

# Apalachicola Bay Aquatic Preserve

## SEACAR Habitat Analyses

Last compiled on 08 April, 2024

## Contents

<b>Threshold Filtering</b>	<b>3</b>
<b>Value Qualifiers</b>	<b>4</b>
<b>Water Column</b>	<b>6</b>
<b>Seasonal Kendall-Tau Analysis</b>	<b>6</b>
<b>Water Quality - Discrete</b>	<b>6</b>
Chlorophyll a, Corrected for Pheophytin - Discrete Water Quality . . . . .	7
Chlorophyll a, Uncorrected for Pheophytin - Discrete Water Quality . . . . .	10
Dissolved Oxygen - Discrete Water Quality . . . . .	12
Dissolved Oxygen Saturation - Discrete Water Quality . . . . .	14
pH - Discrete Water Quality . . . . .	17
Salinity - Discrete Water Quality . . . . .	19
Secchi Depth - Discrete Water Quality . . . . .	21
Total Nitrogen - Discrete Water Quality . . . . .	24
Total Phosphorus - Discrete Water Quality . . . . .	28
Total Suspended Solids - Discrete Water Quality . . . . .	30
Turbidity - Discrete Water Quality . . . . .	33
Water Temperature - Discrete Water Quality . . . . .	36
<b>Water Quality - Continuous</b>	<b>40</b>
Dissolved Oxygen - Continuous Water Quality . . . . .	42
apadbwq . . . . .	42
apapcqw . . . . .	43
apaebwq . . . . .	44
apaeswq . . . . .	45
apalmwq . . . . .	46
All Stations Combined . . . . .	47
Dissolved Oxygen Saturation - Continuous Water Quality . . . . .	48
apapcqw . . . . .	48
apaeswq . . . . .	49
apalmwq . . . . .	50
apadbwq . . . . .	51
apaebwq . . . . .	52
All Stations Combined . . . . .	53
pH - Continuous Water Quality . . . . .	54
apaeswq . . . . .	54
apapcqw . . . . .	55
apaebwq . . . . .	56
apalmwq . . . . .	57
apadbwq . . . . .	58
All Stations Combined . . . . .	59
Salinity - Continuous Water Quality . . . . .	60

apaeswq . . . . .	60
apapcwq . . . . .	61
apadbwq . . . . .	62
apaebwq . . . . .	63
apalmwq . . . . .	64
All Stations Combined . . . . .	65
Turbidity - Continuous Water Quality . . . . .	66
apaebwq . . . . .	66
apadbwq . . . . .	67
apaeswq . . . . .	68
apapcwq . . . . .	69
apalmwq . . . . .	70
All Stations Combined . . . . .	71
Water Temperature - Continuous Water Quality . . . . .	72
apaeswq . . . . .	72
apapcwq . . . . .	73
apalmwq . . . . .	74
apadbwq . . . . .	75
apaebwq . . . . .	76
All Stations Combined . . . . .	77
<b>Submerged Aquatic Vegetation</b>	<b>78</b>
Parameters . . . . .	78
Species . . . . .	78
Notes . . . . .	78
<b>Nekton</b>	<b>85</b>

## Threshold Filtering

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

Table 1: Continuous Water Quality threshold values

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

Table 2: Discrete Water Quality threshold values

Parameter Name	Units	Low Threshold	High Threshold
Dissolved Oxygen	mg/L	0.000001	22
Salinity	ppt	0	70
Water Temperature	Degrees C	3	40
pH		2	13
Dissolved Oxygen Saturation	%	0.000001	310
Specific Conductivity	mS/cm	0.005000001	100
Turbidity	NTU	0	-
Total Suspended Solids (TSS)	mg/L	0	-
Chlorophyll a uncorrected for pheophytin	ug/L	0	-
Chlorophyll a corrected for pheophytin	ug/L	0	-
Secchi Depth	m	0.000001	50
Light Extinction Coefficient	$m^{-1}$	0	-
Colored dissolved organic matter, CDOM	PCU	0	-
Fluorescent dissolved organic matter, FDOM	QSE	0	-
Total Nitrogen	mg/L	0	-
Total Kjeldahl Nitrogen TKN	mg/L	0	-
NO <sub>2</sub> +3 Filtered	mg/L	0	-
NH4 Filtered	mg/L	0	-
Total Phosphorus	mg/L	0	-

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

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

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

## Value Qualifiers

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

### STORET and WIN value qualifier codes

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

Table 4: Value Qualifier codes excluded from analysis

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

### Discrete Water Quality Value Qualifiers

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

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

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

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

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

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

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

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

Table 5: SWMP Value Qualifier codes

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

## Water Column

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

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

## Seasonal Kendall-Tau Analysis

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

## Water Quality - Discrete

The following files were used in the discrete analysis:

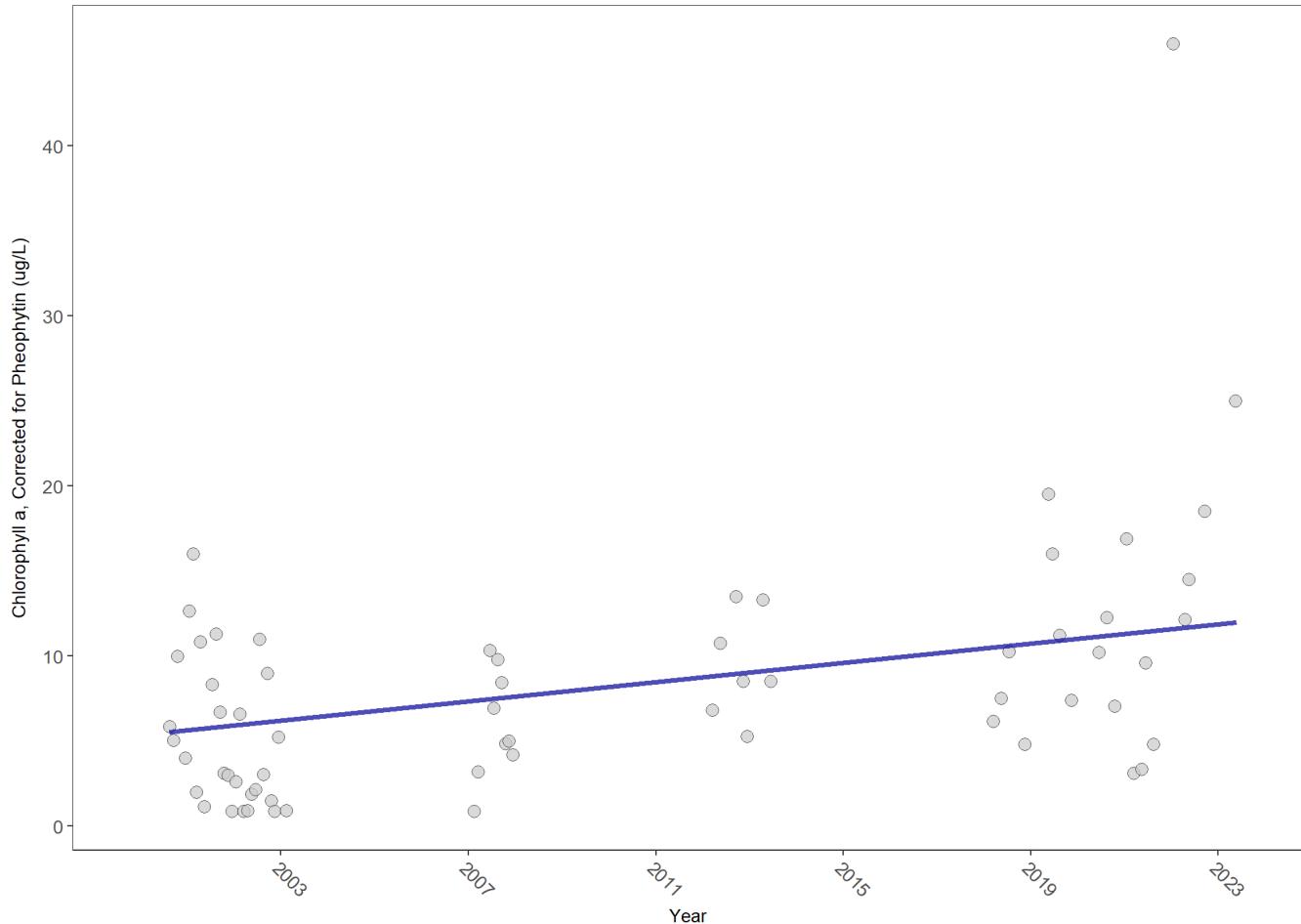
- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_corrected\_for\_pheophytin-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_uncorrected\_for\_pheophytin-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Colored\_dissolved\_organic\_matter\_CDOM-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen\_Saturation-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_pH-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Salinity-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Secchi\_Depth-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Nitrogen-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Phosphorus-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Suspended\_Solids\_TSS-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Turbidity-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Water\_Temperature-2024-Mar-27.txt*

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

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

### Seasonal Kendall-Tau Trend Analysis

Chlorophyll a, Corrected for Pheophytin, Lab, All Depths  
Apalachicola Bay Aquatic Preserve

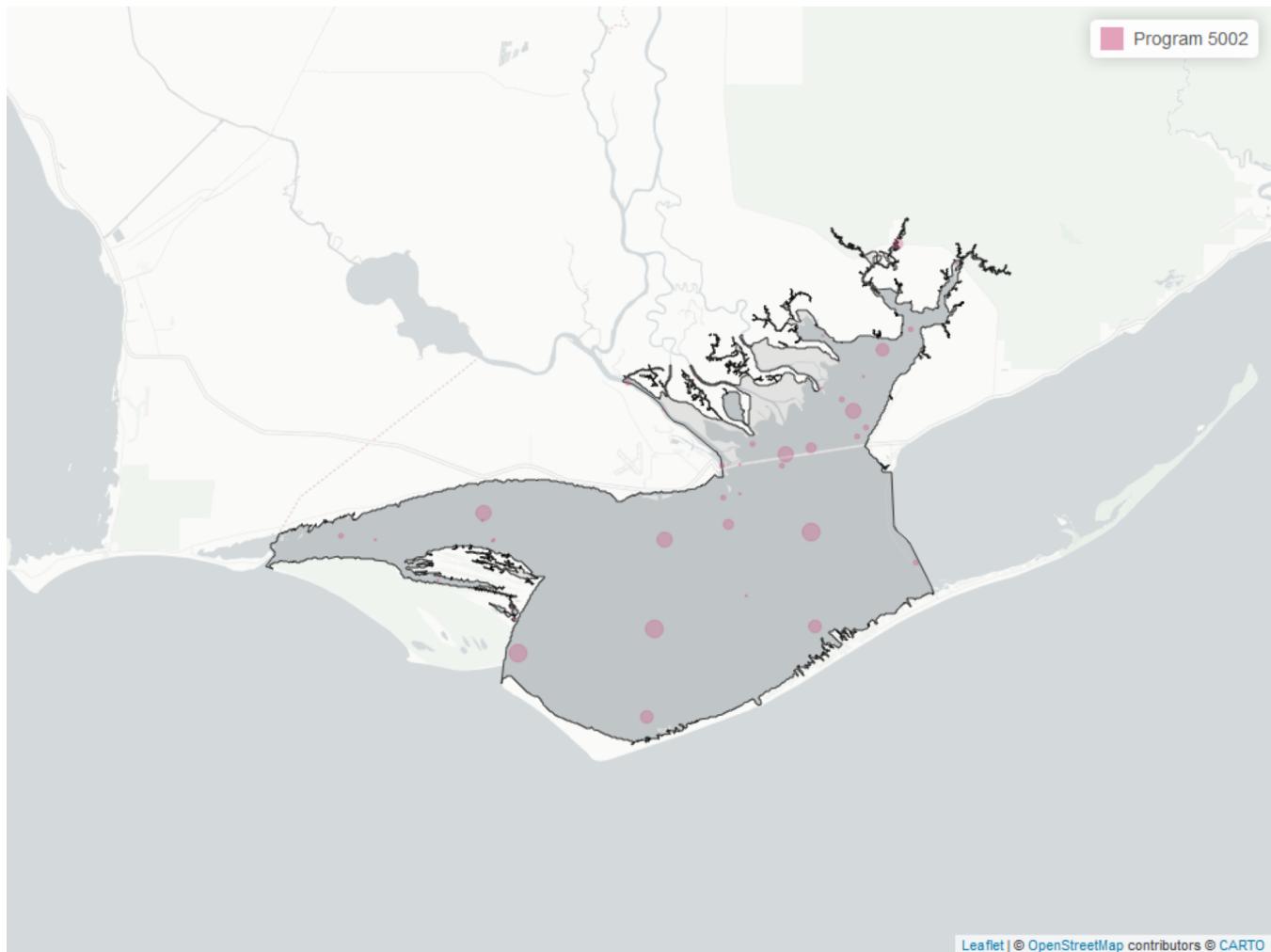


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	493	13	2.6	TRUE	0.313	0.0015	0.2822715	5.381791	15.3028	0.169	2

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

SennIntercept is intercept value at beginning of record for monitoring location

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



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

Table 6: Programs contributing data for Chlorophyll a, Corrected for Pheophytin

ProgramID	N_Data	YearMin	YearMax
5002	494	2000	2023

#### Program names:

5002 - Florida STORET / WIN

#### Value Qualifiers

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

Table 7: Value Qualifiers for Chlorophyll a, Corrected for Pheo-phytin

<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>
2000	67	8	11.9			16	23.9
2001	148	17	11.5			71	48.0
2002	155	15	9.7	27	17.4	79	51.0
2003	13	1	7.7			2	15.4
2007	49	2	4.1			4	8.2
2021	10	1	10.0				

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

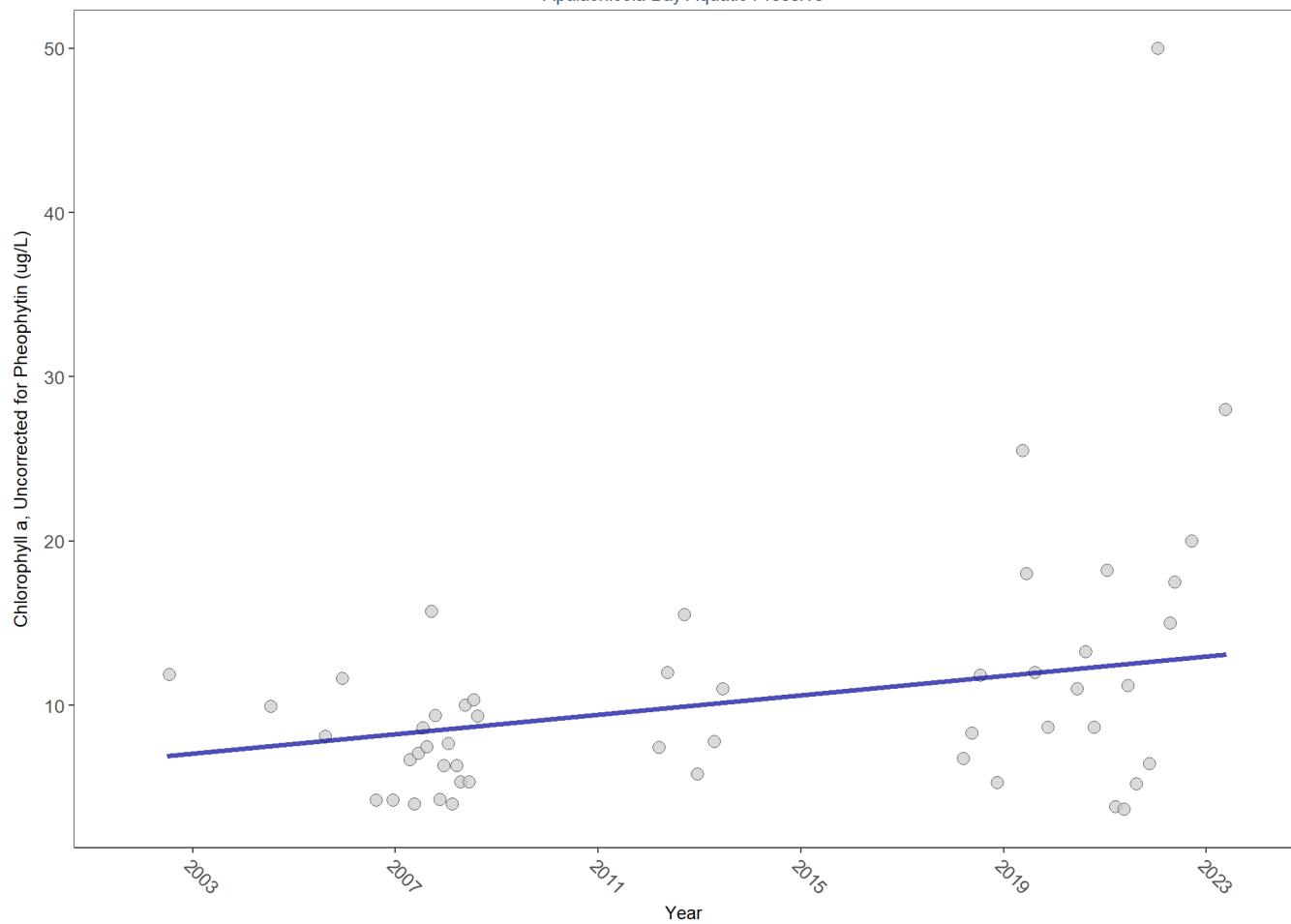
**Programs containing Value Qualified data:**

5002 - Florida STORET / WIN

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

### Seasonal Kendall-Tau Trend Analysis

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



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	135	14	7.8	TRUE	0.2726	0.0186	0.2952381	6.764103	10.1363	0.4286	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

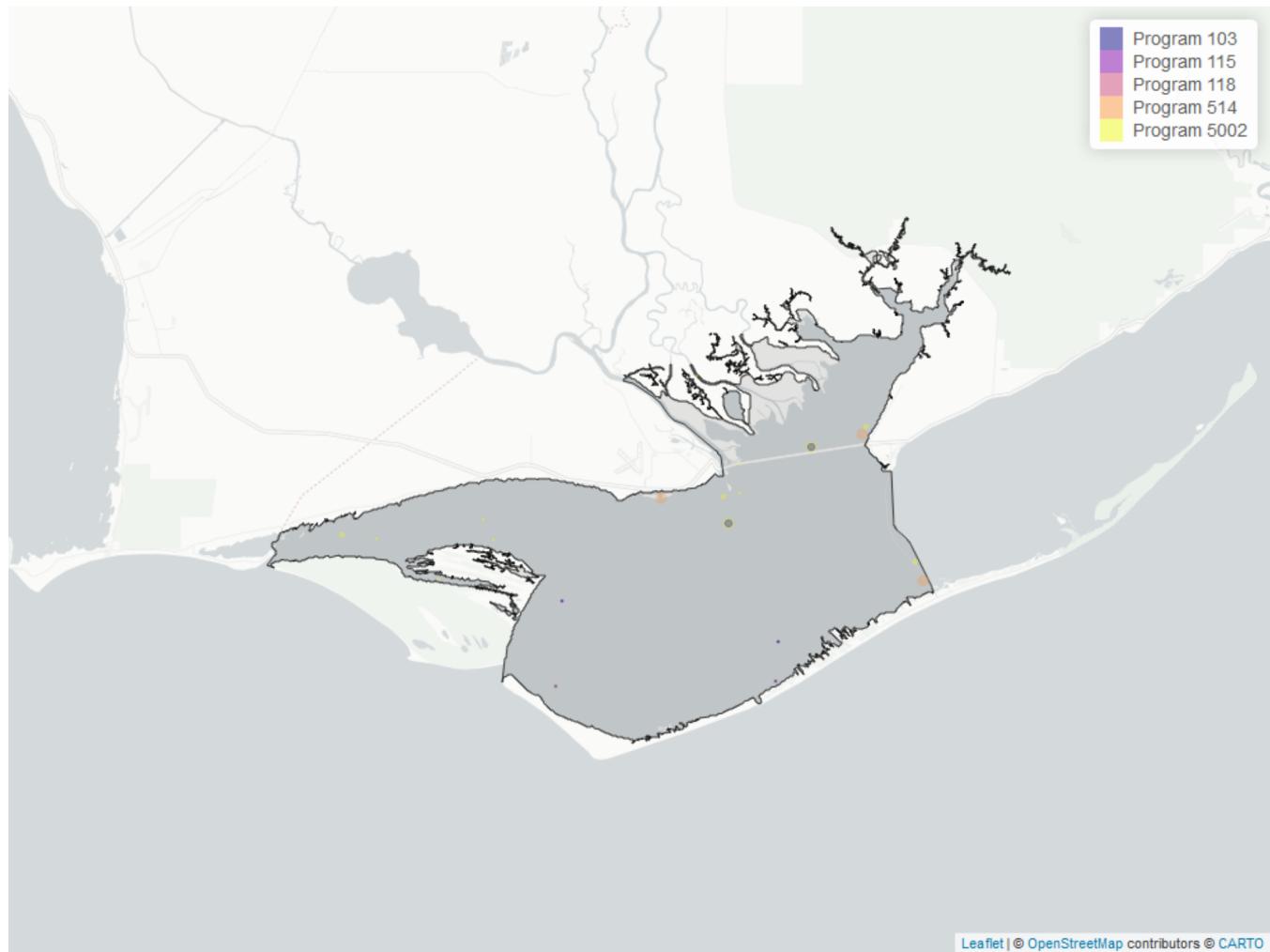


Table 8: Programs contributing data for Chlorophyll a, Uncorrected for Pheophytin

ProgramID	N_Data	YearMin	YearMax
5002	56	2012	2023
514	51	2007	2008
103	25	2002	2021
115	2	2002	2004
118	2	2005	2006

**Program names:**

5002 - Florida STORET / WIN

514 - Florida LAKEWATCH Program

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

115 - Environmental Monitoring Assessment Program

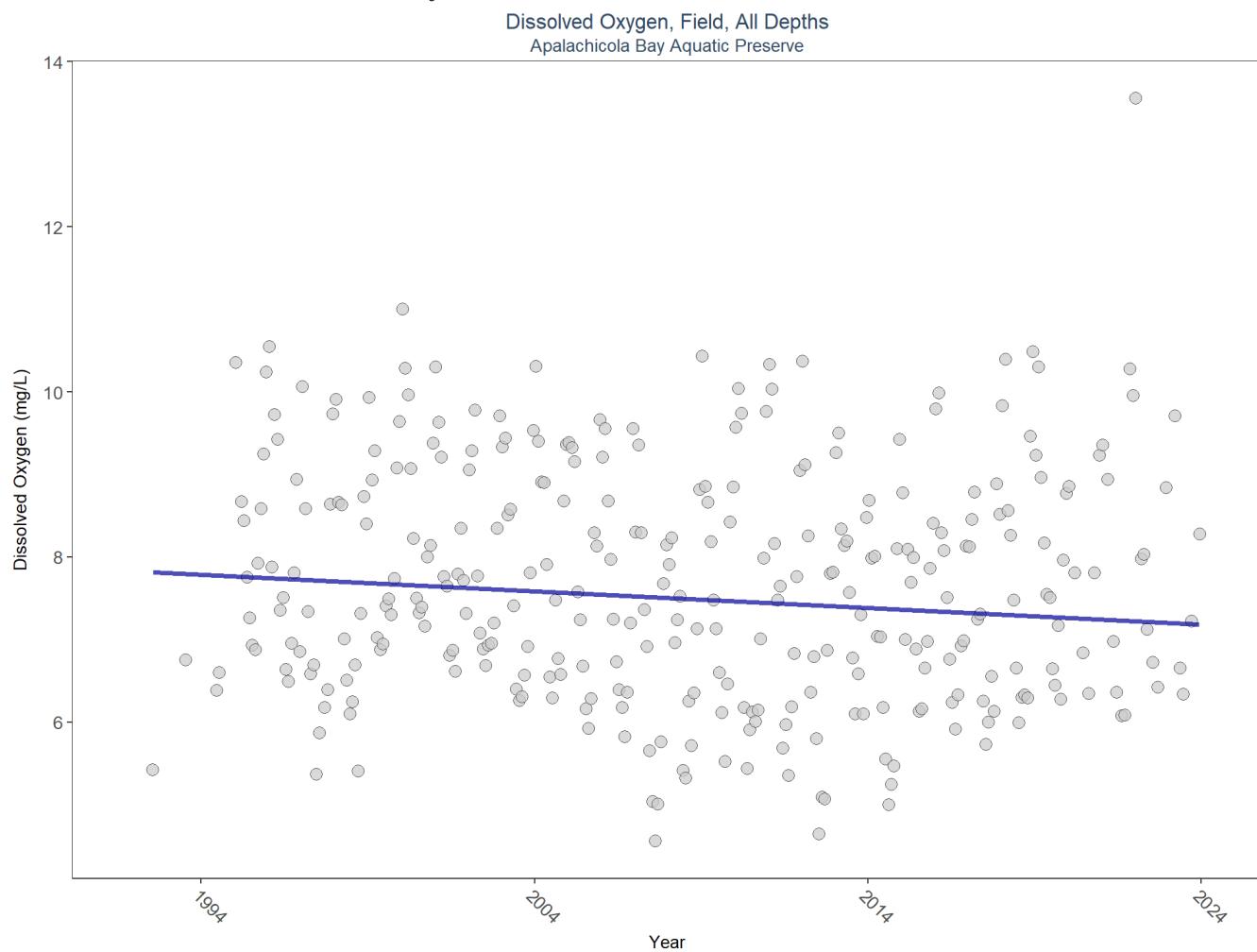
118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

There are no qualifying Value Qualifiers for Chlorophyll a, Uncorrected for Pheophytin in Apalachicola Bay Aquatic Preserve

## 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

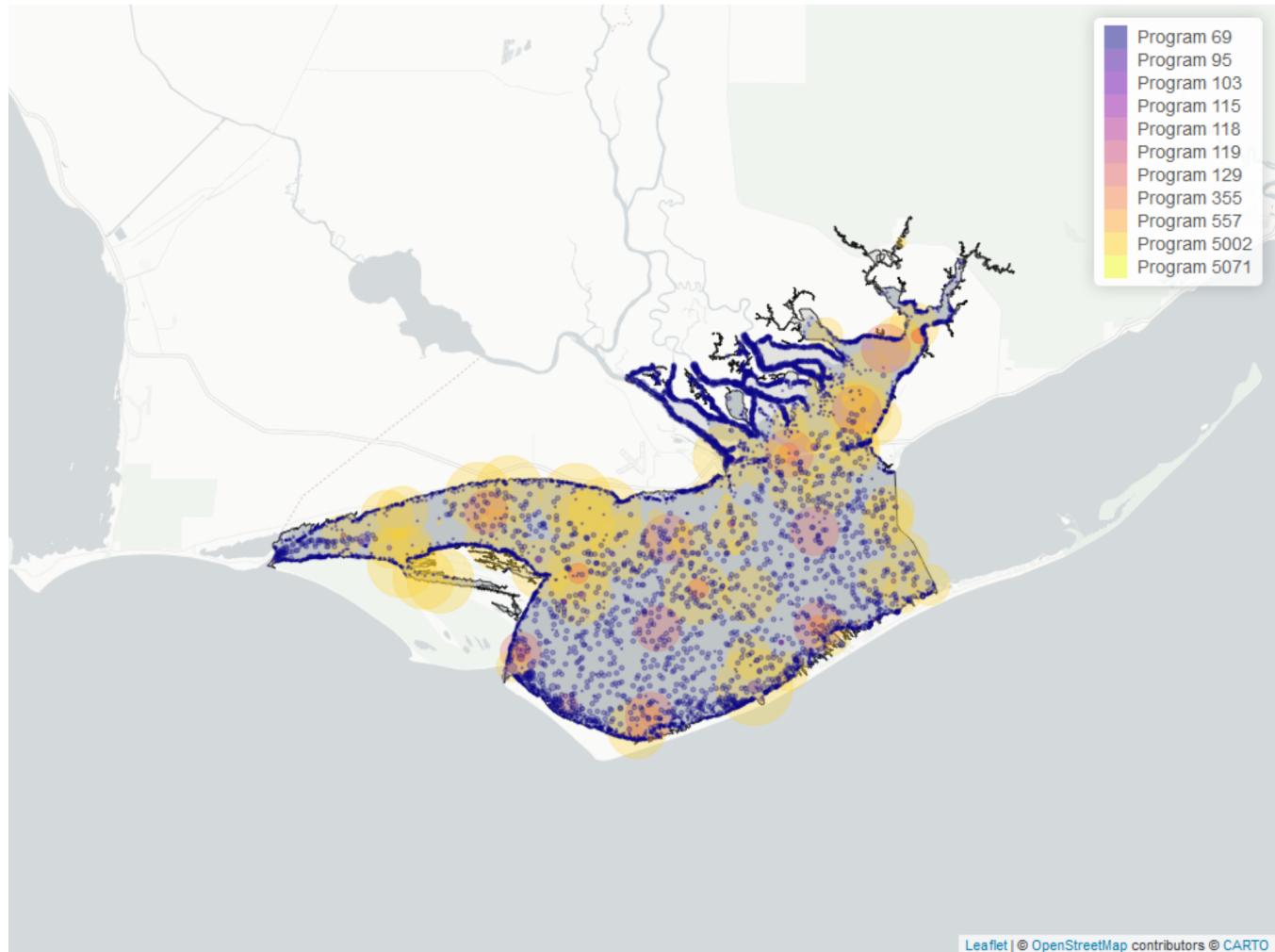


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	46230	32	7.5	TRUE	-0.1422	0.0003	-0.02005656	7.823855	12.2251	0.347	-1

*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 9: Programs contributing data for Dissolved Oxygen

ProgramID	N_Data	YearMin	YearMax
5002	21936	1995	2023
69	19669	1998	2017
129	3426	2000	2023
355	904	2011	2019
95	176	1995	2018
557	80	2006	2021
103	19	2004	2021
115	15	1992	2004
119	14	1994	1994
5071	3	2017	2017
118	2	2005	2006

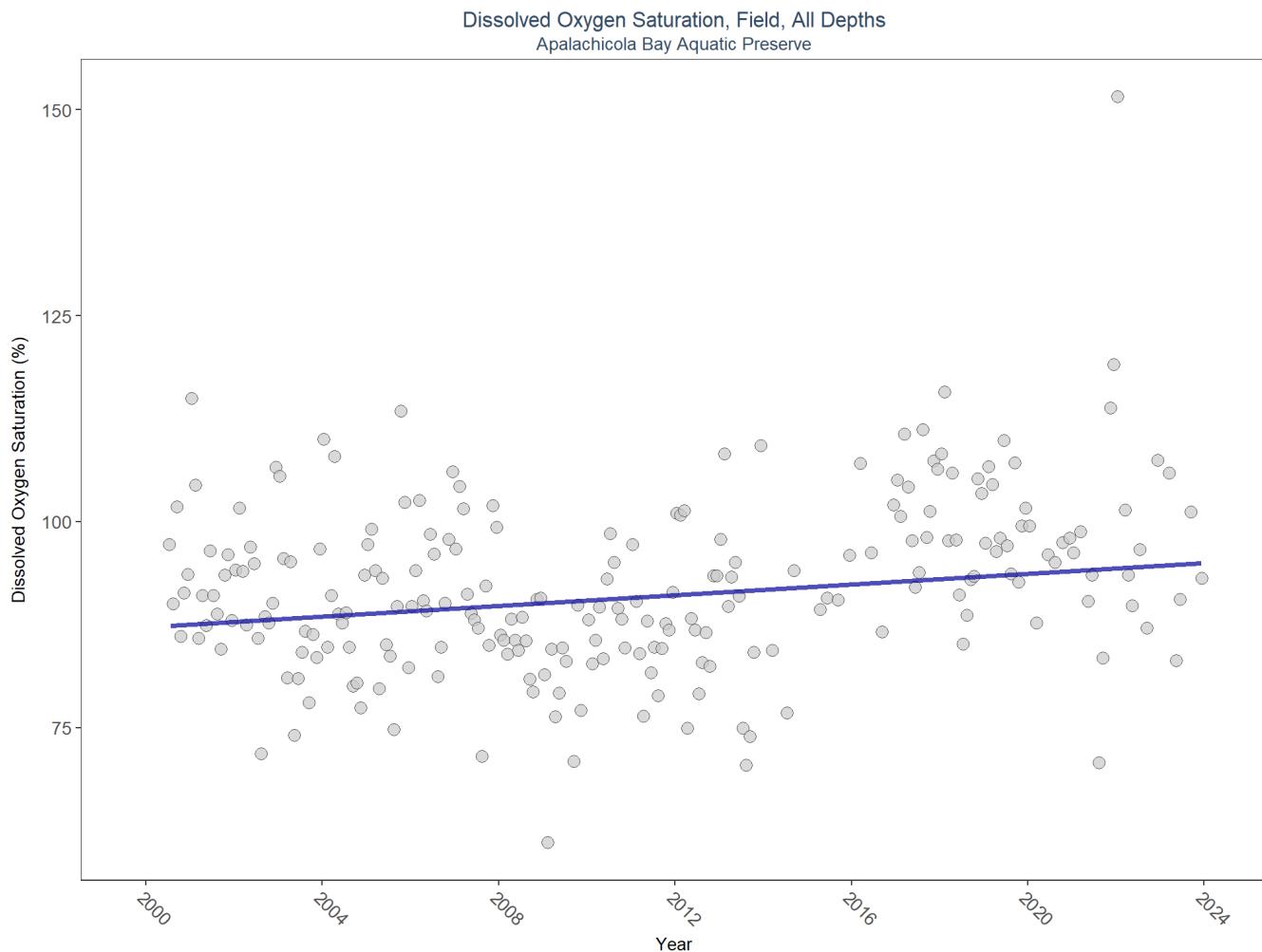
## Program names:

- 5002 - Florida STORET / WIN  
 69 - Fisheries-Independent Monitoring (FIM) Program  
 129 - Apalachicola National Estuarine Research Reserve Juvenile Fish and Benthic Macroinvertebrate Monitoring  
 355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program  
 95 - Harmful Algal Bloom Marine Observation Network  
 557 - Central Panhandle Aquatic Preserves Seagrass Monitoring  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
 115 - Environmental Monitoring Assessment Program  
 119 - National Status and Trends Bioeffects program  
 5071 - Oyster shell heights and taxonomic diversity in 2015-2017 among previously documented oiled and non-oiled reefs in Louisiana, Alabama, and the Florida panhandle  
 118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

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

## Dissolved Oxygen Saturation - Discrete Water Quality

### Seasonal Kendall-Tau Trend Analysis



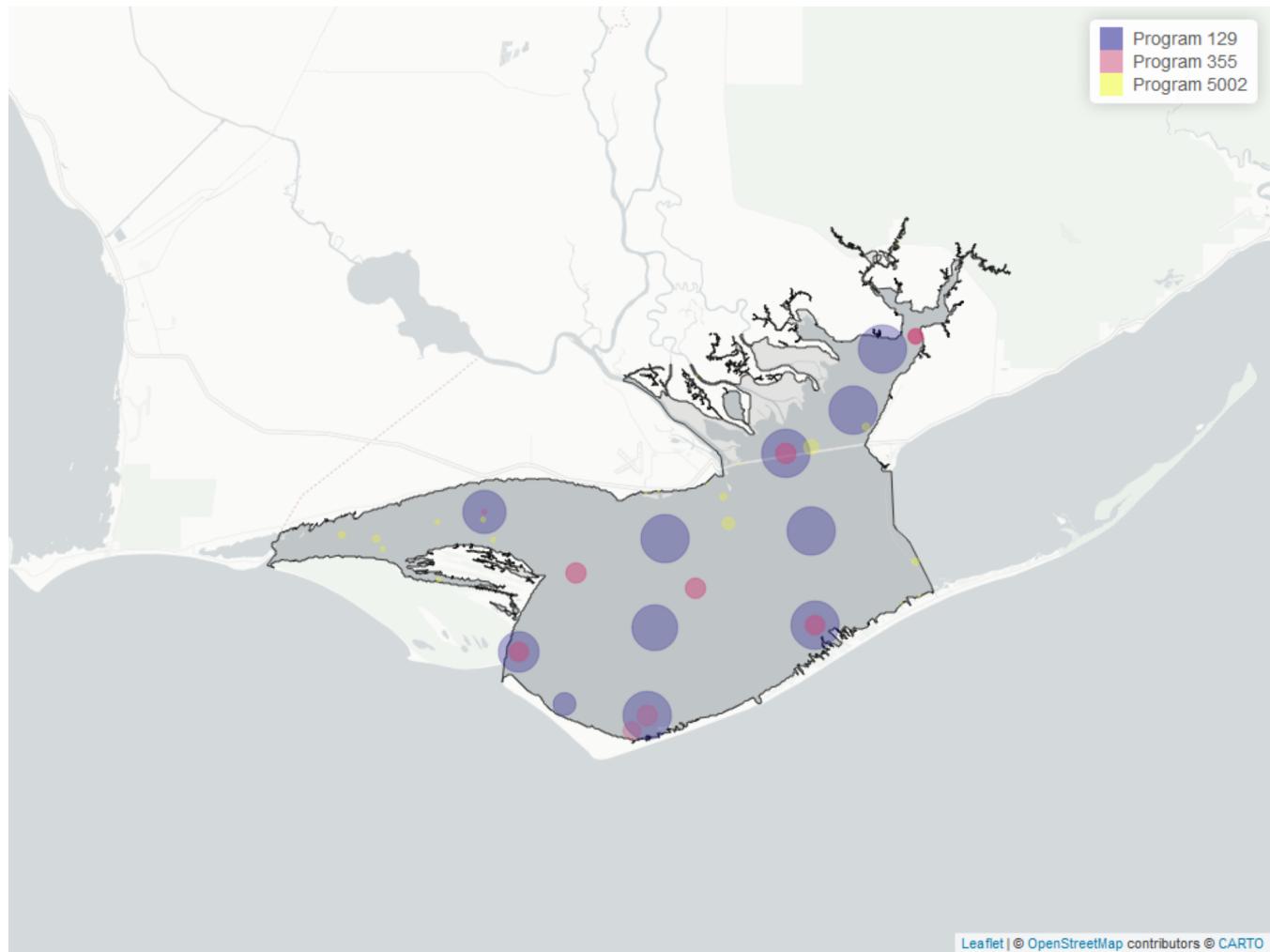
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	4454	24	92.6	TRUE	0.1655	0.0004	0.322831	87.21218	6.0375	0.8708	1

*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 10: Programs contributing data for Dissolved Oxygen Saturation

ProgramID	N_Data	YearMin	YearMax
129	3419	2000	2023
355	904	2011	2019
5002	135	2003	2023

#### Program names:

129 - Apalachicola National Estuarine Research Reserve Juvenile Fish and Benthic Macroinvertebrate Monitoring

355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program

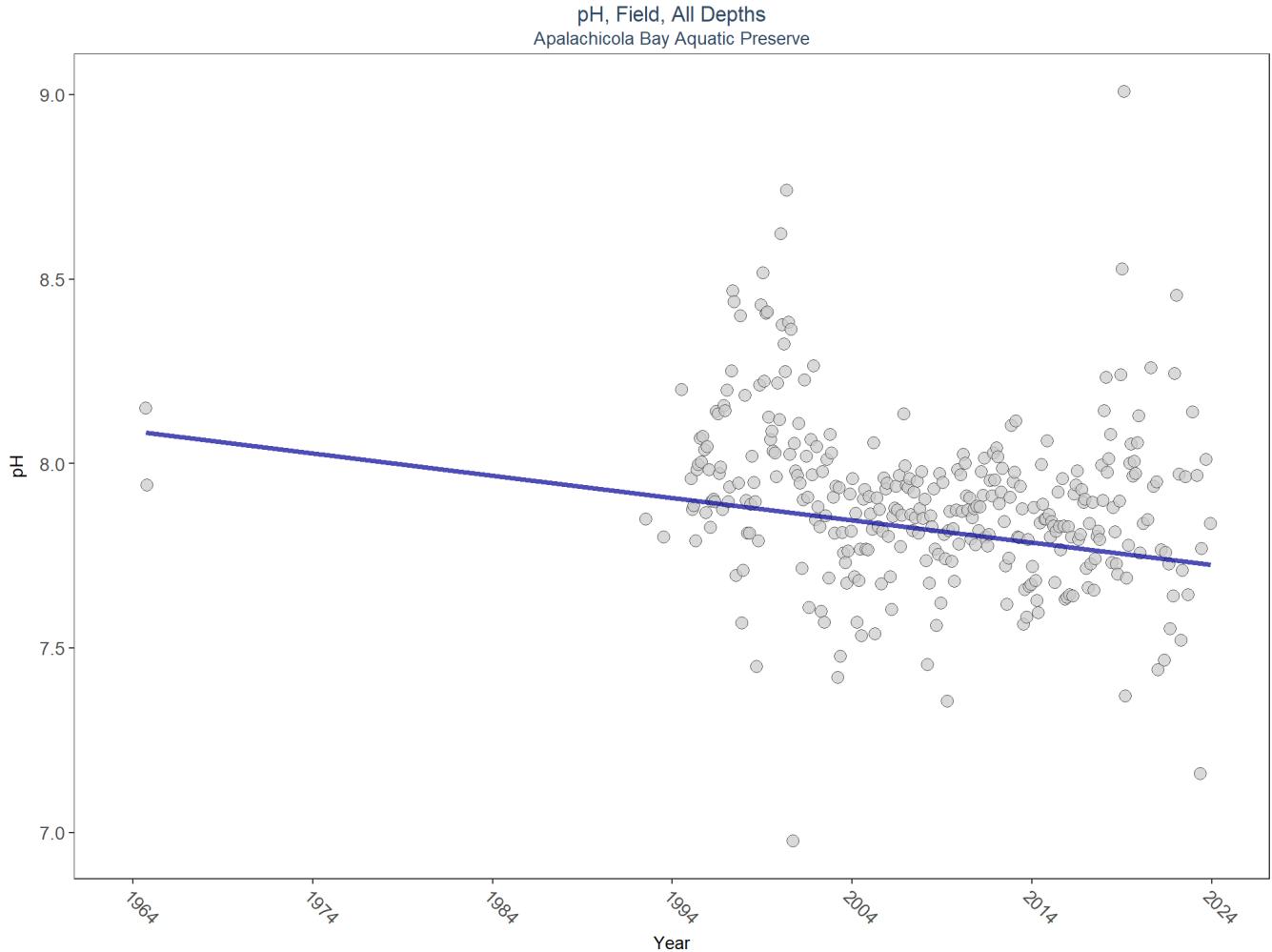
5002 - Florida STORET / WIN

There are no qualifying Value Qualifiers for Dissolved Oxygen Saturation in Apalachicola 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

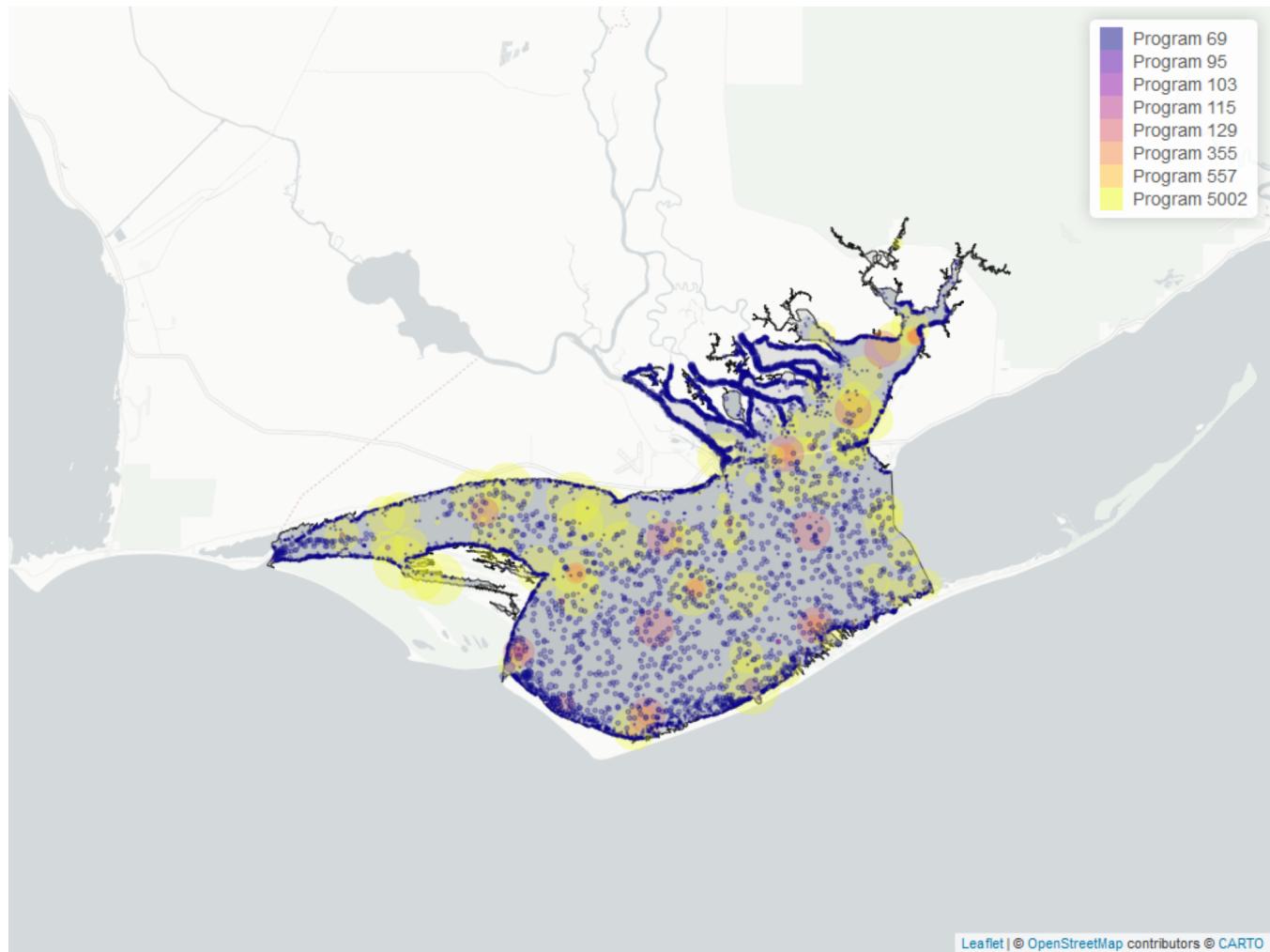


Table 11: Programs contributing data for pH

ProgramID	N_Data	YearMin	YearMax
69	19734	1998	2017
5002	12898	1995	2023
129	1956	2000	2023
355	719	2011	2019
95	104	1964	2018
557	69	2006	2021
103	19	2004	2021
115	15	1992	2004

**Program names:**

69 - Fisheries-Independent Monitoring (FIM) Program

5002 - Florida STORET / WIN

129 - Apalachicola National Estuarine Research Reserve Juvenile Fish and Benthic Macroinvertebrate Monitoring

355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program

95 - Harmful Algal Bloom Marine Observation Network

557 - Central Panhandle Aquatic Preserves Seagrass Monitoring

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

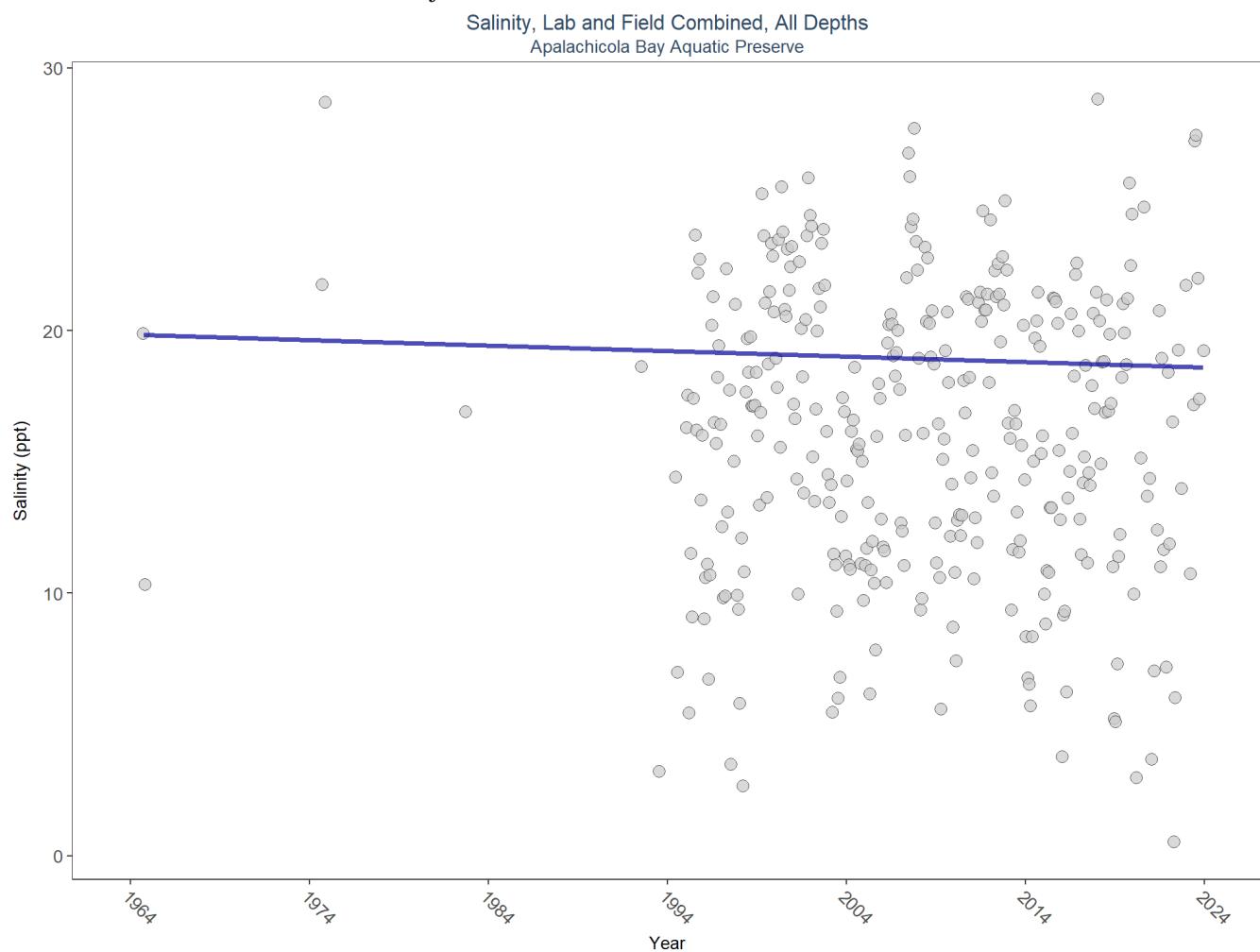
115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for pH in Apalachicola 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

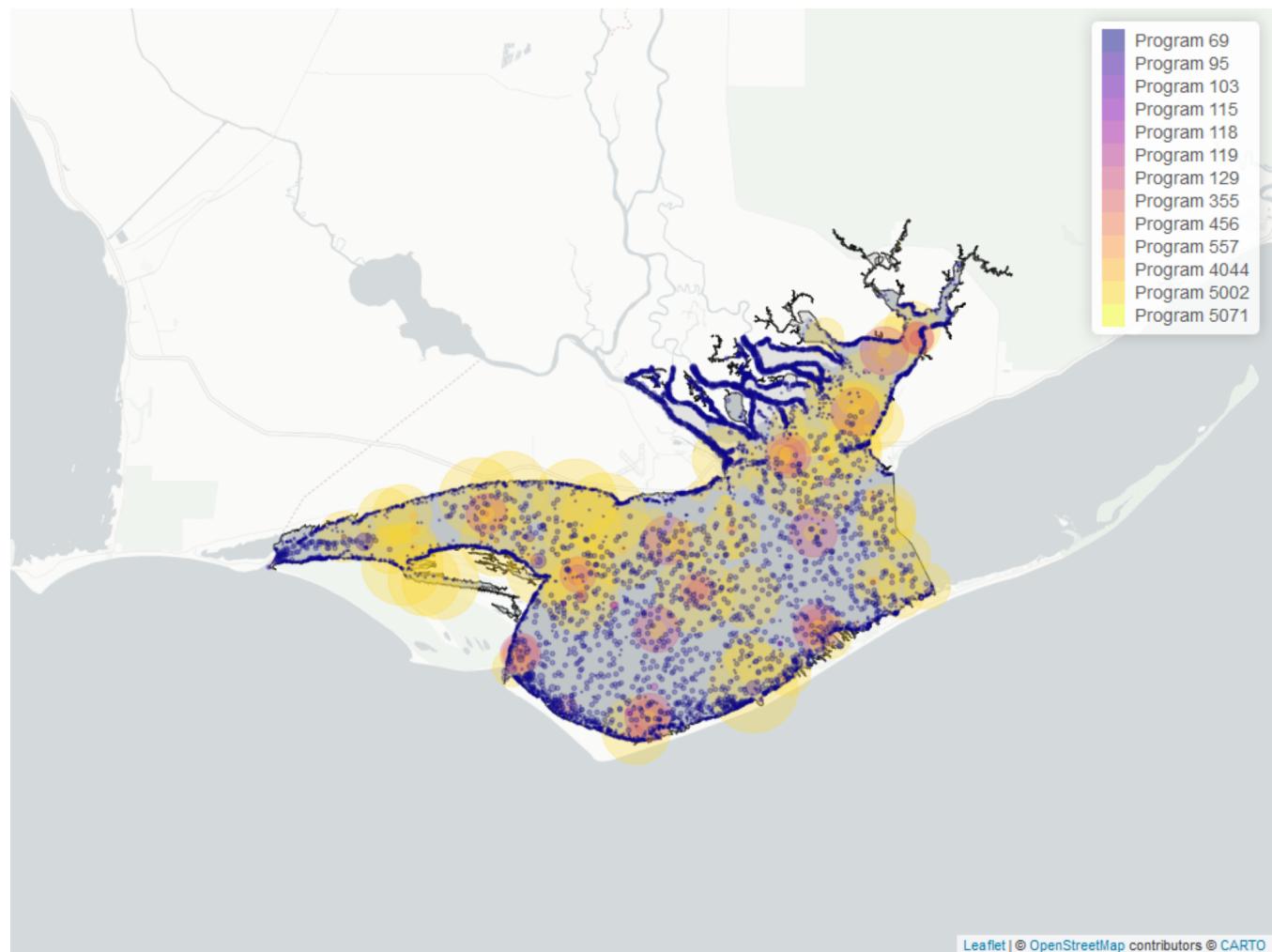


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	56237	35	16.2	TRUE	-0.0327	0.4595	-0.02083385	19.85562	10.9671	0.446	0

*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 12: Programs contributing data for Salinity

ProgramID	N_Data	YearMin	YearMax
5002	30341	1995	2022
69	19812	1998	2017
129	3375	2000	2023
355	1940	2003	2019
95	286	1964	2018
4044	280	2007	2023
557	80	2006	2021
118	57	2015	2020
456	33	2005	2013
115	15	1992	2004
119	14	1994	1994
5071	3	2017	2017

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
103	1	2004	2004

**Program names:**

5002 - Florida STORET / WIN

69 - Fisheries-Independent Monitoring (FIM) Program

129 - Apalachicola National Estuarine Research Reserve Juvenile Fish and Benthic Macroinvertebrate Monitoring

355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program

95 - Harmful Algal Bloom Marine Observation Network

4044 - NRDA Oyster Cultch Recovery Project

557 - Central Panhandle Aquatic Preserves Seagrass Monitoring

118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

456 - Oyster Sentinel

115 - Environmental Monitoring Assessment Program

119 - National Status and Trends Bioeffects program

5071 - Oyster shell heights and taxonomic diversity in 2015-2017 among previously documented oiled and non-oiled reefs in Louisiana, Alabama, and the Florida panhandle

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

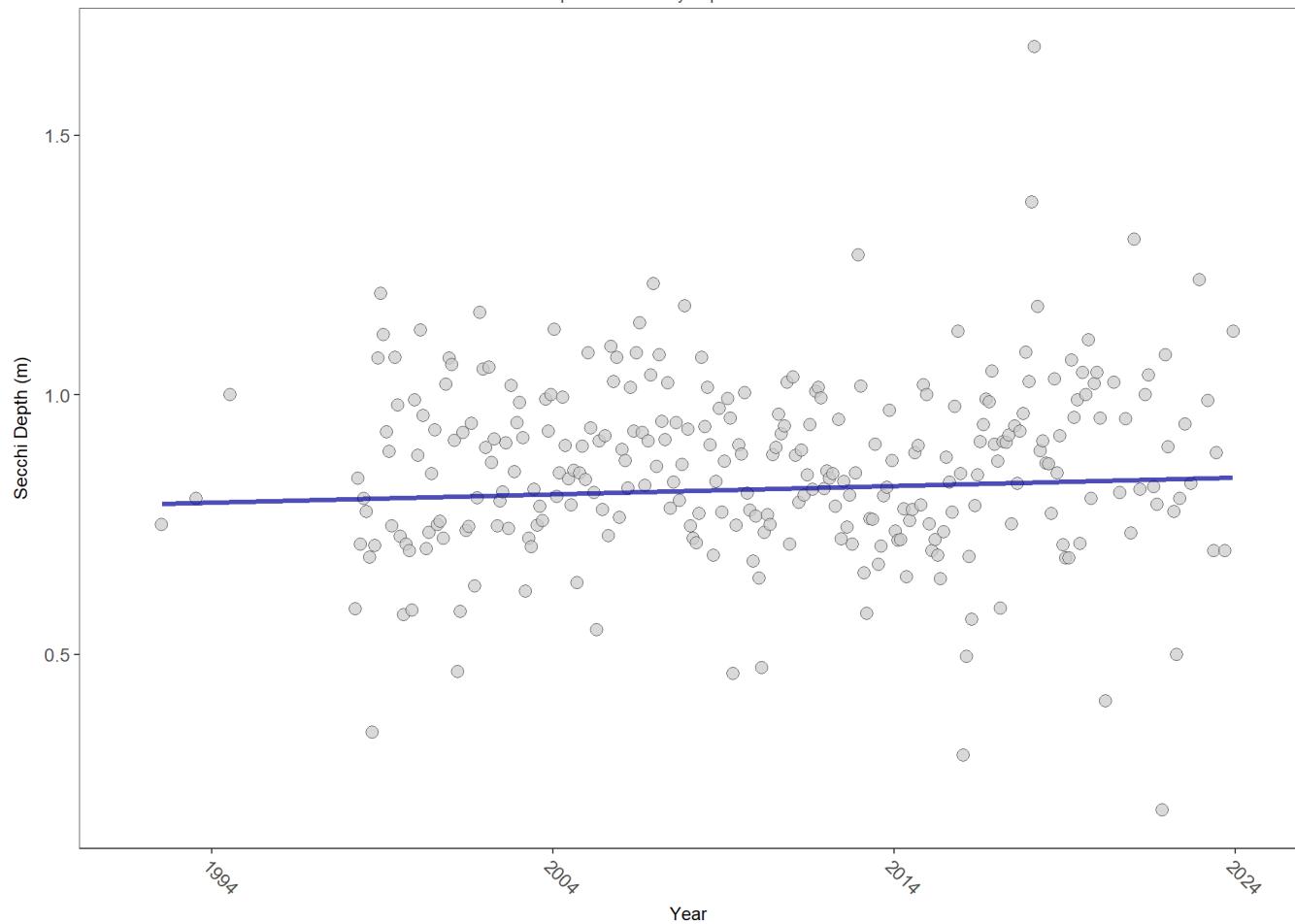
There are no qualifying Value Qualifiers for Salinity in Apalachicola Bay Aquatic Preserve

### **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**

Secchi Depth, Field, Surface  
Apalachicola Bay Aquatic Preserve

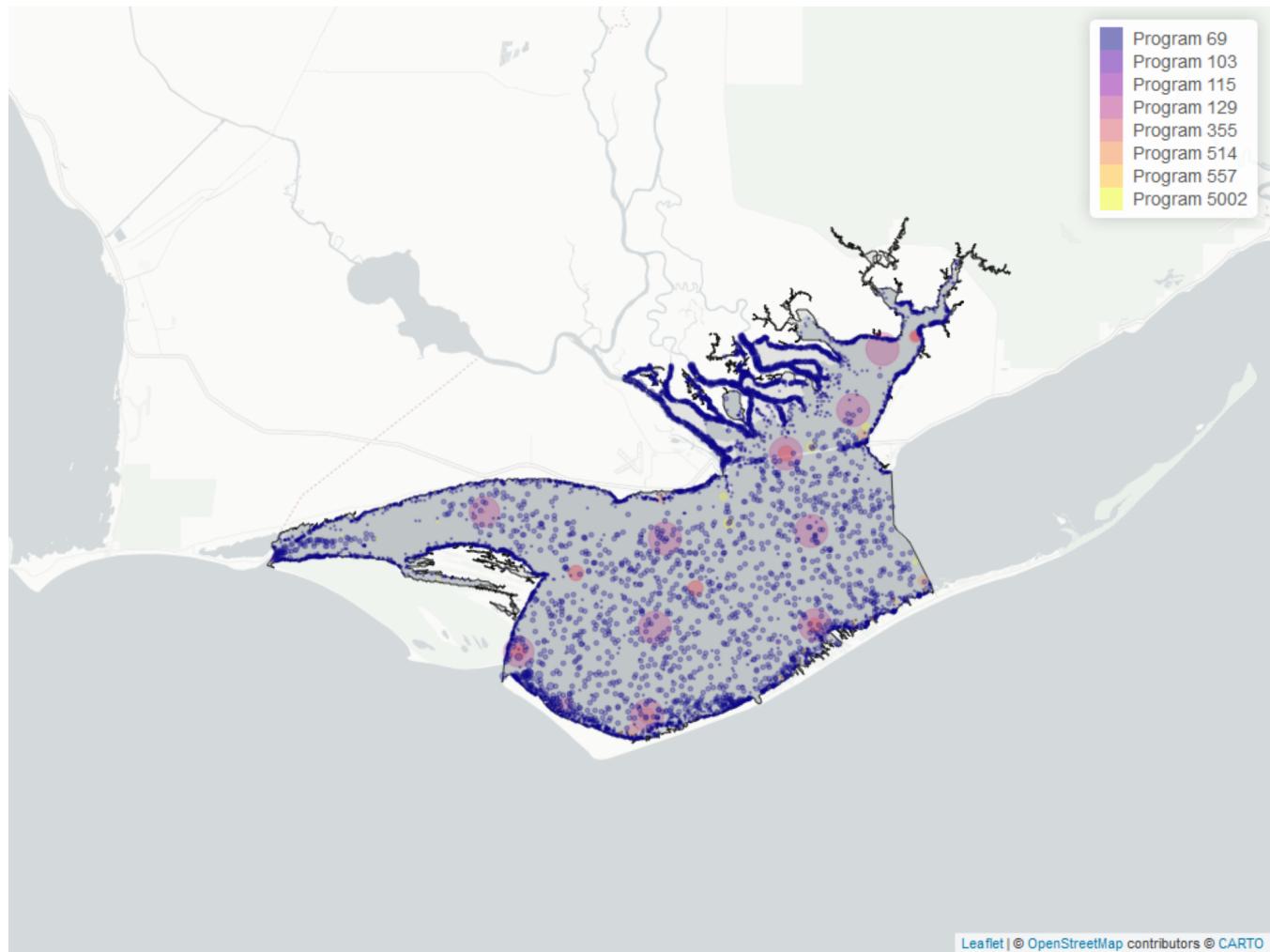


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
Surface	21885	29	0.8	TRUE	0.0424	0.2414	0.001622637	0.7893377	20.9994	0.0334	0

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

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

Map showing location of Discrete sampling sites for Secchi Depth



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

Table 13: Programs contributing data for Secchi Depth

ProgramID	N_Data	YearMin	YearMax
69	19569	1998	2017
129	1703	2000	2023
355	445	2011	2019
5002	55	2012	2023
557	49	2006	2021
514	48	2007	2008
103	10	2021	2021
115	6	1992	2004

**Program names:**

69 - Fisheries-Independent Monitoring (FIM) Program

- 129 - Apalachicola National Estuarine Research Reserve Juvenile Fish and Benthic Macroinvertebrate Monitoring  
 355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program  
 5002 - Florida STORET / WIN  
 557 - Central Panhandle Aquatic Preserves Seagrass Monitoring  
 514 - Florida LAKEWATCH Program  
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)  
 115 - Environmental Monitoring Assessment Program

### Value Qualifiers

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

Table 14: Value Qualifiers for Secchi Depth

Year	$N_{Total}$	$N_S$	$perc_S$
2018	125	1	0.8
2020	69	1	1.4
2021	69	2	2.9
2022	42	2	4.8

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

### Programs containing Value Qualified data:

- 5002 - Florida STORET / WIN

## Total Nitrogen - Discrete Water Quality

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

### Total Nitrogen Calculation:

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

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

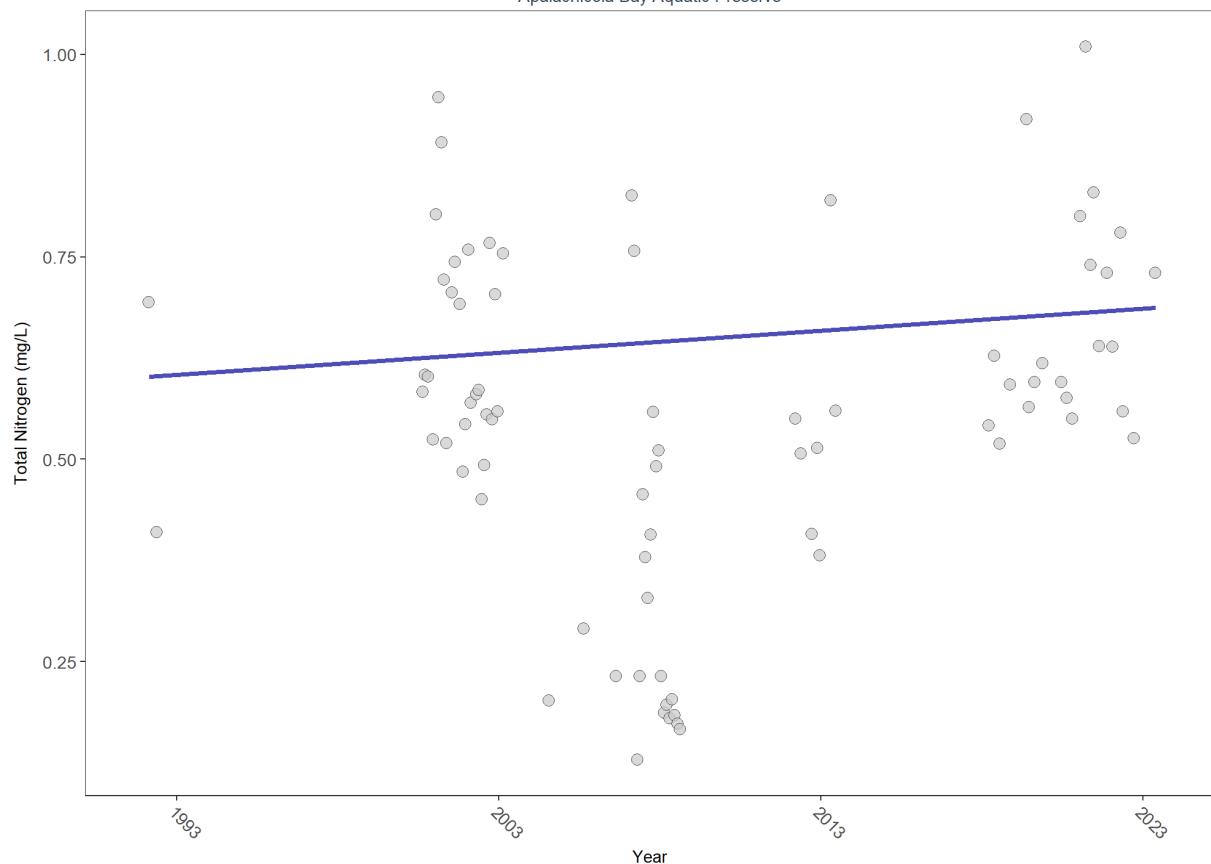
Additional Information:

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

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

## Seasonal Kendall-Tau Trend Analysis

Total Nitrogen, Lab, All Depths  
Apalachicola Bay Aquatic Preserve

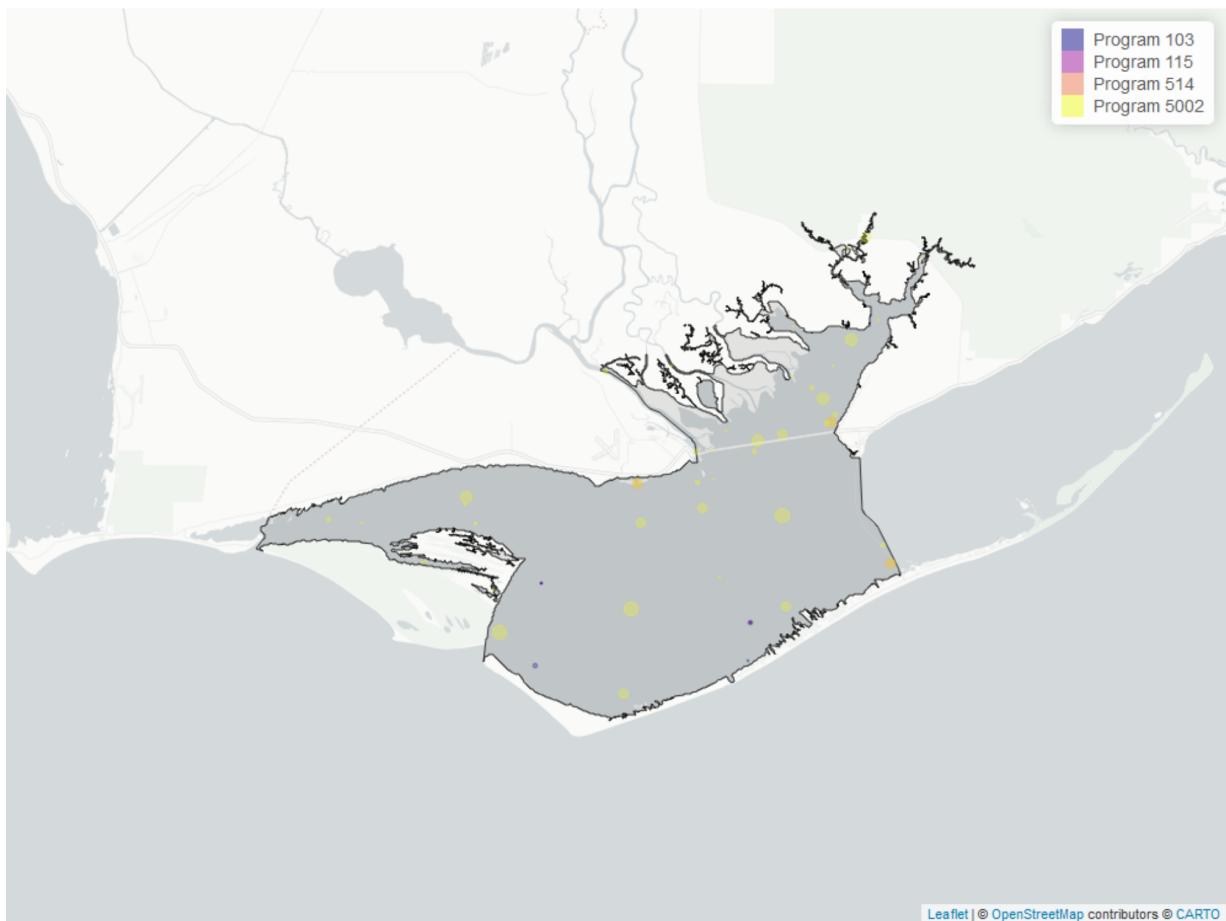


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	487	18	0.54	TRUE	0.063	0.1897	0.002734057	0.6015235	17.9909	0.0818	0

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

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

Map showing location of Discrete sampling sites for Total Nitrogen



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

Table 15: Programs contributing data for Total Nitrogen

ProgramID	N_Data	YearMin	YearMax
5002	421	1992	2023
514	50	2007	2008
103	14	2002	2006
115	2	2002	2004

**Program names:**

5002 - Florida STORET / WIN

514 - Florida LAKEWATCH Program

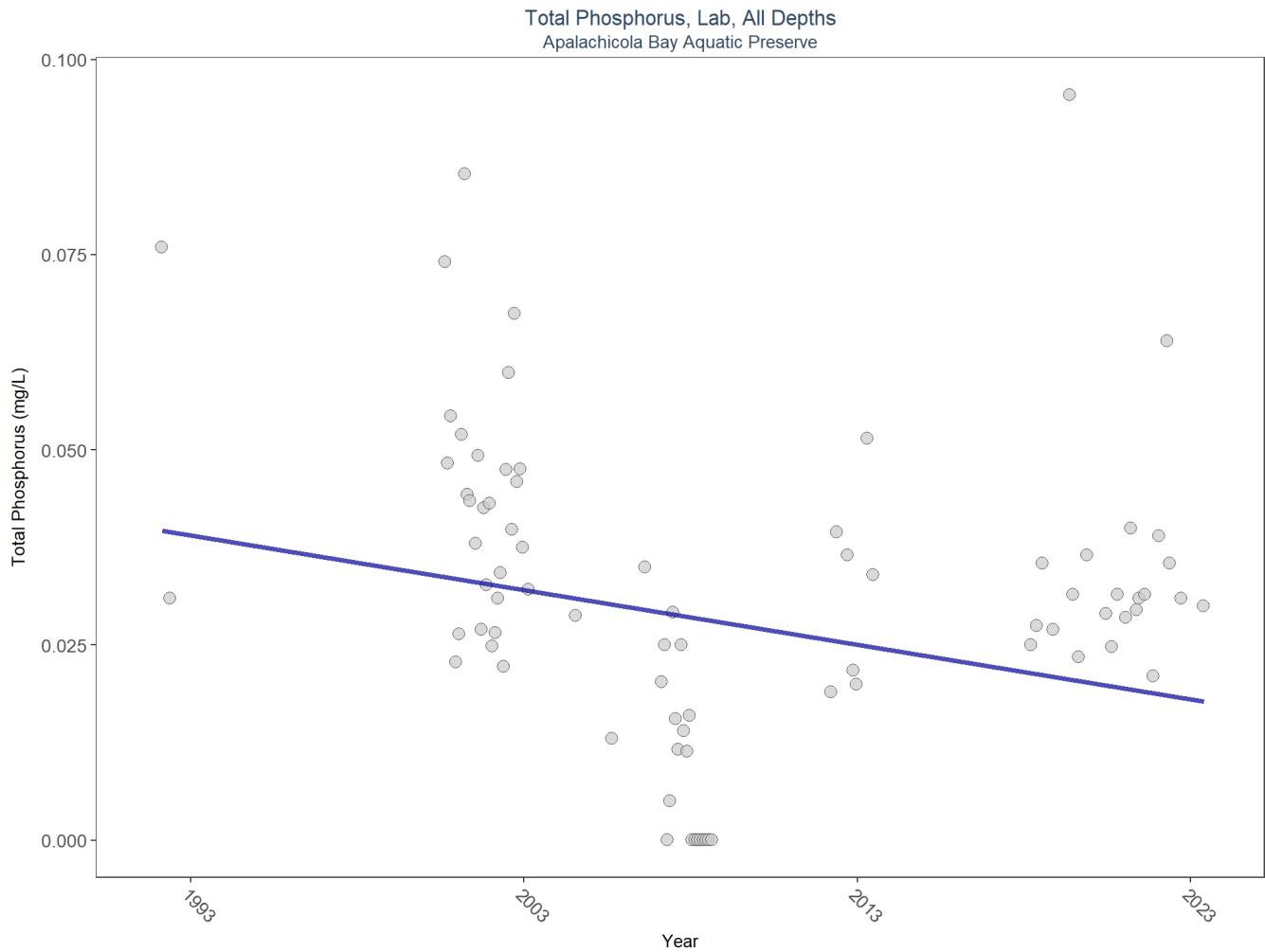
103 - EPA STOrage and RETrieval Data Warehouse (STORET)

115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for Total Nitrogen in Apalachicola Bay Aquatic Preserve

## Total Phosphorus - Discrete Water Quality

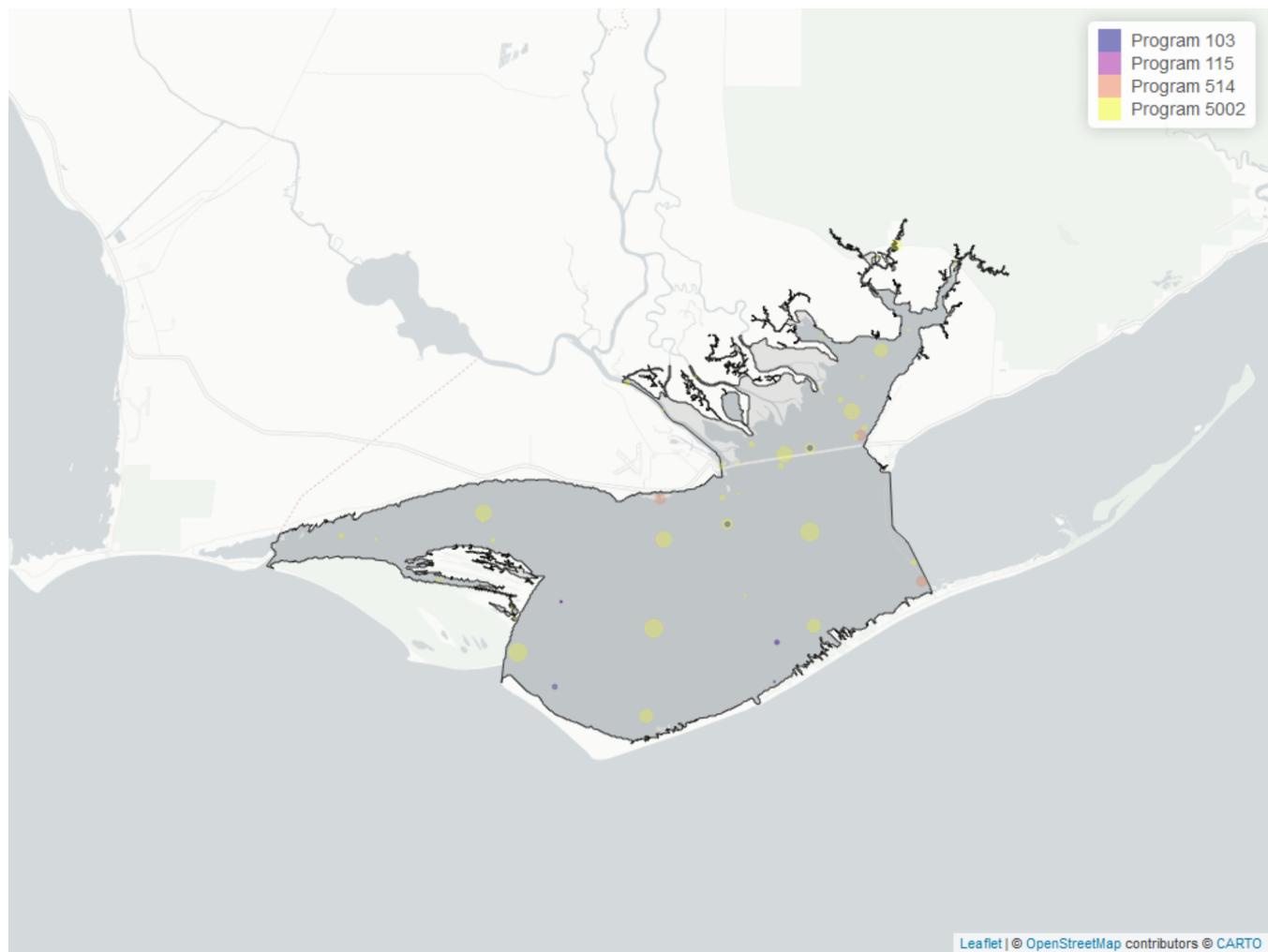
### Seasonal Kendall-Tau Trend Analysis



*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 Total Phosphorus



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

Table 16: Programs contributing data for Total Phosphorus

ProgramID	N_Data	YearMin	YearMax
5002	491	1992	2023
514	50	2007	2008
103	20	2002	2021
115	2	2002	2004

#### Program names:

5002 - Florida STORET / WIN

514 - Florida LAKEWATCH Program

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

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 17: Value Qualifiers for Total Phosphorus

<i>Year</i>	<i>N_Total</i>	<i>N_I</i>	<i>perc_I</i>	<i>N_U</i>	<i>perc_U</i>
2000	67	25	37.3	1	1.5
2001	148	69	46.6	8	5.4
2002	157	61	38.9	2	1.3
2003	13	11	84.6		
2007	70	19	27.1	24	34.3
2012	13	2	15.4		

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

#### Programs containing Value Qualified data:

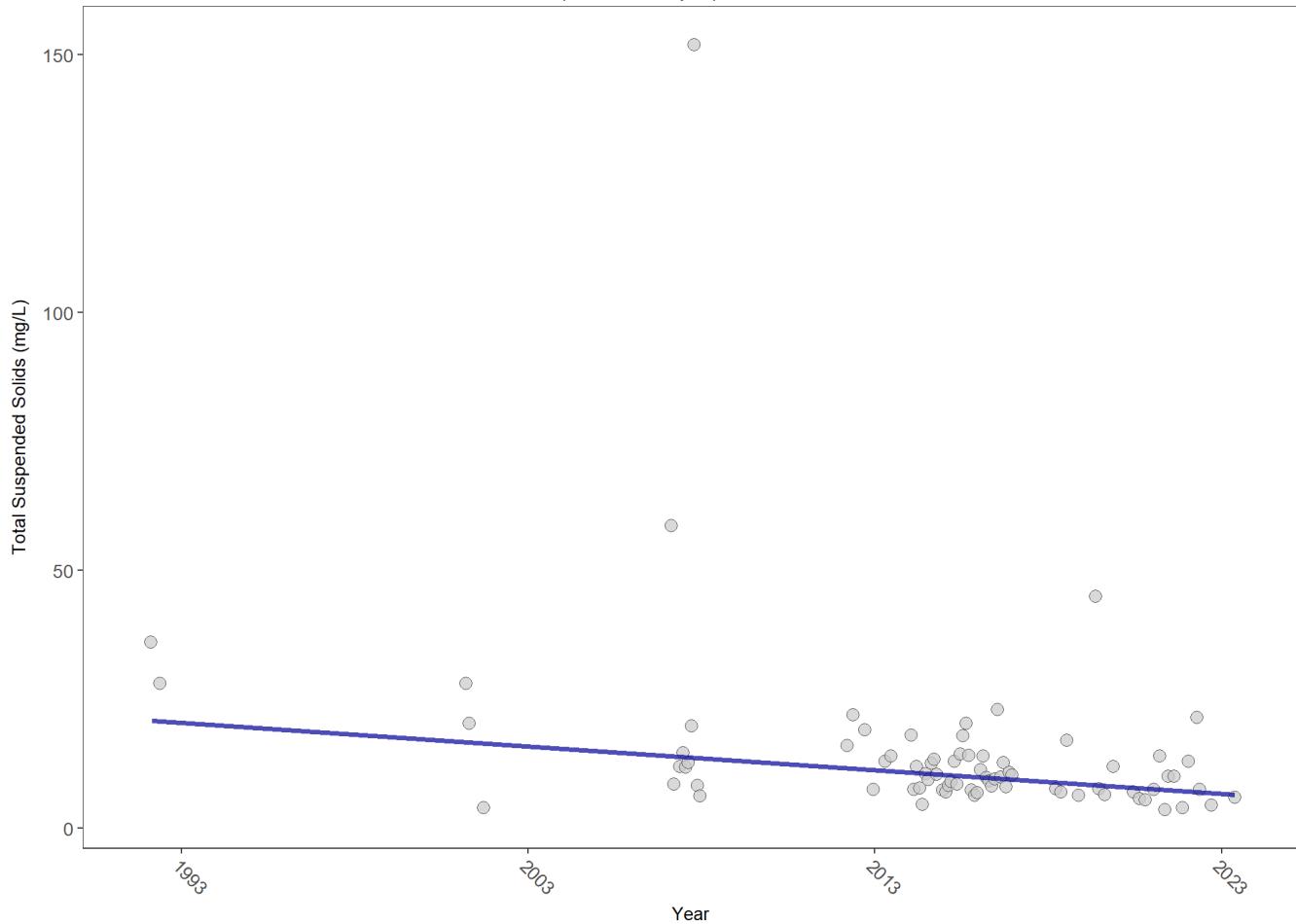
5002 - Florida STORET / WIN

### 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  
Apalachicola Bay Aquatic Preserve

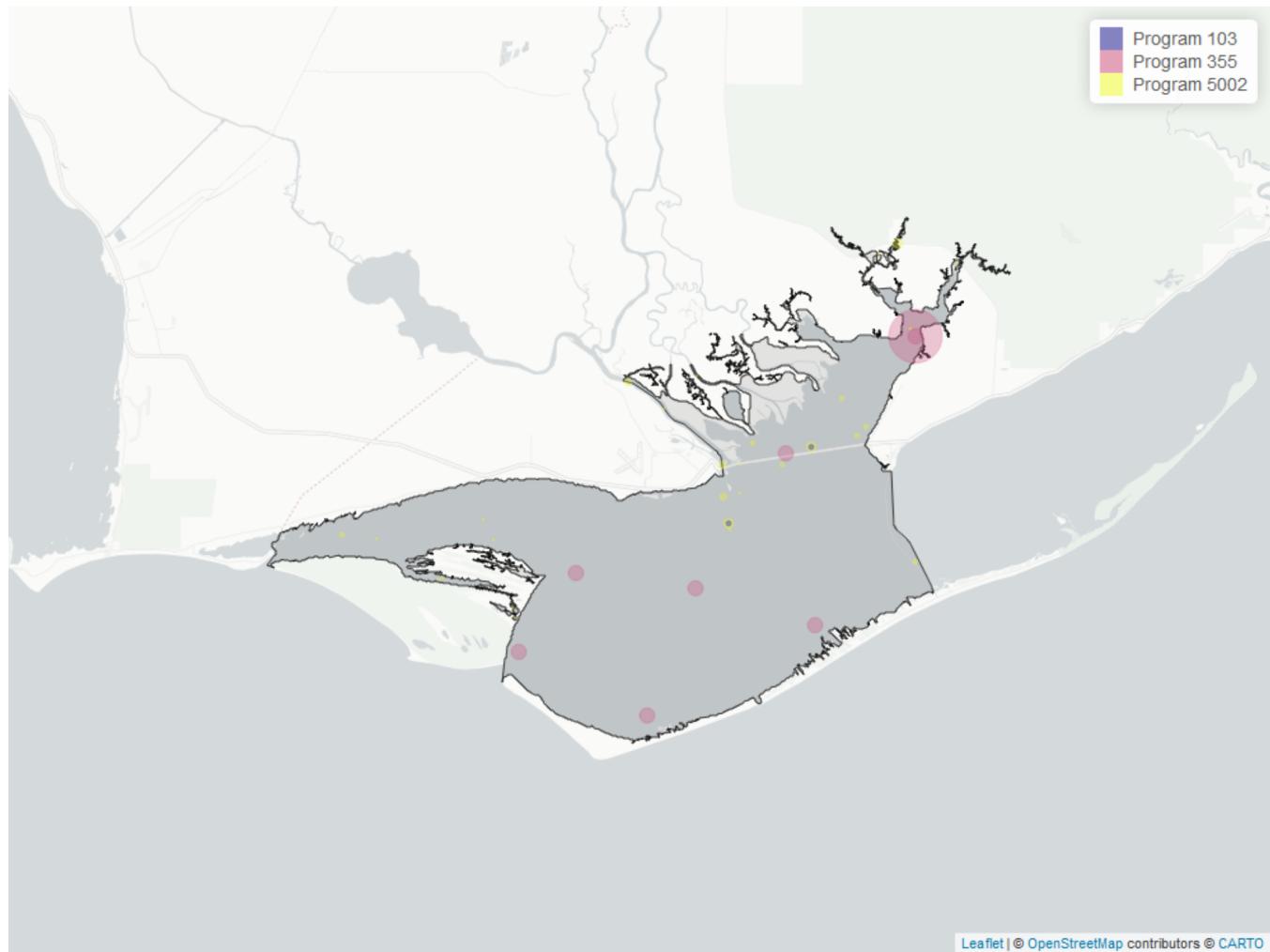


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	795	14	9	TRUE	-0.2542	0.0022	-0.4603175	20.89472	12.9207	0.2985	-1

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

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

Map showing location of Discrete sampling sites for Total Suspended Solids



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

Table 18: Programs contributing data for Total Suspended Solids

ProgramID	N_Data	YearMin	YearMax
355	707	2014	2019
5002	114	1992	2023
103	10	2021	2021

#### Program names:

355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program

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 19: Value Qualifiers for Total Suspended Solids

<i>Year</i>	<i>N_Total</i>	<i>N_I</i>	<i>perc_I</i>	<i>N_U</i>	<i>perc_U</i>
2001	5	2	40.0		
2007	48	30	62.5	6	12.5
2012	8	3	37.5		
2013	3	1	33.3		
2018	15	10	66.7		
2019	10	7	70.0		
2020	8	8	100.0		
2021	20	7	35.0		
2022	8	5	62.5		
2023	1	1	100.0		

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

#### Programs containing Value Qualified data:

355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program

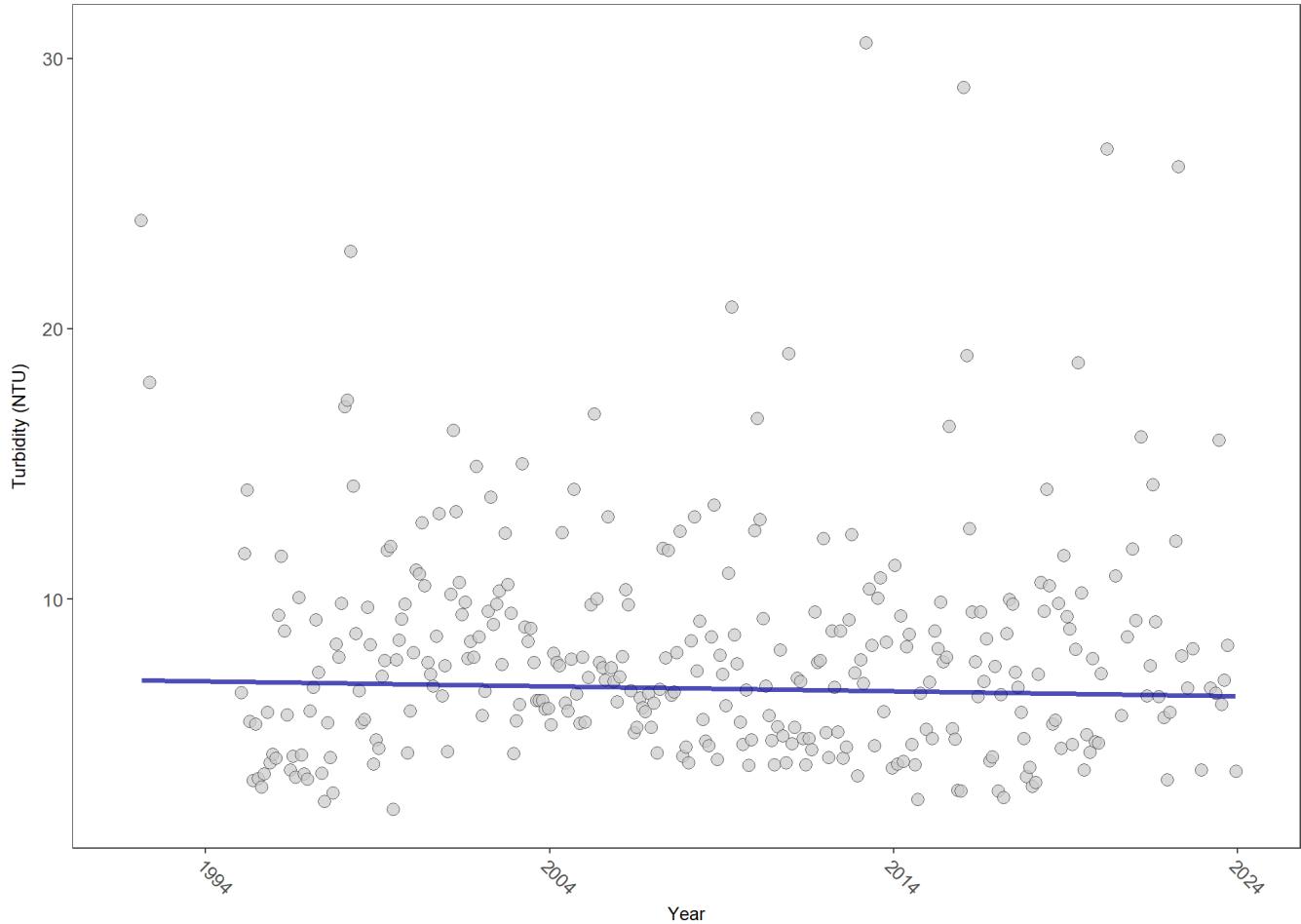
5002 - Florida STORET / WIN

### Turbidity - Discrete Water Quality

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

#### Seasonal Kendall-Tau Trend Analysis

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

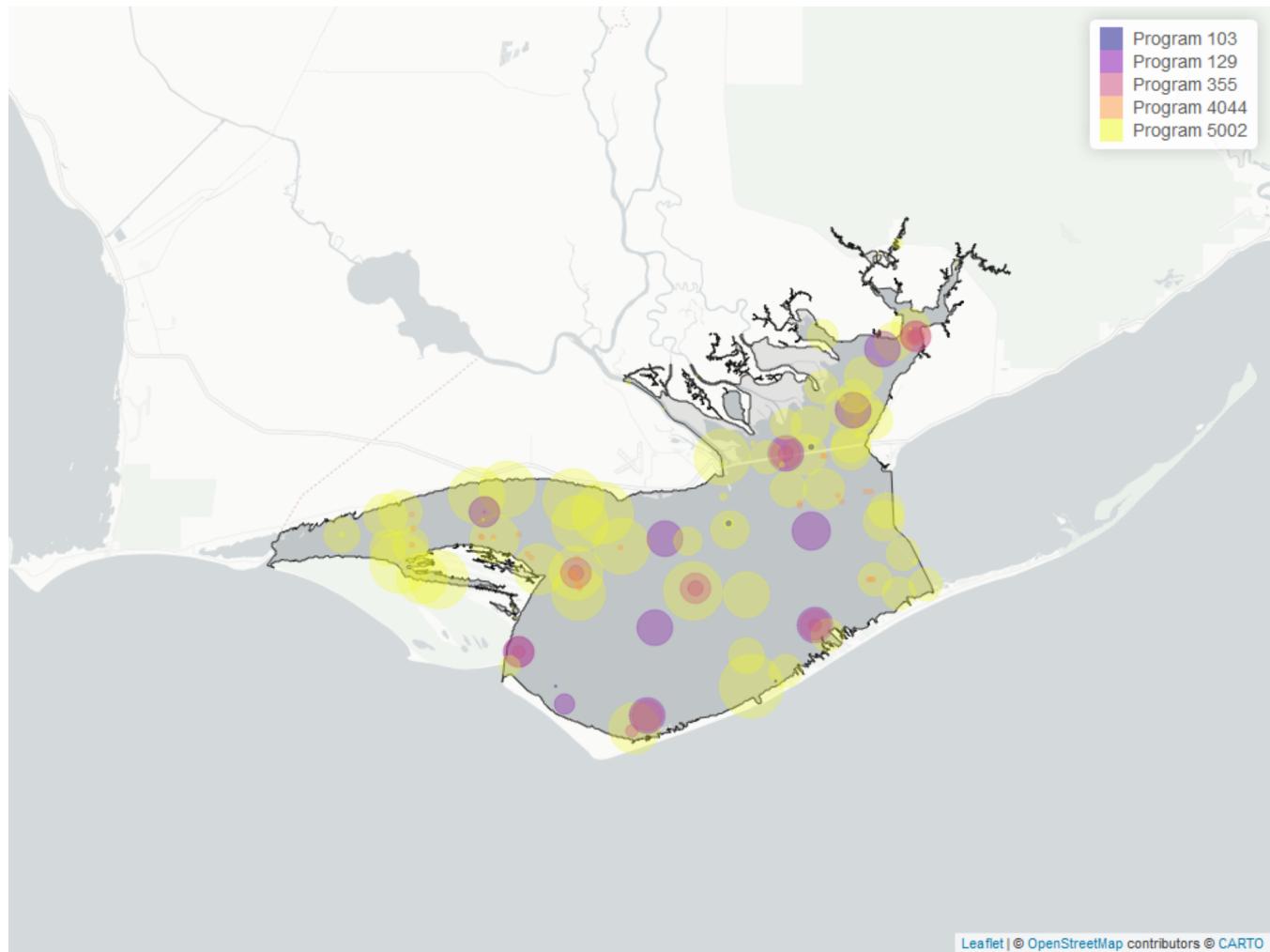


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	19056	30	5.7	TRUE	-0.0342	0.4121	-0.01837466	7.000446	21.2818	0.0306	0

$p < 0.00005$  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 20: Programs contributing data for Turbidity

ProgramID	N_Data	YearMin	YearMax
5002	15517	1992	2023
129	1970	2000	2023
355	1445	2004	2019
4044	112	2021	2023
103	13	2005	2021

#### Program names:

5002 - Florida STORET / WIN

129 - Apalachicola National Estuarine Research Reserve Juvenile Fish and Benthic Macroinvertebrate Monitoring

355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program

4044 - NRDA Oyster Cultch Recovery Project

### Value Qualifiers

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

Table 21: Value Qualifiers for Turbidity

Year	$N_{Total}$	$N_Q$	$perc_Q$
2007	839	5	0.6

**Note:**  $^1Q$  - Sample held beyond the accepted holding time

### Programs containing Value Qualified data:

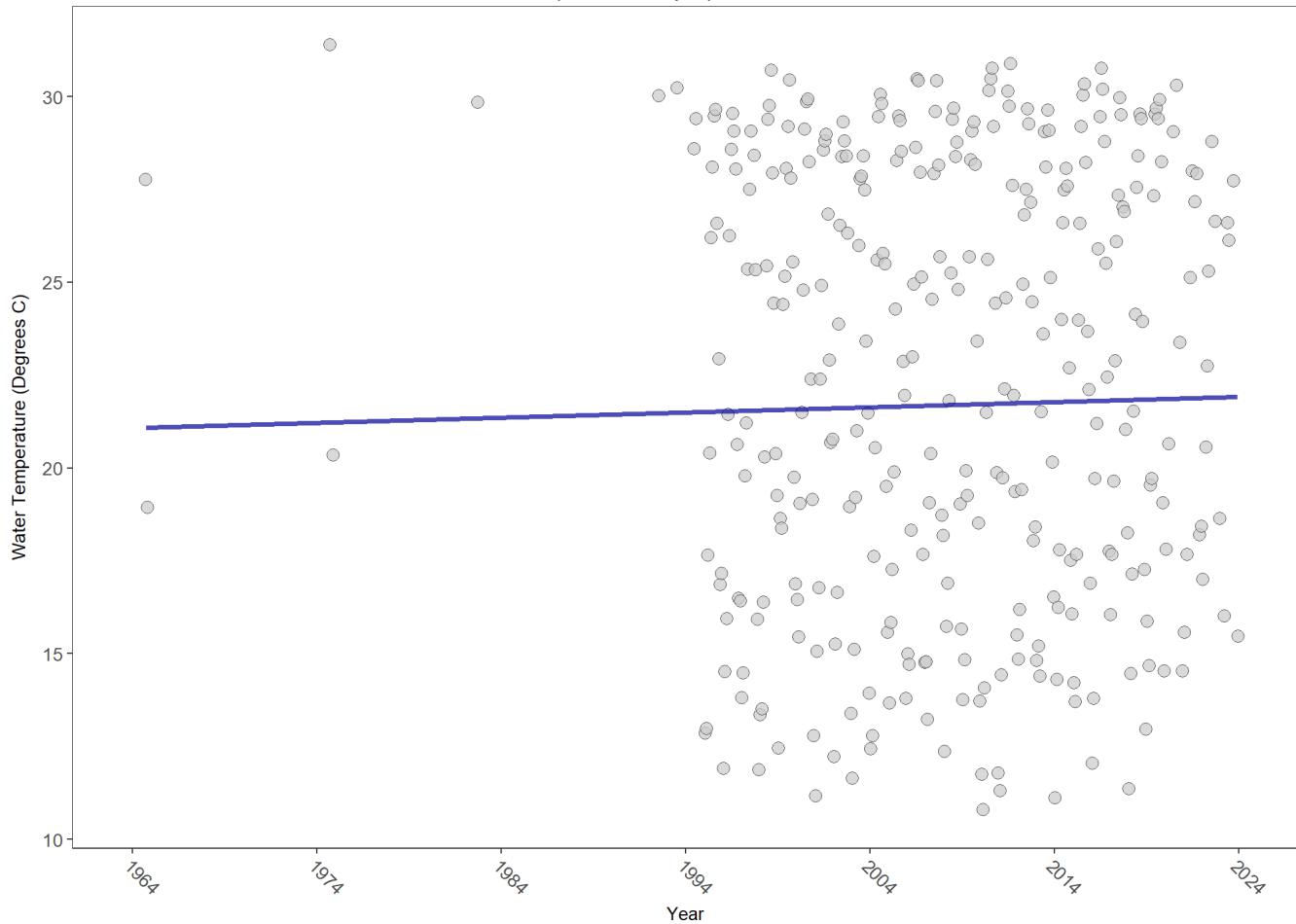
355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program  
 5002 - Florida STORET / WIN

### Water Temperature - Discrete Water Quality

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

### Seasonal Kendall-Tau Trend Analysis

Water Temperature, Field, All Depths  
Apalachicola Bay Aquatic Preserve

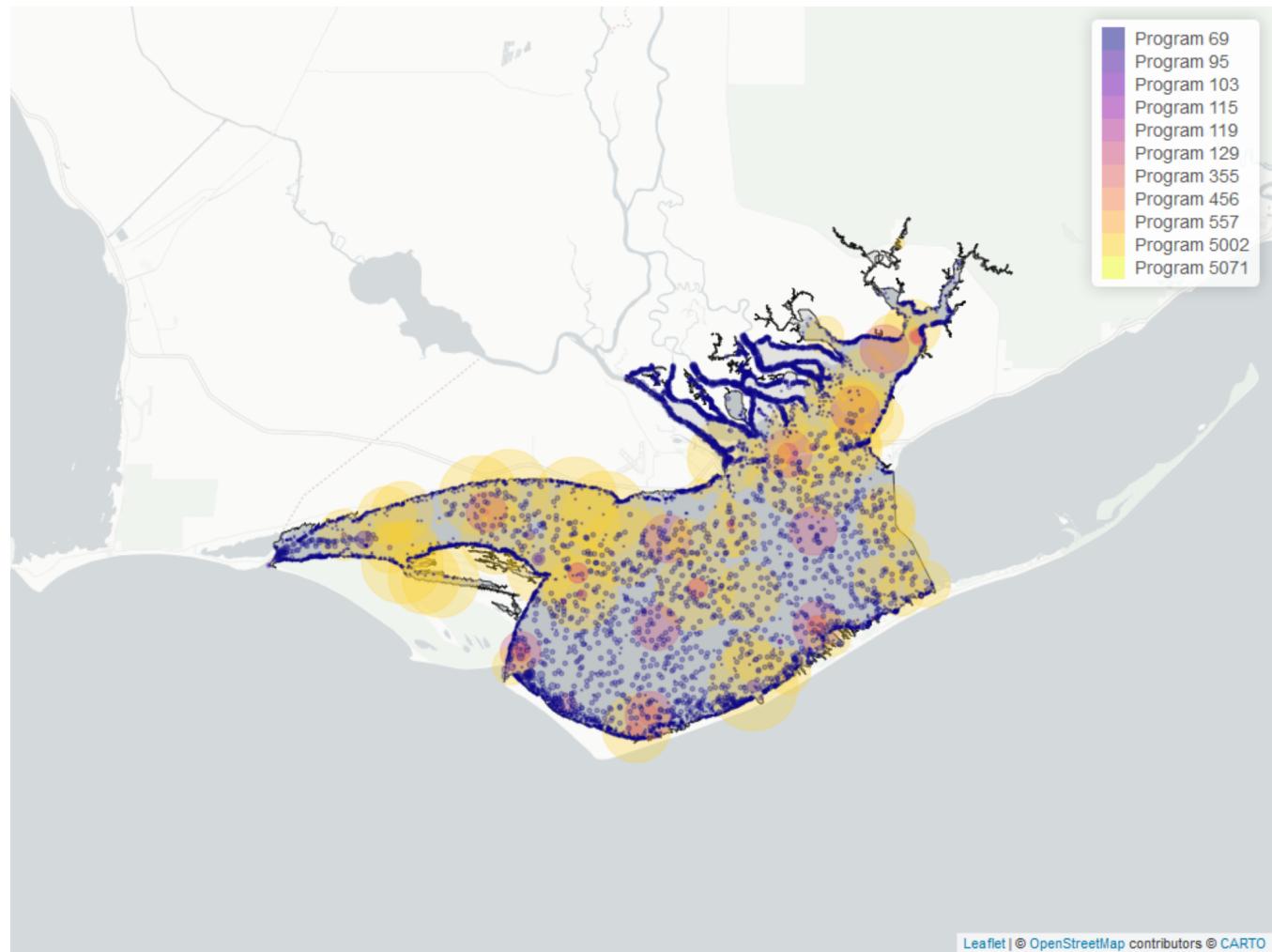


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	55058	35	24	TRUE	0.0571	0.1427	0.01407531	21.07583	6.2487	0.8563	0

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

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Water Temperature



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

Table 22: Programs contributing data for Water Temperature

ProgramID	N_Data	YearMin	YearMax
5002	30490	1995	2023
69	19889	1998	2017
129	3380	2000	2023
355	903	2011	2019
95	246	1964	2018
557	80	2006	2021
456	33	2005	2013
103	19	2004	2021
115	15	1992	2004
119	14	1994	1994
5071	3	2017	2017

**Program names:**

5002 - Florida STORET / WIN

69 - Fisheries-Independent Monitoring (FIM) Program

129 - Apalachicola National Estuarine Research Reserve Juvenile Fish and Benthic Macroinvertebrate Monitoring

355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program

95 - Harmful Algal Bloom Marine Observation Network

557 - Central Panhandle Aquatic Preserves Seagrass Monitoring

456 - Oyster Sentinel

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

115 - Environmental Monitoring Assessment Program

119 - National Status and Trends Bioeffects program

5071 - Oyster shell heights and taxonomic diversity in 2015-2017 among previously documented oiled and non-oiled reefs in Louisiana, Alabama, and the Florida panhandle

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

## Water Quality - Continuous

The following files were used in the continuous analysis:

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

Table 23: Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

<i>ProgramLocationID</i>	<i>Years of Data</i>	<i>Use in Analysis</i>	<i>Parameters</i>
apadbwq	23	TRUE	DO , DOS , pH , Sal , Turb , TempW
apaebwq	28	TRUE	Turb
apaebwq	30	TRUE	DO , DOS , pH , Sal , TempW
apaeswq	29	TRUE	Turb
apaeswq	30	TRUE	DO , DOS , pH , Sal , TempW
apalmwq	8	TRUE	DO , DOS , pH , Sal , Turb , TempW
apapcwq	8	TRUE	DO , DOS , pH , Sal , Turb , TempW



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

## Dissolved Oxygen - Continuous Water Quality

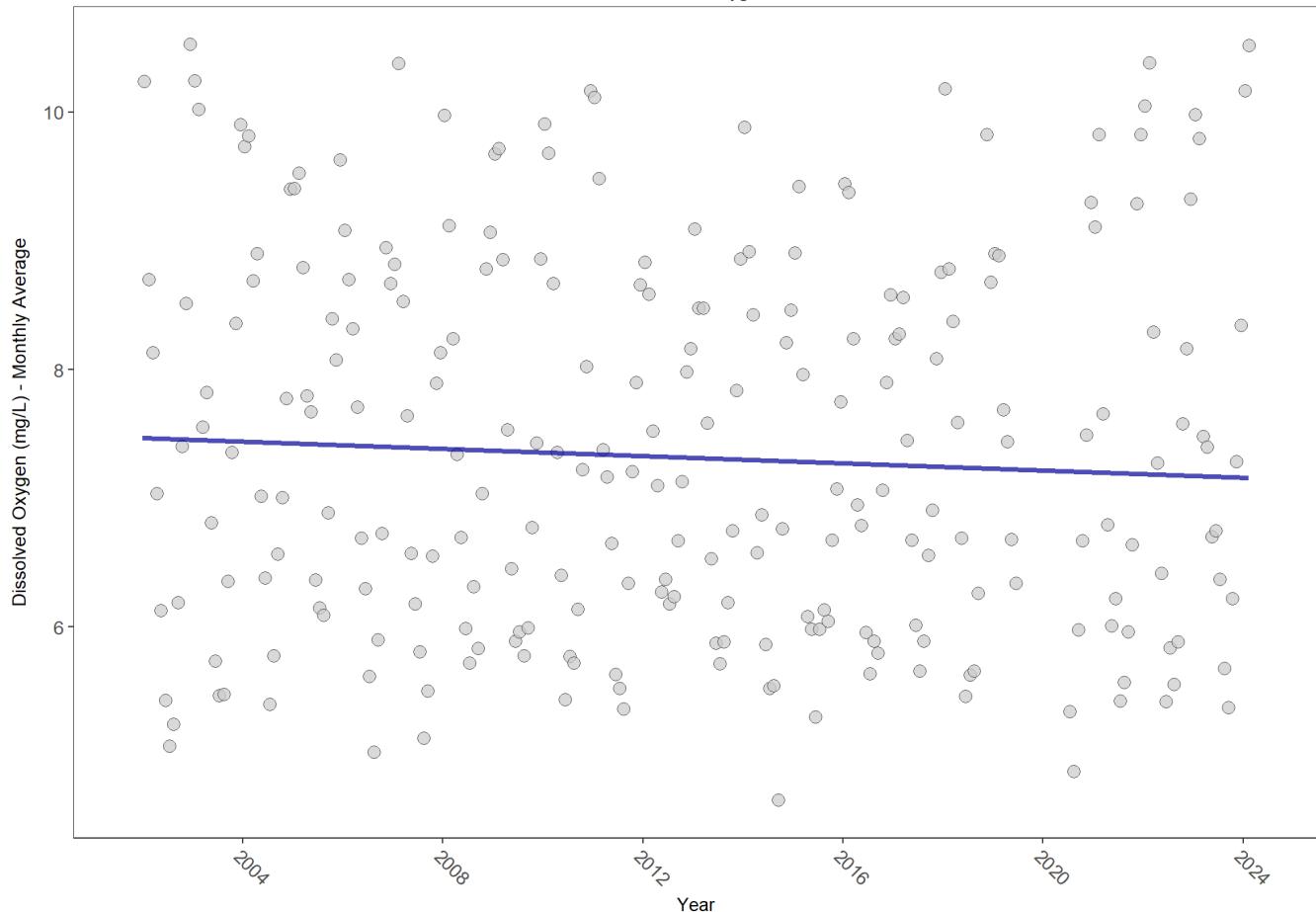
apadbwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apadbwq

Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	588608	23	7.3	TRUE	-0.127	0.0060	-0.01412514	7.46969	10.7741	0.4624	-1

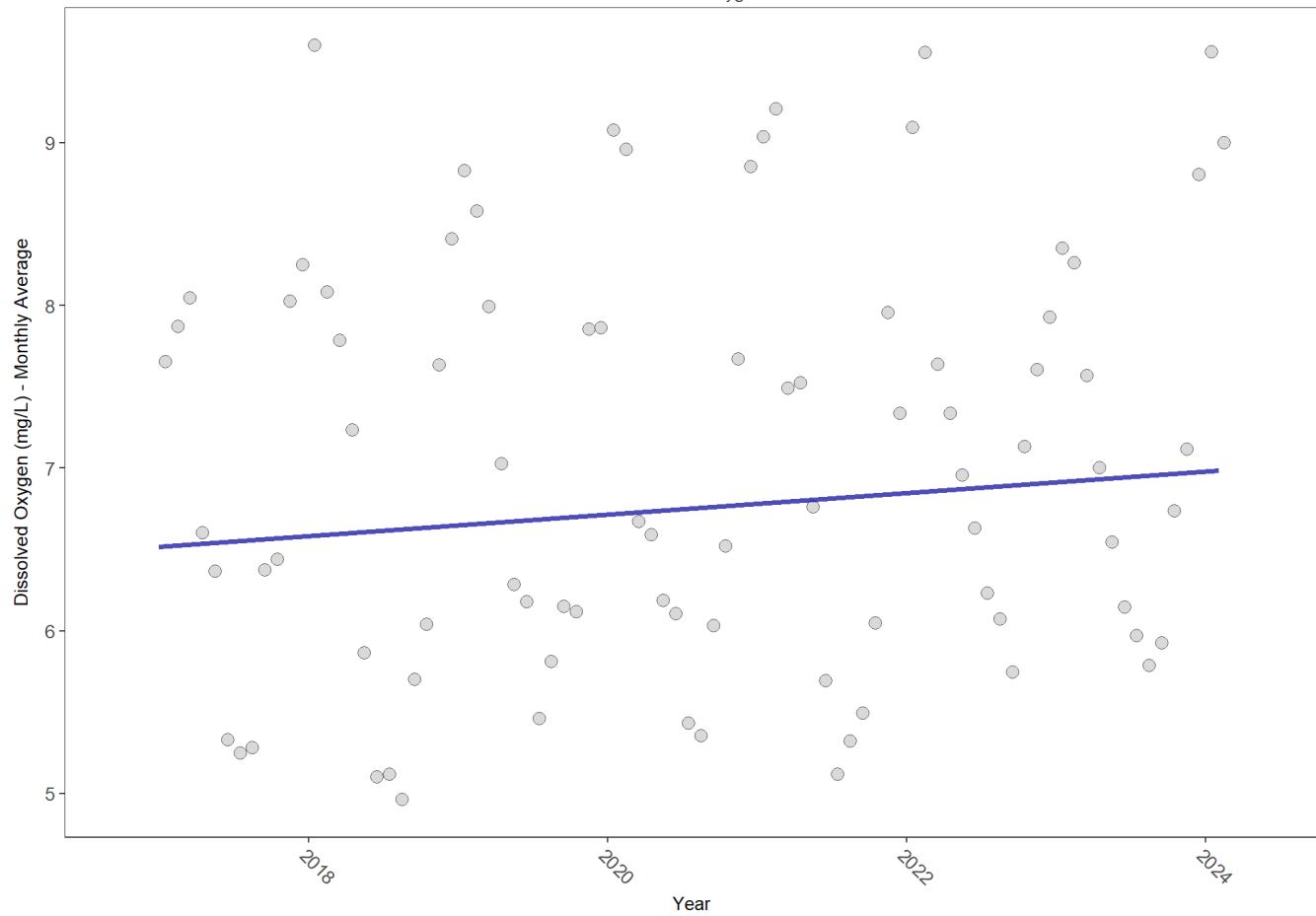
*p < 0.00005 appear as 0 due to rounding.*

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

## apapcwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apapcwq  
Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	232084	8	6.9	TRUE	0.1584	0.0727	0.06595949	6.515778	16.466	0.1247	0

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

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

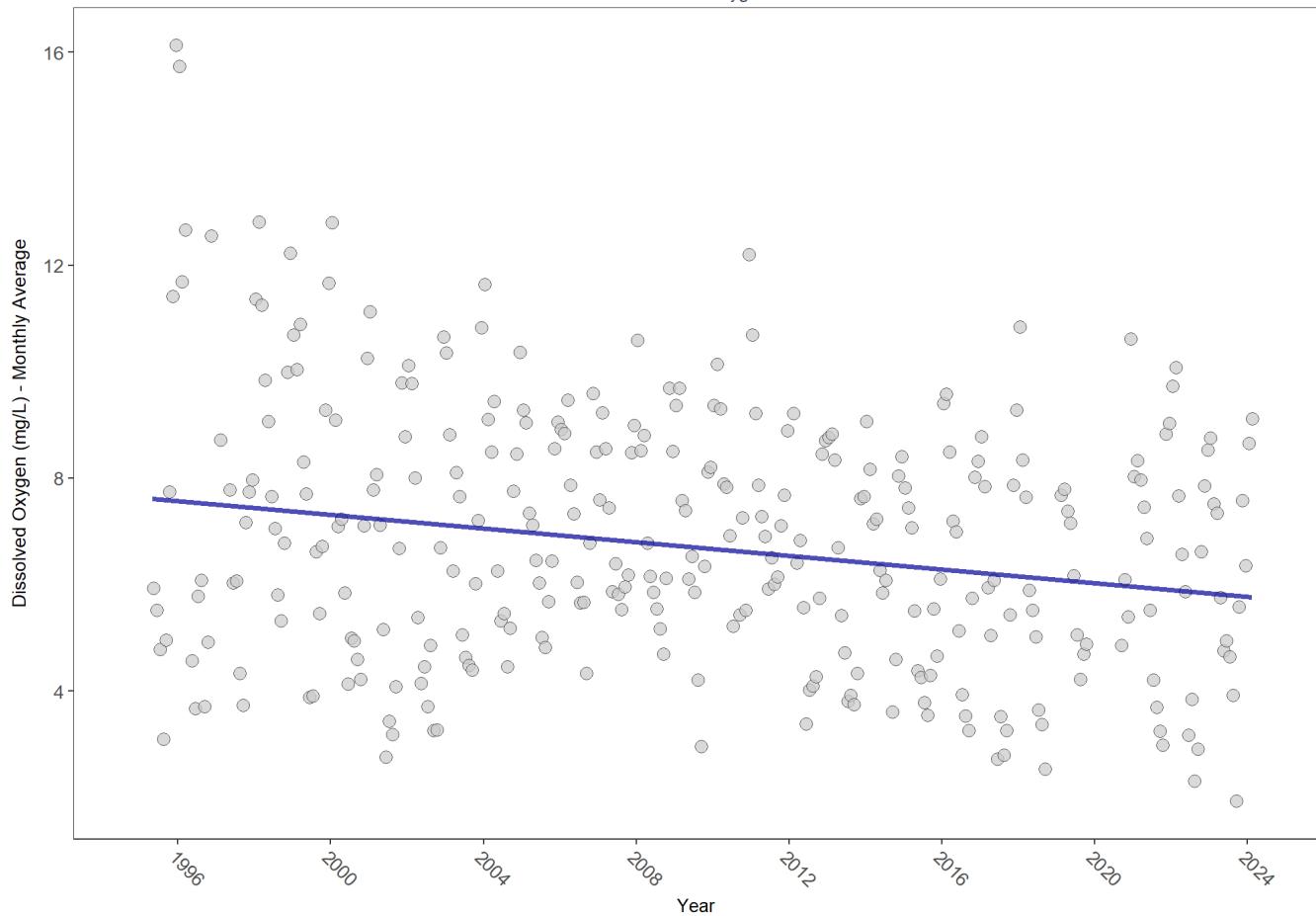
## apaebwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apaebwq

Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	630825	30	6.9	TRUE	-0.2896	0.0000	-0.06426285	7.638883	8.3136	0.685	-1

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

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

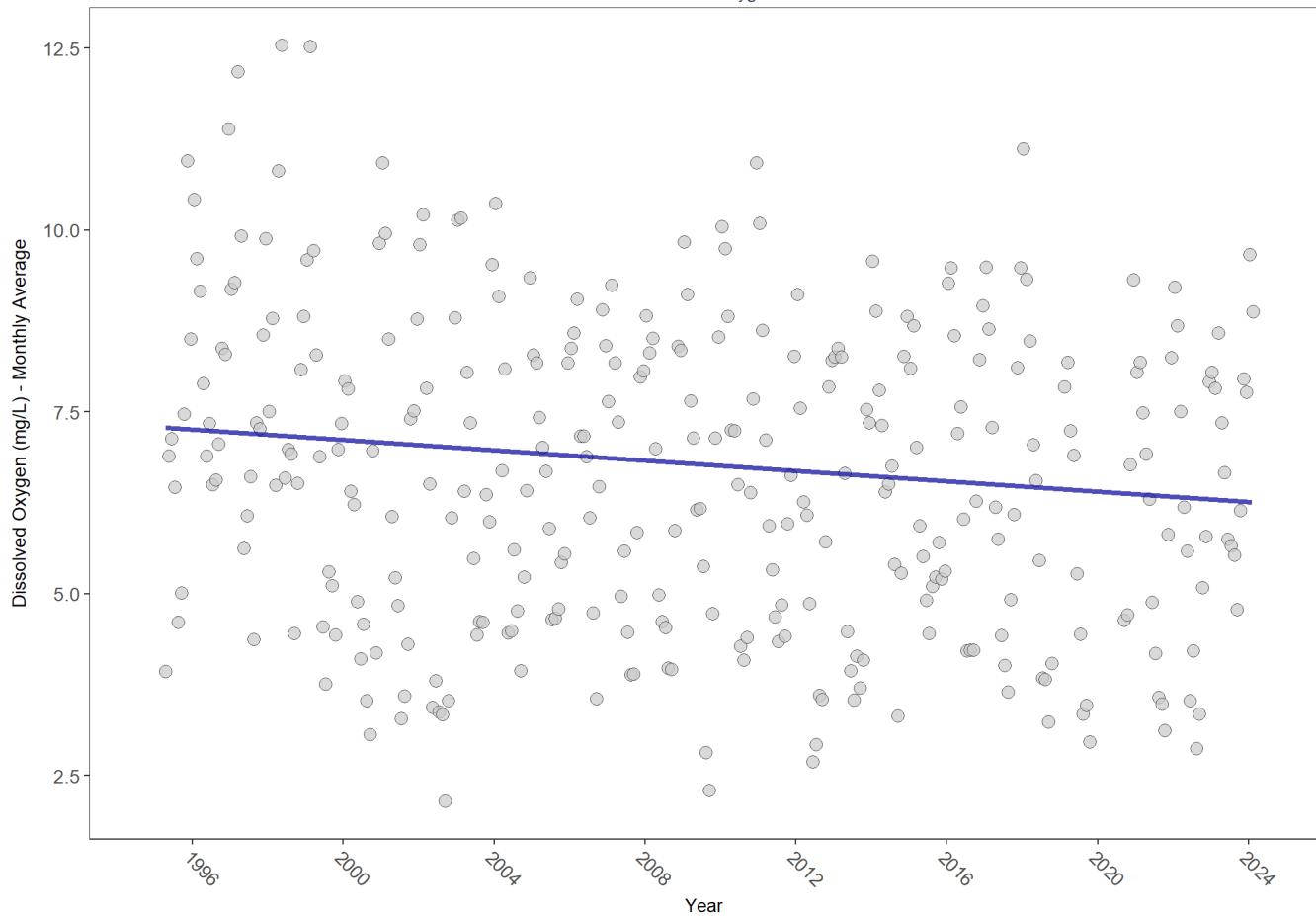
## apaeswq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apaeswq

Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	681262	30	6.8	TRUE	-0.1868	0.0000	-0.03570202	7.297669	7.9134	0.721	-1

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

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

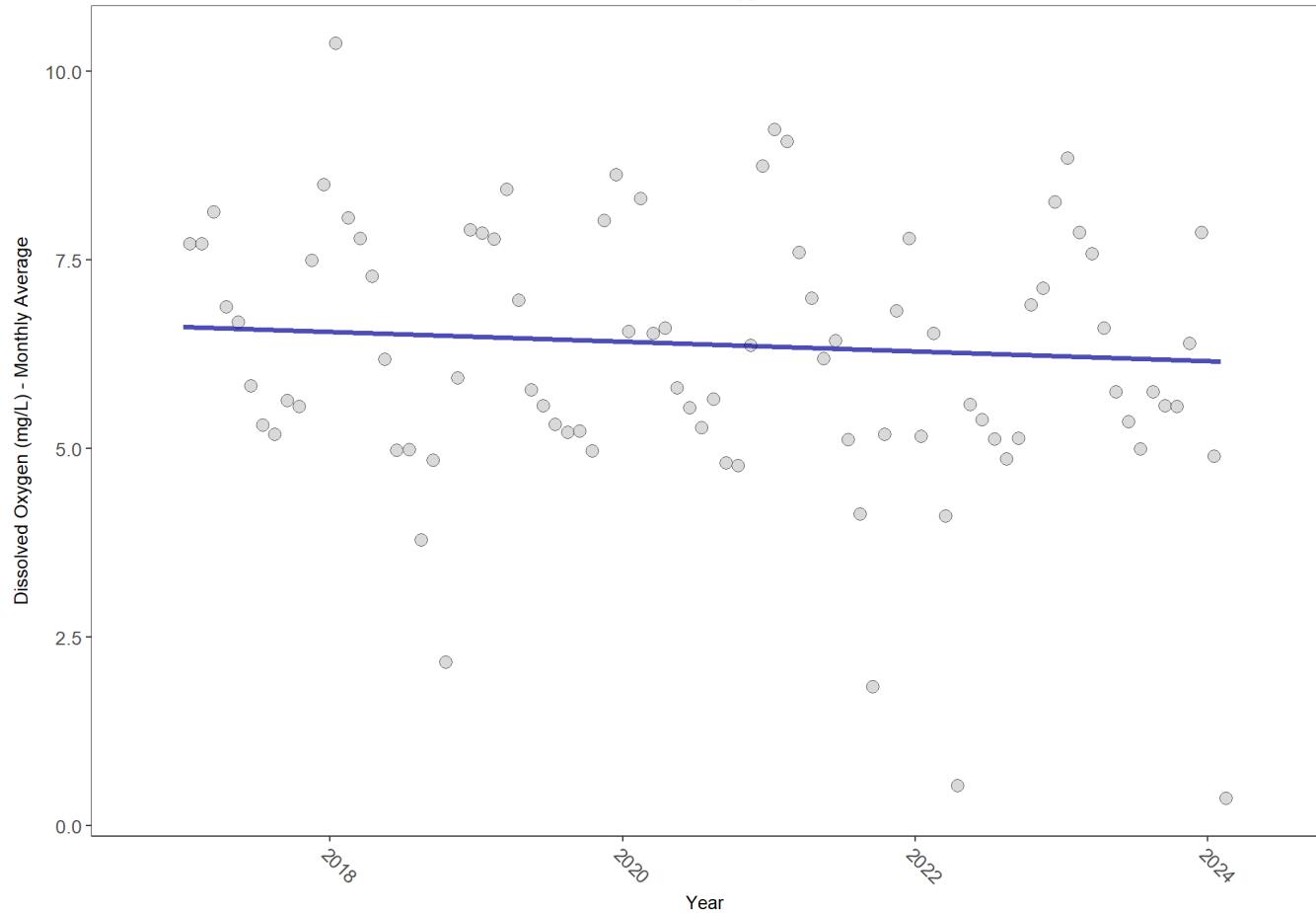
## apalmwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apalmwq

Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	228250	8	6.4	TRUE	-0.1783	0.0498	-0.06413717	6.608815	9.8334	0.5454	-1

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

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

## All Stations Combined

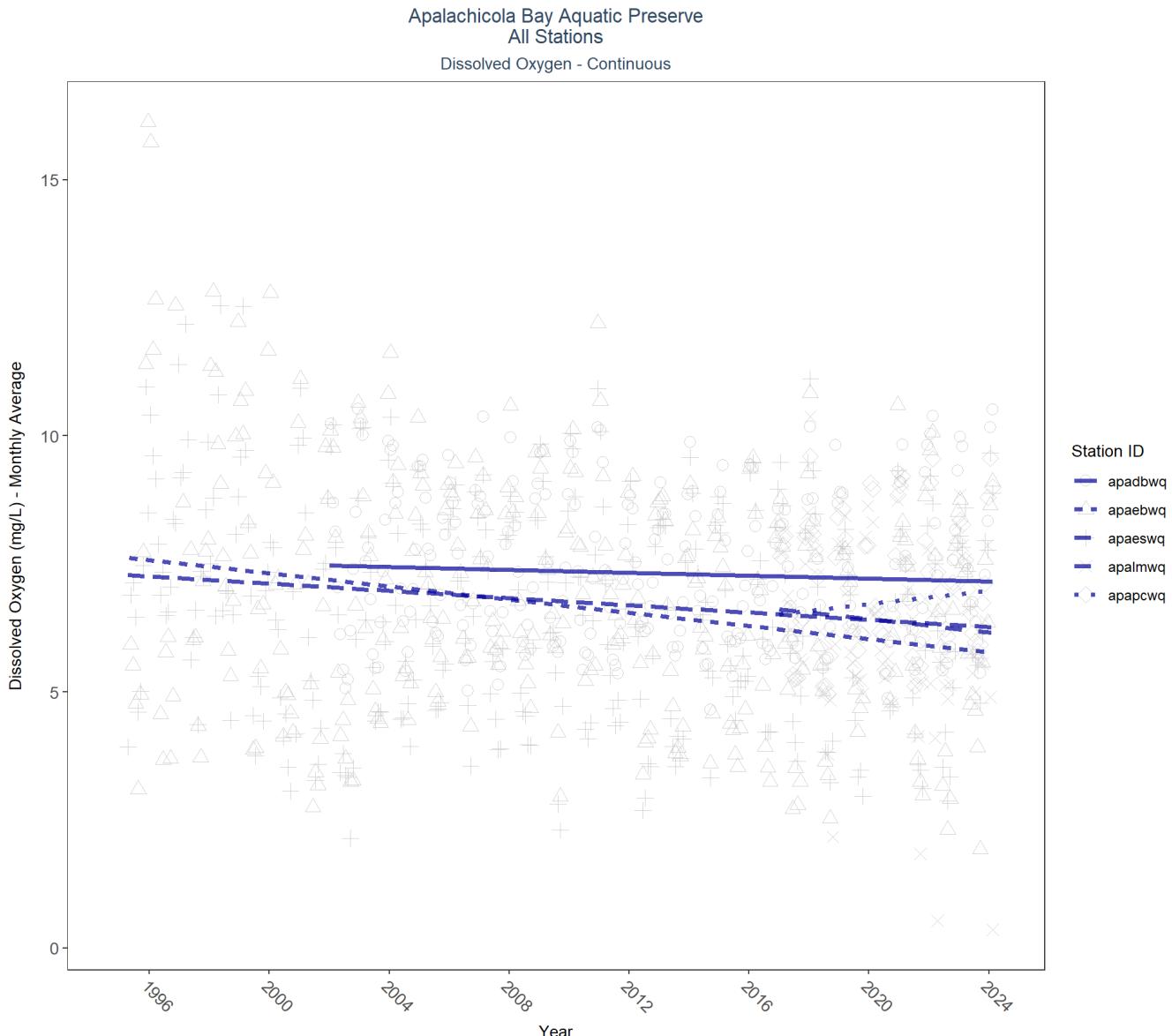


Table 24: Seasonal Kendall-Tau Results for All Stations - Dissolved Oxygen

Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
apadbwq	588608	23	2002 - 2024	7.3	-0.13	7.47	-0.01	0.0060
apapcwq	232084	8	2017 - 2024	6.9	0.16	6.52	0.07	0.0727
apaebwq	630825	30	1995 - 2024	6.9	-0.29	7.64	-0.06	0.0000
apaeswq	681262	30	1995 - 2024	6.8	-0.19	7.30	-0.04	0.0000
apalmwq	228250	8	2017 - 2024	6.4	-0.18	6.61	-0.06	0.0498

## Dissolved Oxygen Saturation - Continuous Water Quality

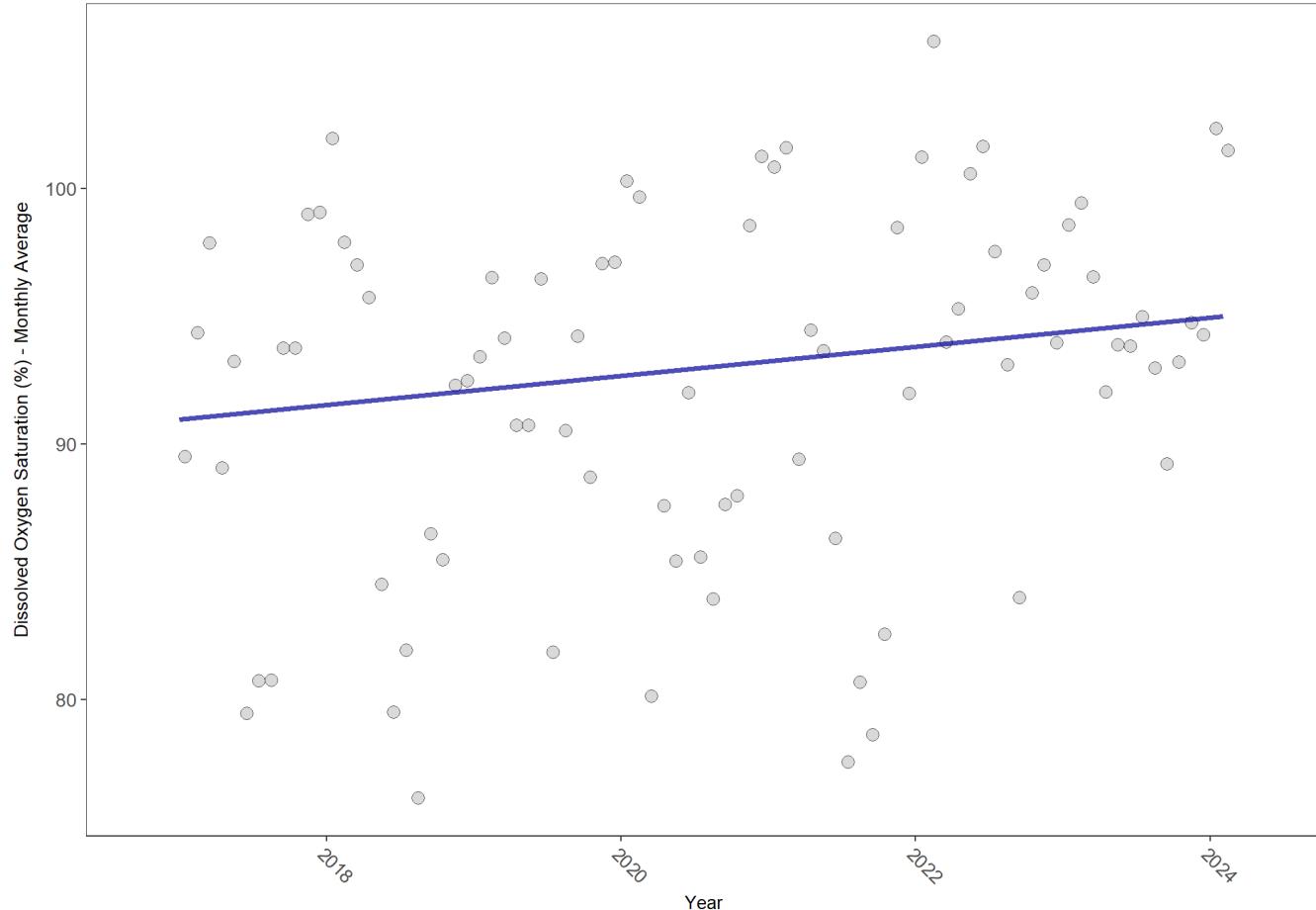
apapcwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apapcwq

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	235540	8	94.4	TRUE	0.1783	0.0408	0.5699207	90.95942	14.6208	0.2005	1

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

SennIntercept is intercept value at beginning of record for monitoring location

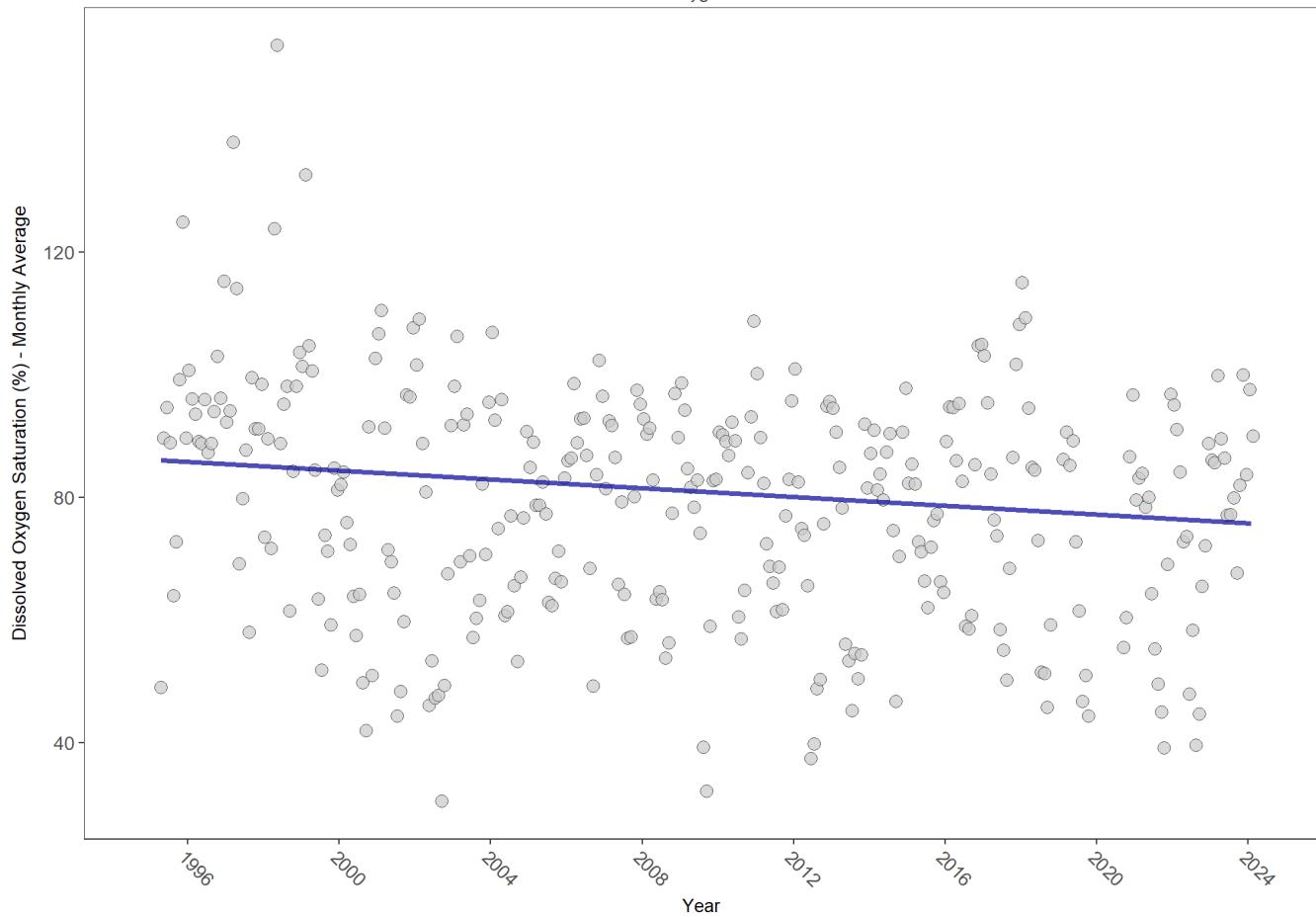
## apaeswq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apaeswq

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	682431	30	83.9	TRUE	-0.1475	0.0001	-0.3570521	86.11747	9.1684	0.6063	-1

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

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

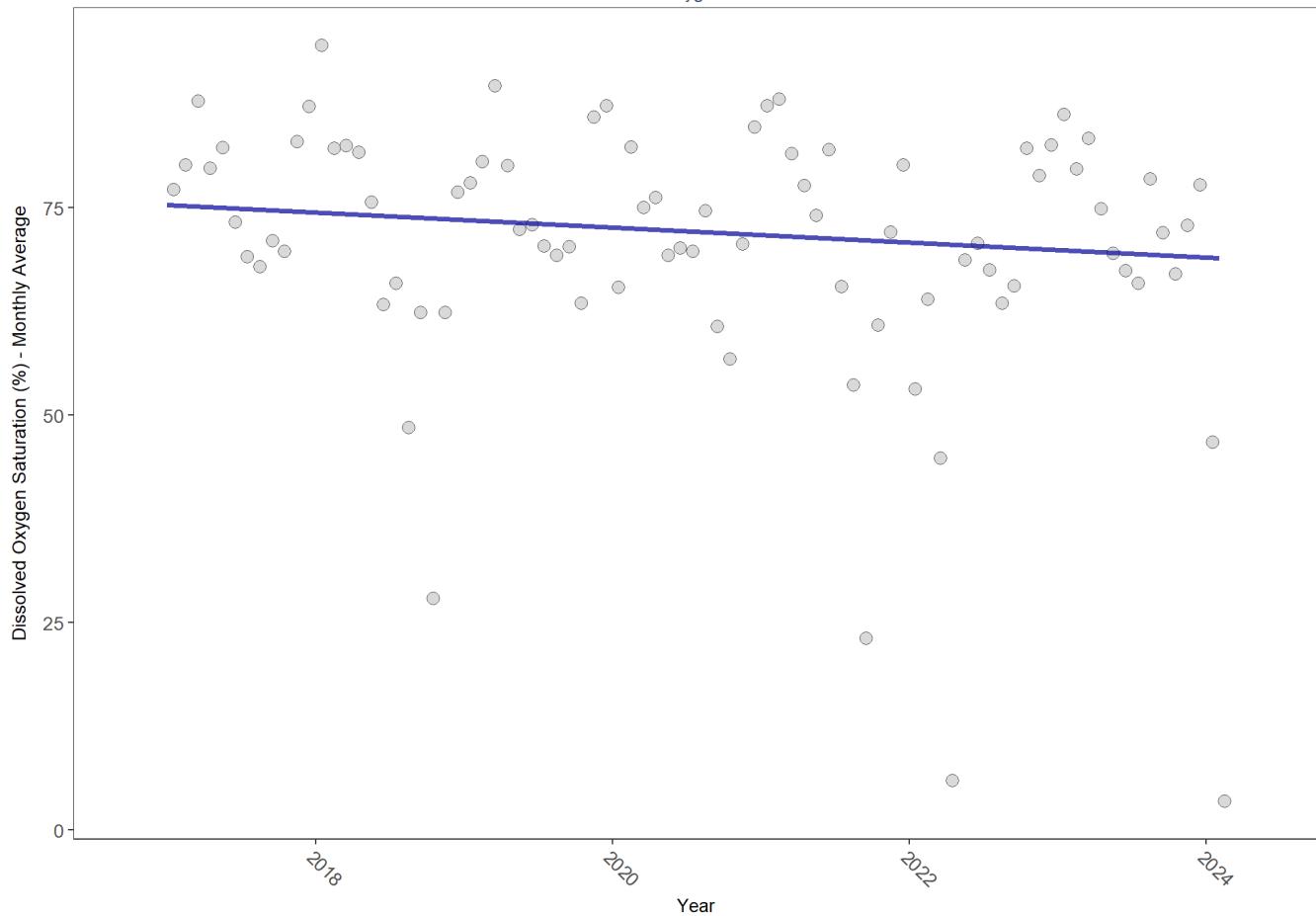
## apalmwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apalmwq

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	228186	8	75	TRUE	-0.1993	0.0270	-0.9097555	75.37145	9.9699	0.5331	-1

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

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

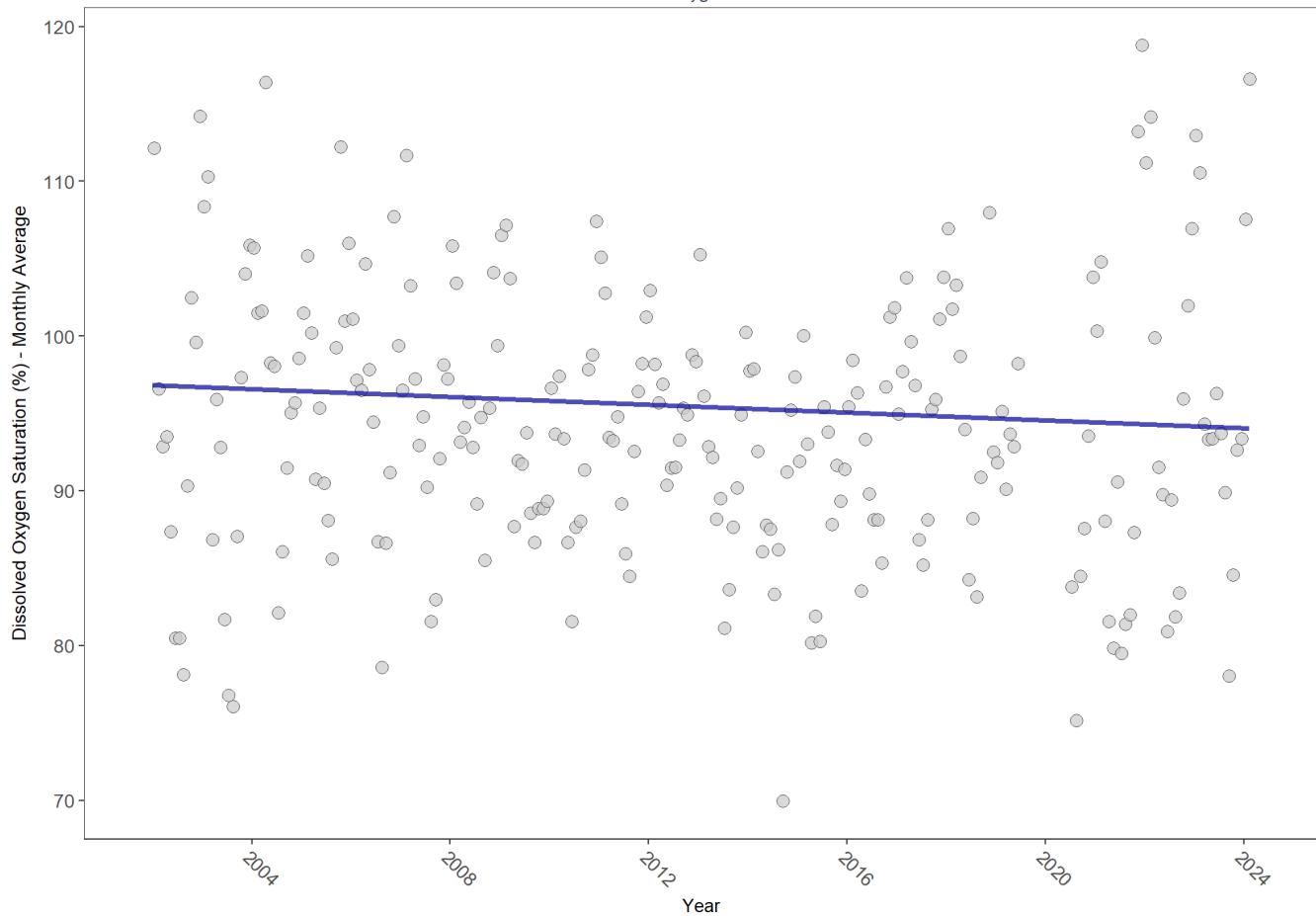
## apadbwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apadbwq

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	592057	23	94.8	TRUE	-0.0822	0.0788	-0.1265844	96.82057	12.6318	0.3181	0

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

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

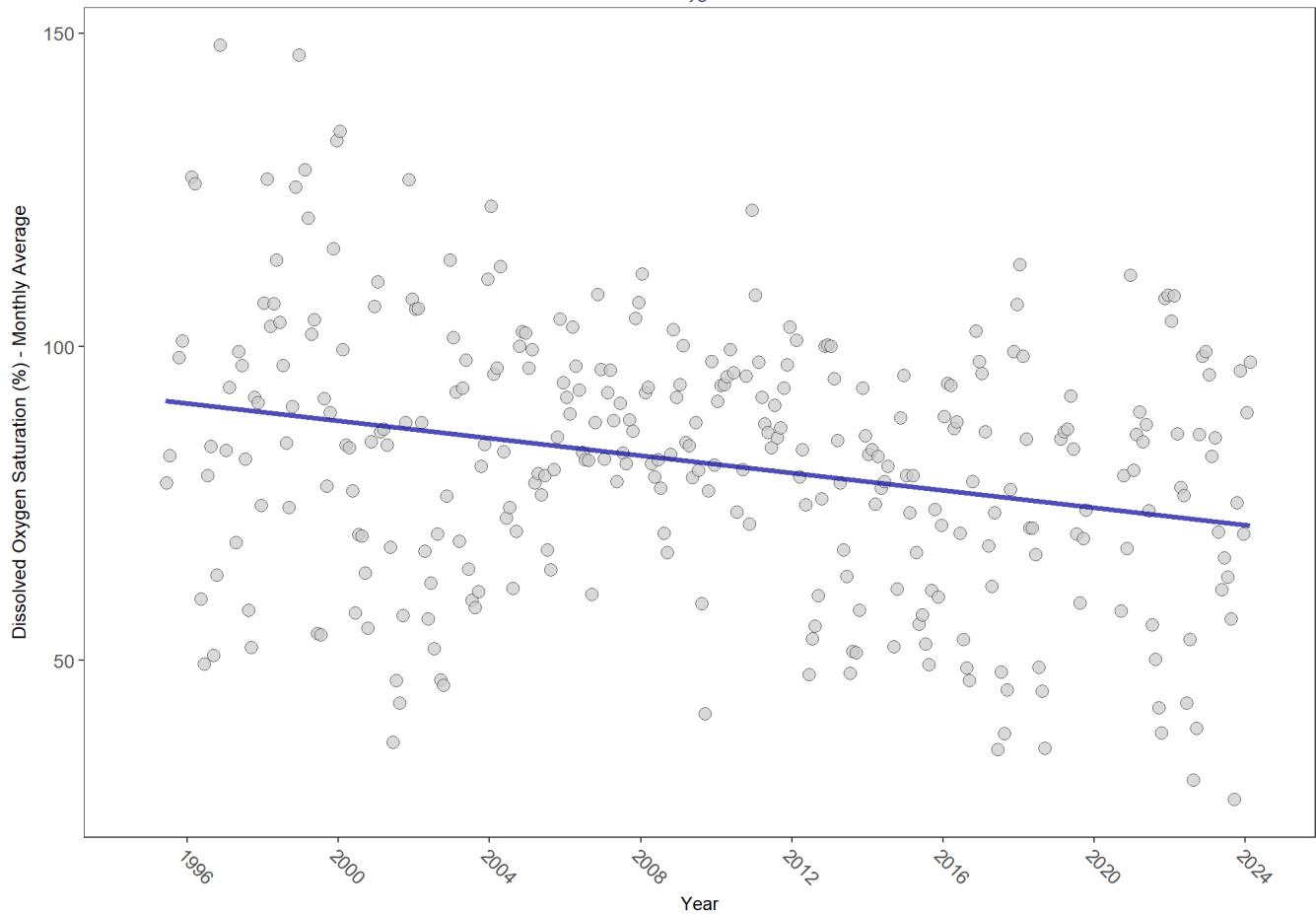
## apaebwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apaebwq

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	626646	30	85	TRUE	-0.2623	0.0000	-0.6918942	91.67259	4.0833	0.9674	-1

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

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

## All Stations Combined

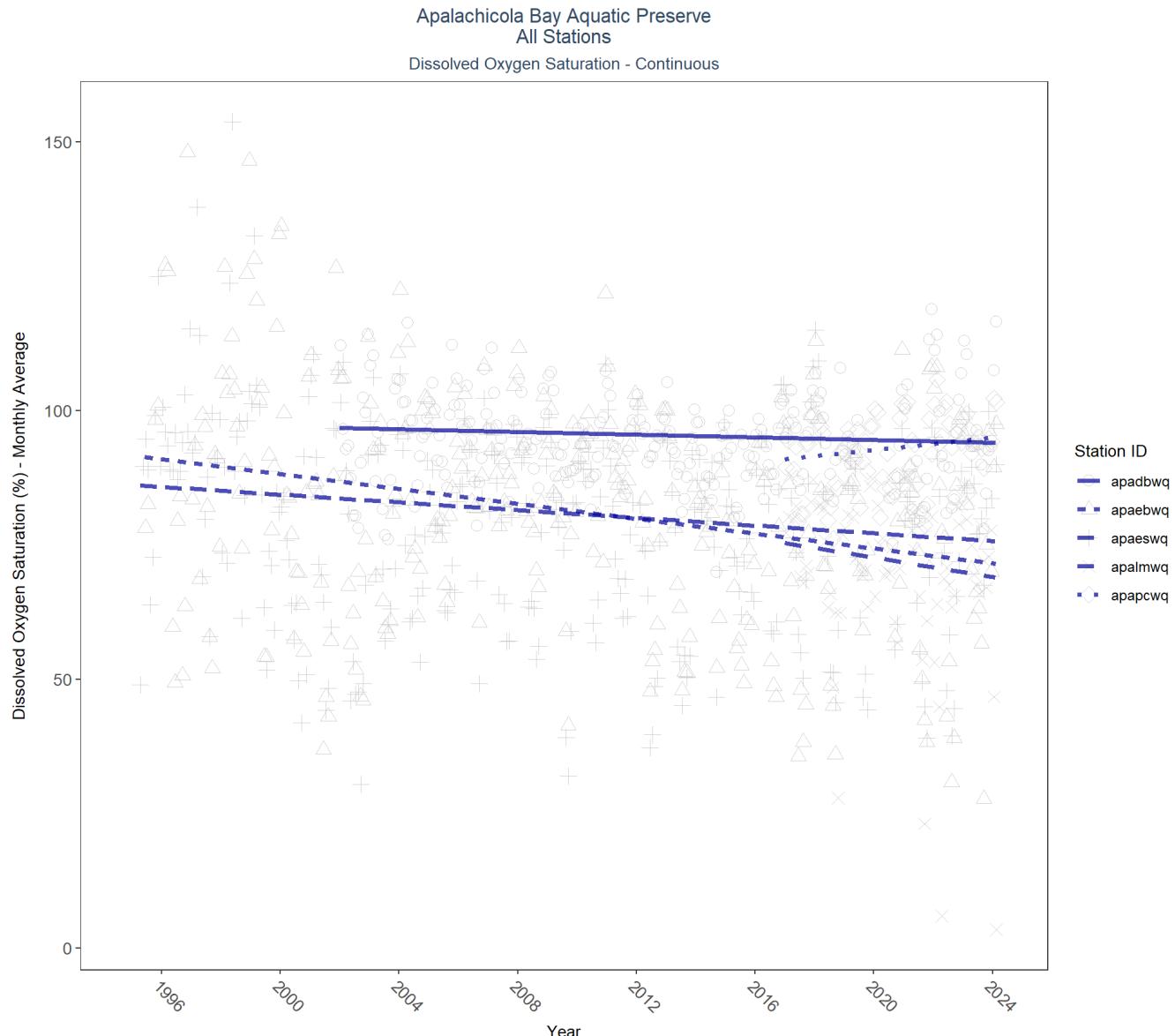


Table 25: Seasonal Kendall-Tau Results for All Stations - Dissolved Oxygen Saturation

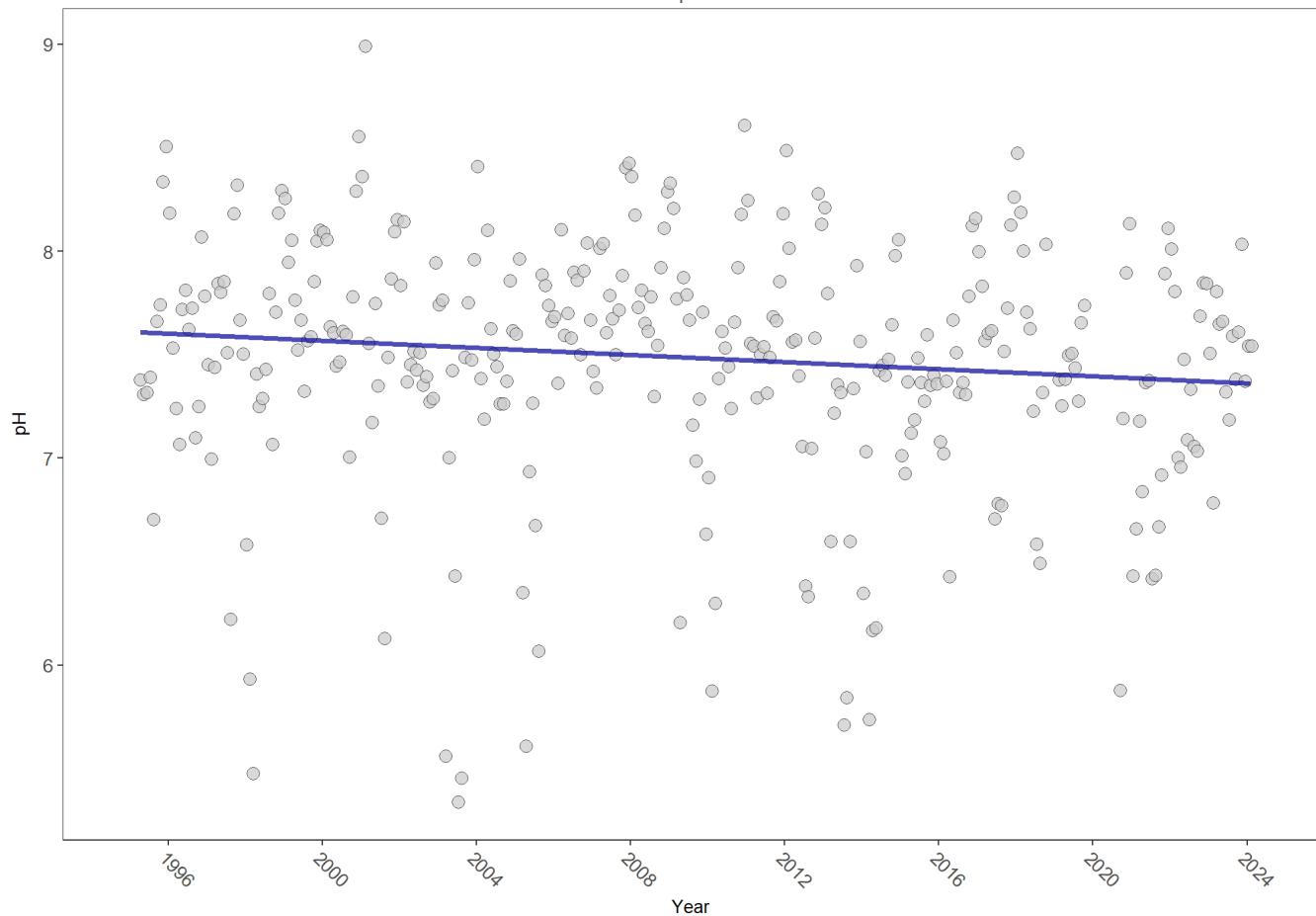
Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
apapcwq	235540	8	2017 - 2024	94.4	0.18	90.96	0.57	0.0408
apaeswq	682431	30	1995 - 2024	83.9	-0.15	86.12	-0.36	0.0001
apalmwq	228186	8	2017 - 2024	75.0	-0.20	75.37	-0.91	0.0270
apadbwq	592057	23	2002 - 2024	94.8	-0.08	96.82	-0.13	0.0788
apaebwq	626646	30	1995 - 2024	85.0	-0.26	91.67	-0.69	0.0000

## pH - Continuous Water Quality

apaeswq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apaeswq  
pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	688178	30	7.5	TRUE	-0.1357	0.0004	-0.008583472	7.610967	2.5438	0.9955	-1

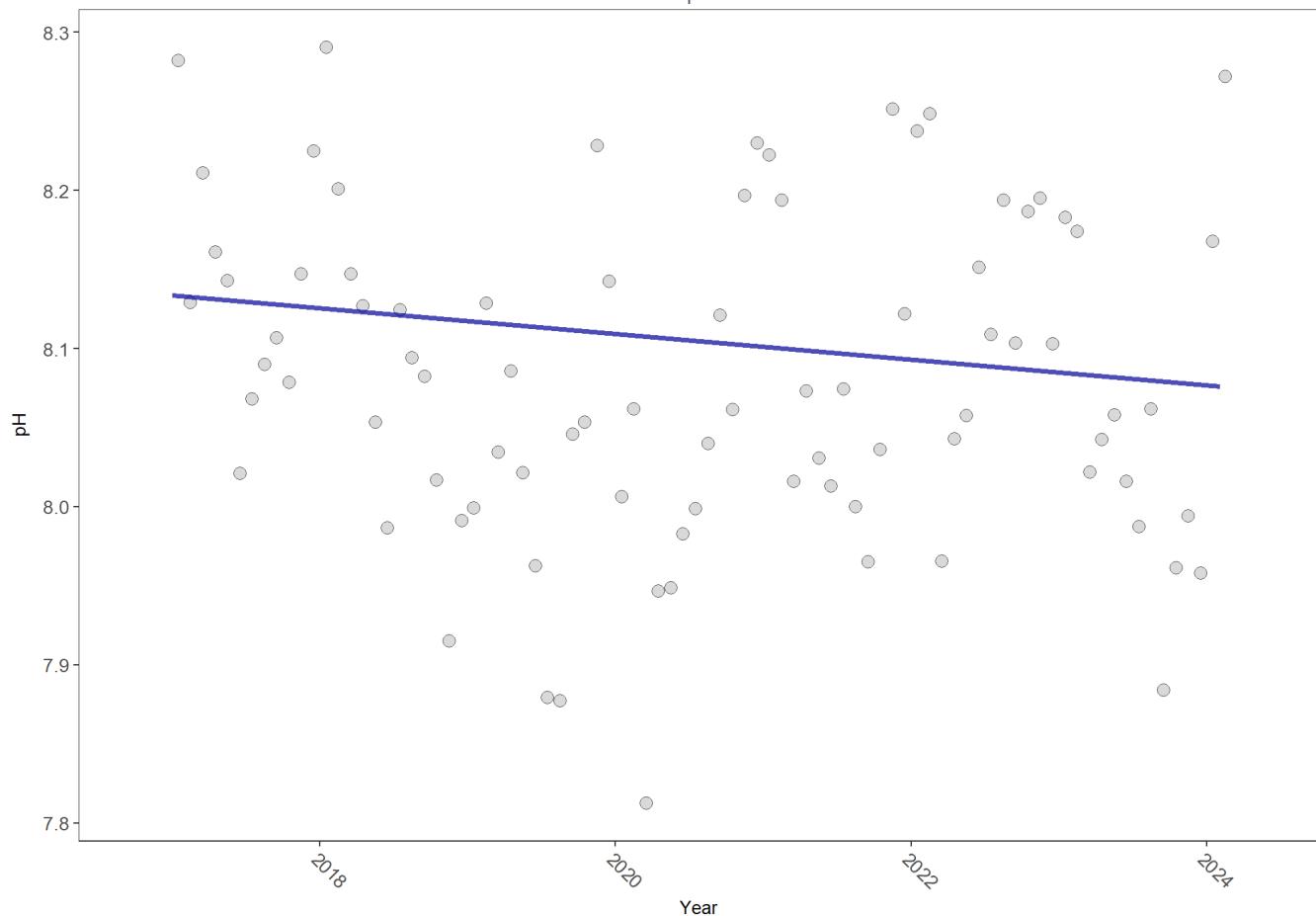
$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

## apapcwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apapcwq  
pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	231974	8	8.1	TRUE	-0.1417	0.1441	-0.008115376	8.133649	11.865	0.3739	0

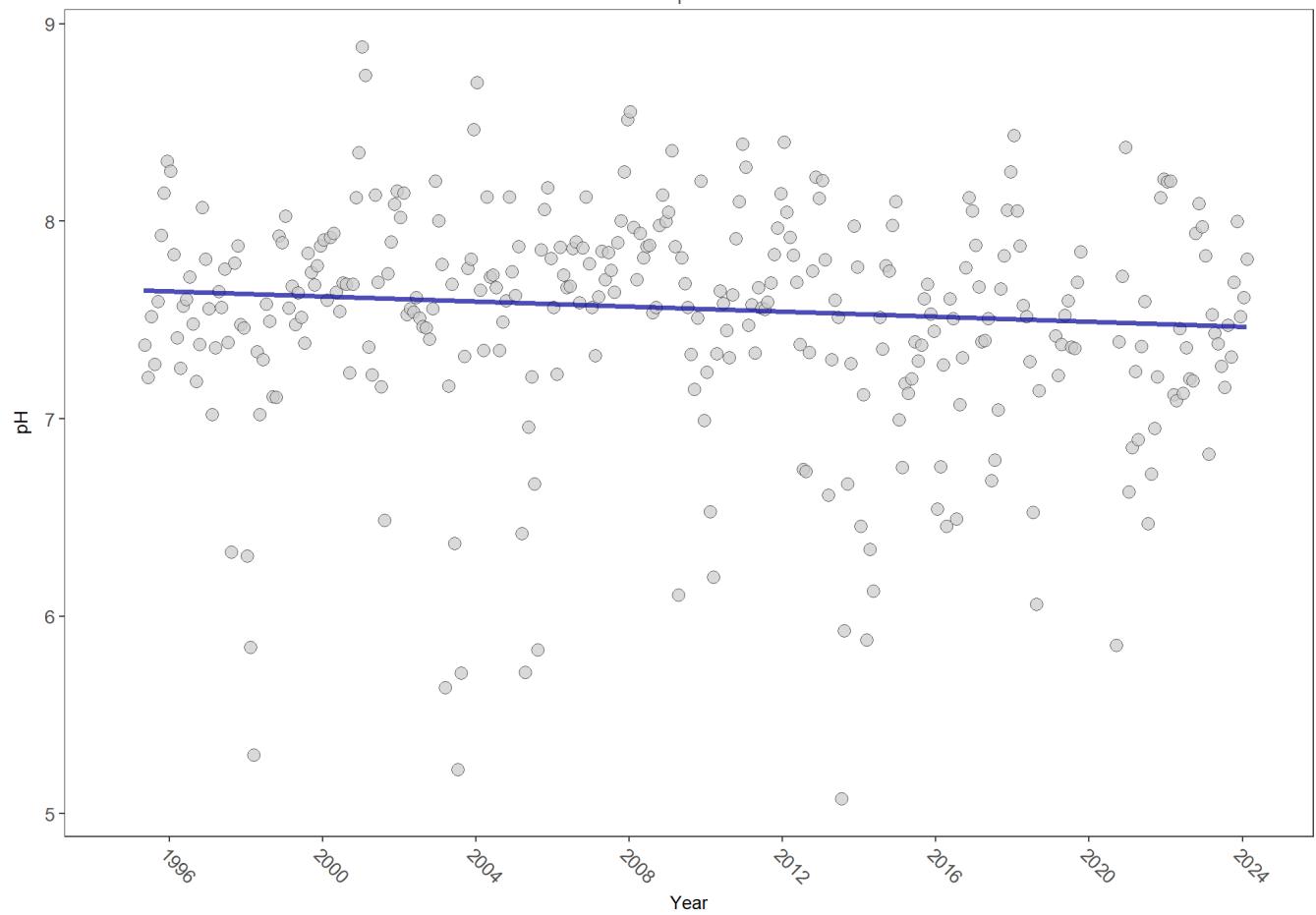
$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

## apaebwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apaebwq  
pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	683408	30	7.6	TRUE	-0.1091	0.0049	-0.006424367	7.653363	5.9238	0.8784	-1

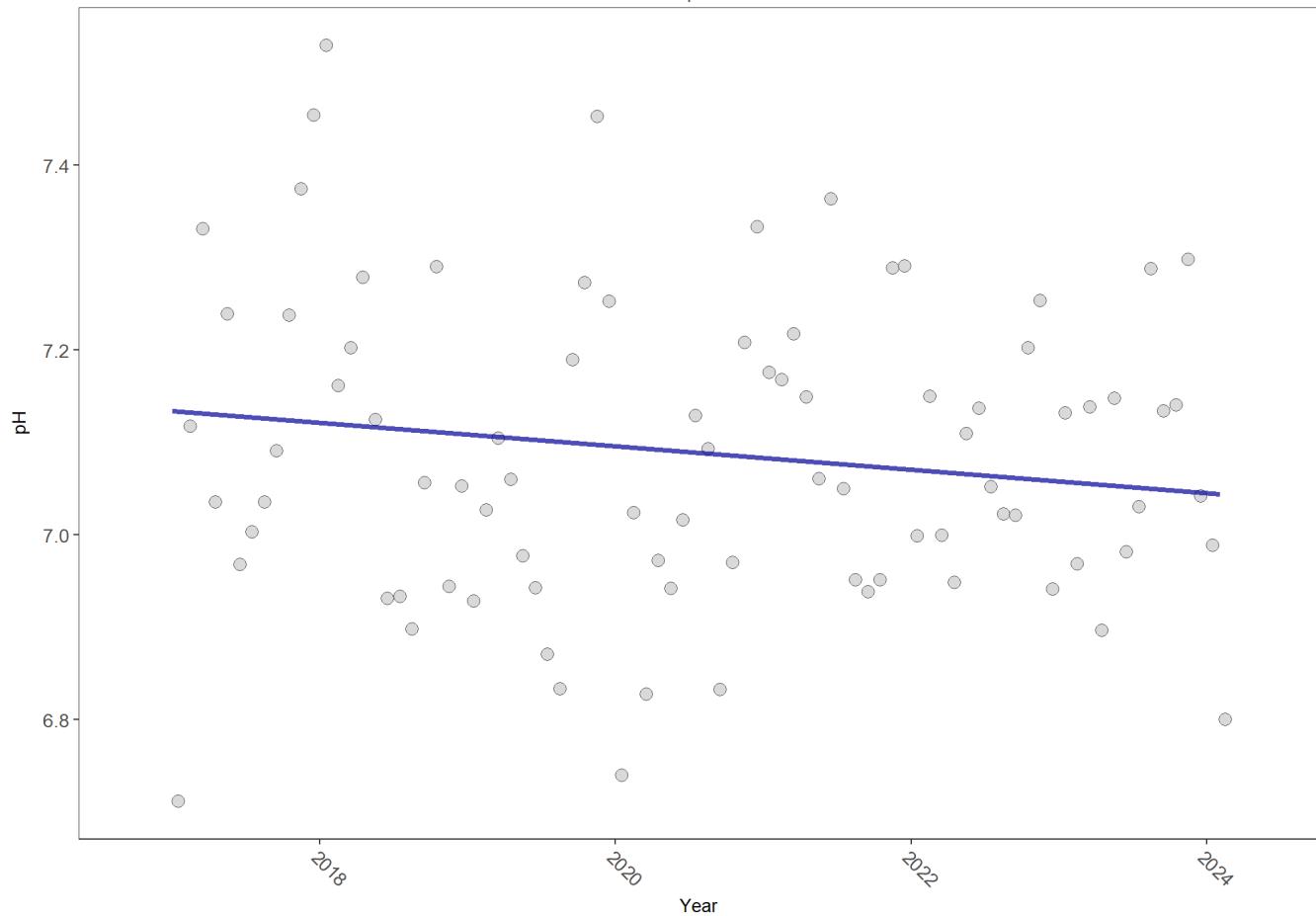
$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

## apalmwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apalmwq  
pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	230318	8	7.1	TRUE	-0.0886	0.3371	-0.01264713	7.134075	12.5424	0.3243	0

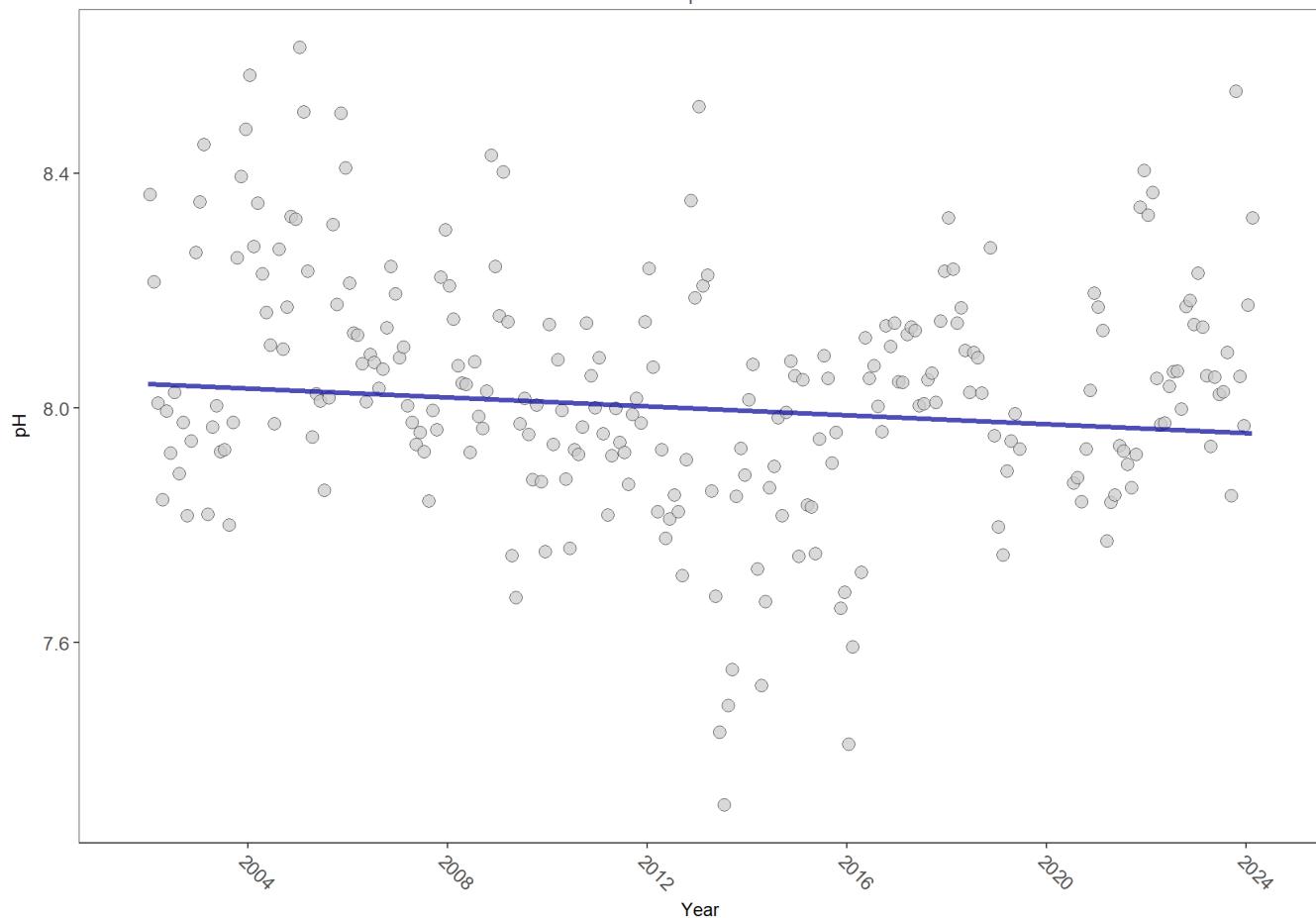
*p < 0.00005 appear as 0 due to rounding.*

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

## apadbwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apadbwq  
pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	569023	23	8	TRUE	-0.1126	0.0131	-0.003822226	8.041222	10.7993	0.4602	-1

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

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

## All Stations Combined

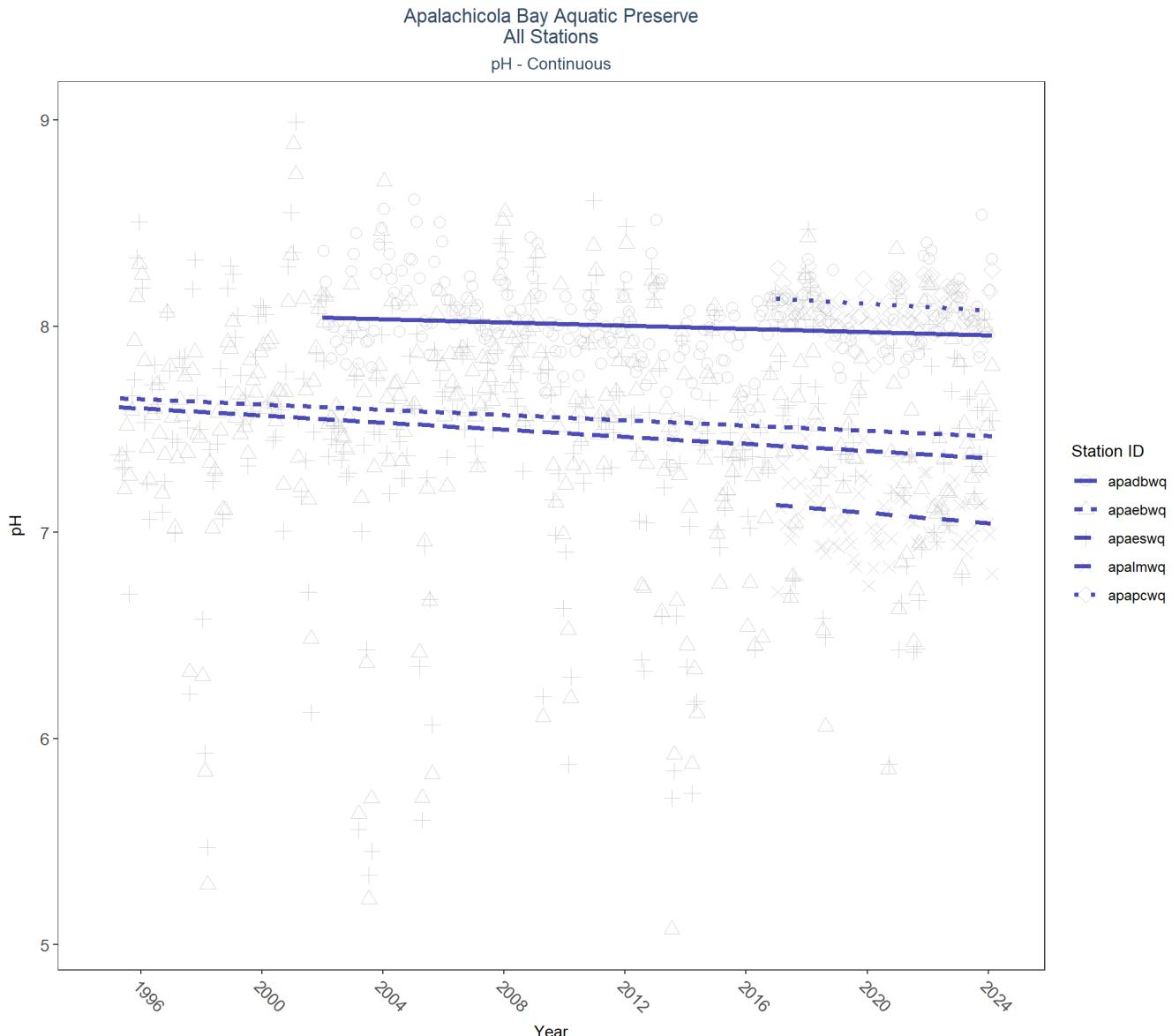


Table 26: Seasonal Kendall-Tau Results for All Stations - pH

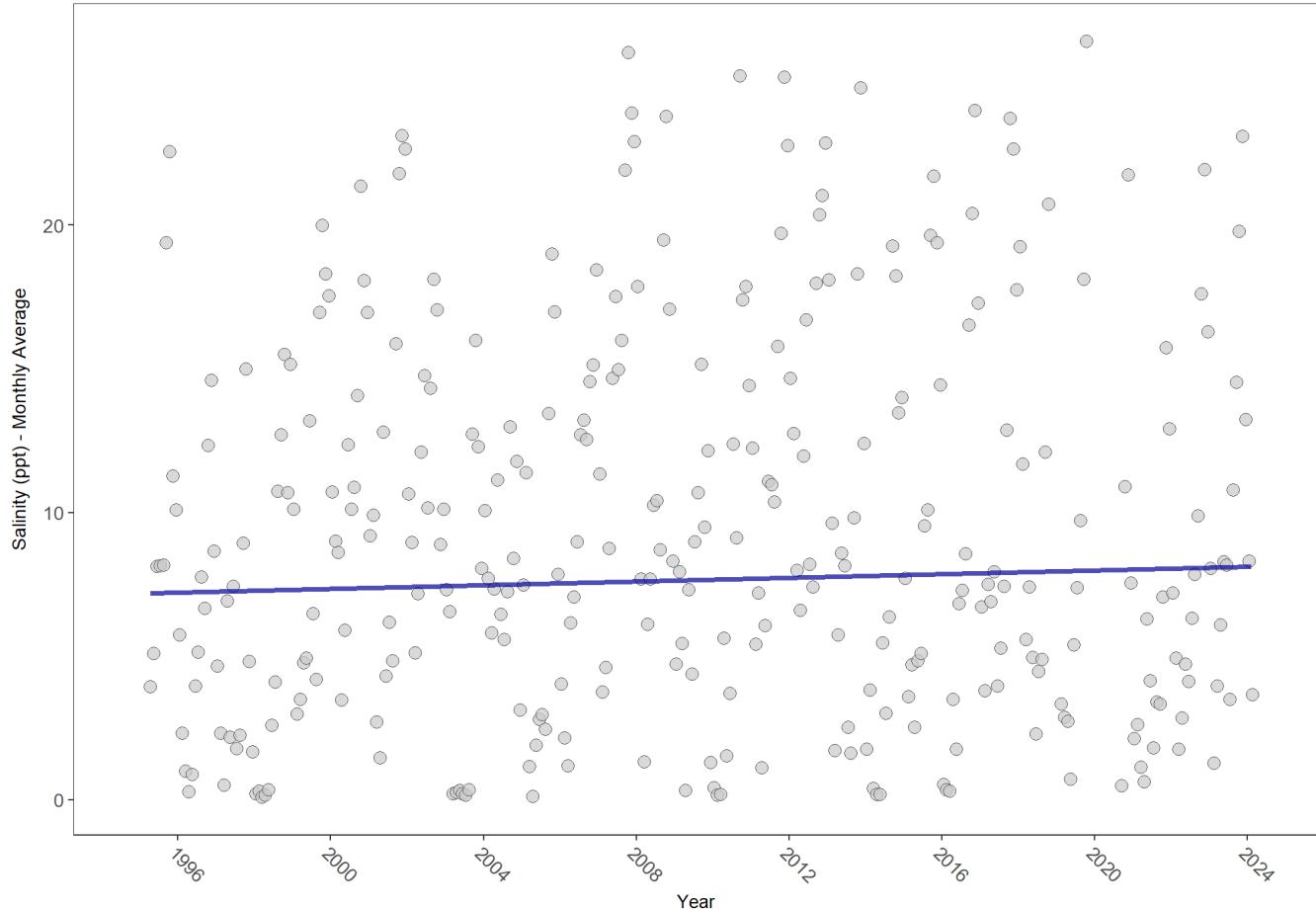
Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
apaeswq	688178	30	1995 - 2024	7.5	-0.14	7.61	-0.01	0.0004
apapcwq	231974	8	2017 - 2024	8.1	-0.14	8.13	-0.01	0.1441
apaebwq	683408	30	1995 - 2024	7.6	-0.11	7.65	-0.01	0.0049
apalmwq	230318	8	2017 - 2024	7.1	-0.09	7.13	-0.01	0.3371
apadbwq	569023	23	2002 - 2024	8.0	-0.11	8.04	0.00	0.0131

## Salinity - Continuous Water Quality

apaeswq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apaeswq  
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	725430	30	7.5	TRUE	0.053	0.1880	0.03221921	7.176649	10.54	0.4826	0

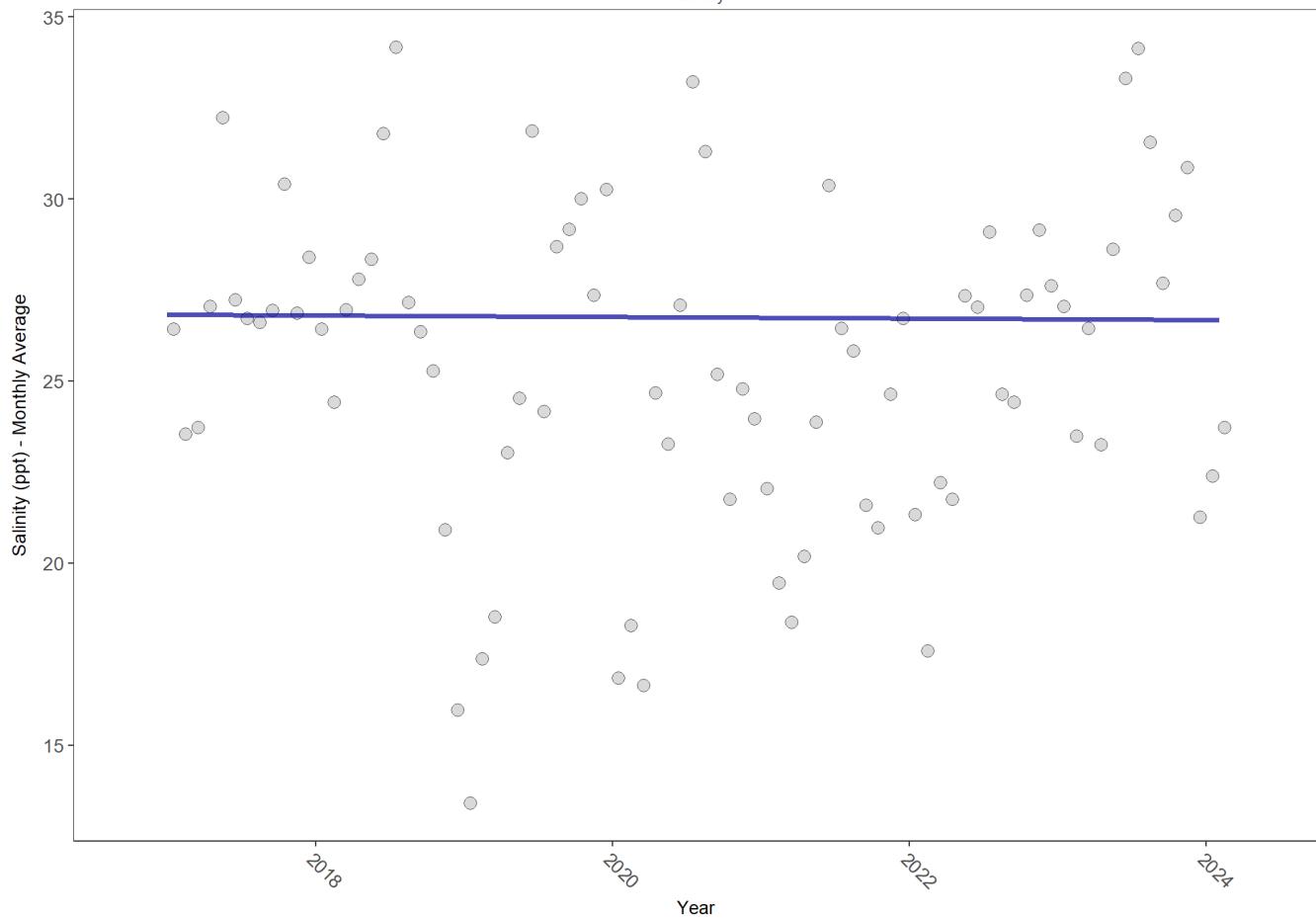
$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

## apapcwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apapcwq  
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	234391	8	26.6	TRUE	-0.0255	0.8347	-0.0186066	26.81743	5.677	0.894	0

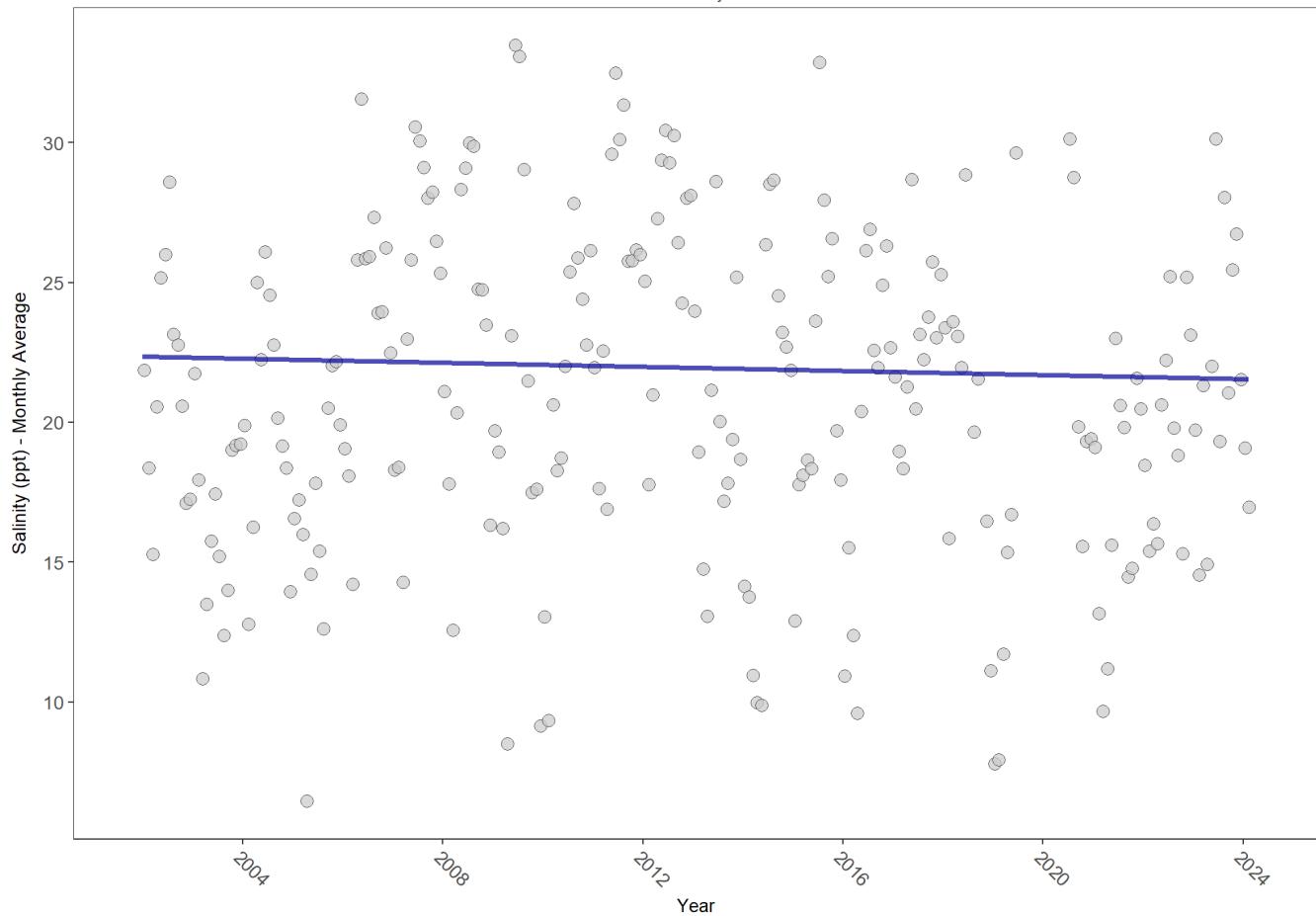
*p < 0.00005 appear as 0 due to rounding.*

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

## apadbwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apadbwq  
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	586052	23	22.1	TRUE	-0.0331	0.4487	-0.03677575	22.3597	8.3821	0.6787	0

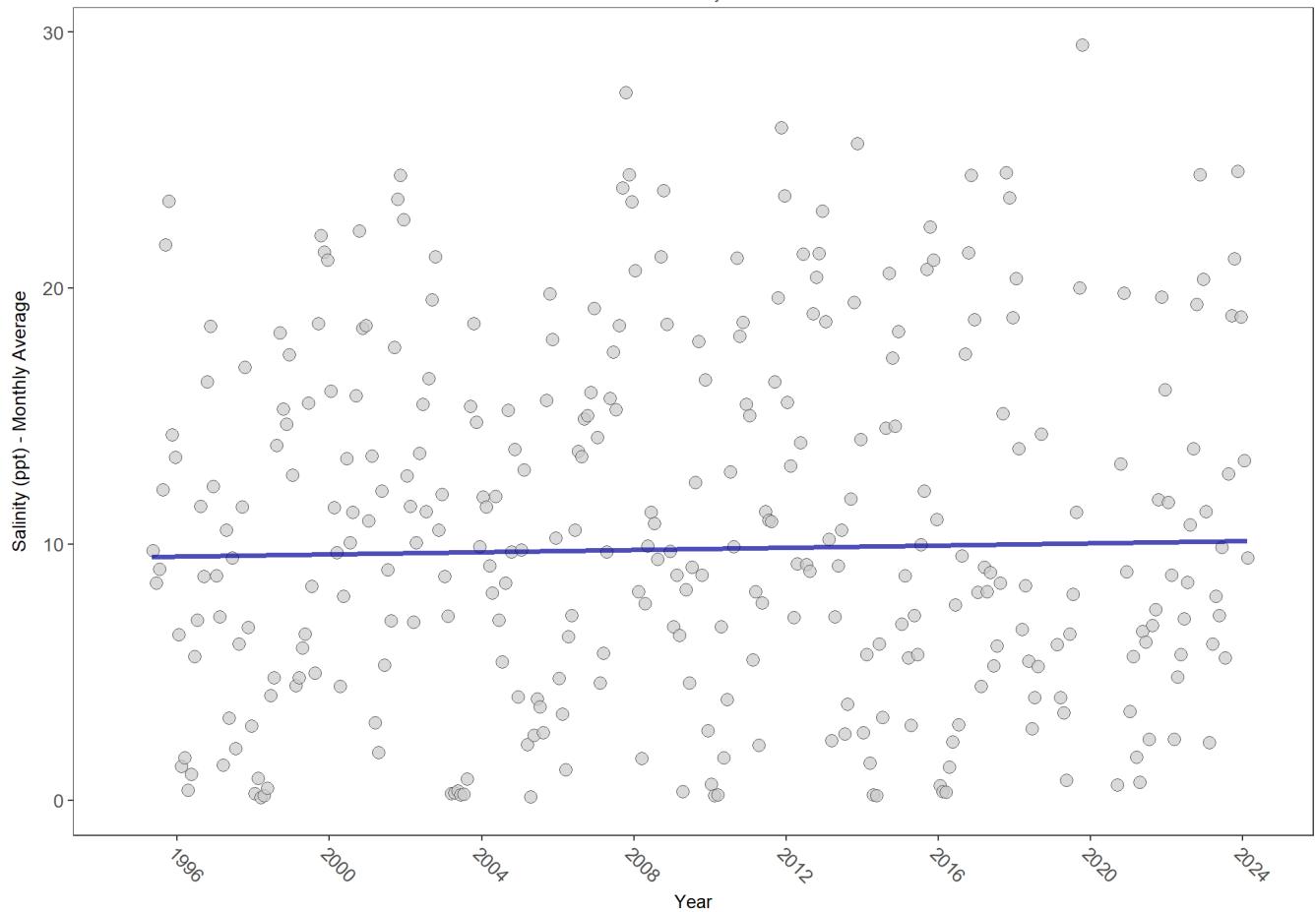
*p < 0.00005 appear as 0 due to rounding.*

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

## apaebwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apaebwq  
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	712575	30	9.9	TRUE	0.0367	0.3779	0.02104722	9.503467	11.6363	0.3916	0

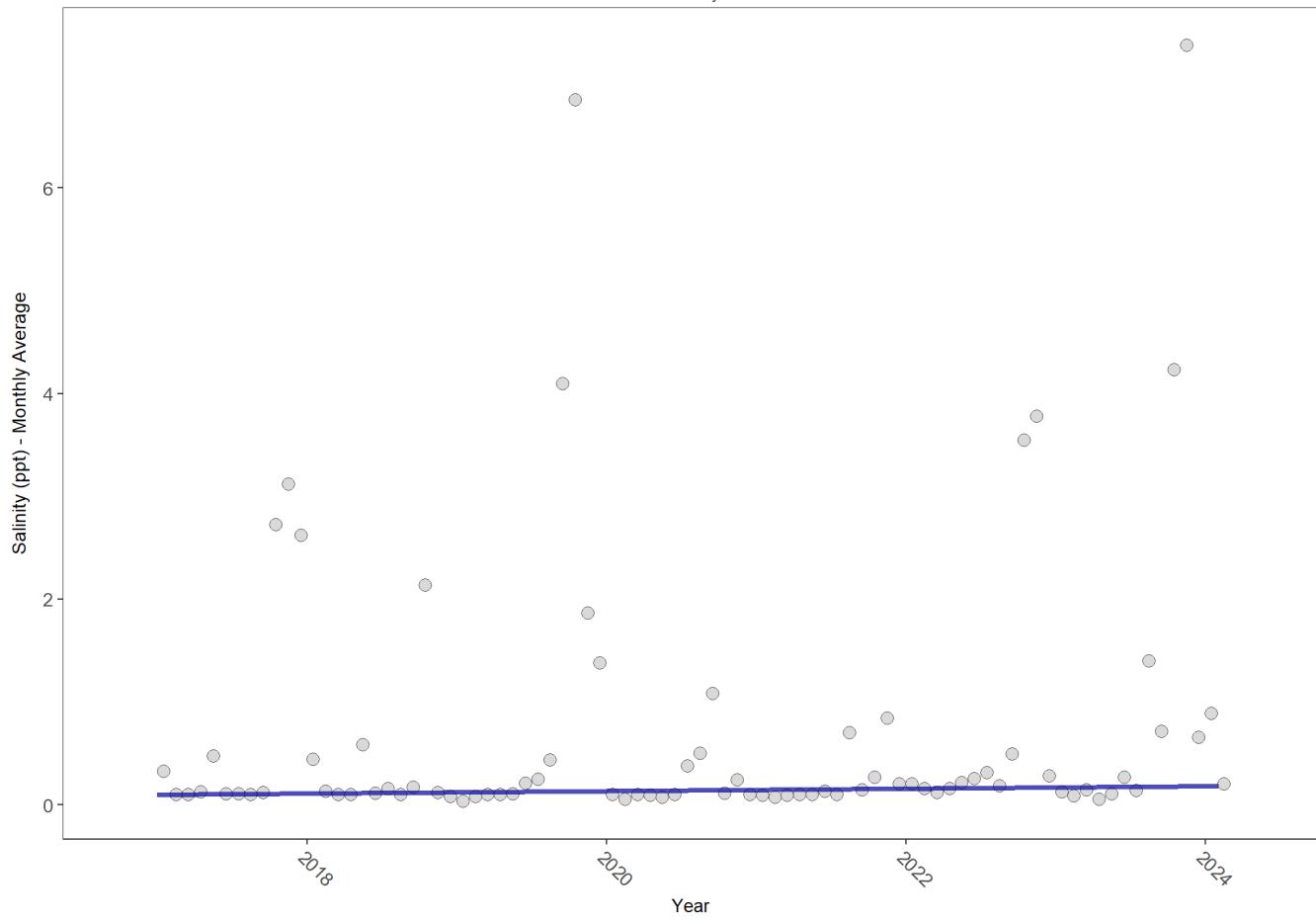
*p < 0.00005 appear as 0 due to rounding.*

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

## apalmwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apalmwq  
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	240151	8	0.1	TRUE	0.1805	0.0494	0.01154874	0.09906767	8.7159	0.6481	2

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

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

## All Stations Combined

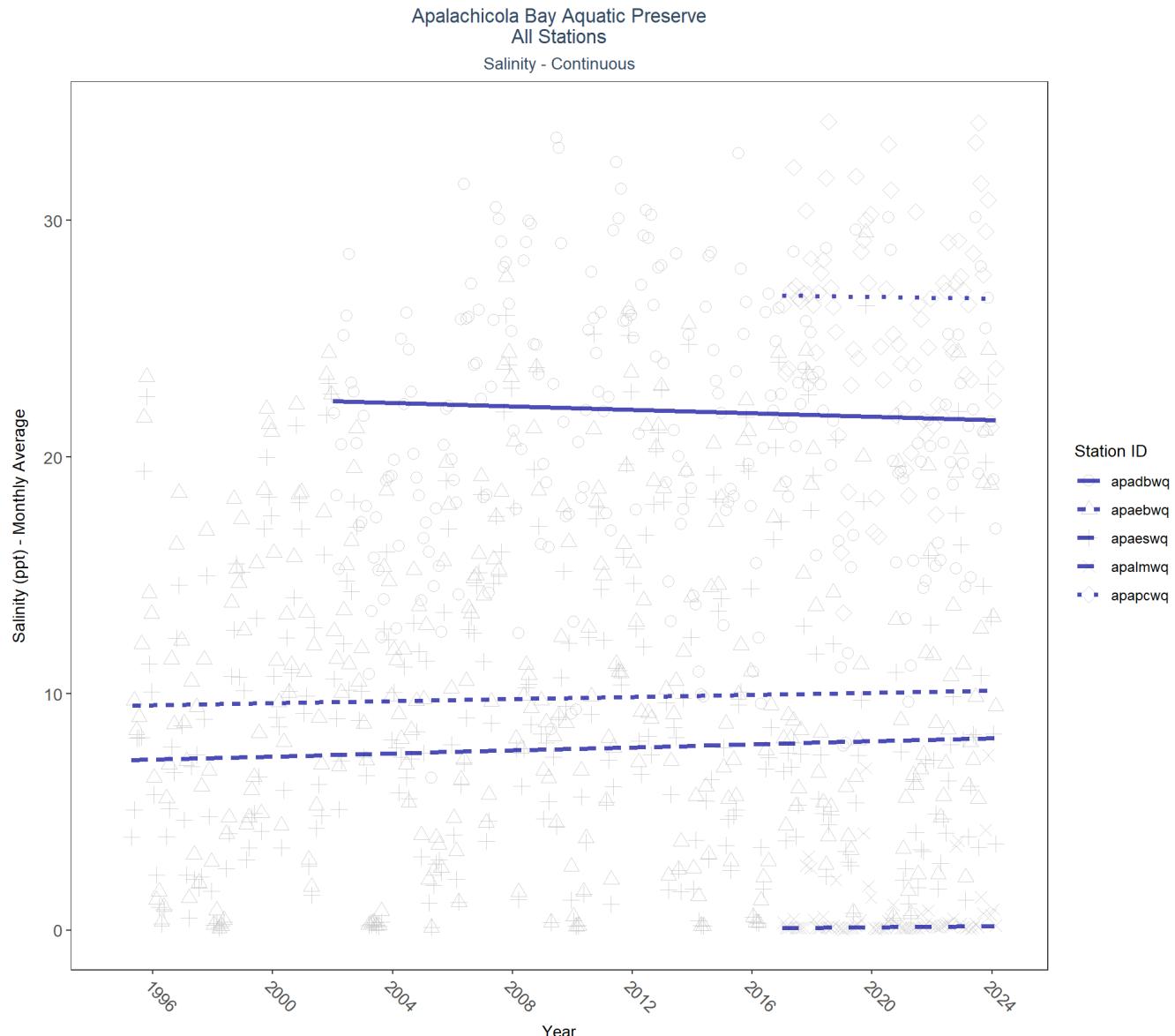


Table 27: Seasonal Kendall-Tau Results for All Stations - Salinity

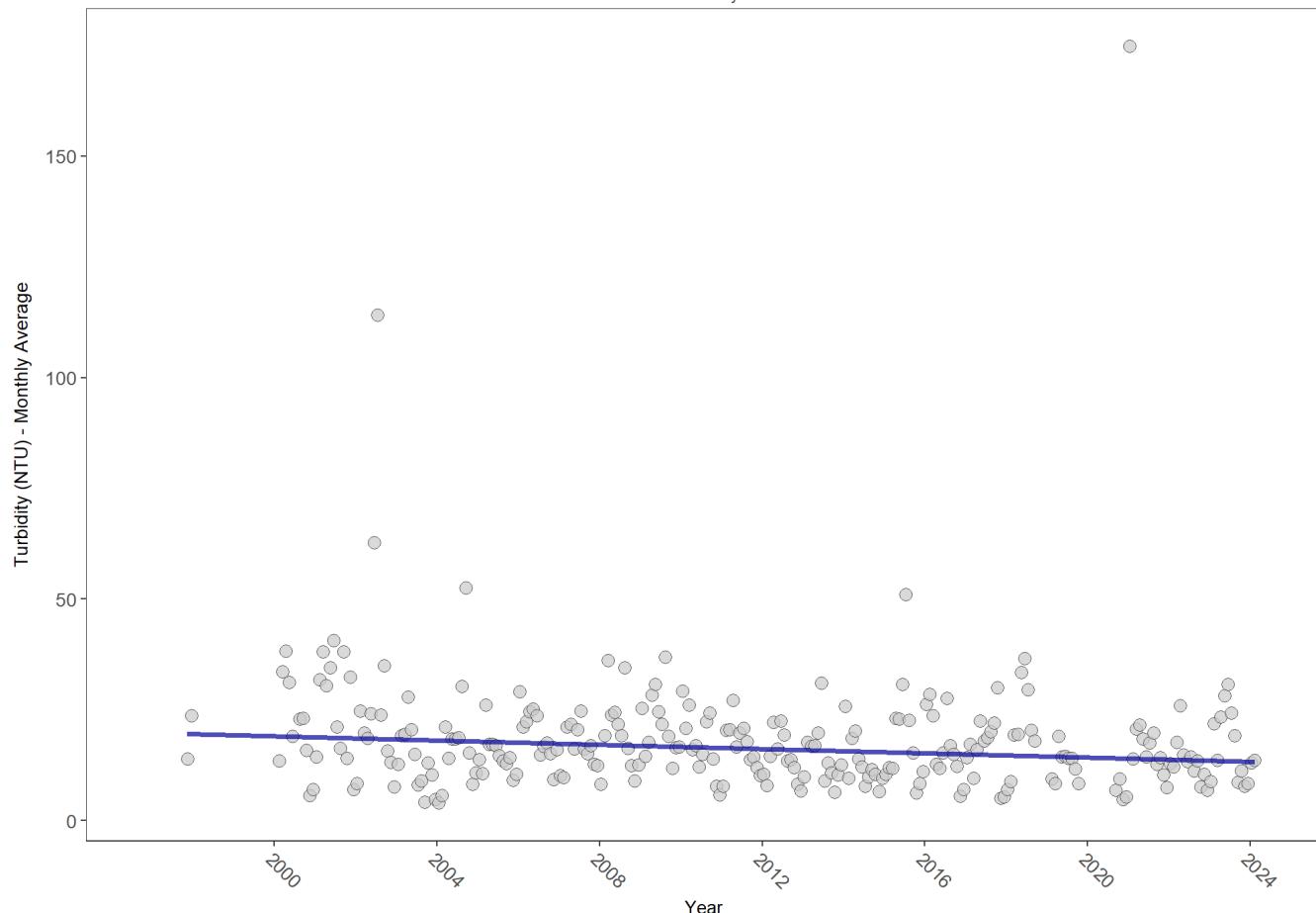
Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
apaeswq	725430	30	1995 - 2024	7.5	0.05	7.18	0.03	0.1880
apapcwq	234391	8	2017 - 2024	26.6	-0.03	26.82	-0.02	0.8347
apadbwq	586052	23	2002 - 2024	22.1	-0.03	22.36	-0.04	0.4487
apaebwq	712575	30	1995 - 2024	9.9	0.04	9.50	0.02	0.3779
apalmwq	240151	8	2017 - 2024	0.1	0.18	0.10	0.01	0.0494

## Turbidity - Continuous Water Quality

apaebwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apaebwq  
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	601147	26	13	TRUE	-0.2146	0.0000	-0.2390843	19.73698	13.1971	0.2806	-1

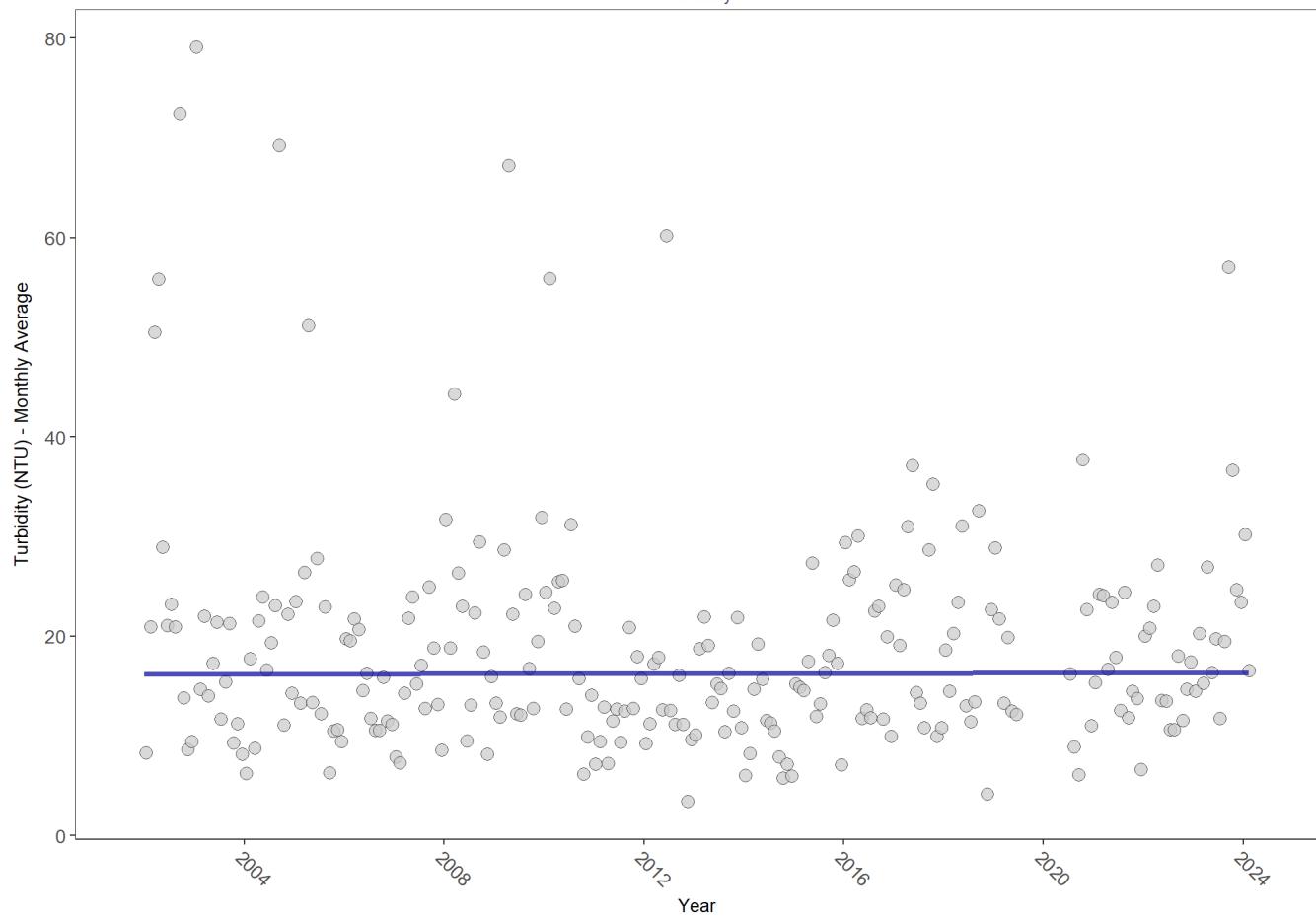
$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

## apadbwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apadbwq  
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	575230	23	10	TRUE	0.002	0.9655	0.003647613	16.21442	11.5743	0.3965	0

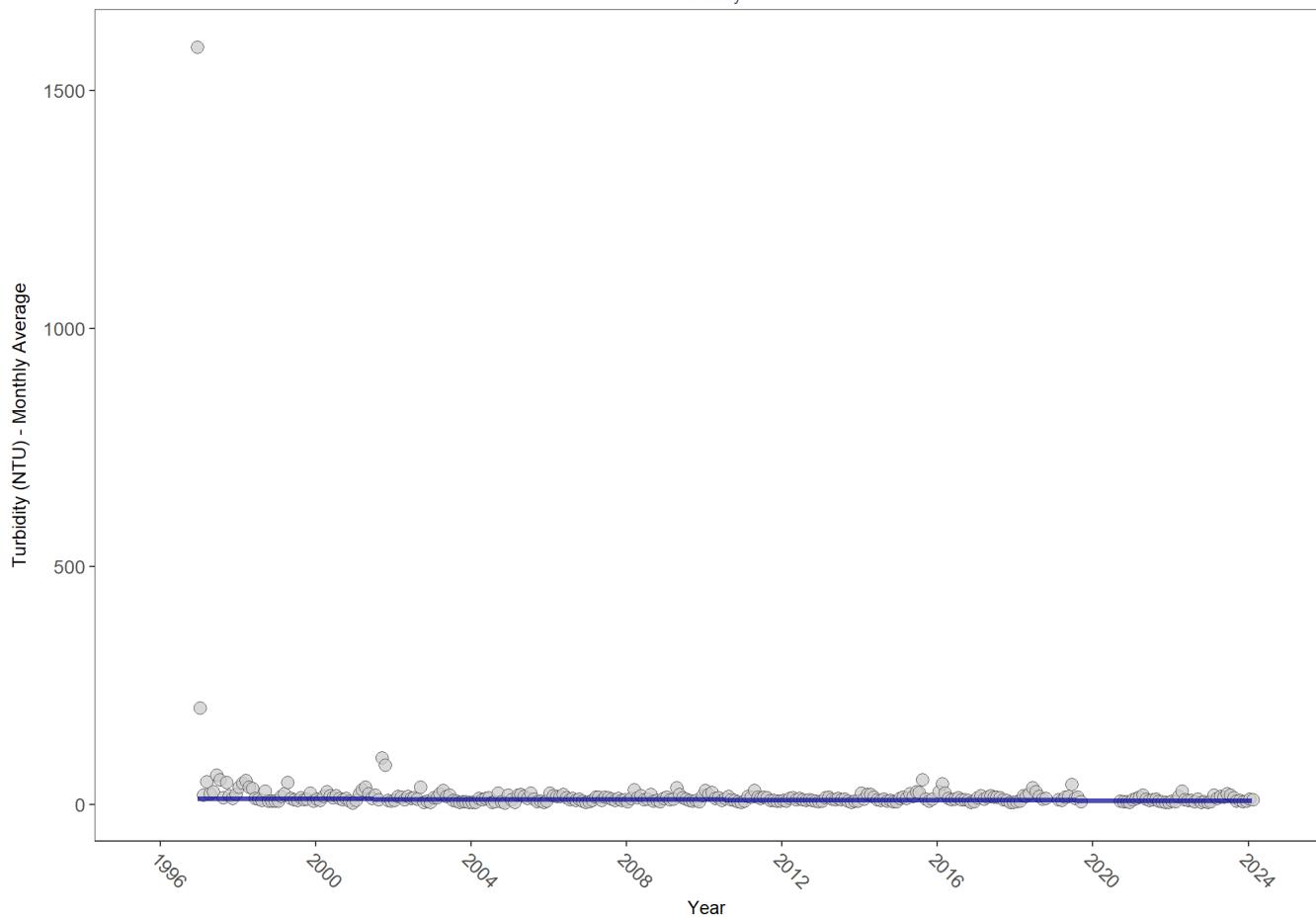
*p < 0.00005 appear as 0 due to rounding.*

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

## apaeswq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apaeswq  
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	669279	29	9	TRUE	-0.1736	0.0000	-0.12673	11.57636	11.4231	0.4085	-1

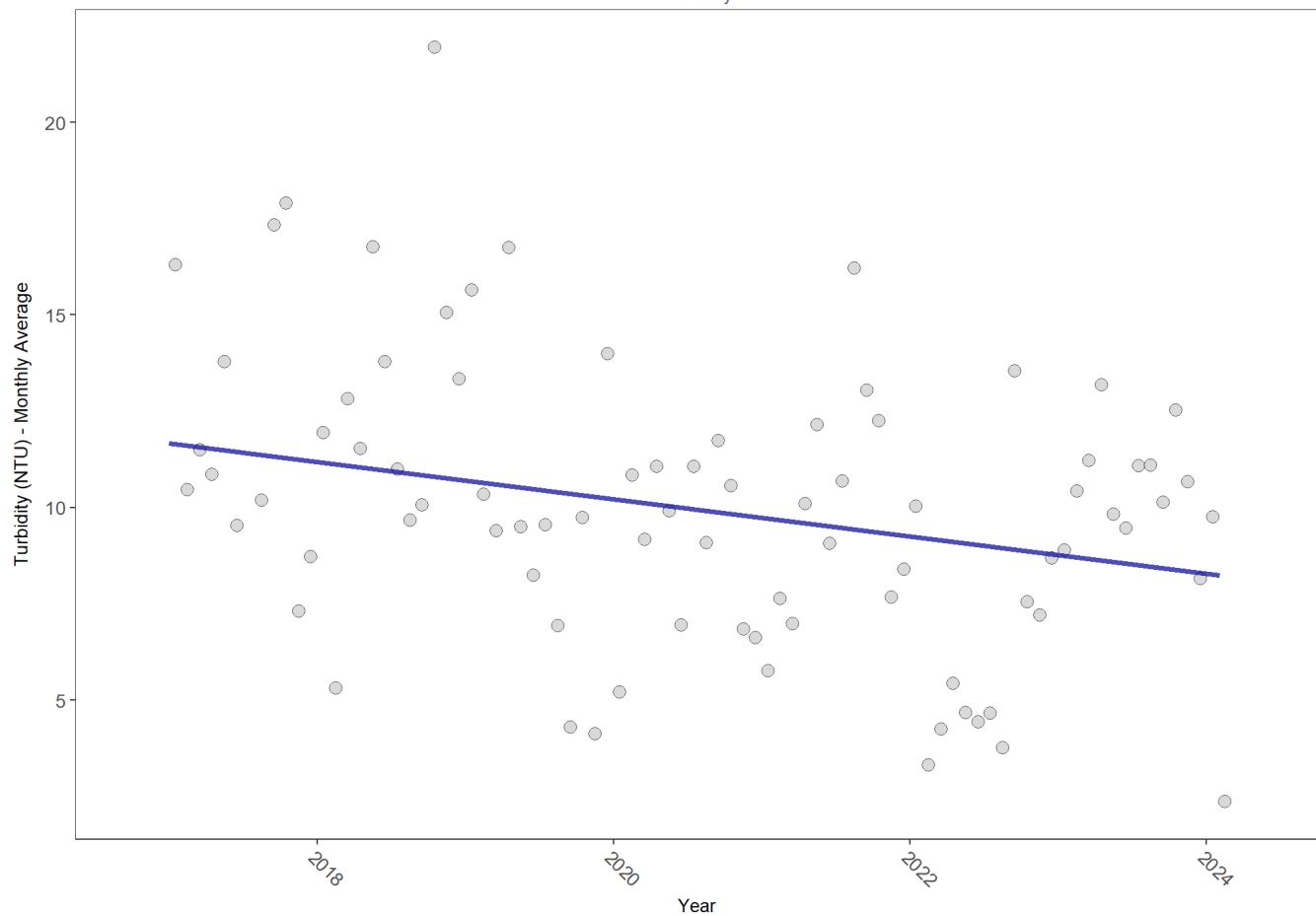
*p < 0.00005 appear as 0 due to rounding.*

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

## apapcwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apapcwq  
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	223412	8	7	TRUE	-0.2155	0.0158	-0.4837693	11.66961	5.3517	0.9129	-1

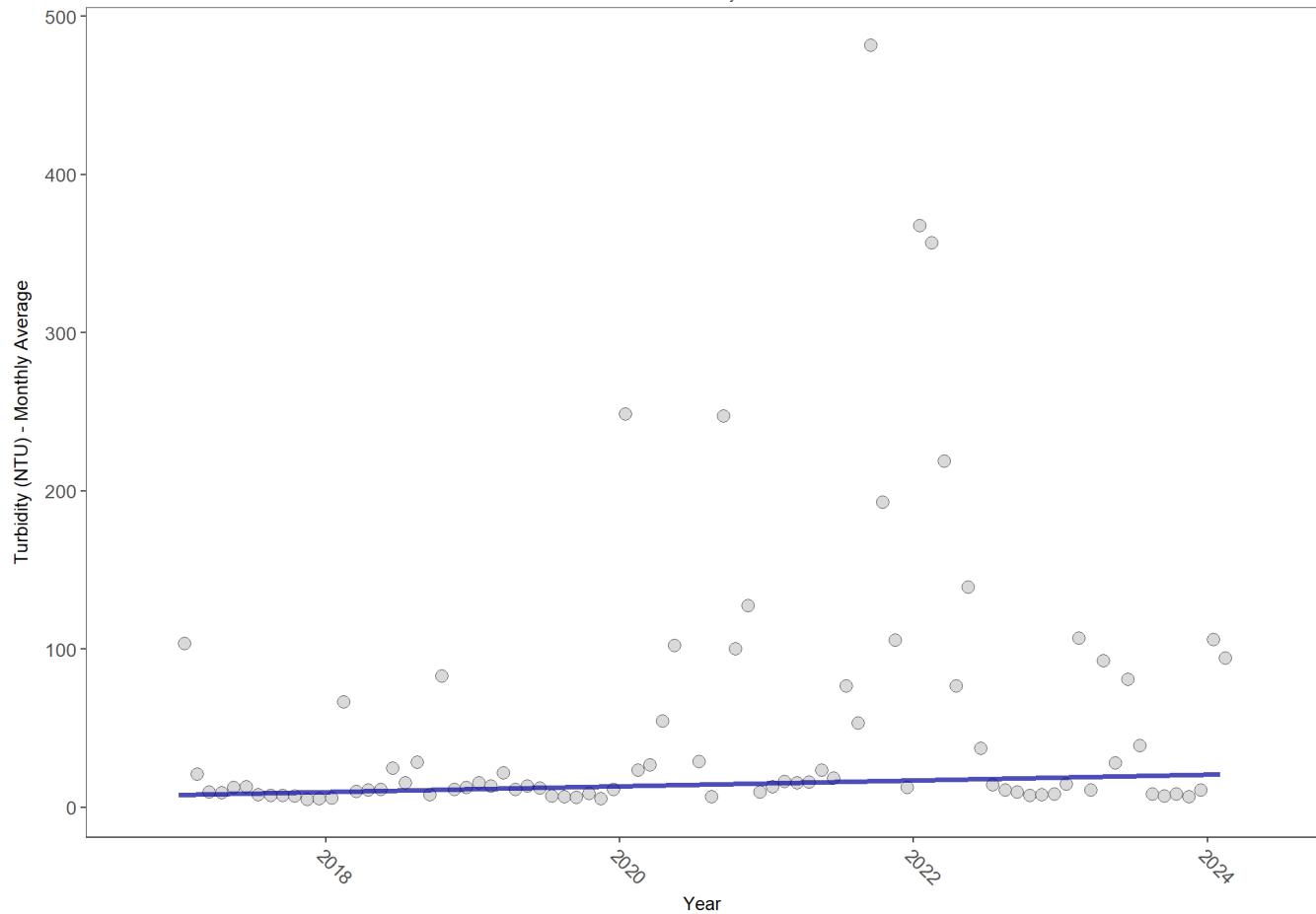
*p < 0.00005 appear as 0 due to rounding.*

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

## apalmwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apalmwq  
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	214143	8	12	TRUE	0.3275	0.0004	1.796144	8.067747	8.1173	0.7028	2

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

SennIntercept is intercept value at beginning of record for monitoring location

## All Stations Combined

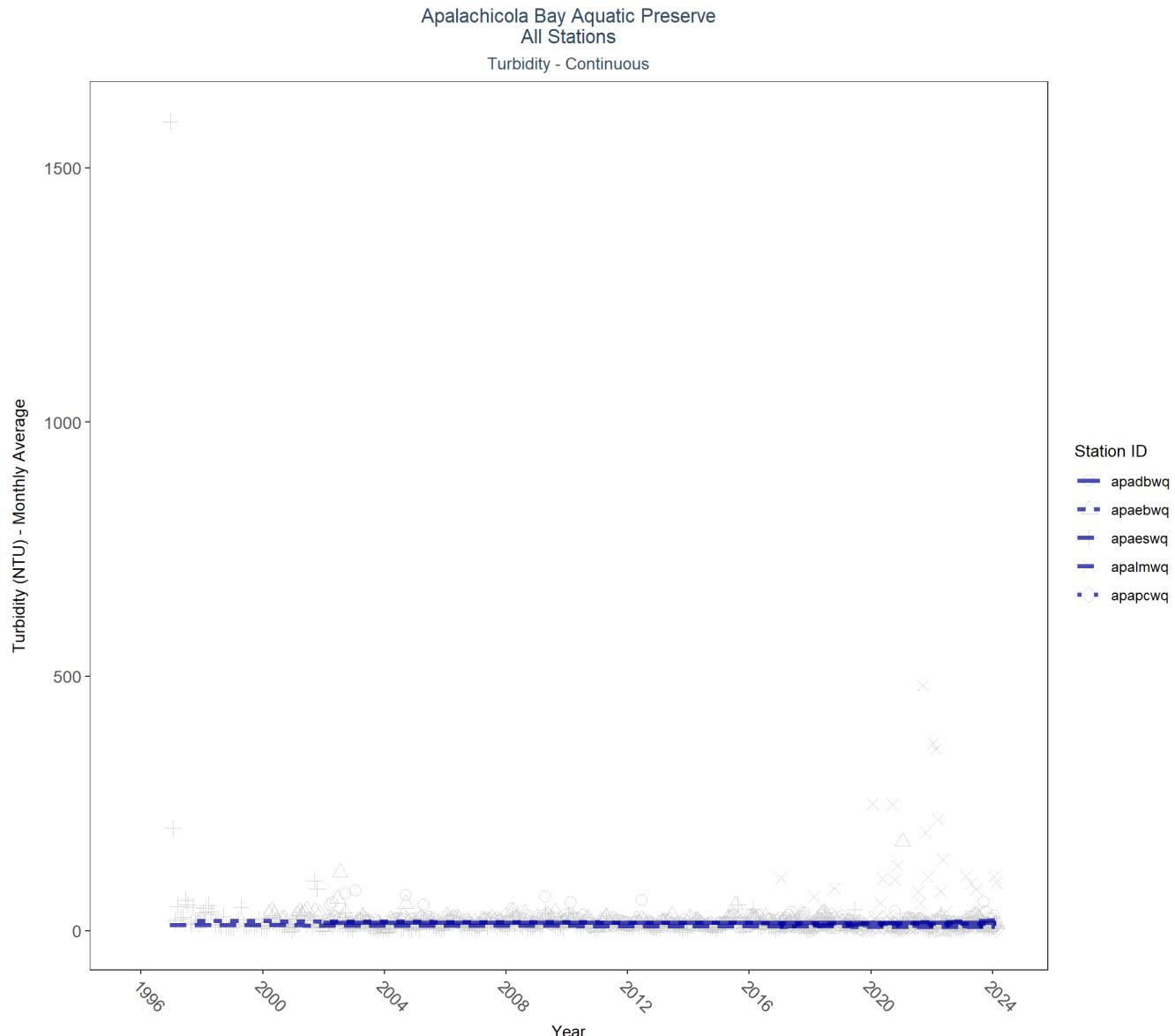


Table 28: Seasonal Kendall-Tau Results for All Stations - Turbidity

Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
apaebwq	601147	26	1997 - 2024	13	-0.21	19.74	-0.24	0.0000
apadbwq	575230	23	2002 - 2024	10	0.00	16.21	0.00	0.9655
apaeswq	669279	29	1996 - 2024	9	-0.17	11.58	-0.13	0.0000
apapcwq	223412	8	2017 - 2024	7	-0.22	11.67	-0.48	0.0158
apalmwq	214143	8	2017 - 2024	12	0.33	8.07	1.80	0.0004

## Water Temperature - Continuous Water Quality

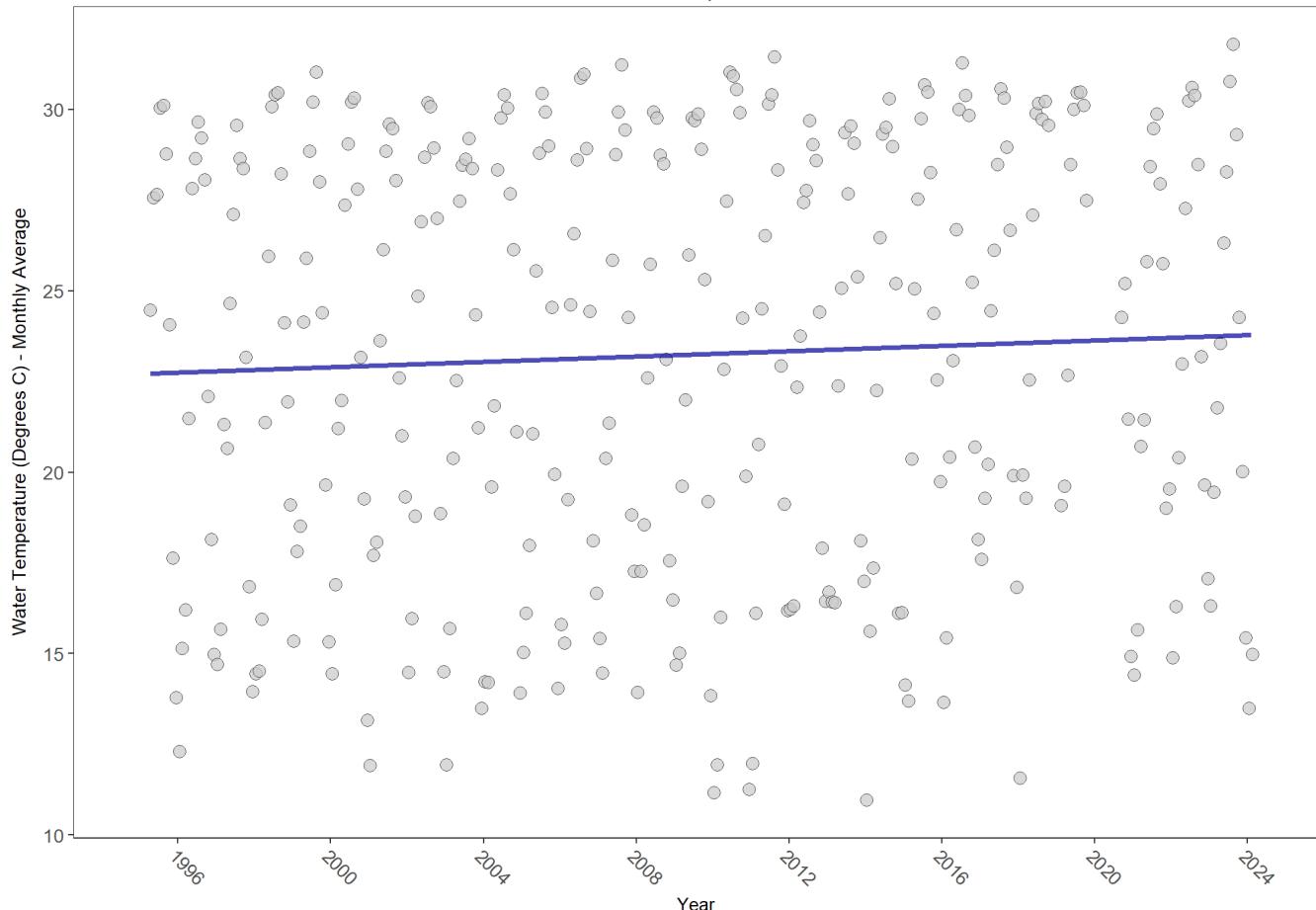
apaeswq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apaeswq

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	734660	30	24.1	TRUE	0.1731	0.0000	0.03686426	22.71664	5.3278	0.9143	1

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

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

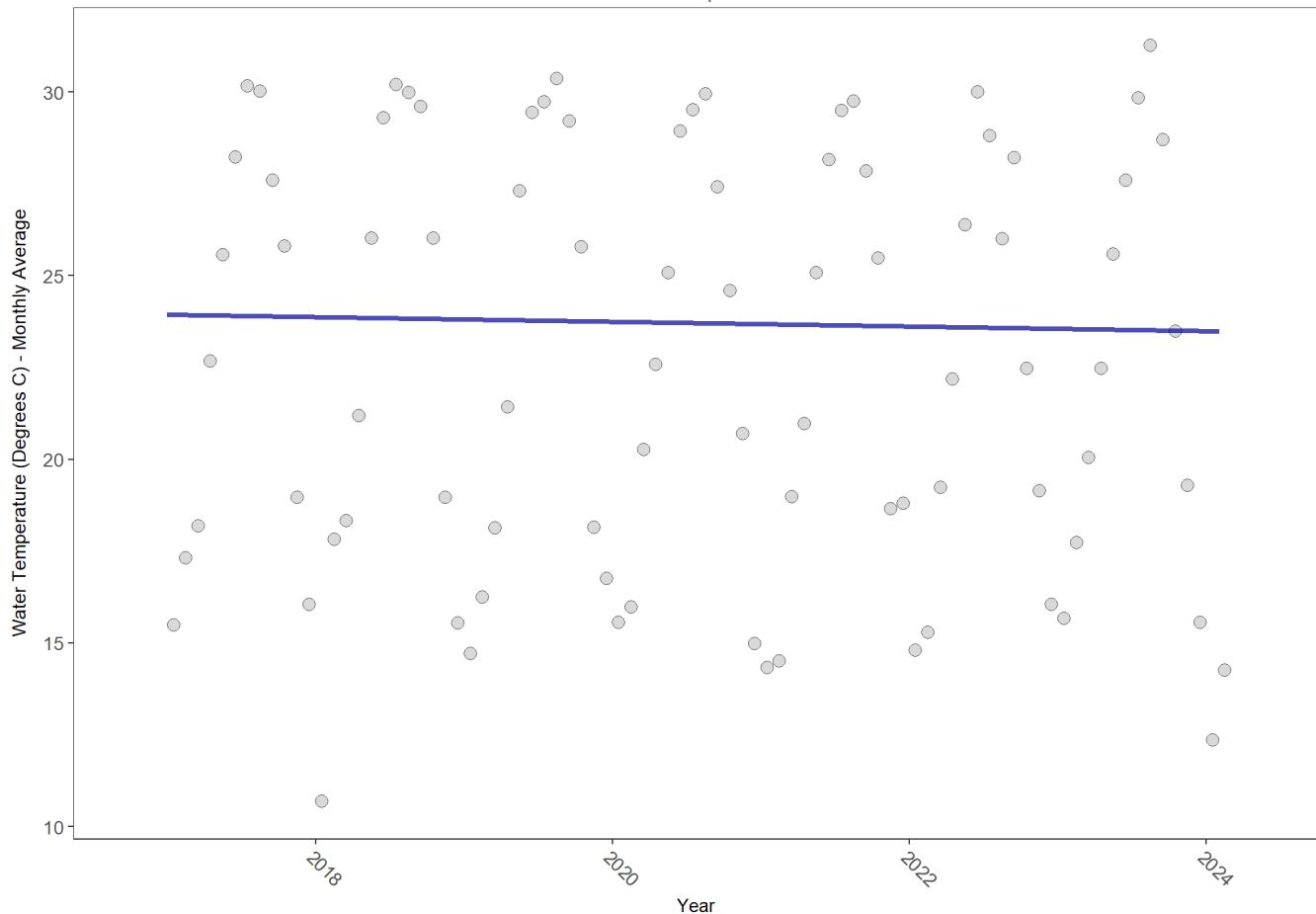
## apapcwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apapcwq

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	237844	8	23	TRUE	-0.1019	0.2598	-0.0631506	23.93469	14.298	0.2169	0

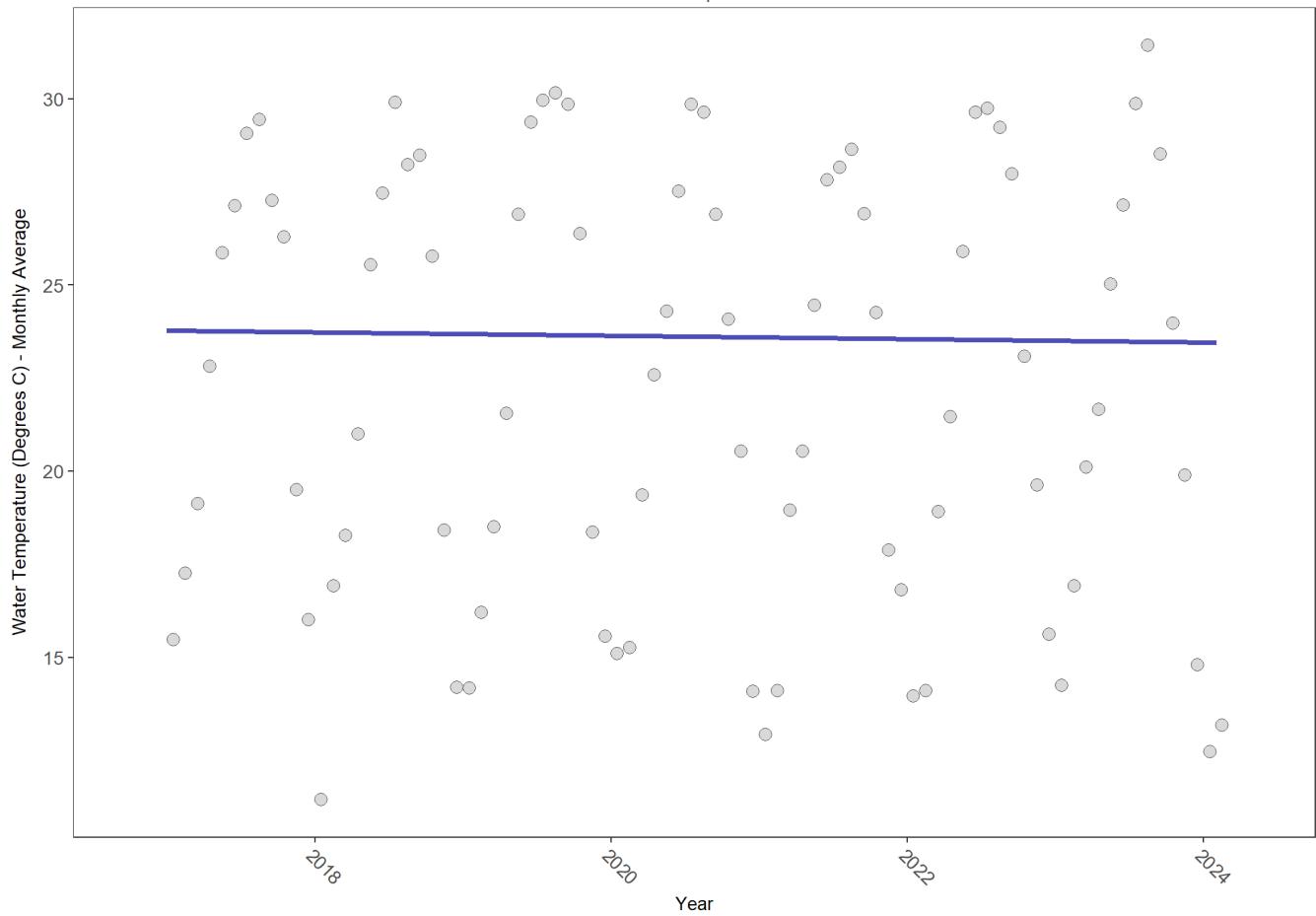
*p < 0.00005 appear as 0 due to rounding.*

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

## apalmwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apalmwq  
Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	240151	8	22.5	TRUE	-0.0709	0.3807	-0.04478551	23.77631	13.5468	0.2591	0

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

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

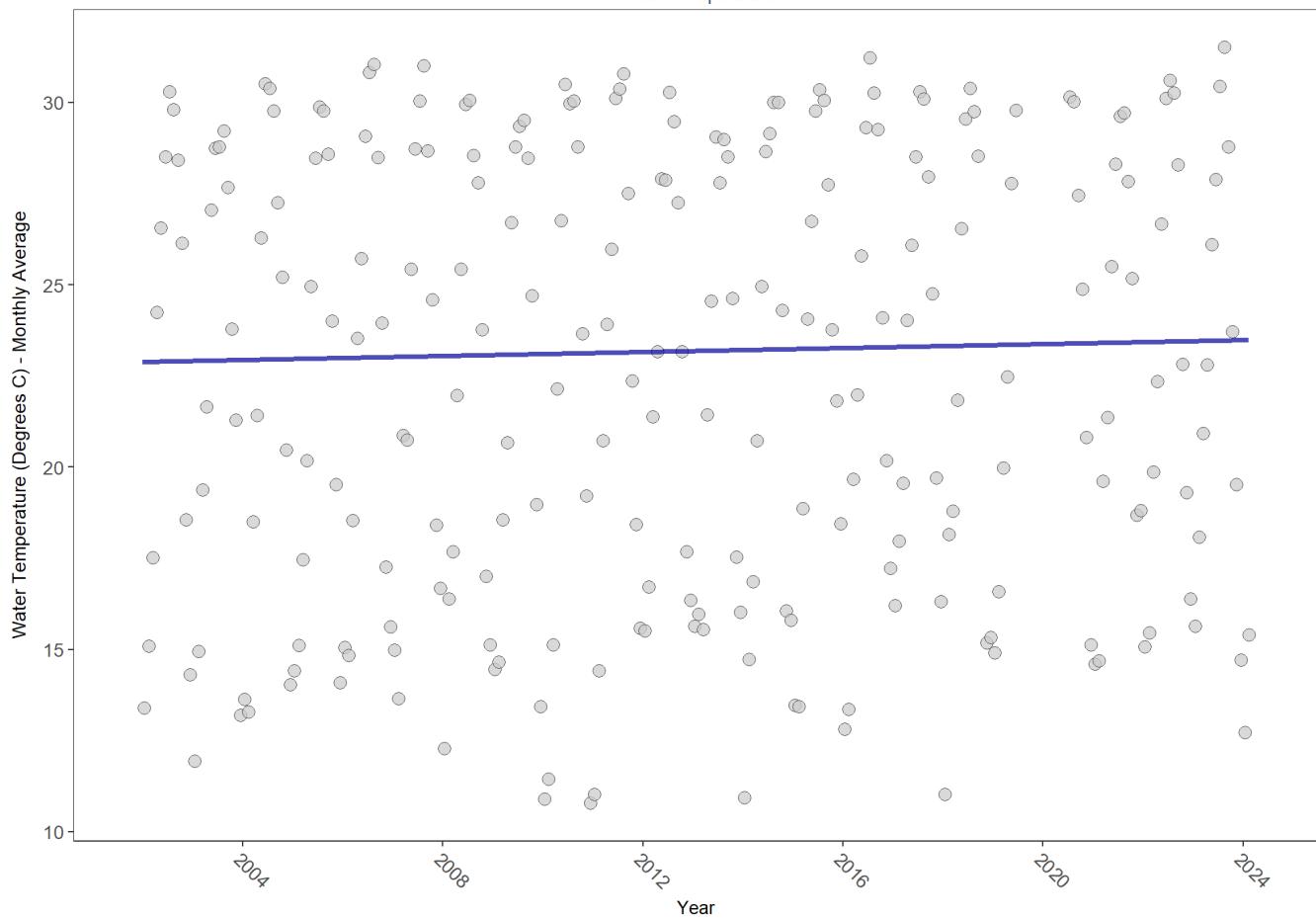
## apadbwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve

apadbwq

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	611217	23	23.2	TRUE	0.1307	0.0037	0.02751177	22.88535	7.7075	0.7392	1

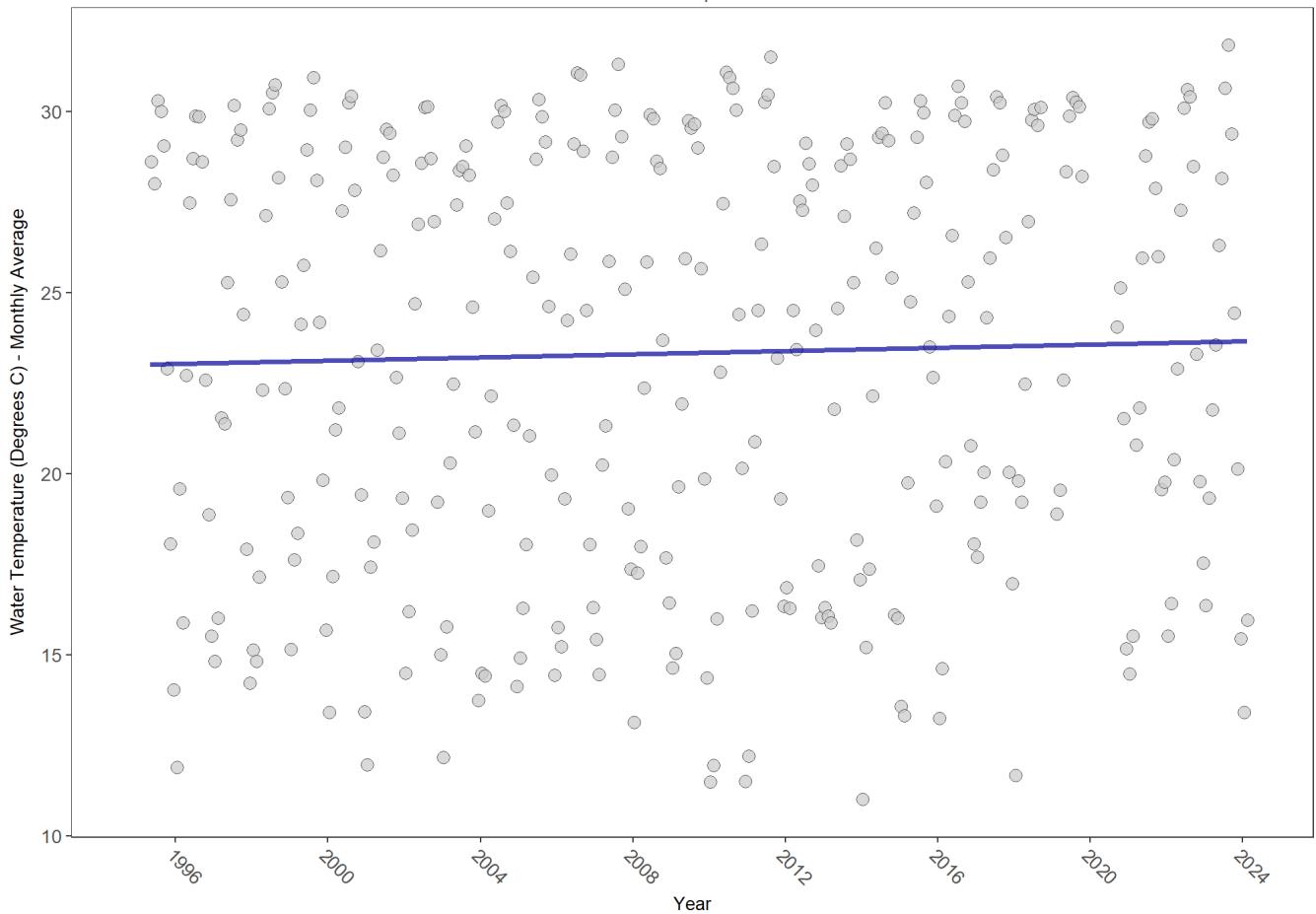
*p < 0.00005 appear as 0 due to rounding.*

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

## apaebwq

Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program (355)

Apalachicola Bay Aquatic Preserve  
apaebwq  
Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	727646	30	24.1	TRUE	0.1304	0.0009	0.02242776	23.00322	4.7759	0.9415	1

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

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

## All Stations Combined

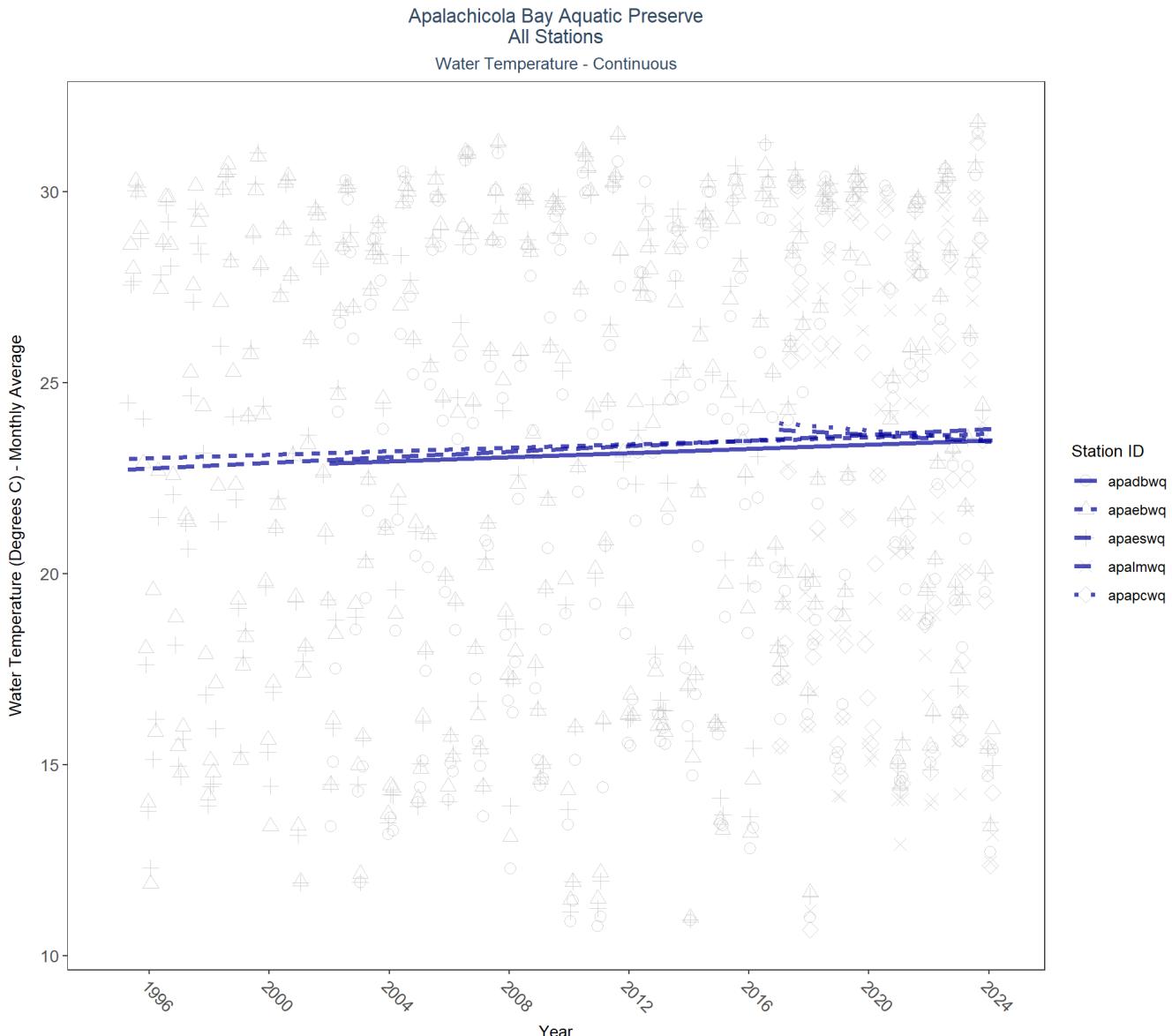


Table 29: Seasonal Kendall-Tau Results for All Stations - Water Temperature

Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
apaeswq	734660	30	1995 - 2024	24.1	0.17	22.72	0.04	0.0000
apapcwq	237844	8	2017 - 2024	23.0	-0.10	23.93	-0.06	0.2598
apalmwq	240151	8	2017 - 2024	22.5	-0.07	23.78	-0.04	0.3807
apadbwq	611217	23	2002 - 2024	23.2	0.13	22.89	0.03	0.0037
apaebwq	727646	30	1995 - 2024	24.1	0.13	23.00	0.02	0.0009

# Submerged Aquatic Vegetation

The data file used is: All\_SAV\_Parameters-2024-Mar-29.txt

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

## Parameters

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

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

## Species

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

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

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

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

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

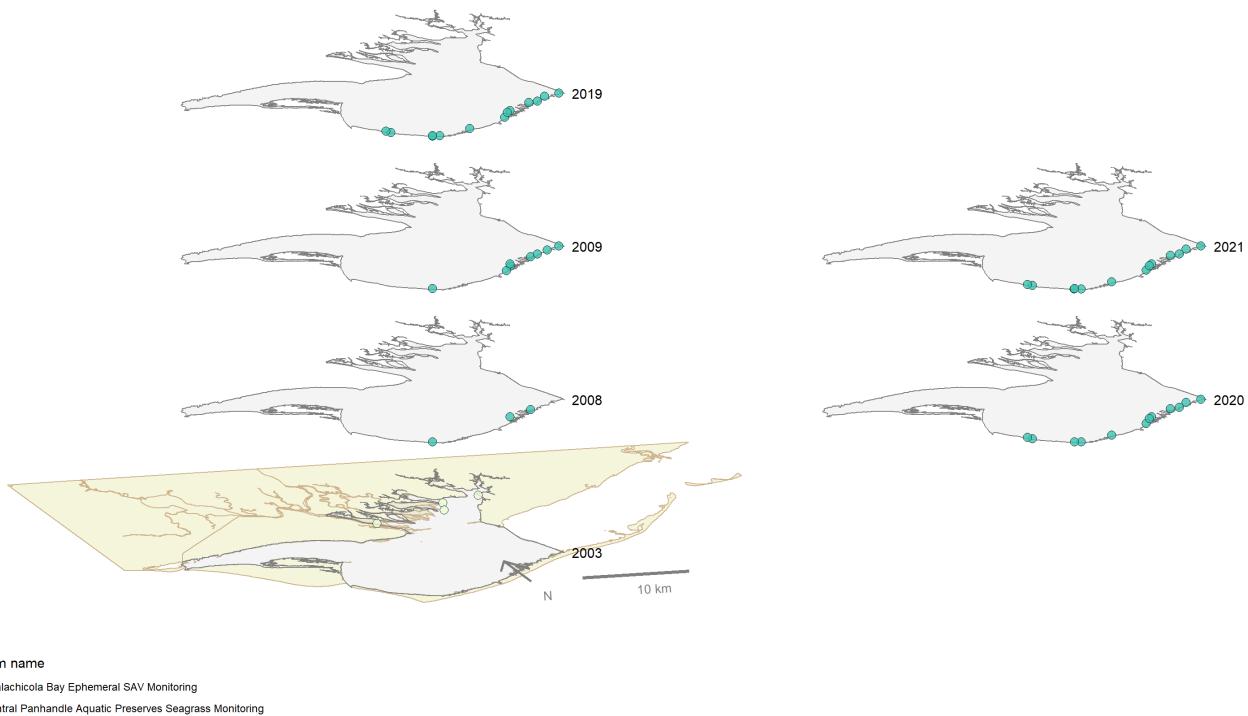
## Notes

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

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

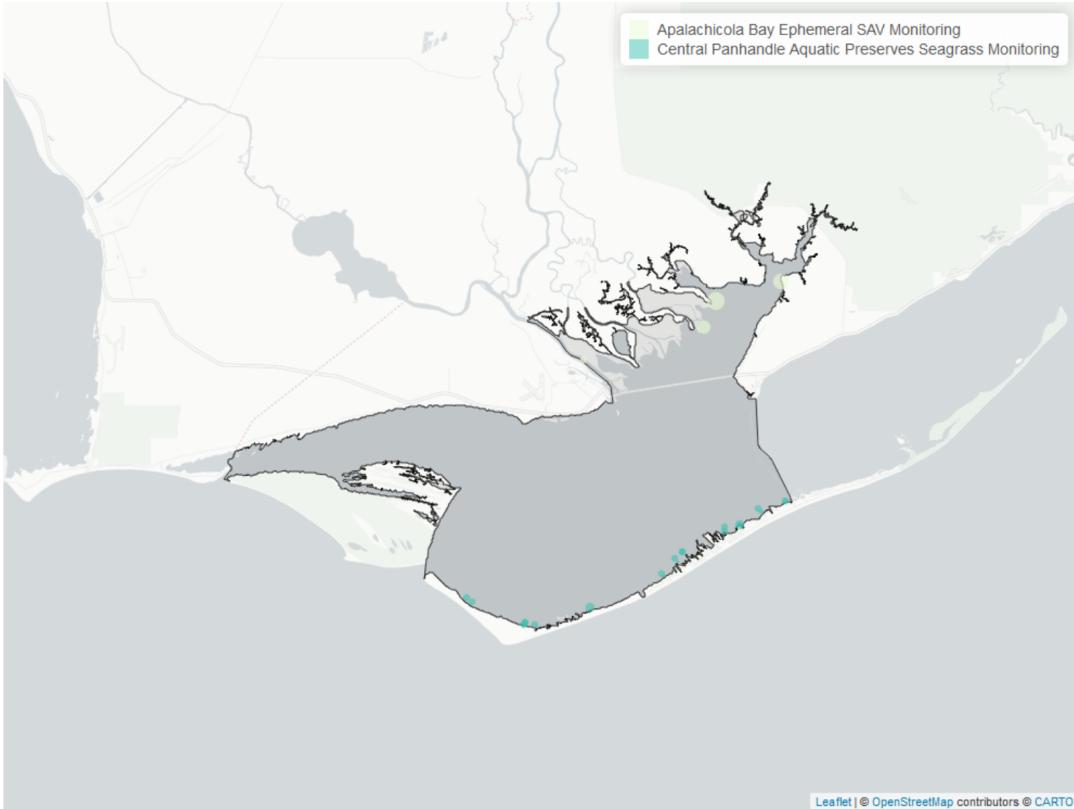
- Biscayne Bay Aquatic Preserve
- Florida Keys National Marine Sanctuary

Apalachicola Bay Aquatic Preserve  
SAV Percent Cover - Sample Locations



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

**Sampling locations by Program:**



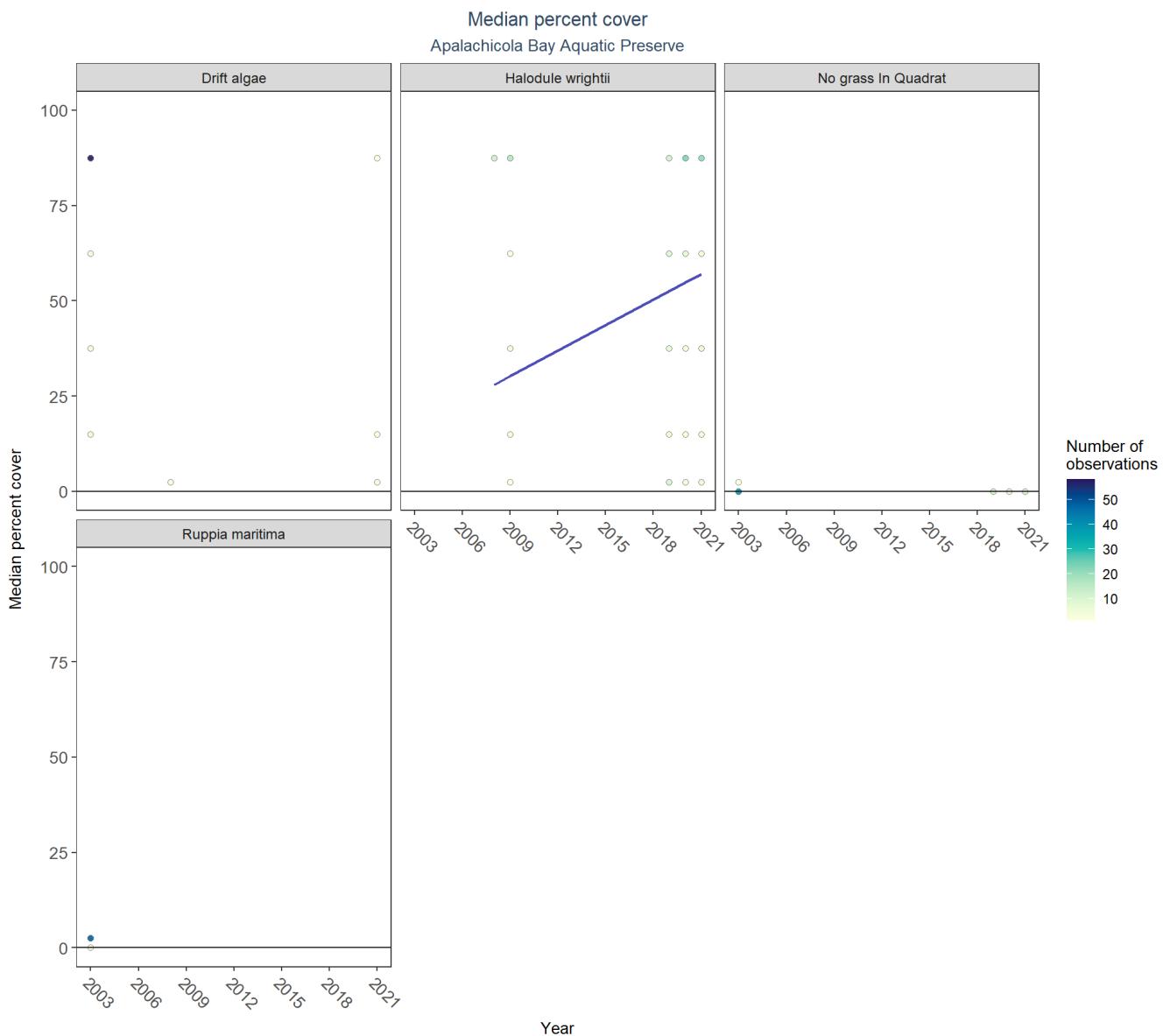
Map showing SAV sampling sites within the boundaries of *Apalachicola Bay Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Table 30: Central Panhandle Aquatic Preserves Seagrass Monitoring  
- *Program 557*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
195	2008	2021	Braun Blanquet	21

Table 31: Apalachicola Bay Ephemeral SAV Monitoring - *Program 997*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
79	2003	2003	Braun Blanquet	4
81	2003	2003	Percent Cover	4



Median percent cover by species in *Apalachicola 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.

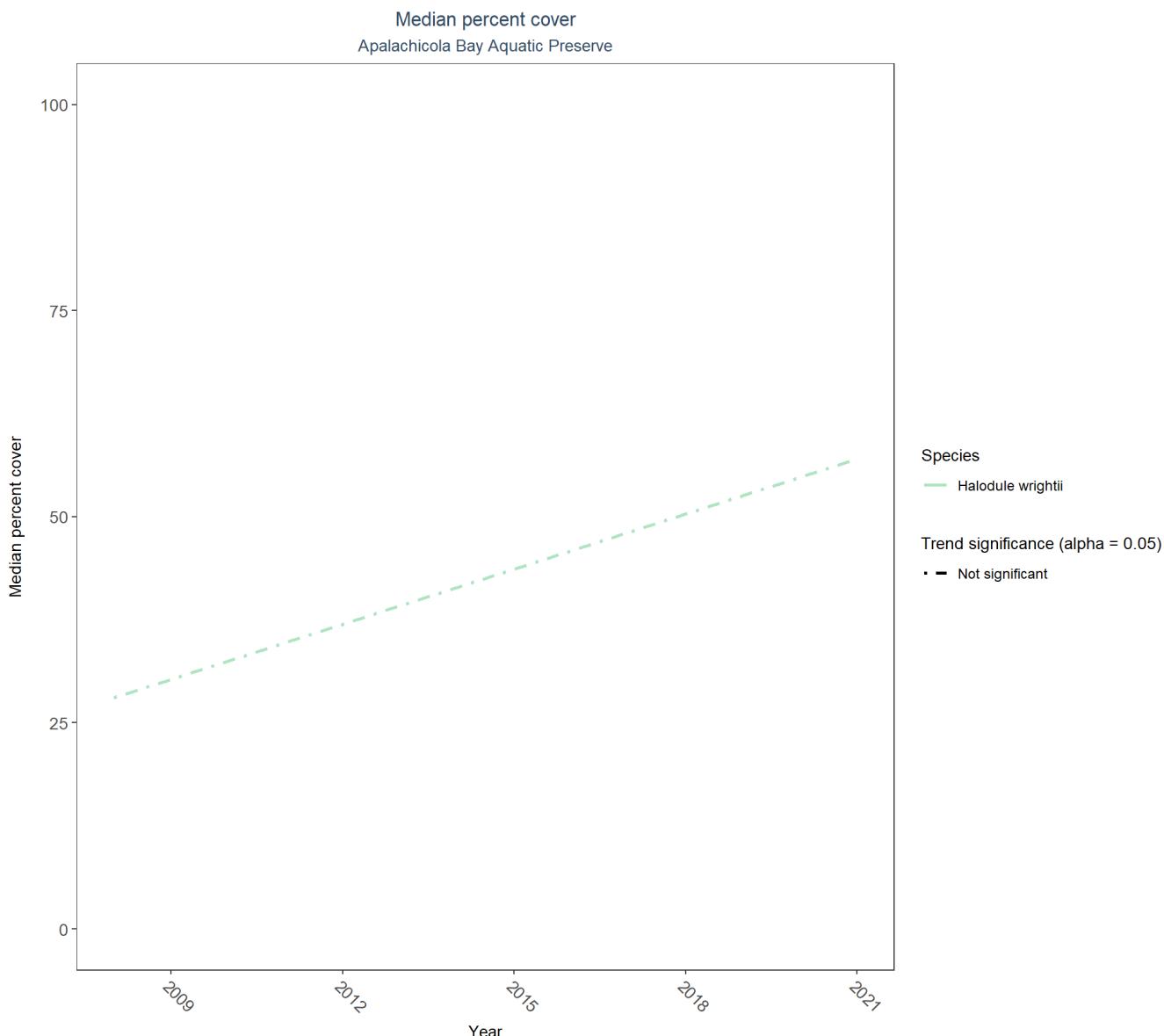
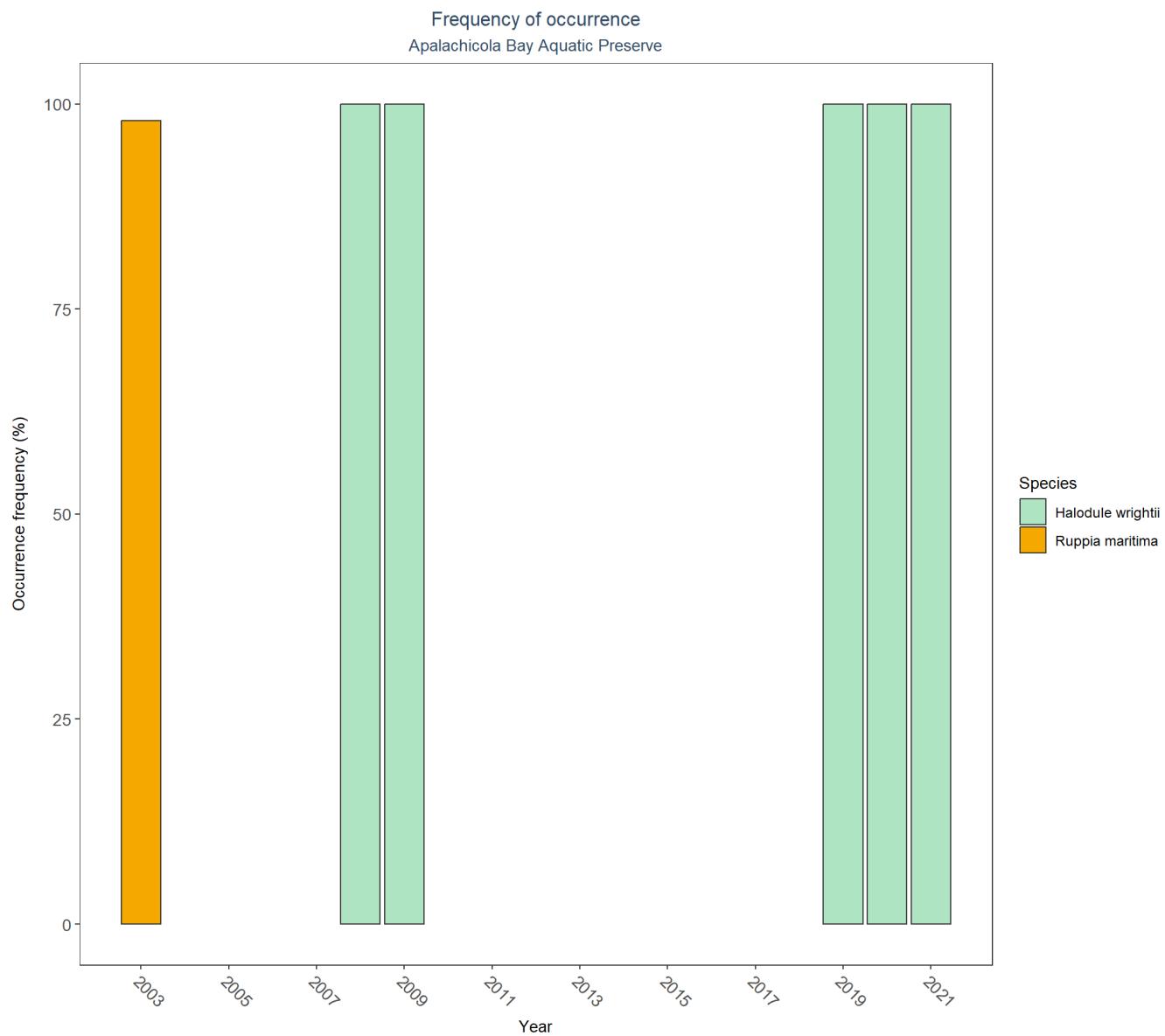


Table 32: Percent Cover Trend Analysis for Apalachicola Bay Aquatic Preserve

Species	CommonName	Trend Significance (0.05)	Period of Record	LME-Intercept	LME-Slope	p
Drift algae		Insufficient data to calculate trend				
Halodule wrightii	Shoal grass	No significant trend	2008 - 2021	-3.2216	2.2314	0.4055
No grass In Quadrat		Insufficient data to calculate trend				
Ruppia maritima	Widgeon grass	Insufficient data to calculate trend				



# Nekton

The data file used is: All\_NEKTON\_Parameters-2024-Mar-27.txt

Nekton Species Richness  
Apalachicola Bay Aquatic Preserve

