

Hydrologic Monitoring Network in South and Central Florida

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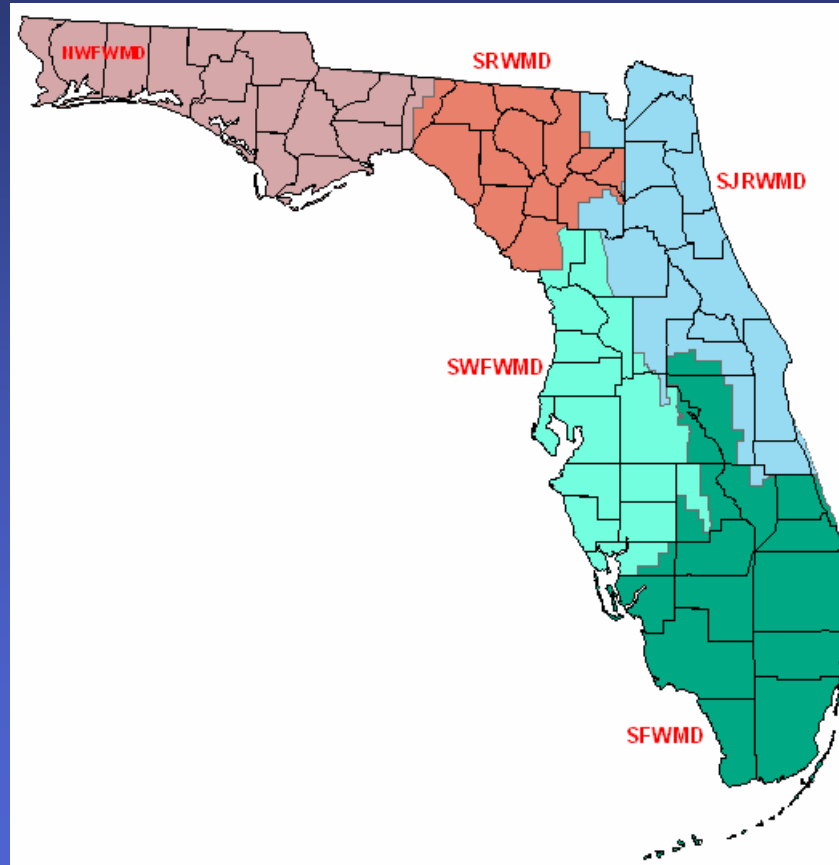
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June 5, 2007

Presentation will include following topics:

- **Background on South Florida Water Management District**
- **Hydrologic Monitoring Network**
- **Hydrologic Data Processing**
- **Hydro Data Retrieval System**
- **Data Analysis and Reporting**
- **Questions and Answers**

South Florida Water Management District



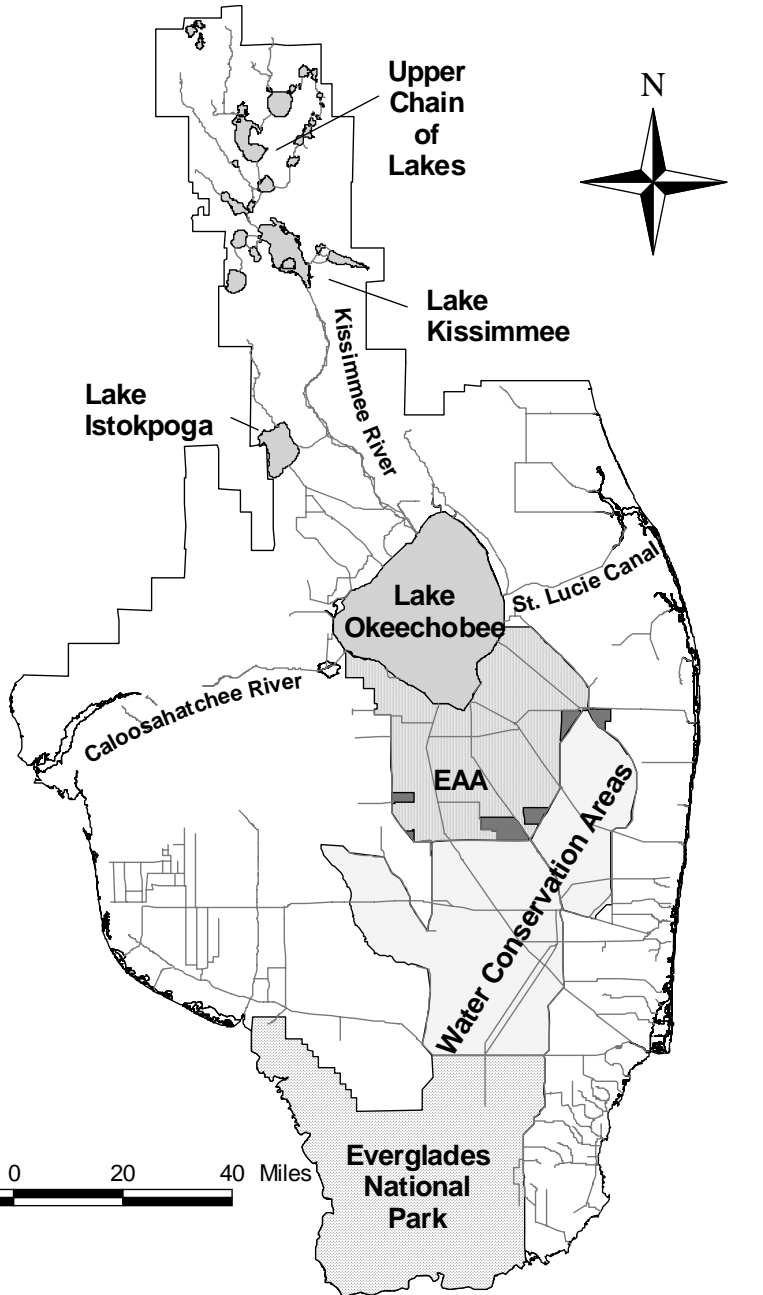


MISSION

To manage and protect water resources of the region
by balancing and improving water quality,
flood control, natural systems and water supply.

**The Upper
Kissimmee
Chain of Lakes
form
the headwaters
of the
Kissimmee-
Okeechobee-
Everglades
watershed**

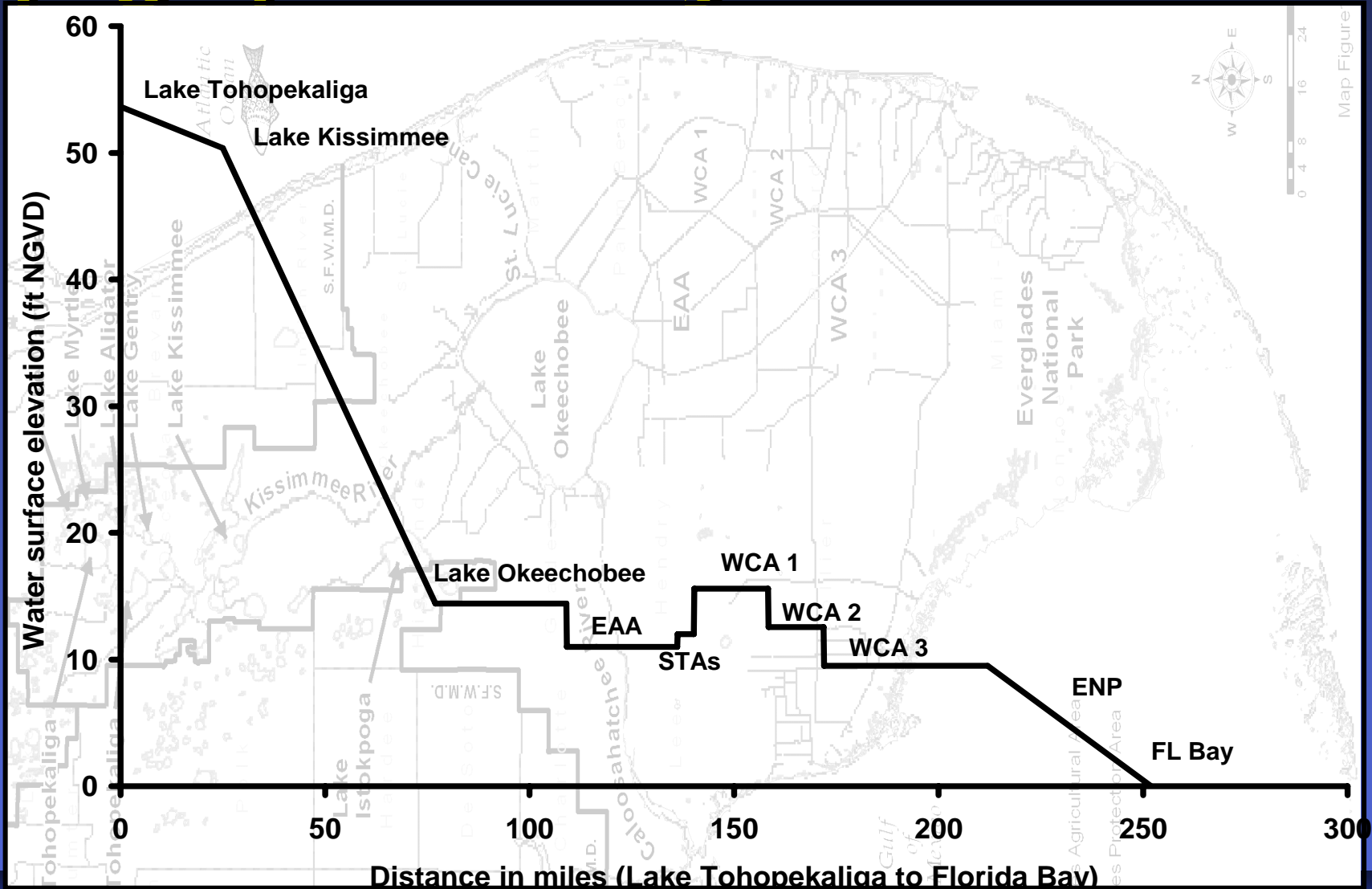




South Florida Water Management District

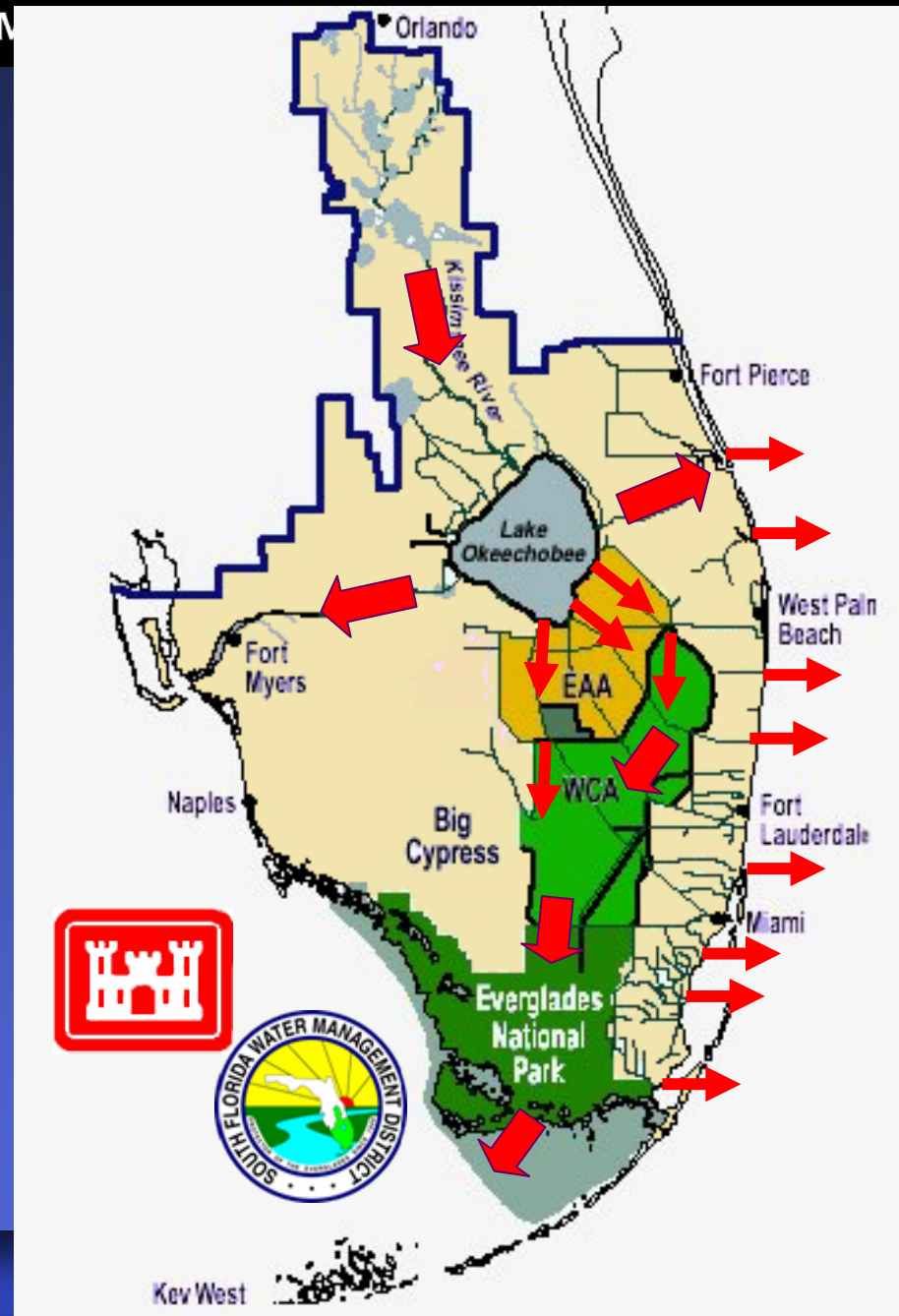
- 16 counties
- 46,439 sq. kilometer
- 2,898 km of canals
- 22 major pump stations
- 2,220 water control structures

Topographic and Hydraulic Gradient



Operations

- Operated in accordance with criteria - rules
 - SFWMD
 - USACE
- Water volumes are essential
 - Rainfall
 - Space and time
 - Flows and storages
 - Lakes and canals



Hydrologic Monitoring Network Includes

- Meteorological Monitoring
- Rainfall Monitoring
- Surface Water Stage Monitoring
- Surface Water Flow Monitoring
- Groundwater Monitoring

Hydrologic Data Attributes

■ Data Type

- Meteorological, Rain, Stage, Gate Opening, Pump speed, Flow, GW Stage

■ Data Frequency

- Break point (5 to 15 minutes), Daily, Weekly, Monthly

■ Data Transmission

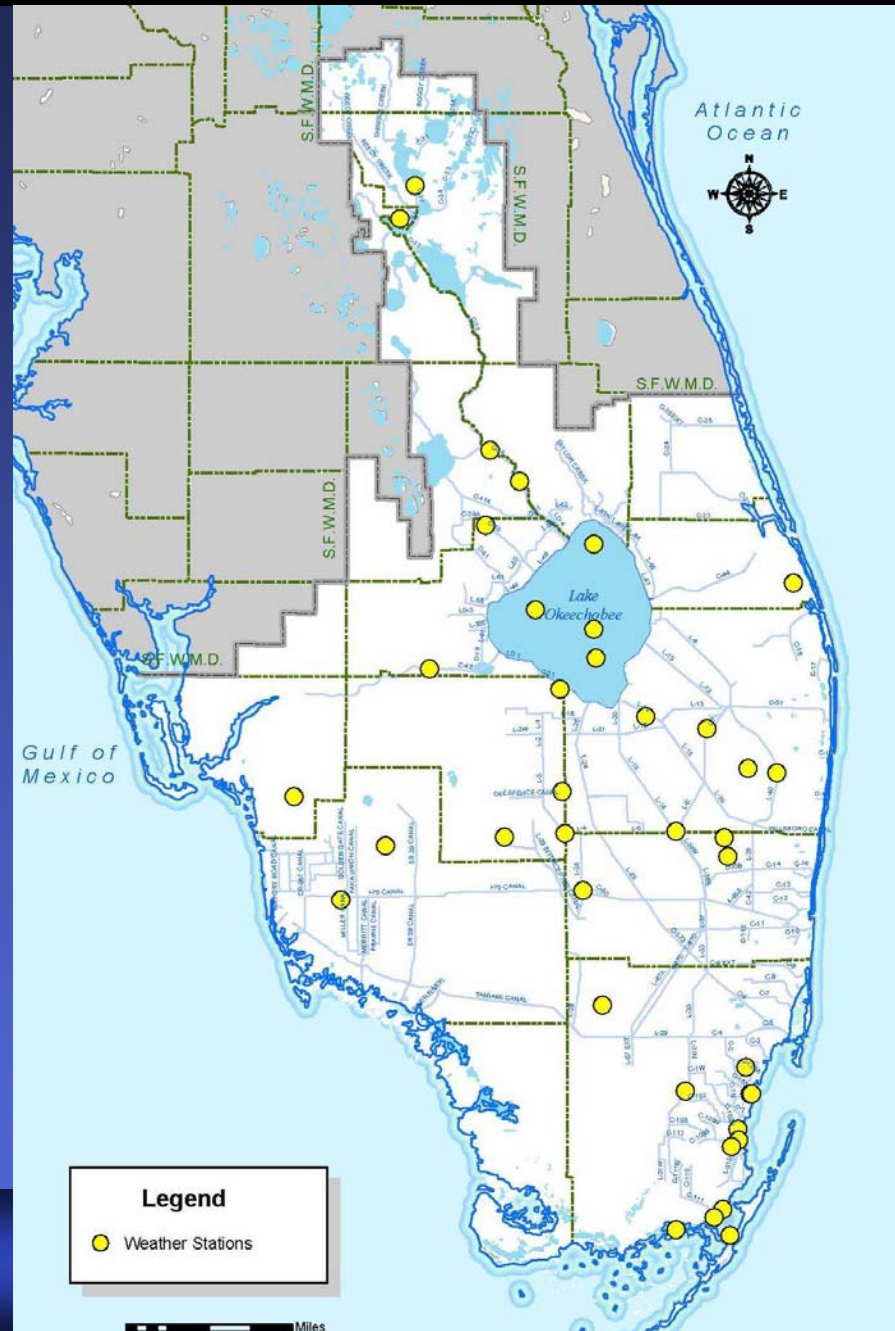
- Real Time, Near-Real-Time, Manual

Monitoring Network Details

- A. Development of Monitoring Network**
- B. Existing Monitoring Network**
 - 1. Field Instrumentation at the Station
 - 2. Active Monitoring Stations
- C. Hydrologic Data**
 - 1. Data Storage
 - 2. Data Quality Assurance/ Quality Control
- D. Monitoring Network Optimization/Design**

Active Meteorologic Stations

- 41 Active Weather Stations
 - 26 Stations full profile
10 parameters
 - 15 Stations partial profile
 - 20 Stations PET
Computed by Simple Method



Active Rain Gauge Stations

■ 279 Active Rain Gauge Stations

■ 233 Breakpoint Gauges

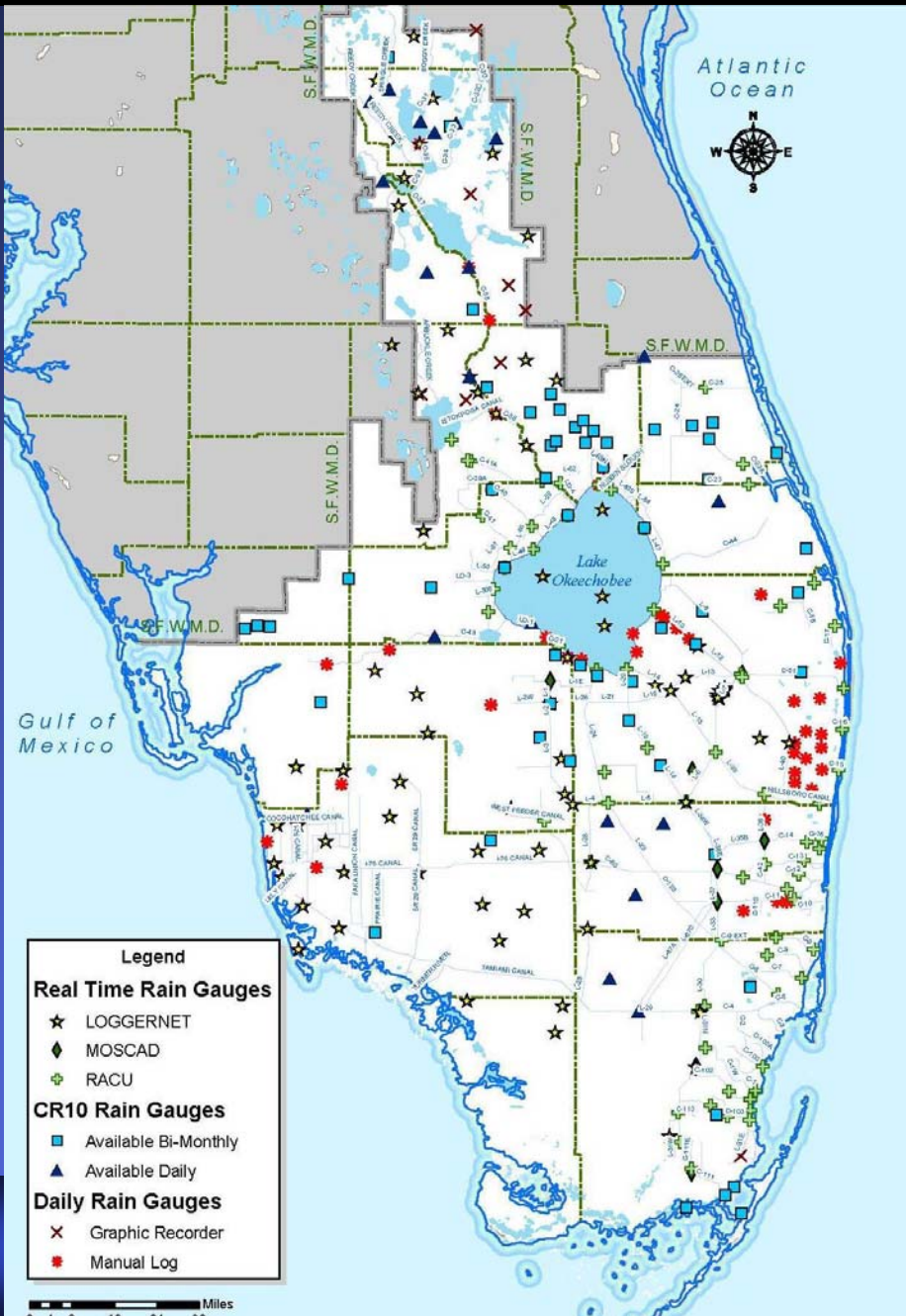
■ 144 Real Time

■ 21 ARDAMS

■ 60 CR10s

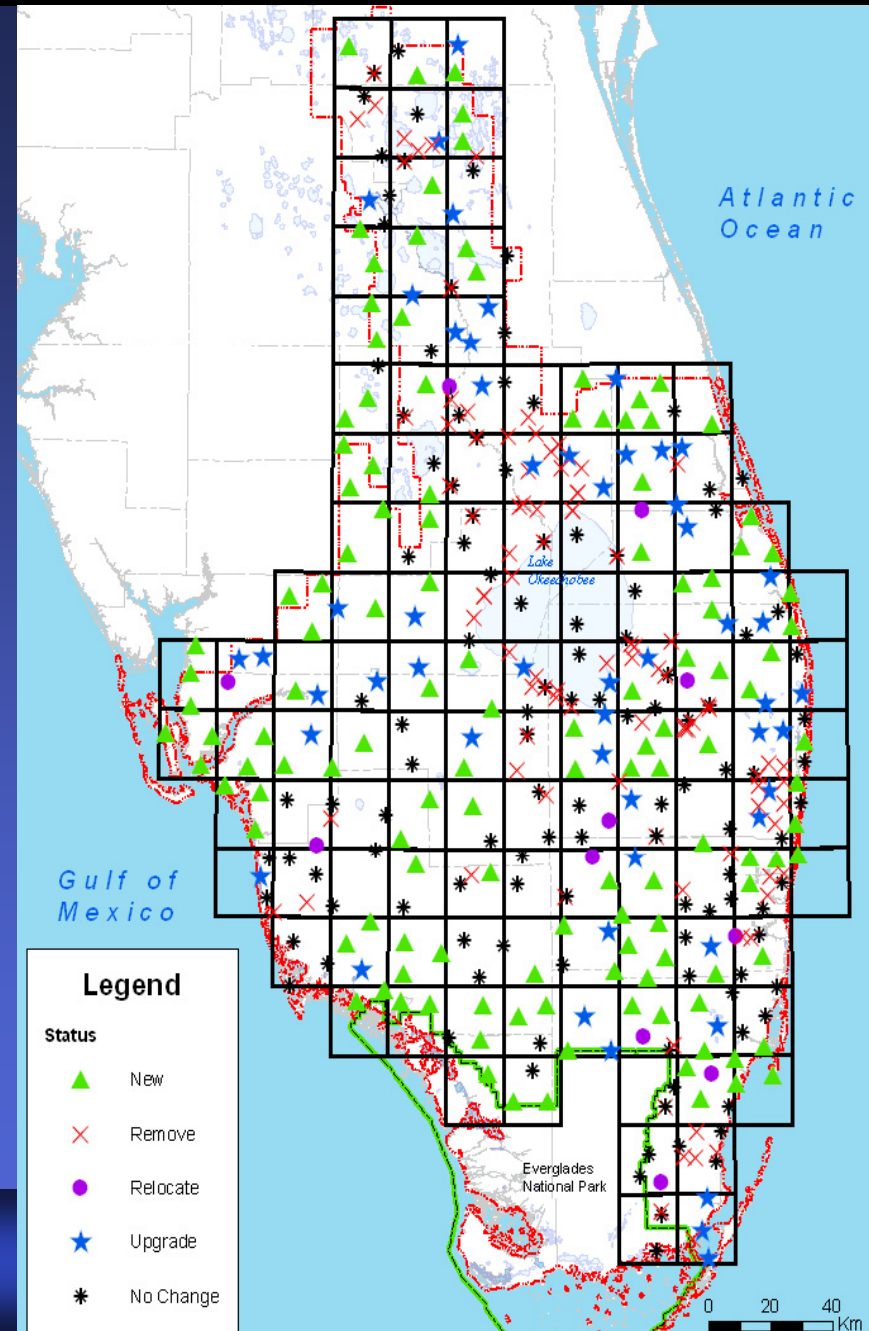
■ 8 Graphics

■ 46 Daily Rain Gauge

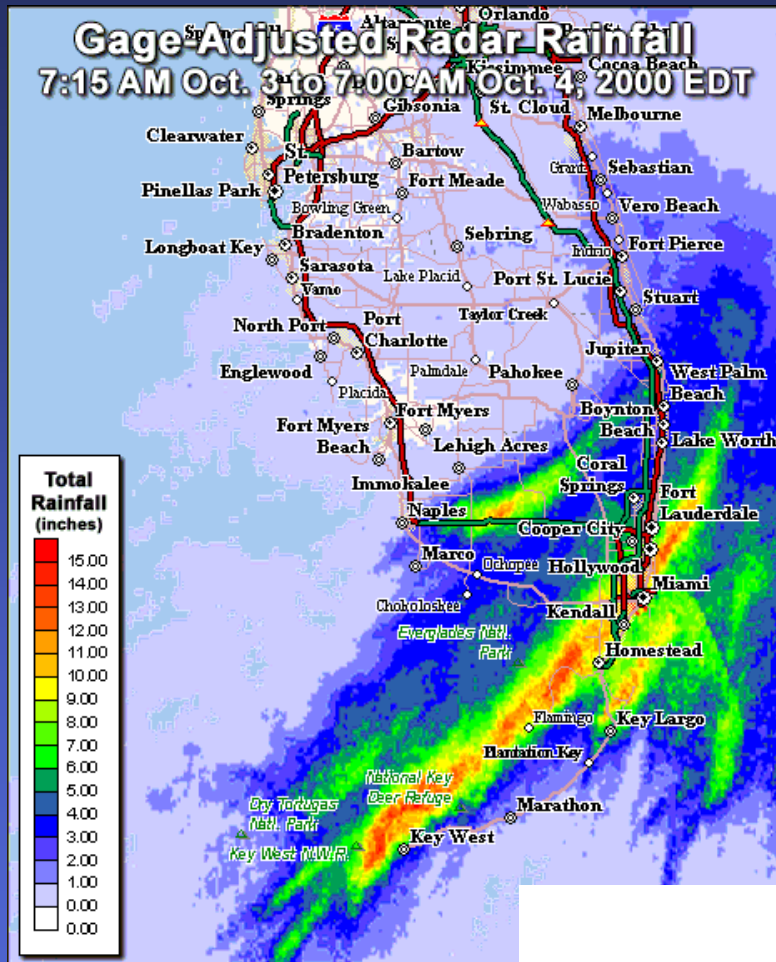


Rain Gauge Network Optimization

- 313 Total Rain Gauges Required
- 172 Existing Rain Gauges
- 93 Existing Rain Gauges to be Remove
- 11 Existing Rain Gauges to be relocated
- 130 New Rain Gauges are needed



Radar Rainfall - NEXRAD



- National Weather Service deployed Next Generation Radar (NEXRAD) a.k.a. WSR-88D Weather Radar
- Opportunity to improve the spatial estimation of rainfall amounts
- NEXRAD sends out a radio signal and measures the signal reflected from falling raindrops (reflectivity)

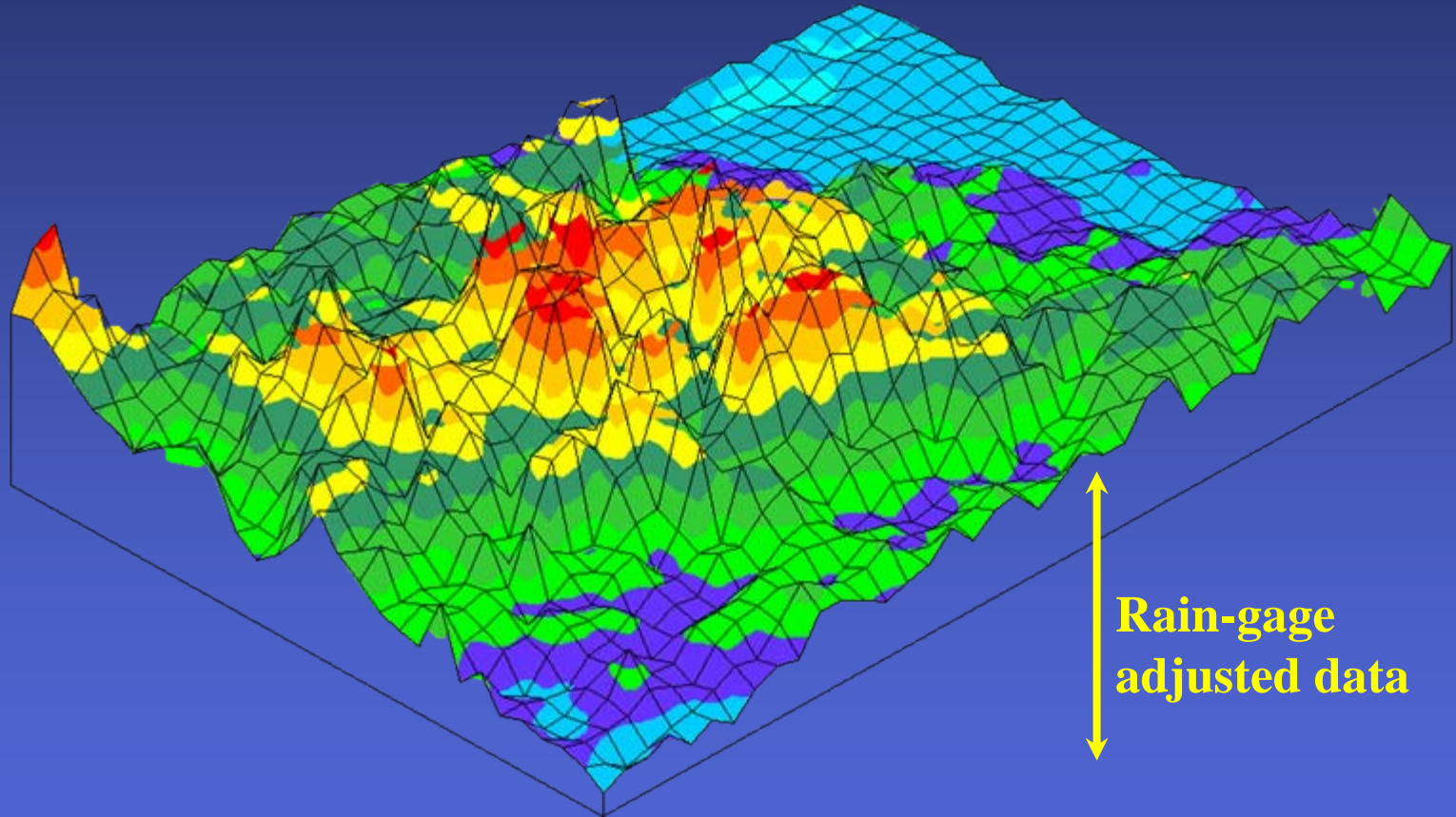
NEXRAD Technology

- NEXRAD uses reflectivity to estimate the amounts of rainfall by using calibrated algorithms (Z-R relationship) or look up tables (**WSI and OneRain**)
- It can measure reflectivity out to a distance of 230 km
- District areal coverage comes from 5 radars (Tampa, Melbourne, Jacksonville, Miami and Key West)

NEXRAD Data

- 2 km X 2 km grid (= 1 pixel)
- 35 mile boundary buffer from shore line
- base map (in state plane coordinates)
- Total of 33,774 pixels
 - ~ 12,000 pixels within District boundaries
- Unique pixel id - 8 digit integer (e.g., 10074793)

Gage Adjusted NEXRAD Data

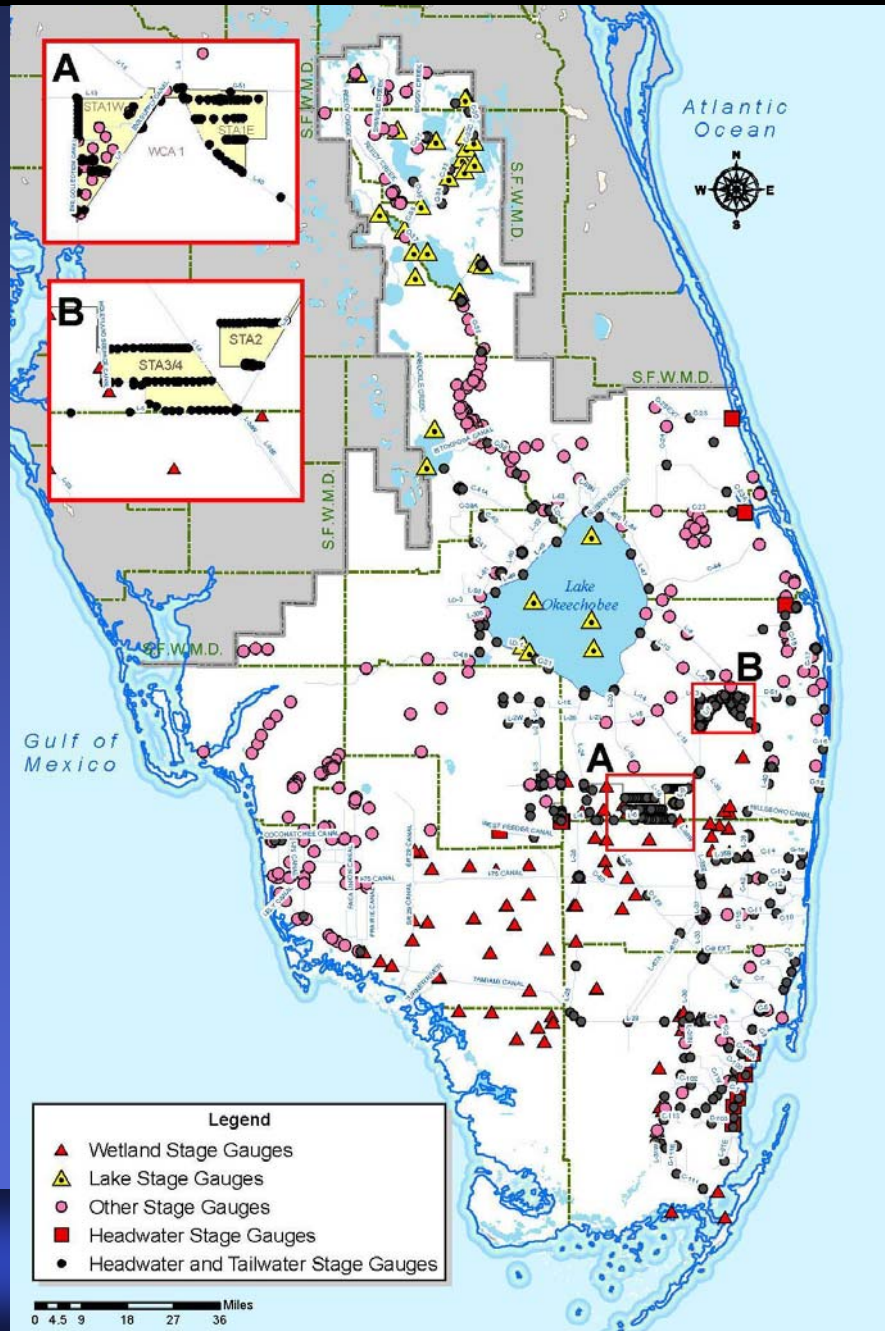


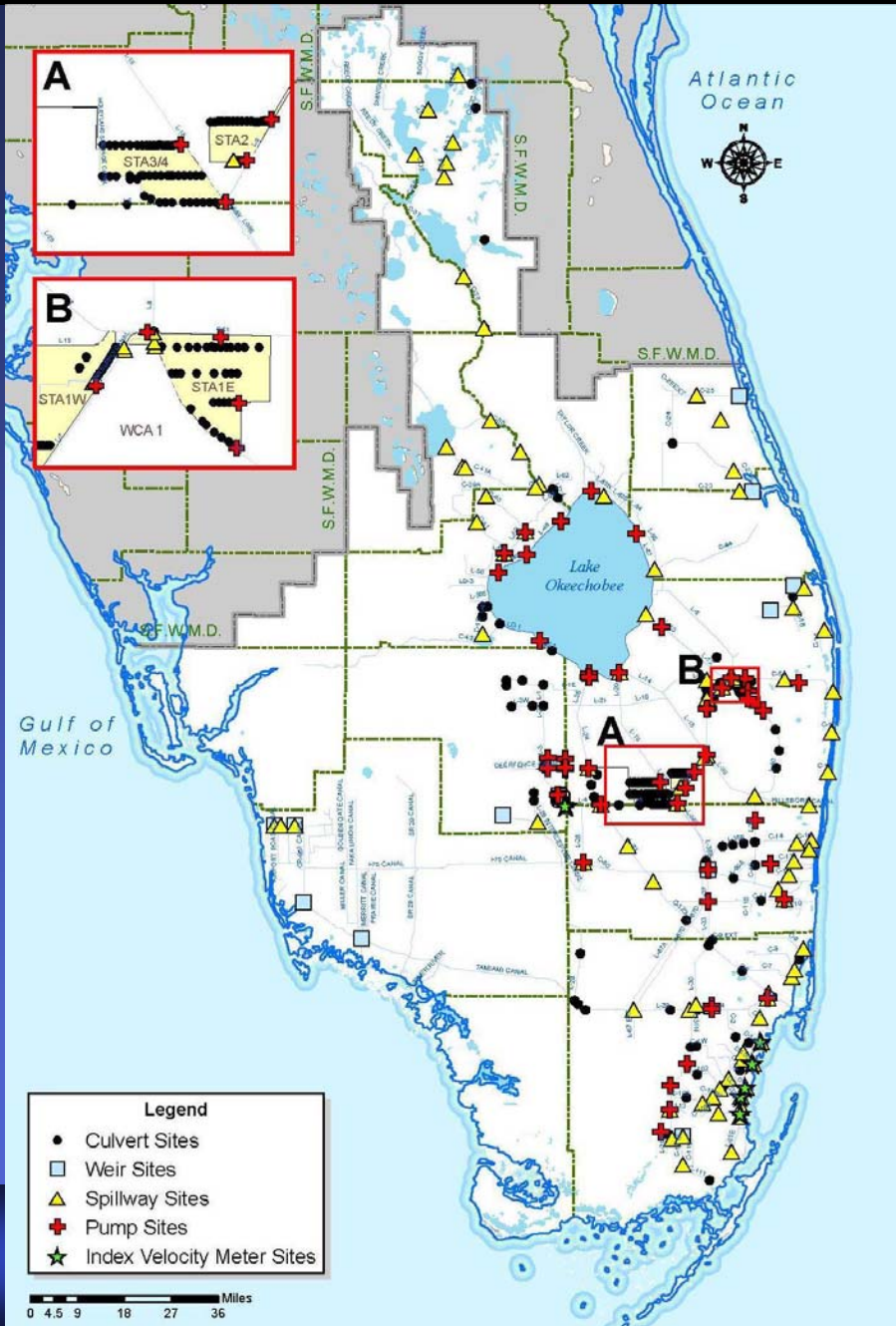
Data Types

- **Near Real-time (NRT) Data**
 - District receives **15-minute NEXRAD data** every 15 to 20 - min. interval
 - This data is **rain-gage adjusted** every 15-min. Rain gage data are obtained from 80 telemetry stations
- **End-of-the-Month (EOM) Data**
 - NRT data is revised with **additional 110 rain gages** obtained from CR10 stations
 - **Perform complex adjustments and QA/QC**

Active Stage Gauge Stations

- 1,195 Active Stage Gauge Stations
- 1,153 Breakpoint Gauges
- 42 Daily Manual Gauges

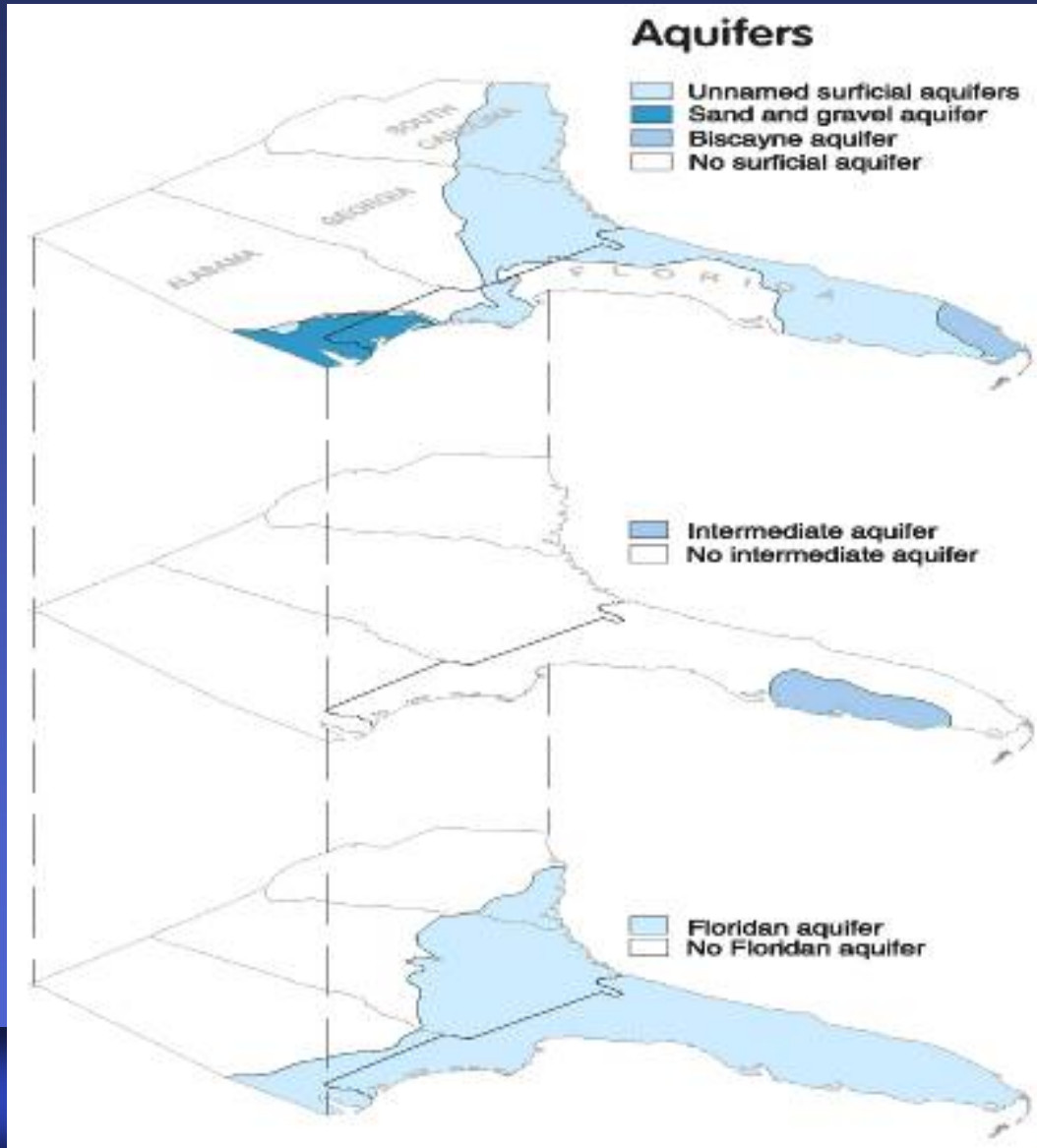




Active Flow Stations

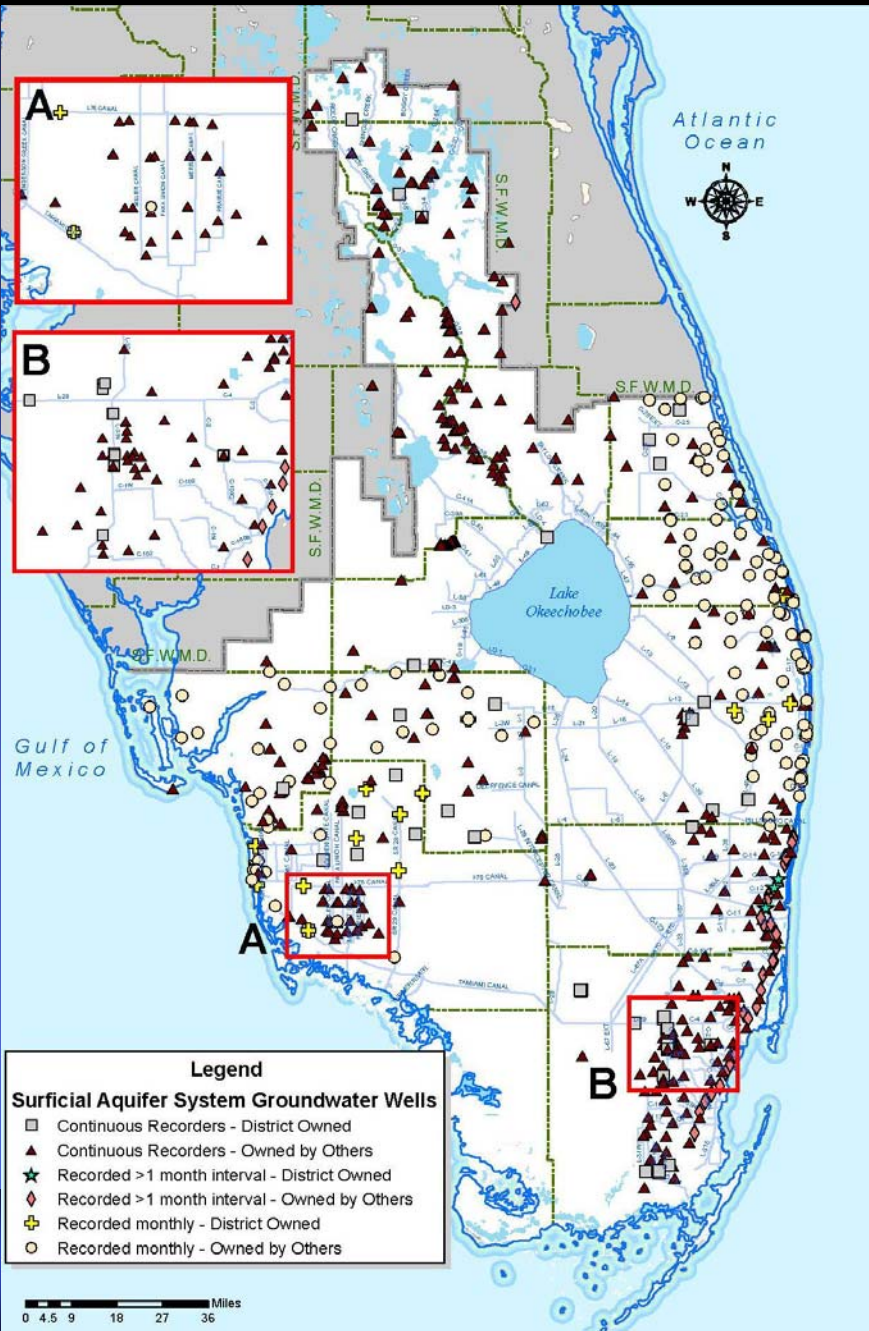
- 435 Active Flow Stations
 - 247 Culverts
 - 96 Spillways
 - 60 Pumps
 - 14 Weirs
 - 18 Index Velocity Meters

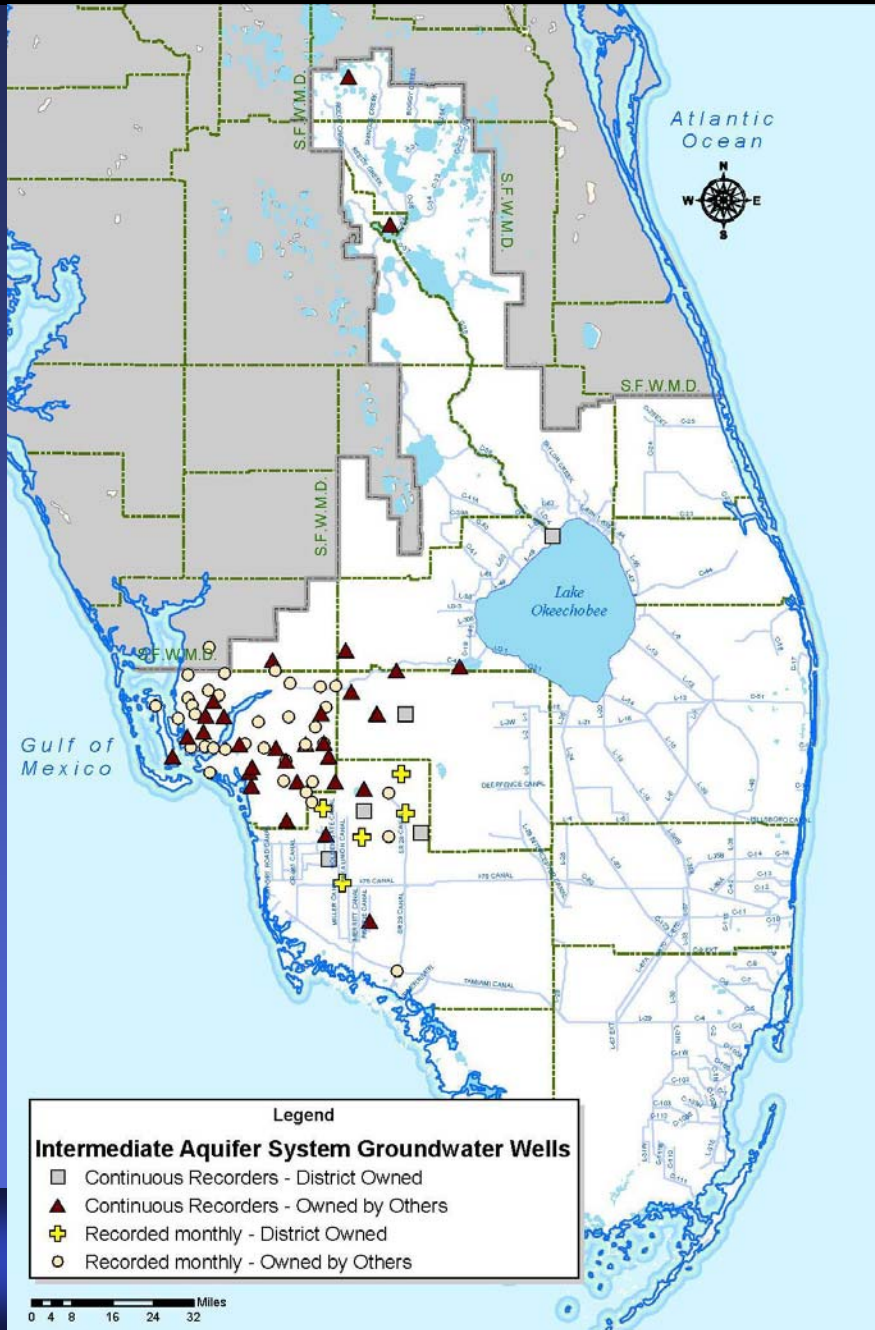
Groundwater Network



Active Groundwater Wells

- 975 Active Wells
 - 362 USGS Wells
 - 613 District Wells
- Surficial Aquifer
 - 743 Wells (76%)



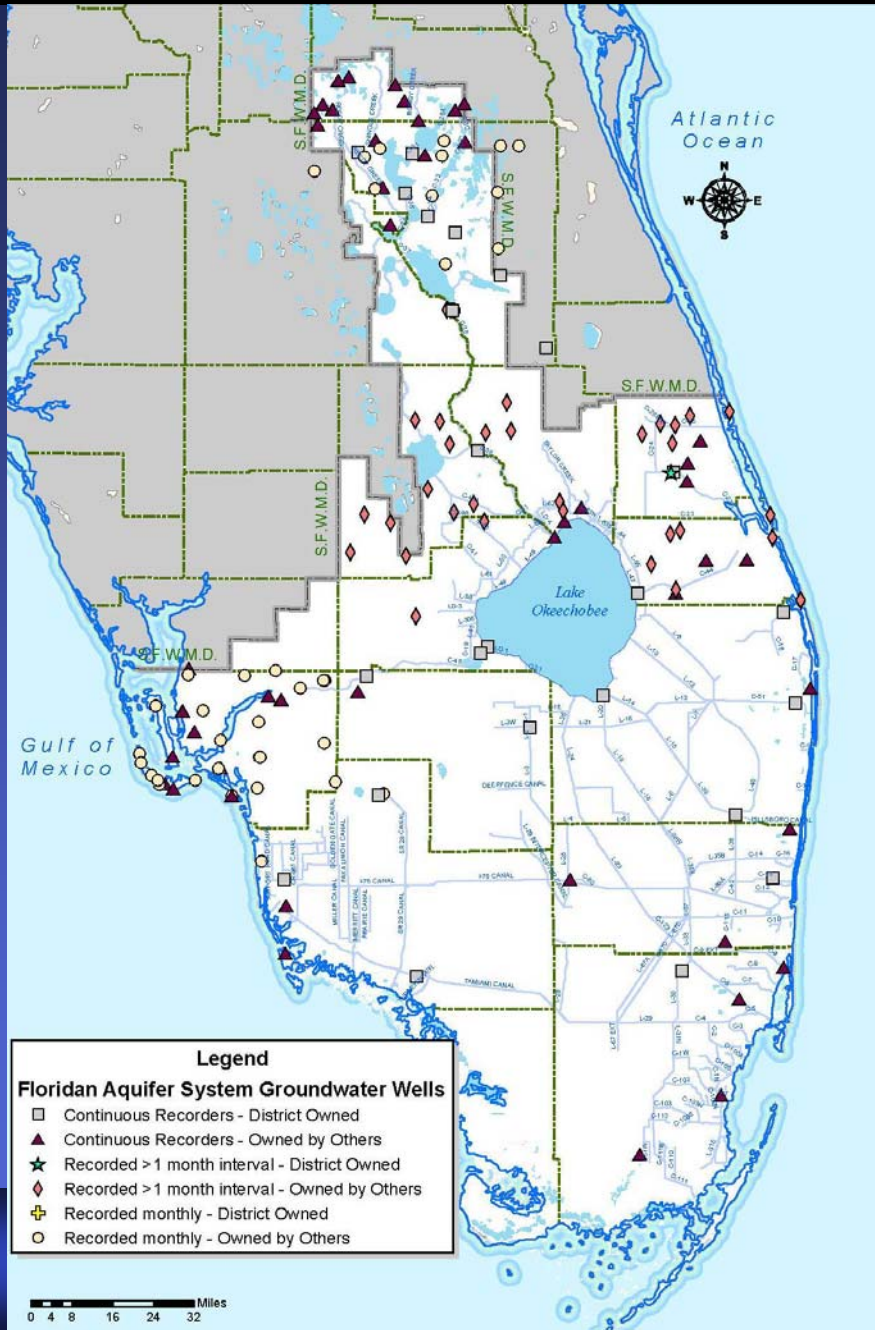


Active Groundwater Wells

- Intermediate Aquifer
- 82 Wells (8%)

Active Groundwater Wells

- Floridan Aquifer
- 150 Wells (15%)



Groundwater Network

Aquifer System	Aquifer Unit	Number of Wells by Frequency of Measurements			Total Number	% of Total
		Continuous	Monthly	>1 Month		
Surficial	Water Table					
	Biscayne	537	173	33	743	76
Intermediate	Lower Tamiami					
	Sandstone Mid-Hawthorn	40	42	N/A	82	8
Floridan	Lower Hawthorn					
	Suwannee Ocala Group	79	39	32	150	15
Total Number		656	254	65	975	100
% of Total		67	26	7	100	100

Hydrologic Data Management

Data Collection Process



Hydrologic Data Attributes

■ Data Type

- Meteorological, Rain, Stage, Gate Opening, Pump speed, Flow, GW Stage

■ Data Frequency

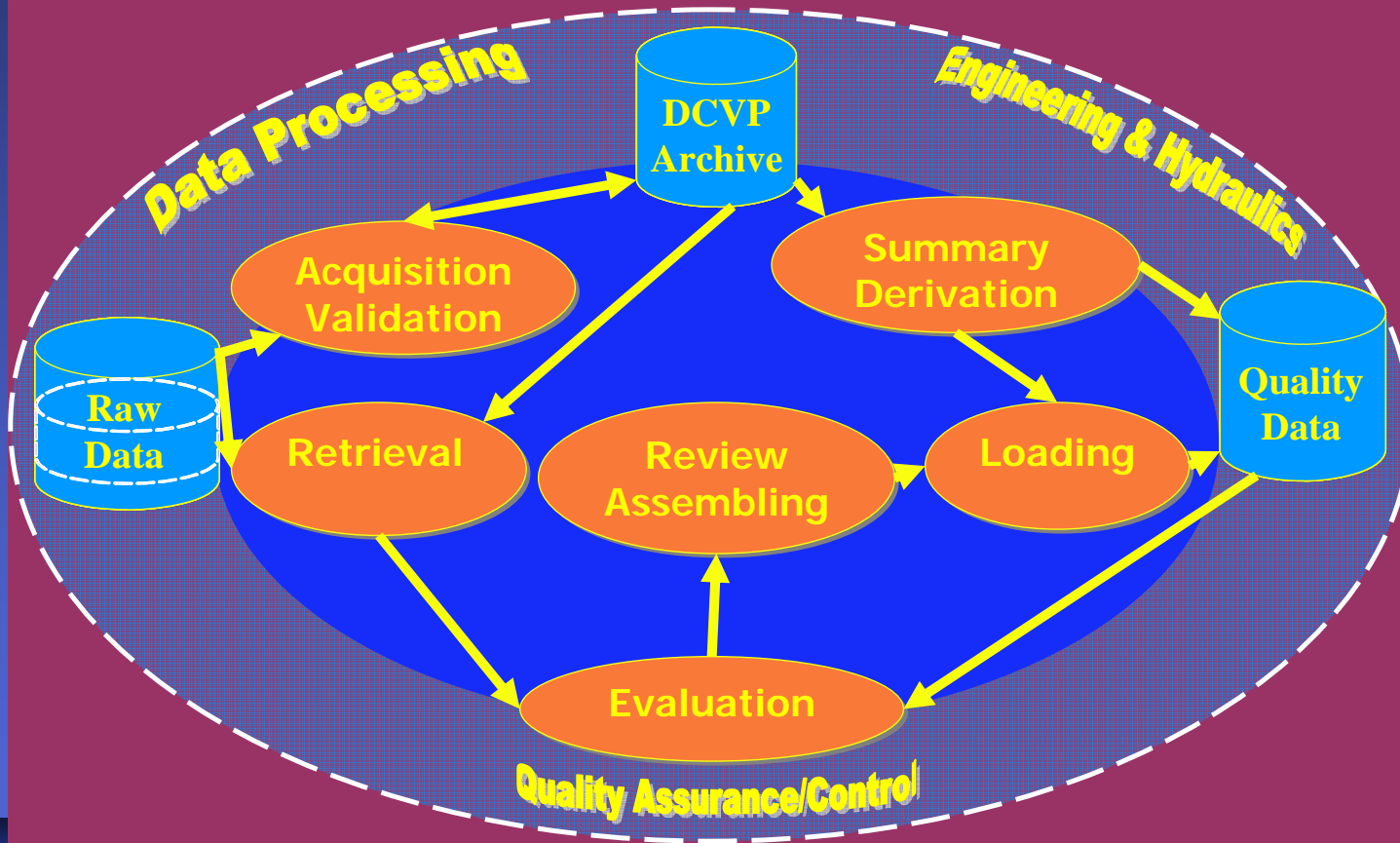
- Break point (5 to 15 minutes), Daily, Weekly, Monthly

■ Data Transmission

- Real Time, Near-Real-Time, Manual

Hydrologic Data Management

Hydro-Data Management Process



Hydro Data Retrieval System

The screenshot shows a Microsoft Internet Explorer browser window titled "DBHYDRO Browser - Microsoft Internet Explorer provided by SFWMD". The address bar contains the URL "http://sonar.sfwmd.gov:7777/pls/dbhydro_pro_plsql/show_dbkey_info.main_page". The browser's toolbar includes buttons for Back, Forward, Stop, Refresh, Print, Home, Search, Favorites, History, Mail, and Edit. Below the toolbar is a search bar with the Google logo and a search button. The main content area of the browser displays the "DBHYDRO Browser Menu" page. The menu is centered and features a blue horizontal bar at the top. Below the bar is a search box containing three checkboxes: "Surface Water Data", "Meteorological Data", and "Ground Water Data", followed by a "Submit" button. The menu items are listed below the search box, each as a blue underlined link: "Water Quality and Other Sample Data", "Hydrogeologic Data", "Access By Station Name", "Access By Site Name", "Real Time Data", "Data Validation and Processing Utilities", "Nutrient Load Data", "Radar-Based Rainfall Data", "Meta Data", and "Miscellaneous Items and Reports". At the bottom of the page, there is a footer with a blue horizontal bar and a list of links: "Main Menu | IWEB | XWEB | User's Guide | What's New | FAO | Guest Book | Comments?". The browser's status bar at the bottom right shows "Internet".

DBHYDRO Browser - Microsoft Internet Explorer provided by SFWMD

File Edit View Favorites Tools Help

Back Forward Stop Refresh Print Home Search Favorites History Mail Edit

Address http://sonar.sfwmd.gov:7777/pls/dbhydro_pro_plsql/show_dbkey_info.main_page

Google Search Popups okay Check AutoLink AutoFill Options

DBHYDRO Browser Menu

Surface Water Data Meteorological Data Ground Water Data

Submit

[Water Quality and Other Sample Data](#)

[Hydrogeologic Data](#)

[Access By Station Name](#)

[Access By Site Name](#)

[Real Time Data](#)

[Data Validation and Processing Utilities](#)

[Nutrient Load Data](#)

[Radar-Based Rainfall Data](#)

[Meta Data](#)

[Miscellaneous Items and Reports](#)

Main Menu | IWEB | XWEB | User's Guide | What's New | FAO | Guest Book | Comments?

Internet

Hydro Data Retrieval System

DBHYDRO Browser - Microsoft Internet Explorer provided by SFWMD

File Edit View Favorites Tools Help

Back Forward Stop Refresh Print Home Search Favorites History Mail Edit

Address http://sonar.sfwmd.gov:7777/pls/dbhydro_pro_plsql/show_dbkey_info.show_dbkeys_matched?v_js_flag=Y&v_category=SW&v_category=WEATHER&v_category=GW&v_dbkey=15034%2F0

Google Search Popups okay Check AutoLink AutoFill Options

Time Series Listing

Get Data	Dbkey	Station	Group	Data Type	Freq	Stat	Recorder	Agency	Start Date	End Date	Strata	County	Op Num	Latitude	Longitude	X COORD
<input type="checkbox"/>	15034	S6	S6	FLOW	DA	MEAN	PREF	WMD	01-JAN-1963	30-APR-2006	0	PAL		262820.263	802644.181	837525.021
<input type="checkbox"/>	OH521	S65CW	S65CW	ETP	DA	SUM	PREF	WMD	21-OCT-1992	30-APR-2006	0	OKE	0	272405.143	810653.226	618924.042
<input type="checkbox"/>	06684	S6_H	S6	STG	DA	MEAN	TELE	WMD	31-MAY-1985	06-JUL-2006	0	PAL	0	262819.164	802645.235	837429.585
<input type="checkbox"/>	RQ460	S6_R	S6	RAIN	BK	INST	TELE	WMD	18-MAR-1997	15-JUL-2006	0	PAL		262820.263	802644.181	837525.021

Get Data Clear All Check All

Query returned 4 records.

NEXRAD Data Retrieval System

Nexrad - Microsoft Internet Explorer provided by SFWMD

Default Map Hide Navigation Panel

Active Data Layer: Entire District

AHED: ArchHydro Enhanced Database Pilot Data

Display Layers:

- Entire District
- LOSA Water Basins
- AHED WC Catchments
- AHED Watersheds
- Rain Areas
- Basins
- County

Time Specific Data **Near Real Time Data**

Map Text

Start Date: 01 January 2007 00 00

End Date: 01 January 2007 00 00

[NEXRAD Text Based Interface](#) [About Nexrad Data](#) [Users Guide](#)

Man: 1314398.83 . 438724.26 Window: 606 . 409 Local intranet

NEXRAD Data - Tropical Storm Barry

Nexrad - Microsoft Internet Explorer provided by SFWMD

SFWMD NEXRAD Rain Grid Area Rainfall Estimates from 05/31/2007 00:15 to 06/01/2007 23:59

Hide Navigation Panel

Active Data Layer: NEXRAD Rain Grid

Display Layers:

- Entire District
- LOSA Water Basins
- AHED: ArcHydro Enhanced Database Pilot Data
- AHED WC Catchments
- AHED Watersheds
- Rain Areas
- Basins
- County

Refresh Map/Reset

Time Specific Data | **Near Real Time Data**

Map Text

Start Date: 31 May 2007 00 00

End Date: 02 June 2007 00 00

[NEXRAD Text Based Interface](#) [About Nexrad Data](#) [Users Guide](#)

Map: 1044529.45 , 651659.93 Window: 509 , 332 Local intranet

Data Analyses and Reporting





Good Afternoon Chandra

May 31, 2007

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 - » Reports & Plans
 - » Scientific & Technical Pubs
 - » Simulation Modeling
 - » Web Boards
- Weather & Water Conditions

Data & Documents



Environmental Database (DBHYDRO)

This is the SFWMD's corporate environmental database, storing hydrologic, meteorologic, hydrogeologic and water quality data. It is designed for use by skilled professionals and researchers. [more >](#)



Forms, Apps and Software

This web site uses a number of software plug-ins and applications. From here, you can download tools needed to view and use a variety of standard web formats. [more >](#)



GIS/Maps

Geographic Information Systems (GIS) provide a visual and spatial perspective of data about water resource systems. GIS can be interactive, and may include satellite pictures. [more >](#)



Local Government Assistance

Many SFWMD projects and programs



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What's New >>

South Florida Environmental Report
SFER

Get Adobe FREE software to view and print

South Florida Environmental Report

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Hydrologic Monitoring Network Report : Appendix 2-4

- Chandra Pathak
- John Raymond
- Quinlong Wu
- Madhav Pandey
- Zhiming Chen
- Taiye Sangoyomi
- Anthony Larenas

Questions and Answers



Thank you

