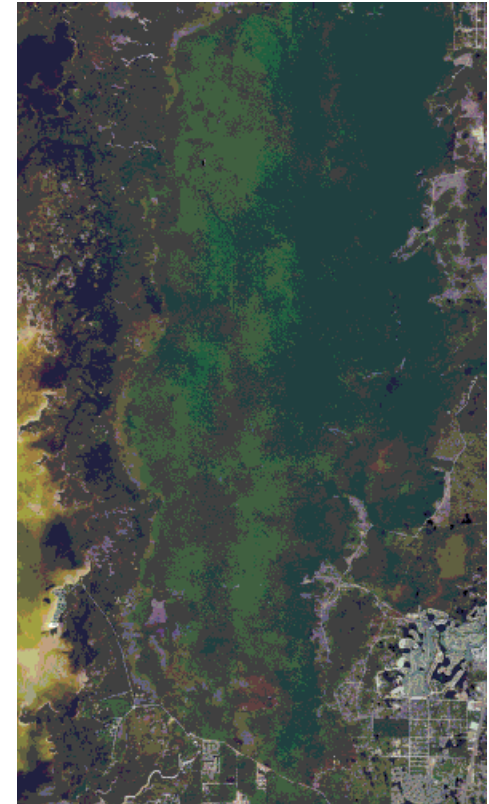


Initial Inventory of Karst Features in the Chassahowitzka Swamp and Vicinity

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Overview

Note: This monograph is the compilation of initial fieldwork and interviews with local residents and has limited information about the karst features within the study area. It will be followed by a superseding, companion document that will provide complete characterizations of all identified karst features within the Chassahowitzka Swamp. The companion document will be finalized upon completion of the fieldwork; as of the publication of this document, the companion document is estimated to be completed in 2008.

For the sake of this report, the study area is generally bounded by SR-50 to the South, US-19 to the East, the Chassahowitzka River to the North, and the Gulf of Mexico to the West. It will be herein categorically referred to as the Chassahowitzka Swamp. It is principally government-managed property, under the auspices of the Chassahowitzka Wildlife Management Area (CWMA) and the Chassahowitzka National wildlife Refuge. There are also a few small parcels of privately held property; these are predominately on the northern and southern borders.

The Chassahowitzka Swamp has numerous hydraulically active (karst) features. The area is characterized by:

- Springs, representing either an initial discharge point or a resurgence point
- Numerous low magnitude springs, producing surface streams that re-enter the aquifer in swallets
- Open karst windows, and

- Relic karst in the form of water-filled sinks with nominal to nil subsurface aquifer interaction or dry subsidences

The focus herein is the identification of "points of interests" (POIs) that have not previously been documented or where existing documentation is extremely questionable or no longer current. POI is a broad term that is used here to represent a known feature or an observed feature that may be of interest.

Please refer to the Glossary for KUR's specific usage of key terms (e.g. exsurgence, spring, karst window,swallet) for the purposes of classification and segregation of the POIs within this document.

KUR grouped the identified POIs in the following spatial groupings, herein referred to as arrays:

- Blind Creek System (this system is divided into two sections for organizational convenience)
 - o Blind Spring
 - o Warm Spring
- Scrub Island
- Sawmill Island
- Eagles Nest
- Other isolated points of interest

The following Figures, 1-3, illustrate the initial dimensions of each array. All photos are from the 2004 Digital Ortho Quarter Quadrangle (DOQQ).

Figure 1 – Blind Creek System

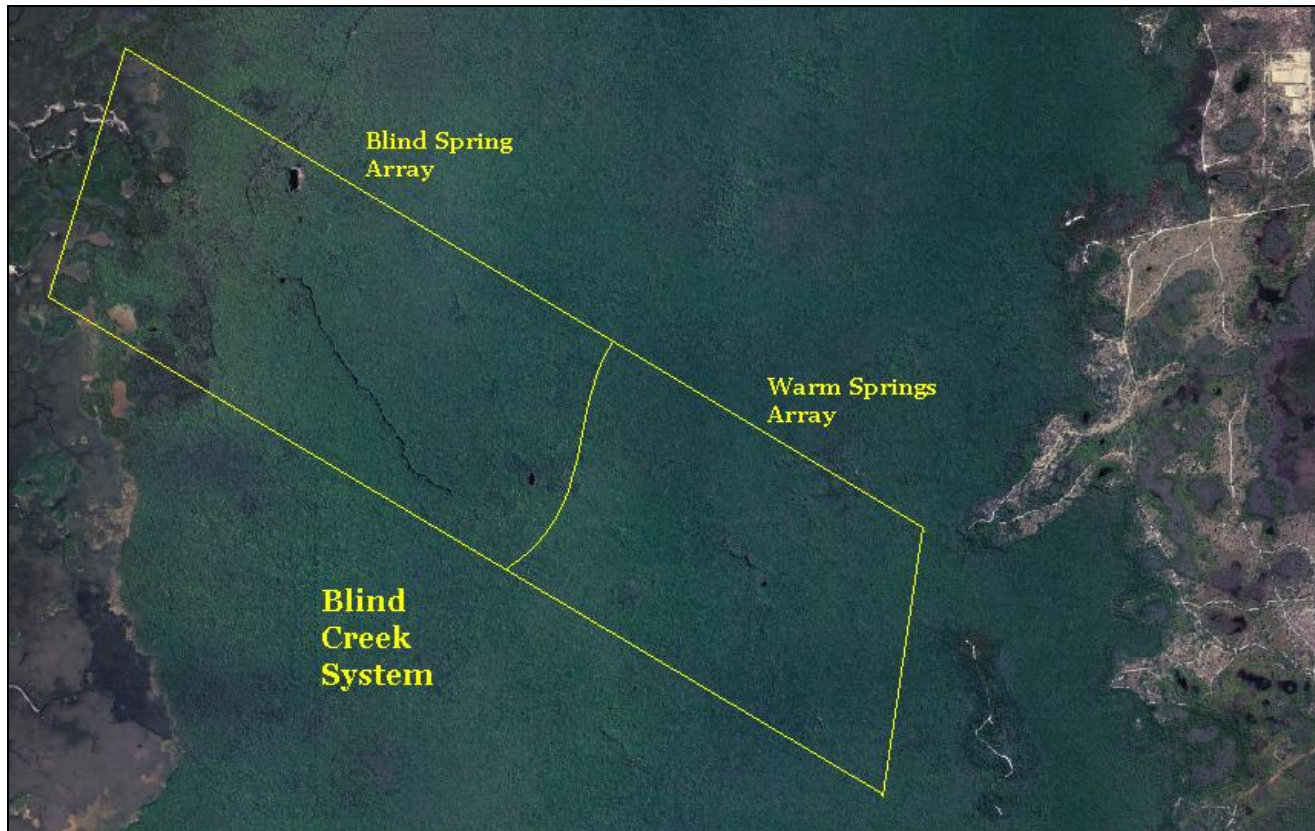


Figure 2 – Scrub Island Array



Figure 3 – Sawmill Island and Eagles Nest Arrays



Groundwater movement in the study area has a generalized coastward trend. The Eagles Nest region has a more southeasterly bias due to the presence of Mud Spring and various other springs in its vicinity.

Due to the proximity to the Gulf of Mexico, many of the karst features respond to tidal stage.

Even with the presence of Blind Spring, there also appears to be an apparent lack of strong discharge points between Chassahowitzka Spring and Weeki Wachee. This is circumstantially supported by the westward shift of the saltwater-freshwater interface between Chassahowitzka Spring and Weeki Wachee (see Figure 4).

Given reduction of groundwater head due to the discharge from Chassahowitzka and Weeki Wachee Springs, these features (along with elevation differentials) create localized anomalies where the saltwater-freshwater interface manifests itself further more inland at shallower depths.

Each array is analyzed in the following format:

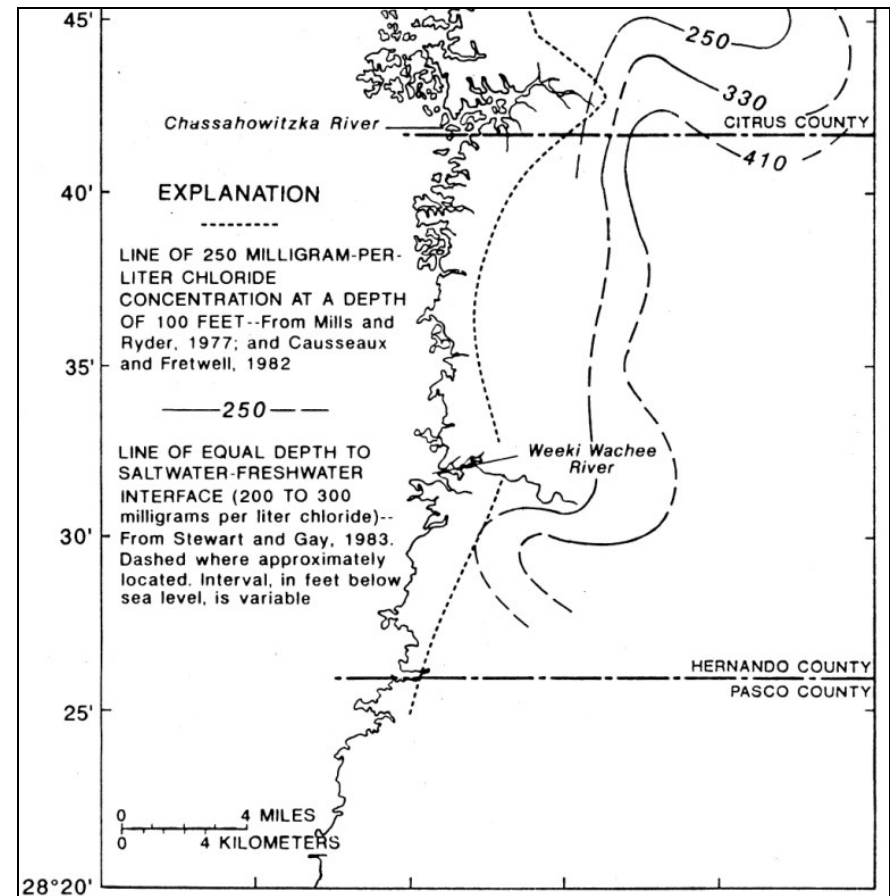
1. **Overview**
2. **A table** – characterizing POIs identified to date.
3. **A figure** – illustrating certain key points of interest within the array.

These areas (and others) will require further evaluation. Additionally, further fieldwork is expected to bring to light other karst features not yet identified.

Use UTM's whenever possible for field work; Lat/Lon coordinates were converted from actual UTM's.

All of the comments in the following sections are based on qualitative observations. Some sites were visited one or more times, others have not been visited yet. Subsequent research and water sampling will provide greater quantitative rigor that will be documented in the companion document.

Figure 4 – Saltwater-Freshwater Interfaces



(Adapted from Water-Resources Investigations Report 92-4069)

Blind Creek System

Overview

From a geologic perspective, the separation of this system between the Warm Springs array and the Blind Spring array is essentially arbitrary. While primarily for convenience, the distinction between the two arrays is based on the termination of all surface flow. Warm springs ends with no remaining water moving at the surface. The Blind Spring array encompasses all the coastward points of interest after 3169429A (the last karst window). Thereafter, water begins discharging again at 3169327A and 3169246A.

Blind Creek starts at a large spring basin (3168699A); this spring is referred to as Warm Springs by the local residents. The spring produces a broad clear stream that meanders for approximately a quarter mile through the swamp to a swallet (3169024A) where almost all the stream returns underground.

Presumably, this water (plus other possible contributing sources) resurge at another exsurgence (3169246A) that forms the final leg of Blind Creek before it again returns underground approximately one mile north-northeast at another swallet (3170487A). From there, this water most likely makes its final resurgence at Blind Spring (3171211A) in the coastal marsh.

It is highly likely that both sections of surface stream may have more spring/resurgences and swallets that are not evident from the aerial images.

The large rectangular pond just north of 3170836A was not identified as a POI; it does not appear to be hydraulically active from the surface. The water was dark tannic and the pond

appears to have been used as a dredging point to cull aggregate for grading the nearby logging trails.

Beauford spring (3168415A) sits east of the Warm Springs basin. It has a very large cavern just below the surface of the pool. The majority of the water entering this room continues underground through a small tunnel.

A portion of the water is discharged through the surface opening. This discharge creates a small stream that returns underground at a small fracture at the end of the run named Beauford Swallet (3168500A).

Water quality at Beauford Spring is visually more "blue" than the discharge at Warm Springs, which has a slightly greenish hue. The operating presumption is that there is no direct surficial input into the conduit system "upstream" from Beauford Spring.

Exploration at Beauford Swallet indicates that, along with the water from the spring run entering the system, two other underground sources converge and continue on westward. One of these sources was observed to be clear tannic while the other was clear water – possibly the water that remained underground in the Beauford Spring cavern.

The water continuing underground may discharge at Warm Springs, but further research is needed to determine if there is any direct conduit joining the two features.

Throughout this array, KUR has found anecdotal evidence that there may be a combination of different aquifers, the Floridan and one or more surficial aquifers, each with its own conduit system that converges and intertwines at one or more points.

Figure 5 – Key features of the Blind Creek System

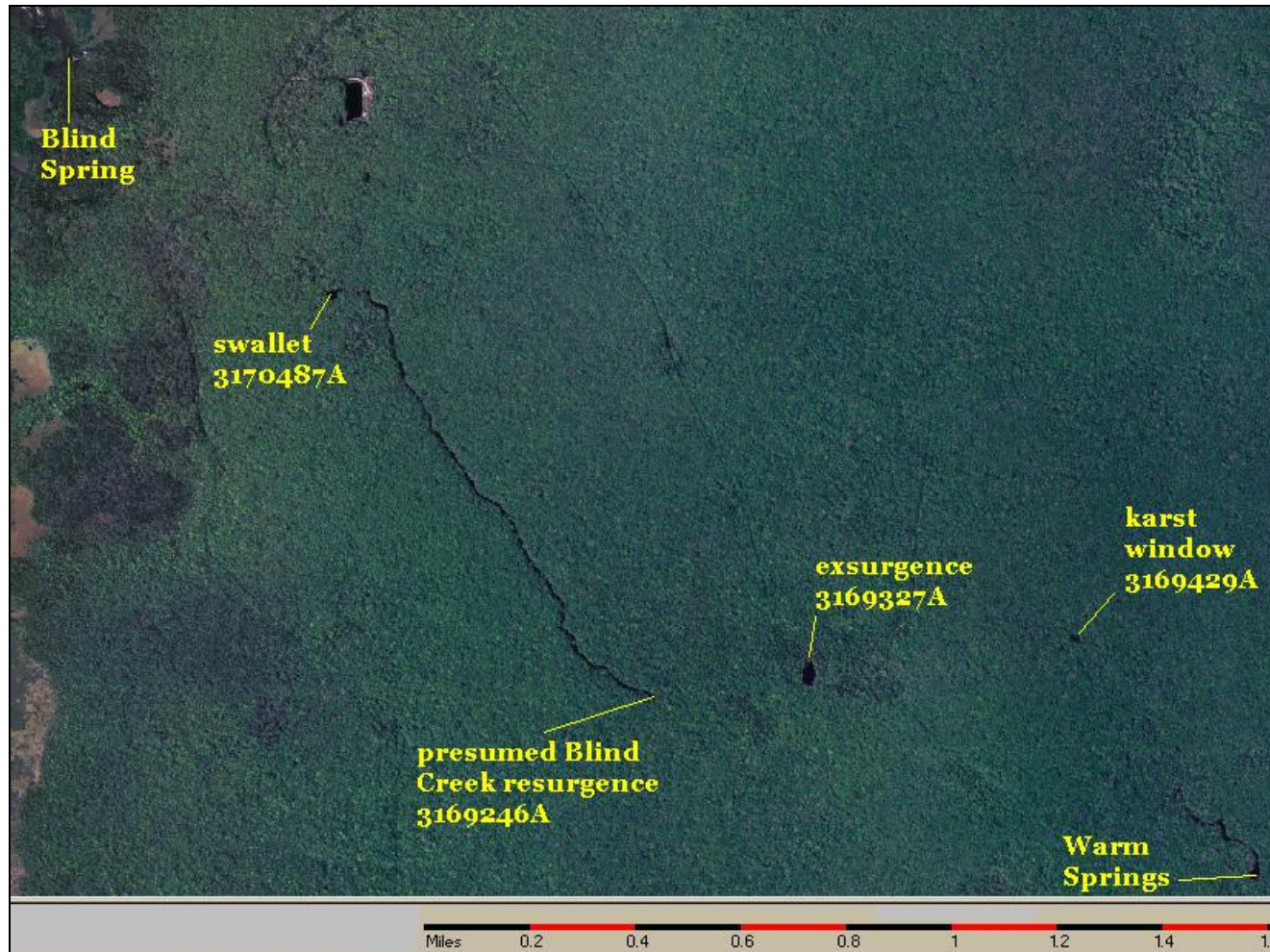


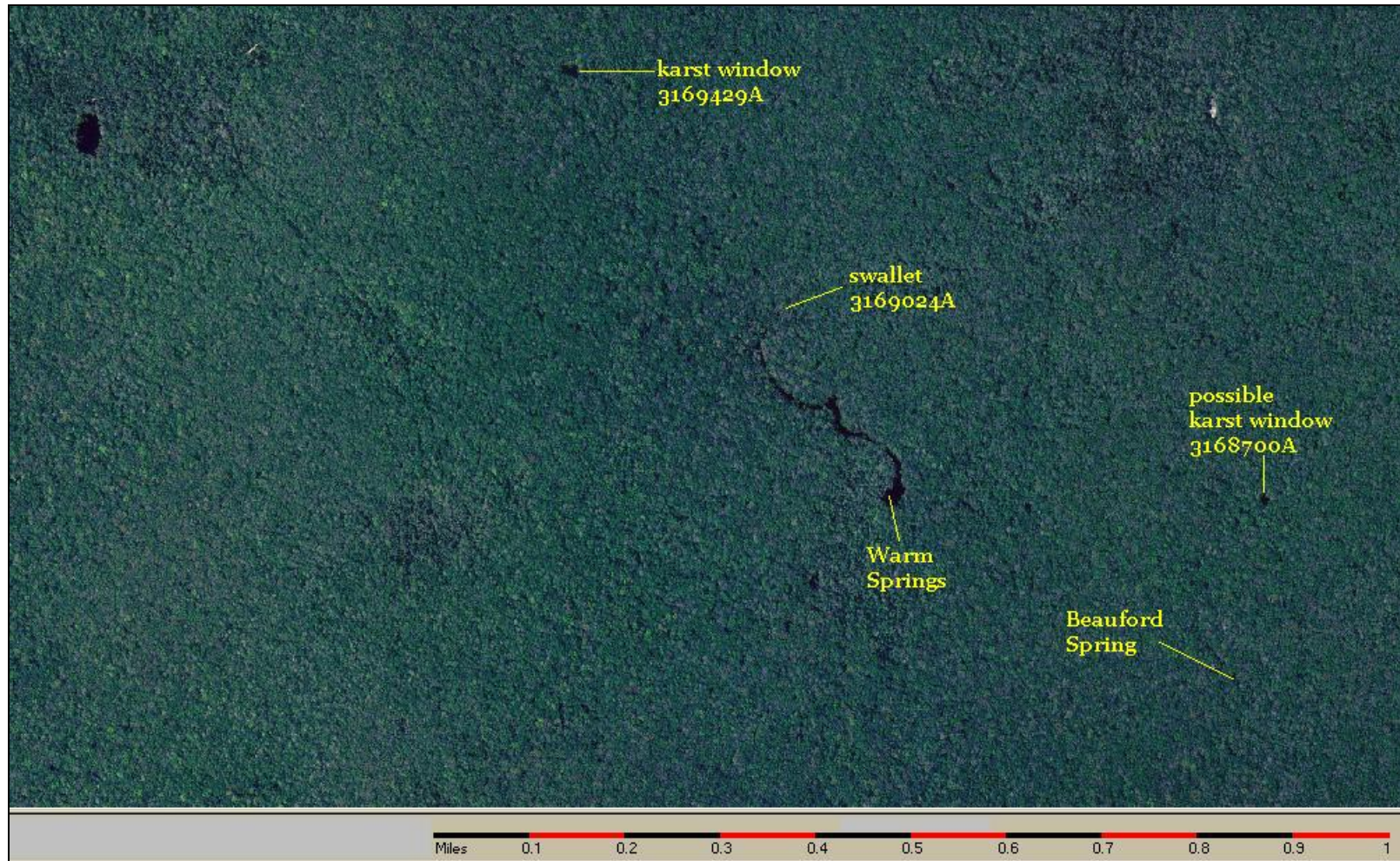
Table 1 – Warm Springs Array – selected points of interest

<i>POI Reference</i>	<i>Categorization</i>	<i>Common Name</i>	<i>LAT (N) UTM E</i>	<i>LON (W) UTM N</i>	<i>Source</i>	<i>Comments</i>
3168699A	Spring	Warm Spring(s)	28 38 9.521 17343942	82 35 47.634 3168699	Physical inspection	Very large circular pond with a clear stream running northward from the pond. A large horseshoe-shaped fracture/collapse is the dominating feature on the floor of the basin. Caverns were explored to a depth of 140ffw. Water appeared to be groundwater, although a slight green hue was observed. On a subsequent visit, the water discharging from the cave appeared to have a tannic component; this was after a recent rainfall indicating the possible presence of karst windows or swallets upstream from this POI. There may still be access to human-passable conduit; further investigation is needed.
3169429A	Karst Window	none	28 38 32.995 17343394	82 36 8.170 3169429	Physical inspection	Large elliptical pond with no stream feeding or sourcing from the pond. A large east-west trending fracture exists in the bottom of the pond. Surface water was clear and cold. There may be access to human-passable conduit; further investigation is needed.
3169418A	Unknown (pond)	none	28 38 32.638 17343396	82 36 8.091 3169418	2004 DOQQ	Small pond; further investigation needed to categorize this point.

POI Reference	Categorization	Common Name	LAT (N) UTM E	LON (W) UTM N	Source	Comments
3169362A	Swallet	none	28 38 30.835 17343433	82 36 6.701 3169362	Physical inspection	This is a cluster of small swallets drawing the remaining water discharging at Warm Spring (that was not drawn underground at 3169024A). These openings do not appear to be humanly passable.
3169024A	Swallet	none	28 38 19.995 17343751	82 35 54.826 3169024	Physical inspection	This appears to be one of the primary swallets that captures the water discharging at Warm Springs. Approximately 85% of the water reaching this point returns underground via a set of north-south fractures. A swirl in the surface water was visible from the water draining underground. There may be access to human-passable conduit; further investigation is needed.
3168700A	Unknown (probable Karst Window)	none	28 38 9.826 17344570	82 35 24.512 3168700	Physical inspection	Small circular pond; no streams feeding to or sourcing from the pond. A large opening, obscured by fallen trees, was observed. Qualitative assessment of the water quality appeared to be consistent with 3169429A.
3168695A	Unknown (pond)	none	28 38 9.663 17344569	82 35 24.546 3168695	2004 DOQQ	Small pond; further investigation needed to categorize this point.
3168682A	Unknown (pond)	none	28 38 9.021 17344062	82 35 43.207 3168682	2004 DOQQ	Small pond; further investigation needed to categorize this point.
3169091A	Unknown (pond)	none	28 38 22.152 17343707	82 35 56.479 3169091	2004 DOQQ	Small pond. Given proximity to 3169024A, this may be a connected karst window. Further investigation needed to categorize this point.

POI Reference	Categorization	Common Name	LAT (N) UTM E	LON (W) UTM N	Source	Comments
3168874A	Unknown (possible spring or swallet)	none	28 38 15.159 17343835	82 35 51.659 3168874	2004 DOQQ	An abrupt elbow of stream. Since this precedes 3169024A on the Warm springs run, it may either be a swallet or possibly another spring. Further investigation needed to categorize.
3168552A	Unknown (pond)	none	28 38 4.747 17343943	82 35 47.524 3168552	2004 DOQQ	Small pond; further investigation needed to categorize this point.
3168415A	Spring	Beauford Spring	28 38 .553 17344534	82 35 25.698 3168415	Physical inspection	A small canopy covered pond contains a fracture/collapse opening down into a very large cavern. Water enters the cavern from a small vent at 140ffw. A large portion of the water entering the cavern continues underground into another restricted conduit at 160ffw. The remainder discharges at the surface and flows approximately 700 feet to Beauford Siphon. Water appeared to be from Floridan aquifer and the clearest (blue tint) water observed in this array.
3168500A	Swallet	Beauford Siphon	28 38 3.286 17344469	82 35 28.133 3168500	Physical inspection	The stream from Beauford Spring ends abruptly at a swallet fracture. While the opening is relatively small (2-3 feet wide x 8 feet long), the system has been explored to a depth of 180ffw. At that depth two other conduits were identified, one was introducing tannic water and the other was introducing clear water (this conduit may link to conduit in the bottom of the Beauford Spring cavern). There may be access to further human-passable conduit; further investigation is needed.

Figure 6 – Warm Springs Array – selected points of interest



Blind Creek System – Blind Spring Array

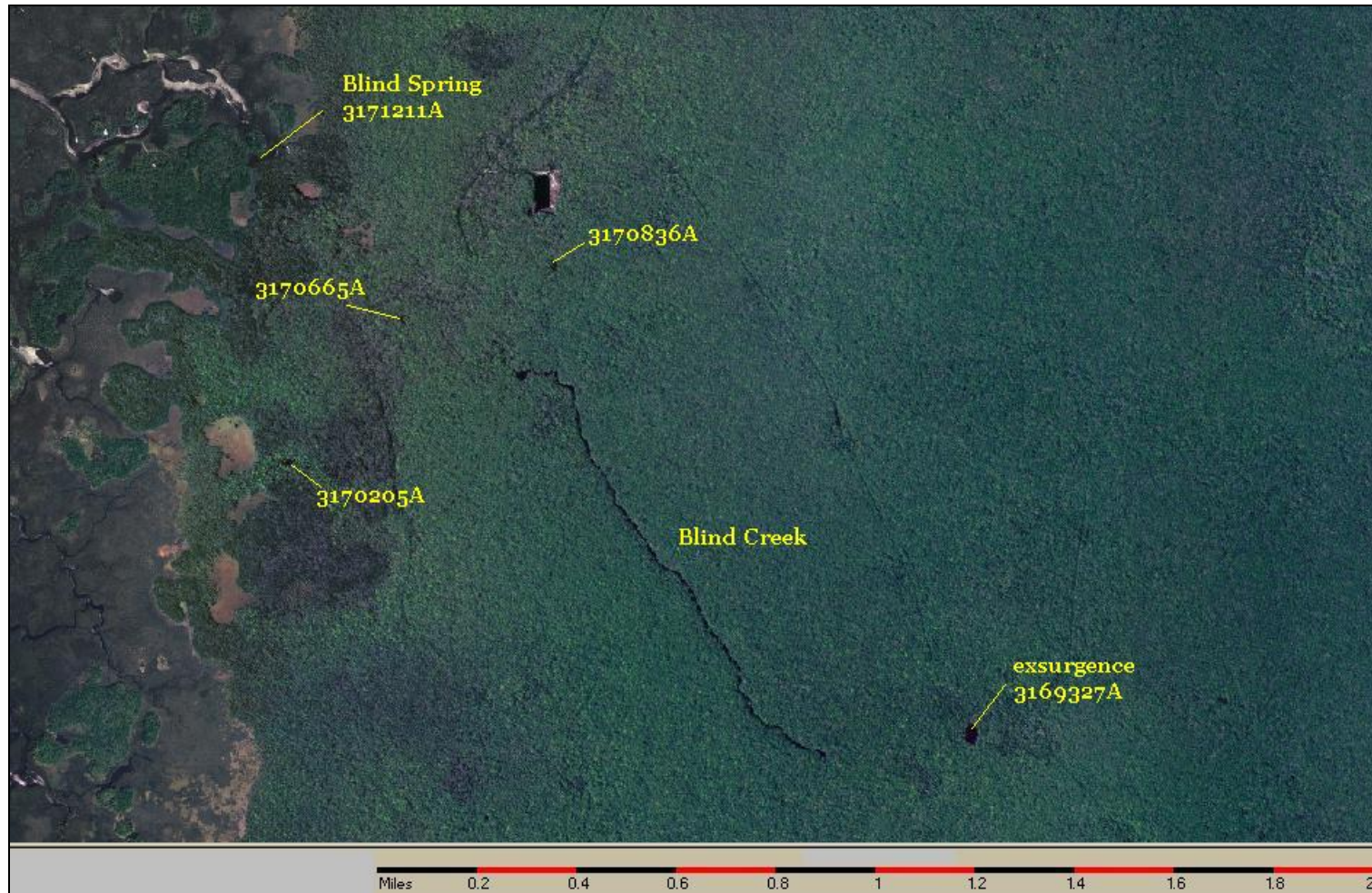
Table 2 – Blind Spring Array – selected points of interest

<i>POI Reference</i>	<i>Categorization</i>	<i>Common Name</i>	<i>LAT (N) UTM E</i>	<i>LON (W) UTM N</i>	<i>Source</i>	<i>Comments</i>
3171211A	Spring (resurgence)	Blind Spring	28 39 29.517 17340305	82 38 2.805 3171211	Physical inspection	This is a large spring. Divers have explored the primary discharging conduit to 180ffw; it continued sloping deeper. Another conduit was identified at 115ffw that was taking water indicating that not all the water was discharging to the surface at this point. There is human-passable conduit; further investigation is needed.
3169327A	Exsurgence (possibly other features)	none	28 38 29.324 17342576	82 36 38.239 3169327	Physical inspection	This is a large almost rectangular pond. Just below the water's surface on the northern edge of the pond is a steep vertical wall that drops to 130ffw where a spring vent was identified. The southern section of the pond has not been visited above or below the surface. There may be either a siphoning conduit or swallet within the pond or a surface run on the southern side of the pond. There may be access to human-passable conduit; further investigation is needed.

POI Reference	Categorization	Common Name	LAT (N) UTM E	LON (W) UTM N	Source	Comments
3169246A	Unknown (possibly a Spring or resurgence)	none	28 38 26.484 17342100	82 36 55.725 3169246	2004 DOQQ	Based on review of aerial photography, this appears to be the resurgence of the waters (among other possible contributing sources) from Warm Springs. Further investigation needed to categorize this point.
3170836A	Unknown (pond)	none	28 39 17.744 17341224	82 37 28.775 3170836	2004 DOQQ	Moderately large rectangular pond; further investigation needed to categorize this point.
3170205A	Unknown (pond)	none	28 38 56.871 17340374	82 37 59.758 3170205	2004 DOQQ	Small pond; further investigation needed to categorize this point.
3170665A	Unknown (pond)	none	28 39 11.971 17340731	82 37 46.843 3170665	2004 DOQQ	Small ox-bow shaped pond; further investigation needed to categorize this point. Given that it is line between swallet 3170487A and Blind Spring, it may be a karst window or a resurgence/swallet combination with a very brief surface stream.
3170665A	Unknown (pond or karst window)	none	28 39 19.09 17340523	82 37 54.614 3170887	2004 DOQQ	Possible pond (in line between Blind Spring and 3170487A). Further investigation needed to categorize this point.
3170487A	Swallet	none	28 39 6.359 17341114	82 37 32.651 3170487	Physical inspection	The vast majority of the stream (that started at 3169246A) returns underground in a large North-South fracture that drops to 140ffw where it intersects a horizontal conduit (presumably leading to Blind Spring). There is human-passable conduit; further investigation is needed.

Figure 7 –Blind Spring Array – selected points of interest

(refer also to Figure 5 for other points of interest within this array)



Scrub Island Array

Overview

Scrub Island is a raised dome surrounded by hardwood swamp.

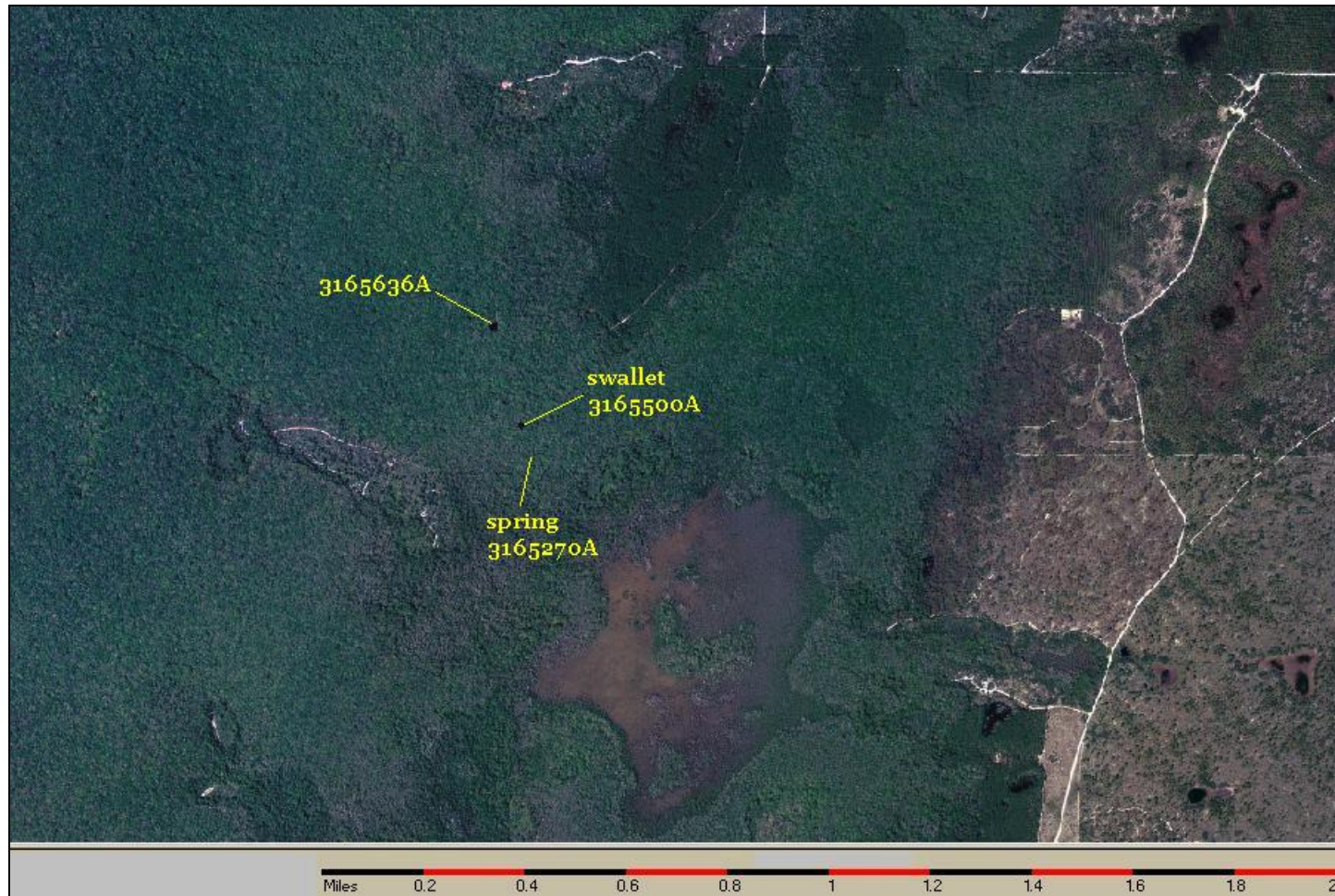
The most distinctive features in the swamp are two large ponds (3165500A and 3165636A). 3165500A has a system of surface streams that feed it. The surface streams appear to be a combination of surface run-off and groundwater discharge.

This area has had very limited reconnaissance.

Table 3 – Scrub Island Array – selected points of interest

<i>POI Reference</i>	<i>Categorization</i>	<i>Common Name</i>	<i>LAT (N) UTM E</i>	<i>LON (W) UTM N</i>	<i>Source</i>	<i>Comments</i>
3165500A	Swallet	none	28 36 25.92 17344660	82 35 19.633 3165500	Physical observation	Large pond with one stream entering the pond at the northeastern edge. The stream has multiple branches, one of which is created by 3165270A. The water quality in the pond is dependent on whether the stream is dominated by tannic water or the spring fed branch. There is a large fracture opening in the bottom of the basin. The fracture opens into a cavernous room with the bottom of the room at 120ffw. No conduits were located. There may be access to human-passable conduit; further investigation is needed.
3165270A	Spring	none	28 36 18.459 17344683	82 35 18.674 3165270	Physical observation	One classic choked solution tube and numerous very small vents, which create a run that flows into 316550A. Water quality was very clear; no taste of salinity.
3165636A	Pond (possible karst window)	none	28 36 30.303 17344579	82 35 22.681 3165636	Physical observation	Large pond, no in or out flowing streams noted. Water was dark tannic and cold when visited in March 2004. Further investigation is needed to categorize.

Figure 8 – Scrub Island Array



Sawmill Island Array

Overview

Sawmill Island is another raised dome located very close to the coast. It is surrounded by hardwood swamp to the east and coastal marshes to the west.

A few ponds were reported by local hunters. Investigation to date has identified two ponds. Since the saltwater interface is much closer to the surface where these springs have been found, it was surprising to observe them discharging freshwater.

This area has also received very limited reconnaissance. Further fieldwork is expected to yield additional POIs.

Table 4 – Sawmill Island Array – selected points of interest

<i>POI Reference</i>	<i>Categorization</i>	<i>Common Name</i>	<i>LAT (N) UTM E</i>	<i>LON (W) UTM N</i>	<i>Source</i>	<i>Comments</i>
3164110A	Pond (unknown)	none	28 35 39.108 17340859	82 37 38.844 3164110	Physical inspection	Large pond; possible karst window. Dark tannic water when visited in September 2005. Reports from hunter characterize the water as blue and clear normally. No streams associated with pond. Further investigation needed to clearly categorize this area.
3162456A	Spring	none	28 34 45.928 17342100	82 36 52.35 3162456	Physical inspection	Very small pond with two spring vents discharging clear non-brackish water in September 2005. Spring discharge creates a small stream that meanders westward.
3162556A	Spring	none	28 34 49.03 17341766	82 37 4.691 3162556	Physical inspection	A series of clear water seeps create a small stream that feeds into 3162545A.
3162545A	Pond (possible karst window or swallet)	none	28 34 48.511 17341398	82 37 18.227 3162545	Physical inspection	Elliptical pond with greenish water observed in September 2005. Reported by hunters to normally have blue-clear water. Further investigation needed to clearly categorize this area.

Figure 9 – Sawmill Island Array



Eagles Nest Array

Overview

This array is predominately marsh and hardwood swamp. This area also has numerous springs. It also contains one of the most well know cave systems, Eagles Nest (a karst window). It is assumed that the water moving through the Eagles Nest system discharges at Mud Spring.

The brief surface stream created at Gator Spring (3160234A) returns underground and, via conduit, feeds into the large "upstream" tunnel in Eagles Nest. Several different "vents" have been identified that feed into the upstream Eagles Nest tunnel. These vents appear to have different sources based on the variations in the comparative water quality.

It is presumed that the karst window (3160037A) intersects the conduit leading from Gator swallet to Eagles Nest. Further exploration is expected to resolve this question.

Table 5 – Eagles Nest Array – selected points of interest

<i>POI Reference</i>	<i>Categorization</i>	<i>Common Name</i>	<i>LAT (N) UTM E</i>	<i>LON (W) UTM N</i>	<i>Source</i>	<i>Comments</i>
3159792A	Karst Window	Eagles Nest	28 33 19.599 17342566	82 36 33.885 3159792	Physical inspection	There is a large opening at 60ffw near the center of the pond. This is a well-known karst window with very large diameter conduit extending upstream and downstream from the karst window.
3160234A	Spring & Swallet	Gator Slough	28 33 34.136 17342978	82 36 18.946 3160234	Physical inspection	The coordinates reference a pond at the edge of a saw grass marsh. The northern portion of the pond has a solution tube that is mostly obscured by organic debris. The flow it produces forms a brief stream and returns underground in a swallet that takes all the water from the stream. This conduit is assumed to feed into the upstream tunnel at Eagles Nest. There is human-passable conduit that has been explored to a depth of 180ffw; further investigation is needed.
3160118A	Unknown (pond)	none	28 33 30.223 17342645	82 36 31.14 3160118	2004 DOQQ	This is a small pond to the West Southwest of Gator Slough. Further investigation needed to categorize this point.

POI Reference	Categorization	Common Name	LAT (N) UTM E	LON (W) UTM N	Source	Comments
3160037A	Karst Window	Snake Eyes Sink	28 33 27.73 17342962	82 36 19.437 3160037	Physical inspection	This set of two sinks is just south of Gator Slough and is covered by the hardwood canopy. One of the sinks has a solution tube that is blocked by fallen trees; the water has been observed to be dark tannic at times and clear at other times. There appears to be human-passable conduit; further investigation is needed.
3159462A	Unknown (pond)	none	28 33 8.107 17340807	82 37 38.434 3159462	2004 DOQQ	Small pond located Northwest of 3159270A. Based on the aerial images, there appears to be a small stream either emanating from or draining into the pond. Further investigation needed to categorize this point.
3159270A	Exsurgence(s) & possible other features	none	28 33 2.023 17341153	82 37 25.609 3159270	Physical inspection	There appears to be a cluster of springs that produces a dendritic series of streams. Further investigation needed to clearly categorize all the features of this area.

Figure 10 – Eagles Nest Array – selected points of interest



Miscellaneous/Isolated Points of Interest

Overview

While not documented here, there are numerous springs along the southern side of the Chassahowitzka River (see Appendix B) and several springs south of SR50 and west of Weeki Wachee. These will be addressed in detail in the final document.

The following table identifies isolated POIs dispersed across the Chassahowitzka Swamp that may prove to be karst features or connected to a larger system in one of the other arrays.

Table 6 – Miscellaneous (isolated) points of interest

<i>POI Reference</i>	<i>Categorization</i>	<i>Common Name</i>	<i>LAT (N) UTM E</i>	<i>LON (W) UTM N</i>	<i>Source</i>	<i>Comments</i>
3170650A	Relic subsidence	none	28 39 13.843 17346139	82 34 27.69 3170650	Physical observation	A large, broad circular subsidence is dry and appears to be relict karst window; the bottom is approximately a 20-foot below local elevation. This appears to part of a chain of relict subsidences trending to the east and west from this site.
3170311A	Subsidence	none	28 39 2.797 17346059	82 34 30.471 3170311	Physical observation	This is a recent collapse; approximately 20 feet in diameter and 10 feet deep to water surface. Water has always been dark tannic. This may be associated with the series of subsidences referenced in 3170650A
3169941A	Unknown (pond)	none	28 38 51.399 17347513	82 33 36.751 3169941	2004 DOQQ	Small pond; further investigation needed to categorize this point.
3169690A	Unknown (pond)	none	28 38 42.528 17345833	82 34 38.491 3169690	2004 DOQQ	Possible pond; may be karst window. Further investigation needed to categorize this point.
3169018A	Unknown (pond)	none	28 38 21.161 17346911	82 33 58.473 3169018	2004 DOQQ	Possible pond; may be karst window. Further investigation needed to categorize this point.
3172891A	Unknown (pond)	none	28 40 26.389 17345563	82 34 49.993 3172891	2004 DOQQ	Possible pond; may be karst window. Further investigation needed to categorize this point.

Appendices

Appendix A – Terminology

Aquifer – A geological formation capable of storing significant quantities of water. It is usually composed of sand, gravel, or permeable rock, which lies upon a layer of clay or other impermeable material (an aquiclude), which does not allow the water to penetrate to lower depths. This can result in various aquifers existing at various depths.

Bedding Plane – The division plane, typically horizontal, that separates each successive layer of sedimentary or stratified rock. Typically the bedding plane has eroded to a greater extent than the adjacent layers, accelerating flow and further dissolution of the adjacent layers.

Brackish (water) – water with a conductance greater than 1,000 microsiemens per cm at 25°C, but less than 51,000 microsiemens per cm at 25°C, typically water with a conductance in the range of 30,000-40,000 microsiemens per cm at 25°C.

Clastic – Pertaining to fragments (such as mud, sand, and gravel) produced by the mechanical breakdown of rocks.

Coastal – impacted directly or indirectly by the tidal cycle, bounded by the landward side of the mean low tide.

Collapse – a catastrophic failure of strata as a result of dissolution or man-made breaches.

Conduit – a non-matrix cavity that has a linear trend that facilitates accelerated transmission of water relative to local matrix.

Detrital Covering – Dead or decaying organic matter, typically plant matter. The Detrital covering is permeable and allows discharge that may keep smaller particles suspended.

Estavelle – an intermittent Exsurgence, usually characterized by a positive discharge. Flow cessation or reversal occurs based on normal seasonal, aquifer, and river stage fluctuations.

Exsurgence – a point of constant water discharge from an underground conduit. While discharge rate may vary under normal conditions, discharge is positive. This term avoids any assumptions about water source or composition. Discharge is halted in only unusual circumstances (in contrast to a estavelle, where reversals are more commonplace).

Fracture – A break in a rock formation due to structural stresses (e.g, faults, shears, joints, and planes of fracture cleavage). Horizontal fractures should not be confused with Bedding Planes.

Freshwater – groundwater with a conductance less than 1,000 microsiemens per cm at 25°C.

Groundwater – Water that has percolated into natural, underground aquifers. It is recharged from, and eventually flows to, the surface naturally; natural discharge often occurs at springs and seeps and can form oases or swamps.

Karst Window – an opening in the surface that reveals portions of subterranean flow, or the unroofed portion

of a cave. Karst window do not discharge or draw surface water under prevailing conditions.

Saline (salt) water – water with a conductance approaching 51,000 microsiemens per cm at 25°C, (e.g. consistent with ocean water). See also Brackish (water) for the classification of lower levels of conductance.

Mixed (water) – water at the discharge point from disparate sources with different compositions that has been combined in underground conduits prior to discharge at the surface. Mixture may be defined as any combination of fresh, brackish, salt, or surface-runoff.

Pond – a general term used for a closed body of water of indeterminate structural origin. A pond may or may not have streams connected to it.

Relic sink – an ancient subsidence that is no longer active where the surface soils and sediments have created a softer curvature.

Resurgence – the re-emergence of groundwater through a karst feature, a part of whose waters are derived from previous surface inflow. The term resurgence obligates the presences of a groundwater exsurgence and a swallet. See also **Spring** and **Exsurgence**.

River Rise – (see **resurgence**)

Seep – water discharges diffusely from a subterranean source. Discharge is from intergranular pore spaces in the matrix and the flow is typically laminar.

Solution Tube – general term that groups solution chimneys and vertical shafts together. Primary characterization is a vertical and predominately circular or elliptical opening that has developed from surface drainage.

Spring – a point of discharge where the water discharge is positive under prevailing conditions and the water is predominately (>75%) groundwater. Resurgences have

groundwater that has already reached the surface and returned underground before discharging at this point.

Surface runoff – water collected on the ground resulting from rain, etc.

Surficial (water) – river, lake or surface runoff; not sourced directly from groundwater.

Subsidence – a surface depression resulting from collapse of subterranean voids.

Swallet – A hole in the land through which a stream delivers surface water to the aquifer (considered the opposite of an exsurgence). Swallet is synonymous with swallow hole.

Vent – an opening that concentrates groundwater discharge at the earth's surface, regardless of location. Flow is turbulent (i.e. non-laminar).

Appendix B – Springs documented in Bulletin No. 66

Name	FGS Characterization	Lat - Lon
Blind Spring	River Rise	28 39 28.32178 – 82 38 04.62095
Rita Marie Spring	Spring	28 41 24.53773 – 82 35 20.10944
Ryles Spring	Spring	28 41 13.79555 – 82 36 50.82444
Salt Spring	Spring	28 32 46.74908 – 82 37 08.27512
Beauford Spring	(not visited)	28 38 09.82 – 82 35 47.24
Betty Jay Spring	(not visited)	28 41 25.39 – 82 35 29.41
Blue Run Spring	(not visited)	28 41 12.50 – 82 36 05.17