# Pine Island Sound Aquatic Preserve

SEACAR Water Quality Analysis

Last compiled on 30 September, 2025

## Contents

# Indicators

## Nutrients

### Total Nitrogen - Discrete

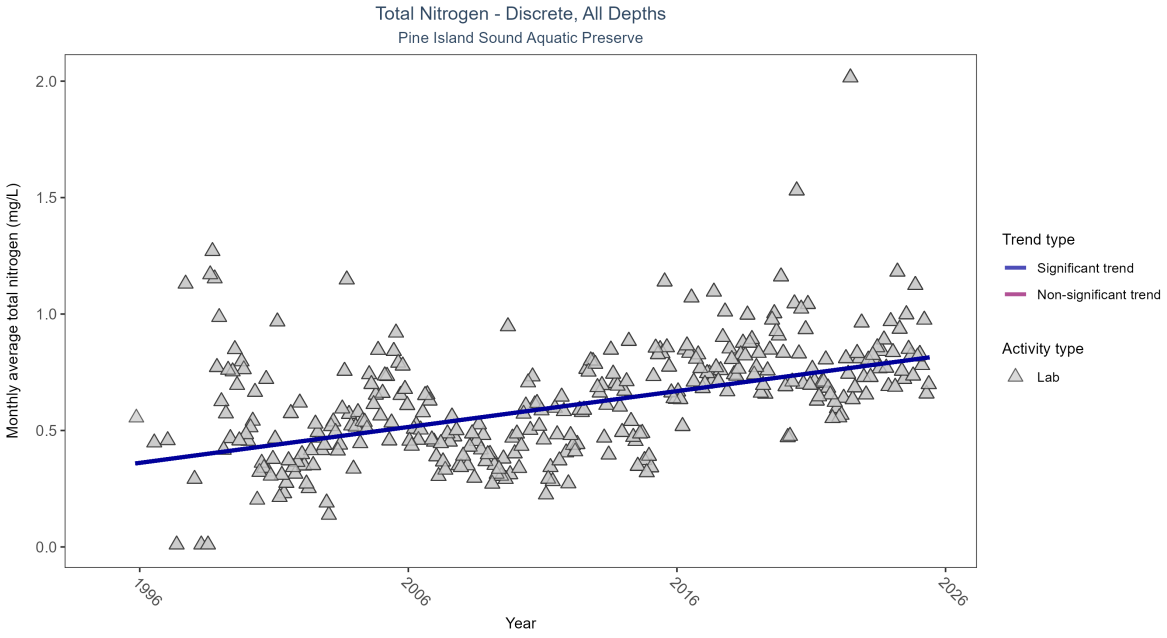


Figure 1: Scatter plot of monthly average total nitrogen over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only nitrogen values obtained from laboratory analyses (triangles) are included in the 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 increasing trend | 6135 | 31 | 1995 - 2025 | 0.62 | 0.37231 | 0.34554 | 0.01541 | 0 |

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

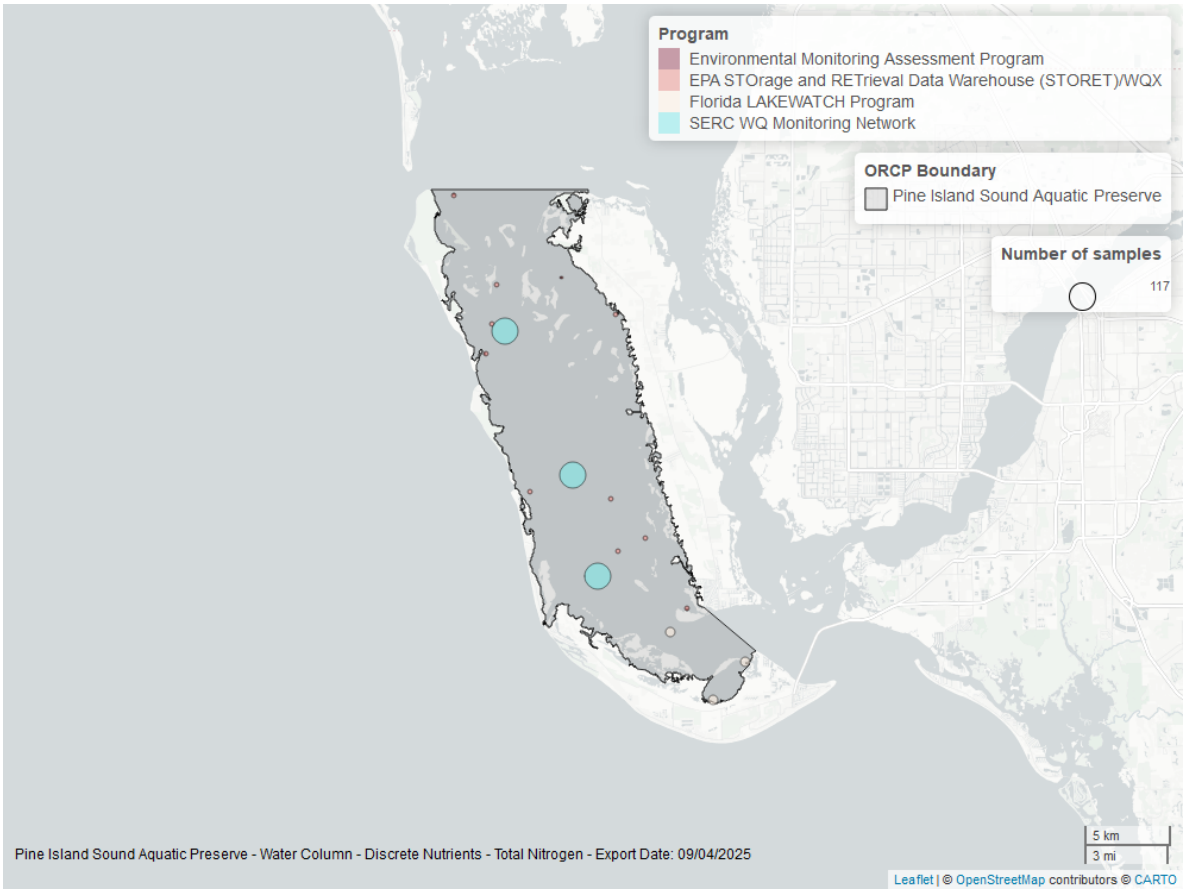


Figure 2: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Total Phosphorus - Discrete

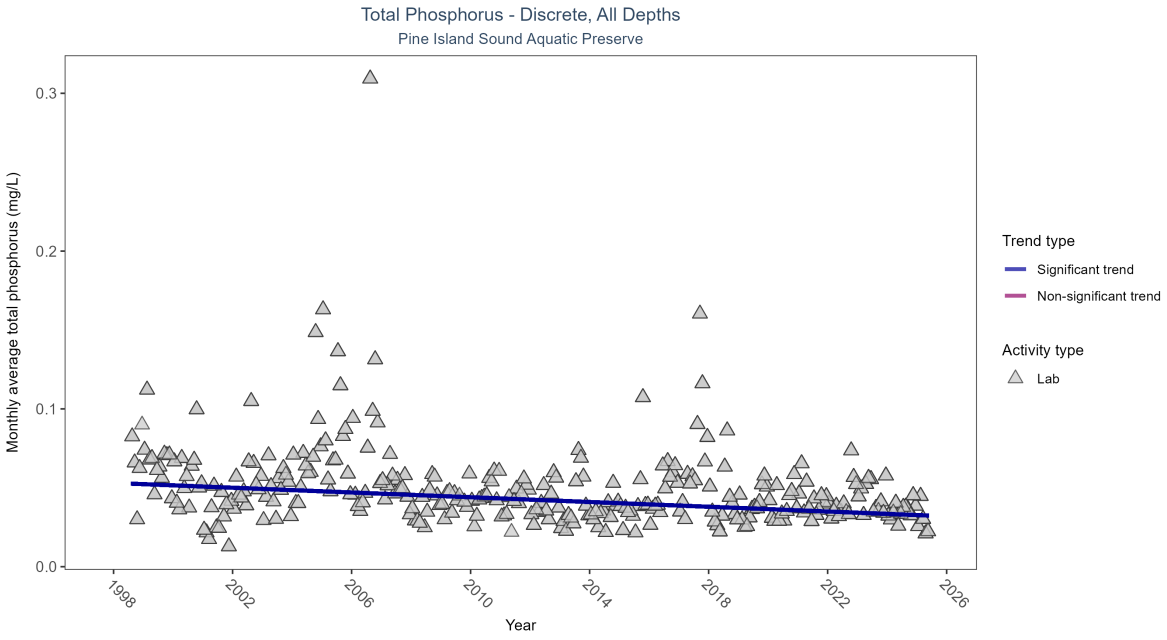


Figure 3: Scatter plot of monthly average total phosphorus over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only phosphorus values obtained from laboratory analyses (triangles) are included in 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 | 4243 | 28 | 1998 - 2025 | 0.038 | -0.24887 | 0.05306 | -0.00075 | 0 |

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

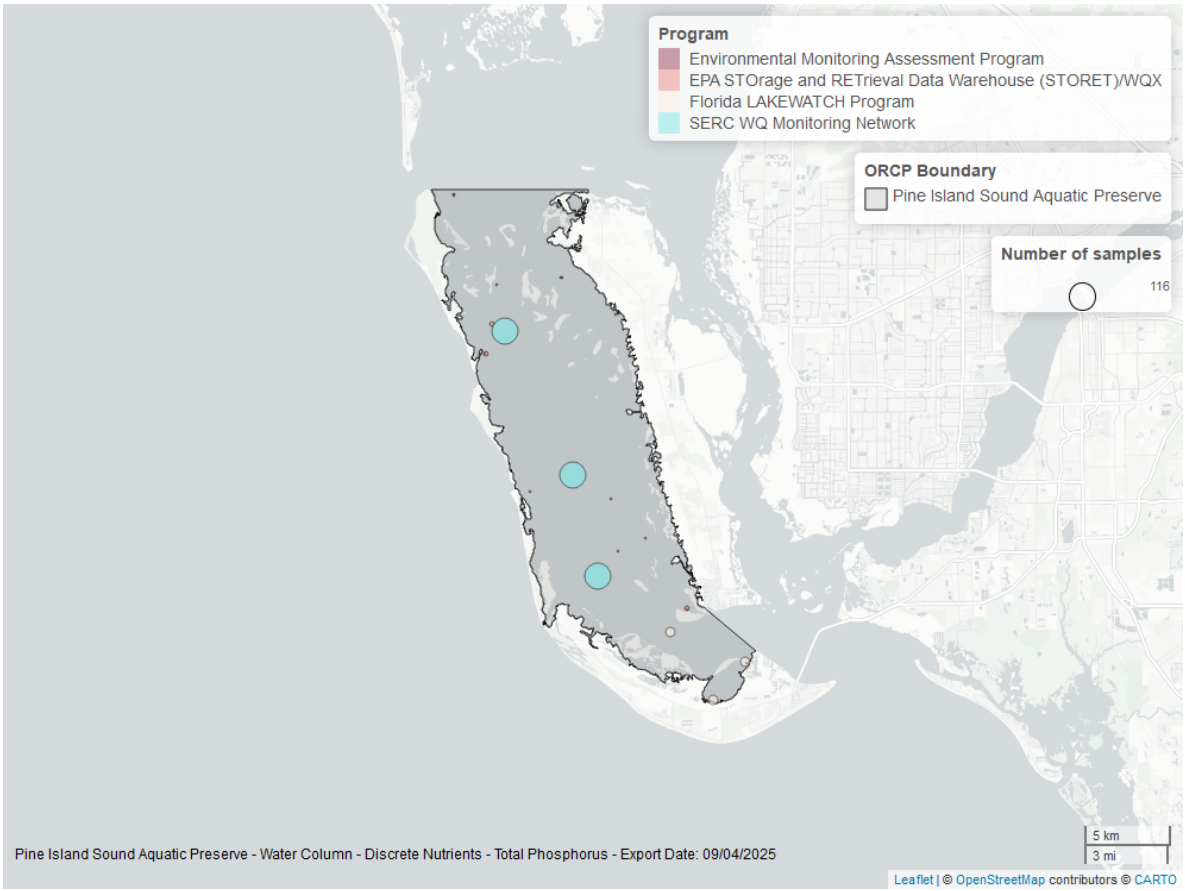


Figure 4: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Water Quality

### Dissolved Oxygen - Discrete

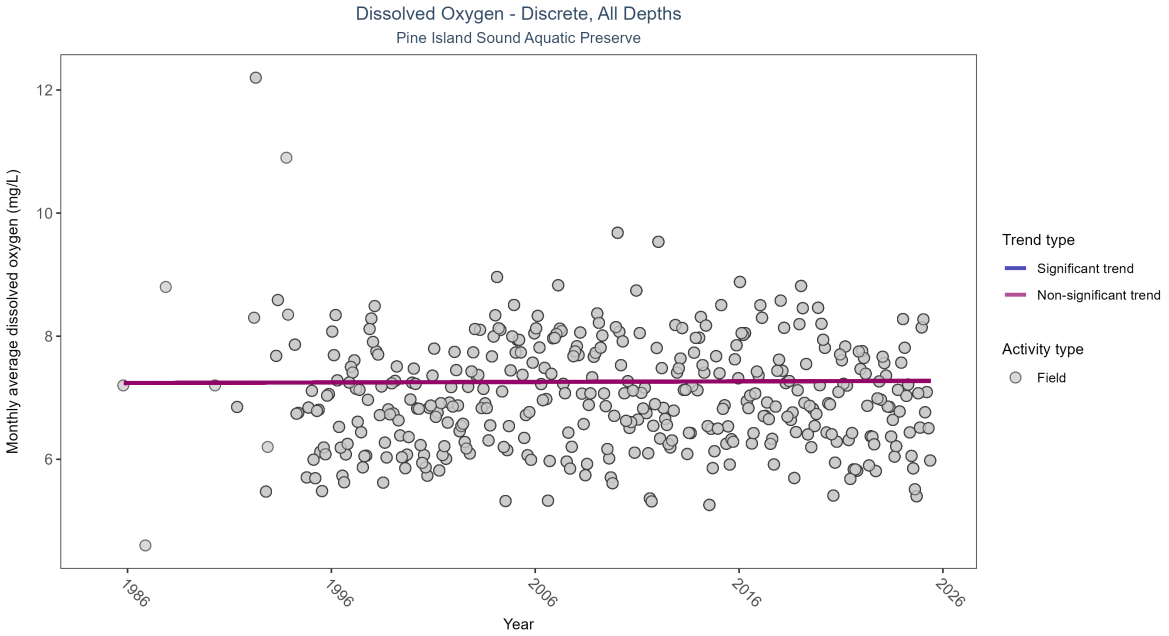


Figure 5: Scatter plot of monthly average dissolved oxygen over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only dissolved oxygen values measured in the field (circles) are included in the plot.

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 | 36122 | 39 | 1985 - 2025 | 6.9 | 0.01202 | 7.23842 | 0.00089 | 0.8038 |

Dissolved oxygen showed no detectable trend between 1985 and 2025.

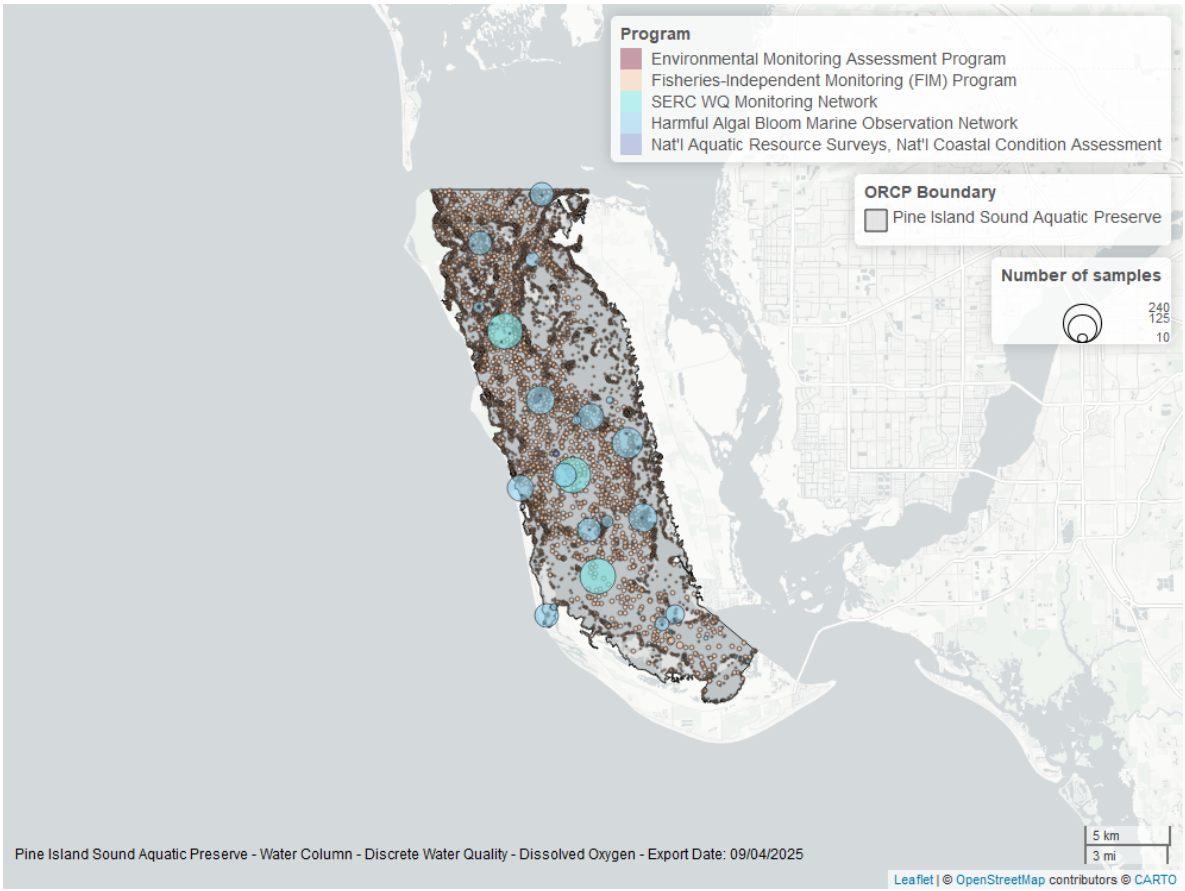


Figure 6: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Dissolved Oxygen - Continuous

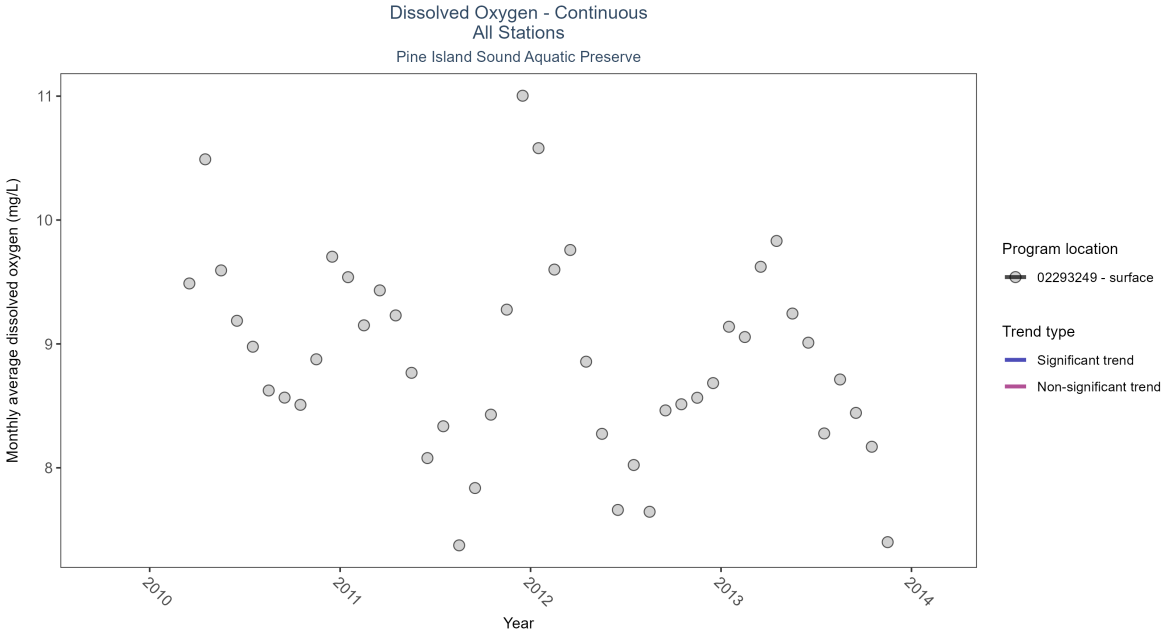


Figure 7: Scatter plot of monthly average dissolved oxygen over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

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 |
|---|---|---|---|---|---|---|---|---|---|
| 02293249 | Insufficient data to calculate trend | 1302 | 4 | 2010 - 2013 | 8.8 | - | - | - | - |

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

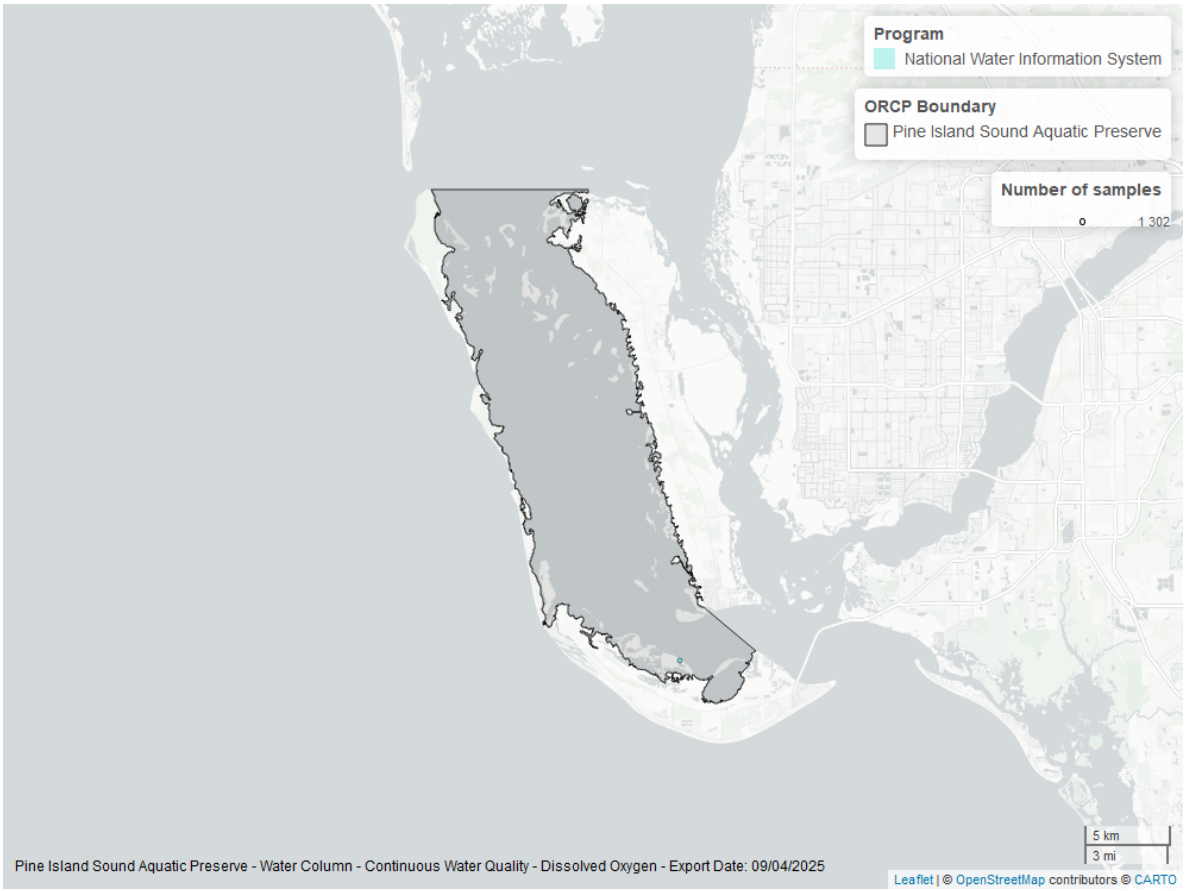


Figure 8: Map showing location of dissolved oxygen continuous water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Dissolved Oxygen Saturation - Discrete

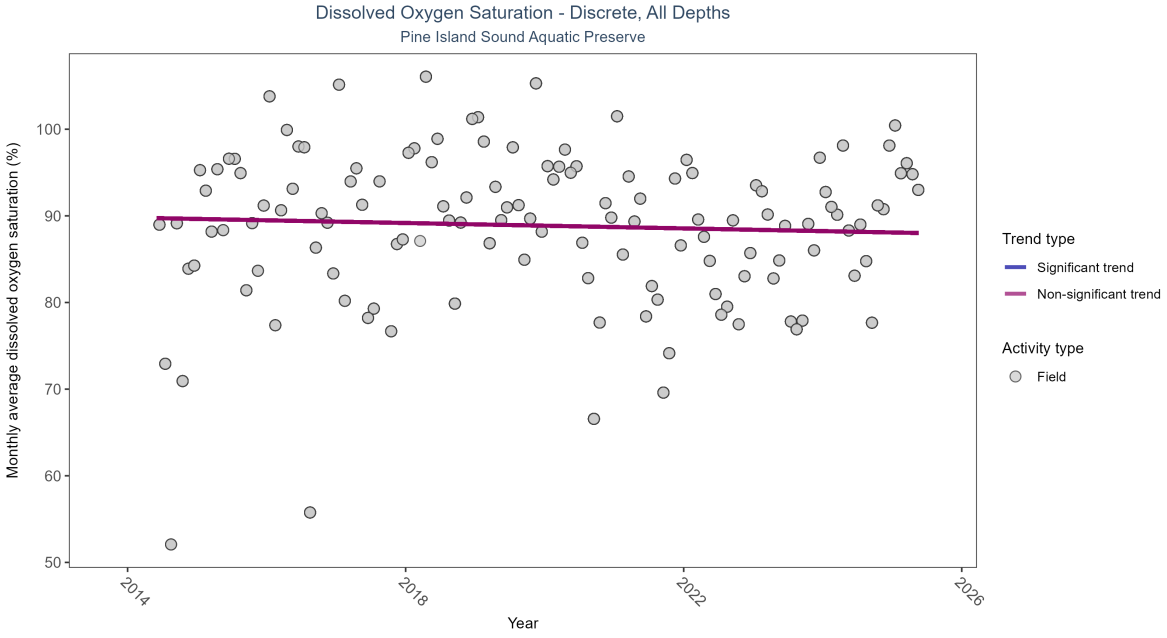


Figure 9: Scatter plot of monthly average dissolved oxygen saturation over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only dissolved oxygen saturation values measured in the field (circles) 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 | 3530 | 12 | 2014 - 2025 | 91.2 | -0.06056 | 89.79964 | -0.15615 | 0.4009 |

Dissolved oxygen saturation showed no detectable trend between 2014 and 2025.

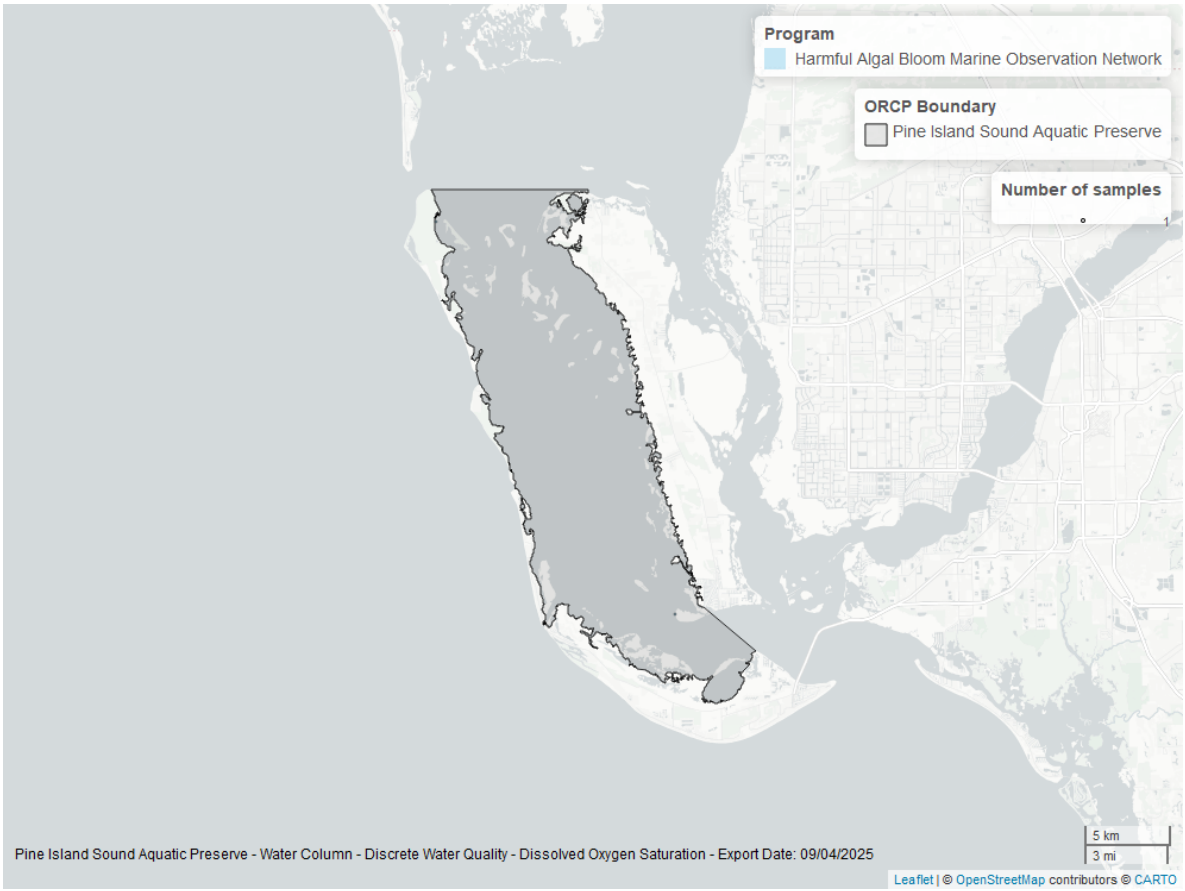


Figure 10: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Salinity - Discrete

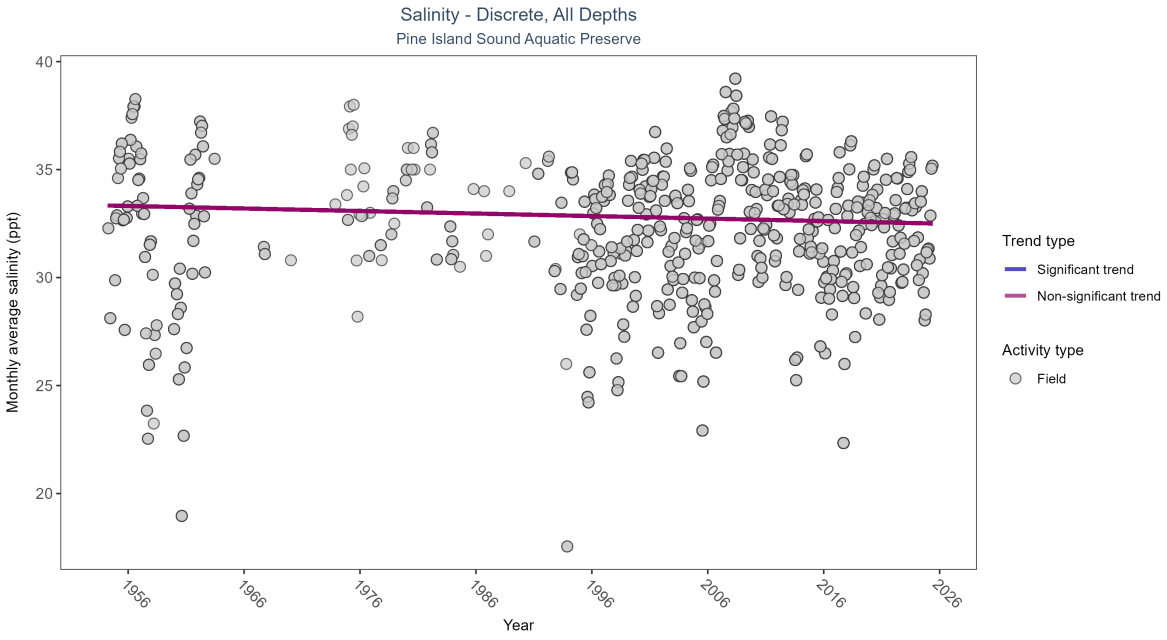


Figure 11: Scatter plot of monthly average salinity over time. If the time series included ten or more years of discrete observations, significant (blue) or non-significant (magenta) trend lines are also shown. Discrete salinity values derived from grab samples analyzed in the field (circles) or the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

Table 6: 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 | No significant trend | 35229 | 64 | 1954 - 2025 | 32.8 | -0.05932 | 33.3382 | -0.01168 | 0.0569 |

Salinity showed no detectable trend between 1954 and 2025.

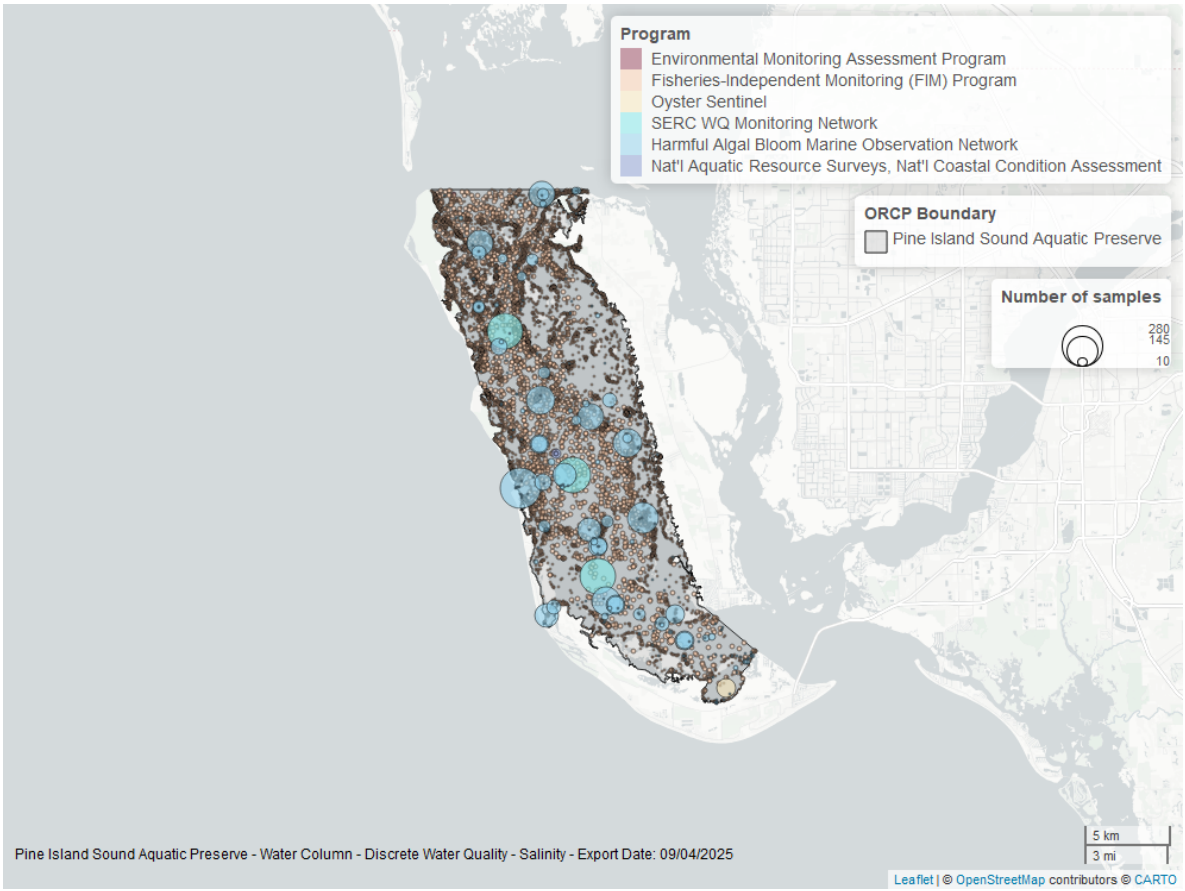


Figure 12: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Salinity - Continuous

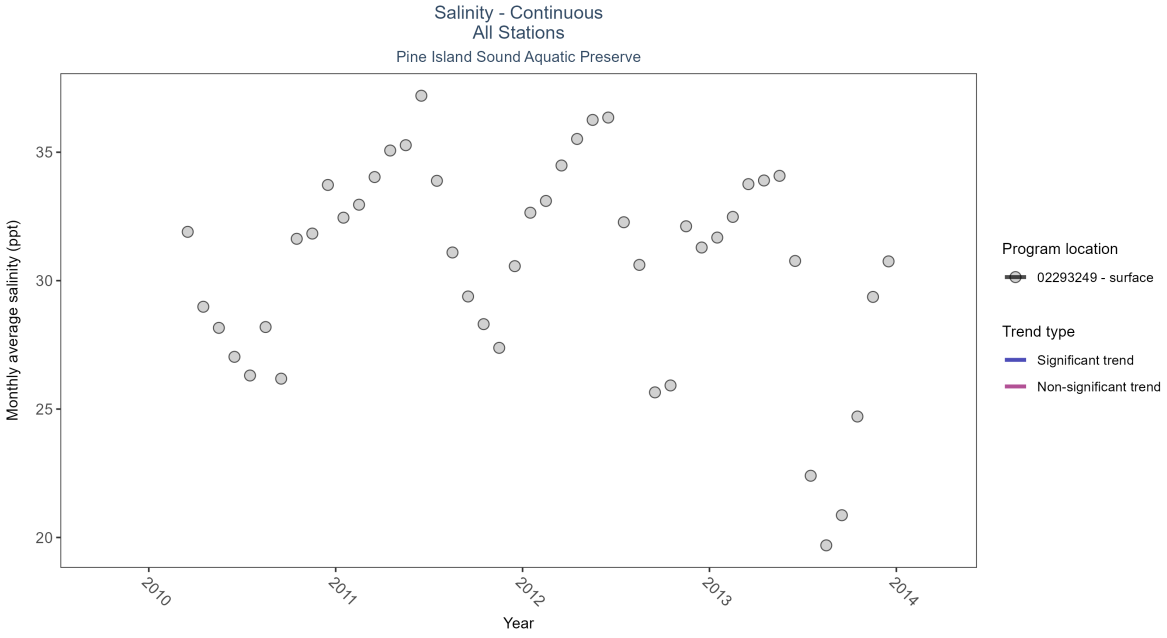


Figure 13: Scatter plot of monthly average salinity over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 7: 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 |
|---|---|---|---|---|---|---|---|---|---|
| 02293249 | Insufficient data to calculate trend | 1871 | 4 | 2010 - 2013 | 32 | - | - | - | - |

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

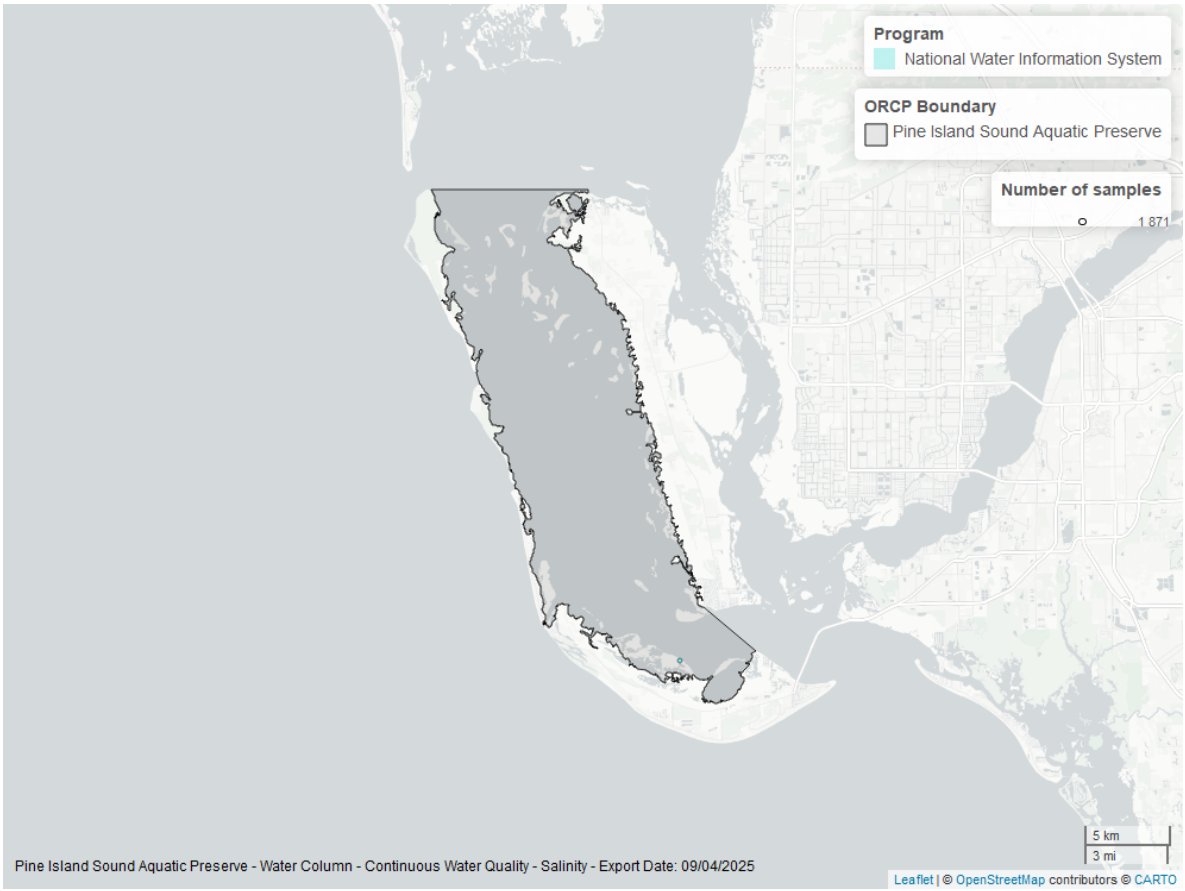


Figure 14: Map showing location of salinity continuous water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Water Temperature - Discrete

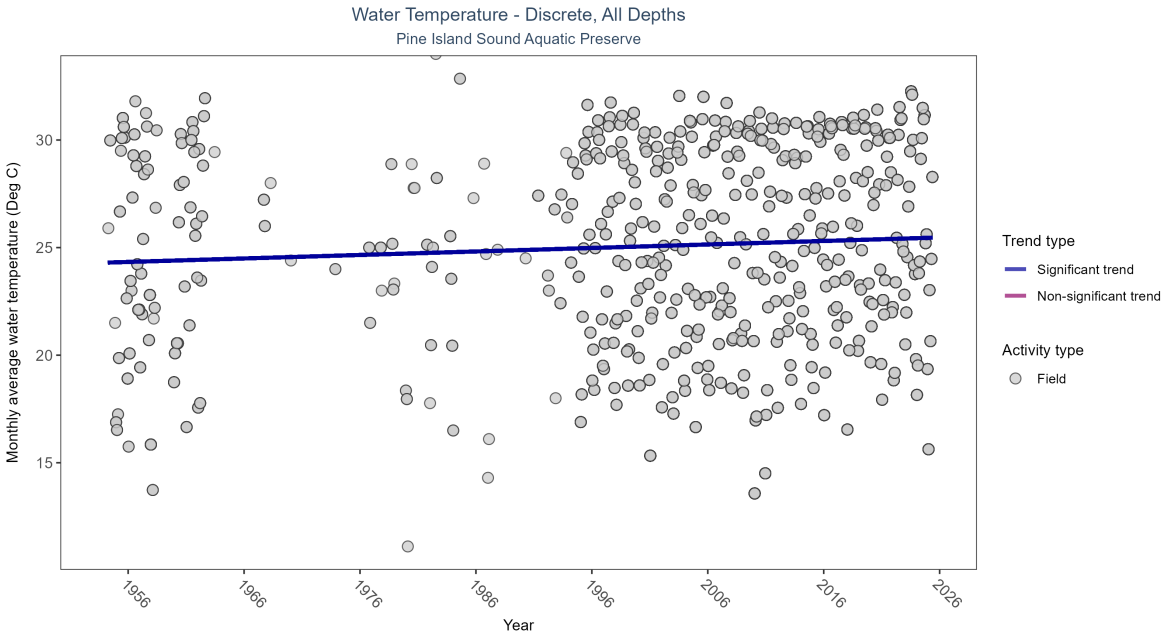


Figure 15: Scatter plot of monthly average water temperature over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only water temperature measurements taken in the field (circles) are included in the plot.

Table 8: 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 | 38169 | 62 | 1954 - 2025 | 26.4 | 0.15574 | 24.29957 | 0.01625 | 0 |

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

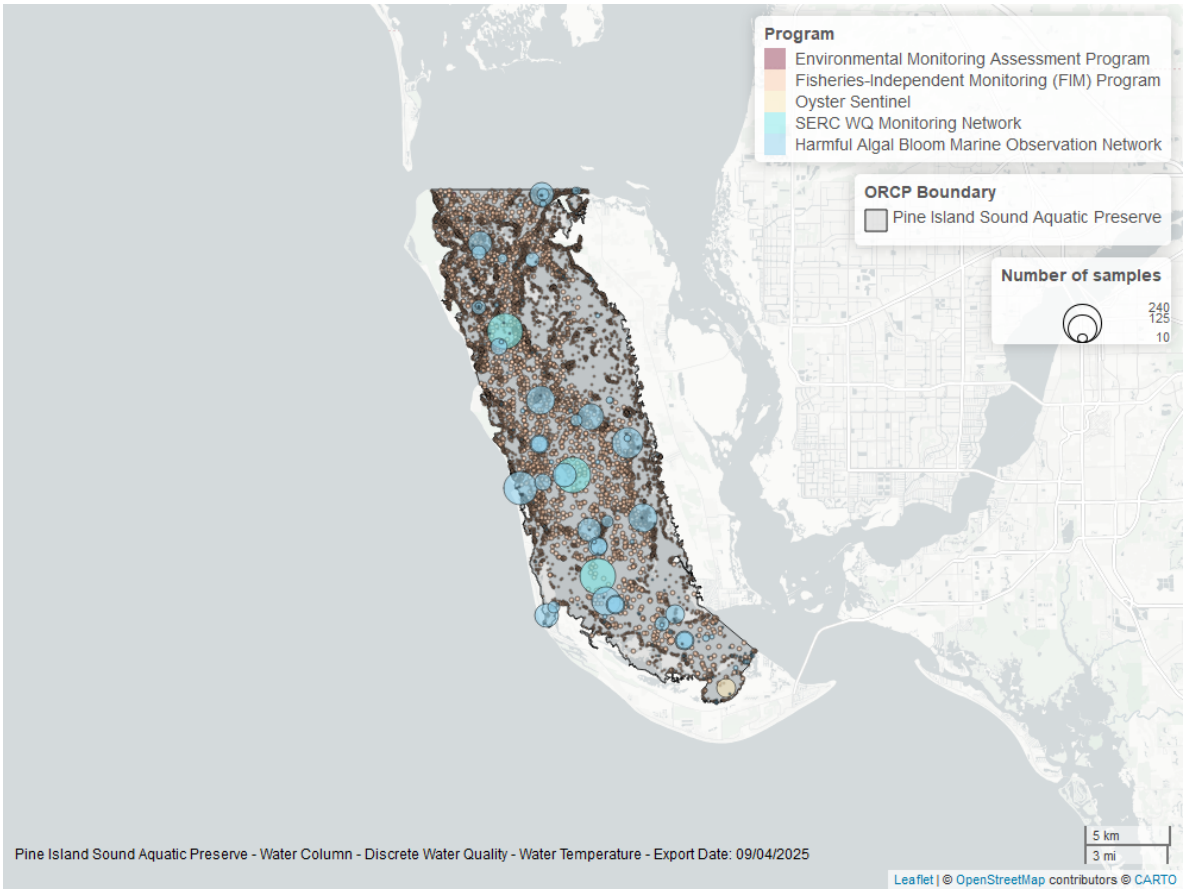


Figure 16: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Water Temperature - Continuous

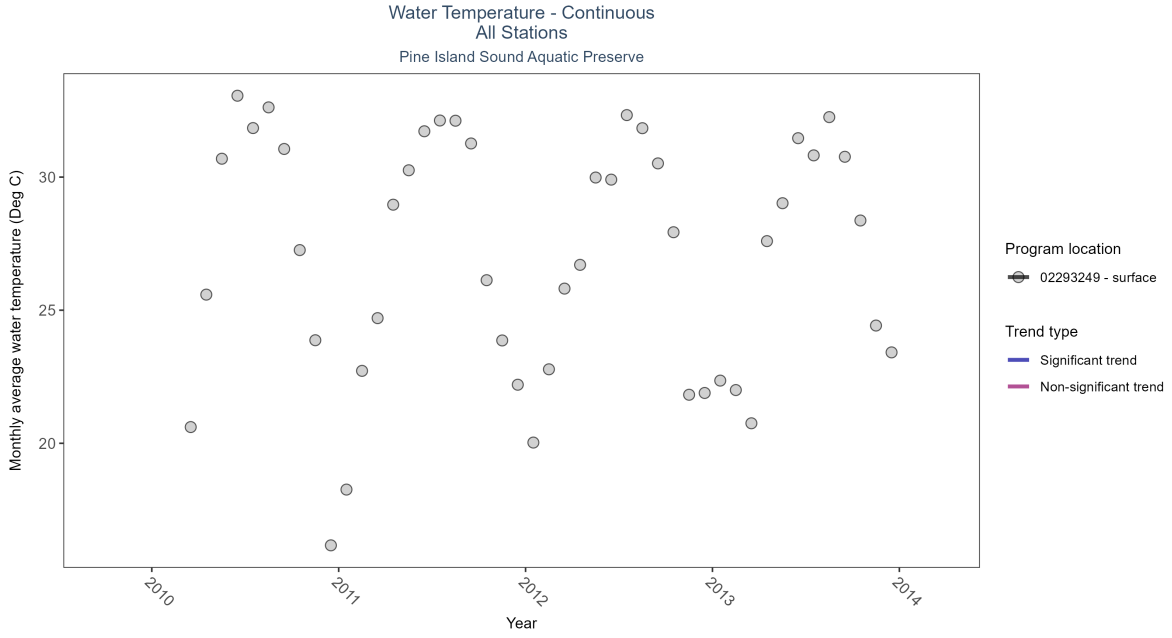


Figure 17: Scatter plot of monthly average water temperature over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 9: 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 |
|---|---|---|---|---|---|---|---|---|---|
| 02293249 | Insufficient data to calculate trend | 2445 | 4 | 2010 - 2013 | 28.1 | - | - | - | - |

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

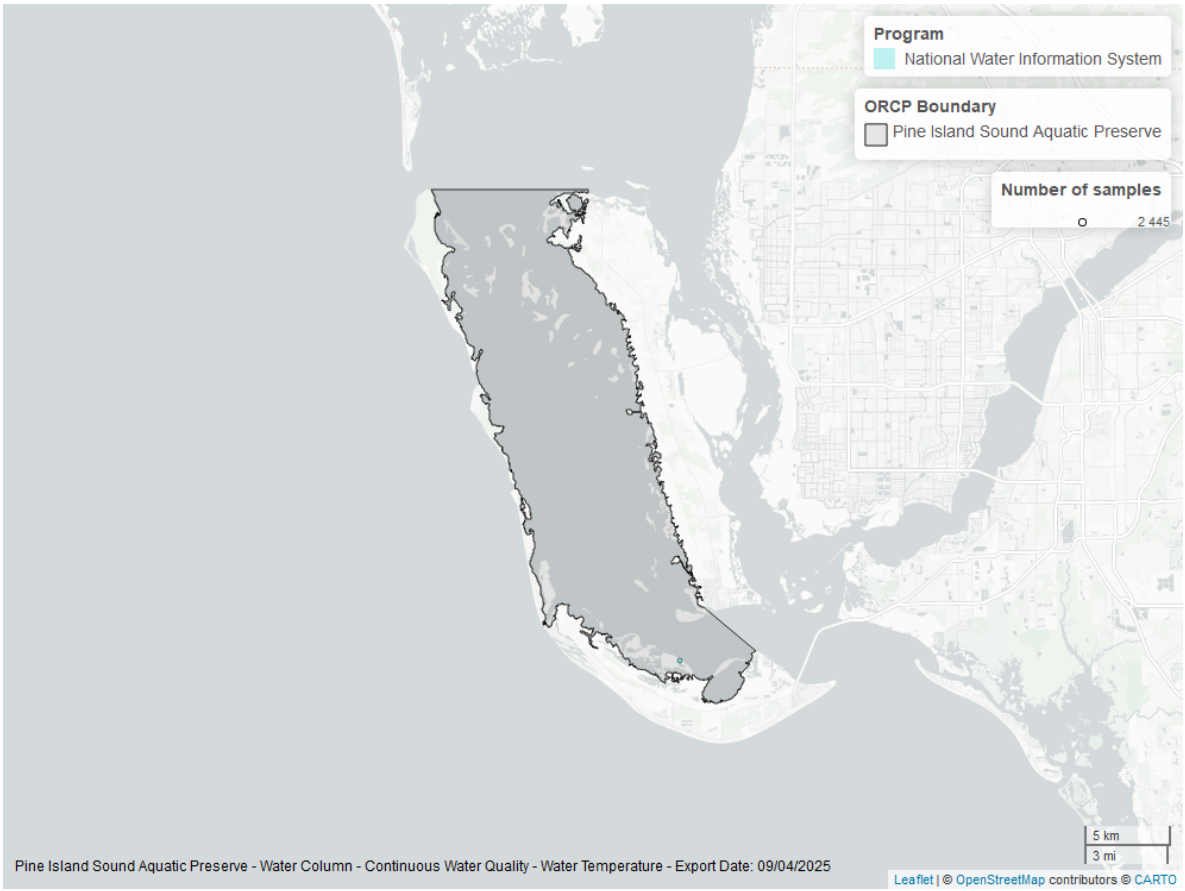


Figure 18: Map showing location of water temperature continuous water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### pH - Discrete

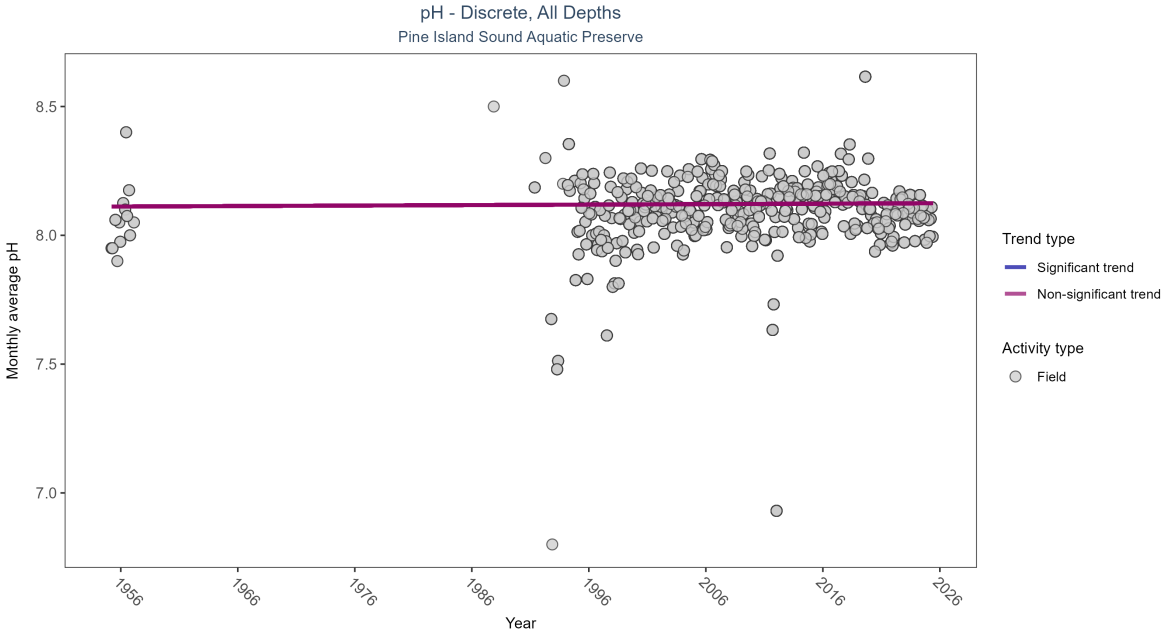


Figure 19: Scatter plot of monthly average pH over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only pH values measured in the field (circles) are included in the plot.

Table 10: 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 | No significant trend | 33716 | 39 | 1955 - 2025 | 8.1 | 0.01467 | 8.11154 | 0.00019 | 0.6954 |

pH showed no detectable trend between 1955 and 2025.

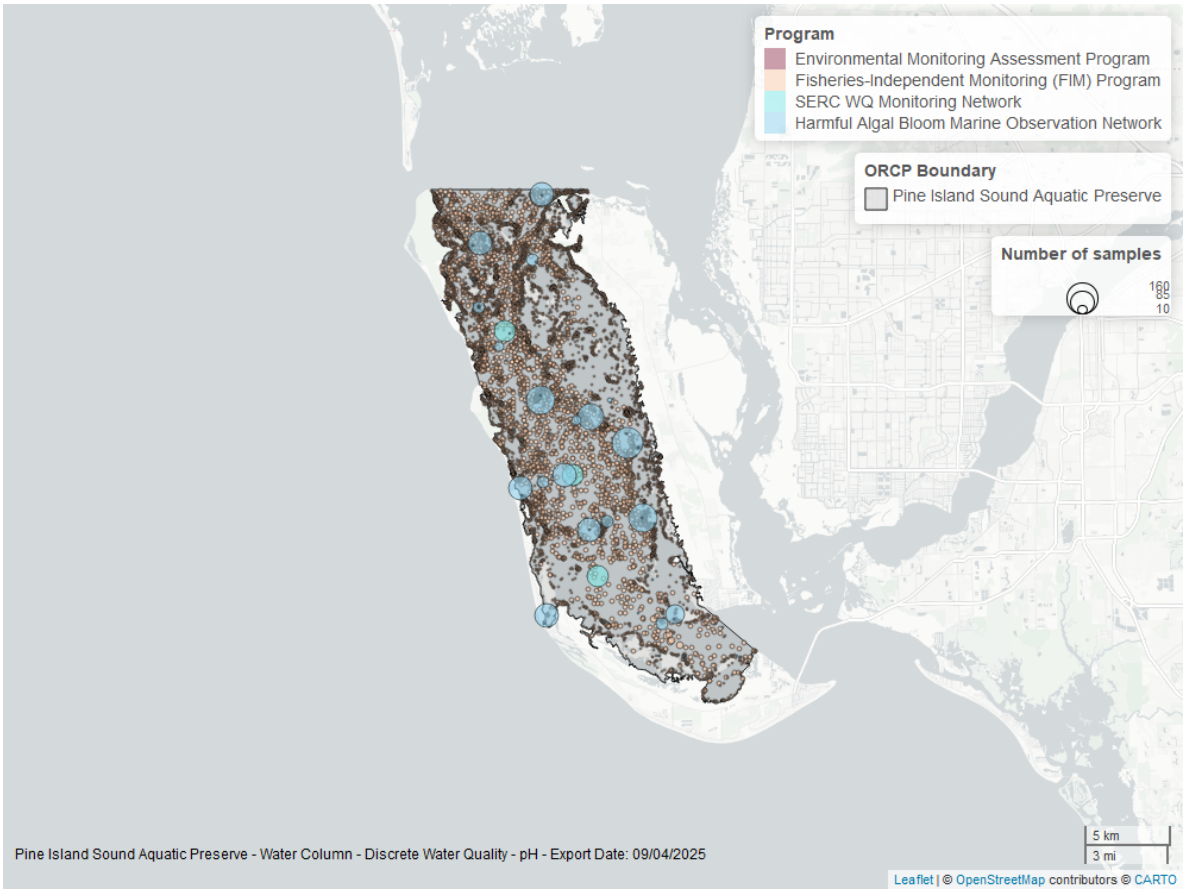


Figure 20: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## pH - Continuous

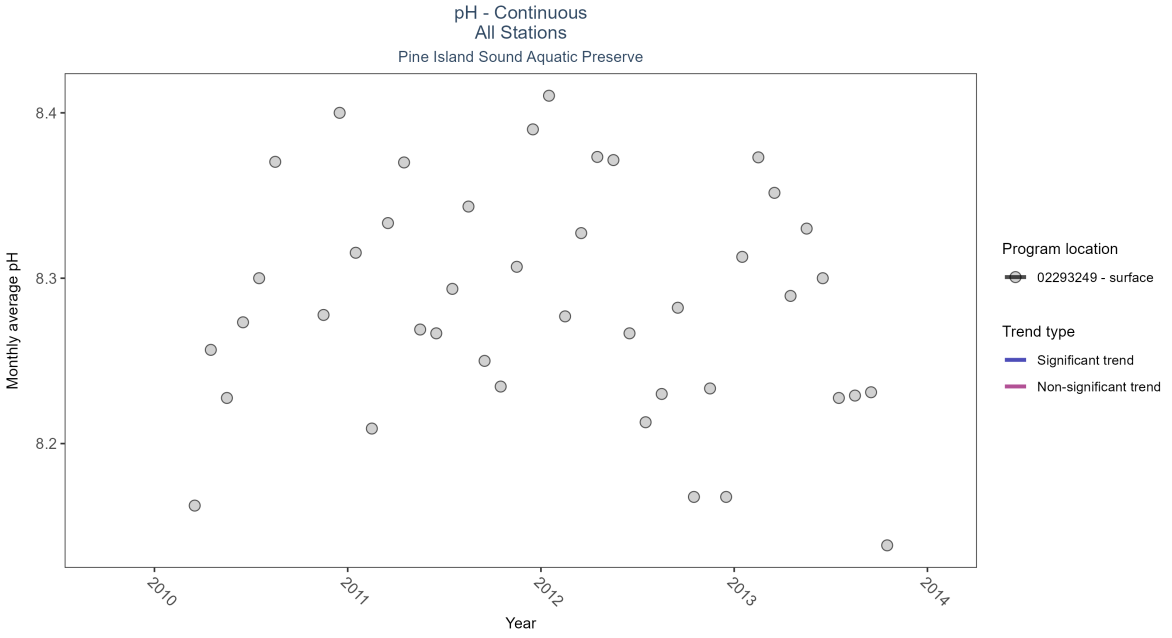


Figure 21: Scatter plot of monthly average pH over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 11: 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 |
|---|---|---|---|---|---|---|---|---|---|
| 02293249 | Insufficient data to calculate trend | 1164 | 4 | 2010 - 2013 | 8.3 | - | - | - | - |

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

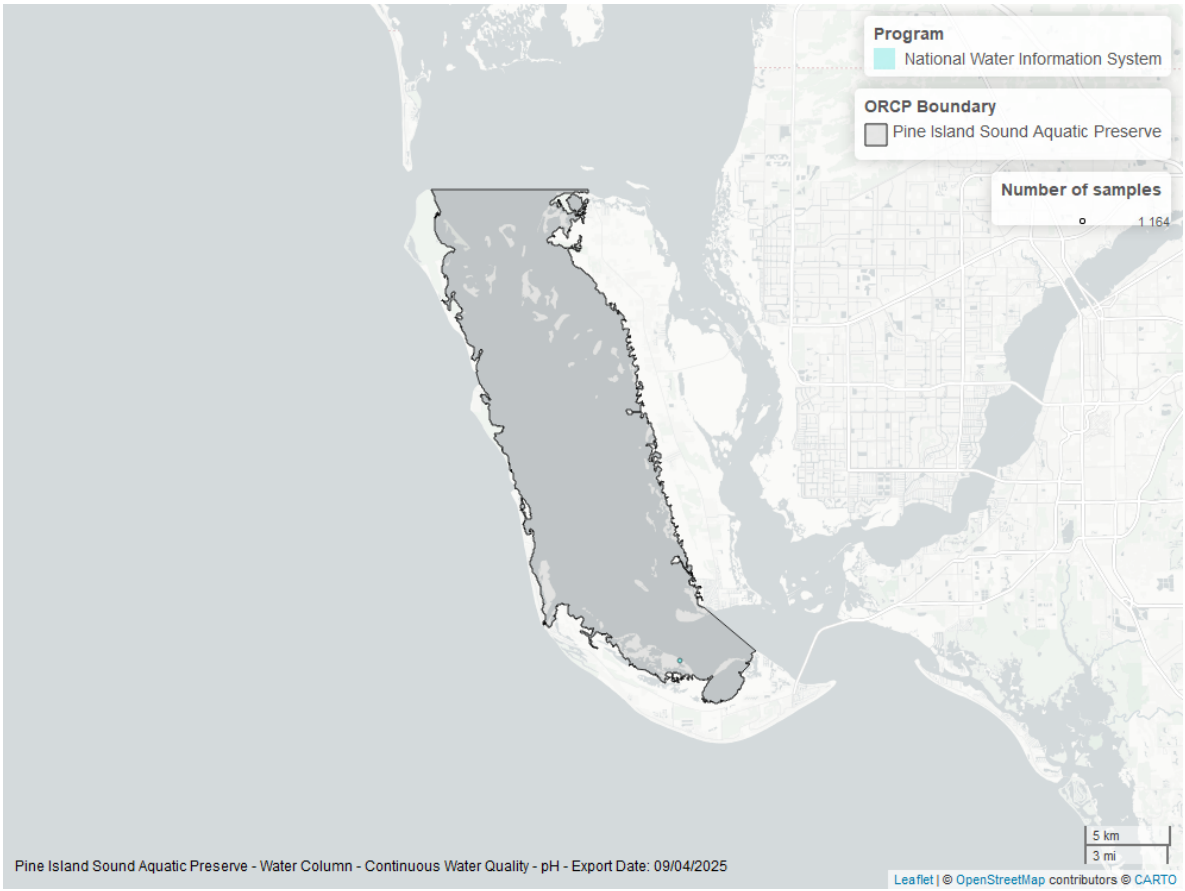


Figure 22: Map showing location of ph continuous water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

## Water Clarity

### Turbidity - Discrete

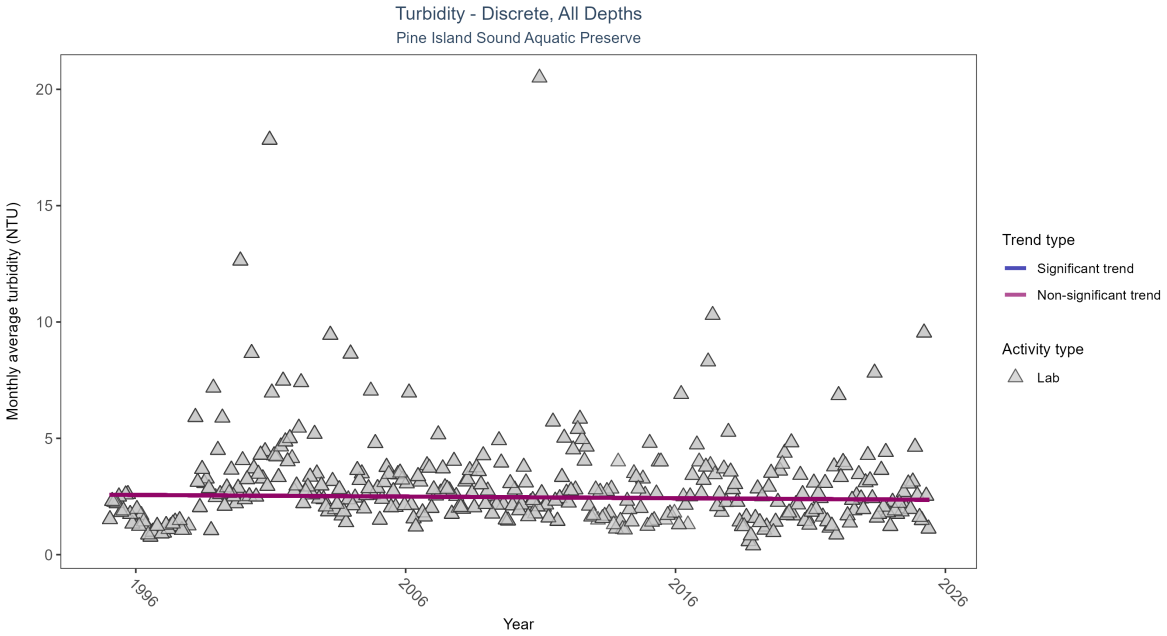


Figure 23: Scatter plot of monthly average turbidity over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only turbidity values measured in the laboratory (triangles) are included in the plot.

Table 12: 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 | 6611 | 31 | 1995 - 2025 | 2 | -0.03142 | 2.57413 | -0.00707 | 0.4206 |

Turbidity showed no detectable trend between 1995 and 2025.

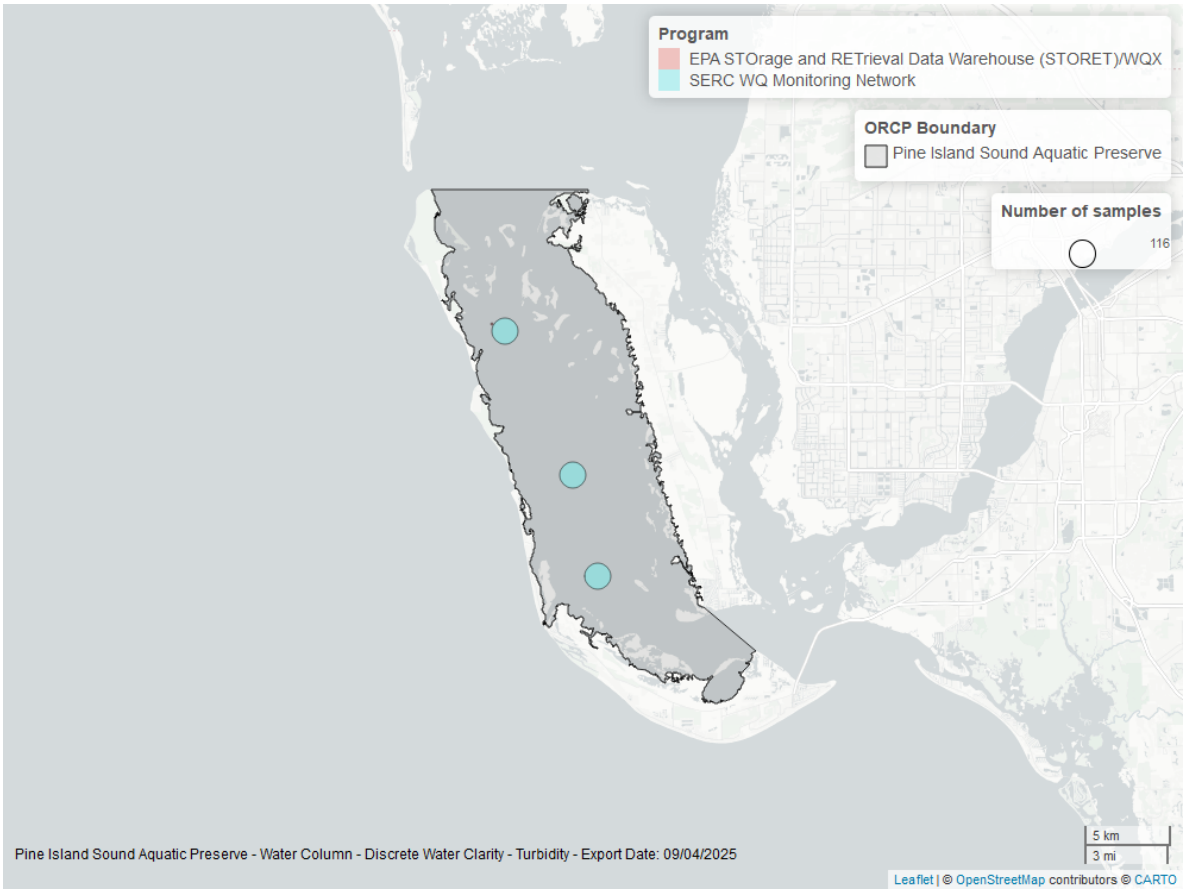


Figure 24: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Turbidity - Continuous

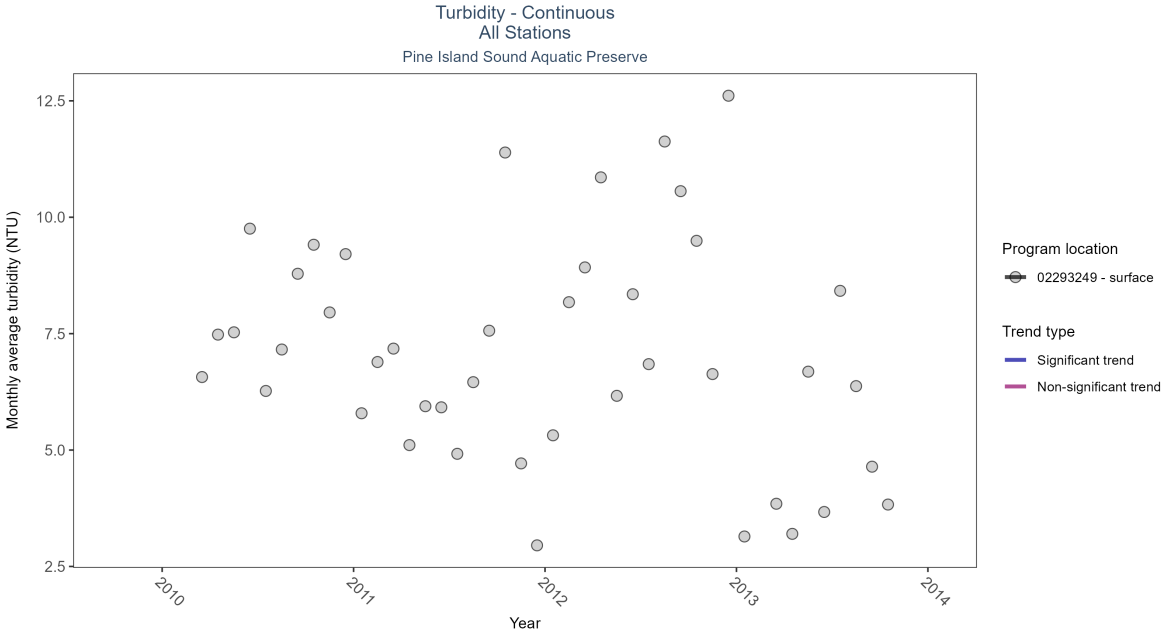


Figure 25: Scatter plot of monthly average turbidity over time at continuously monitored program locations. Each location is analyzed separately, with significant (blue) or non-significant (magenta) trend lines shown for time series that included five or more years of observations.

Table 13: 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 |
|---|---|---|---|---|---|---|---|---|---|
| 02293249 | Insufficient data to calculate trend | 1174 | 4 | 2010 - 2013 | 5.4 | - | - | - | - |

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

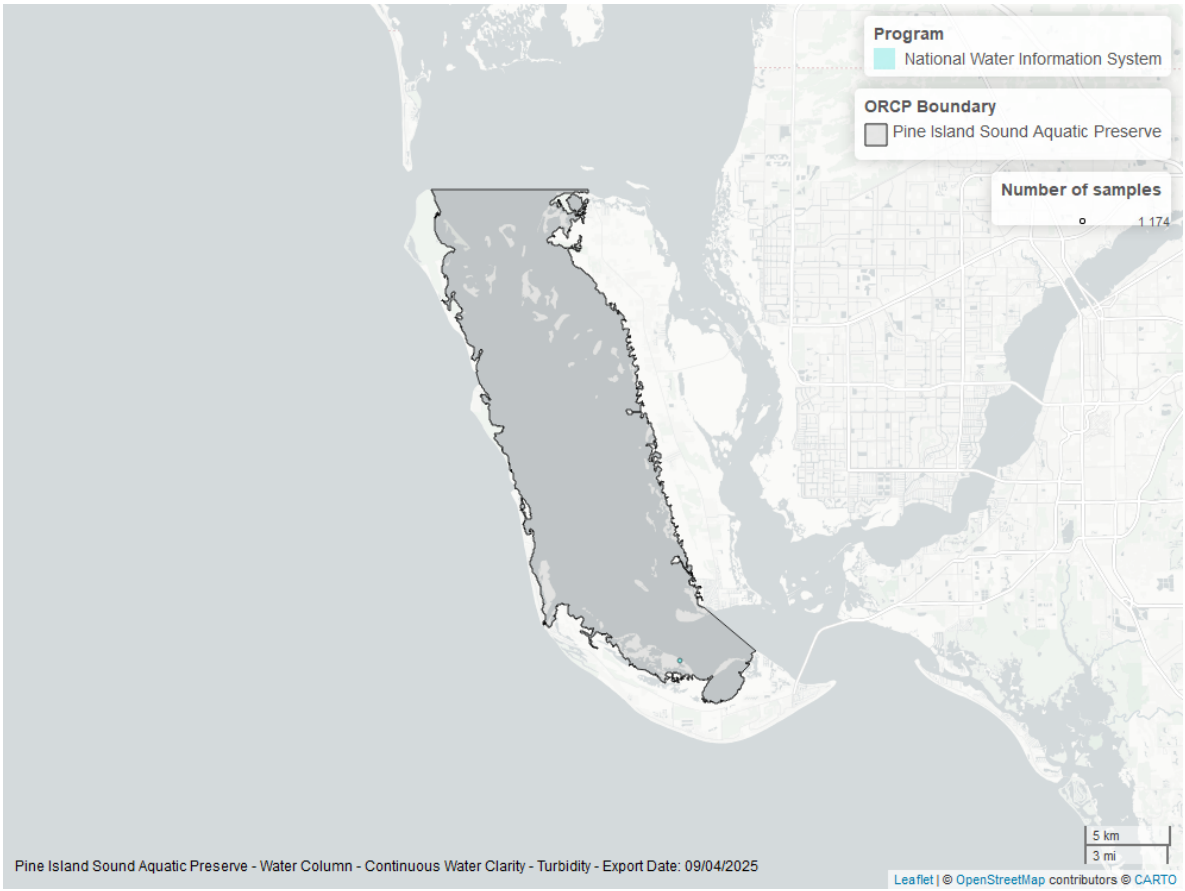


Figure 26: Map showing location of turbidity continuous water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Total Suspended Solids - Discrete

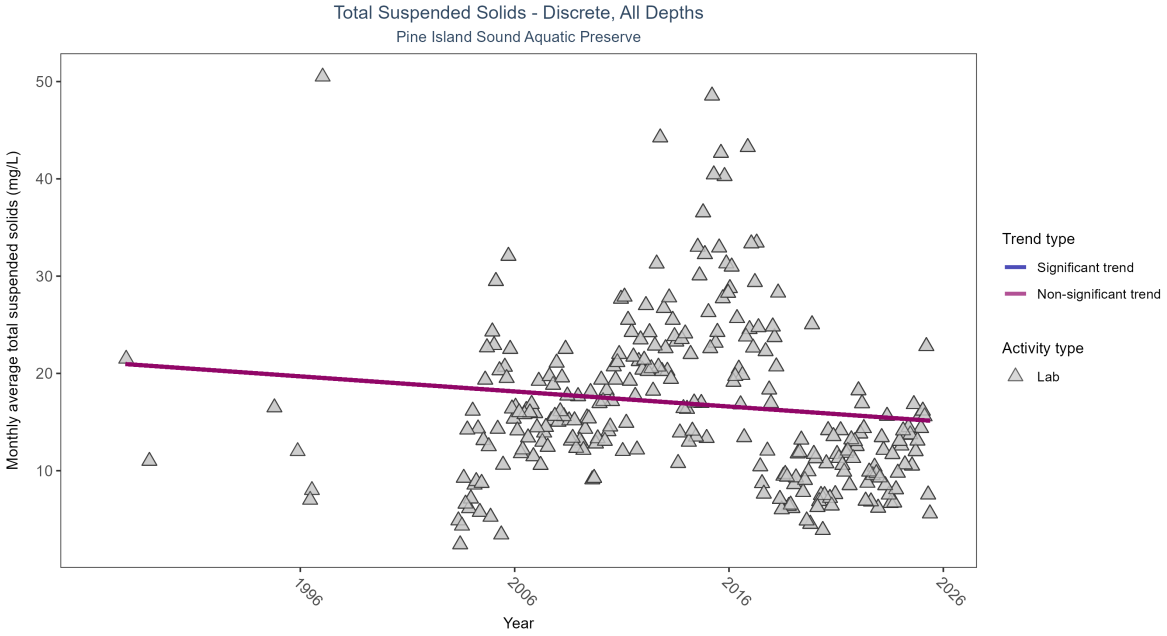


Figure 27: Scatter plot of monthly average total suspended solids (TSS) over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only TSS values obtained from laboratory analyses (triangles) are included in the plot.

Table 14: 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 | No significant trend | 2752 | 29 | 1987 - 2025 | 12.1 | -0.08658 | 21.09117 | -0.155 | 0.0517 |

Total suspended solids showed no detectable trend between 1987 and 2025.

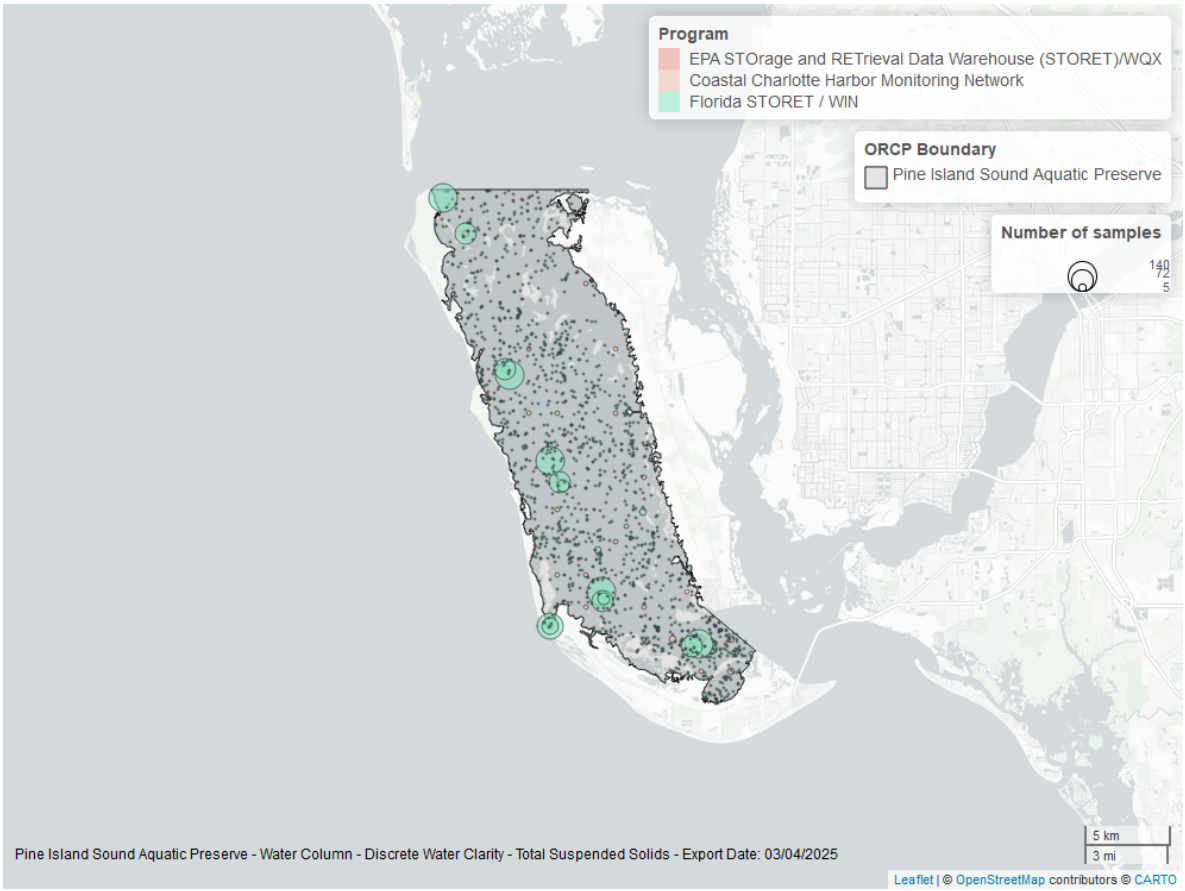


Figure 28: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Chlorophyll a, Uncorrected for Pheophytin - Discrete

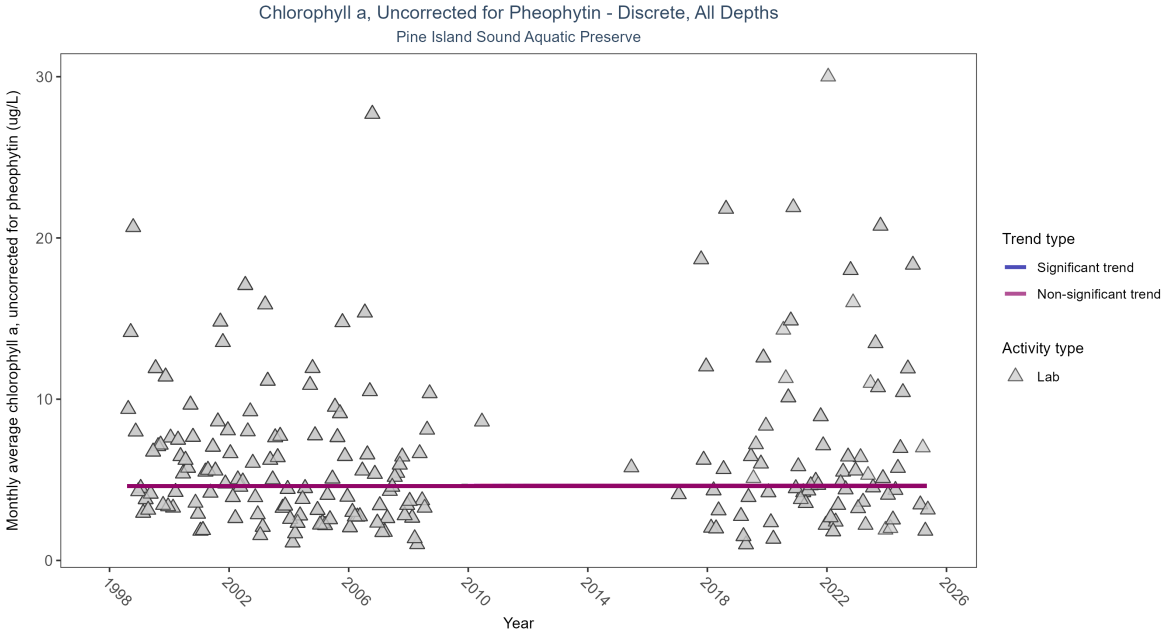


Figure 29: Scatter plot of monthly average levels of chlorophyll a, uncorrected for pheophytin, over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only laboratory-analyzed chlorophyll a (triangles) is included in the plot.

Table 15: 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 | 1239 | 22 | 1998 - 2025 | 4.3 | 0.00034 | 4.6113 | 0.00043 | 1 |

Chlorophyll a, uncorrected for pheophytin, showed no detectable trend between 1998 and 2025.

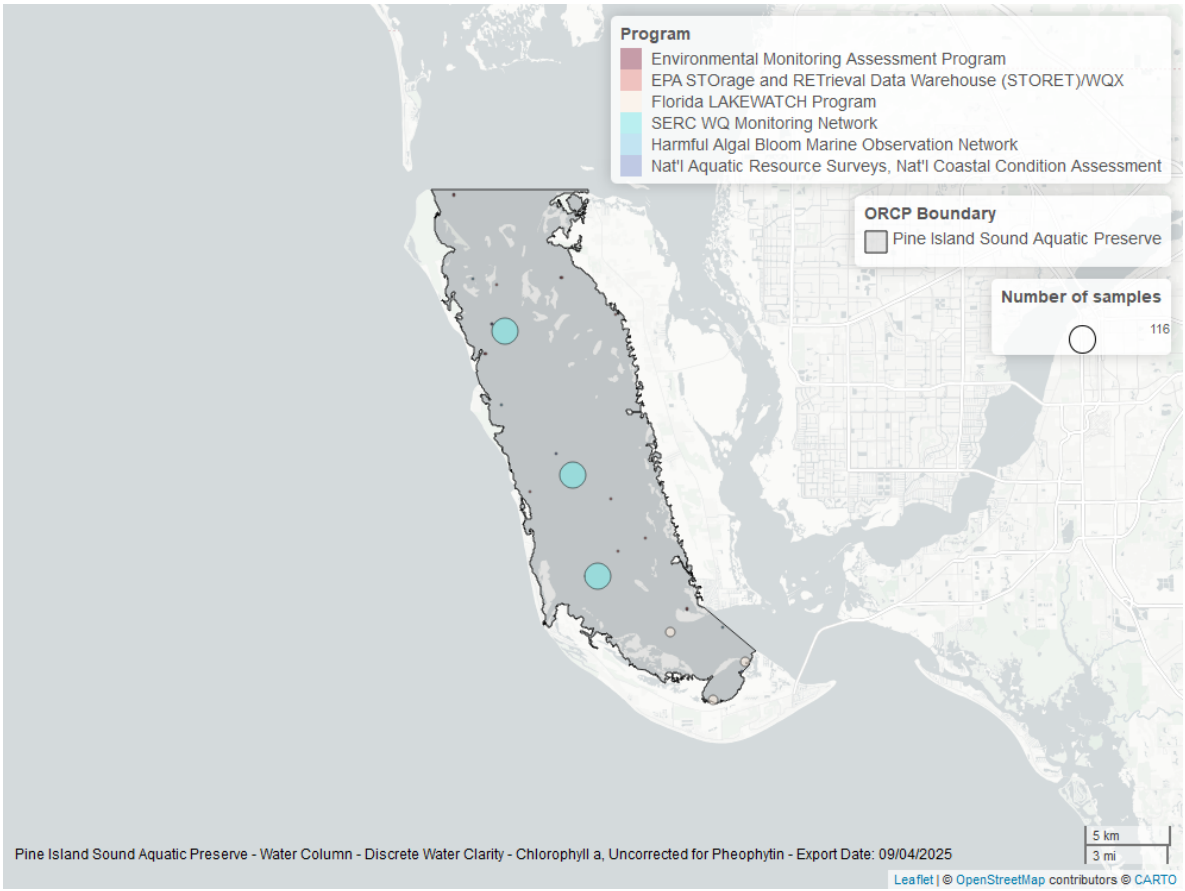


Figure 30: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Chlorophyll a, Corrected for Pheophytin - Discrete

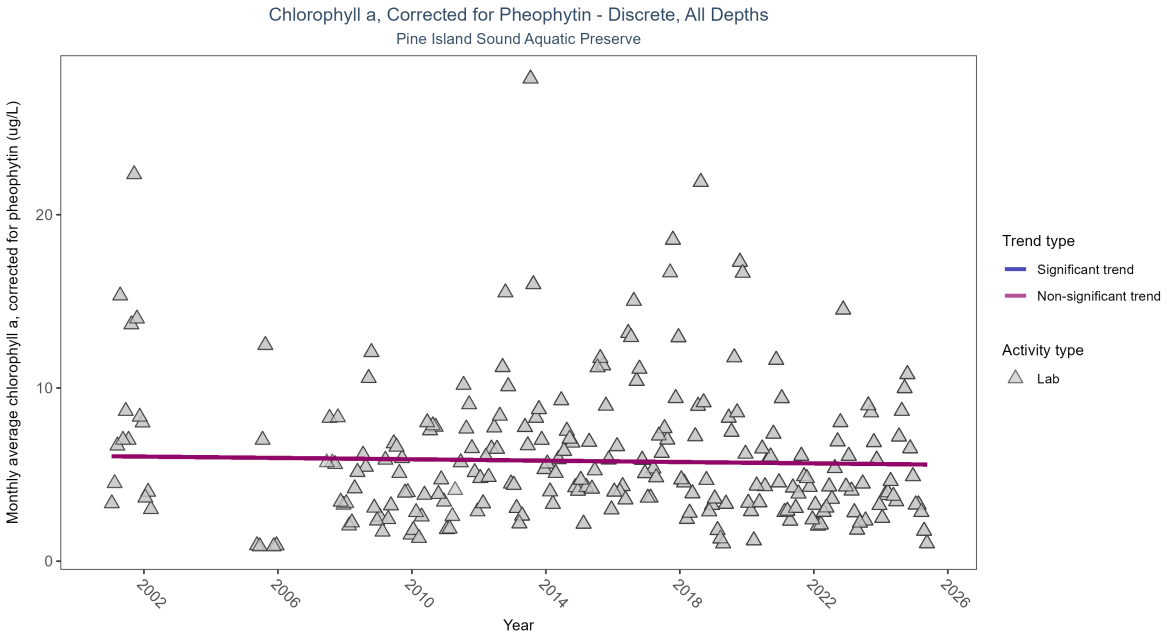


Figure 31: Scatter plot of monthly average levels of chlorophyll a, corrected for pheophytin, over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only laboratory-analyzed chlorophyll a (triangles)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

Table 16: 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 | No significant trend | 3942 | 22 | 2001 - 2025 | 3.99 | -0.0425 | 6.05682 | -0.0196 | 0.4065 |

Chlorophyll a, corrected for pheophytin, showed no detectable trend between 2001 and 2025.

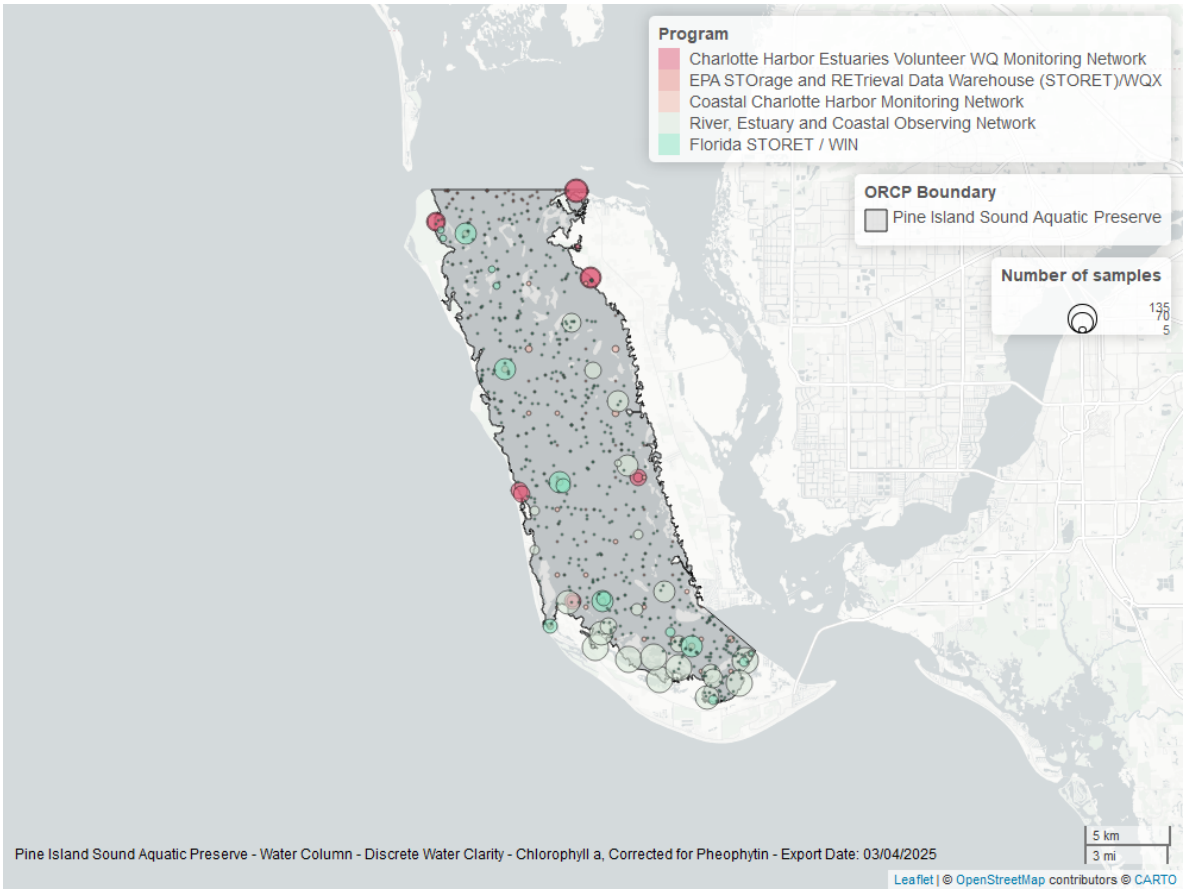


Figure 32: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Secchi Depth - Discrete

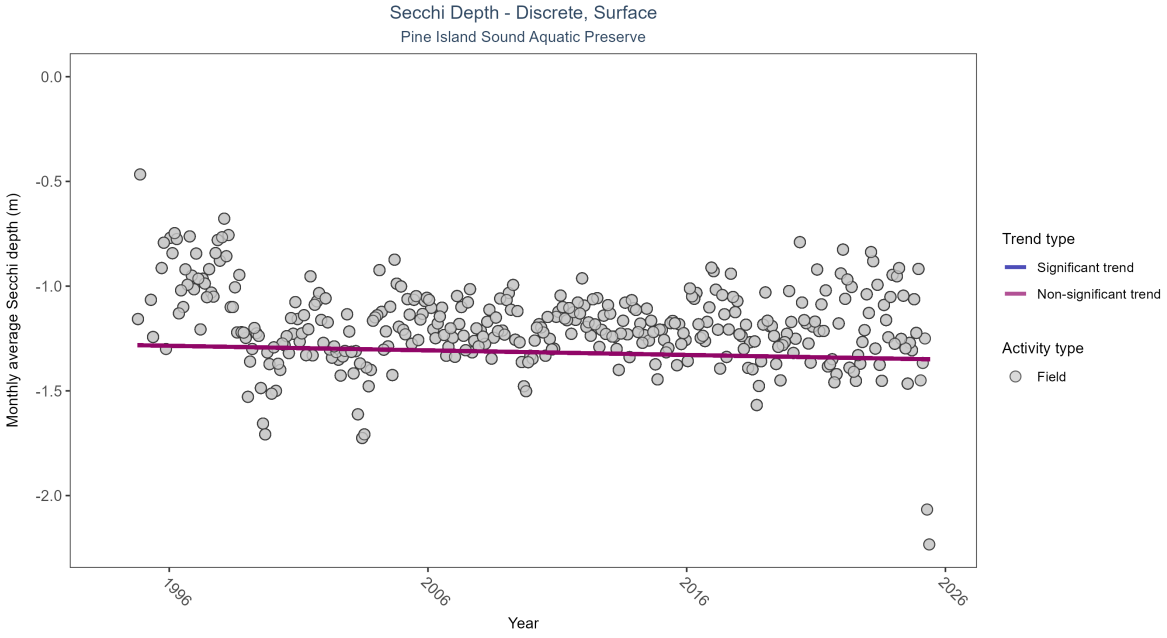


Figure 33: Scatter plot of monthly average Secchi depth over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Secchi depth is only measured in the field (circles).

Table 17: 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 | No significant trend | 22482 | 32 | 1994 - 2025 | -1.2 | -0.05669 | -1.28041 | -0.00219 | 0.1327 |

Secchi depth showed no detectable trend between 1994 and 2025.

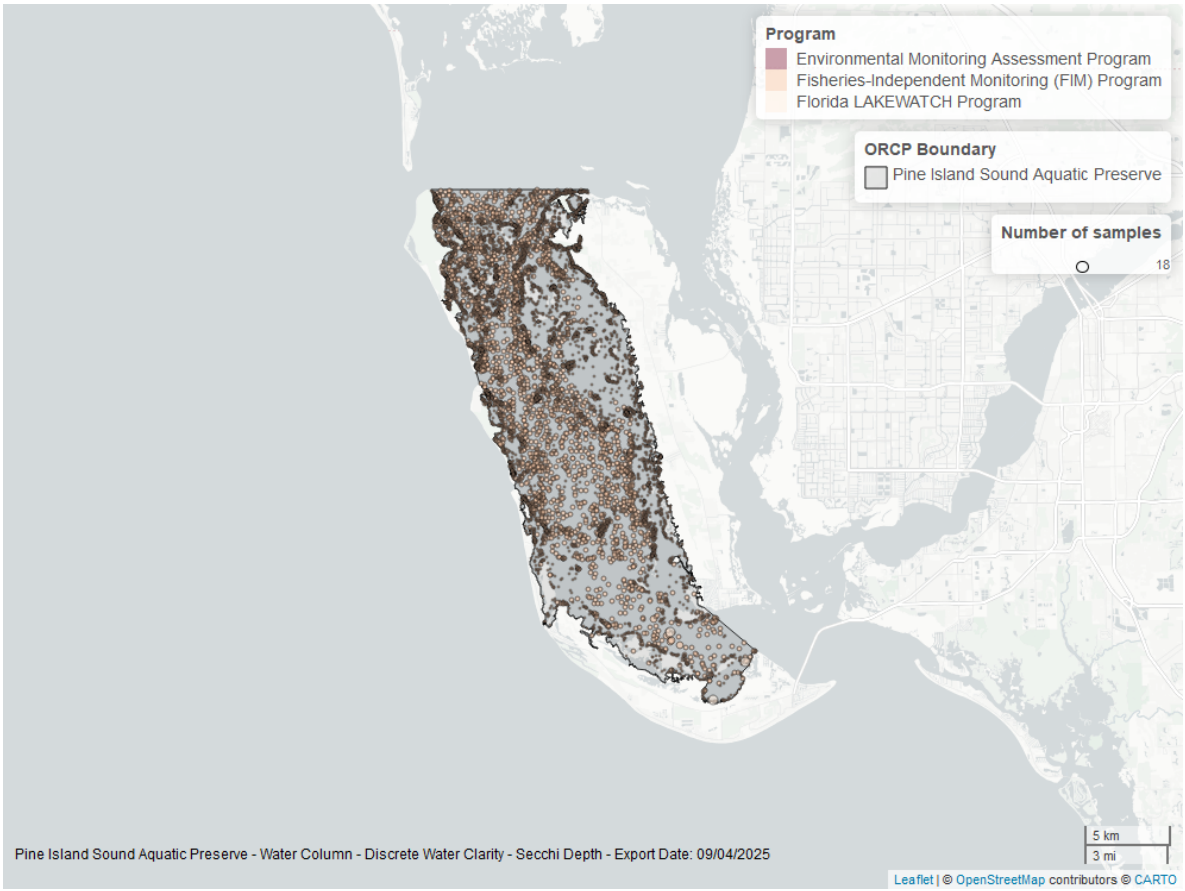


Figure 34: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.

### Colored Dissolved Organic Matter - Discrete

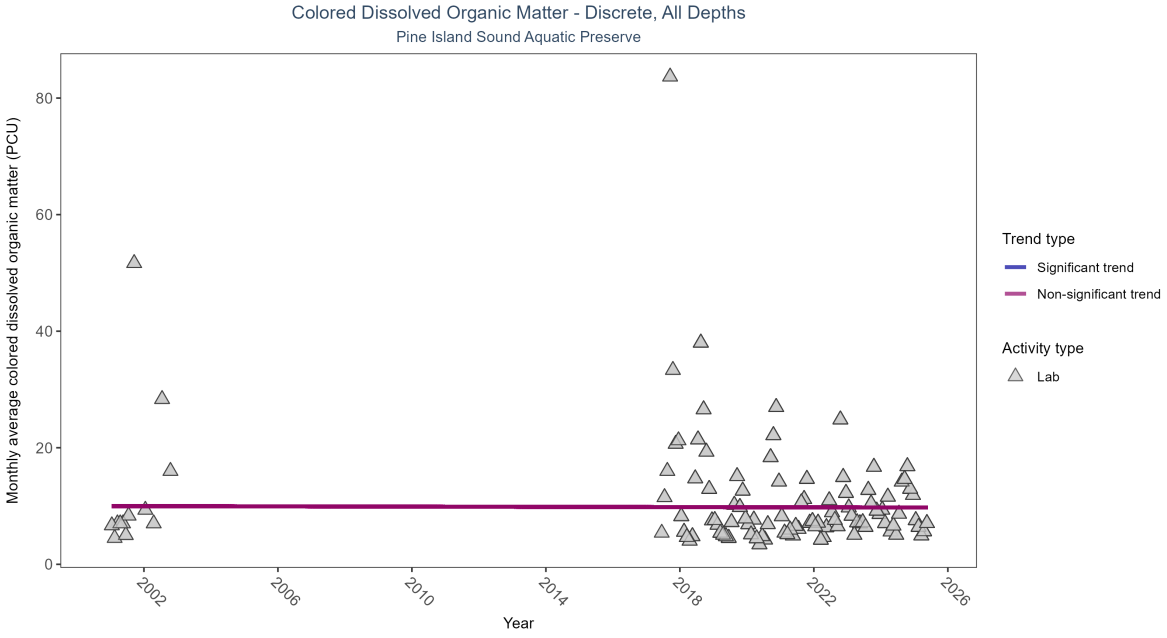


Figure 35: Scatter plot of monthly average colored dissolved organic matter (CDOM) over time. If the time series included ten or more years of discrete observations, a significant (blue) or non-significant (magenta) trend line is also shown. Only laboratory-analyzed CDOM (triangles) is included in the plot.

Table 18: 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 | No significant trend | 1460 | 11 | 2001 - 2025 | 7.44 | -0.01977 | 9.98917 | -0.01018 | 0.8345 |

Colored dissolved organic matter showed no detectable trend between 2001 and 2025.

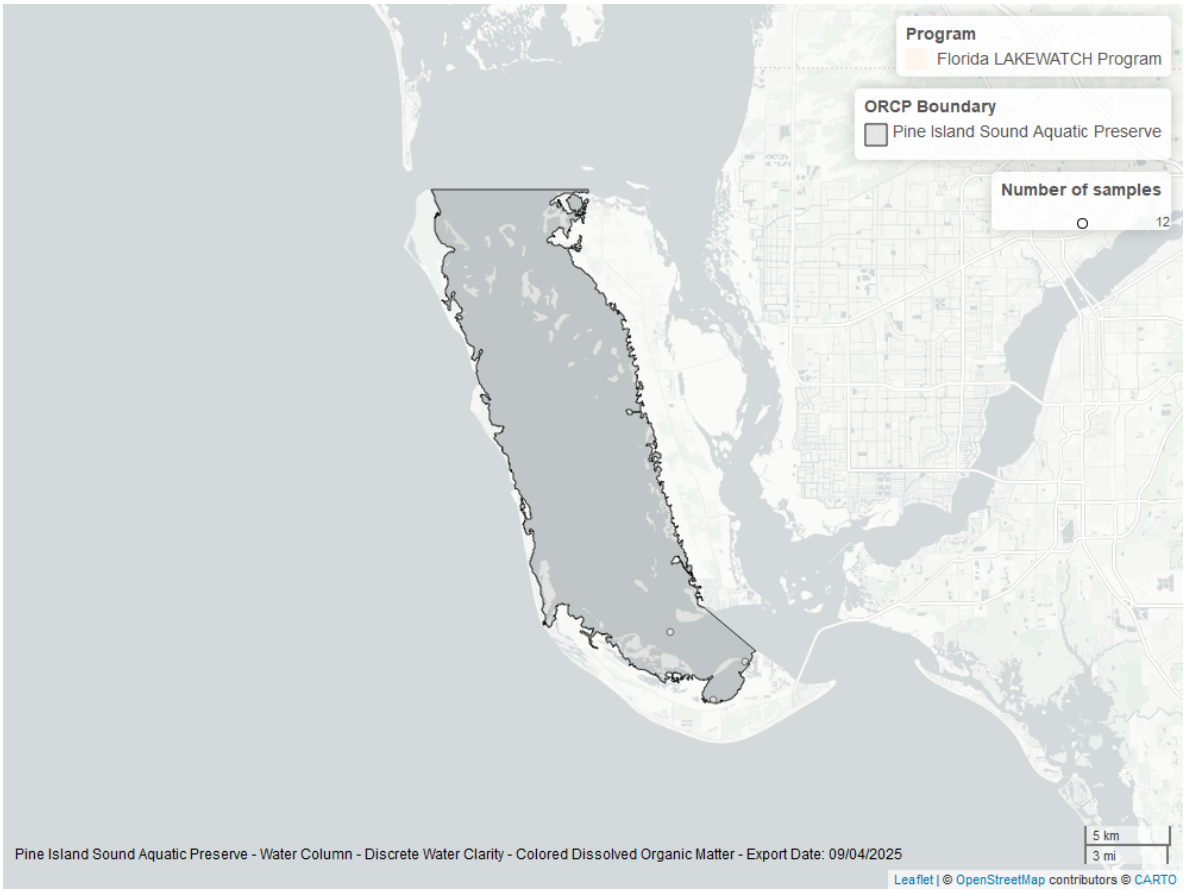


Figure 36: Map showing location of discrete water quality sampling locations within the boundaries of *Pine Island Sound Aquatic Preserve*. The bubble size on the maps above reflect the amount of data available at each sampling site.