



NATIONAL  
ESTUARINE  
RESEARCH  
RESERVE  
SYSTEM



# NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM

## 10 Years of System-Wide Monitoring Program (SWMP) in the Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR)

### Water Quality & Weather Components

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## Overview

- What is SWMP? Goal?
- GTMNERR SWMP Sites
- GTMNERR SWMP Data



# What is System-Wide Monitoring Program (SWMP)?

- Long-term standardized monitoring program
- Established by NOAA conducted by each NERR
- Three monitoring components:
  - Abiotic indicators of water quality and weather
  - Biological monitoring
  - Watershed, habitat, and land use mapping



## SWMP Goal

- Establish a system-wide monitoring program that measures short-term variability and long-term change in estuaries
- Provide researchers, resource managers, educators, and other coastal decision makers with information on Reserve conditions
- Gain a better understanding of how human activities and natural events can change coastal ecosystems



## SWMP Abiotic – Water

- YSI 6600 EDS Datasondes
- Parameters Monitored
  - Temperature
  - Salinity
  - Dissolved Oxygen
  - pH
  - Depth
  - Turbidity
- Nutrients
  - Collected monthly
    - Nitrogen
    - Phosphorus
    - Chlorophyll a
    - Various other analytes





# GTMNERR SWMP Water Quality

- 4 permanent water quality monitoring stations
  - 15 minute intervals
  - 365 days a year



# GTMNERR SWMP Water Quality

Site: Pine Island

- Tolomato River
- Low Impact
- Northern most site within the Reserve



# GTMNERR SWMP Water Quality

## Site: San Sebastian

- Confluence of San Sebastian River and Matanzas River
- High Impact
- Located near St. Augustine Inlet
- Channel Marker 1





# GTMNERR SWMP Water Quality

Site: Fort Matanzas

- Matanzas River
- Medium Impact
- Channel Marker 75
- Located near Matanzas Inlet





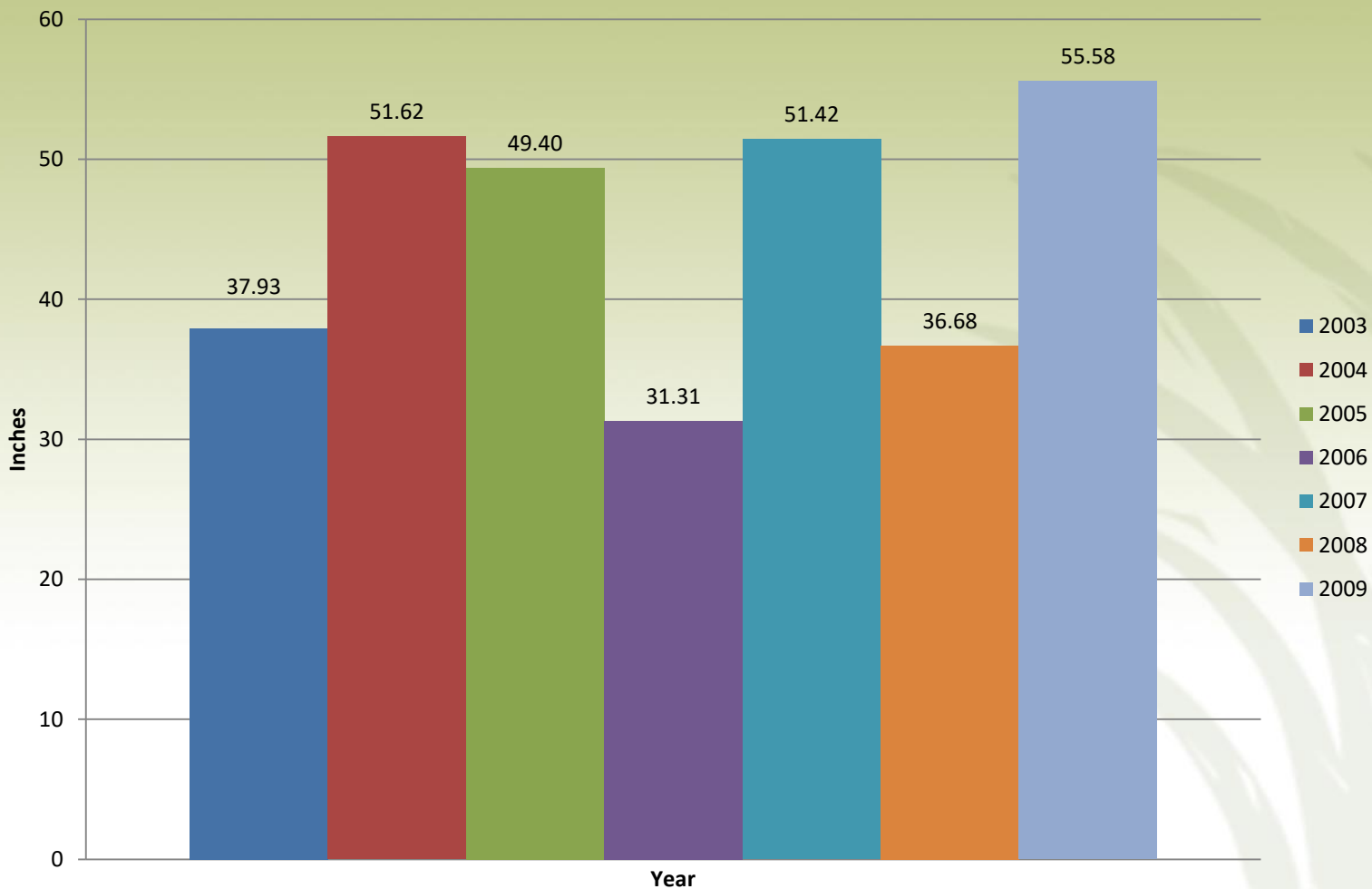


## SWMP Abiotic– Weather Station

- 1 permanent weather station
  - 15 minute intervals
  - 365 days a year
- Weather Parameters
  - Temperature
  - Wind Speed & Direction
  - Relative Humidity
  - Barometric Pressure
  - Rainfall
  - Photosynthetic Active Radiation (PAR)
    - Photosynthetic wavelengths used by plants
- Real-time data (Satellite Telemetry)
- Princess Place Preserve (Pellicer Creek)



## GTMNERR Weather Station: Annual Rainfall Total





# [Almost] 10 years of SWMP Data

- Water Quality
  - Physical Monitoring
    - Pine Island & Fort Matanzas – 2001
    - San Sebastian & Pellicer Creek – 2002
  - Nutrient Monitoring – Mid 2002
- Weather Station – Late 2002



# [Almost] 10 years of SWMP Data

- Data collected provides a strong baseline
  - A great point of reference for additional monitoring and/or research projects within the Reserve
- Data is like an accordion
  - It can be very broad or extremely detailed depending on what you are looking for
  - Short-term variability and long-term change



# Short-term Variability

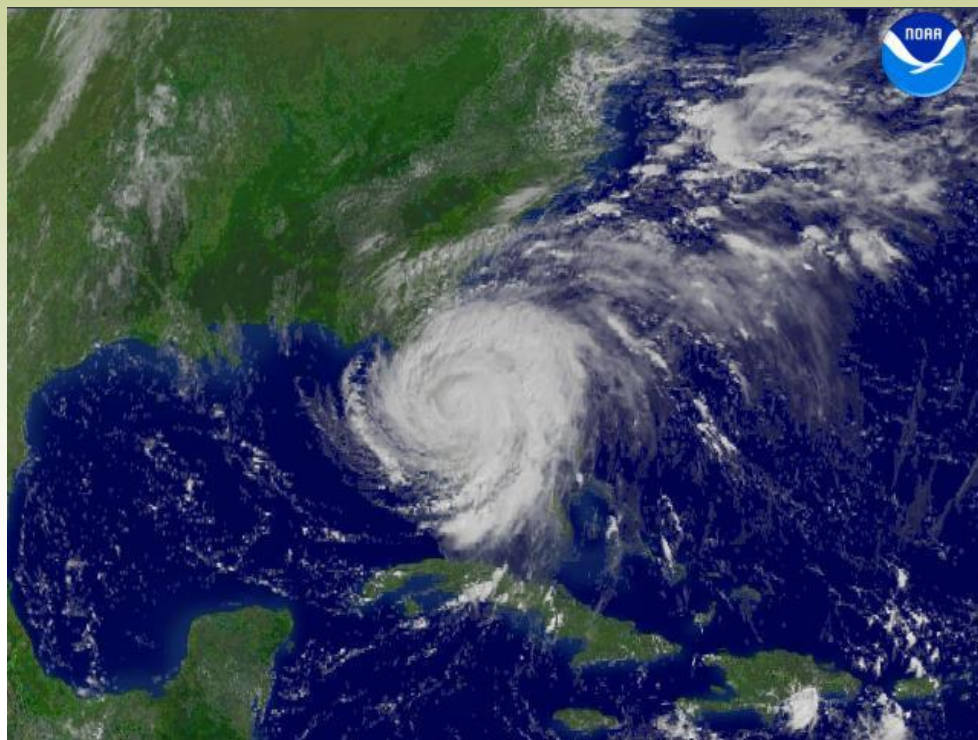
- 2004 Hurricanes: Frances, Jeanne, Charley
- 2008 Tropical Storm Fay
- 2009 No Name Low Pressure System



## Short-term Variability

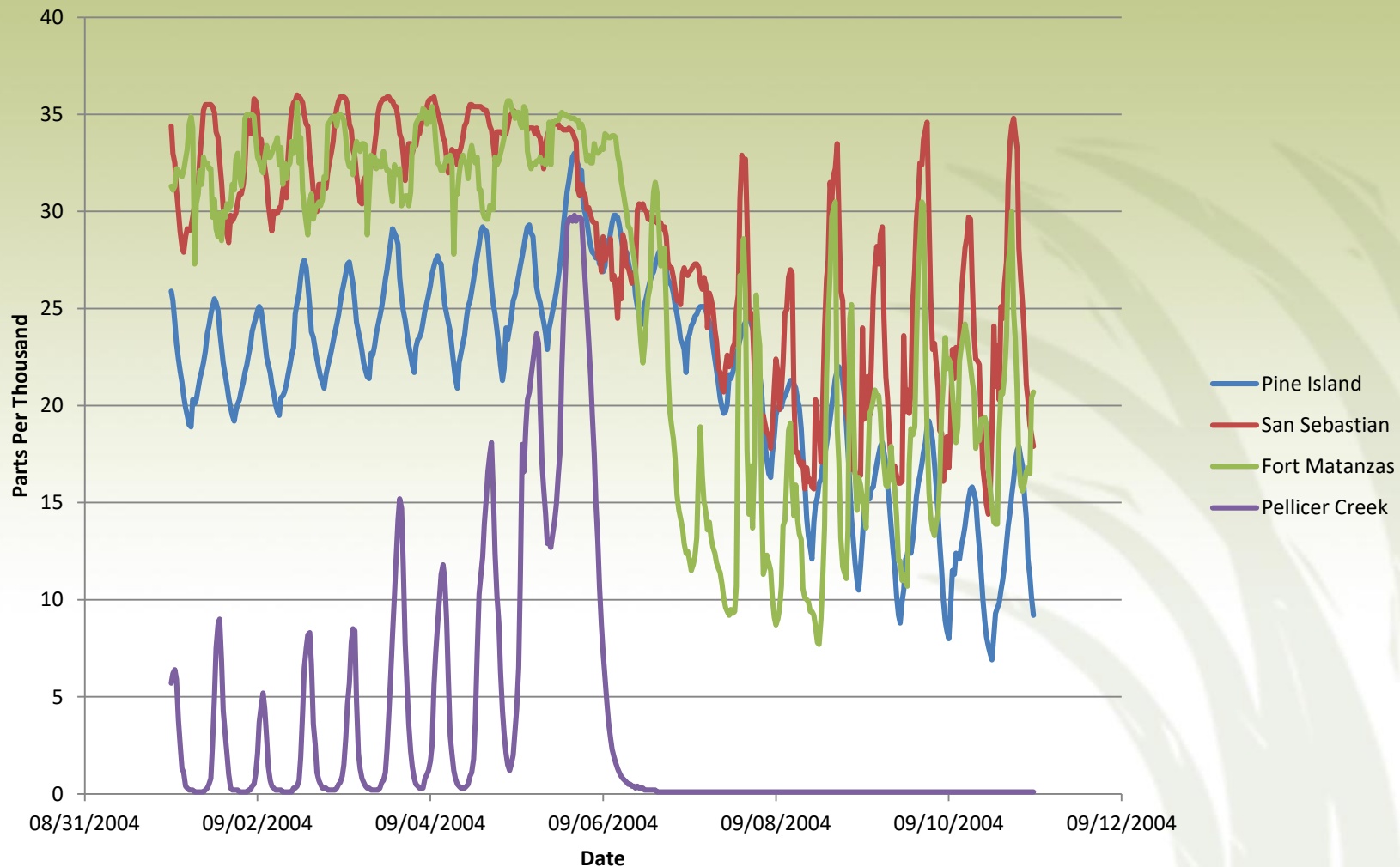
- Hurricane Frances
  - Aug. 25 – Sept. 10, 2004

Date	Rainfall (mm)
9/4/2004	5.080
9/5/2004	1.270
9/6/2004	173.230
9/7/2004	23.368
9/8/2004	3.556
Total	206.504 mm
	<b>8.13 inches</b>





## Hurricane Frances Salinity September 2004



# Short-term Variability

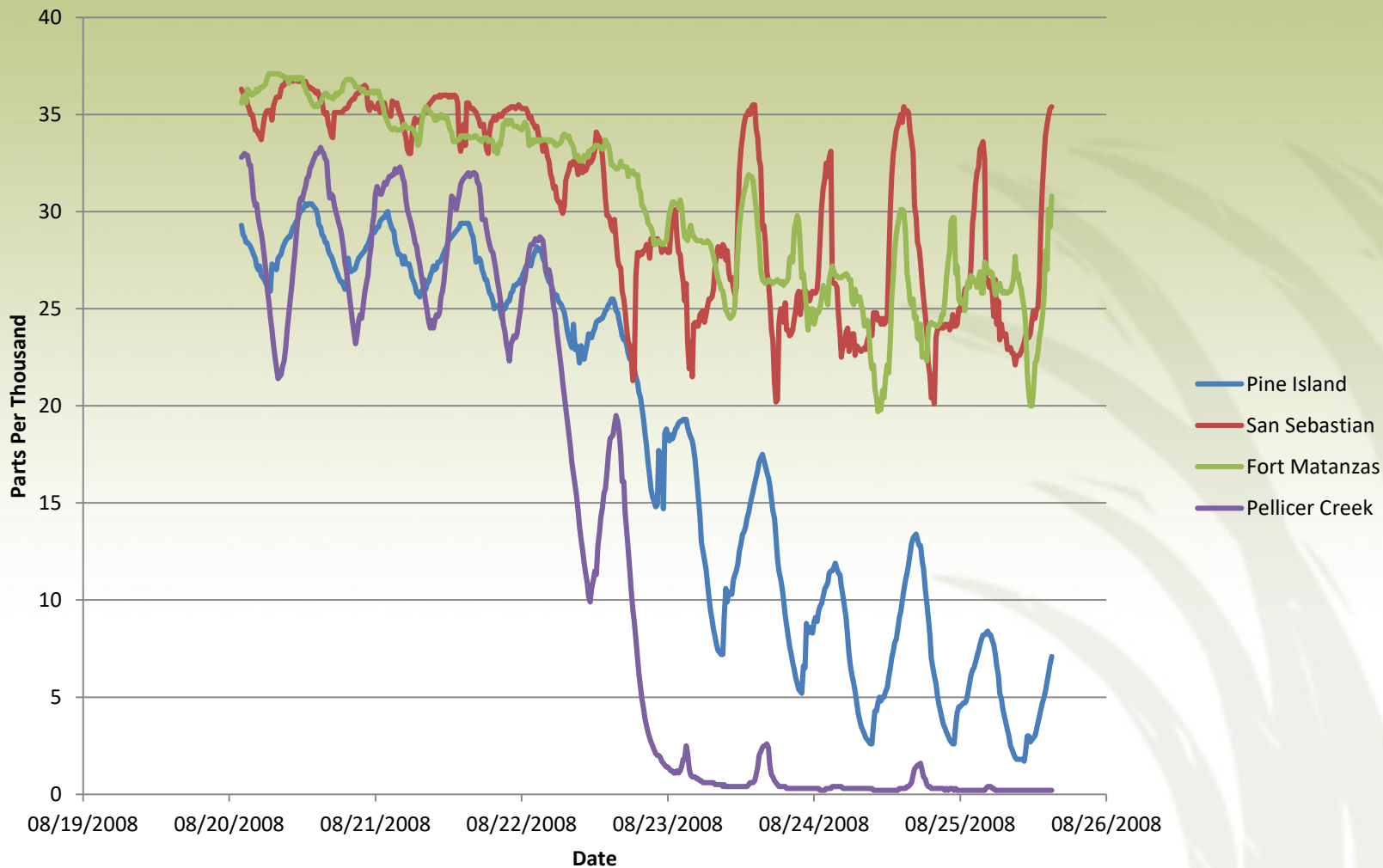
## ■ Tropical Storm Fay

- August 15 – 28, 2008

Date	Rainfall (mm)
8/20/2008	44.450
8/21/2008	33.782
8/22/2008	99.314
8/23/2008	4.826
8/24/2008	10.414
8/25/2008	5.588
Total Rainfall	198.374 mm
	<b>7.81 inches</b>



## Tropical Storm Fay Salinity



# Short-term Variability

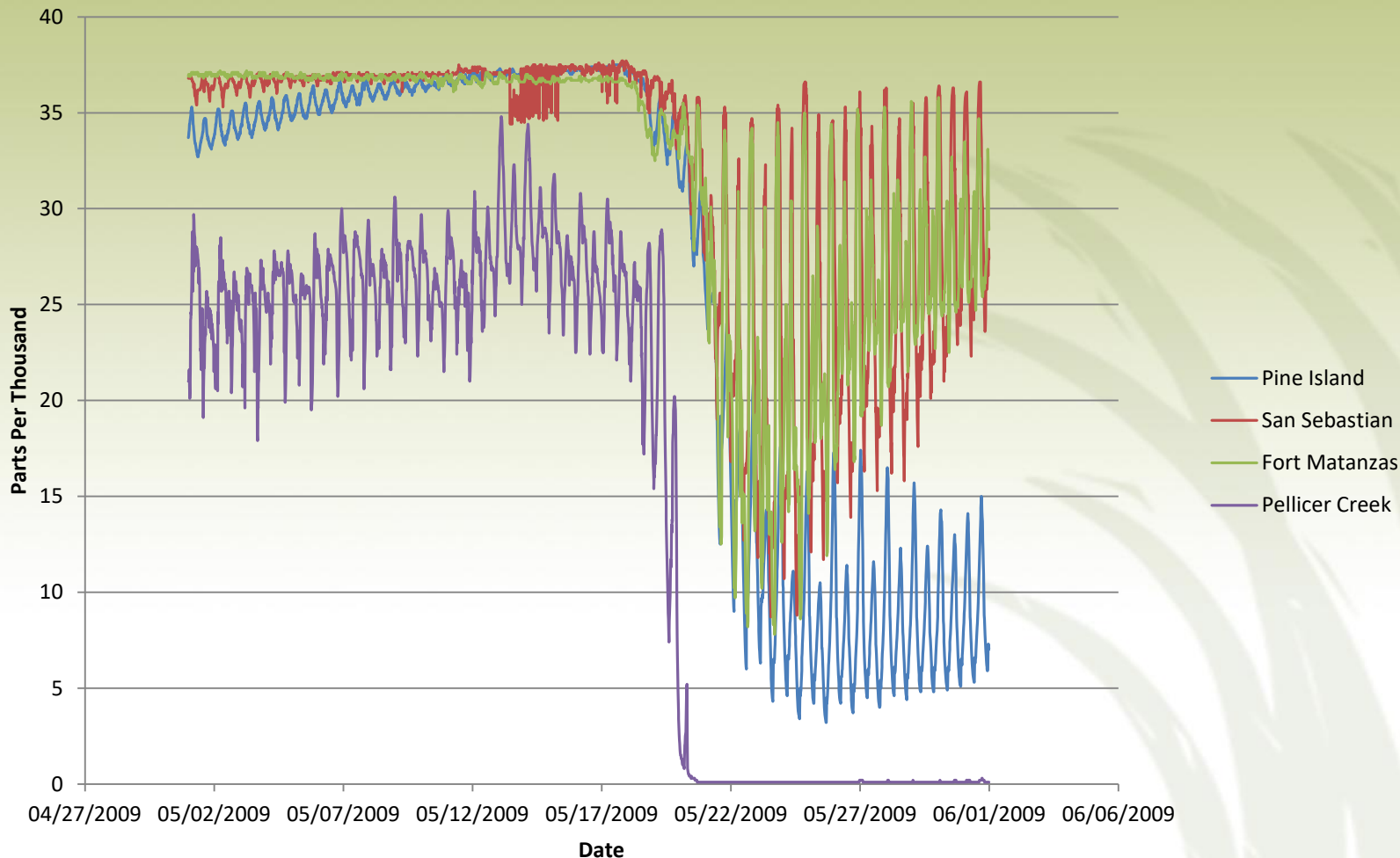
- No Name Low Pressure System
  - May 2009
  - Slow moving
  - A lot of Rain

Date	Rainfall (mm)
5/17/2009	24.384
5/18/2009	110.744
5/19/2009	60.198
5/20/2009	120.650
5/21/2009	63.754
5/22/2009	19.558
5/23/2009	13.716
Total Rainfall	434.594 mm
	<b>17.11 inches</b>

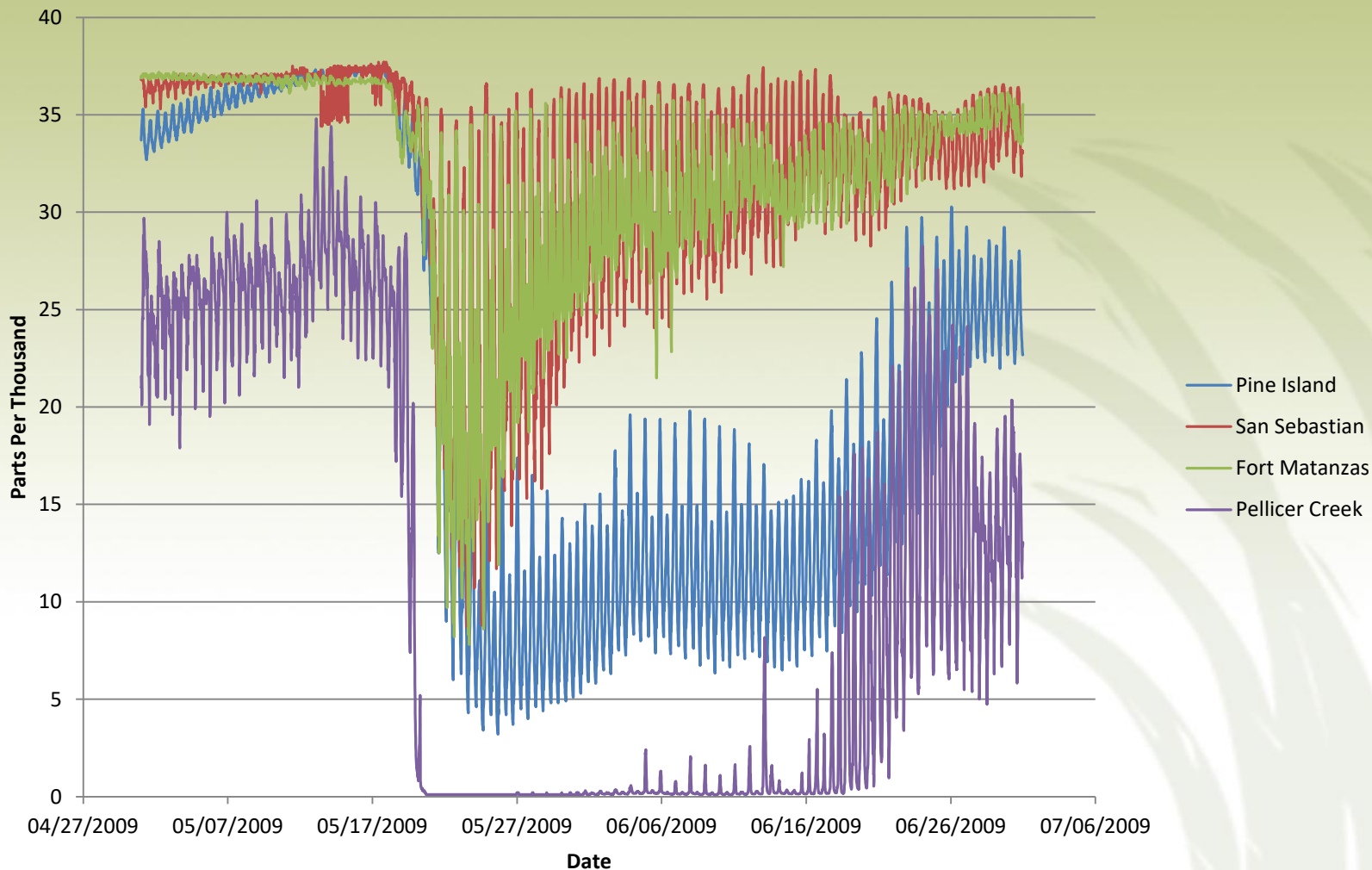




## Low Pressure System Salinity May 2009



## May-June 2009 Salinity



# Long-term Change

- Average Annual Temperature
- Average Annual Dissolved Oxygen Percent
- Average Annual Salinity

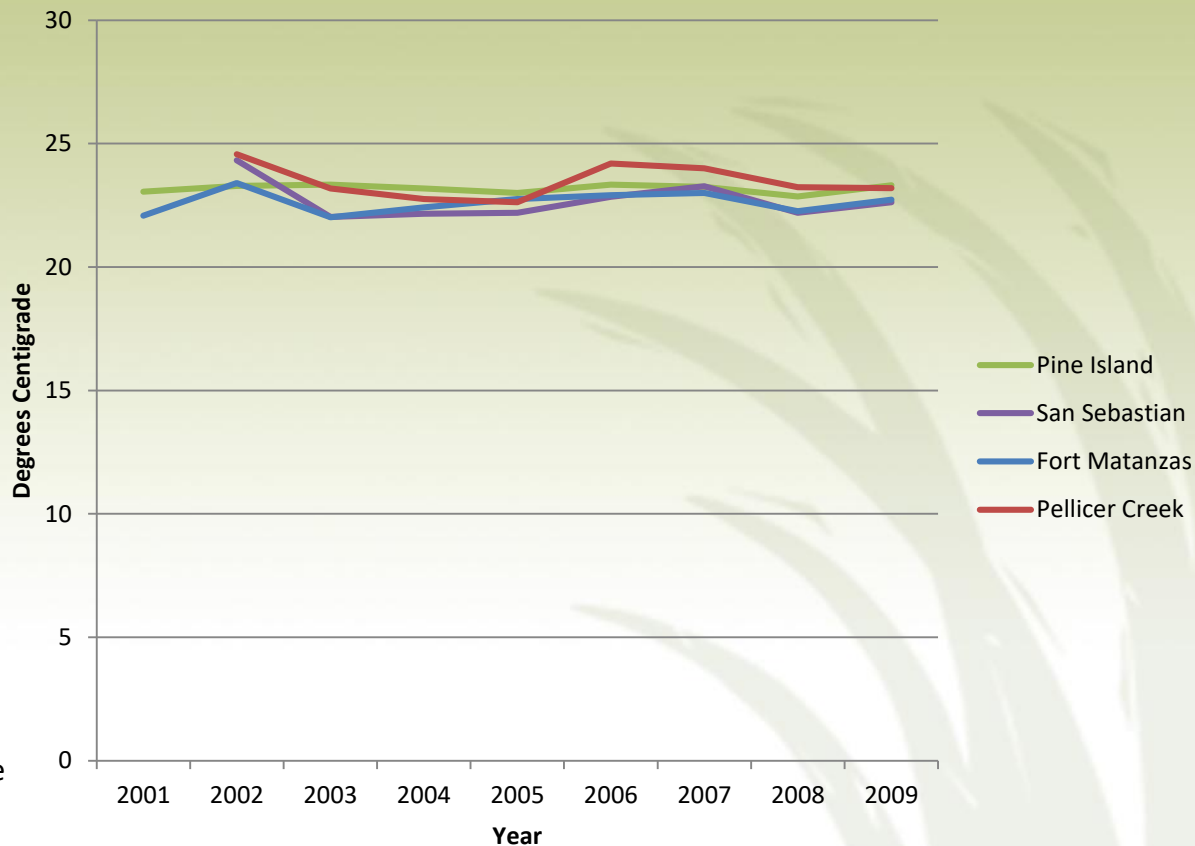


## Lifetime\* Average Temperature

Site	°C	°F
Pine Island	23.17	73.71
San Sebastian	22.68	72.82
Fort Matanzas	22.65	72.77
Pellicer Creek	23.49	74.28

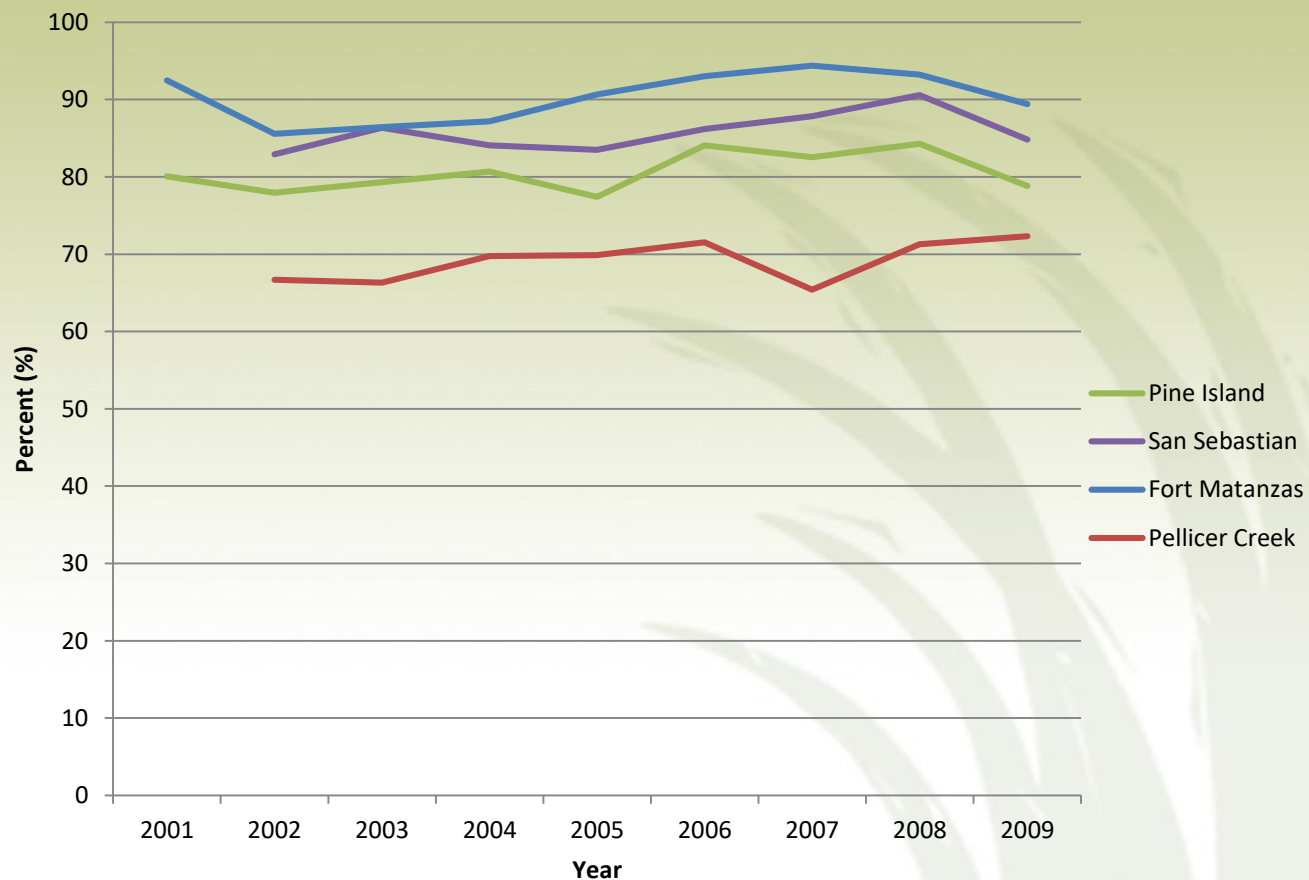
\*Every year GTMNERR collected data for that site

## Average Annual Temperature





## Average Annual Dissolved Oxygen



### Lifetime\* Average Dissolved Oxygen

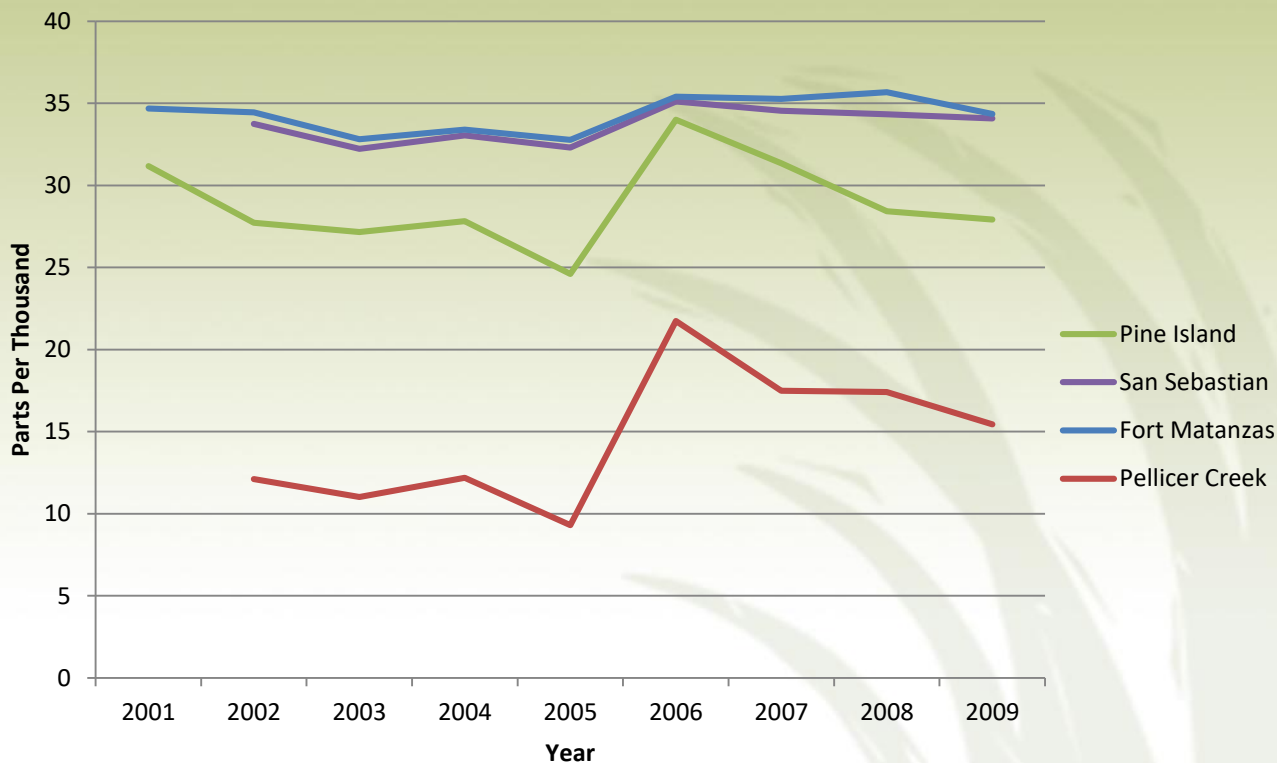
Site	%
Pine Island	80.57
San Sebastian	85.78
Fort Matanzas	90.26
Pellicer Creek	69.15

\*Every year GTMNERR collected data for that site



Lifetime* Average Salinity	
Site	ppt
Pine Island	28.97
San Sebastian	33.83
Fort Matanzas	34.48
Pellicer Creek	15.48

## Average Annual Salinity



\*Every year GTMNERR collected data for that site



## What does the data tell us?

- When changes occur in the estuary
  - Short-term
  - Long-term



## How is the data managed?

- GTMNERR reviews data biweekly, quarterly, and annually based on NERRS Standard Operating Procedures
- Datasets are also reviewed by the NERRS Centralized Data Management Office





## Where can I get the data?

- GTMNERR data download
  - [www.nerrsdata.org](http://www.nerrsdata.org)



## What does all of this mean?

- We have established a comprehensive baseline of data
- 9-10 years of data seems like a long time but it really isn't when establishing long-term trends
- Data great for investigating short-term variability (storms, drought, etc.)
- GTMNERR data coupled with partnering agencies historic data can track health of estuary over time



## Is our water quality good?

- Physical data alone can not answer that question
- Physical data are useful screening indicators of potential problems
- The physical and chemical data coupled with biological monitoring (ex. oysters or fish) can all be used to determine the health of the estuary



## What next?

- Continue water quality and weather monitoring
  - Continue analyzing data
- Enhance our Biological monitoring efforts
  - Long-term oyster monitoring and/or fisheries monitoring
- Facilitate or conduct research within the Reserve that answers questions pertaining to the health of the estuary





# Contact Information

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Data Download (multiple sites)

[www.nerrsdata.org](http://www.nerrsdata.org)

[www.estuaries.gov](http://www.estuaries.gov)



## Questions?

*Now that's a  
long-term change!*



Century Plant

