

# Pine Island Sound Aquatic Preserve

## SEACAR Habitat Analyses

Last compiled on 14 March, 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

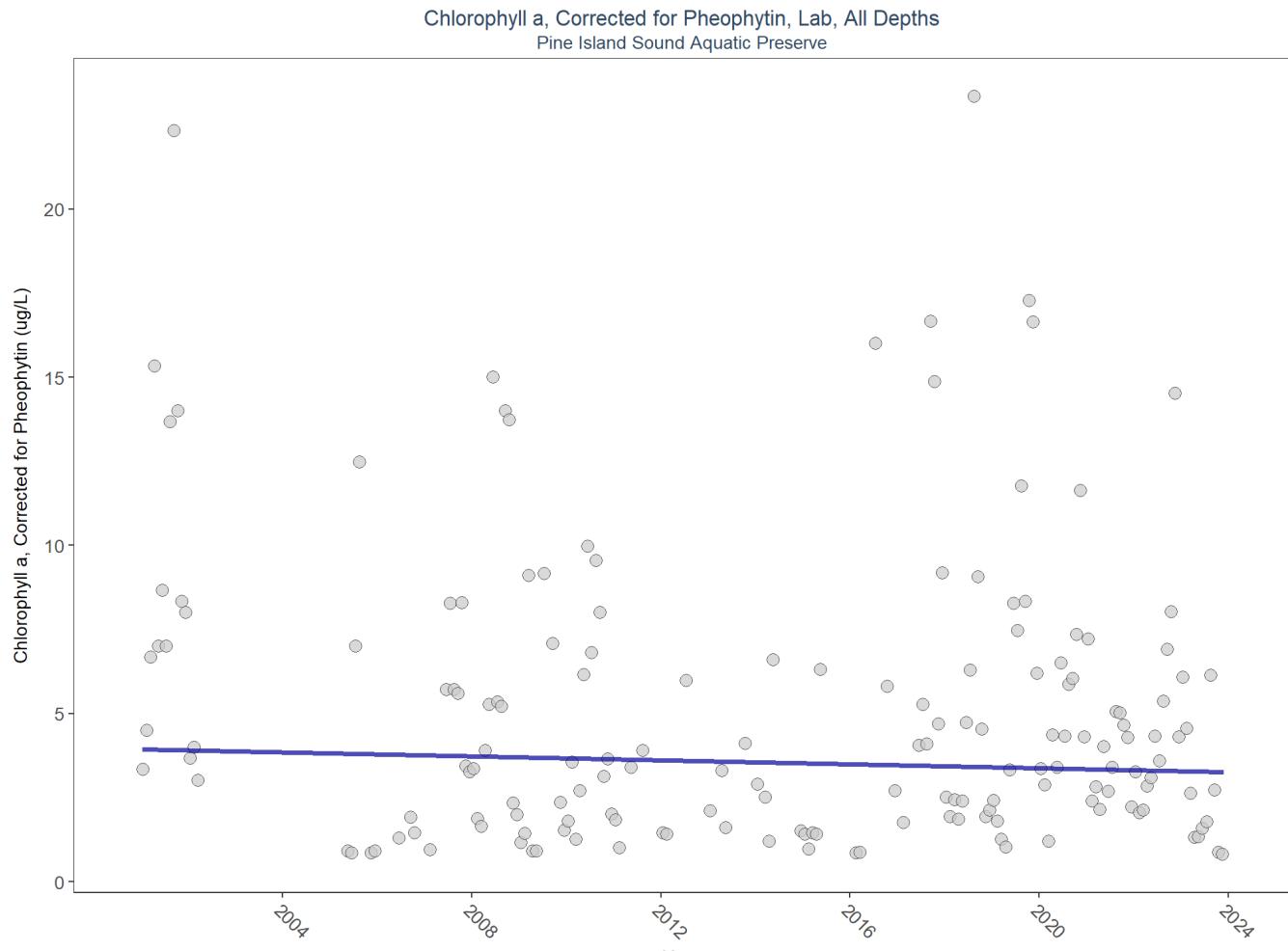
The following files were used in the discrete analysis:

- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_corrected\_for\_pheophytin-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_uncorrected\_for\_pheophytin-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_Colored\_dissolved\_organic\_matter\_CDOM-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen\_Saturation-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_pH-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_Salinity-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_Secchi\_Depth-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Nitrogen-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Phosphorus-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Suspended\_Solids\_TSS-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_Turbidity-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_Water\_Temperature-2024-Feb-22.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

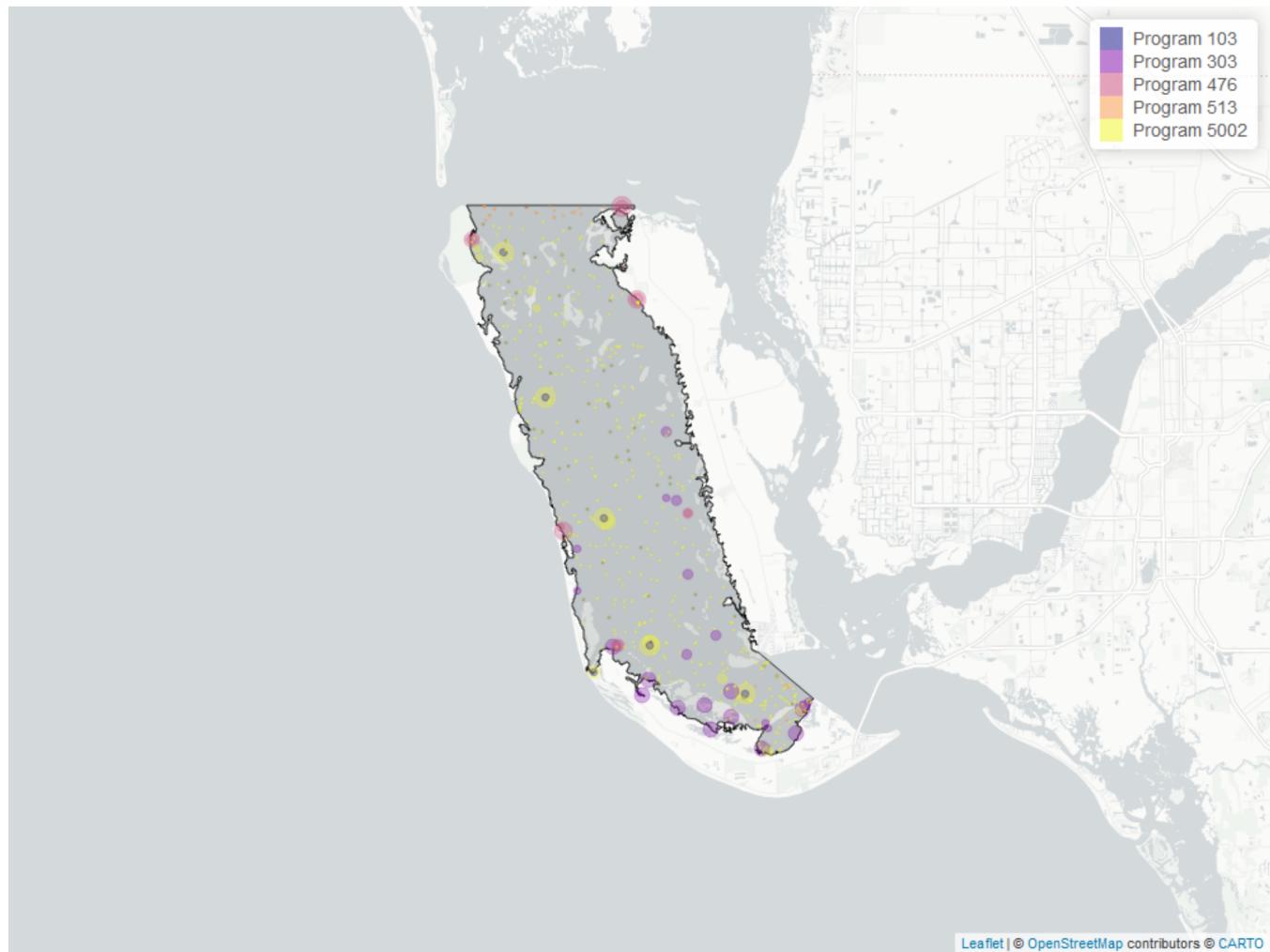


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	2027	21	3.15	TRUE	-0.0649	0.3183	-0.03	3.940469	14.6172	0.2007	0

$p < 0.00005$  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	965	2001	2023
303	598	2019	2023
476	331	2008	2023
103	115	2020	2021
513	38	2006	2023

#### Program names:

5002 - Florida STORET / WIN

303 - River, Estuary and Coastal Observing Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

513 - Coastal Charlotte Harbor Monitoring Network

### 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	$N_{Total}$	$N_I$	$perc_I$	$N_Q$	$perc_Q$	$N_U$	$perc_U$
2005	28					20	71.4
2006	5	5	100.0				
2007	17	2	11.8	1	5.9		
2008	42	10	23.8				
2009	22	8	36.4	3	13.6	1	4.6
2010	39	11	28.2	6	15.4	1	2.6
2011	16	5	31.2	5	31.2		
2012	8	4	50.0	4	50.0		
2013	7	4	57.1				
2014	7	3	42.9	2	28.6		
2015	8	7	87.5				
2016	6	3	50.0				
2017	29	2	6.9			1	3.5
2018	169	58	34.3				
2019	329	71	21.6			3	0.9
2020	332	49	14.8	1	0.3	5	1.5
2021	439	91	20.7			6	1.4
2022	335	103	30.8	16	4.8	24	7.2
2023	165	64	38.8	1	0.6	34	20.6

**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

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

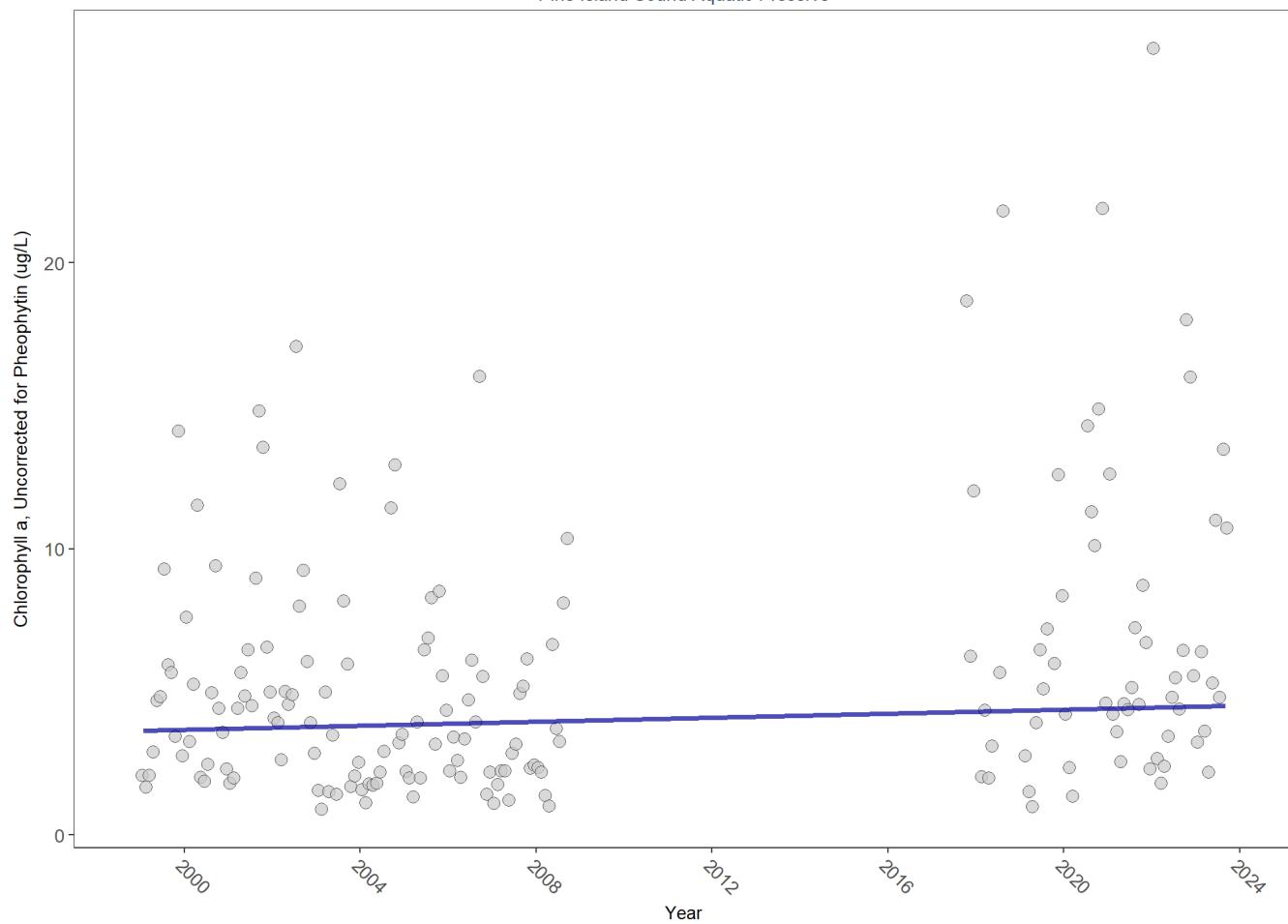
513 - Coastal Charlotte Harbor Monitoring Network

303 - River, Estuary and Coastal Observing Network

# Chlorophyll a, Uncorrected for Pheophytin - Discrete Water Quality

## Seasonal Kendall-Tau Trend Analysis

Chlorophyll a, Uncorrected for Pheophytin, Lab, All Depths  
Pine Island Sound Aquatic Preserve

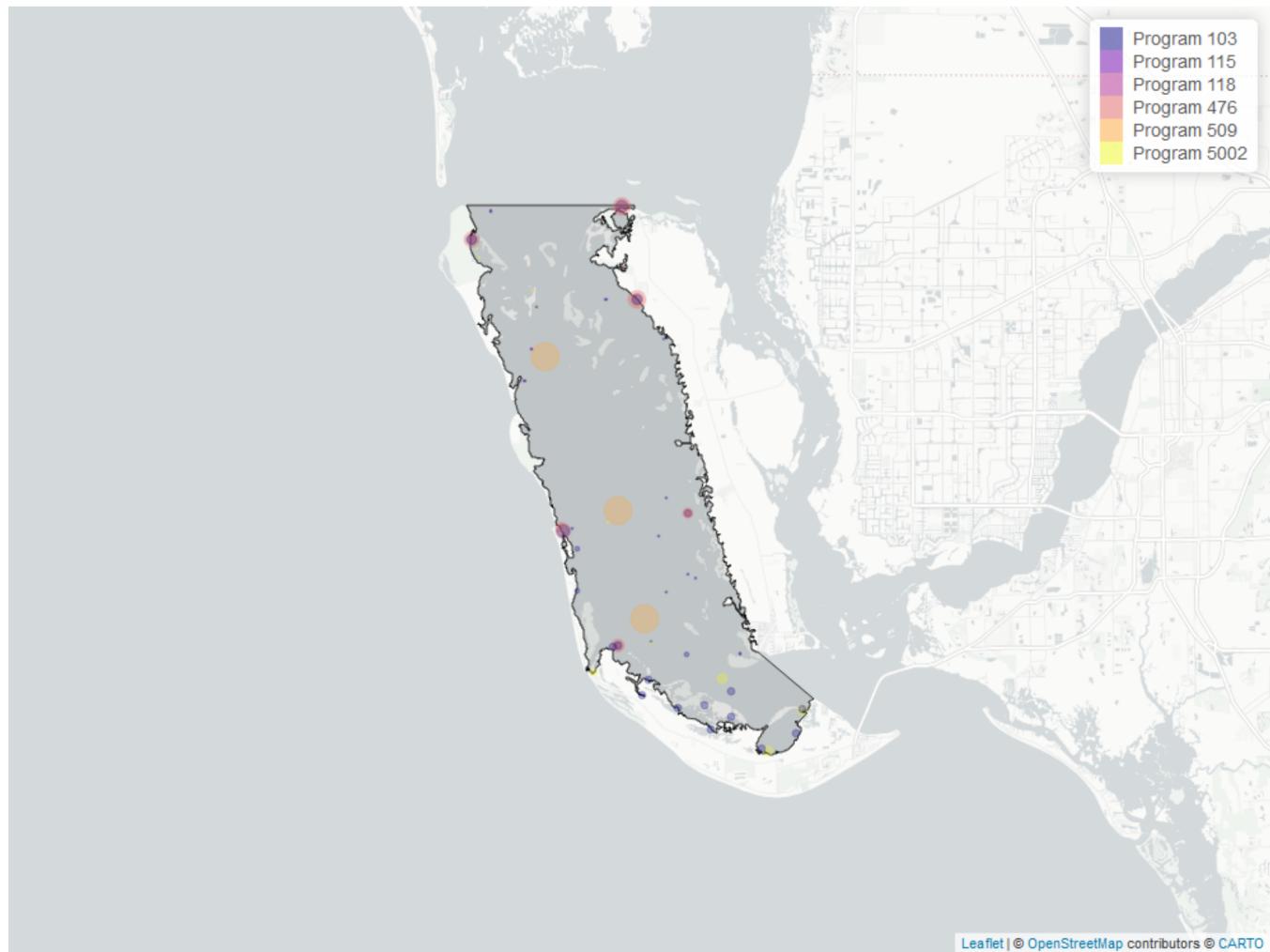


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	959	17	3.6304	TRUE	0.1107	0.0621	0.03517333	3.643443	15.5428	0.159	0

*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, 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
509	348	1999	2008
476	324	1999	2023
103	225	2002	2022
5002	81	2001	2021
115	4	2002	2004
118	1	2006	2006

#### Program names:

509 - SERC Water Quality Monitoring Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

5002 - Florida STORET / WIN

115 - Environmental Monitoring Assessment Program

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	$N_{Total}$	$N_I$	$perc_I$	$N_Q$	$perc_Q$	$N_U$	$perc_U$
1999	48					3	6.2
2000	51					2	3.9
2001	84					13	15.5
2003	42					4	9.5
2004	46	1	2.2			8	17.4
2005	51	4	7.8			8	15.7
2006	44					3	6.8
2007	67	24	35.8			2	3.0
2008	37	7	18.9			1	2.7
2018	28	1	3.6				
2019	39	7	18.0				
2020	60	7	11.7			2	3.3
2021	234	4	1.7				
2022	51	8	15.7	3	5.9		
2023	21	3	14.3				

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:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

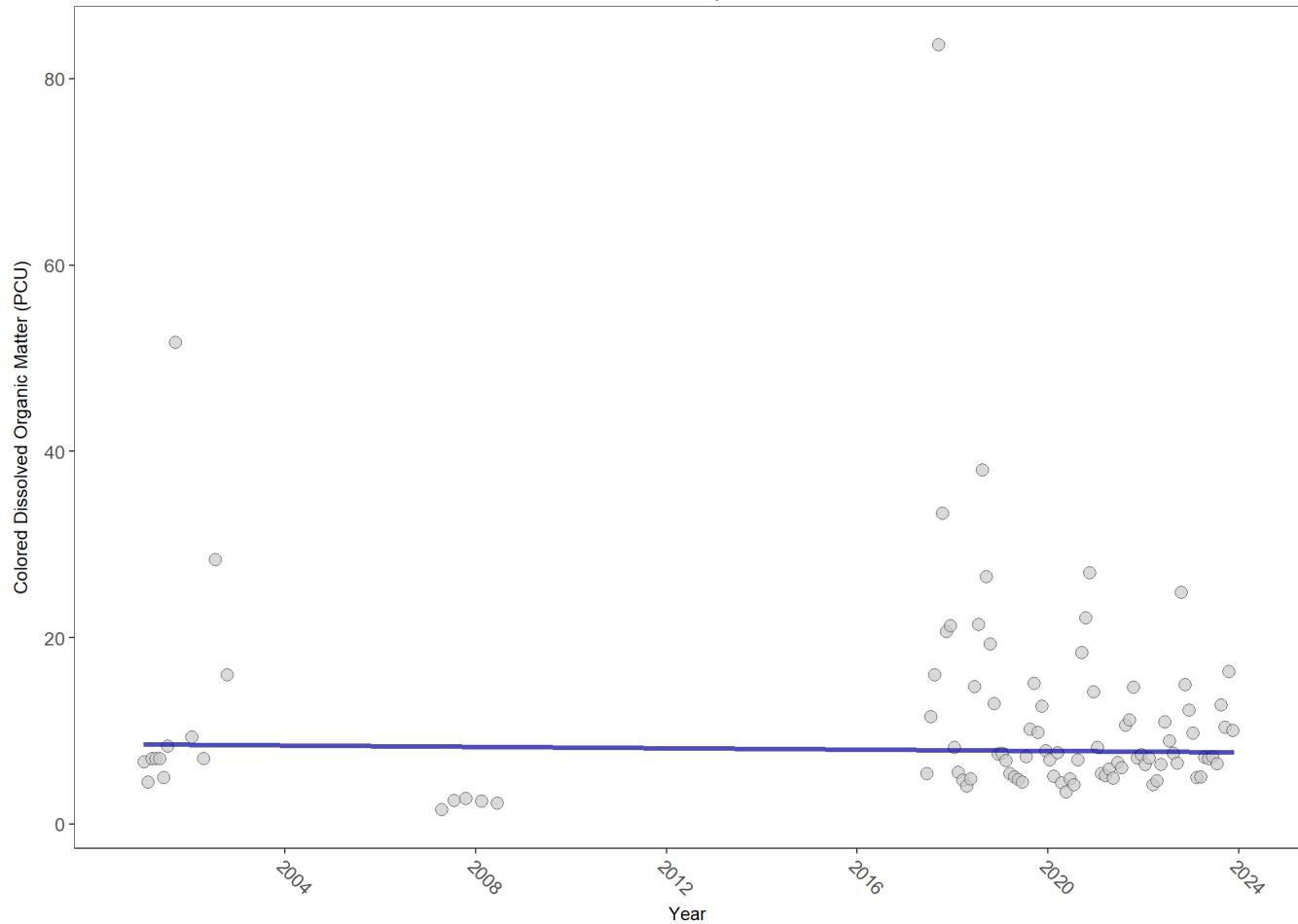
5002 - Florida STORET / WIN

## 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

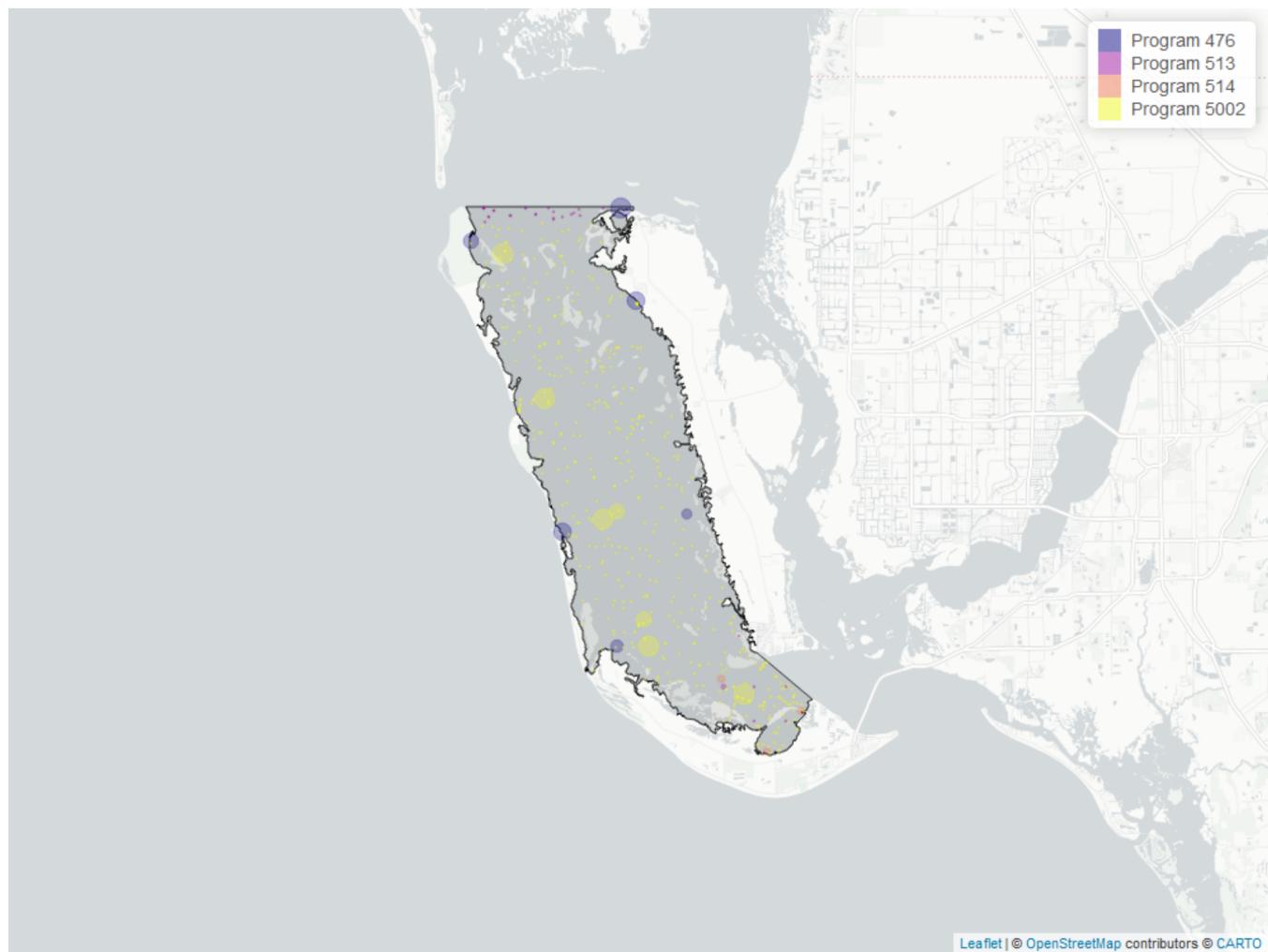
Colored Dissolved Organic Matter, Lab, All Depths  
Pine Island Sound Aquatic Preserve



*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 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
5002	870	2018	2023
476	233	2017	2023
513	41	2007	2023
514	35	2001	2002

#### Program names:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

513 - Coastal Charlotte Harbor Monitoring Network

514 - Florida LAKEWATCH 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 11: Value Qualifiers for Colored Dissolved Organic Matter

Year	$N_{Total}$	$N_I$	$perc_I$	$N_Q$	$perc_Q$	$N_U$	$perc_U$
2007	6	4	66.7			2	33.3
2008	5	2	40.0			3	60.0
2017	26	1	3.9			1	3.9
2018	169	51	30.2			10	5.9
2019	186	70	37.6			13	7.0
2020	172	69	40.1			15	8.7
2021	209	71	34.0			12	5.7
2022	207	43	20.8	3	1.4	28	13.5
2023	164	38	23.2			12	7.3

**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:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

5002 - Florida STORET / WIN

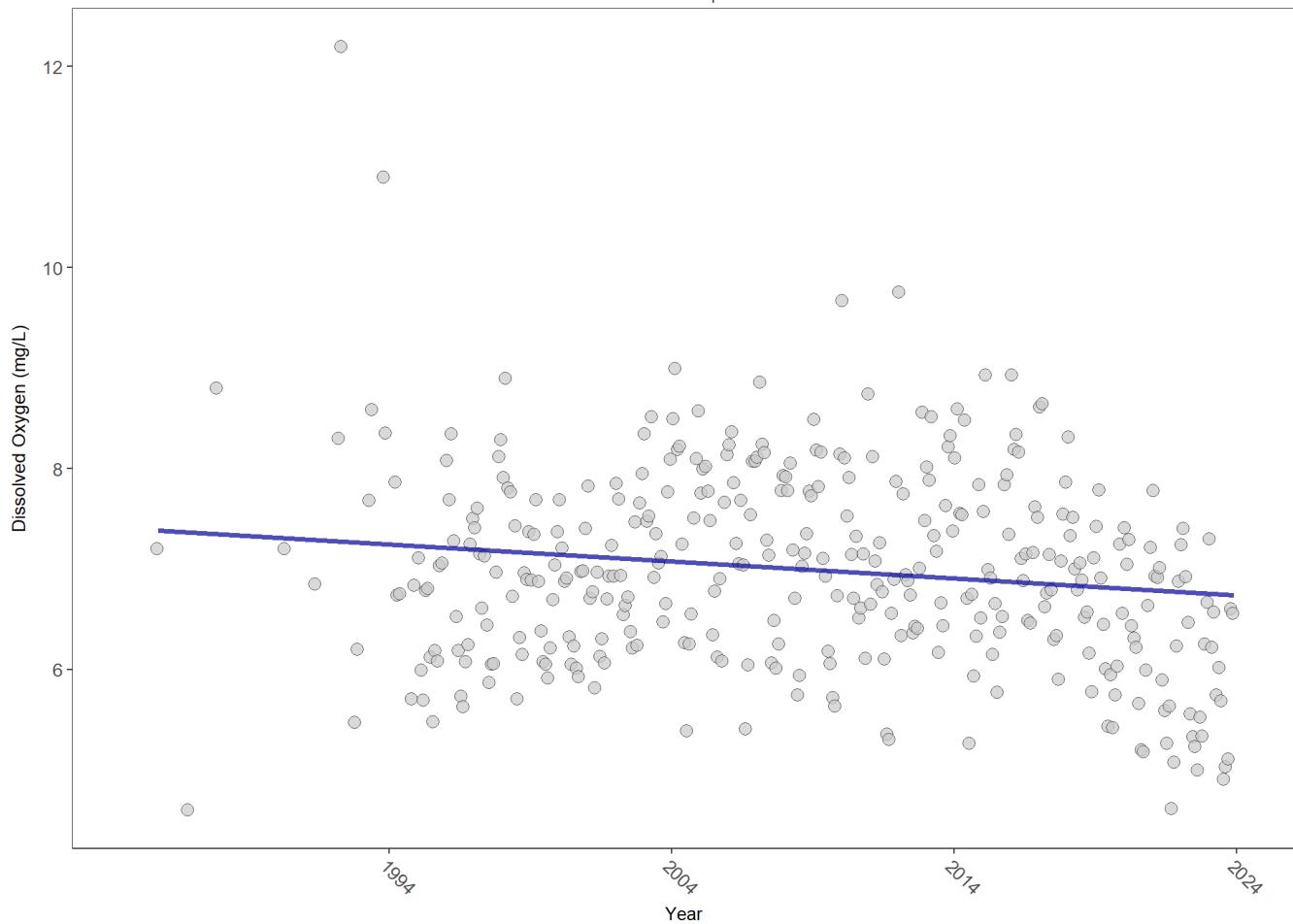
513 - Coastal Charlotte Harbor Monitoring Network

## 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  
Pine Island Sound Aquatic Preserve

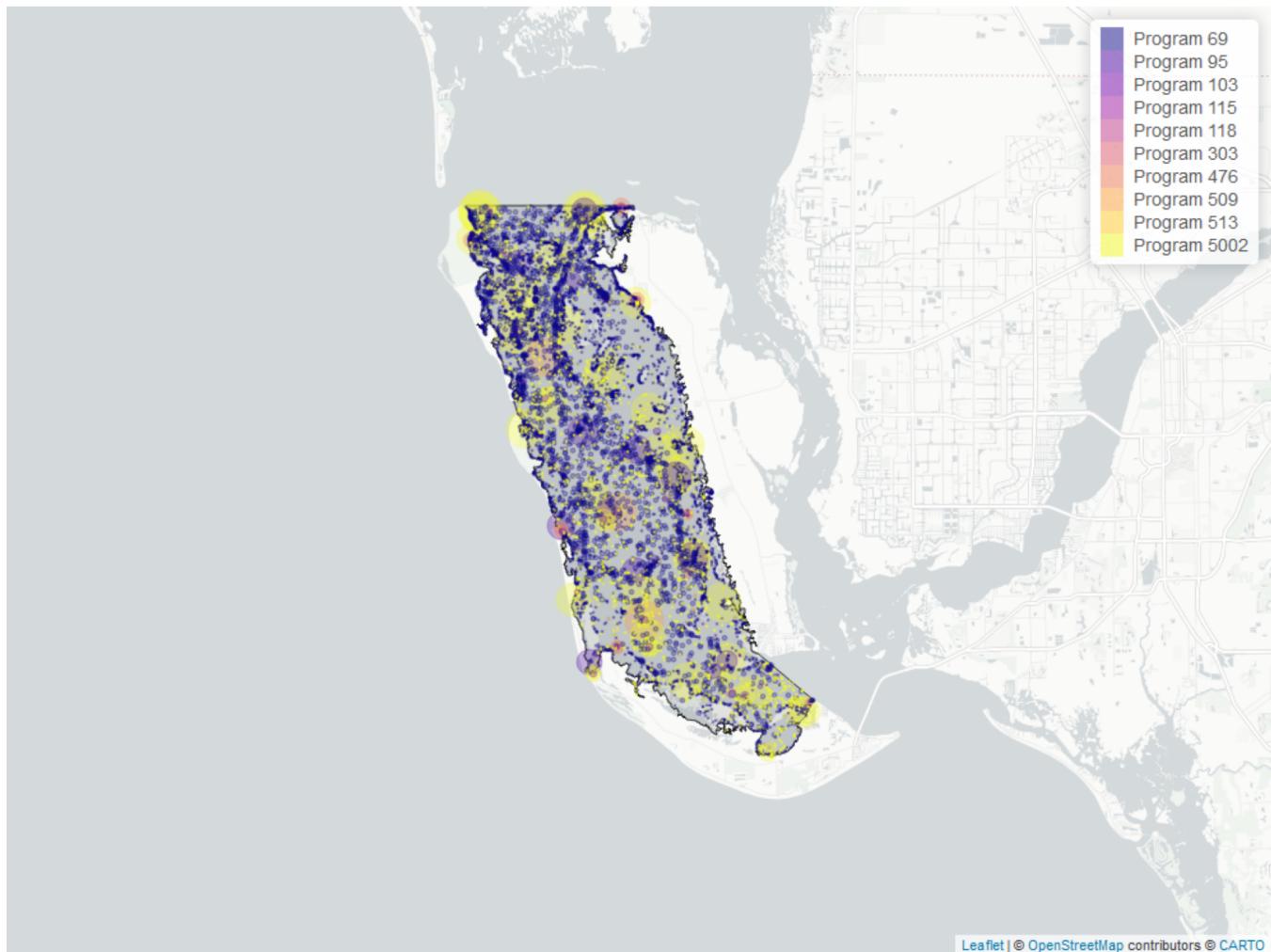


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	27987	37	7	TRUE	-0.1329	0.0003	-0.01695313	7.400189	7.6138	0.7474	-1

*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
69	15947	1990	2017
5002	9353	1987	2023
95	1490	1985	2018
509	696	1999	2008
476	323	2008	2023
103	221	2003	2022
303	61	2019	2020
513	12	2023	2023
115	11	2002	2004
118	1	2006	2006

**Program names:**

69 - Fisheries-Independent Monitoring (FIM) Program  
5002 - Florida STORET / WIN  
95 - Harmful Algal Bloom Marine Observation Network  
509 - SERC Water Quality Monitoring Network  
476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
303 - River, Estuary and Coastal Observing Network  
513 - Coastal Charlotte Harbor Monitoring Network  
115 - Environmental Monitoring Assessment Program  
118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

### Value Qualifiers

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

Table 13: Value Qualifiers for Dissolved Oxygen

Year	$N_{Total}$	$N_H$	$perc_H$
2008	1463	20	1.4

**Note:**  $H^1$  - Value based on field kit determination

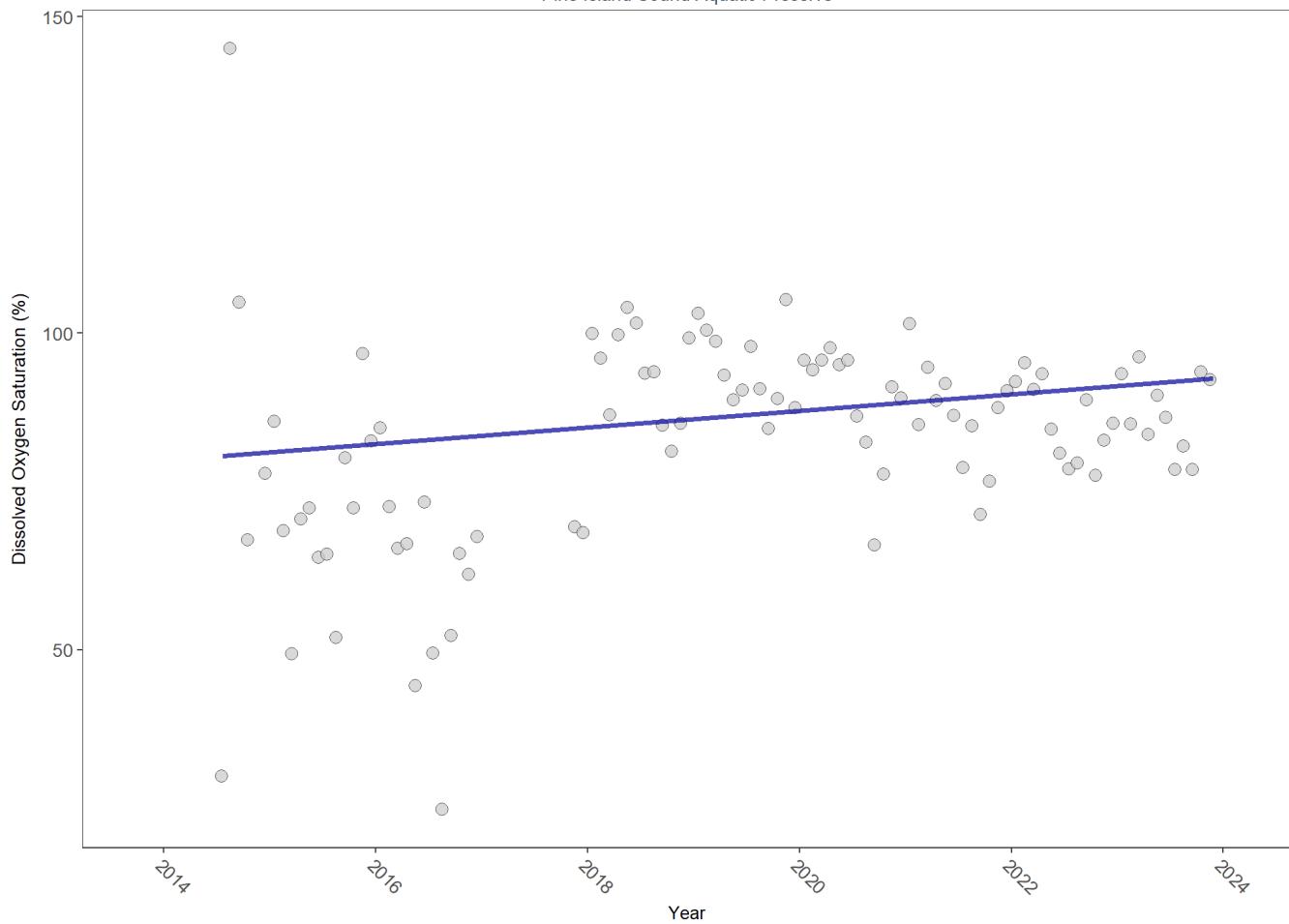
### Programs containing Value Qualified data:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

## Dissolved Oxygen Saturation - Discrete Water Quality

### Seasonal Kendall-Tau Trend Analysis

Dissolved Oxygen Saturation, Field, All Depths  
Pine Island Sound Aquatic Preserve

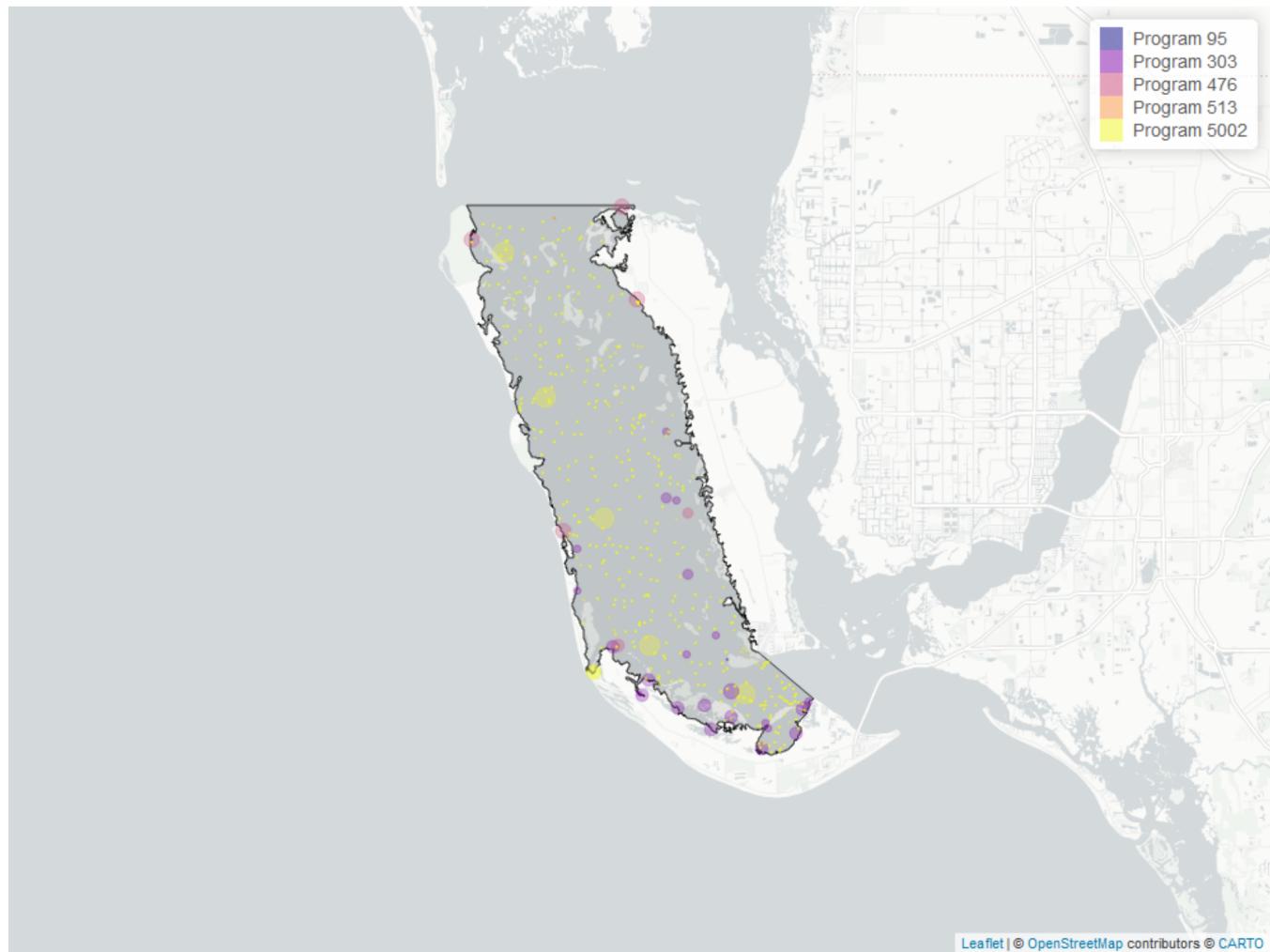


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1780	10	91.86373	TRUE	0.1632	0.0471	1.315672	79.84351	6.5434	0.8348	1

*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 14: Programs contributing data for Dissolved Oxygen Saturation

ProgramID	N_Data	YearMin	YearMax
5002	1140	2014	2023
303	456	2019	2023
476	185	2017	2023
513	12	2023	2023
95	2	2016	2016

#### Program names:

5002 - Florida STORET / WIN

303 - River, Estuary and Coastal Observing Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

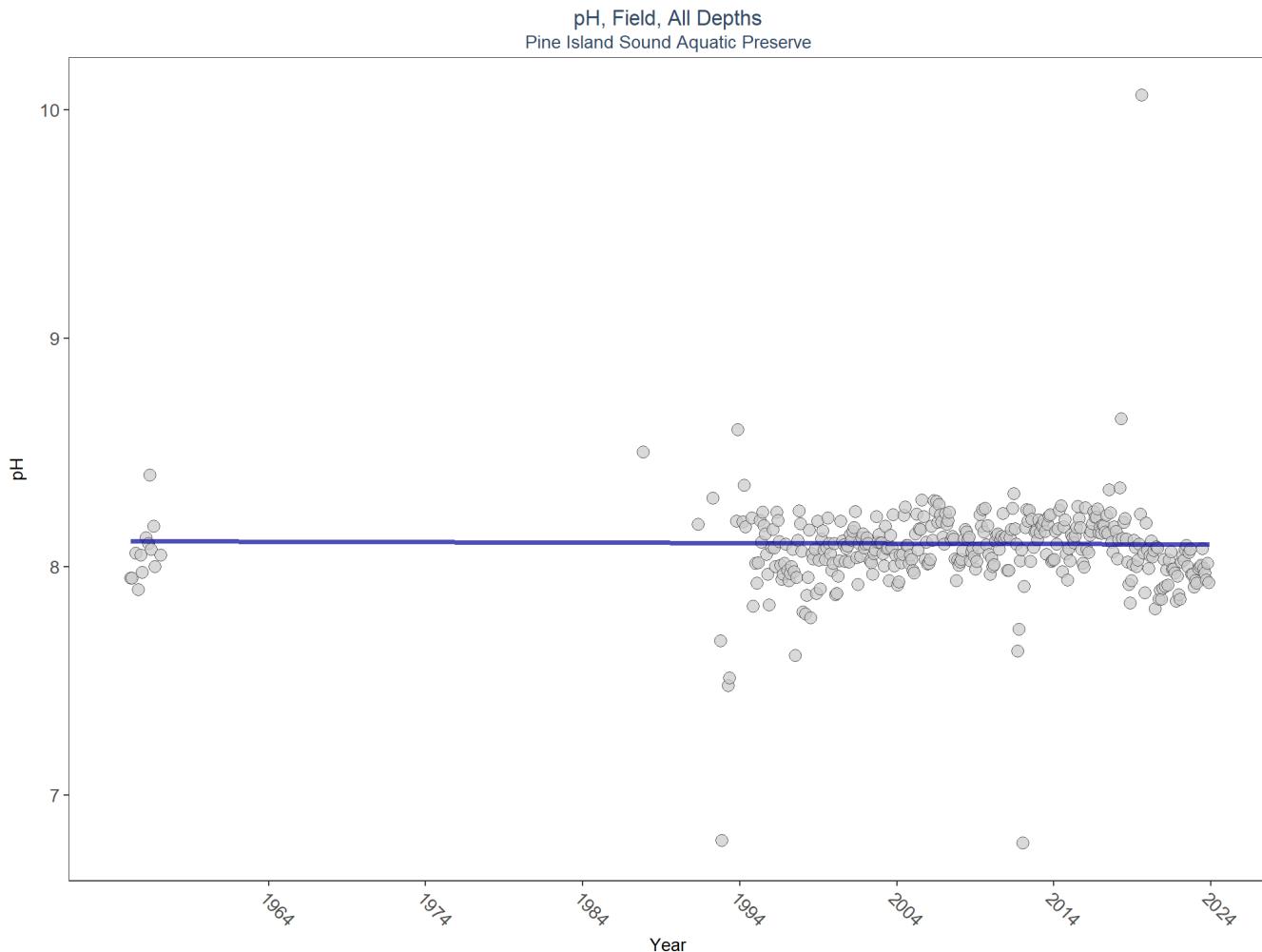
513 - Coastal Charlotte Harbor Monitoring Network  
 95 - Harmful Algal Bloom Marine Observation Network

There are no qualifying Value Qualifiers for Dissolved Oxygen Saturation in Pine Island Sound 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

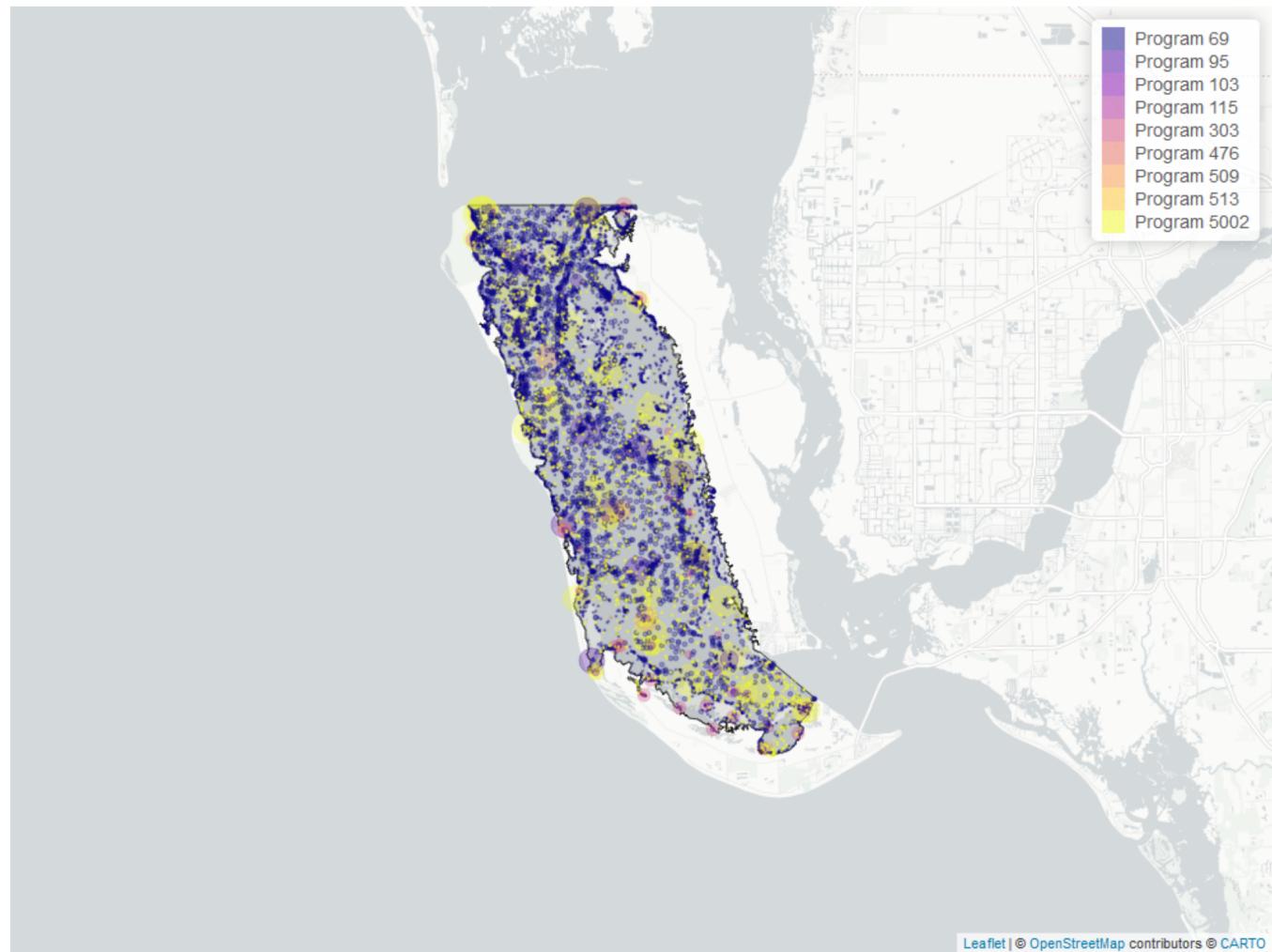


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	25506	37	8.1	TRUE	-0.0142	0.7035	-0.0002052974	8.111716	6.3198	0.8512	0

*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 pH



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

Table 15: Programs contributing data for pH

ProgramID	N_Data	YearMin	YearMax
69	15789	1991	2017
5002	7132	1987	2023
95	1405	1955	2018
303	403	2019	2023
103	291	2020	2022
509	270	2001	2008
476	265	2009	2023
513	12	2023	2023
115	11	2002	2004

**Program names:**

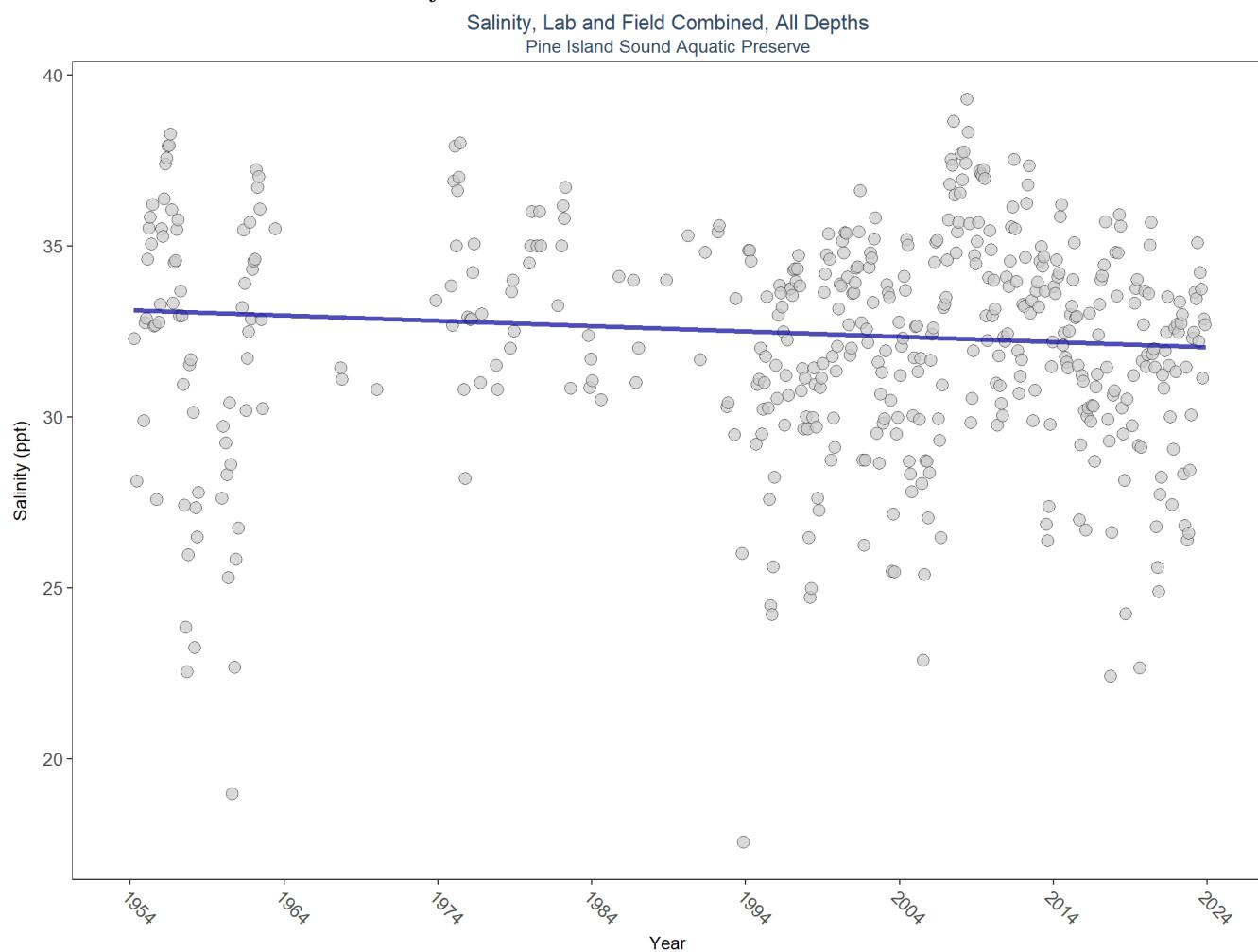
- 69 - Fisheries-Independent Monitoring (FIM) Program  
 5002 - Florida STORET / WIN  
 95 - Harmful Algal Bloom Marine Observation Network  
 303 - River, Estuary and Coastal Observing Network  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
 509 - SERC Water Quality Monitoring Network  
 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
 513 - Coastal Charlotte Harbor Monitoring Network  
 115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for pH in Pine Island Sound 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

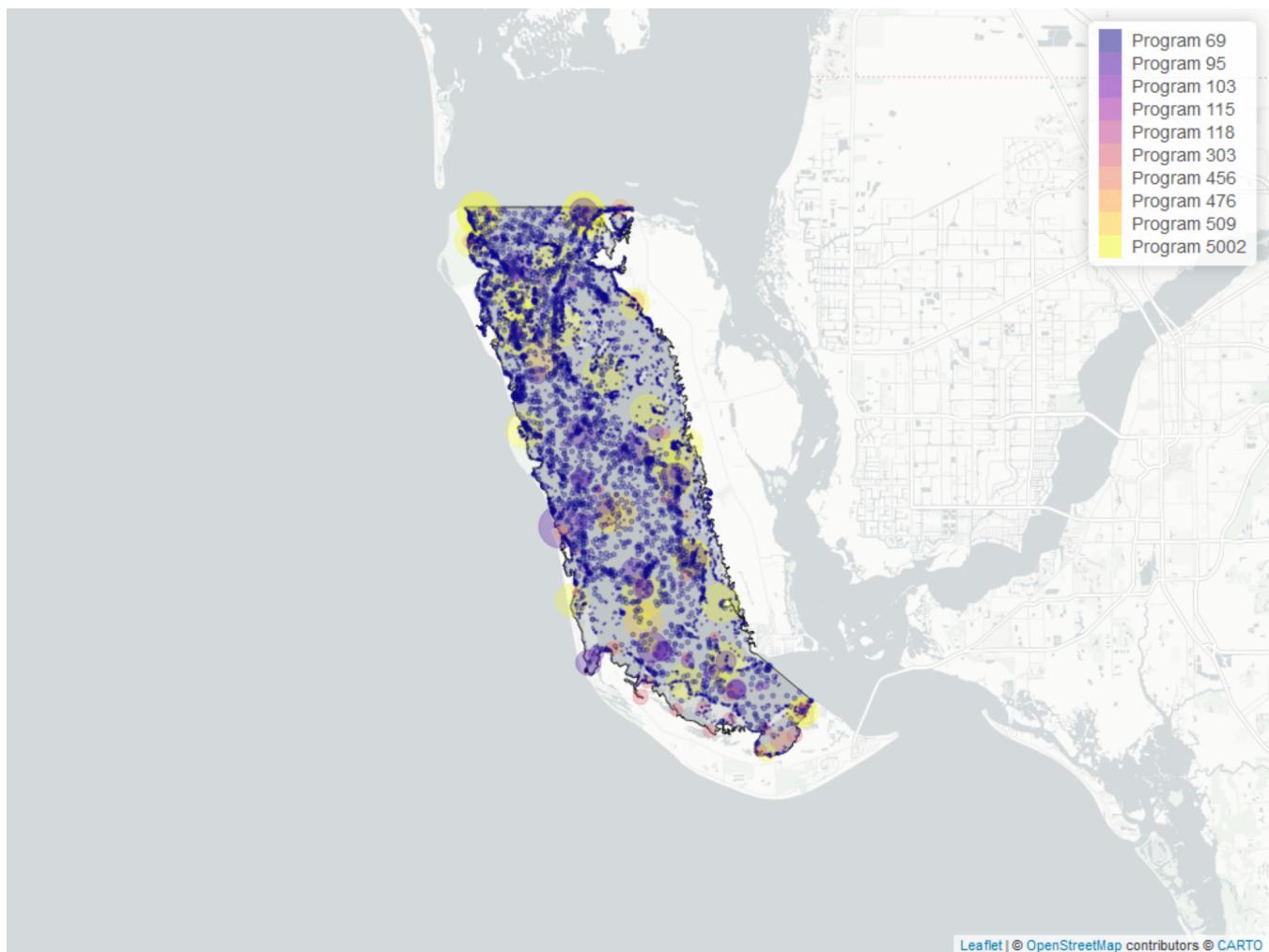


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	26638	62	32.9	TRUE	-0.0805	0.0129	-0.01552345	33.11989	7.4891	0.7582	-1

$p < 0.00005$  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 16: Programs contributing data for Salinity

ProgramID	N_Data	YearMin	YearMax
69	16066	1990	2017
5002	6187	1995	2023
95	2881	1954	2018
509	702	1999	2008
303	480	2019	2023
476	224	2016	2023
456	71	1970	2012
118	20	2015	2020
115	11	2002	2004
103	1	2004	2004

**Program names:**

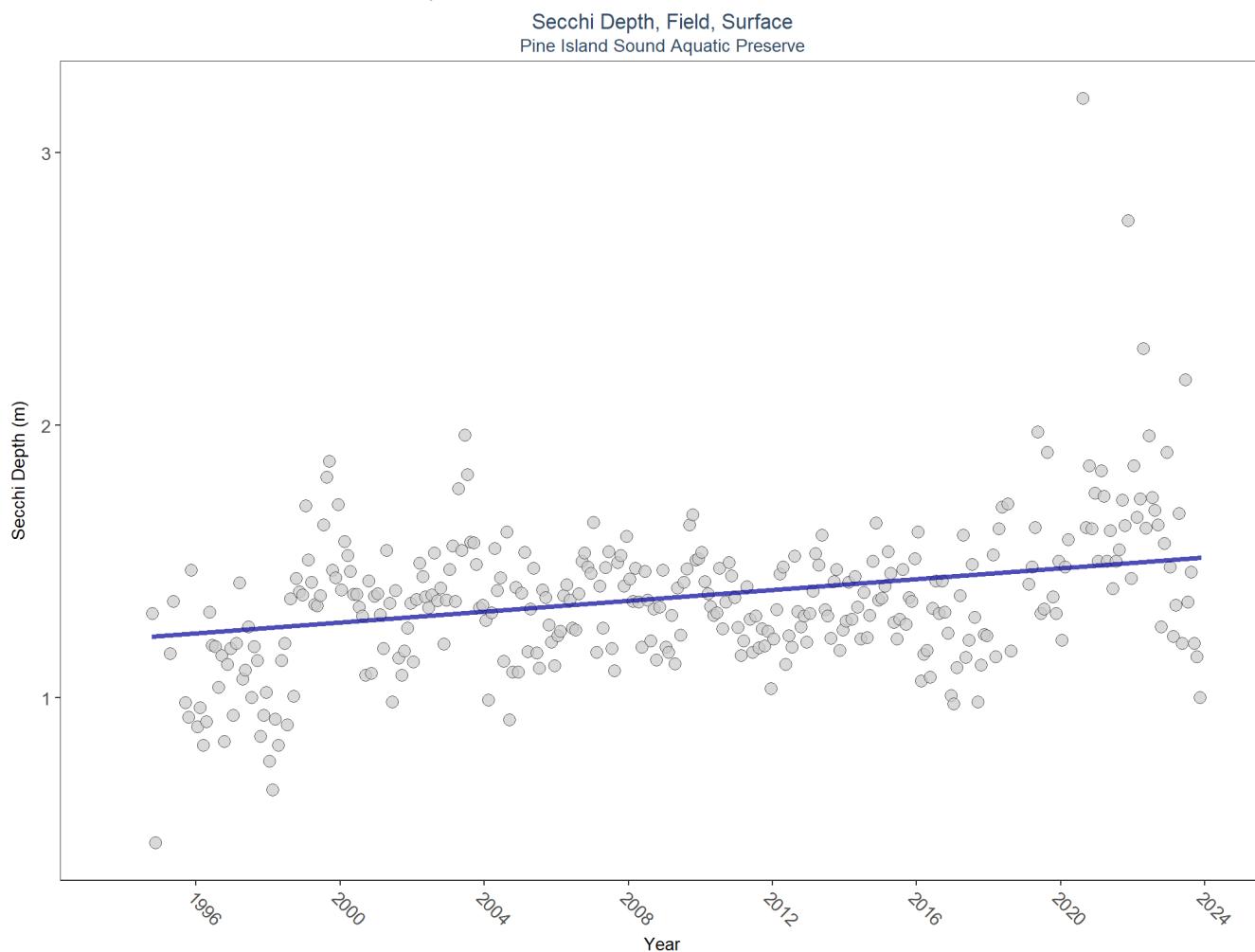
69 - Fisheries-Independent Monitoring (FIM) Program  
 5002 - Florida STORET / WIN  
 95 - Harmful Algal Bloom Marine Observation Network  
 509 - SERC Water Quality Monitoring Network  
 303 - River, Estuary and Coastal Observing Network  
 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
 456 - Oyster Sentinel  
 118 - National Aquatic Resource Surveys, National Coastal Condition Assessment  
 115 - Environmental Monitoring Assessment Program  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)

There are no qualifying Value Qualifiers for Salinity in Pine Island Sound 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



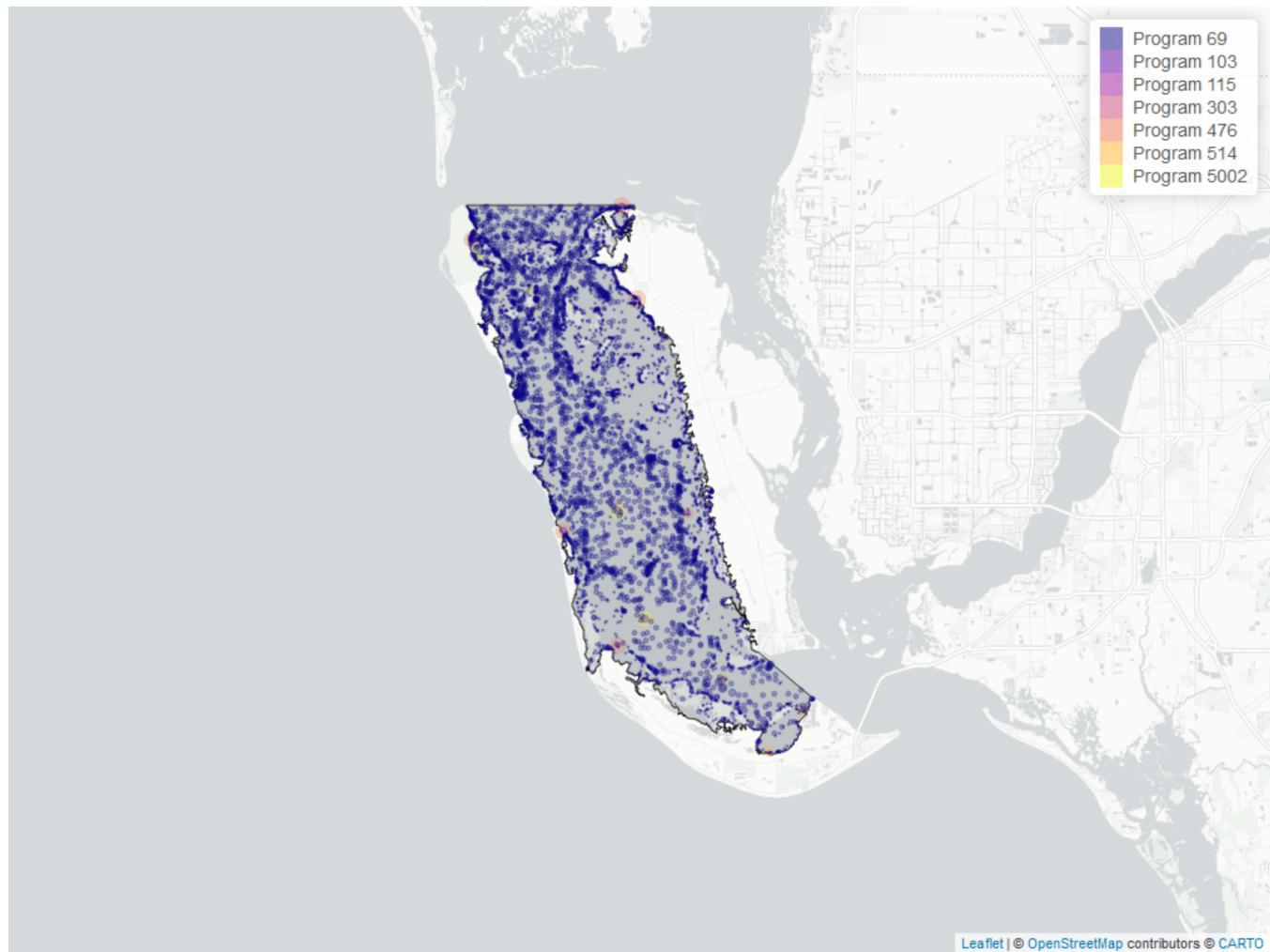
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
Surface	16231	30	1.2	TRUE	0.2259	0.0000	0.009961556	1.216	4.5889	0.9494	1

*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 Secchi Depth



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

Table 17: Programs contributing data for Secchi Depth

ProgramID	N_Data	YearMin	YearMax
69	15774	1994	2017
476	222	2017	2023
5002	108	2005	2023
103	69	2020	2022
514	53	2001	2002
115	3	2002	2004
303	2	2019	2019

#### Program names:

69 - Fisheries-Independent Monitoring (FIM) Program

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

- 5002 - Florida STORET / WIN  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
 514 - Florida LAKEWATCH Program  
 115 - Environmental Monitoring Assessment Program  
 303 - River, Estuary and Coastal Observing Network

### Value Qualifiers

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

Table 18: Value Qualifiers for Secchi Depth

Year	$N_{Total}$	$N_S$	$perc_S$
2017	843	5	0.6
2018	28	6	21.4
2019	42	16	38.1
2020	44	12	27.3
2021	124	17	13.7
2022	66	19	28.8
2023	44	12	27.3

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

### Programs containing Value Qualified data:

- 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
 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)  $TN = ORGN + NH_4 + NO_3;$

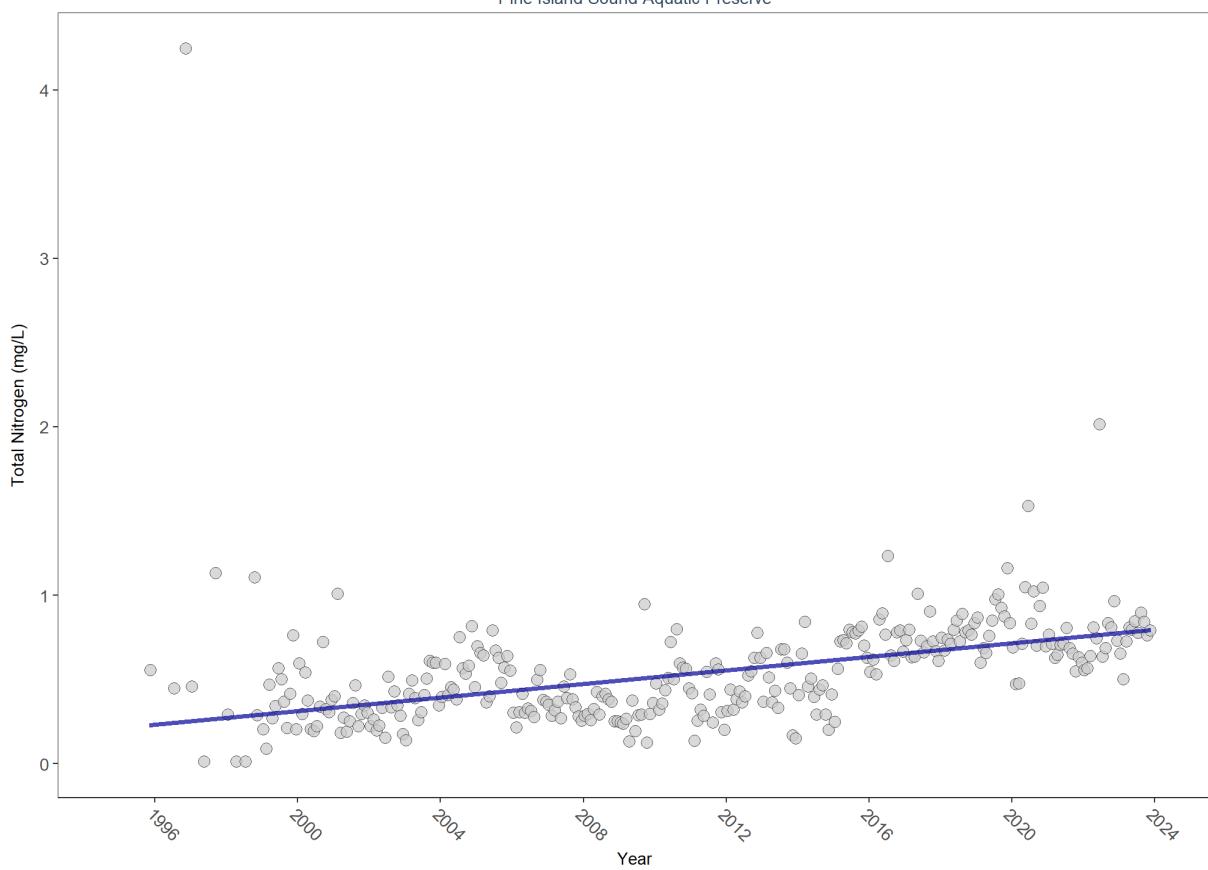
Additional Information:

- 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\_QAACFlagCode = “1Q”
  - SEACAR\_QAAC>Description = “SEACAR Calculated”

## Seasonal Kendall-Tau Trend Analysis

Total Nitrogen, Lab, All Depths  
Pine Island Sound Aquatic Preserve

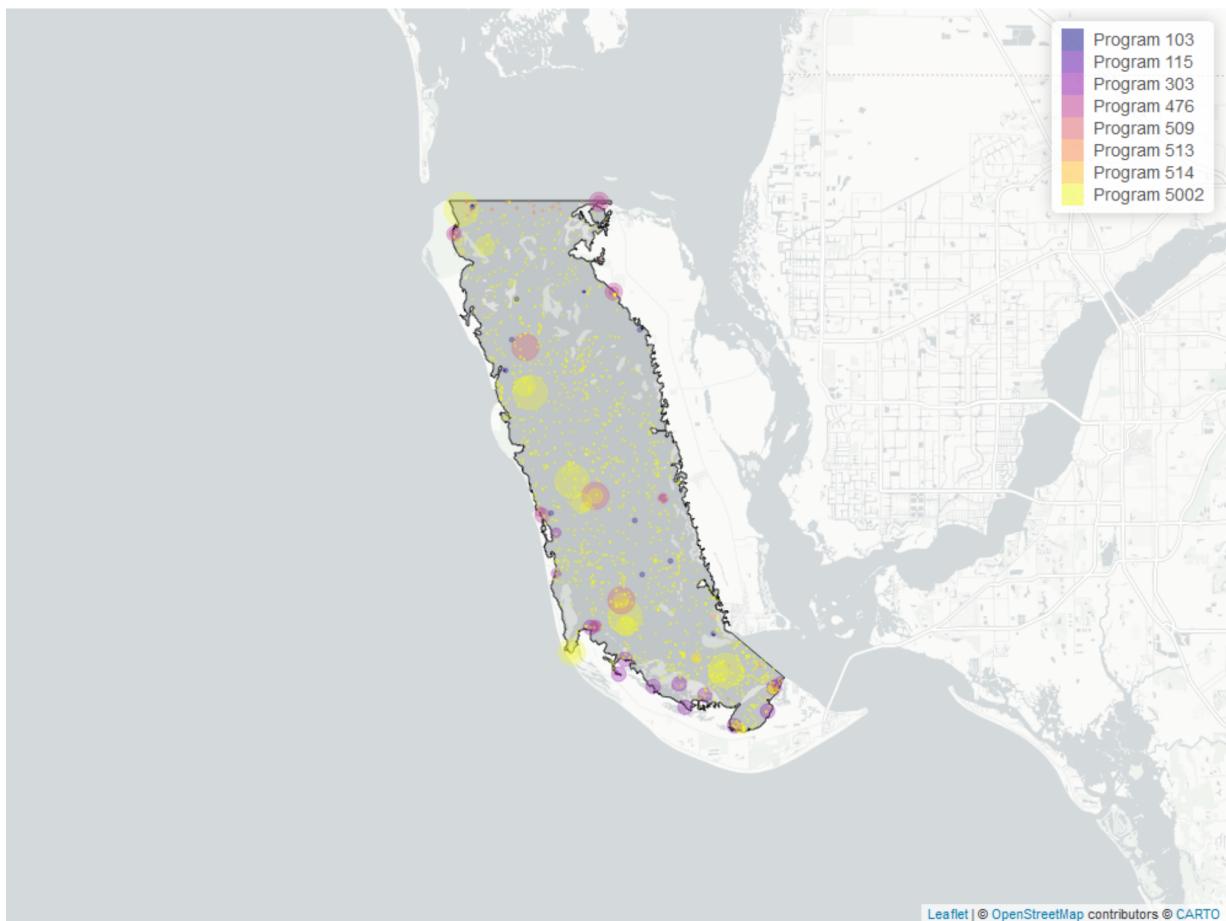


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	4100	29	0.53	TRUE	0.4389	0.0000	0.02011101	0.2130017	9.5559	0.5707	1

$p < 0.00005$  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 19: Programs contributing data for Total Nitrogen

ProgramID	N_Data	YearMin	YearMax
5002	2890	1995	2023
303	401	2019	2023
509	351	1999	2008
476	338	1998	2023
514	59	2001	2002
103	42	2002	2006
513	42	2006	2023
115	4	2002	2004

#### Program names:

5002 - Florida STORET / WIN

303 - River, Estuary and Coastal Observing Network

509 - SERC Water Quality Monitoring Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

514 - Florida LAKEWATCH Program

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

513 - Coastal Charlotte Harbor Monitoring Network

115 - Environmental Monitoring Assessment 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 20: Value Qualifiers for Total Nitrogen

Year	$N_{Total}$	$N_I$	$perc_I$	$N_Q$	$perc_Q$	$N_U$	$perc_U$
1997	15					5	33.3
1998	23					10	43.5
1999	62					10	16.1
2001	185					11	6.0
2003	121					2	1.6
2004	169	2	1.2	1	0.6		
2005	198	24	12.1				
2006	180	73	40.6			8	4.4
2007	191	50	26.2			14	7.3
2008	198	25	12.6			3	1.5
2009	159	49	30.8			24	15.1
2011	126	24	19.0			17	13.5
2012	98	9	9.2			3	3.1
2013	77	9	11.7			11	14.3
2014	152	22	14.5			5	3.3
2015	102	5	4.9			2	2.0
2020	276			1	0.4		
2021	329			1	0.3		

**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:

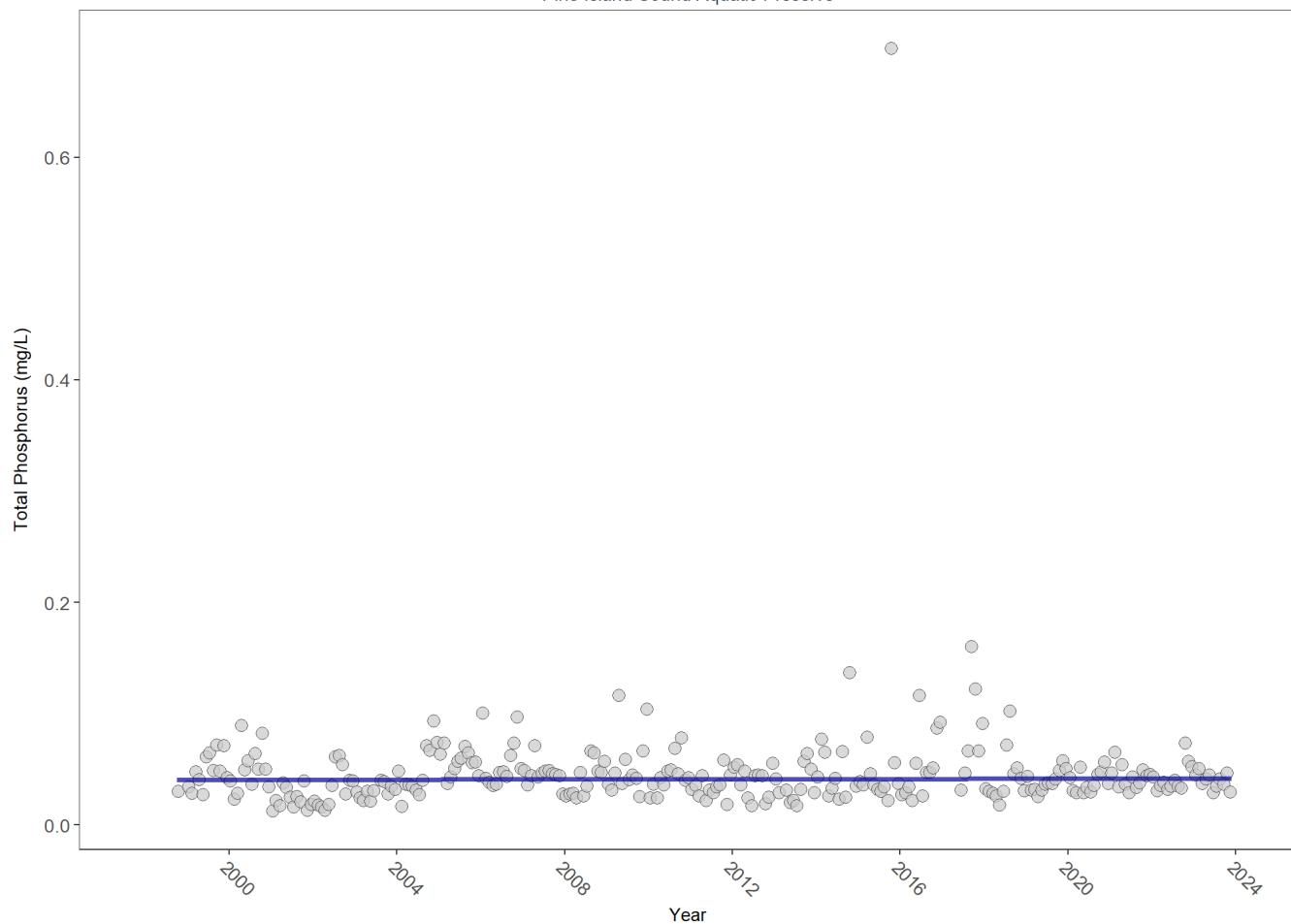
5002 - Florida STORET / WIN

303 - River, Estuary and Coastal Observing Network

## Total Phosphorus - Discrete Water Quality

### Seasonal Kendall-Tau Trend Analysis

Total Phosphorus, Lab, All Depths  
Pine Island Sound Aquatic Preserve

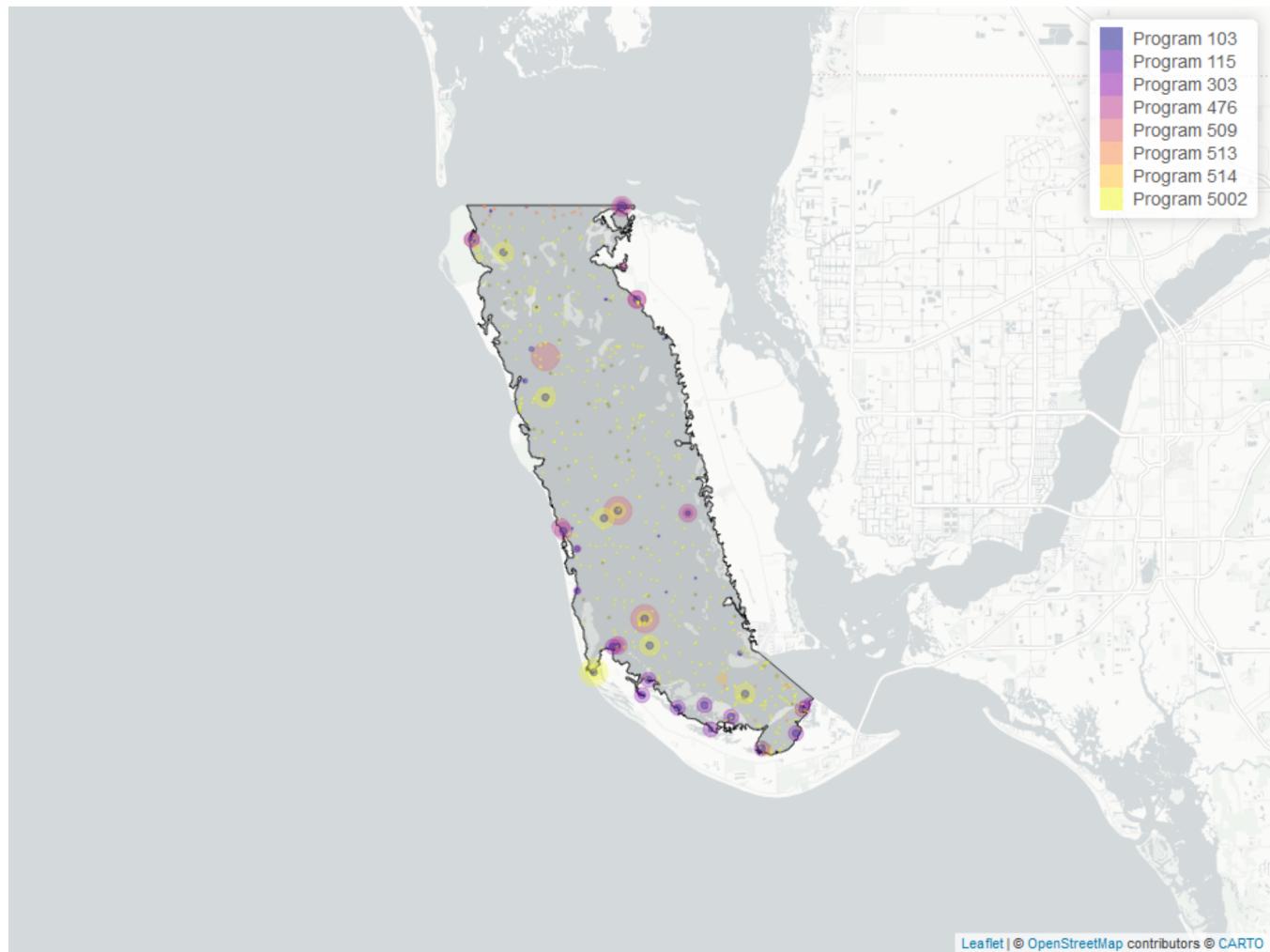


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	2649	26	0.036	TRUE	0.0171	0.7261	0.00004334903	0.04042068	17.8329	0.0855	0

$p < 0.00005$  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 Phosphorus



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

Table 21: Programs contributing data for Total Phosphorus

ProgramID	N_Data	YearMin	YearMax
5002	1066	2005	2023
476	501	1998	2023
303	386	2019	2023
509	348	1999	2008
103	293	2002	2022
514	59	2001	2002
513	42	2006	2023
115	4	2002	2004

**Program names:**

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
 303 - River, Estuary and Coastal Observing Network  
 509 - SERC Water Quality Monitoring Network  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
 514 - Florida LAKEWATCH Program  
 513 - Coastal Charlotte Harbor Monitoring Network  
 115 - Environmental Monitoring Assessment Program

### Value Qualifiers

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

Table 22: Value Qualifiers for Total Phosphorus

Year	$N_{Total}$	$N_I$	$\text{perc}_I$	$N_Q$	$\text{perc}_Q$	$N_U$	$\text{perc}_U$
1998	3			3	100.0		
1999	47			10	21.3		
2000	42	1	2.4	3	7.1		
2001	76			5	6.6		
2002	94					20	21.3
2003	47					3	6.4
2004	65	11	16.9	8	12.3		
2005	105	45	42.9			1	0.9
2006	94	49	52.1			2	2.1
2007	89	39	43.8			1	1.1
2008	66	5	7.6				
2009	32	1	3.1				
2010	24	5	20.8				
2011	25	7	28.0				
2012	13	4	30.8				
2013	14	6	42.9				
2014	13	3	23.1				
2015	12	2	16.7				
2016	12	4	33.3				
2018	169	31	18.3			10	5.9
2019	270	57	21.1			1	0.4
2020	304	66	21.7			1	0.3
2021	562	81	14.4	10	1.8	7	1.2
2022	308	44	14.3	2	0.7	3	1.0
2023	184	12	6.5			3	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:

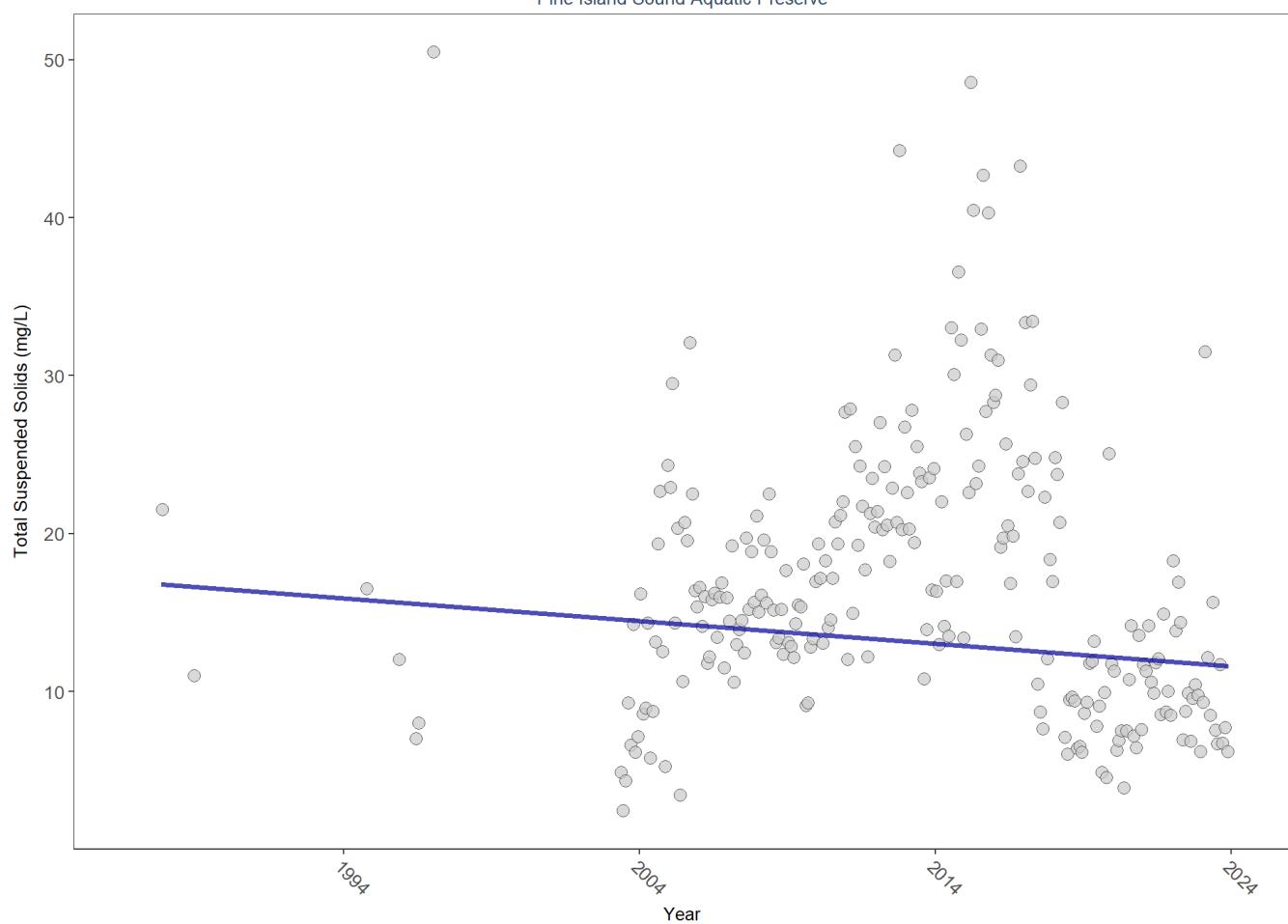
476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
 303 - River, Estuary and Coastal Observing Network  
 5002 - Florida STORET / WIN  
 513 - Coastal Charlotte Harbor Monitoring Network

## 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  
Pine Island Sound Aquatic Preserve

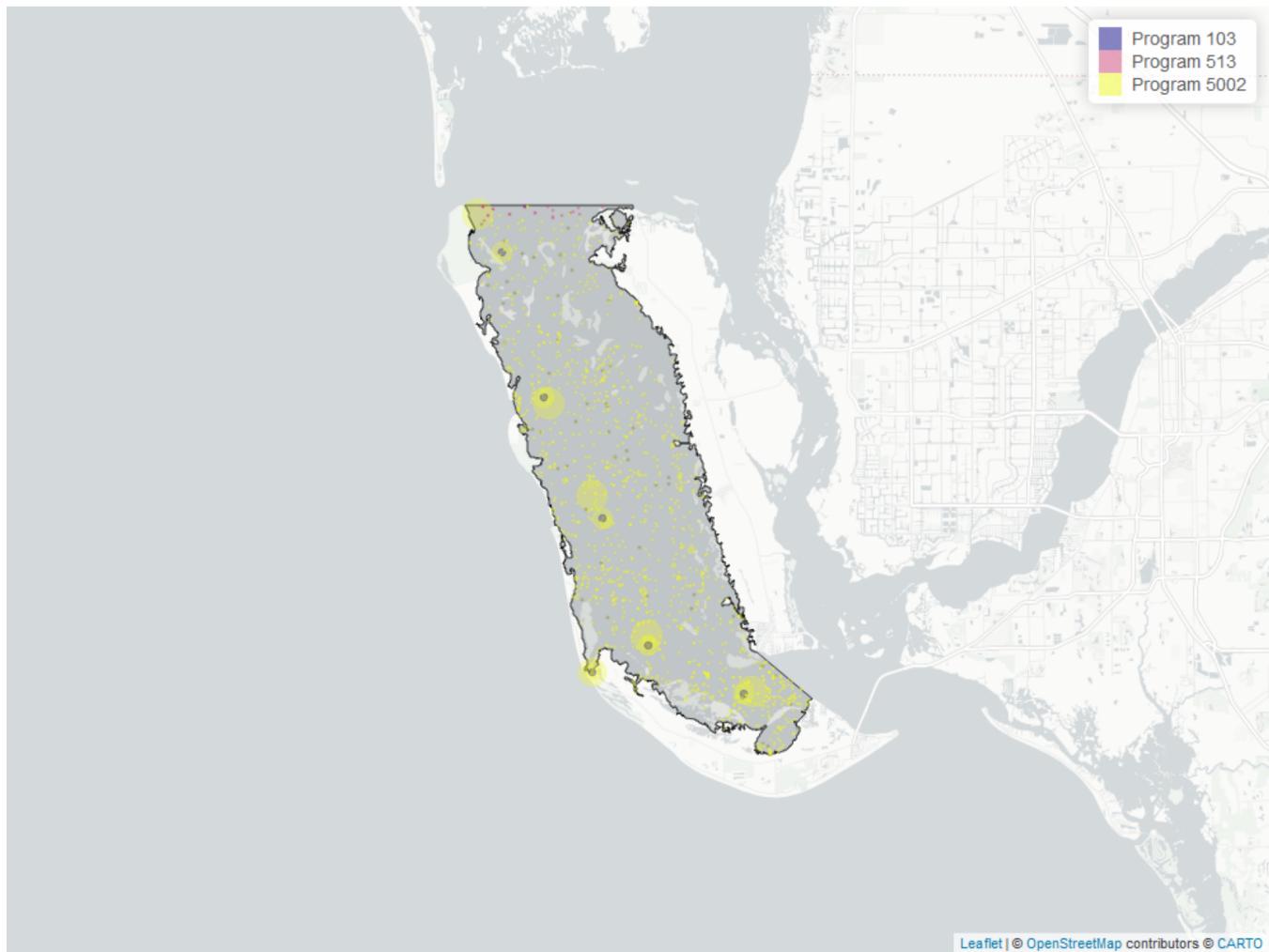


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	2635	27	12.7	TRUE	-0.0574	0.2065	-0.1434598	16.89323	7.9098	0.7214	0

*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 Suspended Solids



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

Table 23: Programs contributing data for Total Suspended Solids

ProgramID	N_Data	YearMin	YearMax
5002	2513	1987	2023
103	115	2020	2021
513	30	2018	2023

#### Program names:

5002 - Florida STORET / WIN

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

513 - Coastal Charlotte Harbor Monitoring Network

#### 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 Total Suspended Solids

Year	$N_{\_Total}$	$N_{\_I}$	$perc_{\_I}$	$N_{\_Q}$	$perc_{\_Q}$	$N_{\_U}$	$perc_{\_U}$
2003	54	19	35.2			8	14.8
2004	112	36	32.1			5	4.5
2005	115	2	1.7				
2007	153	7	4.6				
2008	171	14	8.2	5	2.9	2	1.2
2009	154	5	3.2				
2011	123	1	0.8				
2012	91					1	1.1
2014	145	1	0.7				
2018	141	1	0.7			1	0.7
2019	147	15	10.2				
2020	153	13	8.5				
2021	253	1	0.4	2	0.8		
2022	152	2	1.3				
2023	130	1	0.8	1	0.8		

**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:

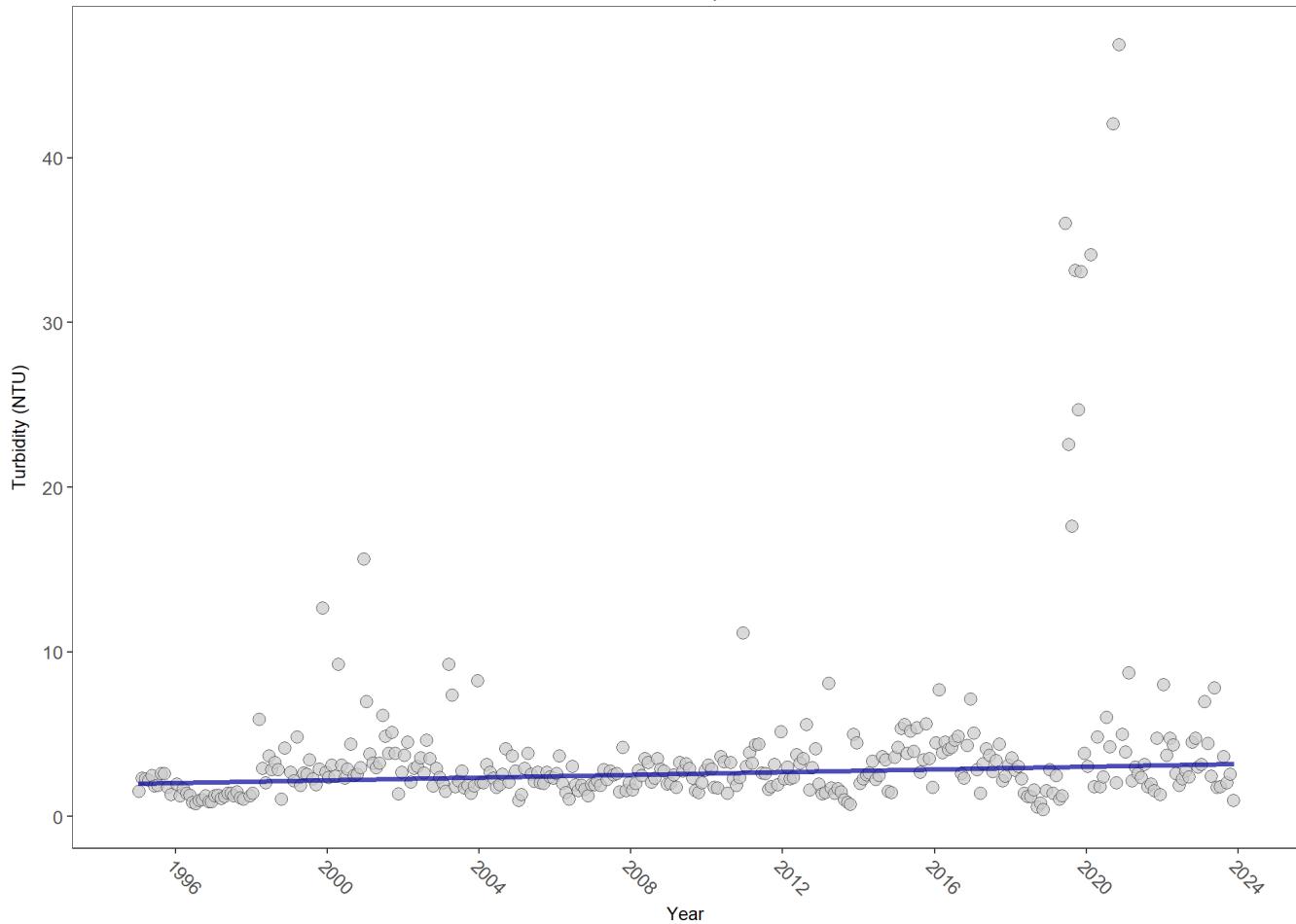
5002 - Florida STORET / WIN

#### 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  
Pine Island Sound Aquatic Preserve

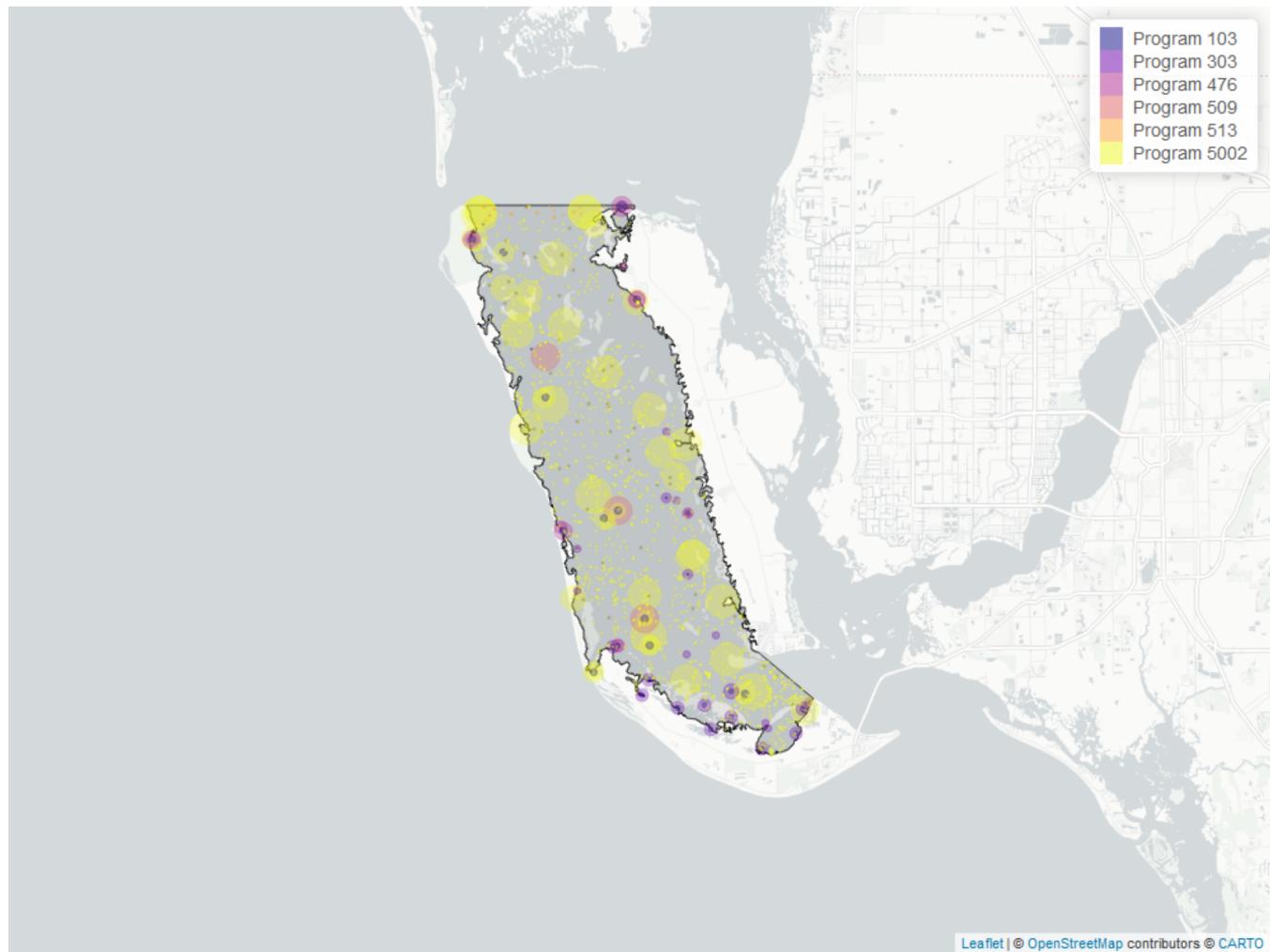


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	8029	29	1.95	TRUE	0.1731	0.0000	0.04196	1.989347	7.3849	0.7671	1

*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



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

Table 25: Programs contributing data for Turbidity

ProgramID	N_Data	YearMin	YearMax
5002	6584	1995	2023
303	453	2019	2023
476	413	1999	2023
509	348	1999	2008
103	252	2006	2022
513	31	2006	2023

**Program names:**

5002 - Florida STORET / WIN

303 - River, Estuary and Coastal Observing Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

509 - SERC Water Quality Monitoring Network  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
 513 - Coastal Charlotte Harbor Monitoring Network

### Value Qualifiers

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

Table 26: Value Qualifiers for Turbidity

Year	$N_{Total}$	$N_I$	$perc_I$	$N_Q$	$perc_Q$	$N_U$	$perc_U$
2000	453			5	1.1		
2003	365					10	2.7
2004	319	21	6.6			1	0.3
2006	341	11	3.2				
2007	326	2	0.6				
2009	318			3	0.9		
2010	324			4	1.2		
2011	302			3	1.0		
2012	162			4	2.5		
2014	144			2	1.4		
2018	169	31	18.3			21	12.4
2019	305	17	5.6			27	8.8
2020	359	29	8.1			3	0.8
2021	482	31	6.4				
2022	330	2	0.6	3	0.9		
2023	182	12	6.6				

**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

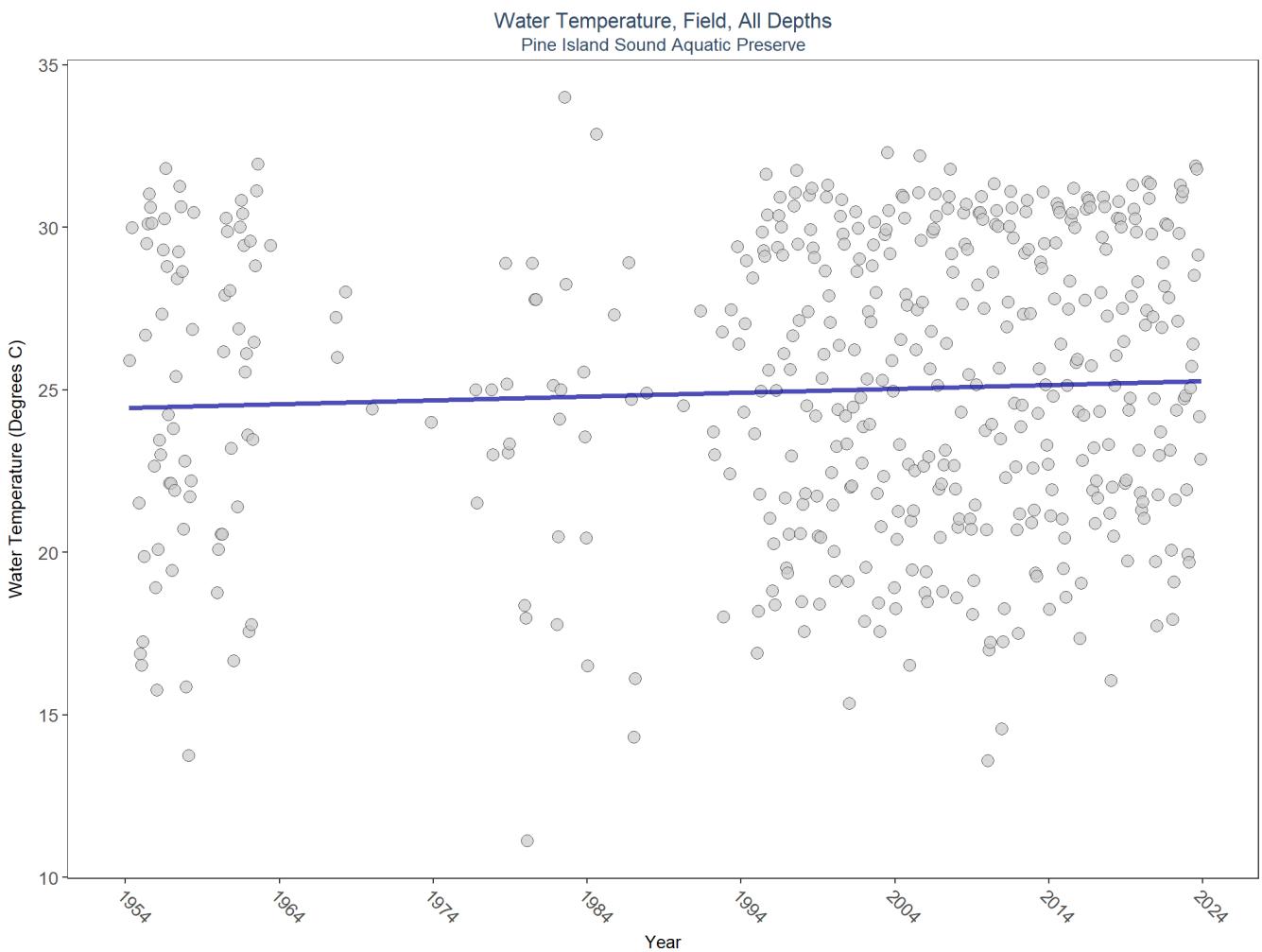
### Programs containing Value Qualified data:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
 5002 - Florida STORET / WIN  
 513 - Coastal Charlotte Harbor Monitoring Network

## 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.

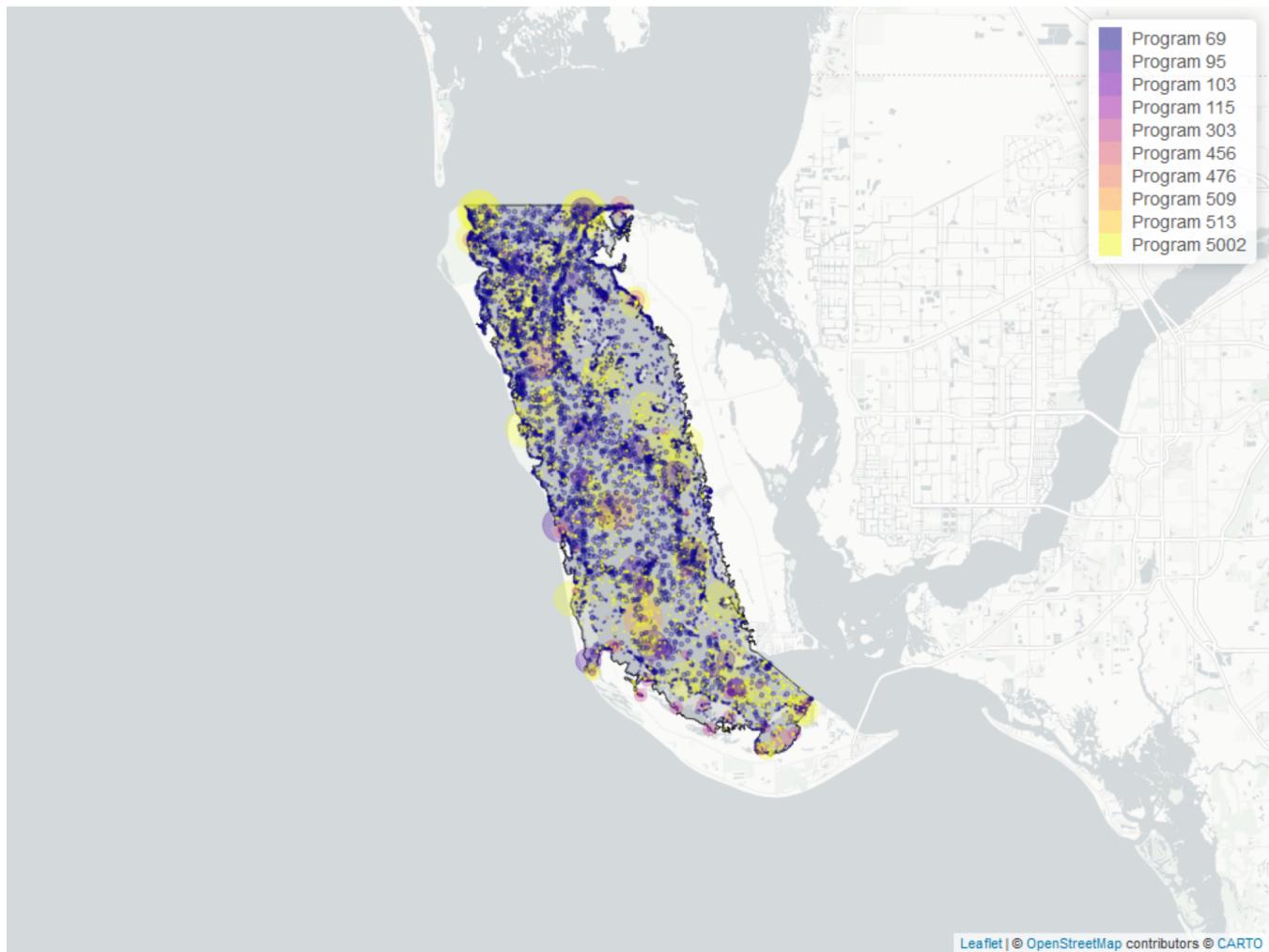
### Seasonal Kendall-Tau Trend Analysis



$p < 0.00005$  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



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

Table 27: Programs contributing data for Water Temperature

ProgramID	N_Data	YearMin	YearMax
69	16060	1990	2017
5002	9404	1987	2023
95	2554	1954	2018
509	702	1999	2008
303	465	2019	2023
103	293	2004	2022
476	223	2017	2023
456	71	1970	2012
513	12	2023	2023
115	11	2002	2004

**Program names:**

*69* - Fisheries-Independent Monitoring (FIM) Program  
*5002* - Florida STORET / WIN  
*95* - Harmful Algal Bloom Marine Observation Network  
*509* - SERC Water Quality Monitoring Network  
*303* - River, Estuary and Coastal Observing Network  
*103* - EPA STOrage and RETrieval Data Warehouse (STORET)  
*476* - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
*456* - Oyster Sentinel  
*513* - Coastal Charlotte Harbor Monitoring Network  
*115* - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for Water Temperature in Pine Island Sound Aquatic Preserve

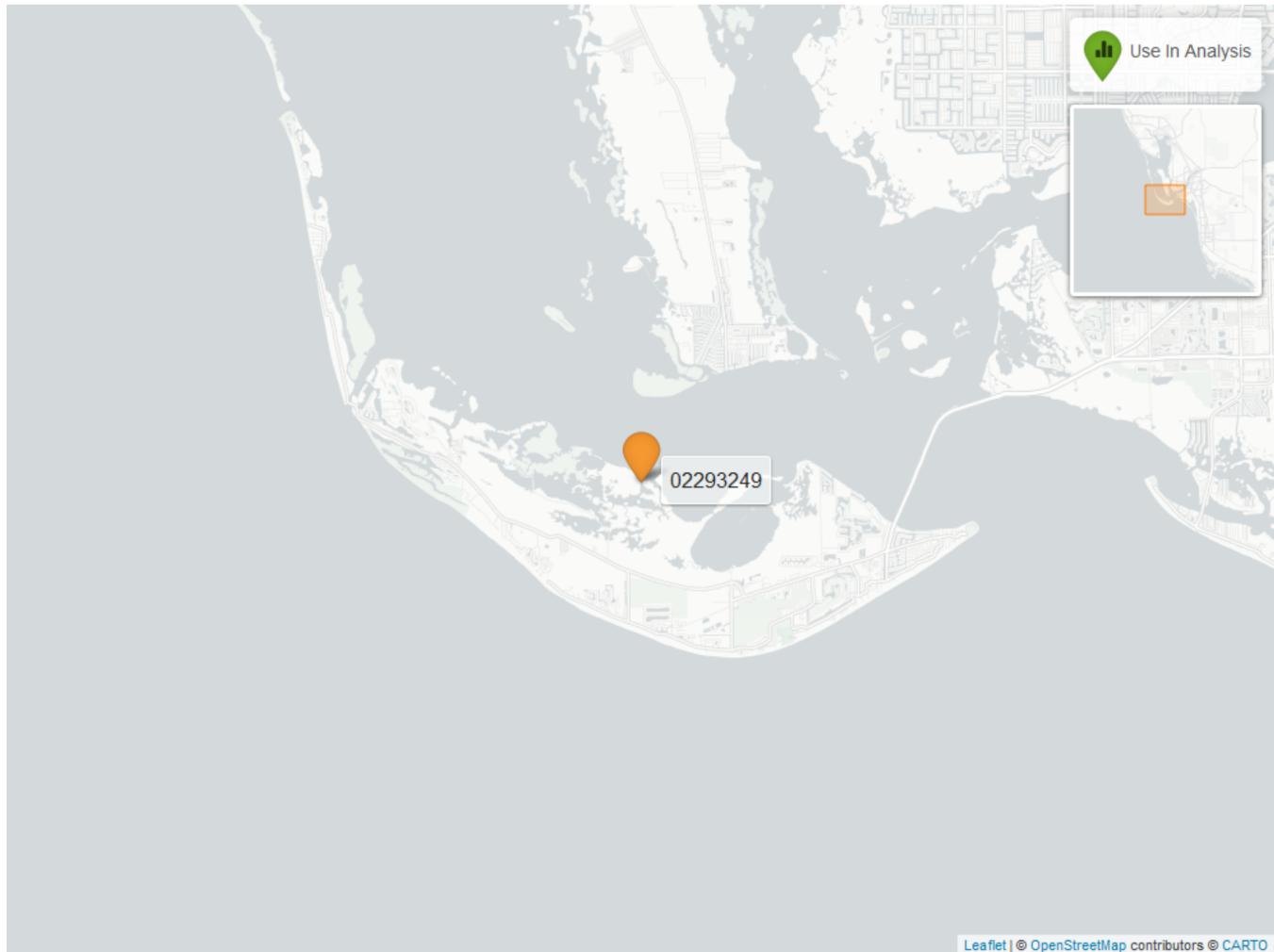
## Water Quality - Continuous

The following files were used in the continuous analysis:

- *Combined\_WQ\_WC\_NUT\_cont\_Dissolved\_Oxygen\_SW-2024-Feb-23.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Dissolved\_Oxygen\_Saturation\_SW-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_pH\_SW-2024-Feb-23.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Salinity\_SW-2024-Feb-23.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Turbidity\_SW-2024-Feb-22.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Water\_Temperature\_SW-2024-Feb-23.txt*

Table 28: National Water Information System (7)

<i>ProgramLocationID</i>	<i>Years of Data</i>	<i>Use in Analysis</i>	<i>Parameters</i>
02293249	4	FALSE	DO , pH , Sal , Turb , TempW



Map showing Continuous Water Quality Monitoring sampling locations within the boundaries of Pine Island Sound 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-Feb-23.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.

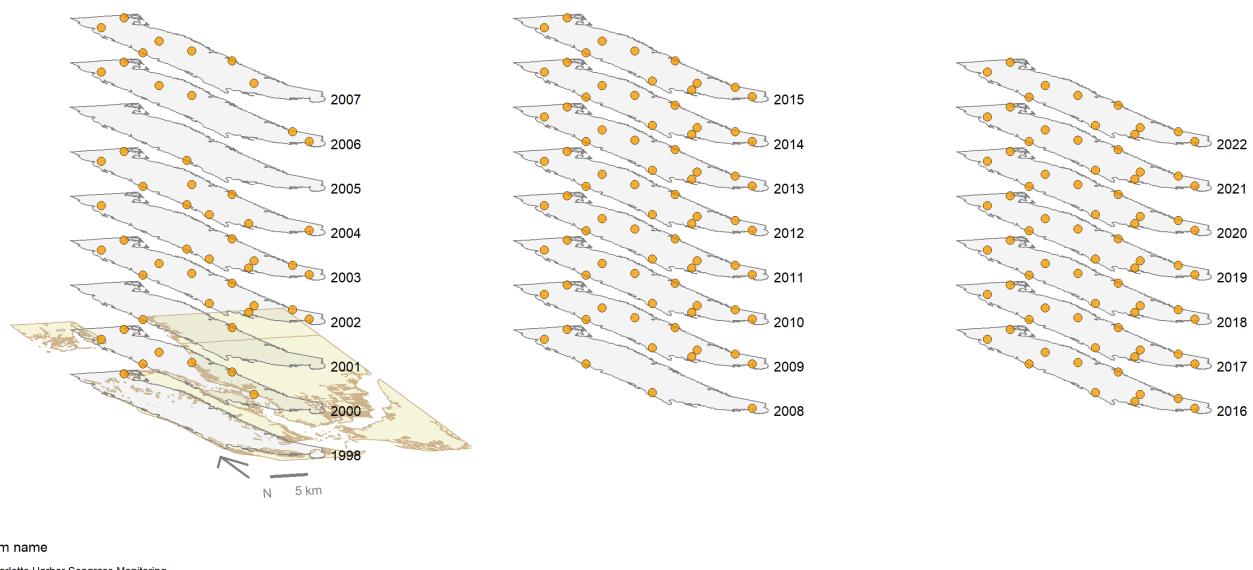
## Notes

*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

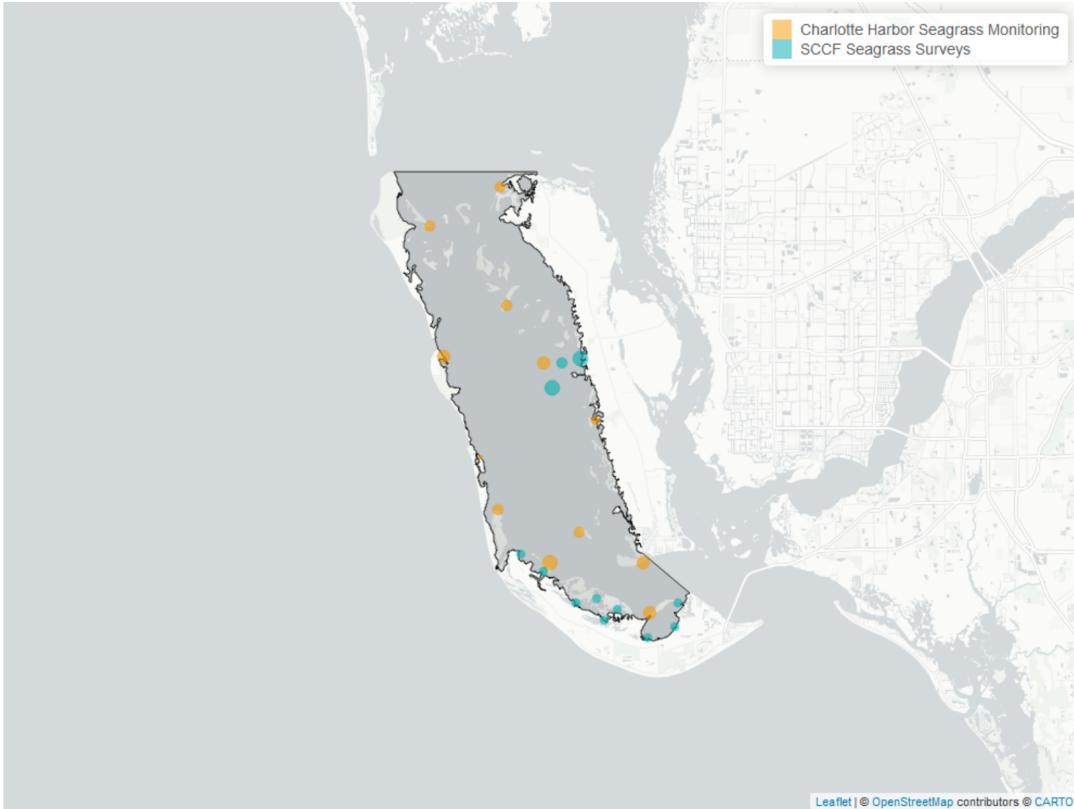
- Biscayne Bay Aquatic Preserve
- Florida Keys National Marine Sanctuary

Pine Island Sound Aquatic Preserve  
SAV Percent Cover - Sample Locations



Maps showing the temporal scope of SAV sampling sites within the boundaries of *Pine Island Sound Aquatic Preserve* by Program name.

**Sampling locations by Program:**



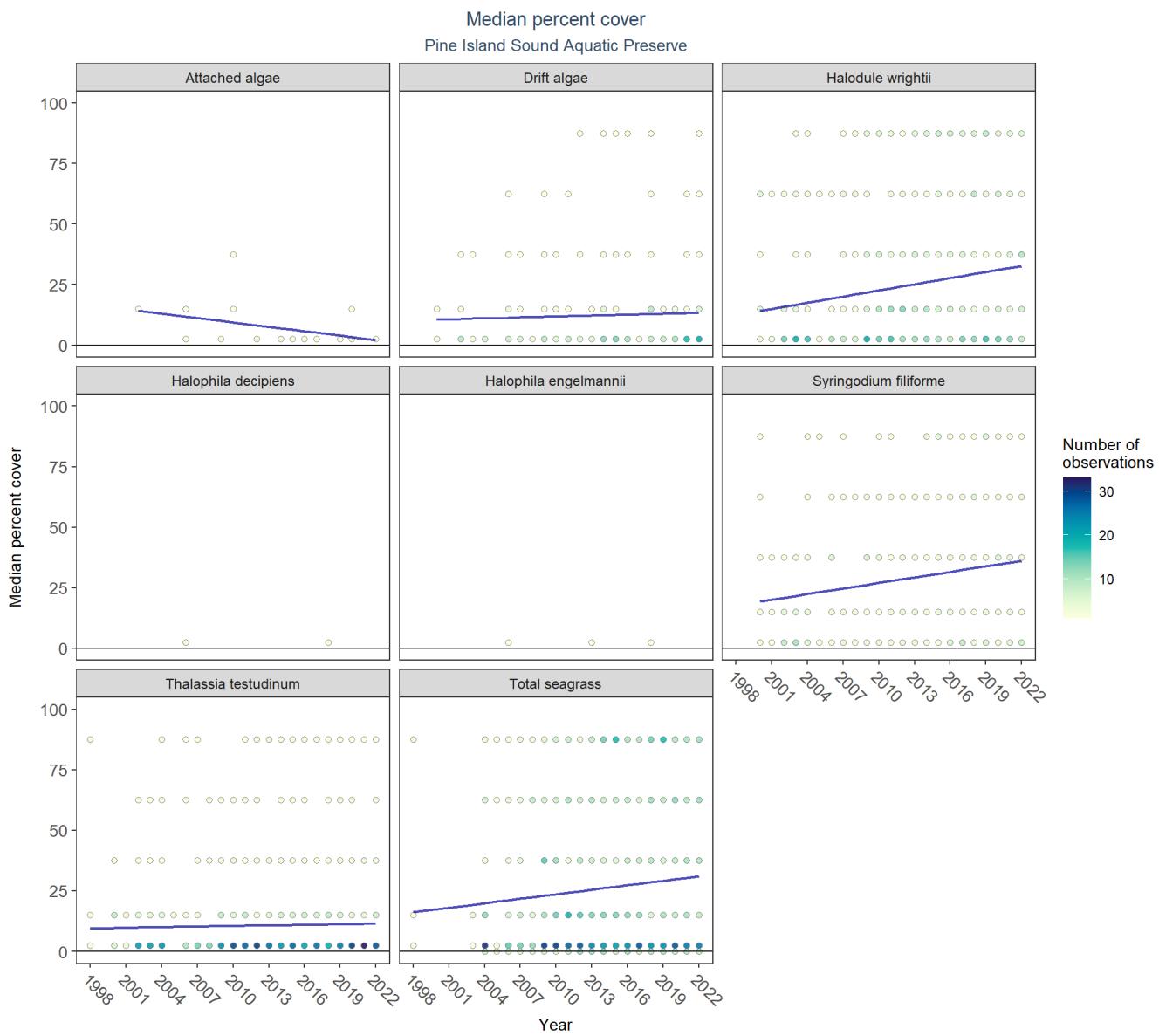
Map showing SAV sampling sites within the boundaries of *Pine Island Sound Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Table 29: Charlotte Harbor Seagrass Monitoring - *Program 570*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
3078	1998	2022	Braun Blanquet	12

Table 30: SCCF Seagrass Surveys - *Program 3015*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
2639	2010	2022	Percent Occurrence	12



Median percent cover by species in *Pine Island Sound 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.

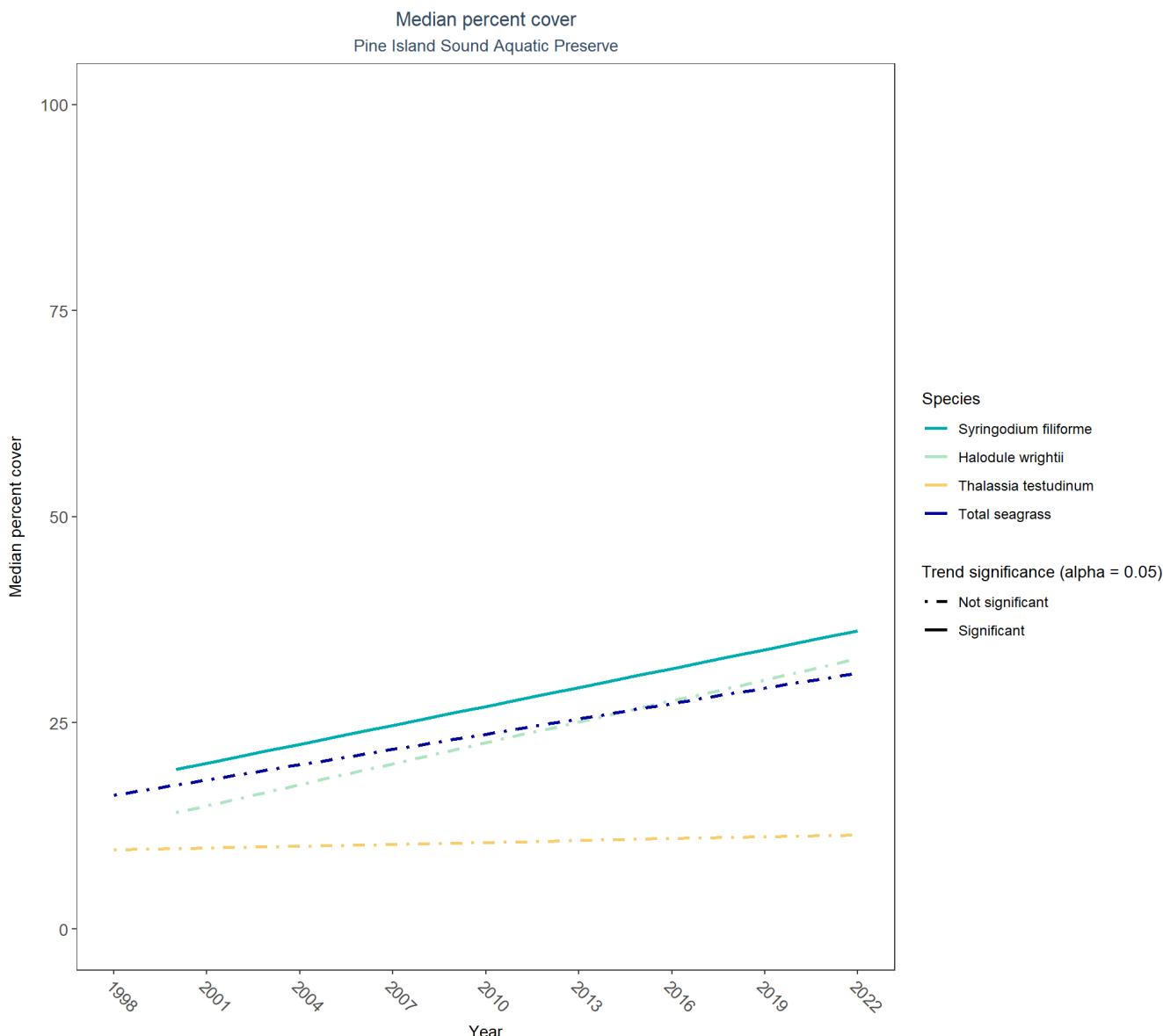
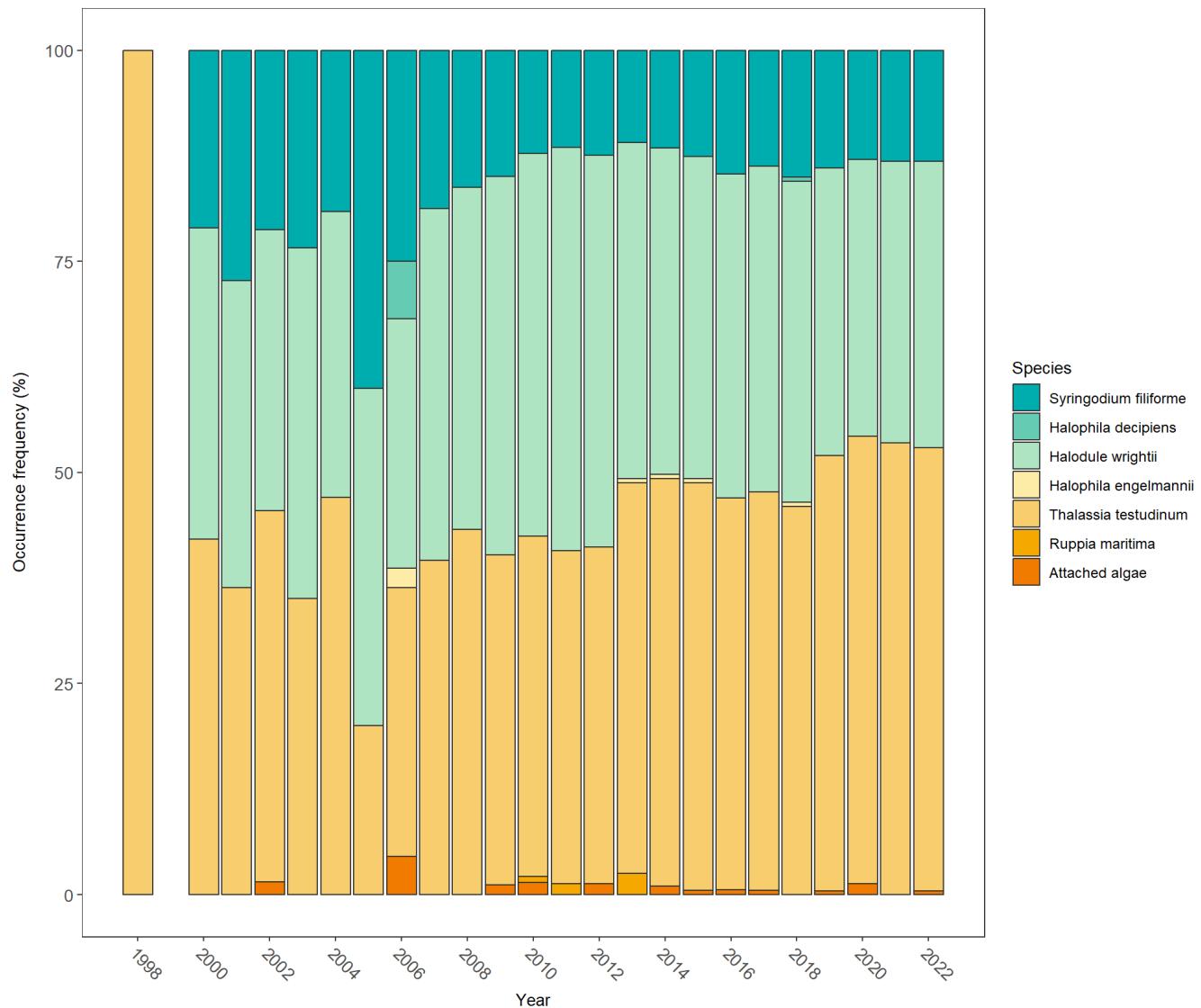
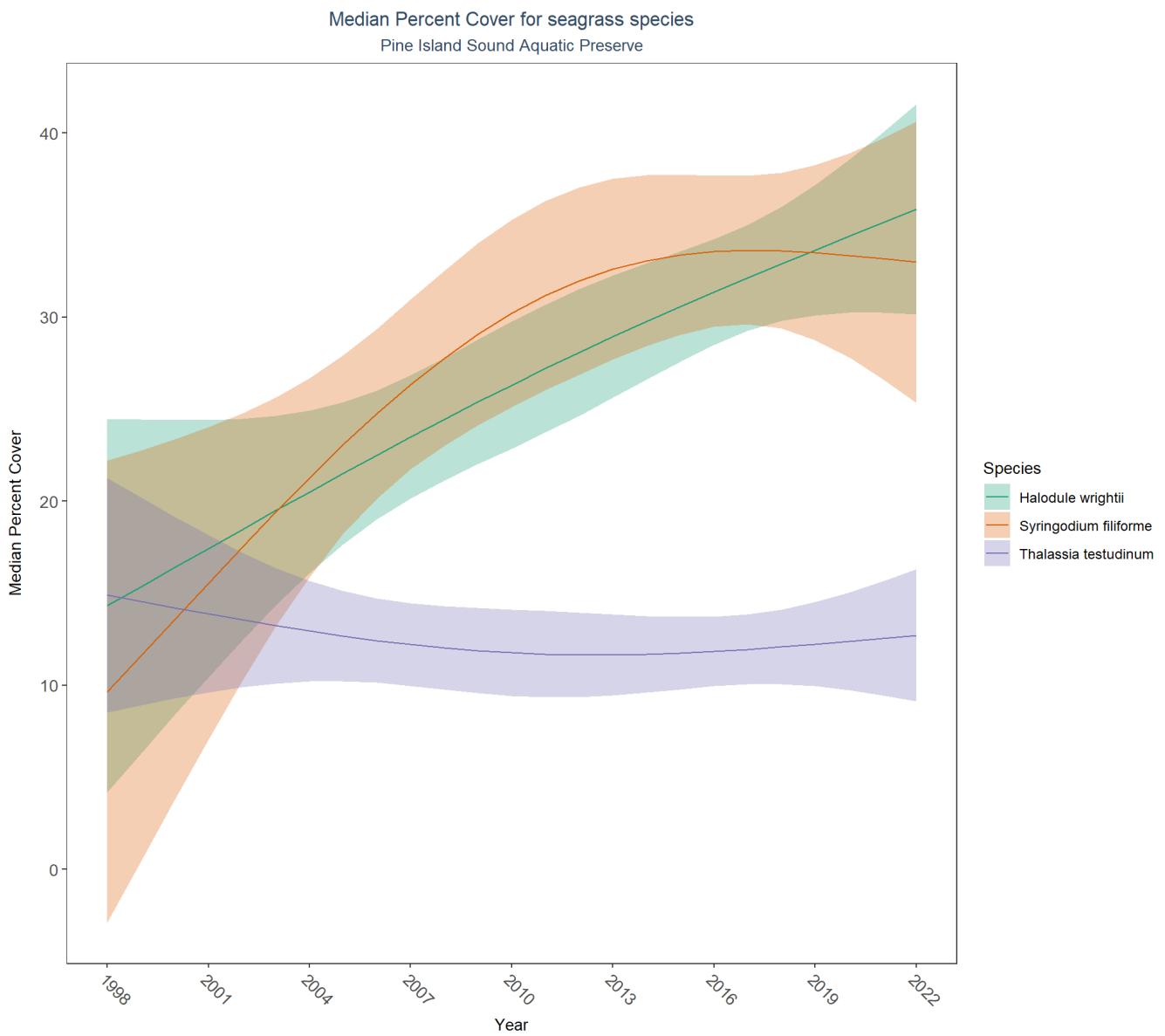


Table 31: Percent Cover Trend Analysis for Pine Island Sound Aquatic Preserve

Species	Common Name	Trend Significance (0.05)	Period of Record	LME-Intercept	LME-Slope	p
Attached algae		No significant trend	2002 - 2022	18.9755	-0.6010	0.1337
Drift algae		No significant trend	2000 - 2022	9.9600	0.1200	0.5570
Halodule wrightii	Shoal grass	No significant trend	2000 - 2022	9.0208	0.8475	0.0554
Halophila decipiens	Paddle grass	Insufficient data to calculate trend				
Halophila engelmannii	Star grass	Insufficient data to calculate trend				
Ruppia maritima	Widgeon grass	Insufficient data to calculate trend				
Syringodium filiforme	Manatee grass	Significantly increasing trend	2000 - 2022	14.7615	0.7652	0.0419
Thalassia testudinum	Turtle grass	No significant trend	1998 - 2022	9.2990	0.0751	0.5887
Total seagrass		No significant trend	1998 - 2022	13.7213	0.6195	0.0825

Frequency of occurrence  
Pine Island Sound Aquatic Preserve





Generalized additive models for each species in Pine Island Sound Aquatic Preserve. Species must have at least 10 years of data to be evaluated.

*Drift algae, Total seagrass, Attached algae, and Total SAV* are excluded from the analyses.