

# Jensen Beach to Jupiter Inlet Aquatic Preserve

## SEACAR Habitat Analyses

Last compiled on 03 September, 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:

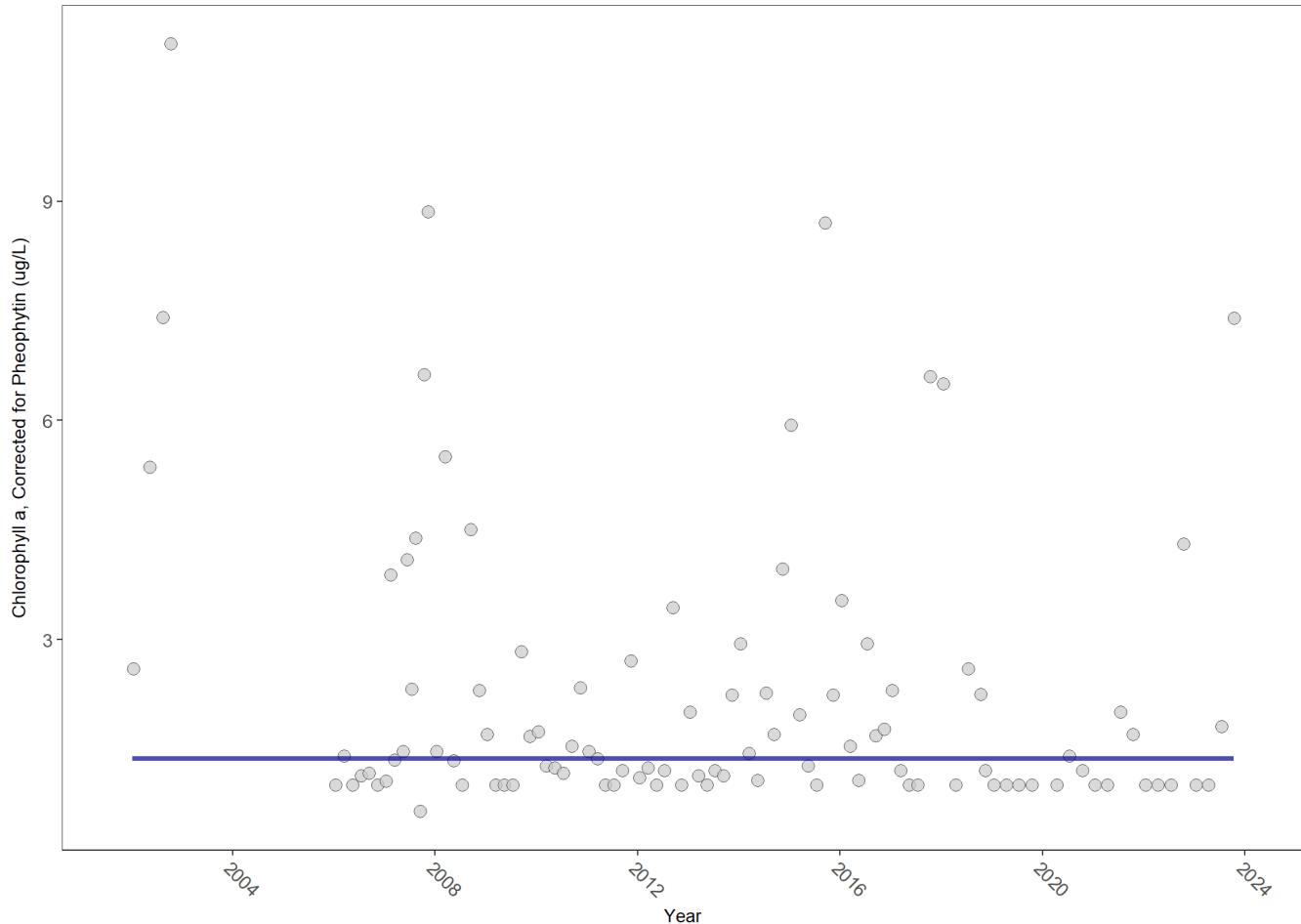
- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_corrected\_for\_pheophytin-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_uncorrected\_for\_pheophytin-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_Colored\_dissolved\_organic\_matter\_CDOM-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen\_Saturation-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_pH-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_Salinity-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_Secchi\_Depth-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Nitrogen-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Phosphorus-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Suspended\_Solids\_TSS-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_Turbidity-2024-Jul-11.txt*
- *Combined\_WQ\_WC\_NUT\_Water\_Temperature-2024-Jul-11.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

Chlorophyll a, Corrected for Pheophytin, Lab, All Depths  
Jensen Beach to Jupiter Inlet Aquatic Preserve

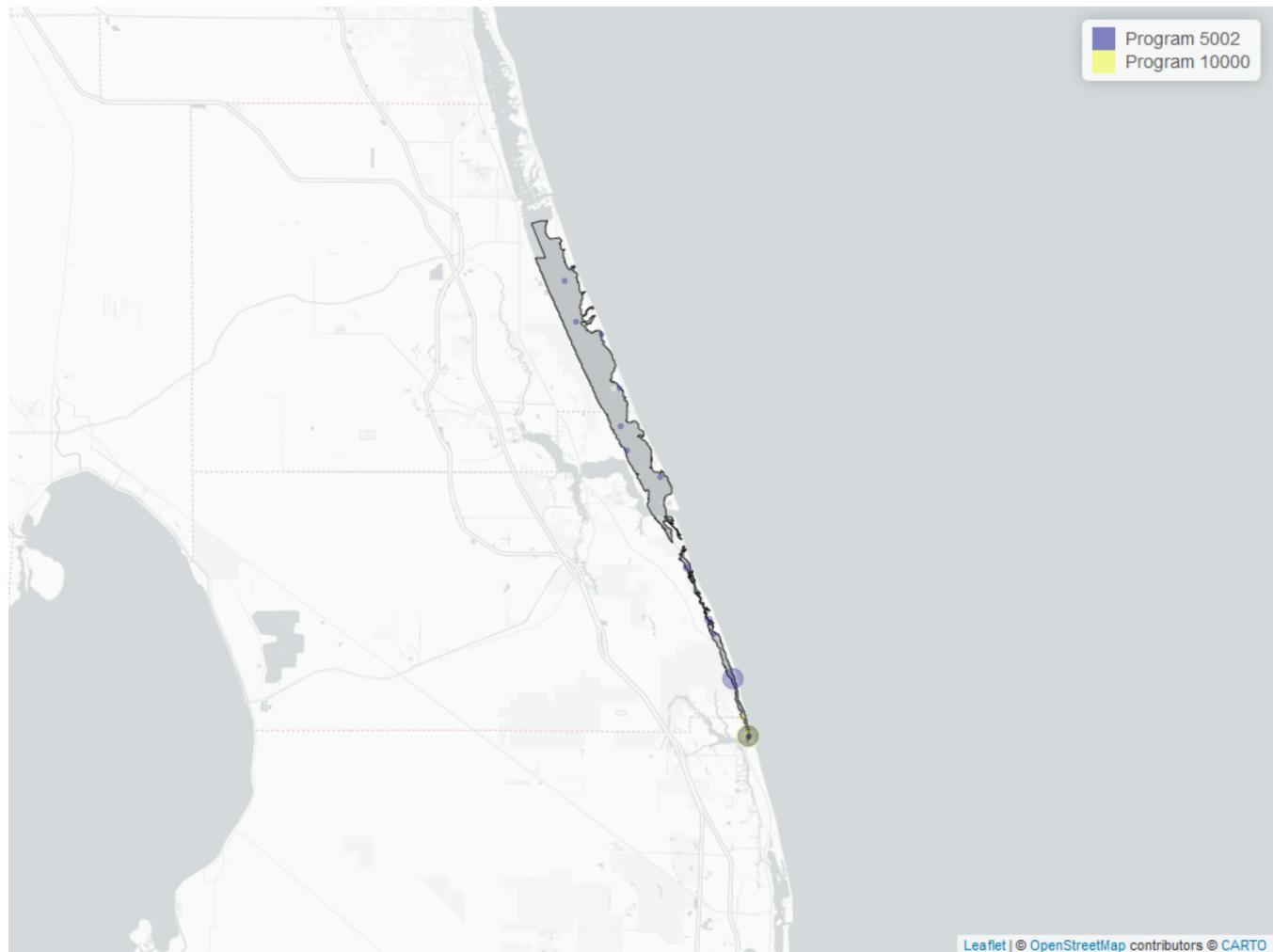


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	308	19	1.4	TRUE	-0.0431	0.8994	0	1.370208	NA	NA	0

*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 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
5002	207	2002	2017
10000	104	2006	2023

#### Program names:

5002 - Florida STORET / WIN

10000 - RiverKeeper

#### 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

<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>
2006	18					9	50.0
2007	62	6	9.7			7	11.3
2008	18					4	22.2
2009	18			2	11.1	6	33.3
2010	18					2	11.1
2012	18					2	11.1
2013	18					5	27.8
2014	18					2	11.1
2015	18					2	11.1
2016	25					1	4.0
2020	3					1	33.3
2021	4					2	50.0
2022	4					2	50.0
2023	4					2	50.0

**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:**

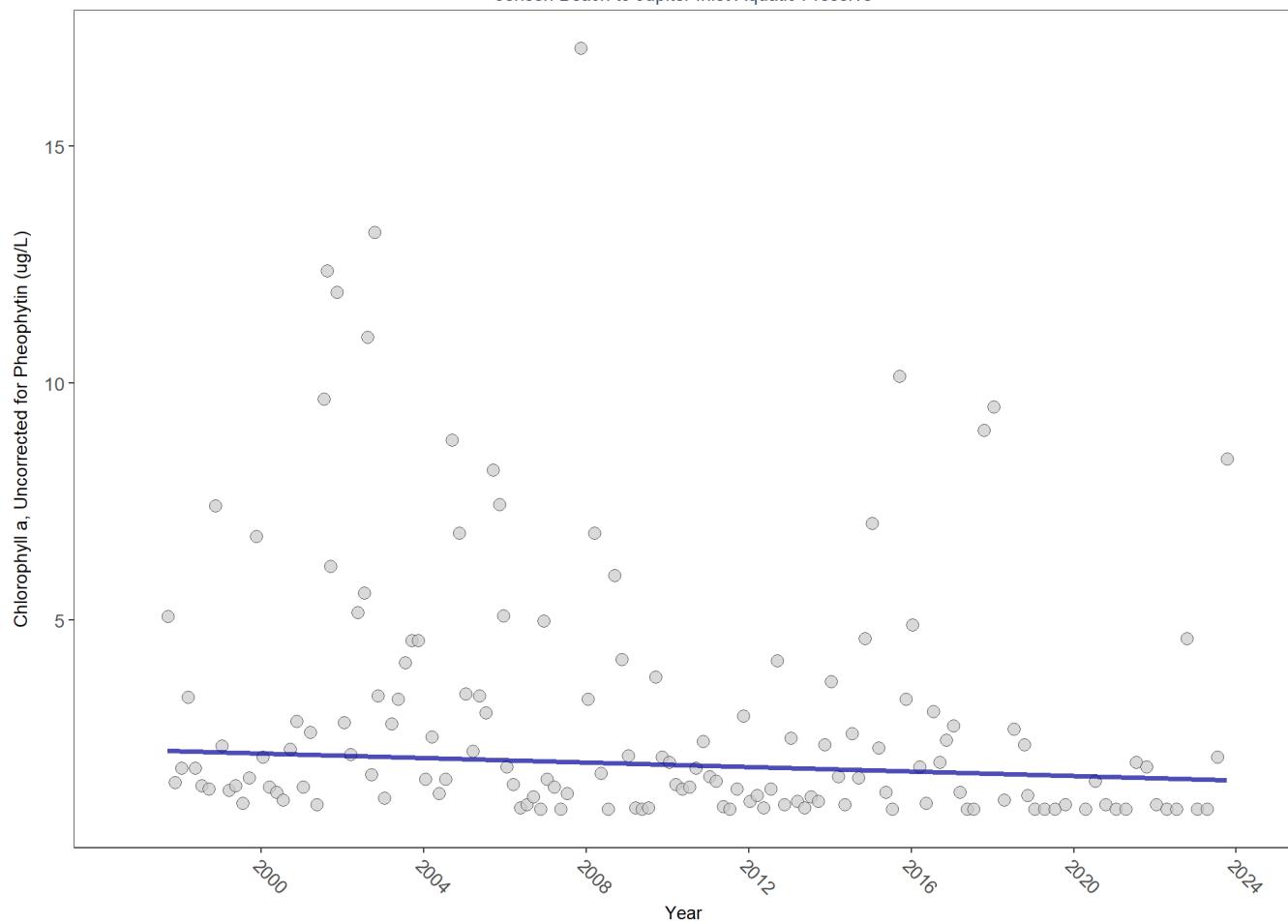
5002 - Florida STORET / WIN

10000 - RiverKeeper

# Chlorophyll a, Uncorrected for Pheophytin - Discrete Water Quality

## Seasonal Kendall-Tau Trend Analysis

Chlorophyll a, Uncorrected for Pheophytin, Lab, All Depths  
Jensen Beach to Jupiter Inlet Aquatic Preserve

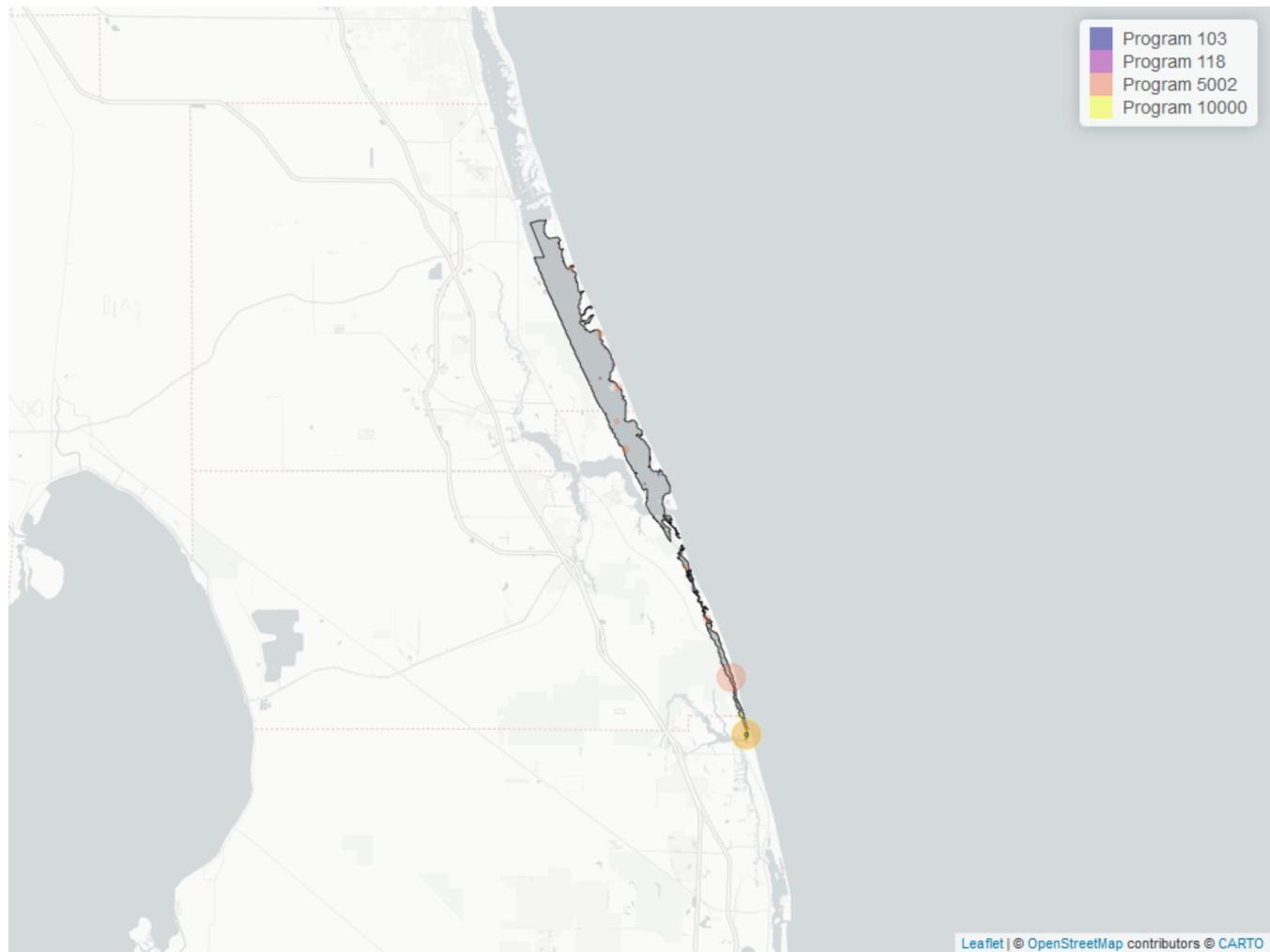


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	439	27	1.9	TRUE	-0.1963	0.0078	-0.02380952	2.25562	3.3875	0.9469	-1

*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
5002	282	1997	2017
10000	152	1997	2023
103	5	2021	2021
118	5	2005	2010

#### Program names:

5002 - Florida STORET / WIN

10000 - RiverKeeper

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
- $N_Q$  is the total amount of values flagged with the respective value qualifier in a given year
- $perc_Q$  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	$N_{Total}$	$N_Q$	$perc_Q$	$N_U$	$perc_U$
1997	6			1	16.7
1999	18			3	16.7
2000	18			4	22.2
2001	43			1	2.3
2002	40			2	5.0
2003	16			1	6.2
2004	18			1	5.6
2005	20			1	5.0
2006	19			6	31.6
2007	15			4	26.7
2008	18			2	11.1
2009	18	2	11.1	4	22.2
2010	18			2	11.1
2012	18			3	16.7
2013	18			4	22.2
2014	18			1	5.6
2015	18			1	5.6
2016	25			1	4.0
2021	9			2	22.2
2022	4			1	25.0
2023	4			2	50.0

**Note:** <sup>1</sup>**Q** - Sample held beyond the accepted holding time <sup>2</sup>**U** - Compound was analyzed for but not detected

## Programs containing Value Qualified data:

10000 - RiverKeeper

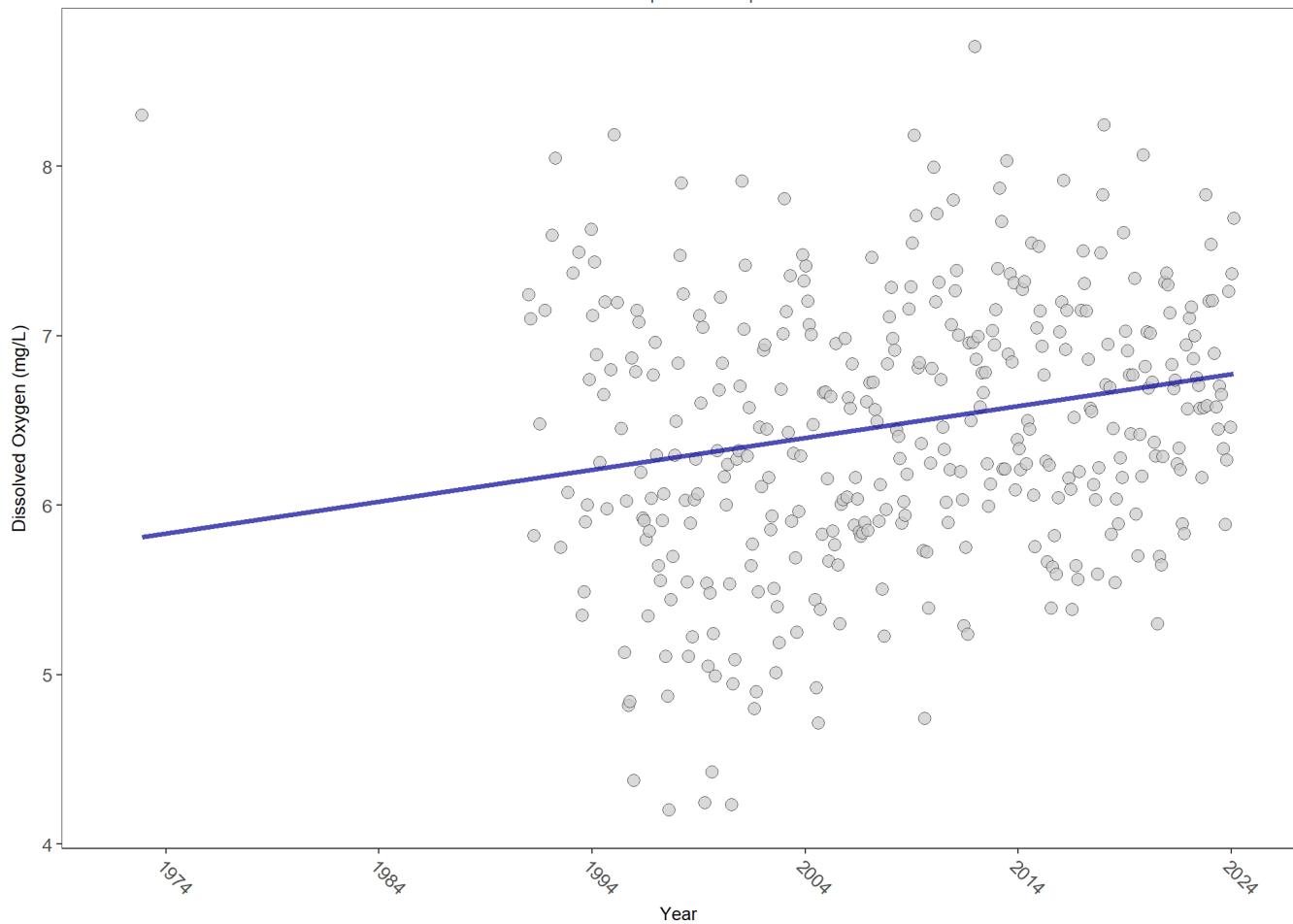
5002 - Florida STORET / WIN

## 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  
Jensen Beach to Jupiter Inlet Aquatic Preserve

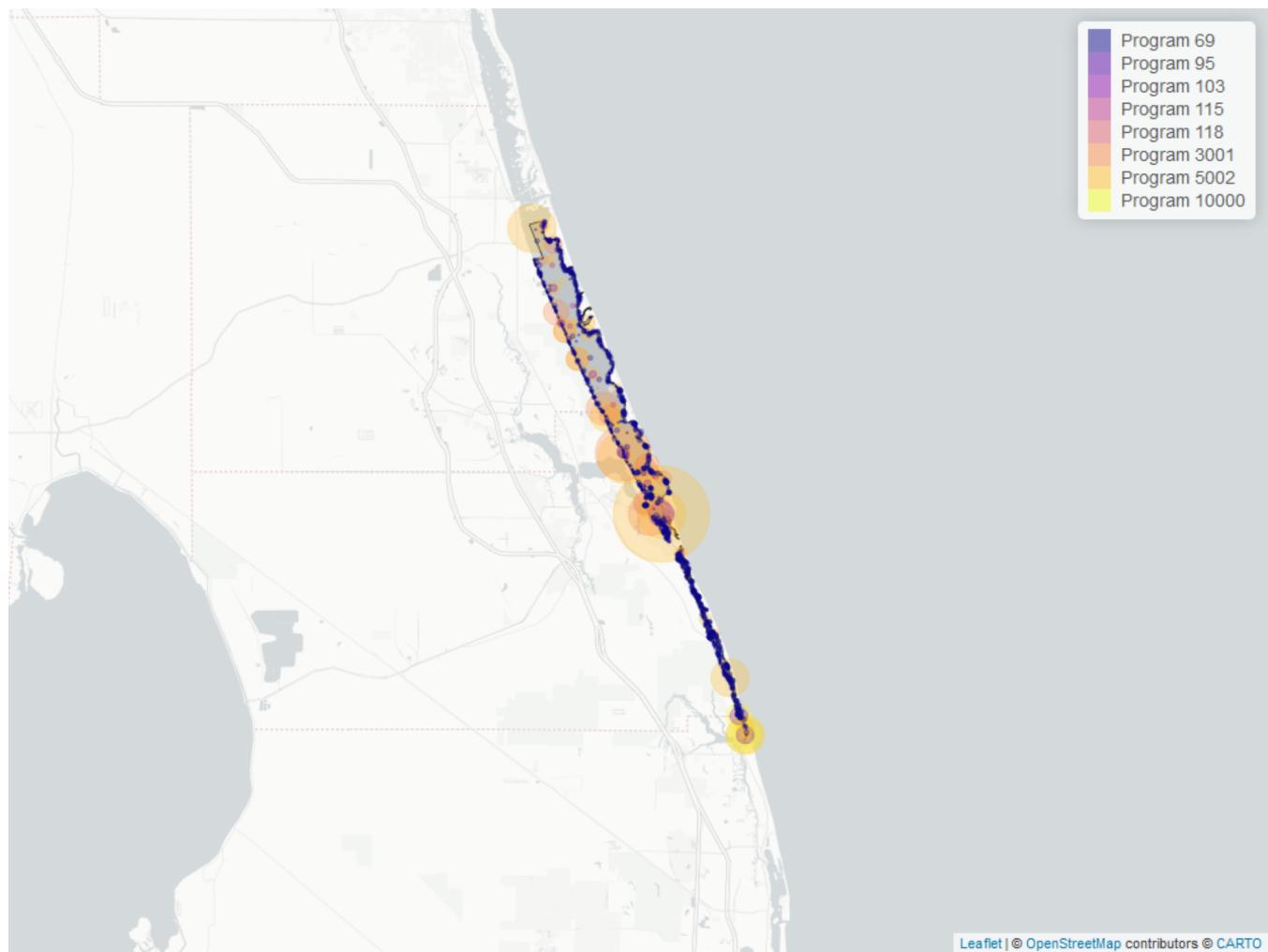


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	10500	35	6.4	TRUE	0.2031	0.0000	0.01880303	5.795875	10.8735	0.4539	1

$p < 0.00005$  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 10: Programs contributing data for Dissolved Oxygen

ProgramID	N_Data	YearMin	YearMax
5002	4095	1991	2024
69	3600	1998	2022
3001	1628	1993	2023
10000	455	1991	2023
3013	389	2003	2023
103	273	2020	2021
95	50	1972	2018
115	20	1994	1995
118	3	2005	2006

**Program names:**

5002 - Florida STORET / WIN  
 69 - Fisheries-Independent Monitoring (FIM) Program  
 3001 - Lagoon Watch (Formerly Marine Discovery Center)  
 10000 - RiverKeeper  
 3013 - Seagrass (SJRWMD)  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
 95 - Harmful Algal Bloom Marine Observation Network  
 115 - Environmental Monitoring Assessment Program  
 118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

There are no qualifying Value Qualifiers for Dissolved Oxygen in Jensen Beach to Jupiter Inlet Aquatic Preserve

## Dissolved Oxygen Saturation - Discrete Water Quality

### Seasonal Kendall-Tau Trend Analysis

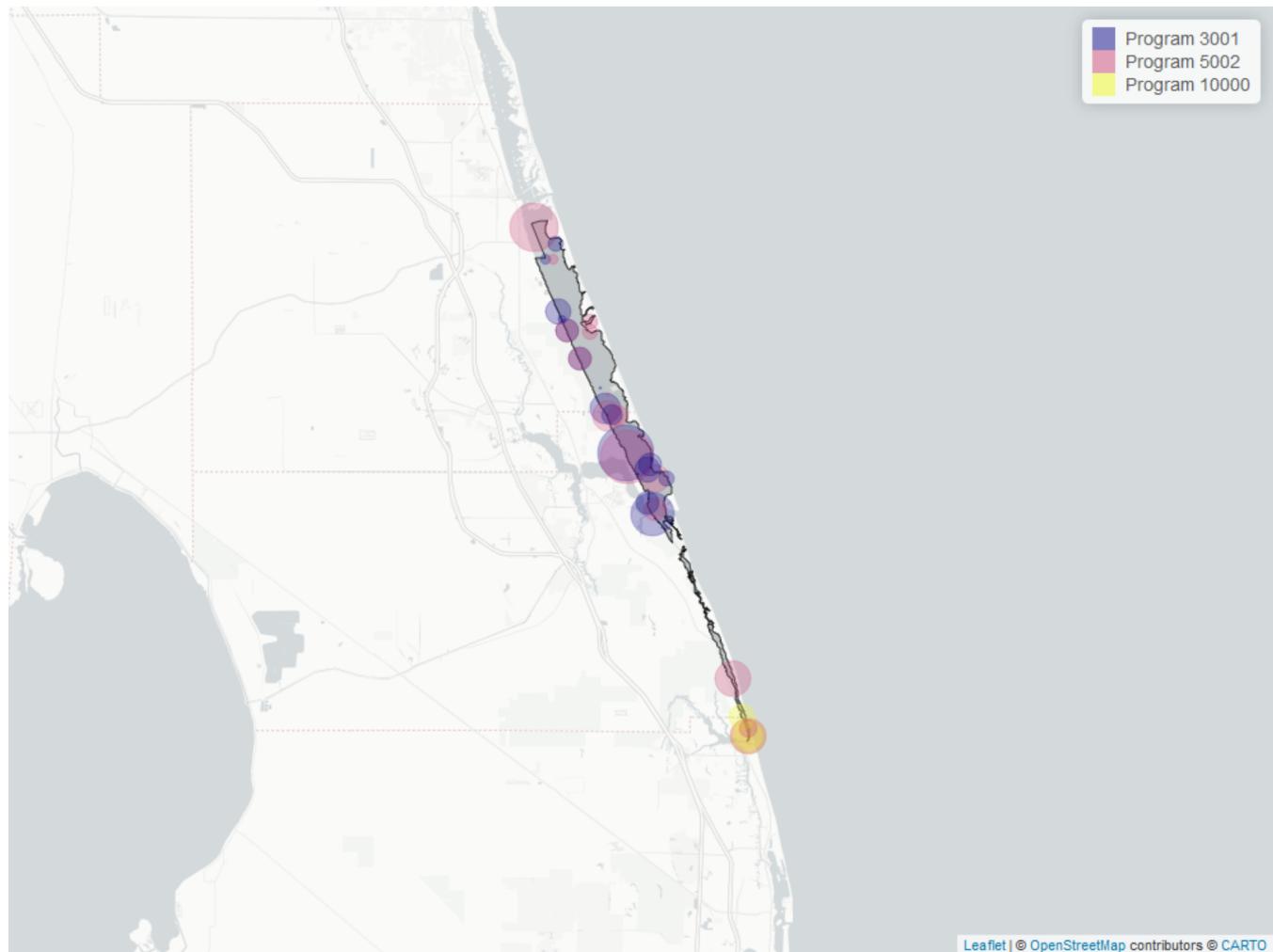


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	4153	31	78.639	TRUE	0.6664	0.0000	2.810196	15.58739	7.8047	0.7307	1

$p < 0.00005$  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 Saturation



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

Table 11: Programs contributing data for Dissolved Oxygen Saturation

ProgramID	N_Data	YearMin	YearMax
5002	1903	1995	2017
3001	1608	1993	2023
10000	434	1995	2023
3013	209	2014	2023

#### Program names:

5002 - Florida STORET / WIN

3001 - Lagoon Watch (Formerly Marine Discovery Center)

10000 - RiverKeeper

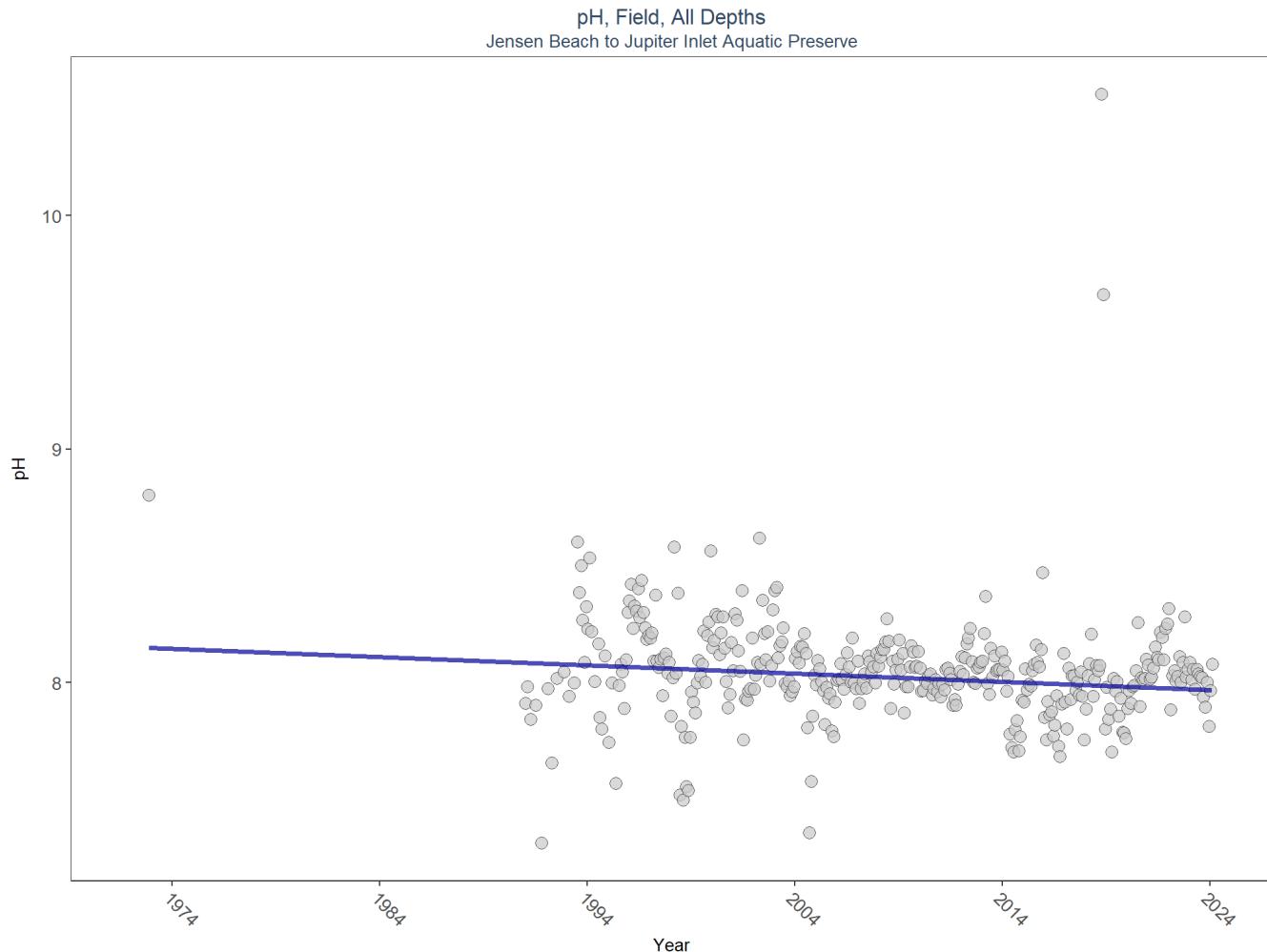
3013 - Seagrass (SJRWMD)

There are no qualifying Value Qualifiers for Dissolved Oxygen Saturation in Jensen Beach to Jupiter Inlet 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.

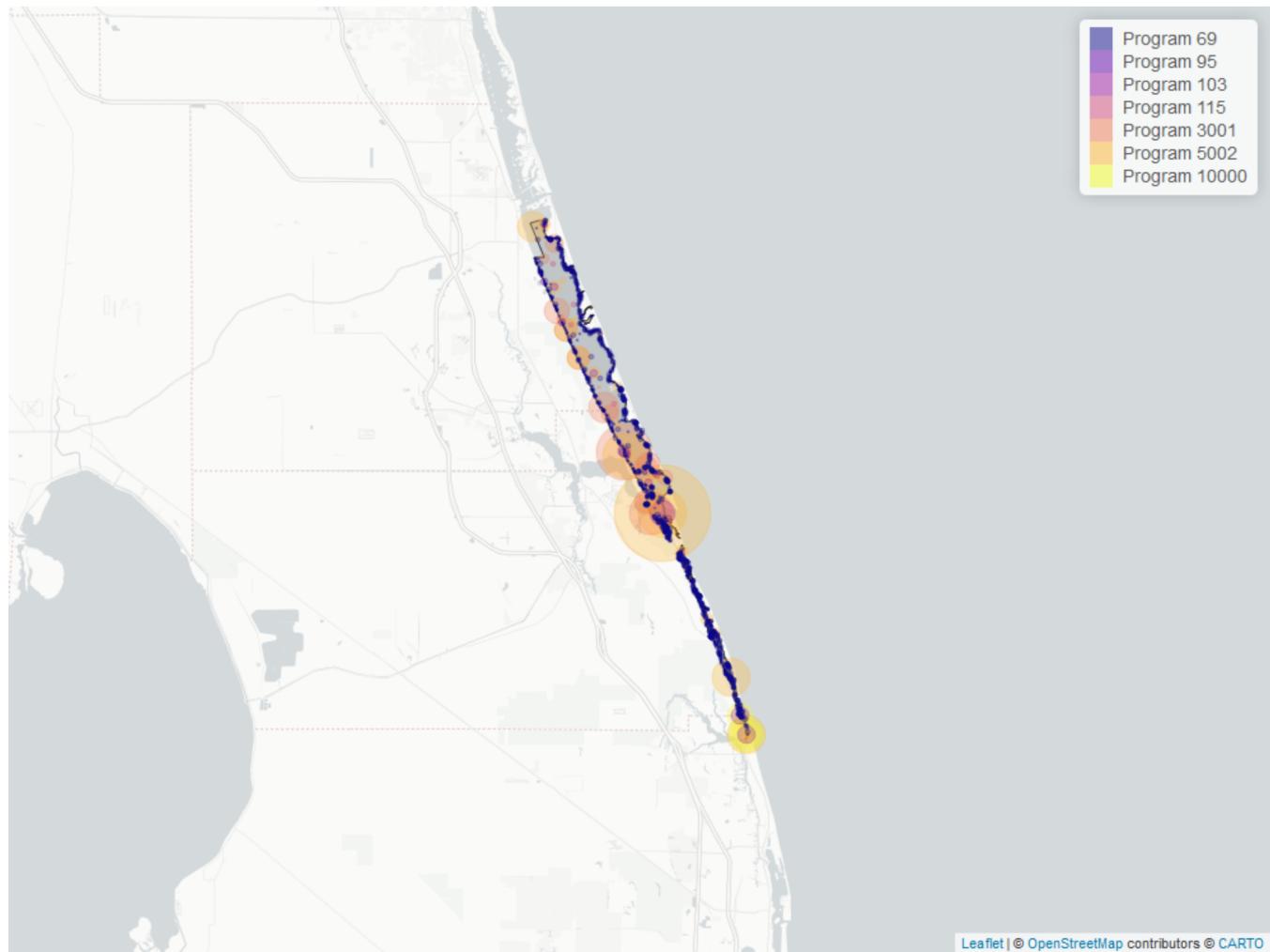
### Seasonal Kendall-Tau Trend Analysis



*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 12: Programs contributing data for pH

ProgramID	N_Data	YearMin	YearMax
69	3533	1998	2022
5002	3214	1991	2024
3001	1611	1993	2023
10000	417	1991	2023
3013	374	2003	2023
103	271	2020	2021
95	59	1972	2018
115	16	1994	1995

**Program names:**

69 - Fisheries-Independent Monitoring (FIM) Program

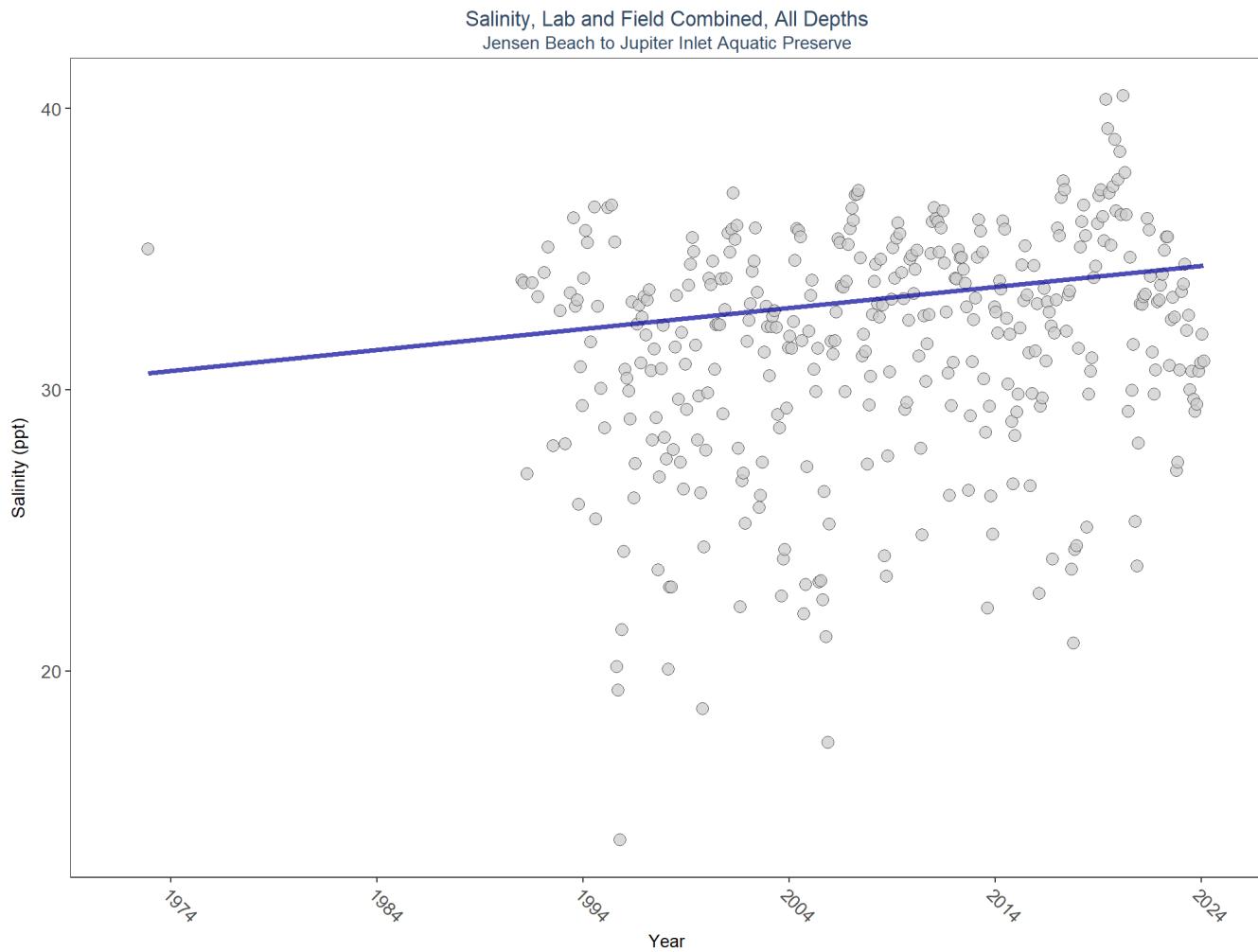
5002 - Florida STORET / WIN  
 3001 - Lagoon Watch (Formerly Marine Discovery Center)  
 10000 - RiverKeeper  
 3013 - Seagrass (SJRWMD)  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
 95 - Harmful Algal Bloom Marine Observation Network  
 115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for pH in Jensen Beach to Jupiter Inlet 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

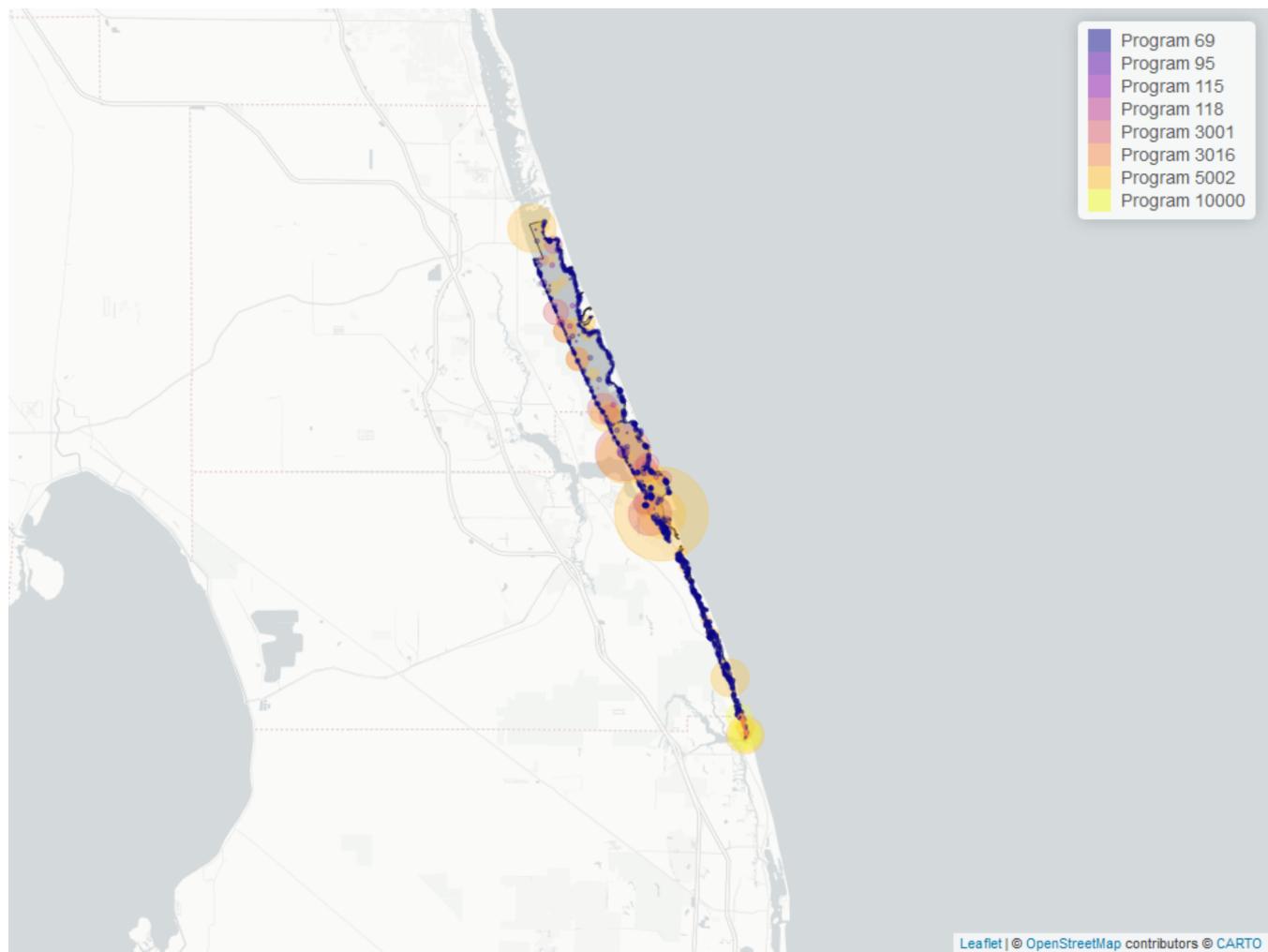


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	10526	35	32.8	TRUE	0.1465	0.0001	0.07442299	30.53329	5.7688	0.8883	1

*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 13: Programs contributing data for Salinity

ProgramID	N_Data	YearMin	YearMax
5002	4088	1991	2024
69	3816	1997	2022
3001	1619	1993	2023
3013	432	2003	2023
10000	411	1991	2023
3016	81	2013	2013
95	62	1972	2018
115	19	1994	1995
118	8	2021	2021

**Program names:**

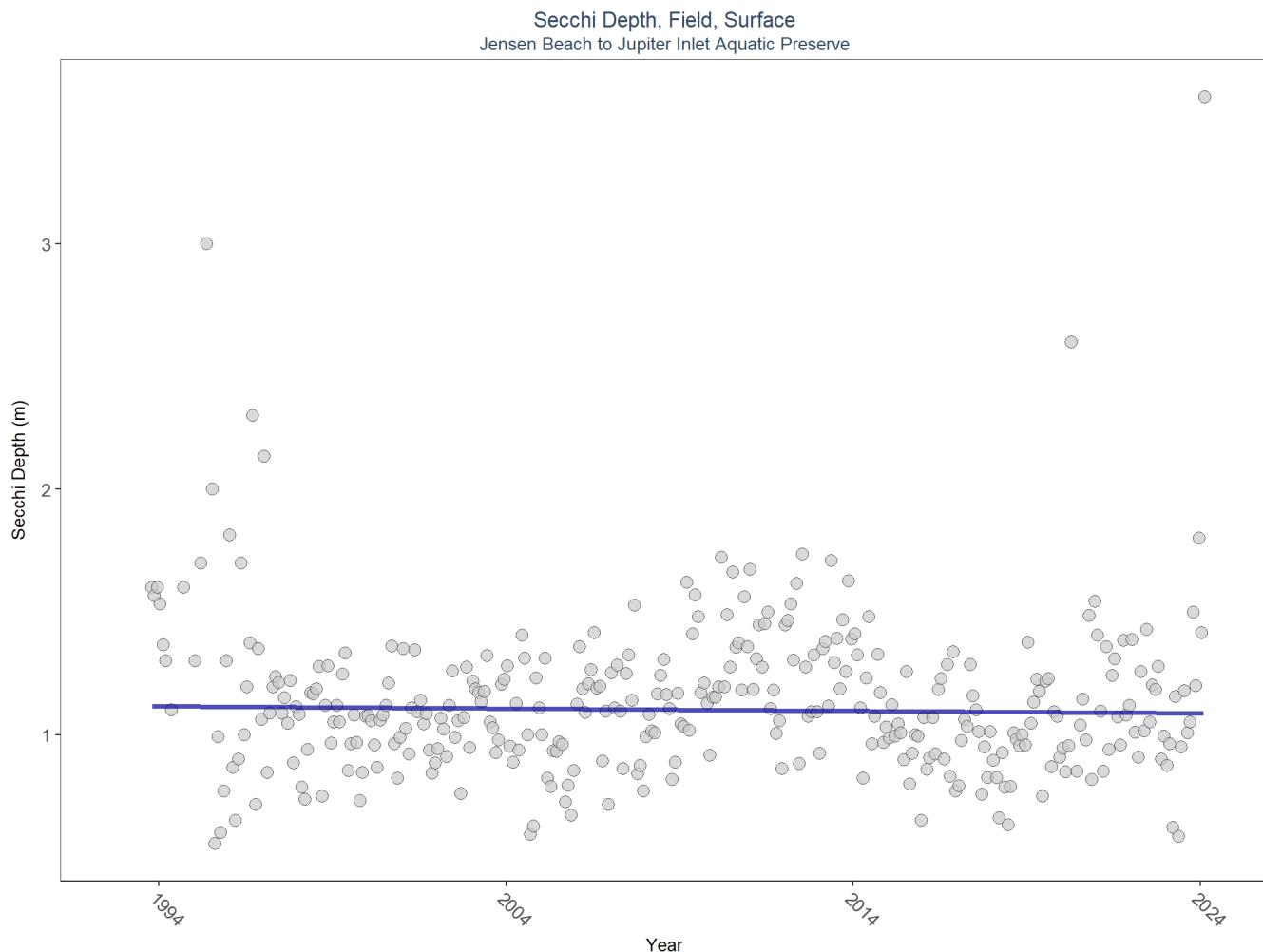
5002 - Florida STORET / WIN  
 69 - Fisheries-Independent Monitoring (FIM) Program  
 3001 - Lagoon Watch (Formerly Marine Discovery Center)  
 3013 - Seagrass (SJRWMD)  
 10000 - RiverKeeper  
 3016 - Lake Worth Lagoon Seagrass Mapping Project  
 95 - Harmful Algal Bloom Marine Observation Network  
 115 - Environmental Monitoring Assessment Program  
 118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

There are no qualifying Value Qualifiers for Salinity in Jensen Beach to Jupiter Inlet 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.

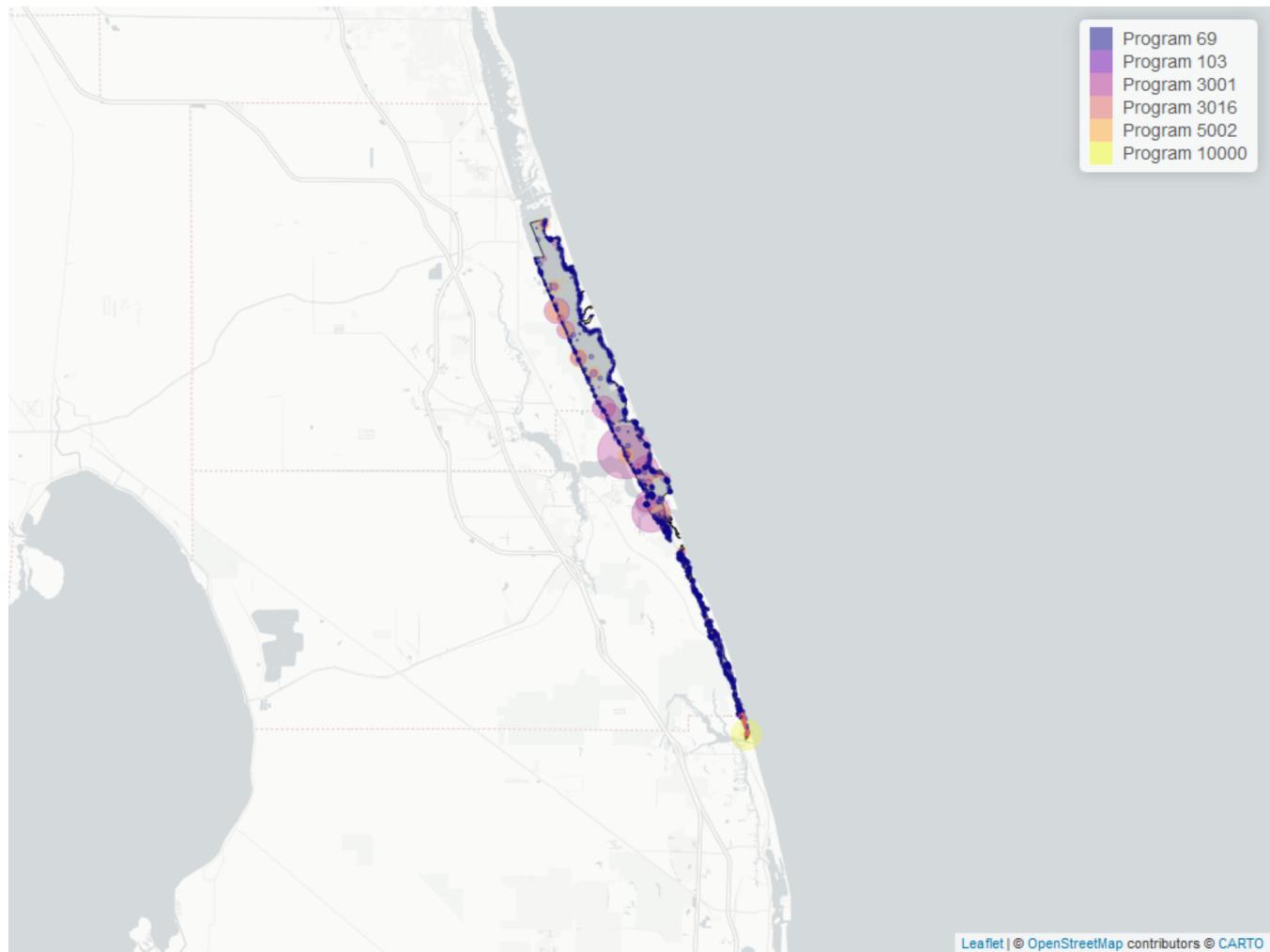
### Seasonal Kendall-Tau Trend Analysis



$p < 0.00005$  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 14: Programs contributing data for Secchi Depth

ProgramID	N_Data	YearMin	YearMax
69	3835	1997	2022
3001	1188	1993	2023
5002	436	2000	2024
3013	373	2003	2023
10000	156	1994	2023
3016	81	2013	2013
103	80	2020	2021

#### Program names:

69 - Fisheries-Independent Monitoring (FIM) Program

3001 - Lagoon Watch (Formerly Marine Discovery Center)

5002 - Florida STORET / WIN  
 3013 - Seagrass (SJRWM)  
 10000 - RiverKeeper  
 3016 - Lake Worth Lagoon Seagrass Mapping Project  
 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 15: Value Qualifiers for Secchi Depth

Year	$N_{Total}$	$N_S$	$perc_S$
2020	159	2	1.3
2021	377	49	13.0
2022	289	39	13.5
2023	155	51	32.9
2024	11	3	27.3

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

### Programs containing Value Qualified data:

5002 - Florida STORET / WIN

## 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)  $TN = ORGN + NH_4 + NO_3;$

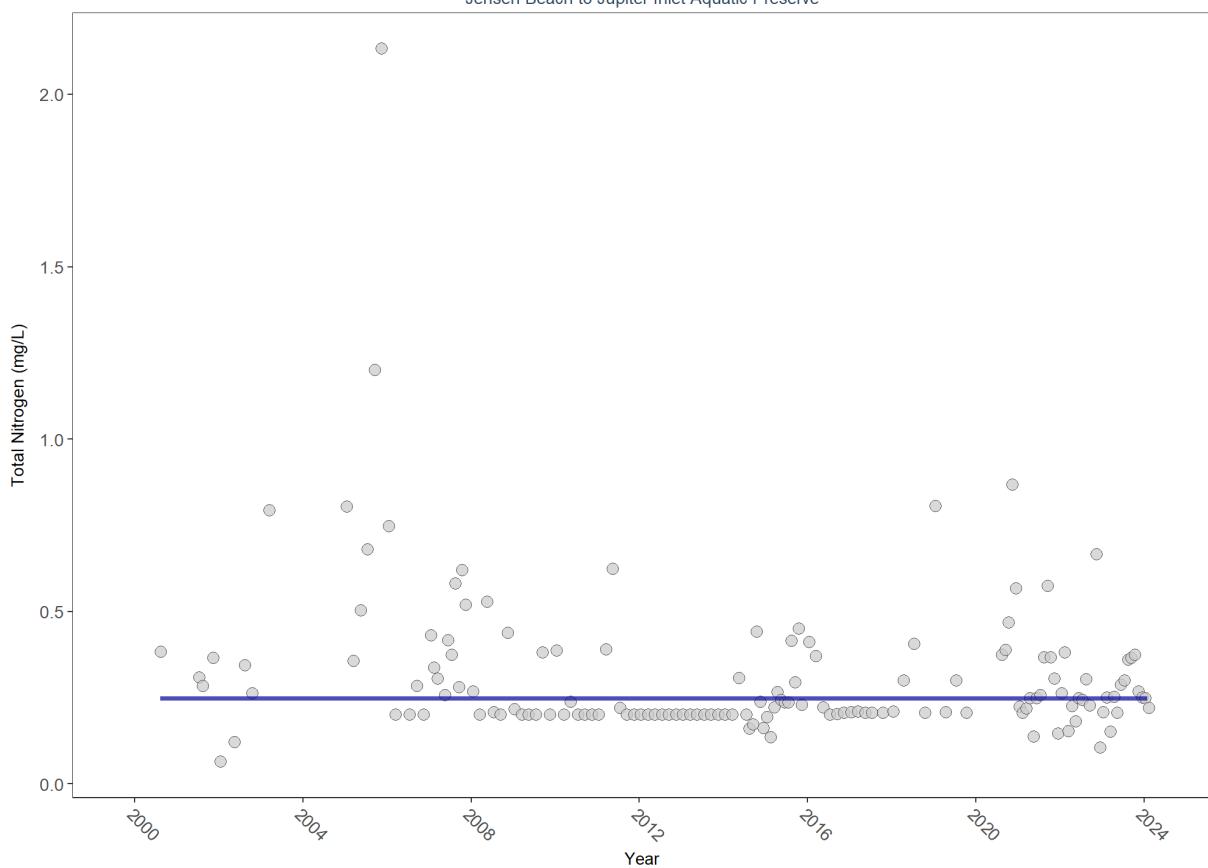
Additional Information:

- 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  
Jensen Beach to Jupiter Inlet Aquatic Preserve

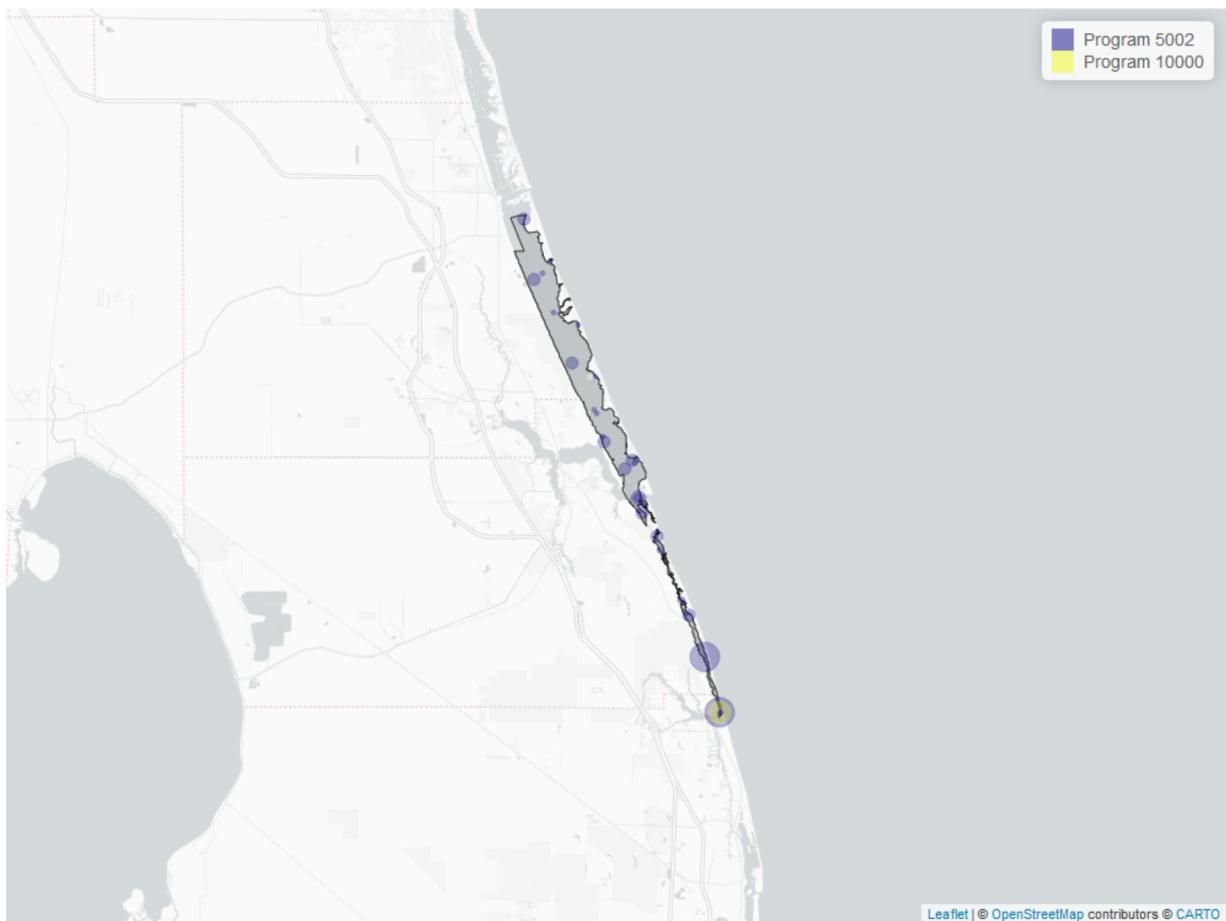


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	570	24	0.2485	TRUE	-0.0577	0.4003	0	0.2486038	5.1207	0.9252	0

$p < 0.00005$  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 Total Nitrogen



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

Table 16: Programs contributing data for Total Nitrogen

ProgramID	N_Data	YearMin	YearMax
5002	625	1991	2024
10000	85	2003	2019

#### Program names:

5002 - Florida STORET / WIN

10000 - RiverKeeper

#### Value Qualifiers

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

Table 17: Value Qualifiers for Total Nitrogen

<i>Year</i>	<i>N_Total</i>	<i>N_U</i>	<i>perc_U</i>
2006	15	6	40.0
2007	62	10	16.1
2008	18	6	33.3
2009	18	10	55.6
2010	18	7	38.9
2011	18	4	22.2
2012	18	2	11.1
2014	23	4	17.4
2015	29	4	13.8

**Note:** <sup>1</sup>**U** - Compound was analyzed for but not detected

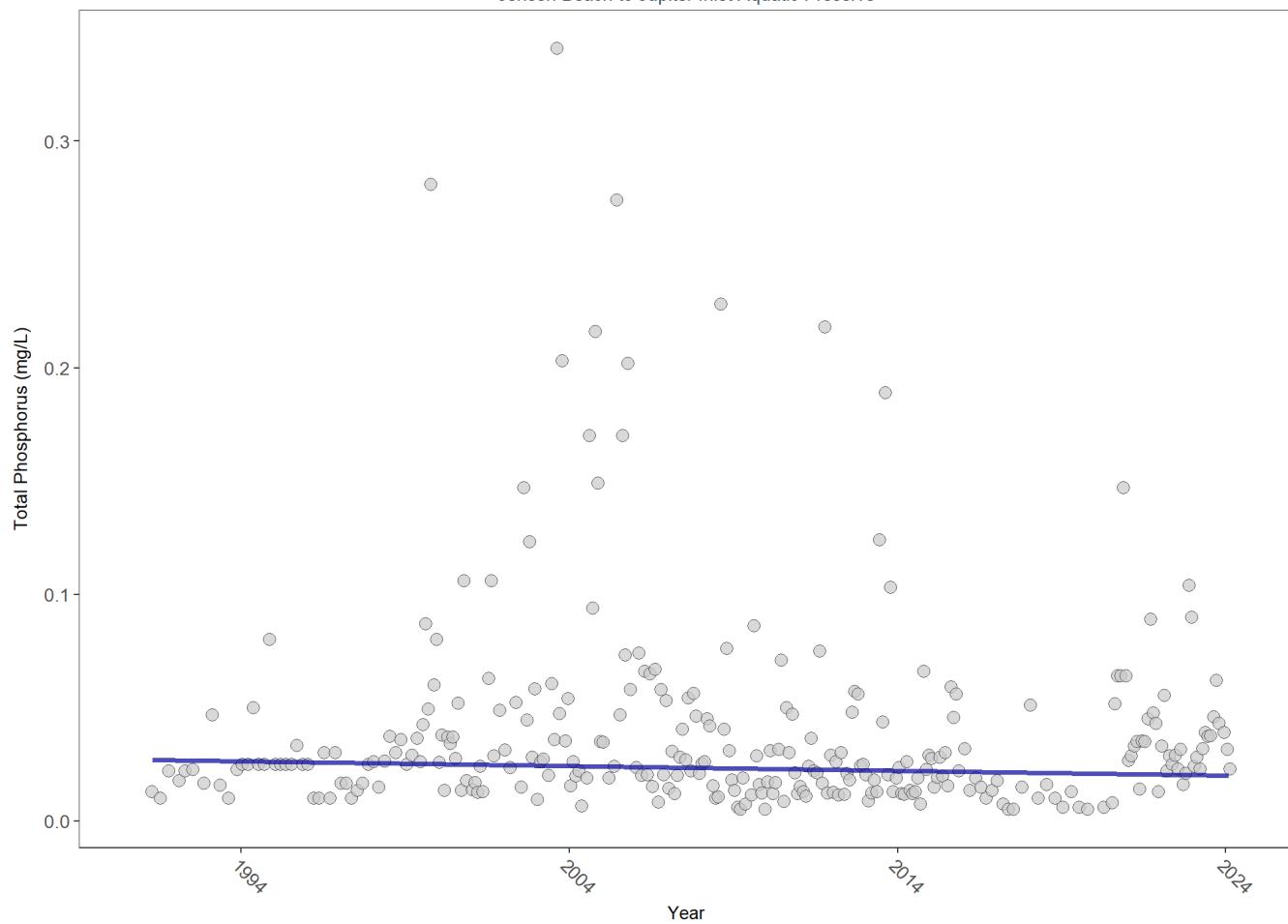
**Programs containing Value Qualified data:**

5002 - Florida STORET / WIN

## Total Phosphorus - Discrete Water Quality

### Seasonal Kendall-Tau Trend Analysis

Total Phosphorus, Lab, All Depths  
Jensen Beach to Jupiter Inlet Aquatic Preserve

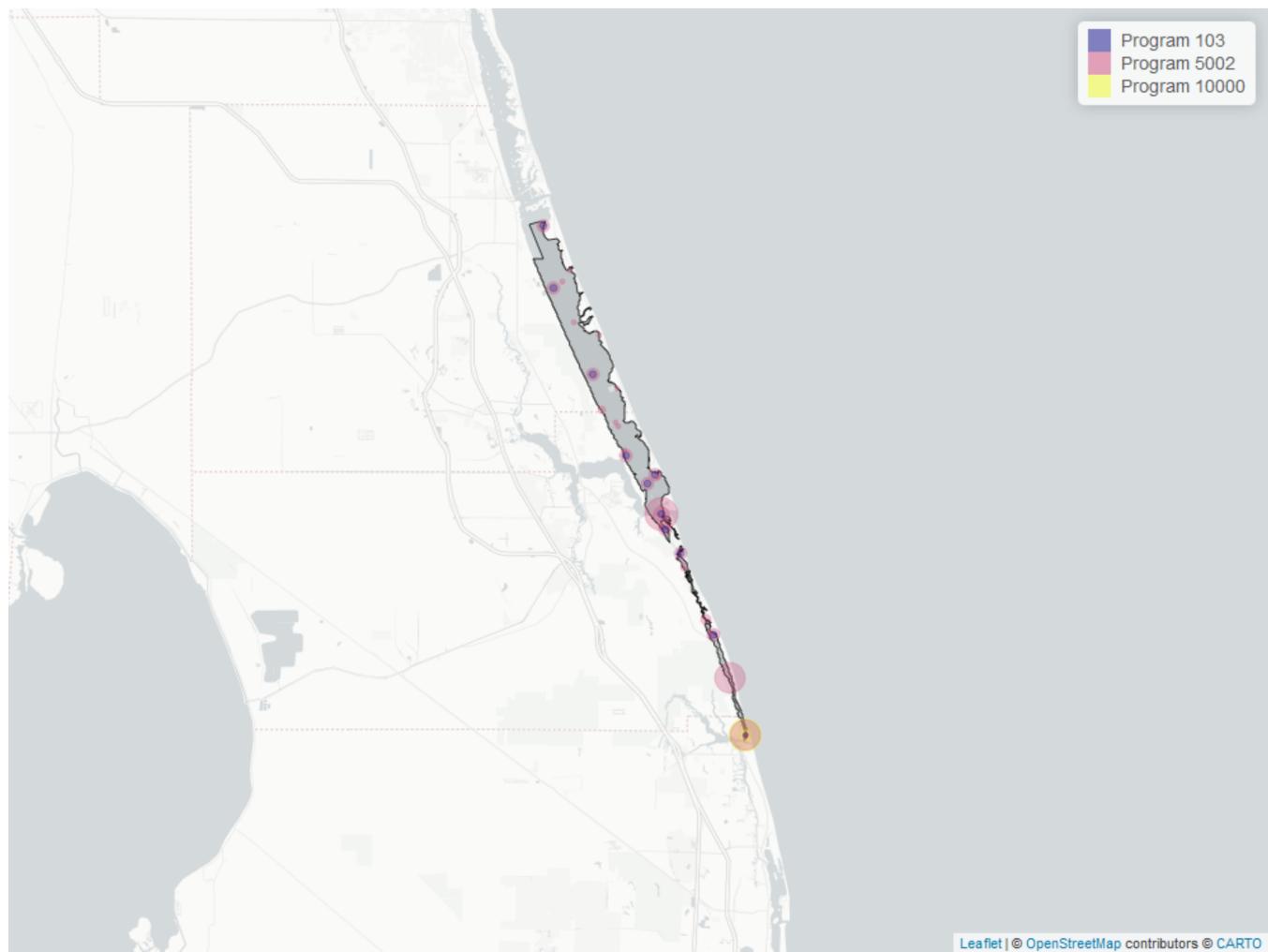


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1059	34	0.026	TRUE	-0.0993	0.0319	-0.0002161172	0.0271425	12.0447	0.3603	-1

*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 18: Programs contributing data for Total Phosphorus

ProgramID	N_Data	YearMin	YearMax
5002	822	1991	2024
10000	177	1991	2023
103	79	2020	2021

#### Program names:

5002 - Florida STORET / WIN

10000 - RiverKeeper

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 19: Value Qualifiers for Total Phosphorus

Year	$N_{\_Total}$	$N_{\_I}$	$perc_{\_I}$	$N_{\_Q}$	$perc_{\_Q}$	$N_{\_U}$	$perc_{\_U}$
2001	39	1	2.6				
2004	30					2	6.7
2005	28			1	3.6		
2006	30	2	6.7				
2007	77	27	35.1			13	16.9
2008	30					2	6.7
2009	30	5	16.7			1	3.3
2010	30	1	3.3	2	6.7		
2011	29					1	3.5
2012	30					1	3.3
2021	157	1	0.6				
2023	79	1	1.3				

**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

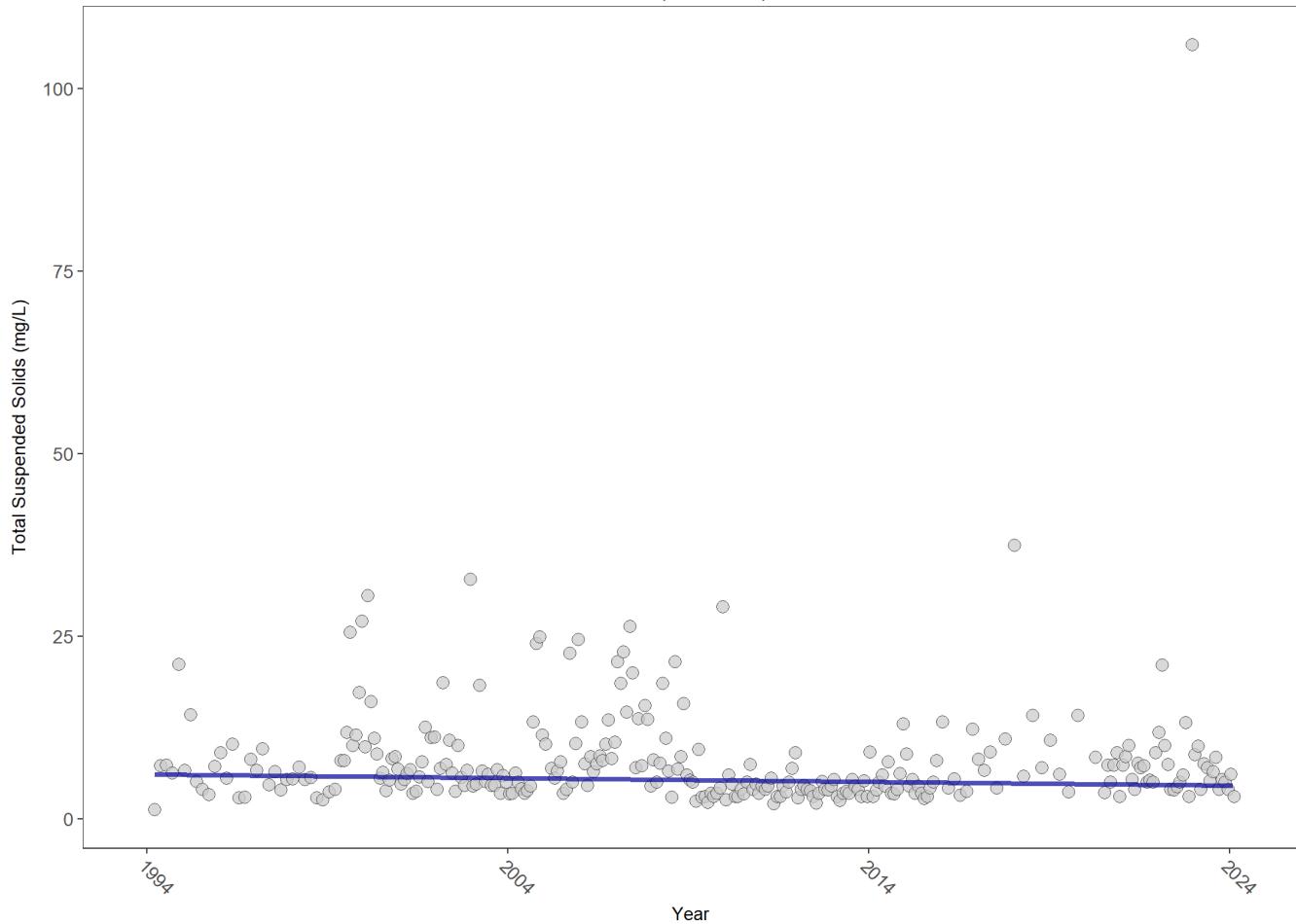
10000 - RiverKeeper

### 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  
Jensen Beach to Jupiter Inlet Aquatic Preserve

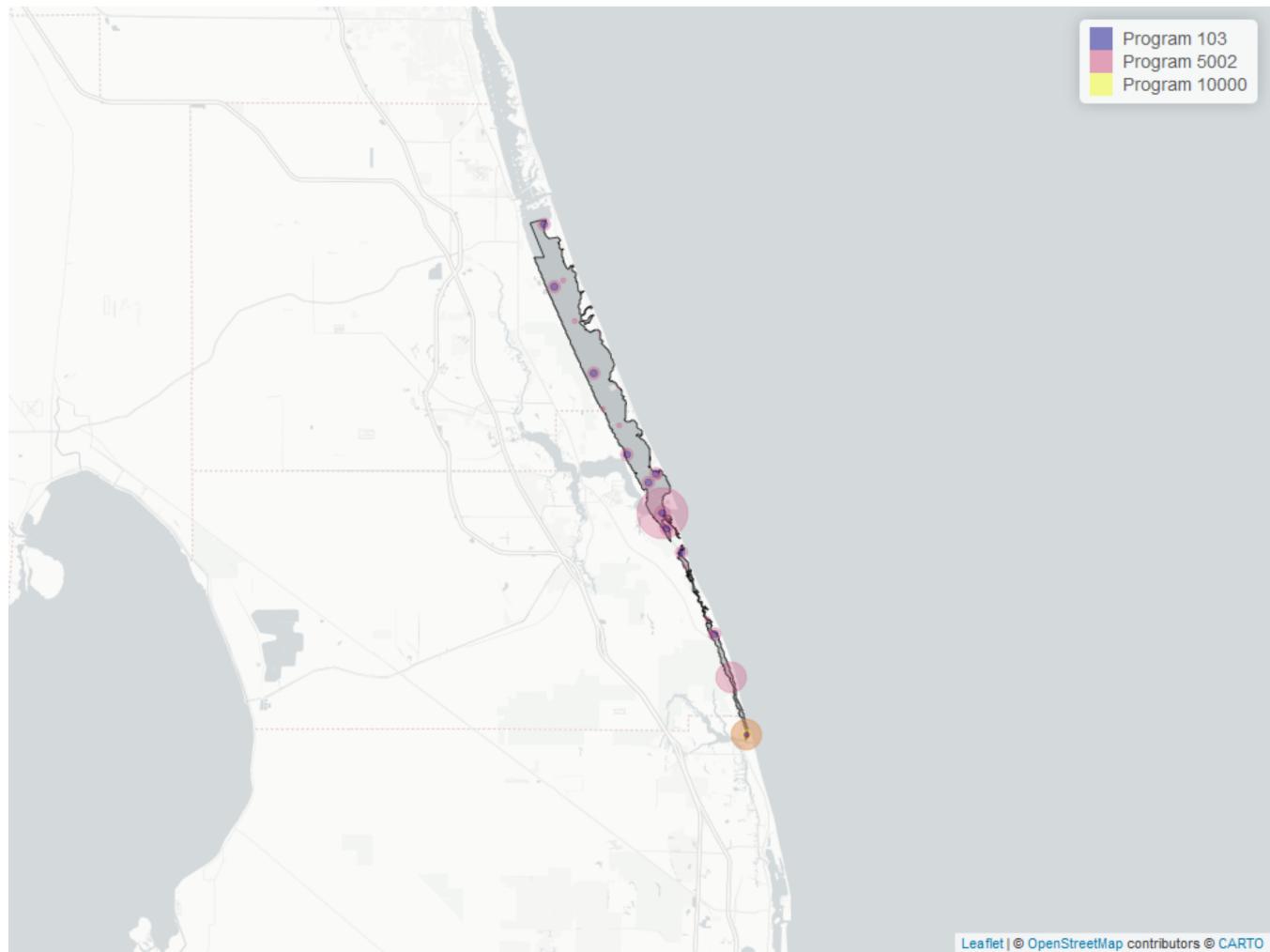


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1198	31	6	TRUE	-0.1013	0.0279	-0.05128205	6.124683	7.0524	0.7948	-1

*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 20: Programs contributing data for Total Suspended Solids

ProgramID	N_Data	YearMin	YearMax
5002	957	1994	2024
10000	165	1994	2023
103	79	2020	2021

#### Program names:

5002 - Florida STORET / WIN

10000 - RiverKeeper

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 21: Value Qualifiers for Total Suspended Solids

Year	$N_{\_Total}$	$N_{\_I}$	$perc_{\_I}$	$N_{\_Q}$	$perc_{\_Q}$	$N_{\_U}$	$perc_{\_U}$
2000	50					5	10.0
2001	42					9	21.4
2002	50	1	2.0			9	18.0
2003	45	16	35.6			9	20.0
2004	42	11	26.2			9	21.4
2005	43	15	34.9	2	4.7	4	9.3
2006	41	17	41.5				
2007	82	27	32.9	2	2.4	2	2.4
2008	42	13	31.0	2	4.8	4	9.5
2009	40	11	27.5			10	25.0
2010	38	11	29.0			10	26.3
2011	37	11	29.7			7	18.9
2012	40	11	27.5			11	27.5
2013	37	8	21.6			11	29.7
2014	39	9	23.1			9	23.1
2015	37	10	27.0			9	24.3
2016	24	3	12.5			3	12.5
2020	27	22	81.5			1	3.7
2021	157	68	43.3			1	0.6
2022	60	35	58.3	1	1.7	10	16.7
2023	79	65	82.3			5	6.3
2024	11	10	90.9			1	9.1

**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 <sup>3</sup>U - Compound was analyzed for but not detected

#### Programs containing Value Qualified data:

5002 - Florida STORET / WIN

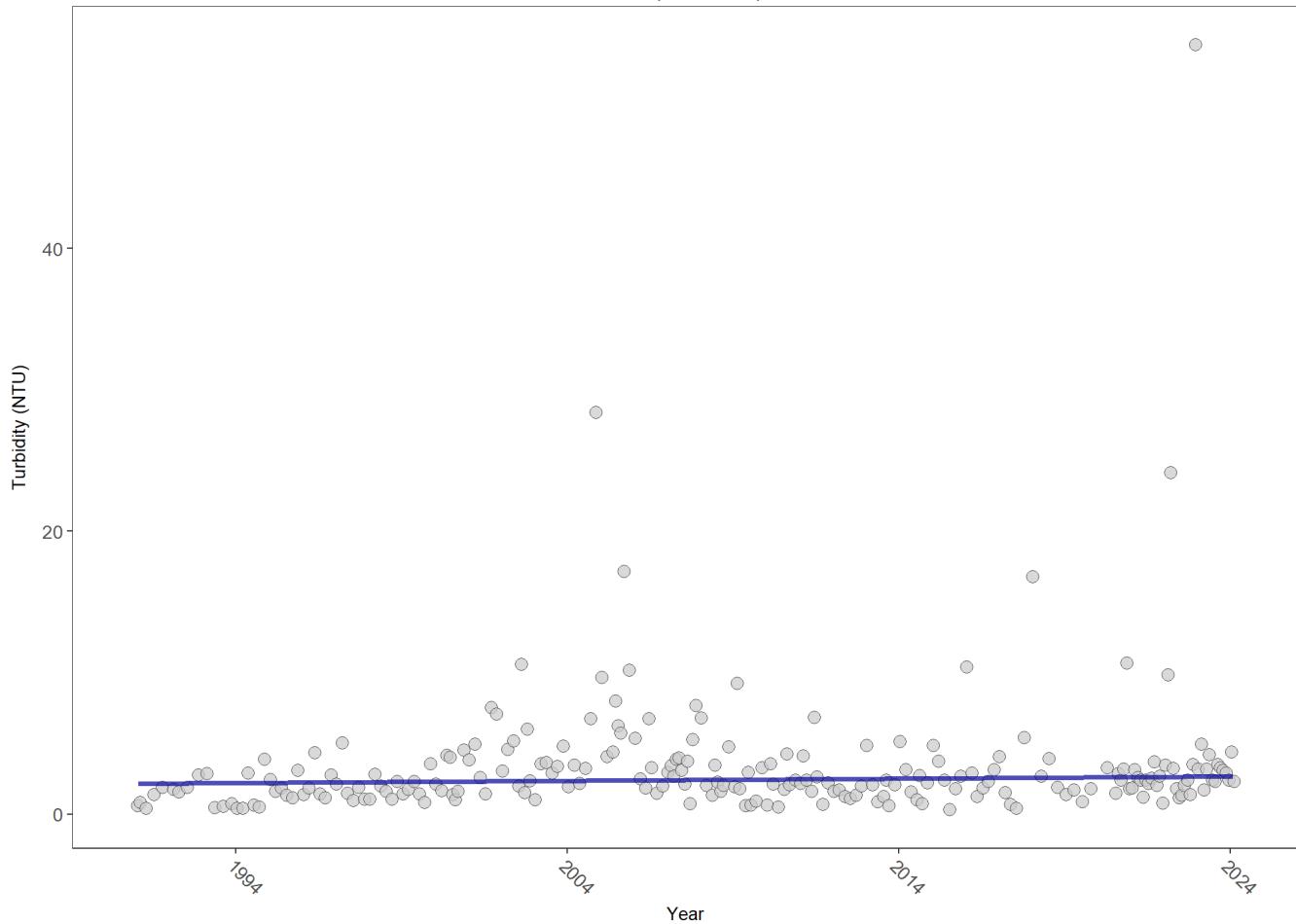
10000 - RiverKeeper

### 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

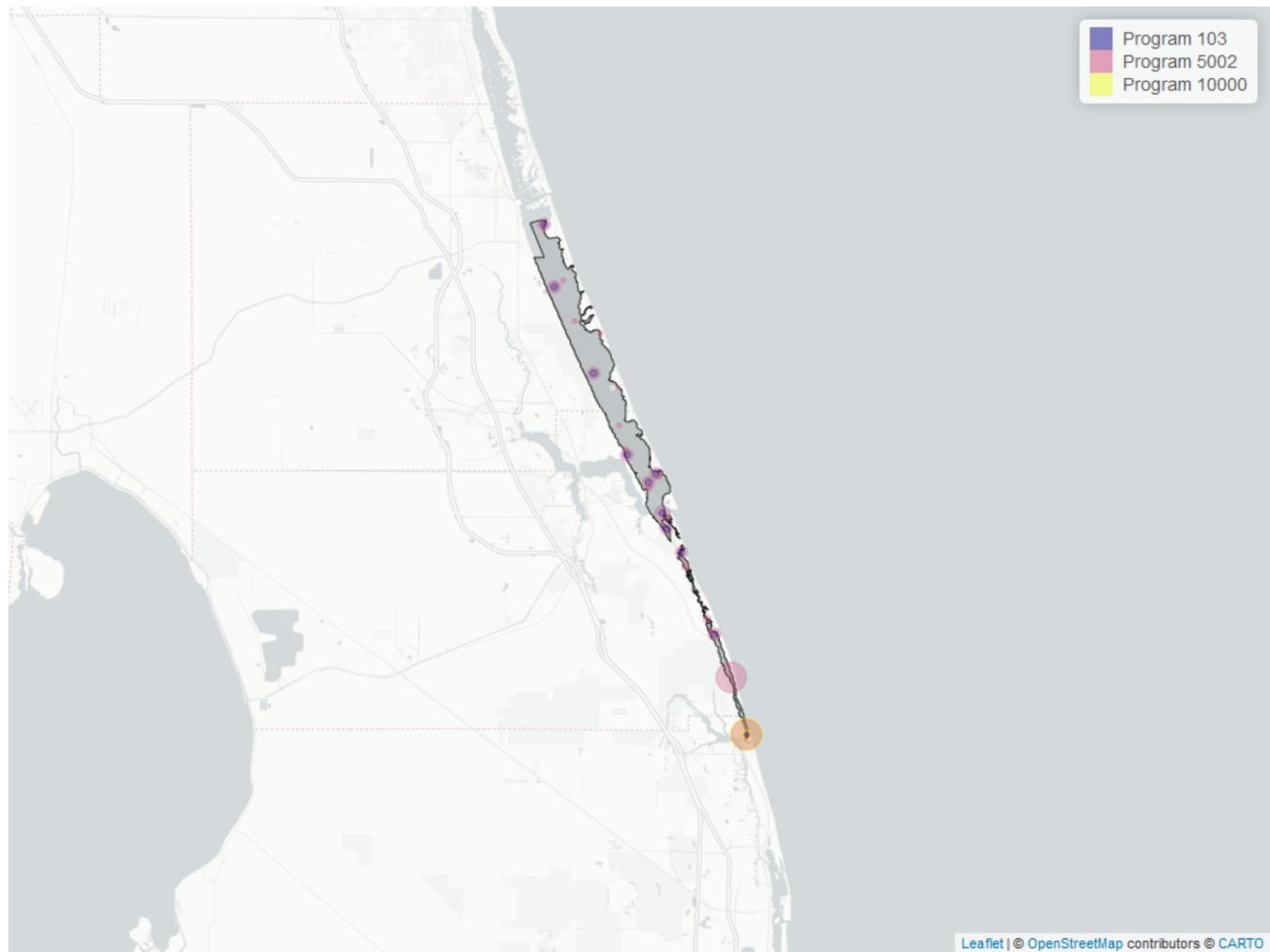
Turbidity, Lab and Field Combined, All Depths  
Jensen Beach to Jupiter Inlet Aquatic Preserve



$p < 0.00005$  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



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

Table 22: Programs contributing data for Turbidity

ProgramID	N_Data	YearMin	YearMax
5002	621	1991	2024
10000	180	1991	2023
3013	138	2004	2022
103	79	2020	2021

#### Program names:

5002 - Florida STORET / WIN

10000 - RiverKeeper

3013 - Seagrass (SJRWMD)

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 23: Value Qualifiers for Turbidity

<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>
2012	18					1	5.6
2021	157			1	0.6		
2022	61	1	1.6				

**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:

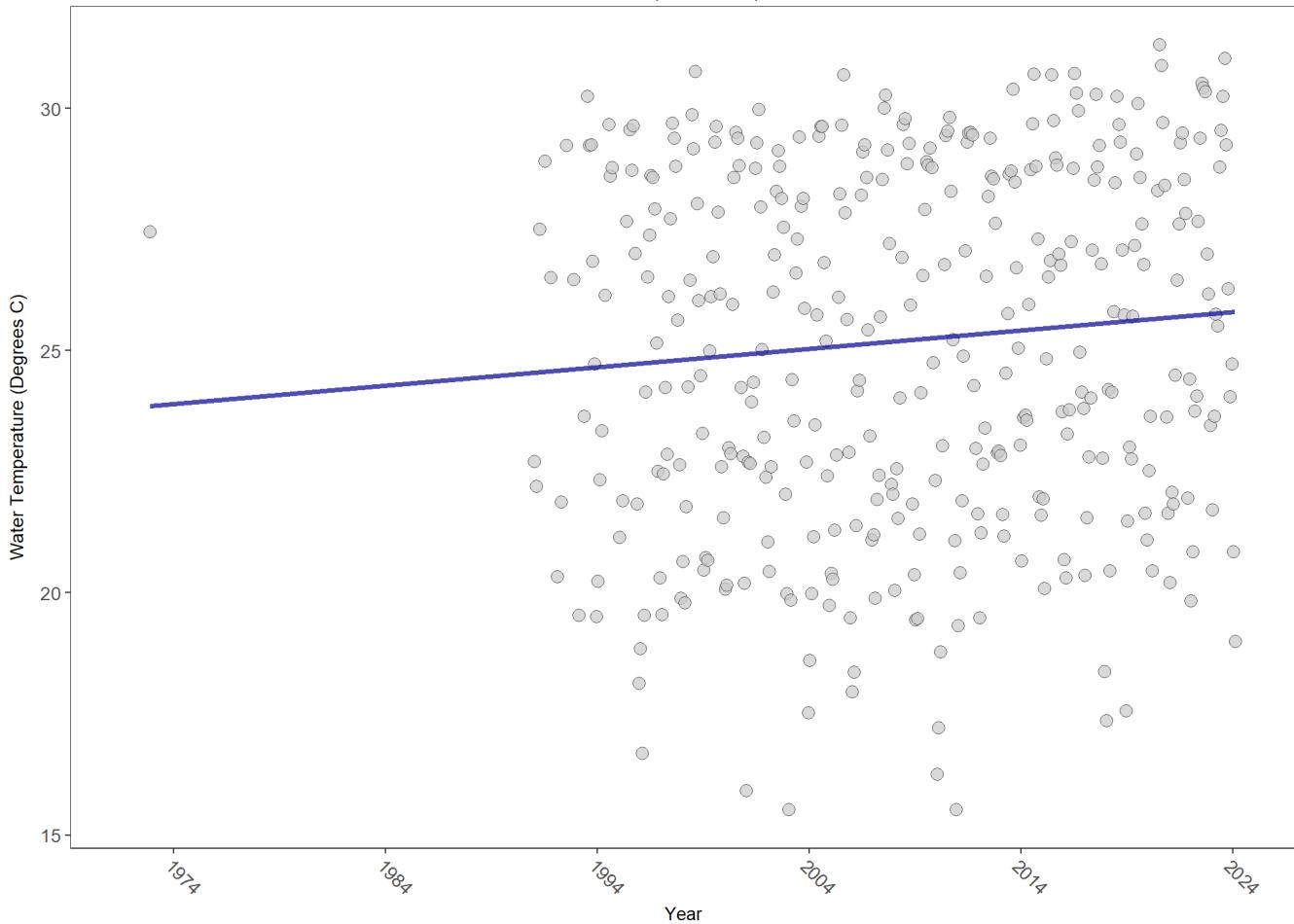
5002 - Florida STORET / WIN

### 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  
Jensen Beach to Jupiter Inlet Aquatic Preserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	10467	35	25.5	TRUE	0.2073	0.0000	0.03795584	23.82294	6.9411	0.8038	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

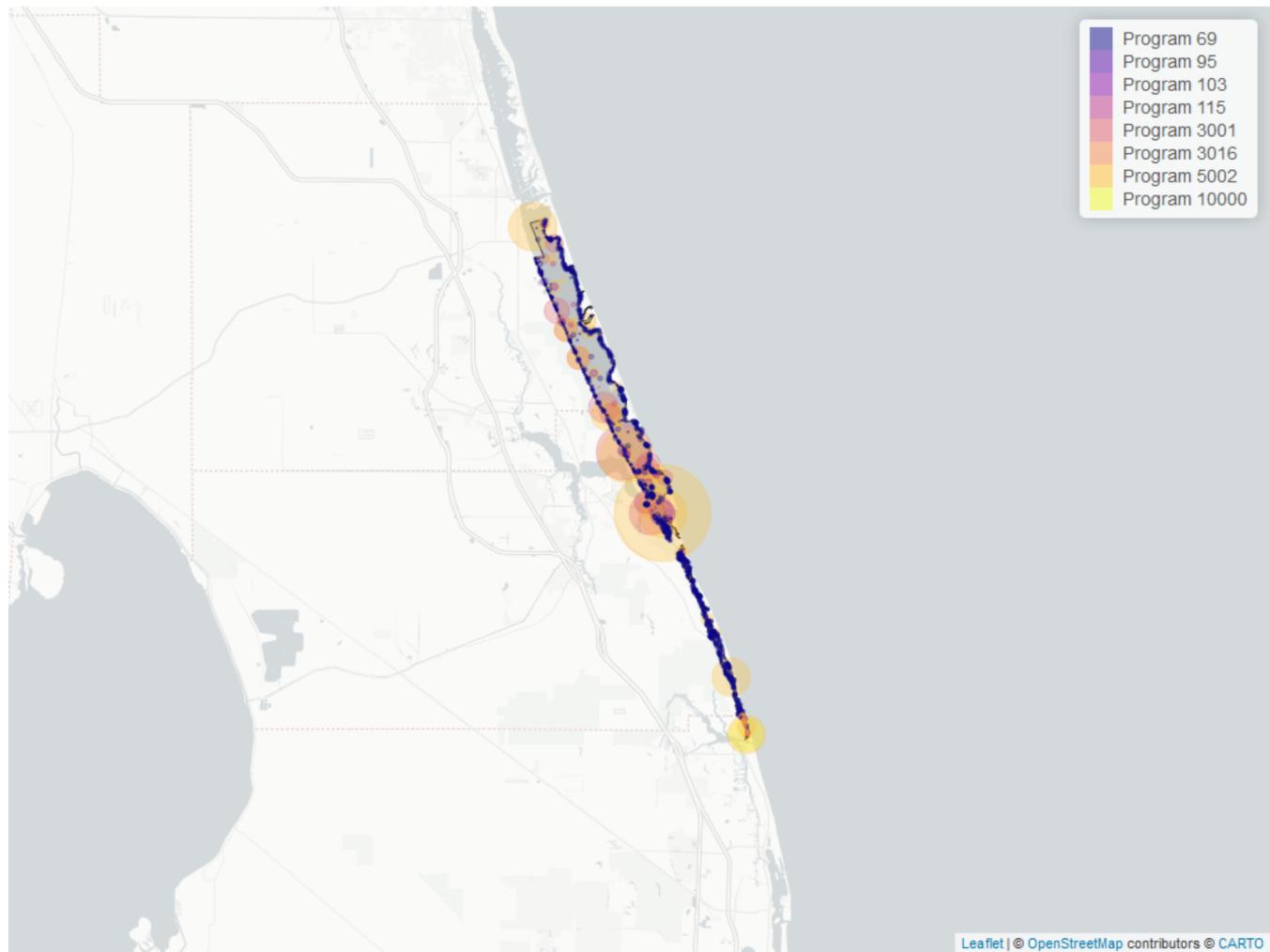


Table 24: Programs contributing data for Water Temperature

ProgramID	N_Data	YearMin	YearMax
5002	4102	1991	2024
69	3842	1997	2022
3001	1628	1993	2023
3013	431	2003	2023
10000	174	1991	2019
103	165	2020	2021
3016	81	2013	2013
95	64	1972	2018
115	16	1994	1995

**Program names:**

*5002* - Florida STORET / WIN  
*69* - Fisheries-Independent Monitoring (FIM) Program  
*3001* - Lagoon Watch (Formerly Marine Discovery Center)  
*3013* - Seagrass (SJRWMD)  
*10000* - RiverKeeper  
*103* - EPA STOrage and RETrieval Data Warehouse (STORET)  
*3016* - Lake Worth Lagoon Seagrass Mapping Project  
*95* - Harmful Algal Bloom Marine Observation Network  
*115* - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for Water Temperature in Jensen Beach to Jupiter Inlet Aquatic Preserve

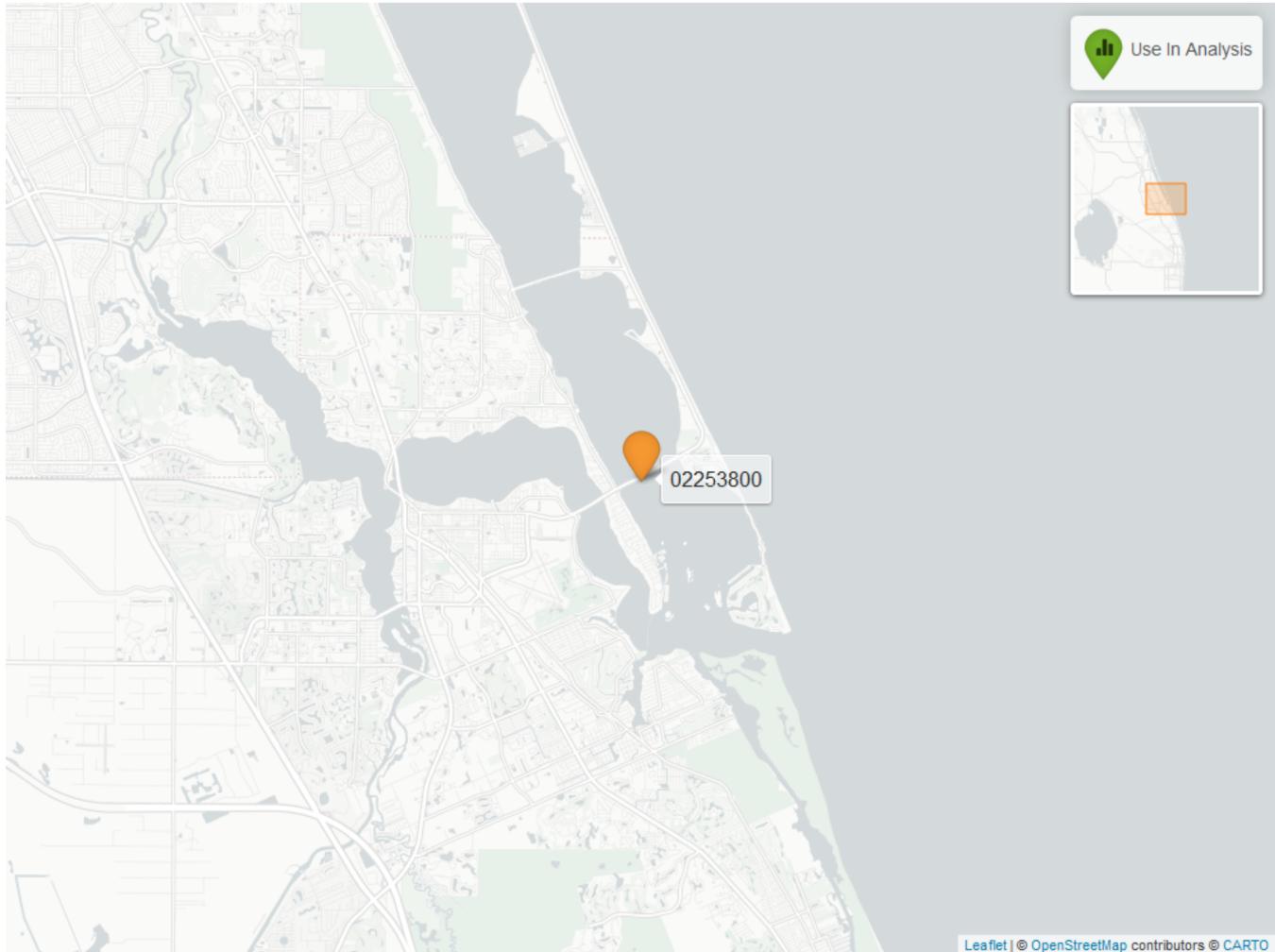
## Water Quality - Continuous

The following files were used in the continuous analysis:

- *Combined\_WQ\_WC\_NUT\_cont\_Dissolved\_Oxygen\_NE-2024-Jul-02.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Dissolved\_Oxygen\_Saturation\_NE-2024-Jul-02.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_pH\_NE-2024-Jul-02.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Salinity\_NE-2024-Jul-02.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Turbidity\_NE-2024-Jul-02.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Water\_Temperature\_NE-2024-Jul-02.txt*

Table 25: National Water Information System (7)

<i>ProgramLocationID</i>	<i>Years of Data</i>	<i>Use in Analysis</i>	<i>Parameters</i>
02253800	3	FALSE	Sal , TempW



Map showing Continuous Water Quality Monitoring sampling locations within the boundaries of Jensen Beach to Jupiter Inlet Aquatic Preserve. Sites marked as *Use In Analysis* are featured in this report.

# Submerged Aquatic Vegetation

The data file used is: All\_SAV\_Parameters-2024-Jul-02.txt

**Submerged aquatic vegetation (SAV)** refers to plants and plant-like macroalgae species that live entirely underwater. The two primary categories of SAV inhabiting Florida estuaries are *benthic macroalgae* and *seagrasses*. They often grow together in dense beds or meadows that carpet the seafloor. *Macroalgae* include multicellular species of green, red and brown algae that often live attached to the substrate by a holdfast. They tend to grow quickly and can tolerate relatively high nutrient levels, making them a threat to seagrasses and other benthic habitats in areas with poor water quality. In contrast, *seagrasses* are grass-like, vascular, flowering plants that are attached to the seafloor by extensive root systems. *Seagrasses* occur throughout the coastal areas of Florida, including protected bays and lagoons as well as deeper offshore waters on the continental shelf. *Seagrasses* have taken advantage of the broad, shallow shelf and clear water to produce two of the most extensive seagrass beds anywhere in continental North America.

## Parameters

**Percent Cover** measures the fraction of an area of seafloor that is covered by SAV, usually estimated by evaluating multiple small areas of seafloor. Percent cover is often estimated for total SAV, individual types of vegetation (seagrass, attached algae, drift algae) and individual species.

**Frequency of Occurrence** was calculated as the number of times a taxon was observed in a year divided by the number of sampling events, multiplied by 100. Analysis is conducted at the quadrat level and is inclusive of all quadrats (i.e., quadrats evaluated using Braun-Blanquet, modified Braun-Blanquet, and percent cover.)

## Species

**Turtle grass** (*Thalassia testudinum*) is the largest of the Florida seagrasses, with longer, thicker blades and deeper root structures than any of the other seagrasses. It is considered a climax seagrass species.

**Shoal grass** (*Halodule wrightii*) is an early colonizer of vegetated areas and usually grows in water too shallow for other species except *widgeon grass*. It can often tolerate larger salinity ranges than other seagrass species. *Shoal grass* is characterized by thin, flat blades, that are narrower than *turtle grass* blades.

**Manatee grass** (*Syringodium filiforme*) is easily recognizable because its leaves are thin and cylindrical instead of the flat, ribbon-like form shared by many other seagrass species. The leaves can grow up to half a meter in length. *Manatee grass* is usually found in mixed seagrass beds or small, dense monospecific patches.

**Widgeon grass** (*Ruppia maritima*) grows in both fresh and salt water and is widely distributed throughout Florida's estuaries in less saline areas, particularly in inlets along the east coast. This species resembles *shoal grass* in certain environments but can be identified by the pointed tips of its leaves.

Three species of *Halophila spp.* are found in Florida - **Star grass** (*Halophila engelmannii*), **Paddle grass** (*Halophila decipiens*), and **Johnson's seagrass** (*Halophila johnsonii*). These are smaller, more fragile seagrasses than other Florida species and are considered ephemeral. They grow along a single long rhizome, with short blades. These species are not well-studied, although surveys are underway to define their ecological roles.

## Notes

*Star grass*, *Paddle grass*, and *Johnson's seagrass* will be grouped together and listed as **Halophila spp.** in the following managed areas. This is because several surveys did not specify to the species level:

- Banana River Aquatic Preserve
- Indian River-Malabar to Vero Beach Aquatic Preserve
- Indian River-Vero Beach to Ft. Pierce Aquatic Preserve
- Jensen Beach to Jupiter Inlet Aquatic Preserve
- Loxahatchee River-Lake Worth Creek Aquatic Preserve
- Mosquito Lagoon Aquatic Preserve

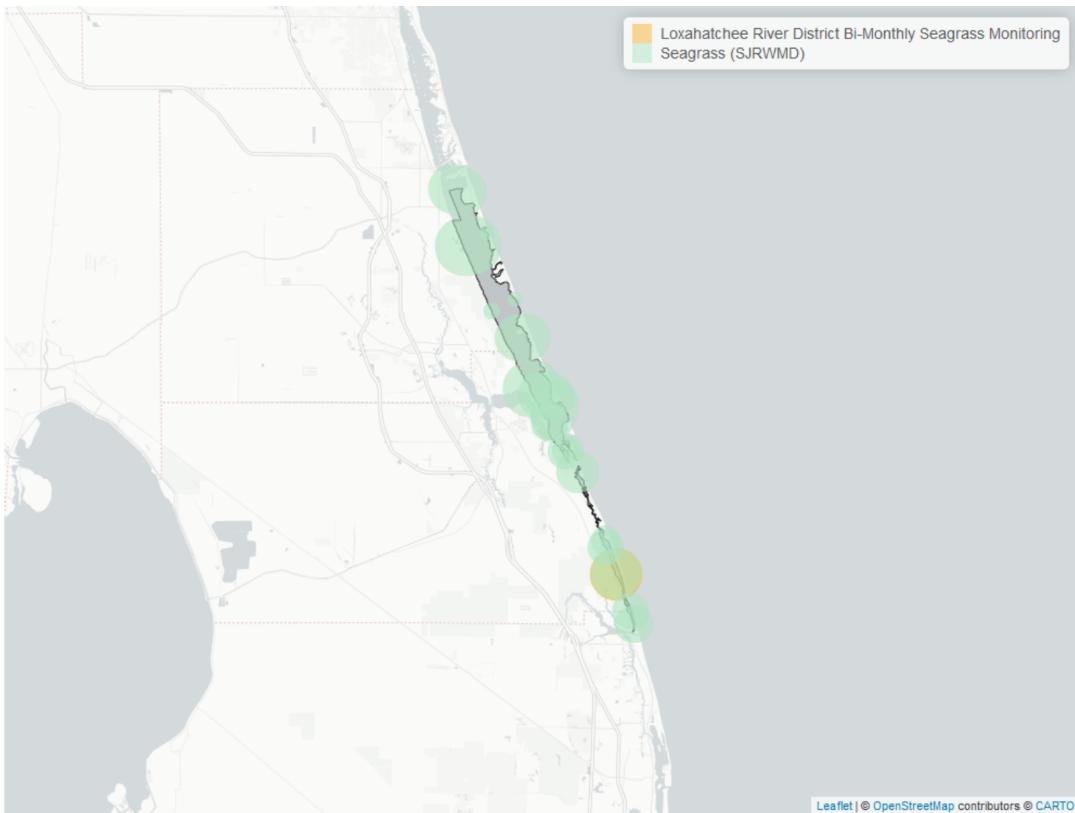
- Biscayne Bay Aquatic Preserve
- Florida Keys National Marine Sanctuary

Jensen Beach to Jupiter Inlet Aquatic Preserve  
SAV Percent Cover - Sample Locations



Maps showing the temporal scope of SAV sampling sites within the boundaries of *Jensen Beach to Jupiter Inlet Aquatic Preserve* by Program name.

**Sampling locations by Program:**



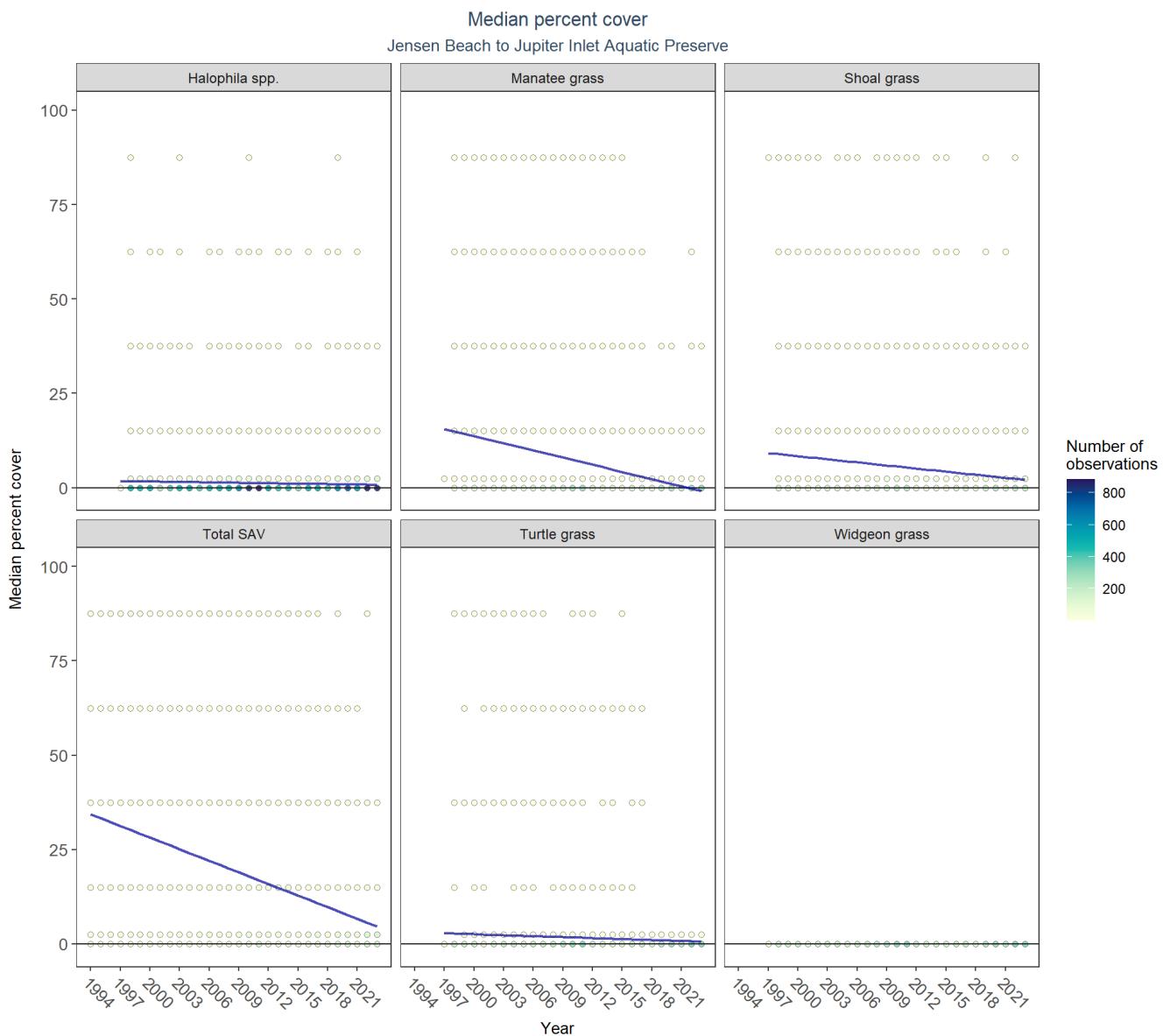
Map showing SAV sampling sites within the boundaries of *Jensen Beach to Jupiter Inlet Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Table 26: Seagrass (SJRWMD) - *Program 3013*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
43441	1994	2023	Percent Cover	18
52153	1994	2023	Percent Occurrence	18

Table 27: Loxahatchee River District Bi-Monthly Seagrass Monitoring - *Program 3017*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
5172	2007	2023	Percent Occurrence	1



Median percent cover by species in *Jensen Beach to Jupiter Inlet Aquatic Preserve*. Linear mixed-effects models are applied to each species to produce species trends. The trendlines are then isolated and reproduced below for ease of viewing. The LME results are available in table form beneath the supplemental trendplot below.

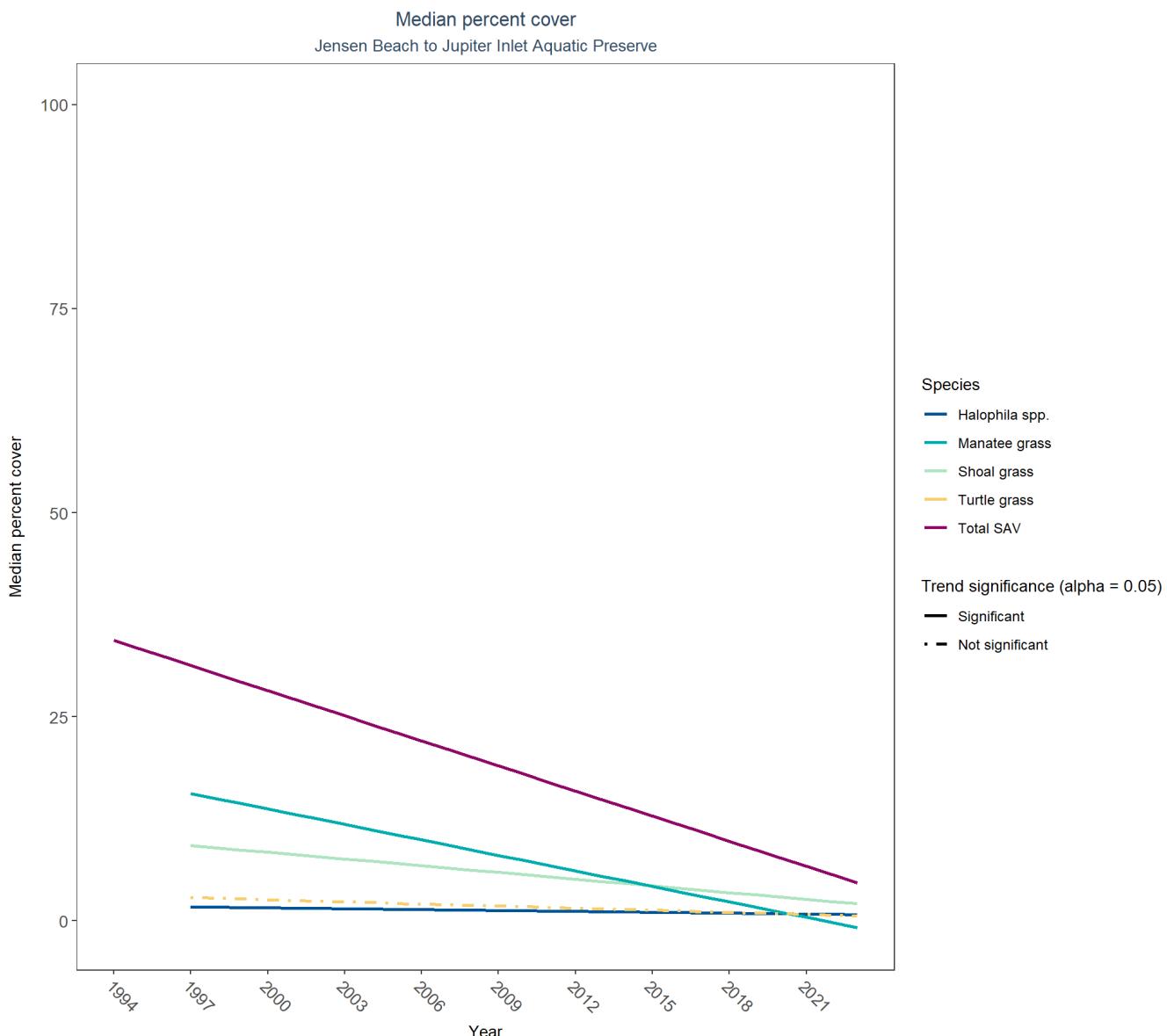
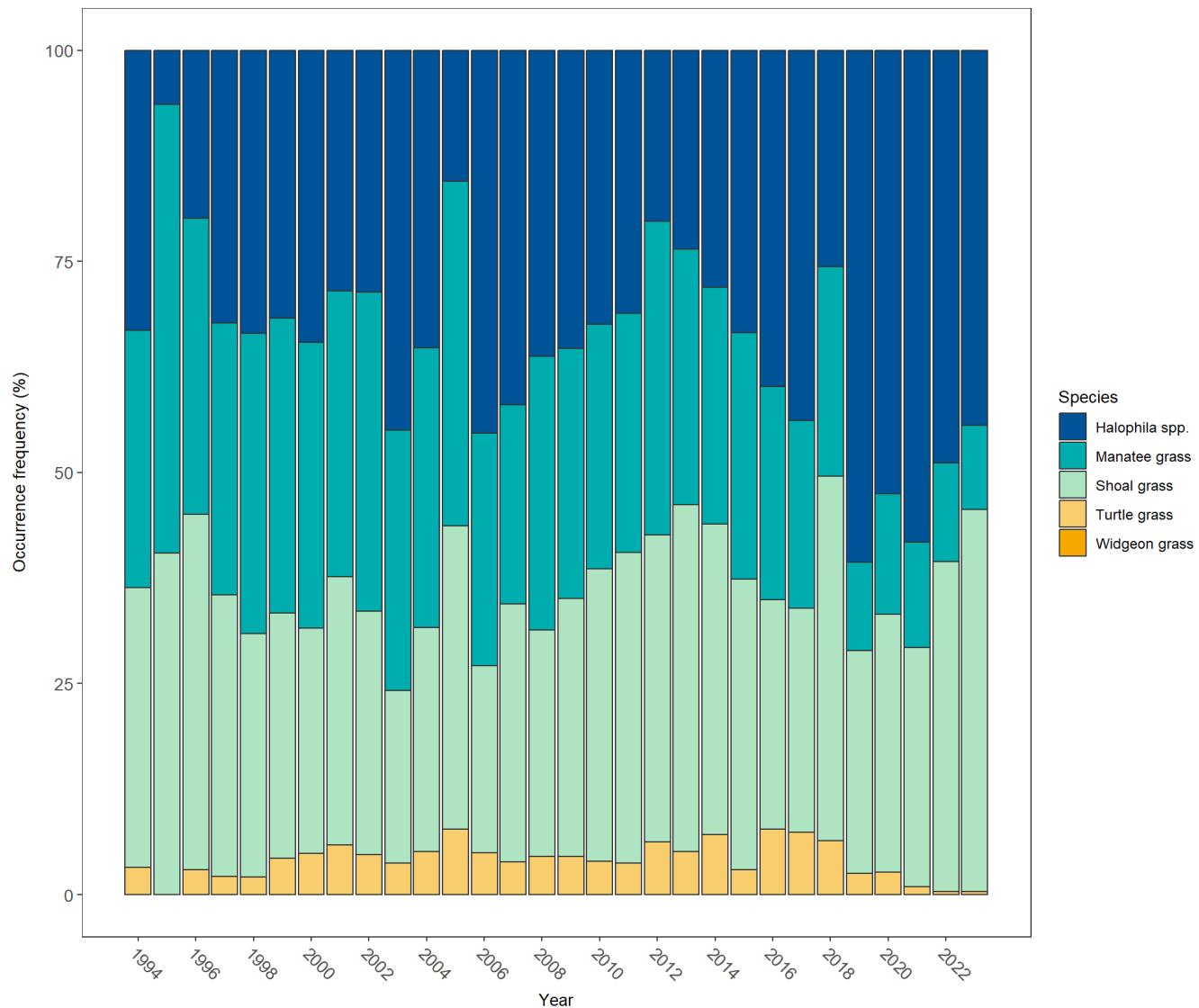


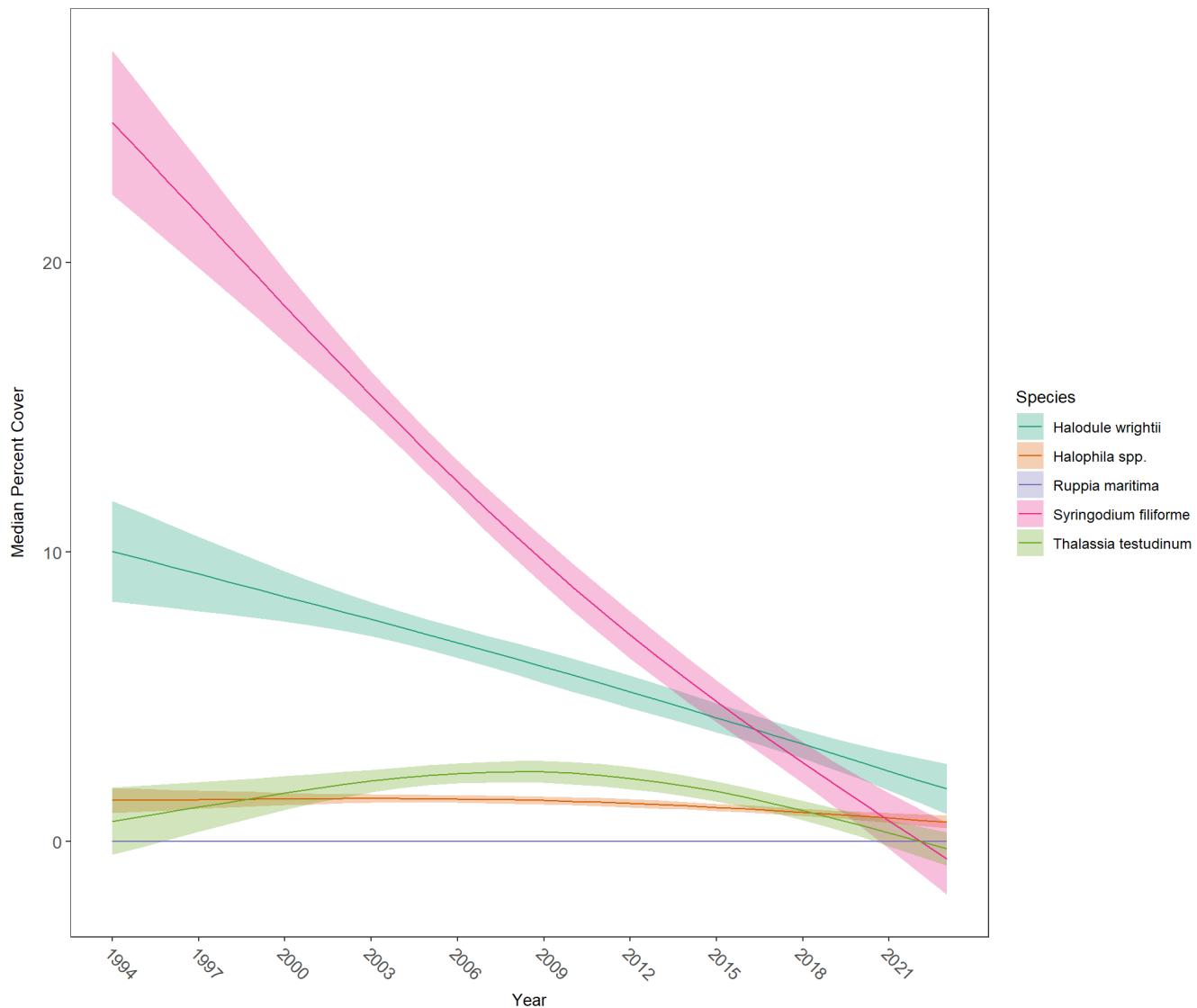
Table 28: Percent Cover Trend Analysis for Jensen Beach to Jupiter Inlet Aquatic Preserve

Species	Common Name	Trend Significance (0.05)	Period of Record	LME-Intercept	LME-Slope	p
Drift algae		Insufficient data to calculate trend				
Halodule wrightii	Shoal grass	Significantly decreasing trend	1997 - 2023	10.0429	-0.2746	0.0000
Halophila spp.		Significantly decreasing trend	1997 - 2023	1.8258	-0.0362	0.0166
Ruppia maritima	Widgeon grass	Model did not fit the available data	1997 - 2023			
Syringodium filiforme	Manatee grass	Significantly decreasing trend	1997 - 2023	17.5046	-0.6328	0.0002
Thalassia testudinum	Turtle grass	No significant trend	1997 - 2023	3.0884	-0.0852	0.0610
Total SAV		Significantly decreasing trend	1994 - 2023	34.3511	-1.0249	0.0000
Total seagrass		Insufficient data to calculate trend				

Frequency of occurrence  
Jensen Beach to Jupiter Inlet Aquatic Preserve



Median Percent Cover for seagrass species  
Jensen Beach to Jupiter Inlet Aquatic Preserve



Generalized additive models for each species in Jensen Beach to Jupiter Inlet Aquatic Preserve. Species must have at least 10 years of data to be evaluated.

*Drift algae, Total seagrass, Attached algae, No grass in Quadrat, and Total SAV* are excluded from the analyses.