

**GROUND WATER FLOW PATTERNS  
IN THE ECONFINA CREEK SPRINGSHED  
WASHINGTON AND BAY COUNTIES, FLORIDA**



PREPARED BY:  
NORTHWEST FLORIDA  
WATER MANAGEMENT DISTRICT  
JULY 2004

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IN THE ECONFINA CREEK SPRINGSHED  
WASHINGTON AND BAY COUNTIES, FLORIDA**

Water Resources Special Report 04-03

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July 2004

NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT

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## INTRODUCTION

This report serves as one of several project deliverables prepared by the Northwest Florida Water Management District under the FY 03-04 Florida Springs Initiative.

Econfina Creek flows from its headwaters in southwest Jackson County to Bay County; ultimately discharging to Deer Point Lake, the primary water supply for Bay County. Along the middle portion of Econfina Creek in Washington and Bay counties, thirty-nine known Floridan Aquifer springs exist, represented as both individual springs and spring groups. Research (Musgrove et al., 1965) has shown that during base flow conditions, ground water from these springs is the main component of creek discharge. Because of Econfina Creek's important contribution to Deer Point Lake, information contributing to the knowledge of the source of water issued by these springs is crucial.

An earlier study completed by the Northwest Florida Water Management District (Richards, 1997) delineated the Floridan Aquifer zone of contribution to Econfina Creek. For the present study, a fluorescent dye tracer study was completed as an initial attempt to demonstrate the existence of individual springsheds within the more general zone of contribution established by the earlier work. To accomplish this, ground water flow connections that exist between areas of recharge to the Floridan Aquifer and springs located along Econfina Creek must be understood. Fluorescent tracer studies have proven effective in determining such connections in karst aquifer systems. Two traces were completed during the course of the study. Knowledge gained of existing ground water flow connections and flow patterns has allowed a preliminary understanding of individual springsheds that exist in the basin. This information should aid similar future efforts in the basin.

## STUDY AREA

The known Floridan Aquifer springs located along Econfina Creek (Figure 1) are found in Washington and Bay counties. This portion of Econfina Creek lies within the Bennett, Fla USGS 7.5 minute topographic quadrangle, both north and south of State Highway 20. The study area is at the southern extent of the Dougherty Karst Plain within the Sand Hill Lakes physiographic subregion. The karst aquifer underlying the area is developed in a sequence of southward dipping Miocene aged and older carbonates.

Econfina Creek within the study area is well incised and penetrates the surficial and intermediate hydrostratigraphic units to expose the carbonates of the Floridan Aquifer. The Sand Hill Lakes surrounding Econfina Creek in the study area serves as a significant recharge area for the springs under study. Substantial surface flow is lacking in the area due to underdraining by karst development in the underlying carbonates. Dissolution of the carbonates has led to the collapse of overlying material and the subsequent formation of the numerous sinkholes and sinkhole lakes found in the area (Musgrove et al., 1965).

## METHODOLOGY

### Field Reconnaissance

A thorough field reconnaissance was conducted to locate karst features pertinent to the study. Many springs and three swallets in the study area were known but required a visit to determine

their role in the study. Previously unknown springs were located using differential GPS. Numerous sinkholes were visited to determine their utility as dye introduction points.

#### Determination of Dye Mass

Various schools of thought exist when determining the quantity of dye to introduce in a tracer study. Methodologies are steeped in a sundry of mathematical equations, prior experience, or a combination of the two. Regardless, whether measured or empirically based, consideration is often given to desired recovery concentration, travel distance, and spring discharge. For the present study, a dye mass was determined by utilizing the following: 1) Field (2002), 2) the Efficient Hydrologic Tracer-Test Design (EHTD) software program described in Field, 3) unpublished documentation by Gary Schindel (Edwards Aquifer Authority) and Steve Worthington (Worthington Groundwater), 4) prior tracing experience. Between these sources, a dye mass was calculated that was acceptable and agreeable among the listed sources. Although not ideal, historical flow data (Appendix C) was applied to the calculations.

#### Dye Recovery

The recovery of dye (Table 1) introduced into the ground water system was accomplished primarily with activated charcoal dye detectors. These receptors function as an adsorptive media for passing dye. Detector locations were established so that dye introduced into the flow system was recoverable from all known points of discharge. Because they are continually exposed to flowing water, acting as 24-hour water samplers, minor ambient dye concentrations passing in the water are detectable.

Table 1—Fluorescent Dyes Used in Tracer Study

<b>Name</b>	<b>Dye Type</b>	<b>Color Index Name</b>	<b>Manufacturer</b>
Uranine*	Xanthene	Acid Yellow 73	ChemCentral
Eosine	Xanthene	Acid Red 87	ChemCentral

\* The preferred term fluorescein is used in this study.

Detectors were deployed at discrete locations (Table 2) using weighted stands and line to keep them in flowing water and to avoid detector loss. They were placed at springs, in spring runs and along the creek so ground water discharging from unknown springs or in a diffuse nature to the stream bottom could be detected. Detectors were left exposed to the water for approximately seven days, after which they were collected and a new detector was secured in its place. An additional detector served as a field blank. As detectors were collected, the field blank was frequently handled as a control against any unintentional transfer of dye to detectors. The detectors were then mailed to a laboratory to analyze for the presence of dye.

As an additional measure, a water sample was taken at the time of detector exchange during periods of the study. It served both to confirm the presence of dye recovered from a charcoal detector and as a backup sample in the event that a detector was lost. Water samples do not provide the composite fluorescence signature of charcoal. To determine the presence of dye with only water samples, it is acknowledged that more intensive water sampling is needed. However, for the scope of this study, it was felt that an individual sample taken at the time of charcoal detector collection was an adequate confirmation.



Although many of the sites were monitored for the entirety of the project, several sites were only monitored for a portion of the study. Prior to the first dye introduction, Glowing Spring was thought to be the northernmost Floridan spring in the basin. Site 1, therefore, served as the general upbasin monitoring location until Devils Hole (sites 19 and 20), Tupelo (site 21) and Palm (site 22) springs were located and could be monitored individually. Site 19 was established as the replacement upbasin monitoring location.

In conjunction with results from site 1, site 2 was temporarily used for monitoring Glowing Spring. A negative recovery from site 1 and a positive recovery from site 2 could be interpreted as a recovery from Glowing Spring. The two locations were necessary because with increased stage on Econfina Creek, the spring is submerged and discharge from the spring mixes with creek water making the two water types indiscernible. With this in mind, it is acknowledged that with the establishment of a single, direct monitoring location for Glowing Spring (site 23); the elevated creek level that existed while this site was monitored could have made interpreting the exact source of dye recovered difficult. No dye was recovered at Glowing Spring or sites upstream during the entirety of the study.

Attempts to monitor Pitt Spring (site 9) were abandoned when it was obvious that excessive human traffic and the accompanying vandalism would not allow for a monitoring station to exist. Although Gainer Springs #2 (site 13) was monitored later into the study, continued attempts were also abandoned due to vandalism. Monitoring at these locations would more likely be successful if tracing was attempted during the winter months when human traffic is greatly reduced.

Sites 17 and 18 were only necessary for dye introduction 1. They served as downstream monitoring locations in the event dye was not recovered at any of the springs. With the successful results from trace 1, dye introduction points were focused to the north and it was felt that site 10 would serve a purpose similar to that of sites 17 and 18.

Table 2—Monitoring Locations

Site ID	Location	Site ID	Location
1	Econfina above Glowing Spring	13	Gainer Springs #2
2	Econfina below Glowing Spring	14	Gainer Springs #1 run
3	Bathtub Spring	15	Gainer Springs #5
4	Blue Spring run	16	Gainer Springs #4
5	Strickland Spring run	17	Econfina Creek at camp
6	Williford Spring run	18	Econfina Creek at County Road 388
7	Bluff Spring	19	Econfina Creek above Devils Hole
8	Sylvan Spring run	20	Econfina Creek below Devils Hole
9	Pitt Spring	21	Tupelo Spring
10	Econfina Creek at Hwy 20	22	Palm Spring
11	Fenceline Spring	23	Glowing Spring
12	Gainer Springs #3 run		

### Analysis

Charcoal and water samples collected from the field were analyzed by Ewers Water Consultants, Inc. (EWC) in Richmond, Kentucky. Semi-quantitative analyses were performed utilizing synchronous scanning spectrofluorophotometry. In general, this method is able to detect the presence of dye in concentrations of the parts per trillion range. Results in Appendix B use a

‘+/-’ system to denote the presence or absence of dye. EWC defines ‘Low Flow’ as an indicator that the dye detector has not been subjected to sufficient water flow to remove the intrinsic fluorescence signature from the charcoal.

## RESULTS

### Background

A period of background data collection is necessary due to the potential existence of natural and anthropogenic sources of fluorescence in ground and surface waters. These background levels of fluorescence can be problematic if an existing substance fluoresces at a wavelength similar to that of a dye used in the investigation. Because of this, background data can greatly influence the type and quantity of dye used in a tracer study.

The interval February 26 through March 18, 2004 served as the background data collection period. Three exchanges, each representing approximately seven days of exposure, were completed with accompanying water samples representing the fluorescence signature of the water at the time of sampling. All locations and the field blanks showed no presence of substances fluorescing at wavelengths similar to that of the dyes used.

In addition to this period of background monitoring, April 8 through May 5 served as the period of background monitoring for Devils Hole, Tupelo, and Palm springs; springs located after the initiation of trace 1. Four exchanges, each representing approximately seven days of exposure, were completed with accompanying water samples representing the fluorescence signature of the water at the time of sampling. All locations showed no presence of substances fluorescing at wavelengths similar to that of the dyes used.

### Dye Trace 1

On March 22, 2004, three-and-one-half pounds of a 25 percent solution of eosine (diluted to two gallons) were introduced through a swallet southeast of Bay Gall (Appendix D). The dye was released with a peristaltic pump over a fifteen minute period to a small stream discharging into the swallet.

Analysis of the first post-introduction exchange dated March 25 reported eosine recoveries in charcoal and water samples at Sylvan Spring run, Fenceline Spring, and Gainer Springs 1, 3, and 5. Although the charcoal samples were lost, eosine was recovered in the water samples from Gainer Springs 2 and 4.

The second post-introduction exchange dated April 1 showed eosine recoveries at Sylvan Spring run, Fenceline Spring, and Gainer Springs 1-5. No conclusive recoveries were reported for the water samples collected on this date.

The third post-introduction exchange dated April 8 showed recoveries of eosine in charcoal samples at Sylvan Spring run, Fenceline Spring, and Gainer Springs 1, 2, 4, and 5. The detector for Gainer Springs 3 was lost. Due to the lack of recoveries in the water samples from April 1, they were no longer collected for trace 1.

The exchanges dated April 15, 22, 29, and May 5 show eosine recoveries from charcoal were restricted to the five Gainer Springs. Reports and intensities of recoveries at the individual

springs decreased as weeks progressed. The limited recovery from the May 5 exchange demonstrated that all but a minimal quantity of eosine had exited the system prior to the second dye introduction.

It should be noted that prior to discontinuing monitoring at Pitt Spring, a questionable recovery of eosine was reported in a water sample dated 03/25. Although this does not qualify as a positive recovery, considering dye was recovered both north and south of Pitt Spring, it would be reasonable to think that dye would be recovered at Pitt if monitored.

### Dye Trace 2

On May 6, 2004, five pounds of a 50 percent solution of fluorescein (diluted to two gallons) was introduced to the ground water system through a well. The section 20 well (Appendix D) is a four inch monitoring well cased to 195 feet below land surface (bls) with open hole conditions to 290 feet bls. A caliber log run at the time of well construction showed an opening of significance at 270 feet bls. A ¾ inch tremie pipe was extended to 270 ft bls and the dye was introduced and flushed from the well with approximately 1000 gallons of water.

No positive recoveries of fluorescein were reported for the first and second post-introduction exchanges dated May 13 and 20.

By the third post-introduction exchange dated May 27, a low intensity recovery of fluorescein was reported from the charcoal sample at Bluff Spring although only a questionable recovery from the site was reported for the water sample. Additional questionable recoveries of fluorescein reported for this exchange were from the charcoal sample from Strickland Spring run and the water sample from Williford Spring run.

The exchanges dated June 3, 10, 16, 24 and 30 showed recoveries in both charcoal and water samples from Williford and Bluff springs. A lower intensity recovery was reported from charcoal at Strickland Spring with a questionable to negative recovery from the water sample.

## CONCLUSIONS AND RECOMMENDATIONS

The ground water flow connections established by the two dye traces (Figure 2) provide an initial understanding of the ground water flow pattern in the area. The results reveal that in this portion of the basin, a dispersive ground water flow pattern exists between areas of aquifer recharge and springs located along Econfinia Creek. This pattern is demonstrated in the first trace by the recovery of dye at seven different monitoring sites (Figure 3) representing approximately 20 springs located along one mile of Econfinia Creek. Dye introduced during the second trace was recovered at three different monitoring sites (Figure 4) representing 11 known springs located along one half mile of Econfinia Creek.

The results of the traces do not allow definitive basin boundaries to be drawn. They do however demonstrate that groups of springs share a common springshed within the larger more general Floridan Aquifer zone of contribution delineated in the 1997 District study. To more closely define these individual springsheds, it will be necessary to introduce dye at points located between the introduction points in this and future studies. A more general recommendation is to focus dye introduction in areas that would test the 1997 delineation. Testing this boundary could reveal areas that lie outside of the currently delineated ground water basin. These areas could then be purchased as public lands for further protection of the resource.

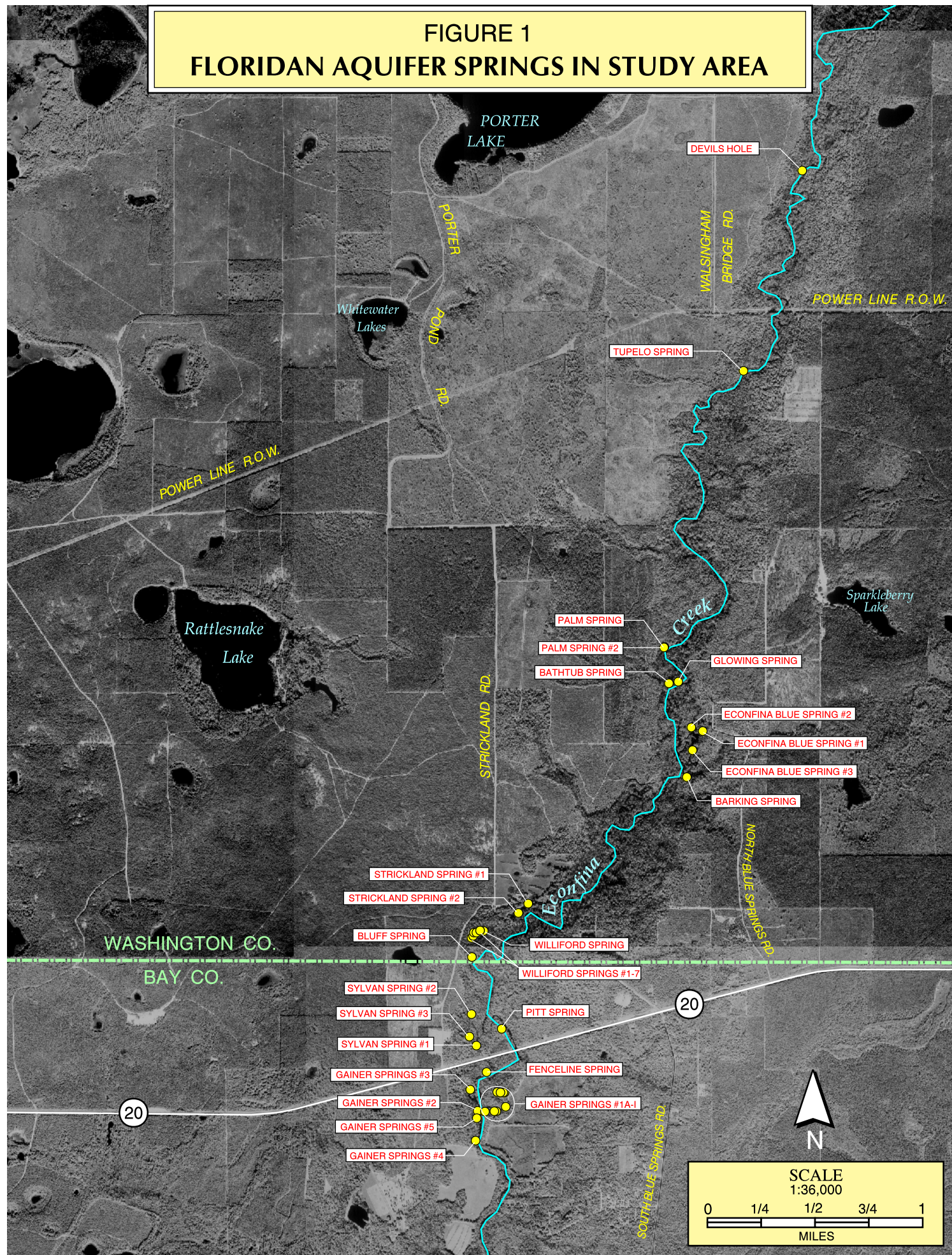
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- Musgrove, R.H., J.B. Foster, and L.G. Toler, 1965, Water Resources of the Econfinia Creek Basin Area in Northwestern Florida, Florida Geological Survey, Report of Investigations No. 41, 51 p.
- Richards, C.J., 1997, Delineation of the Floridan Aquifer Zone of Contribution for Econfinia Creek and Deer Point Lake Bay and Washington Counties, Florida, Northwest Florida Water Management District, Water Resources Special Report 97-2, 30 p.

## APPENDIX A

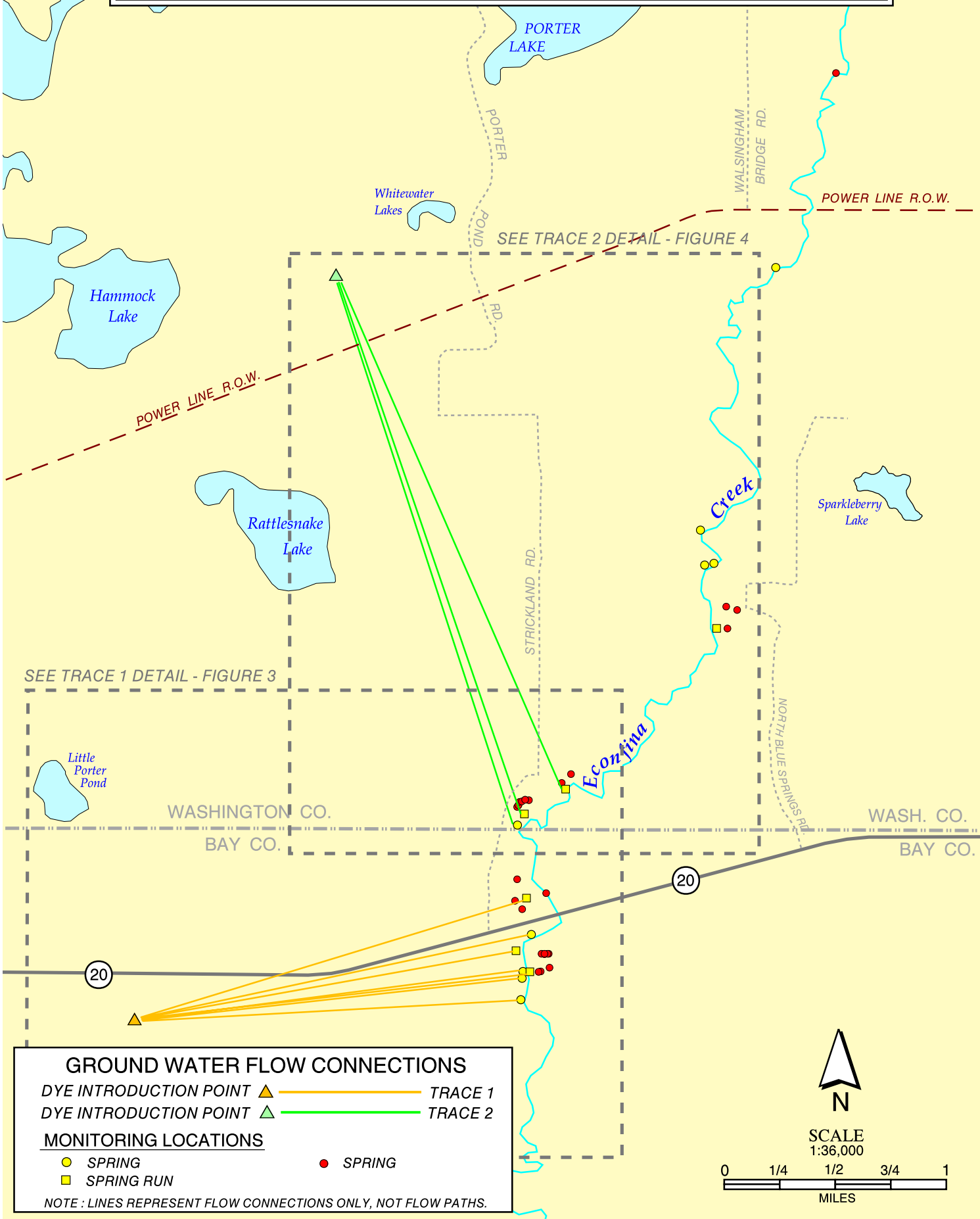


FIGURE 1  
FLORIDAN AQUIFER SPRINGS IN STUDY AREA





# FIGURE 2 GROUND WATER FLOW CONNECTIONS IN STUDY AREA



**GROUND WATER FLOW CONNECTIONS**

DYE INTRODUCTION POINT TRACE 1

DYE INTRODUCTION POINT TRACE 2

**MONITORING LOCATIONS**

SPRING

SPRING RUN

NOTE : LINES REPRESENT FLOW CONNECTIONS ONLY, NOT FLOW PATHS.

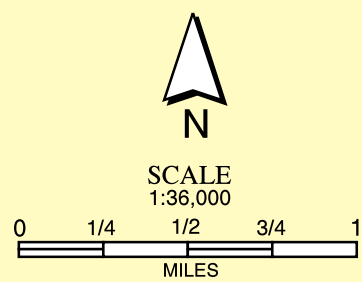
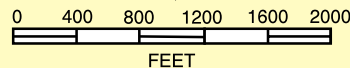




FIGURE 3  
RESULTS FROM TRACE 1



SCALE  
1:14,400



MONITORING LOCATIONS

TRACE 1


- 5 - STRICKLAND SPRING RUN
- 6 - WILLIFORD SPRING RUN
- 7 - BLUFF SPRING
- 8 - SYLVAN SPRING RUN
- 11 - FENCELINE SPRING
- 12 - GAINER SPRINGS #3 RUN
- 13 - GAINER SPRINGS #2
- 14 - GAINER SPRINGS #1 RUN
- 15 - GAINER SPRINGS #5
- 16 - GAINER SPRINGS #4


GROUND WATER FLOW CONNECTIONS

DYE INTRODUCTION POINT  TRACE 1

MONITORING LOCATIONS

 SPRING

 SPRING RUN

 SPRING

NOTE : LINES REPRESENT FLOW CONNECTIONS ONLY, NOT FLOW PATHS.

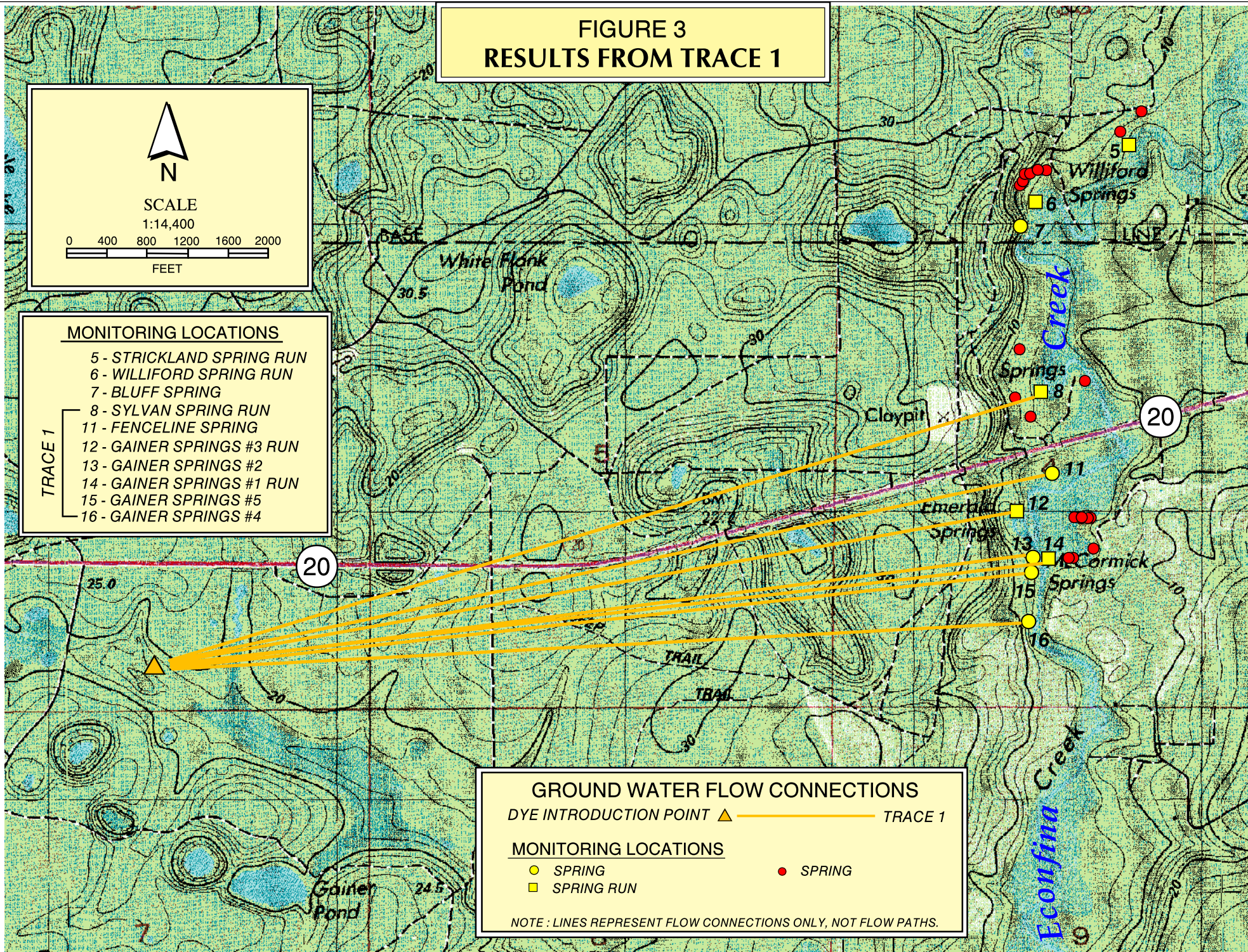
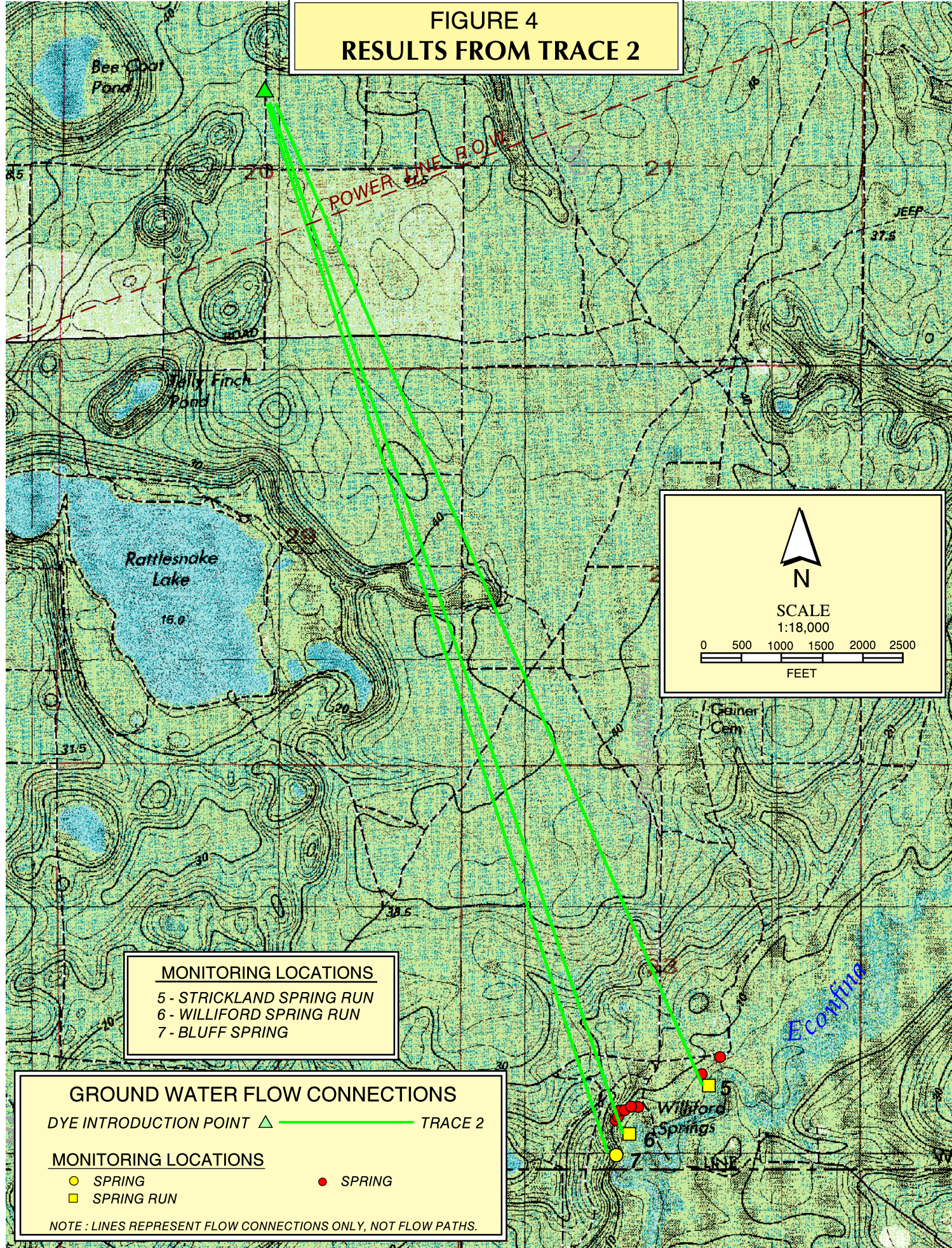




FIGURE 4  
RESULTS FROM TRACE 2





## APPENDIX B

# BACKGROUND MONITORING

Date: 02/26/2004 - 03/18/2004

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	03/04/04	Charcoal	-	-	-	-
2	Econfina below Glowing Sp.	03/04/04	Charcoal	-	-	-	-
3	Bathtub Sp.	03/04/04	Charcoal	-	-	-	-
4	Blue Sp. run	03/04/04	Charcoal	-	-	-	-
5	Strickland Sp. run	03/04/04	Charcoal	-	-	-	-
6	Williford Sp. run	03/04/04	Charcoal	-	-	-	-
7	Bluff Sp.	03/04/04	Charcoal	-	-	-	-
8	Sylvan Sp. run	03/04/04	Charcoal	Detector lost			
9	Pitt Sp. run	03/04/04	Charcoal	-	-	-	-
10	Econfina @ Hwy 20	Monitoring station not established					
11	Fenceline Sp.	03/04/04	Charcoal	-	-	-	-
12	Gainer Sps. #3 run	03/04/04	Charcoal	-	-	-	-
13	Gainer Sps. #2	03/04/04	Charcoal	-	-	-	-
14	Gainer Sps. #1 run	03/04/04	Charcoal	-	-	-	-
15	Gainer Sps. #5	03/04/04	Charcoal	-	-	-	-
16	Gainer Sps. #4	03/04/04	Charcoal	-	-	-	-
17	Econfina @ camp	Monitoring station not established					
18	Econfina @ CR 388	03/04/04	Charcoal	Detector lost			
FB	Field Blank	03/04/04	Charcoal	-	-	-	+

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
1	Econfina above Glowing Sp.	03/04/04	Water	-	-	-
2	Econfina below Glowing Sp.	03/04/04	Water	-	-	-
3	Bathtub Sp.	03/04/04	Water	-	-	-
4	Blue Sp. run	03/04/04	Water	-	-	-
5	Strickland Sp. run	03/04/04	Water	-	-	-
6	Williford Sp. run	03/04/04	Water	-	-	-
7	Bluff Sp.	03/04/04	Water	-	-	-
8	Sylvan Sp. run	03/04/04	Water	-	-	-
9	Pitt Sp. run	03/04/04	Water	-	-	-
10	Econfina @ Hwy 20	Monitoring station not established				
11	Fenceline Sp.	03/04/04	Water	-	-	-
12	Gainer Sps. #3 run	03/04/04	Water	-	-	-
13	Gainer Sps. #2	03/04/04	Water	-	-	-
14	Gainer Sps. #1 run	03/04/04	Water	-	-	-
15	Gainer Sps. #5	03/04/04	Water	-	-	-
16	Gainer Sps. #4	03/04/04	Water	-	-	-
17	Econfina @ camp	Monitoring station not established				
18	Econfina @ CR 388	03/04/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

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4	Blue Sp. run	03/11/04	Charcoal	-	-	-	-
5	Strickland Sp. run	03/11/04	Charcoal	-	-	-	-
6	Williford Sp. run	03/11/04	Charcoal	-	-	-	-
7	Bluff Sp.	03/11/04	Charcoal	-	-	-	-
8	Sylvan Sp. run	03/11/04	Charcoal	-	-	-	-
9	Pitt Sp. run	03/11/04	Charcoal	-	-	-	-
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Symbol	Definition
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+++	Very Positive Fluorescence Signature
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15	Gainer Sps. #5	03/18/04	Charcoal	-	-	-	-
16	Gainer Sps. #4	03/18/04	Charcoal	-	-	-	-
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3	Bathtub Sp.	03/18/04	Water	-	-	-
4	Blue Sp. run	03/18/04	Water	-	-	-
5	Strickland Sp. run	03/18/04	Water	-	-	-
6	Williford Sp. run	03/18/04	Water	-	-	-
7	Bluff Sp.	03/18/04	Water	-	-	-
8	Sylvan Sp. run	03/18/04	Water	-	-	-
9	Pitt Sp. run	03/18/04	Water	-	-	-
10	Econfina @ Hwy 20	03/18/04	Water	-	-	-
11	Fenceline Sp.	03/18/04	Water	-	-	-
12	Gainer Sps. #3 run	03/18/04	Water	-	-	-
13	Gainer Sps. #2	03/18/04	Water	-	-	-
14	Gainer Sps. #1 run	03/18/04	Water	-	-	-
15	Gainer Sps. #5	03/18/04	Water	-	-	-
16	Gainer Sps. #4	03/18/04	Water	-	-	-
17	Econfina @ camp	03/18/04	Water	-	-	-
18	Econfina @ CR 388	03/18/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #1**  
**Date: 03/22/2004 Location: Swallet below Bay Gall**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	3/25/2004	Charcoal	-	-	-	-
2	Econfina below Glowing Sp.	3/25/2004	Charcoal	-	-	-	-
3	Bathtub Sp.	3/25/2004	Charcoal	-	-	-	-
4	Blue Sp. run	3/25/2004	Charcoal	-	-	-	-
5	Strickland Sp. run	3/25/2004	Charcoal	-	-	-	-
6	Williford Sp. run	3/25/2004	Charcoal	-	-	-	-
7	Bluff Sp.	3/25/2004	Charcoal	-	-	-	-
8	Sylvan Sp. run	3/25/2004	Charcoal	-	+++	-	-
9	Pitt Sp. run	3/25/2004	Charcoal	Detector lost			
10	Econfina @ Hwy 20	3/25/2004	Charcoal	-	-	-	-
11	Fenceline Sp.	3/25/2004	Charcoal	-	++++	-	-
12	Gainer Sps. #3 run	3/25/2004	Charcoal	-	++++	-	-
13	Gainer Sps. #2	3/25/2004	Charcoal	Detector lost			
14	Gainer Sps. #1 run	3/25/2004	Charcoal	-	+++	-	-
15	Gainer Sps. #5	3/25/2004	Charcoal	-	++++	-	-
16	Gainer Sps. #4	3/25/2004	Charcoal	Detector lost			
17	Econfina @ camp	3/25/2004	Charcoal	-	++	-	-
18	Econfina @ CR 388	3/25/2004	Charcoal	-	?	-	-
FB	Field Blank	3/25/2004	Charcoal	-	-	-	+

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
1	Econfina above Glowing Sp.	3/25/2004	Water	-	-	-
2	Econfina below Glowing Sp.	3/25/2004	Water	-	-	-
3	Bathtub Sp.	3/25/2004	Water	-	-	-
4	Blue Sp. run	3/25/2004	Water	-	-	-
5	Strickland Sp. run	3/25/2004	Water	-	-	-
6	Williford Sp. run	3/25/2004	Water	-	-	-
7	Bluff Sp.	3/25/2004	Water	-	-	-
8	Sylvan Sp. run	3/25/2004	Water	-	+	-
9	Pitt Sp. run	3/25/2004	Water	?	?	-
10	Econfina @ Hwy 20	3/25/2004	Water	-	-	-
11	Fenceline Sp.	3/25/2004	Water	-	+	-
12	Gainer Sps. #3 run	3/25/2004	Water	-	+	-
13	Gainer Sps. #2	3/25/2004	Water	-	+	-
14	Gainer Sps. #1 run	3/25/2004	Water	-	+	-
15	Gainer Sps. #5	3/25/2004	Water	-	+	-
16	Gainer Sps. #4	3/25/2004	Water	-	+	-
17	Econfina @ camp	3/25/2004	Water	-	-	-
18	Econfina @ CR 388	3/25/2004	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #1**  
**Date: 03/22/2004 Location: Swallet below Bay Gall**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	04/01/04	Charcoal	-	-	-	-
2	Econfina below Glowing Sp.	04/01/04	Charcoal	-	-	-	-
3	Bathtub Sp.	04/01/04	Charcoal	-	-	-	-
4	Blue Sp. run	04/01/04	Charcoal	-	-	-	-
5	Strickland Sp. run	04/01/04	Charcoal	-	-	-	-
6	Williford Sp. run	04/01/04	Charcoal	-	-	-	-
7	Bluff Sp.	04/01/04	Charcoal	-	-	-	-
8	Sylvan Sp. run	04/01/04	Charcoal	-	+++	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	04/01/04	Charcoal	-	-	-	-
11	Fenceline Sp.	04/01/04	Charcoal	-	+++	-	-
12	Gainer Sps. #3 run	04/01/04	Charcoal	-	++++	-	-
13	Gainer Sps. #2	04/01/04	Charcoal	-	++++	-	-
14	Gainer Sps. #1 run	04/01/04	Charcoal	-	+++	-	-
15	Gainer Sps. #5	04/01/04	Charcoal	-	++++	-	-
16	Gainer Sps. #4	04/01/04	Charcoal	-	++++	-	-
17	Econfina @ camp	04/01/04	Charcoal	-	+++	-	-
18	Econfina @ CR 388	04/01/04	Charcoal	-	++	-	-
FB	Field Blank	04/01/04	Charcoal	-	-	-	+

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
1	Econfina above Glowing Sp.	04/01/04	Water	-	-	-
2	Econfina below Glowing Sp.	04/01/04	Water	-	-	-
3	Bathtub Sp.	04/01/04	Water	-	-	-
4	Blue Sp. run	04/01/04	Water	-	-	-
5	Strickland Sp. run	04/01/04	Water	-	-	-
6	Williford Sp. run	04/01/04	Water	-	-	-
7	Bluff Sp.	04/01/04	Water	-	-	-
8	Sylvan Sp. run	04/01/04	Water	-	-	-
9	Pitt Sp. run	No longer monitoring				
10	Econfina @ Hwy 20	04/01/04	Water	-	-	-
11	Fenceline Sp.	04/01/04	Water	-	-	-
12	Gainer Sps. #3 run	04/01/04	Water	-	-	-
13	Gainer Sps. #2	04/01/04	Water	-	-	-
14	Gainer Sps. #1 run	04/01/04	Water	-	-	-
15	Gainer Sps. #5	04/01/04	Water	-	?	-
16	Gainer Sps. #4	04/01/04	Water	-	?	-
17	Econfina @ camp	04/01/04	Water	-	-	-
18	Econfina @ CR 388	04/01/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #1**  
**Date: 03/22/2004 Location: Swallet below Bay Gall**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	04/08/04	Charcoal	-	-	-	-
2	Econfina below Glowing Sp.	04/08/04	Charcoal	-	-	-	-
3	Bathtub Sp.	04/08/04	Charcoal	-	-	-	-
4	Blue Sp. run	04/08/04	Charcoal	-	-	-	-
5	Strickland Sp. run	04/08/04	Charcoal	-	-	-	-
6	Williford Sp. run	04/08/04	Charcoal	-	-	-	-
7	Bluff Sp.	04/08/04	Charcoal	-	-	-	-
8	Sylvan Sp. run	04/08/04	Charcoal	-	++	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	04/08/04	Charcoal	-	-	-	-
11	Fenceline Sp.	04/08/04	Charcoal	-	++	-	-
12	Gainer Sps. #3 run	04/08/04	Charcoal	Detector lost			
13	Gainer Sps. #2	04/08/04	Charcoal	-	+++	-	-
14	Gainer Sps. #1 run	04/08/04	Charcoal	-	++	-	-
15	Gainer Sps. #5	04/08/04	Charcoal	-	+++	-	-
16	Gainer Sps. #4	04/08/04	Charcoal	-	++++	-	-
17	Econfina @ camp	04/08/04	Charcoal	-	?	-	-
18	Econfina @ CR 388	04/08/04	Charcoal	-	?	-	-
FB	Field Blank	04/08/04	Charcoal	-	-	-	+

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification



**DYE INTRODUCTION #1**  
**Date: 03/22/2004 Location: Swallet below Bay Gall**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathtub Sp.	04/15/04	Charcoal	-	-	-	-
4	Blue Sp. run	04/15/04	Charcoal	-	-	-	-
5	Strickland Sp. run	04/15/04	Charcoal	-	-	-	-
6	Williford Sp. run	04/15/04	Charcoal	-	-	-	-
7	Bluff Sp.	04/15/04	Charcoal	-	-	-	-
8	Sylvan Sp. run	04/15/04	Charcoal	-	?	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	04/15/04	Charcoal	-	-	-	-
11	Fenceline Sp.	04/15/04	Charcoal	-	?	-	-
12	Gainer Sps. #3 run	04/15/04	Charcoal	Detector lost			
13	Gainer Sps. #2	04/15/04	Charcoal	-	++	-	-
14	Gainer Sps. #1 run	04/15/04	Charcoal	-	+	-	-
15	Gainer Sps. #5	04/15/04	Charcoal	-	+++	-	-
16	Gainer Sps. #4	04/15/04	Charcoal	-	+++	-	-
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	04/15/04	Charcoal	-	-	-	-
20	Econfina below Devils Hole	04/15/04	Charcoal	-	-	-	-
21	Tupelo Sp.	04/15/04	Charcoal	Detector lost			
22	Palm Sp.	04/15/04	Charcoal	-	-	-	-
23	Glowing Sp.	04/15/04	Charcoal	Charcoal lost			
FB	Field Blank	04/15/04	Charcoal	-	-	-	+

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
19	Econfina above Devils Hole	04/15/04	Water	-	-	-
20	Econfina below Devils Hole	04/15/04	Water	-	-	-
21	Tupelo Sp.	04/15/04	Water	-	-	-
22	Palm Sp.	04/15/04	Water	-	-	-
23	Glowing Sp.	04/15/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #1**  
**Date: 03/22/2004 Location: Swallet below Bay Gall**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathtub Sp.	04/22/04	Charcoal	-	-	-	-
4	Blue Sp. run	04/22/04	Charcoal	-	-	-	-
5	Strickland Sp. run	04/22/04	Charcoal	-	-	-	-
6	Williford Sp. run	04/22/04	Charcoal	-	-	-	-
7	Bluff Sp.	04/22/04	Charcoal	-	-	-	-
8	Sylvan Sp. run	04/22/04	Charcoal	-	?	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	04/22/04	Charcoal	-	-	-	-
11	Fenceline Sp.	04/22/04	Charcoal	-	?	-	-
12	Gainer Sps. #3 run	04/22/04	Charcoal	-	+	-	-
13	Gainer Sps. #2	04/22/04	Charcoal	-	+	-	-
14	Gainer Sps. #1 run	04/22/04	Charcoal	-	+	-	-
15	Gainer Sps. #5	04/22/04	Charcoal	-	++	-	-
16	Gainer Sps. #4	04/22/04	Charcoal	-	+++	-	-
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	04/22/04	Charcoal	-	-	-	-
20	Econfina below Devils Hole	04/22/04	Charcoal	-	-	-	-
21	Tupelo Sp.	04/22/04	Charcoal	-	-	-	-
22	Palm Sp.	04/22/04	Charcoal	-	-	-	-
23	Glowing Sp.	04/22/04	Charcoal*	-	-	-	-
FB	Field Blank	04/22/04	Charcoal	-	-	-	+

\* Detector damaged, 0.19 g charcoal recovered

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
19	Econfina above Devils Hole	04/22/04	Water	-	-	-
20	Econfina below Devils Hole	04/22/04	Water	-	-	-
21	Tupelo Sp.	04/22/04	Water	-	-	-
22	Palm Sp.	04/22/04	Water	-	-	-
23	Glowing Sp.	04/22/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #1**  
**Date: 03/22/2004 Location: Swallet below Bay Gall**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathtub Sp.	04/29/04	Charcoal	-	-	-	-
4	Blue Sp. run	04/29/04	Charcoal	-	-	-	-
5	Strickland Sp. run	04/29/04	Charcoal	-	-	-	-
6	Williford Sp. run	04/29/04	Charcoal	-	-	-	-
7	Bluff Sp.	04/29/04	Charcoal	-	-	-	-
8	Sylvan Sp. run	04/29/04	Charcoal	-	?	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	04/29/04	Charcoal	-	-	-	-
11	Fenceline Sp.	04/29/04	Charcoal	-	-	-	-
12	Gainer Sps. #3 run	04/29/04	Charcoal	-	?	-	-
13	Gainer Sps. #2	04/30/04	Charcoal	-	+	-	-
14	Gainer Sps. #1 run	04/29/04	Charcoal	-	?	-	-
15	Gainer Sps. #5	04/29/04	Charcoal	-	++	-	-
16	Gainer Sps. #4	04/29/04	Charcoal	-	++	-	-
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	04/29/04	Charcoal	-	-	-	-
20	Econfina below Devils Hole	04/29/04	Charcoal	-	-	-	-
21	Tupelo Sp.	04/29/04	Charcoal	-	-	-	-
22	Palm Sp.	04/29/04	Charcoal	-	-	-	-
23	Glowing Sp.	04/29/04	Charcoal	-	-	-	-
FB	Field Blank	04/29/04	Charcoal	-	-	-	+

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
19	Econfina above Devils Hole	04/29/04	Water	-	-	-
20	Econfina below Devils Hole	04/29/04	Water	-	-	-
21	Tupelo Sp.	04/29/04	Water	-	-	-
22	Palm Sp.	04/29/04	Water	-	-	-
23	Glowing Sp.	04/29/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #1**  
**Date: 03/22/2004 Location: Swallet below Bay Gall**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathtub Sp.	05/05/04	Charcoal	-	-	-	-
4	Blue Sp. run	05/05/04	Charcoal	Detector lost			
5	Strickland Sp. run	05/05/04	Charcoal	-	-	-	-
6	Williford Sp. run	05/05/04	Charcoal	-	-	-	-
7	Bluff Sp.	05/05/04	Charcoal	-	-	-	-
8	Sylvan Sp. run	05/05/04	Charcoal	-	-	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	05/05/04	Charcoal	-	-	-	-
11	Fenceline Sp.	05/05/04	Charcoal	-	-	-	-
12	Gainer Sps. #3 run	05/05/04	Charcoal	-	-	-	-
13	Gainer Sps. #2	05/05/04	Charcoal	-	?	-	-
14	Gainer Sps. #1 run	05/05/04	Charcoal	-	-	-	-
15	Gainer Sps. #5	05/05/04	Charcoal	-	?	-	-
16	Gainer Sps. #4	05/05/04	Charcoal	-	+	-	-
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	05/05/04	Charcoal	-	-	-	-
20	Econfina below Devils Hole	05/05/04	Charcoal	-	-	-	-
21	Tupelo Sp.	05/05/04	Charcoal	-	-	-	-
22	Palm Sp.	05/05/04	Charcoal	-	-	-	-
23	Glowing Sp.	05/05/04	Charcoal	-	-	-	-
FB	Field Blank	05/05/04	Charcoal	-	-	-	+

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
19	Econfina above Devils Hole	05/05/04	Water	-	-	-
20	Econfina below Devils Hole	05/05/04	Water	-	-	-
21	Tupelo Sp.	05/05/04	Water	-	-	-
22	Palm Sp.	05/05/04	Water	-	-	-
23	Glowing Sp.	05/05/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #2**  
**Date: 05/06/2004 Location: Section 20 well**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathtub Sp.	05/13/04	Charcoal	-	-	-	-
4	Blue Sp. run	05/13/04	Charcoal	-	-	-	-
5	Strickland Sp. run	05/13/04	Charcoal	-	-	-	-
6	Williford Sp. run	05/13/04	Charcoal	Detector lost			
7	Bluff Sp.	05/13/04	Charcoal	-	-	-	-
8	Sylvan Sp. run	05/13/04	Charcoal	-	-	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	05/13/04	Charcoal	-	-	-	-
11	Fenceline Sp.	05/13/04	Charcoal	-	-	-	-
12	Gainer Sps. #3 run	05/13/04	Charcoal	-	-	-	-
13	Gainer Sps. #2	05/13/04	Charcoal	-	?	-	-
14	Gainer Sps. #1 run	05/13/04	Charcoal	-	-	-	-
15	Gainer Sps. #5	05/13/04	Charcoal	-	?	-	-
16	Gainer Sps. #4	05/13/04	Charcoal	-	?	-	-
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	05/13/04	Charcoal	-	-	-	-
20	Econfina below Devils Hole	05/13/04	Charcoal	-	-	-	-
21	Tupelo Sp.	05/13/04	Charcoal	-	-	-	-
22	Palm Sp.	05/13/04	Charcoal	-	-	-	-
23	Glowing Sp.	05/13/04	Charcoal	-	-	-	-
FB	Field Blank	05/13/04	Charcoal	-	-	-	+

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
6	Williford Sp. run	05/13/04	Water	-	-	-
13	Gainer Sps. #2	05/13/04	Water	-	-	-
15	Gainer Sps. #5	05/13/04	Water	-	-	-
16	Gainer Sps. #4	05/13/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #2**  
**Date: 05/06/2004 Location: Section 20 well**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathtub Sp.	05/20/04	Charcoal	-	-	-	-
4	Blue Sp. run	05/20/04	Charcoal	-	-	-	-
5	Strickland Sp. run	05/20/04	Charcoal	-	-	-	-
6	Williford Sp. run	05/20/04	Charcoal	-	-	-	-
7	Bluff Sp.	05/20/04	Charcoal	-	-	-	-
8	Sylvan Sp. run	05/20/04	Charcoal	-	-	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	05/20/04	Charcoal	-	-	-	-
11	Fenceline Sp.	05/20/04	Charcoal	-	-	-	-
12	Gainer Sps. #3 run	05/20/04	Charcoal	-	-	-	-
13	Gainer Sps. #2	05/20/04	Charcoal	-	-	-	-
14	Gainer Sps. #1 run	05/20/04	Charcoal	Detector lost			
15	Gainer Sps. #5	05/20/04	Charcoal	-	-	-	-
16	Gainer Sps. #4	05/20/04	Charcoal	-	-	-	-
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	05/20/04	Charcoal	-	-	-	-
20	Econfina below Devils Hole	05/20/04	Charcoal	-	-	-	-
21	Tupelo Sp.	05/20/04	Charcoal*	-	-	-	-
22	Palm Sp.	05/20/04	Charcoal	-	-	-	-
23	Glowing Sp.	05/20/04	Charcoal	-	-	-	-
FB	Field Blank	05/20/04	Charcoal	-	-	-	+

\* Detector damaged, 1.07 g charcoal recovered

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
14	Gainer Sps. #1 run	05/20/04	Water	?	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #2**  
**Date: 05/06/2004 Location: Section 20 well**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathtub Sp.	05/27/04	Charcoal	-	-	-	-
4	Blue Sp. run	05/27/04	Charcoal	-	-	-	-
5	Strickland Sp. run	05/27/04	Charcoal	?	-	-	-
6	Williford Sp. run	05/27/04	Charcoal	Detector lost			
7	Bluff Sp.	05/27/04	Charcoal	+	-	-	-
8	Sylvan Sp. run	05/27/04	Charcoal	-	-	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	05/27/04	Charcoal	-	-	-	-
11	Fenceline Sp.	05/27/04	Charcoal	-	-	-	-
12	Gainer Sps. #3 run	05/27/04	Charcoal	Detector lost			
13	Gainer Sps. #2	05/27/04	Charcoal	Detector lost			
14	Gainer Sps. #1 run	05/27/04	Charcoal	-	-	-	-
15	Gainer Sps. #5	05/27/04	Charcoal	-	-	-	-
16	Gainer Sps. #4	05/27/04	Charcoal	-	-	-	-
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	05/27/04	Charcoal	-	-	-	-
20	Econfina below Devils Hole	05/27/04	Charcoal	-	-	-	-
21	Tupelo Sp.	05/27/04	Charcoal	-	-	-	-
22	Palm Sp.	05/27/04	Charcoal	-	-	-	-
23	Glowing Sp.	05/27/04	Charcoal	-	-	-	-
FB	Field Blank	05/27/04	Charcoal	-	-	-	+

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
5	Strickland Sp. run	05/27/04	Water	-	-	-
6	Williford Sp. run	05/27/04	Water	?	-	-
7	Bluff Sp.	05/27/04	Water	?	-	-
12	Gainer Sps. #3 run	05/27/04	Water	-	-	-
13	Gainer Sps. #2	05/27/04	Water	-	-	-
21	Tupelo Sp.	05/27/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #2**  
**Date: 05/06/2004 Location: Section 20 well**

Site #	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathtub Sp.	06/03/04	Charcoal	-	-	-	-
4	Blue Sp. run	06/03/04	Charcoal	-	-	-	-
5	Strickland Sp. run	06/03/04	Charcoal	+	-	-	-
6	Williford Sp. run	06/03/04	Charcoal	+++	-	-	-
7	Bluff Sp.	06/03/04	Charcoal	+++	-	-	-
8	Sylvan Sp. run	06/03/04	Charcoal	-	-	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	06/03/04	Charcoal	-	-	-	-
11	Fenceline Sp.	06/03/04	Charcoal	-	-	-	-
12	Gainer Sps. #3 run	06/03/04	Charcoal	-	-	-	-
13	Gainer Sps. #2	06/03/04	Charcoal	Detector lost			
14	Gainer Sps. #1 run	06/03/04	Charcoal	-	-	-	-
15	Gainer Sps. #5	06/03/04	Charcoal	-	-	-	-
16	Gainer Sps. #4	06/03/04	Charcoal	-	-	-	-
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	06/03/04	Charcoal	Detector lost			
20	Econfina below Devils Hole	06/03/04	Charcoal	-	-	-	-
21	Tupelo Sp.	06/03/04	Charcoal	-	-	-	-
22	Palm Sp.	06/03/04	Charcoal	-	-	-	-
23	Glowing Sp.	06/03/04	Charcoal	-	-	-	-
FB	Field Blank	06/03/04	Charcoal	-	-	-	+

Site #	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
5	Strickland Sp. run	06/03/04	Water	?	-	-
6	Williford Sp. run	06/03/04	Water	+	-	-
7	Bluff Sp.	06/03/04	Water	+	-	-
13	Gainer Sps. #2	06/03/04	Water	-	-	-
19	Econfina above Devils Hole	06/03/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification



**DYE INTRODUCTION #2**  
**Date: 05/06/2004 Location: Section 20 well**

Site #	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathtub Sp.	06/10/04	Charcoal	-	-	-	-
4	Blue Sp. run	06/10/04	Charcoal	-	-	-	-
5	Strickland Sp. run	06/10/04	Charcoal	++	-	-	-
6	Williford Sp. run	06/10/04	Charcoal	+++	-	-	-
7	Bluff Sp.	06/10/04	Charcoal	+++	-	-	-
8	Sylvan Sp. run	06/10/04	Charcoal	-	-	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	06/10/04	Charcoal	-	-	-	-
11	Fenceline Sp.	06/10/04	Charcoal	-	-	-	-
12	Gainer Sps. #3 run	06/10/04	Charcoal	-	-	-	-
13	Gainer Sps. #2	06/10/04	Charcoal	Detector lost			
14	Gainer Sps. #1 run	06/10/04	Charcoal	-	-	-	-
15	Gainer Sps. #5	06/10/04	Charcoal	-	-	-	-
16	Gainer Sps. #4	06/10/04	Charcoal	-	-	-	-
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	06/10/04	Charcoal	Detector lost			
20	Econfina below Devils Hole	06/10/04	Charcoal	-	-	-	-
21	Tupelo Sp.	06/10/04	Charcoal	-	-	-	-
22	Palm Sp.	06/10/04	Charcoal	-	-	-	-
23	Glowing Sp.	06/10/04	Charcoal	-	-	-	-
FB	Field Blank	06/10/04	Charcoal	-	-	-	+

Site #	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
5	Strickland Sp. run	06/10/04	Water	?	-	-
6	Williford Sp. run	06/10/04	Water	+	-	-
7	Bluff Sp.	06/10/04	Water	+	-	-
13	Gainer Sps. #2	06/10/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #2**  
**Date: 05/06/2004 Location: Section 20 well**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathub Sp.	06/16/04	Charcoal	-	-	-	-
4	Blue Sp. run	06/16/04	Charcoal	-	-	-	-
5	Strickland Sp. run	06/16/04	Charcoal	++	-	-	-
6	Williford Sp. run	06/16/04	Charcoal	+++	-	-	-
7	Bluff Sp.	06/16/04	Charcoal	+++	-	-	-
8	Sylvan Sp. run	06/16/04	Charcoal	-	-	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	06/16/04	Charcoal	-	-	-	-
11	Fenceline Sp.	06/16/04	Charcoal	-	-	-	-
12	Gainer Sps. #3 run	06/16/04	Charcoal	-	-	-	-
13	Gainer Sps. #2	No longer monitoring					
14	Gainer Sps. #1 run	06/16/04	Charcoal	-	-	-	-
15	Gainer Sps. #5	06/16/04	Charcoal	-	-	-	-
16	Gainer Sps. #4	06/16/04	Charcoal	-	-	-	-
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	06/16/04	Charcoal	-	-	-	-
20	Econfina below Devils Hole	06/16/04	Charcoal	-	-	-	-
21	Tupelo Sp.	06/16/04	Charcoal	-	-	-	-
22	Palm Sp.	06/16/04	Charcoal	-	-	-	-
23	Glowing Sp.	06/16/04	Charcoal	-	-	-	-
FB	Field Blank	06/16/04	Charcoal	-	-	-	+

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
5	Strickland Sp. run	06/16/04	Water	?	-	-
6	Williford Sp. run	06/16/04	Water	+	-	-
7	Bluff Sp.	06/16/04	Water	+	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #2**  
**Date: 05/06/2004 Location: Section 20 well**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathtub Sp.	06/24/04	Charcoal	-	-	-	-
4	Blue Sp. run	06/24/04	Charcoal	Detector lost			
5	Strickland Sp. run	06/24/04	Charcoal	++	-	-	-
6	Williford Sp. run	06/24/04	Charcoal	+++	-	-	-
7	Bluff Sp.	06/24/04	Charcoal	+++	-	-	-
8	Sylvan Sp. run	06/24/04	Charcoal	-	-	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	06/24/04	Charcoal	-	-	-	-
11	Fenceline Sp.	06/24/04	Charcoal	-	-	-	-
12	Gainer Sps. #3 run	06/24/04	Charcoal	-	-	-	-
13	Gainer Sps. #2	No longer monitoring					
14	Gainer Sps. #1 run	06/24/04	Charcoal	-	-	-	-
15	Gainer Sps. #5	06/24/04	Charcoal	-	-	-	-
16	Gainer Sps. #4	06/24/04	Charcoal	Detector lost			
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	06/24/04	Charcoal	-	-	-	-
20	Econfina below Devils Hole	06/24/04	Charcoal	-	-	-	-
21	Tupelo Sp.	06/24/04	Charcoal	-	-	-	-
22	Palm Sp.	06/24/04	Charcoal	-	-	-	-
23	Glowing Sp.	06/24/04	Charcoal	-	-	-	-
FB	Field Blank	06/24/04	Charcoal	-	-	-	+

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT
4	Blue Sp. run	06/24/04	Water	-	-	-
5	Strickland Sp. run	06/24/04	Water	-	-	-
6	Williford Sp. run	06/24/04	Water	+	-	-
7	Bluff Sp.	06/24/04	Water	+	-	-
16	Gainer Sps. #4	06/24/04	Water	-	-	-

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

**DYE INTRODUCTION #2**  
**Date: 05/06/2004 Location: Section 20 well**

Site ID	Location	Sample Date	Sample Medium	Fluorescein	Eosine	Rhodamine WT	Low Flow
1	Econfina above Glowing Sp.	No longer monitoring					
2	Econfina below Glowing Sp.	No longer monitoring					
3	Bathtub Sp.	06/30/04	Charcoal	-	-	-	-
4	Blue Sp. run	06/30/04	Charcoal	Detector lost			
5	Strickland Sp. run	06/30/04	Charcoal	++	-	-	-
6	Williford Sp. run	06/30/04	Charcoal	+++	-	-	-
7	Bluff Sp.	06/30/04	Charcoal	+++	-	-	-
8	Sylvan Sp. run	06/30/04	Charcoal	-	-	-	-
9	Pitt Sp. run	No longer monitoring					
10	Econfina @ Hwy 20	06/30/04	Charcoal	-	-	-	-
11	Fenceline Sp.	06/30/04	Charcoal	Detector lost			
12	Gainer Sps. #3 run	06/30/04	Charcoal	-	-	-	-
13	Gainer Sps. #2	No longer monitoring					
14	Gainer Sps. #1 run	06/30/04	Charcoal	-	-	-	-
15	Gainer Sps. #5	06/30/04	Charcoal	-	-	-	-
16	Gainer Sps. #4	06/30/04	Charcoal	Detector not recoverable due to high water			
17	Econfina @ camp	No longer monitoring					
18	Econfina @ CR 388	No longer monitoring					
19	Econfina above Devils Hole	06/30/04	Charcoal	-	-	-	-
20	Econfina below Devils Hole	06/30/04	Charcoal	-	-	-	-
21	Tupelo Sp.	06/30/04	Charcoal	-	-	-	-
22	Palm Sp.	06/30/04	Charcoal	-	-	-	-
23	Glowing Sp.	06/30/04	Charcoal	-	-	-	-
FB	Field Blank	06/30/04	Charcoal	-	-	-	+

Symbol	Definition
-	No Dye Present
+	Positive Fluorescence Signature
++	Strong Positive Fluorescence Signature
+++	Very Positive Fluorescence Signature
++++	Spectacularly Positive Fluorescence Signature, Analyzed Under Low Sensitivity
+++++	Dilution Required
?	Fluorescence is Not the Dye of Interest or Concentration too Low for Positive Identification

## APPENDIX C

### HISTORICAL DISCHARGE MEASUREMENTS

Location	Date	Discharge (cfs)	Discharge (Mgd)
Devils Hole	05/26/04	32.2	20.8
Palm Springs Composite	05/26/04	2.4	1.5
Tupelo Spring	05/26/04	4.0	2.6
Glowing Spring	12/23/03	34.4	22.3
Bathtub Spring	12/23/03	1.6	1.0
Blue Springs Composite	11/19/03	7.1	4.6
	05/16/72	14.2	9.2
	08/28/63	12.6	8.1
	05/28/63	11.1	7.2
	01/29/63	12.7	8.2
	09/11/62	10.8	7.0
	04/10/62	12.3	7.9
	<b>Avg.</b>	<b>11.5</b>	<b>7.5</b>
Barking Spring	12/30/03	0.7	0.5
Strickland Springs Composite	12/03/03	5.5	3.6
Williford Springs Composite	11/25/03	28.6	18.5
	05/24/94	22.5	14.5
	05/15/72	26.4	17.1
	08/27/63	31.2	20.2
	05/29/63	31.9	20.6
	01/31/63	32.3	20.9
	09/11/62	31.1	20.1
	<b>Avg.</b>	<b>29.1</b>	<b>18.8</b>
Bluff Spring	03/09/04	0.9	0.5
Sylvan Springs Composite	11/19/03	16.6	10.7
Pitt Spring	12/03/03	5.0	3.3
	05/24/94	5.9	3.8
	<b>Avg.</b>	<b>5.4</b>	<b>3.5</b>
Fenceline Spring	03/09/04	4.0	2.6
Gainer Springs Composite	04/05/04	177.4	114.7
	01/05/04	192.8	124.6
	10/06/03	214.0	138.3
	07/14/03	115.0	74.3
	04/07/03	174.0	112.5
	01/06/03	168.2	108.7
	10/14/02	128.2	82.9
	04/08/02	140.2	90.6
	01/07/02	131.3	84.9
	<b>Avg.</b>	<b>160.1</b>	<b>103.5</b>
<b>TOTAL</b>		<b>308.6</b>	<b>199.4</b>

## APPENDIX D



# NFWFMD Well Inventory Database System

## Site Schedule

Printed: August 12, 2004 02:15

Site Id **302528085344801**

Site Type **K**

NWF ID **8398**

Well Name **SWALLET BELOW BAY GALL**

State ID

Owner **NFWFMD**

Contact Person

Phone

Street

City

State

Zip

County **Bav**

Latitude **302527.908**

Longitude **853448.188**

Datum **WGS84**

Loc Method **Global Positioning Satellite (GPS)**

Land Net **S06T01SR13W**

Loc Accuracy **0.3 < 3 meters**

Loc Source **NFWFMD**

Elevation **45**

Datum **NGVD29**

Method **Topo Map**

Accuracy **1 < 5 feet**

Source **NFWFMD**

Location Map **BENNETT**

GW Region **Dougherty Karst Region**

Site Use **Unused**

Water Use

Depth Of Well

Depth Of Casing

MP Distance From LSD

Diameter

Construction Data Source

Casing Material

Finish

Driller License Number

Date of Construction

Construction Method

Screen Length

Screened Intervals

Water Level

Measure Date

WL Source

WL Method

Hydrogeologic Units

Lift

Power

Horsepower

Pump Intake

Normal Yield

Spcap Discharge

Spcap Source

Spcap Discharge Method

Spcap Static Level

Spcap Pumping Level

Spcap Drawdown

Hours Pumped

Spcap

**Field Water Quality**

Discharge **.06 on 4/14/2003 @ 00:00**

Temperature

pH

Specific Conductance

Chloride

Consumptive Use Permit

Construction Permit

FL Geological Survey #

Abandonment Permit

DEP Public Supply #

Project #'s

Geophysical Log #

Depth Logged

Available LOG Data

Visited By

Date Visited

Data Entered By **K\_DEFOSSET**

Date Entered **03/24/2003**

Last Updated By **T\_PRATT**

Last Updated **04/12/2004**

Ambient Network

Shown to KD & AC by E. Toole 03/24/2003. Surface stream flowing from the east and sinking at this point. It had rained the previous day(s) up to 5".





# NWFWMD Well Inventory Database System Site Schedule

Printed: August 12, 2004 02:17

Site Id **302836085334601**

Site Type **G**

NWF ID **5961**

Well Name **SECTION 20**

State ID **AAA0580**

Owner **NWFWMD**

Contact Person **BUREAU OF GROUND WATER**

Phone **904-539-5999**

Street **RT 1 BOX 3100**

City **HAVANA**

State **FL**

Zip **32333**

County **Washington**

Latitude **302837.159**

Longitude **853346.117**

Datum **WGS84**

Loc Method **Global Positioning Satellite (GPS)**

Land Net **BDAS020T01NR13W**

Loc Accuracy **0.3 < 3 meters**

Loc Source **NWFWMD**

Elevation **136.68**

Datum **NGVD29**

Method **Survey**

Accuracy **< 0.1 feet**

Source **NWFWMD**

Location Map **BENNETT FL**

GW Region **Dougherty Karst Region**

Site Use **Monitor / OBS**

Water Use **Monitor**

Depth Of Well **290**

Depth Of Casing **195**

MP Distance From LSD **1.7**

Diameter **4**

Construction Data Source **NWFWMD**

Casing Material **PVC**

Finish **Open Hole**

Driller License Number **2226**

Date of Construction **07/12/1996**

Construction Method **Hydraulic Rotary**

Screen Length

Screened Intervals

Water Level **-98.94**

Measure Date **07/15/1996**

WL Source **NWFWMD**

WL Method **Steel Tape**

Hydrogeologic Units **Floridan Aquifer (Undiff)**

Lift **No Pump**

Power

Horsepower

Pump Intake

Normal Yield

Spcap Discharge

Spcap Source

Spcap Discharge Method

Spcap Static Level

Spcap Pumping Level

Spcap Drawdown

Hours Pumped

Spcap

**Field Water Quality**

Discharge

Temperature

pH

Specific Conductance

Chloride

Consumptive Use Permit

Construction Permit **M199601388**

FL Geological Survey # **17443**

Abandonment Permit

DEP Public Supply #

Project #'s **54**

Geophysical Log # **54**

Depth Logged **290**

Available LOG Data **Caliper**

**Gamma**

**Electric**

**FSG-litho**

Visited By **C\_RICHARDS**

Date Visited **07/12/1996**

Data Entered By **C\_RICHARDS**

Date Entered **07/23/1996**

Last Updated By **K\_BARRIOS**

Last Updated **05/10/2004**

Ambient Network

**\*\*(C.RICHARDS,23-JUL-96) AKA WELL #5;MP = TOP OF 4 INCH PVC CASING = +1.70 FT LSD; MP ELEVATION = 138.38; ELEVATION LEVELED BY NWFWMD NGVD 1929; THREADED FLUSH JOINT WELL CASING USED; 8 INCH SOLVENT BONDED (GLUE) SURFACE CASING USED AND RETREIVED**