

Nature Coast Aquatic Preserve

SEACAR Habitat Analyses

Last compiled on 08 April, 2024

Contents

Threshold Filtering	2
Value Qualifiers	3
Water Column	5
Seasonal Kendall-Tau Analysis	5
Water Quality - Discrete	5
Chlorophyll a, Uncorrected for Pheophytin - Discrete Water Quality	6
Colored Dissolved Organic Matter - Discrete Water Quality	8
Dissolved Oxygen - Discrete Water Quality	11
pH - Discrete Water Quality	14
Salinity - Discrete Water Quality	17
Secchi Depth - Discrete Water Quality	19
Total Nitrogen - Discrete Water Quality	22
Total Phosphorus - Discrete Water Quality	27
Turbidity - Discrete Water Quality	29
Water Temperature - Discrete Water Quality	32
Water Quality - Continuous	36
Salinity - Continuous Water Quality	38
BBSHS	38
Water Temperature - Continuous Water Quality	39
BBSHS	39
Submerged Aquatic Vegetation	40
Parameters	40
Species	40
Notes	40
Nekton	48

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

Parameter Name	Units	Low Threshold	High Threshold	Sensor Type
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

Parameter Name	Units	Low Threshold	High Threshold
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 ₂ +3 Filtered	mg/L	0	-
NH4 Filtered	mg/L	0	-
Total Phosphorus	mg/L	0	-

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

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

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

Value Qualifiers

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

STORET and WIN value qualifier codes

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

Table 4: Value Qualifier codes excluded from analysis

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

Discrete Water Quality Value Qualifiers

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

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

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

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

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

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

Systemwide Monitoring Program (SWMP) value qualifier codes

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

Table 5: SWMP Value Qualifier codes

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

Water Column

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

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

Seasonal Kendall-Tau Analysis

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

Water Quality - Discrete

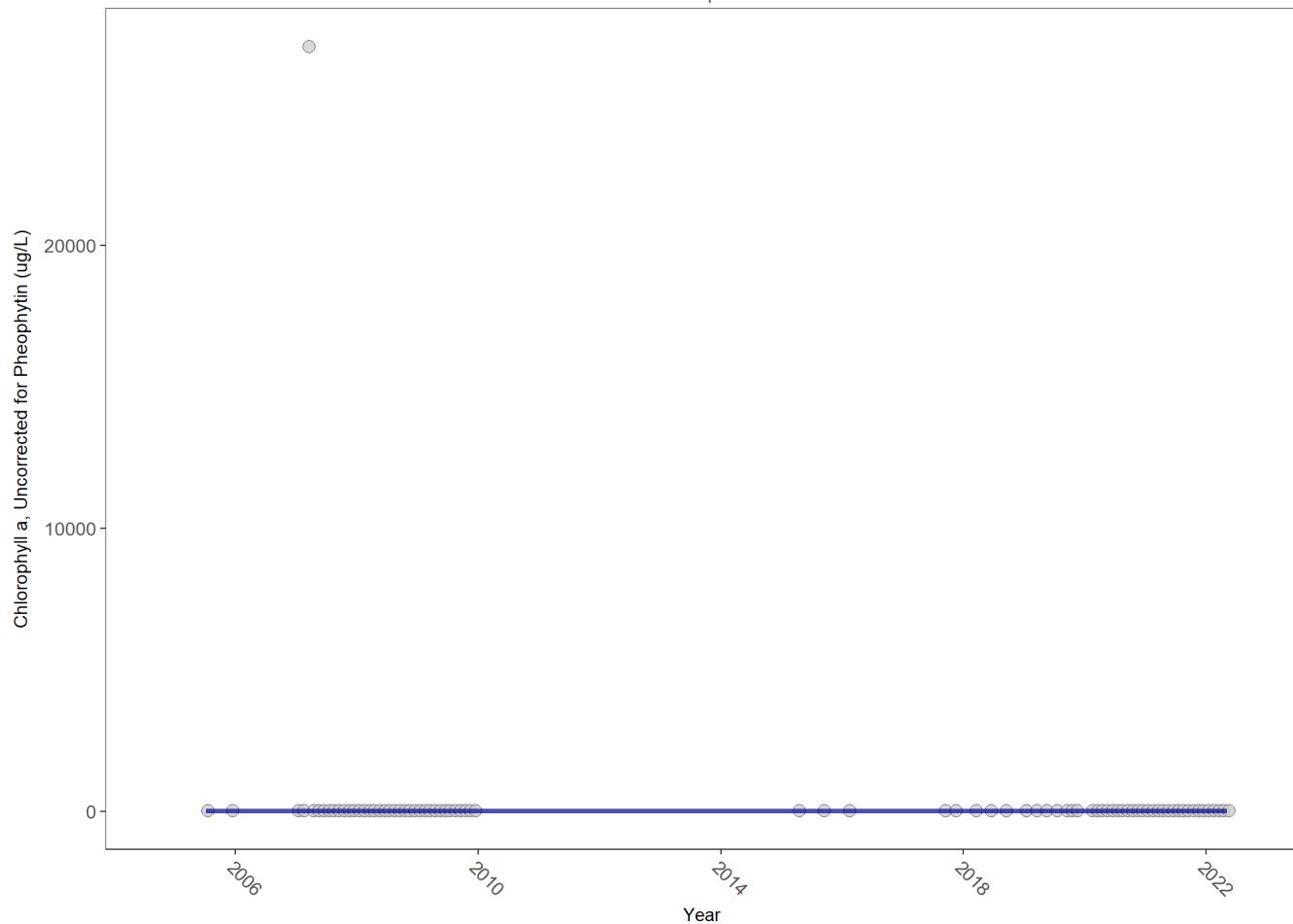
The following files were used in the discrete analysis:

- *Combined_WQ_WC_NUT_Chlorophyll_a_corrected_for_pheophytin-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_Chlorophyll_a_uncorrected_for_pheophytin-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_Colored_dissolved_organic_matter_CDOM-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_Dissolved_Oxygen-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_Dissolved_Oxygen_Saturation-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_pH-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_Salinity-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_Secchi_Depth-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_Total_Nitrogen-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_Total_Phosphorus-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_Total_Suspended_Solids_TSS-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_Turbidity-2024-Mar-27.txt*
- *Combined_WQ_WC_NUT_Water_Temperature-2024-Mar-27.txt*

Chlorophyll a, Uncorrected for Pheophytin - Discrete Water Quality

Seasonal Kendall-Tau Trend Analysis

Chlorophyll a, Uncorrected for Pheophytin, Lab, All Depths
Nature Coast Aquatic Preserve

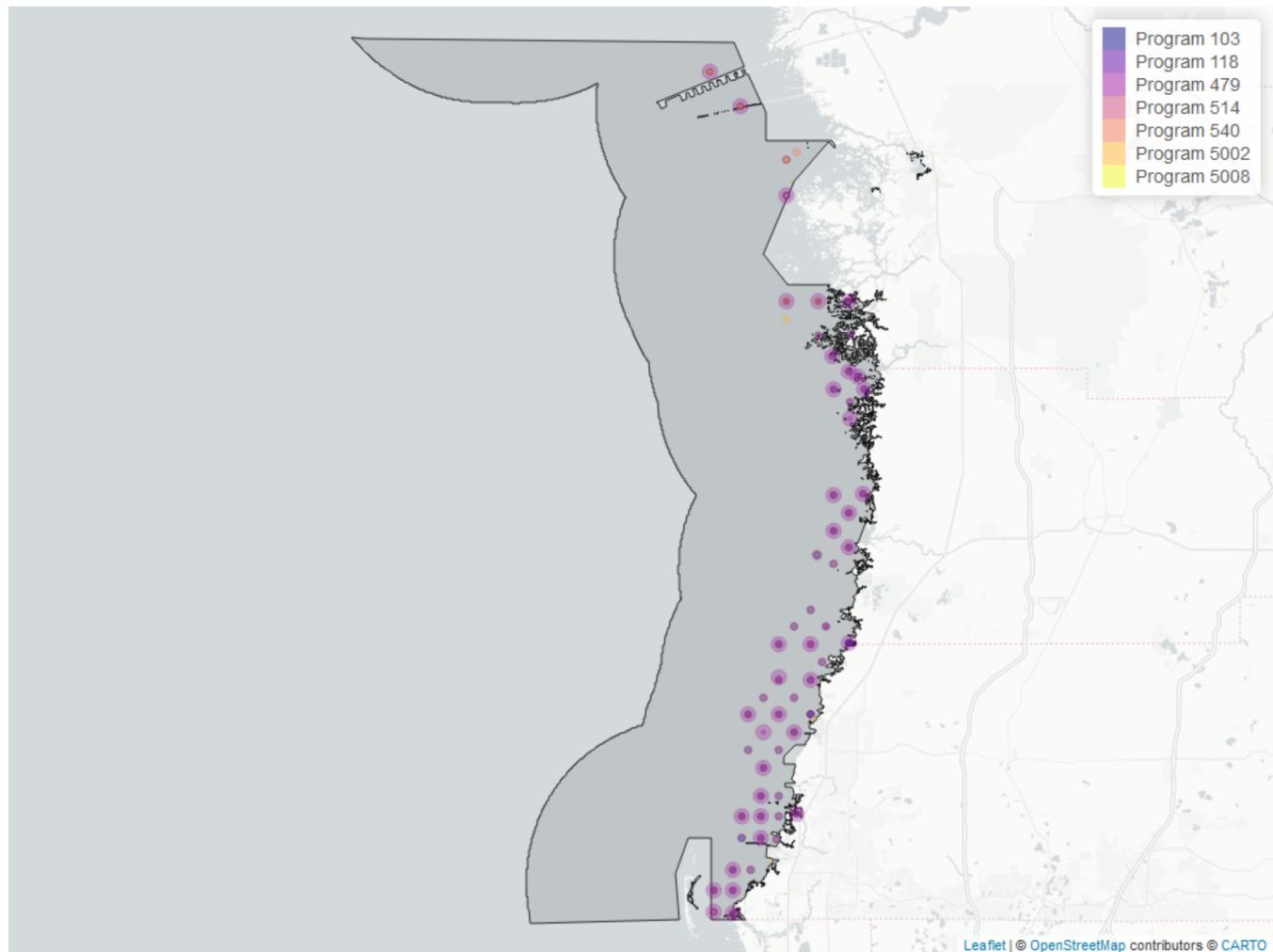


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	2609	12	1	TRUE	0.0494	0.5057	0.006741907	1.551648	8.6062	0.6582	0

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 6: Programs contributing data for Chlorophyll a, Uncorrected for Pheophytin

ProgramID	N_Data	YearMin	YearMax
479	1445	2007	2022
103	577	2005	2021
514	516	2020	2022
5002	62	2015	2020
540	7	2017	2019
5008	5	2021	2022
118	1	2005	2005

Program names:

479 - Southwest Florida Water Management District - Water Quality Monitoring

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

514 - Florida LAKEWATCH Program

5002 - Florida STORET / WIN

540 - Shellfish Harvest Area Classification Program

5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region

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 7: Value Qualifiers for Chlorophyll a, Uncorrected for Pheophytin

Year	N_{Total}	N_I	$perc_I$	N_Q	$perc_Q$	N_U	$perc_U$
2015	3	1	33.3				
2019	74	33	44.6	38	51.4	16	21.6
2020	34	6	17.6	1	2.9	11	32.4
2021	805					102	12.7
2022	356	18	5.1	3	0.8	163	45.8

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

Programs containing Value Qualified data:

479 - Southwest Florida Water Management District - Water Quality Monitoring

514 - Florida LAKEWATCH Program

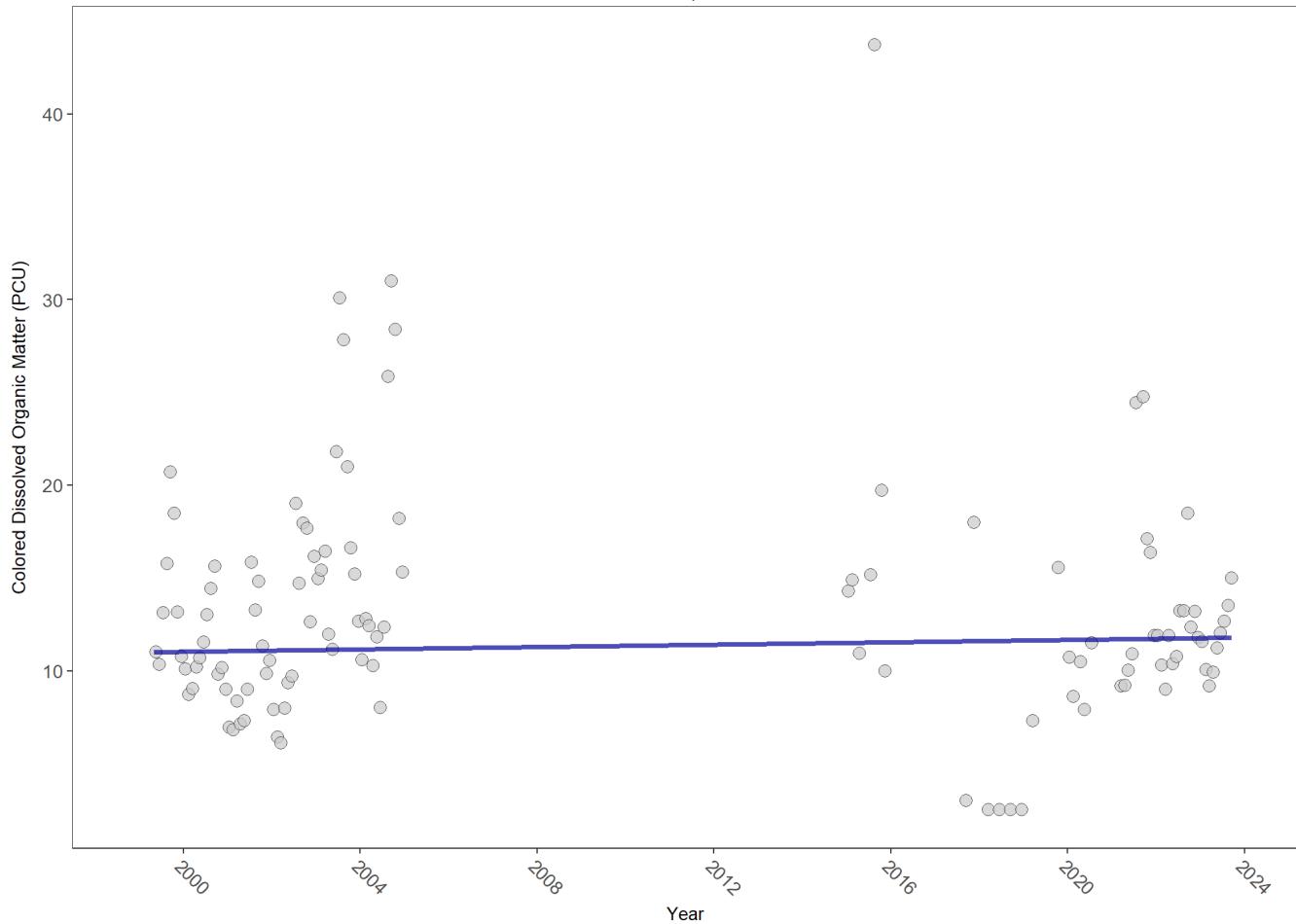
5002 - Florida STORET / WIN

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
Nature Coast Aquatic Preserve

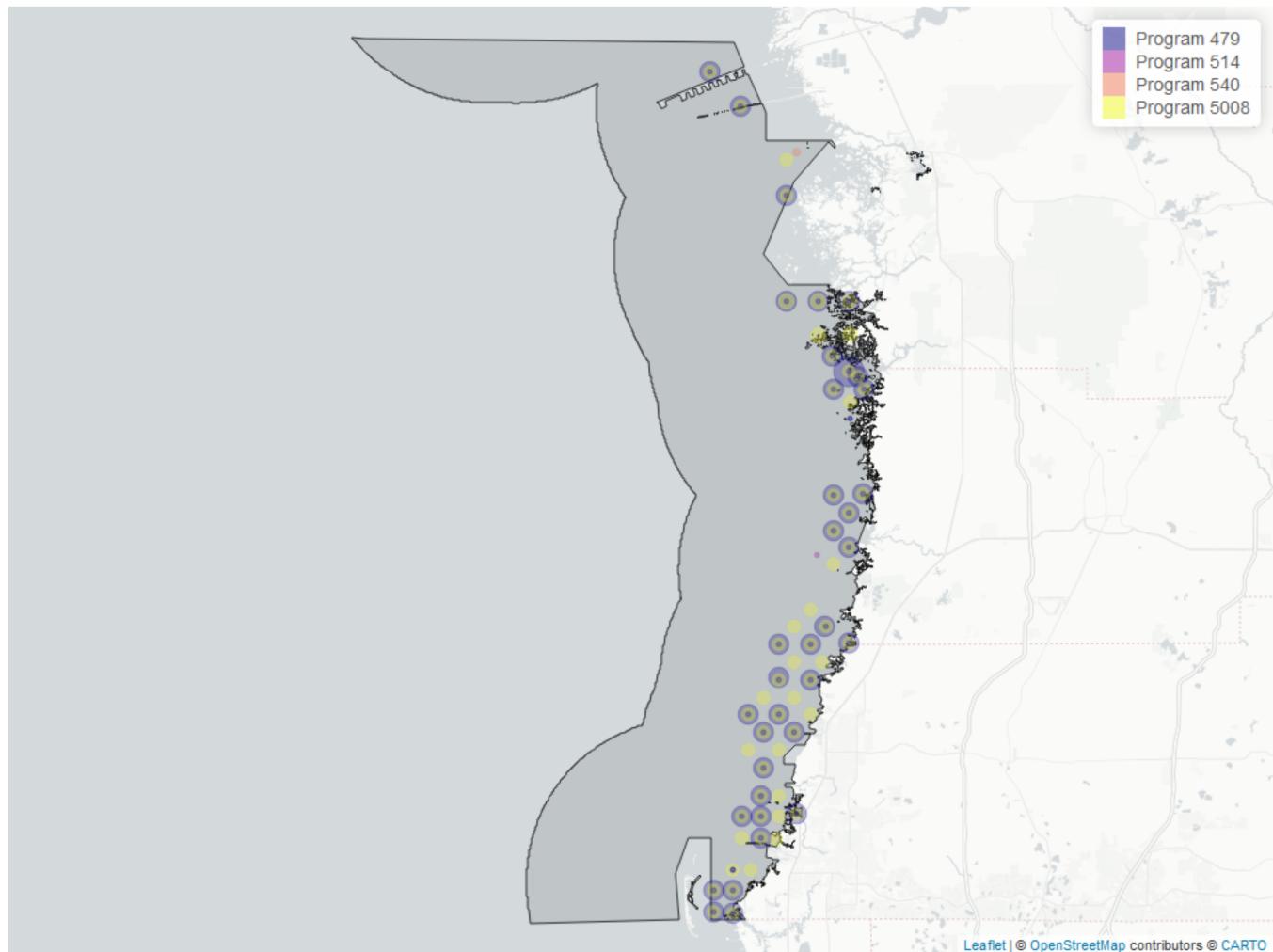


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	4394	14	10.2	TRUE	0.0966	0.2168	0.03111774	11.01554	3.2709	0.9866	0

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

SennIntercept is intercept value at beginning of record for monitoring location

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



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

Table 8: Programs contributing data for Colored Dissolved Organic Matter

ProgramID	N_Data	YearMin	YearMax
479	2718	1999	2022
5008	1683	2021	2023
540	7	2017	2019
514	4	2020	2021

Program names:

- 479 - Southwest Florida Water Management District - Water Quality Monitoring
- 5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region
- 540 - Shellfish Harvest Area Classification Program
- 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 9: Value Qualifiers for Colored Dissolved Organic Matter

Year	N_{Total}	N_I	$perc_I$	N_Q	$perc_Q$	N_U	$perc_U$
2017	2	1	50				
2018	4					4	100
2020	114			3	2.6		
2021	505			2	0.4		

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

Programs containing Value Qualified data:

540 - Shellfish Harvest Area Classification Program

514 - Florida LAKEWATCH Program

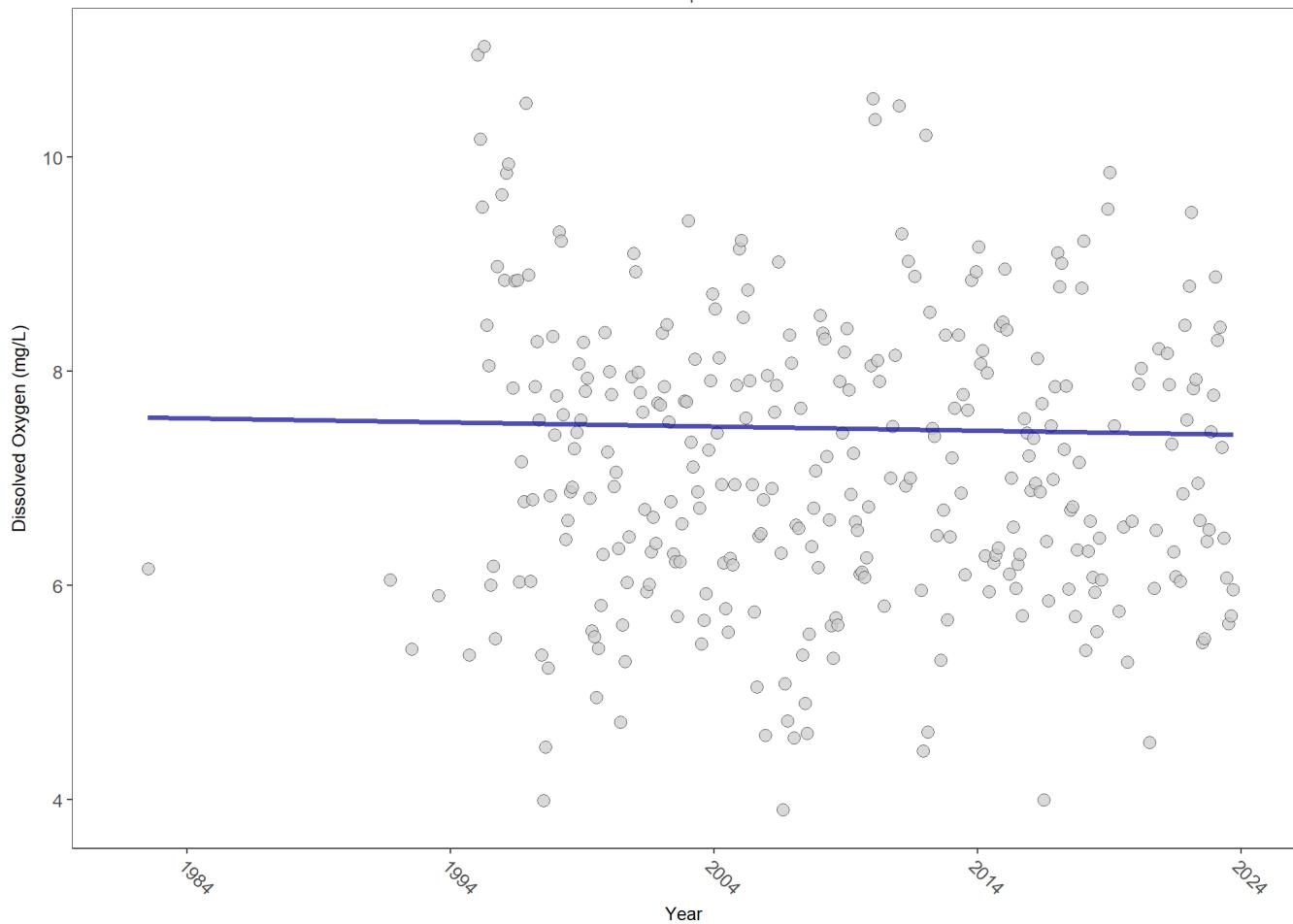
5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region

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
Nature Coast Aquatic Preserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	8034	34	7.06	TRUE	-0.0236	0.5645	-0.003834009	7.569086	8.3034	0.6859	0

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Dissolved Oxygen

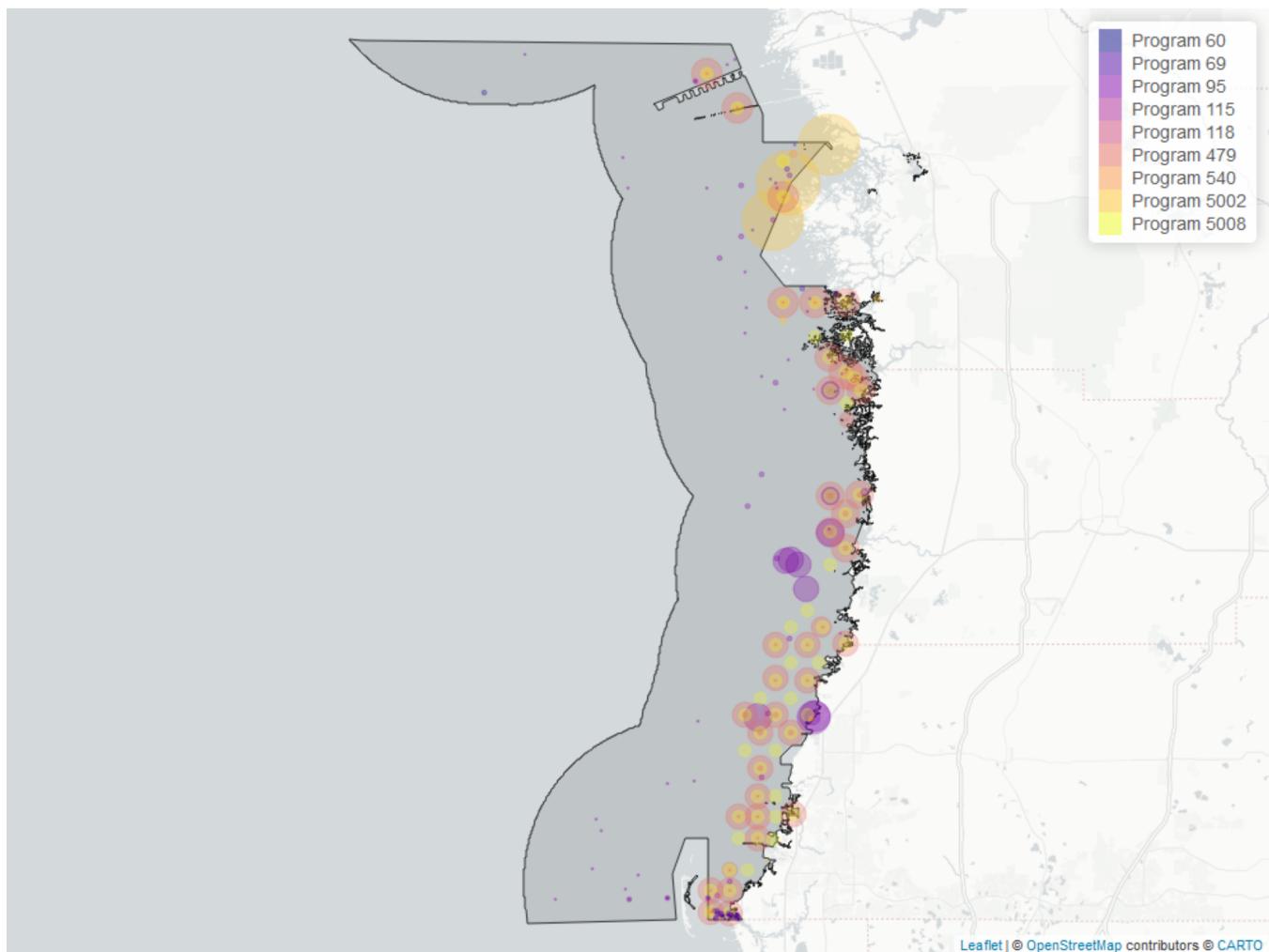


Table 10: Programs contributing data for Dissolved Oxygen

ProgramID	N_Data	YearMin	YearMax
479	4232	1996	2022
5002	1799	1995	2020
5008	1680	2021	2023
95	220	1982	2018
69	80	2003	2008
115	12	1991	1994
540	7	2017	2019
60	3	2015	2015
118	1	2005	2005

Program names:

479 - Southwest Florida Water Management District - Water Quality Monitoring
5002 - Florida STORET / WIN
5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region
95 - Harmful Algal Bloom Marine Observation Network
69 - Fisheries-Independent Monitoring (FIM) Program
115 - Environmental Monitoring Assessment Program
540 - Shellfish Harvest Area Classification Program
60 - Southeast Area Monitoring and Assessment Program (SEAMAP) - Gulf of Mexico Fall & Summer Shrimp/Groundfish Survey
118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

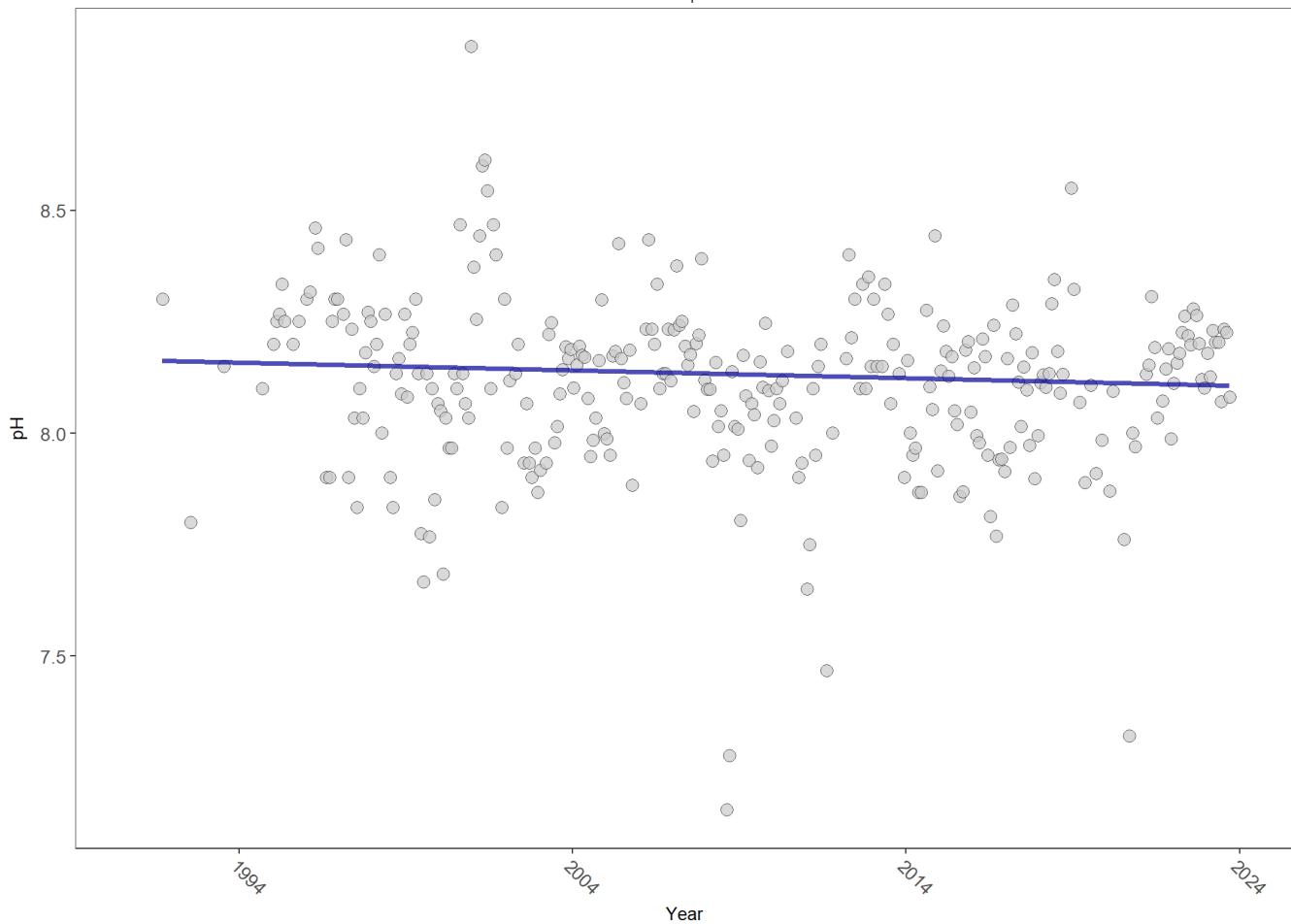
There are no qualifying Value Qualifiers for Dissolved Oxygen in Nature Coast Aquatic Preserve

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

pH, Field, All Depths
Nature Coast Aquatic Preserve

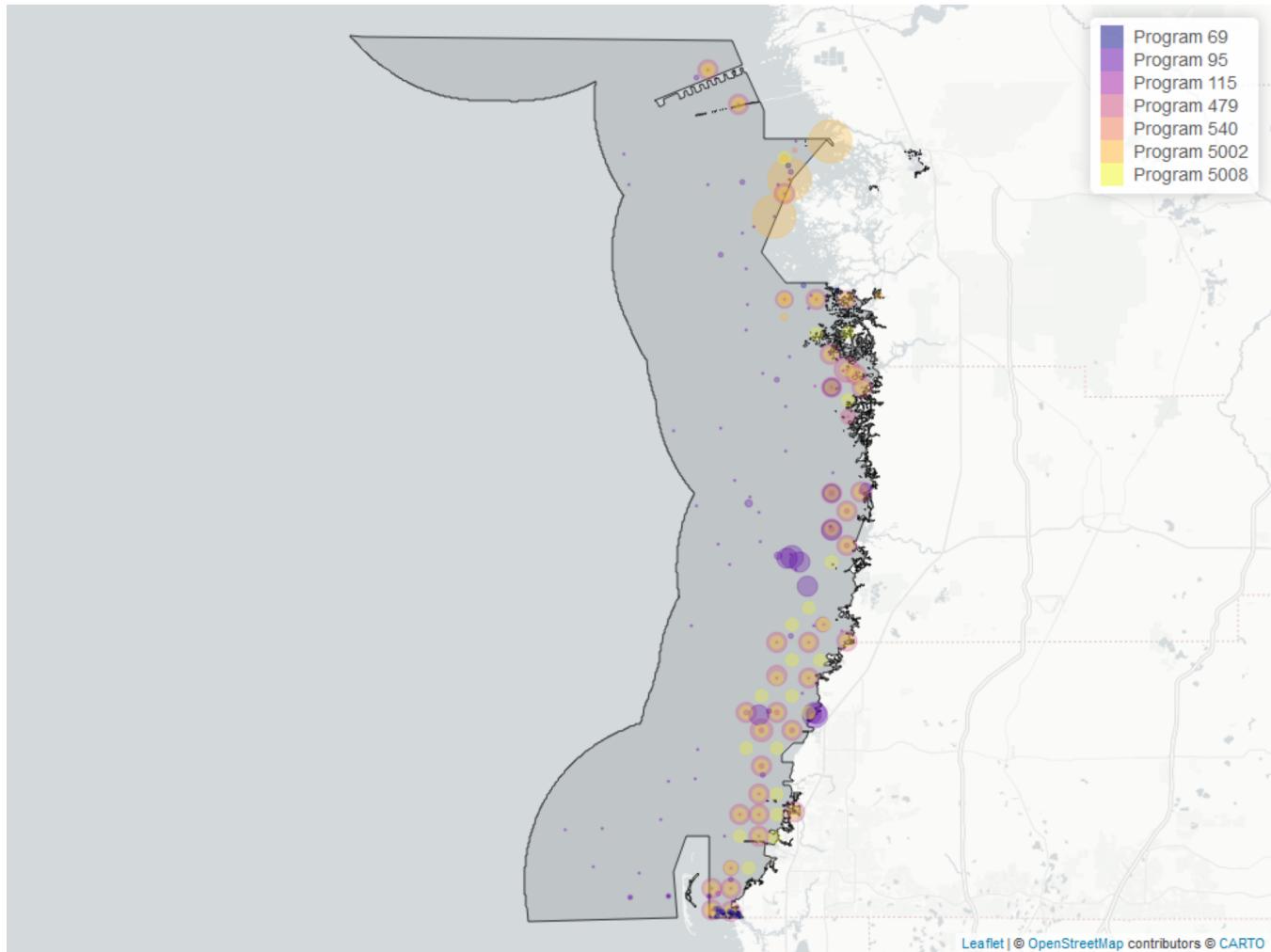


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	5491	33	8.16	TRUE	-0.0567	0.1739	-0.00175105	8.164598	17.8823	0.0844	0

$p < 0.00005$ 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 11: Programs contributing data for pH

ProgramID	N_Data	YearMin	YearMax
479	2514	2000	2022
5008	1680	2021	2023
5002	932	1995	2020
95	272	2003	2018
69	80	2003	2008
115	12	1991	1994
540	3	2017	2018

Program names:

479 - Southwest Florida Water Management District - Water Quality Monitoring

5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region

5002 - Florida STORET / WIN

95 - Harmful Algal Bloom Marine Observation Network

69 - Fisheries-Independent Monitoring (FIM) Program

115 - Environmental Monitoring Assessment Program

540 - Shellfish Harvest Area Classification Program

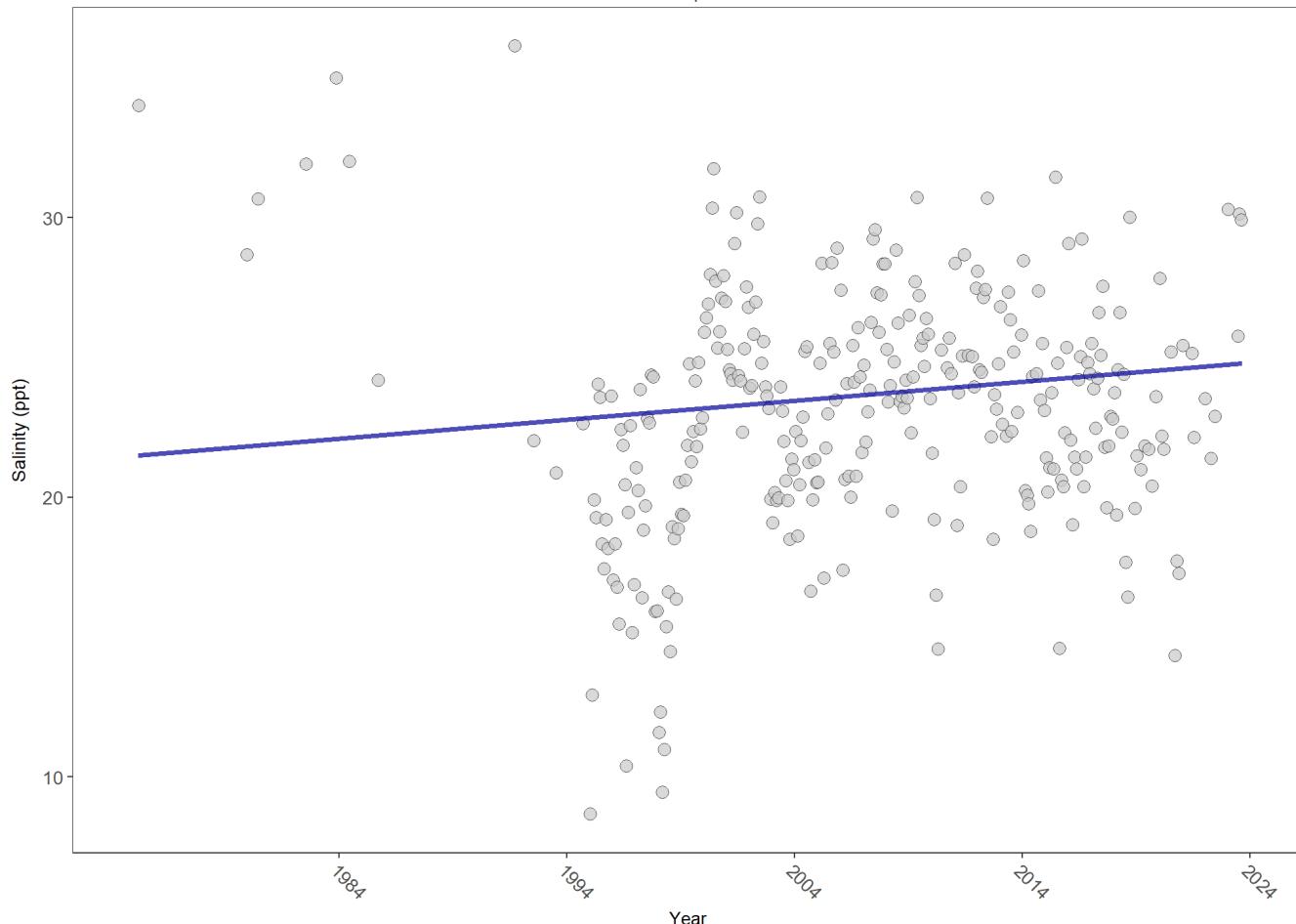
There are no qualifying Value Qualifiers for pH in Nature Coast Aquatic Preserve

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

Salinity, Lab and Field Combined, All Depths
Nature Coast Aquatic Preserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	7177	40	24.1	TRUE	0.0881	0.0249	0.0681192	21.48119	13.8707	0.2402	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

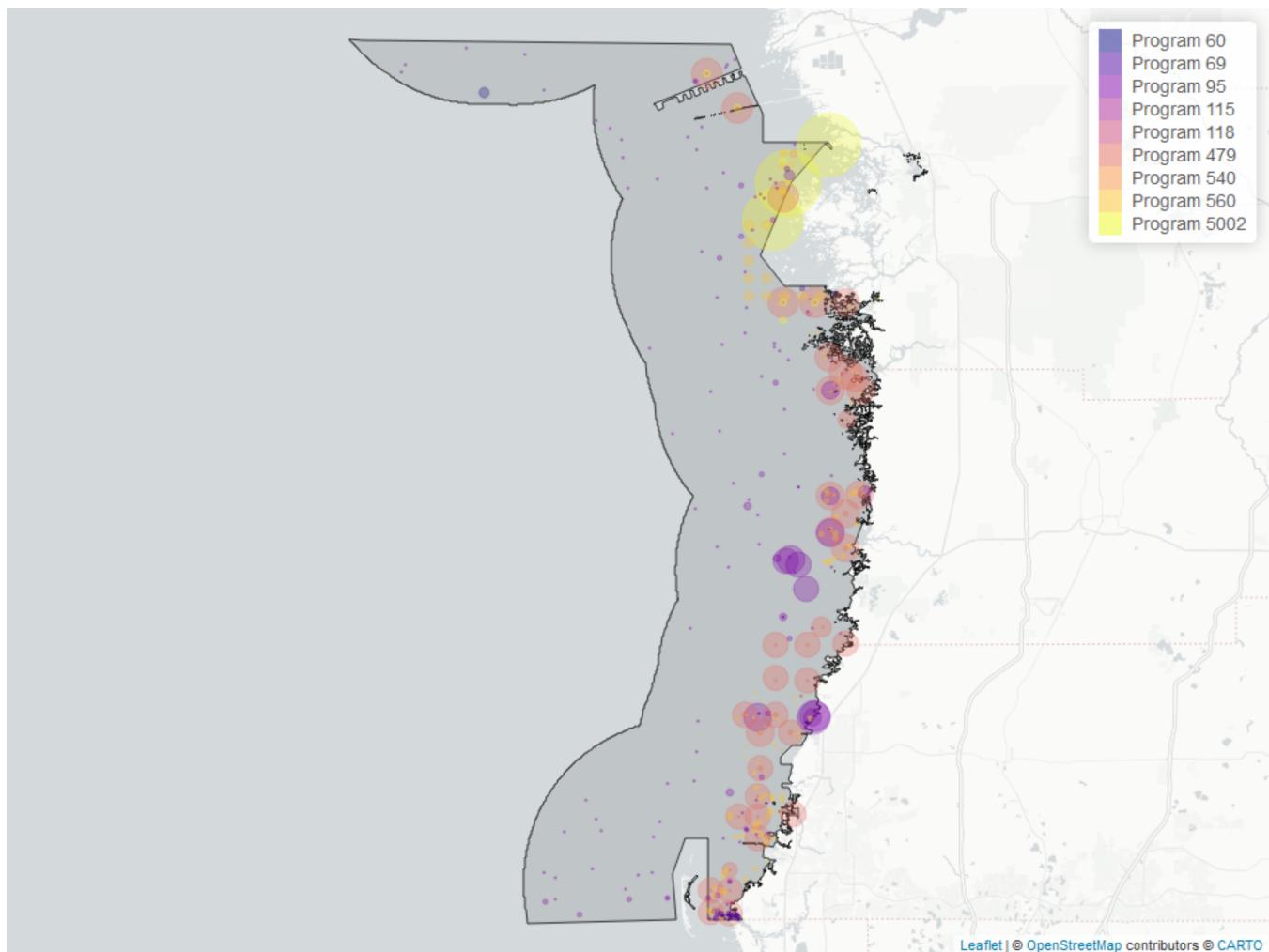


Table 12: Programs contributing data for Salinity

ProgramID	N_Data	YearMin	YearMax
479	4262	1996	2022
5002	1948	1995	2020
560	450	2006	2023
95	398	1975	2018
69	80	2003	2008
60	15	2015	2015
115	12	1991	1994
540	7	2017	2019
118	5	2021	2021

Program names:

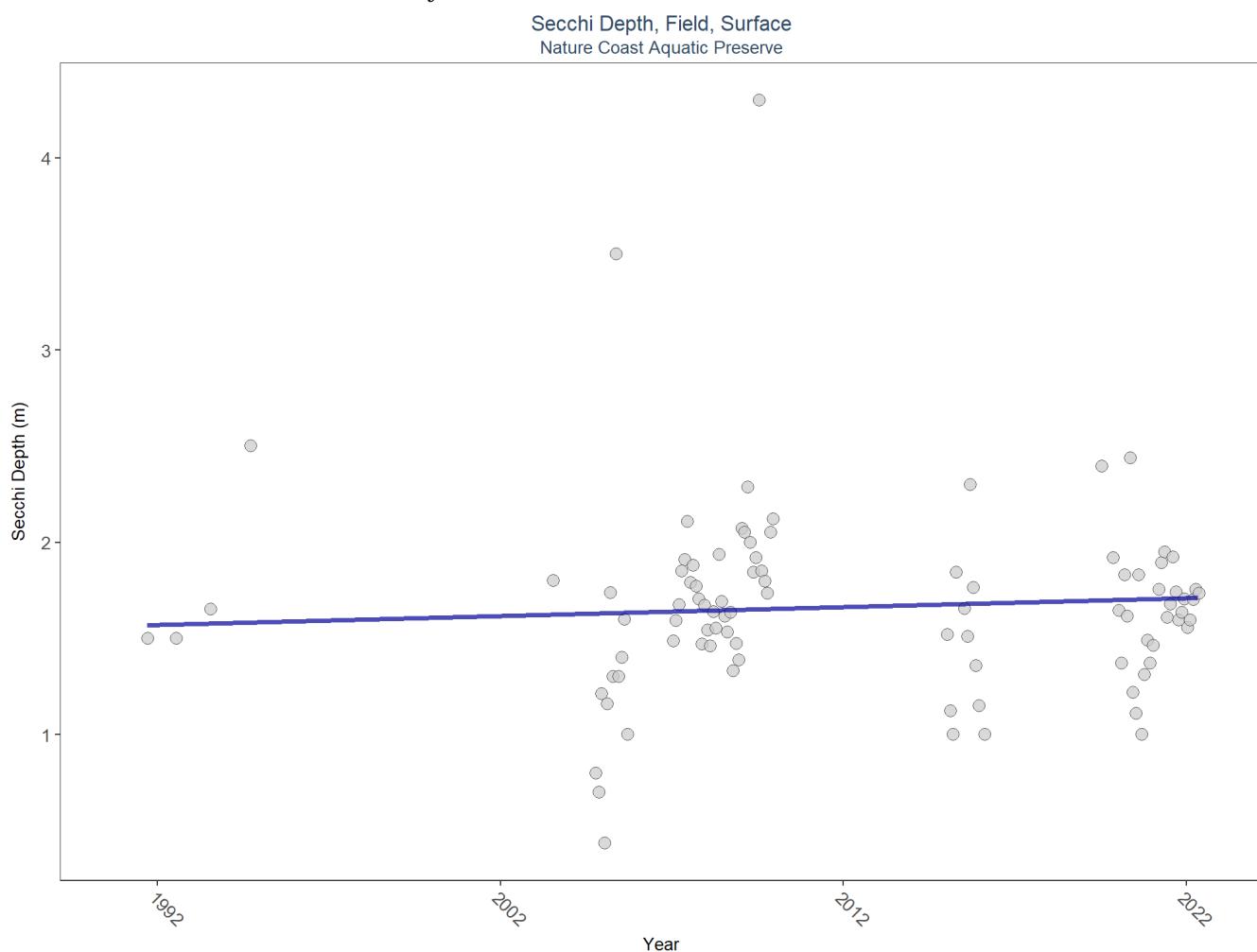
479 - Southwest Florida Water Management District - Water Quality Monitoring
 5002 - Florida STORET / WIN
 560 - Big Bend Seagrasses & Nature Coast Aquatic Preserves - Seagrass Monitoring
 95 - Harmful Algal Bloom Marine Observation Network
 69 - Fisheries-Independent Monitoring (FIM) Program
 60 - Southeast Area Monitoring and Assessment Program (SEAMAP) - Gulf of Mexico Fall & Summer Shrimp/Groundfish Survey
 115 - Environmental Monitoring Assessment Program
 540 - Shellfish Harvest Area Classification Program
 118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

There are no qualifying Value Qualifiers for Salinity in Nature Coast 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

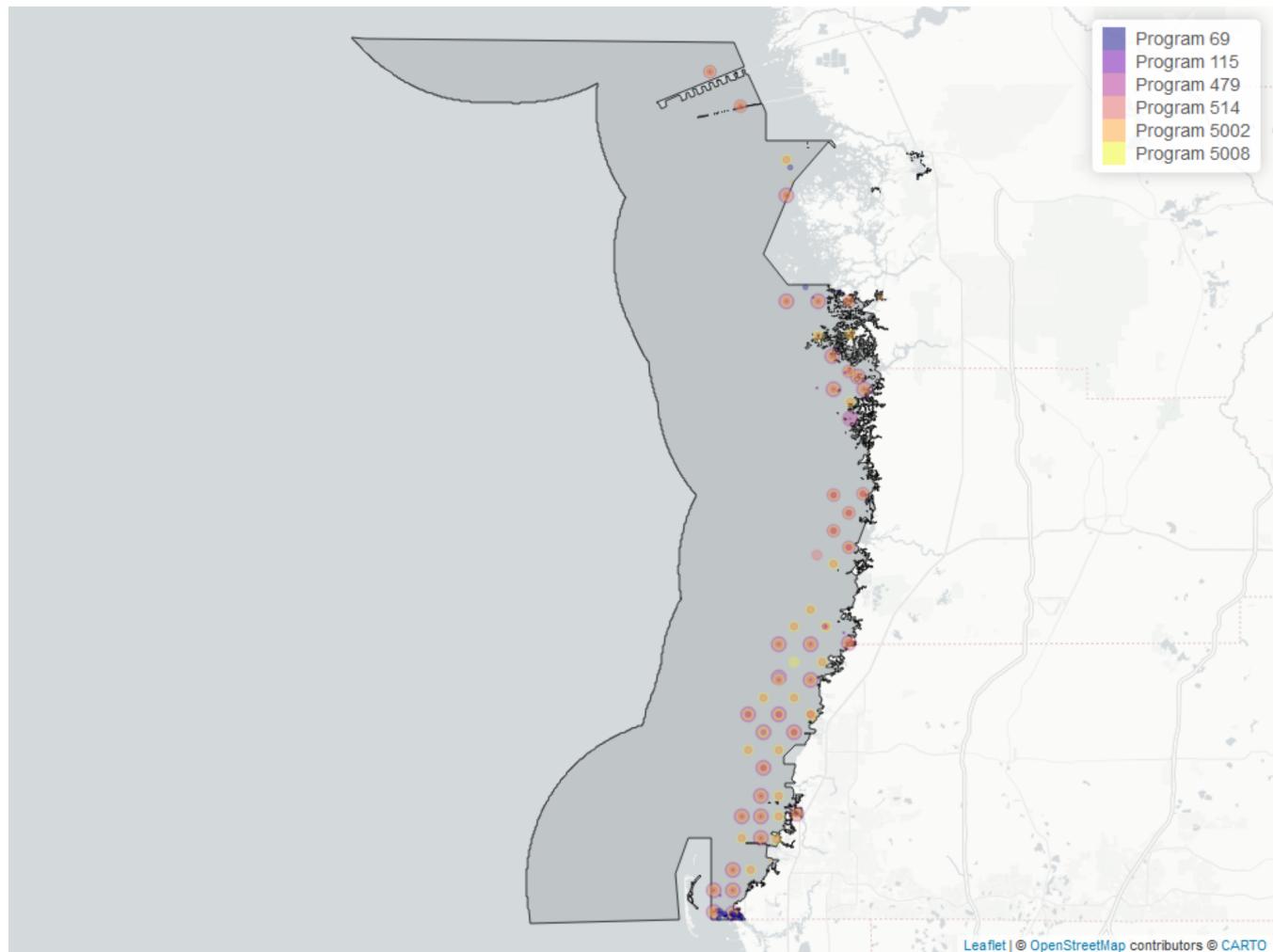


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
Surface	2861	16	1.6	TRUE	0.098	0.2259	0.004643167	1.564871	5.1657	0.9229	0

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 Secchi Depth



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

Table 13: Programs contributing data for Secchi Depth

ProgramID	N_Data	YearMin	YearMax
479	1400	2007	2022
5008	840	2021	2022
514	522	2019	2022
69	80	2003	2008
5002	13	2015	2020
115	6	1991	1994

Program names:

479 - Southwest Florida Water Management District - Water Quality Monitoring

5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region

514 - Florida LAKEWATCH Program

69 - Fisheries-Independent Monitoring (FIM) Program

5002 - Florida STORET / WIN

115 - Environmental Monitoring Assessment Program

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 14: Value Qualifiers for Secchi Depth

Year	N_{Total}	N_S	$perc_S$
2015	157	5	3.2
2016	1	1	100.0
2019	11	11	100.0
2020	16	15	93.8
2021	789	675	85.6
2022	636	579	91.0

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

Programs containing Value Qualified data:

514 - Florida LAKEWATCH Program

5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region

479 - Southwest Florida Water Management District - Water Quality Monitoring

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) $TN = ORGN + NH_4 + NO_3;$

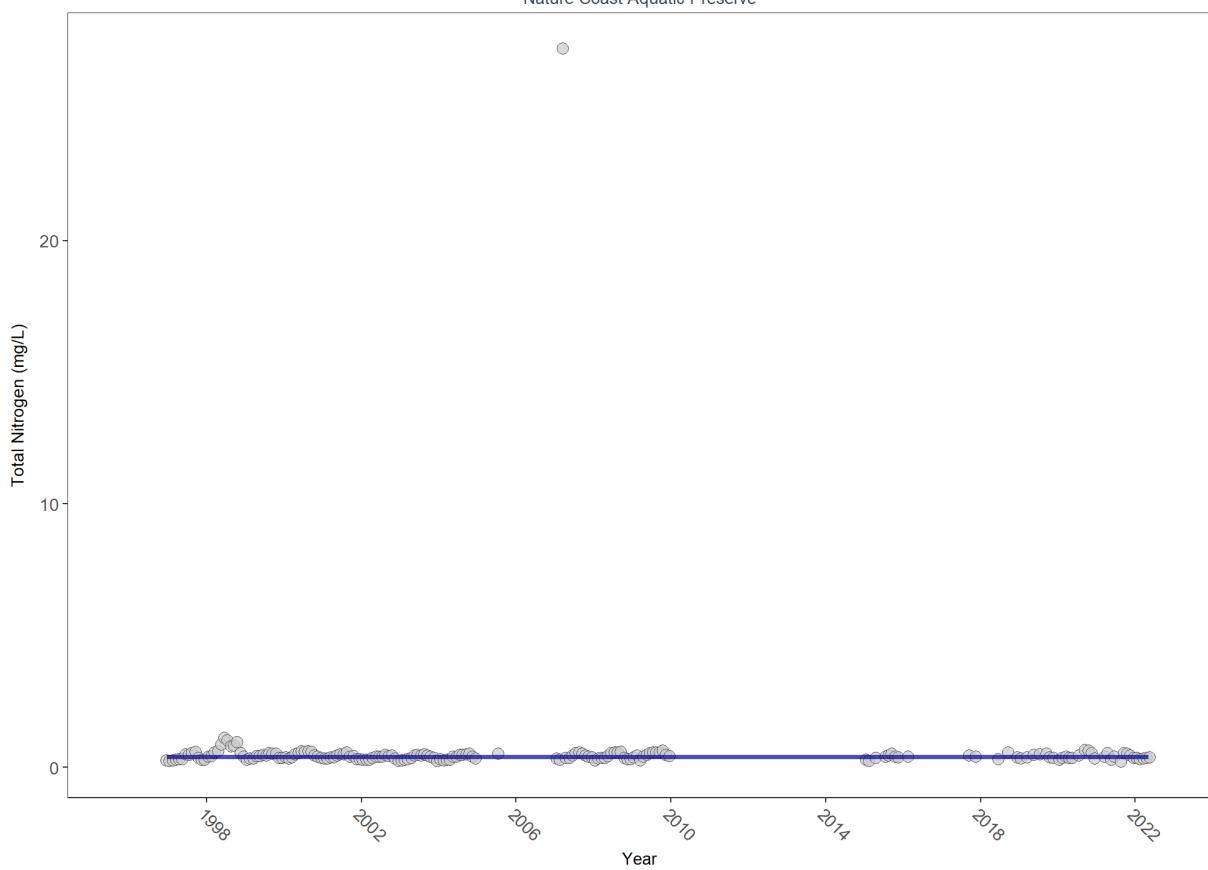
Additional Information:

- 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
Nature Coast Aquatic Preserve

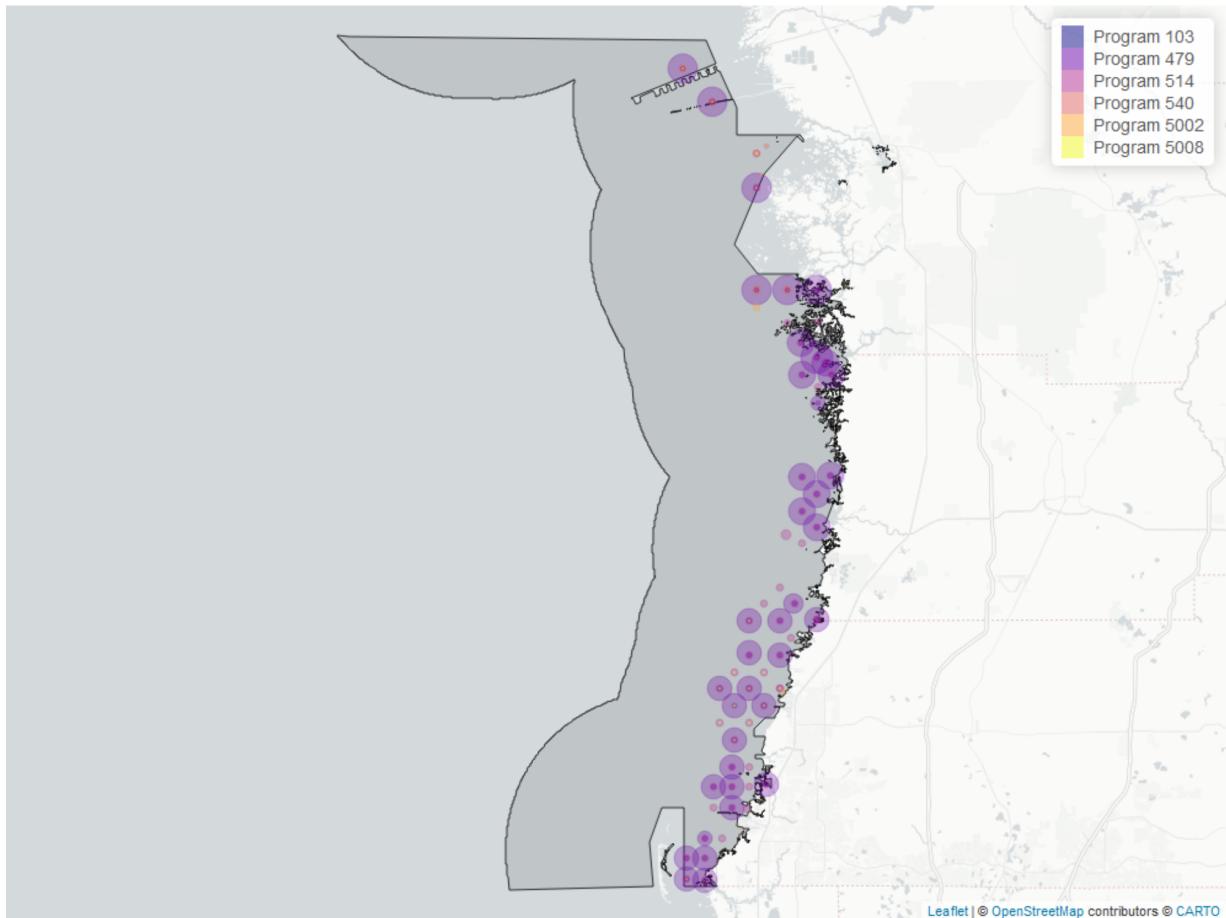


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	5015	21	0.39	TRUE	-0.0319	0.6993	-0.0002681849	0.4068392	11.3933	0.4109	0

$p < 0.00005$ 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 15: Programs contributing data for Total Nitrogen

ProgramID	N_Data	YearMin	YearMax
479	4415	1996	2022
514	516	2019	2022
5002	62	2015	2020
5008	16	2021	2022
540	6	2017	2019
103	2	2005	2005

Program names:

479 - Southwest Florida Water Management District - Water Quality Monitoring

514 - Florida LAKEWATCH Program

5002 - Florida STORET / WIN

5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region

540 - Shellfish Harvest Area Classification Program

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

Value Qualifiers

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

Table 16: Value Qualifiers for Total Nitrogen

Year	N_{Total}	N_I	$perc_I$	N_Q	$perc_Q$
2019	75	1	1.3		
2020	143	3	2.1	26	18.2
2021	241	1	0.4		
2022	356	5	1.4		

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

Programs containing Value Qualified data:

479 - Southwest Florida Water Management District - Water Quality Monitoring

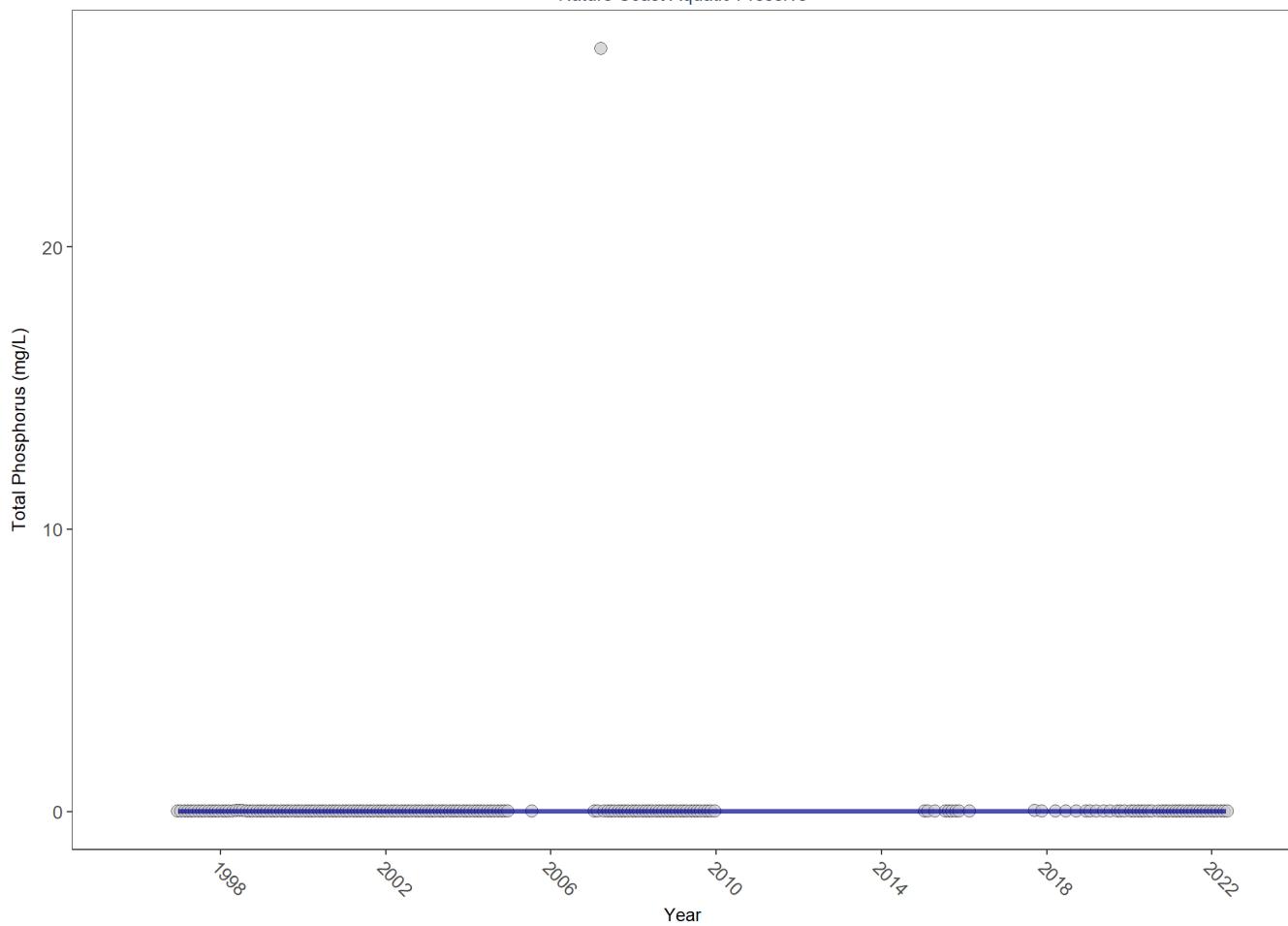
514 - Florida LAKEWATCH Program

5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region

Total Phosphorus - Discrete Water Quality

Seasonal Kendall-Tau Trend Analysis

Total Phosphorus, Lab, All Depths
Nature Coast Aquatic Preserve

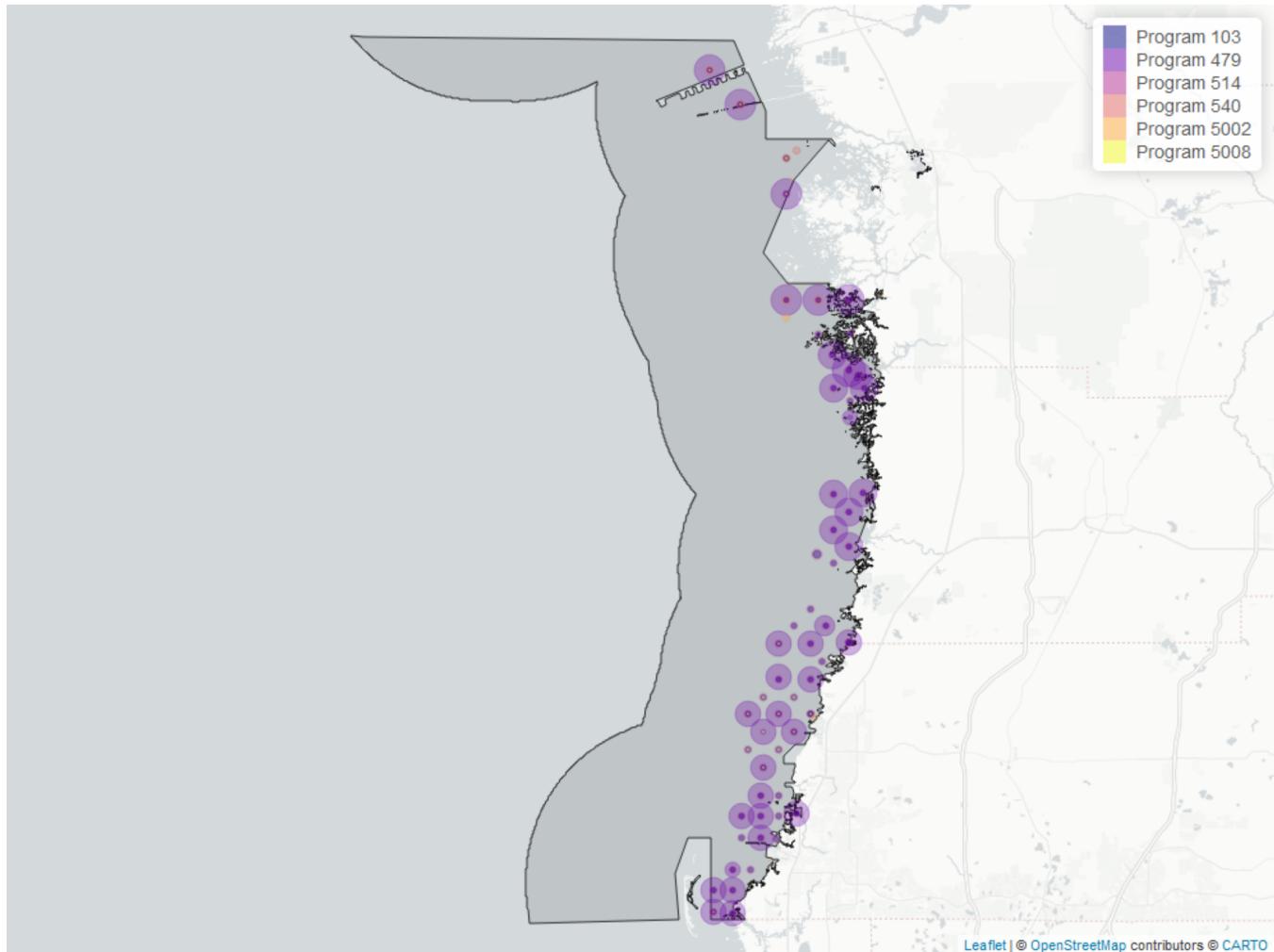


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	5362	21	0.009	TRUE	-0.1091	0.0739	-0.00006585425	0.01191611	14.9787	0.1835	0

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 17: Programs contributing data for Total Phosphorus

ProgramID	N_Data	YearMin	YearMax
479	4416	1996	2022
514	516	2019	2022
103	345	2005	2021
5002	62	2015	2020
5008	16	2021	2022
540	7	2017	2019

Program names:

479 - Southwest Florida Water Management District - Water Quality Monitoring

514 - Florida LAKEWATCH Program

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

5002 - Florida STORET / WIN

5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region

540 - Shellfish Harvest Area Classification 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 18: Value Qualifiers for Total Phosphorus

Year	N_{Total}	N_I	$perc_I$	N_Q	$perc_Q$	N_U	$perc_U$
2015	154	1	0.7				
2019	75	37	49.3			6	8.0
2020	144	74	51.4	16	11.1	37	25.7
2021	583	138	23.7			2	0.3
2022	356	257	72.2			27	7.6

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

Programs containing Value Qualified data:

514 - Florida LAKEWATCH Program

479 - Southwest Florida Water Management District - Water Quality Monitoring

5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region

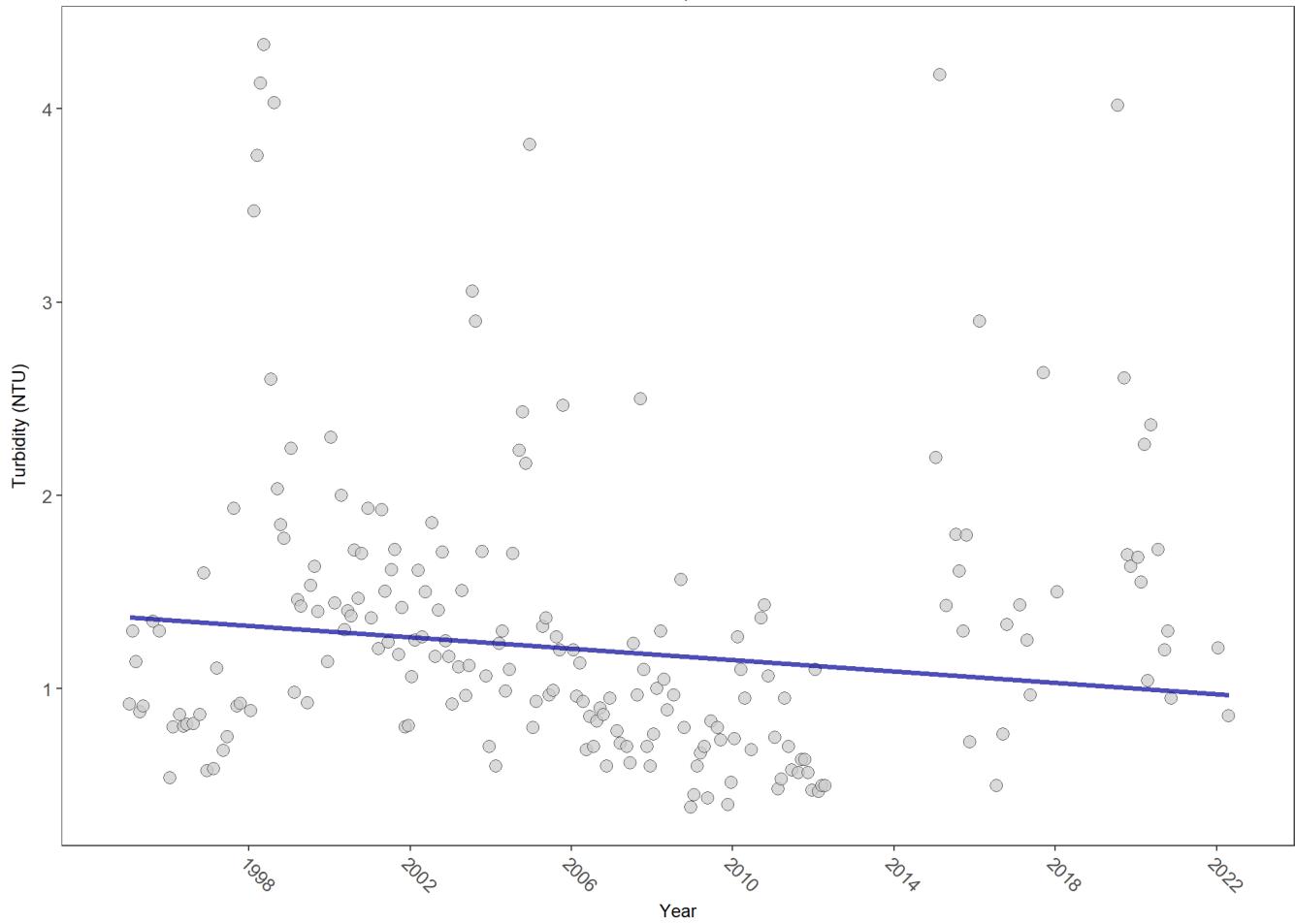
5002 - Florida STORET / WIN

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
Nature Coast Aquatic Preserve

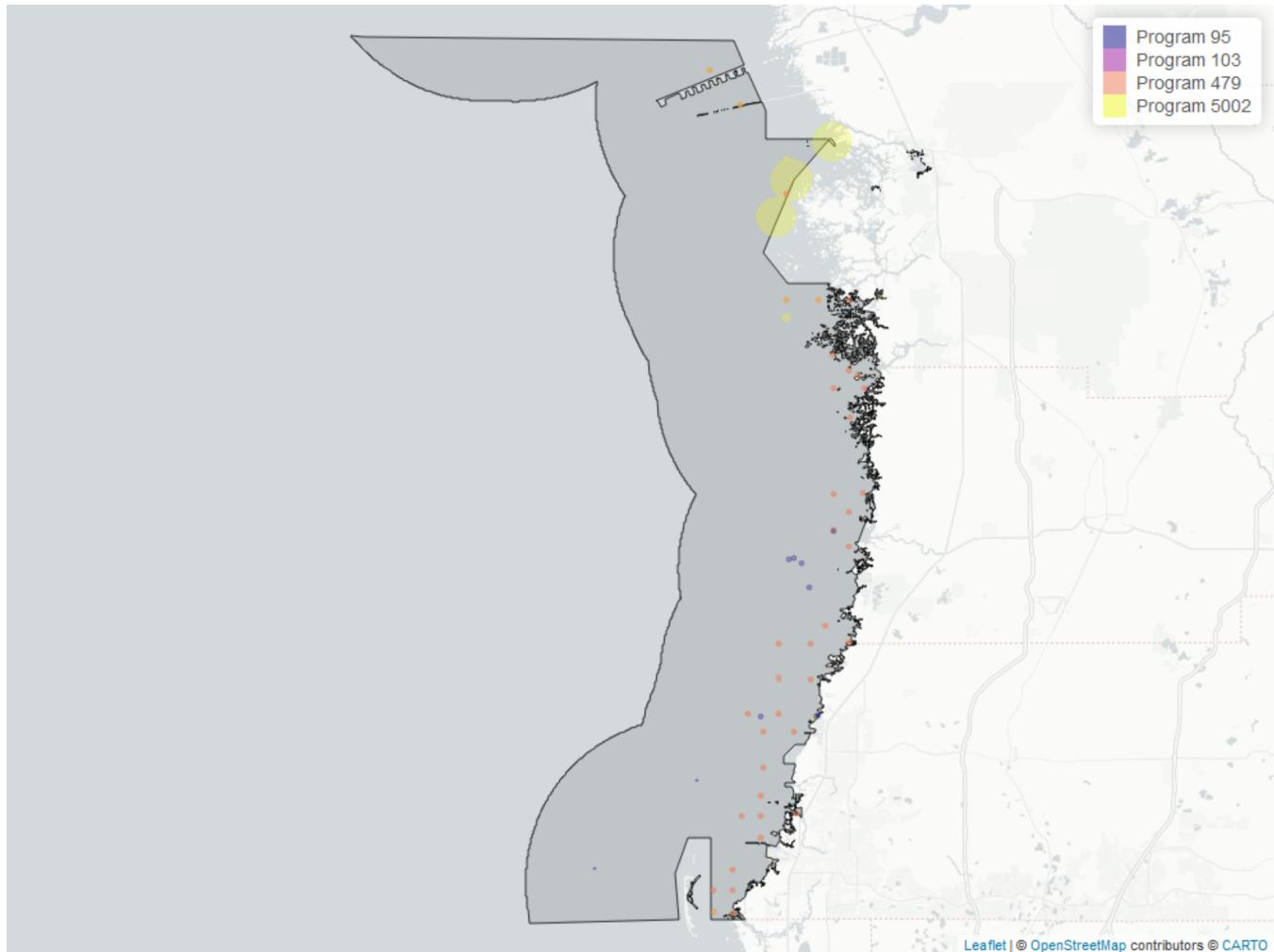


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1123	25	1	TRUE	-0.1573	0.0091	-0.01469444	1.370051	9.5016	0.5757	-1

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 19: Programs contributing data for Turbidity

ProgramID	N_Data	YearMin	YearMax
5002	743	1995	2020
479	375	2015	2022
95	4	2003	2003
103	1	2005	2005

Program names:

5002 - Florida STORET / WIN

479 - Southwest Florida Water Management District - Water Quality Monitoring

95 - Harmful Algal Bloom Marine Observation Network

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

Value Qualifiers

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

Table 20: Value Qualifiers for Turbidity

<i>Year</i>	<i>N_Total</i>	<i>N_I</i>	<i>perc_I</i>	<i>N_Q</i>	<i>perc_Q</i>
2019	55	3	5.4		
2020	134	12	9.0	1	0.8
2022	76	41	54.0		

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

Programs containing Value Qualified data:

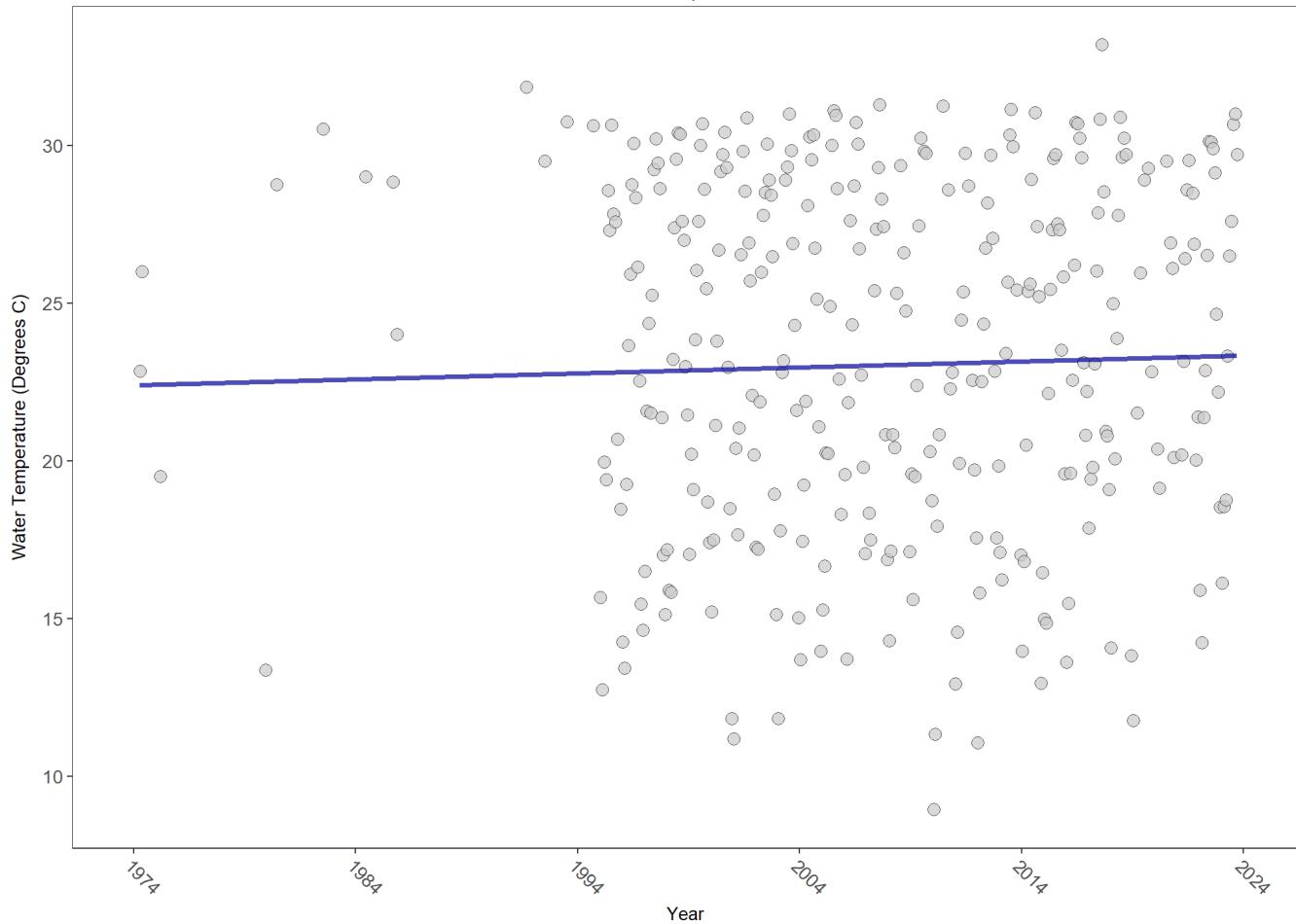
479 - Southwest Florida Water Management District - Water Quality Monitoring
 5002 - Florida STORET / WIN

Water Temperature - Discrete Water Quality

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

Seasonal Kendall-Tau Trend Analysis

Water Temperature, Field, All Depths
Nature Coast Aquatic Preserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	7071	40	24.45	TRUE	0.073	0.0776	0.01923077	22.38718	6.6017	0.8304	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 Water Temperature

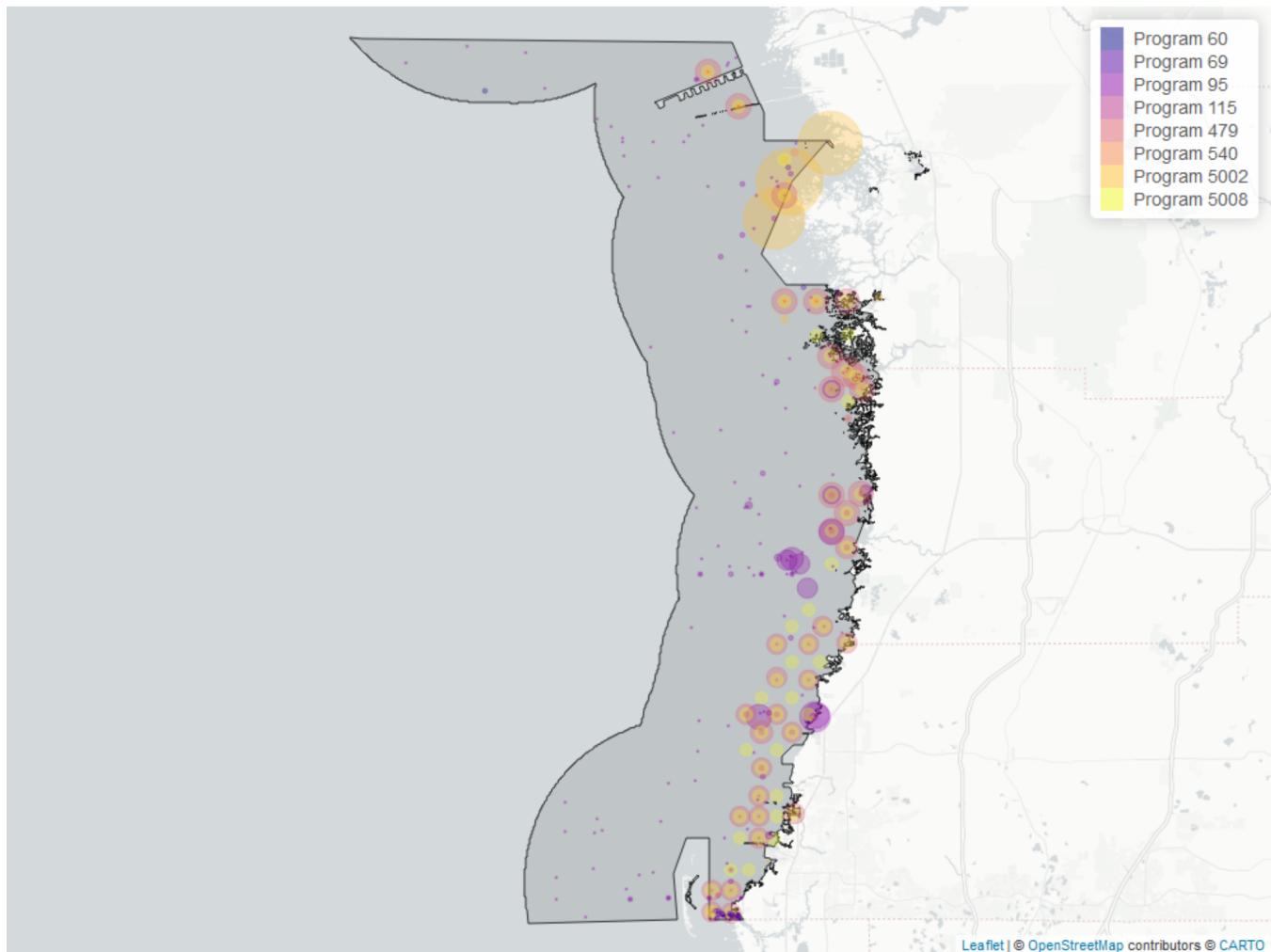


Table 21: Programs contributing data for Water Temperature

ProgramID	N_Data	YearMin	YearMax
479	2930	1996	2022
5002	1956	1995	2020
5008	1680	2021	2023
95	403	1974	2018
69	80	2003	2008
115	12	1991	1994
540	7	2017	2019
60	3	2015	2015

Program names:

479 - Southwest Florida Water Management District - Water Quality Monitoring

5002 - Florida STORET / WIN

5008 - Project COAST (Coastal Assessment Team) - Springs Coast Ecosystem Region

95 - Harmful Algal Bloom Marine Observation Network

69 - Fisheries-Independent Monitoring (FIM) Program

115 - Environmental Monitoring Assessment Program

540 - Shellfish Harvest Area Classification Program

60 - Southeast Area Monitoring and Assessment Program (SEAMAP) - Gulf of Mexico Fall & Summer Shrimp/Groundfish Survey

There are no qualifying Value Qualifiers for Water Temperature in Nature Coast Aquatic Preserve

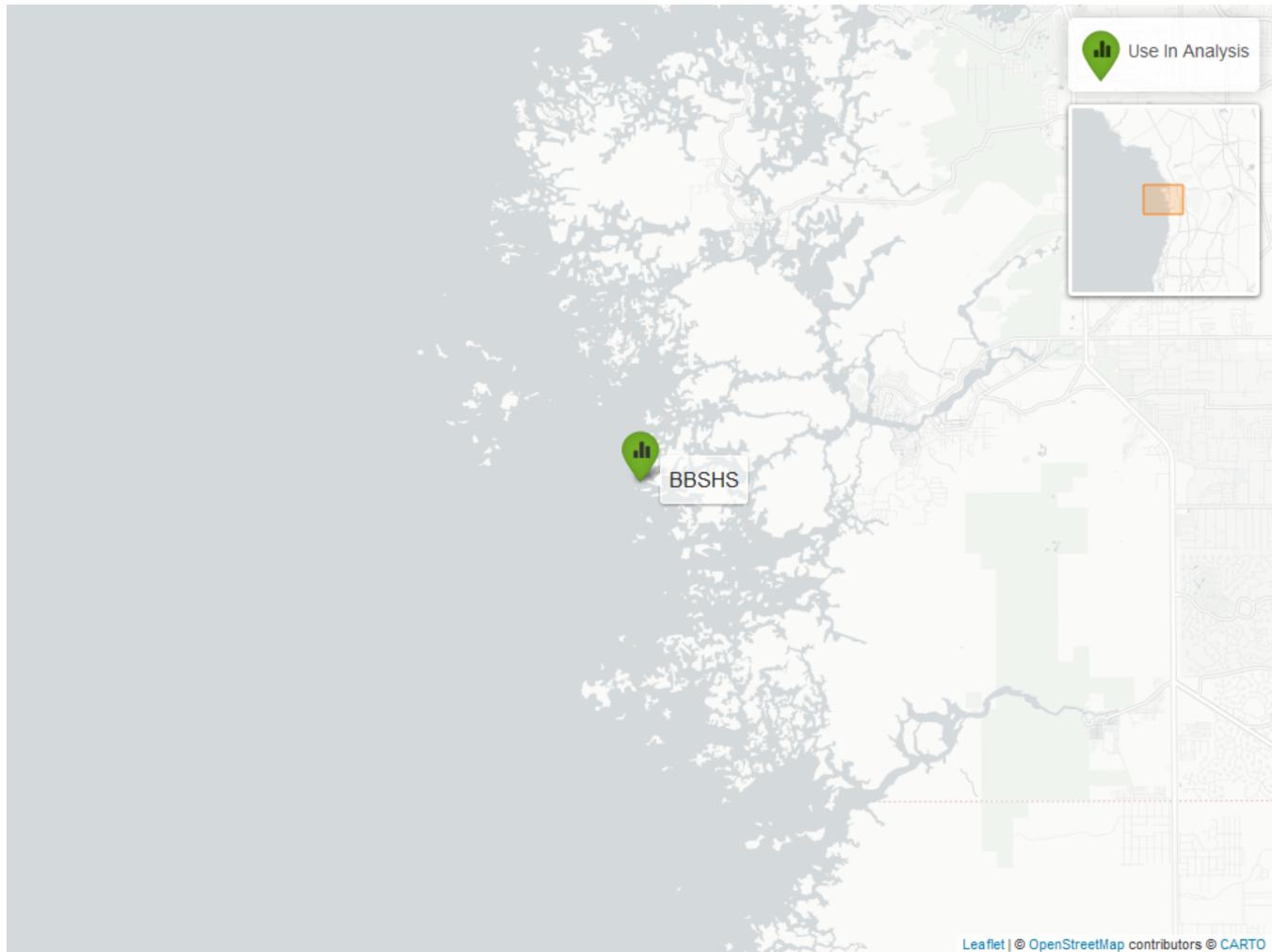
Water Quality - Continuous

The following files were used in the continuous analysis:

- *Combined_WQ_WC_NUT_cont_Dissolved_Oxygen_NW-2024-Mar-23.txt*
- *Combined_WQ_WC_NUT_cont_Dissolved_Oxygen_Saturation_NW-2024-Mar-23.txt*
- *Combined_WQ_WC_NUT_cont_pH_NW-2024-Mar-23.txt*
- *Combined_WQ_WC_NUT_cont_Salinity_NW-2024-Mar-23.txt*
- *Combined_WQ_WC_NUT_cont_Turbidity_NW-2024-Mar-23.txt*
- *Combined_WQ_WC_NUT_cont_Water_Temperature_NW-2024-Mar-23.txt*

Table 22: Big Bend Seagrasses Aquatic Preserves Continuous Water Quality Monitoring (471)

<i>ProgramLocationID</i>	<i>Years of Data</i>	<i>Use in Analysis</i>	<i>Parameters</i>
BBSHS	1	FALSE	DO , DOS , pH , Turb
BBSHS	13	TRUE	Sal , TempW



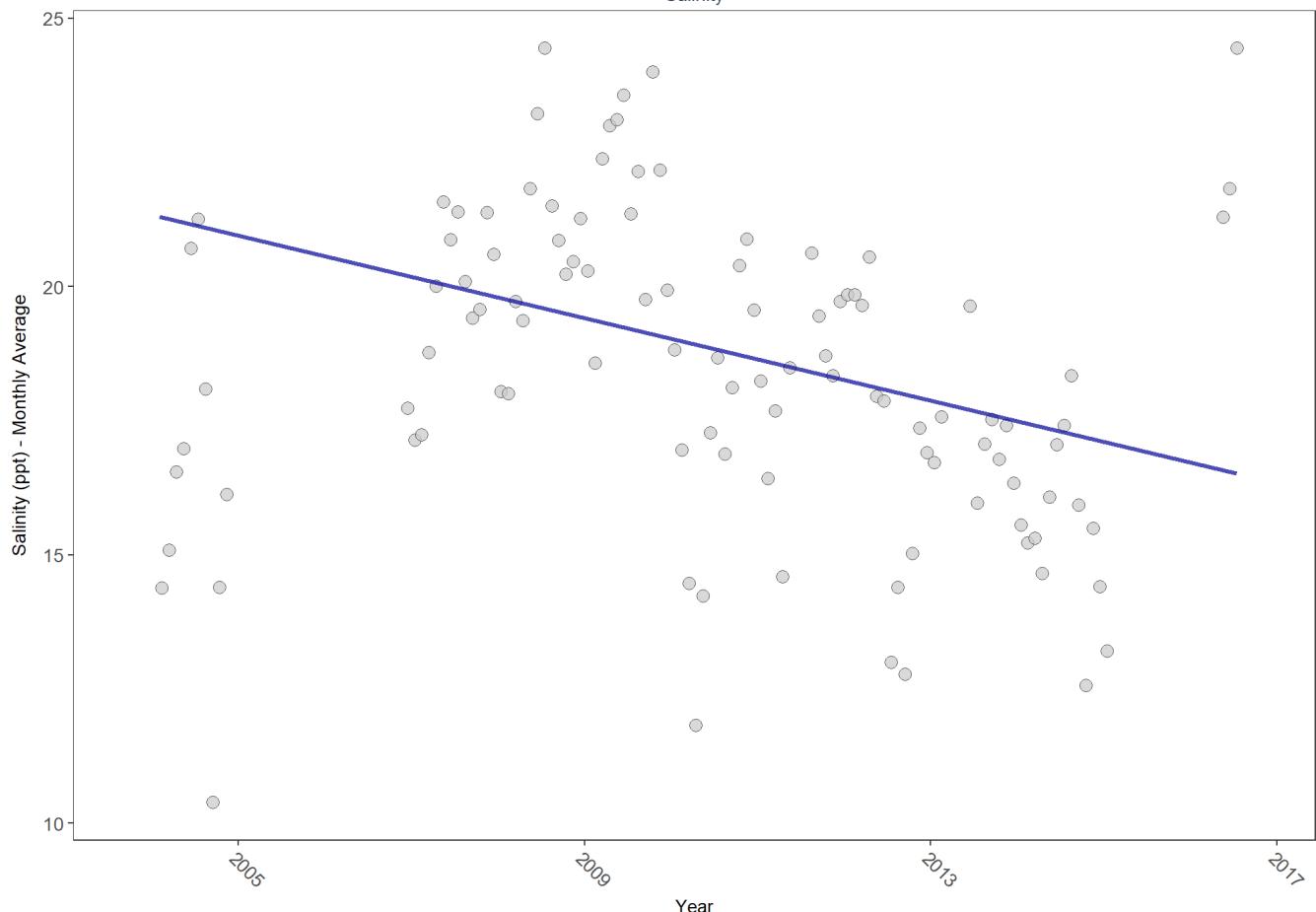
Map showing Continuous Water Quality Monitoring sampling locations within the boundaries of Nature Coast Aquatic Preserve. Sites marked as *Use In Analysis* are featured in this report.

Salinity - Continuous Water Quality

BBSHS

Big Bend Seagrasses Aquatic Preserves Continuous Water Quality Monitoring (471)

Nature Coast Aquatic Preserve
BBSHS
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	235670	12	18.4	TRUE	-0.2177	0.0050	-0.3837804	21.32939	5.3322	0.914	-1

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

SennIntercept is intercept value at beginning of record for monitoring location

Water Temperature - Continuous Water Quality

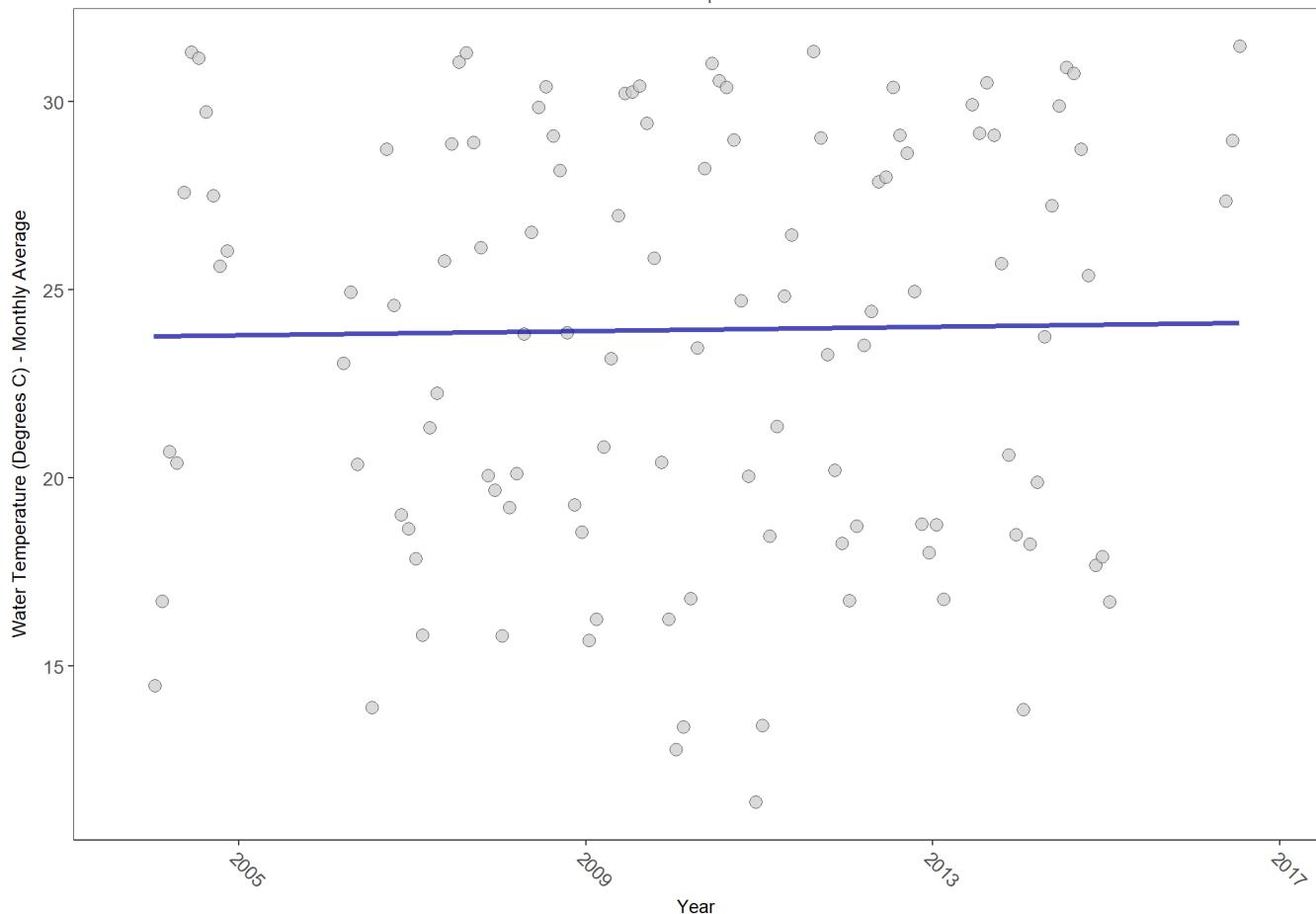
BBHS

Big Bend Seagrasses Aquatic Preserves Continuous Water Quality Monitoring (471)

Nature Coast Aquatic Preserve

BBHS

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	244110	12	24.5	TRUE	0.0468	0.5239	0.02859333	23.76923	8.6115	0.6577	0

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

SennIntercept is intercept value at beginning of record for monitoring location

Submerged Aquatic Vegetation

The data file used is: All_SAV_Parameters-2024-Mar-29.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.

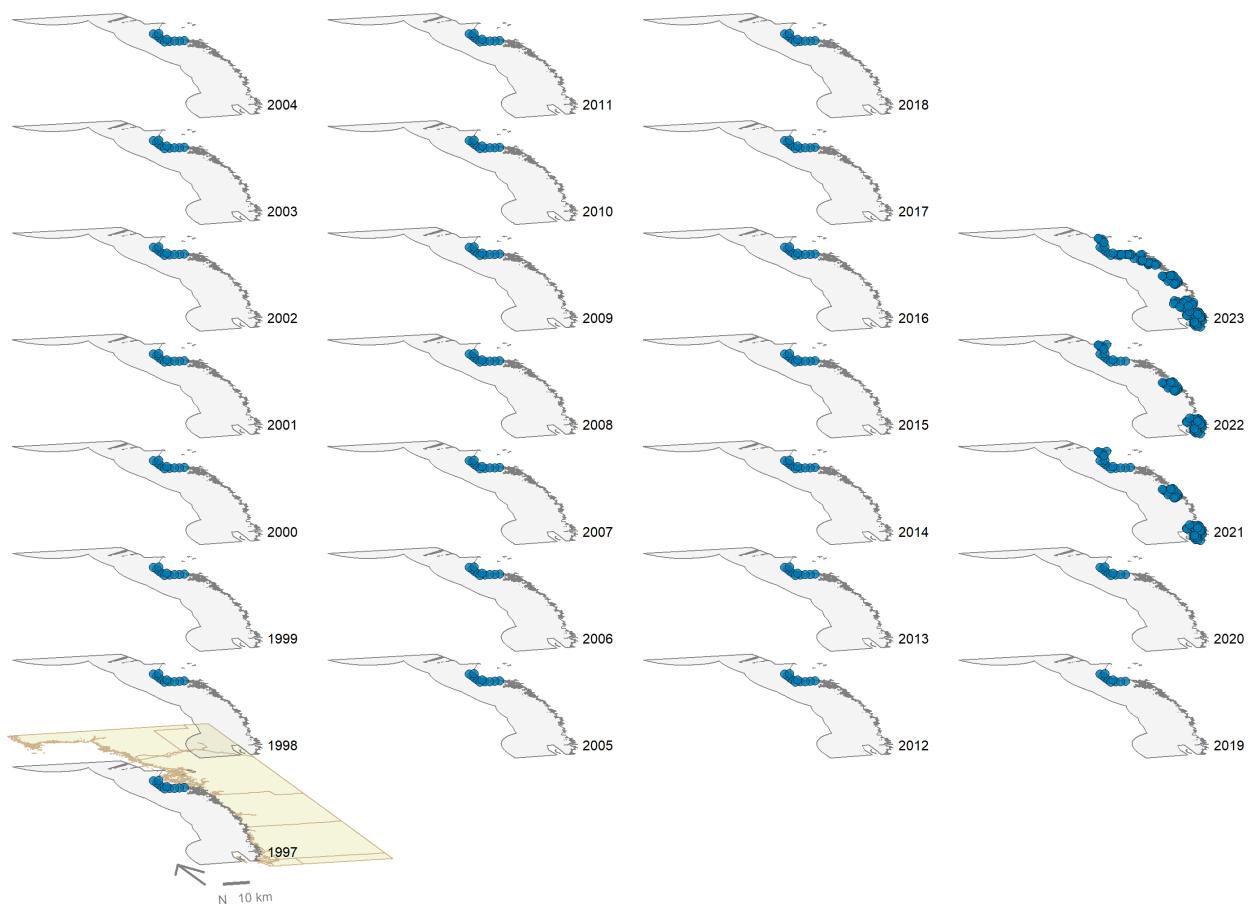
Notes

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

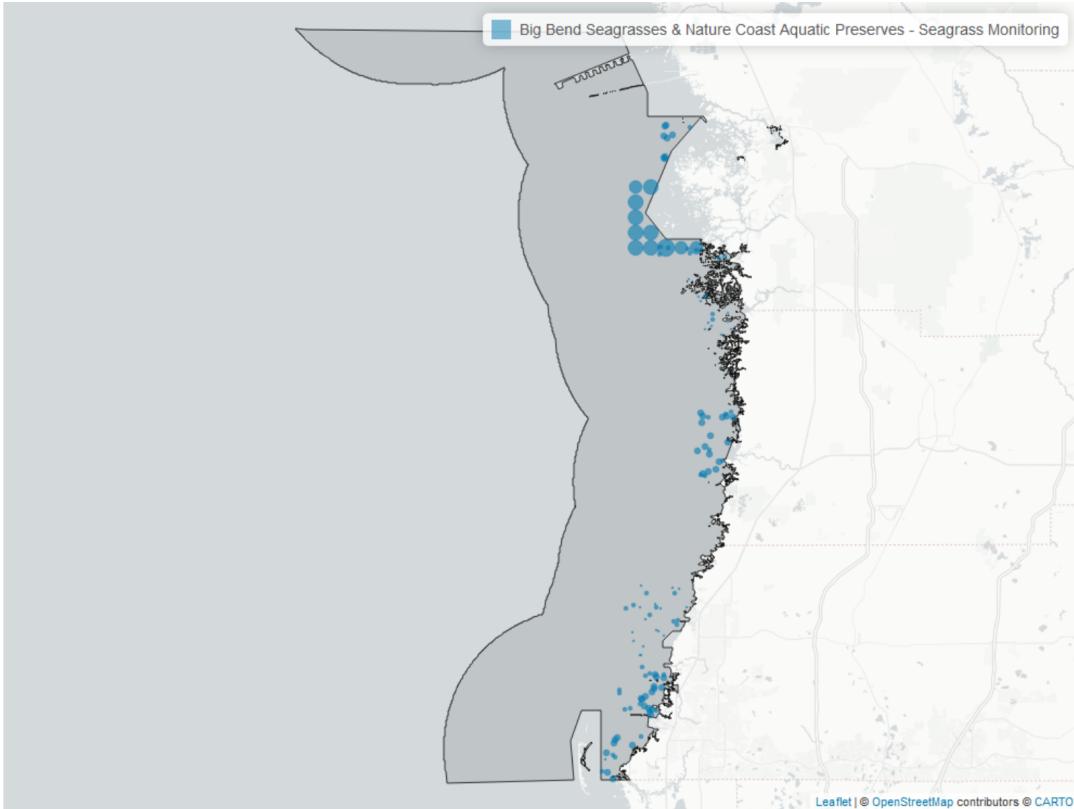
Nature Coast Aquatic Preserve
SAV Percent Cover - Sample Locations



Program name
● Big Bend Seagrasses & Nature Coast Aquatic Preserves - Seagrass Monitoring

Maps showing the temporal scope of SAV sampling sites within the boundaries of *Nature Coast Aquatic Preserve* by Program name.

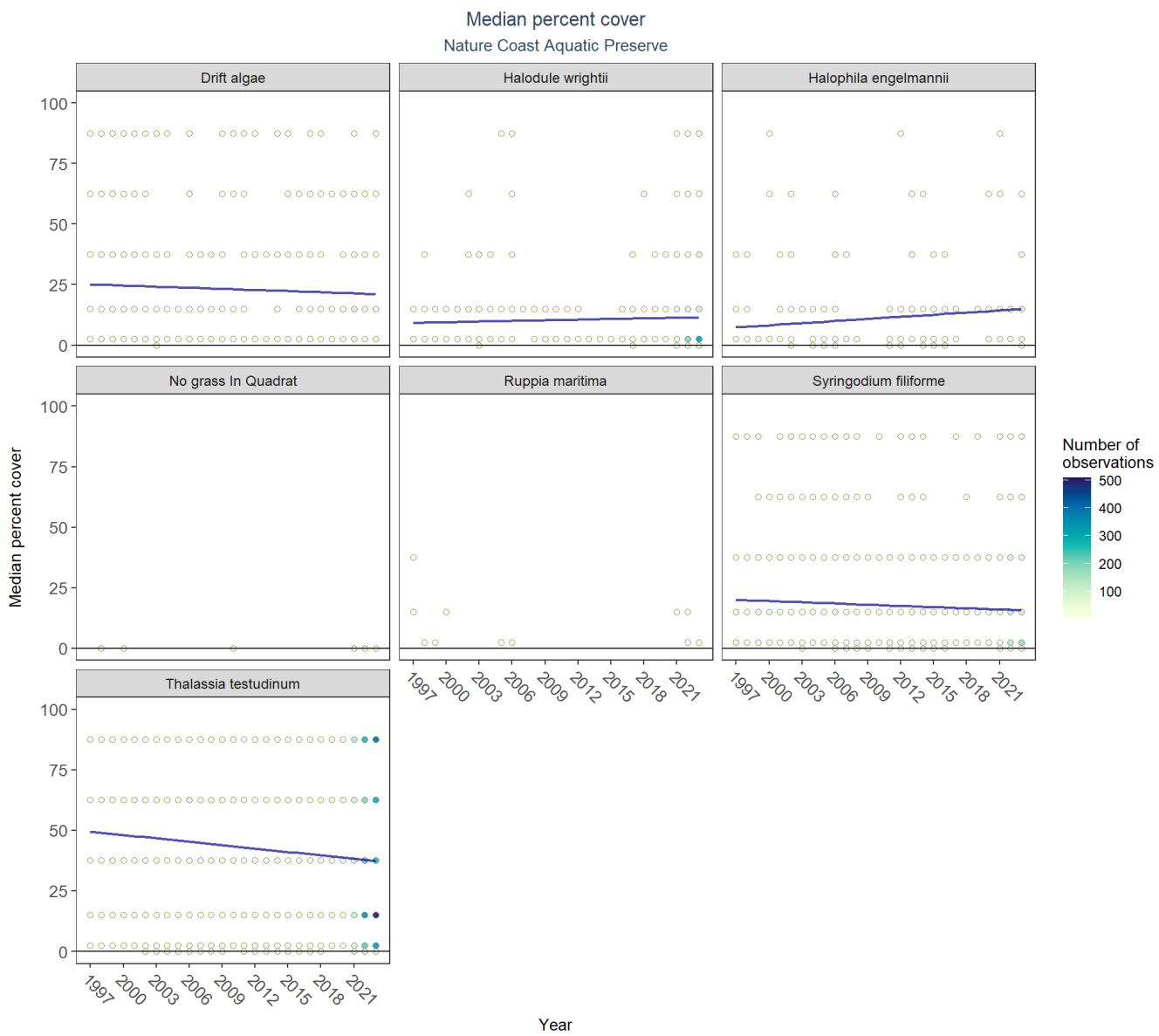
Sampling locations by Program:



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

Table 23: Big Bend Seagrasses & Nature Coast Aquatic Preserves - Seagrass Monitoring - *Program 560*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
6717	1997	2023	Modified Braun Blanquet	123
3168	2022	2023	Percent Cover	125



Median percent cover by species in *Nature Coast 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.

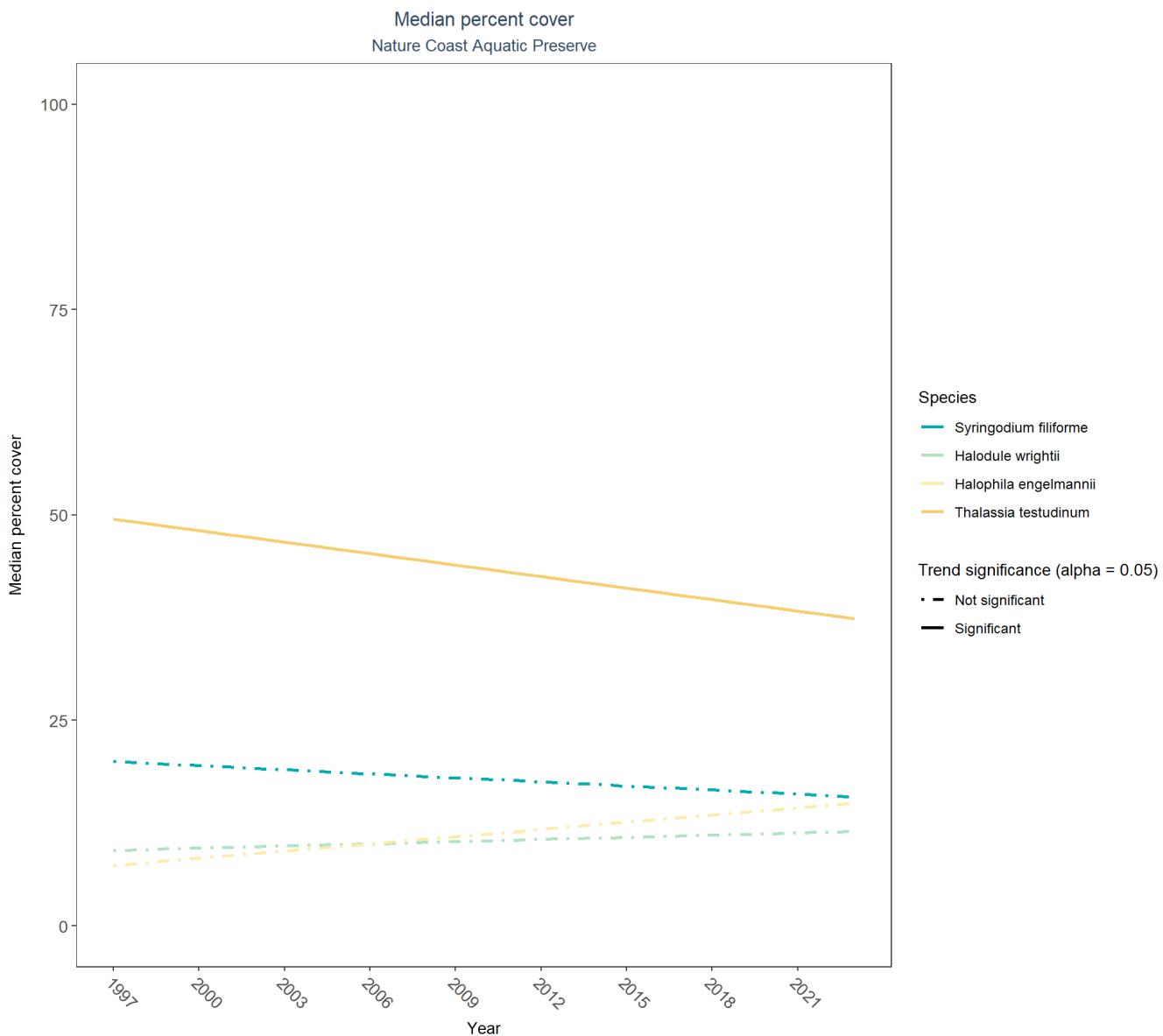
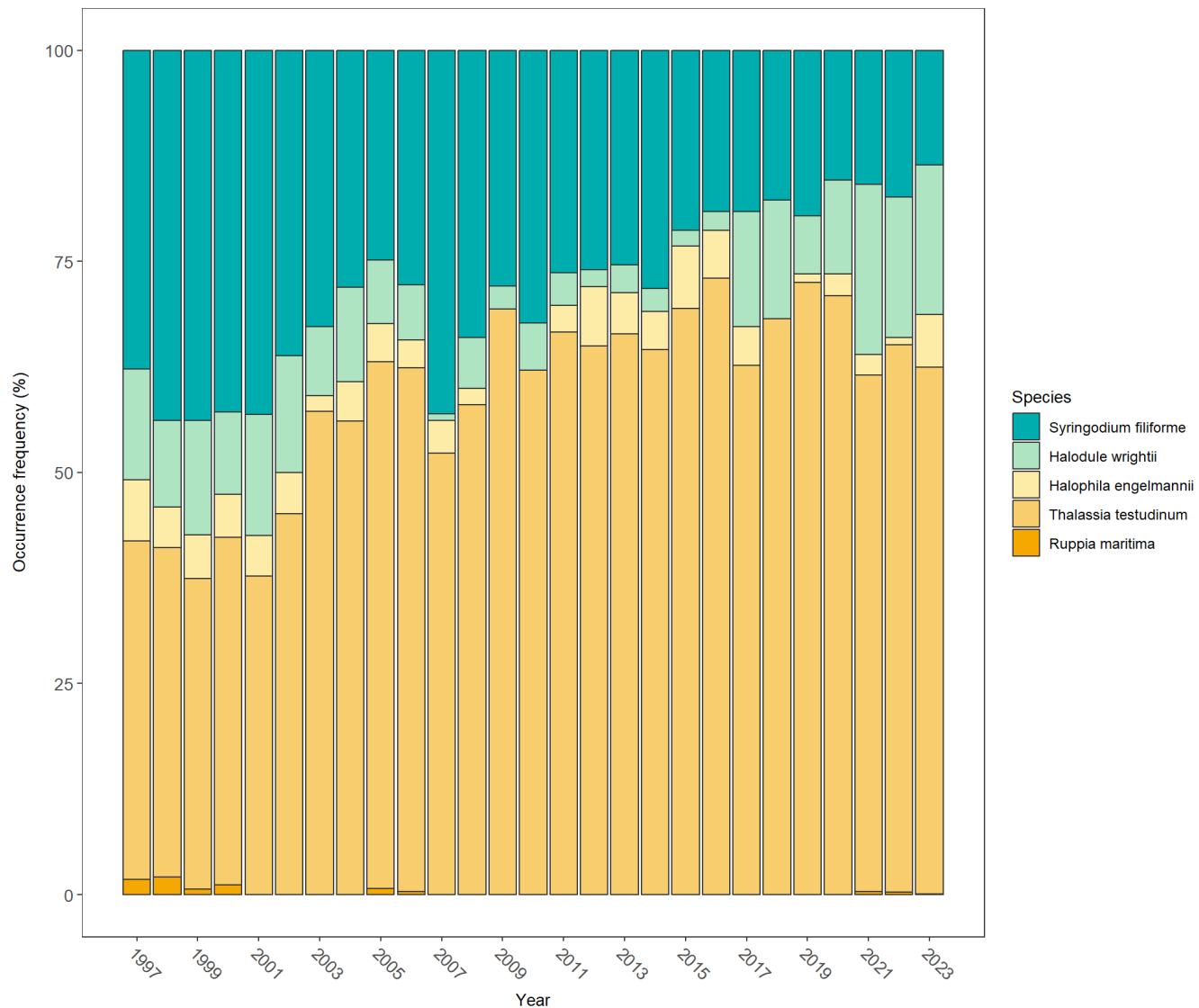
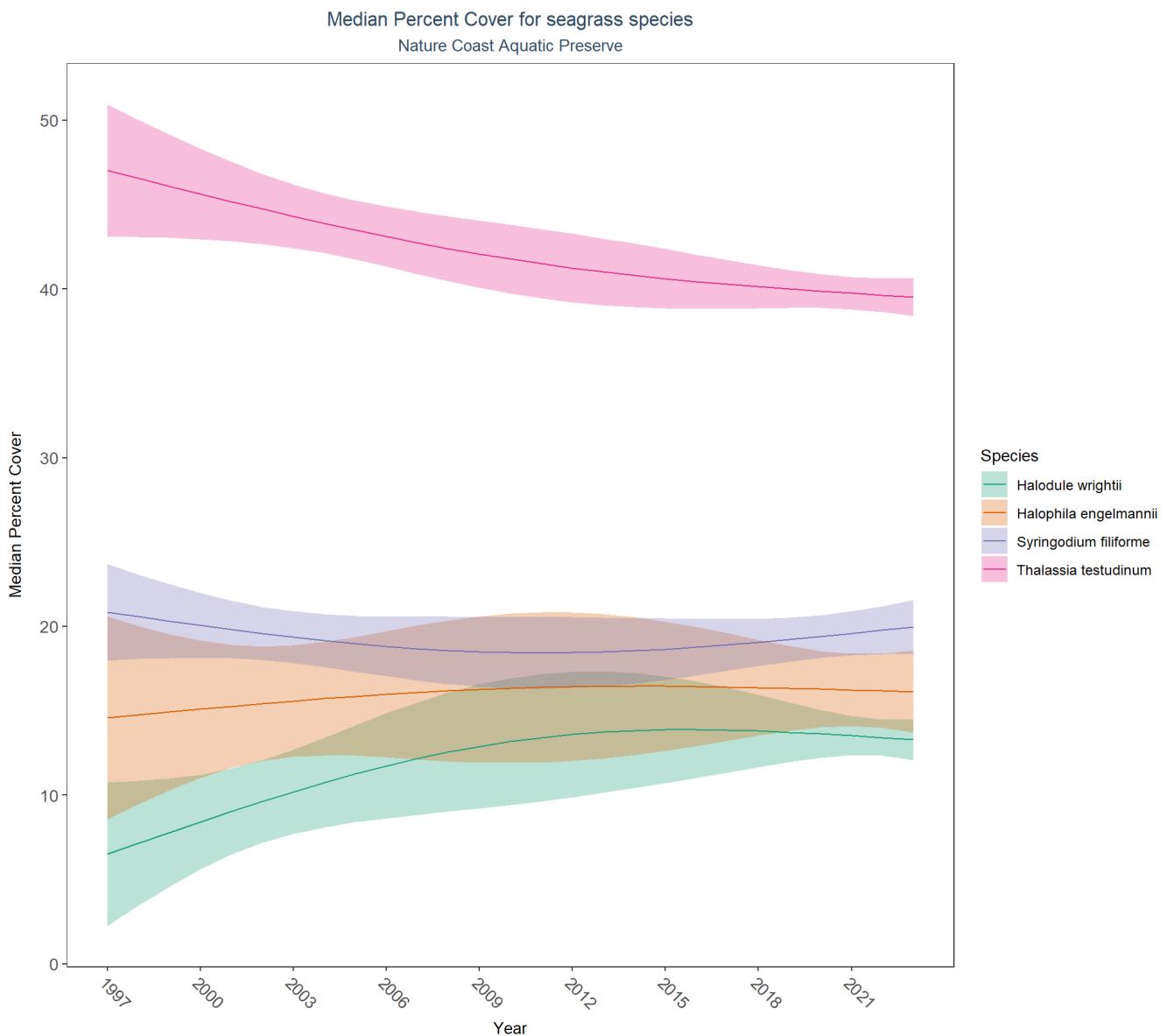


Table 24: Percent Cover Trend Analysis for Nature Coast Aquatic Preserve

Species	CommonName	Trend Significance (0.05)	Period of Record	LME-Intercept	LME-Slope	p
Drift algae		No significant trend	1997 - 2023	25.5513	-0.1532	0.2716
Halodule wrightii	Shoal grass	No significant trend	1997 - 2023	8.9364	0.0876	0.2987
Halophila engelmannii	Star grass	No significant trend	1997 - 2023	6.4686	0.2925	0.0615
No grass In Quadrat		Model did not fit the available data	1998 - 2023			
Ruppia maritima	Widgeon grass	Model did not fit the available data	1997 - 2023			
Syringodium filiforme	Manatee grass	No significant trend	1997 - 2023	20.4864	-0.1647	0.3493
Thalassia testudinum	Turtle grass	Significantly decreasing trend	1997 - 2023	50.9233	-0.4669	0.0243

Frequency of occurrence
Nature Coast Aquatic Preserve





Generalized additive models for each species in Nature Coast 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.

Nekton

The data file used is: All_NEKTON_Parameters-2024-Mar-27.txt

