

Apalachicola National Estuarine Research Reserve

SEACAR Habitat Analyses

Last compiled on 04 September, 2024

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Threshold Filtering

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

Table 1: Continuous Water Quality threshold values

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

Table 2: Discrete Water Quality threshold values

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

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

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

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

Value Qualifiers

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

STORET and WIN value qualifier codes

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

Table 4: Value Qualifier codes excluded from analysis

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

Discrete Water Quality Value Qualifiers

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

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

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

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

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

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

Systemwide Monitoring Program (SWMP) value qualifier codes

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

Table 5: SWMP Value Qualifier codes

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

Water Column

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

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

Seasonal Kendall-Tau Analysis

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

Water Quality - Discrete

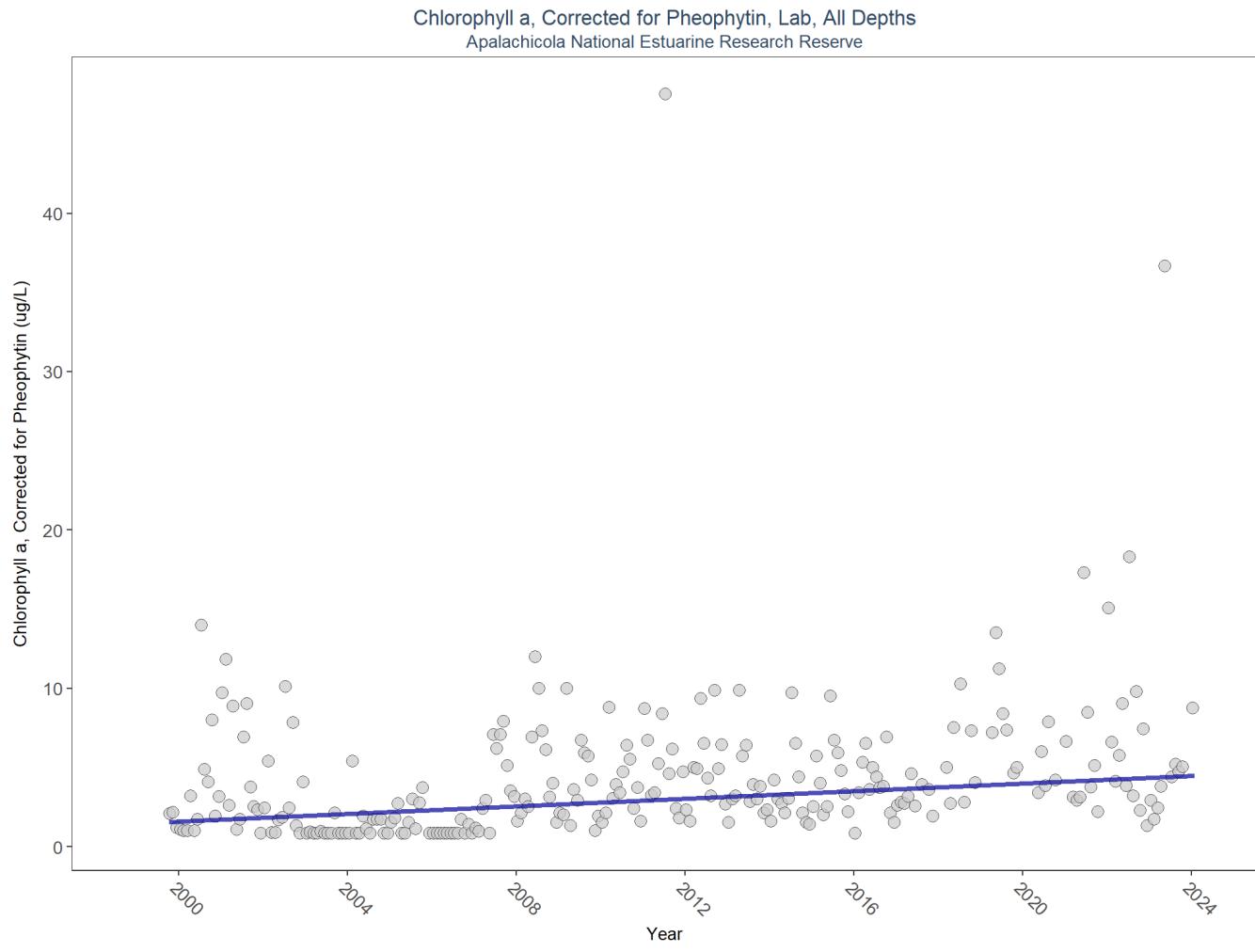
The following files were used in the discrete analysis:

- *Combined_WQ_WC_NUT_Chlorophyll_a_corrected_for_pheophytin-2024-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.

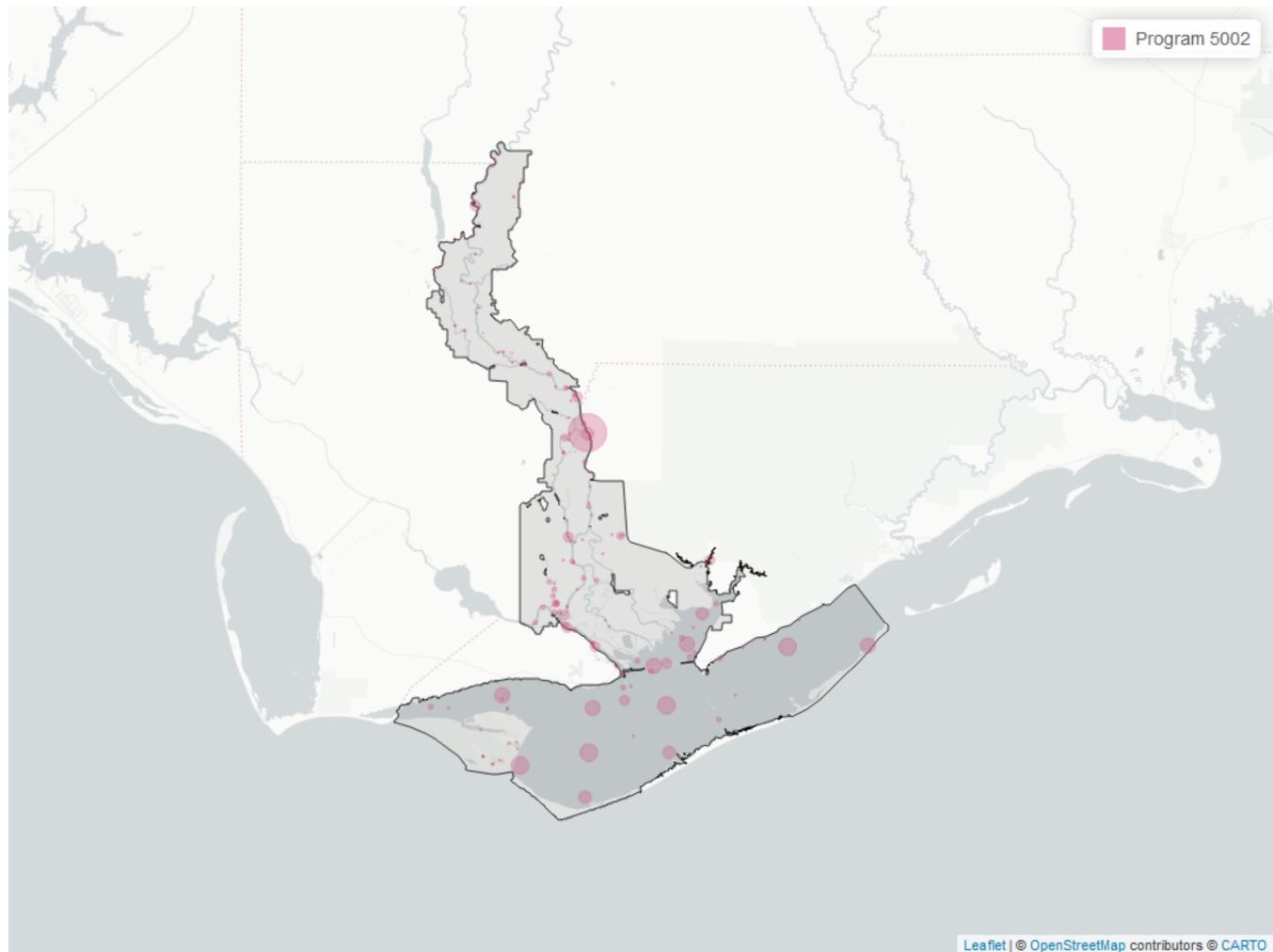
Seasonal Kendall-Tau Trend Analysis



$p < 0.00005$ 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
5002	1127	1999	2024

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 Pheophytin

<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>
1999	3	3	100.0				
2000	101	20	19.8			31	30.7
2001	227	23	10.1			116	51.1
2002	206	18	8.7	30	14.6	114	55.3
2003	29	2	6.9			14	48.3
2004	12					11	91.7
2005	28	3	10.7			14	50.0
2006	12	1	8.3			11	91.7
2007	147	16	10.9			26	17.7
2008	19	9	47.4				
2009	14	3	21.4				
2010	13	3	23.1				
2011	27	3	11.1				
2012	38	5	13.2				
2013	18	1	5.6			1	5.6
2014	16	4	25.0				
2015	15	3	20.0				
2016	14	2	14.3			1	7.1
2017	16					1	6.2
2018	22	2	9.1				
2019	33	3	9.1				
2020	25	7	28.0			1	4.0
2021	32	14	43.8				
2022	41	15	36.6			1	2.4
2023	16	5	31.2			1	6.2

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

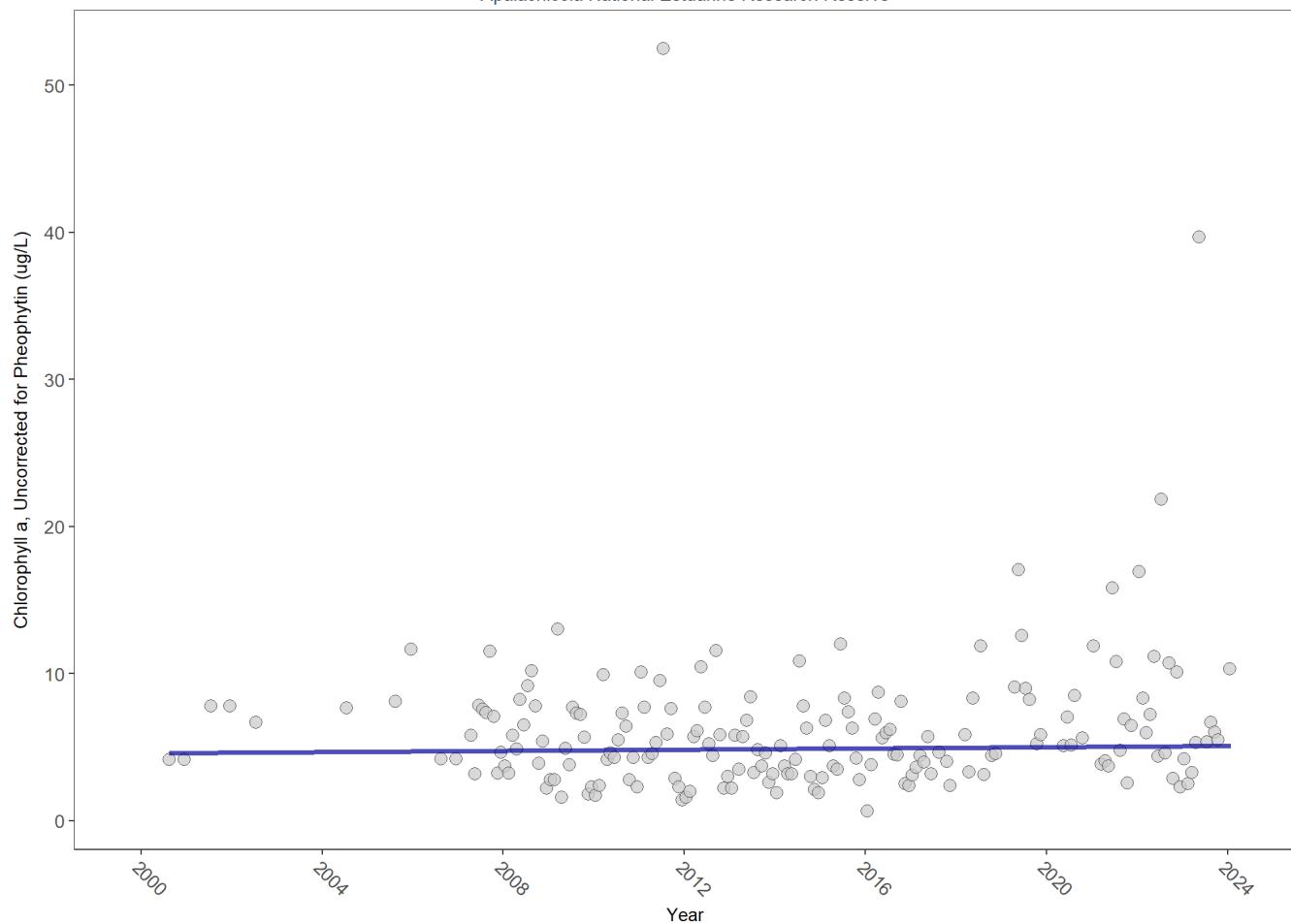
Programs containing Value Qualified data:

5002 - Florida STORET / WIN

Chlorophyll a, Uncorrected for Pheophytin - Discrete Water Quality

Seasonal Kendall-Tau Trend Analysis

Chlorophyll a, Uncorrected for Pheophytin, Lab, All Depths
Apalachicola National Estuarine Research Reserve

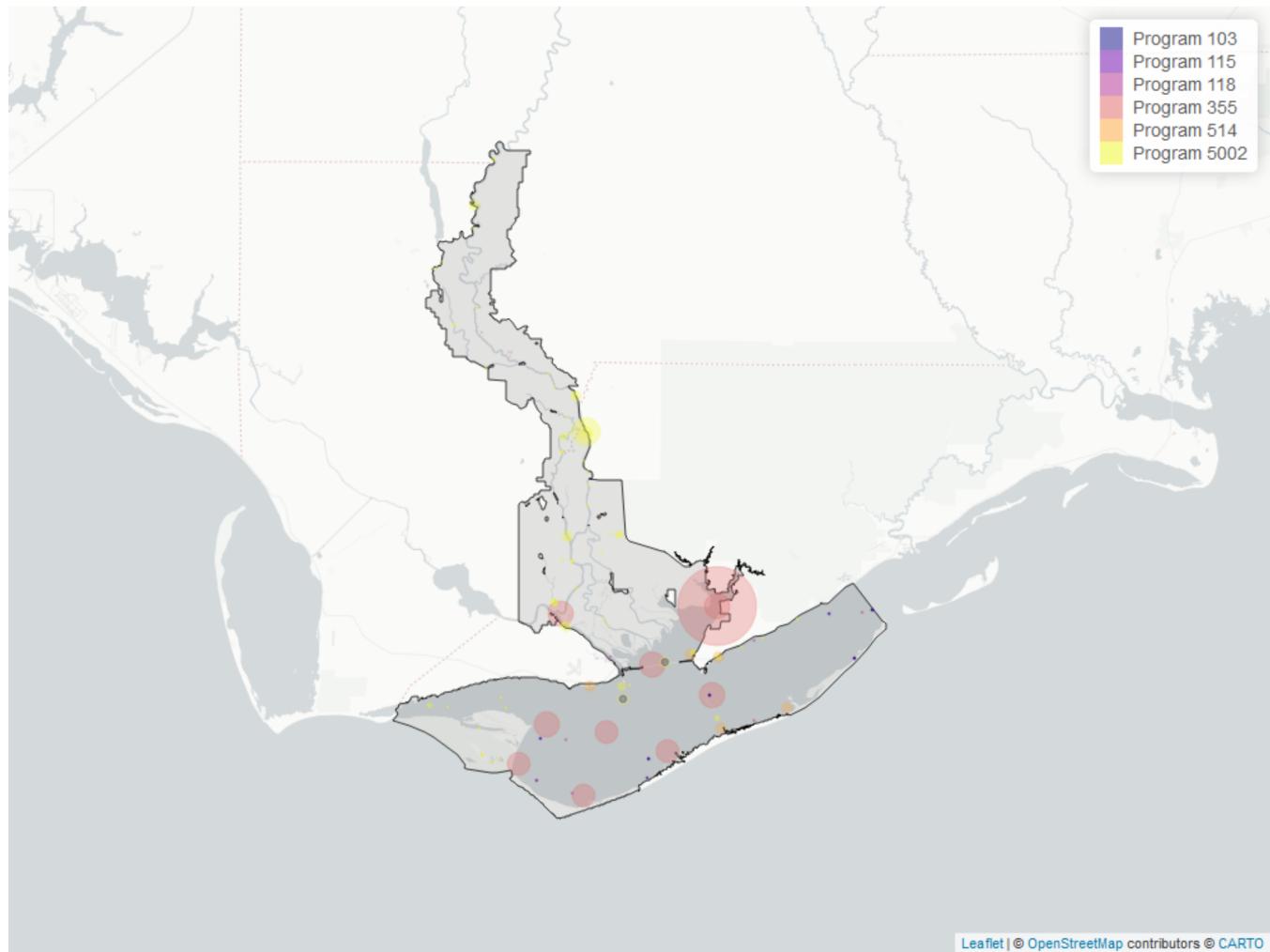


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	470	24	5.1	TRUE	0.039	0.4204	0.01998212	4.585702	18.0686	0.08	0

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

SennIntercept is intercept value at beginning of record for monitoring location

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



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

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

ProgramID	N_Data	YearMin	YearMax
355	1774	2007	2018
5002	350	2007	2024
514	85	2007	2008
103	33	2000	2021
118	10	2000	2010
115	6	2000	2004

Program names:

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

514 - Florida LAKEWATCH Program

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

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	$perc_U$
2012	30	2	6.7		
2013	17	1	5.9		
2016	14	2	14.3		
2017	16	1	6.2		
2018	22	1	4.6		
2020	25	2	8.0	1	4
2021	52	1	1.9		
2022	41	2	4.9		
2023	16	2	12.5		

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

Programs containing Value Qualified data:

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

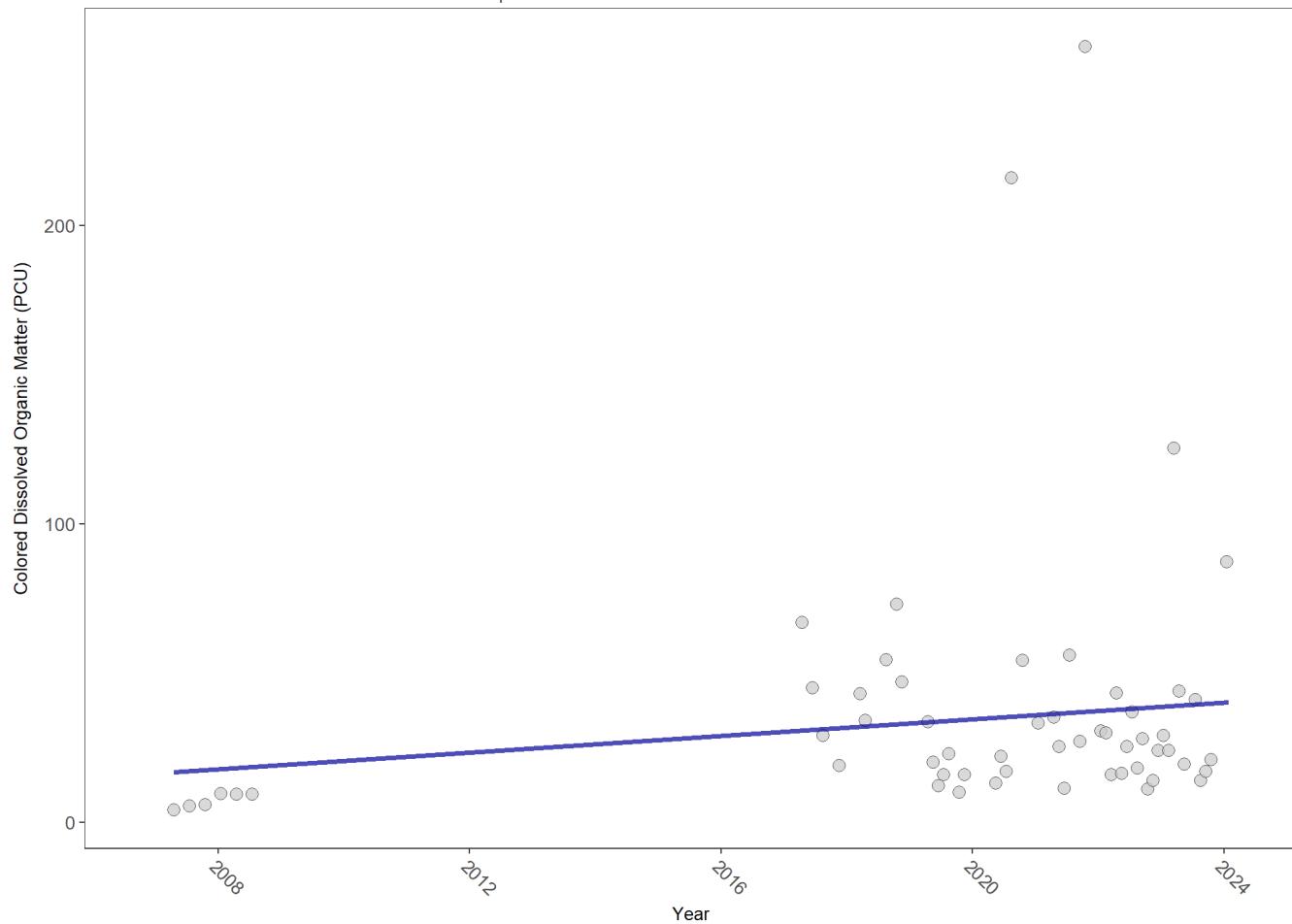
5002 - Florida STORET / WIN

Colored Dissolved Organic Matter - Discrete Water Quality

Colored Dissolved Organic Matter (CDOM) occurs naturally in every water body. It is made up of mainly plant material, algae and bacteria. The composition is determined by its source; plants, soil, algae, and wastewater are common sources.

Seasonal Kendall-Tau Trend Analysis

Colored Dissolved Organic Matter, Lab, All Depths
Apalachicola National Estuarine Research Reserve

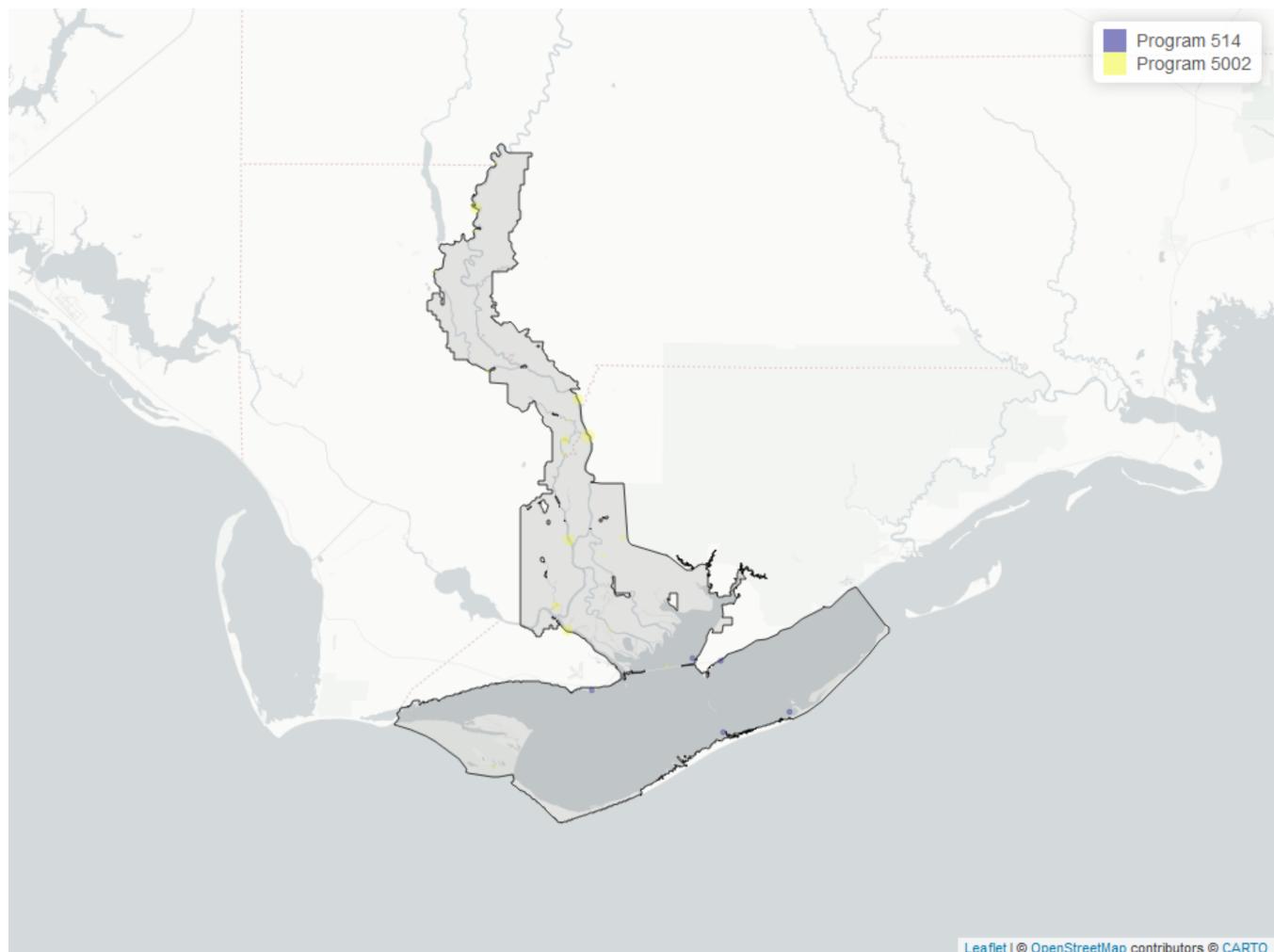


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	145	10	21	TRUE	0.0989	0.0873	1.393095	16.39583	16.9213	0.0761	0

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

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



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

Table 10: Programs contributing data for Colored Dissolved Organic Matter

ProgramID	N_Data	YearMin	YearMax
5002	125	2017	2024
514	26	2007	2008

Program names:

5002 - Florida STORET / WIN

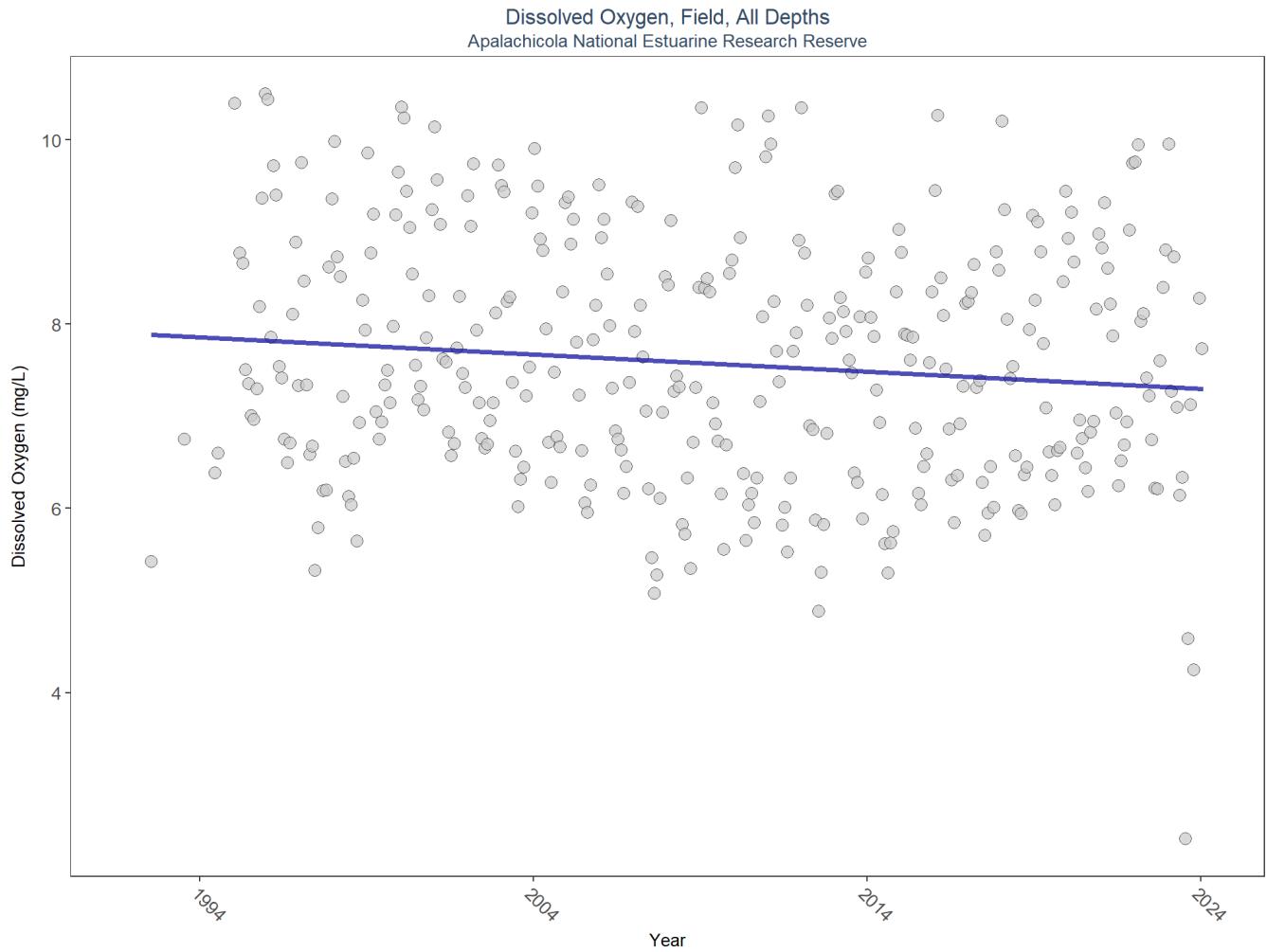
514 - Florida LAKEWATCH Program

There are no qualifying Value Qualifiers for Colored Dissolved Organic Matter in Apalachicola National Estuarine Research Reserve

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	79409	33	7.5	TRUE	-0.1517	0.0001	-0.01866436	7.896792	13.1328	0.2847	-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

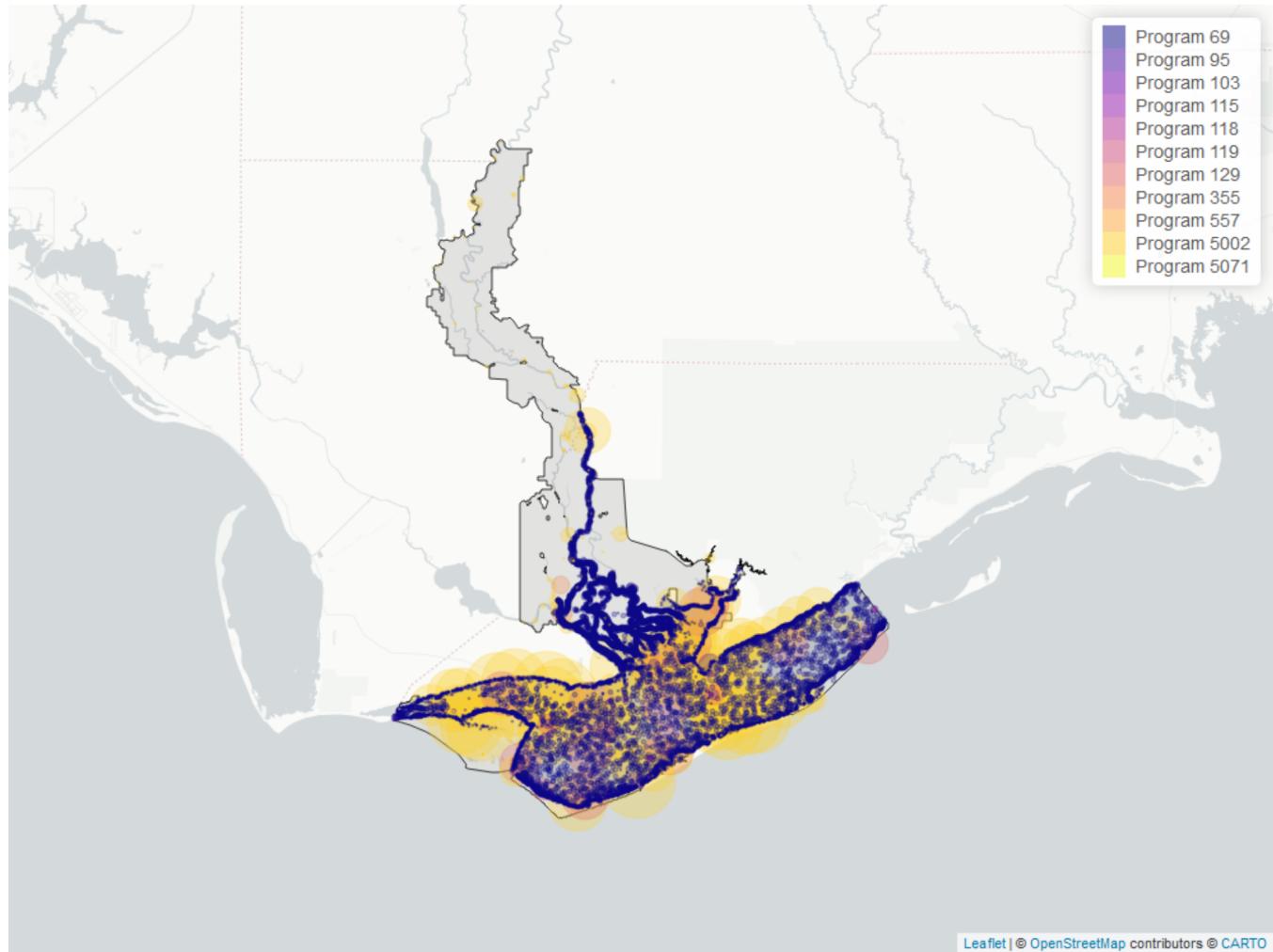


Table 11: Programs contributing data for Dissolved Oxygen

ProgramID	N_Data	YearMin	YearMax
69	41529	1998	2022
5002	32048	1995	2024
129	3956	2000	2023
355	1190	2011	2019
95	410	1995	2018
557	222	2006	2023
115	28	1992	2004
103	24	2004	2021
119	14	1994	1994
118	4	2000	2006
5071	4	2017	2017

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

115 - Environmental Monitoring Assessment Program

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

119 - National Status and Trends Bioeffects program

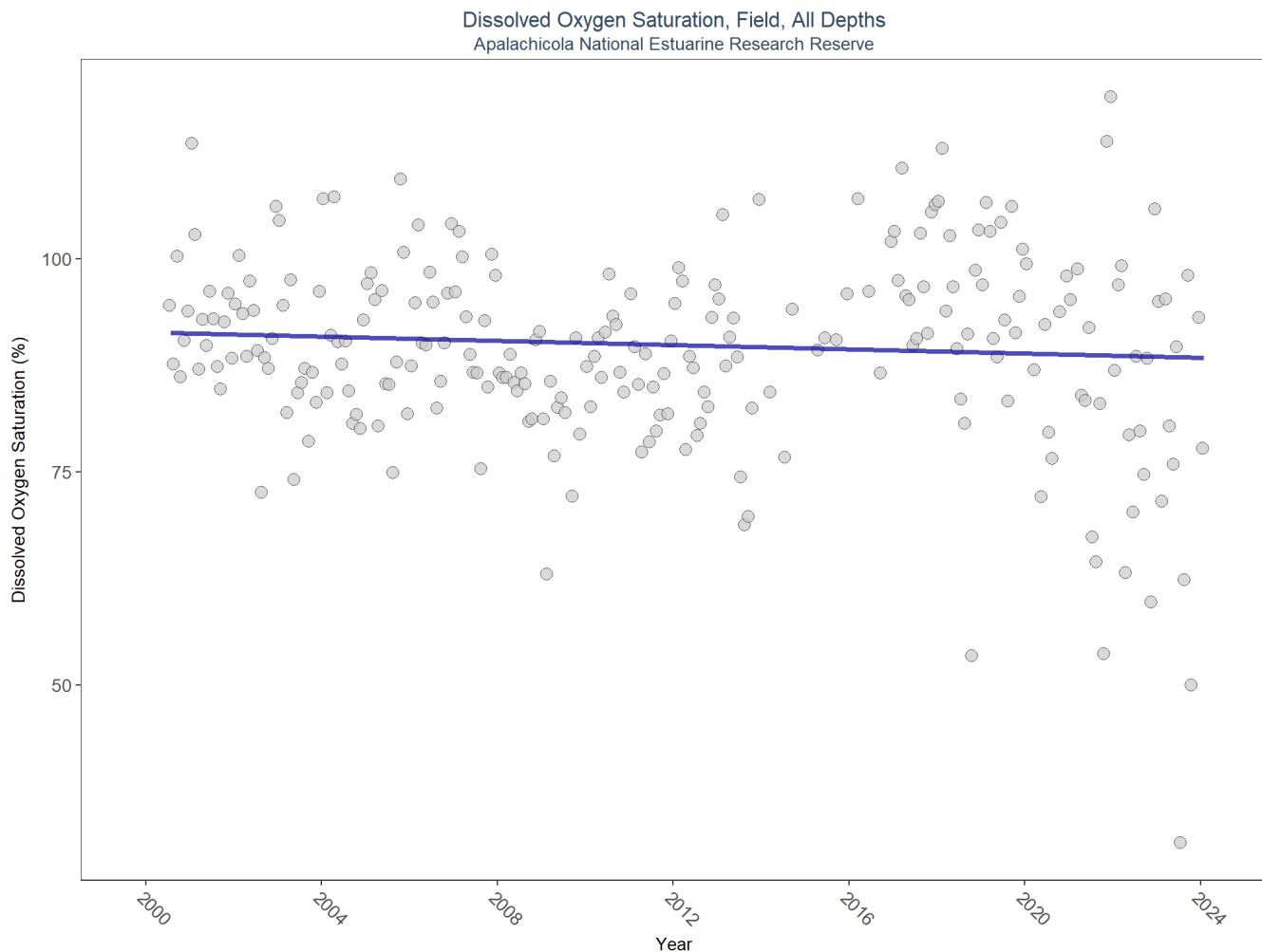
118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

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 Dissolved Oxygen in Apalachicola National Estuarine Research Reserve

Dissolved Oxygen Saturation - Discrete Water Quality

Seasonal Kendall-Tau Trend Analysis

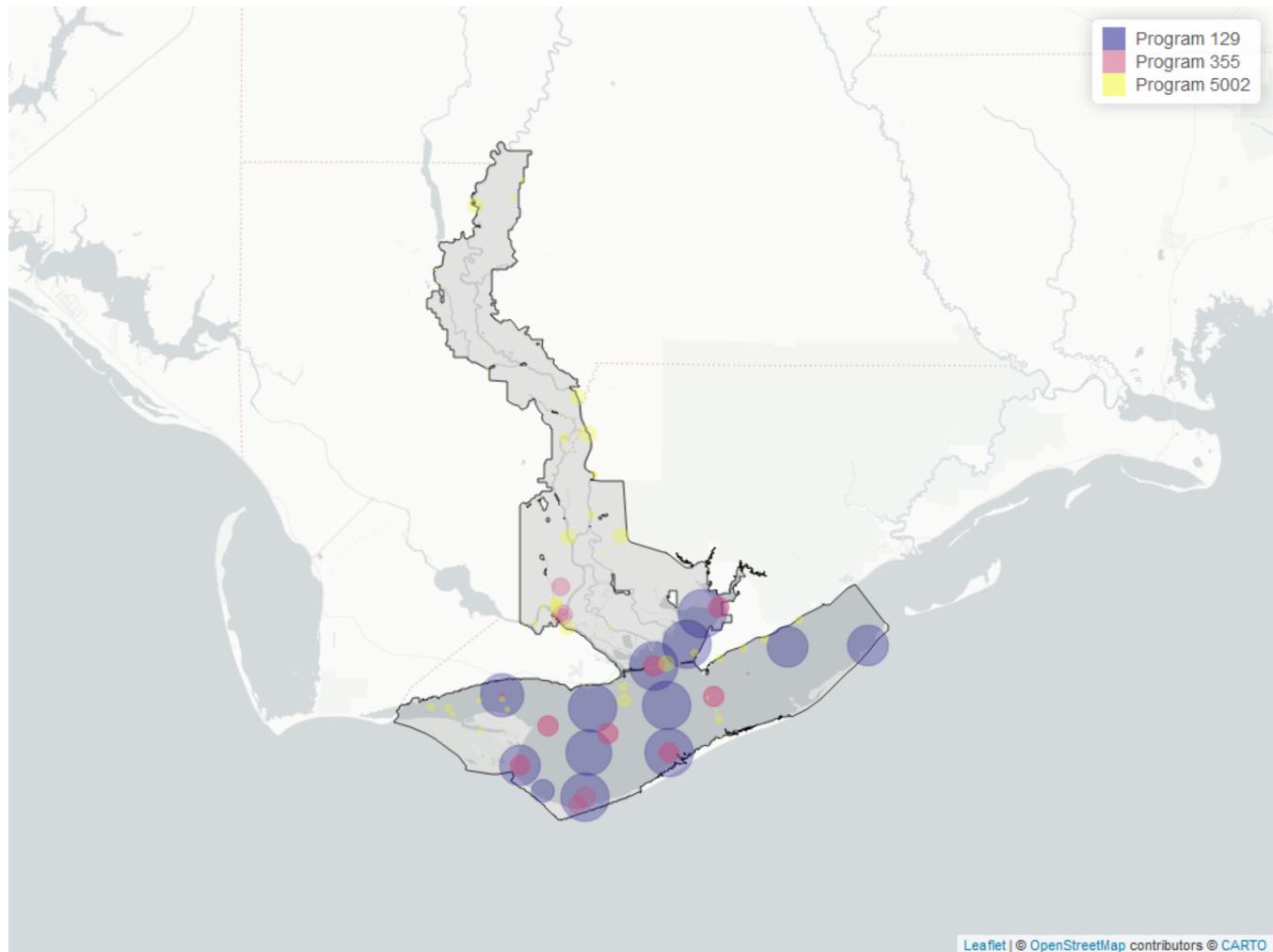


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	5629	25	91.4	TRUE	-0.0678	0.1538	-0.1231334	91.3719	23.039	0.0175	0

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
129	3938	2000	2023
355	1190	2011	2019
5002	509	2003	2024

Program names:

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

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

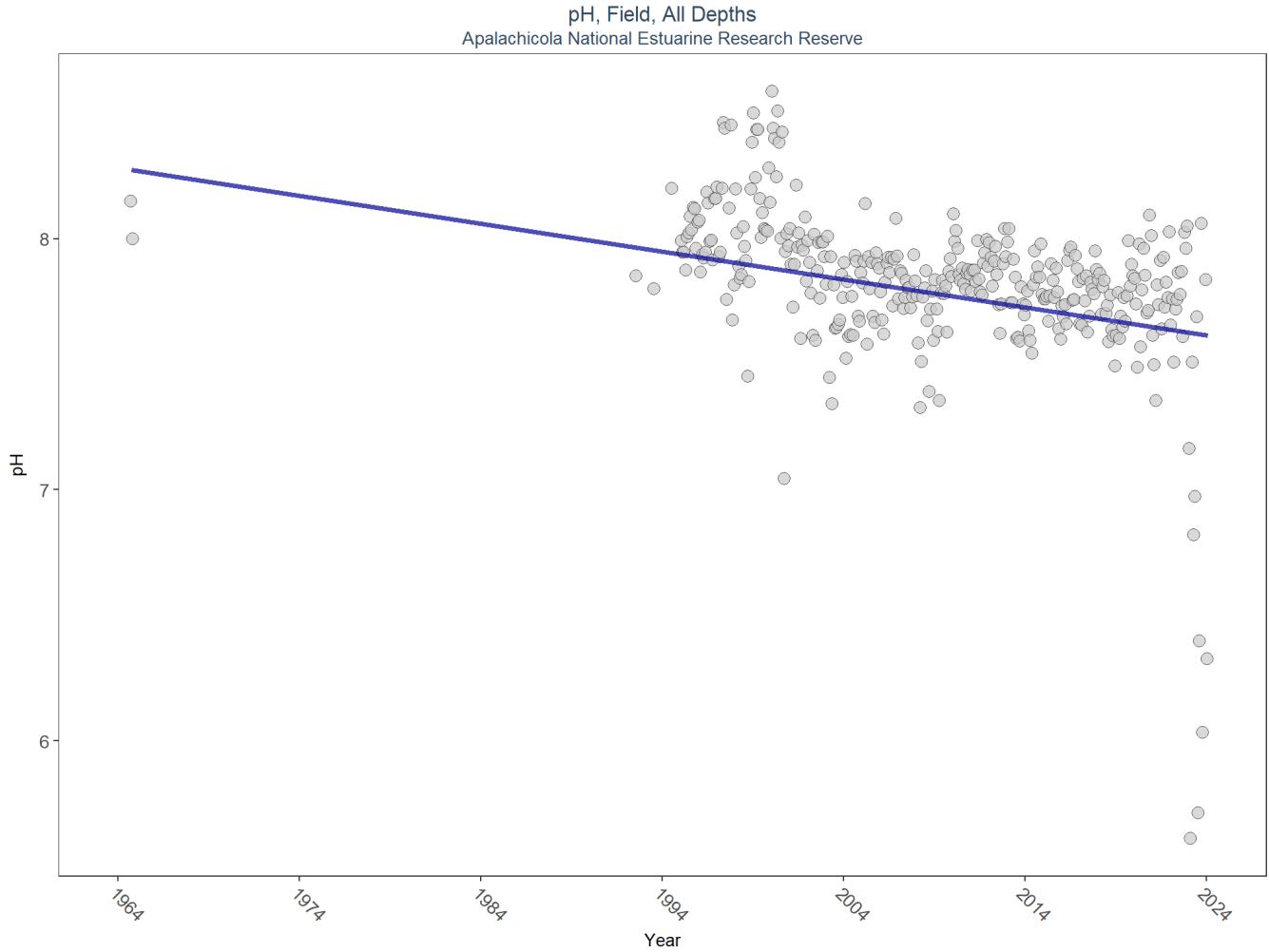
5002 - Florida STORET / WIN

There are no qualifying Value Qualifiers for Dissolved Oxygen Saturation in Apalachicola National Estuarine Research Reserve

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.

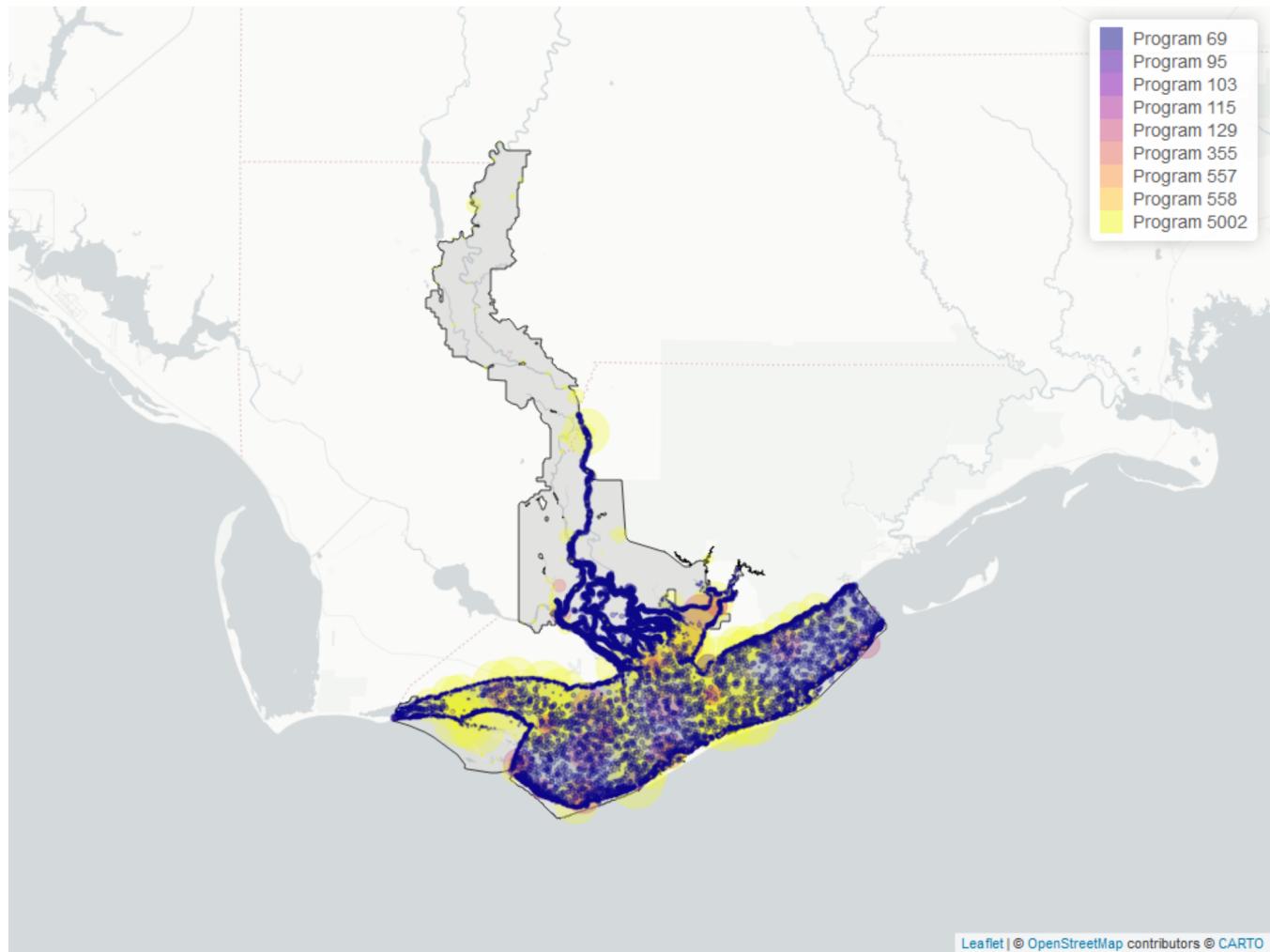
Seasonal Kendall-Tau Trend Analysis



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	41711	1998	2022
5002	19183	1995	2024
129	2249	2000	2023
355	931	2011	2019
95	305	1964	2018
557	209	2006	2023
558	38	2008	2013
115	28	1992	2004
103	19	2004	2021

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

558 - Franklin County Coastal Waters Seagrass Monitoring

115 - Environmental Monitoring Assessment Program

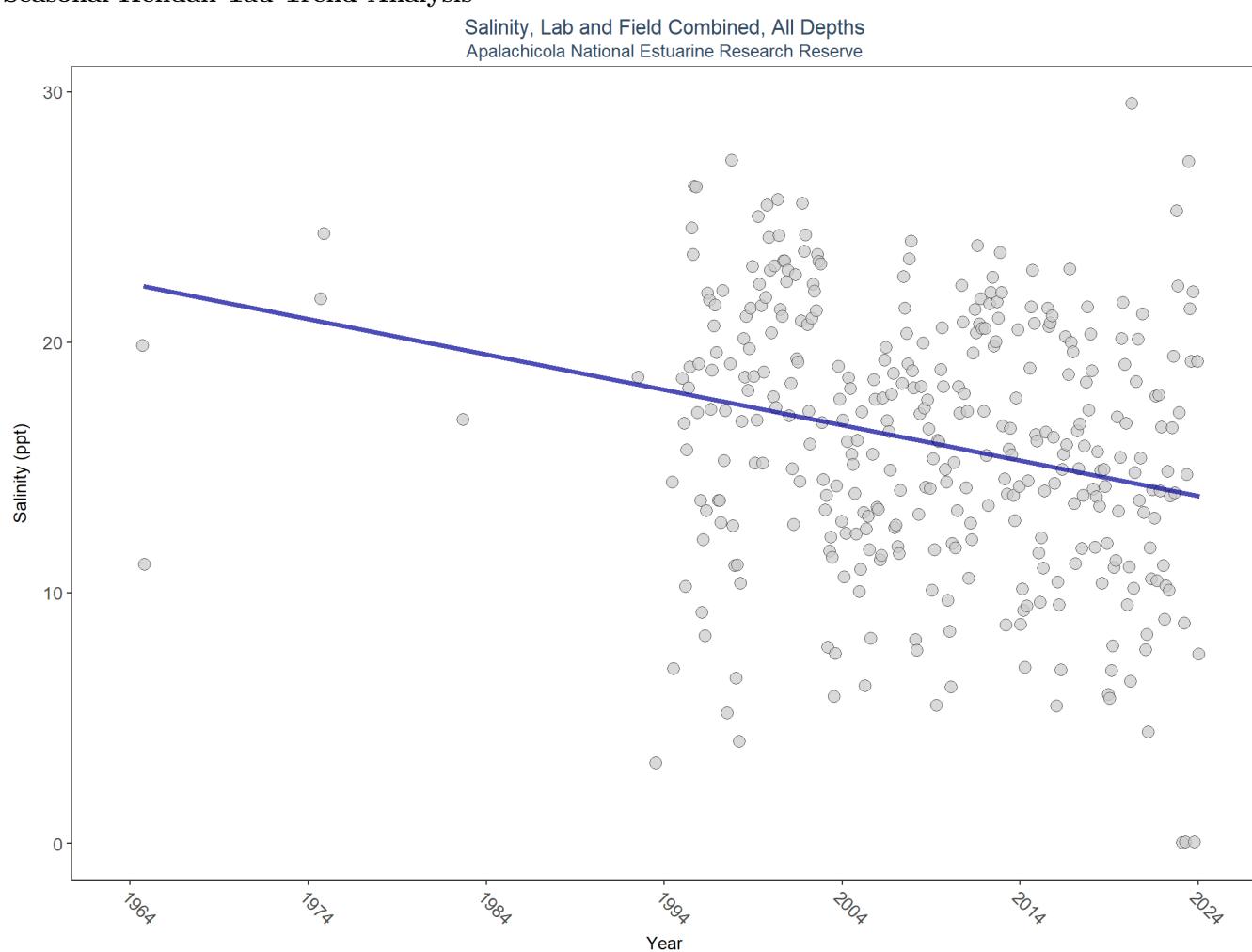
103 - EPA STOrage and RETrieval Data Warehouse (STORET)

There are no qualifying Value Qualifiers for pH in Apalachicola National Estuarine Research Reserve

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.

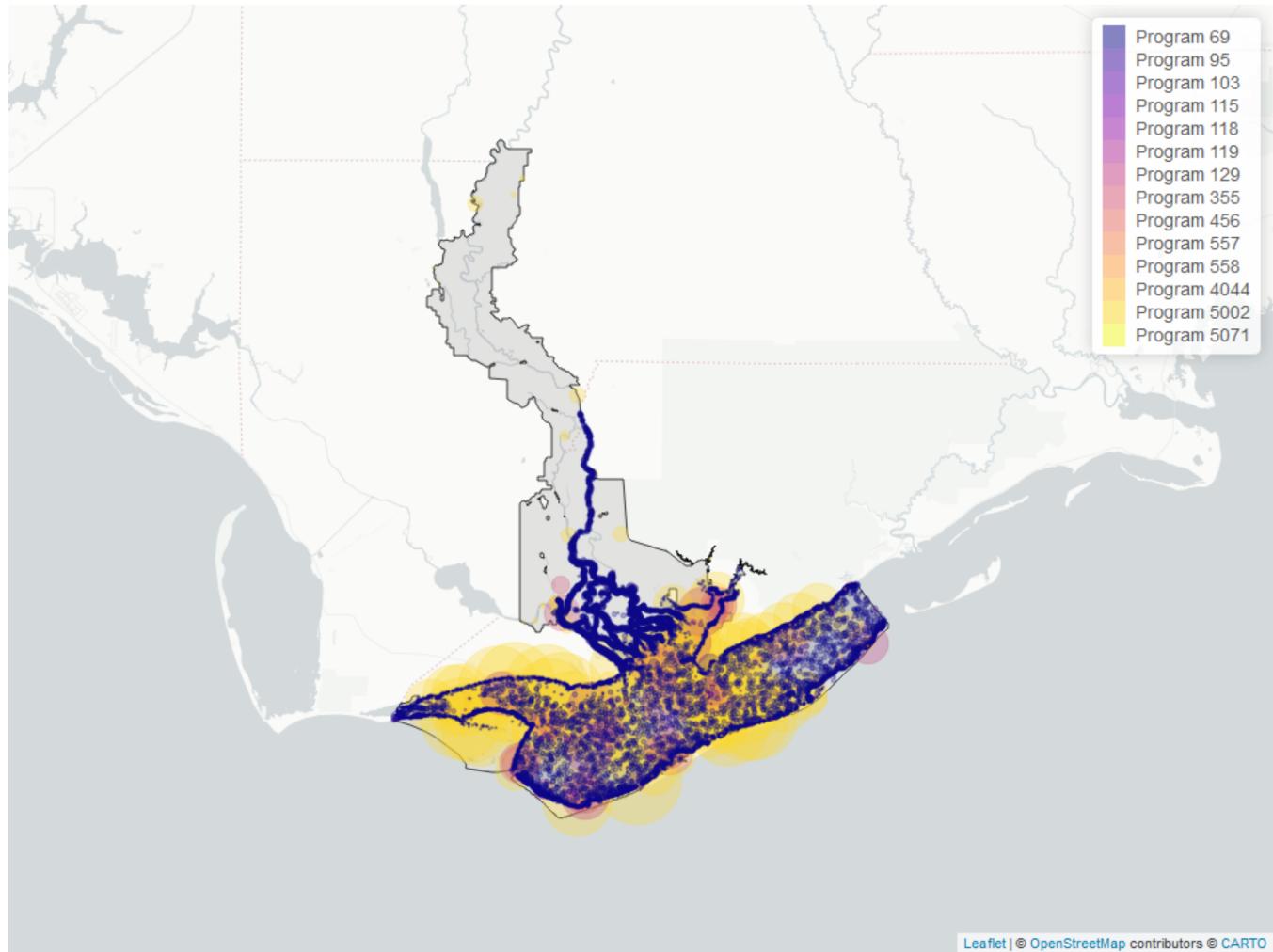
Seasonal Kendall-Tau Trend Analysis



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

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Salinity



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

Table 14: Programs contributing data for Salinity

ProgramID	N_Data	YearMin	YearMax
5002	43853	1995	2024
69	41833	1998	2022
129	3968	2000	2023
355	2501	2003	2019
95	586	1964	2018
4044	280	2007	2023
557	222	2006	2023
558	132	2008	2014
118	79	2015	2020
456	63	2005	2015
115	28	1992	2004
119	14	1994	1994

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
5071	4	2017	2017
103	3	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
 558 - Franklin County Coastal Waters 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)

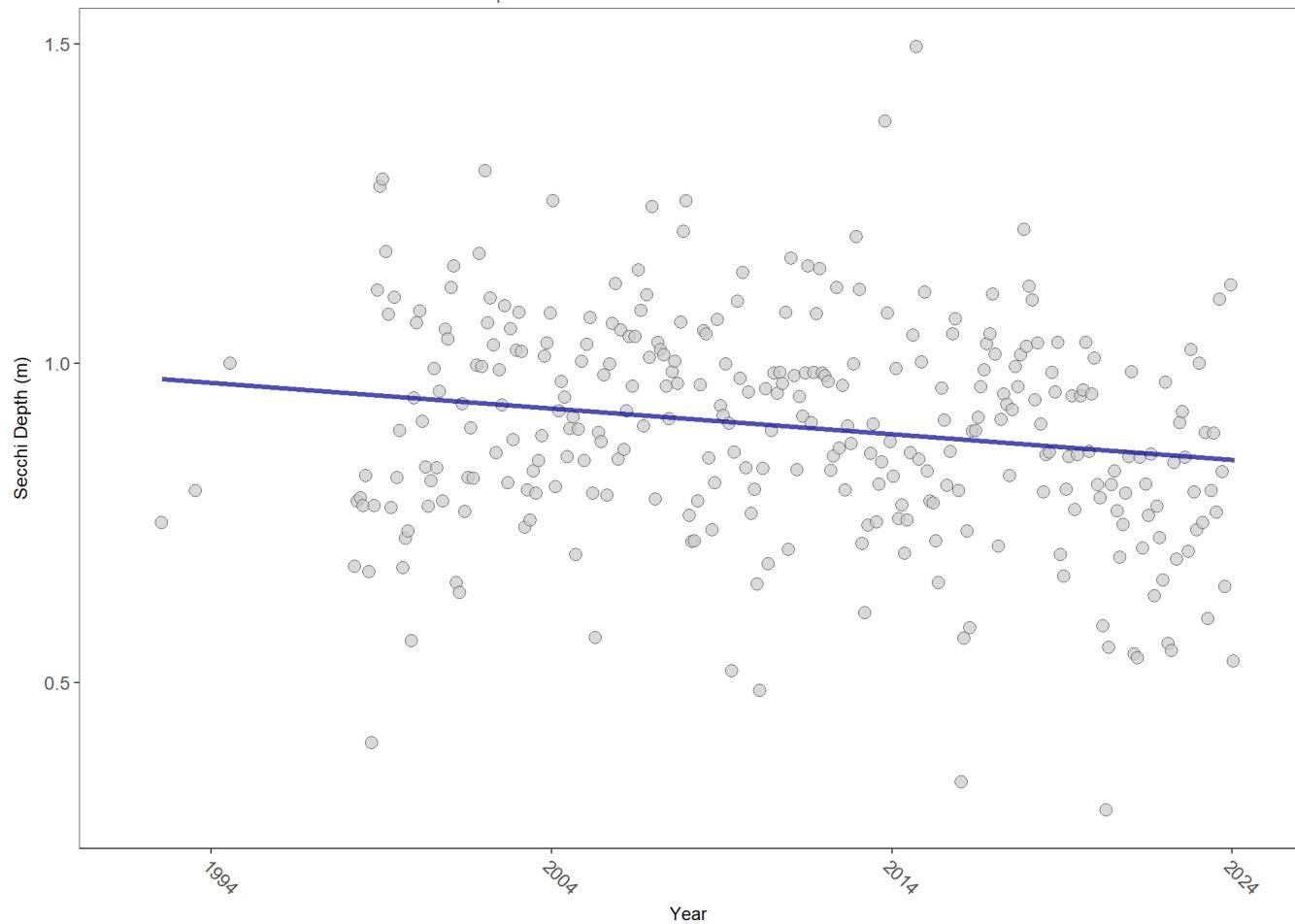
There are no qualifying Value Qualifiers for Salinity in Apalachicola National Estuarine Research Reserve

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 National Estuarine Research Reserve

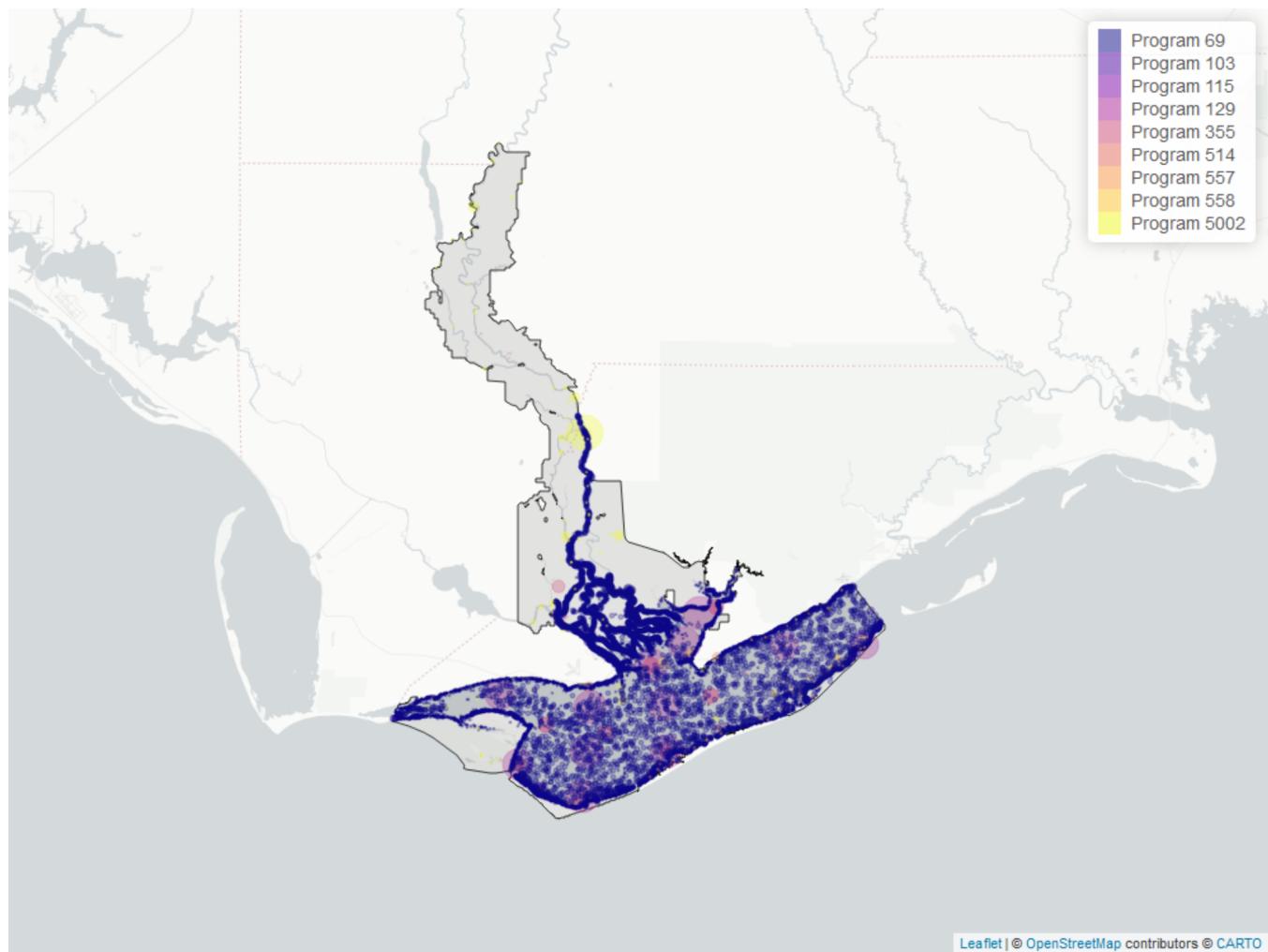


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
Surface	44773	30	0.8	TRUE	-0.1413	0.0006	-0.004010194	0.9776015	20.9355	0.034	-1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Secchi Depth



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

Table 15: Programs contributing data for Secchi Depth

ProgramID	N_Data	YearMin	YearMax
69	41353	1998	2022
129	1966	2000	2023
355	587	2011	2019
5002	453	2003	2024
558	188	2008	2017
557	128	2006	2023
514	80	2007	2008
115	10	1992	2004
103	10	2021	2021

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
 558 - Franklin County Coastal Waters Seagrass Monitoring
 557 - Central Panhandle Aquatic Preserves Seagrass Monitoring
 514 - Florida LAKEWATCH Program
 115 - Environmental Monitoring Assessment Program
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)

Value Qualifiers

- N_{Total} is total amount of data for a given year
- $N_{}$ is the total amount of values flagged with the respective value qualifier in a given year
- $perc_{S}$ 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	$perc_S$
2015	1910	1	0.0
2018	2136	1	0.0
2020	1309	1	0.1
2021	1256	2	0.2
2022	1292	2	0.1

Note: ¹S - 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) $TN = ORGN + NH_4 + NO_3;$

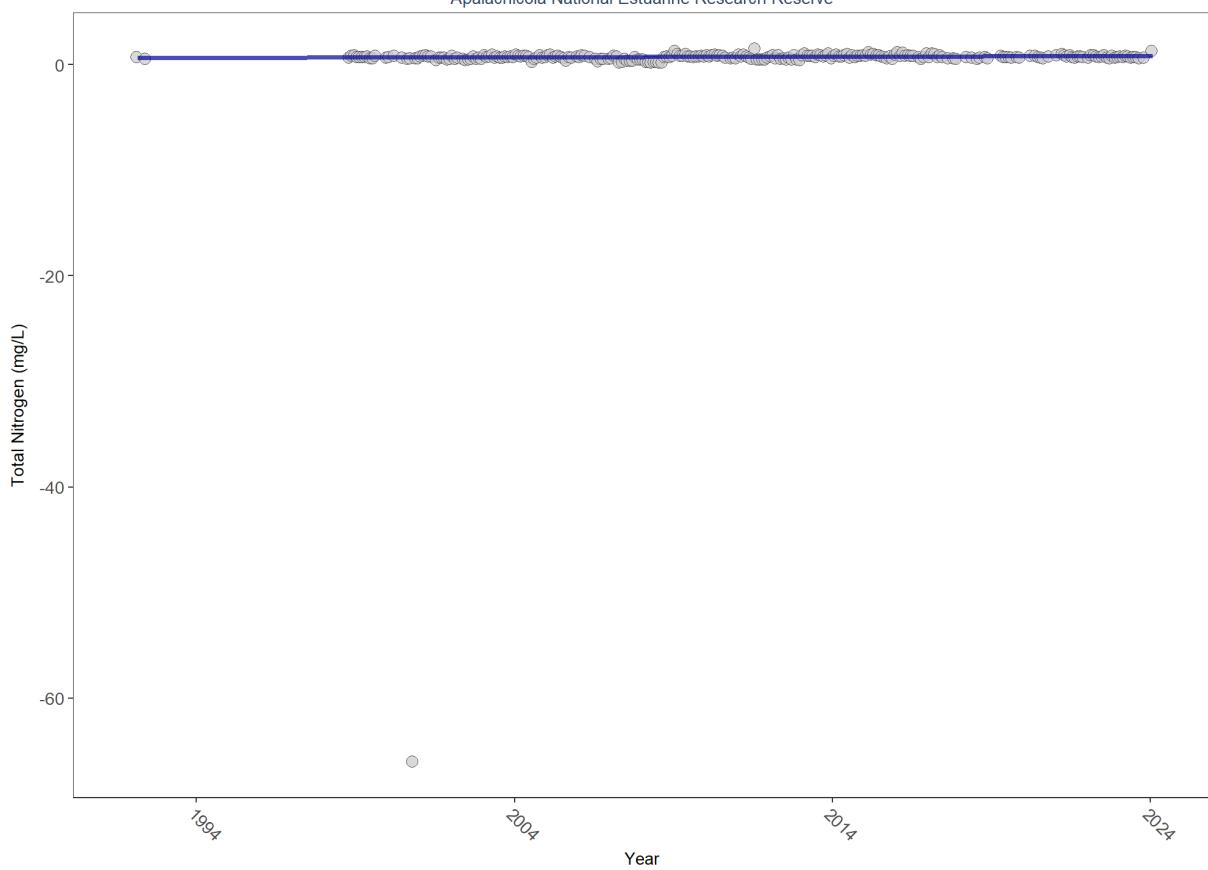
Additional Information:

- 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 National Estuarine Research Reserve

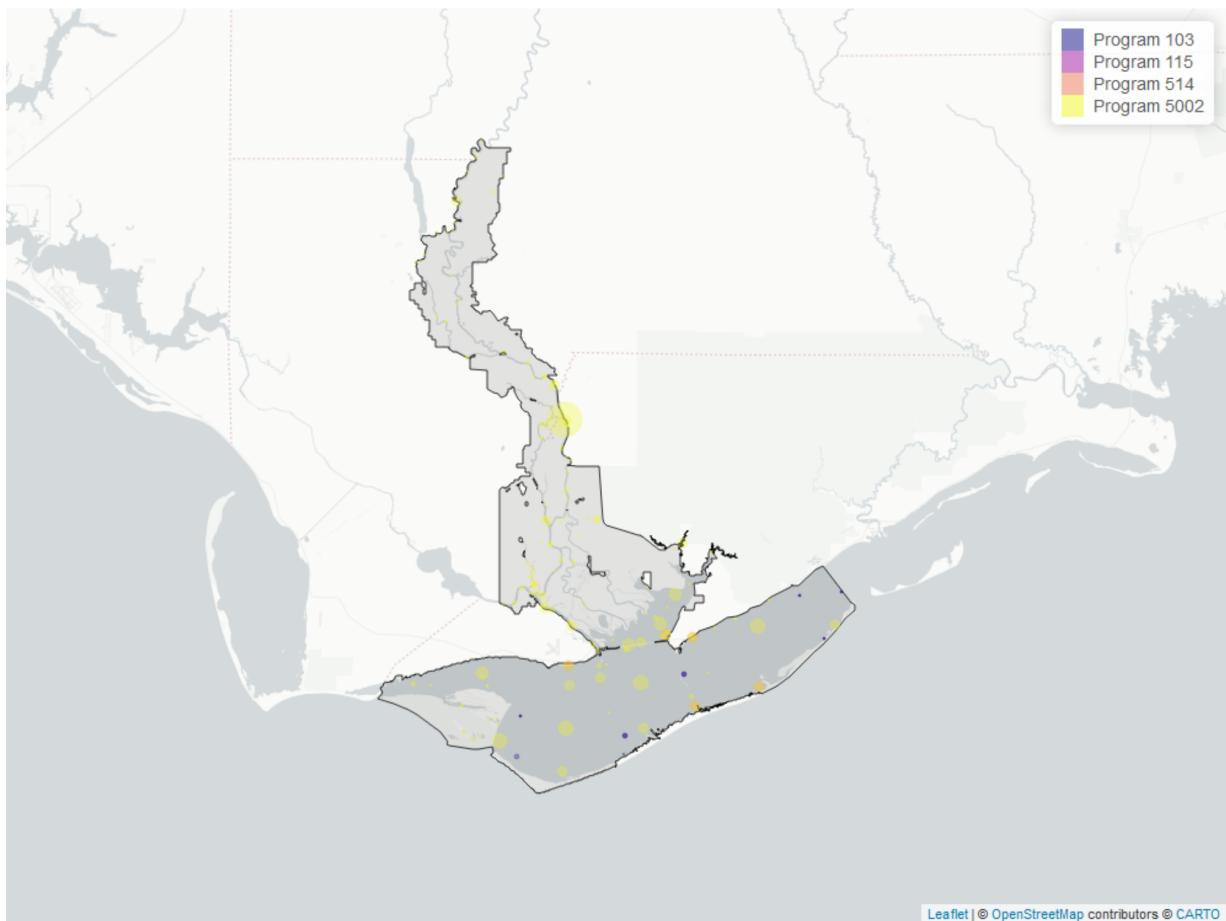


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1130	28	0.63	TRUE	0.1781	0.0000	0.005245726	0.6669552	7.1433	0.7874	1

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	1013	1992	2024
514	83	2007	2008
103	28	2000	2006
115	6	2000	2004

Program names:

5002 - Florida STORET / WIN

514 - Florida LAKEWATCH Program

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

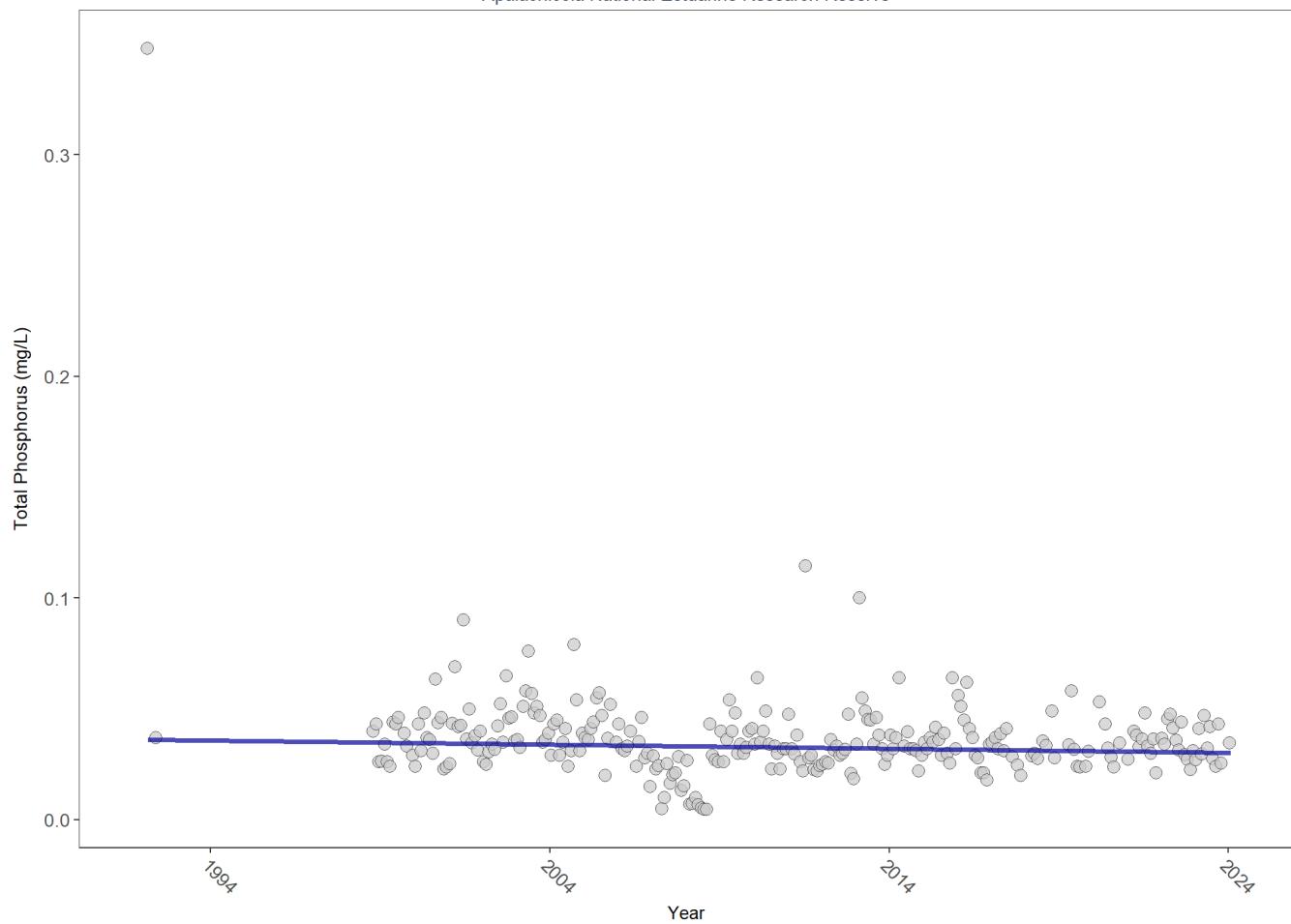
115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for Total Nitrogen in Apalachicola National Estuarine Research Reserve

Total Phosphorus - Discrete Water Quality

Seasonal Kendall-Tau Trend Analysis

Total Phosphorus, Lab, All Depths
Apalachicola National Estuarine Research Reserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1232	28	0.032	TRUE	-0.1025	0.0178	-0.0001832214	0.03598016	17.3063	0.0991	-1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Total Phosphorus

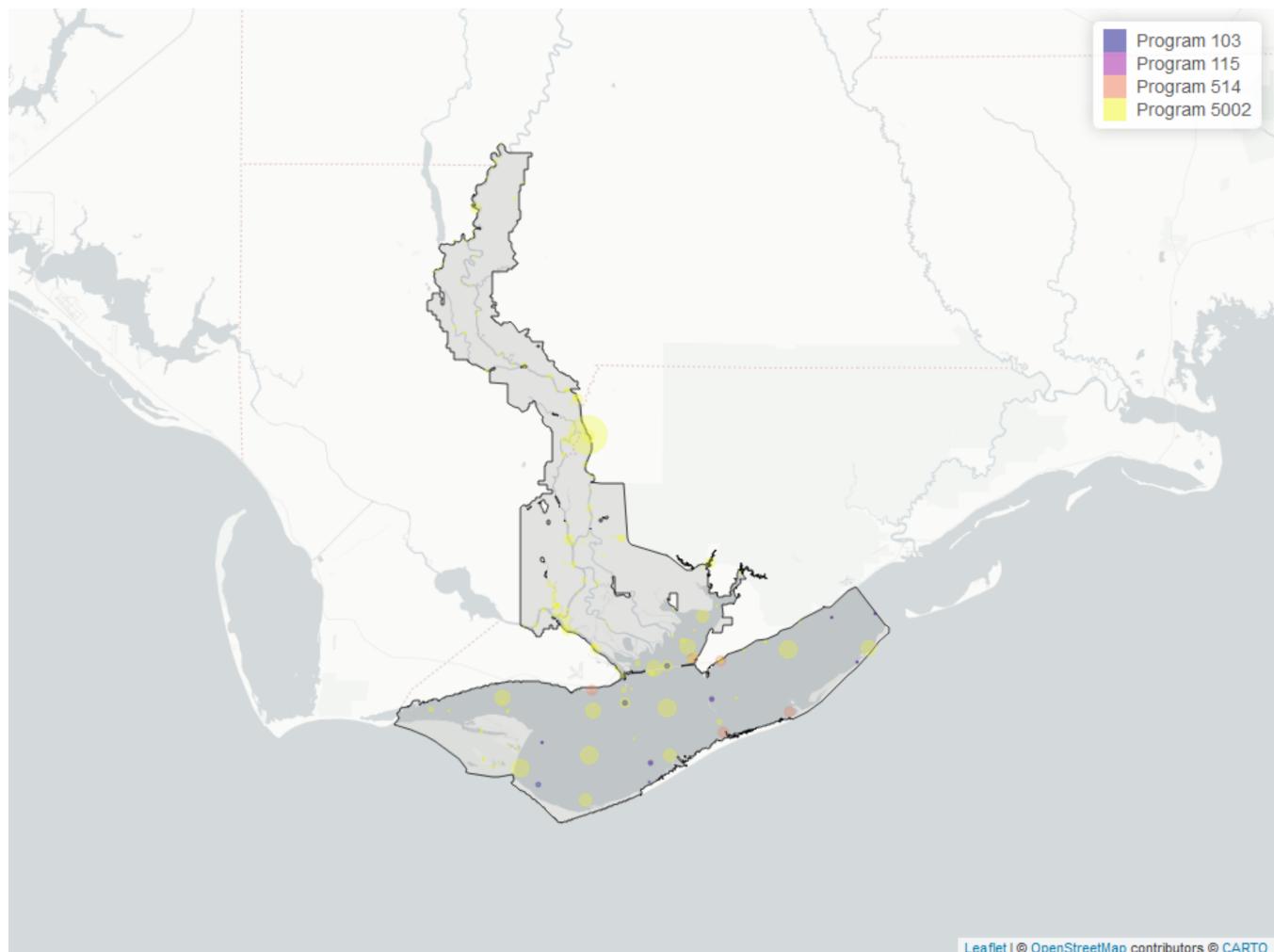


Table 18: Programs contributing data for Total Phosphorus

ProgramID	N_Data	YearMin	YearMax
5002	1145	1992	2024
514	83	2007	2008
103	26	2000	2021
115	6	2000	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 19: Value Qualifiers for Total Phosphorus

Year	N_{Total}	N_I	$perc_I$	N_Q	$perc_Q$	N_U	$perc_U$
1999	14	2	14.3				
2000	104	44	42.3			1	1.0
2001	230	97	42.2	1	0.4	11	4.8
2002	216	86	39.8			7	3.2
2003	29	15	51.7				
2007	181	66	36.5			57	31.5
2008	59	7	11.9				
2012	38	3	7.9				

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

Programs containing Value Qualified data:

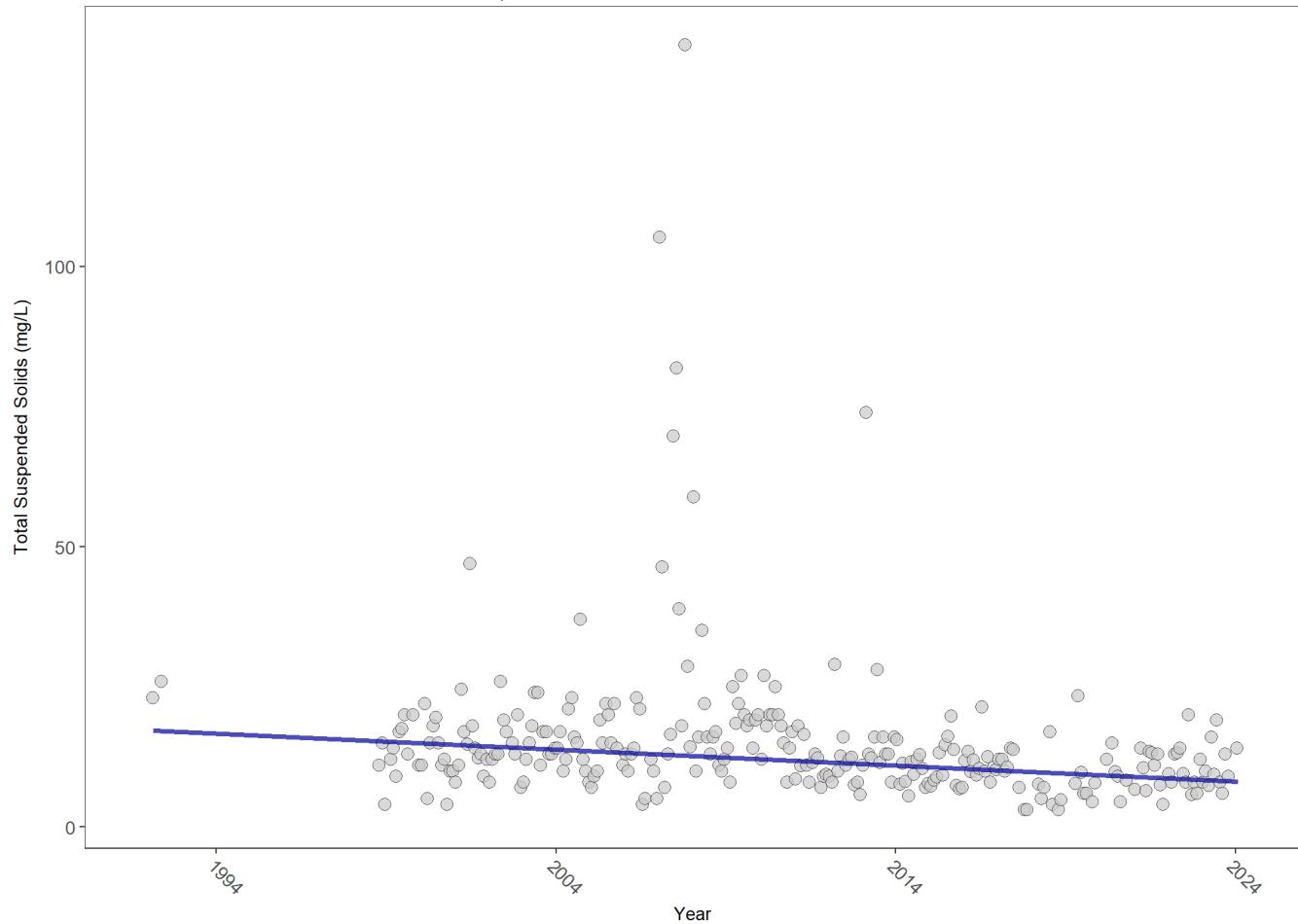
5002 - Florida STORET / WIN

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 National Estuarine Research Reserve



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1460	28	10	TRUE	-0.2624	0.0000	-0.2857143	17.20089	17.6017	0.0913	-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

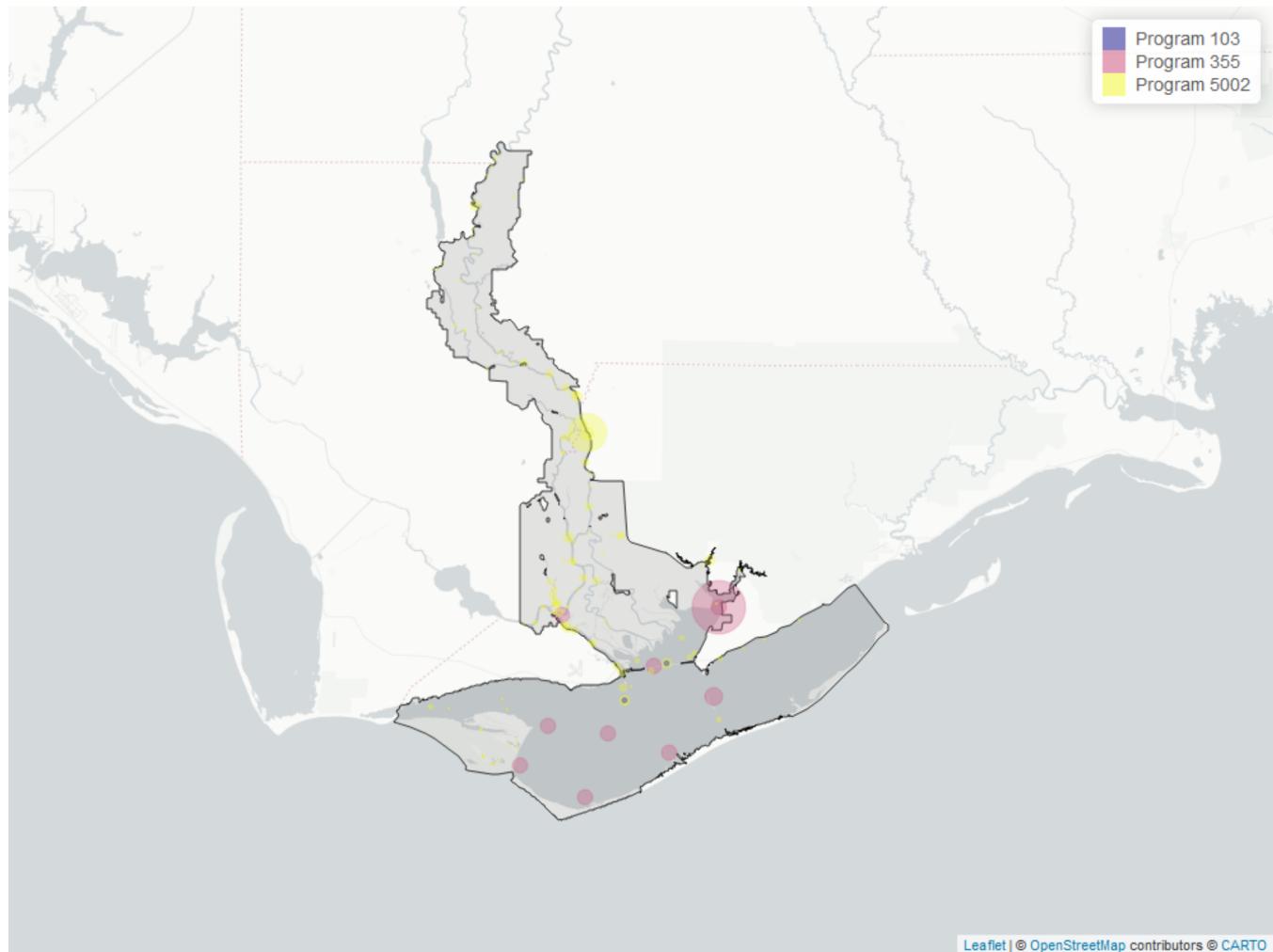


Table 20: Programs contributing data for Total Suspended Solids

ProgramID	N_Data	YearMin	YearMax
355	790	2014	2019
5002	705	1992	2024
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 21: Value Qualifiers for Total Suspended Solids

Year	$N_{_Total}$	$N_{_I}$	$perc_{_I}$	$N_{_Q}$	$perc_{_Q}$	$N_{_U}$	$perc_{_U}$
1999	14			4	28.6		
2000	13	3	23.1	1	7.7	1	7.7
2001	38	21	55.3			1	2.6
2002	12	8	66.7				
2003	12	7	58.3				
2004	12	7	58.3				
2005	11	7	63.6				
2006	12	8	66.7			1	8.3
2007	208	110	52.9			19	9.1
2008	26	8	30.8				
2009	14	5	35.7	1	7.1		
2010	13	4	30.8				
2011	27	17	63.0				
2012	31	12	38.7			3	9.7
2013	18	4	22.2				
2014	265	3	1.1				
2015	275	3	1.1				
2016	272	2	0.7				
2017	35	9	25.7				
2018	26	20	76.9				
2019	36	27	75.0				
2020	26	18	69.2			1	3.9
2021	42	17	40.5				
2022	41	22	53.7				
2023	16	7	43.8				
2024	3	1	33.3				

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

Programs containing Value Qualified data:

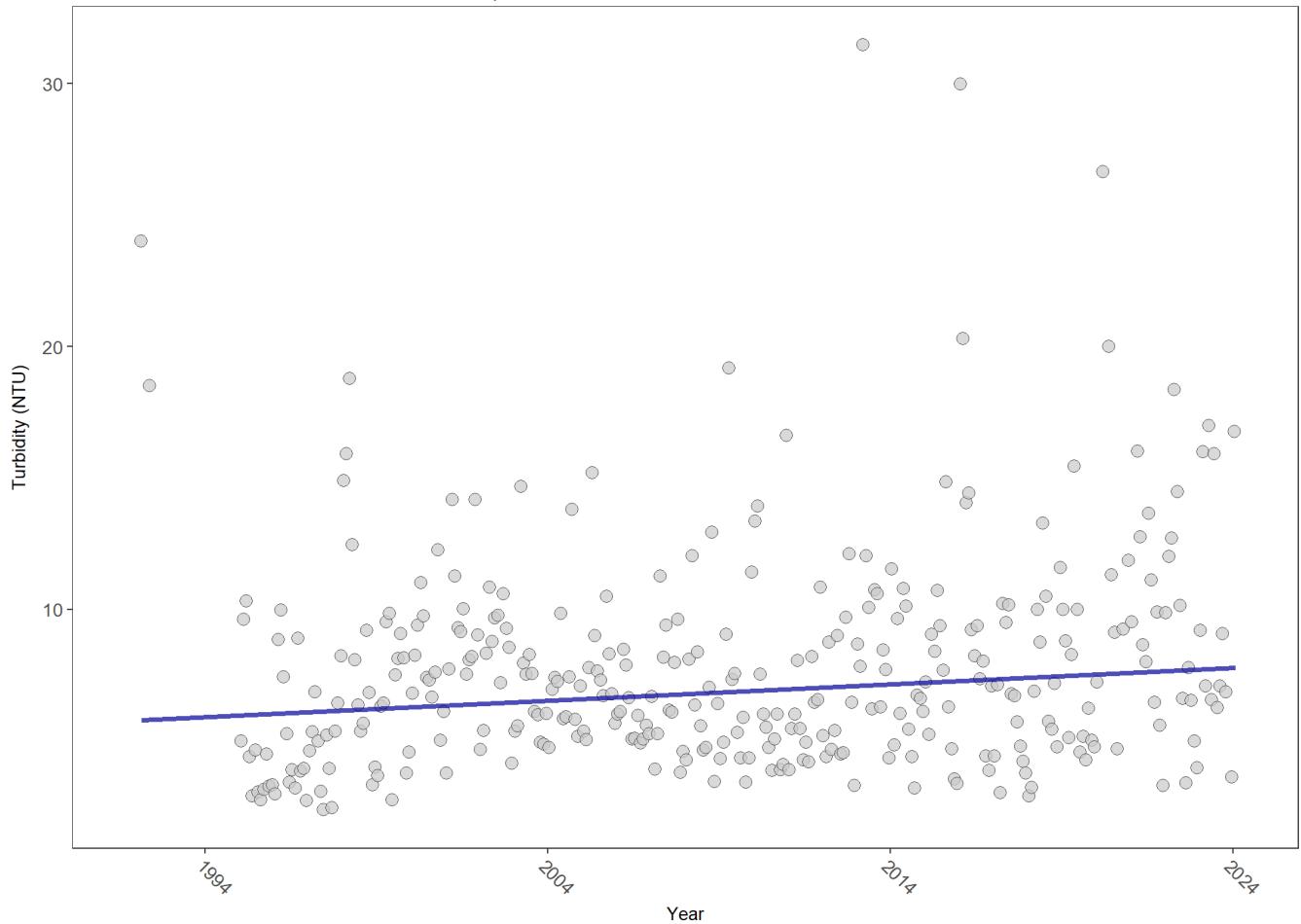
355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program
 5002 - Florida STORET / WIN

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 National Estuarine Research Reserve

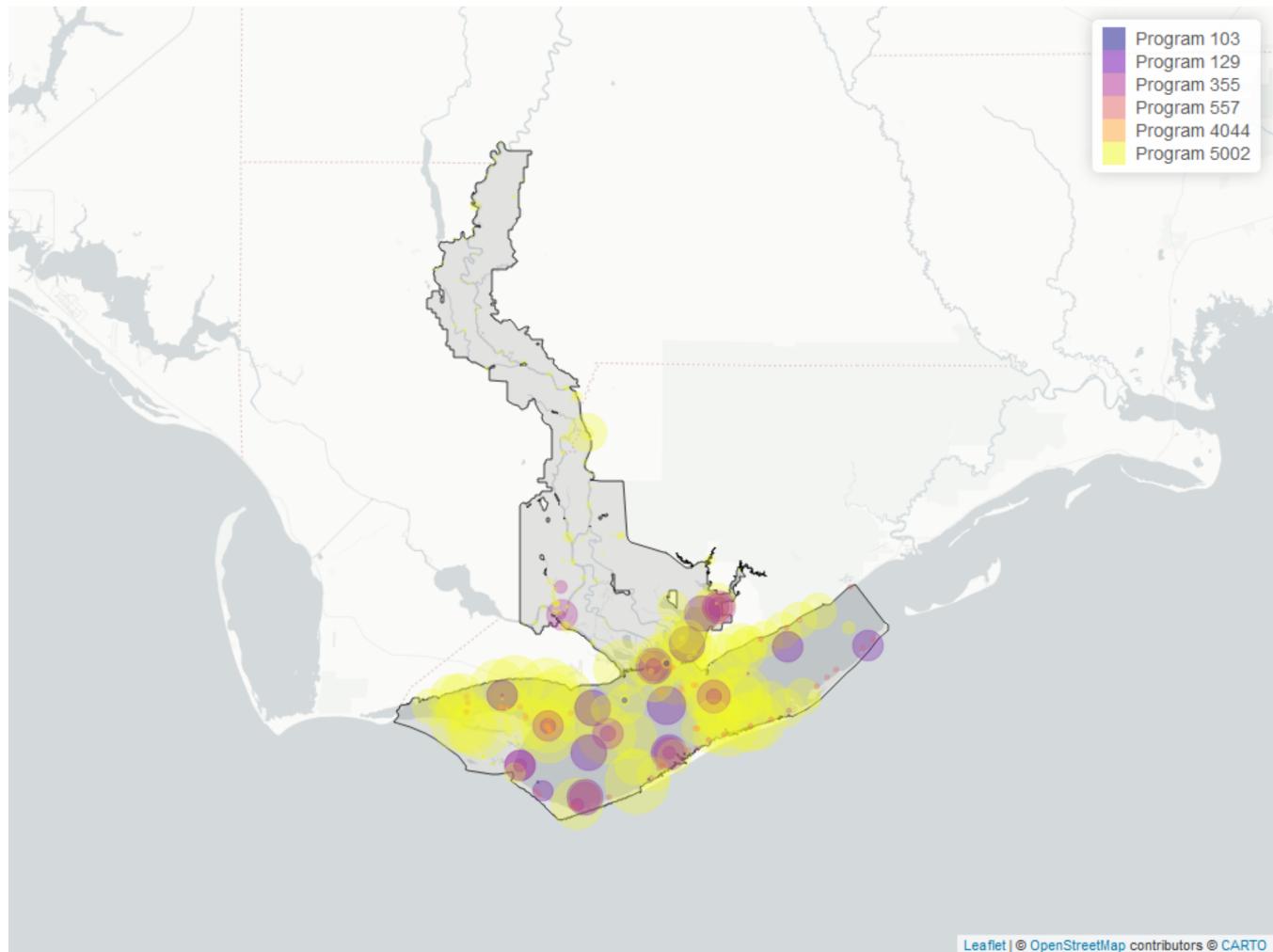


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	27233	31	5.3	TRUE	0.1275	0.0007	0.06210648	5.78663	21.0163	0.0332	1

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

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Turbidity



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

Table 22: Programs contributing data for Turbidity

ProgramID	N_Data	YearMin	YearMax
5002	22948	1992	2024
129	2253	2000	2023
355	1832	2004	2019
4044	112	2021	2023
557	78	2022	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
557 - Central Panhandle Aquatic Preserves Seagrass Monitoring
103 - EPA STOrage and RETrieval Data Warehouse (STORET)

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 23: Value Qualifiers for Turbidity

Year	N_{Total}	N_Q	$perc_Q$
2007	1195	8	0.7

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

Programs containing Value Qualified data:

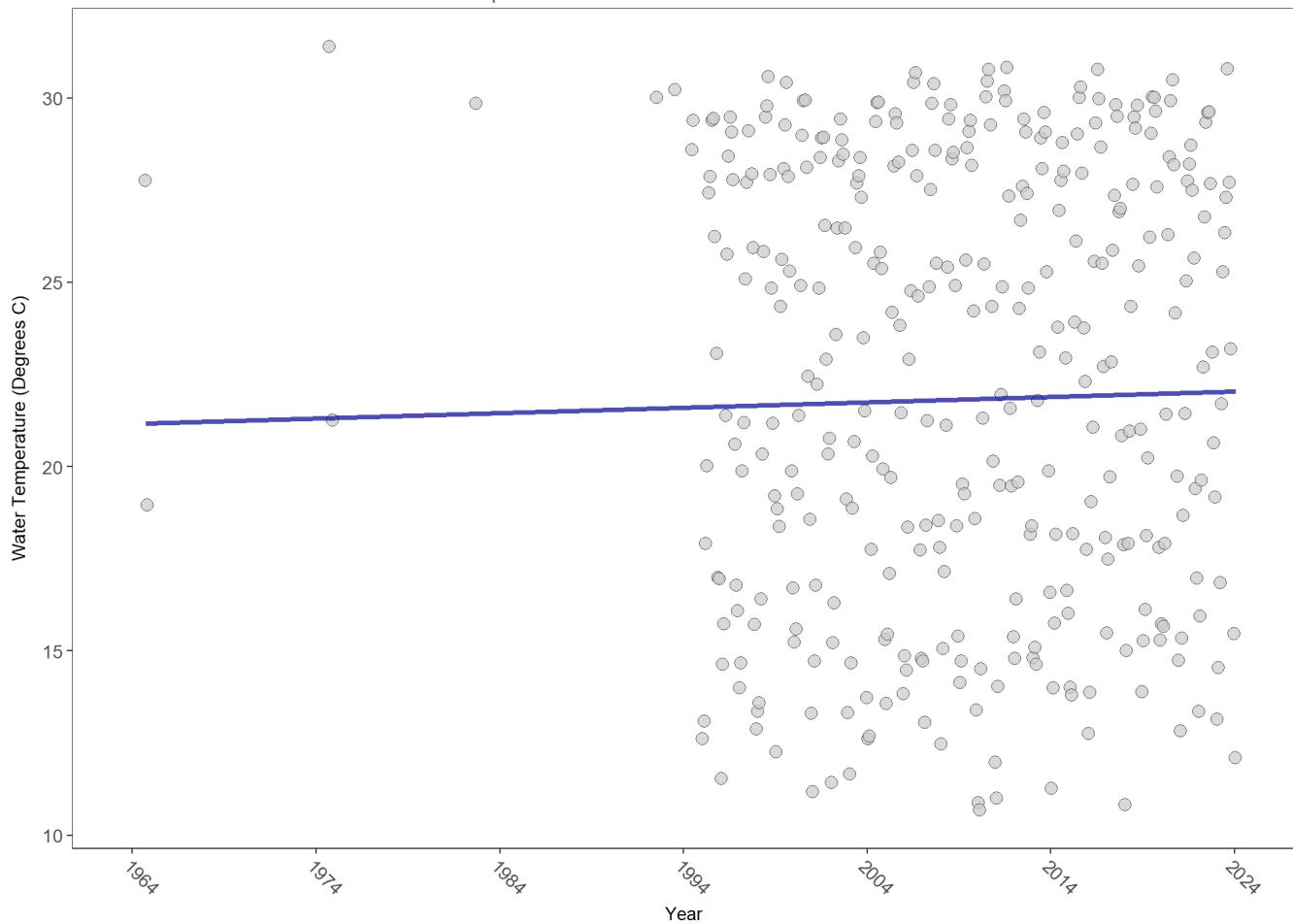
5002 - Florida STORET / WIN
355 - Apalachicola National Estuarine Research Reserve System-Wide Monitoring Program

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 National Estuarine Research Reserve

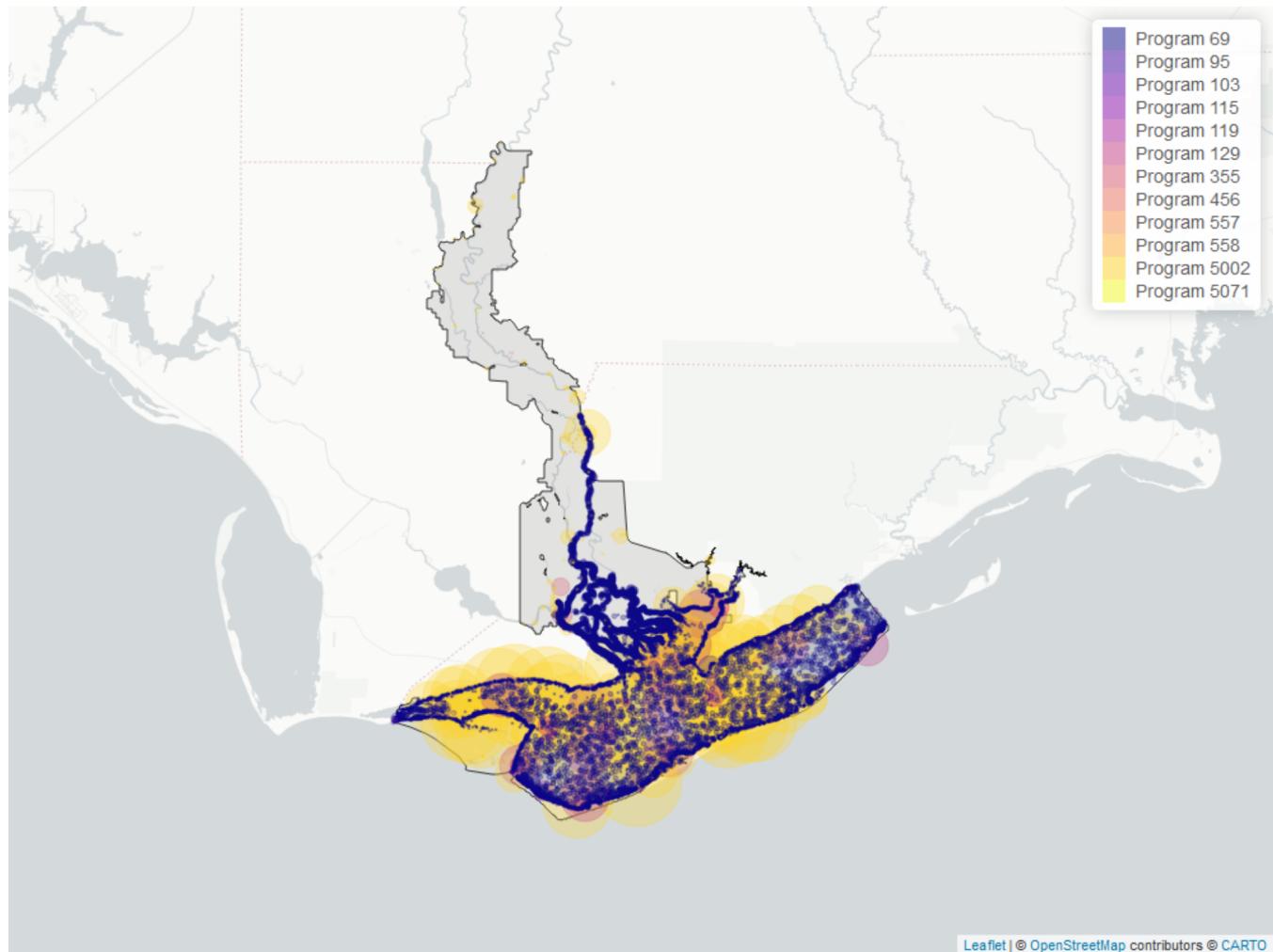


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	92448	36	23.4	TRUE	0.0822	0.0306	0.01469005	21.15822	3.4883	0.9826	1

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 24: Programs contributing data for Water Temperature

ProgramID	N_Data	YearMin	YearMax
5002	44314	1995	2024
69	41971	1998	2022
129	3961	2000	2023
355	1189	2011	2019
95	537	1964	2018
557	222	2006	2023
558	146	2008	2017
456	63	2005	2015
115	28	1992	2004
103	20	2004	2021
119	14	1994	1994
5071	4	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
558 - Franklin County Coastal Waters Seagrass Monitoring
456 - Oyster Sentinel
115 - Environmental Monitoring Assessment Program
103 - EPA STOrage and RETrieval Data Warehouse (STORET)
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 National Estuarine Research Reserve

Water Quality - Continuous

The following files were used in the continuous analysis:

- *Combined_WQ_WC_NUT_cont_Dissolved_Oxygen_NW-2024-Jul-02.txt*
- *Combined_WQ_WC_NUT_cont_Dissolved_Oxygen_Saturation_NW-2024-Jul-02.txt*
- *Combined_WQ_WC_NUT_cont_pH_NW-2024-Jul-02.txt*
- *Combined_WQ_WC_NUT_cont_Salinity_NW-2024-Jul-02.txt*
- *Combined_WQ_WC_NUT_cont_Turbidity_NW-2024-Jul-02.txt*
- *Combined_WQ_WC_NUT_cont_Water_Temperature_NW-2024-Jul-02.txt*

Table 25: 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>
apabpwq	5	TRUE	DO , DOS , pH , Sal , Turb , TempW
apacpwq	23	TRUE	DO , DOS , pH , Sal , Turb , TempW
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

Table 26: National Data Buoy Center (5)

<i>ProgramLocationID</i>	<i>Years of Data</i>	<i>Use in Analysis</i>	<i>Parameters</i>
APCF1	20	TRUE	TempW



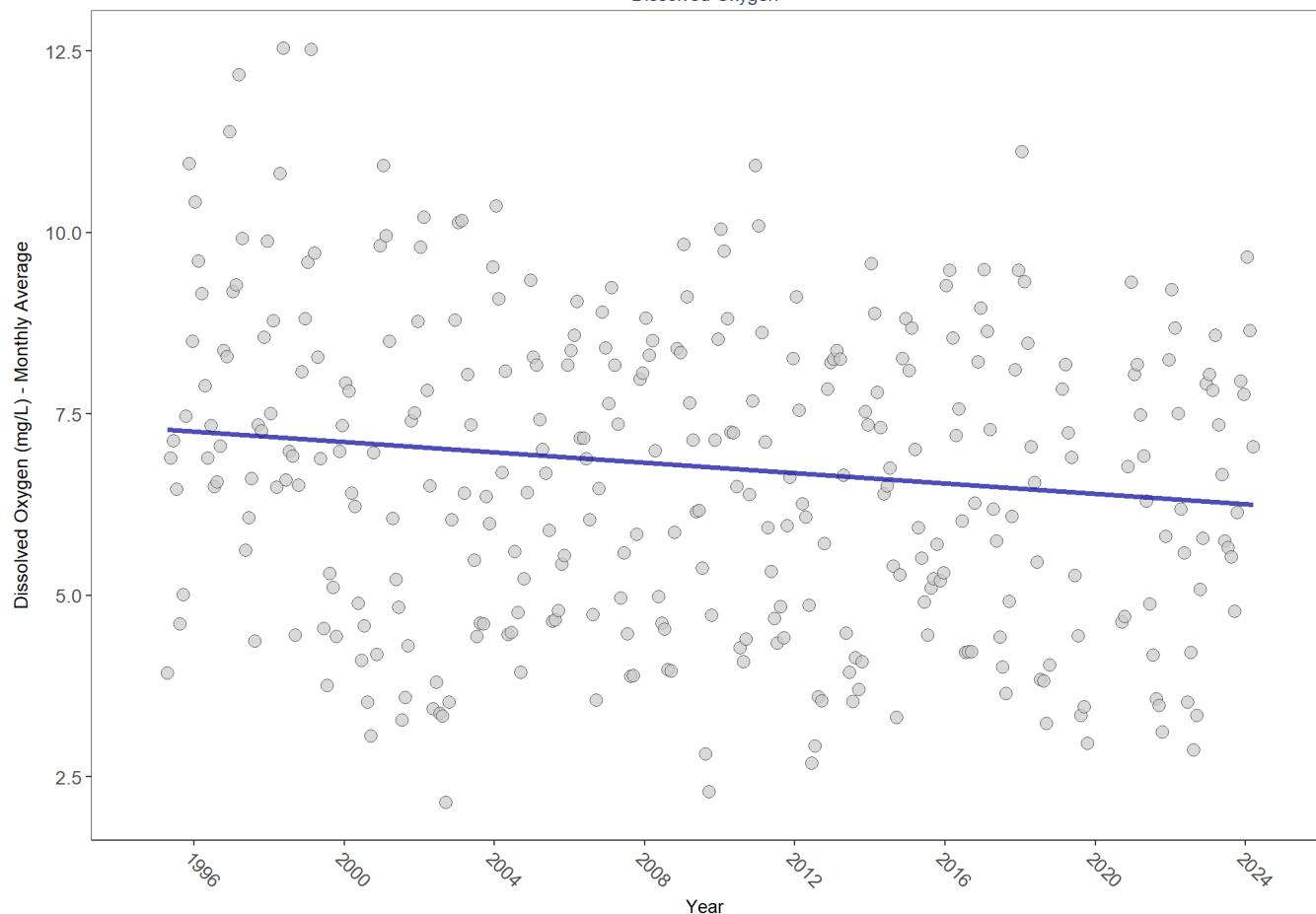
Map showing Continuous Water Quality Monitoring sampling locations within the boundaries of Apalachicola National Estuarine Research Reserve. Sites marked as *Use In Analysis* are featured in this report.

Dissolved Oxygen - Continuous Water Quality

apaeswq

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

Apalachicola National Estuarine Research Reserve
apaeswq
Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	685724	30	6.8	TRUE	-0.1908	0.0000	-0.0358822	7.297669	7.5861	0.7498	-1

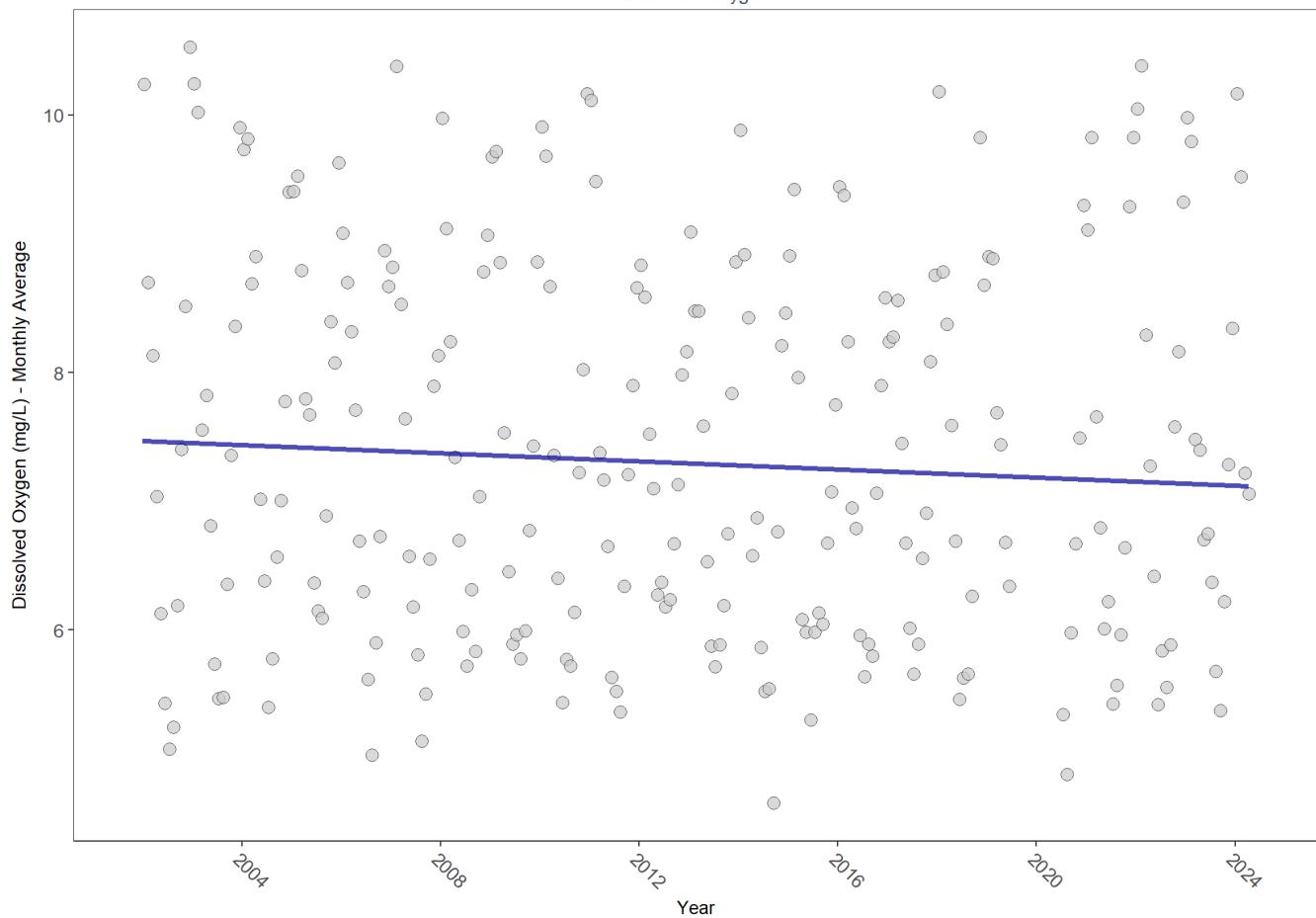
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apadbwq

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

Apalachicola National Estuarine Research Reserve
apadbwq
Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	594252	23	7.3	TRUE	-0.1424	0.0017	-0.01586005	7.470136	11.3184	0.417	-1

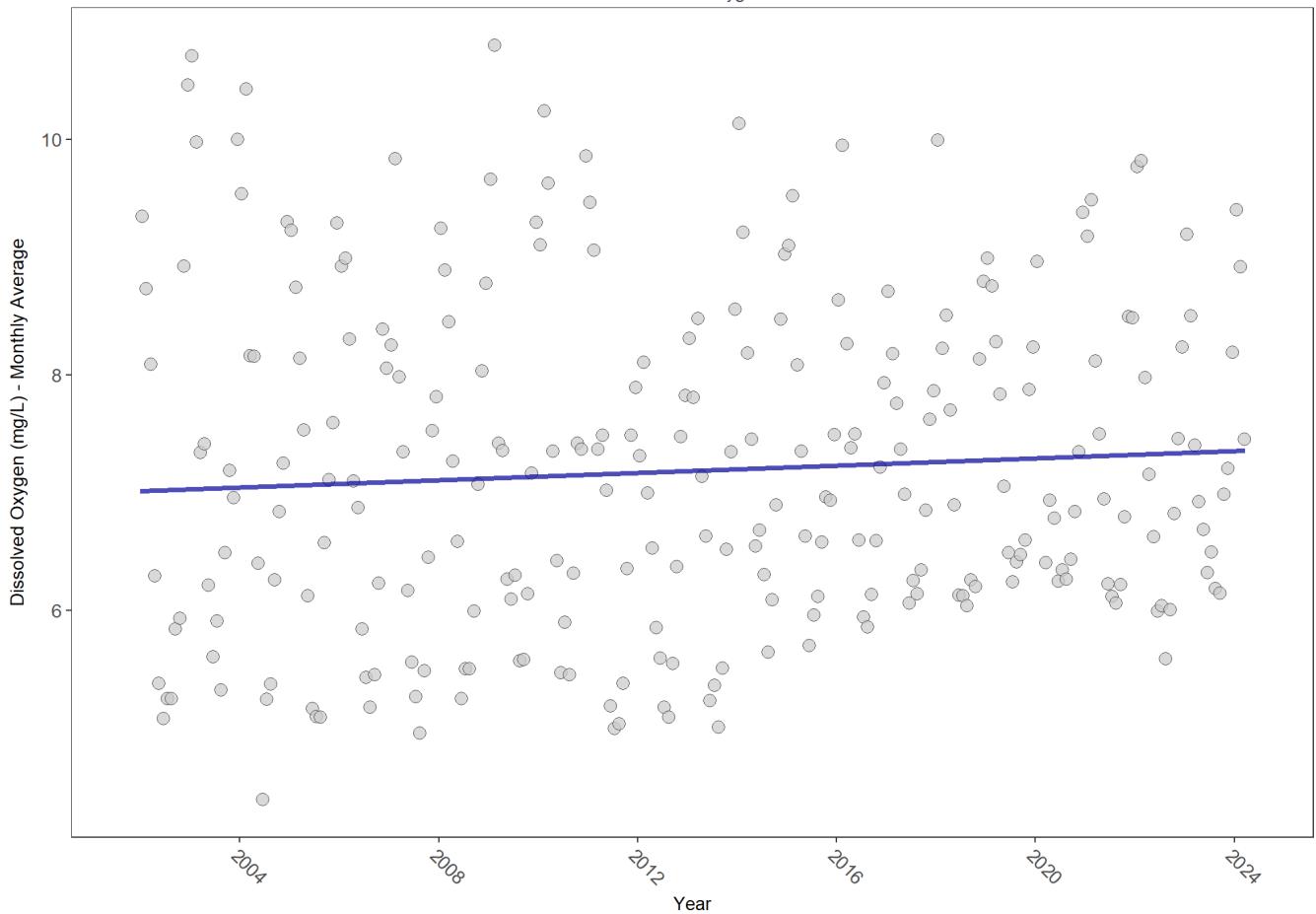
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apacpwq

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

Apalachicola National Estuarine Research Reserve
apacpwq
Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	587912	23	7.1	TRUE	0.1352	0.0025	0.01541004	7.011855	37.1041	0.0001	1

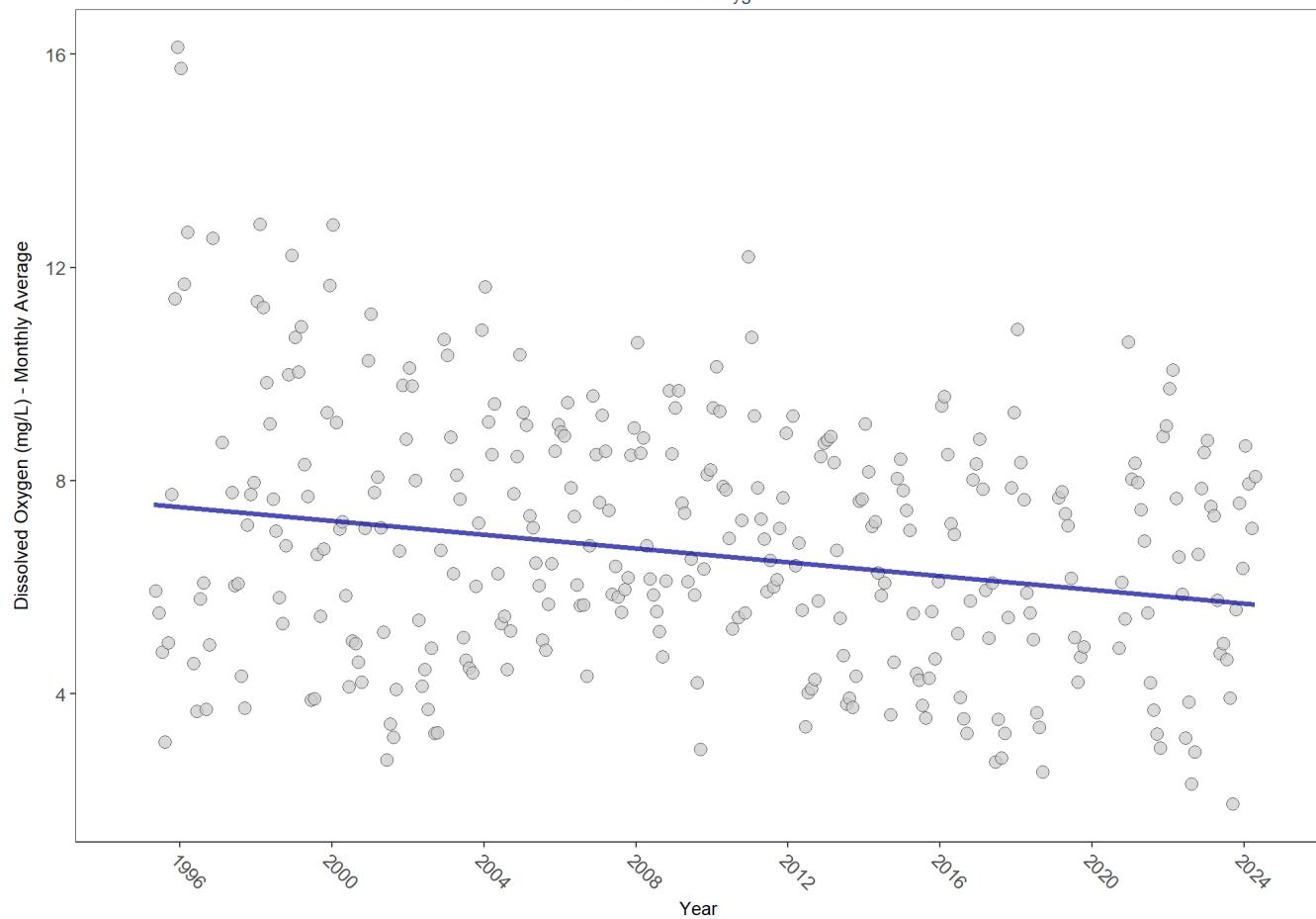
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apaebwq

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

Apalachicola National Estuarine Research Reserve
apaebwq
Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	636636	30	6.9	TRUE	-0.2903	0.0000	-0.06445053	7.568381	8.2748	0.6885	-1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

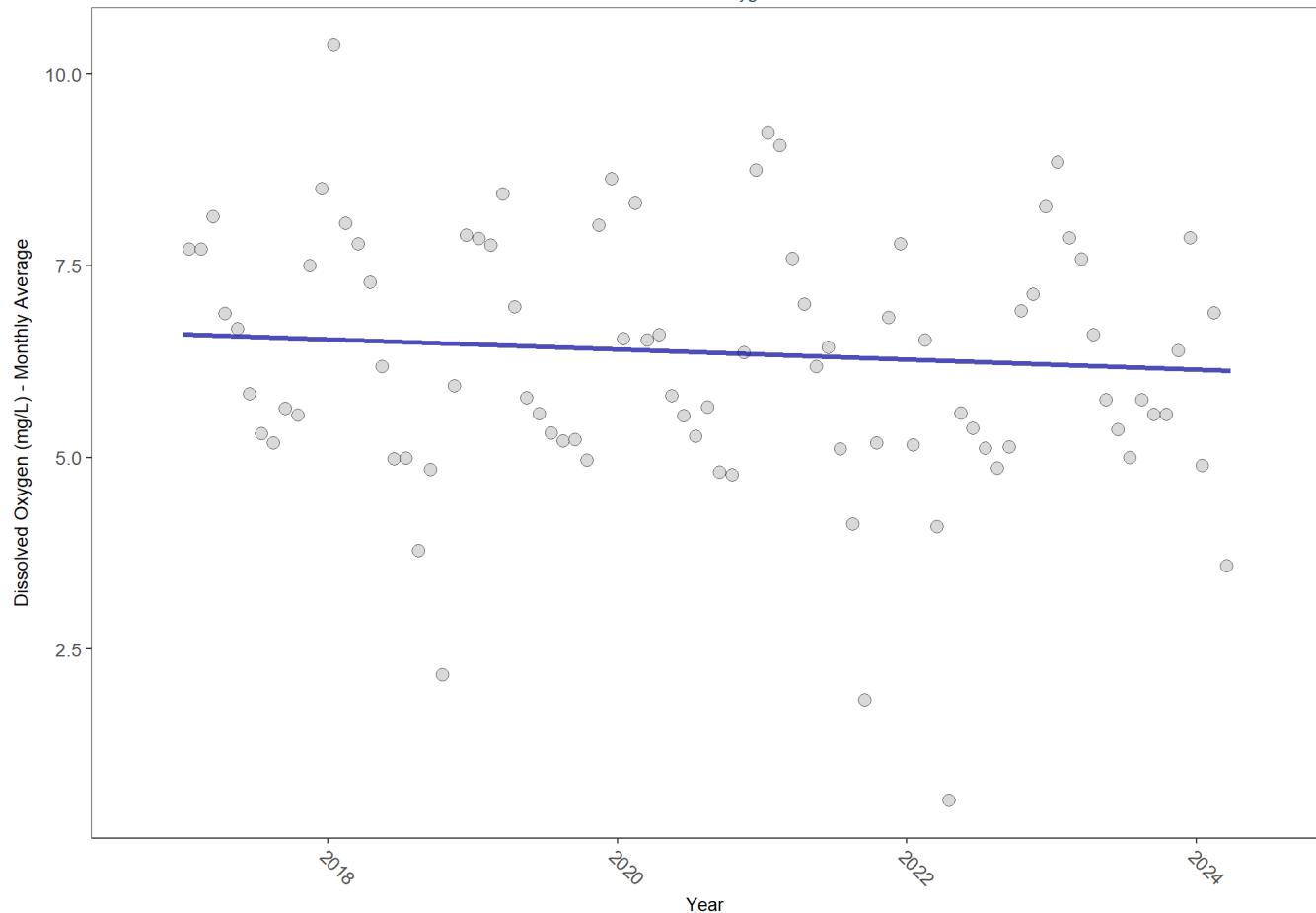
apalmwq

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

Apalachicola National Estuarine Research Reserve

apalmwq

Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	233443	8	6.4	TRUE	-0.1866	0.0330	-0.06635305	6.608815	11.4975	0.4026	-1

p < 0.00005 appear as 0 due to rounding.

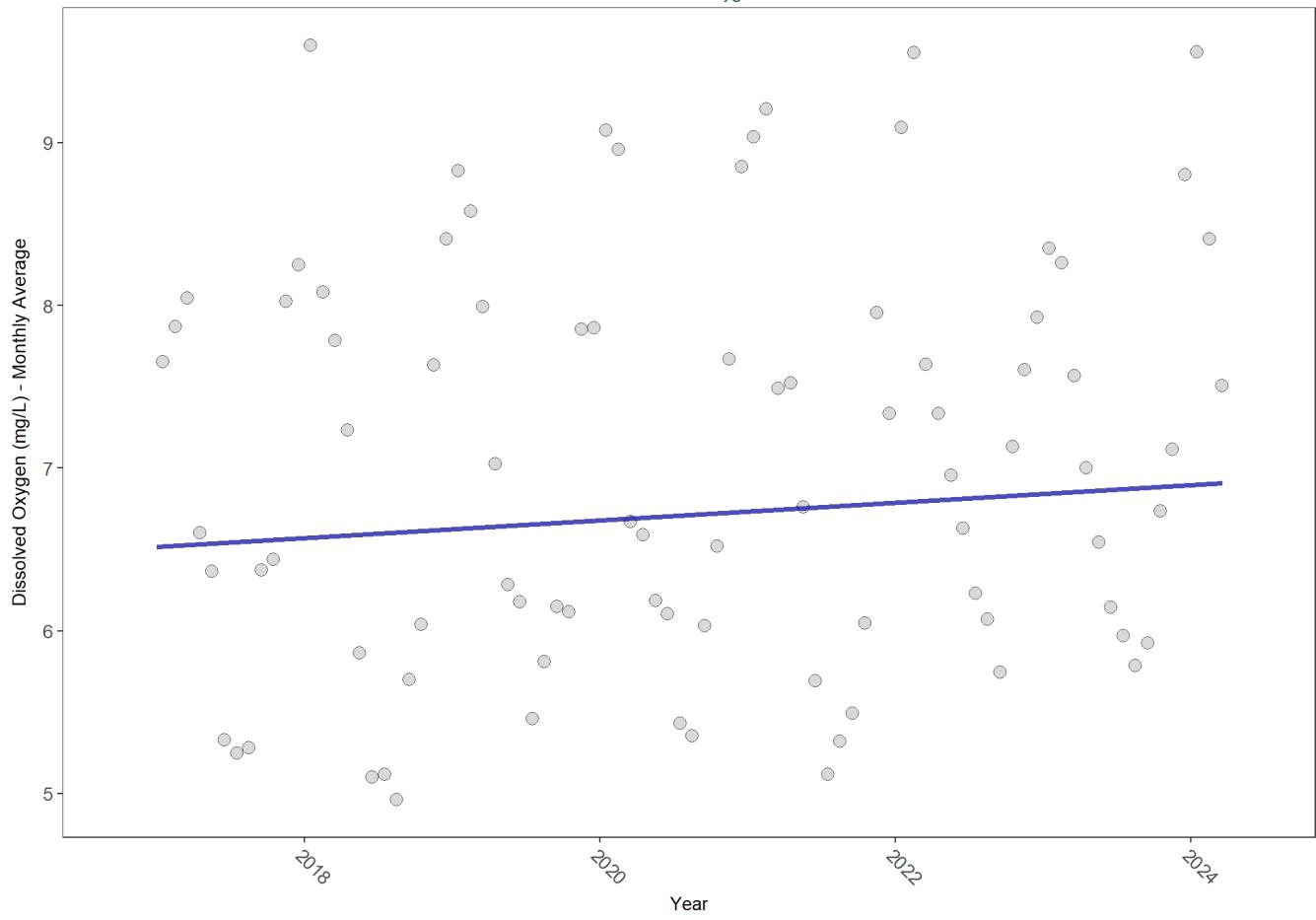
SennIntercept is intercept value at beginning of record for monitoring location

apapcwq

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

Apalachicola National Estuarine Research Reserve

apapcwq
Dissolved Oxygen



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

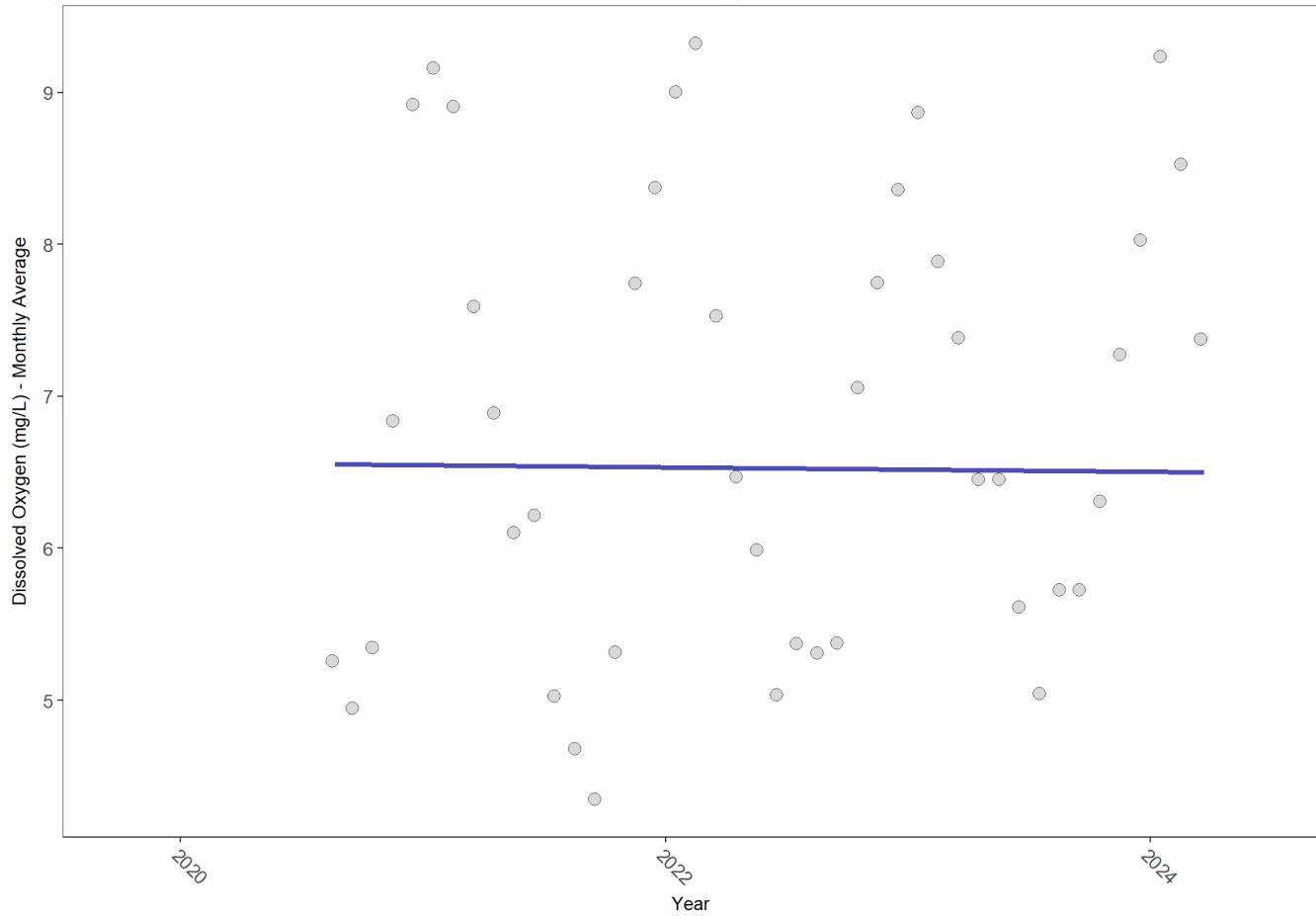
SennIntercept is intercept value at beginning of record for monitoring location

apabpwq

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

Apalachicola National Estuarine Research Reserve

apabpwq
Dissolved Oxygen



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	121641	5	6.7	TRUE	-0.0758	0.7434	-0.01432615	6.563153	16.4097	0.1266	0

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

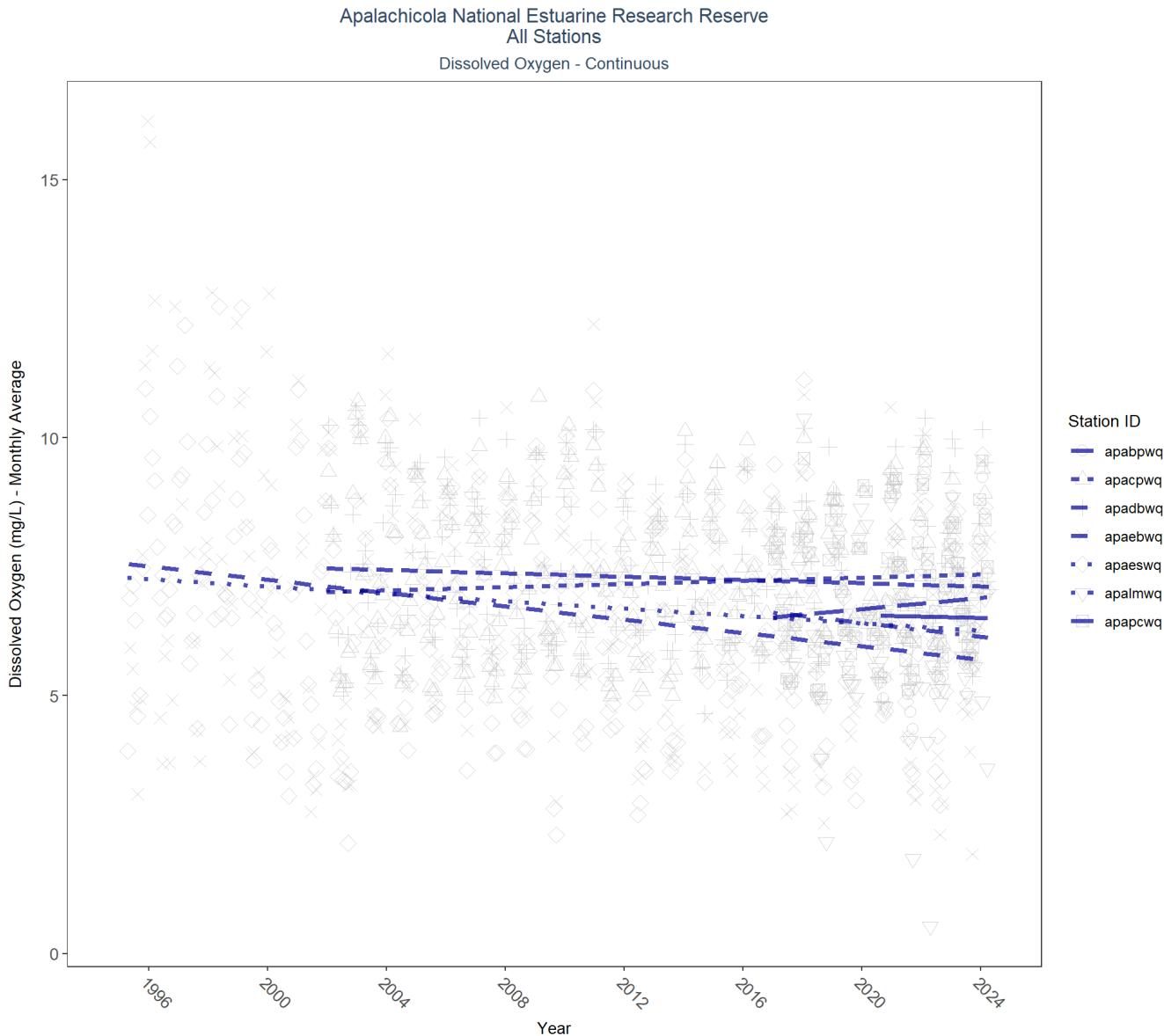


Table 27: Seasonal Kendall-Tau Results for All Stations - Dissolved Oxygen

Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
apaeswq	685724	30	1995 - 2024	6.8	-0.19	7.30	-0.04	0.0000
apadbwq	594252	23	2002 - 2024	7.3	-0.14	7.47	-0.02	0.0017
apacpwd	587912	23	2002 - 2024	7.1	0.14	7.01	0.02	0.0025
apaebwq	636636	30	1995 - 2024	6.9	-0.29	7.57	-0.06	0.0000
apalmwd	233443	8	2017 - 2024	6.4	-0.19	6.61	-0.07	0.0330
apapcqw	236584	8	2017 - 2024	7.0	0.14	6.52	0.05	0.1400
apabpwq	121641	5	2020 - 2024	6.7	-0.08	6.56	-0.01	0.7434

Dissolved Oxygen Saturation - Continuous Water Quality

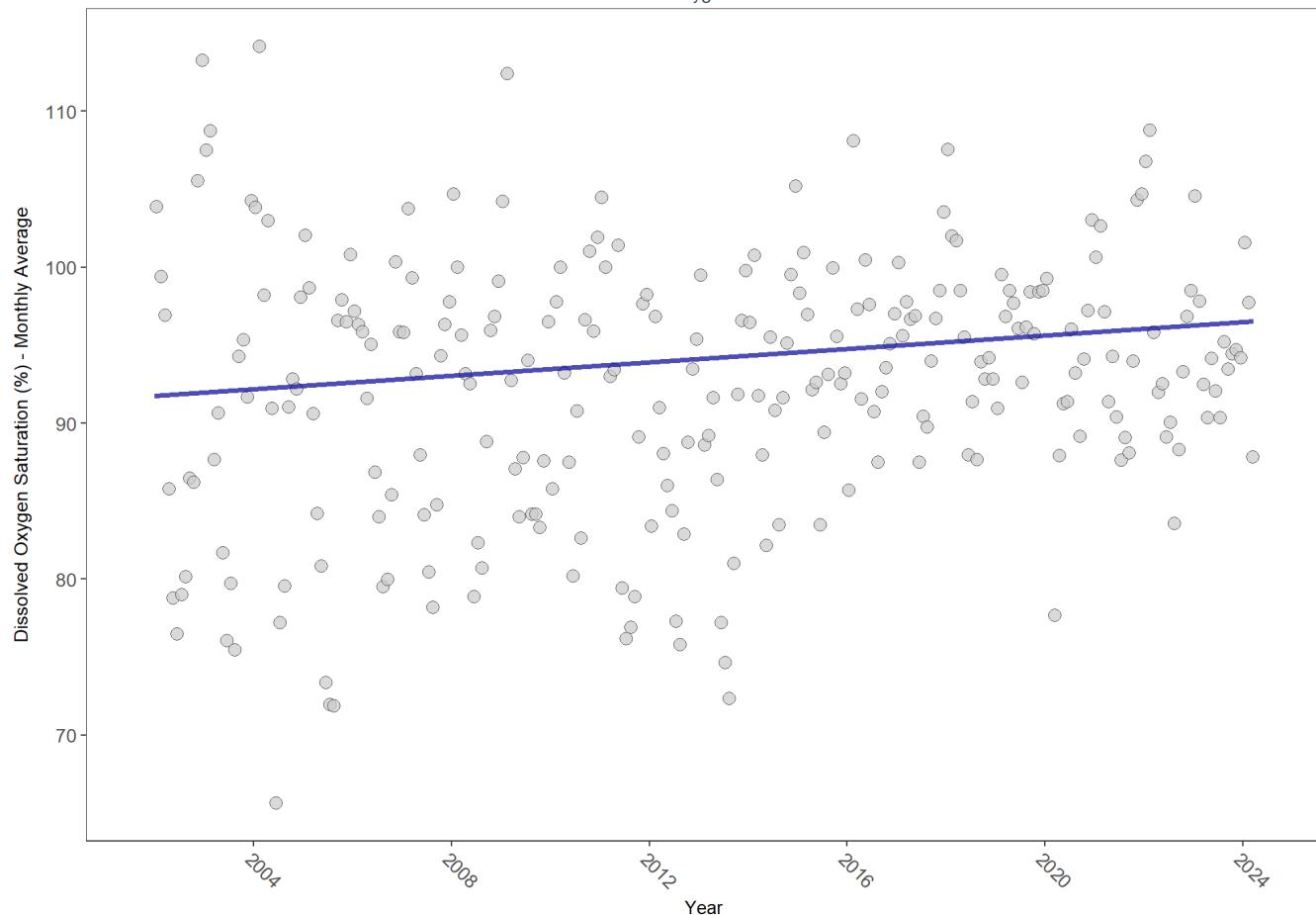
apacpwq

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

Apalachicola National Estuarine Research Reserve

apacpwq

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	589440	23	94.1	TRUE	0.1671	0.0002	0.2148468	91.75591	25.9299	0.0066	1

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

SennIntercept is intercept value at beginning of record for monitoring location

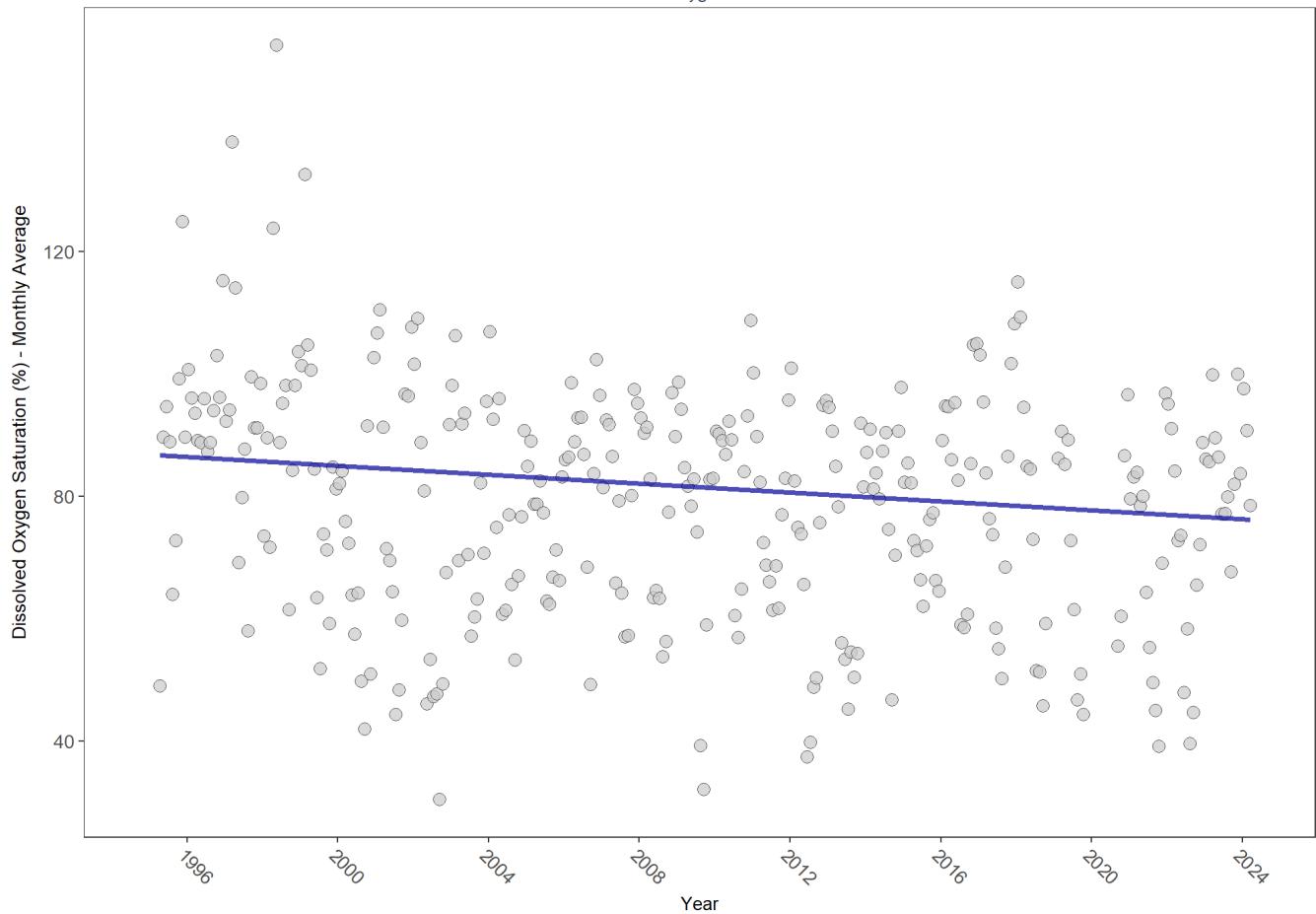
apaeswq

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

Apalachicola National Estuarine Research Reserve

apaeswq

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	686888	30	83.9	TRUE	-0.1496	0.0001	-0.3605238	86.73909	8.2838	0.6877	-1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

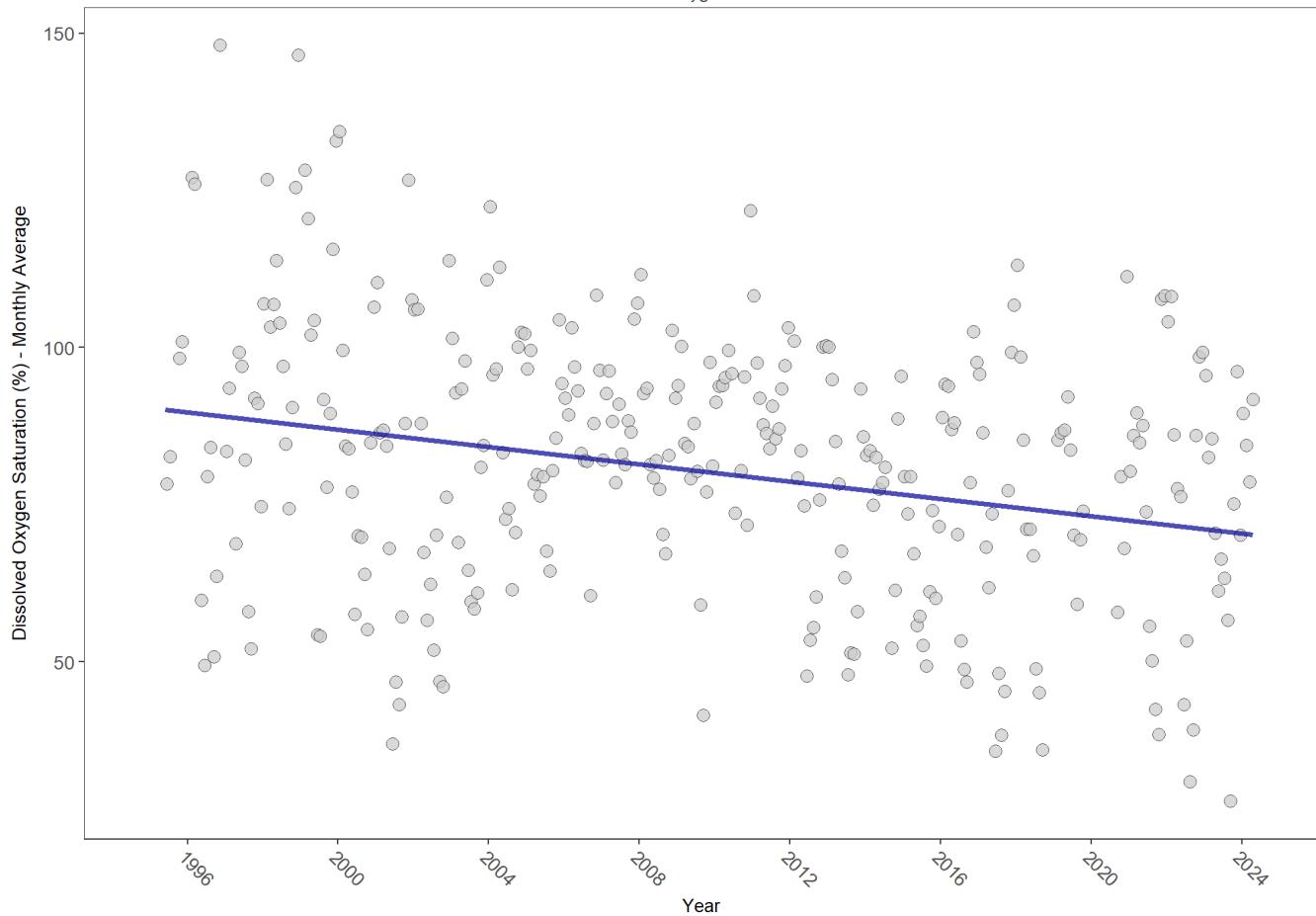
apaebwq

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

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apaebwq

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	632462	30	85	TRUE	-0.2663	0.0000	-0.6910223	90.43737	4.7687	0.9418	-1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

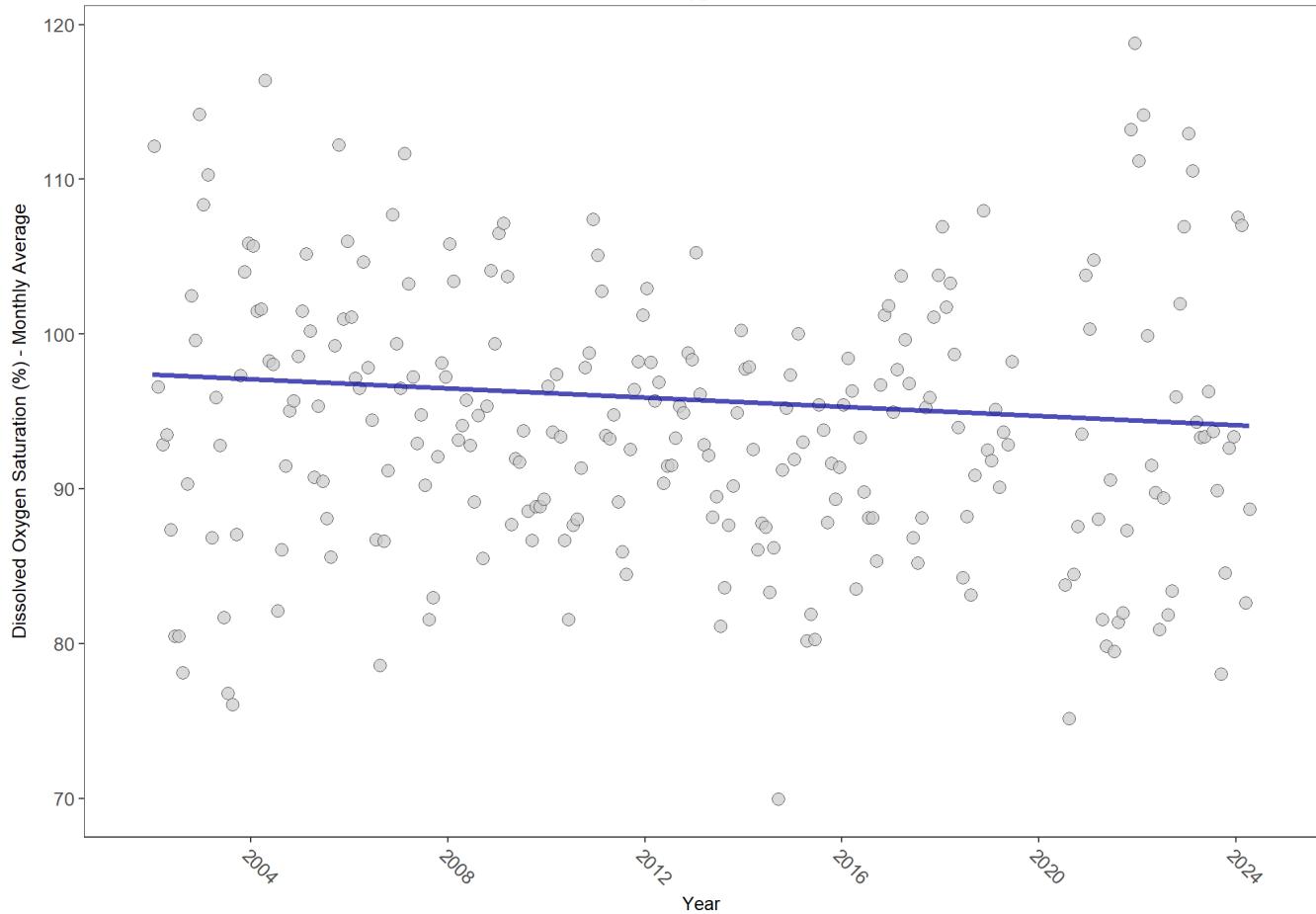
apadbwq

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

Apalachicola National Estuarine Research Reserve

apadbwq

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	597701	23	94.8	TRUE	-0.0959	0.0360	-0.1490784	97.38575	12.5427	0.3243	-1

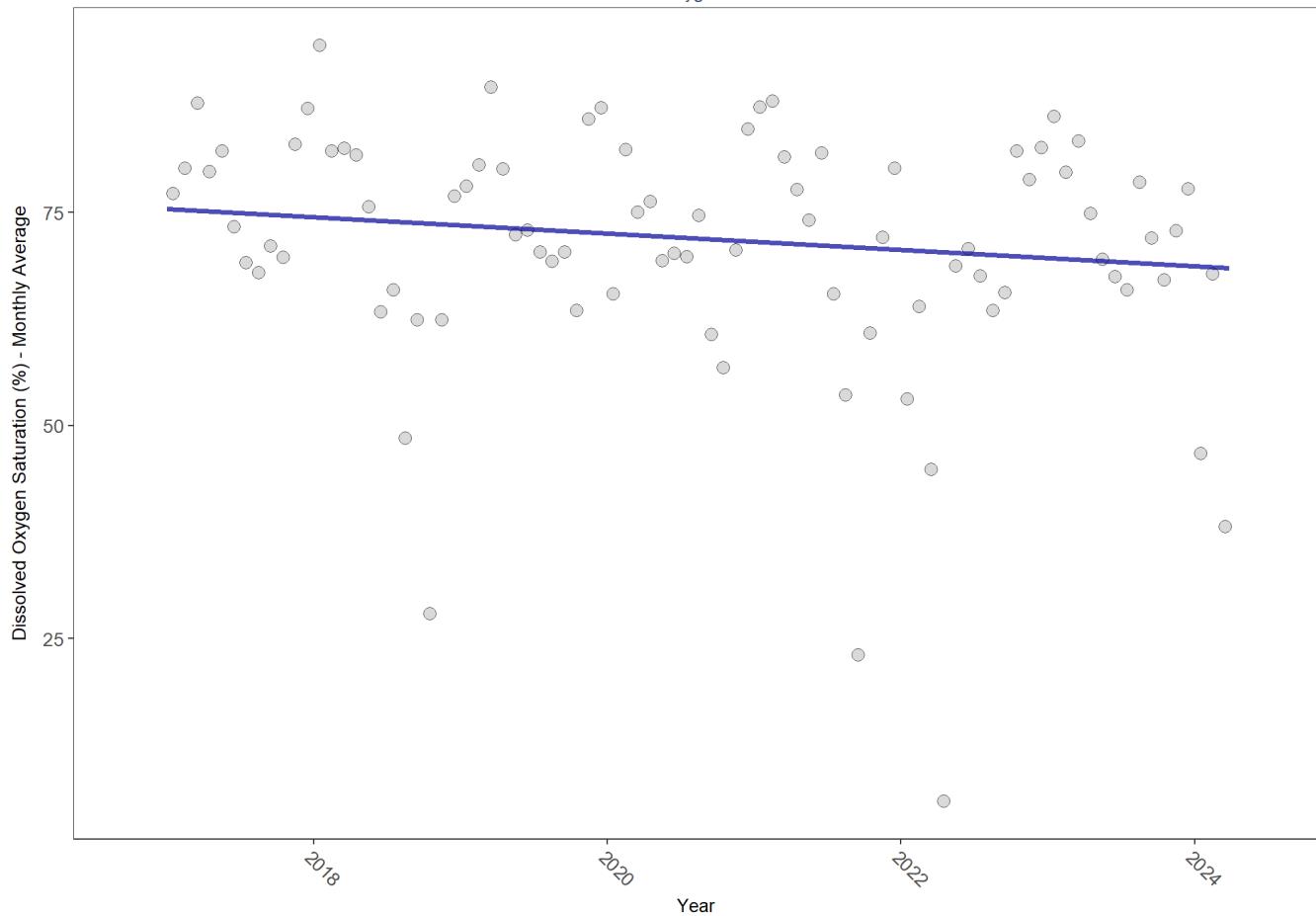
$p < 0.00005$ appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apalmwq

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

Apalachicola National Estuarine Research Reserve
apalmwq
Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	233379	8	74.9	TRUE	-0.2096	0.0174	-0.9532034	75.37145	10.8691	0.4543	-1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

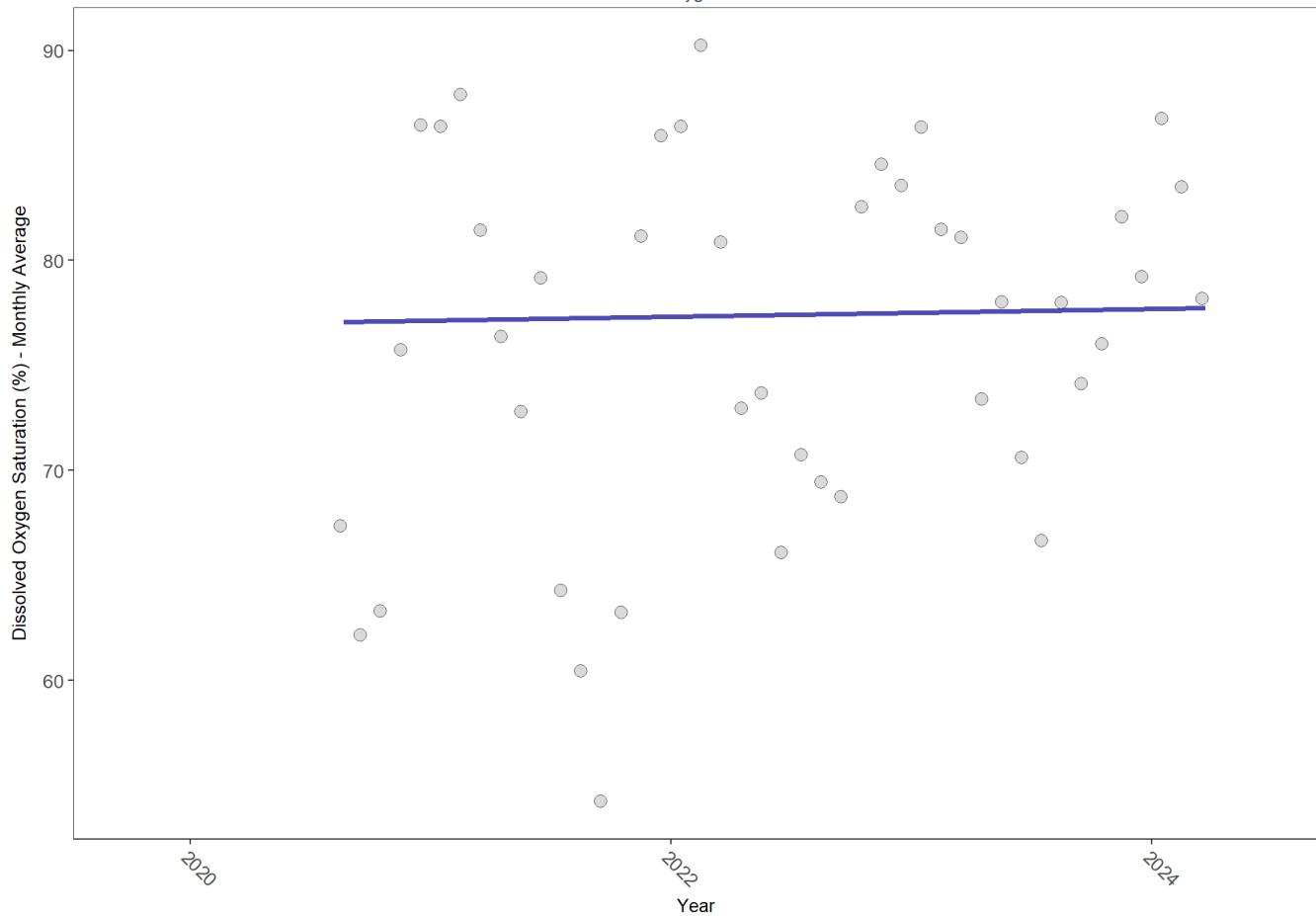
apabpwq

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

Apalachicola National Estuarine Research Reserve

apabpwq

Dissolved Oxygen Saturation



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	121641	5	77	TRUE	0.1061	0.5854	0.1939583	76.9296	15.7145	0.1521	0

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

SennIntercept is intercept value at beginning of record for monitoring location

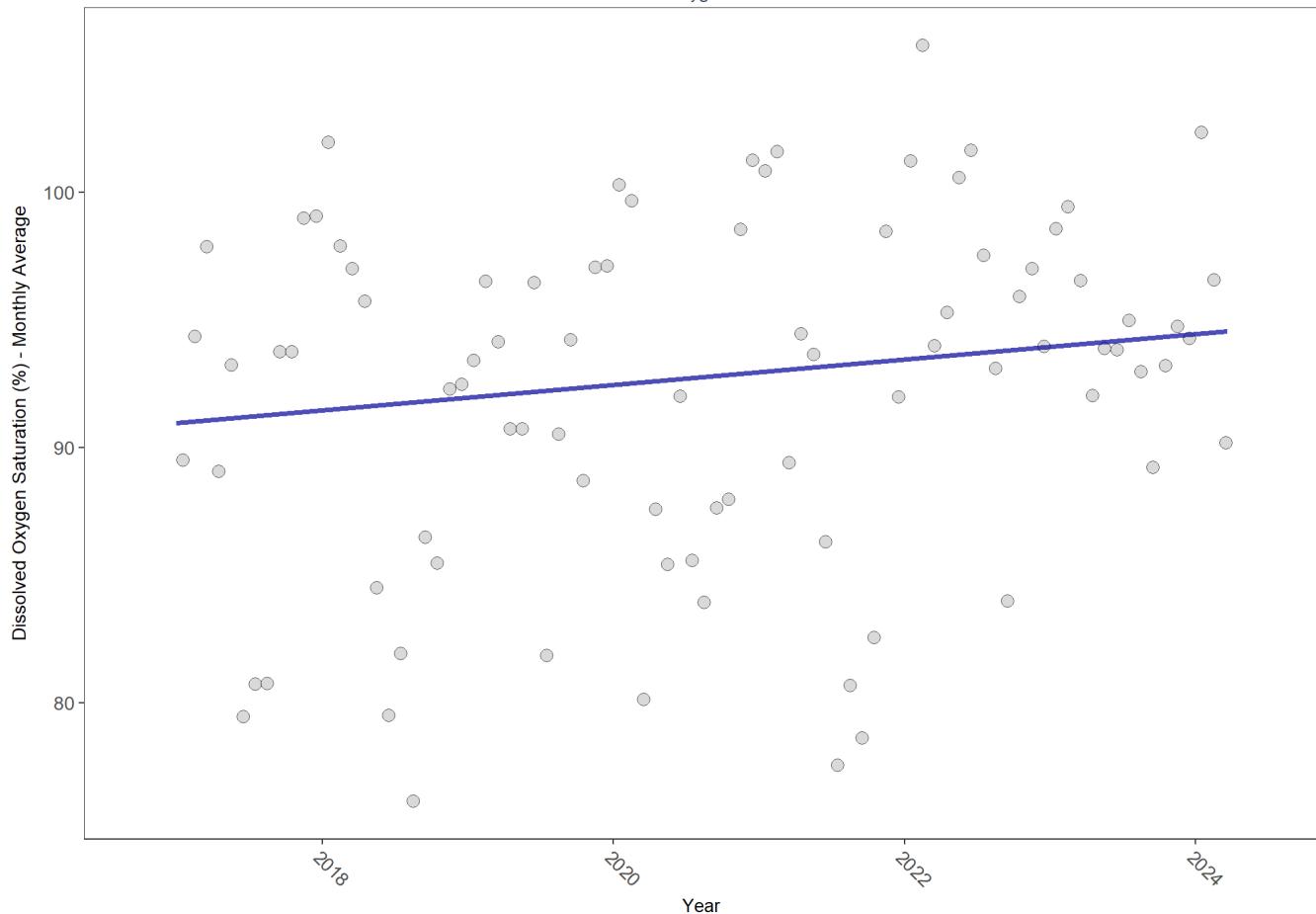
apapcwq

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

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apapcwq

Dissolved Oxygen Saturation



p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

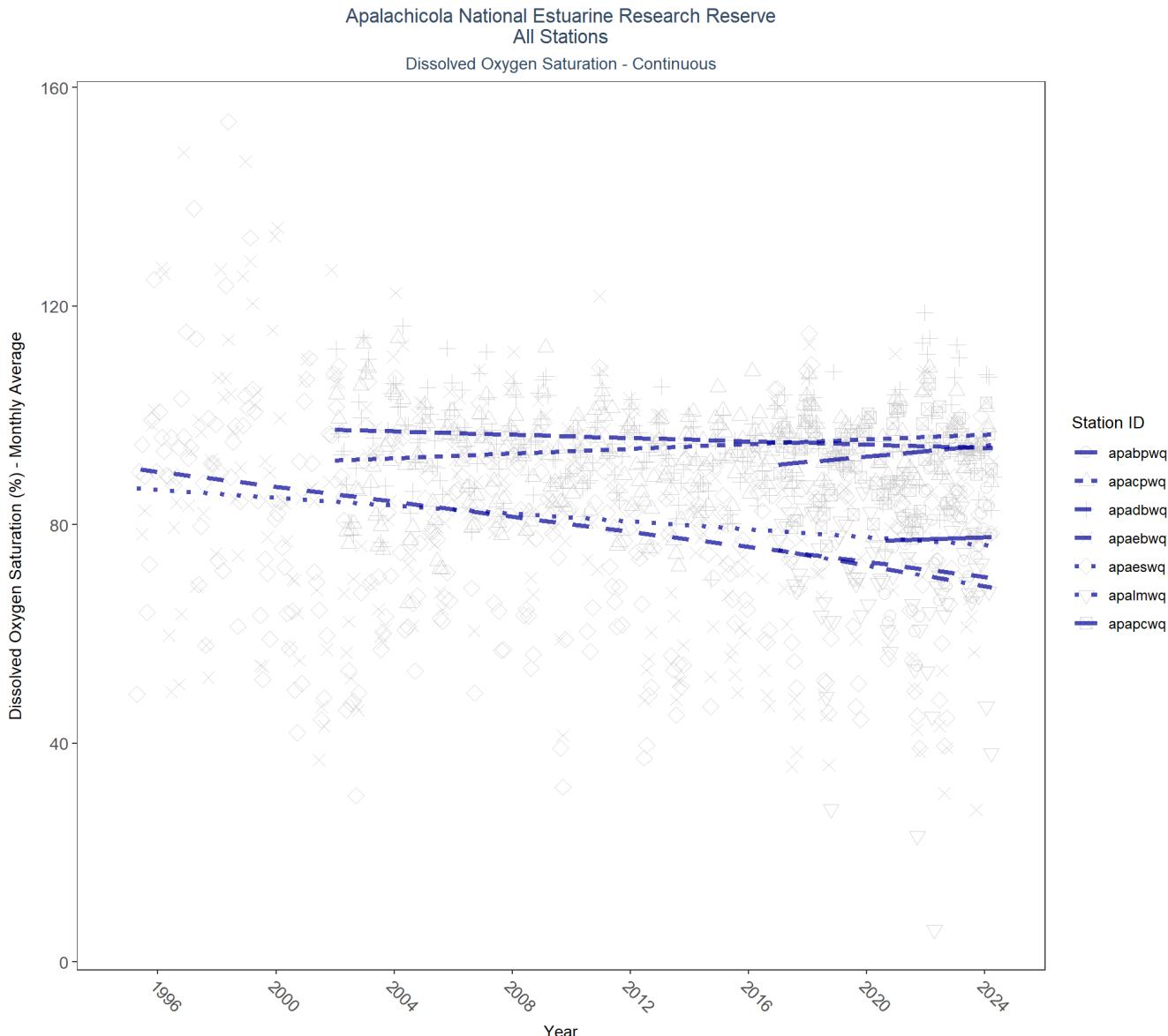


Table 28: Seasonal Kendall-Tau Results for All Stations - Dissolved Oxygen Saturation

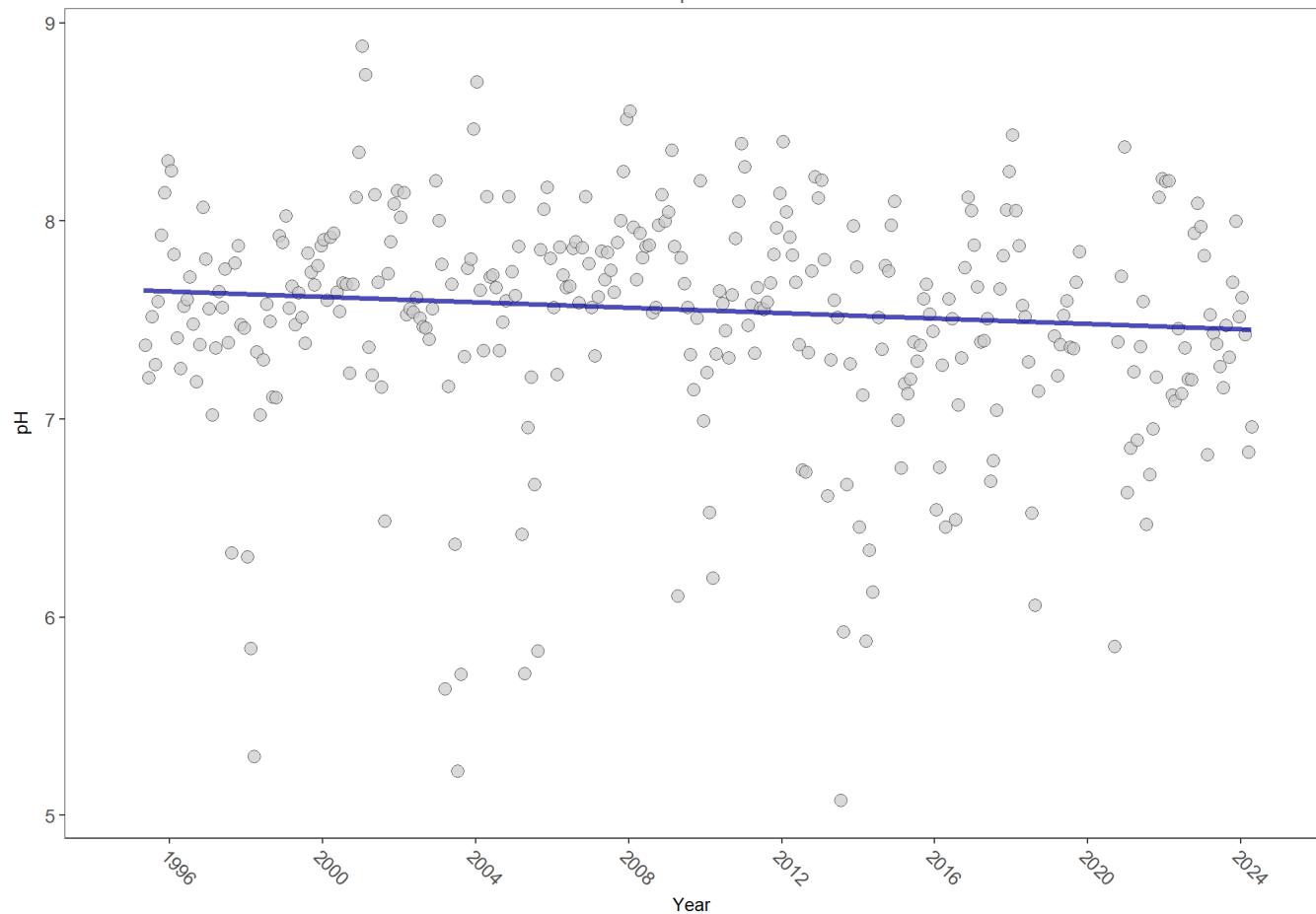
Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
apacpwd	589440	23	2002 - 2024	94.1	0.17	91.76	0.21	0.0002
apaeswq	686888	30	1995 - 2024	83.9	-0.15	86.74	-0.36	0.0001
apaebwq	632462	30	1995 - 2024	85.0	-0.27	90.44	-0.69	0.0000
apadbwq	597701	23	2002 - 2024	94.8	-0.10	97.39	-0.15	0.0360
apalmwd	233379	8	2017 - 2024	74.9	-0.21	75.37	-0.95	0.0174
apabpwq	121641	5	2020 - 2024	77.0	0.11	76.93	0.19	0.5854
apapcqw	240040	8	2017 - 2024	94.4	0.15	90.96	0.50	0.1010

pH - Continuous Water Quality

apaebwq

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

Apalachicola National Estuarine Research Reserve
apaebwq
pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	689204	30	7.6	TRUE	-0.1182	0.0022	-0.00682522	7.653363	5.5944	0.899	-1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

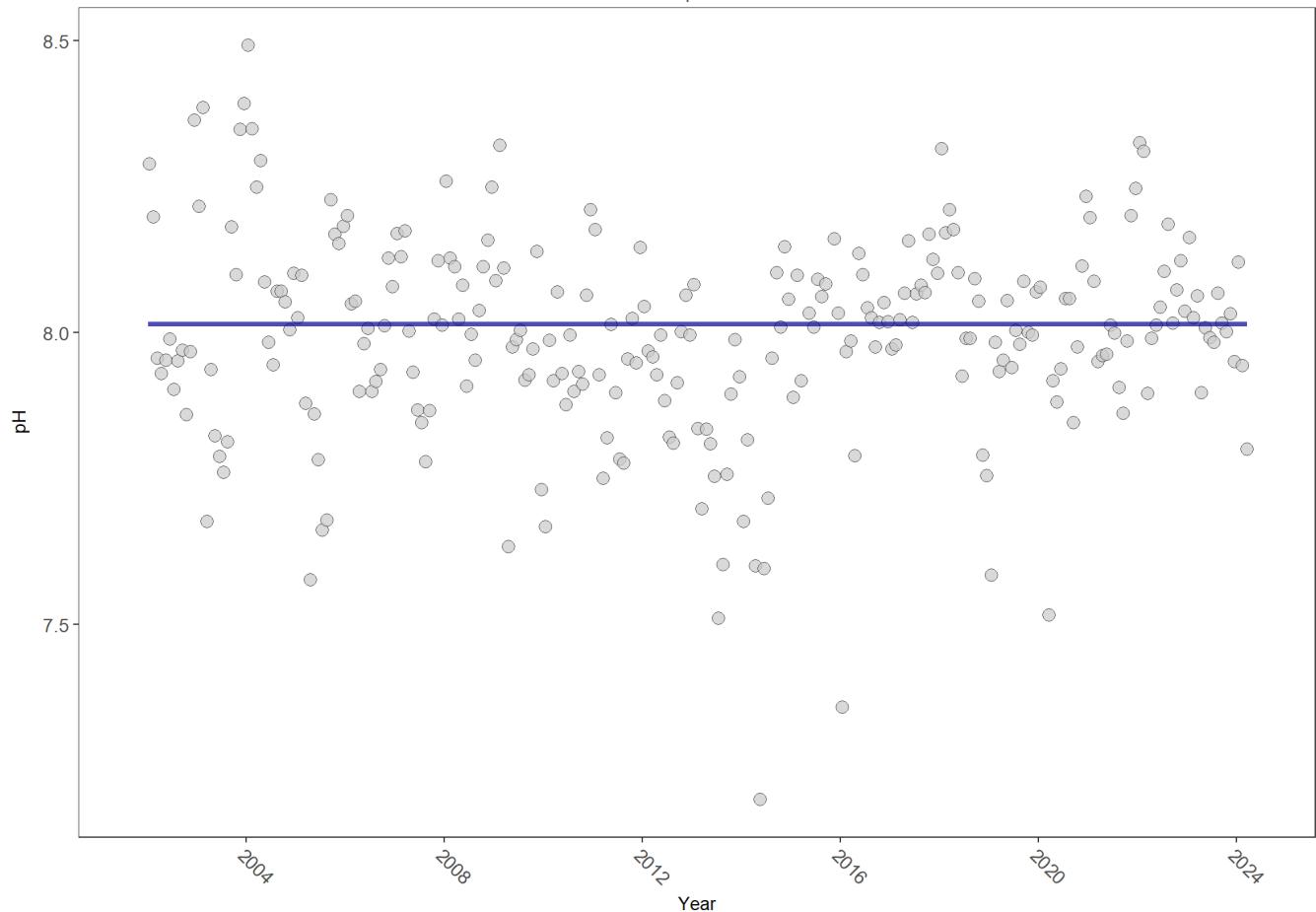
apacpwq

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

Apalachicola National Estuarine Research Reserve

apacpwq

pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	586529	23	8	TRUE	0.0005	1.0000	0.0000006164181	8.015006	23.8779	0.0133	0

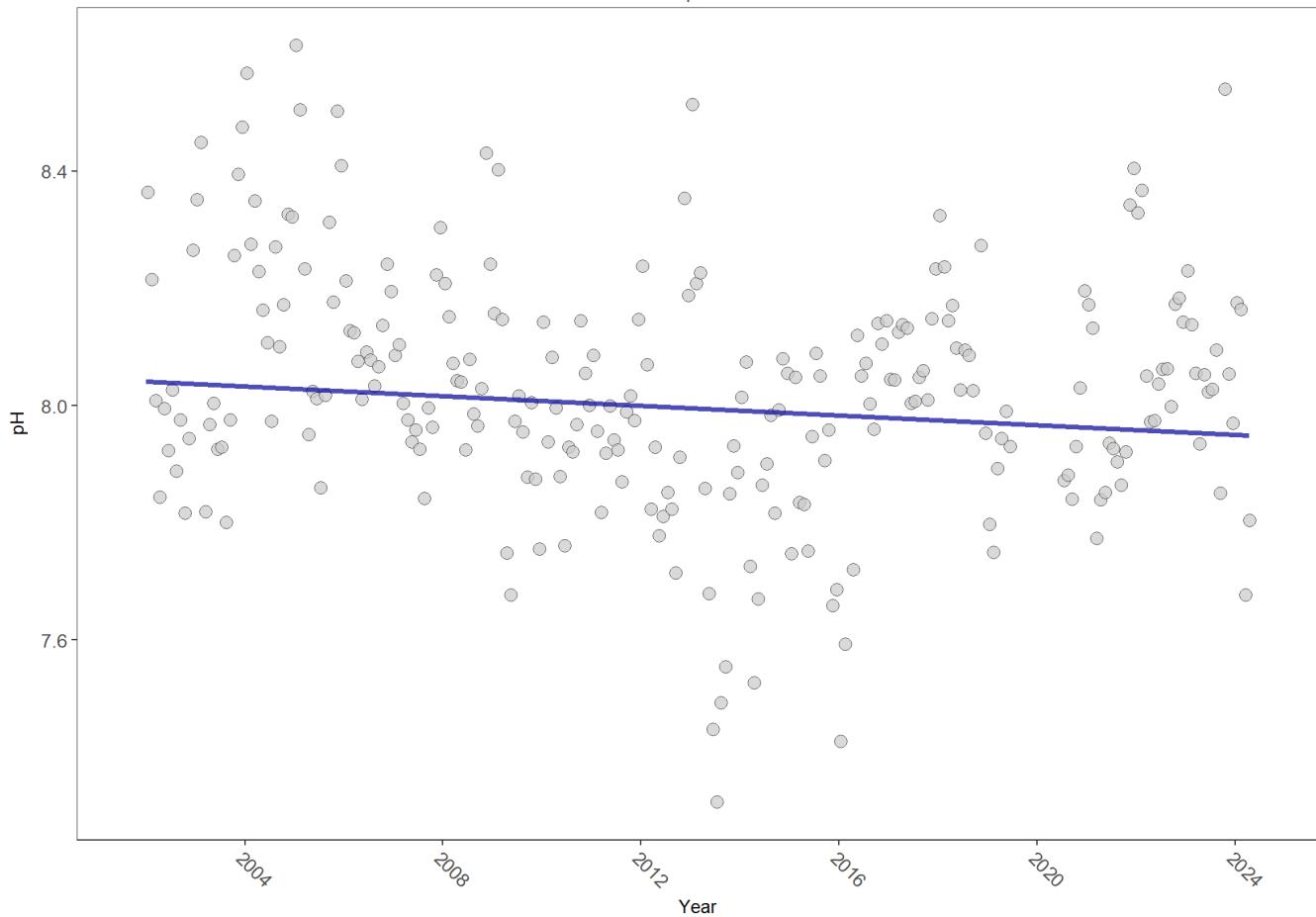
$p < 0.00005$ appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apadbwq

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

Apalachicola National Estuarine Research Reserve
apadbwq
pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	574667	23	8	TRUE	-0.1271	0.0048	-0.004167231	8.041222	11.7197	0.3851	-1

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

SennIntercept is intercept value at beginning of record for monitoring location

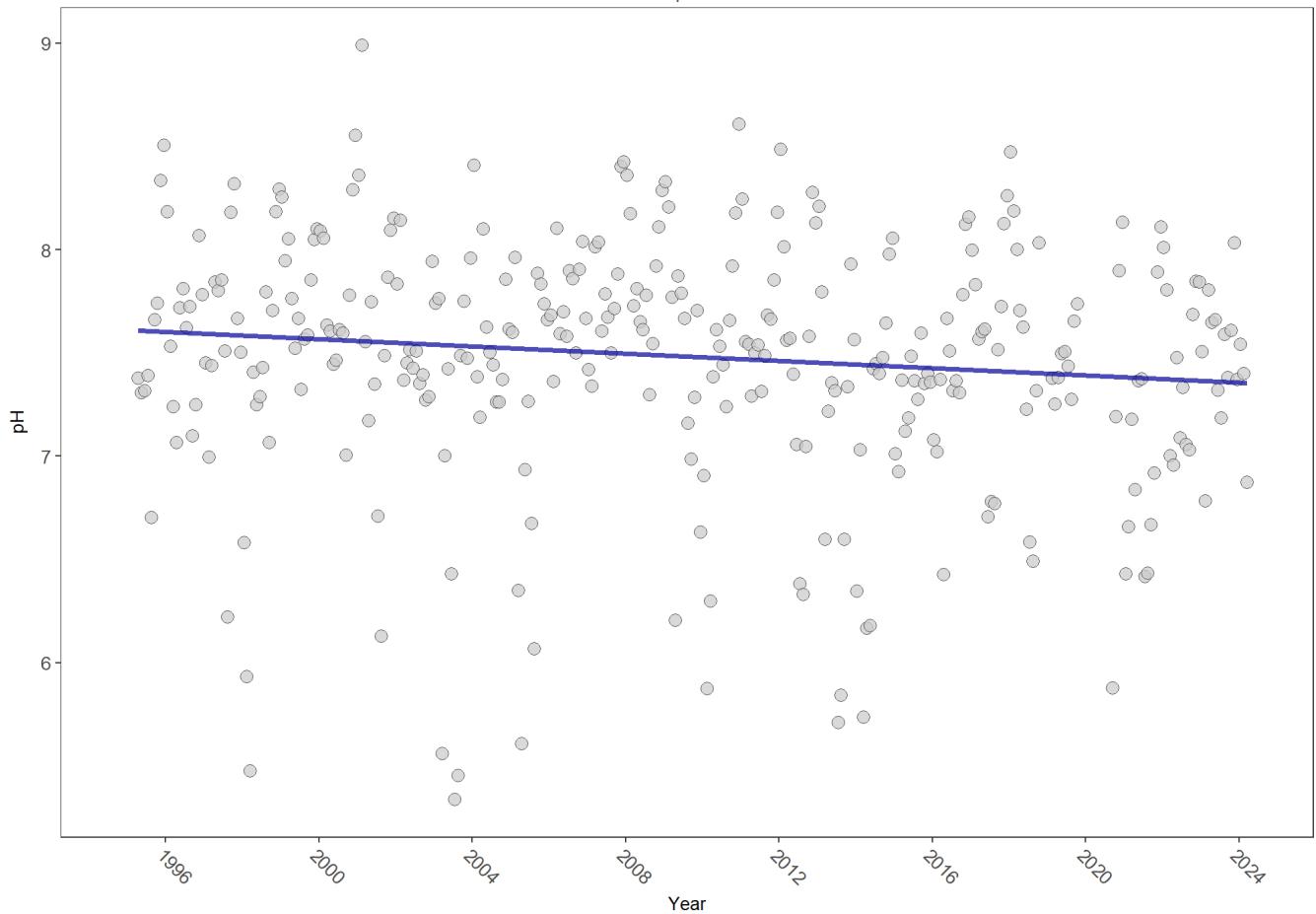
apaeswq

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

Apalachicola National Estuarine Research Reserve

apaeswq

pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	692655	30	7.5	TRUE	-0.139	0.0003	-0.008764153	7.610967	2.0363	0.9984	-1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

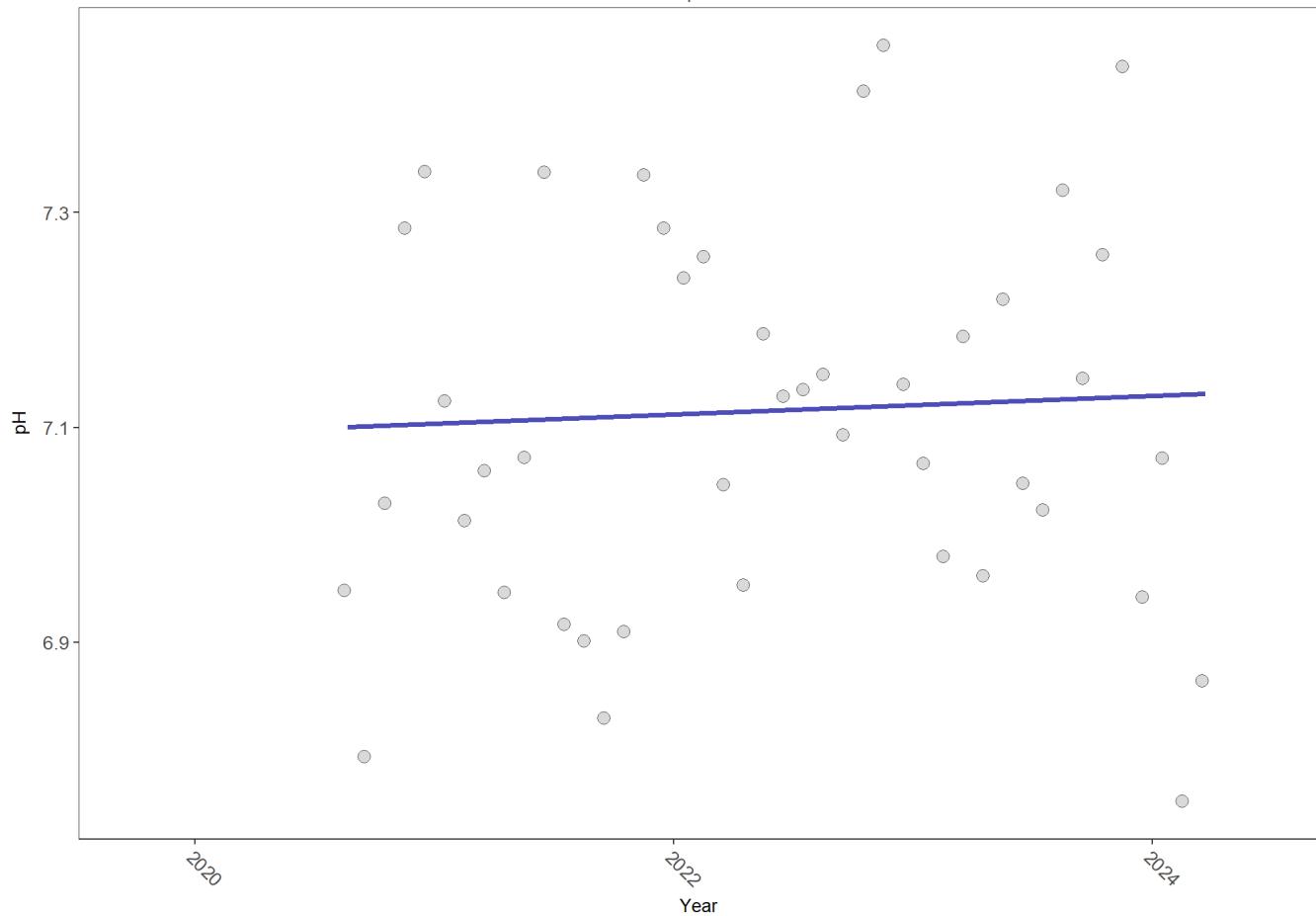
apabpwq

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

Apalachicola National Estuarine Research Reserve

apabpwq

pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	120402	5	7.1	TRUE	0.1212	0.5854	0.008493726	7.095174	22.2285	0.0227	0

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

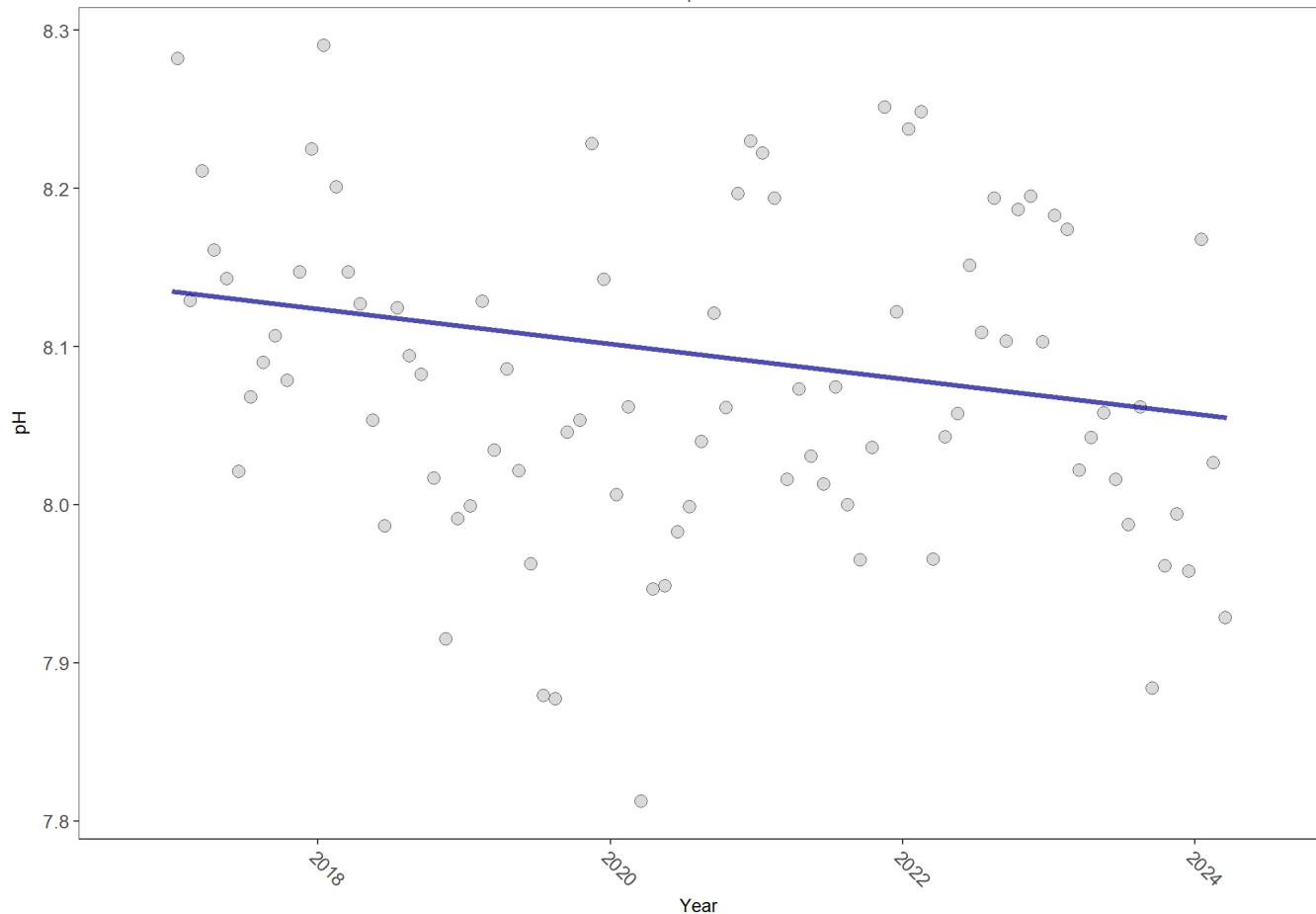
apapcwq

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

Apalachicola National Estuarine Research Reserve

apapcwq

pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	236474	8	8.1	TRUE	-0.1965	0.0268	-0.01107581	8.135148	9.5227	0.5738	-1

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

SennIntercept is intercept value at beginning of record for monitoring location

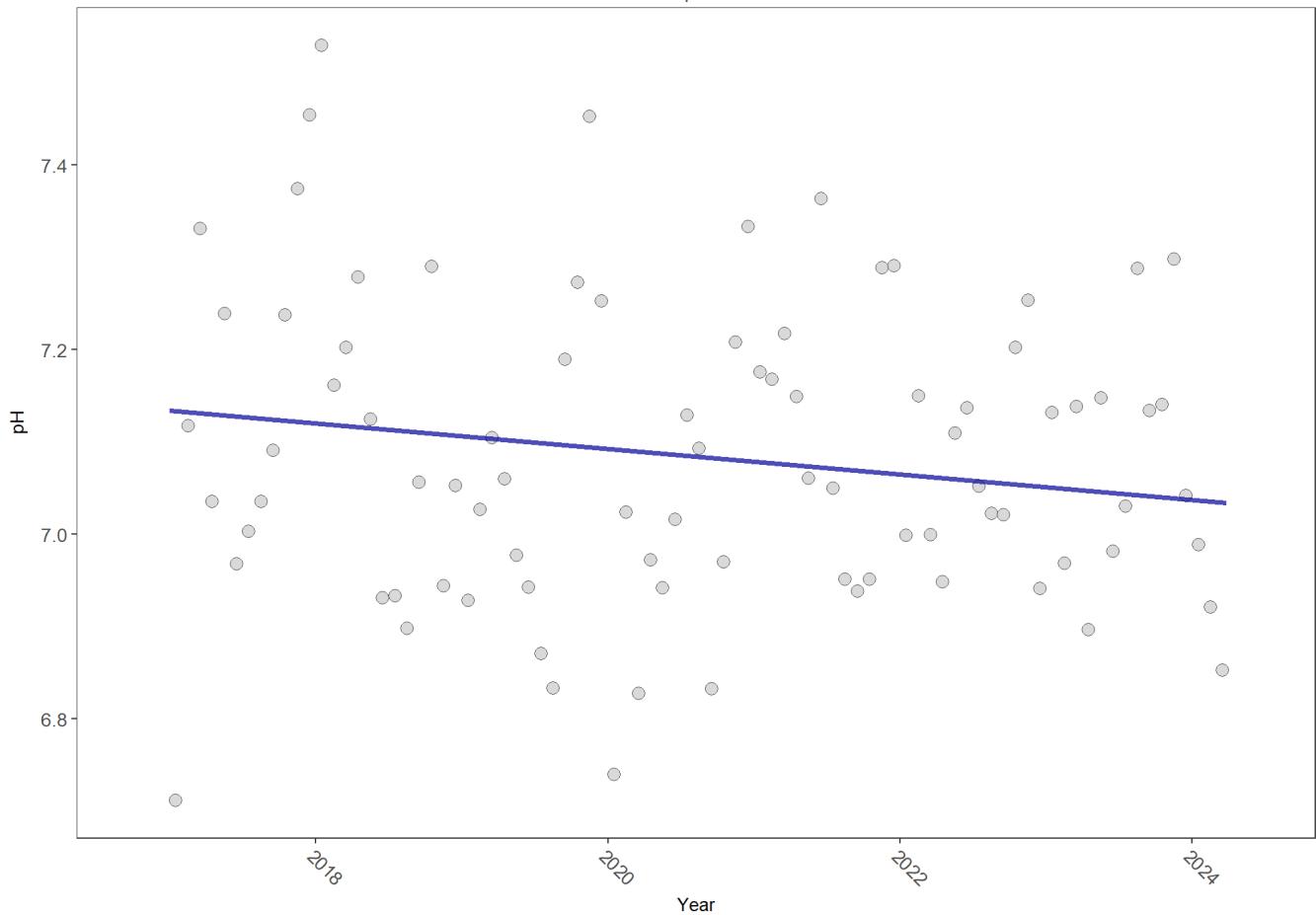
apalmwq

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

Apalachicola National Estuarine Research Reserve

apalmwq

pH



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	235511	8	7.1	TRUE	-0.1002	0.2510	-0.01380389	7.134075	13.3805	0.2692	0

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

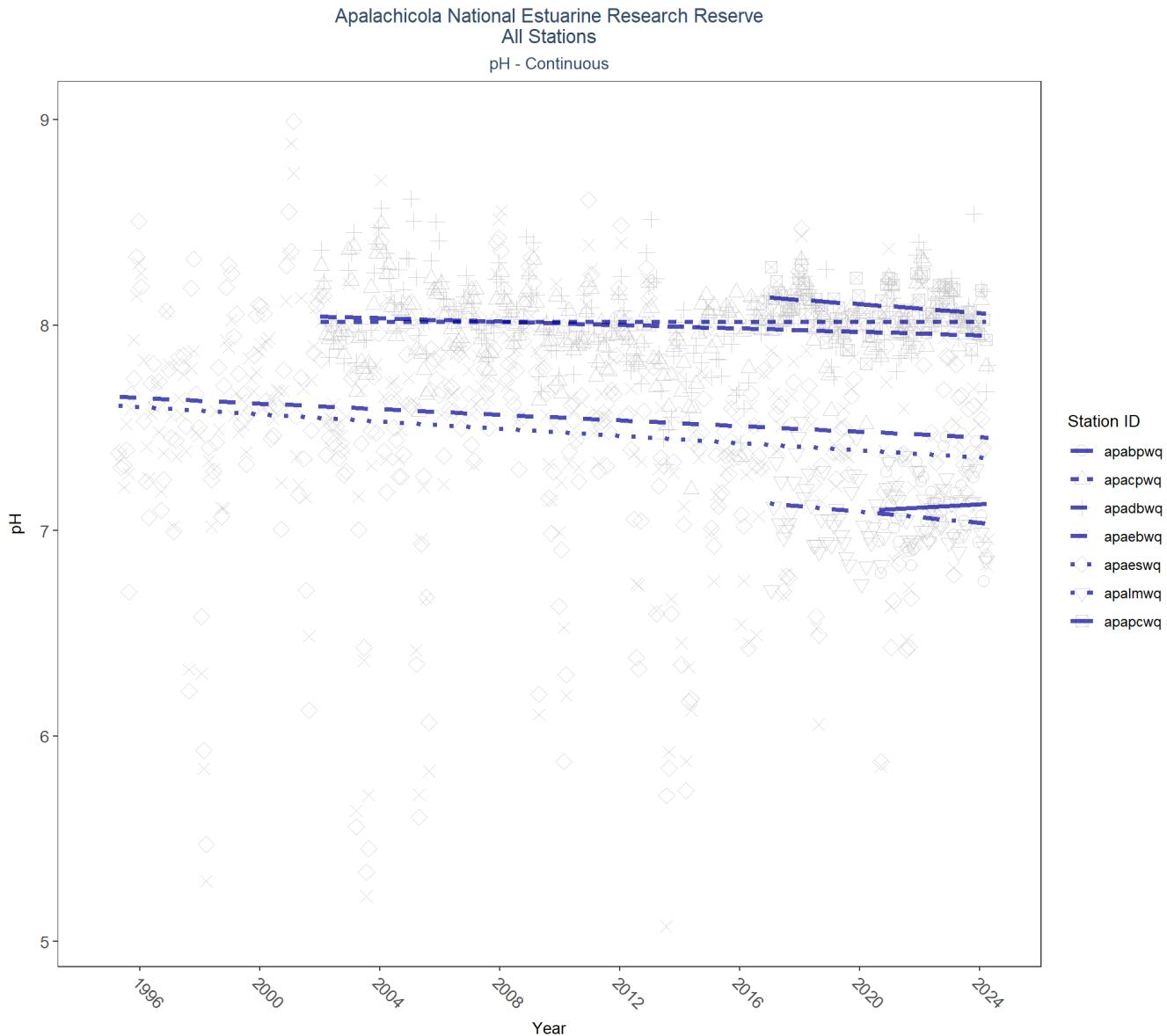


Table 29: Seasonal Kendall-Tau Results for All Stations - pH

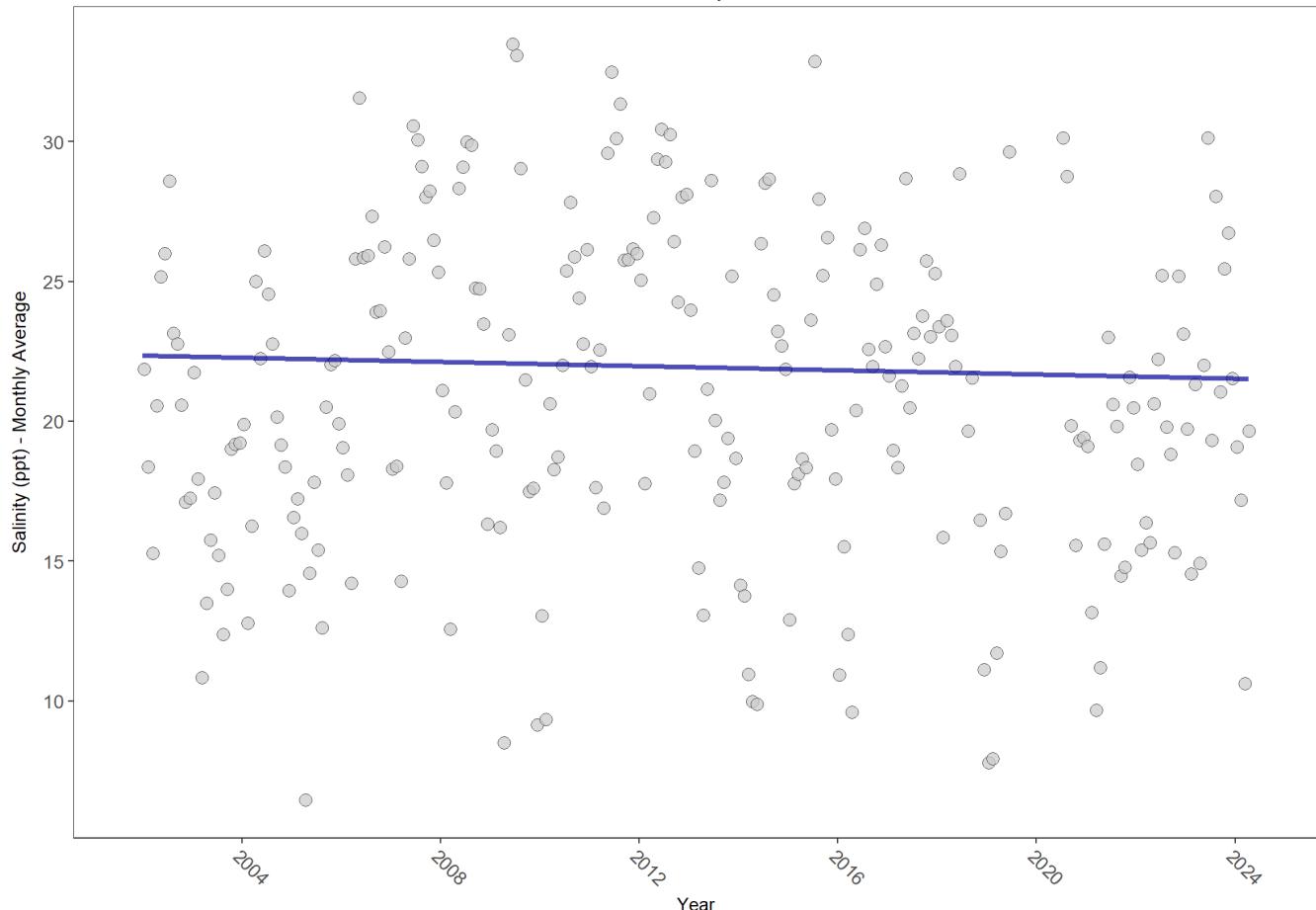
Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
apaebwq	689204	30	1995 - 2024	7.6	-0.12	7.65	-0.01	0.0022
apacpwd	586529	23	2002 - 2024	8.0	0.00	8.02	0.00	1.0000
apadbwq	574667	23	2002 - 2024	8.0	-0.13	8.04	0.00	0.0048
apaeswq	692655	30	1995 - 2024	7.5	-0.14	7.61	-0.01	0.0003
apabpwq	120402	5	2020 - 2024	7.1	0.12	7.10	0.01	0.5854
apapcqw	236474	8	2017 - 2024	8.1	-0.20	8.14	-0.01	0.0268
apalmwd	235511	8	2017 - 2024	7.1	-0.10	7.13	-0.01	0.2510

Salinity - Continuous Water Quality

apadbwq

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

Apalachicola National Estuarine Research Reserve
apadbwq
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	591696	23	22	TRUE	-0.038	0.3849	-0.03740371	22.3597	7.3095	0.7735	0

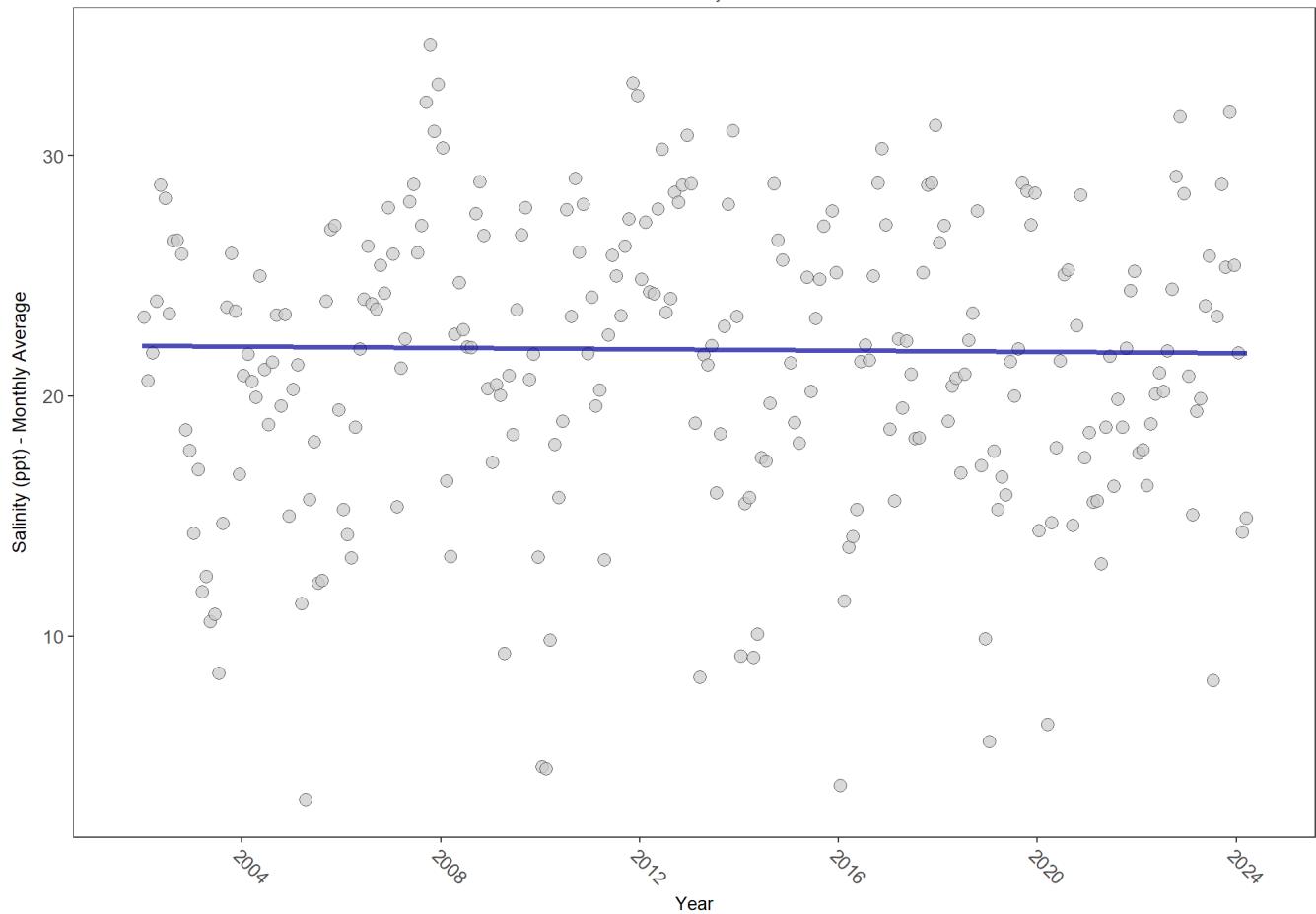
$p < 0.00005$ appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apacpwq

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

Apalachicola National Estuarine Research Reserve
apacpwq
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	601649	23	22.4	TRUE	-0.0097	0.8062	-0.0135061	22.07828	11.6316	0.392	0

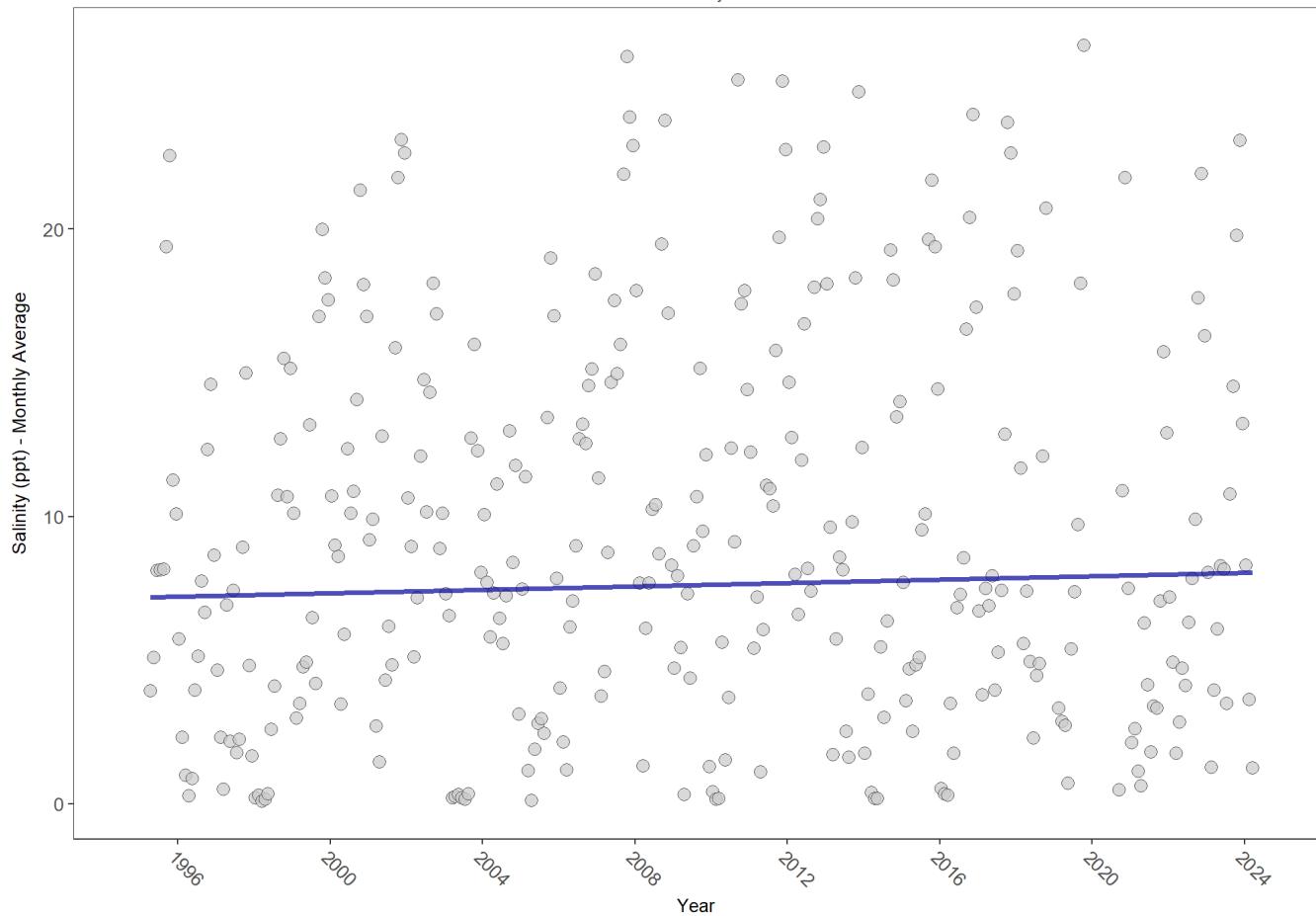
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apaeswq

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

Apalachicola National Estuarine Research Reserve
apaeswq
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	729880	30	7.4	TRUE	0.0509	0.2038	0.02950885	7.176649	10.3875	0.4959	0

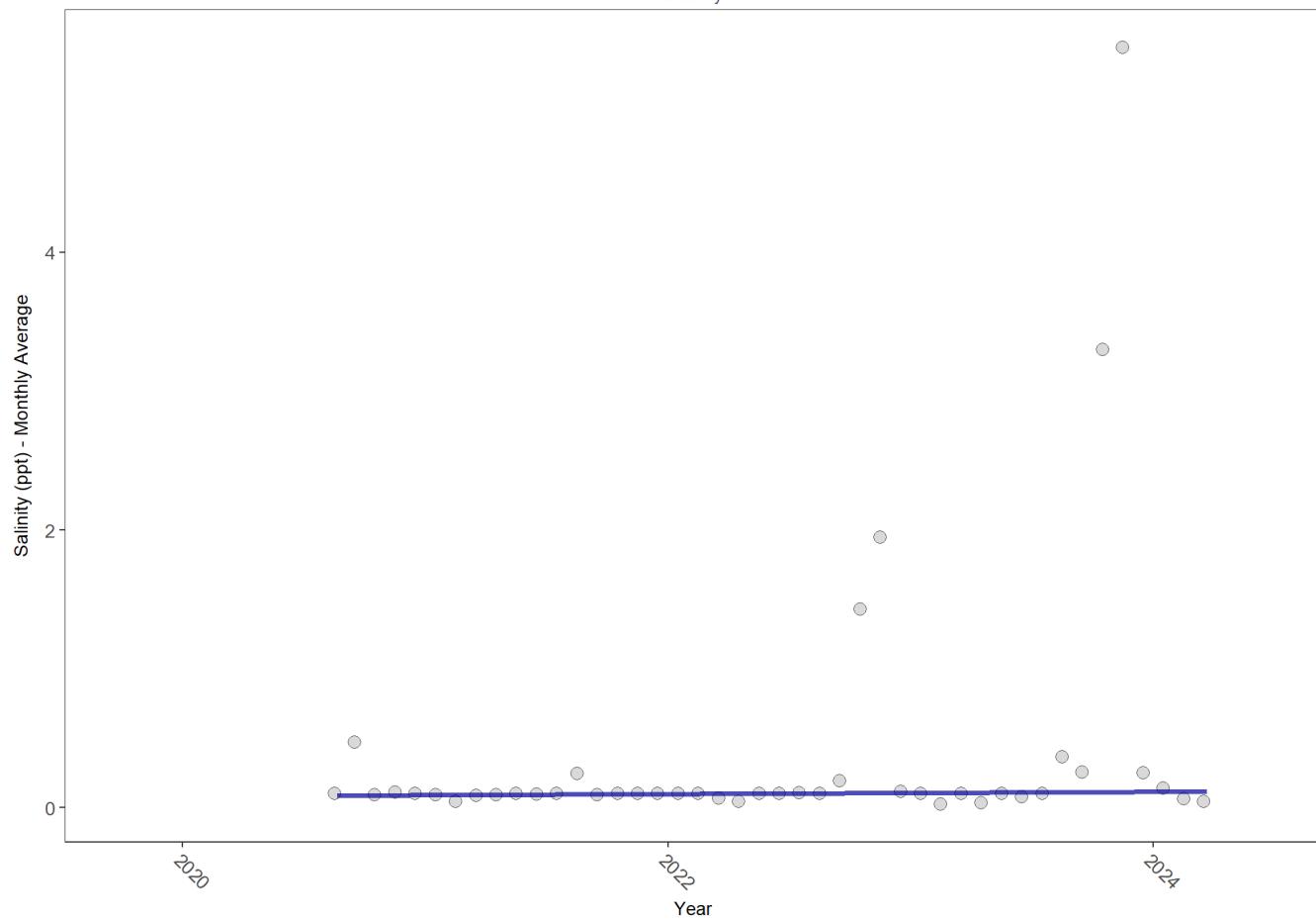
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apabpwq

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

Apalachicola National Estuarine Research Reserve
apabpwq
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	121640	5	0.1	TRUE	0.2121	0.0935	0.007916516	0.08290405	14.1553	0.2245	0

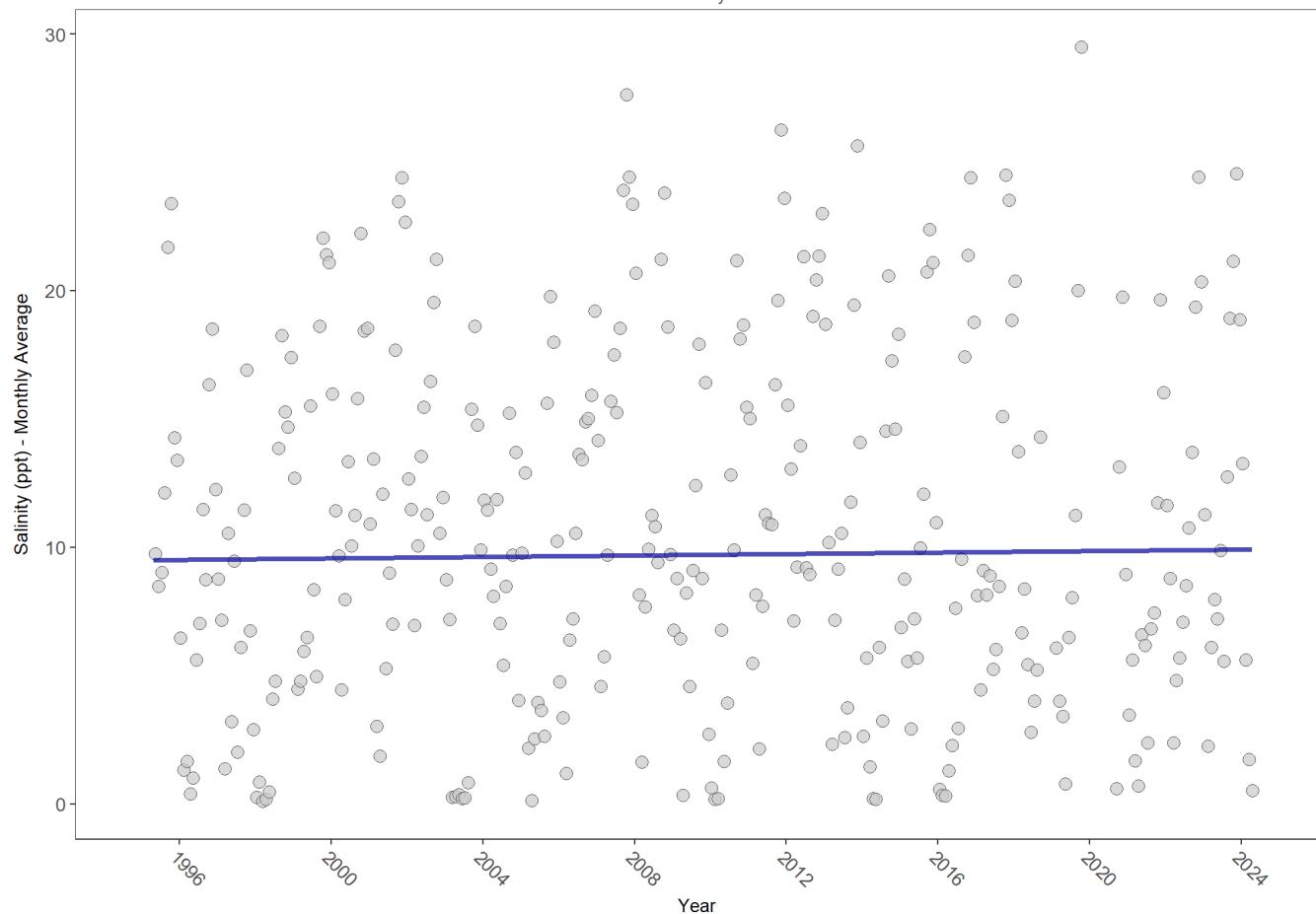
$p < 0.00005$ appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apaebwq

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

Apalachicola National Estuarine Research Reserve
apaebwq
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	718398	30	9.8	TRUE	0.0277	0.5121	0.01409515	9.503467	11.7239	0.3848	0

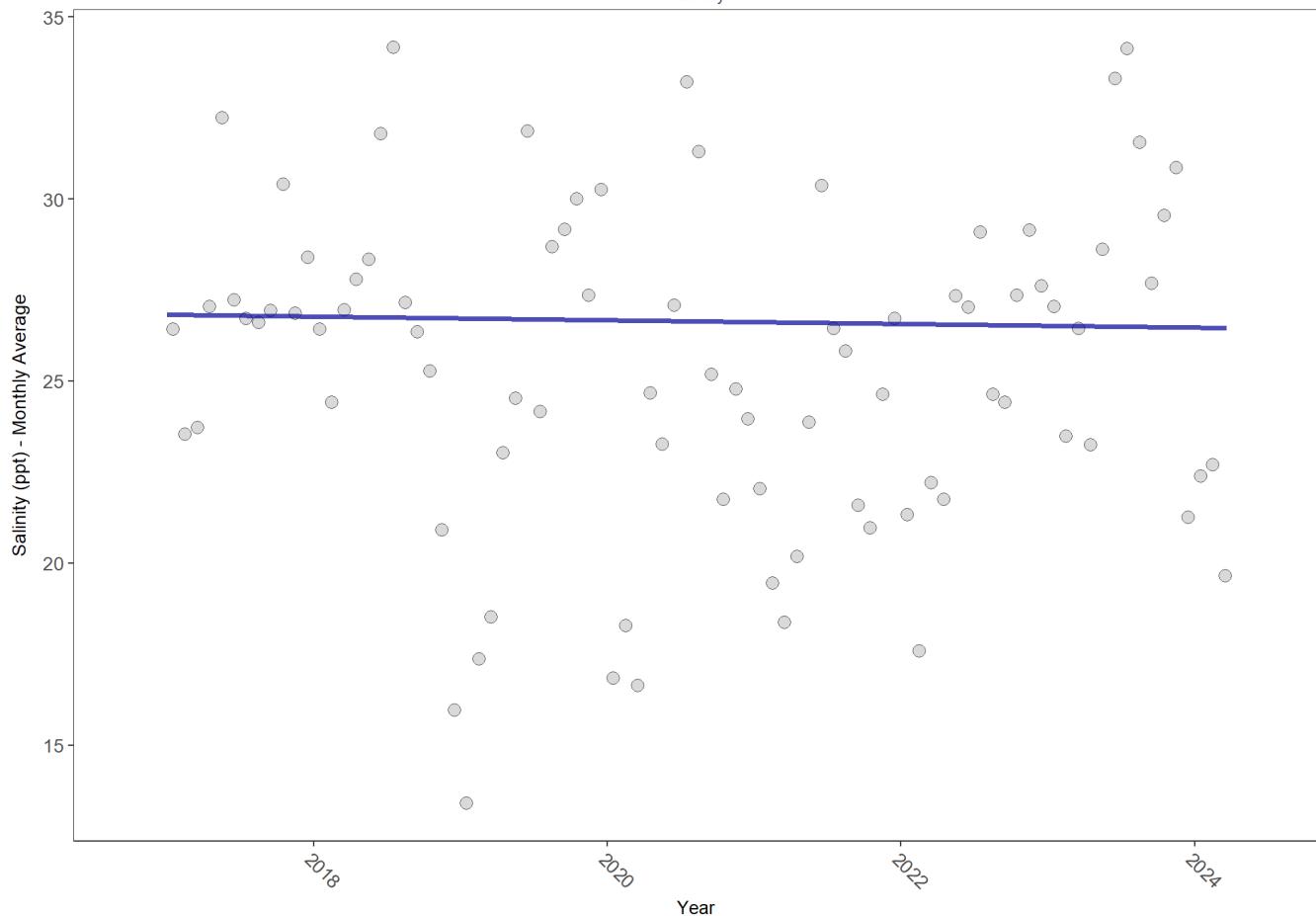
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apapcwq

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

Apalachicola National Estuarine Research Reserve
apapcwq
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	238891	8	26.6	TRUE	-0.0411	0.6818	-0.04921317	26.81743	5.5871	0.8994	0

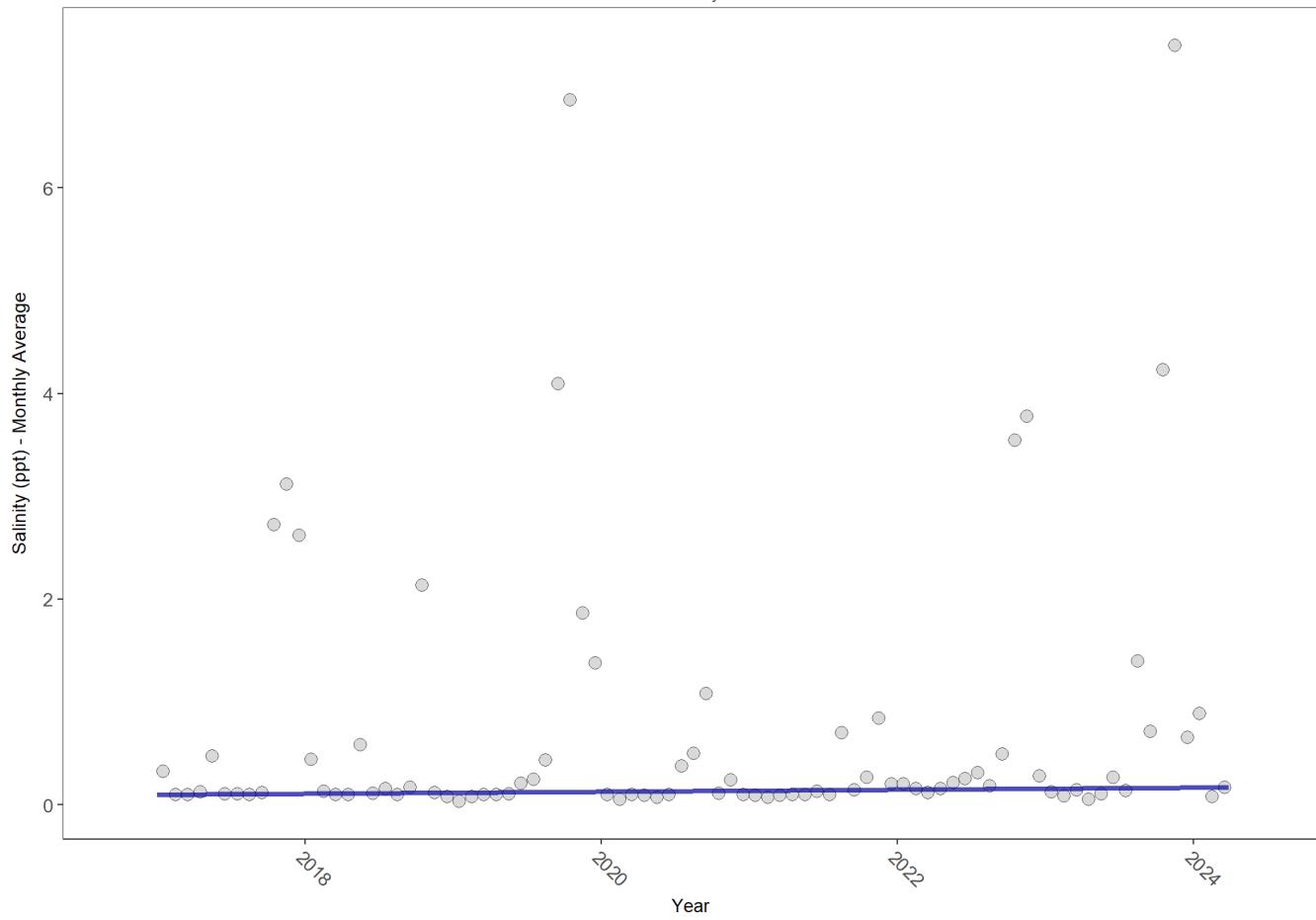
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apalmwq

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

Apalachicola National Estuarine Research Reserve
apalmwq
Salinity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	245344	8	0.1	TRUE	0.1741	0.0589	0.009697403	0.09886312	9.5886	0.5677	0

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

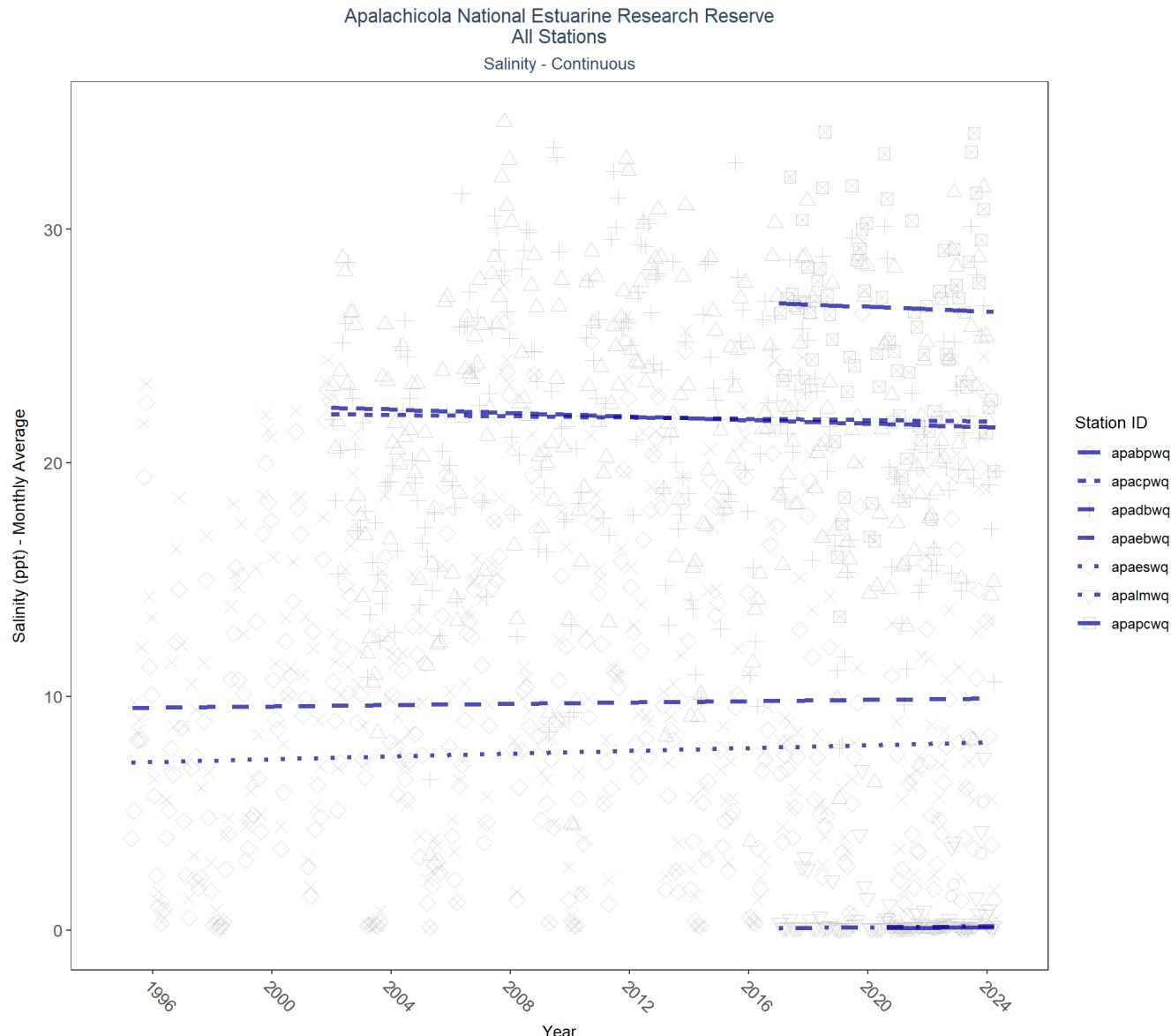


Table 30: Seasonal Kendall-Tau Results for All Stations - Salinity

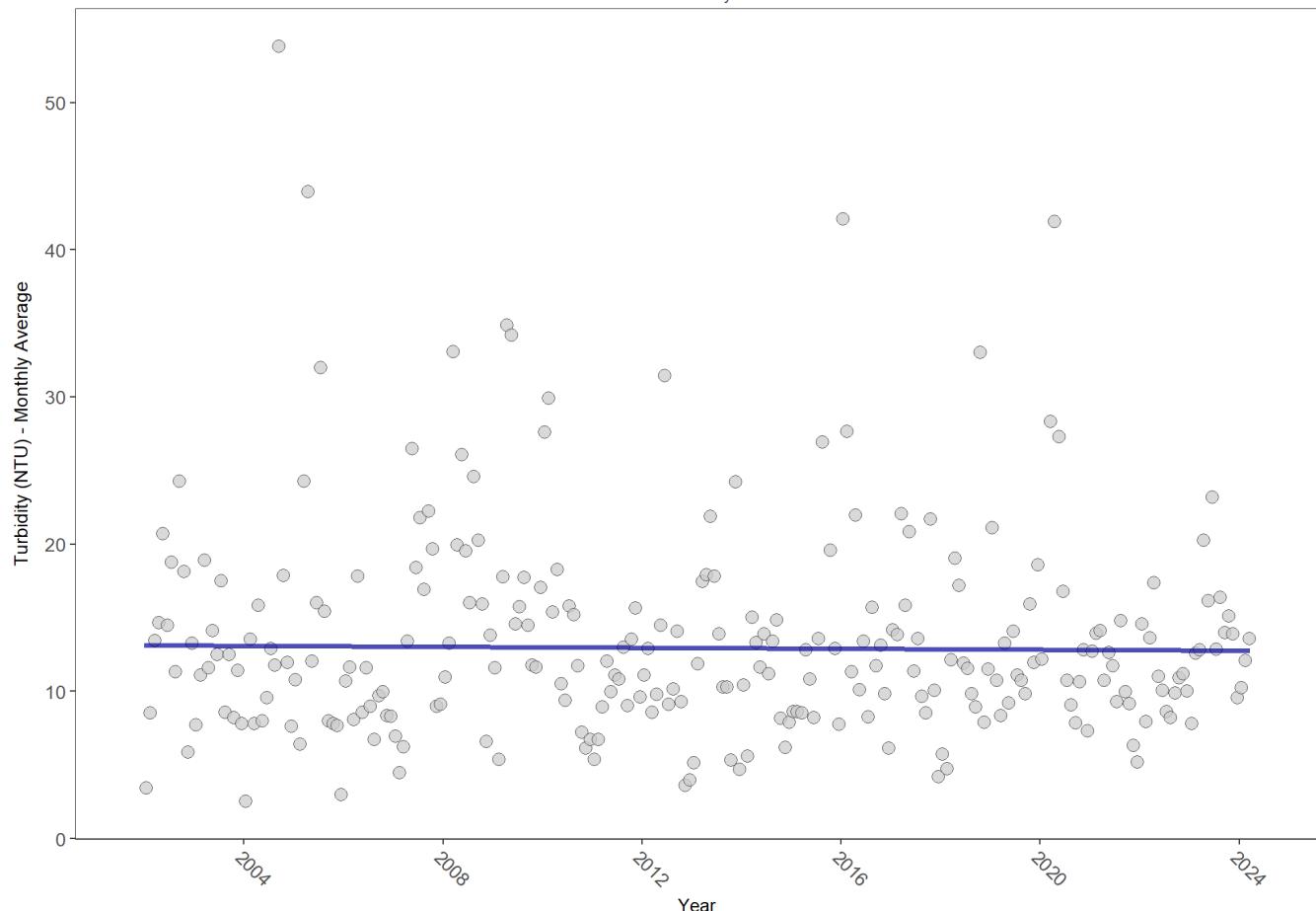
Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
apadbwq	591696	23	2002 - 2024	22.0	-0.04	22.36	-0.04	0.3849
apacpwd	601649	23	2002 - 2024	22.4	-0.01	22.08	-0.01	0.8062
apaeswq	729880	30	1995 - 2024	7.4	0.05	7.18	0.03	0.2038
apabpwq	121640	5	2020 - 2024	0.1	0.21	0.08	0.01	0.0935
apaebwq	718398	30	1995 - 2024	9.8	0.03	9.50	0.01	0.5121
apapcqw	238891	8	2017 - 2024	26.6	-0.04	26.82	-0.05	0.6818
apalmwd	245344	8	2017 - 2024	0.1	0.17	0.10	0.01	0.0589

Turbidity - Continuous Water Quality

apacpwq

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

Apalachicola National Estuarine Research Reserve
apacpwq
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	598703	23	8	TRUE	-0.0157	0.7709	-0.01471184	13.11693	19.6228	0.0508	0

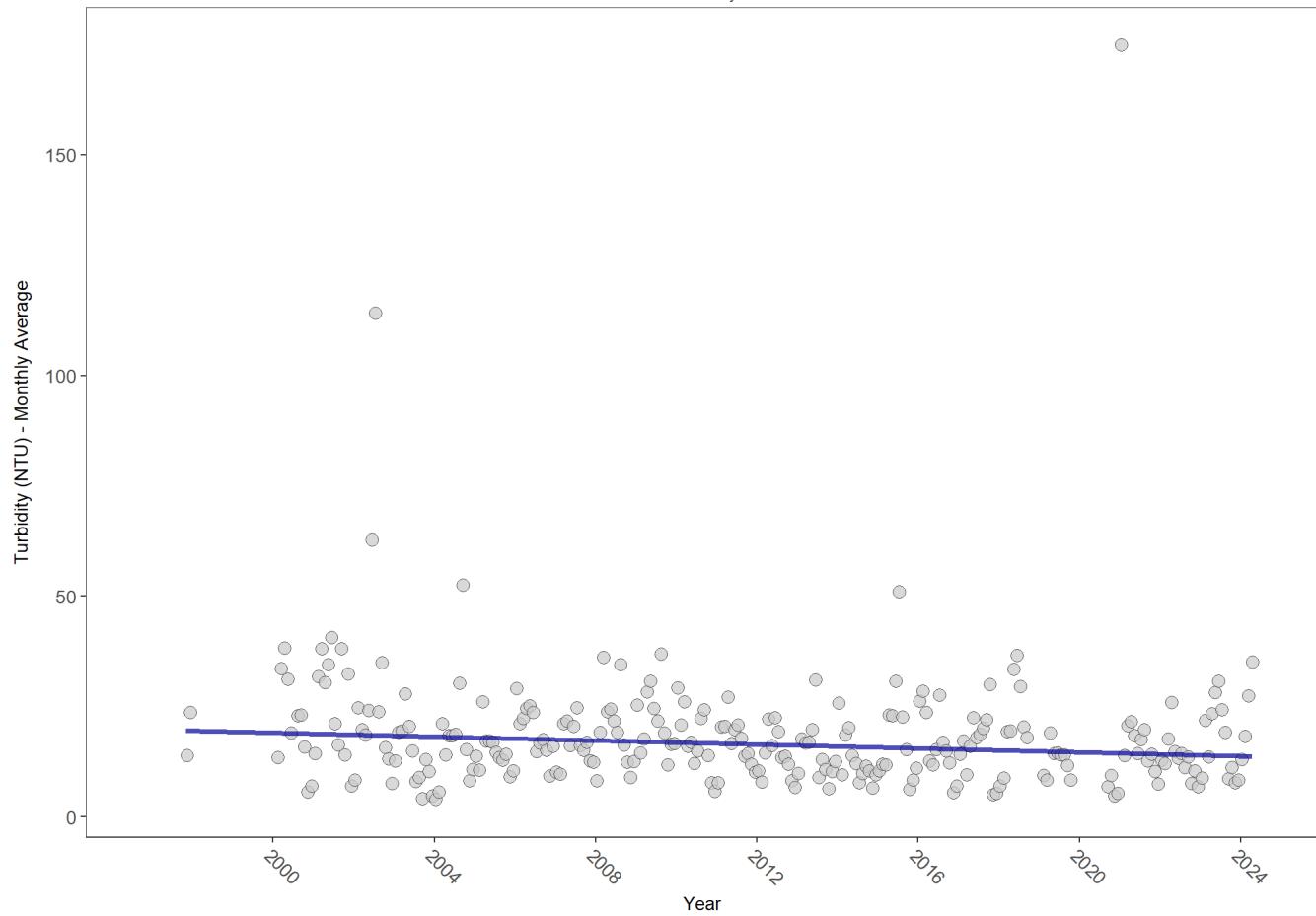
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apaebwq

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

Apalachicola National Estuarine Research Reserve
apaebwq
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	606952	26	13	TRUE	-0.1963	0.0000	-0.2190181	19.73698	12.2079	0.3482	-1

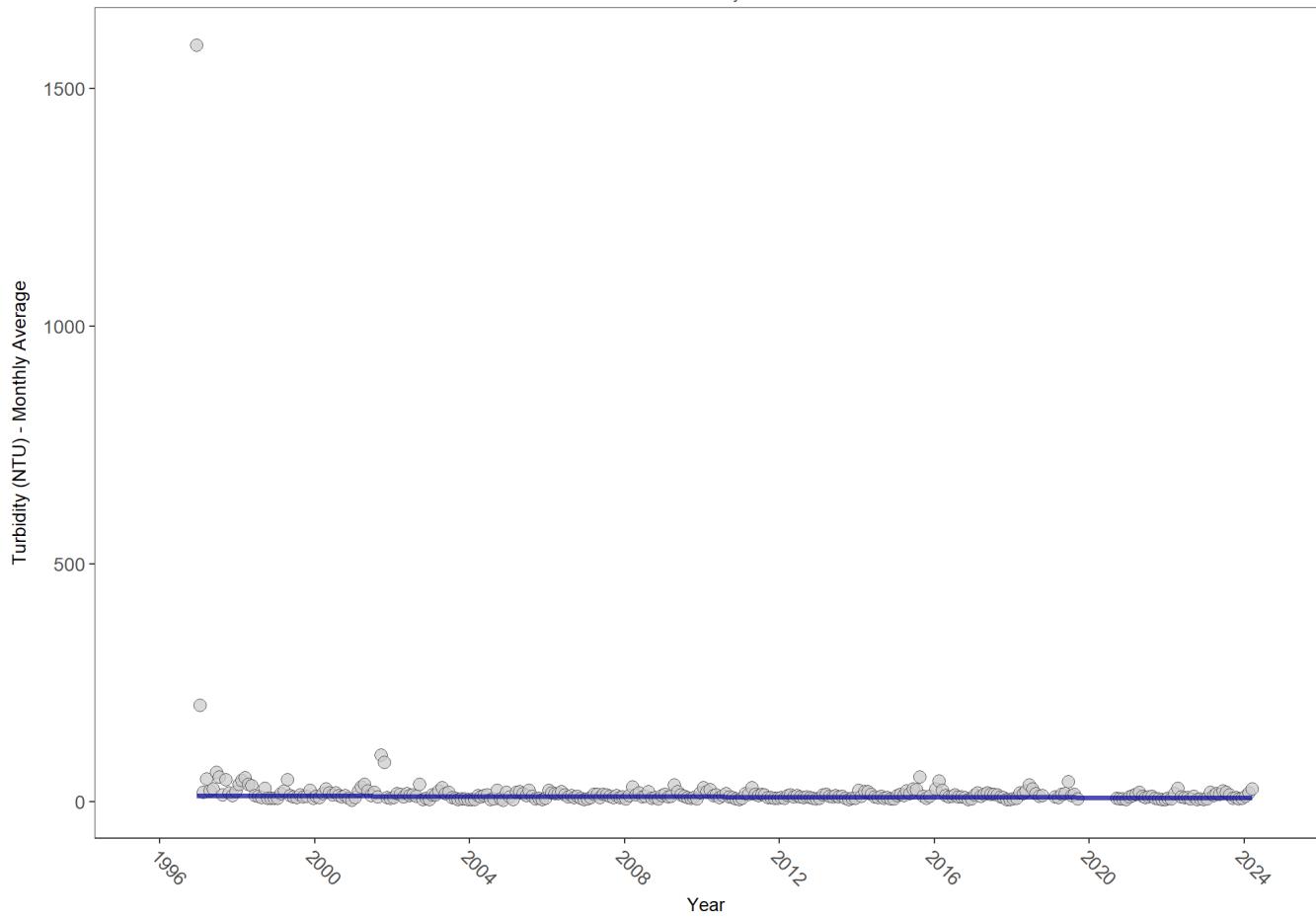
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apaeswq

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

Apalachicola National Estuarine Research Reserve
apaeswq
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	673747	29	9	TRUE	-0.1621	0.0001	-0.1217825	11.57636	10.4728	0.4884	-1

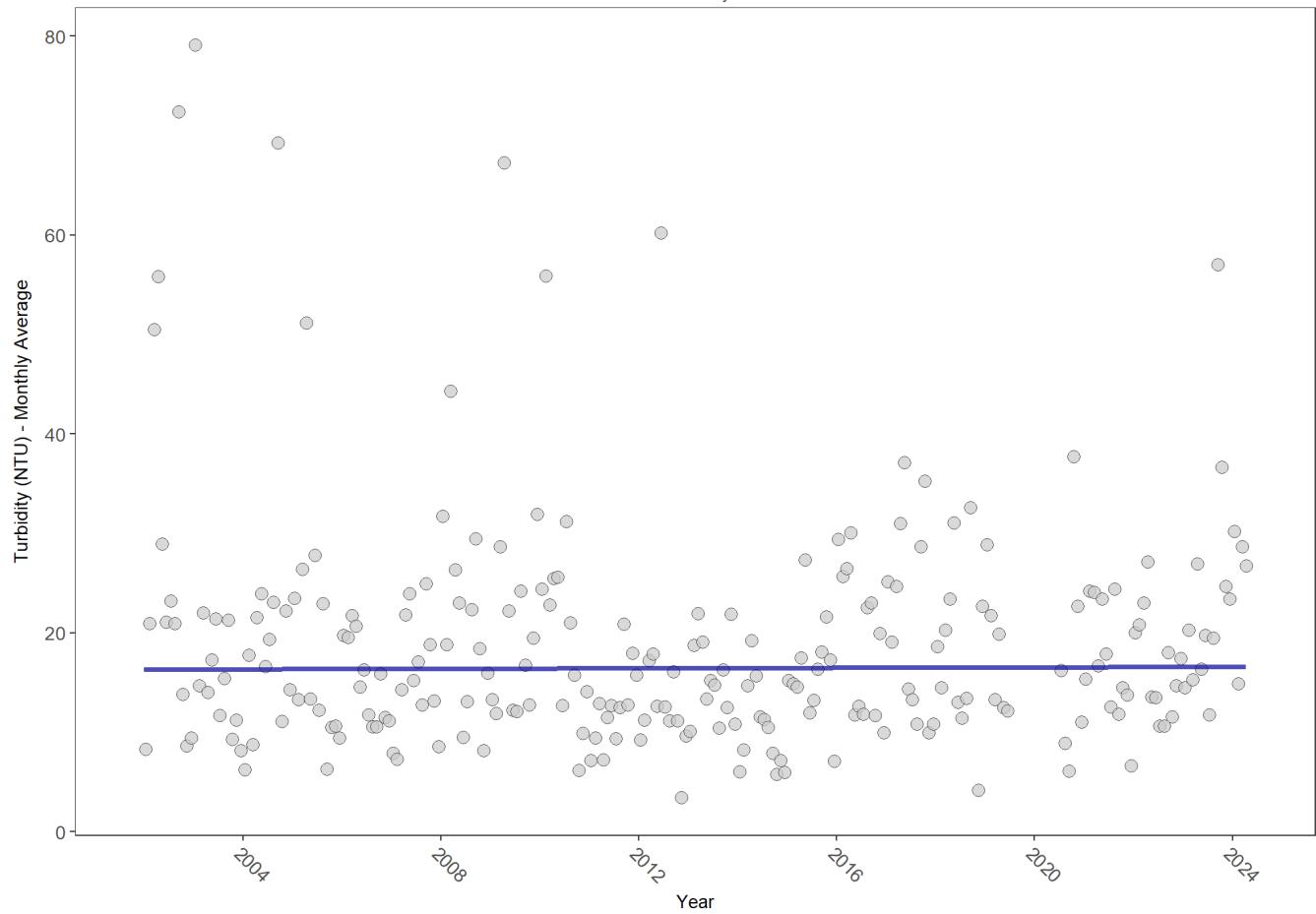
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apadbwq

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

Apalachicola National Estuarine Research Reserve
apadbwq
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	580874	23	10	TRUE	0.0116	0.8040	0.01160348	16.29621	10.9005	0.4516	0

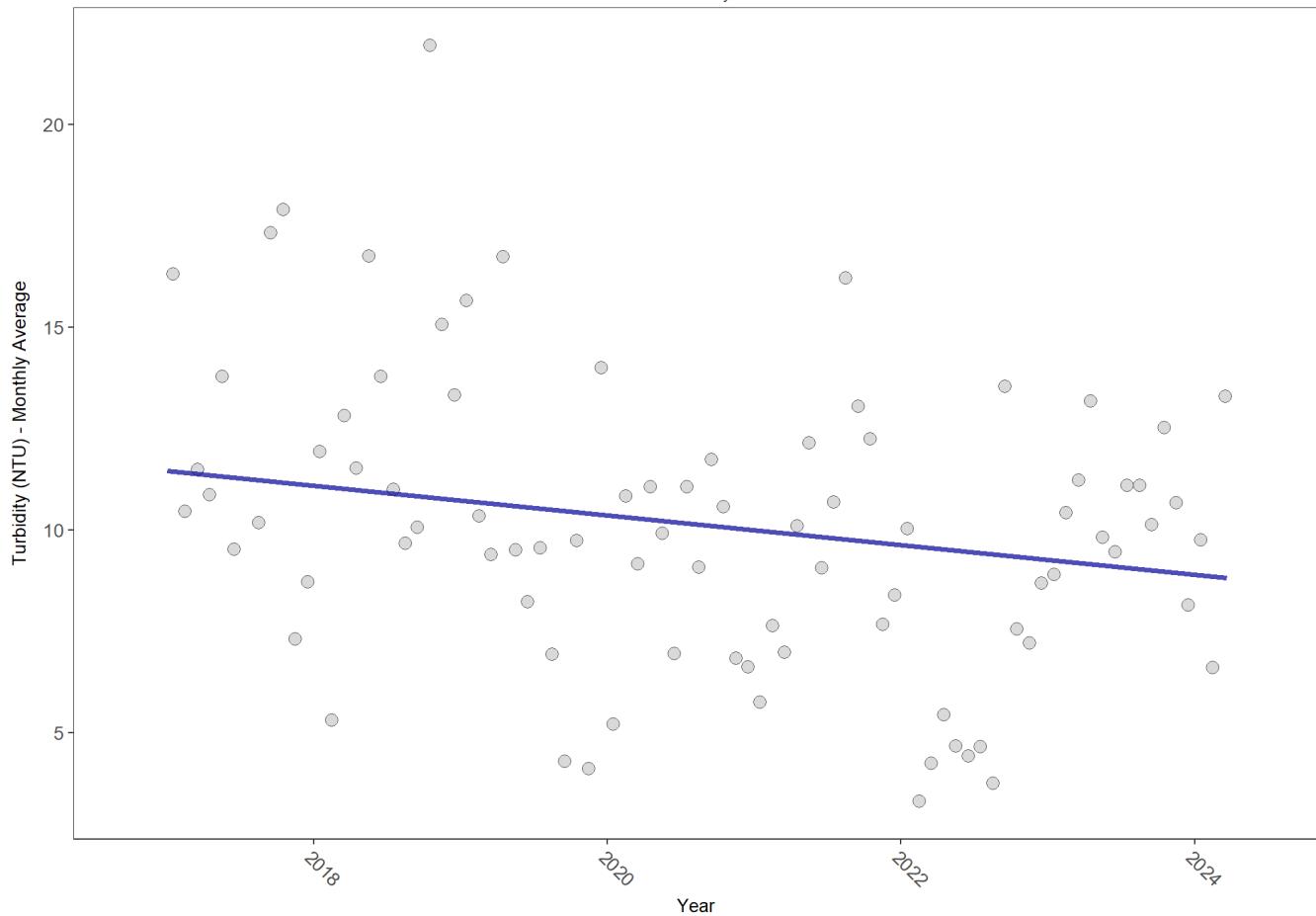
$p < 0.00005$ appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apapcwq

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

Apalachicola National Estuarine Research Reserve
apapcwq
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	227912	8	7	TRUE	-0.1703	0.0559	-0.3666391	11.46053	3.9026	0.9727	0

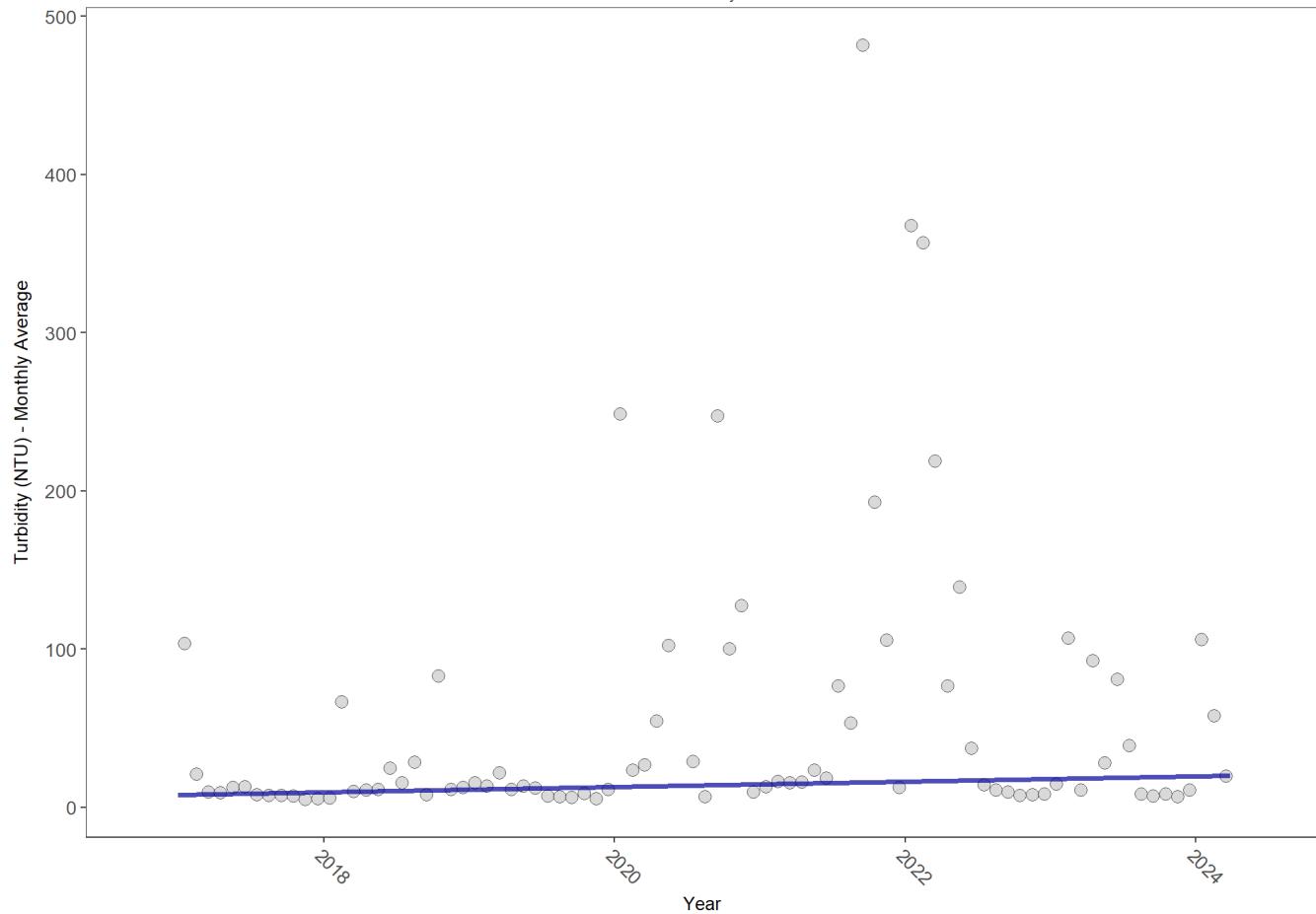
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apalmwq

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

Apalachicola National Estuarine Research Reserve
apalmwq
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	219328	8	12	TRUE	0.3154	0.0007	1.651083	8.067747	8.0149	0.712	2

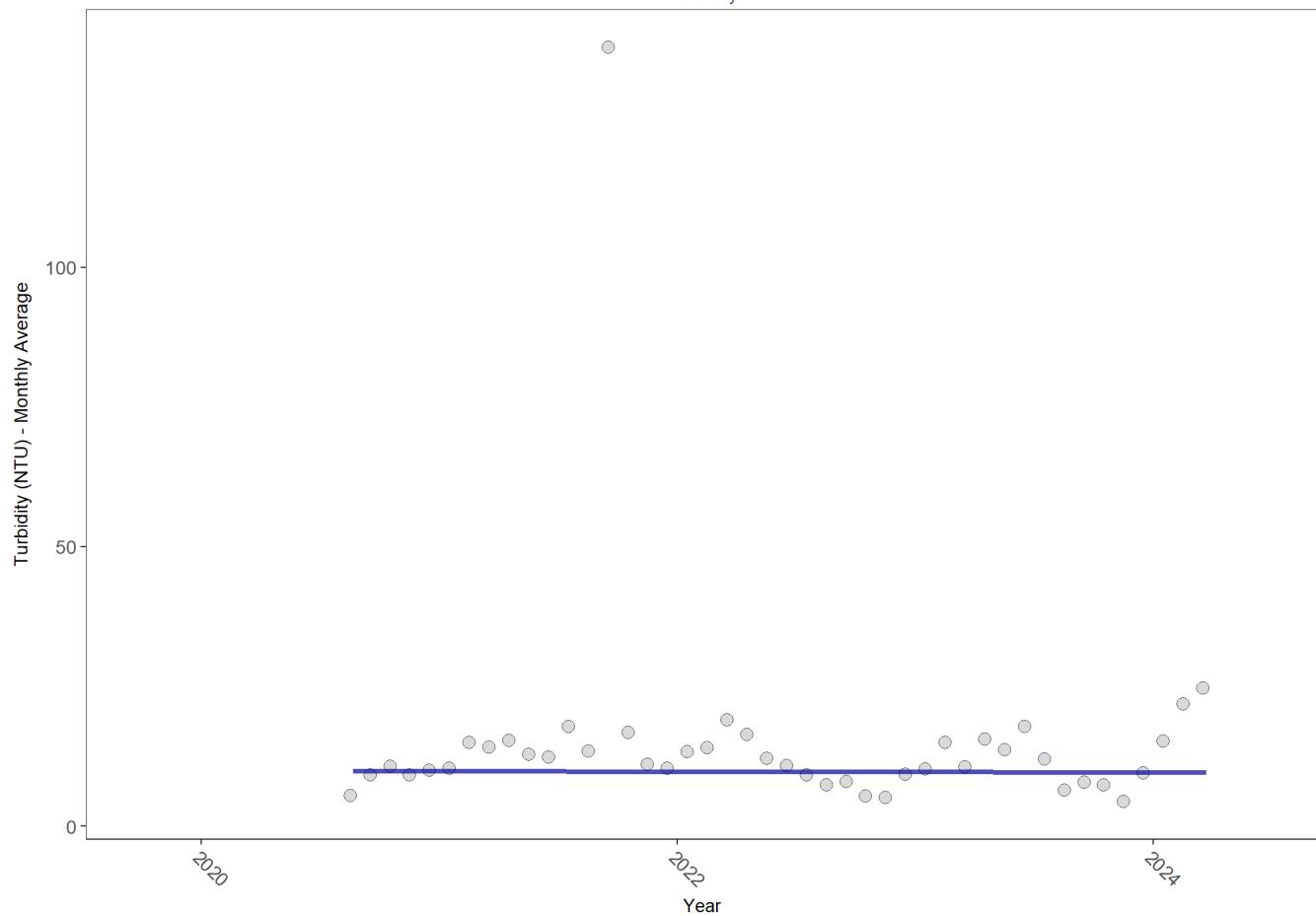
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apabpwq

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

Apalachicola National Estuarine Research Reserve
apabpwq
Turbidity



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	121636	5	11	TRUE	-0.0152	0.9131	-0.0739772	9.972843	8.4673	0.6709	0

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

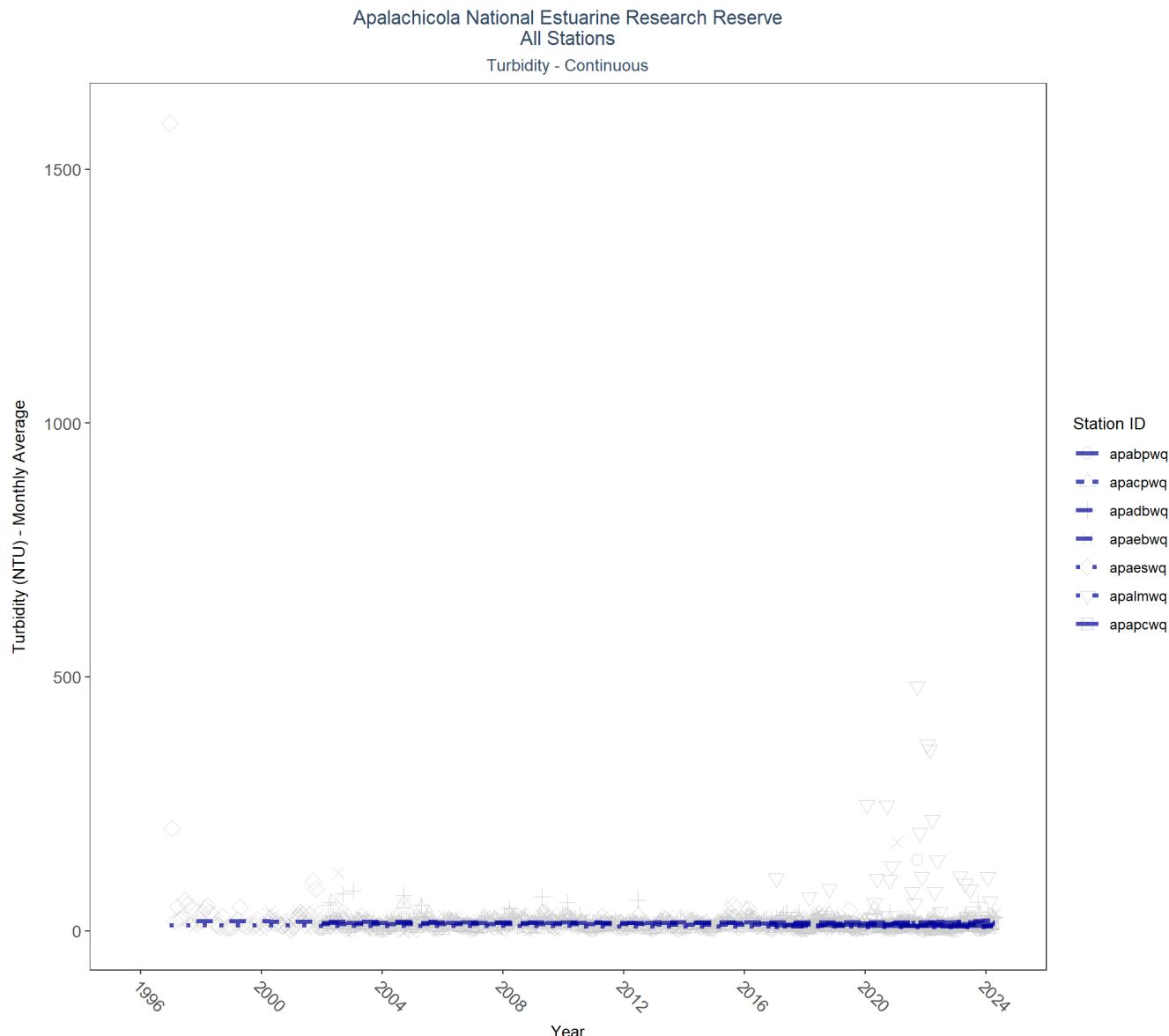


Table 31: Seasonal Kendall-Tau Results for All Stations - Turbidity

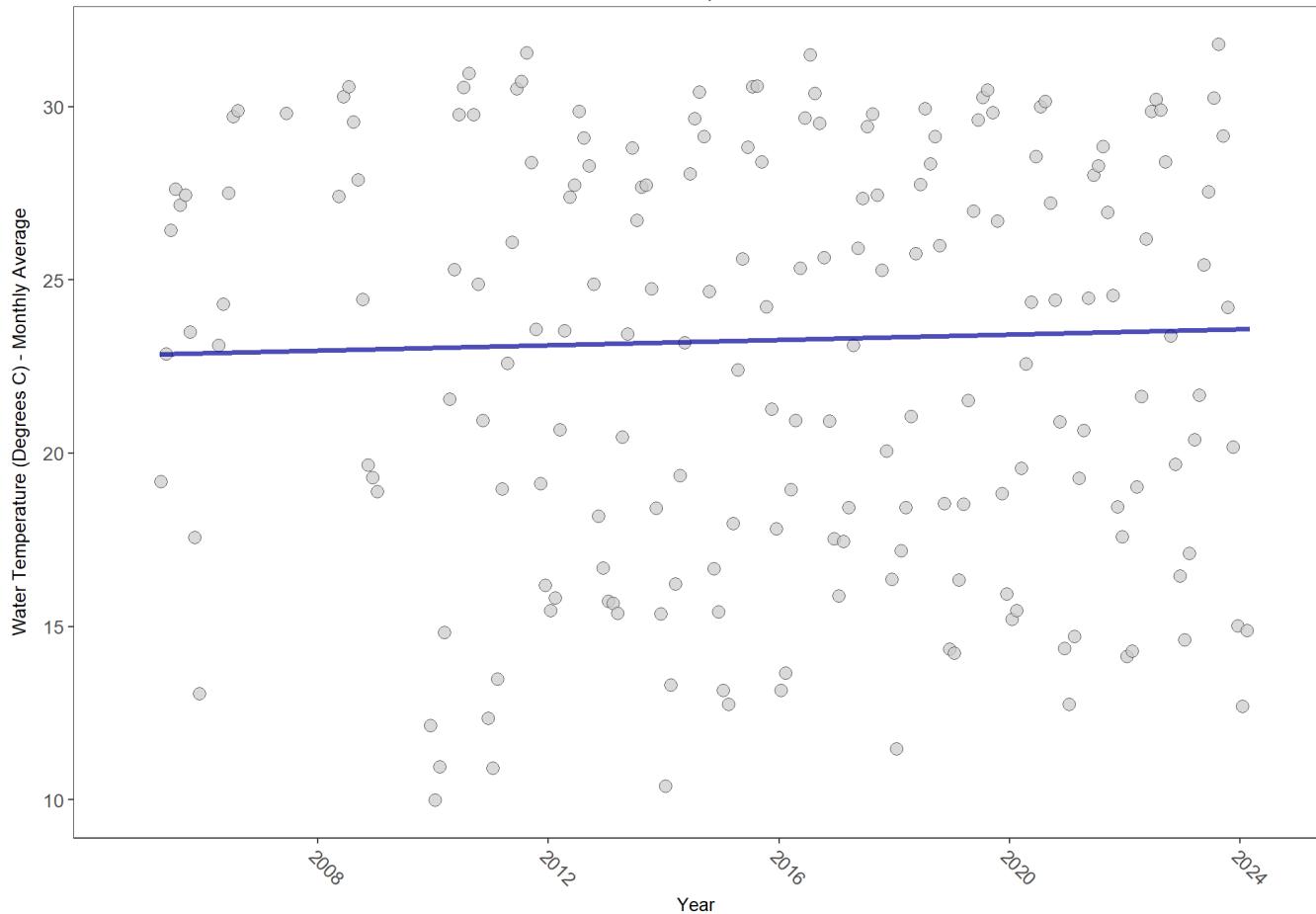
Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
apacpwd	598703	23	2002 - 2024	8	-0.02	13.12	-0.01	0.7709
apaebwq	606952	26	1997 - 2024	13	-0.20	19.74	-0.22	0.0000
apaeswq	673747	29	1996 - 2024	9	-0.16	11.58	-0.12	0.0001
apadbwq	580874	23	2002 - 2024	10	0.01	16.30	0.01	0.8040
apapcqw	227912	8	2017 - 2024	7	-0.17	11.46	-0.37	0.0559
apalmwd	219328	8	2017 - 2024	12	0.32	8.07	1.65	0.0007
apabpwq	121636	5	2020 - 2024	11	-0.02	9.97	-0.07	0.9131

Water Temperature - Continuous Water Quality

APCF1

National Data Buoy Center (5)

Apalachicola National Estuarine Research Reserve
APCF1
Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
surface	1281063	20	23.3	TRUE	0.1083	0.0548	0.03809272	22.8515	4.6249	0.948	0

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

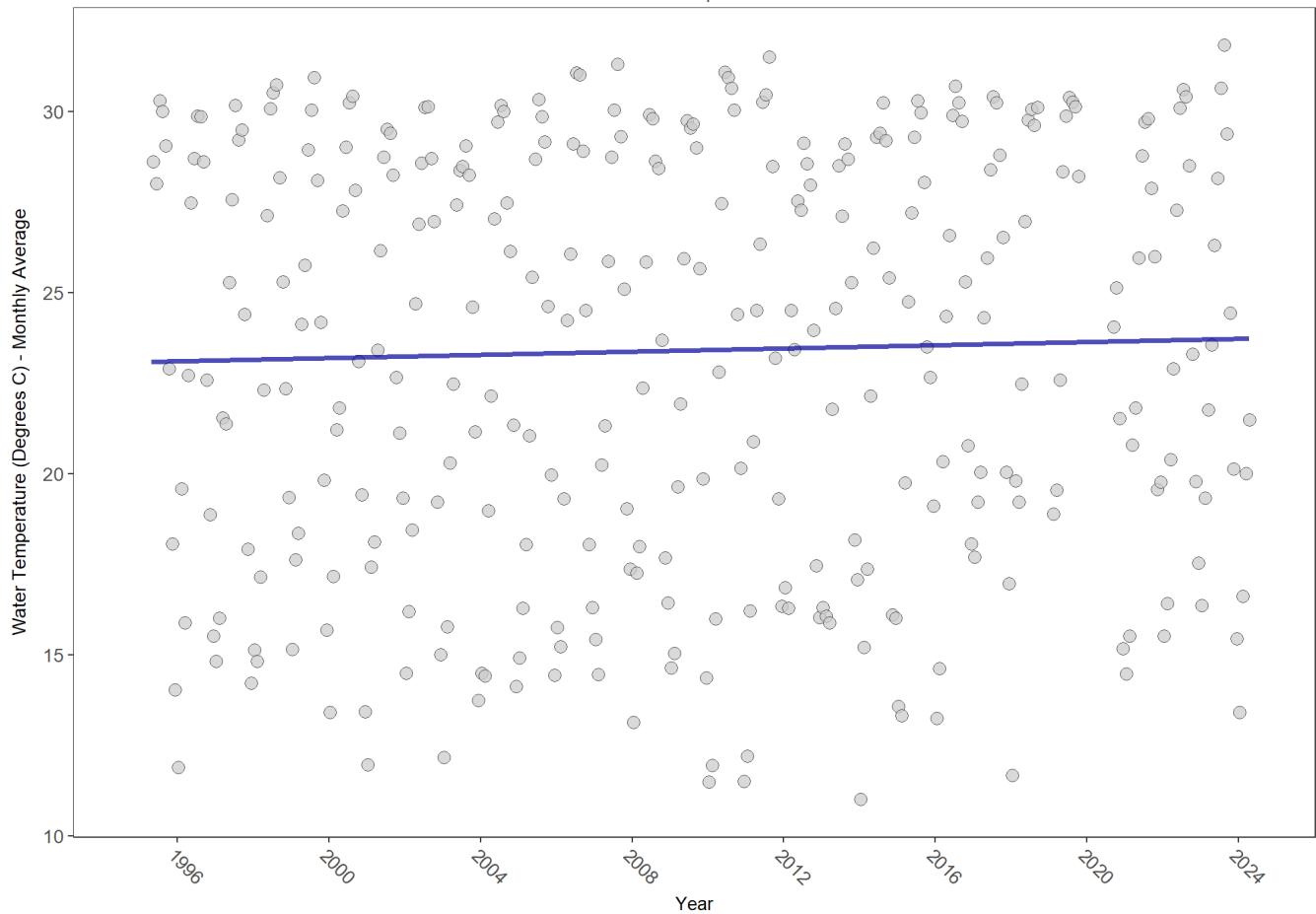
apaebwq

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

Apalachicola National Estuarine Research Reserve

apaebwq

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	733449	30	24	TRUE	0.128	0.0010	0.0223304	23.074	4.5372	0.9515	1

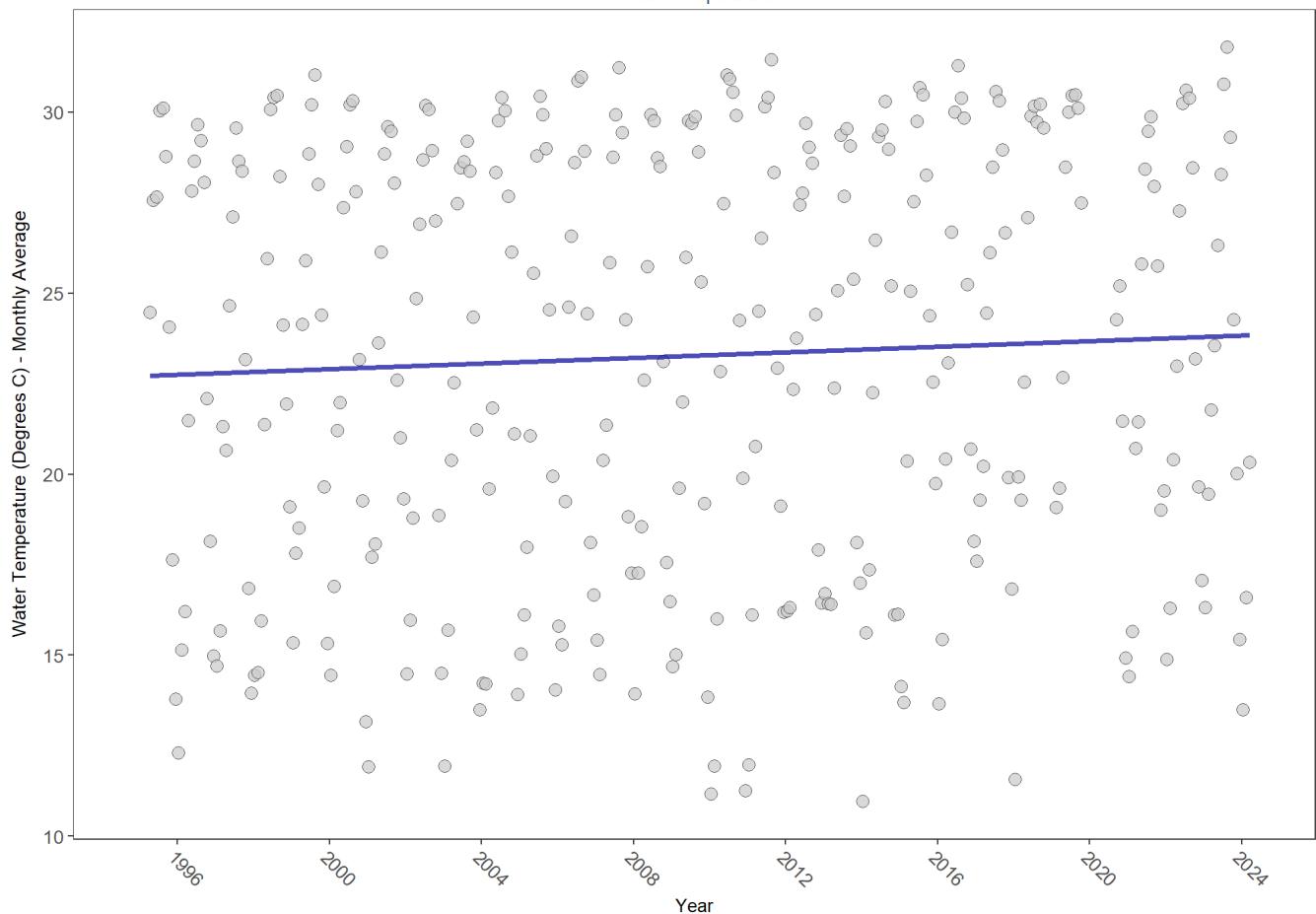
$p < 0.00005$ appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apaeswq

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

Apalachicola National Estuarine Research Reserve
apaeswq
Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	739130	30	24	TRUE	0.1792	0.0000	0.03818793	22.71664	5.1489	0.9237	1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

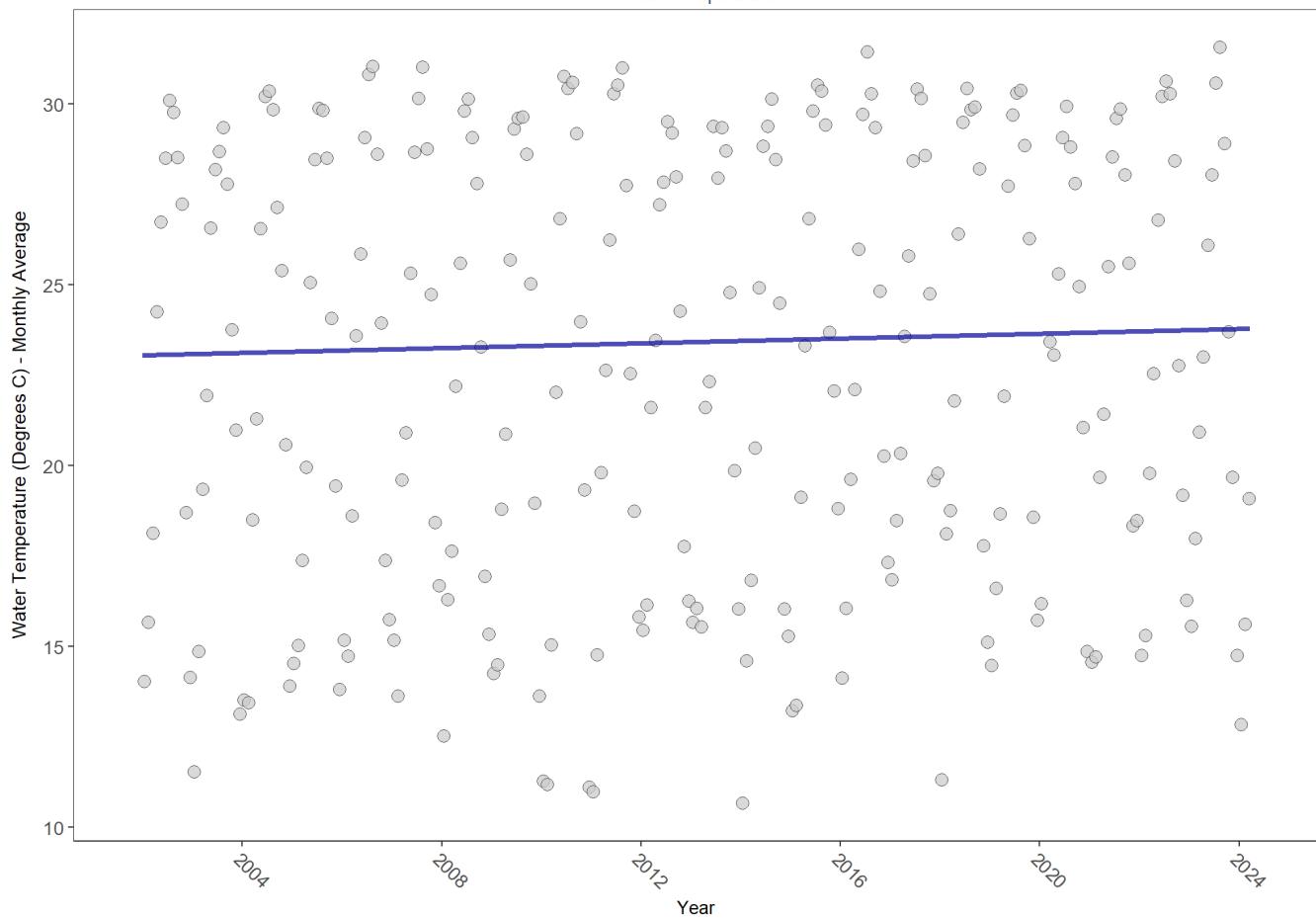
apacpwq

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

Apalachicola National Estuarine Research Reserve

apacpwq

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	640642	23	23.4	TRUE	0.149	0.0007	0.03340399	23.05736	5.1226	0.9251	1

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

SennIntercept is intercept value at beginning of record for monitoring location

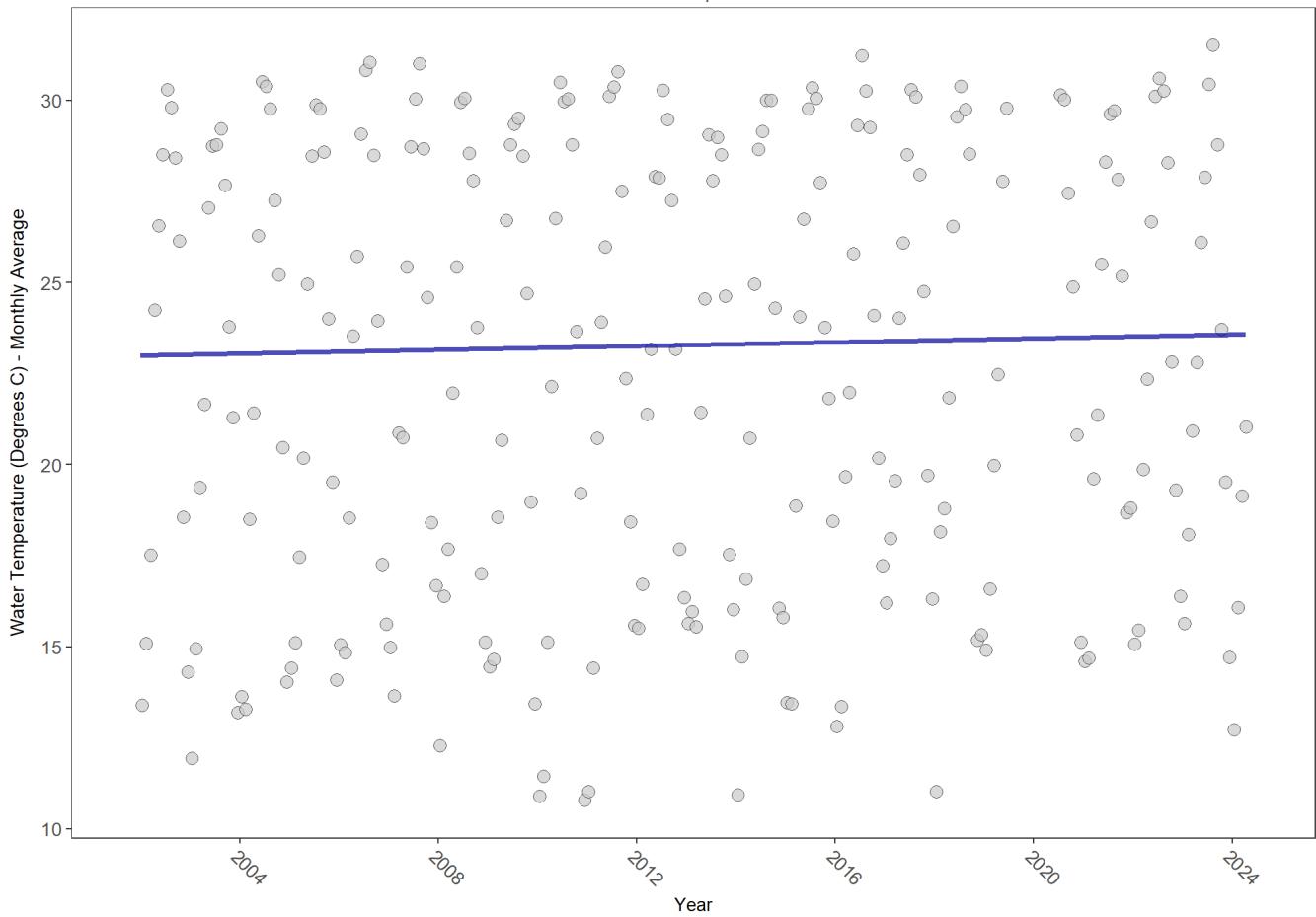
apadbwq

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

Apalachicola National Estuarine Research Reserve

apadbwq

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	616867	23	23.1	TRUE	0.125	0.0051	0.0265843	22.99519	7.8482	0.7268	1

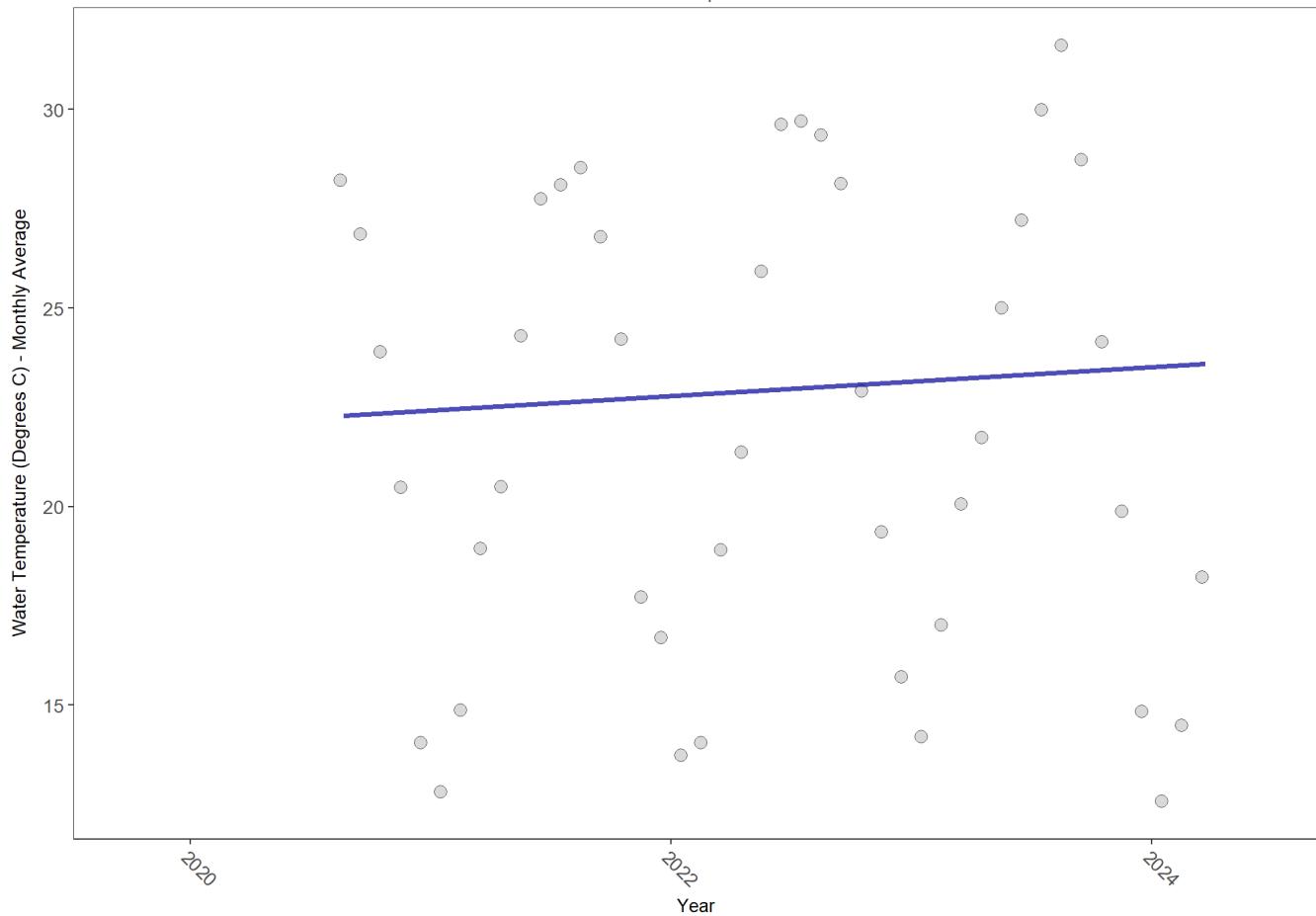
$p < 0.00005$ appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

apabpwq

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

Apalachicola National Estuarine Research Reserve
apabpwq
Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	121640	5	21.9	TRUE	0.2576	0.1561	0.36602	22.04772	9.0634	0.616	0

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

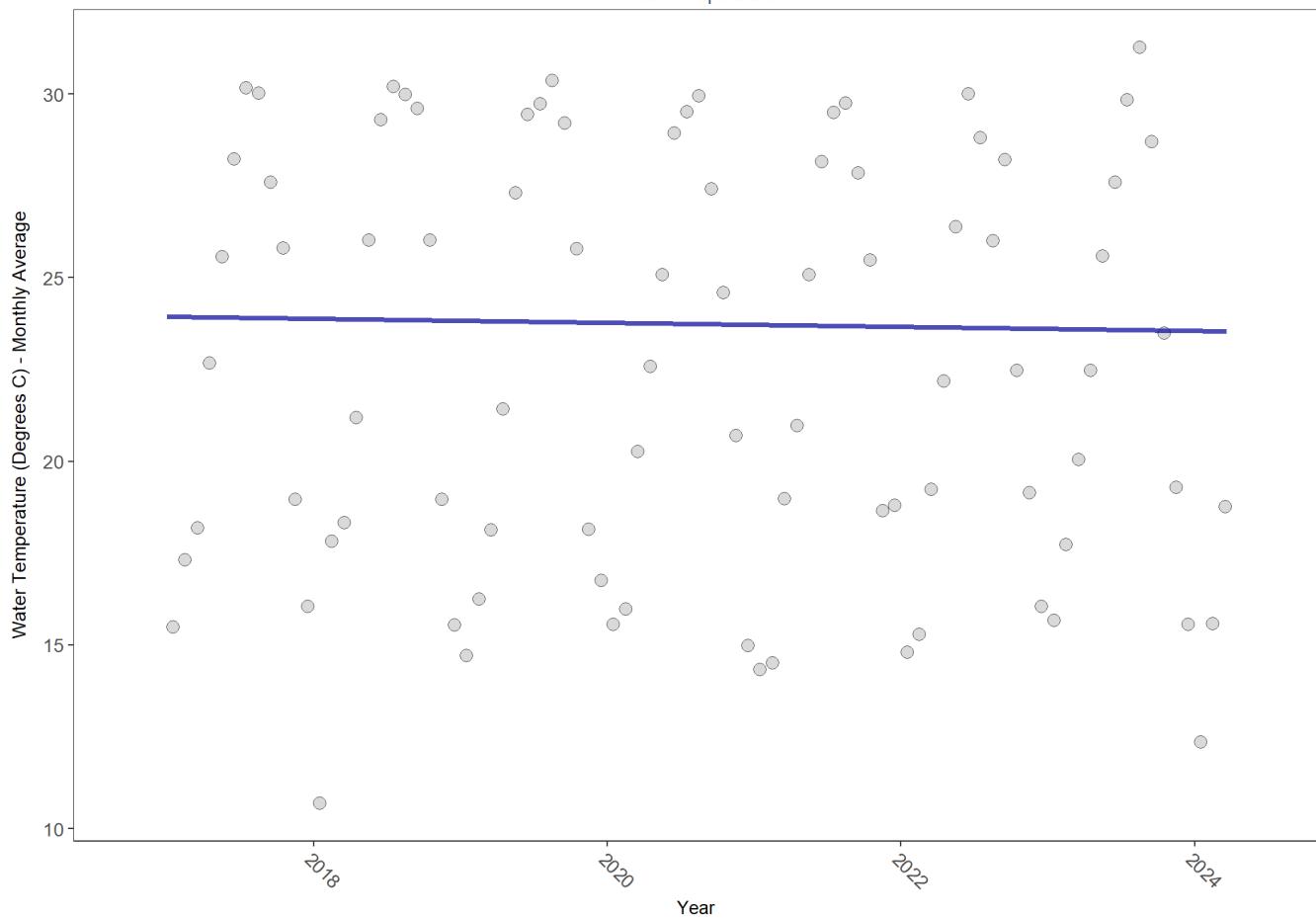
apapcwq

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

Apalachicola National Estuarine Research Reserve

apapcwq

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	242344	8	22.8	TRUE	-0.0969	0.3252	-0.05533261	23.93469	11.6812	0.3881	0

p < 0.00005 appear as 0 due to rounding.

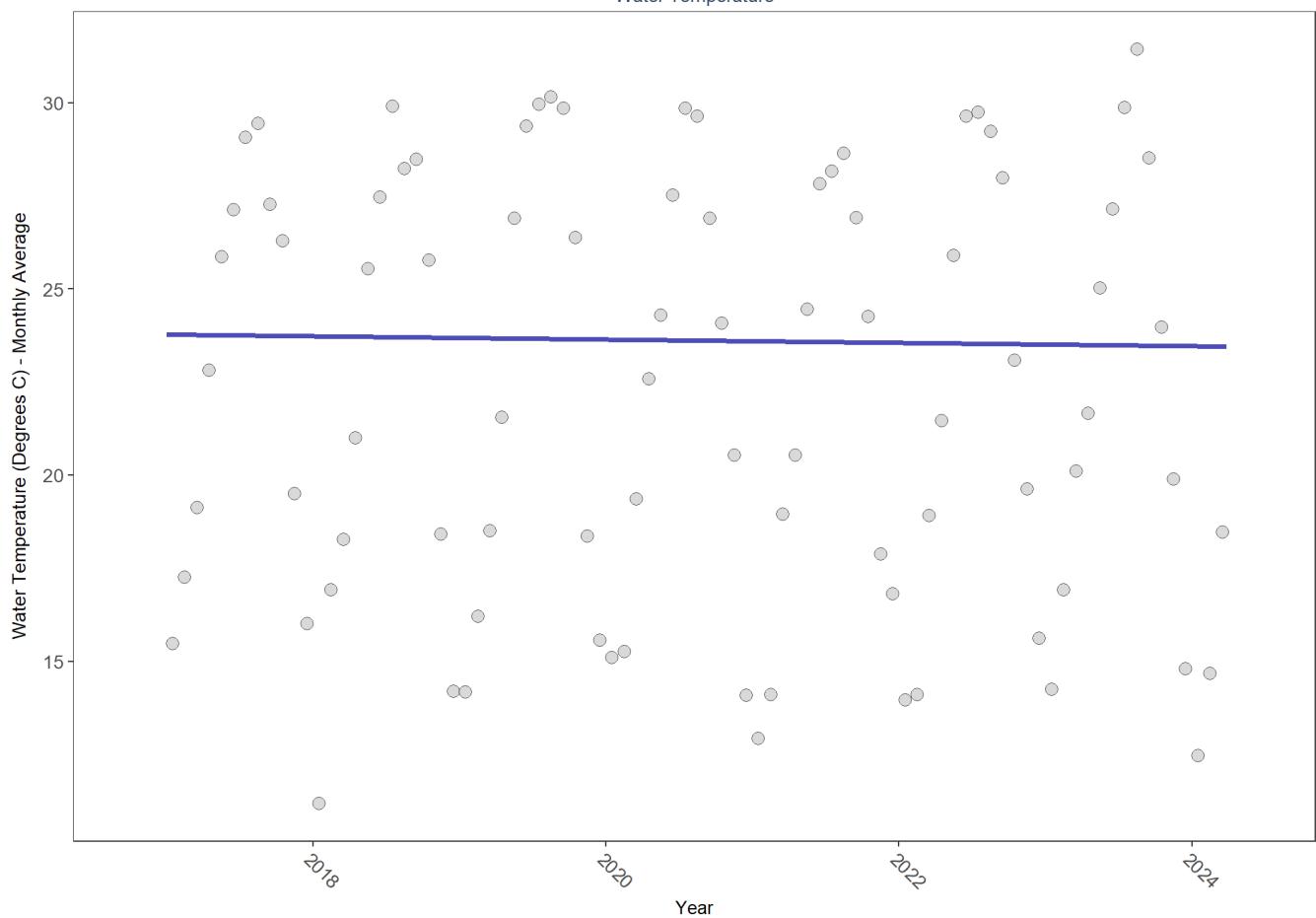
SennIntercept is intercept value at beginning of record for monitoring location

apalmwq

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

Apalachicola National Estuarine Research Reserve

Water Temperature



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	245344	8	22.3	TRUE	-0.0772	0.3671	-0.04391129	23.77631	10.156	0.5164	0

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

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

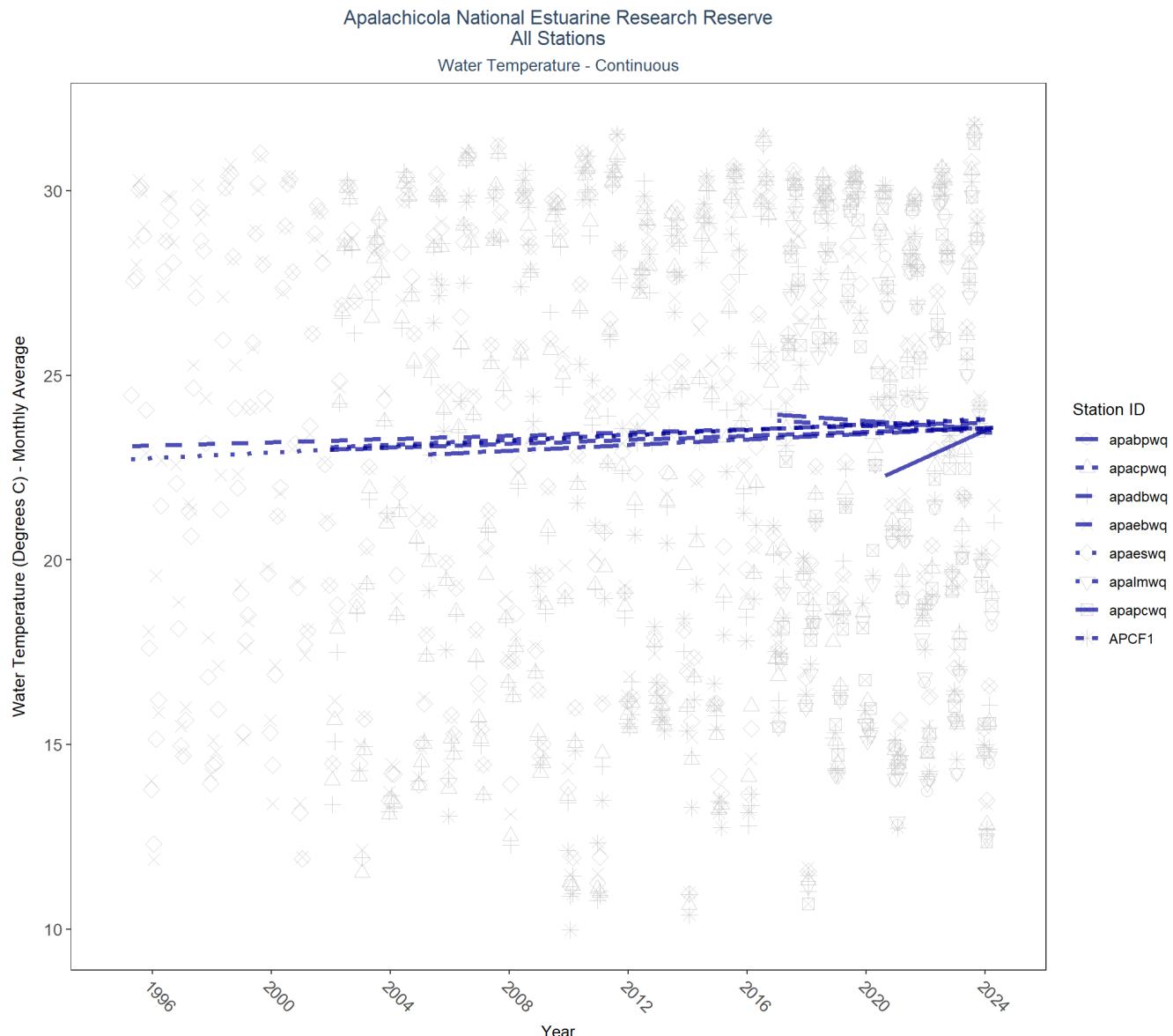


Table 32: Seasonal Kendall-Tau Results for All Stations - Water Temperature

Station	N_Data	N_Years	Period of Record	Median	tau	SennIntercept	SennSlope	p
APCF1	1281063	20	2005 - 2024	23.3	0.11	22.85	0.04	0.0548
apaebwq	733449	30	1995 - 2024	24.0	0.13	23.07	0.02	0.0010
apaeswq	739130	30	1995 - 2024	24.0	0.18	22.72	0.04	0.0000
apacpwq	640642	23	2002 - 2024	23.4	0.15	23.06	0.03	0.0007
apadbwq	616867	23	2002 - 2024	23.1	0.12	23.00	0.03	0.0051
apabpwq	121640	5	2020 - 2024	21.9	0.26	22.05	0.37	0.1561
apapcwq	242344	8	2017 - 2024	22.8	-0.10	23.93	-0.06	0.3252
apalmwd	245344	8	2017 - 2024	22.3	-0.08	23.78	-0.04	0.3671

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.

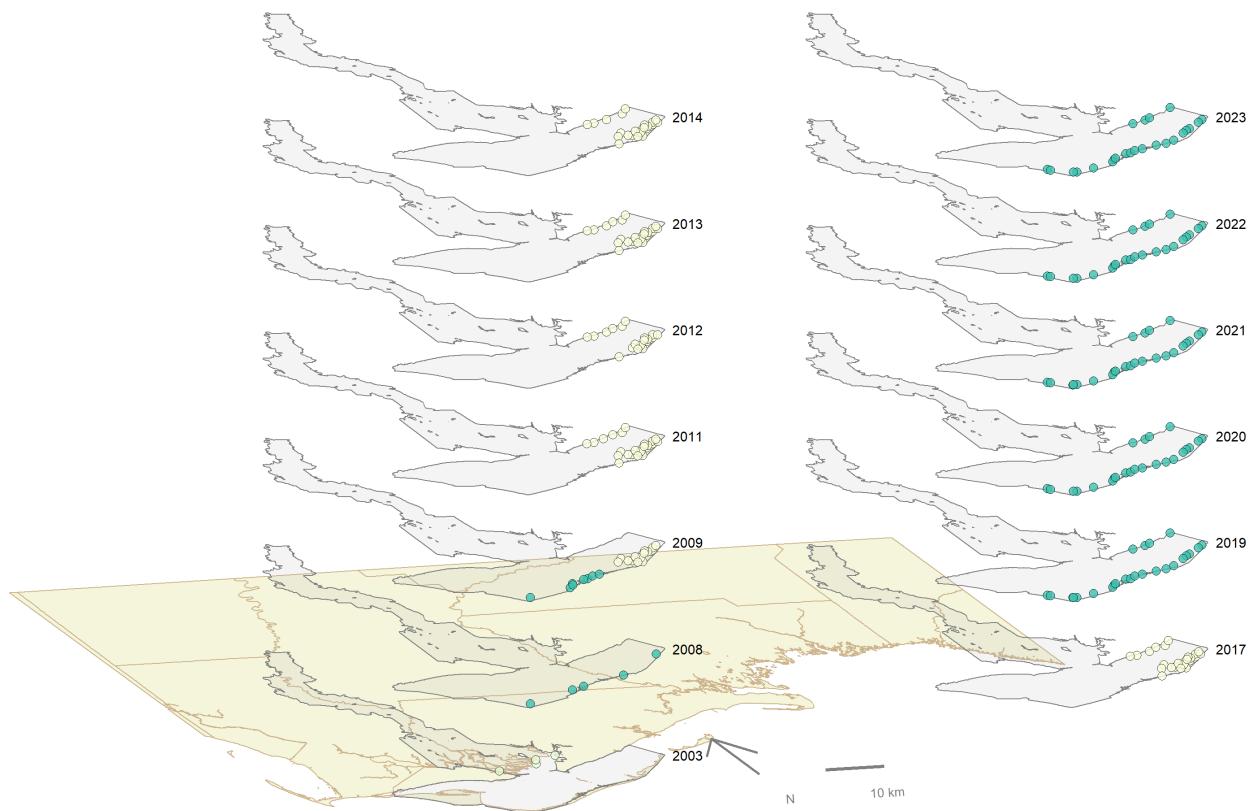
Notes

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

Apalachicola National Estuarine Research Reserve
SAV Percent Cover - Sample Locations

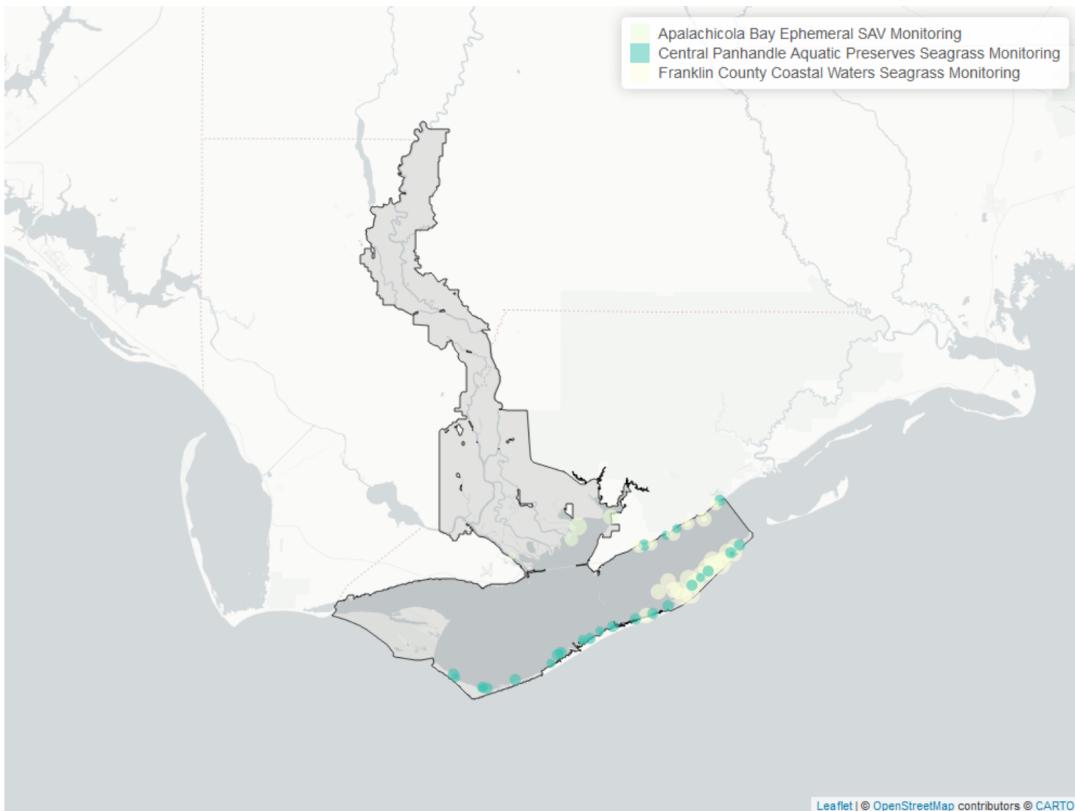


Program name

- Apalachicola Bay Ephemeral SAV Monitoring
- Central Panhandle Aquatic Preserves Seagrass Monitoring
- Franklin County Coastal Waters Seagrass Monitoring

Maps showing the temporal scope of SAV sampling sites within the boundaries of *Apalachicola National Estuarine Research Reserve* by Program name.

Sampling locations by Program:



Map showing SAV sampling sites within the boundaries of *Apalachicola National Estuarine Research Reserve*. The point size reflects the number of samples at a given sampling site.

Table 33: Franklin County Coastal Waters Seagrass Monitoring -
Program 558

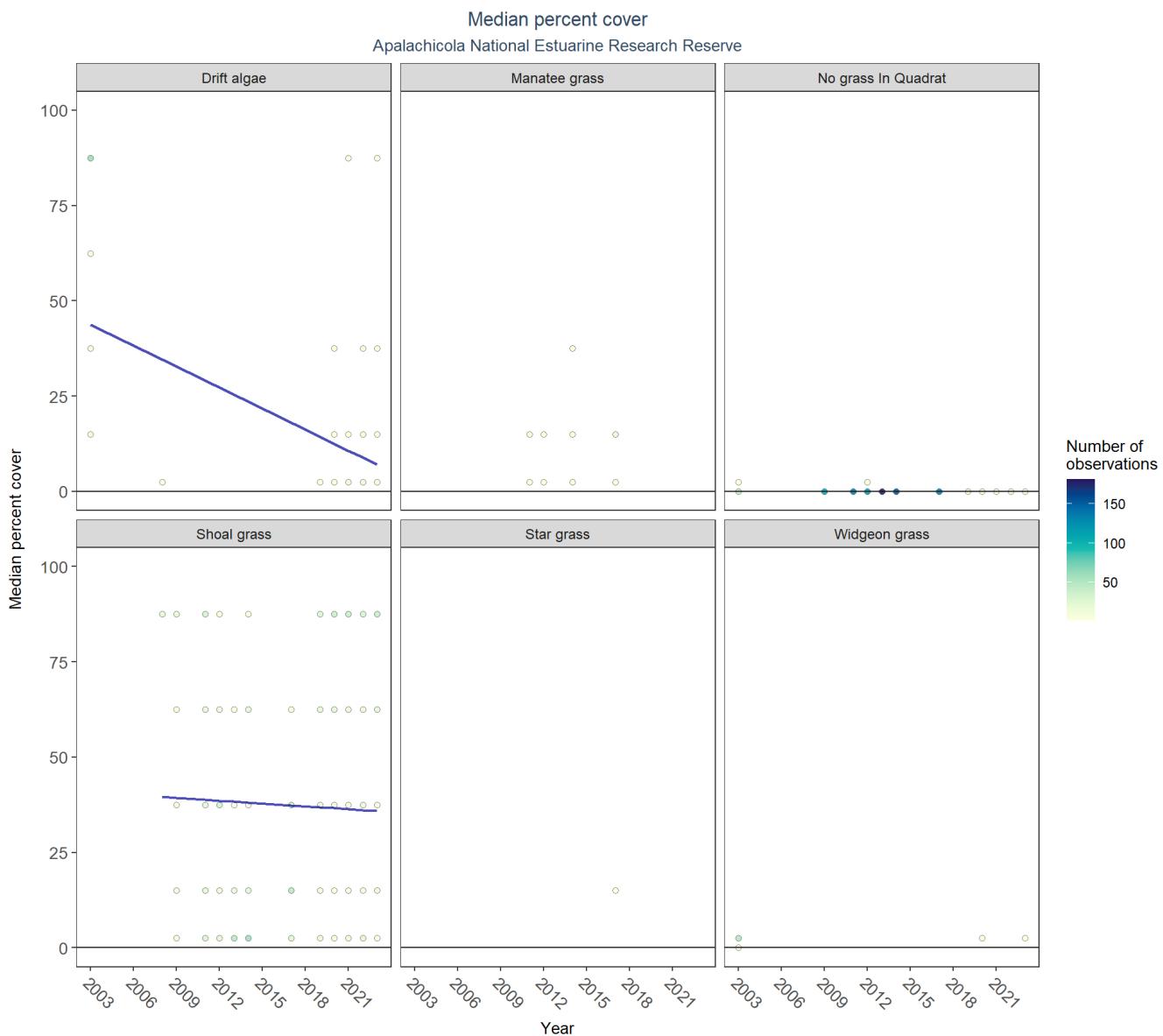
<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
1402	2009	2017	Percent Cover	32

Table 34: 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>
590	2008	2023	Braun Blanquet	35

Table 35: 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 National Estuarine Research Reserve*. 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.

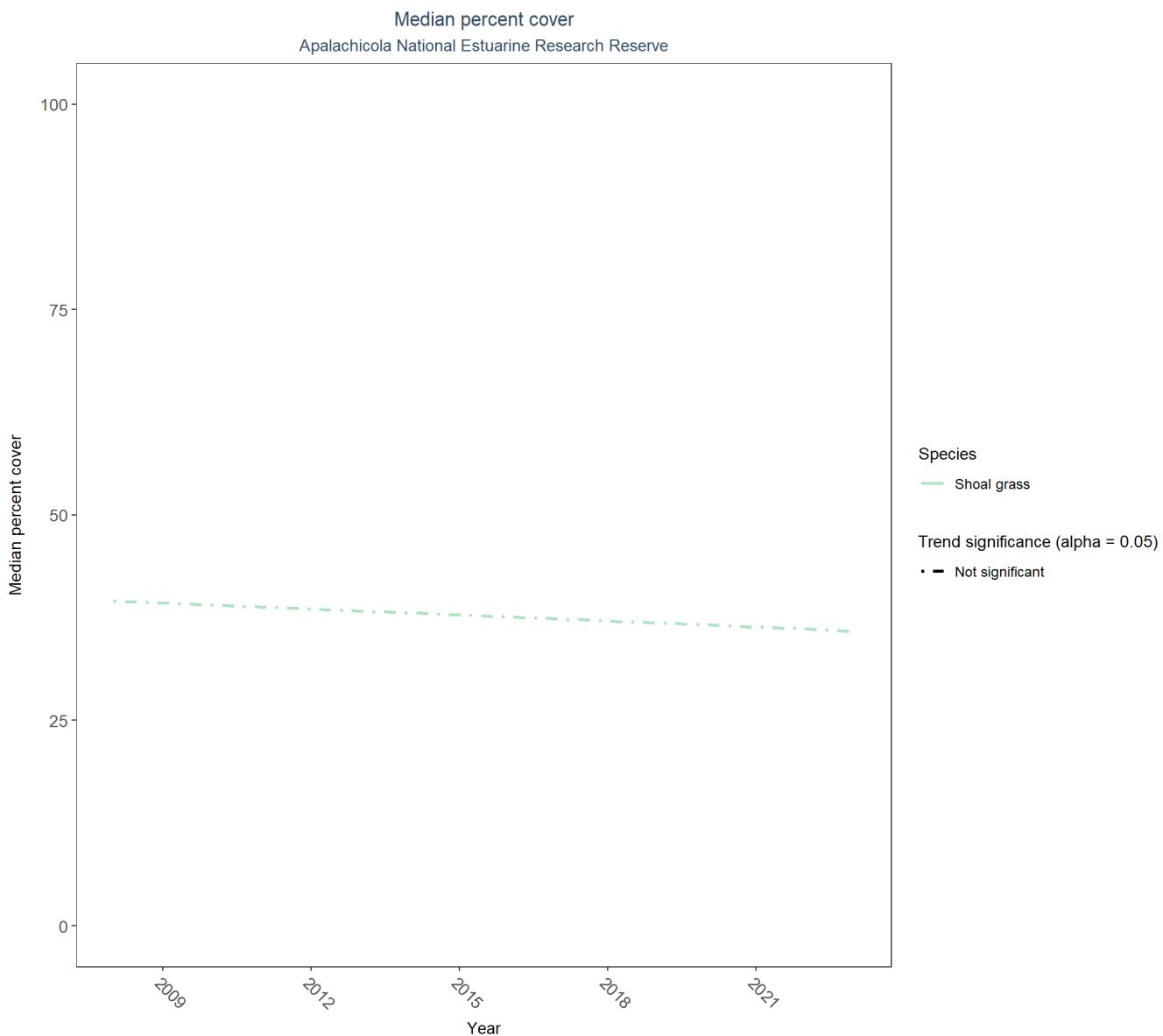
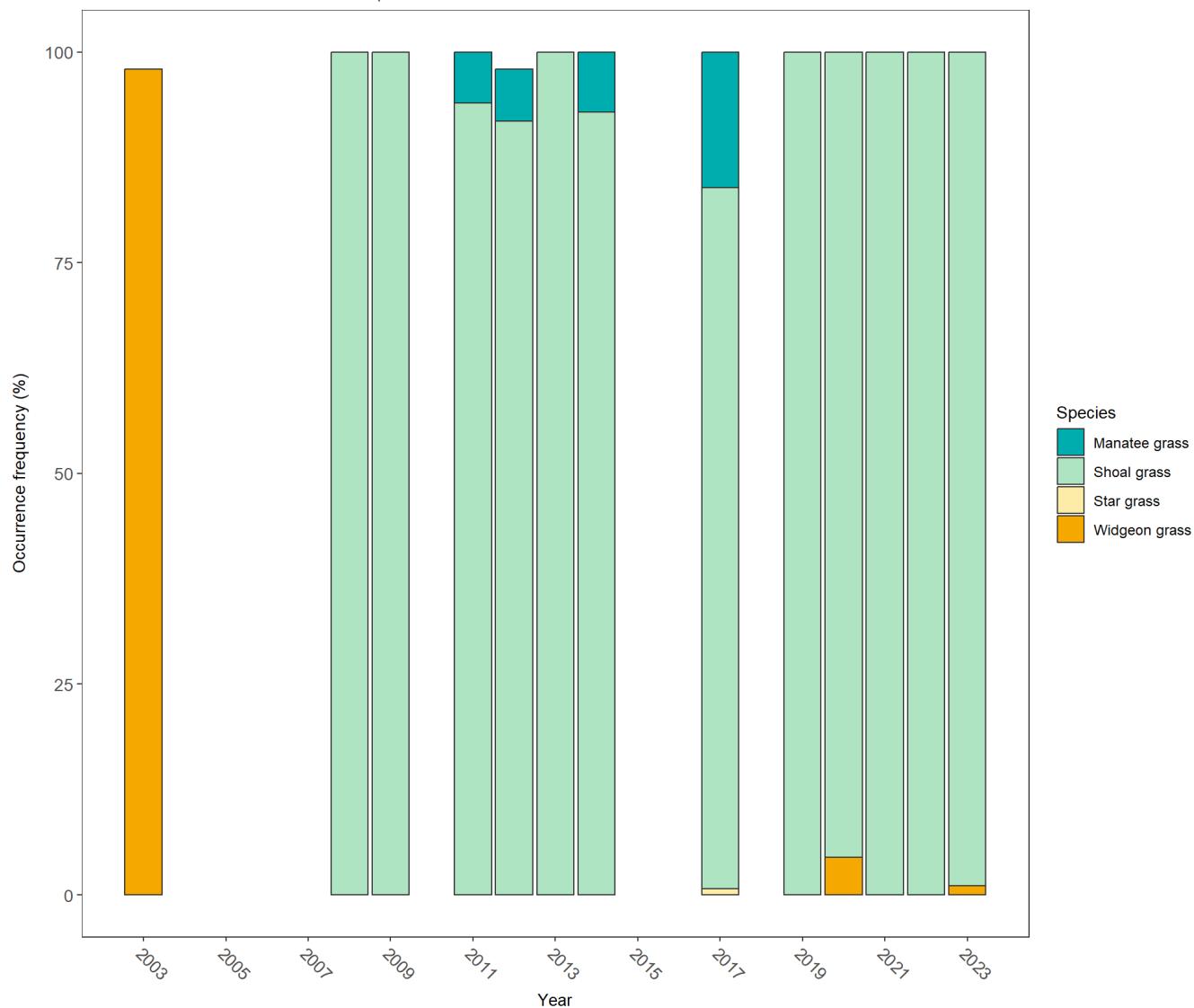


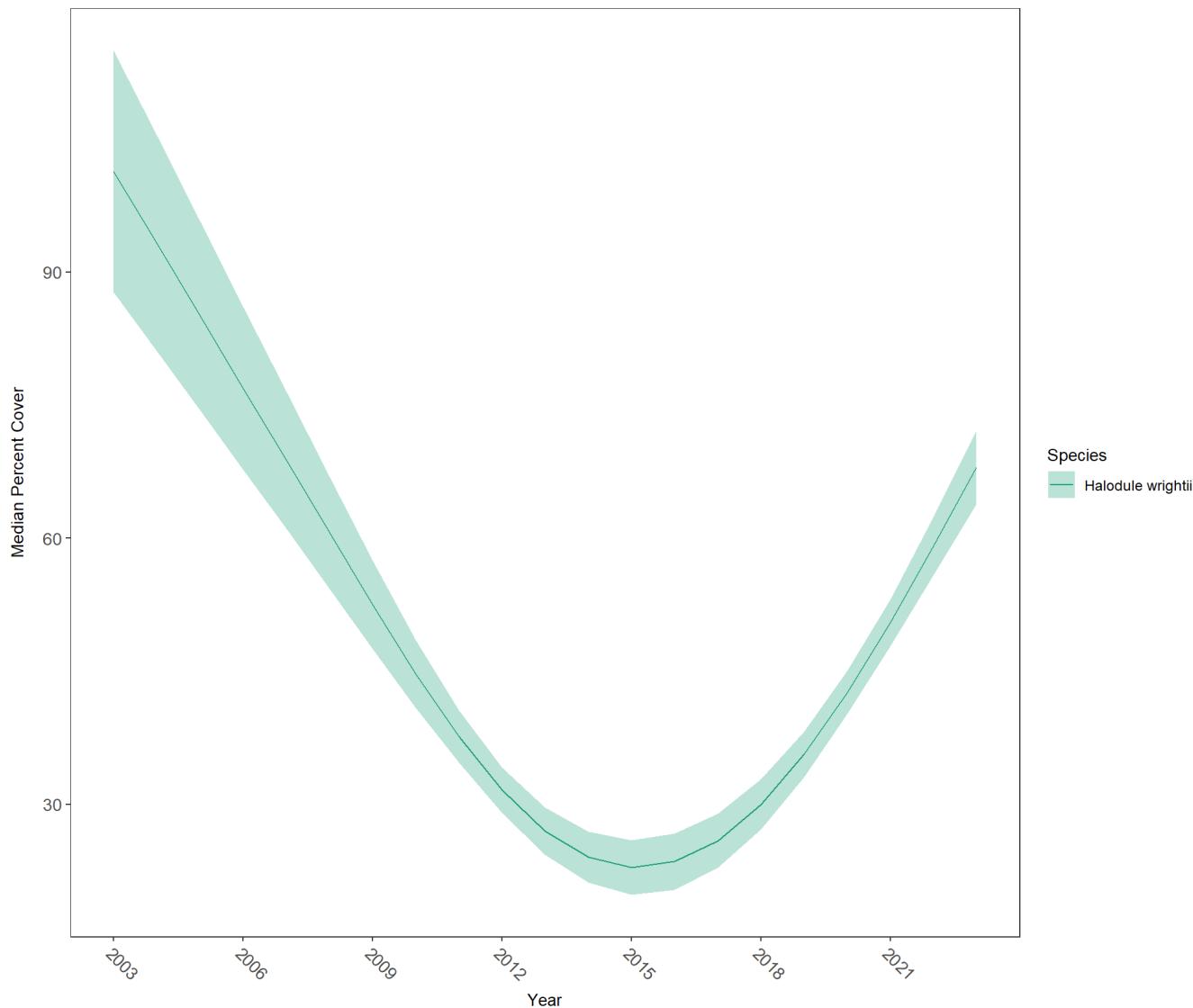
Table 36: Percent Cover Trend Analysis for Apalachicola National Estuarine Research Reserve

Species	CommonName	Trend Significance (0.05)	Period of Record	LME-Intercept	LME-Slope	p
Drift algae		Significantly decreasing trend	2003 - 2023	60.3106	-1.8363	0.0315
Halodule wrightii	Shoal grass	No significant trend	2008 - 2023	42.9809	-0.2445	0.7268
Halophila engelmannii	Star grass	Insufficient data to calculate trend				
No grass In Quadrat		Model did not fit the available data	2003 - 2023			
Ruppia maritima	Widgeon grass	Insufficient data to calculate trend				
Syringodium filiforme	Manatee grass	Insufficient data to calculate trend				

Frequency of occurrence
Apalachicola National Estuarine Research Reserve



Median Percent Cover for seagrass species
Apalachicola National Estuarine Research Reserve



Generalized additive models for each species in Apalachicola National Estuarine Research Reserve. Species must have at least 10 years of data to be evaluated.

Drift algae, Total seagrass, Attached algae, No grass In Quadrat, and Total SAV are excluded from the analyses.

Nekton

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

