

# Big Bend Seagrasses Aquatic Preserve

## Seagrass and Water Quality Trend Analysis

Florida SEACAR

2024-04-25

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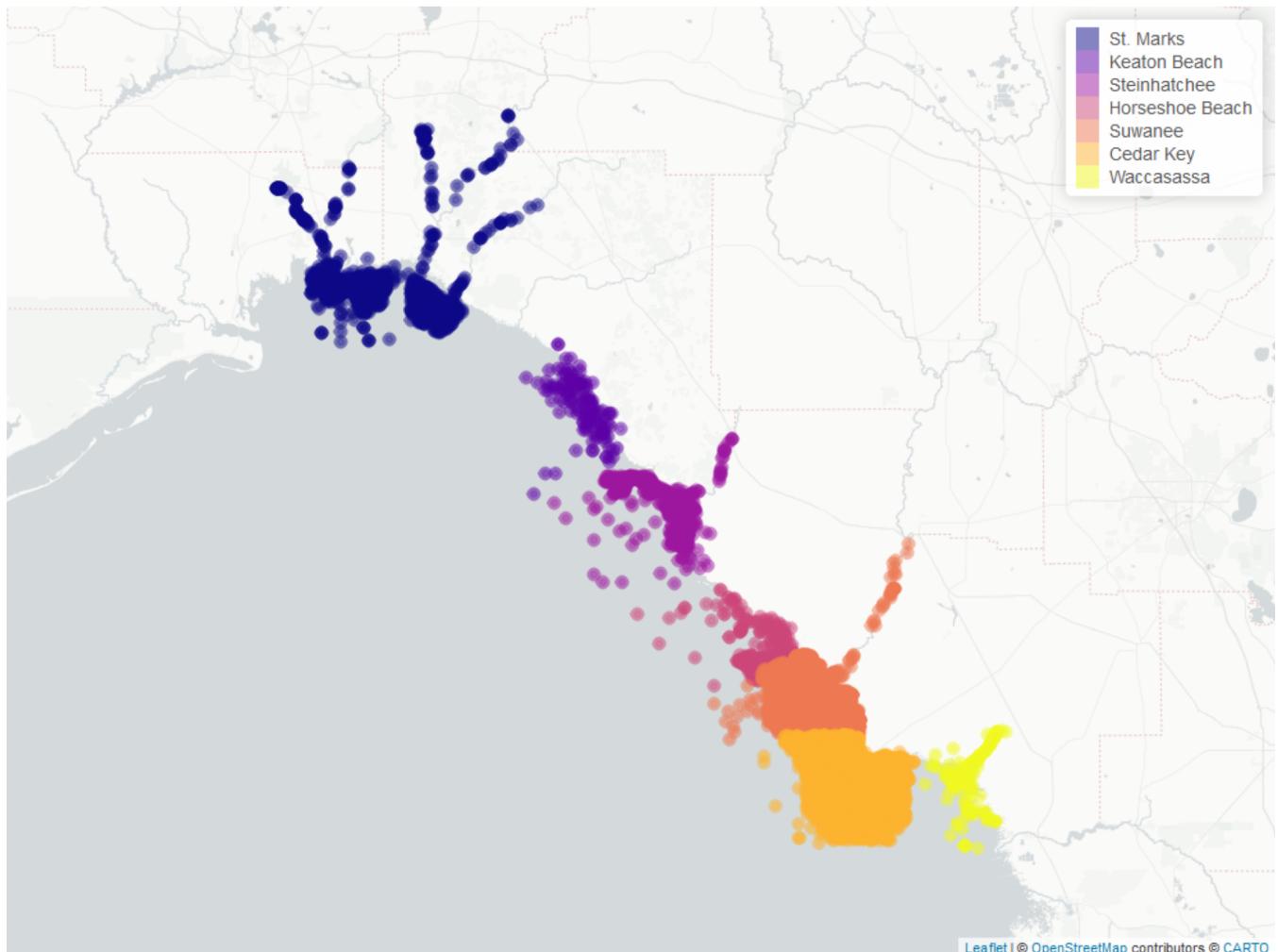
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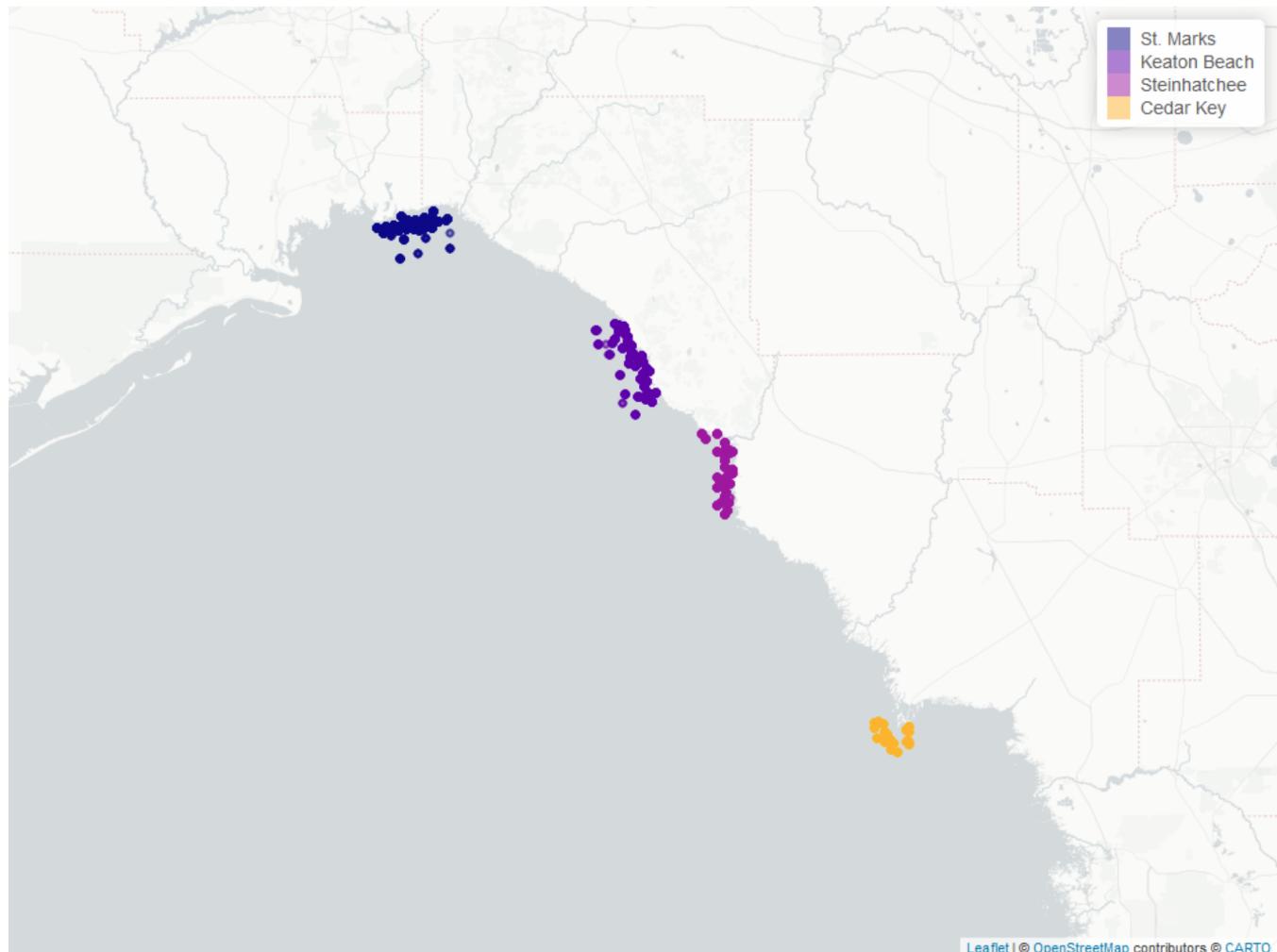
The following files were used in the analysis:

- *Combined\_WQ\_WC\_NUT\_Ammonia\_Un-ionized\_NH3-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_corrected\_for\_pheophytin-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Chlorophyll\_a\_uncorrected\_for\_pheophytin-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Colored\_dissolved\_organic\_matter\_CDOM-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Dissolved\_Oxygen\_Saturation-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Light\_Exinction\_Coefficient-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_NH4\_Filtered-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Nitrate\_N-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Nitrite\_N-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Nitrogen\_organic-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_NO2\_3\_Filtered-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_pH-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_PO4\_Filtered-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Salinity-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Secchi\_Depth-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Specific\_Conductivity-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Kjeldahl\_Nitrogen\_TKN-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Nitrogen-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Phosphorus-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Total\_Suspended\_Solids\_TSS-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Turbidity-2024-Mar-27.txt*
- *Combined\_WQ\_WC\_NUT\_Water\_Temperature-2024-Mar-27.txt*

## Water Quality Discrete - Sample Locations - All Parameters



## Submerged Aquatic Vegetation - Sample Locations



# Horseshoe Beach

Seasonal Kendall-Tau trend plots will be produced below for parameters where *SufficientData* is **TRUE**.

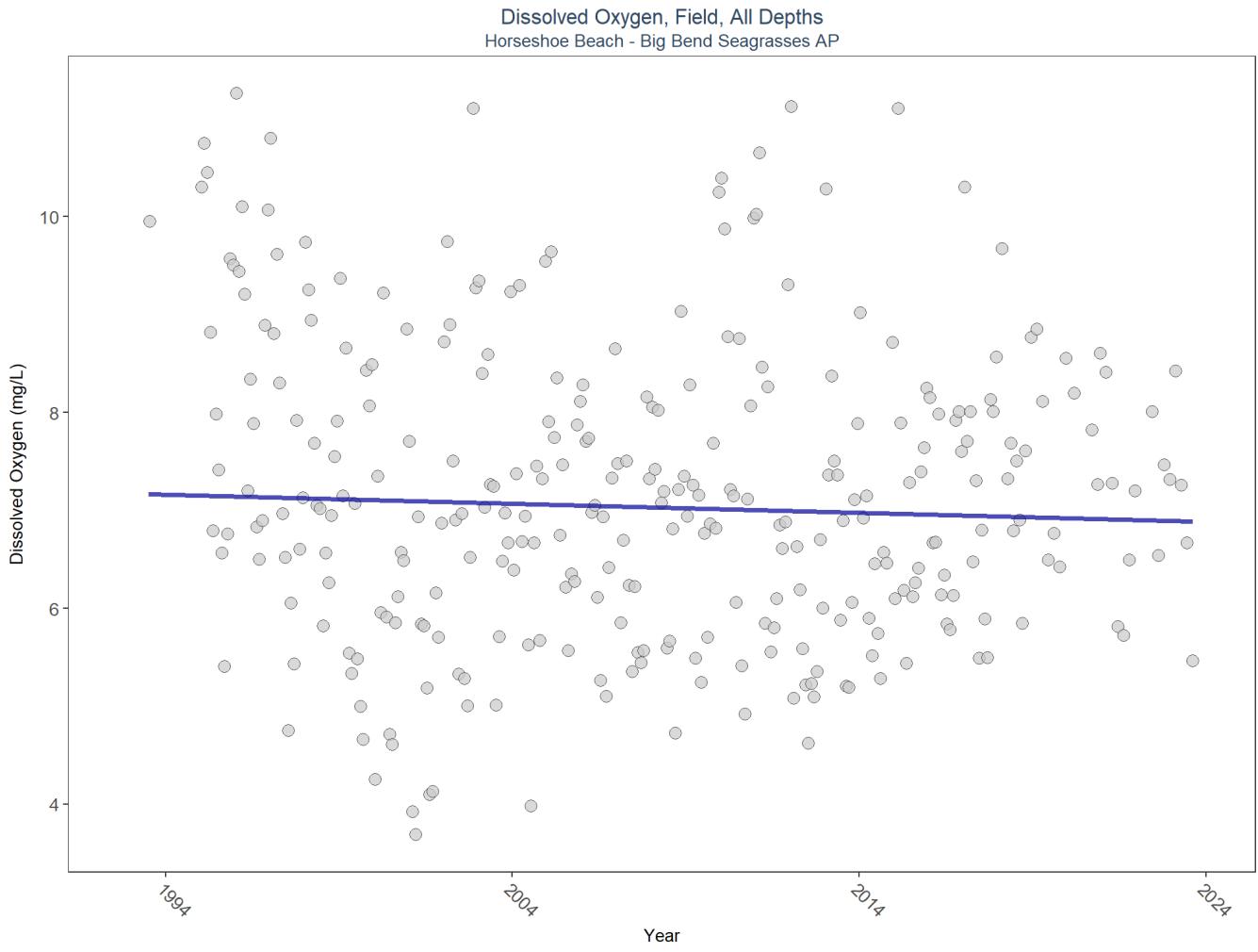
Trend arrows denote trends where the p value is less than 5% and the slope is less than 10% of the median value.

Table 1: Seasonal Kendall-Tau Results for Horseshoe Beach

ParameterName	Period-of-Record	N-Years	N-Data	SufficientData	SennSlope	SennIntercept	p	Trend
Chlorophyll a, Uncorrected for Pheophytin	2002 - 2023	8	239	FALSE	-	-	-	-
Dissolved Oxygen	1993 - 2023	30	25796	TRUE	-0.01	7.17	0.3271	0
Dissolved Oxygen Saturation	2017 - 2017	1	3	FALSE	-	-	-	-
Salinity	1993 - 2023	30	27342	TRUE	0.04	23.07	0.3234	0
Water Temperature	1993 - 2023	30	27340	TRUE	0.05	22.26	0.0008	↑
Secchi Depth	1993 - 2021	25	928	TRUE	-0.01	1.17	0.0208	↓
pH	1993 - 2023	30	14096	TRUE	0.00	8.00	0.1240	0
Total Phosphorus	2002 - 2023	10	228	TRUE	0.00	0.07	0.3531	0
Colored Dissolved Organic Matter	2020 - 2021	2	9	FALSE	-	-	-	-
Chlorophyll a, Corrected for Pheophytin	2012 - 2023	9	208	FALSE	-	-	-	-
Turbidity	1995 - 2023	26	10401	TRUE	0.00	3.61	0.9929	0
Total Suspended Solids	2017 - 2017	1	2	FALSE	-	-	-	-
Total Nitrogen	2002 - 2023	10	208	TRUE	-0.03	1.09	0.0122	↓

## Discrete WQ

### Dissolved Oxygen

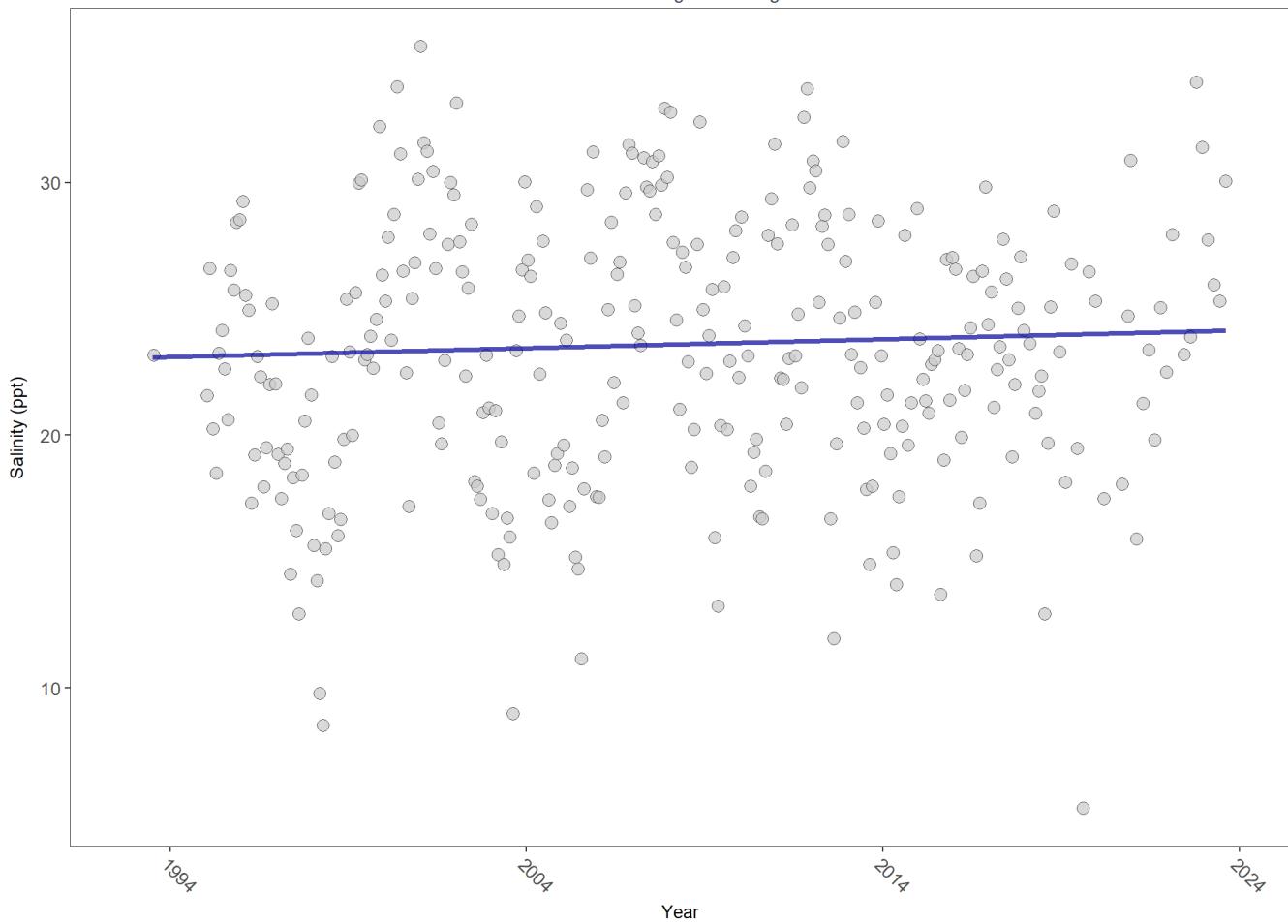


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Salinity

Salinity, Lab and Field Combined, All Depths  
Horseshoe Beach - Big Bend Seagrasses AP

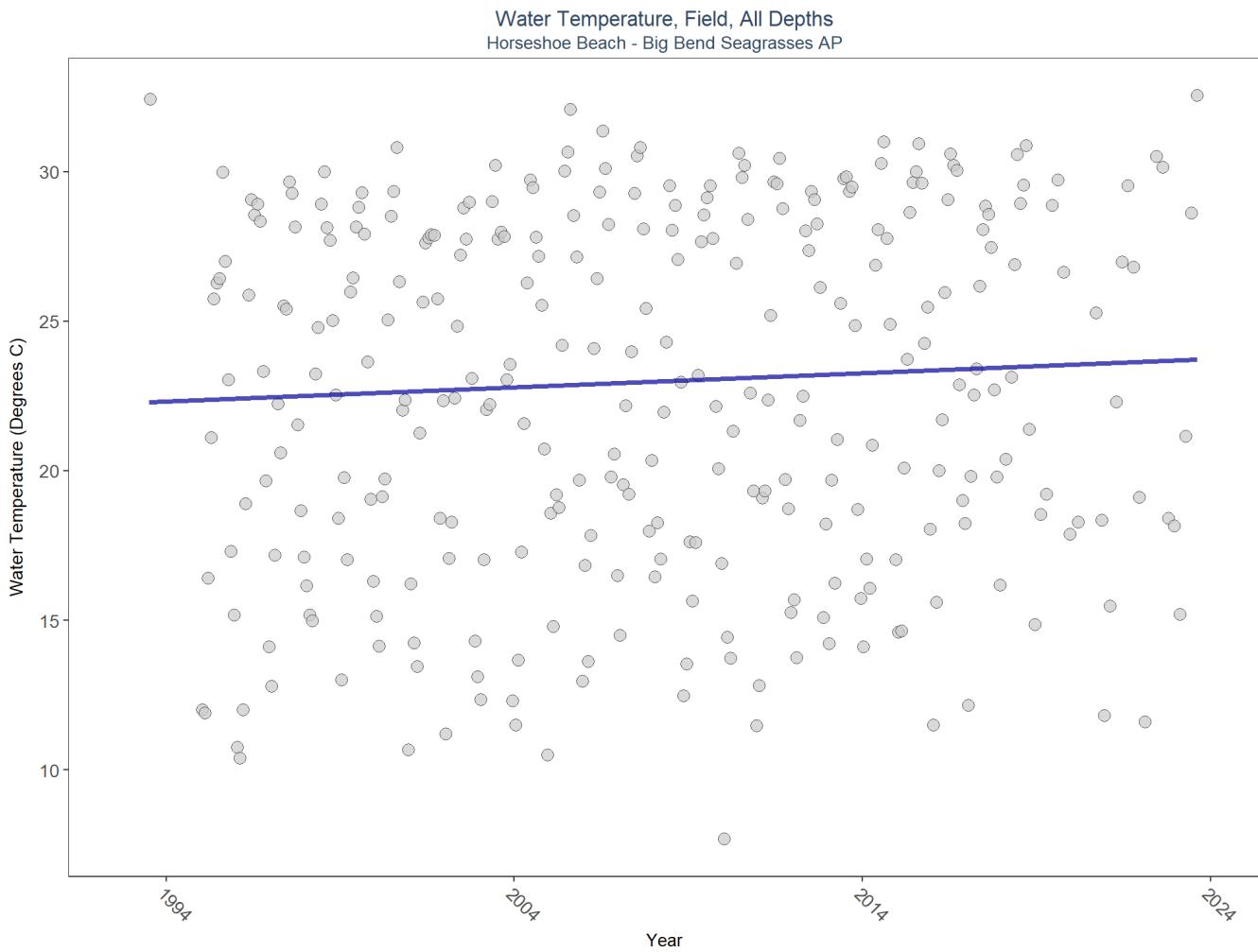


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	27342	30	22.5	TRUE	0.0403	0.3234	0.03528449	23.0659	5.4923	0.905	0

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

*SennIntercept is intercept value at beginning of record for monitoring location*

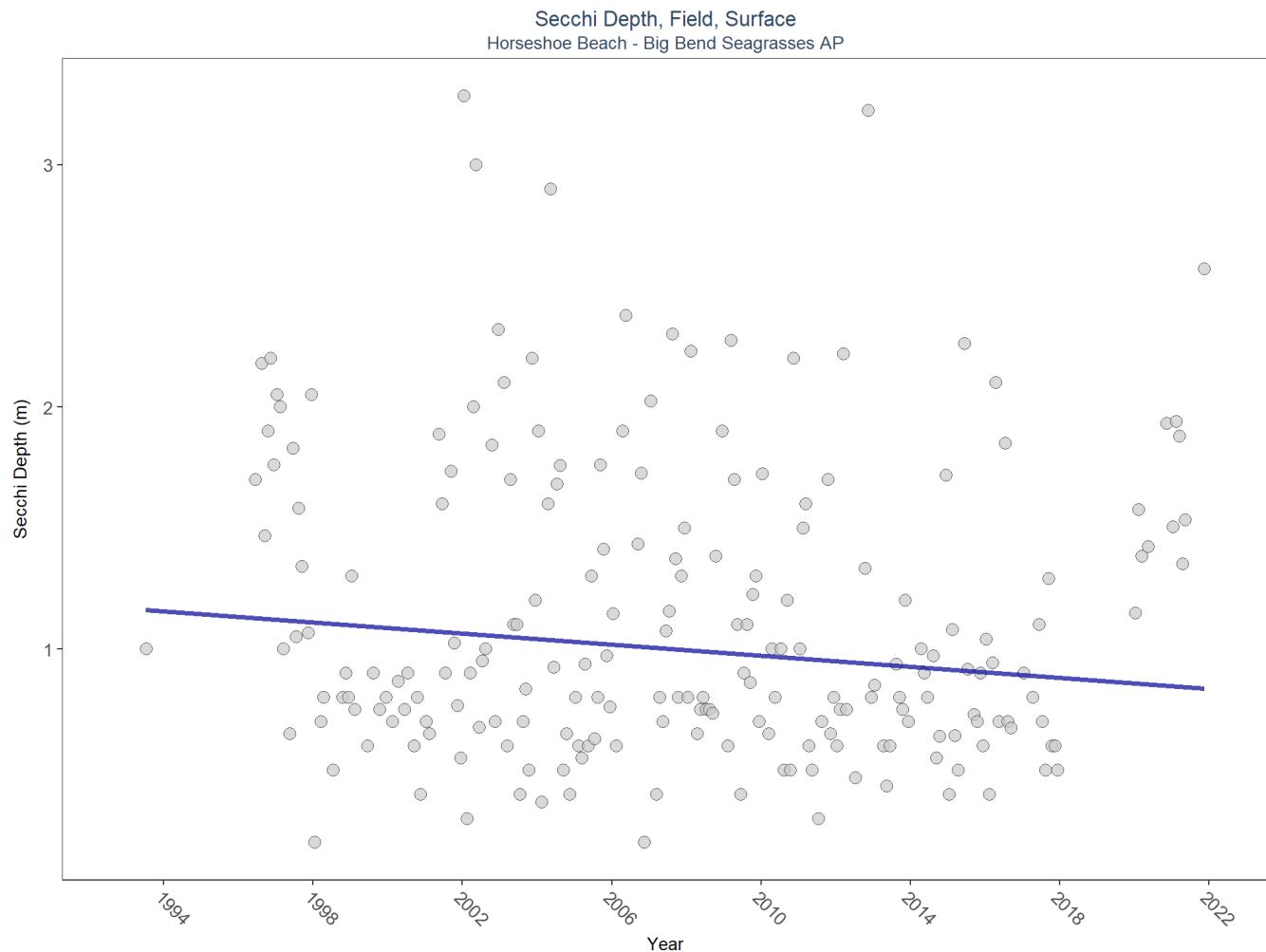
## Water Temperature



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

*SennIntercept is intercept value at beginning of record for monitoring location*

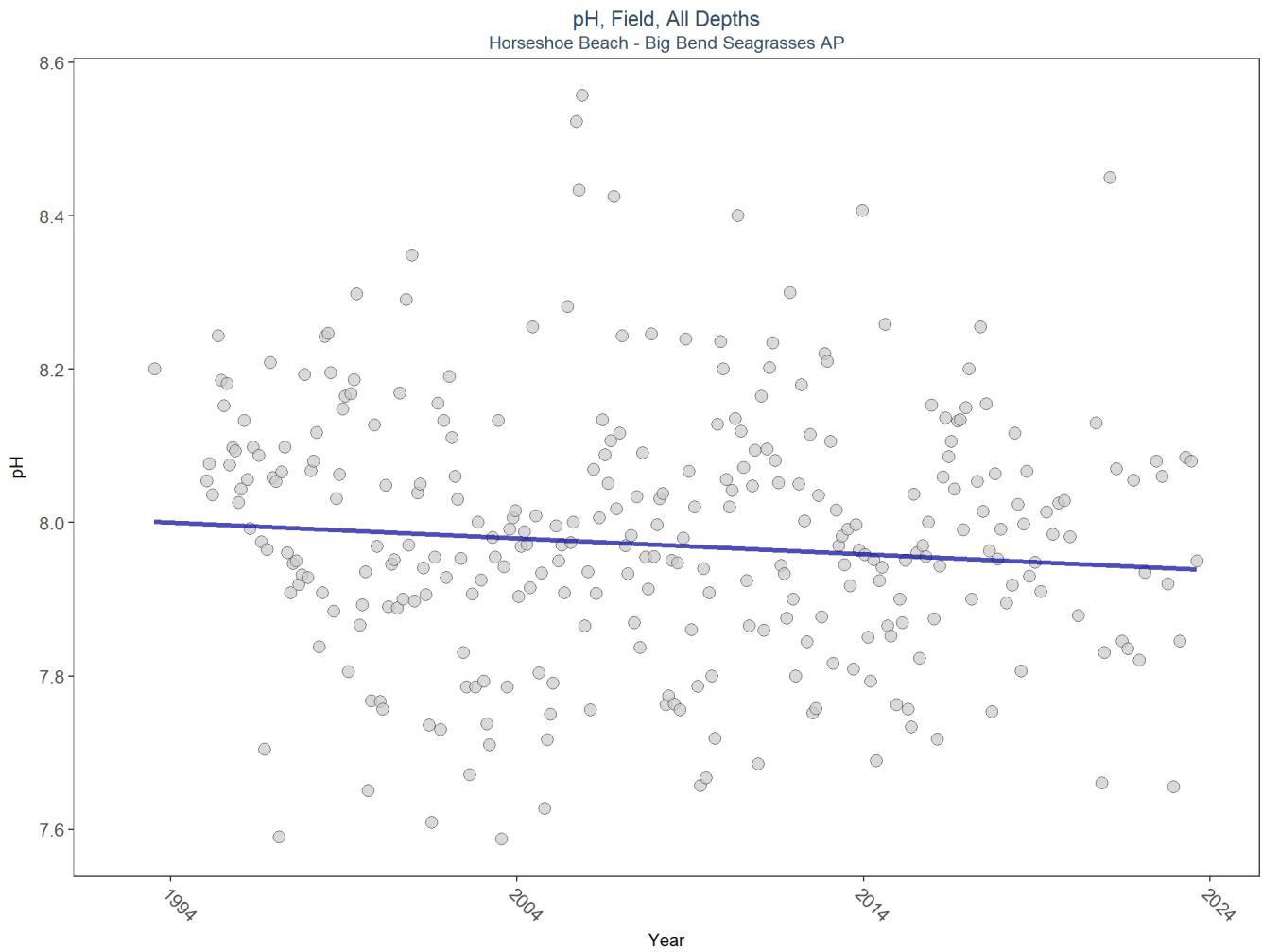
## Secchi Depth



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

*SennIntercept is intercept value at beginning of record for monitoring location*

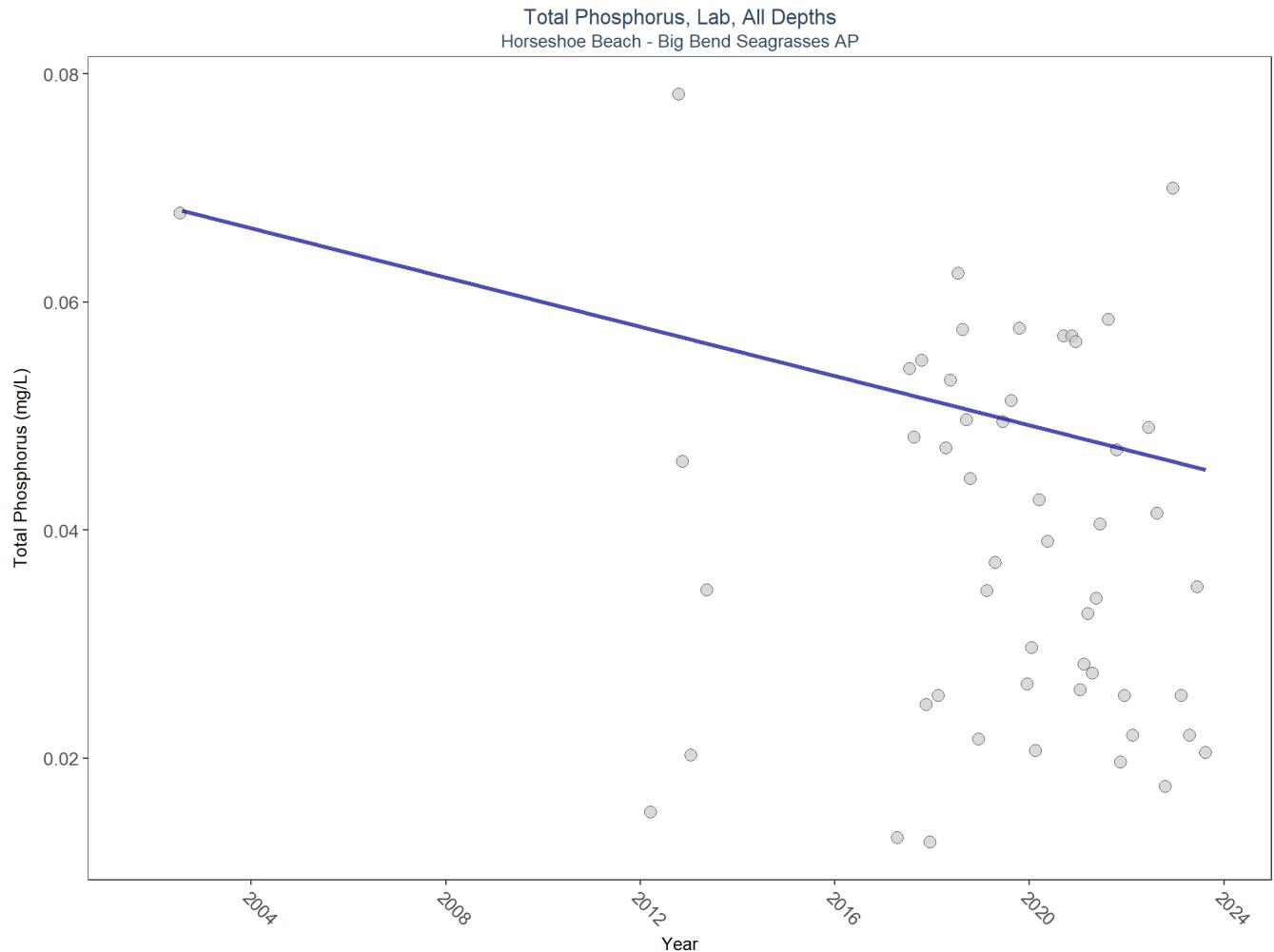
## pH



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

*SennIntercept is intercept value at beginning of record for monitoring location*

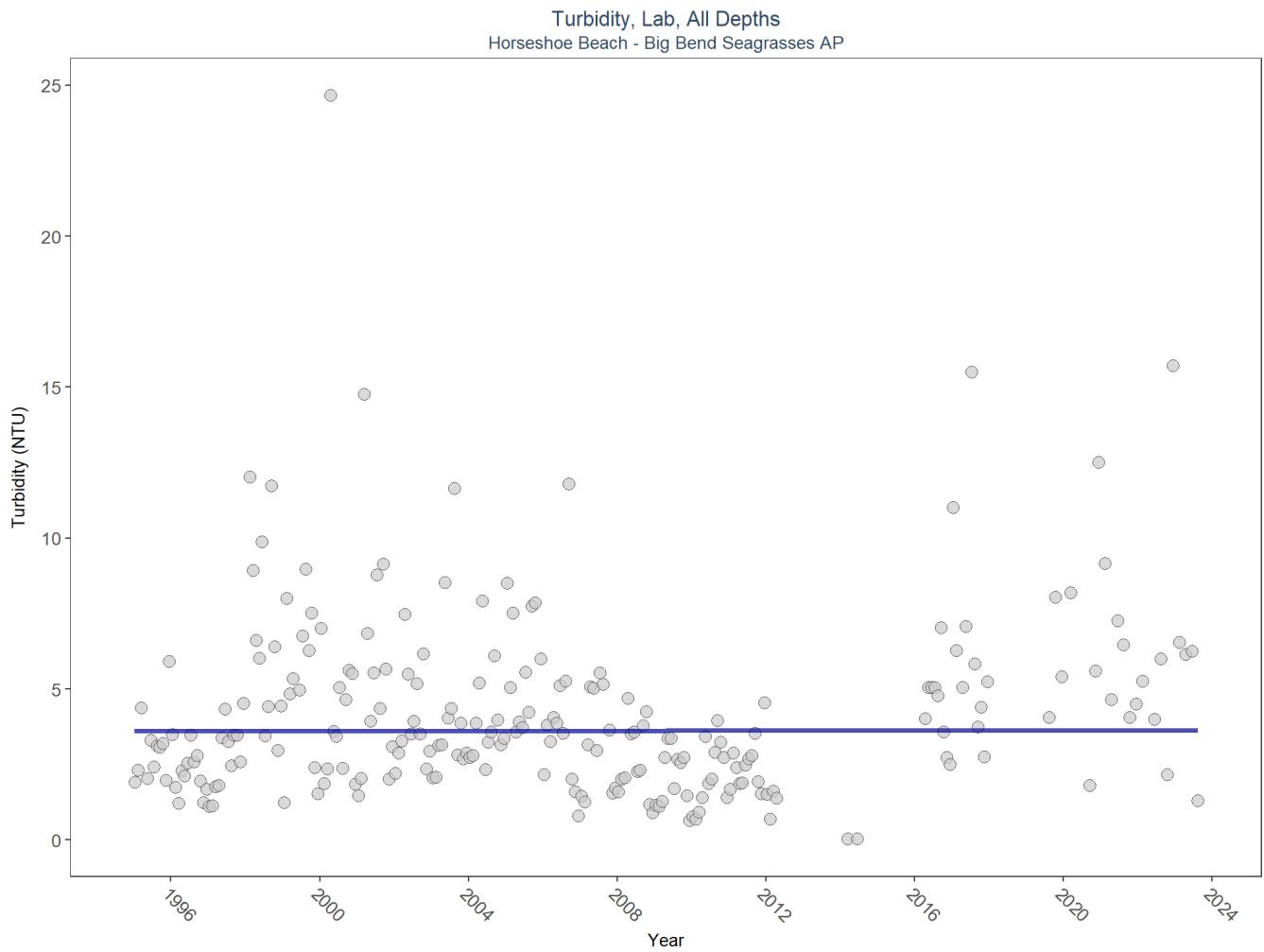
## Total Phosphorus



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

*SennIntercept is intercept value at beginning of record for monitoring location*

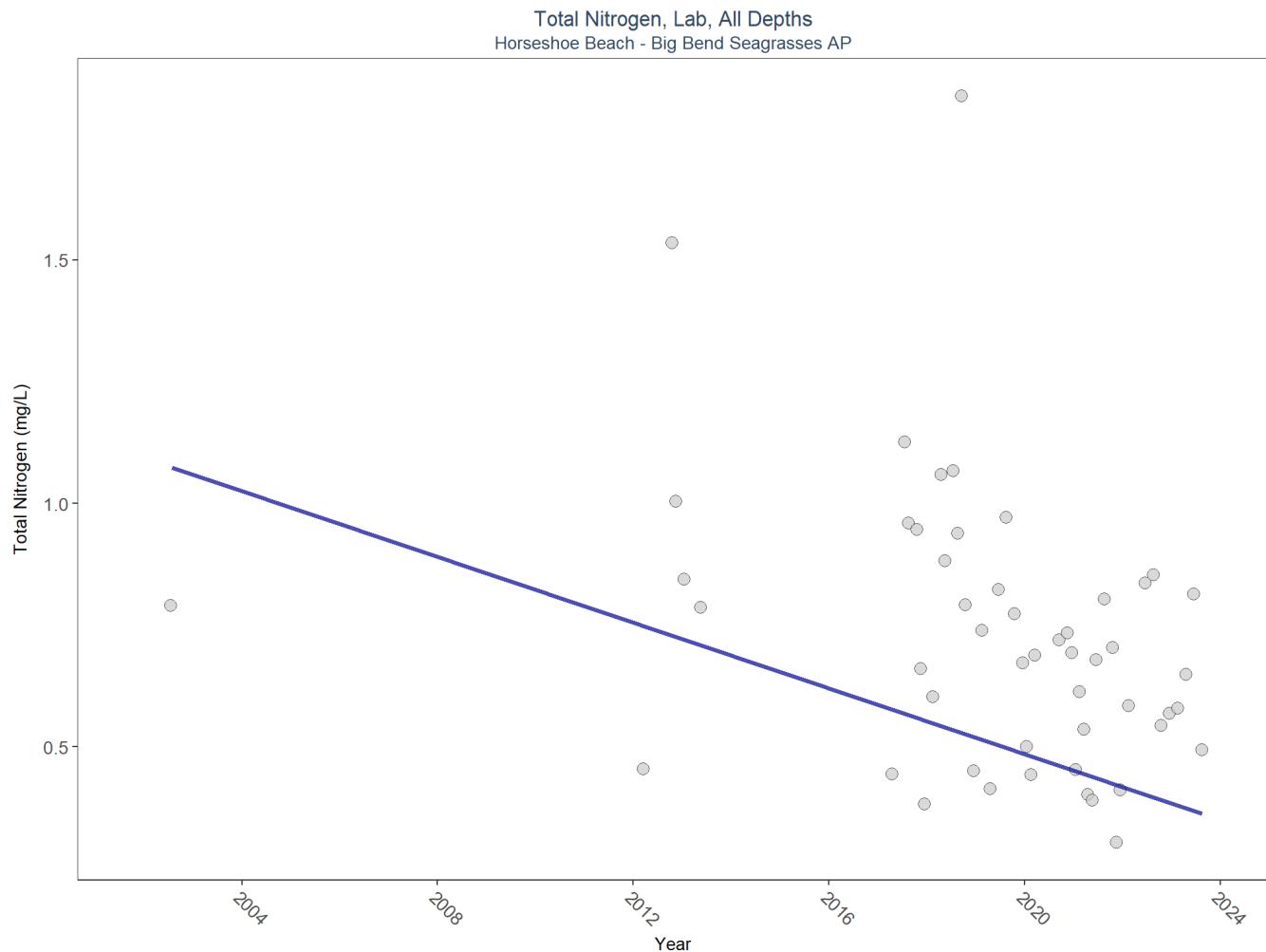
## Turbidity



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

SennIntercept is intercept value at beginning of record for monitoring location

## Total Nitrogen



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Steinhatchee

Seasonal Kendall-Tau trend plots will be produced below for parameters where *SufficientData* is **TRUE**.

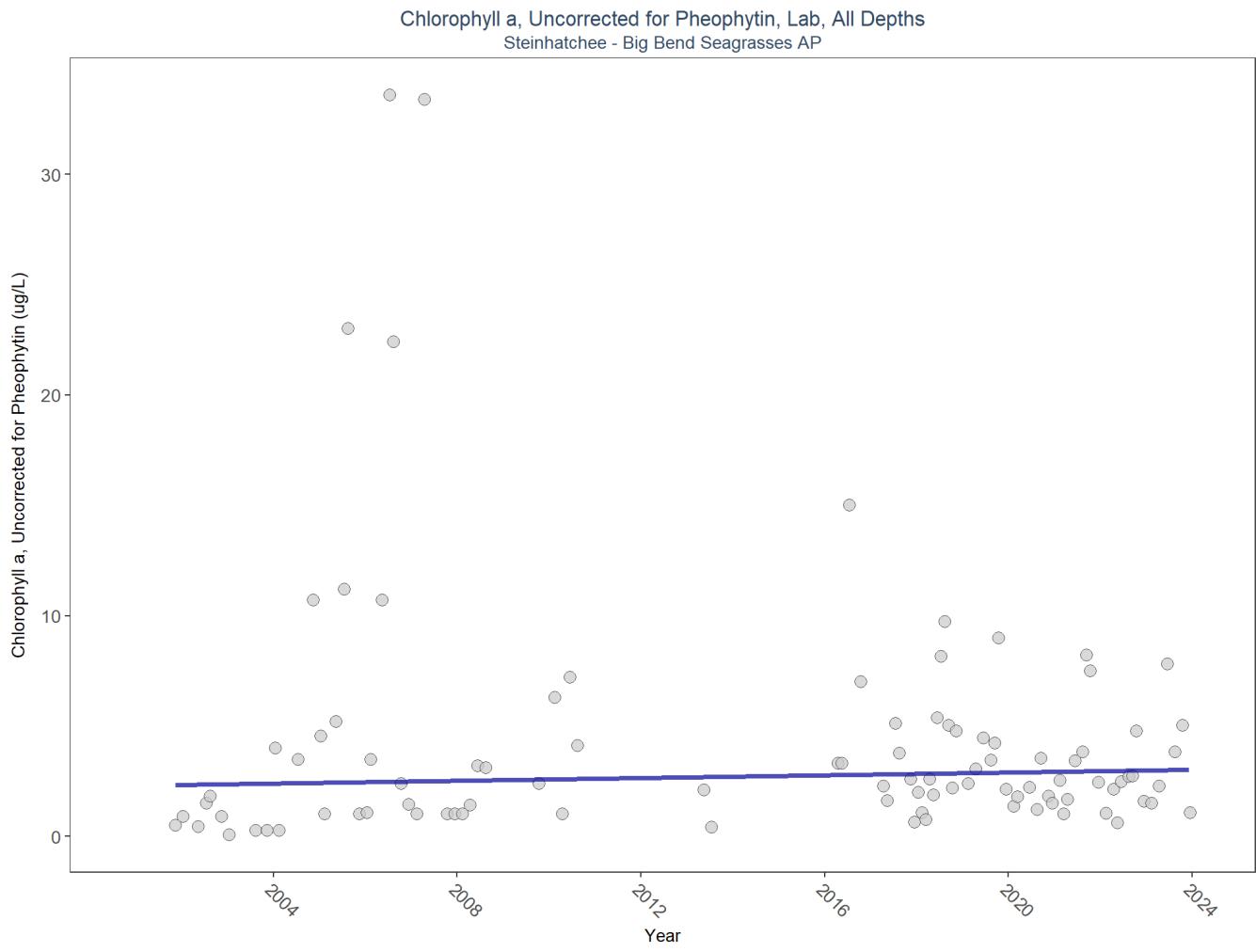
Trend arrows denote trends where the p value is less than 5% and the slope is less than 10% of the median value.

Table 2: Seasonal Kendall-Tau Results for Steinhatchee

ParameterName	Period-of-Record	N-Years	N-Data	SufficientData	SennSlope	SennIntercept	p	Trend
Chlorophyll a, Uncorrected for Pheophytin	2001 - 2023	19	290	TRUE	0.03	2.32	0.1989	0
Dissolved Oxygen	1993 - 2023	28	2701	TRUE	-0.01	7.32	0.3905	0
Dissolved Oxygen Saturation	2001 - 2022	13	92	TRUE	2.74	22.71	0.0069	↑
Salinity	1990 - 2023	28	3132	TRUE	-0.26	34.44	0.0000	↓
Water Temperature	1990 - 2023	29	2723	TRUE	0.00	23.00	0.9435	0
Secchi Depth	1993 - 2022	18	2318	TRUE	-0.03	2.38	0.0764	0
pH	1993 - 2023	27	2692	TRUE	-0.01	8.25	0.0004	↓
Total Phosphorus	2001 - 2023	16	282	TRUE	0.00	0.06	0.0000	↓
Colored Dissolved Organic Matter	2019 - 2022	4	33	FALSE	-	-	-	-
Chlorophyll a, Corrected for Pheophytin	2001 - 2023	13	242	TRUE	0.06	0.73	0.0448	↑
Turbidity	1994 - 2023	24	227	TRUE	-0.02	2.65	0.3430	0
Total Suspended Solids	1994 - 2022	11	45	TRUE	-0.09	5.69	0.4069	0
Total Nitrogen	2001 - 2023	20	238	TRUE	0.00	0.78	0.2656	0

## Discrete WQ

### Chlorophyll a, Uncorrected for Pheophytin



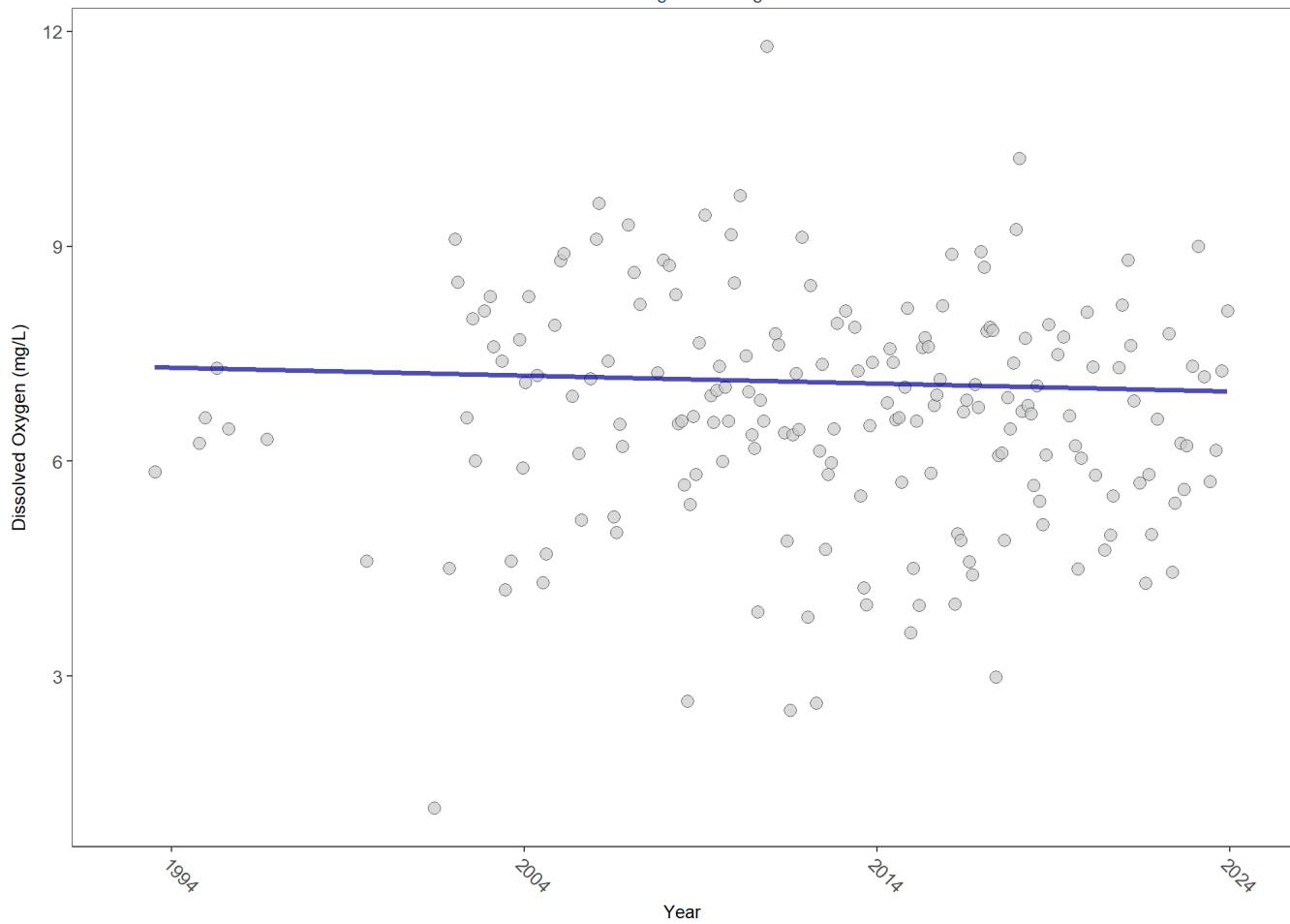
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	290	19	2.1	TRUE	0.1084	0.1989	0.03083333	2.315833	8.9865	0.6231	0

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Dissolved Oxygen

Dissolved Oxygen, Field, All Depths  
Steinhatchee - Big Bend Seagrasses AP

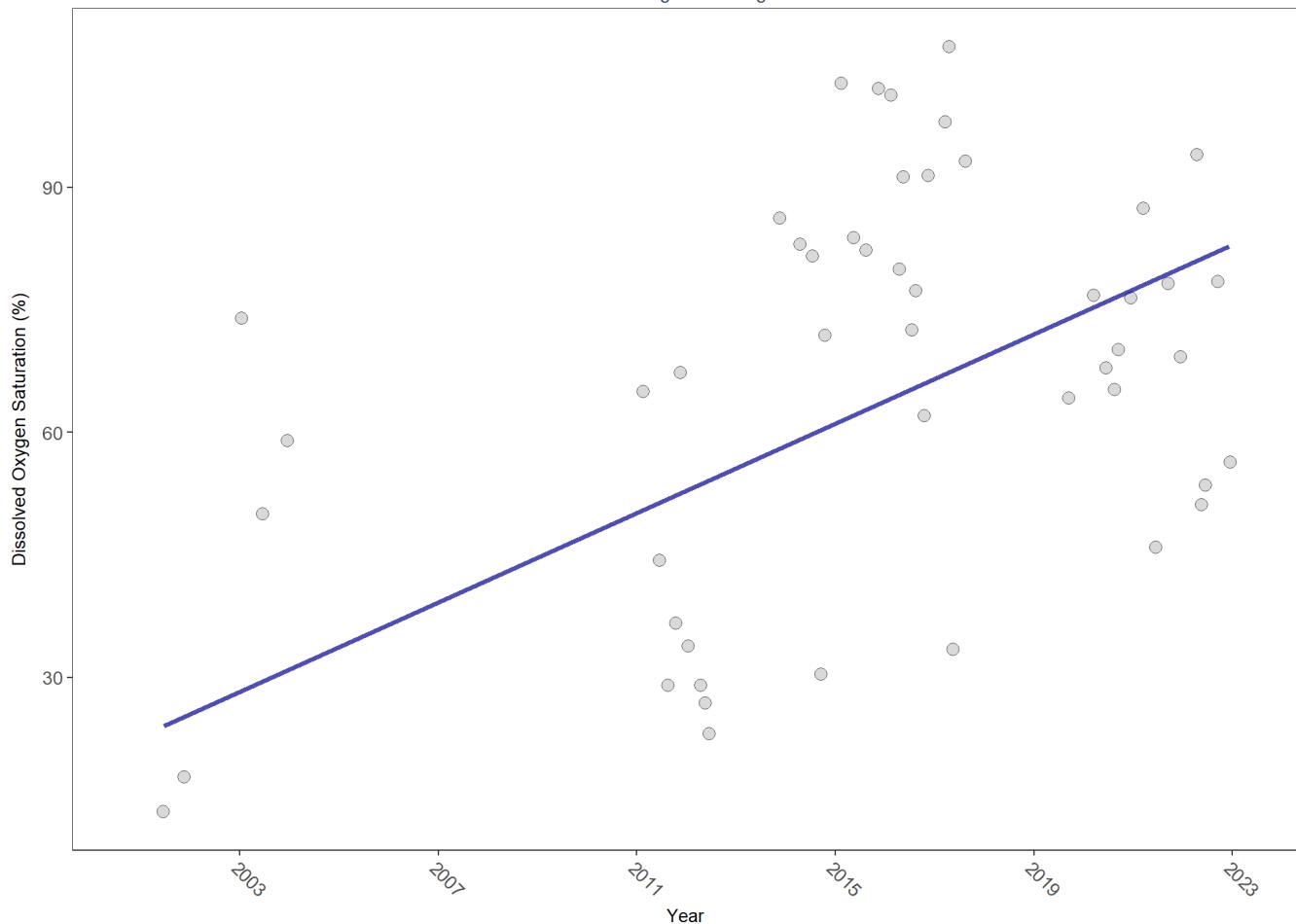


$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

## Dissolved Oxygen Saturation

Dissolved Oxygen Saturation, Field, All Depths  
Steinhatchee - Big Bend Seagrasses AP

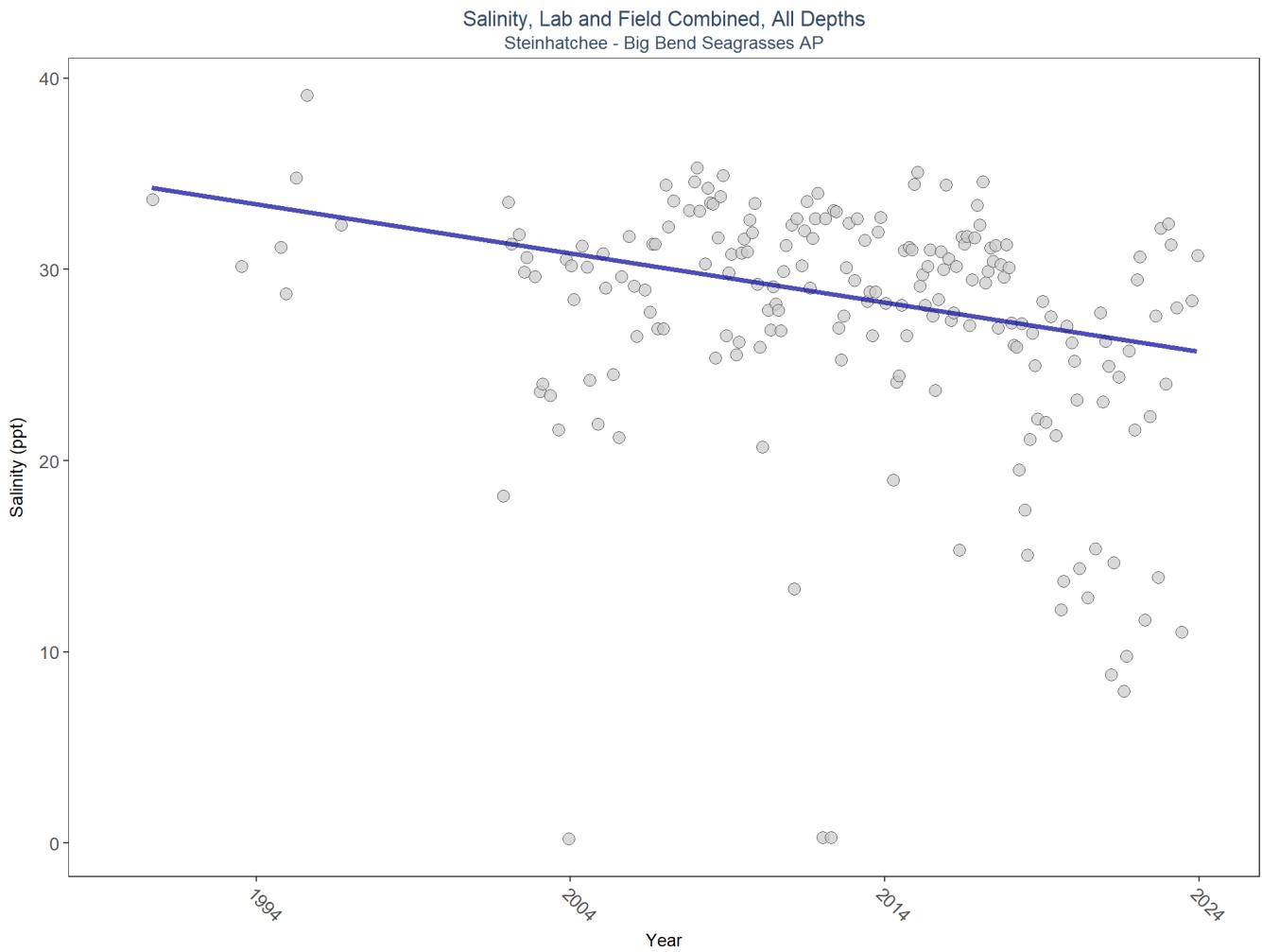


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	92	13	67.65	TRUE	0.2585	0.0069	2.739912	22.71467	14.5334	0.2049	1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

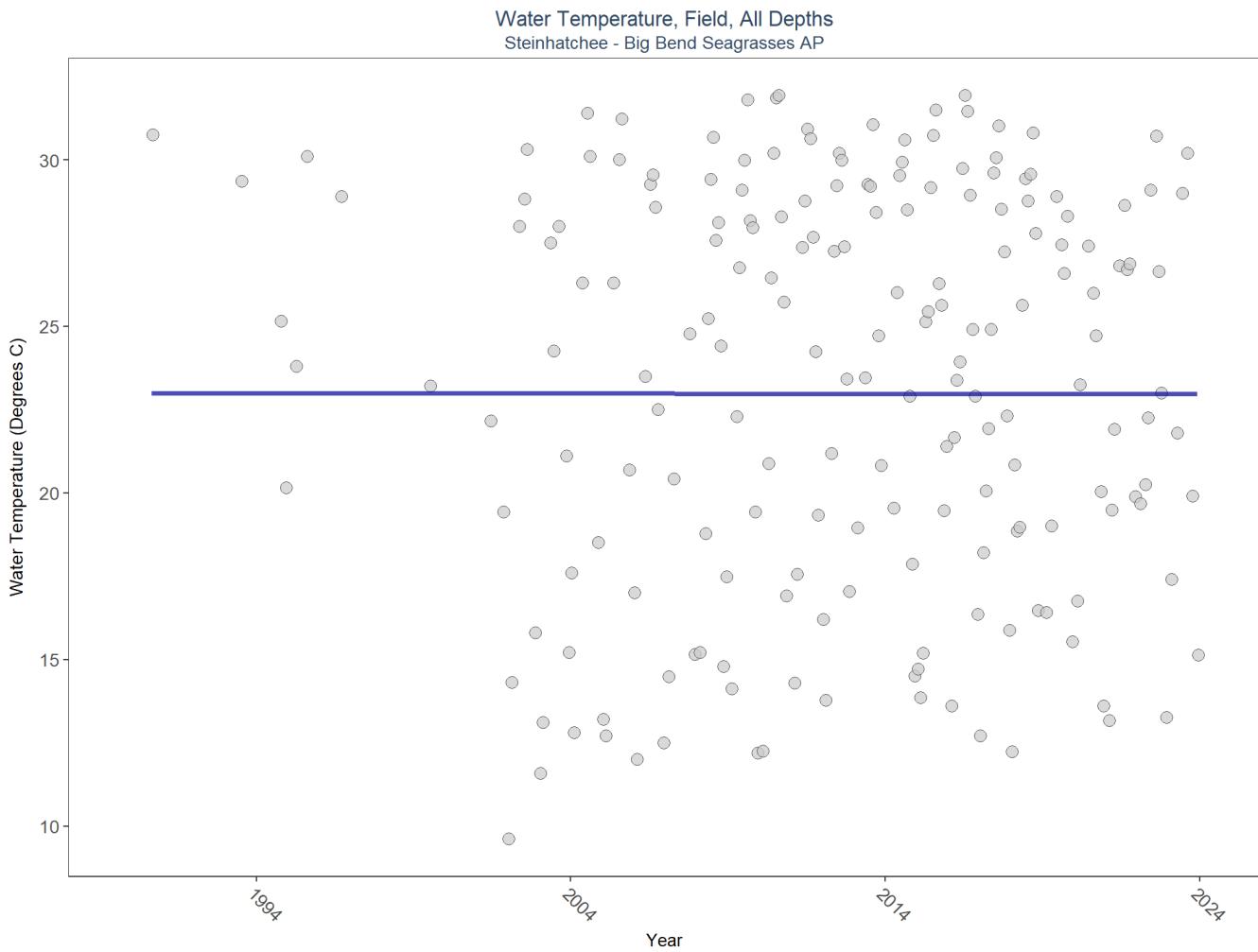
## Salinity



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

*SennIntercept is intercept value at beginning of record for monitoring location*

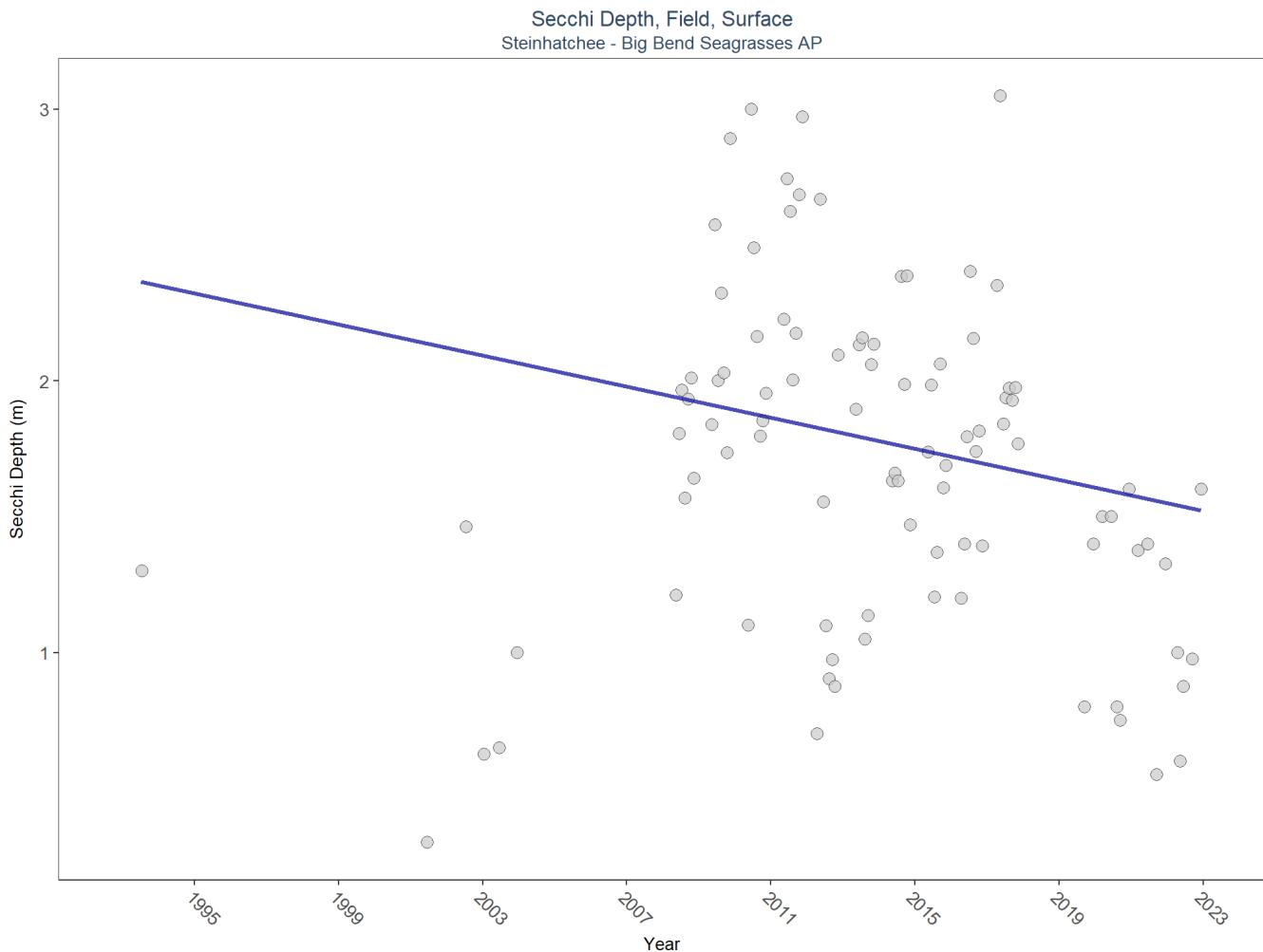
## Water Temperature



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

*SennIntercept is intercept value at beginning of record for monitoring location*

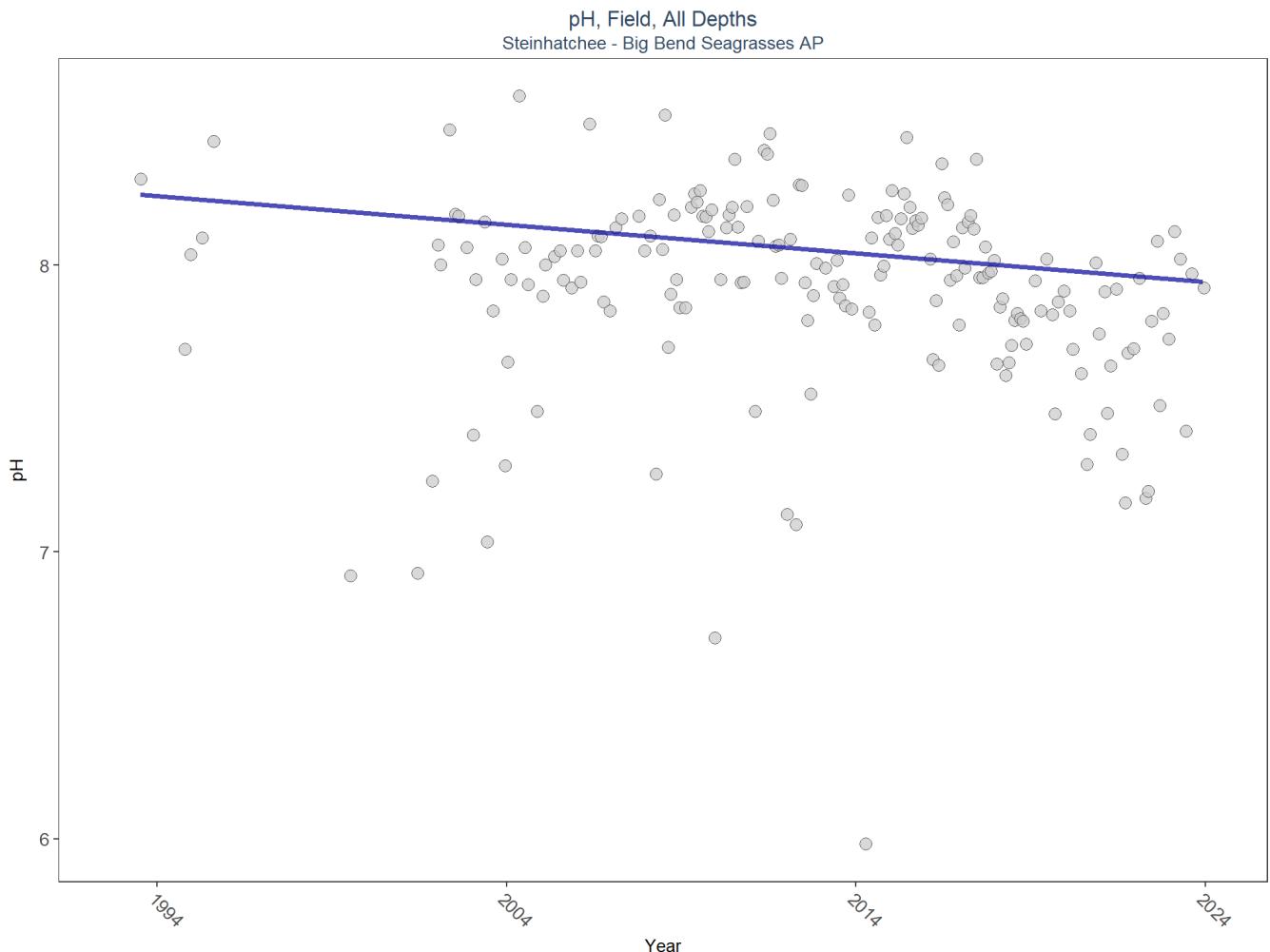
## Secchi Depth



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

*SennIntercept is intercept value at beginning of record for monitoring location*

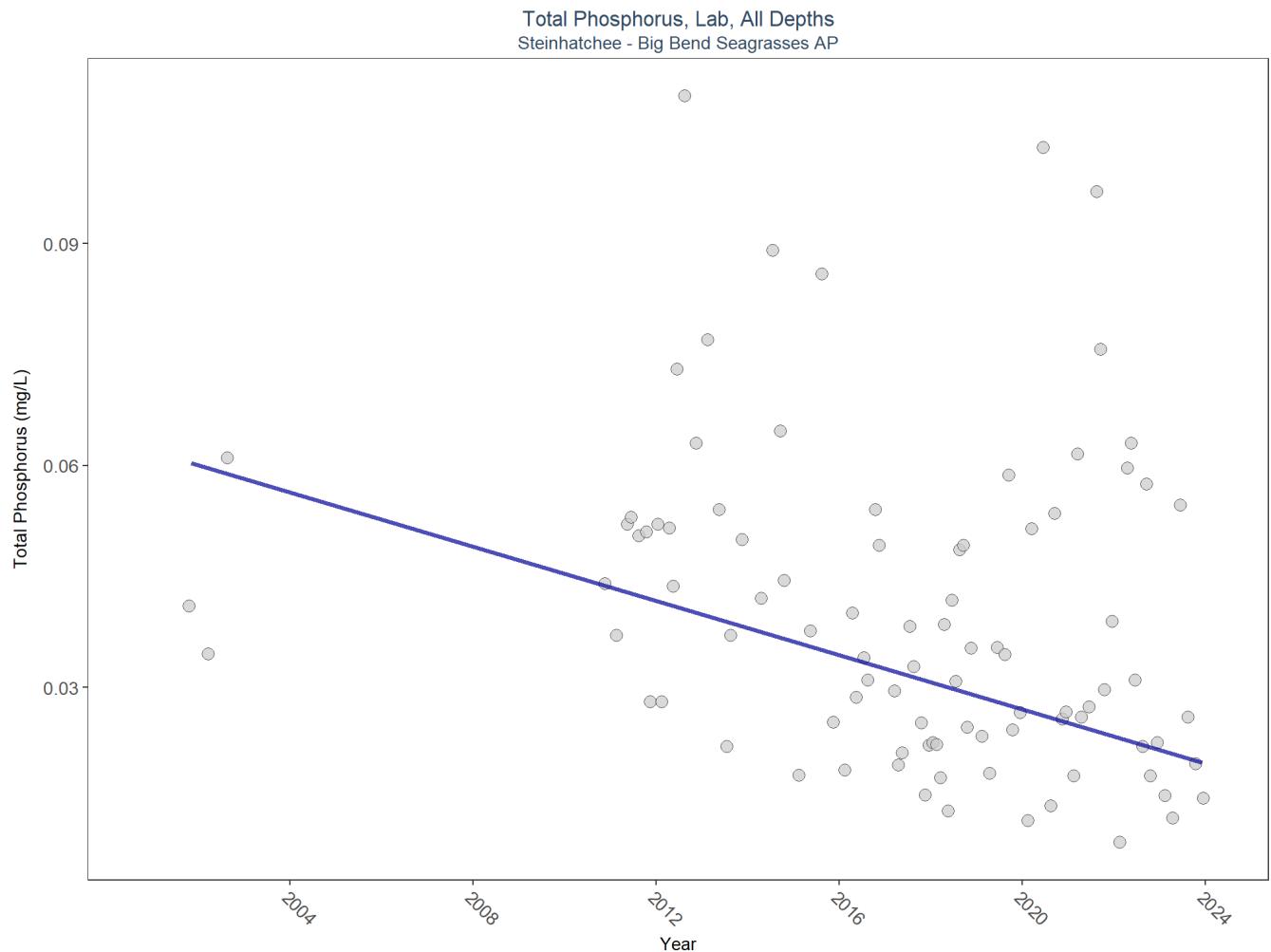
## pH



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Phosphorus



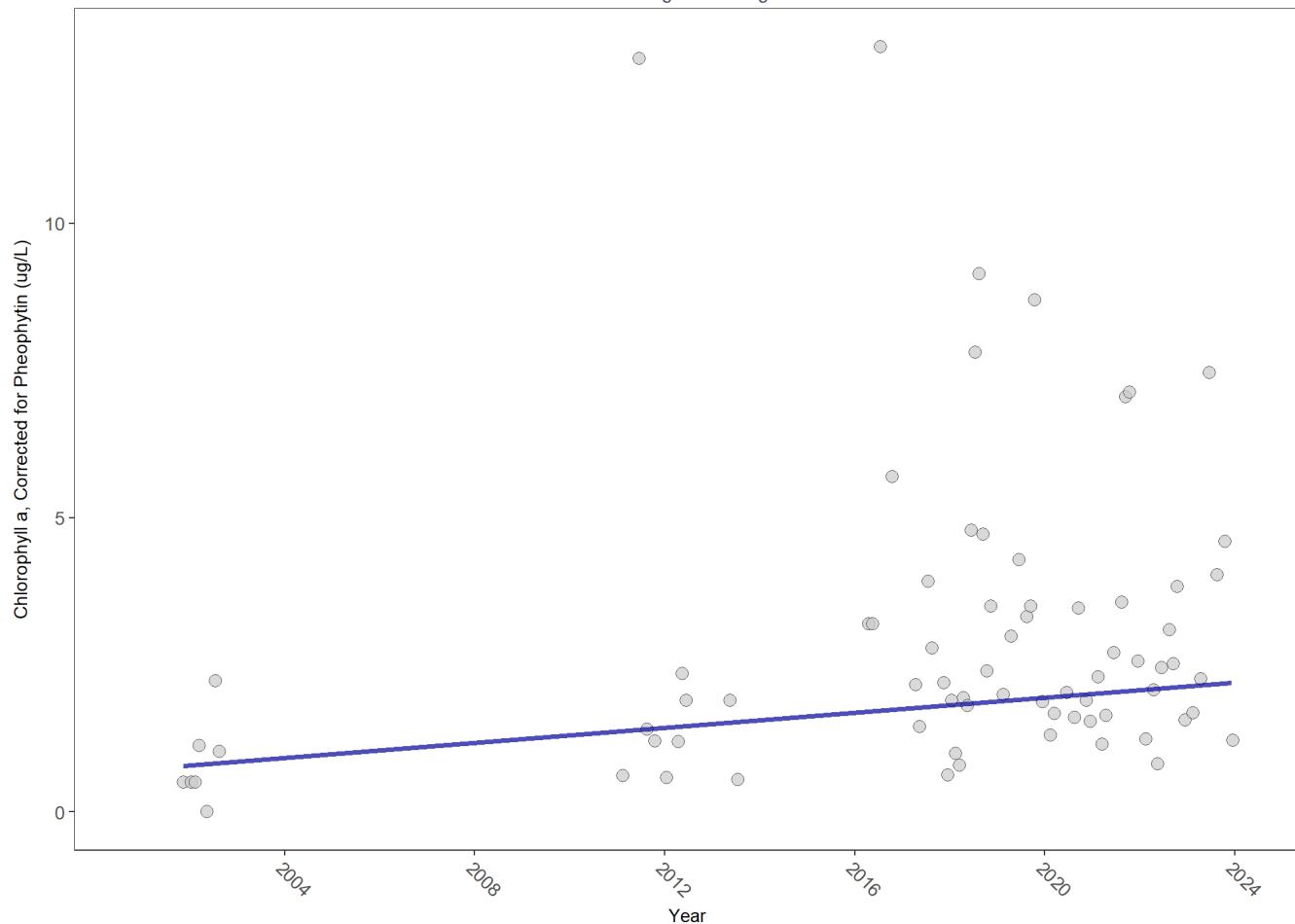
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	282	16	0.029	TRUE	-0.3207	0.0000	-0.001833333	0.06187917	12.9914	0.2939	-1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Chlorophyll a, Corrected for Pheophytin

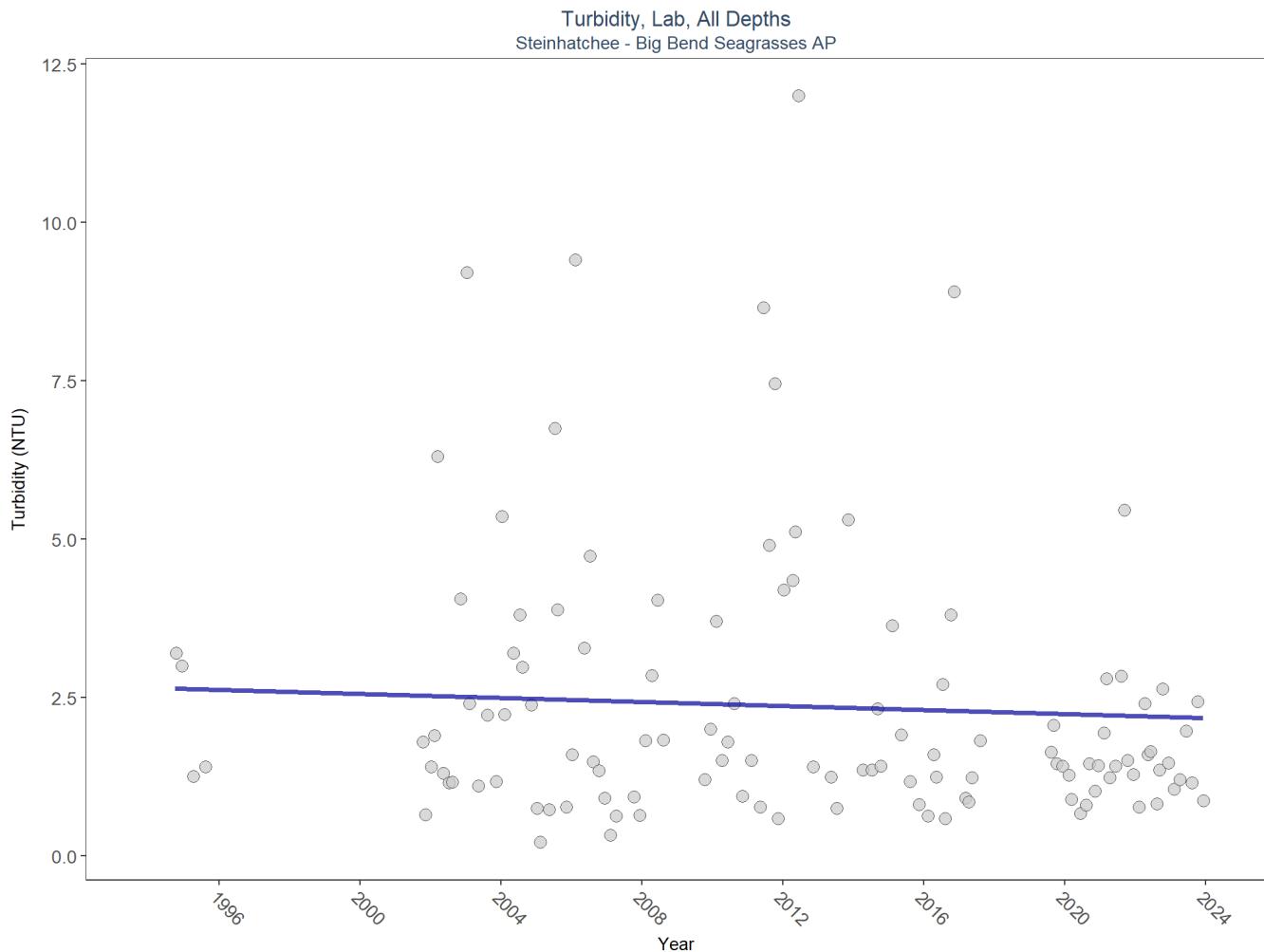
Chlorophyll a, Corrected for Pheophytin, Lab, All Depths  
Steinhatchee - Big Bend Seagrasses AP



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

SennIntercept is intercept value at beginning of record for monitoring location

## Turbidity

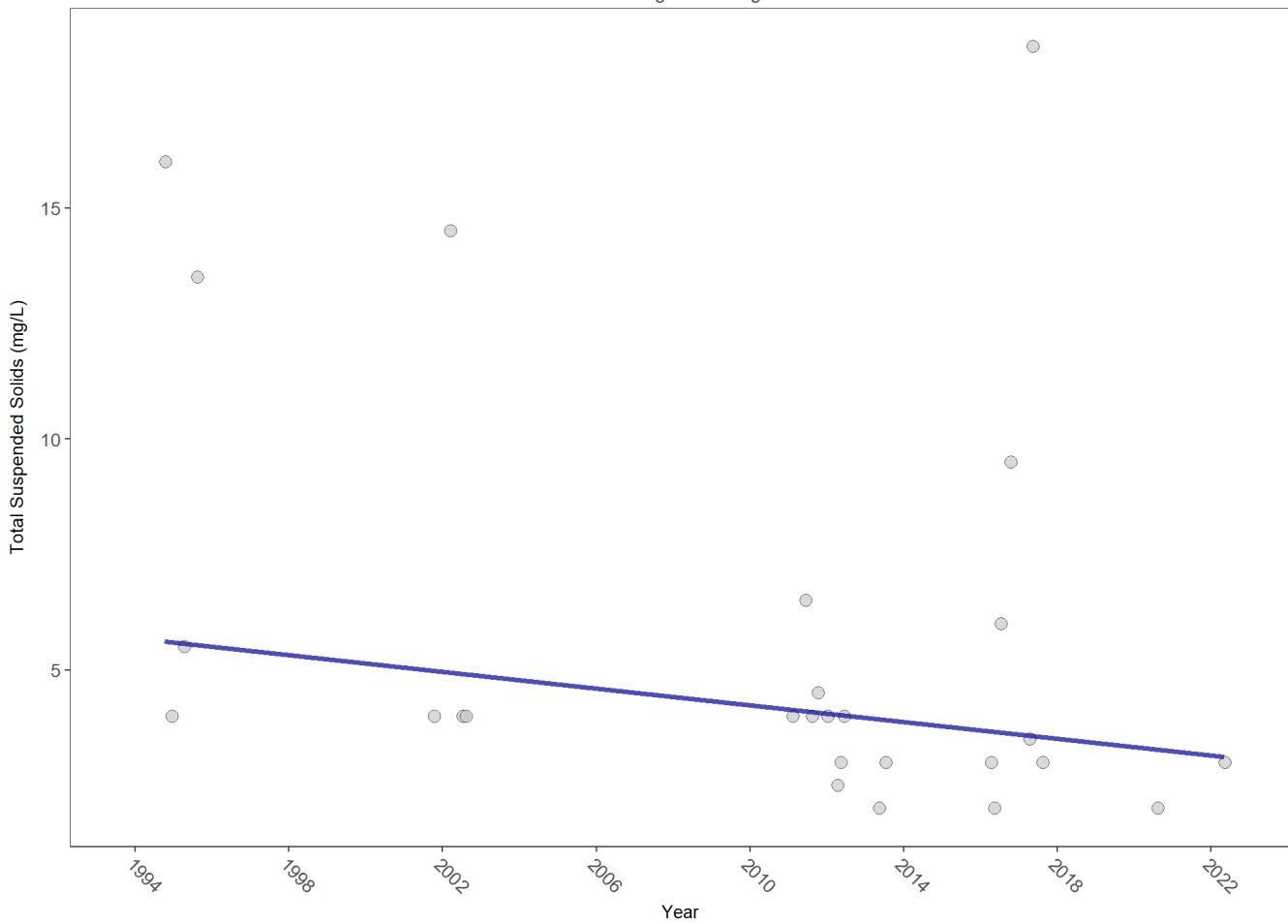


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Suspended Solids

Total Suspended Solids, Lab and Field Combined, All Depths  
Steinhatchee - Big Bend Seagrasses AP

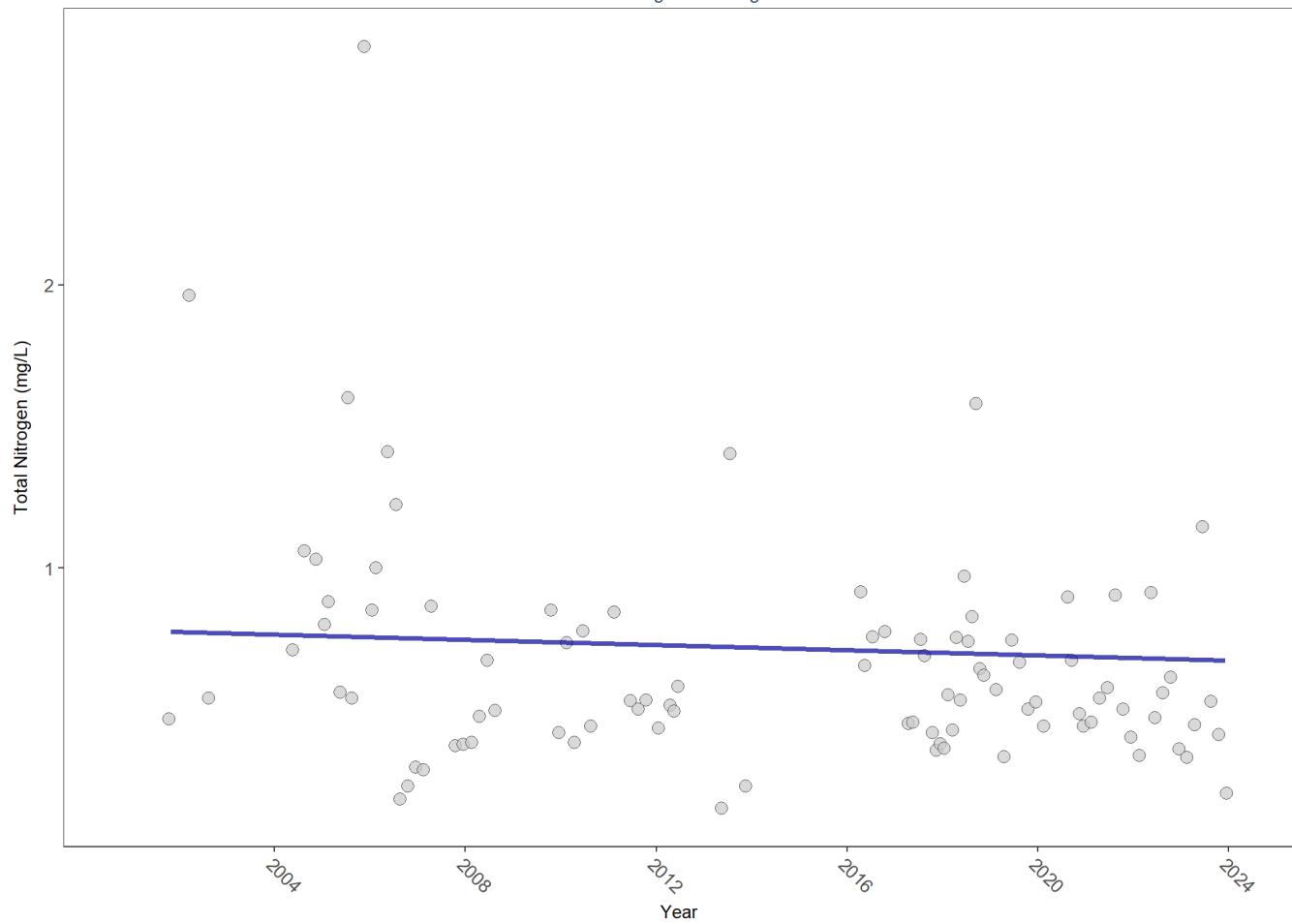


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Nitrogen

Total Nitrogen, Lab, All Depths  
Steinhatchee - Big Bend Seagrasses AP



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Submerged Aquatic Vegetation

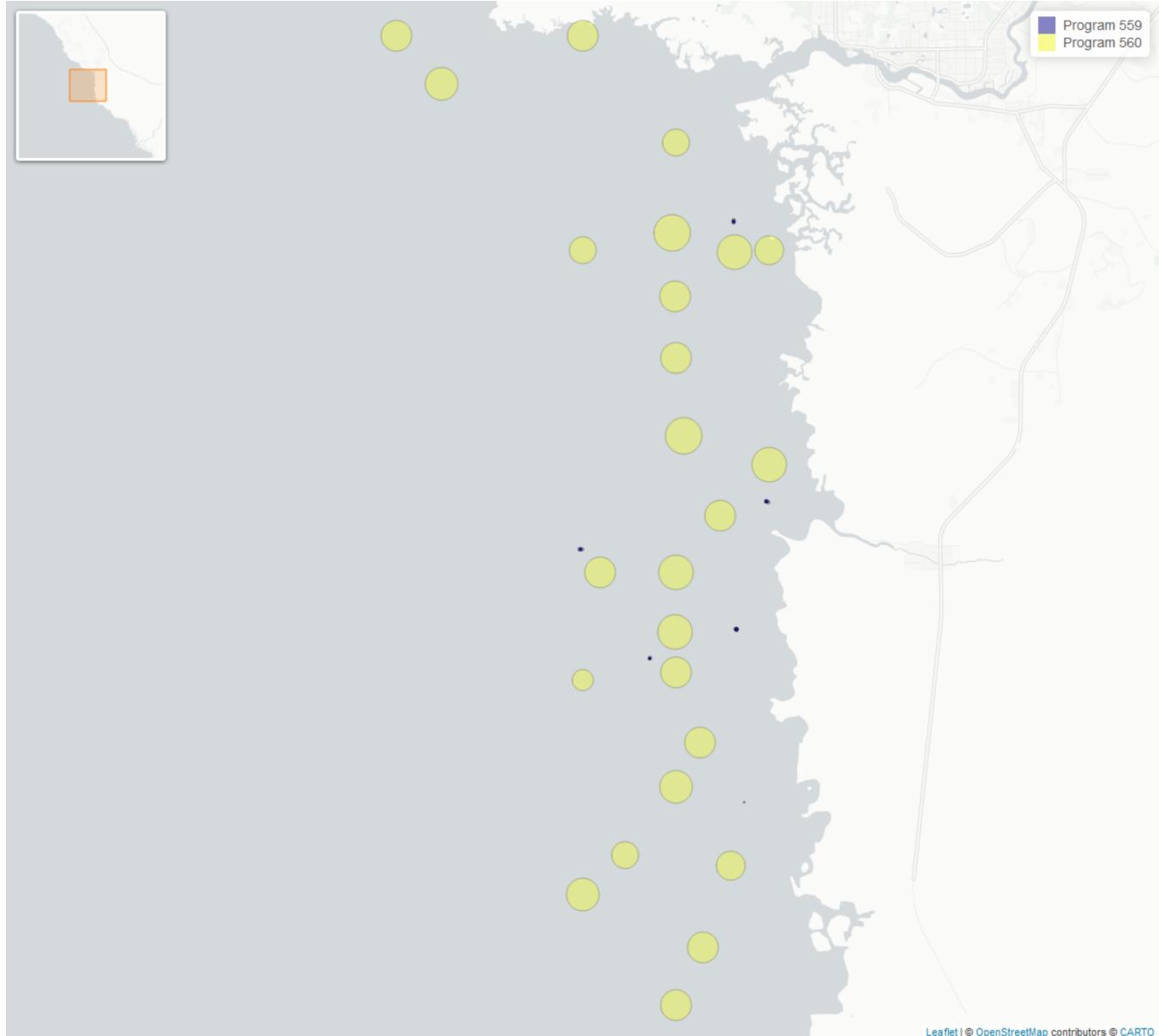


Table 3: Northern Big Bend Seagrass Monitoring - *Program 559*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
82	2012	2018	Modified Braun Blanquet	32

Table 4: Big Bend Seagrasses & Nature Coast Aquatic Preserves - Seagrass Monitoring - *Program 560*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
5932	2000	2023	Modified Braun Blanquet	25
650	2022	2023	Percent Cover	25

## Median Percent Cover - Species Trends



## Median Percent Cover - Species Trend Table

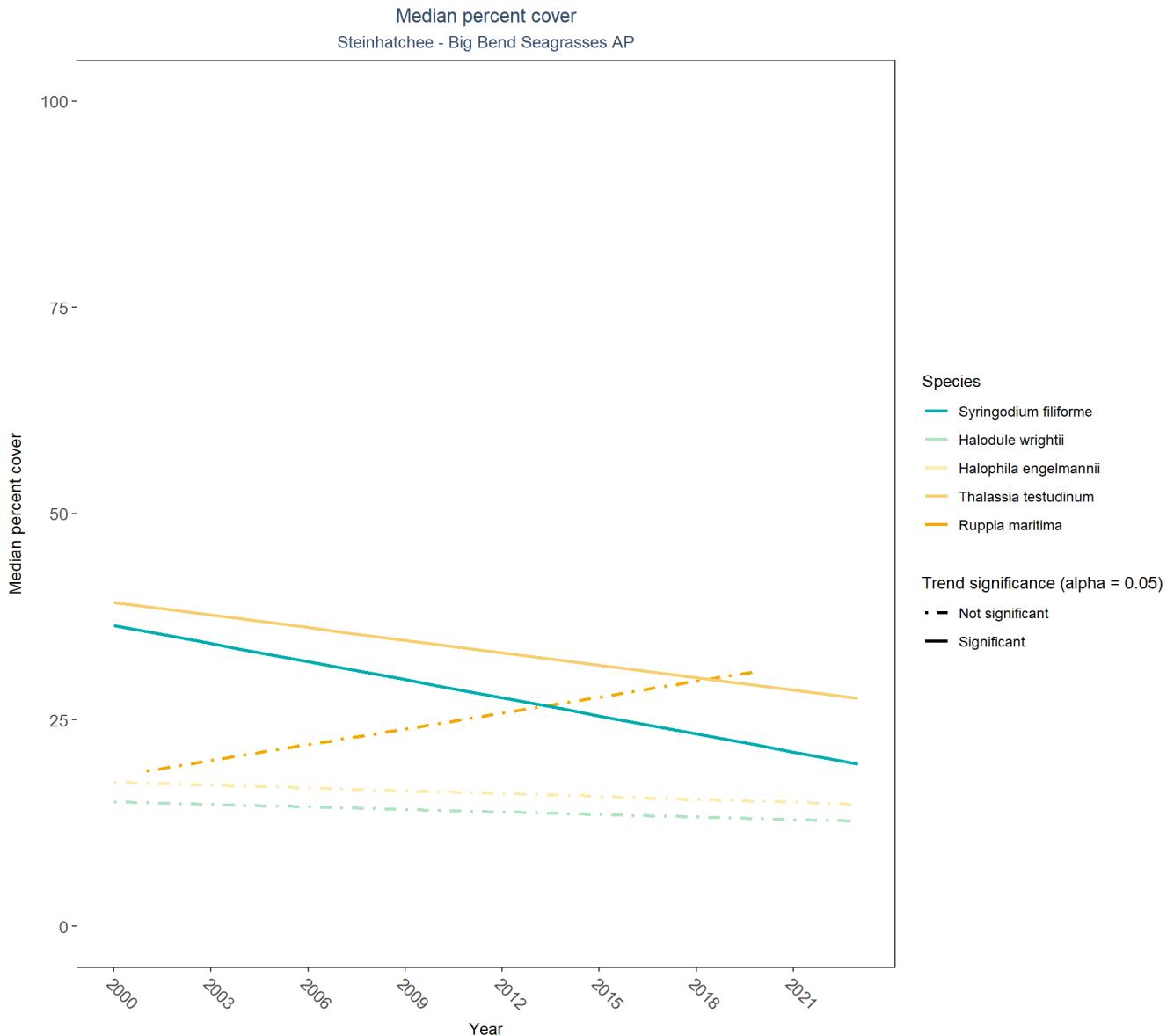
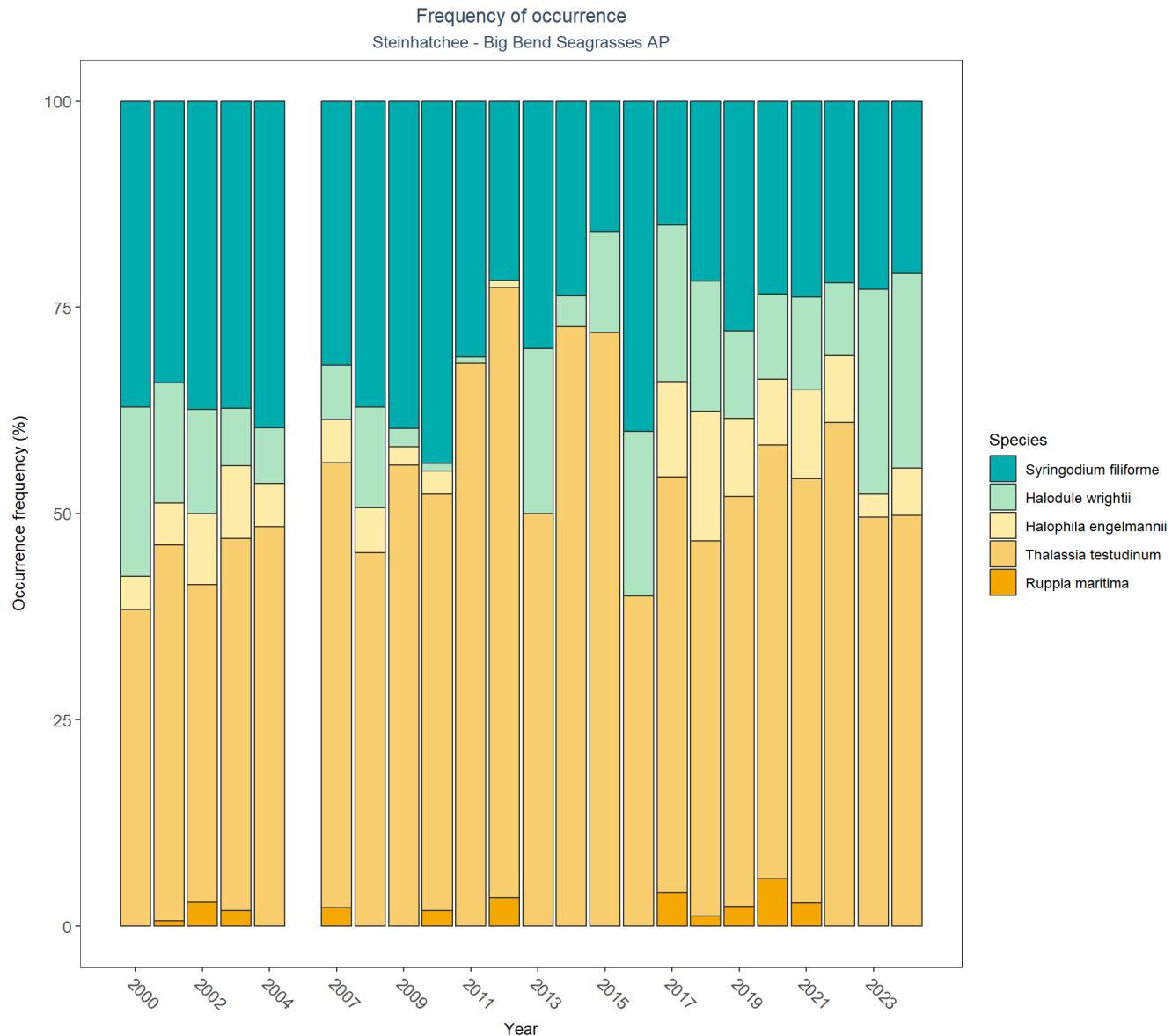


Table 5: Percent Cover Trend Analysis for Steinhatchee

Species	Trend Significance (0.05)	Period of Record	LME_Intercept	LME_Slope	p
Drift algae	No significant trend	2000 - 2023	17.0667	0.1788	0.3118
Halodule wrightii	No significant trend	2000 - 2023	15.0705	-0.1016	0.6154
Halophila engelmannii	No significant trend	2000 - 2023	17.4504	-0.1148	0.6068
No grass In Quadrat	Model did not fit the available data	2004 - 2023	-	-	-
Ruppia maritima	No significant trend	2001 - 2020	18.1473	0.6401	0.2906
Syringodium filiforme	Significantly decreasing trend	2000 - 2023	36.4470	-0.7298	0.0000
Thalassia testudinum	Significantly decreasing trend	2000 - 2023	39.2272	-0.5062	0.0000

## Frequency of Occurrence Barplots



## St. Marks

Seasonal Kendall-Tau trend plots will be produced below for parameters where *SufficientData* is **TRUE**.

Trend arrows denote trends where the p value is less than 5% and the slope is less than 10% of the median value.

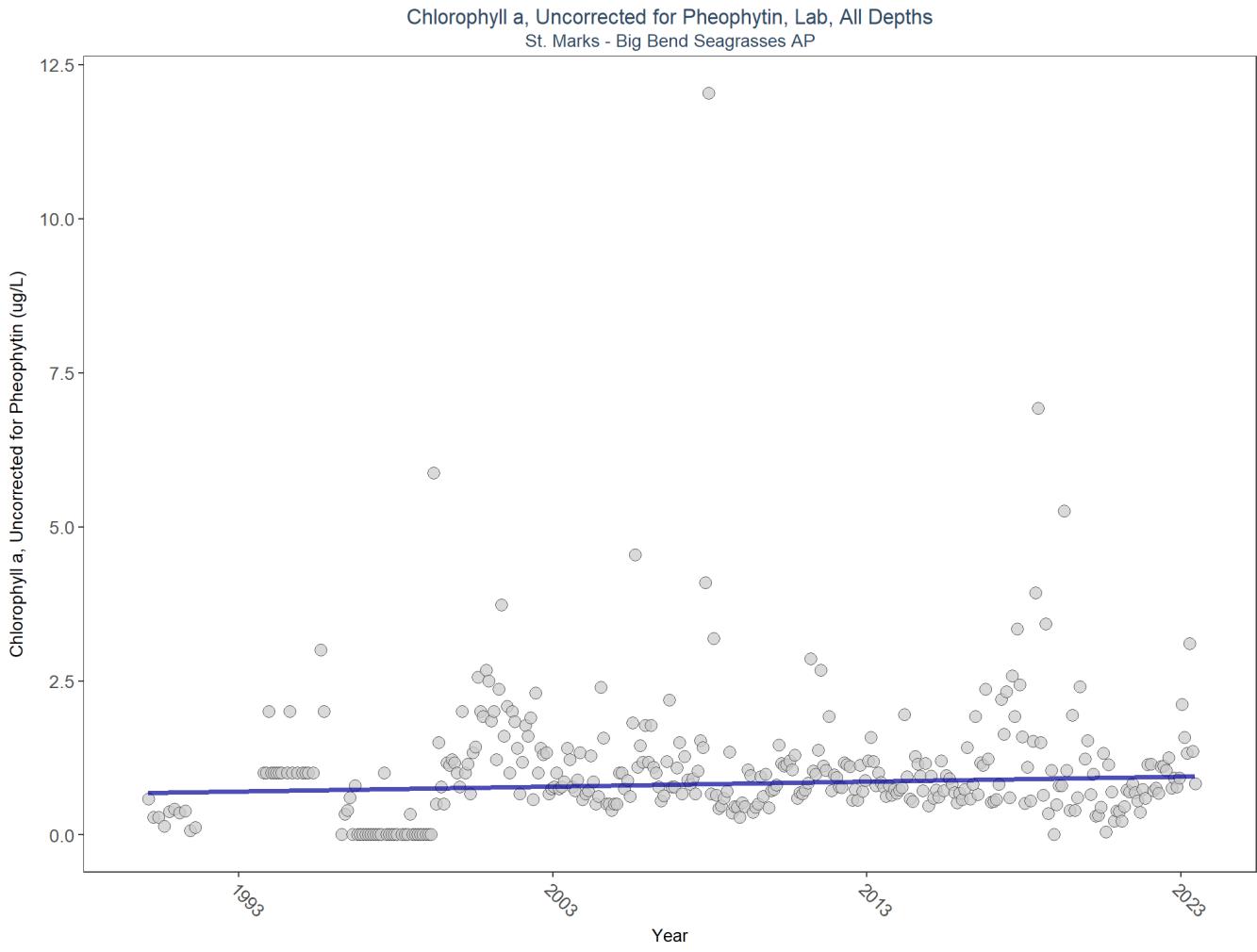
St. Marks contains a *large trend*. Trends marked in  $\uparrow$  or  $\downarrow$  are deemed *large* trends, meaning the p value is less than 5% and the slope is greater than 10% of the median value.

Table 6: Seasonal Kendall-Tau Results for St. Marks

ParameterName	Period-of-Record	N-Years	N-Data	SufficientData	SennSlope	SennIntercept	p	Trend
Chlorophyll a, Uncorrected for Pheophytin	1990 - 2023	33	3041	TRUE	0.01	0.69	0.0363	$\uparrow$
Dissolved Oxygen	1989 - 2023	35	6677	TRUE	-0.01	6.19	0.2046	0
Dissolved Oxygen Saturation	1999 - 2023	19	744	TRUE	-0.64	77.96	0.0235	$\downarrow$
Salinity	1964 - 2023	34	5947	TRUE	0.00	17.10	0.3520	0
Water Temperature	1964 - 2023	37	7016	TRUE	0.07	18.82	0.0000	$\uparrow$
Secchi Depth	1991 - 2023	33	6818	TRUE	-0.05	3.47	0.0000	$\downarrow$
pH	1964 - 2023	36	6438	TRUE	0.02	6.61	0.0000	$\uparrow$
Total Phosphorus	1992 - 2023	32	3669	TRUE	0.00	0.00	0.0000	$\uparrow$
Colored Dissolved Organic Matter	2001 - 2023	23	2062	TRUE	0.86	-2.13	0	$\uparrow$
Chlorophyll a, Corrected for Pheophytin	1999 - 2023	25	1961	TRUE	-0.01	1.00	0.0001	$\downarrow$
Turbidity	1990 - 2023	33	2590	TRUE	-0.01	1.53	0.0207	$\downarrow$
Total Suspended Solids	1990 - 2023	33	1821	TRUE	-0.04	4.47	0.0000	$\downarrow$
Total Nitrogen	1990 - 2023	34	5310	TRUE	0.00	0.33	0.0171	$\uparrow$

## Discrete WQ

### Chlorophyll a, Uncorrected for Pheophytin

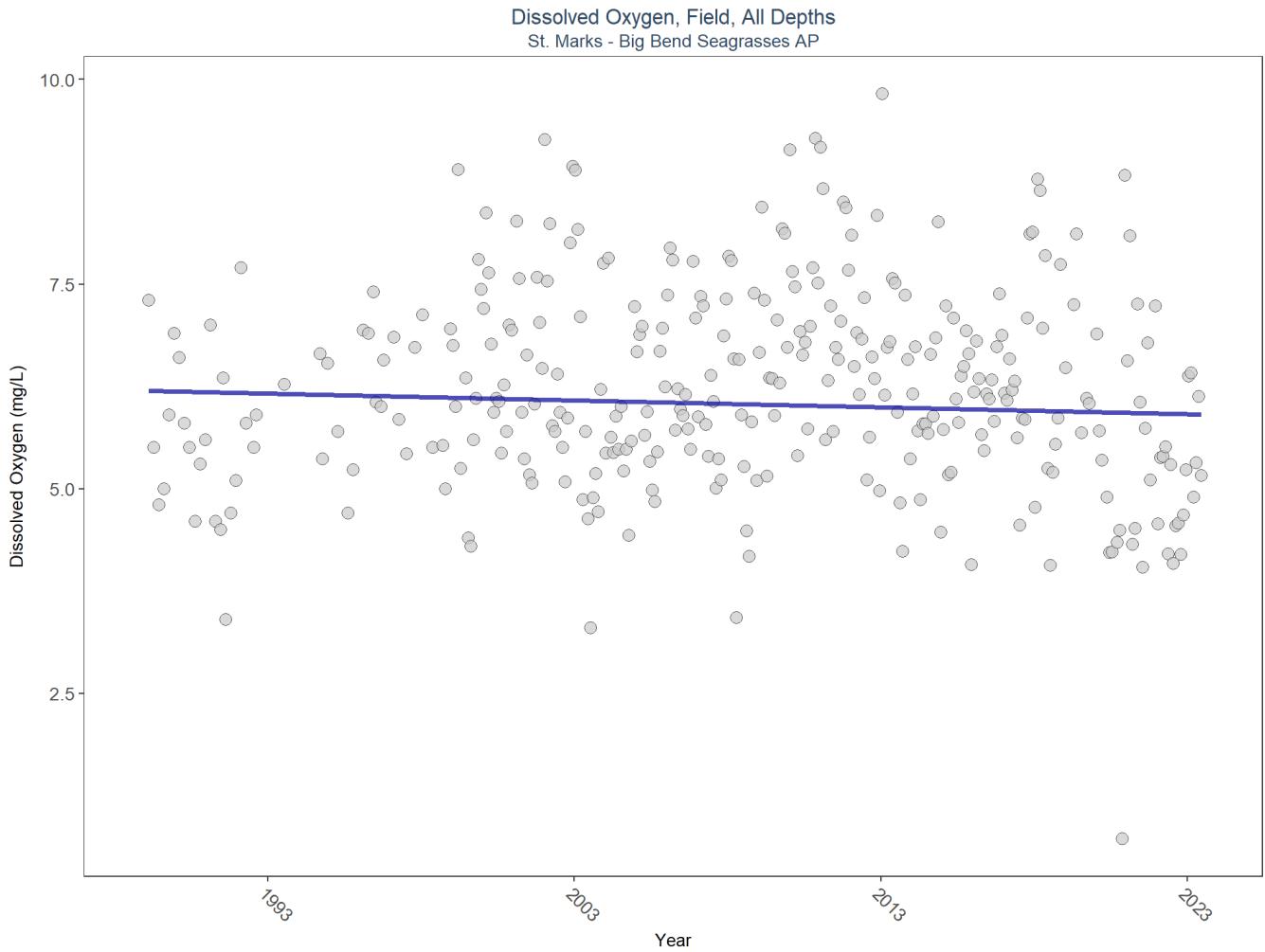


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	3041	33	1	TRUE	0.0785	0.0363	0.007814815	0.685883	10.0447	0.5264	1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

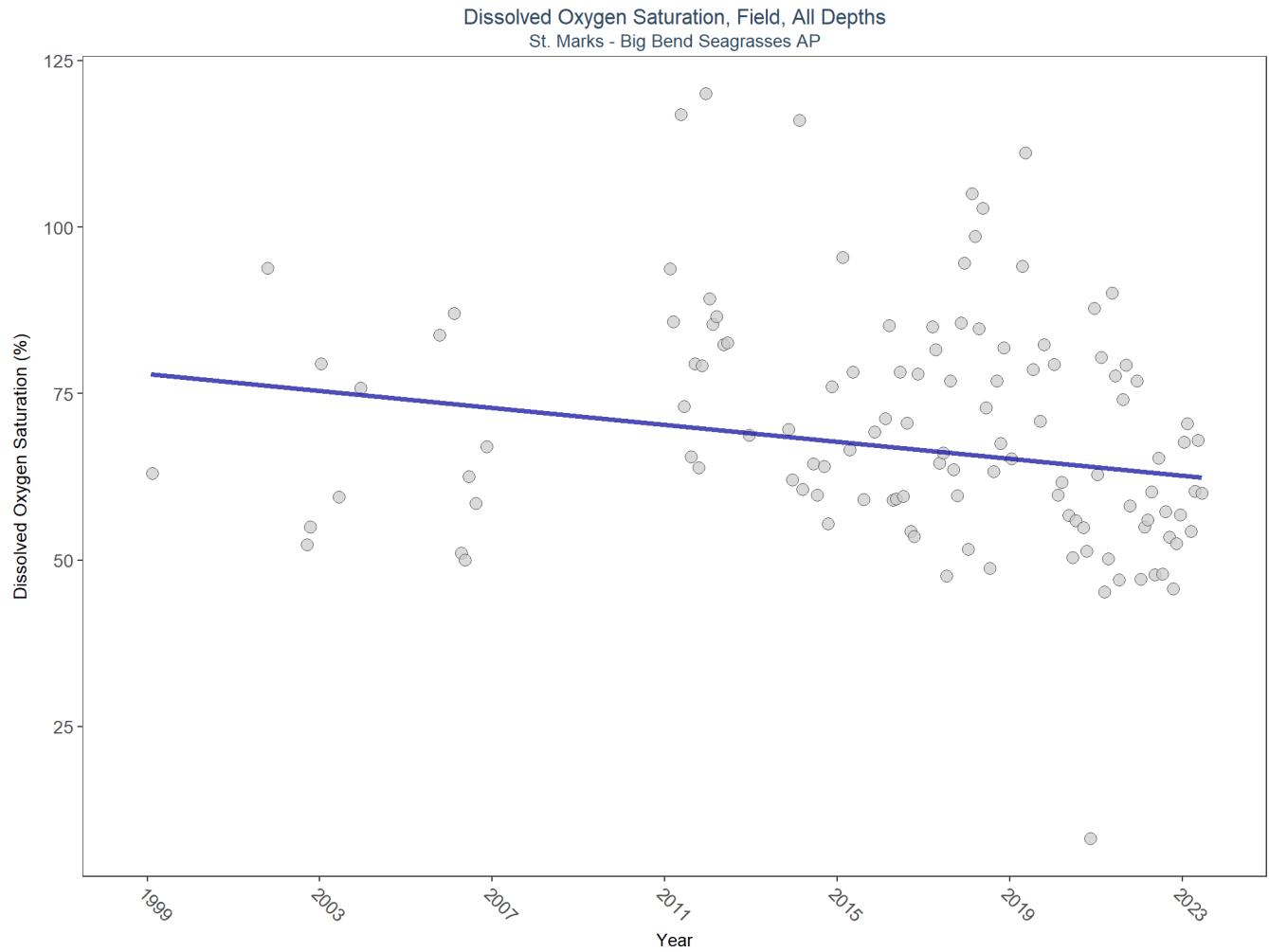
## Dissolved Oxygen



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Dissolved Oxygen Saturation

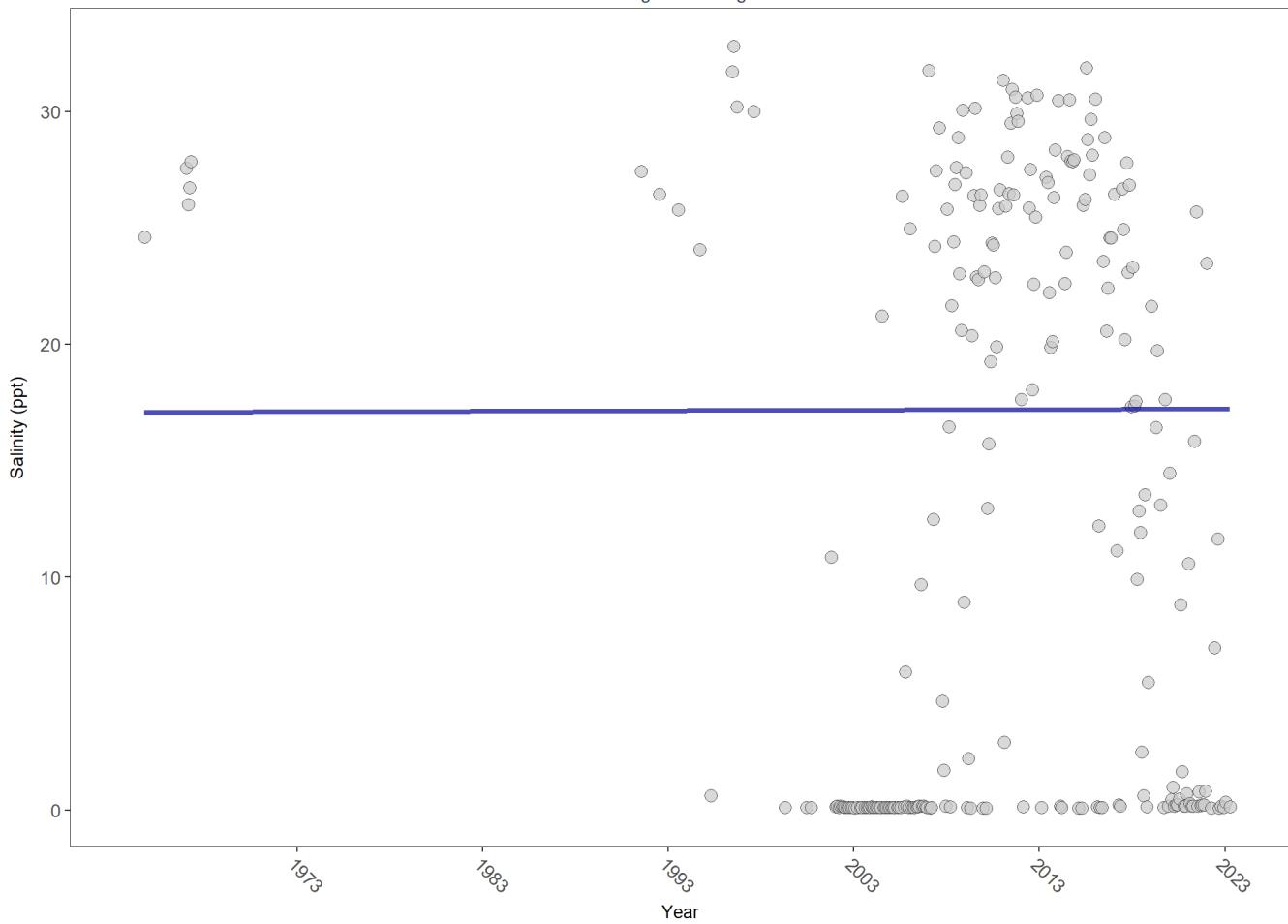


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Salinity

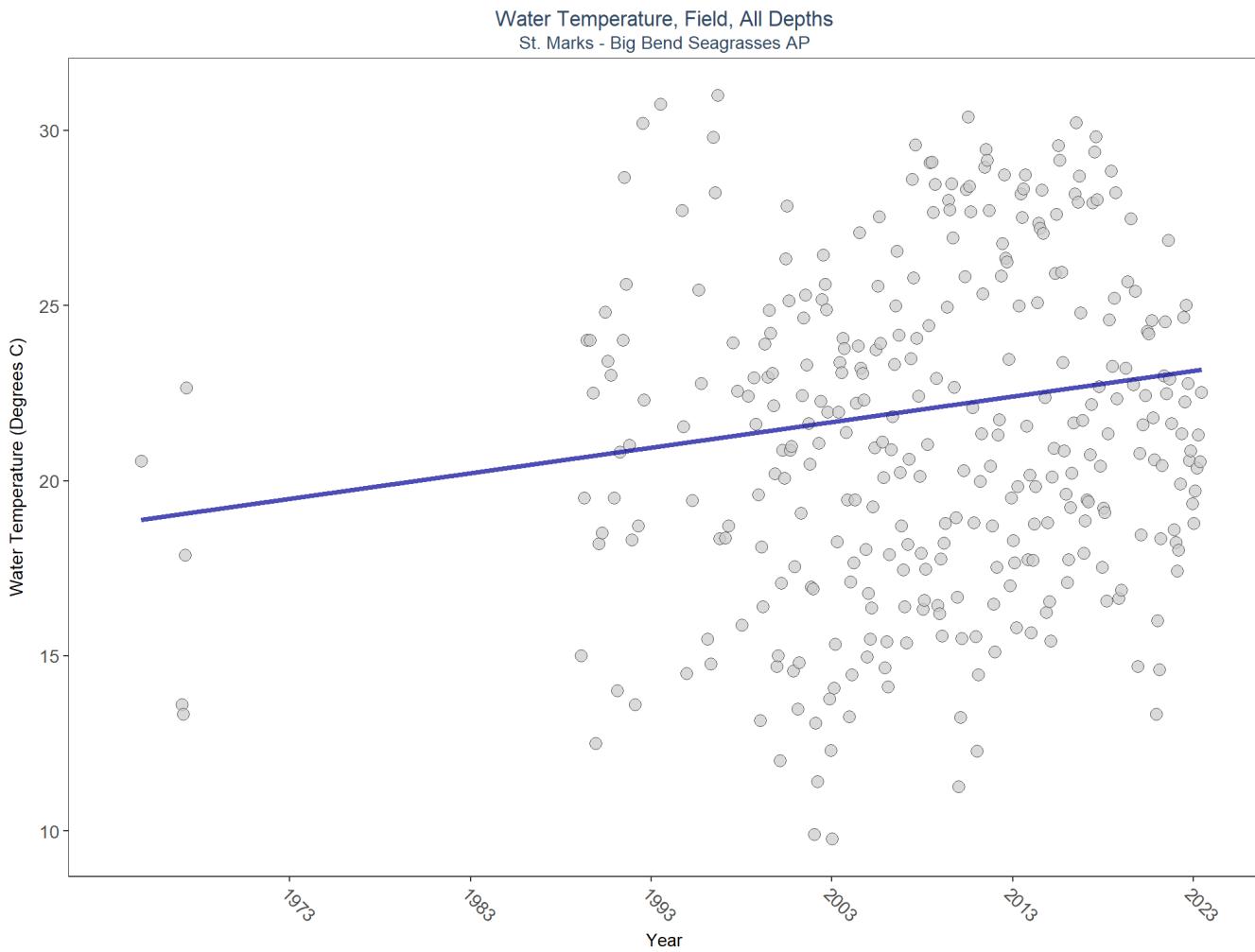
Salinity, Lab and Field Combined, All Depths  
St. Marks - Big Bend Seagrasses AP



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

SennIntercept is intercept value at beginning of record for monitoring location

## Water Temperature

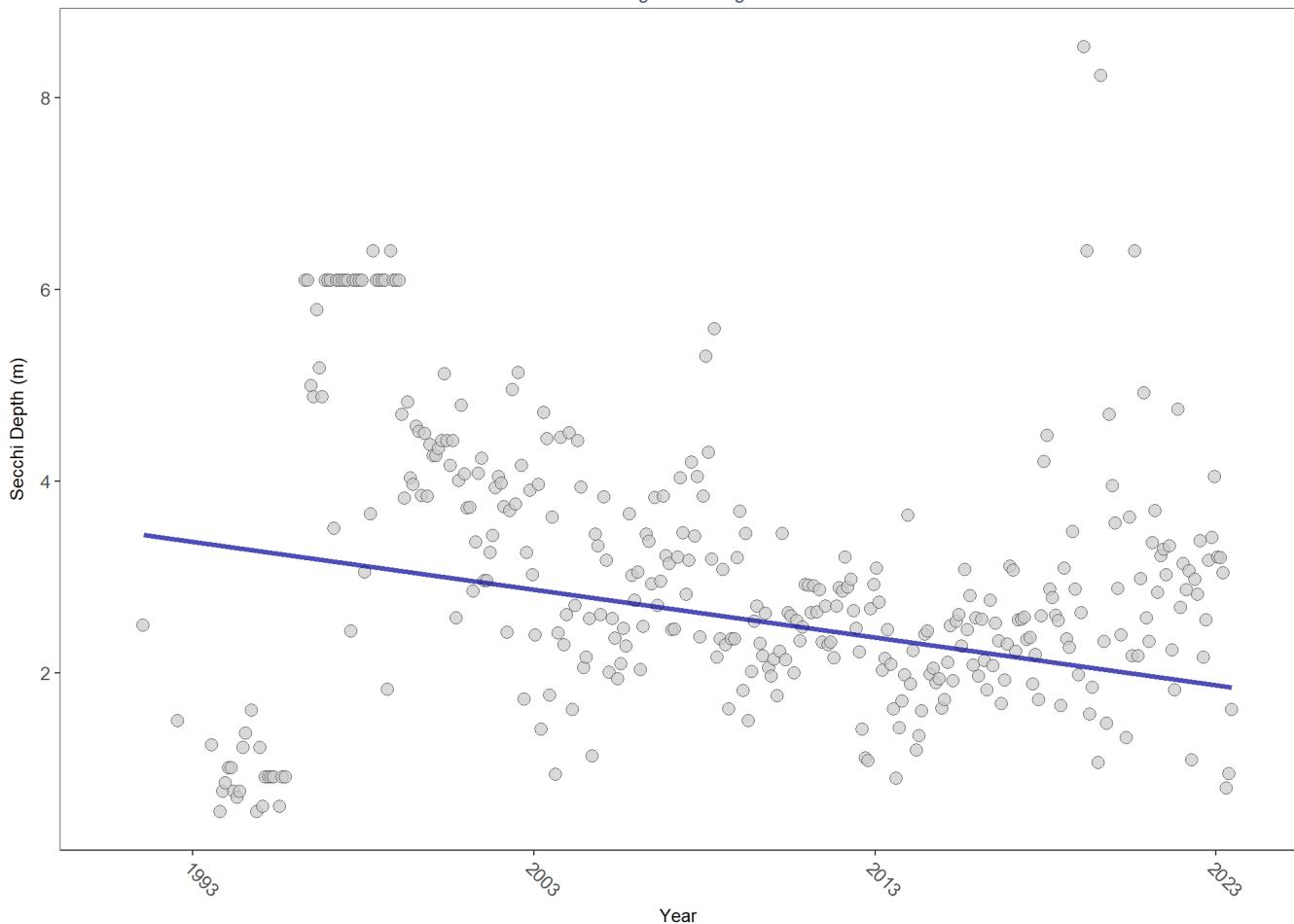


$p < 0.00005$  appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

## Secchi Depth

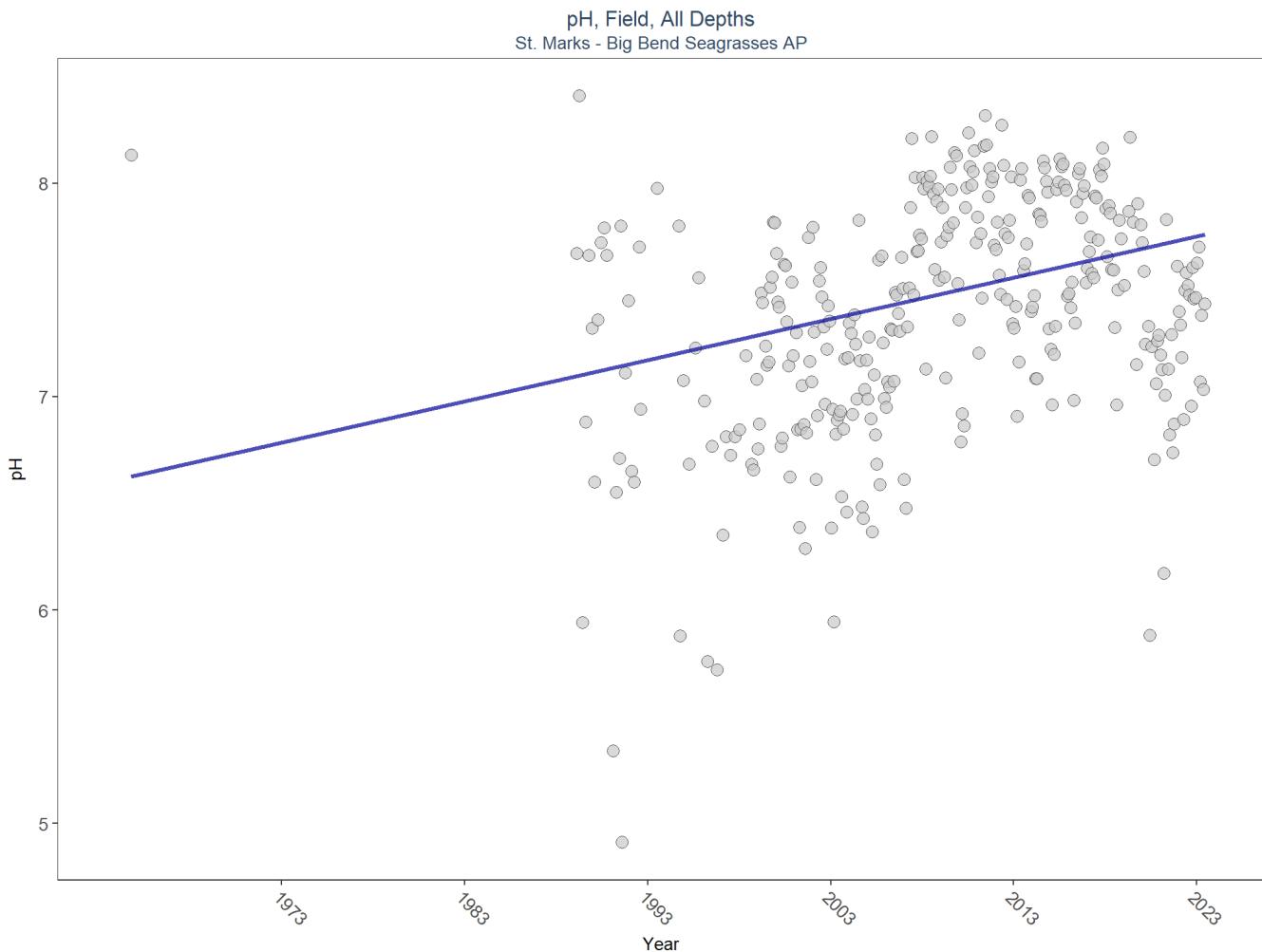
Secchi Depth, Field, Surface  
St. Marks - Big Bend Seagrasses AP



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## pH

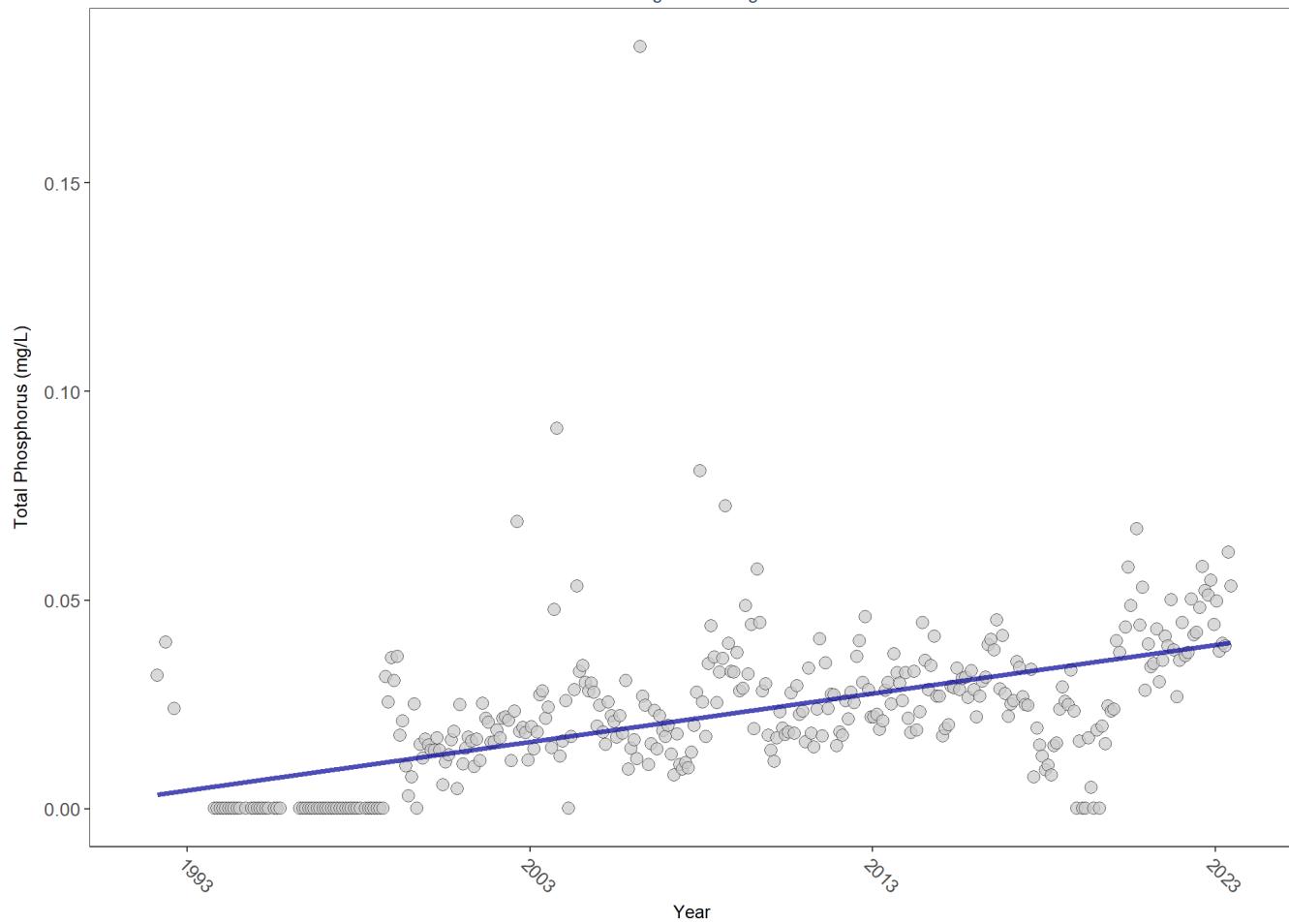


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Phosphorus

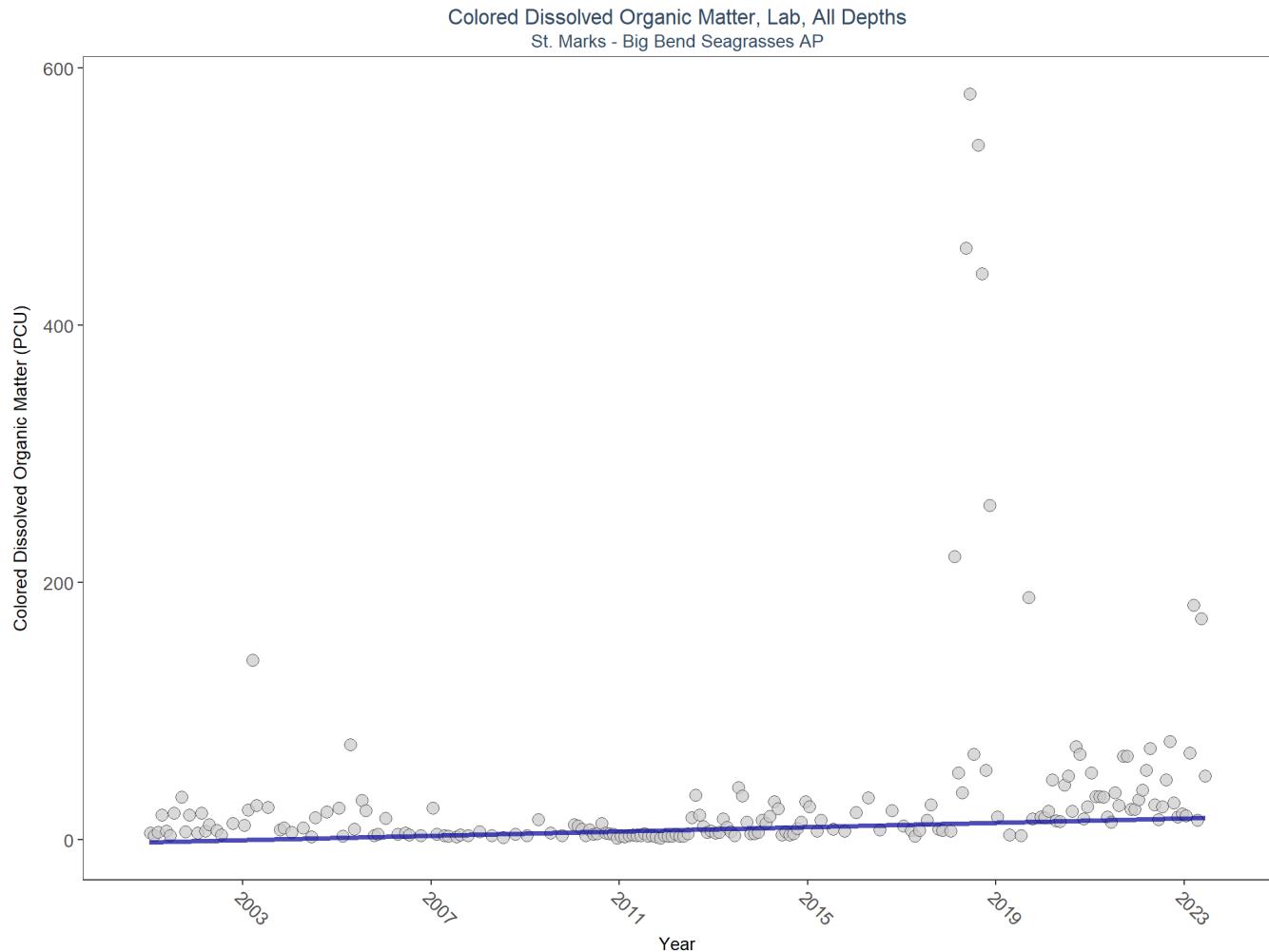
Total Phosphorus, Lab, All Depths  
St. Marks - Big Bend Seagrasses AP



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Colored Dissolved Organic Matter

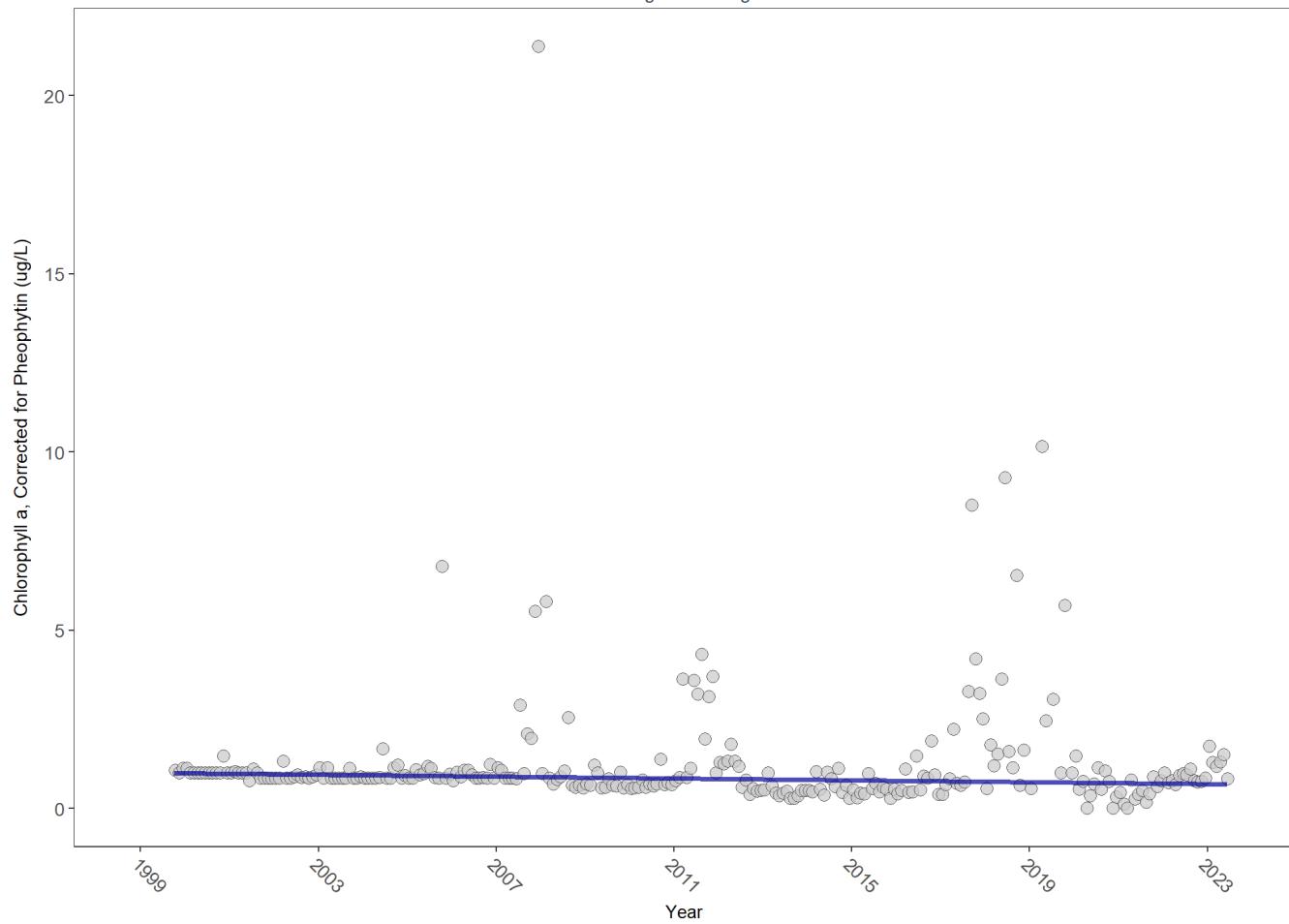


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Chlorophyll a, Corrected for Pheophytin

Chlorophyll a, Corrected for Pheophytin, Lab, All Depths  
St. Marks - Big Bend Seagrasses AP



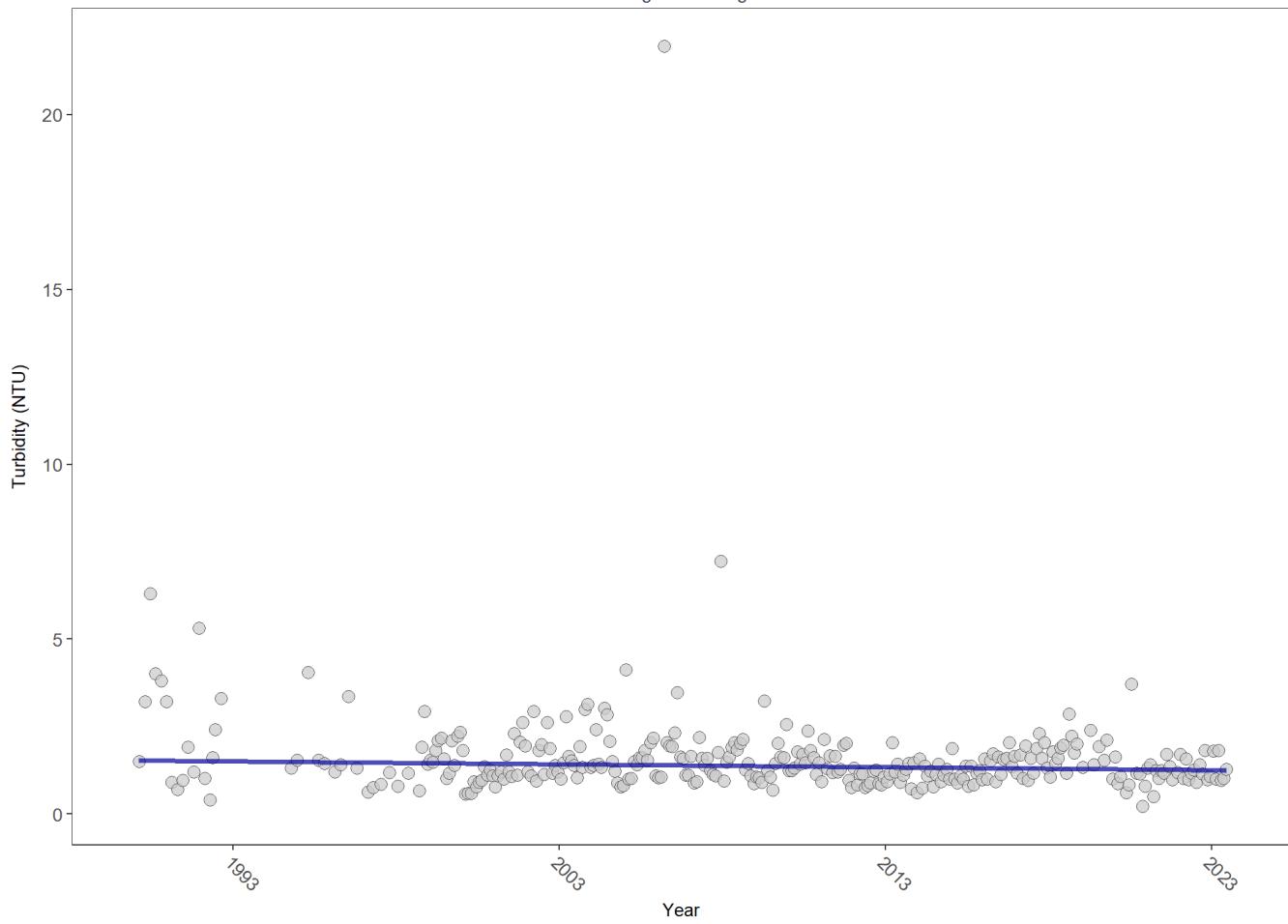
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1961	25	0.82	TRUE	-0.1673	0.0001	-0.01273864	1.001836	2.5563	0.9954	-1

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

SennIntercept is intercept value at beginning of record for monitoring location

## Turbidity

Turbidity, Lab, All Depths  
St. Marks - Big Bend Seagrasses AP



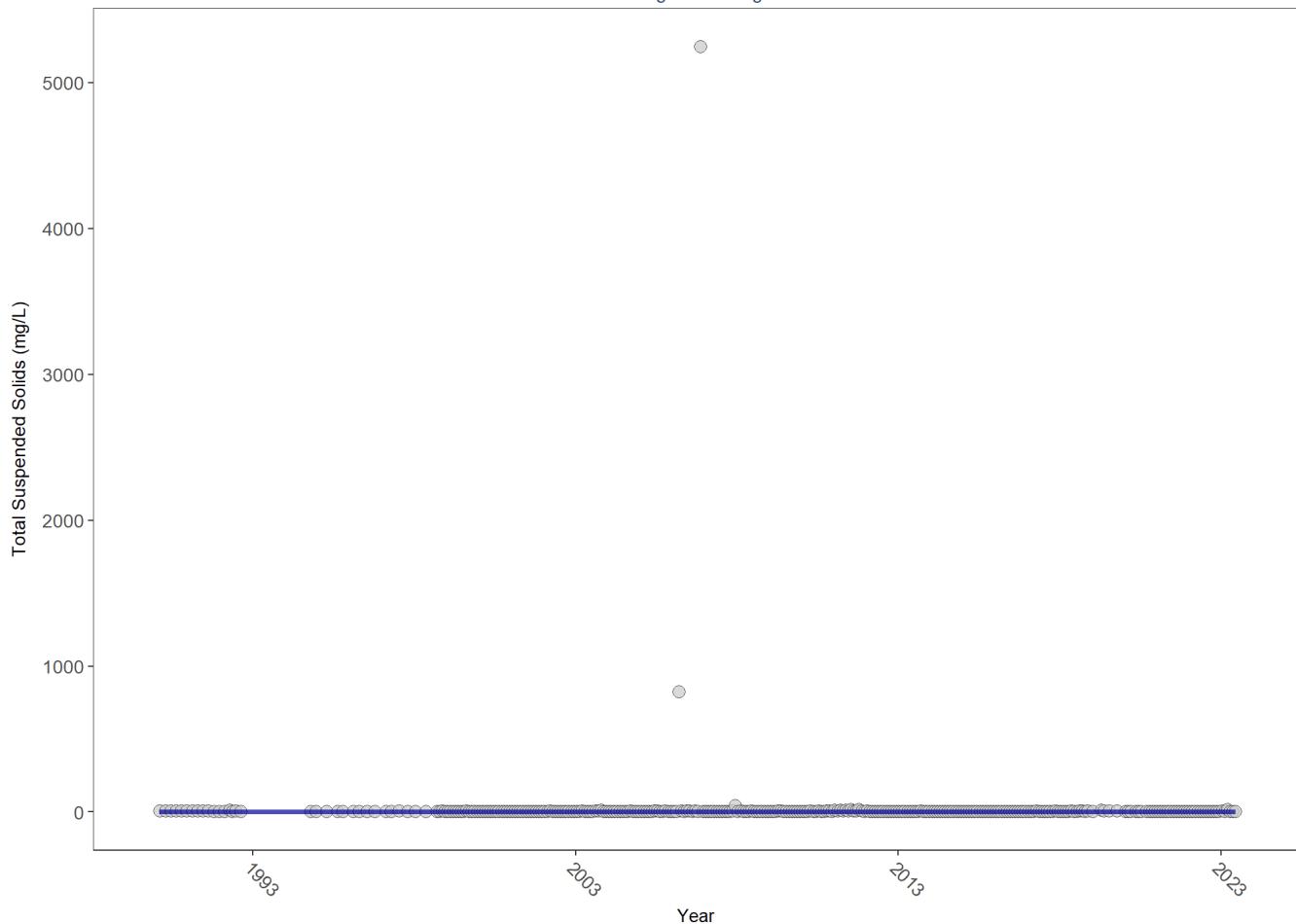
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	2590	33	1.2	TRUE	-0.0951	0.0207	-0.008285714	1.527288	19.1533	0.0584	-1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Suspended Solids

Total Suspended Solids, Lab and Field Combined, All Depths  
St. Marks - Big Bend Seagrasses AP



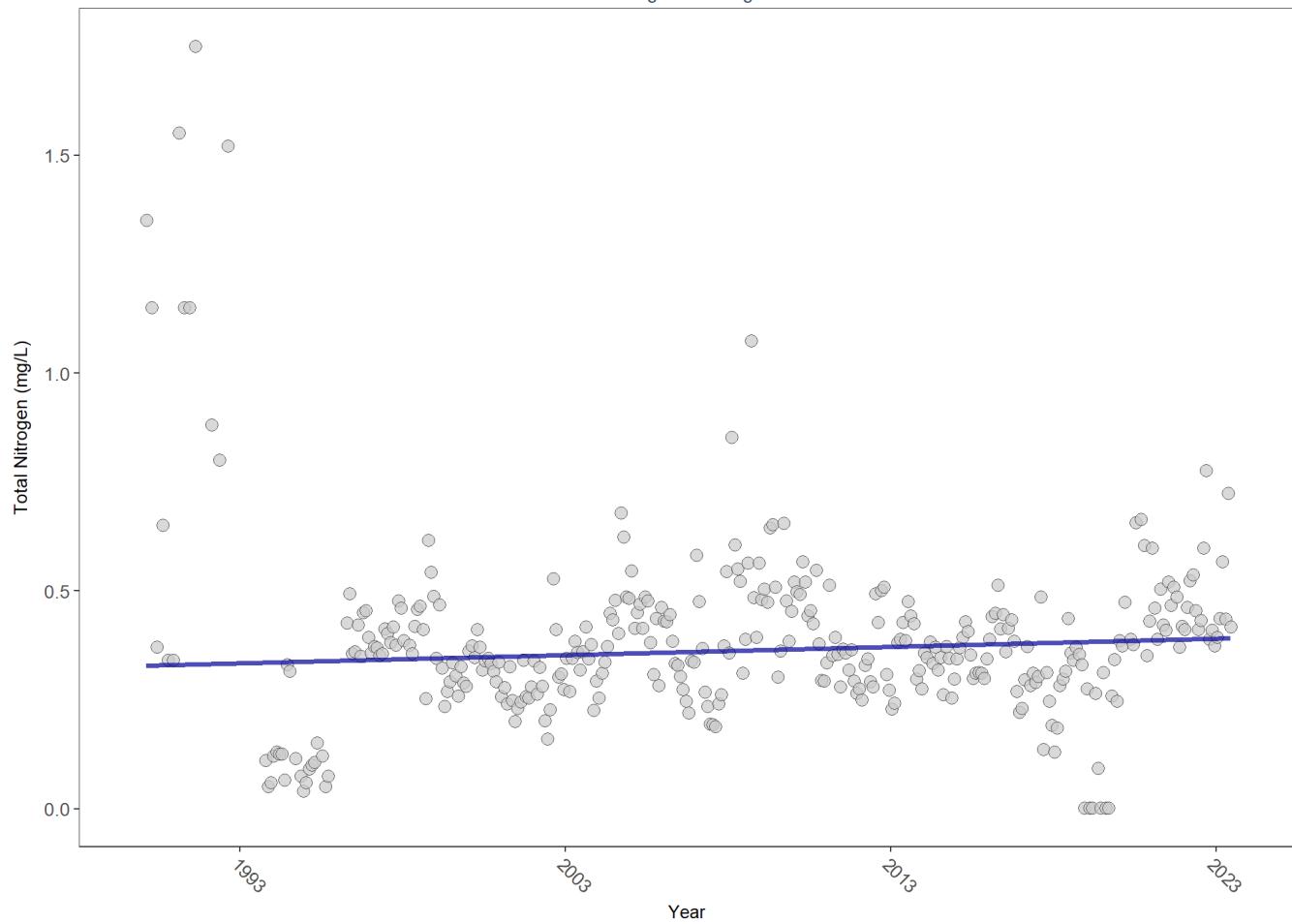
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1821	33	4	TRUE	-0.2204	0.0000	-0.04471104	4.465476	10.2299	0.5098	-1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Nitrogen

Total Nitrogen, Lab, All Depths  
St. Marks - Big Bend Seagrasses AP



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	5310	34	0.35	TRUE	0.0915	0.0171	0.001915102	0.3279319	11.4426	0.407	1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Submerged Aquatic Vegetation

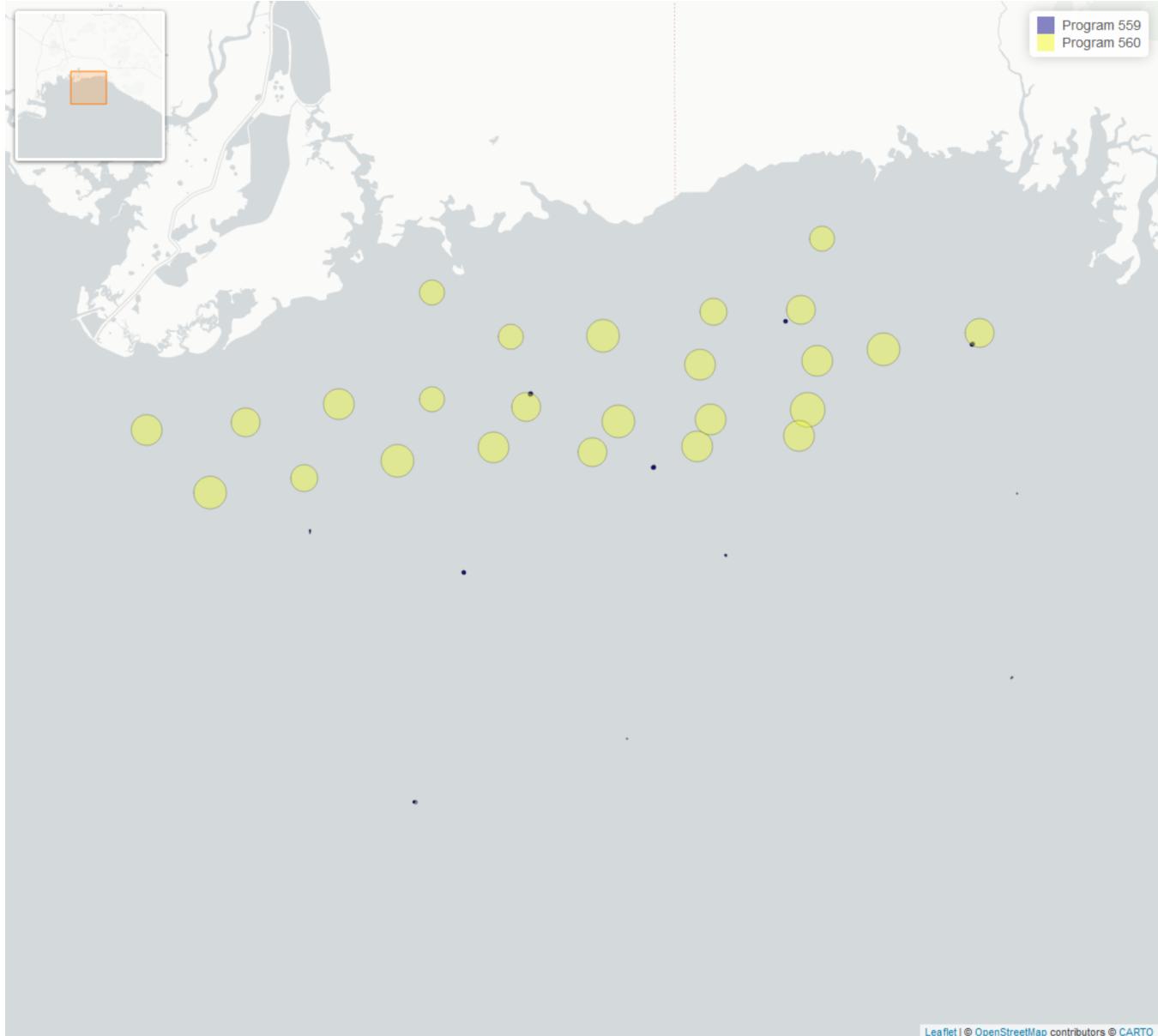


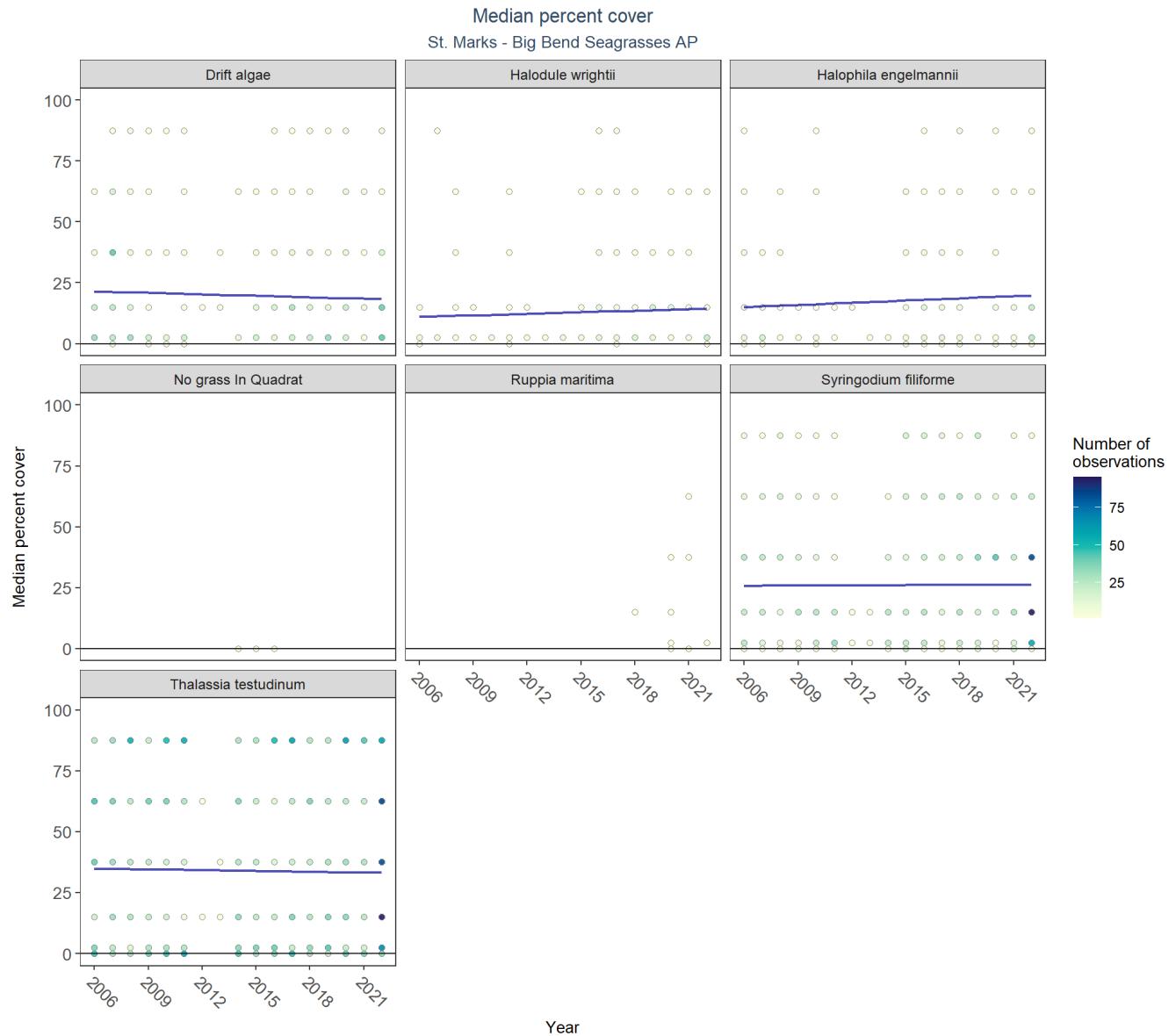
Table 7: Northern Big Bend Seagrass Monitoring - *Program 559*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
131	2012	2018	Modified Braun Blanquet	54

Table 8: Big Bend Seagrasses & Nature Coast Aquatic Preserves - Seagrass Monitoring - *Program 560*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
5495	2006	2022	Modified Braun Blanquet	25
493	2022	2022	Percent Cover	25

## Median Percent Cover - Species Trends



## Median Percent Cover - Species Trend Table

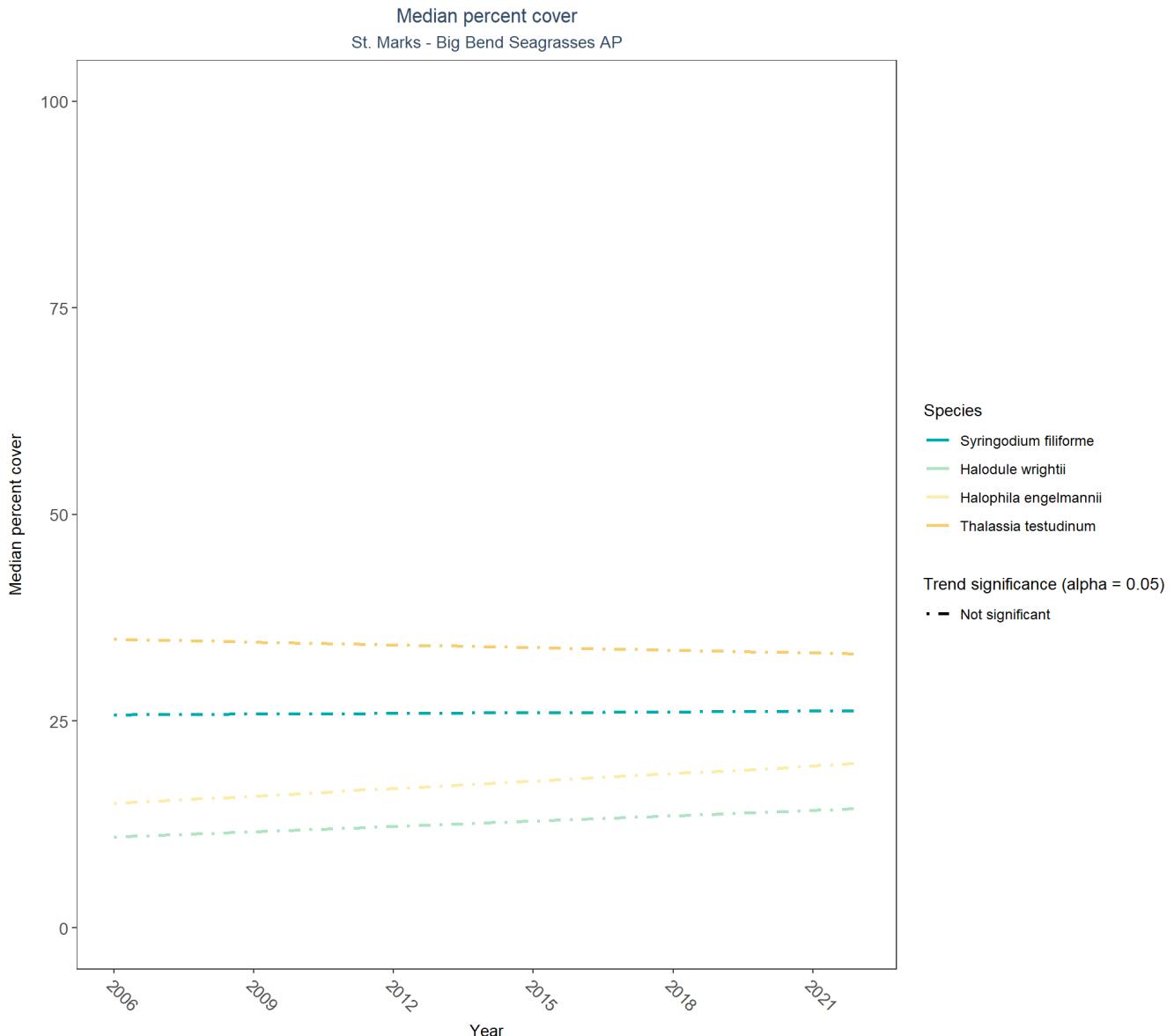
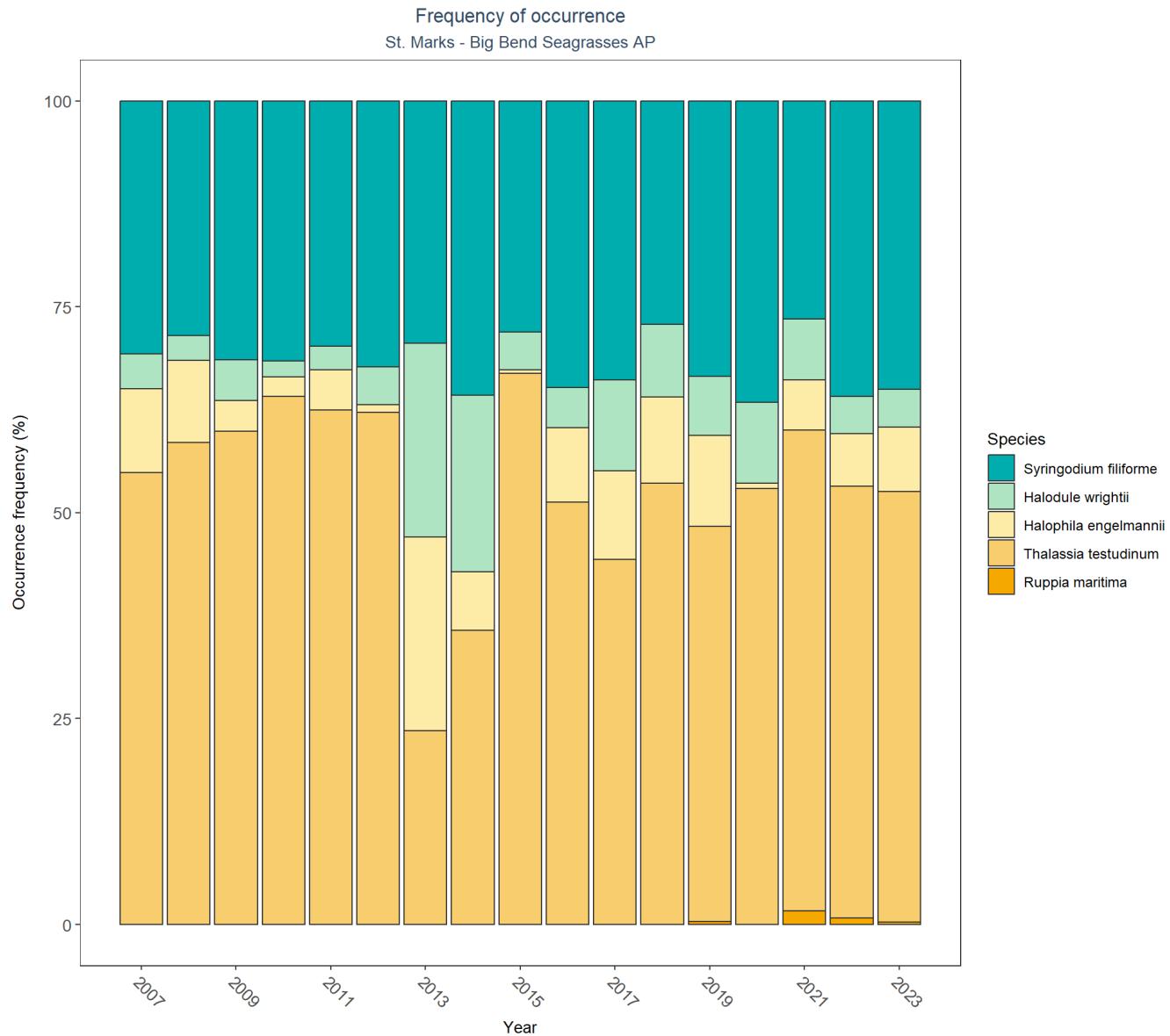


Table 9: Percent Cover Trend Analysis for St. Marks

Species	Trend Significance (0.05)	Period of Record	LME_Intercept	LME_Slope	p
Drift algae	No significant trend	2006 - 2022	22.6671	-0.1993	0.3994
<i>Halodule wrightii</i>	No significant trend	2006 - 2022	9.7163	0.2137	0.4598
<i>Halophila engelmannii</i>	No significant trend	2006 - 2022	13.2398	0.3004	0.3774
No grass In Quadrat	Insufficient data to calculate trend	-	-	-	-
<i>Ruppia maritima</i>	Insufficient data to calculate trend	-	-	-	-
<i>Syringodium filiforme</i>	No significant trend	2006 - 2022	25.5948	0.0297	0.8922
<i>Thalassia testudinum</i>	No significant trend	2006 - 2022	35.5687	-0.1105	0.5326

## Frequency of Occurrence Barplots



## Keaton Beach

Seasonal Kendall-Tau trend plots will be produced below for parameters where *SufficientData* is **TRUE**.

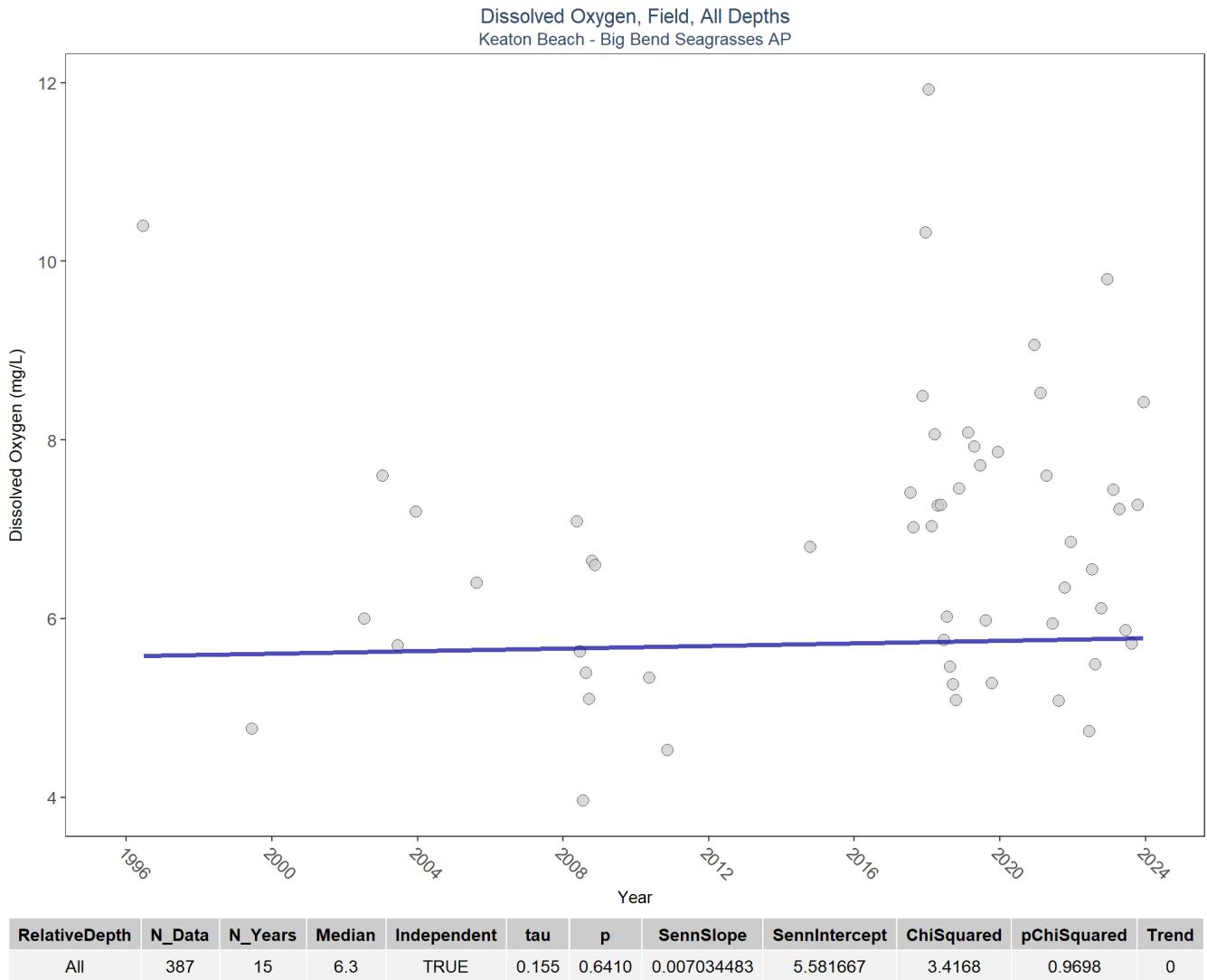
Trend arrows denote trends where the p value is less than 5% and the slope is less than 10% of the median value.

Table 10: Seasonal Kendall-Tau Results for Keaton Beach

ParameterName	Period-of-Record	N-Years	N-Data	SufficientData	SennSlope	SennIntercept	p	Trend
Chlorophyll a, Uncorrected for Pheophytin	2010 - 2023	8	148	FALSE	-	-	-	-
Dissolved Oxygen	1996 - 2023	15	387	TRUE	0.01	5.58	0.6410	0
Dissolved Oxygen Saturation	2003 - 2022	2	4	FALSE	-	-	-	-
Salinity	1996 - 2023	15	548	TRUE	-0.29	36.71	0.0387	↓
Water Temperature	1996 - 2023	17	398	TRUE	-0.05	27.40	0.1437	0
Secchi Depth	2002 - 2022	5	241	FALSE	-	-	-	-
pH	1999 - 2023	13	388	TRUE	-0.02	8.33	0.2284	0
Total Phosphorus	2010 - 2023	8	137	FALSE	-	-	-	-
Colored Dissolved Organic Matter	2022 - 2022	1	1	FALSE	-	-	-	-
Chlorophyll a, Corrected for Pheophytin	2010 - 2023	8	125	FALSE	-	-	-	-
Turbidity	2010 - 2023	6	51	FALSE	-	-	-	-
Total Suspended Solids	2010 - 2022	2	3	FALSE	-	-	-	-
Total Nitrogen	2010 - 2023	8	126	FALSE	-	-	-	-

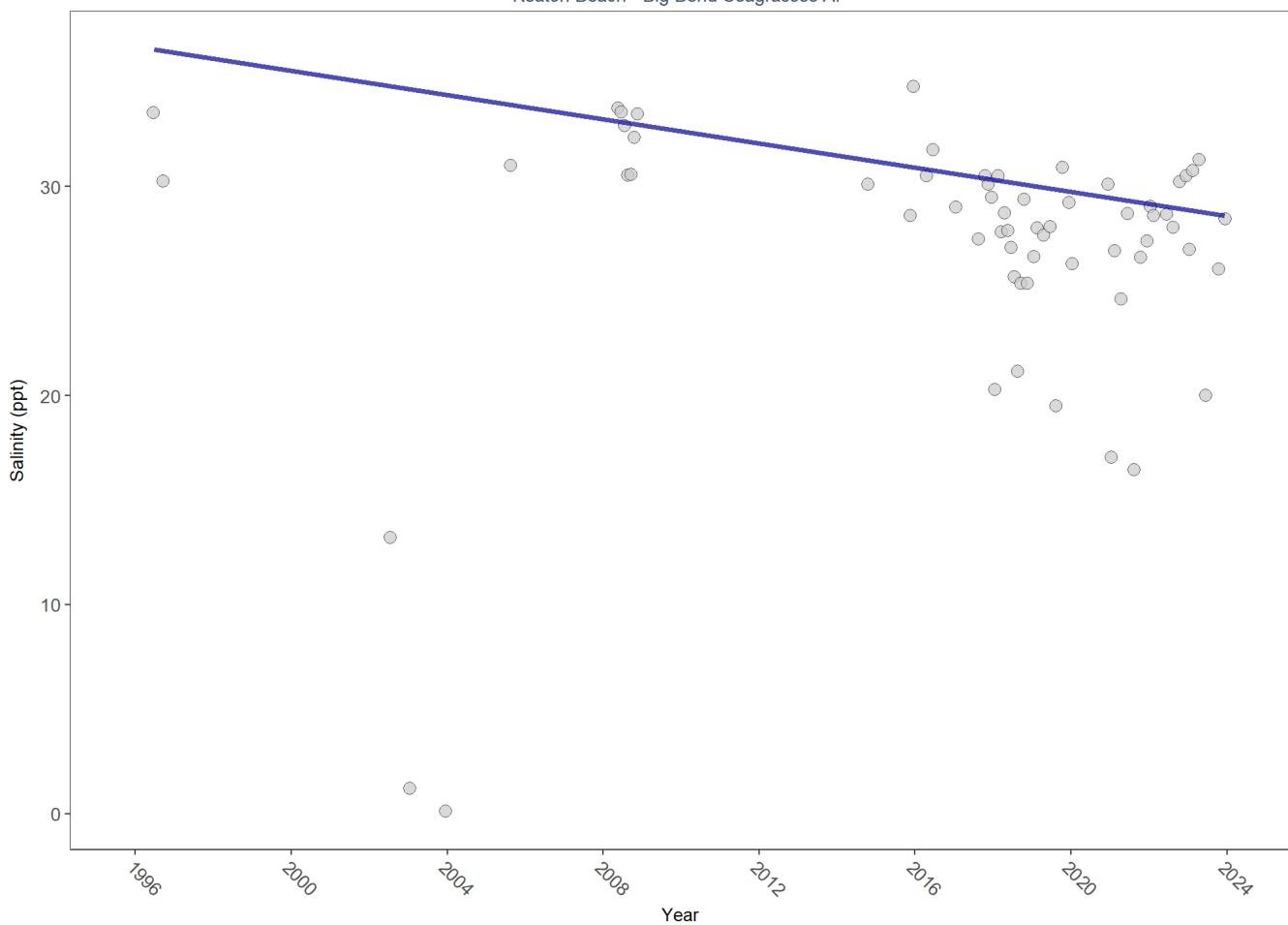
## Discrete WQ

### Dissolved Oxygen



## Salinity

Salinity, Lab and Field Combined, All Depths  
Keaton Beach - Big Bend Seagrasses AP



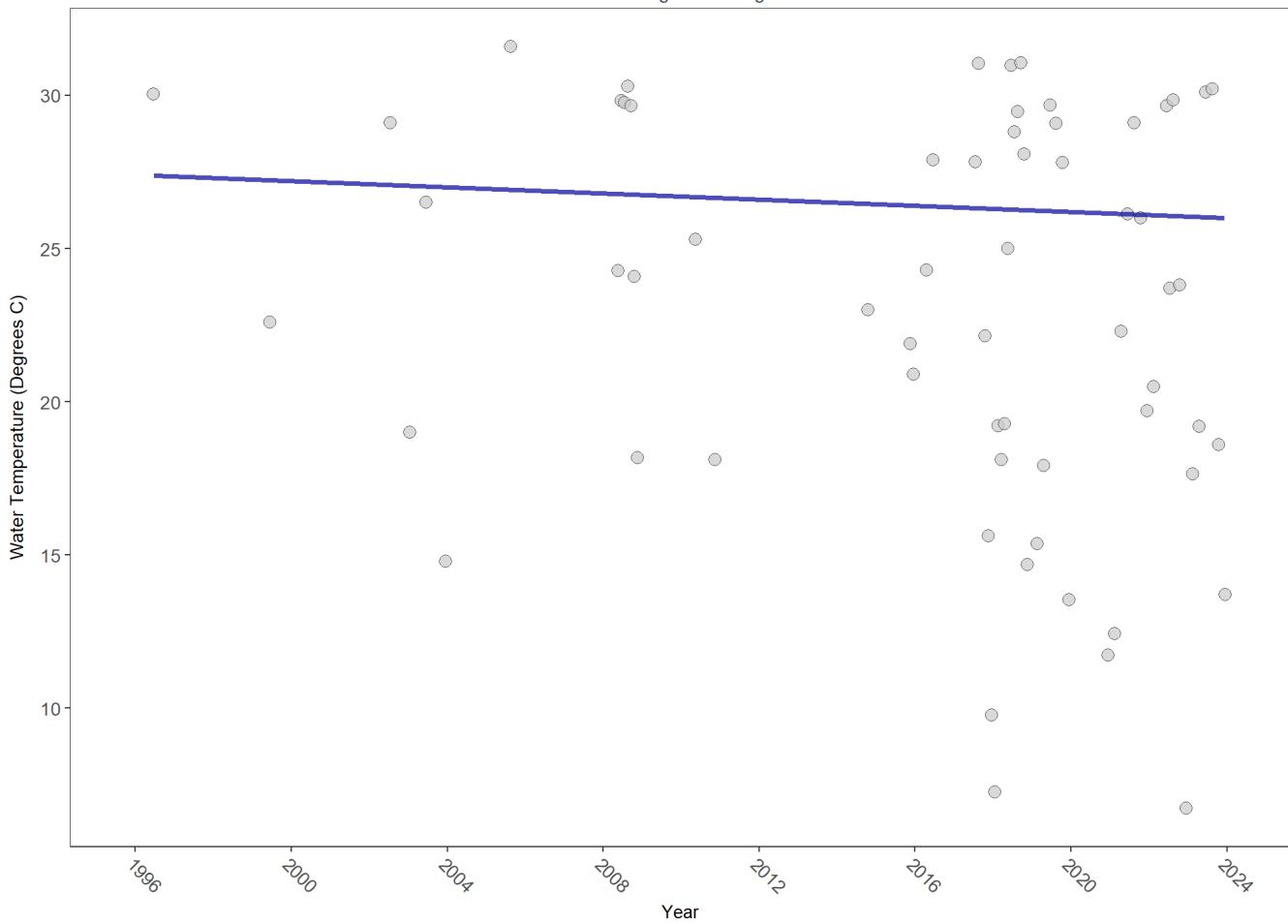
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	548	15	30.035	TRUE	-0.2506	0.0387	-0.2895833	36.71332	11.085	0.3509	-1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Water Temperature

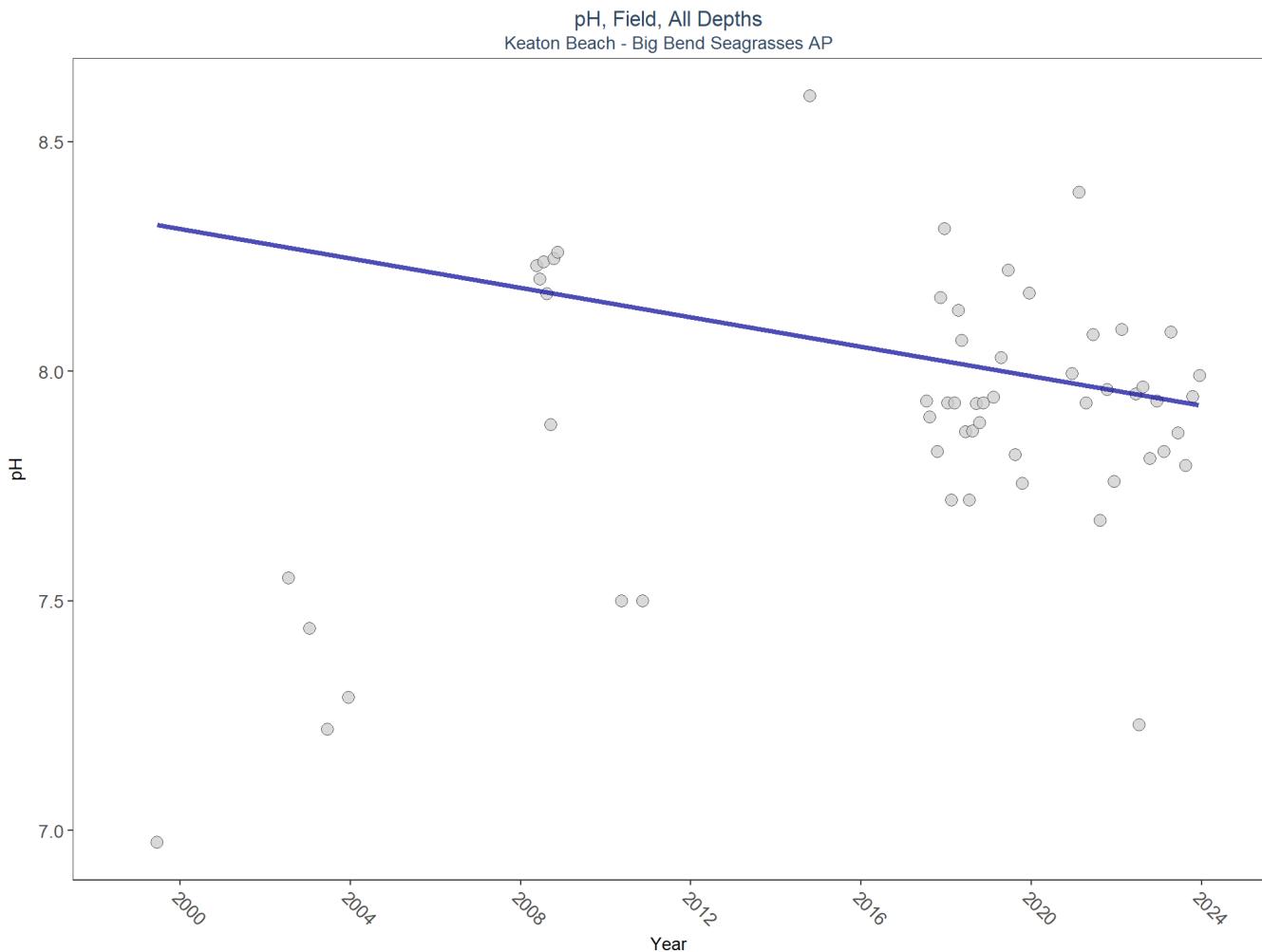
Water Temperature, Field, All Depths  
Keaton Beach - Big Bend Seagrasses AP



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

SennIntercept is intercept value at beginning of record for monitoring location

## pH



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Submerged Aquatic Vegetation

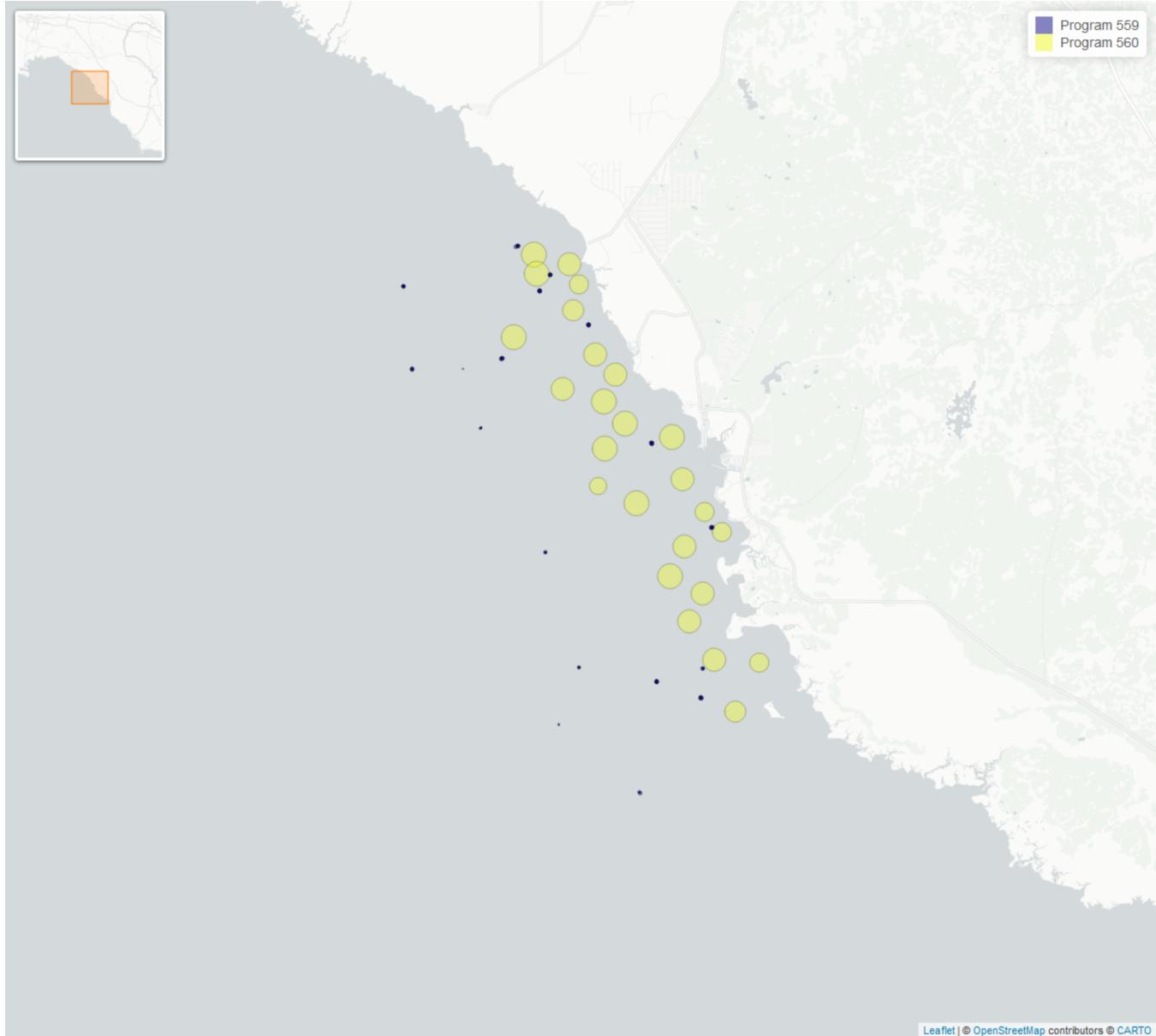


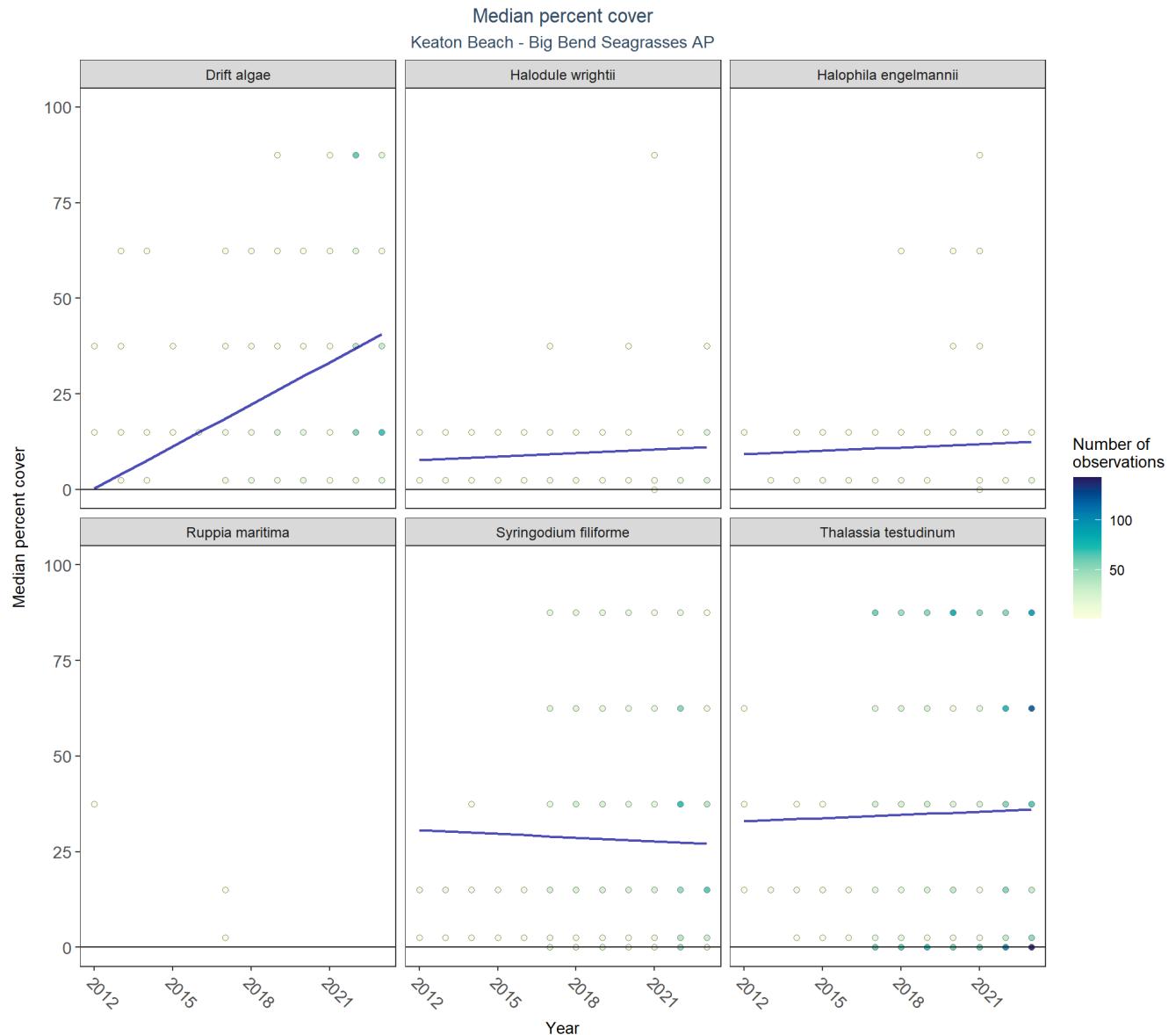
Table 11: Northern Big Bend Seagrass Monitoring - *Program 559*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
324	2012	2018	Modified Braun Blanquet	109

Table 12: Big Bend Seagrasses & Nature Coast Aquatic Preserves - Seagrass Monitoring - *Program 560*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
2624	2017	2023	Modified Braun Blanquet	25
923	2022	2023	Percent Cover	25

## Median Percent Cover - Species Trends



## Median Percent Cover - Species Trend Table

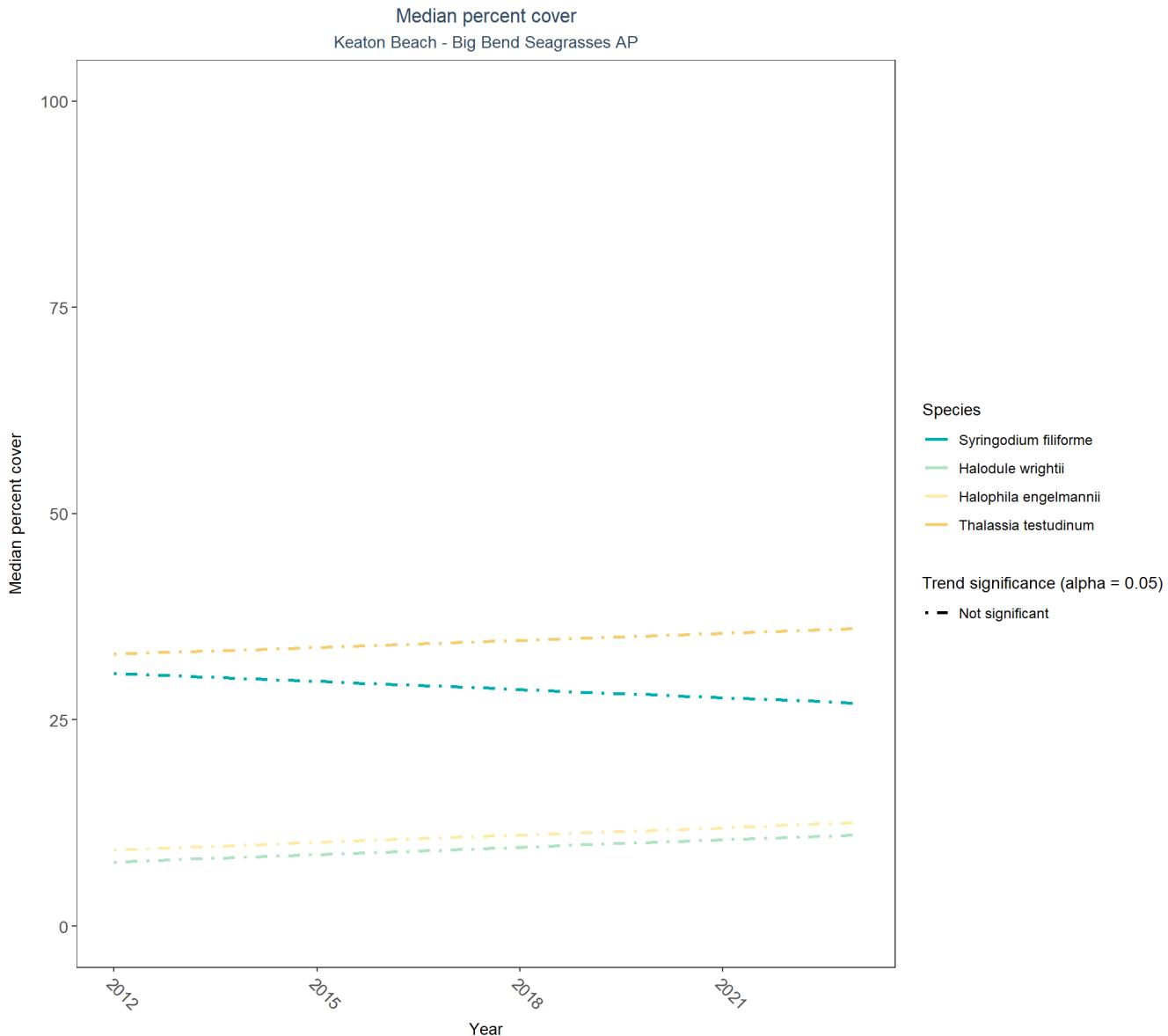
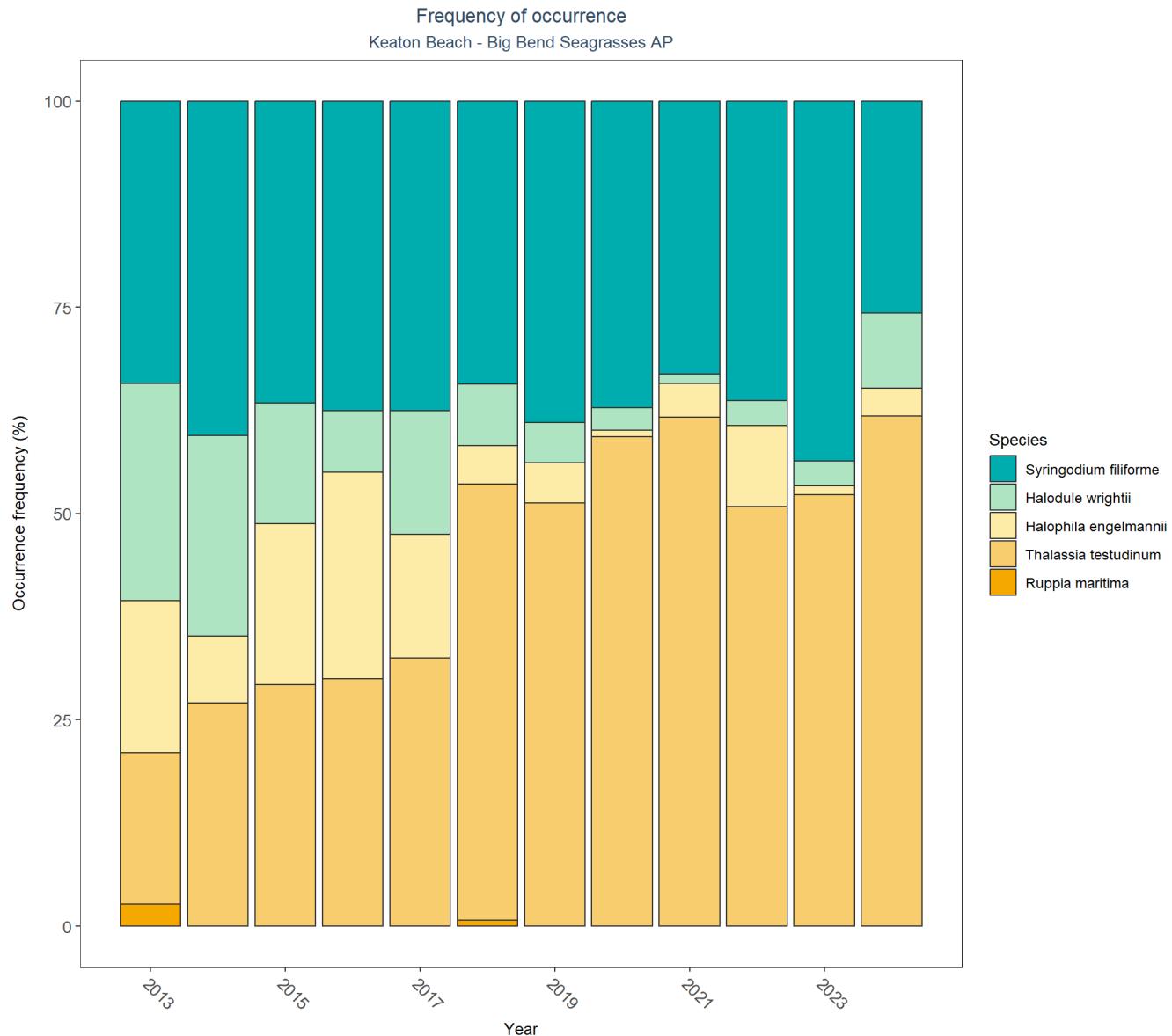


Table 13: Percent Cover Trend Analysis for Keaton Beach

Species	Trend Significance (0.05)	Period of Record	LME_Intercept	LME_Slope	p
Drift algae	Significantly increasing trend	2012 - 2023	-43.6145	3.6603	0.0000
Halodule wrightii	No significant trend	2012 - 2023	4.1773	0.2999	0.3295
Halophila engelmannii	No significant trend	2012 - 2023	5.6832	0.2979	0.4728
Ruppia maritima	Insufficient data to calculate trend	-	-	-	-
Syringodium filiforme	No significant trend	2012 - 2023	34.5480	-0.3252	0.5980
Thalassia testudinum	No significant trend	2012 - 2023	29.6074	0.2800	0.5202

## Frequency of Occurrence Barplots



## Cedar Key

Seasonal Kendall-Tau trend plots will be produced below for parameters where *SufficientData* is **TRUE**.

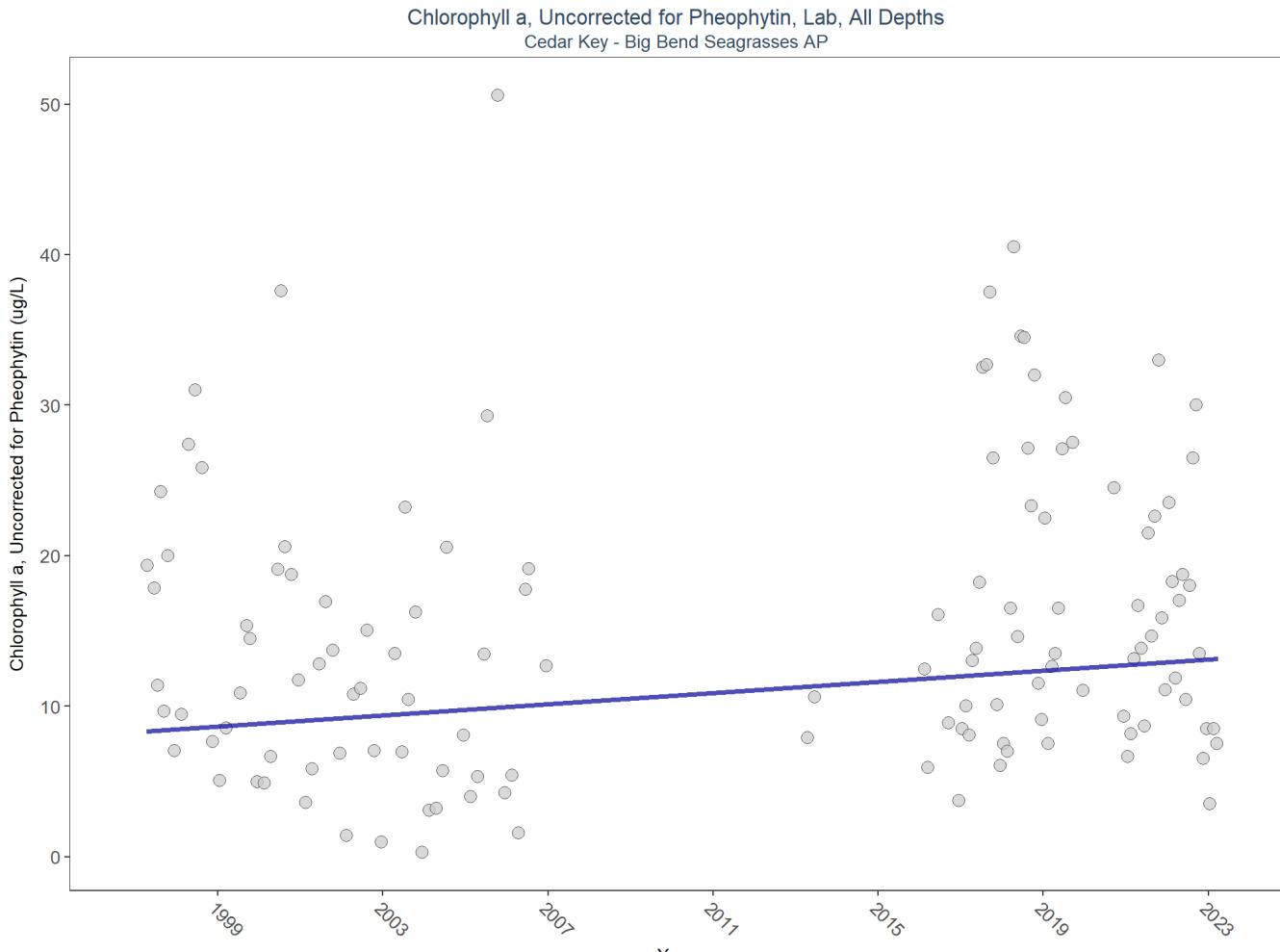
Trend arrows denote trends where the p value is less than 5% and the slope is less than 10% of the median value.

Table 14: Seasonal Kendall-Tau Results for Cedar Key

ParameterName	Period-of-Record	N-Years	N-Data	SufficientData	SennSlope	SennIntercept	p	Trend
Chlorophyll a, Uncorrected for Pheophytin	1997 - 2023	19	466	TRUE	0.19	8.27	0.0217	↑
Dissolved Oxygen	1985 - 2022	29	41852	TRUE	-0.02	7.29	0.0143	↓
Dissolved Oxygen Saturation	2013 - 2016	2	8	FALSE	-	-	-	-
Salinity	1967 - 2023	33	44128	TRUE	0.00	26.68	0.8623	0
Water Temperature	1967 - 2022	31	43746	TRUE	0.03	22.55	0.0019	↑
Secchi Depth	1994 - 2023	29	16404	TRUE	-0.01	1.16	0.0013	↓
pH	1994 - 2022	28	29333	TRUE	-0.01	8.10	0.0000	↓
Total Phosphorus	2000 - 2023	15	482	TRUE	0.00	0.04	0.2148	0
Colored Dissolved Organic Matter	2017 - 2023	7	123	FALSE	-	-	-	-
Chlorophyll a, Corrected for Pheophytin	1997 - 2023	18	449	TRUE	-0.09	13.83	0.2205	0
Turbidity	1995 - 2022	24	10510	TRUE	0.04	7.64	0.2050	0
Total Suspended Solids	1995 - 2013	4	48	FALSE	-	-	-	-
Total Nitrogen	2000 - 2023	17	502	TRUE	-0.02	0.83	0.0008	↓

## Discrete WQ

### Chlorophyll a, Uncorrected for Pheophytin

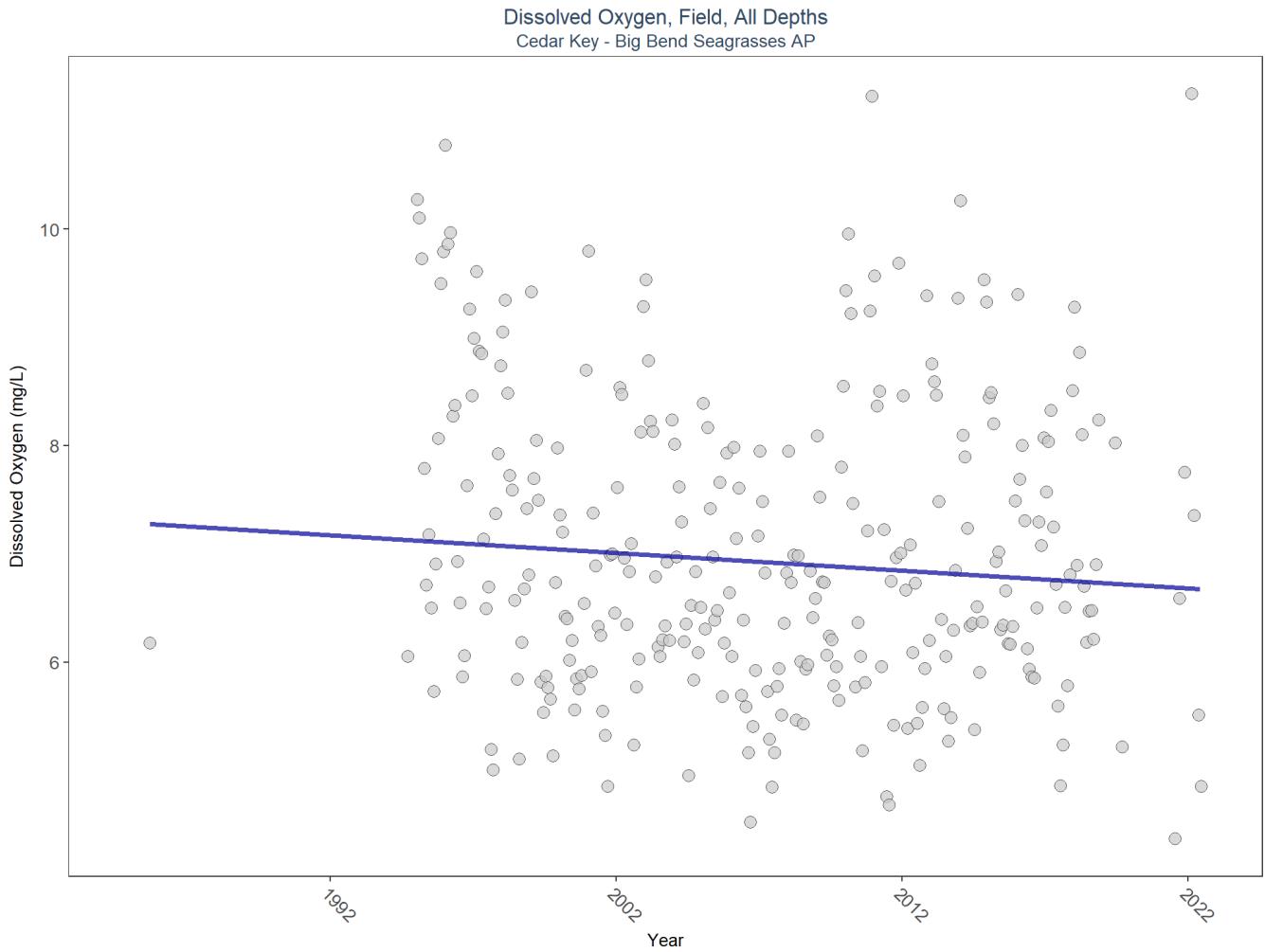


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	466	19	12	TRUE	0.1724	0.0217	0.1852632	8.269725	6.2839	0.8538	1

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

SennIntercept is intercept value at beginning of record for monitoring location

## Dissolved Oxygen

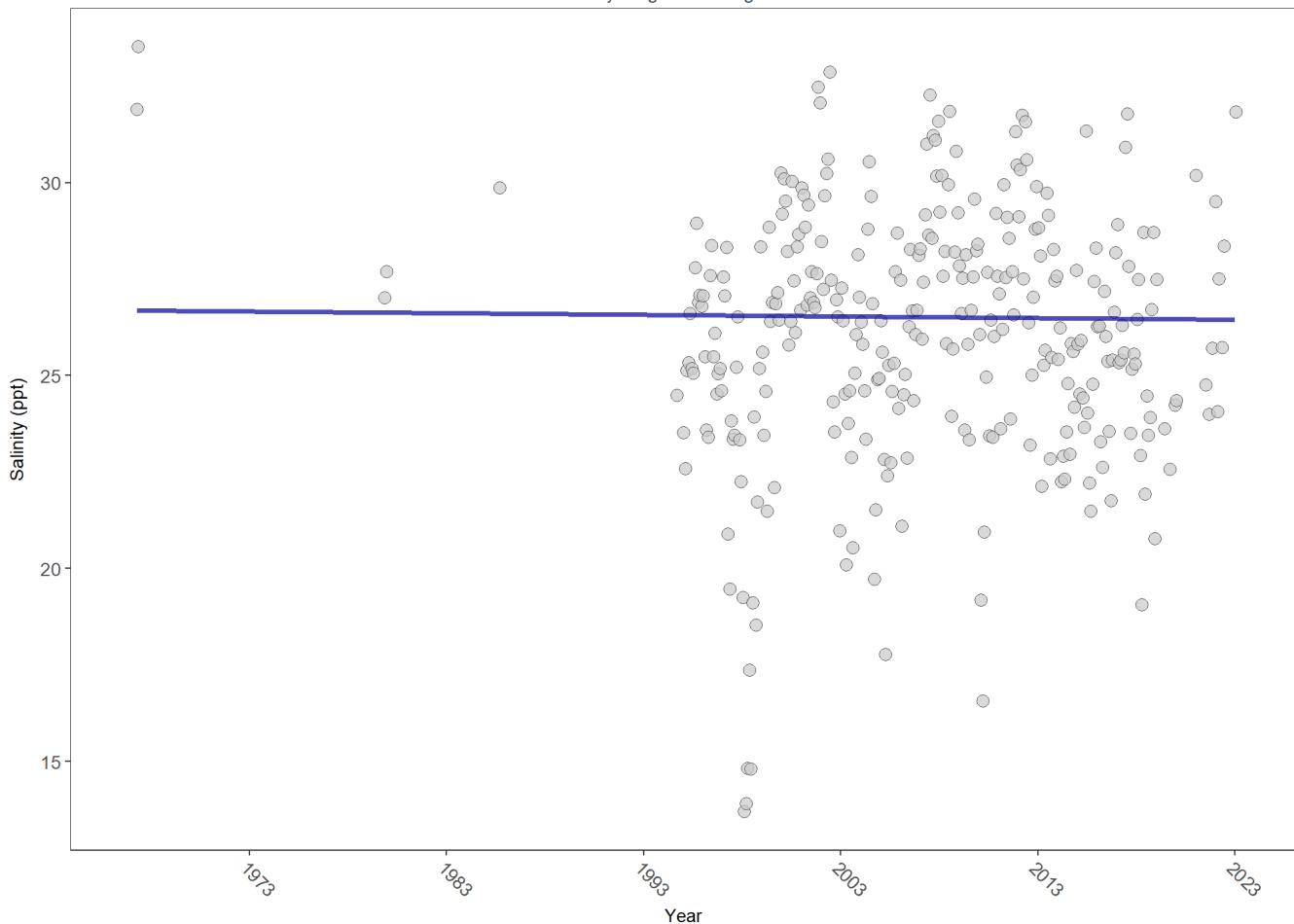


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Salinity

Salinity, Lab and Field Combined, All Depths  
Cedar Key - Big Bend Seagrasses AP

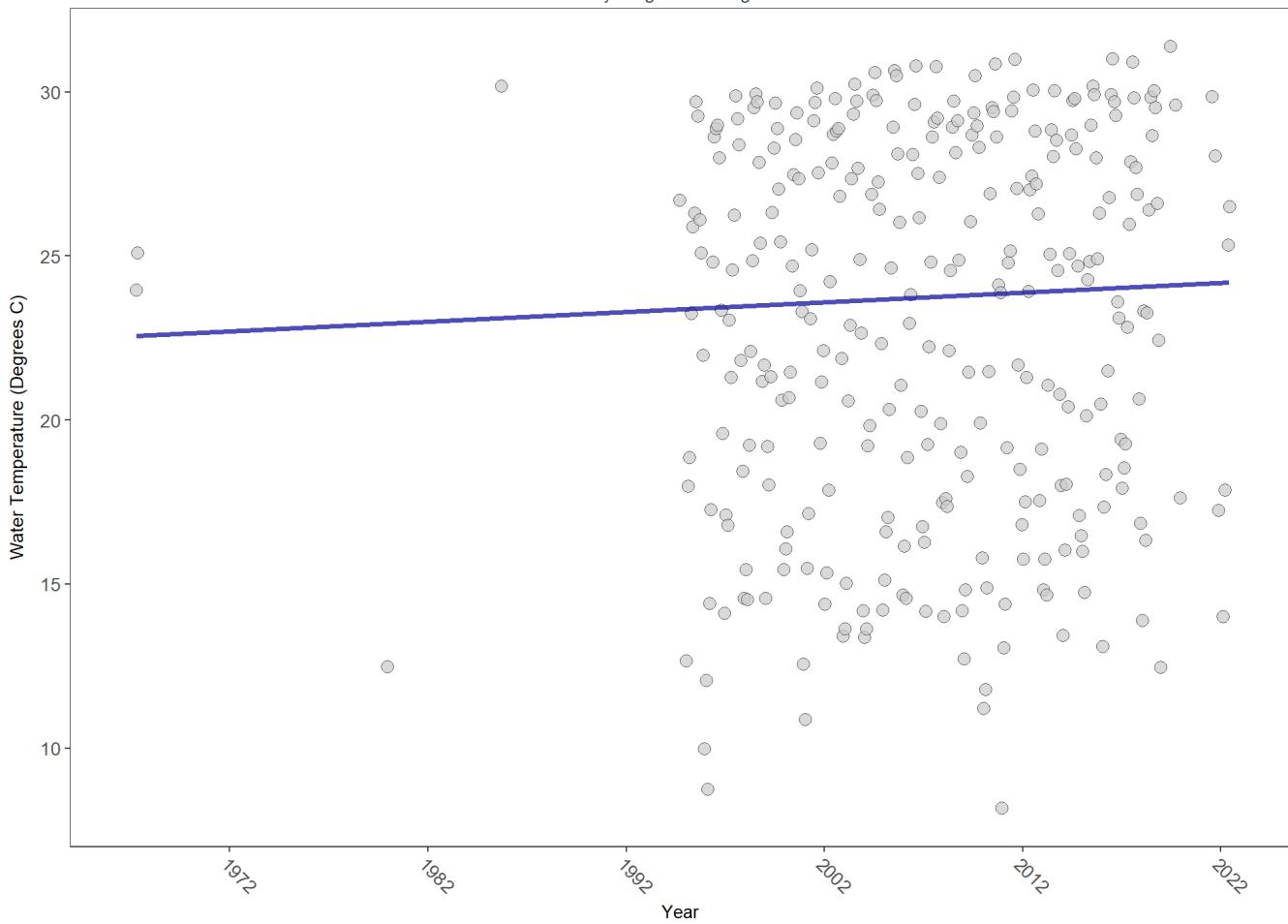


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Water Temperature

Water Temperature, Field, All Depths  
Cedar Key - Big Bend Seagrasses AP

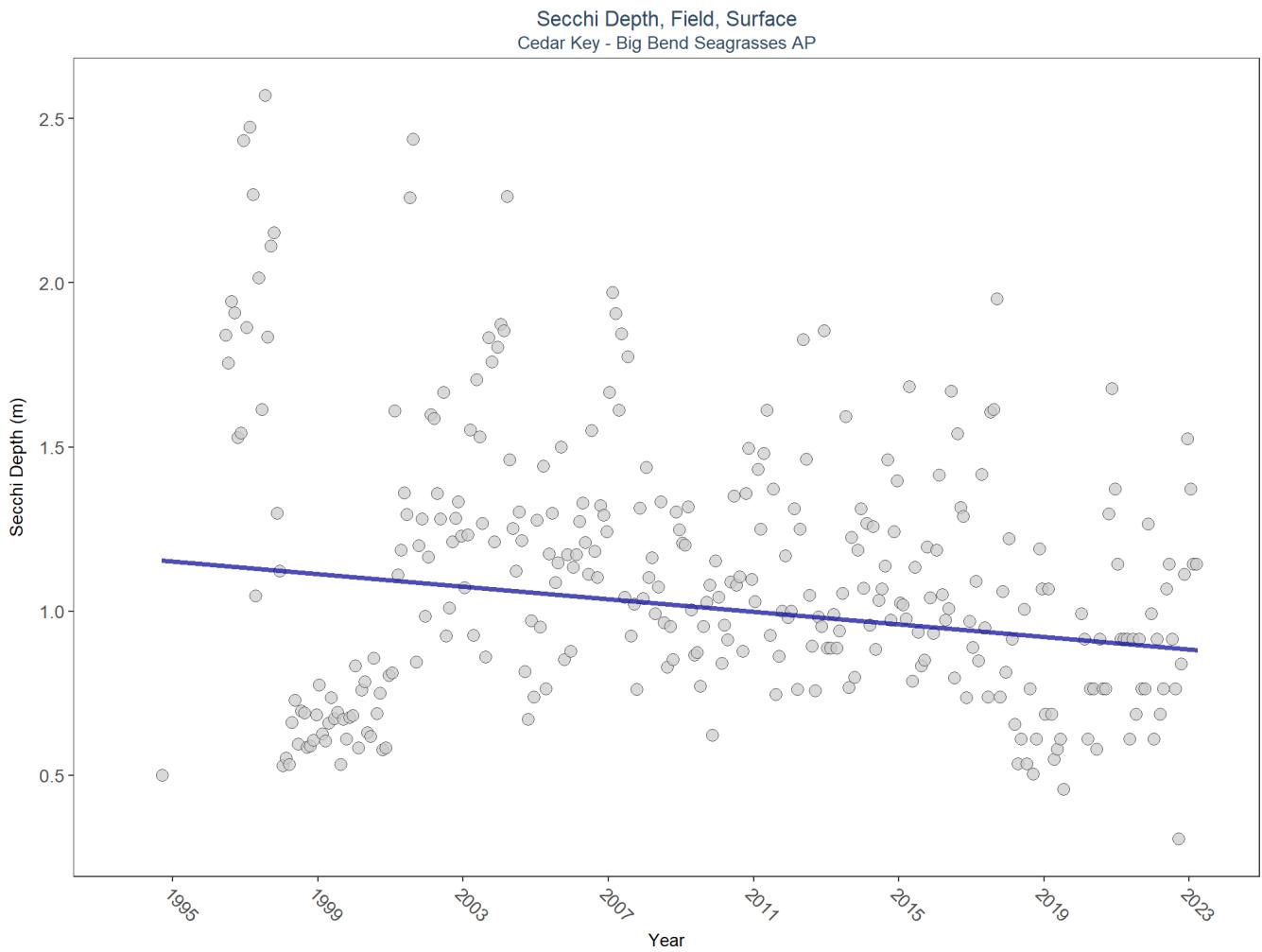


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	43746	31	24	TRUE	0.1253	0.0019	0.02954248	22.5494	10.002	0.5302	1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Secchi Depth

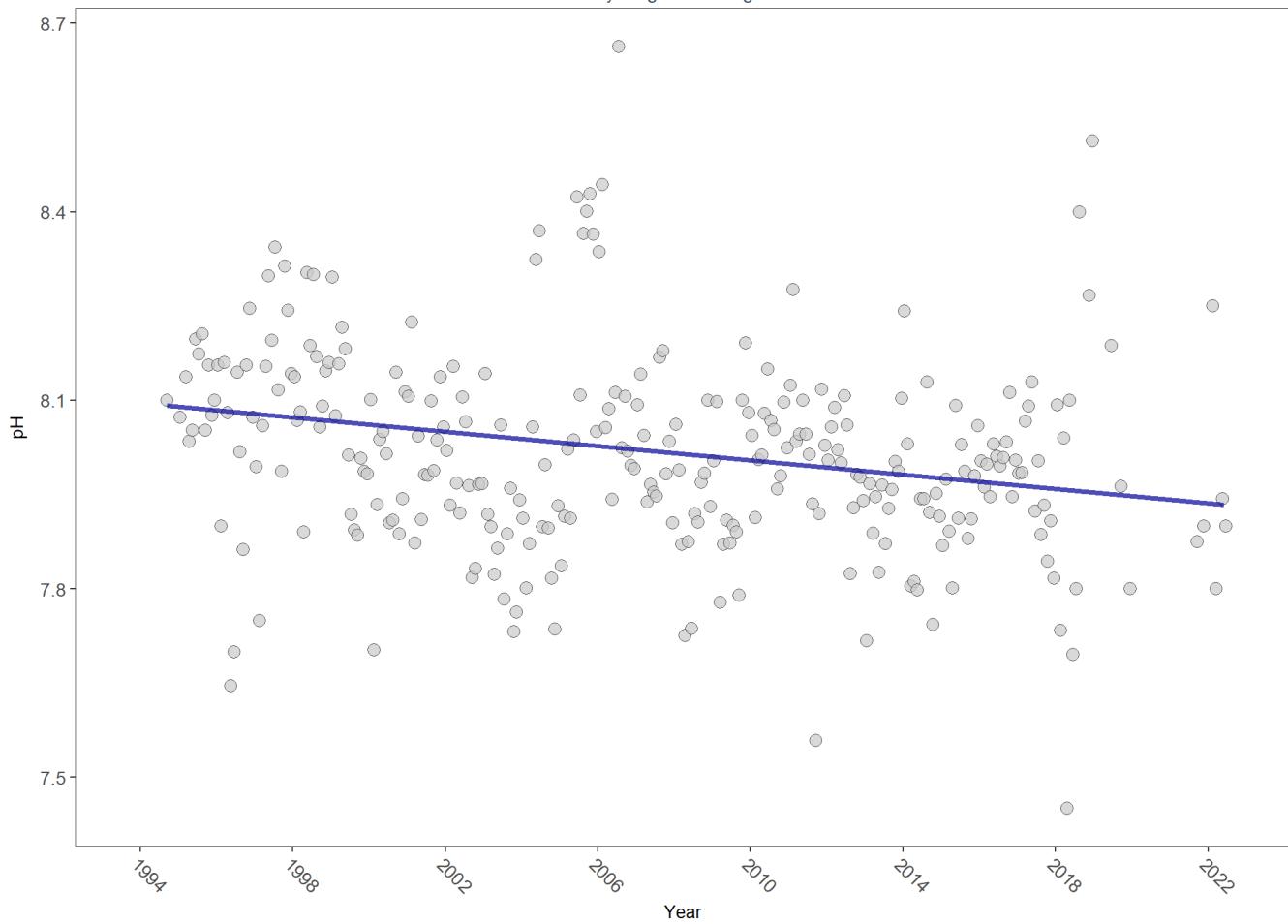


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## pH

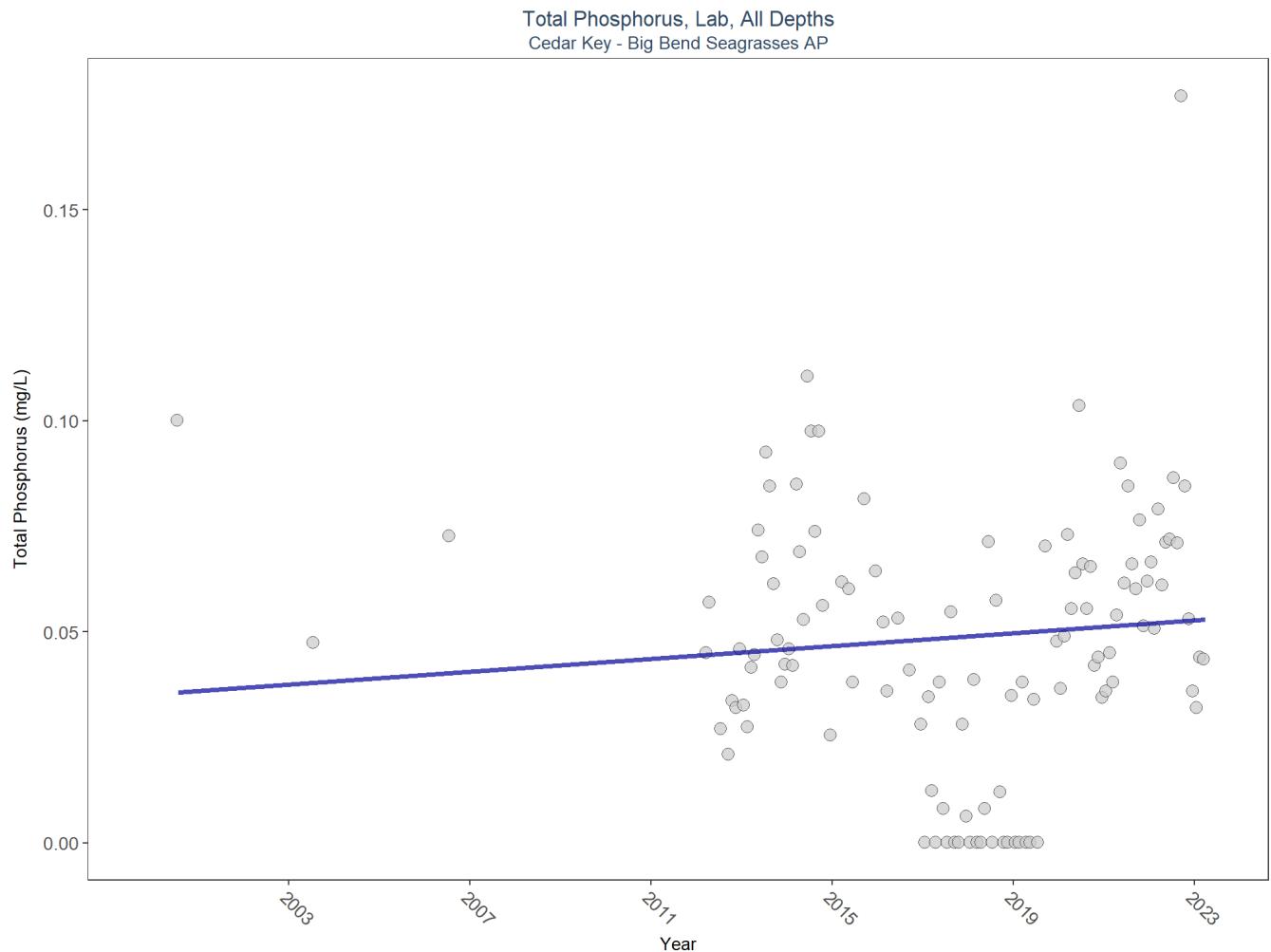
pH, Field, All Depths  
Cedar Key - Big Bend Seagrasses AP



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

SennIntercept is intercept value at beginning of record for monitoring location

## Total Phosphorus

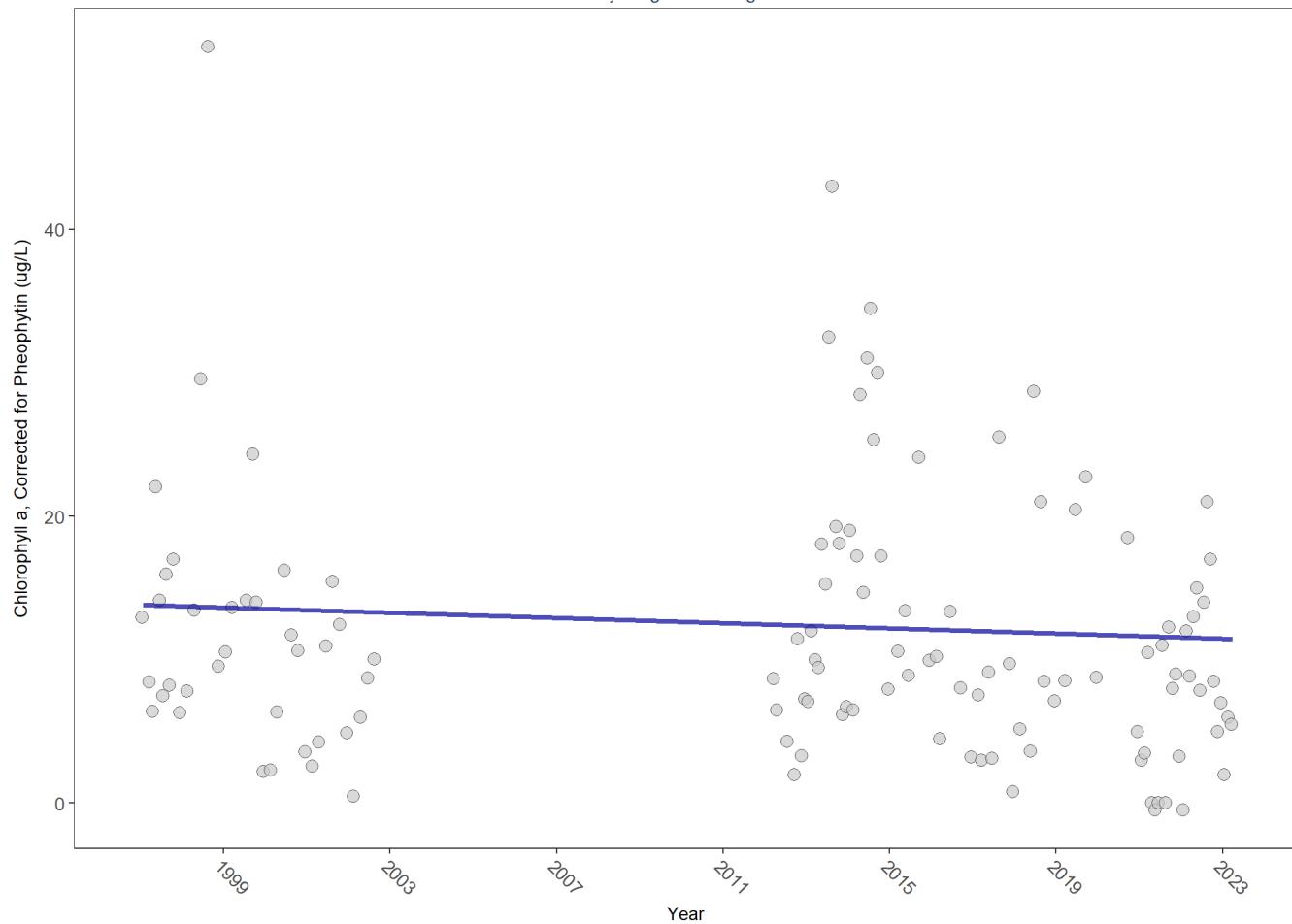


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Chlorophyll a, Corrected for Pheophytin

Chlorophyll a, Corrected for Pheophytin, Lab, All Depths  
Cedar Key - Big Bend Seagrasses AP

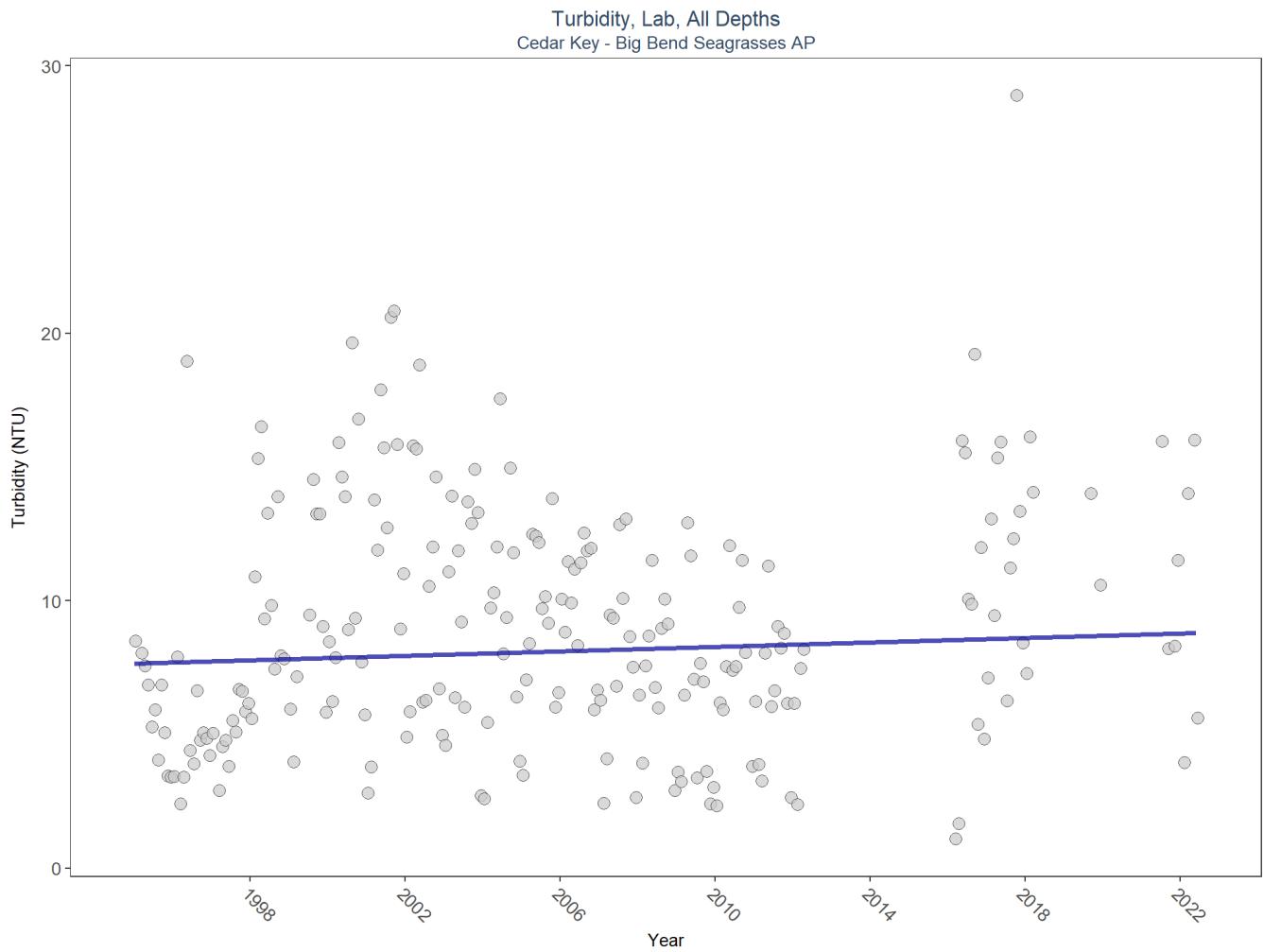


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	449	18	9.8	TRUE	-0.1114	0.2205	-0.09030303	13.83032	11.4903	0.4031	0

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Turbidity

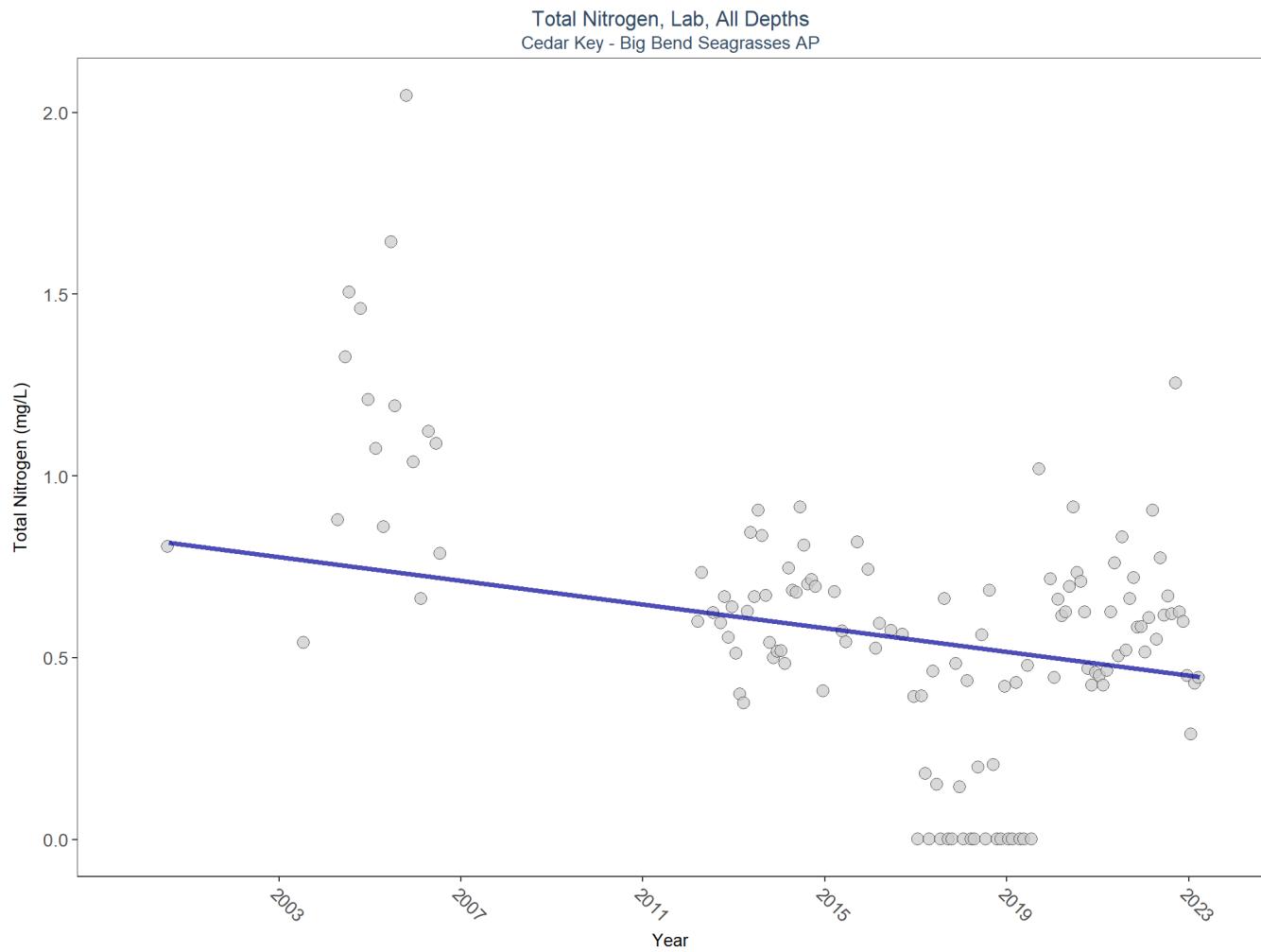


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	10510	24	6.7	TRUE	0.0611	0.2050	0.04172663	7.641508	4.3002	0.9603	0

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Nitrogen



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Submerged Aquatic Vegetation

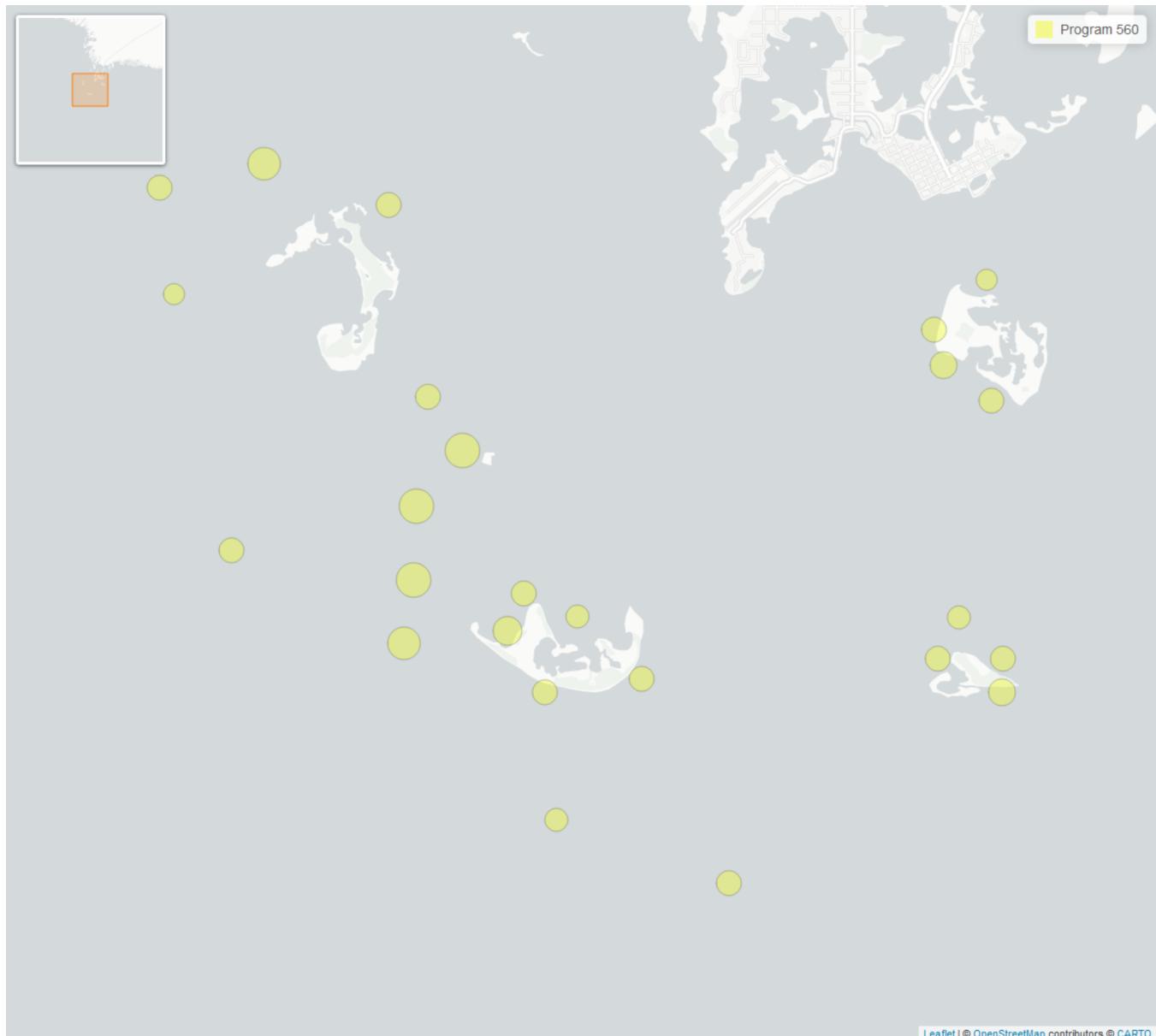
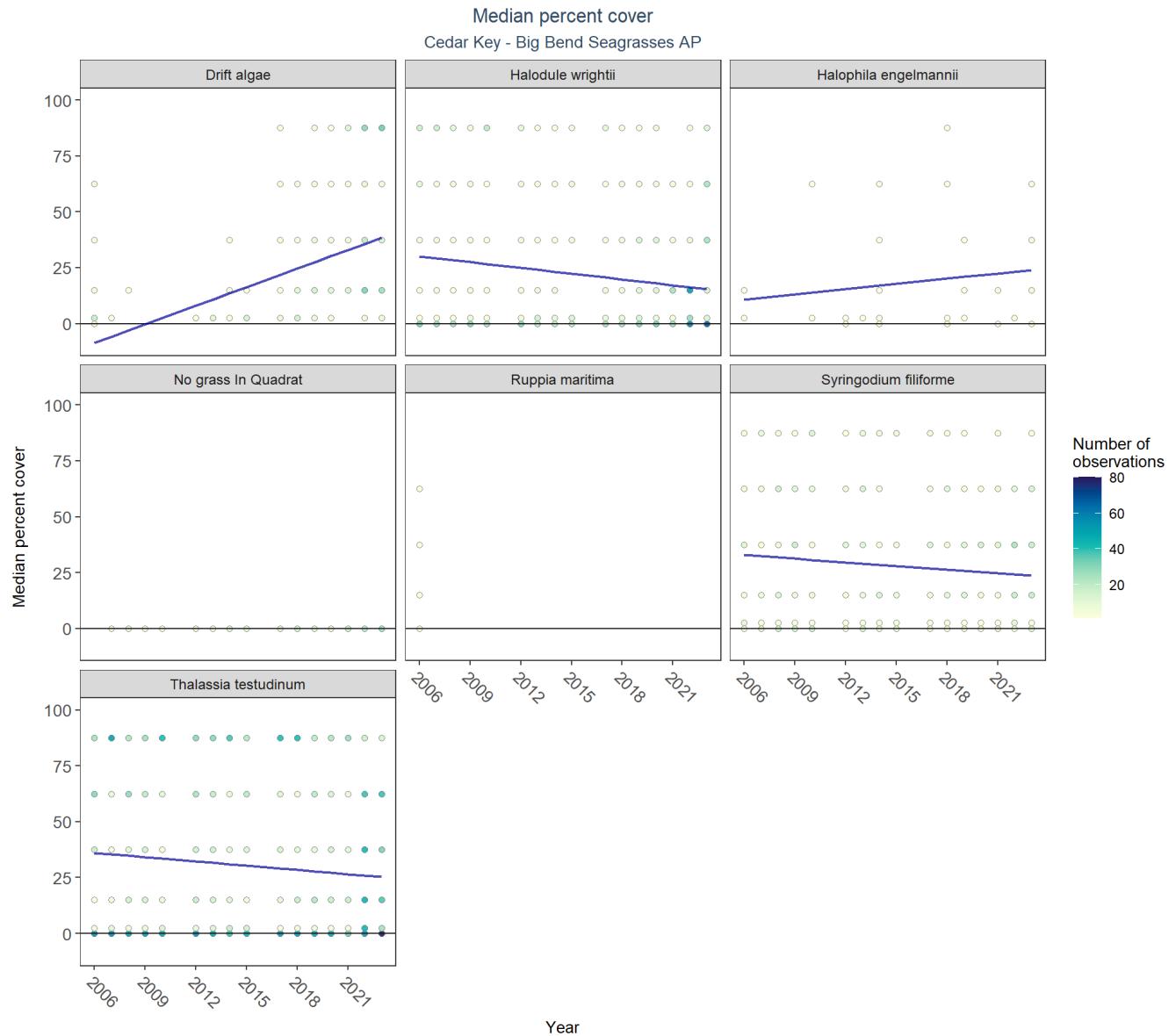


Table 15: Big Bend Seagrasses & Nature Coast Aquatic Preserves  
- Seagrass Monitoring - *Program 560*

<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>	<i>Collection Method</i>	<i>Sample Locations</i>
4284	2006	2023	Modified Braun Blanquet	25
604	2022	2023	Percent Cover	25

## Median Percent Cover - Species Trends



## Median Percent Cover - Species Trend Table

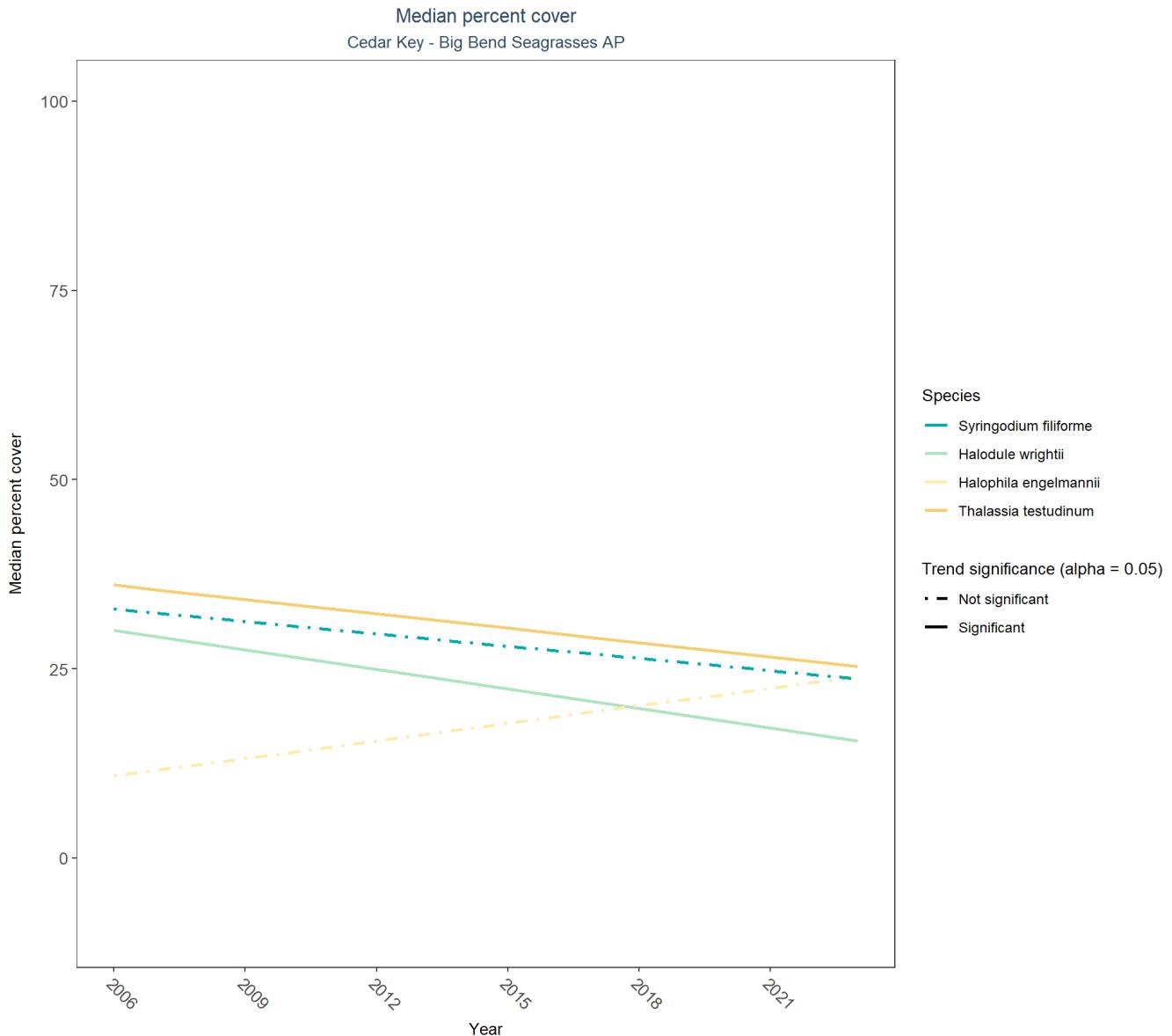
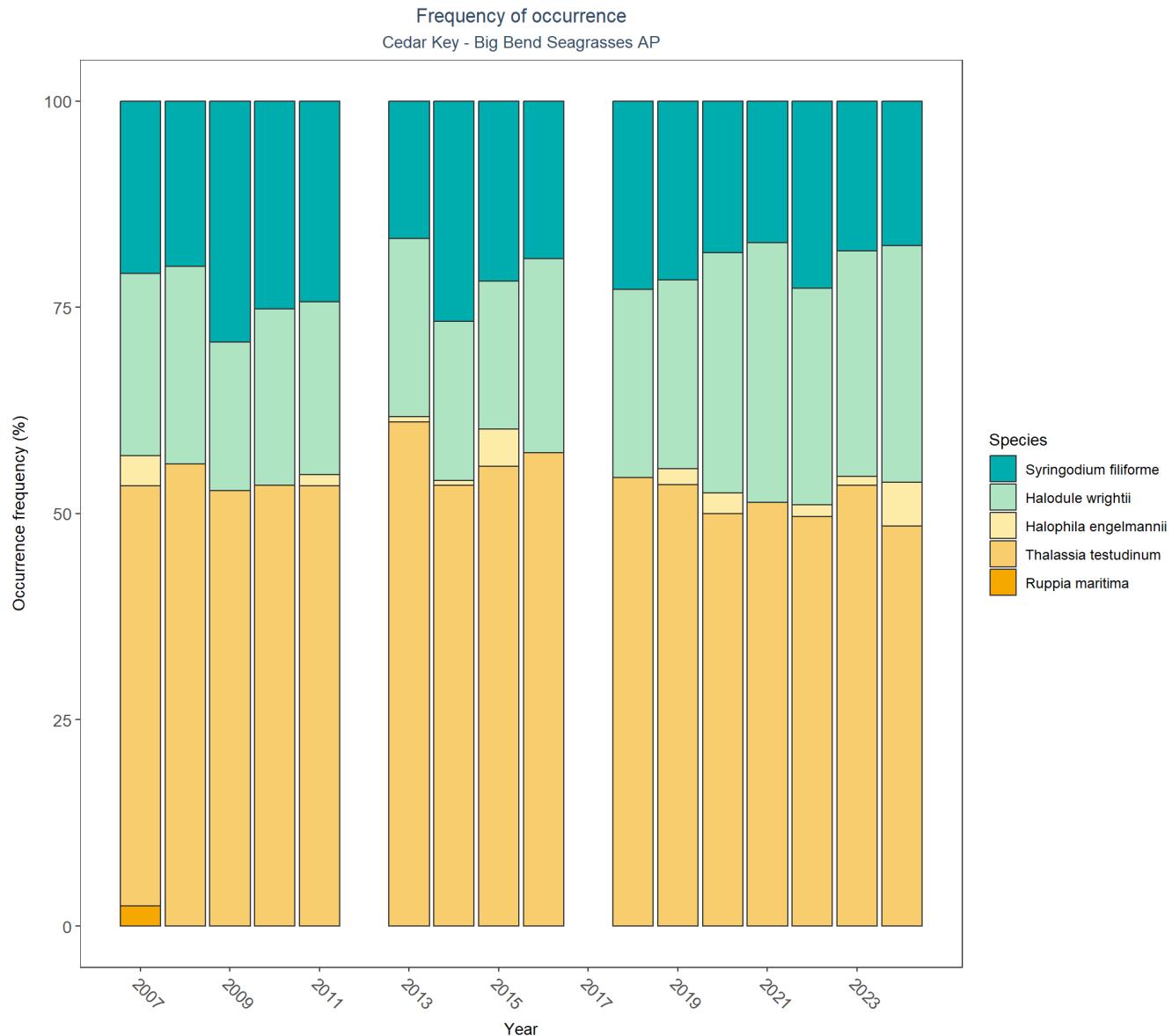


Table 16: Percent Cover Trend Analysis for Cedar Key

Species	Trend Significance (0.05)	Period of Record	LME_Intercept	LME_Slope	p
Drift algae	Significantly increasing trend	2006 - 2023	-25.1735	2.7656	0.0004
Halodule wrightii	Significantly decreasing trend	2006 - 2023	35.3026	-0.8630	0.0000
Halophila engelmannii	No significant trend	2006 - 2023	6.1752	0.7753	0.1595
No grass In Quadrat	Model did not fit the available data	2007 - 2023	-	-	-
Ruppia maritima	Insufficient data to calculate trend	-	-	-	-
Syringodium filiforme	No significant trend	2006 - 2023	36.1352	-0.5411	0.0829
Thalassia testudinum	Significantly decreasing trend	2006 - 2023	39.8845	-0.6344	0.0000

## Frequency of Occurrence Barplots



## Suwanee

Seasonal Kendall-Tau trend plots will be produced below for parameters where *SufficientData* is **TRUE**.

Trend arrows denote trends where the p value is less than 5% and the slope is less than 10% of the median value.

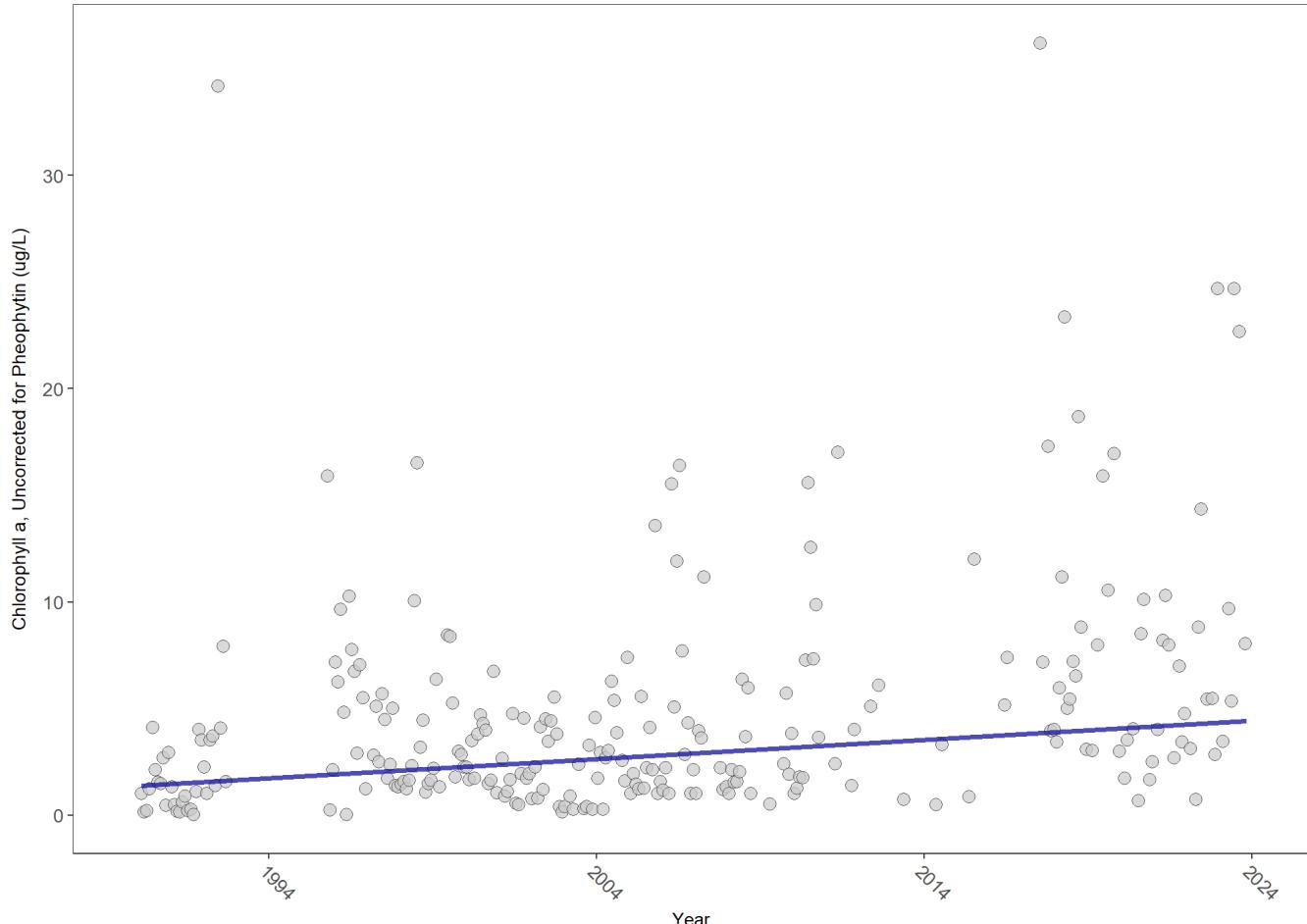
Table 17: Seasonal Kendall-Tau Results for Suwanee

ParameterName	Period-of-Record	N-Years	N-Data	SufficientData	SennSlope	SennIntercept	p	Trend
Chlorophyll a, Uncorrected for Pheophytin	1990 - 2023	32	1269	TRUE	0.09	1.36	0.0000	↑
Dissolved Oxygen	1989 - 2023	35	47898	TRUE	-0.01	6.65	0.0368	↓
Dissolved Oxygen Saturation	2013 - 2023	10	174	TRUE	-6.70	83.16	0.0227	↓
Salinity	1990 - 2023	33	49523	TRUE	-0.01	15.14	0.7712	0
Water Temperature	1989 - 2023	35	50187	TRUE	0.03	23.12	0.0135	↑
Secchi Depth	1991 - 2023	28	20031	TRUE	0.00	0.90	0.3905	0
pH	1989 - 2023	35	35320	TRUE	0.00	7.93	0.2062	0
Total Phosphorus	2001 - 2023	23	541	TRUE	0.00	0.09	0.0214	↑
Colored Dissolved Organic Matter	2002 - 2023	6	124	FALSE	-	-	-	-
Chlorophyll a, Corrected for Pheophytin	1995 - 2023	24	795	TRUE	0.07	1.68	0.0004	↑
Turbidity	1990 - 2023	34	13484	TRUE	0.00	3.96	0.9031	0
Total Suspended Solids	1990 - 2023	31	605	TRUE	-0.08	5.09	0.0000	↓
Total Nitrogen	1990 - 2023	25	746	TRUE	0.00	1.19	0.4314	0

## Discrete WQ

### Chlorophyll a, Uncorrected for Pheophytin

Chlorophyll a, Uncorrected for Pheophytin, Lab, All Depths  
Suwanee - Big Bend Seagrasses AP

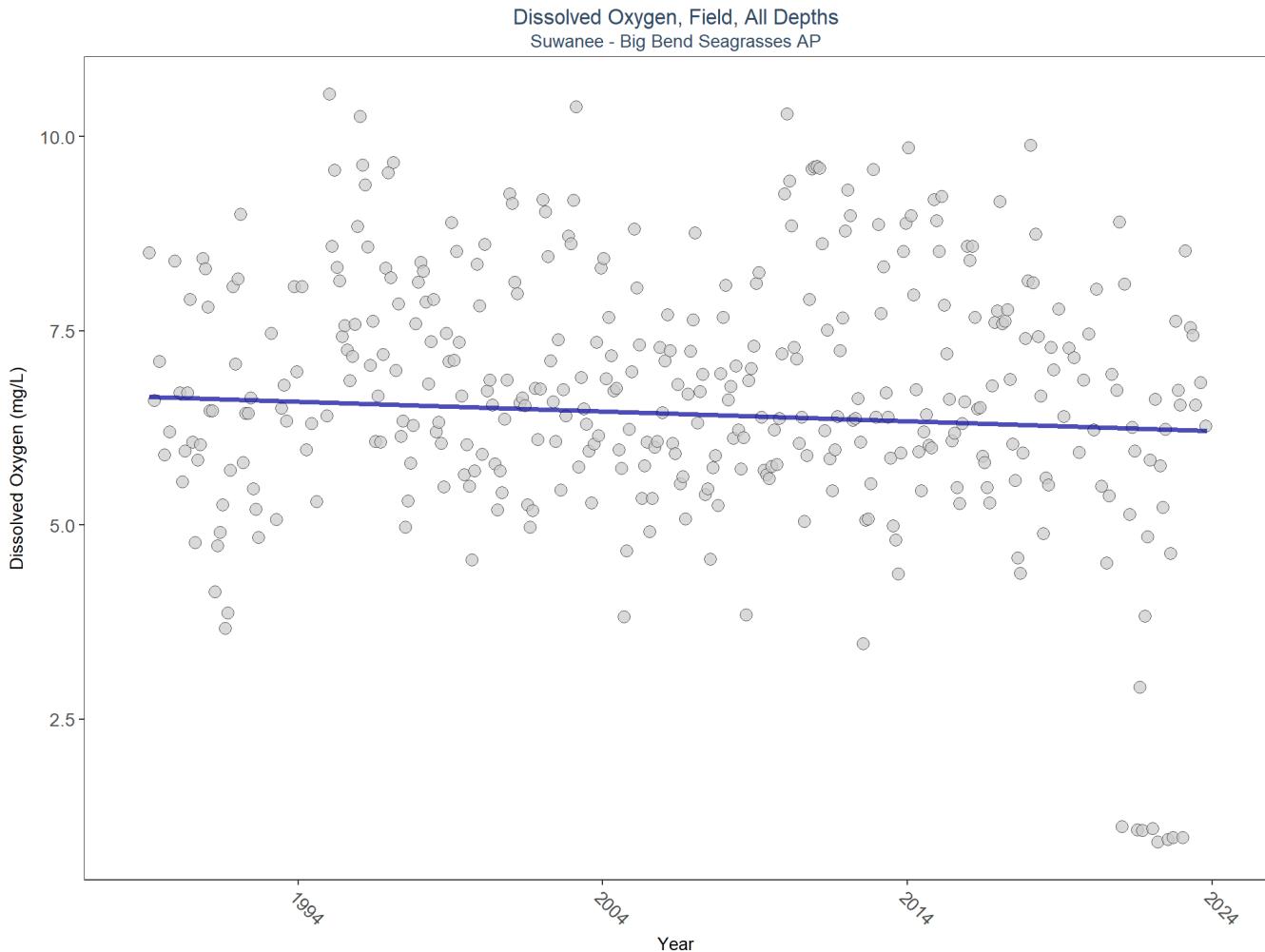


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1269	32	2.3	TRUE	0.2514	0.0000	0.09065972	1.36038	11.6409	0.3912	1

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

SennIntercept is intercept value at beginning of record for monitoring location

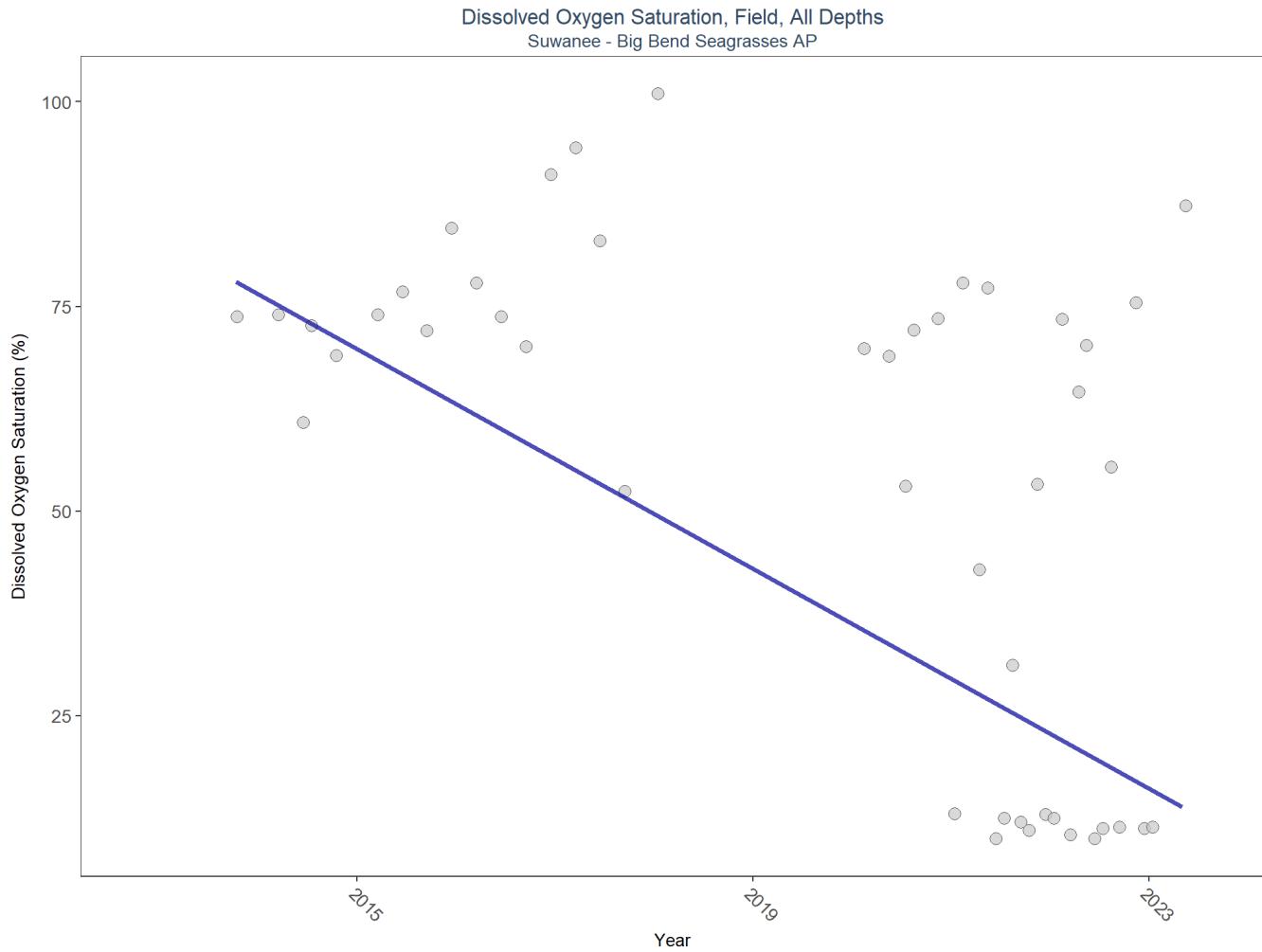
## Dissolved Oxygen



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Dissolved Oxygen Saturation

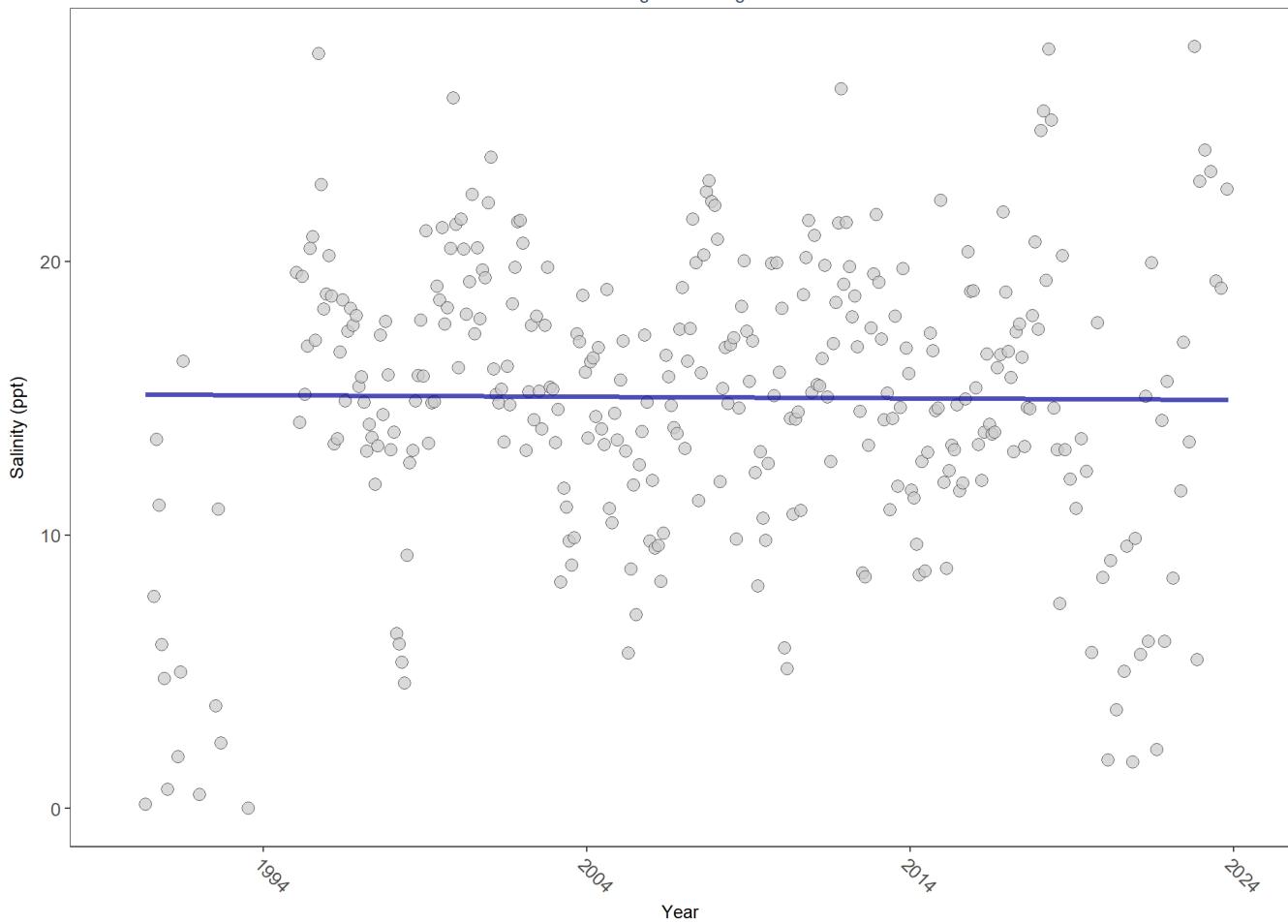


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Salinity

Salinity, Lab and Field Combined, All Depths  
Suwanee - Big Bend Seagrasses AP



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

*SennIntercept is intercept value at beginning of record for monitoring location*

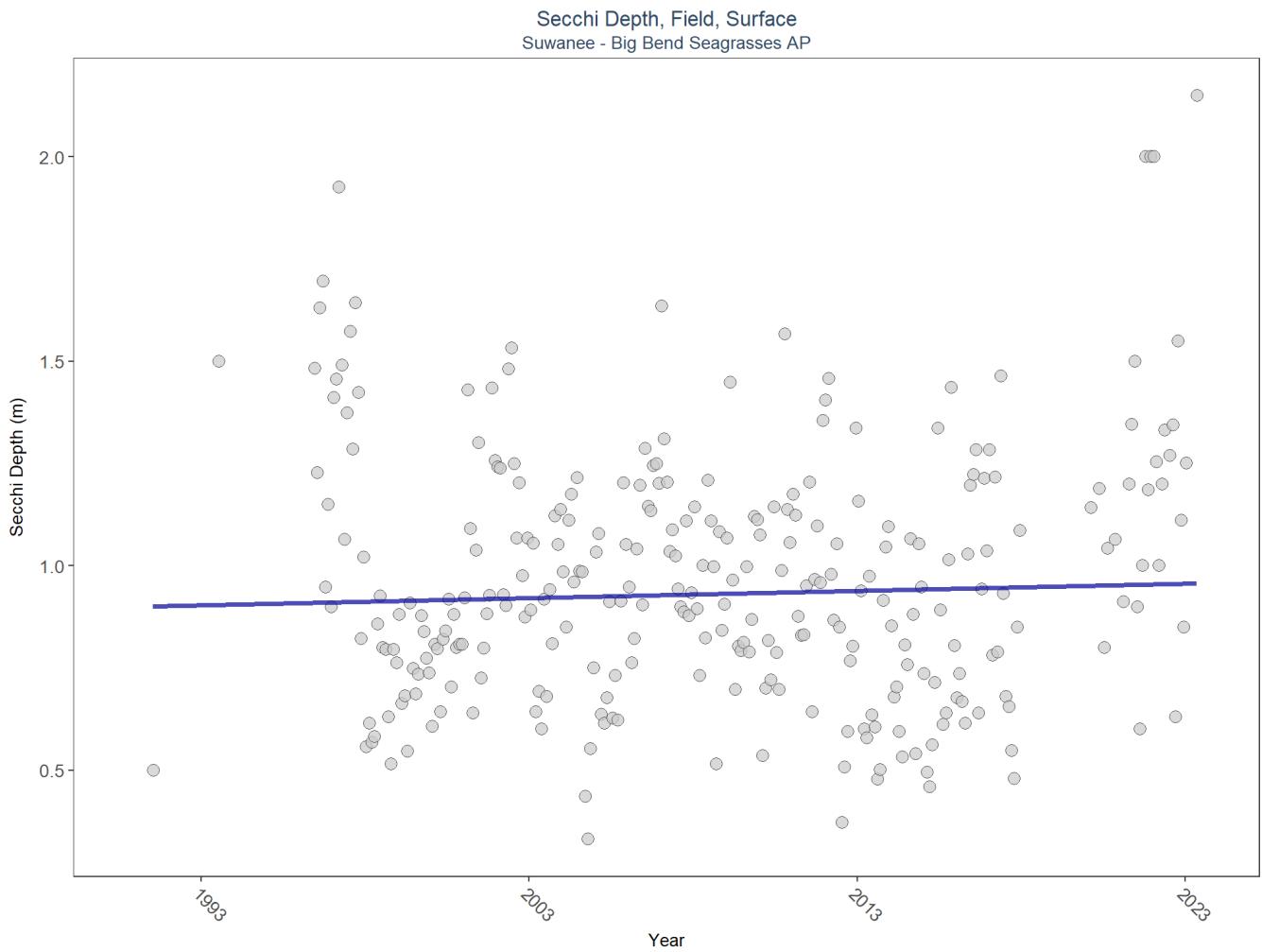
## Water Temperature



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Secchi Depth

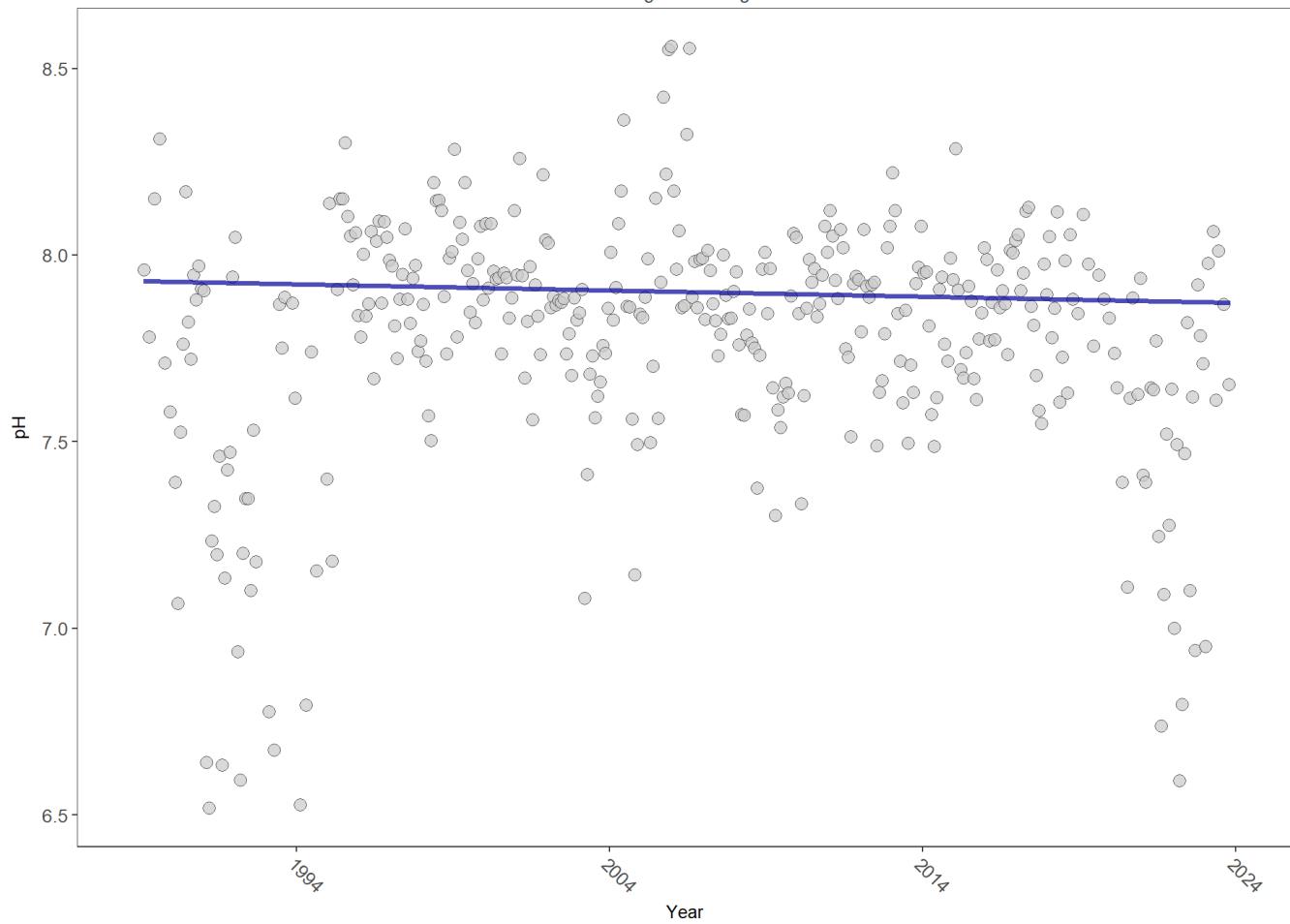


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## pH

pH, Field, All Depths  
Suwanee - Big Bend Seagrasses AP

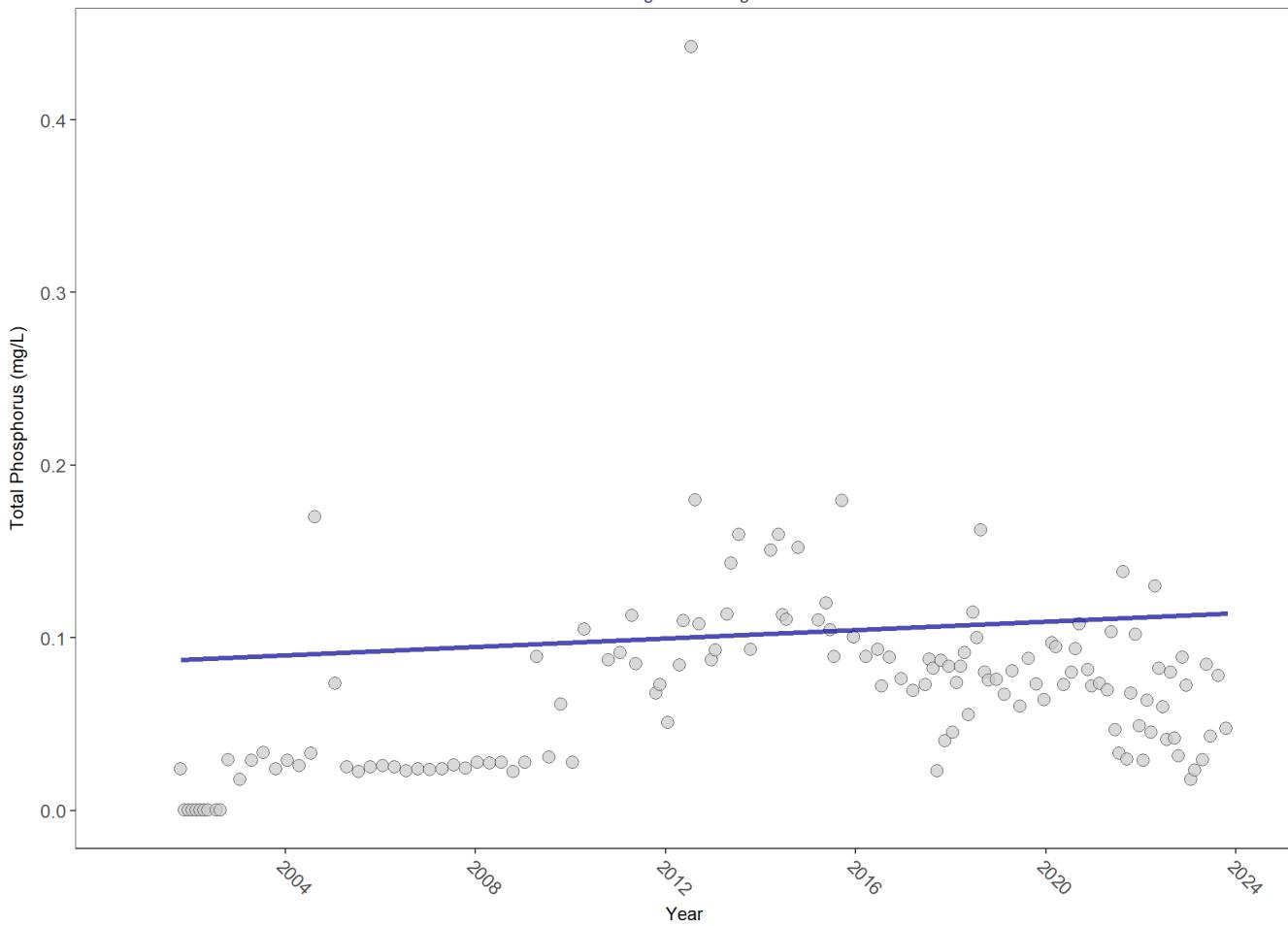


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Phosphorus

Total Phosphorus, Lab, All Depths  
Suwanee - Big Bend Seagrasses AP



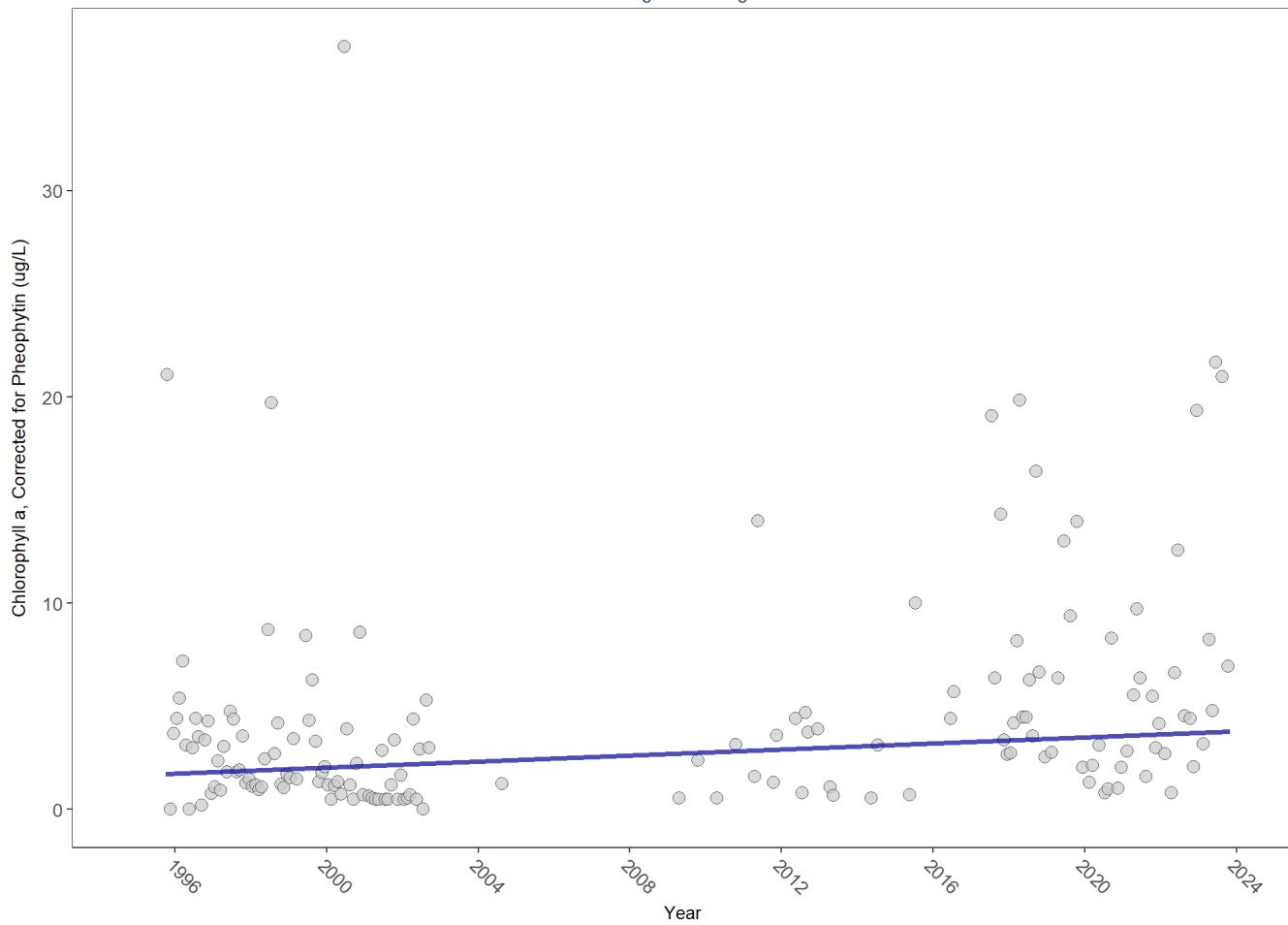
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	541	23	0.0764	TRUE	0.0701	0.0214	0.00122037	0.08629833	32.7648	6e-04	1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Chlorophyll a, Corrected for Pheophytin

Chlorophyll a, Corrected for Pheophytin, Lab, All Depths  
Suwanee - Big Bend Seagrasses AP

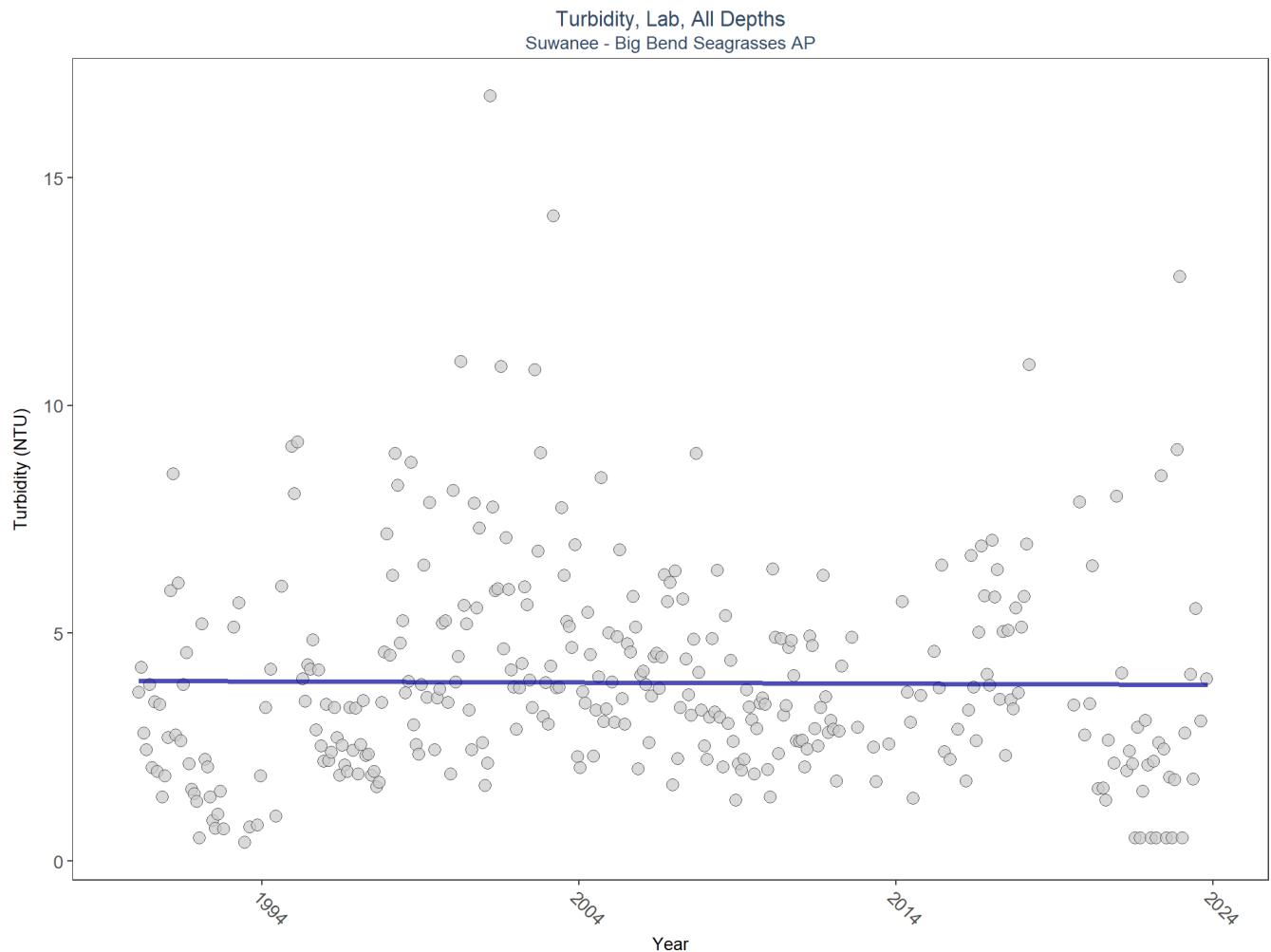


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	795	24	1.9	TRUE	0.2113	0.0004	0.07328125	1.679112	7.7879	0.7322	1

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

SennIntercept is intercept value at beginning of record for monitoring location

## Turbidity

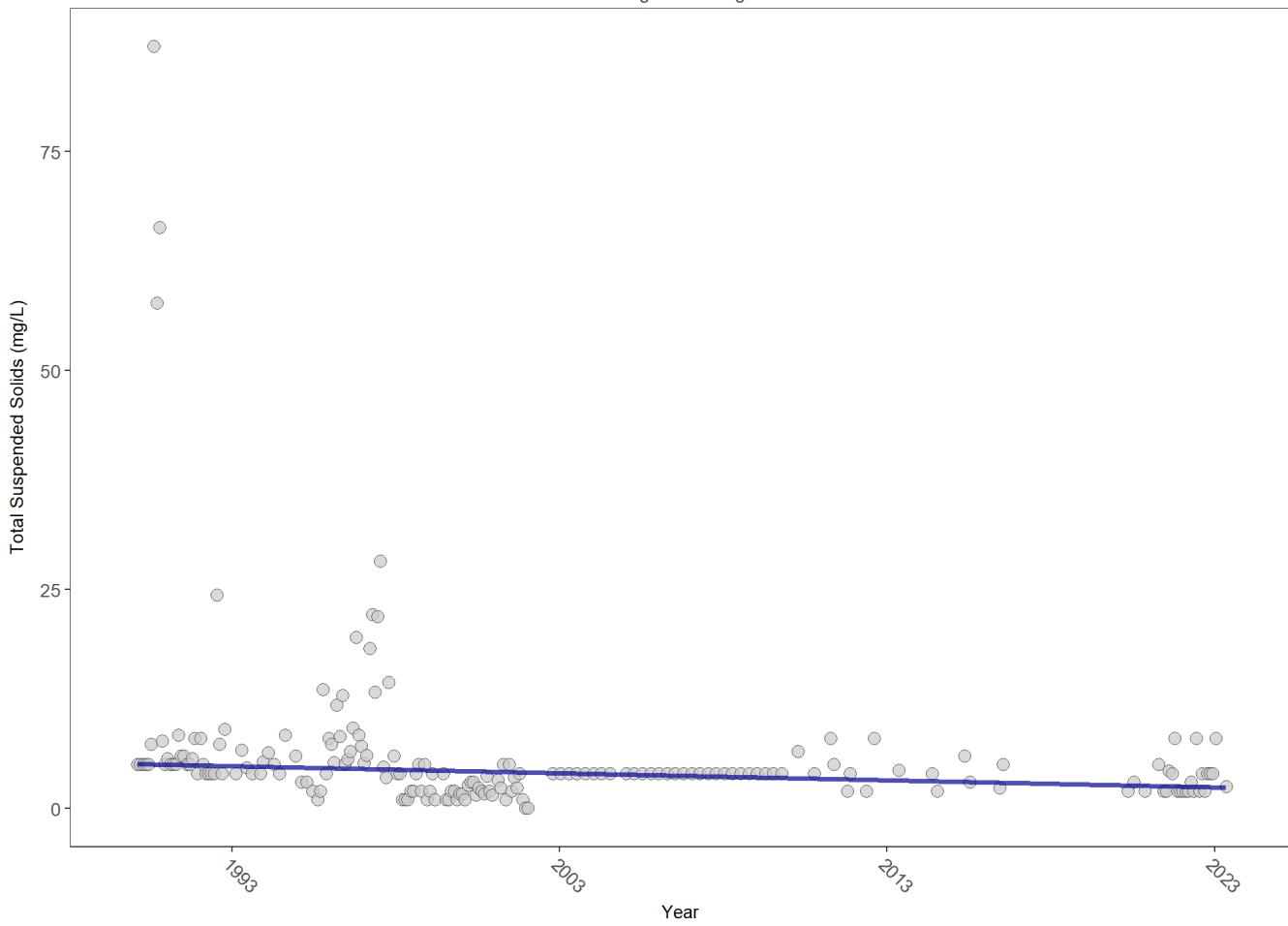


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Suspended Solids

Total Suspended Solids, Lab and Field Combined, All Depths  
Suwanee - Big Bend Seagrasses AP

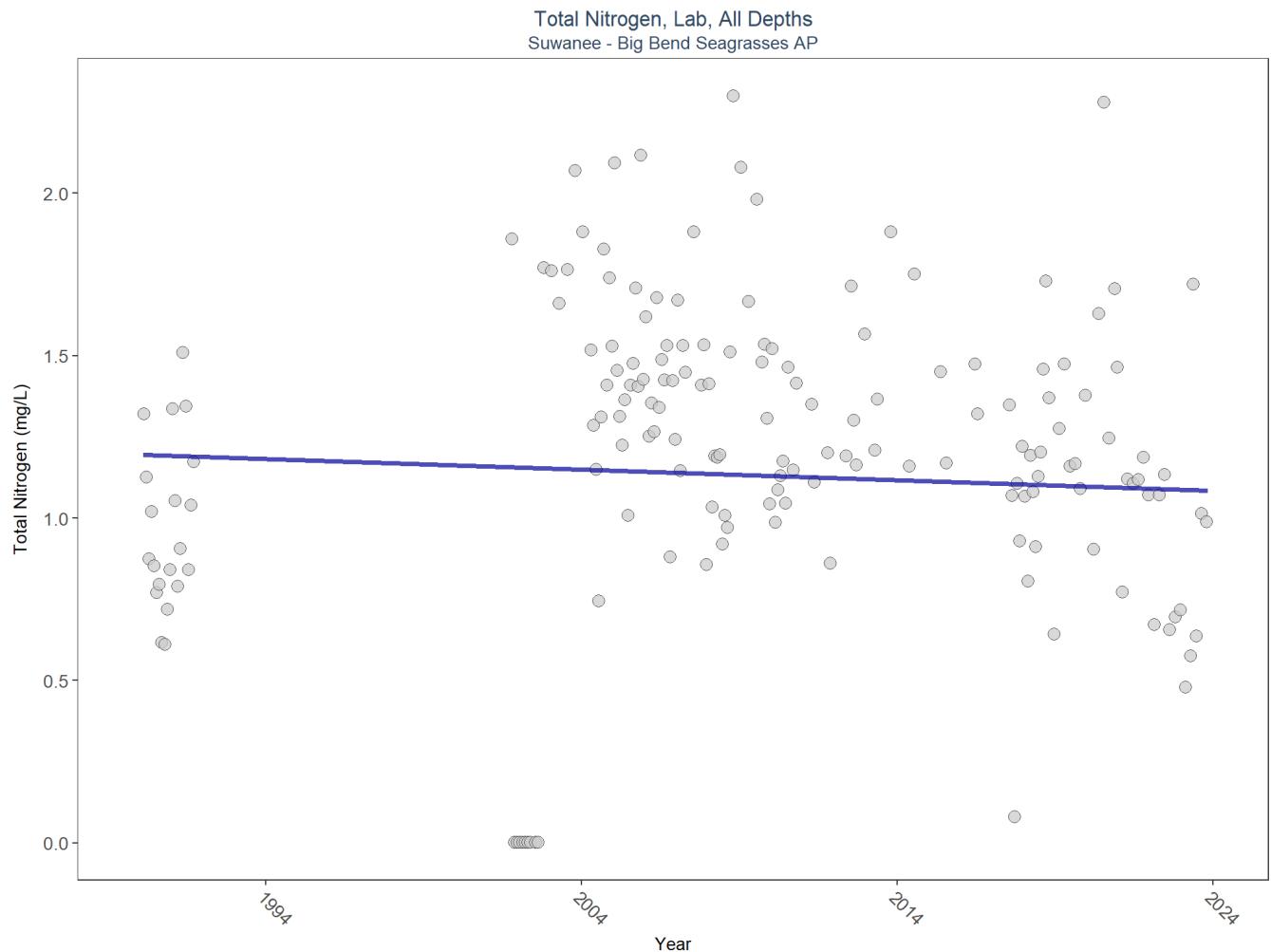


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	605	31	5	TRUE	-0.2669	0.0000	-0.08080808	5.092593	2.5426	0.9955	-1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Nitrogen



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Waccasassa

Seasonal Kendall-Tau trend plots will be produced below for parameters where *SufficientData* is **TRUE**.

Trend arrows denote trends where the p value is less than 5% and the slope is less than 10% of the median value.

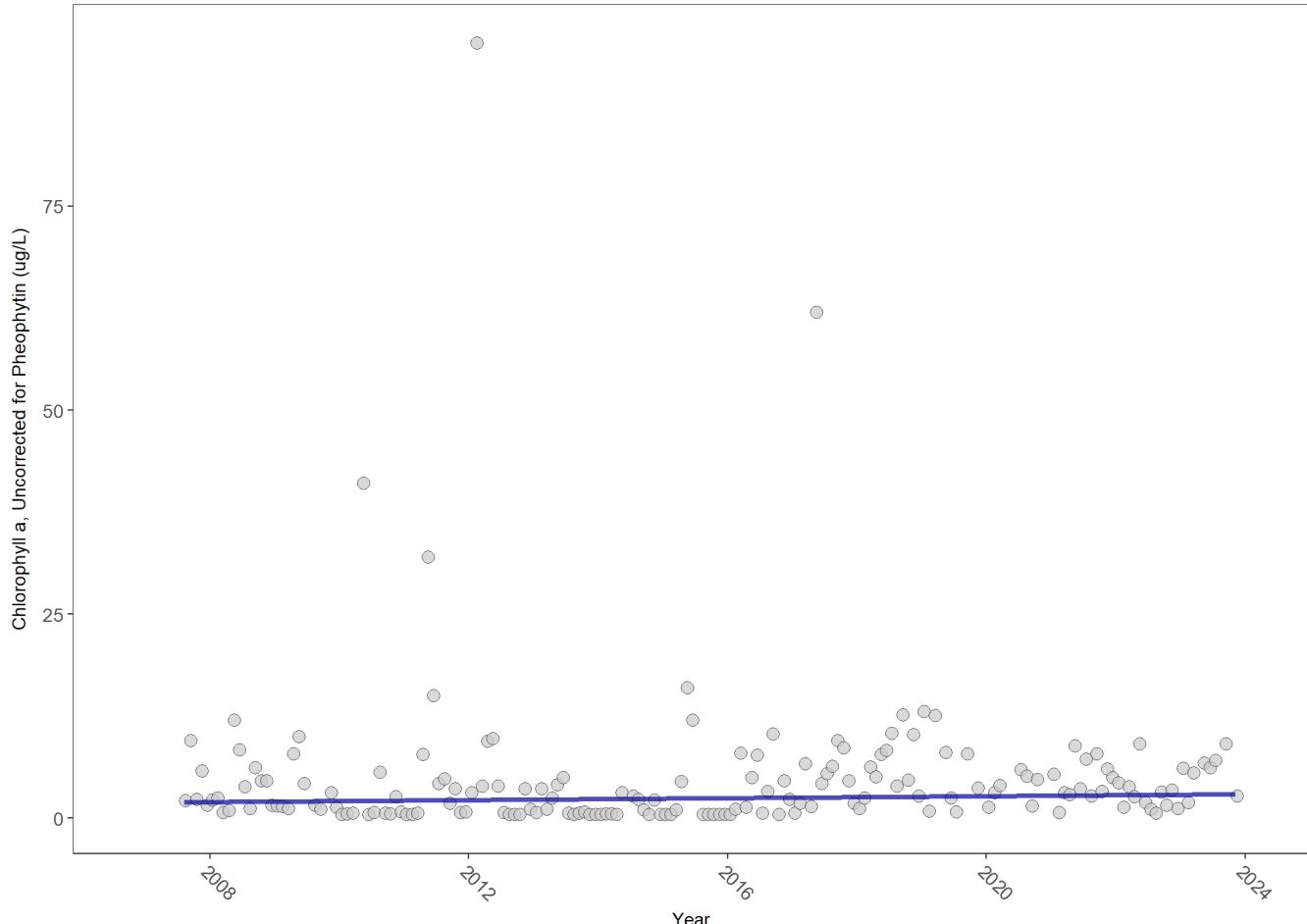
Table 18: Seasonal Kendall-Tau Results for Waccasassa

ParameterName	Period-of-Record	N-Years	N-Data	SufficientData	SennSlope	SennIntercept	p	Trend
Chlorophyll a, Uncorrected for Pheophytin	2007 - 2023	17	477	TRUE	0.06	1.98	0.0810	0
Dissolved Oxygen	1992 - 2023	31	12191	TRUE	-0.01	6.91	0.0413	↓
Dissolved Oxygen Saturation	2001 - 2023	8	214	FALSE	-	-	-	-
Salinity	1992 - 2023	31	12359	TRUE	-0.08	21.19	0.0855	0
Water Temperature	1992 - 2023	31	12901	TRUE	0.01	22.47	0.6544	0
Secchi Depth	1992 - 2023	24	547	TRUE	0.00	1.03	0.9911	0
pH	1992 - 2023	31	6997	TRUE	-0.01	8.06	0.0000	↓
Total Phosphorus	1998 - 2023	26	680	TRUE	0.00	0.07	0.0000	↓
Colored Dissolved Organic Matter	2017 - 2023	7	92	FALSE	-	-	-	-
Chlorophyll a, Corrected for Pheophytin	1999 - 2023	25	644	TRUE	0.06	0.89	0.0000	↑
Turbidity	1995 - 2023	29	5171	TRUE	-0.09	5.35	0.0000	↓
Total Suspended Solids	1998 - 2023	26	321	TRUE	-0.06	4.77	0.0000	↓
Total Nitrogen	1998 - 2023	26	636	TRUE	0.00	0.59	0.0116	↑↑

## Discrete WQ

### Chlorophyll a, Uncorrected for Pheophytin

Chlorophyll a, Uncorrected for Pheophytin, Lab, All Depths  
Waccasassa - Big Bend Seagrasses AP



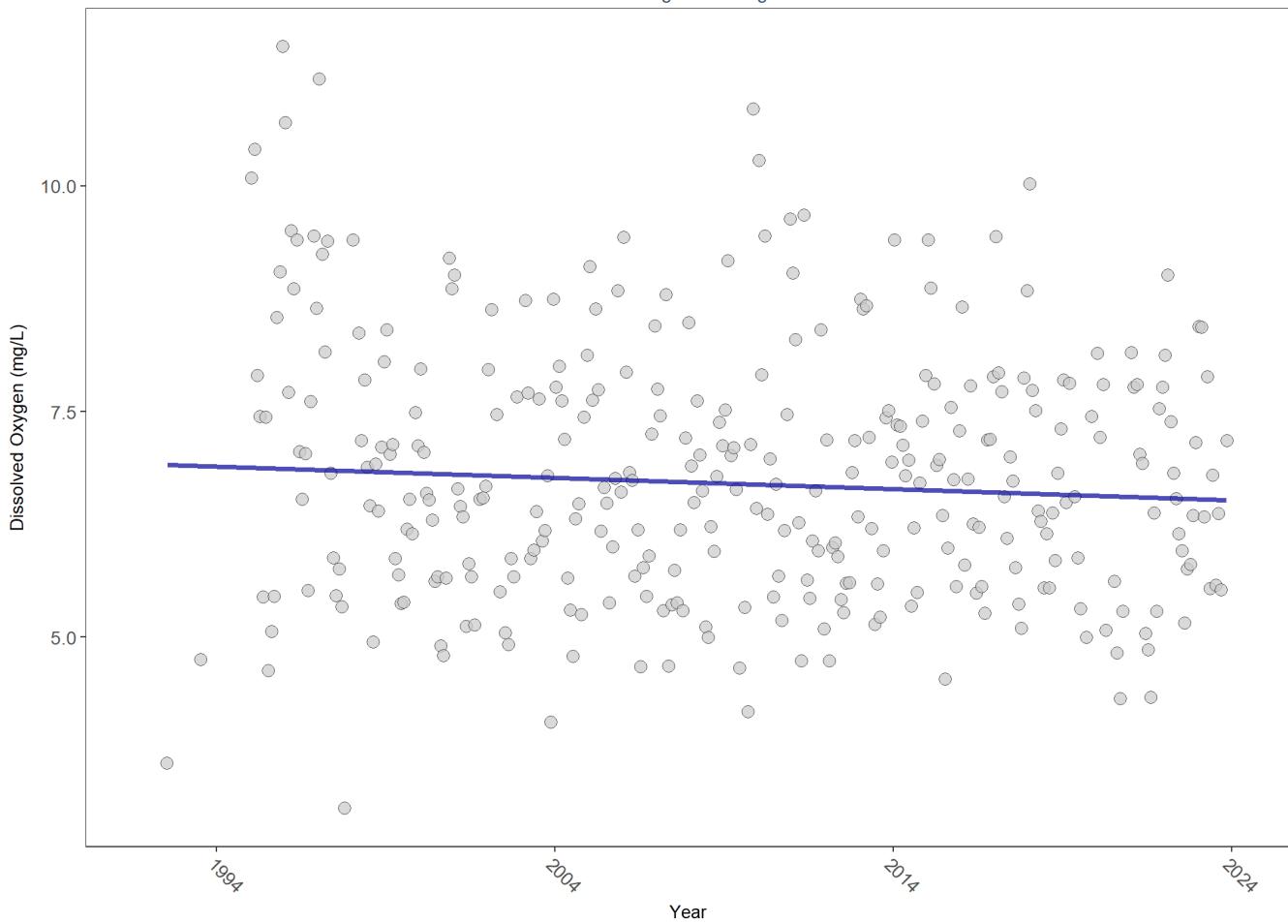
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	477	17	3.7	TRUE	0.0915	0.0810	0.05791667	1.975265	11.3885	0.4113	0

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

SennIntercept is intercept value at beginning of record for monitoring location

## Dissolved Oxygen

Dissolved Oxygen, Field, All Depths  
Waccasassa - Big Bend Seagrasses AP



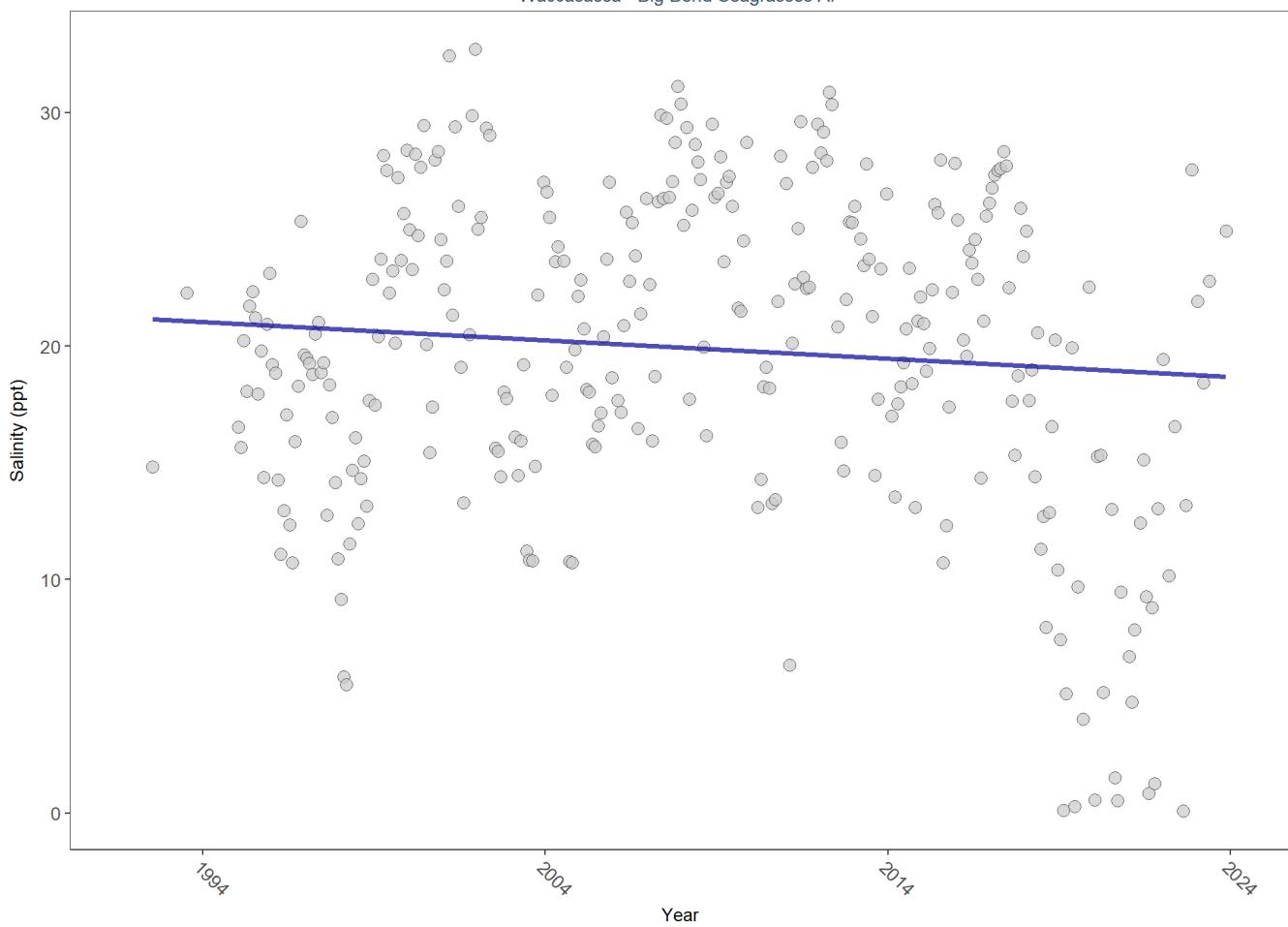
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	12191	31	6.6	TRUE	-0.0829	0.0413	-0.0122827	6.91168	6.3317	0.8503	-1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Salinity

Salinity, Lab and Field Combined, All Depths  
Waccasassa - Big Bend Seagrasses AP

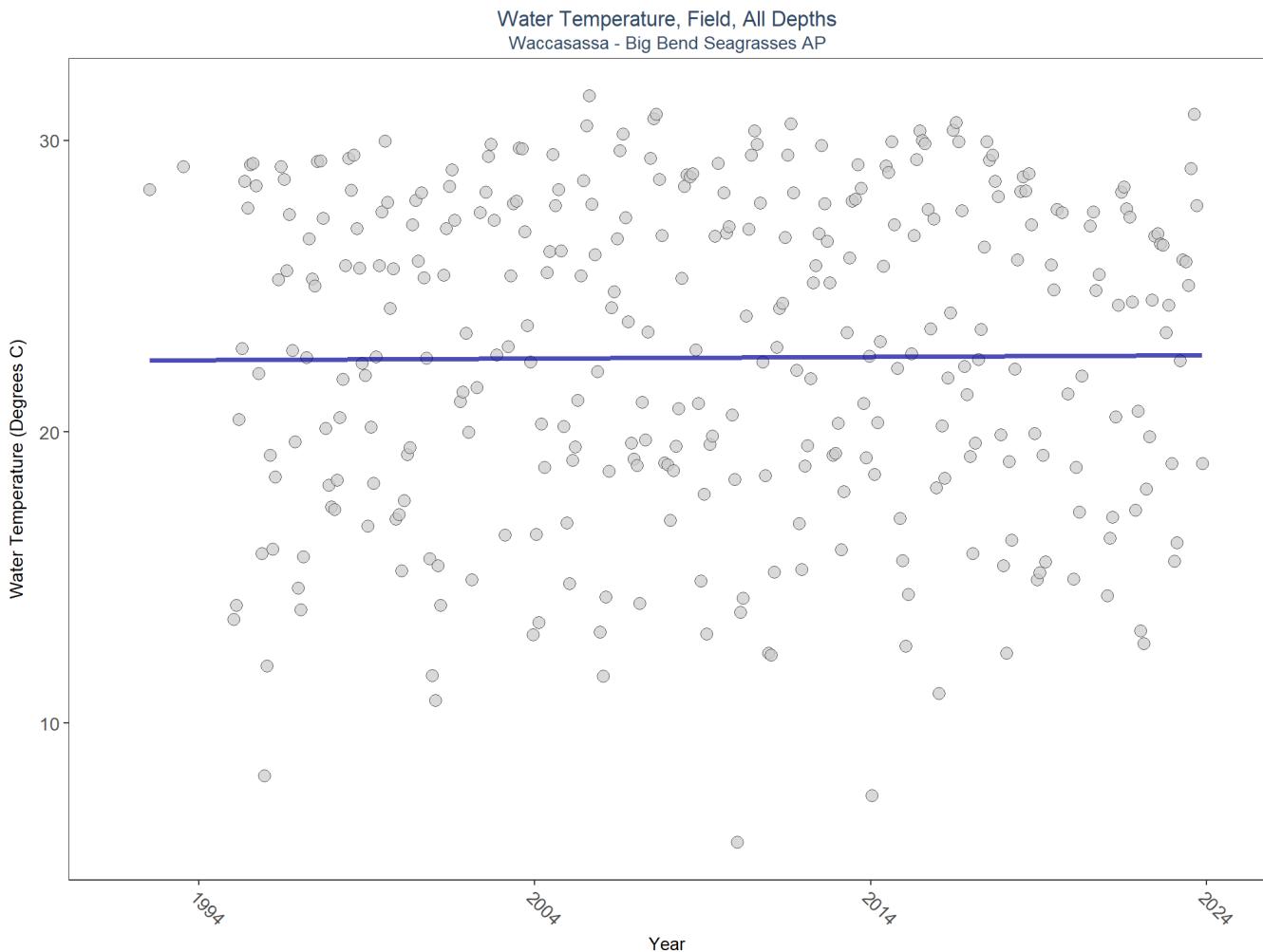


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	12359	31	21.3	TRUE	-0.0666	0.0855	-0.07864277	21.19479	8.3546	0.6812	0

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

*SennIntercept is intercept value at beginning of record for monitoring location*

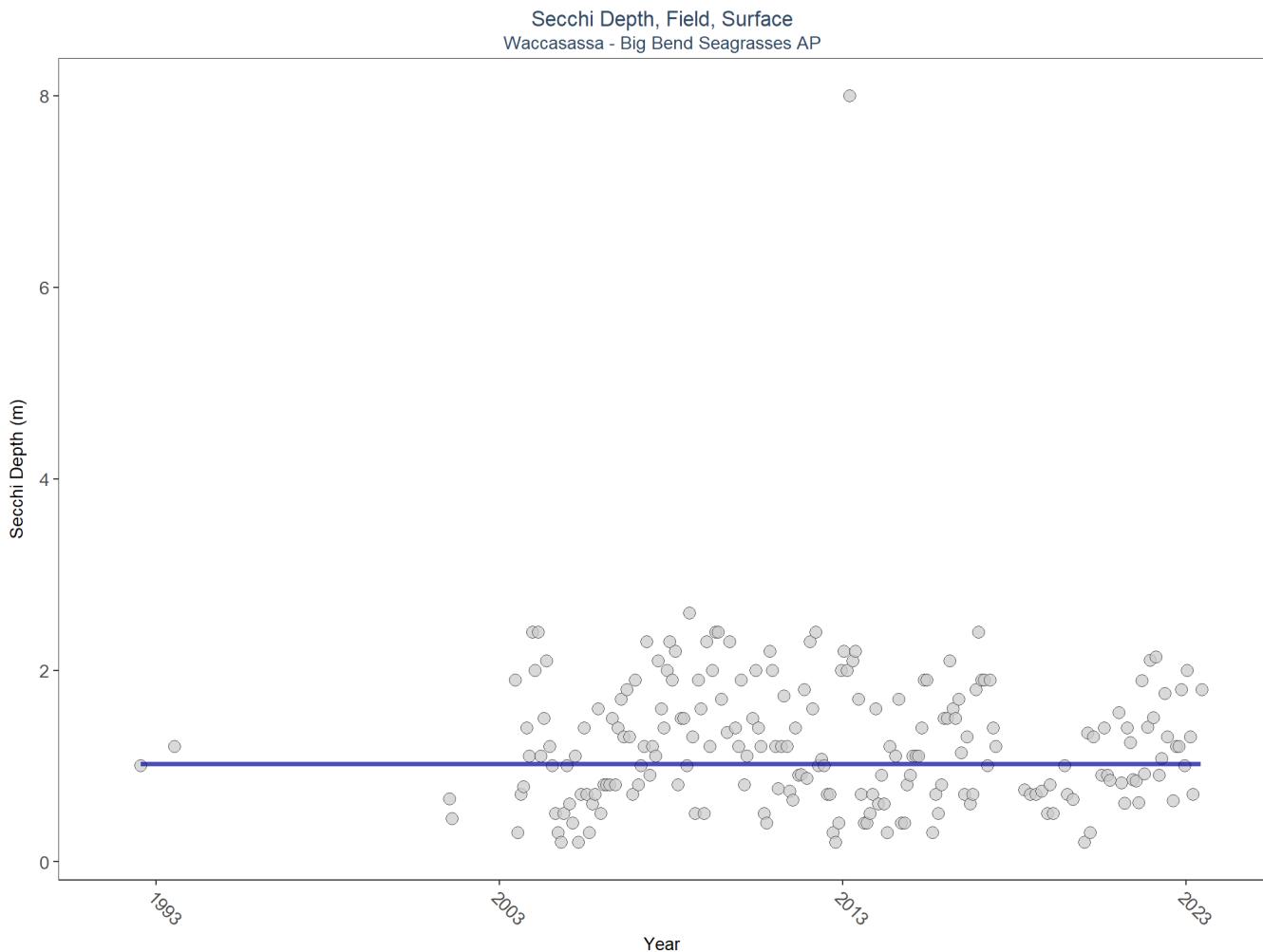
## Water Temperature



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Secchi Depth

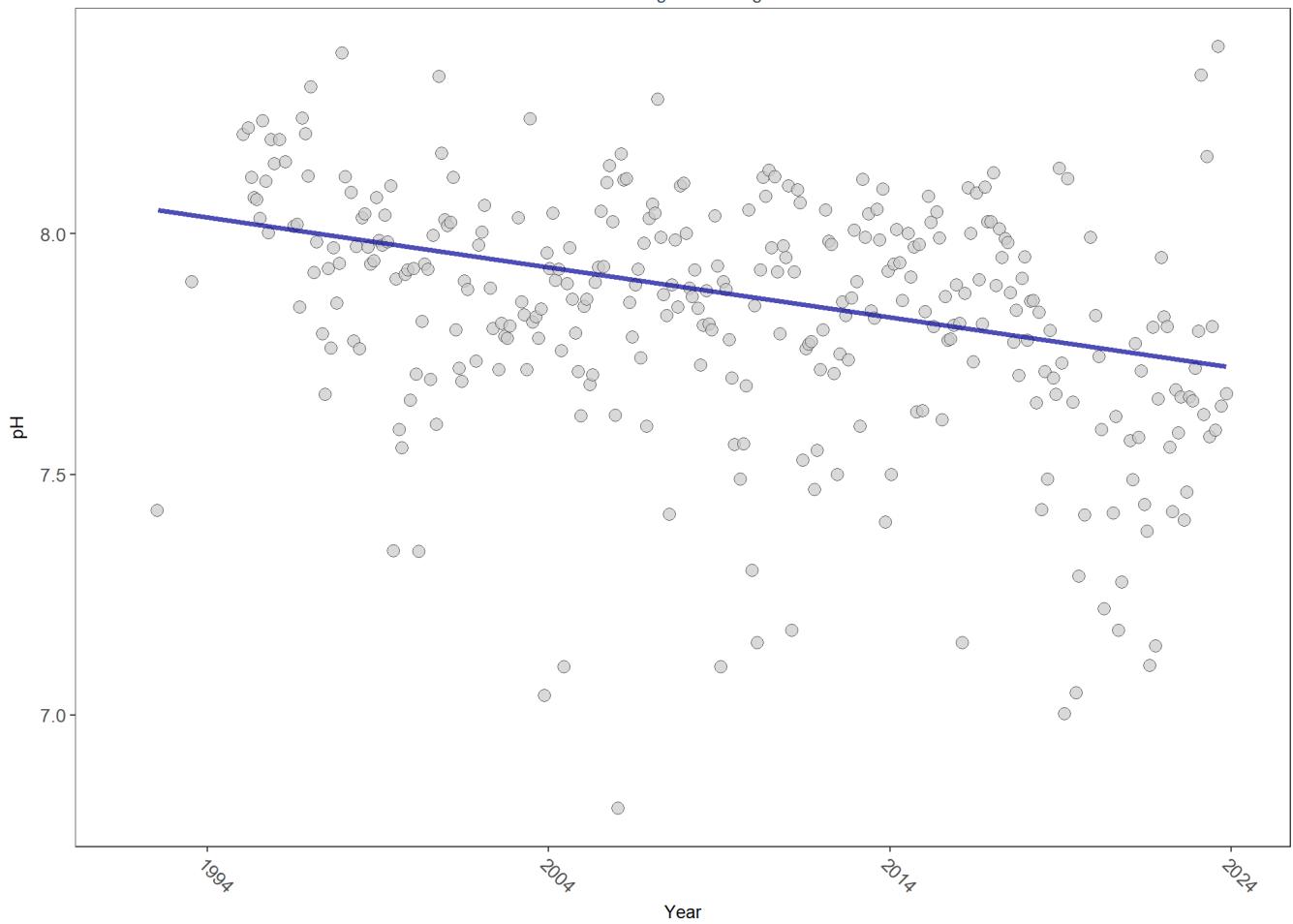


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## pH

pH, Field, All Depths  
Waccasassa - Big Bend Seagrasses AP

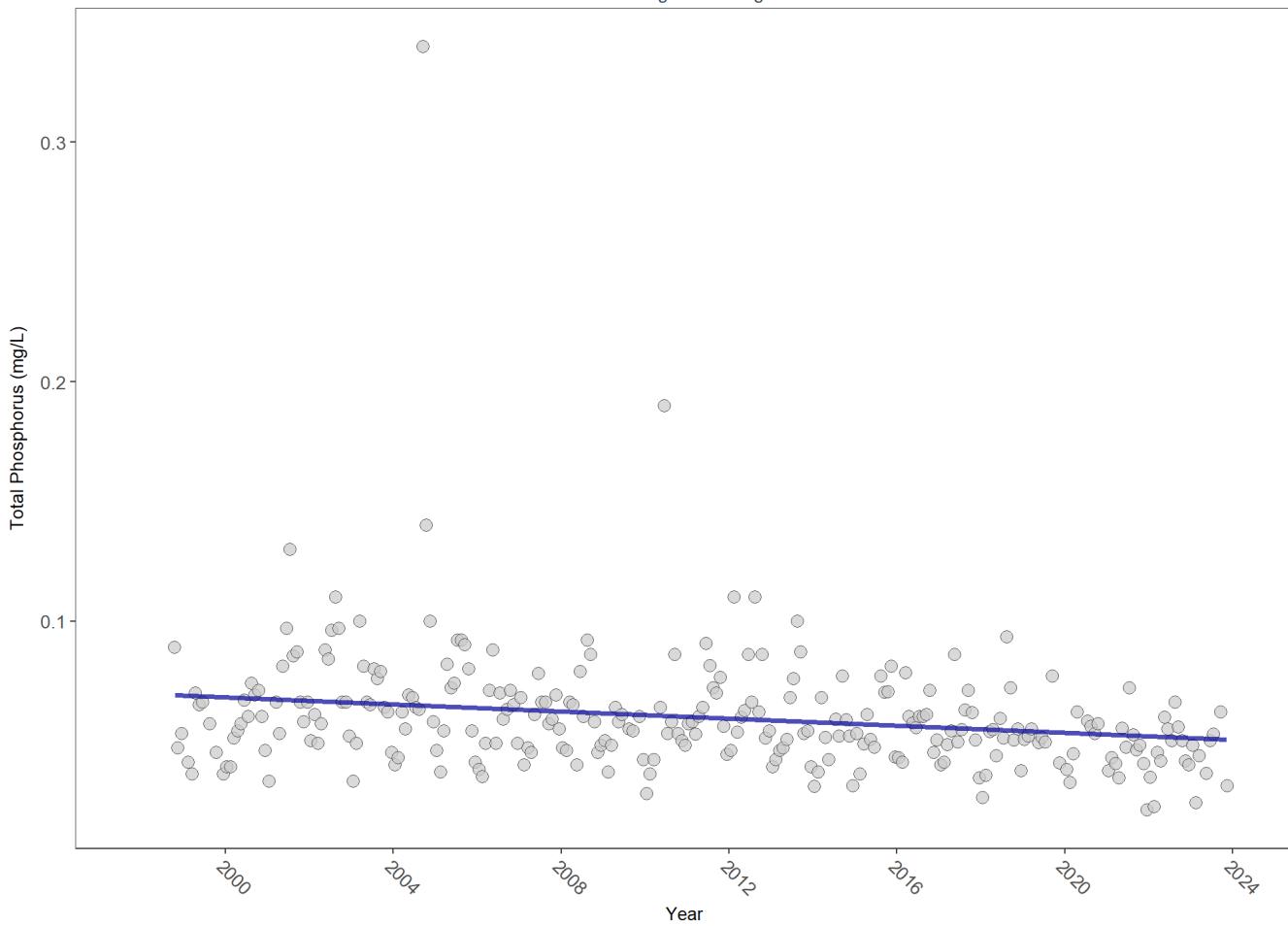


*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Phosphorus

Total Phosphorus, Lab, All Depths  
Waccasassa - Big Bend Seagrasses AP



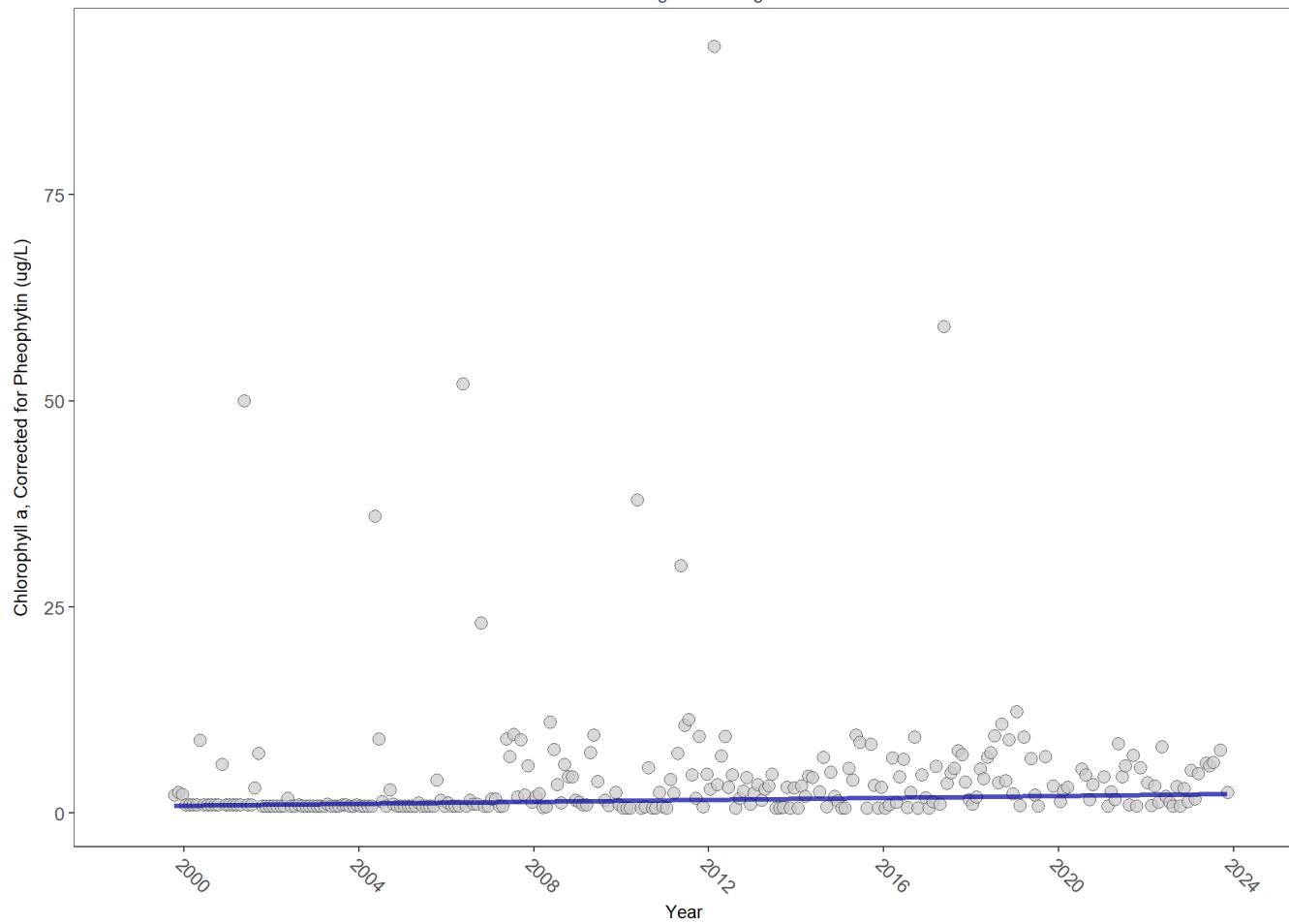
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	680	26	0.054	TRUE	-0.31	0.0000	-0.00075	0.06984056	8.3605	0.6807	-1

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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Chlorophyll a, Corrected for Pheophytin

Chlorophyll a, Corrected for Pheophytin, Lab, All Depths  
Waccasassa - Big Bend Seagrasses AP

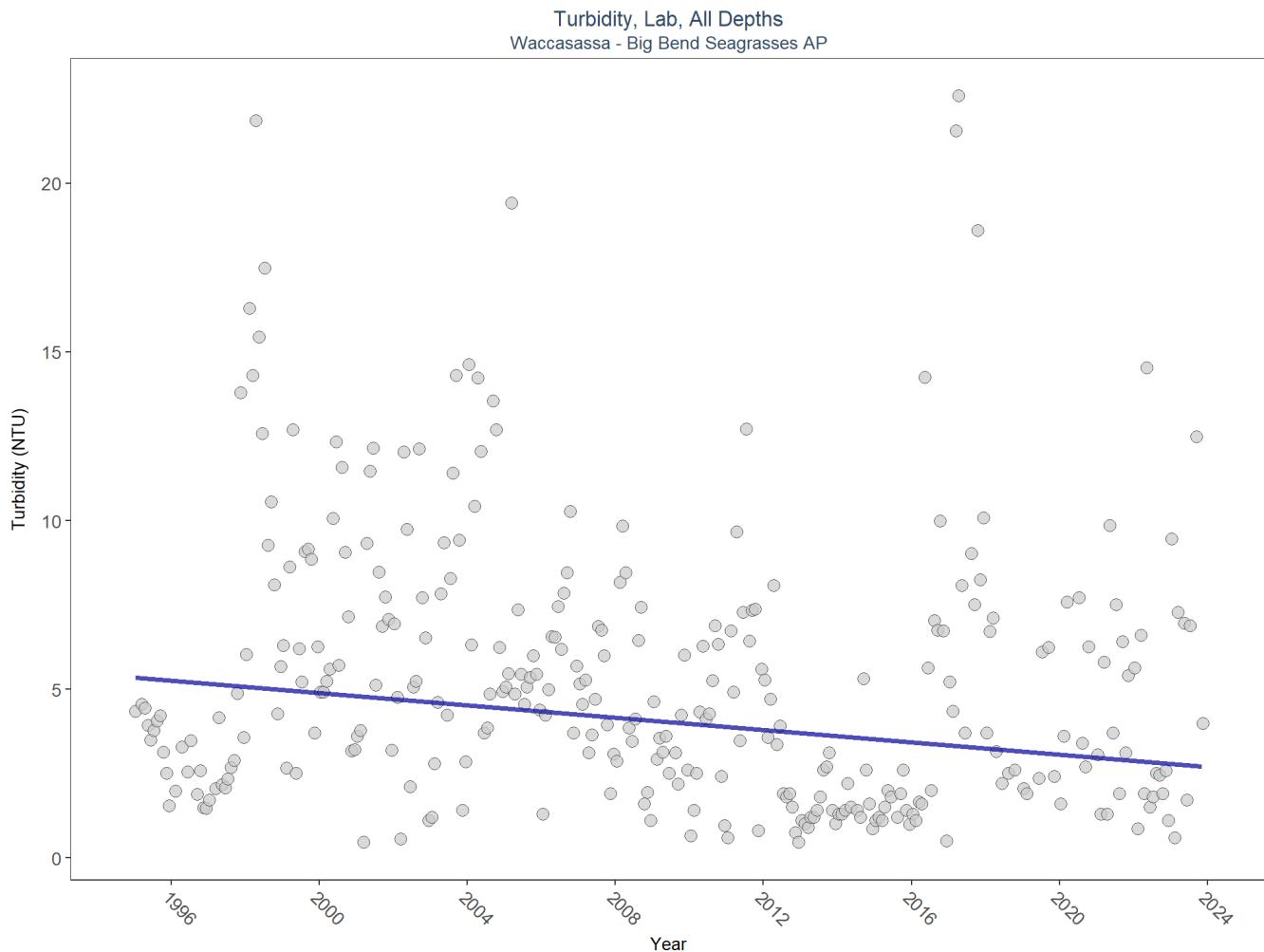


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	644	25	2.85	TRUE	0.1945	0.0000	0.05630952	0.8940009	10.0711	0.524	1

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

SennIntercept is intercept value at beginning of record for monitoring location

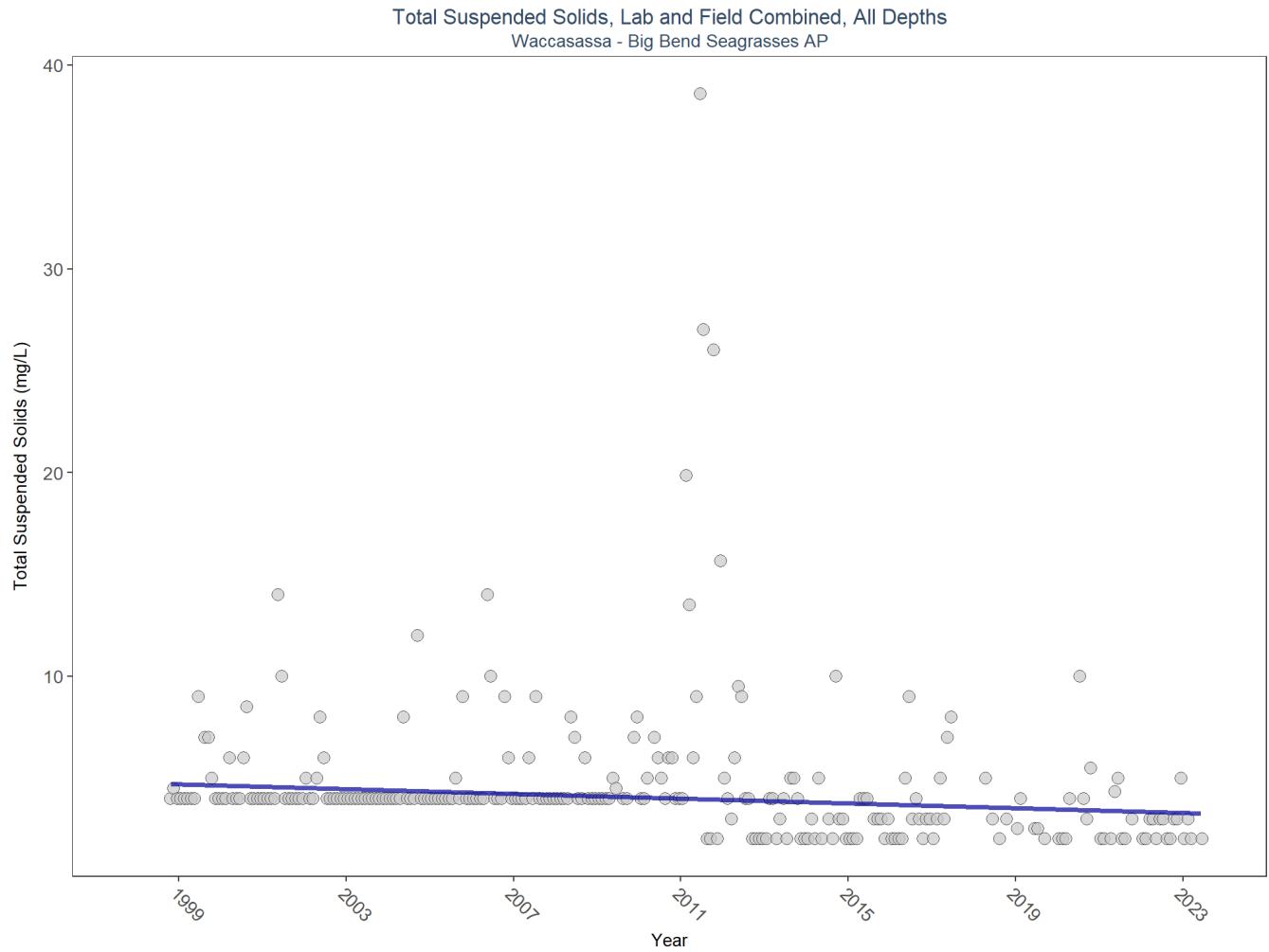
## Turbidity



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

*SennIntercept is intercept value at beginning of record for monitoring location*

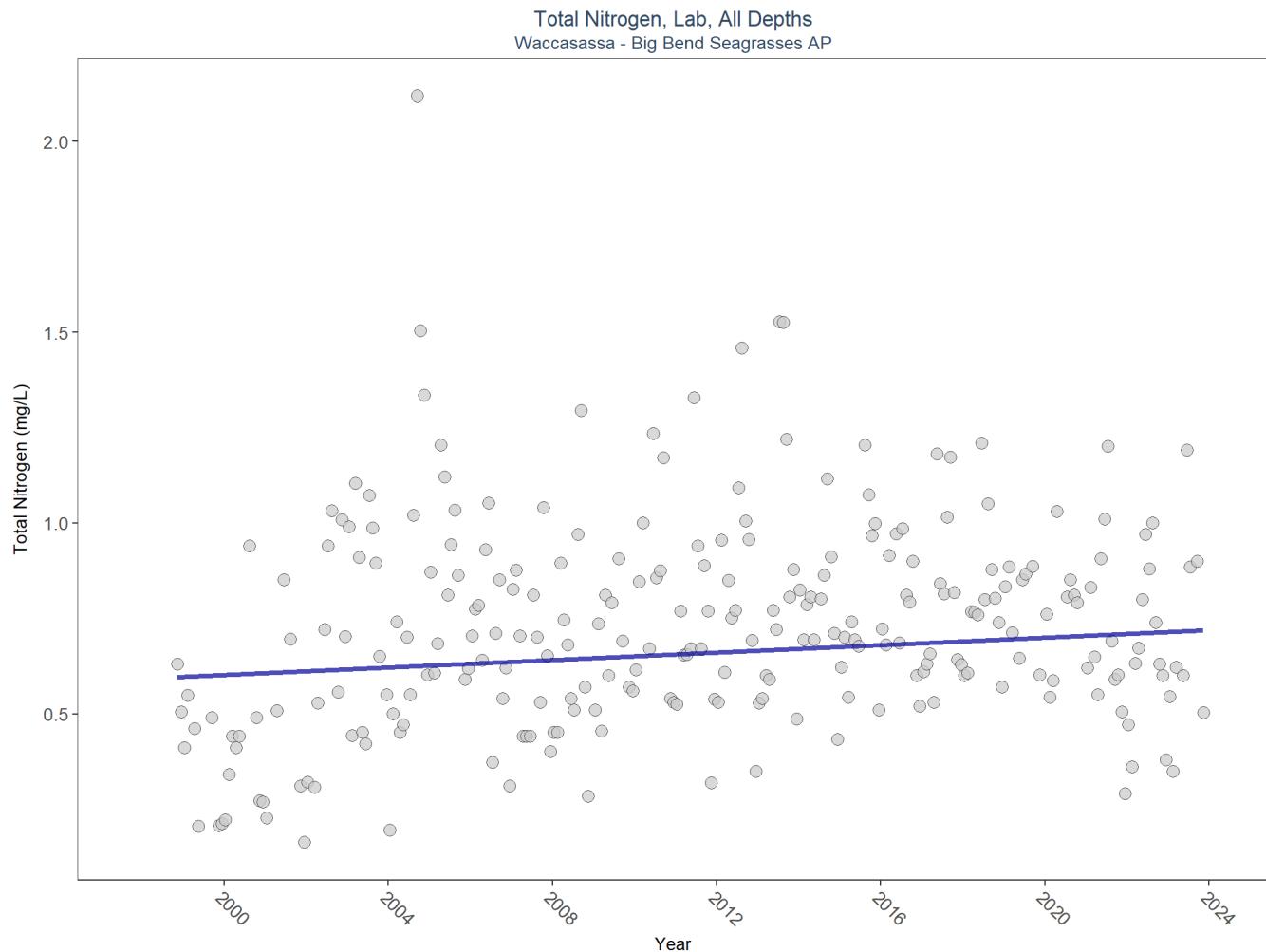
## Total Suspended Solids



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

*SennIntercept is intercept value at beginning of record for monitoring location*

## Total Nitrogen



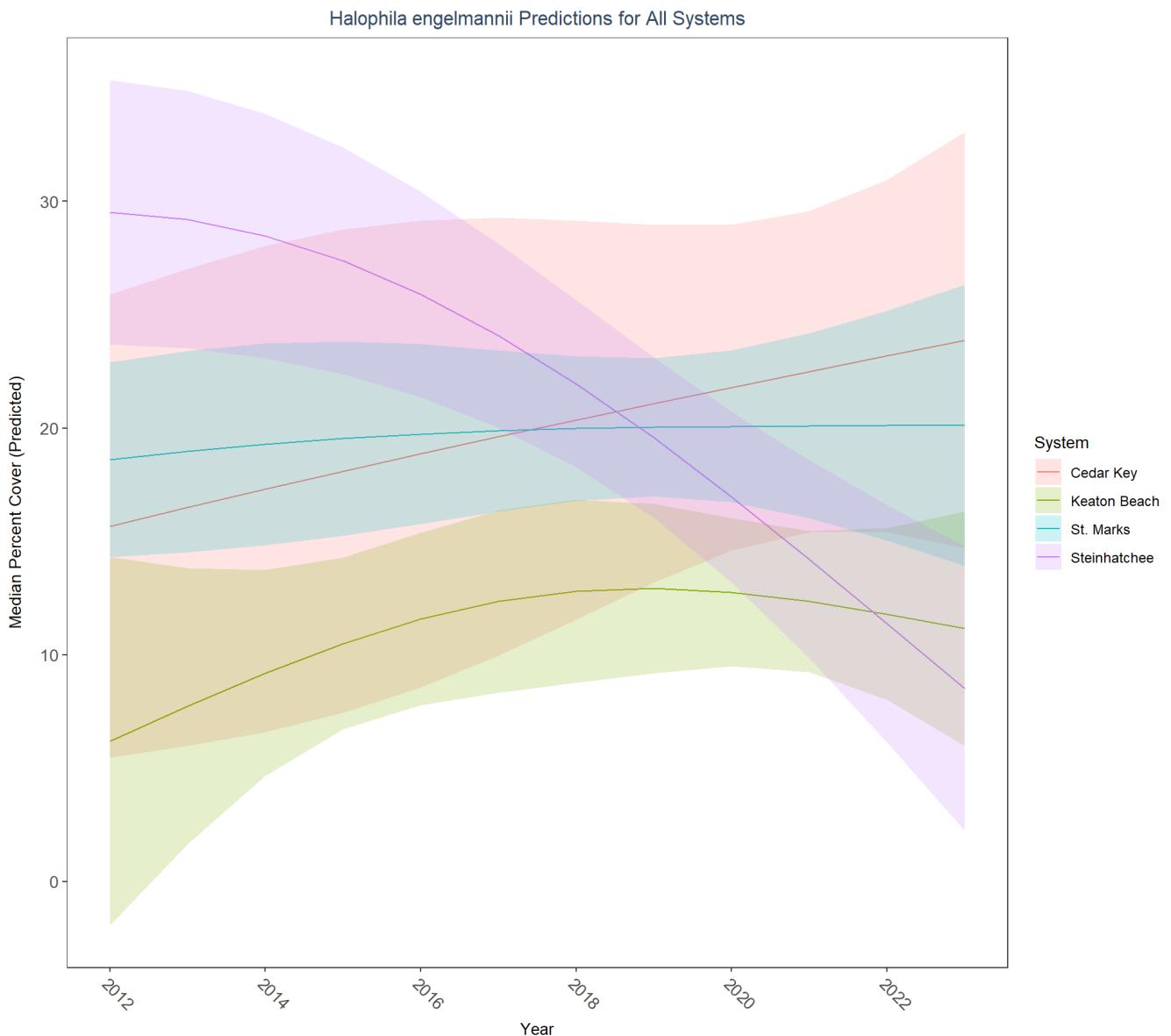
*p < 0.00005 appear as 0 due to rounding.*

*SennIntercept is intercept value at beginning of record for monitoring location*

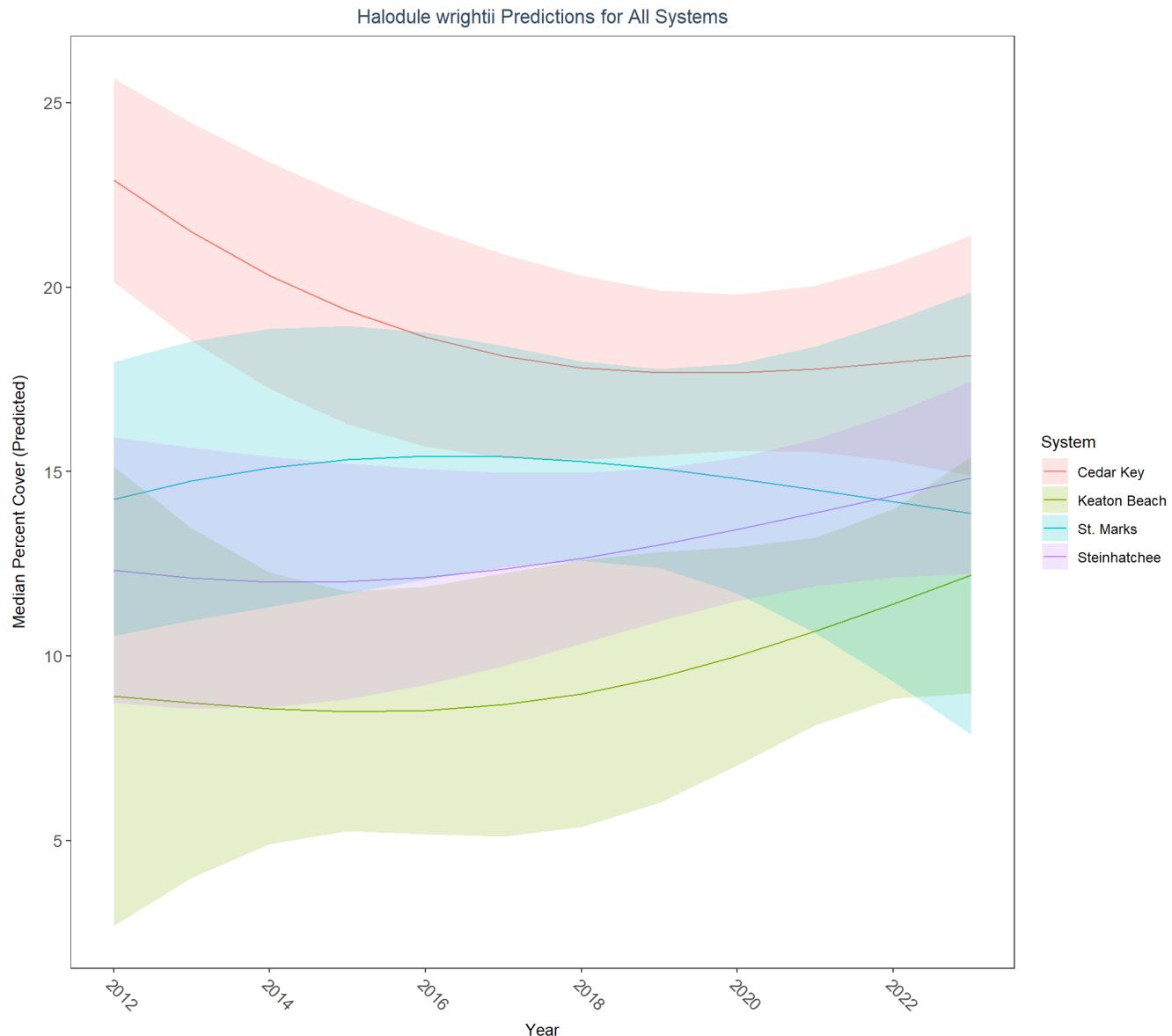
# Submerged Aquatic Vegetation - Generalized Additive Models

Models generated for all systems

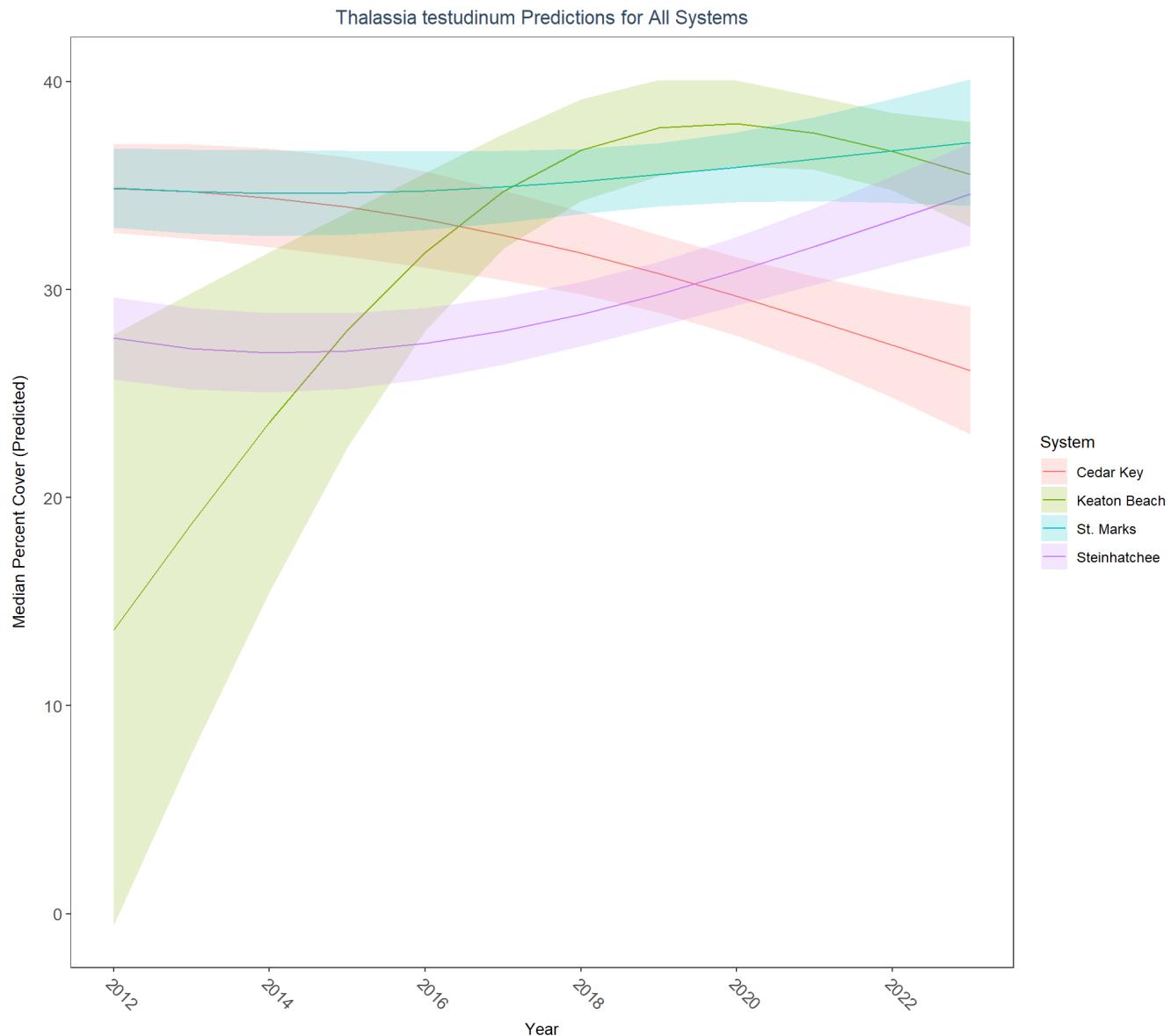
## *Halophila engelmannii*



## *Halodule wrightii*



## **Thalassia testudinum**



## Syringodium filiforme

