

Nassau River-St. Johns River Marshes Aquatic Preserve

SEACAR Habitat Analyses

Last compiled on 03 September, 2024

Contents

| | |
|--|-----------|
| Threshold Filtering | 2 |
| Value Qualifiers | 3 |
| Water Column | 5 |
| Seasonal Kendall-Tau Analysis | 5 |
| Water Quality - Discrete | 5 |
| Chlorophyll a, Corrected for Pheophytin - Discrete Water Quality | 6 |
| Chlorophyll a, Uncorrected for Pheophytin - Discrete Water Quality | 9 |
| Dissolved Oxygen - Discrete Water Quality | 11 |
| Dissolved Oxygen Saturation - Discrete Water Quality | 14 |
| pH - Discrete Water Quality | 16 |
| Salinity - Discrete Water Quality | 18 |
| Secchi Depth - Discrete Water Quality | 20 |
| Total Nitrogen - Discrete Water Quality | 22 |
| Total Phosphorus - Discrete Water Quality | 25 |
| Total Suspended Solids - Discrete Water Quality | 27 |
| Turbidity - Discrete Water Quality | 30 |
| Water Temperature - Discrete Water Quality | 33 |
| Water Quality - Continuous | 37 |
| Dissolved Oxygen - Continuous Water Quality | 40 |
| NEKD | 40 |
| NELC | 41 |
| NCB19020038 | 42 |
| NCBNRCM | 43 |
| All Stations Combined | 44 |
| Dissolved Oxygen Saturation - Continuous Water Quality | 45 |
| NEKD | 45 |
| NELC | 46 |
| NCBNRCM | 47 |
| NCB19020038 | 48 |
| All Stations Combined | 49 |
| pH - Continuous Water Quality | 50 |
| NEKD | 50 |
| NELC | 51 |
| NCB19020038 | 52 |
| NCBNRCM | 53 |
| All Stations Combined | 54 |
| Salinity - Continuous Water Quality | 55 |
| NEKD | 55 |
| NELC | 56 |
| NCBNRCM | 57 |

| | |
|--|----|
| NCB19020038 | 58 |
| All Stations Combined | 59 |
| Turbidity - Continuous Water Quality | 60 |
| NEKD | 60 |
| NELC | 61 |
| NCB19020038 | 62 |
| NCBNRCM | 63 |
| All Stations Combined | 64 |
| Water Temperature - Continuous Water Quality | 65 |
| NEKD | 65 |
| NELC | 66 |
| NCBNRCM | 67 |
| NCB19020038 | 68 |
| All Stations Combined | 69 |

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

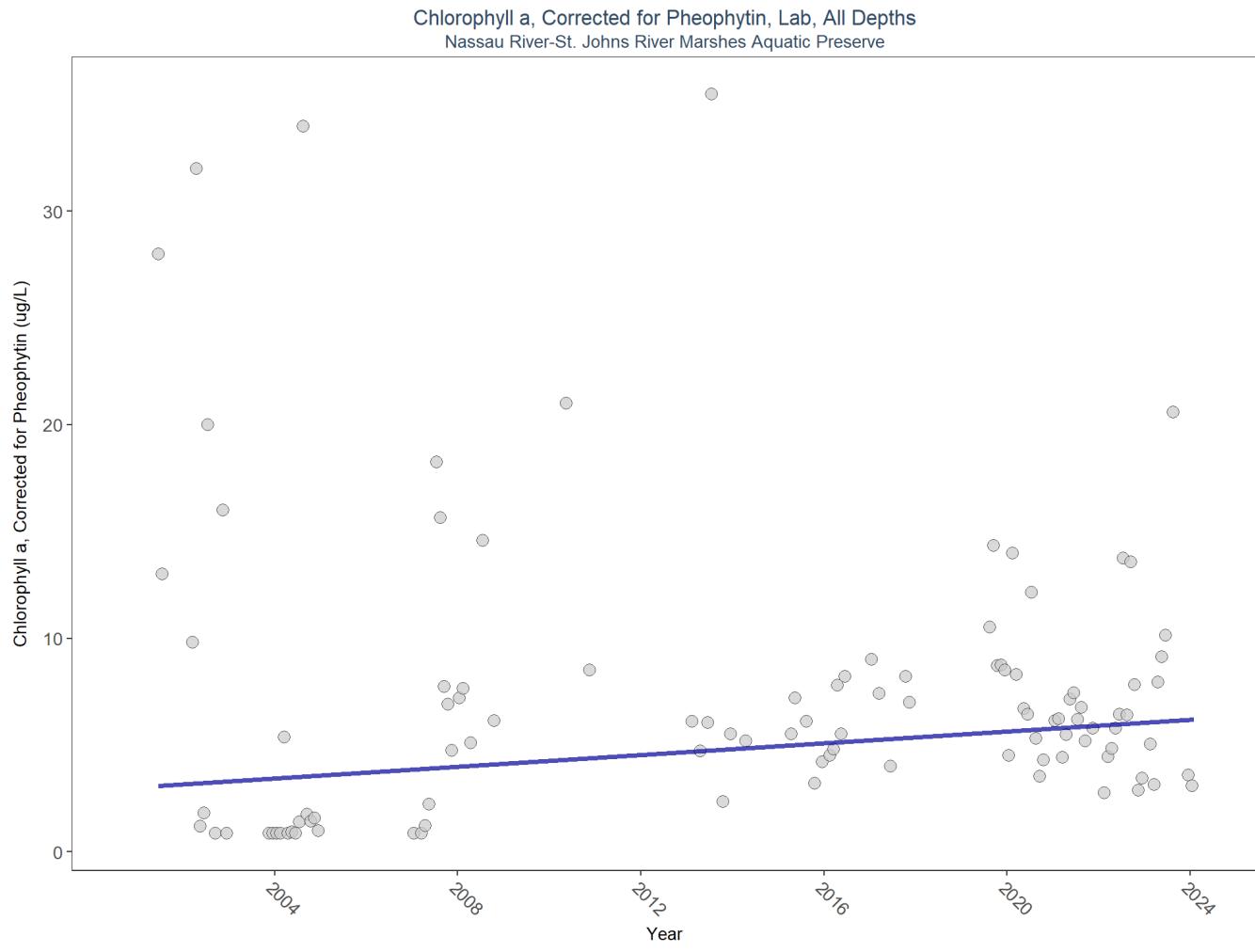
The following files were used in the discrete analysis:

- *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.

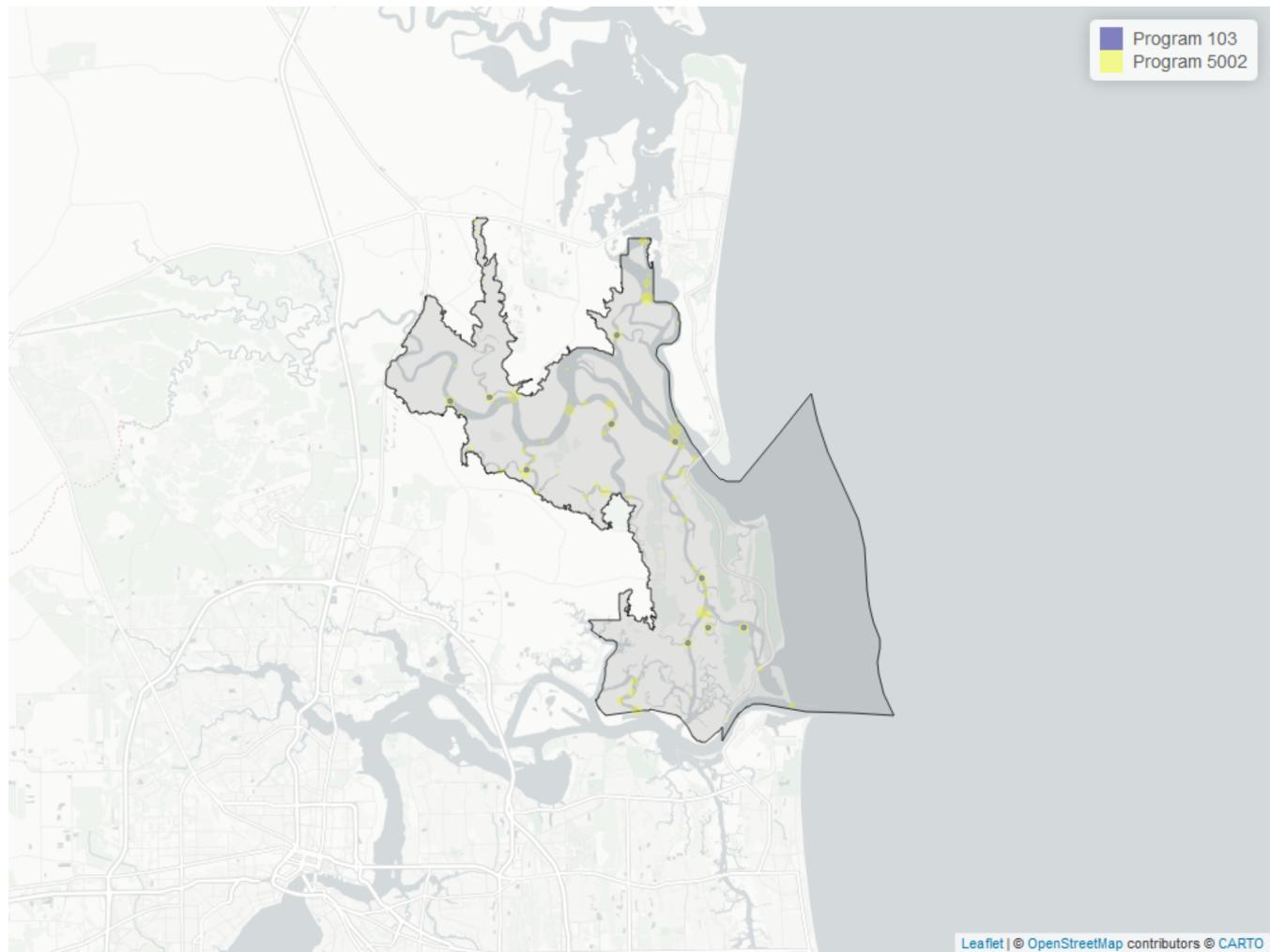
Seasonal Kendall-Tau Trend Analysis



$p < 0.00005$ 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 | 546 | 2001 | 2024 |
| 103 | 39 | 2021 | 2021 |

Program names:

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 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> |
|-------------|----------------|------------|---------------|------------|---------------|------------|---------------|
| 2004 | 47 | 2 | 4.3 | 1 | 2.1 | 34 | 72.3 |
| 2007 | 28 | 2 | 7.1 | | | 12 | 42.9 |
| 2008 | 84 | 1 | 1.2 | | | | |
| 2013 | 15 | 1 | 6.7 | | | | |
| 2020 | 63 | 8 | 12.7 | | | 1 | 1.6 |
| 2021 | 142 | 10 | 7.0 | 9 | 6.3 | 5 | 3.5 |
| 2022 | 105 | 12 | 11.4 | | | | |
| 2023 | 55 | 5 | 9.1 | | | | |

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

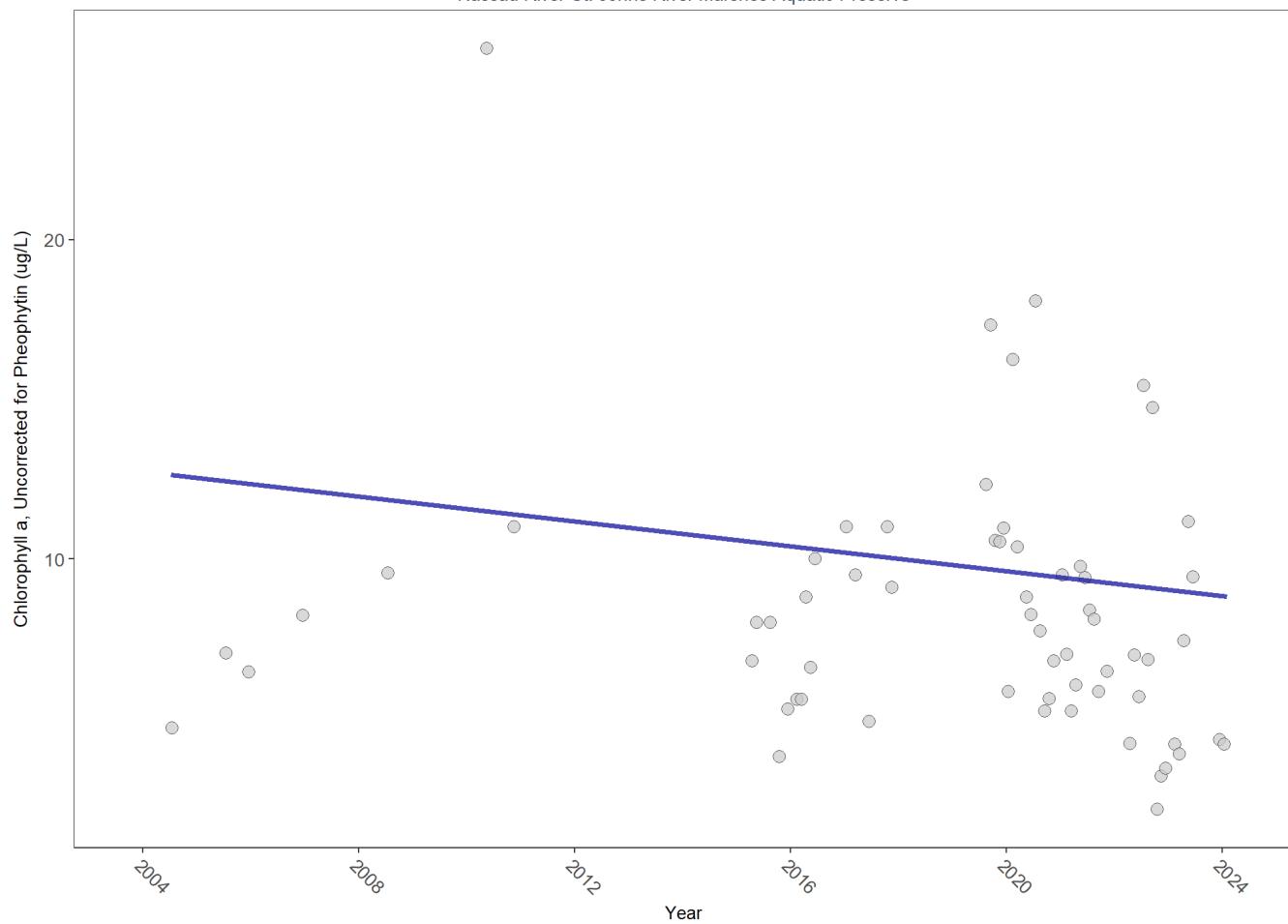
Programs containing Value Qualified data:

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
Nassau River-St. Johns River Marshes Aquatic Preserve

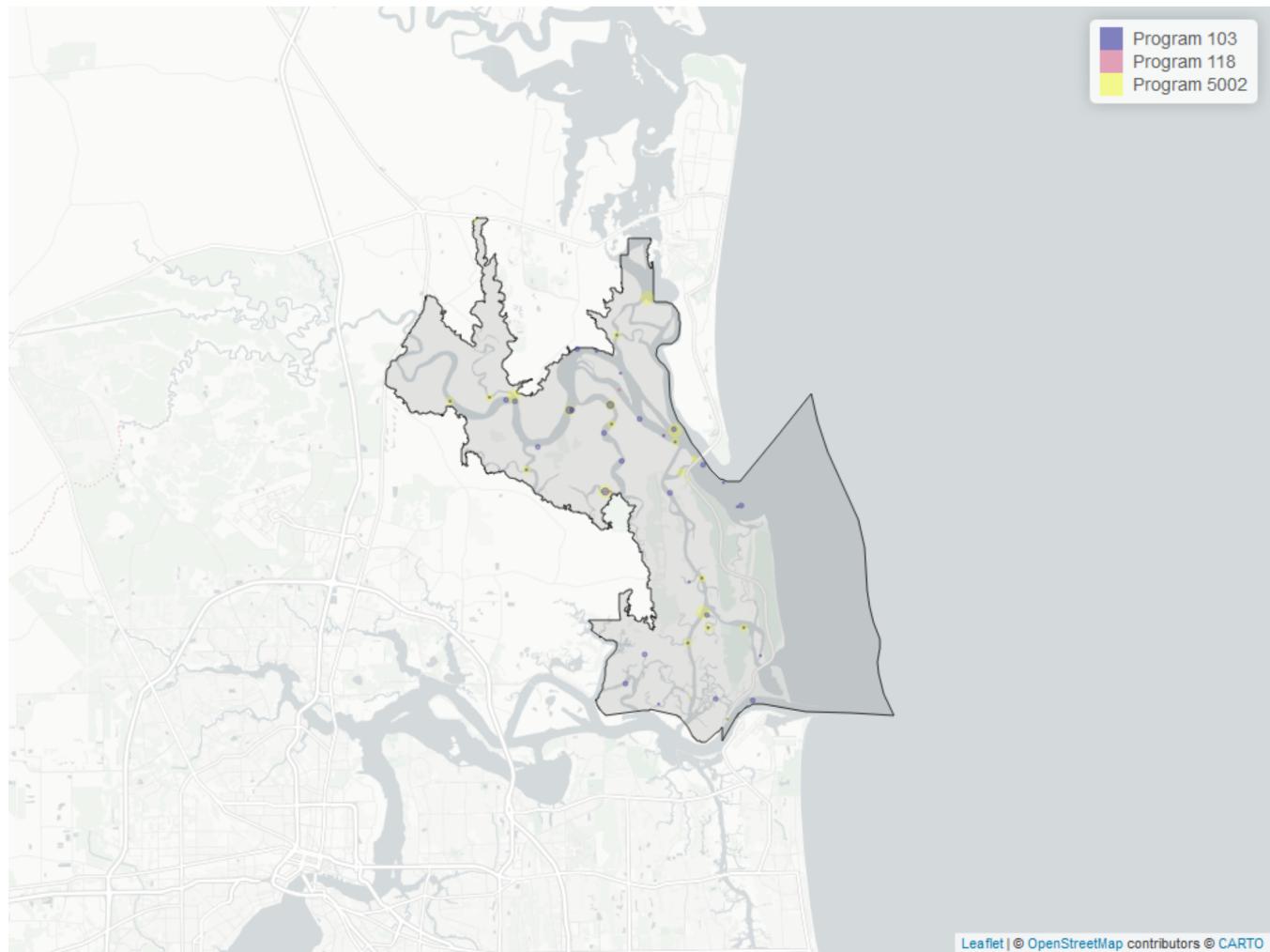


| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|------------|---------------|------------|-------------|-------|
| All | 398 | 14 | 7.6 | TRUE | -0.2201 | 0.1003 | -0.1943325 | 12.7288 | 11.3152 | 0.4172 | 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 |
|-----------|--------|---------|---------|
| 5002 | 262 | 2010 | 2024 |
| 103 | 139 | 2004 | 2021 |
| 118 | 3 | 2005 | 2010 |

Program names:

5002 - Florida STORET / WIN

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

Value Qualifiers

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

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

| Year | N_{Total} | N_I | $perc_I$ | N_Q | $perc_Q$ | N_U | $perc_U$ |
|------|-------------|-------|----------|-------|----------|-------|----------|
| 2020 | 64 | | | | | 1 | 1.6 |
| 2021 | 134 | 4 | 3.0 | 10 | 7.5 | 7 | 5.2 |
| 2022 | 45 | 9 | 20.0 | | | | |
| 2023 | 24 | 1 | 4.2 | | | | |

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:

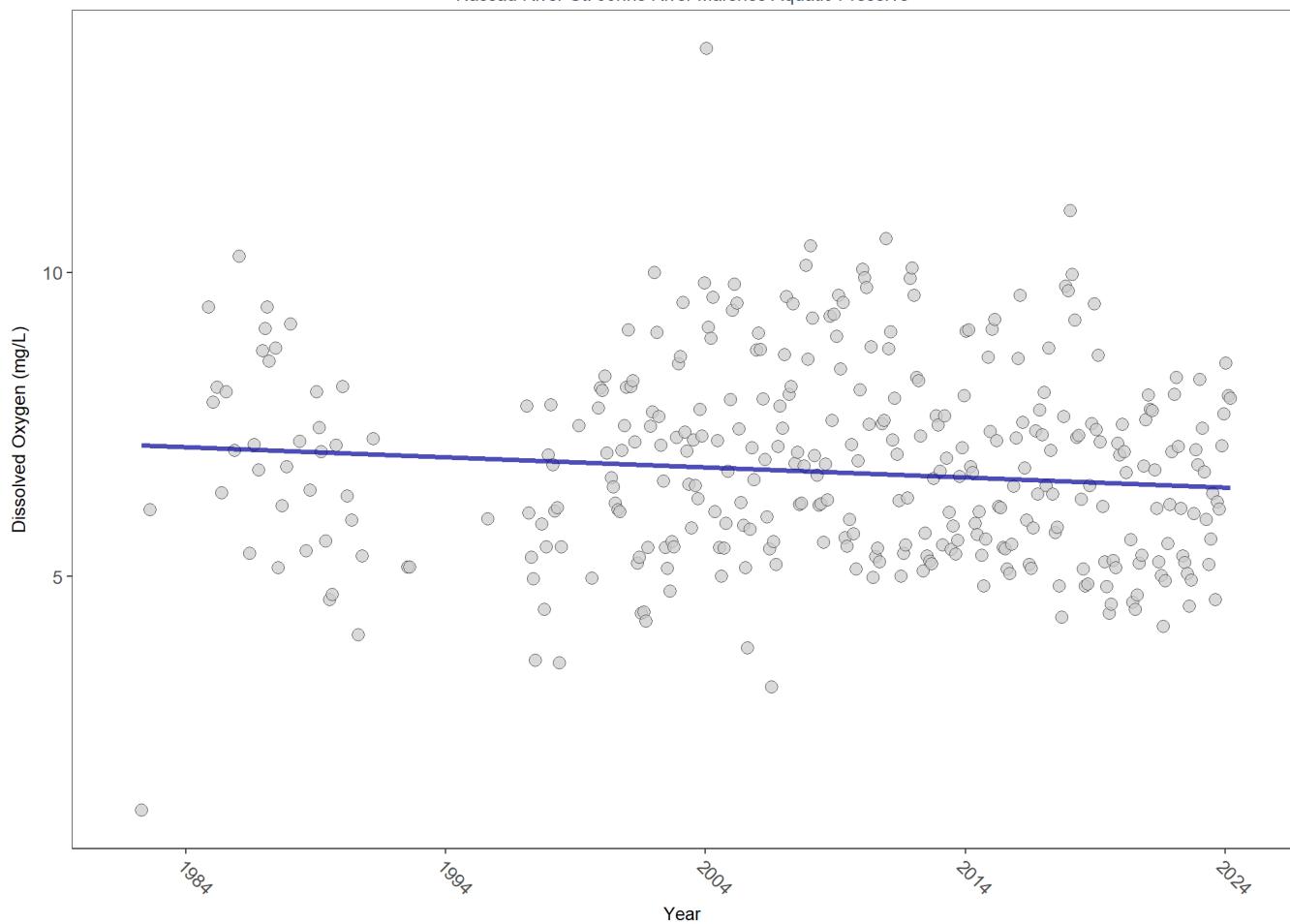
5002 - Florida STORET / WIN

Dissolved Oxygen - Discrete Water Quality

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

Seasonal Kendall-Tau Trend Analysis

Dissolved Oxygen, Field, All Depths
Nassau River-St. Johns River Marshes Aquatic Preserve

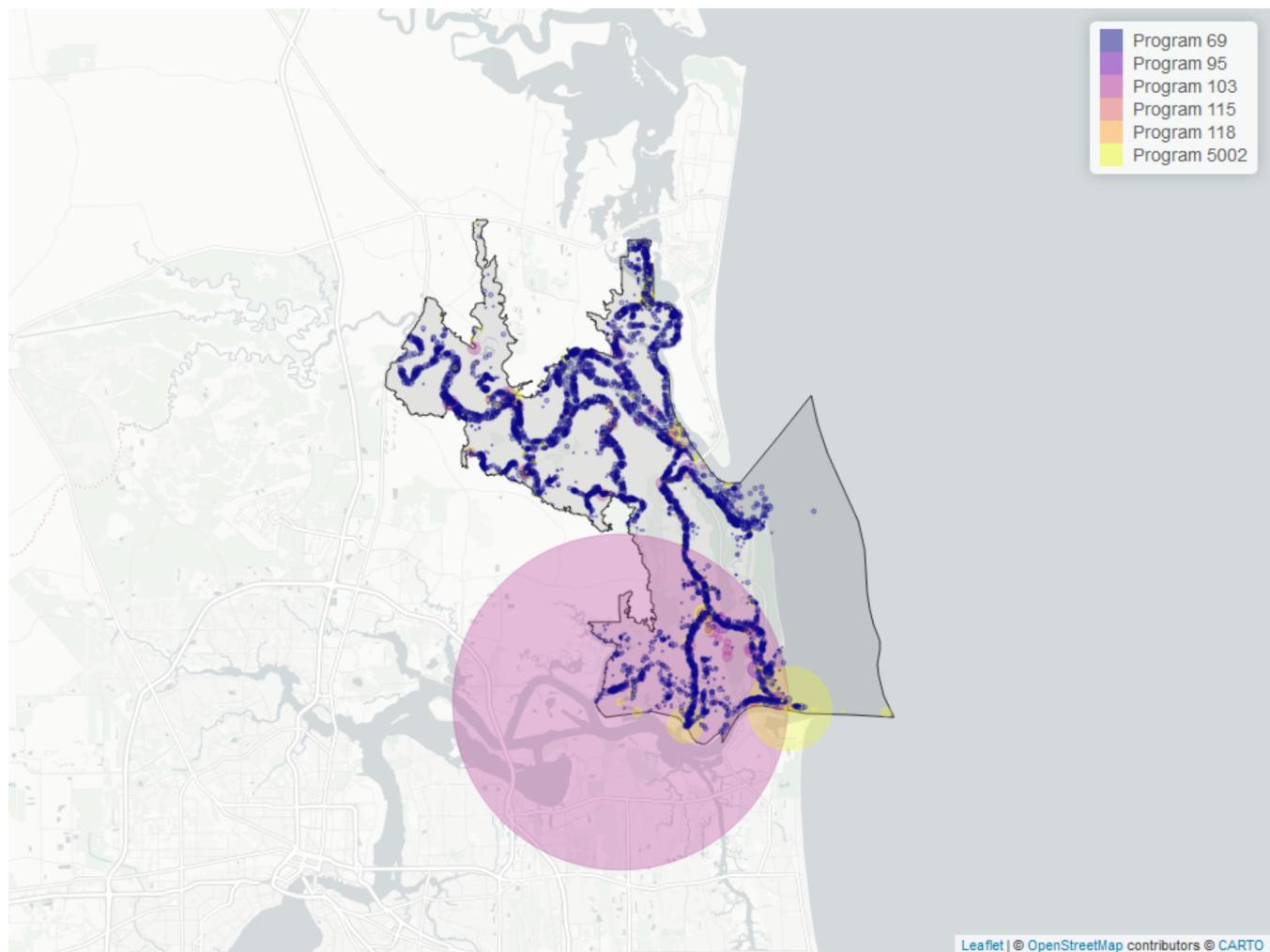


| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|-------------|---------------|------------|-------------|-------|
| All | 39135 | 39 | 6.3 | TRUE | -0.1288 | 0.0009 | -0.01670446 | 7.163706 | 5.3177 | 0.9148 | -1 |

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Dissolved Oxygen



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

Table 10: Programs contributing data for Dissolved Oxygen

| ProgramID | N_Data | YearMin | YearMax |
|-----------|--------|---------|---------|
| 103 | 18455 | 1982 | 2021 |
| 69 | 18151 | 2001 | 2022 |
| 5002 | 2425 | 1997 | 2024 |
| 95 | 189 | 2013 | 2018 |
| 115 | 4 | 1995 | 1995 |
| 118 | 2 | 2005 | 2006 |

Program names:

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

69 - Fisheries-Independent Monitoring (FIM) Program

5002 - Florida STORET / WIN

95 - Harmful Algal Bloom Marine Observation Network

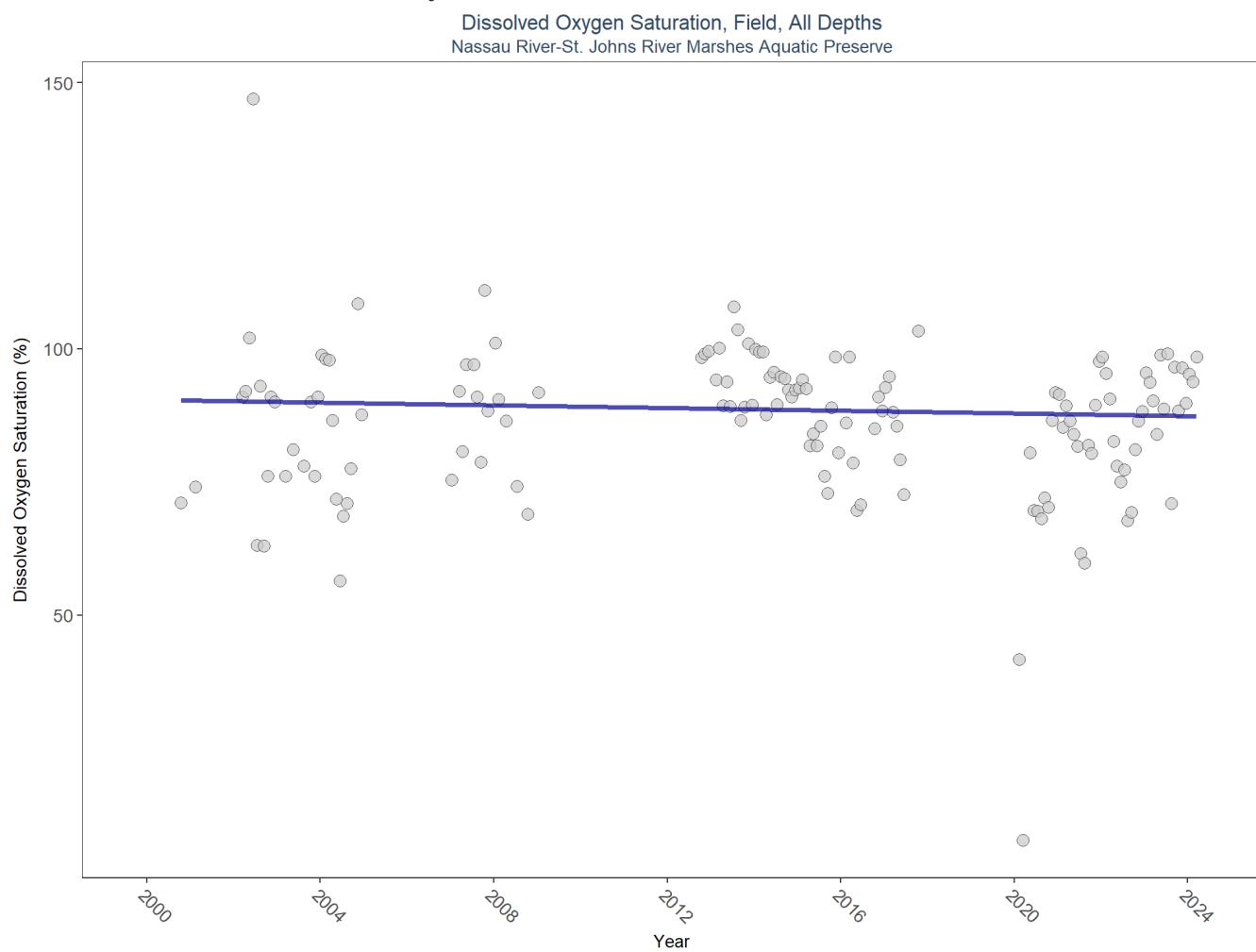
115 - Environmental Monitoring Assessment Program

118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

There are no qualifying Value Qualifiers for Dissolved Oxygen in Nassau River-St. Johns River Marshes Aquatic Preserve

Dissolved Oxygen Saturation - Discrete Water Quality

Seasonal Kendall-Tau Trend Analysis

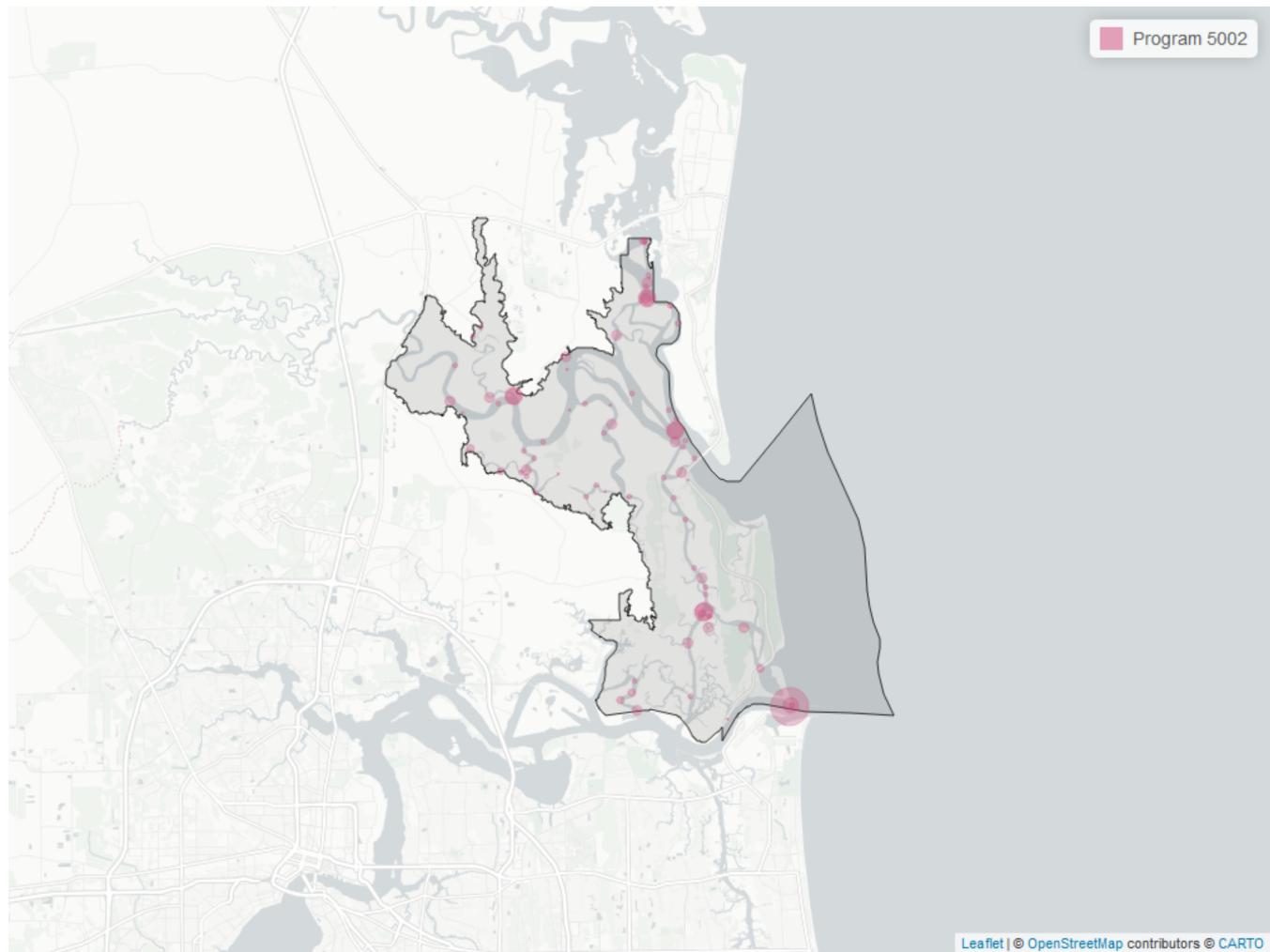


| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|------------|---------------|------------|-------------|-------|
| All | 1119 | 19 | 88.8 | TRUE | -0.1034 | 0.1014 | -0.1283951 | 90.4207 | 6.6991 | 0.8229 | 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 11: Programs contributing data for Dissolved Oxygen Saturation

| ProgramID | N_Data | YearMin | YearMax |
|-----------|--------|---------|---------|
| 5002 | 1137 | 2000 | 2024 |

Program names:

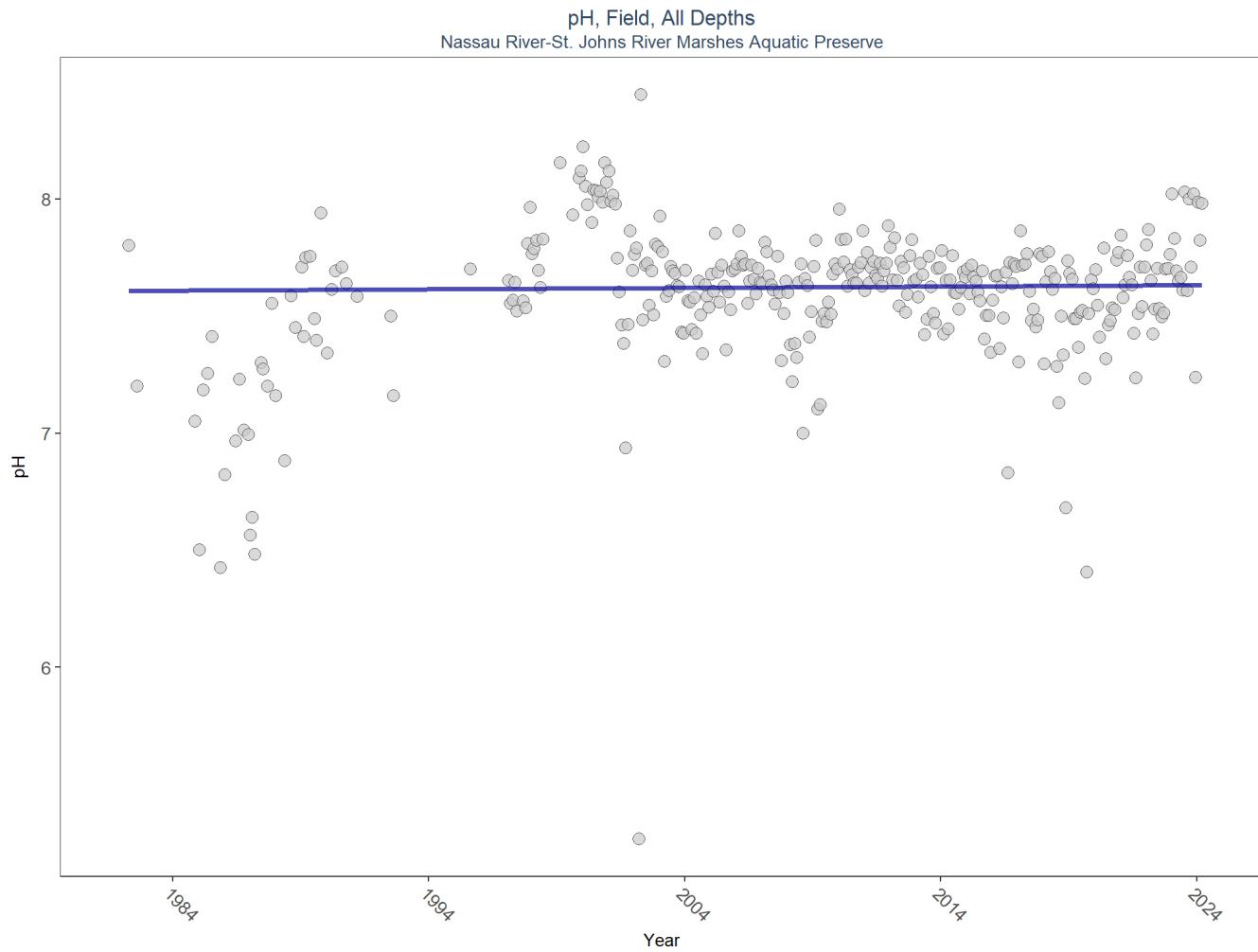
5002 - Florida STORET / WIN

There are no qualifying Value Qualifiers for Dissolved Oxygen Saturation in Nassau River-St. Johns River Marshes Aquatic Preserve

pH - Discrete Water Quality

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

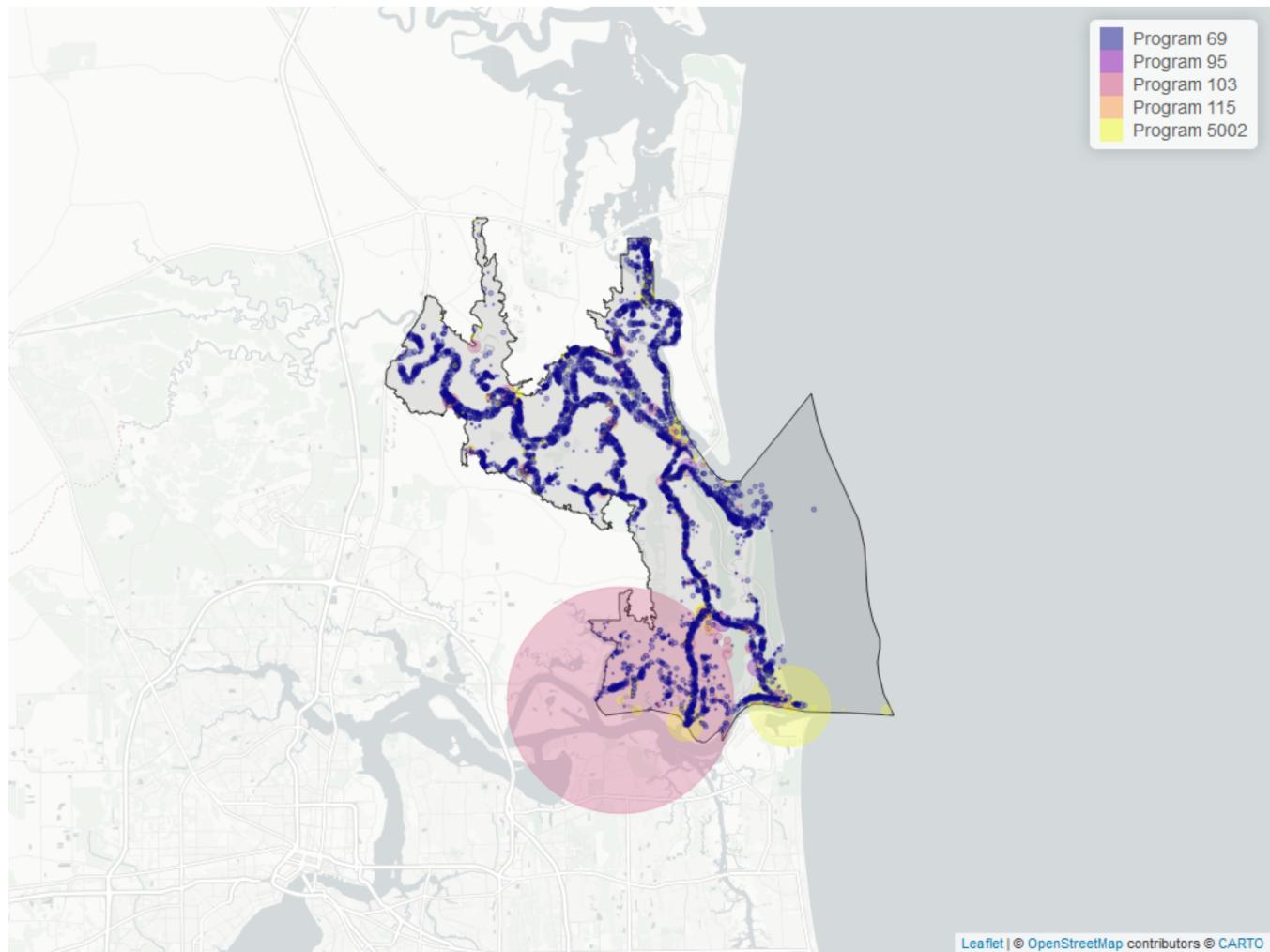
Seasonal Kendall-Tau Trend Analysis



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

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for pH



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

Table 12: Programs contributing data for pH

| ProgramID | N_Data | YearMin | YearMax |
|-----------|--------|---------|---------|
| 69 | 18155 | 2001 | 2022 |
| 103 | 8896 | 1982 | 2021 |
| 5002 | 2318 | 1997 | 2024 |
| 95 | 192 | 2013 | 2018 |
| 115 | 3 | 1995 | 1995 |

Program names:

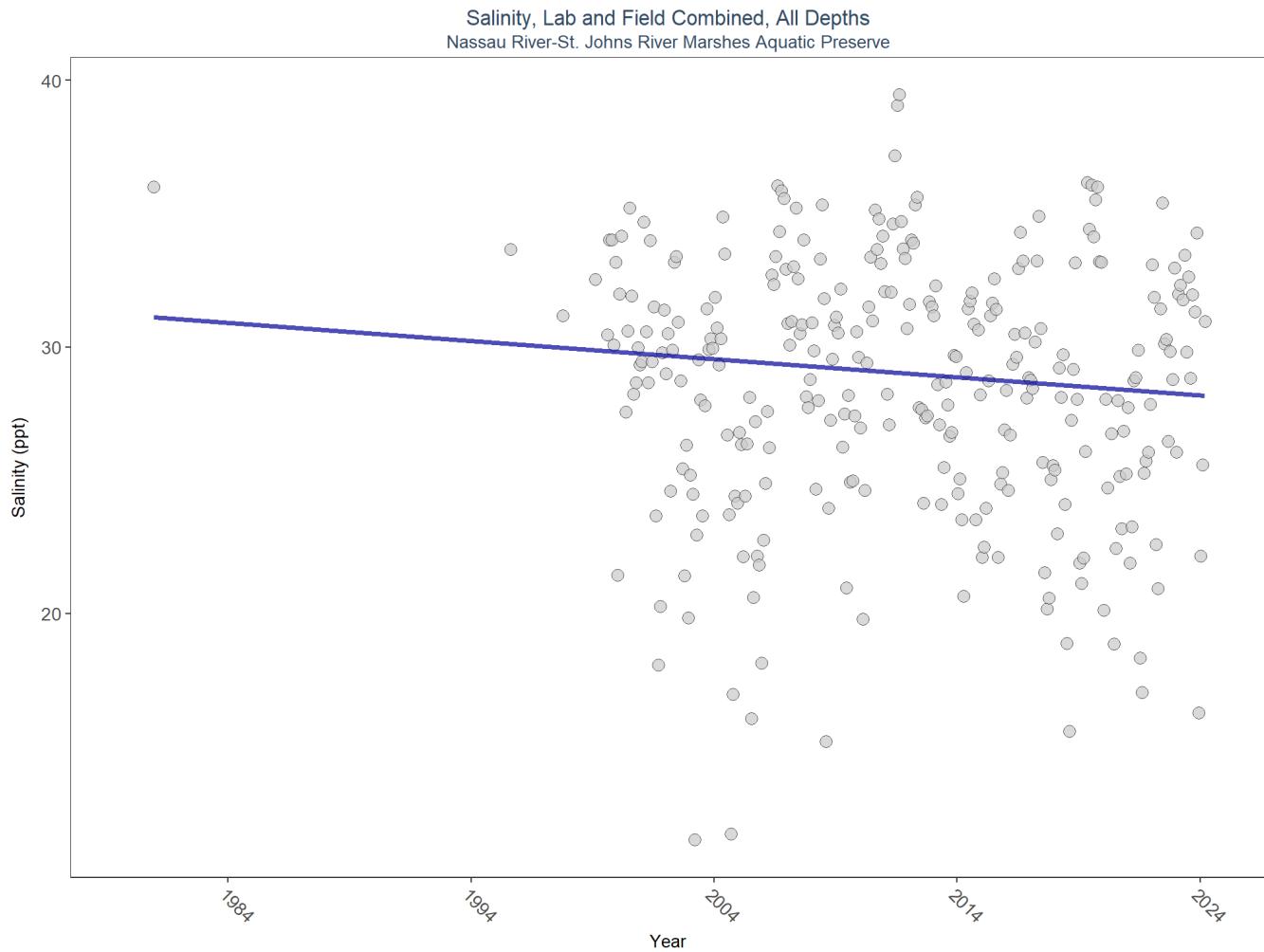
- 69 - Fisheries-Independent Monitoring (FIM) Program
- 103 - EPA STOrage and RETrieval Data Warehouse (STORET)
- 5002 - Florida STORET / WIN
- 95 - Harmful Algal Bloom Marine Observation Network

There are no qualifying Value Qualifiers for pH in Nassau River-St. Johns River Marshes 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

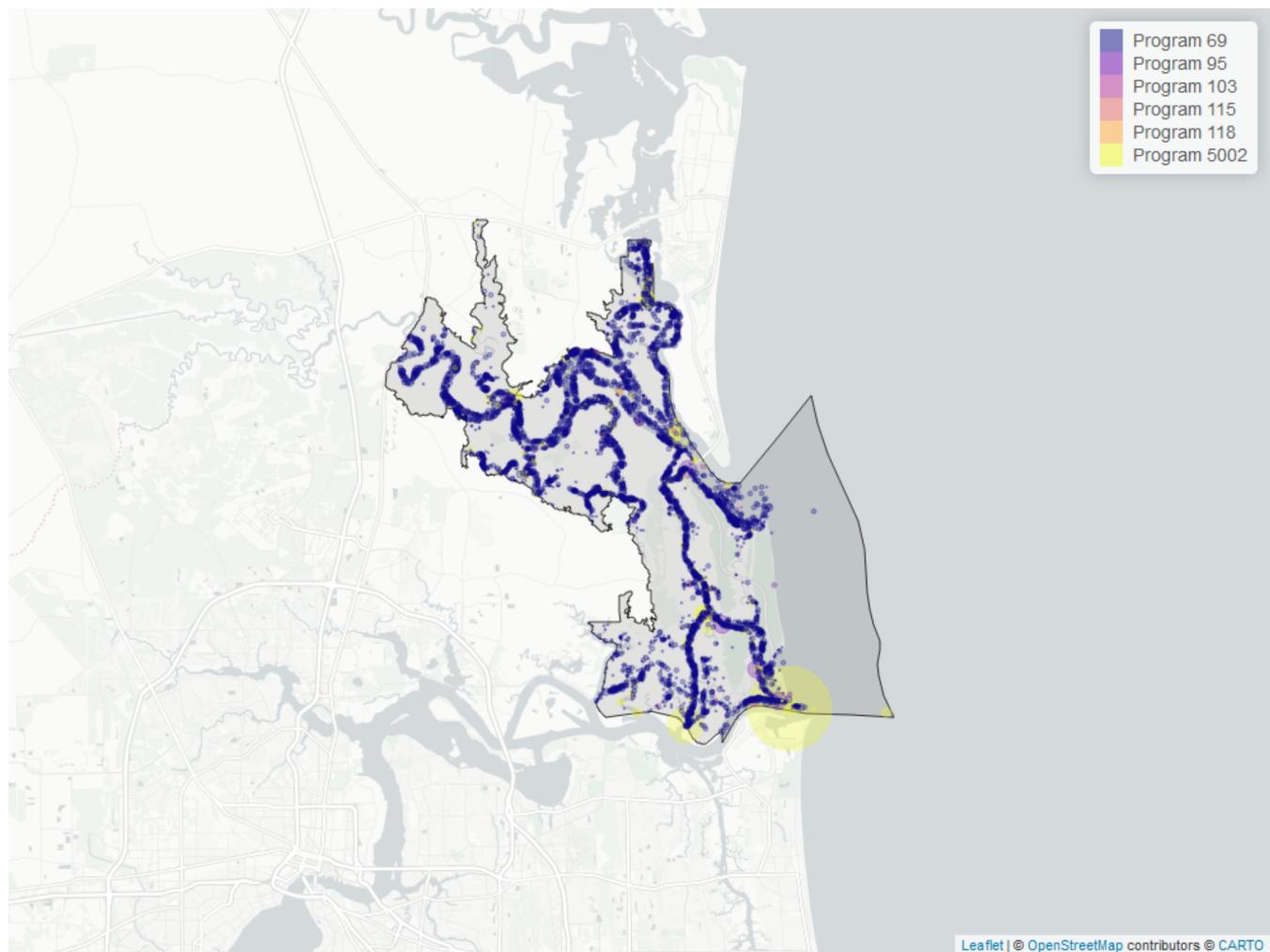


| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|-------------|---------------|------------|-------------|-------|
| All | 20976 | 29 | 30.5 | TRUE | -0.0622 | 0.1217 | -0.06766462 | 31.17209 | 5.4227 | 0.909 | 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 13: Programs contributing data for Salinity

| ProgramID | N_Data | YearMin | YearMax |
|-----------|--------|---------|---------|
| 69 | 18214 | 2001 | 2022 |
| 5002 | 2416 | 1997 | 2024 |
| 95 | 212 | 1980 | 2018 |
| 103 | 136 | 2004 | 2008 |
| 118 | 13 | 2015 | 2021 |
| 115 | 4 | 1995 | 1995 |

Program names:

69 - Fisheries-Independent Monitoring (FIM) Program

5002 - Florida STORET / WIN

95 - Harmful Algal Bloom Marine Observation Network

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

118 - National Aquatic Resource Surveys, National Coastal Condition Assessment

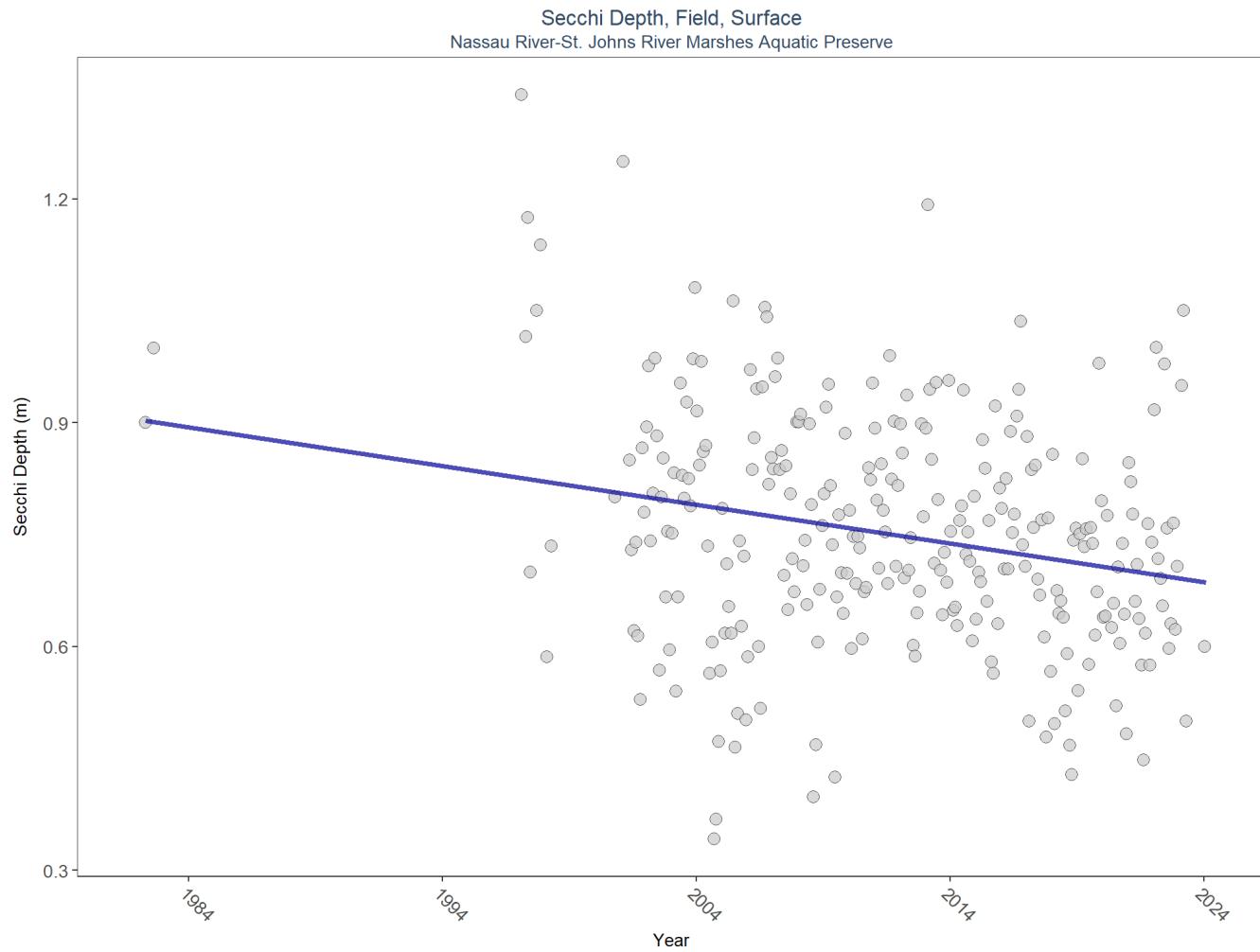
115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for Salinity in Nassau River-St. Johns River Marshes 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.

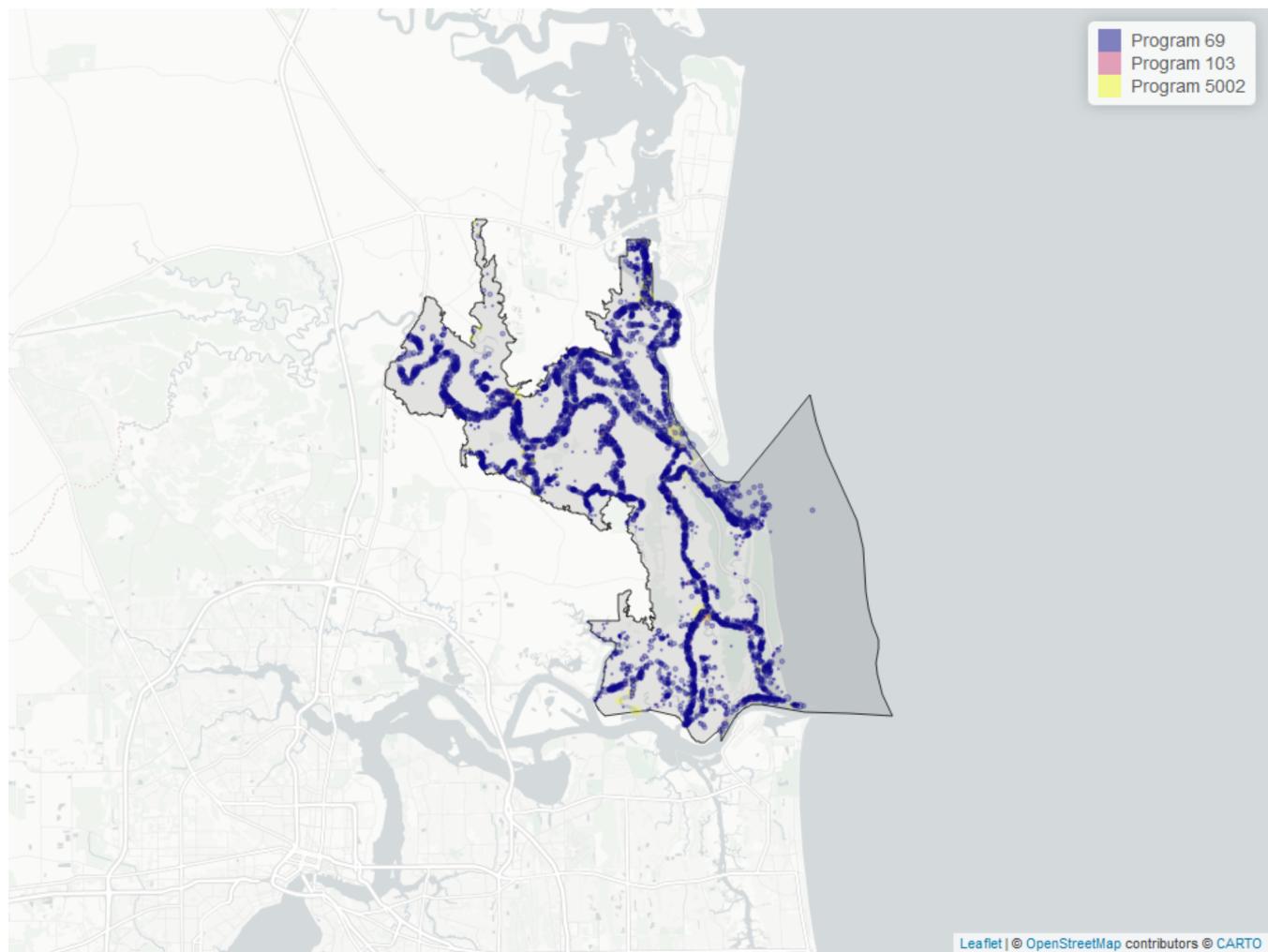
Seasonal Kendall-Tau Trend Analysis



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 14: Programs contributing data for Secchi Depth

| ProgramID | N_Data | YearMin | YearMax |
|-----------|--------|---------|---------|
| 69 | 18146 | 2001 | 2022 |
| 5002 | 461 | 2000 | 2024 |
| 103 | 94 | 1982 | 2021 |

Program names:

69 - Fisheries-Independent Monitoring (FIM) 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 15: Value Qualifiers for Secchi Depth

| <i>Year</i> | <i>N_Total</i> | <i>N_S</i> | <i>perc_S</i> |
|-------------|----------------|------------|---------------|
| 2017 | 813 | 1 | 0.1 |
| 2020 | 739 | 1 | 0.1 |
| 2021 | 877 | 1 | 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.

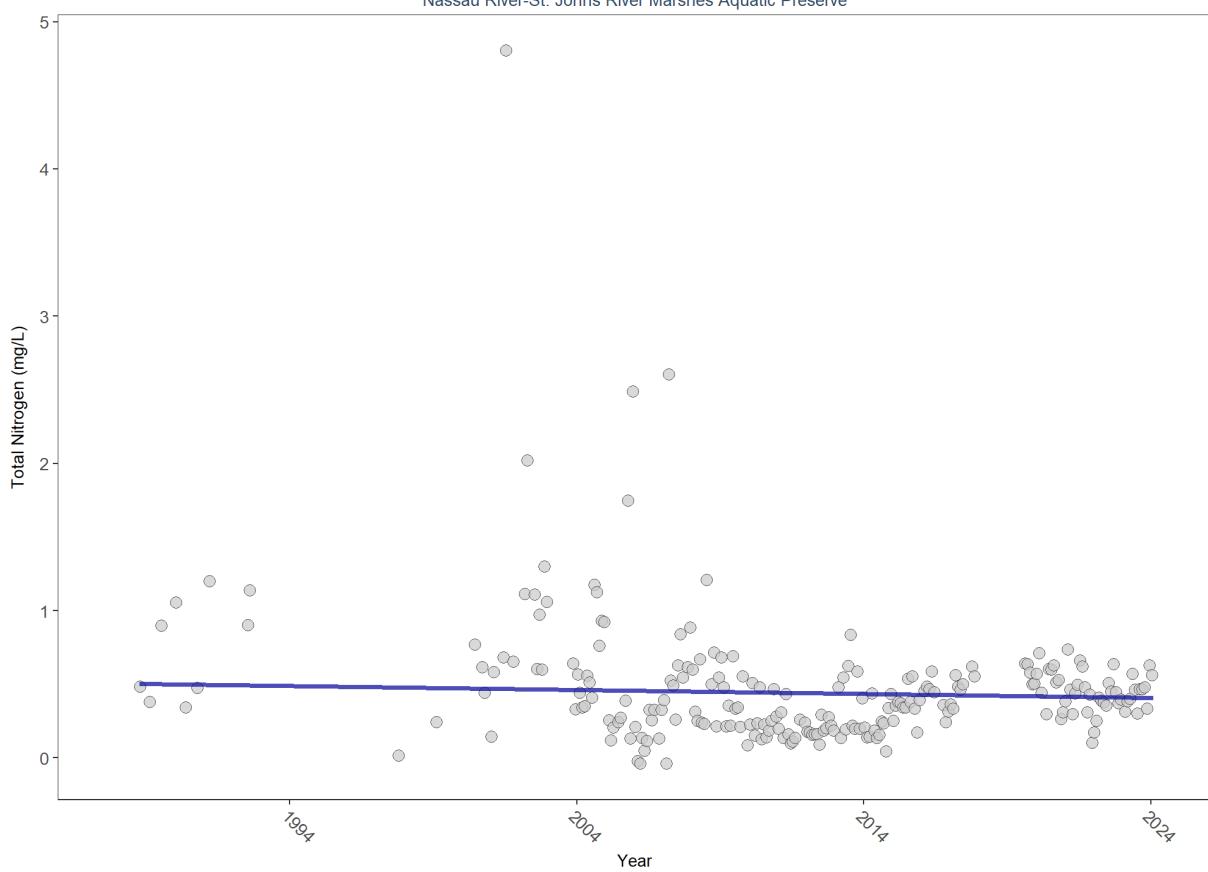
- 1) $TN = TKN + NO_3O_2;$
- 2) $TN = TKN + NO_3 + NO_2;$
- 3) $TN = ORGN + NH_4 + NO_3O_2;$
- 4) $TN = ORGN + NH_4 + NO_2 + NO_3;$
- 5) $TN = TKN + NO_3;$
- 6) $TN = ORGN + NH_4 + NO_3;$

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_QAQCFlagCode = “1Q”
 - SEACAR_QAQC_Description = “SEACAR Calculated”

Seasonal Kendall-Tau Trend Analysis

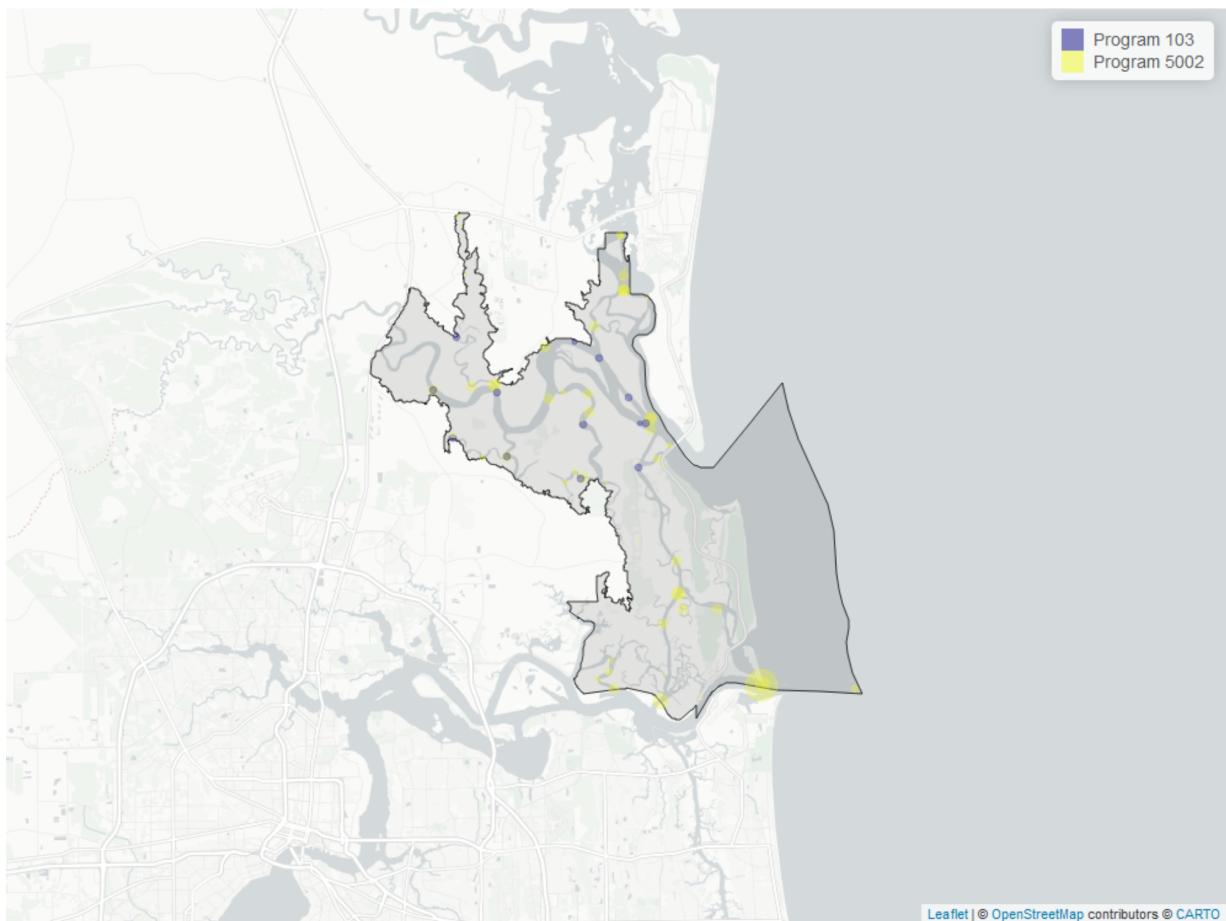
Total Nitrogen, Lab, All Depths
Nassau River-St. Johns River Marshes Aquatic Preserve



$p < 0.00005$ 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 16: Programs contributing data for Total Nitrogen

| ProgramID | N_Data | YearMin | YearMax |
|-----------|--------|---------|---------|
| 5002 | 824 | 1997 | 2024 |
| 103 | 94 | 1988 | 2005 |

Program names:

5002 - Florida STORET / WIN

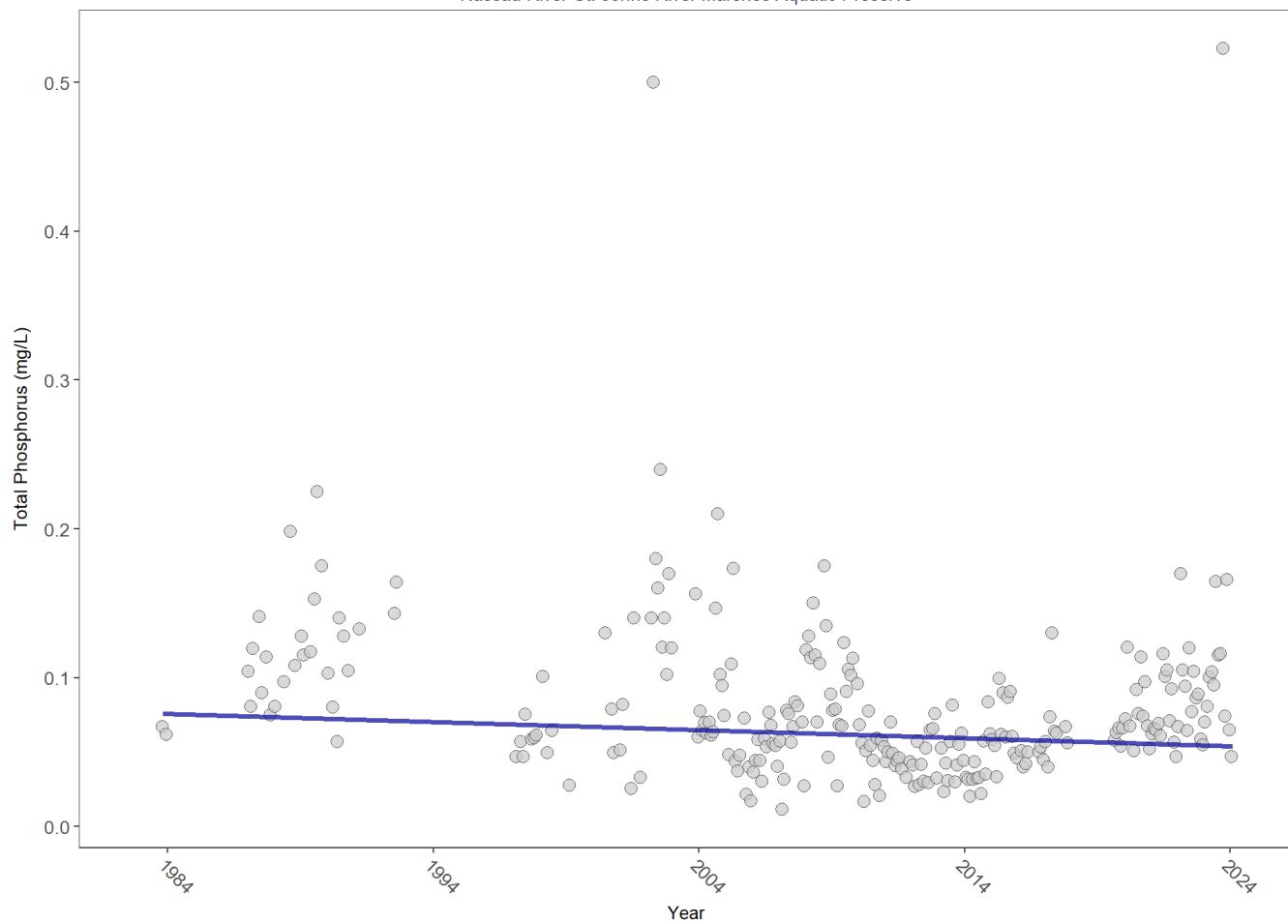
103 - EPA STOrage and RETrieval Data Warehouse (STORET)

There are no qualifying Value Qualifiers for Total Nitrogen in Nassau River-St. Johns River Marshes Aquatic Preserve

Total Phosphorus - Discrete Water Quality

Seasonal Kendall-Tau Trend Analysis

Total Phosphorus, Lab, All Depths
Nassau River-St. Johns River Marshes Aquatic Preserve

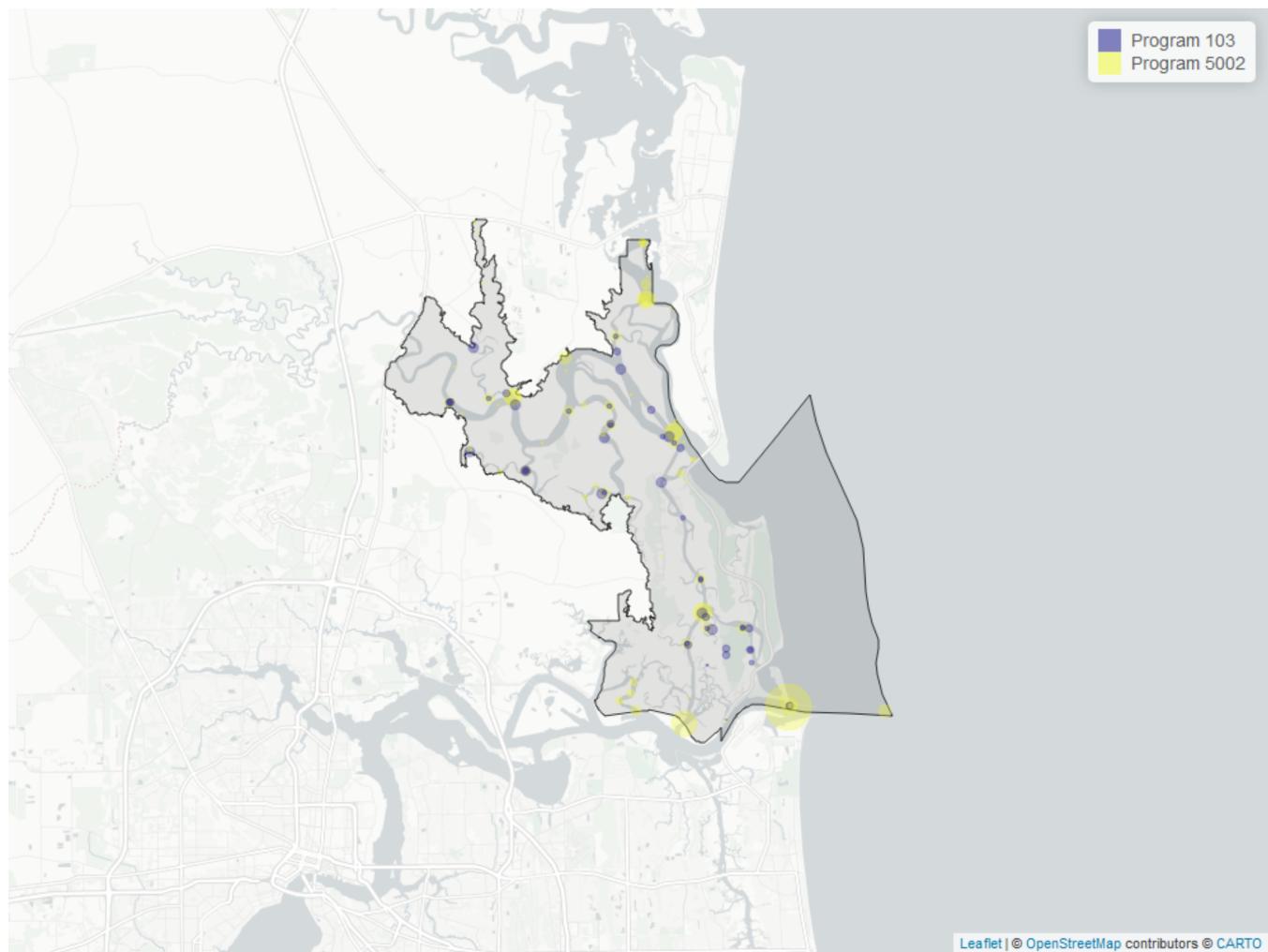


| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|---------------|---------------|------------|-------------|-------|
| All | 1656 | 34 | 0.0696 | TRUE | -0.1118 | 0.0161 | -0.0005444231 | 0.07625182 | 5.6071 | 0.8983 | -1 |

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Map showing location of Discrete sampling sites for Total Phosphorus



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

Table 17: Programs contributing data for Total Phosphorus

| ProgramID | N_Data | YearMin | YearMax |
|-----------|--------|---------|---------|
| 5002 | 1299 | 1997 | 2024 |
| 103 | 376 | 1983 | 2021 |

Program names:

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_{\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 18: Value Qualifiers for Total Phosphorus

| Year | N_Total | N_I | perc_I | N_Q | perc_Q | N_U | perc_U |
|------|---------|-----|--------|-----|--------|-----|--------|
| 2002 | 14 | | | 1 | 7.1 | | |
| 2003 | 8 | 1 | 12.5 | | | | |
| 2004 | 86 | 12 | 13.9 | | | | |
| 2005 | 24 | 8 | 33.3 | | | | |
| 2006 | 24 | 14 | 58.3 | | | | |
| 2007 | 75 | 28 | 37.3 | 2 | 2.7 | | |
| 2008 | 68 | 33 | 48.5 | 1 | 1.5 | | |
| 2009 | 55 | 36 | 65.4 | | | | |
| 2010 | 56 | 22 | 39.3 | | | | |
| 2011 | 36 | 15 | 41.7 | 2 | 5.6 | | |
| 2012 | 24 | 14 | 58.3 | | | | |
| 2013 | 37 | 16 | 43.2 | | | | |
| 2014 | 39 | 28 | 71.8 | 3 | 7.7 | | |
| 2015 | 133 | 92 | 69.2 | 10 | 7.5 | | |
| 2016 | 36 | 19 | 52.8 | | | | |
| 2017 | 57 | 35 | 61.4 | 2 | 3.5 | | |
| 2020 | 99 | 17 | 17.2 | 1 | 1.0 | | |
| 2021 | 204 | 21 | 10.3 | 2 | 1.0 | 1 | 0.5 |
| 2022 | 151 | 10 | 6.6 | | | 1 | 0.7 |
| 2023 | 97 | 7 | 7.2 | 12 | 12.4 | | |

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

Programs containing Value Qualified data:

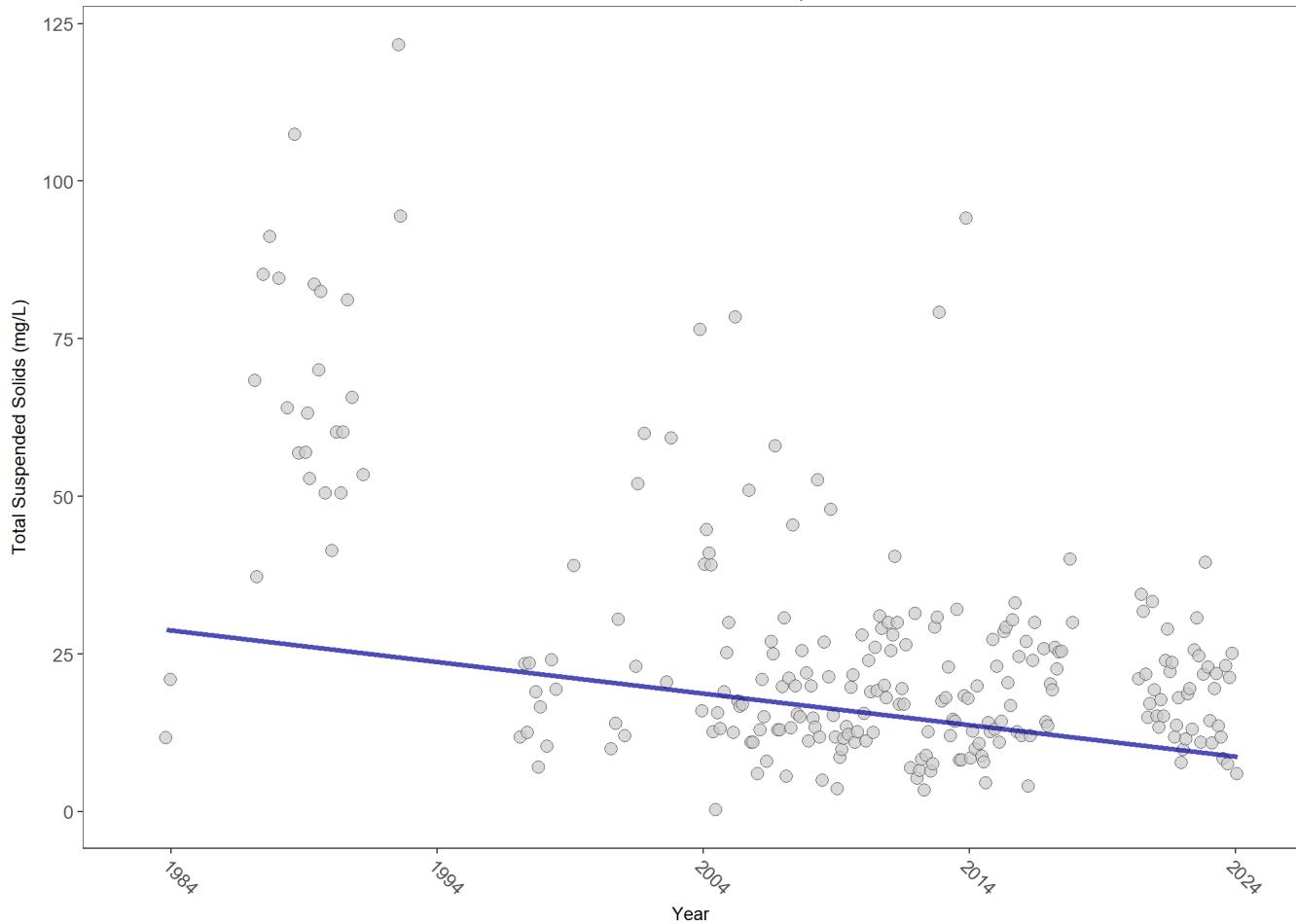
5002 - Florida STORET / WIN

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

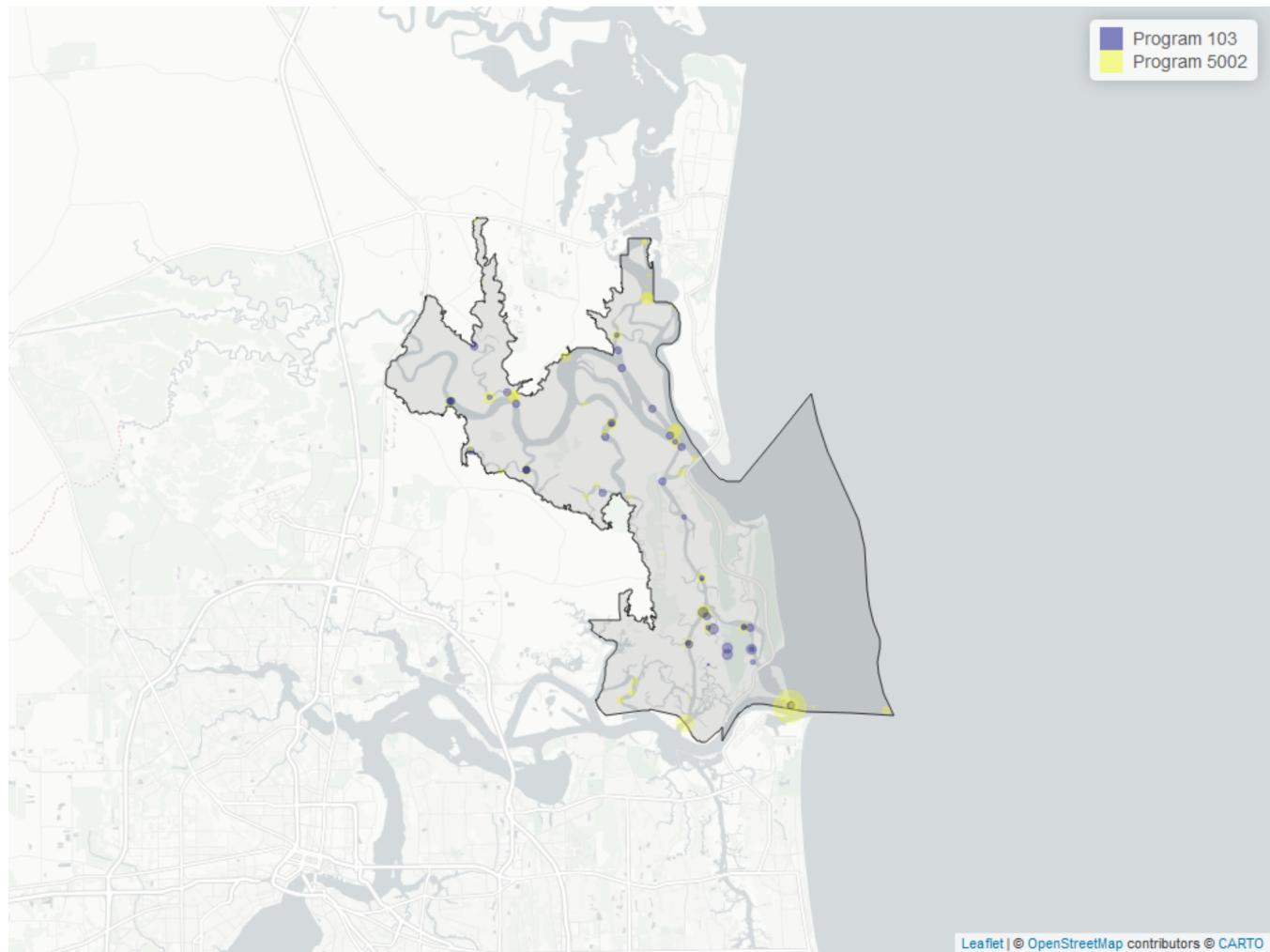
Total Suspended Solids, Lab and Field Combined, All Depths
Nassau River-St. Johns River Marshes Aquatic Preserve



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 19: Programs contributing data for Total Suspended Solids

| ProgramID | N_Data | YearMin | YearMax |
|-----------|--------|---------|---------|
| 5002 | 754 | 1997 | 2024 |
| 103 | 321 | 1983 | 2021 |

Program names:

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_{\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 20: Value Qualifiers for Total Suspended Solids

| <i>Year</i> | <i>N_Total</i> | <i>N_I</i> | <i>perc_I</i> | <i>N_Q</i> | <i>perc_Q</i> | <i>N_U</i> | <i>perc_U</i> |
|-------------|----------------|------------|---------------|------------|---------------|------------|---------------|
| 2001 | 7 | | | | | 1 | 14.3 |
| 2006 | 12 | 1 | 8.3 | 1 | 8.3 | | |
| 2007 | 49 | 3 | 6.1 | | | | |
| 2009 | 27 | 1 | 3.7 | 1 | 3.7 | | |
| 2010 | 29 | 2 | 6.9 | | | | |
| 2011 | 17 | 1 | 5.9 | 2 | 11.8 | | |
| 2012 | 12 | 5 | 41.7 | | | | |
| 2013 | 26 | 3 | 11.5 | | | | |
| 2014 | 20 | 3 | 15.0 | | | | |
| 2015 | 69 | 16 | 23.2 | 6 | 8.7 | | |
| 2016 | 21 | 4 | 19.0 | | | | |
| 2017 | 31 | 2 | 6.4 | | | | |
| 2020 | 56 | | | 8 | 14.3 | | |
| 2021 | 150 | 2 | 1.3 | | | | |
| 2022 | 112 | 6 | 5.4 | | | | |
| 2023 | 78 | 3 | 3.9 | | | | |
| 2024 | 1 | 1 | 100.0 | | | | |

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

Programs containing Value Qualified data:

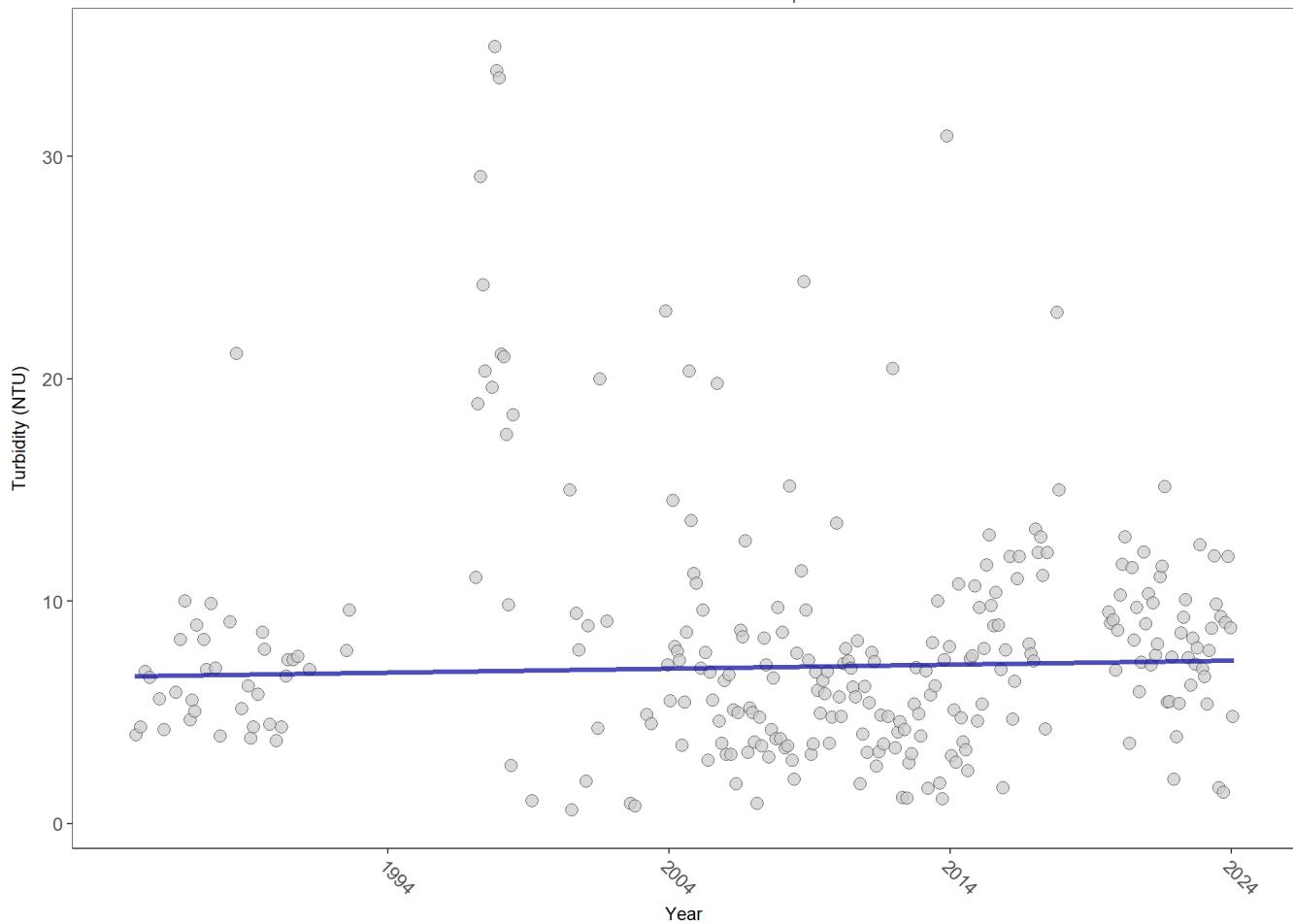
5002 - Florida STORET / WIN

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
Nassau River-St. Johns River Marshes Aquatic Preserve

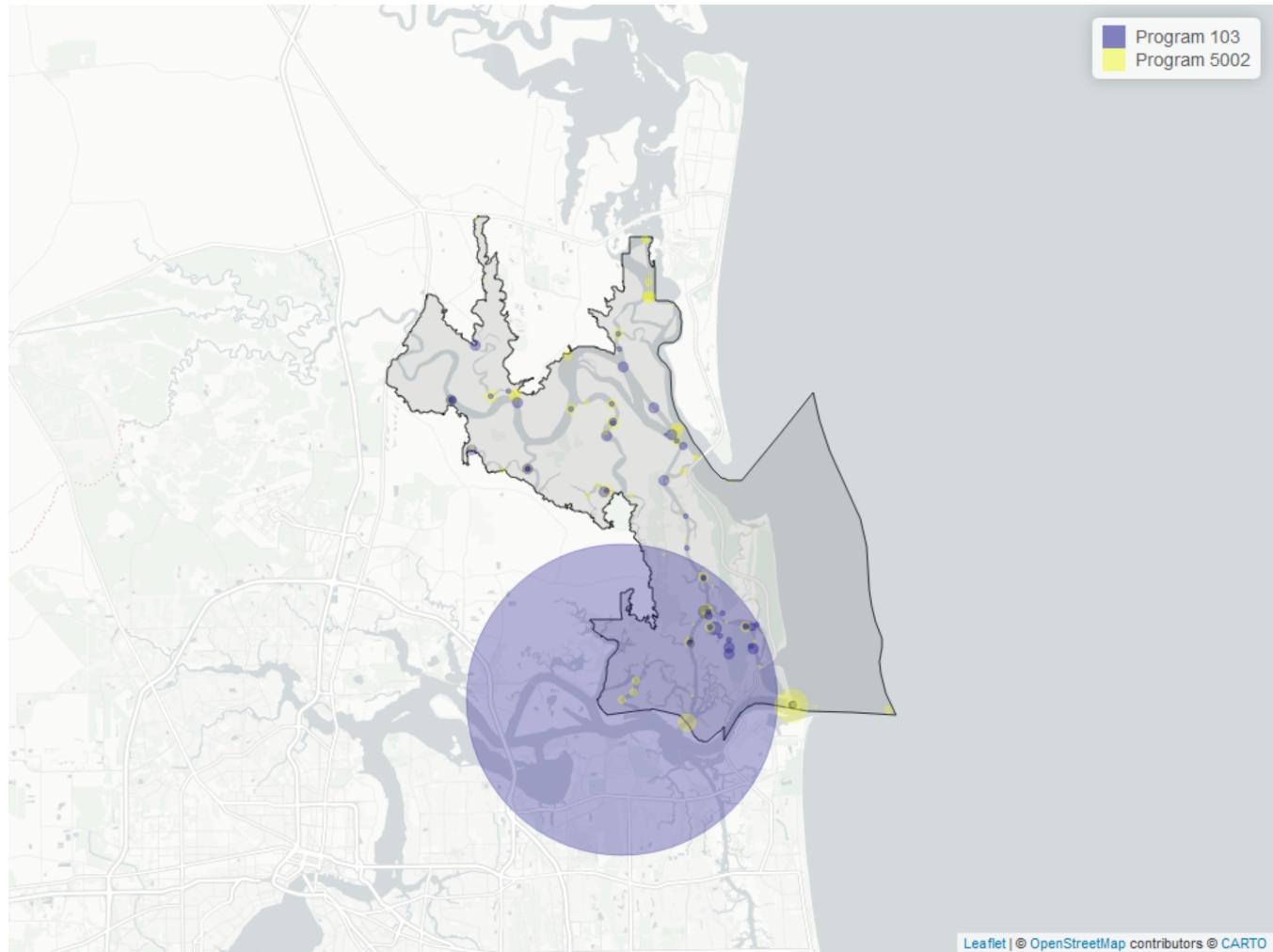


| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|-------|--------|------------|---------------|------------|-------------|-------|
| All | 16135 | 35 | 15.8 | TRUE | 0.025 | 0.4137 | 0.01837607 | 6.622662 | 11.1341 | 0.4321 | 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 21: Programs contributing data for Turbidity

| <i>ProgramID</i> | <i>N_Data</i> | <i>YearMin</i> | <i>YearMax</i> |
|------------------|---------------|----------------|----------------|
| 103 | 15270 | 1985 | 2021 |
| 5002 | 867 | 1997 | 2024 |

Program names:

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

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 22: Value Qualifiers for Turbidity

| <i>Year</i> | <i>N_Total</i> | <i>N_I</i> | <i>perc_I</i> | <i>N_Q</i> | <i>perc_Q</i> |
|-------------|----------------|------------|---------------|------------|---------------|
| 2007 | 53 | 1 | 1.9 | | |
| 2011 | 17 | 1 | 5.9 | 3 | 17.6 |
| 2012 | 12 | 2 | 16.7 | 2 | 16.7 |
| 2013 | 26 | 3 | 11.5 | 1 | 3.9 |
| 2014 | 20 | 1 | 5.0 | 6 | 30.0 |
| 2015 | 69 | 1 | 1.4 | 3 | 4.3 |
| 2016 | 21 | | | 1 | 4.8 |
| 2021 | 173 | | | 1 | 0.6 |

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

Programs containing Value Qualified data:

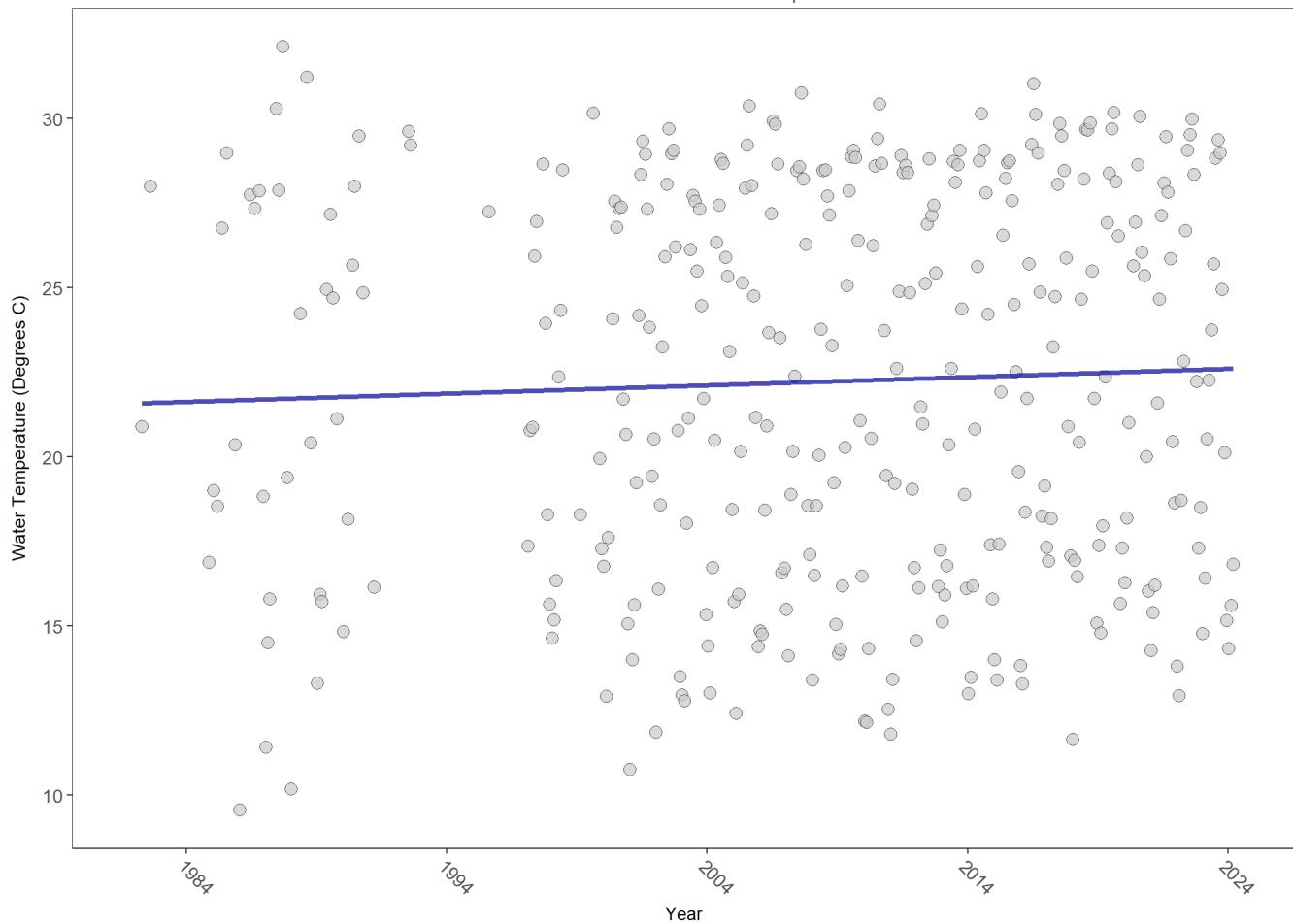
5002 - Florida STORET / WIN

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
Nassau River-St. Johns River Marshes Aquatic Preserve

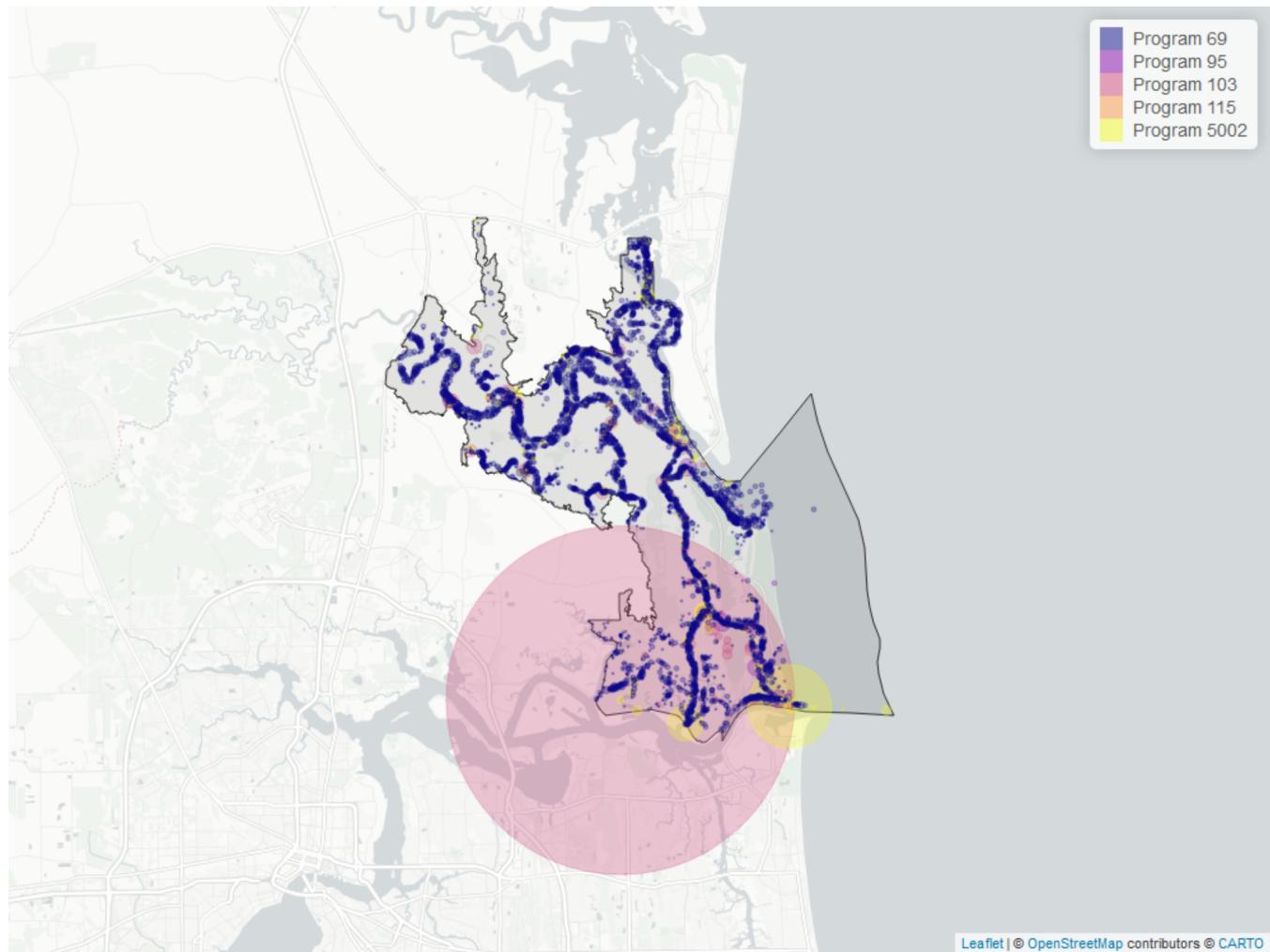


| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|--------|--------|-----------|---------------|------------|-------------|-------|
| All | 40713 | 39 | 21.57 | TRUE | 0.1182 | 0.0018 | 0.0248415 | 21.57337 | 5.4632 | 0.9067 | 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 23: Programs contributing data for Water Temperature

| ProgramID | N_Data | YearMin | YearMax |
|-----------|--------|---------|---------|
| 103 | 19853 | 1982 | 2021 |
| 69 | 18218 | 2001 | 2022 |
| 5002 | 2434 | 1997 | 2024 |
| 95 | 212 | 2007 | 2018 |
| 115 | 4 | 1995 | 1995 |

Program names:

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

69 - Fisheries-Independent Monitoring (FIM) Program

5002 - Florida STORET / WIN

95 - Harmful Algal Bloom Marine Observation Network

115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for Water Temperature in Nassau River-St. Johns River Marshes Aquatic Preserve

Water Quality - Continuous

The following files were used in the continuous analysis:

- *Combined_WQ_WC_NUT_cont_Dissolved_Oxygen_NE-2024-Jul-02.txt*
- *Combined_WQ_WC_NUT_cont_Dissolved_Oxygen_Saturation_NE-2024-Jul-02.txt*
- *Combined_WQ_WC_NUT_cont_pH_NE-2024-Jul-02.txt*
- *Combined_WQ_WC_NUT_cont_Salinity_NE-2024-Jul-02.txt*
- *Combined_WQ_WC_NUT_cont_Turbidity_NE-2024-Jul-02.txt*
- *Combined_WQ_WC_NUT_cont_Water_Temperature_NE-2024-Jul-02.txt*

Table 24: National Water Information System (7)

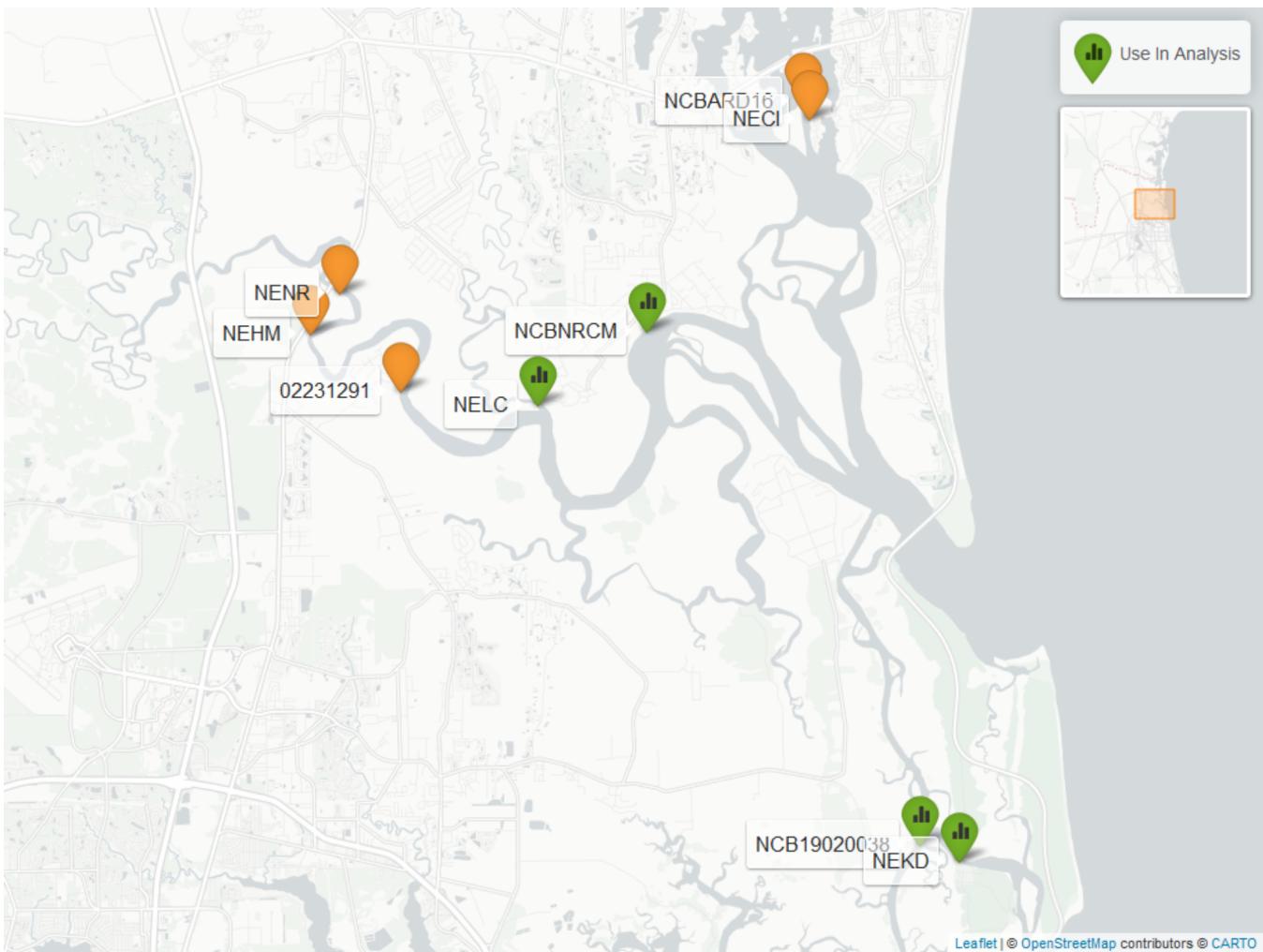
| <i>ProgramLocationID</i> | <i>Years of Data</i> | <i>Use in Analysis</i> | <i>Parameters</i> |
|--------------------------|----------------------|------------------------|-------------------|
| 02231291 | 3 | FALSE | DO , TempW |

Table 25: Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

| <i>ProgramLocationID</i> | <i>Years of Data</i> | <i>Use in Analysis</i> | <i>Parameters</i> |
|--------------------------|----------------------|------------------------|------------------------------------|
| NECI | 1 | FALSE | DO , DOS , pH , Sal , Turb , TempW |
| NEHM | 2 | FALSE | DO , DOS , pH , Sal , Turb , TempW |
| NEKD | 8 | TRUE | DO , DOS , pH , Sal , Turb , TempW |
| NELC | 7 | TRUE | DO , DOS , pH , Sal , Turb , TempW |
| NENR | 3 | FALSE | DO , DOS , pH , Sal , Turb , TempW |

Table 26: St. Johns River Water Management District Continuous Water Quality Programs (5061)

| <i>ProgramLocationID</i> | <i>Years of Data</i> | <i>Use in Analysis</i> | <i>Parameters</i> |
|--------------------------|----------------------|------------------------|------------------------------------|
| NCB19020038 | 5 | TRUE | DO , DOS , pH , Sal , Turb , TempW |
| NCBARD16 | 2 | FALSE | DO , DOS , pH , Sal , Turb , TempW |
| NCBNRCM | 5 | TRUE | DO , DOS , pH , Sal , Turb , TempW |



Map showing Continuous Water Quality Monitoring sampling locations within the boundaries of Nassau River-St. Johns River Marshes Aquatic Preserve. Sites marked as *Use In Analysis* are featured in this report.

Dissolved Oxygen - Continuous Water Quality

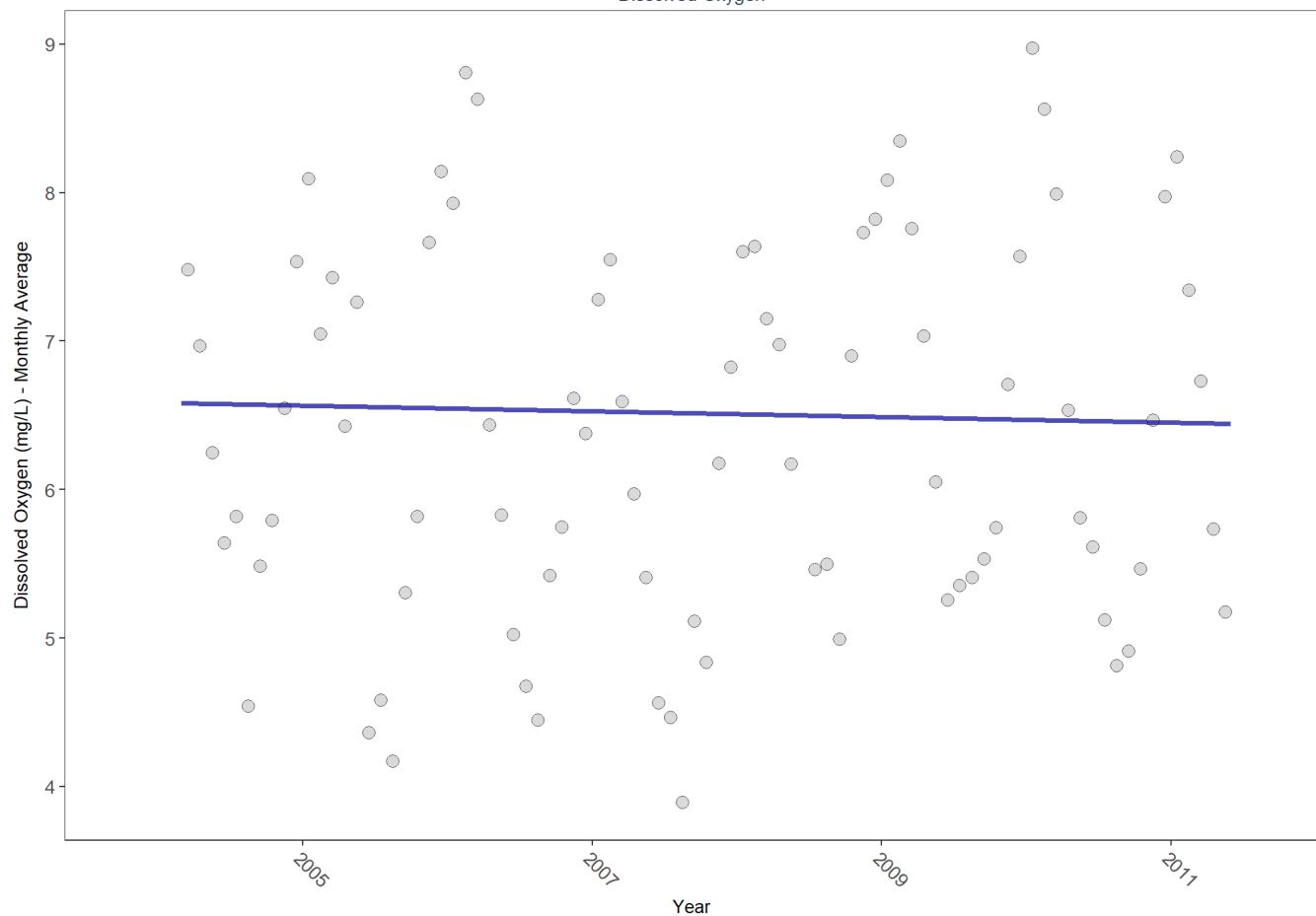
NEKD

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve

NEKD

Dissolved Oxygen



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|-------------|---------------|------------|-------------|-------|
| bottom | 110958 | 8 | 6.4 | TRUE | -0.0447 | 0.5607 | -0.01927373 | 6.586815 | 9.5559 | 0.5707 | 0 |

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

SennIntercept is intercept value at beginning of record for monitoring location

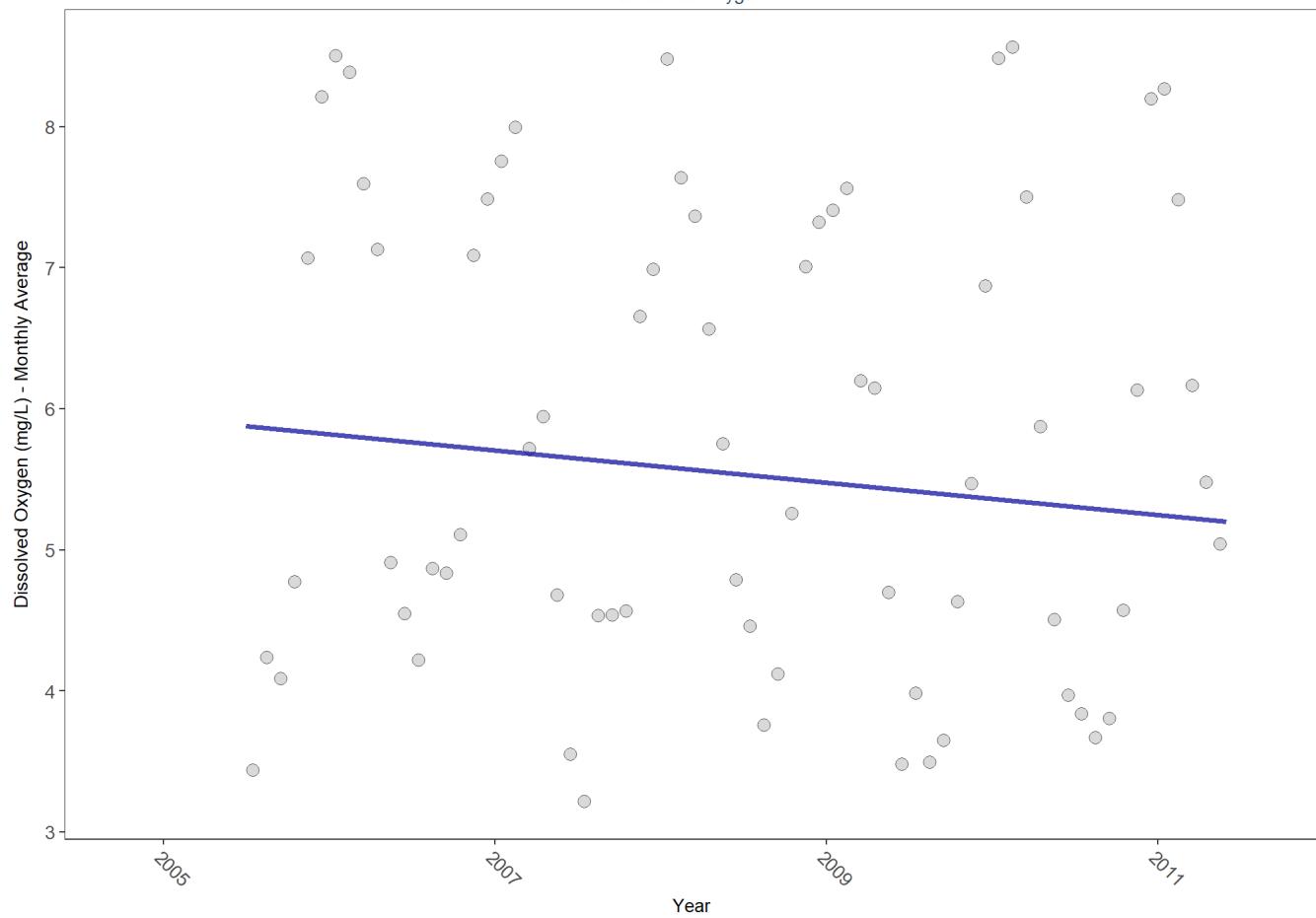
NELC

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve

NELC

Dissolved Oxygen



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|------------|---------------|------------|-------------|-------|
| bottom | 95860 | 7 | 5.6 | TRUE | -0.3352 | 0.0014 | -0.1139401 | 5.932437 | 5.1427 | 0.9241 | -1 |

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

SennIntercept is intercept value at beginning of record for monitoring location

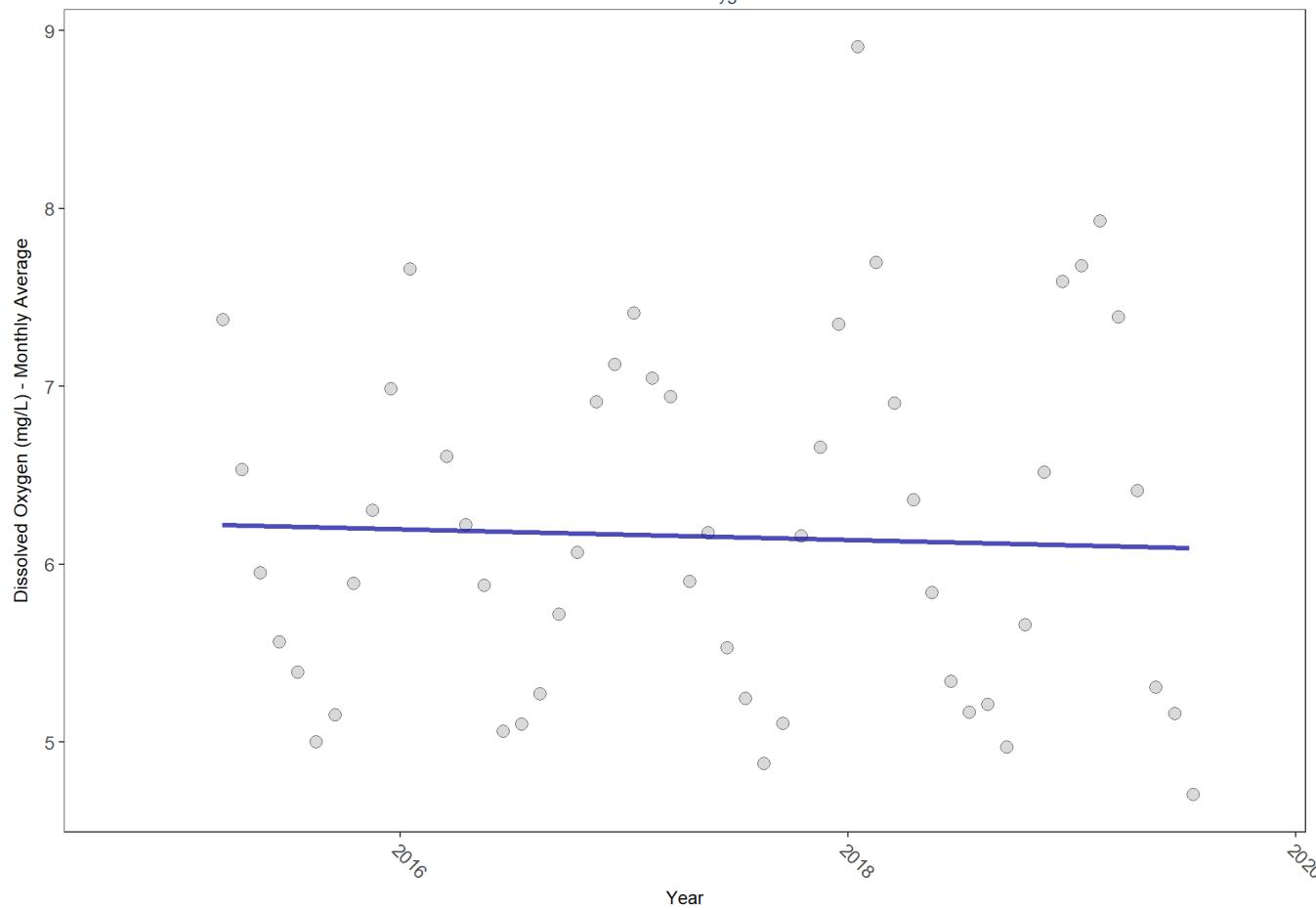
NCB19020038

St. Johns River Water Management District Continuous Water Quality Programs (5061)

Nassau River-St. Johns River Marshes Aquatic Preserve

NCB19020038

Dissolved Oxygen



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|-------------|---------------|------------|-------------|-------|
| surface | 34476 | 5 | 6.16 | TRUE | -0.0256 | 0.6108 | -0.02995256 | 6.227101 | 14.4149 | 0.2109 | 0 |

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

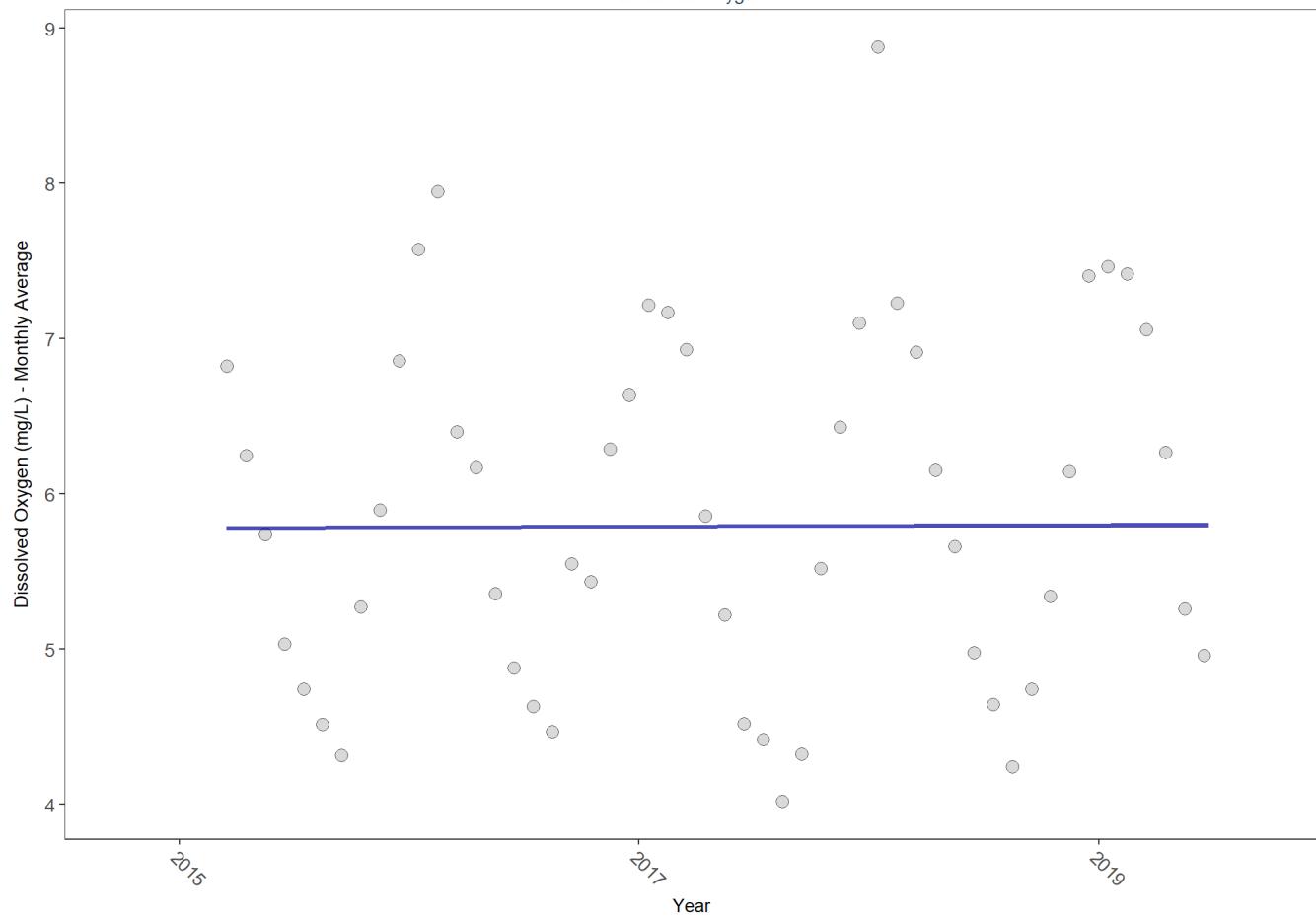
NCBNRCM

St. Johns River Water Management District Continuous Water Quality Programs (5061)

Nassau River-St. Johns River Marshes Aquatic Preserve

NCBNRCM

Dissolved Oxygen



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|--------|--------|-------------|---------------|------------|-------------|-------|
| surface | 35477 | 5 | 5.79 | TRUE | 0.0513 | 0.7970 | 0.005475297 | 5.776387 | 8.7446 | 0.6455 | 0 |

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

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

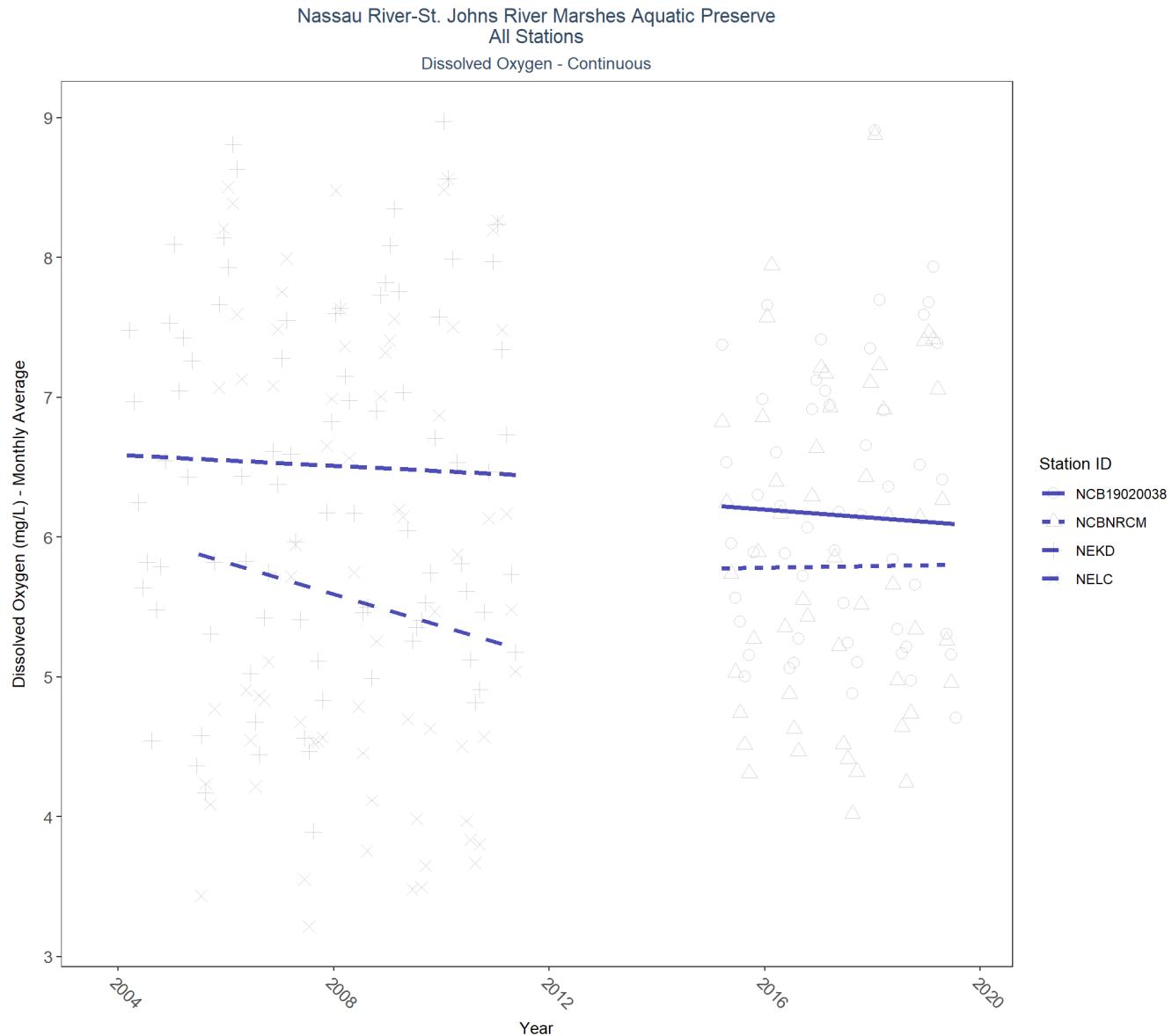


Table 27: Seasonal Kendall-Tau Results for All Stations - Dissolved Oxygen

| Station | N_Data | N_Years | Period of Record | Median | tau | SennIntercept | SennSlope | p |
|-------------|--------|---------|------------------|--------|-------|---------------|-----------|--------|
| 02231291 | 689 | 3 | 2014 - 2016 | 6.10 | - | - | - | - |
| NEHM | 36209 | 2 | 2022 - 2023 | 5.80 | - | - | - | - |
| NEKD | 110958 | 8 | 2004 - 2011 | 6.40 | -0.04 | 6.59 | -0.02 | 0.5607 |
| NELC | 95860 | 7 | 2005 - 2011 | 5.60 | -0.34 | 5.93 | -0.11 | 0.0014 |
| NENR | 31438 | 3 | 2009 - 2011 | 5.80 | - | - | - | - |
| NECI | 6582 | 1 | 2023 - 2023 | 6.70 | - | - | - | - |
| NCBARD16 | 7417 | 2 | 2015 - 2016 | 5.08 | - | - | - | - |
| NCB19020038 | 34476 | 5 | 2015 - 2019 | 6.16 | -0.03 | 6.23 | -0.03 | 0.6108 |
| NCBNRCM | 35477 | 5 | 2015 - 2019 | 5.79 | 0.05 | 5.78 | 0.01 | 0.7970 |

Dissolved Oxygen Saturation - Continuous Water Quality

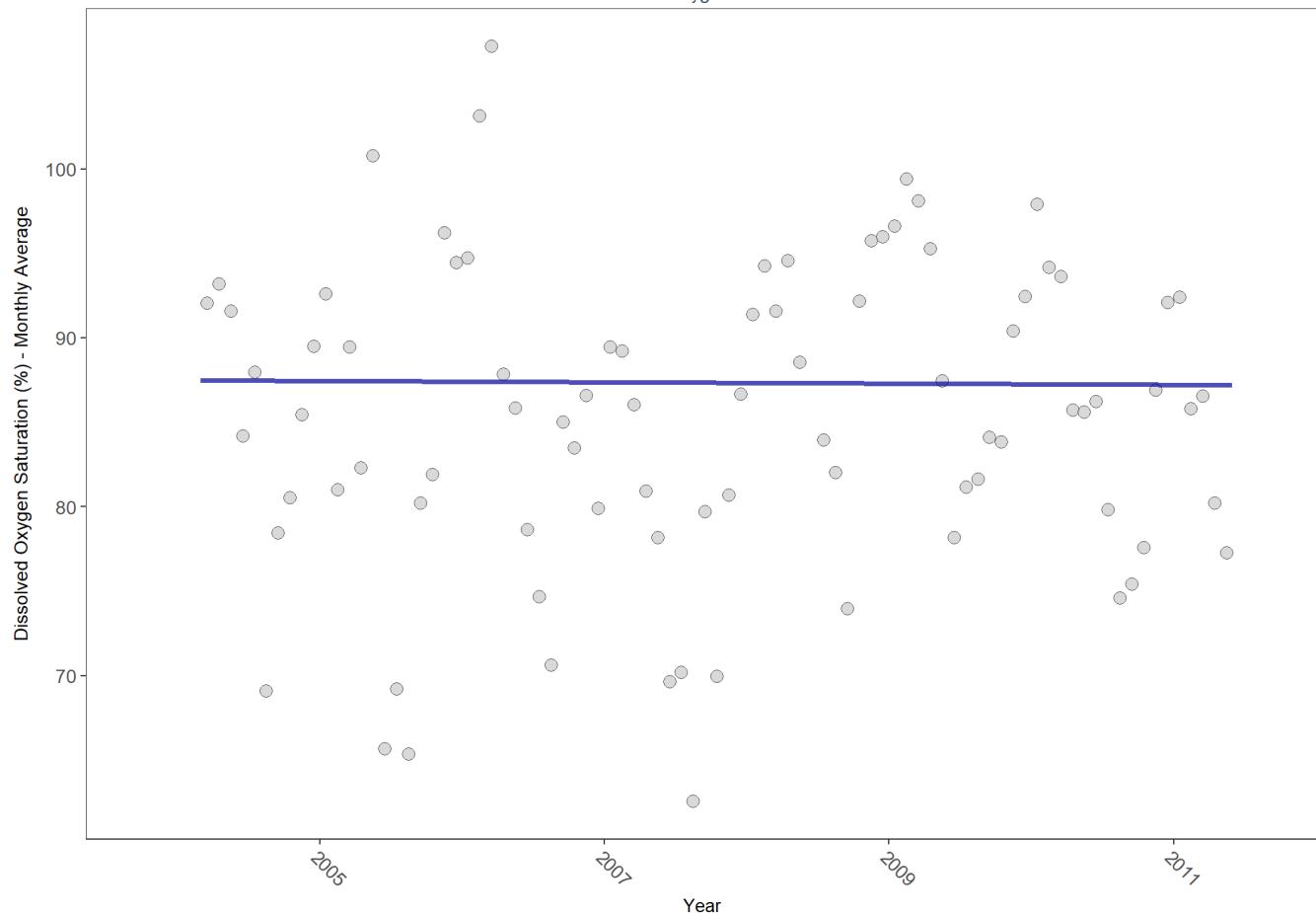
NEKD

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve

NEKD

Dissolved Oxygen Saturation



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|--------|--------|-------------|---------------|------------|-------------|-------|
| bottom | 110983 | 8 | 89.1 | TRUE | 0.0029 | 0.9338 | -0.04101835 | 87.49355 | 6.883 | 0.8085 | 0 |

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

SennIntercept is intercept value at beginning of record for monitoring location

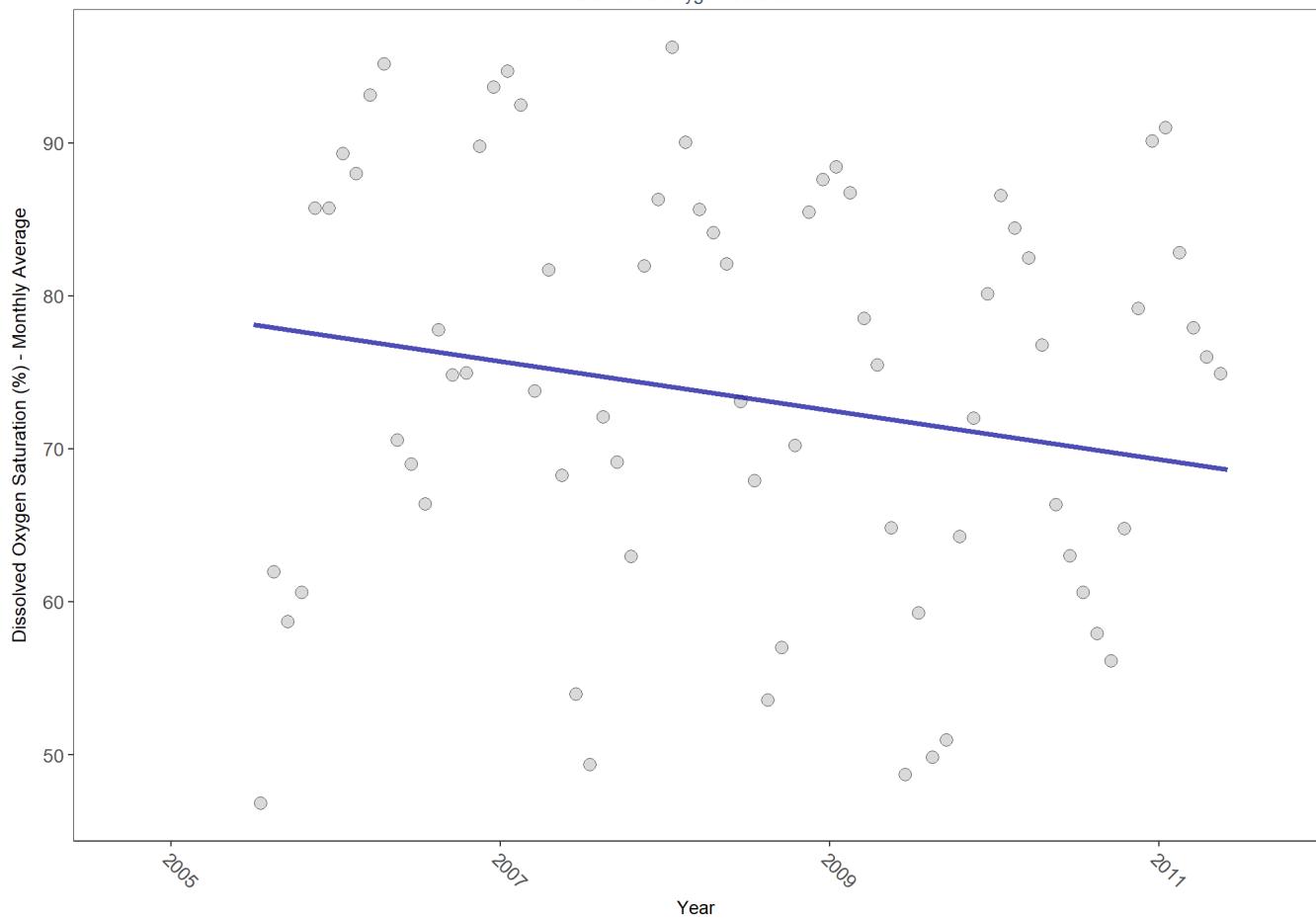
NELC

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve

NELC

Dissolved Oxygen Saturation



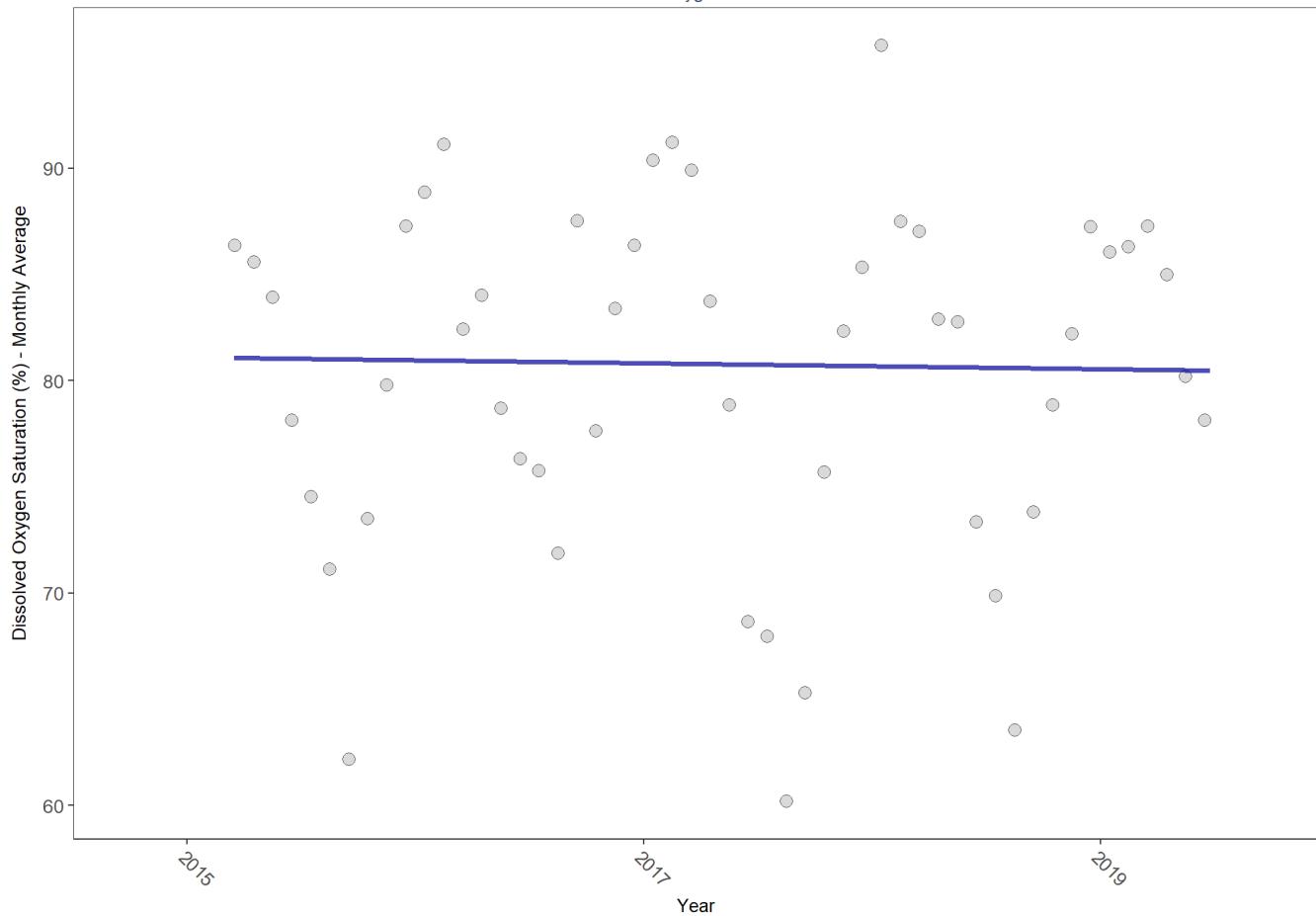
| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|-----------|---------------|------------|-------------|-------|
| bottom | 95868 | 7 | 77.9 | TRUE | -0.2676 | 0.0111 | -1.604914 | 78.92834 | 10.6209 | 0.4755 | -1 |

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

NCBNRCM

St. Johns River Water Management District Continuous Water Quality Programs (5061)
 Nassau River-St. Johns River Marshes Aquatic Preserve
 NCBNRCM
 Dissolved Oxygen Saturation

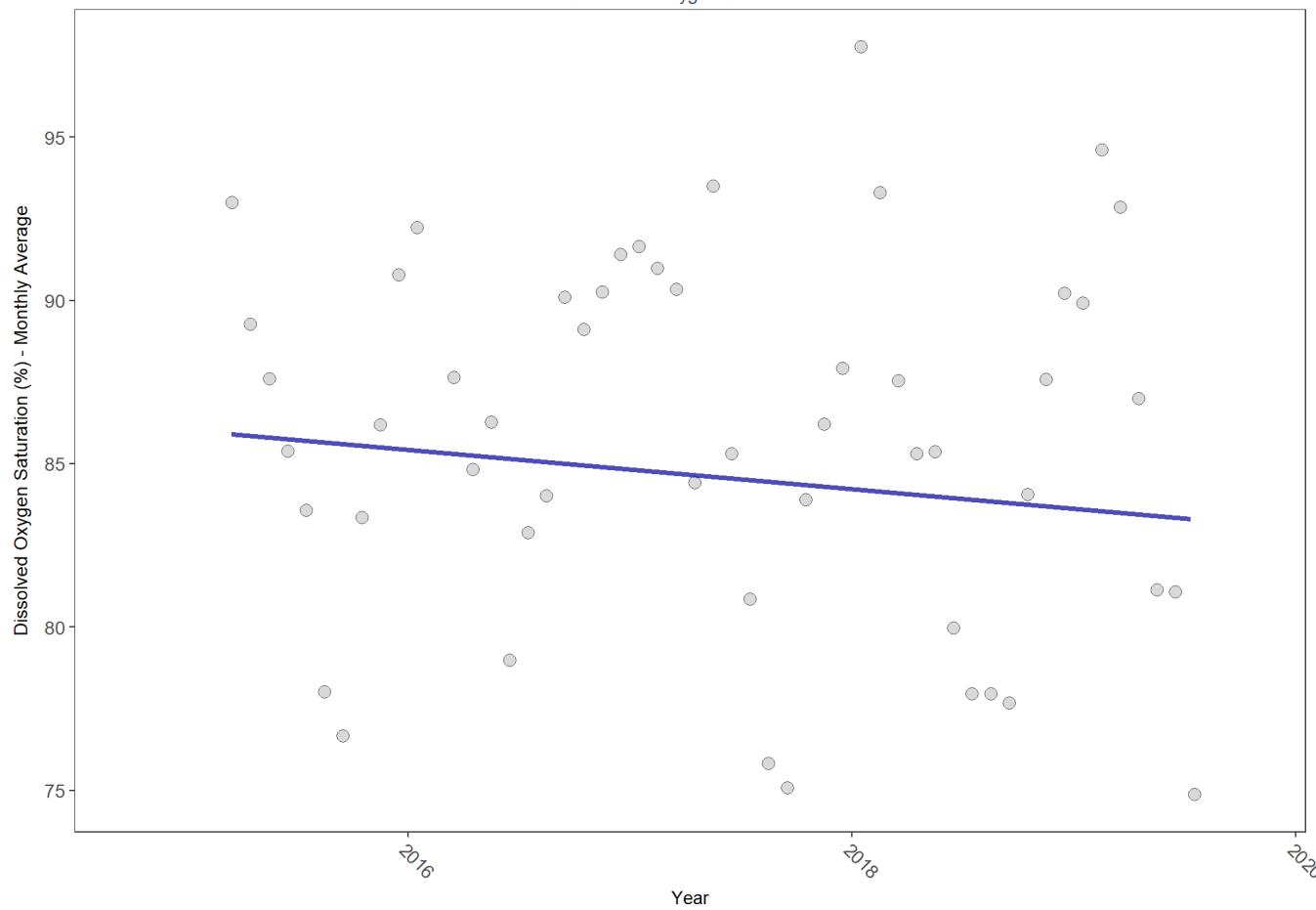


p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

NCB19020038

St. Johns River Water Management District Continuous Water Quality Programs (5061)
 Nassau River-St. Johns River Marshes Aquatic Preserve
 NCB19020038
 Dissolved Oxygen Saturation



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|------------|---------------|------------|-------------|-------|
| surface | 34438 | 5 | 87.058 | TRUE | -0.1603 | 0.1268 | -0.5969938 | 86.01865 | 12.0611 | 0.3591 | 0 |

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

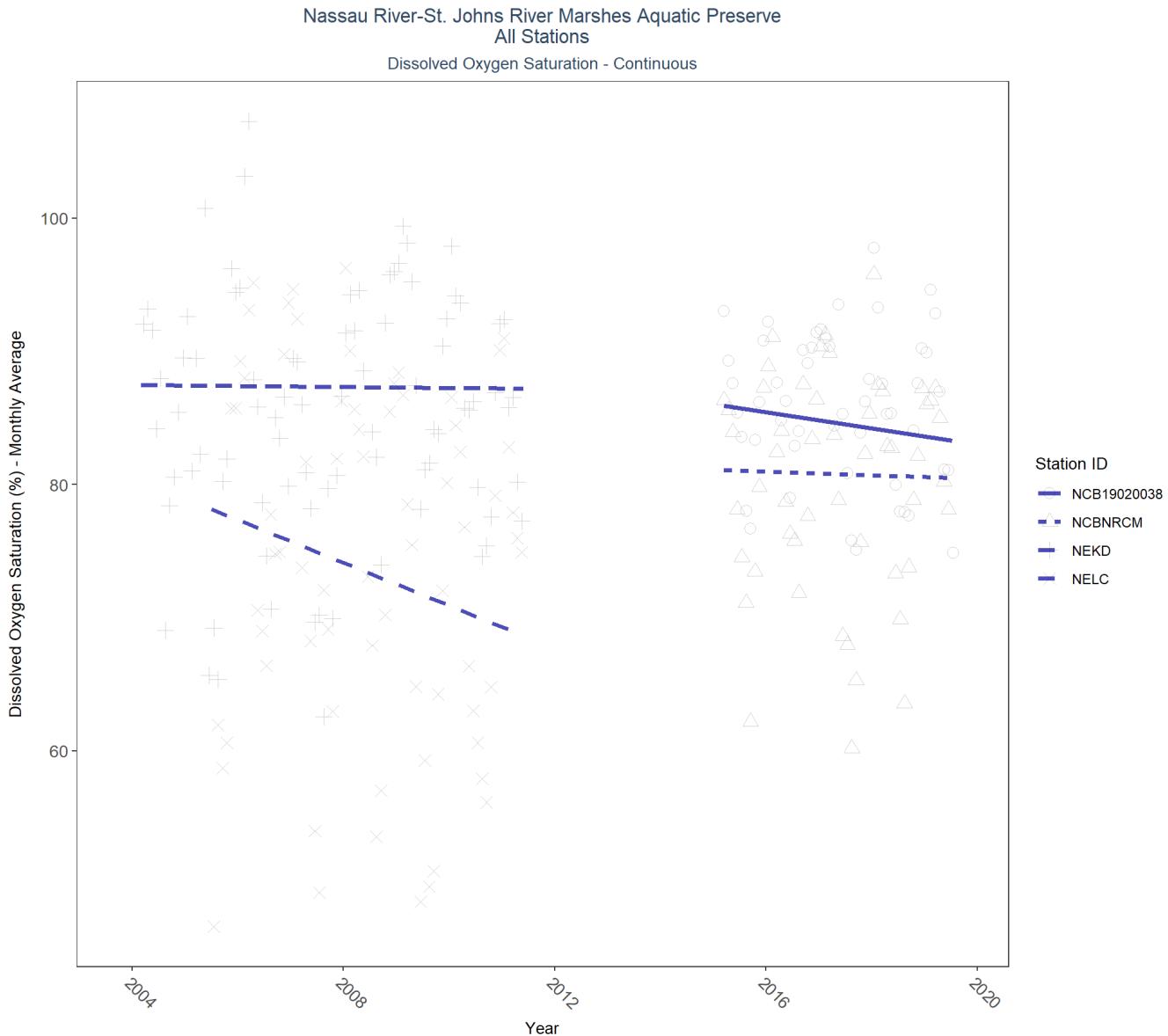


Table 28: Seasonal Kendall-Tau Results for All Stations - Dissolved Oxygen Saturation

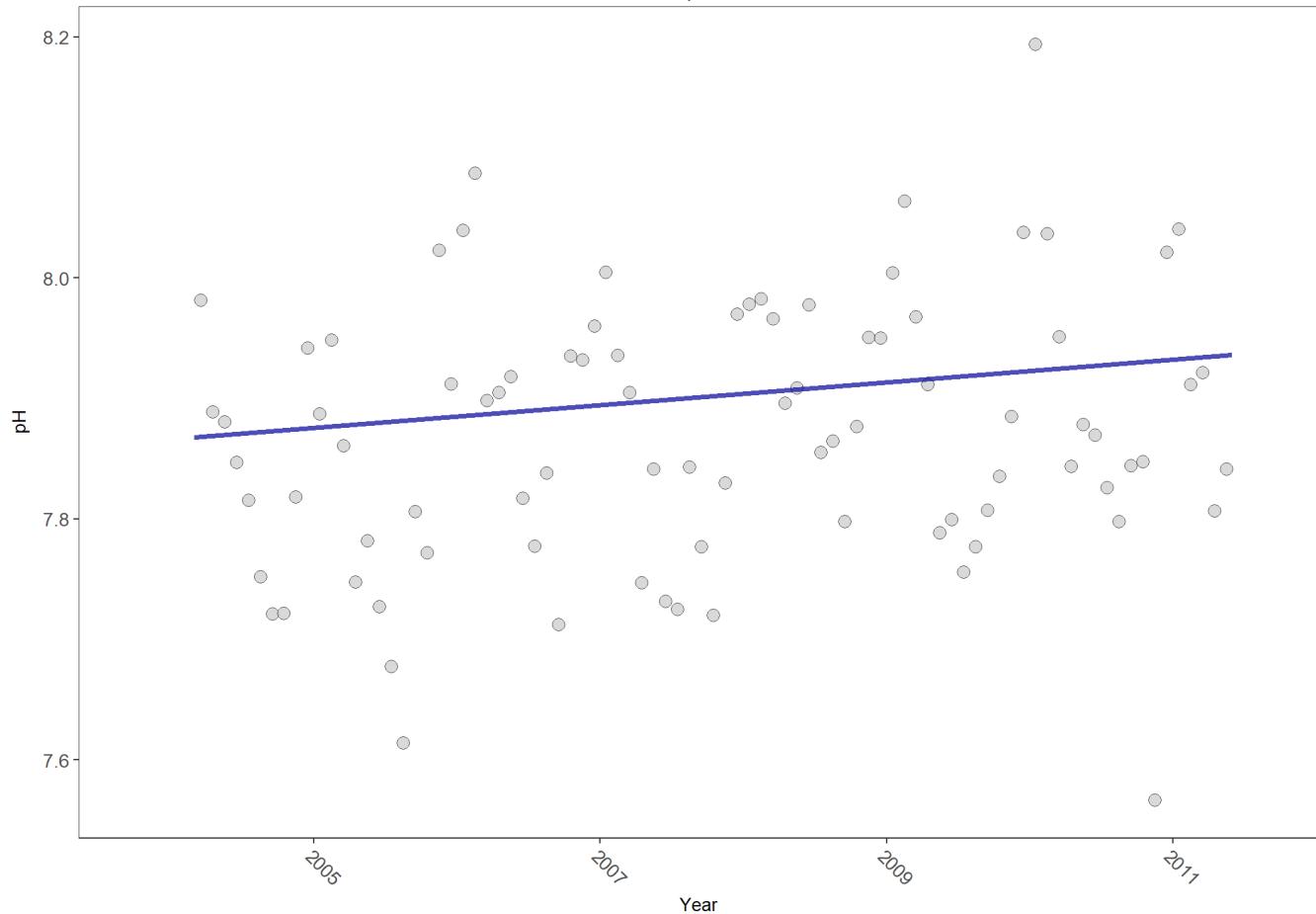
| Station | N_Data | N_Years | Period of Record | Median | tau | SennIntercept | SennSlope | p |
|-------------|--------|---------|------------------|--------|-------|---------------|-----------|--------|
| NEHM | 36209 | 2 | 2022 - 2023 | 75.10 | - | - | - | - |
| NEKD | 110983 | 8 | 2004 - 2011 | 89.10 | 0 | 87.49 | -0.04 | 0.9338 |
| NELC | 95868 | 7 | 2005 - 2011 | 77.90 | -0.27 | 78.93 | -1.6 | 0.0111 |
| NENR | 31438 | 3 | 2009 - 2011 | 73.20 | - | - | - | - |
| NECI | 6582 | 1 | 2023 - 2023 | 84.70 | - | - | - | - |
| NCBNRCM | 35240 | 5 | 2015 - 2019 | 82.06 | -0.05 | 81.1 | -0.14 | 0.7970 |
| NCBARD16 | 7417 | 2 | 2015 - 2016 | 74.44 | - | - | - | - |
| NCB19020038 | 34438 | 5 | 2015 - 2019 | 87.06 | -0.16 | 86.02 | -0.6 | 0.1268 |

pH - Continuous Water Quality

NEKD

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve
NEKD
pH



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|--------|--------|-------------|---------------|------------|-------------|-------|
| bottom | 113471 | 8 | 7.9 | TRUE | 0.1877 | 0.0491 | 0.009431004 | 7.866128 | 8.9917 | 0.6227 | 1 |

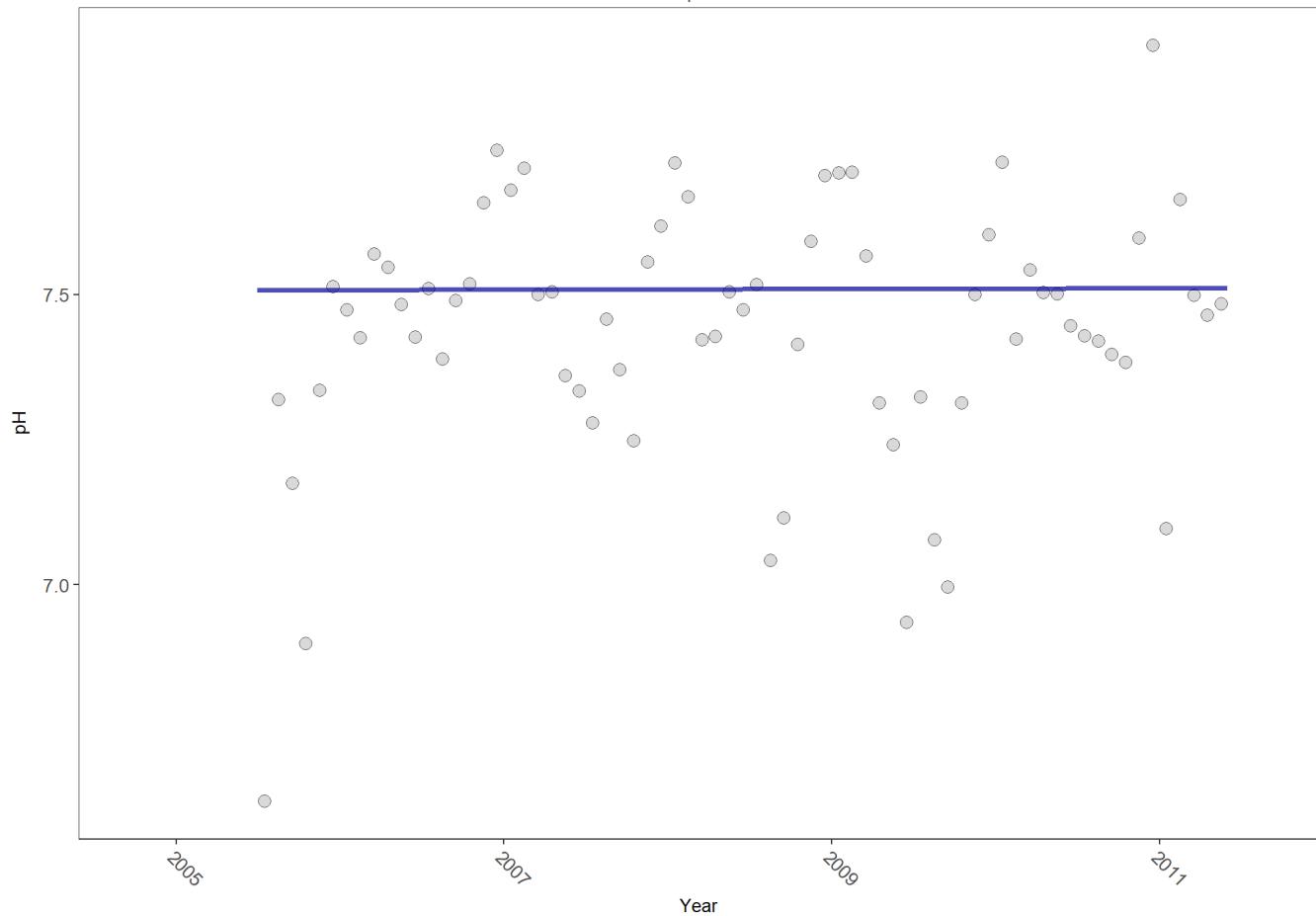
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

NELC

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve
NELC
pH



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|--------|--------|--------------|---------------|------------|-------------|-------|
| bottom | 96488 | 7 | 7.5 | TRUE | 0.0169 | 0.9121 | 0.0007435948 | 7.507162 | 6.0088 | 0.8728 | 0 |

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

SennIntercept is intercept value at beginning of record for monitoring location

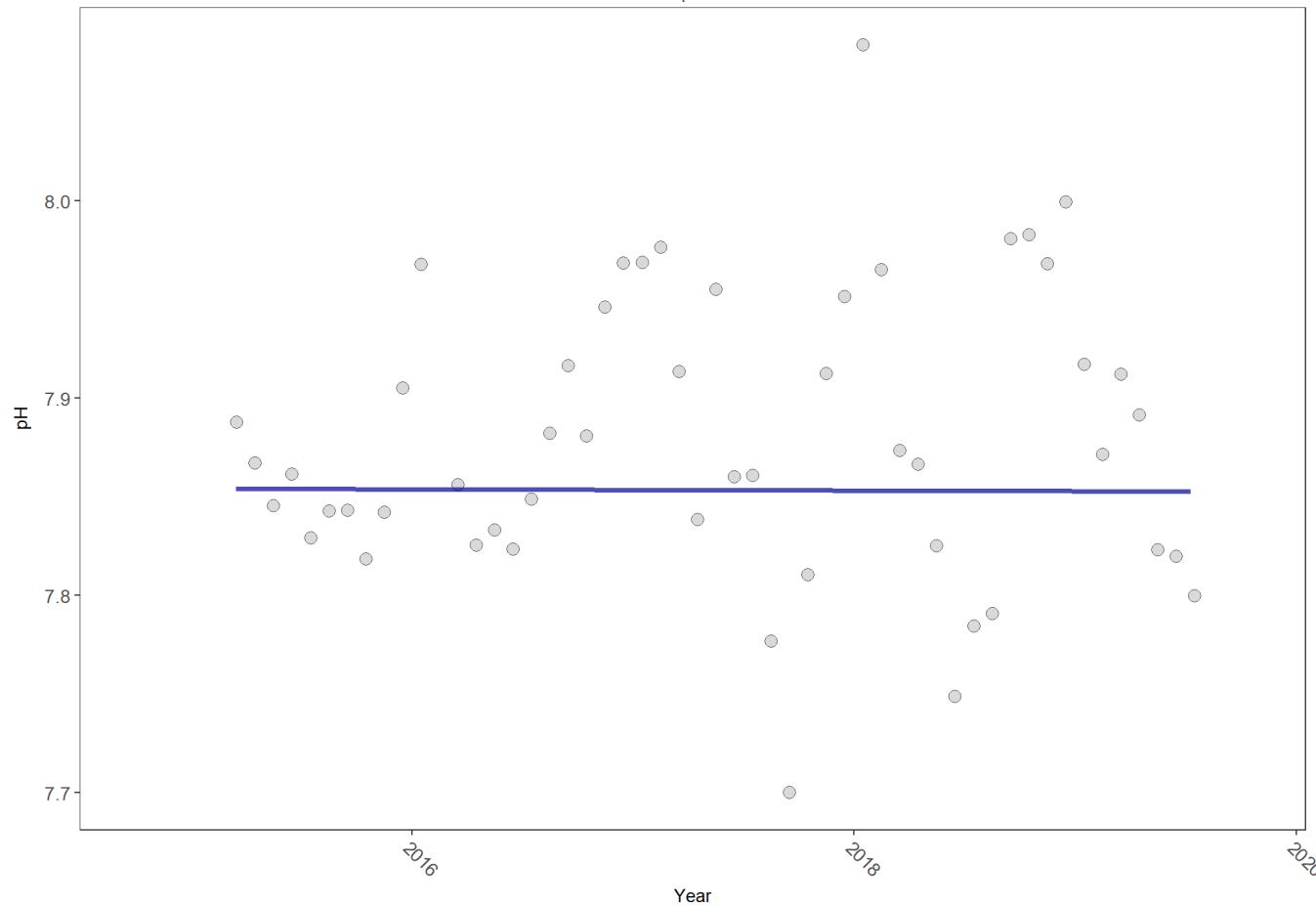
NCB19020038

St. Johns River Water Management District Continuous Water Quality Programs (5061)

Nassau River-St. Johns River Marshes Aquatic Preserve

NCB19020038

pH



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|---------------|---------------|------------|-------------|-------|
| surface | 34405 | 5 | 7.88 | TRUE | -0.0064 | 1.0000 | -0.0003055556 | 7.854219 | 13.2901 | 0.2748 | 0 |

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

SennIntercept is intercept value at beginning of record for monitoring location

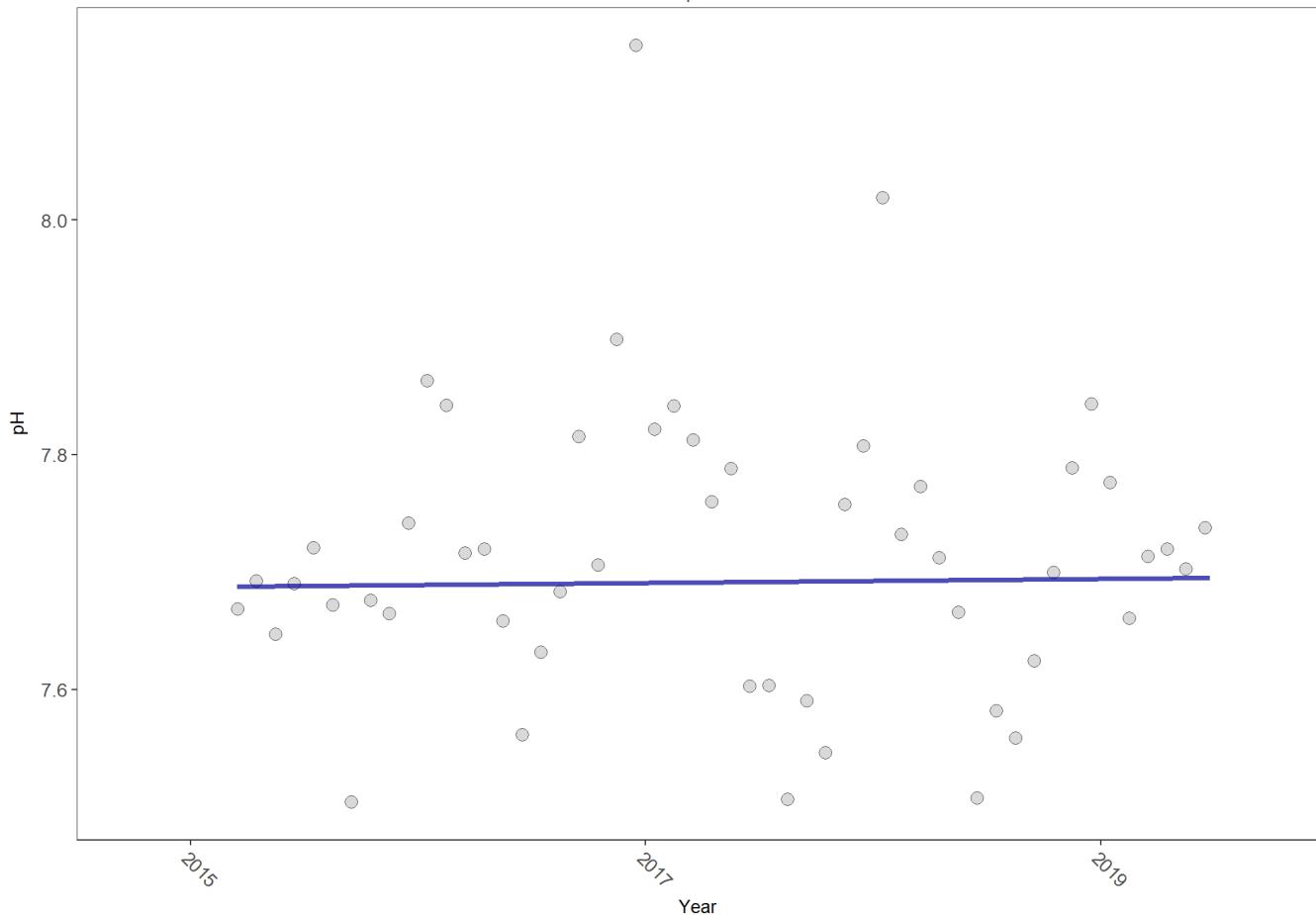
NCBNRCM

St. Johns River Water Management District Continuous Water Quality Programs (5061)

Nassau River-St. Johns River Marshes Aquatic Preserve

NCBNRCM

pH



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|-------------|---------------|------------|-------------|-------|
| surface | 35819 | 5 | 7.72 | TRUE | -0.0128 | 0.9317 | 0.001818175 | 7.687072 | 13.9579 | 0.2353 | 0 |

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

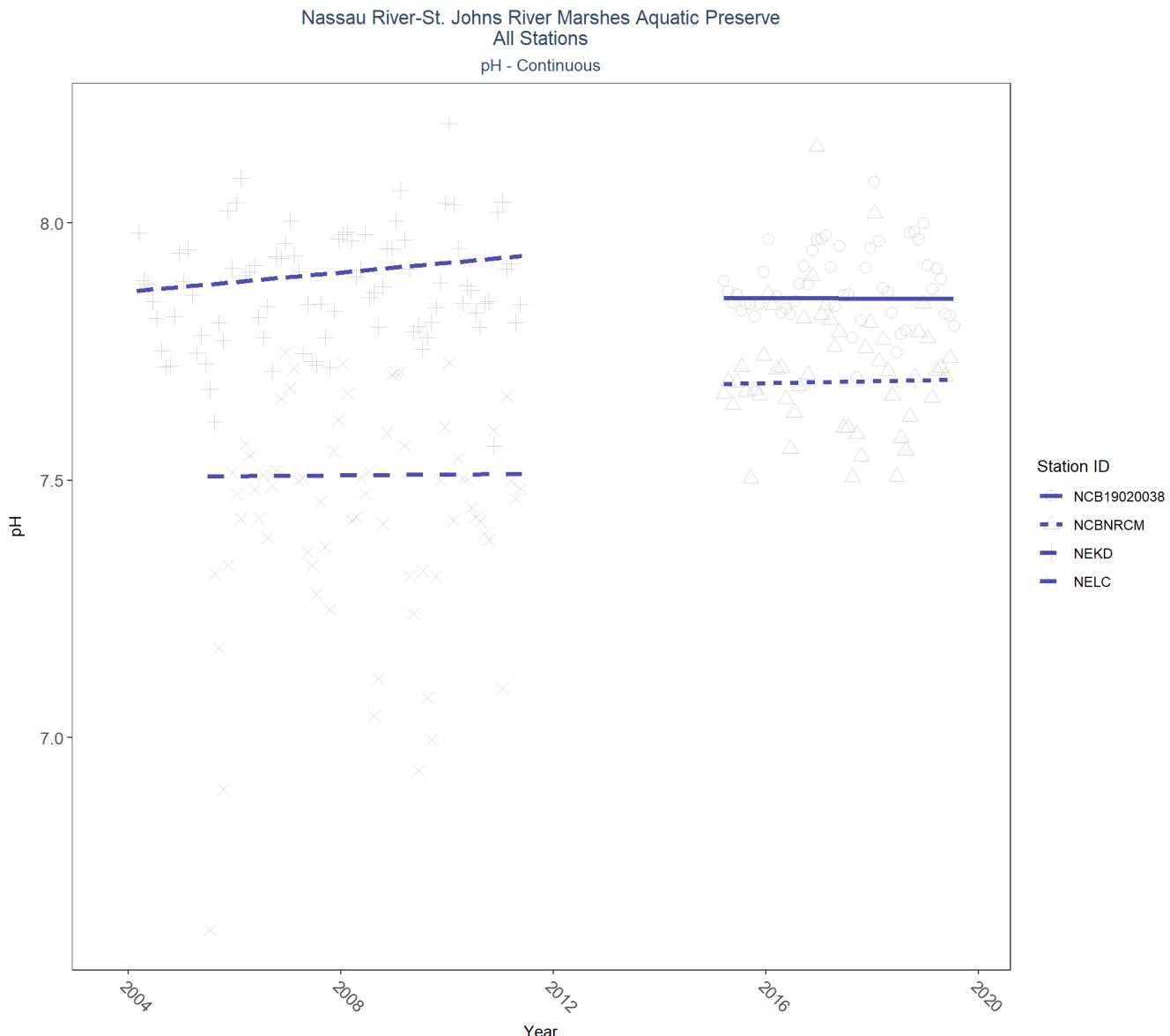


Table 29: Seasonal Kendall-Tau Results for All Stations - pH

| Station | N_Data | N_Years | Period of Record | Median | tau | SennIntercept | SennSlope | p |
|-------------|--------|---------|------------------|--------|-------|---------------|-----------|--------|
| NEHM | 36217 | 2 | 2022 - 2023 | 7.20 | - | - | - | - |
| NEKD | 113471 | 8 | 2004 - 2011 | 7.90 | 0.19 | 7.87 | 0.01 | 0.0491 |
| NELC | 96488 | 7 | 2005 - 2011 | 7.50 | 0.02 | 7.51 | 0 | 0.9121 |
| NENR | 31438 | 3 | 2009 - 2011 | 7.10 | - | - | - | - |
| NECI | 4272 | 1 | 2023 - 2023 | 7.70 | - | - | - | - |
| NCB19020038 | 34405 | 5 | 2015 - 2019 | 7.88 | -0.01 | 7.85 | 0 | 1.0000 |
| NCBARD16 | 6952 | 2 | 2015 - 2016 | 7.66 | - | - | - | - |
| NCBNRCM | 35819 | 5 | 2015 - 2019 | 7.72 | -0.01 | 7.69 | 0 | 0.9317 |

Salinity - Continuous Water Quality

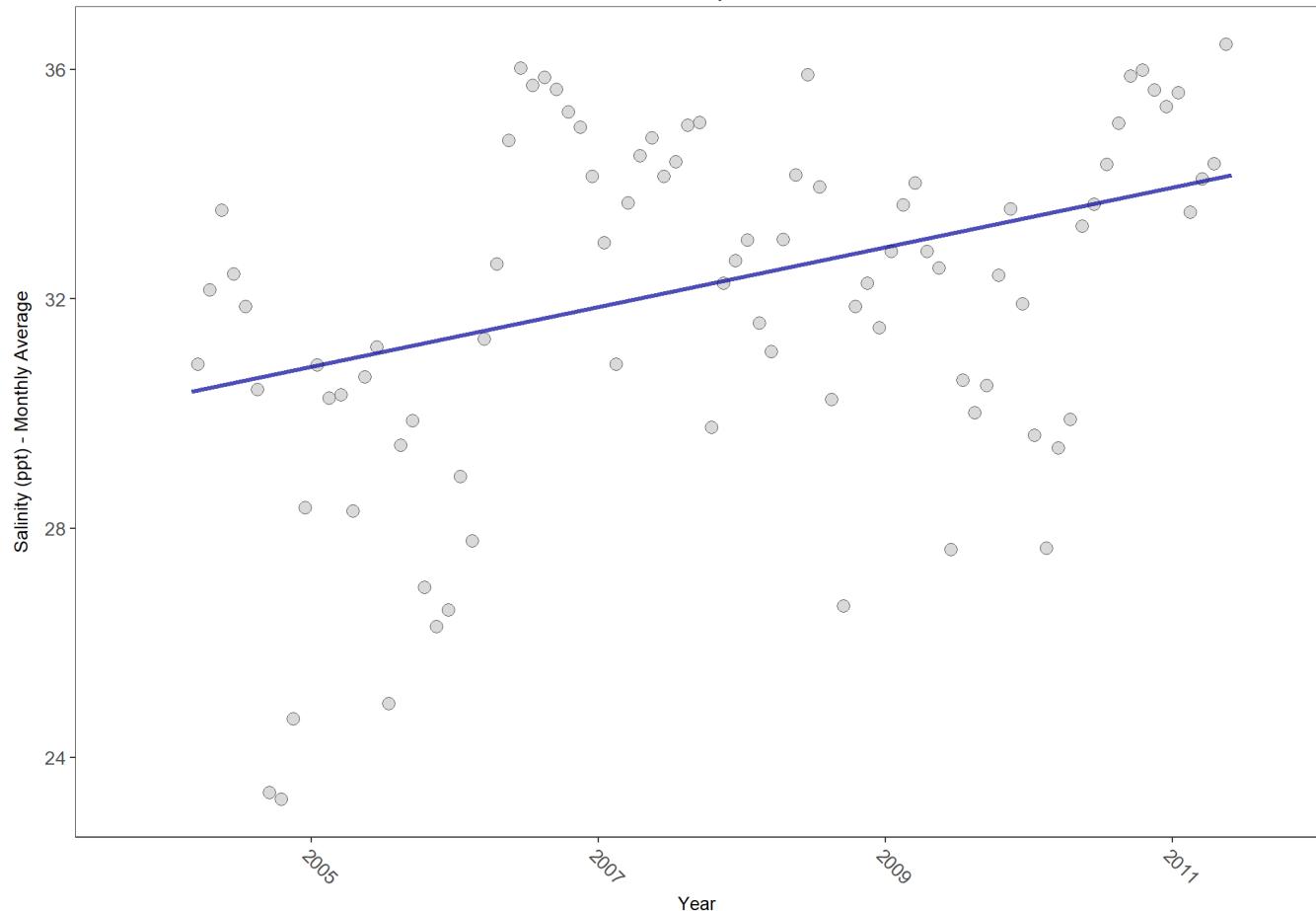
NEKD

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve

NEKD

Salinity



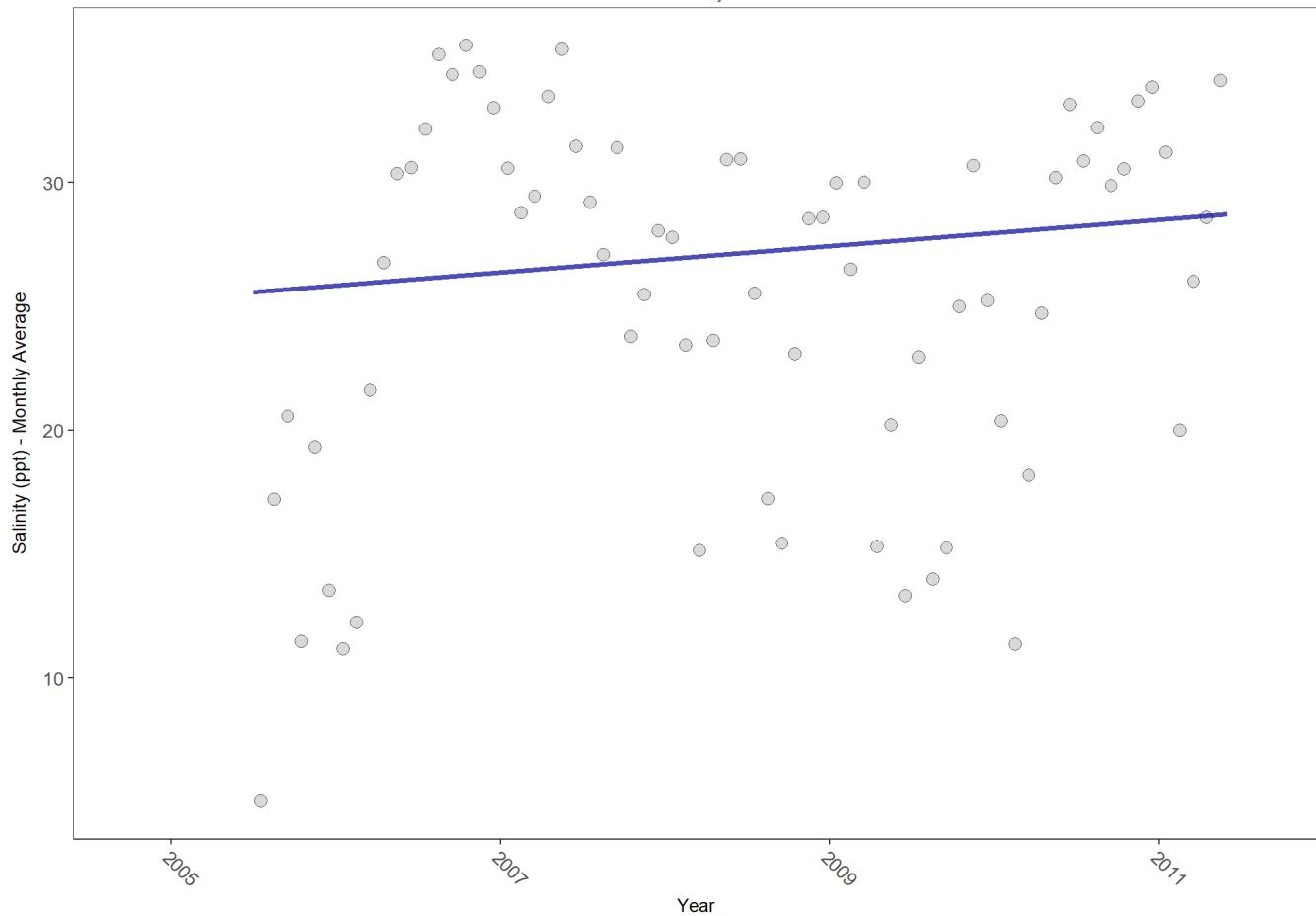
$p < 0.00005$ appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

NELC

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve
NELC
Salinity



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|--------|--------|-----------|---------------|------------|-------------|-------|
| bottom | 100339 | 7 | 27.9 | TRUE | 0.0873 | 0.4397 | 0.5338517 | 25.29957 | 5.2765 | 0.917 | 0 |

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

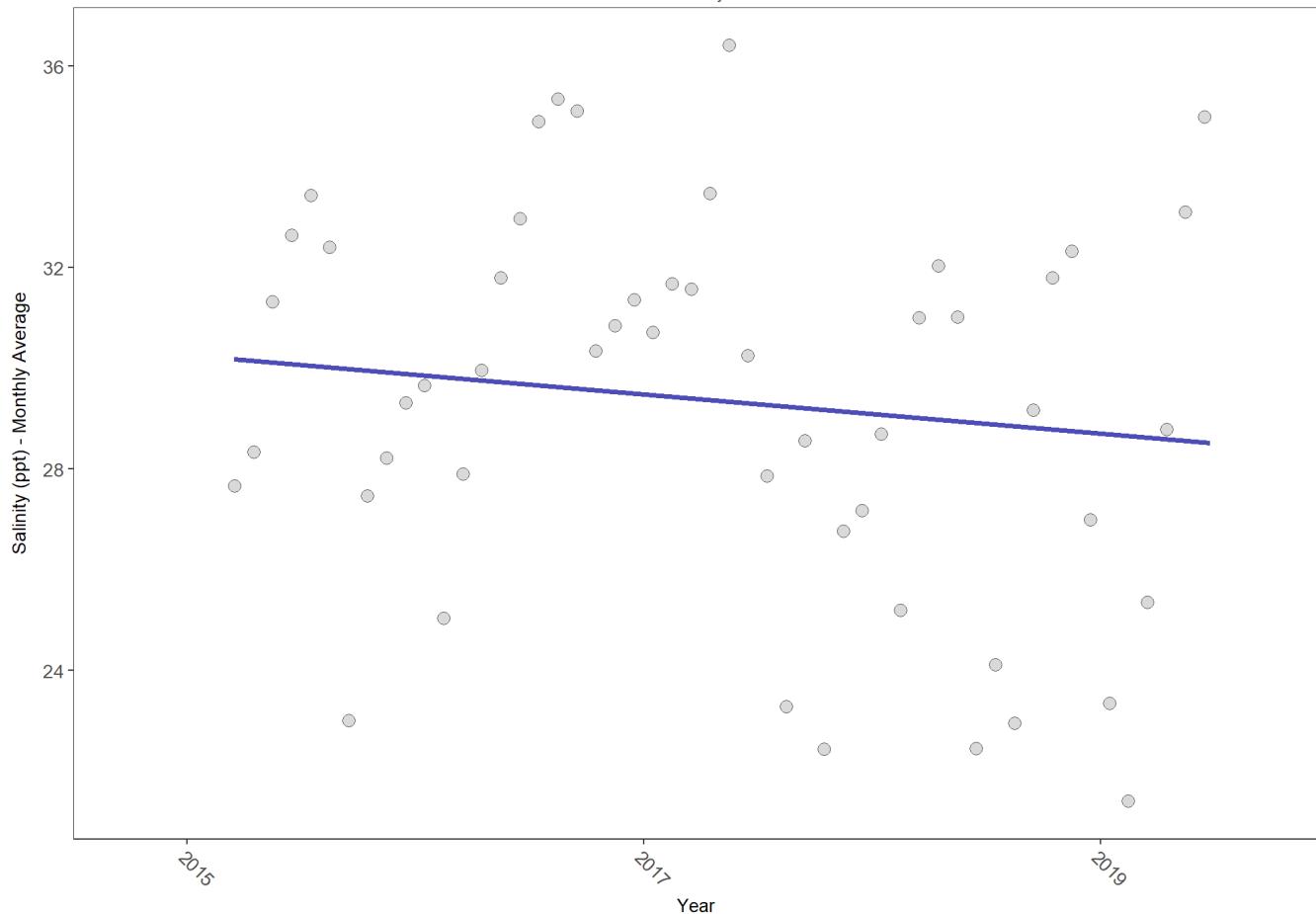
NCBNRCM

St. Johns River Water Management District Continuous Water Quality Programs (5061)

Nassau River-St. Johns River Marshes Aquatic Preserve

NCBNRCM

Salinity



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

SennIntercept is intercept value at beginning of record for monitoring location

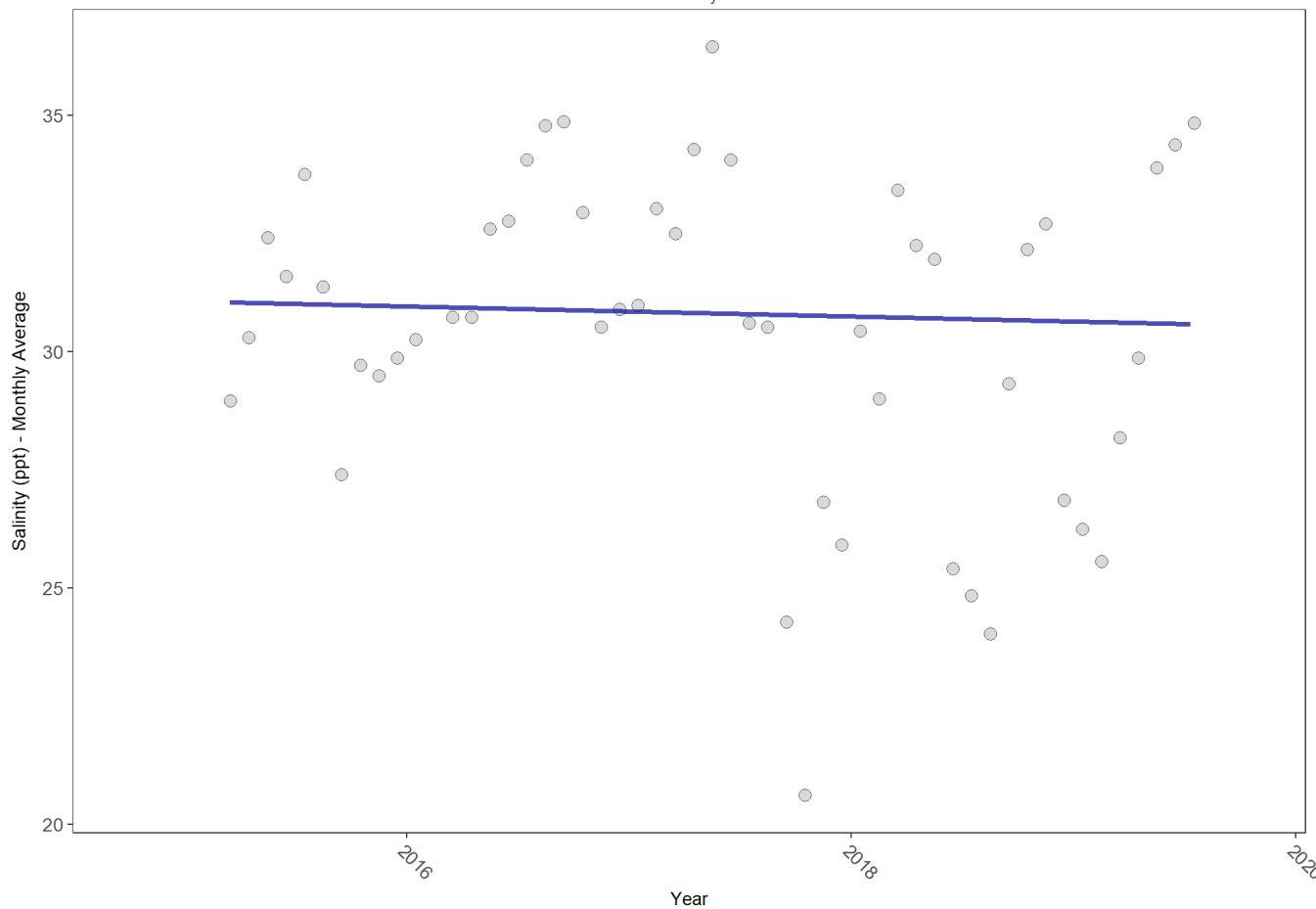
NCB19020038

St. Johns River Water Management District Continuous Water Quality Programs (5061)

Nassau River-St. Johns River Marshes Aquatic Preserve

NCB19020038

Salinity



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|----------|-------------|---------|--------|-----------|---------------|------------|-------------|-------|
| surface | 34438 | 5 | 31.75222 | TRUE | -0.0577 | 1.0000 | -0.108309 | 31.06804 | 6.8998 | 0.8071 | 0 |

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

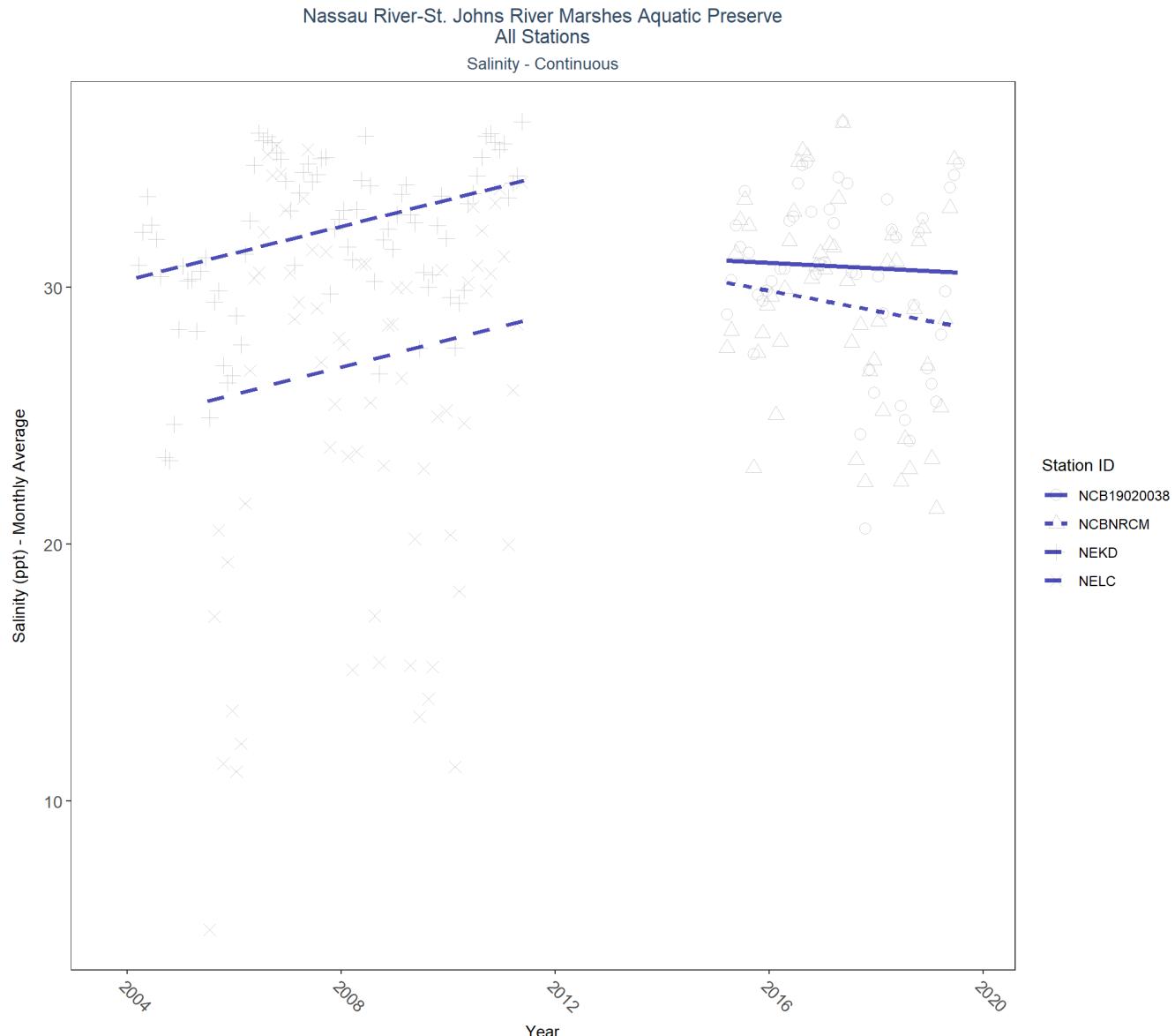


Table 30: Seasonal Kendall-Tau Results for All Stations - Salinity

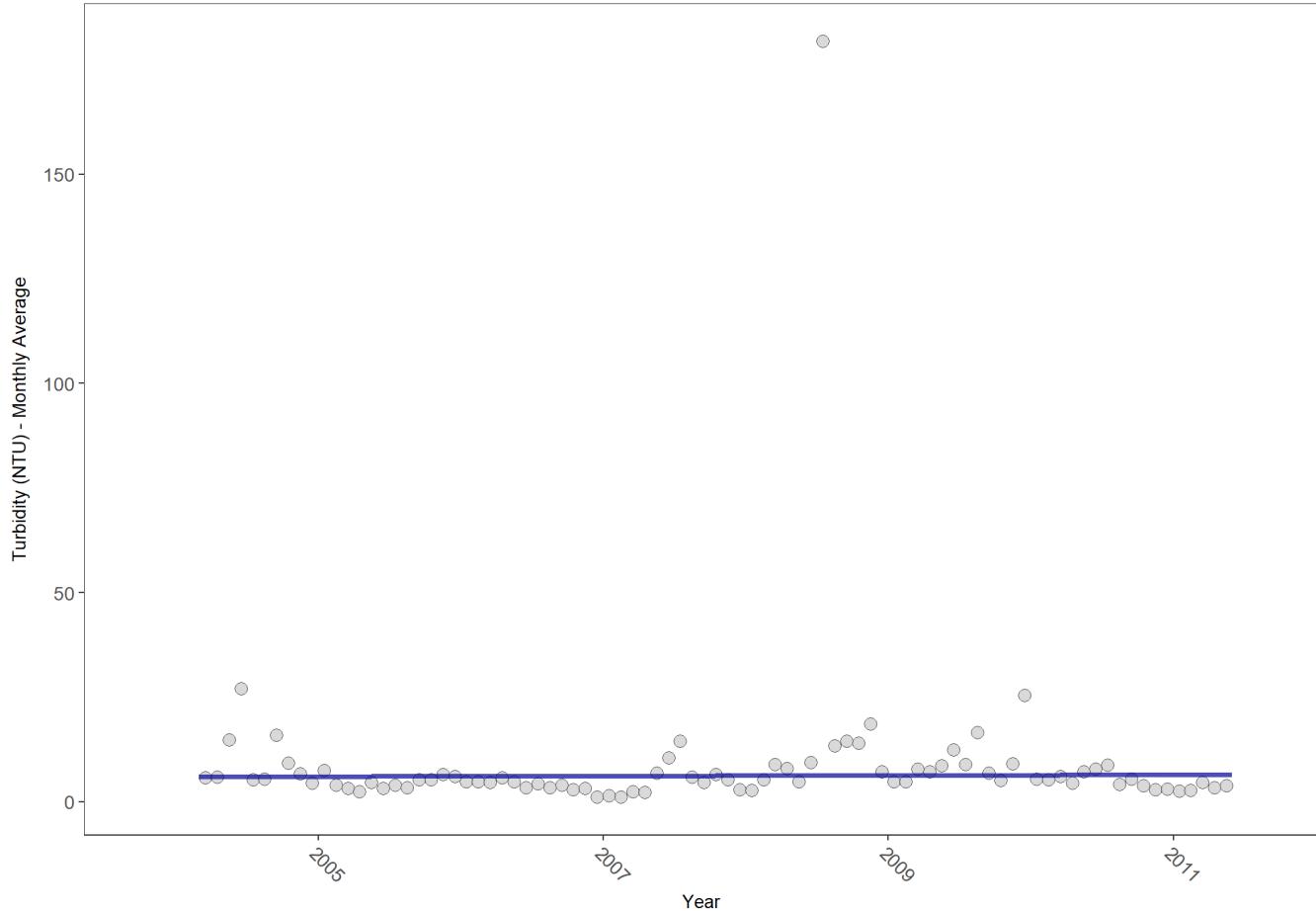
| Station | N_Data | N_Years | Period of Record | Median | tau | SennIntercept | SennSlope | p |
|-------------|--------|---------|------------------|--------|-------|---------------|-----------|--------|
| NEHM | 36216 | 2 | 2022 - 2023 | 19.60 | - | - | - | - |
| NEKD | 118328 | 8 | 2004 - 2011 | 33.20 | 0.31 | 30.29 | 0.52 | 0.0006 |
| NELC | 100339 | 7 | 2005 - 2011 | 27.90 | 0.09 | 25.3 | 0.53 | 0.4397 |
| NENR | 31438 | 3 | 2009 - 2011 | 12.40 | - | - | - | - |
| NECI | 6581 | 1 | 2023 - 2023 | 31.10 | - | - | - | - |
| NCBARD16 | 7418 | 2 | 2015 - 2016 | 30.07 | - | - | - | - |
| NCBNRCM | 35411 | 5 | 2015 - 2019 | 30.29 | -0.12 | 30.26 | -0.39 | 0.5483 |
| NCB19020038 | 34438 | 5 | 2015 - 2019 | 31.75 | -0.06 | 31.07 | -0.11 | 1.0000 |

Turbidity - Continuous Water Quality

NEKD

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve
NEKD
Turbidity



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|--------|--------|------------|---------------|------------|-------------|-------|
| bottom | 114181 | 8 | 4 | TRUE | 0.0203 | 0.8697 | 0.04741014 | 6.06342 | 4.3028 | 0.9602 | 0 |

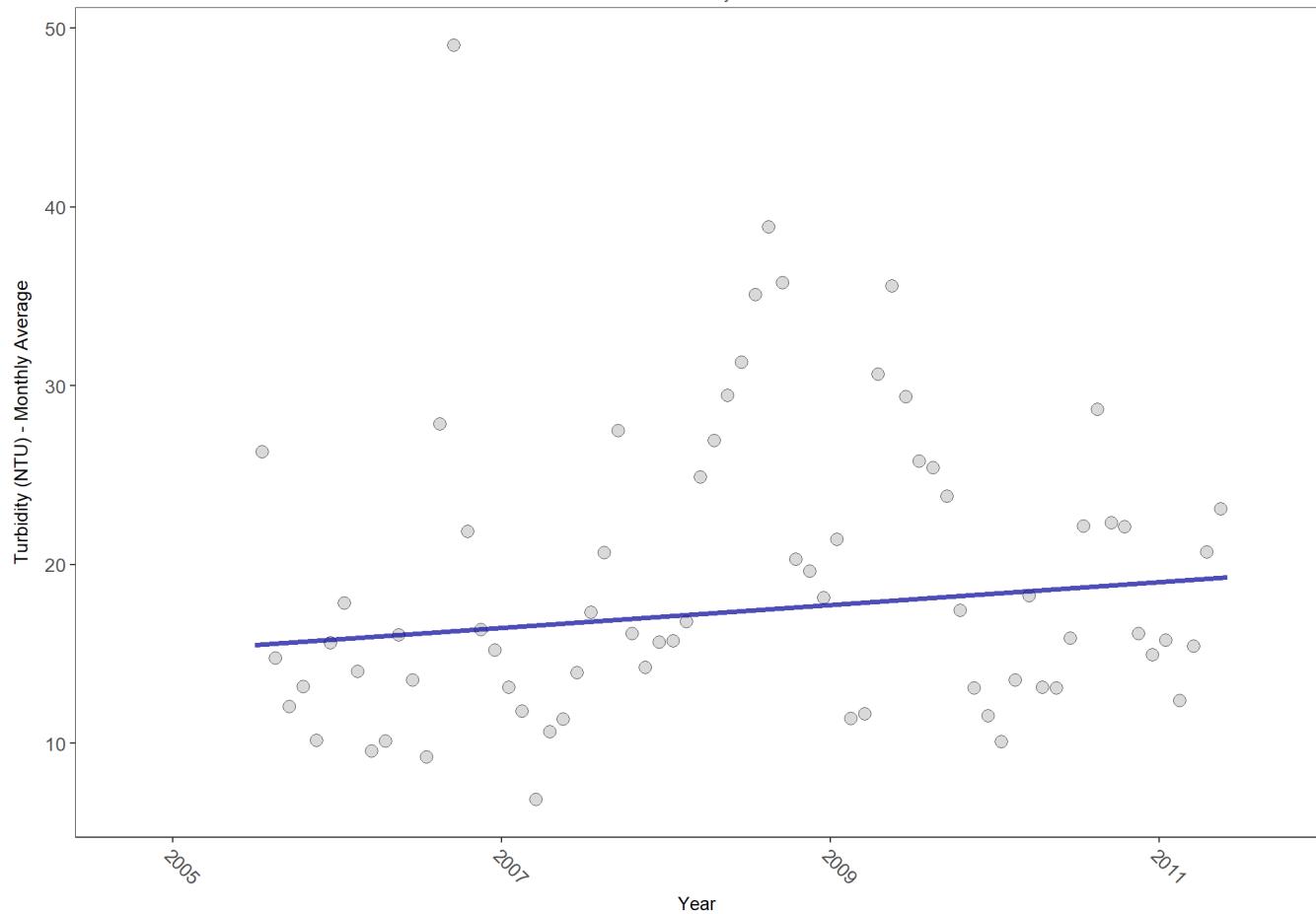
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

NELC

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve
NELC
Turbidity



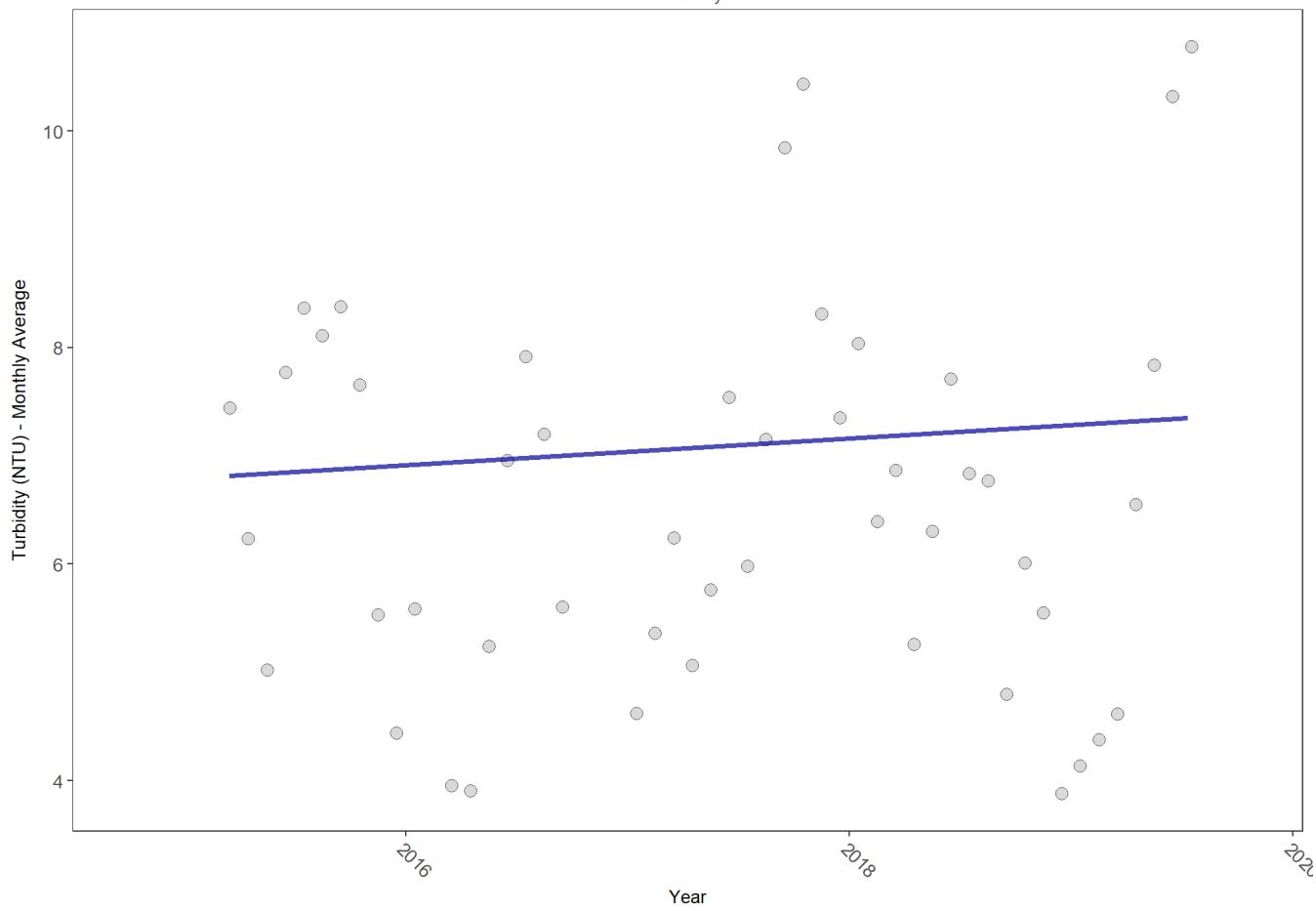
| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|--------|--------|-----------|---------------|------------|-------------|-------|
| bottom | 96153 | 7 | 15 | TRUE | 0.1577 | 0.1513 | 0.6379887 | 15.18443 | 6.3479 | 0.8492 | 0 |

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

SennIntercept is intercept value at beginning of record for monitoring location

NCB19020038

St. Johns River Water Management District Continuous Water Quality Programs (5061)
 Nassau River-St. Johns River Marshes Aquatic Preserve
 NCB19020038
 Turbidity



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|-----------|---------------|------------|-------------|-------|
| surface | 31407 | 5 | 5.77 | TRUE | -0.0136 | 0.7876 | 0.1241474 | 6.789956 | 14.3051 | 0.2166 | 0 |

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

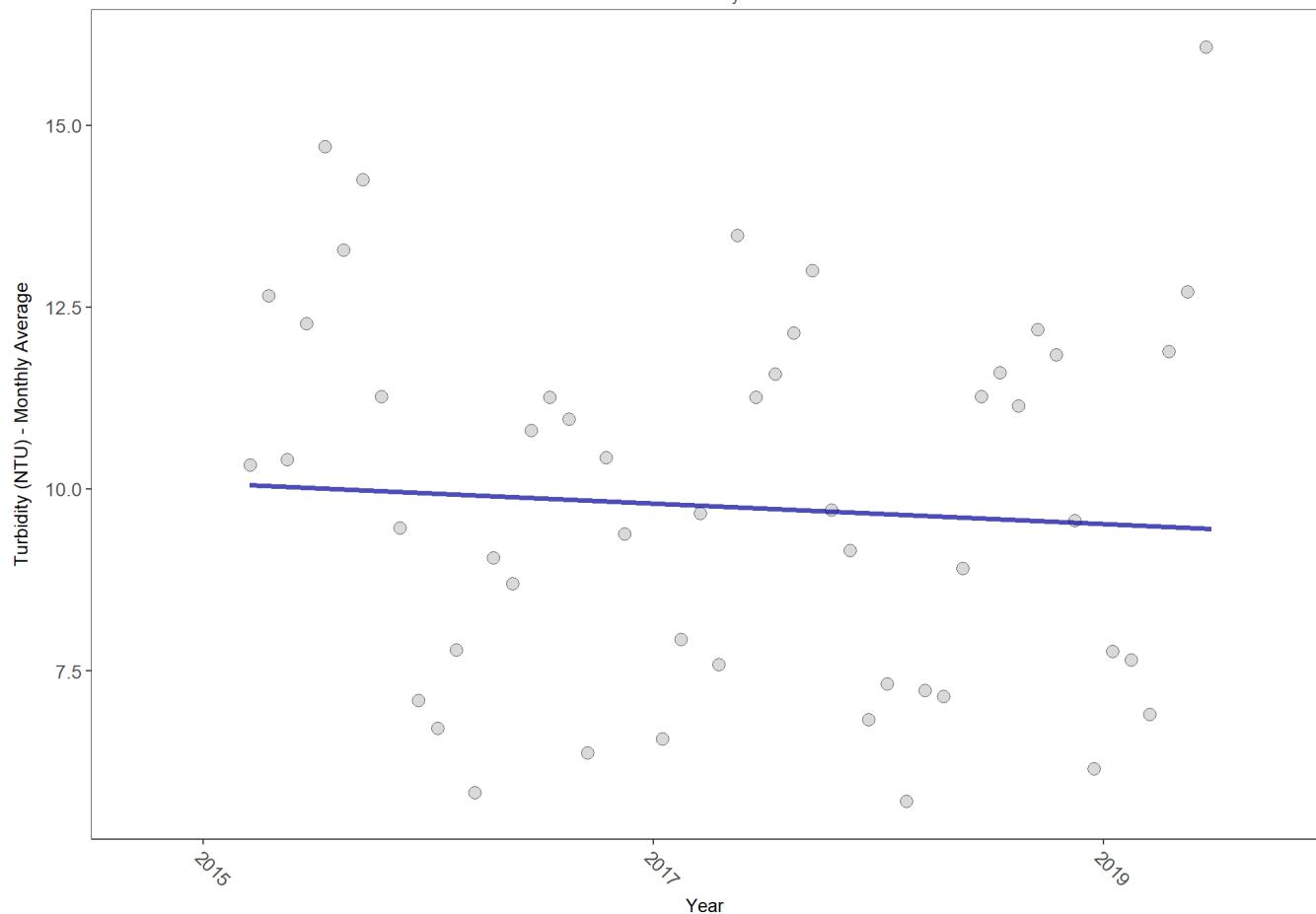
NCBNRCM

St. Johns River Water Management District Continuous Water Quality Programs (5061)

Nassau River-St. Johns River Marshes Aquatic Preserve

NCBNRCM

Turbidity



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|------------|---------------|------------|-------------|-------|
| surface | 34696 | 5 | 8.64 | TRUE | -0.1046 | 0.6001 | -0.1419202 | 10.0869 | 8.1815 | 0.697 | 0 |

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

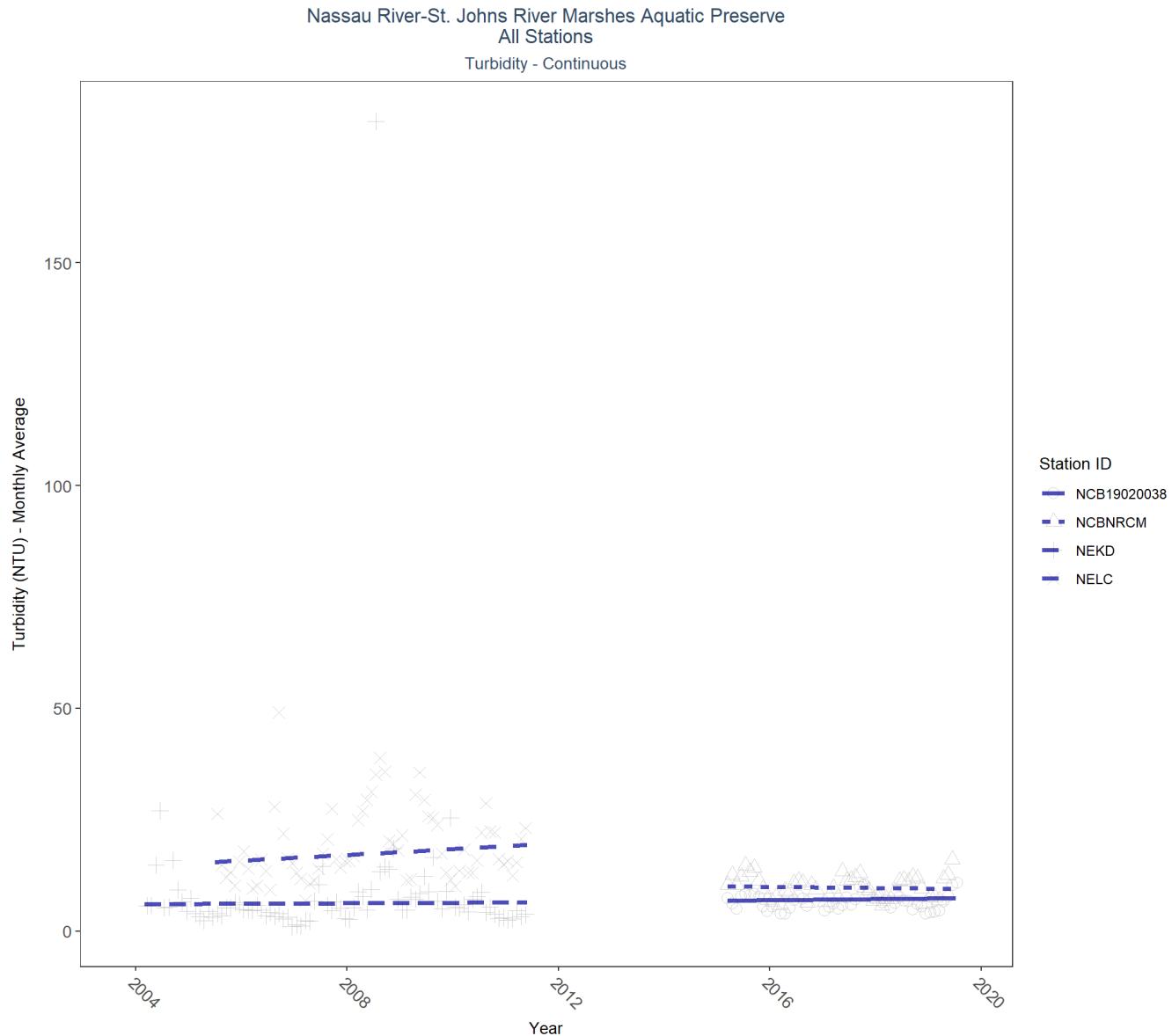


Table 31: Seasonal Kendall-Tau Results for All Stations - Turbidity

| Station | N_Data | N_Years | Period of Record | Median | tau | SennIntercept | SennSlope | p |
|-------------|--------|---------|------------------|--------|-------|---------------|-----------|--------|
| NEHM | 36395 | 2 | 2022 - 2023 | 9.00 | - | - | - | - |
| NEKD | 114181 | 8 | 2004 - 2011 | 4.00 | 0.02 | 6.06 | 0.05 | 0.8697 |
| NELC | 96153 | 7 | 2005 - 2011 | 15.00 | 0.16 | 15.18 | 0.64 | 0.1513 |
| NENR | 31087 | 3 | 2009 - 2011 | 21.00 | - | - | - | - |
| NECI | 6581 | 1 | 2023 - 2023 | 13.00 | - | - | - | - |
| NCBARD16 | 7385 | 2 | 2015 - 2016 | 12.89 | - | - | - | - |
| NCB19020038 | 31407 | 5 | 2015 - 2019 | 5.77 | -0.01 | 6.79 | 0.12 | 0.7876 |
| NCBNRCM | 34696 | 5 | 2015 - 2019 | 8.64 | -0.1 | 10.09 | -0.14 | 0.6001 |

Water Temperature - Continuous Water Quality

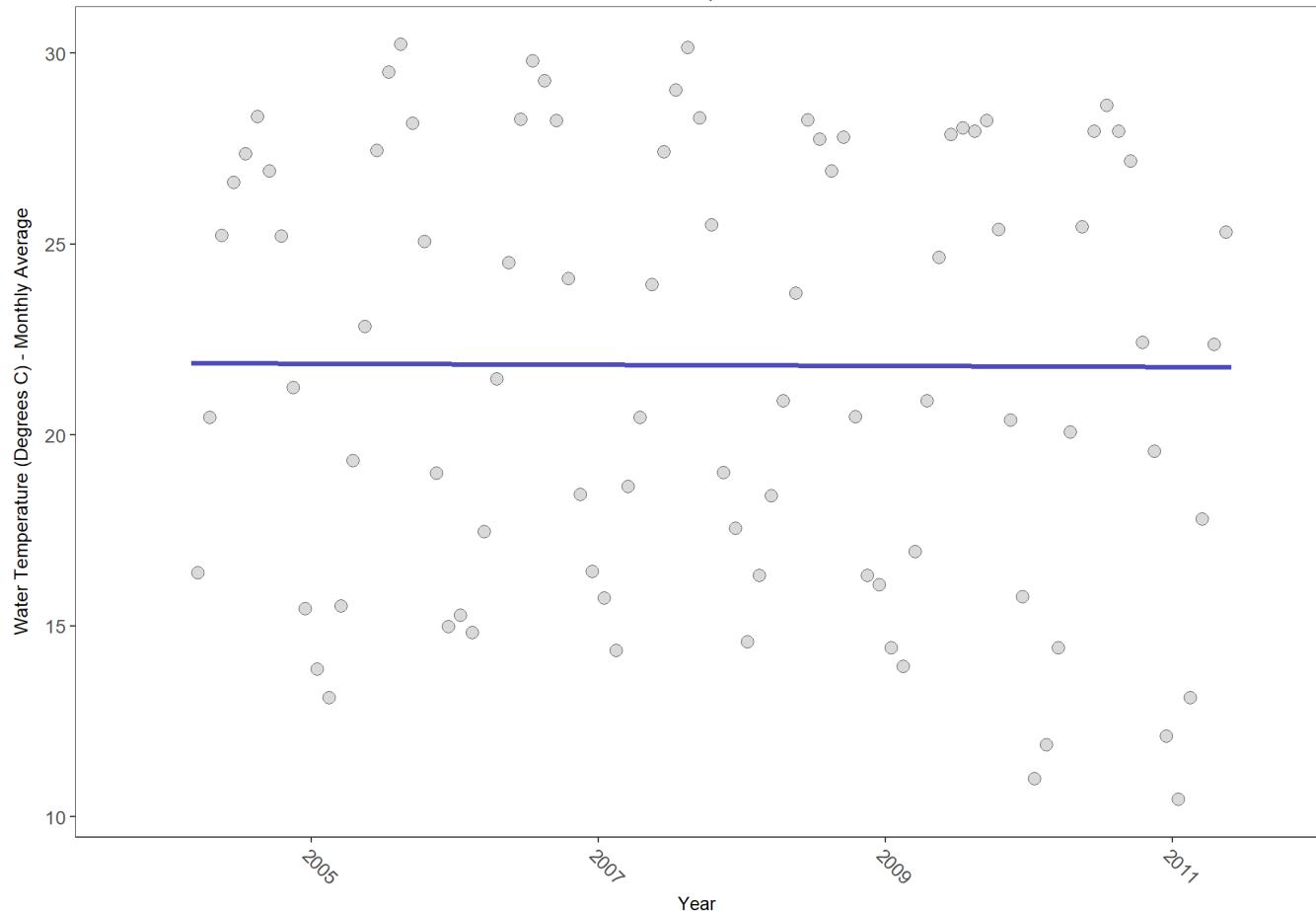
NEKD

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve

NEKD

Water Temperature



| RelativeDepth | N_Data | N_Years | Median | Independent | tau | p | SennSlope | SennIntercept | ChiSquared | pChiSquared | Trend |
|---------------|--------|---------|--------|-------------|---------|--------|-------------|---------------|------------|-------------|-------|
| bottom | 118328 | 8 | 22.1 | TRUE | -0.0367 | 0.8057 | -0.01301241 | 21.87533 | 9.189 | 0.6045 | 0 |

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

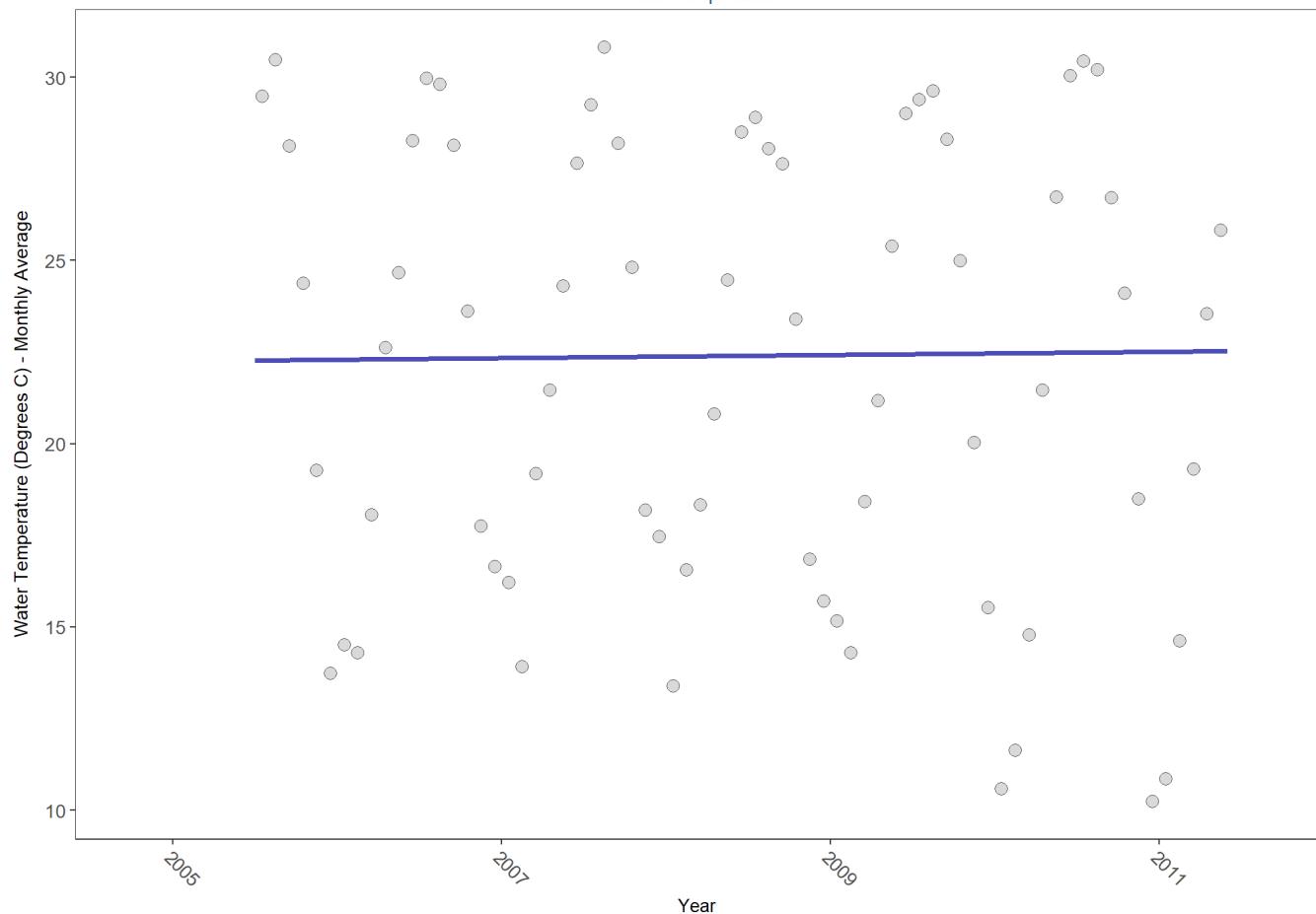
NELC

Northeast Aquatic Preserves Continuous Water Quality Monitoring (5006)

Nassau River-St. Johns River Marshes Aquatic Preserve

NELC

Water Temperature



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

SennIntercept is intercept value at beginning of record for monitoring location

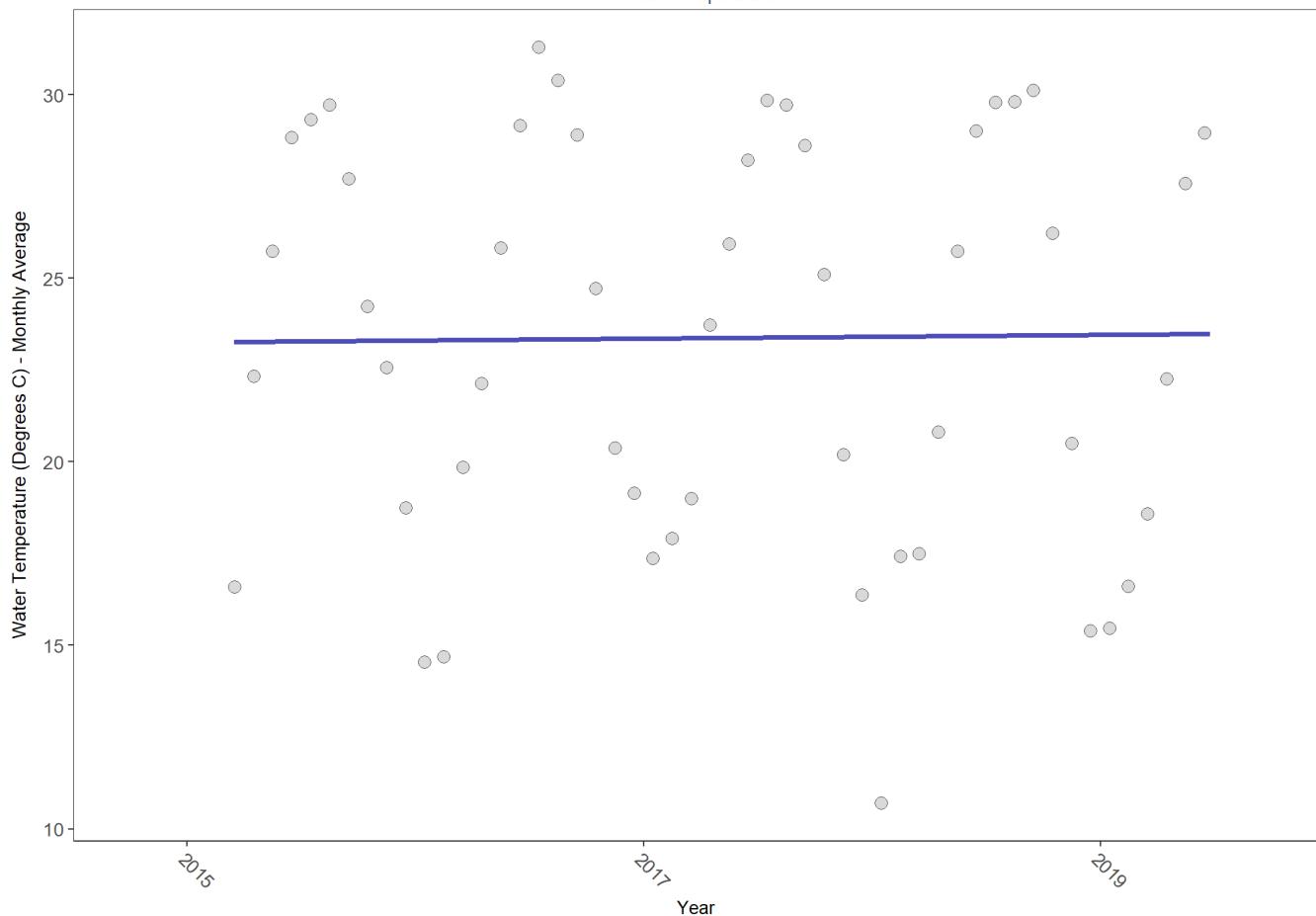
NCBNRCM

St. Johns River Water Management District Continuous Water Quality Programs (5061)

Nassau River-St. Johns River Marshes Aquatic Preserve

NCBNRCM

Water Temperature

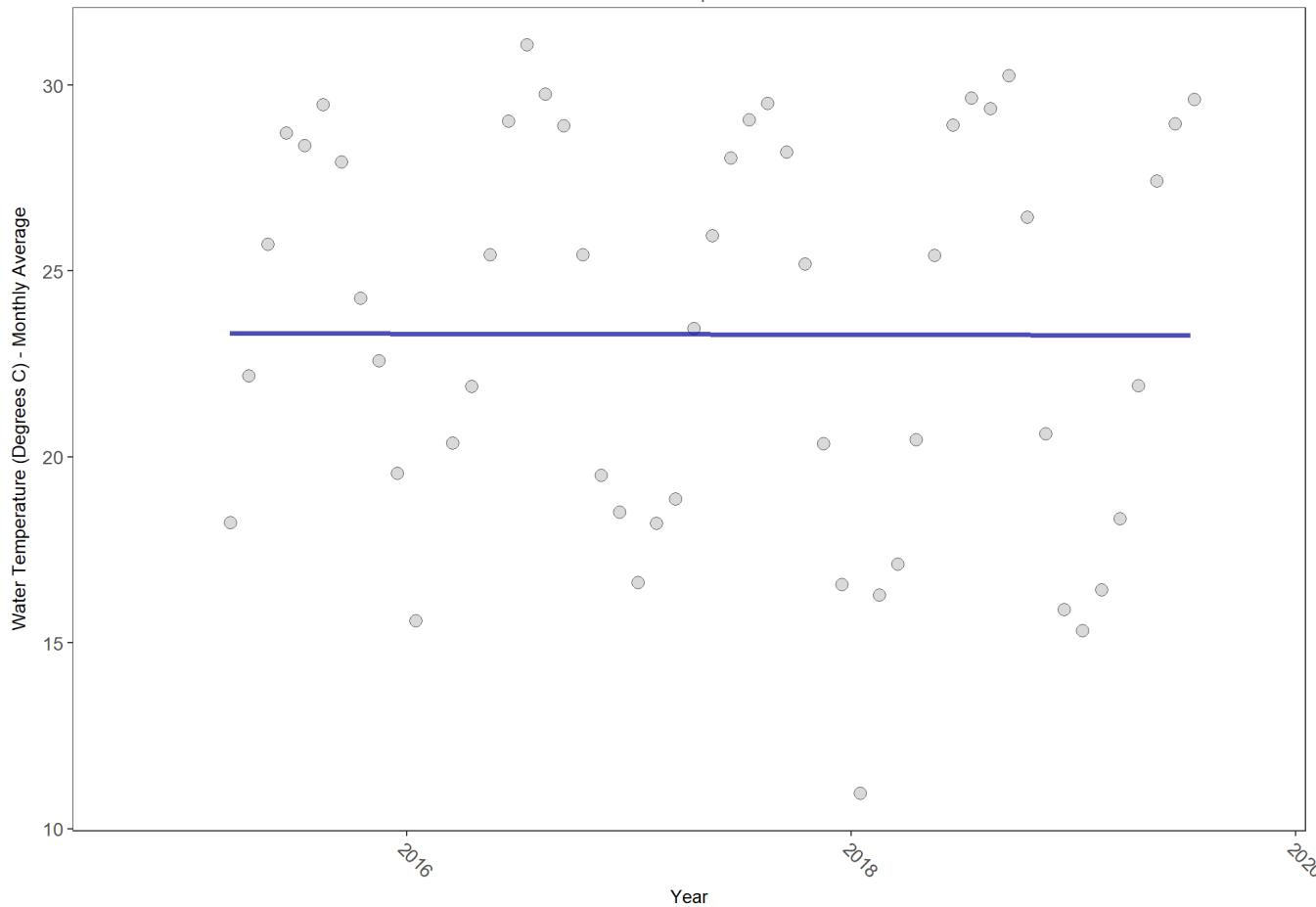


$p < 0.00005$ appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

NCB19020038

St. Johns River Water Management District Continuous Water Quality Programs (5061)
 Nassau River-St. Johns River Marshes Aquatic Preserve
 NCB19020038
 Water Temperature



p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

All Stations Combined

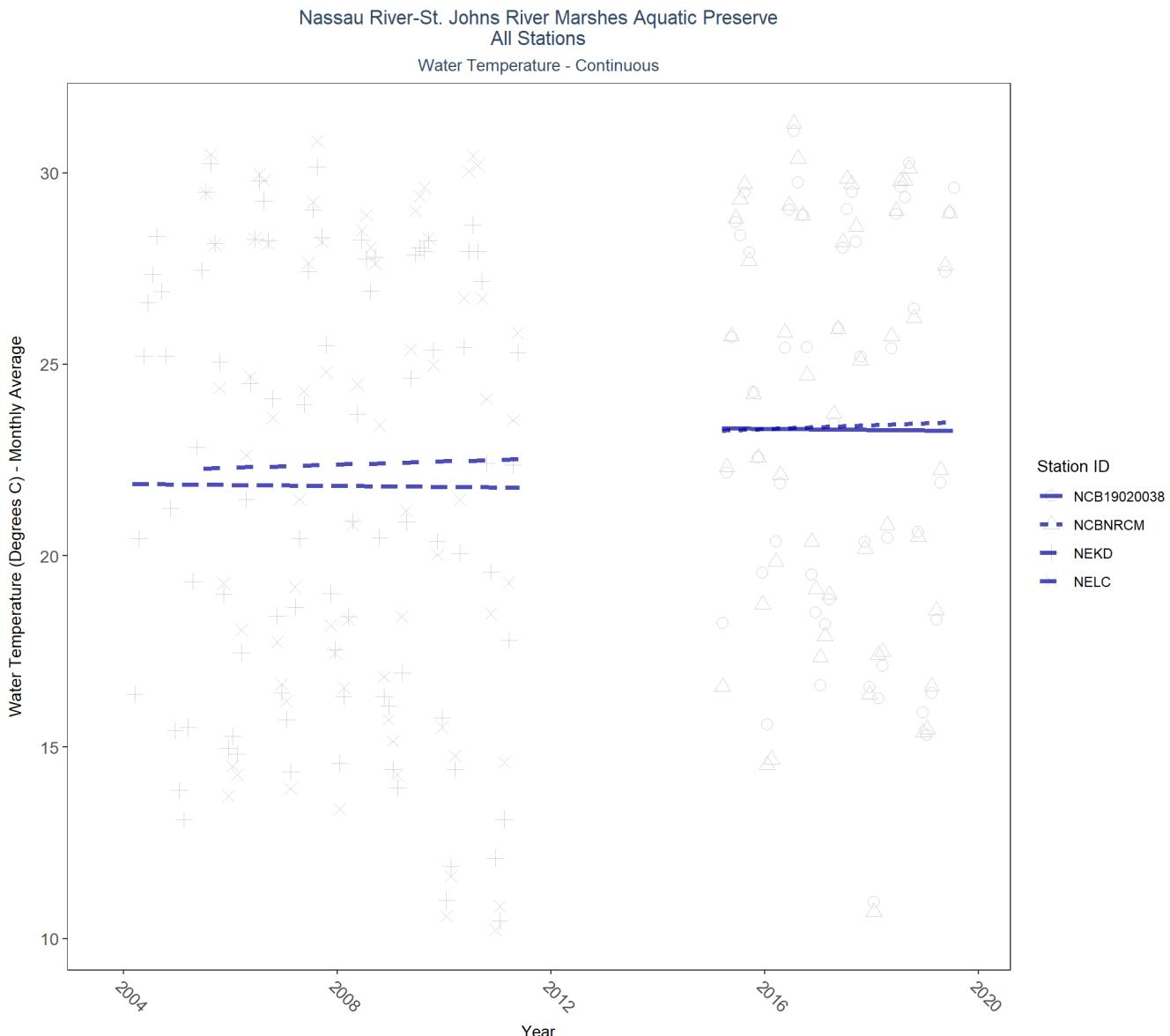


Table 32: Seasonal Kendall-Tau Results for All Stations - Water Temperature

| Station | N_Data | N_Years | Period of Record | Median | tau | SennIntercept | SennSlope | p |
|-------------|--------|---------|------------------|--------|-------|---------------|-----------|--------|
| 02231291 | 710 | 3 | 2014 - 2016 | 24.50 | - | - | - | - |
| NEHM | 36621 | 2 | 2022 - 2023 | 22.70 | - | - | - | - |
| NEKD | 118328 | 8 | 2004 - 2011 | 22.10 | -0.04 | 21.88 | -0.01 | 0.8057 |
| NELC | 100343 | 7 | 2005 - 2011 | 22.70 | 0.05 | 22.26 | 0.04 | 0.7405 |
| NENR | 31438 | 3 | 2009 - 2011 | 22.00 | - | - | - | - |
| NECI | 6584 | 1 | 2023 - 2023 | 18.40 | - | - | - | - |
| NCBNRCM | 35817 | 5 | 2015 - 2019 | 24.03 | 0.07 | 23.26 | 0.05 | 0.6681 |
| NCBARD16 | 7419 | 2 | 2015 - 2016 | 25.08 | - | - | - | - |
| NCB19020038 | 34483 | 5 | 2015 - 2019 | 24.78 | -0.03 | 23.32 | -0.01 | 1.0000 |