

# Matlacha Pass Aquatic Preserve

## SEACAR Habitat Analyses

Last compiled on 03 September, 2024

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## Threshold Filtering

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

Table 1: Continuous Water Quality threshold values

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

Table 2: Discrete Water Quality threshold values

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

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

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

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

## Value Qualifiers

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

### STORET and WIN value qualifier codes

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

Table 4: Value Qualifier codes excluded from analysis

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

### Discrete Water Quality Value Qualifiers

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

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

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

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

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

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

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

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

Table 5: SWMP Value Qualifier codes

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

## Water Column

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

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

## Seasonal Kendall-Tau Analysis

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

## Water Quality - Discrete

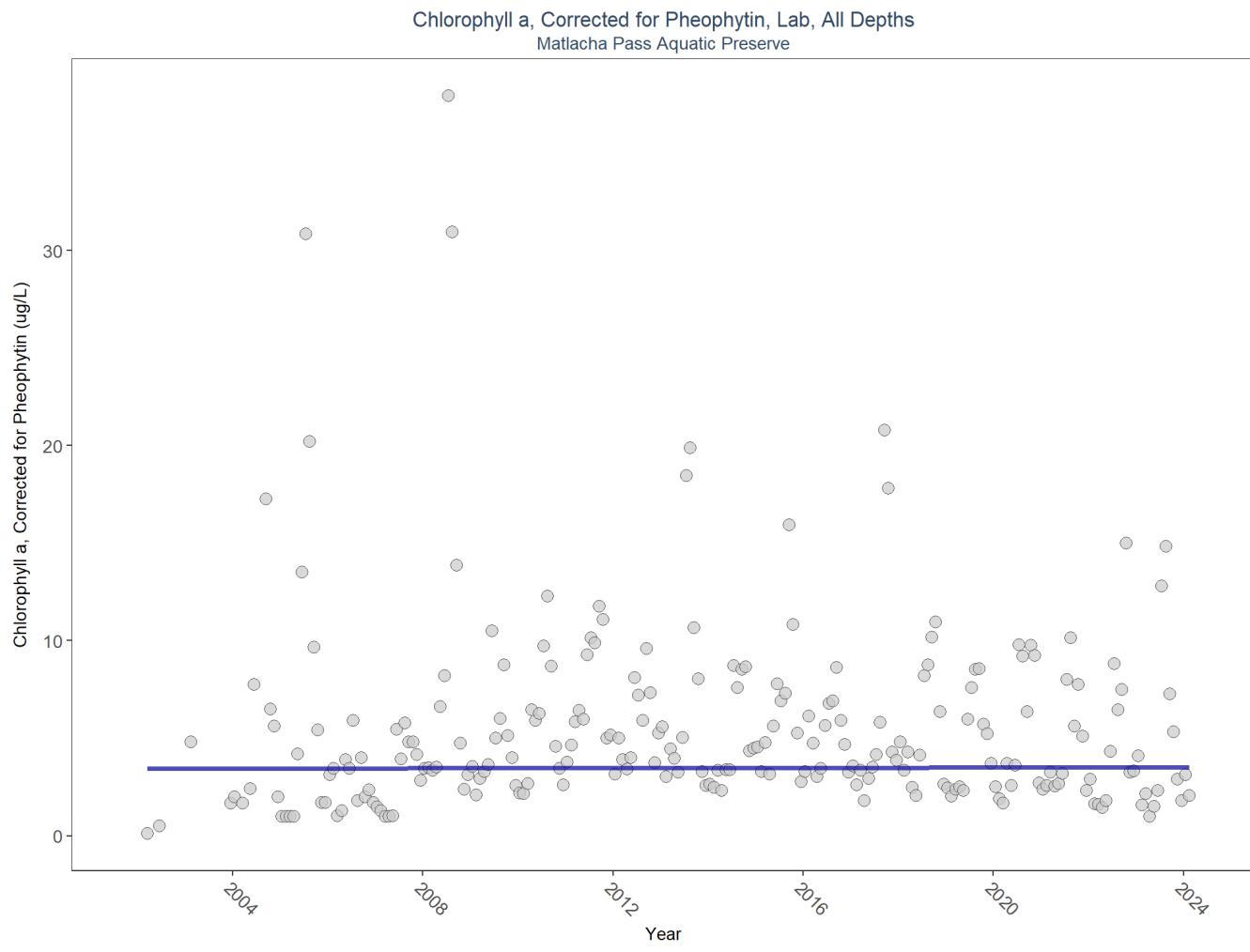
The following files were used in the discrete analysis:

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

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

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

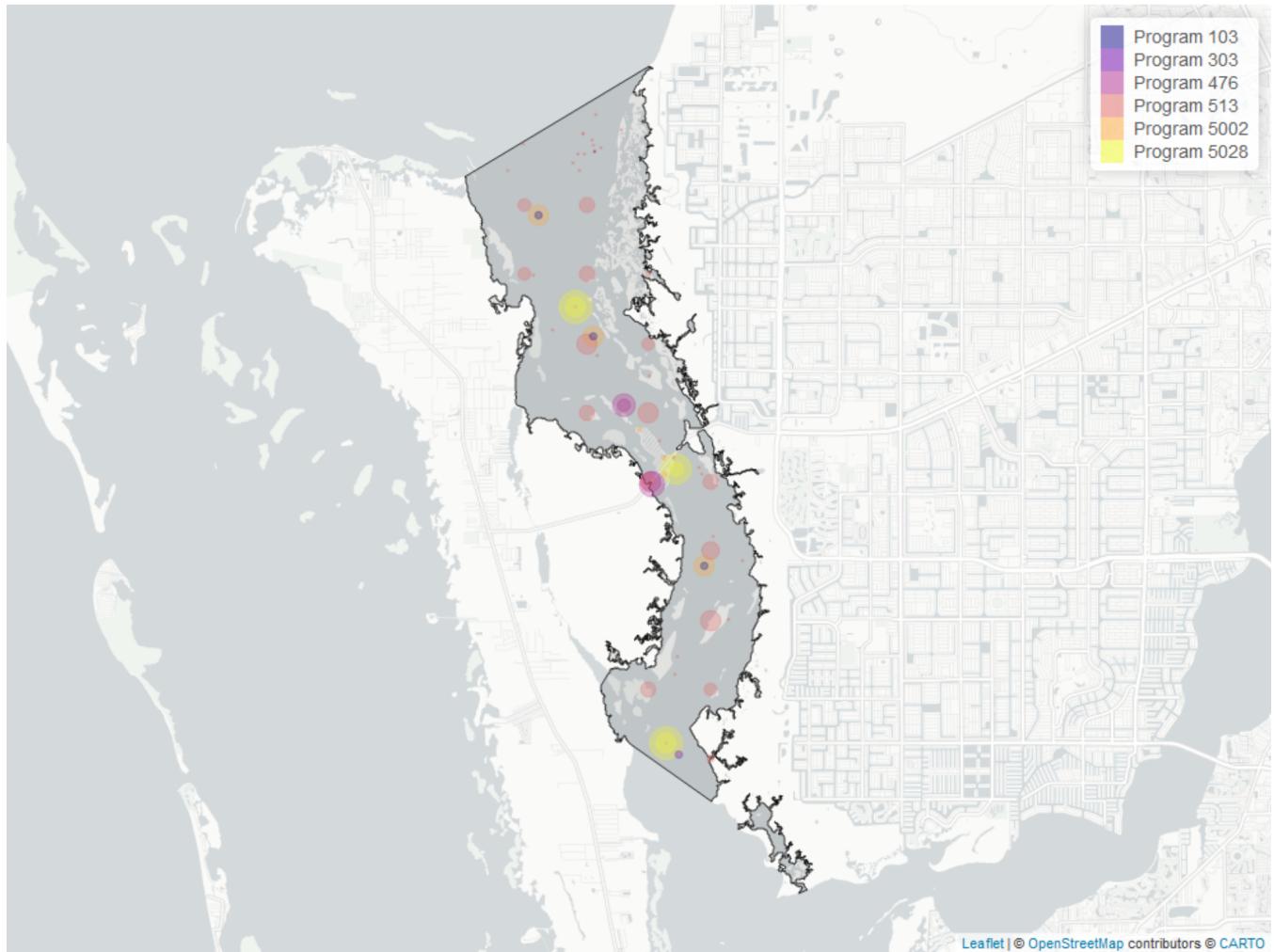
### Seasonal Kendall-Tau Trend Analysis



$p < 0.00005$  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
5028	639	2007	2024
513	604	2002	2023
476	261	2008	2024
5002	221	2005	2024
103	28	2020	2021
303	7	2019	2019

#### Program names:

5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program

513 - Coastal Charlotte Harbor Monitoring Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

5002 - Florida STORET / WIN

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

303 - River, Estuary and Coastal Observing Network

### Value Qualifiers

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

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

Year	$N_{Total}$	$N_I$	$perc_I$	$N_Q$	$perc_Q$	$N_U$	$perc_U$
2002	7					7	100.0
2003	8					2	25.0
2004	31					2	6.4
2005	59					15	25.4
2006	50					6	12.0
2007	69	2	2.9			16	23.2
2008	119	6	5.0			5	4.2
2009	124	7	5.7	4	3.2		
2010	126	5	4.0	1	0.8	1	0.8
2011	91	1	1.1			1	1.1
2012	102					6	5.9
2013	99					6	6.1
2014	86	2	2.3	1	1.2	9	10.5
2015	82	4	4.9			8	9.8
2016	92	1	1.1	2	2.2	14	15.2
2017	56	2	3.6				
2018	87	10	11.5				
2019	110	25	22.7				
2020	75	16	21.3				
2021	120	25	20.8				
2022	76	28	36.8			9	11.8
2023	80	39	48.8			7	8.8
2024	11	8	72.7			1	9.1

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

- Sample held beyond the accepted holding time <sup>3</sup>U - Compound was analyzed for but not detected

### Programs containing Value Qualified data:

513 - Coastal Charlotte Harbor Monitoring Network

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

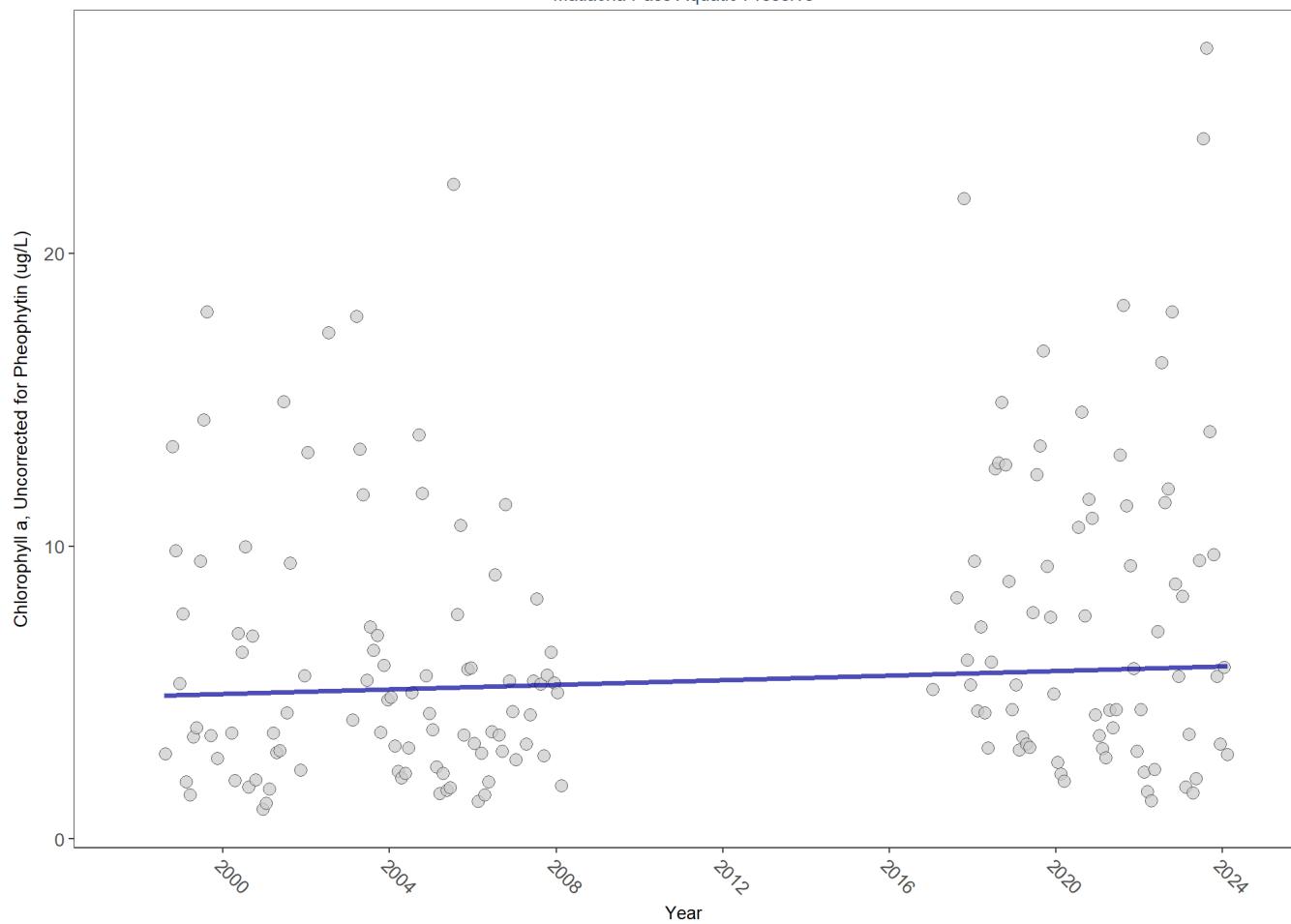
5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program

303 - River, Estuary and Coastal Observing Network

# Chlorophyll a, Uncorrected for Pheophytin - Discrete Water Quality

## Seasonal Kendall-Tau Trend Analysis

Chlorophyll a, Uncorrected for Pheophytin, Lab, All Depths  
Matlacha Pass Aquatic Preserve

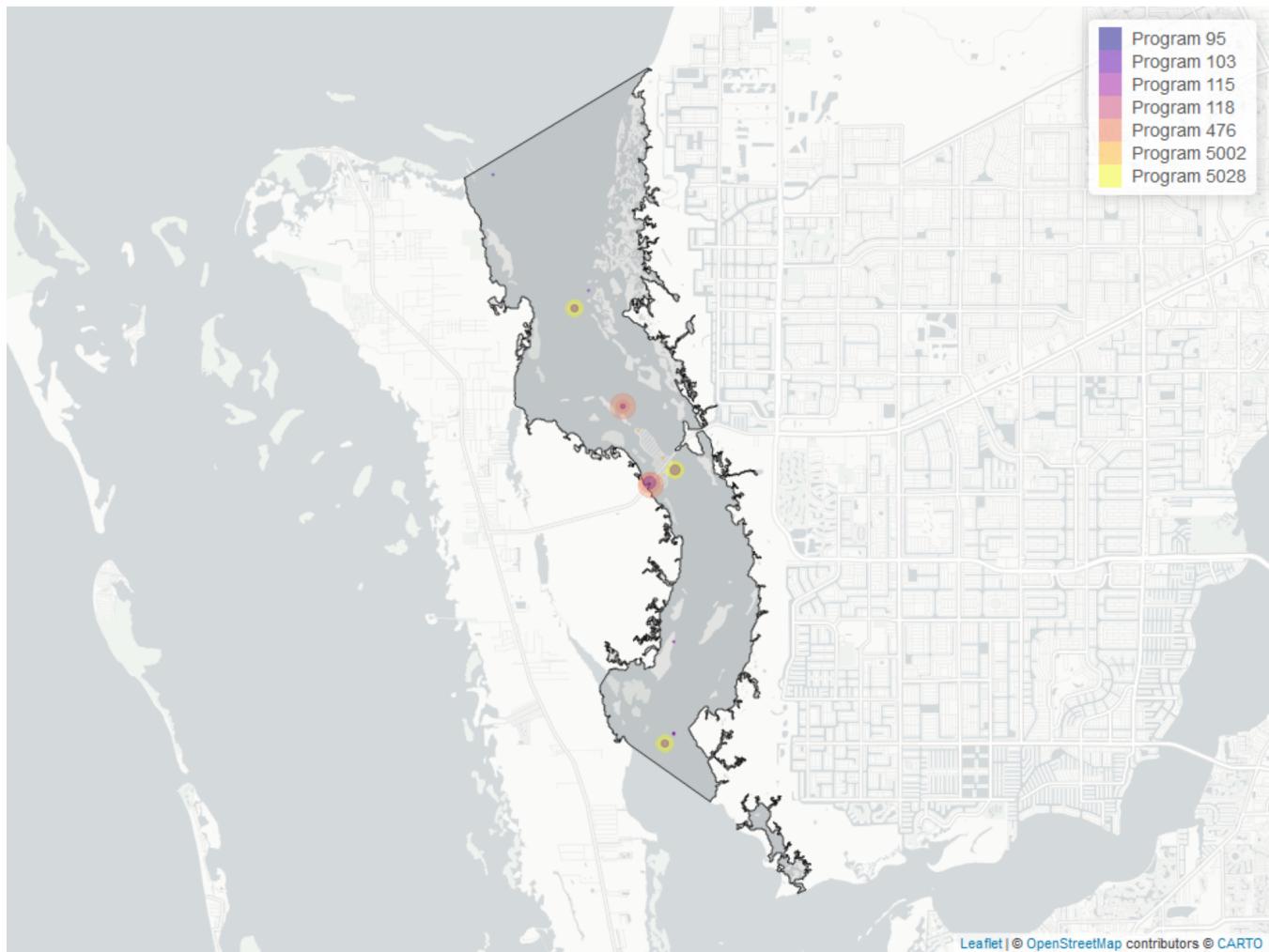


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	578	19	4.755	TRUE	0.1128	0.0417	0.03960784	4.873975	15.3416	0.1674	1

*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	284	1998	2024
5028	241	2017	2024
103	77	2001	2022
5002	6	2005	2005
118	2	2001	2005
95	1	2013	2013
115	1	2001	2001

**Program names:**

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
 5002 - Florida STORET / WIN  
 118 - National Aquatic Resource Surveys, National Coastal Condition Assessment  
 95 - Harmful Algal Bloom Marine Observation Network  
 115 - Environmental Monitoring Assessment Program

### Value Qualifiers

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

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

Year	$N_{Total}$	$N_I$	$perc_I$	$N_U$	$perc_U$
1999	22			2	9.1
2001	27			4	14.8
2003	23			1	4.3
2004	21	1	4.8	1	4.8
2005	32	1	3.1	4	12.5
2006	25			4	16.0
2007	23	9	39.1	2	8.7
2008	4	2	50.0		
2019	53	1	1.9		
2020	41	3	7.3		
2021	120	5	4.2		
2022	49	8	16.3	1	2.0
2023	46	8	17.4		
2024	8	3	37.5		

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

### Programs containing Value Qualified data:

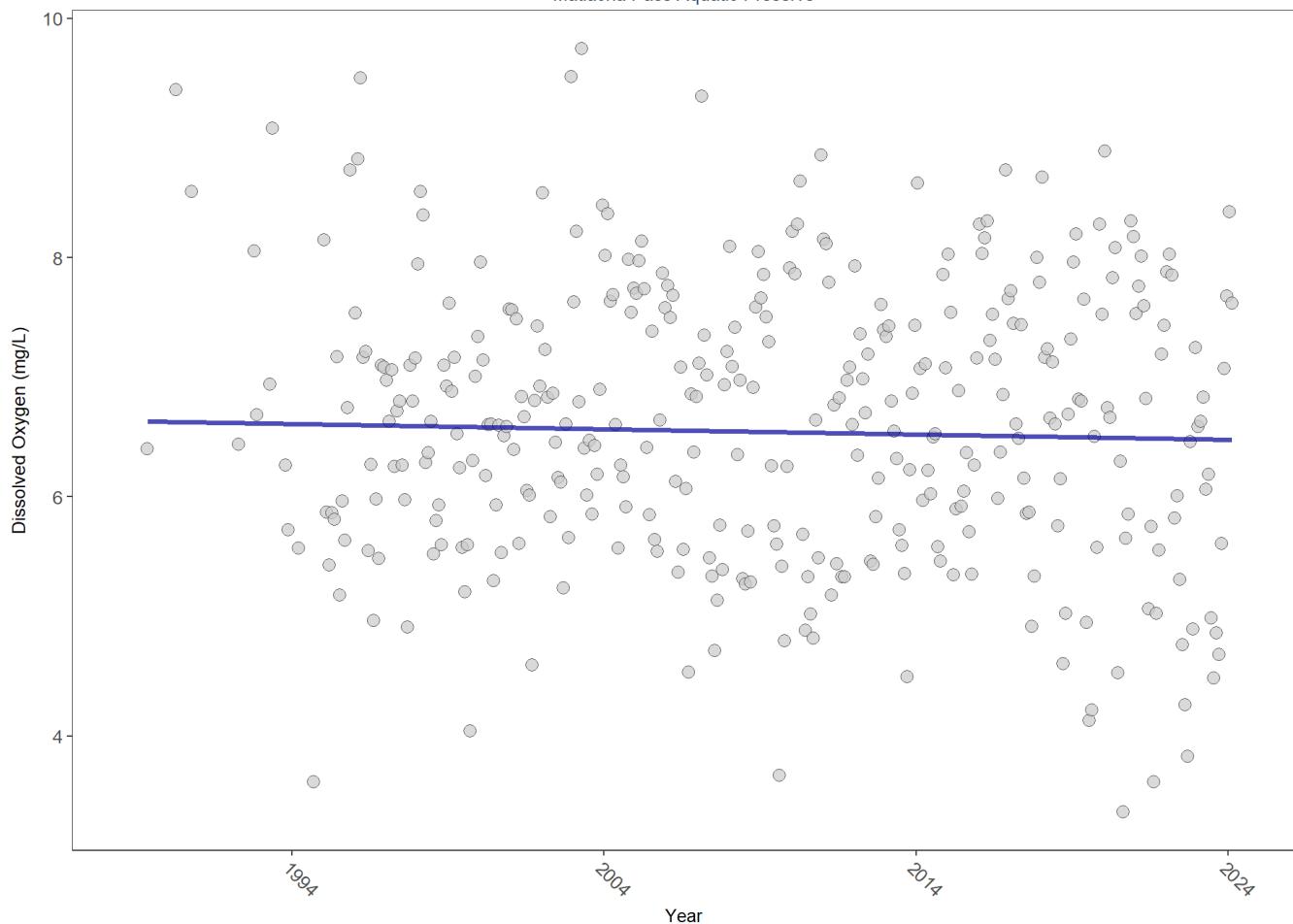
5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program  
 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
 5002 - Florida STORET / WIN

### 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  
Matlacha Pass Aquatic Preserve

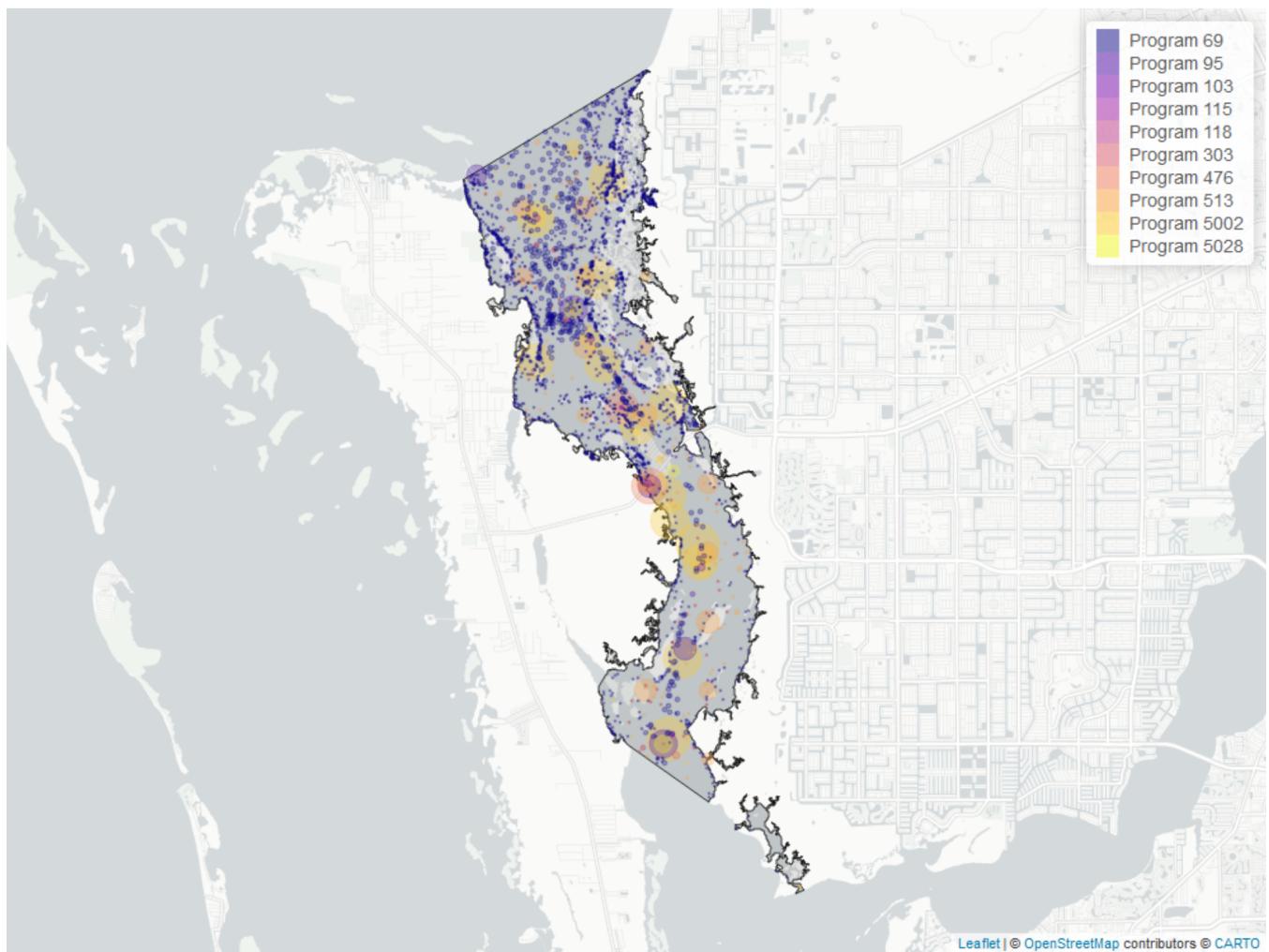


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	11017	35	6.6	TRUE	-0.0305	0.4129	-0.004397277	6.632621	17.9512	0.0827	0

*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



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
69	5547	1989	2022
5002	3112	1995	2024
513	1194	2002	2024
95	499	1996	2018
476	462	1998	2024
5028	136	2007	2024
103	121	2020	2022
303	7	2019	2019
115	5	2001	2001
118	2	2001	2005

**Program names:**

69 - Fisheries-Independent Monitoring (FIM) Program  
5002 - Florida STORET / WIN  
513 - Coastal Charlotte Harbor Monitoring Network  
95 - Harmful Algal Bloom Marine Observation Network  
476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program  
103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
303 - River, Estuary and Coastal Observing Network  
115 - Environmental Monitoring Assessment Program  
118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

### Value Qualifiers

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

Table 11: Value Qualifiers for Dissolved Oxygen

Year	$N_{Total}$	$N_H$	$perc_H$
2008	463	8	1.7

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

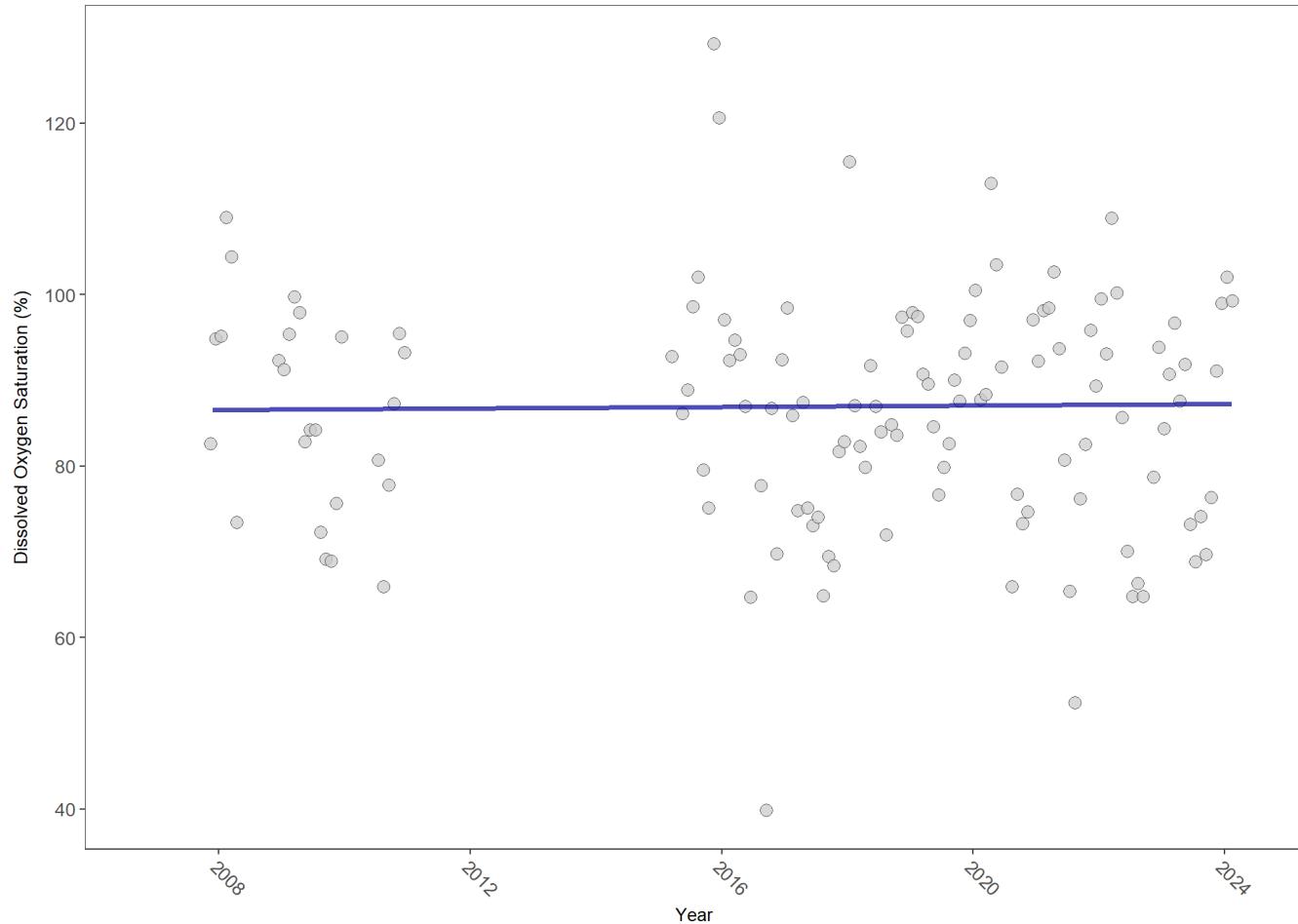
### Programs containing Value Qualified data:

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  
Matlacha Pass Aquatic Preserve

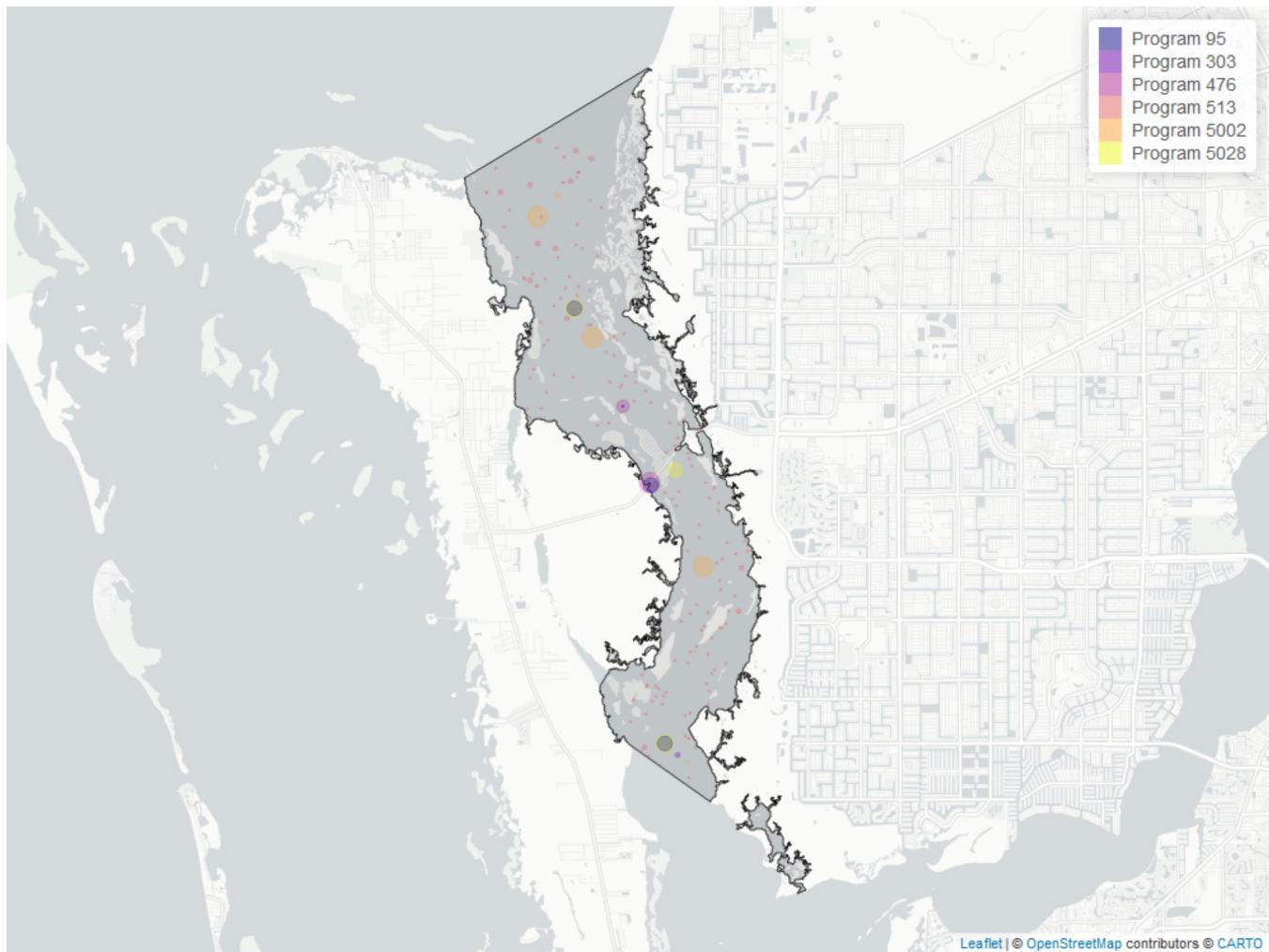


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	801	14	88.3	TRUE	0.0214	0.6795	0.04166667	86.55035	10.6956	0.4691	0

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

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

Map showing location of Discrete sampling sites for Dissolved Oxygen Saturation



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

Table 12: Programs contributing data for Dissolved Oxygen Saturation

ProgramID	N_Data	YearMin	YearMax
513	267	2020	2024
5002	204	2018	2024
5028	139	2007	2024
95	120	2008	2018
476	81	2017	2024
303	5	2019	2019

#### Program names:

513 - Coastal Charlotte Harbor Monitoring Network

5002 - Florida STORET / WIN

5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program

95 - Harmful Algal Bloom Marine Observation Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

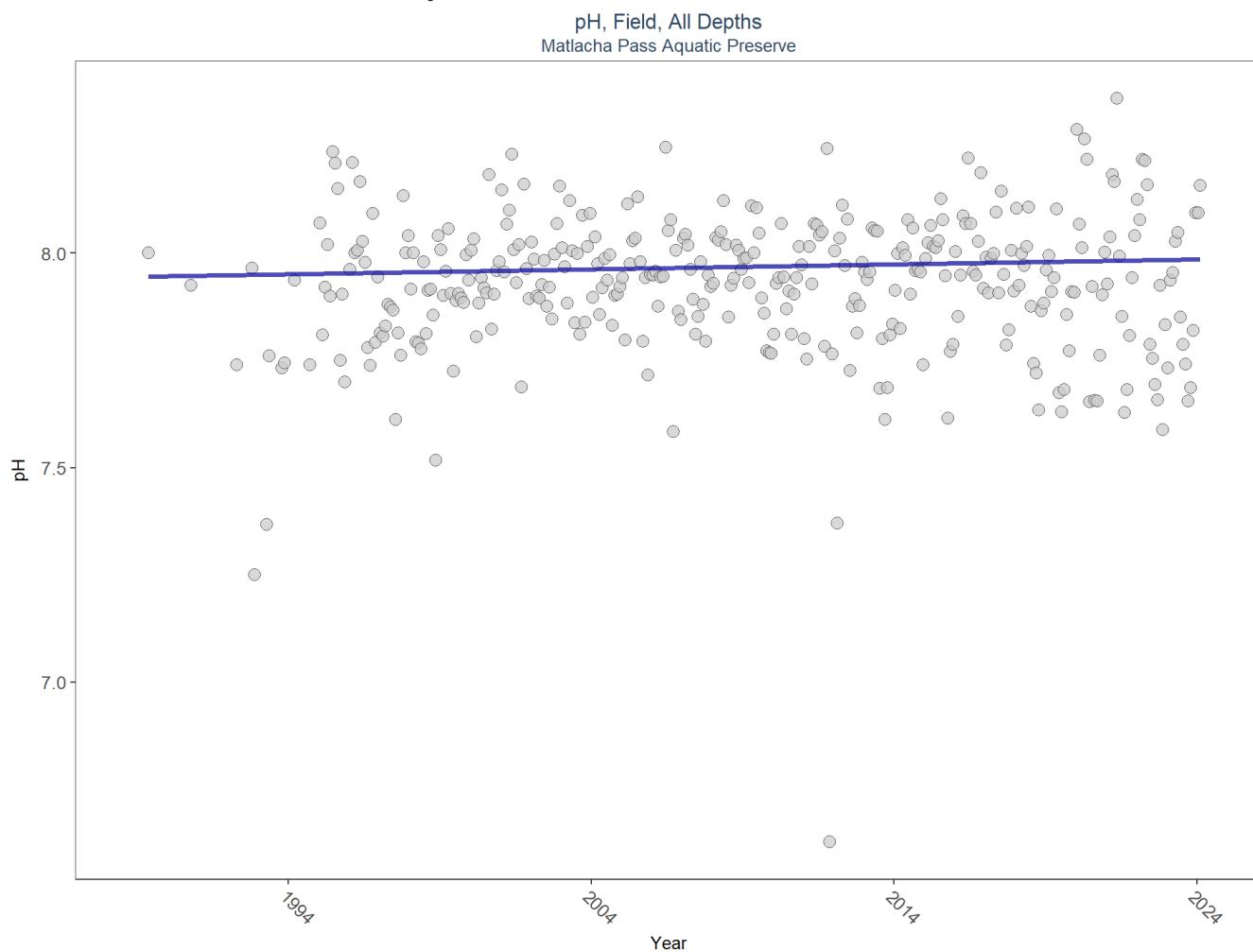
303 - River, Estuary and Coastal Observing Network

There are no qualifying Value Qualifiers for Dissolved Oxygen Saturation in Matlacha Pass 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.

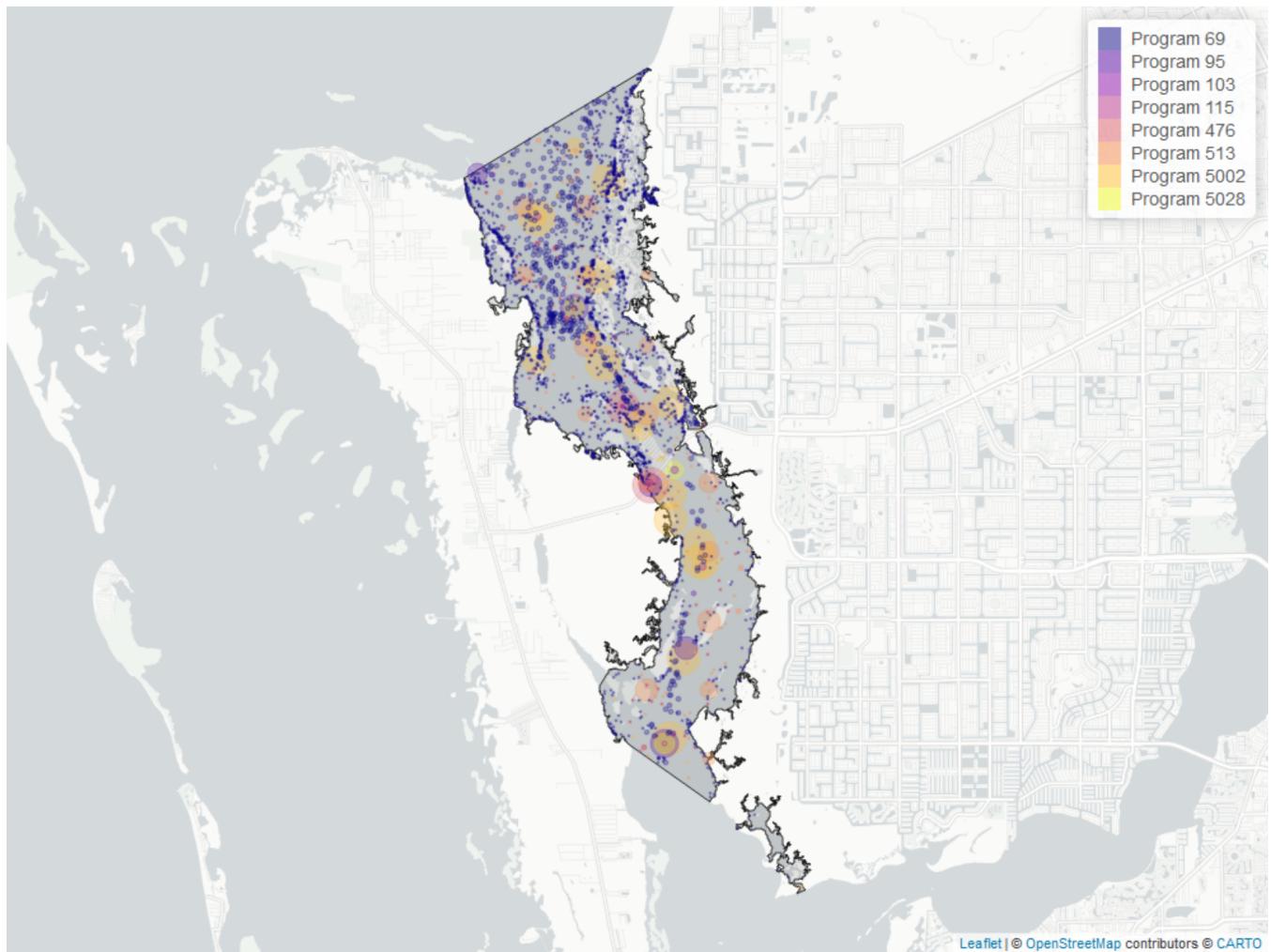
### Seasonal Kendall-Tau Trend Analysis



$p < 0.00005$  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
69	5484	1989	2022
5002	2430	1995	2024
513	1197	2002	2024
95	501	1996	2018
476	465	1998	2024
5028	178	2007	2024
103	136	2020	2022
115	5	2001	2001

**Program names:**

69 - Fisheries-Independent Monitoring (FIM) Program

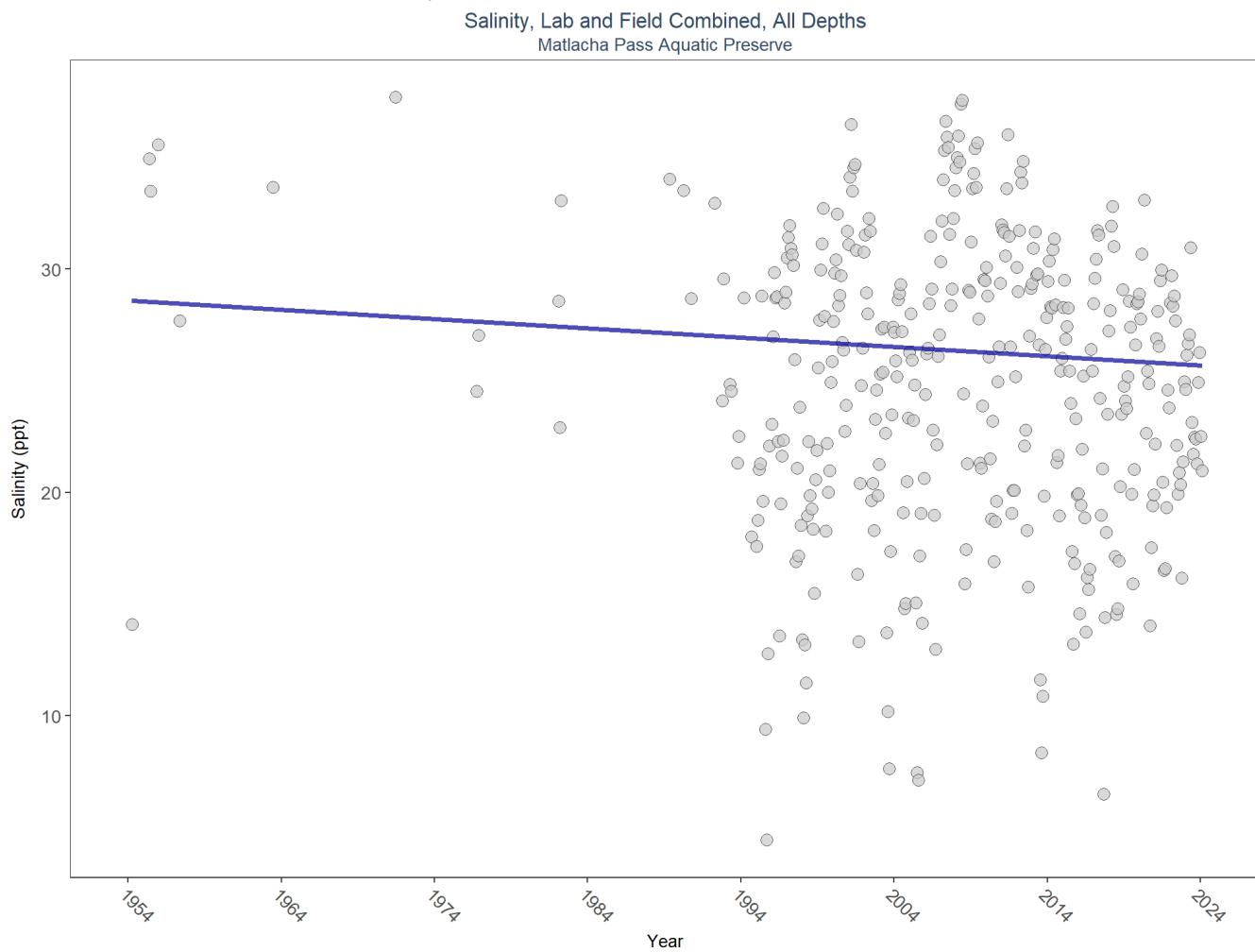
5002 - Florida STORET / WIN  
 513 - Coastal Charlotte Harbor Monitoring Network  
 95 - Harmful Algal Bloom Marine Observation Network  
 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
 5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
 115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for pH in Matlacha Pass 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

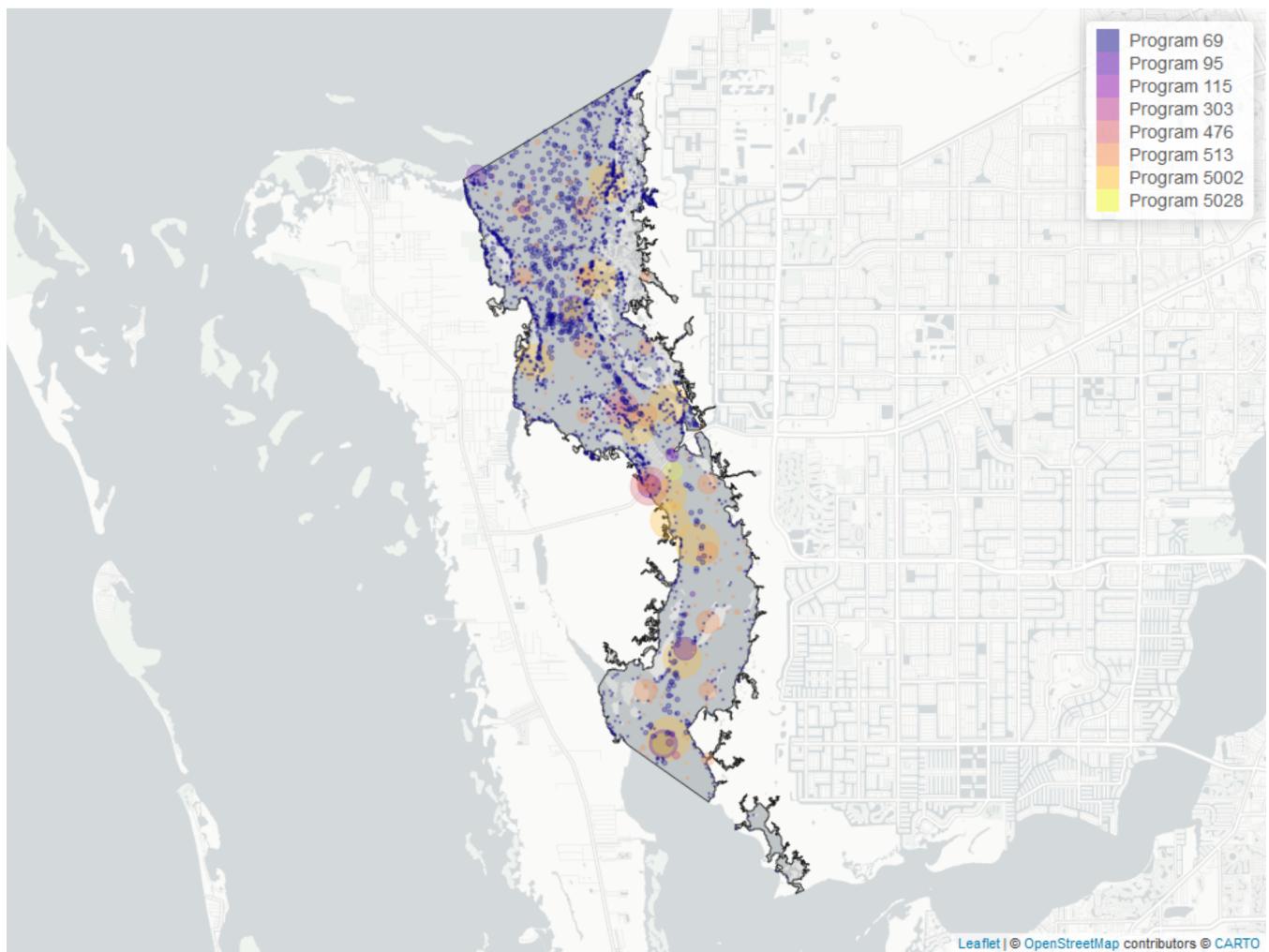


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	10281	42	25.94	TRUE	-0.0574	0.1087	-0.04164108	28.58822	3.6744	0.9785	0

*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 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
69	5589	1989	2022
5002	2263	1995	2017
513	1206	2002	2024
95	559	1954	2018
476	481	1998	2024
5028	178	2007	2024
303	7	2019	2019
115	5	2001	2001

**Program names:**

69 - Fisheries-Independent Monitoring (FIM) Program

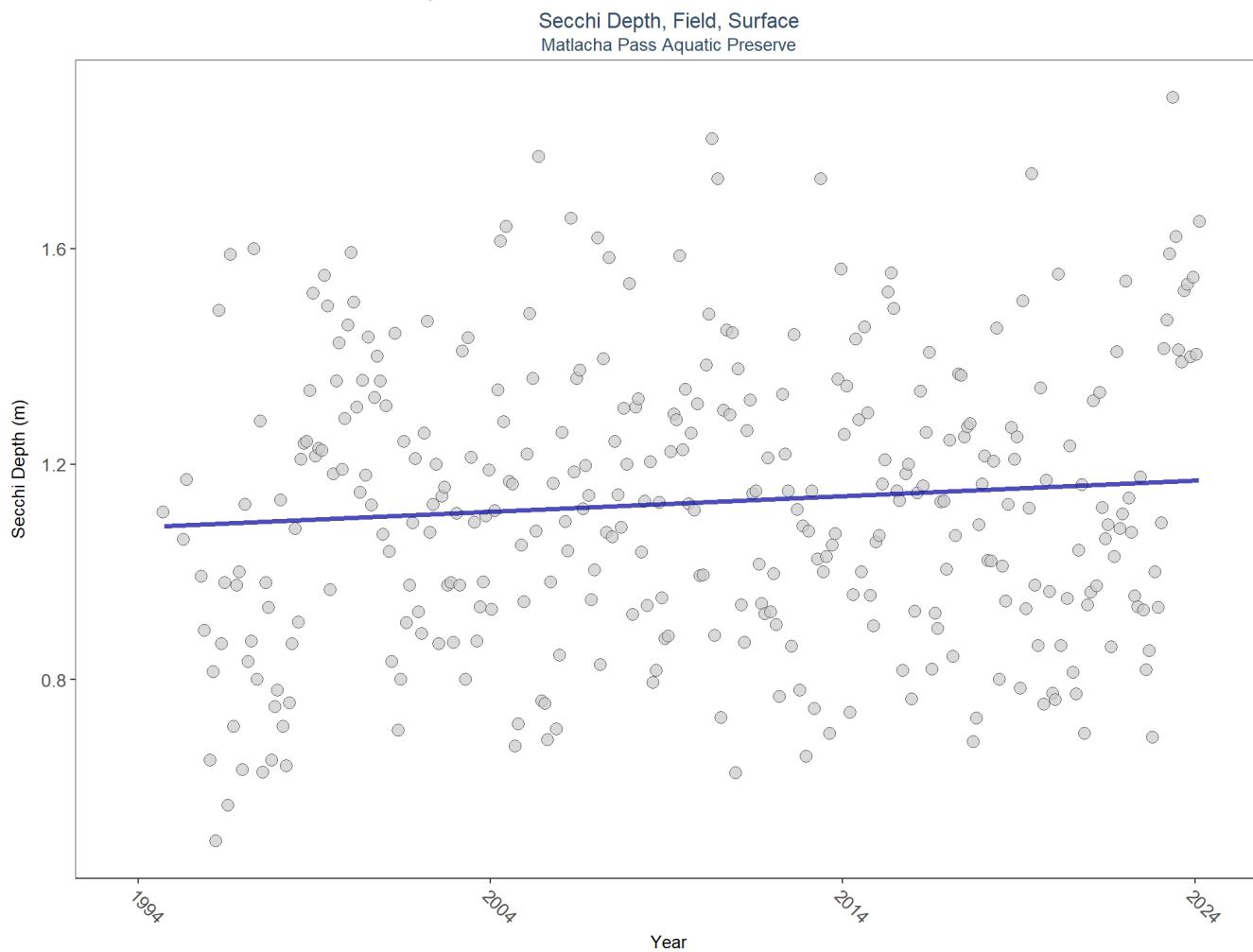
5002 - Florida STORET / WIN  
 513 - Coastal Charlotte Harbor Monitoring Network  
 95 - Harmful Algal Bloom Marine Observation Network  
 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
 5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program  
 303 - River, Estuary and Coastal Observing Network  
 115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for Salinity in Matlacha Pass 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

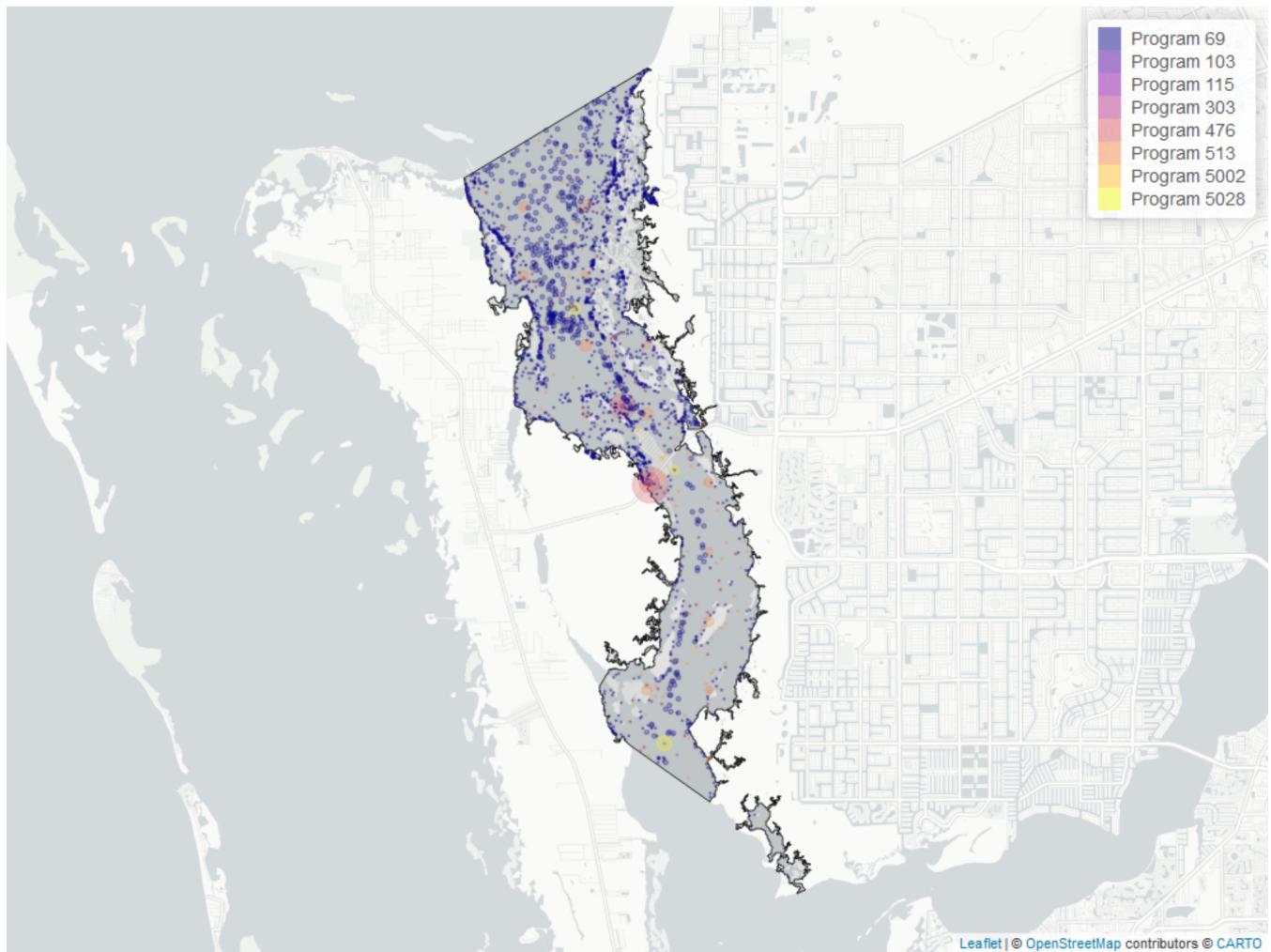


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
Surface	6312	31	1	TRUE	0.062	0.1025	0.00289484	1.08268	8.5687	0.6616	0

*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 15: Programs contributing data for Secchi Depth

ProgramID	N_Data	YearMin	YearMax
69	5379	1994	2022
476	392	1998	2024
513	377	2002	2024
5028	76	2007	2024
103	66	2020	2022
5002	19	2005	2005
303	2	2019	2019
115	1	2001	2001

**Program names:**

69 - Fisheries-Independent Monitoring (FIM) Program

- 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
 513 - Coastal Charlotte Harbor Monitoring Network  
 5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
 5002 - Florida STORET / WIN  
 303 - River, Estuary and Coastal Observing Network  
 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 16: Value Qualifiers for Secchi Depth

Year	$N_{Total}$	$N_S$	$perc_S$
2007	348	2	0.6
2008	300	5	1.7
2009	298	7	2.4
2019	199	1	0.5
2021	318	41	12.9
2022	228	28	12.3
2023	97	38	39.2
2024	12	4	33.3

**Note:** <sup>1</sup>S - Secchi disk visible to bottom of waterbody

### Programs containing Value Qualified data:

- 513 - Coastal Charlotte Harbor Monitoring Network  
 5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program  
 5002 - Florida STORET / WIN  
 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

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

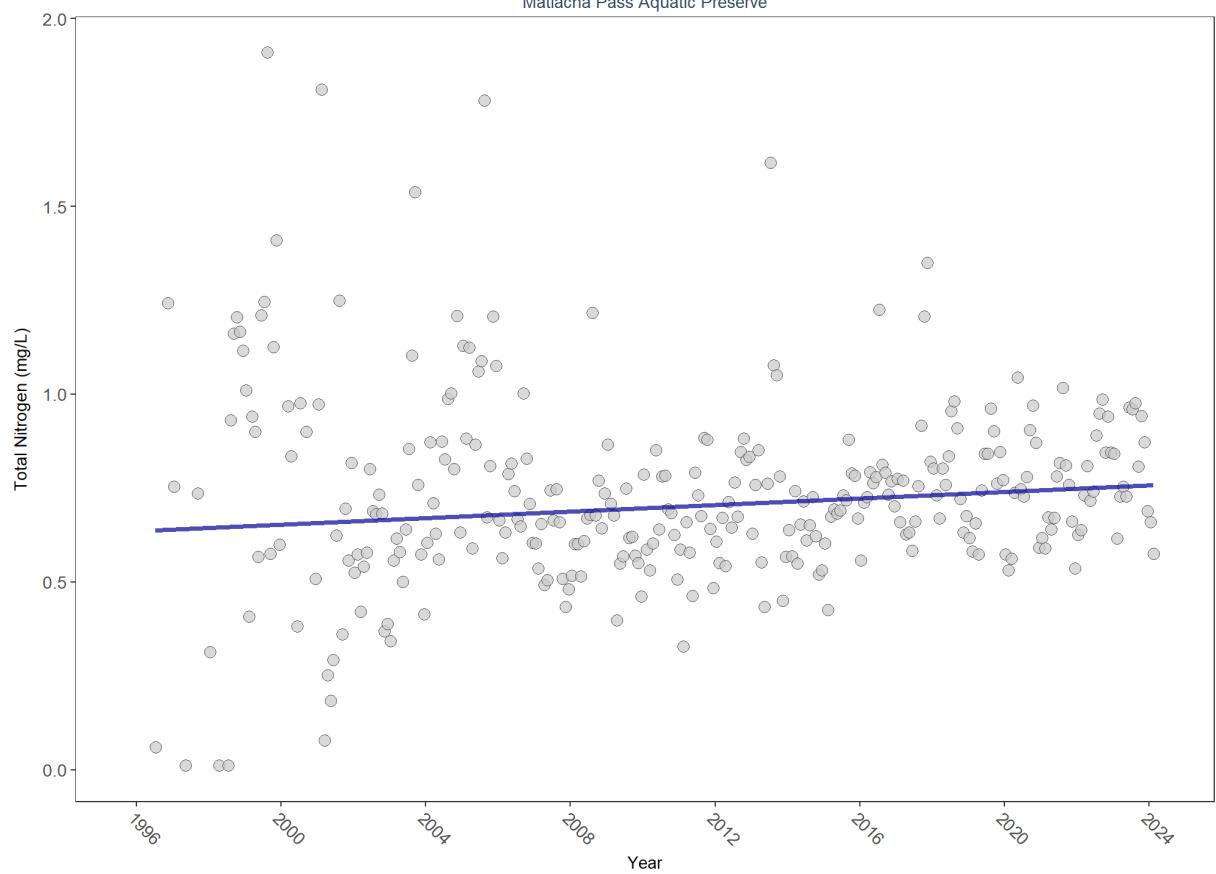
Additional Information:

- 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<sub>3</sub>O<sub>2</sub> 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  
Matlacha Pass Aquatic Preserve

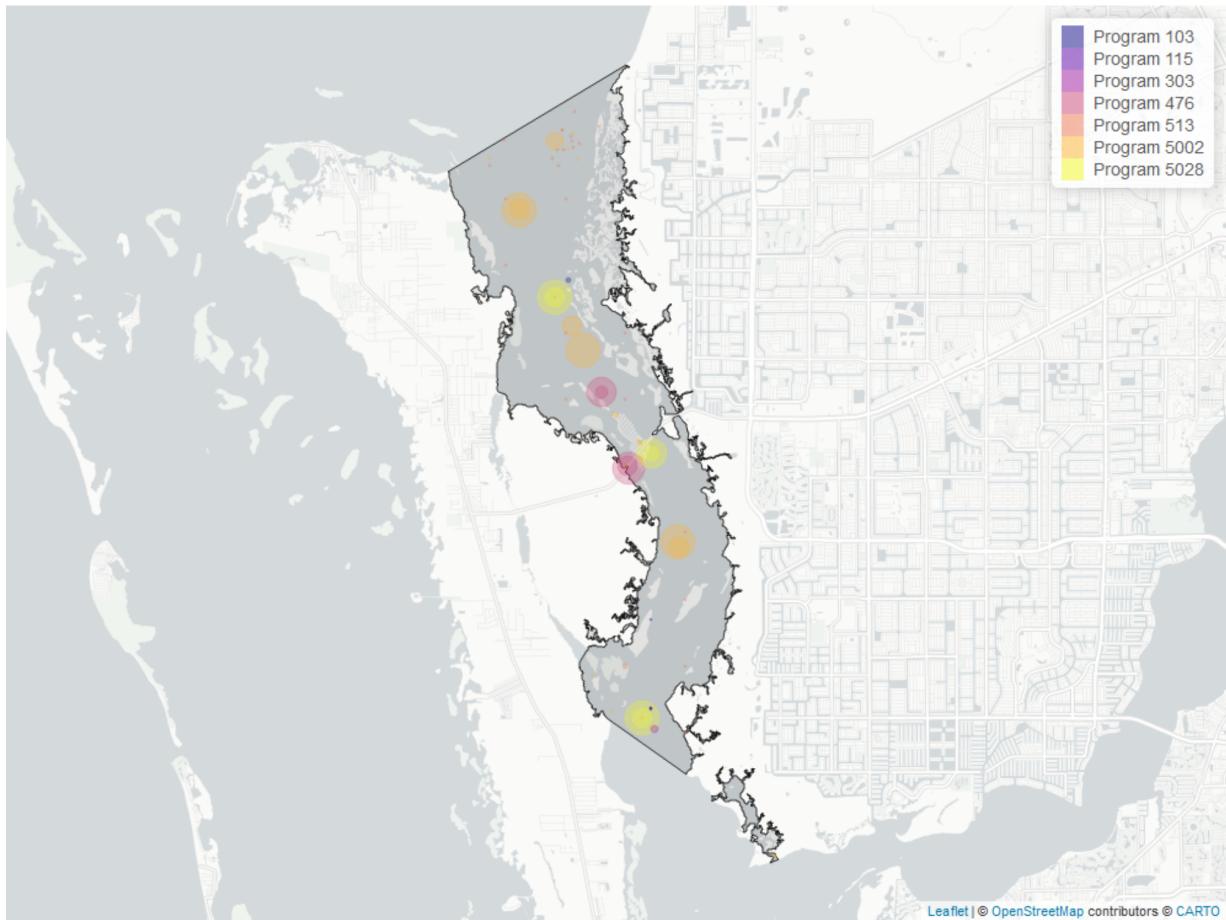


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1975	29	0.704	TRUE	0.1246	0.0021	0.004345328	0.6361543	7.8278	0.7286	1

*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

ProgramID	N_Data	YearMin	YearMax
5002	833	1996	2024
5028	675	2005	2024
476	416	1998	2024
513	41	2009	2023
303	7	2019	2019
103	7	2001	2005
115	1	2001	2001

#### Program names:

5002 - Florida STORET / WIN

5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

513 - Coastal Charlotte Harbor Monitoring Network

303 - River, Estuary and Coastal Observing 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 18: Value Qualifiers for Total Nitrogen

Year	$N_{Total}$	$N_I$	$perc_I$	$N_U$	$perc_U$
1997	12			4	33.3
1998	24			8	33.3
1999	36			1	2.8
2001	60			1	1.7
2004	56	1	1.8		
2005	85	2	2.4		
2006	78	15	19.2		
2007	83	5	6.0	6	7.2
2008	99	1	1.0		
2009	101	5	5.0		
2011	84	4	4.8		
2012	92	1	1.1		
2013	103	8	7.8	1	1.0
2014	92	1	1.1		

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

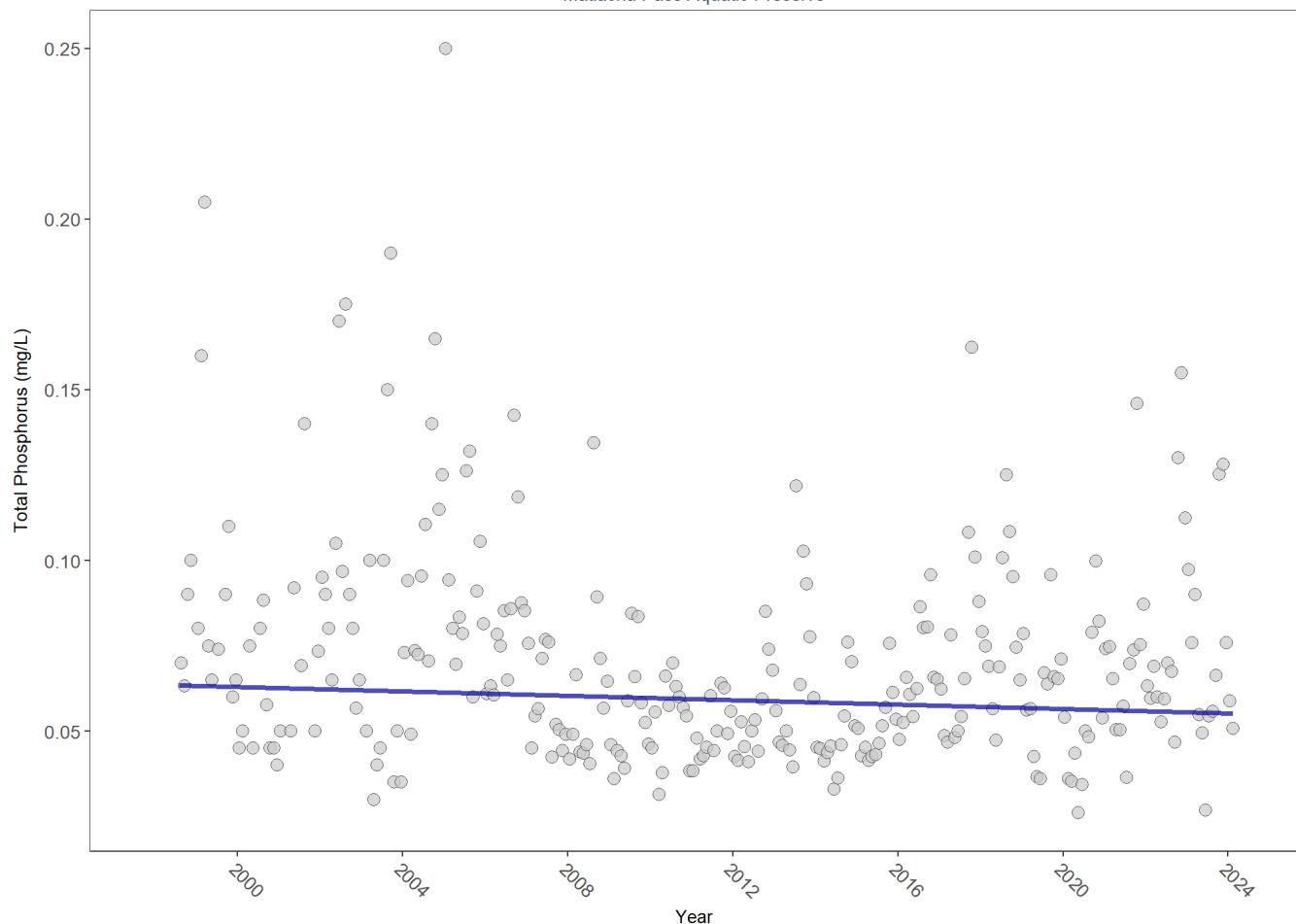
### Programs containing Value Qualified data:

5002 - Florida STORET / WIN

## Total Phosphorus - Discrete Water Quality

### Seasonal Kendall-Tau Trend Analysis

Total Phosphorus, Lab, All Depths  
Matlacha Pass Aquatic Preserve

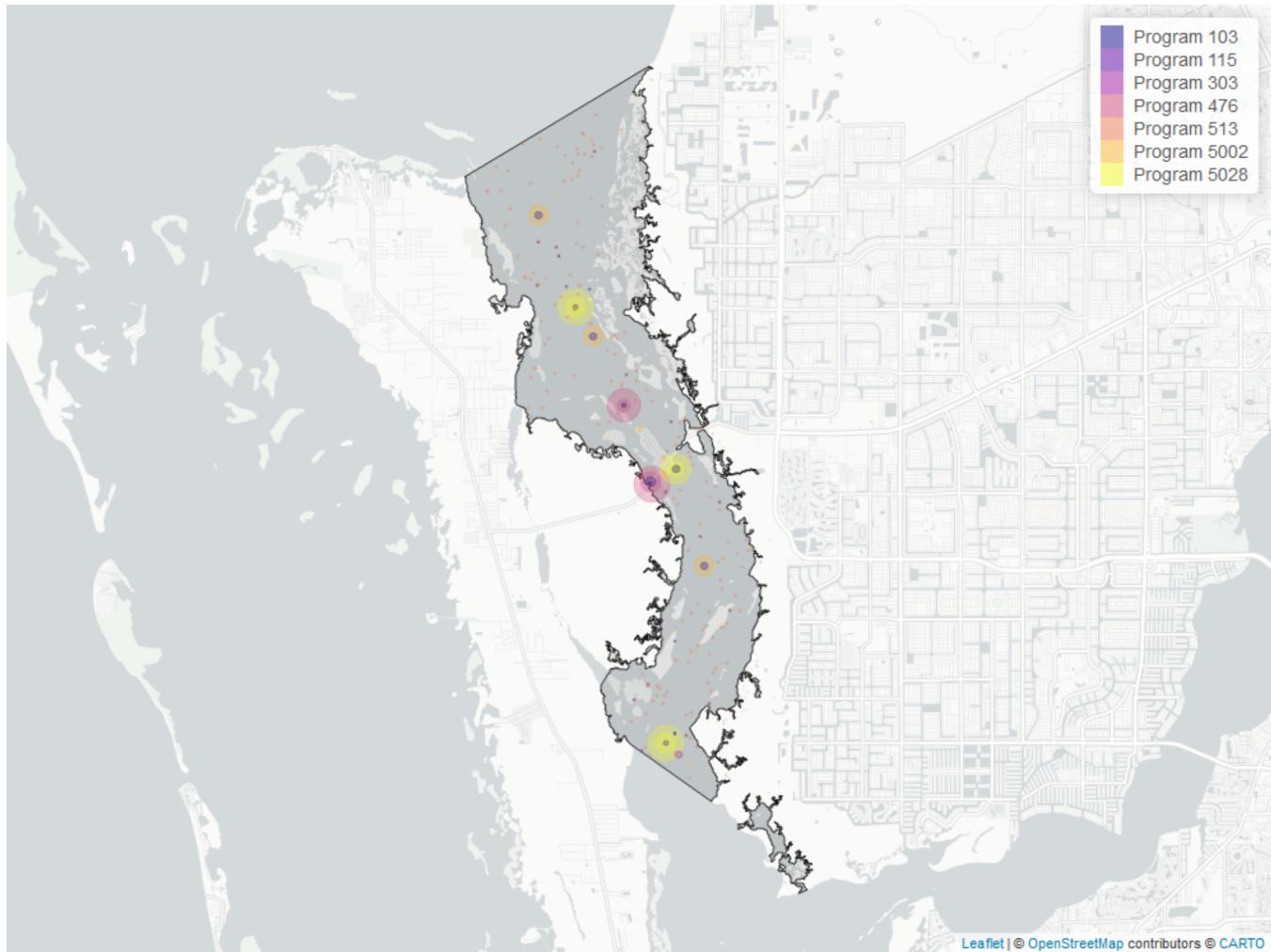


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1645	27	0.059	TRUE	-0.0653	0.1496	-0.0003166667	0.06355212	30.1253	0.0015	0

*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 19: Programs contributing data for Total Phosphorus

ProgramID	N_Data	YearMin	YearMax
5028	693	2005	2024
476	474	1998	2024
5002	227	2005	2024
513	191	2018	2024
103	90	2001	2022
303	7	2019	2019
115	1	2001	2001

**Program names:**

5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

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

### Value Qualifiers

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

Table 20: Value Qualifiers for Total Phosphorus

Year	$N_{Total}$	$N_I$	$perc_I$	$N_Q$	$perc_Q$	$N_U$	$perc_U$
1998	8			1	12.5		
1999	21			3	14.3		
2000	24			5	20.8		
2001	14			2	14.3	1	7.1
2002	28					1	3.6
2004	23	2	8.7	2	8.7		
2005	51	3	5.9			1	2.0
2006	48	2	4.2				
2007	48	12	25.0				
2008	71					1	1.4
2009	71	1	1.4				
2018	87	2	2.3				
2019	99	1	1.0				
2020	94	6	6.4	4	4.3		
2021	230	6	2.6			54	23.5
2022	122	6	4.9	24	19.7	39	32.0
2023	143	8	5.6			8	5.6
2024	15	3	20.0				

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

### Programs containing Value Qualified data:

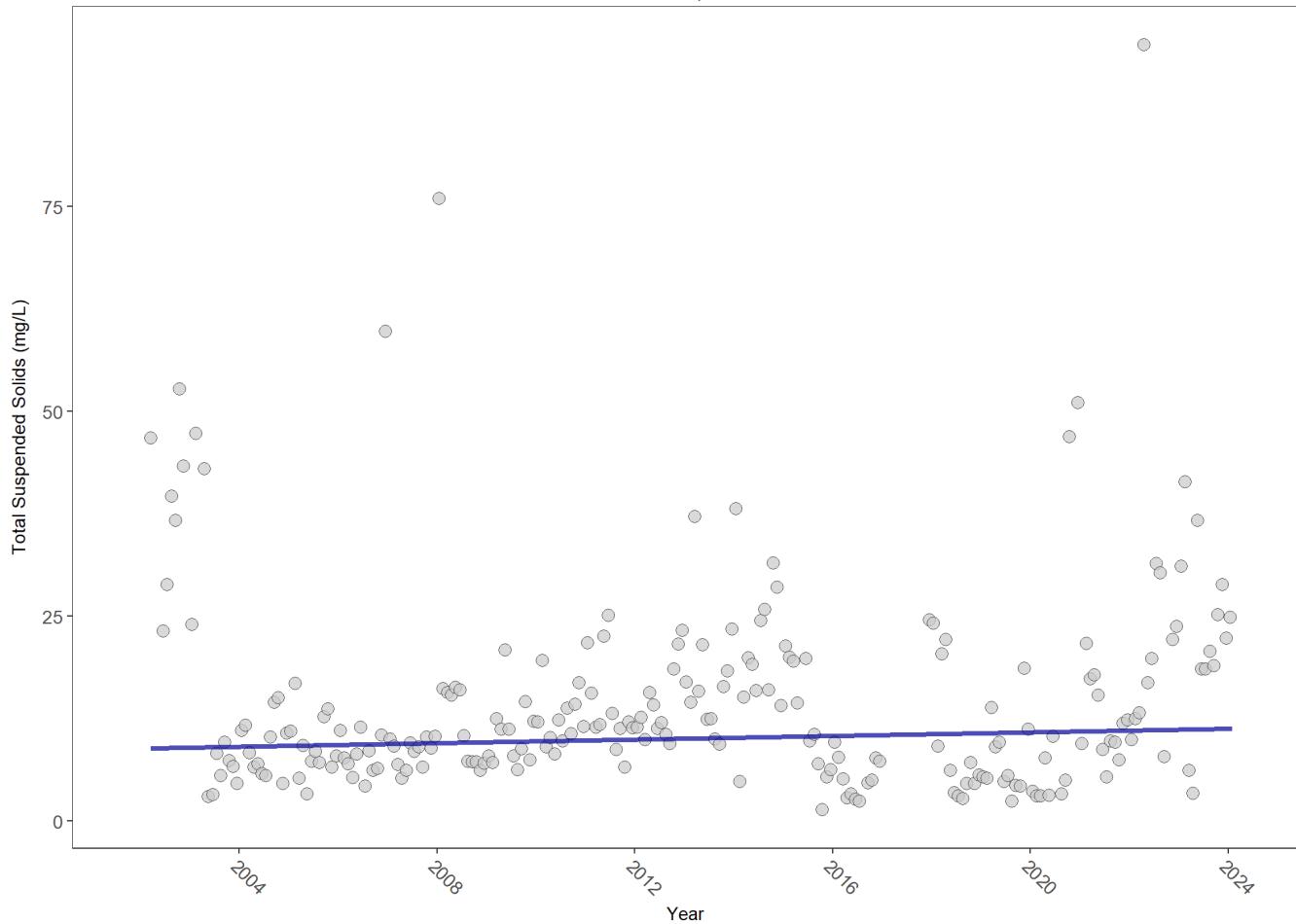
- 513 - Coastal Charlotte Harbor Monitoring Network  
 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
 5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program  
 5002 - Florida STORET / WIN

### 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  
Matlacha Pass Aquatic Preserve

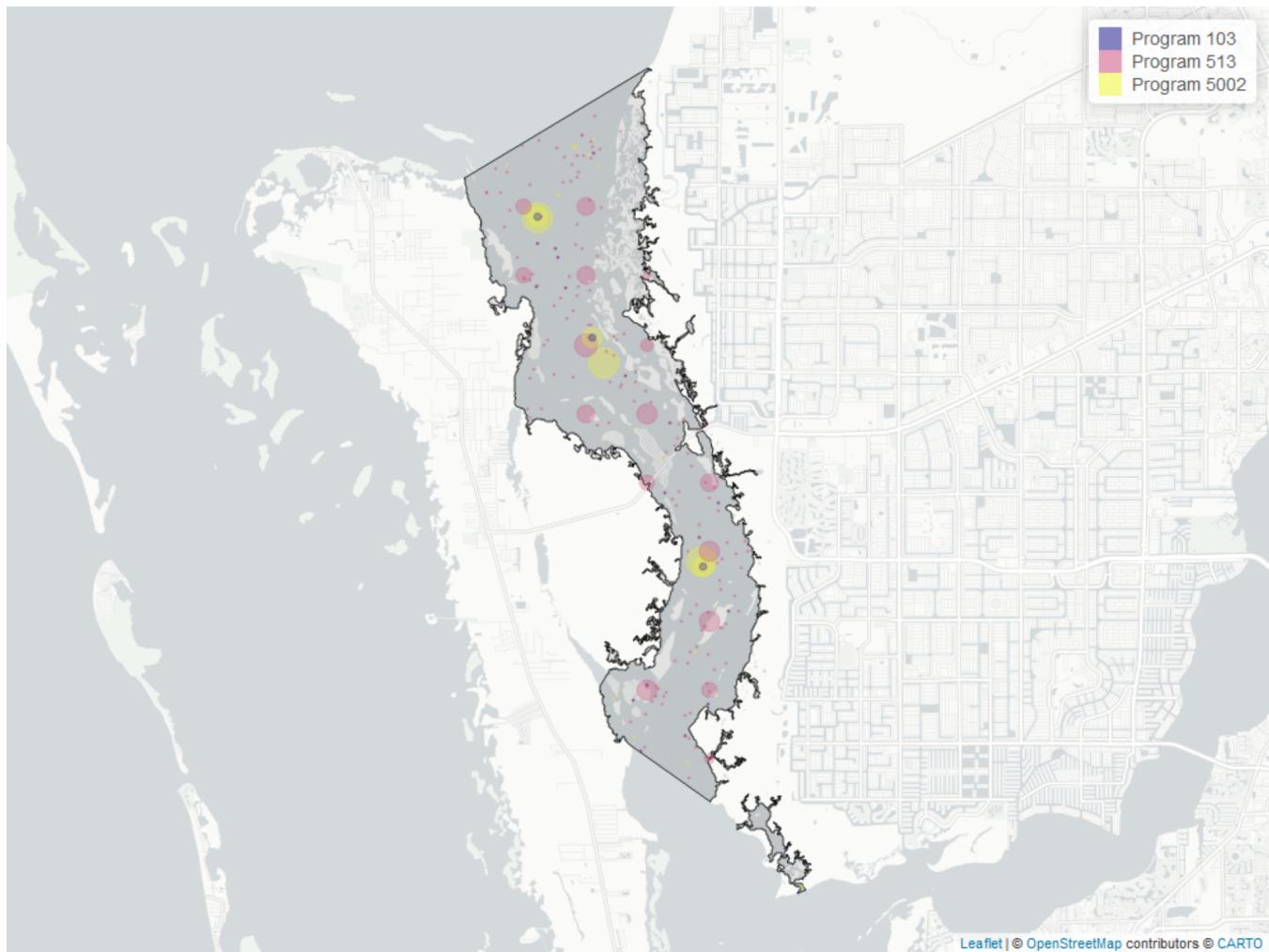


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1613	23	10	TRUE	0.0678	0.1572	0.11	8.87733	10.019	0.5287	0

*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
513	928	2002	2024
5002	637	2003	2024
103	48	2020	2021

#### Program names:

513 - Coastal Charlotte Harbor Monitoring Network

5002 - Florida STORET / WIN

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

Year	$N_{\_Total}$	$N_{\_I}$	$perc_{\_I}$	$N_{\_Q}$	$perc_{\_Q}$	$N_{\_U}$	$perc_{\_U}$
2003	70	15	21.4			8	11.4
2004	83	16	19.3			2	2.4
2005	84	1	1.2				
2006	86					1	1.2
2007	91					3	3.3
2008	88			3	3.4	1	1.1
2011	91					6	6.6
2012	87					6	6.9
2013	86					6	7.0
2014	90					7	7.8
2015	44					7	15.9
2016	50					8	16.0
2018	41	2	4.9				
2019	38	2	5.3				
2020	49	4	8.2			1	2.0
2021	137	4	2.9	3	2.2		
2022	86	2	2.3	17	19.8		
2023	89	3	3.4			3	3.4

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

#### Programs containing Value Qualified data:

5002 - Florida STORET / WIN

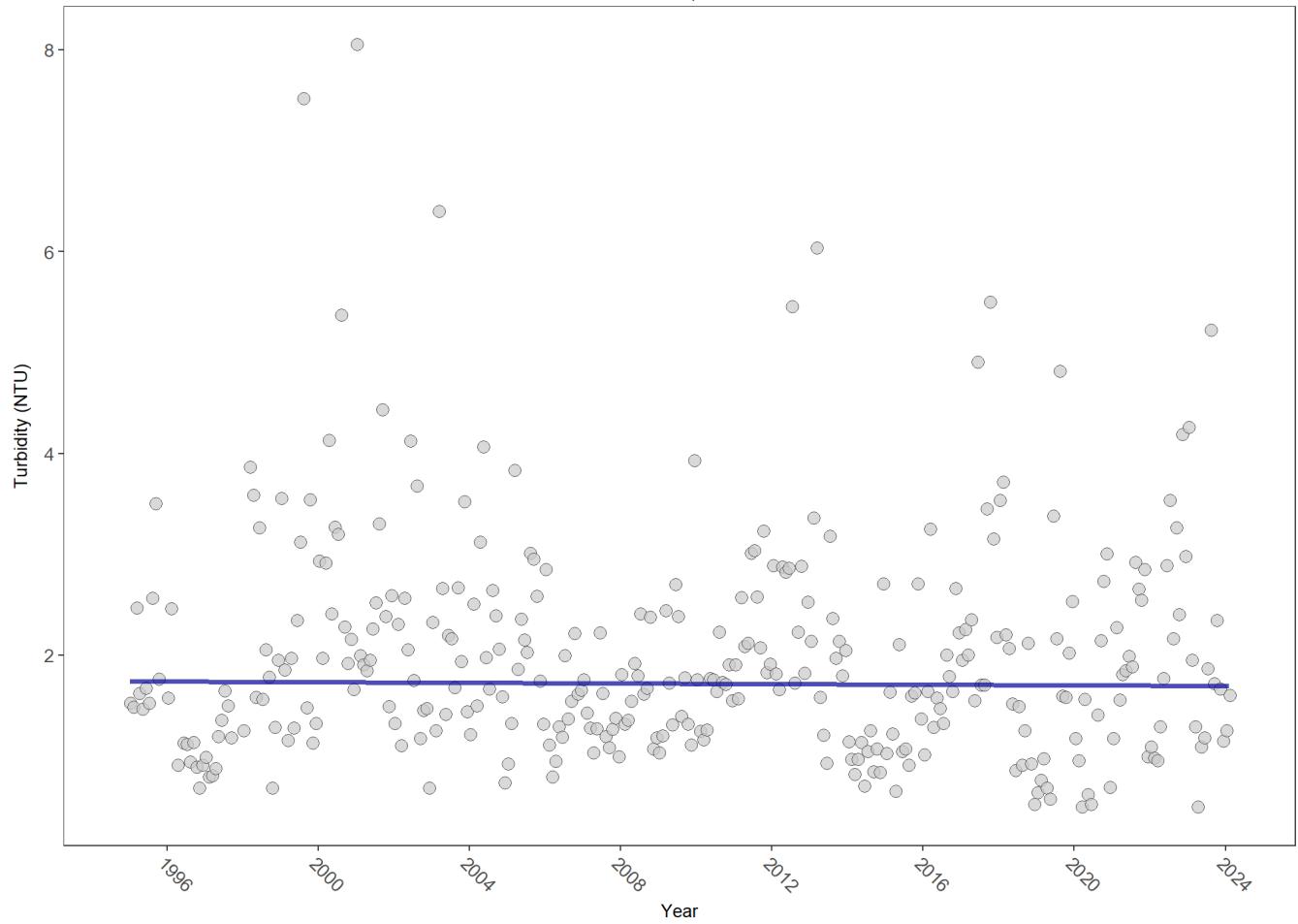
513 - Coastal Charlotte Harbor Monitoring Network

### 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  
Matlacha Pass Aquatic Preserve

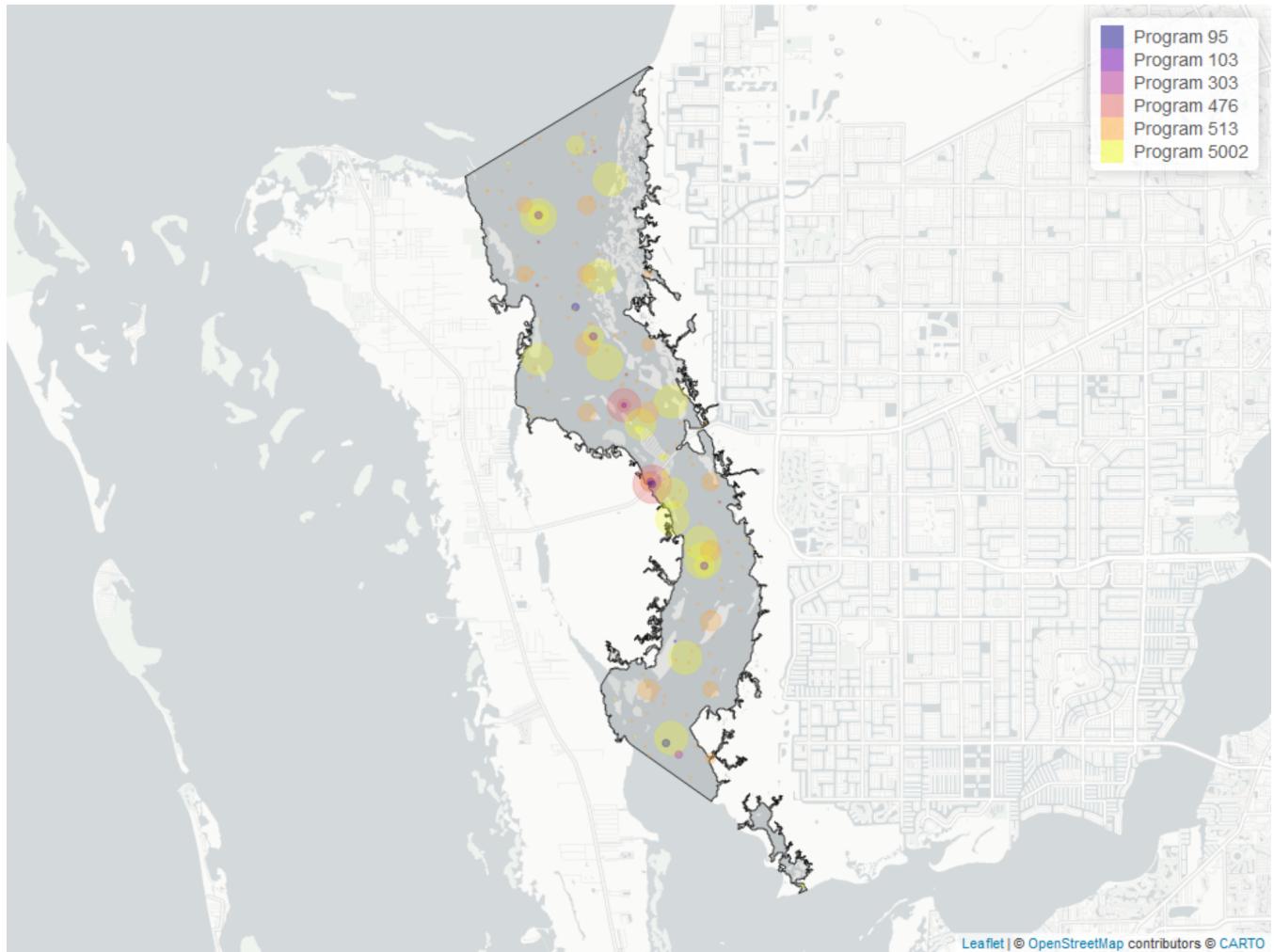


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	3942	30	1.6	TRUE	-0.0079	0.7805	-0.00161157	1.73962	16.3849	0.1274	0

$p < 0.00005$  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	2507	1995	2024
513	880	2002	2023
476	486	1998	2024
103	49	2005	2022
95	31	2012	2013
303	8	2019	2019

#### Program names:

5002 - Florida STORET / WIN

513 - Coastal Charlotte Harbor Monitoring Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

95 - Harmful Algal Bloom Marine Observation Network

303 - River, Estuary and Coastal Observing 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	259			2	0.8		
2003	260					1	0.4
2004	212	6	2.8			1	0.5
2006	146	2	1.4				
2007	132					1	0.8
2009	172			2	1.2		
2010	210			1	0.5		
2014	111			1	0.9	1	0.9
2016	73			3	4.1	1	1.4
2018	51	8	15.7			5	9.8
2019	58	5	8.6			15	25.9
2020	53	12	22.6	6	11.3	7	13.2
2021	142	19	13.4	25	17.6	1	0.7
2022	58	14	24.1	11	19.0		
2023	101	8	7.9	19	18.8	2	2.0
2024	5	2	40.0	1	20.0		

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

### Programs containing Value Qualified data:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

5002 - Florida STORET / WIN

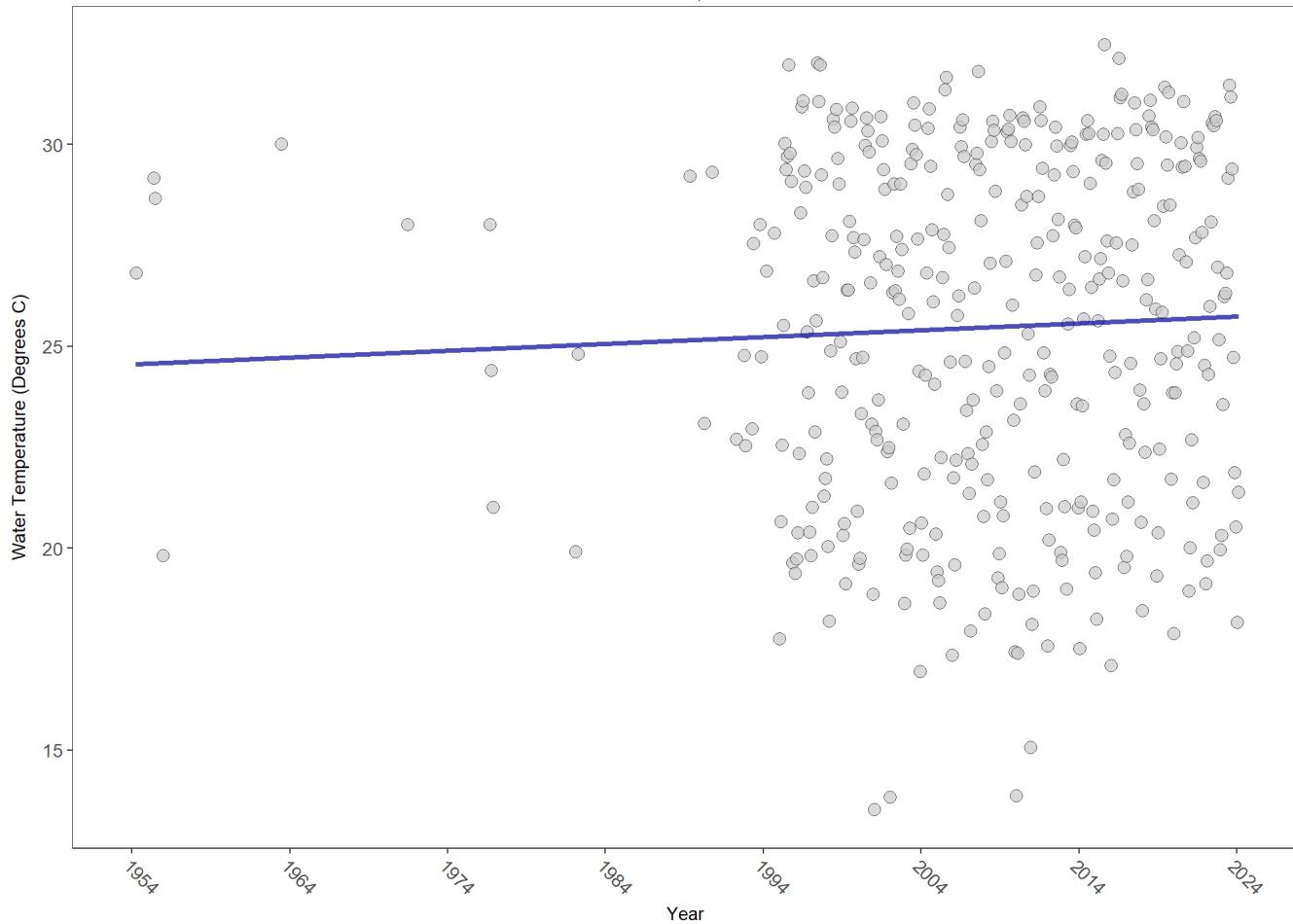
513 - Coastal Charlotte Harbor Monitoring Network

## 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  
Matlacha Pass Aquatic Preserve

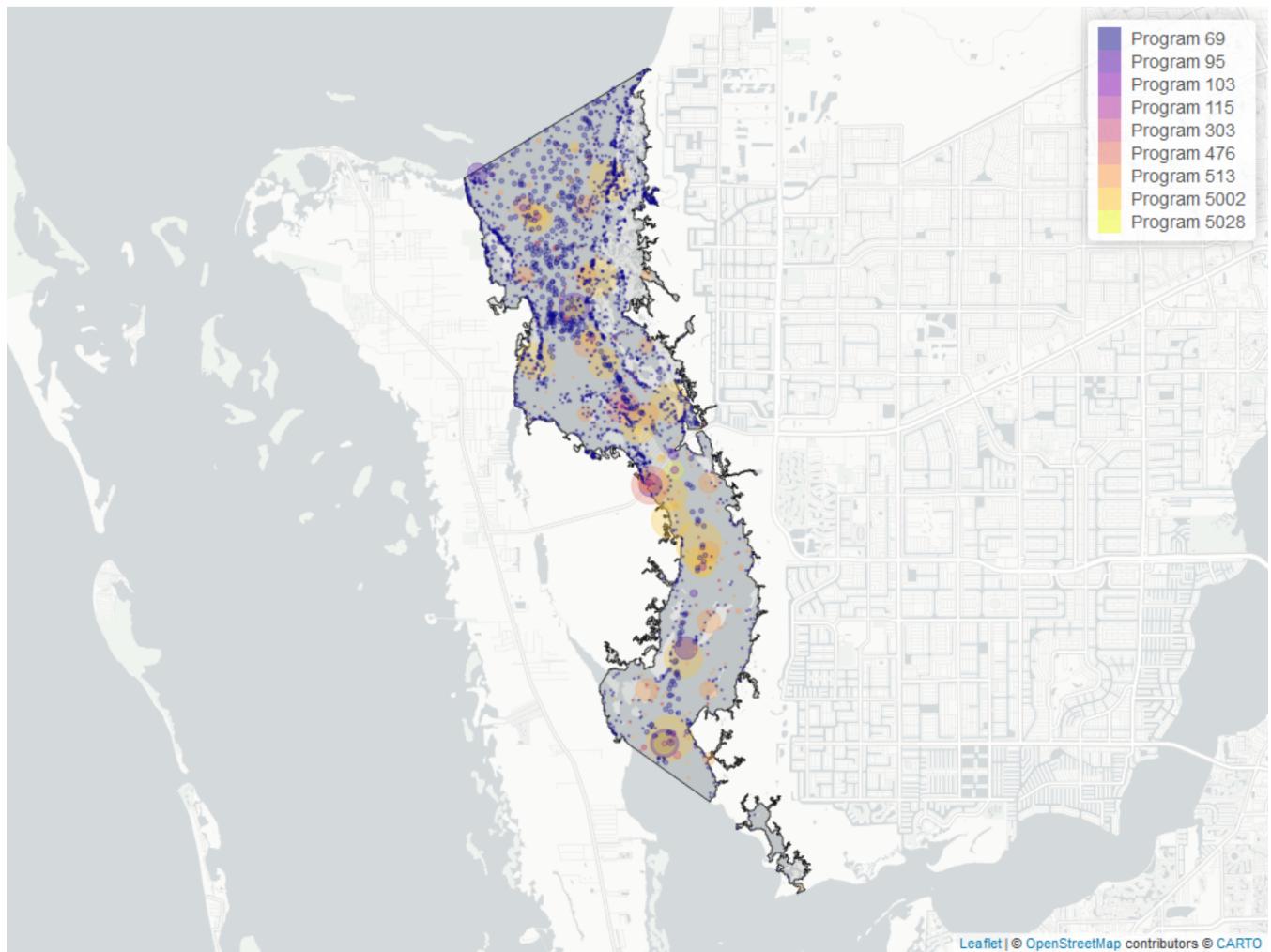


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	11251	41	26.1	TRUE	0.0837	0.0195	0.0168071	24.5592	8.6763	0.6517	1

*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
69	5593	1989	2022
5002	3085	1995	2024
513	1209	2002	2024
95	566	1954	2018
476	483	1998	2024
5028	170	2007	2024
103	136	2020	2022
303	7	2019	2019
115	5	2001	2001

**Program names:**

69 - Fisheries-Independent Monitoring (FIM) Program  
5002 - Florida STORET / WIN  
513 - Coastal Charlotte Harbor Monitoring Network  
95 - Harmful Algal Bloom Marine Observation Network  
476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network  
5028 - Charlotte Harbor Aquatic Preserves Monthly Water Quality Program  
103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
303 - River, Estuary and Coastal Observing Network  
115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for Water Temperature in Matlacha Pass Aquatic Preserve

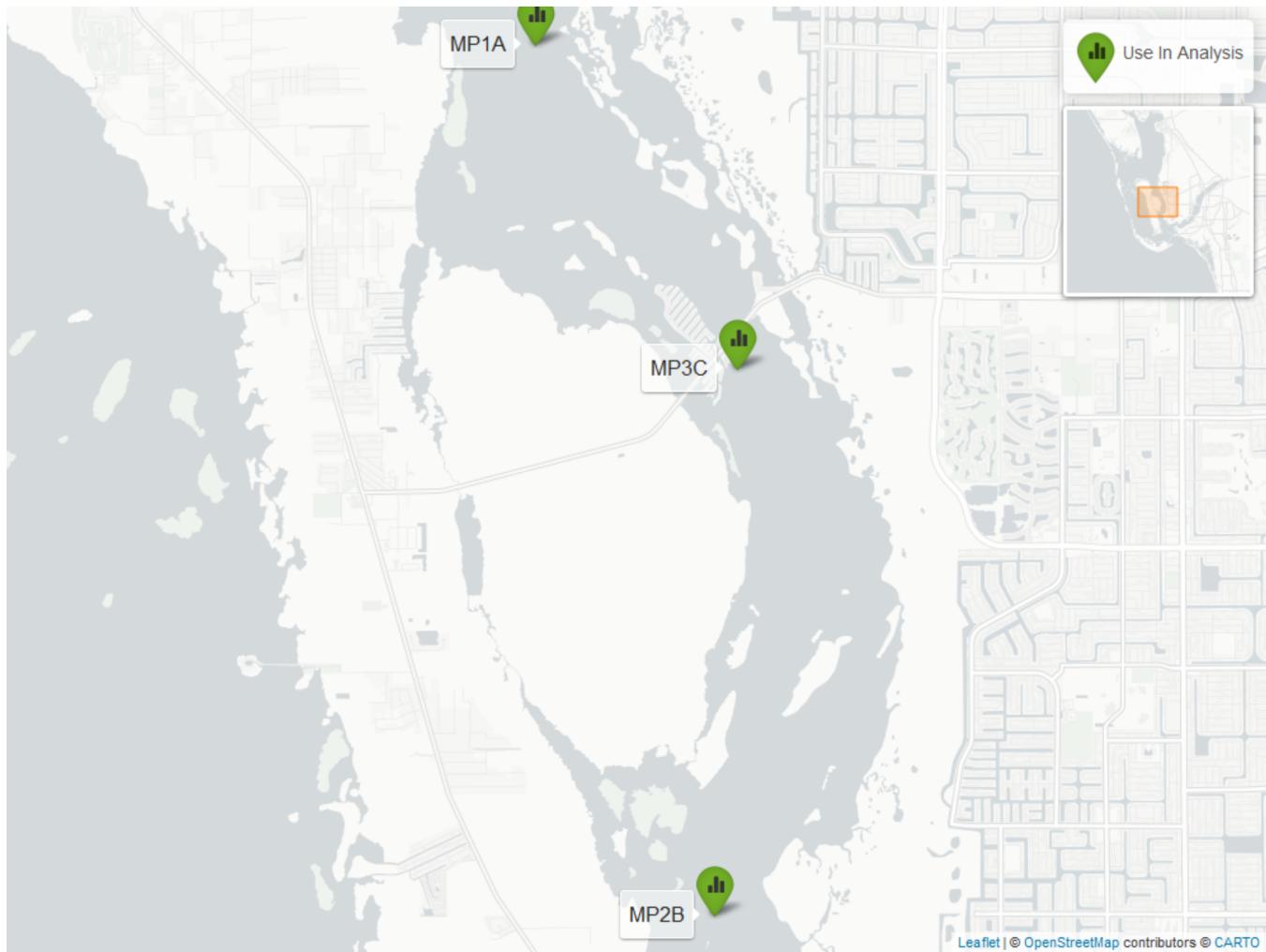
## Water Quality - Continuous

The following files were used in the continuous analysis:

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

Table 26: Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

<i>ProgramLocationID</i>	<i>Years of Data</i>	<i>Use in Analysis</i>	<i>Parameters</i>
MP1A	18	TRUE	DO , DOS , pH , Sal , Turb , TempW
MP2B	18	TRUE	DO , DOS , pH , Sal , Turb , TempW
MP3C	15	TRUE	DO , DOS , pH , Sal , Turb , TempW



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

## Dissolved Oxygen - Continuous Water Quality

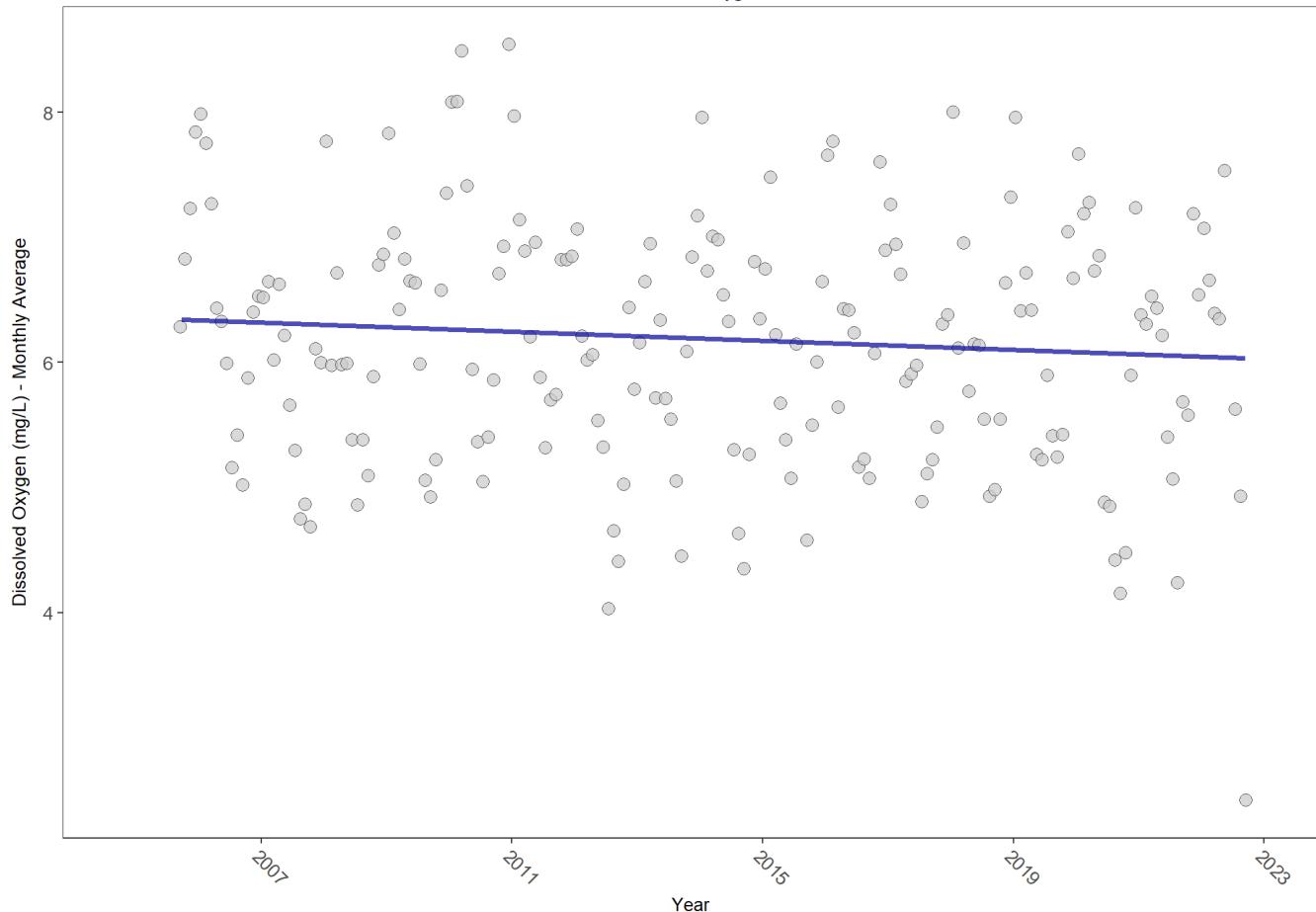
**MP1A**

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP1A

Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	529522	18	6.3	TRUE	-0.1006	0.0556	-0.01817387	6.355787	4.8906	0.9363	0

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

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

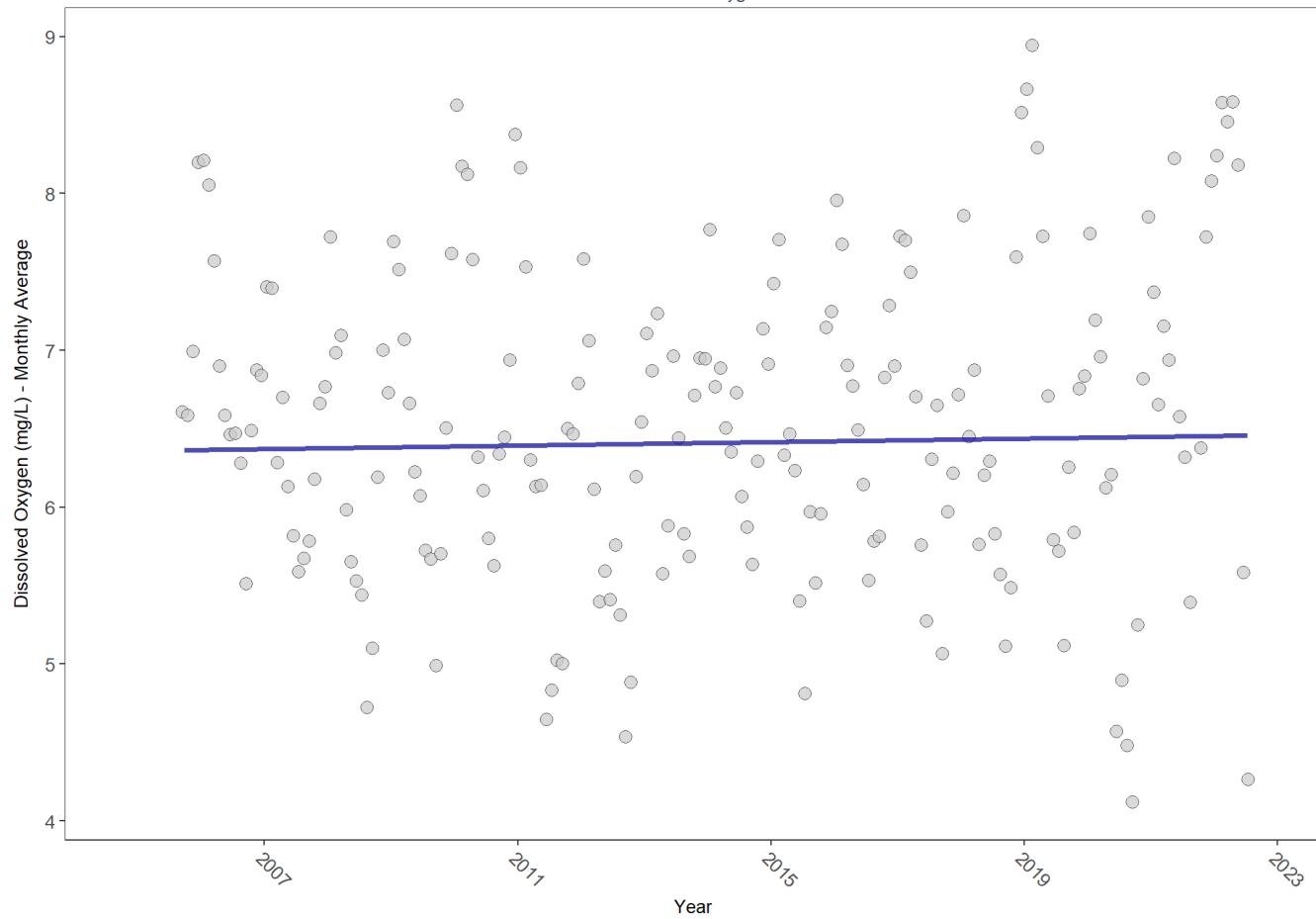
## MP2B

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP2B

Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	543952	18	6.6	TRUE	0.0308	0.5386	0.0005581996	6.361188	10.4885	0.4871	0

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

SennIntercept is intercept value at beginning of record for monitoring location

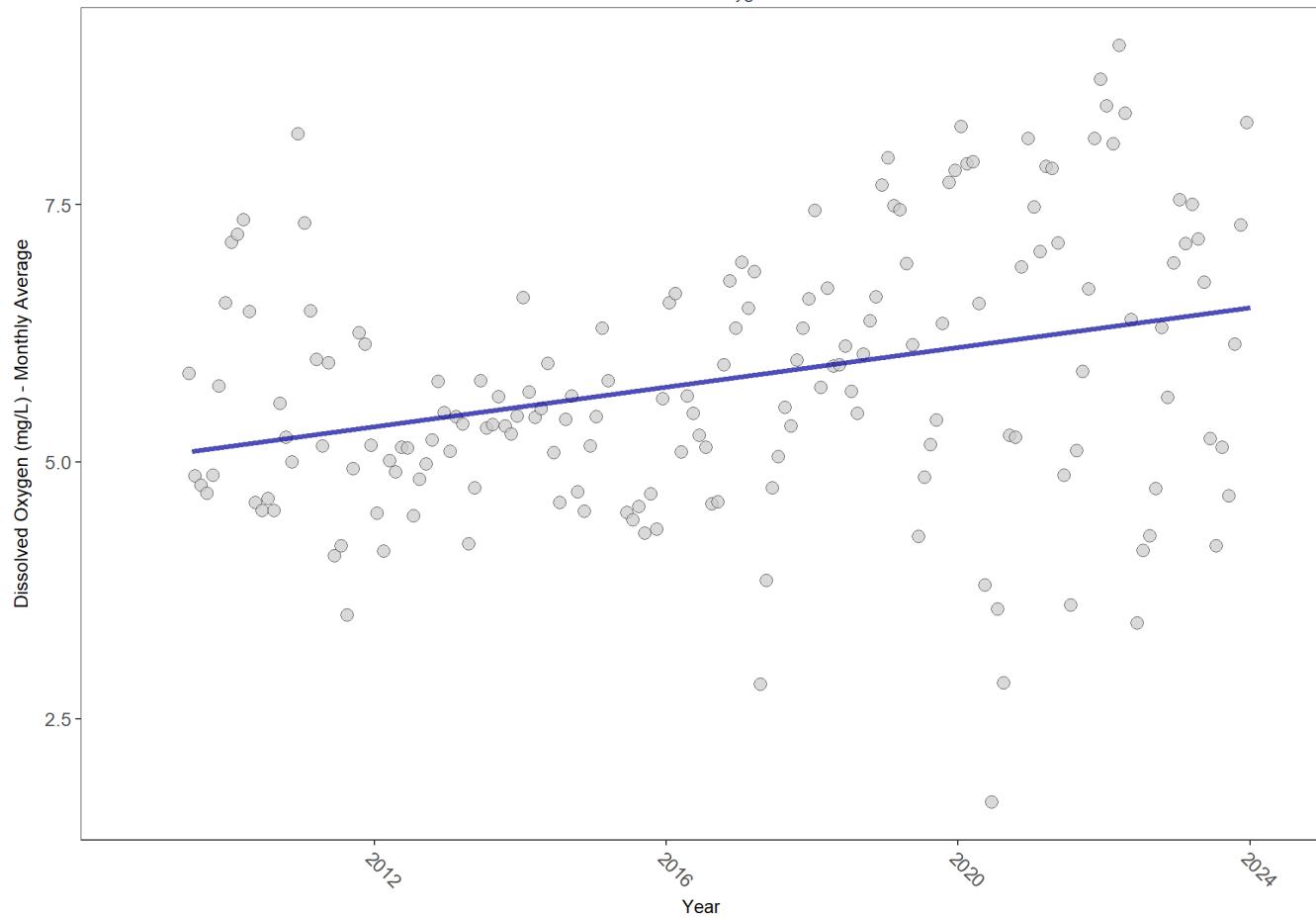
## MP3C

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP3C

Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	462542	15	5.8	TRUE	0.2864	0.0000	0.09620877	5.055256	23.4478	0.0153	1

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

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

## All Stations Combined

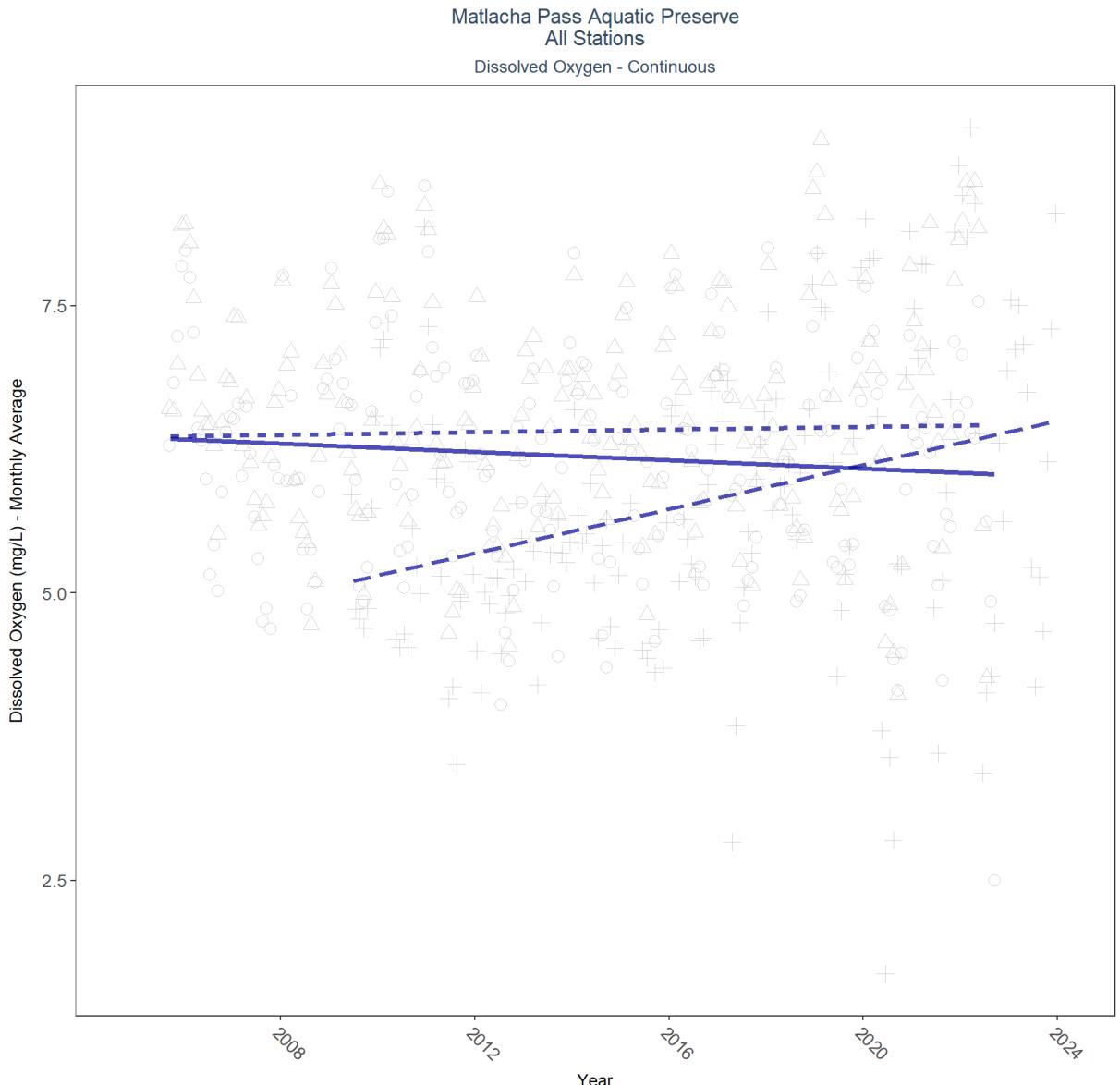


Table 27: Seasonal Kendall-Tau Results for All Stations - Dissolved Oxygen

Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
MP1A	529522	18	2005 - 2022	6.3	-0.10	6.36	-0.02	0.0556
MP2B	543952	18	2005 - 2022	6.6	0.03	6.36	0.01	0.5386
MP3C	462542	15	2009 - 2023	5.8	0.29	5.06	0.10	0.0000

## Dissolved Oxygen Saturation - Continuous Water Quality

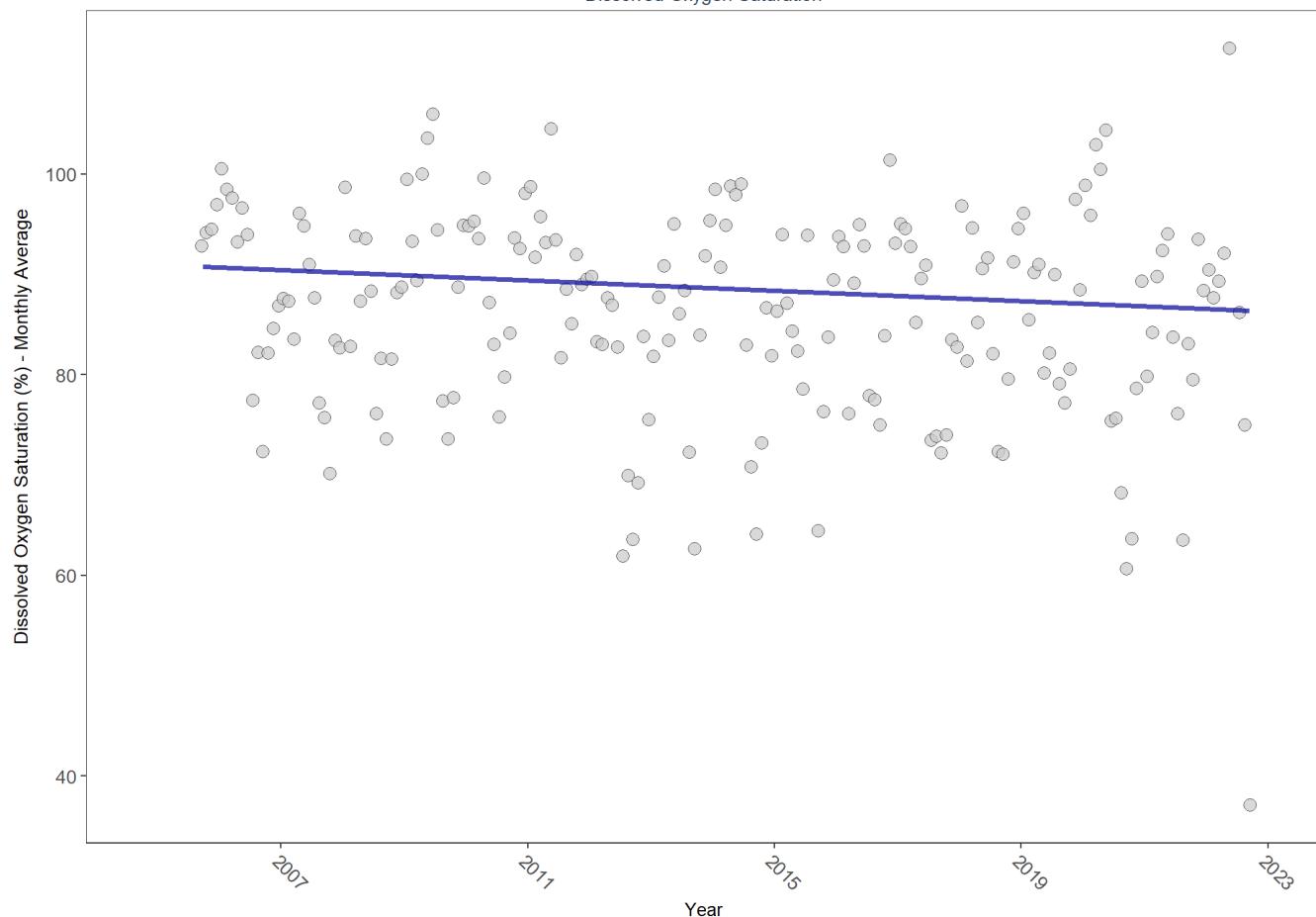
**MP1A**

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP1A

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	526884	18	87.9	TRUE	-0.1531	0.0035	-0.2561534	90.93464	6.005	0.873	-1

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

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

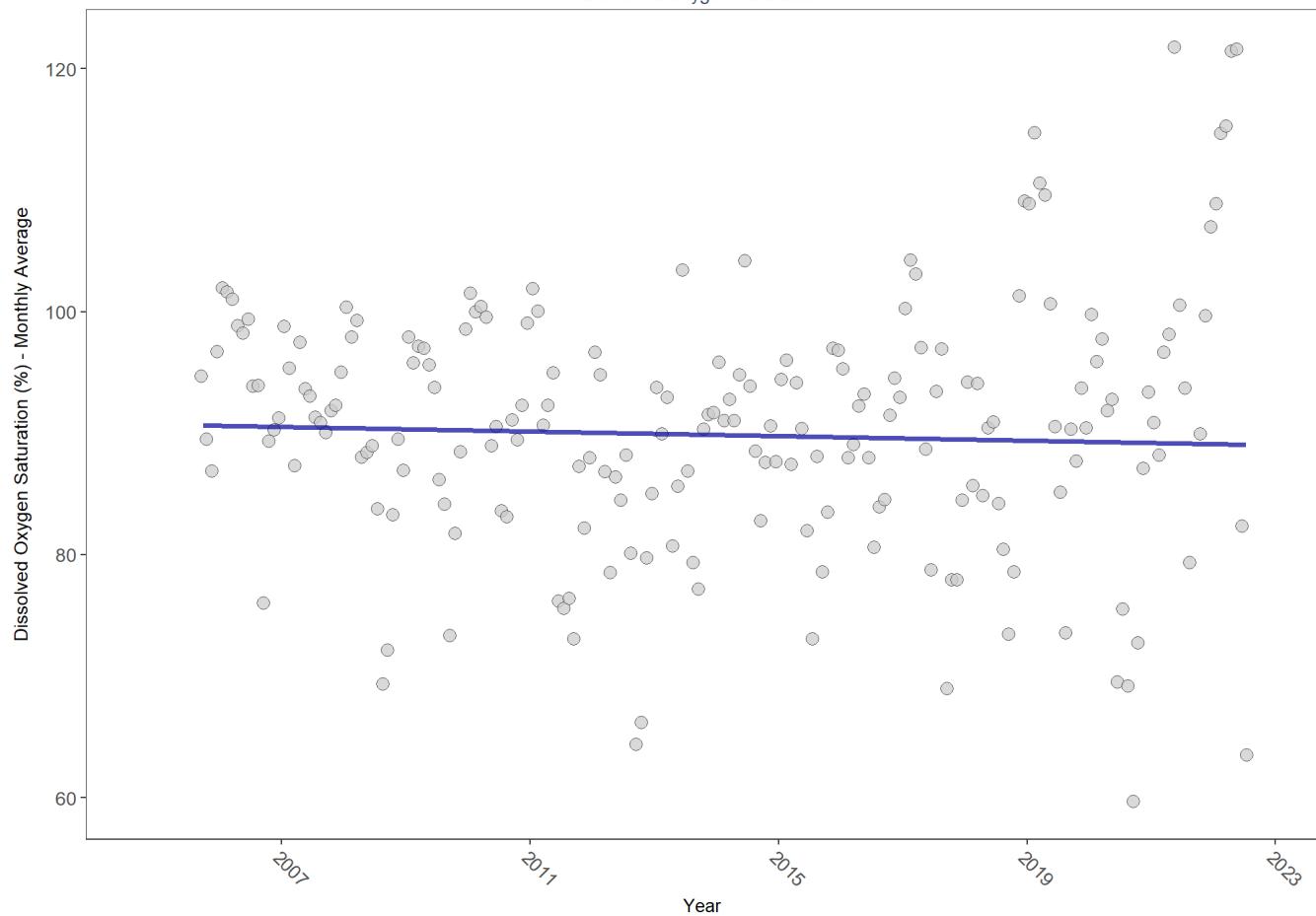
## MP2B

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP2B

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	544252	18	91.1	TRUE	-0.0404	0.4621	-0.09154772	90.68854	11.2514	0.4225	0

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

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

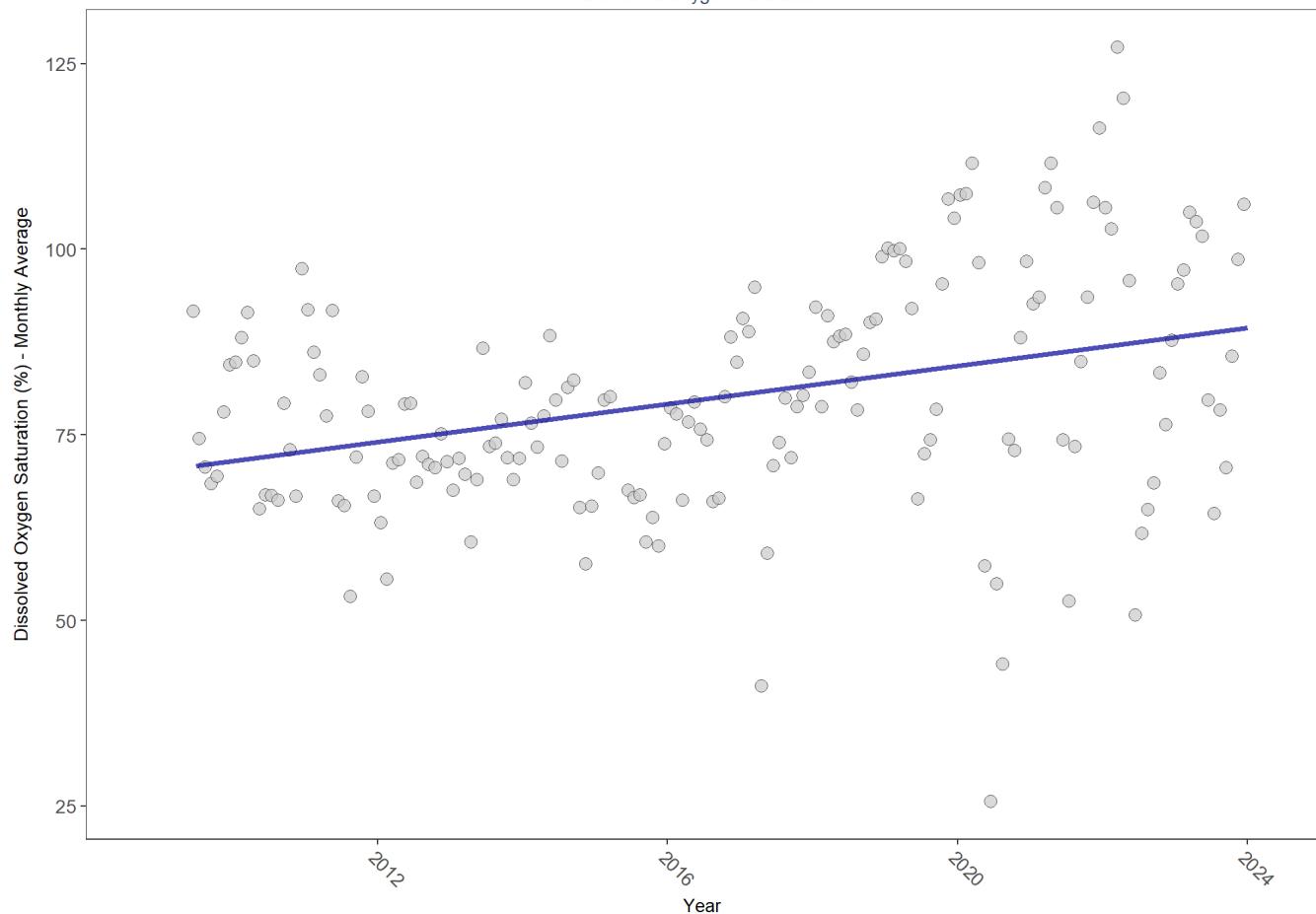
## MP3C

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP3C

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	463883	15	80.9	TRUE	0.2843	0.0000	1.281363	70.15533	23.8391	0.0134	1

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

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

## All Stations Combined

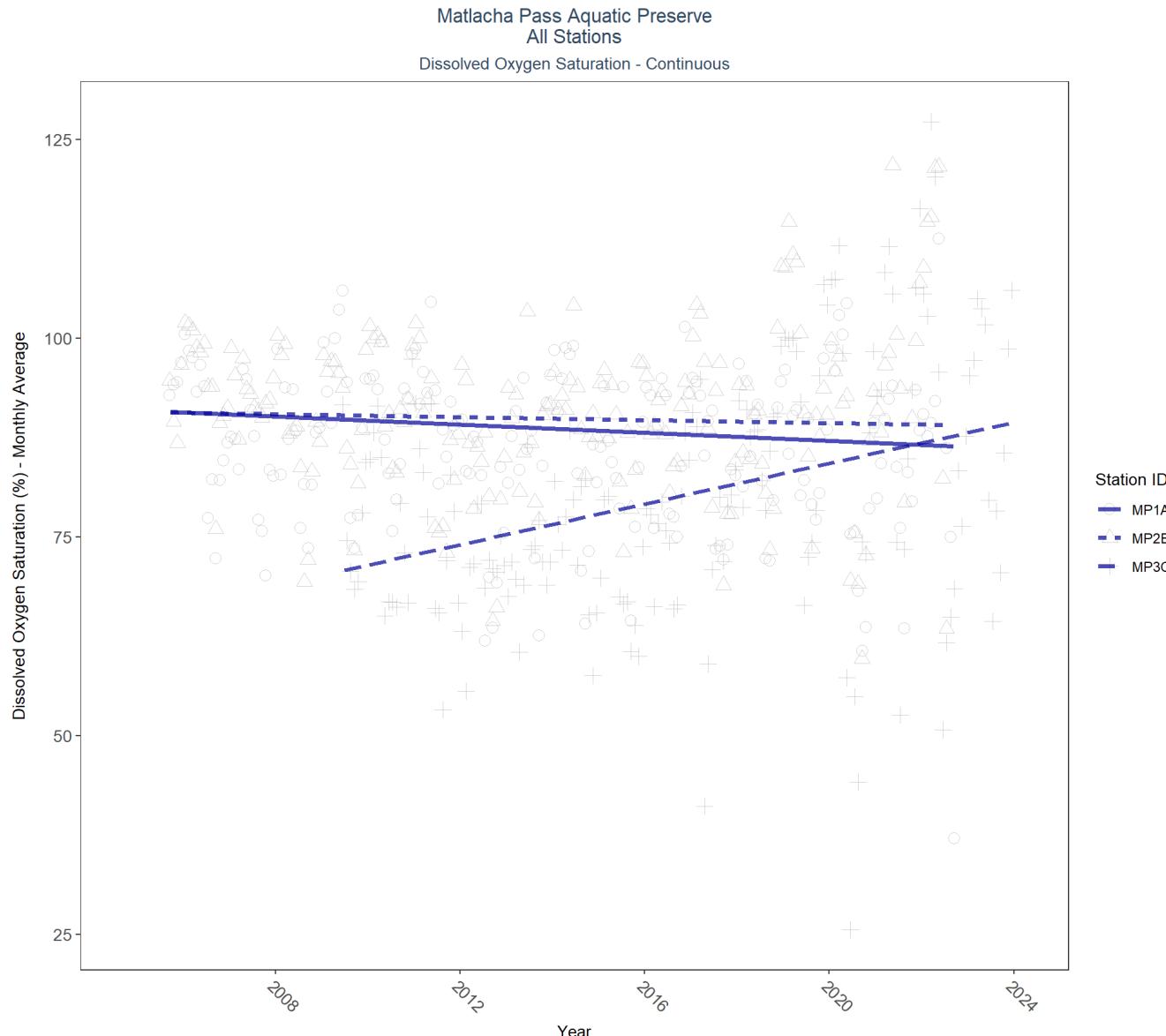


Table 28: Seasonal Kendall-Tau Results for All Stations - Dissolved Oxygen Saturation

Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
MP1A	526884	18	2005 - 2022	87.9	-0.15	90.93	-0.26	0.0035
MP2B	544252	18	2005 - 2022	91.1	-0.04	90.69	-0.09	0.4621
MP3C	463883	15	2009 - 2023	80.9	0.28	70.16	1.28	0.0000

## pH - Continuous Water Quality

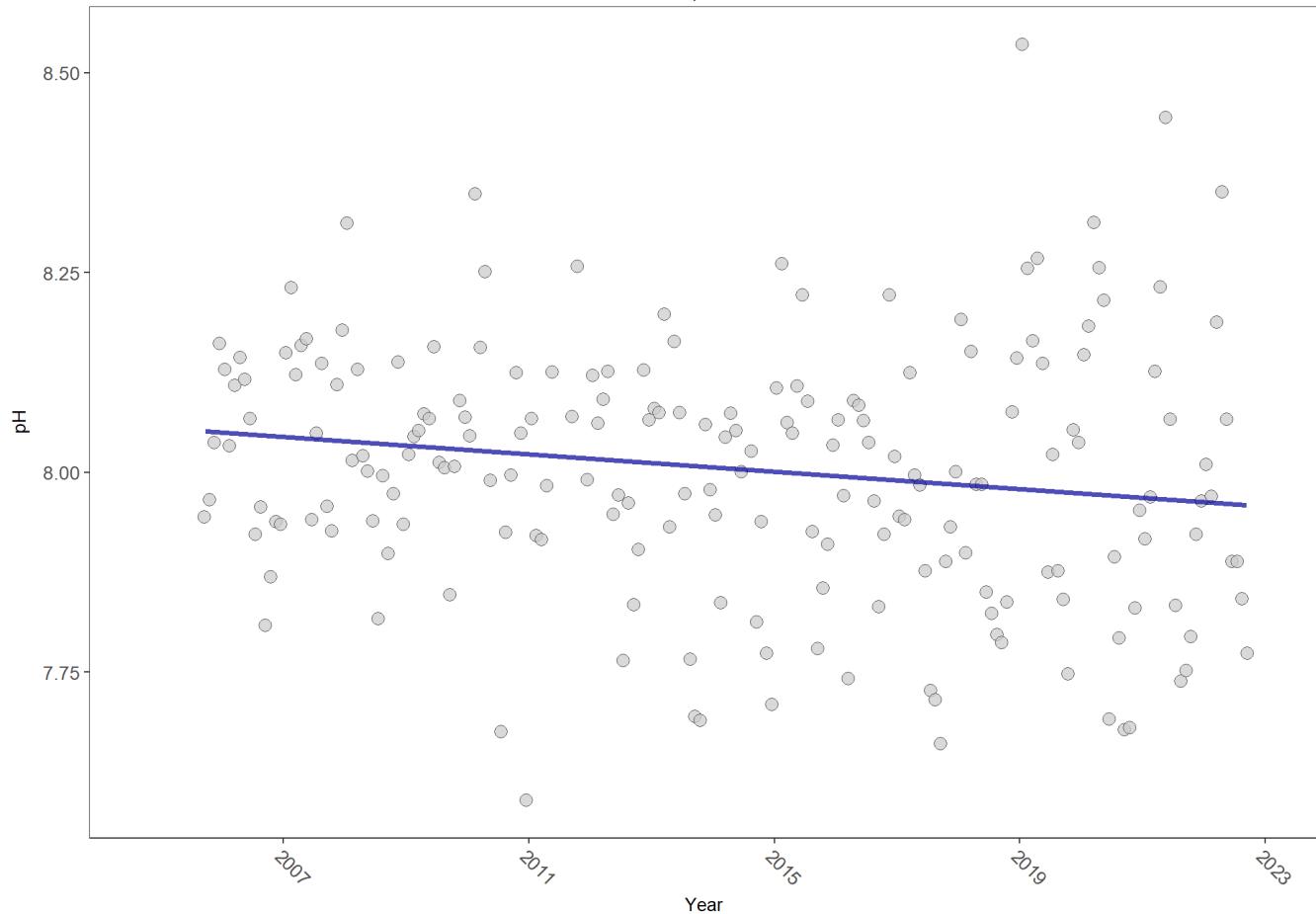
### MP1A

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP1A

pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	493048	18	8	TRUE	-0.1467	0.0055	-0.005418347	8.055265	20.8854	0.0346	-1

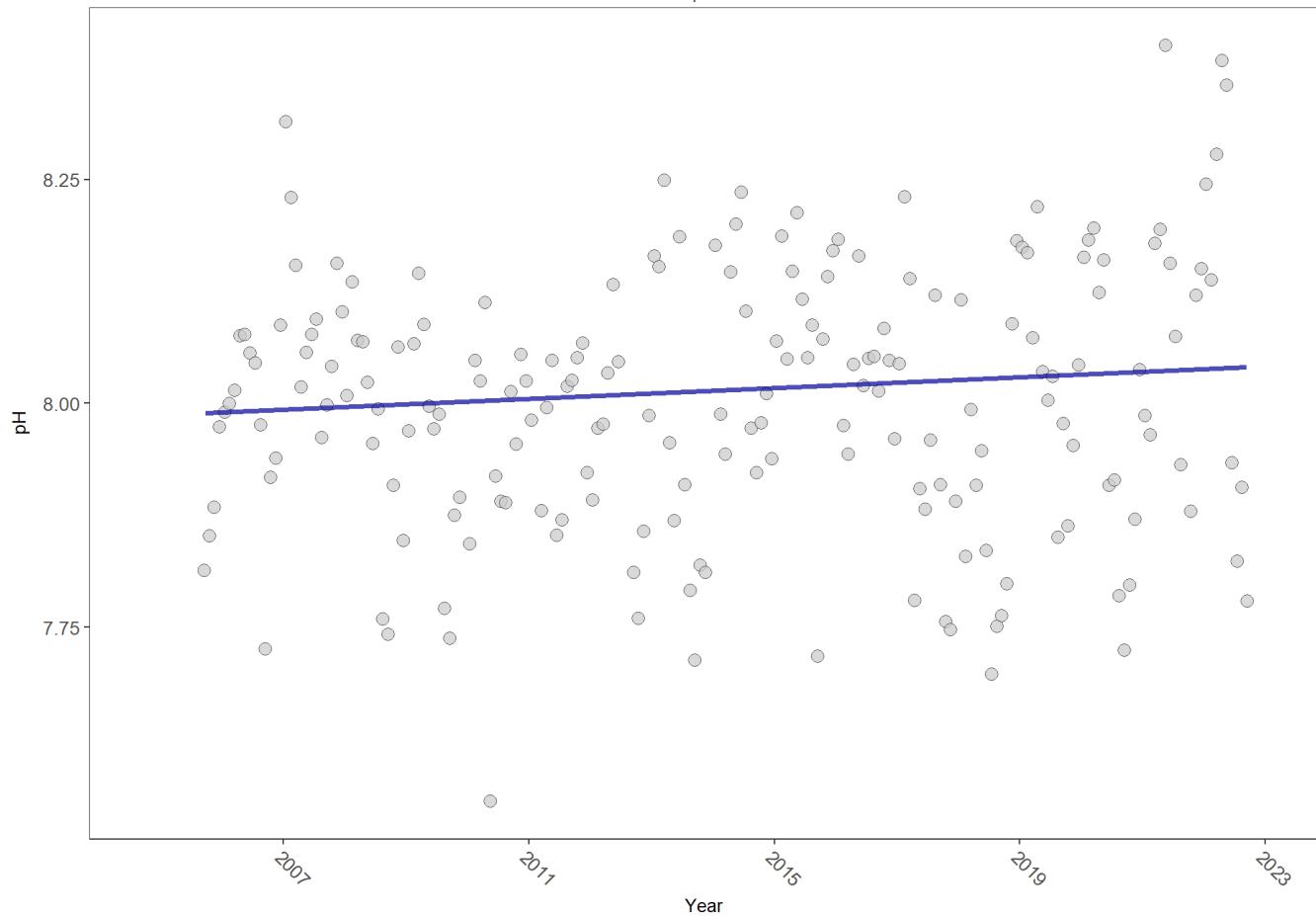
$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

## MP2B

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve  
MP2B  
pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	509989	18	8	TRUE	0.0641	0.2185	0.0003039621	7.986764	9.6248	0.5644	0

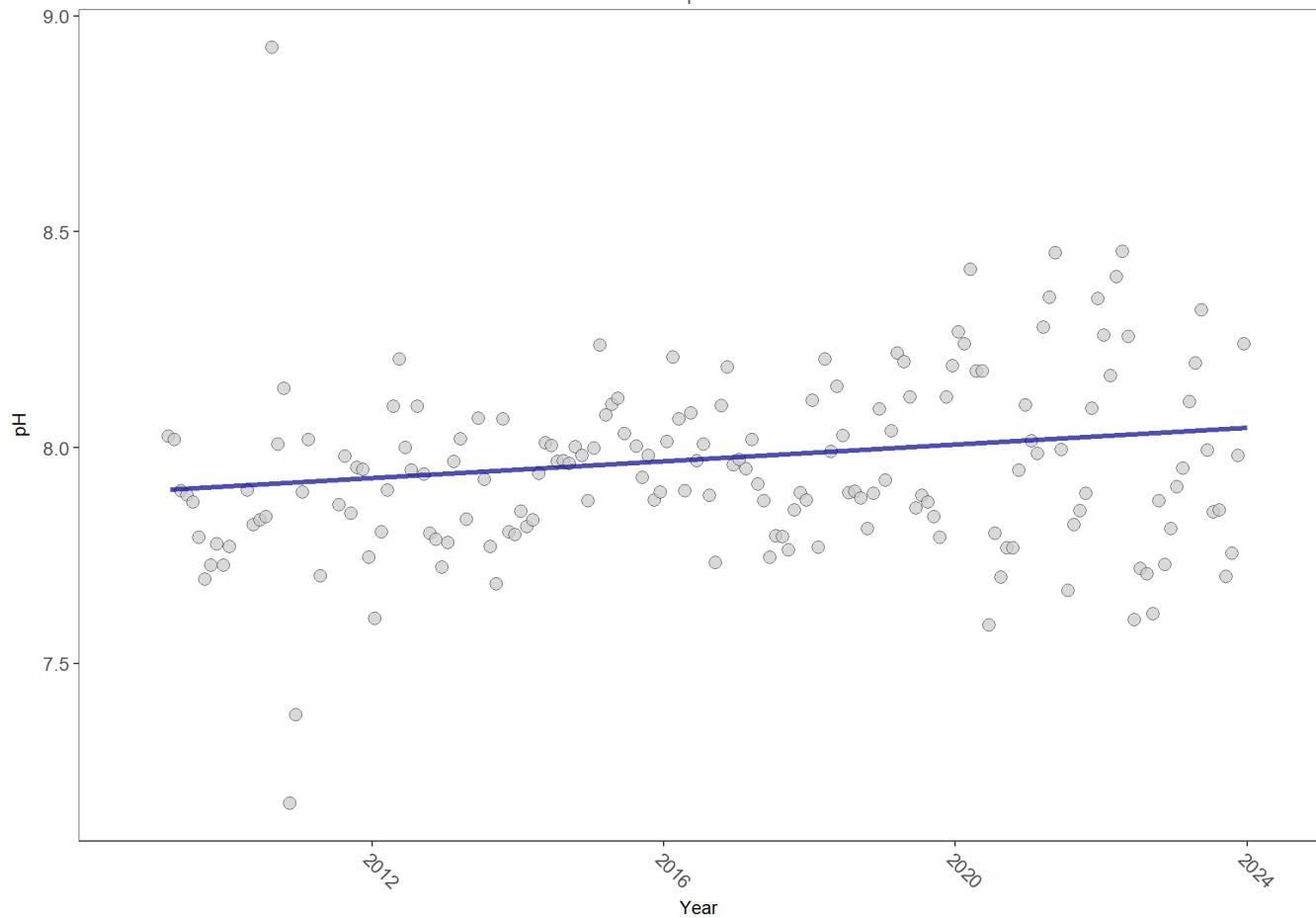
*p < 0.00005 appear as 0 due to rounding.*

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

## MP3C

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve  
MP3C  
pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	429960	15	7.9	TRUE	0.1604	0.0077	0.009667659	7.901639	50.8787	0	1

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

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

## All Stations Combined

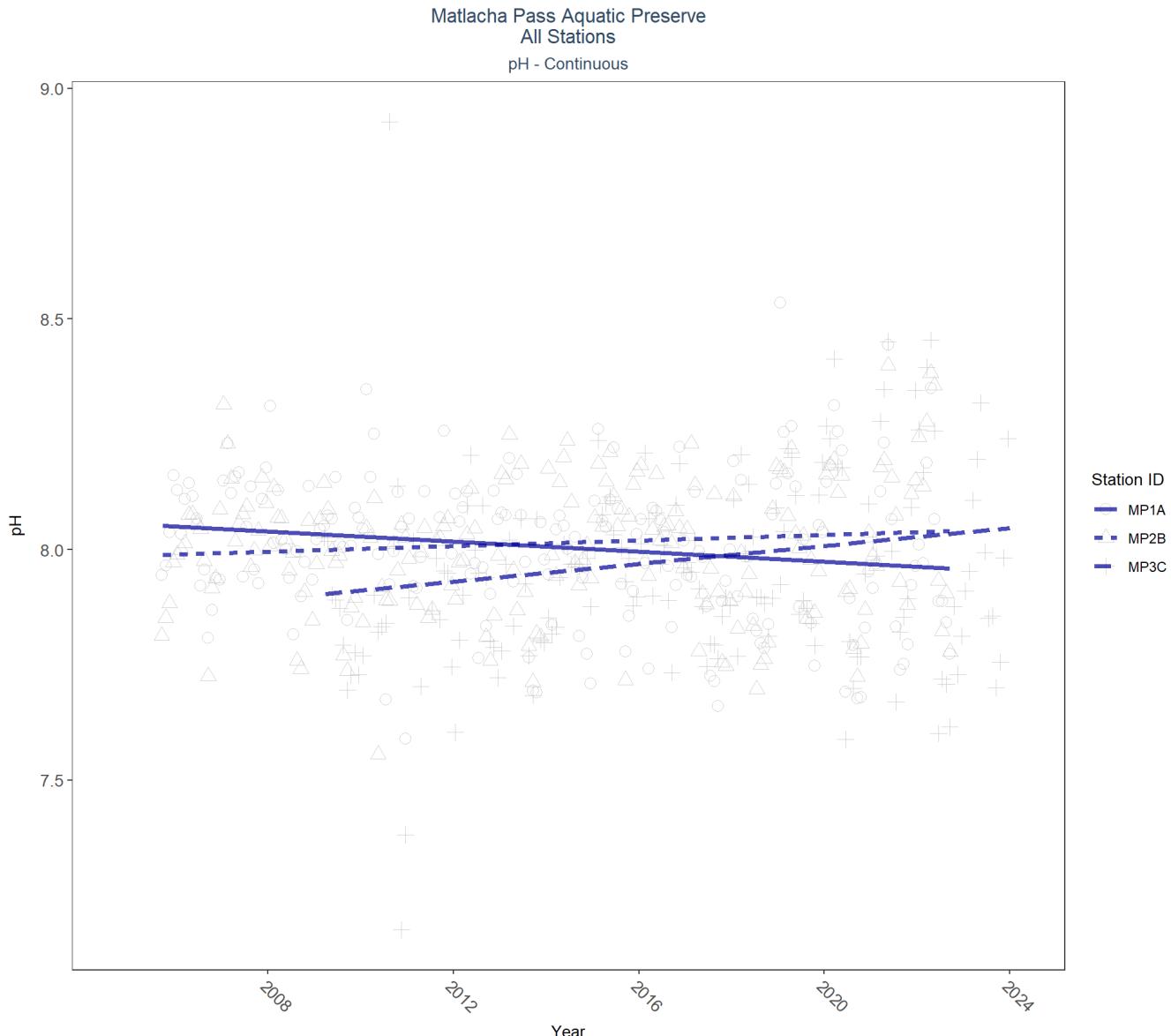


Table 29: Seasonal Kendall-Tau Results for All Stations - pH

Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
MP1A	493048	18	2005 - 2022	8.0	-0.15	8.06	-0.01	0.0055
MP2B	509989	18	2005 - 2022	8.0	0.06	7.99	0.00	0.2185
MP3C	429960	15	2009 - 2023	7.9	0.16	7.90	0.01	0.0077

## Salinity - Continuous Water Quality

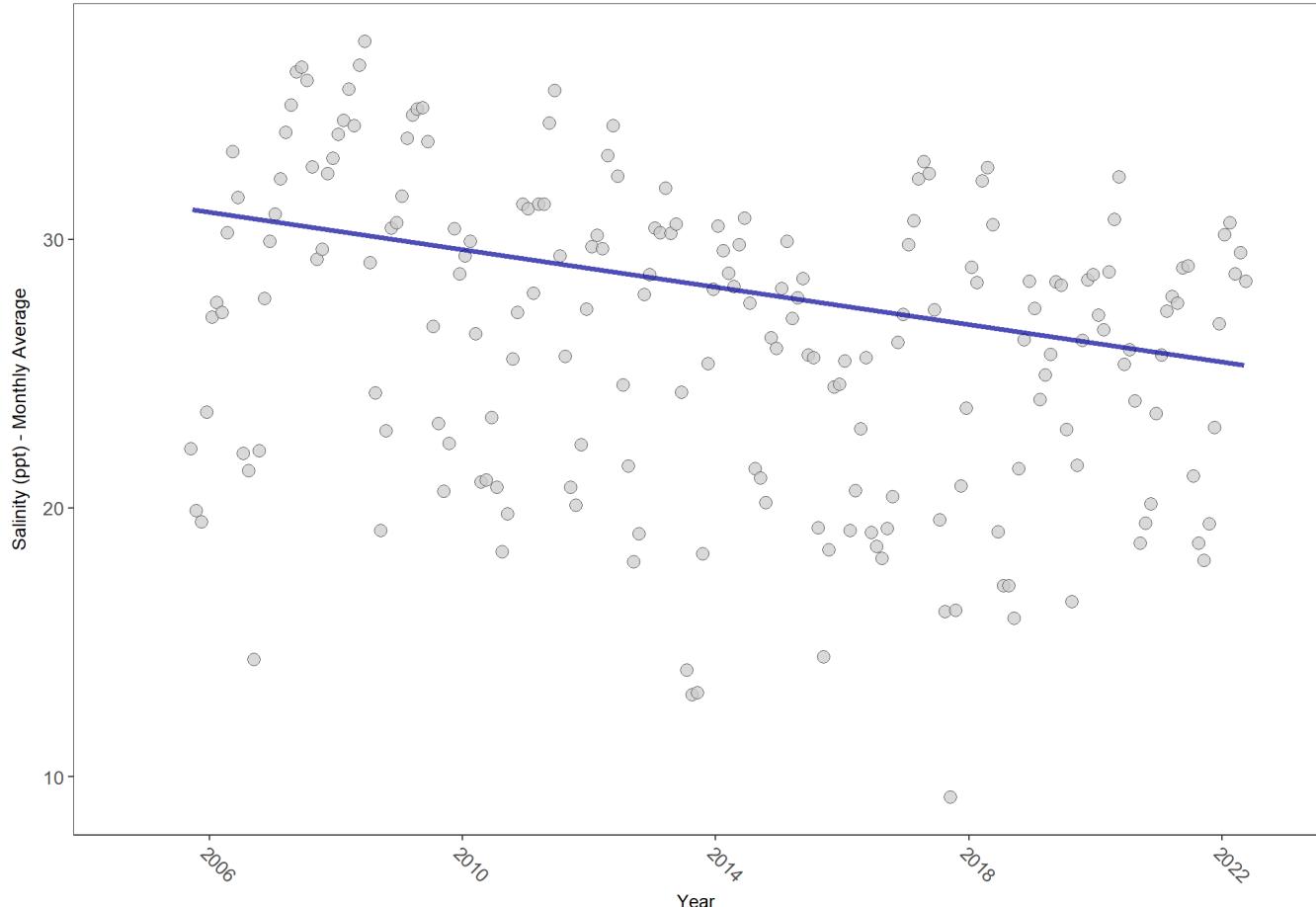
### MP1A

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP1A

Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	541260	18	27.3	TRUE	-0.3274	0.0000	-0.3477367	31.35551	1.86	0.9989	-1

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

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

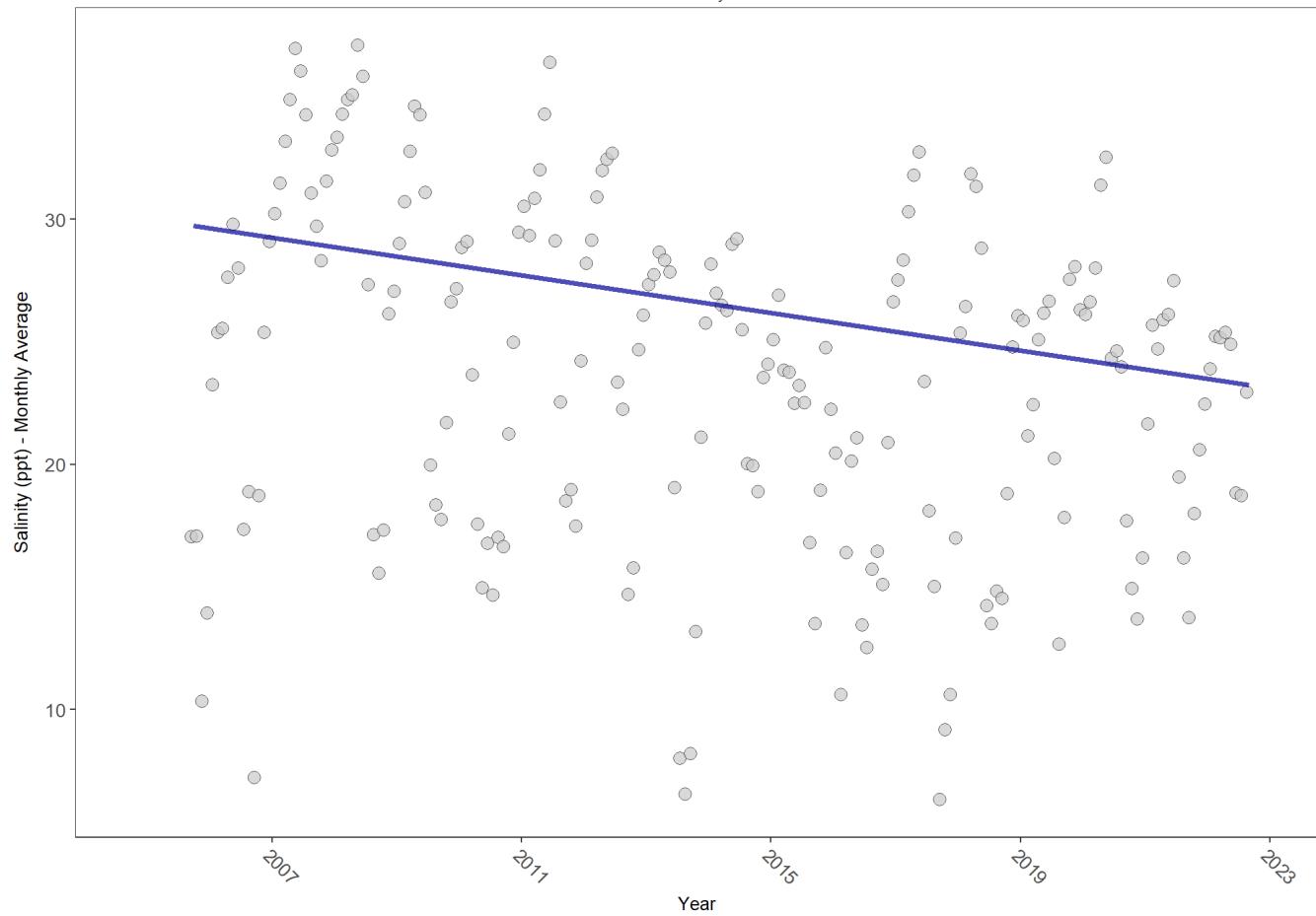
## MP2B

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP2B

Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	563919	18	24.7	TRUE	-0.3199	0.0000	-0.3833114	30.02281	5.7166	0.8916	-1

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

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

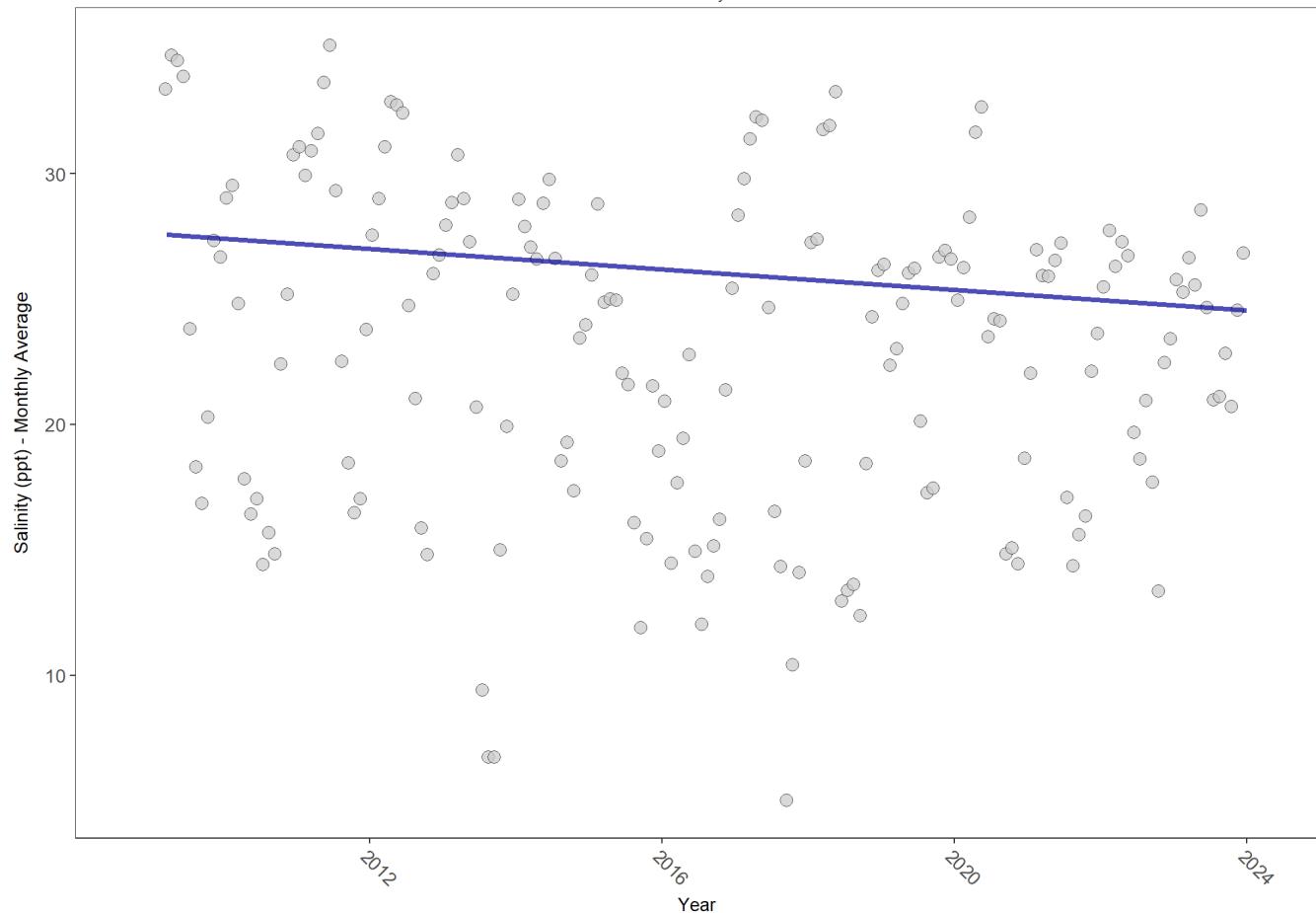
## MP3C

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP3C

Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	487998	15	23.9	TRUE	-0.168	0.0035	-0.2037393	27.61822	10.7638	0.4633	-1

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

SennIntercept is intercept value at beginning of record for monitoring location

## All Stations Combined

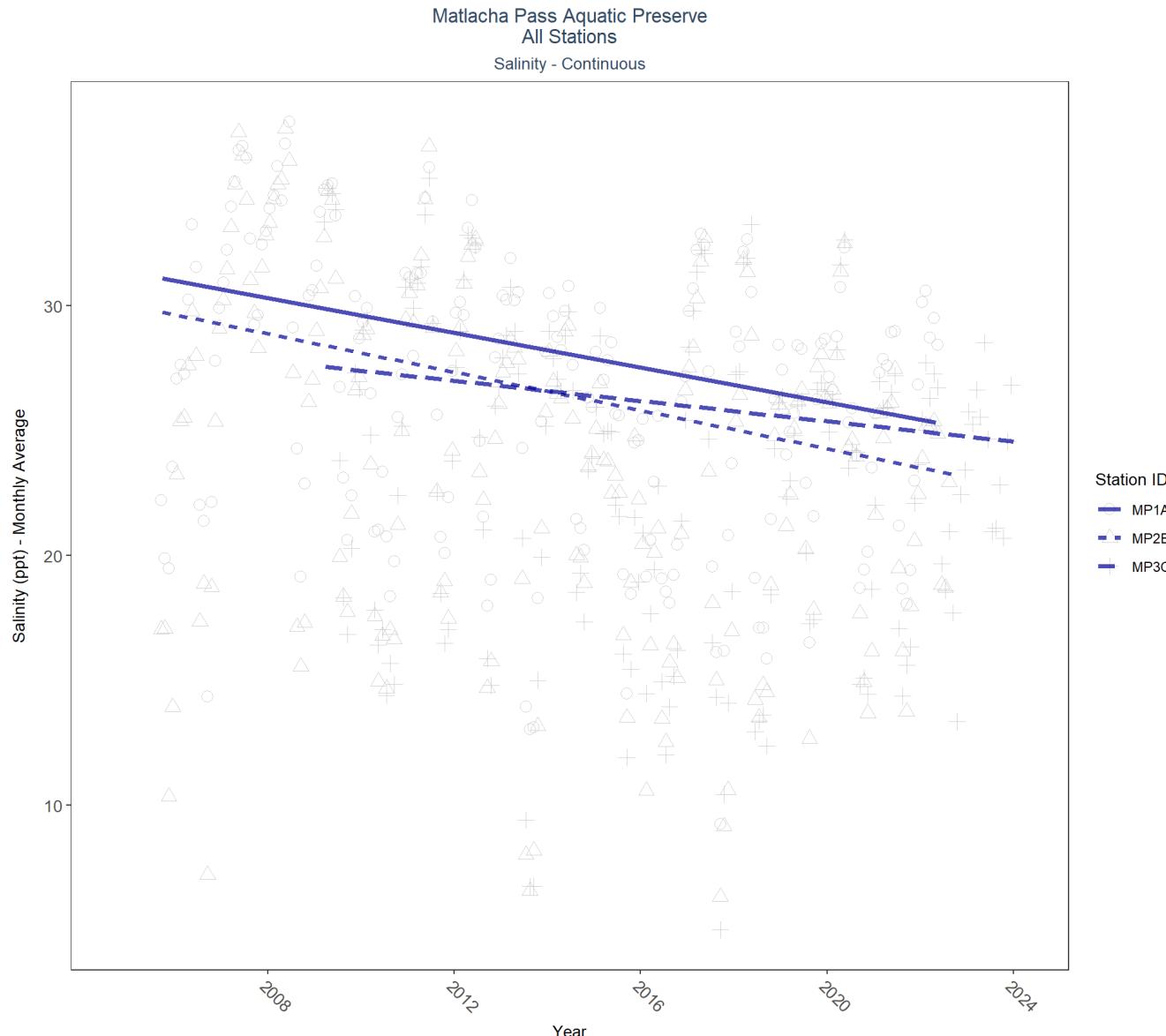


Table 30: Seasonal Kendall-Tau Results for All Stations - Salinity

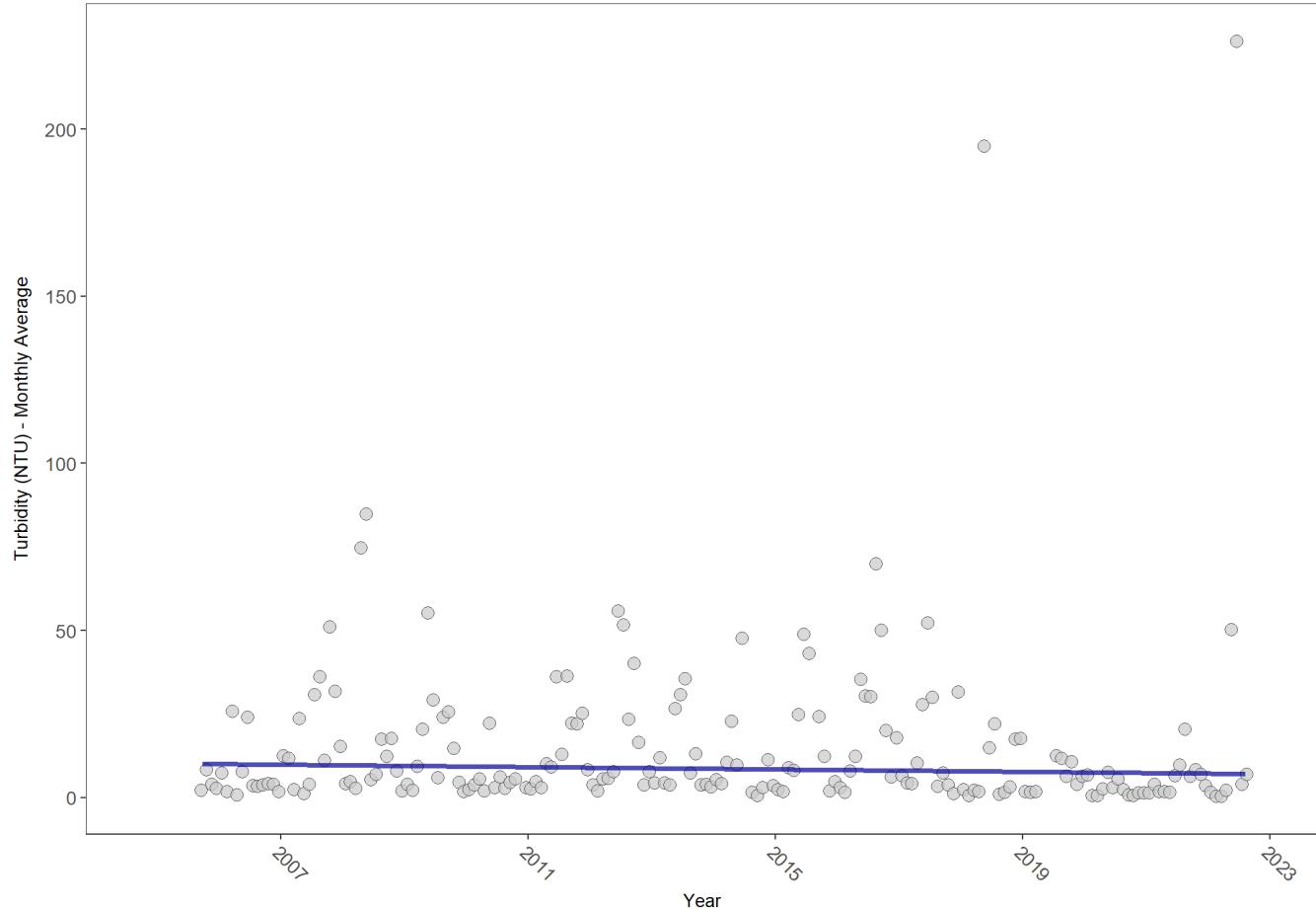
Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
MP1A	541260	18	2005 - 2022	27.3	-0.33	31.36	-0.35	0.0000
MP2B	563919	18	2005 - 2022	24.7	-0.32	30.02	-0.38	0.0000
MP3C	487998	15	2009 - 2023	23.9	-0.17	27.62	-0.20	0.0035

## Turbidity - Continuous Water Quality

### MP1A

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve  
MP1A  
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	434165	18	2	TRUE	-0.1497	0.0038	-0.180606	10.26682	20.303	0.0414	-1

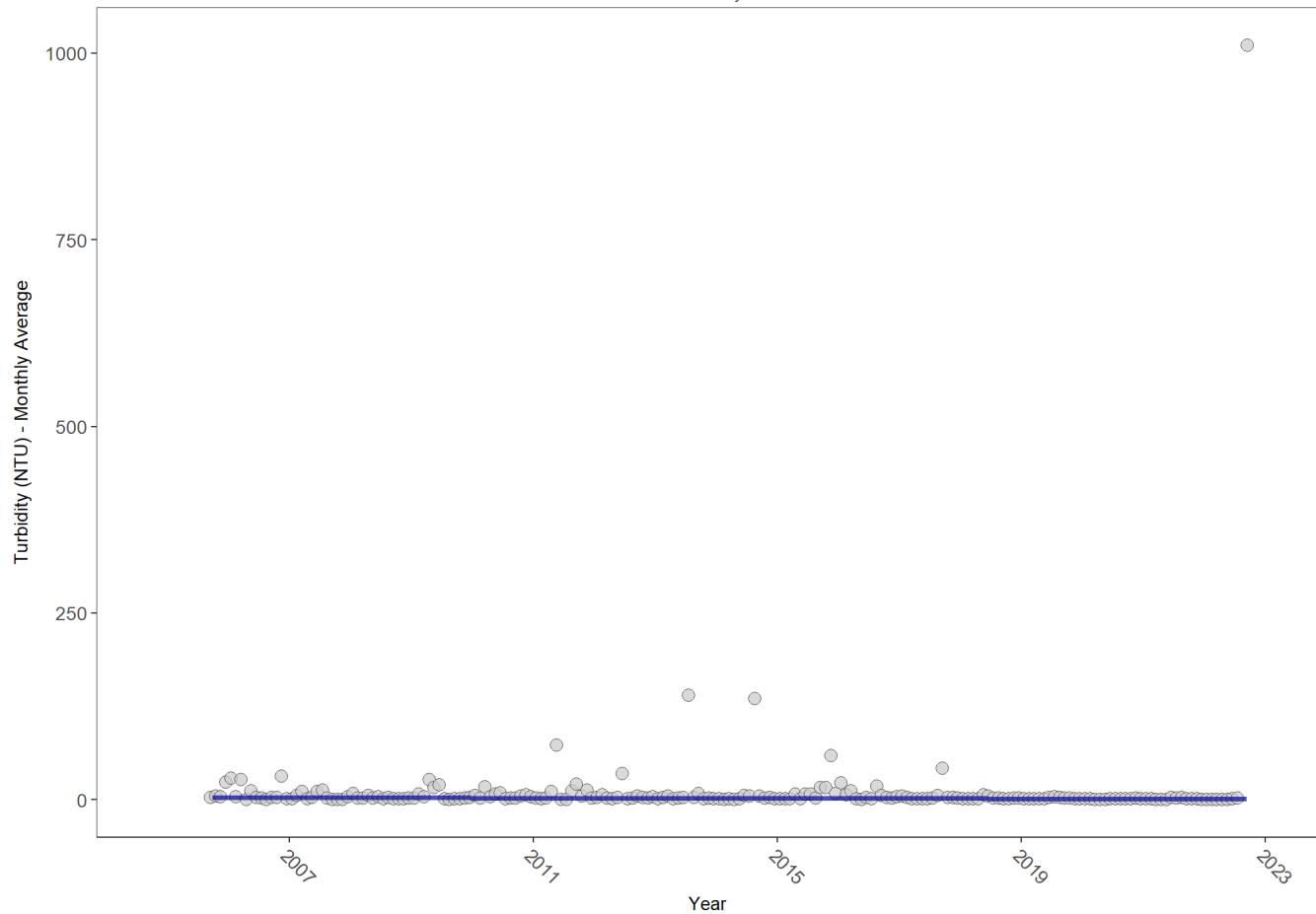
*p < 0.00005 appear as 0 due to rounding.*

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

## MP2B

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve  
MP2B  
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	490414	18	1	TRUE	-0.2456	0.0000	-0.1332287	3.068462	29.3555	0.002	-2

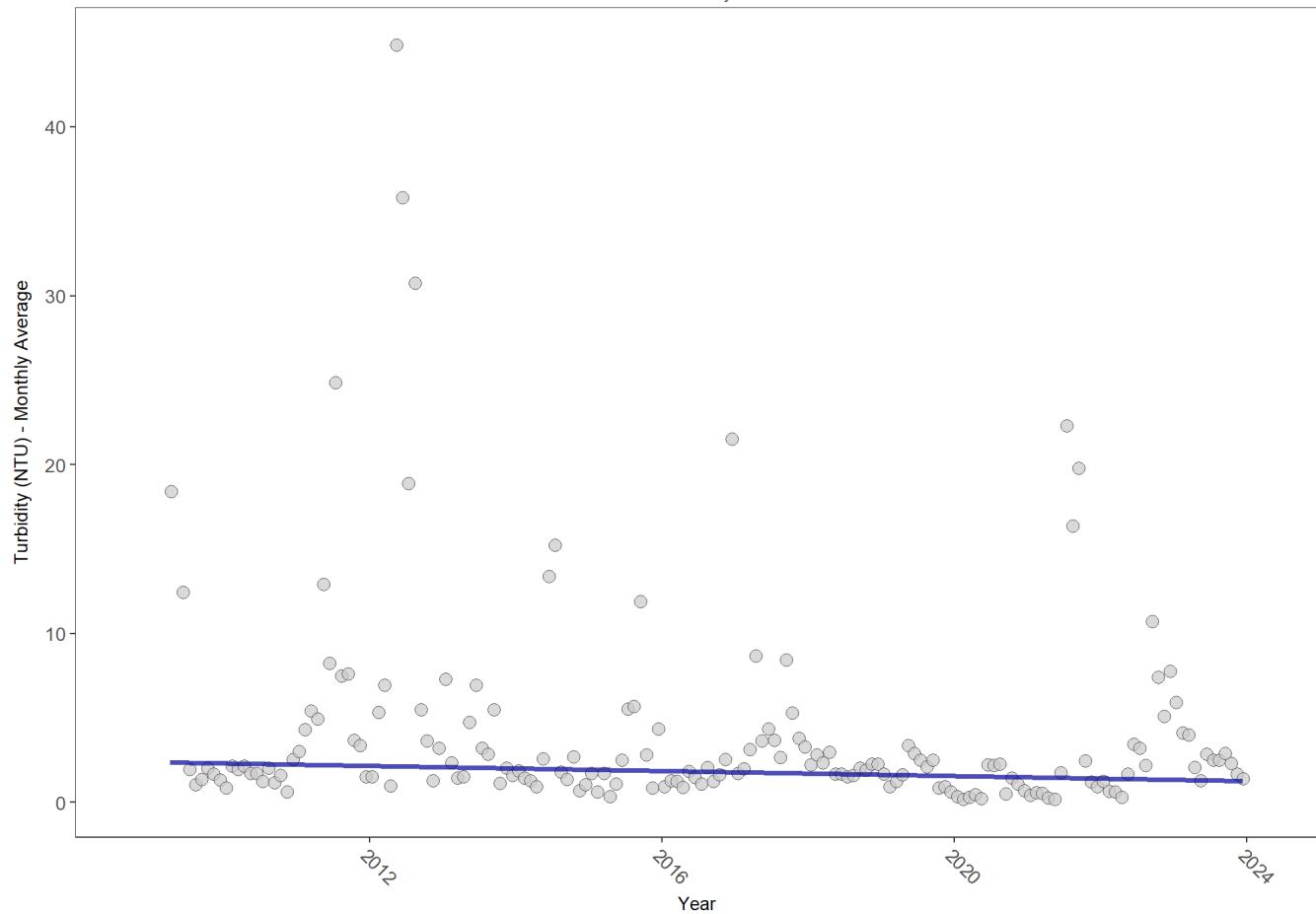
*p < 0.00005 appear as 0 due to rounding.*

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

## MP3C

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve  
MP3C  
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	424131	15	1	TRUE	-0.1341	0.0223	-0.07427214	2.378927	15.3843	0.1656	-1

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

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

## All Stations Combined

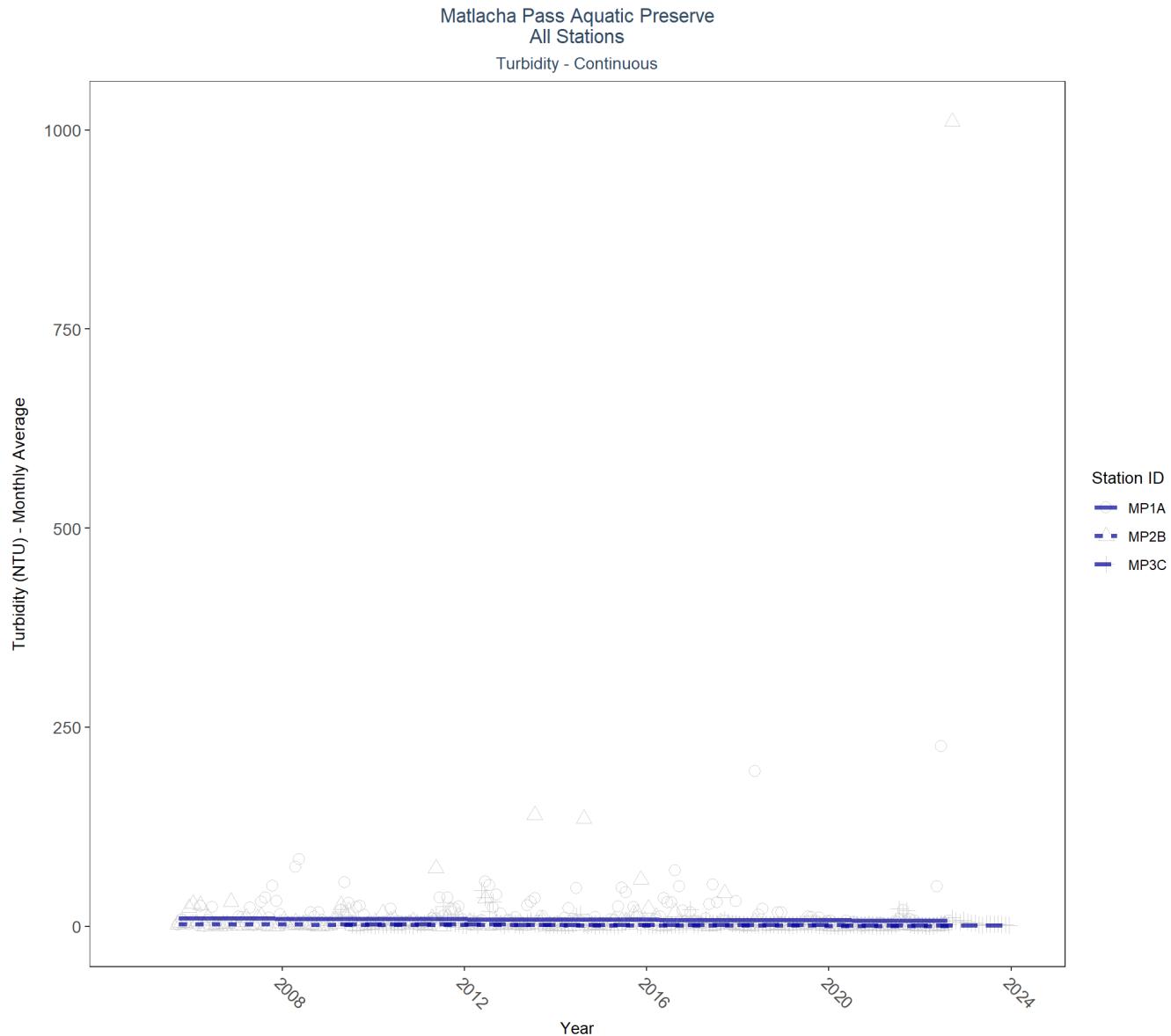


Table 31: Seasonal Kendall-Tau Results for All Stations - Turbidity

Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
MP1A	434165	18	2005 - 2022	2	-0.15	10.27	-0.18	0.0038
MP2B	490414	18	2005 - 2022	1	-0.25	3.07	-0.13	0.0000
MP3C	424131	15	2009 - 2023	1	-0.13	2.38	-0.07	0.0223

## Water Temperature - Continuous Water Quality

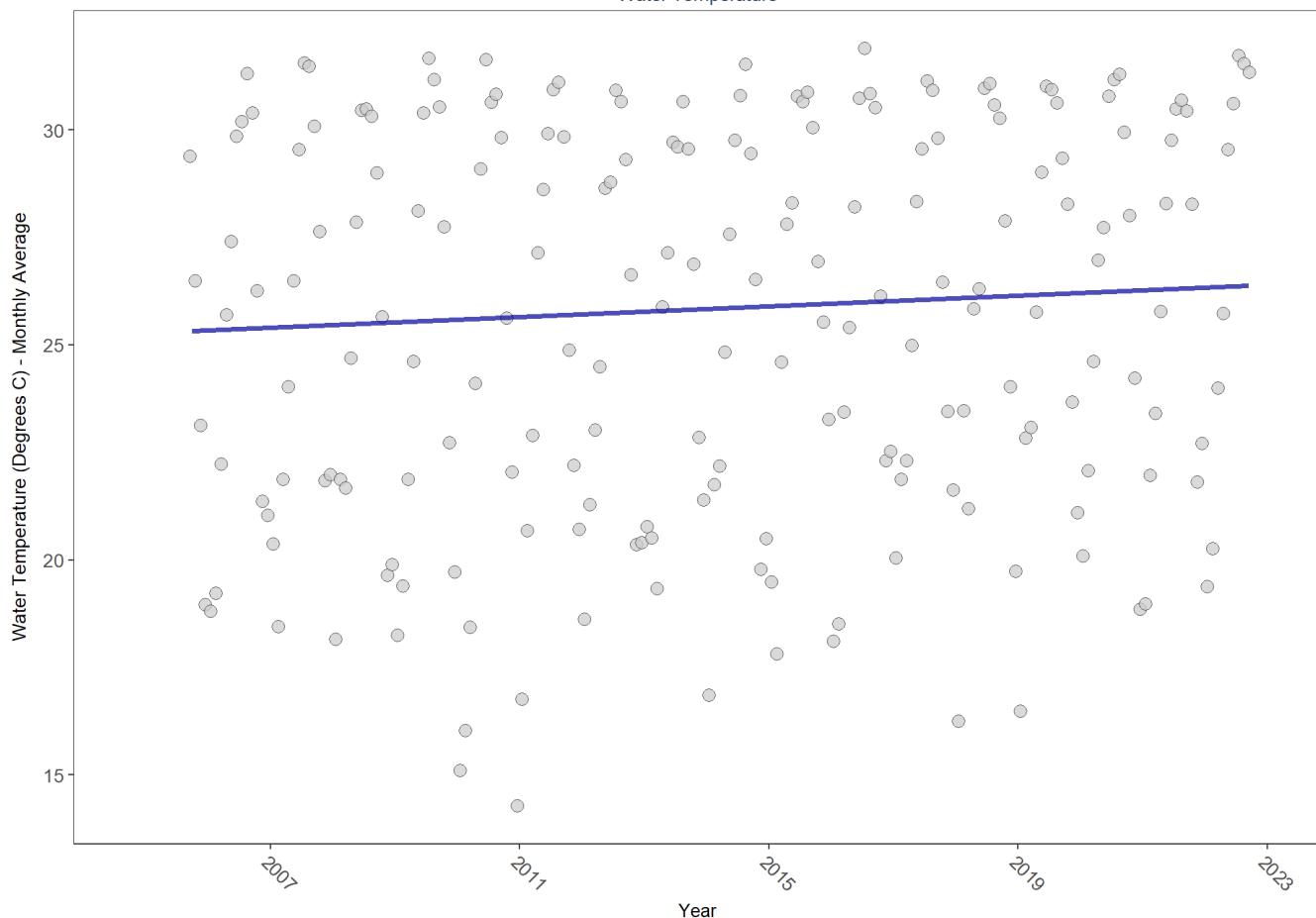
**MP1A**

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP1A

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	574443	18	26.4	TRUE	0.2397	0.0000	0.06195139	25.27953	6.9336	0.8044	1

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

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

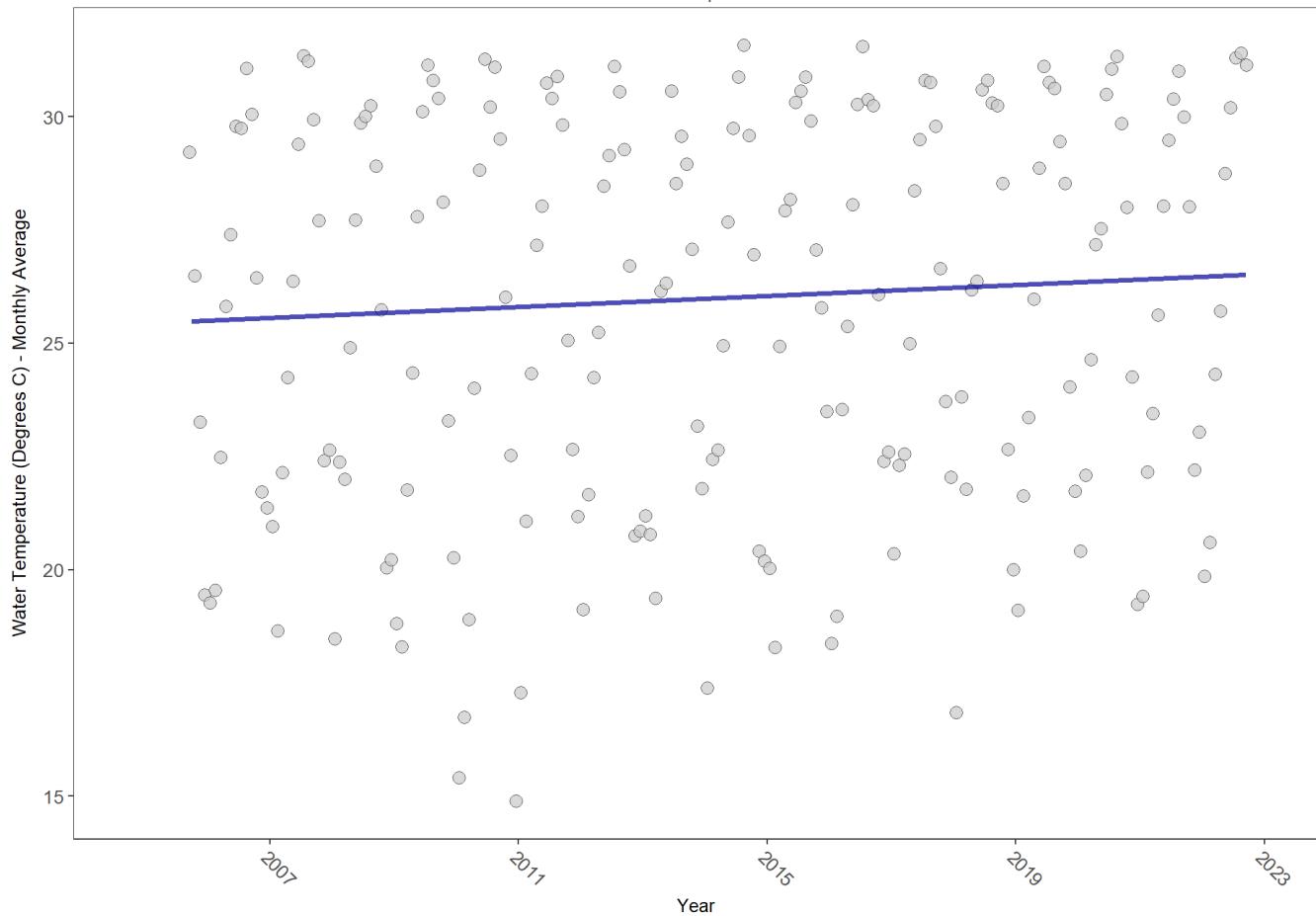
## MP2B

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP2B

Water Temperature



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

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

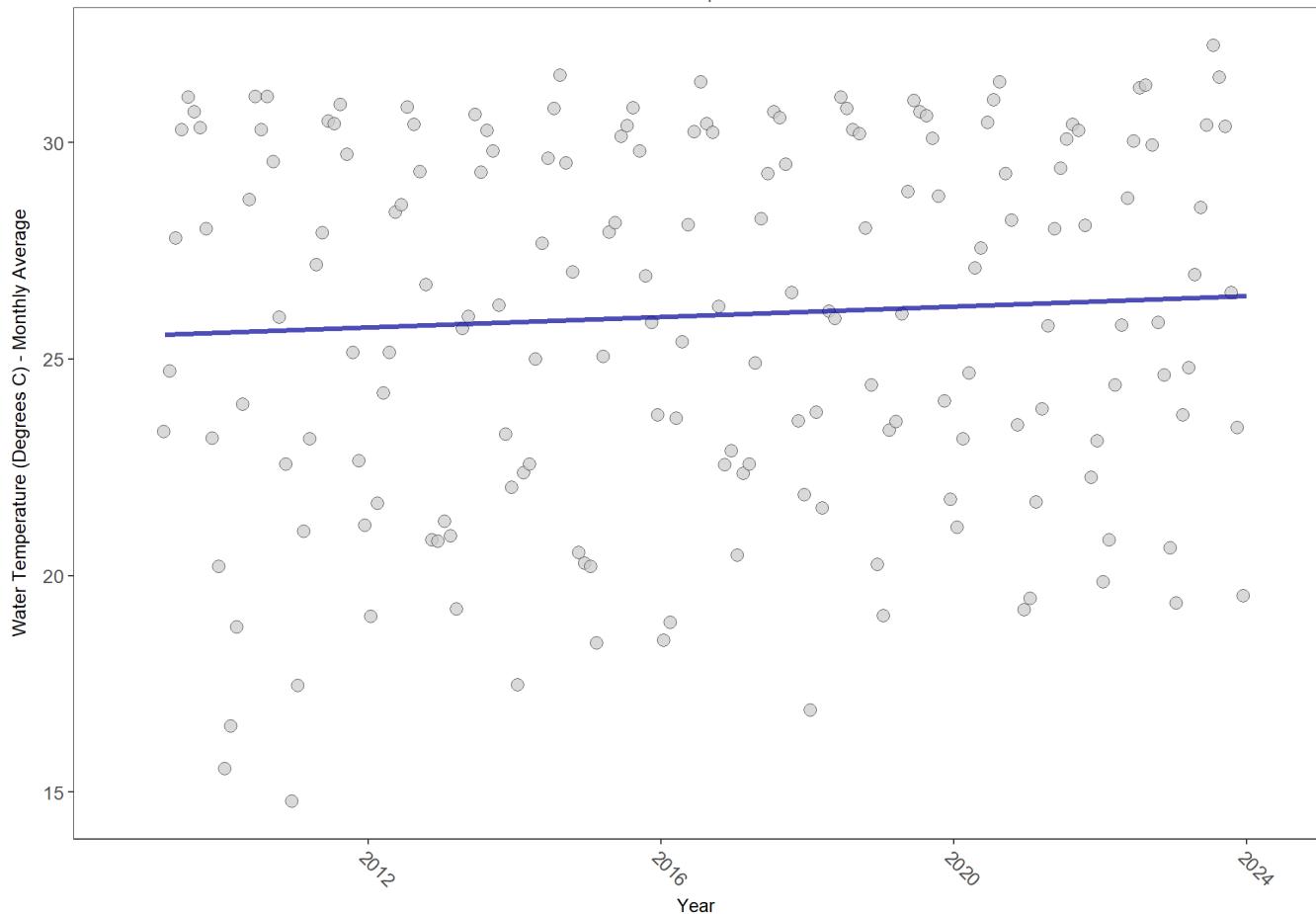
## MP3C

Charlotte Harbor Aquatic Preserves Continuous Water Quality Monitoring (512)

Matlacha Pass Aquatic Preserve

MP3C

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	491944	15	26.6	TRUE	0.1995	0.0004	0.06037924	25.55775	5.5711	0.9004	1

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

SennIntercept is intercept value at beginning of record for monitoring location

## All Stations Combined

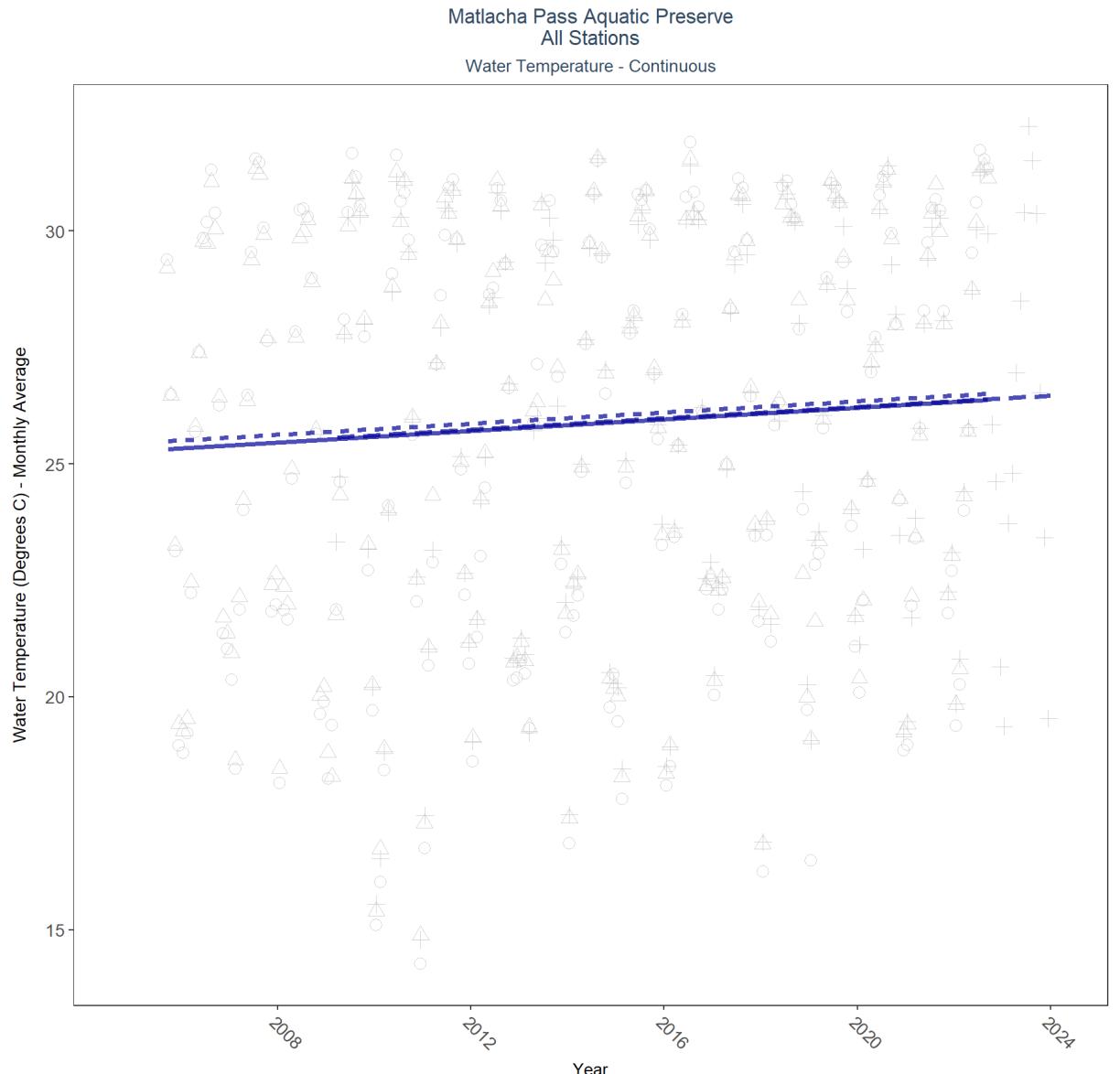


Table 32: Seasonal Kendall-Tau Results for All Stations - Water Temperature

Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
MP1A	574443	18	2005 - 2022	26.4	0.24	25.28	0.06	0.0000
MP2B	572608	18	2005 - 2022	26.2	0.21	25.44	0.06	0.0001
MP3C	491944	15	2009 - 2023	26.6	0.20	25.56	0.06	0.0004

# 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.

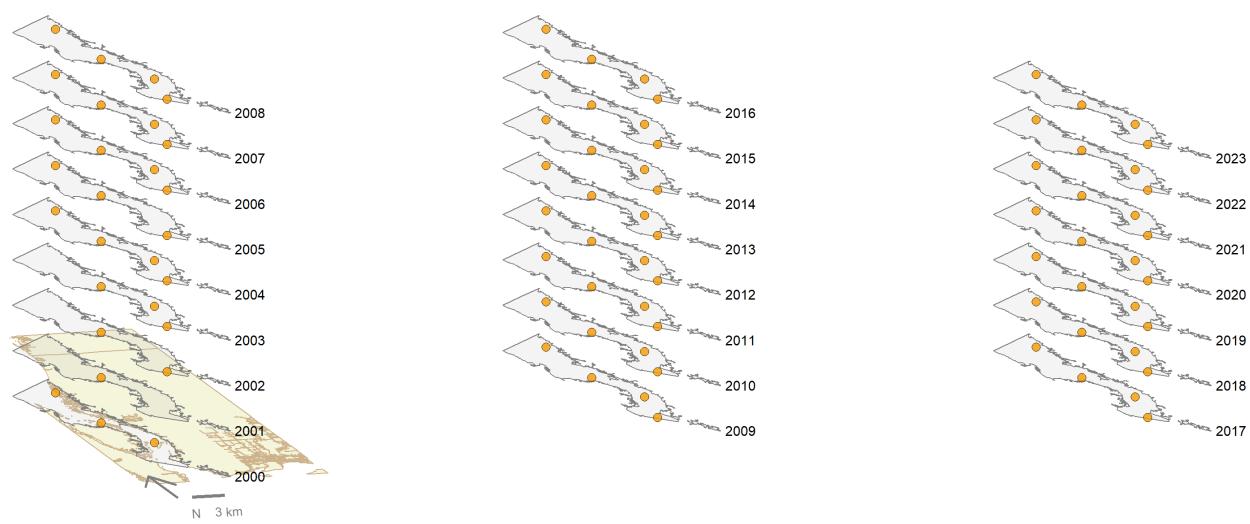
## Notes

*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

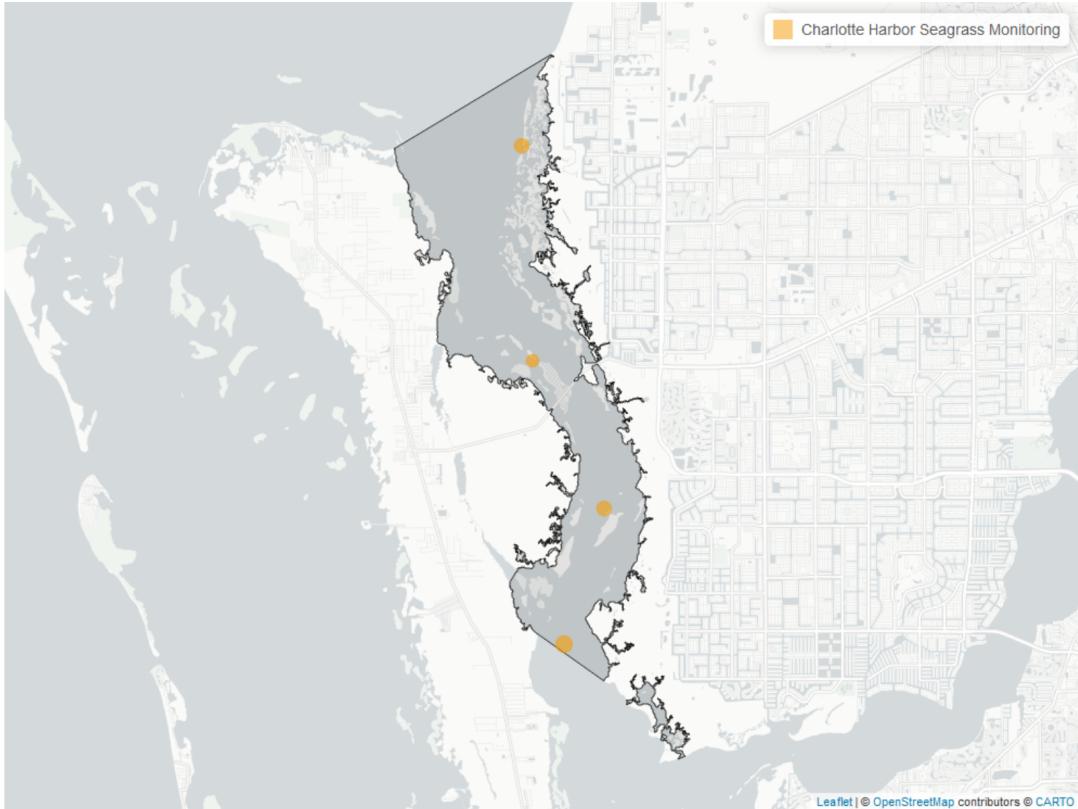
Matlacha Pass Aquatic Preserve  
SAV Percent Cover - Sample Locations



Program name  
Charlotte Harbor Seagrass Monitoring

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

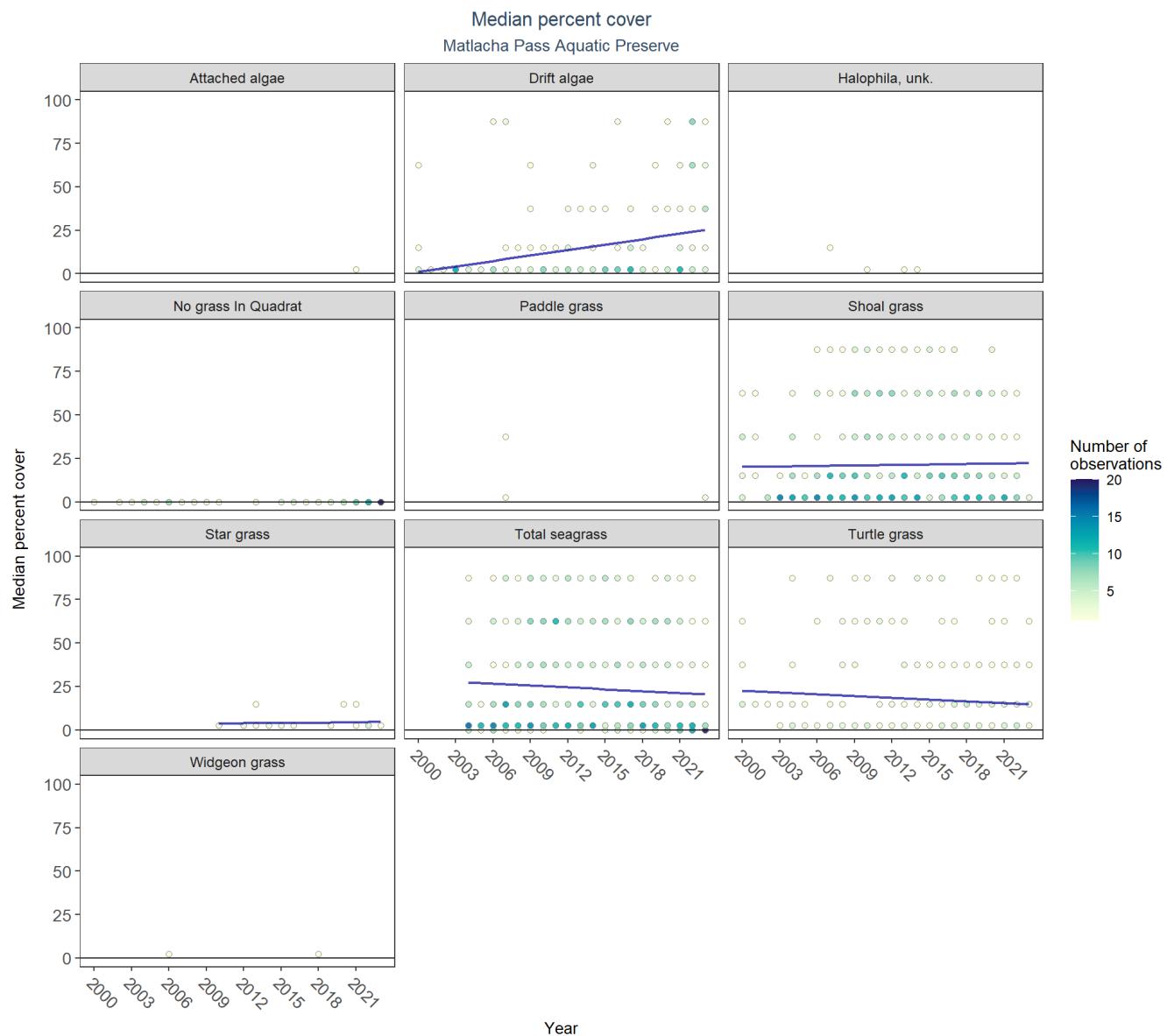
**Sampling locations by Program:**



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

Table 33: Charlotte Harbor Seagrass Monitoring - *Program 570*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
1745	2000	2023	Braun Blanquet	4



Median percent cover by species in *Matlacha Pass 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.

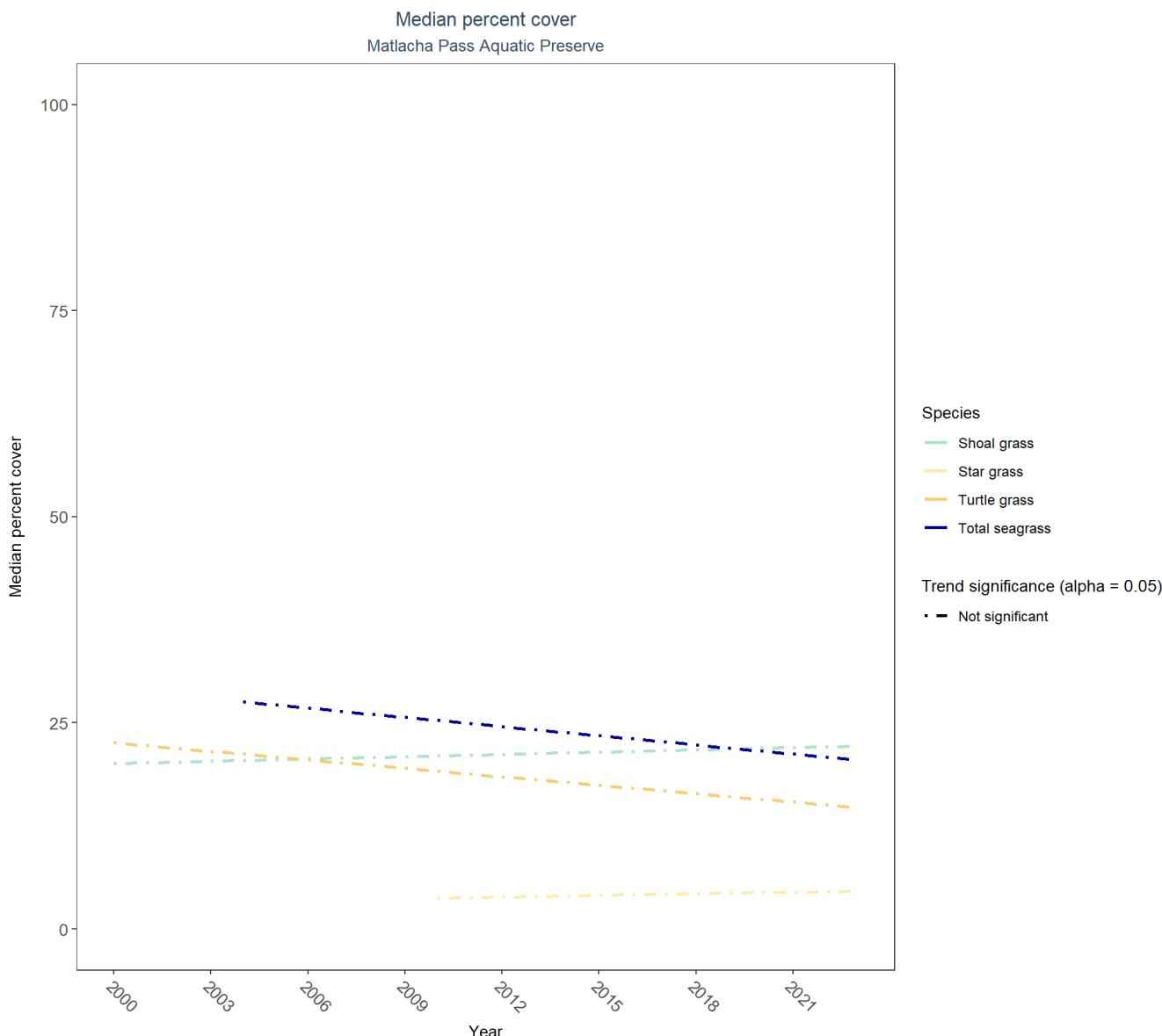
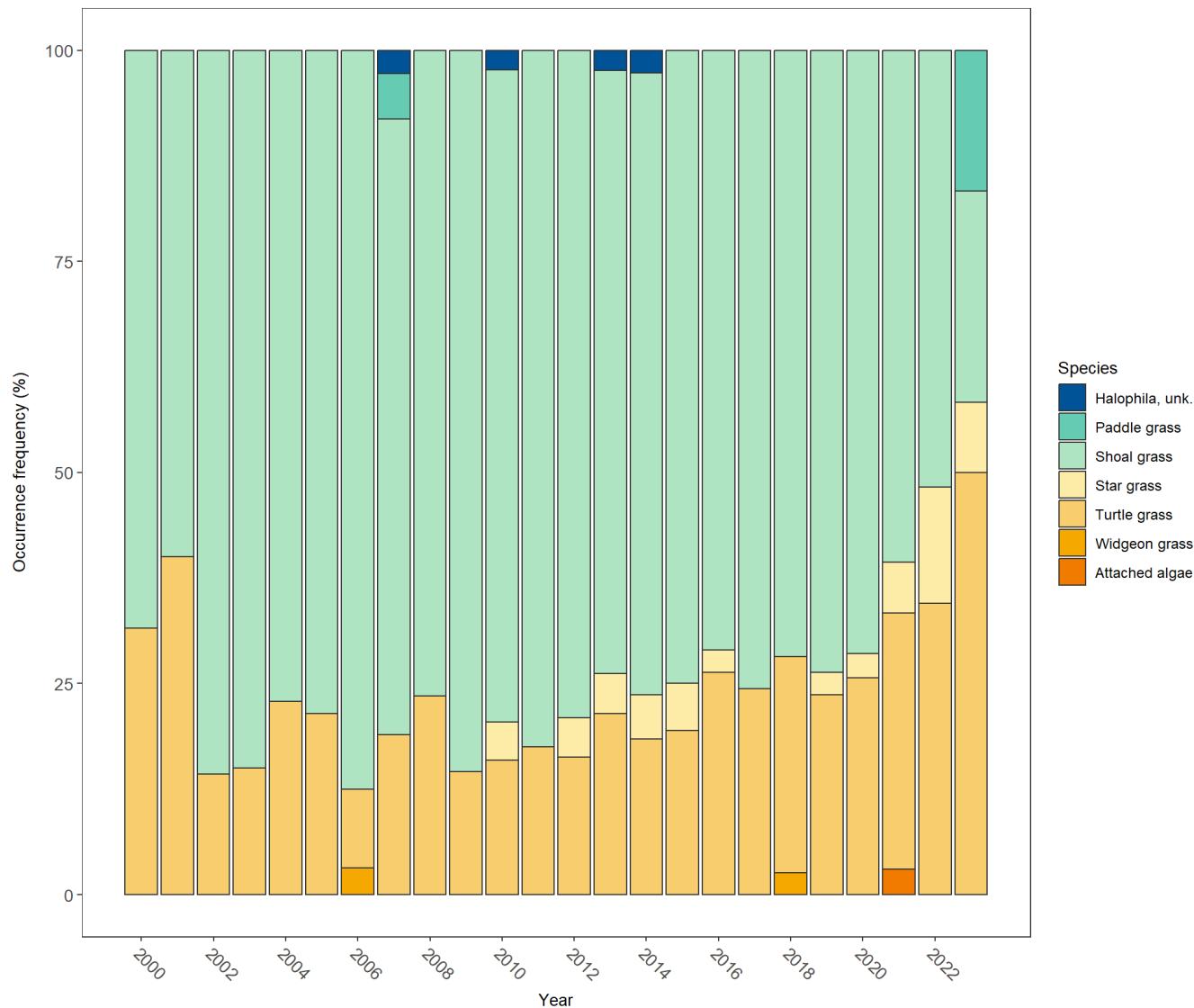
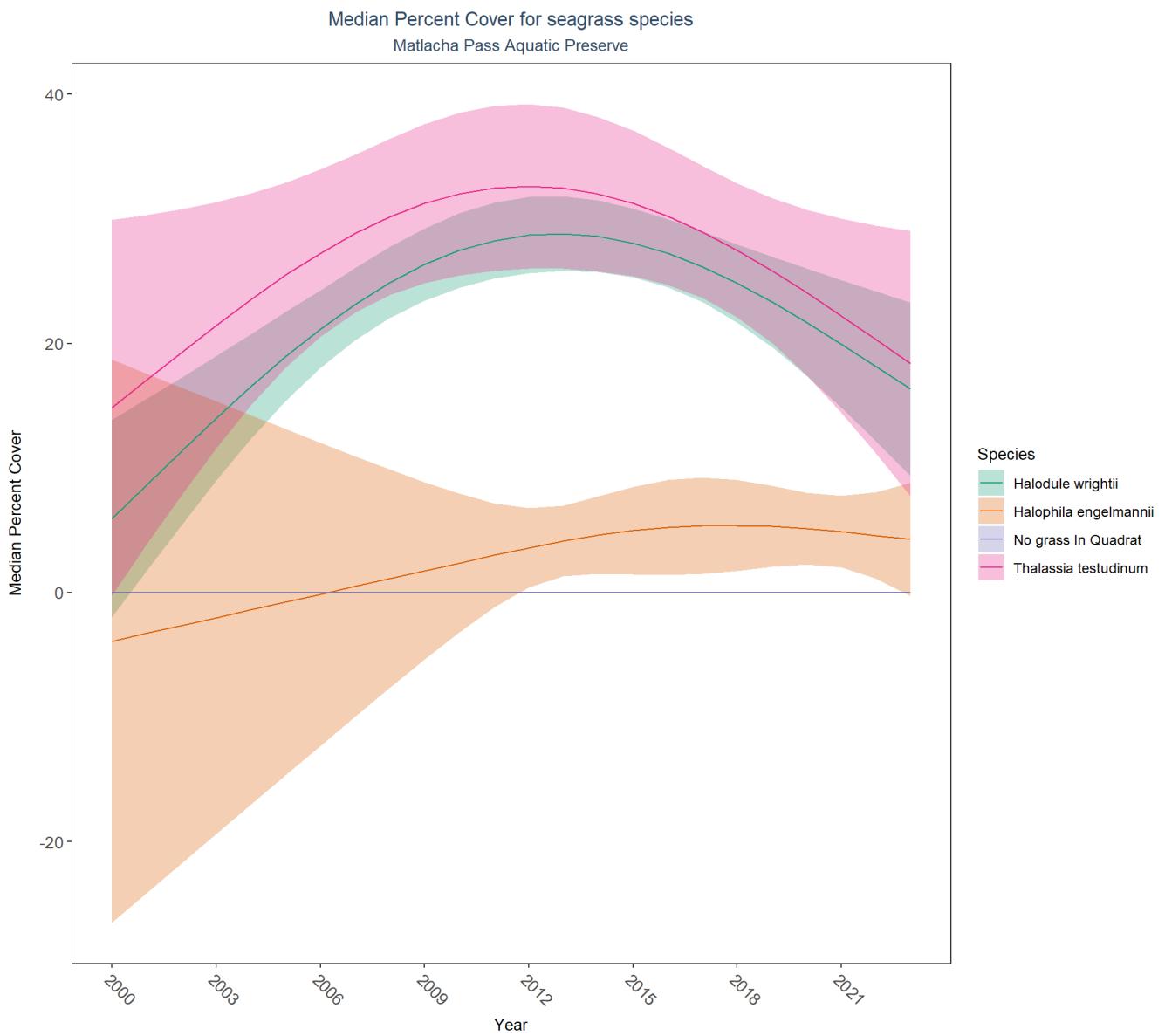


Table 34: Percent Cover Trend Analysis for Matlacha Pass Aquatic Preserve

Species	CommonName	Trend Significance (0.05)	Period of Record	LME-Intercept	LME-Slope	p
Attached algae		Insufficient data to calculate trend				
Drift algae		No significant trend	2000 - 2023	-5.1624	1.0463	0.1328
Halodule wrightii	Shoal grass	No significant trend	2000 - 2023	19.5160	0.0924	0.8535
Halophila decipiens	Paddle grass	Insufficient data to calculate trend				
Halophila engelmannii	Star grass	No significant trend	2010 - 2023	2.6423	0.0682	0.7809
No grass In Quadrat		Model did not fit the available data	2000 - 2023			
Ruppia maritima	Widgeon grass	Insufficient data to calculate trend				
Thalassia testudinum	Turtle grass	No significant trend	2000 - 2023	24.6268	-0.3422	0.3648
Total seagrass		No significant trend	2004 - 2023	31.2507	-0.3715	0.3147
Halophila, unk.		Insufficient data to calculate trend				

Frequency of occurrence  
Matlacha Pass Aquatic Preserve





Generalized additive models for each species in Matlacha Pass 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.