

# Guana River Marsh Aquatic Preserve

## SEACAR Habitat Analyses

Last compiled on 08 April, 2024

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## Threshold Filtering

Threshold filters, following the guidance of Florida Department of Environmental Protection's (*FDEP*) Division of Environmental Assessment and Restoration (*DEAR*) are used to exclude specific results values from the SEACAR Analysis. Based on the threshold filters, Quality Assurance / Quality Control (*QAQC*) Flags are inserted into the *SEACAR\_QAQCFlagCode* and *SEACAR\_QAQC\_Description* columns of the export data. The *Include* column indicates whether the *QAQC* Flag will also indicate that data are excluded from analysis. No data are excluded from the data export, but the analysis scripts can use the *Include* column to exclude data (1 to include, 0 to exclude).

Table 1: Continuous Water Quality threshold values

<i>Parameter Name</i>	<i>Units</i>	<i>Low Threshold</i>	<i>High Threshold</i>	<i>Sensor Type</i>
Dissolved Oxygen	mg/L	0	50	YSI EXOs
Dissolved Oxygen	mg/L	0	50	Analysis Only - 2022-04-04
Dissolved Oxygen	mg/L	0	50	6600 Series
Salinity	ppt	0	70	6600 Series
Salinity	ppt	0	70	YSI EXOs
Salinity	ppt	0	70	Analysis Only - 2022-04-04
Water Temperature	Degrees C	-5	45	YSI EXOs
Water Temperature	Degrees C	-5	45	Analysis Only - 2022-04-04
Water Temperature	Degrees C	-5	45	6600 Series
pH	pH	2	14	Analysis Only - 2022-04-04
pH	pH	2	14	6600 Series
pH	pH	2	14	YSI EXOs
Dissolved Oxygen Saturation	%	0	500	YSI EXOs
Dissolved Oxygen Saturation	%	0	500	6600 Series
Dissolved Oxygen Saturation	%	0	500	Analysis Only - 2022-04-04
Specific Conductivity	mS/cm	0	100	6600 Series
Specific Conductivity	mS/cm	0	200	YSI EXOs
Turbidity	NTU	0	4000	YSI EXOs
Turbidity	NTU	0	1000	6600 Series
Turbidity	NTU	0	4000	Analysis Only - 2022-04-04

Table 2: Discrete Water Quality threshold values

<i>Parameter Name</i>	<i>Units</i>	<i>Low Threshold</i>	<i>High Threshold</i>
Dissolved Oxygen	mg/L	0.000001	22
Salinity	ppt	0	70
Water Temperature	Degrees C	3	40
pH		2	13
Dissolved Oxygen Saturation	%	0.000001	310
Specific Conductivity	mS/cm	0.005000001	100
Turbidity	NTU	0	-
Total Suspended Solids (TSS)	mg/L	0	-
Chlorophyll a uncorrected for pheophytin	ug/L	0	-
Chlorophyll a corrected for pheophytin	ug/L	0	-
Secchi Depth	m	0.000001	50
Light Extinction Coefficient	$m^{-1}$	0	-
Colored dissolved organic matter, CDOM	PCU	0	-
Fluorescent dissolved organic matter, FDOM	QSE	0	-
Total Nitrogen	mg/L	0	-
Total Kjeldahl Nitrogen TKN	mg/L	0	-
NO <sub>2</sub> +3 Filtered	mg/L	0	-
NH <sub>4</sub> Filtered	mg/L	0	-
Total Phosphorus	mg/L	0	-

Parameter Name	Units	Low Threshold	High Threshold
PO4 Filtered	mg/L	0	-
Ammonia- Un-ionized (NH3)	mg/L	0	-
Nitrate (N)	mg/L	0	-
Nitrite (N)	mg/L	0	-
Nitrogen, organic	mg/L	0	-

Table 3: Quality Assurance Flags inserted based on threshold checks listed in Table 1 & 2

SEACAR QAQC Description	Include	SEACAR QAQCFlagCode
Exceeds Maximum threshold. Not verified in raw data	No	2Q
Exceeds Maximum threshold. Verified in raw data	No	3Q
Below Minimum threshold. Not verified in raw data	No	4Q
Below Minimum threshold. Verified in raw data	No	5Q
Within threshold tolerance	Yes	6Q
No defined thresholds for this parameter	Yes	7Q

## Value Qualifiers

Value qualifier codes included within the data are used to exclude certain results from the analysis. The data are retained in the data export files, but the analysis uses the *Include* column to filter the results.

### STORET and WIN value qualifier codes

Value qualifier codes from *STORET* and *WIN* data are examined with the database and used to populate the *Include* column in data exports.

Table 4: Value Qualifier codes excluded from analysis

Qualifier Source	Value Qualifier	Include	MDL	Description
STORET-WIN	H	No	0	Value based on field kit determination; results may not be accurate
STORET-WIN	J	No	0	Estimated value
STORET-WIN	V	No	0	Analyte was detected at or above method detection limit
STORET-WIN	Y	No	0	Lab analysis from an improperly preserved sample; data may be inaccurate

### Discrete Water Quality Value Qualifiers

The following value qualifiers are highlighted in the Discrete Water Quality section of this report. An exception is made for **Program 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network** and data flagged with Value Qualifier **H** are included for this program only.

**H** - Value based on field kit determination; results may not be accurate. This code shall be used if a field screening test (e.g., field gas chromatograph data, immunoassay, or vendor-supplied field kit) was used to generate the value and the field kit or method has not been recognized by the Department as equivalent to laboratory methods.

**I** - The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantitation limit.

**Q** - Sample held beyond the accepted holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.

**S** - Secchi disk visible to bottom of waterbody. The value reported is the depth of the waterbody at the location of the Secchi disk measurement.

**U** - Indicates that the compound was analyzed for but not detected. This symbol shall be used to indicate that the specified component was not detected. The value associated with the qualifier shall be the laboratory method detection limit. Unless requested by the client, less than the method detection limit values shall not be reported.

### Systemwide Monitoring Program (SWMP) value qualifier codes

Value qualifier codes from the *SWMP* continuous program are examined with the database and used to populate the *Include* column in data exports. *SWMP* Qualifier Codes are indicated by *QualifierSource=SWMP*.

Table 5: SWMP Value Qualifier codes

<i>Qualifier Source</i>	<i>Value Qualifier</i>	<i>Include</i>	<i>Description</i>
SWMP	-1	Yes	Optional parameter not collected
SWMP	-2	No	Missing data
SWMP	-3	No	Data rejected due to QA/QC
SWMP	-4	No	Outside low sensor range
SWMP	-5	No	Outside high sensor range
SWMP	0	Yes	Passed initial QA/QC checks
SWMP	1	No	Suspect data
SWMP	2	Yes	Reserved for future use
SWMP	3	Yes	Calculated data: non-vented depth/level sensor correction for changes in barometric pressure
SWMP	4	Yes	Historical: Pre-auto QA/QC
SWMP	5	Yes	Corrected data

## Water Column

The water column habitat extends from the surface of all water bodies to the bottom sediments and encompasses the different features found in the water at different depths (National Oceanographic Center, 2016). The water column habitat must be viewed in relation to its interconnectedness with other habitats. A healthy water column is an integral component in ensuring a healthy marine and coastal ecosystem. Having a flourishing marine and coastal ecosystem in Florida is necessary to support a strong economy. The health of the water column is dependent upon factors as diverse as land use (e.g., agriculture, mining, forestry practices); human population growth; emissions, (e.g., power plants, automobiles, wastewater); climate (e.g., rainfall, temperature, winds and currents); and decadal trends (e.g., El Niño/La Niña, Atlantic Multidecadal Oscillation, climate change).

The water column is composed of various physical, chemical and biological features, and only a small number of them are adequately monitored. Features of the water column that are monitored are used as indicators of the water column health and help assess the status of other habitats. These indicators include nutrient concentrations (nitrogen and phosphorus); water quality (dissolved oxygen, temperature, salinity and pH); water clarity (Secchi depth, turbidity, chlorophyll-a and colored dissolved organic matter); and nekton (fish, macroinvertebrates and megafauna).

## Seasonal Kendall-Tau Analysis

Indicators must have a minimum of five to ten years, depending on the habitat, of data within the geographic range of the analysis to be included in the analysis. Ten years of data are required for discrete parameters, and five years of data are required for continuous parameters. If there are insufficient years of data, the number of years of data available will be noted and labeled as “insufficient data to conduct analysis”. Further, for the preferred Seasonal Kendall-Tau test, there must be data from at least two months in common across at least two consecutive years within the RCP managed area being analyzed. Values that pass both of these tests will be included in the analysis and be labeled as *Use\_In\_Analysis* = **TRUE**. Any that fail either test will be excluded from the analyses and labeled as *Use\_In\_Analysis* = **FALSE**.

## Water Quality - Discrete

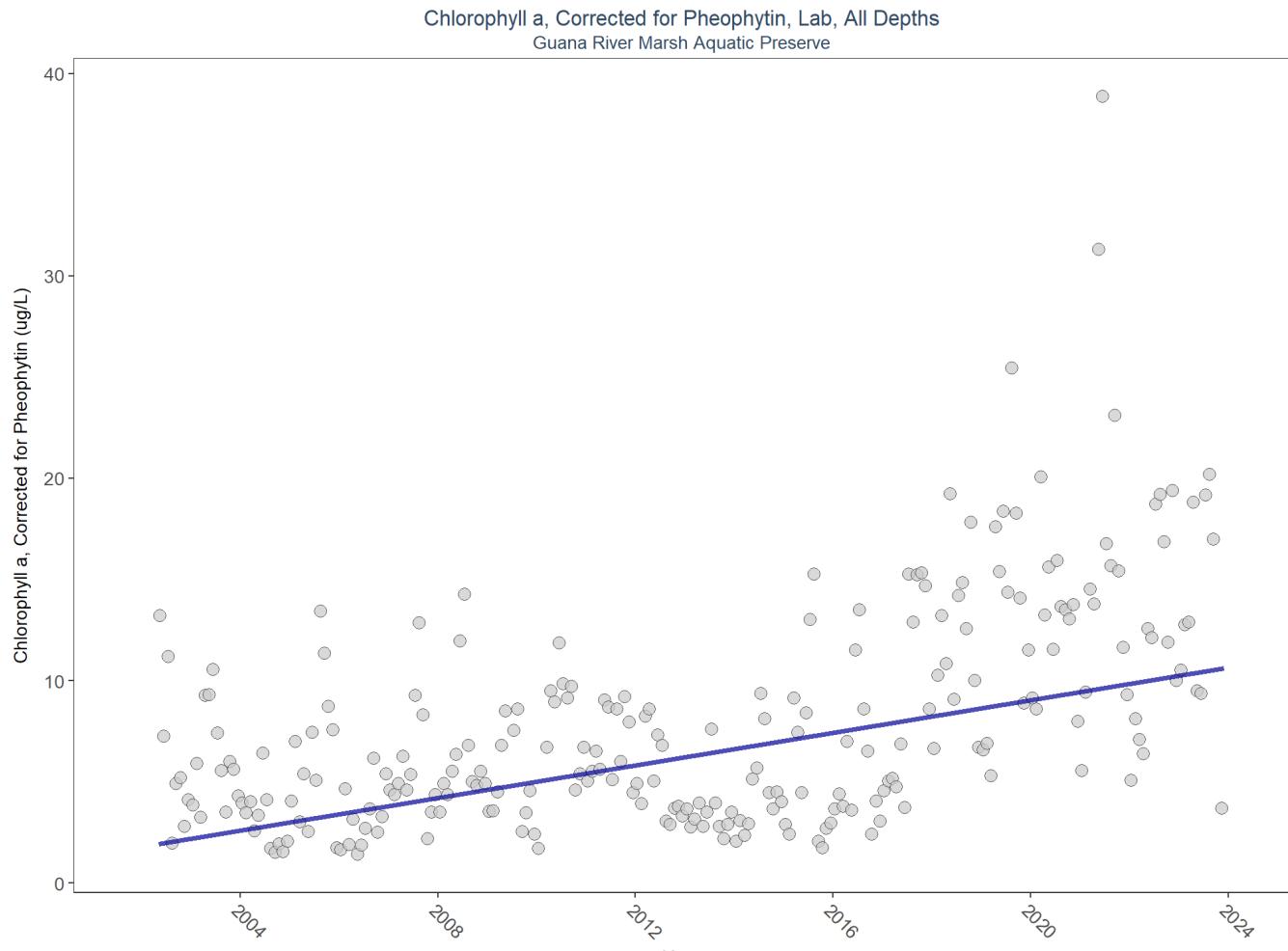
The following files were used in the discrete analysis:

- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_corrected\_for\_pheophytin-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_uncorrected\_for\_pheophytin-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Colored\_dissolved\_organic\_matter\_CDOM-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen\_Saturation-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_pH-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Salinity-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Secchi\_Depth-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Nitrogen-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Phosphorus-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Suspended\_Solids\_TSS-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Turbidity-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Water\_Temperature-2024-Mar-27.txt*

## Chlorophyll a, Corrected for Pheophytin - Discrete Water Quality

Chlorophyll-a is monitored as a measure of microalgae growing in the water. Algae are a natural part of coastal and aquatic ecosystems but in excess can cause poor water quality and clarity, and decreased levels of dissolved oxygen.

### Seasonal Kendall-Tau Trend Analysis

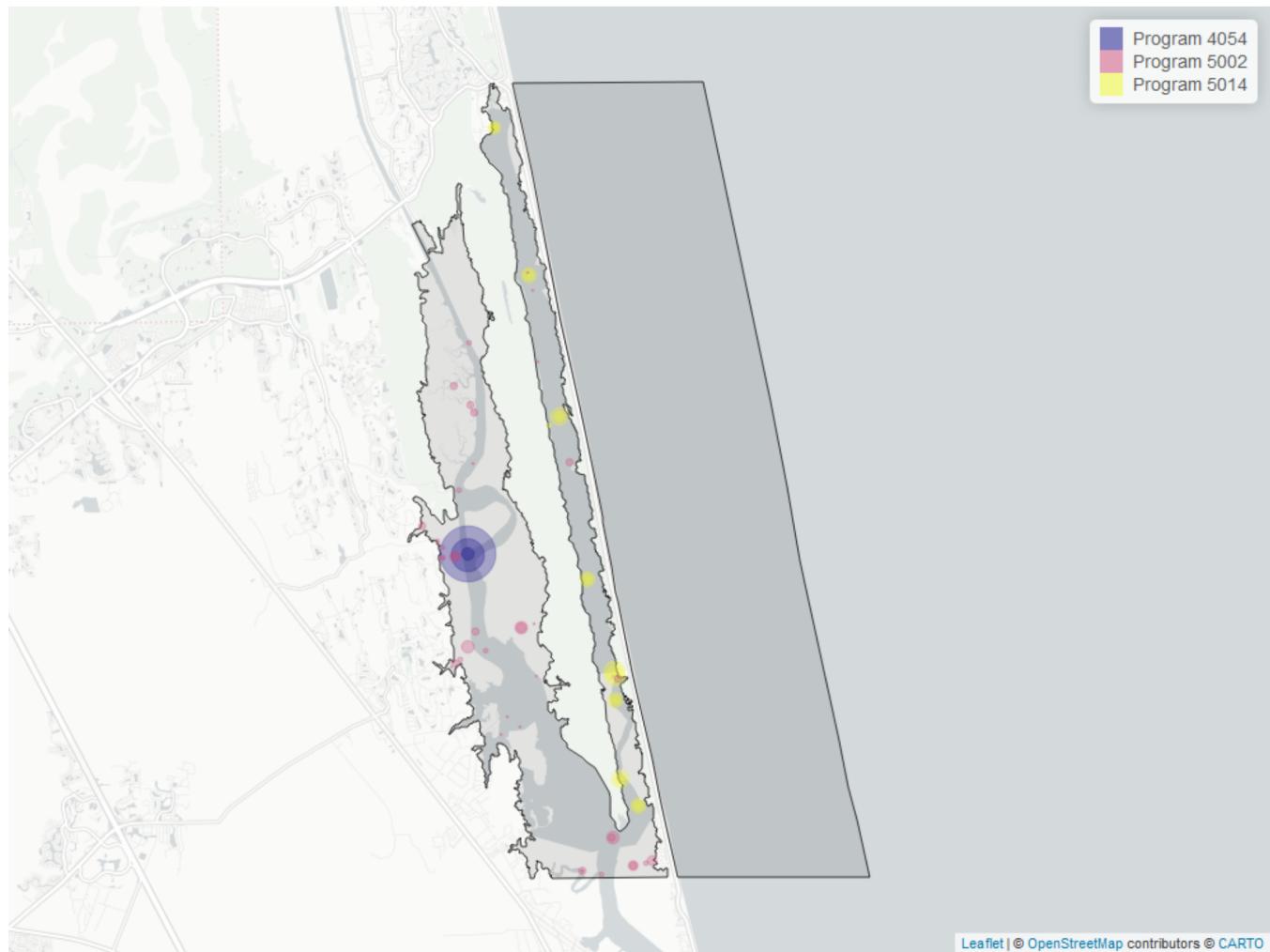


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1522	22	5.3	TRUE	0.4201	0.0000	0.4022727	1.783099	6.4688	0.8403	1

*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

Map showing location of Discrete sampling sites for Chlorophyll a, Corrected for Pheophytin



The bubble size on the above plots reflects the amount of data available at each sampling site

Table 6: Programs contributing data for Chlorophyll a, Corrected for Pheophytin

ProgramID	N_Data	YearMin	YearMax
4054	670	2002	2021
5014	553	2017	2023
5002	320	2002	2023

#### Program names:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5014 - Guana River and Guana Lake Water Quality Monitoring

5002 - Florida STORET / WIN

#### Value Qualifiers

- $N_{Total}$  is total amount of data for a given year
- $N_{}$  is the total amount of values flagged with the respective value qualifier in a given year
- $perc_{}$  is the percent of data flagged with the respective value qualifier as a proportion of  $N_{Total}$

Table 7: Value Qualifiers for Chlorophyll a, Corrected for Pheophytin

Year	$N_{Total}$	$N_I$	$perc_I$	$N_Q$	$perc_Q$	$N_U$	$perc_U$
2004	52	1	1.9			25	48.1
2005	150	13	8.7			65	43.3
2006	47					23	48.9
2013	52					1	1.9
2015	48	1	2.1				
2016	48	1	2.1				
2017	81	3	3.7			1	1.2
2018	135	1	0.7				
2019	164	6	3.7			3	1.8
2020	163	6	3.7	5	3.1	1	0.6
2021	158	8	5.1	9	5.7	9	5.7
2022	124	4	3.2			15	12.1
2023	53			9	17.0	2	3.8

**Note:** <sup>1</sup>I - Reported value is greater than or equal to lab method detection limit, but less than quantitation limit <sup>2</sup>Q  
 - Sample held beyond the accepted holding time <sup>3</sup>U - Compound was analyzed for but not detected

#### Programs containing Value Qualified data:

5002 - Florida STORET / WIN

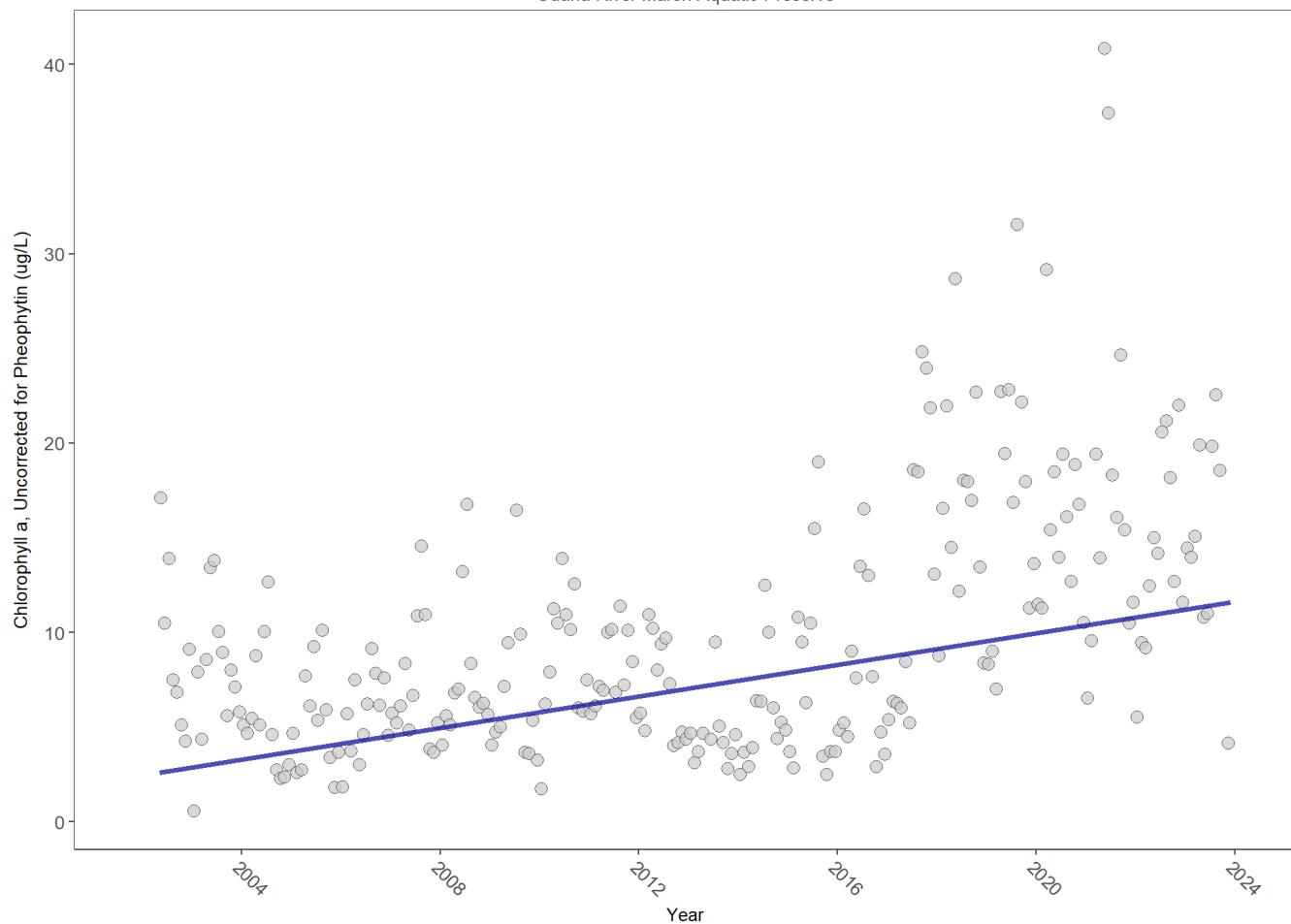
4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5014 - Guana River and Guana Lake Water Quality Monitoring

# Chlorophyll a, Uncorrected for Pheophytin - Discrete Water Quality

## Seasonal Kendall-Tau Trend Analysis

Chlorophyll a, Uncorrected for Pheophytin, Lab, All Depths  
Guana River Marsh Aquatic Preserve

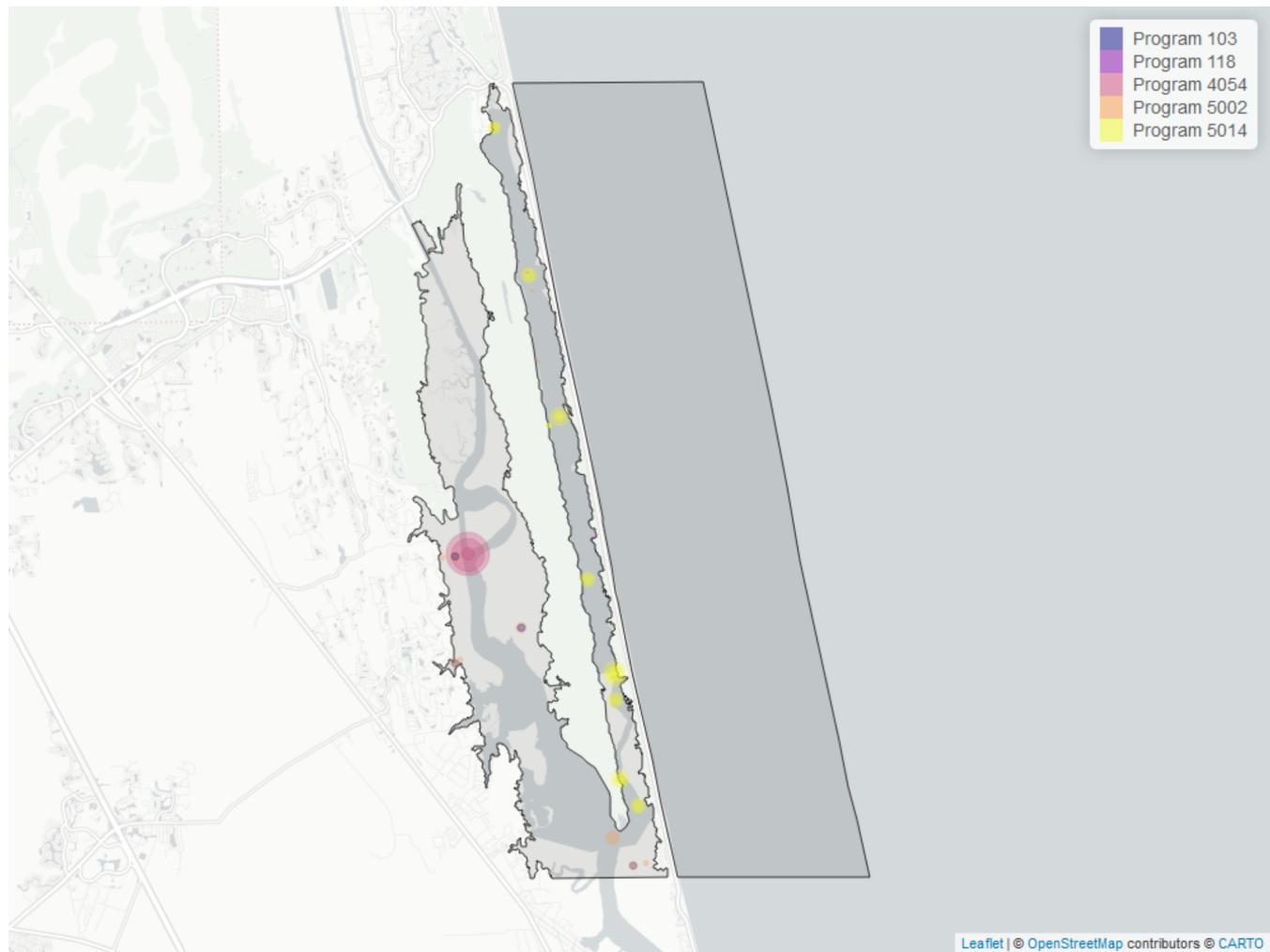


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1211	22	7.7	TRUE	0.3969	0.0000	0.4168403	2.441465	5.2725	0.9173	1

$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Chlorophyll a, Uncorrected for Pheophytin



The bubble size on the above plots reflects the amount of data available at each sampling site

Table 8: Programs contributing data for Chlorophyll a, Uncorrected for Pheophytin

ProgramID	N_Data	YearMin	YearMax
5014	600	2017	2023
4054	492	2002	2020
5002	96	2019	2023
103	40	2021	2021
118	1	2006	2006

#### Program names:

5014 - Guana River and Guana Lake Water Quality Monitoring

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5002 - Florida STORET / WIN

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

### Value Qualifiers

- $N_{Total}$  is total amount of data for a given year
- $N_{}$  is the total amount of values flagged with the respective value qualifier in a given year
- $perc_{}$  is the percent of data flagged with the respective value qualifier as a proportion of  $N_{Total}$

Table 9: Value Qualifiers for Chlorophyll a, Uncorrected for Pheophytin

Year	$N_{Total}$	$N_I$	$perc_I$	$N_Q$	$perc_Q$	$N_U$	$perc_U$
2019	144					1	0.7
2020	139	1	0.7	5	3.6		
2021	174			9	5.2	7	4.0
2022	124	3	2.4			10	8.1
2023	53	2	3.8	9	17.0	1	1.9

**Note:** <sup>1</sup>I - Reported value is greater than or equal to lab method detection limit, but less than quantitation limit <sup>2</sup>Q  
- Sample held beyond the accepted holding time <sup>3</sup>U - Compound was analyzed for but not detected

### Programs containing Value Qualified data:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5014 - Guana River and Guana Lake Water Quality Monitoring

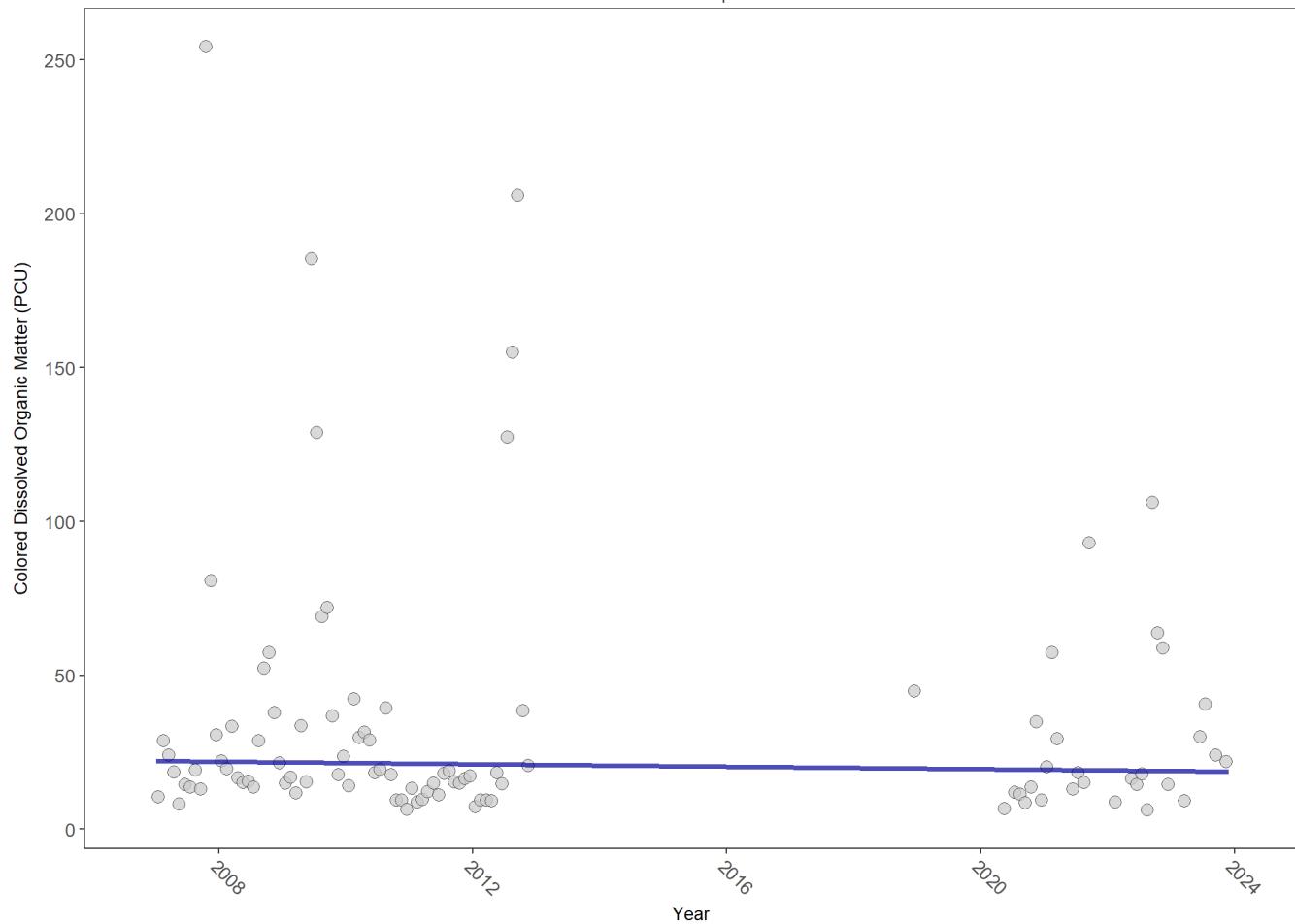
5002 - Florida STORET / WIN

## Colored Dissolved Organic Matter - Discrete Water Quality

**Colored Dissolved Organic Matter (CDOM)** occurs naturally in every water body. It is made up of mainly plant material, algae and bacteria. The composition is determined by its source; plants, soil, algae, and wastewater are common sources.

### Seasonal Kendall-Tau Trend Analysis

Colored Dissolved Organic Matter, Lab, All Depths  
Guana River Marsh Aquatic Preserve

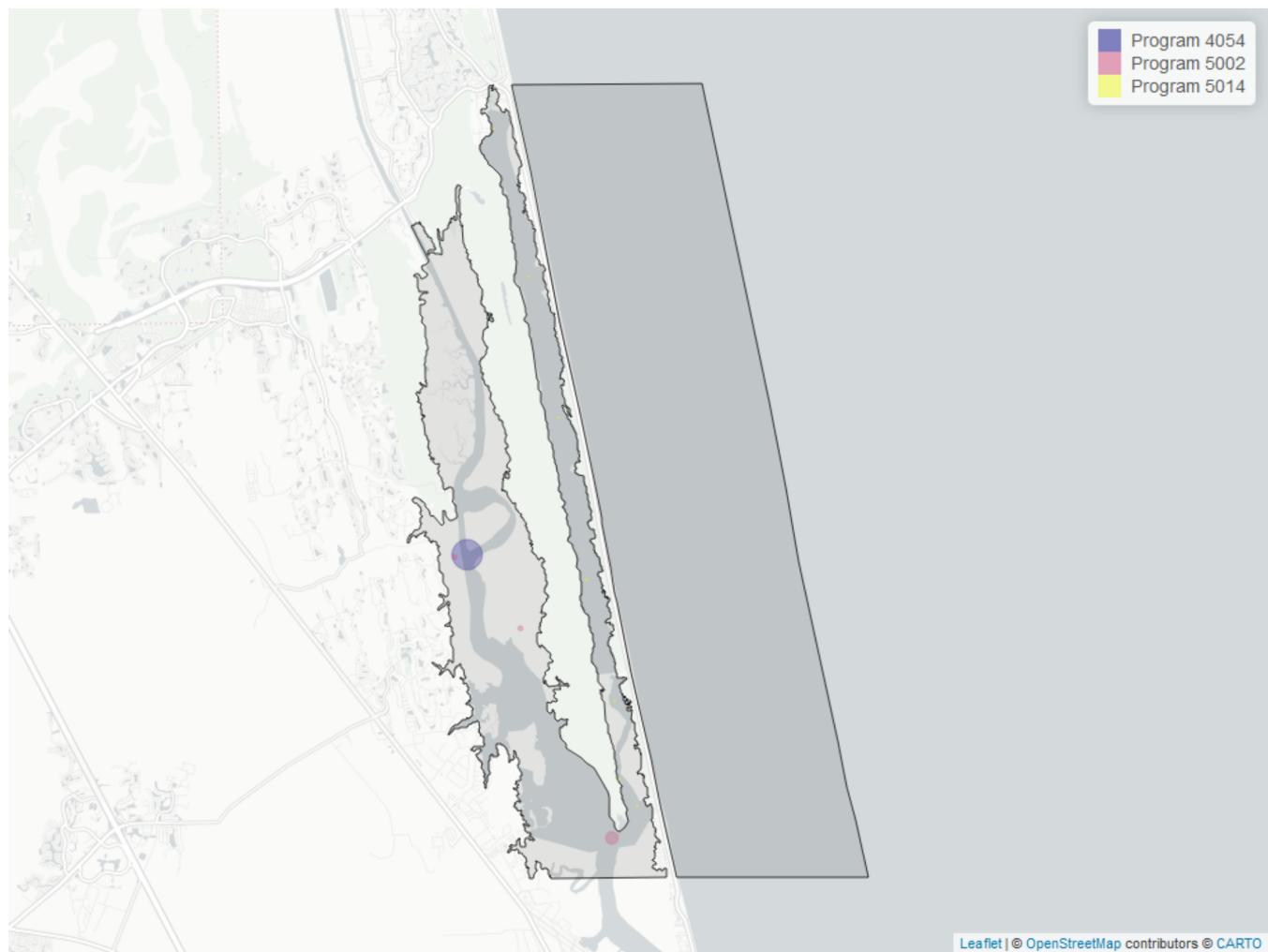


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	182	11	18.05	TRUE	-0.1405	0.1478	-0.195395	22.04197	7.4056	0.7654	0

*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

Map showing location of Discrete sampling sites for Colored Dissolved Organic Matter



The bubble size on the above plots reflects the amount of data available at each sampling site

Table 10: Programs contributing data for Colored Dissolved Organic Matter

ProgramID	N_Data	YearMin	YearMax
4054	142	2007	2012
5002	33	2020	2023
5014	7	2018	2018

#### Program names:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program  
5002 - Florida STORET / WIN

5014 - Guana River and Guana Lake Water Quality Monitoring

#### Value Qualifiers

- $N_{Total}$  is total amount of data for a given year
- $N_{\_}$  is the total amount of values flagged with the respective value qualifier in a given year
- $perc_{\_}$  is the percent of data flagged with the respective value qualifier as a proportion of  $N_{Total}$

Table 11: Value Qualifiers for Colored Dissolved Organic Matter

<i>Year</i>	<i>N_Total</i>	<i>N_I</i>	<i>perc_I</i>	<i>N_Q</i>	<i>perc_Q</i>
2020	7	3	42.9	1	14.3
2022	9	2	22.2	1	11.1

**Note:** <sup>1</sup>**I** - Reported value is greater than or equal to lab method detection limit, but less than quantitation limit <sup>2</sup>**Q**  
 - Sample held beyond the accepted holding time

#### Programs containing Value Qualified data:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5002 - Florida STORET / WIN

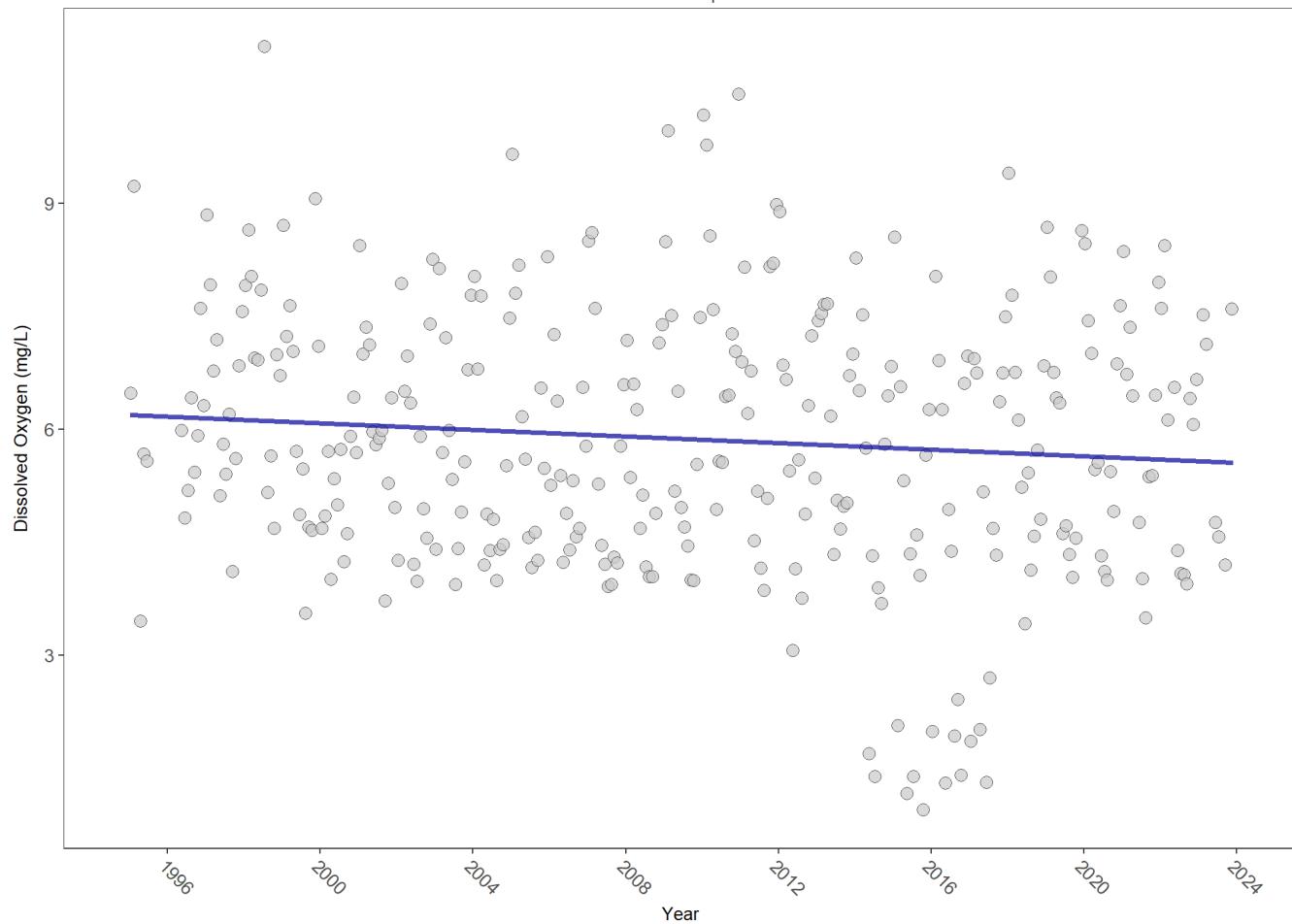
5014 - Guana River and Guana Lake Water Quality Monitoring

### Dissolved Oxygen - Discrete Water Quality

**Dissolved Oxygen (DO)** is a key indicator of water quality. Oxygen enters surface waters by air-sea gas exchange, by wind action, or as a byproduct of aquatic plant photosynthesis. The actual quantity of DO in aquatic environments is dependent on the above processes as well as water temperature and salinity.

#### Seasonal Kendall-Tau Trend Analysis

Dissolved Oxygen, Field, All Depths  
Guana River Marsh Aquatic Preserve

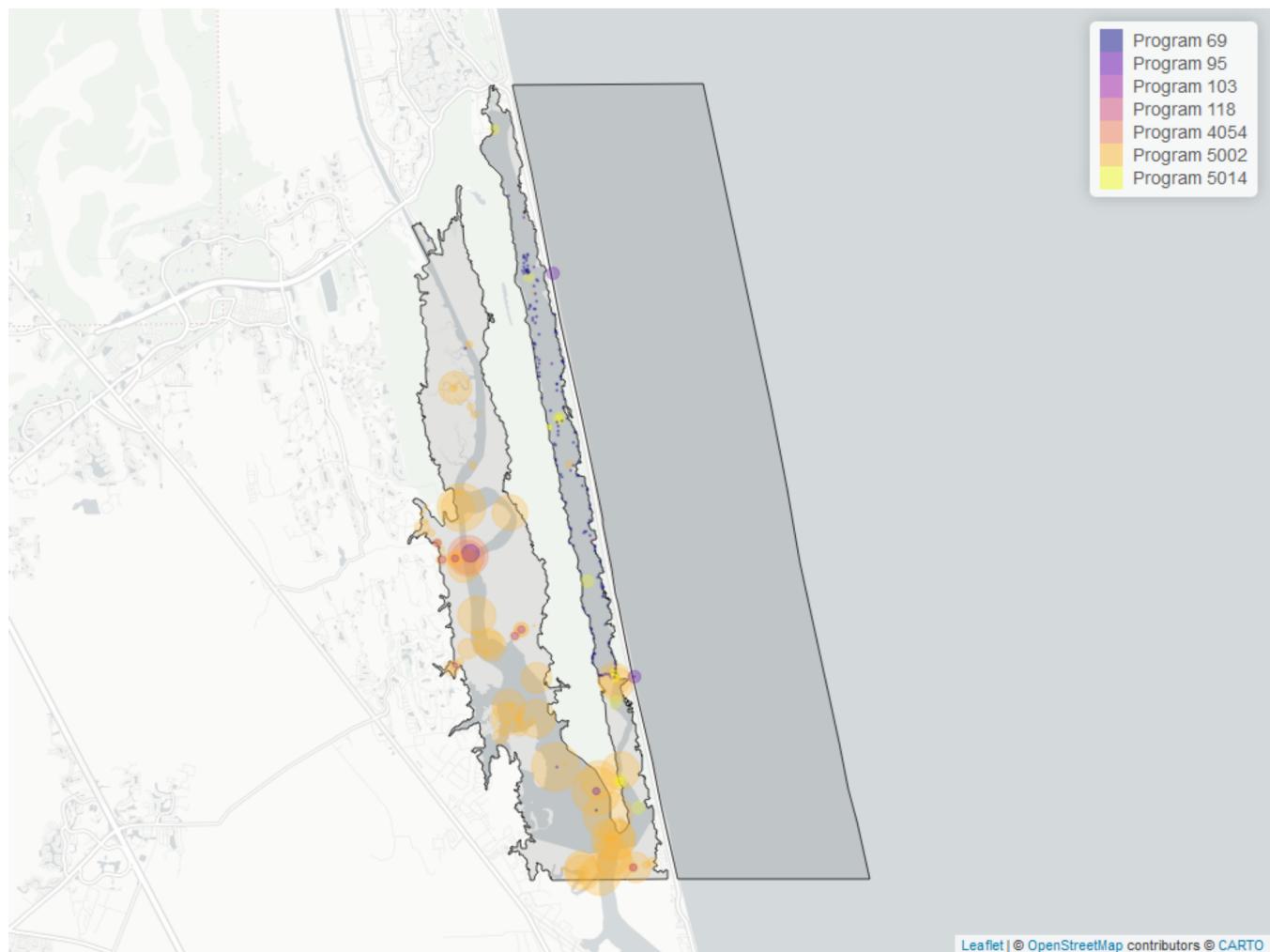


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	7535	29	5.7	TRUE	-0.1192	0.0020	-0.02181667	6.186977	12.8688	0.302	-1

*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

Map showing location of Discrete sampling sites for Dissolved Oxygen



The bubble size on the above plots reflects the amount of data available at each sampling site

Table 12: Programs contributing data for Dissolved Oxygen

ProgramID	N_Data	YearMin	YearMax
5002	6555	1995	2023
4054	451	2002	2020
5014	255	2017	2022
69	150	2001	2010
95	127	2007	2018
103	57	2021	2021
118	1	2006	2006

**Program names:**

5002 - Florida STORET / WIN

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5014 - Guana River and Guana Lake Water Quality Monitoring

69 - Fisheries-Independent Monitoring (FIM) Program

95 - Harmful Algal Bloom Marine Observation Network

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

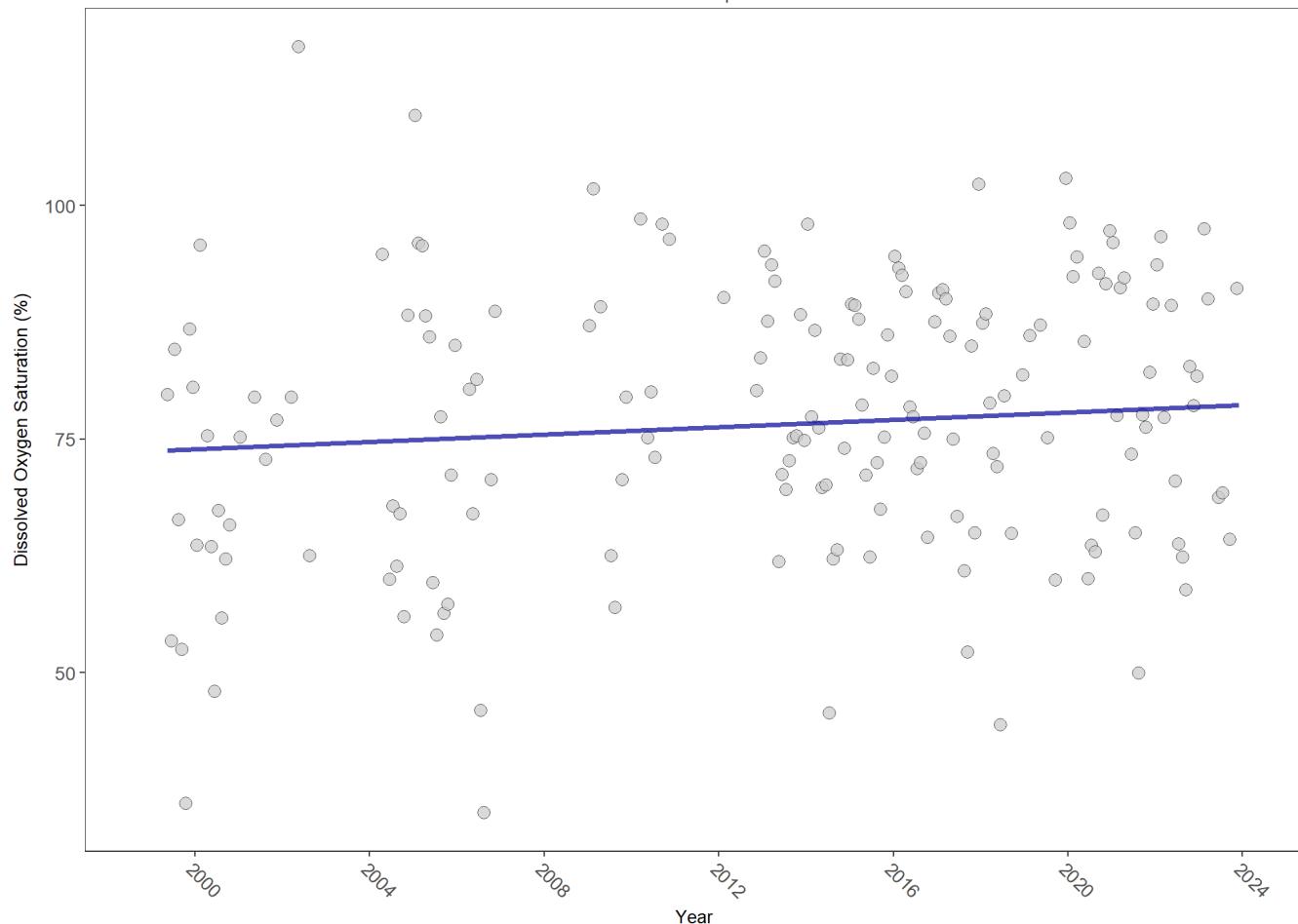
118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

There are no qualifying Value Qualifiers for Dissolved Oxygen in Guana River Marsh Aquatic Preserve

## Dissolved Oxygen Saturation - Discrete Water Quality

### Seasonal Kendall-Tau Trend Analysis

Dissolved Oxygen Saturation, Field, All Depths  
Guana River Marsh Aquatic Preserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1150	21	78	TRUE	0.0942	0.1097	0.1977533	73.68712	10.8374	0.457	0

$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Dissolved Oxygen Saturation



The bubble size on the above plots reflects the amount of data available at each sampling site

Table 13: Programs contributing data for Dissolved Oxygen Saturation

ProgramID	N_Data	YearMin	YearMax
5002	929	1999	2023
5014	236	2017	2022
95	3	2012	2013

#### Program names:

5002 - Florida STORET / WIN

5014 - Guana River and Guana Lake Water Quality Monitoring

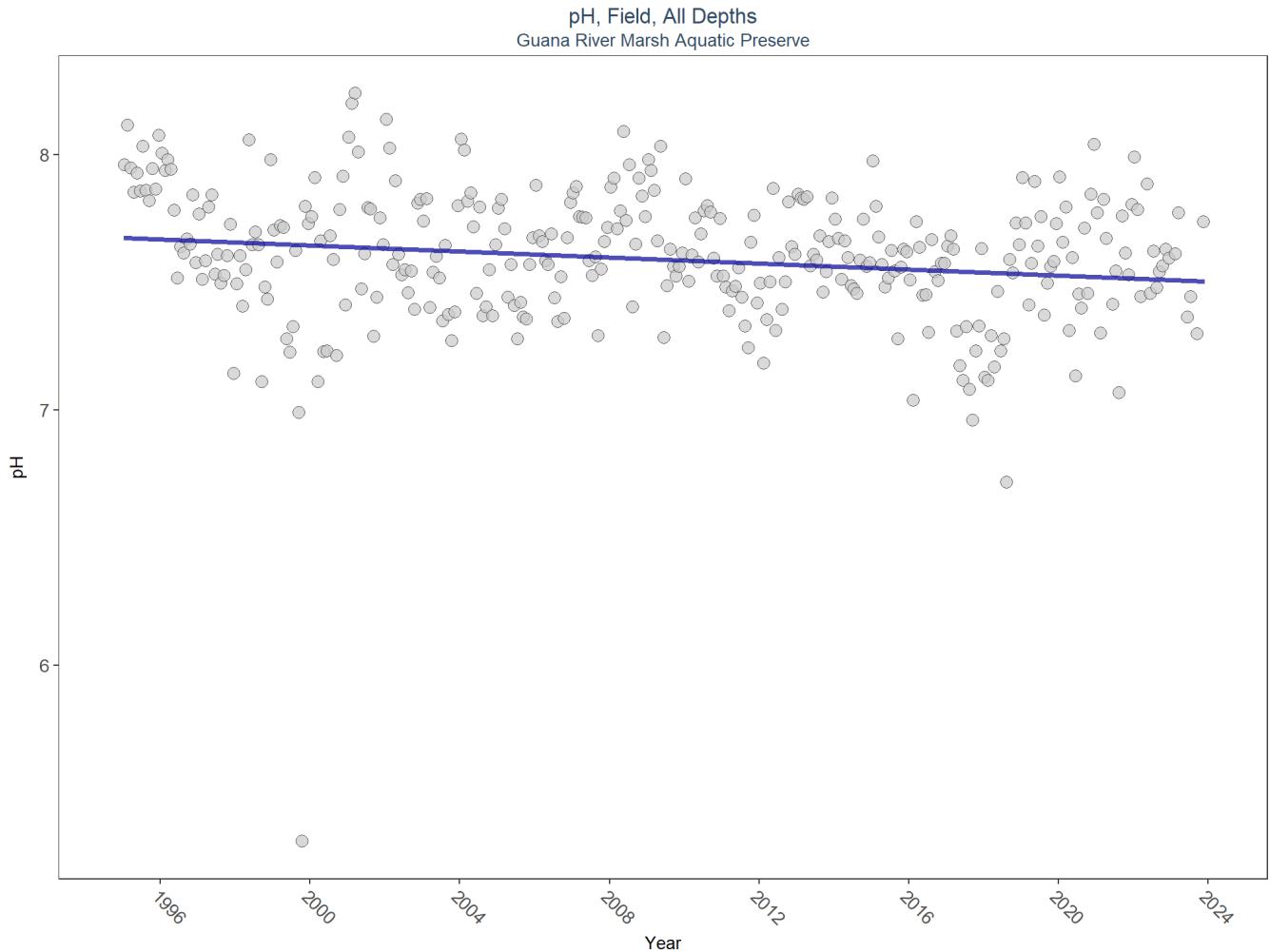
95 - Harmful Algal Bloom Marine Observation Network

There are no qualifying Value Qualifiers for Dissolved Oxygen Saturation in Guana River Marsh Aquatic Preserve

## pH - Discrete Water Quality

The **pH** of water is the measure of how acidic or basic the water body is on a scale of 0-14, with lower readings indicating acidic and higher readings indicating basic, and a pH of 7 being neutral. Florida's natural waters fall between 6.5 and 8.5 on this scale. A water body's pH can change due to precipitation, geology, vegetation, water pollution and air pollution.

### Seasonal Kendall-Tau Trend Analysis



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	6101	29	7.7	TRUE	-0.161	0.0000	-0.005891652	7.672876	15.1141	0.1773	-1

*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

Map showing location of Discrete sampling sites for pH



The bubble size on the above plots reflects the amount of data available at each sampling site

Table 14: Programs contributing data for pH

ProgramID	N_Data	YearMin	YearMax
5002	5398	1995	2023
4054	452	2002	2020
5014	259	2017	2022
69	153	2001	2010
95	93	2007	2018
103	57	2021	2021

#### Program names:

5002 - Florida STORET / WIN

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5014 - Guana River and Guana Lake Water Quality Monitoring

69 - Fisheries-Independent Monitoring (FIM) Program

95 - Harmful Algal Bloom Marine Observation Network

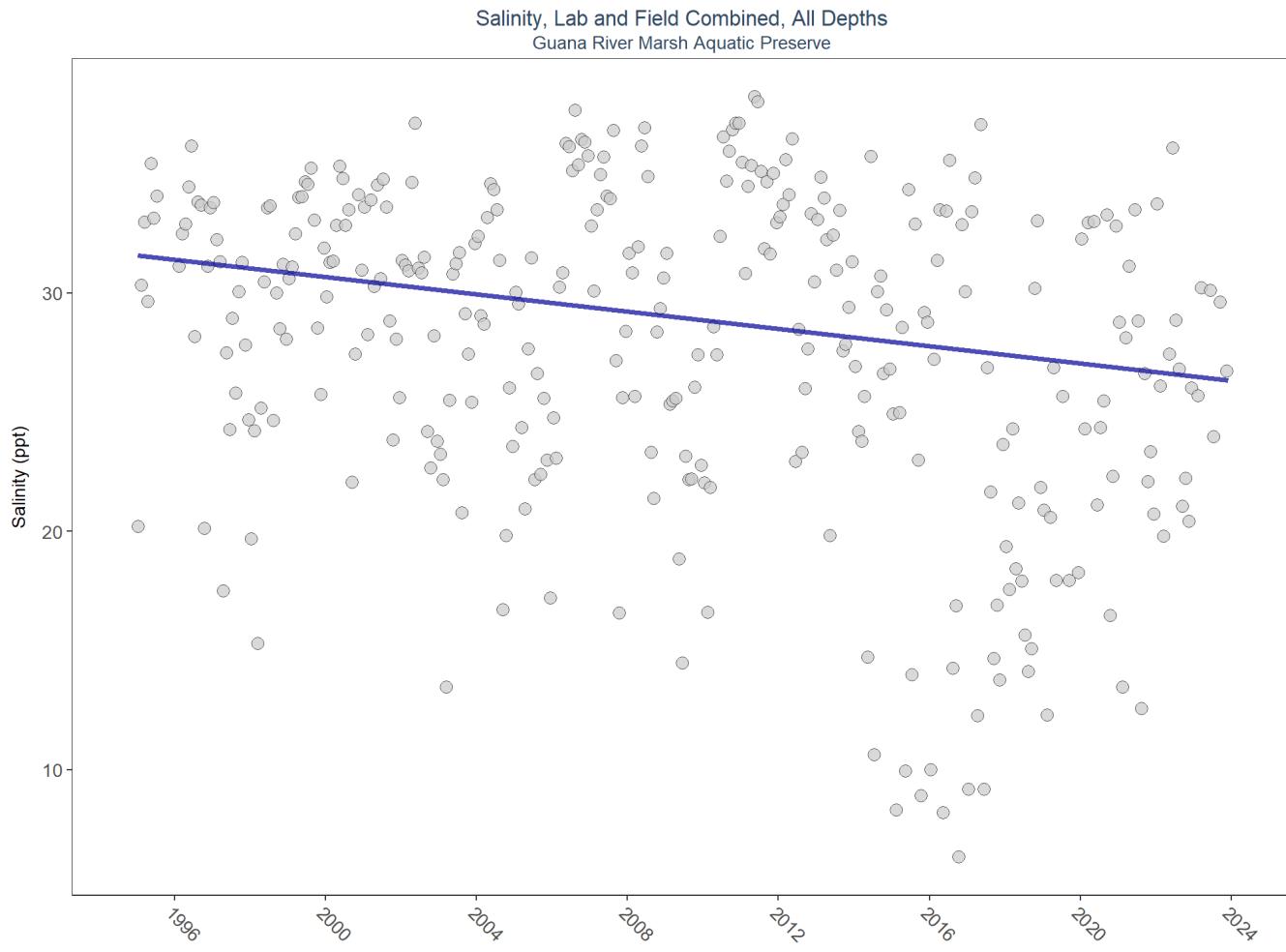
103 - EPA STOrage and RETrieval Data Warehouse (STORET)

There are no qualifying Value Qualifiers for pH in Guana River Marsh Aquatic Preserve

## Salinity - Discrete Water Quality

**Salinity** is a measure of the amount of salt in the water. In estuarine ecosystems, salinity is influenced by precipitation, evaporation, surface-water inputs, and exchange with coastal waters.

### Seasonal Kendall-Tau Trend Analysis



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	8270	29	31	TRUE	-0.1745	0.0000	-0.1812958	31.58022	4.0928	0.9671	-1

*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

Map showing location of Discrete sampling sites for Salinity



The bubble size on the above plots reflects the amount of data available at each sampling site

Table 15: Programs contributing data for Salinity

ProgramID	N_Data	YearMin	YearMax
5002	7292	1995	2023
4054	351	2002	2019
5014	259	2017	2022
95	231	1999	2018
69	153	2001	2010

#### Program names:

5002 - Florida STORET / WIN

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5014 - Guana River and Guana Lake Water Quality Monitoring

95 - Harmful Algal Bloom Marine Observation Network

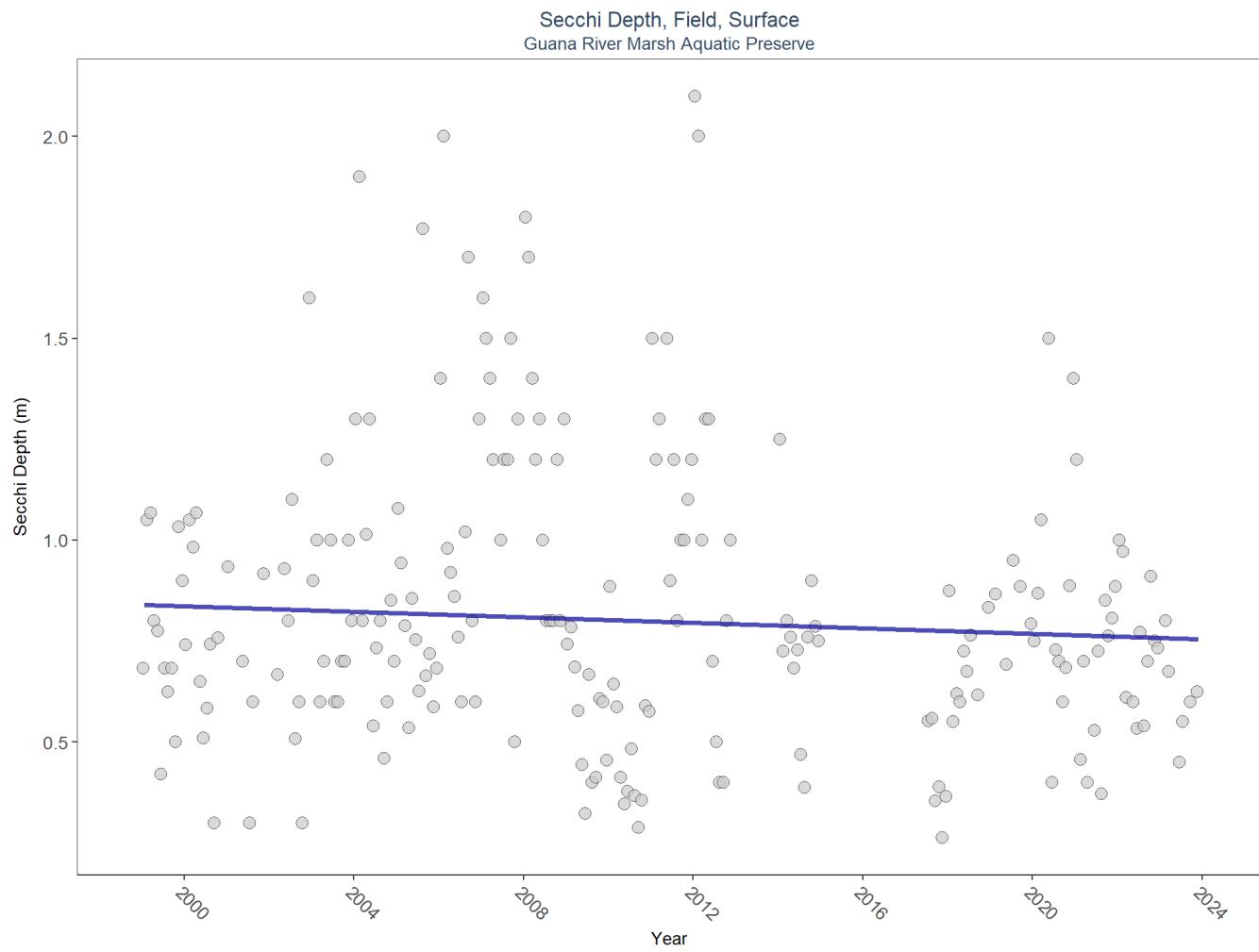
69 - Fisheries-Independent Monitoring (FIM) Program

There are no qualifying Value Qualifiers for Salinity in Guana River Marsh Aquatic Preserve

## Secchi Depth - Discrete Water Quality

**Secchi depth** is a measure of the transparency or clarity of the water by a device called a Secchi disk. A Secchi disk is a black and white disk that is lowered into the water on a cord. The Secchi depth is the depth at which the disk can no longer be seen. The deeper the Secchi depth, the greater the water clarity.

### Seasonal Kendall-Tau Trend Analysis



*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

Map showing location of Discrete sampling sites for Secchi Depth



The bubble size on the above plots reflects the amount of data available at each sampling site

Table 16: Programs contributing data for Secchi Depth

ProgramID	N_Data	YearMin	YearMax
5002	680	1999	2023
4054	236	2002	2014
5014	227	2017	2022
69	153	2001	2010
103	35	2021	2021

#### Program names:

5002 - Florida STORET / WIN

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5014 - Guana River and Guana Lake Water Quality Monitoring

69 - Fisheries-Independent Monitoring (FIM) Program

## Value Qualifiers

- $N_{Total}$  is total amount of data for a given year
- $N_{}$  is the total amount of values flagged with the respective value qualifier in a given year
- $perc_{}$  is the percent of data flagged with the respective value qualifier as a proportion of  $N_{Total}$

Table 17: Value Qualifiers for Secchi Depth

Year	$N_{Total}$	$N_S$	$perc_S$
2018	67	1	1.5
2019	32	3	9.4
2020	68	5	7.3
2021	105	1	0.9
2022	90	6	6.7
2023	23	1	4.3

**Note:**  $^1S$  - Secchi disk visible to bottom of waterbody

## Programs containing Value Qualified data:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5002 - Florida STORET / WIN

5014 - Guana River and Guana Lake Water Quality Monitoring

## Total Nitrogen - Discrete Water Quality

**Nitrogen** and **Phosphorous** are key nutrients that provide nourishment essential for the growth and maintenance of aquatic plants and animals; however, excess nutrients can cause harmful algal blooms and other water quality concerns. Nutrients enter water bodies several ways, including runoff from rain events and atmospheric deposition from natural and industrial sources.

### Total Nitrogen Calculation:

The logic for calculated Total Nitrogen was provided by Kevin O'Donnell and colleagues at FDEP (with the help of Jay Silvanima, Watershed Monitoring Section). The following logic is used, in this order, based on the availability of specific nitrogen components.

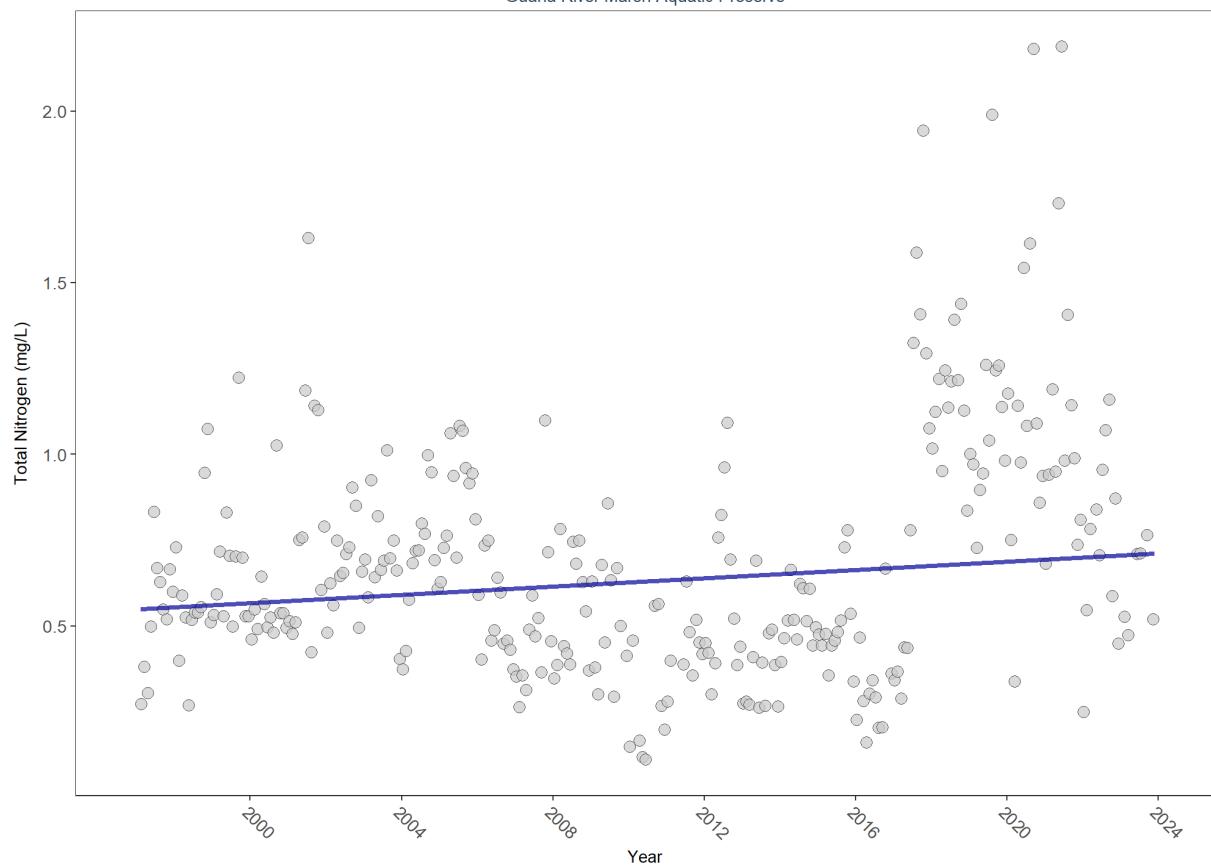
- 1)  $TN = TKN + NO_3O_2;$
- 2)  $TN = TKN + NO_3 + NO_2;$
- 3)  $TN = ORGN + NH_4 + NO_3O_2;$
- 4)  $TN = ORGN + NH_4 + NO_2 + NO_3;$
- 5)  $TN = TKN + NO_3;$
- 6)  $TN = ORGN + NH_4 + NO_3;$

### Additional Information:

- Rules for use of sample fraction:
  - FDEP report that if both “Total” and “Dissolved” are reported, only “Total” is used. If the total is not reported, they do use dissolved as a best available replacement.
  - An analysis of all SEACAR data shows that 90% of all possible TN calculations can be done using nitrogen components with the same sample fraction, rather than use nitrogen components with mixed total/dissolved sample fractions. In other words, TN can be calculated when TKN and  $NO_3O_2$  are both total sample fraction, or when both are dissolved sample fraction. This is important, because then the calculated TN value is not based on components with mixed sample fractions.
- Values inserted into data:
  - ParameterName = “Total Nitrogen”
  - SEACAR\_QAQCFlagCode = “1Q”
  - SEACAR\_QAQC\_Description = “SEACAR Calculated”

## Seasonal Kendall-Tau Trend Analysis

Total Nitrogen, Lab, All Depths  
Guana River Marsh Aquatic Preserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1930	27	0.618	TRUE	0.0913	0.0239	0.006076277	0.5475227	4.6707	0.9461	1

*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

Map showing location of Discrete sampling sites for Total Nitrogen



The bubble size on the above plots reflects the amount of data available at each sampling site

Table 18: Programs contributing data for Total Nitrogen

ProgramID	N_Data	YearMin	YearMax
5002	1097	1997	2023
5014	490	2017	2022
4054	368	2002	2020

#### Program names:

5002 - Florida STORET / WIN

5014 - Guana River and Guana Lake Water Quality Monitoring

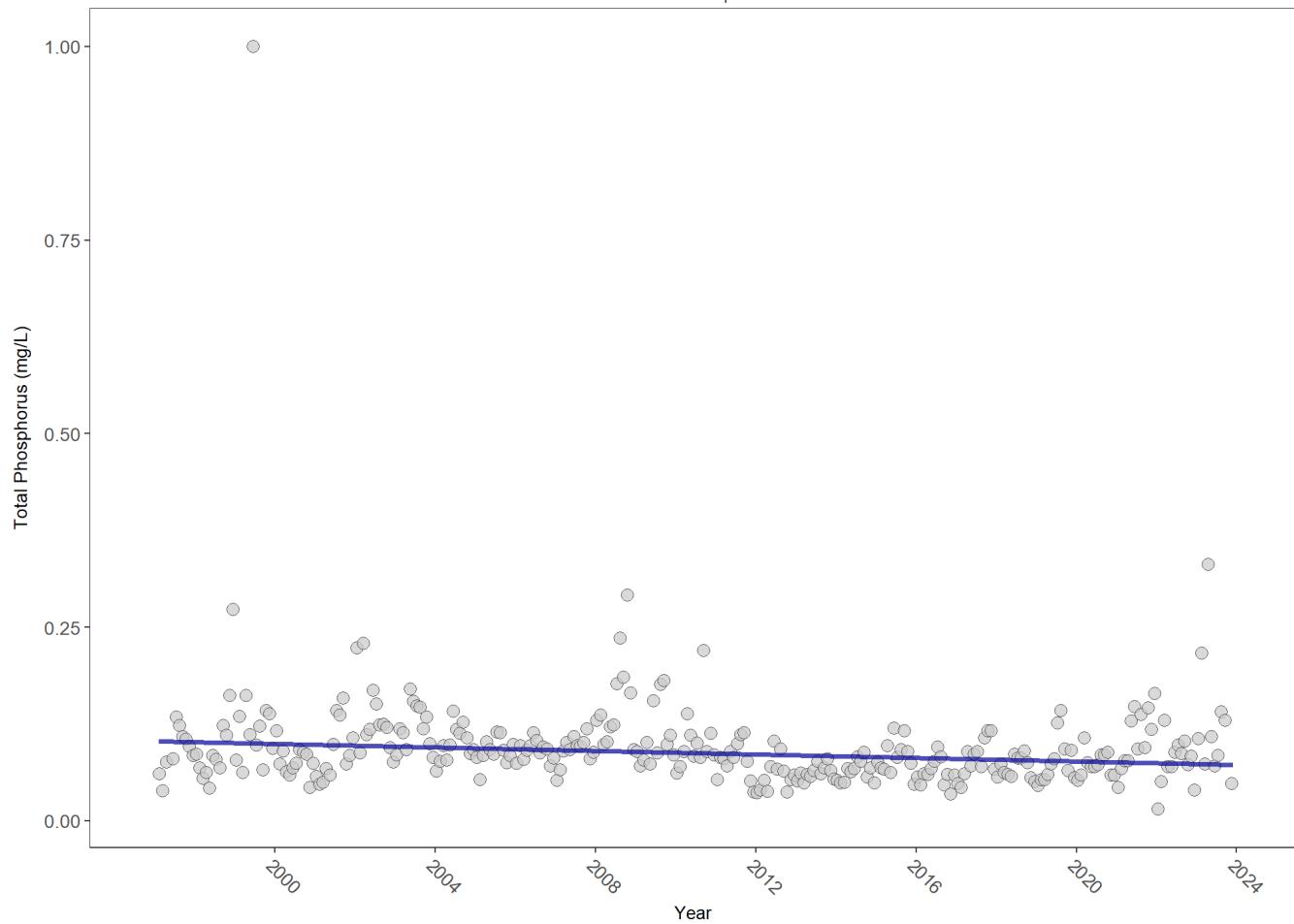
4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

There are no qualifying Value Qualifiers for Total Nitrogen in Guana River Marsh Aquatic Preserve

## Total Phosphorus - Discrete Water Quality

### Seasonal Kendall-Tau Trend Analysis

Total Phosphorus, Lab, All Depths  
Guana River Marsh Aquatic Preserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	2716	27	0.076	TRUE	-0.2135	0.0000	-0.001149375	0.1030538	8.9194	0.6293	-1

$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Total Phosphorus



The bubble size on the above plots reflects the amount of data available at each sampling site

Table 19: Programs contributing data for Total Phosphorus

ProgramID	N_Data	YearMin	YearMax
5002	1695	1997	2023
5014	554	2017	2023
4054	499	2002	2020
103	20	2021	2021

#### Program names:

5002 - Florida STORET / WIN

5014 - Guana River and Guana Lake Water Quality Monitoring

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

#### Value Qualifiers

- $N_{Total}$  is total amount of data for a given year
- $N_{\_}$  is the total amount of values flagged with the respective value qualifier in a given year
- $perc_{\_}$  is the percent of data flagged with the respective value qualifier as a proportion of  $N_{Total}$

Table 20: Value Qualifiers for Total Phosphorus

Year	$N_{Total}$	$N_I$	$perc_I$	$N_Q$	$perc_Q$	$N_U$	$perc_U$
1998	78			1	1.3	2	2.6
1999	112			6	5.4	5	4.5
2001	75			6	8.0		
2002	101			2	2.0		
2004	118	3	2.5				
2005	215	79	36.7				
2006	115	72	62.6				
2007	96	66	68.8				
2008	96	51	53.1	1	1.0		
2009	102	60	58.8				
2010	92	63	68.5				
2011	89	45	50.6				
2012	74	34	46.0				
2013	76	40	52.6				
2014	101	30	29.7				
2015	74	38	51.4	6	8.1		
2016	73	39	53.4				
2017	84	19	22.6				
2018	112					3	2.7
2019	142					2	1.4
2020	150	4	2.7			1	0.7
2021	161	3	1.9	2	1.2	32	19.9
2022	135	5	3.7	2	1.5	8	5.9
2023	53	1	1.9				

**Note:** <sup>1</sup>I - Reported value is greater than or equal to lab method detection limit, but less than quantitation limit <sup>2</sup>Q  
 - Sample held beyond the accepted holding time <sup>3</sup>U - Compound was analyzed for but not detected

#### Programs containing Value Qualified data:

5002 - Florida STORET / WIN

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

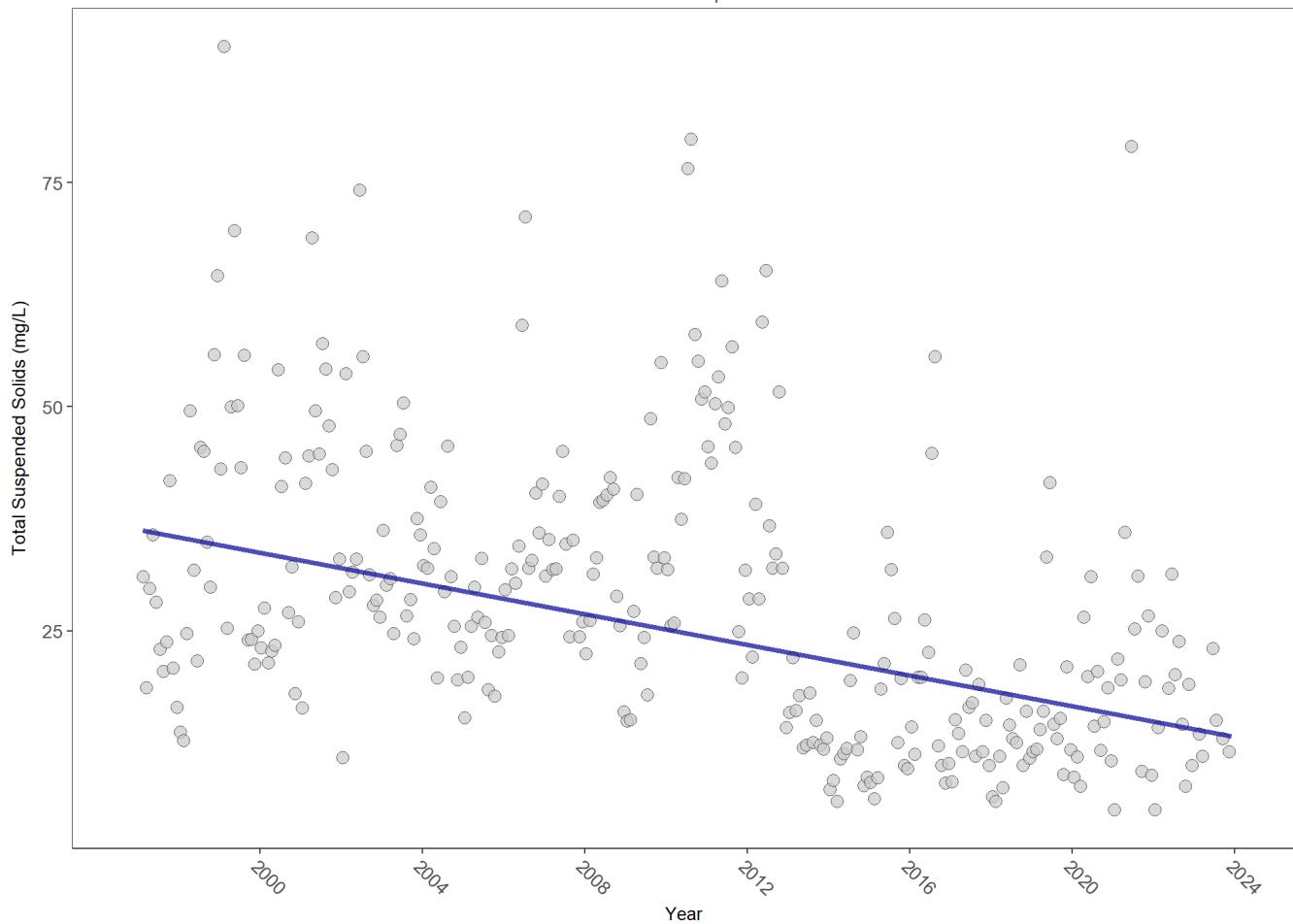
5014 - Guana River and Guana Lake Water Quality Monitoring

#### Total Suspended Solids - Discrete Water Quality

**Total Suspended Solids (TSS)** are solid particles suspended in water that exceed 2 microns in size and can be trapped by a filter.

#### Seasonal Kendall-Tau Trend Analysis

Total Suspended Solids, Lab and Field Combined, All Depths  
Guana River Marsh Aquatic Preserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1939	27	25	TRUE	-0.3694	0.0000	-0.8548177	36.29543	5.5883	0.8994	-1

*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

Map showing location of Discrete sampling sites for Total Suspended Solids



The bubble size on the above plots reflects the amount of data available at each sampling site

Table 21: Programs contributing data for Total Suspended Solids

ProgramID	N_Data	YearMin	YearMax
5002	1341	1997	2023
4054	472	2002	2020
5014	139	2018	2022
103	20	2021	2021

#### Program names:

5002 - Florida STORET / WIN

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5014 - Guana River and Guana Lake Water Quality Monitoring

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

#### Value Qualifiers

- $N_{Total}$  is total amount of data for a given year
- $N_{\_}$  is the total amount of values flagged with the respective value qualifier in a given year
- $perc_{\_}$  is the percent of data flagged with the respective value qualifier as a proportion of  $N_{Total}$

Table 22: Value Qualifiers for Total Suspended Solids

<i>Year</i>	<i>N_Total</i>	<i>N_I</i>	<i>perc_I</i>	<i>N_Q</i>	<i>perc_Q</i>	<i>N_U</i>	<i>perc_U</i>
1998	78			1	1.3		
1999	78			2	2.6	1	1.3
2000	78			1	1.3		
2001	75			13	17.3		
2002	86			8	9.3	1	1.2
2004	99	1	1.0				
2005	114	9	7.9				
2009	102	2	2.0				
2010	92	1	1.1	6	6.5		
2011	83	1	1.2	4	4.8		
2012	50	3	6.0				
2013	49	9	18.4				
2014	76	26	34.2				
2015	49	17	34.7				
2016	48	16	33.3				
2017	39	3	7.7				
2018	48	22	45.8				
2019	64	16	25.0				
2020	66	24	36.4			1	1.5
2021	68	7	10.3	1	1.5	3	4.4
2022	66	21	31.8				
2023	12	3	25.0				

**Note:** <sup>1</sup>I - Reported value is greater than or equal to lab method detection limit, but less than quantitation limit <sup>2</sup>Q  
- Sample held beyond the accepted holding time <sup>3</sup>U - Compound was analyzed for but not detected

#### Programs containing Value Qualified data:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5002 - Florida STORET / WIN

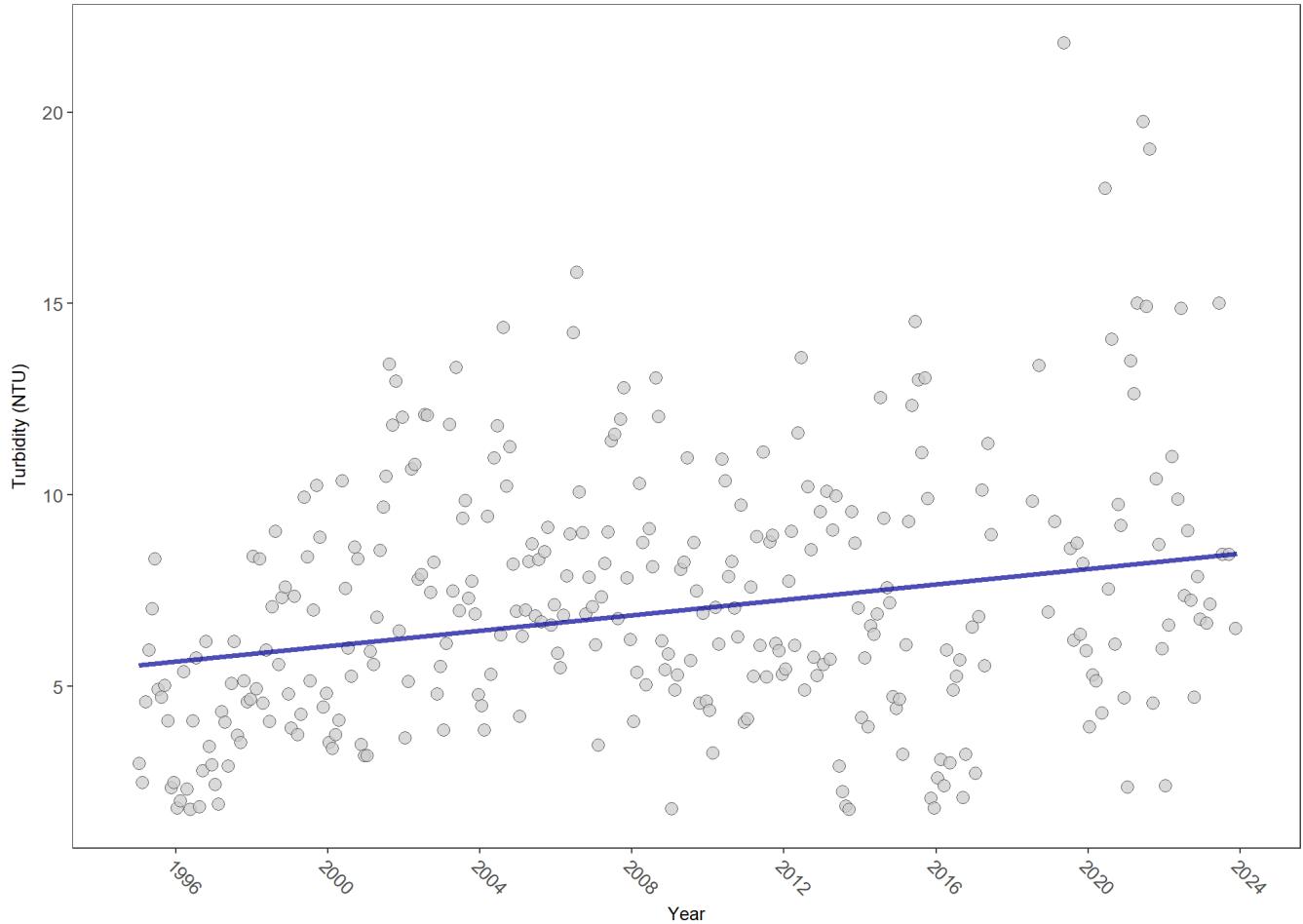
5014 - Guana River and Guana Lake Water Quality Monitoring

#### Turbidity - Discrete Water Quality

**Turbidity** results from suspended solids in the water, including silts, clays, tannins, industrial wastes, sewage and plankton, which are all factors that contribute to how clouded or murky a water column is. Turbidity is caused by soil erosion, excess nutrients, pollutants, and physical forces such as winds, currents and bottom feeders.

#### Seasonal Kendall-Tau Trend Analysis

Turbidity, Lab and Field Combined, All Depths  
Guana River Marsh Aquatic Preserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	5270	29	5.3	TRUE	0.2096	0.0000	0.1008389	5.545604	10.7536	0.4641	1

*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

Map showing location of Discrete sampling sites for Turbidity

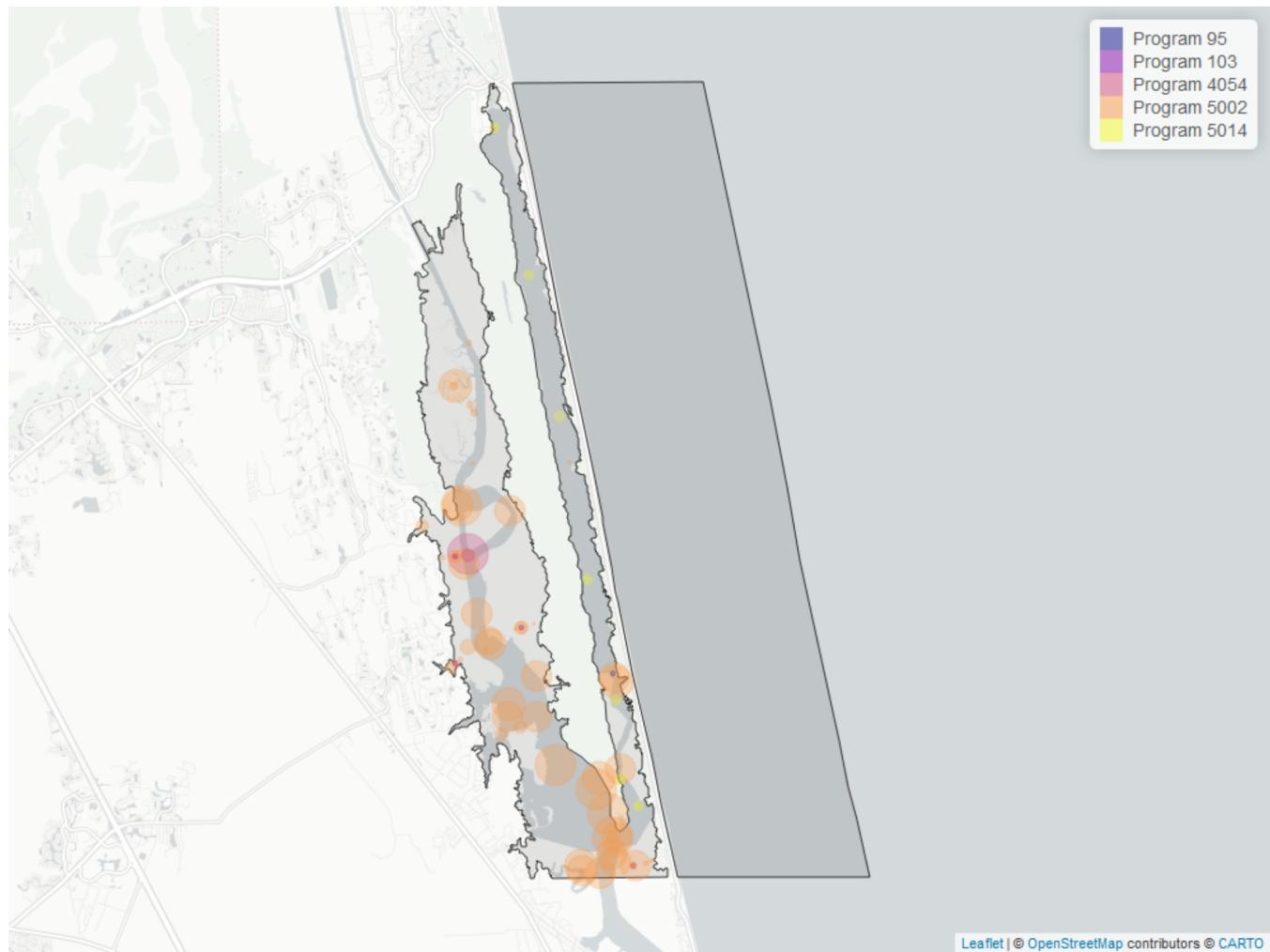


Table 23: Programs contributing data for Turbidity

ProgramID	N_Data	YearMin	YearMax
5002	4838	1995	2023
4054	278	2002	2020
5014	139	2018	2022
103	20	2021	2021
95	4	2012	2012

#### Program names:

5002 - Florida STORET / WIN

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5014 - Guana River and Guana Lake Water Quality Monitoring

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

### Value Qualifiers

- $N_{Total}$  is total amount of data for a given year
- $N_{}$  is the total amount of values flagged with the respective value qualifier in a given year
- $perc_{}$  is the percent of data flagged with the respective value qualifier as a proportion of  $N_{Total}$

Table 24: Value Qualifiers for Turbidity

Year	$N_{Total}$	$N_I$	$perc_I$	$N_Q$	$perc_Q$
1997	474			1	0.2
2001	301			1	0.3
2011	183			7	3.8
2013	24			5	20.8
2015	23	1	4.3	5	21.7
2016	24	1	4.2	1	4.2
2022	66	1	1.5		

**Note:** <sup>1</sup>I - Reported value is greater than or equal to lab method detection limit, but less than quantitation limit <sup>2</sup>Q  
 - Sample held beyond the accepted holding time

### Programs containing Value Qualified data:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5014 - Guana River and Guana Lake Water Quality Monitoring

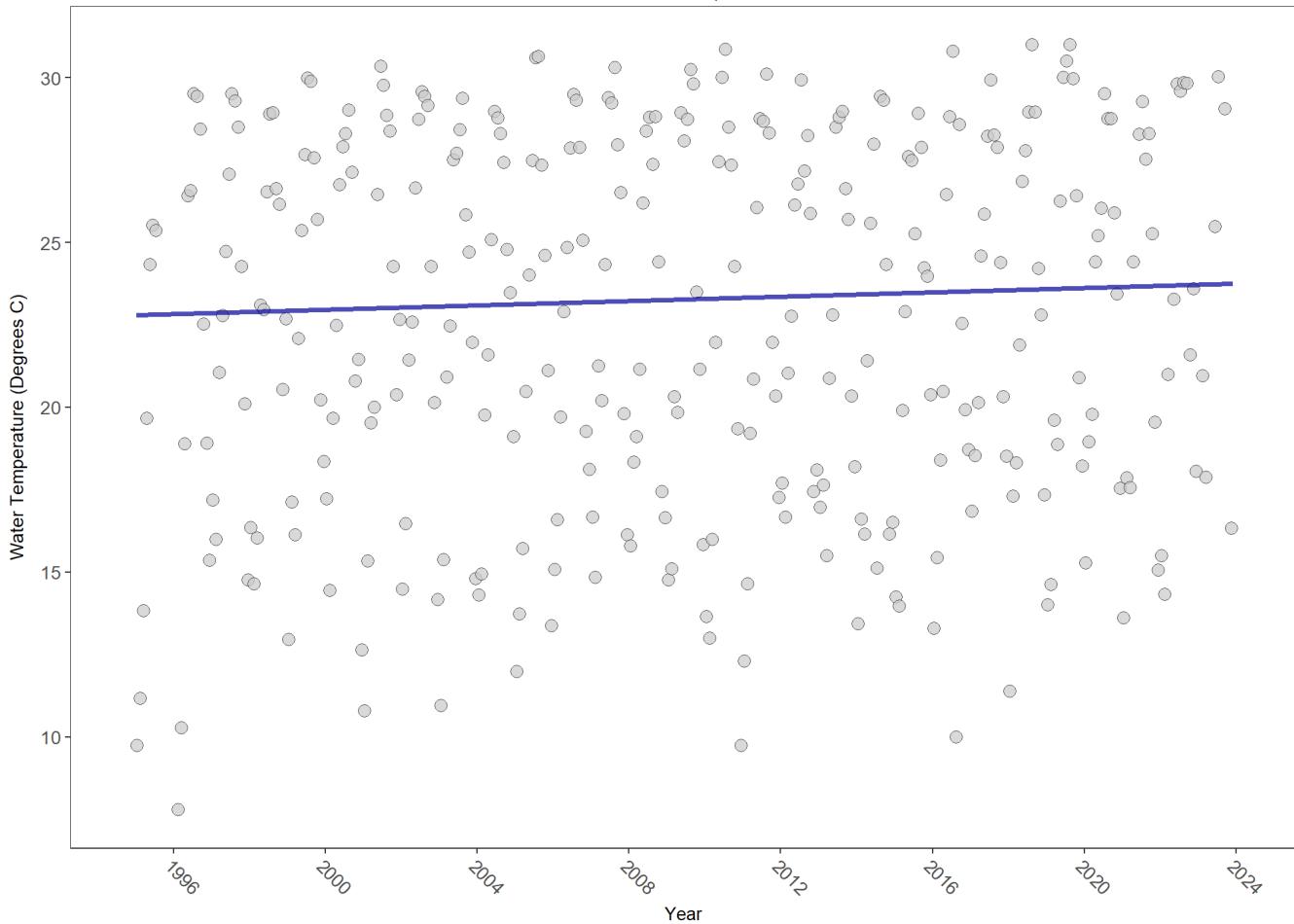
5002 - Florida STORET / WIN

## Water Temperature - Discrete Water Quality

**Temperature** determines the capacity of water to hold oxygen. Cooler water can hold more dissolved oxygen because water molecules are more tightly packed, making it harder for oxygen to escape. Additionally, as water temperature increases, fish and other aquatic organisms become more active and consume oxygen at a faster rate.

### Seasonal Kendall-Tau Trend Analysis

Water Temperature, Field, All Depths  
Guana River Marsh Aquatic Preserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	8223	29	23.1	TRUE	0.1122	0.0033	0.03310454	22.80078	8.3643	0.6803	1

*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

Map showing location of Discrete sampling sites for Water Temperature



Table 25: Programs contributing data for Water Temperature

ProgramID	N_Data	YearMin	YearMax
5002	7501	1995	2023
4054	462	2002	2020
5014	259	2017	2022
95	223	2007	2018
69	153	2001	2010
103	57	2021	2021

**Program names:**

5002 - Florida STORET / WIN

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program

5014 - Guana River and Guana Lake Water Quality Monitoring

*95* - Harmful Algal Bloom Marine Observation Network

*69* - Fisheries-Independent Monitoring (FIM) Program

*103* - EPA STOrage and RETrieval Data Warehouse (STORET)

There are no qualifying Value Qualifiers for Water Temperature in Guana River Marsh Aquatic Preserve

## Water Quality - Continuous

The following files were used in the continuous analysis:

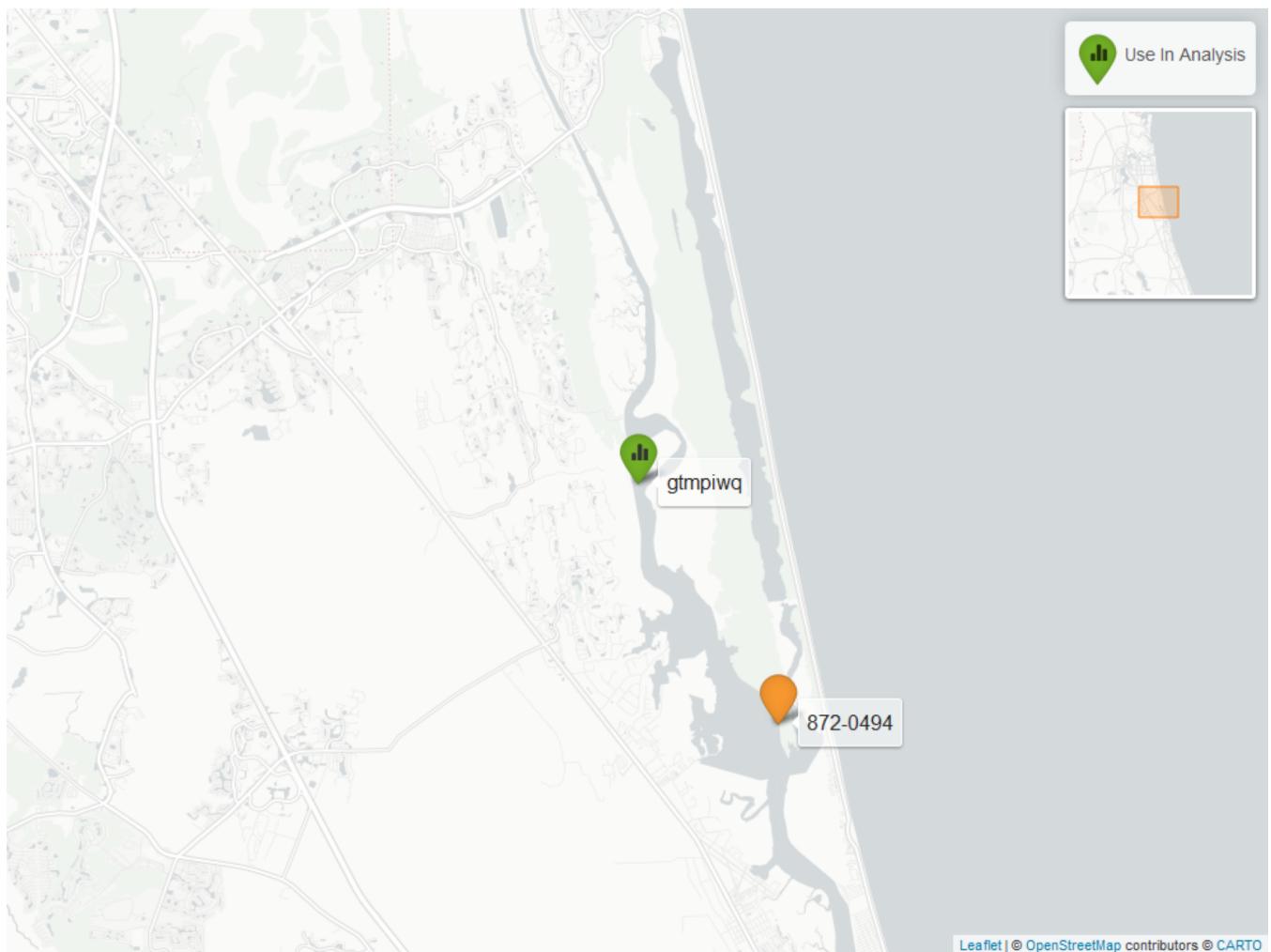
- *Combined\_WQ\_WC\_NUT\_cont\_Dissolved\_Oxygen\_NE-2024-Mar-23.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Dissolved\_Oxygen\_Saturation\_NE-2024-Mar-23.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_pH\_NE-2024-Mar-23.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Salinity\_NE-2024-Mar-23.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Turbidity\_NE-2024-Mar-23.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Water\_Temperature\_NE-2024-Mar-23.txt*

Table 26: Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program (4054)

<i>ProgramLocationID</i>	<i>Years of Data</i>	<i>Use in Analysis</i>	<i>Parameters</i>
gtmpiwq	22	TRUE	DO , DOS , pH , Sal , Turb , TempW

Table 27: FDEP Bureau of Survey and Mapping Continuous Water Quality Program (5062)

<i>ProgramLocationID</i>	<i>Years of Data</i>	<i>Use in Analysis</i>	<i>Parameters</i>
872-0494	2	FALSE	Sal , TempW



Map showing Continuous Water Quality Monitoring sampling locations within the boundaries of Guana River Marsh Aquatic Preserve. Sites marked as *Use In Analysis* are featured in this report.

## Dissolved Oxygen - Continuous Water Quality

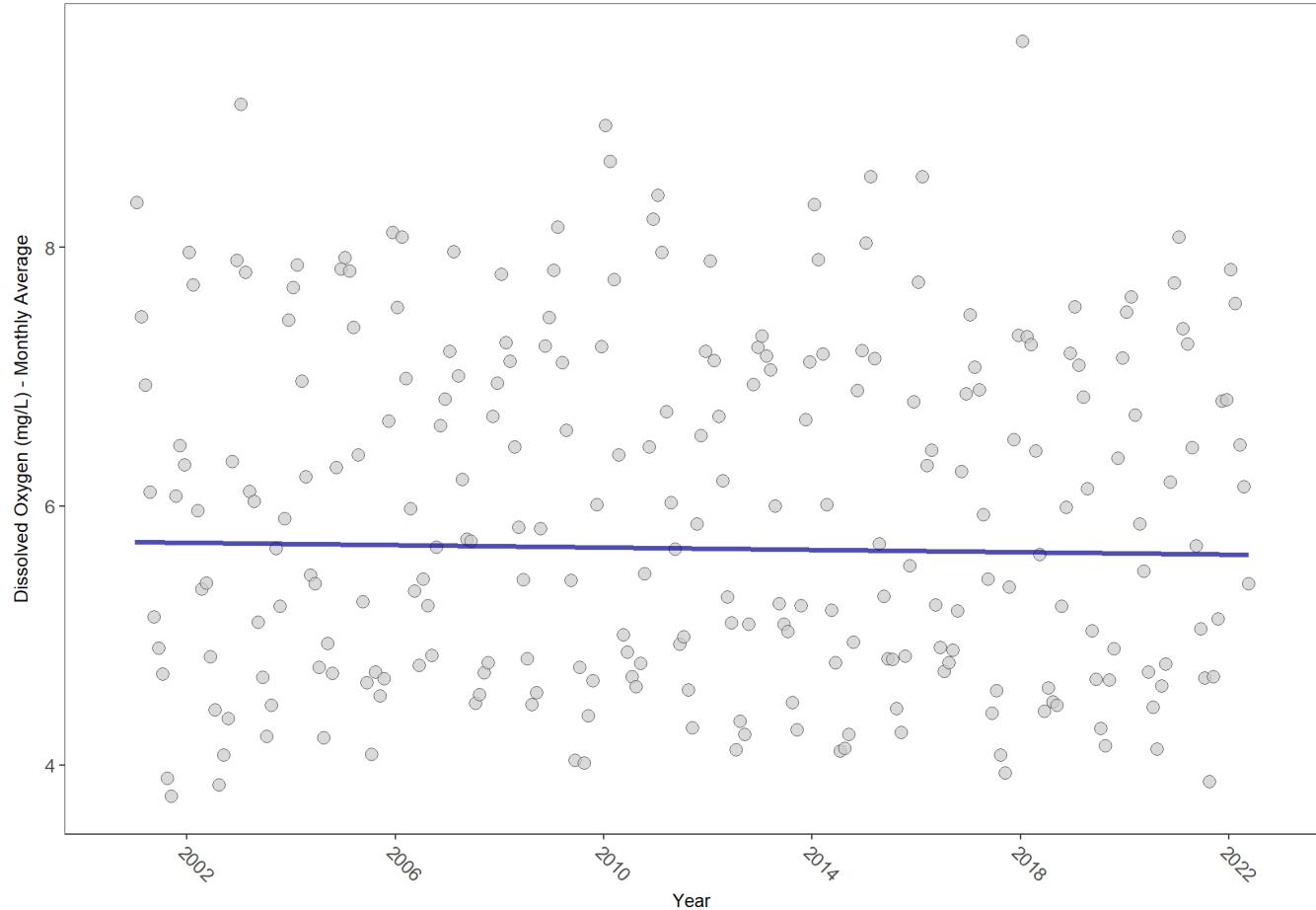
gtmipiwb

Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program (4054)

Guana River Marsh Aquatic Preserve

gtmipiwb

Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	576064	22	5.9	TRUE	-0.0485	0.2940	-0.004492187	5.721386	3.1878	0.988	0

$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

## Dissolved Oxygen Saturation - Continuous Water Quality

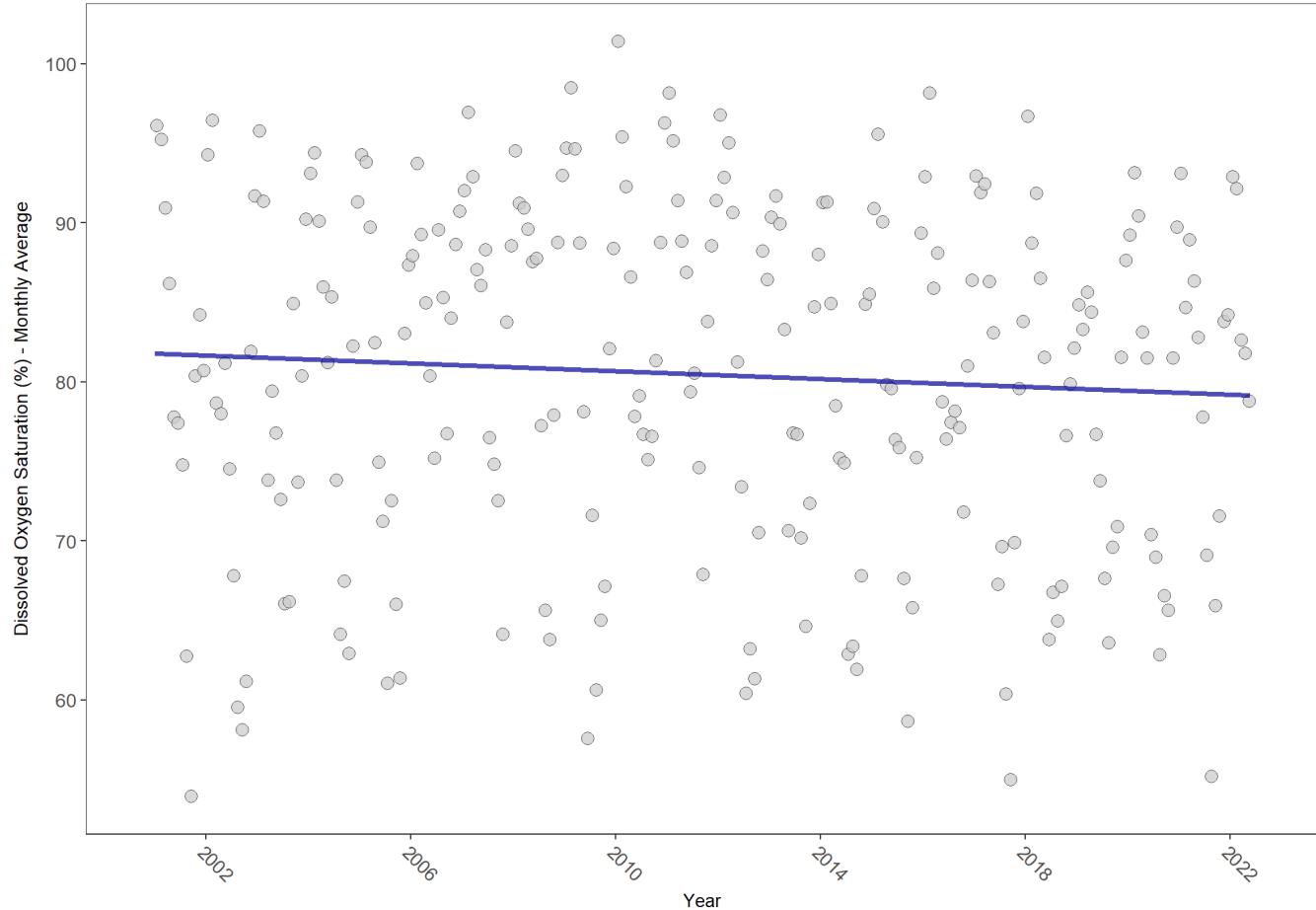
gtmipiwb

Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program (4054)

Guana River Marsh Aquatic Preserve

gtmipiwb

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	580954	22	83.1	TRUE	-0.1098	0.0155	-0.1238298	81.7863	7.889	0.7232	-1

$p < 0.00005$  appear as 0 due to rounding.

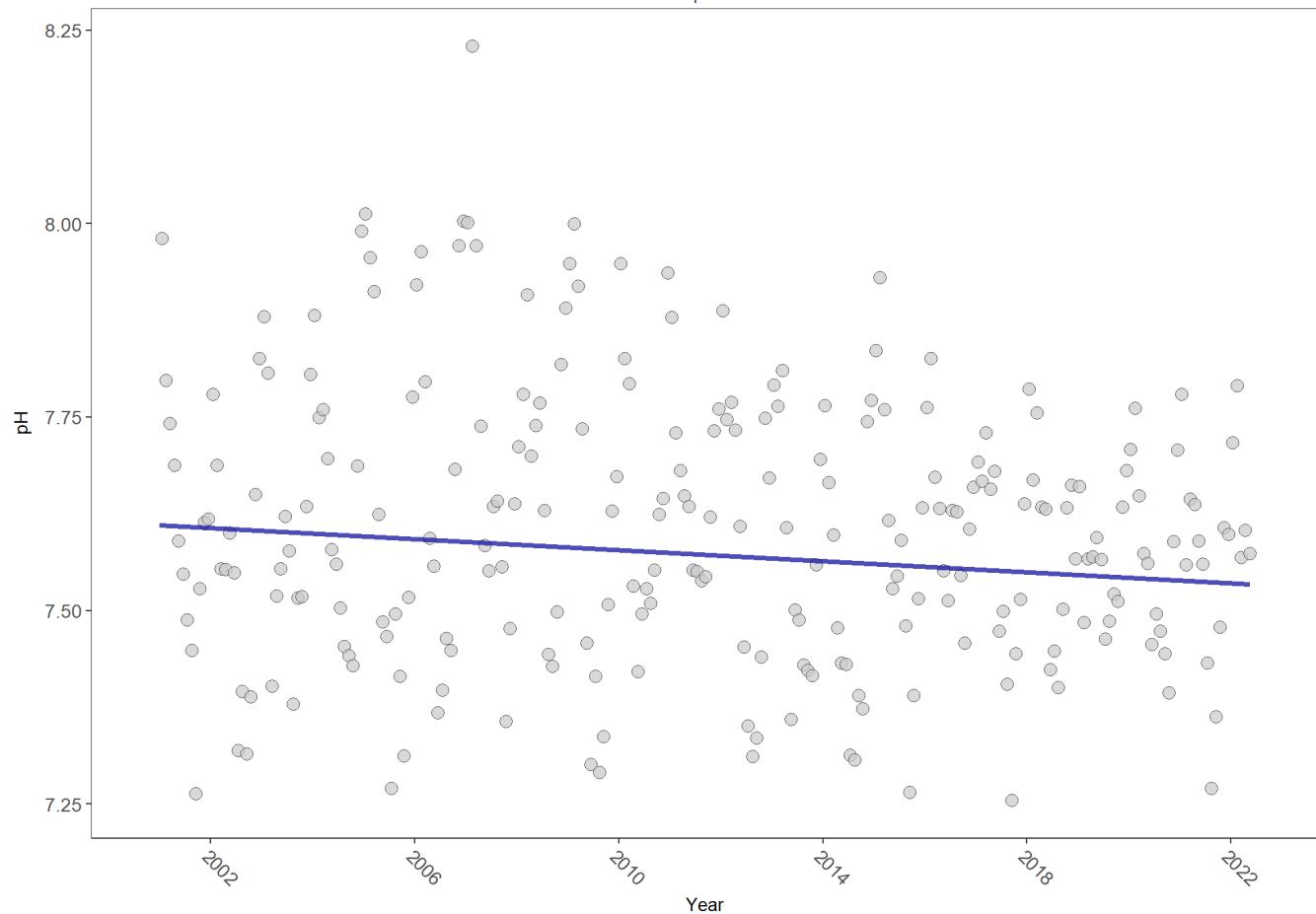
SennIntercept is intercept value at beginning of record for monitoring location

## pH - Continuous Water Quality

gtmipiwb

Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program (4054)

Guana River Marsh Aquatic Preserve  
gtmipiwb  
pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	572116	22	7.6	TRUE	-0.1489	0.0009	-0.003539015	7.609804	13.6578	0.2525	-1

$p < 0.00005$  appear as 0 due to rounding.

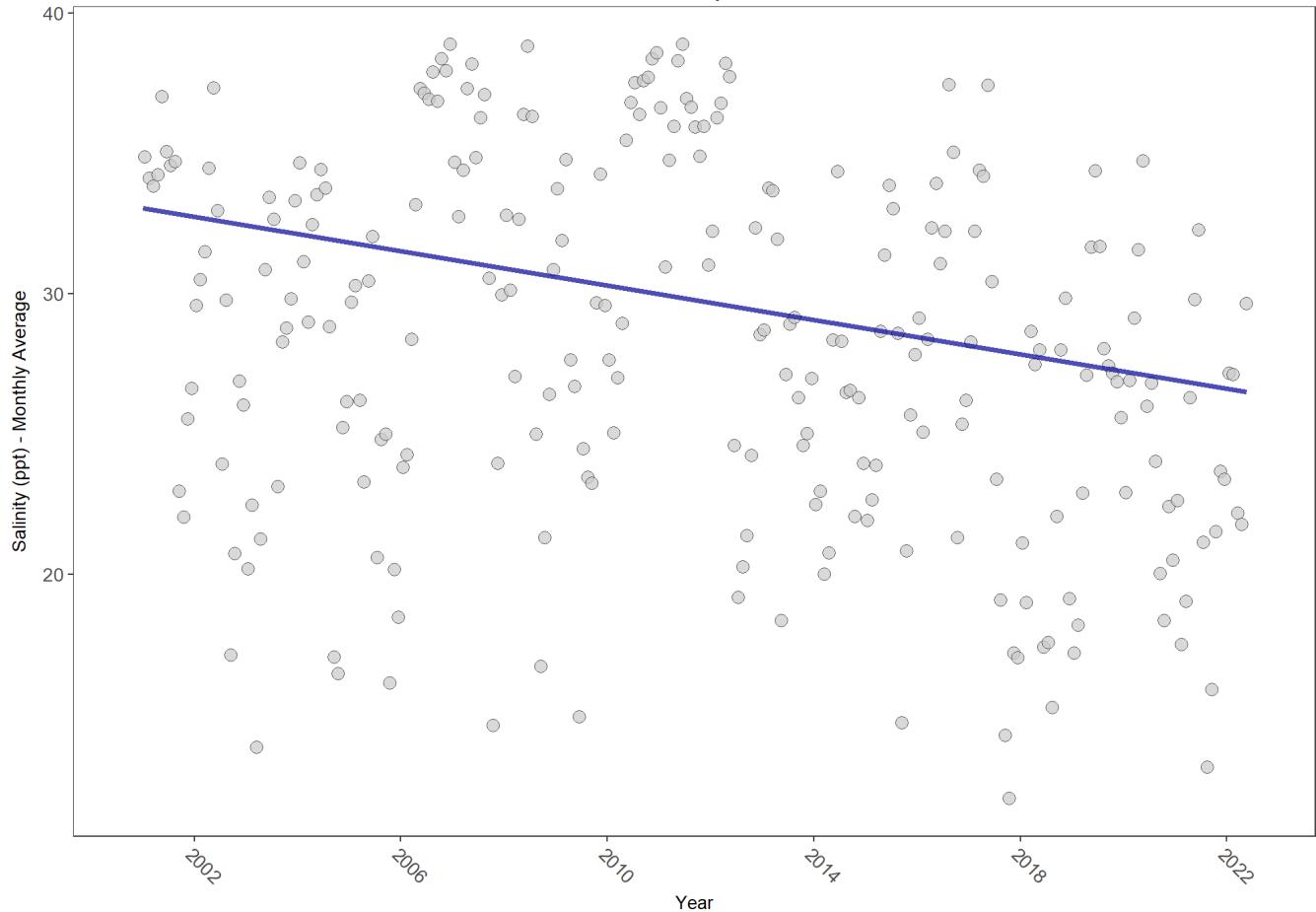
SennIntercept is intercept value at beginning of record for monitoring location

## Salinity - Continuous Water Quality

gtmpiwq

Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program (4054)

Guana River Marsh Aquatic Preserve  
gtmpiwq  
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	577716	22	28.3	TRUE	-0.2337	0.0000	-0.3058606	33.03749	4.0445	0.9686	-1

*p < 0.00005 appear as 0 due to rounding.*

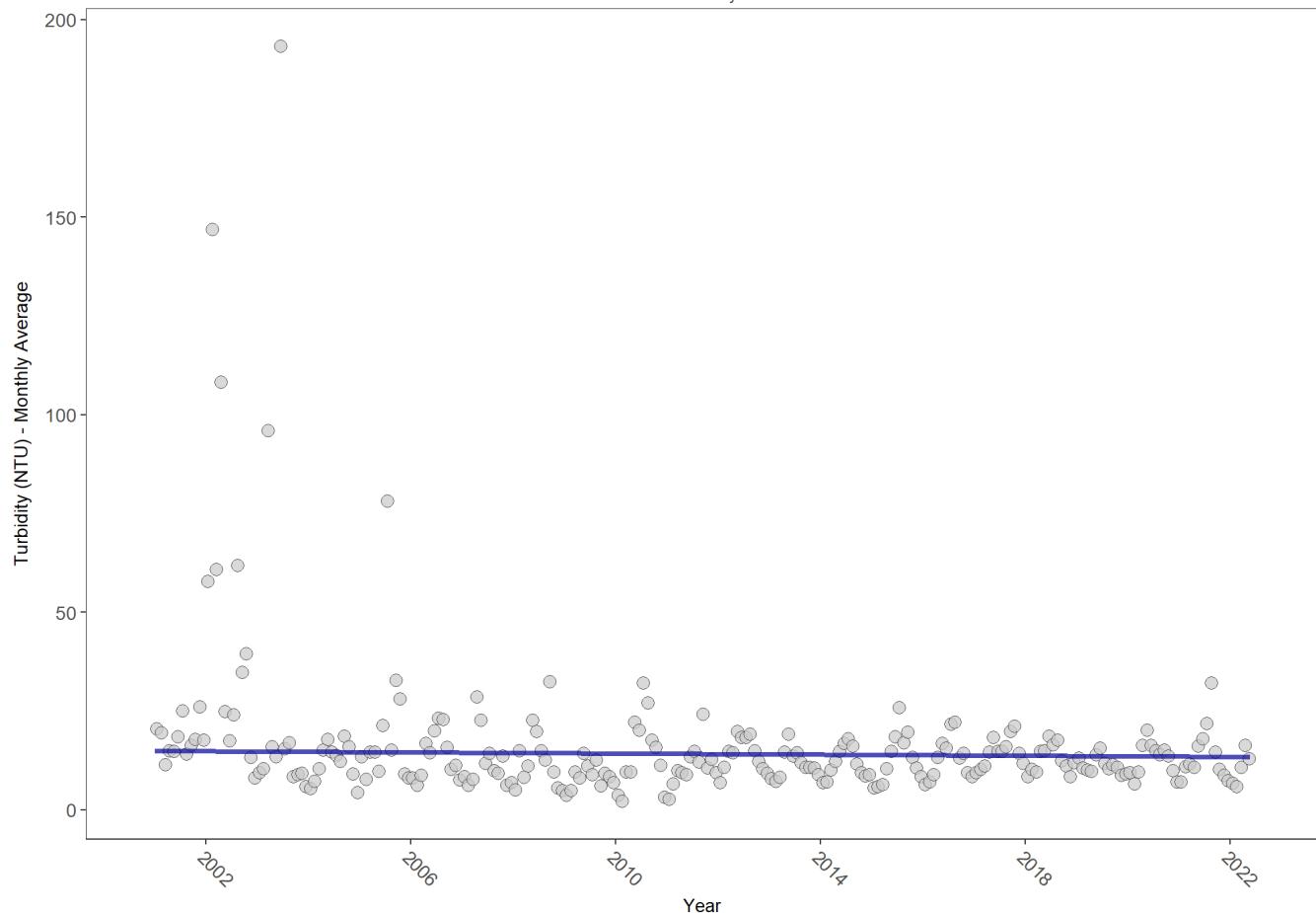
*SennIntercept is intercept value at beginning of record for monitoring location*

## Turbidity - Continuous Water Quality

gttmpiwq

Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program (4054)

Guana River Marsh Aquatic Preserve  
gttmpiwq  
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	552290	22	10	TRUE	-0.0883	0.0496	-0.07148746	14.97332	4.049	0.9685	-1

*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Water Temperature - Continuous Water Quality

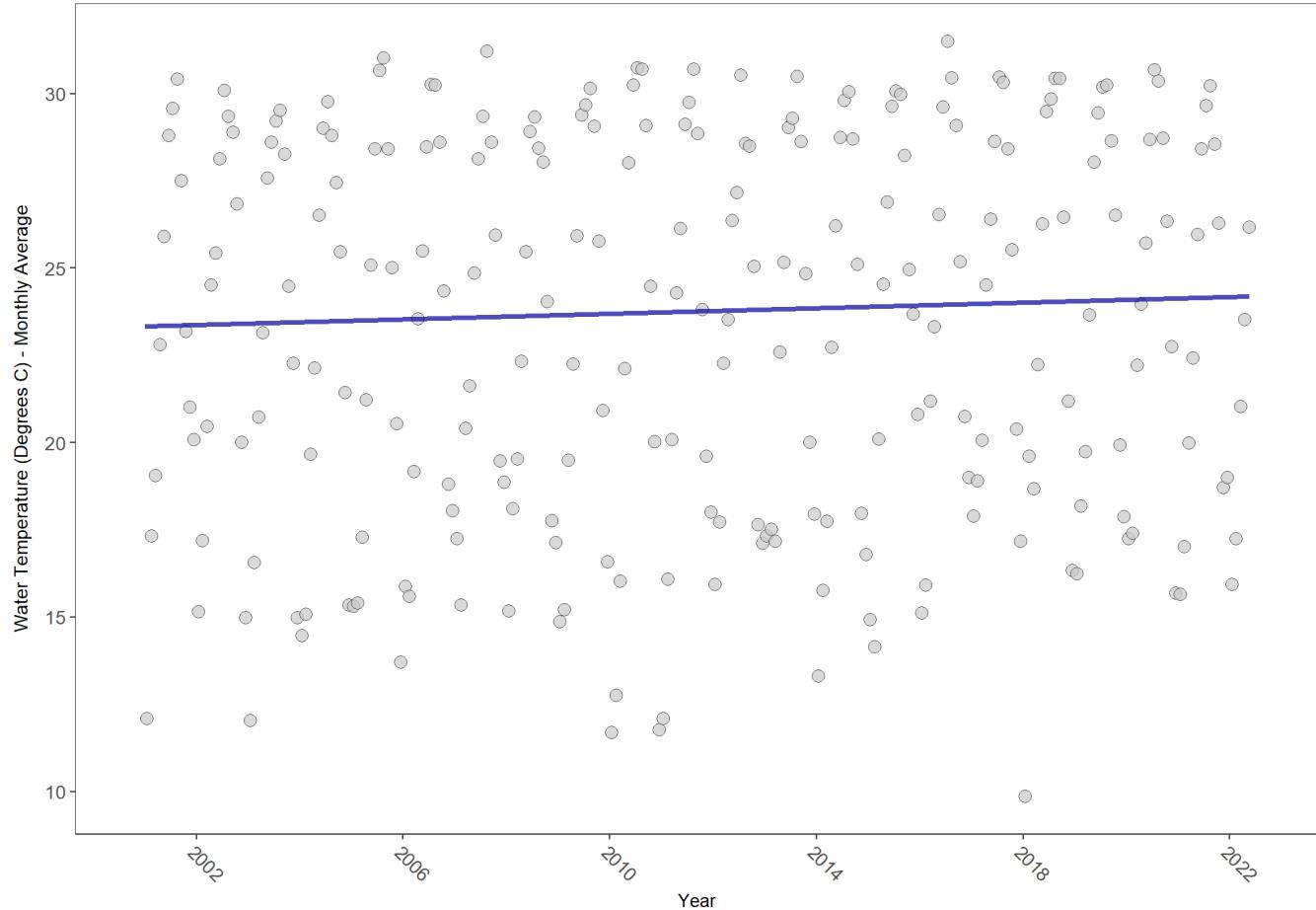
gttmpiwq

Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program (4054)

Guana River Marsh Aquatic Preserve

gttmpiwq

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	627043	22	24.1	TRUE	0.1768	0.0001	0.04030242	23.33673	4.5392	0.9514	1

$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location