

# Terra Ceia Aquatic Preserve

## SEACAR Water Quality Analysis

Last compiled on 10 July, 2025

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# Indicators

## Nutrients

### Total Nitrogen - Discrete

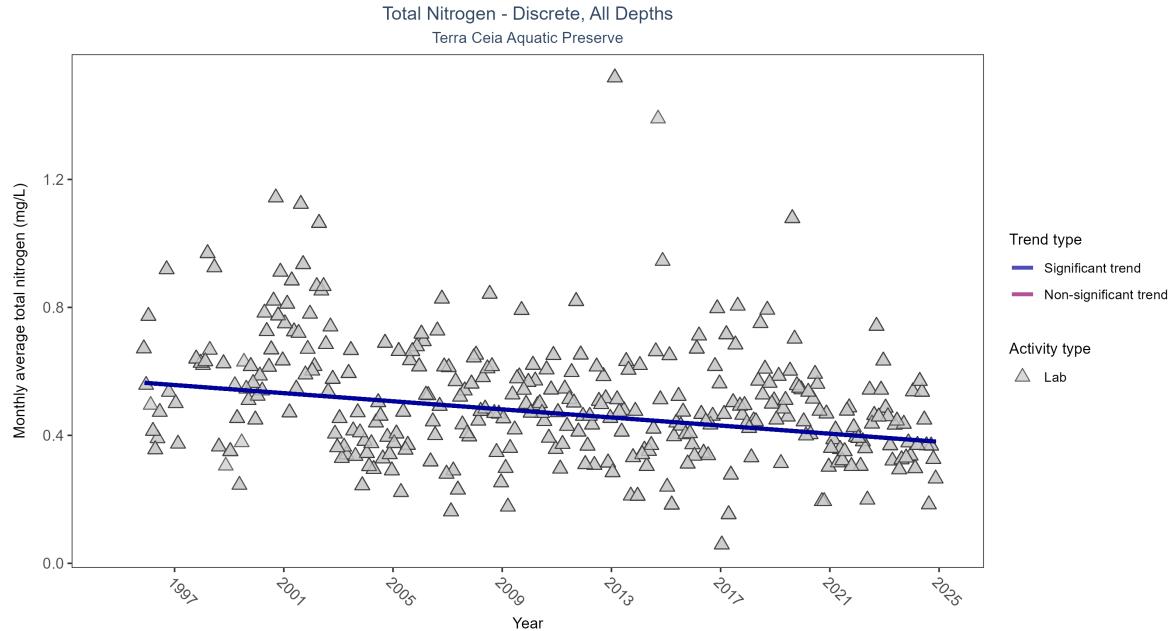


Figure 1: Scatter plot of monthly average total nitrogen over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only nitrogen values obtained from laboratory analyses (triangles) are included in the plot.

Table 1: Seasonal Kendall-Tau Results for - Total Nitrogen

| Activity Type | Statistical Trend              | Sample Count | Years with Data | Period of Record | Median Result Value | Tau      | Sen Intercept | Sen Slope | P |
|---------------|--------------------------------|--------------|-----------------|------------------|---------------------|----------|---------------|-----------|---|
| Lab           | Significantly decreasing trend | 2343         | 30              | 1995 - 2024      | 0.381               | -0.22252 | 0.56998       | -0.00634  | 0 |

Monthly average total nitrogen decreased by 0.01 mg/L per year.

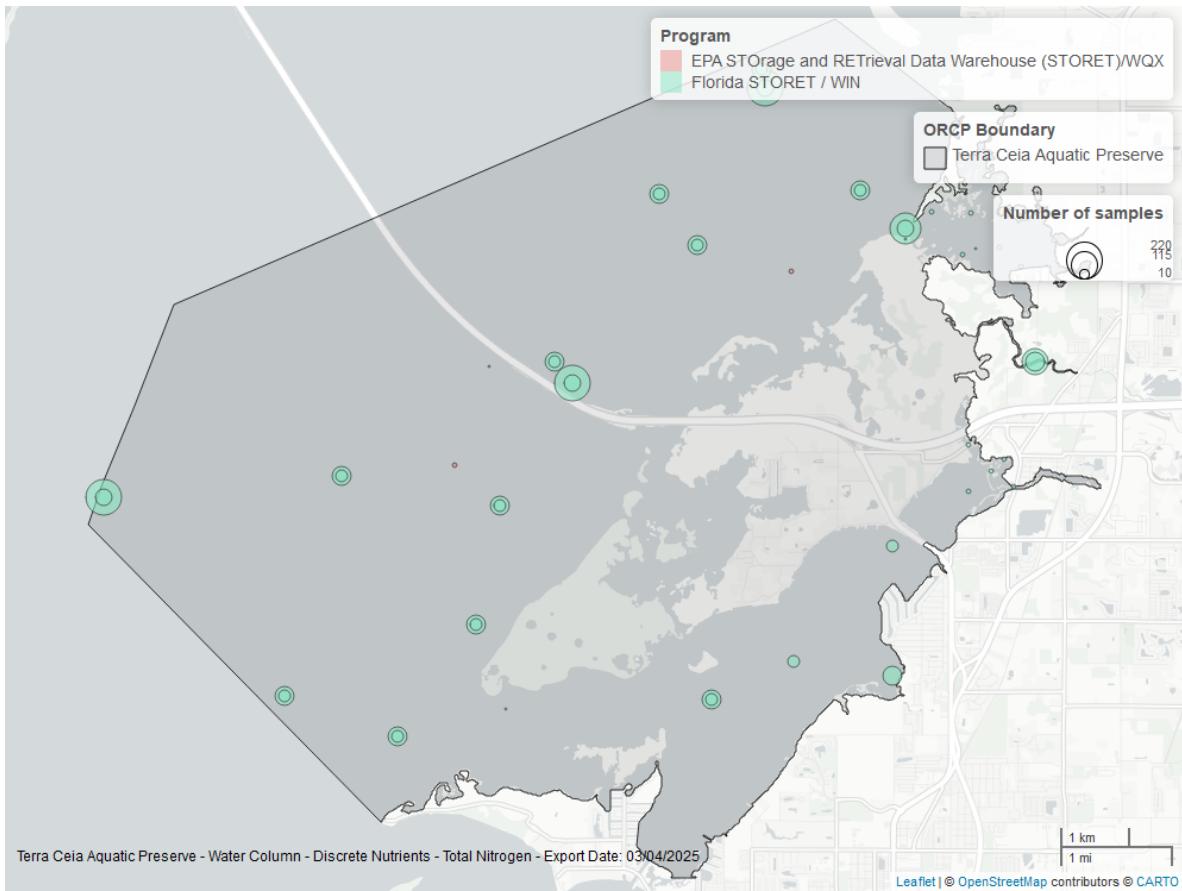


Figure 2: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Total Phosphorus - Discrete

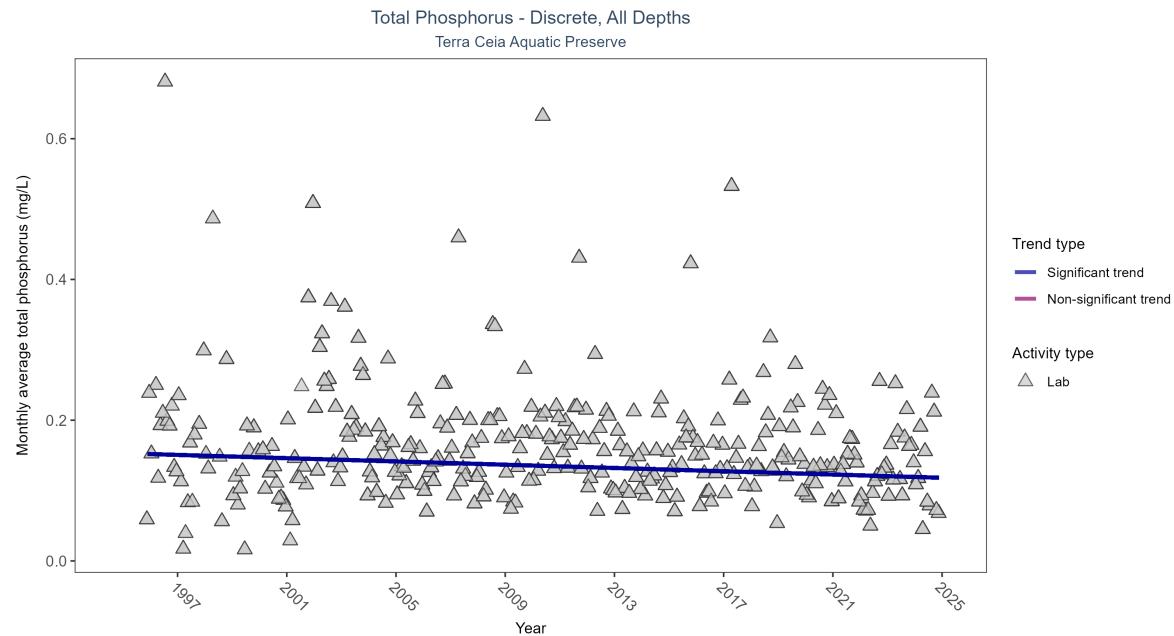


Figure 3: Scatter plot of monthly average total phosphorus over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only phosphorus values obtained from laboratory analyses (triangles) are included in the plot.

Table 2: Seasonal Kendall-Tau Results for - Total Phosphorus

| Activity Type | Statistical Trend              | Sample Count | Years with Data | Period of Record | Median Result Value | Tau      | Sen Intercept | Sen Slope | P      |
|---------------|--------------------------------|--------------|-----------------|------------------|---------------------|----------|---------------|-----------|--------|
| Lab           | Significantly decreasing trend | 3134         | 30              | 1995 - 2024      | 0.11                | -0.11246 | 0.15299       | -0.00116  | 0.0031 |

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

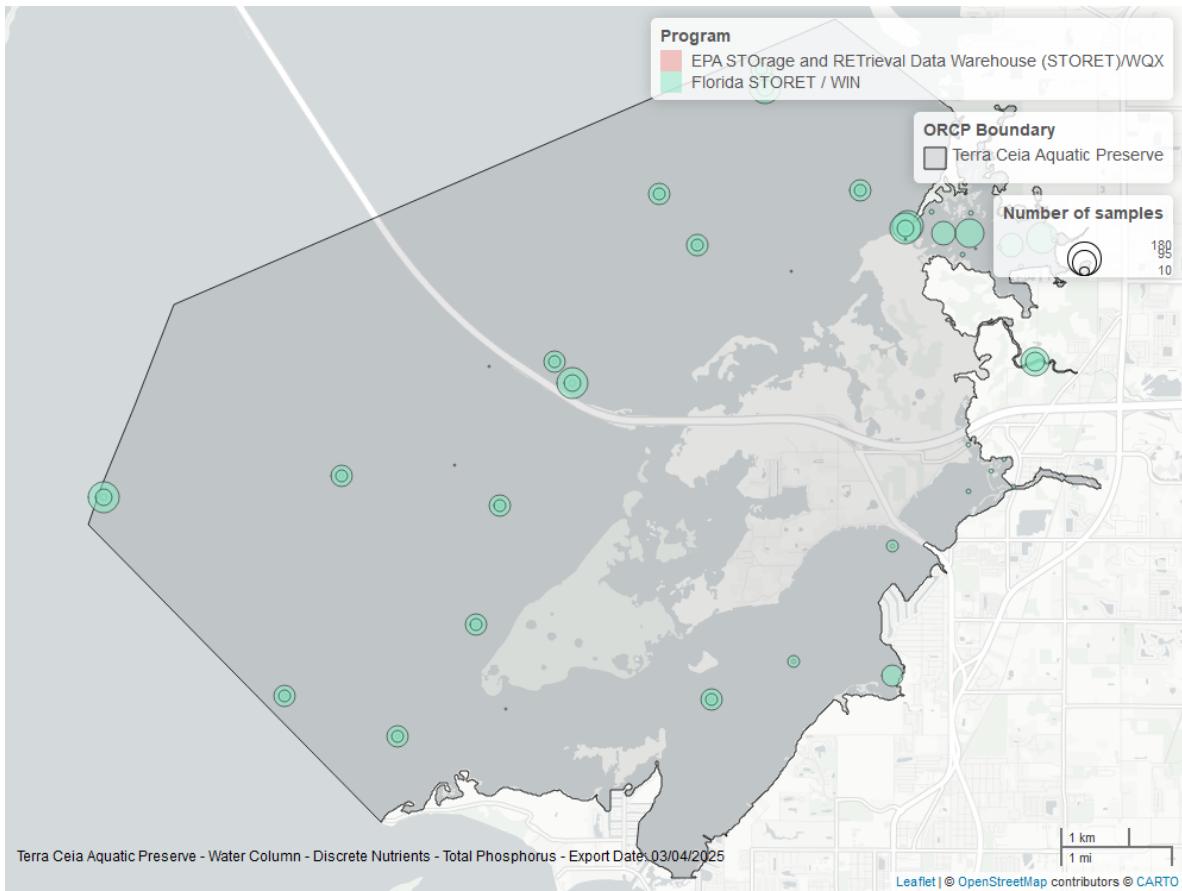


Figure 4: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Water Quality

### Dissolved Oxygen - Discrete

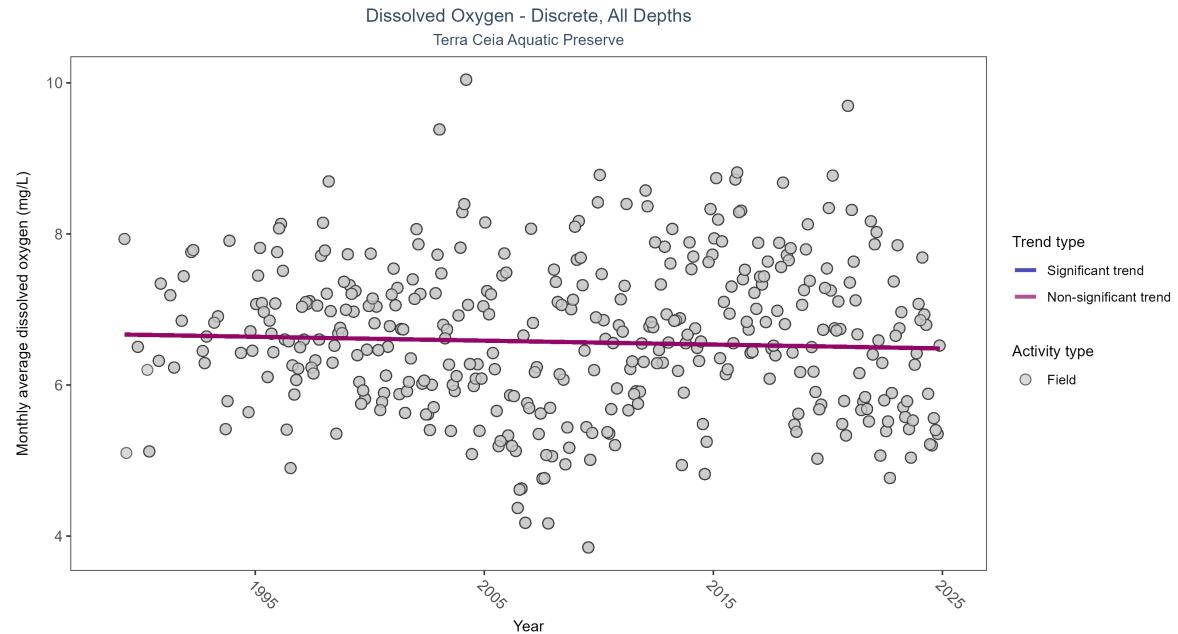


Figure 5: Scatter plot of monthly average dissolved oxygen over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only dissolved oxygen values measured in the field (circles) are included in the plot.

Table 3: Seasonal Kendall-Tau Results for - Dissolved Oxygen

| Activity Type | Statistical Trend    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau      | Sen Intercept | Sen Slope | P      |
|---------------|----------------------|--------------|-----------------|------------------|---------------------|----------|---------------|-----------|--------|
| Field         | No significant trend | 24588        | 36              | 1989 - 2024      | 6.53                | -0.04249 | 6.66926       | -0.00515  | 0.2306 |

Dissolved oxygen showed no detectable trend between 1989 and 2024.

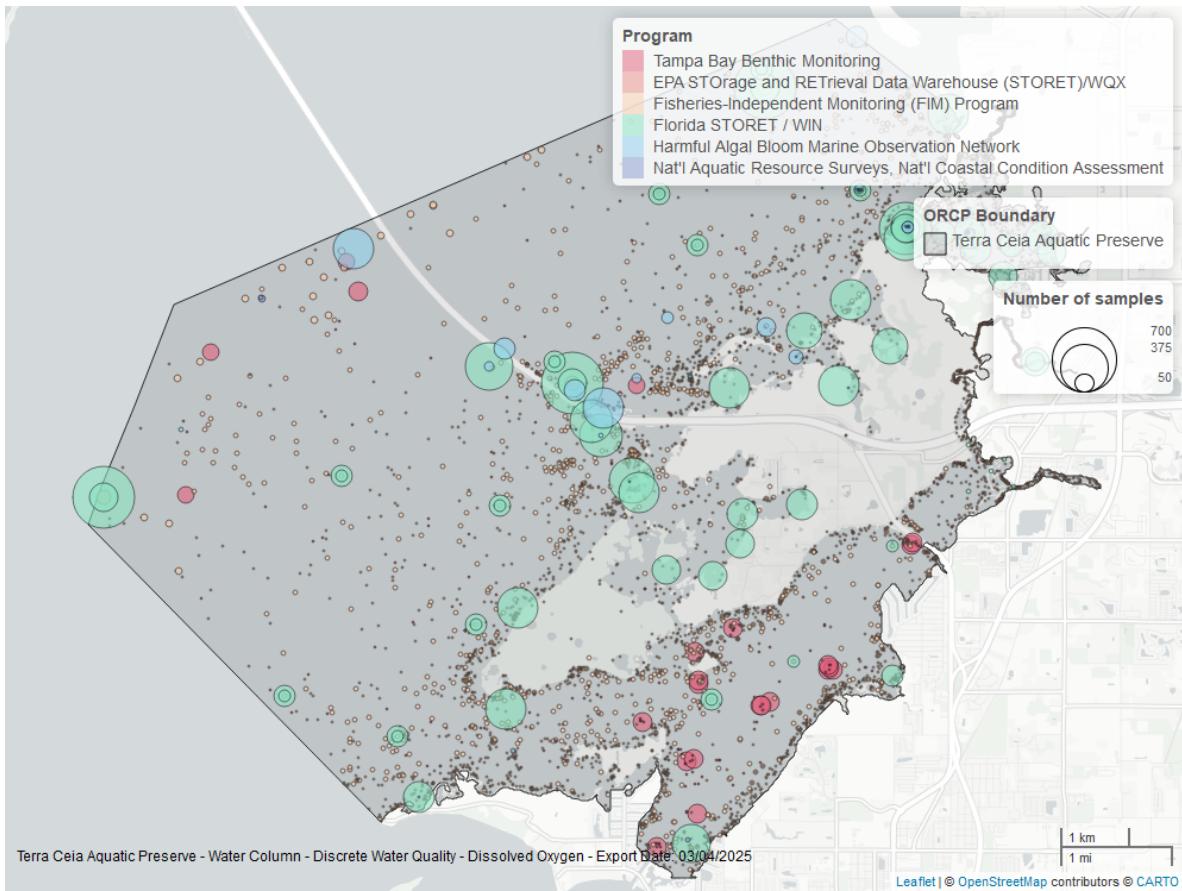


Figure 6: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Dissolved Oxygen - Continuous

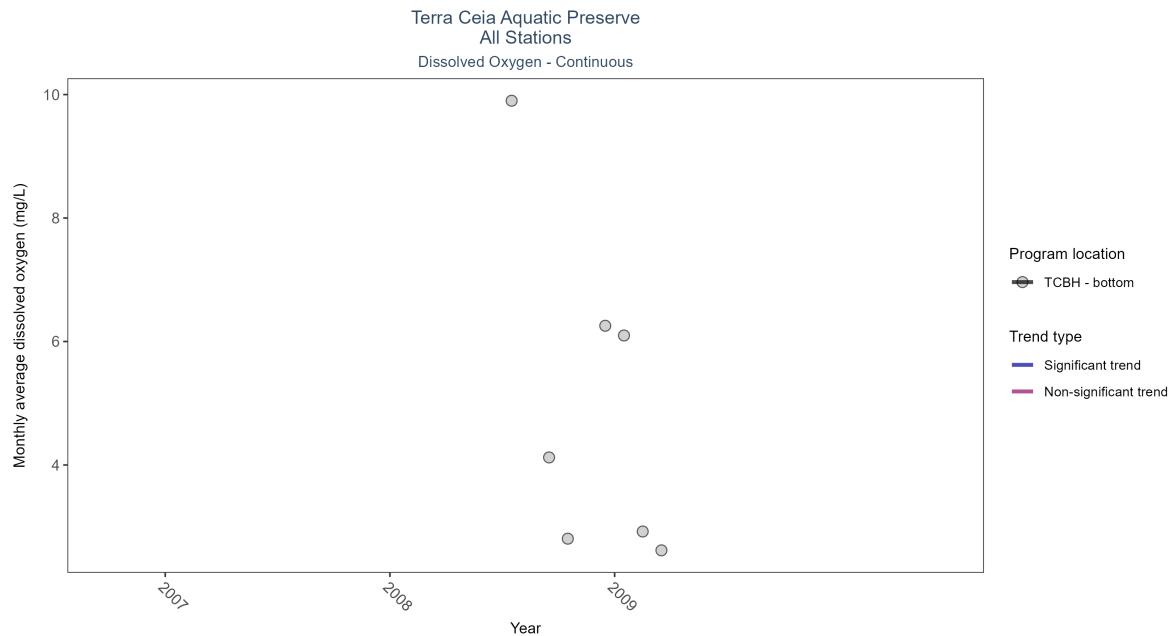


Figure 7: Scatter plot of monthly average dissolved oxygen over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 4: Seasonal Kendall-Tau Results - Dissolved Oxygen

| Program Location | Statistical Trend                    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau | Sen Intercept | Sen Slope | P |
|------------------|--------------------------------------|--------------|-----------------|------------------|---------------------|-----|---------------|-----------|---|
| TCBH             | Insufficient data to calculate trend | 8153         | 2               | 2008 - 2009      | 4.2                 | -   | -             | -         | - |

There was insufficient data to fit a model for one location.

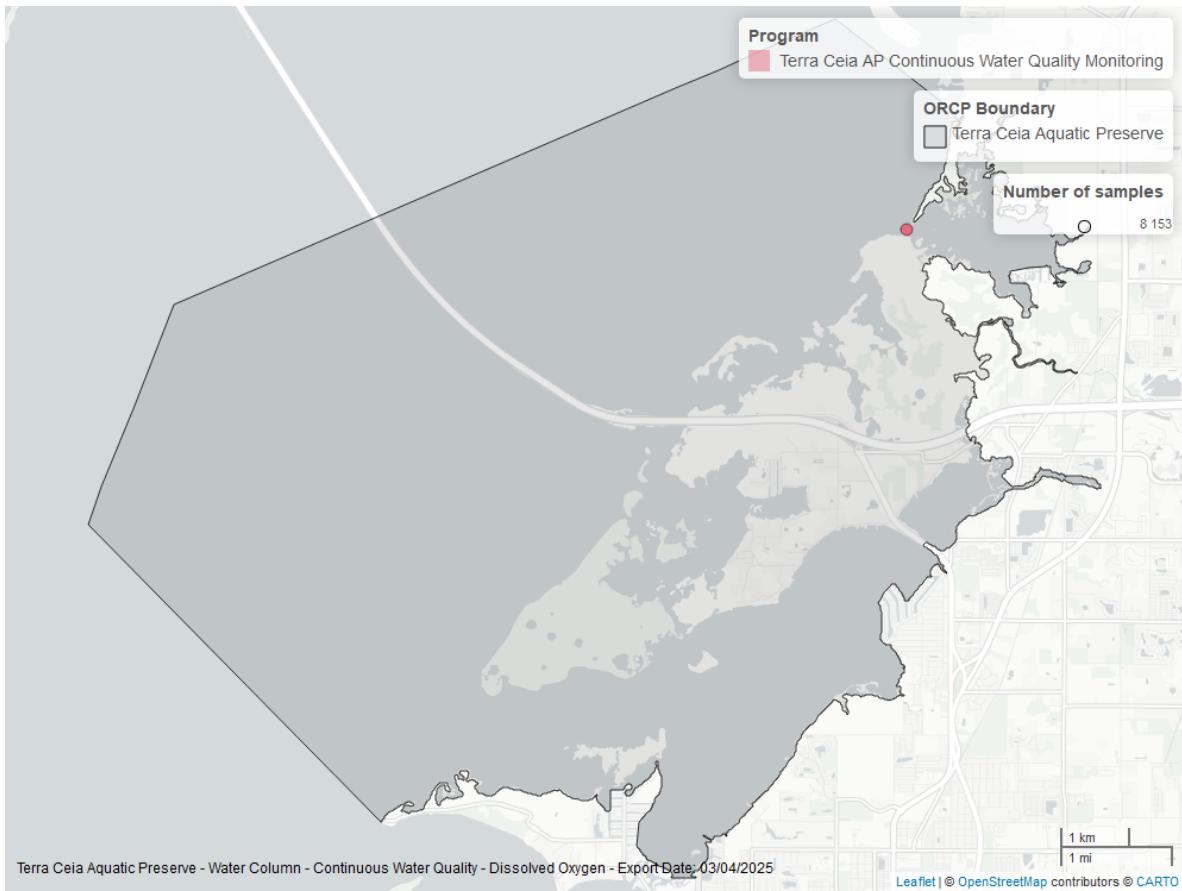


Figure 8: Map showing location of dissolved oxygen continuous water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Dissolved Oxygen Saturation - Discrete

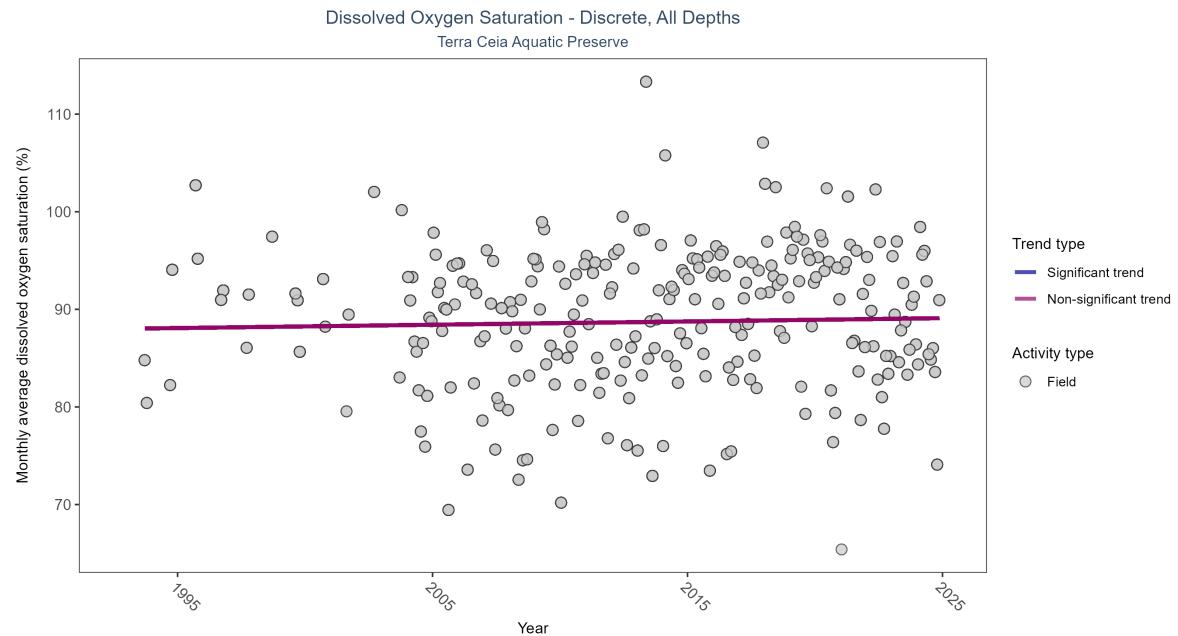


Figure 9: Scatter plot of monthly average dissolved oxygen saturation over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only dissolved oxygen saturation values measured in the field (circles)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

Table 5: Seasonal Kendall-Tau Results for - Dissolved Oxygen Saturation

| Activity Type | Statistical Trend    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau     | Sen Intercept | Sen Slope | P      |
|---------------|----------------------|--------------|-----------------|------------------|---------------------|---------|---------------|-----------|--------|
| Field         | No significant trend | 5033         | 32              | 1993 - 2024      | 89.9                | 0.04899 | 88.01305      | 0.03384   | 0.5993 |

Dissolved oxygen saturation showed no detectable trend between 1993 and 2024.

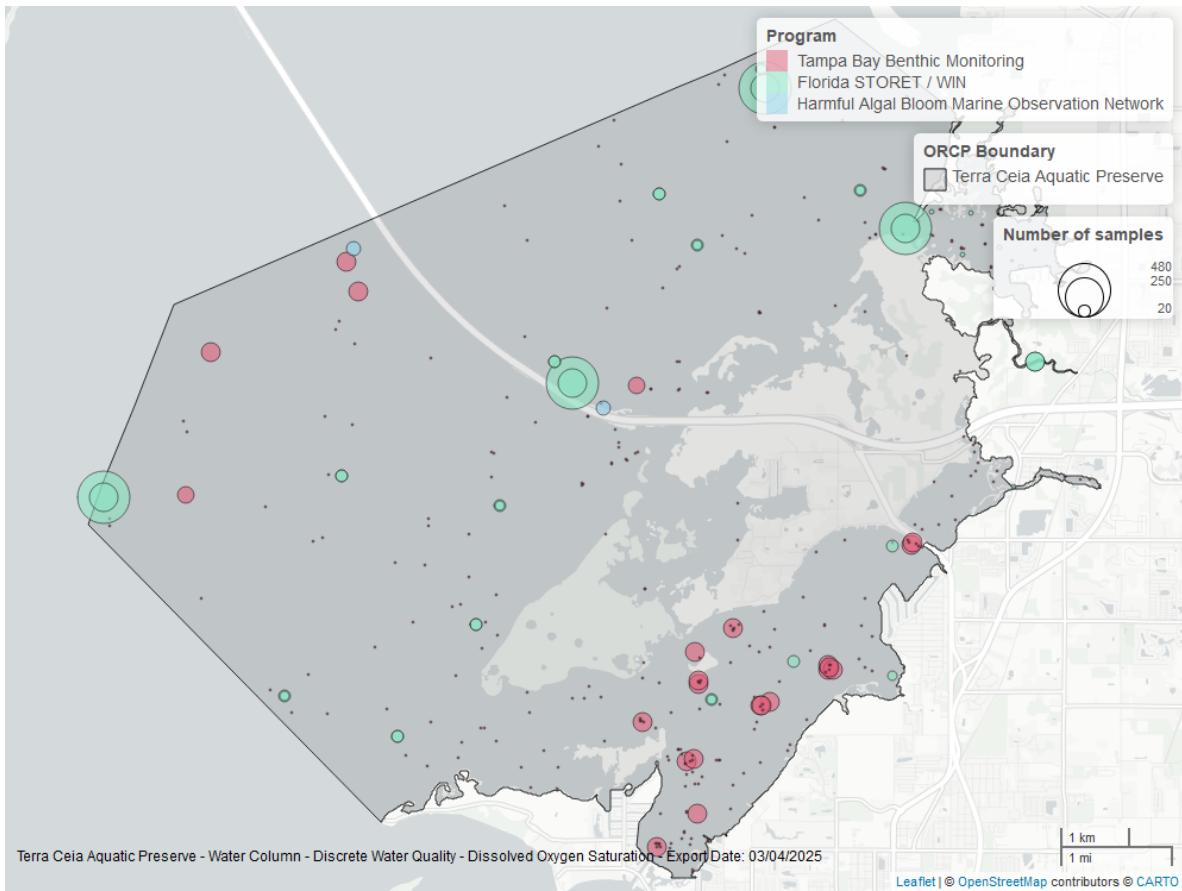


Figure 10: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Dissolved Oxygen Saturation - Continuous

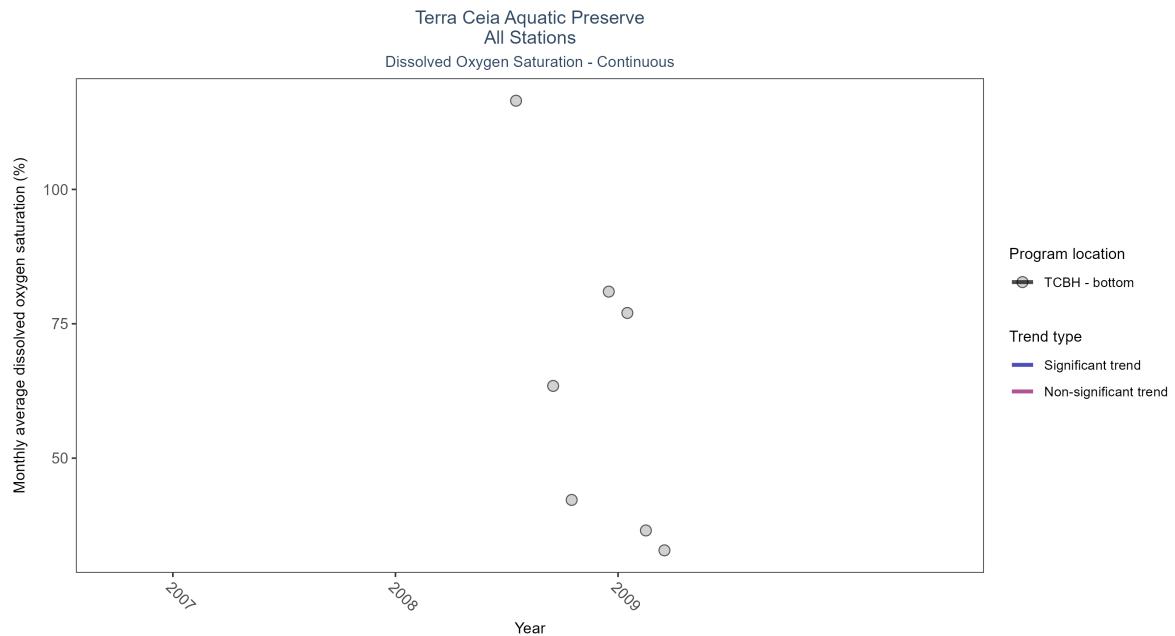


Figure 11: Scatter plot of monthly average dissolved oxygen saturation over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 6: Seasonal Kendall-Tau Results - Dissolved Oxygen Saturation

| Program Location | Statistical Trend                    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau | Sen Intercept | Sen Slope | P |
|------------------|--------------------------------------|--------------|-----------------|------------------|---------------------|-----|---------------|-----------|---|
| TCBH             | Insufficient data to calculate trend | 8153         | 2               | 2008 - 2009      | 59.5                | -   | -             | -         | - |

There was insufficient data to fit a model for one location.

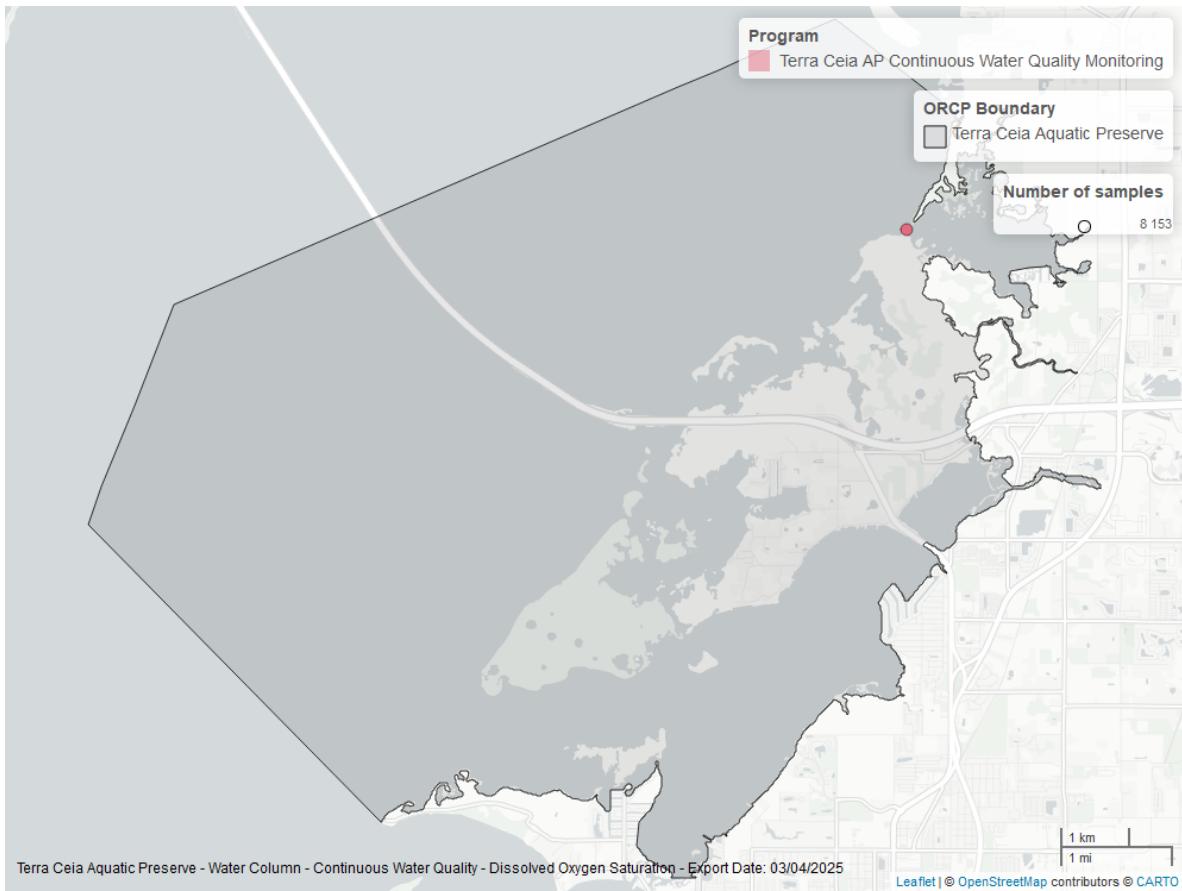


Figure 12: Map showing location of dissolved oxygen saturation continuous water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Salinity - Discrete

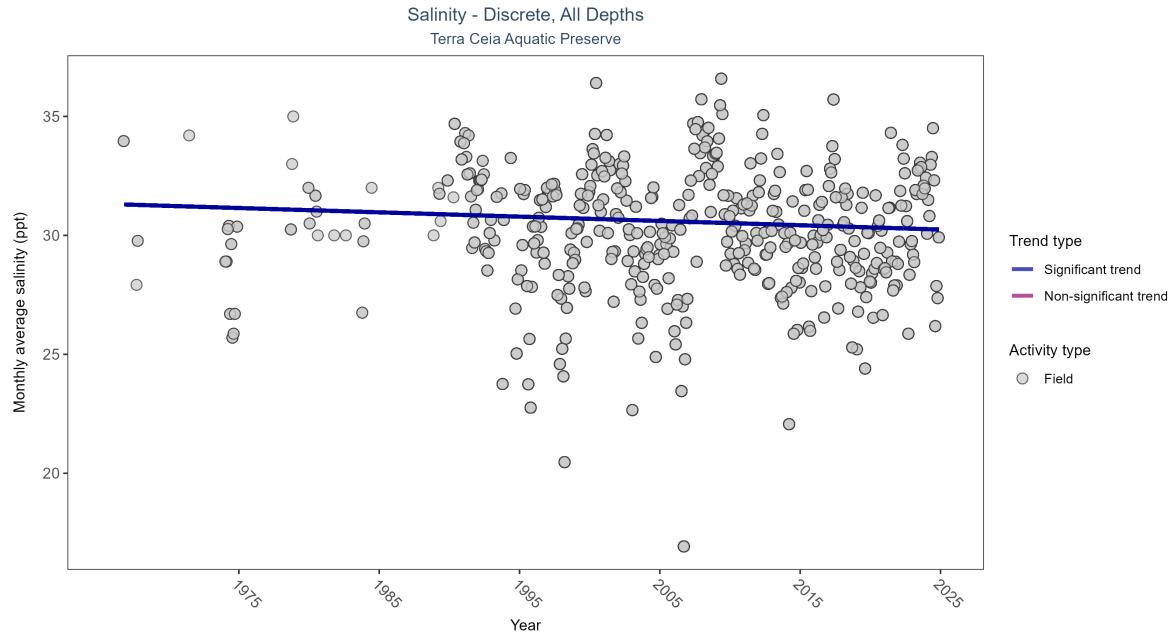


Figure 13: Scatter plot of monthly average salinity over time. If the time series included ten or more years of discrete observations, significant (blue) or non-significant (magenta) trend lines are also shown. Discrete salinity values derived from grab samples analyzed in the field (circles) or the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

Table 7: Seasonal Kendall-Tau Results for - Salinity

| Activity Type | Statistical Trend              | Sample Count | Years with Data | Period of Record | Median Result Value | Tau      | Sen Intercept | Sen Slope | P      |
|---------------|--------------------------------|--------------|-----------------|------------------|---------------------|----------|---------------|-----------|--------|
| All           | Significantly decreasing trend | 24810        | 48              | 1966 - 2024      | 30.6                | -0.06746 | 31.31304      | -0.01811  | 0.0433 |

Monthly average salinity decreased by 0.02 ppt per year.

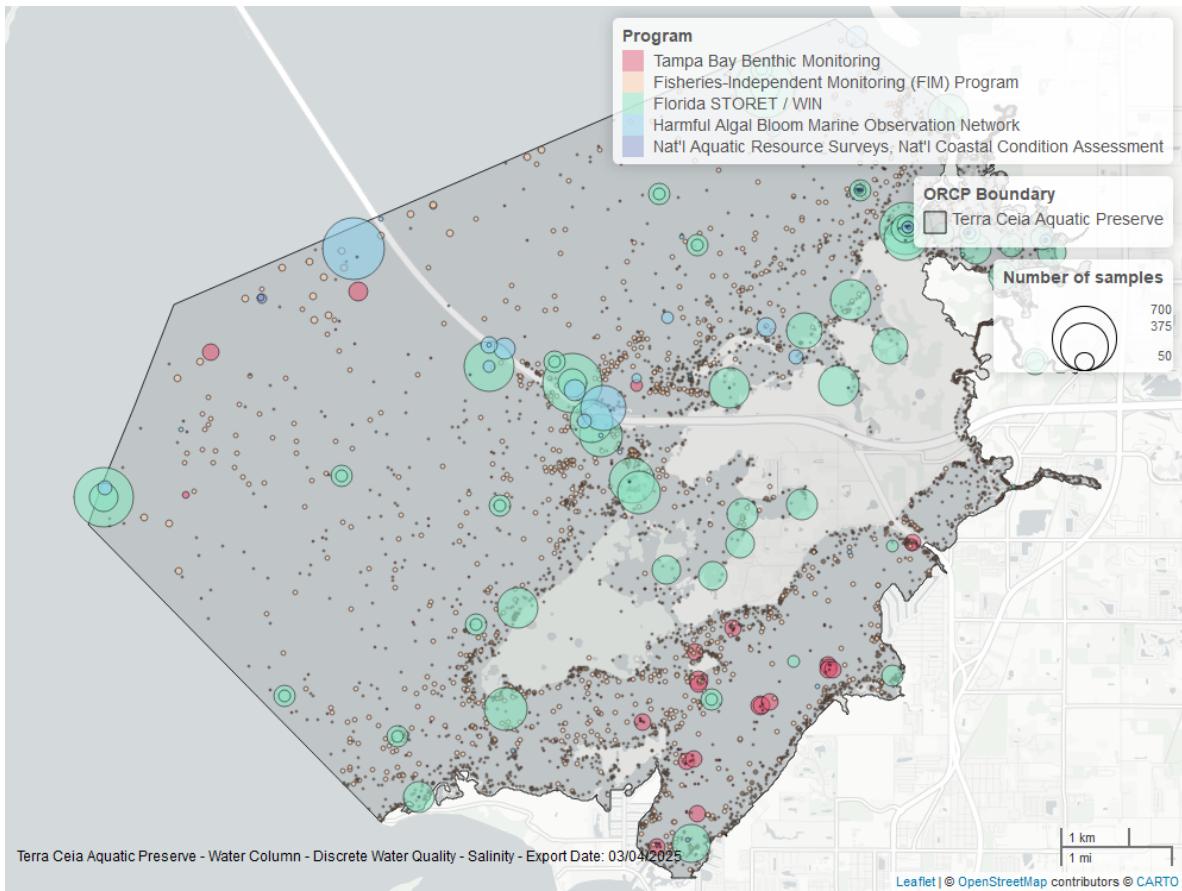


Figure 14: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Salinity - Continuous

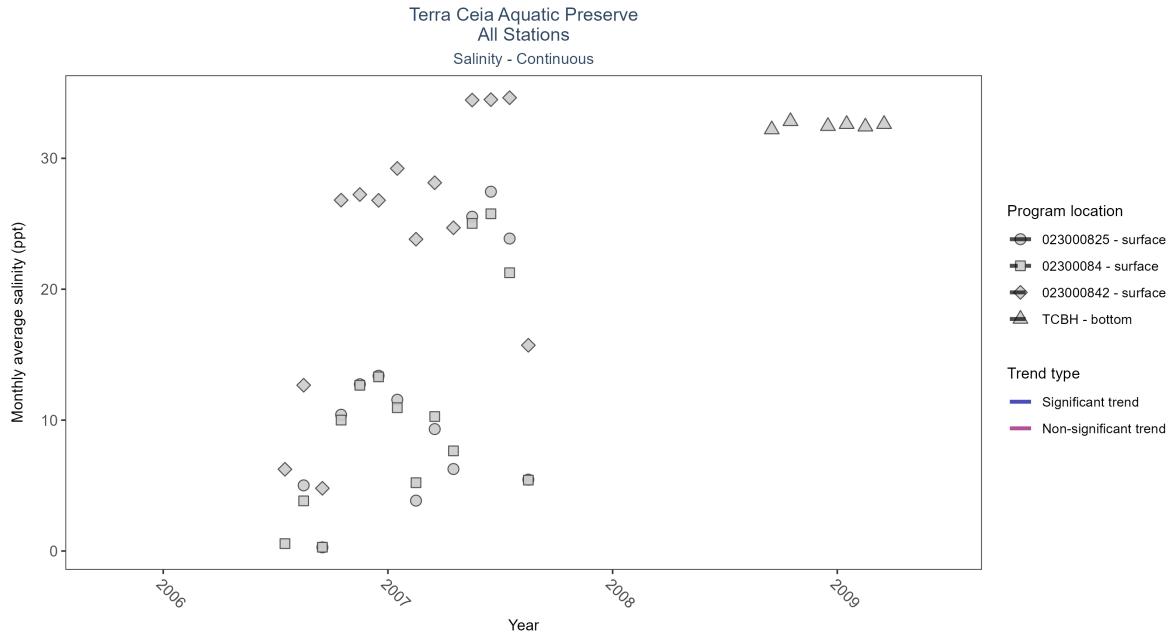


Figure 15: Scatter plot of monthly average salinity over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 8: Seasonal Kendall-Tau Results - Salinity

| Program Location | Statistical Trend                    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau | Sen Intercept | Sen Slope | P |
|------------------|--------------------------------------|--------------|-----------------|------------------|---------------------|-----|---------------|-----------|---|
| 023000825        | Insufficient data to calculate trend | 645          | 2               | 2006 - 2007      | 12.0                | -   | -             | -         | - |
| 02300084         | Insufficient data to calculate trend | 696          | 2               | 2006 - 2007      | 11.0                | -   | -             | -         | - |
| 023000842        | Insufficient data to calculate trend | 578          | 2               | 2006 - 2007      | 28.0                | -   | -             | -         | - |
| TCBH             | Insufficient data to calculate trend | 8304         | 2               | 2008 - 2009      | 32.6                | -   | -             | -         | - |

There was insufficient data to fit a model for four locations.

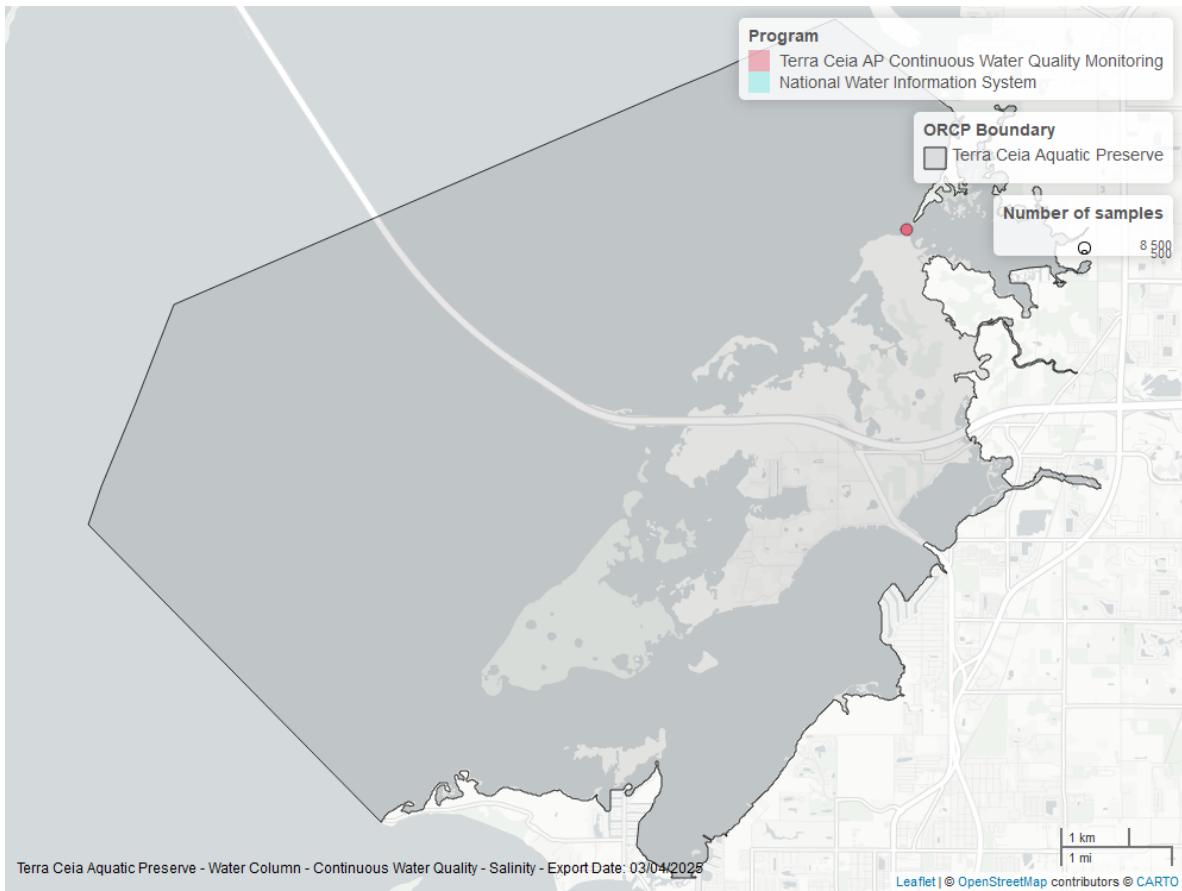


Figure 16: Map showing location of salinity continuous water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Water Temperature - Discrete

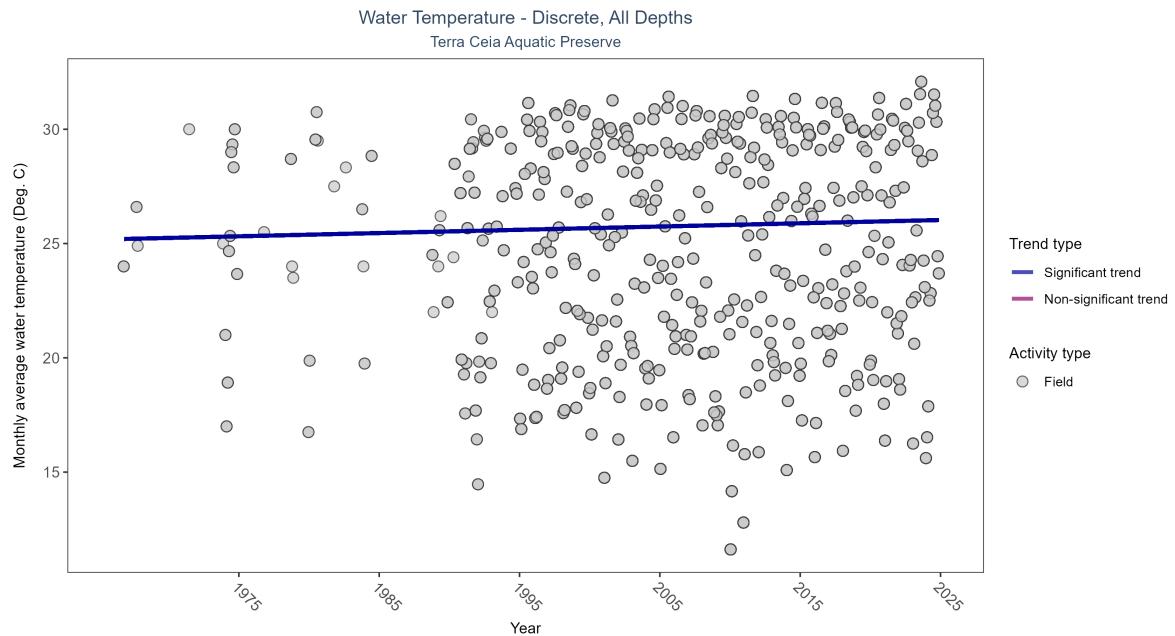


Figure 17: Scatter plot of monthly average water temperature over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only water temperature measurements taken in the field (circles) are included in the plot.

Table 9: Seasonal Kendall-Tau Results for - Water Temperature

| Activity Type | Statistical Trend              | Sample Count | Years with Data | Period of Record | Median Result Value | Tau     | Sen Intercept | Sen Slope | P     |
|---------------|--------------------------------|--------------|-----------------|------------------|---------------------|---------|---------------|-----------|-------|
| Field         | Significantly increasing trend | 25741        | 50              | 1966 - 2024      | 26.7                | 0.09284 | 25.18823      | 0.01425   | 0.008 |

Monthly average water temperature increased by  $0.01^{\circ}\text{C}$  per year.

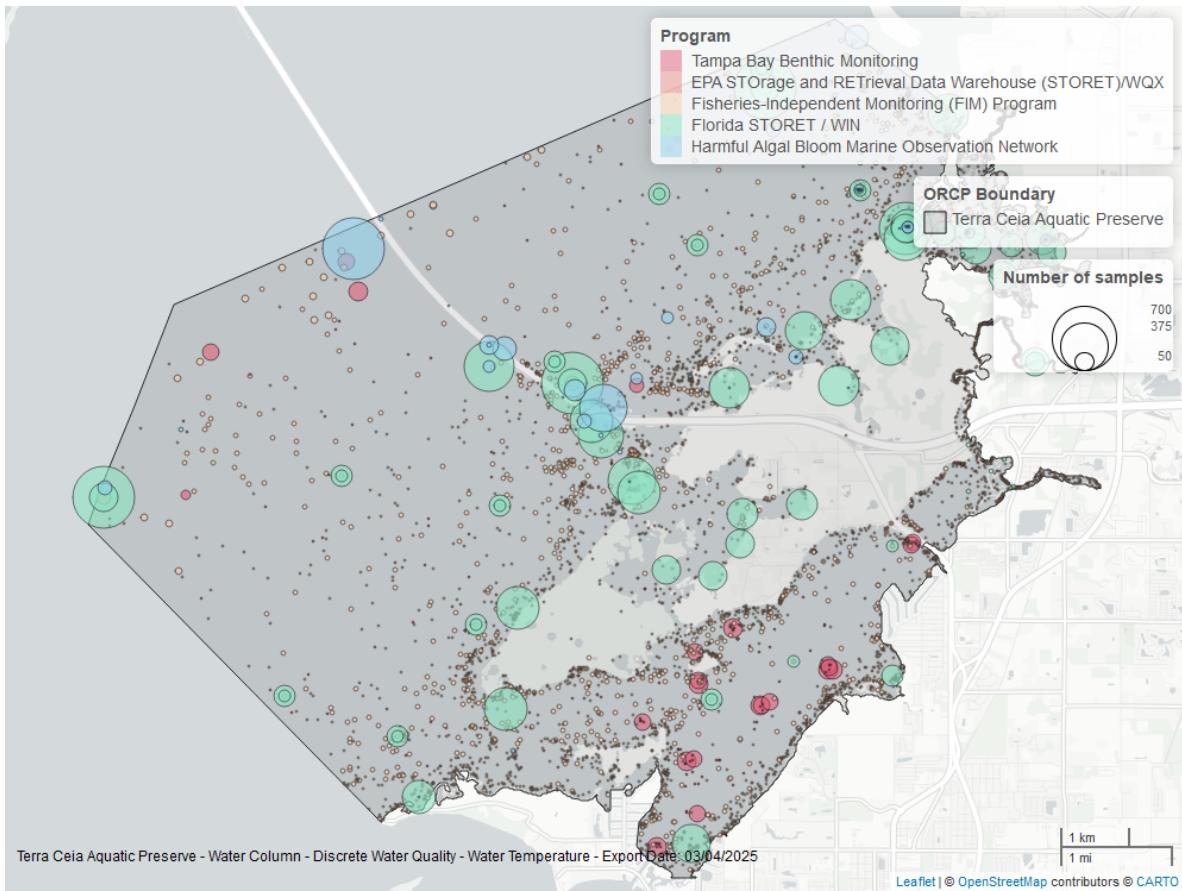


Figure 18: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Water Temperature - Continuous

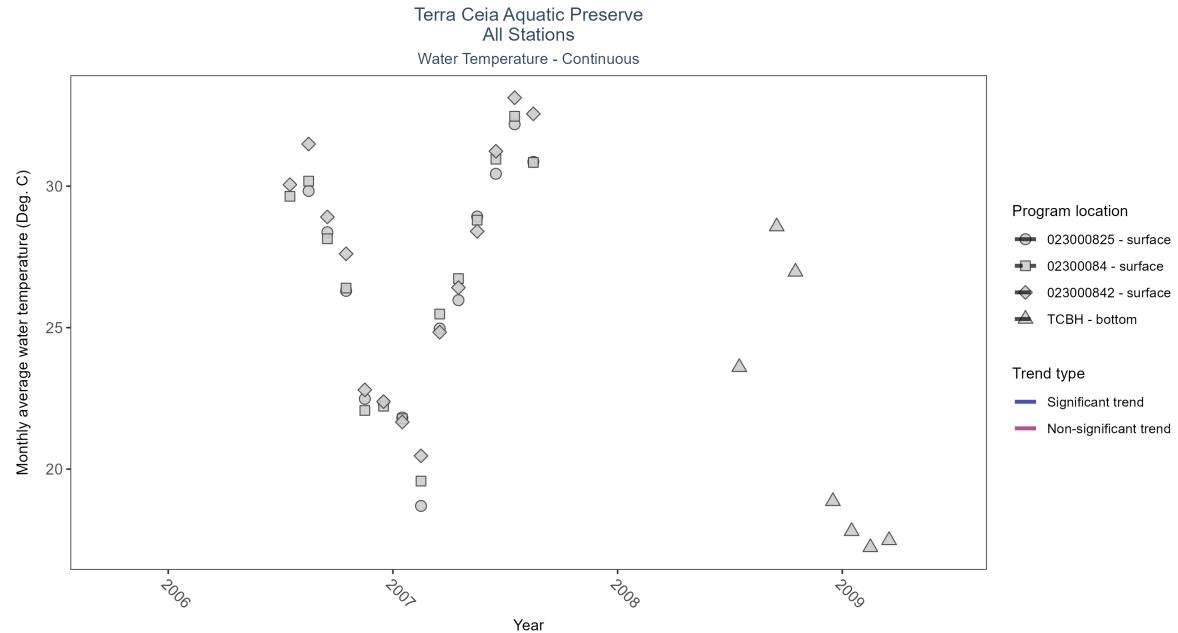


Figure 19: Scatter plot of monthly average water temperature over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 10: Seasonal Kendall-Tau Results - Water Temperature

| Program Location | Statistical Trend                    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau | Sen Intercept | Sen Slope | P |
|------------------|--------------------------------------|--------------|-----------------|------------------|---------------------|-----|---------------|-----------|---|
| 023000825        | Insufficient data to calculate trend | 659          | 2               | 2006 - 2007      | 26.6                | -   | -             | -         | - |
| 02300084         | Insufficient data to calculate trend | 717          | 2               | 2006 - 2007      | 27.5                | -   | -             | -         | - |
| 023000842        | Insufficient data to calculate trend | 571          | 2               | 2006 - 2007      | 27.7                | -   | -             | -         | - |
| TCBH             | Insufficient data to calculate trend | 8305         | 2               | 2008 - 2009      | 20.0                | -   | -             | -         | - |

There was insufficient data to fit a model for four locations.

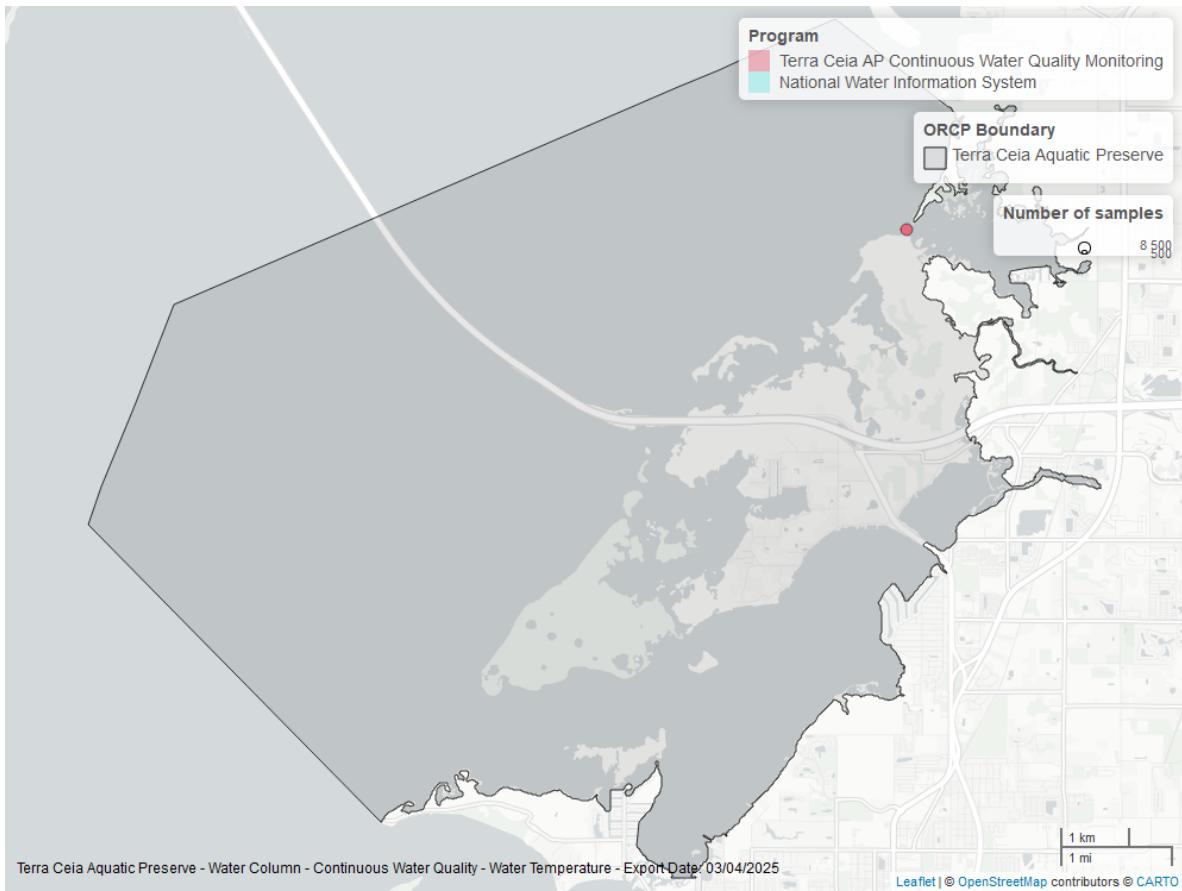


Figure 20: Map showing location of water temperature continuous water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## pH - Discrete

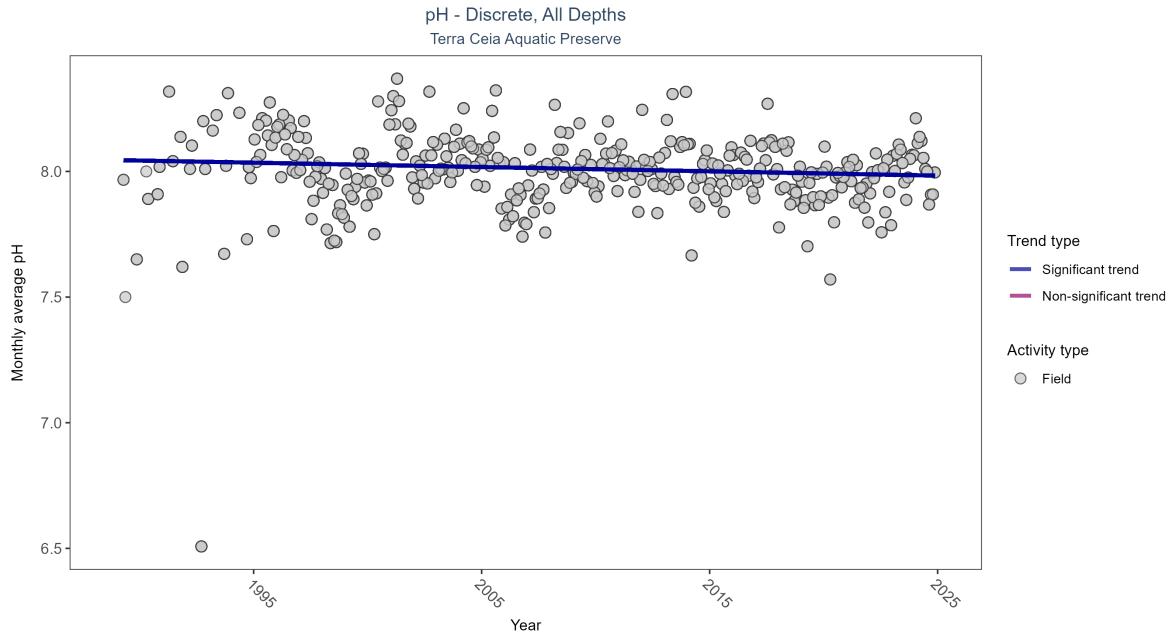


Figure 21: Scatter plot of monthly average pH over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only pH values measured in the field (circles) are included in the plot.

Table 11: Seasonal Kendall-Tau Results for - pH

| Activity Type | Statistical Trend              | Sample Count | Years with Data | Period of Record | Median Result Value | Tau      | Sen Intercept | Sen Slope | P      |
|---------------|--------------------------------|--------------|-----------------|------------------|---------------------|----------|---------------|-----------|--------|
| Field         | Significantly decreasing trend | 22811        | 36              | 1989 - 2024      | 8                   | -0.09519 | 8.04497       | -0.00172  | 0.0099 |

Monthly average pH decreased by less than 0.01 pH units per year.

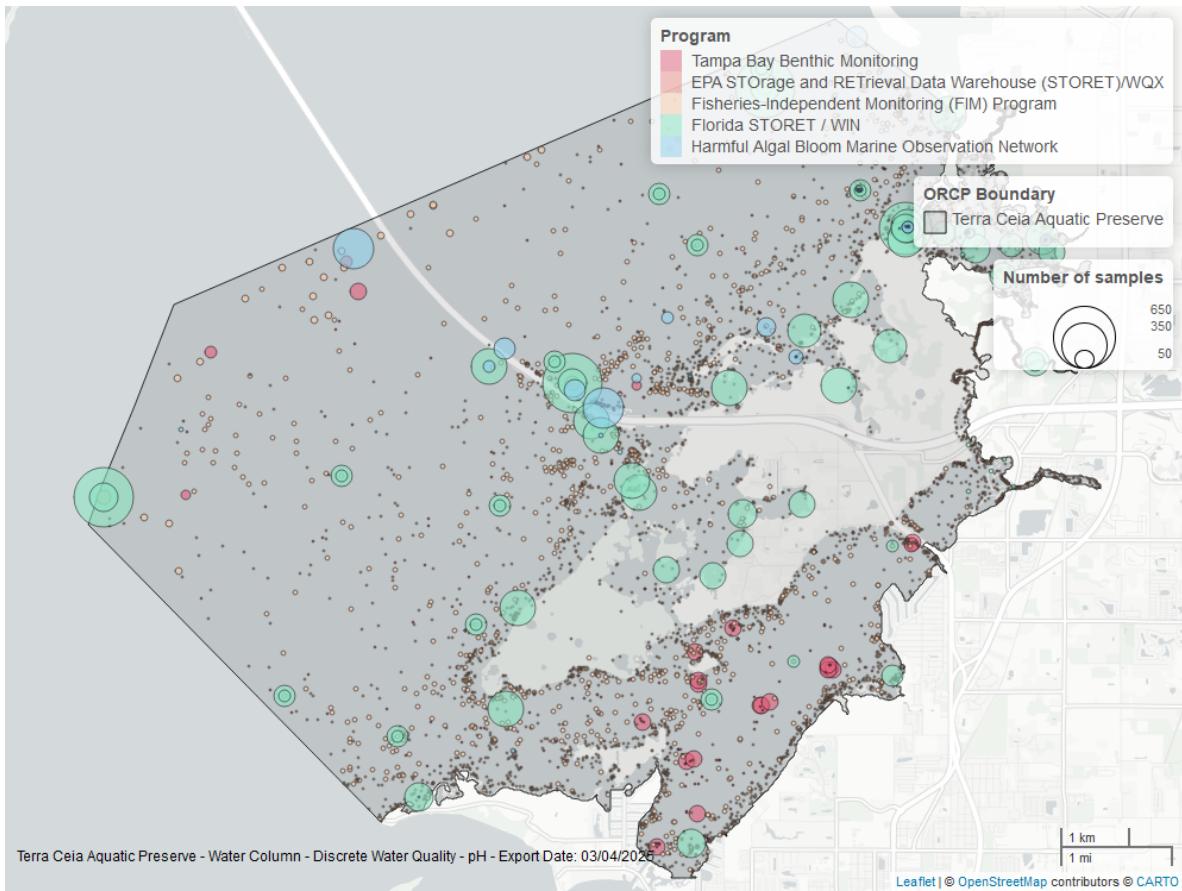


Figure 22: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## pH - Continuous

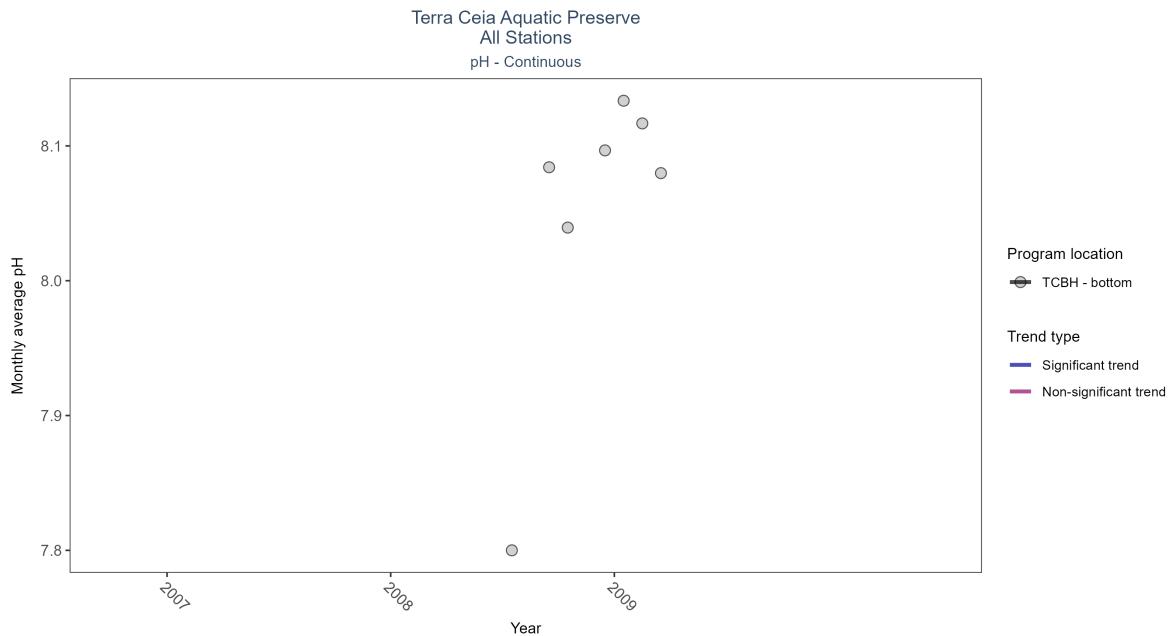


Figure 23: Scatter plot of monthly average pH over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 12: Seasonal Kendall-Tau Results - pH

| Program Location | Statistical Trend                    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau | Sen Intercept | Sen Slope | P |
|------------------|--------------------------------------|--------------|-----------------|------------------|---------------------|-----|---------------|-----------|---|
| TCBH             | Insufficient data to calculate trend | 8306         | 2               | 2008 - 2009      | 8.1                 | -   | -             | -         | - |

There was insufficient data to fit a model for one location.

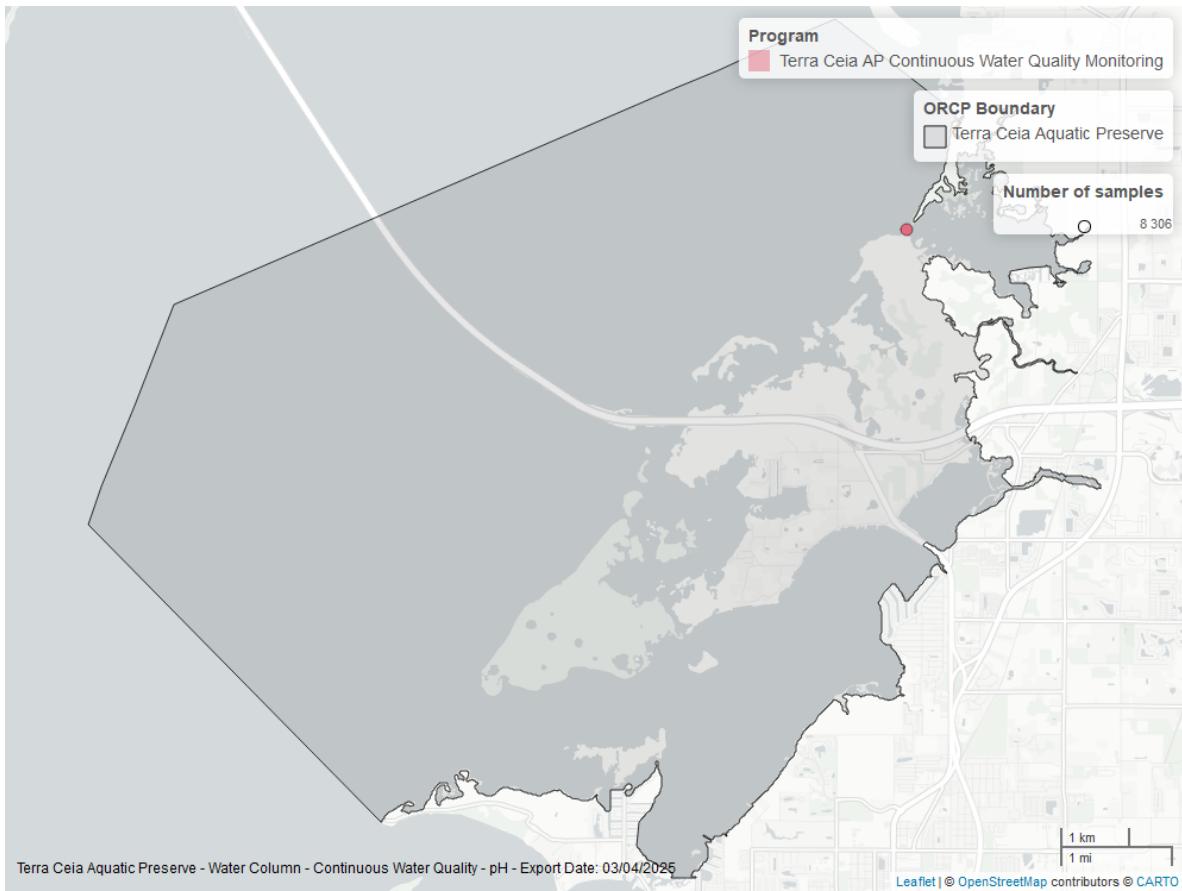


Figure 24: Map showing location of ph continuous water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Water Clarity

### Turbidity - Discrete

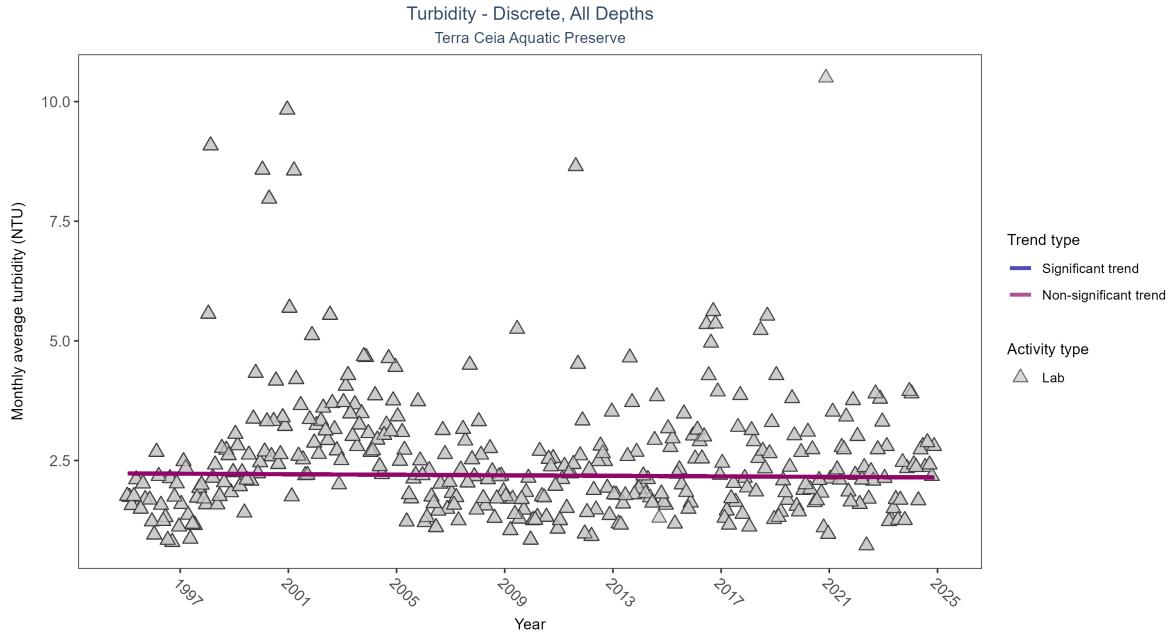


Figure 25: Scatter plot of monthly average turbidity over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only turbidity values measured in the laboratory (triangles) are included in the plot.

Table 13: Seasonal Kendall-Tau Results for - Turbidity

| Activity Type | Statistical Trend    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau | Sen Intercept | Sen Slope | P        |        |
|---------------|----------------------|--------------|-----------------|------------------|---------------------|-----|---------------|-----------|----------|--------|
| Lab           | No significant trend | 8031         | 30              | 1995 - 2024      |                     | 1.9 | -0.02215      | 2.22967   | -0.00278 | 0.5699 |

Turbidity showed no detectable trend between 1995 and 2024.

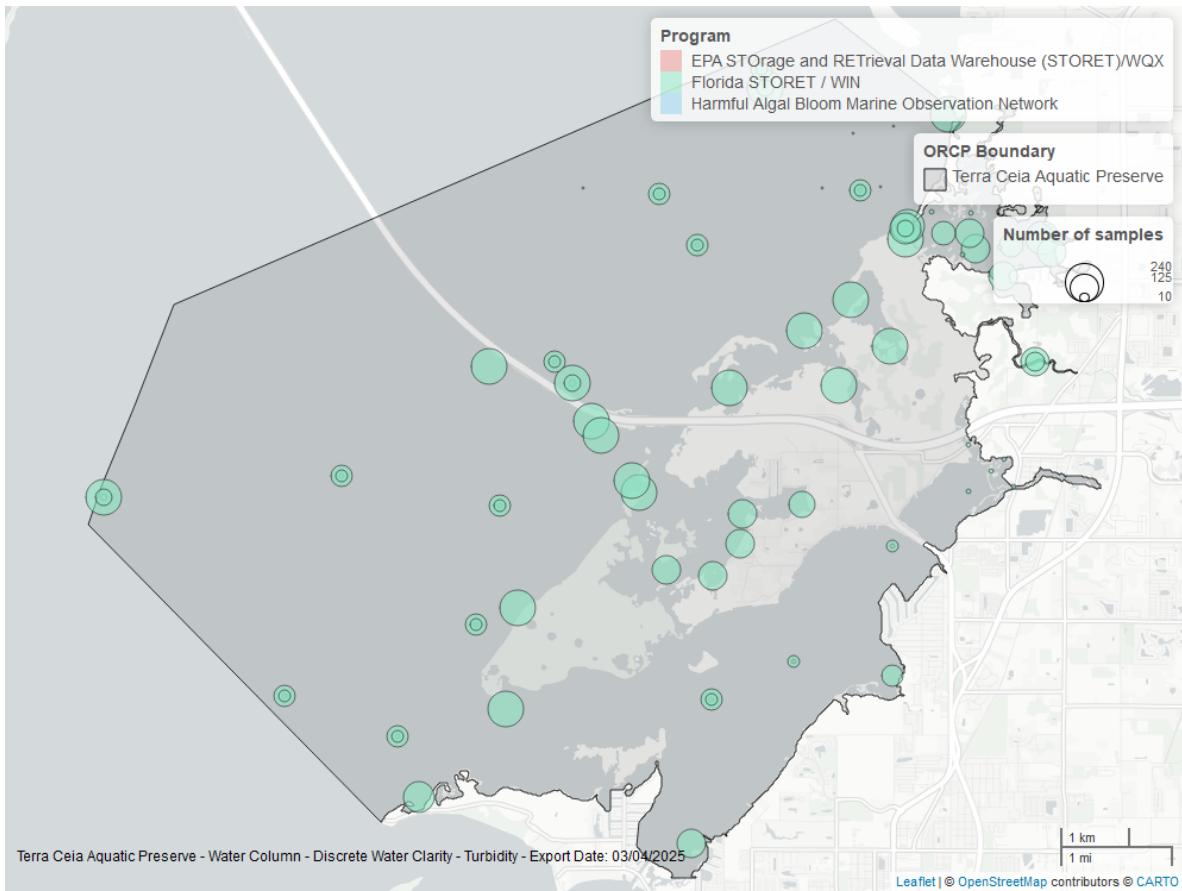


Figure 26: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Turbidity - Continuous

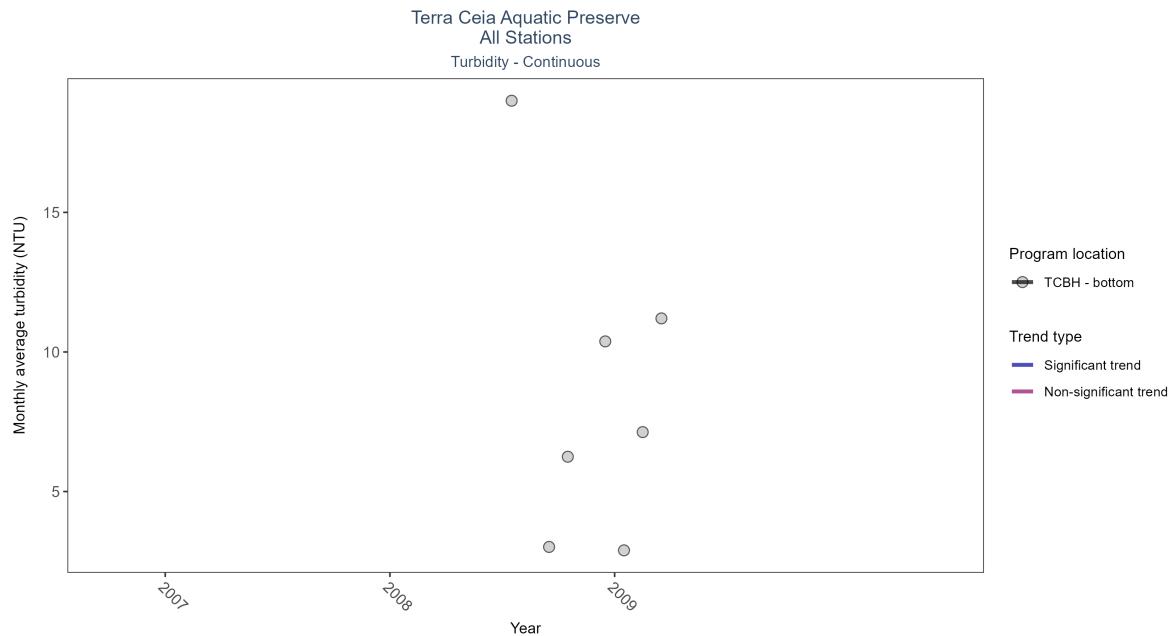


Figure 27: Scatter plot of monthly average turbidity over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 14: Seasonal Kendall-Tau Results - Turbidity

| Program Location | Statistical Trend                    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau | Sen Intercept | Sen Slope | P |
|------------------|--------------------------------------|--------------|-----------------|------------------|---------------------|-----|---------------|-----------|---|
| TCBH             | Insufficient data to calculate trend | 8263         | 2               | 2008 - 2009      | 2                   | -   | -             | -         | - |

There was insufficient data to fit a model for one location.

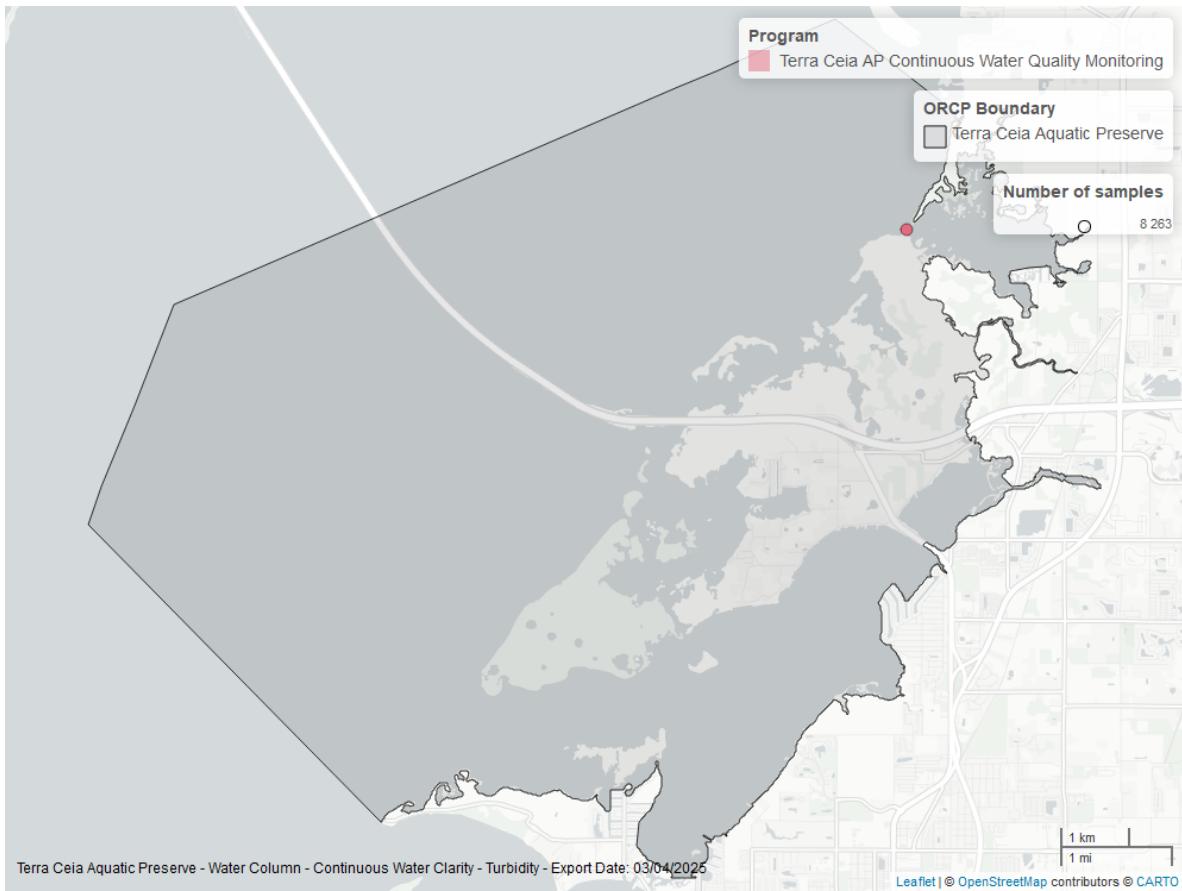


Figure 28: Map showing location of turbidity continuous water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Total Suspended Solids - Discrete

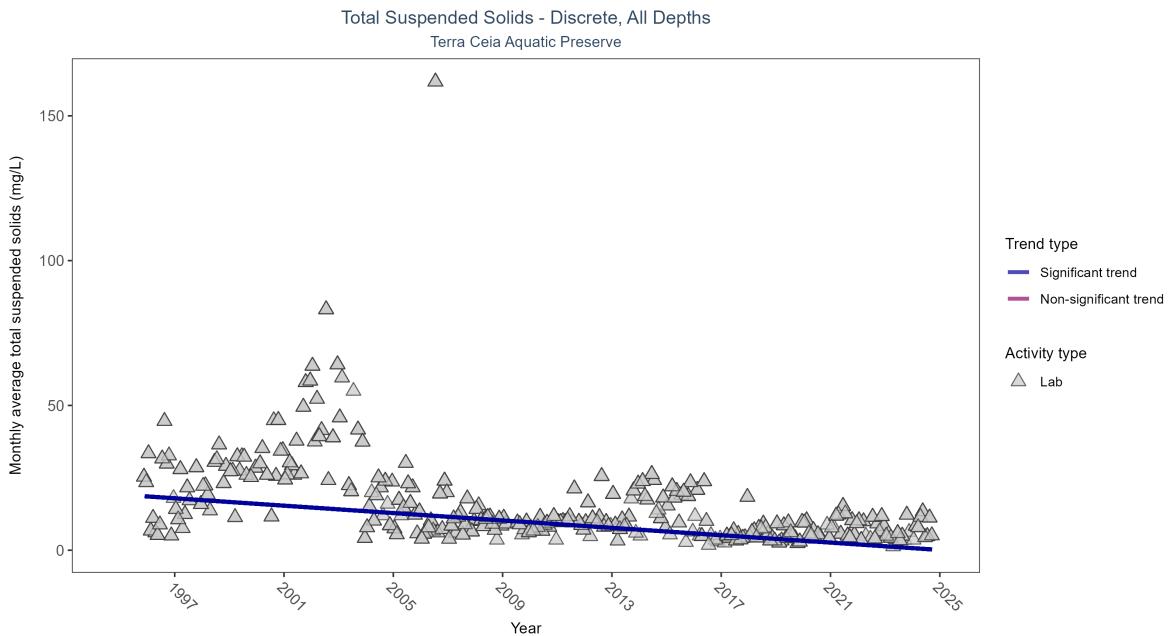


Figure 29: Scatter plot of monthly average total suspended solids (TSS) over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only TSS values obtained from laboratory analyses (triangles) are included in the plot.

Table 15: Seasonal Kendall-Tau Results for - Total Suspended Solids

| Activity Type | Statistical Trend              | Sample Count | Years with Data | Period of Record | Median Result Value | Tau      | Sen Intercept | Sen Slope | P |
|---------------|--------------------------------|--------------|-----------------|------------------|---------------------|----------|---------------|-----------|---|
| Lab           | Significantly decreasing trend | 1661         | 30              | 1995 - 2024      | 10.6                | -0.43743 | 19.21194      | -0.63731  | 0 |

Monthly average total suspended solids decreased by 0.64 mg/L per year, indicating an increase in water clarity.

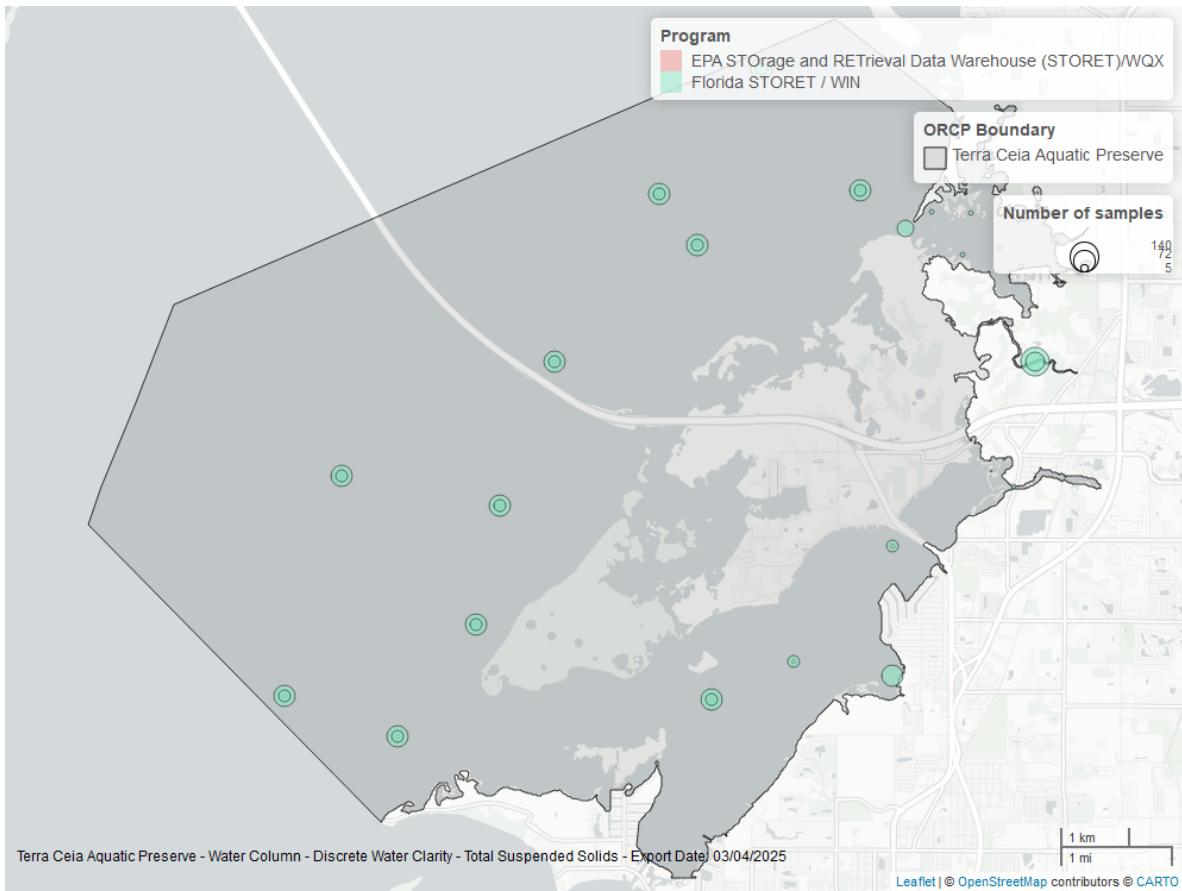


Figure 30: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Chlorophyll a, Uncorrected for Pheophytin - Discrete

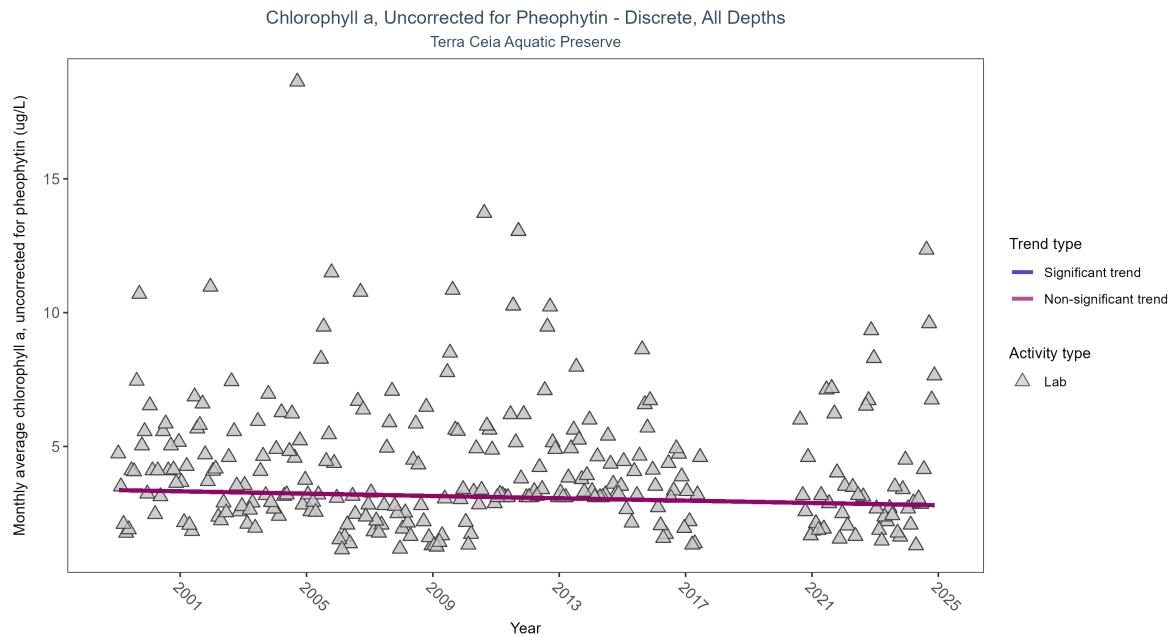


Figure 31: Scatter plot of monthly average levels of chlorophyll a, uncorrected for pheophytin, over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only laboratory-analyzed chlorophyll a (triangles) is included in the plot.

Table 16: Seasonal Kendall-Tau Results for - Chlorophyll a, Uncorrected for Pheophytin

| Activity Type | Statistical Trend    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau | Sen Intercept | Sen Slope | P        |        |
|---------------|----------------------|--------------|-----------------|------------------|---------------------|-----|---------------|-----------|----------|--------|
| Lab           | No significant trend | 1092         | 24              | 1999 - 2024      |                     | 3.2 | -0.08102      | 3.36562   | -0.02171 | 0.0671 |

Chlorophyll a, uncorrected for pheophytin, showed no detectable trend between 1999 and 2024.

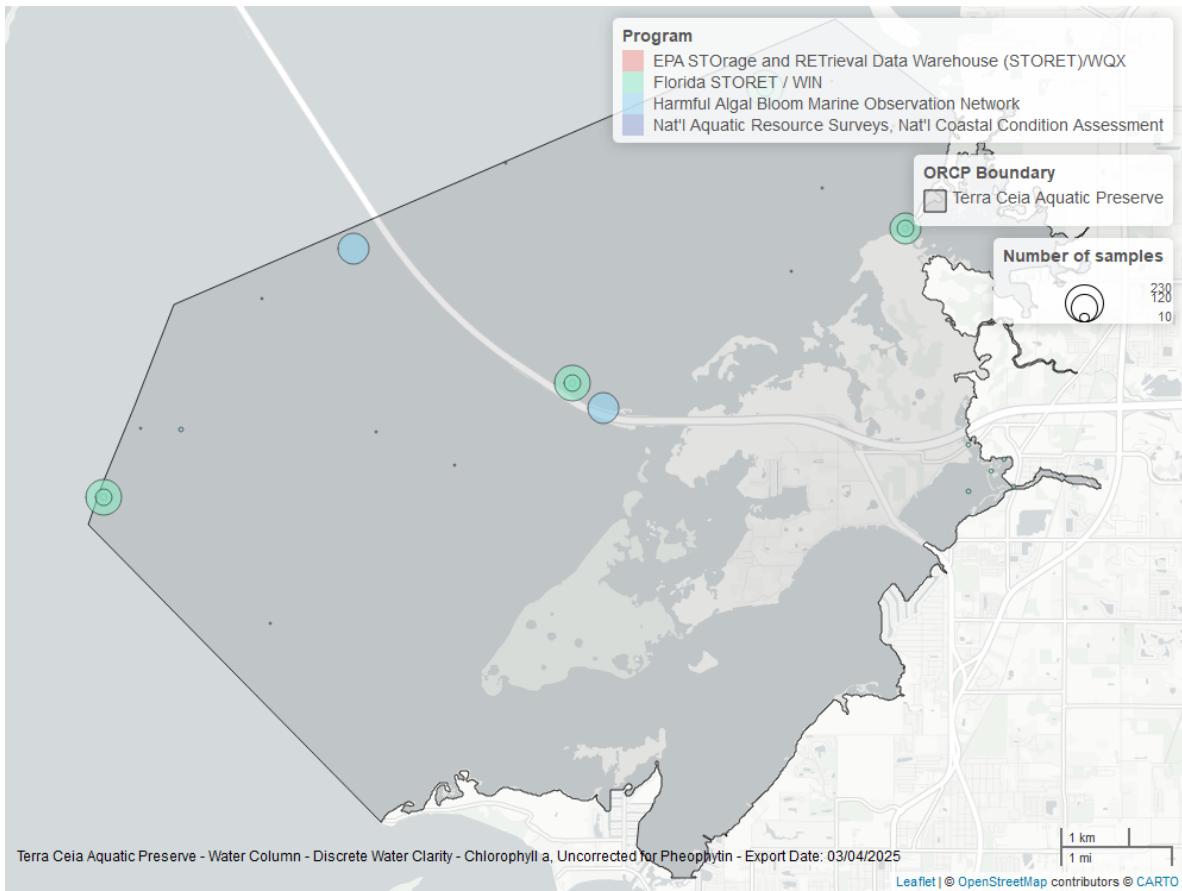


Figure 32: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Chlorophyll a, Corrected for Pheophytin - Discrete

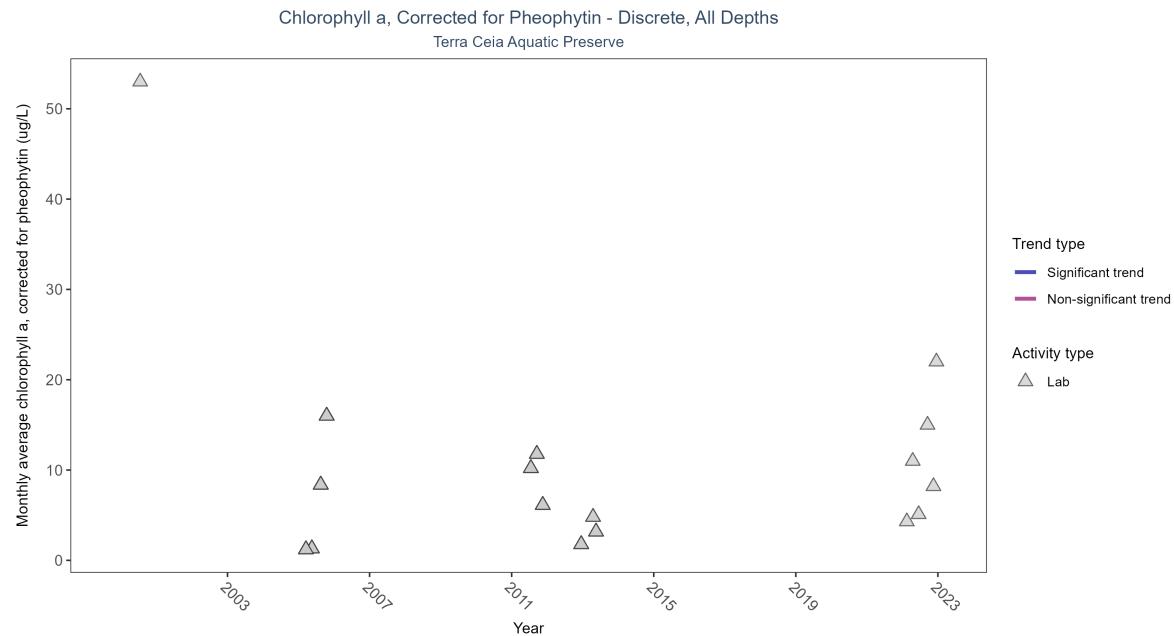


Figure 33: Scatter plot of monthly average levels of chlorophyll a, corrected for pheophytin, over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only laboratory-analyzed chlorophyll a (triangles) is included in the plot.

Table 17: Seasonal Kendall-Tau Results for - Chlorophyll a, Corrected for Pheophytin

| Activity Type | Statistical Trend                    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau | Sen Intercept | Sen Slope | P |
|---------------|--------------------------------------|--------------|-----------------|------------------|---------------------|-----|---------------|-----------|---|
| Lab           | Insufficient data to calculate trend | 54           | 6               | 2000 - 2022      | 5.1                 | -   | -             | -         | - |

There was insufficient data to fit a model for chlorophyll a, corrected for pheophytin.

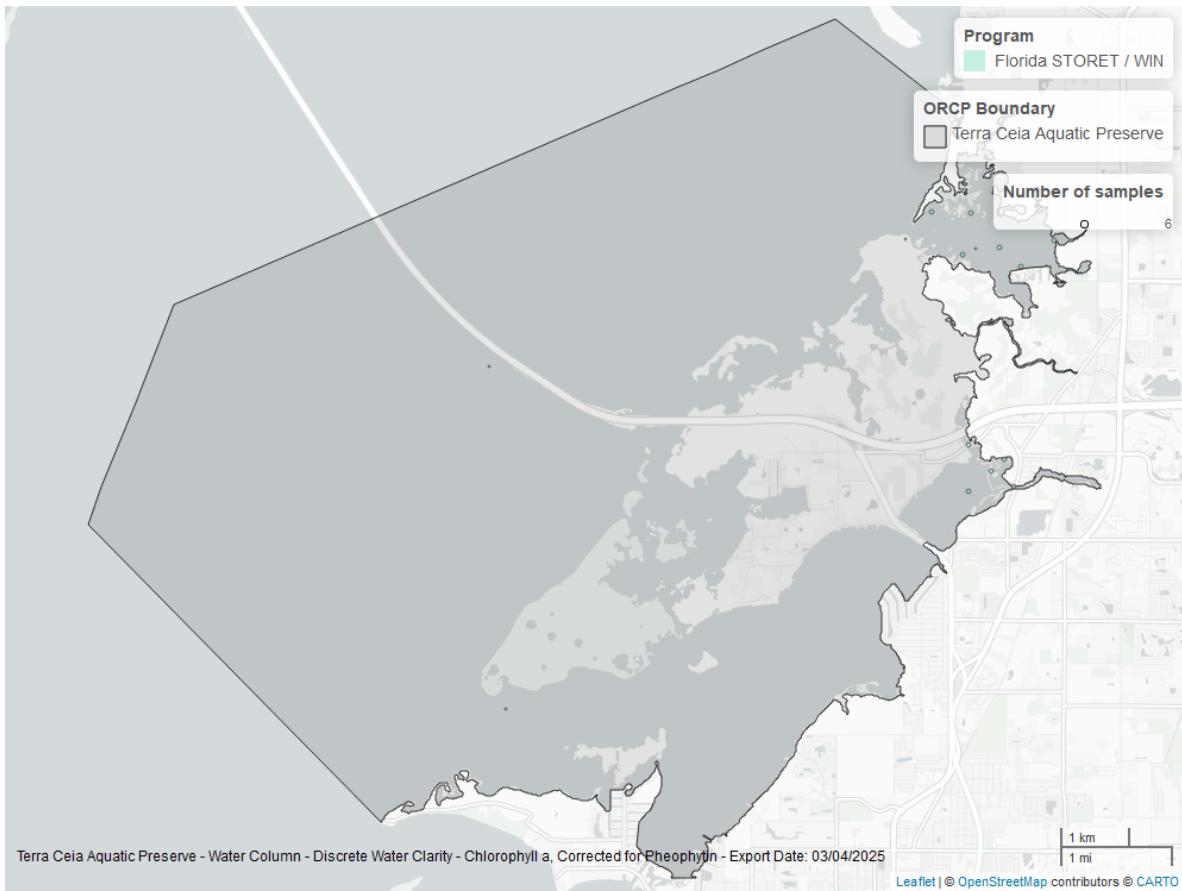


Figure 34: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Secchi Depth - Discrete

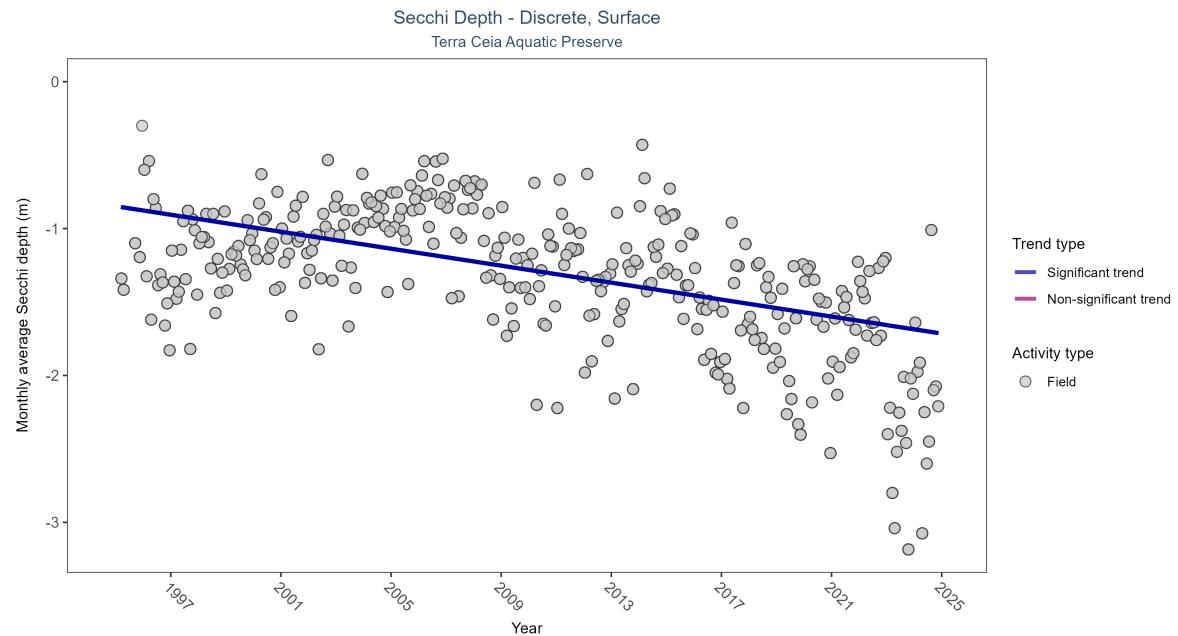


Figure 35: Scatter plot of monthly average Secchi depth over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Secchi depth is only measured in the field (circles).

Table 18: Seasonal Kendall-Tau Results for - Secchi Depth

| Activity Type | Statistical Trend              | Sample Count | Years with Data | Period of Record | Median Result Value | Tau     | Sen Intercept | Sen Slope | P |
|---------------|--------------------------------|--------------|-----------------|------------------|---------------------|---------|---------------|-----------|---|
| Field         | Significantly decreasing trend | 9860         | 30              | 1995 - 2024      | -1                  | -0.3755 | -0.84796      | -0.02889  | 0 |

Monthly average Secchi depth became deeper by 0.03 m per year, indicating an increase in water clarity.

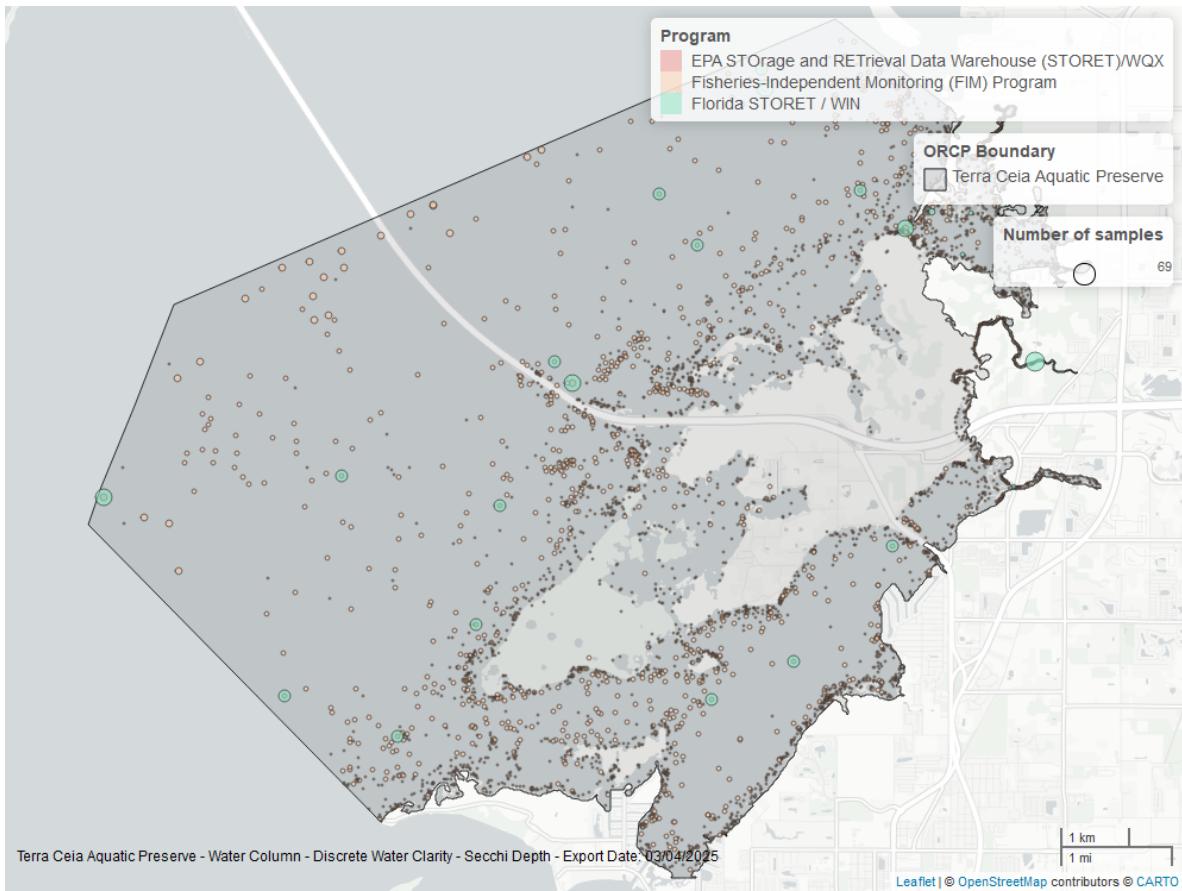


Figure 36: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Colored Dissolved Organic Matter - Discrete

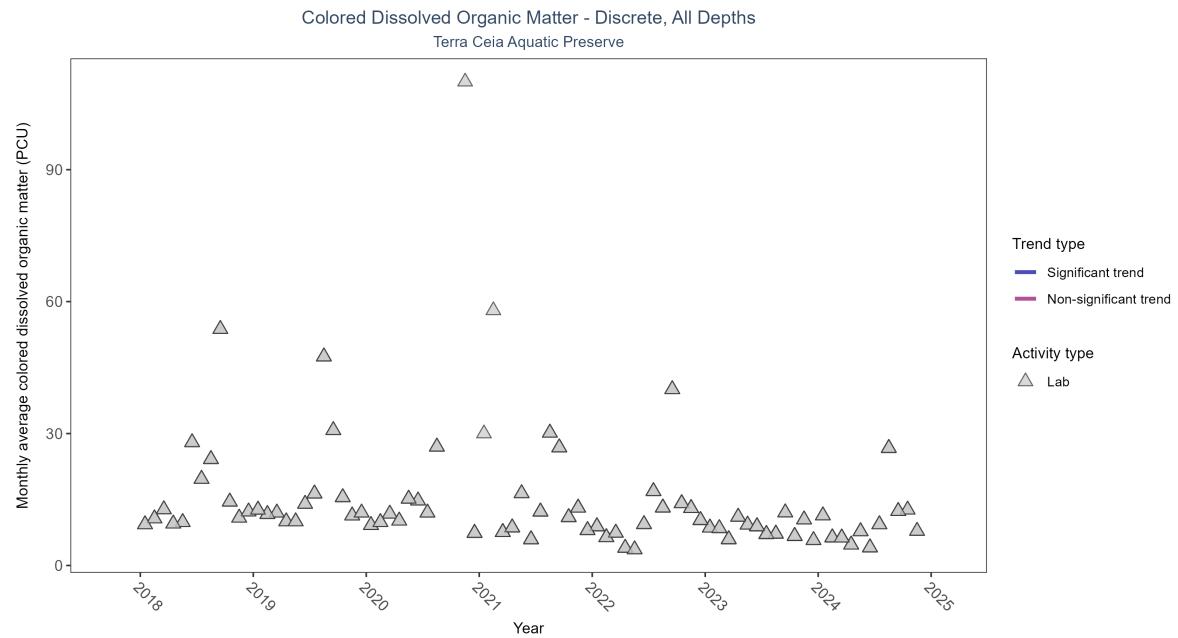


Figure 37: Scatter plot of monthly average colored dissolved organic matter (CDOM) over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only laboratory-analyzed CDOM (triangles) is included in the plot.

Table 19: Seasonal Kendall-Tau Results for - Colored Dissolved Organic Matter

| Activity Type | Statistical Trend                    | Sample Count | Years with Data | Period of Record | Median Result Value | Tau | Sen Intercept | Sen Slope | P |
|---------------|--------------------------------------|--------------|-----------------|------------------|---------------------|-----|---------------|-----------|---|
| Lab           | Insufficient data to calculate trend | 573          | 7               | 2018 - 2024      | 6                   | -   | -             | -         | - |

There was insufficient data to fit a model for colored dissolved organic matter.

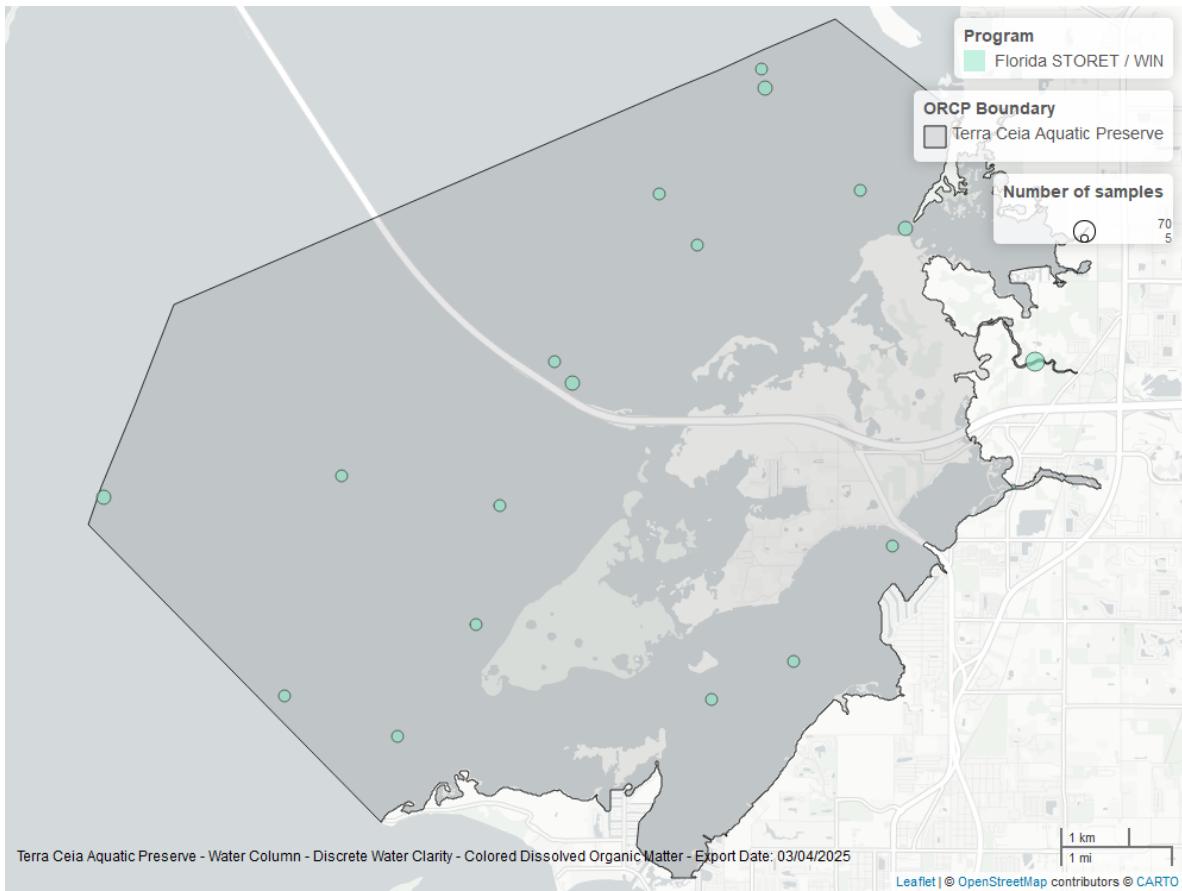


Figure 38: Map showing location of discrete water quality sampling locations within the boundaries of *Terra Ceia Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.