

Lemon Bay Aquatic Preserve

SEACAR Habitat Analyses

Last compiled on 04 September, 2024

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Threshold Filtering

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

Table 1: Continuous Water Quality threshold values

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

Table 2: Discrete Water Quality threshold values

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

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

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

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

Value Qualifiers

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

STORET and WIN value qualifier codes

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

Table 4: Value Qualifier codes excluded from analysis

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

Discrete Water Quality Value Qualifiers

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

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

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

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

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

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

Systemwide Monitoring Program (SWMP) value qualifier codes

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

Table 5: SWMP Value Qualifier codes

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

Water Column

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

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

Seasonal Kendall-Tau Analysis

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

Water Quality - Discrete

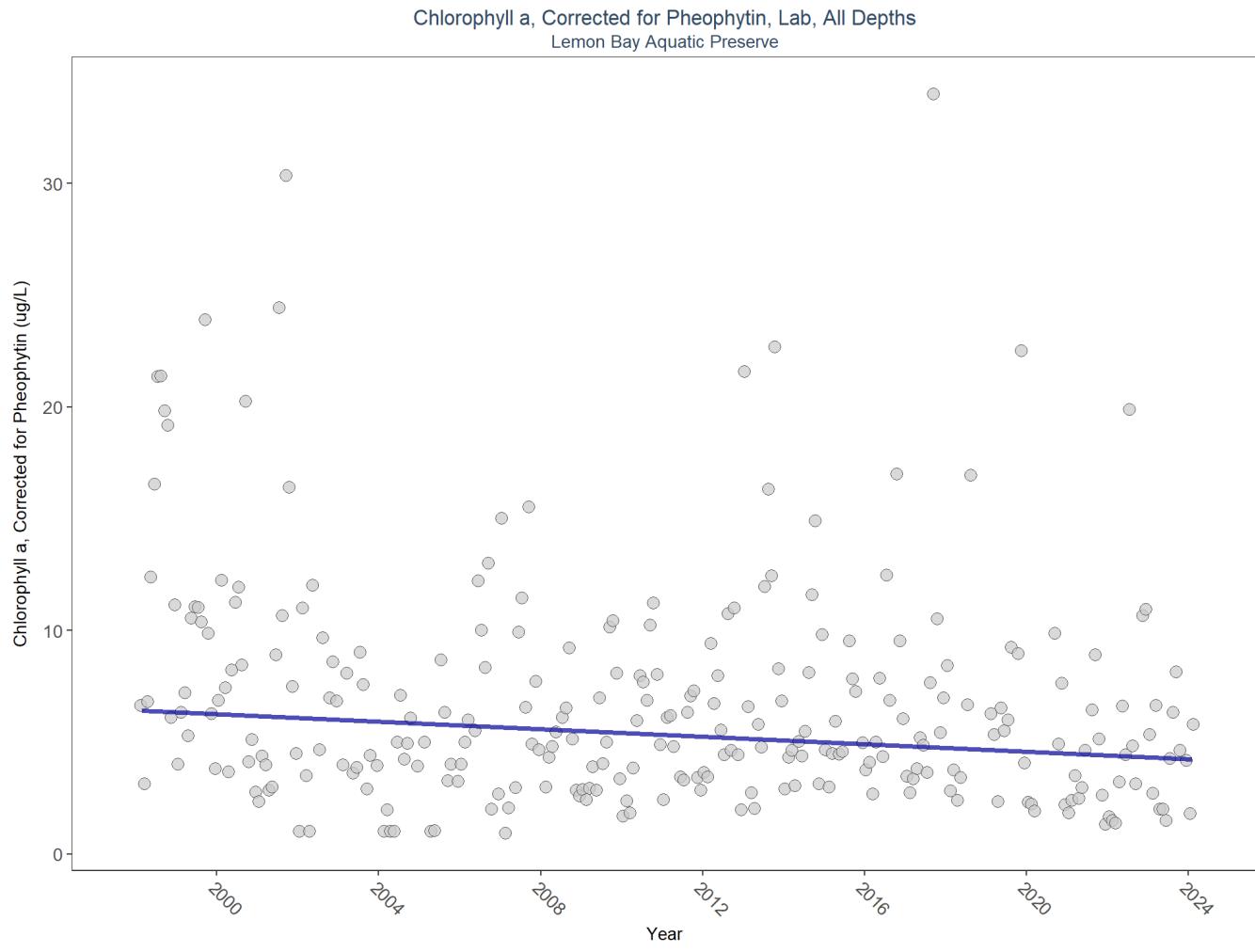
The following files were used in the discrete analysis:

- *Combined_WQ_WC_NUT_Chlorophyll_a_corrected_for_pheophytin-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_Chlorophyll_a_uncorrected_for_pheophytin-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_Colored_dissolved_organic_matter_CDOM-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_Dissolved_Oxygen-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_Dissolved_Oxygen_Saturation-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_pH-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_Salinity-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_Secchi_Depth-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_Total_Nitrogen-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_Total_Phosphorus-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_Total_Suspended_Solids_TSS-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_Turbidity-2024-Jul-11.txt*
- *Combined_WQ_WC_NUT_Water_Temperature-2024-Jul-11.txt*

Chlorophyll a, Corrected for Pheophytin - Discrete Water Quality

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

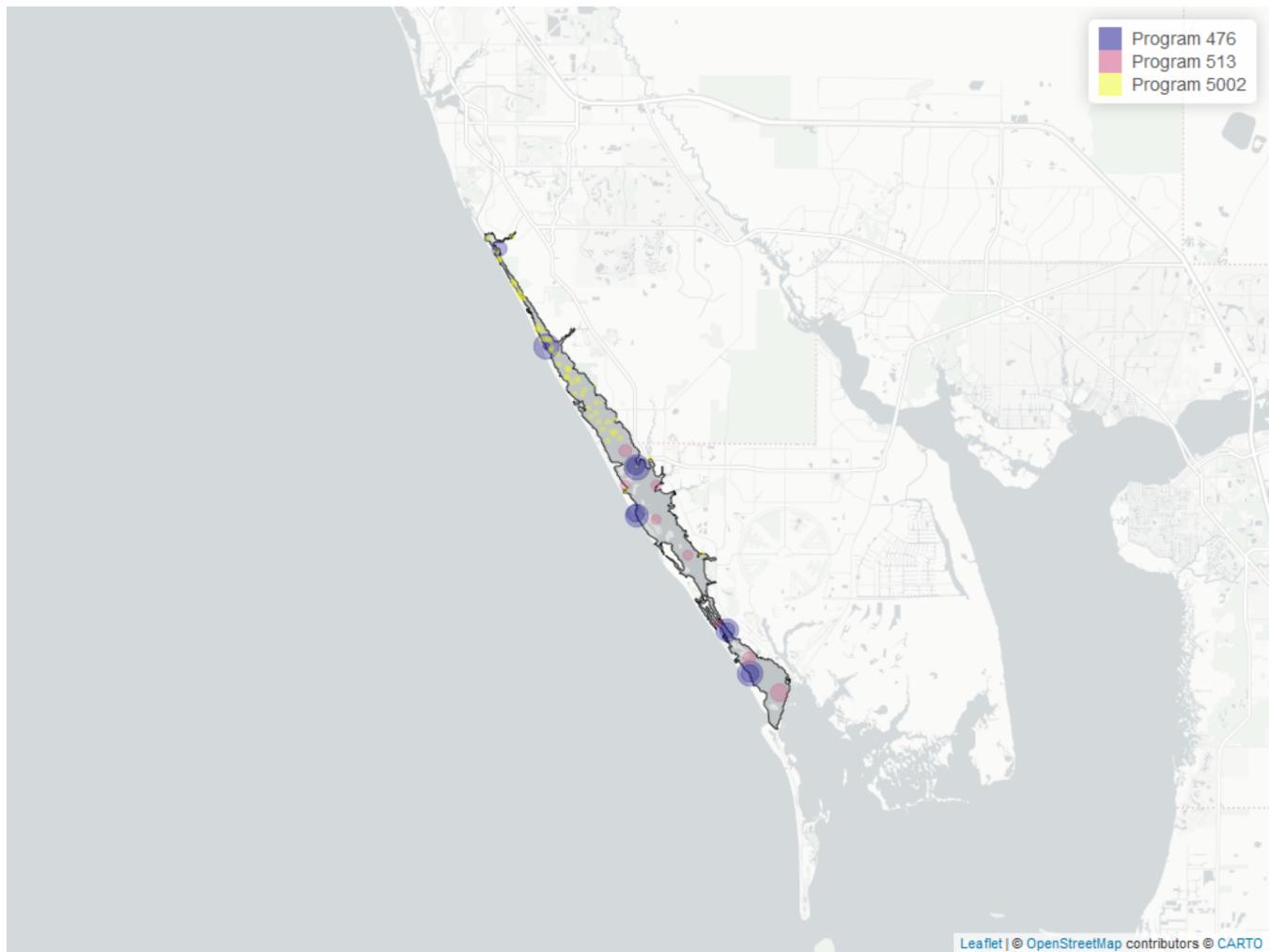
Seasonal Kendall-Tau Trend Analysis



$p < 0.00005$ 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
476	685	2008	2024
5002	190	1998	2019
513	179	2001	2009

Program names:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

5002 - Florida STORET / WIN

513 - Coastal Charlotte Harbor Monitoring Network

Value Qualifiers

- N_{Total} is total amount of data for a given year
- N_{I} is the total amount of values flagged with the respective value qualifier in a given year
- perc_{I} 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}
1998	43	1	2.3				
1999	47	1	2.1				
2000	47	2	4.3				
2001	46	2	4.3			1	2.2
2002	21					2	9.5
2004	22					5	22.7
2005	17					3	17.6
2006	23	5	21.7				
2007	48	2	4.2			10	20.8
2008	72	4	5.6			1	1.4
2009	62	3	4.8	2	3.2		
2010	58	9	15.5	6	10.3		
2011	56	1	1.8	7	12.5		
2012	50	2	4.0			1	2.0
2013	44	2	4.6				
2014	48	1	2.1				
2016	36	1	2.8				
2017	33	3	9.1				
2018	27	2	7.4				
2019	43	4	9.3				
2020	23	9	39.1				
2021	43	19	44.2			2	4.7
2022	35	16	45.7	2	5.7		
2023	46	19	41.3			1	2.2
2024	4	3	75.0				

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:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

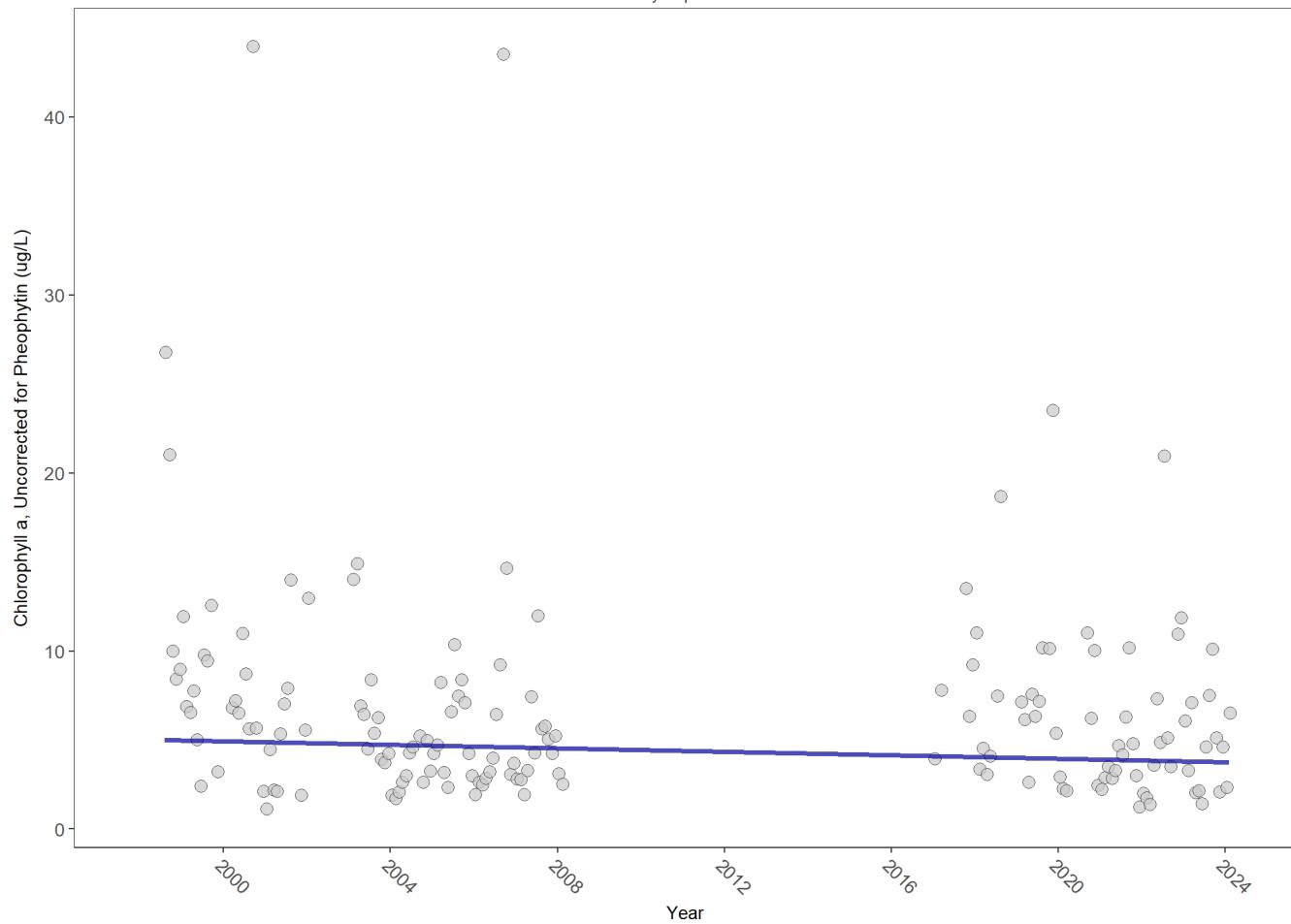
513 - Coastal Charlotte Harbor Monitoring Network

5002 - Florida STORET / WIN

Chlorophyll a, Uncorrected for Pheophytin - Discrete Water Quality

Seasonal Kendall-Tau Trend Analysis

Chlorophyll a, Uncorrected for Pheophytin, Lab, All Depths
Lemon Bay Aquatic Preserve

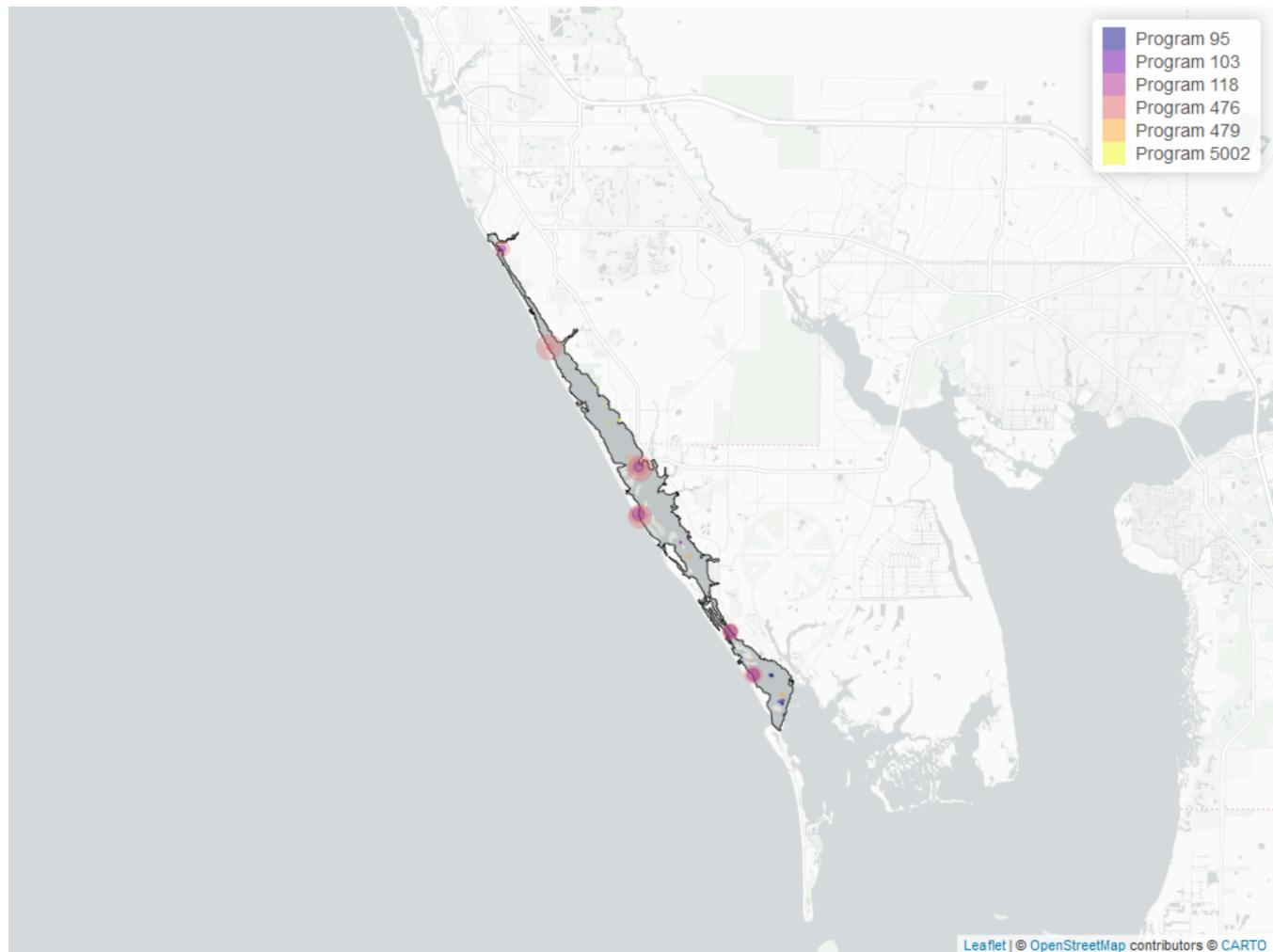


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	686	19	4.169	TRUE	-0.1243	0.0457	-0.04833333	5.029111	4.6902	0.9452	-1

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

SennIntercept is intercept value at beginning of record for monitoring location

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



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

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

ProgramID	N_Data	YearMin	YearMax
476	583	1998	2024
103	101	2005	2022
479	17	2021	2021
95	13	2003	2013
5002	7	2017	2019
118	1	2005	2005

Program names:

- 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network
103 - EPA STOrage and RETrieval Data Warehouse (STORET)

479 - Southwest Florida Water Management District - Water Quality Monitoring

95 - Harmful Algal Bloom Marine Observation Network

5002 - Florida STORET / WIN

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	$perc_U$
2000	27					2	7.4
2001	32					4	12.5
2003	36					1	2.8
2004	35					3	8.6
2005	45					6	13.3
2006	55					5	9.1
2007	60	23	38.3			7	11.7
2008	11	7	63.6			3	27.3
2017	12	1	8.3				
2019	43	1	2.3				
2020	29	5	17.2				
2021	148	16	10.8				
2022	40	12	30.0	2	5		
2023	46	10	21.7			1	2.2
2024	4	2	50.0				

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:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

479 - Southwest Florida Water Management District - Water Quality Monitoring

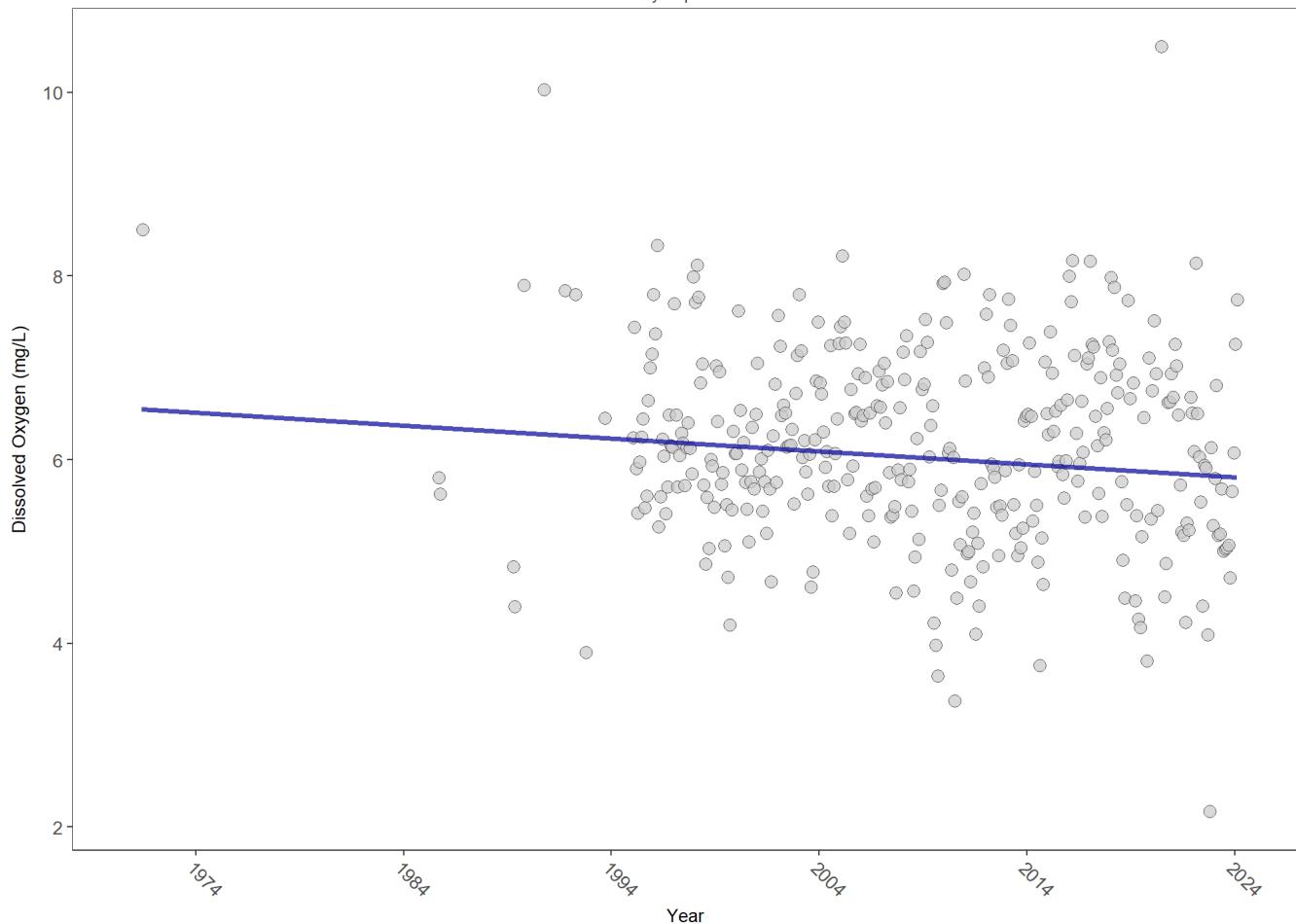
5002 - Florida STORET / WIN

Dissolved Oxygen - Discrete Water Quality

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

Seasonal Kendall-Tau Trend Analysis

Dissolved Oxygen, Field, All Depths
Lemon Bay Aquatic Preserve

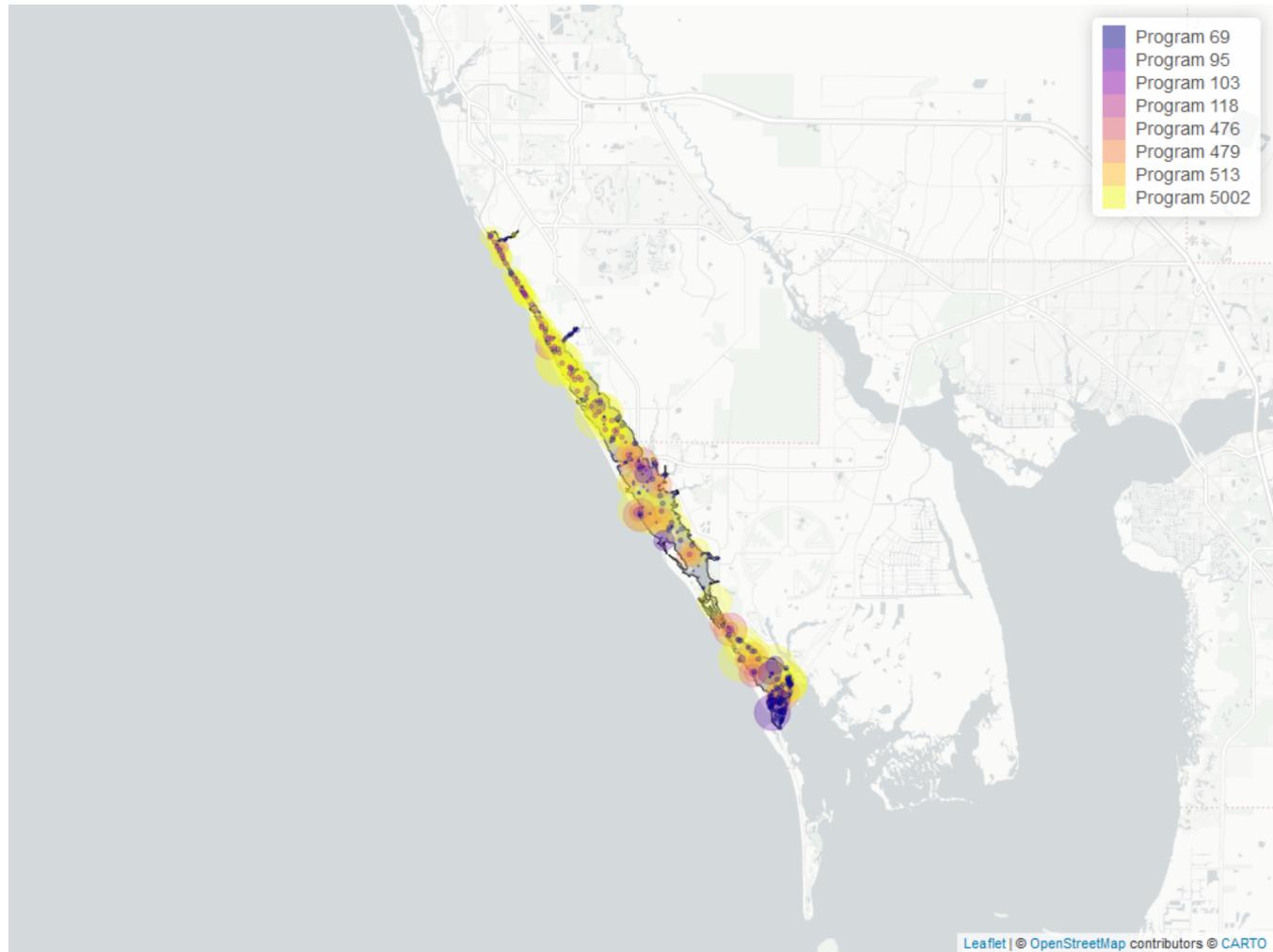


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	12563	37	6.1	TRUE	-0.0981	0.0062	-0.01400918	6.554101	17.6072	0.0912	-1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Dissolved Oxygen



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

Table 10: Programs contributing data for Dissolved Oxygen

ProgramID	N_Data	YearMin	YearMax
5002	8562	1995	2024
476	997	1998	2024
479	972	2001	2021
69	861	1989	2022
95	647	1971	2018
513	407	2001	2009
103	231	2020	2022
118	1	2005	2005

Program names:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network
479 - Southwest Florida Water Management District - Water Quality Monitoring
69 - Fisheries-Independent Monitoring (FIM) Program
95 - Harmful Algal Bloom Marine Observation Network
513 - Coastal Charlotte Harbor Monitoring Network
103 - EPA STOrage and RETrieval Data Warehouse (STORET)
118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

Value Qualifiers

- N_{Total} is total amount of data for a given year
- N_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 11: Value Qualifiers for Dissolved Oxygen

Year	N_{Total}	N_H	$perc_H$
2008	440	15	3.4

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

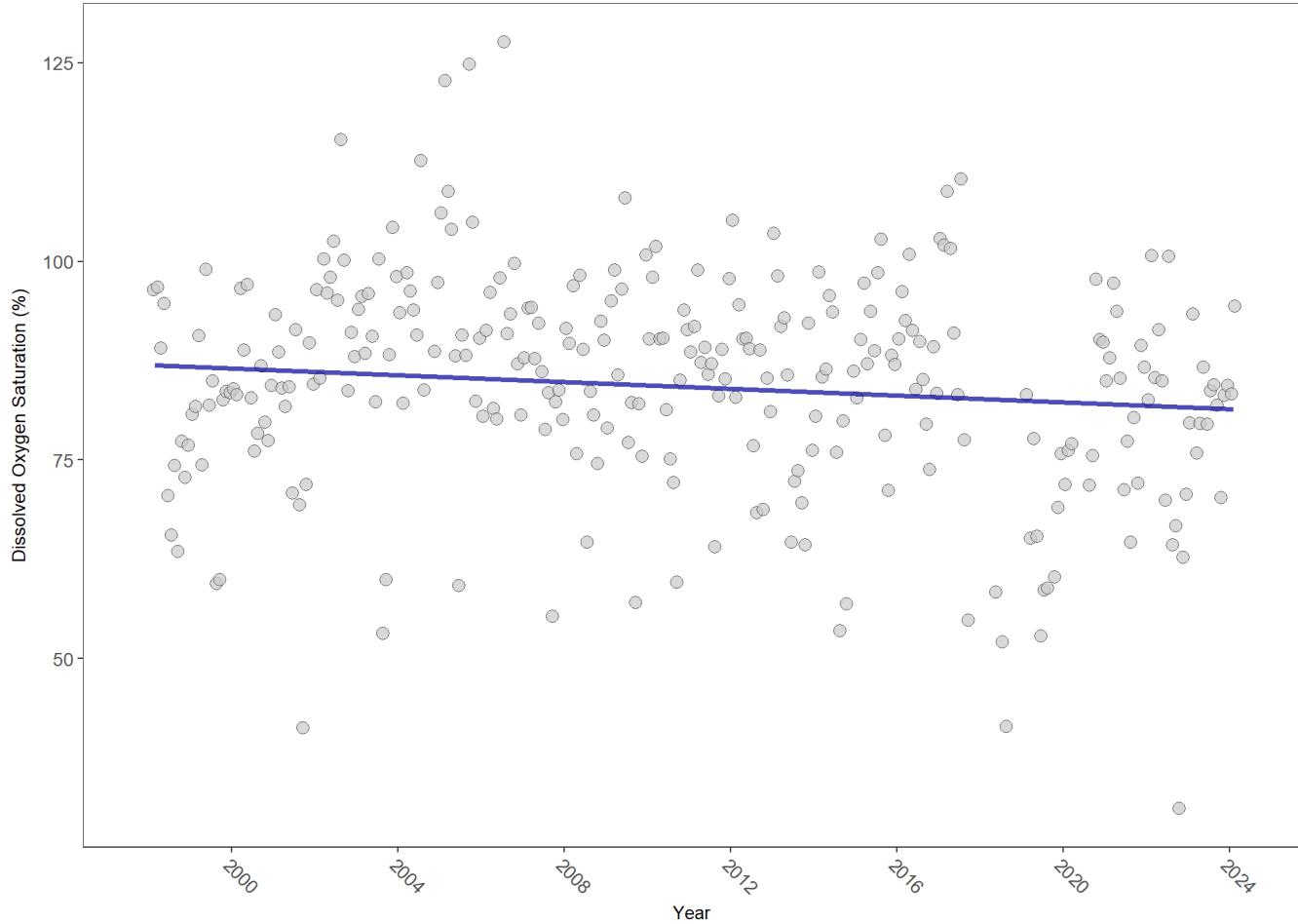
Programs containing Value Qualified data:

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
Lemon Bay Aquatic Preserve

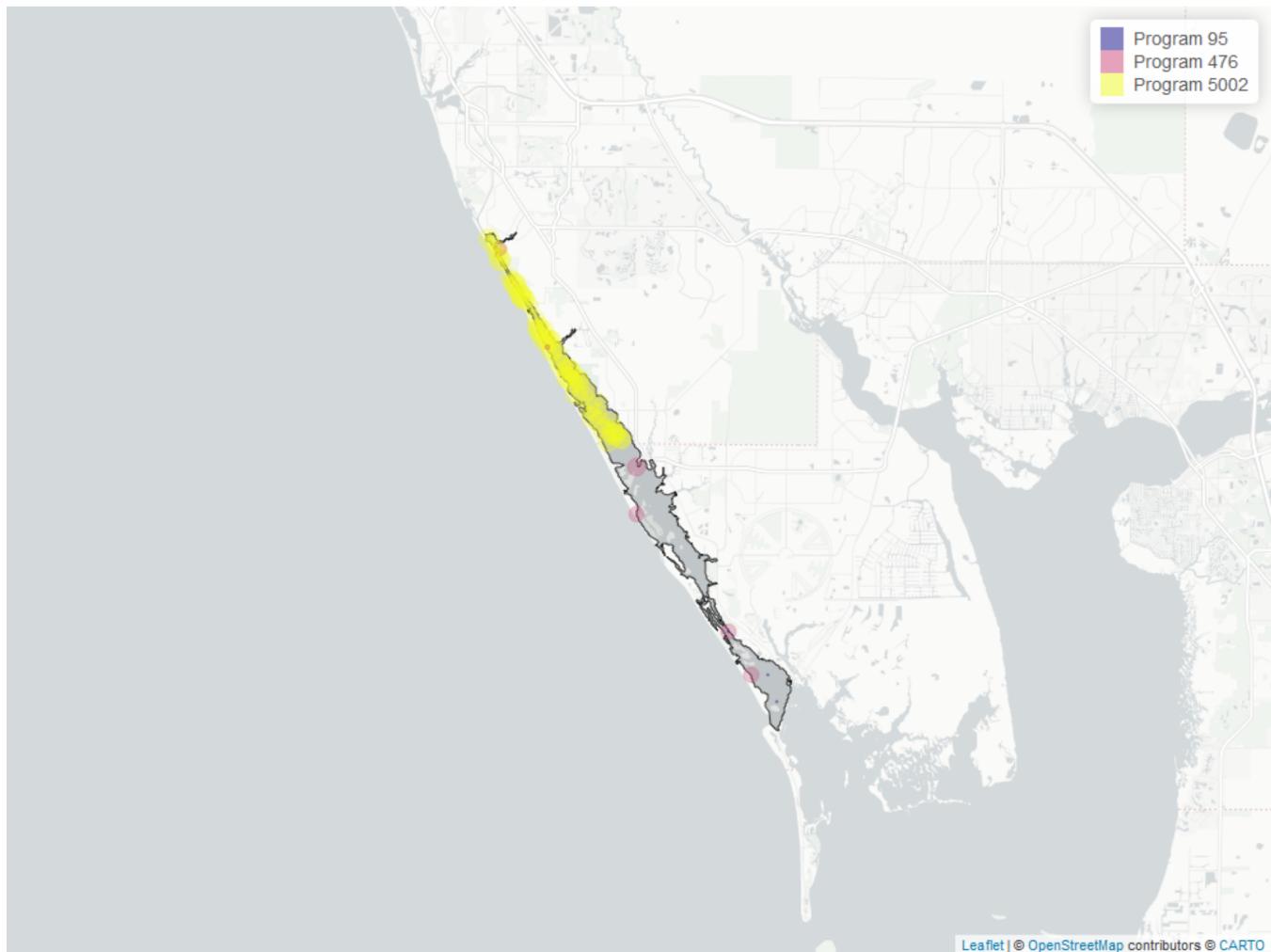


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	4330	27	87	TRUE	-0.109	0.0098	-0.2148148	86.97917	12.1587	0.3518	-1

$p < 0.00005$ 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 12: Programs contributing data for Dissolved Oxygen Saturation

ProgramID	N_Data	YearMin	YearMax
5002	4175	1998	2024
476	194	2018	2024
95	4	2005	2018

Program names:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

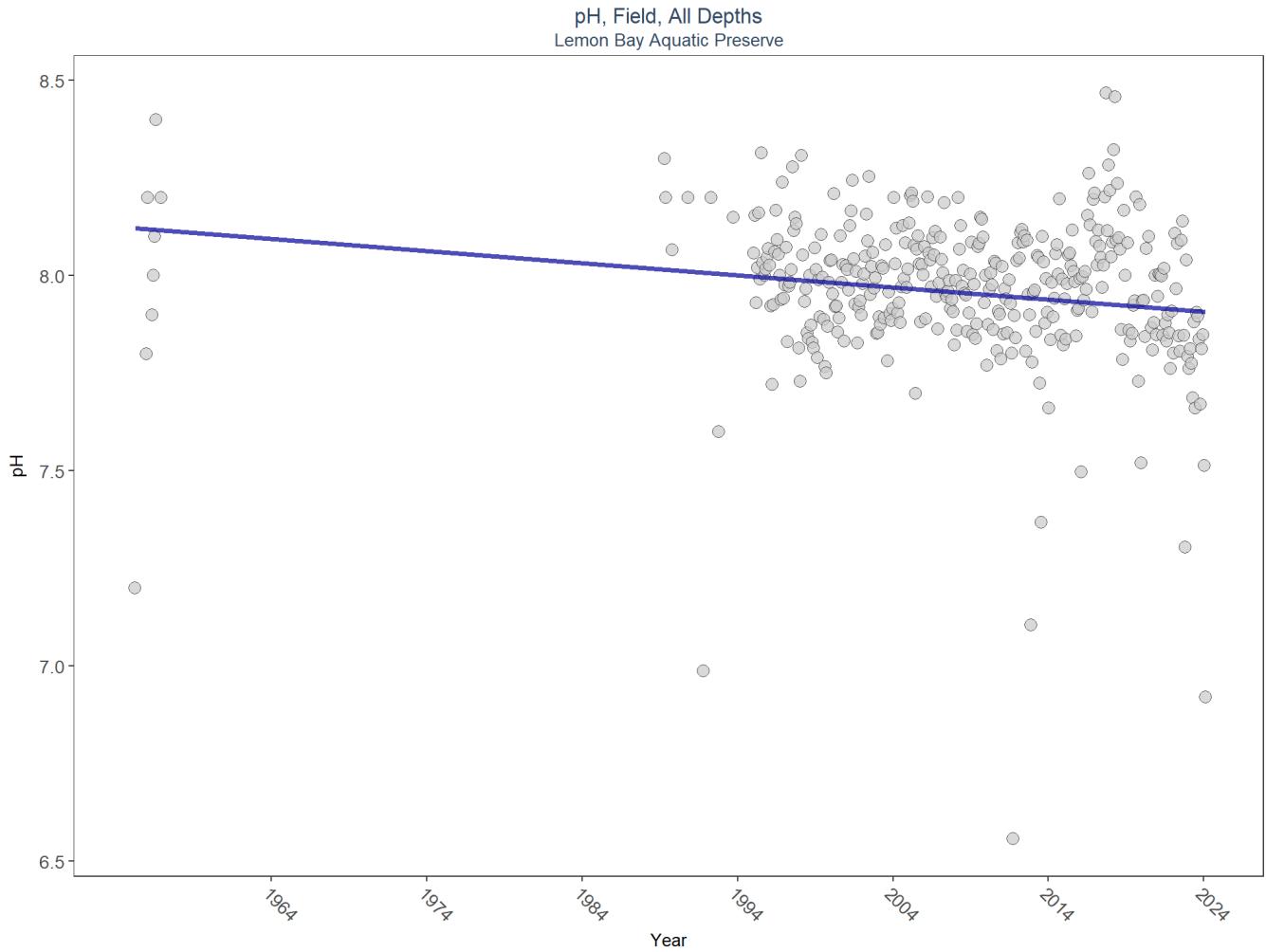
95 - Harmful Algal Bloom Marine Observation Network

There are no qualifying Value Qualifiers for Dissolved Oxygen Saturation in Lemon Bay Aquatic Preserve

pH - Discrete Water Quality

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

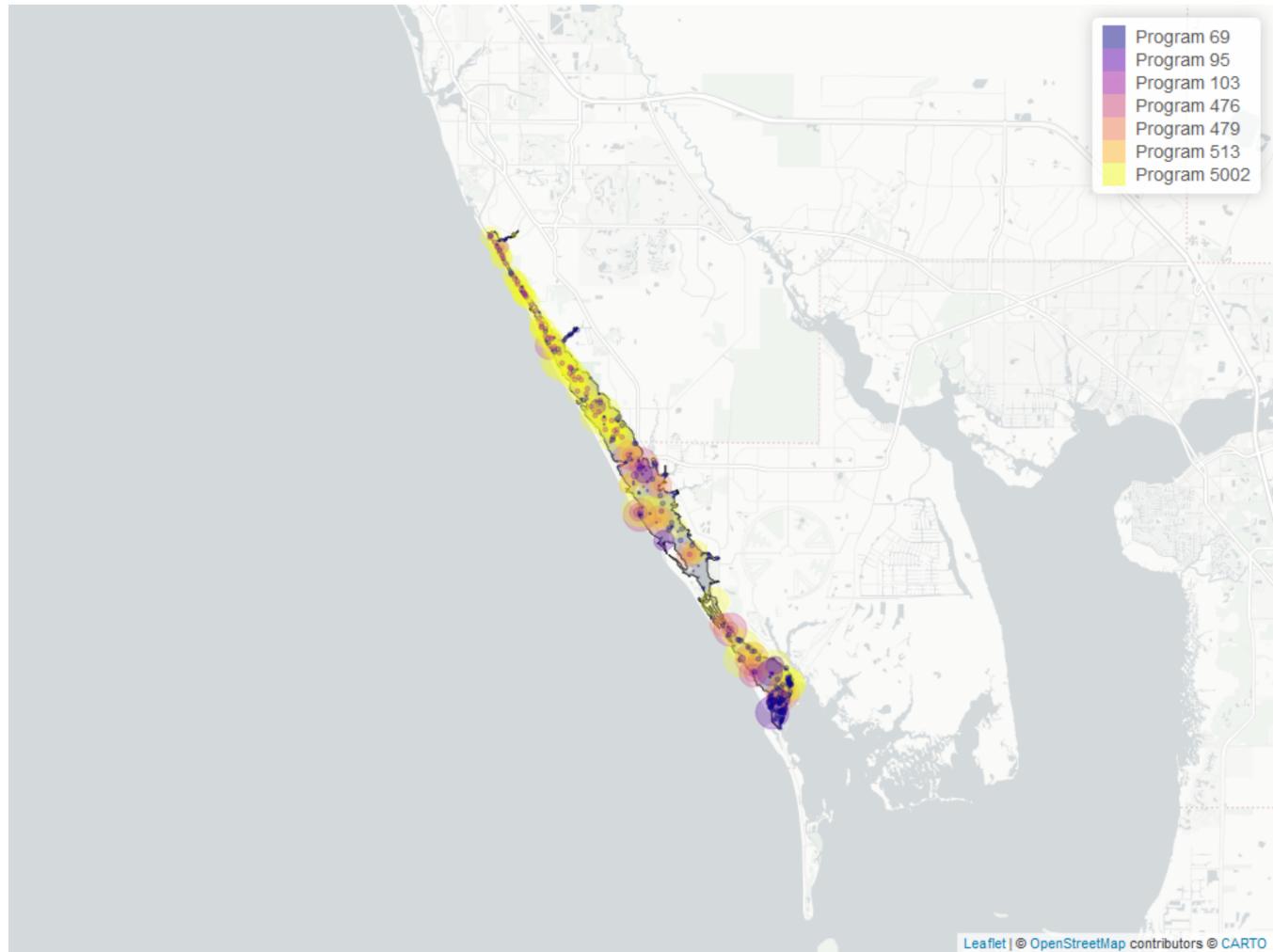
Seasonal Kendall-Tau Trend Analysis



p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for pH



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

Table 13: Programs contributing data for pH

ProgramID	N_Data	YearMin	YearMax
5002	6935	1995	2024
476	1015	1998	2024
479	976	2001	2021
69	859	1989	2022
95	625	1955	2018
513	407	2001	2009
103	232	2020	2022

Program names:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

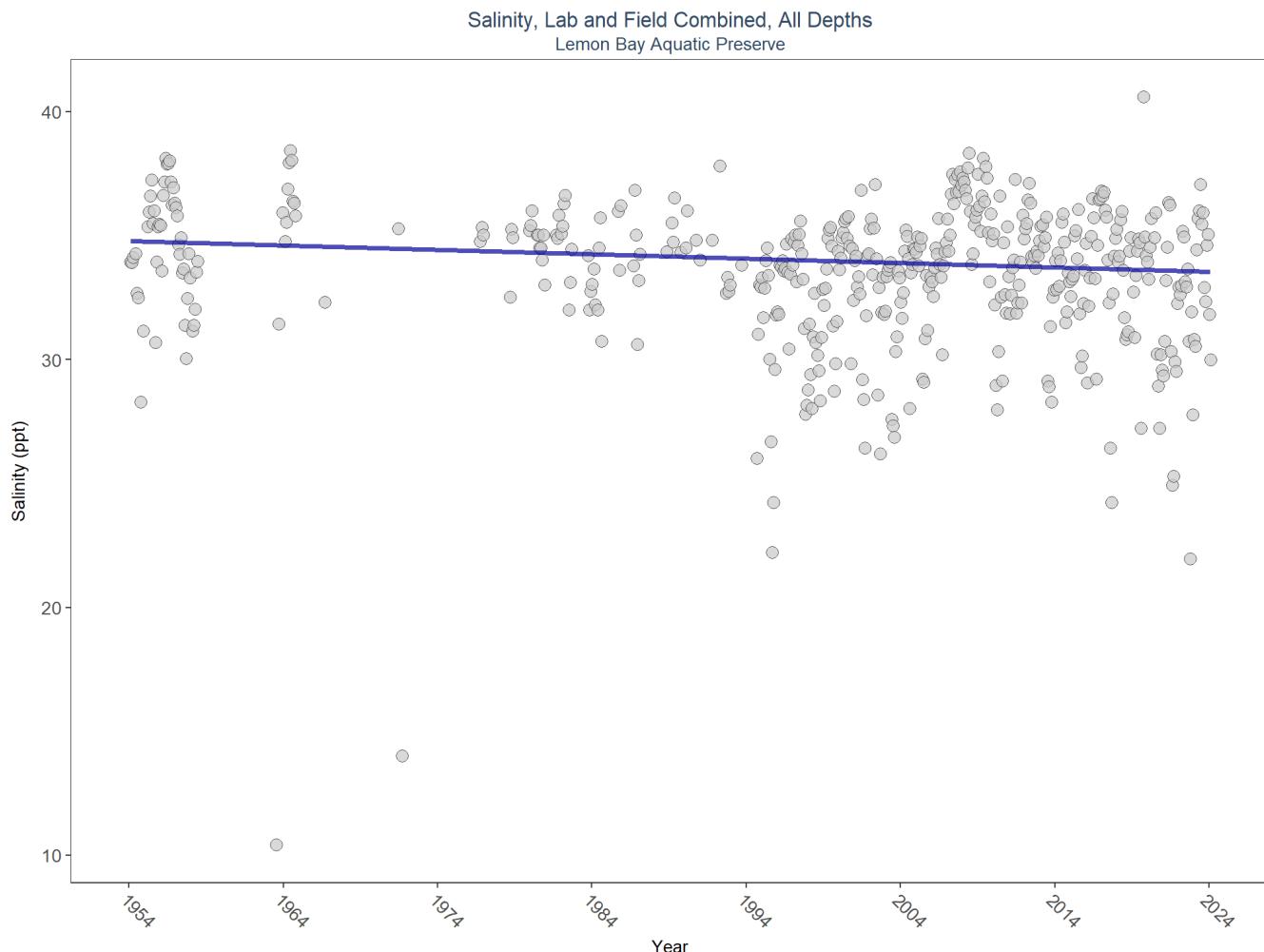
- 479 - Southwest Florida Water Management District - Water Quality Monitoring
 69 - Fisheries-Independent Monitoring (FIM) Program
 95 - Harmful Algal Bloom Marine Observation Network
 513 - Coastal Charlotte Harbor Monitoring Network
 103 - EPA STORET and RETrieval Data Warehouse (STORET)

There are no qualifying Value Qualifiers for pH in Lemon Bay 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

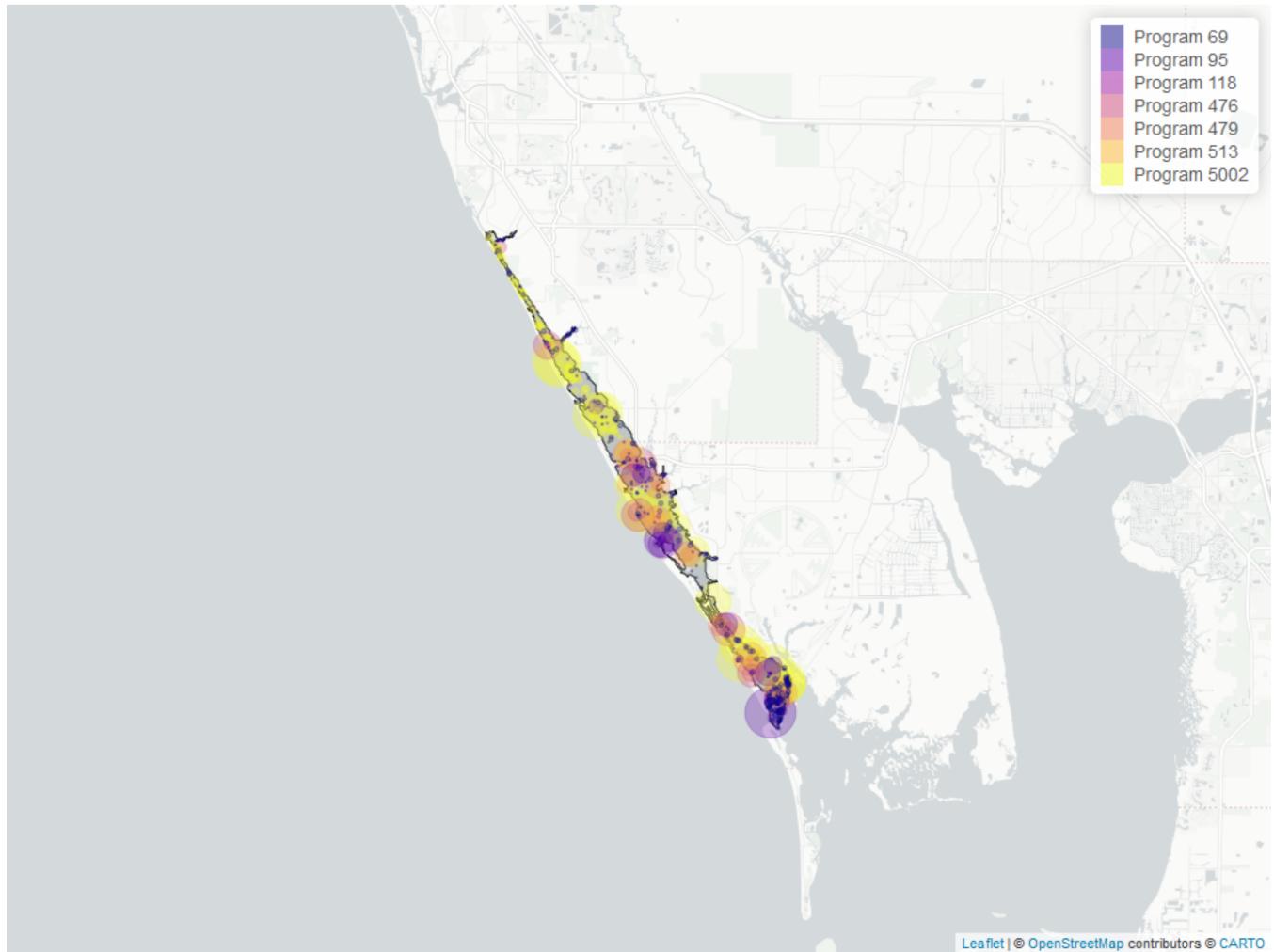


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	10008	57	34	TRUE	-0.0907	0.0029	-0.01776695	34.78815	10.368	0.4976	-1

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 14: Programs contributing data for Salinity

ProgramID	N_Data	YearMin	YearMax
5002	5196	1995	2024
95	1521	1954	2018
476	1026	1998	2024
479	988	2001	2021
69	872	1989	2022
513	407	2001	2009
118	4	2020	2020

Program names:

5002 - Florida STORET / WIN

95 - Harmful Algal Bloom Marine Observation Network

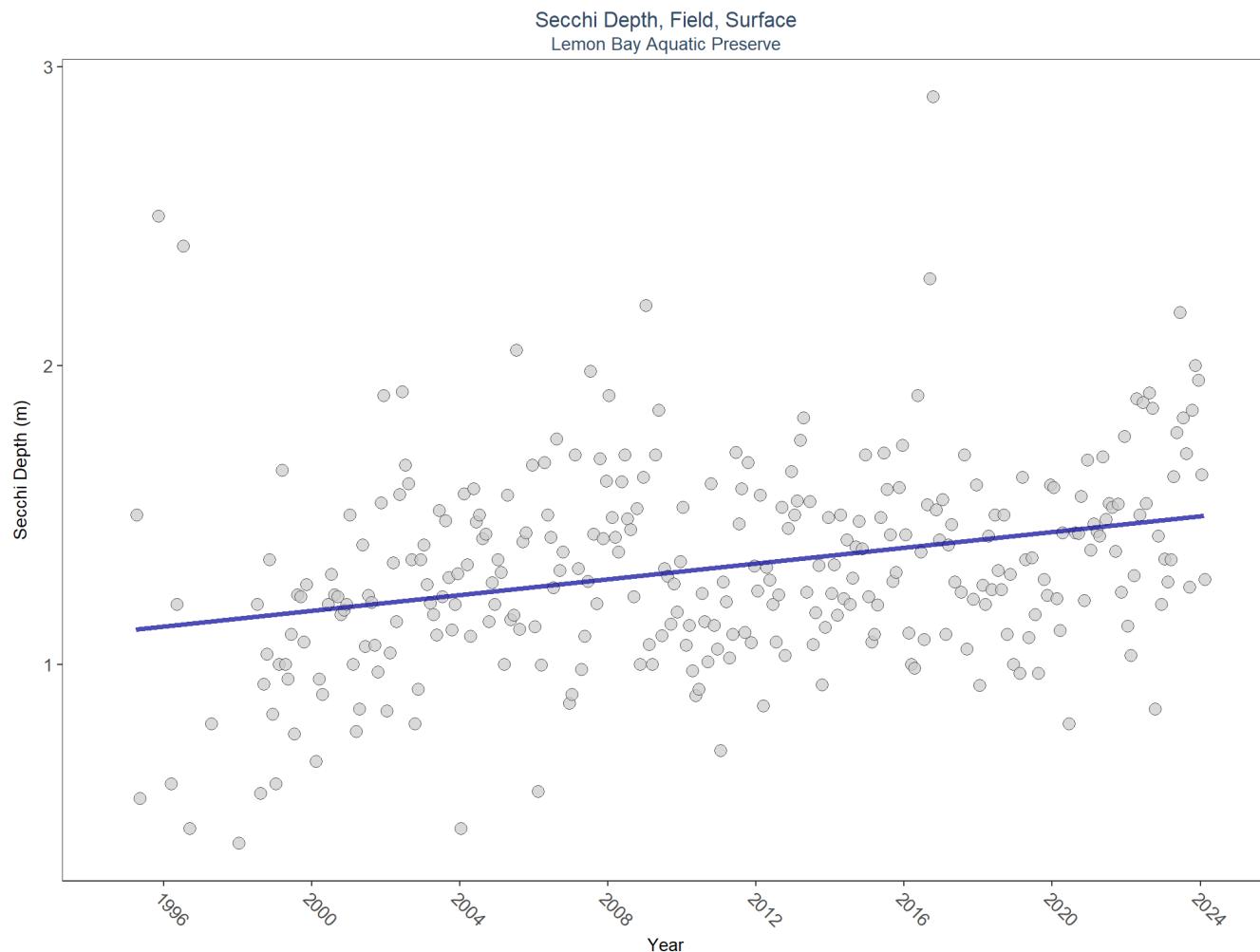
- 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network
 479 - Southwest Florida Water Management District - Water Quality Monitoring
 69 - Fisheries-Independent Monitoring (FIM) Program
 513 - Coastal Charlotte Harbor Monitoring Network
 118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

There are no qualifying Value Qualifiers for Salinity in Lemon Bay 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

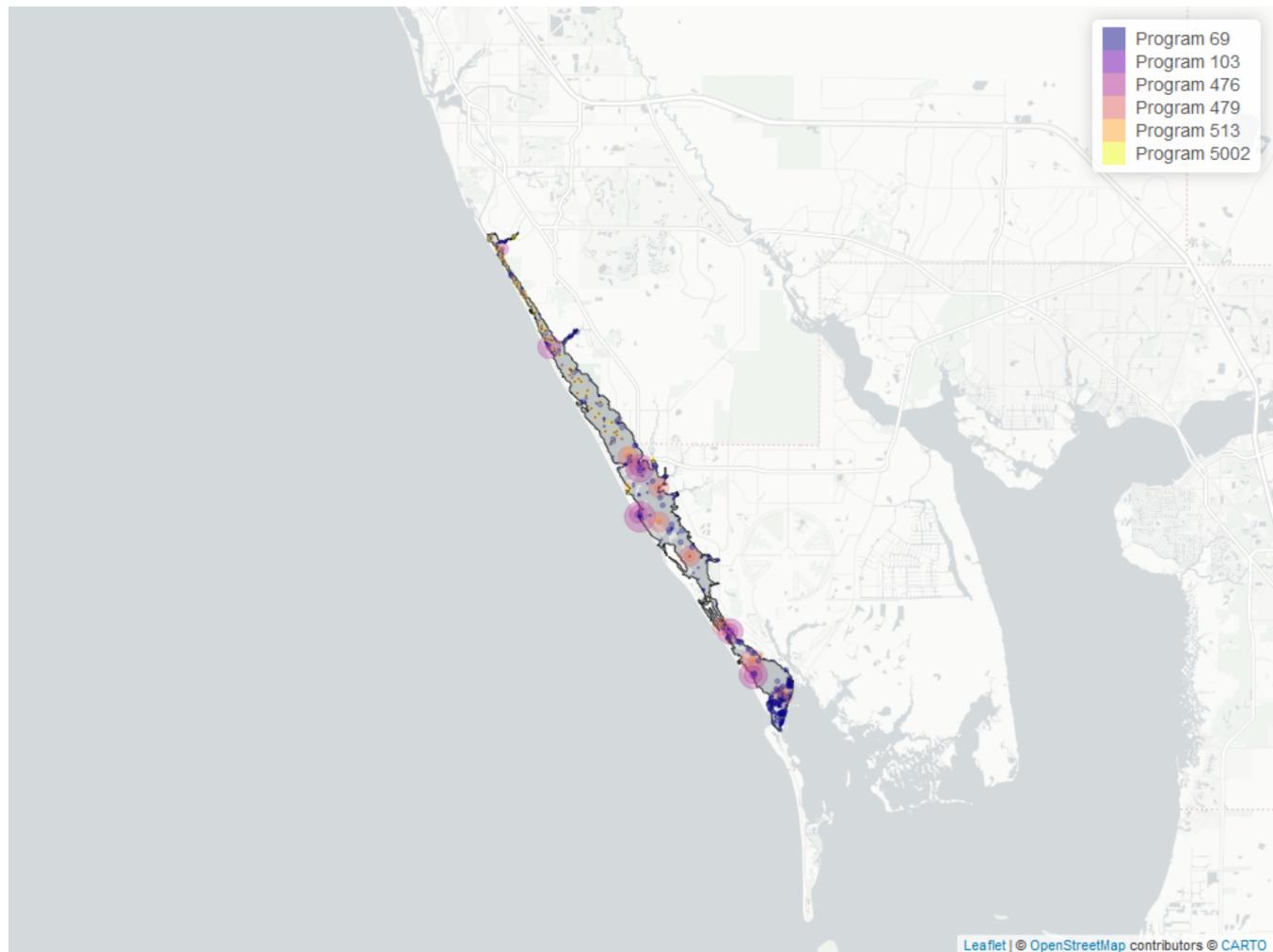


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
Surface	2508	30	1.3	TRUE	0.225	0.0000	0.01314103	1.113941	5.9217	0.8785	1

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 15: Programs contributing data for Secchi Depth

ProgramID	N_Data	YearMin	YearMax
69	829	1995	2022
476	775	1998	2024
479	514	2001	2021
5002	210	2007	2024
103	102	2020	2022
513	80	2001	2009

Program names:

69 - Fisheries-Independent Monitoring (FIM) Program

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

479 - Southwest Florida Water Management District - Water Quality Monitoring

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_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 16: Value Qualifiers for Secchi Depth

Year	N_{Total}	N_S	$perc_S$
2017	39	8	20.5
2018	63	12	19.0
2019	54	21	38.9
2020	121	29	24.0
2021	211	75	35.5
2022	107	57	53.3
2023	111	87	78.4
2024	9	8	88.9

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

Programs containing Value Qualified data:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

479 - Southwest Florida Water Management District - Water Quality Monitoring

Total Nitrogen - Discrete Water Quality

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

Total Nitrogen Calculation:

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

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

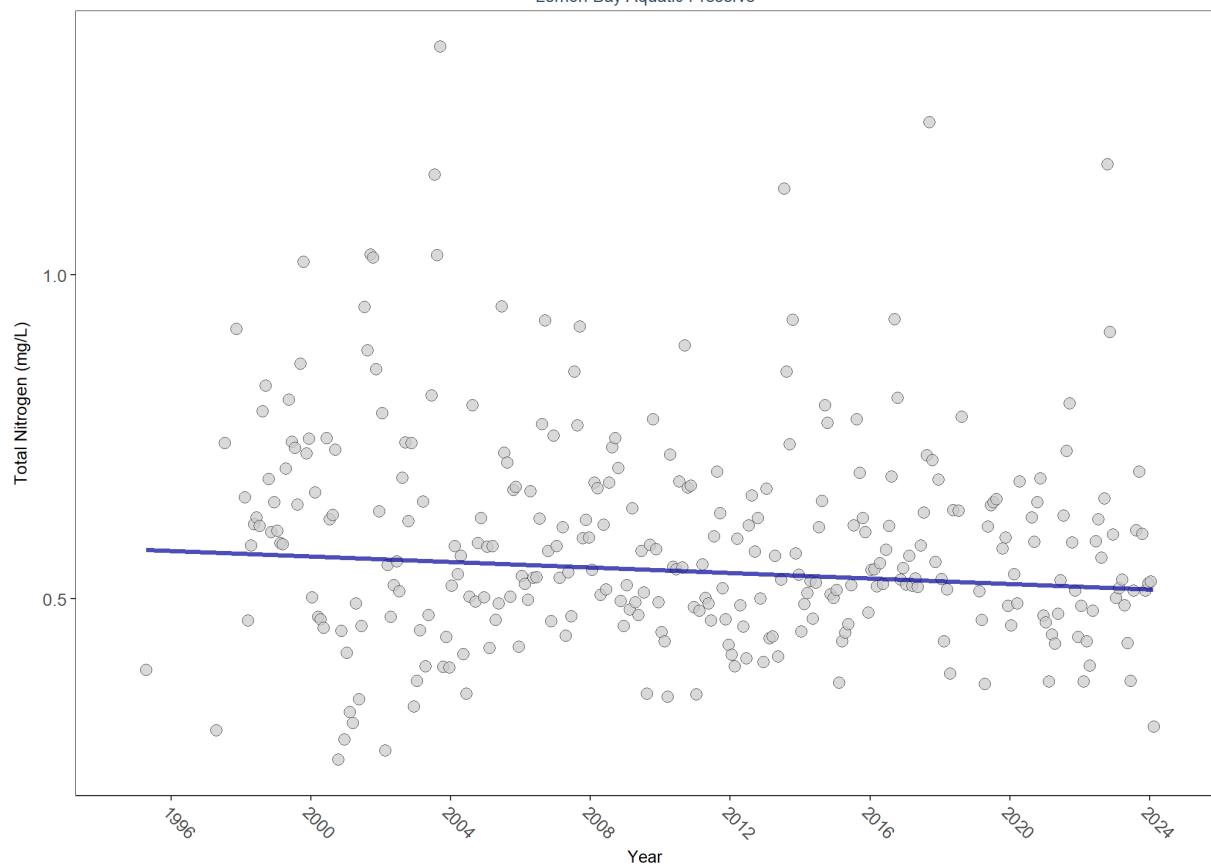
Additional Information:

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

- Values inserted into data:
 - ParameterName = “Total Nitrogen”
 - SEACAR_QAACFlagCode = “1Q”
 - SEACAR_QAAC>Description = “SEACAR Calculated”

Seasonal Kendall-Tau Trend Analysis

Total Nitrogen, Lab, All Depths
Lemon Bay Aquatic Preserve

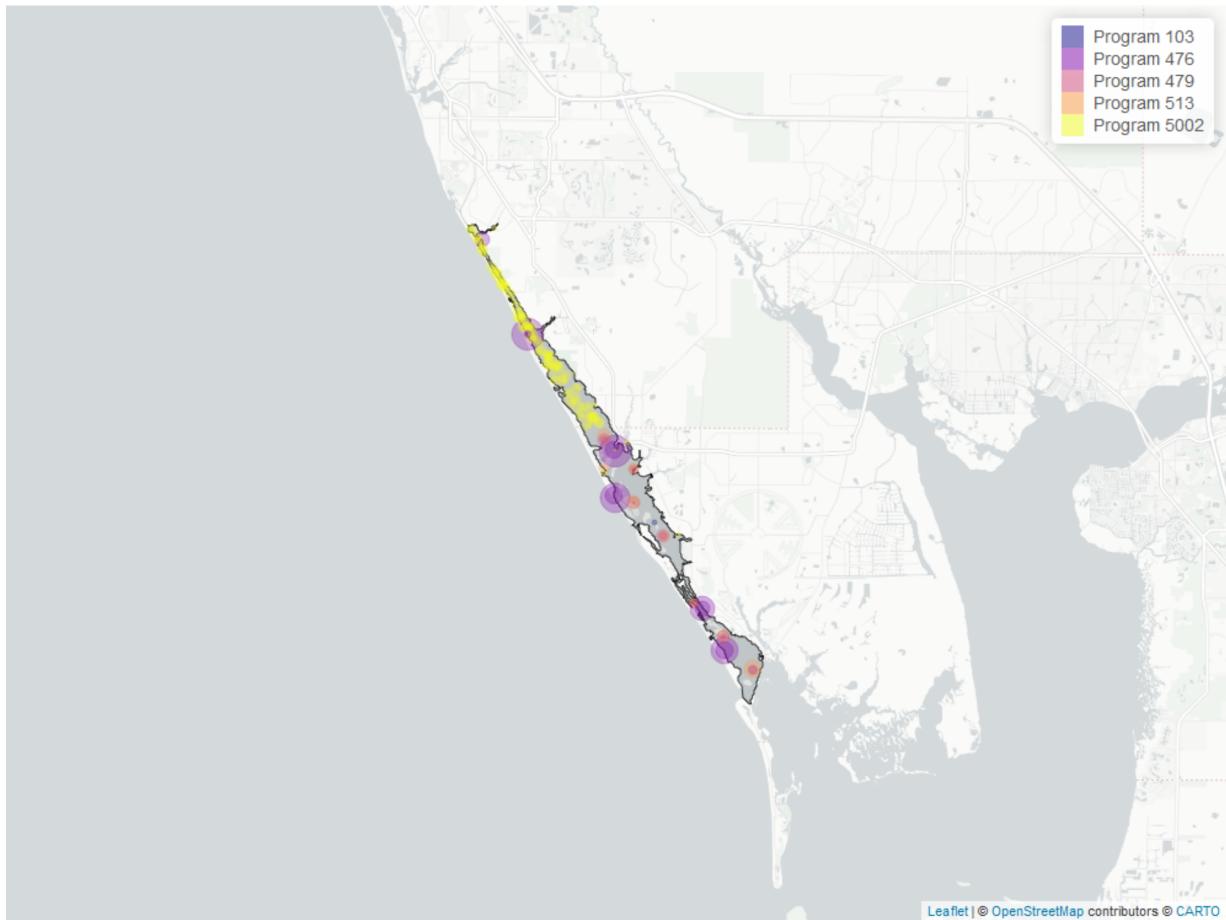


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	2579	29	0.545	TRUE	-0.0895	0.0267	-0.002146032	0.5762212	4.957	0.9332	-1

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 17: Programs contributing data for Total Nitrogen

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
5002	1272	1995	2024
476	931	1998	2024
479	194	2007	2021
513	181	2001	2009
103	4	2005	2005

Program names:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

479 - Southwest Florida Water Management District - Water Quality Monitoring

513 - Coastal Charlotte Harbor Monitoring 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 18: Value Qualifiers for Total Nitrogen

<i>Year</i>	<i>N_Total</i>	<i>N_I</i>	<i>perc_I</i>	<i>N_U</i>	<i>perc_U</i>
2001	82			1	1.2
2002	102			2	2.0
2004	99			3	3.0
2005	113			2	1.8
2006	131	5	3.8	1	0.8
2007	155	1	0.7		

Note: ¹**I** - Reported value is greater than or equal to lab method detection limit, but less than quantitation limit ²**U** - Compound was analyzed for but not detected

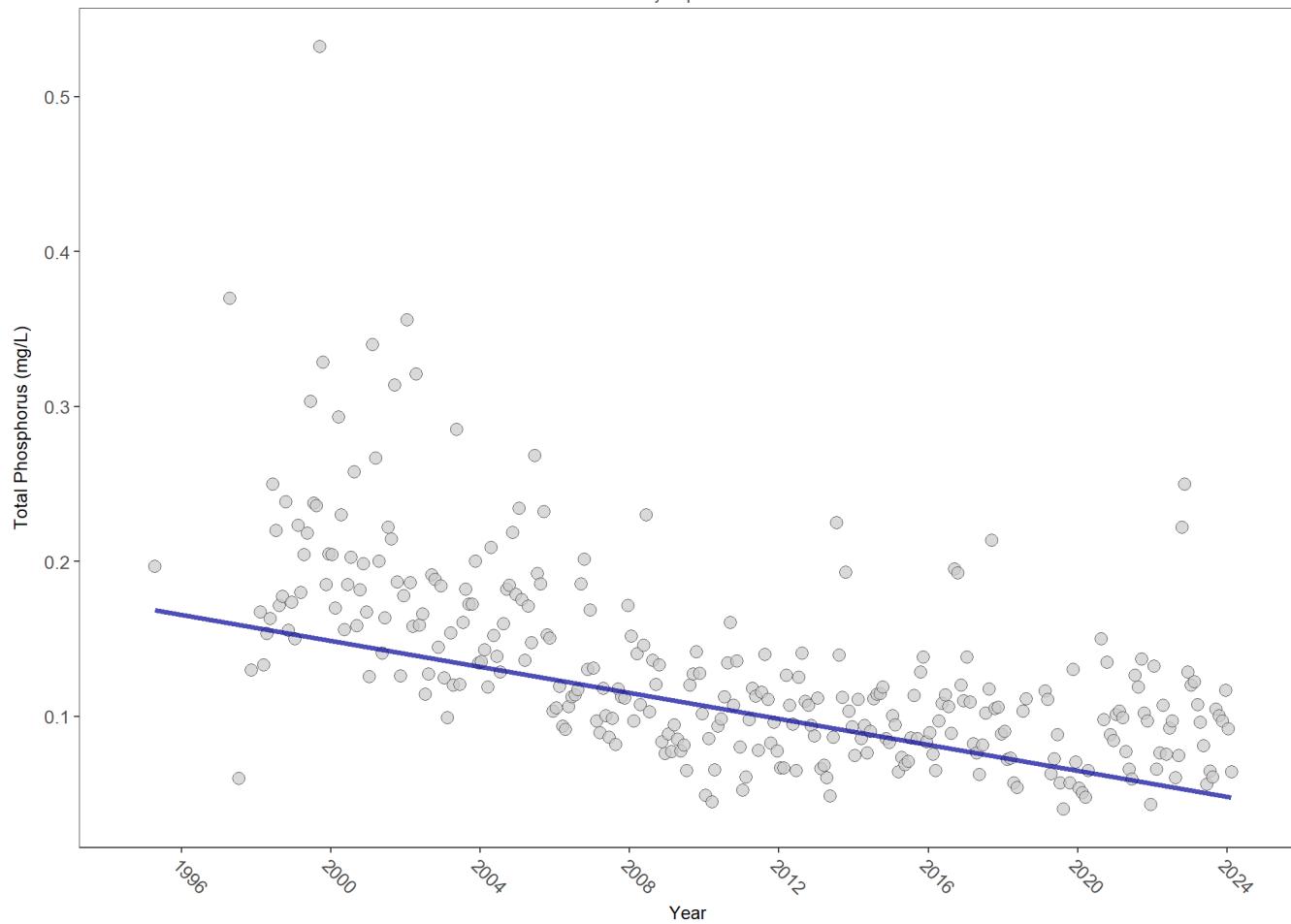
Programs containing Value Qualified data:

513 - Coastal Charlotte Harbor Monitoring Network

Total Phosphorus - Discrete Water Quality

Seasonal Kendall-Tau Trend Analysis

Total Phosphorus, Lab, All Depths
Lemon Bay Aquatic Preserve

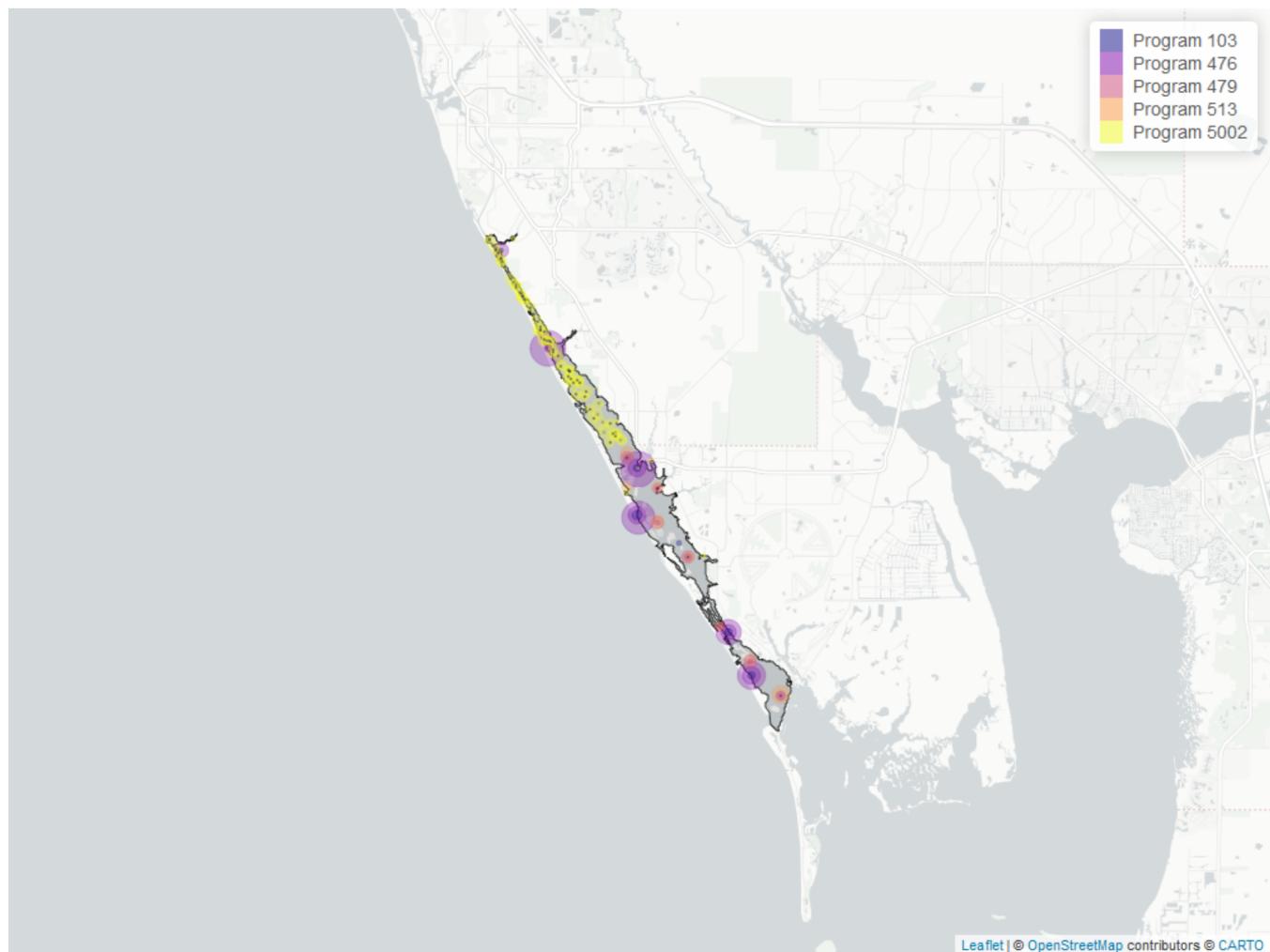


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	2738	29	0.1	TRUE	-0.4704	0.0000	-0.0042	0.1700357	6.0992	0.8667	-1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Total Phosphorus



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

Table 19: Programs contributing data for Total Phosphorus

ProgramID	N_Data	YearMin	YearMax
5002	1263	1995	2024
476	1038	1998	2024
479	195	2007	2021
513	184	2001	2009
103	124	2005	2022

Program names:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

479 - Southwest Florida Water Management District - Water Quality Monitoring

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 20: Value Qualifiers for Total Phosphorus

Year	N_{Total}	N_I	$perc_I$	N_Q	$perc_Q$	N_U	$perc_U$
1998	56	20	35.7	1	1.8		
1999	74	11	14.9	4	5.4		
2000	69	9	13.0				
2001	83	9	10.8	3	3.6	1	1.2
2002	104	15	14.4			8	7.7
2003	115	19	16.5			10	8.7
2004	105	32	30.5	5	4.8	2	1.9
2005	123	36	29.3	1	0.8		
2006	138	62	44.9			1	0.7
2007	171	96	56.1			6	3.5
2008	159	34	21.4			2	1.3
2009	121	47	38.8			3	2.5
2010	114	37	32.5			10	8.8
2011	114	45	39.5			8	7.0
2012	129	41	31.8			4	3.1
2013	126	39	31.0			4	3.2
2014	130	49	37.7				
2015	126	47	37.3			2	1.6
2016	101	46	45.5				
2017	75	32	42.7			5	6.7
2020	83	18	21.7			1	1.2
2021	215	43	20.0			4	1.9
2022	84	39	46.4			1	1.2
2023	100	49	49.0			4	4.0
2024	8					4	50.0

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:

5002 - Florida STORET / WIN

513 - Coastal Charlotte Harbor Monitoring Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

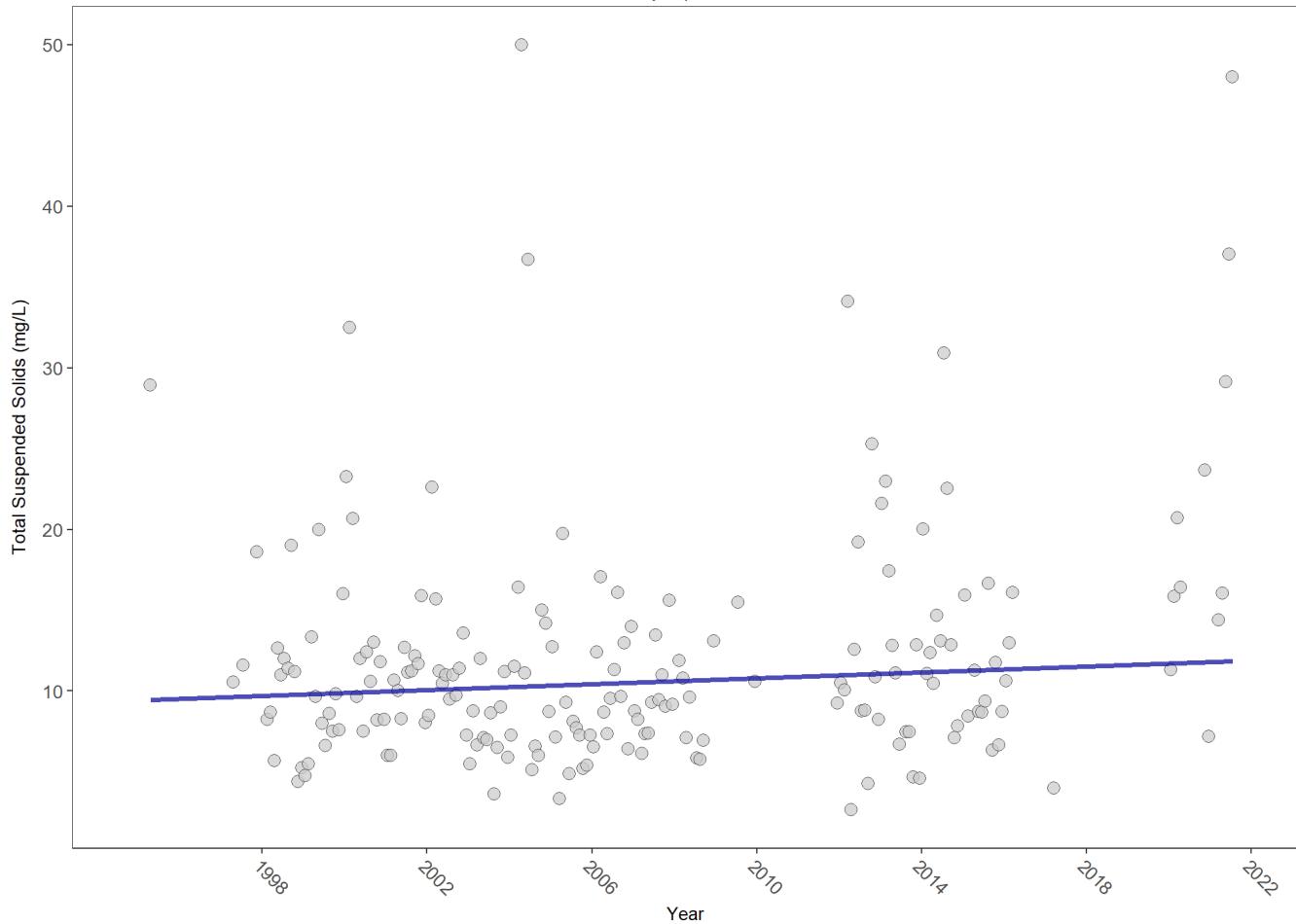
479 - Southwest Florida Water Management District - Water Quality Monitoring

Total Suspended Solids - Discrete Water Quality

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

Seasonal Kendall-Tau Trend Analysis

Total Suspended Solids, Lab and Field Combined, All Depths
Lemon Bay Aquatic Preserve

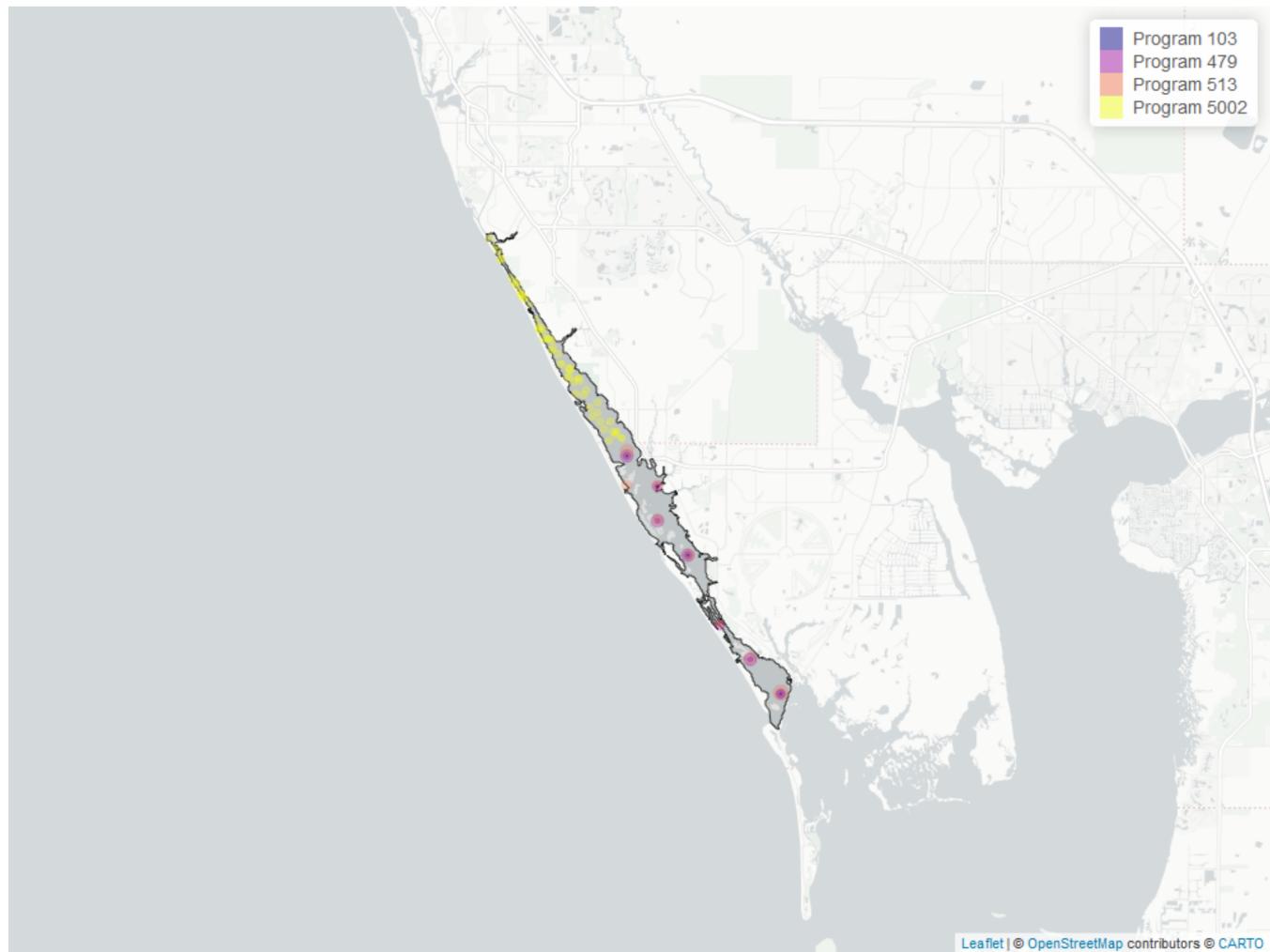


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	868	23	9	TRUE	0.0739	0.1523	0.09089286	9.429735	9.2375	0.6	0

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 21: Programs contributing data for Total Suspended Solids

ProgramID	N_Data	YearMin	YearMax
5002	504	1995	2017
479	195	2007	2021
513	172	2001	2009
103	4	2020	2020

Program names:

5002 - Florida STORET / WIN

479 - Southwest Florida Water Management District - Water Quality Monitoring

513 - Coastal Charlotte Harbor Monitoring 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 22: Value Qualifiers for Total Suspended Solids

<i>Year</i>	<i>N_Total</i>	<i>N_I</i>	<i>perc_I</i>	<i>N_Q</i>	<i>perc_Q</i>	<i>N_U</i>	<i>perc_U</i>
1998	43	16	37.2				
1999	47	21	44.7				
2000	47	10	21.3				
2001	69	19	27.5				
2002	61	13	21.3				
2003	74	21	28.4	2	2.7	8	10.8
2004	69	15	21.7			6	8.7
2005	75	33	44.0	1	1.3	2	2.7
2006	81	25	30.9				
2007	83	23	27.7				
2017	1	1	100.0				
2021	17			4	23.5		

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 ³**U** - Compound was analyzed for but not detected

Programs containing Value Qualified data:

5002 - Florida STORET / WIN

513 - Coastal Charlotte Harbor Monitoring Network

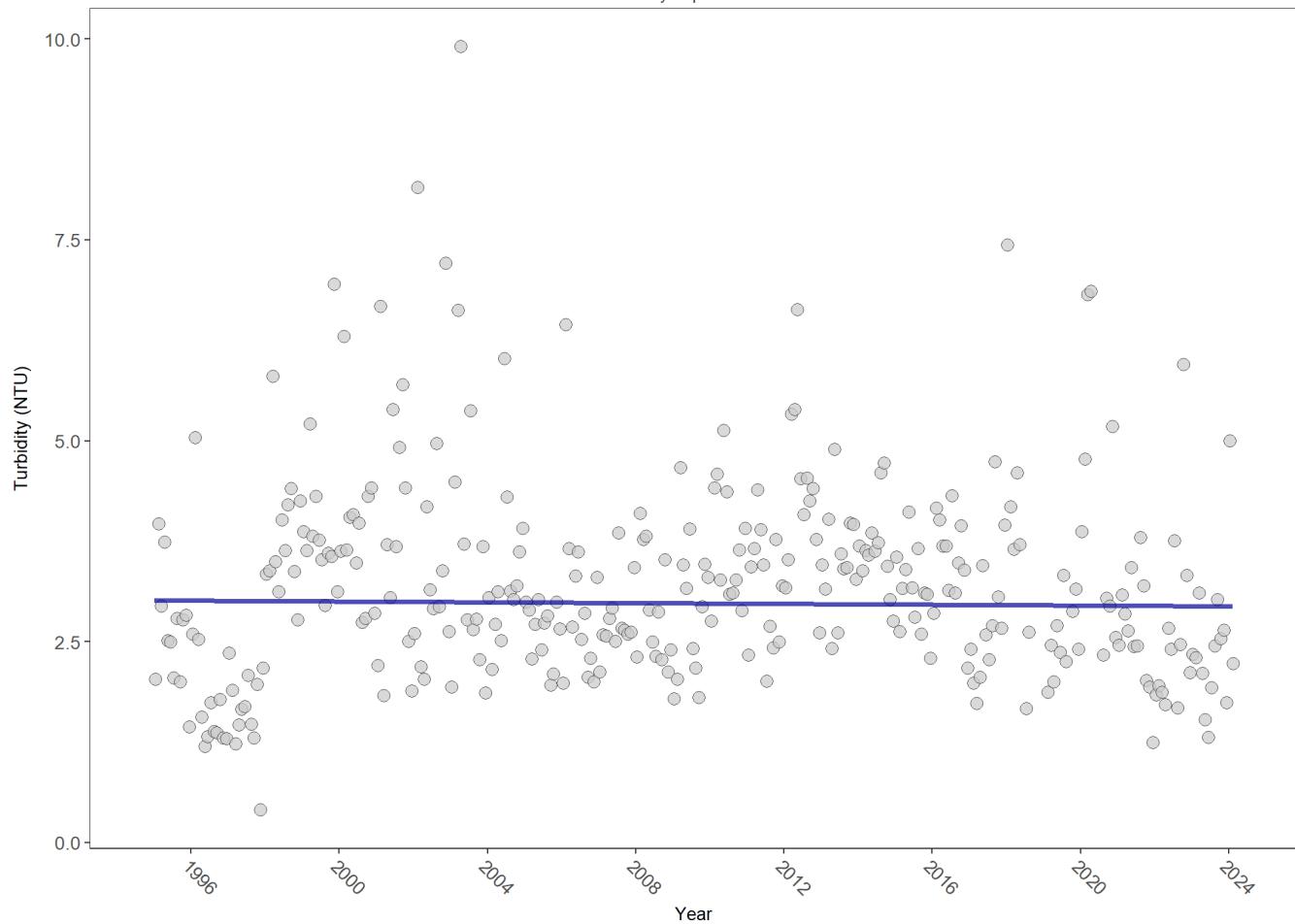
479 - Southwest Florida Water Management District - Water Quality Monitoring

Turbidity - Discrete Water Quality

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

Seasonal Kendall-Tau Trend Analysis

Turbidity, Lab and Field Combined, All Depths
Lemon Bay Aquatic Preserve

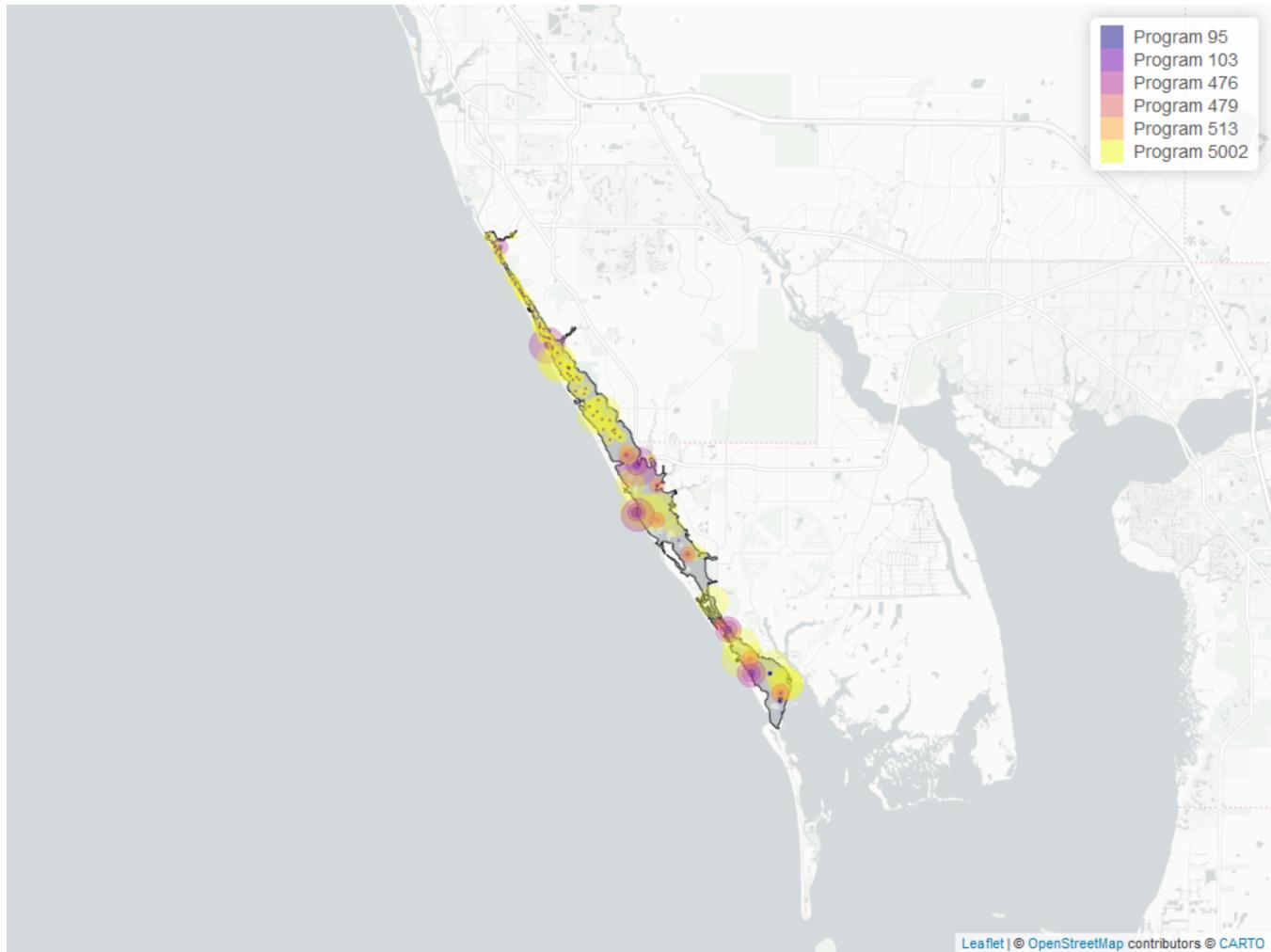


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	5829	30	2.6	TRUE	-0.0099	0.7710	-0.002465986	3.012996	11.0944	0.4354	0

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 Turbidity



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

Table 23: Programs contributing data for Turbidity

ProgramID	N_Data	YearMin	YearMax
5002	4147	1995	2024
476	1074	1998	2024
479	321	2001	2021
513	185	2001	2009
103	123	2005	2022
95	14	2003	2004

Program names:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

479 - Southwest Florida Water Management District - Water Quality Monitoring

513 - Coastal Charlotte Harbor Monitoring Network
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)
 95 - Harmful Algal Bloom Marine Observation 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 Turbidity

Year	N_{Total}	N_I	$perc_I$	N_Q	$perc_Q$	N_U	$perc_U$
2000	296			2	0.7		
2003	235			1	0.4	4	1.7
2004	247	13	5.3			1	0.4
2006	232					1	0.4
2007	318					1	0.3
2009	309			2	0.7		
2010	391			6	1.5		
2011	332			5	1.5		
2016	101			4	4.0		
2022	98	1	1.0	2	2.0		
2023	117	5	4.3				
2024	10			3	30.0		

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:

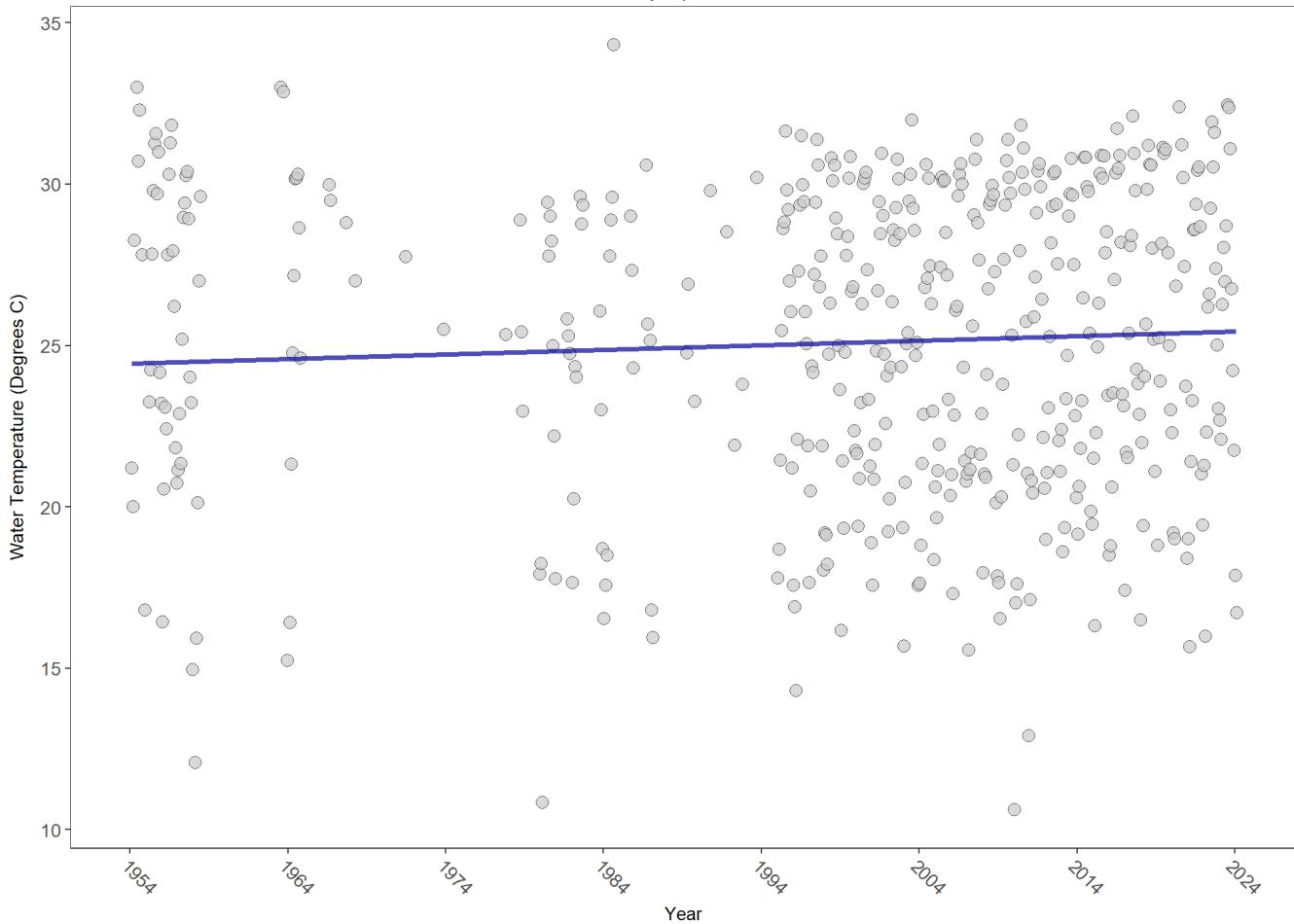
476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network
 5002 - Florida STORET / WIN
 513 - Coastal Charlotte Harbor Monitoring Network

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

Water Temperature, Field, All Depths
Lemon Bay Aquatic Preserve

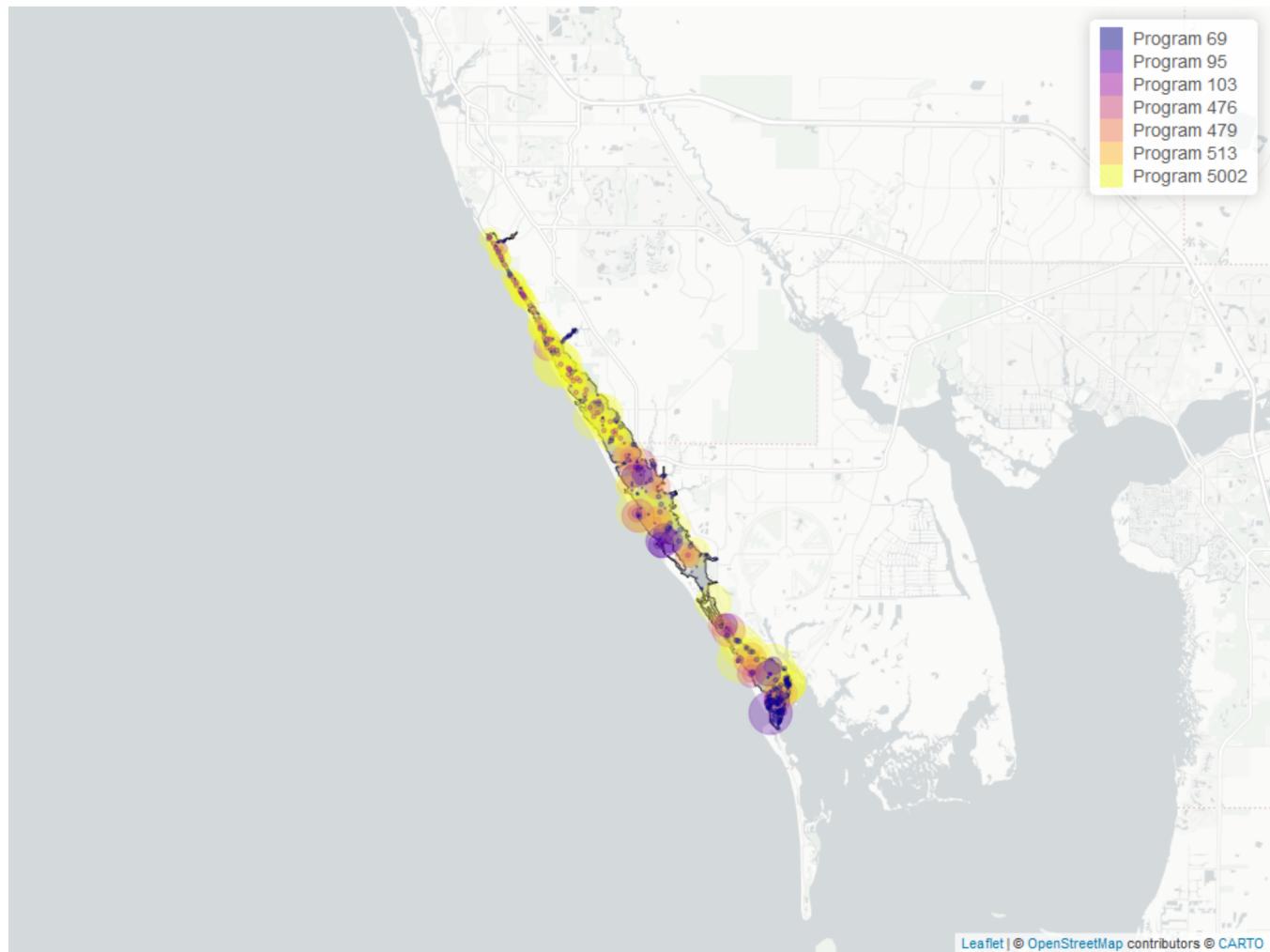


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	13732	58	26.4	TRUE	0.1039	0.0009	0.01413238	24.45097	16.6598	0.1183	1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Water Temperature



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

Table 25: Programs contributing data for Water Temperature

ProgramID	N_Data	YearMin	YearMax
5002	8876	1995	2024
95	1330	1954	2018
476	1030	1998	2024
479	982	2001	2021
69	877	1989	2022
513	407	2001	2009
103	232	2020	2022

Program names:

5002 - Florida STORET / WIN

95 - Harmful Algal Bloom Marine Observation Network

- 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network
- 479 - Southwest Florida Water Management District - Water Quality Monitoring
- 69 - Fisheries-Independent Monitoring (FIM) Program
- 513 - Coastal Charlotte Harbor Monitoring Network
- 103 - EPA STOrage and RETrieval Data Warehouse (STORET)

There are no qualifying Value Qualifiers for Water Temperature in Lemon Bay Aquatic Preserve

Submerged Aquatic Vegetation

The data file used is: All_SAV_Parameters-2024-Jul-02.txt

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

Parameters

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

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

Species

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

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

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

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

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

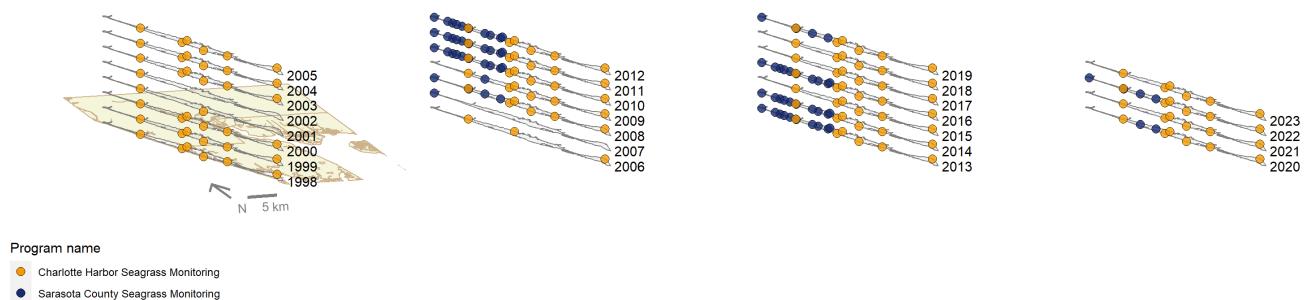
Notes

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

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

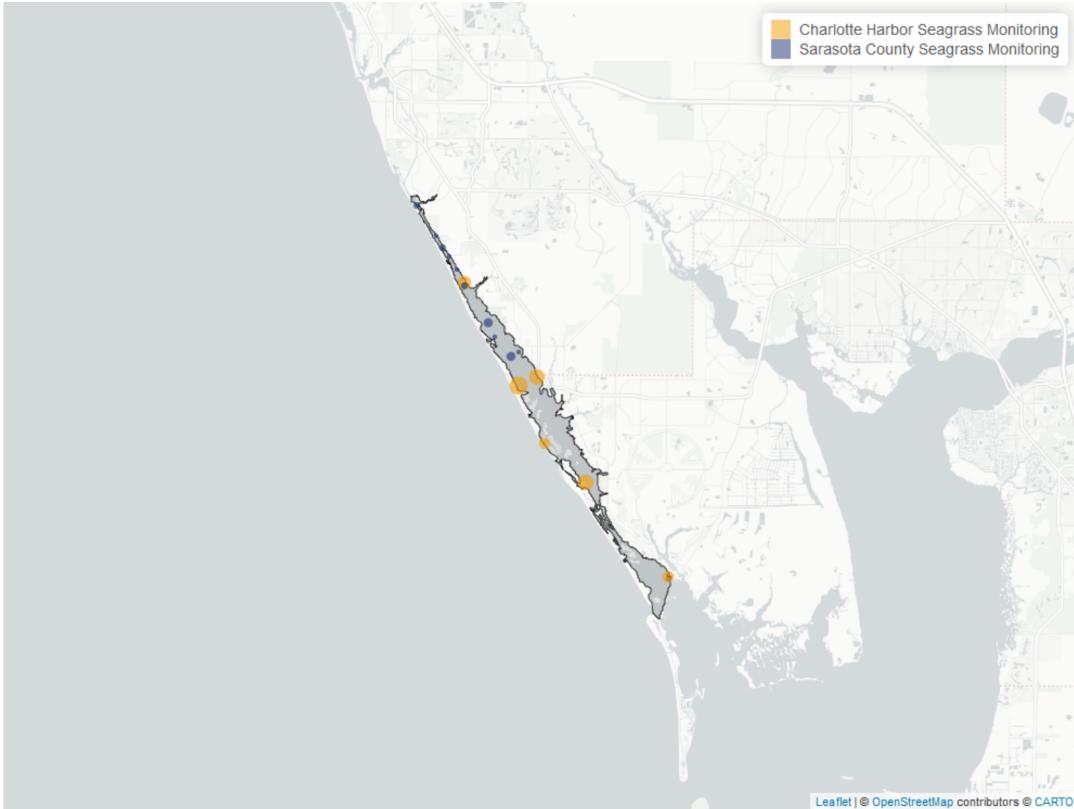
- Biscayne Bay Aquatic Preserve
- Florida Keys National Marine Sanctuary

Lemon Bay Aquatic Preserve
SAV Percent Cover - Sample Locations



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

Sampling locations by Program:



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

Table 26: Charlotte Harbor Seagrass Monitoring - *Program 570*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
2113	1998	2023	Braun Blanquet	6

Table 27: Sarasota County Seagrass Monitoring - *Program 568*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
716	2007	2022	Percent Cover	10



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

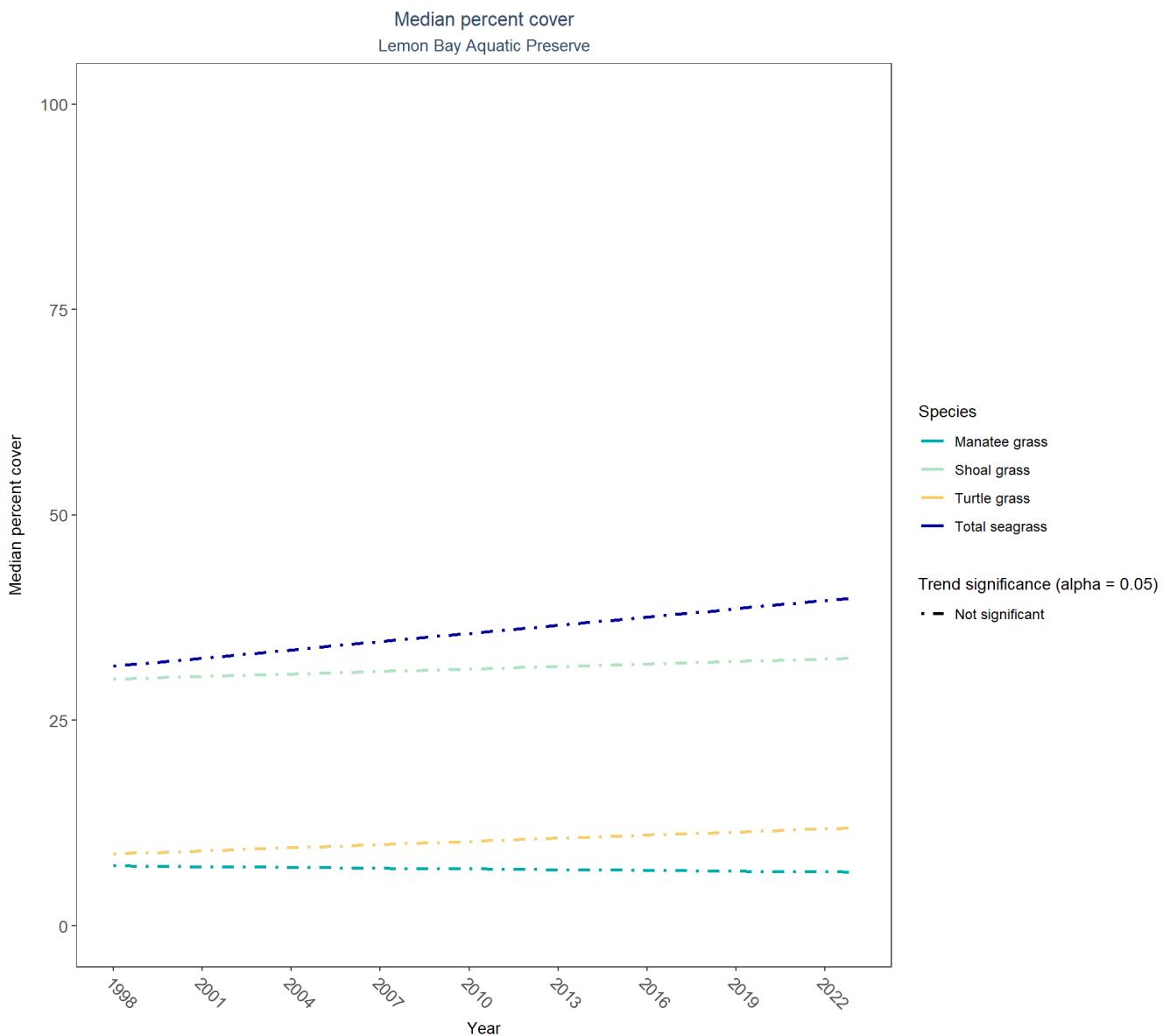
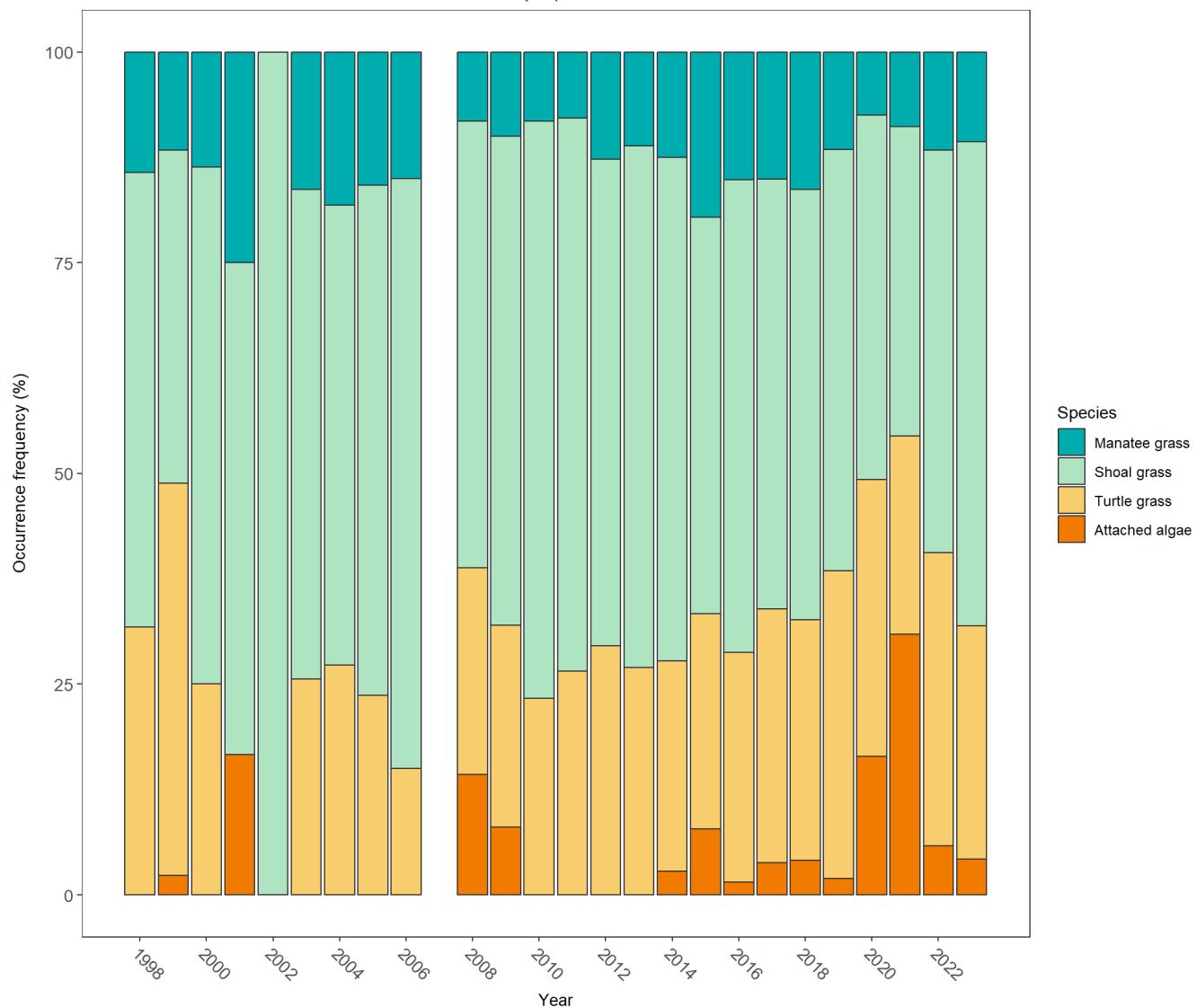


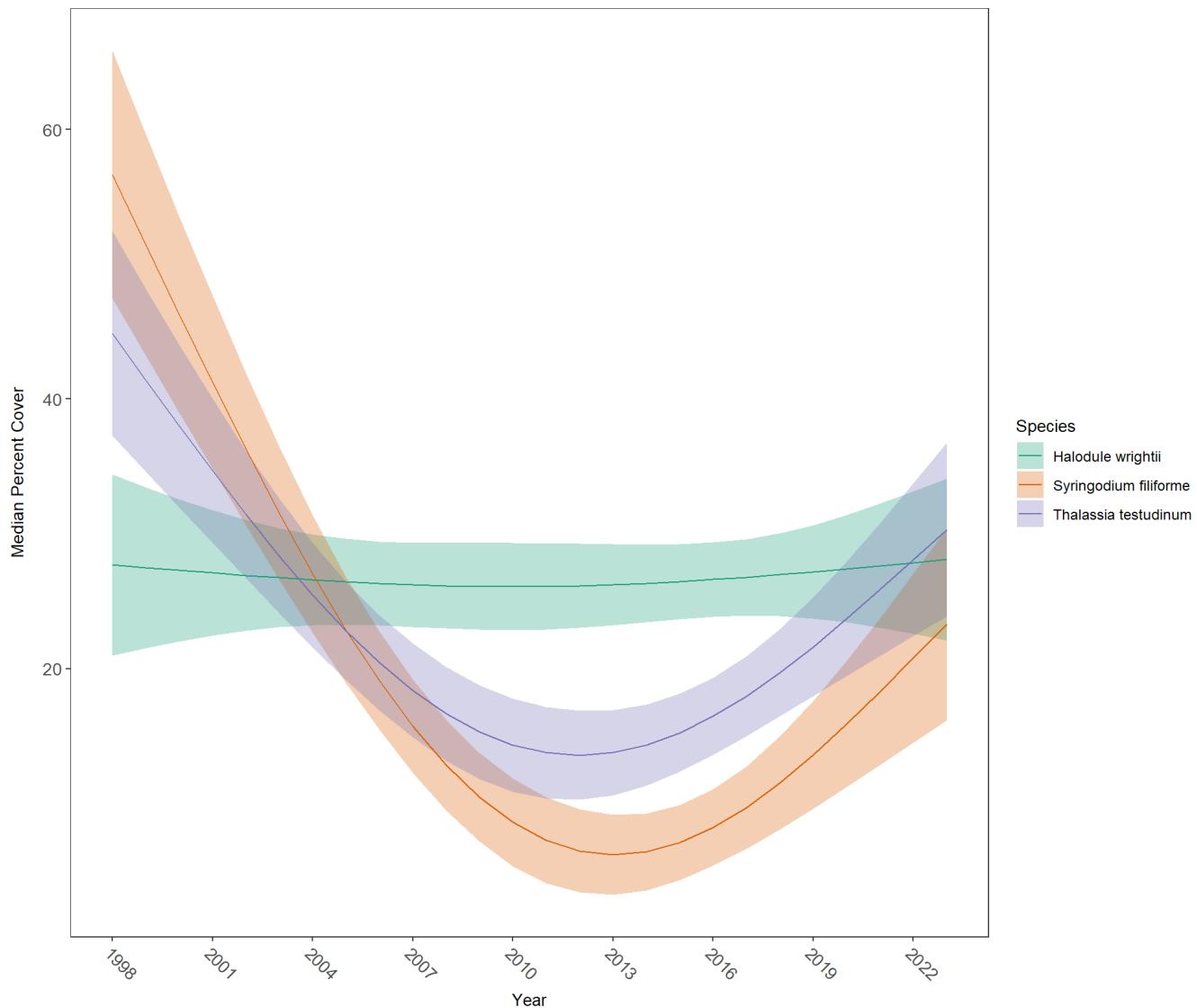
Table 28: Percent Cover Trend Analysis for Lemon Bay Aquatic Preserve

Species	Common Name	Trend Significance (0.05)	Period of Record	LME-Intercept	LME-Slope	p
Attached algae		No significant trend	1999 - 2023	-1.5680	0.4932	0.2421
Drift algae		Significantly decreasing trend	1999 - 2023	22.6455	-0.5528	0.0242
Halodule wrightii	Shoal grass	No significant trend	1998 - 2023	29.6399	0.1013	0.5726
No grass In Quadrat		Model did not fit the available data	1998 - 2023			
Syringodium filiforme	Manatee grass	No significant trend	1998 - 2023	7.4180	-0.0304	0.9119
Thalassia testudinum	Turtle grass	No significant trend	1998 - 2023	8.2359	0.1274	0.7929
Total seagrass		No significant trend	1998 - 2023	30.2821	0.3321	0.3908

Frequency of occurrence
Lemon Bay Aquatic Preserve



Median Percent Cover for seagrass species
Lemon Bay Aquatic Preserve

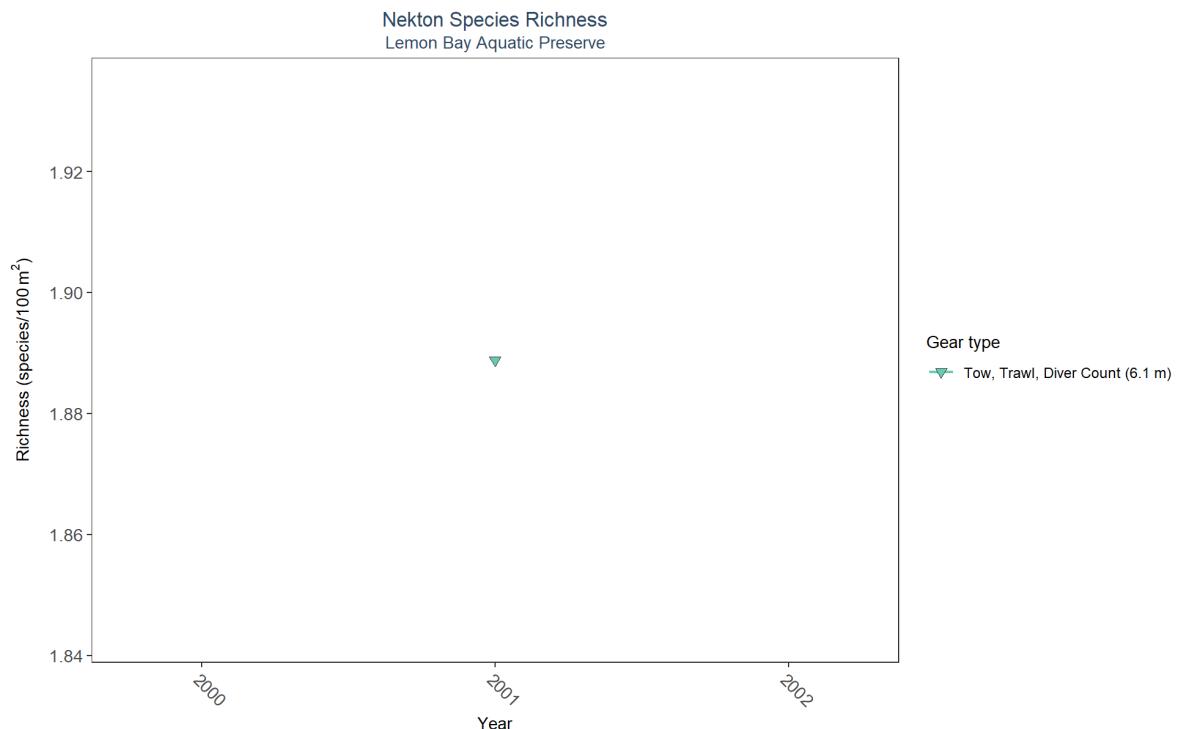


Generalized additive models for each species in Lemon Bay Aquatic Preserve. Species must have at least 10 years of data to be evaluated.

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-Jul-02.txt



GearType	GearSize_m	N_Years	EarliestYear	LatestYear	N_Data	Min	Max	Median	Mean	StDev	Year_MinRichness	Year_MaxRichness
Tow, Trawl, Diver Count	6.1	1	2001	2001	3	1.42	2.29	1.96	1.89	0.44	2001	2001