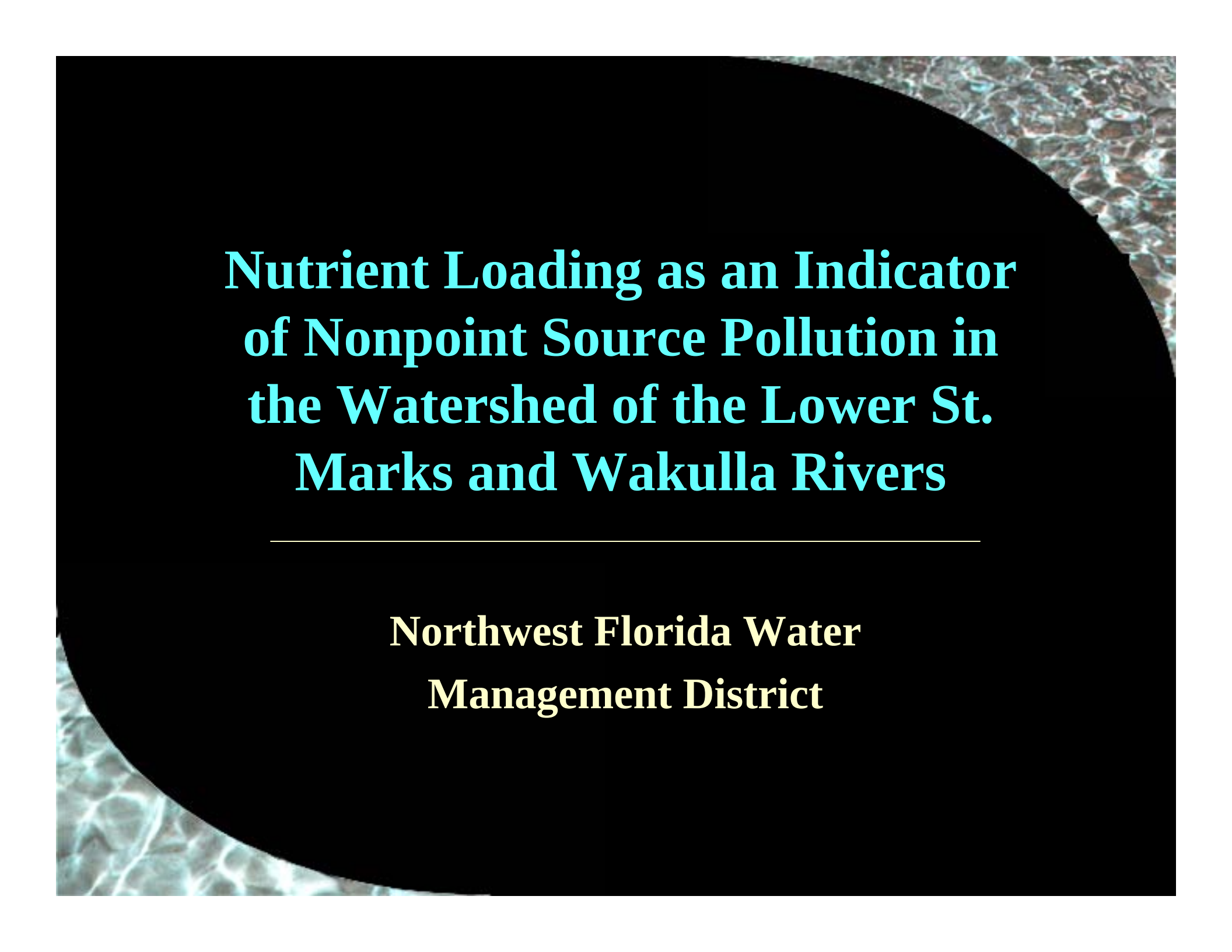
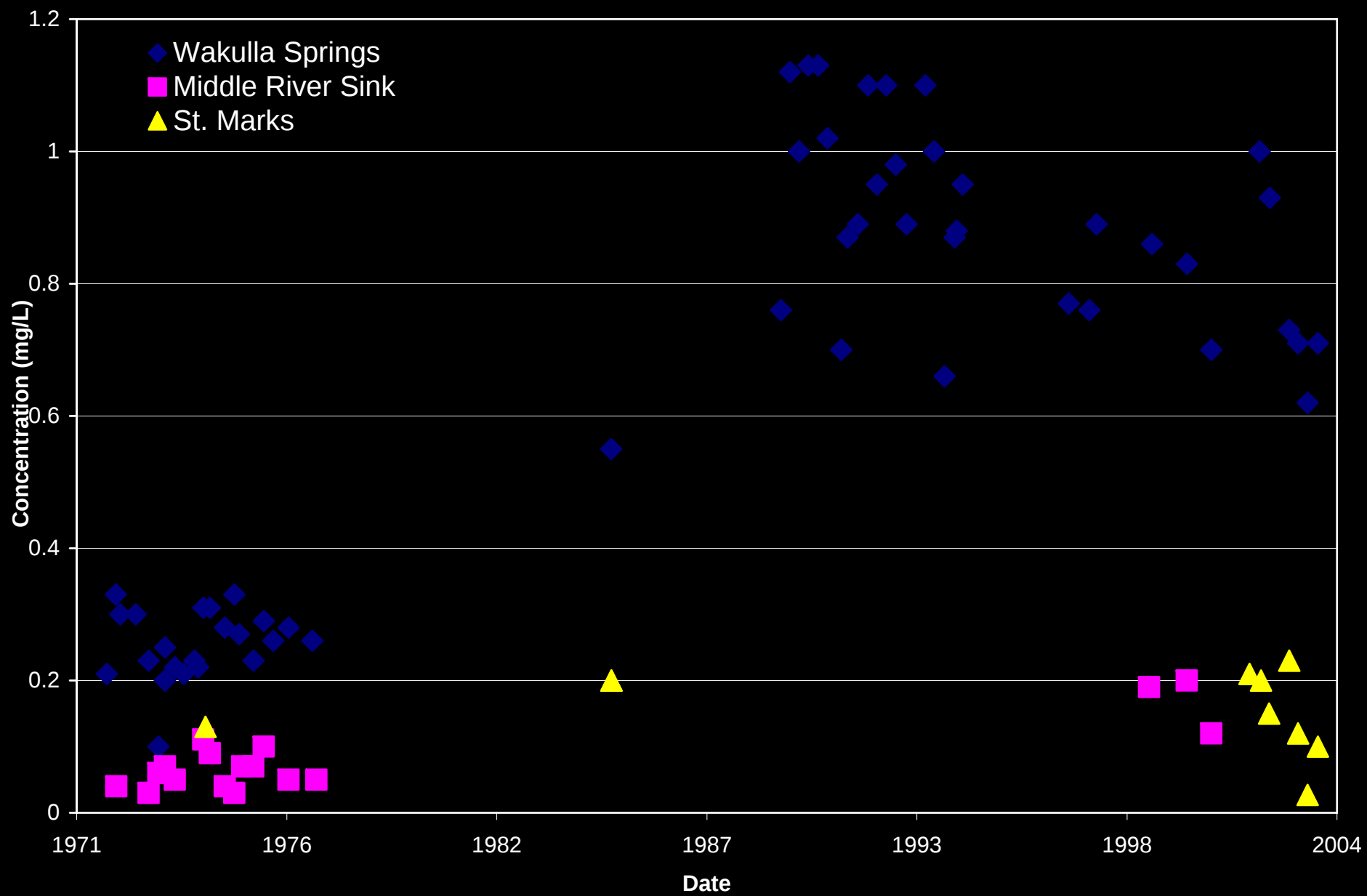


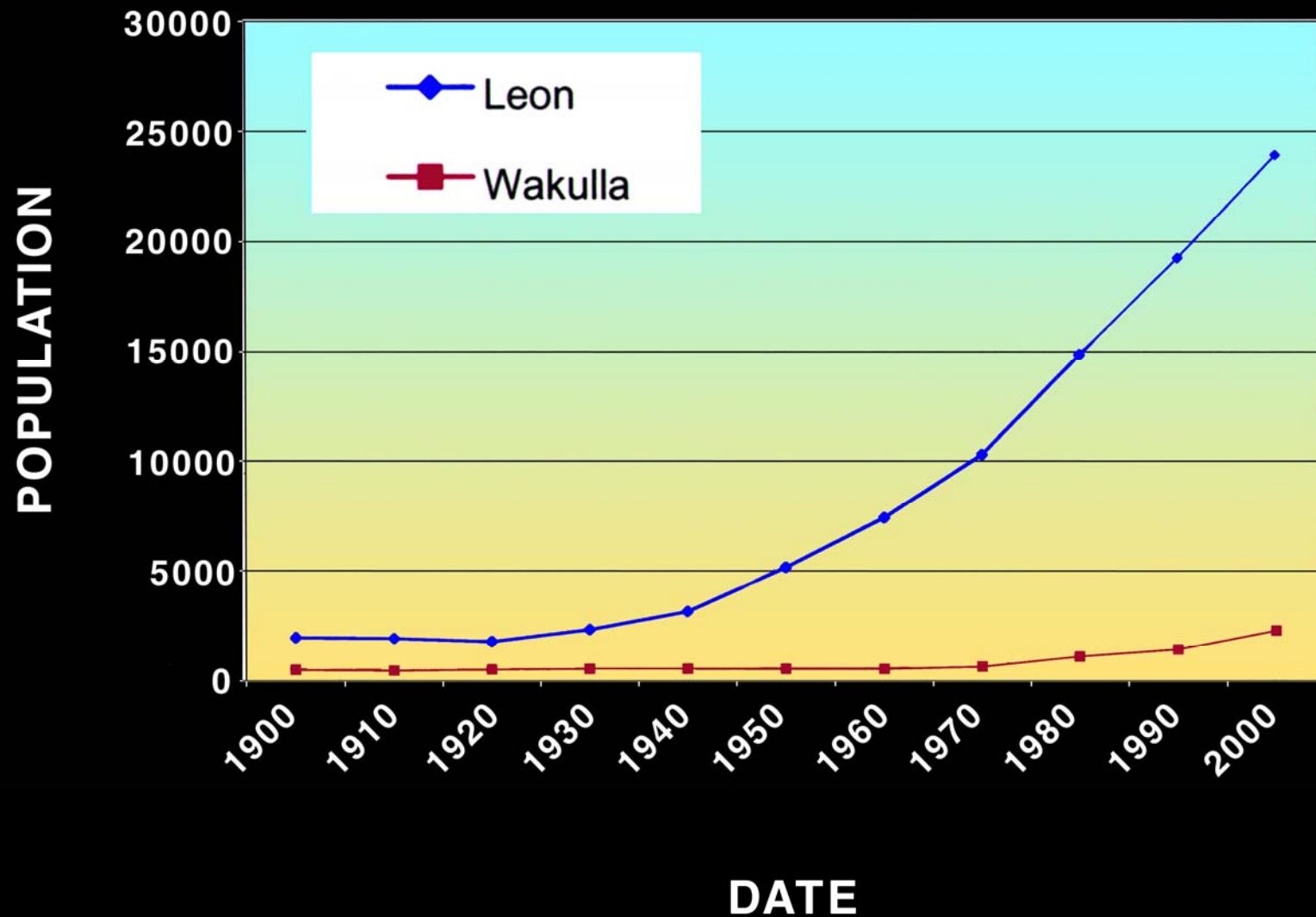
The background of the slide features a close-up photograph of water ripples, creating a textured, shimmering effect. This image is partially obscured by a large, solid black semi-circular shape that covers the left and central portions of the frame.

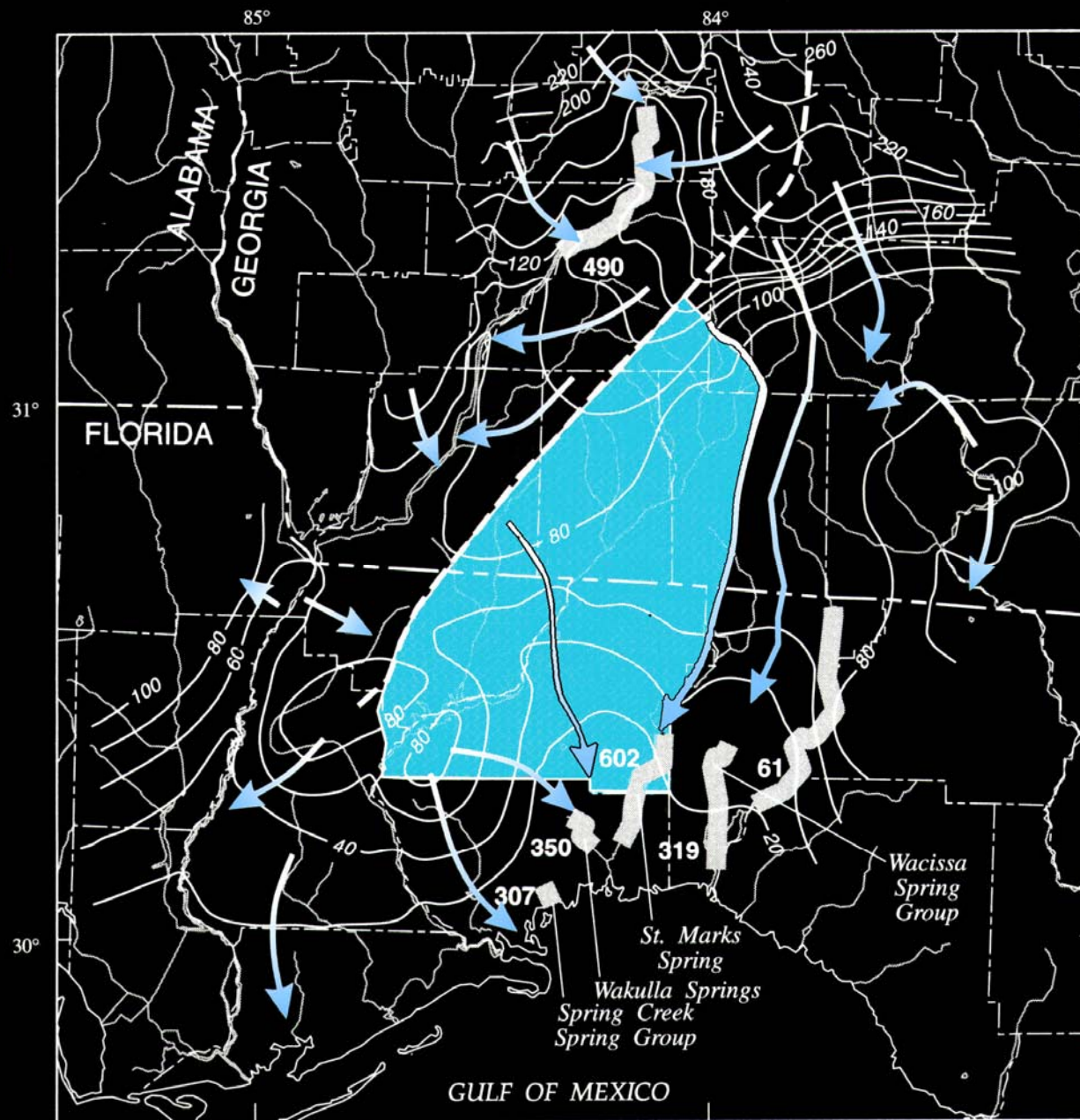
Nutrient Loading as an Indicator of Nonpoint Source Pollution in the Watershed of the Lower St. Marks and Wakulla Rivers

**Northwest Florida Water
Management District**

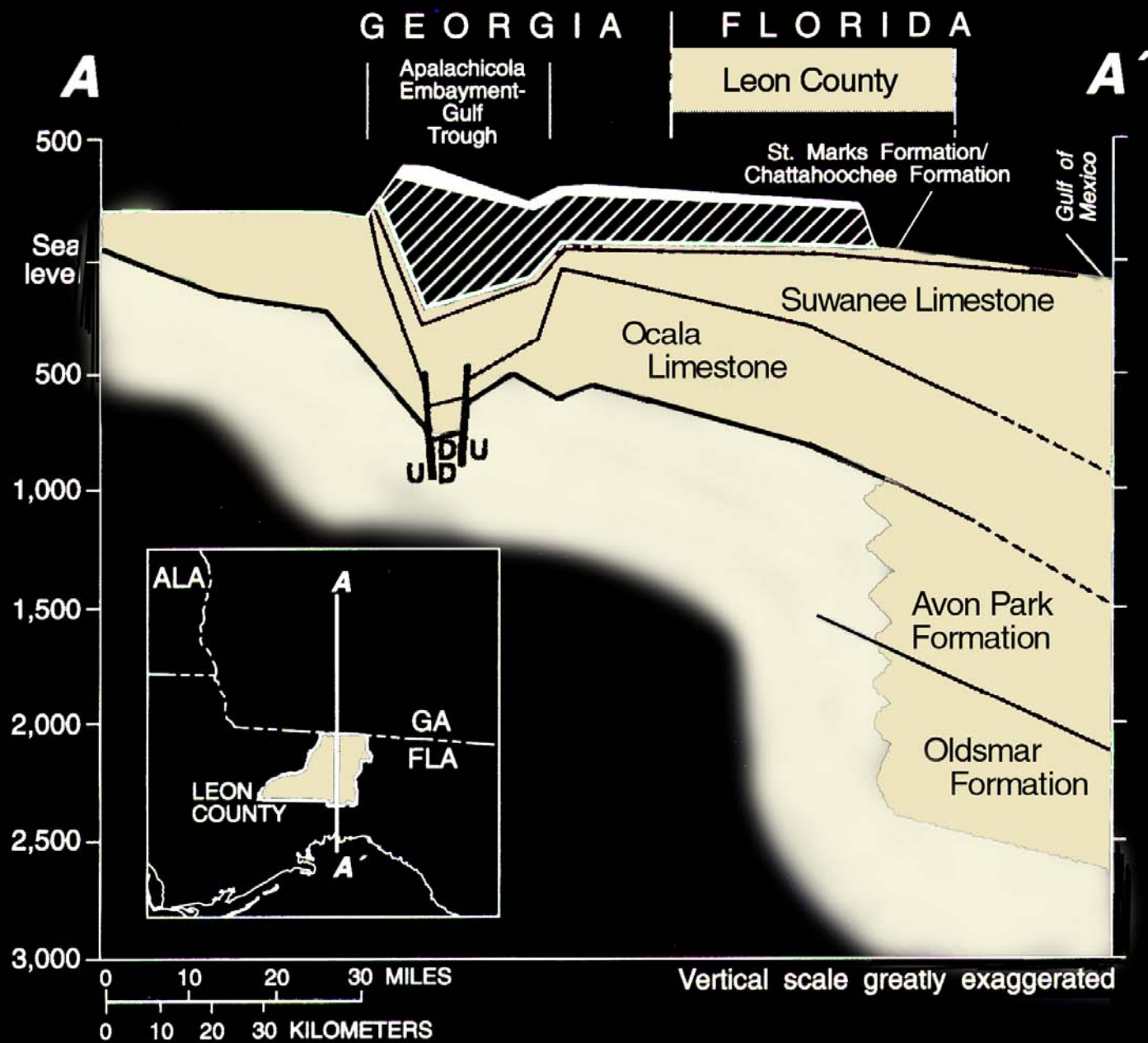


Population Increase in Leon and Wakulla Counties since 1900



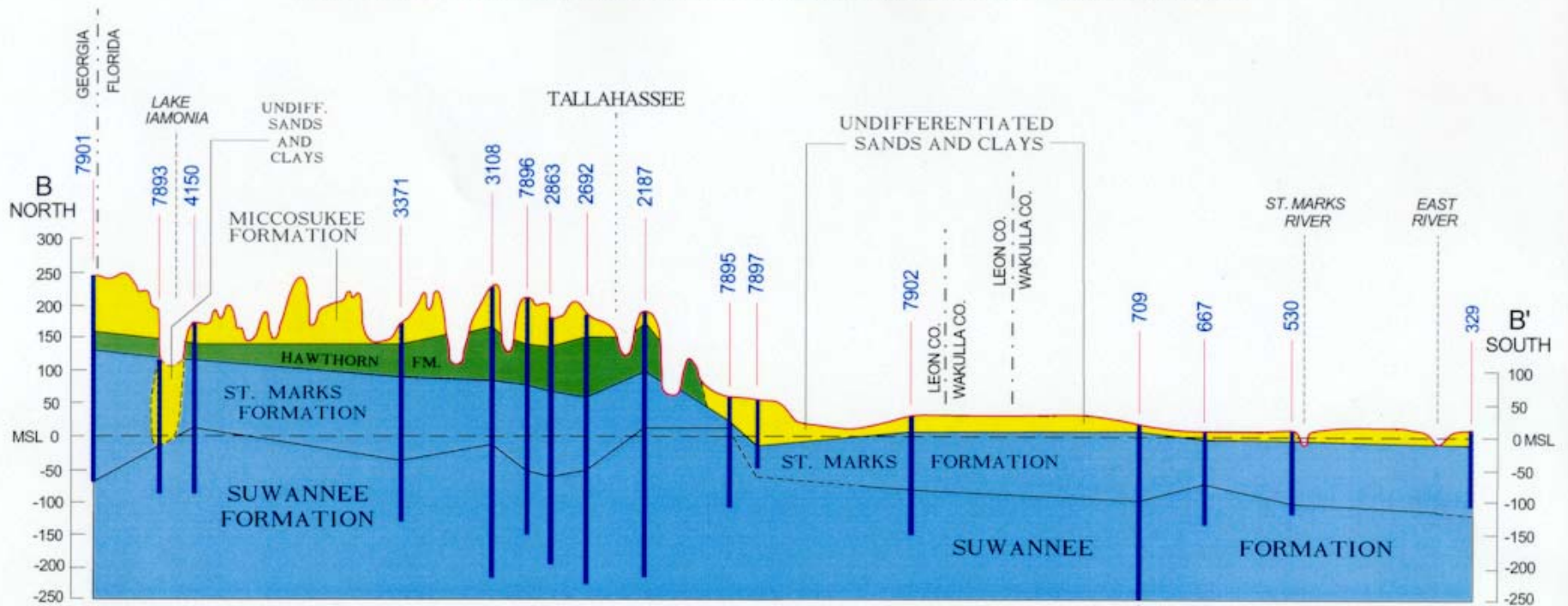


Source, USGS



Source, USGS

GEOLOGIC CROSS-SECTION B-B' IN LEON AND WAKULLA COUNTIES

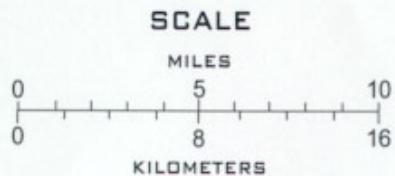
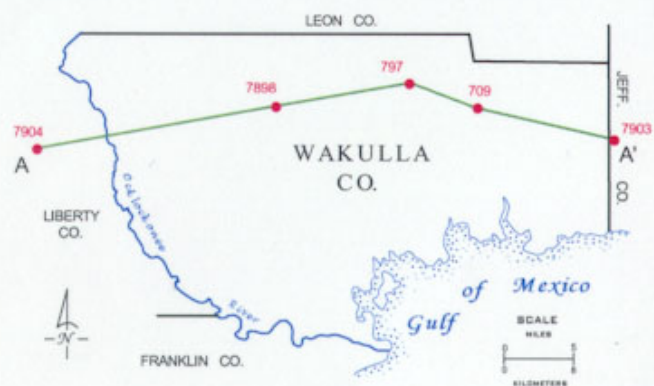
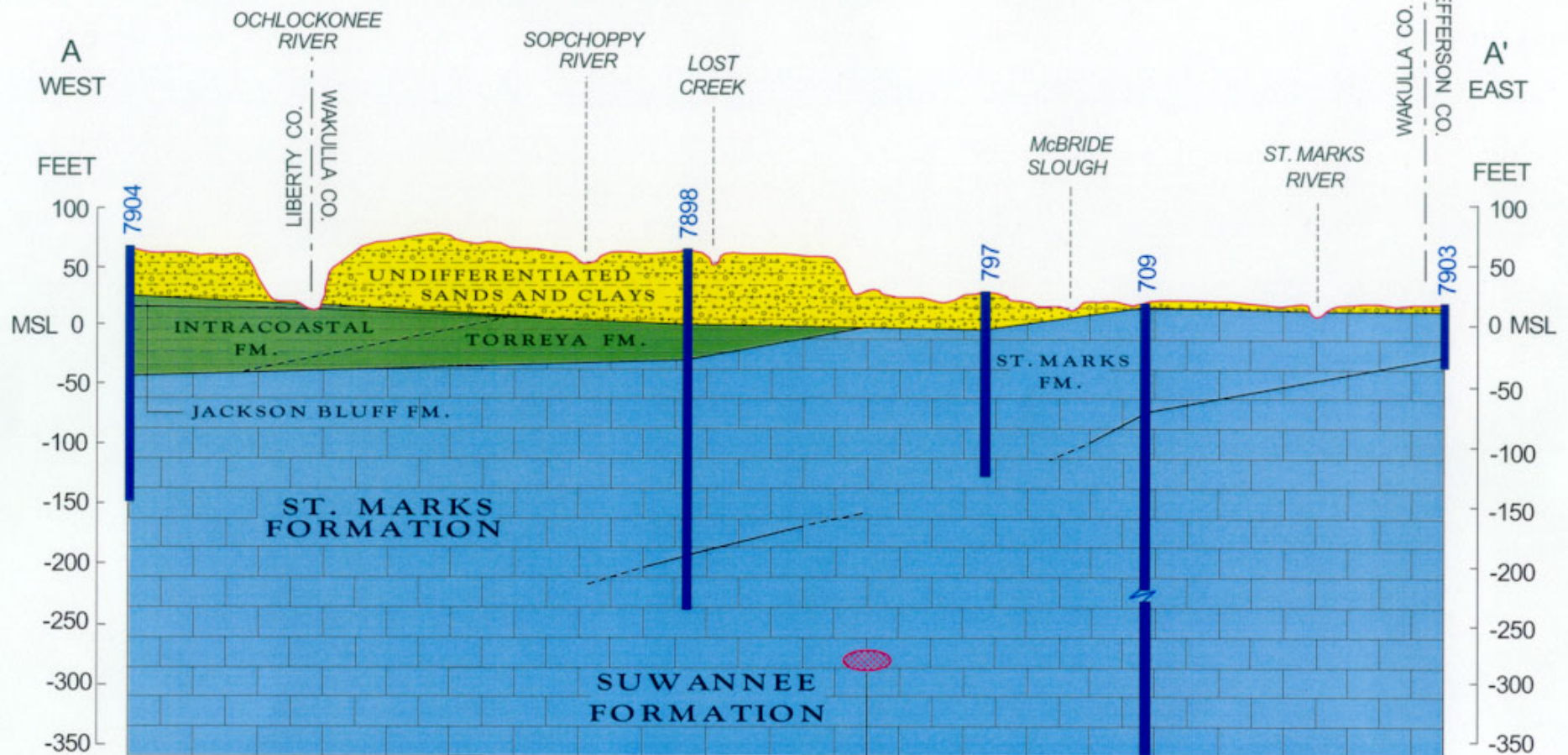


TD-2169'



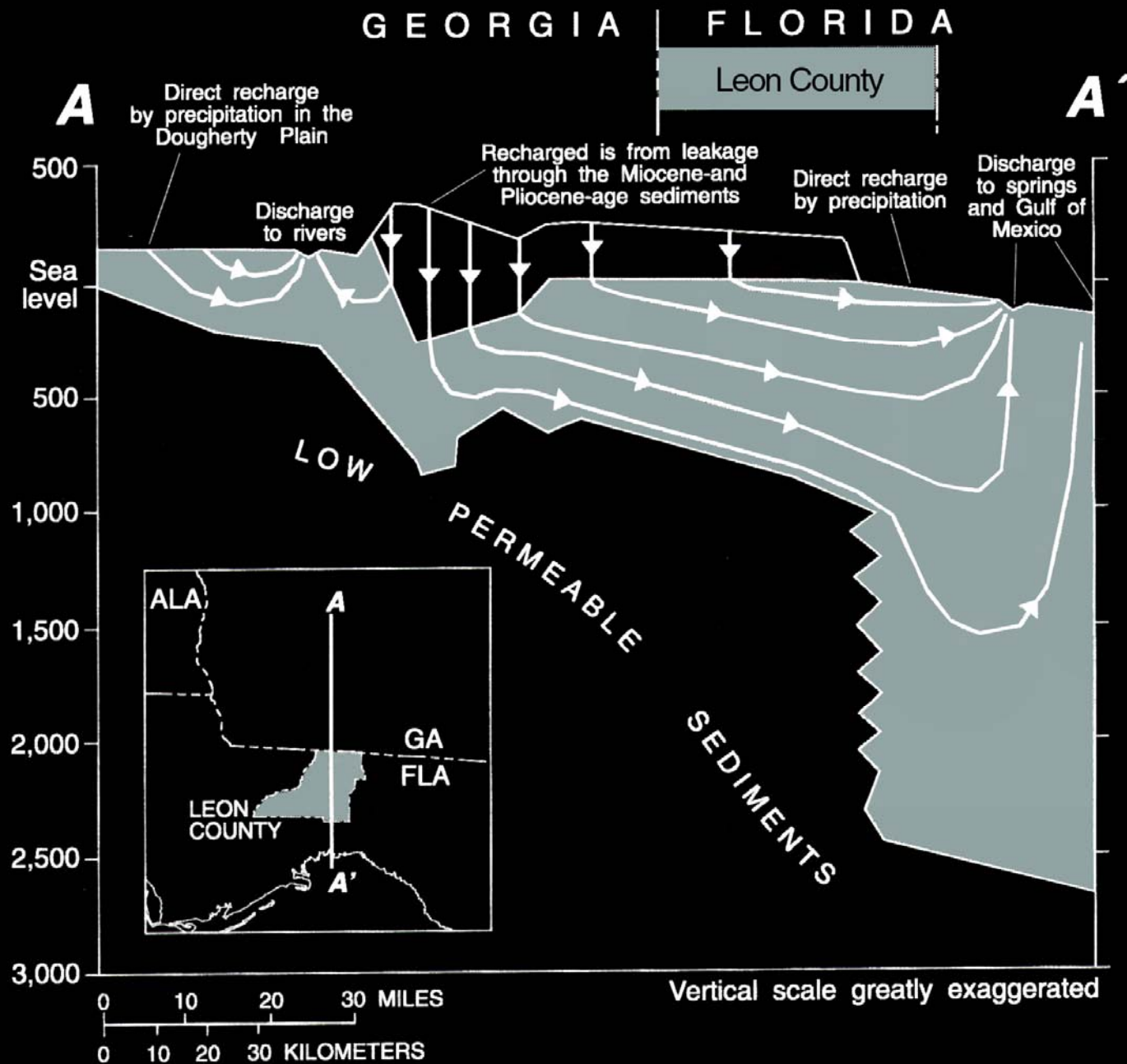
Source : Wakulla County - After Rupert and Spencer, Bulletin 60, Florida Geological Survey, 1988.
Leon County - After Hendry and Sproul, Bulletin 47, Florida Geological Survey, 1966.

GEOLOGIC CROSS-SECTION A-A' IN WAKULLA COUNTY

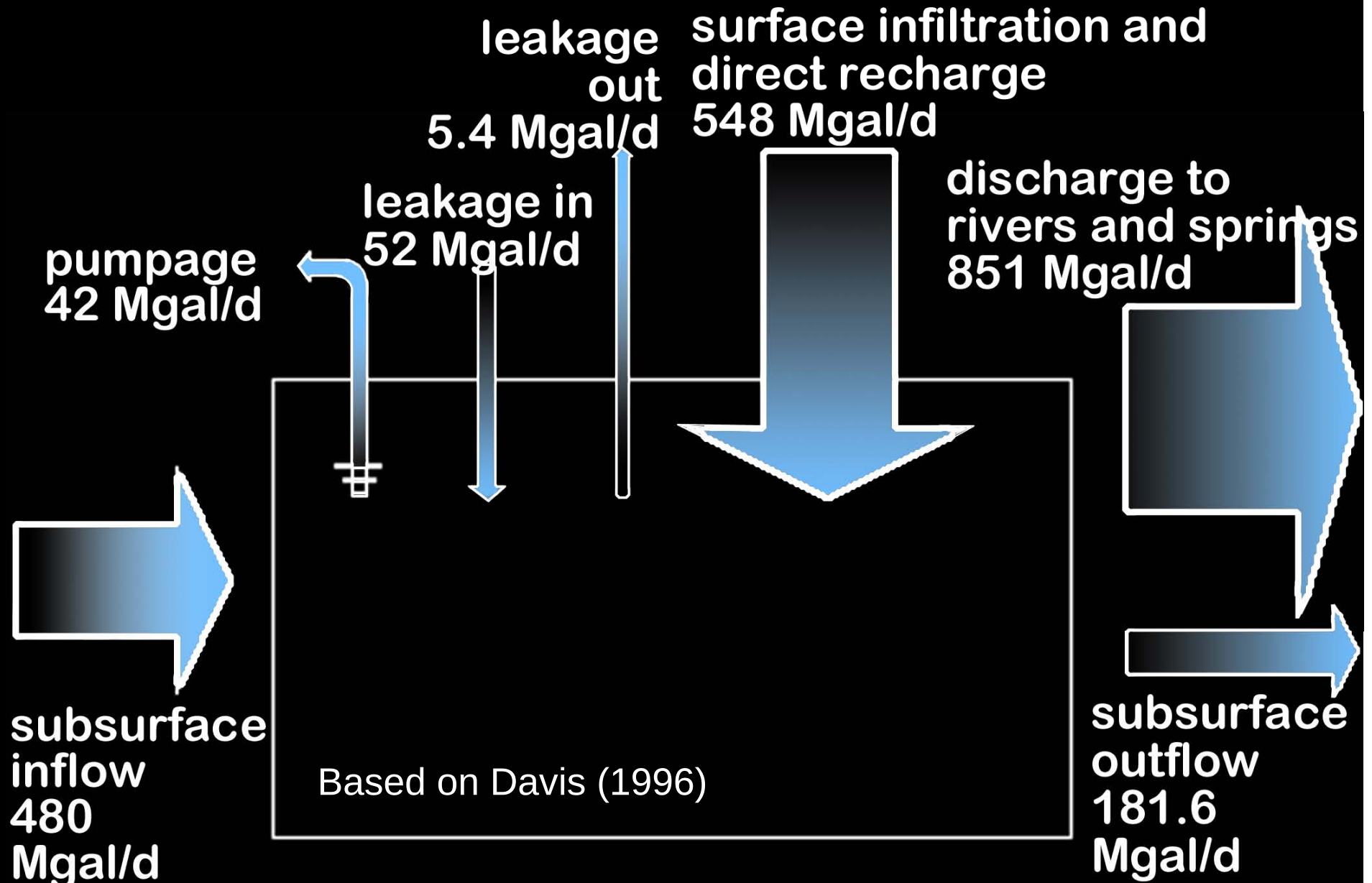


T.D. = 2169'
AVERAGE TRAVERSED CAVE DEPTH
IN THE WAKULLA SPRINGS CAVE SYSTEM

Source : After Rupert and Spencer, Bulletin 60,
Florida Geological Survey, 1988.



Region VII Water Budget

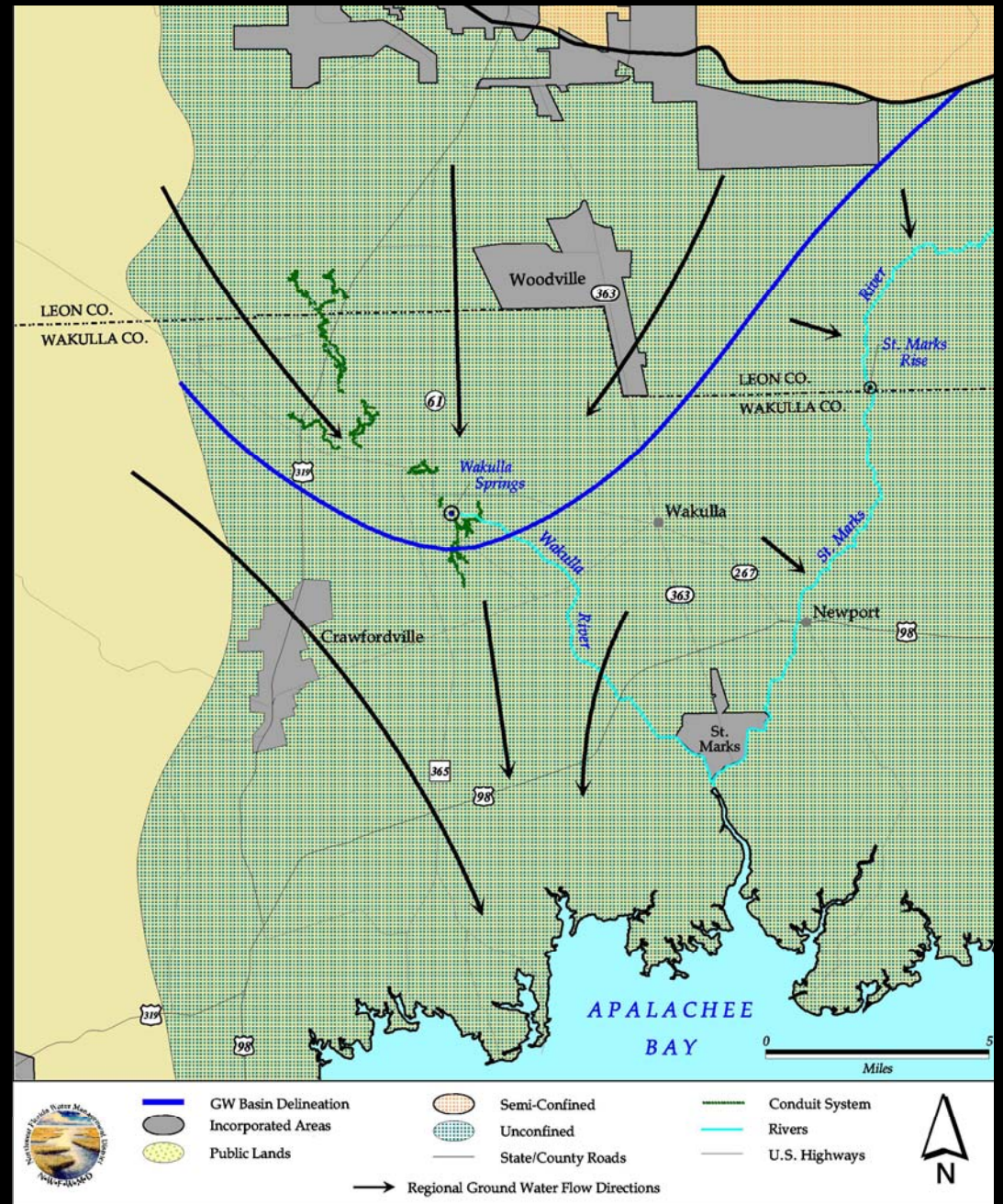


Southern Leon and Wakulla Counties

March 2000



Ground Water Flow Directions



Plausible Model of Wakulla Springs GW/SW Mixing

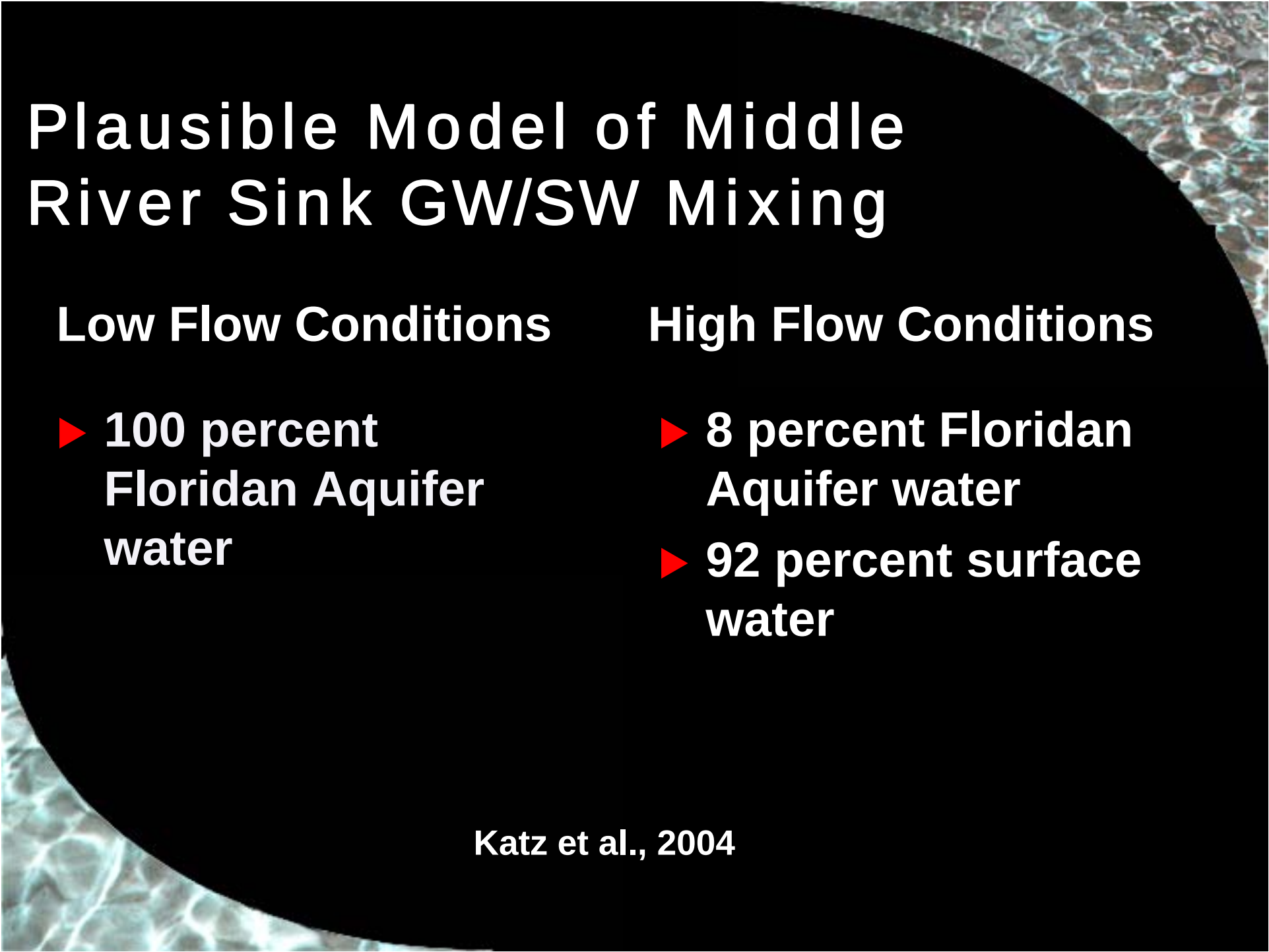
Low Flow Conditions

- ▶ 100 percent Floridan Aquifer water

High Flow Conditions

- ▶ 84 percent Floridan Aquifer water
- ▶ 16 percent surface water

Katz et al., 2004



Plausible Model of Middle River Sink GW/SW Mixing

Low Flow Conditions

- ▶ 100 percent Floridan Aquifer water

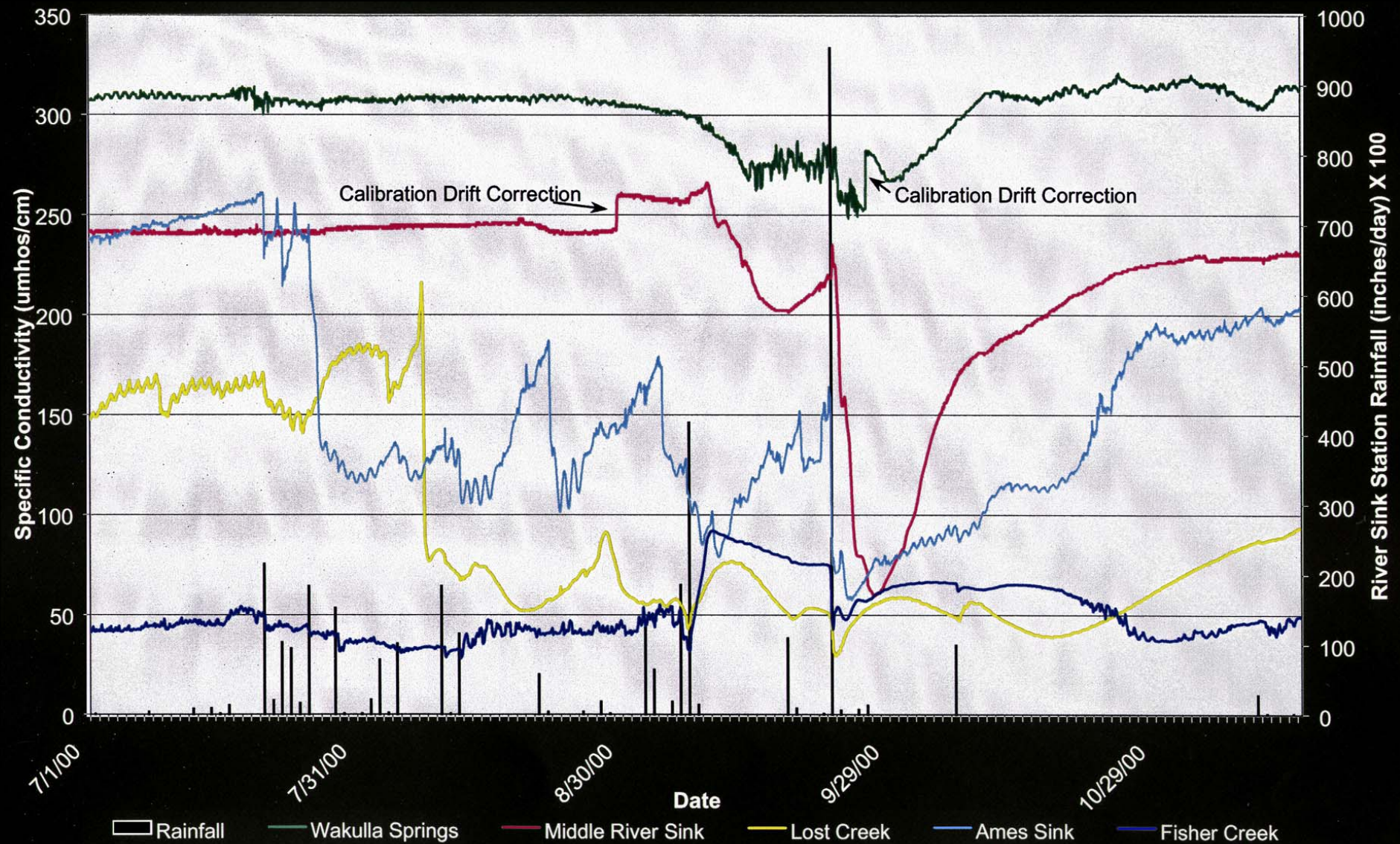
High Flow Conditions

- ▶ 8 percent Floridan Aquifer water
- ▶ 92 percent surface water

Katz et al., 2004

Specific Conductivity and Rainfall versus Time Prior to and Following Tropical Storm Helene

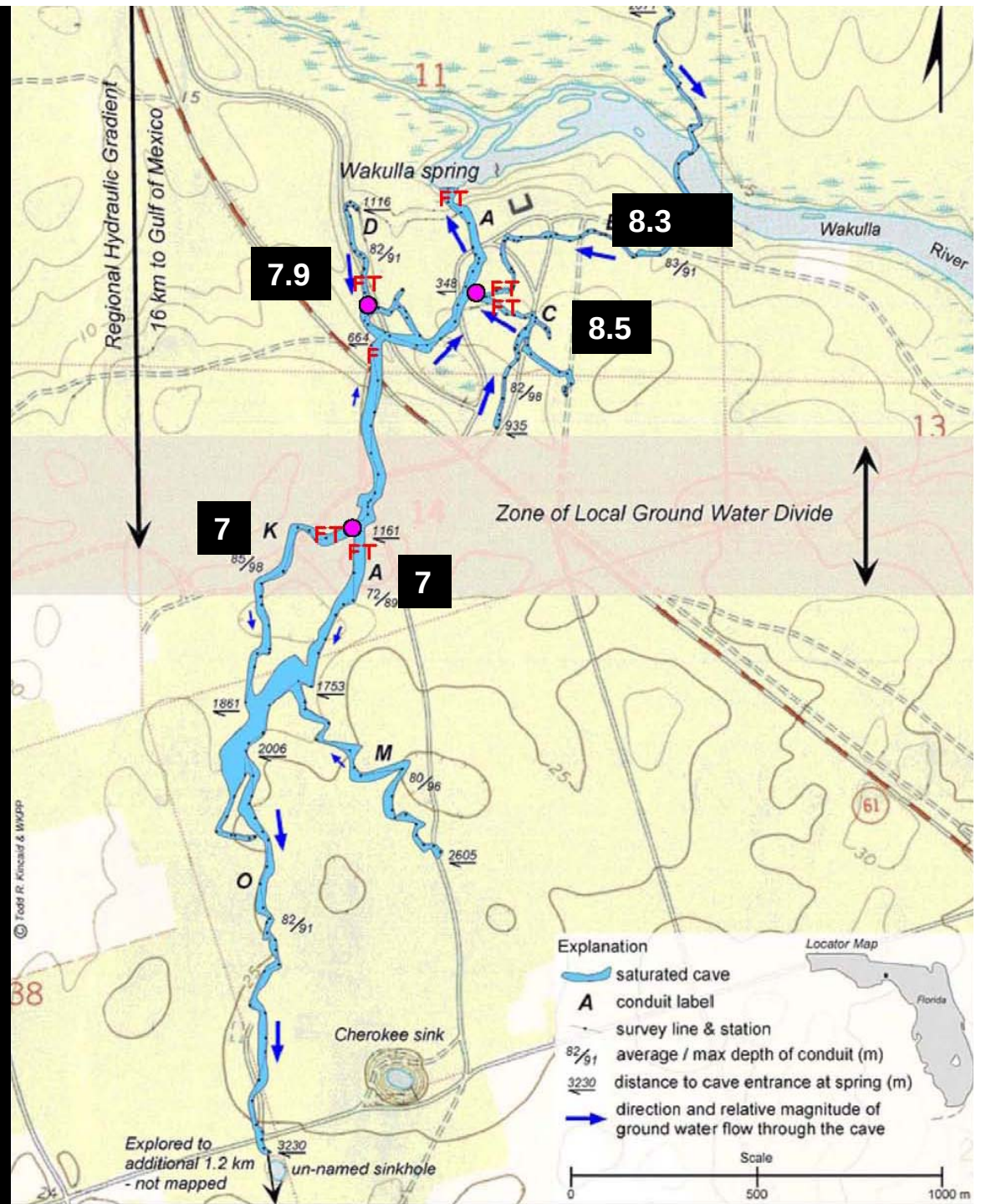
July - November, 2000



Chloride (mg/L)

Sampled 02/26/2004

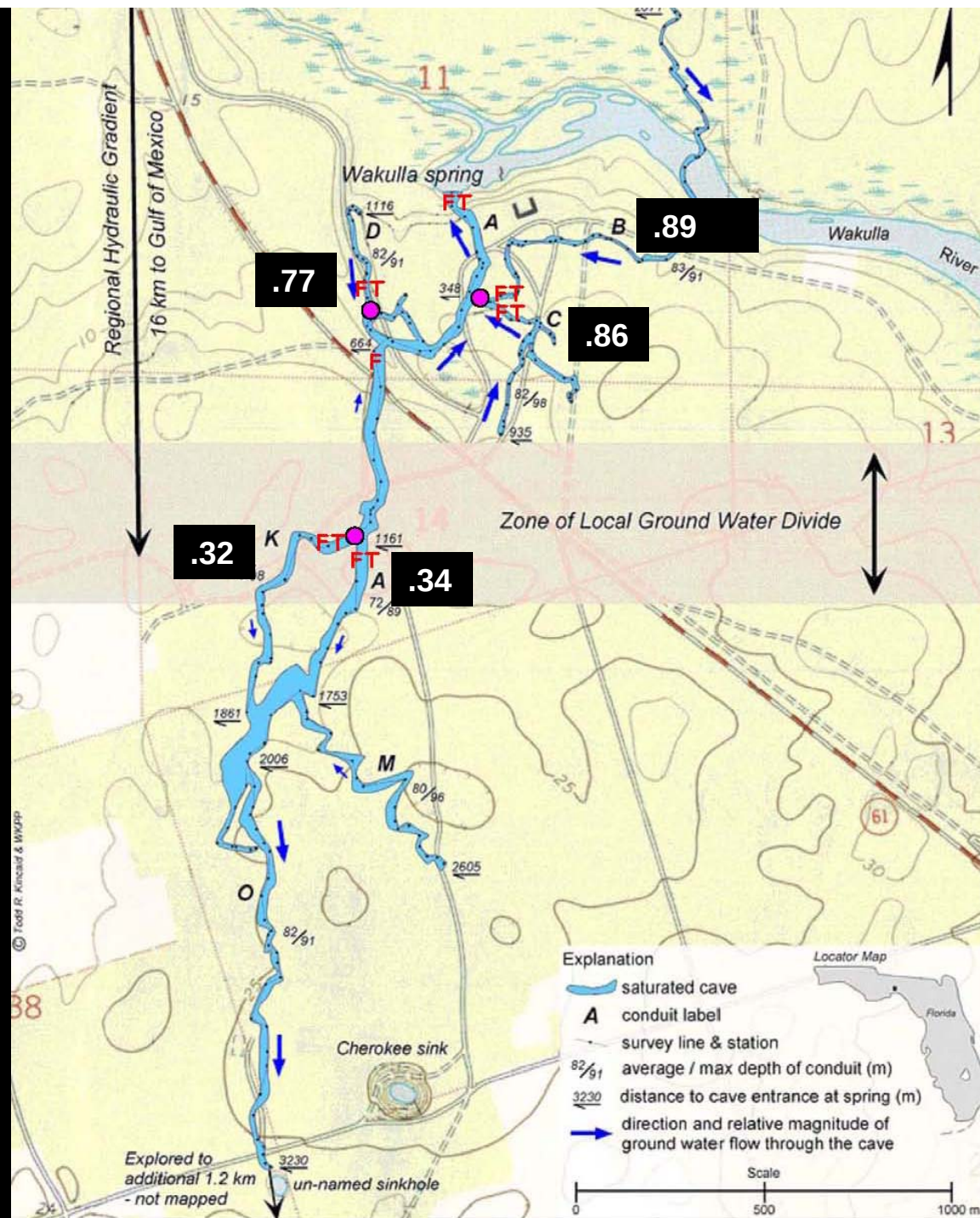
Base per Hazlett-Kincaid, Inc.



Nitrate +Nitrite (mg/L-N)

Sampled 02/26/2004

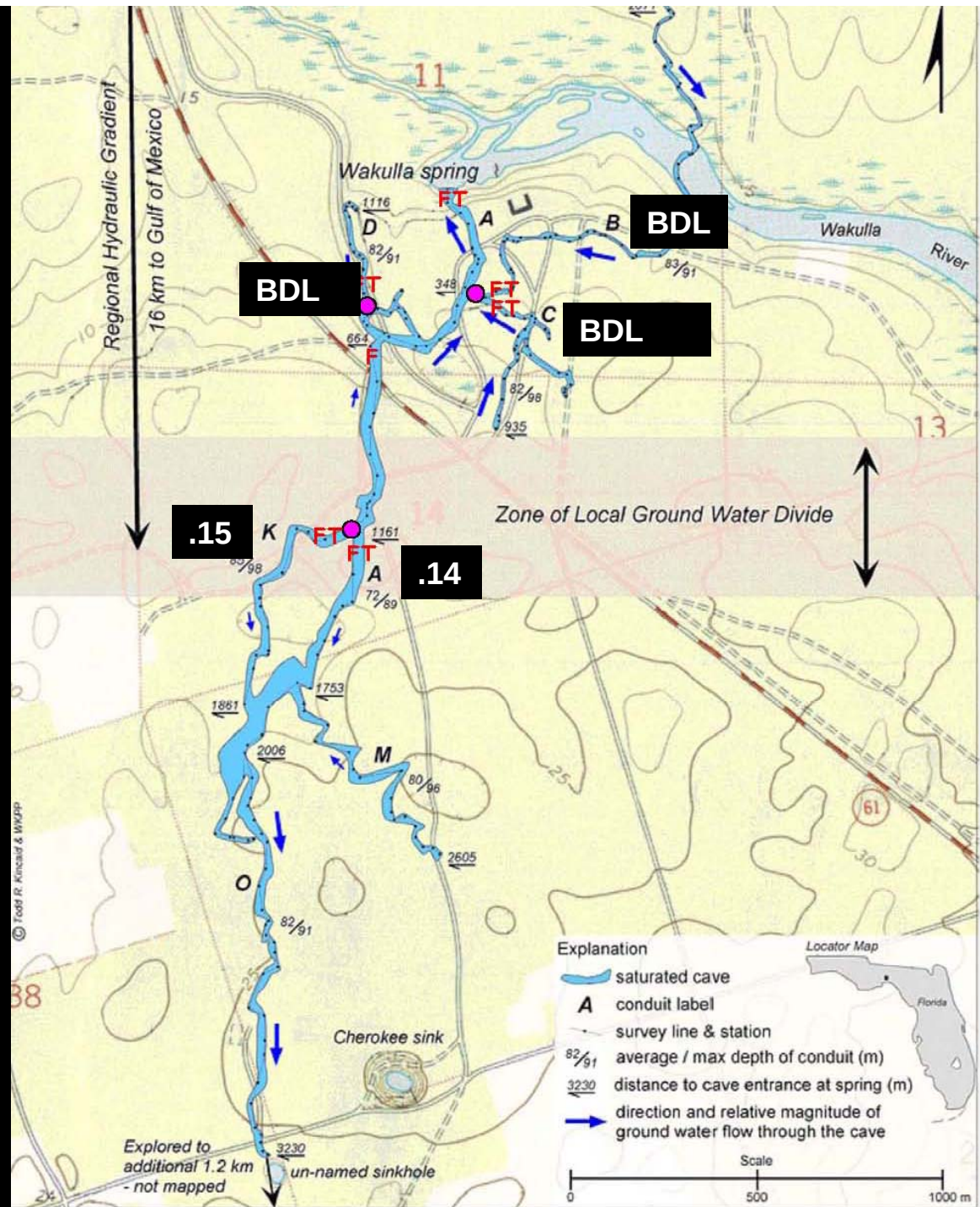
Base per Hazlett-Kincaid, Inc.



TKN (mg/L-N)

Sampled 02/26/2004

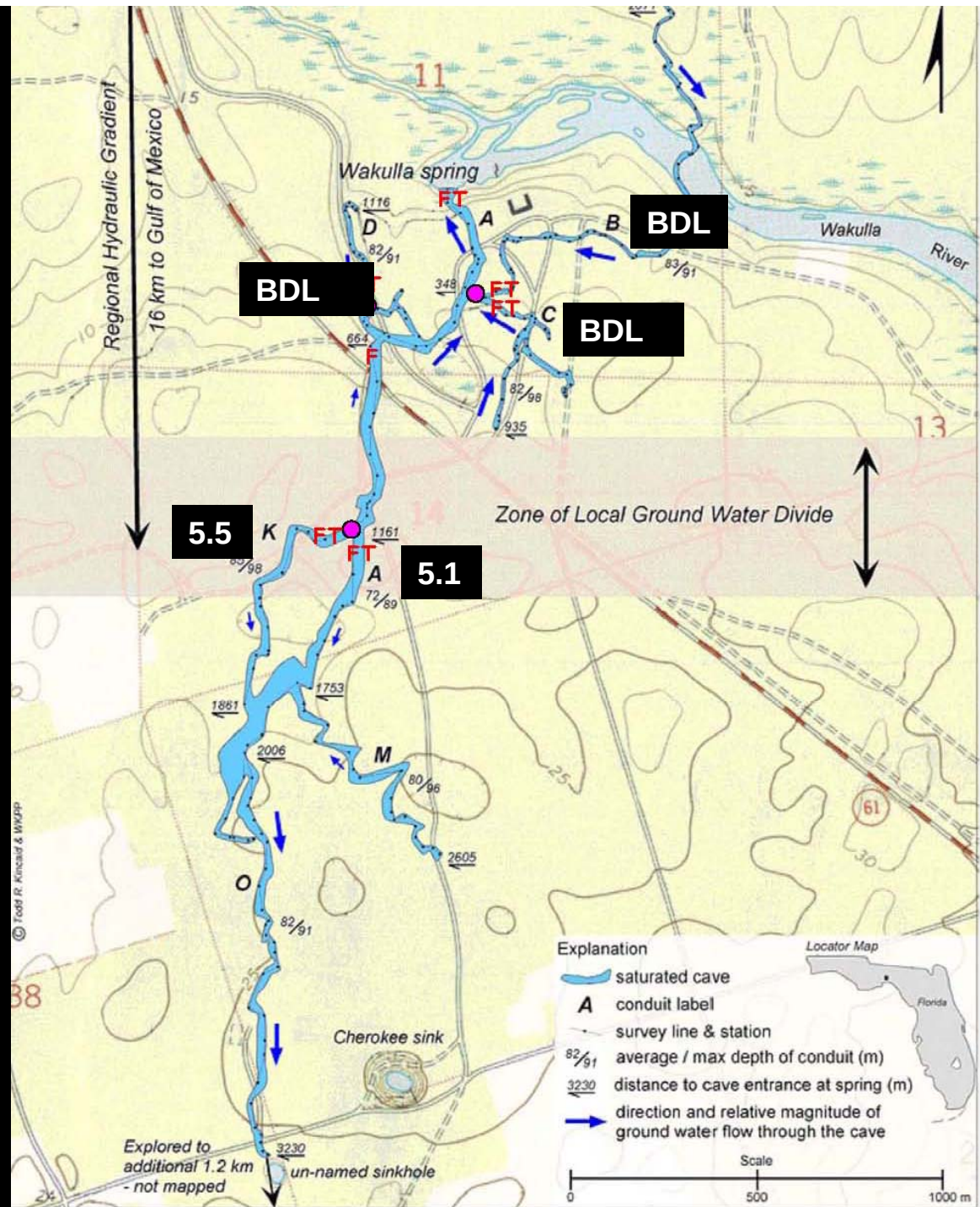
Base per Hazlett-Kincaid, Inc.



TOC (mg/L-C)

Sampled 02/26/2004

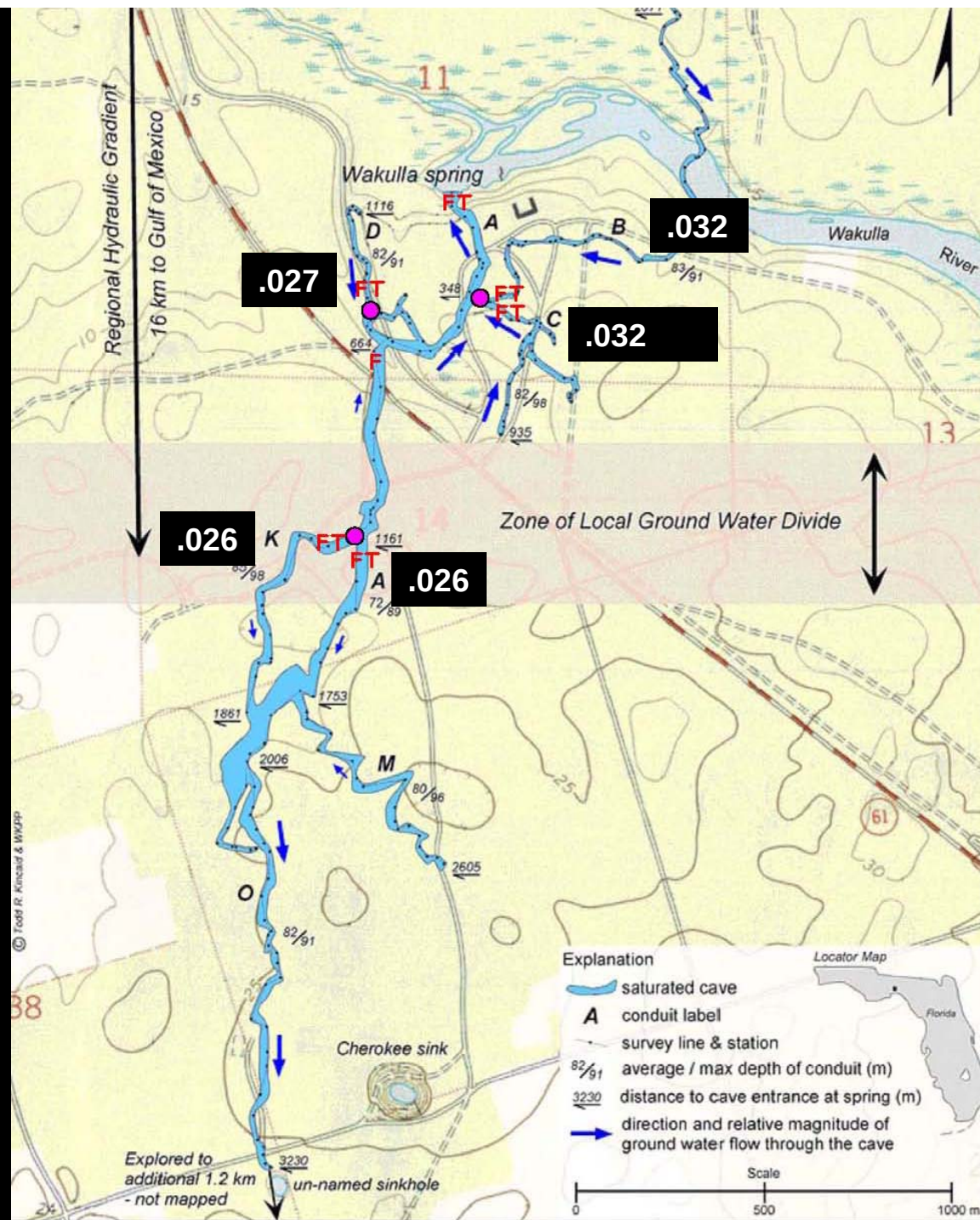
Base per Hazlett-Kincaid, Inc.



Ortho-P (mg/L-P)

Sampled 02/26/2004

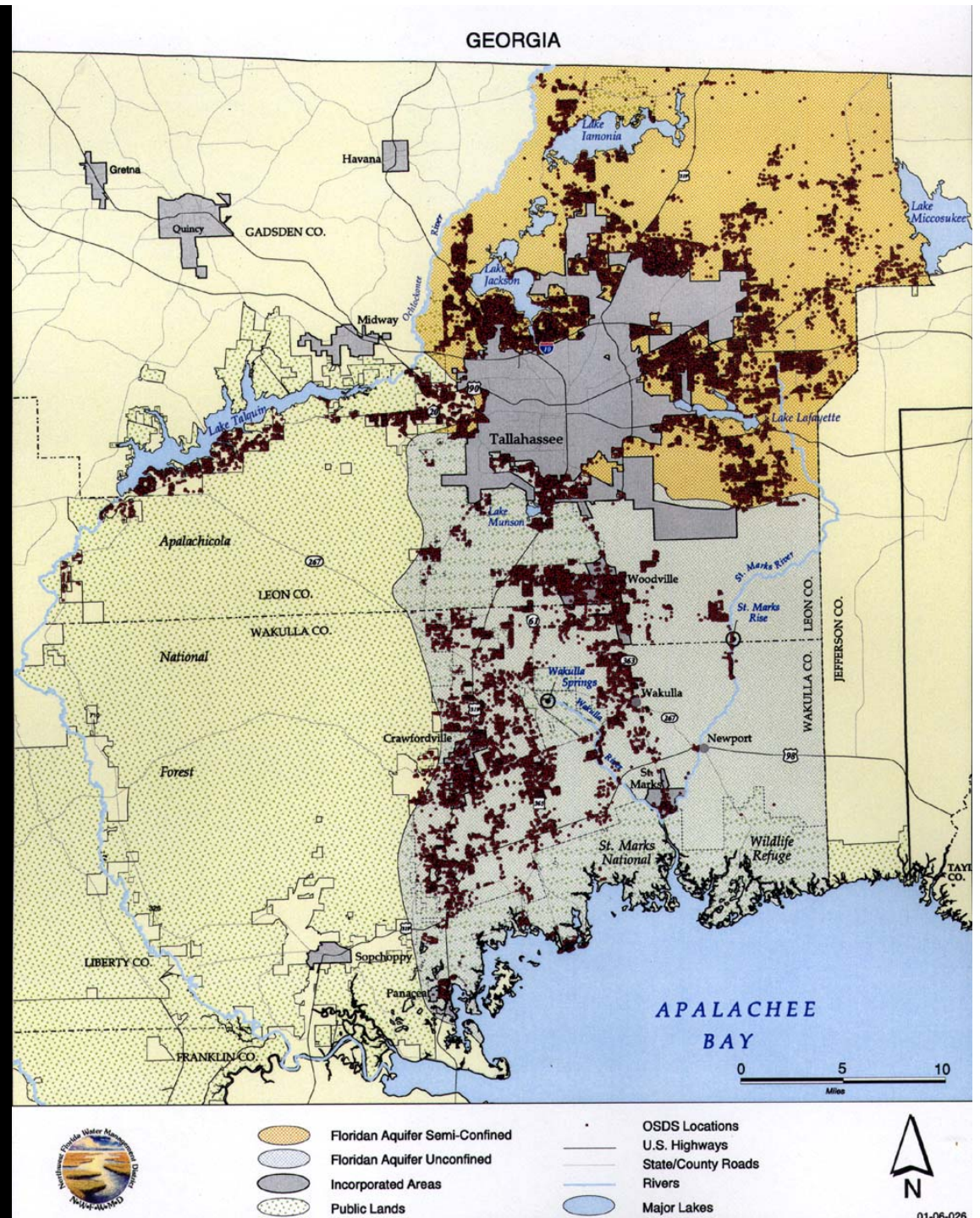
Base per Hazlett-Kincaid, Inc.



Compile Nitrate Loading Data

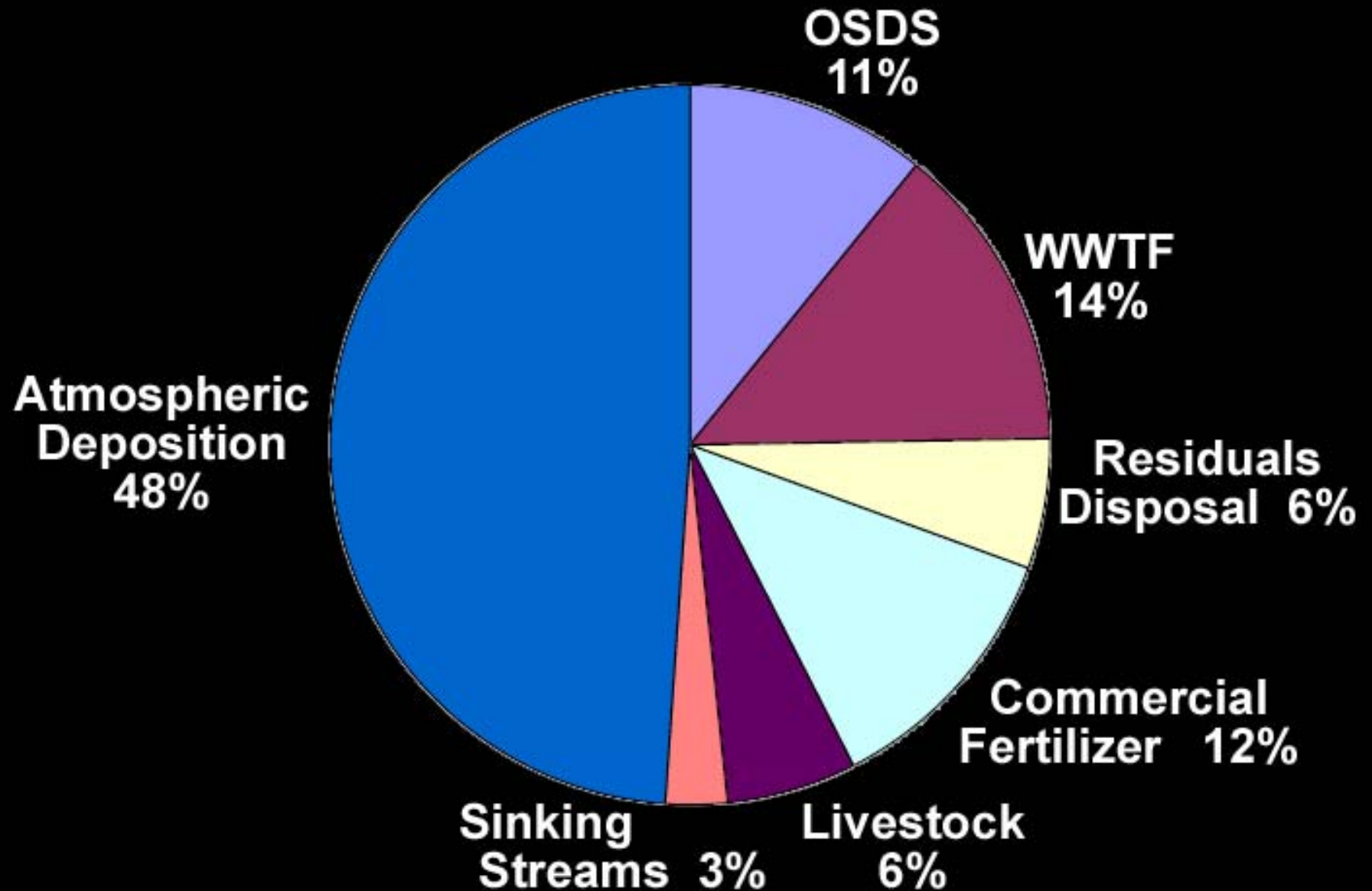
- ▶ Atmospheric Deposition
- ▶ Commercial Fertilizer
- ▶ WWTFs
- ▶ OSDS
- ▶ Livestock
- ▶ Stormwater
- ▶ Landfills

OSDS Locations

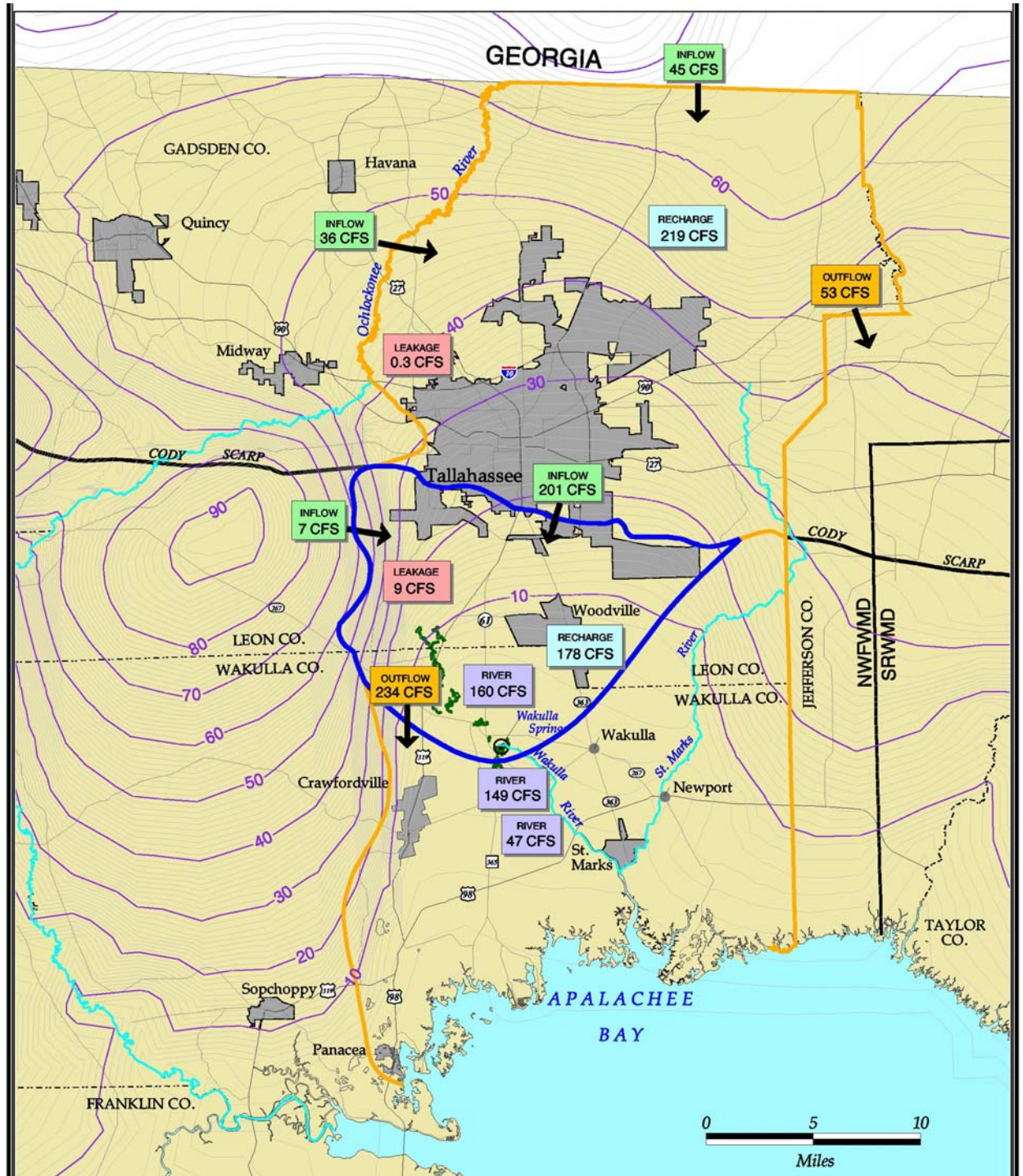


Nitrogen Source Percentages

Leon and Wakulla Counties Combined



Localized Water Budget



Estimated Nitrogen Budget for Aquifer Volume around Wakulla Springs

- Outflow from Wakulla Springs: ~270,000 kg-N/yr.
- Inflow from semi-confined Leon County: ~73,000 kg-N/yr.
- Remainder (~197,000 kg-N/yr) originating in the near vicinity of Wakulla Springs.

Ten-year Average Nitrogen Loadings in Near Vicinity of Wakulla Springs

• WWTF effluent.....	~	360,000 kg-N/yr
• Atmospheric deposition ...	~	232,000 kg-N/yr
• WWTF residuals.....	~	130,000 kg-N/yr
• Commercial fertilizer	~	60,000 kg-N/yr
• OSDS	~	56,000 kg-N/yr
• Sinking streams	~	33,000 kg-N/yr
• Livestock	~	14,000 kg-N/yr
• Total	~	885,000 kg-N/yr

