

USGS-SWFWMD Cooperative Funding Study



Streamflow Losses through Karst Features in the Upper Peace River Hydrologic Area, Polk County, Florida, May 2002 to May 2003

Introduction

In October 2001, the U.S. Geological Survey (USGS) in cooperation with the Southwest Florida Water Management District (SWFWMD) began a study to evaluate the distribution, timing, and volume of surface-water to ground-water exchange in the Upper Peace River Hydrologic Area in Polk County, Florida (fig. 1). Historically, ground-water levels in

this area were above surface-water levels (gaining stream), wells and second-order magnitude springs flowed, and tributaries drained the surrounding highlands (scarp) (Stewart, 1960). Strip-mining of phosphate ore (1) altered the landscape, (2) changed the natural surface-water drainage patterns, and (3) changed the ground-water flow patterns by removing the upper 50 ft (feet) of sediments and lowering the potentiometric surface of the aquifers. Today, this area of the Peace River appears to be a losing stream. Streamflow losses are predominantly through karst features found in the low-water channel and the flood plain.

Karst Features

Locations, surface orientations, and dimensions of prominent karst features were measured in mid-May 2002 when reaches of the river were dry. Examples of features are shown in the photographs. Pricano fracture (fig. 2) is a coalescing group of vertical pipes; Midway sink (fig. 3) is a collapsing sinkhole with small fractures near the base; Dover sink (fig. 4) at the base of the outcrop is located at the end of a 200-ft-long distributary in the flood plain; and the crevasse (fig. 5) includes multiple



Figure 1. Upper Peace River Hydrologic Area, Polk County, Florida.



Figure 2. Pricano fracture.



Figure 3. Midway sink.



Figure 4. Dover sink.



Figure 5. The crevasse.

Effect of Karst Development On Peace River Flow



- ❑ **USGS study started in 2002 and will end in 2008.**
- ❑ **Cooperatively-funded program through the Governing Board, Peace River Basin Board, Alafia River Basin Board, and Manasota Basin Board.**
- ❑ **Total project cost: \$962,000 split equally with the USGS.**

Effect of Karst Development on Peace River Flow

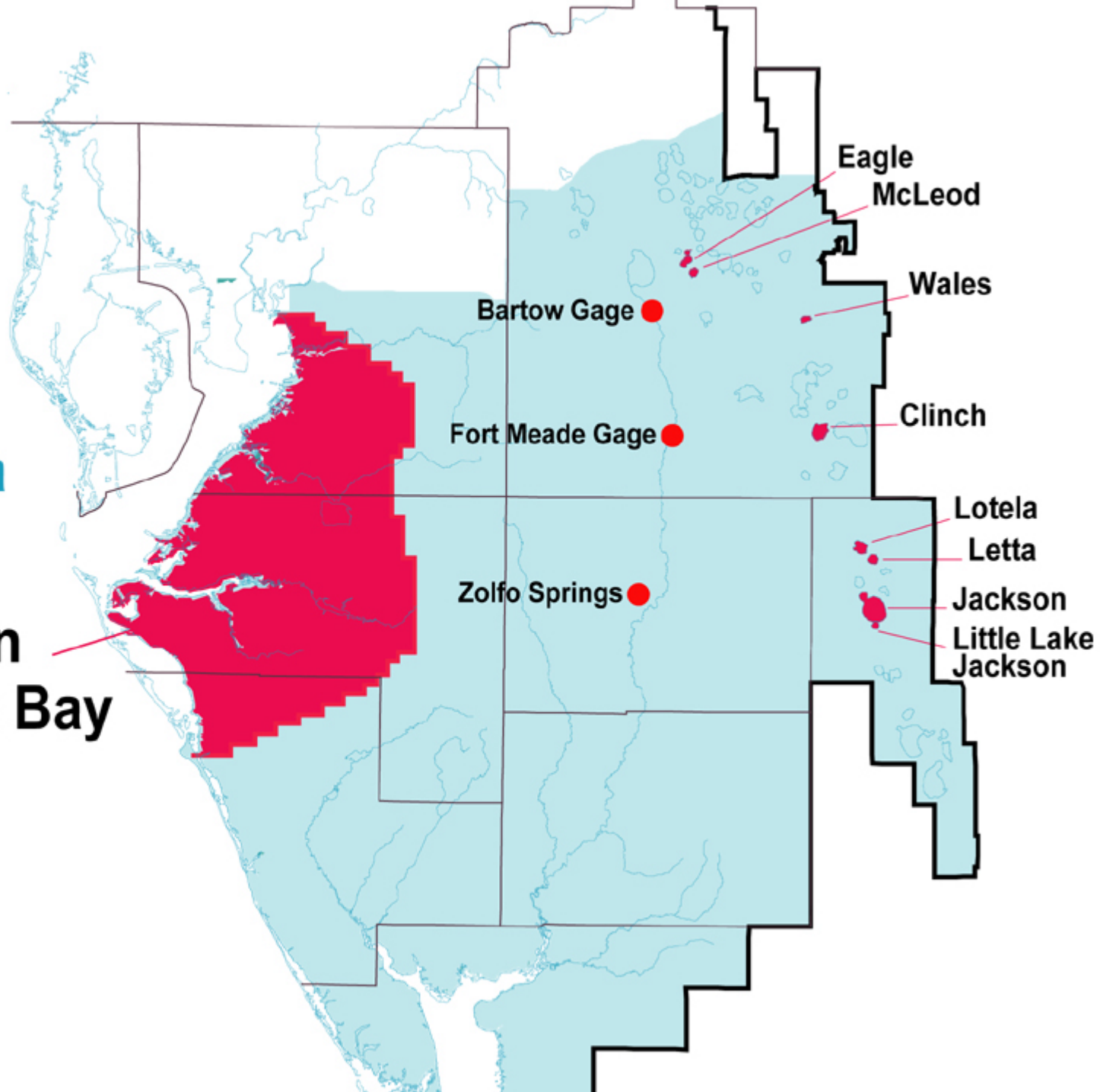
Purpose

To understand the extent, timing, and magnitude of Peace River flow loss through karst features to the underlying aquifers.

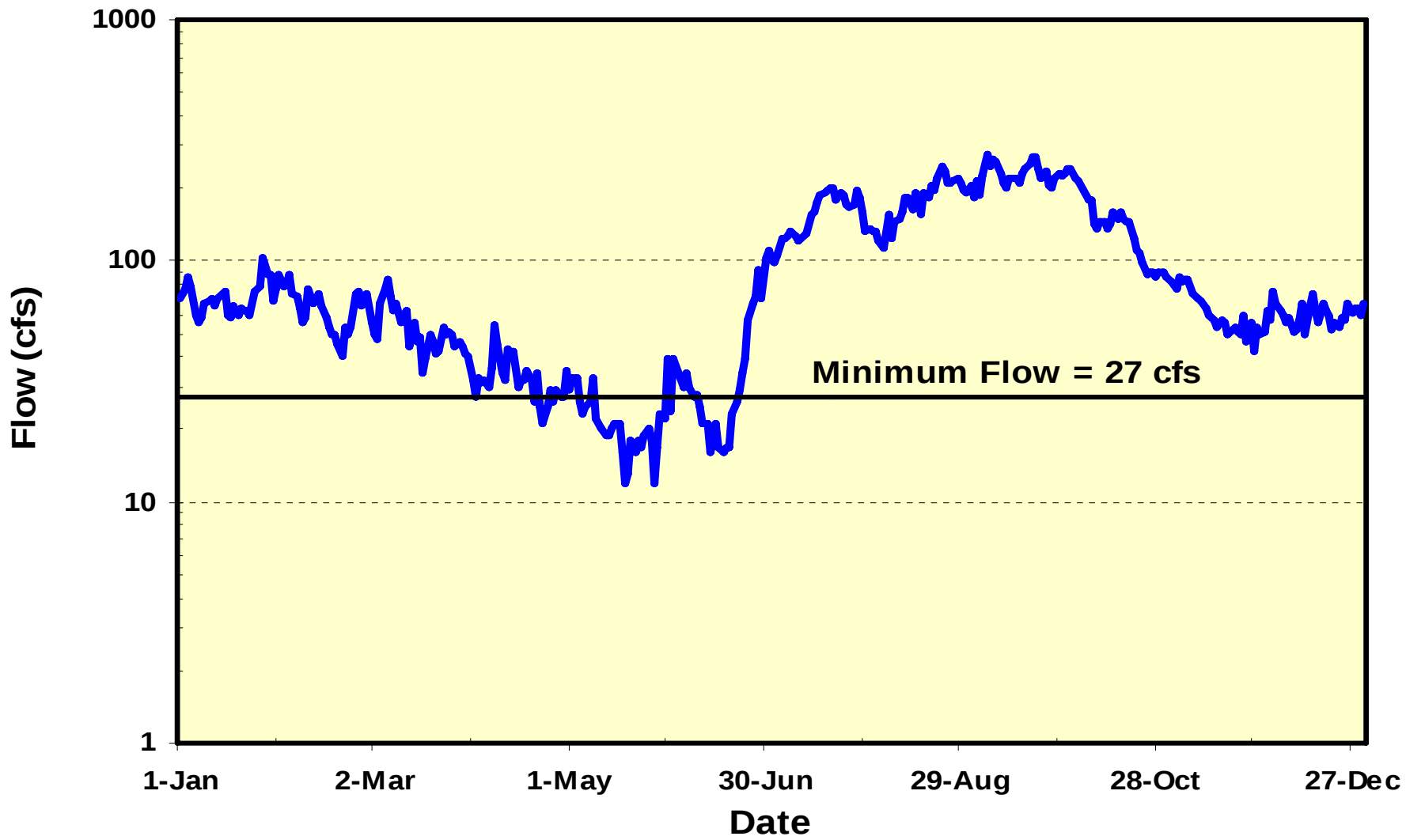
This process is the first step toward developing water resource development projects that will eventually augment low stream flow along the upper reach of the river.

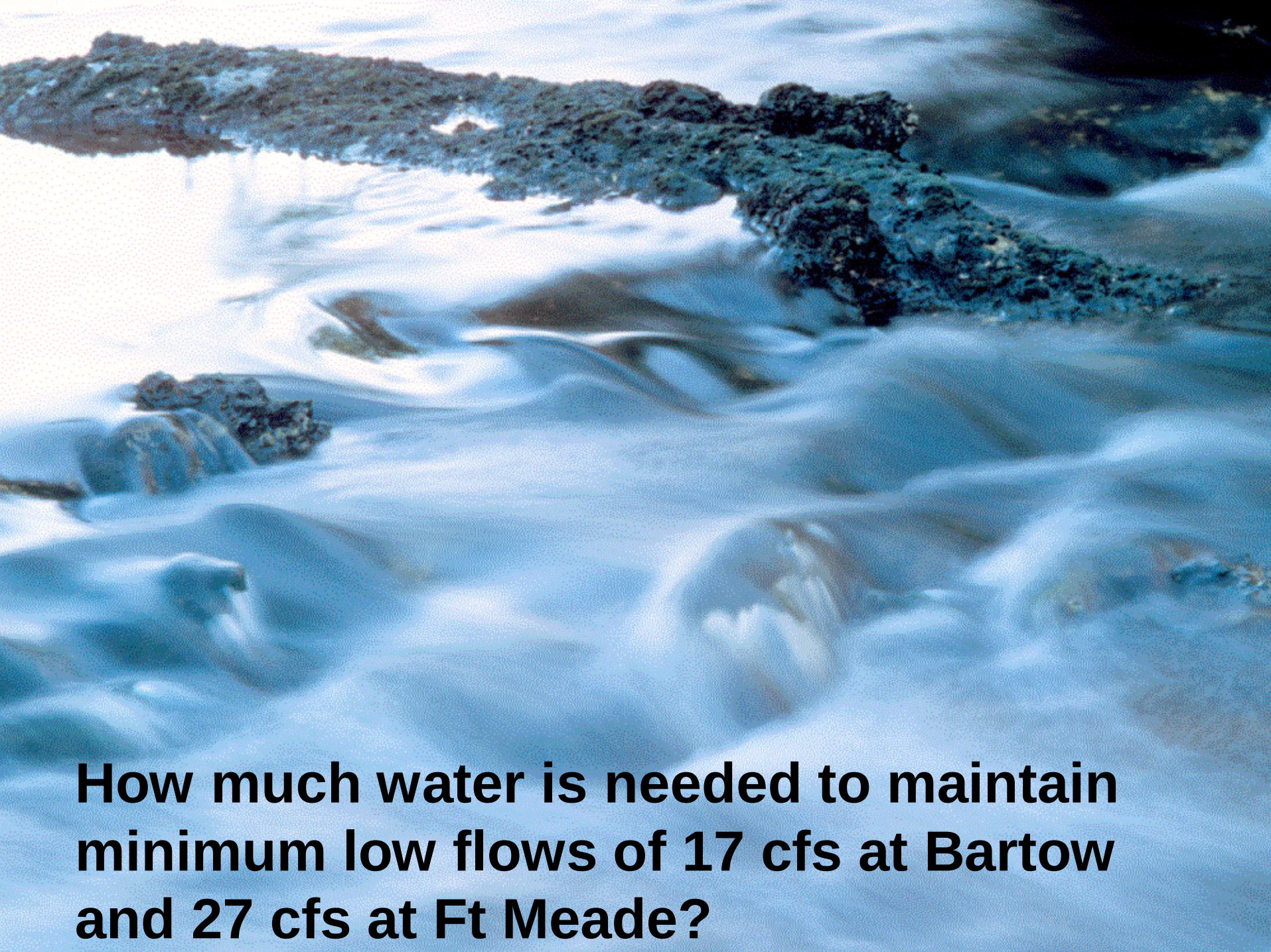
Southern Water Use Caution Area

Eastern
Tampa Bay
MIA



Median Daily Flow at Ft Meade (1975-2003)





How much water is needed to maintain minimum low flows of 17 cfs at Bartow and 27 cfs at Ft Meade?

USGS-SWFWMD Cooperative Study

- ❑ Locate and map karst features
- ❑ Determine river seepage to the ground-water system
- ❑ Better define the hydraulic connection between the river and underlying aquifers

Project Location

Bartow

Kissengen Spring

Homeland

Ft. Meade

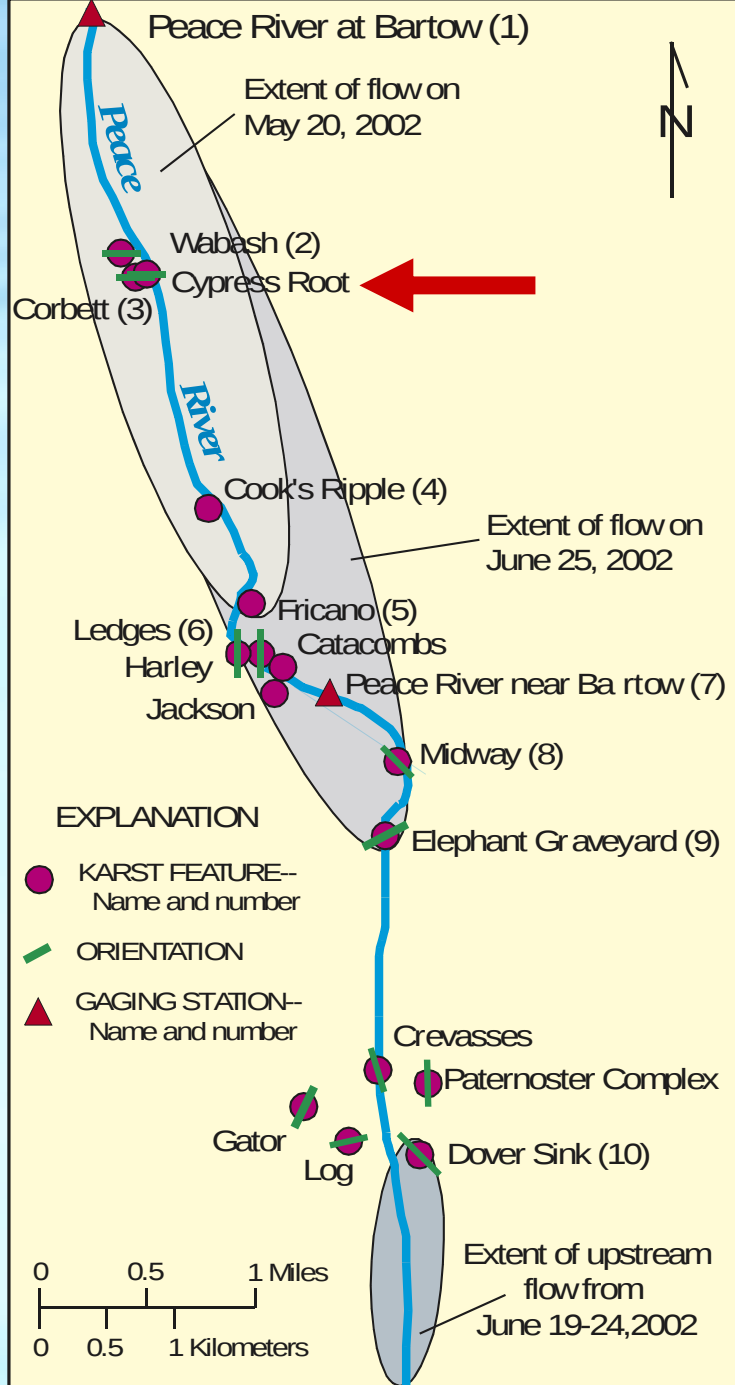
- Flow Station
- Sinkholes or subsidence features by Patton (1981)



0 2
scale in miles

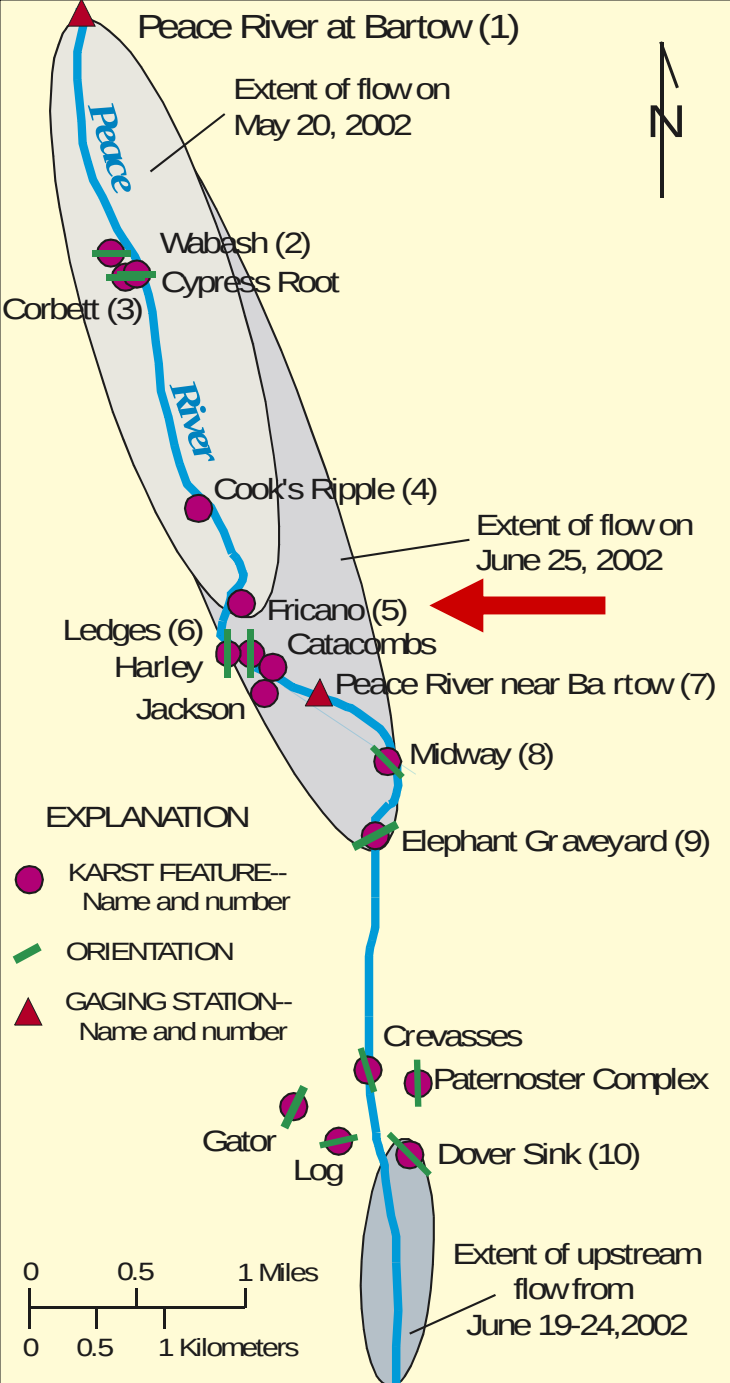
Major Elements of the USGS Project

- ❑ Installation of two new stream flow measuring stations between Bartow and Homeland
- ❑ Semi-annual seepage measurements along a 13-mi section of river
- ❑ Data collection and long-term monitoring from installation of wells at three sites
- ❑ Summarizing the results through an interim and final report



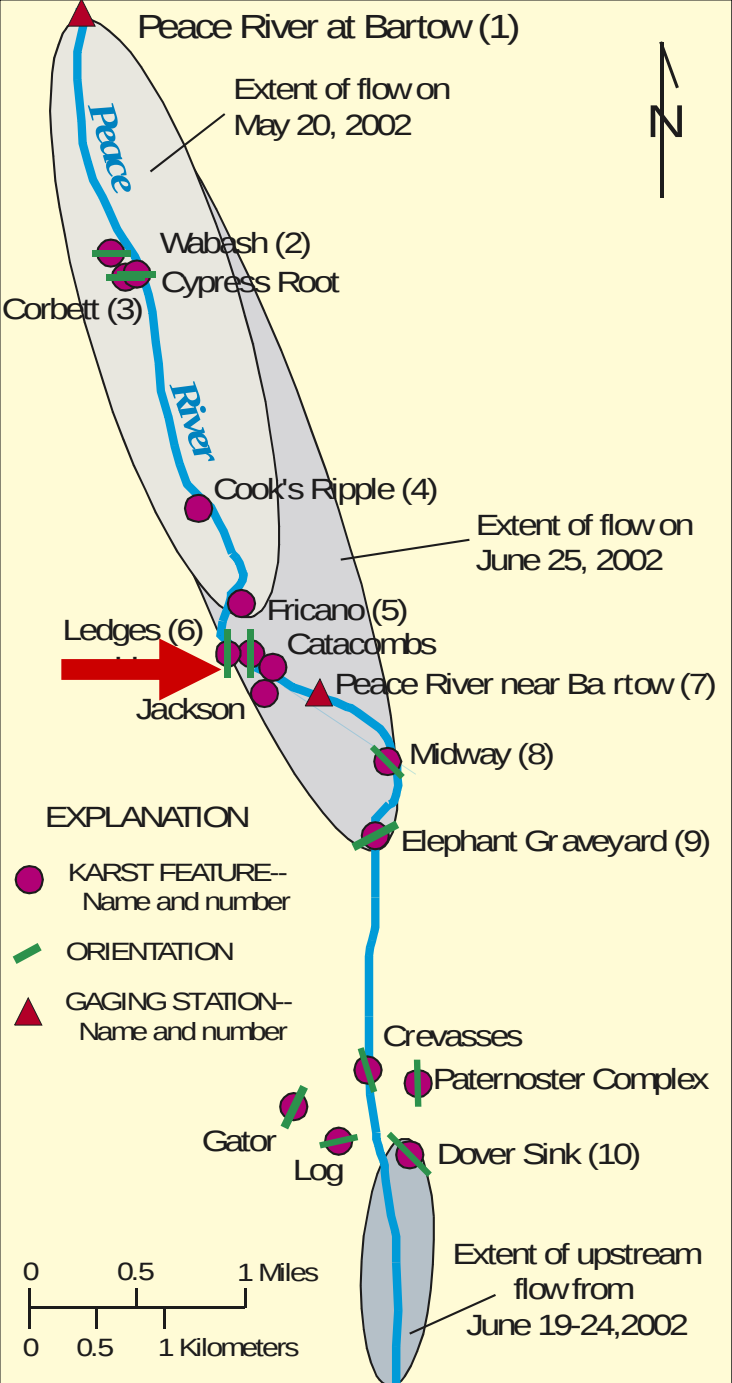
Cypress Root





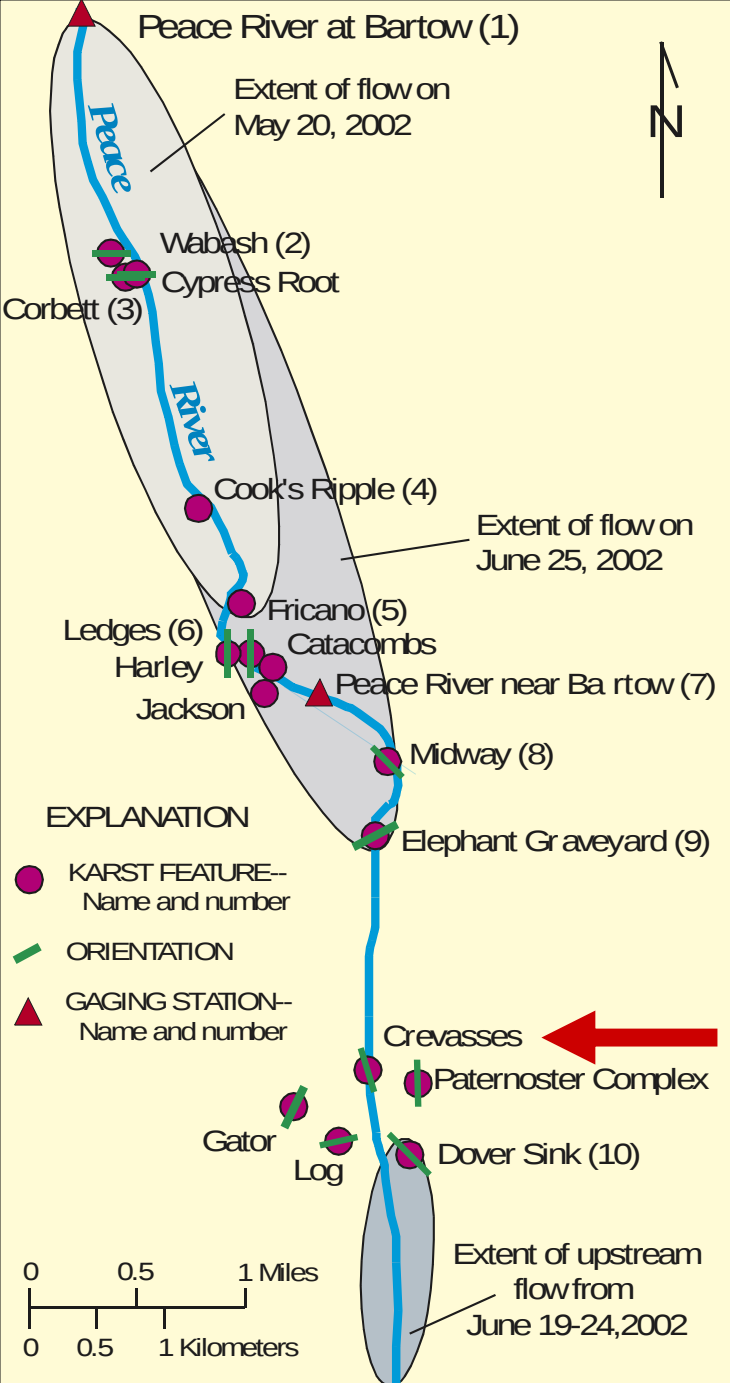
Fricano





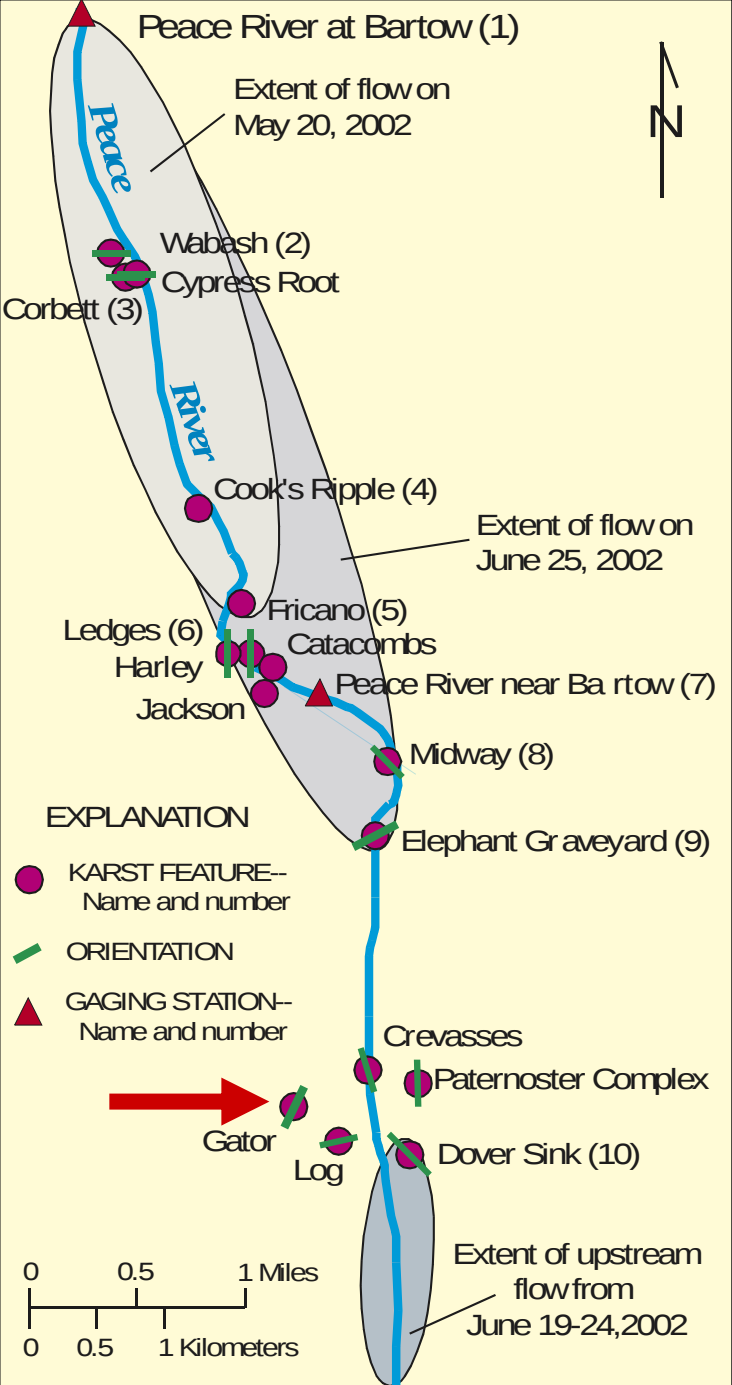
The Ledges





Crevasses





Gator Sink



Peace River @ Bartow

Drilling Sites

Site 1

Site 2

Site 3

Site 4



miles

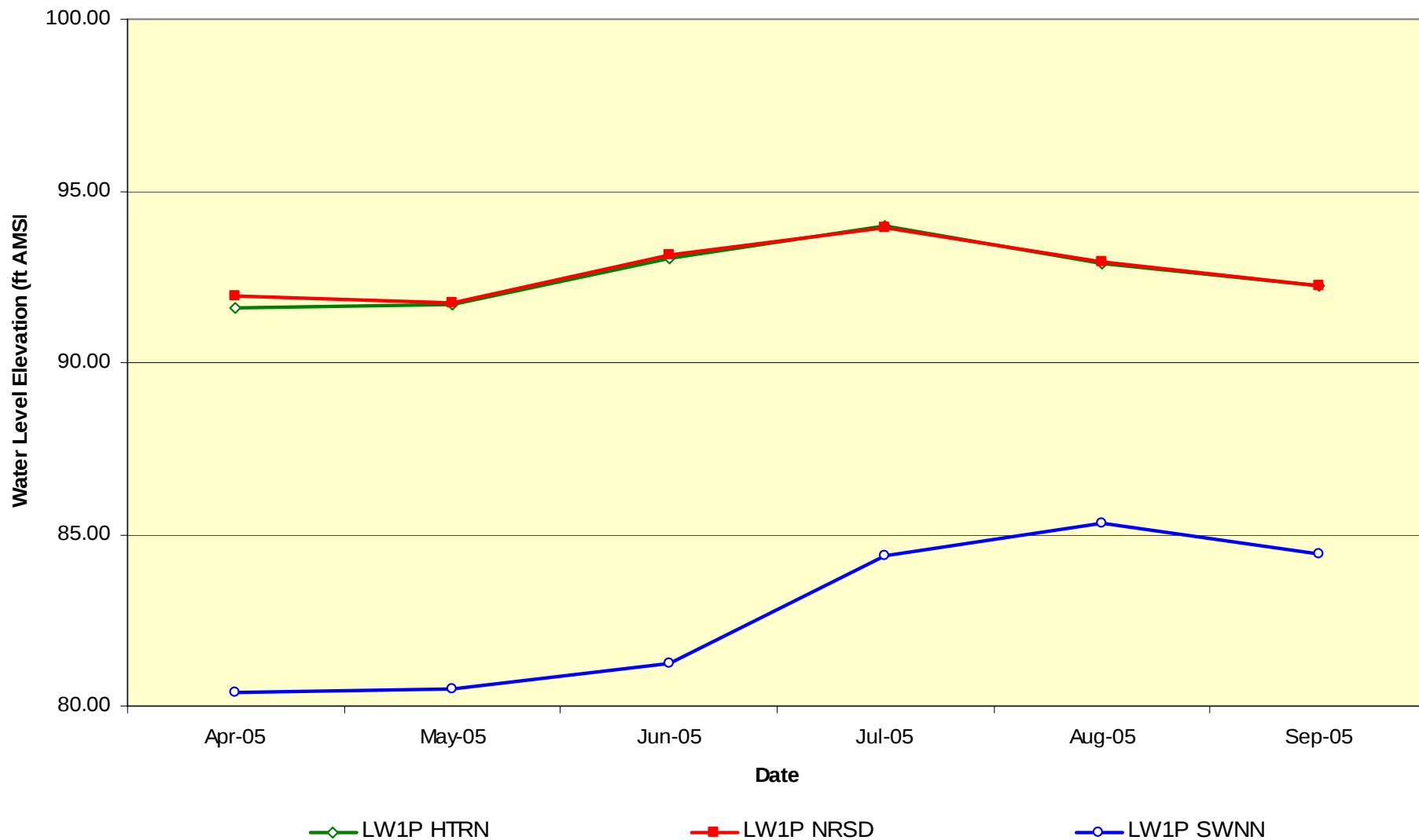


Peace River @ Homeland

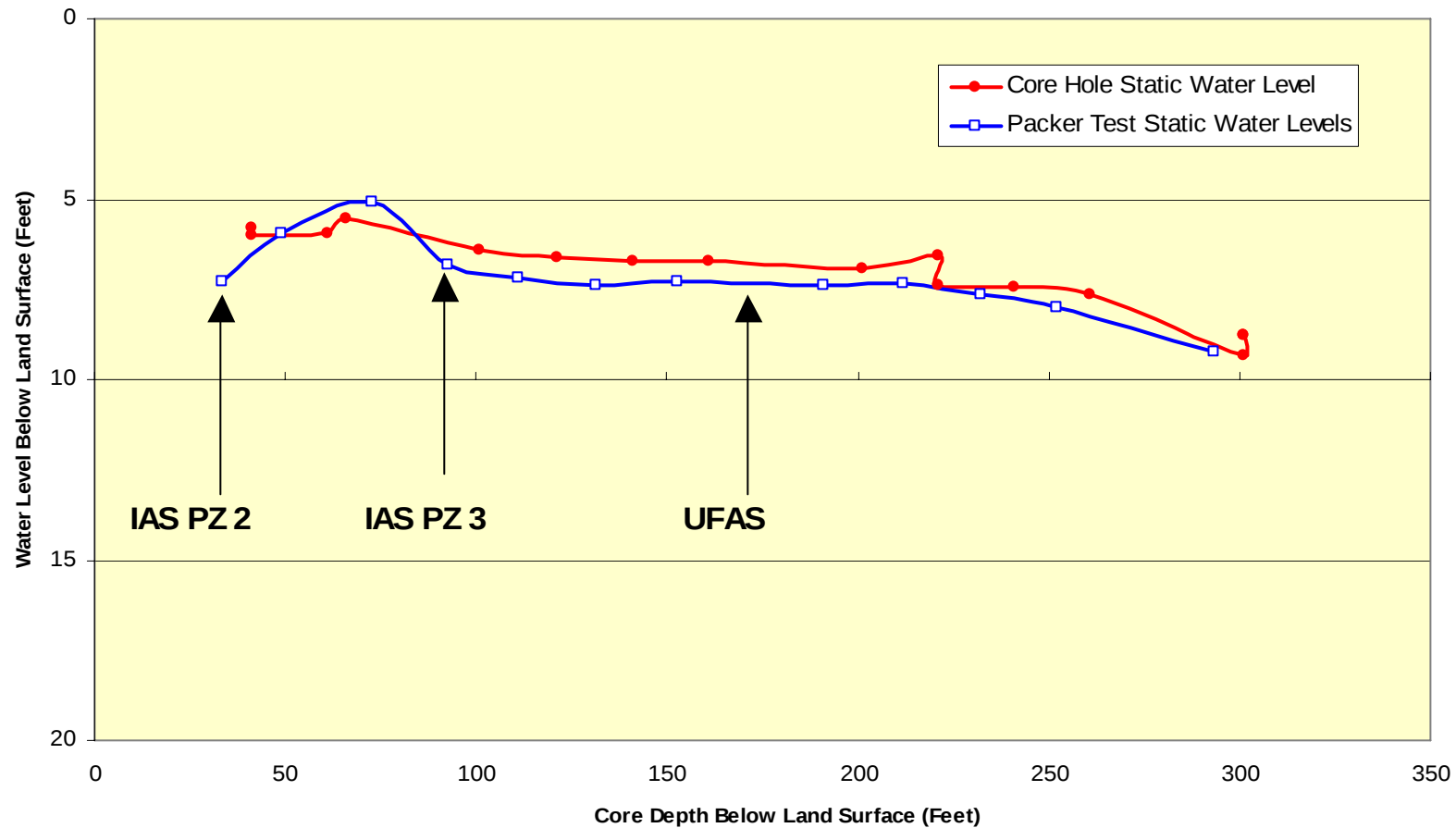
Site 1 Core Samples



LW1P Water Level Elevations for the POR



**LW3P Dragline Crossing Wire- Line Coring Water Level
August-September**



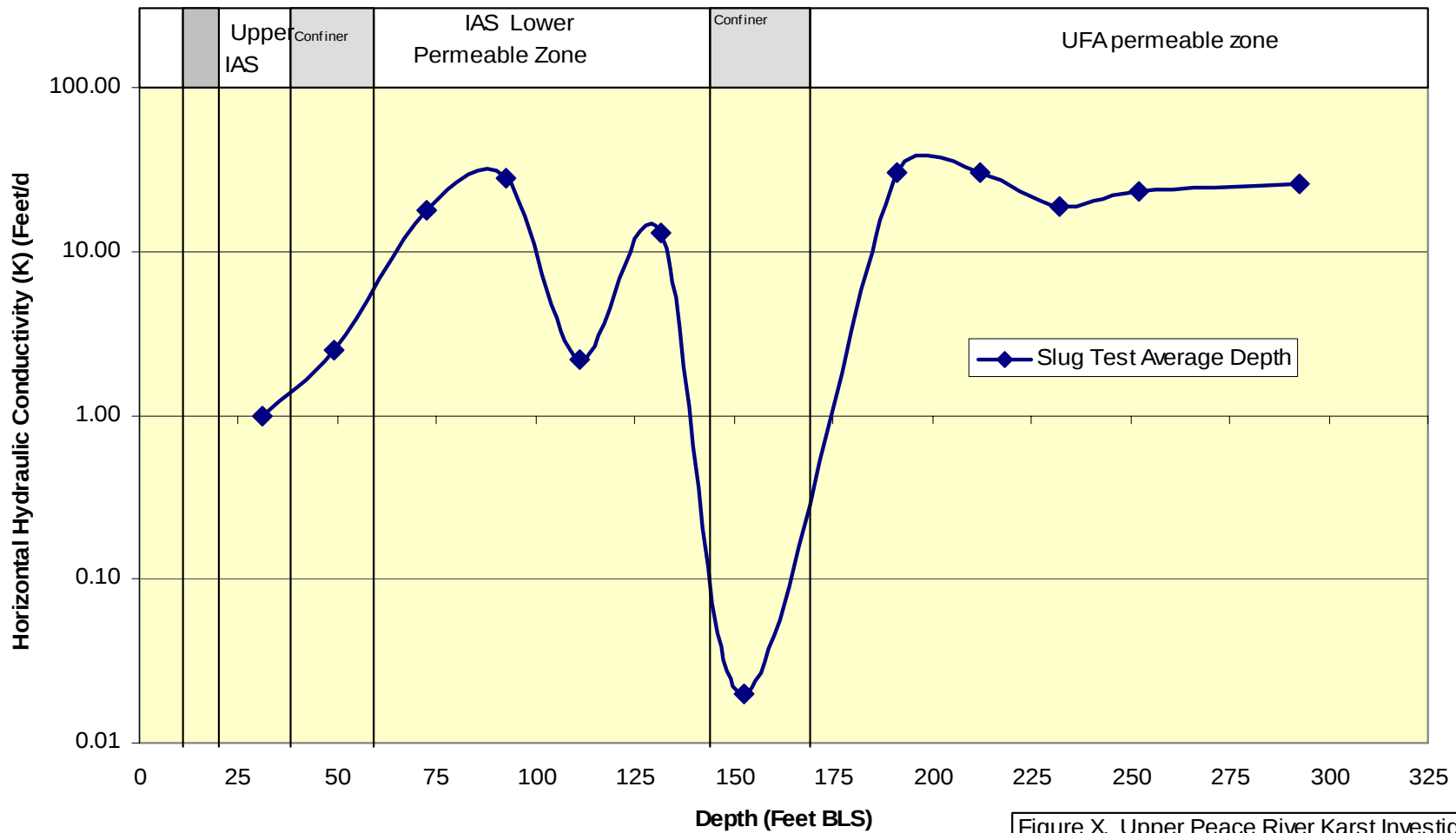
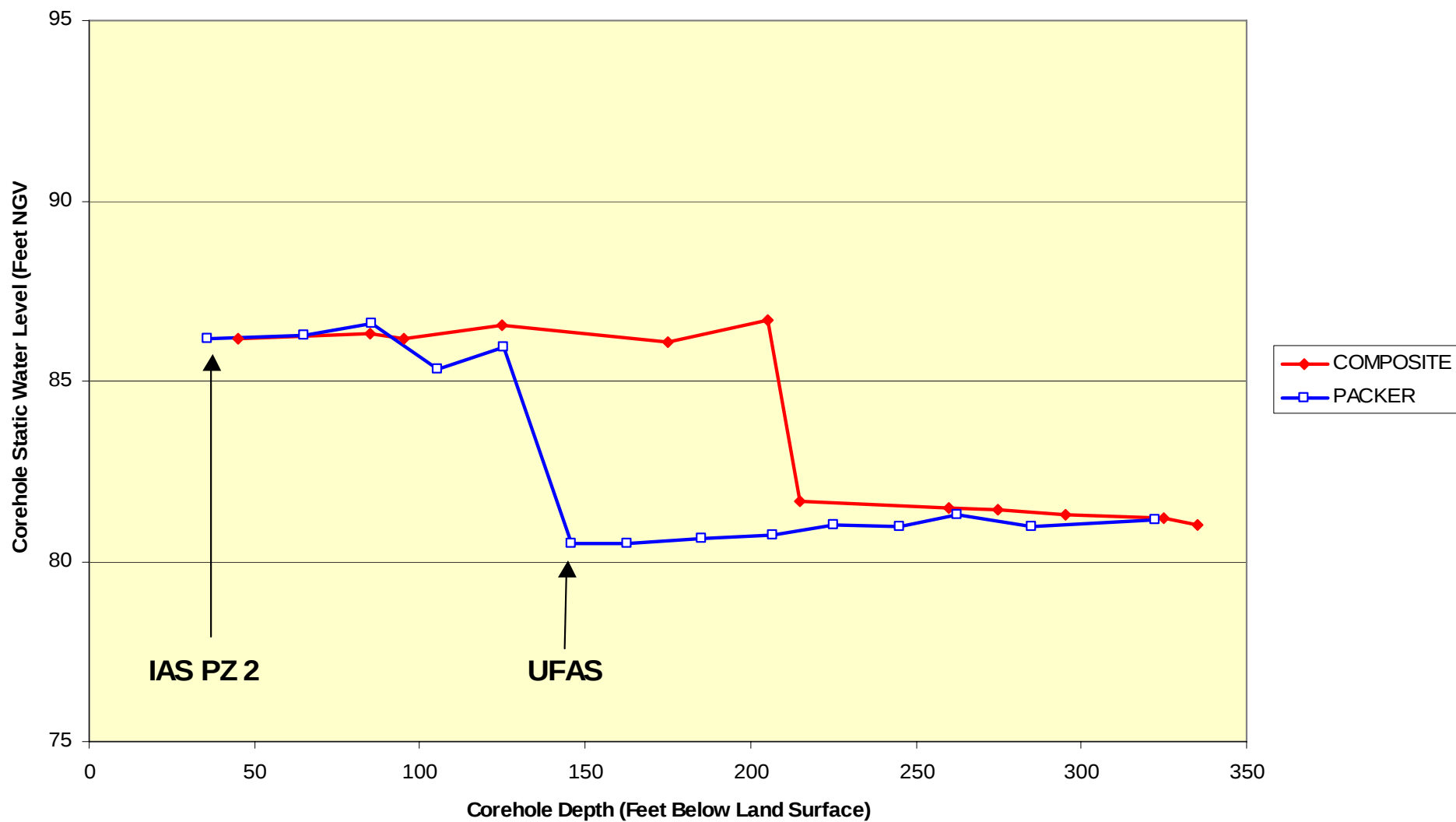


Figure X. Upper Peace River Karst Investigation

LW3P Former Dragline Crossing Hydraulic Conductivity Graph

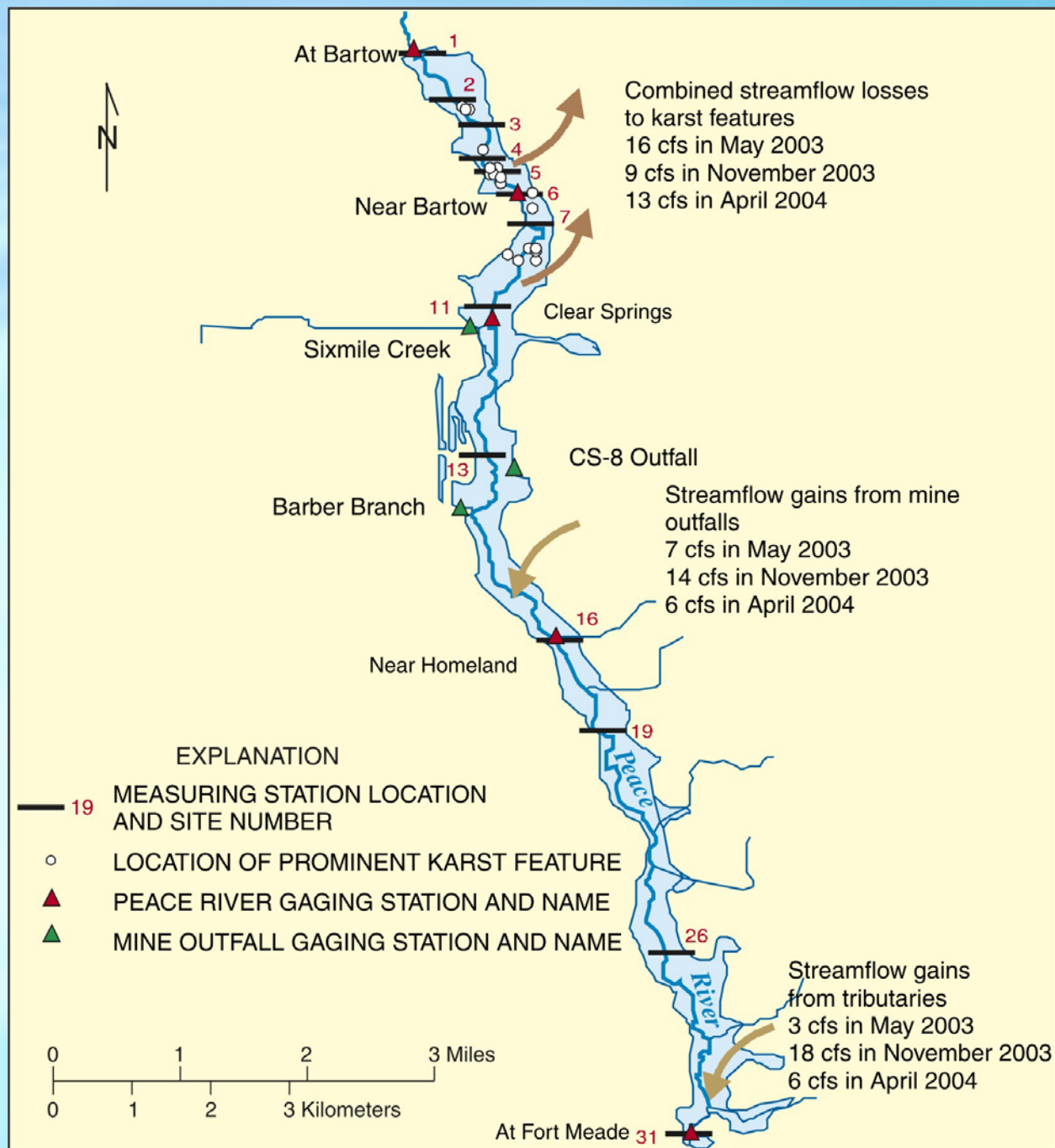
LW4P KISSINGEN SPRINGS

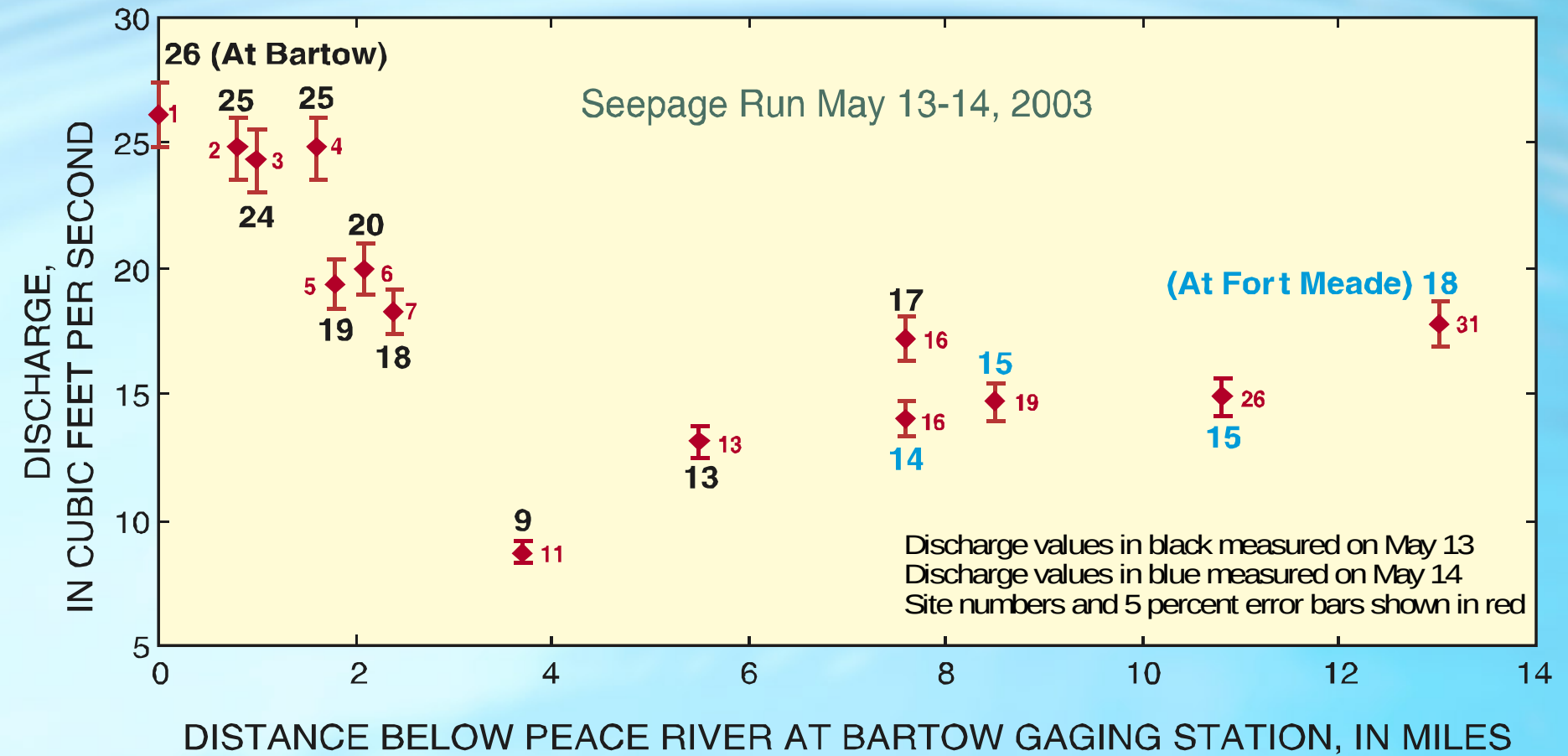


Seepage Measurements







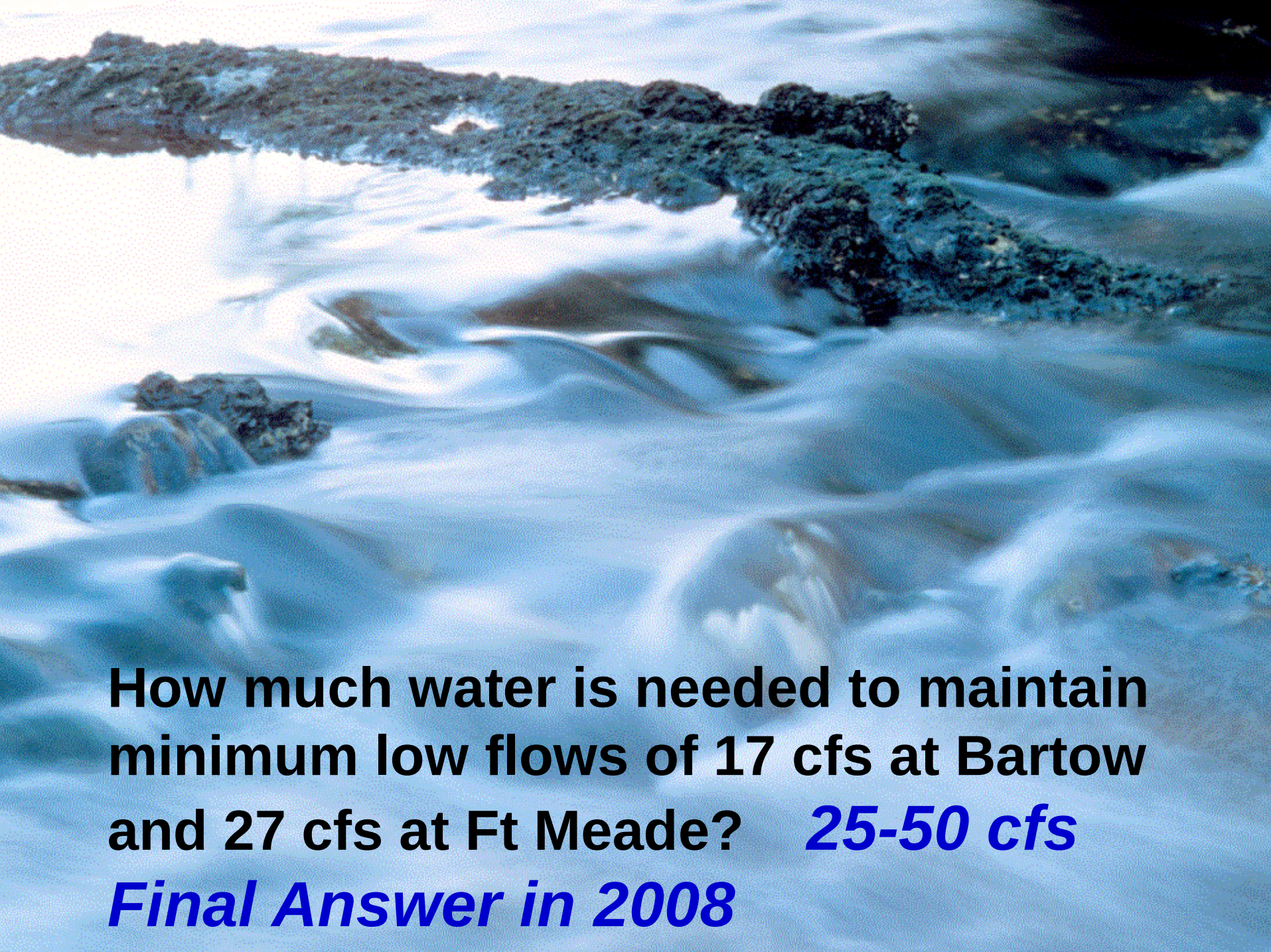


USGS Stream Flow Loss

Month/Year	Stream flow loss (cfs)
June 2002	30
May 2003	16
Nov 2003	9
April 2004	13
Average:	17

Future Expectations

- ❑ Exact location of karst features
- ❑ Better quantify river volume lost to seepage
- ❑ Confirm the hydraulic connection between Peace River and Upper Floridan aquifer
- ❑ Provide for mitigation of seepage loss through berming or plugging of karst openings



How much water is needed to maintain
minimum low flows of 17 cfs at Bartow
and 27 cfs at Ft Meade? **25-50 cfs**
Final Answer in 2008

Water Resource Development Projects for the Upper Peace River

- ❑ Increasing Storage in Lake Hancock
- ❑ Creating Storage on Mined Lands
- ❑ Restoring/Reconnecting Mined Lands
- ❑ Restoring Historical Storage Lost Due to Drainage Improvements













