

Everglades National Park

South Florida Natural Resources Center

National Park Service
U.S. Department of the Interior



Hydrology of the Florida Panther National Wildlife Refuge

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**Florida Panther National
Wildlife Refuge**



**Florida Integrated
Science Center**



Project Staff

- **Ron Reese, USGS, Ft. Lauderdale**
- **Larry Richardson, USFWS, FPNWR**
- **Roy Sonenshein, NPS, SFNRC**

Funding

- **Critical Ecosystems Studies Initiative (NPS)**
- **Priority Ecosystems Science (USGS)**



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Project Assistance

- **Chris Reich and Don Hickey, USGS – Drilling and well construction**
- **B. J. Reynolds, USGS - GPS Survey**
- **Rick Solis and Liz Hittle - Surface Water measurements**
- **Dr. Mark Grasmueck – UM/RSMAS – GPR work**
- **USGS staff – Transducer installation and monitoring**



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Summary

- Objectives of project
- Project Location
- Monitoring Stations
- Data Collection and Analysis



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Objectives

- **Inventory existing hydrologic data**
- **Design and install a hydrologic monitoring network**
- **Collect other hydrologic data as needed**
- **Evaluate historic and current data**



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Questions to be Answered

- How are water levels in the refuge affected by adjacent canals?
- What affect does geology have on water levels?



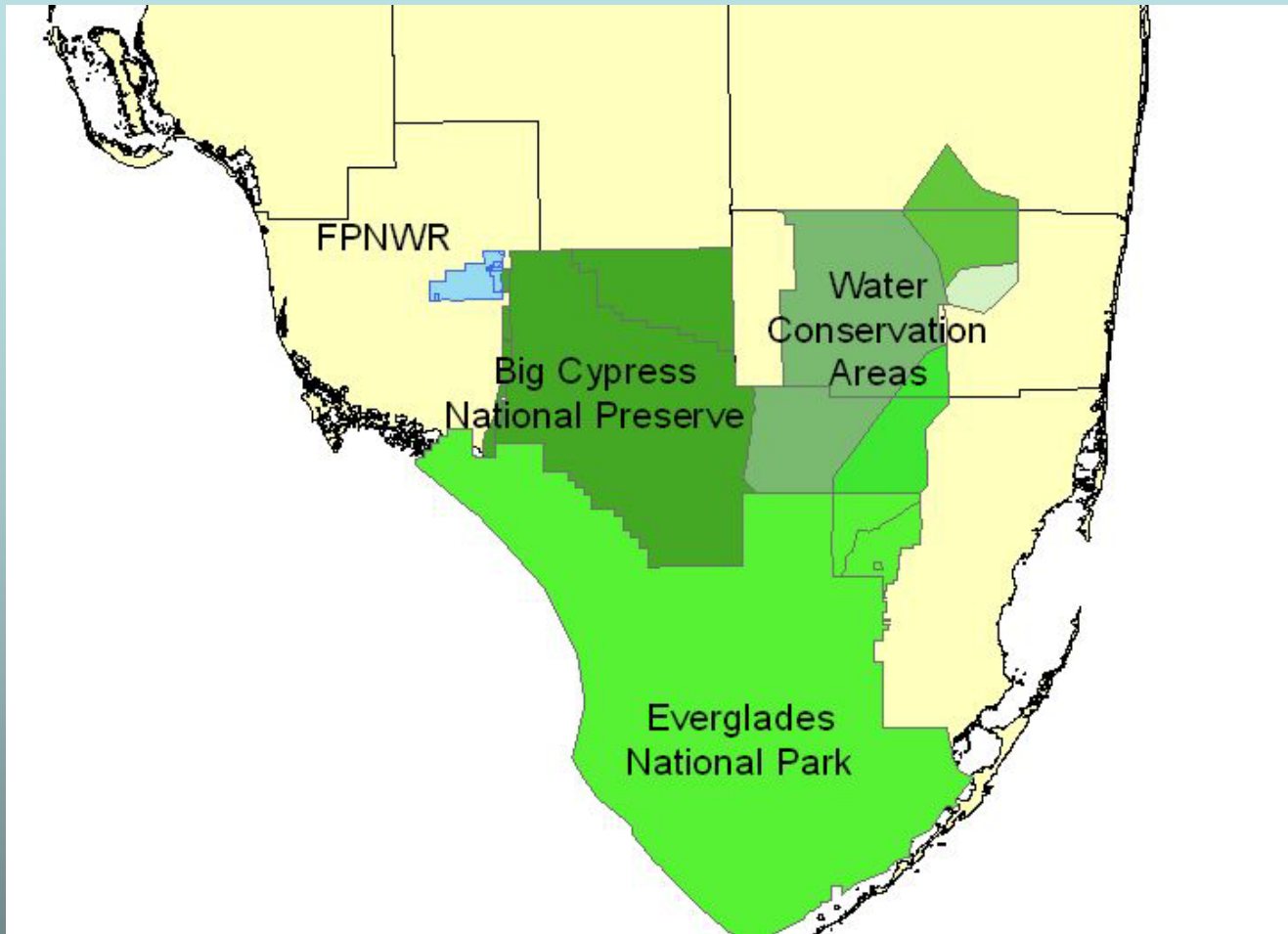
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Location of Florida Panther National Wildlife Refuge



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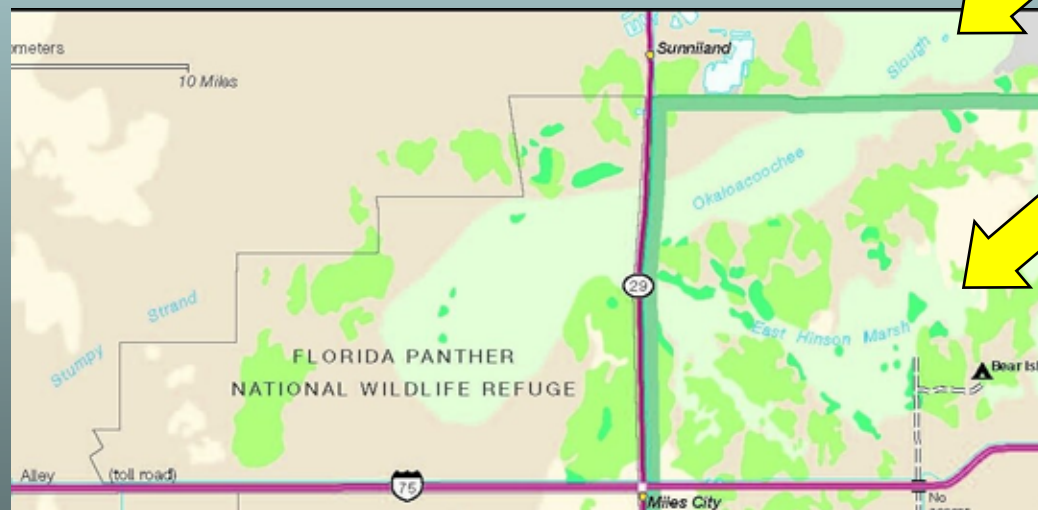


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Predevelopment Conditions

- Water flowed from NE in the Okaloacoochee Slough and the east in the East Hinson Marsh towards Fakahatchee Strand to the south



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Current Conditions

- **3 canals affect hydrology**
 - **SR29**
 - Control structure at north end of refuge
 - Control structures south of I75
 - **I75**
 - Begins west of SR29
 - Flows to west
 - All flow in canal is discharge from ground water in refuge or surface water runoff
 - **Merritt**
 - Lucky Lake control structure about 0.75 miles south of I75



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SR29 bridge with berm between canal and refuge



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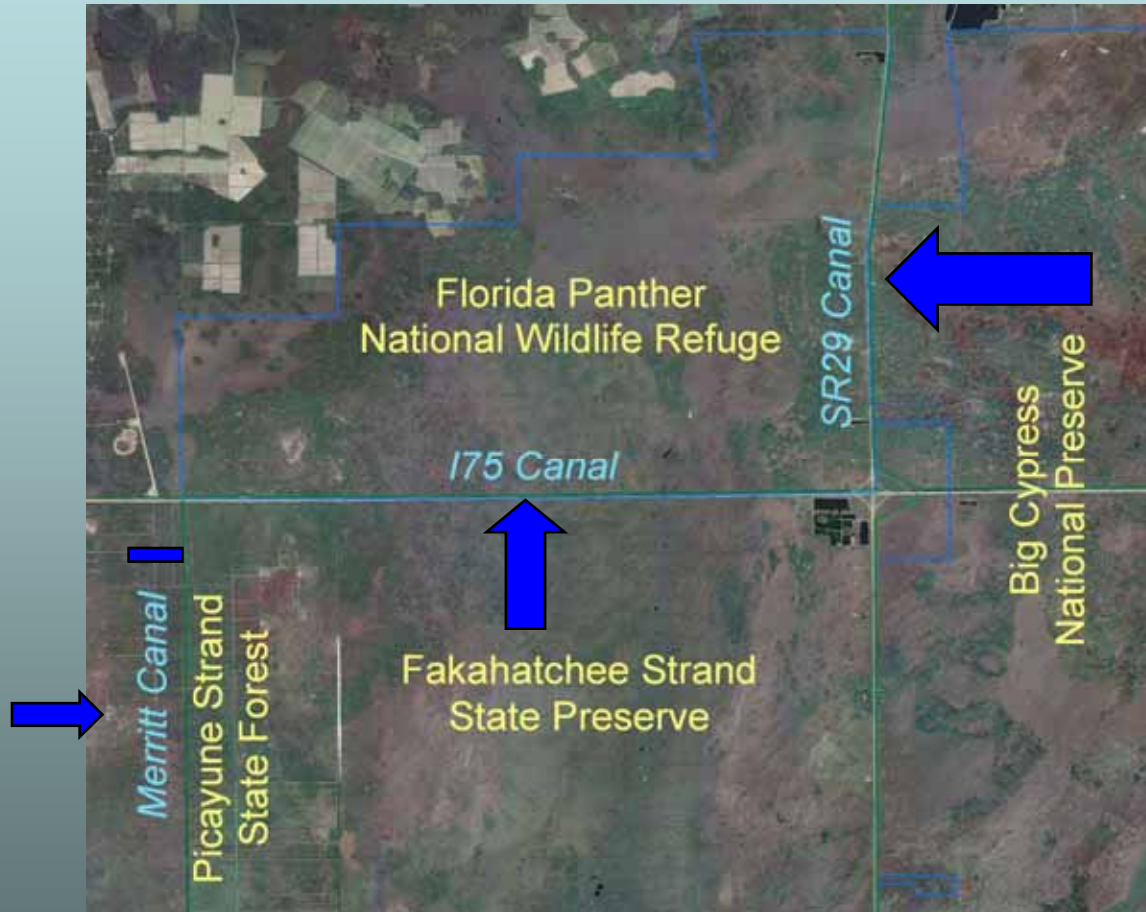
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Current Conditions



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Current Conditions

- **Urban area (Golden Gate Estates North) located west of refuge**
- **Agriculture on north side of refuge**
- **New urban development on north side of refuge**



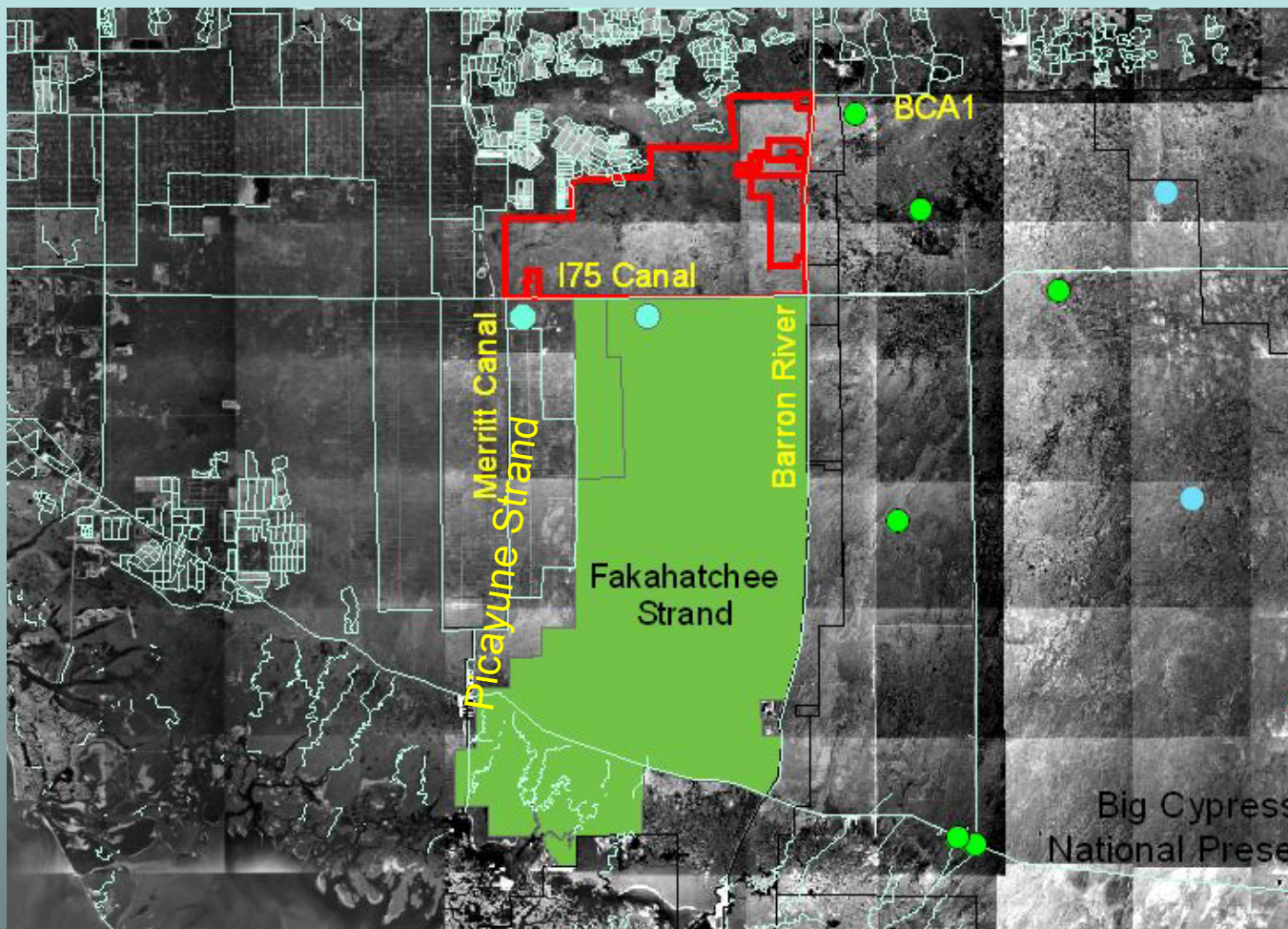
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Existing Monitoring Stations



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Ground Water Monitoring Network

- Limited access to refuge restricts well placement
- Pairs of wells installed at 9 locations
- North-south transect to determine gradient to canal
- Shallow well completed above confining layer



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Ground Water Monitoring Network

- **Instrumentation – submersible pressure transducer**
- **Hourly water level readings**
- **Installed summer of 2006 – only some wells**
- **Additional transducers installed in 2007**
- **Transducers moved between sites as needed**
- **Surveyed to NAVD88 datum**



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Drilling Monitor Well



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Sand Pack Around Screen



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Cement Seal Outside of Casing



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Monitor wells with protective sleeve to protect from fire and animals



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Monitor well and reference mark



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Well Instrumentation



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GPS Survey



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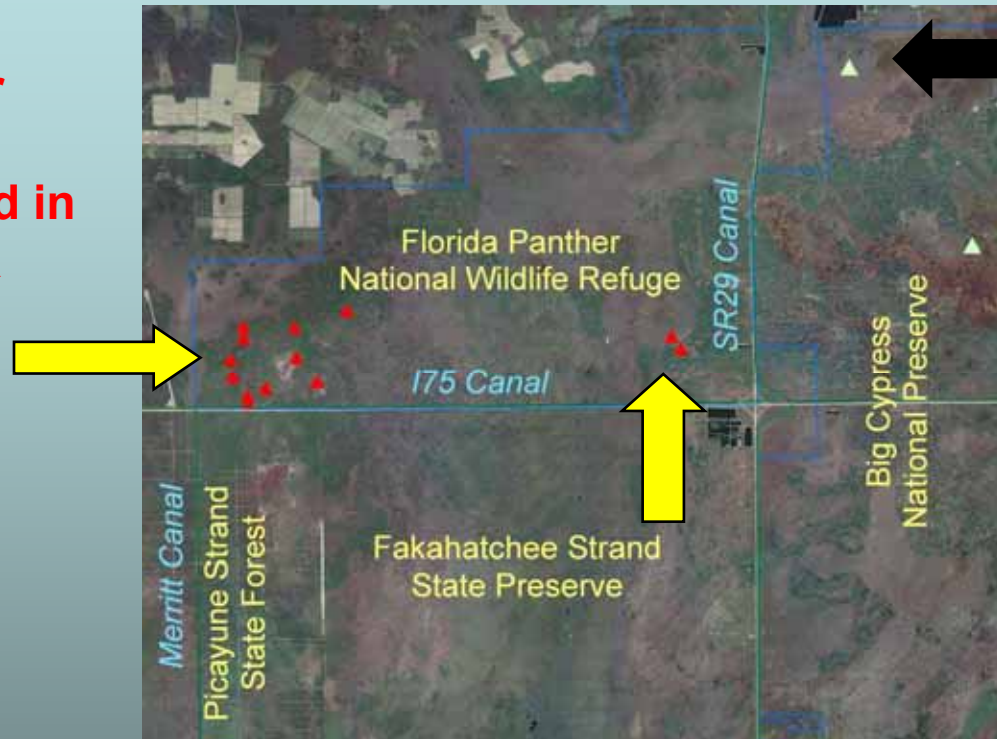
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**New
monitor
wells
installed in
FPNWR**



**Existing
Big
Cypress
Monitoring
Stations**

Monitoring Network



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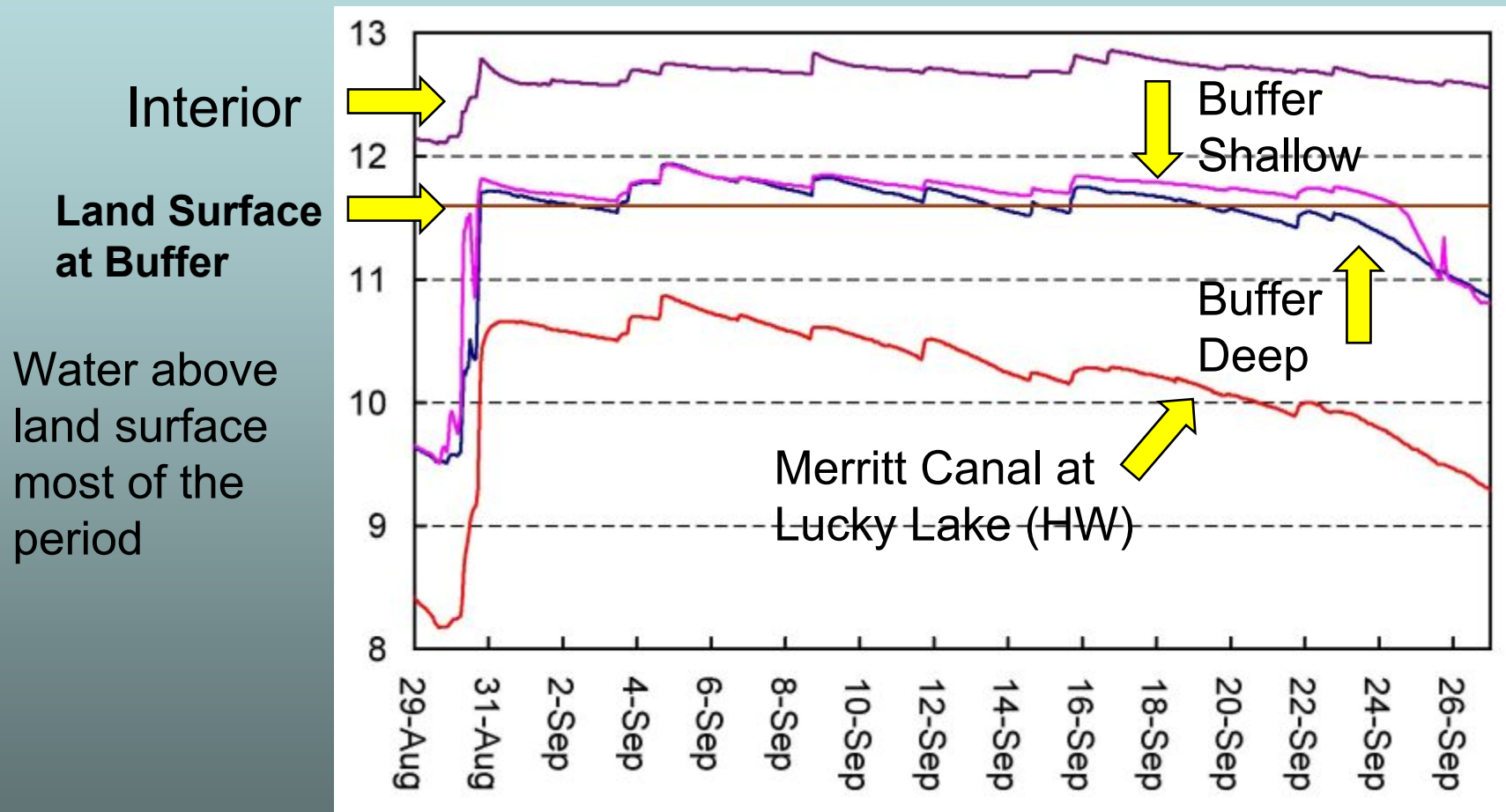
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September 2006 Water Level Data



Surface Water Measurements Boundary Flows

- Inflow
 - SR29 bridges and culverts
- Outflow
 - I75 bridges and culverts



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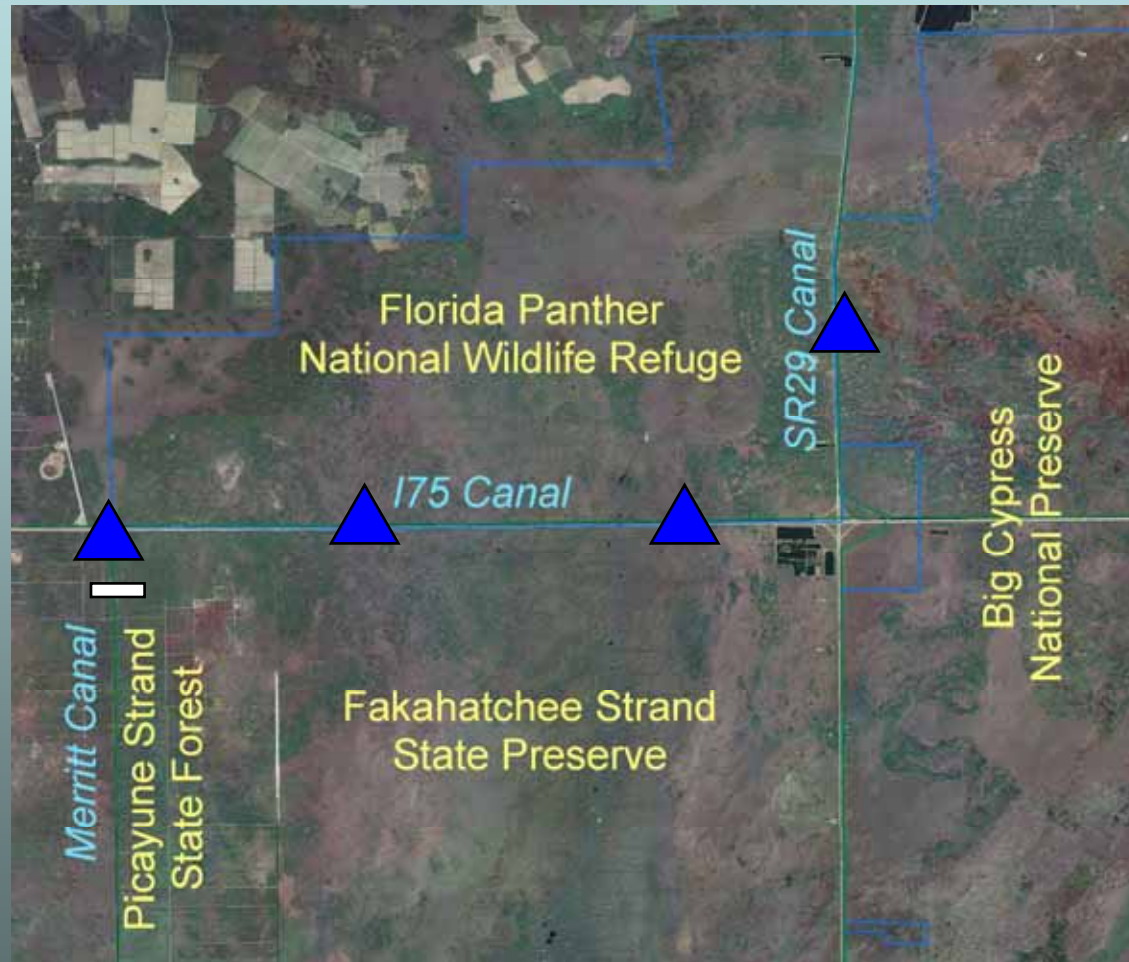
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Canal Measuring Sites



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SR29 Bridge ADCP Measurement



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SR29 culvert under road



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175 culverts Doppler measurement



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Culvert under I75



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ADCP measurements



Culvert in I75 Canal



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Merritt Canal Bridge and Plug



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Merritt Canal Plug south side of highway



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Merritt Canal Flowing to the south over earthen dam (plug)

Note small waterfall flowing into canal



Earthen Plug in canal



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Discharge overland flow



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Discharge results October 2006

- Inflow
 - SR29 bridge **26 cfs**
- Outflow
 - I75 borrow canal **36 cfs**
 - Merritt Canal at I75 **67 cfs**



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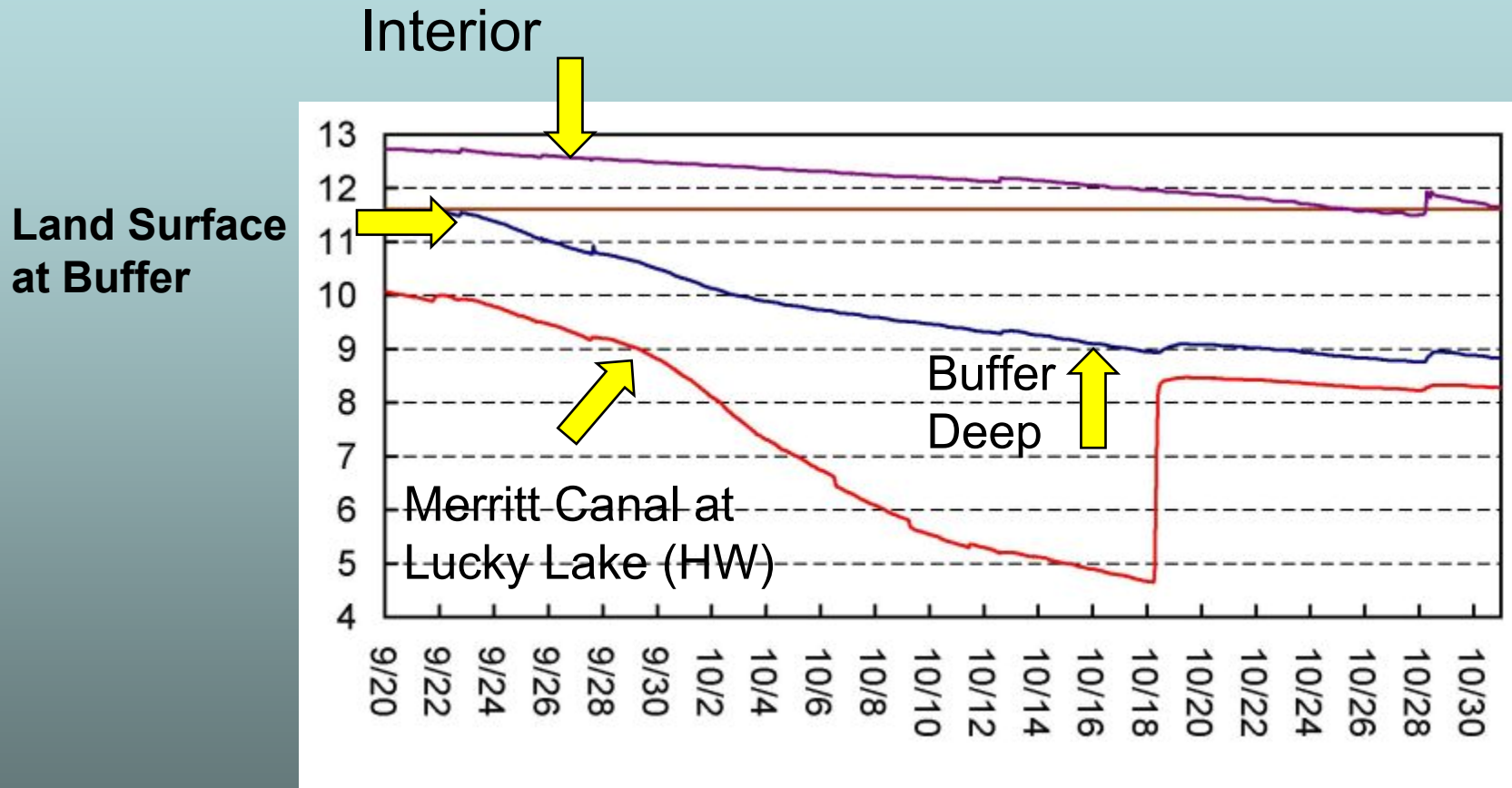
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Water Levels 2006



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Ground Penetrating Radar (GPR) Survey

Survey Crew:

Mark Grasmueck

David Viggiano

Survey dates:

7. and 8. May 2007



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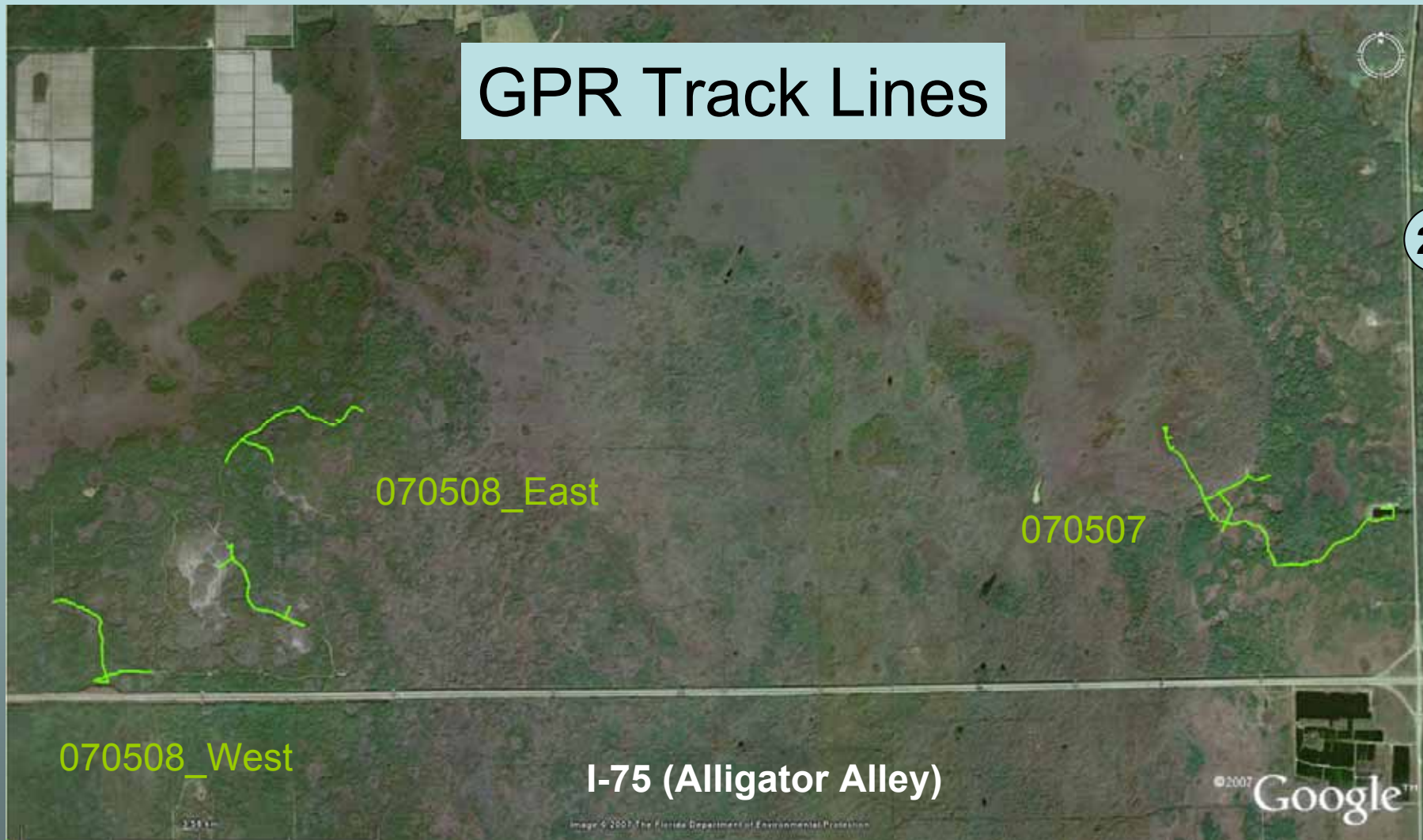


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GPR Track Lines

29



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Examination of the entire dataset yielded
9 different radar facies types:

	Unclassified
	Transparent (sand)
	Patchy
	Chaotic
	Stratified
	Base Reflector
	Strong Surface (pond)
	Fill
	Attenuated



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Patchy = Mix of chaotic and transparent

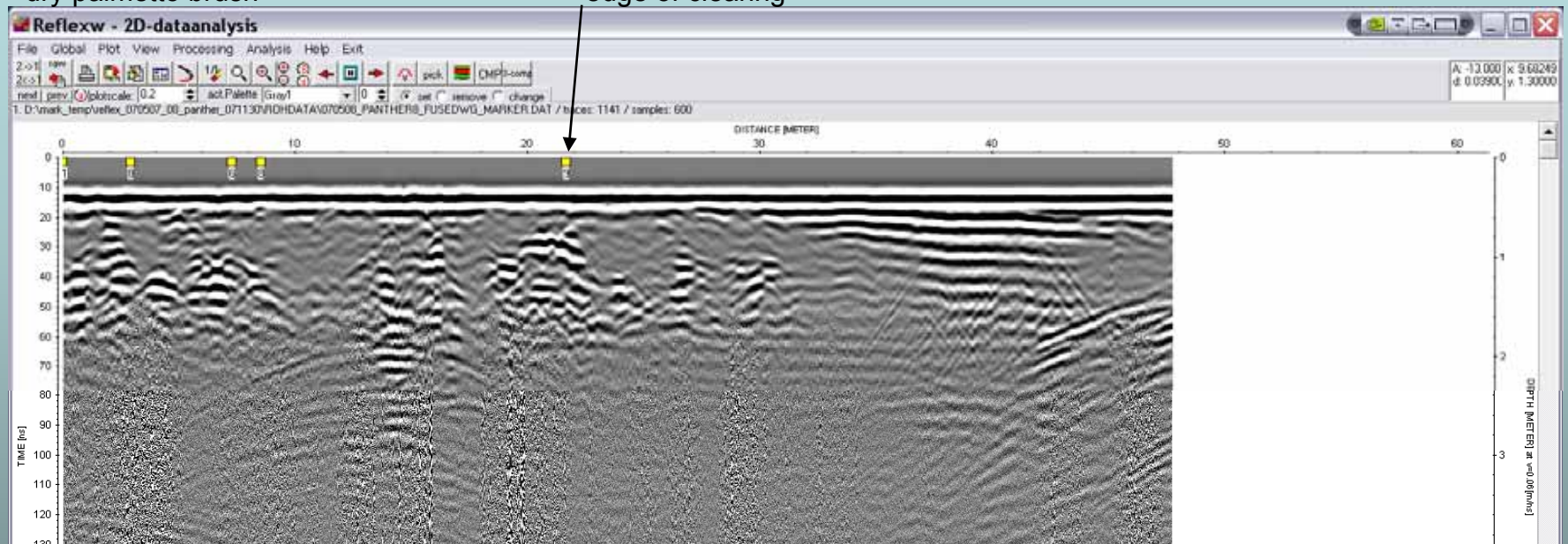


Pond

toward the end of profile evidence of swampy area. Change in vegetation.

dry palmetto brush

edge of clearing



- Example where both vegetation and GPR show the sudden change of geologic and hydrologic properties in the subsurface over a distance of less than 50 m .
- The GPR pond signatures was common
- Often the vegetation on the surface has already changed while the subsurface reveals there were wetter conditions in the past.



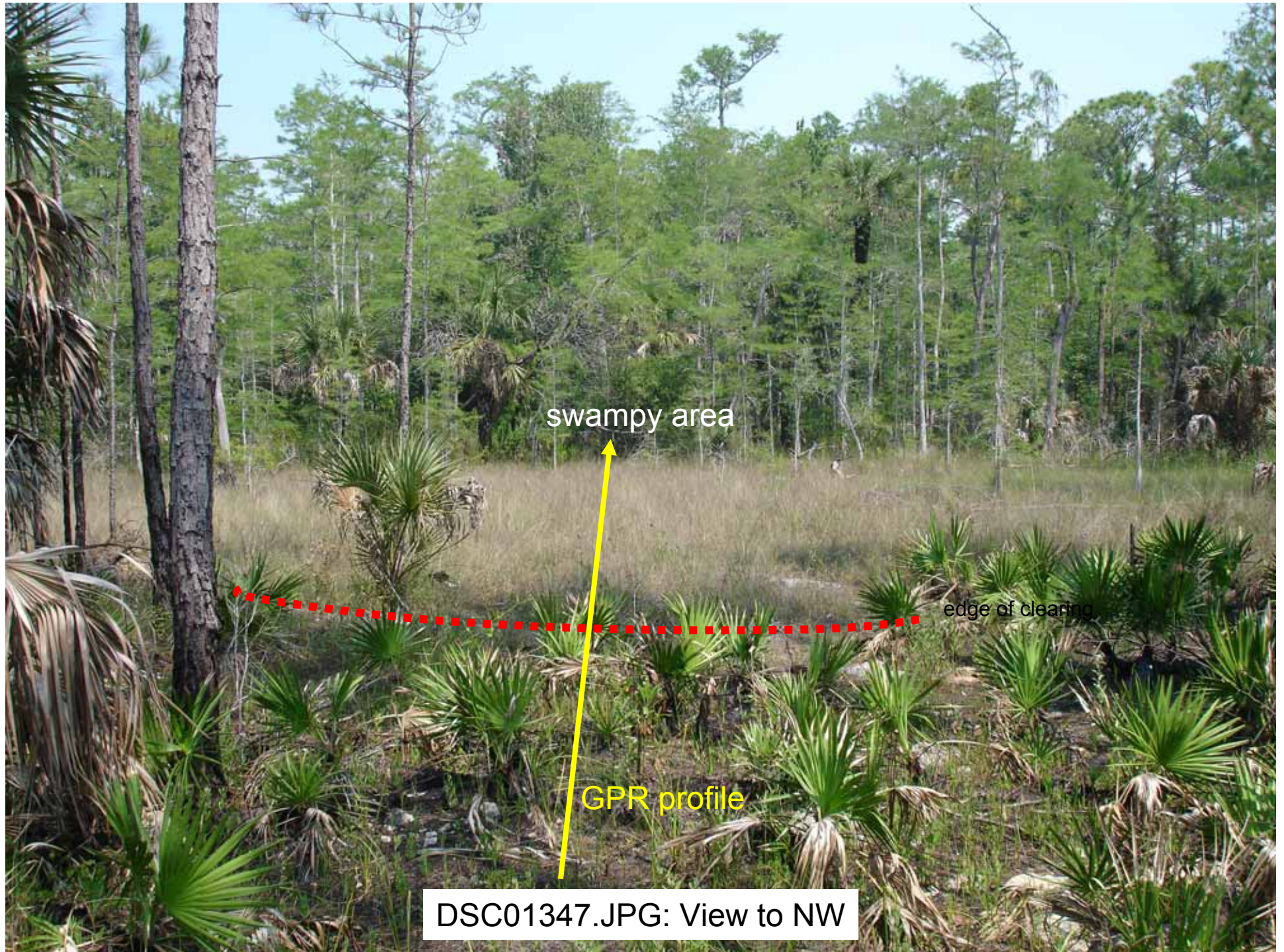
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swampy area

edge of clearing

GPR profile

DSC01347.JPG: View to NW



Rock pinnacle and soil-filled pits in the epikarst



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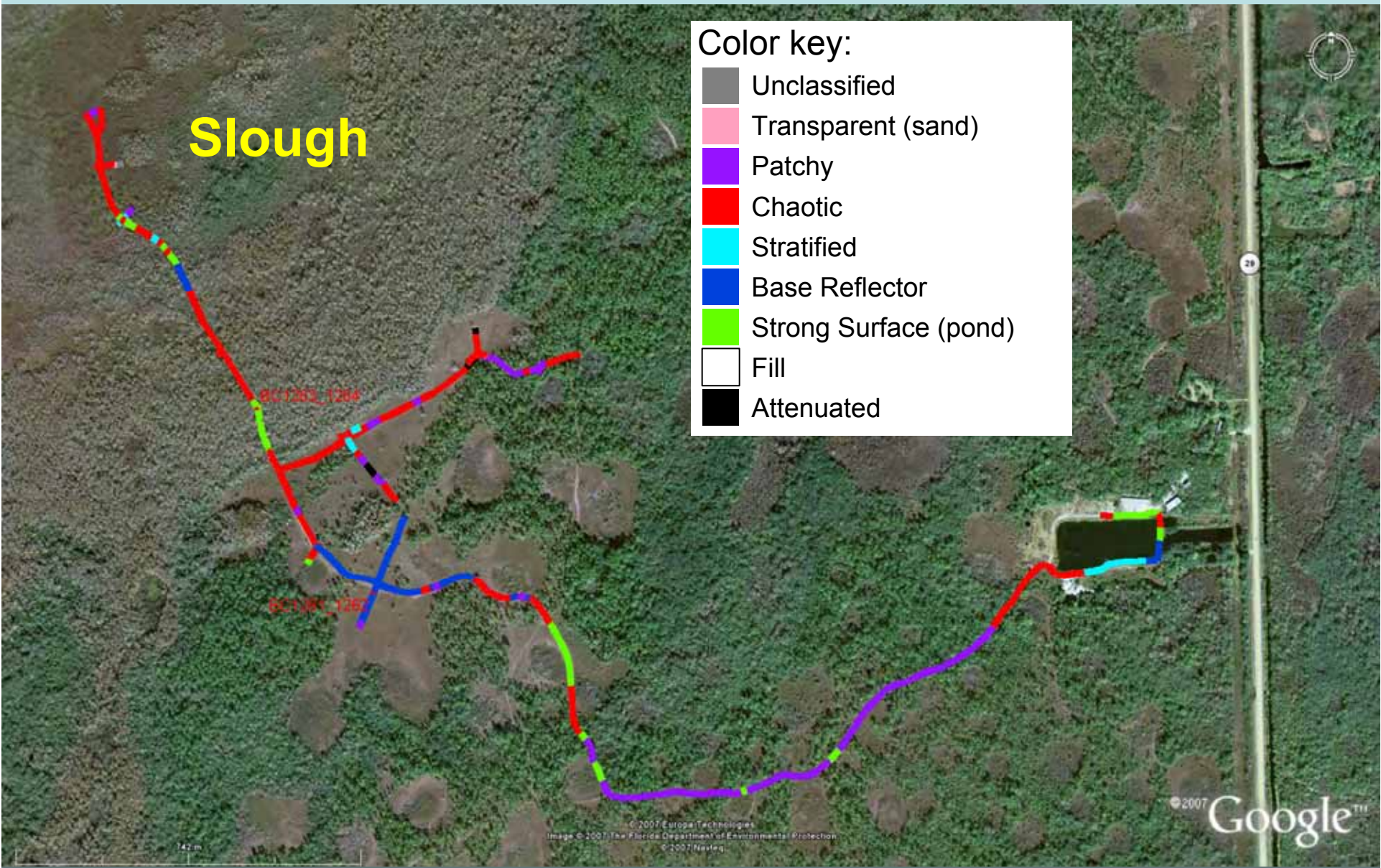
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Slough

Color key:

- Unclassified
- Transparent (sand)
- Patchy
- Chaotic
- Stratified
- Base Reflector
- Strong Surface (pond)
- Fill
- Attenuated



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Conclusions

- **Berm next to SR29 Canal helps to prevent drainage**
- **SR29 Canal generally not high enough to supply water to refuge**
- **Operations of Lucky Lake Structure on Merritt Canal has major effect on water levels in refuge**
- **Modifications to plug in Merritt Canal could help maintain higher water levels in refuge**



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Conclusions

- **There appears to be no geologic confinement allowing for ponding of surface water in the refuge**
- **Epikarst features provide connection through low permeability rocks**
- **What will be the impact of the Picayune Strand restoration on the refuge?**



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Questions???



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