Biscayne Bay Aquatic Preserve

SEACAR Habitat Analyses

Last compiled on 08 October, 2025

Contents

Funding & Acknowledgements

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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

Qualifier Source	*Value Qualifier*	*Include*	*Description*
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 $p >= 0.05$). 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-Sep-04.txt*
- *Combined_WQ_WC_NUT_Chlorophyll_a_uncorrected_for_pheophytin-2025-Sep-04.txt*
- *Combined_WQ_WC_NUT_Colored_dissolved_organic_matter_CDOM-2025-Sep-04.txt*
- *Combined_WQ_WC_NUT_Dissolved_Oxygen-2025-Sep-04.txt*
- *Combined_WQ_WC_NUT_Dissolved_Oxygen_Saturation-2025-Sep-04.txt*
- *Combined_WQ_WC_NUT_pH-2025-Sep-04.txt*
- *Combined_WQ_WC_NUT_Salinity-2025-Sep-04.txt*
- *Combined_WQ_WC_NUT_Secchi_Depth-2025-Sep-04.txt*
- *Combined_WQ_WC_NUT_Total_Nitrogen-2025-Sep-04.txt*
- *Combined_WQ_WC_NUT_Total_Phosphorus-2025-Sep-04.txt*
- *Combined_WQ_WC_NUT_Total_Suspended_Solids_TSS-2025-Sep-04.txt*
- *Combined_WQ_WC_NUT_Turbidity-2025-Sep-04.txt*
- *Combined_WQ_WC_NUT_Water_Temperature-2025-Sep-04.txt*

Chlorophyll a, Corrected for Pheophytin - Discrete

Seasonal Kendall-Tau Trend Analysis

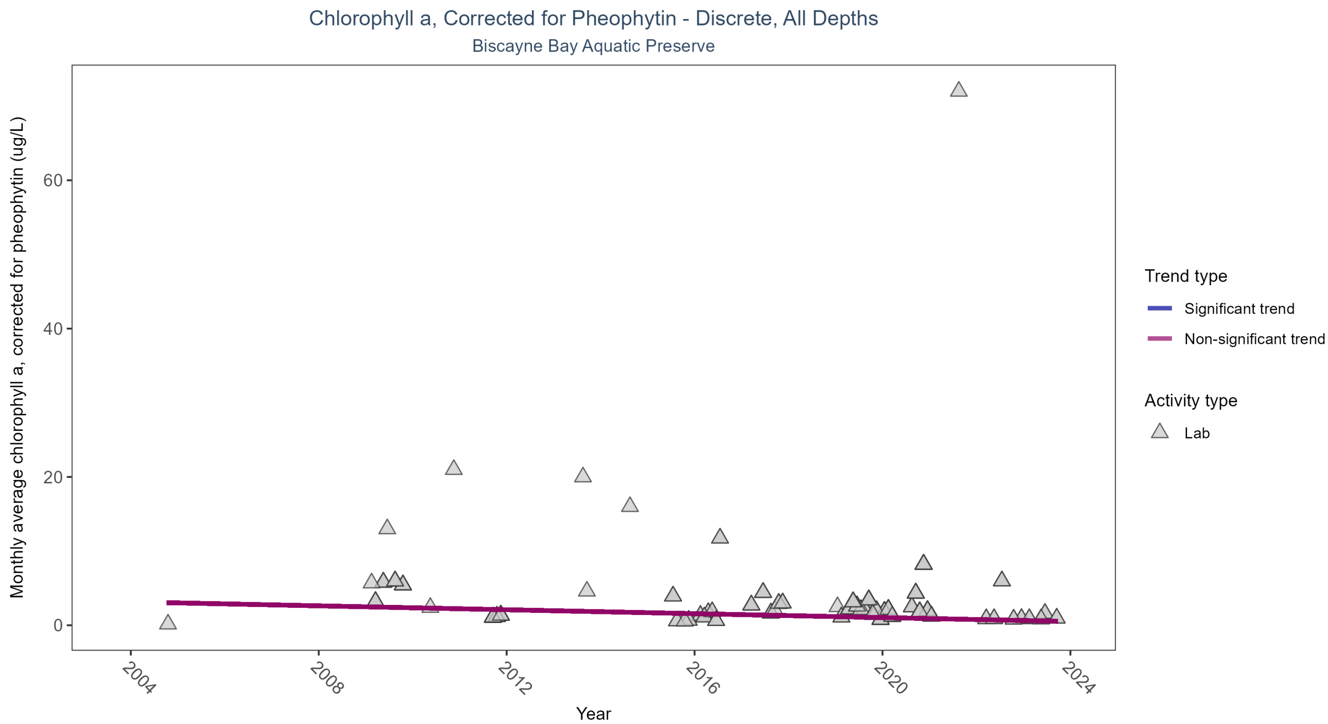

Figure 1: Scatter plot of monthly average levels of chlorophyll a, corrected for pheophytin, over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only laboratory-analyzed chlorophyll a (triangles) 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	470	14	2004 - 2023	1.4	-0.1845	3.148	-0.1318	0.1713

Chlorophyll a, corrected for pheophytin, showed no detectable trend between 2004 and 2023.

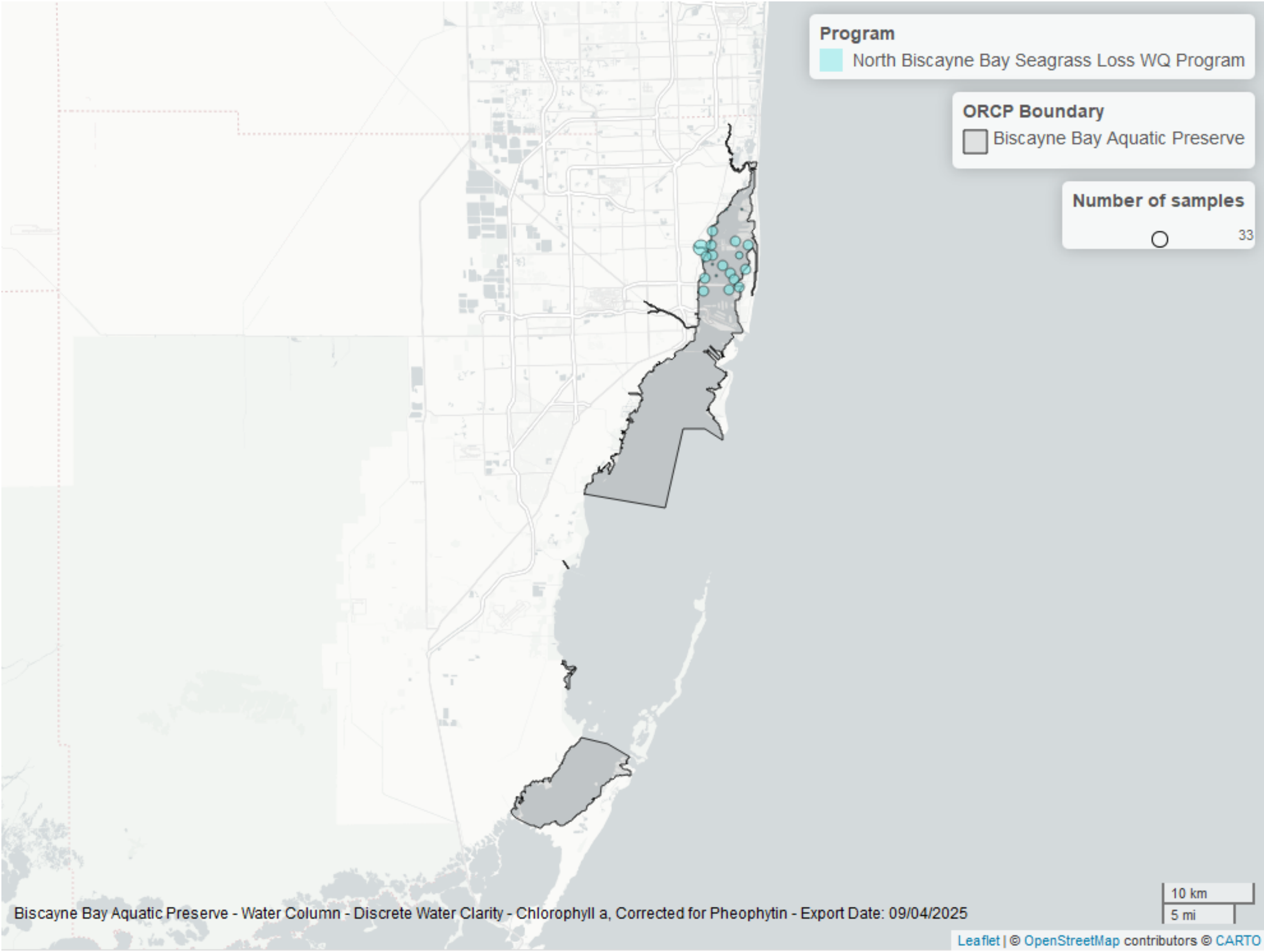

Figure 2: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

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

ProgramID	*N_Data*	*YearMin*	*YearMax*
5026	287	2019	2021
5002	184	2004	2023

Program names:

5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

Chlorophyll a, Uncorrected for Pheophytin - Discrete

Seasonal Kendall-Tau Trend Analysis

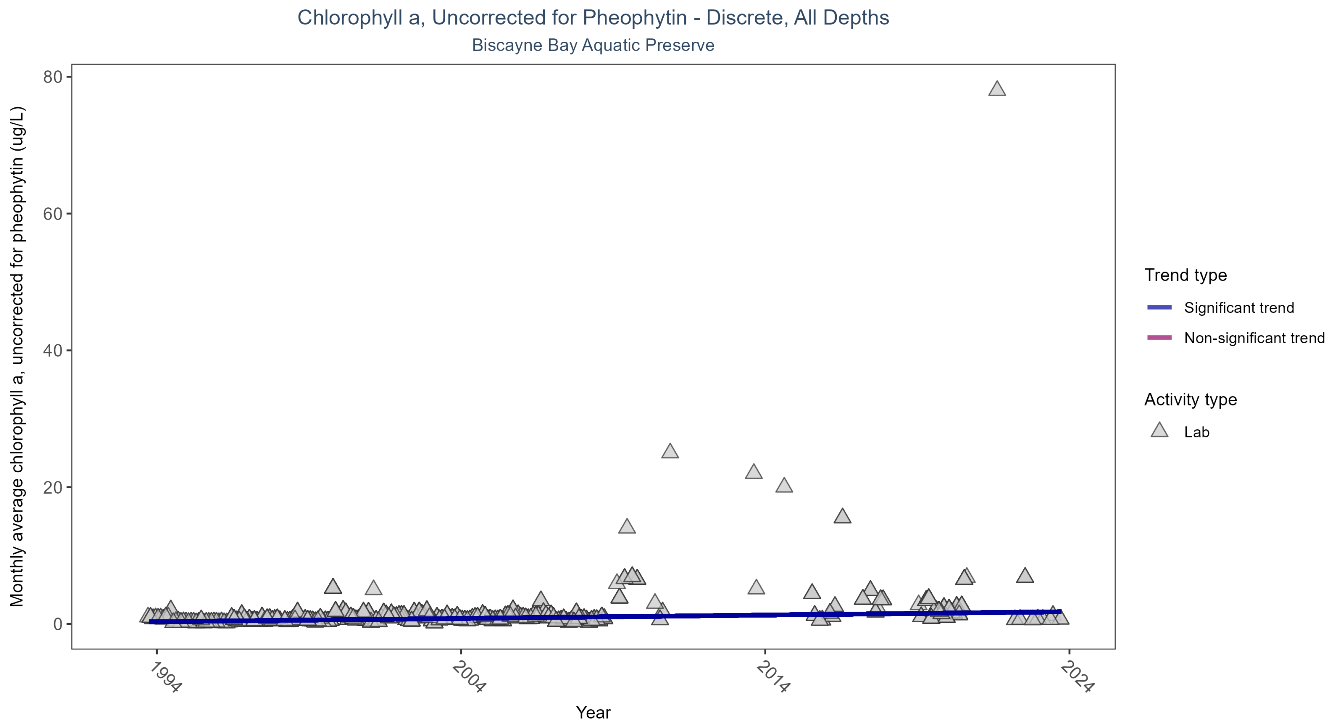

Figure 3: Scatter plot of monthly average levels of chlorophyll a, uncorrected for pheophytin, over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only laboratory-analyzed chlorophyll a (triangles) 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	Significantly increasing trend	2256	28	1993 - 2023	0.6676	0.3947	0.2649	0.0489	0

Monthly average chlorophyll a, uncorrected for pheophytin, increased by 0.05 µg/L per year, indicating a decrease in water clarity.

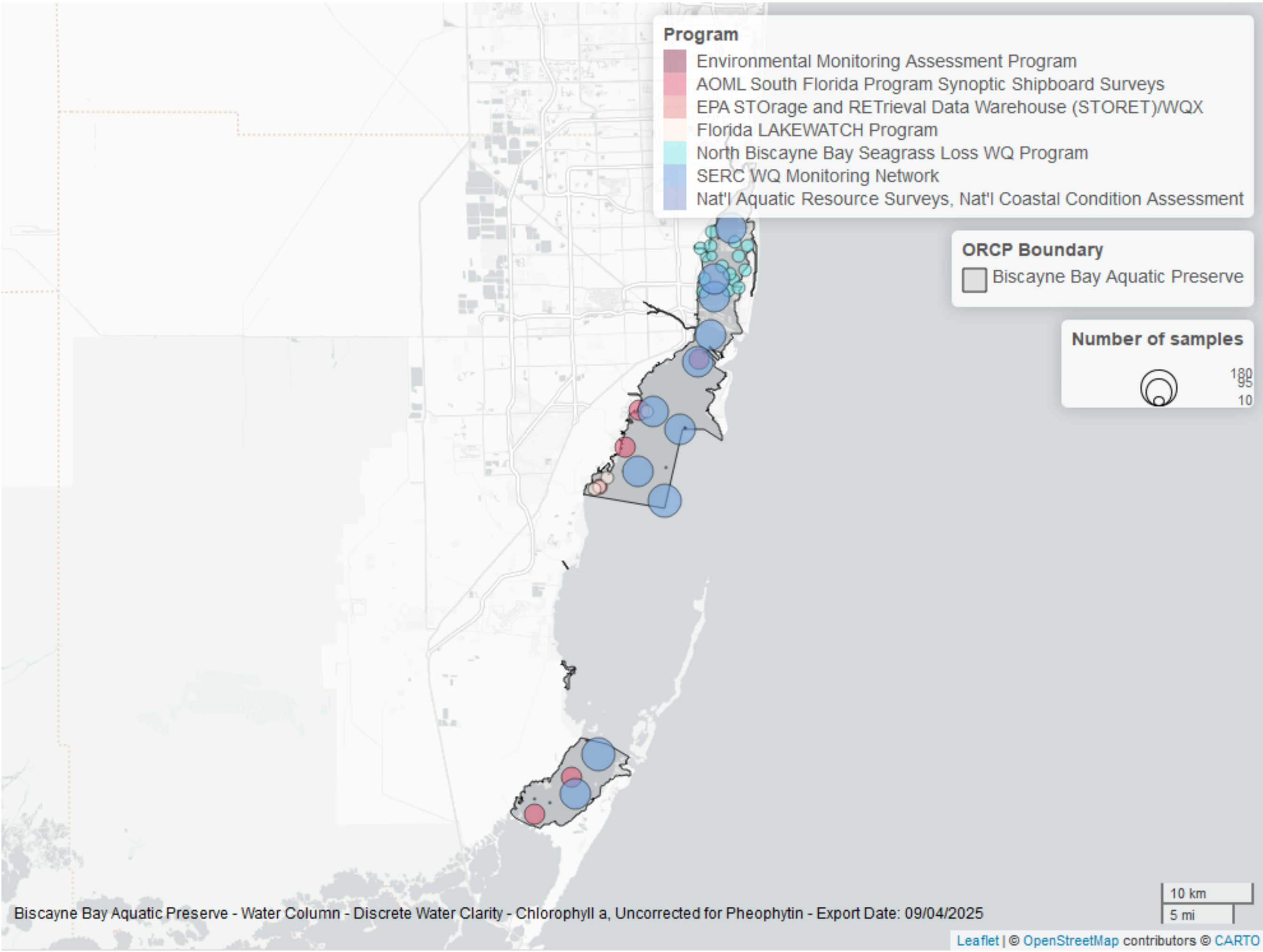

Figure 4: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

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

ProgramID	*N_Data*	*YearMin*	*YearMax*
509	1636	1993	2008
5026	410	2019	2020
3	385	2002	2012
5002	103	2001	2023
514	92	2000	2005
103	9	2002	2015
118	6	2006	2010
115	1	2004	2004

Program names:

3 - Atlantic Oceanographic and Meteorological Laboratory (AOML) South Florida Program Synoptic Shipboard Surveys[3]
103 - EPA STOrage and RETrieval Data Warehouse (STORET)/WQX[4]
115 - Environmental Monitoring Assessment Program[5]
118 - National Aquatic Resource Surveys, National Coastal Condition Assessment[6]

509 - SERC Water Quality Monitoring Network[7]
514 - Florida LAKEWATCH Program[8]
5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

Dissolved Oxygen - Discrete

Seasonal Kendall-Tau Trend Analysis

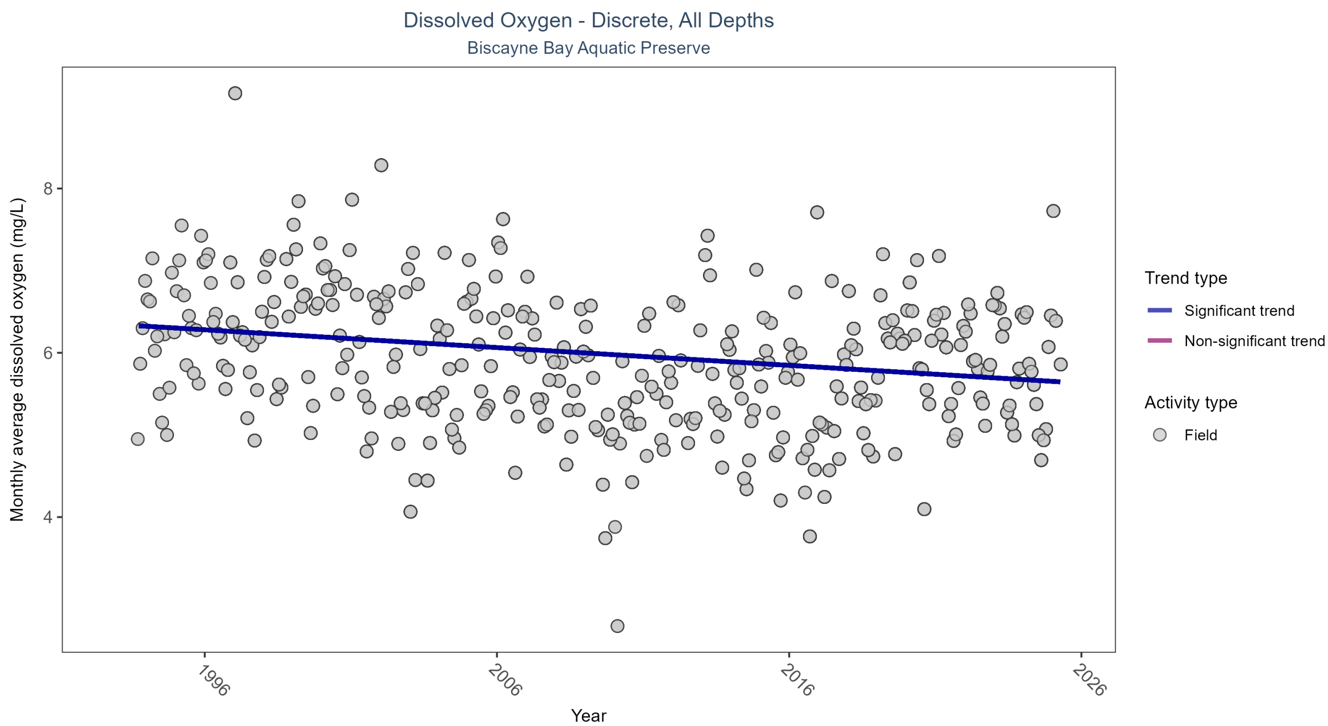

Figure 5: Scatter plot of monthly average dissolved oxygen over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only dissolved oxygen values measured in the field (circles) are included in the plot.

Table 10: 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	Significantly decreasing trend	21565	33	1993 - 2025	5.99	-0.2586	6.3449	-0.0216	0

Monthly average dissolved oxygen decreased by 0.02 mg/L per year.

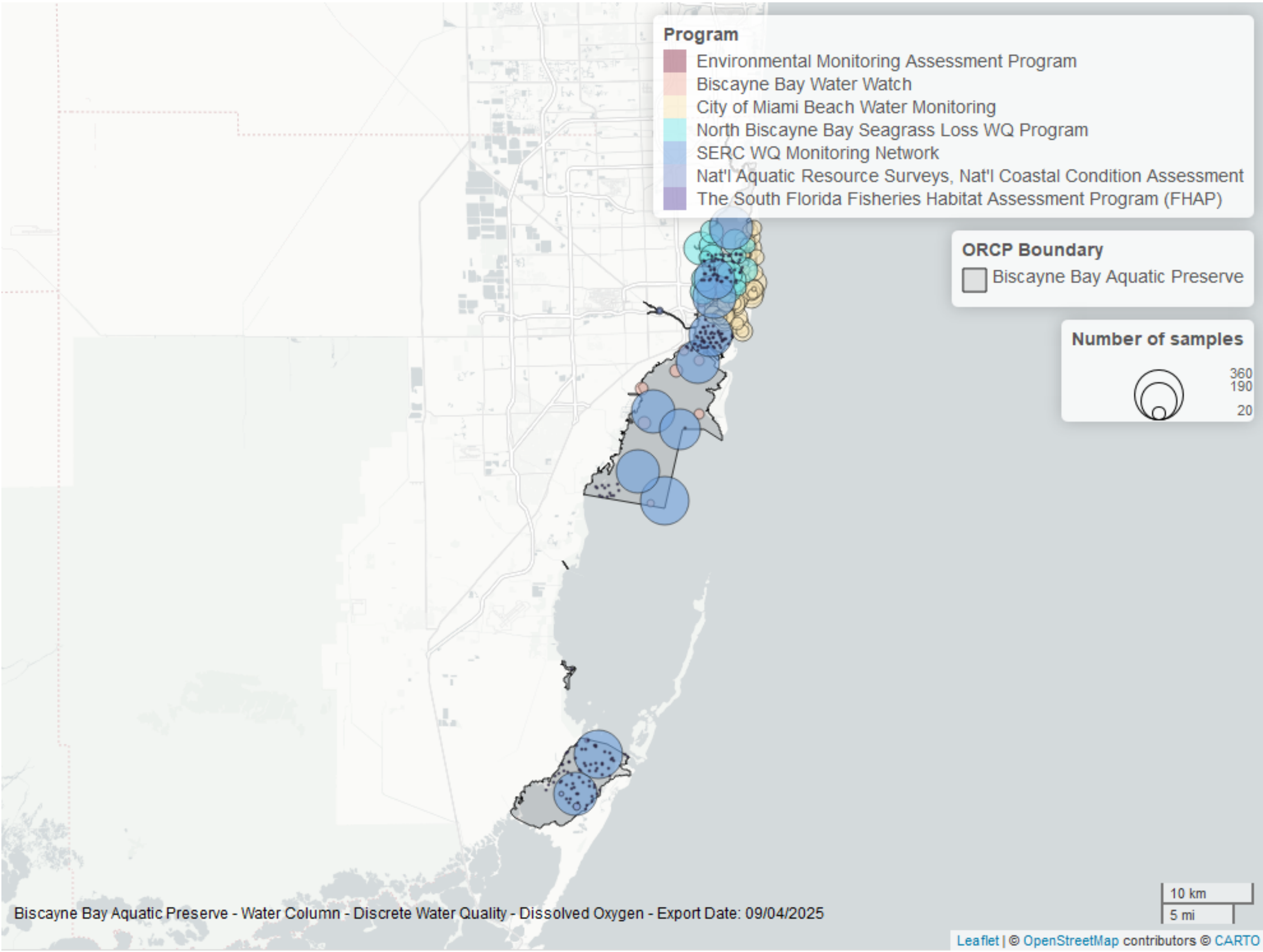

Figure 6: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 11: Programs contributing data for Dissolved Oxygen

ProgramID	*N_Data*	*YearMin*	*YearMax*
5002	14627	2001	2025
509	3316	1993	2008
4058	2638	2016	2024
5026	1698	2019	2025
4049	192	2006	2008
4057	166	2015	2019
118	28	2006	2020
103	15	2015	2015
115	3	2004	2004

Program names:

103 - EPA STOrage and RETrieval Data Warehouse (STORET)/WQX[4]
115 - Environmental Monitoring Assessment Program[5]
118 - National Aquatic Resource Surveys, National Coastal Condition Assessment[6]
509 - SERC Water Quality Monitoring Network[7]

4049 - The South Florida Fisheries Habitat Assessment Program (FHAP)[9]
4057 - Biscayne Bay Water Watch[10]
4058 - City of Miami Beach Water Monitoring[11]
5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

Dissolved Oxygen Saturation - Discrete

Seasonal Kendall-Tau Trend Analysis

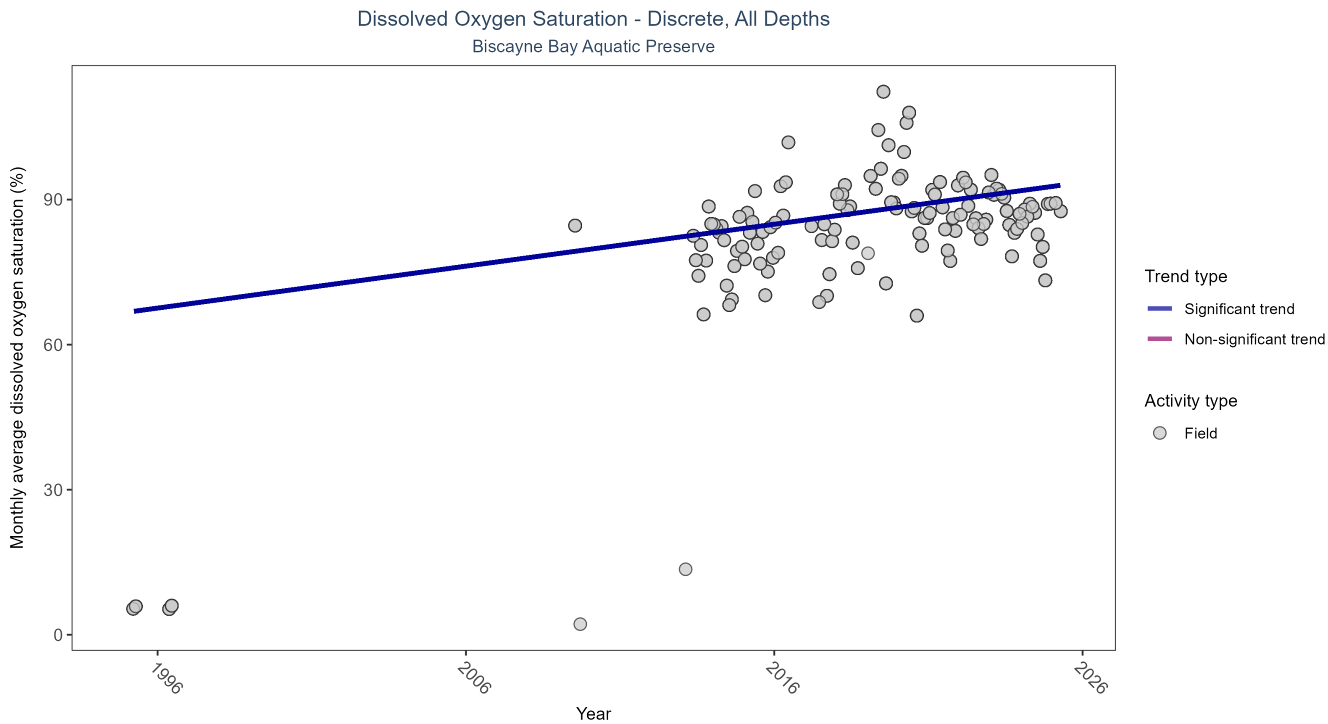

Figure 7: Scatter plot of monthly average dissolved oxygen saturation over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only dissolved oxygen saturation values measured in the field (circles)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

Table 12: 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	Significantly increasing trend	10503	16	1995 - 2025	90.4	0.3122	66.6945	0.8671	0

Monthly average dissolved oxygen saturation increased by 0.87% per year.

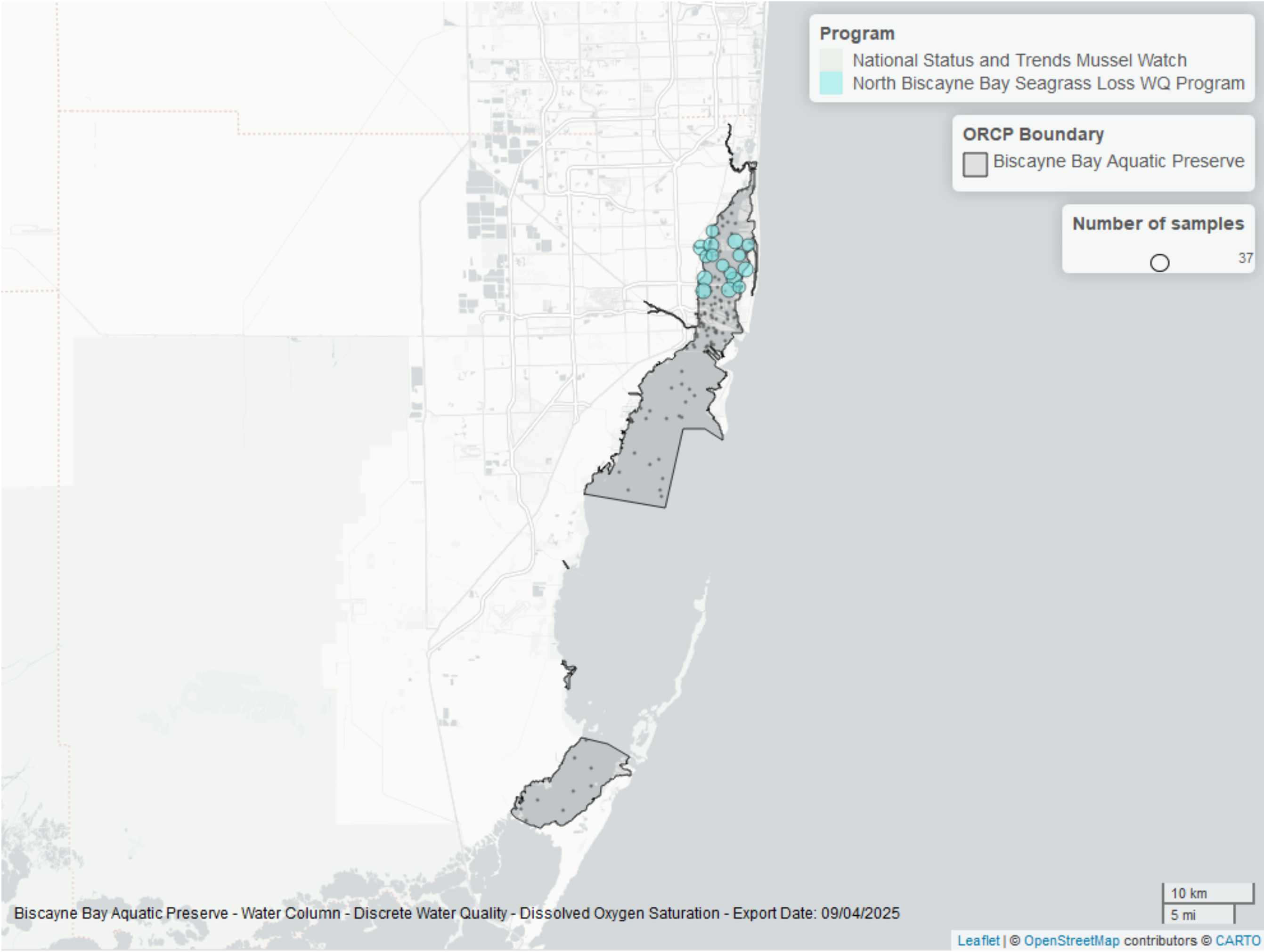

Figure 8: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 13: Programs contributing data for Dissolved Oxygen Saturation

ProgramID	*N_Data*	*YearMin*	*YearMax*
5002	9871	2009	2025
5026	474	2019	2020
102	259	1995	1996

Program names:

102 - National Status and Trends Mussel Watch[12]
5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

pH - Discrete

Seasonal Kendall-Tau Trend Analysis

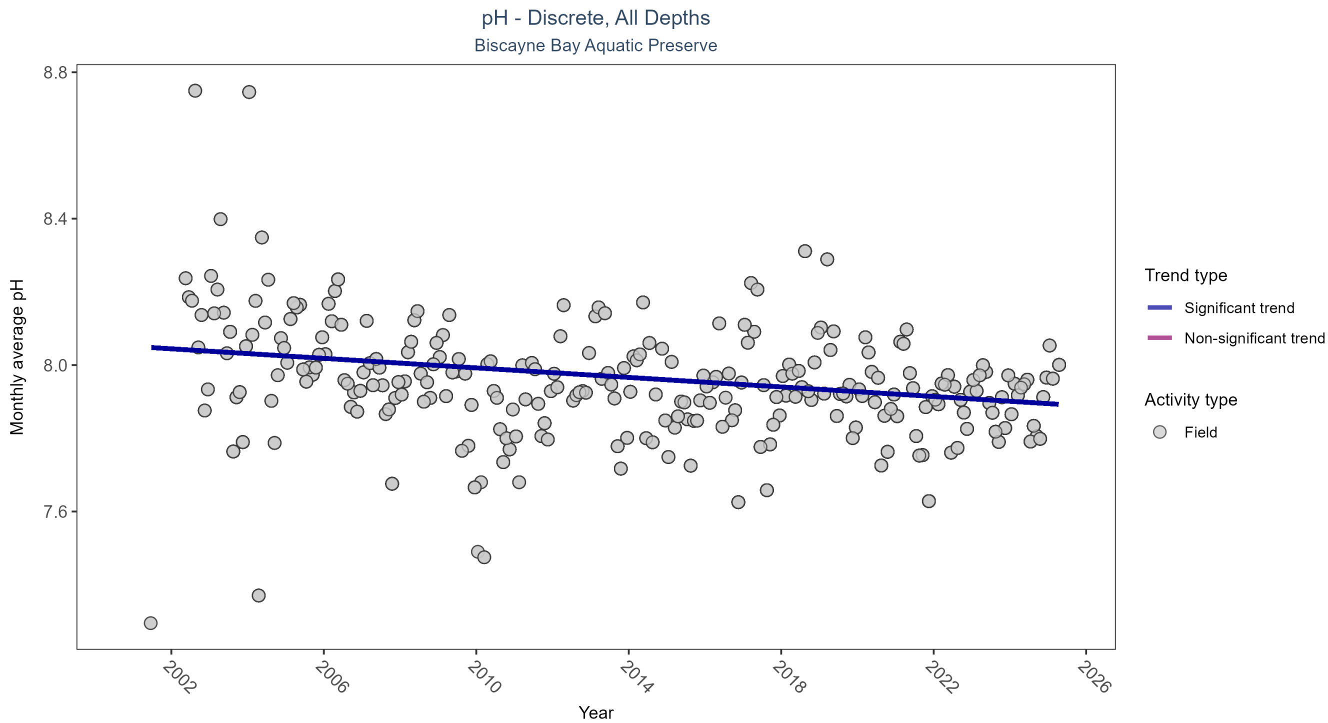

Figure 9: Scatter plot of monthly average pH over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only pH values measured in the field (circles) are included in the plot.

Table 14: 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	18459	25	2001 - 2025	7.96	-0.2805	8.051	-0.0065	0

Monthly average pH decreased by 0.01 pH units per year.

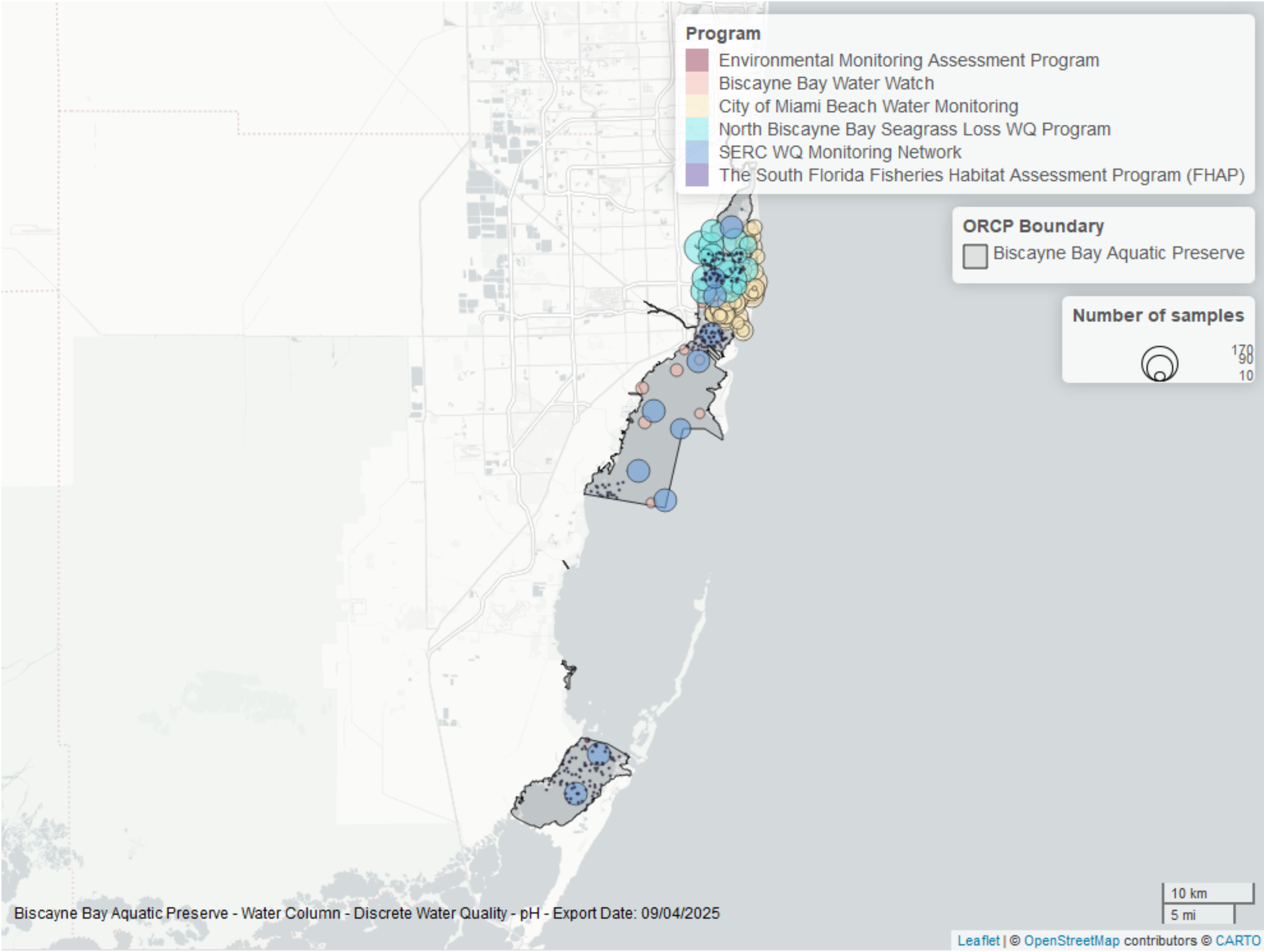

Figure 10: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 15: Programs contributing data for pH

ProgramID	*N_Data*	*YearMin*	*YearMax*
5002	13701	2001	2025
4058	2681	2016	2024
5026	1767	2019	2025
509	822	2002	2008
4049	247	2005	2008
4057	169	2015	2019
103	13	2015	2015
115	3	2004	2004

Program names:

103 - EPA STOrage and RETrieval Data Warehouse (STORET)/WQX[4]
115 - Environmental Monitoring Assessment Program[5]
509 - SERC Water Quality Monitoring Network[7]
4049 - The South Florida Fisheries Habitat Assessment Program (FHAP)[9]
4057 - Biscayne Bay Water Watch[10]

4058 - City of Miami Beach Water Monitoring[11]
5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

Salinity - Discrete

Seasonal Kendall-Tau Trend Analysis

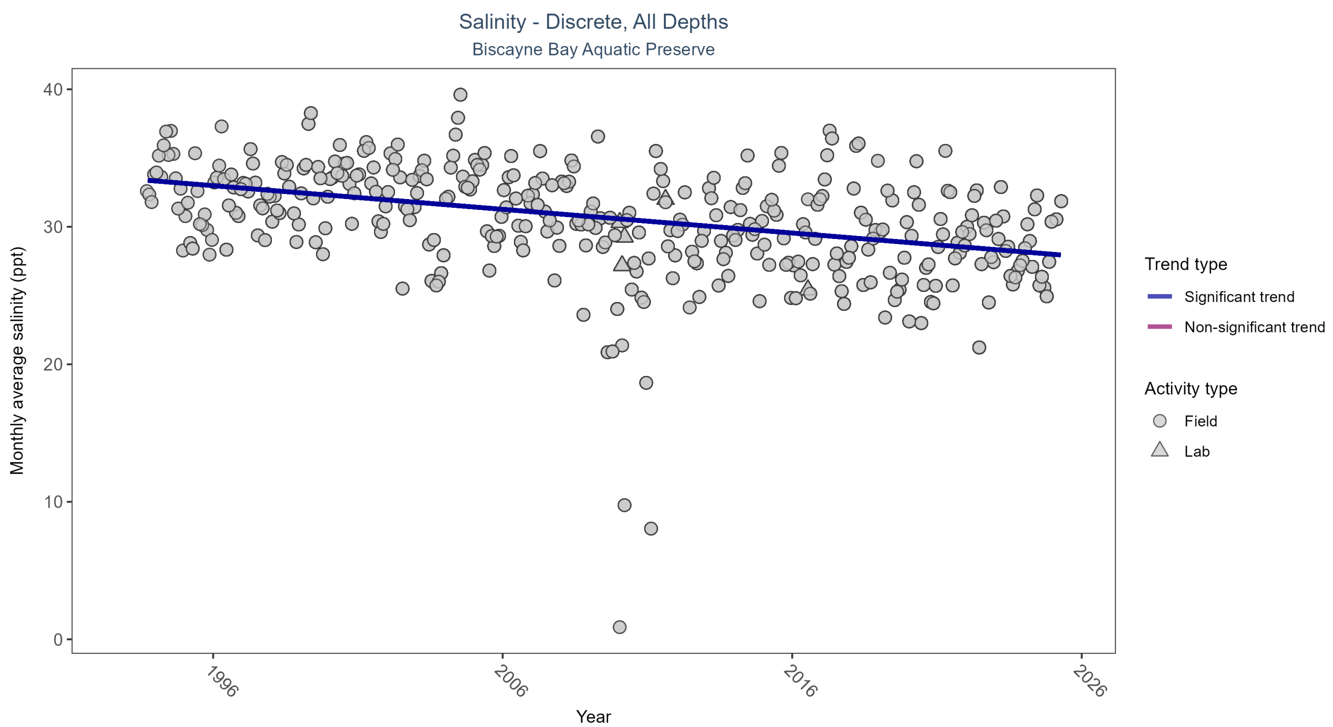

Figure 11: Scatter plot of monthly average salinity over time. If the time series included ten or more years of discrete observations, significant (blue) or non-significant (magenta) trend lines are also shown. Discrete salinity values derived from grab samples analyzed in the field (circles) or the laboratory (triangles) are both included in the plot.

Table 16: 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	Significantly decreasing trend	24920	33	1993 - 2025	32	-0.4054	33.5072	-0.1721	0

Monthly average salinity decreased by 0.17 ppt per year.

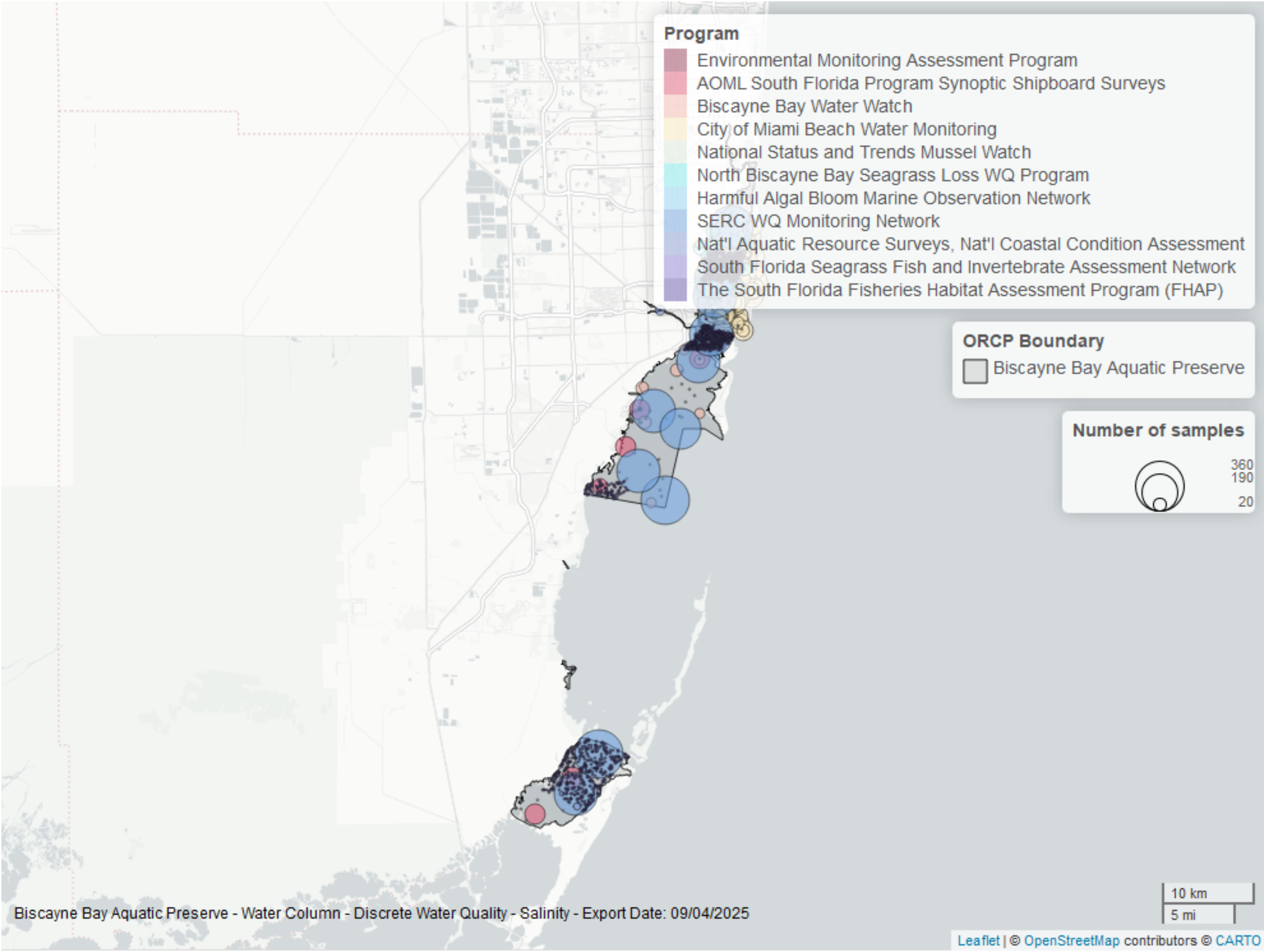

Figure 12: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 17: Programs contributing data for Salinity

ProgramID	*N_Data*	*YearMin*	*YearMax*
5002	14891	2003	2025
509	3316	1993	2008
4058	2676	2016	2024
965	2512	2005	2011
5026	438	2019	2024
3	392	2002	2012
4049	271	2005	2008
102	263	1995	1996
4057	171	2015	2019
118	29	2015	2020
95	7	2013	2013
115	3	2004	2004

Program names:

3 - Atlantic Oceanographic and Meteorological Laboratory (AOML) South Florida Program Synoptic Shipboard

Surveys[3]
95 - Harmful Algal Bloom Marine Observation Network[13]
102 - National Status and Trends Mussel Watch[12]
115 - Environmental Monitoring Assessment Program[5]
118 - National Aquatic Resource Surveys, National Coastal Condition Assessment[6]
509 - SERC Water Quality Monitoring Network[7]
965 - South Florida Seagrass Fish and Invertebrate Assessment Network[14]
4049 - The South Florida Fisheries Habitat Assessment Program (FHAP)[9]
4057 - Biscayne Bay Water Watch[10]
4058 - City of Miami Beach Water Monitoring[11]
5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

Secchi Depth - Discrete

Seasonal Kendall-Tau Trend Analysis

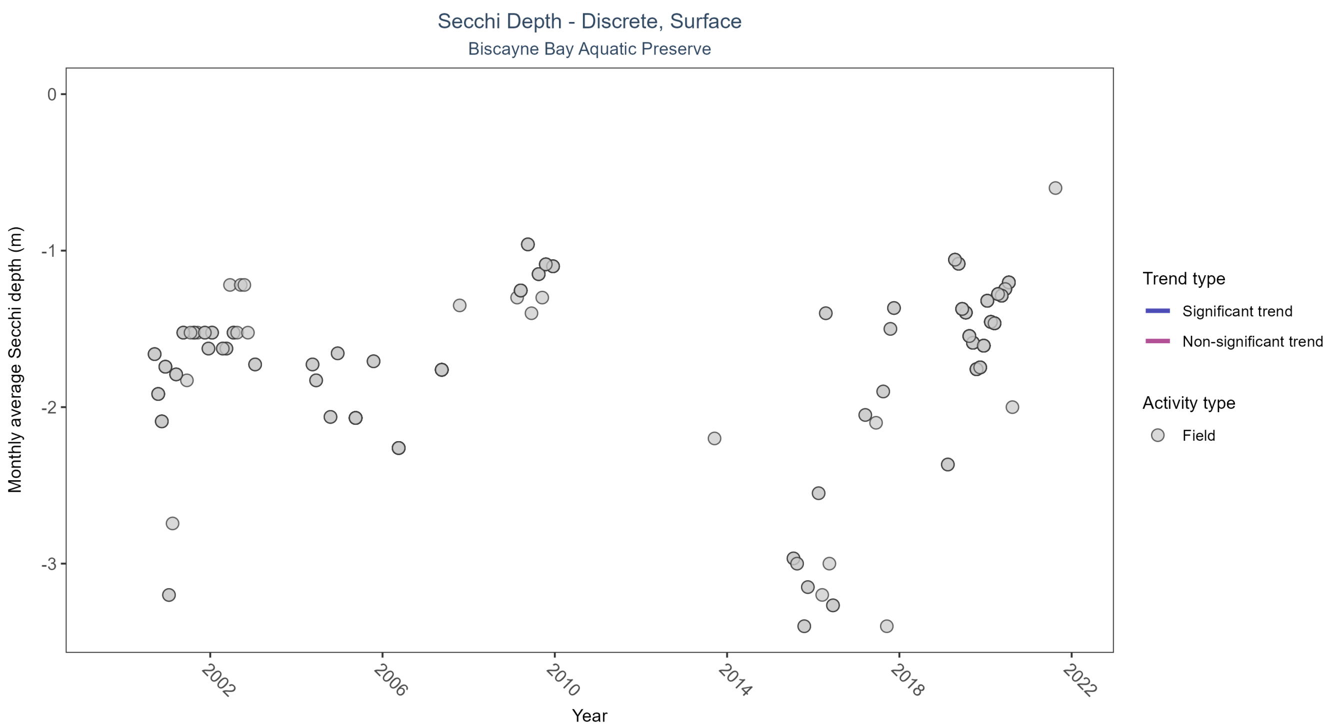

Figure 13: Scatter plot of monthly average Secchi depth over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Secchi depth is only measured in the field (circles).

Table 18: 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	No significant trend	687	19	2000 - 2022	-1.524	0.1156	-1.6676	0.0126	0.3365

Secchi depth showed no detectable trend between 2000 and 2022.

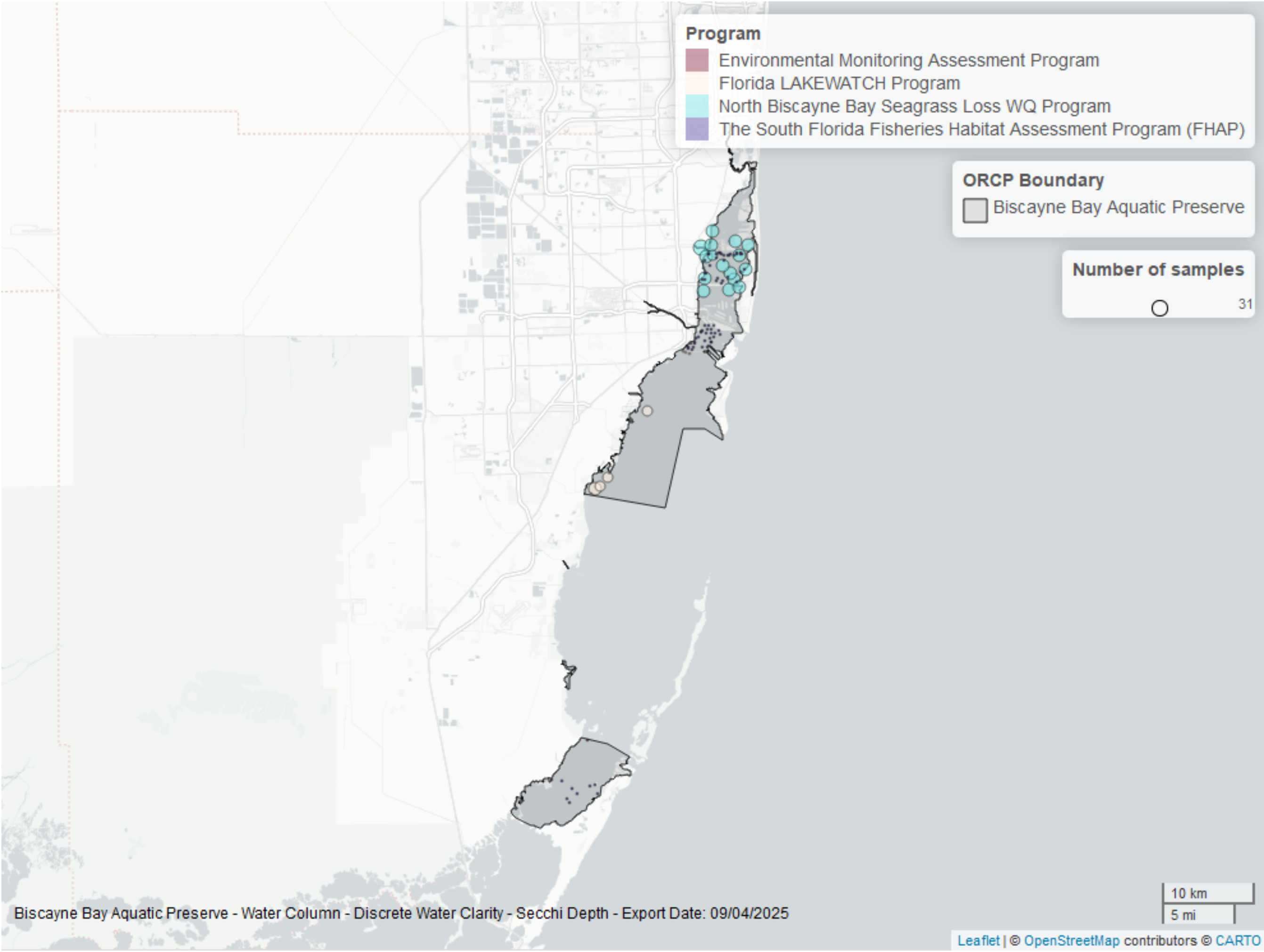

Figure 14: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 19: Programs contributing data for Secchi Depth

ProgramID	*N_Data*	*YearMin*	*YearMax*
5026	426	2019	2020
5002	101	2007	2022
514	86	2000	2005
4049	73	2005	2007
103	1	2015	2015
115	1	2004	2004

Program names:

103 - EPA STOrage and RETrieval Data Warehouse (STORET)/WQX[4]
115 - Environmental Monitoring Assessment Program[5]
514 - Florida LAKEWATCH Program[8]
4049 - The South Florida Fisheries Habitat Assessment Program (FHAP)[9]
5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

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 + NO3O2;
2) TN = TKN + NO3 + NO2;
3) TN = ORGN + NH4 + NO3O2;
4) TN = ORGN + NH4 + NO2 + NO3;
5) TN = TKN + NO3;
6) TN = ORGN + NH4 + NO3;

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 NO3O2 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_QAQCFlagCode = "1Q"
  - SEACAR_QAQC_Description = "SEACAR Calculated"

Seasonal Kendall-Tau Trend Analysis

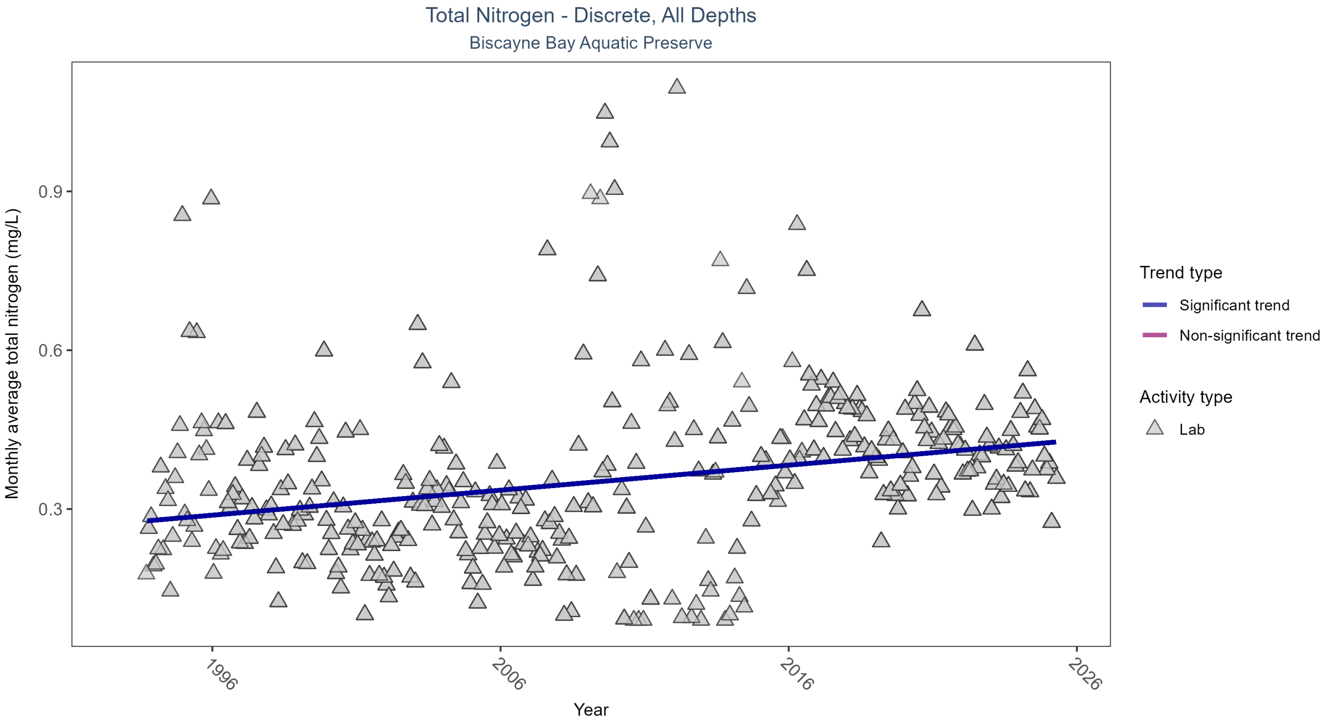

Figure 15: Scatter plot of monthly average total nitrogen over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only nitrogen values obtained from laboratory analyses (triangles) are included in the plot.

Table 20: 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	Significantly increasing trend	8525	33	1993 - 2025	0.333	0.2331	0.2742	0.0047	0

Monthly average total nitrogen increased by less than 0.01 mg/L per year.

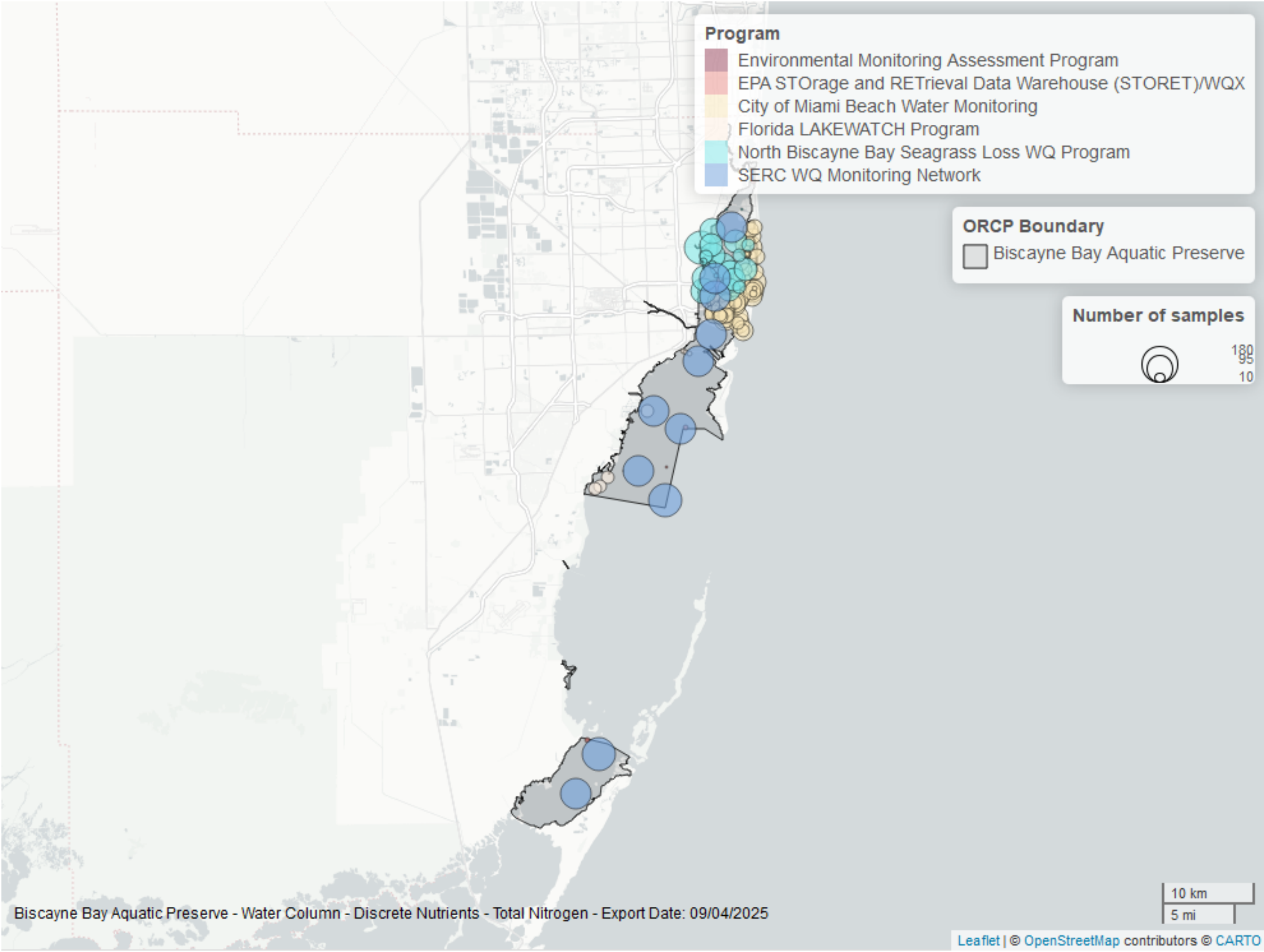

Figure 16: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 21: Programs contributing data for Total Nitrogen

ProgramID	*N_Data*	*YearMin*	*YearMax*
5002	2828	1994	2025
4058	2334	2016	2024
509	1654	1993	2008
5026	1644	2019	2025
514	104	2000	2005
103	17	2002	2006
115	1	2004	2004

Program names:

103 - EPA STOrage and RETrieval Data Warehouse (STORET)/WQX[4]
115 - Environmental Monitoring Assessment Program[5]
509 - SERC Water Quality Monitoring Network[7]
514 - Florida LAKEWATCH Program[8]
4058 - City of Miami Beach Water Monitoring[11]

5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

Total Phosphorus - Discrete

Seasonal Kendall-Tau Trend Analysis

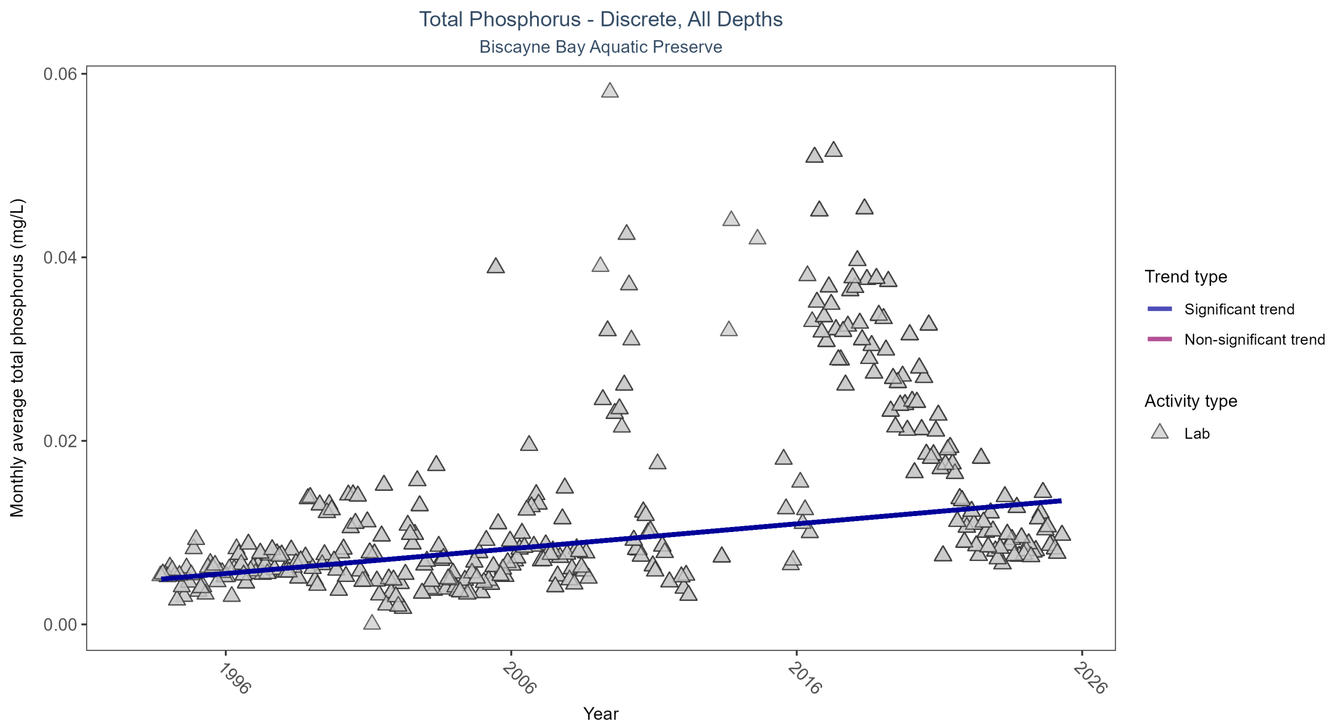

Figure 17: Scatter plot of monthly average total phosphorus over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only phosphorus values obtained from laboratory analyses (triangles) are included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

Table 22: 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 increasing trend	8640	33	1993 - 2025	0.009	0.376	0.0047	0.0003	0

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

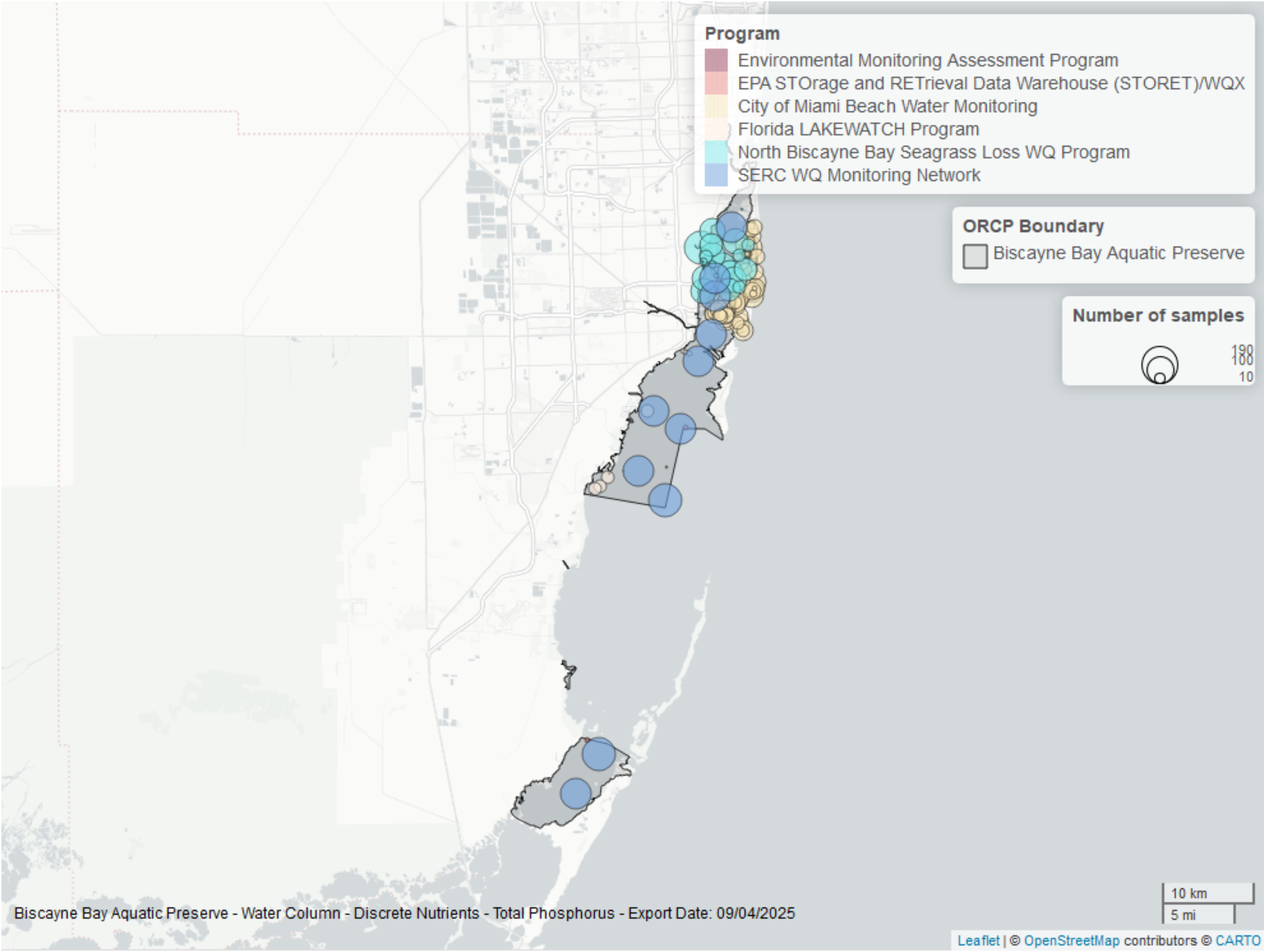

Figure 18: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 23: Programs contributing data for Total Phosphorus

ProgramID	*N_Data*	*YearMin*	*YearMax*
5002	2815	2001	2025
4058	2496	2016	2024
5026	1696	2019	2025
509	1655	1993	2008
514	103	2000	2005
103	15	2002	2015
115	1	2004	2004

Program names:

103 - EPA STOrage and RETrieval Data Warehouse (STORET)/WQX[4]
115 - Environmental Monitoring Assessment Program[5]
509 - SERC Water Quality Monitoring Network[7]
514 - Florida LAKEWATCH Program[8]
4058 - City of Miami Beach Water Monitoring[11]

5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

Total Suspended Solids - Discrete

Seasonal Kendall-Tau Trend Analysis

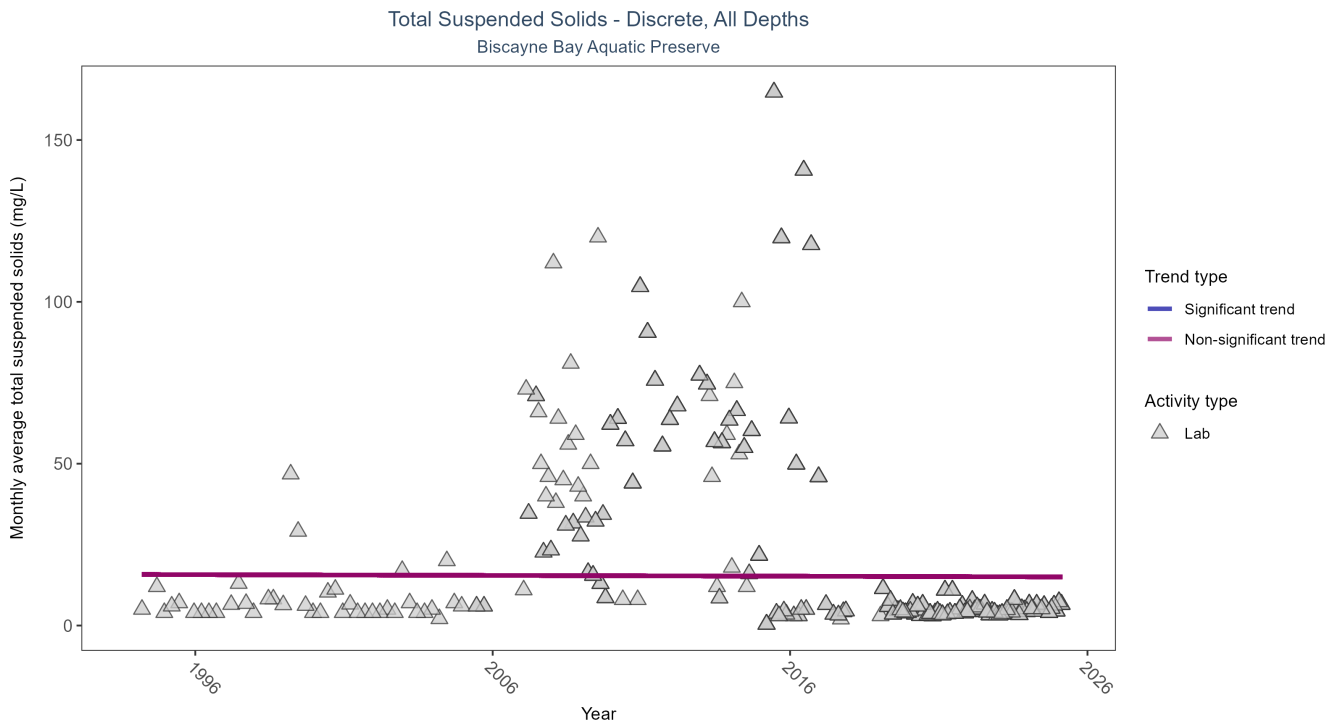

Figure 19: Scatter plot of monthly average total suspended solids (TSS) over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only TSS values obtained from laboratory analyses (triangles) are included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

Table 24: 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	2462	30	1994 - 2025	5	-0.1247	15.7686	-0.0238	0.4603

Total suspended solids showed no detectable trend between 1994 and 2025.

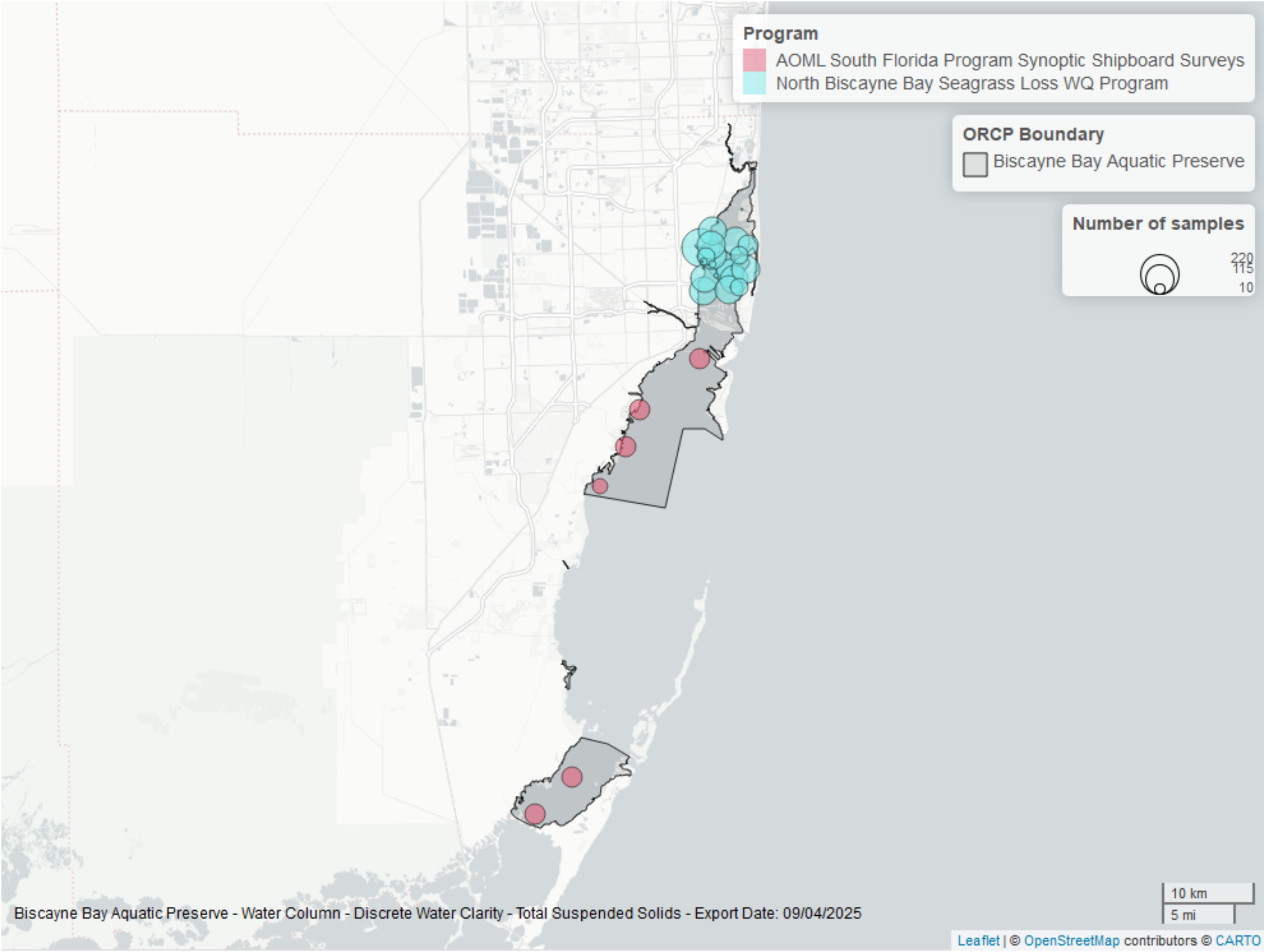

Figure 20: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 25: Programs contributing data for Total Suspended Solids

ProgramID	*N_Data*	*YearMin*	*YearMax*
5026	2161	2019	2025
5002	1219	1994	2024
3	370	2002	2012

Program names:

3 - Atlantic Oceanographic and Meteorological Laboratory (AOML) South Florida Program Synoptic Shipboard Surveys[3]
5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

Turbidity - Discrete

Seasonal Kendall-Tau Trend Analysis

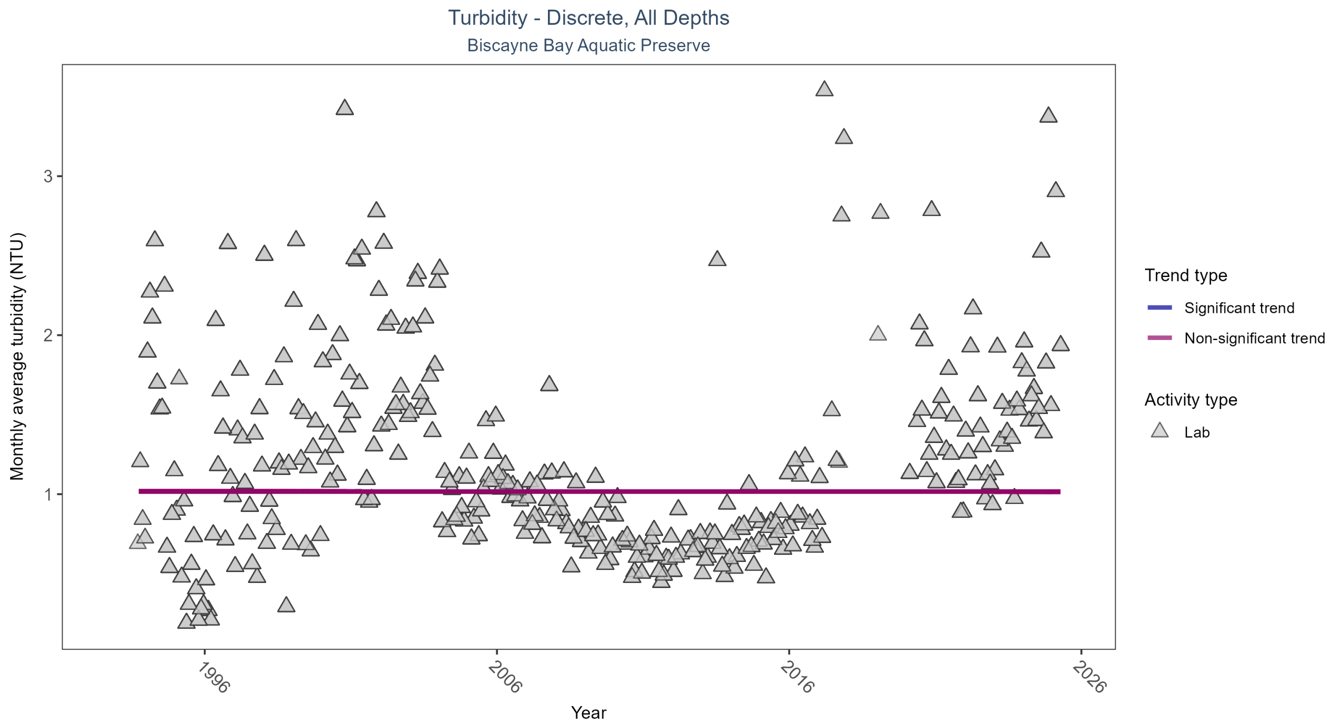

Figure 21: Scatter plot of monthly average turbidity over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only turbidity values measured in the laboratory (triangles) are included in the plot.

Table 26: 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	No significant trend	12092	32	1993 - 2025	0.8	-0.0011	1.0171	0	0.9956

Turbidity showed no detectable trend between 1993 and 2025.

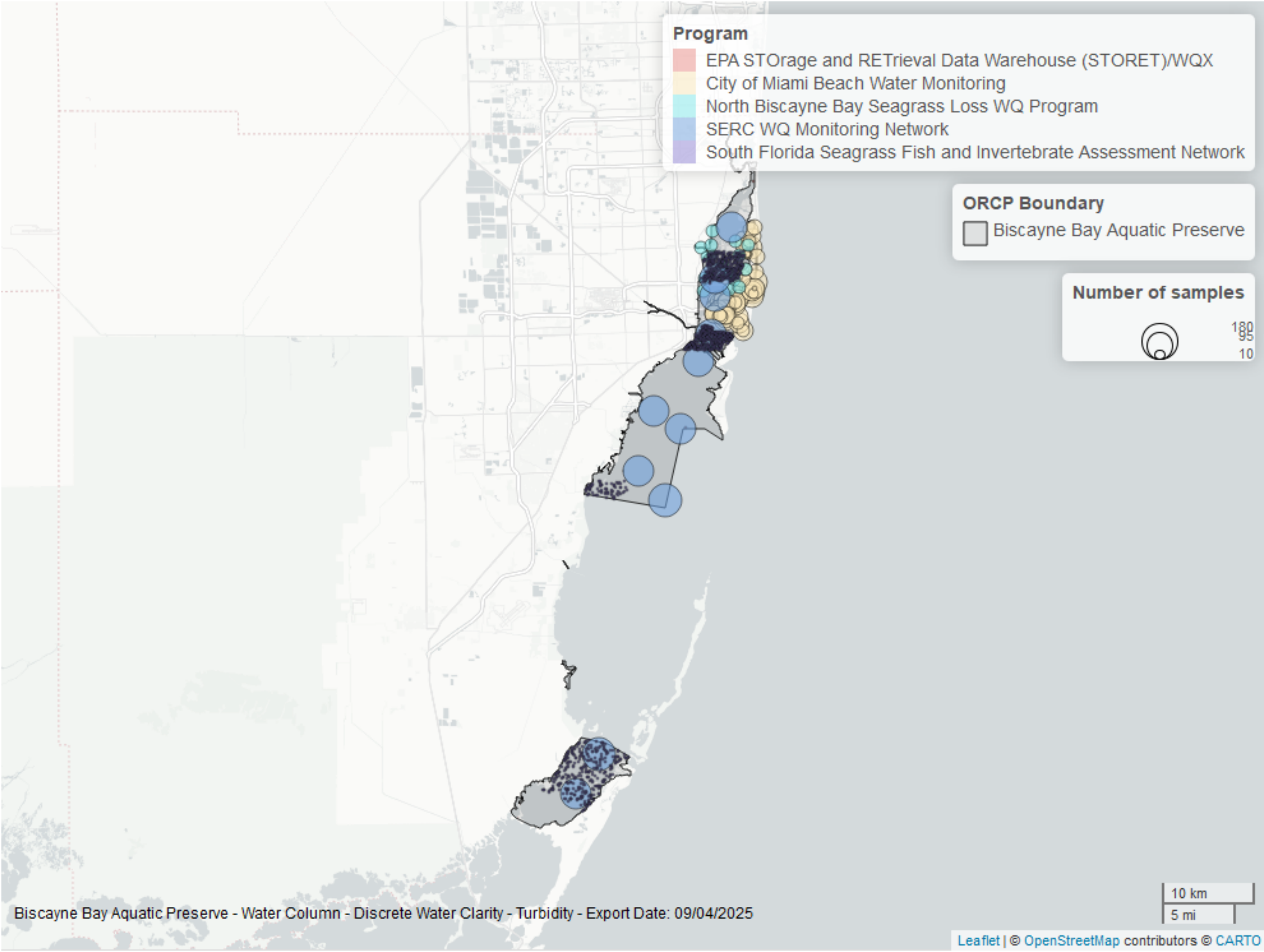

Figure 22: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 27: Programs contributing data for Turbidity

ProgramID	*N_Data*	*YearMin*	*YearMax*
5002	11295	1994	2025
4058	2682	2016	2024
509	1658	1993	2008
965	1254	2005	2011
5026	410	2019	2020
103	4	2006	2006

Program names:

103 - EPA STOrage and RETrieval Data Warehouse (STORET)/WQX[4]
509 - SERC Water Quality Monitoring Network[7]
965 - South Florida Seagrass Fish and Invertebrate Assessment Network[14]
4058 - City of Miami Beach Water Monitoring[11]
5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

Water Temperature - Discrete

Seasonal Kendall-Tau Trend Analysis

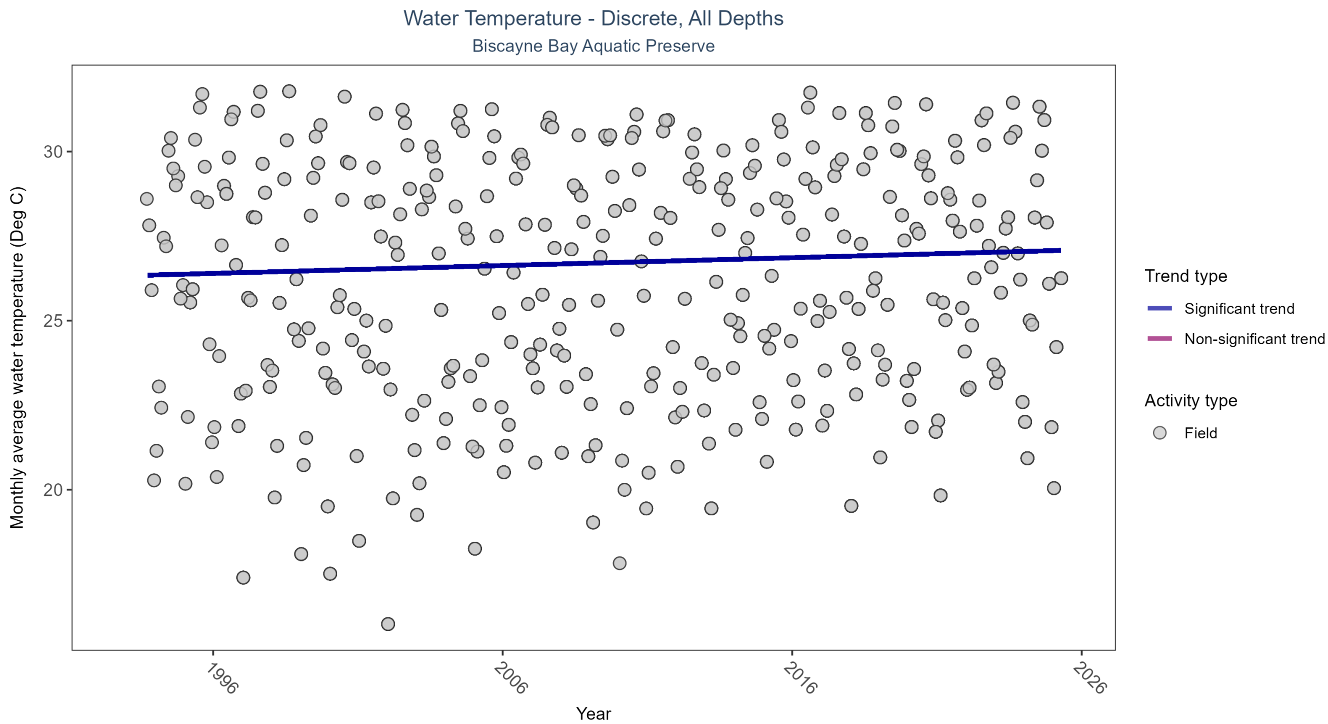

Figure 23: Scatter plot of monthly average water temperature over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only water temperature measurements taken in the field (circles) are included in the plot.

Table 28: 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	Significantly increasing trend	25176	33	1993 - 2025	27	0.118	26.3264	0.0232	0.0012

Monthly average water temperature increased by 0.02°C per year.

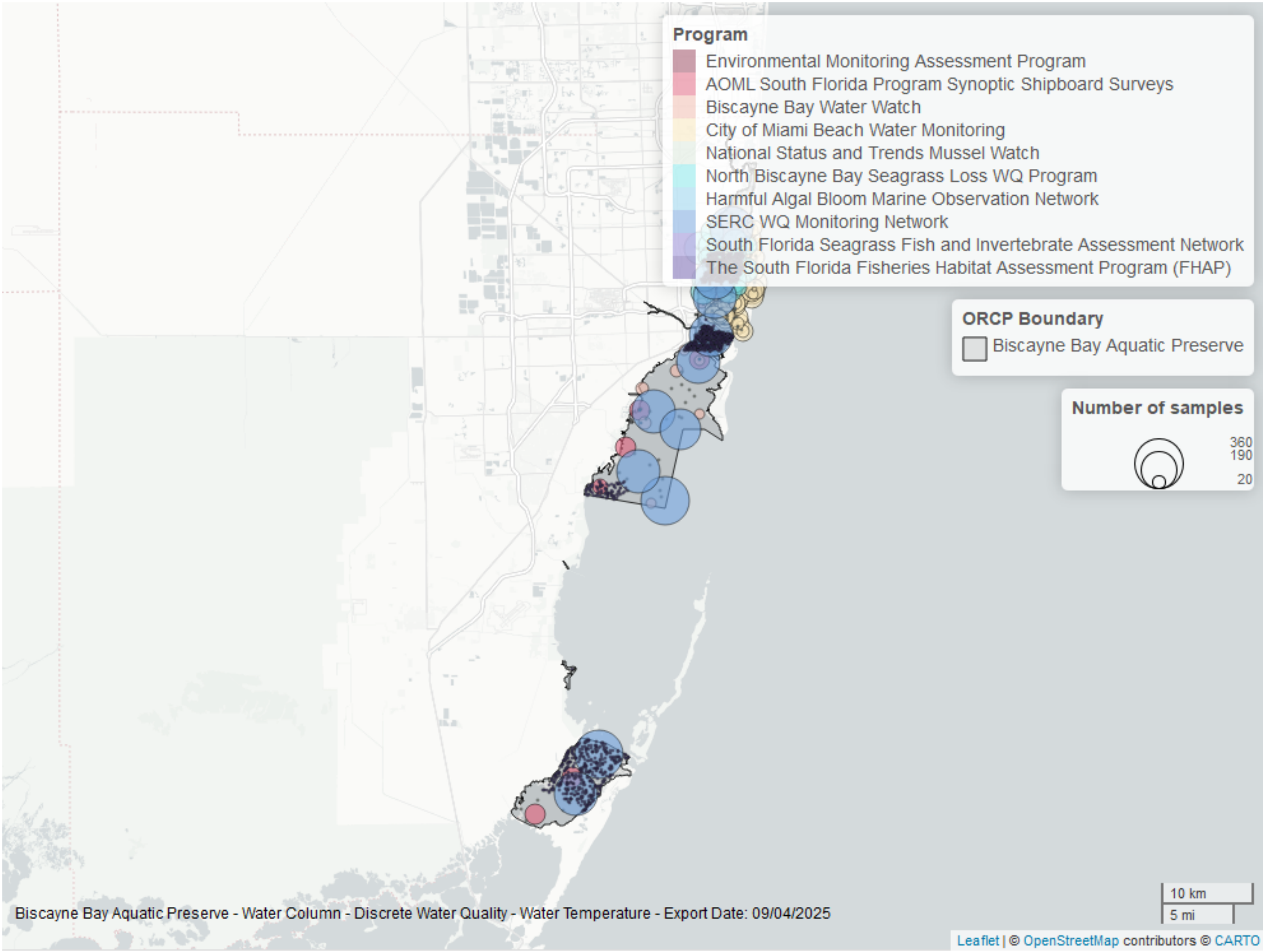

Figure 24: Map showing location of discrete water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Table 29: Programs contributing data for Water Temperature

ProgramID	*N_Data*	*YearMin*	*YearMax*
5002	14585	2001	2025
509	3316	1993	2008
4058	2667	2016	2024
965	2512	2005	2011
5026	1774	2019	2025
3	392	2002	2012
4049	271	2005	2008
102	263	1995	1996
4057	168	2015	2019
95	9	2012	2015
115	3	2004	2004

Program names:

3 - Atlantic Oceanographic and Meteorological Laboratory (AOML) South Florida Program Synoptic Shipboard Surveys[3]

95 - Harmful Algal Bloom Marine Observation Network[13]
102 - National Status and Trends Mussel Watch[12]
115 - Environmental Monitoring Assessment Program[5]
509 - SERC Water Quality Monitoring Network[7]
965 - South Florida Seagrass Fish and Invertebrate Assessment Network[14]
4049 - The South Florida Fisheries Habitat Assessment Program (FHAP)[9]
4057 - Biscayne Bay Water Watch[10]
4058 - City of Miami Beach Water Monitoring[11]
5002 - Florida STORET / WIN[1]
5026 - North Biscayne Bay Seagrass Loss Water Quality Program[2]

Water Quality - Continuous

The following files were used in the continuous analysis:

- *Combined_WQ_WC_NUT_cont_Dissolved_Oxygen_SE-2025-Sep-19.txt*
- *Combined_WQ_WC_NUT_cont_Dissolved_Oxygen_Saturation_SE-2025-Sep-19.txt*
- *Combined_WQ_WC_NUT_cont_pH_SE-2025-Sep-19.txt*
- *Combined_WQ_WC_NUT_cont_Salinity_SE-2025-Sep-19.txt*
- *Combined_WQ_WC_NUT_cont_Turbidity_SE-2025-Sep-19.txt*
- *Combined_WQ_WC_NUT_cont_Water_Temperature_SE-2025-Sep-19.txt*

Continuous monitoring locations in Biscayne Bay Aquatic Preserve

Table 30: Station overview for Continuous parameters by Program

ProgramID	*ProgramLocationID*	*Years of Data*	*Use in Analysis*	*Parameters*
5077	BBBB14	7	TRUE	DO , DOS , pH , Sal , Turb , TempW
5077	BBCWA4	4	FALSE	DO , DOS , pH , Sal , Turb , TempW
5077	BBJT71	7	TRUE	DO , DOS , pH , Sal , Turb , TempW
5077	BBLR03	6	TRUE	DO , DOS
5077	BBLR03	7	TRUE	pH , Sal , Turb , TempW
5077	BBMRDW	5	TRUE	DO , DOS , pH , Sal , Turb , TempW
5077	BBMRRB	4	FALSE	DO , DOS , pH , Sal , Turb , TempW

Program names:

5077 - Biscayne Bay Aquatic Preserves Continuous Water Quality Monitoring[15]

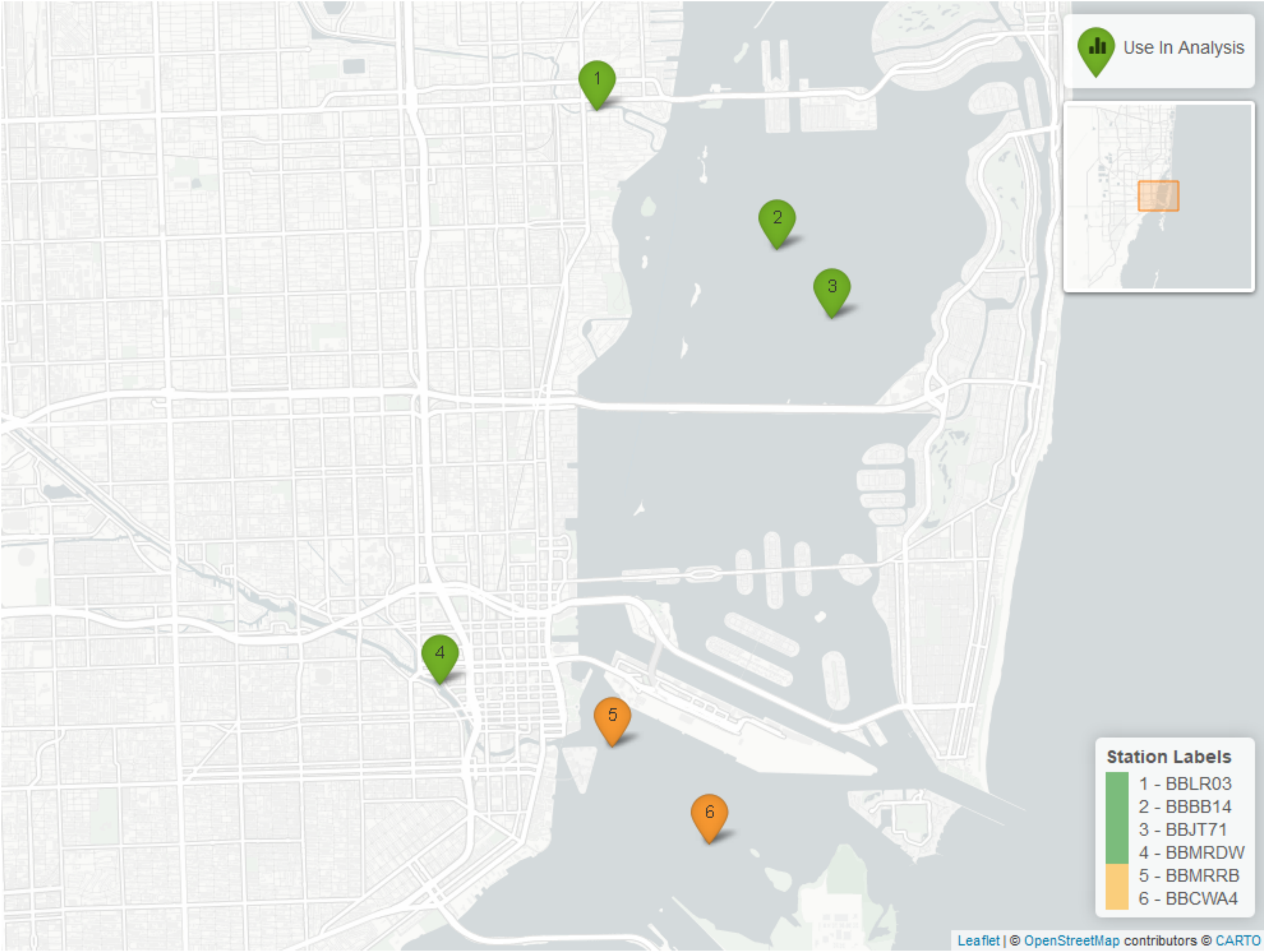

Figure 25: Map showing continuous water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. Sites marked as *Use In Analysis* (green) are featured in this report.

Dissolved Oxygen - Continuous

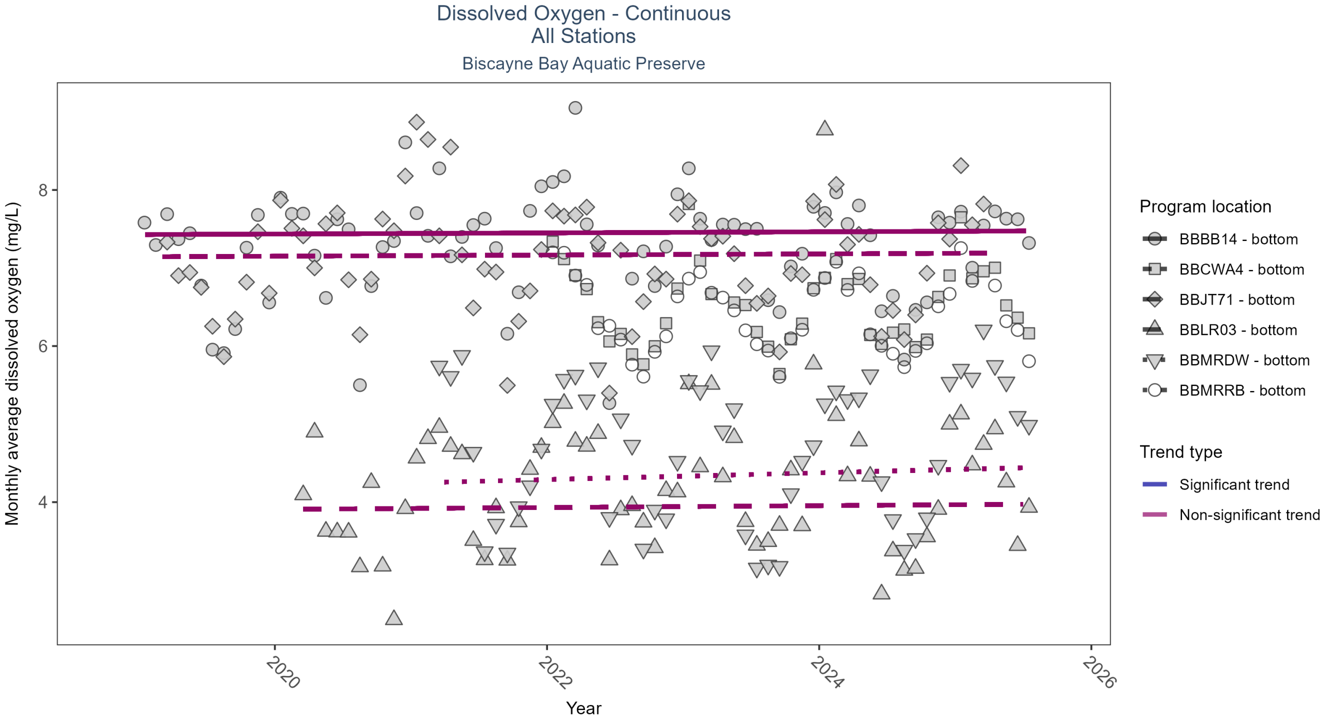

Figure 26: Scatter plot of monthly average dissolved oxygen over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 31: 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
BBBB14	No significant trend	200944	7	2019 - 2025	7.2	0.03	7.43	0.01	0.67
BBCWA4	Insufficient data to calculate trend	108422	4	2022 - 2025	6.5	-	-	-	-
BBLR03	No significant trend	171094	6	2020 - 2025	4.2	0.05	3.91	0.01	0.71
BBJT71	No significant trend	207039	7	2019 - 2025	7.0	0.06	7.14	0.01	0.56
BBMRRB	Insufficient data to calculate trend	112164	4	2022 - 2025	6.4	-	-	-	-
BBMRDW	No significant trend	142811	5	2021 - 2025	4.8	0.12	4.25	0.04	0.45

No detectable change in monthly average dissolved oxygen was observed at four locations. There was insufficient data to fit a model for two locations.

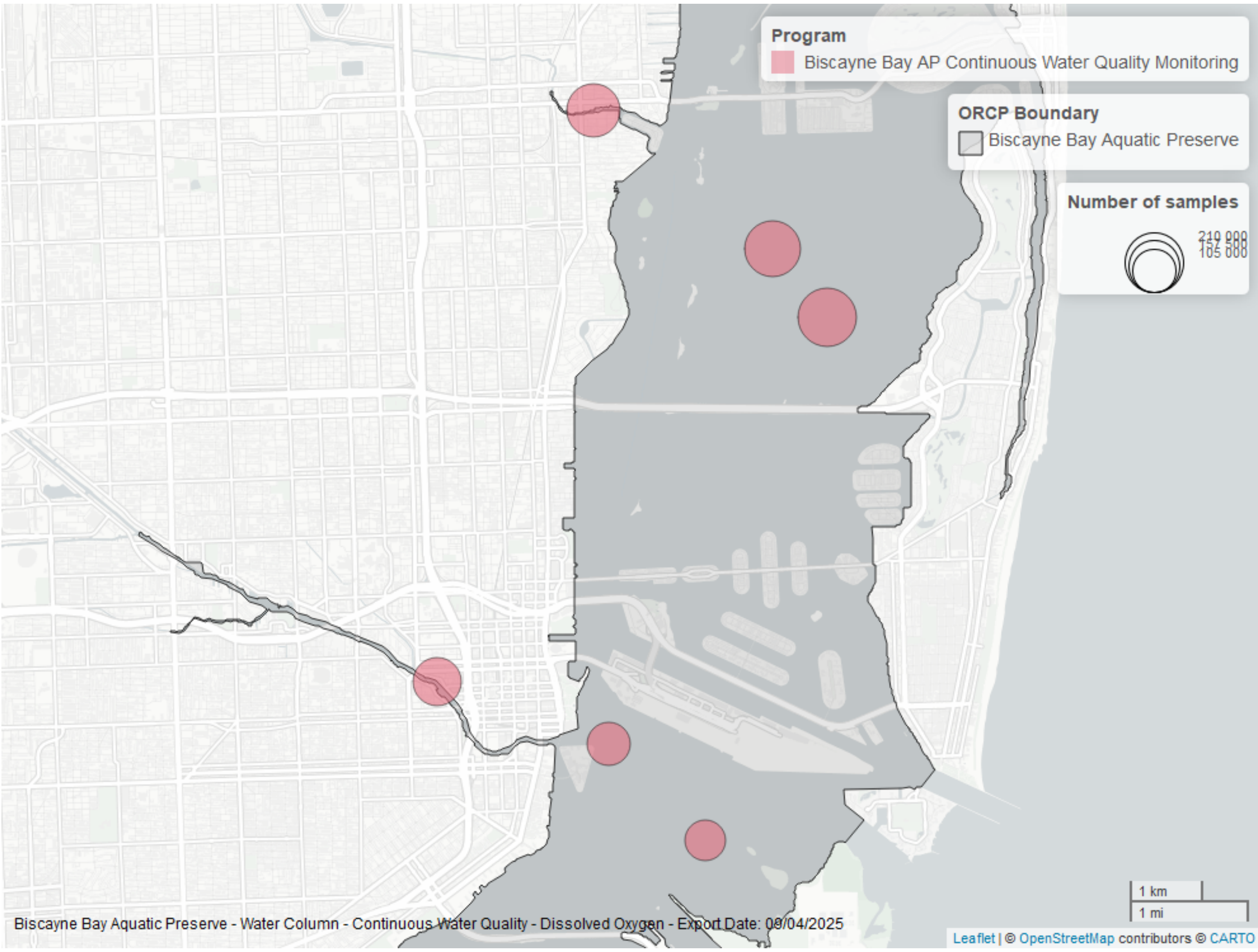

Figure 27: Map showing location of dissolved oxygen continuous water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Dissolved Oxygen Saturation - Continuous

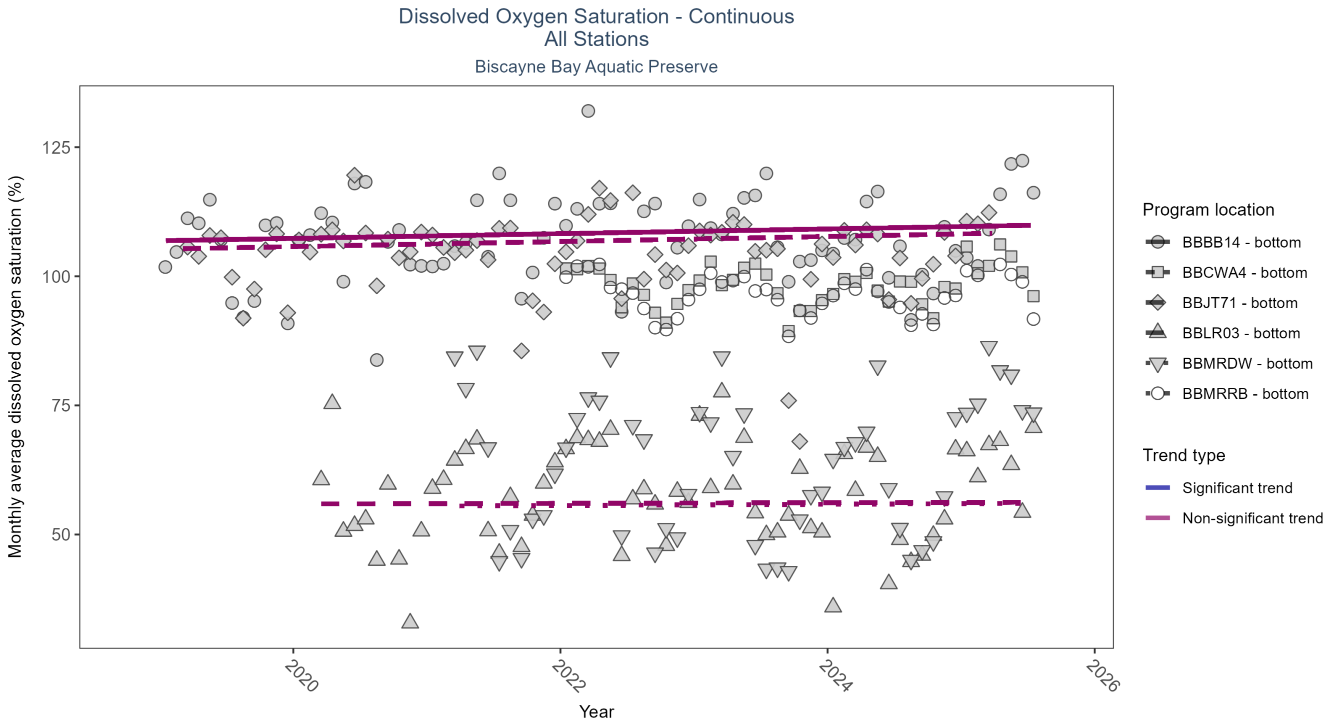

Figure 28: Scatter plot of monthly average dissolved oxygen saturation over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 32: 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
BBBB14	No significant trend	200684	7	2019 - 2025	104.9	0.1	106.88	0.46	0.27
BBCWA4	Insufficient data to calculate trend	112145	4	2022 - 2025	97.8	-	-	-	-
BBJT71	No significant trend	208190	7	2019 - 2025	102.0	0.13	105.26	0.49	0.19
BBLR03	No significant trend	171093	6	2020 - 2025	58.0	0.02	55.91	0.06	0.9
BBMRDW	No significant trend	142812	5	2021 - 2025	62.6	0.02	55.49	0.12	0.93
BBMRRB	Insufficient data to calculate trend	112172	4	2022 - 2025	96.0	-	-	-	-

No detectable change in monthly average dissolved oxygen saturation was observed at four locations. There was insufficient data to fit a model for two locations.

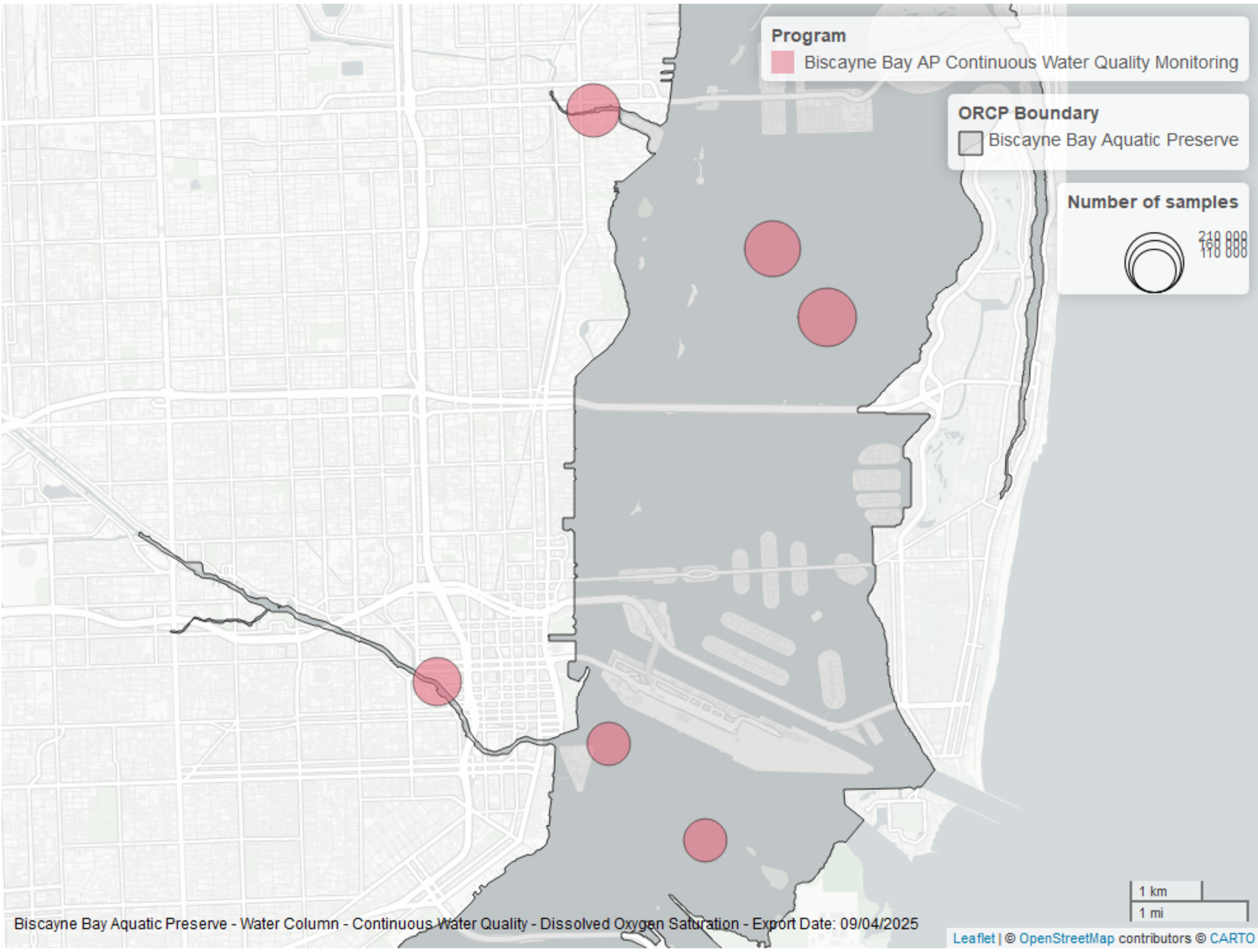

Figure 29: Map showing location of dissolved oxygen saturation continuous water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

pH - Continuous

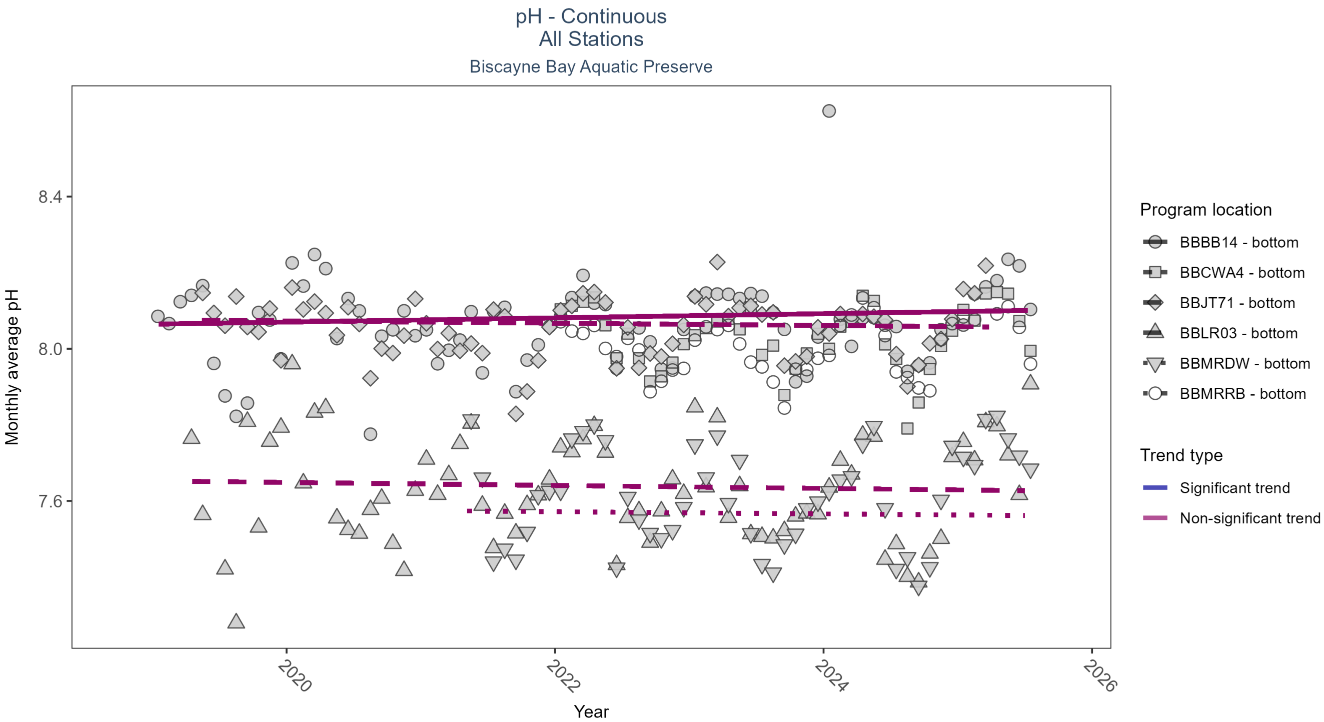

Figure 30: Scatter plot of monthly average pH over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 33: 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
BBBB14	No significant trend	196871	7	2019 - 2025	8.1	0.1	8.06	0.01	0.31
BBCWA4	Insufficient data to calculate trend	112102	4	2022 - 2025	8.0	-	-	-	-
BBLR03	No significant trend	186604	7	2019 - 2025	7.6	-0.08	7.65	0	0.58
BBJT71	No significant trend	195449	7	2019 - 2025	8.1	-0.07	8.08	0	0.51
BBMRRB	Insufficient data to calculate trend	112216	4	2022 - 2025	8.0	-	-	-	-
BBMRDW	No significant trend	137864	5	2021 - 2025	7.6	-0.06	7.57	0	0.79

No detectable change in monthly average pH was observed at four locations. There was insufficient data to fit a model for two locations.

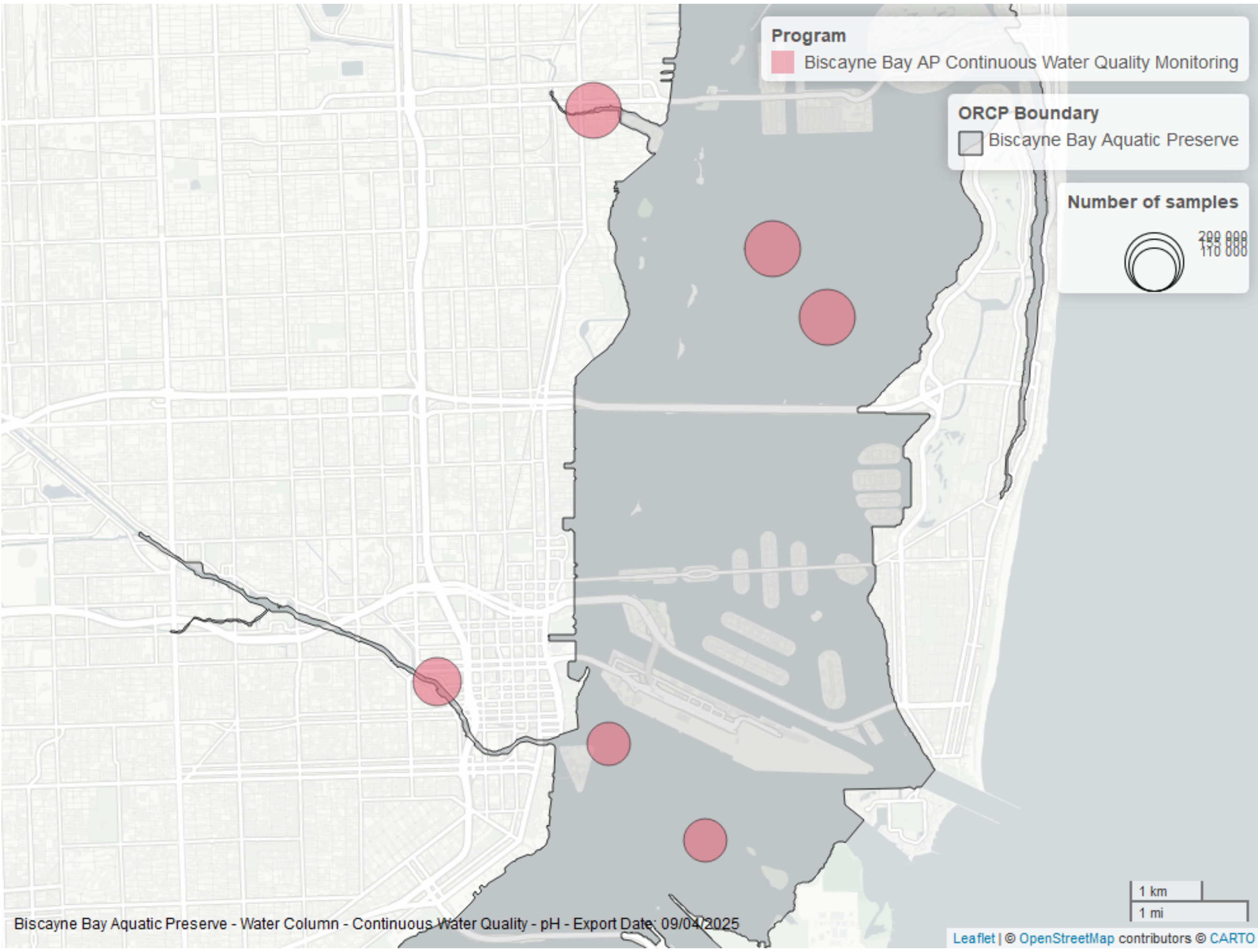

Figure 31: Map showing location of ph continuous water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Salinity - Continuous

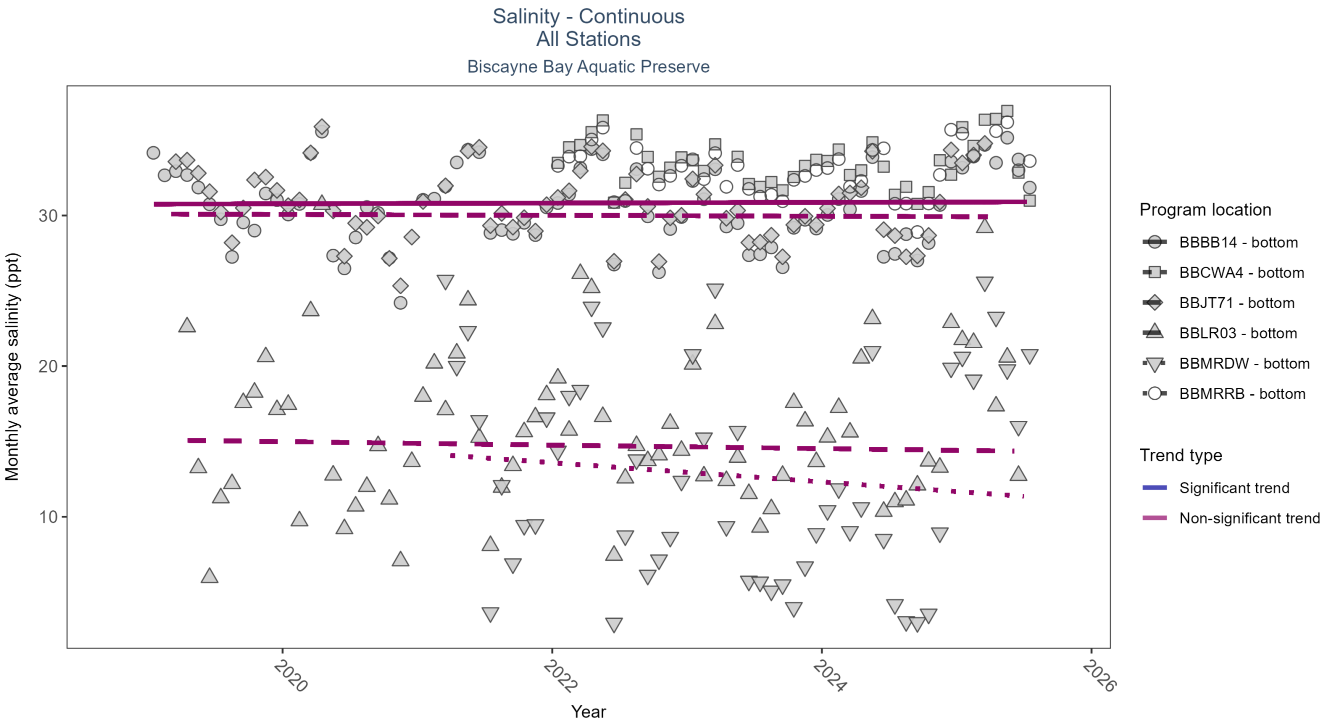

Figure 32: Scatter plot of monthly average salinity over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 34: 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
BBBB14	No significant trend	190558	7	2019 - 2025	30.6	0.01	30.76	0.02	0.92
BBCWA4	Insufficient data to calculate trend	106537	4	2022 - 2025	33.6	-	-	-	-
BBLR03	No significant trend	188602	7	2019 - 2025	18.4	-0.05	15.1	-0.12	0.72
BBJT71	No significant trend	193275	7	2019 - 2025	31.0	-0.02	30.1	-0.03	0.87
BBMRDW	No significant trend	140940	5	2021 - 2025	10.7	-0.23	14.22	-0.64	0.16
BBMRRB	Insufficient data to calculate trend	112172	4	2022 - 2025	33.2	-	-	-	-

No detectable change in monthly average salinity was observed at four locations. There was insufficient data to fit a model for two locations.

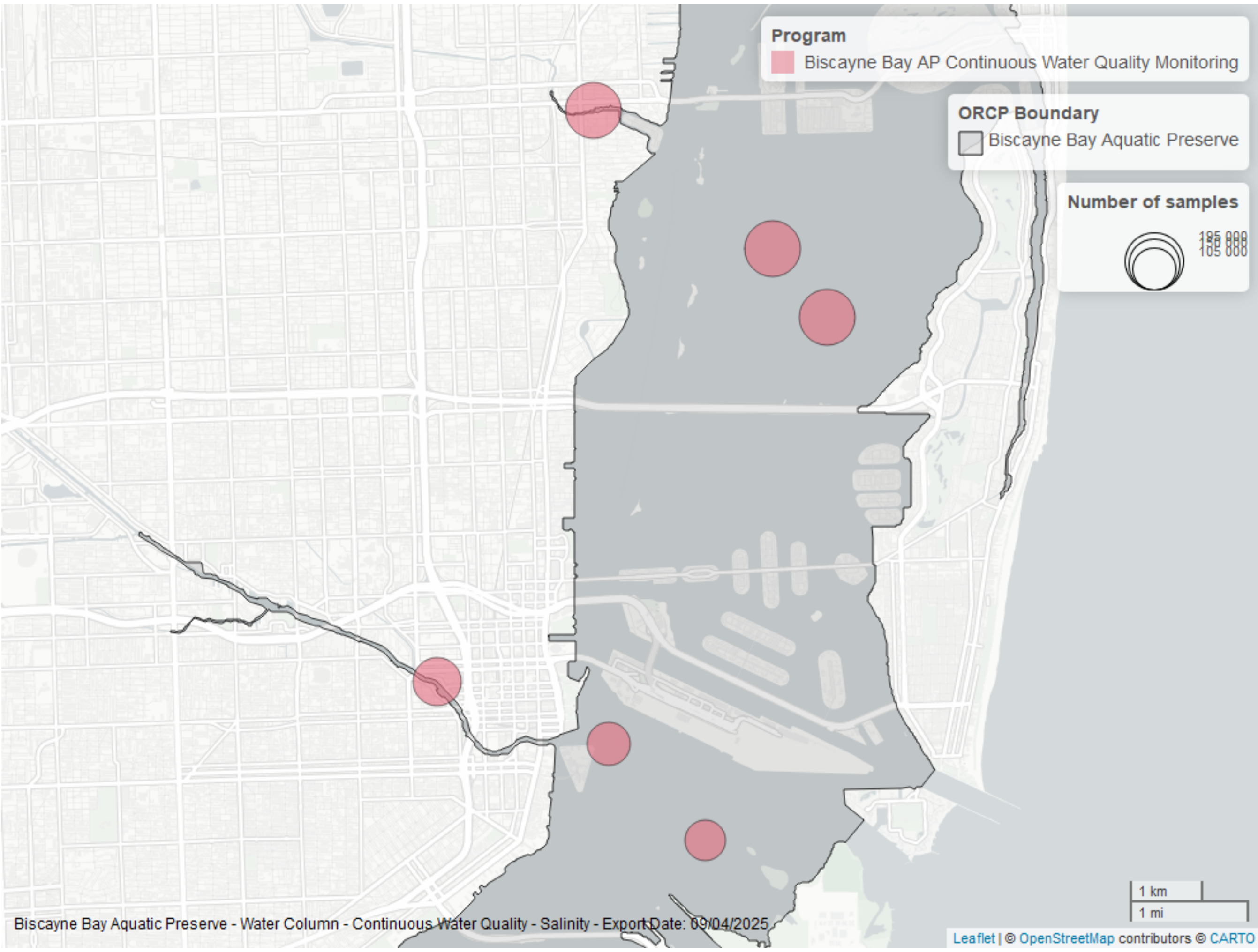

Figure 33: Map showing location of salinity continuous water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Turbidity - Continuous

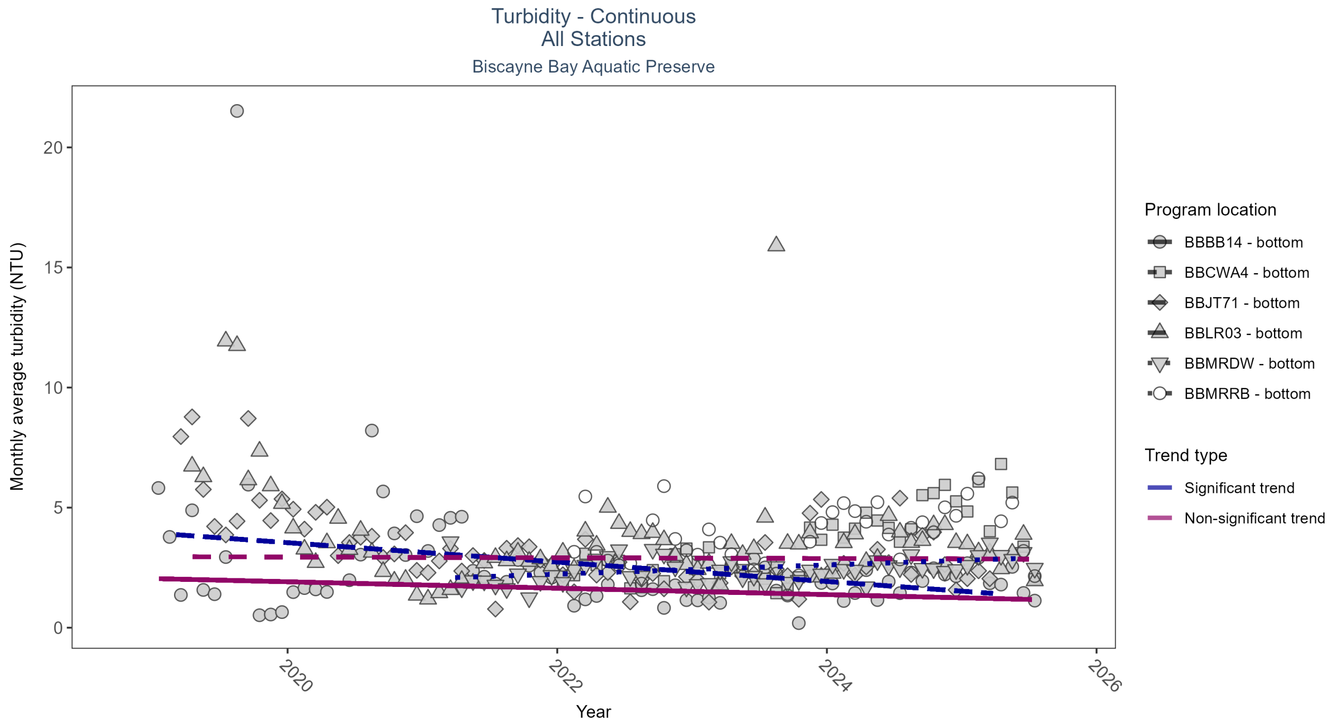

Figure 34: Scatter plot of monthly average turbidity over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 35: 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
BBBB14	No significant trend	189989	7	2019 - 2025	2	-0.2	2.05	-0.13	0.06
BBCWA4	Insufficient data to calculate trend	109259	4	2022 - 2025	3	-	-	-	-
BBLR03	No significant trend	193530	7	2019 - 2025	3	0	2.96	-0.02	0.88
BBJT71	Significantly decreasing trend	201128	7	2019 - 2025	3	-0.46	3.94	-0.4	0
BBMRDW	Significantly increasing trend	142449	5	2021 - 2025	2	0.36	2.04	0.19	0.01
BBMRRB	Insufficient data to calculate trend	110910	4	2022 - 2025	3	-	-	-	-

At one program location, monthly average turbidity increased by 0.19 NTU per year. At one program location, monthly average turbidity decreased by 0.40 NTU per year. No detectable change in monthly average turbidity was observed at two locations. There was insufficient data to fit a model for two locations.

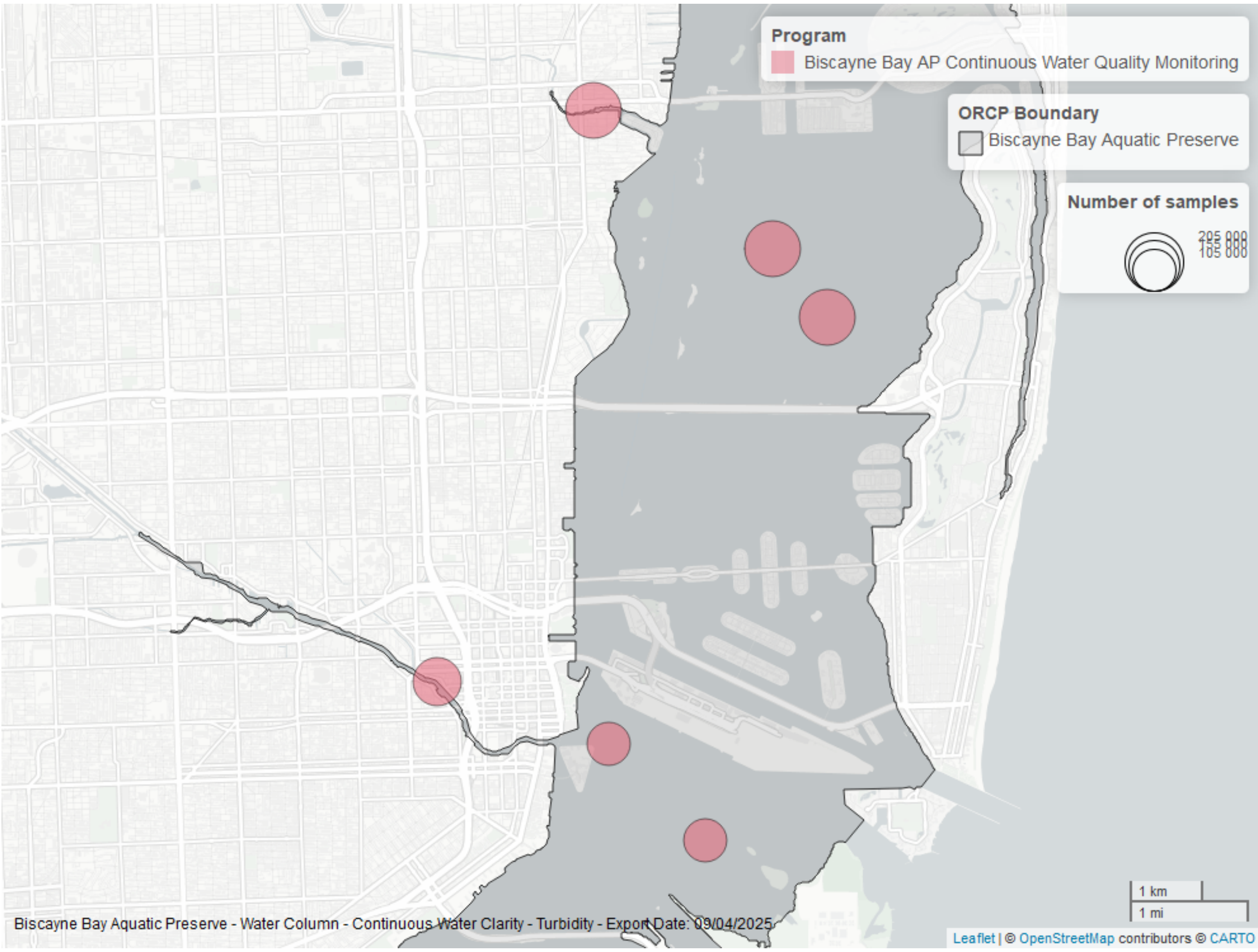

Figure 35: Map showing location of turbidity continuous water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Water Temperature - Continuous

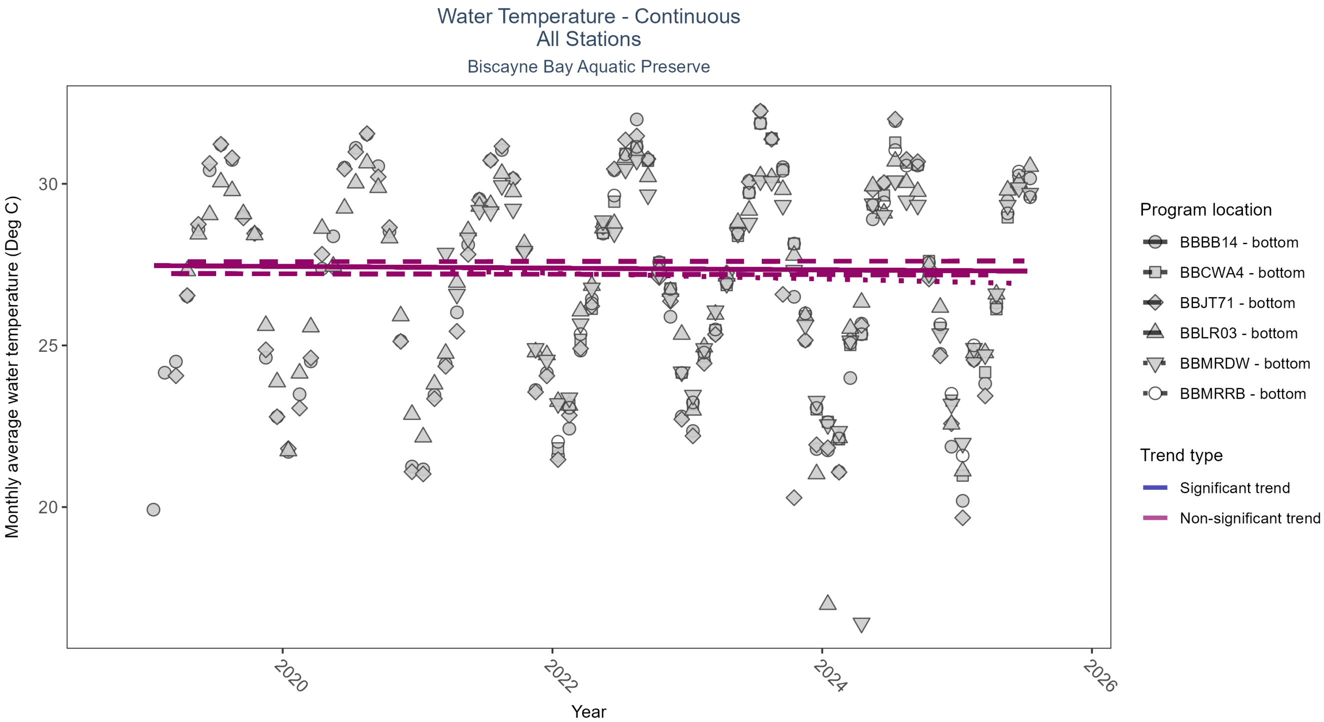

Figure 36: Scatter plot of monthly average water temperature over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 36: 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
BBCWA4	Insufficient data to calculate trend	113090	4	2022 - 2025	27.1	-	-	-	-
BBBB14	No significant trend	201056	7	2019 - 2025	27.0	-0.04	27.47	-0.03	0.74
BBLR03	No significant trend	197360	7	2019 - 2025	27.7	0	27.59	0	0.96
BBJT71	No significant trend	208542	7	2019 - 2025	27.1	-0.03	27.22	-0.01	0.87
BBMRDW	No significant trend	142823	5	2021 - 2025	27.3	-0.13	27.32	-0.09	0.45
BBMRRB	Insufficient data to calculate trend	112980	4	2022 - 2025	27.1	-	-	-	-

No detectable change in monthly average water temperature was observed at four locations. There was insufficient data to fit a model for two locations.

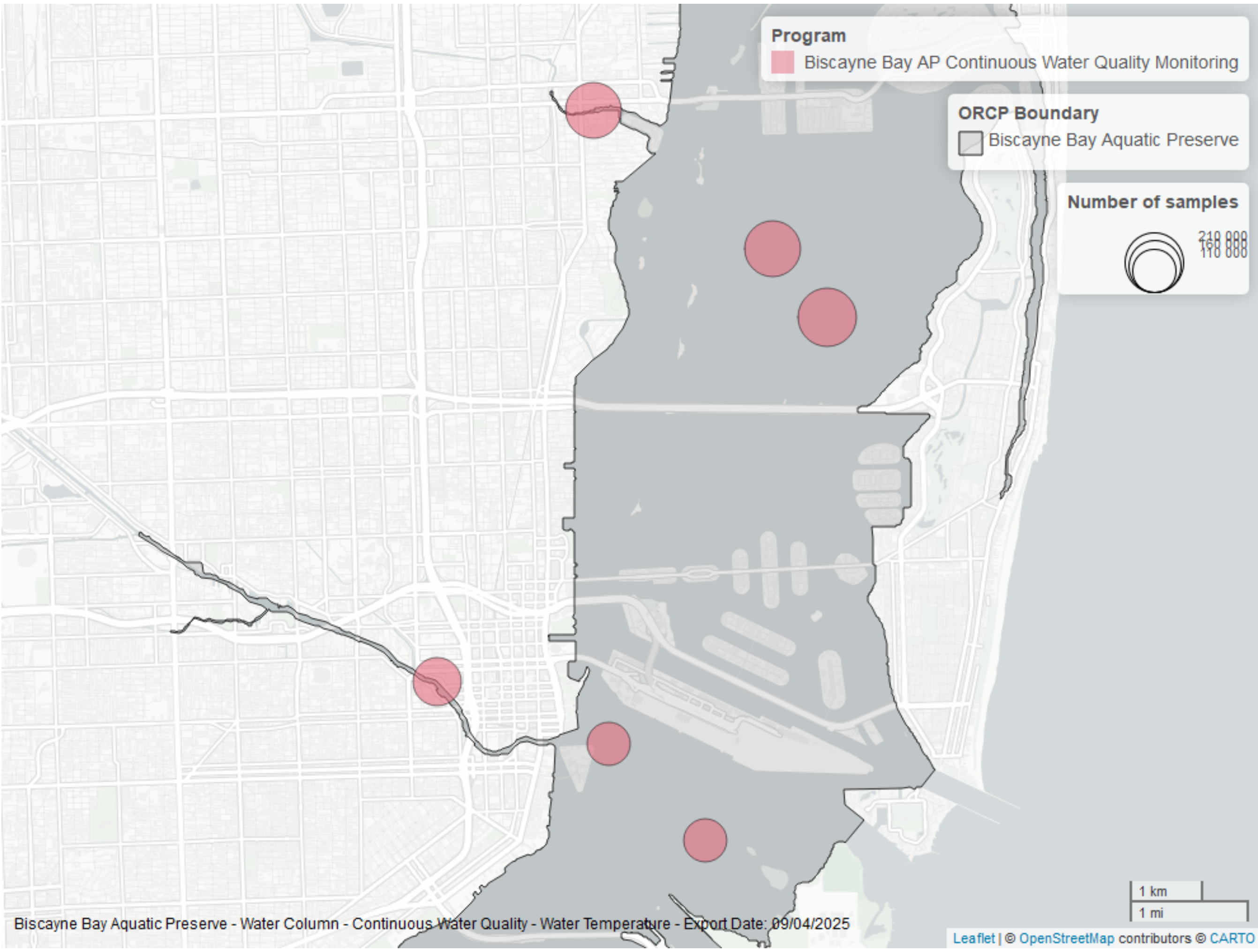

Figure 37: Map showing location of water temperature continuous water quality sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Submerged Aquatic Vegetation

The data file used is: **All__SAV__Parameters-2025-Sep-04.txt**

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

Parameters

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

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

Species

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

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

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

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

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

Notes

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

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

- Biscayne Bay Aquatic Preserve
- Florida Keys National Marine Sanctuary

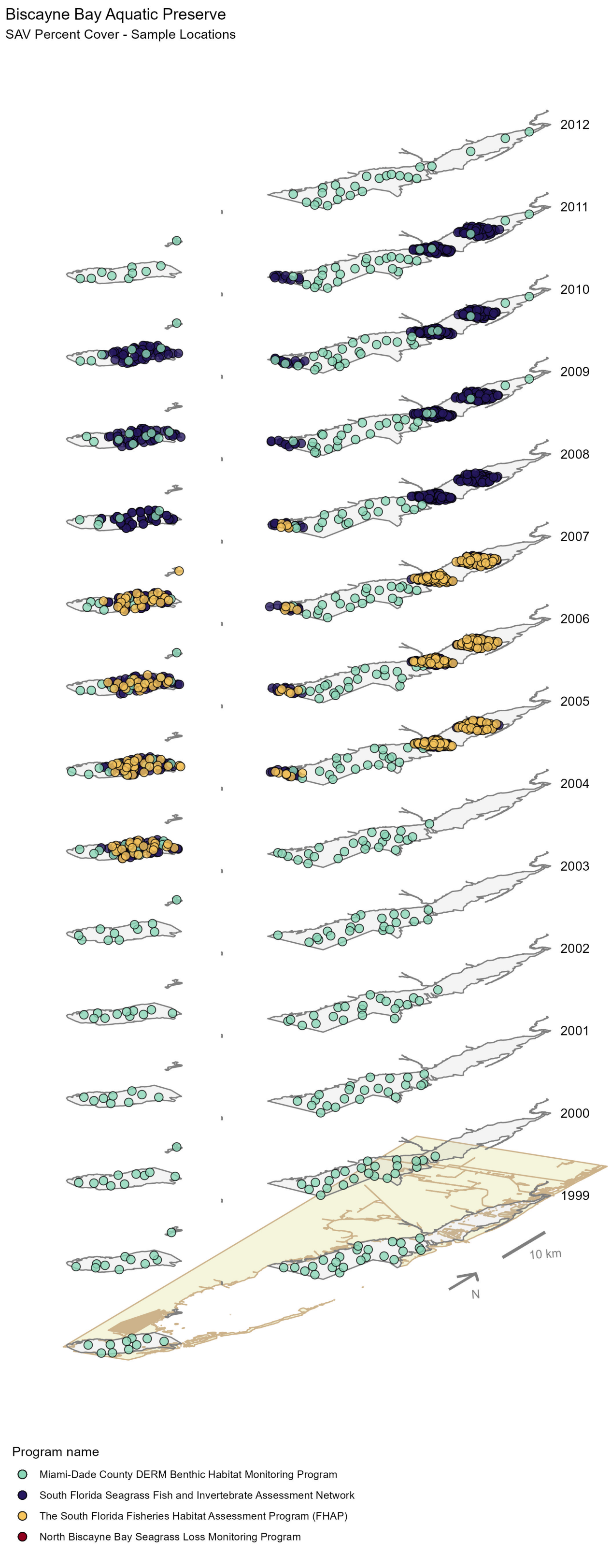

Figure 38: Maps showing the temporal scope of SAV sampling sites within the boundaries of *Biscayne Bay Aquatic Preserve* by Program name.

Click here to view spatio-temporal plots on GitHub.

Sampling locations by Program:

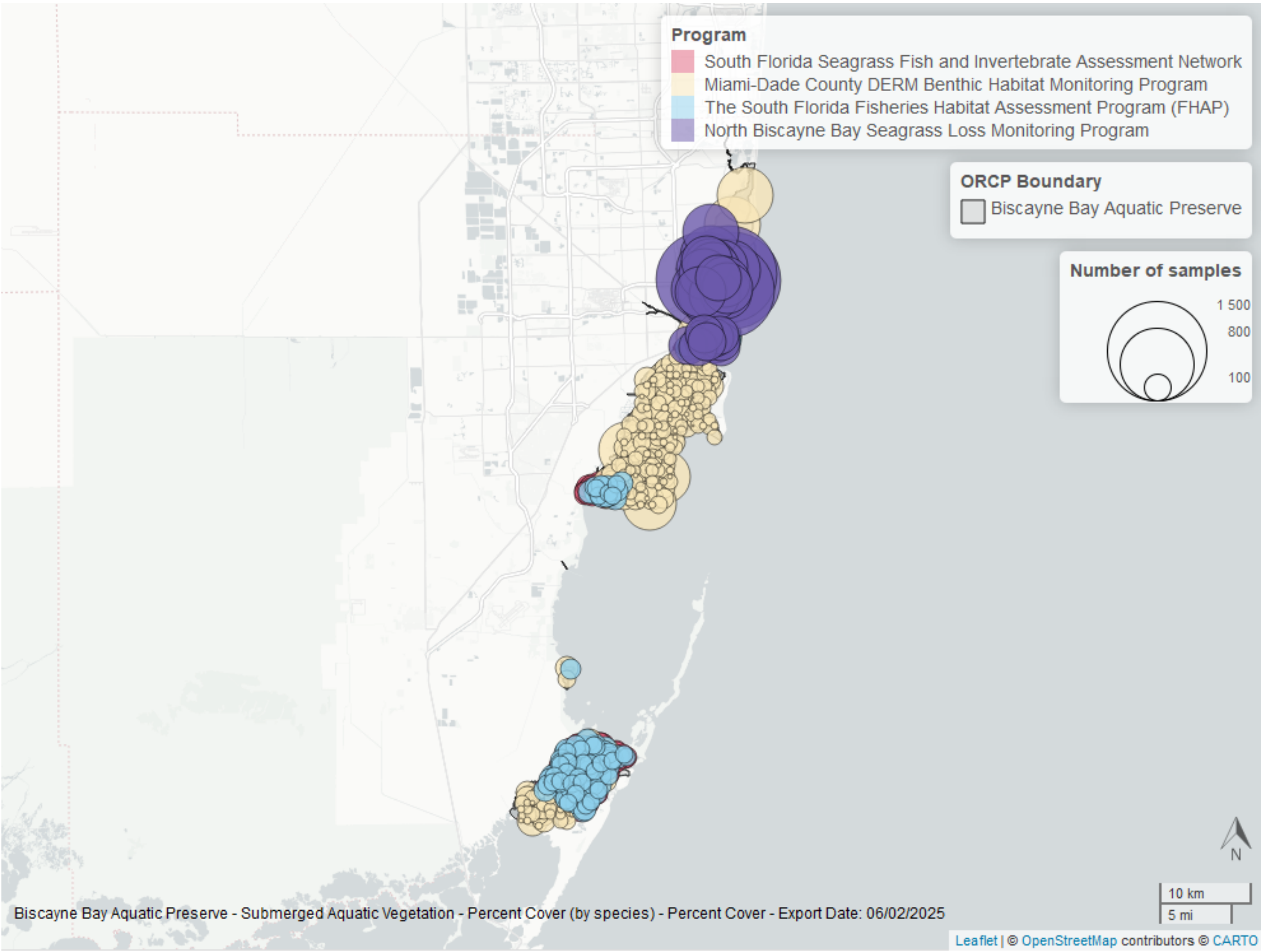

Figure 39: Map showing SAV sampling sites within the boundaries of *Biscayne Bay Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Table 37: Program Information for Submerged Aquatic Vegetation

ProgramID	*N-Data*	*YearMin*	*YearMax*	*method*	*Sample Locations*
965	71071	2005	2011	Braun Blanquet	94
4018	18876	1999	2024	Braun Blanquet	377
4049	18891	2005	2008	Braun Blanquet	273
5027	8250	2018	2024	Braun Blanquet	39
4018	966	1999	2007	Percent Cover	232
5027	8292	2018	2024	Percent Cover	39

Program names:

965 - South Florida Seagrass Fish and Invertebrate Assessment Network[14]
4018 - Miami-Dade County DERM Benthic Habitat Monitoring Program[16]
4018 - Miami-Dade County DERM Benthic Habitat Monitoring Program[16]

4049 - The South Florida Fisheries Habitat Assessment Program (FHAP)[9]
5027 - North Biscayne Bay Seagrass Loss Monitoring Program[17]
5027 - North Biscayne Bay Seagrass Loss Monitoring Program[17]

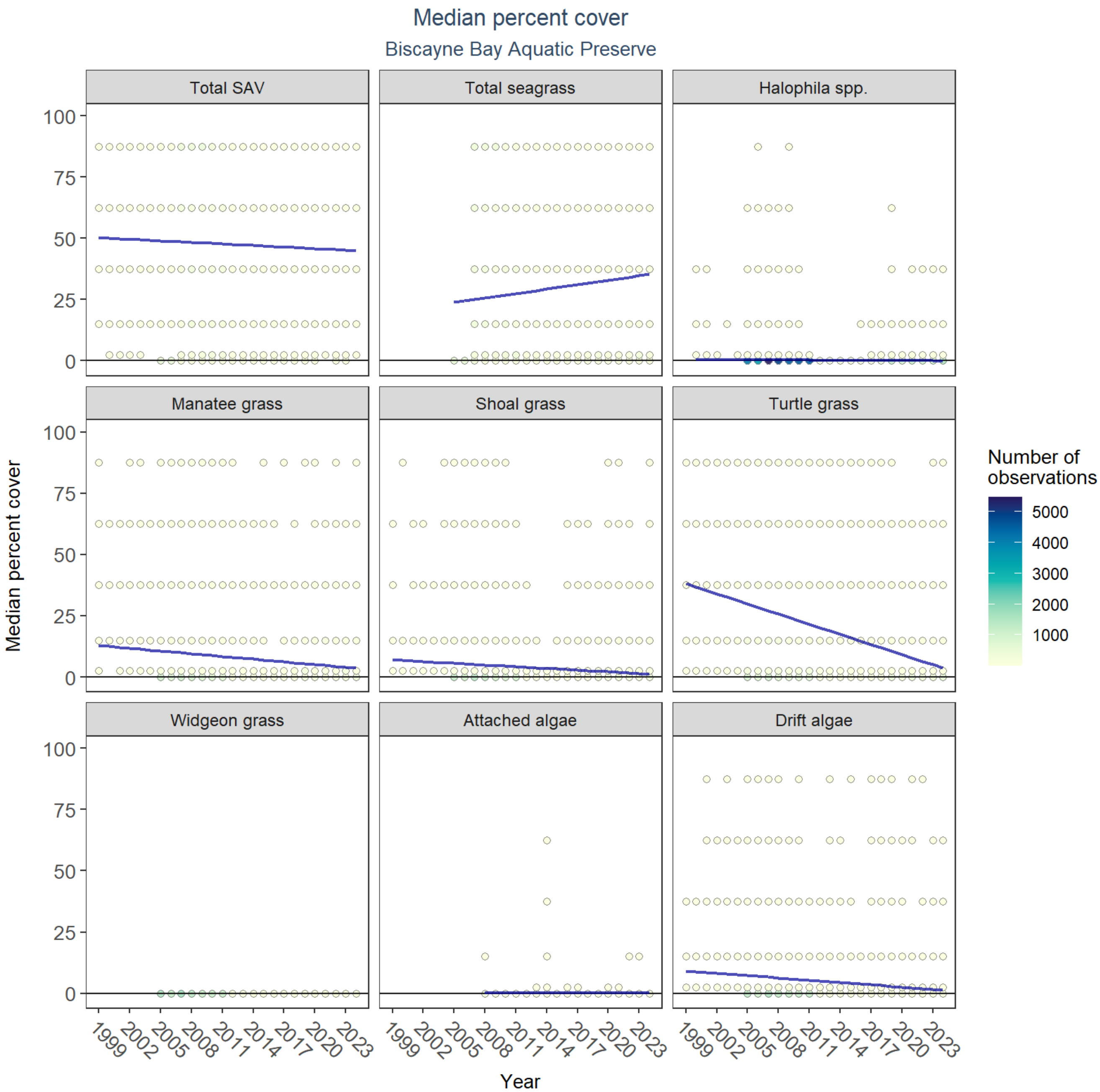

Figure 40: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

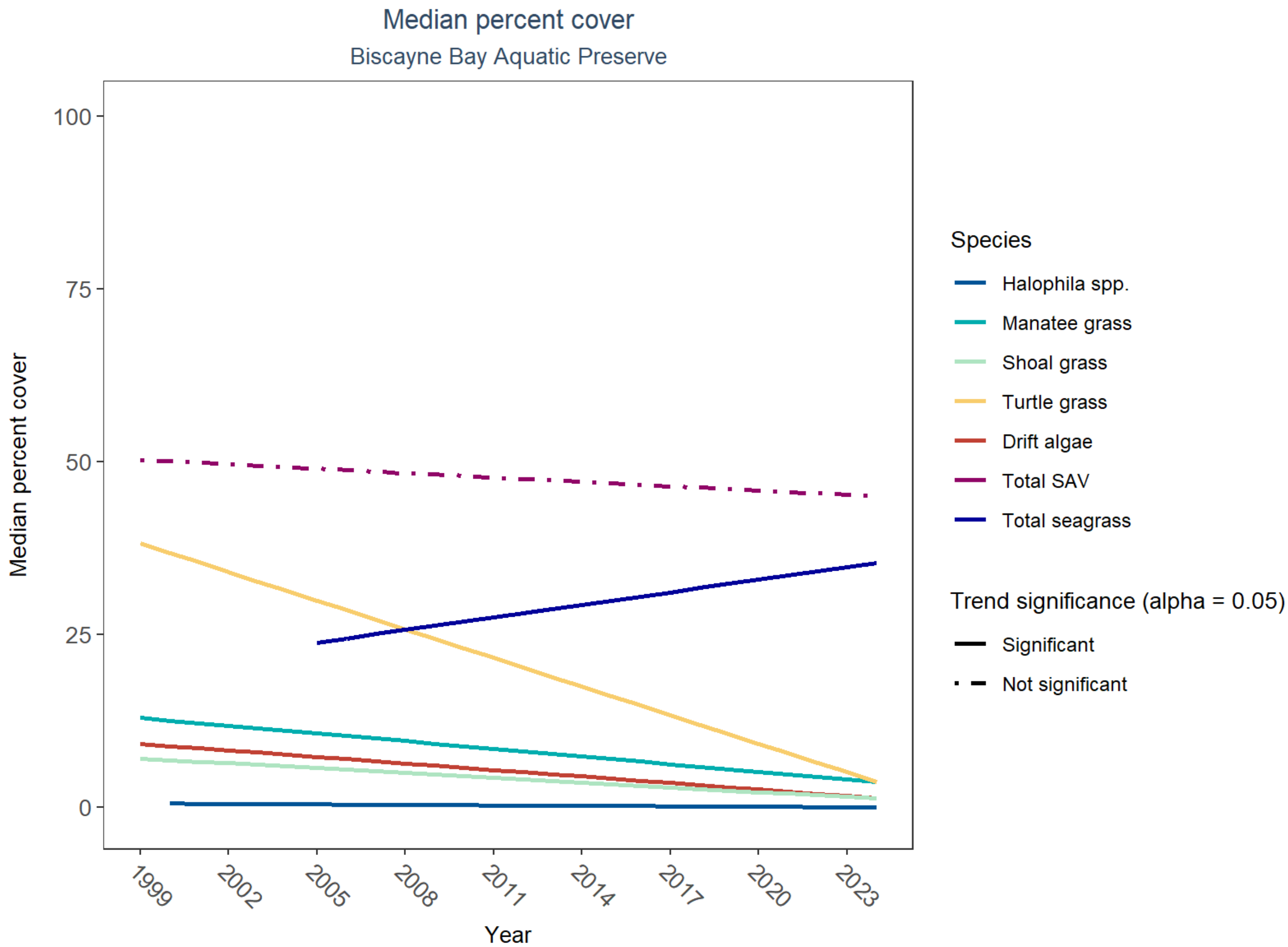

Figure 41: Trends in median percent cover for various seagrass species in Biscayne Bay Aquatic Preserve - simplified

Table 38: Percent Cover Trend Analysis for Biscayne Bay Aquatic Preserve

CommonName	*Trend Significance (0.05)*	*Period of Record*	*LME-Intercept*	*LME-Slope*	*p*
Attached algae	No significant trend	2008 - 2024	-0.0338584	0.0096341	0.1028815
Drift algae	Significantly decreasing trend	1999 - 2024	10.7300596	-0.3136985	0.0000005
Shoal grass	Significantly decreasing trend	1999 - 2024	8.2062832	-0.2315470	0.0000061
Halophila spp.	Significantly decreasing trend	2000 - 2024	0.6686064	-0.0227167	0.0094132
Widgeon grass	Model did not fit the available data	2005 - 2024	-	-	-
Manatee grass	Significantly decreasing trend	1999 - 2024	14.7507003	-0.3702865	0.0002821
Turtle grass	Significantly decreasing trend	1999 - 2024	45.0504478	-1.3794830	0.0000000
Total SAV	No significant trend	1999 - 2024	51.3012406	-0.2107209	0.2467480
Total seagrass	Significantly increasing trend	2005 - 2024	17.1668353	0.6060217	0.0012732

An annual increase in percent cover was observed for total seagrass (0.6%). Annual decreases in percent cover were observed for *Halophila* spp. (-0.0%), manatee grass (-0.4%), shoal grass (-0.2%), turtle grass (-1.4%), and drift algae (-0.3%). No detectable change in percent cover was observed for total SAV and attached algae. The model could not be fitted for widgeon grass.

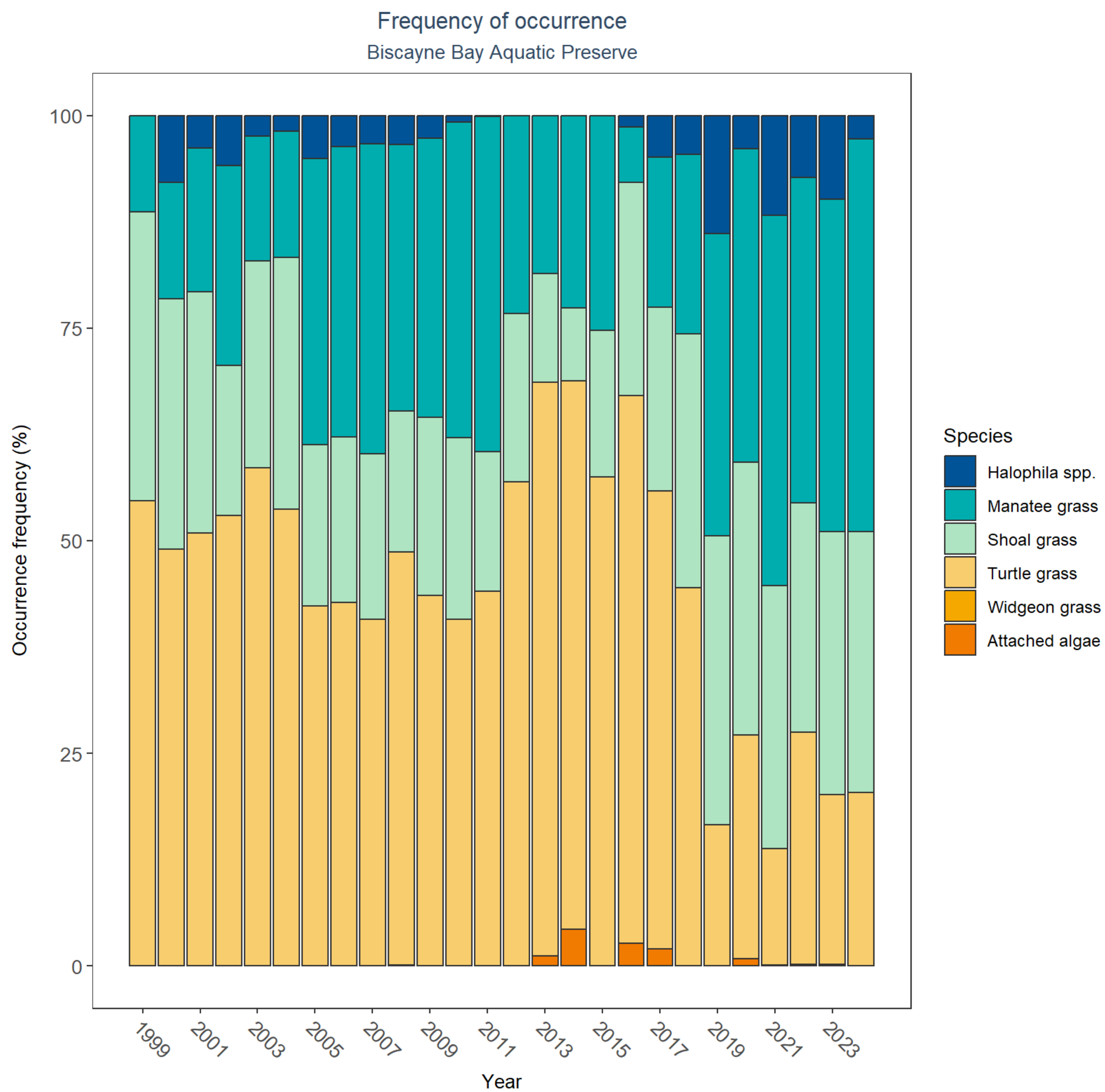

Figure 42: Frequency of occurrence for various seagrass species in Biscayne Bay Aquatic Preserve

SAV Water Column Analysis

The following parameters are available for Biscayne Bay Aquatic Preserve within the SAV_WC_Report:

- Colored Disolved Organic Matter
- Chlorophyll a
- Dissolved Oxygen
- Dissolved Oxygen Saturation
- pH
- Salinity

- Secchi Depth
- Water Temperature
- Total Nitrogen
- Total Suspended Solids
- Turbidity

Access the reports here: DRAFT_SAV_WC_Report_2024-11-20.pdf

Coral Reef

The data file used is: **All__CORAL__Parameters-2025-Sep-04.txt**
Species Richness

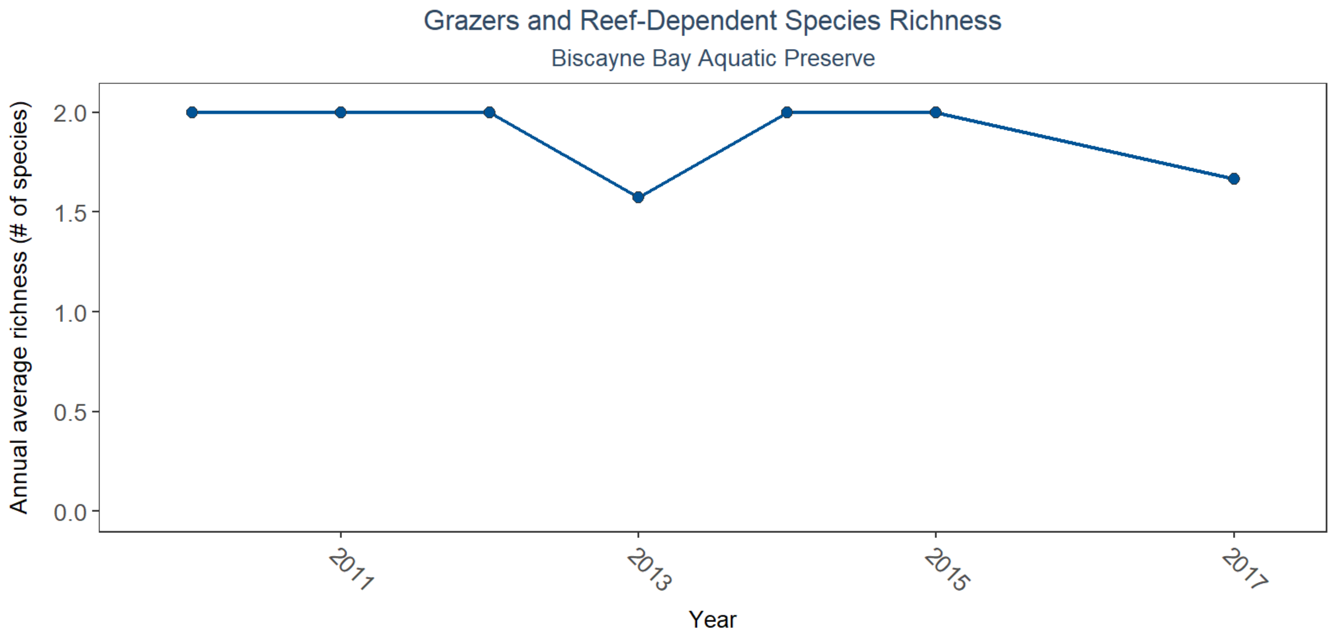

Figure 43: Line graph of annual average species richness of grazers and reef-dependent species over time. If the time series included more than one year of observations, a line connects the data points for visualization.

Table 39: Coral Species Richness

Sample Count	*Number of Years*	*Period of Record*	*Median N of Taxa*	*Mean N of Taxa*
23	7	2010 - 2017	2	1.82609

The median annual number of taxa was 2 based on 23 observations collected between 2010 and 2017.

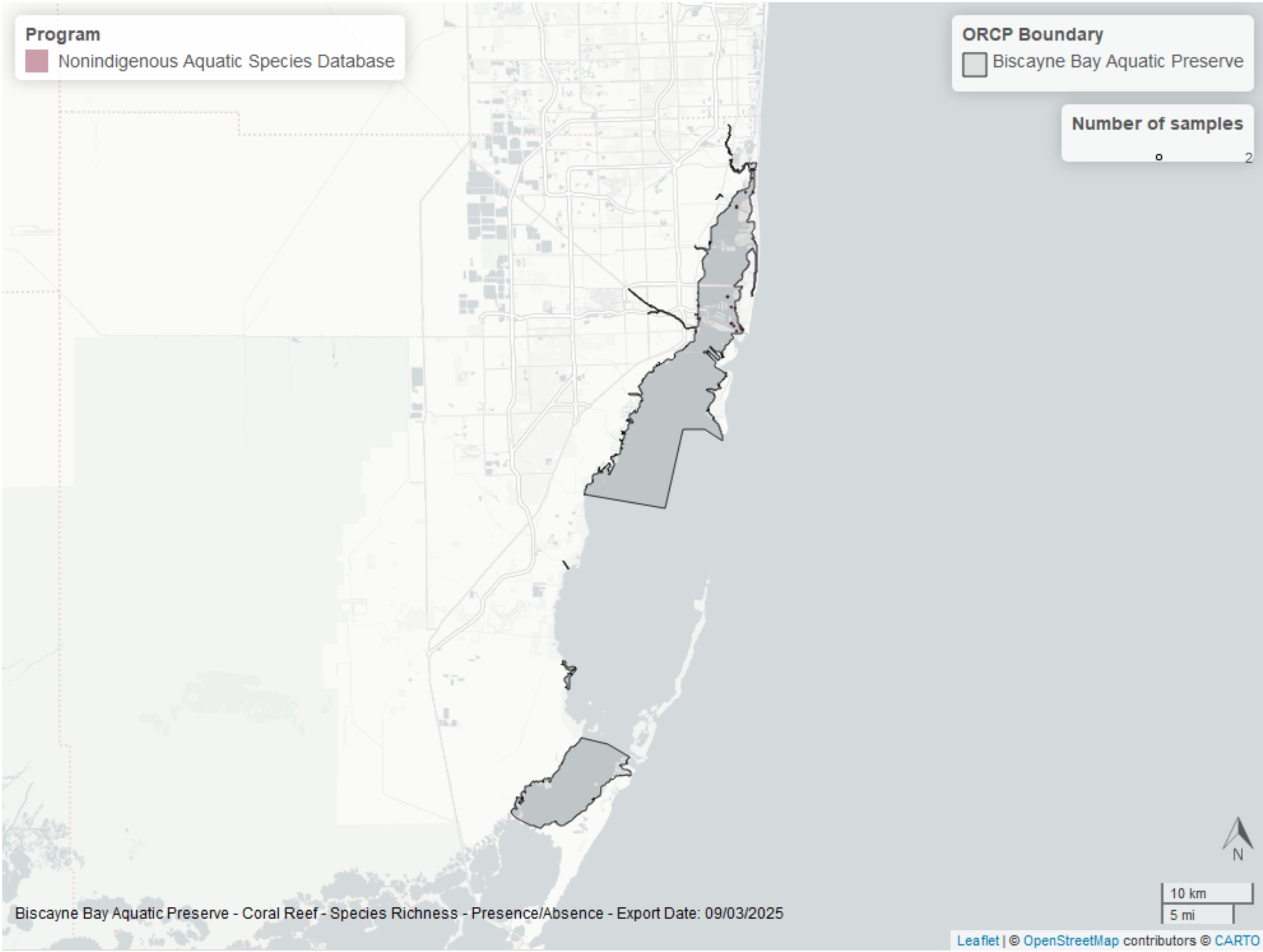

Figure 44: Map showing location of coral species richness sampling locations within the boundaries of *Biscayne Bay Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

Species list

Acanthophora muscoides[1]	Dictyota spp.[1]	Pterois miles[2]
Acanthophora sp.[1]	Drift red algae[1]	Pterois volitans[2]
Acetabularia sp.[1]	Ernodesmis sp.[1]	Rhipocephalus[1]
Acetabularia spp.[1]	Galaxaura spp.[1]	Rhipocephalus phoenix[1]
Actiniaria	Gracilaria sp.[1]	Rhipocephalus spp.[1]
Agardhiella ramosissima[1]	Gracilaria spp.[1]	Ruppia maritima[1]
Amphiroa spp.[1]	Grateloupia[1]	Sargassum sp.[1]
Anadyomene linkiana[1]	Griffithsia[1]	Sargassum spp.[1]
Anadyomene spp.[1]	Halimeda discoidea[1]	Schizothrix calcicola
Anadyomene stellata[1]	Halimeda incrassata[1]	Scleractinia
Avrainvillea levis[1]	Halimeda opuntia[1]	Spermothamnion[1]
Batophora oerstedii[1]	Halimeda spp.[1]	Spyridia filamentosa[1]
Batophora spp.[1]	Halodule wrightii[1]	Syringodium filiforme[1]
Brown algae[1]	Halophila decipiens[1]	Thalassia testudinum[1]
Bryopsis[1]	Halophila engelmannii[1]	Total brown algae[1]
Calcareous green algae[1]	Halophila johnsonii[1]	Total calcareous green algae[1]
Caulerpa cupressoides[1]	Halophila sp.[1]	Total green algae[1]
Caulerpa sertularioides[1]	Hydrozoa	Total macroalgae[1]
Caulerpa spp.[1]	Hypnea[1]	Total other green algae[1]
Centroceras sp.[1]	Hypoglossum[1]	Total other red algae[1]
Ceramium[1]	Jania spp.[1]	Total SAV[1]
Chaetomorpha linum[1]	Laurencia spp.[1]	Total seagrass[1]
Champia parvula[1]	Neomeris[1]	Turbinaria turbinata
Chara spp.[1]	Octocorallia	Udotea[1]
Chondria capillaris[1]	Other coral	Udotea spp.[1]
Chondria spp.[1]	Other green algae[1]	Ulva sp.[1]
Cladocephalus[1]	Other red algae[1]	Unidentified mangrove
Cladophora[1]	Padina gymnospora[1]	Unidentified species
Crustose coralline algae[1]	Penicillus sp.[1]	Unknown blue sponge
Dasya sp.[1]	Penicillus spp.[1]	Unknown orange encrusting sponge
Dasycladus[1]	Polysiphonia sp.[1]	Valonia[1]
Derbesia[1]	Porifera	Wrightiella[1]
Dictyosphaeria[1]	Pterocladiella sanctarum[1]	Acanthophora muscoides[1]

1 - Submerged Aquatic Vegetation, 2 - Coral Reef - Species Richness, 3 - Coral Reef - Percent Cover

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