The Geology of Lake Jackson

Wakulla Springs Alliance
July 23, 2021

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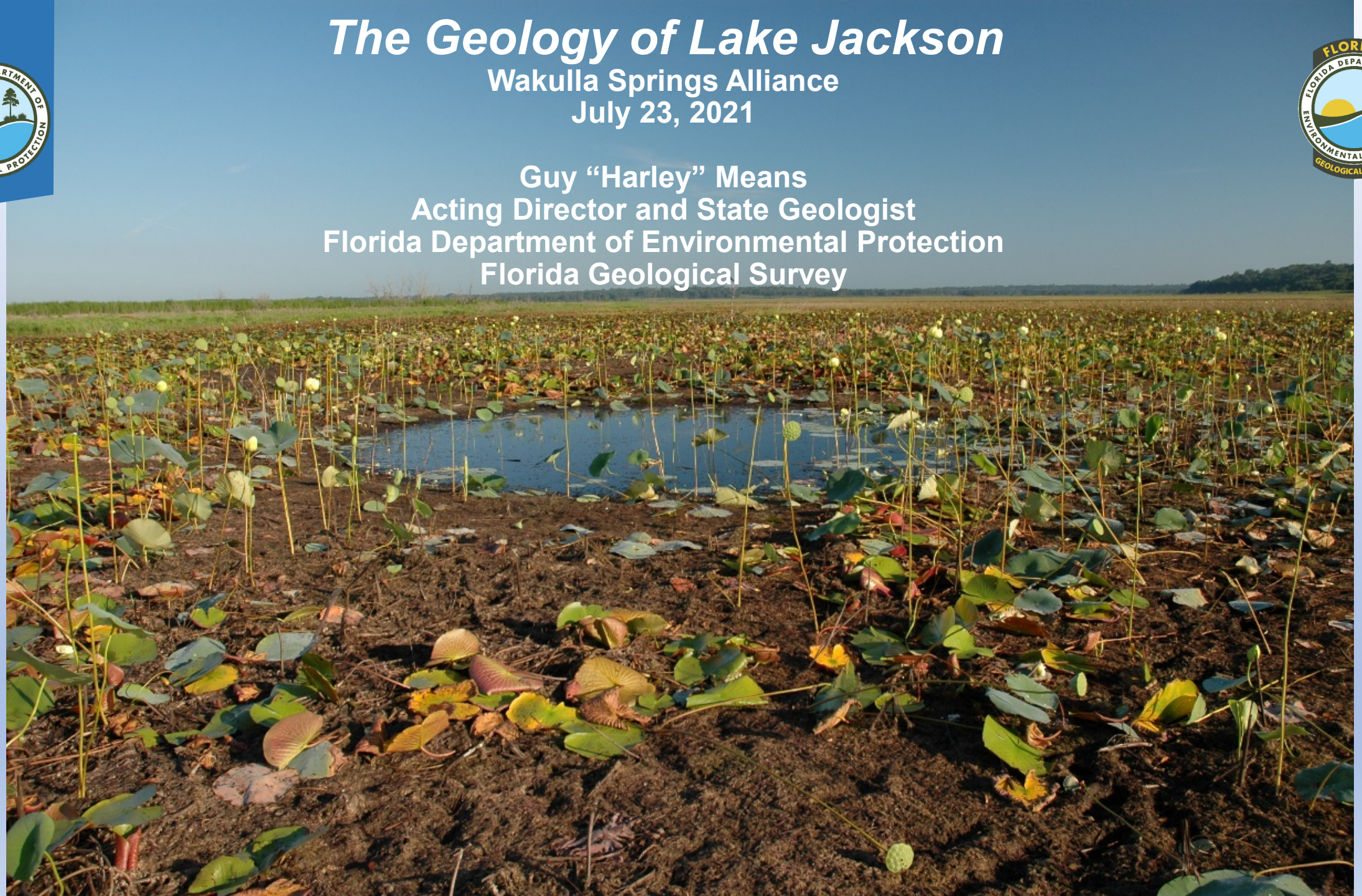
Florida Department of Environmental Protection
Florida Geological Survey

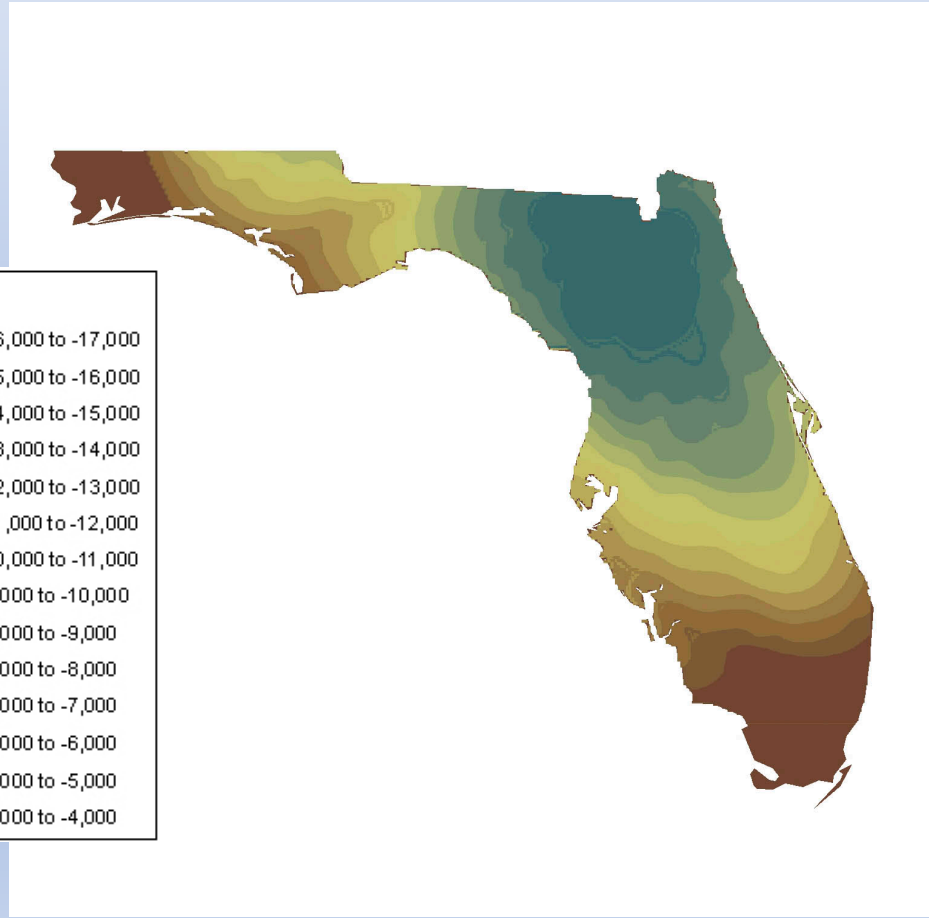


The Florida Platform

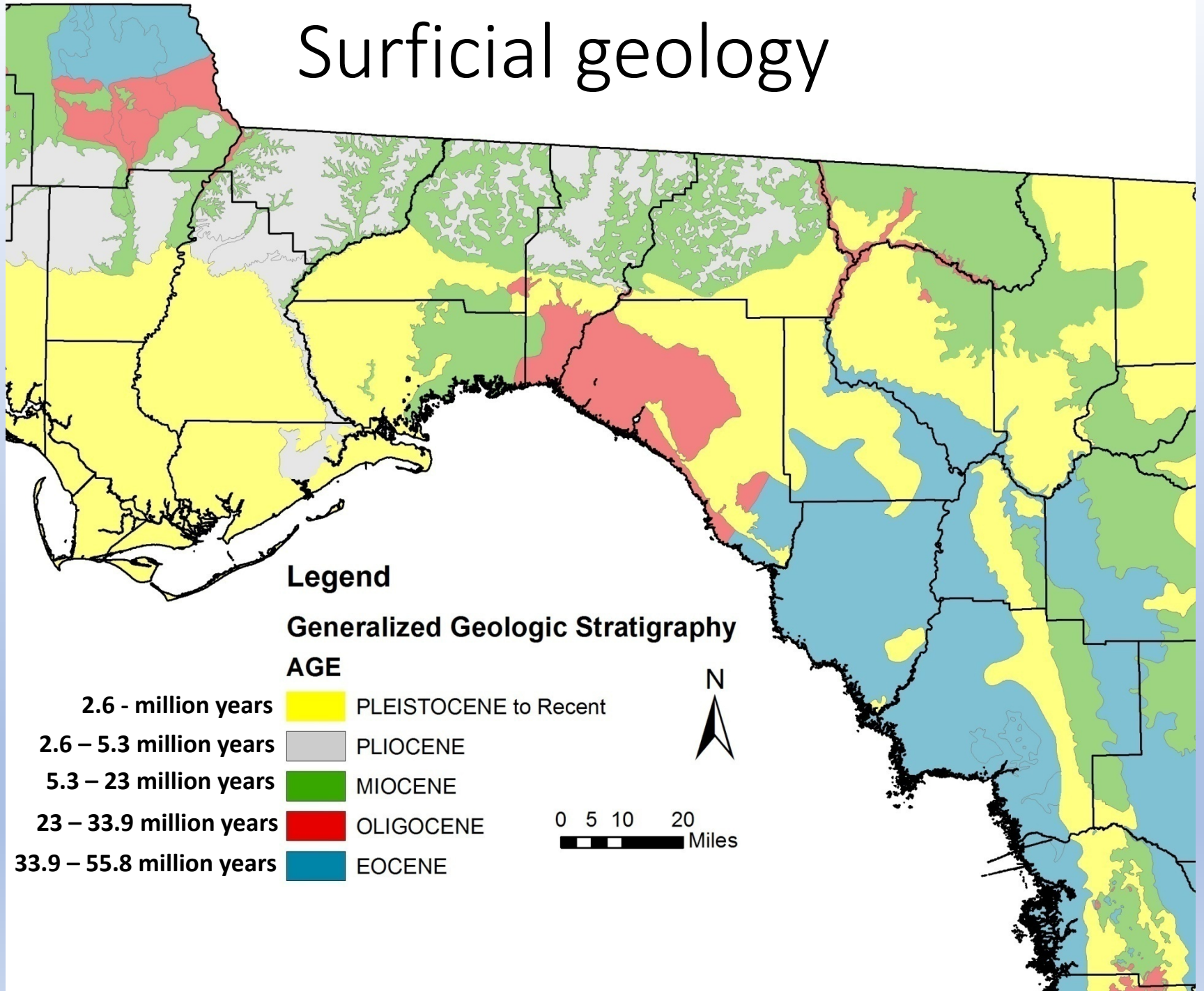
Florida’s limestone foundation

- Florida’s limestone deposits accumulated over millions of years.
- Limestone thickness is variable across the state with the thickest deposits being in west and south Florida.

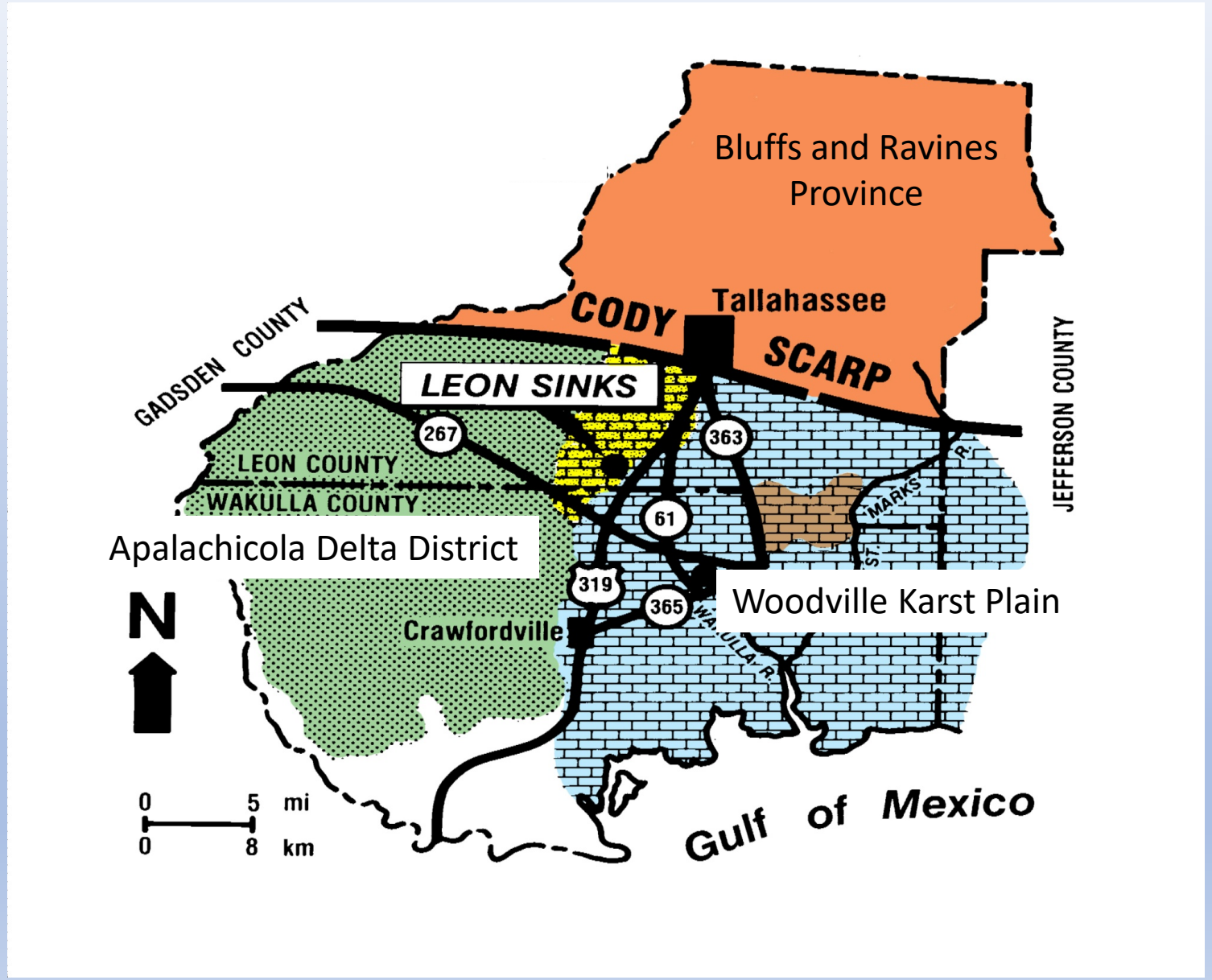
Depth to basement rocks



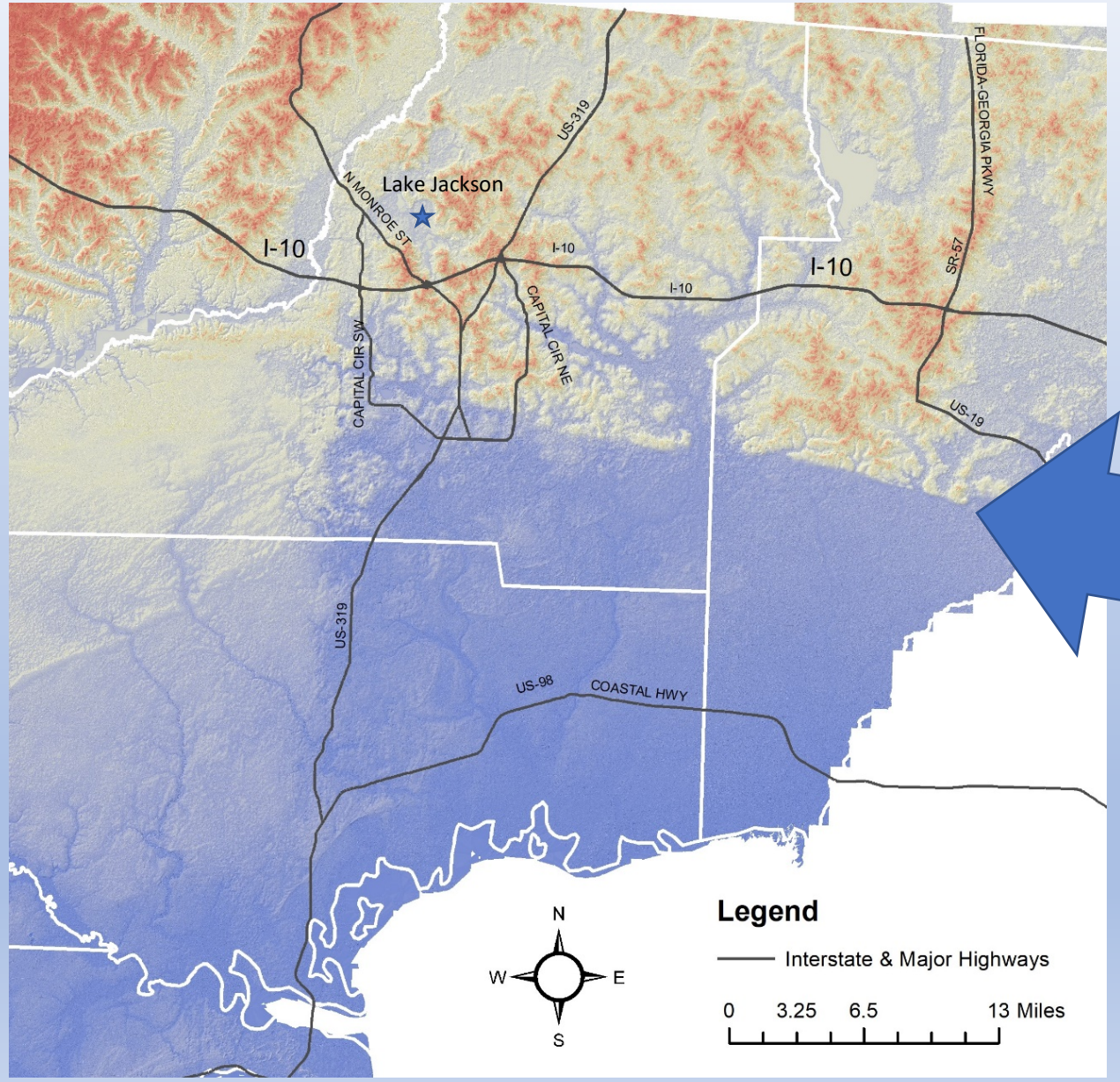
Surficial geology



Geomorphology



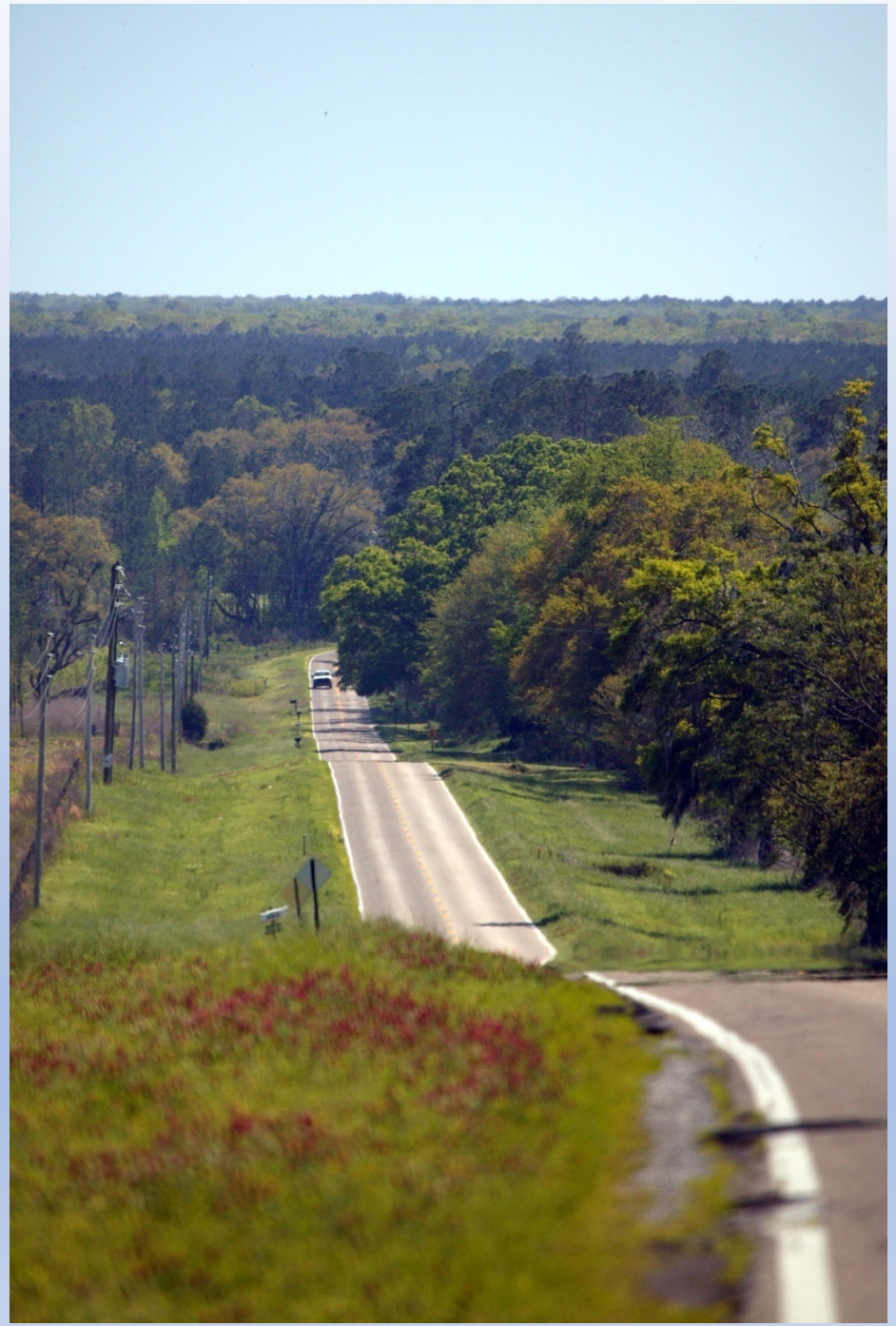
Geomorphology



Cody Scarp

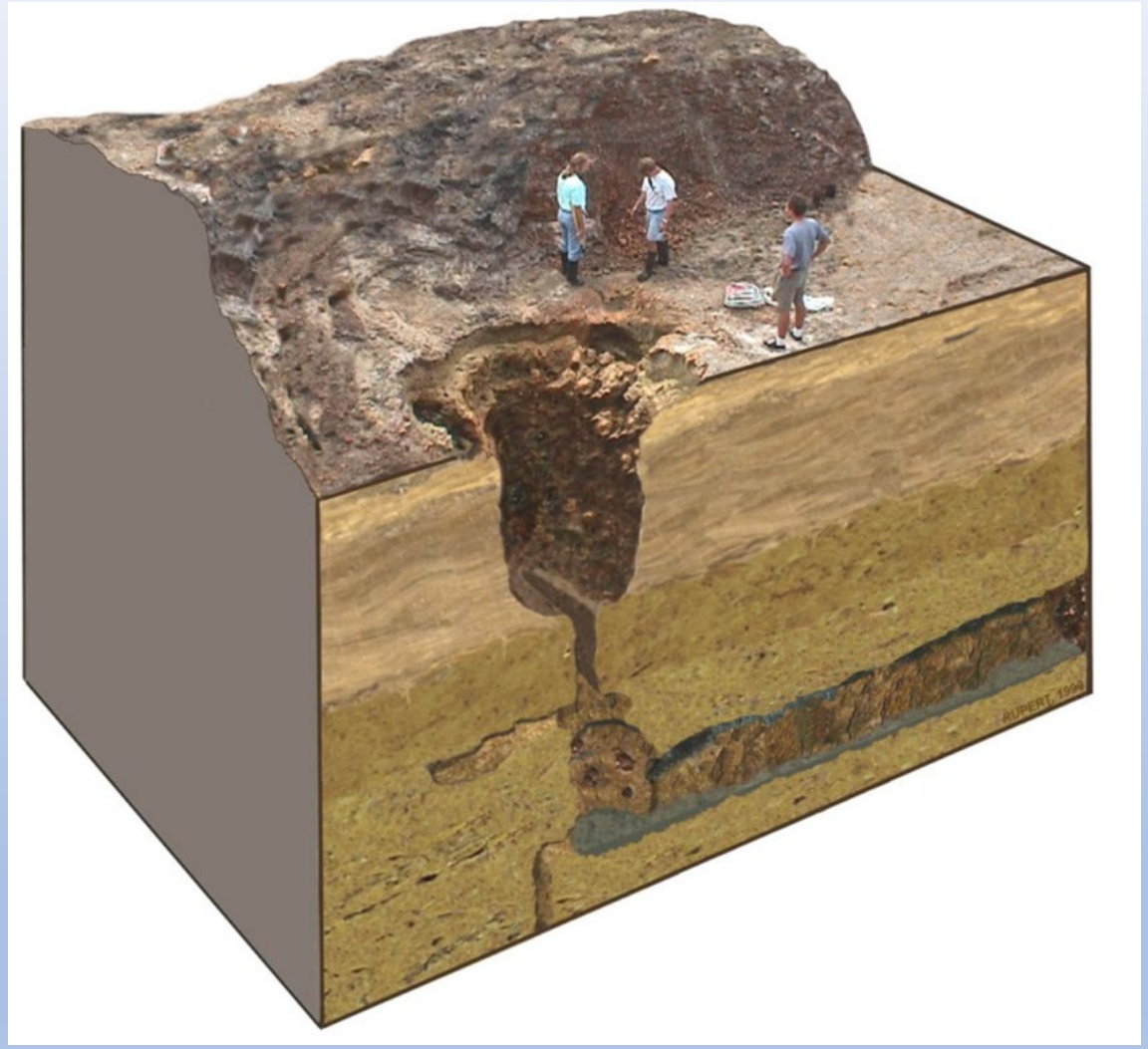
Cody Scarp

Erosional escarpment that divides the clayey sands of the Tallahassee Hills Province from the flat Woodville Karst Plain Province.



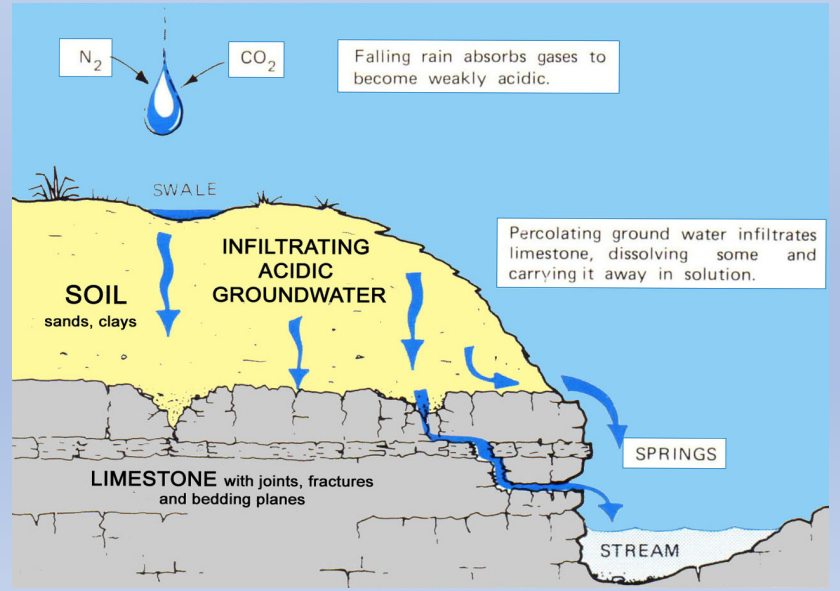
What is karst?

Karst – a type of topography that is formed on limestone, gypsum and other rocks by dissolution, and that is characterized by sinkholes, caves and underground drainage (Bates and Jackson, 1987).



How does karst topography form?

- As rainwater falls through the atmosphere, it picks up carbon dioxide and becomes slightly acidic.
- The slightly acidic rainwater becomes more acidic as it moves through soil.
- Limestone, which underlies all of Florida, is dissolved by the acidic water. This creates pore space which includes cavities, caves and conduits.
- The overlying sediment can collapse into the limestone voids creating sinkholes and karst topography.



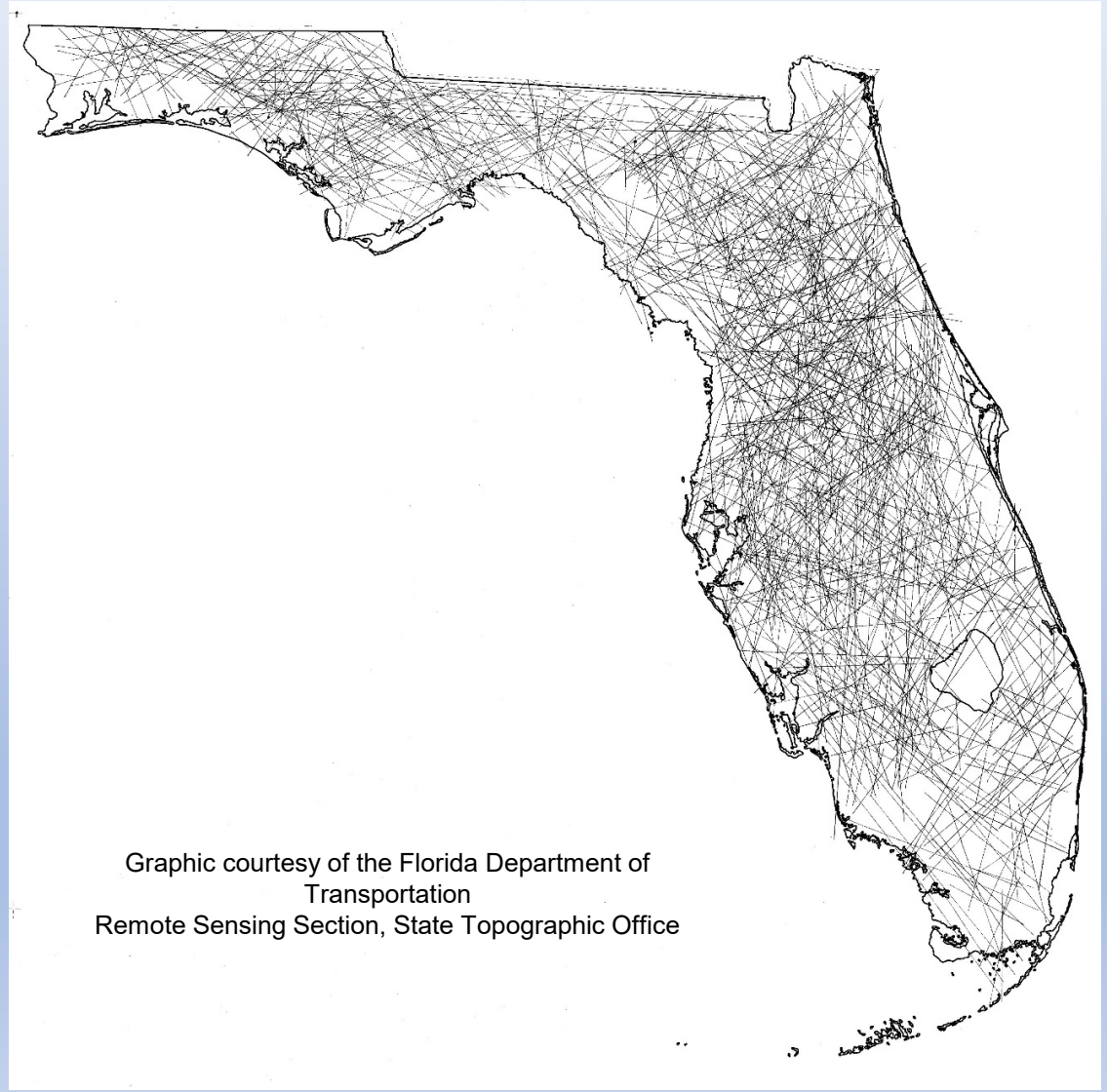
How does the acidic water get into the underlying carbonate rocks?

Carbonate rocks (like limestone) are porous and permeable

Void spaces in limestone are interconnected

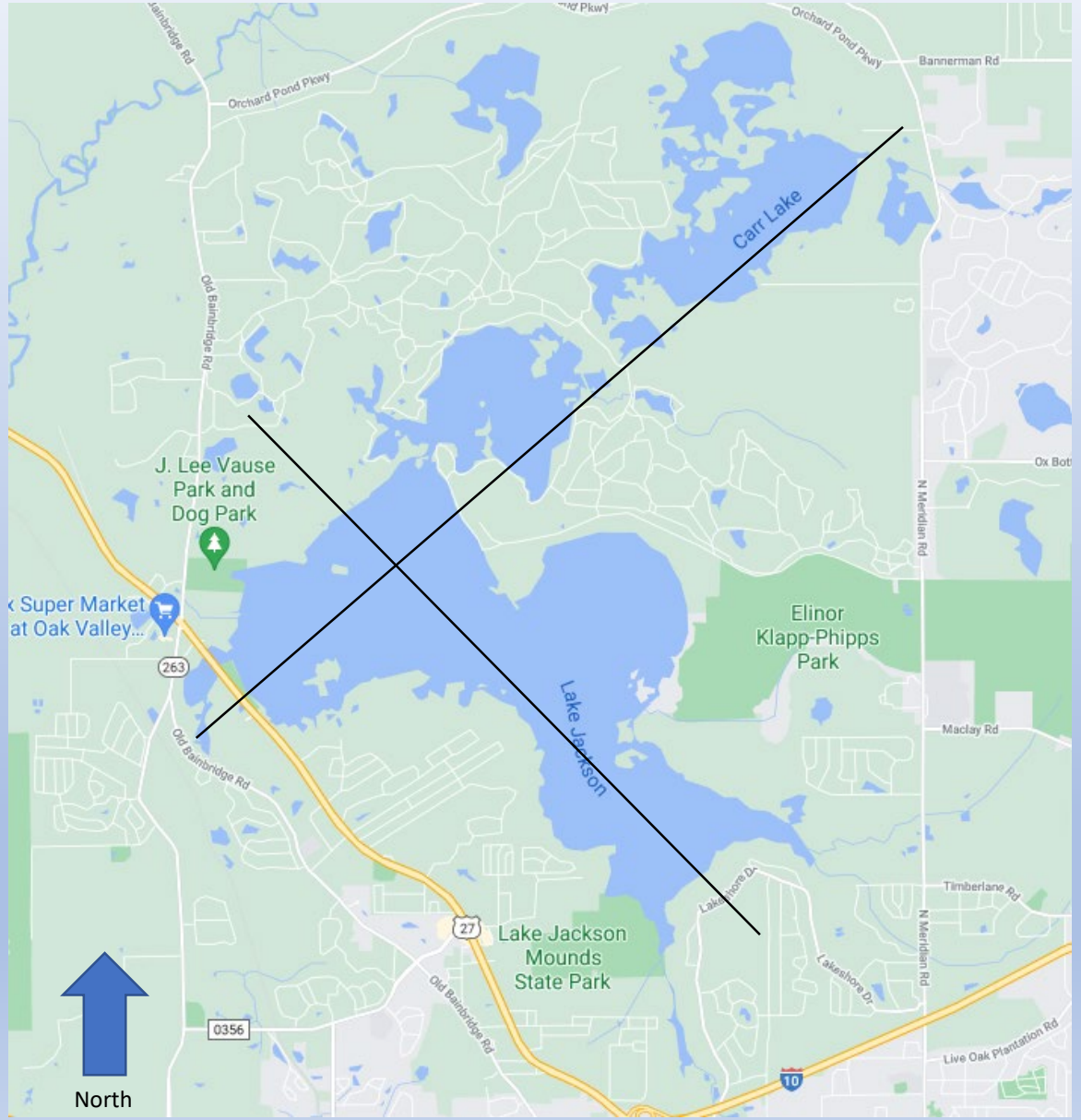
Limestone is brittle and can fracture

Fracture pattern in Florida based on lineament analysis



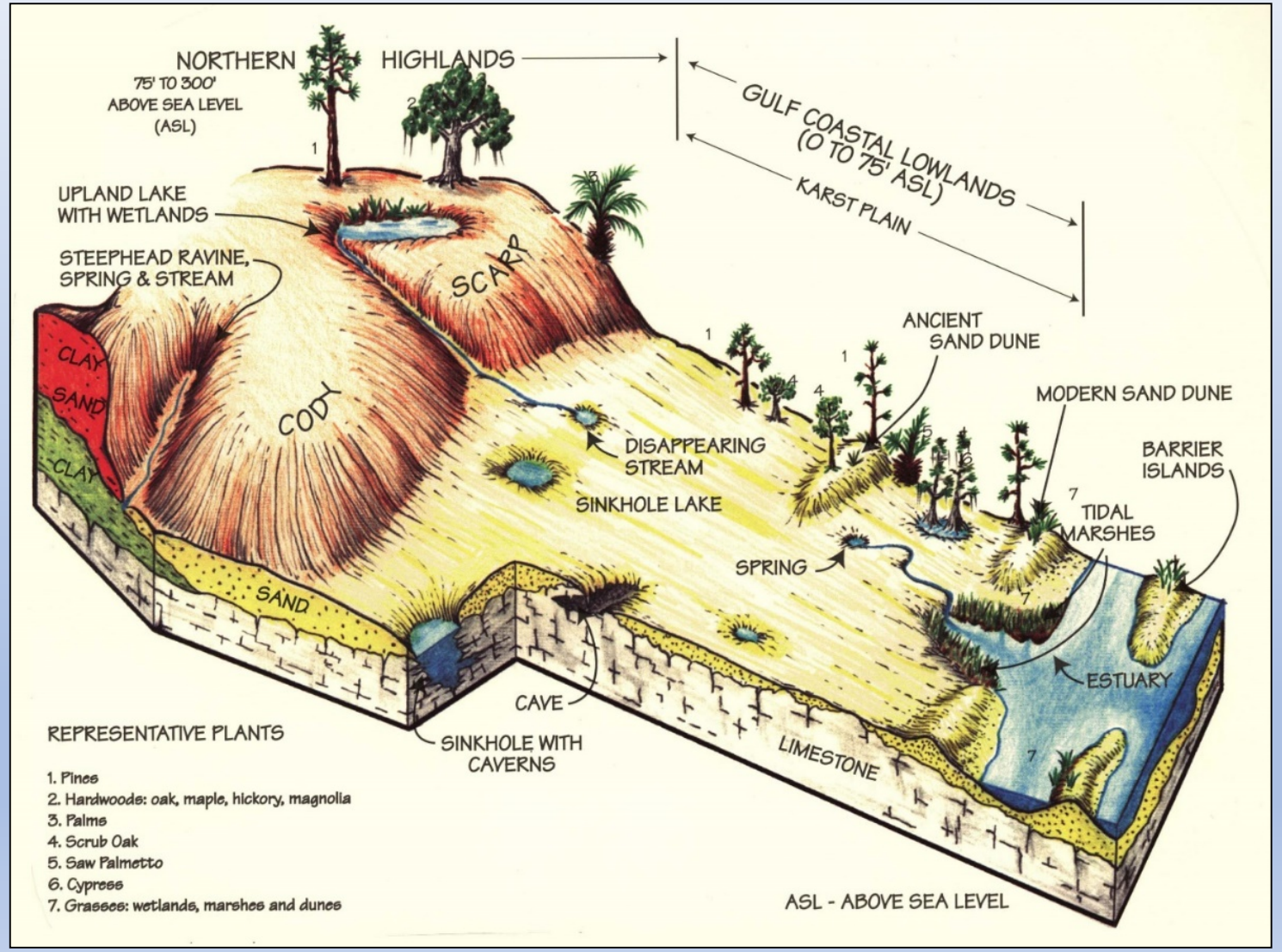
Graphic courtesy of the Florida Department of Transportation
Remote Sensing Section, State Topographic Office

Lake Jackson linear patterns



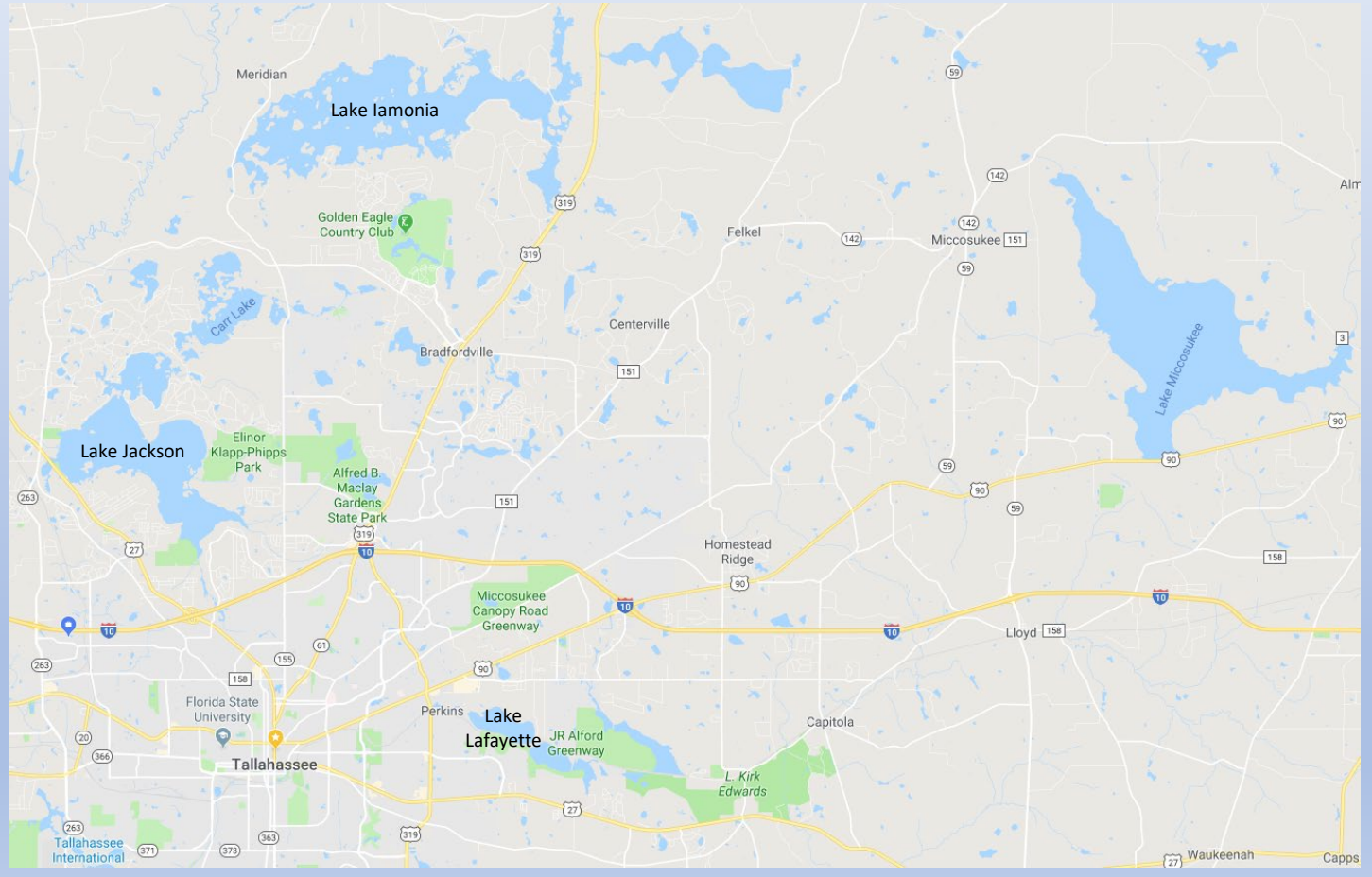
Karst features in our area

- Sinkholes
- Swallets
- Uvalas
- Springs
- Caves (both air and water filled)
- Karst lakes (Lake Jackson)



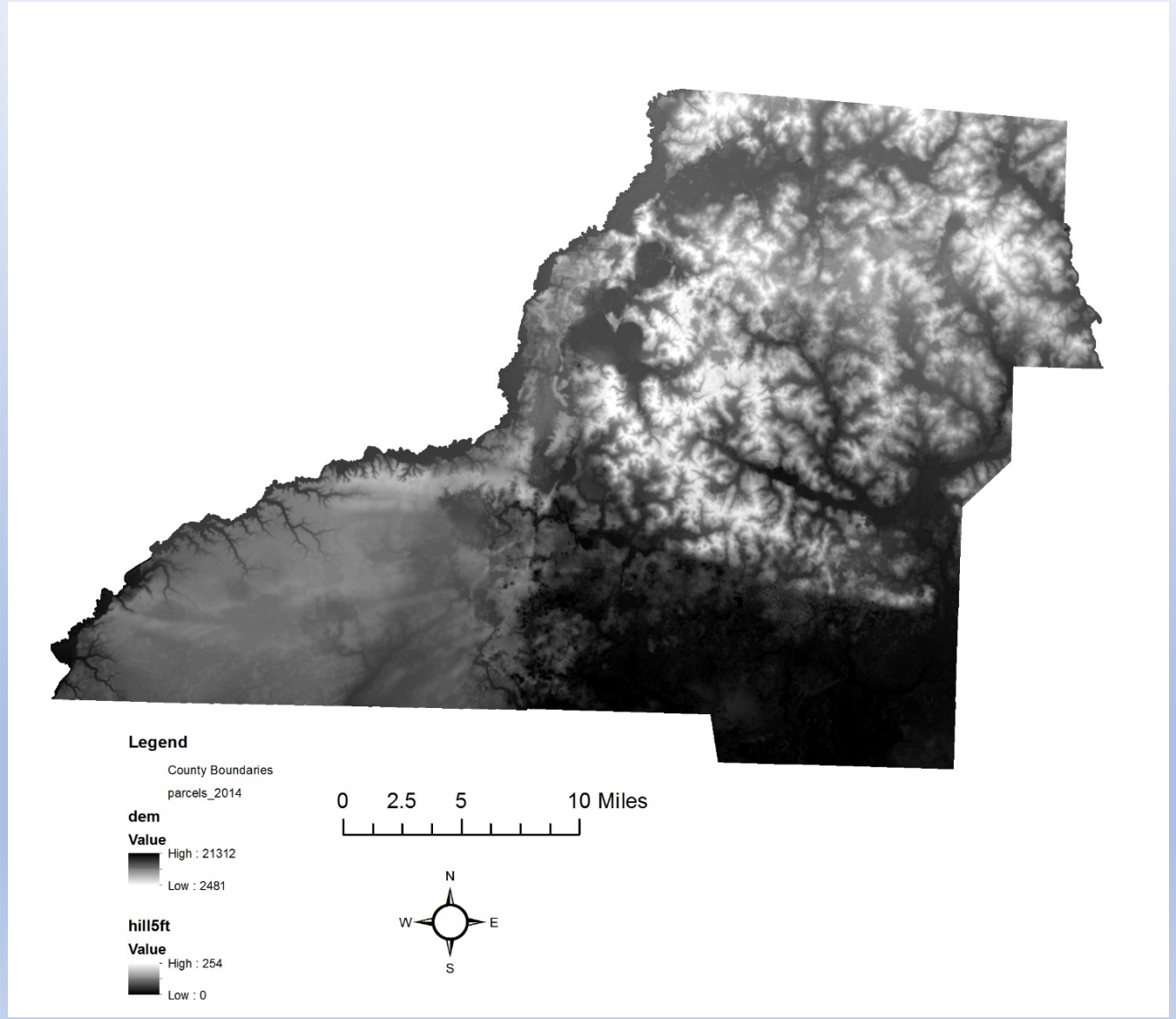
Large karst lakes in the area

- Lake Jackson is approximately 4,000 acres in size and is one of several large sinkhole lakes located in this area.
- Lakes Iamonia, Miccosukee, and Lafayette are other examples.



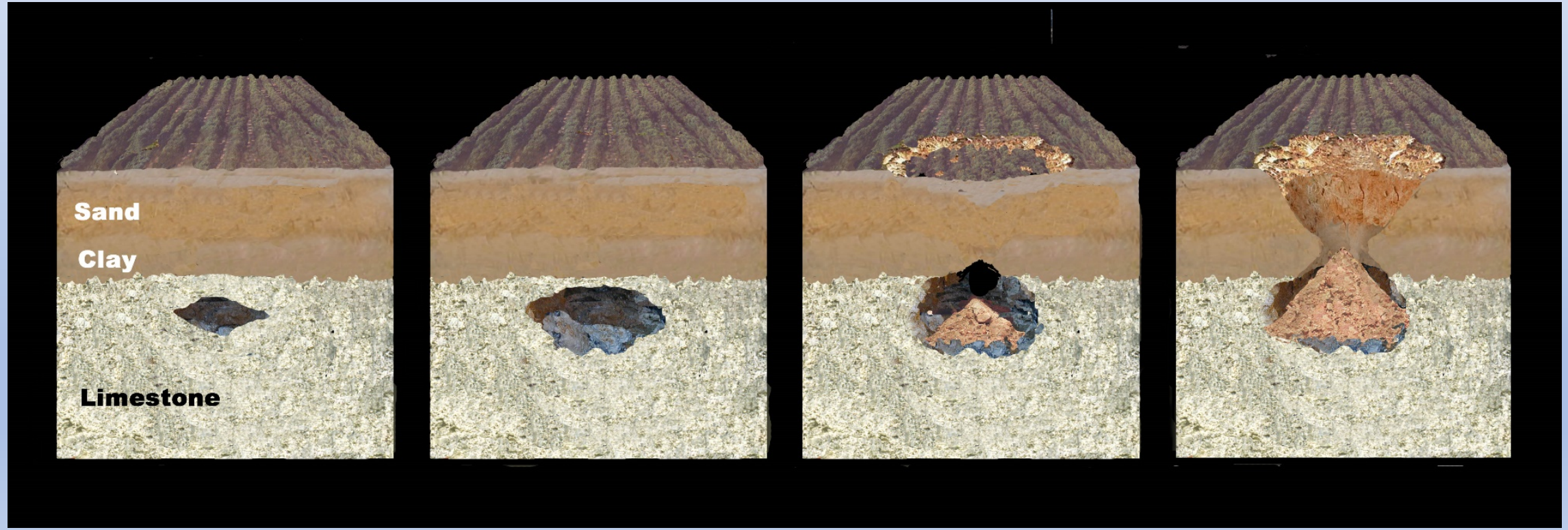
LiDAR showing erosion patterns

Lake basins in northern Leon County are karst lakes formed either by sinkhole activity in creek beds or by planar dissolution of underlying limestone which lowers land surface creating the basin.



Formation of Lake Jackson

Cover subsidence and cover collapse sinkholes coalesce over geologic time creating closed lake basins.

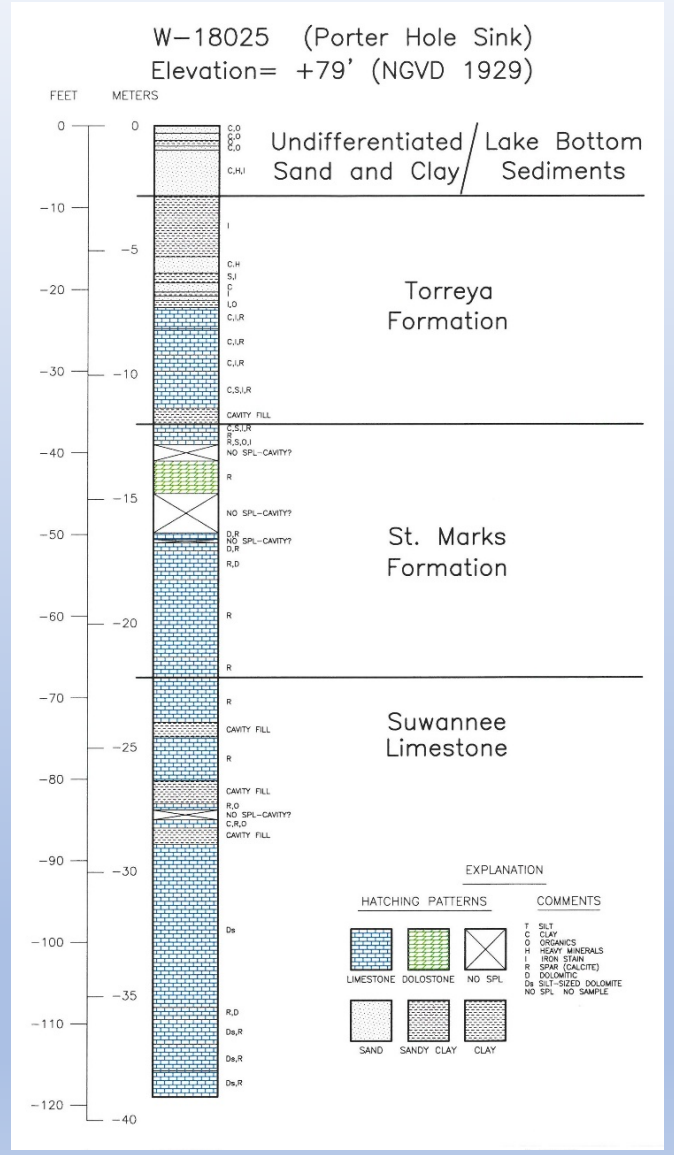


Formation of Lake Jackson

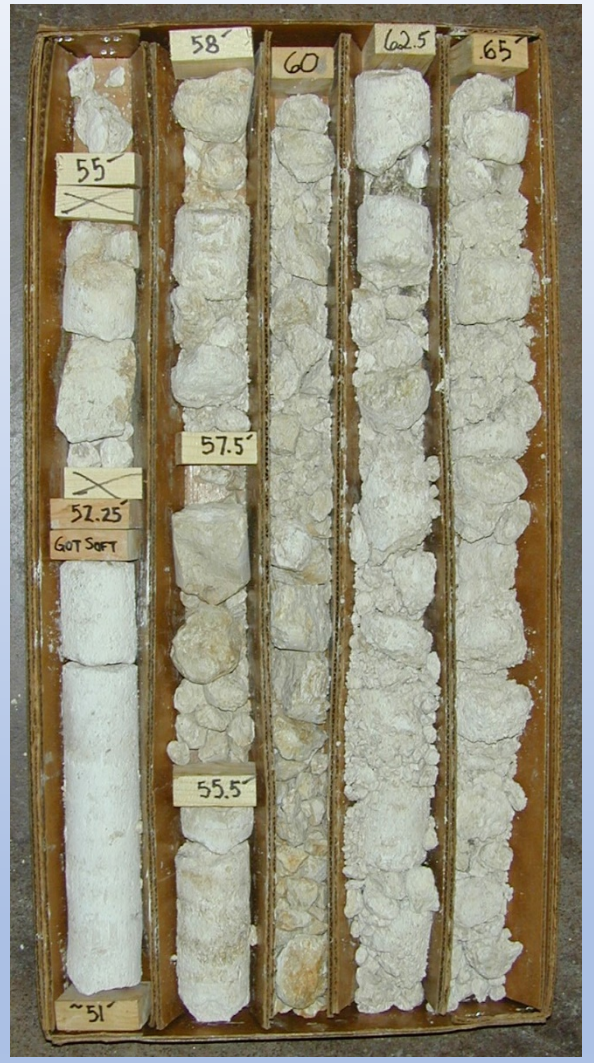
Near Lime Sink, 2004

What geologic units underlie Lake Jackson?

During the 1999 draining of Lake Jackson, the FGS drilled several cores in the dry lakebed.

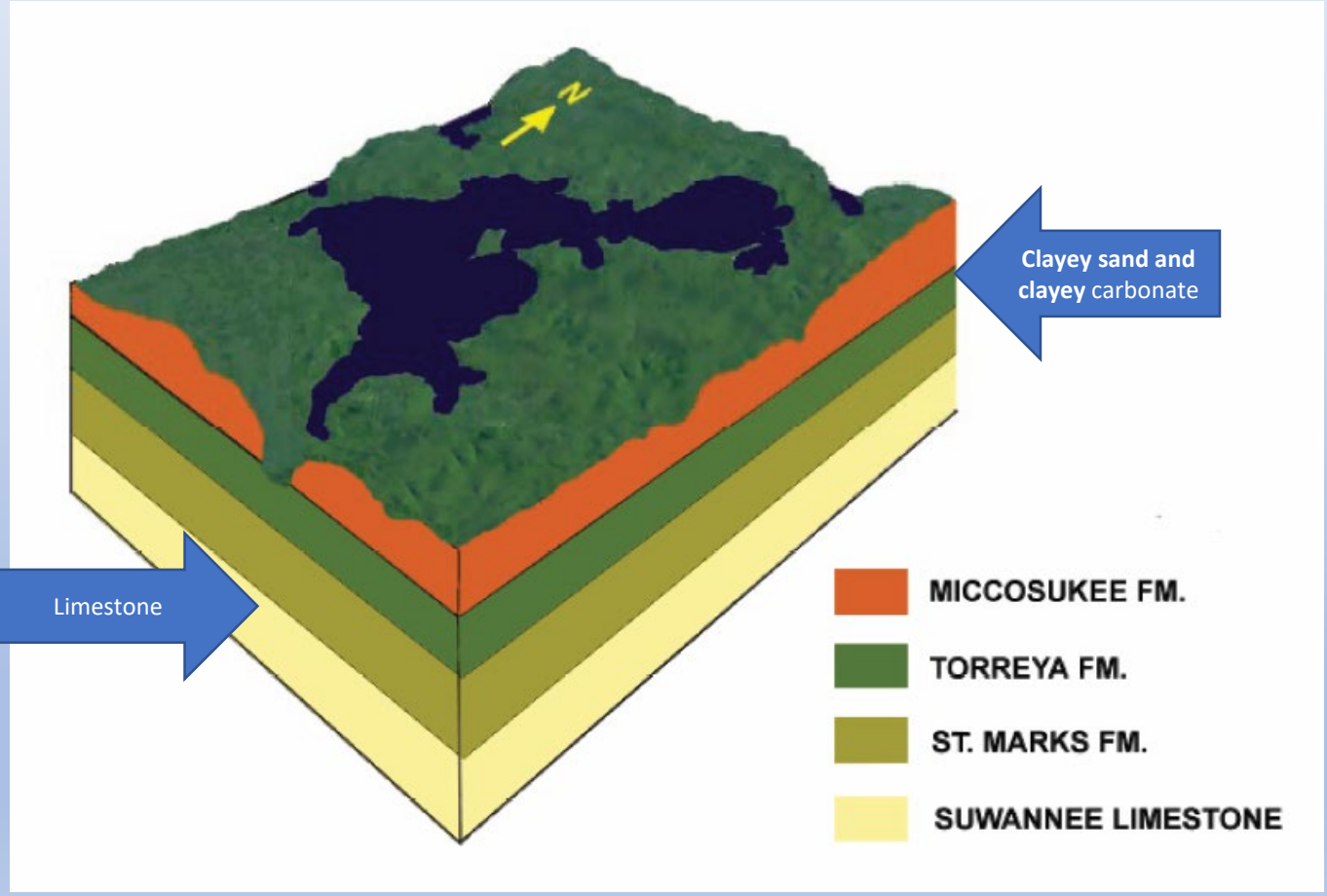


Torreya/St. Marks contact



Strata underlying Lake Jackson

- Limestone containing void spaces can be seen at several places in the bed of the lake when it is low.
- Sinkhole activity and dissolution of underlying limestone is going on today and will continue.
- Coalescing sinkholes are responsible for creating the Lake Jackson Basin.



September 1999 draining event

Lake Jackson water levels
Began to decline in March of
1998 (lake level at ~86 feet).

On September 16, 1999, one
of the large lake pools connected
to Porter Sink drained exposing
the lake bottom.

September 1999 draining event

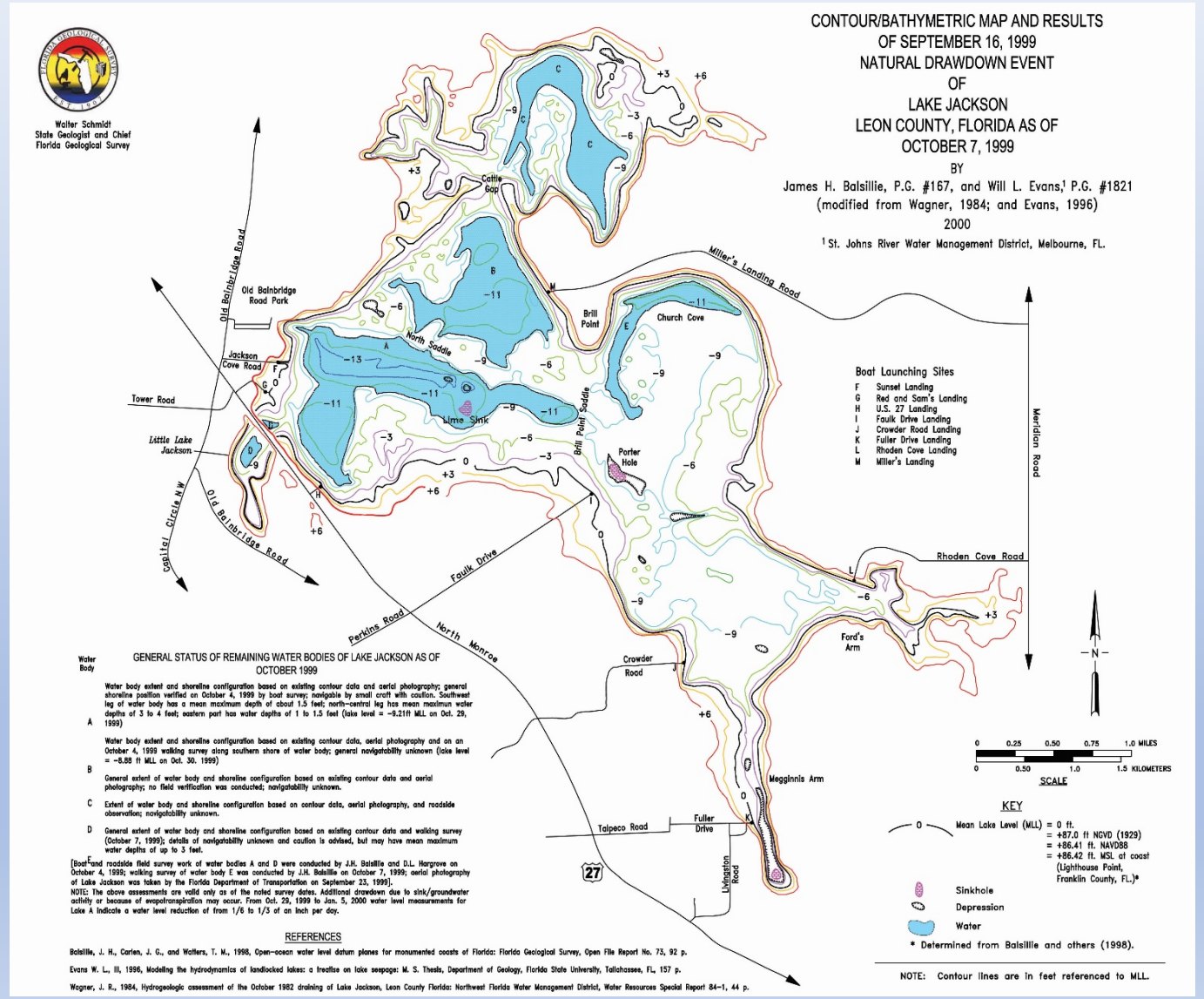
What do geologists do when the lake goes dry?

FGS took advantage of the opportunity!

Sampled lake sediment

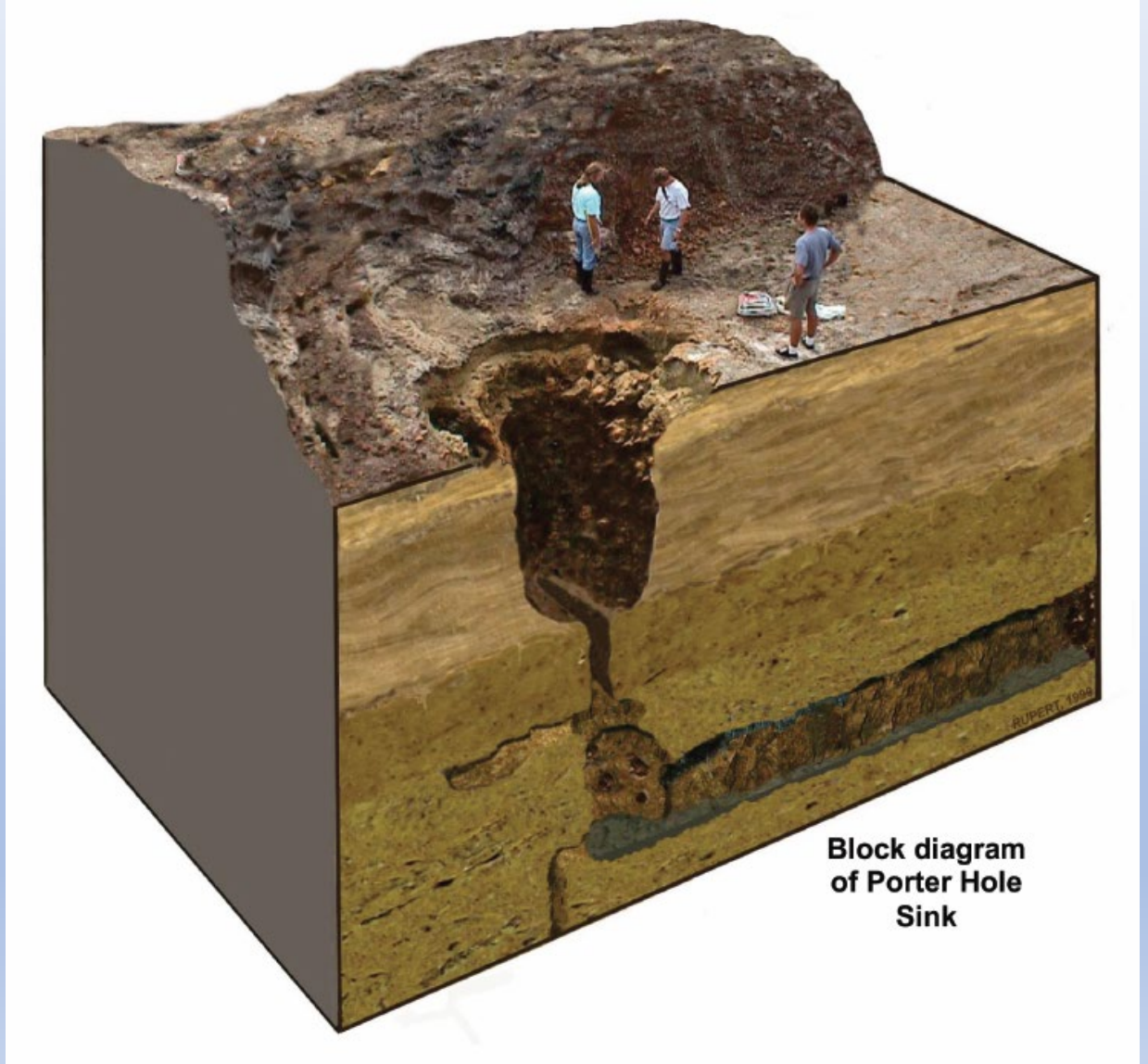
Conducted a bathymetric survey of the lakebed

Lake Jackson bathymetric map



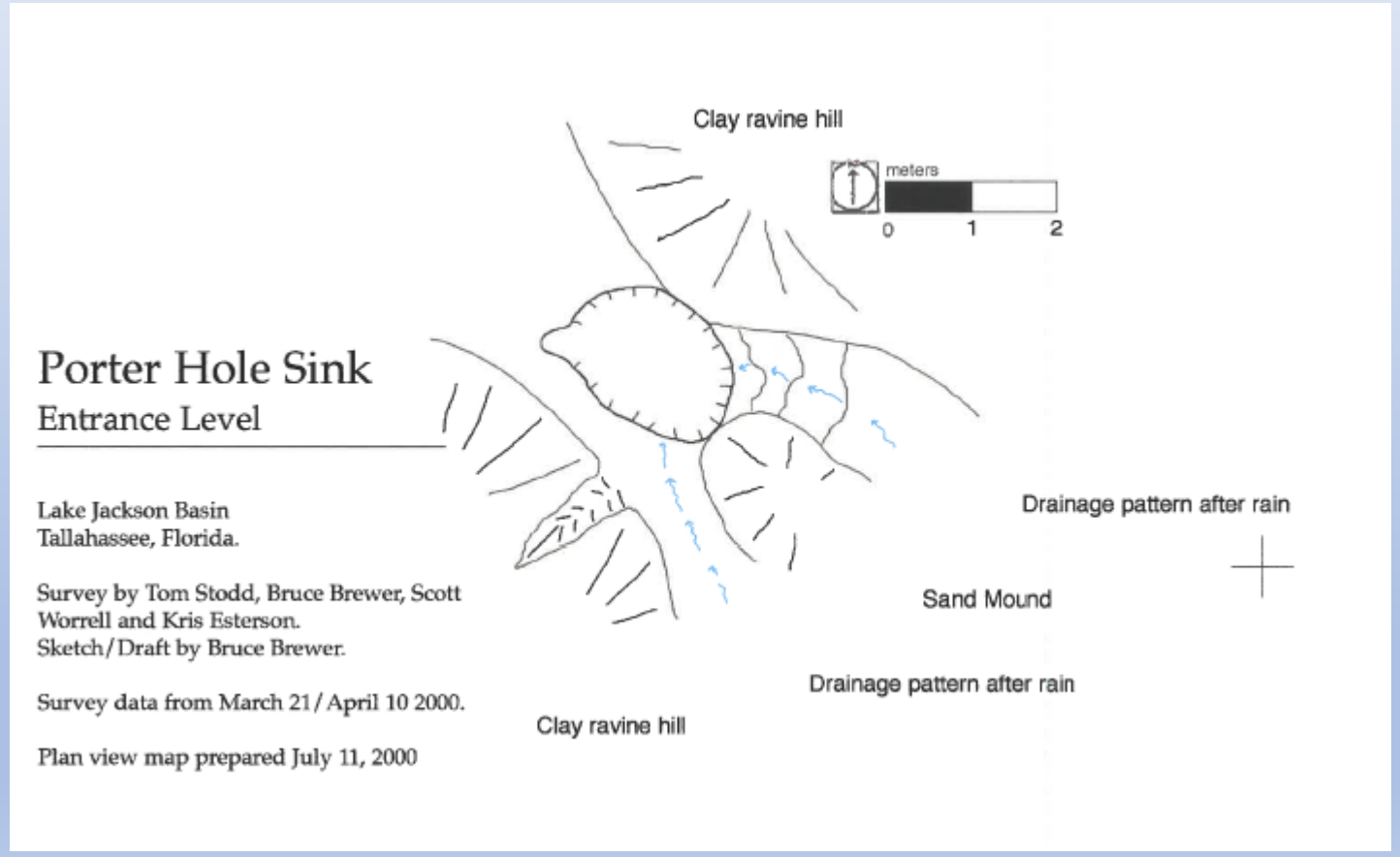
We also climbed around under the lake!

Porter Hole Sink

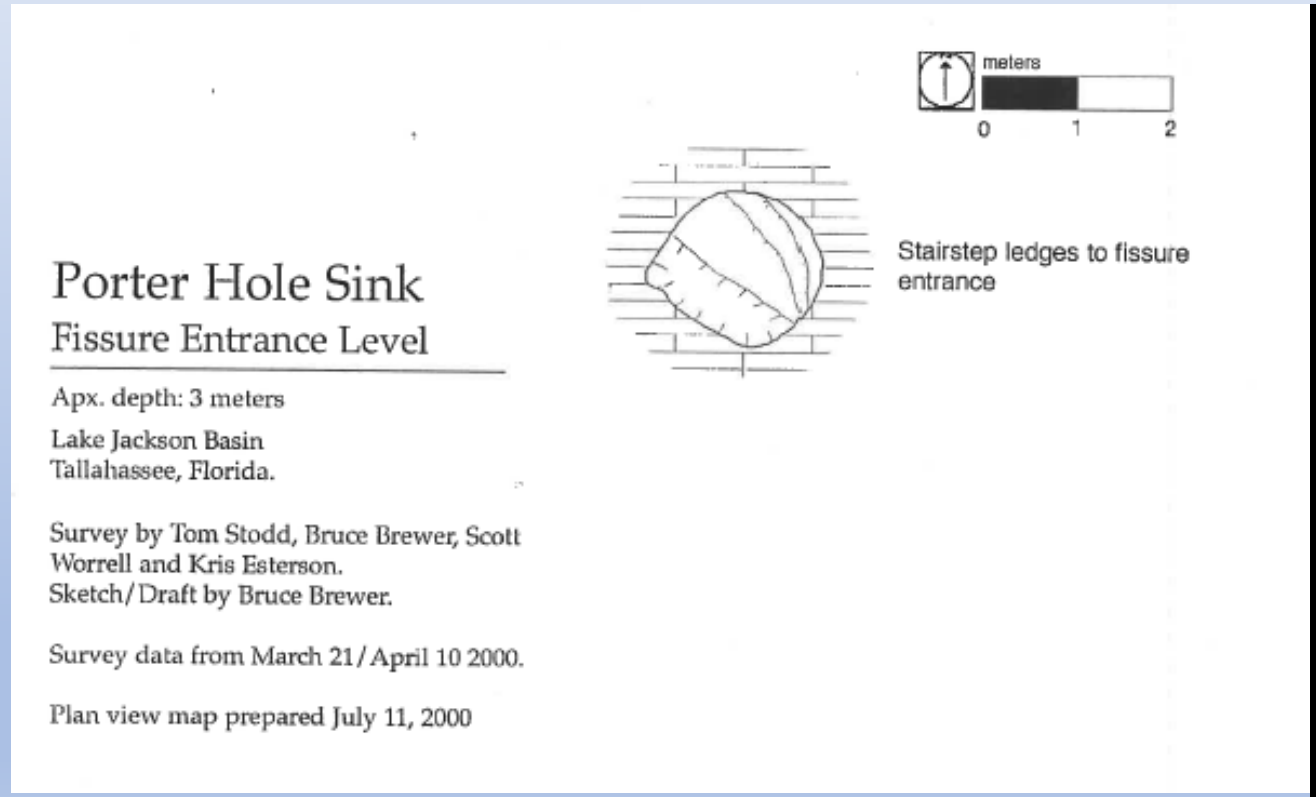


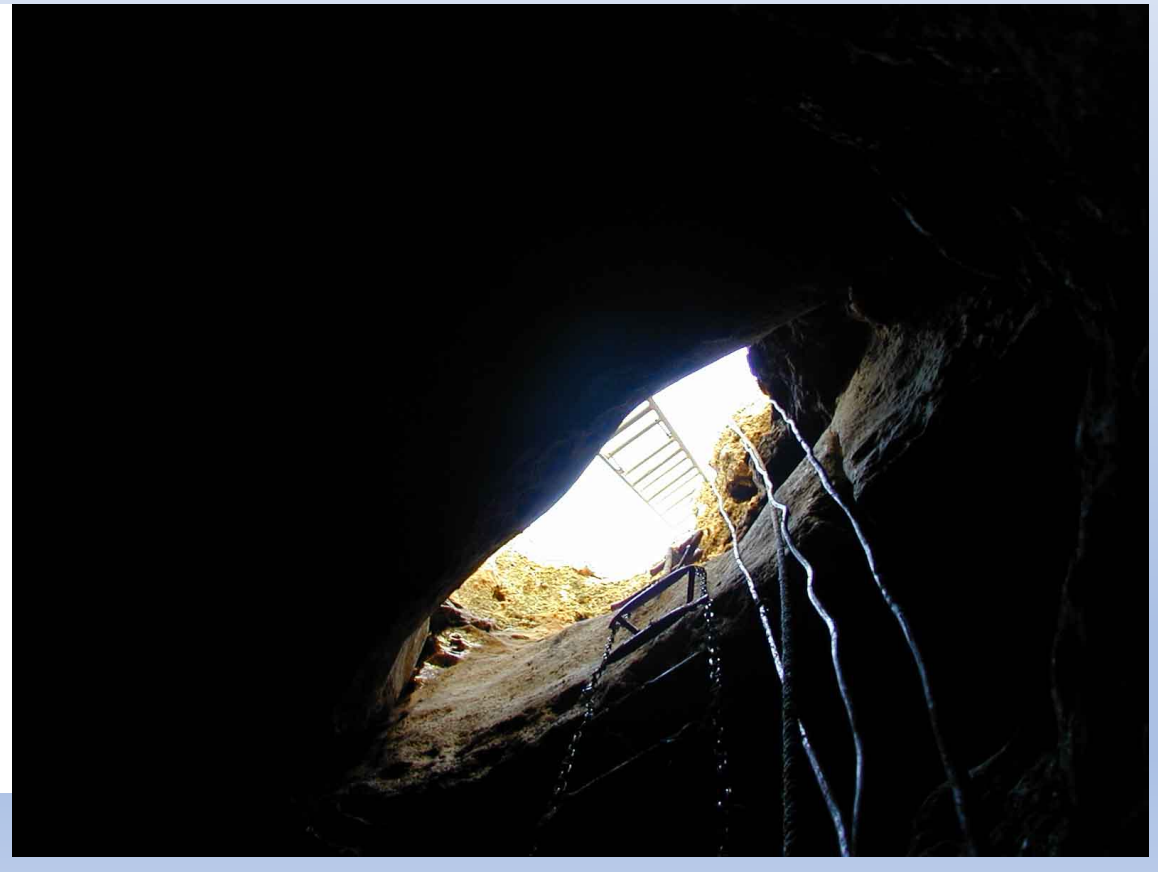
Block diagram of Porter Hole Sink

Porter Hole Sink cave system



Porter Hole Sink





Porter Hole Sink

Porter Hole Sink
Middle Level

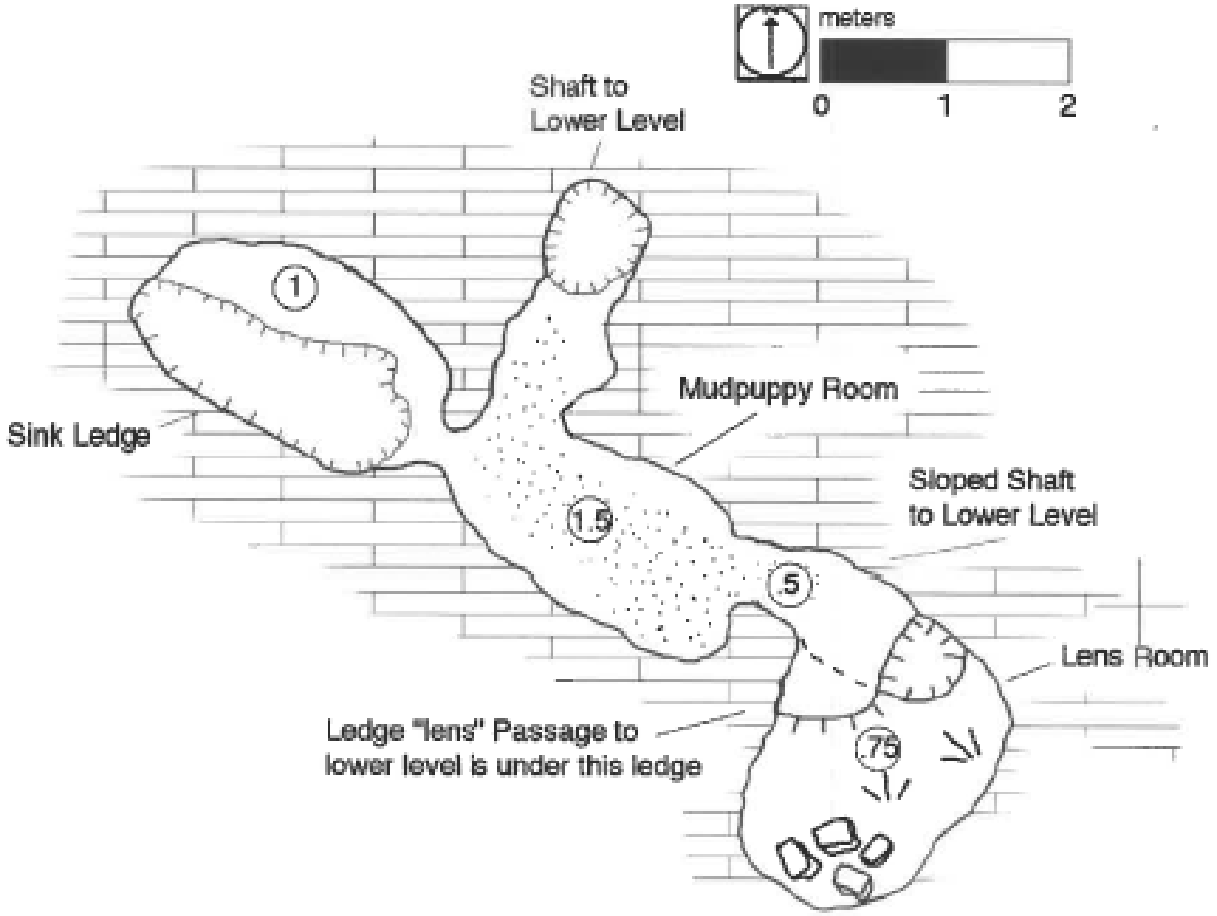
Apx. depth: 5 meters

Lake Jackson Basin
Tallahassee, Florida.

Survey by Tom Stodd, Bruce Brewer, Scott Worrell and Kris Esterson.
Sketch/Draft by Bruce Brewer.

Survey data from March 21/April 10 2000.

Plan view map prepared July 11, 2000



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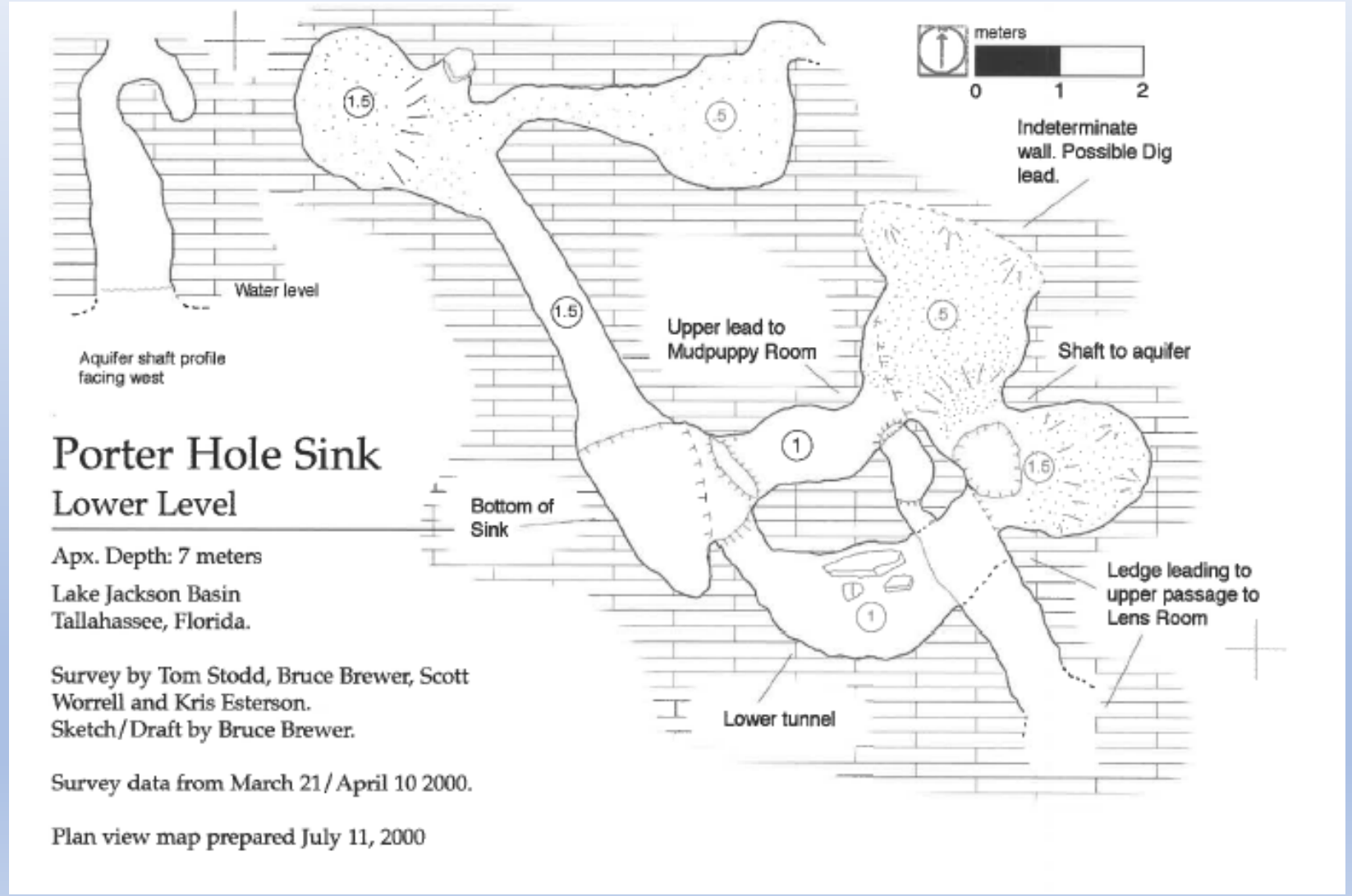
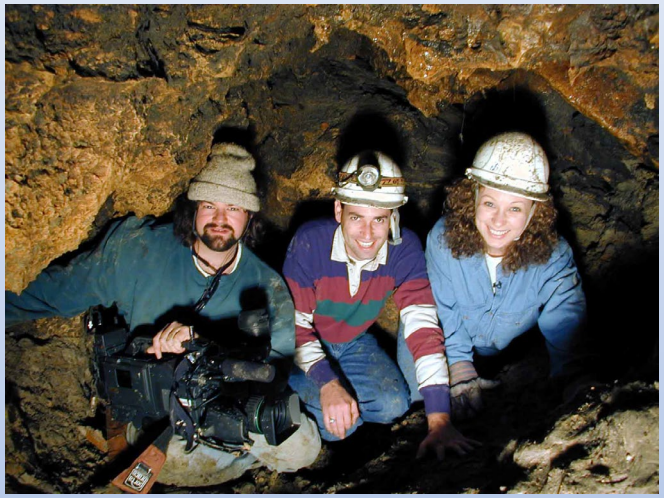


Porter Hole Sink cave – snot-tites!

People in Porter Hole Sink

WFSU TV Crew



Sean McGlynn

County Commissioner

Means brothers

Lime Sink and Megginnis Arm

Lime Sink was reportedly filled with concrete and debris in 1959 to try to prevent the lake from draining.

A sink in Megginnis Arm was filled by the County in 1954 (Tallahassee Democrat, August 17, 1954)

Lime Sink – May 2000

Historic draining of the lake

Documented draining of the lake occurred:

- 1907
- 1909
- 1932
- 1935/36
- 1957
- 1982
- 1999/2000
- 2002
- 2007
- 2012
- 2021

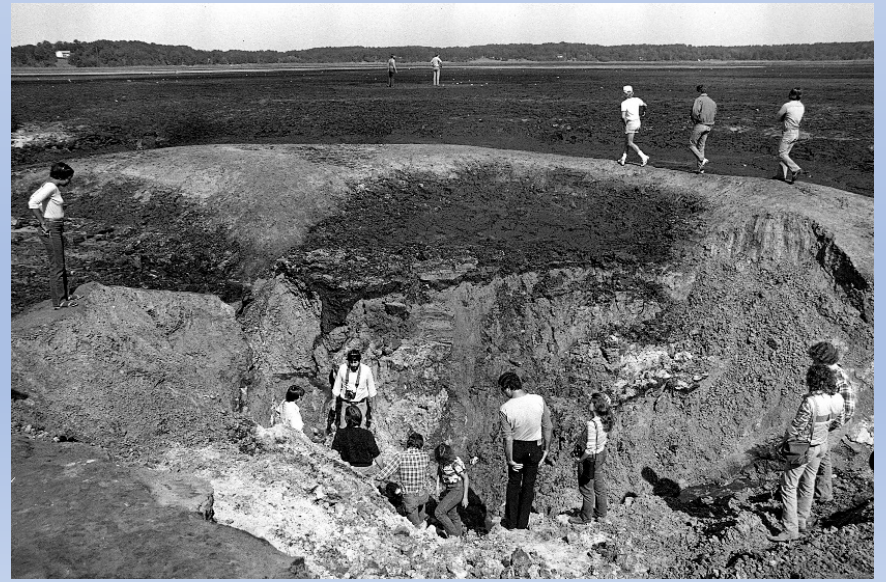
Historic photos

1909

1932

1932

1982



June 2021 dry down

When the lake drains, where does the water go?

Into the underlying Floridan aquifer system

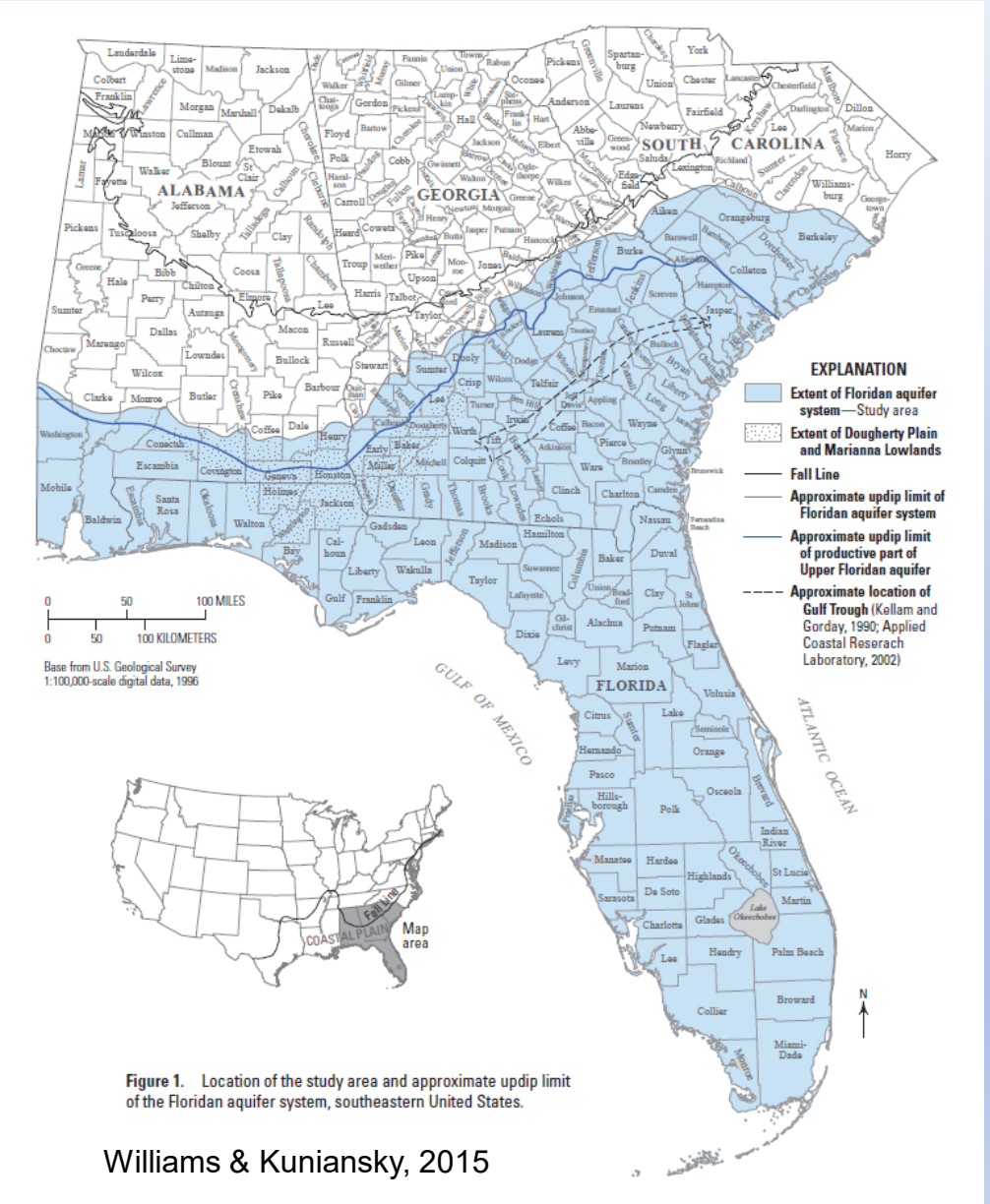
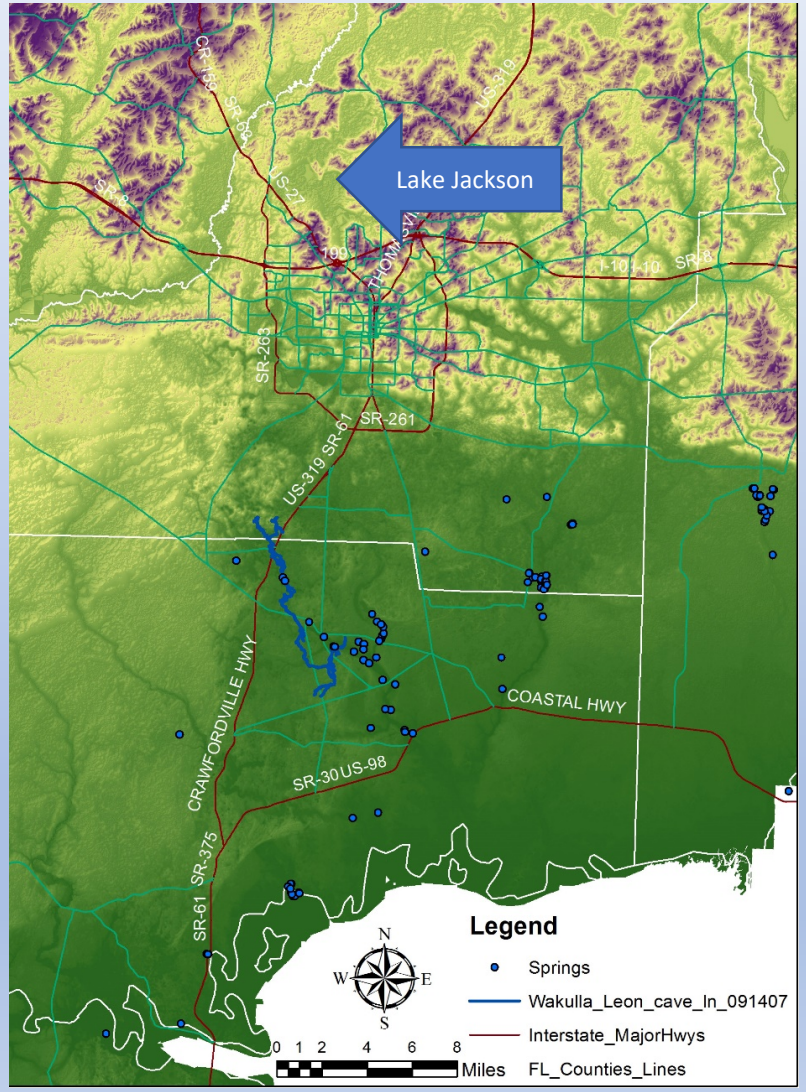


Figure 1. Location of the study area and approximate updip limit of the Floridan aquifer system, southeastern United States.

Williams & Kuniansky, 2015

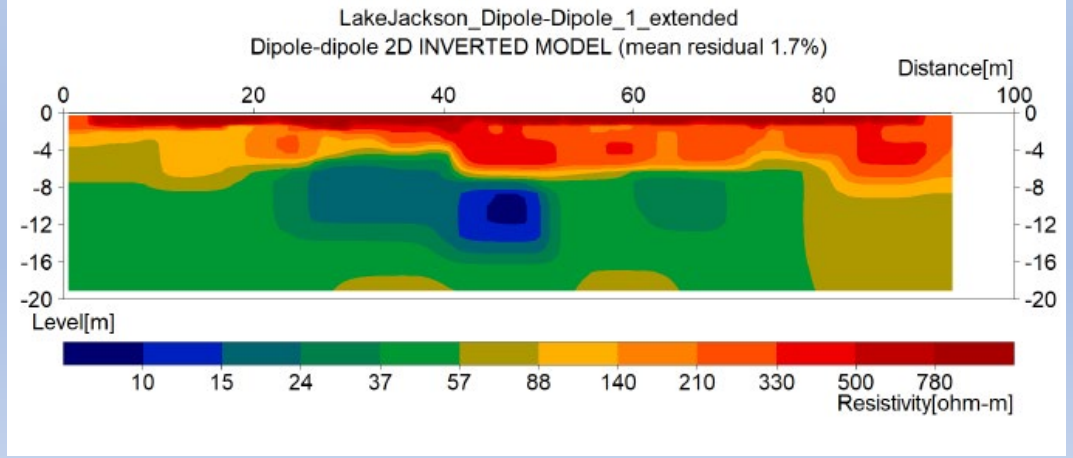
Water can travel rapidly through conduits and ultimately discharge at….

We have one of the longest mapped underwater cave systems in the US:
Wakulla-Leon
Sinks Cave System
(over 32 miles)

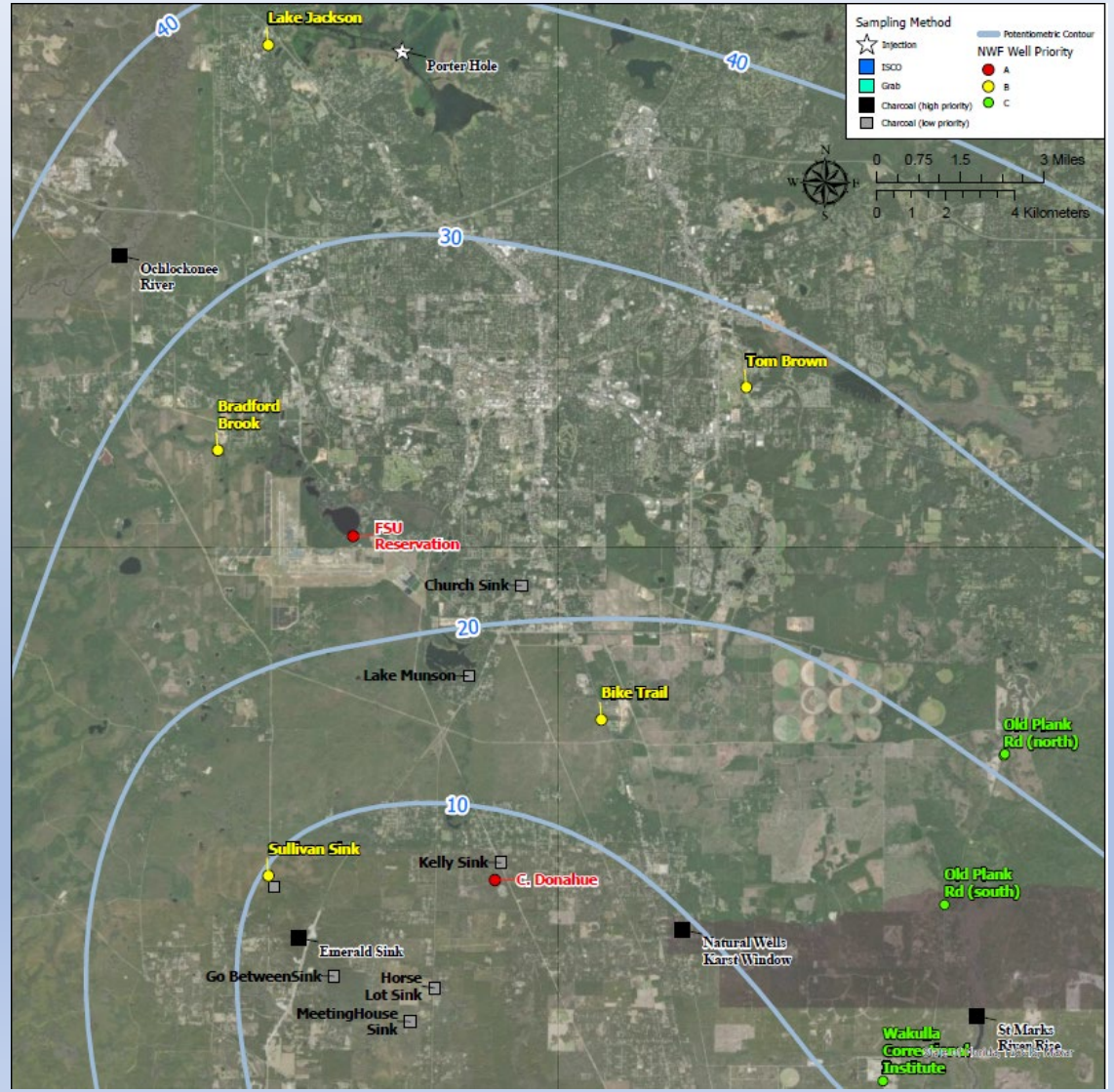


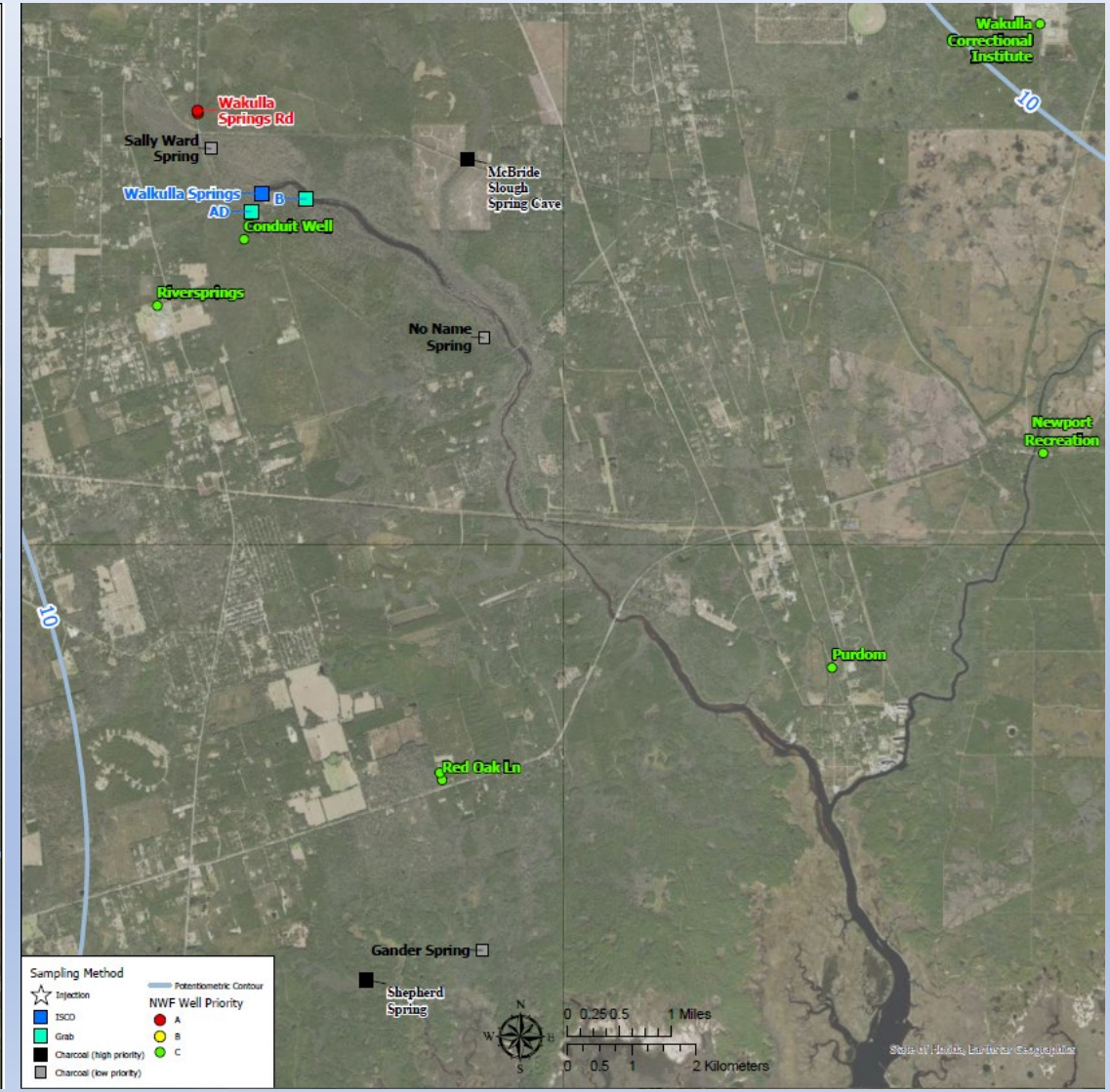
FGS research at Lake Jackson (resistivity)

Resistivity Transect Location: Lake Jackson near Porter Sink



Possible dye trace from Porter Hole Sink





Questions?

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