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# USGS Monitoring in WCA 1 (Loxahatchee National Wildlife Refuge)

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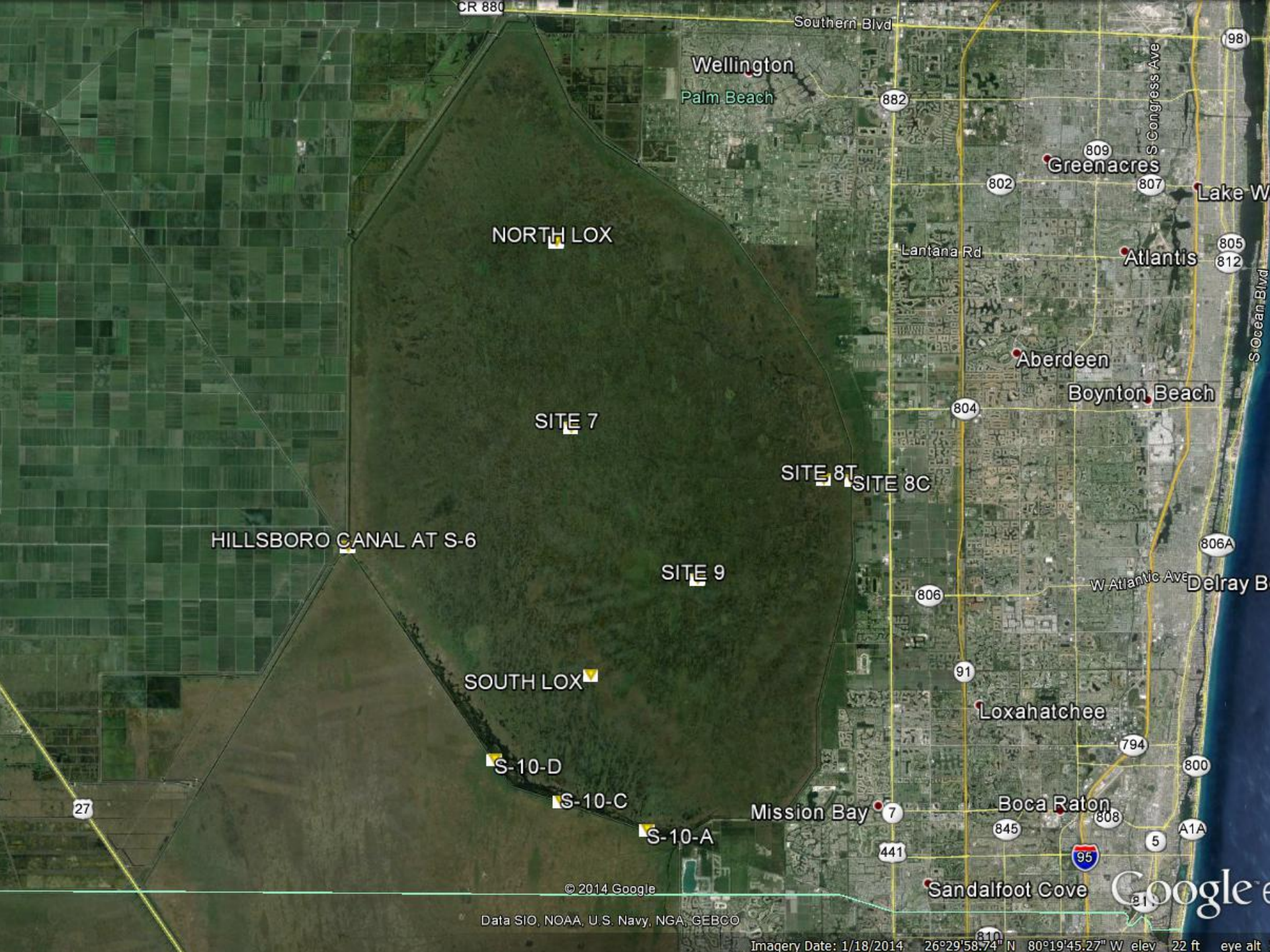
**Davie Office**
**Oct 21, 2014**

**U.S. Department of the Interior**
**U.S. Geological Survey**


CR 880
Southern Blvd
Wellington
Palm Beach
882
809
Greenacres
802
807
S Congress Ave
Lake W
NORTH LOX
Lantana Rd
Atlantis
805
812
S Ocean Blvd
Aberdeen
Boynton Beach
804
SITE 7
SITE 8T
SITE 8C
HILLSBORO CANAL AT S-6
806A
SITE 9
W Atlantic Ave
Delray B
806
91
SOUTH LOX
Loxahatchee
794
800
S-10-D
S-10-C
27
Mission Bay
7
Boca Raton
808
845
A1A
5
441
95
S-10-A
© 2014 Google
Sandalfoot Cove
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google
Imagery Date: 1/18/2014 26°29'58.74" N 80°19'45.27" W elev 22 ft eye alt

# Cooperators for stations in WCA 1

- USACE Streamgaging program
  - Site 7
  - Site 8C
  - Site 8T
  - Site 9
  - S-10-A, S-10-C, and S-10-D
- USACE EDEN project
  - North and South Loxahatchee
- SFWMD
  - Hillsboro Canal at S-6 near Shawano

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# Site 7

# Site 8C

# Site 9

# Site 7, 8C, 9 gages

- Continuous stage data
- Data recorded at 15-minute intervals and transmitted hourly
- Equipment
  - DCP – logger and telemetry
  - Water level sensor – shaft encoder/float/float tape systems inside of a stilling well
  - Reference gages inside and outside of well
- Initial data on NWISWeb only from DCP until EDL entered; EDL retrieved during site visit

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SITE 9
ID: CE8B20ZE
TX TIME = 00:52:00
INTERVAL = 01:00:00
CHANNEL = 161

# Site 7, 8C, 9 site visits

- Routine site inspections
  - Inspect operation of water level sensor
    - Compare sensor reading to reference gages
    - If necessary, reset the sensor
  - Download data file, or EDL, from DCP
- Optical levels every 3 years
  - Compare reference gages to benchmark or local reference marks
  - If necessary, reset reference gages and sensor

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# Data entry into NWIS

- Water level data
  - GOES data transmitted hourly – automatic entry
  - Downloaded log, or EDL, files – manual entry
  - Considered provisional until QA’d and approved
  - Data reviewed from inspection to inspection
- Site inspections
  - Water level sensor readings
  - Reference gage readings

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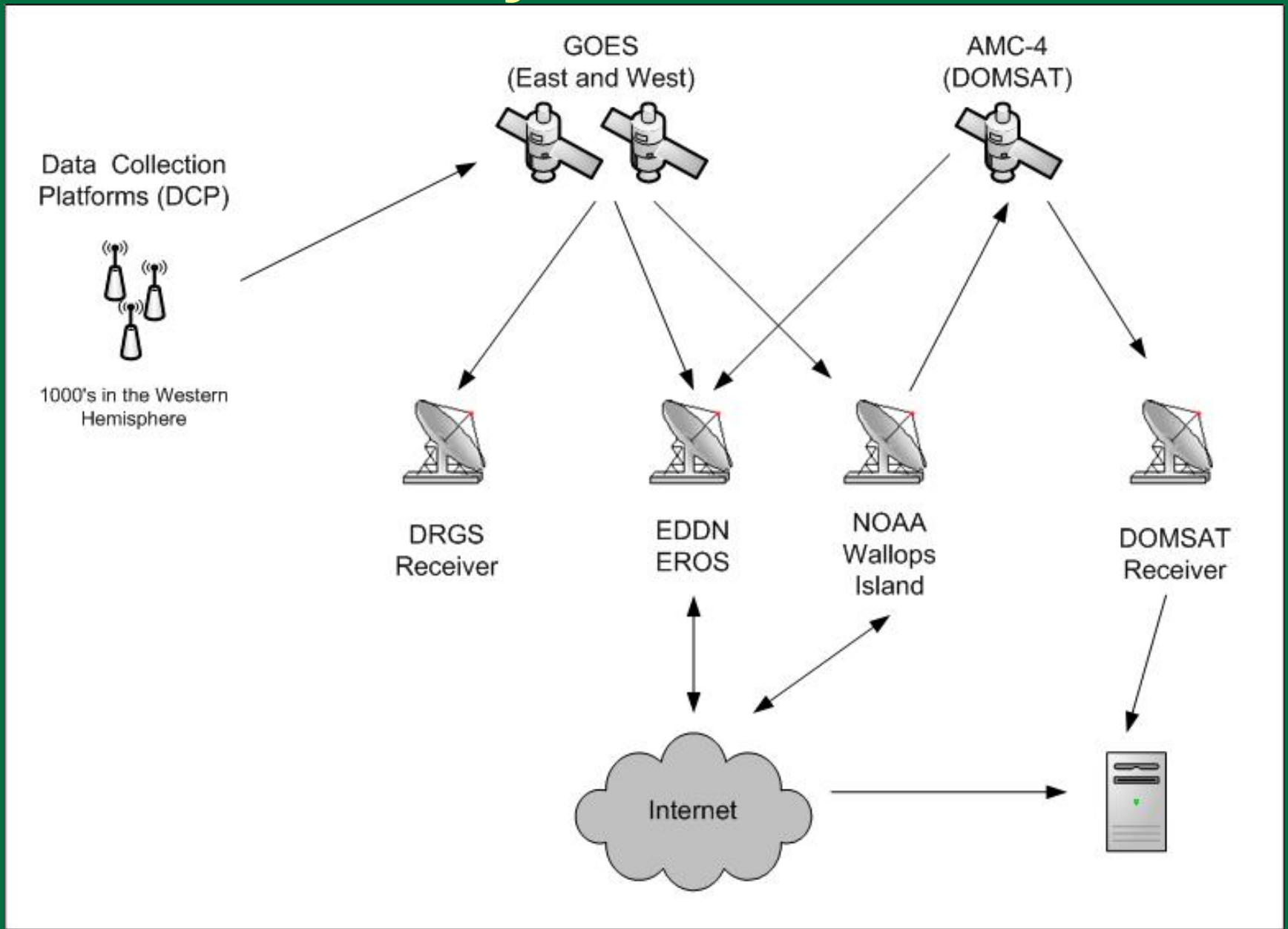
# Goes Telemetry



# Record processing

- Enter inspection info into NWIS and archive
- Enter EDL file into NWIS and archive
  - Fill in gaps in DCP record if possible
- Apply corrections to parts of record if necessary
- Check conducted by separate individual
- Approval

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# Access to data

- NWIS – storage of USGS data, accessible on NWISWeb
- EDEN – retrieves data from NWIS and other agencies
- DBHYDRO – retrieves data from NWIS and other agencies

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**National Water Information System: Web Interface**

USGS Water Resources (District Access)

Data Category: Current Conditions | Geographic Area: Florida | GO

**Click to hide News Bulletins**

- Try our new Mobile-friendly water data site from your mobile device!
- Full News

**Click to hide state-specific text**

Click Here for information on data reliability

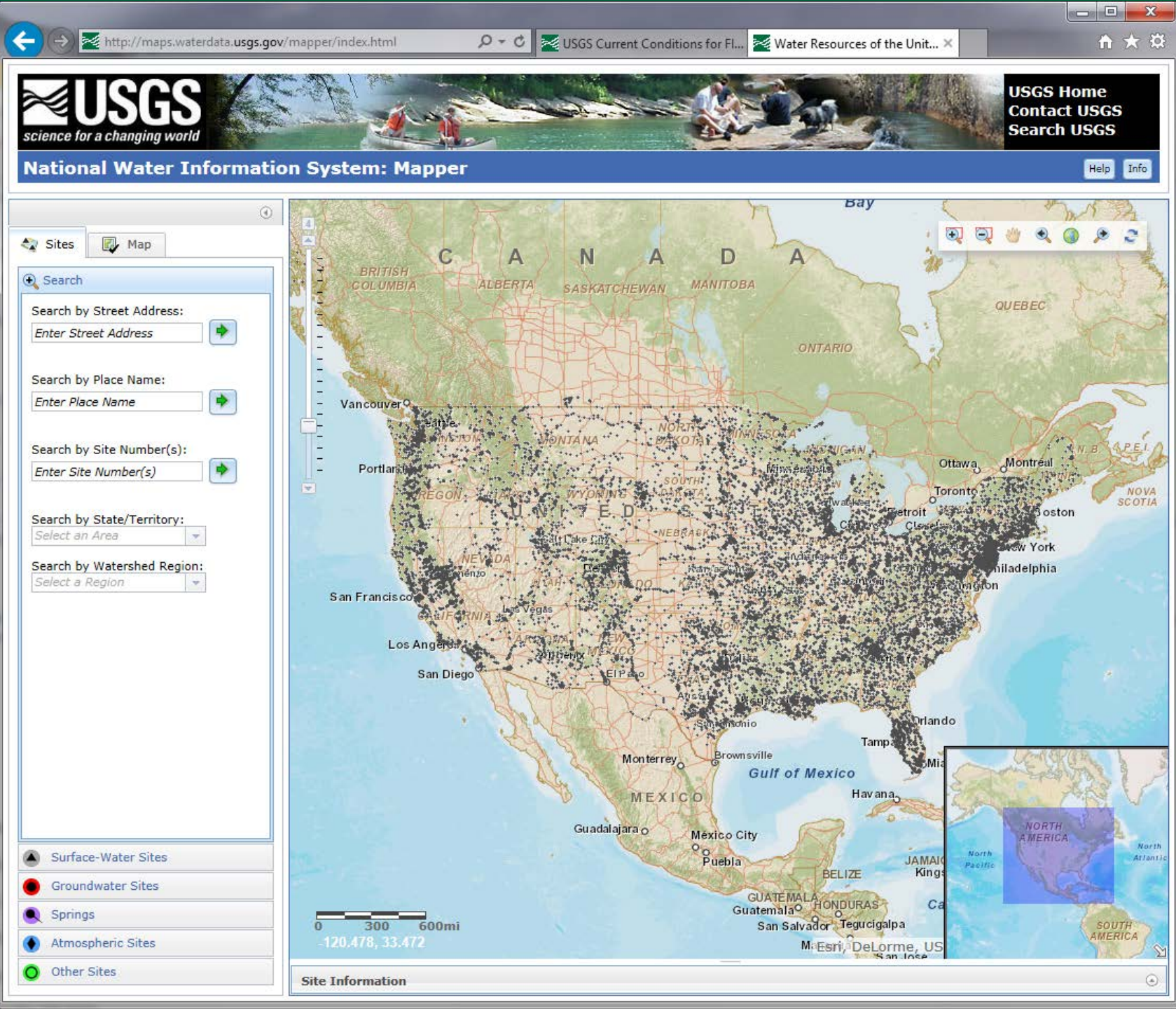
# Current Conditions for Florida: Streamflow -- 530 site(s) found

PROVISIONAL DATA SUBJECT TO REVISION

--- Predefined displays --- Florida Streamflow Table | Group table by County | Select sites by number or name | go | show sites on a map

Customize table to display other current-condition parameters

| Station Number | Station name | Date/Time | Gage height, feet | Dis-charge, ft3/s | Long-term median flow 10/20 |
|---|---|---|---|---|---|
| **Baldwin County, Alabama** | | | | | |
| 02376500 | PERDIDO RIVER AT BARRINEAU PARK, FL | 10/20 16:00 CDT | 1.60 | 283 | 350 |
| **Alachua County** | | | | | |
| 02321500 | SANTA FE RIVER AT WORTHINGTON SPRINGS, FLA. Tallahassee records | 10/20 17:15 EDT | 10.05 | 129 | 122 |
| **Baker County** | | | | | |


http://maps.waterdata.usgs.gov/mapper/index.html
USGS Current Conditions for Fl...
Water Resources of the Unit...
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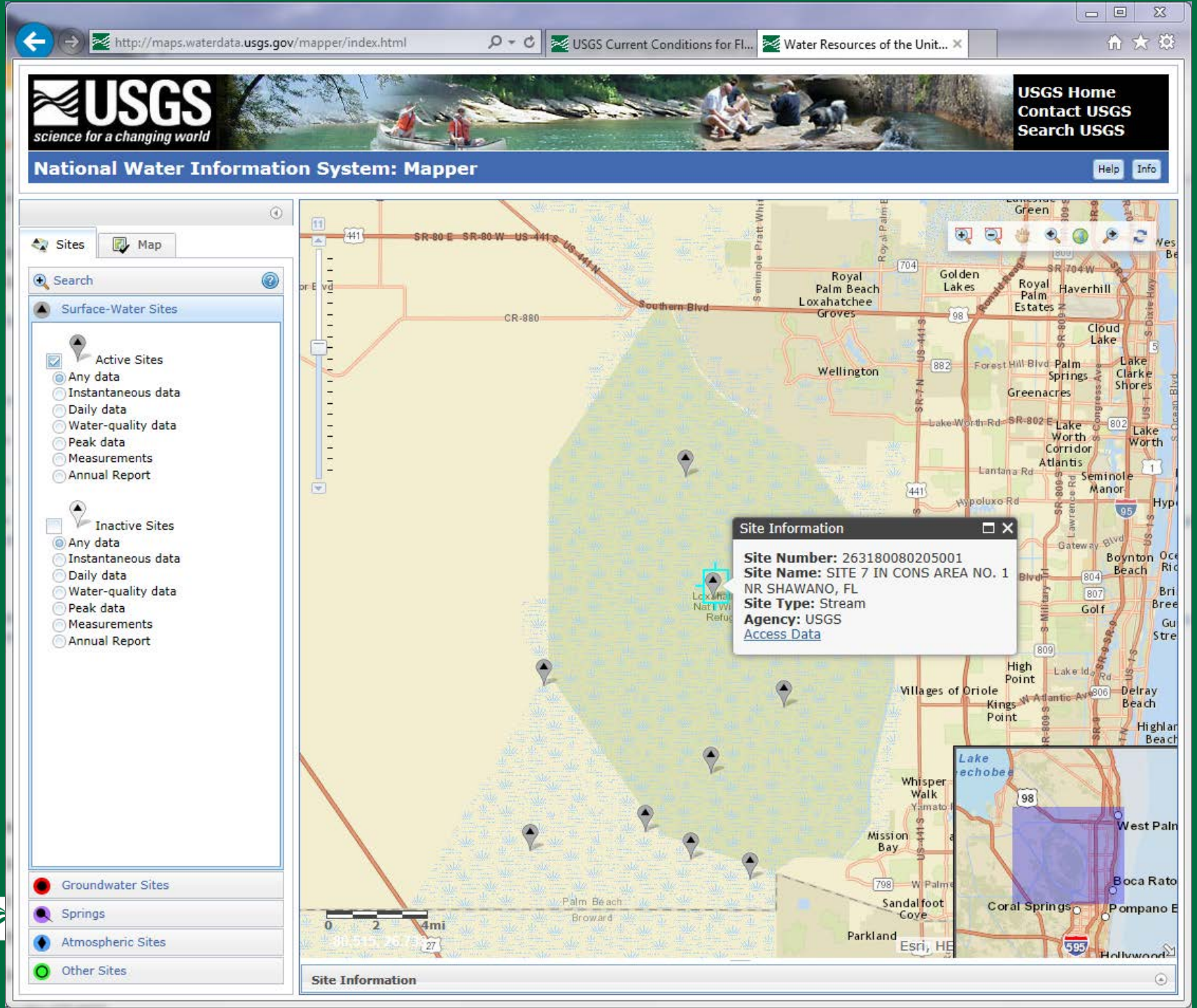
Map
Search
Search by Street Address:
Enter Street Address
Search by Place Name:
Enter Place Name
Search by Site Number(s):
Enter Site Number(s)
Search by State/Territory:
Select an Area
Search by Watershed Region:
Select a Region
Surface-Water Sites
Groundwater Sites
Springs
Atmospheric Sites
Other Sites
CANADA
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
UNITED STATES
MEXICO
Gulf of Mexico
Vancouver
Portland
San Francisco
Los Angeles
San Diego
Las Vegas
Phoenix
El Paso
Monterrey
Brownsville
Guadalajara
México City
Puebla
Havana
Ottawa
Montreal
Toronto
Detroit
Boston
New York
Philadelphia
Orlando
Tampa
BELIZE
GUATEMALA
Guatemala
HONDURAS
Tegucigalpa
San Salvador
0 300 600mi
-120.478, 33.472
Esri, DeLorme, US
NORTH AMERICA
SOUTH AMERICA
Site Information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Map
Search
Surface-Water Sites
Active Sites
Any data
Instantaneous data
Daily data
Water-quality data
Peak data
Measurements
Annual Report
Inactive Sites
Any data
Instantaneous data
Daily data
Water-quality data
Peak data
Measurements
Annual Report
Groundwater Sites
Springs
Atmospheric Sites
Other Sites
Site Information
Site Number: 263180080205001
Site Name: SITE 7 IN CONS AREA NO. 1 NR SHAWANO, FL
Site Type: Stream
Agency: USGS
Access Data
Royal Palm Beach
Loxahatchee Groves
Golden Lakes
Royal Palm Estates
Haverhill
Wellington
Greenacres
Palm Springs
Lake Worth Corridor
Atlantis
Seminole Manor
Boynton Beach
Golf
High Point
Villages of Oriole
Kings Point
Delray Beach
Whisper Walk
Mission Bay
Sandalfoot Cove
Parkland
Coral Springs
Pompano Beach
Boca Raton
West Palm
Southern Blvd
CR-880
Lake Worth Rd
Lantana Rd
Hypoluxo Rd
Forest Hill Blvd
Gateway Blvd
Palm Beach
Broward
0 2 4mi
Esri, HE
Site Information

# Problem 1: Issues affecting data

- GOES failure
  - Fill in gaps with EDL file after retrieved from site
- DCP issue (or power)
  - Fill in data from EDL file if available
  - Data lost if unavailable
  - Site visit required to fix
- Water level sensor issue
  - Encoder reset – apply offset based on best guess
    - We use sensor with battery back-up to minimize loss
  - Encoder failure – lost data
  - Creatures interfere with proper operation
  - Site visit required to fix

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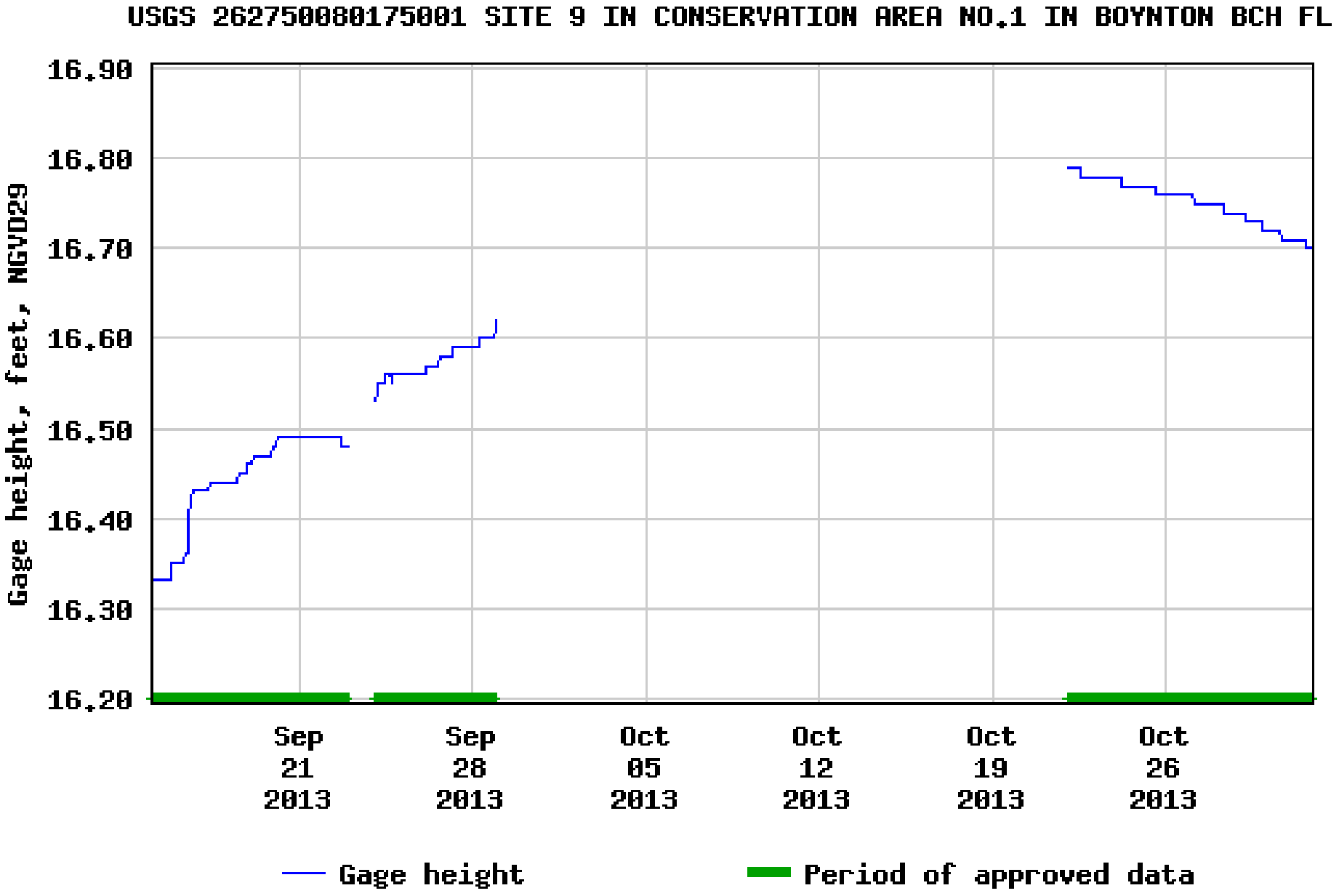
USGS 262750080175001 SITE 9 IN CONSERVATION AREA NO.1 IN BOYNTON BCH FL
Gage height, feet, NGVD29
16.90
16.80
16.70
16.60
16.50
16.40
16.30
16.20
Sep 21 2013
Sep 28 2013
Oct 05 2013
Oct 12 2013
Oct 19 2013
Oct 26 2013
Gage height
Period of approved data

# Problem 2: Gaps in record

**At issue is the missing data at Site 9 from Sept 29 to Oct 22**

- **USGS has traditionally only estimated record to determine discharge, if possible**
  - **Accuracy is poor, but unquantified**
- **USGS EDEN project currently fills gaps based on linear regression with best neighboring station; results stored in EDEN database, not NWIS**
- **DBHYDRO contains data from NWIS**
  - **Is revised record retrieved?**

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# Why not estimate water level record?

- Usually do not estimate stage only record:
  - Historically, our process is to use “eyeball” to estimate discharge record
  - In this area, stages are controlled by gates, and stages can change quickly due to operations
- EDEN has analyzed long term record to develop regression equations which are published in this report:

Estimation of Missing Water-Level Data for the Everglades Depth Estimation Network (EDEN), 2013 update

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# Suggestions for more complete record

- Use EDEN equations and remaining record to determine stages
- Install additional back-up sensors
- Replace encoders with self logging encoders
- Insert EDEN estimations into NWIS – increases time to complete and QA record

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