/28/2009	891	A	3.98	A	22	A	2.68	A	-1030	A	0.91	A	25.1	A
10/29/2009	884	A	3.85	A	24	A	2.73	A	-1010	A	0.6	A	25.3	A
10/30/2009	873	A	4	A	29	A	2.87	A	-1260	A	0.96	A	25.1	A
10/31/2009	879	A	4.13	A	30	A	2.88	A	-910	A	0.98	A	25.2	A
11/1/2009	844	A	3.74	A	29	A	2.87	A	-549	A	-0.04	A	22.9	A
11/2/2009	742	A	3.54	A	27	A	2.81	A	-395	A	0.1	A	18.9	A
11/3/2009	652	A	3.29	A	24	A	2.74	A	-45	A	-0.12	A	15.1	A
11/4/2009	594	A	3.18	A	20	A	2.63	A	-171	A	-0.15	A	15.1	A
11/5/2009	554	A	2.98	A	19	A	2.58	A	12	A	-0.51	A	14.7	A
11/6/2009	514	A	2.82	A	16	A	2.51	A	-140	A	-0.46	A	16.8	A
11/7/2009	527	A	3	A	15	A	2.47	A	-868	A	0.17	A	18.2	A
11/8/2009	582	A	3.25	A	13	A	2.37	A	-1100	A	0.48	A	19.1	A
11/9/2009	622	A	3.59	A	13	A	2.39	A	-1810	A	1.28	A		
11/10/2009	762	A	4.65	A	14	Ae			-1540	A	2.69	A		
11/11/2009	900	A	4.17	A	30	Ae			-631	A	0.43	A		
11/12/2009	768	A	3.42	A	46	A	3.31	A	-277	A	-0.65	A		
11/13/2009	689	A	3.36	A	58	A	3.56	A	-618	A	-0.11	A		
11/14/2009	701	A	3.47	A	59	A	3.58	A	-1240	A	0.15	A		
11/15/2009	733	A	3.65	A	55	A	3.49	A	-1000	A	0.28	A		
11/16/2009	751	A	3.69	A	46	A	3.3	A	-1070	A	0.28	A		
11/17/2009	770	A	3.79	A	37	A	3.09	A	-1220	A	0.5	A		
11/18/2009	777	A	3.81	A	32	A	2.96	A	-973	A	0.29	A		
11/19/2009	773	A	3.66	A	30	A	2.88	A	-887	A	-0.01	A	23.3	A
11/20/2009	768	A	3.57	A	27	A	2.8	A	-944	A	0.03	A	22.4	A
11/21/2009	781	A	3.7	A	23	A	2.71	A	-1190	A	0.46	A	23	A
11/22/2009	826	A	4.05	A	28	A	2.84	A	-1430	A	1.26	A	23.9	A
11/23/2009	859	A	3.85	A	34	A	3	A	-1260	A	0.36	A	24.5	A
11/24/2009	853	A	3.71	A	40	A	3.16	A	-1050	A	0.06	A	24.7	A
11/25/2009	855	A	3.7	A	42	A	3.21	A	-983	A	0.11	A	24.5	A
11/26/2009	852	A	3.72	A	42	A	3.2	A	-800	A	-0.06	A	24.5	A
11/27/2009	836	A	3.54	A	40	A	3.16	A	-672	A	-0.86	A	24	A

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11/28/2009	825	A	3.61	A	36	A	3.06	A	-1150	A	-0.18	A	24.4	A
11/29/2009	827	A	3.79	A	32	A	2.95	A	-1370	A	0.31	A	24.8	A
11/30/2009	853	A	3.95	A	29	A	2.86	A	-1400	A	0.53	A	25.3	A
12/1/2009	890	A	3.99	A	24	Ae			-1370	A	0.4	A	25.6	A
12/2/2009	1000	A	4.67	A	338	Ae			-1640	A	1.69	A	24.6	A
12/3/2009	1150	A	4.67	A	1120	A	11.24	A	-559	A	0.26	A	22.4	A
12/4/2009	1310	A	4.59	A	1780	A	13.39	A	-26	A	-0.33	A	21.8	A
12/5/2009	1360	A	4.69	A	1430	A	12.44	A	1400	A	-0.67	A	10.9	A
12/6/2009	1210	A	4.36	A	1020	A	11.12	A	2110	A	-0.69	A	3.2	A
12/7/2009	1130	A	4.25	A	699	A	9.86	A	1810	A	-0.27	A	5.1	A
12/8/2009	1060	A	4.18	A	522	A	8.79	A	1320	A	0.28	A	5.5	A
12/9/2009	1030	A	4.3	A	424	A	7.96	A	1090	A	0.94	A	8	A
12/10/2009	983	A	3.98	A	362	A	7.41	A	1820	A	-0.26	A	3.7	A
12/11/2009	869	A	3.65	A	354	A	7.33	A	1440	A	-0.83	A	3.1	A
12/12/2009	884	A	3.77	A	673	Ae			1200	A	-0.19	A	4.3	A
12/13/2009	949	A	4.03	A	872	A	10.53	A	1230	A	0.22	A	6.6	A
12/14/2009	997	A	4.13	A	1190	A	11.73	A	1310	A	0.08	A	5.1	A
12/15/2009	1020	A	4.19	A	997	A	11.06	A	1600	A	-0.1	A	3.8	A
12/16/2009	988	A	4.03	A	745	A	10.06	A	1460	A	-0.65	A	2.8	A
12/17/2009	940	A	3.87	A	551	A	9.01	A	1450	A	-0.5	A	2.3	A
12/18/2009	965	A	4.29	A	494	A	8.56	A	1100	A	0.9	A	5.5	A
12/19/2009	982	A	4.01	A	534	A	8.89	A	1830	A	-0.9	A	1.9	A
12/20/2009	915	A	3.77	A	525	A	8.82	A	1720	A	-1.07	A	1.7	A
12/21/2009	888	A	3.76	A	462	A	8.3	A	1550	A	-0.56	A	2.1	A
12/22/2009	866	A	3.82	A	392	A	7.68	A	1480	A	-0.07	A	5.4	A
12/23/2009	851	A	3.93	A	331	A	7.12	A	985	A	0.57	A	11.5	A
12/24/2009	911	A	4.18	A	325	A	7.05	A	390	A	1.4	A	14.6	A
12/25/2009	1040	A	4.6	A	313	A	6.94	A	527	A	1.17	A	16.6	A
12/26/2009	992	A	4.15	A	342	A	7.22	A	1550	A	-0.23	A	9.3	A
12/27/2009	864	A	3.92	A	357	A	7.36	A	1500	A	-0.15	A	8.8	A
12/28/2009	853	A	3.78	A	322	A	7.03	A	1820	A	-0.73	A	5	A
12/29/2009	761	A	3.51	A	279	A	6.59	A	1380	A	-0.87	A	4.6	A
12/30/2009	760	A	3.66	A	241	A	6.19	A	1030	A	-0.09	A	9.1	A
12/31/2009	797	A	3.94	A	210	Ae			639	A	0.32	A	9.9	A
1/1/2010	805	A	3.87	A	185	A:e			1180	A	-0.57	A	6.6	A
1/2/2010	702	A	3.3	A	166	A	5.27	A	1530	A	-1.44	A	3.2	A
1/3/2010	656	A	3.26	A	151	A	5.06	A	1130	A	-0.74	A	5	A

Date	Wakulla Springs, Discharge (cfs)	Data Value[1]	Wakulla Springs, Gage (ft)	Data Value[1]	Lost Creek, Discharge (cfs)	Data Value[1]	Lost Creek, Gage (ft)	Data Value[1]	Spring Creek, (cfs)	Data Value[1]	Spring Creek, Gage (ft)	Data Value[1]	Spring Creek, Salinity, (ppt)	Data Value[1]
1/4/2010	634	A	3.23	A	138	A	4.86	A	1150	A	-0.68	A	5.9	A
1/5/2010	605	A	3.04	A	125	A	4.68	A	1370	A	-1.25	A	2.7	A
1/6/2010	575	A	2.94	A	115	A	4.51	A	1100	A	-1.09	A	3.9	A
1/7/2010	563	A	3.08	A	104	A	4.35	A	863	A	-0.21	A	9.8	A
1/8/2010	639	A	3.23	A	96	A	4.23	A	1250	A	-0.73	A	9.9	A
1/9/2010	602	A	3.02	A	91	A	4.16	A	1680	A	-1.38	A	4.8	A
1/10/2010	541	A	2.75	A	87	A	4.08	A	1340	A	-1.85	A	1.9	A
1/11/2010	511	A	2.71	A	81	A	3.99	A	1120	A	-1.27	A	3.2	A
1/12/2010	537	A	2.96	A	76	A	3.91	A	935	A	-0.81	A	10.8	A
1/13/2010	546	A	2.96	A	72	A	3.83	A	983	A	-0.86	A	9.8	A
1/14/2010	556	A	3.11	A	68	A	3.75	A	737	A	-0.52	A	12.9	A
1/15/2010	588	A	3.26	A	64	A	3.68	A	300	A	-0.26	A	15.7	A
1/16/2010	658	A	3.74	A	100	A:e			-328	A	0.73	A	16	A
1/17/2010	777	A	4.28	A	338	A:e			46	A	0.64	A	17.4	A
1/18/2010	773	A	3.77	A	422	A	7.95	A	1190	A	-0.6	A	10.1	A
1/19/2010	680	A	3.55	A	429	A	8.01	A	1200	A	-0.35	A	5	A
1/20/2010	634	A	3.48	A	367	A	7.45	A	1140	A	-0.07	A	5.6	A
1/21/2010	790	A	4.23	A	788	A	9.6	A	1620	A	0.99	A	6	A
1/22/2010	1050	A	4.6	A	2070	A	14.05	A	2020	A	0.24	A	2.2	A
1/23/2010	1230	A	4.95	A	2060	A	14.04	A	2160	A	0.38	A	2.2	A
1/24/2010	1320	A	5.31	A	1560	A	12.81	A	1860	A	1.24	A	2.8	A
1/25/2010	1390	A	5.38	A	1090	A	11.36	A	2210	A	0.18	A	1.2	A
1/26/2010	1300	A	4.98	A	738	A	10.03	A	1910	A	-0.74	A	1.3	A
1/27/2010	1220	A	4.81	A	532	A	8.87	A	1720	A	-0.56	A	1.9	A
1/28/2010	1150	A	4.68	A	419	A	7.93	A	1710	A	-0.45	A	2.5	A
1/29/2010	1090	A	4.68	A	369	A:e			958	A	0.25	A	4.5	A
1/30/2010	1100	A	4.9	A	345	A:e			1240	A	0.47	A	5.2	A
1/31/2010	1020	A	4.41	A	322	A	7.05	A	1650	A	-0.81	A	1.7	A
2/1/2010	947	A	4.25	A	307	A	6.97	A	1400	A	-0.31	A	2.3	A
2/2/2010	937	A	4.26	A	286	A:e			1260	A	-0.29	A	3	A
2/3/2010	883	A	4.04	A	265	A	6.48	A	1310	A	-0.68	A	2.2	A
2/4/2010	858	A	4.05	A	238	A	6.18	A	1060	A	0.15	A	2.7	A
2/5/2010	894	A	4.52	A	307	A	6.87	A	904	A	1.15	A	5.5	A
2/6/2010	955	A	4.27	A	530	A	8.84	A	1480	A	-0.79	A	2	A
2/7/2010	913	A	4.05	A	668	A	9.73	A	1400	A	-1.07	A	1.7	A
2/8/2010	917	A	4.14	A	579	A	9.24	A	1770	A	-0.37	A	3.4	A
2/9/2010	927	A	4.29	A	489	A	8.55	A	1410	A	0.16	A	3.8	A

Date	Wakulla Springs, Discharge (cfs)	Data Value[1]	Wakulla Springs, Gage (ft)	Data Value[1]	Lost Creek, Discharge (cfs)	Data Value[1]	Lost Creek, Gage (ft)	Data Value[1]	Spring Creek, (cfs)	Data Value[1]	Spring Creek, Gage (ft)	Data Value[1]	Spring Creek, Salinity, (ppt)	Data Value[1]
2/10/2010	939	A	4.11	A	436	A	8.11	A	1730	A	-1.6	A	1.7	A
2/11/2010	863	A	3.94	A	377	A	7.6	A	1550	A	-1.13	A	1.7	A
2/12/2010	906	A	4.17	A	369	A	7.52	A	1460	A	-0.2	A	3.3	A
2/13/2010	926	A	4.12	A	479	A	8.47	A	1640	A	-1.11	A	2.2	A
2/14/2010	918	A	4.11	A	527	A	8.85	A	1410	A	-0.45	A	1.5	A
2/15/2010	919	A	4.32	A	476	A	8.45	A	928	A	0.2	A	3.1	A
2/16/2010	907	A	4.14	A	402	A	7.83	A	1380	A	-0.7	A	2.3	A
2/17/2010	865	A	4	A	329	A	7.17	A	1210	A	-0.71	A	1.7	A
2/18/2010	839	A	3.89	A	271	A	6.58	A	1170	A	-0.88	A	2.1	A
2/19/2010	820	A	3.9	A	230	A	6.13	A	1110	A	-0.36	A	2.3	A
2/20/2010	809	A	3.88	A	195	A	5.71	A	1240	A	-0.24	A	3.4	A
2/21/2010	782	A	3.85	A	168	A	5.37	A	1160	A	-0.05	A	6.9	A
2/22/2010	793	A	4.09	A	150	A:e			921	A	0.69	A	10.1	A
2/23/2010	825	A	4.09	A	215	A:e			1370	A	0.12	A	10	A
2/24/2010	828	A	3.88	A	269	A	6.58	A	1560	A	-0.71	A	3	A
2/25/2010	767	A	3.6	A	228	A	6.12	A	1350	A	-1.61	A	1.9	A
2/26/2010	733	A	3.65	A	205	A	5.85	A	1070	A	-0.48	A	3.9	A
2/27/2010	735	A	3.78	A	179	A	5.52	A	954	A	-0.36	A	4.9	A
2/28/2010	735	A	3.7	A	154	A	5.2	A	1010	A	-0.82	A	4.9	A
3/1/2010	700	A	3.72	A	135	A	4.92	A	773	A	-0.01	A	5.4	A
3/2/2010	766	A	4.28	A	186	A	5.62	A	548	A	0.66	A	9.1	A
3/3/2010	769	A	3.65	A	206	A	5.88	A	1400	A	-1.57	A	2.4	A
3/4/2010	682	A	3.36	A	212	A	5.95	A	1210	A	-1.46	A	1.8	A
3/5/2010	640	A	3.35	A	190	A	5.68	A	1060	A	-0.97	A	3.9	A
3/6/2010	645	A	3.34	A	166	A	5.38	A	1330	A	-0.86	A	3.5	A
3/7/2010	633	A	3.32	A	143	A	5.05	A	1540	A	-0.64	A	4.5	A
3/8/2010	635	A	3.34	A	123	A	4.76	A	1570	A	-0.41	A	8	A
3/9/2010	619	A	3.38	A	108	A	4.52	A	1160	A	-0.1	A	10.5	A
3/10/2010	618	A	3.55	A	94	A	4.31	A	690	A	0.33	A	11.2	A
3/11/2010	790	A	4.33	A	424	A:e			914	A	0.89	A	10.6	A
3/12/2010	853	A	4.53	A	711	A	9.91	A	1240	A	0.74	A	6.3	A
3/13/2010	1000	A	4.64	A	774	A	10.2	A	1560	A	-0.11	A	3.4	A
3/14/2010	980	A	4.56	A	642	A	9.59	A	1490	A	-0.42	A	2.1	A
3/15/2010	969	A	4.48	A	509	A	8.72	A	1510	A	-0.69	A	1.6	A
3/16/2010	933	A	4.31	A	392	A	7.75	A	1390	A	-0.92	A	1.5	A
3/17/2010	903	A	4.31	A	316	A:e			1240	A	-0.49	A	2.5	A
3/18/2010	881	A	4.21	A	259	A:e			1280	A	-0.76	A	2.7	A

Date	Wakulla Springs, Discharge (cfs)	Data Value[1]	Wakulla Springs, Gage (ft)	Data Value[1]	Lost Creek, Discharge (cfs)	Data Value[1]	Lost Creek, Gage (ft)	Data Value[1]	Spring Creek, (cfs)	Data Value[1]	Spring Creek, Gage (ft)	Data Value[1]	Spring Creek, Salinity, (ppt)	Data Value[1]
3/19/2010	871	A	4.17	A	215	A	5.96	A	1140	A	-0.32	A	3.3	A
3/20/2010	842	A	4.16	A	184	A	5.57	A	1070	A	-0.03	A	5.2	A
3/21/2010	827	A	4.36	A	160	A	5.26	A	788	A	0.84	A	7.6	A
3/22/2010	860	A	4.18	A	144	A	5.03	A	1500	A	-0.23	A	4.3	A
3/23/2010	782	A	3.85	A	129	A	4.81	A	1390	A	-0.68	A	2.9	A
3/24/2010	746	A	3.75	A	115	A	4.58	A	1320	A	-0.5	A	5.5	A
3/25/2010	733	A	3.84	A	103	A	4.4	A	838	A	0.1	A	6.3	A
3/26/2010	759	A	3.96	A	142	A	4.99	A	1200	A	0.01	A	5.9	A
3/27/2010	724	A	3.79	A	159	A	5.24	A	925	A	-0.22	A	5	A
3/28/2010	689	A	3.94	A	153	A	5.16	A	706	A	0.38	A	4.7	A
3/29/2010	713	A	3.95	A	136	A	4.91	A	1050	A	-0.32	A	5.3	A
3/30/2010	656	A	3.55	A	119	A	4.64	A	1090	A	-0.76	A	3.6	A
3/31/2010	618	A	3.54	A	101	A	4.36	A	1040	A	-0.45	A	3.6	A

Data from USGS Water for the Nation/Surface Water - Historical observations http:Waterdata.usgs.gov/nwis/uv/?referred_modual=sw.

Mean discharge (cfs) and gage (ft) for Wakulla Springs, Lost Creek, and Spring Creek Springs.

Applicable datums: Wakulla Springs (0.0 ft, NGVD29), Lost Creek (11.08 ft, NGVD29) and Spring Creek (0.0 ft, NAVD88).

Black cell denotes data not available.

1 A Approved for publication -- Processing and review completed.
< Actual value is known to be less than reported value.
e Value has been estimated.

APPENDIX C

WATER LEVEL ELEVATIONS AT KARST WINDOW STATIONS ALONG A NORTH-SOUTH TRANSECT

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
12/10/08	15.97	7.14												
12/11/08	15.89	7.23												
12/12/08	16.02	7.15												
12/13/08	15.99	6.81												
12/14/08	15.97	6.80												
12/15/08	15.97	6.81												
12/16/08	15.95	6.80	15.98	6.13			15.87	4.83					15.88	4.23
12/17/08	15.93	6.76	15.99	6.17			15.85	4.80					15.86	4.20
12/18/08	15.92	6.69	15.98	6.10	16.09	5.68	15.84	4.72					15.81	4.05
12/19/08	15.86	6.63	15.92	6.05	16.05	5.67	15.78	4.66					15.74	3.95
12/20/08	15.78	6.59	15.85	6.02	15.98	5.65	15.70	4.64					15.67	3.94
12/21/08	15.73	6.53	15.81	5.98	15.93	5.59	15.65	4.55					15.46	3.50
12/22/08	15.82	6.36	15.90	5.82	16.03	5.44	15.71	4.32					15.24	2.62
12/23/08	15.81	6.26	15.90	5.75	16.04	5.40	15.73	4.31					15.50	3.15
12/24/08	15.86	6.50	15.98	6.06	16.13	5.74	15.90	4.83					16.37	5.30
12/25/08	15.92	6.68	16.05	6.25	16.19	5.91	15.98	5.04					16.51	5.64
12/26/08	15.94	6.72	16.08	6.30	16.22	5.96	16.01	5.09					16.53	5.67
12/27/08	15.92	6.70	16.06	6.30	16.20	5.96	15.99	5.10					16.51	5.66
12/28/08	15.88	6.64	16.02	6.24	16.15	5.89	15.93	4.99					16.24	5.09
12/29/08	15.79	6.48	15.93	6.07	16.07	5.72	15.81	4.75					15.88	4.30
12/30/08	15.70	6.30	15.84	5.90	15.99	5.56	15.71	4.55					15.65	3.79
12/31/08	15.63	6.24	15.77	5.85	15.92	5.52	15.64	4.50					15.59	3.75
1/1/09	15.61	6.04	15.76	5.66	15.90	5.32	15.60	4.23					15.29	2.90
1/2/09	15.61	6.19	15.78	5.85	15.94	5.56	15.69	4.60					16.03	4.76
1/3/09	15.70	6.37	15.87	6.06	16.04	5.77	15.82	4.88					16.38	5.55
1/4/09	15.76	6.48	15.94	6.17	16.10	5.87	15.89	5.00					16.47	5.72
1/5/09	15.75	6.49	15.93	6.18	16.08	5.86	15.86	4.97					16.35	5.47
1/6/09	15.61	6.40	15.78	6.08	15.93	5.75	15.69	4.81					15.93	4.75

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
1/7/09	15.53	6.34	15.70	6.02	15.85	5.69	15.59	4.72					15.74	4.44
1/8/09	15.51	6.07	15.67	5.73	15.82	5.40	15.53	4.34					15.32	3.24
1/9/09	15.56	5.95	15.72	5.61	15.87	5.29	15.57	4.20					15.31	2.99
1/10/09	15.59	6.04	15.77	5.72	15.93	5.42	15.65	4.41					15.75	4.02
1/11/09	15.56	6.09	15.74	5.78	15.90	5.48	15.63	4.49					15.78	4.20
1/12/09	15.56	5.95	15.73	5.62	15.89	5.31	15.60	4.26					15.47	3.35
1/13/09	15.54	6.02	15.73	5.72	15.89	5.43	15.63	4.45					15.85	4.34
1/14/09	15.57	5.88	15.74	5.56	15.90	5.25	15.59	4.17					15.35	2.99
1/15/09	15.57	5.74	15.74	5.41	15.90	5.11	15.58	4.00					15.26	2.63
1/16/09	15.59	5.60	15.76	5.26	15.91	4.95	15.58	3.80					15.12	2.11
1/17/09	15.52	5.55	15.69	5.22	15.85	4.93	15.52	3.79					15.15	2.30
1/18/09	15.37	5.72	15.55	5.41	15.72	5.14	15.43	4.08					15.39	3.37
1/19/09	15.33	5.85	15.52	5.56	15.69	5.30	15.44	4.33					15.75	4.43
1/20/09	15.38	5.82	15.56	5.50	15.72	5.20	15.42	4.14					15.21	3.02
1/21/09	15.41	5.56	15.58	5.23	15.74	4.93	15.42	3.80					15.03	2.29
1/22/09	15.42	5.54	15.60	5.22	15.77	4.94	15.45	3.83					15.19	2.60
1/23/09	15.51	5.76	15.70	5.48	15.88	5.24	15.62	4.26					15.93	4.34
1/24/09	15.54	5.94	15.73	5.65	15.91	5.41	15.67	4.46					16.03	4.69
1/25/09	15.54	5.93	15.72	5.63	15.90	5.37	15.64	4.38					15.78	4.09
1/26/09	15.58	5.92	15.77	5.64	15.95	5.38	15.70	4.42	16.55	4.41			15.98	4.45
1/27/09	15.61	5.99	15.80	5.71	15.98	5.45	15.74	4.51	16.57	4.46			16.09	4.71
1/28/09	15.54	6.04	15.73	5.76	15.91	5.51	15.67	4.58	16.58	4.71			16.08	4.90
1/29/09	15.54	6.08	15.73	5.80	15.91	5.55	15.68	4.63	16.60	4.79			16.08	4.94
1/30/09	15.51	5.89	15.69	5.58	15.86	5.30	15.57	4.25	15.91	3.06			15.39	3.21
1/31/09	15.45	5.61	15.63	5.29	15.80	5.02	15.49	3.91	15.65	2.31			15.14	2.49
2/1/09	15.41	5.58	15.60	5.28	15.78	5.02	15.48	3.96	15.88	2.90			15.39	3.13
2/2/09	15.36	5.71	15.55	5.43	15.73	5.18	15.47	4.18	16.08	3.61			15.61	3.89
2/3/09	15.47	5.84	15.67	5.56	15.85	5.31	15.59	4.33	16.26	3.89			15.82	4.25
2/4/09	15.51	5.64	15.69	5.34	15.86	5.06	15.55	3.97	15.67	2.28			15.23	2.61
2/5/09	15.51	5.41	15.69	5.10	15.86	4.83	15.53	3.69	15.54	1.72			15.19	2.27
2/6/09	15.49	5.40	15.67	5.10	15.85	4.85	15.54	3.75	15.74	2.21			15.34	2.66
2/7/09	15.57	5.61	15.76	5.34	15.96	5.12	15.69	4.11	16.32	3.59			15.90	3.99
2/8/09	15.59	5.74	15.79	5.47	15.98	5.25	15.72	4.28	16.42	3.91			16.01	4.32
2/9/09	15.57	5.84	15.77	5.58	15.97	5.35	15.72	4.40	16.51	4.25			16.08	4.62
2/10/09	15.59	5.94	15.79	5.68	15.98	5.46	15.75	4.54	16.64	4.63			16.21	4.99

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
2/11/09	15.58	6.07	15.79	5.82	15.98	5.61	15.76	4.72	16.77	5.07			16.32	5.39
2/12/09	15.61	6.11	15.81	5.85	16.00	5.62	15.78	4.72	16.74	4.97			16.28	5.25
2/13/09	15.54	5.97	15.74	5.70	15.92	5.46	15.67	4.50	16.38	4.16			15.91	4.43
2/14/09	15.41	5.82	15.60	5.54	15.78	5.28	15.51	4.27	16.03	3.51			15.56	3.76
2/15/09	15.41	5.78	15.60	5.49	15.78	5.23	15.50	4.22	16.09	3.60			15.52	3.64
2/16/09	15.48	5.77	15.66	5.46	15.83	5.20	15.54	4.15	16.10	3.44			15.41	3.21
2/17/09	15.45	5.62	15.62	5.31	15.80	5.05	15.50	3.98	16.09	3.37			15.30	2.90
2/18/09	15.42	5.85	15.61	5.57	15.80	5.34	15.56	4.39	16.68	5.00			15.92	4.62
2/19/09	15.50	6.13	15.69	5.85	15.88	5.60	15.65	4.69	16.90	5.60			16.12	5.15
2/20/09	15.58	5.97	15.75	5.63	15.92	5.34	15.63	4.30	16.30	3.86			15.48	3.33
2/21/09	15.53	5.81	15.69	5.45	15.85	5.17	15.55	4.09	16.06	3.28			15.30	2.88
2/22/09	15.57	5.90	15.74	5.56	15.91	5.29	15.63	4.27	16.32	3.88			15.65	3.70
2/23/09	15.56	5.71	15.72	5.34	15.88	5.06	15.57	3.96	15.86	2.65			15.22	2.54
2/24/09	15.49	5.63	15.64	5.26	15.82	4.99	15.51	3.89	15.81	2.62			15.20	2.56
2/25/09	15.52	5.73	15.68	5.38	15.87	5.14	15.59	4.11	16.20	3.54			15.64	3.61
2/26/09	15.57	5.87	15.73	5.53	15.92	5.30	15.66	4.30	16.38	4.00			15.87	4.18
2/27/09	15.52	5.92	15.68	5.58	15.87	5.35	15.61	4.38	16.38	4.16			15.84	4.28
2/28/09	15.44	5.94	15.61	5.60	15.80	5.38	15.54	4.40	16.28	4.12			15.73	4.22
3/1/09	15.40	5.89	15.55	5.52	15.74	5.28	15.45	4.22	15.84	3.16			15.29	3.24
3/2/09	15.39	5.61	15.54	5.24	15.72	4.99	15.40	3.86	15.52	2.18			15.01	2.35
3/3/09	15.44	5.54	15.60	5.18	15.79	4.96	15.48	3.86	15.77	2.55			15.27	2.75
3/4/09	15.51	5.60	15.68	5.26	15.89	5.07	15.59	4.00	16.03	3.04			15.54	3.26
3/5/09	15.55	5.68	15.73	5.37	15.93	5.17	15.66	4.16	16.25	3.55			15.78	3.82
3/6/09	15.63	5.91	15.82	5.62	16.03	5.43	15.79	4.49	16.68	4.57			16.21	4.85
3/7/09	15.63	5.96	15.81	5.67	16.01	5.46	15.76	4.51	16.56	4.36			16.07	4.59
3/8/09	15.60	6.00	15.79	5.71	15.99	5.50	15.74	4.56	16.60	4.56			16.10	4.77
3/9/09	15.57	5.98	15.76	5.69	15.96	5.47	15.70	4.50	16.44	4.23			15.94	4.42
3/10/09	15.53	5.89	15.72	5.60	15.91	5.38	15.64	4.38	16.28	3.87			15.75	4.02
3/11/09	15.51	5.83	15.70	5.55	15.89	5.33	15.62	4.32	16.26	3.82			15.73	3.95
3/12/09	15.47	5.76	15.66	5.48	15.85	5.26	15.57	4.23	16.14	3.58			15.61	3.71
3/13/09	15.44	5.75	15.64	5.48	15.83	5.27	15.56	4.26	16.24	3.86			15.68	3.92
3/14/09	15.45	5.83	15.66	5.57	15.86	5.36	15.60	4.38	16.42	4.31			15.86	4.37
3/15/09	15.46	5.82	15.67	5.57	15.86	5.35	15.59	4.35	16.32	4.06			15.76	4.12
3/16/09	15.45	5.72	15.65	5.46	15.84	5.23	15.56	4.19	16.15	3.58			15.56	3.58
3/17/09	15.42	5.68	15.62	5.43	15.81	5.20	15.53	4.16	16.12	3.55			15.53	3.54

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
3/18/09	15.44	5.68	15.64	5.43	15.83	5.21	15.55	4.18	16.19	3.68			15.63	3.74
3/19/09	15.46	5.82	15.68	5.59	15.87	5.38	15.62	4.42	16.54	4.56			15.99	4.64
3/20/09	15.50	5.90	15.72	5.67	15.91	5.45	15.66	4.49	16.53	4.53			15.99	4.63
3/21/09	15.54	5.82	15.75	5.58	15.94	5.35	15.67	4.33	16.27	3.75			15.73	3.85
3/22/09	15.51	5.69	15.72	5.45	15.91	5.22	15.62	4.17	16.14	3.39			15.60	3.50
3/23/09	15.51	5.80	15.73	5.58	15.93	5.37	15.68	4.41	16.57	4.48			16.04	4.62
3/24/09	15.56	5.94	15.78	5.72	15.97	5.51	15.74	4.58	16.69	4.81			16.17	4.97
3/25/09	15.57	6.02	15.79	5.81	15.98	5.59	15.75	4.68	16.75	5.01			16.23	5.14
3/26/09	15.53	6.10	15.76	5.89	15.95	5.68	15.73	4.78	16.81	5.29			16.26	5.38
3/27/09	15.53	6.29	15.76	6.09	15.95	5.87	15.74	4.99	16.91	5.71			16.34	5.77
3/28/09	15.57	6.50	15.80	6.29	15.99	6.06	15.78	5.20	17.20	6.51			16.42	6.05
3/29/09	15.68	6.63	15.89	6.37	16.05	6.08	15.82	5.17	17.48	7.02			16.19	5.41
3/30/09	15.71	6.49	15.89	6.18	16.04	5.85	15.76	4.84	17.64	7.19			15.67	3.99
3/31/09	15.68	6.48	15.85	6.16	16.00	5.83	15.73	4.83	18.01	8.12			15.75	4.24
4/1/09	15.93	7.13	16.08	6.75	16.15	6.24	15.90	5.28	19.65	11.97			15.96	4.80
4/2/09	16.41	8.41	16.47	7.81	16.38	6.94	16.20	6.14	21.81	17.13			16.54	6.32
4/3/09	17.32	10.56	17.10	9.31	16.79	7.94	16.76	7.48	22.90	19.68			17.00	7.41
4/4/09	19.16	14.51	17.62	10.25	17.12	8.42	17.23	8.28	23.01	19.67			17.14	7.47
4/5/09	20.24	17.07	17.80	10.73	17.14	8.54	17.25	8.40	22.34	18.17			17.17	7.59
4/6/09	20.18	17.03	17.76	10.73	17.06	8.45	17.09	8.13	21.87	17.19			16.86	6.99
4/7/09	19.82	15.95	17.70	10.32	17.05	8.17	16.96	7.58	21.65	16.43			15.91	4.52
4/8/09	19.07	14.17	17.52	9.85	16.98	7.96	16.84	7.25	21.37	15.73			15.71	4.00
4/9/09	18.13	12.05	17.32	9.46	16.90	7.81	16.73	7.04	21.04	15.02			15.67	3.98
4/10/09	17.65	10.95	17.18	9.15	16.84	7.69	16.66	6.88	20.65	14.12			15.79	4.27
4/11/09	17.36	10.31	17.05	8.87	16.77	7.56	16.56	6.68	20.05	12.77			15.63	3.92
4/12/09	17.15	9.75	16.95	8.57	16.72	7.38	16.48	6.44	19.05	10.40			15.53	3.63
4/13/09	16.97	9.45	16.84	8.44	16.65	7.33	16.41	6.39	18.21	8.57			15.70	4.14
4/14/09	17.00	9.70	16.86	8.66	16.64	7.47	16.41	6.58	19.98	12.82			15.93	4.83
4/15/09	17.08	9.66	16.95	8.64	16.72	7.43	16.46	6.46	20.97	14.90			15.52	3.65
4/16/09	17.05	9.48	16.95	8.53	16.73	7.37	16.46	6.36	20.97	14.78			15.44	3.38
4/17/09	17.01	9.27	16.94	8.38	16.76	7.29	16.48	6.26	20.63	13.86			15.47	3.31
4/18/09	16.89	9.05	16.85	8.22	16.70	7.20	16.41	6.15	19.96	12.37			15.44	3.29
4/19/09	16.75	8.86	16.73	8.08	16.61	7.13	16.32	6.09	18.88	10.01			15.52	3.61
4/20/09	16.62	8.74	16.61	8.00	16.51	7.09	16.22	6.04	17.80	7.73			15.43	3.59
4/21/09	16.57	8.54	16.58	7.85	16.49	6.97	16.18	5.87	17.01	5.80			15.21	3.00

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
4/22/09	16.55	8.36	16.59	7.70	16.52	6.88	16.19	5.75	16.62	4.75			15.20	2.84
4/23/09	16.52	8.20	16.58	7.59	16.52	6.80	16.19	5.66	16.39	4.13			15.23	2.80
4/24/09	16.50	8.04	16.57	7.49	16.53	6.73	16.20	5.59	16.31	3.85			15.32	2.93
4/25/09	16.46	7.92	16.56	7.41	16.53	6.69	16.21	5.56	16.33	3.86			15.45	3.19
4/26/09	16.42	7.83	16.53	7.36	16.53	6.67	16.21	5.57	16.40	4.01			15.57	3.47
4/27/09	16.39	7.74	16.52	7.30	16.52	6.64	16.21	5.54	16.36	3.92			15.59	3.49
4/28/09	16.34	7.63	16.48	7.22	16.49	6.58	16.18	5.48	16.27	3.70			15.52	3.33
4/29/09	16.27	7.53	16.42	7.14	16.44	6.53			16.16	3.53			15.43	3.20
4/30/09	16.23	7.45	16.38	7.09	16.42	6.50			16.21	3.66			15.52	3.42
5/1/09	16.17	7.38	16.34	7.04	16.38	6.47			16.16	3.60			15.48	3.39
5/2/09	16.09	7.30	16.27	6.97	16.31	6.42			16.06	3.48			15.39	3.28
5/3/09	16.04	7.24	16.22	6.94	16.28	6.41			16.13	3.70			15.46	3.51
5/4/09	16.02	7.21	16.20	6.91	16.27	6.39			16.12	3.69			15.46	3.52
5/5/09	16.00	7.15	16.19	6.87	16.26	6.36			16.07	3.55			15.42	3.40
5/6/09	15.97	7.08	16.17	6.80	16.24	6.31			16.04	3.49			15.38	3.32
5/7/09	15.94	7.03	16.14	6.77	16.22	6.28			16.02	3.47			15.35	3.28
5/8/09	15.91	6.98	16.11	6.72	16.20	6.25			16.02	3.48			15.34	3.27
5/9/09	15.91	6.94	16.12	6.69	16.21	6.24			16.16	3.76			15.48	3.55
5/10/09	15.90	6.87	16.10	6.62	16.20	6.18			16.02	3.40			15.34	3.19
5/11/09	15.85	6.80	16.06	6.55	16.16	6.12			16.00	3.39			15.31	3.16
5/12/09	15.85	6.76	16.06	6.52	16.17	6.10			16.05	3.48			15.35	3.22
5/13/09	15.86	6.73	16.08	6.51	16.19	6.11			16.26	3.90	2.45	4.08	15.56	3.64
5/14/09	15.88	6.75	16.10	6.54	16.22	6.15			16.34	4.06	1.69	3.32	15.68	3.90
5/15/09	15.86	6.74	16.08	6.52	16.20	6.12			16.17	3.69	1.24	2.87	15.51	3.53
5/16/09	15.83	6.73	16.06	6.51	16.17	6.11			16.20	3.82	1.38	3.01	15.52	3.60
5/17/09	15.83	6.79	16.05	6.58	16.17	6.20			16.43	4.43	2.11	3.74	15.74	4.20
5/18/09	15.86	6.83	16.08	6.61	16.19	6.20			16.13	3.69	1.13	2.76	15.44	3.45
5/19/09	15.84	6.68	16.05	6.45	16.15	6.02			15.61	2.41	0.13	1.76	15.04	2.44
5/20/09	15.75	6.59	15.96	6.36	16.06	5.92			15.53	2.33	0.21	1.84	14.99	2.44
5/21/09	15.76	6.67	15.98	6.46	16.10	6.07			16.33	4.24	2.15	3.78	15.73	4.20
5/22/09	15.80	6.78	16.04	6.59	16.16	6.21			16.71	5.12	3.02	4.65	16.10	5.06
5/23/09	15.78	6.77	16.02	6.58	16.13	6.18			16.57	4.83	2.57	4.20	15.92	4.69
5/24/09	15.76	6.70	15.99	6.50	16.10	6.09			16.42	4.48	1.99	3.62	15.72	4.21
5/25/09	15.70	6.59	15.92	6.38	16.03	5.95			16.34	4.32	1.81	3.44	15.62	4.00
5/26/09	15.69	6.60	15.91	6.38	16.00	5.92			16.29	4.23	1.70	3.33	15.56	3.91

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
5/27/09	15.73	6.69	15.94	6.45	16.01	5.94			16.73	5.24	1.85	3.48	15.61	4.01
5/28/09	15.77	6.80	15.96	6.50	16.01	5.94	15.78	5.03	17.80	7.73	1.86	3.49	15.61	4.02
5/29/09	15.81	6.87	15.98	6.54	16.01	5.94	15.75	4.97	20.26	13.40	1.82	3.45	15.59	3.96
5/30/09	15.85	6.93	16.00	6.55	16.01	5.92	15.77	4.97	20.98	15.04	1.83	3.46	15.59	3.94
5/31/09	15.88	6.95	16.00	6.50	16.00	5.84	15.75	4.89	20.66	14.24	1.65	3.28	15.54	3.77
6/1/09	15.89	6.93	15.99	6.44	15.99	5.76	15.73	4.79	19.90	12.44	1.44	3.07	15.49	3.61
6/2/09	15.89	6.88	15.98	6.38	15.98	5.71	15.73	4.75	18.58	9.35	1.67	3.30	15.59	3.81
6/3/09	15.85	6.83	15.96	6.34	15.96	5.67	15.71	4.72	17.57	7.03	1.91	3.54	15.67	4.00
6/4/09	15.81	6.84	15.92	6.36	15.91	5.68	15.67	4.75	17.27	6.46	2.11	3.74	15.71	4.21
6/5/09	15.79	6.92	15.89	6.43	15.87	5.72	15.64	4.80	17.81	7.84	2.20	3.83	15.69	4.30
6/6/09	15.84	6.94	15.95	6.46	15.92	5.72	15.69	4.81	19.47	11.56	2.03	3.66	15.67	4.14
6/7/09	15.86	6.90	15.98	6.44	15.95	5.72	15.72	4.81	19.96	12.61	2.14	3.77	15.73	4.21
6/8/09	15.83	6.83	15.96	6.39	15.94	5.68	15.71	4.78	19.52	11.61	2.11	3.74	15.73	4.20
6/9/09	15.78	6.72	15.92	6.31	15.91	5.62	15.67	4.70	18.43	9.09	1.95	3.58	15.66	4.05
6/10/09	15.72	6.59	15.86	6.20	15.87	5.54	15.63	4.61	17.44	6.82	1.70	3.33	15.57	3.85
6/11/09	15.66	6.49	15.81	6.12	15.82	5.48	15.58	4.53	16.90	5.60	1.60	3.23	15.52	3.77
6/12/09	15.61	6.37	15.78	6.02	15.80	5.41	15.54	4.43	16.54	4.78	1.38	3.01	15.44	3.58
6/13/09	15.58	6.26	15.75	5.92	15.78	5.33	15.52	4.33	16.31	4.19	1.08	2.71	15.35	3.32
6/14/09	15.57	6.20	15.76	5.91	15.80	5.34	15.56	4.39	16.51	4.63	1.90	3.53	15.65	3.97
6/15/09	15.56	6.18	15.75	5.90	15.80	5.35	15.56	4.42	16.51	4.64	2.03	3.66	15.71	4.12
6/16/09	15.54	6.16	15.75	5.91	15.81	5.38	15.58	4.47	16.63	4.92	2.42	4.05	15.84	4.45
6/17/09	15.57	6.21	15.79	5.98	15.85	5.46	15.65	4.60	16.85	5.40	2.98	4.61	16.06	4.94
6/18/09	15.56	6.22	15.78	6.01	15.85	5.49	15.65	4.65	16.92	5.61	3.18	4.81	16.12	5.12
6/19/09	15.54	6.19	15.77	5.99	15.84	5.49	15.64	4.66	16.95	5.69	3.25	4.88	16.14	5.17
6/20/09	15.53	6.20	15.77	6.02	15.84	5.53	15.66	4.71	17.05	5.95	3.50	5.13	16.22	5.39
6/21/09	15.52	6.22	15.75	6.04	15.84	5.57	15.66	4.77	17.10	6.12	3.68	5.31	16.26	5.55
6/22/09	15.49	6.23	15.73	6.07	15.82	5.60	15.64	4.82	17.14	6.29	3.85	5.48	16.28	5.67
6/23/09	15.47	6.27	15.72	6.11	15.81	5.65	15.64	4.88	17.17	6.43	3.99	5.62	16.31	5.79
6/24/09	15.53	6.31	15.77	6.16	15.86	5.70	15.71	4.96	17.27	6.59	4.21	5.84	16.41	5.95
6/25/09	15.59	6.39	15.85	6.25	15.94	5.79	15.80	5.08	17.39	6.77	4.47	6.10	16.53	6.15
6/26/09	15.63	6.46	15.89	6.33	15.98	5.87	15.85	5.18	17.44	6.89	4.63	6.26	16.61	6.33
6/27/09	15.67	6.52	15.92	6.39	16.01	5.93	15.89	5.26	17.47	6.93	4.69	6.32	16.69	6.48
6/28/09	15.65	6.54	15.91	6.40	16.00	5.93	15.87	5.27	17.44	6.92	4.68	6.31	16.66	6.47
6/29/09	15.63	6.61	15.89	6.48	15.96	5.99	15.84	5.33	17.42	7.00	4.67	6.30	16.62	6.49
6/30/09	15.66	6.68	15.91	6.53	15.97	6.00	15.85	5.35	17.41	6.96	4.72	6.35	16.61	6.48

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
7/1/09	15.73	6.75	15.97	6.59	16.02	6.04	15.91	5.39	17.44	6.96	4.73	6.36	16.67	6.54
7/2/09	15.78	6.74	16.03	6.58	16.08	6.04	15.96	5.39	17.51	6.99	4.73	6.36	16.73	6.54
7/3/09	15.80	6.70	16.04	6.54	16.09	5.99	15.98	5.34	17.53	6.95	4.67	6.30	16.72	6.44
7/4/09	15.78	6.65	16.02	6.49	16.08	5.95	15.96	5.30	17.50	6.87	4.61	6.24	16.70	6.38
7/5/09	15.74	6.64	15.99	6.49	16.05	5.96	15.94	5.31	17.49	6.92	4.64	6.27	16.70	6.45
7/6/09	15.72	6.64	15.97	6.50	16.03	5.97	15.92	5.33	17.48	6.96	4.69	6.32	16.71	6.53
7/7/09	15.71	6.68	15.97	6.53	16.03	6.01	15.92	5.38	17.47	6.98	4.74	6.37	16.72	6.59
7/8/09	15.73	6.69	15.98	6.55	16.04	6.02	15.94	5.40	17.47	6.97	4.79	6.42	16.74	6.63
7/9/09	15.83	6.80	16.04	6.56	16.10	6.03	15.99	5.41	17.51	6.93	4.80	6.43	16.78	6.61
7/10/09	15.92	6.86	16.10	6.54	16.15	6.01	16.05	5.38	17.55	6.88	4.75	6.38	16.85	6.60
7/11/09	15.92	6.80	16.10	6.49	16.16	5.96	16.05	5.33	17.55	6.81	4.71	6.34	16.85	6.56
7/12/09	15.89	6.78	16.07	6.47	16.13	5.95	16.02	5.32	17.53	6.83	4.70	6.33	16.83	6.56
7/13/09	15.82	6.76	16.00	6.45	16.06	5.93	15.95	5.30	17.47	6.82	4.65	6.28	16.76	6.53
7/14/09	15.82	6.75	16.00	6.45	16.07	5.94	15.96	5.30	17.50	6.88	4.68	6.31	16.77	6.55
7/15/09	15.85	6.74	16.04	6.44	16.10	5.92	16.00	5.29	17.54	6.87	4.65	6.28	16.80	6.52
7/16/09	15.84	6.74	16.02	6.43	16.09	5.91	15.98	5.28	17.51	6.85	4.64	6.27	16.78	6.51
7/17/09	15.82	6.76	16.00	6.46	16.06	5.94	15.96	5.32	17.50	6.90	4.70	6.33	16.77	6.56
7/18/09	15.84	6.79	16.02	6.48	16.08	5.96	15.97	5.33	17.51	6.89	4.65	6.28	16.76	6.54
7/19/09	15.86	6.77	16.04	6.46	16.10	5.94	15.99	5.30	17.50	6.82	4.61	6.24	16.77	6.48
7/20/09	15.83	6.75	16.01	6.44	16.07	5.92	15.97	5.29	17.47	6.79	4.58	6.21	16.74	6.46
7/21/09	15.82	6.75	16.00	6.45	16.07	5.93	15.96	5.30	17.47	6.82	4.60	6.23	16.74	6.49
7/22/09	15.82	6.75	16.00	6.45	16.07	5.94	15.96	5.32	17.48	6.84	4.64	6.27	16.75	6.51
7/23/09	15.80	6.74	15.99	6.44	16.06	5.94	15.95	5.31	17.47	6.84	4.65	6.28	16.73	6.49
7/24/09	15.80	6.74	15.99	6.45	16.06	5.95	15.96	5.32	17.49	6.90	4.70	6.33	16.75	6.54
7/25/09	15.81	6.72	16.00	6.43	16.07	5.92	15.96	5.29	17.49	6.83	4.65	6.28	16.76	6.51
7/26/09	15.82	6.70	16.01	6.41	16.08	5.92	15.97	5.28	17.49	6.81	4.67	6.30	16.78	6.52
7/27/09	15.82	6.70	16.01	6.41	16.08	5.92	15.97	5.27	17.47	6.76	4.62	6.25	16.76	6.48
7/28/09	15.81	6.69	15.99	6.39	16.07	5.89	15.95	5.25	17.45	6.73	4.61	6.24	16.74	6.45
7/29/09	15.82	6.73	16.00	6.43	16.07	5.93	15.96	5.29	17.47	6.80	4.66	6.29	16.76	6.51
7/30/09	15.84	6.75	16.02	6.44	16.09	5.93	15.98	5.29	17.48	6.79	4.64	6.27	16.77	6.50
7/31/09	15.86	6.75	16.04	6.44	16.11	5.93	15.99	5.28	17.49	6.77	4.58	6.21	16.78	6.47
8/1/09	15.87	6.76	16.05	6.44	16.11	5.92	16.00	5.27	17.52	6.80	4.60	6.23	16.79	6.47
8/2/09	15.86	6.80	16.04	6.48	16.10	5.95	15.99	5.31	17.54	6.91	4.63	6.26	16.78	6.52
8/3/09	15.89	6.87	16.07	6.55	16.12	6.01	16.01	5.37	17.58	7.02	4.69	6.32	16.81	6.58
8/4/09	15.94	6.98	16.10	6.64	16.14	6.05	16.03	5.42	17.61	7.09	4.69	6.32	16.79	6.56

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
8/5/09	15.97	7.08	16.12	6.71	16.15	6.10	16.05	5.49	17.86	7.70	4.76	6.39	16.79	6.59
8/6/09	16.00	7.17	16.15	6.80	16.17	6.17	16.07	5.57	18.24	8.60	4.88	6.51	16.80	6.64
8/7/09	16.06	7.24	16.21	6.87	16.22	6.23	16.14	5.65	18.51	9.16	5.00	6.63	16.86	6.70
8/8/09	16.10	7.25	16.26	6.88	16.27	6.24	16.19	5.66	18.24	8.42	5.04	6.67	16.91	6.71
8/9/09	16.12	7.25	16.27	6.88	16.28	6.24	16.19	5.65	18.01	7.86	4.98	6.61	16.90	6.68
8/10/09	16.09	7.23	16.24	6.86	16.25	6.22	16.16	5.63	18.68	9.46	5.02	6.65	16.86	6.62
8/11/09	16.04	7.22	16.20	6.86	16.21	6.23	16.12	5.64	18.74	9.70	5.06	6.69	16.81	6.60
8/12/09	15.99	7.19	16.16	6.84	16.18	6.22	16.08	5.61	18.17	8.46	5.05	6.68	16.77	6.57
8/13/09	16.00	7.20	16.17	6.85	16.19	6.23	16.09	5.62	17.91	7.85	5.08	6.71	16.78	6.60
8/14/09	16.03	7.21	16.20	6.87	16.22	6.26	16.13	5.65	17.84	7.64	5.16	6.79	16.83	6.66
8/15/09	16.04	7.19	16.21	6.87	16.24	6.26	16.14	5.65	17.90	7.74	5.15	6.78	16.84	6.65
8/16/09	16.07	7.25	16.25	6.95	16.28	6.36	16.20	5.79	18.00	7.98	5.66	7.29	16.95	6.90
8/17/09	16.12	7.32	16.30	7.02	16.34	6.43	16.25	5.85	18.13	8.21	5.44	7.07	17.01	6.97
8/18/09	16.08	7.25	16.26	6.95	16.30	6.36	16.21	5.77	18.12	8.21	5.29	6.92	16.96	6.89
8/19/09	16.04	7.21	16.22	6.92	16.26	6.35	16.17	5.74	18.02	8.03	5.23	6.86	16.90	6.82
8/20/09	16.02	7.20	16.21	6.91	16.26	6.36	16.16	5.75	17.89	7.77	5.24	6.87	16.89	6.81
8/21/09	15.99	7.15	16.18	6.86	16.23	6.31	16.13	5.68	17.76	7.48	5.12	6.75	16.86	6.75
8/22/09	15.91	7.06	16.09	6.75	16.14	6.21	16.02	5.54	17.51	7.01	4.78	6.41	16.71	6.52
8/23/09	15.82	6.85	16.00	6.52	16.05	5.99	15.90	5.26	17.22	6.33	4.03	5.66	16.46	5.93
8/24/09	15.79	6.68	15.96	6.35	16.03	5.85	15.86	5.07	17.06	5.87	3.52	5.15	16.33	5.54
8/25/09	15.72	6.51	15.89	6.17	15.97	5.69	15.78	4.87	16.86	5.38	3.09	4.72	16.14	5.07
8/26/09	15.71	6.45	15.88	6.13	15.97	5.67	15.79	4.87	17.00	5.67	3.55	5.18	16.28	5.38
8/27/09	15.74	6.55	15.92	6.24	16.01	5.80	15.85	5.04	17.19	6.15	4.26	5.89	16.52	5.95
8/28/09	15.73	6.65	15.91	6.34	16.00	5.88	15.84	5.14	17.22	6.34			16.56	6.18
8/29/09	15.68	6.55	15.85	6.22	15.94	5.77	15.77	4.98	17.09	6.05			16.29	5.55
8/30/09	15.65	6.42	15.83	6.10	15.92	5.65	15.73	4.82	16.98	5.73			16.14	5.15
8/31/09	15.64	6.35	15.82	6.02	15.91	5.58	15.72	4.74	16.86	5.40	3.69	4.16	16.07	4.93
9/1/09	15.63	6.30	15.81	5.97	15.91	5.53	15.70	4.69	16.79	5.21	3.56	4.03	16.02	4.79
9/2/09	15.65	6.35	15.82	6.03	15.92	5.58	15.73	4.76	16.86	5.41	3.85	4.32	16.14	5.08
9/3/09	15.62	6.34	15.80	6.01	15.89	5.57	15.69	4.72	16.78	5.26	3.64	4.11	16.02	4.86
9/4/09	15.64	6.35	15.81	6.03	15.91	5.60	15.72	4.77	16.93	5.58	3.84	4.31	16.12	5.06
9/5/09	15.64	6.28	15.81	5.95	15.92	5.52	15.71	4.67	16.84	5.31	3.53	4.00	16.03	4.78
9/6/09	15.61	6.19	15.78	5.87	15.89	5.45	15.67	4.57	16.70	4.95	3.26	3.73	15.92	4.51
9/7/09	15.56	6.13	15.73	5.80	15.84	5.39	15.63	4.51	16.60	4.79	3.21	3.68	15.87	4.44
9/8/09	15.53	6.09	15.70	5.77	15.82	5.37	15.60	4.49	16.57	4.74	3.27	3.74	15.88	4.52

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
9/9/09	15.52	6.08	15.70	5.76	15.81	5.37	15.60	4.48	16.56	4.72	3.21	3.68	15.87	4.49
9/10/09	15.53	6.06	15.71	5.75	15.83	5.36	15.62	4.49	16.64	4.87	3.38	3.85	15.95	4.63
9/11/09	15.51	6.01	15.70	5.71	15.82	5.33	15.61	4.47	16.68	4.95	3.52	3.99	15.99	4.72
9/12/09	15.51	6.13	15.70	5.84	15.83	5.47	15.63	4.64	16.84	5.47	4.06	4.53	16.21	5.36
9/13/09	15.54	6.24	15.73	5.95	15.85	5.55	15.66	4.73	16.82	5.44	3.98	4.45	16.28	5.56
9/14/09	15.58	6.24	15.76	5.94	15.87	5.54	15.68	4.72	16.82	5.37	3.84	4.31	16.21	5.32
9/15/09	15.62	6.37	15.80	6.07	15.91	5.66	15.72	4.85	16.94	5.68	4.03	4.50	16.44	5.87
9/16/09	15.64	6.42	15.82	6.12	15.92	5.69	15.74	4.89	16.98	5.78	3.95	4.42	16.33	5.62
9/17/09	15.70	6.53	15.89	6.24	15.99	5.80	15.81	5.02	17.26	6.39	4.11	4.58	16.54	6.07
9/18/09	15.82	6.78	16.01	6.49	16.08	5.98	15.92	5.24	17.64	7.23	4.00	4.47	16.69	6.39
9/19/09	15.91	6.91	16.09	6.61	16.14	6.06	15.99	5.33	17.86	7.68	3.88	4.35	16.35	5.54
9/20/09	15.93	6.95	16.11	6.64	16.16	6.08	16.00	5.34	17.82	7.56	3.77	4.24	16.26	5.31
9/21/09	15.92	6.95	16.10	6.63	16.14	6.06	15.98	5.31	17.54	6.95	3.64	4.11	16.17	5.12
9/22/09	15.89	6.88	16.07	6.55	16.11	5.99	15.95	5.22	17.25	6.26	3.48	3.95	16.07	4.89
9/23/09	15.85	6.79	16.03	6.47	16.07	5.90	15.90	5.12	17.00	5.68	3.33	3.80	15.99	4.71
9/24/09	15.83	6.74	16.00	6.42	16.05	5.87	15.88	5.09	16.93	5.54	3.49	3.96	16.04	4.84
9/25/09	15.81	6.70	15.99	6.37	16.04	5.84	15.86	5.04	16.84	5.32	3.43	3.90	16.02	4.78
9/26/09	15.74	6.59	15.92	6.27	15.98	5.74	15.79	4.92	16.67	4.99	3.20	3.67	15.88	4.51
9/27/09	15.66	6.53	15.84	6.21	15.90	5.70	15.71	4.86	16.54	4.80	3.04	3.51	15.77	4.38
9/28/09	15.69	6.55	15.87	6.25	15.95	5.76	15.77	4.98	16.84	5.48	4.01	4.48	16.15	5.23
9/29/09	15.76	6.66	15.95	6.38	16.03	5.89	15.88	5.16	17.10	6.01	4.62	5.09	16.43	5.82
9/30/09	15.77	6.64	15.97	6.36	16.05	5.89	15.89	5.15	17.05	5.84	4.62	5.09	16.45	5.81
10/1/09	15.78	6.67	15.98	6.40	16.07	5.94	15.92	5.21	17.12	6.00	4.93	5.40	16.57	6.08
10/2/09	15.77	6.72	15.97	6.46	16.06	6.00	15.92	5.29	17.16	6.17	5.13	5.60	16.61	6.26
10/3/09	15.78	6.76	15.98	6.49	16.08	6.05	15.94	5.33	17.18	6.22	5.17	5.64	16.63	6.32
10/4/09	15.81	6.74	16.01	6.48	16.10	6.04	15.96	5.32	17.21	6.23	5.13	5.60	16.65	6.29
10/5/09	15.79	6.76	15.99	6.51	16.09	6.07	15.95	5.36	17.23	6.35	5.23	5.70	16.65	6.37
10/6/09	15.80	6.76	16.00	6.50	16.10	6.06	15.95	5.34	17.22	6.29	5.09	5.56	16.62	6.28
10/7/09	15.80	6.69	16.00	6.42	16.09	5.98	15.93	5.21	17.09	5.92	4.54	5.01	16.48	5.86
10/8/09	15.74	6.49	15.93	6.19	16.03	5.75	15.83	4.91	16.80	5.16	3.65	4.12	16.12	4.96
10/9/09	15.67	6.39	15.86	6.10	15.97	5.68	15.76	4.83	16.76	5.16	3.65	4.12	16.06	4.90
10/10/09	15.64	6.35	15.82	6.06	15.94	5.66	15.73	4.80	16.72	5.10	3.57	4.04	16.03	4.86
10/11/09	15.66	6.31	15.85	6.02	15.97	5.63	15.77	4.79	16.86	5.33	3.92	4.39	16.18	5.11
10/12/09	15.71	6.44	15.91	6.17	16.03	5.79	15.86	5.00	17.15	6.00	4.65	5.12	16.48	5.82
10/13/09	15.73	6.46	15.93	6.19	16.05	5.80	15.87	5.01	17.13	5.93	4.58	5.05	16.47	5.77

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
10/14/09	15.69	6.48	15.89	6.21	16.01	5.83	15.84	5.05	17.12	6.03	4.74	5.21	16.47	5.90
10/15/09	15.63	6.54	15.84	6.27	15.96	5.89	15.79	5.13	17.07	6.10	4.87	5.34	16.44	6.00
10/16/09	15.67	6.65	15.87	6.38	15.99	5.99	15.83	5.23	17.14	6.29	4.87	5.34	16.49	6.13
10/17/09	15.73	6.48	15.91	6.17	16.01	5.74	15.79	4.86	16.63	4.81	3.13	3.60	15.94	4.58
10/18/09	15.68	6.20	15.84	5.85	15.94	5.41	15.67	4.40	16.08	3.37	1.74	2.21	15.38	3.12
10/19/09	15.68	6.16	15.84	5.80	15.95	5.39	15.69	4.41	16.28	3.80	2.33	2.80	15.63	3.65
10/20/09	15.72	6.28	15.89	5.94	16.01	5.55	15.79	4.66	16.77	4.94	3.72	4.19	16.14	4.85
10/21/09	15.75	6.42	15.92	6.10	16.05	5.71	15.86	4.89	17.02	5.60	4.53	5.00	16.44	5.61
10/22/09	15.77	6.60	15.94	6.28	16.06	5.89	15.89	5.12	17.15	6.05	5.05	5.52	16.57	6.07
10/23/09	15.78	6.80	15.96	6.48	16.07	6.09	15.92	5.36	17.25	6.45	5.44	5.91	16.64	6.40
10/24/09	15.82	6.89	15.99	6.56	16.10	6.16	15.95	5.42	17.27	6.48	5.38	5.85	16.65	6.42
10/25/09	15.85	6.82	16.02	6.49	16.13	6.08	15.97	5.32	17.22	6.24	5.21	5.68	16.66	6.29
10/26/09	15.84	6.77	16.01	6.43	16.12	6.03	15.96	5.27	17.17	6.09	5.12	5.59	16.65	6.24
10/27/09	15.80	6.84	15.98	6.53	16.11	6.15	15.96	5.42	17.26	6.44	5.50	5.97	16.70	6.51
10/28/09	15.87	6.94	16.06	6.63	16.18	6.25	16.03	5.53	17.36	6.63	5.58	6.05	16.77	6.60
10/29/09	15.91	6.93	16.09	6.63	16.21	6.24	16.07	5.52	17.42	6.66	5.56	6.03	16.80	6.58
10/30/09	15.90	6.94	16.09	6.65	16.21	6.26	16.07	5.55	17.47	6.80	5.63	6.10	16.80	6.62
10/31/09	15.89	6.99	16.08	6.71	16.20	6.32	16.06	5.62	17.48	6.91	5.68	6.15	16.80	6.70
11/1/09	15.87	6.84	16.06	6.54	16.17	6.14	16.01	5.37	17.25	6.26	4.99	5.46	16.62	6.17
11/2/09	15.82	6.66	16.00	6.35	16.12	5.97	15.93	5.15	16.98	5.59	4.44	4.91	16.44	5.70
11/3/09	15.76	6.46	15.93	6.14	16.06	5.76	15.84	4.86	16.58	4.61	3.49	3.96	16.08	4.81
11/4/09	15.74	6.33	15.92	6.01	16.05	5.65	15.82	4.74	16.55	4.45	3.39	3.86	16.05	4.64
11/5/09	15.71	6.21	15.88	5.89	16.02	5.54	15.78	4.59	16.41	4.07	2.99	3.46	15.91	4.29
11/6/09	15.67	6.10	15.84	5.79	15.98	5.44	15.73	4.48	16.33	3.89	2.89	3.36	15.86	4.15
11/7/09	15.67	6.16	15.86	5.87	16.01	5.55	15.79	4.66	16.70	4.80	3.96	4.43	16.24	5.08
11/8/09	15.71	6.30	15.91	6.02	16.06	5.71	15.86	4.88	16.95	5.40	4.57	5.04	16.49	5.70
11/9/09	15.73	6.43	15.94	6.17	16.09	5.86	15.92	5.07	17.11	5.85	5.04	5.51	16.62	6.06
11/10/09	15.78	6.82	16.00	6.60	16.16	6.30	16.02	5.59	17.40	6.78	5.96	6.43	16.85	6.87
11/11/09	15.78	6.93	15.98	6.68	16.12	6.34	15.97	5.61	17.30	6.69	5.66	6.13	16.73	6.75
11/12/09	15.75	6.75	15.95	6.48	16.07	6.10	15.90	5.33	17.16	6.24	5.10	5.57	16.54	6.17
11/13/09	15.70	6.62	15.89	6.34	16.02	5.97	15.84	5.16	17.03	5.95	4.73	5.20	16.46	5.97
11/14/09	15.74	6.62	15.94	6.35	16.07	6.00	15.90	5.21	17.17	6.18	5.03	5.50	16.59	6.19
11/15/09	15.80	6.71	16.00	6.45	16.14	6.10	15.98	5.34	17.27	6.34	5.24	5.71	16.68	6.34
11/16/09	15.82	6.73	16.02	6.47	16.16	6.11	15.99	5.36	17.25	6.29	5.28	5.75	16.69	6.35
11/17/09	15.82	6.77	16.02	6.51	16.15	6.15	16.00	5.40	17.25	6.32	5.38	5.85	16.70	6.41

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
11/18/09	15.87	6.81	16.07	6.54	16.20	6.19	16.05	5.45	17.30	6.37	5.42	5.89	16.77	6.48
11/19/09	15.89	6.78	16.09	6.51	16.22	6.15	16.06	5.40	17.31	6.31	5.33	5.80	16.75	6.38
11/20/09	15.85	6.73	16.05	6.46	16.18	6.10	16.02	5.34	17.21	6.13	5.28	5.75	16.72	6.35
11/21/09	15.85	6.79	16.04	6.52	16.18	6.18	16.03	5.44	17.27	6.32	5.51	5.98	16.76	6.50
11/22/09	15.86	6.92	16.06	6.66	16.20	6.32	16.07	5.63	17.38	6.68	5.85	6.32	16.84	6.78
11/23/09	15.94	6.96	16.14	6.70	16.27	6.33	16.13	5.63	17.45	6.69	5.72	6.19	16.87	6.71
11/24/09	15.95	6.93	16.15	6.66	16.27	6.29	16.14	5.59	17.45	6.66	5.66	6.13	16.86	6.63
11/25/09	15.91	6.93	16.11	6.66	16.24	6.29	16.10	5.59	17.43	6.67	5.66	6.13	16.82	6.64
11/26/09	15.91	6.95	16.10	6.68	16.23	6.31	16.10	5.61	17.40	6.65	5.67	6.14	16.82	6.66
11/27/09	15.94	6.88	16.13	6.60	16.26	6.24	16.12	5.52	17.38	6.45	5.53	6.00	16.82	6.51
11/28/09	15.92	6.87	16.12	6.60	16.25	6.24	16.11	5.53	17.35	6.42	5.57	6.04	16.83	6.57
11/29/09	15.93	6.90	16.12	6.64	16.26	6.28	16.12	5.59	17.38	6.51	5.71	6.18	16.87	6.69
11/30/09	15.90	6.94	16.10	6.68	16.23	6.32	16.11	5.65	17.38	6.62	5.85	6.32	16.91	6.88
12/1/09	15.90	6.98	16.11	6.72	16.24	6.36	16.11	5.69	17.41	6.70	5.87	6.34	16.91	6.90
12/2/09	15.95	7.36	16.14	7.08	16.25	6.65	16.15	6.04	18.13	8.63	6.35	6.82	17.02	7.43
12/3/09	16.32	7.98	16.47	7.61	16.48	6.97	16.42	6.43	21.17	15.43	6.52	6.99	17.20	7.62
12/4/09	16.62	8.49	16.72	7.98	16.65	7.16	16.62	6.72	22.10	17.39	6.94	7.41	17.27	7.59
12/5/09	16.76	8.87	16.75	8.13	16.65	7.23	16.58	6.68	21.94	17.08	5.70	6.17	17.18	7.44
12/6/09	16.95	9.12	16.74	7.90	16.60	6.91	16.45	6.20	21.73	16.41	3.67	4.14	16.29	5.20
12/7/09	17.05	9.41	16.65	7.75	16.50	6.75	16.33	5.98	21.45	15.82	2.97	3.44	15.84	4.21
12/8/09	16.89	9.21	16.49	7.54	16.38	6.62	16.19	5.80	21.11	15.20	2.68	3.15	15.64	3.92
12/9/09	16.64	8.89	16.33	7.44	16.25	6.60	16.07	5.78	20.73	14.58	3.04	3.51	15.72	4.35
12/10/09	16.61	8.53	16.39	7.29	16.32	6.48	16.11	5.59	20.51	13.79	2.13	2.60	15.49	3.54
12/11/09	16.58	8.14	16.42	7.05	16.37	6.27	16.13	5.32	20.03	12.36	1.46	1.93	15.33	2.87
12/12/09	16.54	8.08	16.41	7.05	16.36	6.26	16.12	5.32	19.77	11.77	1.89	2.36	15.63	3.57
12/13/09	16.60	8.40	16.45	7.34	16.37	6.47	16.16	5.61	21.33	15.58	2.61	3.08	15.84	4.26
12/14/09	16.65	8.58	16.51	7.52	16.41	6.63	16.22	5.82	21.71	16.51	2.82	3.29	15.76	4.12
12/15/09	16.67	8.60	16.52	7.54	16.43	6.65	16.24	5.83	21.62	16.30	2.63	3.10	15.69	3.95
12/16/09	16.71	8.54	16.56	7.47	16.46	6.58	16.25	5.70	21.50	15.85	2.04	2.51	15.51	3.38
12/17/09	16.65	8.46	16.48	7.35	16.38	6.46	16.15	5.53	21.21	15.24	1.83	2.30	15.38	3.12
12/18/09	16.48	8.63	16.30	7.48	16.20	6.59	15.99	5.71	20.86	14.98	2.91	3.38	15.91	4.92
12/19/09	16.58	8.68	16.39	7.52	16.28	6.58	16.03	5.63	21.01	15.14	1.68	2.15	15.39	3.52
12/20/09	16.67	8.54	16.49	7.40	16.38	6.48	16.11	5.49	21.12	15.06	1.29	1.76	15.20	2.76
12/21/09	16.66	8.40	16.50	7.29	16.41	6.42	16.14	5.42	21.00	14.65	1.54	2.01	15.32	2.91
12/22/09	16.59	8.29	16.44	7.21	16.37	6.39	16.11	5.41	20.69	14.01	1.86	2.33	15.45	3.25

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
12/23/09	16.52	8.21	16.38	7.18	16.34	6.40	16.10	5.47	20.27	13.13	2.72	3.19	15.72	3.97
12/24/09	16.45	8.25	16.34	7.29	16.32	6.57	16.15	5.79	19.93	12.55	4.67	5.14	16.45	5.86
12/25/09	16.49	8.49	16.40	7.56	16.38	6.85	16.24	6.14	20.02	12.89	5.30	5.77	16.76	6.73
12/26/09	16.56	8.37	16.47	7.43	16.43	6.67	16.24	5.85	20.36	13.39	3.48	3.95	16.15	5.03
12/27/09	16.48	8.14	16.38	7.20	16.34	6.43	16.10	5.51	20.32	13.27	2.25	2.72	15.61	3.74
12/28/09	16.45	8.02	16.36	7.09	16.32	6.34	16.07	5.38	20.12	12.74	1.84	2.31	15.54	3.53
12/29/09	16.42	7.81	16.34	6.90	16.31	6.15	16.03	5.13	19.38	10.90	1.14	1.61	15.28	2.78
12/30/09	16.39	7.76	16.33	6.88	16.32	6.19	16.07	5.24	18.87	9.72	2.46	2.93	15.76	3.89
12/31/09	16.32	7.79	16.27	6.95	16.27	6.29	16.06	5.41	18.55	9.18	3.52	3.99	16.10	4.90
1/1/10	16.30	7.74	16.25	6.91	16.25	6.25	16.02	5.32	17.99	7.90	2.58	3.05	15.78	4.16
1/2/10	16.24	7.47	16.19	6.62	16.19	5.96	15.88	4.87	16.93	5.31	0.71	1.18	15.11	2.46
1/3/10	16.16	7.33	16.13	6.52	16.14	5.89	15.84	4.80	16.77	4.98	1.06	1.53	15.19	2.69
1/4/10	16.10	7.21	16.08	6.45	16.11	5.84	15.80	4.75	16.59	4.61	1.18	1.65	15.19	2.72
1/5/10	16.08	7.09	16.07	6.32	16.10	5.73	15.78	4.60	16.28	3.79	0.67	1.14	15.06	2.33
1/6/10	16.03	6.96	16.03	6.21	16.07	5.65	15.74	4.51	16.14	3.46	0.68	1.15	15.06	2.31
1/7/10	15.98	6.91	15.99	6.20	16.05	5.67	15.75	4.60	16.37	4.06	1.74	2.21	15.40	3.18
1/8/10	16.01	7.06	16.03	6.39	16.10	5.88	15.85	4.92	16.85	5.25	3.17	3.64	15.97	4.58
1/9/10	16.02	6.90	16.04	6.21	16.11	5.70	15.81	4.63	16.25	3.68	1.45	1.92	15.40	3.06
1/10/10	16.01	6.71	16.03	6.03	16.10	5.53	15.77	4.39	15.94	2.80	0.61	1.08	15.12	2.27
1/11/10	15.97	6.59	16.00	5.93	16.08	5.45	15.75	4.31	15.97	2.85	1.04	1.51	15.19	2.41
1/12/10	15.92	6.64	15.97	6.01	16.06	5.56	15.76	4.49	16.27	3.69	1.87	2.34	15.50	3.27
1/13/10	15.93	6.62	15.98	6.01	16.08	5.56	15.78	4.50	16.29	3.70	1.97	2.44	15.55	3.36
1/14/10	15.91	6.65	15.97	6.05	16.07	5.62	15.80	4.61	16.47	4.18	2.61	3.08	15.77	3.91
1/15/10	15.91	6.71	15.98	6.14	16.09	5.72	15.85	4.79	16.80	5.01	3.67	4.14	16.13	4.81
1/16/10	15.88	6.86	15.96	6.31	16.07	5.89	15.86	5.03	17.15	6.02	4.38	4.85	16.35	5.54
1/17/10	15.99	7.35	16.06	6.80	16.14	6.32	15.97	5.55	19.12	10.82	5.24	5.71	16.60	6.38
1/18/10	16.11	7.36	16.15	6.73	16.19	6.16	15.98	5.29	20.55	13.87	3.52	3.99	16.07	4.87
1/19/10	16.06	7.22	16.08	6.53	16.11	5.95	15.86	4.97	20.78	14.37	2.27	2.74	15.53	3.59
1/20/10	15.99	7.14	16.00	6.43	16.04	5.86	15.77	4.85	20.48	13.75	2.04	2.51	15.41	3.40
1/21/10	16.14	7.77	16.11	6.97	16.09	6.26	15.86	5.36	20.87	14.95	3.38	3.85	16.36	5.88
1/22/10	16.70	9.02	16.57	7.99	16.42	6.96	16.29	6.29	22.18	17.91	4.02	4.49	17.17	7.69
1/23/10	17.12	9.81	16.90	8.56	16.65	7.33	16.58	6.79	22.35	18.13	4.64	5.11	16.78	6.63
1/24/10	17.39	10.66	16.93	8.88	16.63	7.51	16.58	7.00	21.92	17.37	4.90	5.37	16.41	6.00
1/25/10	17.85	11.65	17.02	9.02	16.68	7.56	16.59	6.97	21.66	16.71	4.05	4.52	16.19	5.43
1/26/10	17.88	11.40	17.07	8.81	16.73	7.35	16.58	6.63	21.53	16.06	2.63	3.10	15.78	4.15

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
1/27/10	17.68	10.75	17.05	8.57	16.75	7.21	16.56	6.40	21.35	15.47	2.15	2.62	15.68	3.74
1/28/10	17.40	10.09	16.93	8.27	16.68	7.03	16.47	6.17	21.04	14.73	1.88	2.35	15.58	3.48
1/29/10	17.12	9.66	16.75	8.08	16.55	6.95	16.33	6.07	20.57	13.87	2.25	2.72	15.63	3.82
1/30/10	16.91	9.48	16.61	8.05	16.44	7.00	16.25	6.17	20.31	13.56	3.06	3.53	15.93	4.82
1/31/10	16.94	9.20	16.68	7.87	16.52	6.83	16.27	5.87	20.39	13.41	1.44	1.91	15.41	3.26
2/1/10	16.84	8.92	16.63	7.69	16.48	6.69	16.23	5.72	20.16	12.84	1.63	2.10	15.42	3.24
2/2/10	16.72	8.81	16.53	7.64	16.40	6.68	16.13	5.69	19.89	12.39	1.71	2.18	15.40	3.37
2/3/10	16.69	8.61	16.52	7.49	16.41	6.56	16.12	5.53	19.56	11.48	0.79	1.26	15.26	2.90
2/4/10	16.60	8.45	16.46	7.38	16.37	6.50	16.09	5.48	19.02	10.27			15.39	3.25
2/5/10	16.48	8.58	16.34	7.52	16.26	6.66	16.00	5.69	19.15	10.98			15.77	4.54
2/6/10	16.61	8.82	16.44	7.69	16.31	6.73	16.04	5.72	20.81	14.75			15.45	3.74
2/7/10	16.73	8.83	16.54	7.68	16.40	6.68	16.12	5.65	21.27	15.56			15.22	2.96
2/8/10	16.76	8.86	16.57	7.68	16.43	6.71	16.16	5.70	21.22	15.40			15.36	3.22
2/9/10	16.72	8.93	16.51	7.72	16.38	6.76	16.12	5.78	20.98	15.04			15.47	3.65
2/10/10	16.80	8.92	16.56	7.65	16.43	6.67	16.14	5.61	20.87	14.58			15.10	2.60
2/11/10	16.76	8.85	16.51	7.55	16.39	6.60	16.09	5.53	20.59	13.94			15.07	2.56
2/12/10	16.67	8.89	16.42	7.59	16.31	6.67	16.03	5.64	20.38	13.70			15.32	3.38
2/13/10	16.79	9.00	16.52	7.66	16.40	6.72	16.11	5.67	20.86	14.66			15.19	2.93
2/14/10	16.81	8.96	16.54	7.63	16.43	6.71	16.15	5.68	21.06	15.04			15.28	3.05
2/15/10	16.75	8.95			16.40	6.75	16.14	5.77	20.94	14.89			15.48	3.62
2/16/10	16.76	8.86			16.43	6.70	16.14	5.67	20.74	14.31			15.27	3.02
2/17/10	16.71	8.74			16.40	6.62	16.10	5.56	20.31	13.30			15.18	2.81
2/18/10	16.70	8.62			16.41	6.55	16.11	5.47	19.65	11.67			15.15	2.64
2/19/10	16.66	8.51			16.40	6.51	16.10	5.43	18.69	9.46			15.26	2.87
2/20/10	16.60	8.41			16.37	6.48	16.06	5.39	17.90	7.66			15.27	2.94
2/21/10	16.50	8.28			16.31	6.45	16.01	5.37	17.42	6.65			15.35	3.22
2/22/10	16.38	8.31			16.22	6.54	15.93	5.49	17.42	6.96			15.49	3.85
2/23/10	16.42	8.39			16.26	6.62	15.98	5.58	18.92	10.41			15.51	3.88
2/24/10	16.42	8.29			16.27	6.54	15.95	5.43	19.09	10.70			15.16	2.98
2/25/10	16.45	8.14			16.31	6.42	15.96	5.25	18.42	8.94			14.99	2.39
2/26/10	16.40	8.03			16.29	6.38	15.95	5.23	17.83	7.58			15.17	2.81
2/27/10	16.31	8.00			16.22	6.39	15.90	5.27	17.44	6.86			15.25	3.15
2/28/10	16.32	7.94			16.25	6.38	15.93	5.25	17.08	5.93			15.29	3.16
3/1/10	16.27	7.83			16.23	6.33	15.91	5.23	16.91	5.56			15.42	3.47
3/2/10	16.19	8.04			16.17	6.59	15.90	5.60	17.72	7.83			15.90	4.98

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)
3/3/10	16.29	7.94			16.22	6.40	15.88	5.23	17.68	7.40			14.99	2.55
3/4/10	16.31	7.80			16.25	6.26	15.90	5.07	17.71	7.27			14.96	2.28
3/5/10	16.32	7.73			16.27	6.23	15.92	5.04	17.49	6.68			15.09	2.49
3/6/10	16.33	7.68			16.29	6.21	15.94	5.02	17.13	5.79			15.11	2.48
3/7/10	16.31	7.61			16.29	6.17	15.94	4.99	16.80	5.00			15.15	2.54
3/8/10	16.23	7.56			16.23	6.15	15.89	4.98	16.53	4.50			15.15	2.66
3/9/10	16.17	7.54			16.18	6.17	15.85	5.02	16.41	4.33			15.22	2.94
3/10/10	16.13	7.55			16.17	6.26	15.87	5.18	16.64	4.99			15.62	3.98
3/11/10	16.24	8.04			16.25	6.67	16.00	5.71	18.86	10.33			16.53	6.31
3/12/10	16.46	8.66			16.35	7.02	16.13	6.13	21.12	15.68			16.25	5.80
3/13/10	16.62	9.02			16.44	7.22	16.22	6.32	21.27	16.00			15.73	4.55
3/14/10	16.73	9.08			16.52	7.20	16.27	6.26	21.22	15.70			15.46	3.76
3/15/10	16.79	9.08			16.55	7.16	16.29	6.16	21.08	15.25			15.31	3.27
3/16/10	16.81	9.02												
3/17/10	16.78	8.99												
3/18/10	16.75	8.94												
3/19/10	16.73	8.83												
3/20/10	16.70	8.71												
3/21/10	16.58	8.64												
3/22/10	16.55	8.54												
3/23/10	16.53	8.34												
3/24/10	16.49	8.18												
3/25/10	16.38	8.11												
3/26/10	16.35	8.14												
3/27/10	16.39	8.04												
3/28/10	16.32	7.99												
3/29/10	16.25	7.99												
3/30/10	16.27	7.83												
3/31/10	16.28	7.73												

Blank cell denotes data not available.

Raw PSI measurements by the un-vented devices were corrected for local barometric pressure and then converted to a depth for a column of freshwater.
The depth of freshwater was then added to the surveyed transducer elevation to calculate the water elevations reported above.

Date	Raw PSI Sullivan Sink	Sullivan Sink Water Level Elevation (ft)	Raw PSI Turner Sink	Turner Sink Water Level Elevation (ft)	Raw PSI Wakulla Dock	Wakulla Dock Water Level Elevation (ft)	Raw PSI Revell Sink	Revell Sink Water Level Elevation (ft)	Raw PSI Lost Creek	Lost Creek Swallet Water Level Elevation (ft)	Depth (ft) of water measured at Punchbowl	Punchbowl Sink Water Level Elevation (ft)	Raw PSI measured at Tobacco	Tobacco Sink Water Level Elevation (ft)

Depth of water reported above for Punchbowl Sink was calculated and reported by a vented level logger.

No barometric adjustments required for the Punchbowl data. Depth of water was added to surveyed transducer elevation to calculate water level elevation.

APPENDIX D

DYE DETECTION RESULTS FOR THE 2008 LOST CREEK SWALLET DYE TRACE

Date-Time	Spring Creek Vent 10 (ppb)	Date-Time	Revell Sink (ppb)	Date-Time	Wakulla Main Vent (ppb)	Date-Time	Wakulla K Conduit (ppb)
6/3/2008 23:59	2.16	5/29/2008 14:00	0.00	7/7/2008 12:00	0.00	7/7/2008 20:00	0.00
6/4/2008 8:00	0.89	6/12/2008 20:00	0.00	7/7/2008 20:00	0.00	7/8/2008 4:00	0.00
6/4/2008 16:00	0.90	6/13/2008 4:00	0.00	7/8/2008 4:00	0.00	7/8/2008 12:00	0.00
6/4/2008 23:59	0.76	6/13/2008 12:00	0.00	7/8/2008 12:00	0.00	7/8/2008 20:00	0.00
6/5/2008 8:00	0.53	6/13/2008 20:00	0.00	7/8/2008 20:00	0.00	7/9/2008 4:00	0.00
6/5/2008 16:00	0.54	6/14/2008 4:00	0.00	7/9/2008 4:00	0.00	7/9/2008 12:00	0.00
6/5/2008 23:59	0.42	6/14/2008 12:00	0.00	7/9/2008 12:00	0.00	7/9/2008 20:00	0.00
6/6/2008 8:00	0.32	6/14/2008 20:00	0.00	7/9/2008 20:00	0.00	7/10/2008 4:00	0.00
6/6/2008 16:00	0.41	6/15/2008 4:00	0.00	7/10/2008 4:00	0.00	7/10/2008 12:00	0.00
6/6/2008 23:59	0.40	6/15/2008 12:00	0.00	7/10/2008 12:00	0.00	7/10/2008 20:00	0.00
6/7/2008 8:00	0.33	6/15/2008 20:00	0.00	7/10/2008 20:00	0.00	7/11/2008 4:00	0.00
6/7/2008 16:00	0.38	6/16/2008 4:00	0.00	7/11/2008 4:00	0.00	7/11/2008 12:00	0.00
6/7/2008 23:59	0.28	6/16/2008 12:00	0.00	7/11/2008 12:00	0.00	7/11/2008 20:00	0.00
6/8/2008 8:00	0.27	6/16/2008 20:00	0.00	7/11/2008 20:00	0.00	7/12/2008 4:00	0.00
6/8/2008 16:00	0.30	6/17/2008 4:00	0.00	7/12/2008 4:00	0.00	7/12/2008 12:00	0.00
6/8/2008 23:59	0.24	6/17/2008 12:00	0.00	7/12/2008 12:00	0.00	7/12/2008 20:00	0.00
6/9/2008 8:00	0.19	6/17/2008 20:00	0.00	7/12/2008 20:00	0.00	7/13/2008 4:00	0.00
6/9/2008 10:00	0.03	6/18/2008 4:00	0.00	7/13/2008 4:00	0.00	7/13/2008 12:00	0.00
6/9/2008 16:00	0.40	6/18/2008 20:00	0.00	7/13/2008 12:00	0.00	7/13/2008 20:00	0.02
6/9/2008 23:59	0.29	6/19/2008 4:00	0.00	7/13/2008 20:00	0.02	7/14/2008 4:00	0.01
6/10/2008 8:00	0.24	6/19/2008 12:00	0.00	7/14/2008 4:00	0.02	7/14/2008 12:00	0.02
6/10/2008 16:00	0.25	6/26/2008 16:00	0.12	7/14/2008 12:00	0.02	7/17/2008 16:00	0.03
6/10/2008 23:59	0.21	6/26/2008 23:59	0.13	7/14/2008 20:00	0.02	7/17/2008 23:59	0.03
6/11/2008 8:00	0.15	6/27/2008 8:00	0.11	7/15/2008 4:00	0.02	7/18/2008 8:00	0.03
6/11/2008 16:00	0.16	6/27/2008 16:00	0.12	7/16/2008 12:00	0.03	7/18/2008 16:00	0.03
6/11/2008 23:59	0.13	6/27/2008 23:59	0.11	7/16/2008 20:00	0.03	7/18/2008 23:59	0.03
6/12/2008 8:00	0.14	6/28/2008 8:00	0.12	7/17/2008 4:00	0.04	7/19/2008 8:00	0.03
6/12/2008 16:00	0.15	6/28/2008 16:00	0.15	7/17/2008 12:00	0.04	7/19/2008 16:00	0.03
6/12/2008 23:59	0.12	6/28/2008 23:59	0.15	7/17/2008 20:00	0.04	7/19/2008 23:59	0.04
6/13/2008 8:00	0.12	6/29/2008 8:00	0.17	7/18/2008 4:00	0.04	7/20/2008 8:00	0.04
6/13/2008 16:00	0.13	6/29/2008 16:00	0.20	7/18/2008 12:00	0.04	7/20/2008 16:00	0.04

Date-Time	Spring Creek Vent 10 (ppb)	Date-Time	Revell Sink (ppb)	Date-Time	Wakulla Main Vent (ppb)	Date-Time	Wakulla K Conduit (ppb)
6/13/2008 23:59	0.12	6/29/2008 23:59	0.21	7/18/2008 20:00	0.04	7/20/2008 23:59	0.04
6/14/2008 8:00	0.11	6/30/2008 8:00	0.22	7/19/2008 4:00	0.05	7/21/2008 8:00	0.04
6/14/2008 16:00	0.13	6/30/2008 16:00	0.25	7/19/2008 12:00	0.04	7/21/2008 16:00	0.05
6/14/2008 23:59	0.11	6/30/2008 23:59	0.25	7/19/2008 20:00	0.05	7/21/2008 23:59	0.05
6/15/2008 8:00	0.10	7/1/2008 8:00	0.27	7/20/2008 4:00	0.06	7/22/2008 8:00	0.06
6/15/2008 16:00	0.10	7/1/2008 16:00	0.34	7/20/2008 12:00	0.05	7/22/2008 16:00	0.06
6/15/2008 23:59	0.09	7/1/2008 23:59	0.36	7/20/2008 20:00	0.06	7/22/2008 23:59	0.07
6/16/2008 8:00	0.10	7/2/2008 8:00	0.39	7/21/2008 4:00	0.06	7/23/2008 8:00	0.07
6/16/2008 16:00	0.12	7/2/2008 16:00	0.42	7/21/2008 12:00	0.06	7/23/2008 16:00	0.07
6/16/2008 23:59	0.11	7/2/2008 23:59	0.45	7/21/2008 20:00	0.08	7/23/2008 23:59	0.08
6/17/2008 8:00	0.10	7/3/2008 8:00	0.47	7/22/2008 4:00	0.43	7/24/2008 8:00	0.07
6/17/2008 16:00	0.11	7/3/2008 16:00	0.82	7/22/2008 12:00	0.08	7/24/2008 16:00	0.08
6/17/2008 23:59	0.10	7/3/2008 23:59	0.91	7/22/2008 20:00	0.09	7/24/2008 23:59	0.08
6/18/2008 8:00	0.08	7/4/2008 8:00	1.00	7/23/2008 4:00	0.09	7/25/2008 8:00	0.08
6/18/2008 16:00	0.10	7/4/2008 16:00	1.21	7/23/2008 4:00	0.09	7/25/2008 16:00	0.25
6/18/2008 23:59	0.09	7/4/2008 23:59	1.41	7/24/2008 20:00	0.18	7/25/2008 23:59	0.24
6/19/2008 8:00	0.08	7/5/2008 8:00	1.47	7/25/2008 4:00	0.17	7/26/2008 8:00	0.21
6/19/2008 16:00	0.08	7/5/2008 16:00	1.71	7/25/2008 12:00	0.18	7/26/2008 16:00	0.20
6/19/2008 23:59	0.10	7/5/2008 23:59	1.90	7/25/2008 20:00	0.17	7/26/2008 23:59	0.18
6/20/2008 8:00	0.08	7/6/2008 8:00	1.93	7/26/2008 4:00	0.16	7/27/2008 8:00	0.18
6/20/2008 16:00	0.09	7/6/2008 16:00	2.17	7/26/2008 12:00	0.16	7/27/2008 16:00	0.17
6/20/2008 23:59	0.08	7/6/2008 23:59	2.32	7/26/2008 20:00	0.14	7/27/2008 23:59	0.16
6/21/2008 8:00	0.07	7/7/2008 8:00	2.39	7/27/2008 4:00	0.15	7/28/2008 8:00	0.15
6/21/2008 16:00	0.07	7/7/2008 16:00	2.72	7/27/2008 12:00	0.13	7/28/2008 16:00	0.15
6/21/2008 23:59	0.10	7/7/2008 23:59	2.99	7/27/2008 20:00	0.14	7/28/2008 23:59	0.13
6/22/2008 8:00	0.07	7/8/2008 8:00	3.12	7/28/2008 4:00	0.13	7/29/2008 8:00	0.14
6/22/2008 16:00	0.07	7/8/2008 16:00	3.59	7/28/2008 12:00	0.17	7/29/2008 16:00	0.14
6/22/2008 23:59	0.08	7/8/2008 23:59	3.63	7/28/2008 20:00	0.13	7/29/2008 23:59	0.15
6/23/2008 8:00	0.06	7/9/2008 8:00	3.90	7/29/2008 4:00	0.15	7/30/2008 8:00	0.14
		7/9/2008 16:00	4.15			7/30/2008 16:00	0.14
		7/9/2008 23:59	4.34			7/30/2008 23:59	0.13
		7/10/2008 8:00	4.15			7/31/2008 8:00	0.13
		7/10/2008 16:00	3.00			7/31/2008 16:00	0.14
		7/10/2008 23:59	2.88			7/31/2008 23:59	0.12
		7/11/2008 8:00	2.41			8/1/2008 8:00	0.13
		7/11/2008 16:00	2.55			8/1/2008 16:00	0.14
		7/11/2008 23:59	2.53			8/1/2008 23:59	0.14

Date-Time	Spring Creek Vent 10 (ppb)	Date-Time	Revell Sink (ppb)	Date-Time	Wakulla Main Vent (ppb)	Date-Time	Wakulla K Conduit (ppb)
		7/12/2008 8:00	2.15			8/2/2008 8:00	0.13
		7/12/2008 16:00	2.27			8/1/2008 16:00	0.15
		7/12/2008 23:59	1.68			8/1/2008 23:59	0.17
		7/13/2008 8:00	1.64			8/2/2008 8:00	0.14
		7/13/2008 16:00	1.66			8/2/2008 16:00	0.14
		7/13/2008 23:59	1.35			8/2/2008 23:59	0.17
		7/14/2008 8:00	1.30			8/3/2008 8:00	0.15
		7/14/2008 16:00	1.50			8/3/2008 16:00	0.16
		7/14/2008 23:59	1.46			8/3/2008 23:59	0.18
		7/15/2008 8:00	1.01			8/4/2008 8:00	0.15
		7/15/2008 16:00	1.28			8/4/2008 16:00	0.17
		7/15/2008 23:59	1.27			8/4/2008 23:59	0.18
		7/16/2008 8:00	1.52			8/5/2008 8:00	0.16
		7/16/2008 16:00	0.79			8/5/2008 16:00	0.17
		7/16/2008 23:59	0.16			8/5/2008 23:59	0.17
		7/17/2008 8:00	0.09			8/6/2008 8:00	0.16
		7/17/2008 16:00	0.11			8/6/2008 16:00	0.17
		7/17/2008 23:59	0.10			8/6/2008 23:59	0.17
		7/18/2008 8:00	0.09			8/7/2008 8:00	0.17
		7/18/2008 16:00	0.10			8/7/2008 16:00	0.18
		7/18/2008 23:59	1.10			8/7/2008 23:59	0.17
		7/19/2008 8:00	0.14			8/8/2008 8:00	0.18
		7/19/2008 16:00	0.09			8/8/2008 16:00	0.40
		7/19/2008 23:59	1.54			8/8/2008 23:59	0.38
		7/20/2008 8:00	0.39			8/9/2008 8:00	0.38
		7/20/2008 16:00	0.08			8/9/2008 16:00	0.39
		7/20/2008 23:59	0.64			8/9/2008 23:59	0.62
		7/21/2008 8:00	0.10			8/10/2008 8:00	0.46
		7/21/2008 16:00	0.06			8/10/2008 16:00	0.45
		7/21/2008 23:59	1.14			8/10/2008 23:59	0.41
		7/22/2008 8:00	0.56			8/11/2008 8:00	0.40
		7/22/2008 16:00	0.09			8/11/2008 16:00	0.35
		7/22/2008 23:59	0.69			8/11/2008 23:59	0.36
		7/23/2008 8:00	0.09			8/12/2008 8:00	0.34
		7/23/2008 16:00	0.06			8/12/2008 16:00	0.32
		7/23/2008 23:59	0.13			8/12/2008 23:59	0.33
		7/24/2008 8:00	0.06			8/13/2008 8:00	0.29

Date-Time	Spring Creek Vent 10 (ppb)	Date-Time	Revell Sink (ppb)	Date-Time	Wakulla Main Vent (ppb)	Date-Time	Wakulla K Conduit (ppb)
		7/24/2008 16:00	0.19			8/13/2008 16:00	0.28
		7/24/2008 23:59	0.27			8/13/2008 23:59	0.29
		7/25/2008 8:00	0.18			8/14/2008 8:00	0.24
		7/25/2008 16:00	0.20				
		7/25/2008 23:59	0.18				
		7/26/2008 8:00	0.15				
		7/26/2008 16:00	0.26				
		7/26/2008 23:59	0.15				
		7/27/2008 8:00	0.21				
		7/27/2008 16:00	0.21				
		7/27/2008 23:59	0.14				
		7/28/2008 8:00	0.25				
		7/28/2008 16:00	0.20				
		7/28/2008 23:59	0.17				
		7/29/2008 8:00	0.21				
		7/29/2008 16:00	3.48				
		7/29/2008 23:59	1.62				
		7/30/2008 8:00	0.21				
		7/30/2008 16:00	5.28				
		7/30/2008 23:59	0.97				
		7/31/2008 8:00	0.20				
		7/31/2008 16:00	5.08				
		7/31/2008 23:59	0.42				
		8/1/2008 8:00	0.14				
		8/1/2008 16:00	0.34				
		8/1/2008 23:59	0.07				
		8/2/2008 8:00	0.04				
		8/2/2008 16:00	0.09				
		8/2/2008 23:59	0.05				
		8/3/2008 8:00	0.15				
		8/3/2008 16:00	0.12				
		8/3/2008 23:59	0.11				
		8/4/2008 8:00	0.17				
		8/4/2008 16:00	0.14				
		8/4/2008 23:59	0.14				
		8/5/2008 8:00	0.19				
		8/5/2008 16:00	0.17				

Date-Time	Spring Creek Vent 10 (ppb)	Date-Time	Revell Sink (ppb)	Date-Time	Wakulla Main Vent (ppb)	Date-Time	Wakulla K Conduit (ppb)
		8/5/2008 23:59	0.18				
		8/6/2008 8:00	0.24				
		8/6/2008 16:00	0.21				
		8/6/2008 23:59	0.21				
		8/7/2008 8:00	0.97				
		8/7/2008 16:00	0.28				
		8/7/2008 23:59	0.28				
		8/8/2008 8:00	0.84				
		8/8/2008 16:00	0.65				
		8/8/2008 23:59	0.61				
		8/9/2008 8:00	1.79				
		8/9/2008 16:00	1.22				
		8/9/2008 23:59	1.29				
		8/10/2008 8:00	1.30				
		8/10/2008 16:00	1.23				
		8/10/2008 23:59	1.32				
		8/11/2008 8:00	1.33				
		8/11/2008 16:00	1.25				
		8/11/2008 23:59	1.24				
		8/12/2008 8:00	1.31				
		8/12/2008 16:00	1.30				
		8/12/2008 23:59	1.30				
		8/13/2008 8:00	1.32				
		8/13/2008 16:00	3.99				
		8/14/2008 8:00	3.05				
		8/14/2008 16:00	0.19				

Samples collected by author, analyzed by Cambrian Ground Water Co. LLC and reported by H2H Modeling Group.

APPENDIX E

DYE DETECTION RESULTS FOR THE 2009 LOST CREEK SWALLET DYE TRACE

Date-Time	Spring Creek vent 01 (ppb)	Date-Time	Spring Creek vent 02 (ppb)	Date-Time	Spring Creek vent 10 (ppb)	Date-Time	Punchbowl Sink (ppb)	Date-Time	Revell Sink (ppb)
				6/23/2009 6:00	0.00				
				6/24/2009 6:00	0.00				
				6/25/2009 6:00	0.00				
6/26/2009 6:00	0.00			6/26/2009 6:00	0.00			6/26/2009 6:00	0.00
6/27/2009 6:00	0.00			6/27/2009 6:00	0.00			6/27/2009 6:00	0.00
6/28/2009 6:00	0.00			6/28/2009 6:00	0.00			6/28/2009 6:00	0.00
6/29/2009 6:00	0.00			6/29/2009 6:00	0.00			6/29/2009 6:00	0.00
6/30/2009 6:00	0.00			6/30/2009 6:00	0.00			6/30/2009 6:00	0.00
7/1/2009 6:00	0.00							7/1/2009 6:00	0.00
7/2/2009 6:00	0.00	7/2/2009 6:00	0.00	7/2/2009 6:00	0.00			7/2/2009 6:00	0.00
7/3/2009 6:00	0.00	7/3/2009 6:00	0.00	7/3/2009 6:00	0.00			7/3/2009 6:00	0.00
7/4/2009 6:00	0.00	7/4/2009 6:00	0.00	7/4/2009 6:00	0.00			7/4/2009 6:00	0.00
7/5/2009 6:00	0.00	7/5/2009 6:00	0.00	7/5/2009 6:00	0.00			7/5/2009 6:00	0.00
7/6/2009 6:00	0.00	7/6/2009 6:00	0.00	7/6/2009 6:00	0.00			7/6/2009 6:00	0.00
7/7/2009 6:00	0.00	7/7/2009 6:00	0.00	7/7/2009 6:00	0.00			7/7/2009 6:00	0.00
7/8/2009 6:00	0.00	7/8/2009 6:00	0.00	7/8/2009 6:00	0.00			7/8/2009 6:00	0.00
7/9/2009 6:00	0.00	7/9/2009 6:00	0.00	7/9/2009 6:00	0.00			7/9/2009 6:00	0.00
7/10/2009 6:00	0.00	7/10/2009 6:00	0.00	7/10/2009 6:00	0.00			7/10/2009 6:00	0.00
7/11/2009 6:00	0.00	7/11/2009 6:00	0.00	7/11/2009 6:00	0.00				
7/12/2009 6:00	0.00	7/12/2009 6:00	0.00	7/12/2009 6:00	0.00				
7/13/2009 6:00	0.00	7/13/2009 6:00	0.00	7/13/2009 6:00	0.00			7/13/2009 6:00	0.00
7/14/2009 6:00	0.00	7/14/2009 6:00	0.00	7/14/2009 6:00	0.00			7/14/2009 6:00	0.00
		7/14/2009 14:00	0.00	7/14/2009 14:00	0.00				

Date-Time	Spring Creek vent 01 (ppb)	Date-Time	Spring Creek vent 02 (ppb)	Date-Time	Spring Creek vent 10 (ppb)	Date-Time	Punchbowl Sink (ppb)	Date-Time	Revell Sink (ppb)
		7/14/2009 22:00	0.00	7/14/2009 22:00	0.00				
7/15/2009 6:00	0.00	7/15/2009 6:00	0.00	7/15/2009 6:00	0.00				
		7/15/2009 14:00	0.00	7/15/2009 14:00	0.00	7/15/2009 12:20	0.00	7/15/2009 6:00	0.00
		7/15/2009 22:00	0.00	7/15/2009 22:00	0.00				
7/16/2009 14:00	0.00	7/16/2009 6:00	0.00	7/16/2009 6:00	0.00	7/16/2009 13:48	0.00	7/16/2009 6:00	0.00
7/16/2009 22:00	0.00	7/16/2009 14:00	0.00	7/16/2009 14:00	0.00				
		7/16/2009 22:00	0.00	7/16/2009 22:00	0.00				
7/17/2009 6:00	0.00	7/17/2009 6:00	0.00	7/17/2009 6:00	0.00	7/17/2009 11:45	0.00	7/17/2009 6:00	0.00
7/17/2009 14:00	0.00	7/17/2009 14:00	0.00	7/17/2009 14:00	0.00			7/17/2009 12:00	0.00
7/17/2009 22:00	0.00	7/17/2009 22:00	0.00	7/17/2009 22:00	0.00				
7/18/2009 6:00	0.00	7/18/2009 6:00	0.00	7/18/2009 6:00	0.00			7/18/2009 6:00	0.00
7/18/2009 14:00	0.00	7/18/2009 14:00	0.00	7/18/2009 14:00	0.00			7/18/2009 12:00	0.00
7/18/2009 22:00	0.00	7/18/2009 22:00	0.00	7/18/2009 22:00	0.00				
7/19/2009 6:00	0.00	7/19/2009 6:00	0.00	7/19/2009 6:00	0.00			7/19/2009 6:00	0.00
7/19/2009 14:00	0.00	7/19/2009 14:00	0.00	7/19/2009 14:00	0.00			7/19/2009 12:00	0.00
7/19/2009 22:00	0.00	7/19/2009 22:00	0.00	7/19/2009 22:00	0.00				
7/20/2009 6:00	0.00	7/20/2009 6:00	0.00	7/20/2009 6:00	0.00	7/20/2009 10:15	0.00	7/20/2009 6:00	0.00
7/20/2009 14:00	0.00	7/20/2009 14:00	0.00	7/20/2009 14:00	0.00			7/20/2009 12:00	0.00
7/20/2009 22:00	0.00	7/20/2009 22:00	0.00	7/20/2009 22:00	0.00				
7/21/2009 6:00	0.00	7/21/2009 6:00	0.00	7/21/2009 6:00	0.00				
7/21/2009 14:00	0.00	7/21/2009 14:00	0.00	7/21/2009 14:00	0.00				
7/21/2009 22:00	0.00	7/21/2009 22:00	0.00	7/21/2009 22:00	0.00	7/21/2009 11:45	0.00	7/21/2009 18:00	0.00
7/22/2009 6:00	0.00	7/22/2009 6:00	0.00	7/22/2009 6:00	0.00	7/22/2009 9:30	0.00	7/22/2009 6:00	0.00
7/22/2009 14:00	0.00	7/22/2009 14:00	0.00	7/22/2009 14:00	0.00	7/23/2009 14:00	0.00	7/22/2009 18:00	0.00
7/22/2009 22:00	0.00	7/22/2009 22:00	0.00	7/22/2009 22:00	0.00				
7/23/2009 6:00	0.00	7/23/2009 6:00	0.00	7/23/2009 6:00	0.00			7/23/2009 6:00	0.00
7/23/2009 14:00	0.00	7/23/2009 14:00	0.00	7/23/2009 14:00	0.00			7/23/2009 18:00	0.00

Date-Time	Spring Creek vent 01 (ppb)	Date-Time	Spring Creek vent 02 (ppb)	Date-Time	Spring Creek vent 10 (ppb)	Date-Time	Punchbowl Sink (ppb)	Date-Time	Revell Sink (ppb)
7/23/2009 22:00	0.00	7/23/2009 22:00	0.00	7/23/2009 22:00	0.00				
7/24/2009 6:00	0.00	7/24/2009 6:00	0.00	7/24/2009 6:00	0.00	7/24/2009 13:15	0.00	7/24/2009 6:00	0.00
7/24/2009 14:00	0.00	7/24/2009 14:00	0.00	7/24/2009 14:00	0.00			7/24/2009 18:00	0.00
7/24/2009 22:00	0.00	7/24/2009 22:00	0.00	7/24/2009 22:00	0.00				
7/25/2009 6:00	0.00	7/25/2009 6:00	0.00	7/25/2009 6:00	0.00			7/25/2009 6:00	0.00
7/25/2009 14:00	0.00	7/25/2009 14:00	0.00	7/25/2009 14:00	0.00			7/25/2009 18:00	0.00
7/25/2009 22:00	0.00	7/25/2009 22:00	0.00	7/25/2009 22:00	0.00				
7/26/2009 6:00	0.00	7/26/2009 6:00	0.00	7/26/2009 6:00	0.00			7/26/2009 6:00	0.00
7/26/2009 14:00	0.00	7/26/2009 14:00	0.00	7/26/2009 14:00	0.00			7/26/2009 18:00	0.00
7/26/2009 22:00	0.00	7/26/2009 22:00	0.00	7/26/2009 22:00	0.00				
7/27/2009 6:00	0.00	7/27/2009 6:00	0.00	7/27/2009 6:00	0.00	7/27/2009 14:50	0.00	7/27/2009 6:00	0.00
7/27/2009 14:00	0.00	7/27/2009 14:00	0.00	7/27/2009 14:00	0.00			7/27/2009 18:00	0.00
7/27/2009 22:00	0.00	7/27/2009 22:00	0.00	7/27/2009 22:00	0.00				
7/28/2009 6:00	0.00	7/28/2009 6:00	0.00	7/28/2009 6:00	0.00	7/28/2009 16:15	0.00	7/28/2009 6:00	0.00
7/28/2009 15:00	0.00	7/28/2009 16:00	0.00	7/28/2009 14:00	0.00			7/28/2009 18:00	0.00
7/29/2009 3:00	0.00	7/29/2009 4:00	0.00	7/29/2009 2:00	0.00	7/29/2009 13:20	0.00	7/29/2009 6:00	0.00
7/29/2009 15:00	0.00	7/29/2009 16:00	0.00	7/29/2009 14:00	0.00			7/29/2009 18:00	0.00
7/30/2009 3:00	0.00	7/30/2009 4:00	0.00	7/30/2009 2:00	0.00	7/30/2009 14:55	0.00	7/30/2009 6:00	0.00
7/30/2009 15:00	0.00	7/30/2009 16:00	0.00	7/30/2009 14:00	0.00			7/30/2009 18:00	0.00
7/31/2009 3:00	0.00	7/31/2009 4:00	0.00	7/31/2009 2:00	0.00	7/31/2009 12:10	0.00	7/31/2009 6:00	0.00
7/31/2009 15:00	0.00	7/31/2009 16:00	0.00	7/31/2009 14:00	0.00			7/31/2009 18:00	0.00
8/1/2009 3:00	0.00	8/1/2009 4:00	0.00	8/1/2009 2:00	0.00			8/1/2009 6:00	0.00
8/1/2009 15:00	0.00	8/1/2009 16:00	0.00	8/1/2009 14:00	0.00			8/1/2009 18:00	0.00
8/2/2009 3:00	0.00	8/2/2009 4:00	0.00	8/2/2009 2:00	0.00			8/2/2009 6:00	0.00
8/2/2009 15:00	0.00	8/2/2009 16:00	0.00	8/2/2009 14:00	0.00			8/2/2009 18:00	0.00
8/3/2009 3:00	0.00	8/3/2009 4:00	0.00	8/3/2009 2:00	0.00	8/3/2009 13:50	0.00	8/3/2009 6:00	0.00
8/3/2009 15:00	0.00	8/3/2009 16:00	0.00	8/3/2009 14:00	0.00			8/3/2009 18:00	0.00

Date-Time	Spring Creek vent 01 (ppb)	Date-Time	Spring Creek vent 02 (ppb)	Date-Time	Spring Creek vent 10 (ppb)	Date-Time	Punchbowl Sink (ppb)	Date-Time	Revell Sink (ppb)
8/4/2009 3:00	0.00	8/4/2009 4:00	0.00	8/4/2009 2:00	0.00	8/4/2009 11:15	0.00	8/4/2009 6:00	0.00
8/4/2009 15:00	0.00	8/4/2009 16:00	0.00	8/4/2009 14:00	0.00			8/4/2009 18:00	0.00
8/5/2009 3:00	0.00	8/5/2009 4:00	0.00	8/5/2009 2:00	0.00			8/5/2009 6:00	0.00
8/5/2009 15:00	0.00	8/5/2009 16:00	0.00	8/5/2009 14:00	0.00			8/5/2009 18:00	0.00
8/6/2009 3:00	0.00	8/6/2009 4:00	0.00	8/6/2009 2:00	0.00	8/6/2009 12:10	0.00	8/6/2009 6:00	0.79
8/6/2009 15:00	0.00	8/6/2009 16:00	0.00	8/6/2009 14:00	0.00			8/6/2009 18:00	0.78
8/7/2009 3:00	0.00	8/7/2009 4:00	0.00	8/7/2009 2:00	0.00	8/7/2009 12:45	0.00	8/7/2009 6:00	0.89
8/7/2009 15:00	0.00	8/7/2009 16:00	0.00	8/7/2009 14:00	0.00			8/7/2009 18:00	0.78
8/8/2009 3:00	0.00	8/8/2009 4:00	0.00	8/8/2009 2:00	0.00			8/8/2009 6:00	0.84
8/8/2009 15:00	0.00	8/8/2009 16:00	0.00	8/8/2009 14:00	0.00			8/8/2009 18:00	0.96
8/9/2009 3:00	0.00	8/9/2009 4:00	0.00	8/9/2009 2:00	0.00			8/9/2009 6:00	1.08
8/9/2009 15:00	0.00	8/9/2009 16:00	0.00	8/9/2009 14:00	0.00			8/9/2009 18:00	1.23
8/10/2009 3:00	0.00	8/10/2009 4:00	0.00	8/10/2009 2:00	0.00	8/10/2009 14:45	0.00	8/10/2009 6:00	1.56
8/10/2009 15:00	0.00	8/10/2009 16:00	0.00	8/10/2009 14:00	0.00			8/10/2009 18:00	2.32
8/11/2009 3:00	0.00	8/11/2009 4:00	0.00	8/11/2009 2:00	0.00	8/11/2009 14:40	0.00	8/11/2009 18:00	3.38
8/11/2009 15:00	0.00	8/11/2009 16:00	0.00	8/11/2009 14:00	0.00	8/12/2009 15:05	0.00	8/12/2009 6:00	4.08
8/12/2009 3:00	0.00	8/12/2009 4:00	0.00	8/12/2009 2:00	0.00			8/12/2009 18:00	5.38
8/12/2009 15:00	0.00			8/12/2009 14:00	0.00	8/13/2009 11:40	0.00	8/13/2009 6:00	8.10
8/13/2009 3:00	0.00			8/13/2009 2:00	0.00			8/13/2009 18:00	9.03
8/13/2009 15:00	0.00			8/13/2009 14:00	0.00	8/14/2009 12:00	2.78	8/14/2009 6:00	10.76
8/14/2009 3:00	0.00			8/14/2009 2:00	0.00			8/14/2009 18:00	11.86
8/14/2009 15:00	0.00			8/14/2009 14:00	0.00				
8/15/2009 3:00	0.00			8/15/2009 2:00	0.00			8/15/2009 6:00	15.52
8/15/2009 15:00	0.00			8/15/2009 14:00	0.00			8/15/2009 18:00	16.34
8/16/2009 3:00	0.00			8/16/2009 2:00	0.00			8/16/2009 6:00	19.00
8/16/2009 15:00	0.00			8/16/2009 14:00	0.00			8/16/2009 18:00	23.80
8/17/2009 3:00	0.00			8/17/2009 2:00	0.00	8/17/2009 13:15	3.36	8/17/2009 6:00	27.68

Date-Time	Spring Creek vent 01 (ppb)	Date-Time	Spring Creek vent 02 (ppb)	Date-Time	Spring Creek vent 10 (ppb)	Date-Time	Punchbowl Sink (ppb)	Date-Time	Revell Sink (ppb)
8/17/2009 15:00	0.00			8/17/2009 14:00	0.00			8/17/2009 18:00	36.69
8/18/2009 3:00	0.00			8/18/2009 2:00	0.00	8/18/2009 12:05	3.46	8/18/2009 6:00	45.37
8/18/2009 15:00	0.00			8/18/2009 14:00	0.00			8/18/2009 18:00	47.24
8/19/2009 3:00	0.00			8/19/2009 2:00	0.00	8/19/2009 13:55	4.76	8/19/2009 6:00	52.59
8/19/2009 15:00	0.00			8/19/2009 14:00	0.00			8/19/2009 18:00	47.66
8/20/2009 3:00	0.00			8/20/2009 2:00	0.00	8/20/2009 11:45	6.36	8/20/2009 6:00	45.64
8/20/2009 15:00	0.00			8/20/2009 14:00	0.00			8/20/2009 18:00	47.00
8/21/2009 3:00	1.79			8/21/2009 2:00	0.00			8/21/2009 18:00	54.51
8/21/2009 15:00	2.31			8/21/2009 14:00	0.00			8/22/2009 6:00	52.15
8/22/2009 3:00	2.39			8/22/2009 2:00	1.84			8/22/2009 18:00	47.86
8/22/2009 15:00	2.48			8/22/2009 14:00	2.37			8/23/2009 6:00	48.91
8/23/2009 3:00	3.34			8/23/2009 2:00	3.04			8/23/2009 18:00	51.51
8/23/2009 15:00	3.54			8/23/2009 14:00	2.83	8/24/2009 15:25	14.61	8/24/2009 6:00	48.74
8/24/2009 3:00	3.72			8/24/2009 2:00	3.13			8/24/2009 18:00	45.46
8/24/2009 15:00	6.74			8/24/2009 14:00	4.23	8/25/2009 11:00	11.05	8/25/2009 6:00	37.52
8/25/2009 3:00	6.51			8/25/2009 2:00	5.71			8/25/2009 18:00	28.60
8/25/2009 15:00	10.82			8/25/2009 14:00	6.42				
8/26/2009 15:00	2.03	8/26/2009 13:00	0.00	8/26/2009 2:00	9.94	8/26/2009 14:05	9.51	8/26/2009 6:00	25.24
				8/26/2009 14:00	7.67			8/26/2009 18:00	19.67
8/27/2009 3:00	1.98	8/27/2009 1:00	0.00	8/27/2009 2:00	10.69	8/27/2009 11:45	9.77	8/27/2009 6:00	18.93
8/27/2009 15:00	2.03	8/27/2009 13:00	0.00	8/27/2009 14:00	5.70			8/27/2009 18:00	13.81
8/28/2009 3:00	2.62	8/28/2009 1:00	0.00	8/28/2009 2:00	10.38			8/28/2009 6:00	12.24
8/28/2009 15:00	2.61	8/28/2009 13:00	0.00	8/28/2009 14:00	9.69			8/28/2009 18:00	12.19
8/29/2009 3:00	9.20	8/29/2009 1:00	12.68	8/29/2009 2:00	10.84			8/29/2009 6:00	10.58
8/29/2009 15:00	2.47	8/29/2009 13:00	8.88	8/29/2009 14:00	12.59			8/29/2009 18:00	9.12
8/30/2009 3:00	7.82	8/30/2009 1:00	9.12	8/30/2009 2:00	9.31			8/30/2009 6:00	7.85
8/30/2009 15:00	2.51	8/30/2009 13:00	8.44	8/30/2009 14:00	8.44			8/30/2009 18:00	6.97

Date-Time	Spring Creek vent 01 (ppb)	Date-Time	Spring Creek vent 02 (ppb)	Date-Time	Spring Creek vent 10 (ppb)	Date-Time	Punchbowl Sink (ppb)	Date-Time	Revell Sink (ppb)
8/31/2009 3:00	8.88	8/31/2009 1:00	10.05	8/31/2009 2:00	8.46	8/31/2009 12:15	20.22	8/31/2009 6:00	6.07
8/31/2009 15:00	3.49	8/31/2009 13:00	11.69	8/31/2009 14:00	12.12			8/31/2009 18:00	5.21
9/1/2009 3:00	14.03	9/1/2009 1:00	14.89	9/1/2009 2:00	12.31	9/1/2009 13:55	20.39	9/1/2009 6:00	4.37
9/1/2009 15:00	6.06	9/1/2009 13:00	18.60	9/1/2009 15:00	5.00			9/1/2009 18:00	3.75
		9/1/2009 15:00	21.93	9/2/2009 3:00	8.82	9/2/2009 13:55	17.06	9/2/2009 6:00	3.28
9/2/2009 3:00	9.13	9/2/2009 3:00	21.69	9/2/2009 15:00	4.55			9/2/2009 18:00	2.93
9/2/2009 15:00	5.61	9/2/2009 15:00	21.52	9/3/2009 3:00	17.86	9/3/2009 13:30	14.61	9/3/2009 6:00	2.93
9/3/2009 3:00	15.48	9/3/2009 3:00	19.88	9/3/2009 15:00	4.39			9/3/2009 18:00	2.69
9/3/2009 15:00	4.65	9/3/2009 15:00	20.75						
9/4/2009 3:00	9.79	9/4/2009 3:00	20.84	9/4/2009 3:00	9.96	9/4/2009 12:55	14.18	9/4/2009 6:00	2.39
9/4/2009 15:00	4.49	9/4/2009 15:00	20.87					9/4/2009 18:00	2.14
9/5/2009 3:00	11.14	9/5/2009 3:00	19.78	9/5/2009 15:00	4.11			9/5/2009 6:00	1.95
9/5/2009 13:00	10.22	9/5/2009 15:00	19.27	9/5/2009 3:00	12.01			9/5/2009 18:00	2.07
9/6/2009 3:00	17.37	9/6/2009 3:00	18.94	9/6/2009 3:00	16.59			9/6/2009 6:00	1.83
9/6/2009 15:00	13.88	9/6/2009 15:00	18.63	9/6/2009 15:00	15.66			9/6/2009 18:00	1.76
9/7/2009 3:00	15.49	9/7/2009 3:00	17.78	9/7/2009 15:00	15.92			9/7/2009 6:00	1.94
9/7/2009 3:00	15.49	9/7/2009 15:00	16.79						
9/8/2009 3:00	15.51	9/8/2009 3:00	15.54	9/8/2009 3:00	10.28			9/8/2009 18:00	1.95
9/8/2009 15:00	12.96	9/8/2009 15:00	14.91	9/8/2009 15:00	14.04	9/9/2009 13:00	9.39	9/9/2009 6:00	2.04
9/9/2009 3:00	11.27	9/9/2009 3:00	14.24	9/9/2009 3:00	10.85			9/9/2009 18:00	1.98
9/9/2009 15:00	11.09	9/9/2009 15:00	11.54	9/9/2009 15:00	10.90	9/10/2009 12:05	7.76	9/10/2009 6:00	2.08
9/10/2009 3:00	10.19	9/10/2009 1:00	18.48	9/10/2009 3:00	11.76			9/10/2009 6:00	1.84
9/10/2009 15:00	17.23	9/10/2009 13:00	16.98					9/10/2009 18:00	1.95
9/11/2009 3:00	17.14	9/11/2009 1:00	18.69	9/11/2009 2:00	22.41	9/11/2009 13:30	7.53	9/11/2009 6:00	2.40
9/11/2009 15:00	16.36	9/11/2009 13:00	11.26	9/11/2009 14:00	12.99			9/11/2009 18:00	1.49
9/12/2009 3:00	17.26	9/12/2009 1:00	14.97	9/12/2009 2:00	18.65			9/12/2009 6:00	1.55
9/12/2009 15:00	17.23	9/12/2009 13:00	9.87	9/12/2009 14:00	9.81			9/12/2009 18:00	1.91

Date-Time	Spring Creek vent 01 (ppb)	Date-Time	Spring Creek vent 02 (ppb)	Date-Time	Spring Creek vent 10 (ppb)	Date-Time	Punchbowl Sink (ppb)	Date-Time	Revell Sink (ppb)
9/13/2009 3:00	17.31	9/13/2009 1:00	12.72	9/13/2009 2:00	17.32			9/13/2009 6:00	1.67
9/13/2009 15:00	16.44	9/13/2009 13:00	10.27	9/13/2009 14:00	12.01			9/13/2009 18:00	1.65
9/14/2009 3:00	16.66	9/14/2009 1:00	11.94	9/14/2009 2:00	13.56	9/14/2009 14:10	7.49	9/14/2009 6:00	1.44
9/14/2009 15:00	17.53	9/14/2009 13:00	10.77	9/14/2009 14:00	14.70			9/14/2009 18:00	1.64
9/15/2009 3:00	17.33	9/15/2009 1:00	10.37	9/15/2009 2:00	12.74	9/15/2009 13:30	7.14	9/15/2009 6:00	1.48
9/15/2009 15:00	17.03	9/15/2009 13:00	9.69	9/15/2009 14:00	12.30			9/15/2009 18:00	2.18
9/16/2009 3:00	16.58	9/16/2009 1:00	9.52	9/16/2009 2:00	13.02				
9/16/2009 15:00	16.26	9/16/2009 13:00	10.99	9/16/2009 14:00	11.11				
9/17/2009 3:00	17.28			9/17/2009 2:00	5.83	9/17/2009 14:10	6.97	9/17/2009 6:00	0.97
9/17/2009 15:00	8.21	9/17/2009 13:00	11.83	9/17/2009 14:00	5.67			9/17/2009 18:00	0.76
9/18/2009 3:00	10.89	9/18/2009 1:00	11.29	9/18/2009 2:00	6.31	9/18/2009 12:20	11.00	9/18/2009 6:00	0.73
9/18/2009 15:00	10.57	9/18/2009 13:00	10.68	9/18/2009 14:00	5.24			9/18/2009 18:00	0.70
9/19/2009 3:00	10.55	9/19/2009 1:00	9.14					9/19/2009 6:00	1.11
9/19/2009 15:00	10.61	9/19/2009 13:00	7.96					9/19/2009 18:00	0.70
9/20/2009 3:00	10.97	9/20/2009 1:00	7.75	9/20/2009 2:00	5.21			9/20/2009 6:00	0.89
9/20/2009 15:00	10.56	9/20/2009 13:00	7.90	9/20/2009 14:00	4.69			9/20/2009 18:00	0.71
9/21/2009 3:00	10.64	9/21/2009 1:00	7.52	9/21/2009 2:00	4.90	9/21/2009 14:25	5.83	9/21/2009 6:00	0.72
9/21/2009 15:00	10.48	9/21/2009 13:00	7.48	9/21/2009 14:00	4.24			9/21/2009 18:00	0.75
9/22/2009 3:00	9.63	9/22/2009 1:00	7.75	9/22/2009 2:00	4.39	9/22/2009 12:15	6.11	9/22/2009 6:00	0.70
9/22/2009 15:00	9.63	9/22/2009 13:00	6.83	9/22/2009 14:00	3.89			9/22/2009 18:00	0.67
9/23/2009 3:00	9.89	9/23/2009 1:00	9.06	9/23/2009 2:00	4.22	9/23/2009 12:35	6.27	9/23/2009 6:00	0.65
9/23/2009 13:00	9.30	9/23/2009 13:00	7.39	9/23/2009 14:00	3.96			9/23/2009 18:00	0.63
9/24/2009 3:00	4.41	9/24/2009 1:00	6.80	9/24/2009 2:00	4.31	9/24/2009 14:45	7.04	9/24/2009 6:00	0.70
9/24/2009 15:00	6.45	9/24/2009 13:00	9.52	9/24/2009 14:00	3.97			9/24/2009 18:00	0.68
				9/24/2009 14:00	7.49				
9/25/2009 3:00	5.99	9/25/2009 1:00	6.39	9/25/2009 2:00	7.14	9/25/2009 12:25	7.43	9/25/2009 6:00	0.64
9/25/2009 15:00	5.78	9/25/2009 13:00	6.50	9/25/2009 14:00	7.36				

Date-Time	Spring Creek vent 01 (ppb)	Date-Time	Spring Creek vent 02 (ppb)	Date-Time	Spring Creek vent 10 (ppb)	Date-Time	Punchbowl Sink (ppb)	Date-Time	Revell Sink (ppb)
9/26/2009 3:00	6.63	9/26/2009 1:00	6.16	9/26/2009 2:00	7.32				
9/26/2009 15:00	5.72	9/26/2009 13:00	6.24	9/26/2009 14:00	6.02				
9/27/2009 3:00	5.58	9/27/2009 1:00	6.71	9/27/2009 2:00	6.23				
9/27/2009 15:00	5.39	9/27/2009 13:00	5.31	9/27/2009 14:00	5.85				
9/28/2009 3:00	4.81	9/28/2009 1:00	6.39	9/28/2009 2:00	5.85				
9/28/2009 15:00	2.64	9/28/2009 13:00	5.70	9/28/2009 14:00	5.44				
9/29/2009 3:00	2.36	9/29/2009 1:00	6.45	9/29/2009 2:00	4.94	9/29/2009 12:30	0.00		
9/29/2009 15:00	2.14	9/29/2009 13:00	6.46	9/29/2009 14:00	4.72				
9/30/2009 3:00	2.28	9/30/2009 1:00	5.70	9/30/2009 2:00	4.72	9/30/2009 13:50	0.00		
9/30/2009 15:00	1.94	9/30/2009 13:00	5.58	9/30/2009 14:00	3.92				
10/1/2009 3:00	1.55	10/1/2009 1:00	5.94	10/1/2009 2:00	3.97	10/1/2009 11:35	0.00		
10/1/2009 15:00	1.46	10/1/2009 13:00	4.05	10/1/2009 14:00	3.86				
10/2/2009 3:00	1.43	10/2/2009 1:00	5.80	10/2/2009 2:00	3.91	10/2/2009 13:15	0.00		
10/2/2009 15:00	1.79	10/2/2009 13:00	6.77	10/2/2009 14:00	3.25				
10/3/2009 3:00	1.49	10/3/2009 1:00	5.56	10/3/2009 2:00	3.30				
10/3/2009 15:00	1.23	10/3/2009 13:00	0.00	10/3/2009 14:00	3.41				
10/4/2009 3:00	1.54	10/4/2009 1:00	0.00	10/4/2009 2:00	3.16				
10/4/2009 15:00	1.82	10/4/2009 13:00	0.00	10/4/2009 14:00	3.14				
10/5/2009 3:00	3.28	10/5/2009 1:00	0.00	10/5/2009 2:00	2.86	10/5/2009 14:05	0.00		
10/5/2009 15:00	2.56	10/5/2009 13:00	0.00	10/5/2009 14:00	3.01				
10/6/2009 3:00	1.49			10/6/2009 2:00	2.73	10/6/2009 14:05	0.00		
10/6/2009 15:00	1.73			10/6/2009 14:00	2.69				
10/7/2009 3:00	1.62			10/7/2009 2:00	3.02	10/7/2009 12:40	0.00		
				10/7/2009 14:00	2.80				
				10/8/2009 2:00	3.02	10/8/2009 14:45	0.00		

Date-Time	Spring Creek vent 01 (ppb)	Date-Time	Spring Creek vent 02 (ppb)	Date-Time	Spring Creek vent 10 (ppb)	Date-Time	Punchbowl Sink (ppb)	Date-Time	Revell Sink (ppb)

Samples collected by author, analyzed by Cambrian Ground Water Co. LLC and reported by H2H Modeling Group.

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BIOGRAPHICAL SKETCH

Scott Barrett Dyer was born and raised in Tallahassee, Florida. He worked in international trade in San Diego, Seattle, Charleston, New York and Atlanta from 1989 - 2004. He now conducts hydrological field work for a state agency in Florida. He is the proud father of two daughters and is expecting a son early 2016.