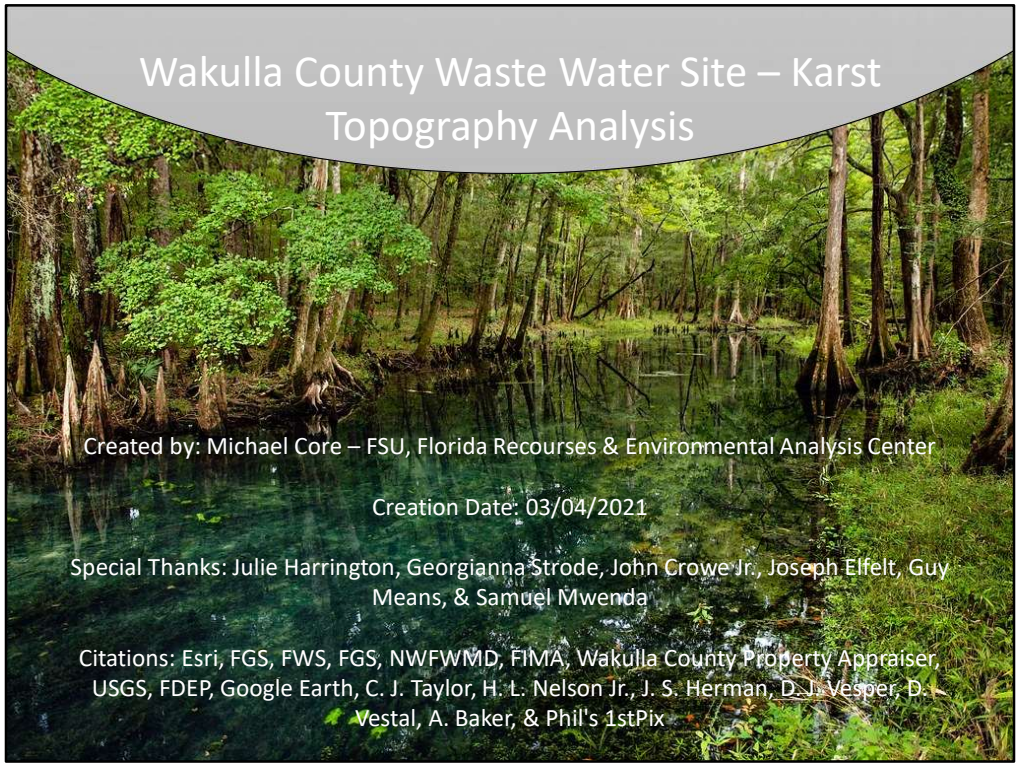
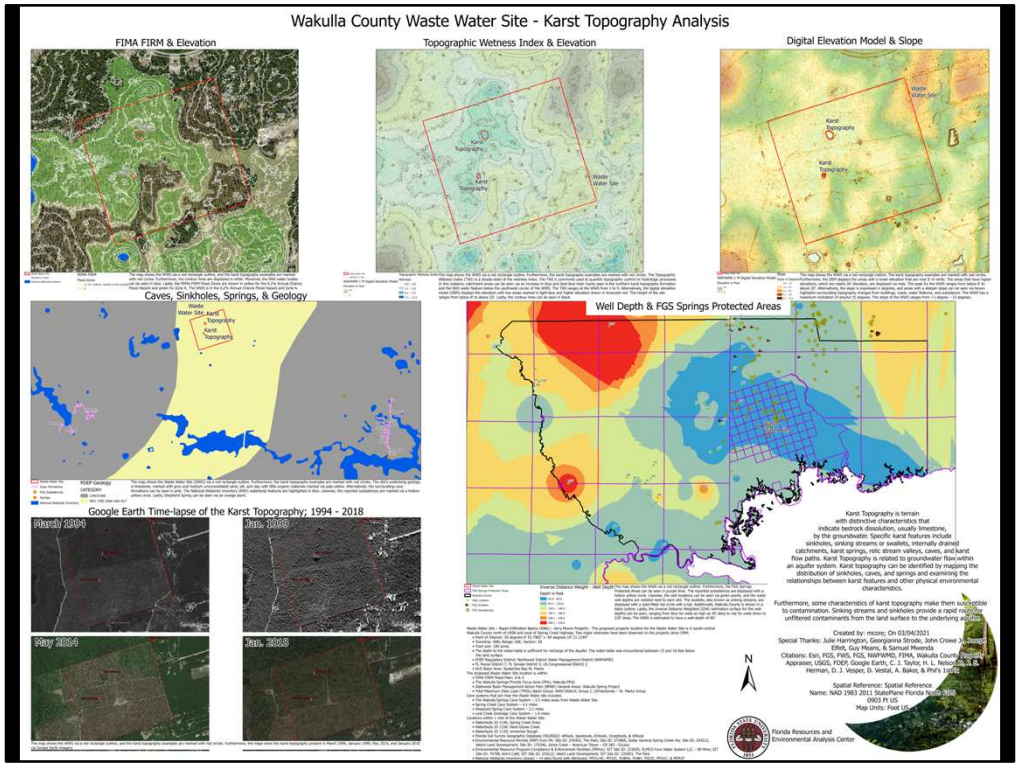



Karst Topography is terrain with distinctive characteristics that indicate bedrock dissolution, usually limestone, by the groundwater. Specific karst features include sinkholes, sinking streams or swallets, internally drained catchments, karst springs, relic stream valleys, caves, and karst flow paths. Karst Topography is related to groundwater flow within an aquifer system. Karst topography can be identified by mapping the distribution of sinkholes, caves, and springs and examining the relationships between karst features and other physical environmental characteristics.

Furthermore, some characteristics of karst topography make them susceptible to contamination. Sinking streams and sinkholes provide a rapid route for unfiltered contaminants from the land surface to the underlying aquifer.

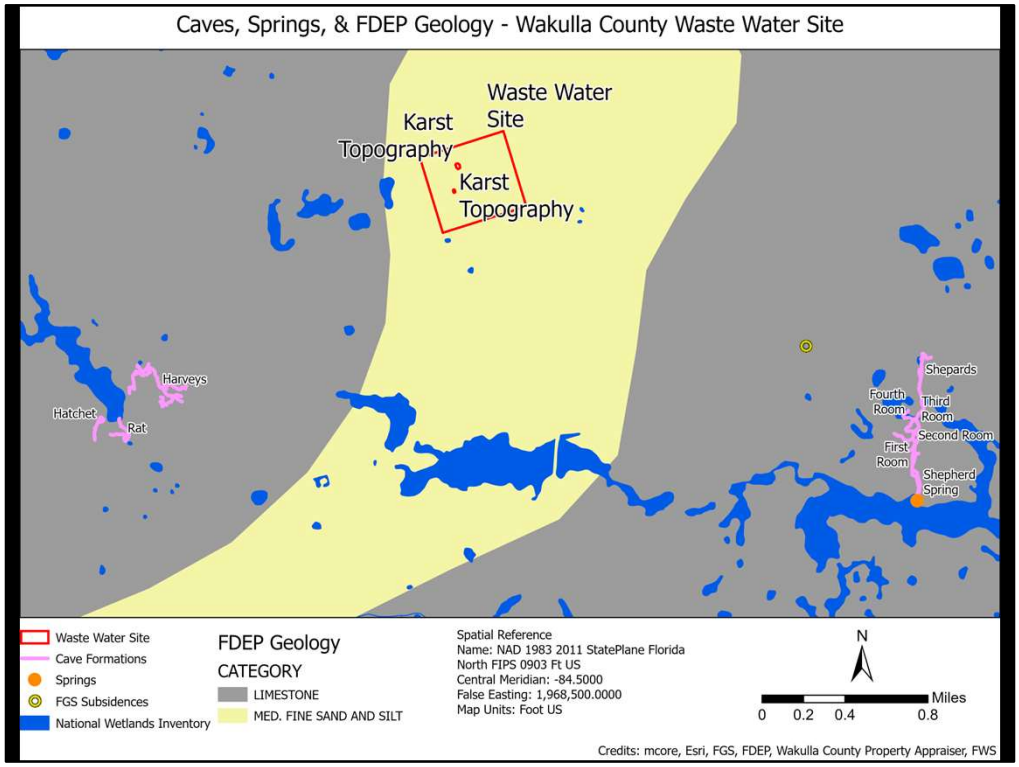



The proposed property location for the Waste Water Site is in south-central Wakulla County, north of US98 and west of Spring Creek Highway. Two major sinkholes have been observed on the property since 1994.
Point of Interest: 30 degrees 8' 55.7982" x -84 degrees 19' 21.1249"
Township: 60N; Range: 60E; Section: 50
Tract size: 100 acres
The depth to the water-table is sufficient for recharge of the aquifer. The water-table was encountered between 13 and 18 feet below the land surface.
FDEP Regulatory District: Northwest District Water Management District (NWFWMD)
FL House District 7; FL Senate District 3; US Congressional District 2
HUC Basin Area: Apalachee Bay-St. Marks

The proposed Waste Water Site location is within:
FIMA FIRM Flood Plain: A & X
The Wakulla Springs Priority Focus Area (PFA); Wakulla PFA2
Statewide Basin Management Action Plan (BMAP) General Areas: Wakulla Spring Project
Total Maximum Daily Load (TMDL) Basin Group: NWD District; Group 1; Ochlockonee – St. Marks Group

Cave systems that are near the Waste Water site includes:
The Wakulla Springs Cave System – 2.5 miles away from Waste Water Site
Spring Creek Cave System – 4.1 miles
Shepherd Spring Cave System – 2.1 miles
Lost Creek Drainage Cave System – 1.4 miles

Locations within 1 mile of the Waste Water Site:
Waterbody ID 1146; Spring Creek Drain
Waterbody ID 1158; West Goose Creek
Waterbody ID 1139; Unnamed Slough
Florida Soil Survey Geographic Database (SSURGO): Alfisols, Spodosols, Entisols, Inceptisols, & Ultisols
Environmental Resource Permits (ERP) from PA: Site ID: 234303, The Park; Site ID: 373965, Dollar General Spring Creek Hw; Site ID: 254212,
Welch Land Development; Site ID: 176346, Johns Creek – American Tower – CR 365 - Oculus
Environmental Resource Program-Compliance & Enforcement Facilities (ERPce): SIT Site ID: 215835, SLMCO Pure Water System LLC – 98 Mine; SIT Site ID: 70708, Kim's Café; SIT Site ID: 254212, Welch Land Development; SIT Site ID: 234303, The Park
National Wetlands Inventory (areas) – 14 sites found with Attributes: PFO1/4C, PFO2C, PUBHx, PUBH, PSS3C, PFO1C, & PEM1FCaves, Sinkholes, Springs, & Geology




The map shows the Waste Water Site (WWS) via a red rectangle outline. Furthermore, the karst topography examples are marked with red circles. The site's underlying geology is limestone, marked with grey and medium unconsolidated sand, silt, and clay with little organic materials marked via pale-yellow. Alternatively, the surrounding cave formations can be seen in pink. The National Wetlands Inventory (NWI) waterbody features are highlighted in blue. Likewise, the reported subsidences are marked via a hollow-yellow circle. Lastly, Shepherd Spring can be seen via an orange point.

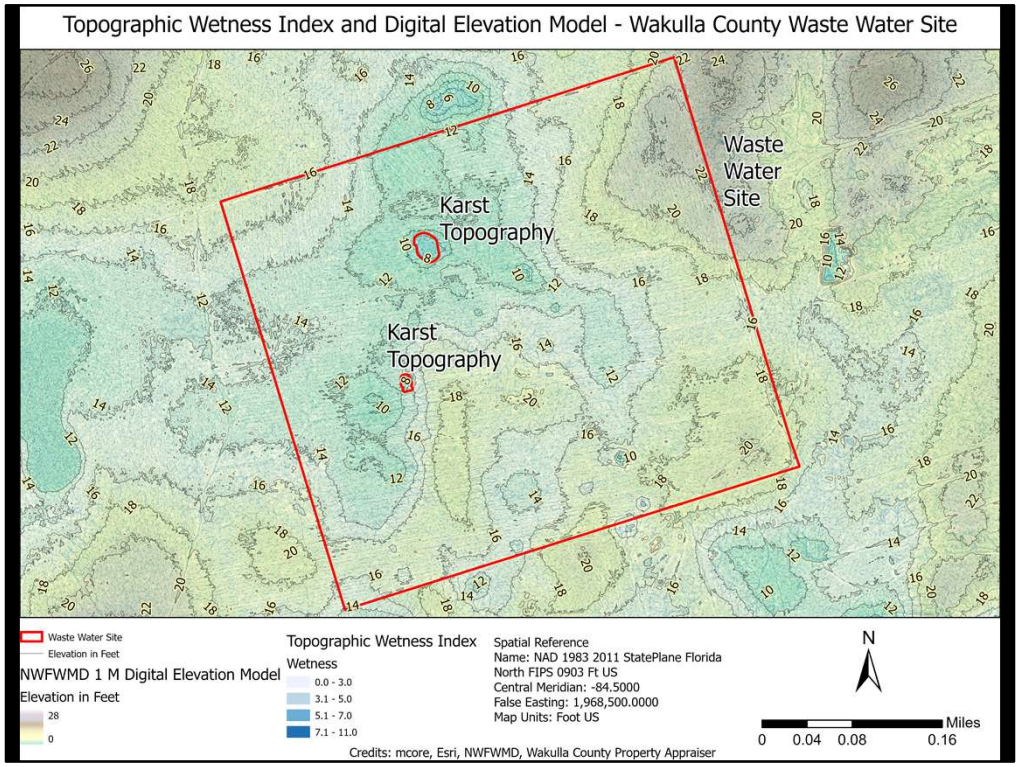
Limestone formations allow for conduits that connect points of infiltration within a karst aquifer.

Medium Fine Sand and Silt allows for drainage into the underlying water table.

Cave systems are evidence of surrounding karst formations.

The NWI shows that there are groundwater exposures near the WWS.

Reported subsidences, also known as sinkholes, are evidence of underlying karst formations.

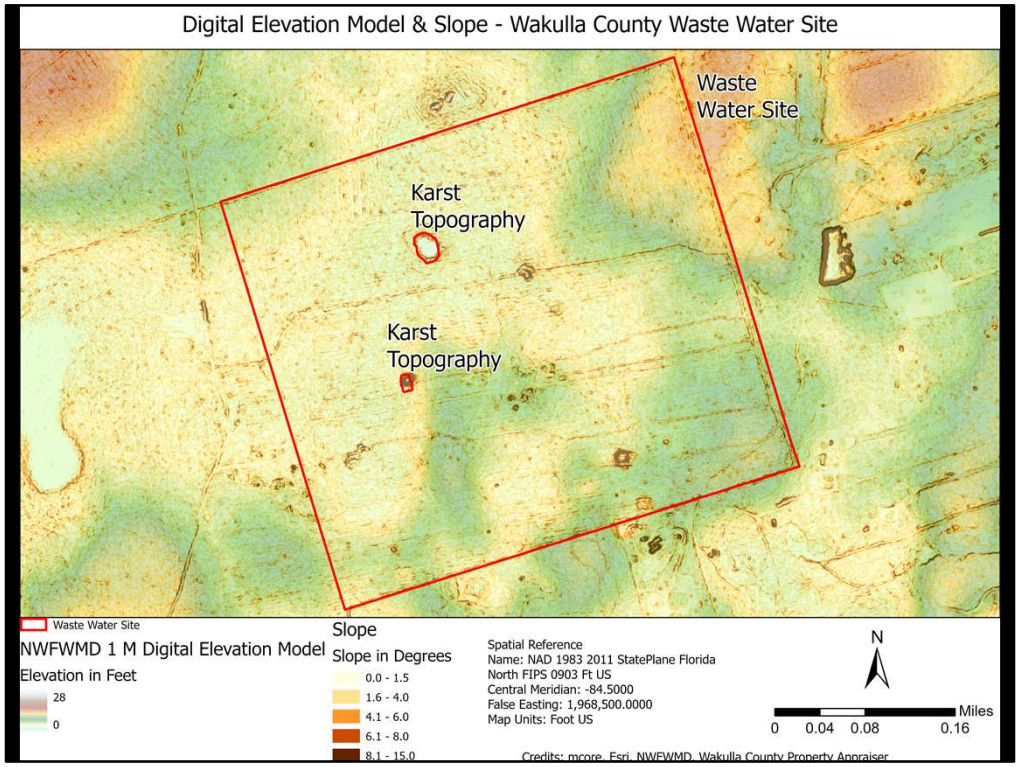



The map shows the WWS via a red rectangle outline. Furthermore, the karst topography examples are marked with red circles. The Topographic Wetness Index (TWI) is a steady-state of the wetness index. The TWI is commonly used to quantify topographic control on hydrologic processes. In this instance, catchment areas can be seen via an increase in blue and dark-blue hash marks seen in the northern karst topography formation and the hourglass-shaped NWI waterbody feature that touches the center-western border of the map. The TWI ranges at the WWS from 1 to 9. Alternatively, the digital elevation model (DEM) displays the elevation with low areas marked in light-blue and higher elevation drawn in brownish-red. The height of the site ranges from below 8' to above 20'. Lastly, the contour lines can be seen in black.

The TWI shows the surface-water flow and surface-water catchments based on topology.

Surface-water catchments can be seen in the hourglass-shaped NWI waterbody feature that touches the center-western border of the map and the karst formations in the WWS.

Areas with lower elevation are in light-blue. The Karst Topography formations on the WWS are lower than the surrounding land, which can indicate the presence of a sinkhole.




The map shows the WWS via a red rectangle outline. The karst topography examples are marked with red circles. Furthermore, the DEM displays the areas with a lower elevation that are near 0' in white. The areas that have higher elevations, which are nearly 26' elevation, are displayed via reds. The peak for the WWS ranges from below 8' to above 20'. Alternatively, the slope is expressed in degrees, and areas with a steeper slope can be seen via brown highlights surrounding topography changes from buildings, roads, water features, and subsidence. The WWS has a maximum inclination of around 15 degrees. The slope of the WWS ranges from <1 degree – 15 degrees.

The DEM has a 5' resolution and was obtained from NWFWMD.

The DEM is an estimation of the elevation based on LiDAR data.

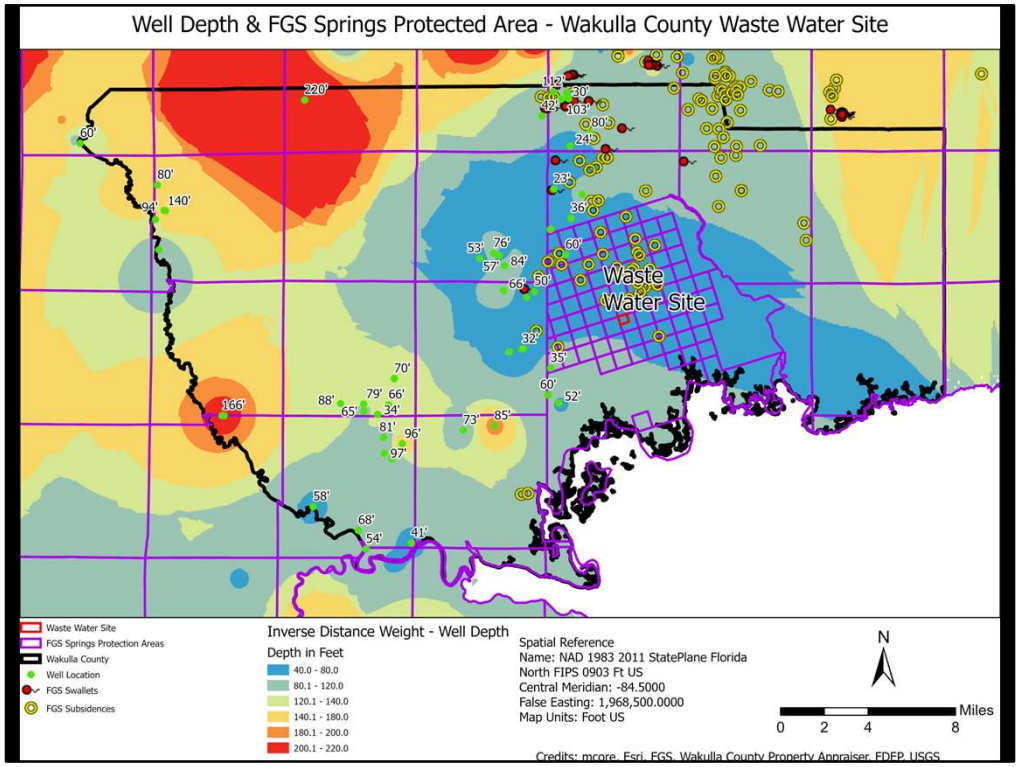
The areas with lower elevations are marked in yellows, while areas with higher elevations are in reds.

Low elevation areas can be seen in the hourglass-shaped NWI waterbody feature that touches the map's center-western border and the karst formations in the WWS.

The slope is a measure of the steepness of the land. Areas with a greater inclination/slop/grade can be seen in brown, while flat areas are absent of the slope lines.

Areas with an increased slope can be seen along the edges of the karst topography in the WWS, the edges of roads and paths, surrounding building/home foundations,

and the edges of water features.
Flat areas can be seen in the center of the karst topography formations in the WWS and the center of water bodies.




The map shows the WWS via a red rectangle outline. Furthermore, the FGS Springs Protected Areas can be seen in purple lines. The reported subsidences are displayed with a hollow yellow circle. Likewise, the well locations can be seen via green points, and the water well depths are notated next to each site. The swallets, also known as sinking streams, are displayed with a solid-filled red circle with a tail. Additionally, Wakulla County is shown in a black outline. Lastly, the Inverse Distance Weighted (IDW) estimation surface for the well-depths can be seen, ranging from blue for wells as high as 40' deep to red for wells down to 220' deep. The WWS is estimated to have a well-depth of 80'.

FGS Springs Protected Areas are identified as areas that contribute flow to Florida springs.

Sinkholes/subsidences are indicative of karst formations.

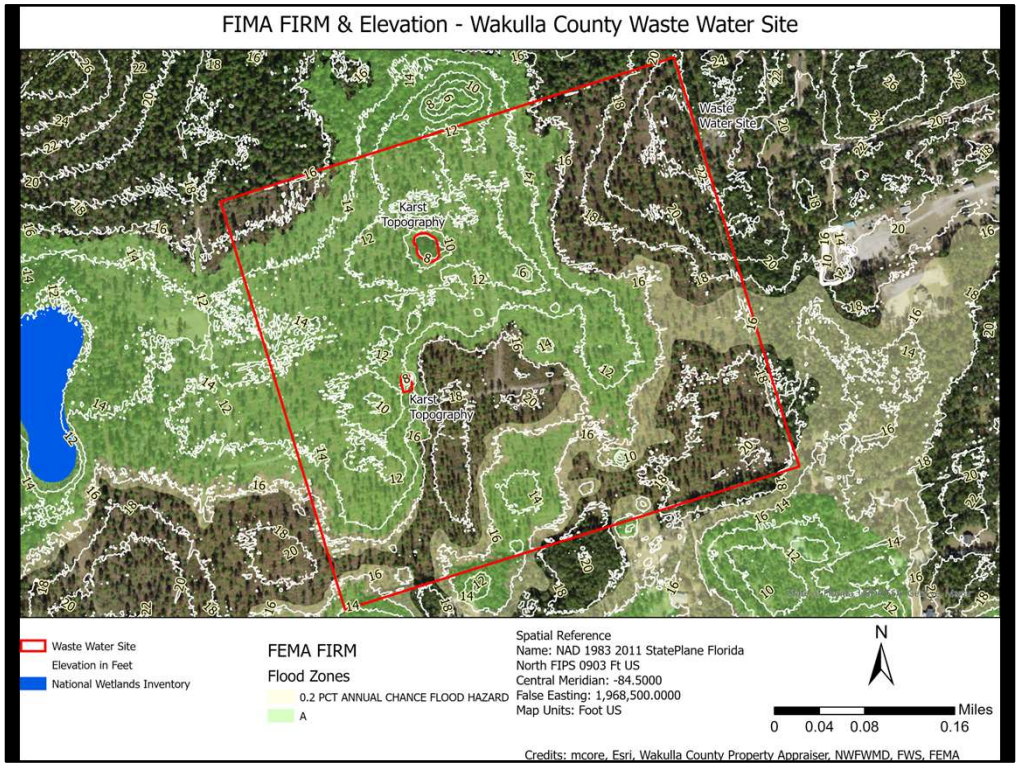
The numerous swallets/sinking steams are evidence of the karst topography.

The IDW estimation surface attempts to measure the groundwater level based on well-depths in Florida.

The groundwater table is estimated to be relatively shallow at the WWS at only 80'.

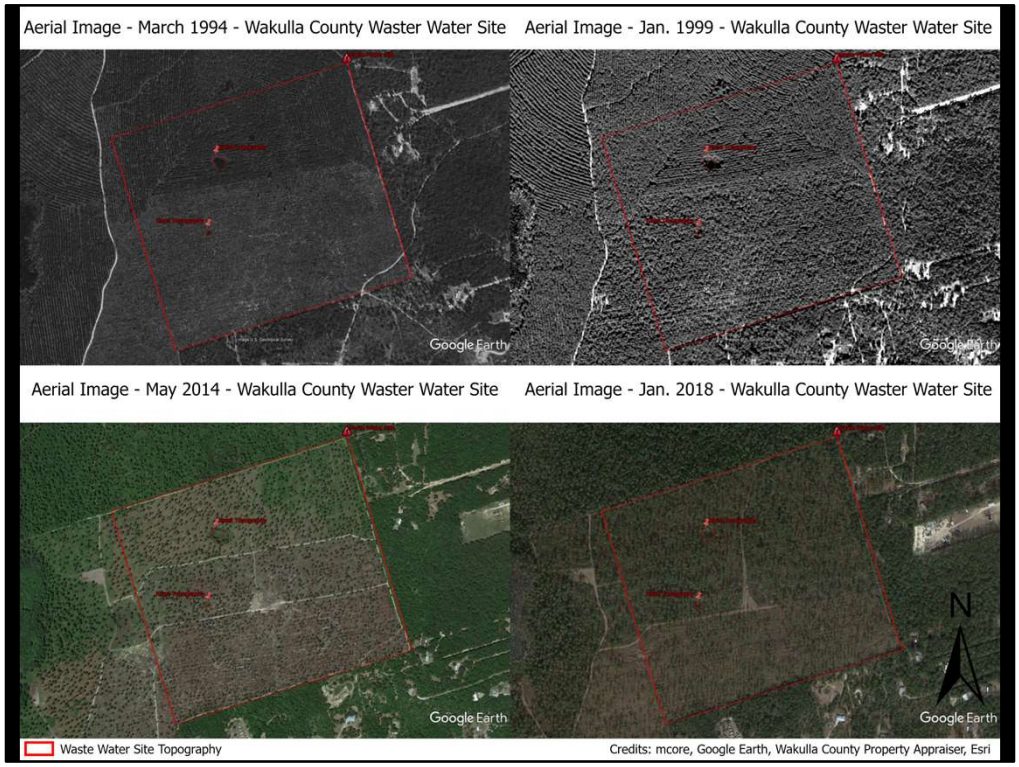
The WWS may be a risk for groundwater contamination based on the shallow water table and the underlying geology of medium-fine sand and silt.

The notion of a shallow water table at the WWS is backed up by on-site borehole testing.




The map shows the WWS via a red rectangle outline, and the karst topography examples are marked with red circles. Furthermore, the contour lines are displayed in white. Moreover, the NWI water bodies can be seen in blue. Lastly, the FEMA FIRM Flood Zones are shown in yellow for the 0.2% Annual Chance Flood Hazard and green for Zone A. The WWS is in the 0.2% Annual Chance Flood Hazard and Zone A.

A large portion of the WWS is in the 100-year flood zone and could overspill contaminants into the surrounding water bodies and the underlying water table.



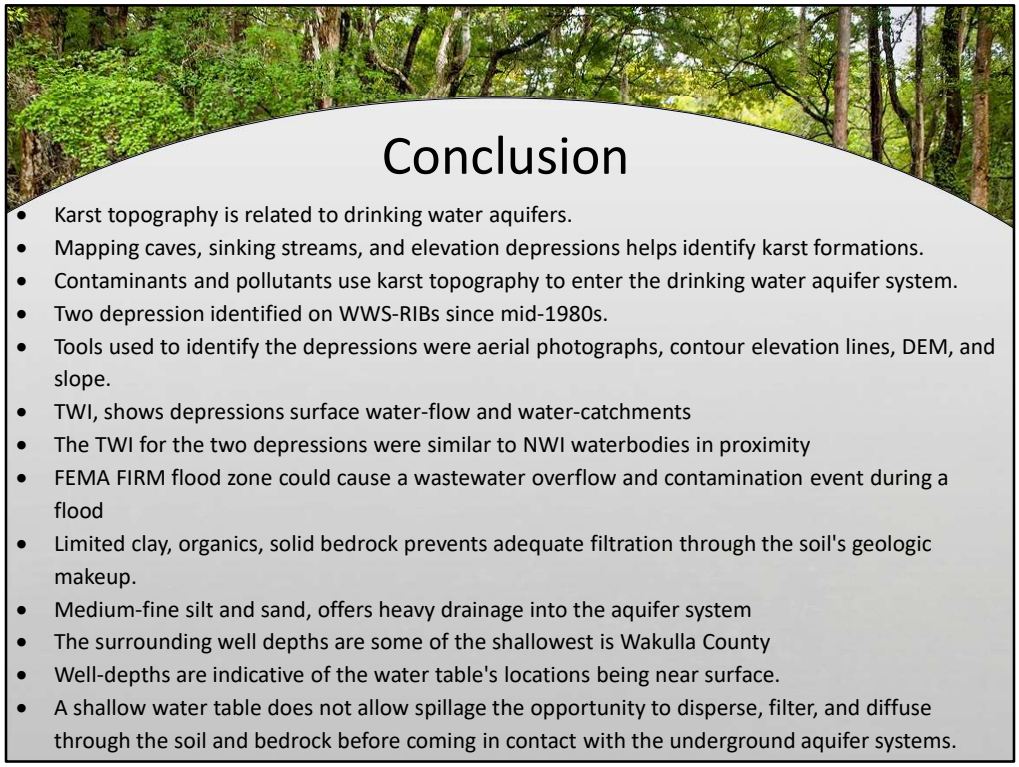

The map shows the WWS via a red rectangle outline, and the karst topography examples are marked with red circles. Furthermore, the maps show the karst topography present in March 1994, January 1999, May 2014, and January 2018 via Google Earth imagery.

It appears that in the early 1990s, there was timber/Agriculture on the WWS.

The karst topology formations were not planted with timber.

The growth of the trees would indicate that the karst formations predate the timber farm.

The karst topography formations have persisted from as early as the 1980s based on the tree growth in the aerial imagery until the present day.




In conclusion, karst topography features are underground caves and water systems that can connect to our drinking water aquifers. Karst topography can be identified based on formations such as caves, sinking streams, and elevation depressions. These types of land features can allow contaminants and pollutants to flow into the drinking water aquifer system. Likewise, The WWS has evidence of two significant depression features that have been on the property since at least the mid-1980s. These depression features can be identified via inspection of the aerial photographs, contour elevation lines, DEM, and slope. Furthermore, utilizing the TWI, the depression features in the WWS can be seen as surface water catchments, similarly to the surrounding NWI waterbody features.

Alternatively, the WWS is in a FEMA FIRM flood zone and could potentially induce a wastewater overflow and contamination event during a flood or deluge. For the WWS, this is particularly alarming, considering there is no clay or bedrock in the underlying soil's geologic makeup. The geologic makeup of the WWS is medium-fine silt and sand, which boasts heavy drainage and offers little protection to the underlying drinking water aquifers.

Lastly, the WWS and the surrounding well depths are some of the shallowest wells in Wakulla County. The shallow well depths surrounding this location are indicative of a water table that is near the surface. A water table near the land's surface offers little opportunity for contaminants, chemicals, and pollutants to disperse, filter, and diffuse through the soil substrates and underlying bedrock before coming in contact

with the underground aquifer systems.

Institute of Science & Public Affairs, Florida Recourses and Environmental Analysis Center