

# Pellicer Creek Aquatic Preserve

## SEACAR Habitat Analyses

Last compiled on 02 July, 2025

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## Funding & Acknowledgements

The data used in this analysis is from the Export Standardized Tables in the SEACAR Data Discovery Interface (DDI). Documents and information available through the SEACAR DDI are owned by the data provider(s) and users are expected to provide appropriate credit following accepted citation formats. Users are encouraged to access data to maximize utilization of gained knowledge, reducing redundant research and facilitating partnerships and scientific innovation.

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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
Dissolved Oxygen	mg/L	-0.000001	50
Dissolved Oxygen Saturation	%	-0.000001	500
Salinity	ppt	-0.000001	70
Turbidity	NTU	-0.000001	4000
Water Temperature	Degrees C	-5.000000	45
pH	None	2.000000	14

Table 2: Discrete Water Quality threshold values

Parameter Name	Units	Low Threshold	High Threshold
Ammonia, Un-ionized (NH3)	mg/L	-	-
Ammonium, Filtered (NH4)	mg/L	-	-
Chlorophyll a, Corrected for Pheophytin	ug/L	-	-
Chlorophyll a, Uncorrected for Pheophytin	ug/L	-	-
Colored Dissolved Organic Matter	PCU	-	-

Parameter Name	Units	Low Threshold	High Threshold
Dissolved Oxygen	mg/L	-0.000001	25
Dissolved Oxygen Saturation	%	-0.000001	310
Fluorescent Dissolved Organic Matter	QSE	-	-
Light Extinction Coefficient	m^-1	-	-
NO2+3, Filtered	mg/L	-	-
Nitrate (NO3)	mg/L	-	-
Nitrite (NO2)	mg/L	-	-
Nitrogen, organic	mg/L	-	-
Phosphate, Filtered (PO4)	mg/L	-	-
Salinity	ppt	-0.000001	70
Secchi Depth	m	0.000001	50
Specific Conductivity	mS/cm	0.005000	100
Total Kjeldahl Nitrogen	mg/L	-	-
Total Nitrogen	mg/L	-	-
Total Nitrogen	mg/L	-	-
Total Phosphorus	mg/L	-	-
Total Suspended Solids	mg/L	-	-
Turbidity	NTU	-	-
Water Temperature	Degrees C	3.000000	40
pH	None	2.000000	13

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

SEACAR QAQC Description	Include	SEACAR QAQCFlagCode
Exceeds maximum threshold	0	2Q
Below minimum threshold	0	4Q
Within threshold tolerance	1	6Q
No defined thresholds for this parameter	1	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	0	0	Value based on field kit determination; results may not be accurate
STORET-WIN	J	0	0	Estimated value
STORET-WIN	V	0	0	Analyte was detected at or above method detection limit
STORET-WIN	Y	0	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 determiniation; 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	1	Optional parameter not collected
SWMP	-2	0	Missing data
SWMP	-3	0	Data rejected due to QA/QC
SWMP	-4	0	Outside low sensor range
SWMP	-5	0	Outside high sensor range
SWMP	0	1	Passed initial QA/QC checks
SWMP	1	0	Suspect data
SWMP	2	1	Reserved for future use
SWMP	3	1	Calculated data: non-vented depth/level sensor correction for changes in barometric pressure
SWMP	4	1	Historical: Pre-auto QA/QC
SWMP	5	1	Corrected data

## Water Column

The water column habitat extends from the water's surface to the bottom sediments, and it's where fish, dolphins, crabs and people swim! So much life makes its home in the water column that the health of marine and coastal ecosystems, as well as human economies, depend on the condition of this vulnerable habitat. Local patterns of rainfall, temperature, winds and currents can rapidly change the condition of the water column, while global influences such as [El Niño/La Niña](#), large-scale fluctuation in sea temperatures and climate change can have long-term effects. Inputs from the prosperity of our day-to-day lives including farming, mining and forestry, and emissions from power generation, automobiles and water treatment can also alter the health of the water column. Acting alone or together, each input can have complex and lasting effects on habitats and ecosystems.

SEACAR evaluates water column health with several essential parameters. These include nutrient surveys of nitrogen and phosphorus, and water quality assessments of salinity, dissolved oxygen, pH, and water temperature. Water clarity is evaluated with Secchi depth, turbidity, levels of chlorophyll a, total suspended solids, and colored dissolved organic matter. Additionally, the richness of nekton is indicated by the abundance of free-swimming fishes and macroinvertebrates like crabs and shrimps.

## 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*. The points for all Water Column plots displayed in this section are monthly averages. Trend significance will be denoted as "Significant Trend" (when  $p < 0.05$ ), or "Non-significant Trend" (when  $p \geq 0.05$ ). Any parameters with insufficient data to perform Seasonal Kendall-Tau test will have their monthly averages plotted without a corresponding trend line.

## Water Quality - Discrete

The following files were used in the discrete analysis:

- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_corrected\_for\_pheophytin-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_uncorrected\_for\_pheophytin-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_Colored\_dissolved\_organic\_matter\_CDOM-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen\_Saturation-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_pH-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_Salinity-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_Secchi\_Depth-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Nitrogen-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Phosphorus-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Suspended\_Solids\_TSS-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_Turbidity-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_Water\_Temperature-2025-Mar-06.txt*

## Chlorophyll a, Corrected for Pheophytin - Discrete

### Seasonal Kendall-Tau Trend Analysis

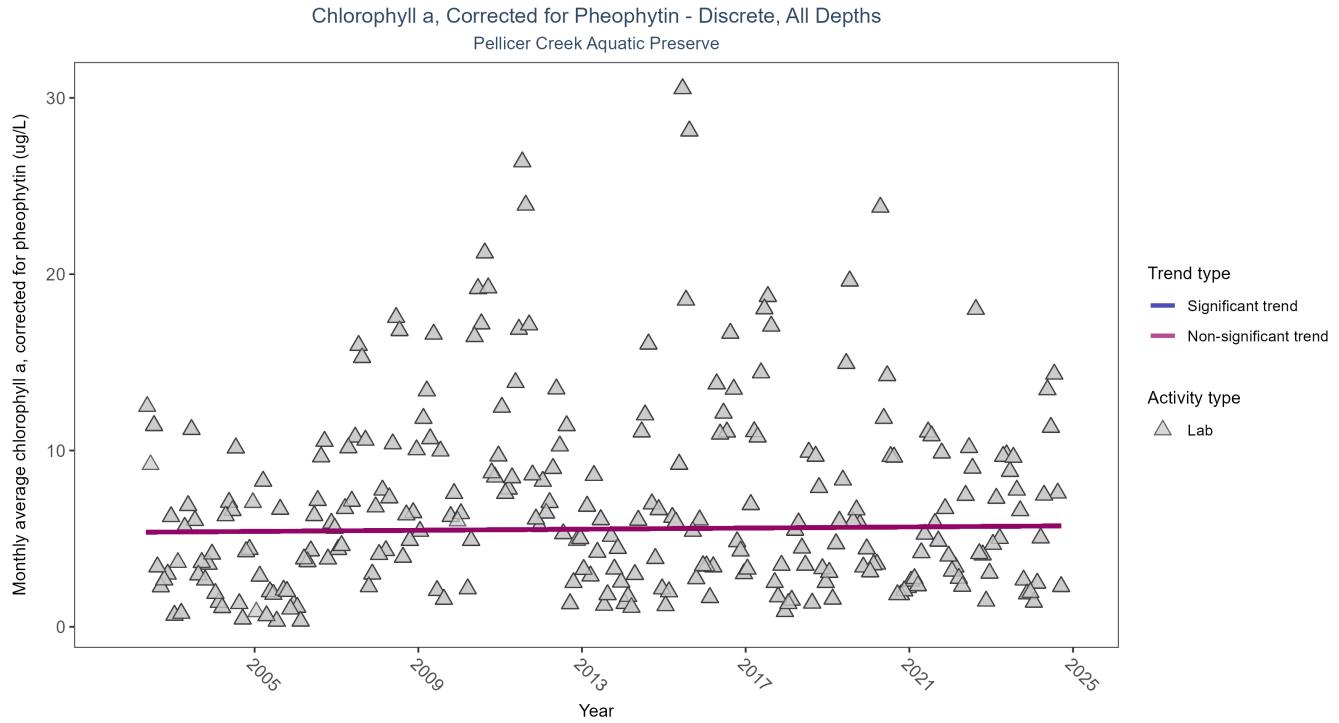


Figure 1: Scatter plot of monthly average levels of chlorophyll a, corrected for pheophytin, over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only laboratory-analyzed chlorophyll a (triangles) is included in the plot.

Table 6: Seasonal Kendall-Tau Trend Analysis for Chlorophyll a, Corrected for Pheophytin

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Lab	No significant trend	4458	23	2002 - 2024	5.1	0.0161	5.3624	0.0158	0.6892

Chlorophyll a, corrected for pheophytin, showed no detectable trend between 2002 and 2024.

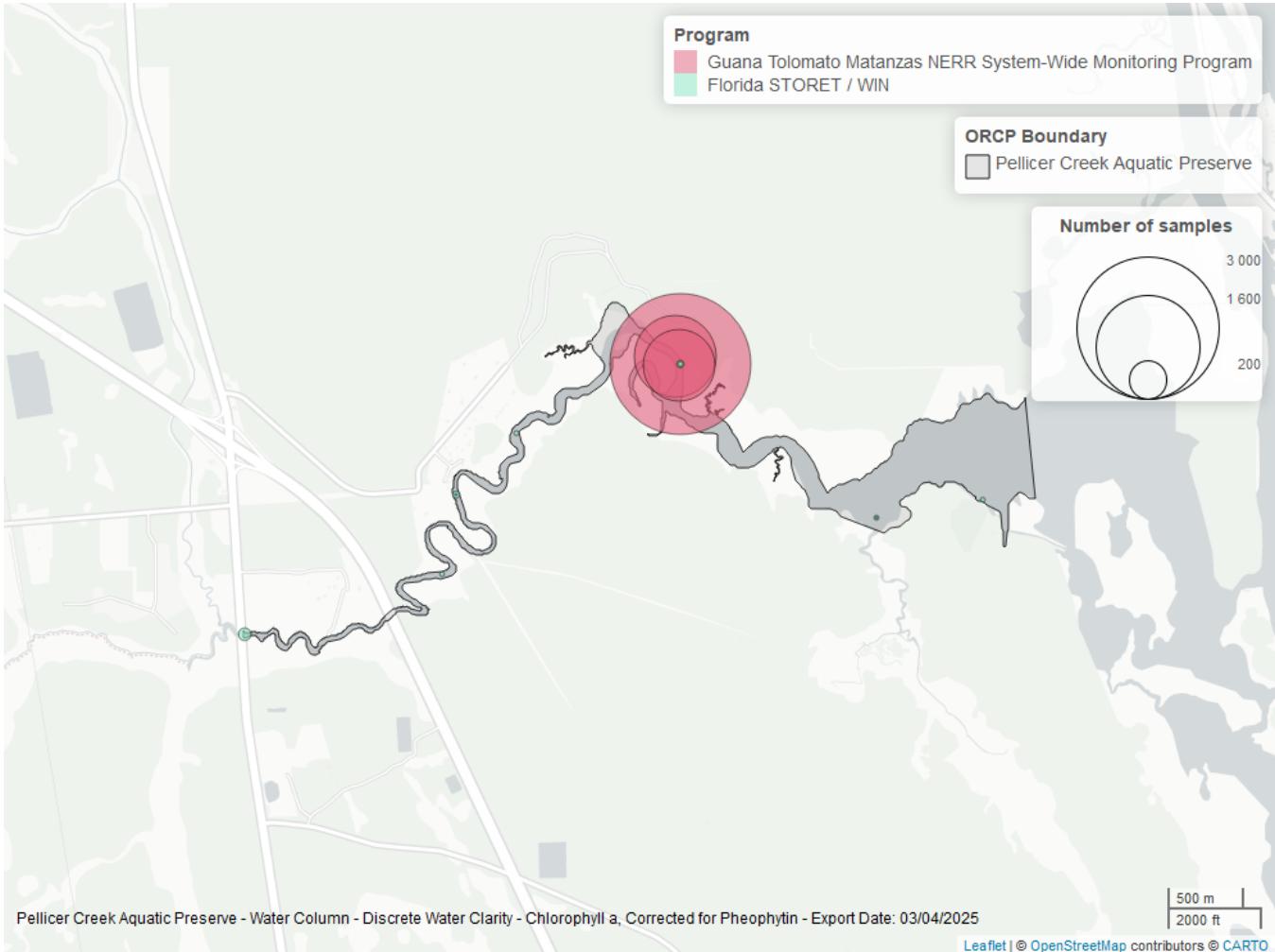


Figure 2: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 7: Programs contributing data for Chlorophyll a, Corrected for Pheophytin

ProgramID	N_Data	YearMin	YearMax
4054	4757	2002	2024
5002	77	2004	2021

#### Program names:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>  
 5002 - Florida STORET / WIN<sup>2</sup>

#### Chlorophyll a, Uncorrected for Pheophytin - Discrete Seasonal Kendall-Tau Trend Analysis

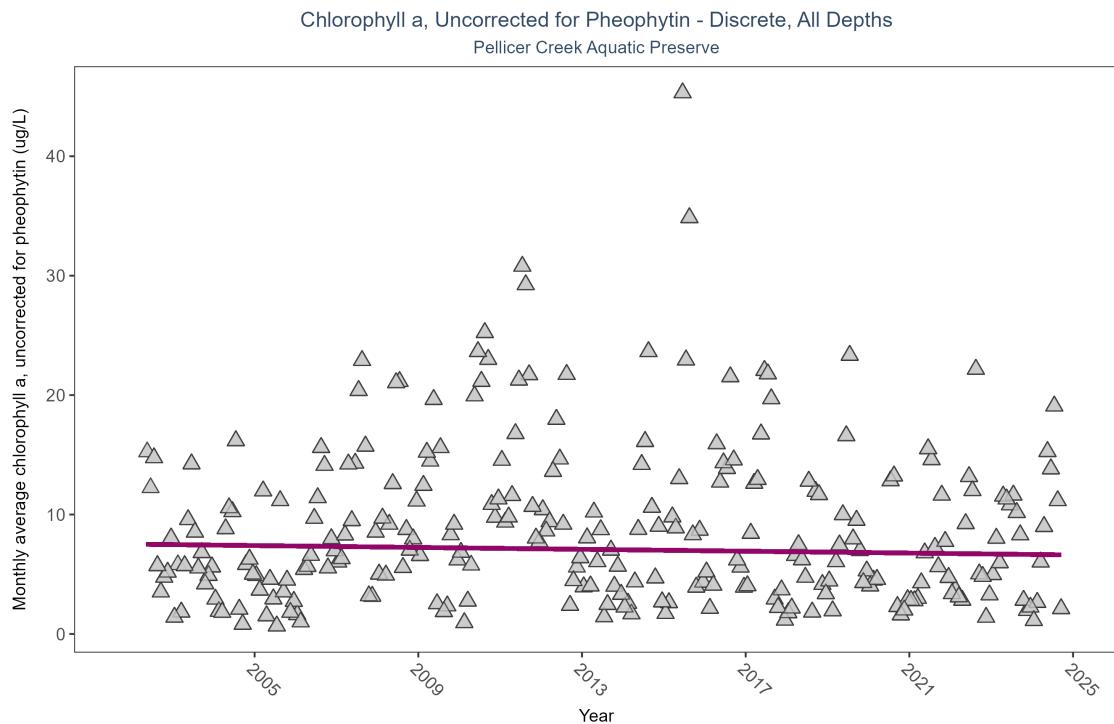


Figure 3: Scatter plot of monthly average levels of chlorophyll a, uncorrected for pheophytin, over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only laboratory-analyzed chlorophyll a (triangles) is included in the plot.

Table 8: Seasonal Kendall-Tau Trend Analysis for Chlorophyll a, Uncorrected for Pheophytin

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Lab	No significant trend	3566	23	2002 - 2024	6.8	-0.0505	7.5198	-0.0393	0.2636

Chlorophyll a, uncorrected for pheophytin, showed no detectable trend between 2002 and 2024.

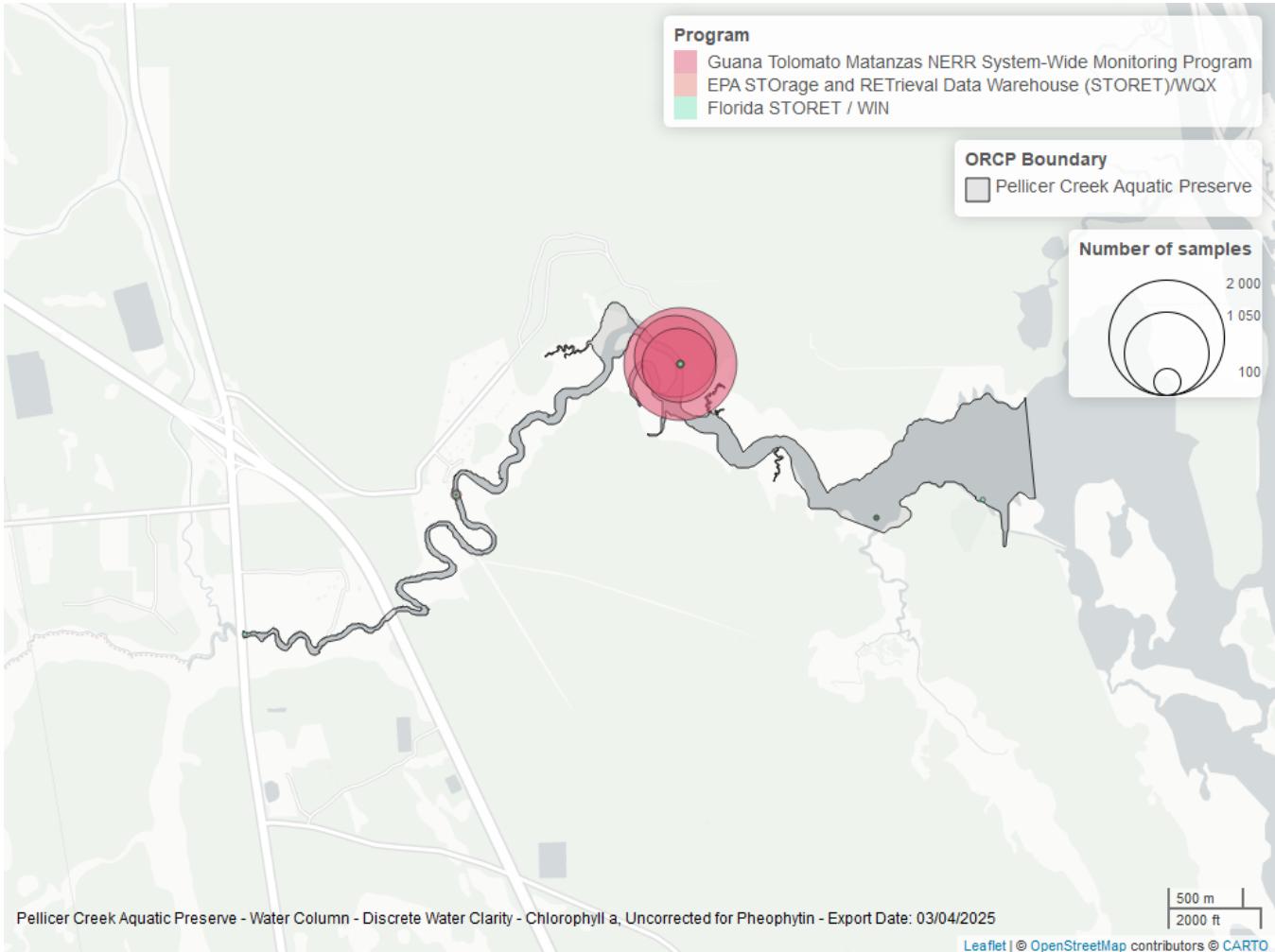


Figure 4: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 9: Programs contributing data for Chlorophyll a, Uncorrected for Pheophytin

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
4054	3810	2002	2024
5002	44	2015	2021
103	26	2020	2021

#### Program names:

103 - EPA STOrage and RETriev Data Warehouse (STORET)/WQX<sup>3</sup>

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>

5002 - Florida STORET / WIN<sup>2</sup>

#### Colored Dissolved Organic Matter - Discrete

#### Seasonal Kendall-Tau Trend Analysis

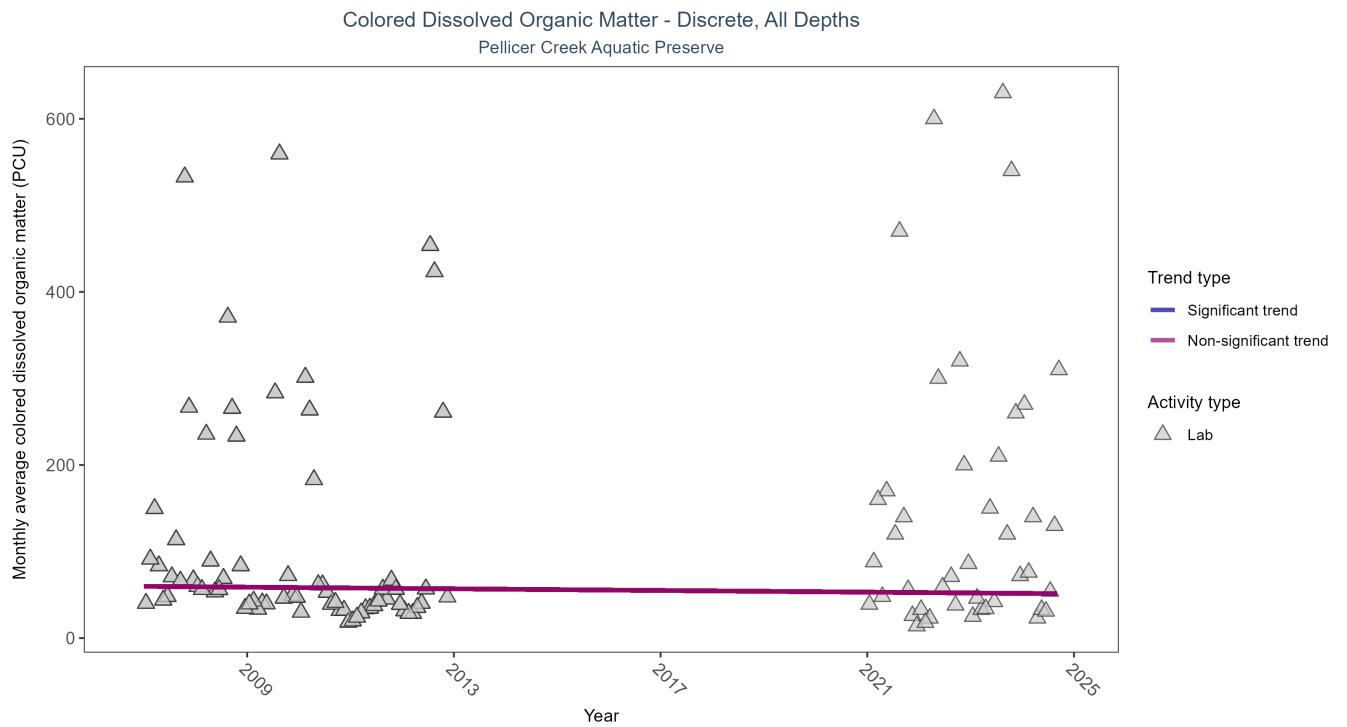


Figure 5: Scatter plot of monthly average colored dissolved organic matter (CDOM) over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only laboratory-analyzed CDOM (triangles) is included in the plot.

Table 10: Seasonal Kendall-Tau Trend Analysis for Colored Dissolved Organic Matter

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Lab	No significant trend	951	10	2007 - 2024	54.6	-0.0696	59.8018	-0.4785	0.3472

Colored dissolved organic matter showed no detectable trend between 2007 and 2024.

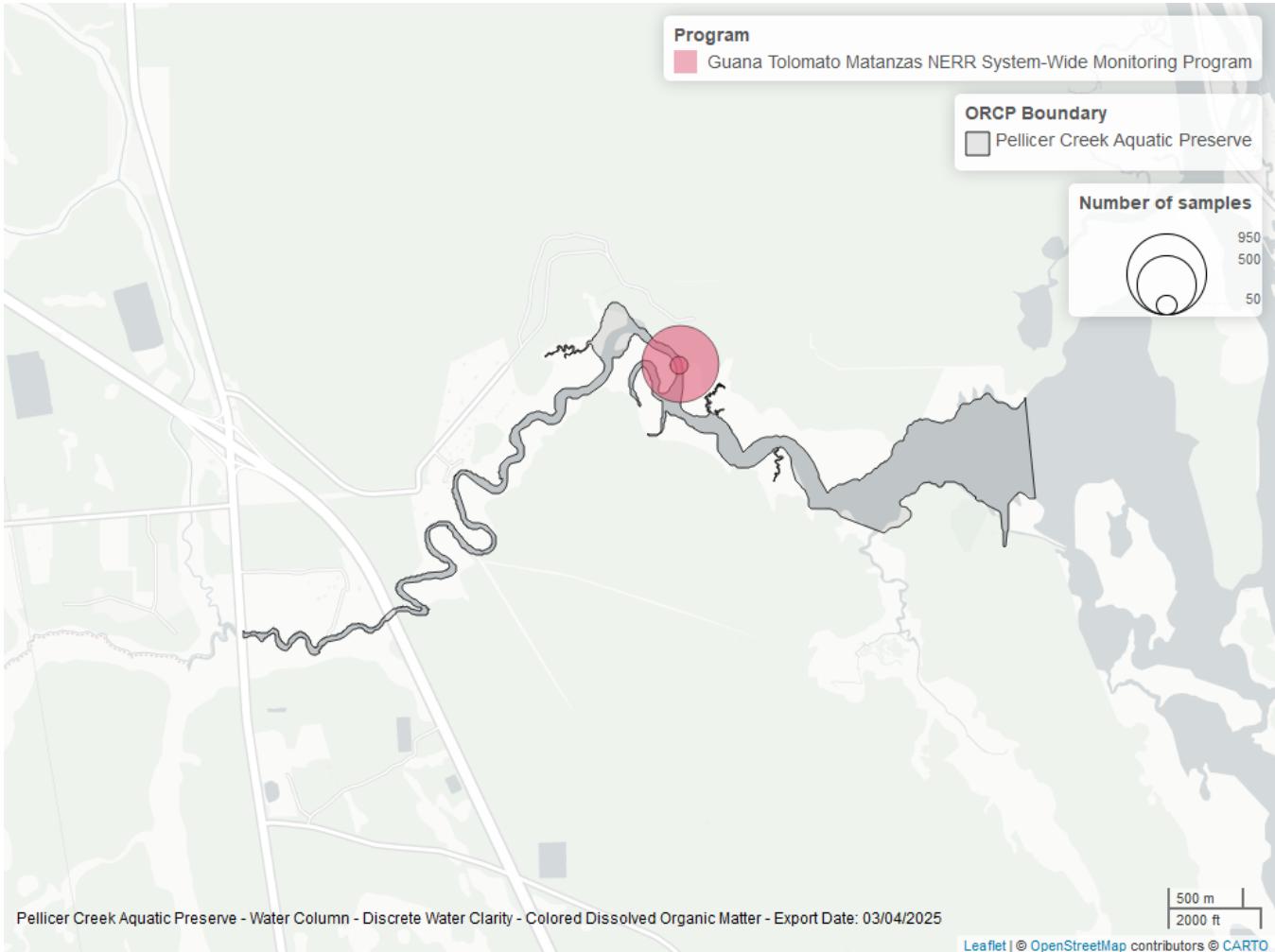


Figure 6: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 11: Programs contributing data for Colored Dissolved Organic Matter

ProgramID	N_Data	YearMin	YearMax
4054	952	2007	2024

#### Program names:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>

#### Dissolved Oxygen - Discrete

#### Seasonal Kendall-Tau Trend Analysis

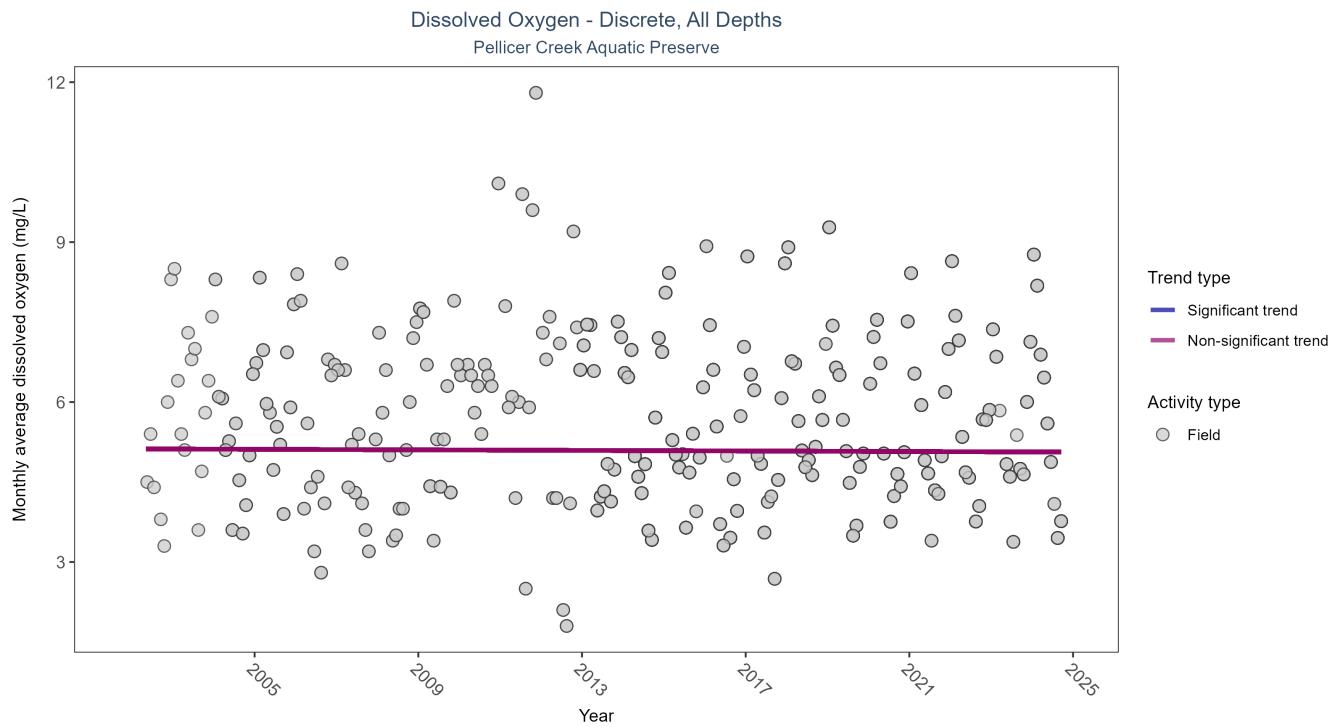


Figure 7: Scatter plot of monthly average dissolved oxygen over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only dissolved oxygen values measured in the field (circles) are included in the plot.

Table 12: Seasonal Kendall-Tau Trend Analysis for Dissolved Oxygen

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Field	No significant trend	2154	23	2002 - 2024	5.6	-0.0098	5.1216	-0.0026	0.8234

Dissolved oxygen showed no detectable trend between 2002 and 2024.

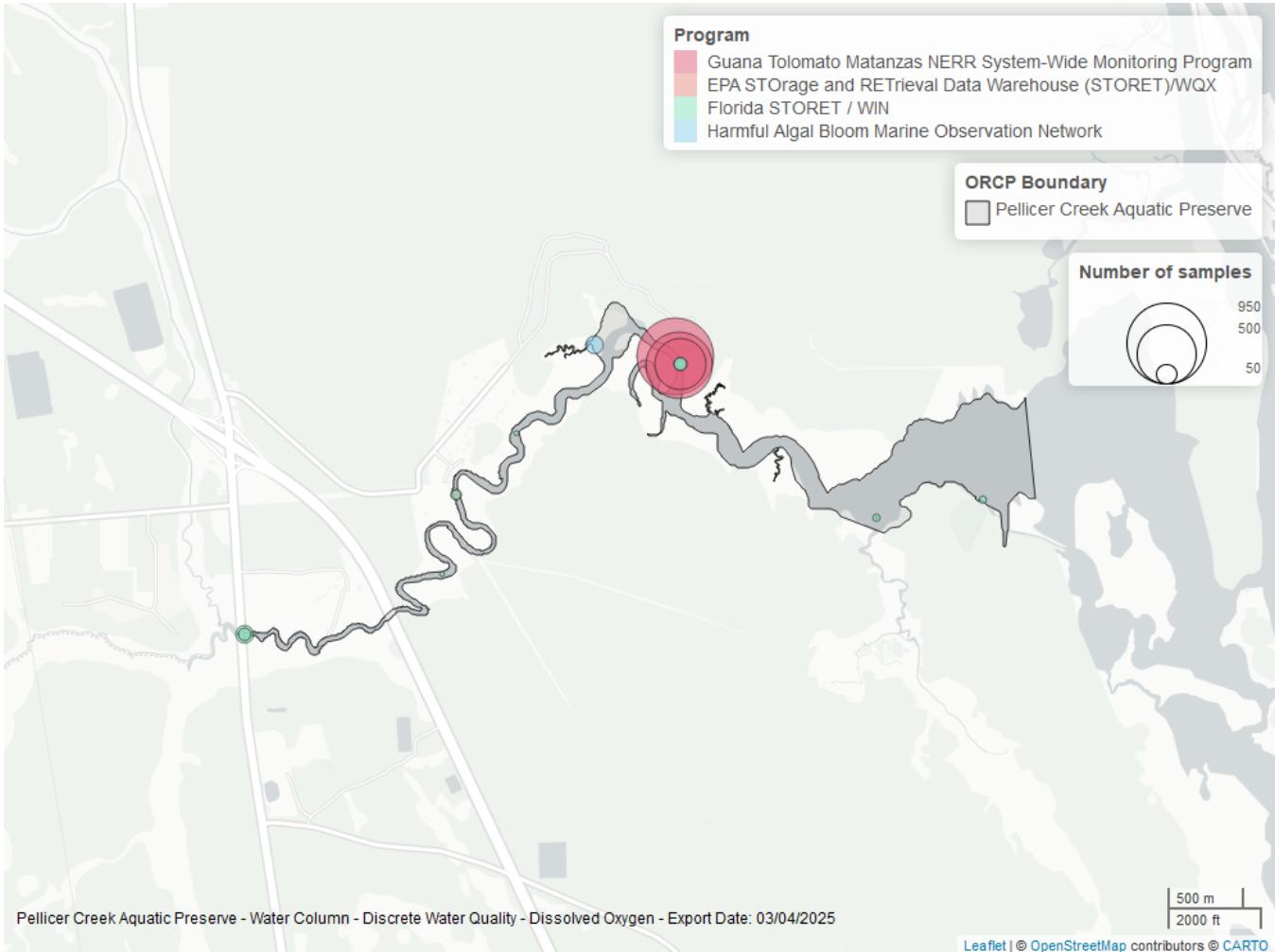


Figure 8: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 13: Programs contributing data for Dissolved Oxygen

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
4054	1964	2002	2024
5002	164	2004	2022
95	51	2014	2018
103	48	2020	2021

#### Program names:

95 - Harmful Algal Bloom Marine Observation Network<sup>4</sup>

103 - EPA STOrage and RETrieval Data Warehouse (STORET)/WQX<sup>3</sup>

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>

5002 - Florida STORET / WIN<sup>2</sup>

#### Dissolved Oxygen Saturation - Discrete

#### Seasonal Kendall-Tau Trend Analysis

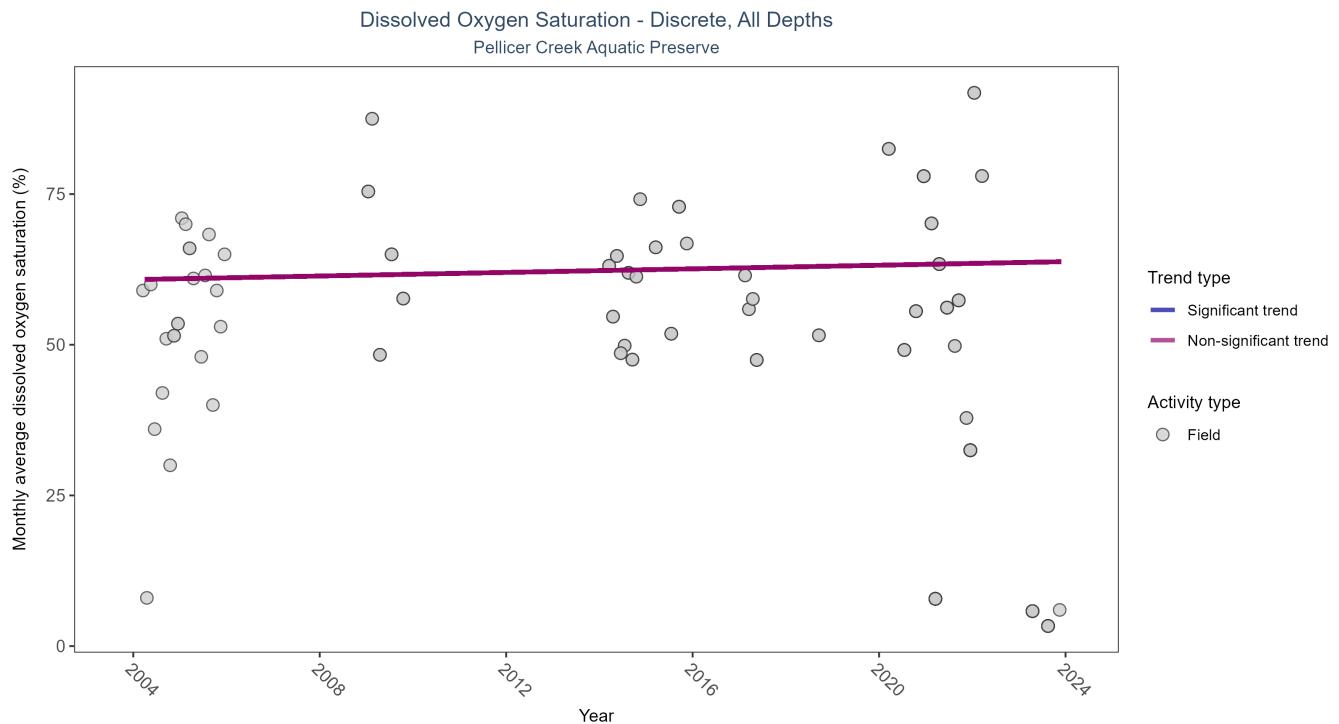


Figure 9: Scatter plot of monthly average dissolved oxygen saturation over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only dissolved oxygen saturation values measured in the field (circles) are included in the plot.

Table 14: Seasonal Kendall-Tau Trend Analysis for Dissolved Oxygen Saturation

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Field	No significant trend	201	11	2004 - 2023	55.5	0.0824	60.807	0.1492	0.6126

Dissolved oxygen saturation showed no detectable trend between 2004 and 2023.

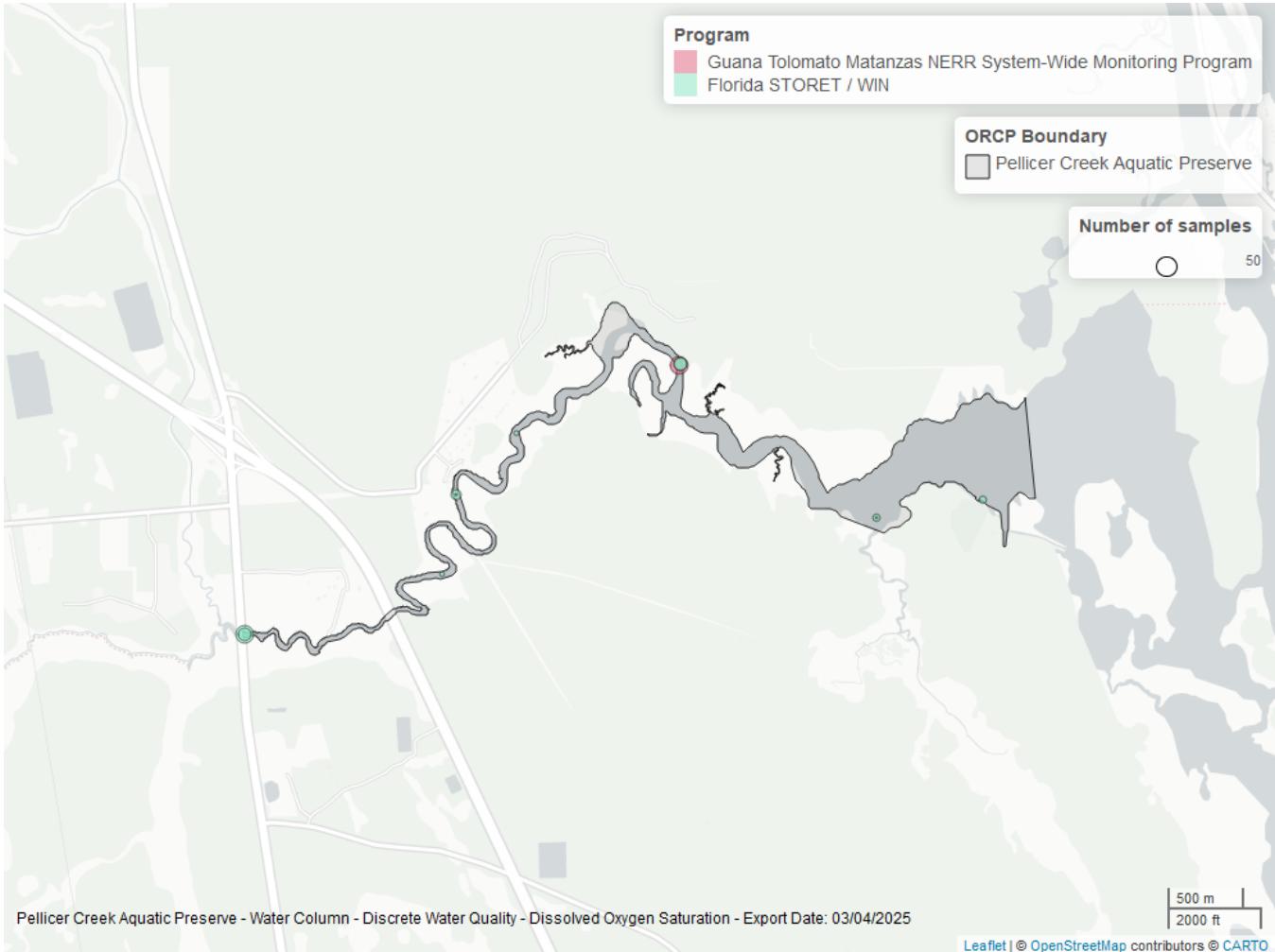


Figure 10: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 15: Programs contributing data for Dissolved Oxygen Saturation

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
5002	166	2004	2022
4054	45	2021	2023

#### Program names:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>  
 5002 - Florida STORET / WIN<sup>2</sup>

#### pH - Discrete

#### Seasonal Kendall-Tau Trend Analysis

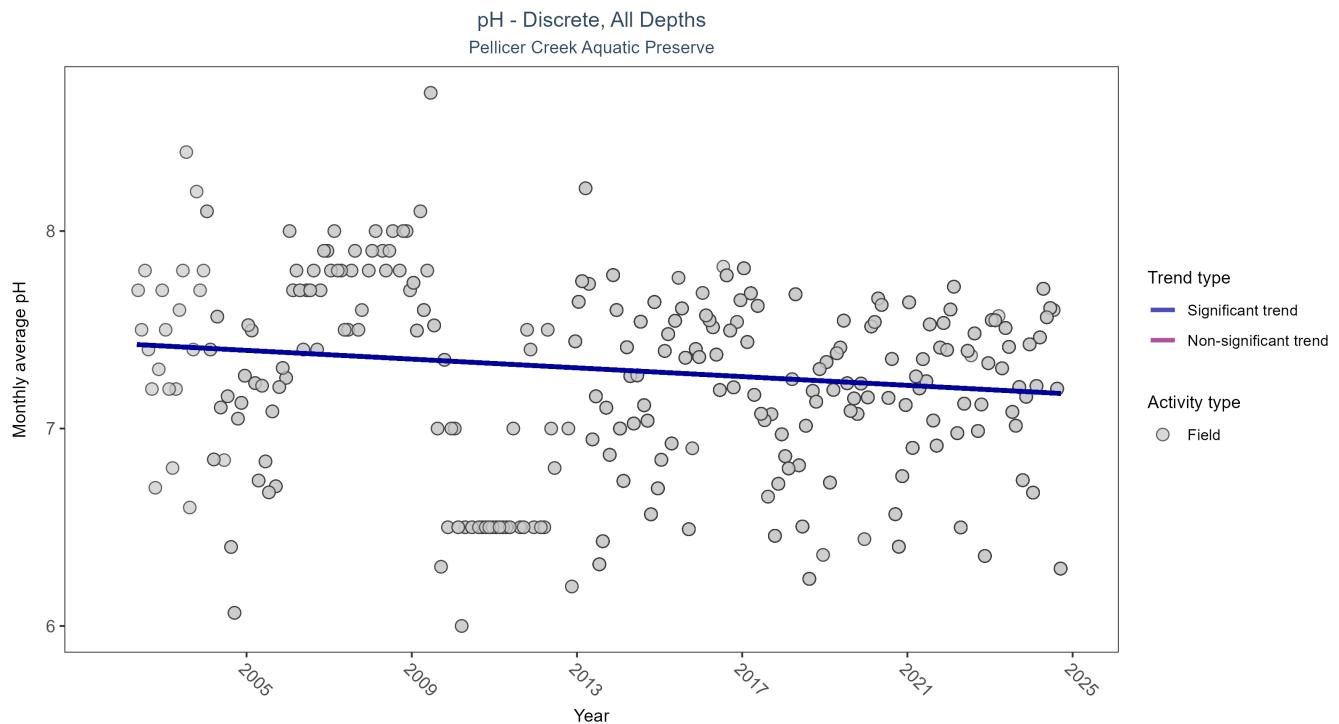


Figure 11: Scatter plot of monthly average pH over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only pH values measured in the field (circles) are included in the plot.

Table 16: Seasonal Kendall-Tau Trend Analysis for pH

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Field	Significantly decreasing trend	2229	23	2002 - 2024	7.26	-0.1028	7.429	-0.0111	0.0231

Monthly average pH decreased by 0.01 pH units per year.

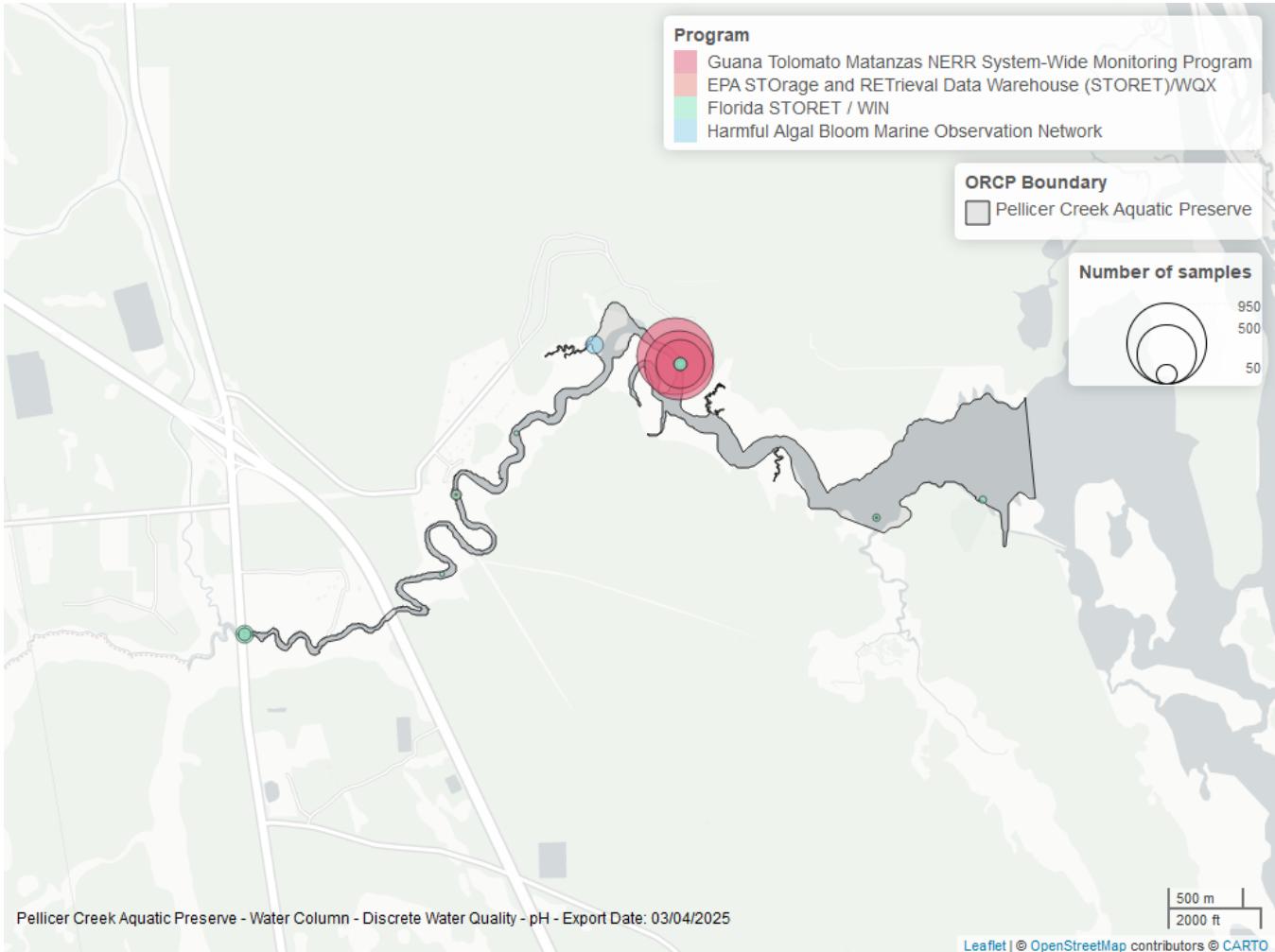


Figure 12: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 17: Programs contributing data for pH

ProgramID	N_Data	YearMin	YearMax
4054	2006	2002	2024
5002	168	2004	2022
95	51	2014	2018
103	48	2020	2021

#### Program names:

95 - Harmful Algal Bloom Marine Observation Network<sup>4</sup>

103 - EPA STOrage and RETrieval Data Warehouse (STORET)/WQX<sup>3</sup>

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>

5002 - Florida STORET / WIN<sup>2</sup>

#### Salinity - Discrete

#### Seasonal Kendall-Tau Trend Analysis

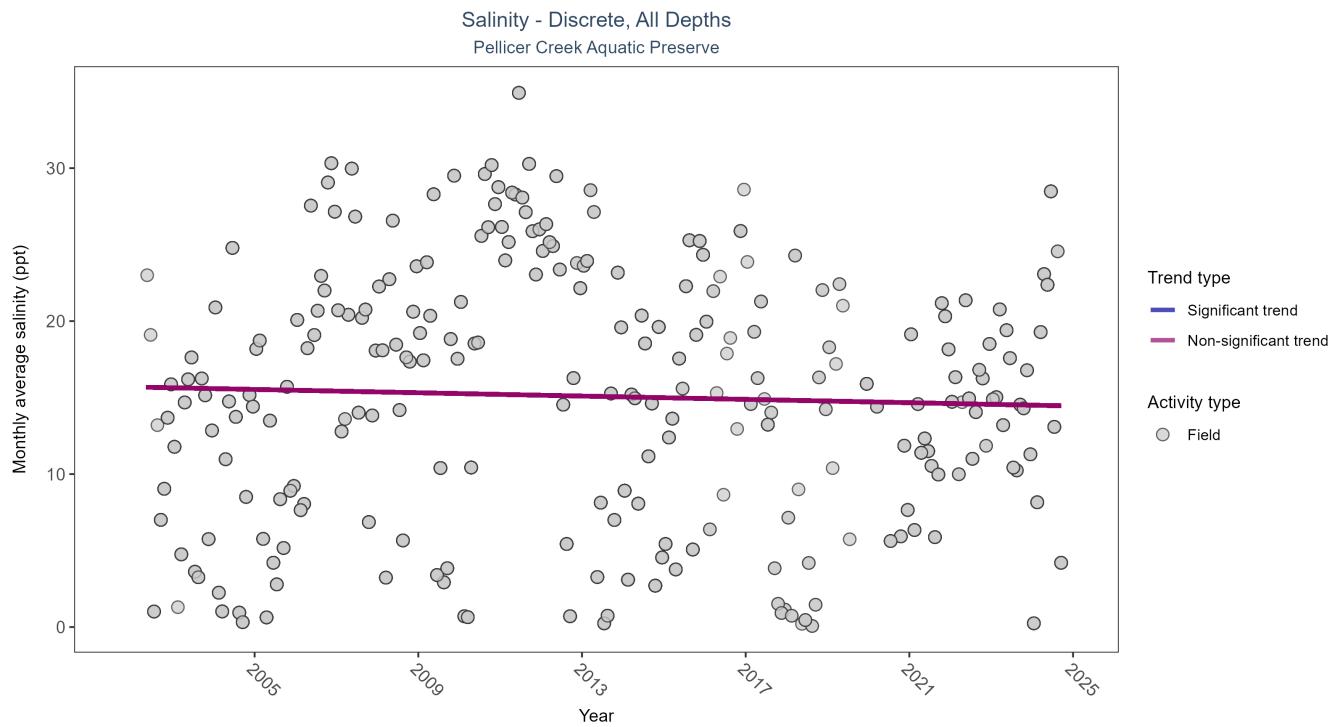


Figure 13: Scatter plot of monthly average salinity over time. If the time series included ten or more years of discrete observations, significant (blue) or non-significant (magenta) trend lines are also shown. Discrete salinity values derived from grab samples analyzed in the field (circles) or the laboratory (triangles) are both included in the plot.

Table 18: Seasonal Kendall-Tau Trend Analysis for Salinity

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
All	No significant trend	2909	23	2002 - 2024	16.2	-0.0259	15.6961	-0.0542	0.5922

Salinity showed no detectable trend between 2002 and 2024.

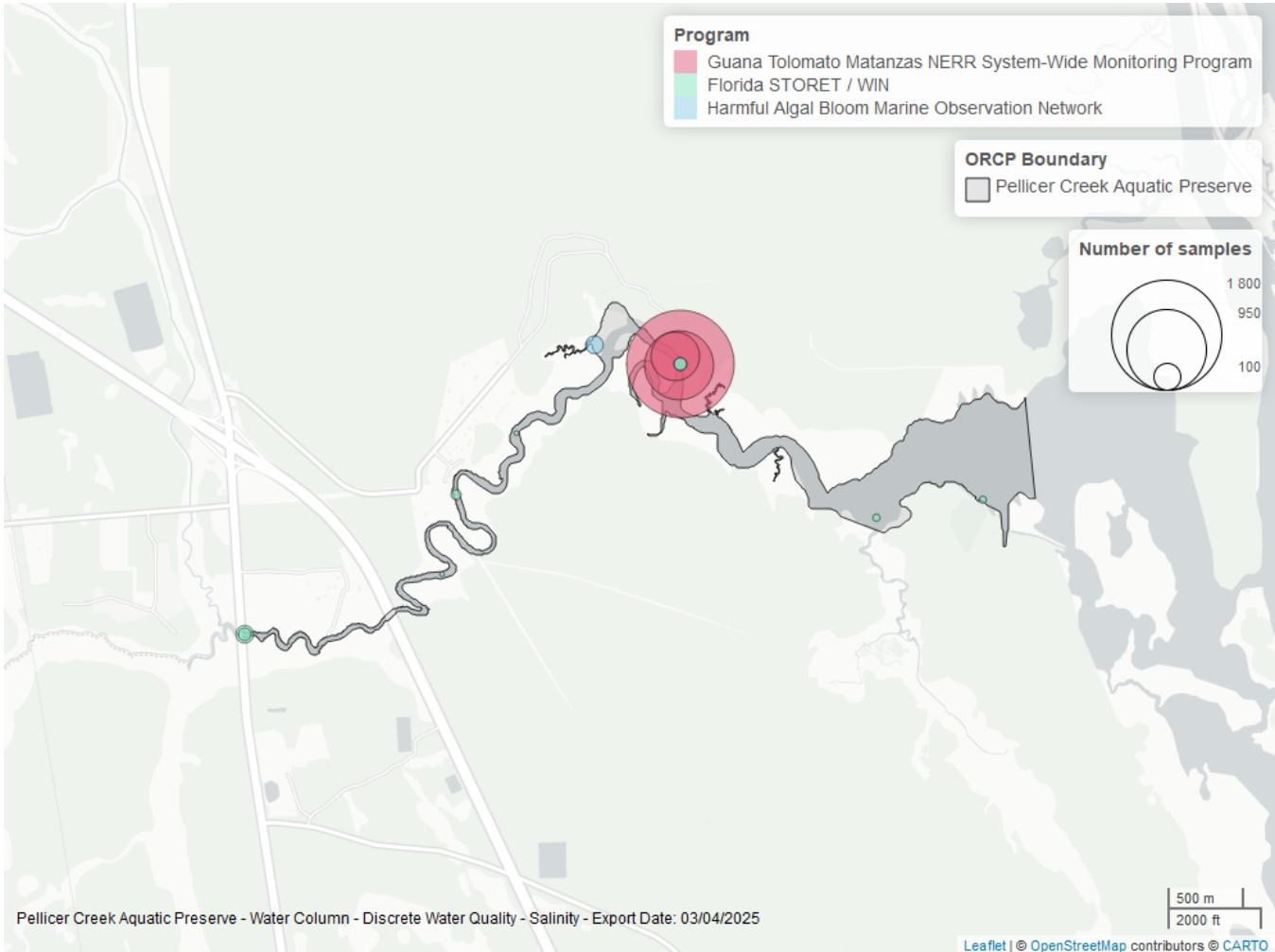


Figure 14: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 19: Programs contributing data for Salinity

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
4054	2885	2002	2024
5002	159	2004	2022
95	52	2014	2018

#### Program names:

95 - Harmful Algal Bloom Marine Observation Network<sup>4</sup>

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>

5002 - Florida STORET / WIN<sup>2</sup>

#### Secchi Depth - Discrete

#### Seasonal Kendall-Tau Trend Analysis

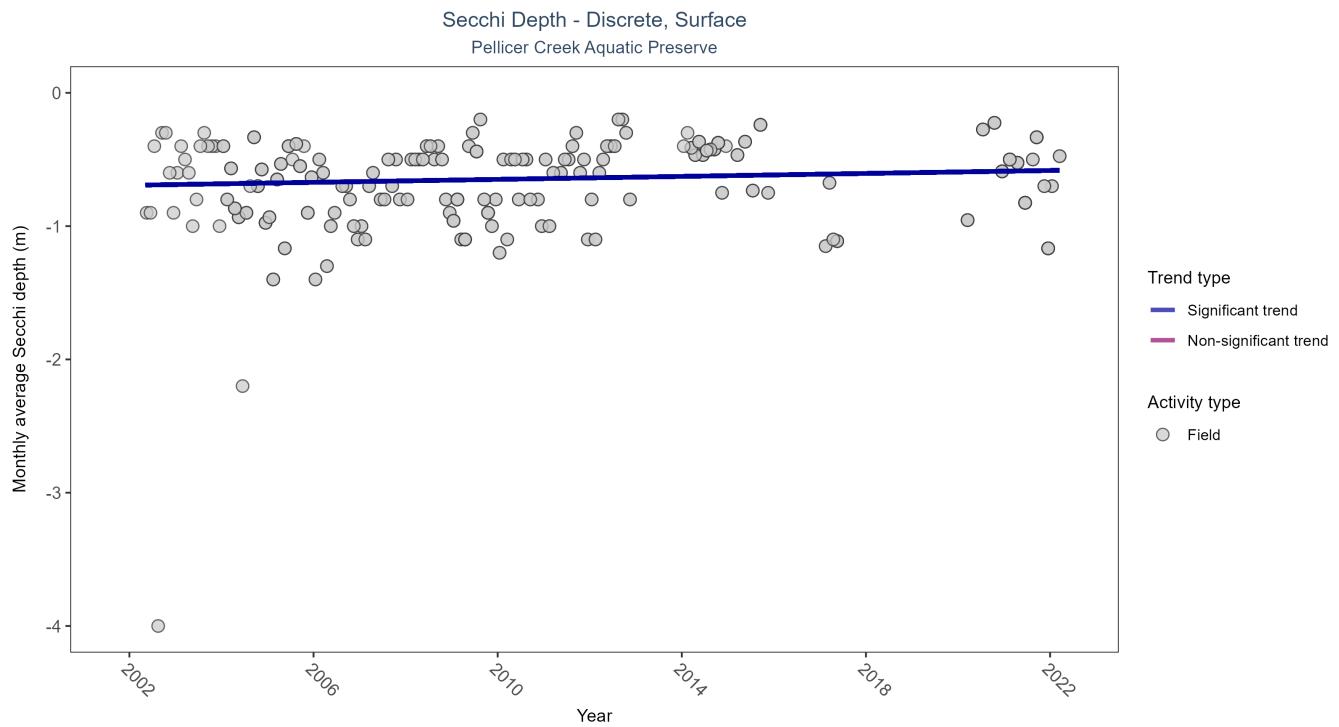


Figure 15: Scatter plot of monthly average Secchi depth over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Secchi depth is only measured in the field (circles).

Table 20: Seasonal Kendall-Tau Trend Analysis for Secchi Depth

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Field	Significantly increasing trend	384	17	2002 - 2022	-0.6	0.1251	-0.6937	0.0056	0.0435

Monthly average Secchi depth became shallower by 0.01 m per year, indicating a decrease in water clarity.

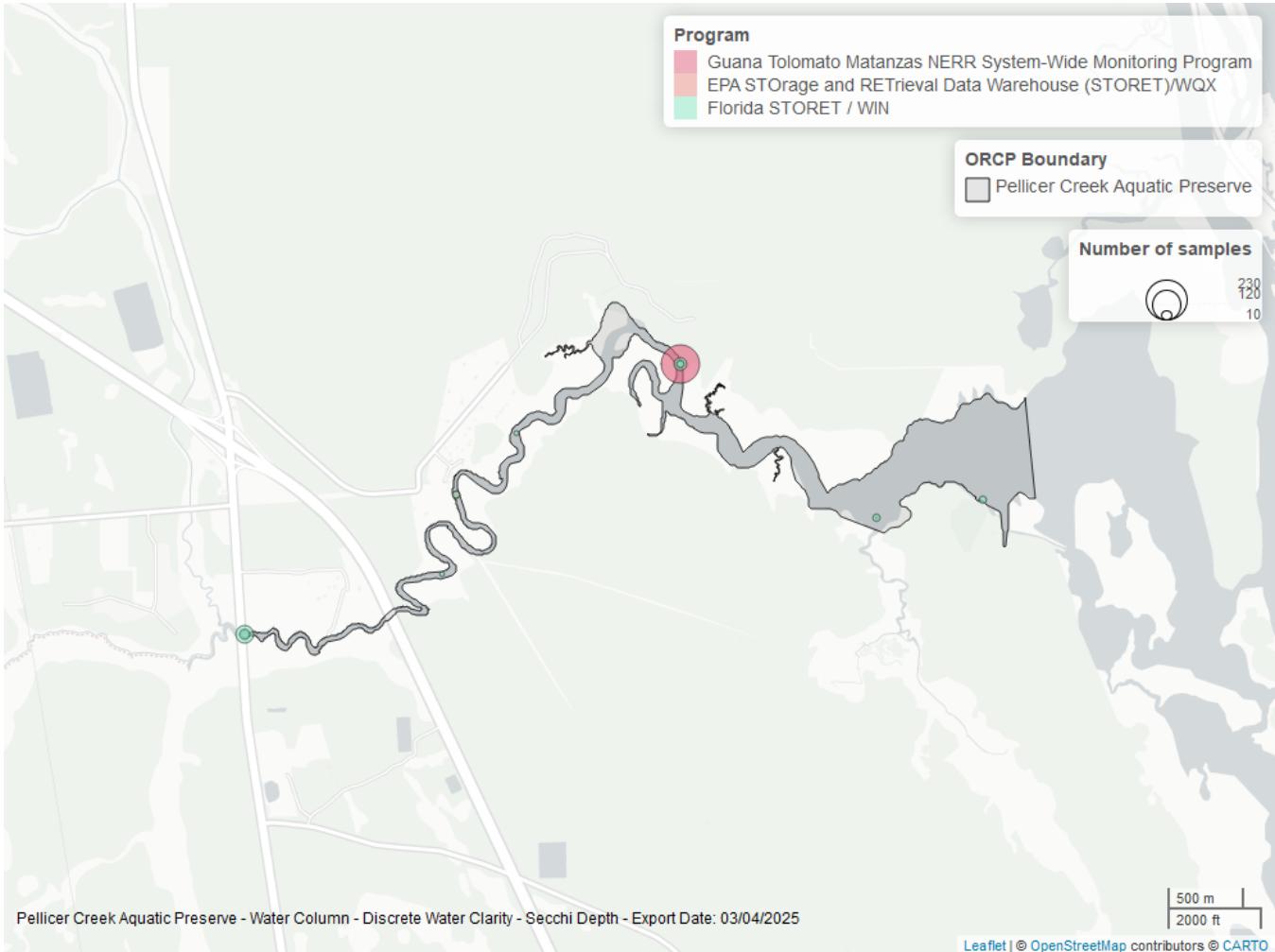


Figure 16: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 21: Programs contributing data for Secchi Depth

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
4054	225	2002	2014
5002	134	2004	2022
103	25	2020	2021

#### Program names:

103 - EPA STOrage and RETriev Data Warehouse (STORET)/WQX<sup>3</sup>

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>

5002 - Florida STORET / WIN<sup>2</sup>

#### Total Nitrogen - Discrete

##### 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:
  - Florida Department of Environmental Protection (FDEP) report that if both “Total” and “Dissolved” components are reported, only “Total” is used. If the total is not reported, then the dissolved components are used as a best available replacement.
  - Total nitrogen calculations are done using nitrogen components with the same sample fraction, nitrogen components with mixed total/dissolved sample fractions are not used. In other words, total nitrogen can be calculated when TKN and NO<sub>3</sub>O<sub>2</sub> are both total sample fractions, or when both are dissolved sample fractions. *Future calculations of total nitrogen values may be 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

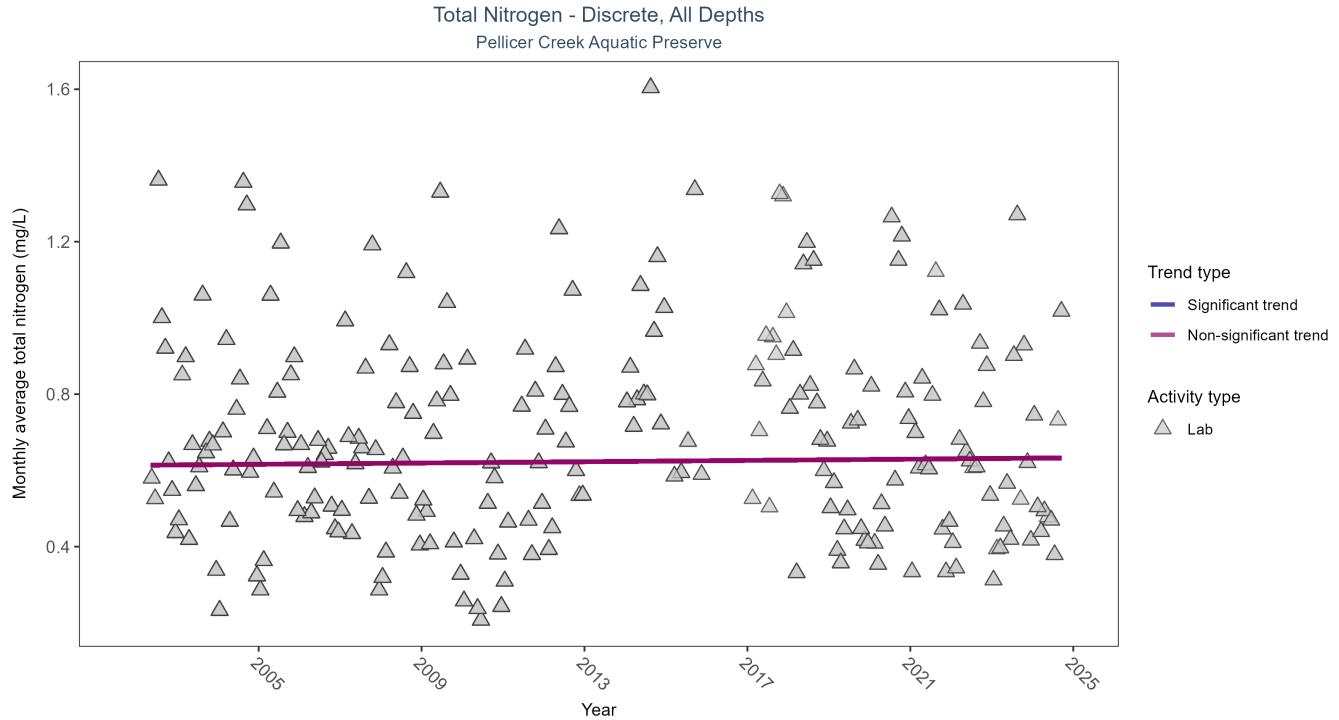


Figure 17: Scatter plot of monthly average total nitrogen over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only nitrogen values obtained from laboratory analyses (triangles) are included in the plot.

Table 22: Seasonal Kendall-Tau Trend Analysis for Total Nitrogen

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Lab	No significant trend	1954	21	2002 - 2024	0.6394	0.018	0.6134	0.0008	0.7131

Total nitrogen showed no detectable trend between 2002 and 2024.

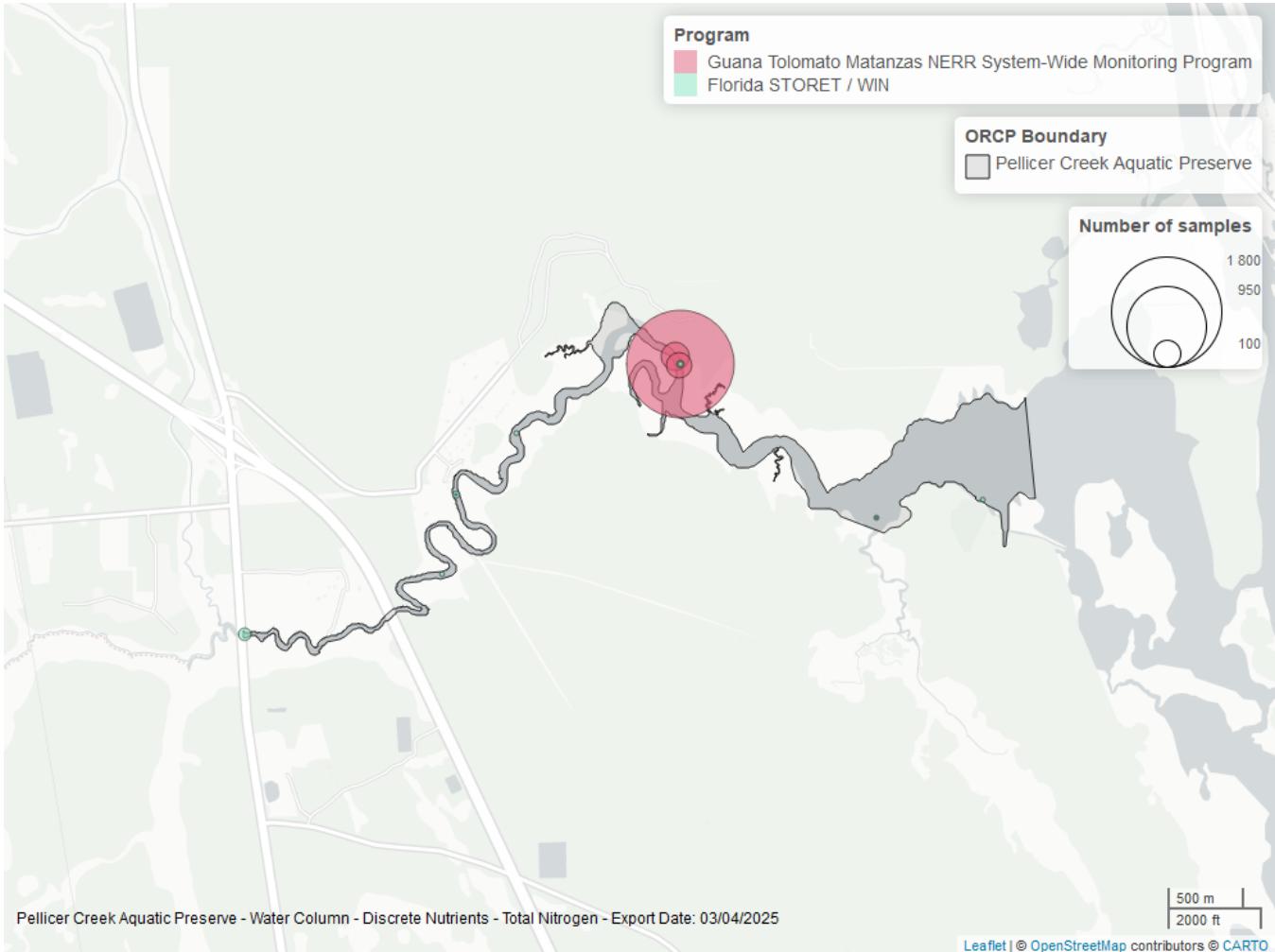


Figure 18: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 23: Programs contributing data for Total Nitrogen

ProgramID	N_Data	YearMin	YearMax
4054	1984	2002	2024
5002	73	2004	2021

#### Program names:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>  
 5002 - Florida STORET / WIN<sup>2</sup>

#### Total Phosphorus - Discrete

#### Seasonal Kendall-Tau Trend Analysis

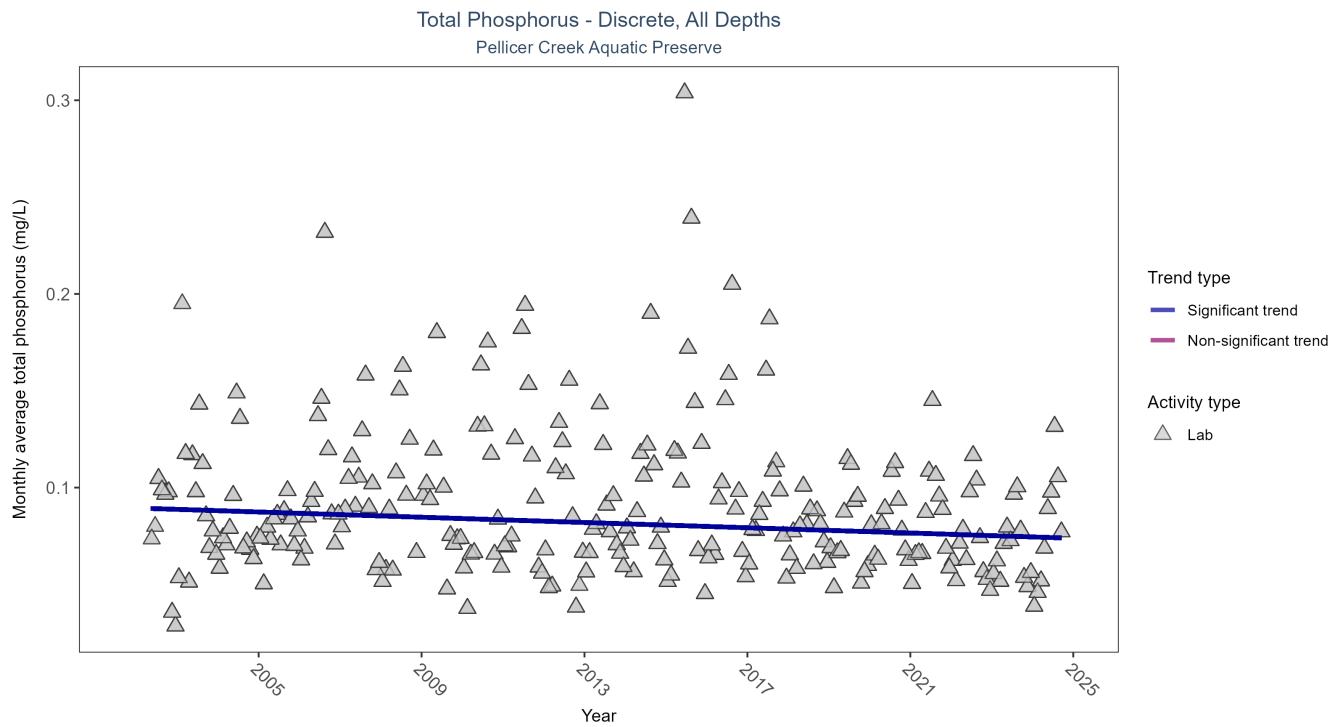


Figure 19: Scatter plot of monthly average total phosphorus over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only phosphorus values obtained from laboratory analyses (triangles) are included in the plot.

Table 24: Seasonal Kendall-Tau Trend Analysis for Total Phosphorus

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Lab	Significantly decreasing trend	3583	23	2002 - 2024	0.081	-0.1679	0.0894	-0.0007	0.0002

Monthly average total phosphorus decreased by less than 0.01 mg/L per year.

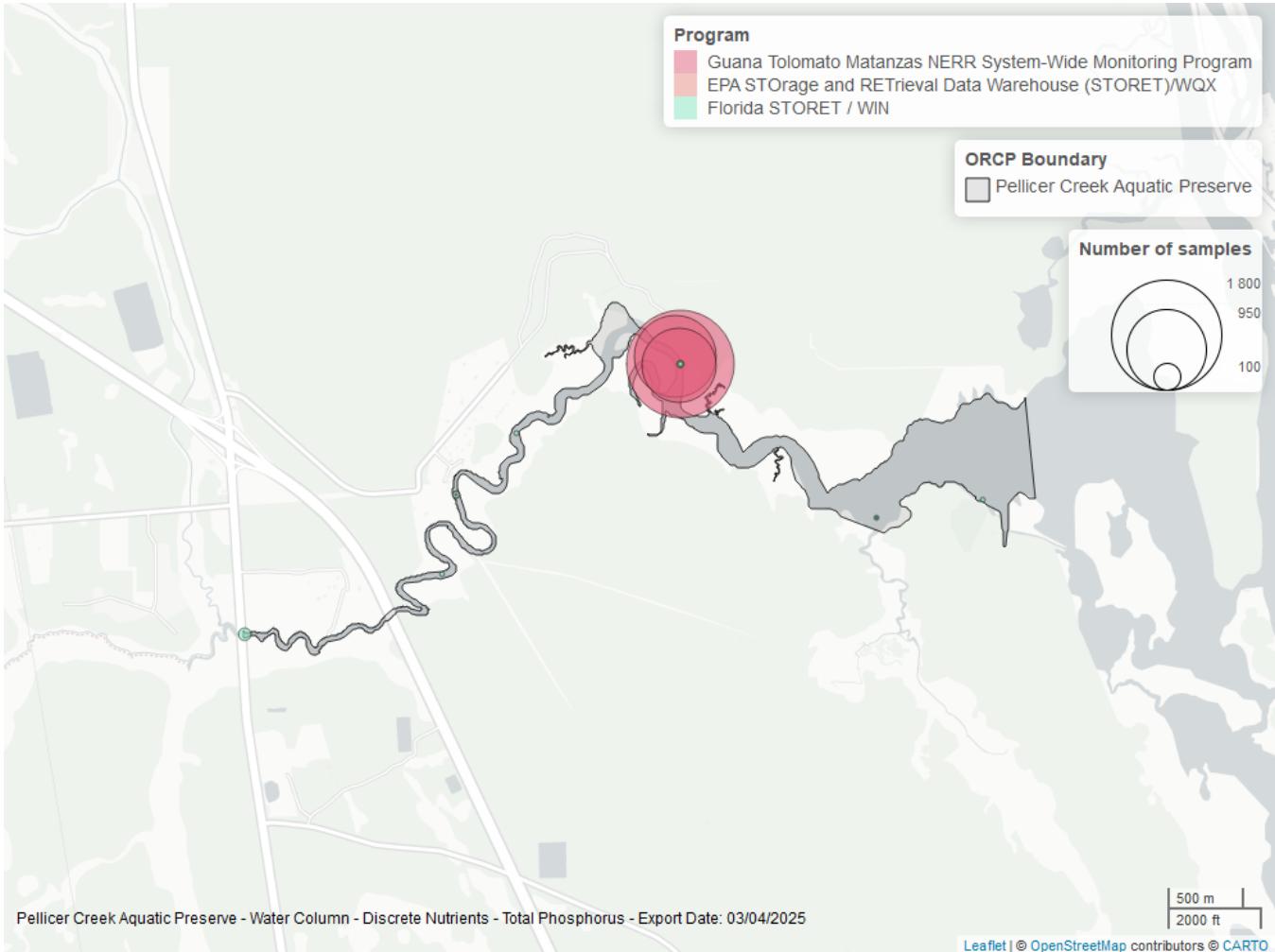


Figure 20: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 25: Programs contributing data for Total Phosphorus

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
4054	3638	2002	2024
5002	76	2004	2021
103	14	2020	2021

#### Program names:

103 - EPA STOrage and RETriev Data Warehouse (STORET)/WQX<sup>3</sup>

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>

5002 - Florida STORET / WIN<sup>2</sup>

#### Total Suspended Solids - Discrete

#### Seasonal Kendall-Tau Trend Analysis

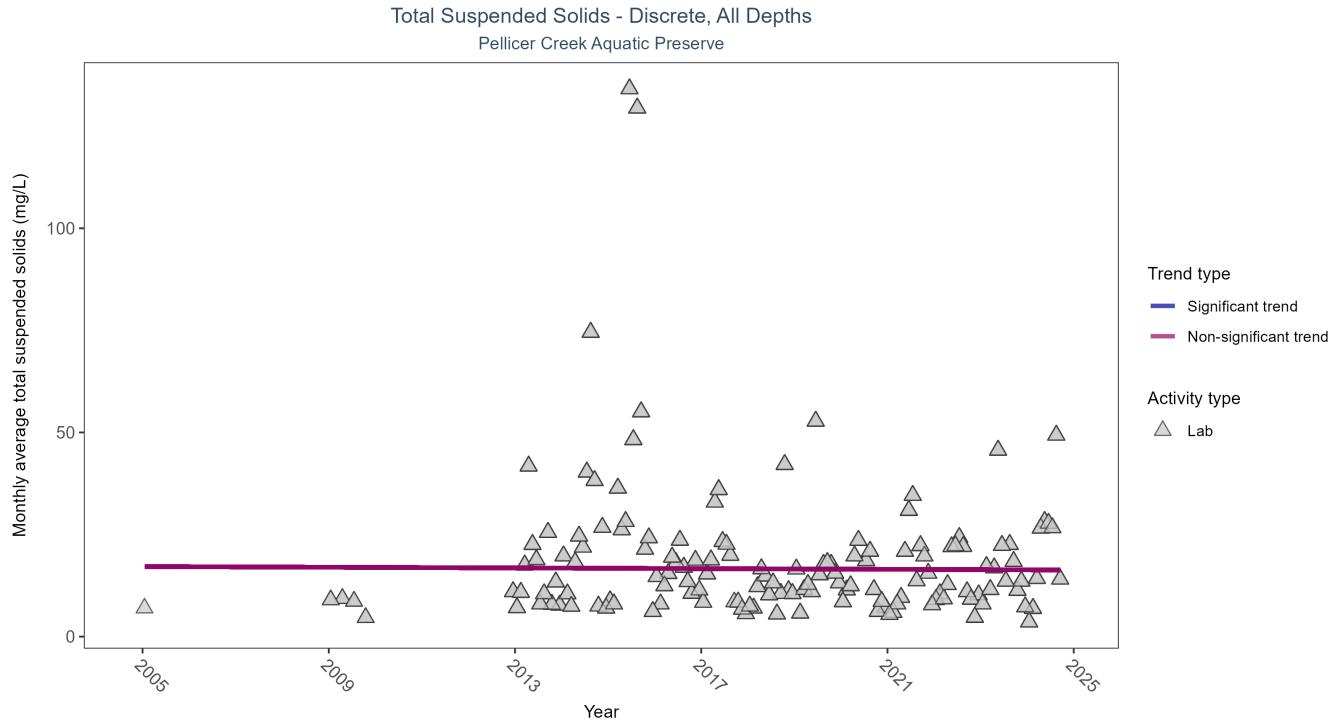


Figure 21: Scatter plot of monthly average total suspended solids (TSS) over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only TSS values obtained from laboratory analyses (triangles) are included in the plot.

Table 26: Seasonal Kendall-Tau Trend Analysis for Total Suspended Solids

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Lab	No significant trend	1774	15	2005 - 2024	14	-0.0177	17.1561	-0.042	0.7871

Total suspended solids showed no detectable trend between 2005 and 2024.

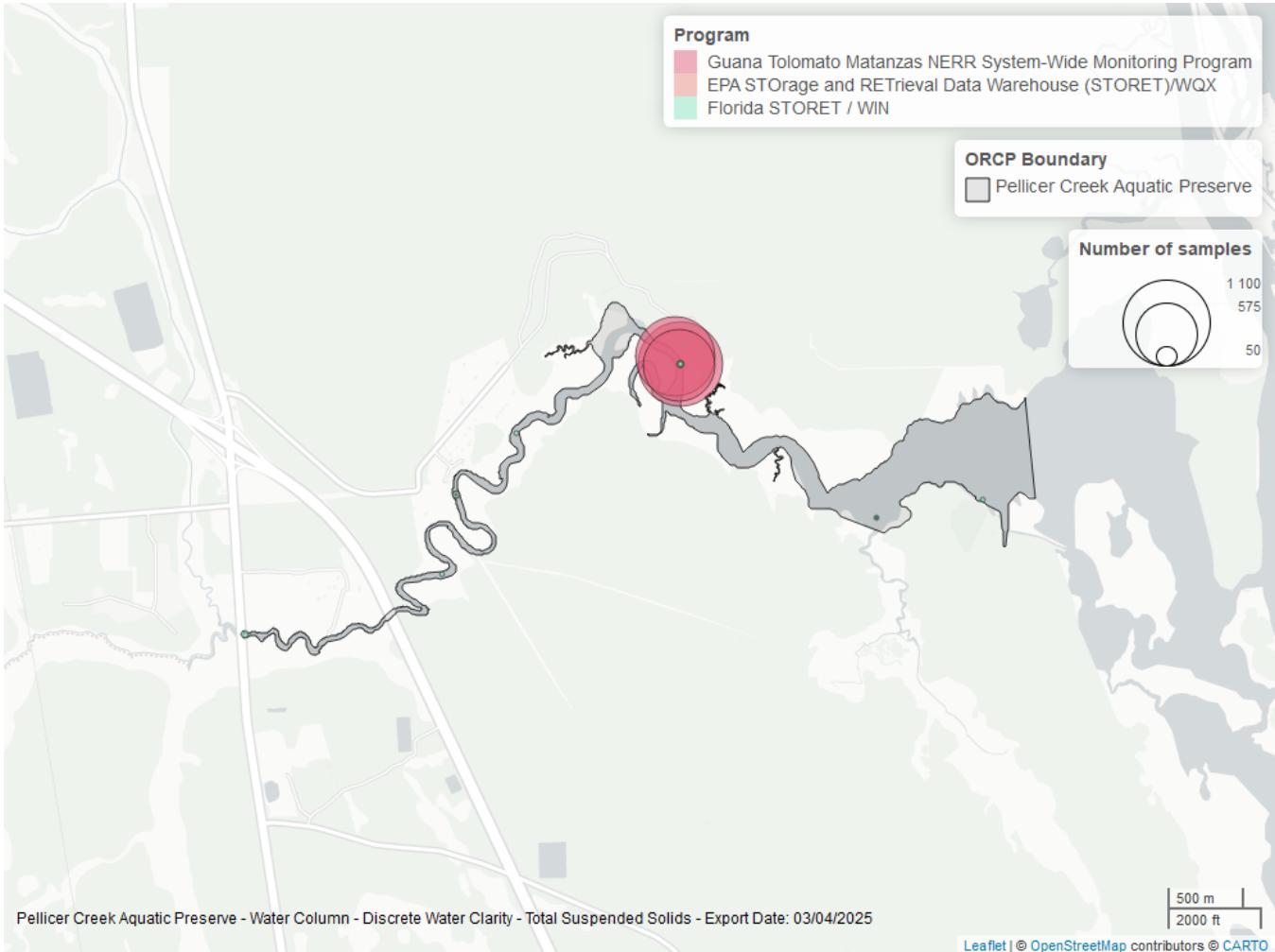


Figure 22: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 27: Programs contributing data for Total Suspended Solids

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
4054	2898	2002	2024
5002	57	2005	2021
103	14	2020	2021

#### Program names:

103 - EPA STOrage and RETriev Data Warehouse (STORET)/WQX<sup>3</sup>

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>

5002 - Florida STORET / WIN<sup>2</sup>

#### Turbidity - Discrete

#### Seasonal Kendall-Tau Trend Analysis

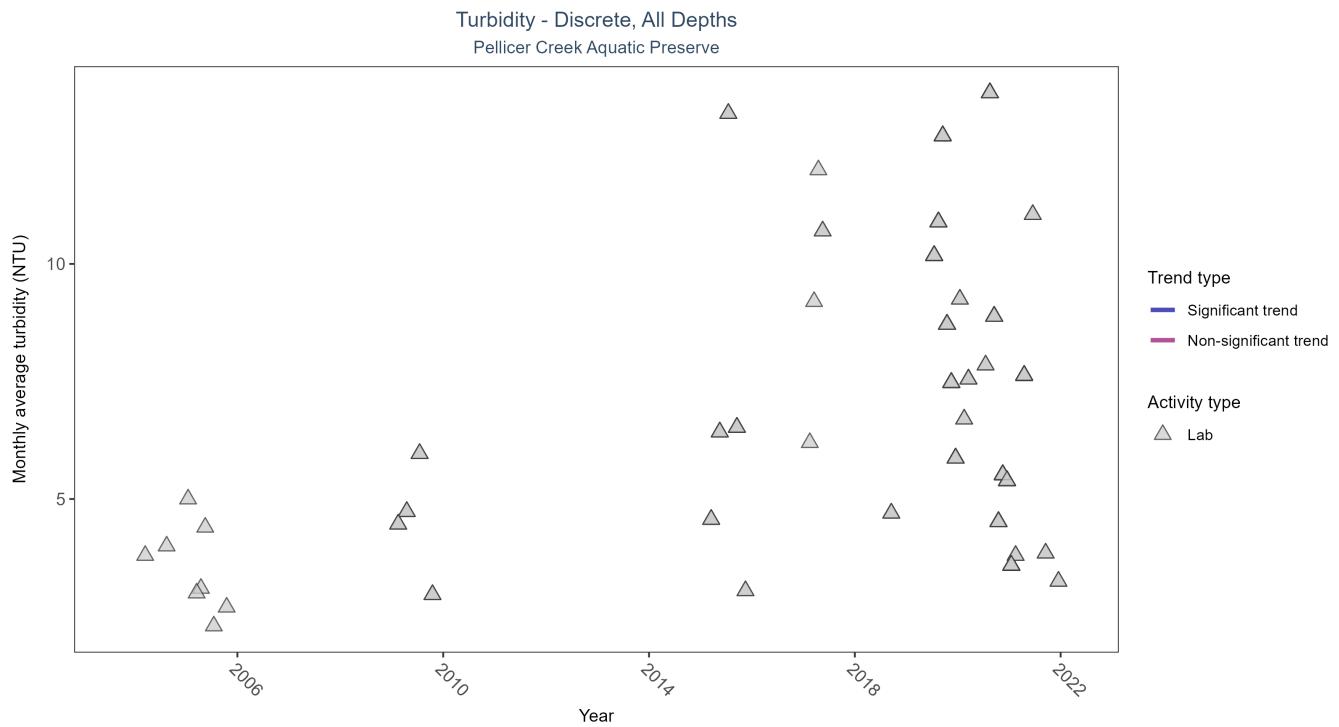


Figure 23: Scatter plot of monthly average turbidity over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only turbidity values measured in the laboratory (triangles) are included in the plot.

Table 28: Seasonal Kendall-Tau Trend Analysis for Turbidity

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Lab	Insufficient data to calculate trend	237	9	2004 - 2021	7	-	-	-	-

There was insufficient data to fit a model for turbidity.

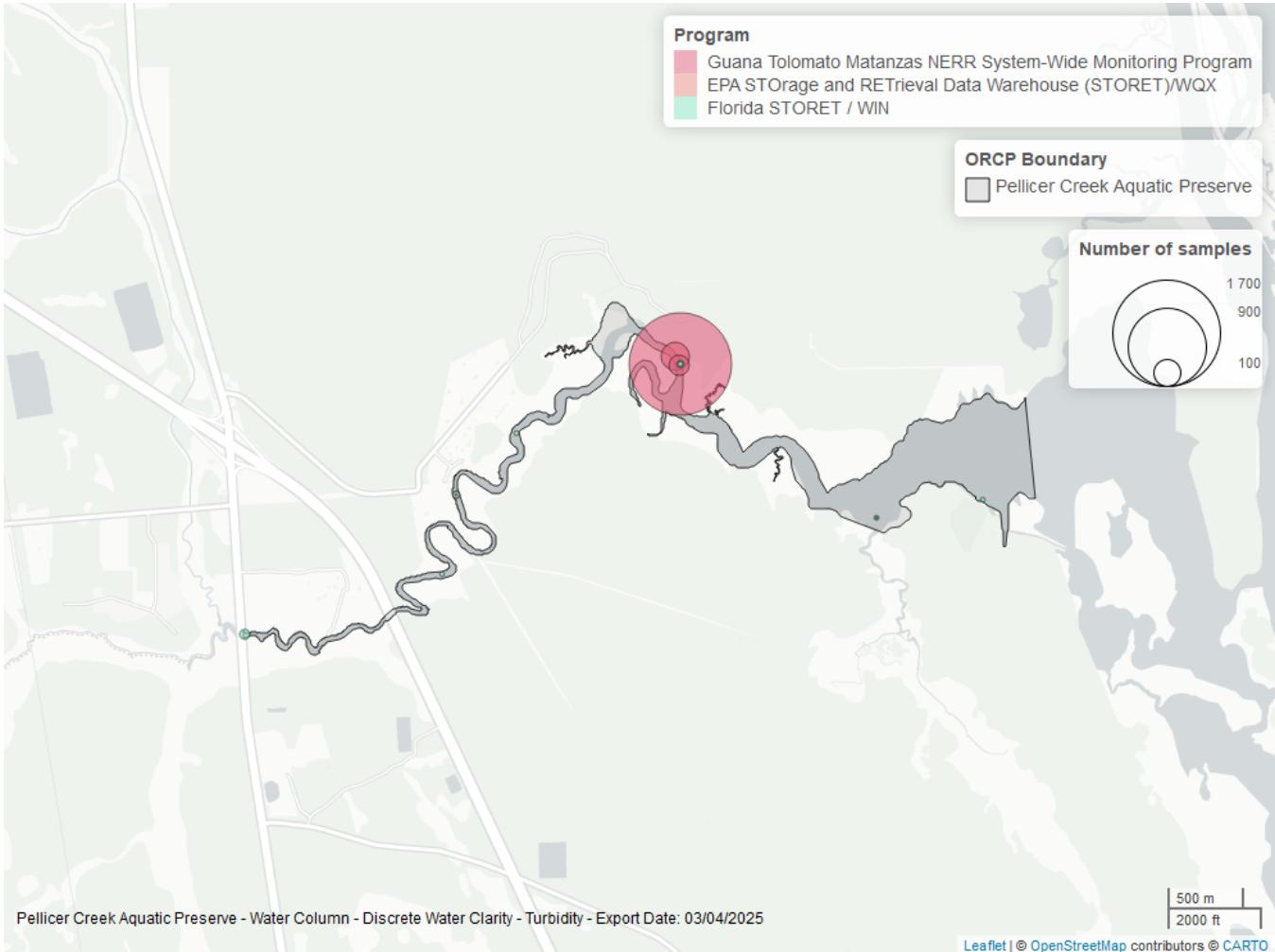


Figure 24: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 29: Programs contributing data for Turbidity

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
4054	1814	2002	2021
5002	67	2004	2021
103	14	2020	2021

#### Program names:

103 - EPA STOrage and RETriev Data Warehouse (STORET)/WQX<sup>3</sup>

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>

5002 - Florida STORET / WIN<sup>2</sup>

#### Water Temperature - Discrete

#### Seasonal Kendall-Tau Trend Analysis

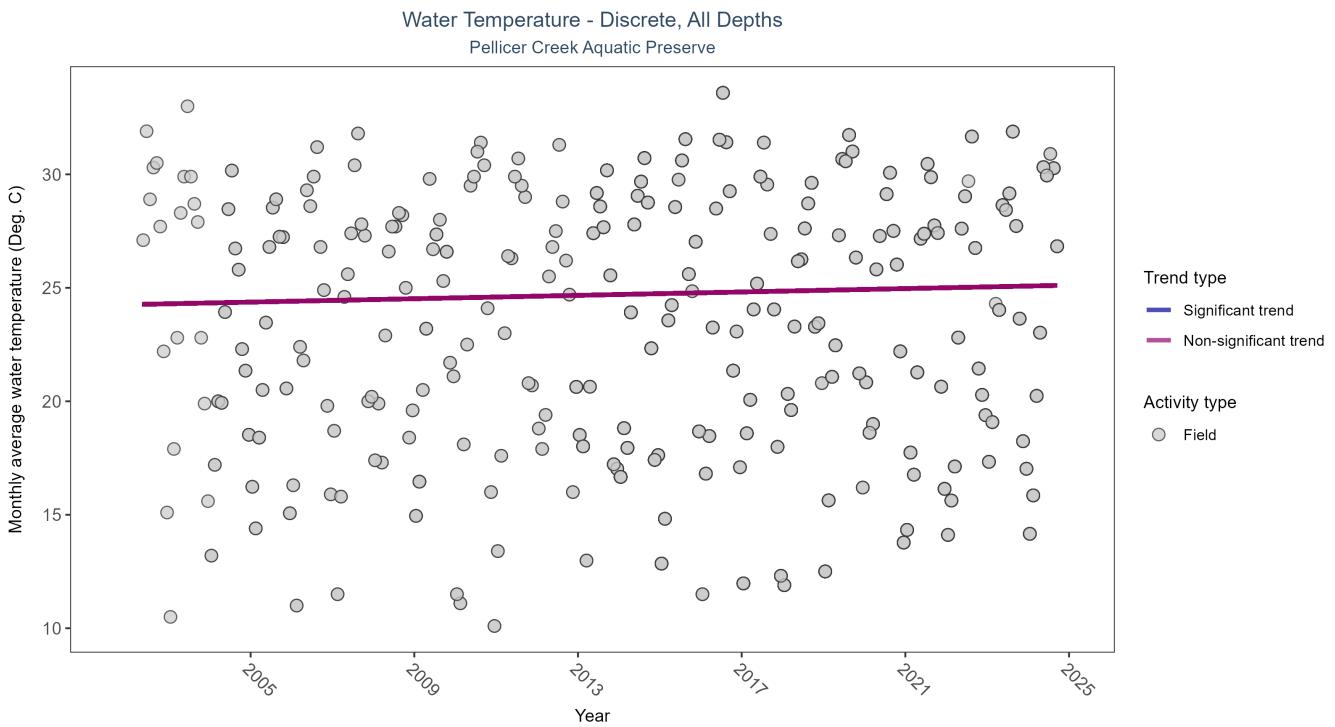


Figure 25: Scatter plot of monthly average water temperature over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only water temperature measurements taken in the field (circles) are included in the plot.

Table 30: Seasonal Kendall-Tau Trend Analysis for Water Temperature

Activity Type	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
Field	No significant trend	2297	23	2002 - 2024	24.045	0.0691	24.259	0.0372	0.1114

Water temperature showed no detectable trend between 2002 and 2024.

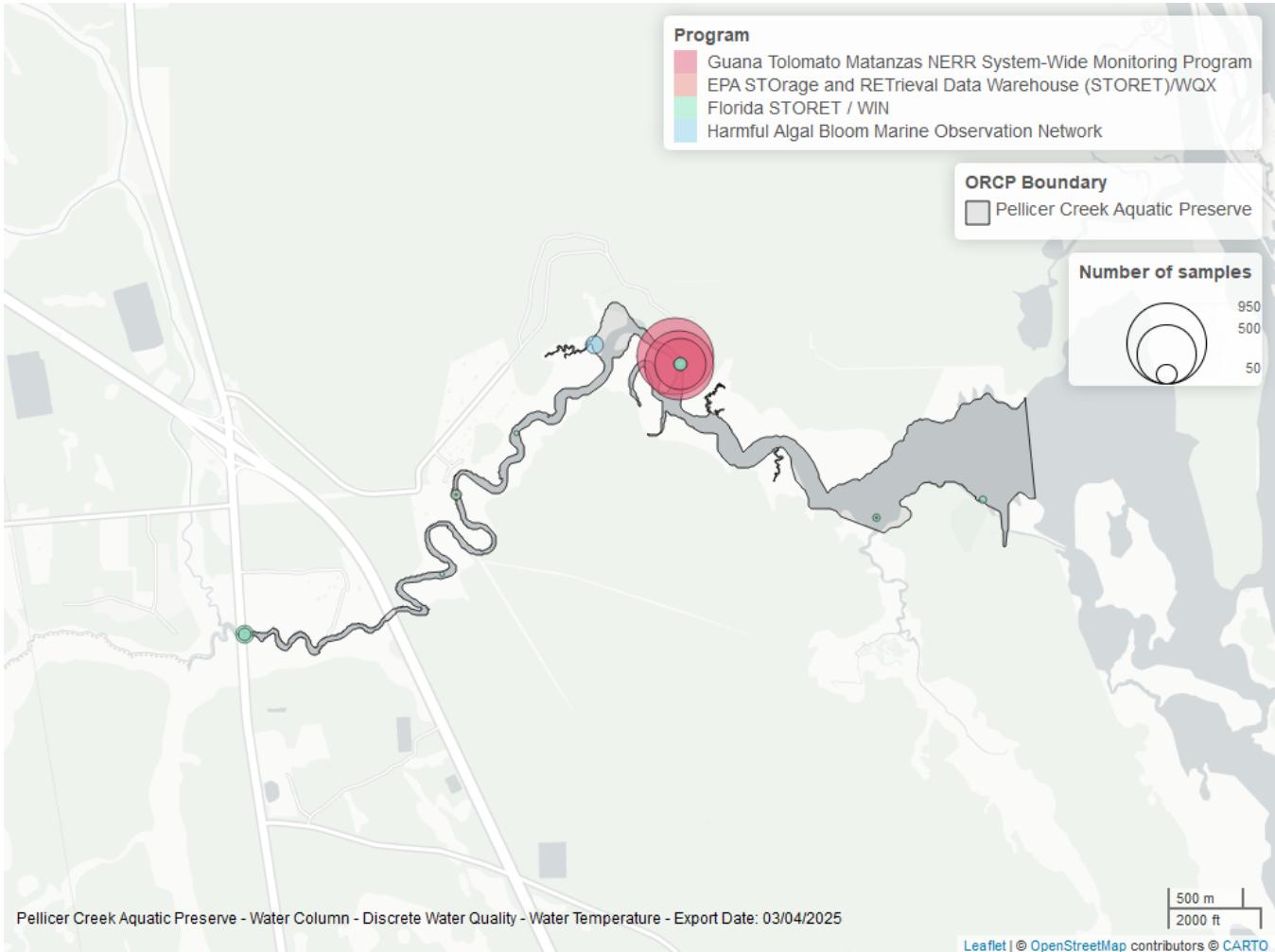


Figure 26: Map showing location of discrete water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 31: Programs contributing data for Water Temperature

ProgramID	N_Data	YearMin	YearMax
4054	2044	2002	2024
5002	168	2004	2022
95	52	2014	2018
103	48	2020	2021

#### Program names:

95 - Harmful Algal Bloom Marine Observation Network<sup>4</sup>

103 - EPA STOrage and RETrieval Data Warehouse (STORET)/WQX<sup>3</sup>

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>

5002 - Florida STORET / WIN<sup>2</sup>

## Water Quality - Continuous

The following files were used in the continuous analysis:

- *Combined\_WQ\_WC\_NUT\_cont\_Dissolved\_Oxygen\_NE-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Dissolved\_Oxygen\_Saturation\_NE-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_pH\_NE-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Salinity\_NE-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Turbidity\_NE-2025-Mar-06.txt*
- *Combined\_WQ\_WC\_NUT\_cont\_Water\_Temperature\_NE-2025-Mar-06.txt*

### Continuous monitoring locations in Pellicer Creek Aquatic Preserve

Table 32: Station overview for Continuous parameters by Program

<i>ProgramID</i>	<i>ProgramLocationID</i>	<i>Years of Data</i>	<i>Use in Analysis</i>	<i>Parameters</i>
4054	gtmpcwq	25	TRUE	DO , DOS , pH , Sal , Turb , TempW

### Program names:

4054 - Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program<sup>1</sup>

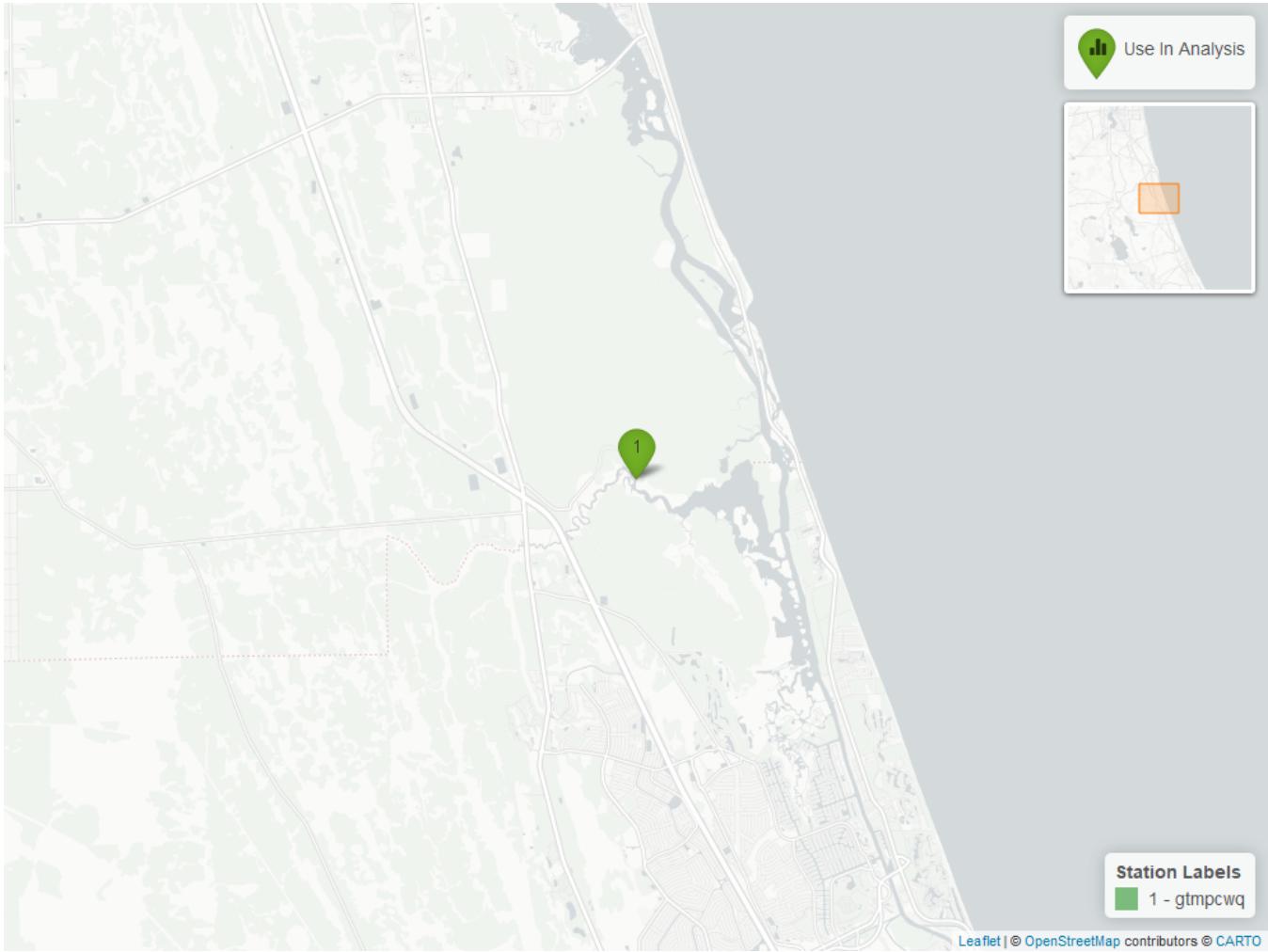


Figure 27: Map showing continuous water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. Sites marked as *Use In Analysis* (green) are featured in this report.

## Dissolved Oxygen - Continuous

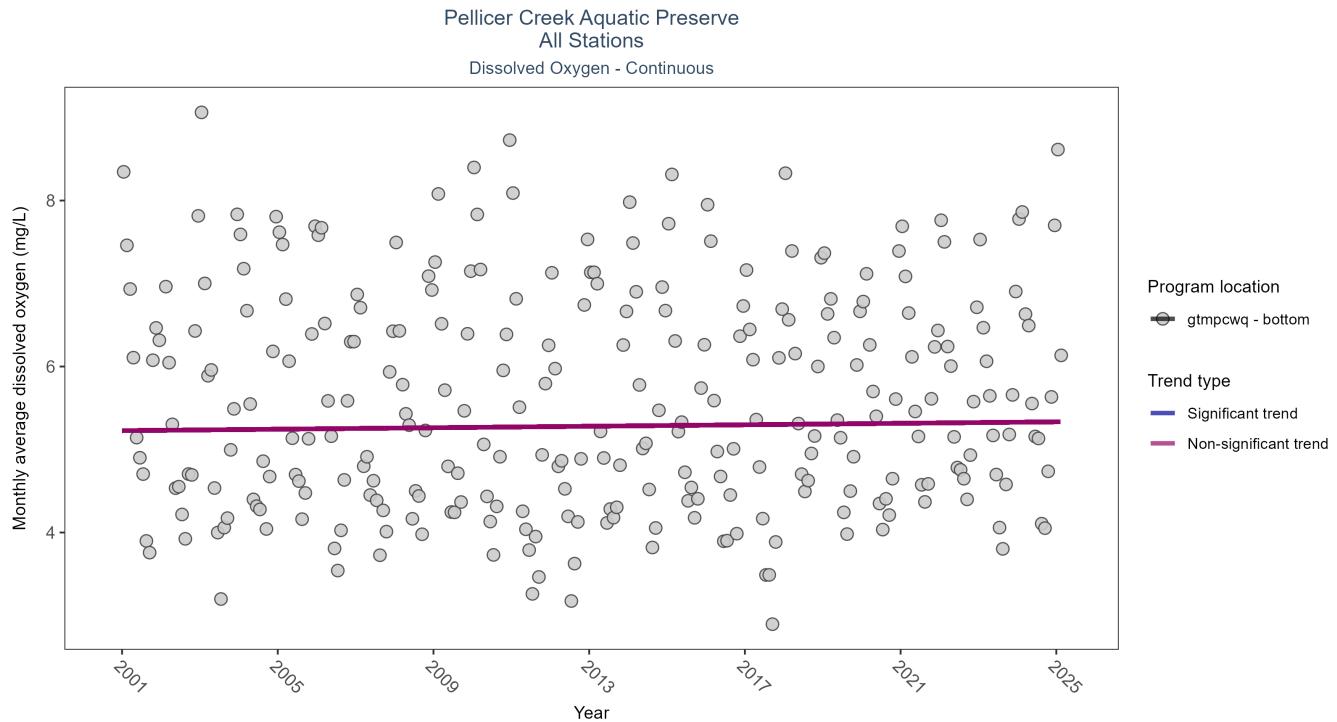


Figure 28: Scatter plot of monthly average dissolved oxygen over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 33: Seasonal Kendall-Tau Results for Dissolved Oxygen - All Stations

Station	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
gtmpcwq	No significant trend	703770	25	2001 - 2025	5.5	0.04	5.23	0	0.33

No detectable change in monthly average dissolved oxygen was observed at one location.

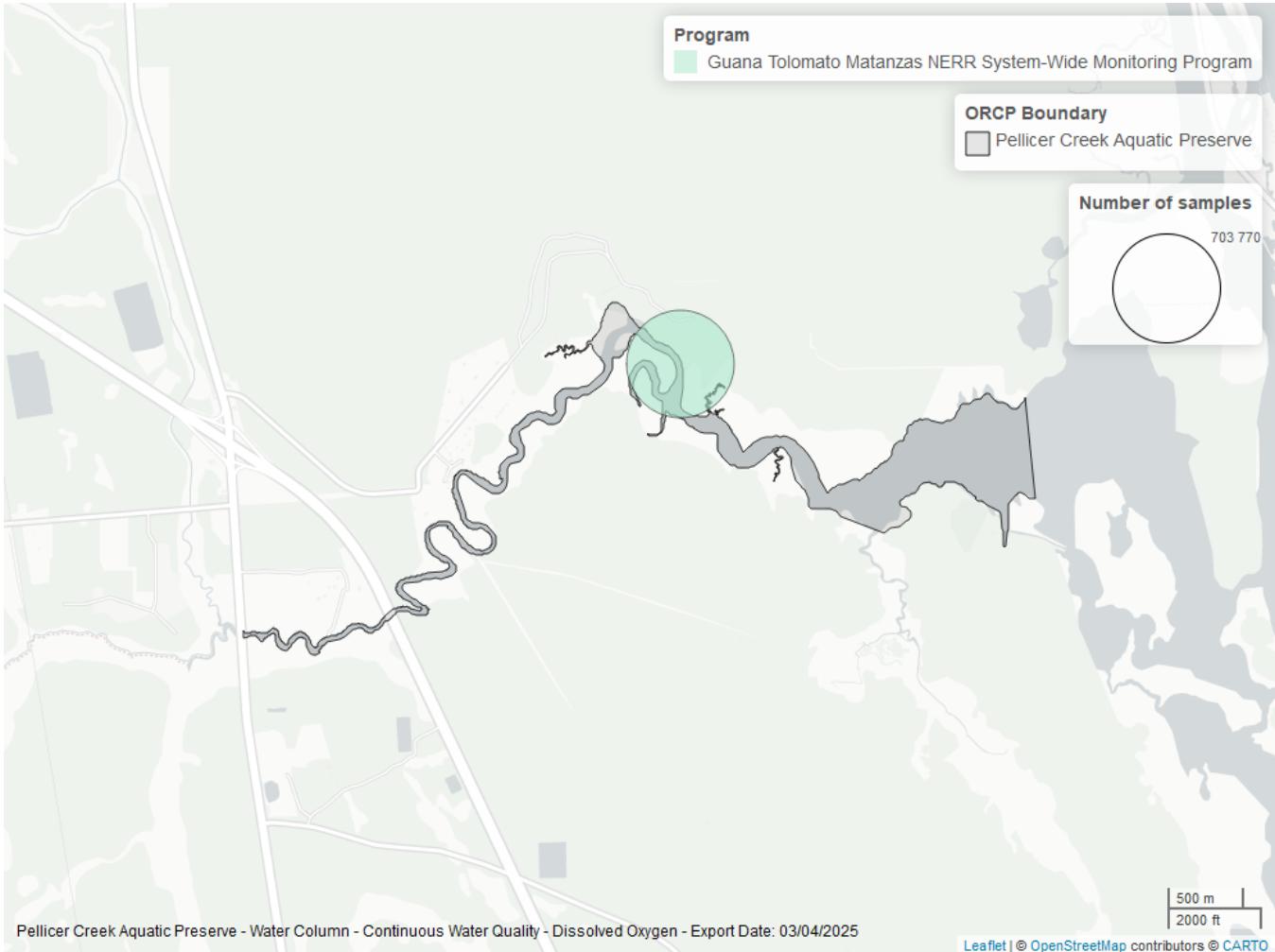


Figure 29: Map showing location of dissolved oxygen continuous water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Dissolved Oxygen Saturation - Continuous

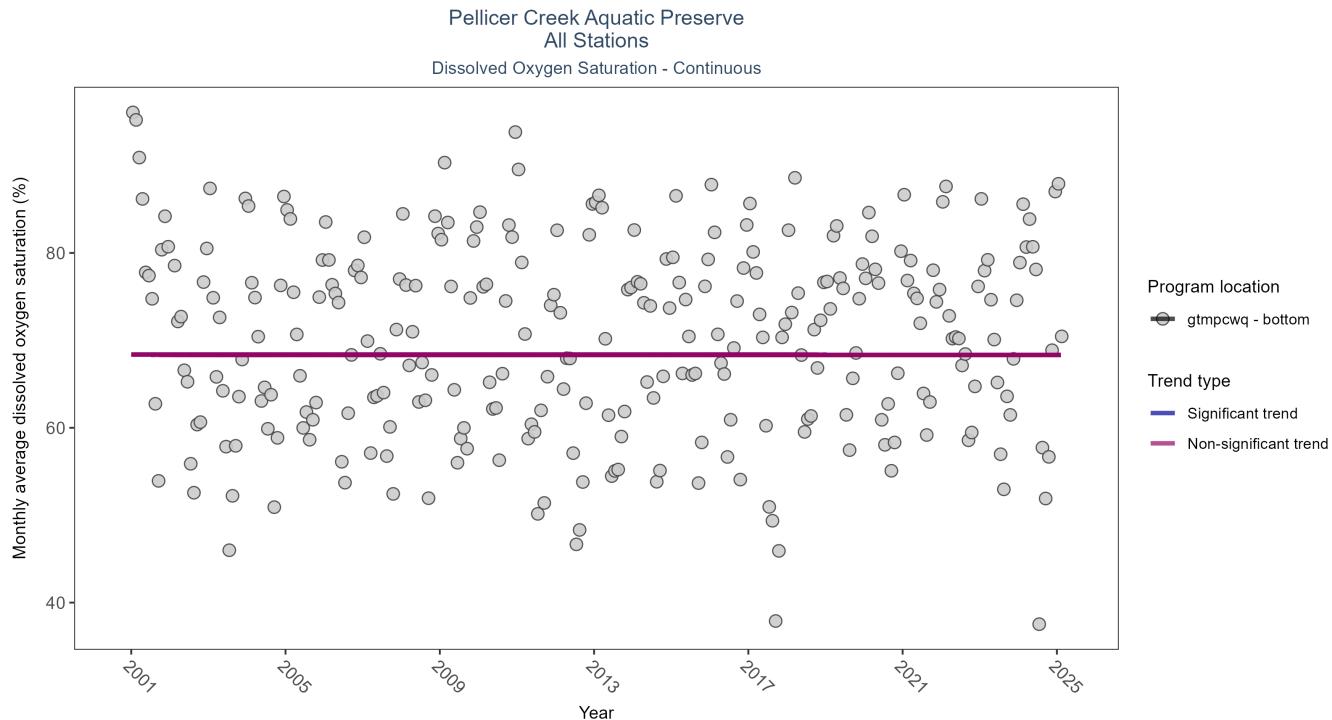


Figure 30: Scatter plot of monthly average dissolved oxygen saturation over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 34: Seasonal Kendall-Tau Results for Dissolved Oxygen Saturation - All Stations

Station	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
gtmpcwq	No significant trend	705263	25	2001 - 2025	71.4	0	68.37	0	0.97

No detectable change in monthly average dissolved oxygen saturation was observed at one location.

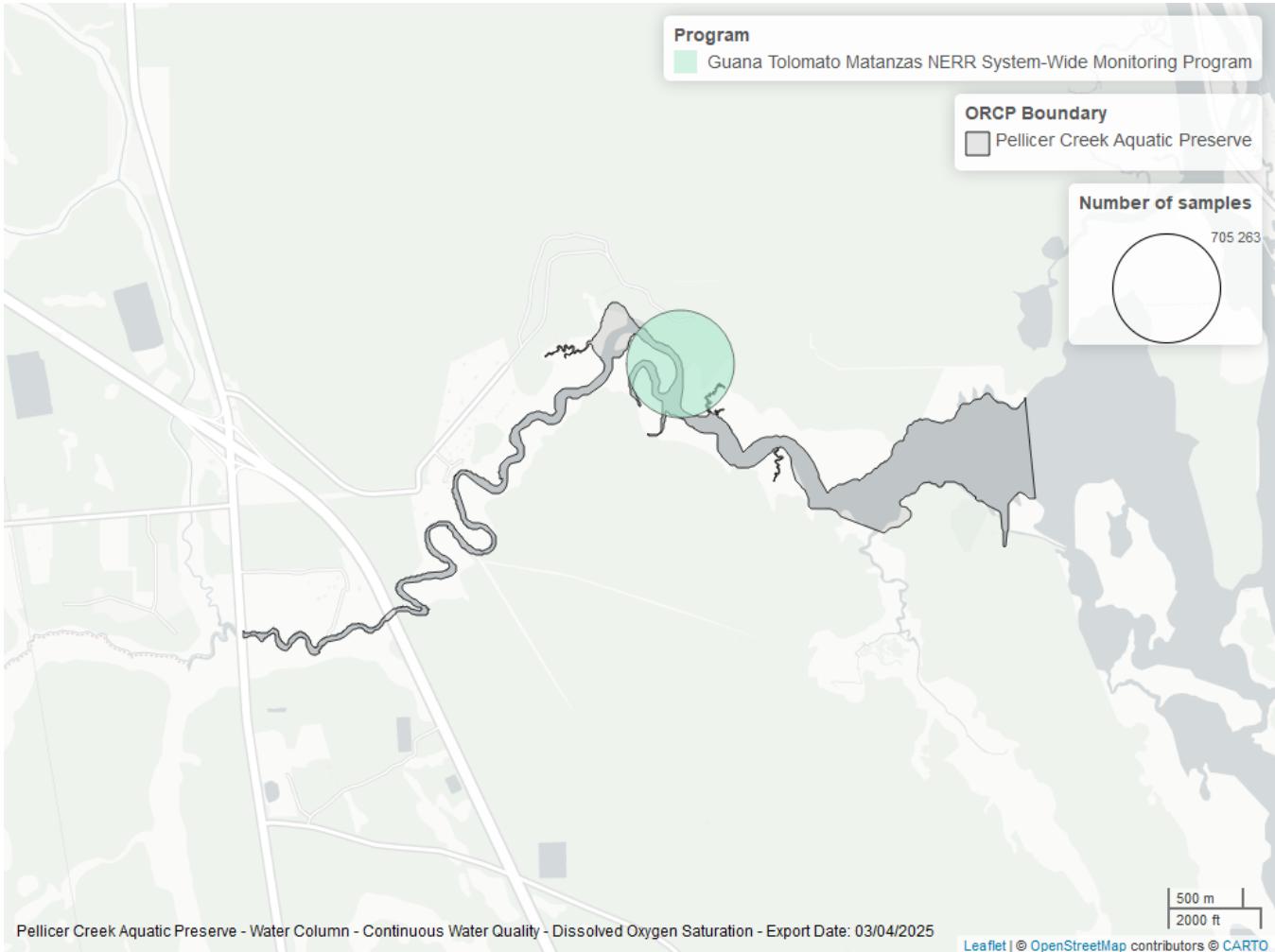


Figure 31: Map showing location of dissolved oxygen saturation continuous water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## pH - Continuous

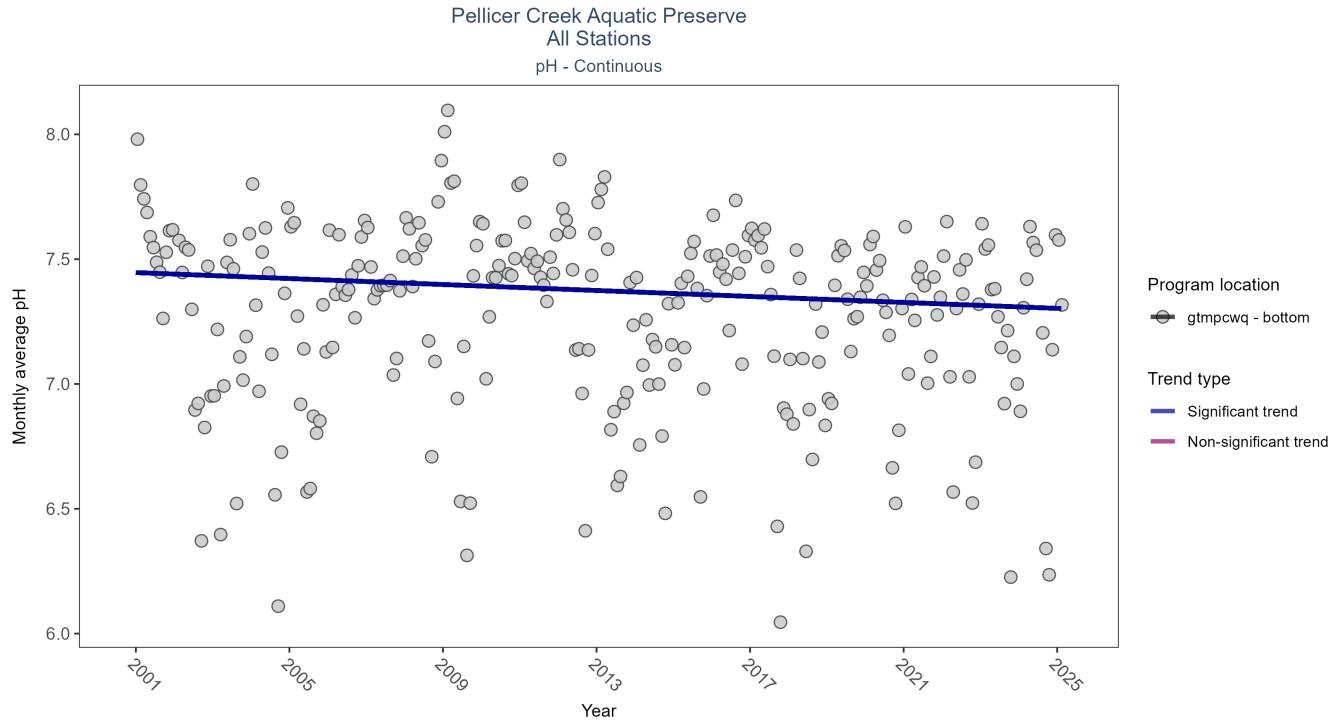


Figure 32: Scatter plot of monthly average pH over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 35: Seasonal Kendall-Tau Results for pH - All Stations

Station	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
gtmpcwq	Significantly decreasing trend	696839	25	2001 - 2025	7.4	-0.12	7.45	-0.01	0

At one program location, monthly average pH decreased by 0.01 pH units per year.

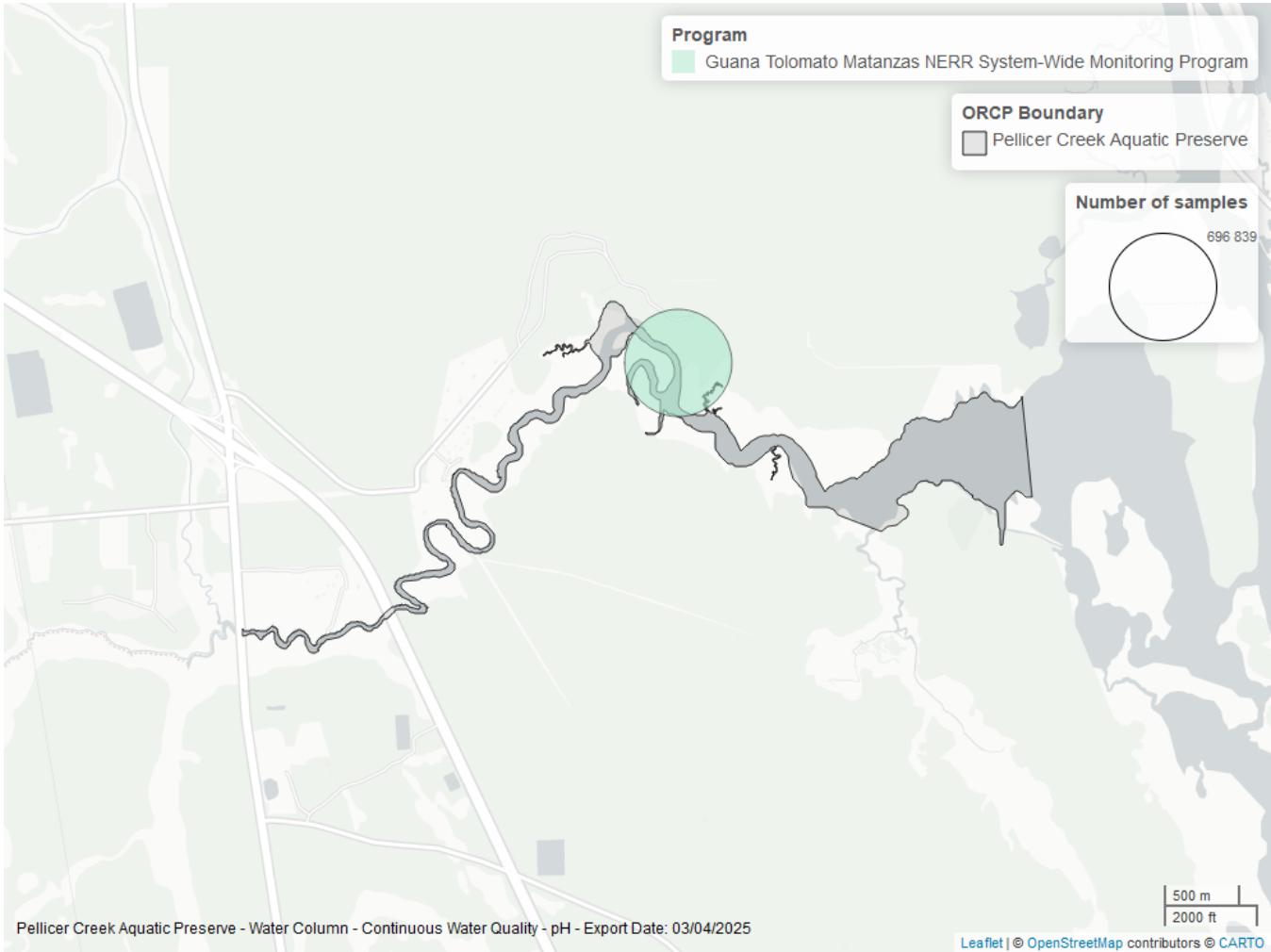


Figure 33: Map showing location of ph continuous water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Salinity - Continuous

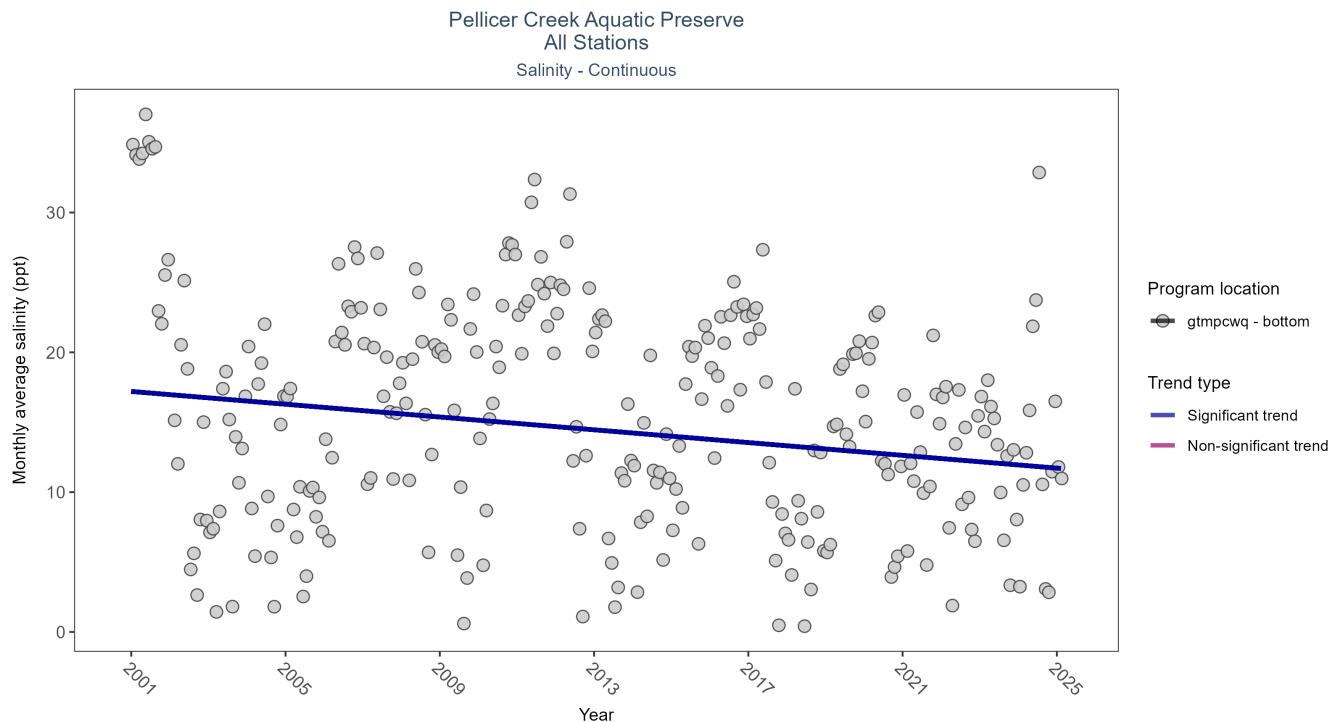


Figure 34: Scatter plot of monthly average salinity over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 36: Seasonal Kendall-Tau Results for Salinity - All Stations

Station	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
gtmpcwq	Significantly decreasing trend	713330	25	2001 - 2025	16.6	-0.14	17.2	-0.23	0

At one program location, monthly average salinity decreased by 0.23 ppt per year.

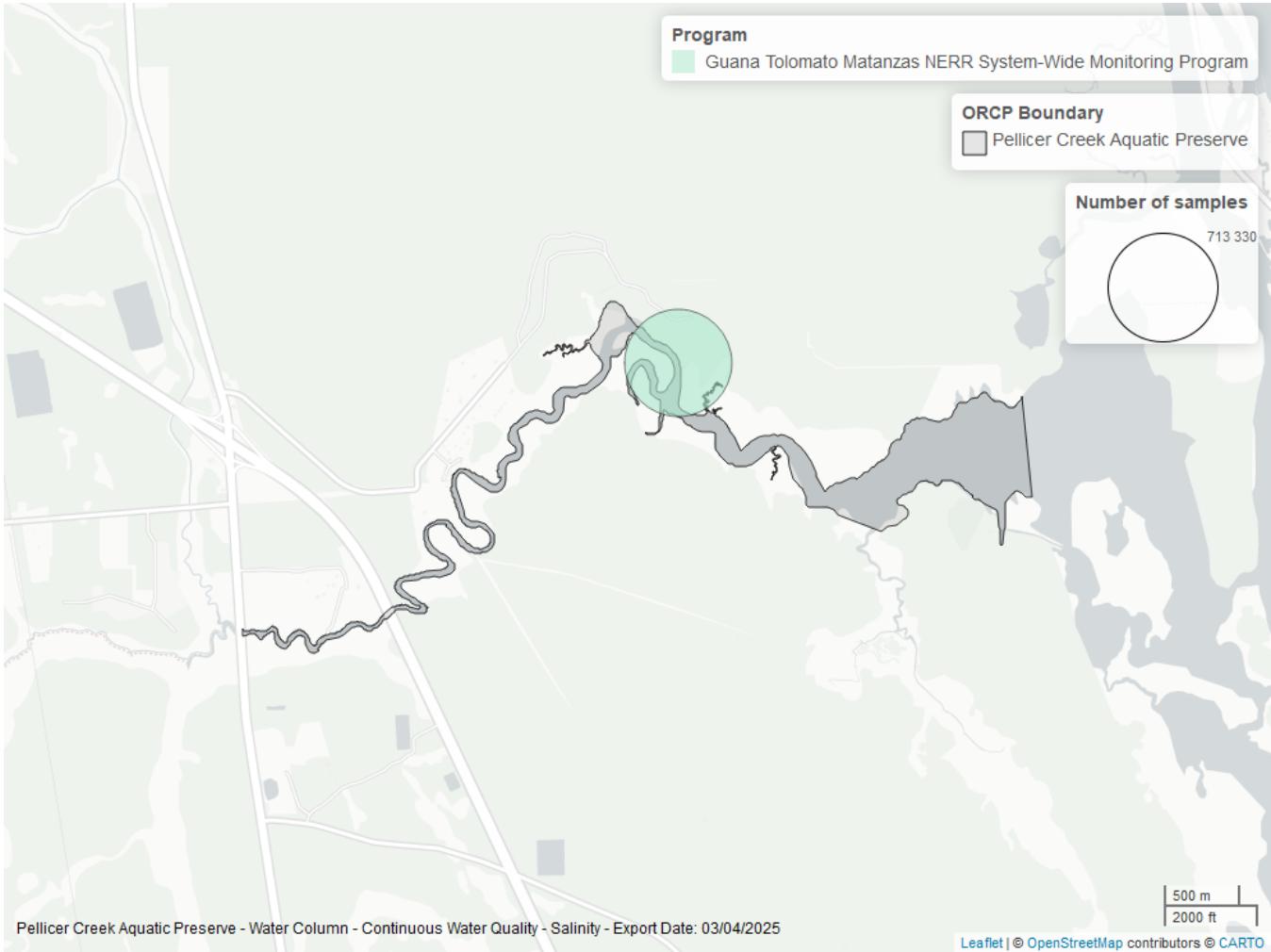


Figure 35: Map showing location of salinity continuous water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Turbidity - Continuous

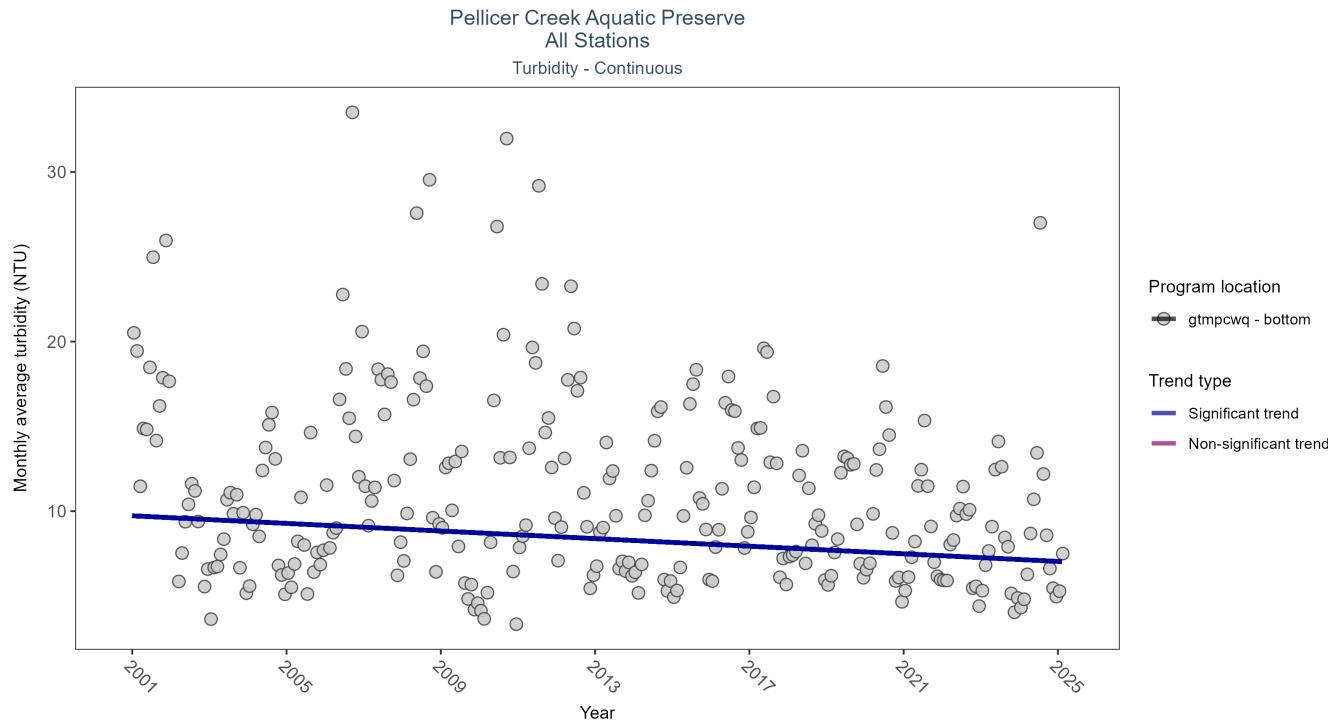


Figure 36: Scatter plot of monthly average turbidity over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 37: Seasonal Kendall-Tau Results for Turbidity - All Stations

Station	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
gtmpcwq	Significantly decreasing trend	687902	25	2001 - 2025	9	-0.18	9.73	-0.11	0

At one program location, monthly average turbidity decreased by 0.11 NTU per year.

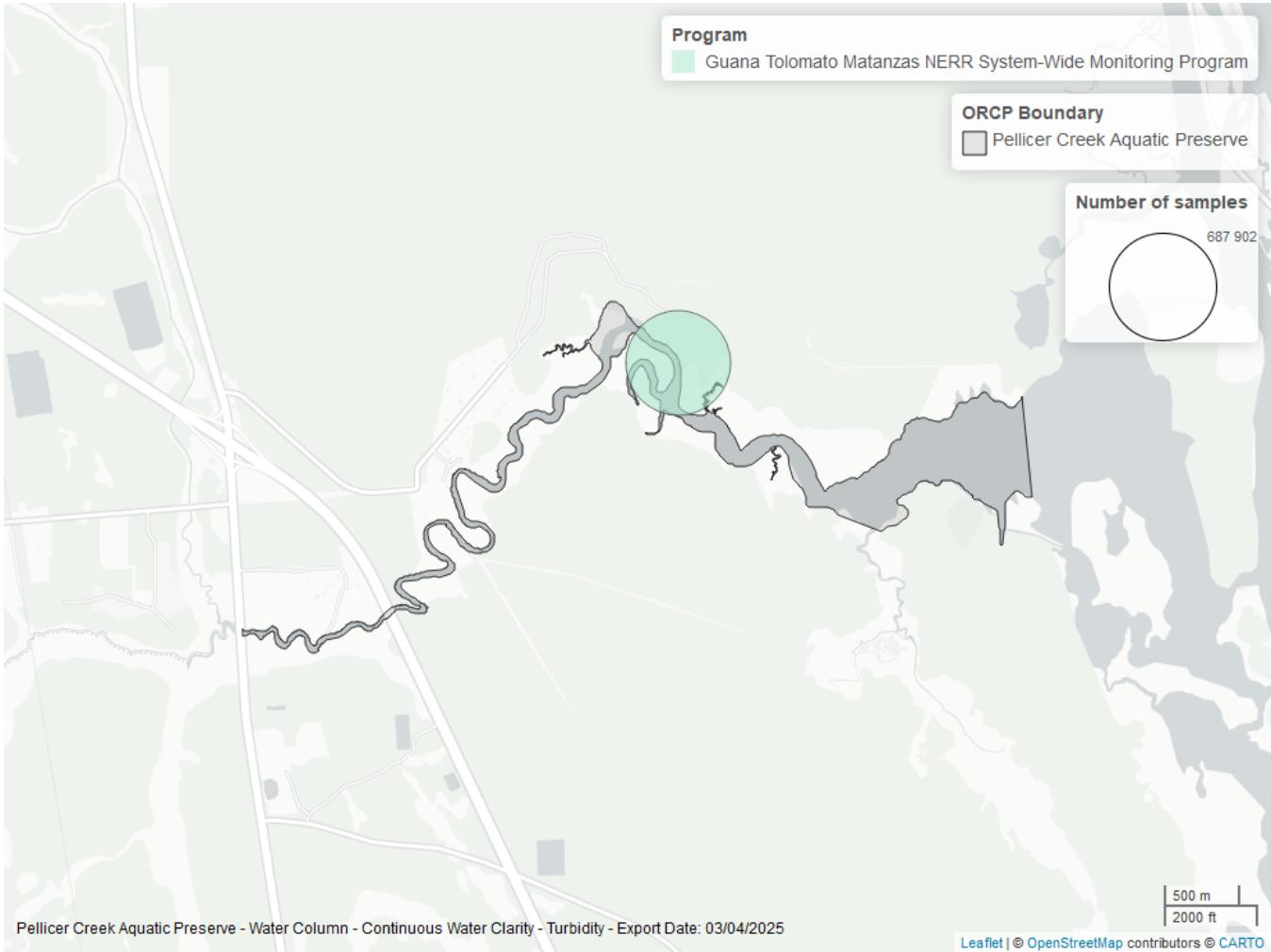


Figure 37: Map showing location of turbidity continuous water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Water Temperature - Continuous

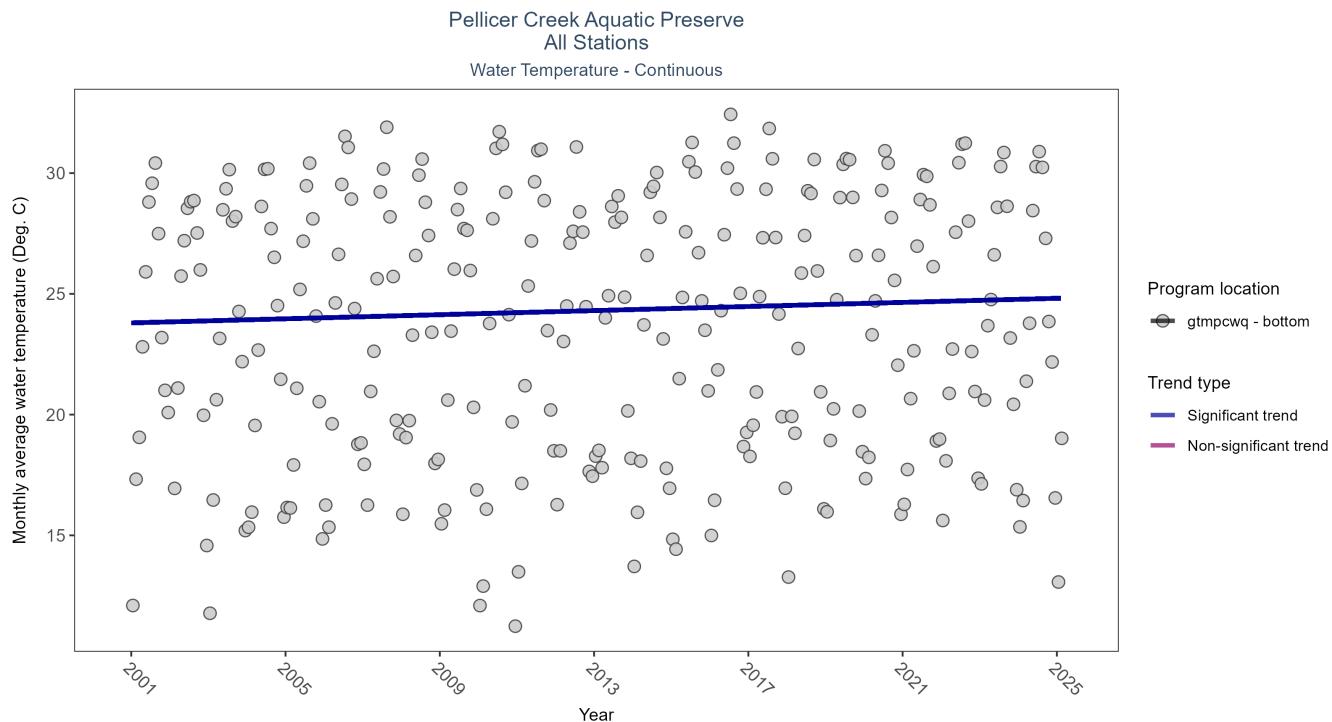


Figure 38: Scatter plot of monthly average water temperature over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 38: Seasonal Kendall-Tau Results for Water Temperature - All Stations

Station	Statistical Trend	Sample Count	Years with Data	Period of Record	Median	tau	Sen Intercept	Sen Slope	p
gtmpcwq	Significantly increasing trend	721896	25	2001 - 2025	24.3	0.15	23.8	0.04	0

At one program location, monthly average water temperature increased by  $0.04^{\circ}\text{C}$  per year.

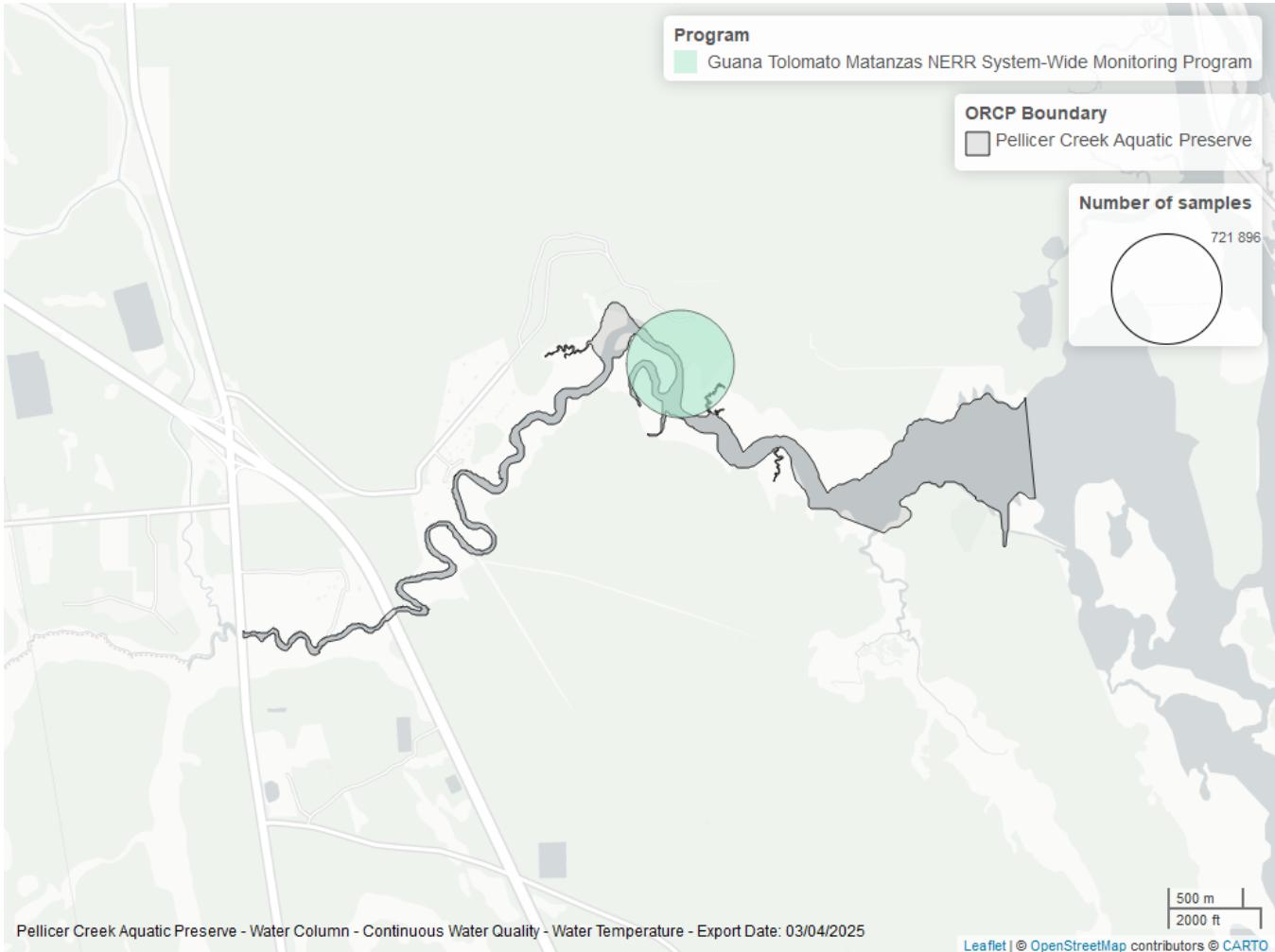


Figure 39: Map showing location of water temperature continuous water quality sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Coastal Wetlands

The data file used is: All\_CW\_Parameters-2025-Mar-06.txt

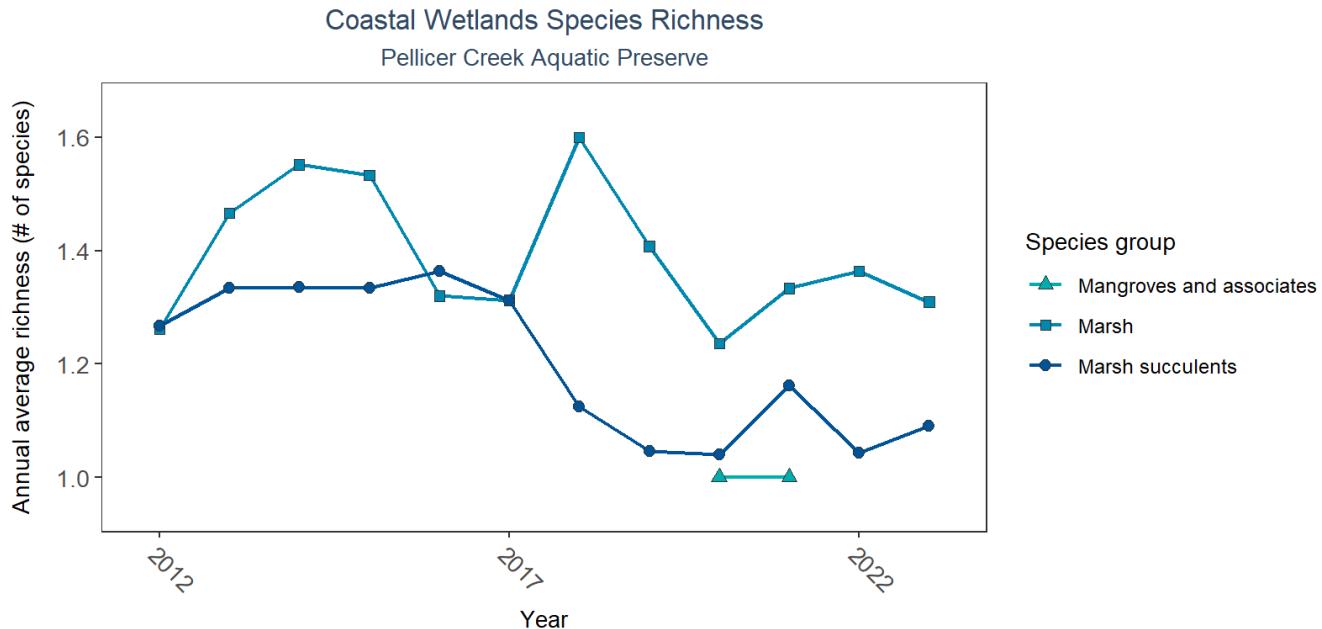


Figure 40: Line graph of annual average coastal wetlands species richness over time for mangroves and associates (triangles), marsh (squares), and marsh succulents (circles). If the time series by species group included more than one year of observations, a line connects data points for visualization.

Table 39: Coastal Wetlands Species Richness

Species Group	Sample Count	Number of Years	Period of Record	Median N of Taxa	Mean N of Taxa
Mangroves and associates	2	2	2020 - 2021	1	1.00
Marsh	564	12	2012 - 2023	1	1.41
Marsh succulents	353	12	2012 - 2023	1	1.24

Between 2020 and 2021, the median annual number of species for *mangroves and associates* was 1 based on 2 observations. Between 2012 and 2023, the median annual number of species for *marsh* was 1 based on 564 observations. Between 2012 and 2023, the median annual number of species for *marsh succulents* was 1 based on 353 observations.

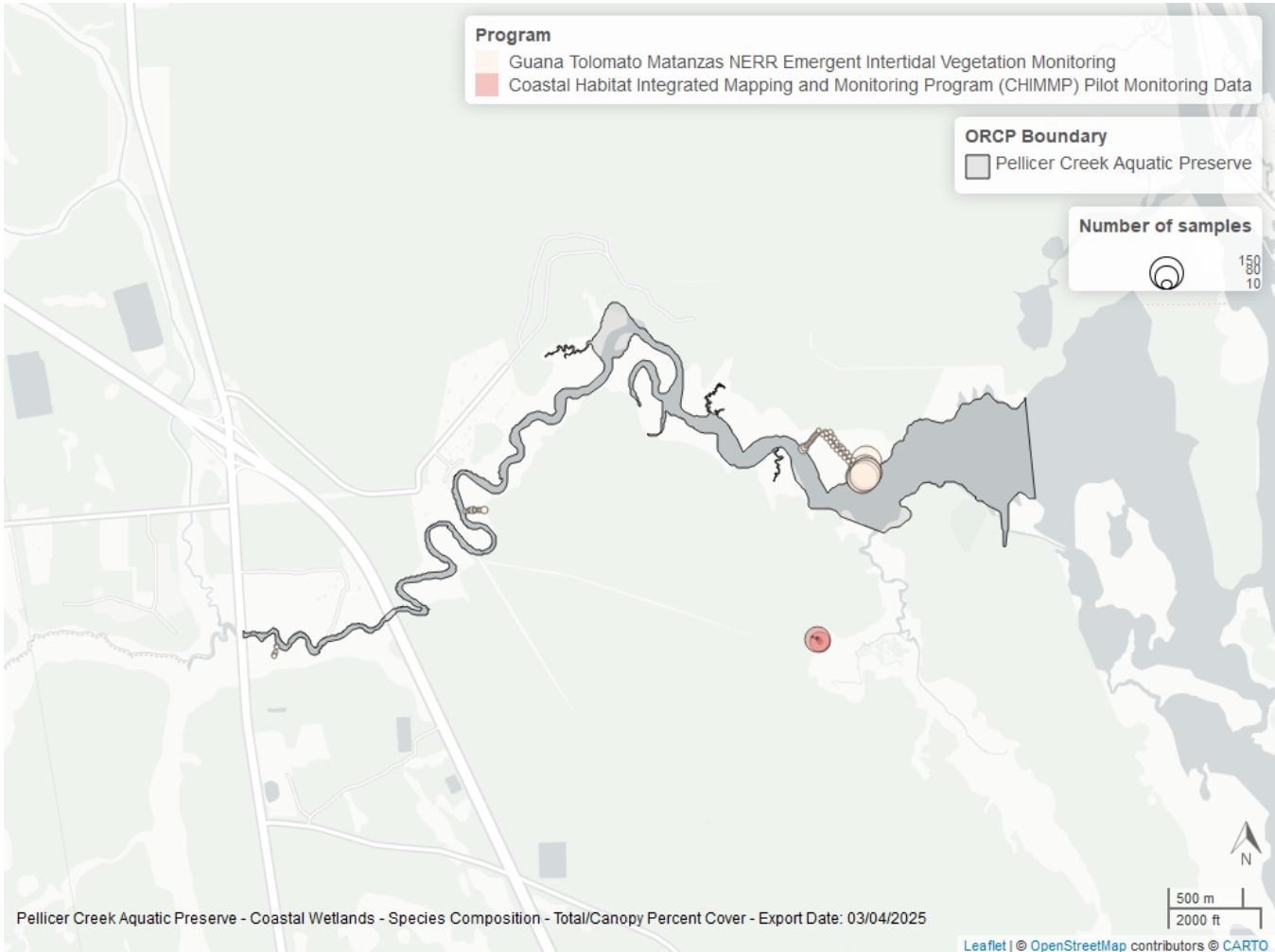


Figure 41: Map showing location of coastal wetlands sampling locations within the boundaries of *Pellicer Creek Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Species list

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<i>Acer rubrum</i>	<i>Fimbristylis spadicea</i>	<i>Polygonum</i> sp.
<i>Acrostichum danaeifolium</i>	<i>Houstonia procumbens</i>	<i>Quercus virginiana</i>
<i>Amorpha fruticosa</i>	<i>Hydrocotyle umbellata</i>	<i>Rhynchospora colorata</i>
<i>Ampelaster carolinianus</i>	<i>Ilex vomitoria</i>	<i>Rhynchospora corniculata</i>
<i>Ampelopsis arborea</i>	<i>Ipomoea sagittata</i>	<i>Rhynchospora</i> sp.
<i>Andropogon</i> sp.	<i>Iresine rhizomatosa</i>	<i>Rubus</i> sp.
<i>Apios americana</i>	<i>Iva frutescens</i>	<i>Sabal palmetto</i>
<i>Aristida</i> sp.	<i>Juncus roemerianus</i> <sup>1</sup>	<i>Sabatia calycina</i>
<i>Avicennia germinans</i> <sup>1</sup>	<i>Juniperus virginiana</i>	<i>Sabatia stellaris</i>
<i>Baccharis halimifolia</i>	<i>Kosteletzkya pentacarpos</i>	<i>Sagittaria lancifolia</i>
<i>Baccharis</i> sp.	<i>Limonium carolinianum</i> <sup>1</sup>	<i>Sagittaria latifolia</i>
<i>Bacopa monnieri</i>	<i>Lobelia cardinalis</i>	<i>Sagittaria subulata</i>
<i>Bare substrate</i>	<i>Ludwigia alata</i>	<i>Salicornia ambigua</i> <sup>1</sup>
<i>Batis maritima</i> <sup>1</sup>	<i>Ludwigia repens</i>	<i>Samolus ebracteatus</i>
<i>Blutaparon vermiculare</i> <sup>1</sup>	<i>Ludwigia</i> sp.	<i>Samolus</i> sp.
<i>Boehmeria cylindrica</i>	<i>Lygodium microphyllum</i>	<i>Samolus valerandi</i>
<i>Centella asiatica</i>	<i>Lythrum alatum</i>	<i>Serenoa repens</i>
<i>Cicuta maculata</i>	<i>Lythrum lineare</i>	<i>Smilax bona-nox</i>
<i>Cladium mariscus</i>	<i>Mikania scandens</i>	<i>Solidago sempervirens</i>
<i>Coleataenia anceps</i>	<i>Myrica cerifera</i>	<i>Spartina alterniflora</i> <sup>1</sup>
<i>Cyperus</i> sp.	<i>Nekemias arborea</i>	<i>Spartina bakeri</i> <sup>1</sup>
<i>Dichanthelium commutatum</i>	<i>Osmunda regalis</i>	<i>Spartina patens</i> <sup>1</sup>
<i>Dichanthelium</i> sp.	<i>Osmundastrum cinnamomeum</i>	<i>Sympyotrichum elliottii</i>
<i>Dichondra carolinensis</i>	<i>Parthenocissus quinquefolia</i>	<i>Thelypteris kunthii</i>
<i>Dichondra</i> sp.	<i>Peltandra virginica</i>	<i>Thelypteris palustris</i>
<i>Distichlis spicata</i> <sup>1</sup>	<i>Persea palustris</i>	<i>Tillandsia usneoides</i>
<i>Eleocharis baldwinii</i>	<i>Persicaria hydropiperoides</i>	<i>Toxicodendron radicans</i>
<i>Eleocharis geniculata</i>	<i>Persicaria punctata</i>	<i>Ulmus americana</i>
<i>Eleocharis</i> sp.	<i>Persicaria</i> sp.	<i>Vigna luteola</i>
<i>Erechtites hieraciifolius</i>	<i>Pinus palustris</i>	<i>Woody debris</i>
<i>Fabaceae</i>	<i>Pluchea odorata</i>	<i>Acer rubrum</i>
<i>Fimbristylis</i> sp.	<i>Pluchea</i> sp.	<i>Acrostichum danaeifolium</i>

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1 - Coastal Wetlands

## References

1. Florida Department of Environmental Protection (DEP); Office of Resilience and Coastal Protection (RCP); Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR); NOAA National Estuarine Research Reserve System (NERRS). [Guana Tolomato Matanzas National Estuarine Research Reserve System-Wide Monitoring Program](#). (2024).
2. Florida Department of Environmental Protection (DEP). [Florida STORET / WIN](#). (2024).
3. U.S. Environmental Protection Agency (EPA). [EPA STOrage and RETrieval Data Warehouse \(STORET\)/WQX](#). (2023).
4. Florida Fish and Wildlife Conservation Commission (FWC); Florida Fish and Wildlife Research Institute (FWRI). [Harmful Algal Bloom Marine Observation Network](#). (2018).