

Estero Bay Aquatic Preserve
SEACAR Habitat Analyses

Last compiled on 11 December, 2023

Introduction

What is SEACAR?

The Statewide Ecosystem Assessment of Coastal and Aquatic Resources project was developed by the Florida Department of Environmental Protection's (DEP) [Office of Resilience and Coastal Protection \(RCP\)](#), through consultation with [Florida Coastal Management Program \(FCMP\)](#) partner agencies, to enhance existing coastal and aquatic management efforts and address identified management needs. The project was designed to look at site-specific status and trends of the submerged resources within RCP managed areas to gain statewide perspective. Each of RCP's managed areas is unique. However, visualizing the state's estuarine managed areas as a whole and looking at the habitats that connect them allows us to build upon a common goal of preserving their scientific, economic, aesthetic and recreational values for the benefit of future generations.

Geographic Scope

RCP manages over 5 million acres of coastal and submerged lands across 34 of Florida's 35 coastal counties, encompassing the extensive coastal marshes of the northeast coast, oyster reefs and seagrass beds of the northern Gulf Coast, and crystal-clear waters and coral reefs of South Florida.

The assessment is divided into four geographic regions (northwest, southwest, northeast, and southeast) based on RCP management boundaries. It encompasses RCP's 38 estuarine aquatic preserves and three national estuarine research reserves, the Coral Reef Conservation Program, and the Florida Keys National Marine Sanctuary, which are managed in partnership with the National Oceanic and Atmospheric Administration. See the @ref(StateOverview) section for additional details.

Why is SEACAR Important?

The SEACAR project is a collaborative effort engaging a diverse group of stakeholders. Federal, state, local and nongovernmental agencies as well as academic institutions invest time and money in monitoring, protecting and restoring the state's natural resources. By utilizing current scientific knowledge about our ecosystems, we can look for ways to improve conservation efforts through partnerships, standardizing monitoring methods, reducing duplication of efforts, and pooling resources to capitalize on research and funding opportunities.

The project utilizes current knowledge and scientific data from coastal and marine managed areas to assess the status and long-term trends of submerged habitats, within RCP's estuarine managed areas, to provide the best available science to help guide planning, management, restoration, and policy decisions.

SEACAR Goals:

- Provide consistent data to help coastal managers and planners prioritize and focus management and restoration efforts.
- Establish a consistent system-wide approach to show statewide and site-specific trends over time.
- Translate valuable ecological data into easy-to-read, publicly available documents capable of informing Florida's diverse population of coastal stakeholders.
- Inform management plans developed for each aquatic preserve and national estuarine research reserve.
- Determine the frequency of habitat assessments to allow for adaptive management.
- Promote increased awareness among legislators and the public to improve:
 - Environmental literacy.
 - Policy changes when necessary.
 - Support for scientifically sound policies and programs.

Florida has become a data-rich state due to researchers and managers providing a wealth of knowledge over the years relating to the state's environmental resources. However, environmental monitoring programs are not always well described or easily located. The [SEACAR Data Discovery Interface](#) was created to provide user-friendly, informative and interactive pages linked to the wealth of environmental data, spatial data, protocols and publications across the state.

The SEACAR Data Discovery Interface provides standardized data for submerged and coastal habitats in one place and includes a mapping feature to allow users to visualize data and overlay monitoring sites to assess data gaps, opportunities and partnerships.

Funding

SEACAR is funded by a grant provided through the Florida Coastal Management Program, under the [Coastal Zone Management Act of 1972](#), as amended, National Oceanic and Atmospheric Administration.

Statewide Overview

The RCP manages a statewide network of marine protected areas encompassing over 5 million acres of the state's most pristine and diverse marine, coastal and aquatic habitats, from mangroves and salt marshes to seagrass beds, coral reefs and oyster reefs.

The statewide network of 42 aquatic preserves, three national estuarine research reserves (NERRs), the Florida Keys National Marine Sanctuary (FKNMS) and Florida's Coral Reef Conservation Program (CRCP) are managed to preserve and protect the scientific, economic, aesthetic and recreational values associated with the state's submerged resources for the benefit of future generations.

National Estuarine Research Reserve System

Florida's NERRs are part of the National Estuarine Research Reserve System, which encompasses a nationwide network of 30 coastal sites spanning 1.3 million acres. Designated to protect and study estuarine systems, management of the research reserves focuses on four primary components: 1) stewardship, 2) research, 3) training, and 4) education. The NERRS are cooperatively managed by the National Oceanic and Atmospheric Administration (NOAA) and the coastal states. Established through the Coastal Zone Management Act, NERRs are managed by a lead agency or university with input from local partners. NOAA provides funding and guidance.

Aquatic Preserves

Aquatic preserves are state-owned sovereign submerged lands in areas that have been set aside for the benefit of future generations due to their exceptional biological, aesthetic and scientific value (Chapter 258.39, Florida Statutes) and they hold the designation of Outstanding Florida Waters (62-302.700, Florida Administrative Code).

The first aquatic preserve, Estero Bay, was established in Southwest Florida in 1966. In 1975, the Florida Aquatic Preserve Act was passed, and the existing preserves were brought under a standard set of management criteria. Today, Florida has 42 aquatic preserves, encompassing over 5.2 million acres. The most recent designation was the Nature Coast Aquatic Preserve in 2020.

Coral Reef Conservation Program

The Coral Reef Conservation Program coordinates research and monitoring along the northern section of Florida's Coral Reef, which extends over 350 nautical miles from the St. Lucie Inlet in Martin County to the Dry Tortugas. The program also develops management strategies and promotes partnerships to protect the coral reefs, hardbottom communities and associated reef resources.

In 2018, House Bill 53 passed, establishing and protecting the Coral Reef Ecosystem Conservation Area (ECA). The ECA includes the sovereign submerged lands and state waters offshore of Martin, Palm Beach, Broward and Miami-Dade counties from the northern boundary of Biscayne National Park to the St. Lucie Inlet.

Florida Keys National Marine Sanctuary

The Florida Keys National Marine Sanctuary is one of 15 Marine Protected Areas that make up the National Marine Sanctuary System. It encompasses 2,900 square nautical miles of waters surrounding the Florida Keys, from south of Miami westward to the Dry Tortugas, excluding Dry Tortugas National Park.

Designated in 1990, the FKNMS is administered by NOAA and is jointly managed with the state of Florida. The sanctuary is managed to encourage recreational activities such as diving, swimming, snorkeling and fishing while reducing user conflict and protecting cultural and natural resources that include shipwrecks, a coral barrier reef system, seagrass beds, mangroves and associated marine life.

Office of Resilience and Coastal Protection Regions

The SEACAR assessment is divided into four regions: northwest, southwest, northeast and southeast. These regions mirror Office of Resilience and Coastal Protection's (RCP)'s management regions and were developed based on location and management needs. Aquatic preserve offices gain local support for their science-based management through coordination with the regional research reserves and the Coral Reef Conservation Program.



Figure 1: The Office of Resilience and Coastal Protection oversees a total of 45 managed areas around the state that include a wide variety of marine, estuarine, aquatic, and upland habitats.

Threshold Filtering

Threshold filters, following Florida Department of Environmental Protection Division of Environmental Assessment and Restoration (DEAR) are used to exclude specific results values from the SEACAR Analysis. Based on the threshold filters, QAQC Flags are inserted into the SEACAR_QAQCFlagCode and SEACAR_QAQC_Description columns of the export data. The Include_YN column indicates whether the QAQC Flag will also indicate that data are excluded from analysis. No data are excluded from the data export, but the analysis scripts can use the Include_YN column to exclude data.

Table 1: Continuous Water Quality threshold values

Parameter Name	Units	Low Threshold	High Threshold	Sensor Type
Dissolved Oxygen	mg/L	0	50	YSI EXOs
Dissolved Oxygen	mg/L	0	50	Analysis Only - 2022-04-04
Dissolved Oxygen	mg/L	0	50	6600 Series
Salinity	ppt	0	70	6600 Series
Salinity	ppt	0	70	YSI EXOs
Salinity	ppt	0	70	Analysis Only - 2022-04-04
Water Temperature	Degrees C	-5	45	YSI EXOs
Water Temperature	Degrees C	-5	45	Analysis Only - 2022-04-04
Water Temperature	Degrees C	-5	45	6600 Series
pH		2	14	Analysis Only - 2022-04-04
pH		2	14	6600 Series
pH		2	14	YSI EXOs
Dissolved Oxygen Saturation	%	0	500	YSI EXOs
Dissolved Oxygen Saturation	%	0	500	6600 Series
Dissolved Oxygen Saturation	%	0	500	Analysis Only - 2022-04-04
Specific Conductivity	mS/cm	0	100	6600 Series
Specific Conductivity	mS/cm	0	200	YSI EXOs
Turbidity	NTU	0	4000	YSI EXOs
Turbidity	NTU	0	1000	6600 Series
Turbidity	NTU	0	4000	Analysis Only - 2022-04-04

Table 2: Discrete Water Quality threshold values

Parameter Name	Units	Low Threshold	High Threshold
Dissolved Oxygen	mg/L	>0	22
Salinity	ppt	0	70
Water Temperature	Degrees C	3	40
pH		2	13
Dissolved Oxygen Saturation	%	>0	310
Specific Conductivity	mS/cm	>0.005	100
Turbidity	NTU	0	
Total Suspended Solids (TSS)	mg/L	0	
Chlorophyll a uncorrected for pheophytin	ug/L	0	
Chlorophyll a corrected for pheophytin	ug/L	0	
Secchi Depth	m	0	50
Light Extinction Coefficient	m^{-1}	0	
Colored dissolved organic matter, CDOM	PCU	0	
Fluorescent dissolved organic matter, FDOM	QSE	0	
Total Nitrogen	mg/L	0	
Total Kjeldahl Nitrogen TKN	mg/L	0	
NO ₂ +3 Filtered	mg/L	0	
NH ₄ Filtered	mg/L	0	

Parameter Name	Units	Low Threshold	High Threshold
Total Phosphorus	mg/L	0	
PO4 Filtered	mg/L	0	
Ammonia- Un-ionized (NH3)	mg/L	0	
Nitrate (N)	mg/L	0	
Nitrite (N)	mg/L	0	
Nitrogen, organic	mg/L	0	

Table 3: QA Flags inserted based on threshold checks

SEACAR QAQC Description	Include YN	SEACAR QAQCFlagCode
Exceeds Maximum threshold. Not verified in raw data	N	2Q
Exceeds Maximum threshold. Verified in raw data	N	3Q
Below Minimum threshold. Not verified in raw data	N	4Q
Below Minimum threshold. Verified in raw data	N	5Q
Within threshold tolerance	Y	6Q
No defined thresholds for this parameter	Y	7Q

Value Qualifiers

Value qualifier codes included within the data are used to exclude certain results from the analysis. The data are retained in the data export files, but the analysis uses the “Include” column to filter the results.

STORET and WIN value qualifier codes

Value qualifier codes from STORET and WIN data are examined with the database and used to populate the Include_YN column in data exports.

Table 4: Value Qualifier codes excluded from analysis

Value Qualifier	Include YN	MDL YN	Qualifier Source
H	0	0	STORET-WIN
J	0	0	STORET-WIN
V	0	0	STORET-WIN
Y	0	0	STORET-WIN

Systemwide Monitoring Program (SWMP) value qualifier codes

Value qualifier codes from the SWMP continuous program are examined with the database and used to populate the Include_YN column in data exports. SWMP Qualifier Codes are indicated by QualifierSource=SWMP.

Table 5: SWMP Value Qualifier codes

Qualifier Source	ValueQualifier	Include YN	Description
SWMP	-1	1	Optional parameter not collected
SWMP	-2	0	Missing data
SWMP	-3	0	Data rejected due to QA/QC
SWMP	-4	0	Outside low sensor range
SWMP	-5	0	Outside high sensor range
SWMP	0	1	Passed initial QA/QC checks
SWMP	1	0	Suspect data
SWMP	2	1	Reserved for future use

<i>Qualifier</i>	<i>Source</i>	<i>Value</i>	<i>Qualifier</i>	<i>Include</i>	<i>YN</i>	<i>Description</i>
SWMP		3		1		Calculated data: non-vented depth/level sensor correction for changes in barometric pressure
SWMP		4		1		Historical: Pre-auto QA/QC
SWMP		5		1		Corrected data

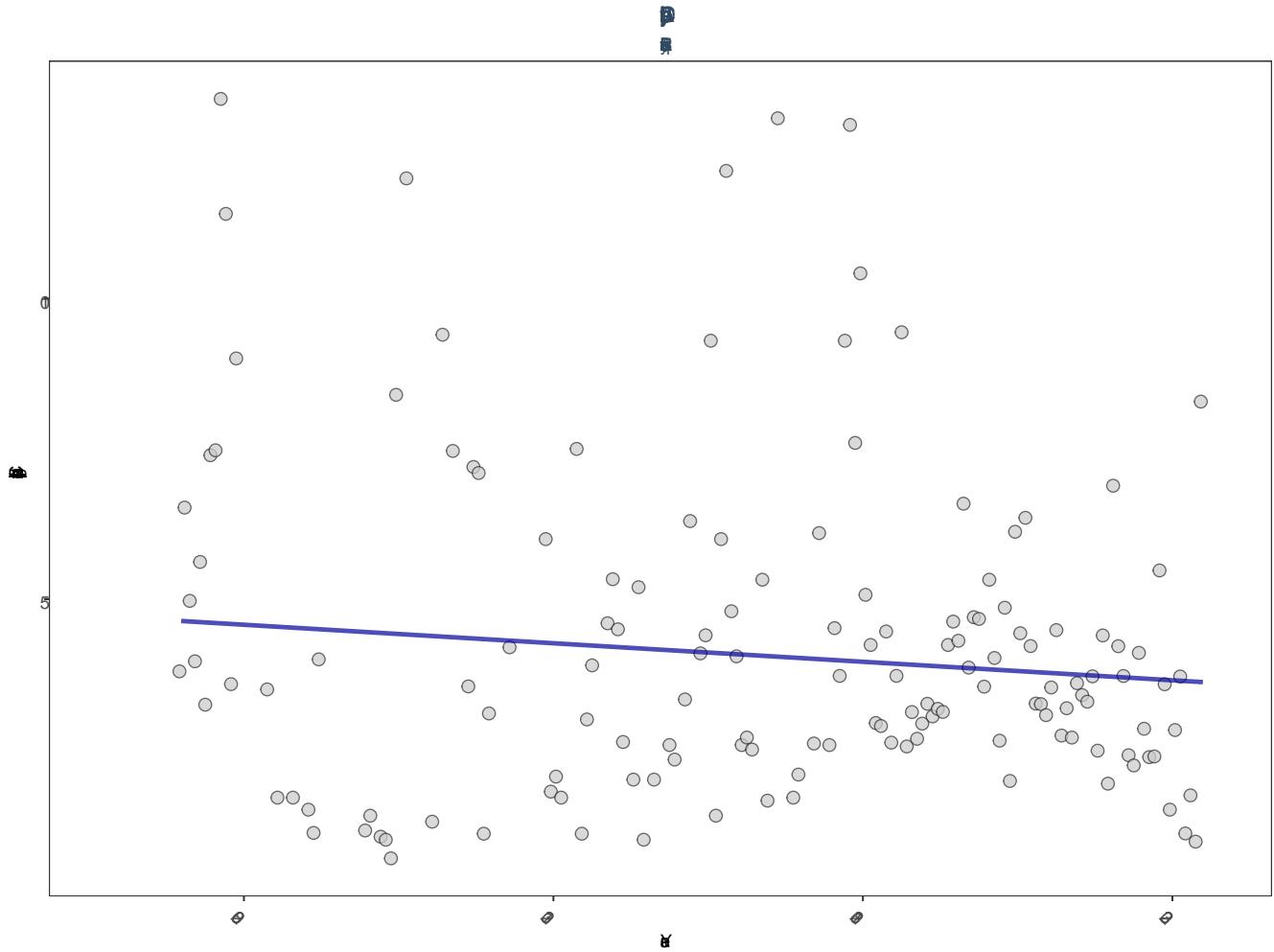
Water Quality - Discrete

The following files were used in the discrete analysis:

- *Combined_WQ_WC_NUT_Chlorophyll_a_corrected_for_pheophytin-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_Chlorophyll_a_uncorrected_for_pheophytin-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_Colored_dissolved_organic_matter_CDOM-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_Dissolved_Oxygen-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_Dissolved_Oxygen_Saturation-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_pH-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_Salinity-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_Secchi_Depth-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_Total_Nitrogen-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_Total_Phosphorus-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_Total_Suspended_Solids_TSS-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_Turbidity-2023-Oct-11.txt*
- *Combined_WQ_WC_NUT_Water_Temperature-2023-Oct-11.txt*

Chlorophyll a corrected for pheophytin

Discrete Seasonal Kendall-Tau Trend Analysis



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	2028	18	2.9	TRUE	-0.0774	0.3014	-0.06159879	4.698829	16.8313	0.113	0

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

SennIntercept is intercept value at beginning of record for monitoring location

Table 6: Programs contributing data for Chlorophyll a corrected for pheophytin

ProgramID	N_Data	YearMin	YearMax
5002	1347	2006	2023
476	486	2008	2023
103	170	2020	2021
4063	59	2018	2022

Program names:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

4063 - Estero Bay Tributary Monitoring

Table 7: Value Qualifiers for Chlorophyll a corrected for pheophytin

<i>Year</i>	<i>N_Total</i>	<i>N_I</i>	<i>perc_I</i>	<i>N_Q</i>	<i>perc_Q</i>	<i>N_U</i>	<i>perc_U</i>
2006	1	1	100.0				
2007	46	3	6.5			4	8.7
2008	5	2	40.0				
2009	8	7	87.5				
2010	9	5	55.6	3	33.3	1	11.1
2011	14	3	21.4	6	42.9		
2012	6	2	33.3			2	33.3
2013	25	10	40.0			5	20.0
2014	20	1	5.0	1	5.0	5	25.0
2015	26	4	15.4			3	11.5
2016	22	8	36.4	2	9.1		
2017	49	4	8.2				
2018	304	78	25.7				
2019	310	66	21.3			2	0.7
2020	307	60	19.5	3	1.0	1	0.3
2021	514	120	23.4			13	2.5
2022	310	110	35.5	3	1.0	20	6.4
2023	86	29	33.7			24	27.9

Programs containing Value Qualified data:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

5002 - Florida STORET / WIN

4063 - Estero Bay Tributary Monitoring

Value Qualifiers

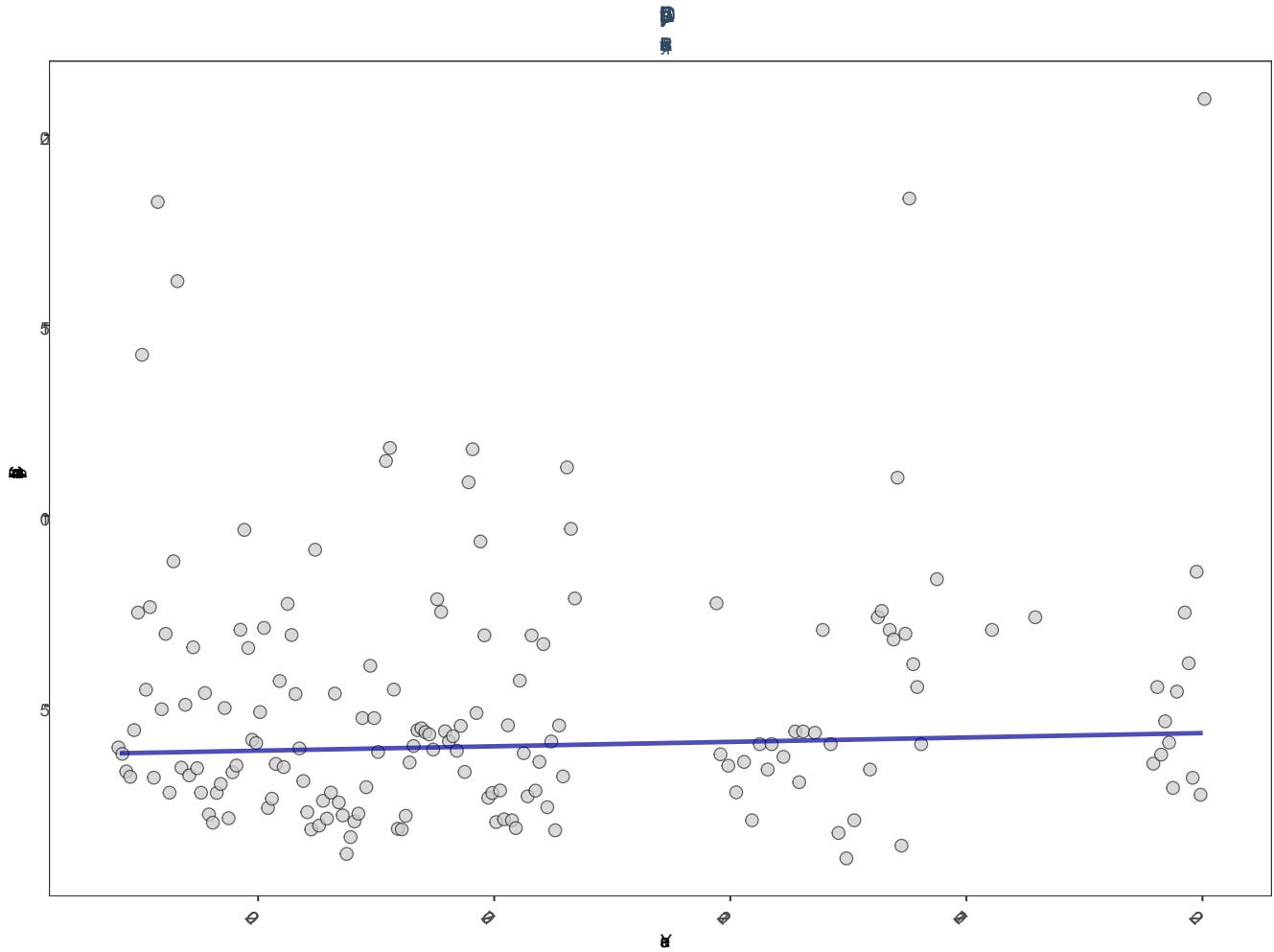
I - The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantitation limit.

Q - Sample held beyond the accepted holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.

U - Indicates that the compound was analyzed for but not detected. This symbol shall be used to indicate that the specified component was not detected. The value associated with the qualifier shall be the laboratory method detection limit. Unless requested by the client, less than the method detection limit values shall not be reported

Chlorophyll a uncorrected for pheophytin

Discrete Seasonal Kendall-Tau Trend Analysis



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	601	21	3.84	TRUE	0.0462	0.4425	0.02310179	3.759233	9.6145	0.5654	0

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Table 8: Programs contributing data for Chlorophyll a uncorrected for pheophytin

ProgramID	N_Data	YearMin	YearMax
509	347	1999	2008
103	110	2003	2022
5002	82	2011	2016
476	69	1999	2008
514	7	2013	2018
115	1	2003	2003

Program names:

509 - SERC Water Quality Monitoring Network

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

514 - Florida LAKEWATCH Program

115 - Environmental Monitoring Assessment Program

Table 9: Value Qualifiers for Chlorophyll a uncorrected for pheophytin

Year	N_Total	N_I	perc_I	N_Q	perc_Q	N_U	perc_U
2000	46					2	4.3
2001	42					6	14.3
2003	44					6	13.6
2004	40	6	15.0			1	2.5
2005	37					1	2.7
2006	45					4	8.9
2007	55	14	25.4			2	3.6
2008	31	3	9.7				
2011	7			1	14.3		

Programs containing Value Qualified data:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

5002 - Florida STORET / WIN

Value Qualifiers

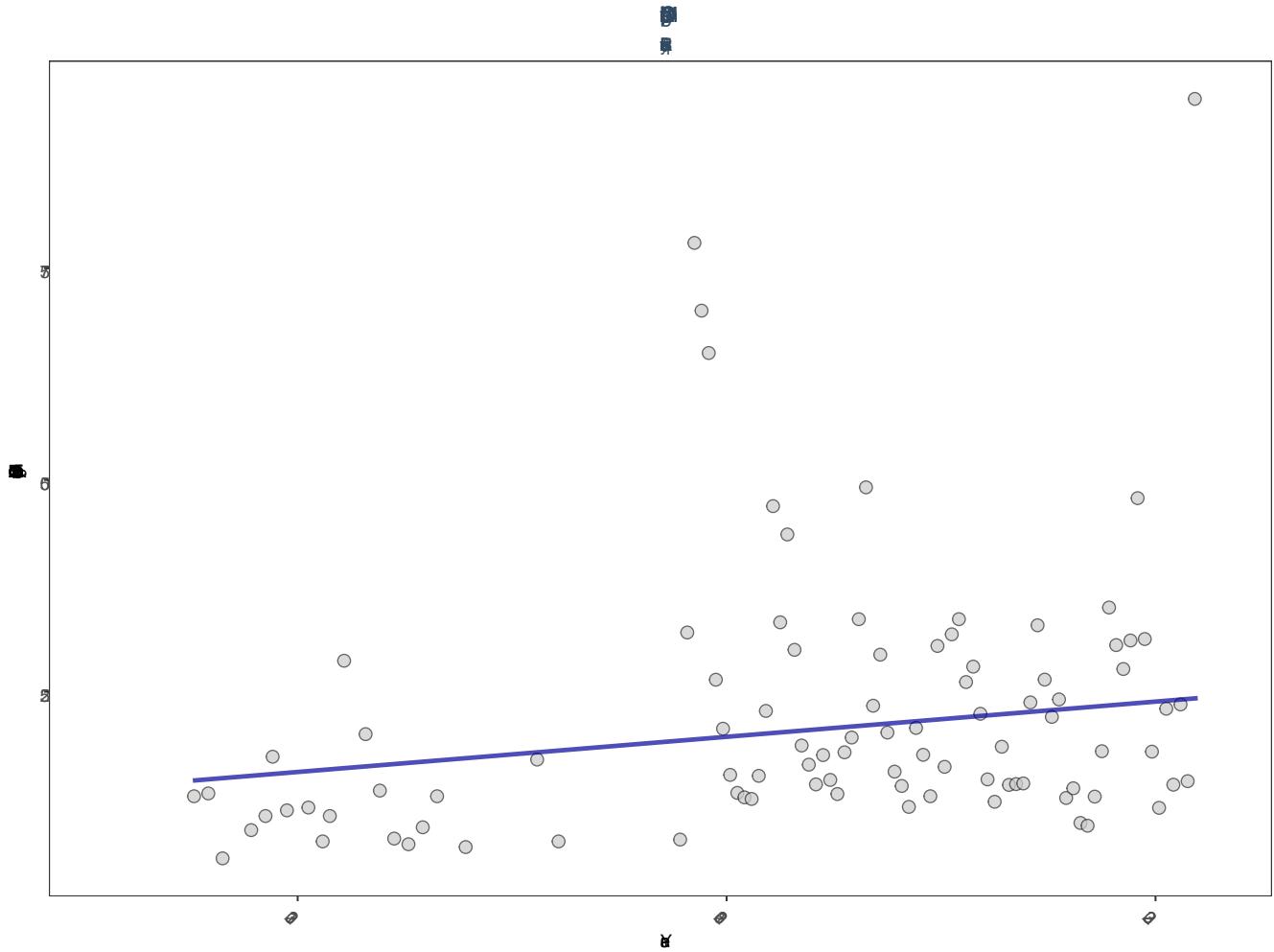
I - The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantitation limit.

Q - Sample held beyond the accepted holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.

U - Indicates that the compound was analyzed for but not detected. This symbol shall be used to indicate that the specified component was not detected. The value associated with the qualifier shall be the laboratory method detection limit. Unless requested by the client, less than the method detection limit values shall not be reported

Colored dissolved organic matter, CDOM

Discrete Seasonal Kendall-Tau Trend Analysis



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	1504	13	14	TRUE	0.2632	0.0009	0.8307738	13.86907	13.4404	0.2655	1

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

SennIntercept is intercept value at beginning of record for monitoring location

Table 10: Programs contributing data for Colored dissolved organic matter, CDOM

ProgramID	N_Data	YearMin	YearMax
5002	1170	2018	2023
476	216	2017	2023
514	63	2011	2017
4063	59	2018	2022

Program names:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

514 - Florida LAKEWATCH Program

4063 - Estero Bay Tributary Monitoring

Table 11: Value Qualifiers for Colored dissolved organic matter,
CDOM

<i>Year</i>	<i>N_Total</i>	<i>N_I</i>	<i>perc_I</i>	<i>N_Q</i>	<i>perc_Q</i>	<i>N_U</i>	<i>perc_U</i>
2017	35	4	11.4				
2018	275	34	12.4			4	1.4
2019	268	36	13.4			9	3.4
2020	242	49	20.2	1	0.4	2	0.8
2021	299	39	13.0			11	3.7
2022	261	38	14.6			7	2.7
2023	68	9	13.2				

Programs containing Value Qualified data:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

Value Qualifiers

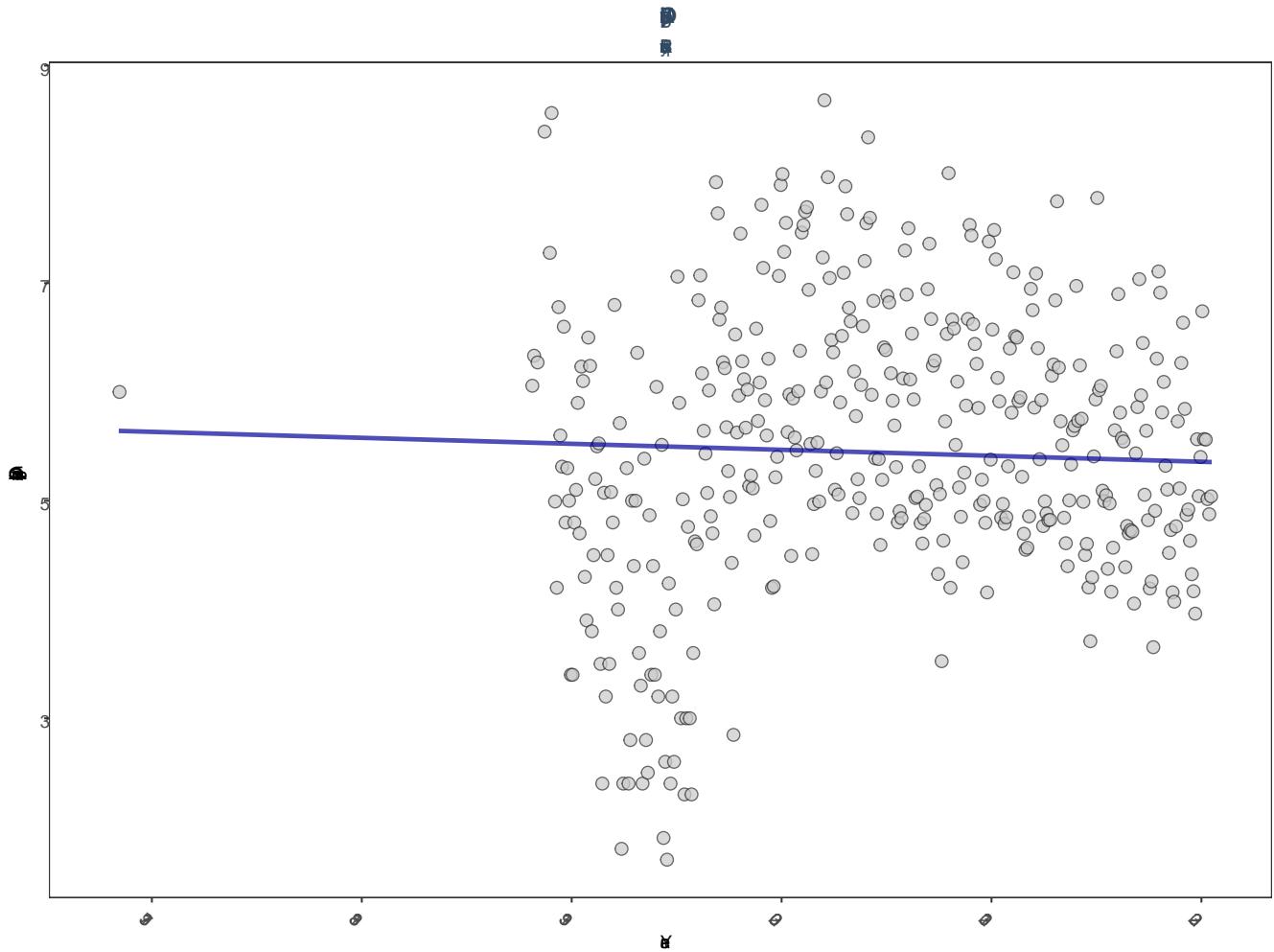
I - The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantitation limit.

Q - Sample held beyond the accepted holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.

U - Indicates that the compound was analyzed for but not detected. This symbol shall be used to indicate that the specified component was not detected. The value associated with the qualifier shall be the laboratory method detection limit. Unless requested by the client, less than the method detection limit values shall not be reported

Dissolved Oxygen

Discrete Seasonal Kendall-Tau Trend Analysis



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	10458	34	5.87755	TRUE	-0.0406	0.2784	-0.005504329	5.644494	11.387	0.4114	0

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

SennIntercept is intercept value at beginning of record for monitoring location

Table 12: Programs contributing data for Dissolved Oxygen

ProgramID	N_Data	YearMin	YearMax
5002	6026	1991	2023
69	2258	2001	2007
509	696	1999	2008
4064	619	2011	2012
95	442	1971	2018
476	305	2008	2023
103	252	2003	2022
4042	46	2016	2022
115	2	2003	2003

Program names:

5002 - Florida STORET / WIN
69 - Fisheries-Independent Monitoring (FIM) Program
509 - SERC Water Quality Monitoring Network
4064 - A spatial model to improve site selection for seagrass restoration in shallow boating environments
95 - Harmful Algal Bloom Marine Observation Network
476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network
103 - EPA STOrage and RETrieval Data Warehouse (STORET)
4042 - Estero Bay Oyster Monitoring
115 - Environmental Monitoring Assessment Program

Table 13: Value Qualifiers for Dissolved Oxygen

Year	N_Total	N_H	perc_H
2008	301	10	3.3

Programs containing Value Qualified data:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

Value Qualifiers

H - Value based on field kit determination; results may not be accurate. This code shall be used if a field screening test (e.g., field gas chromatograph data, immunoassay, or vendor-supplied field kit) was used to generate the value and the field kit or method has not been recognized by the Department as equivalent to laboratory methods.

Dissolved Oxygen Saturation

Discrete Seasonal Kendall-Tau Trend Analysis

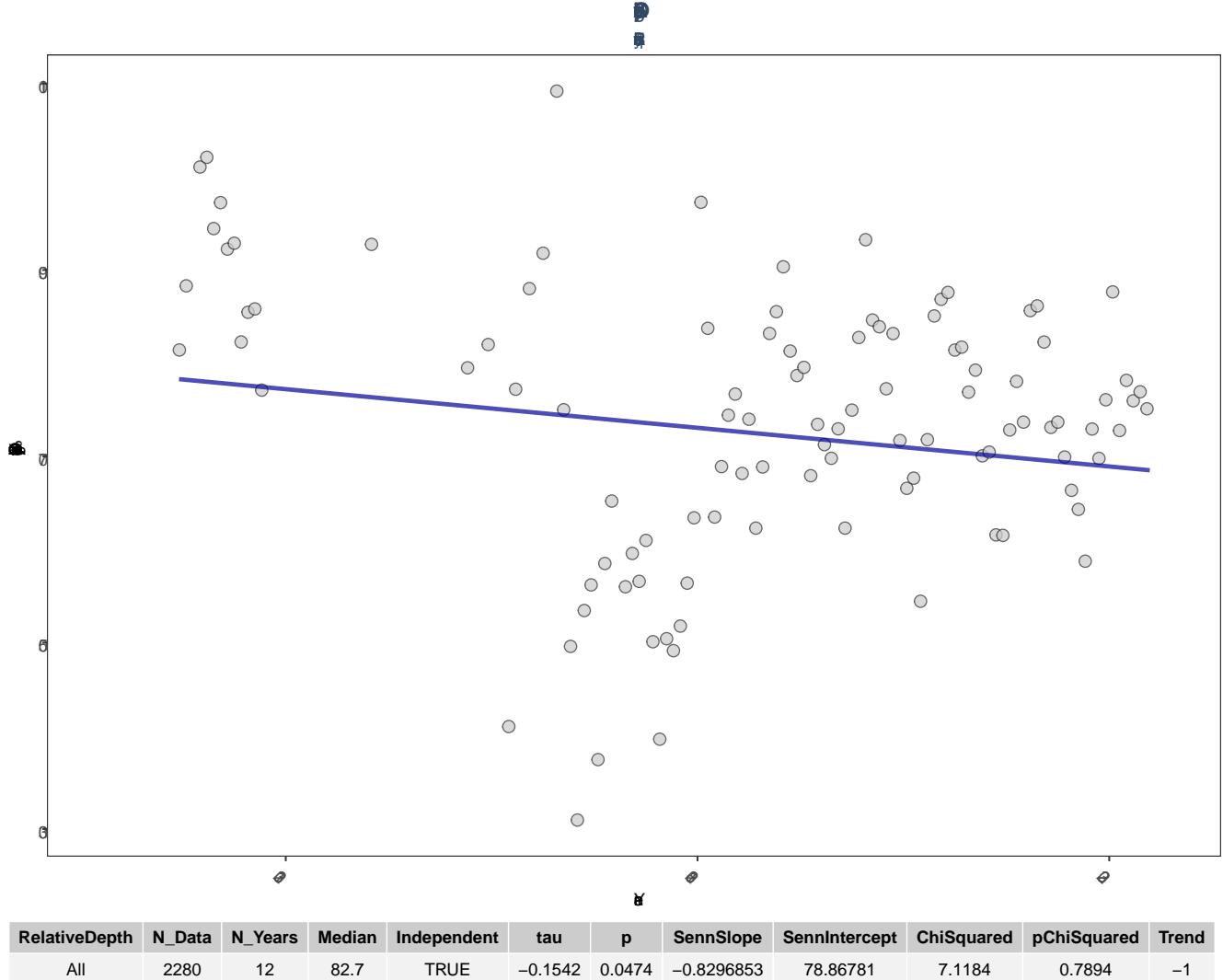


Table 14: Programs contributing data for Dissolved Oxygen Saturation

ProgramID	N_Data	YearMin	YearMax
5002	1328	2015	2023
4064	619	2011	2012
476	182	2017	2023
95	120	2011	2018
4042	37	2016	2022

Program names:

5002 - Florida STORET / WIN

4064 - A spatial model to improve site selection for seagrass restoration in shallow boating environments

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

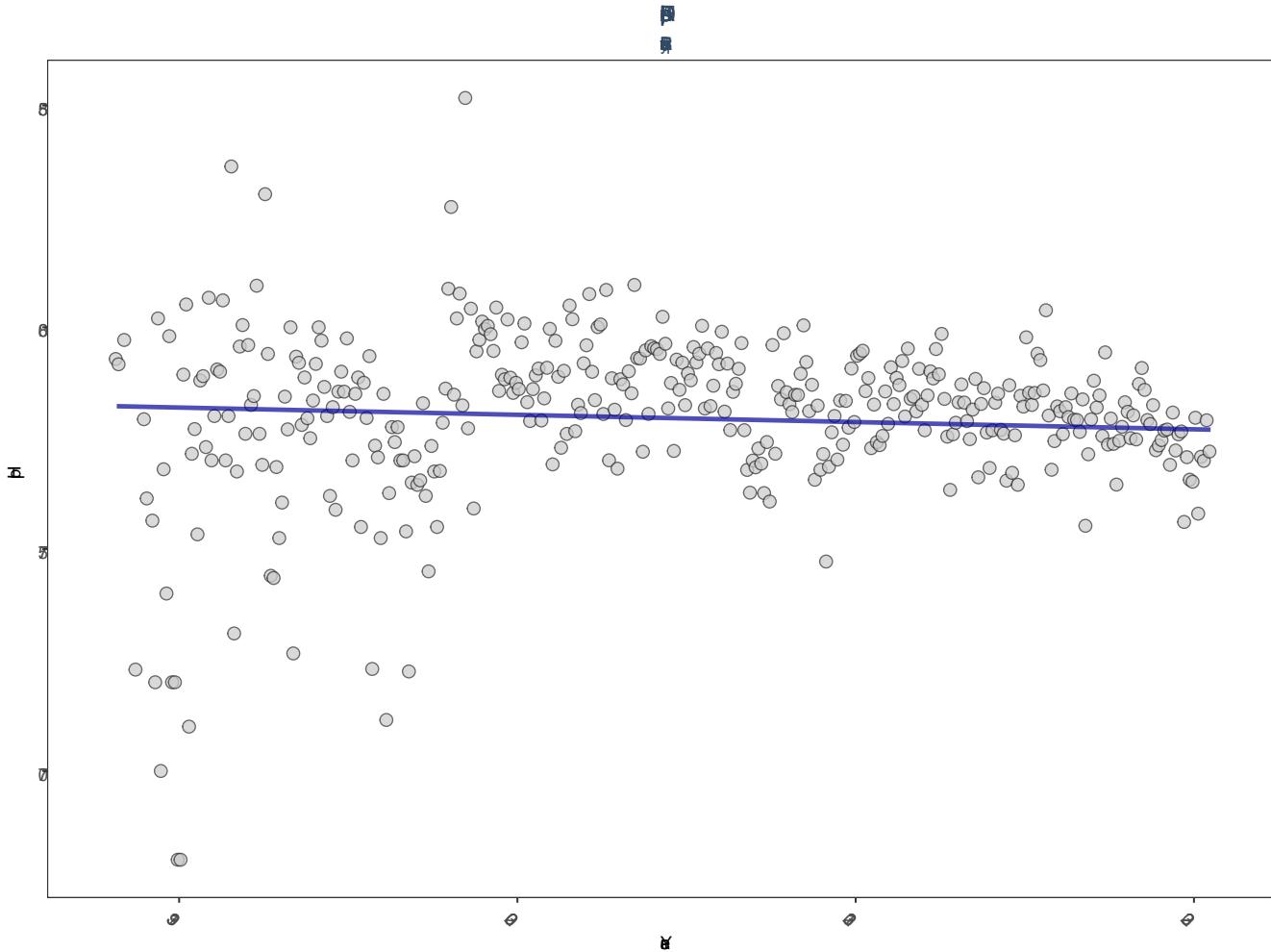
95 - Harmful Algal Bloom Marine Observation Network

4042 - Estero Bay Oyster Monitoring

There are no qualifying Value Qualifiers for Dissolved Oxygen Saturation in Estero Bay Aquatic Preserve

pH

Discrete Seasonal Kendall-Tau Trend Analysis



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

SennIntercept is intercept value at beginning of record for monitoring location

Table 15: Programs contributing data for pH

ProgramID	N_Data	YearMin	YearMax
5002	6311	1991	2023
69	2264	2001	2007
95	444	2005	2018
509	270	2001	2008
103	252	2020	2022

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
476	243	2009	2023
4042	40	2016	2022
115	2	2003	2003

Program names:

- 5002 - Florida STORET / WIN
- 69 - Fisheries-Independent Monitoring (FIM) Program
- 95 - Harmful Algal Bloom Marine Observation Network
- 509 - SERC Water Quality Monitoring Network
- 103 - EPA STOrage and RETrieval Data Warehouse (STORET)
- 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network
- 4042 - Estero Bay Oyster Monitoring
- 115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for pH in Estero Bay Aquatic Preserve

Salinity

Discrete Seasonal Kendall-Tau Trend Analysis

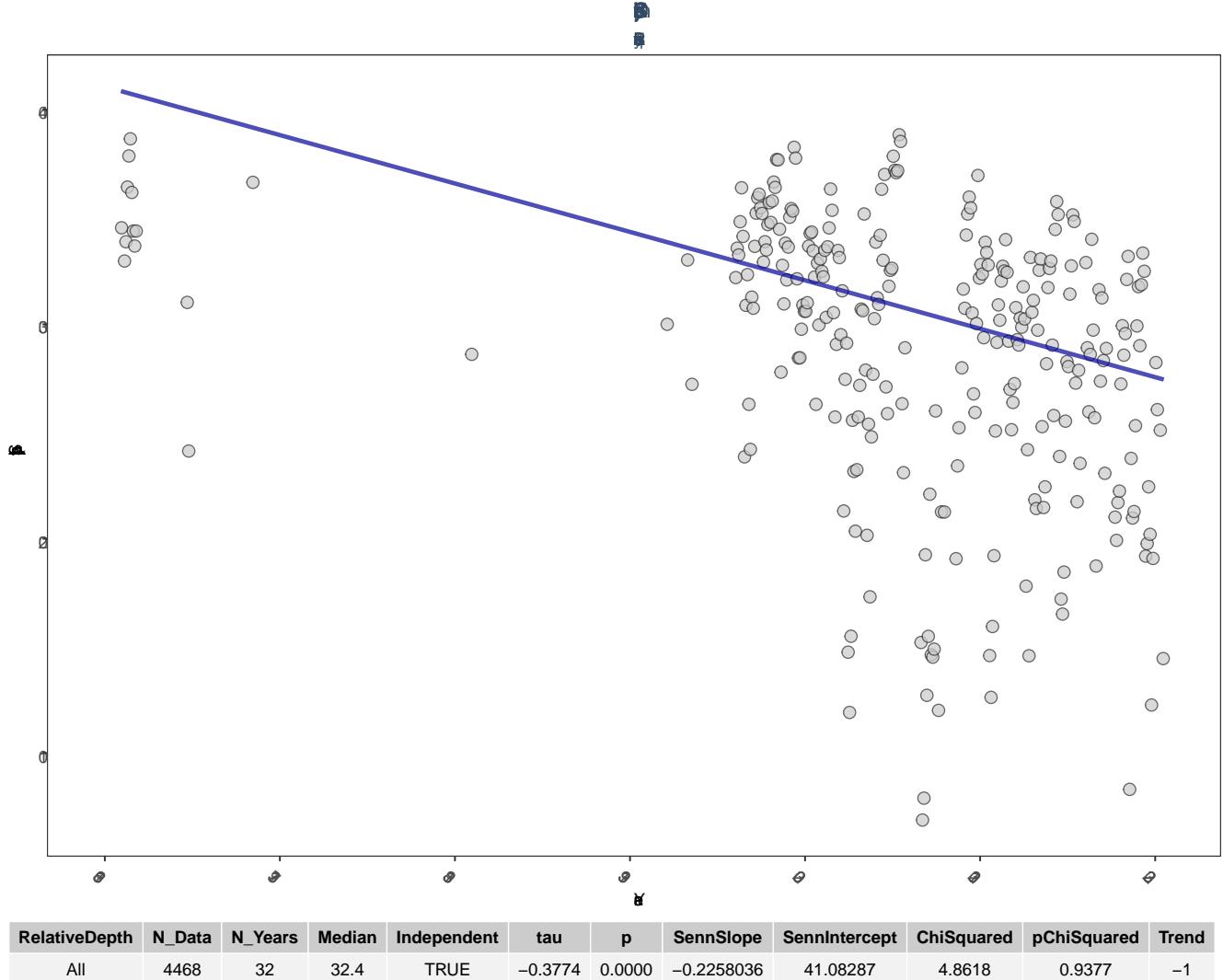


Table 16: Programs contributing data for Salinity

ProgramID	N_Data	YearMin	YearMax
69	2258	2001	2007
509	702	1999	2008
4064	619	2011	2012
95	526	1963	2018
476	213	2014	2023
5002	111	2009	2023
4042	46	2016	2022
115	2	2003	2003

Program names:

69 - Fisheries-Independent Monitoring (FIM) Program

509 - SERC Water Quality Monitoring Network

4064 - A spatial model to improve site selection for seagrass restoration in shallow boating environments

95 - Harmful Algal Bloom Marine Observation Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

5002 - Florida STORET / WIN

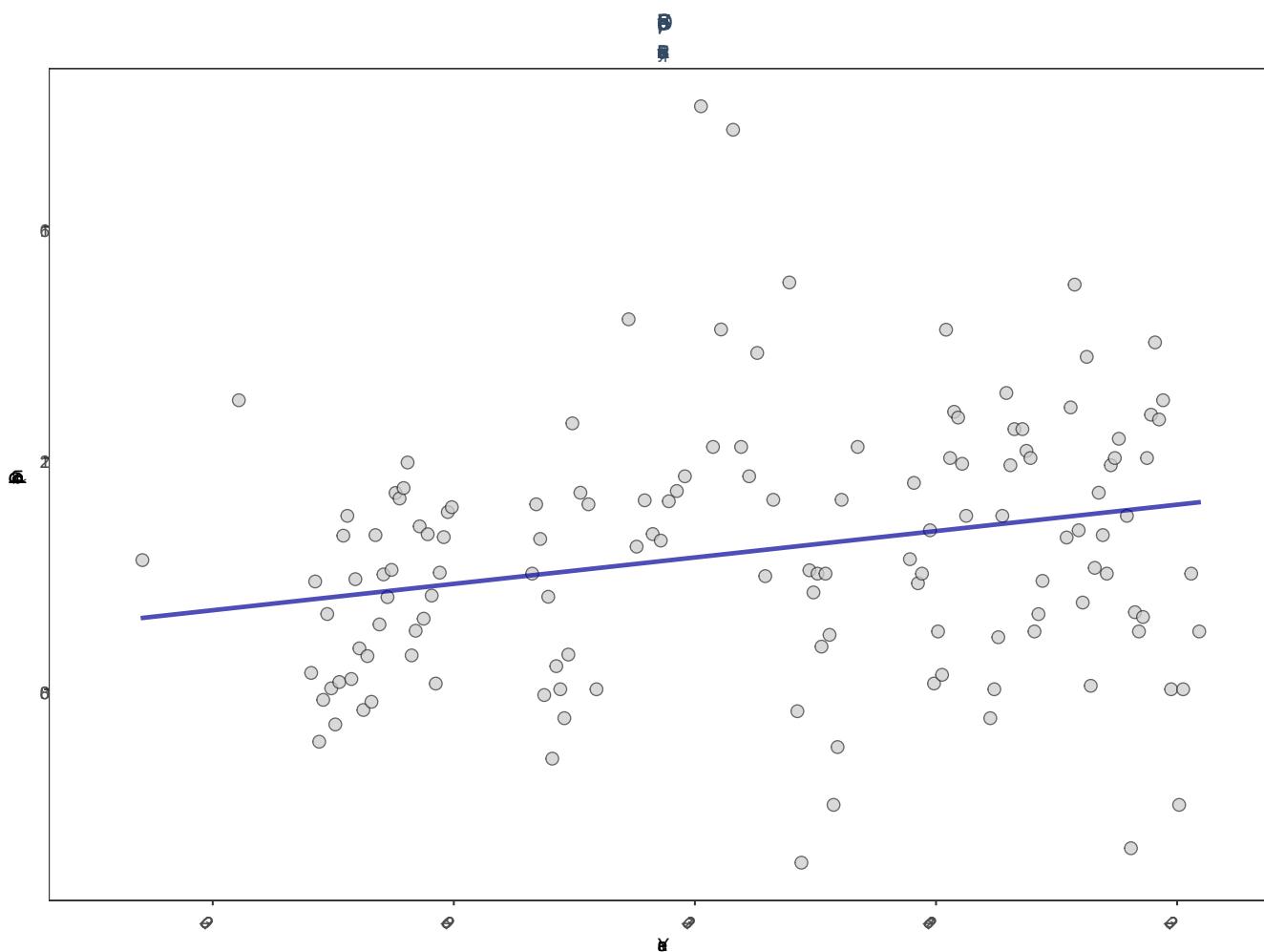
4042 - Estero Bay Oyster Monitoring

115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for Salinity in Estero Bay Aquatic Preserve

Secchi Depth

Discrete Seasonal Kendall-Tau Trend Analysis



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
Surface	2735	20	0.9	TRUE	0.1848	0.0045	0.009129699	0.9184377	7.3386	0.771	1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Table 17: Programs contributing data for Secchi Depth

<i>ProgramID</i>	<i>N_Data</i>	<i>YearMin</i>	<i>YearMax</i>
69	2264	2001	2007
476	196	2017	2023
5002	147	2006	2023
514	76	2011	2018
103	53	2020	2022

Program names:

- 69 - Fisheries-Independent Monitoring (FIM) Program
- 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network
- 5002 - Florida STORET / WIN
- 514 - Florida LAKEWATCH Program
- 103 - EPA STOrage and RETrieval Data Warehouse (STORET)

Table 18: Value Qualifiers for Secchi Depth

<i>Year</i>	<i>N_Total</i>	<i>N_S</i>	<i>perc_S</i>
2015	21	4	19.0
2017	24	2	8.3
2018	34	9	26.5
2019	42	14	33.3
2020	31	9	29.0
2021	94	14	14.9
2022	32	8	25.0
2023	5	2	40.0

Programs containing Value Qualified data:

- 5002 - Florida STORET / WIN
- 476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

Value Qualifiers

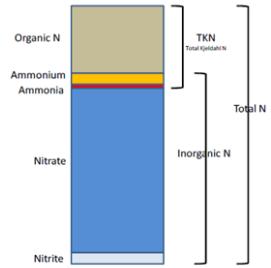
S - Secchi disk visible to bottom of waterbody. The value reported is the depth of the waterbody at the location of the Secchi disk measurement.

Total Nitrogen

Total Nitrogen Calculation:

The logic for calculated Total Nitrogen was provided by Kevin O'Donnell and colleagues at FDEP (with the help of Jay Silvanima, Watershed Monitoring Section). The following logic is used, in this order, based on the availability of specific nitrogen components.

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



Additional Information:

- Rules for use of sample fraction:
 - FDEP report that if both “Total” and “Dissolved” are reported, only “Total” is used. If the total is not reported, they do use dissolved as a best available replacement.
 - An analysis of all SEACAR data shows that 90% of all possible TN calculations can be done using nitrogen components with the same sample fraction, rather than use nitrogen components with mixed total/dissolved sample fractions. In other words, TN can be calculated when TKN and NO₃O₂ are both total sample fraction, or when both are dissolved sample fraction. This is important, because then the calculated TN value is not based on components with mixed sample fractions.
- Values inserted into data:
 - ParameterName = “Total Nitrogen”
 - SEACAR_QAACFlagCode = “1Q”
 - SEACAR_QAAC>Description = “SEACAR Calculated”

Discrete Seasonal Kendall-Tau Trend Analysis

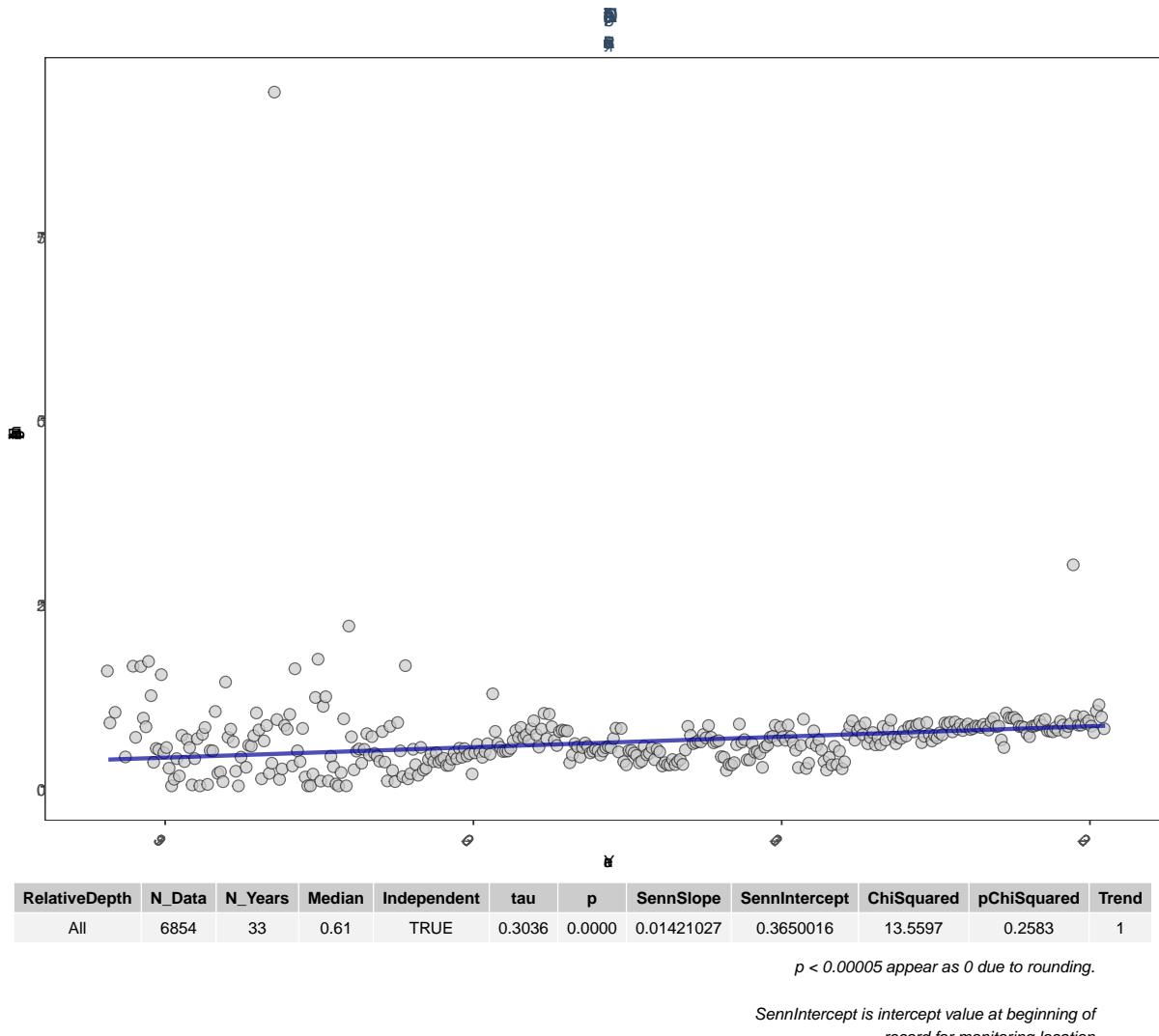


Table 19: Programs contributing data for Total Nitrogen

ProgramID	N_Data	YearMin	YearMax
5002	6117	1991	2023
509	351	1999	2008
476	264	1998	2023
514	81	2011	2017
4063	54	2018	2022
303	8	2020	2021
103	6	2003	2003
115	1	2003	2003

Program names:

5002 - Florida STORET / WIN

509 - SERC Water Quality Monitoring Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

514 - Florida LAKEWATCH Program

4063 - Estero Bay Tributary Monitoring

- 303 - River, Estuary and Coastal Observing Network
 103 - EPA STOrage and RETrieval Data Warehouse (STORET)
 115 - Environmental Monitoring Assessment Program

Table 20: Value Qualifiers for Total Nitrogen

Year	N_Total	N_I	perc_I	N_Q	perc_Q	N_U	perc_U
1991	55	1	1.8			1	1.8
1992	79					1	1.3
1993	41	1	2.4			19	46.3
1994	54	2	3.7			15	27.8
1995	39					1	2.6
1996	54	2	3.7			22	40.7
1997	54	1	1.9			15	27.8
1998	70	1	1.4			55	78.6
1999	109	1	0.9			20	18.4
2000	132	1	0.8			47	35.6
2001	209					4	1.9
2002	227	5	2.2			2	0.9
2004	322	2	0.6	2	0.6		
2005	324	16	4.9				
2006	313	100	32.0				
2007	356	61	17.1			11	3.1
2008	304	24	7.9			1	0.3
2009	281	57	20.3			19	6.8
2011	256	46	18.0			17	6.6
2012	255	6	2.4			5	2.0
2013	242	25	10.3			30	12.4
2014	283	42	14.8			13	4.6
2015	298	6	2.0			2	0.7
2017	280	1	0.4			1	0.4
2020	263			2	0.8		

Programs containing Value Qualified data:

- 5002 - Florida STORET / WIN
 303 - River, Estuary and Coastal Observing Network

Value Qualifiers

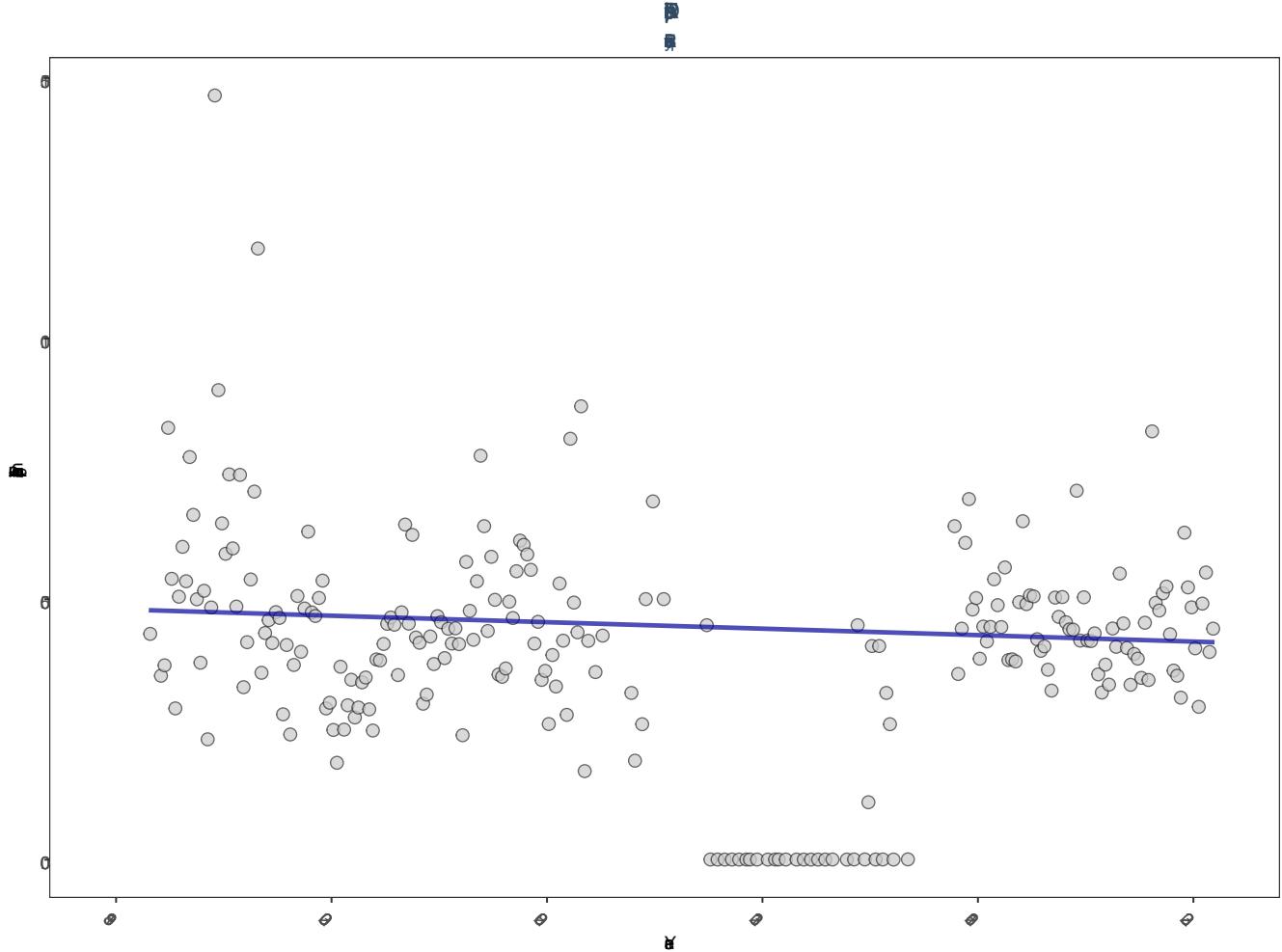
I - The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantitation limit.

Q - Sample held beyond the accepted holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.

U - Indicates that the compound was analyzed for but not detected. This symbol shall be used to indicate that the specified component was not detected. The value associated with the qualifier shall be the laboratory method detection limit. Unless requested by the client, less than the method detection limit values shall not be reported

Total Phosphorus

Discrete Seasonal Kendall-Tau Trend Analysis



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	2369	26	0.041	TRUE	-0.0933	0.0545	-0.0002481456	0.04805668	12.9431	0.2971	0

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Table 21: Programs contributing data for Total Phosphorus

ProgramID	N_Data	YearMin	YearMax
5002	1293	2006	2023
476	376	1998	2023
509	351	1999	2008
103	230	2003	2022
514	81	2011	2017
4063	59	2018	2022
303	8	2020	2021
115	1	2003	2003

Program names:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

509 - SERC Water Quality Monitoring Network

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

514 - Florida LAKEWATCH Program

4063 - Estero Bay Tributary Monitoring

303 - River, Estuary and Coastal Observing Network

115 - Environmental Monitoring Assessment Program

Table 22: Value Qualifiers for Total Phosphorus

Year	N_Total	N_I	perc_I	N_Q	perc_Q	N_U	perc_U
1998	3			3	100.0		
1999	41			5	12.2		
2001	38	1	2.6			1	2.6
2002	43					7	16.3
2003	47					1	2.1
2004	51	10	19.6	4	7.8		
2005	65	24	36.9			5	7.7
2006	74	37	50.0			1	1.4
2007	99	49	49.5			2	2.0
2008	34	1	2.9				
2010	10	2	20.0				
2018	275	20	7.3			4	1.4
2019	268	8	3.0				
2020	287	20	7.0			5	1.7
2021	523	22	4.2			4	0.8
2022	280	19	6.8			3	1.1
2023	81	8	9.9			5	6.2

Programs containing Value Qualified data:

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

5002 - Florida STORET / WIN

303 - River, Estuary and Coastal Observing Network

4063 - Estero Bay Tributary Monitoring

Value Qualifiers

I - The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantitation limit.

Q - Sample held beyond the accepted holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.

U - Indicates that the compound was analyzed for but not detected. This symbol shall be used to indicate that the specified component was not detected. The value associated with the qualifier shall be the laboratory method detection limit. Unless requested by the client, less than the method detection limit values shall not be reported

Total Suspended Solids, TSS

Discrete Seasonal Kendall-Tau Trend Analysis

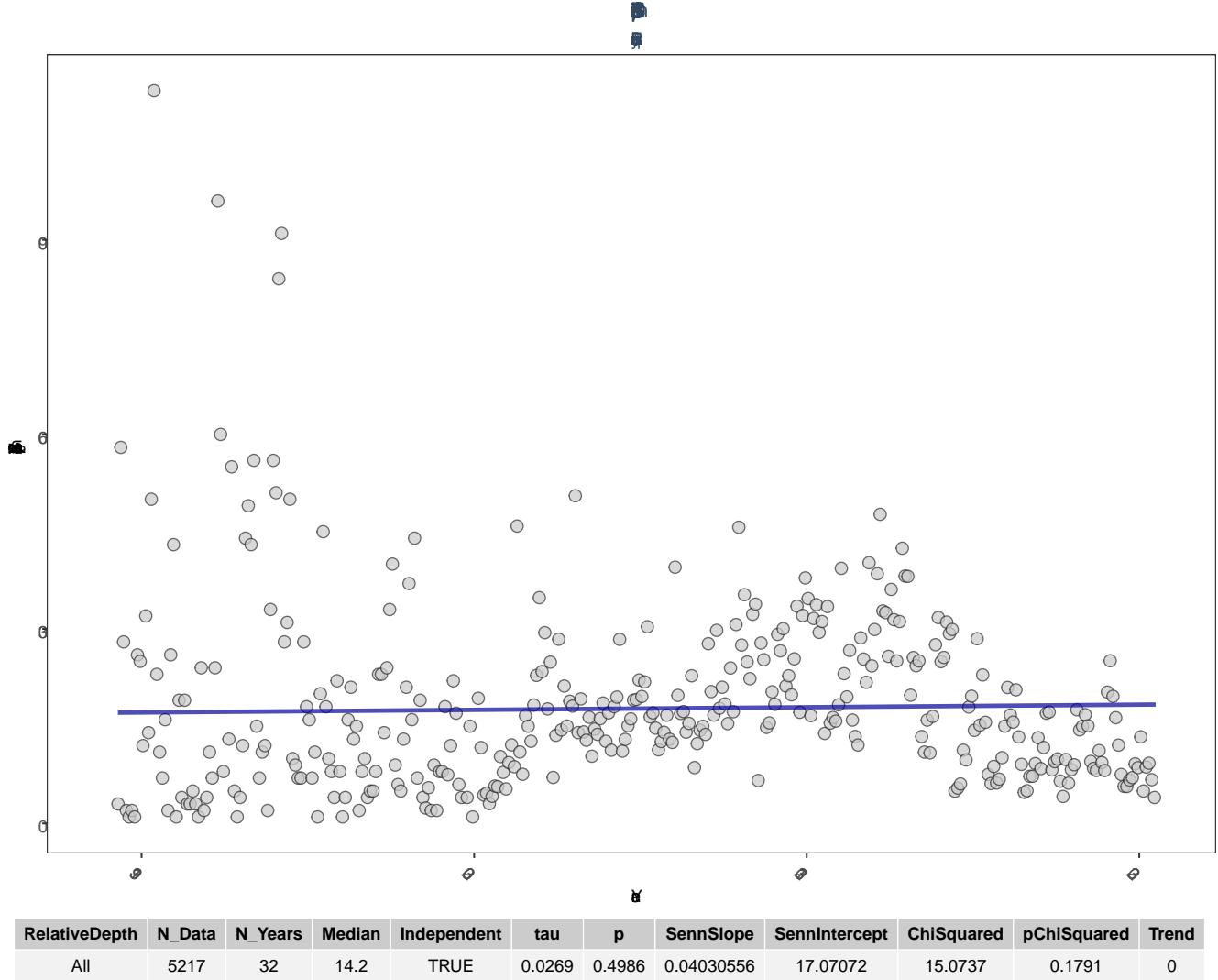


Table 23: Programs contributing data for Total Suspended Solids, TSS

ProgramID	N_Data	YearMin	YearMax
5002	5055	1992	2023
103	170	2020	2021
4063	59	2018	2022

Program names:

5002 - Florida STORET / WIN

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

4063 - Estero Bay Tributary Monitoring

Table 24: Value Qualifiers for Total Suspended Solids, TSS

<i>Year</i>	<i>N_Total</i>	<i>N_I</i>	<i>perc_I</i>	<i>N_U</i>	<i>perc_U</i>
1992	9	3	33.3	2	22.2
1993	13	2	15.4		
1994	12	4	33.3	2	16.7
1995	11			1	9.1
1996	12	1	8.3		
1998	12			1	8.3
1999	12	1	8.3	1	8.3
2001	16	6	37.5		
2002	14	2	14.3	1	7.1
2003	188	85	45.2	36	19.1
2004	280	92	32.9	7	2.5
2005	286	8	2.8		
2006	276			1	0.4
2007	276	3	1.1		
2008	273	4	1.5		
2009	276	5	1.8	1	0.4
2010	217	7	3.2		
2011	242	6	2.5		
2012	218	3	1.4		
2013	204	1	0.5		
2014	250	4	1.6		
2015	265	9	3.4	1	0.4
2016	254	7	2.8		
2017	244	13	5.3		
2018	244	10	4.1	5	2.0
2019	226	13	5.8	5	2.2
2020	233	6	2.6	1	0.4
2021	401	4	1.0	7	1.8
2022	229	5	2.2	2	0.9
2023	67	3	4.5		

Programs containing Value Qualified data:

5002 - Florida STORET / WIN

4063 - Estero Bay Tributary Monitoring

Value Qualifiers

I - The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantitation limit.

U - Indicates that the compound was analyzed for but not detected. This symbol shall be used to indicate that the specified component was not detected. The value associated with the qualifier shall be the laboratory method detection limit. Unless requested by the client, less than the method detection limit values shall not be reported

Turbidity

Discrete Seasonal Kendall-Tau Trend Analysis

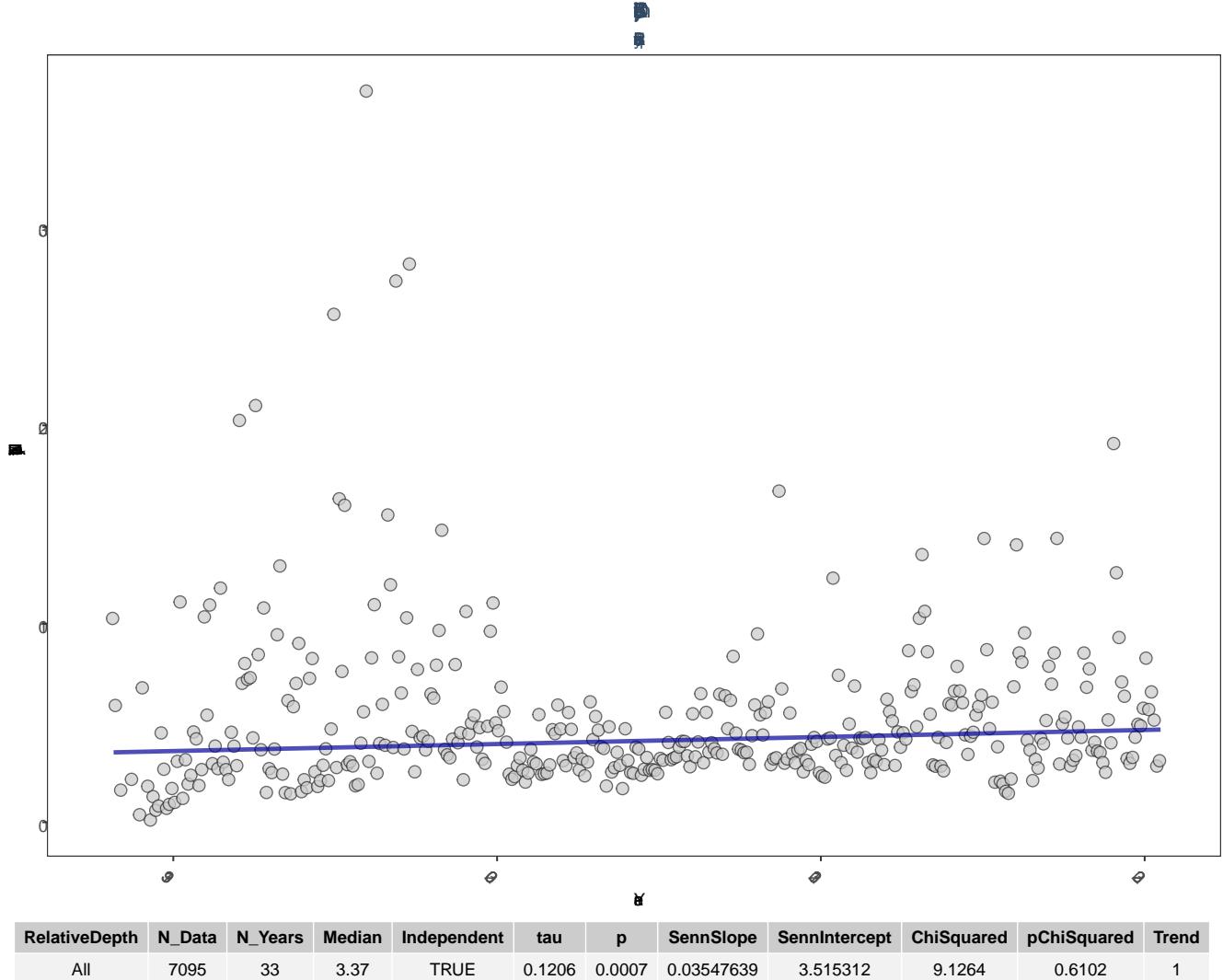


Table 25: Programs contributing data for Turbidity

ProgramID	N_Data	YearMin	YearMax
5002	6158	1991	2023
509	348	1999	2008
476	307	1999	2023
103	221	2020	2022
4063	59	2018	2022
4042	45	2016	2022

Program names:

5002 - Florida STORET / WIN

509 - SERC Water Quality Monitoring Network

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

103 - EPA STOrage and RETrieval Data Warehouse (STORET)

4063 - Estero Bay Tributary Monitoring

4042 - Estero Bay Oyster Monitoring

Table 26: Value Qualifiers for Turbidity

Year	N_Total	N_I	perc_I	N_Q	perc_Q	N_U	perc_U
2003	295					2	0.7
2004	355	14	3.9				
2010	205			3	1.5		
2011	245			4	1.6		
2014	255			1	0.4		
2016	263			2	0.8		
2018	279	28	10.0			4	1.4
2019	257	8	3.1			3	1.2
2020	276	3	1.1	1	0.4		
2021	508	7	1.4	4	0.8	1	0.2
2022	289	1	0.3				

Programs containing Value Qualified data:

5002 - Florida STORET / WIN

476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

4063 - Estero Bay Tributary Monitoring

Value Qualifiers

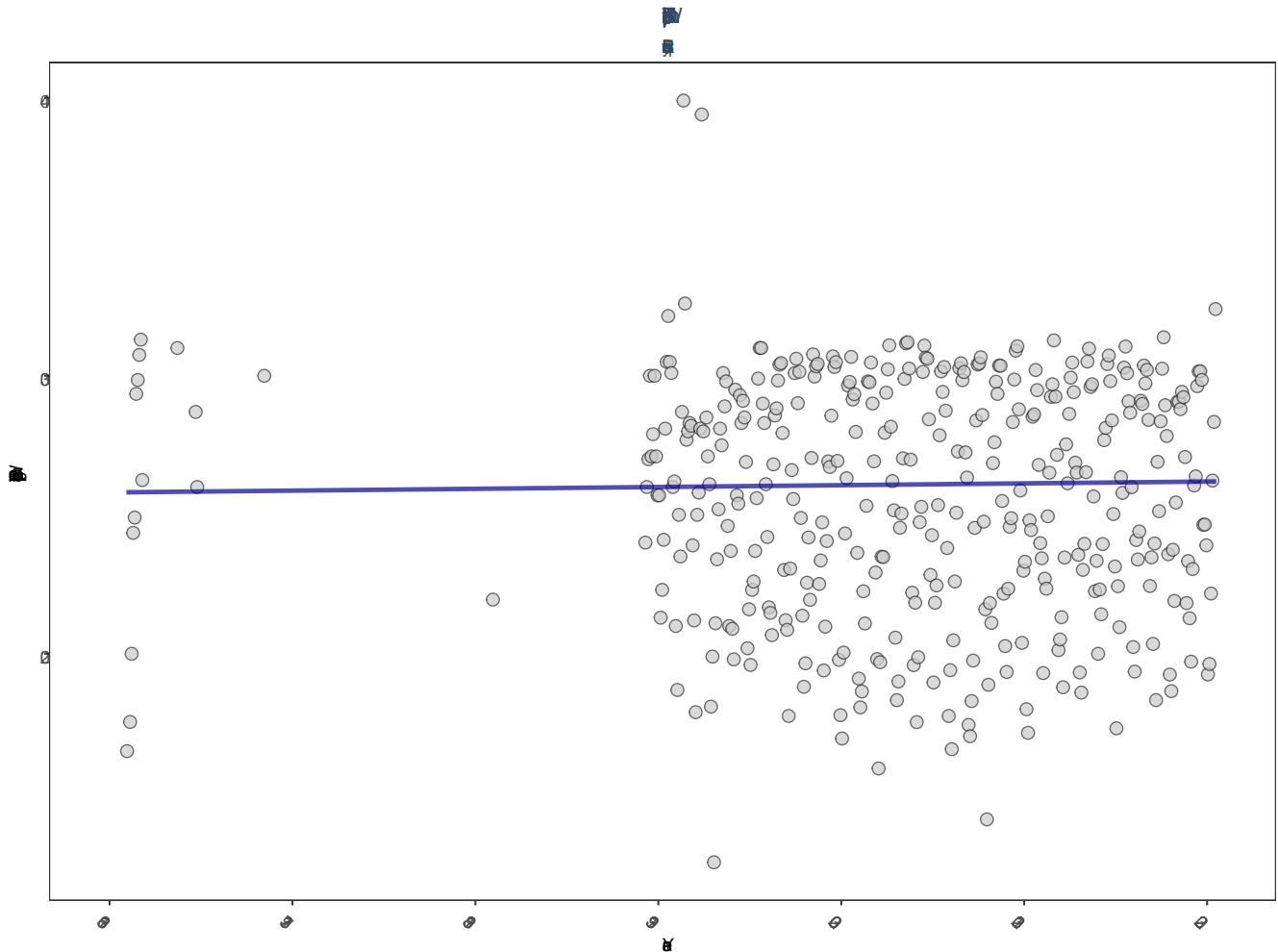
I - The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantitation limit.

Q - Sample held beyond the accepted holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.

U - Indicates that the compound was analyzed for but not detected. This symbol shall be used to indicate that the specified component was not detected. The value associated with the qualifier shall be the laboratory method detection limit. Unless requested by the client, less than the method detection limit values shall not be reported

Water Temperature

Discrete Seasonal Kendall-Tau Trend Analysis



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
All	9912	38	26.1	TRUE	0.0235	0.5090	0.0006515152	25.80441	5.6659	0.8947	0

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

SennIntercept is intercept value at beginning of record for monitoring location

Table 27: Programs contributing data for Water Temperature

ProgramID	N_Data	YearMin	YearMax
5002	5334	1992	2023
69	2261	2001	2007
509	702	1999	2008
4064	619	2011	2012
95	492	1963	2018
103	253	2020	2022
476	208	2011	2023
4042	46	2016	2022
115	2	2003	2003

Program names:

5002 - Florida STORET / WIN
69 - Fisheries-Independent Monitoring (FIM) Program
509 - SERC Water Quality Monitoring Network
4064 - A spatial model to improve site selection for seagrass restoration in shallow boating environments
95 - Harmful Algal Bloom Marine Observation Network
103 - EPA STOrage and RETrieval Data Warehouse (STORET)
476 - Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network
4042 - Estero Bay Oyster Monitoring
115 - Environmental Monitoring Assessment Program

There are no qualifying Value Qualifiers for Water Temperature in Estero Bay Aquatic Preserve

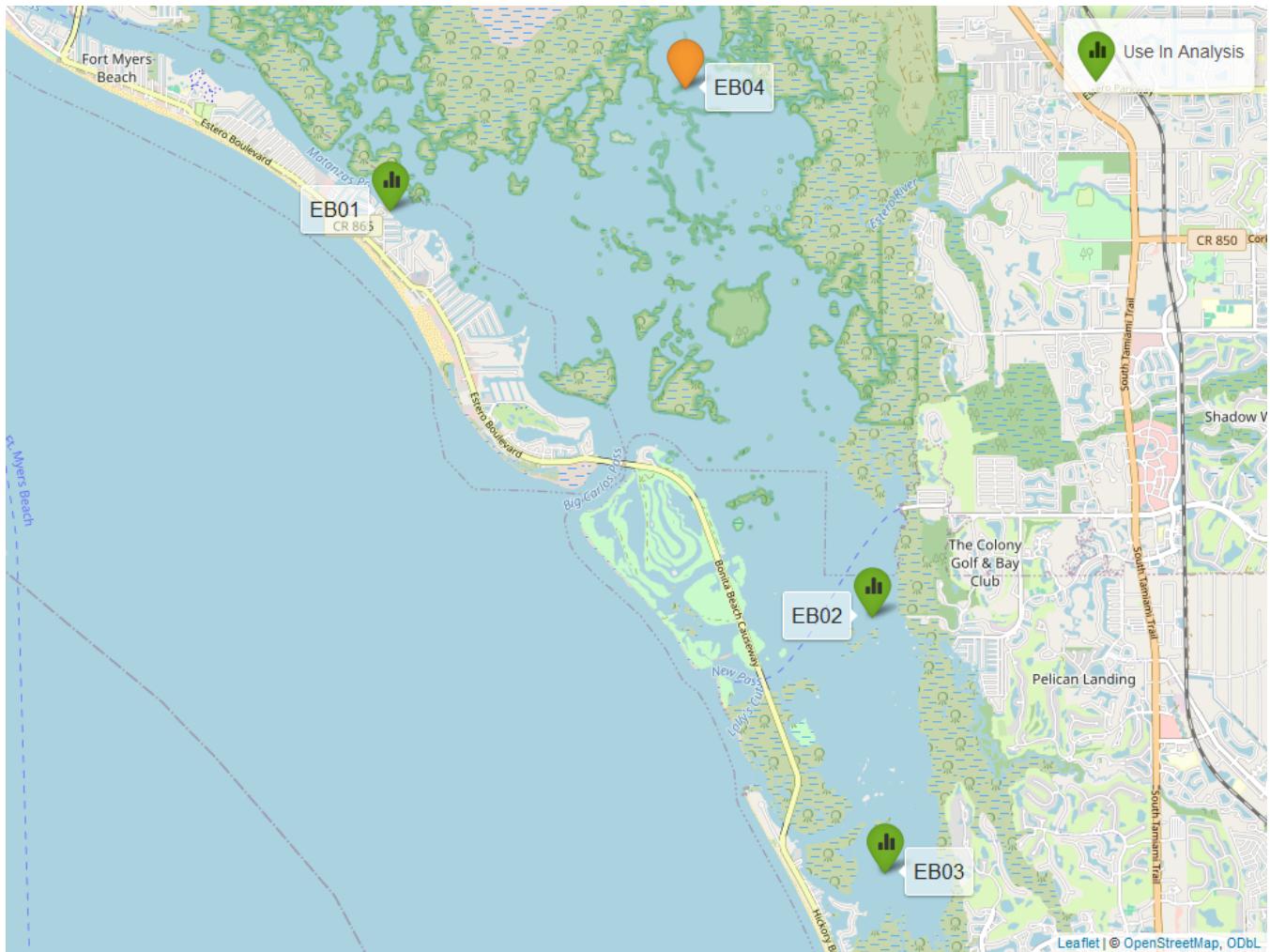
Water Quality - Continuous

The following files were used in the continuous analysis:

- *Combined_WQ_WC_NUT_cont_Dissolved_Oxygen_SW-2023-Jul-14.txt*
- *Combined_WQ_WC_NUT_cont_Dissolved_Oxygen_Saturation_SW-2023-Jul-14.txt*
- *Combined_WQ_WC_NUT_cont_pH_SW-2023-Jul-14.txt*
- *Combined_WQ_WC_NUT_cont_Salinity_SW-2023-Jul-14.txt*
- *Combined_WQ_WC_NUT_cont_Turbidity_SW-2023-Jul-14.txt*
- *Combined_WQ_WC_NUT_cont_Water_Temperature_SW-2023-Jul-14.txt*

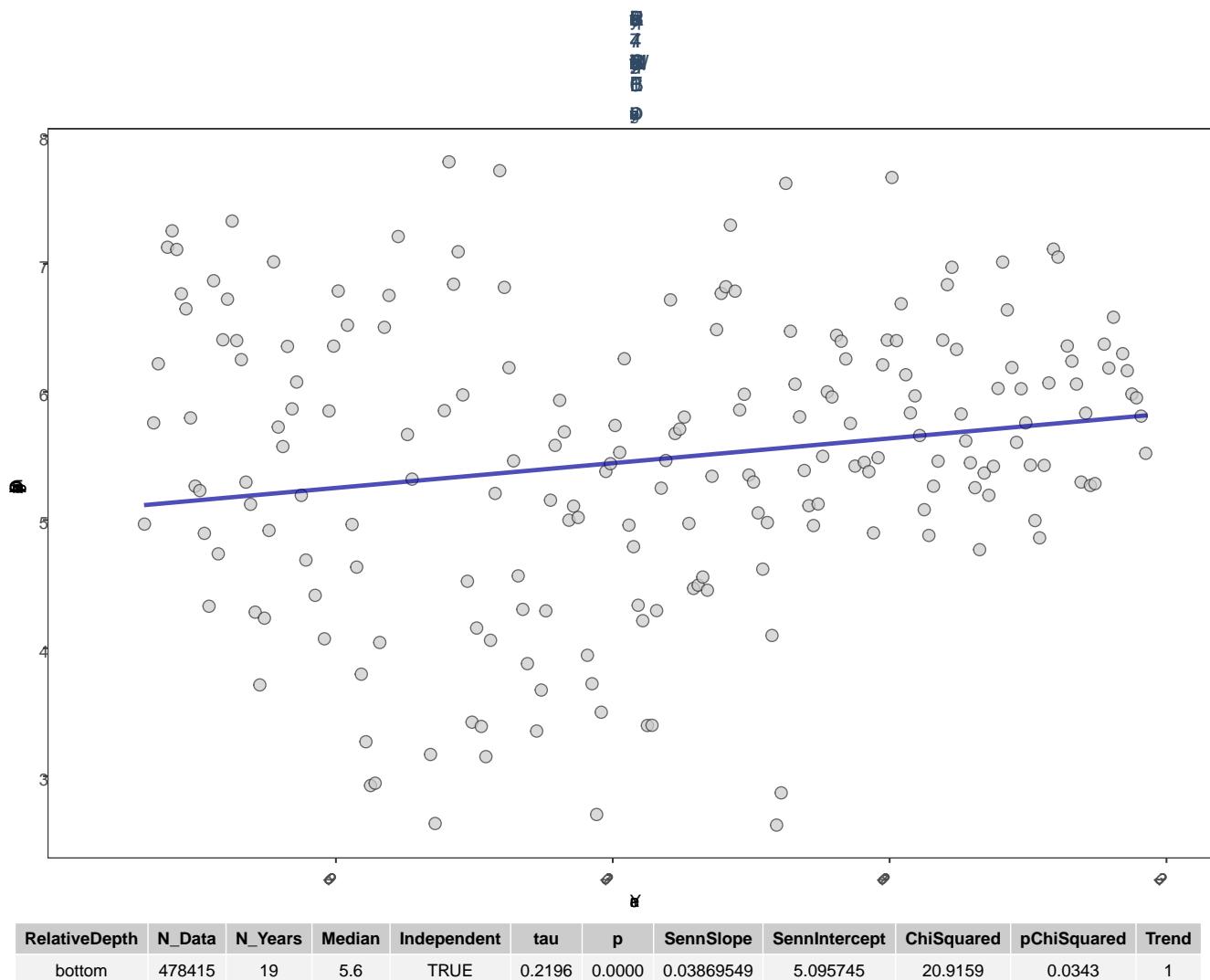
Table 28: Estero Bay Aquatic Preserve Continuous Water Quality Monitoring (474)

Program	LocationID	years_of_data	Use_In_Analysis
EB01		19	TRUE
EB02		19	TRUE
EB03		19	TRUE
EB04		2	FALSE

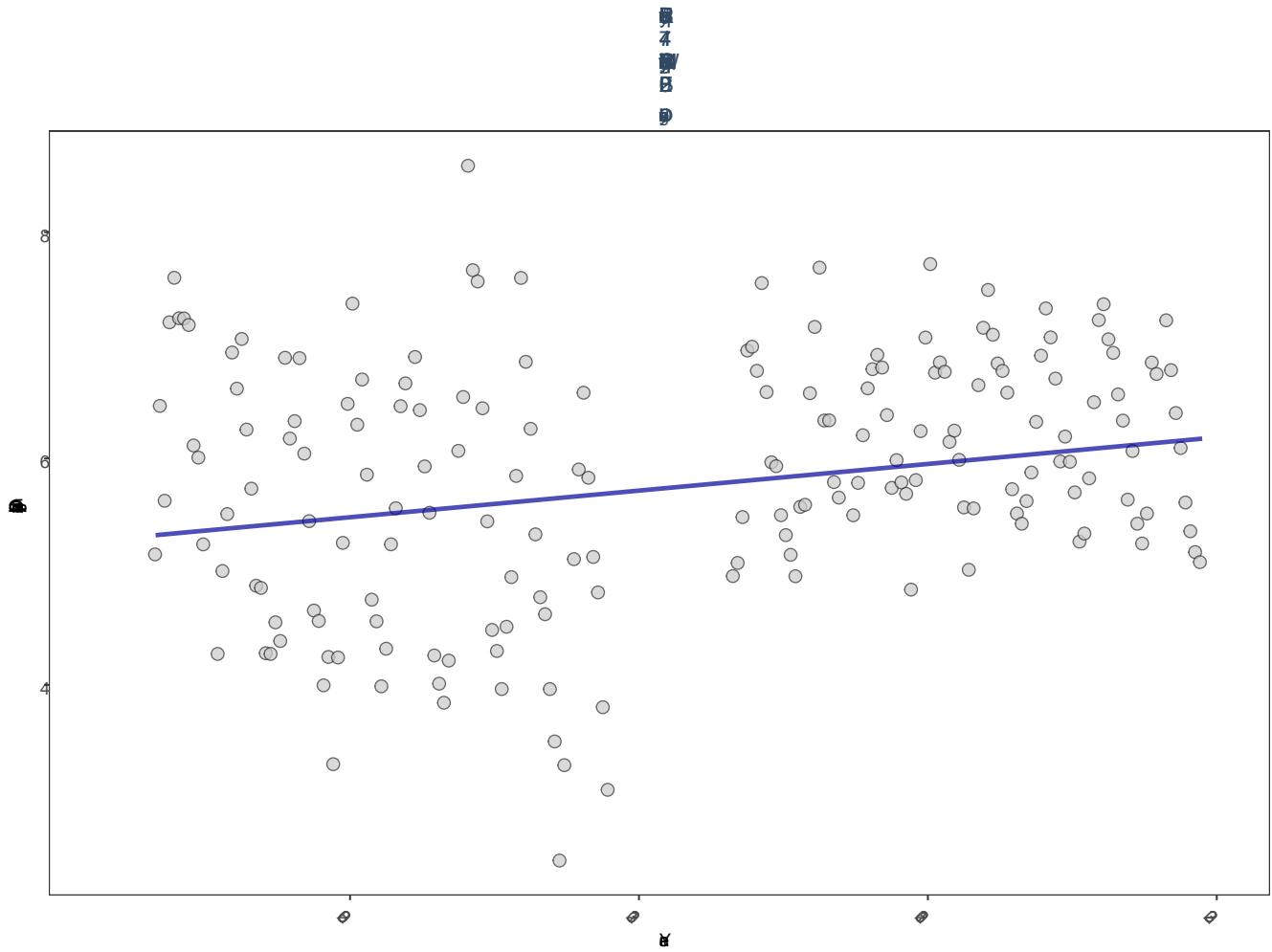


Dissolved Oxygen

EB01



EB02

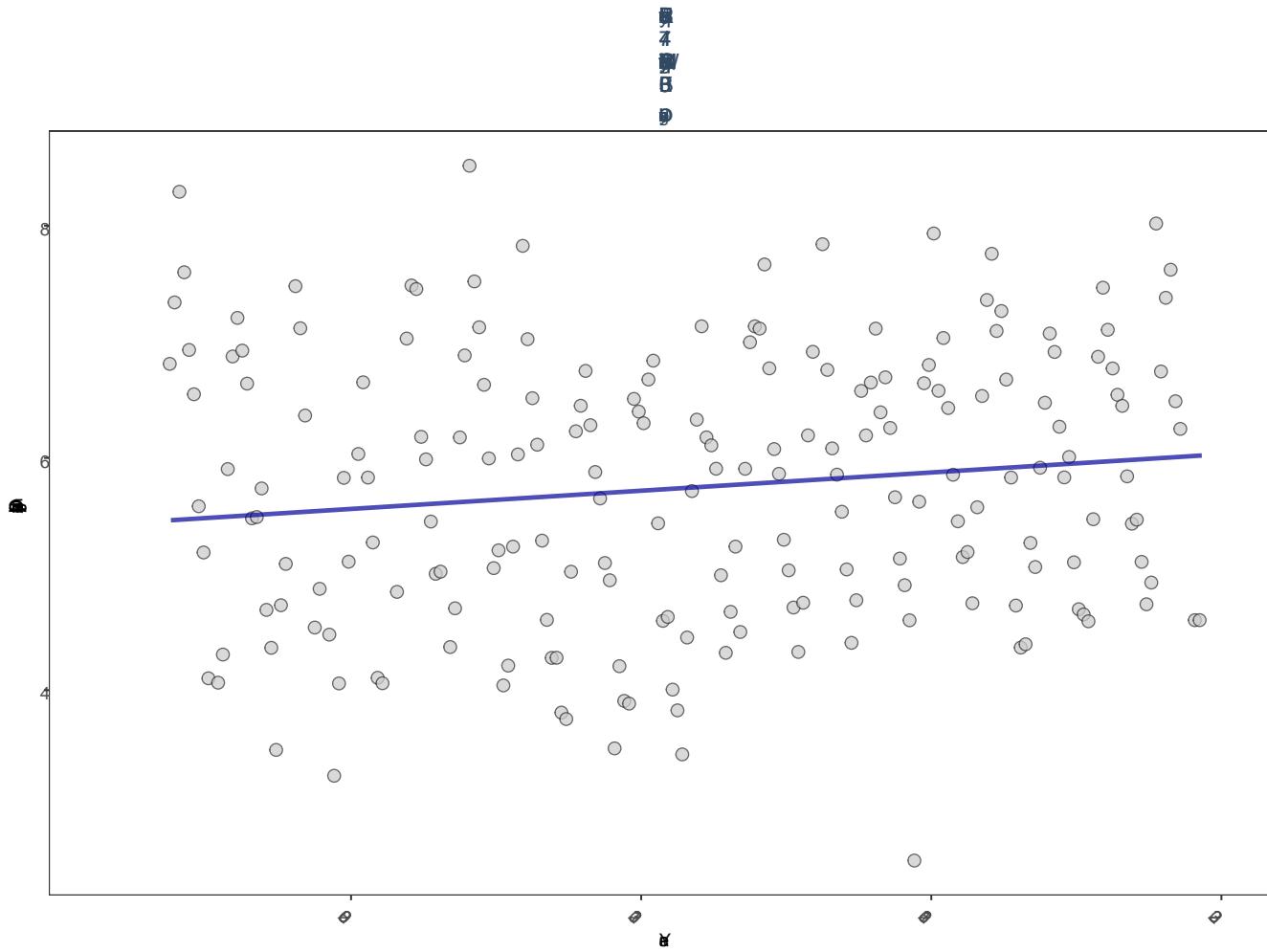


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	416255	18	6	TRUE	0.2991	0.0000	0.04707587	5.292665	5.2778	0.917	1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

EB03



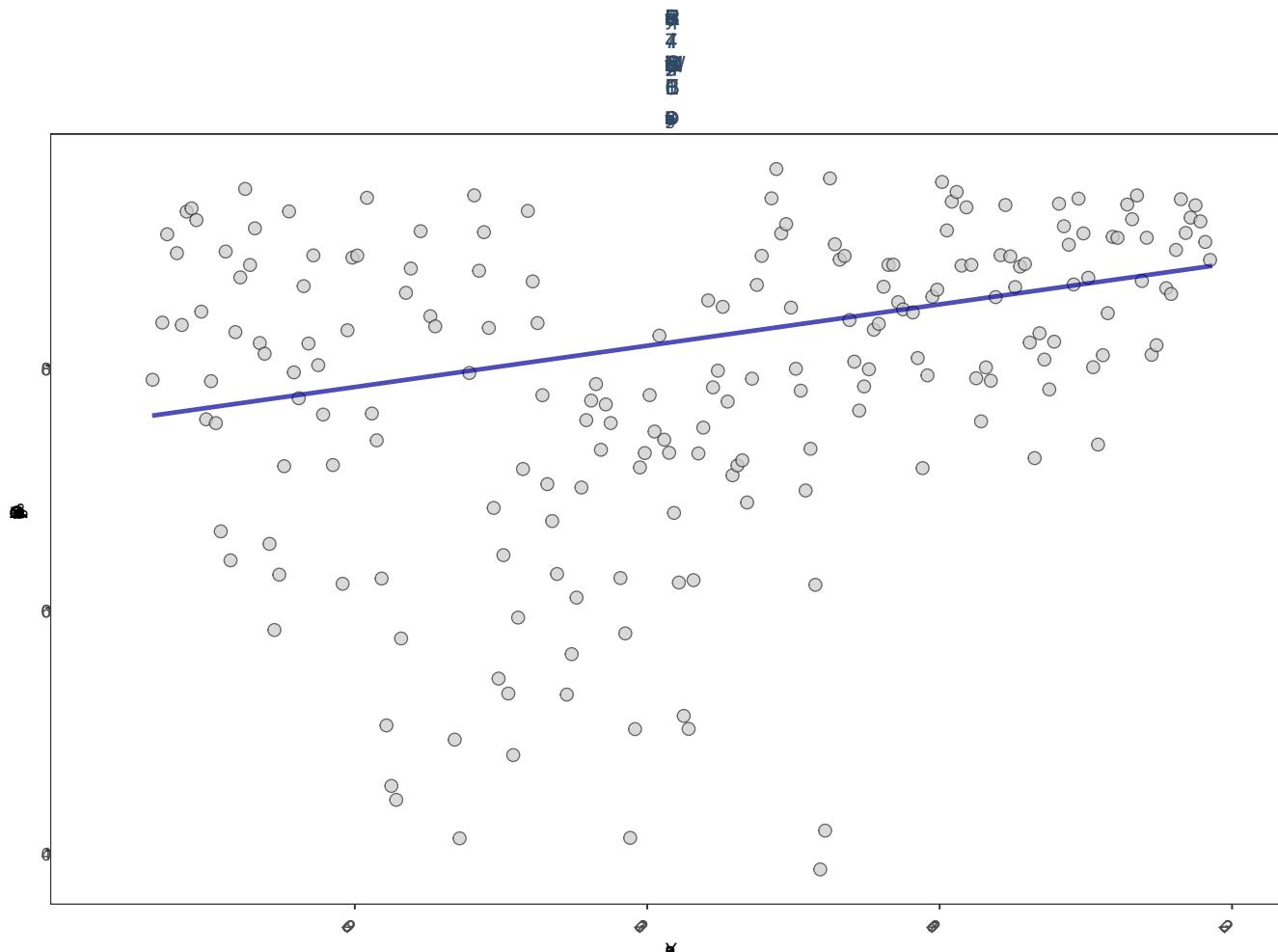
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	439701	19	5.9	TRUE	0.1991	0.0002	0.03138447	5.435208	11.2299	0.4242	1

p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Dissolved Oxygen Saturation

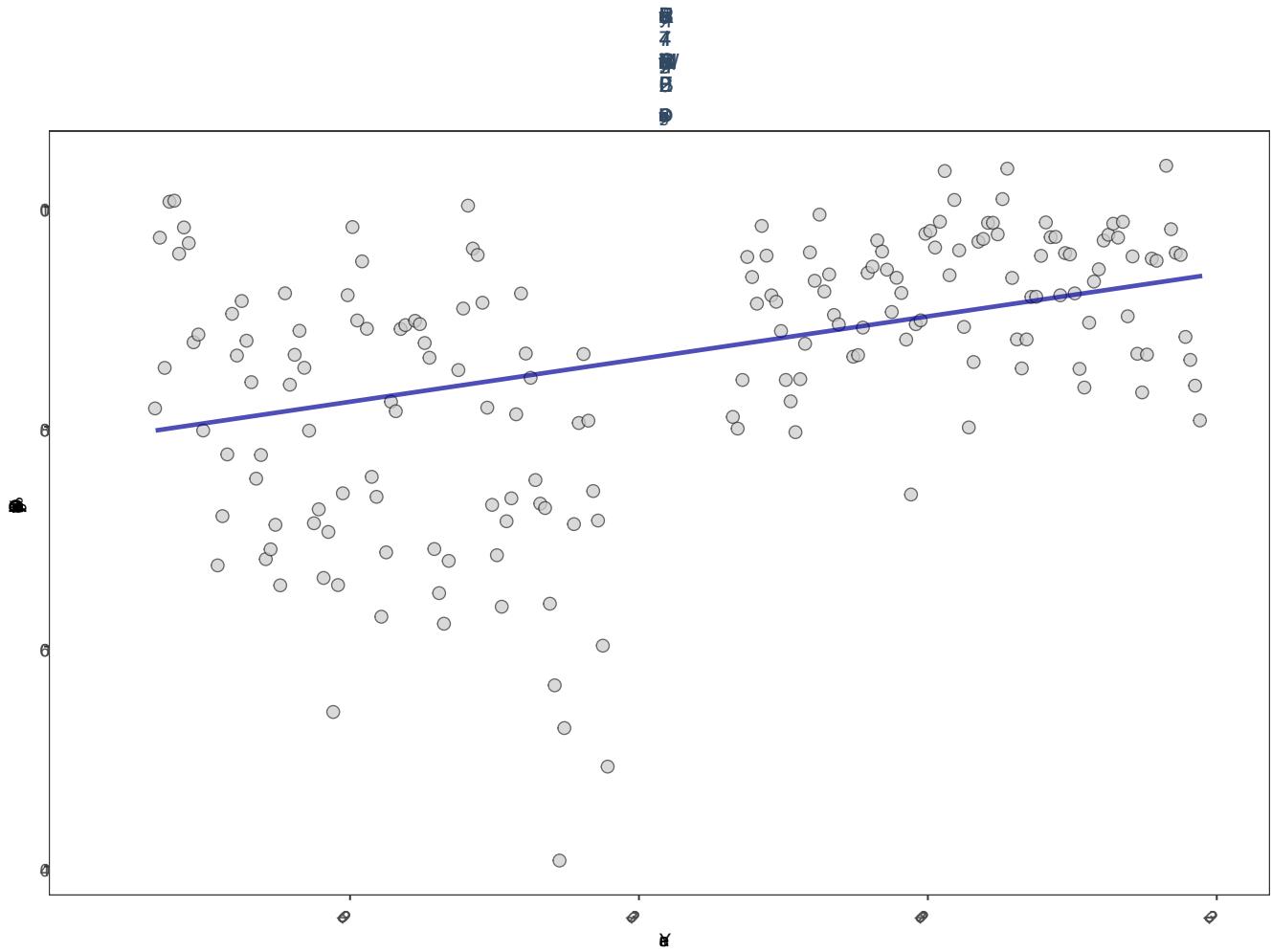
EB01



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

SennIntercept is intercept value at beginning of record for monitoring location

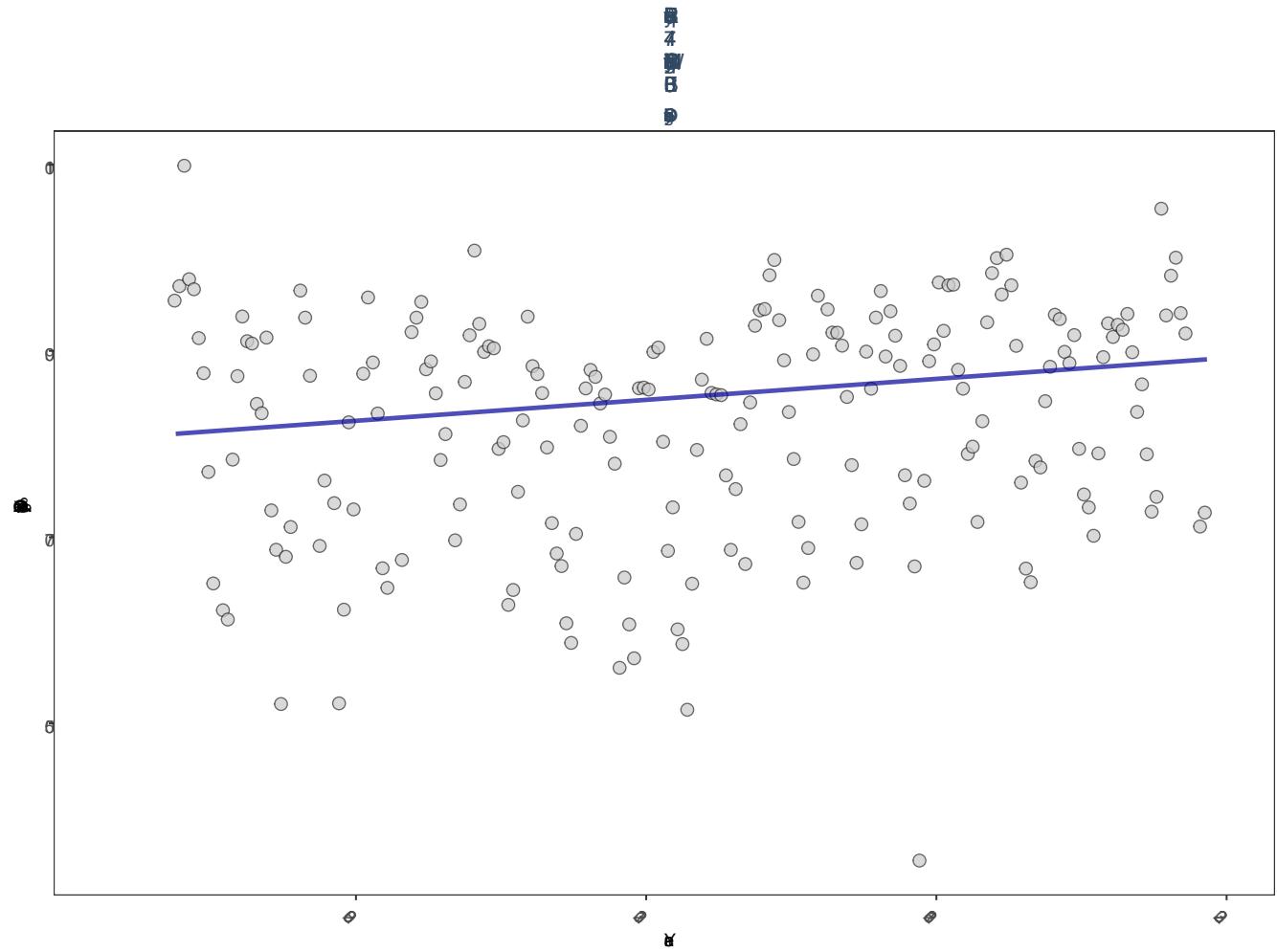
EB02



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

SennIntercept is intercept value at beginning of record for monitoring location

EB03



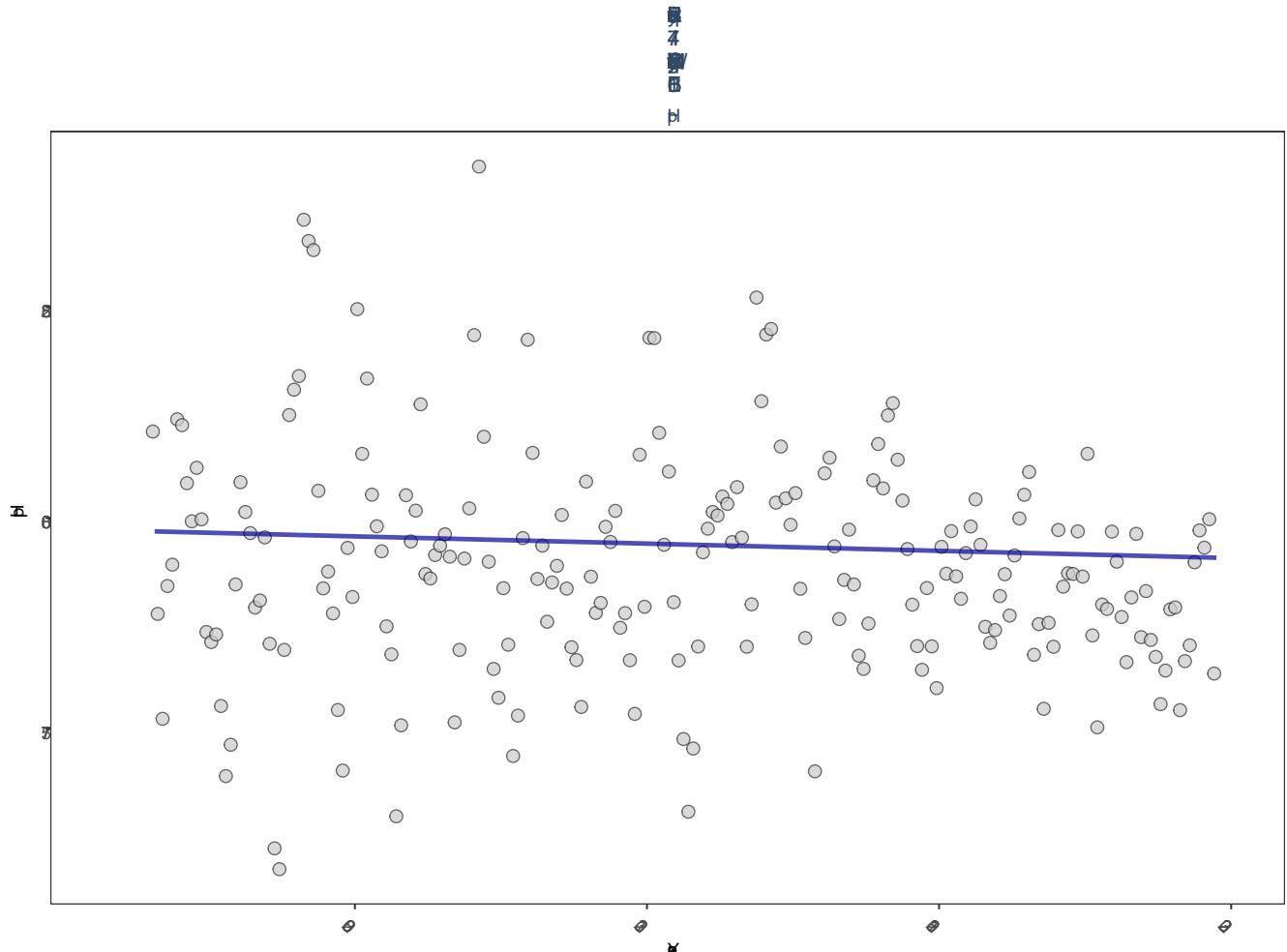
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	441227	19	83.7	TRUE	0.2531	0.0000	0.4503603	80.68982	6.4615	0.8409	1

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

SennIntercept is intercept value at beginning of record for monitoring location

pH

EB01

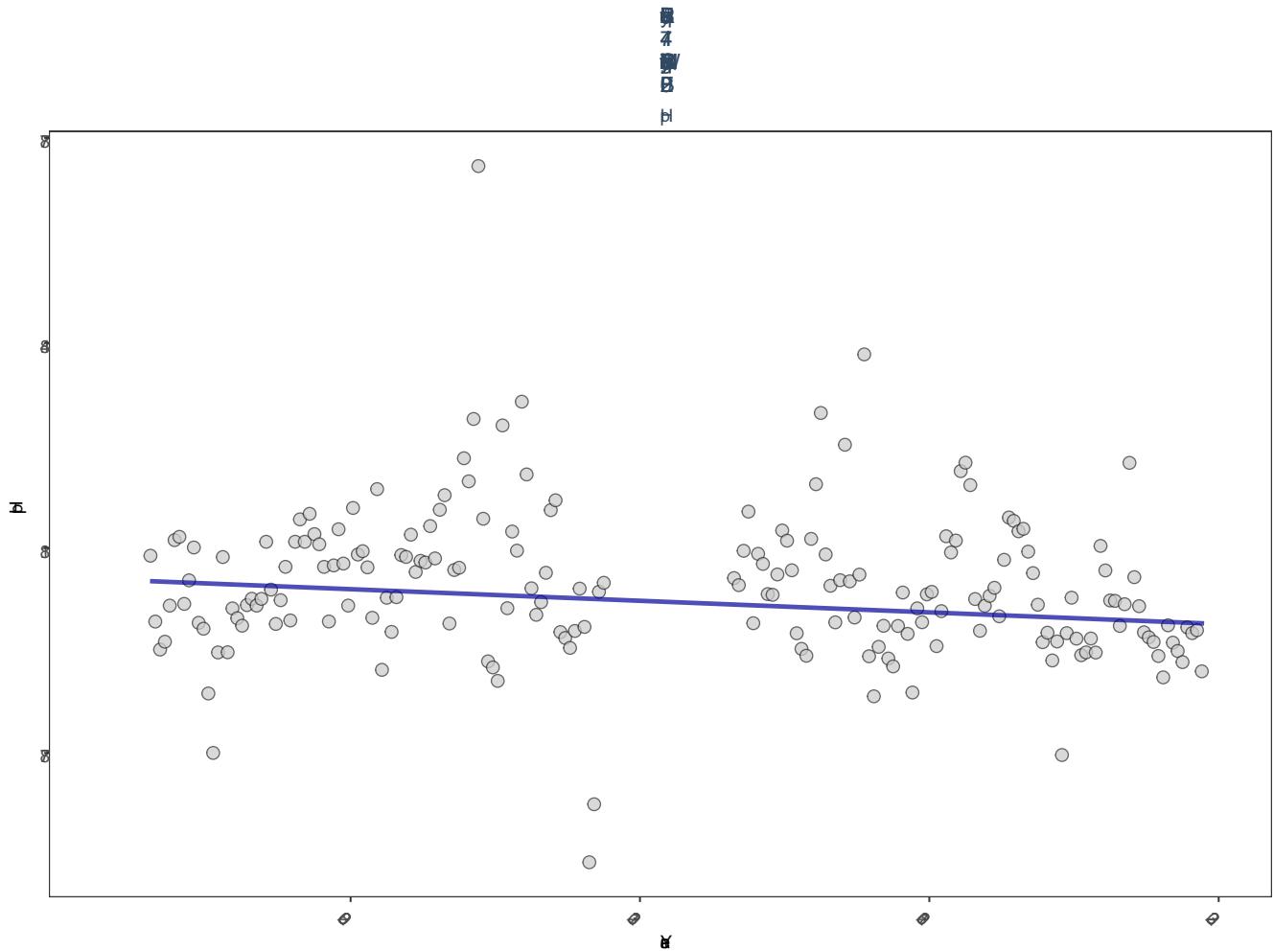


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	561177	19	7.9	TRUE	-0.0742	0.1620	-0.001714161	7.985223	29.3817	0.002	0

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

SennIntercept is intercept value at beginning of record for monitoring location

EB02

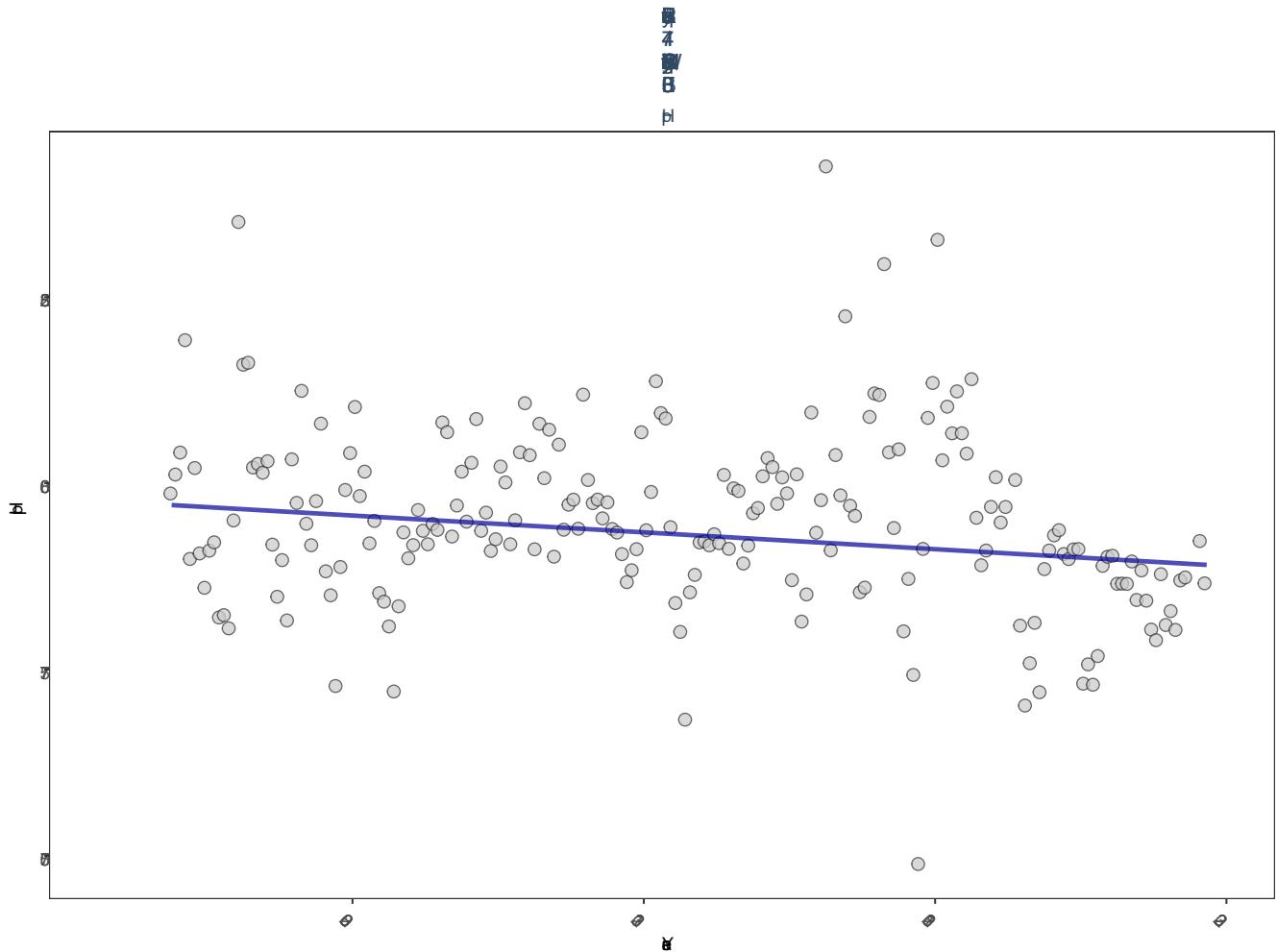


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	477038	18	8	TRUE	-0.1413	0.0086	-0.003392557	8.053129	9.7501	0.553	-1

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

SennIntercept is intercept value at beginning of record for monitoring location

EB03



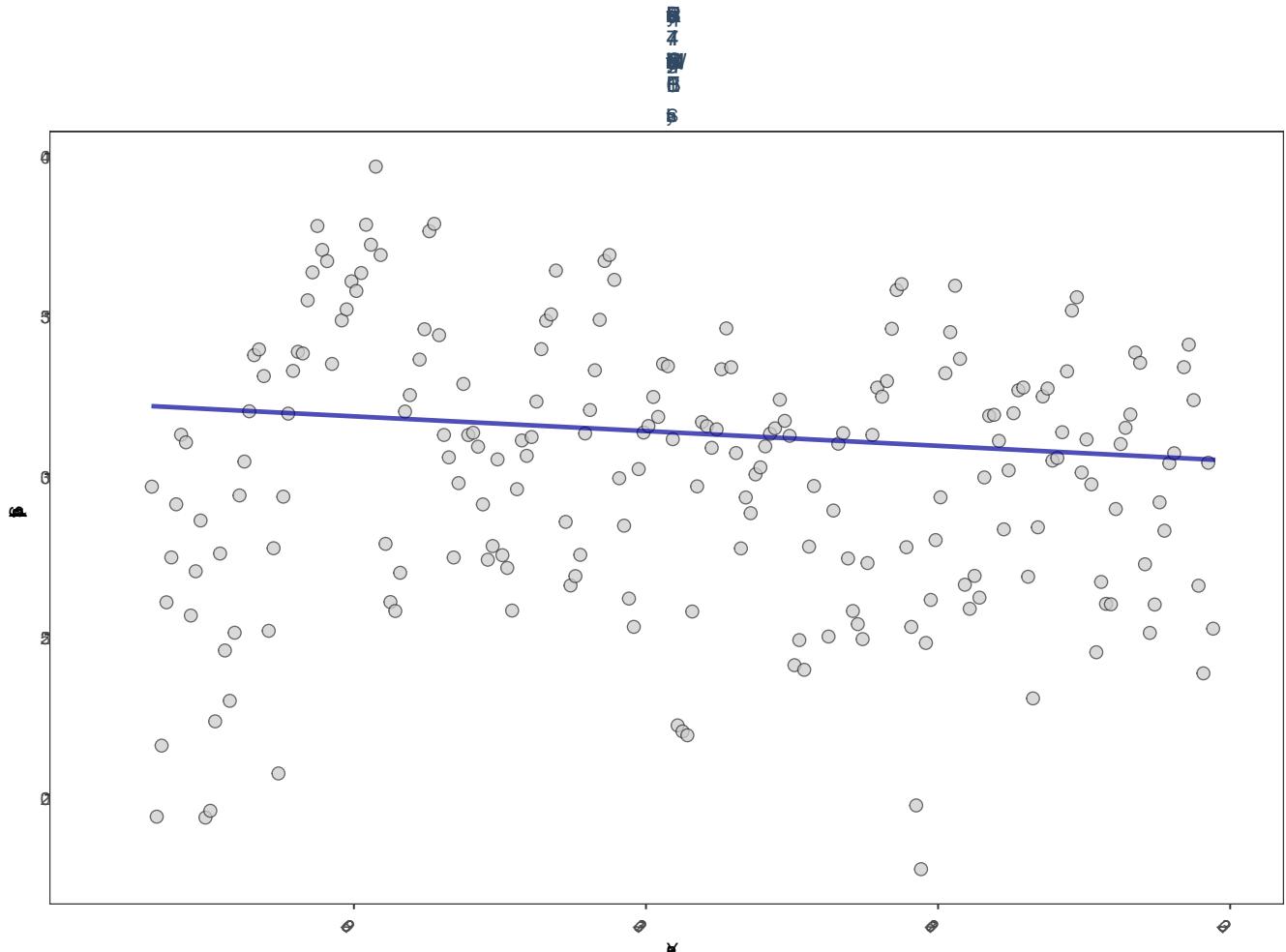
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	525178	19	8	TRUE	-0.1705	0.0007	-0.004519888	7.974864	5.7266	0.891	-1

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

SennIntercept is intercept value at beginning of record for monitoring location

Salinity

EB01

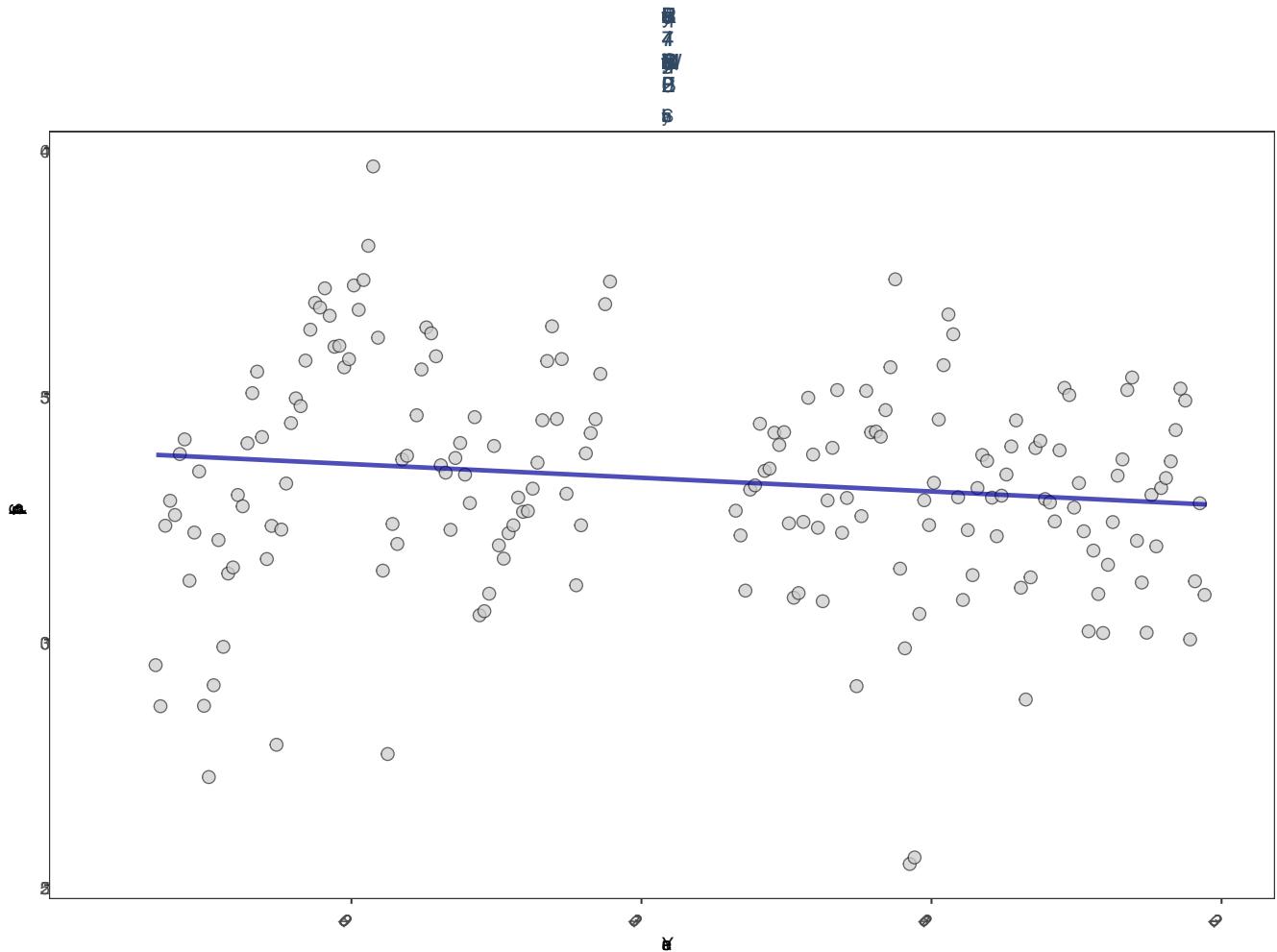


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	566152	19	30.7	TRUE	-0.1226	0.0182	-0.09197087	32.17017	5.8375	0.884	-1

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

SennIntercept is intercept value at beginning of record for monitoring location

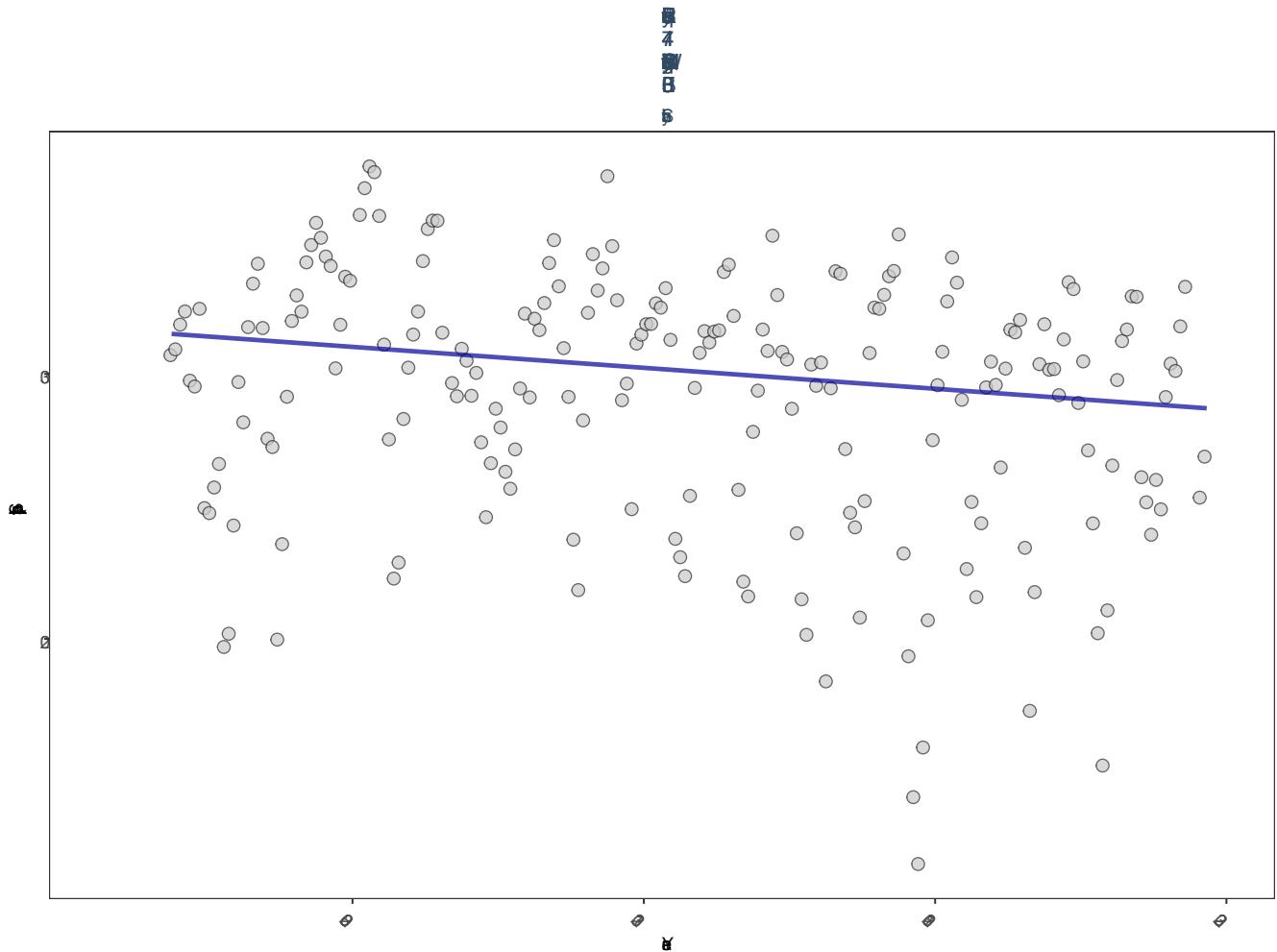
EB02



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

SennIntercept is intercept value at beginning of record for monitoring location

EB03



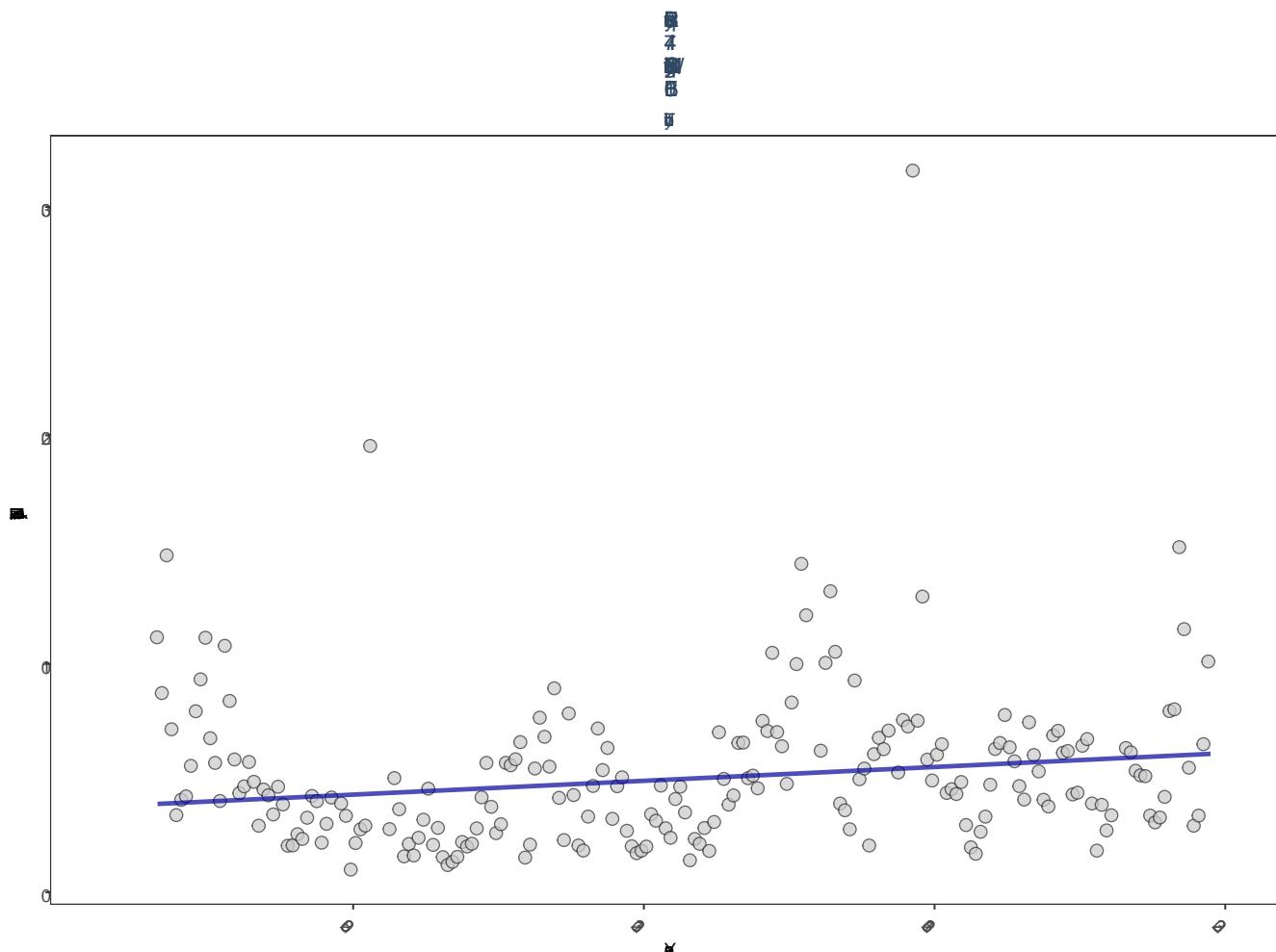
RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	533169	19	30.9	TRUE	-0.2138	0.0000	-0.1580336	31.65294	4.2465	0.9621	-1

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

SennIntercept is intercept value at beginning of record for monitoring location

Turbidity

EB01

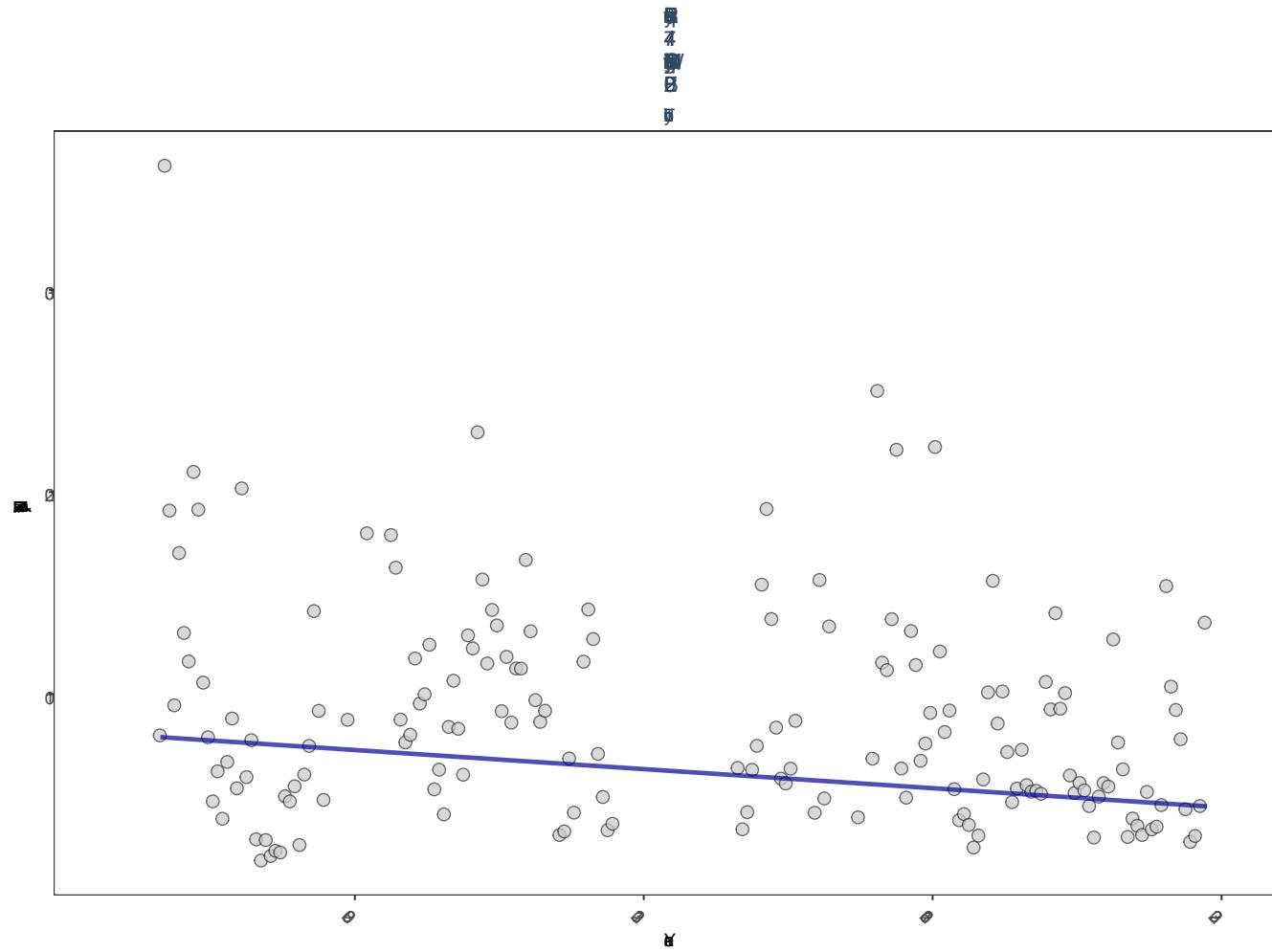


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	509980	19	4	TRUE	0.1746	0.0007	0.1209662	3.788219	12.3991	0.3344	1

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

SennIntercept is intercept value at beginning of record for monitoring location

EB02

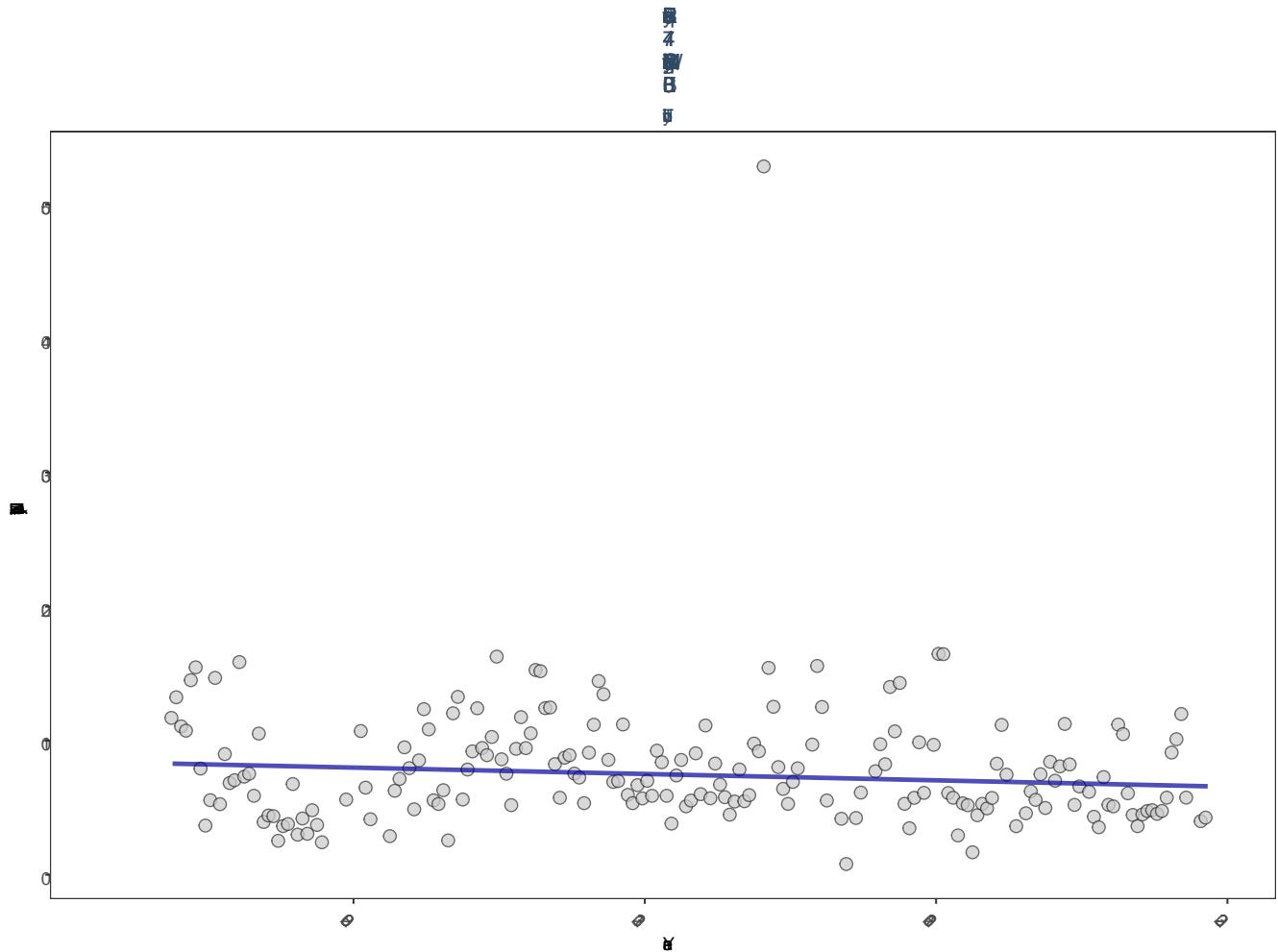


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	396630	18	5	TRUE	-0.1814	0.0028	-0.1889955	7.995252	13.1711	0.2823	-1

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

SennIntercept is intercept value at beginning of record for monitoring location

EB03

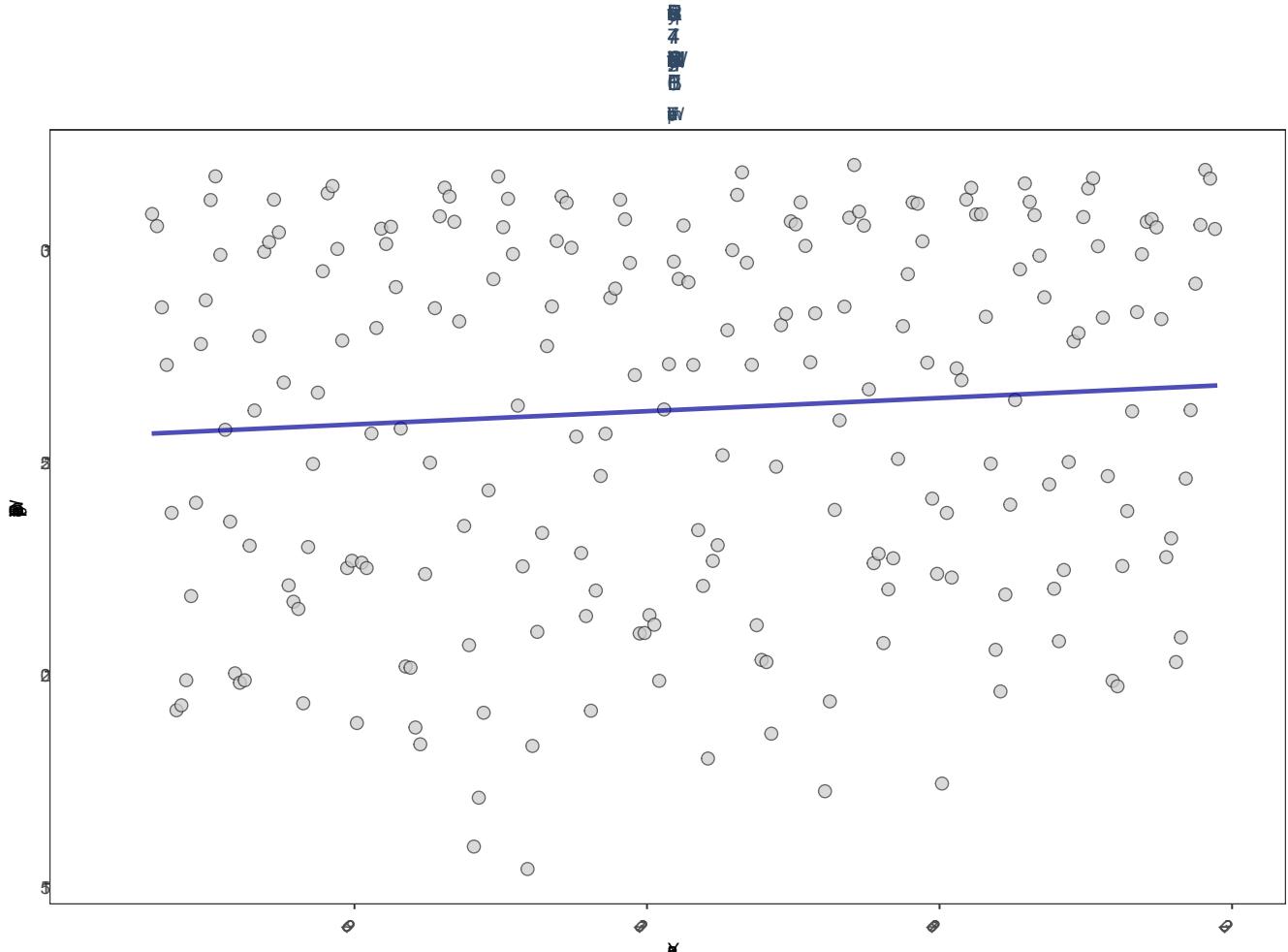


$p < 0.00005$ appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Water Temperature

EB01

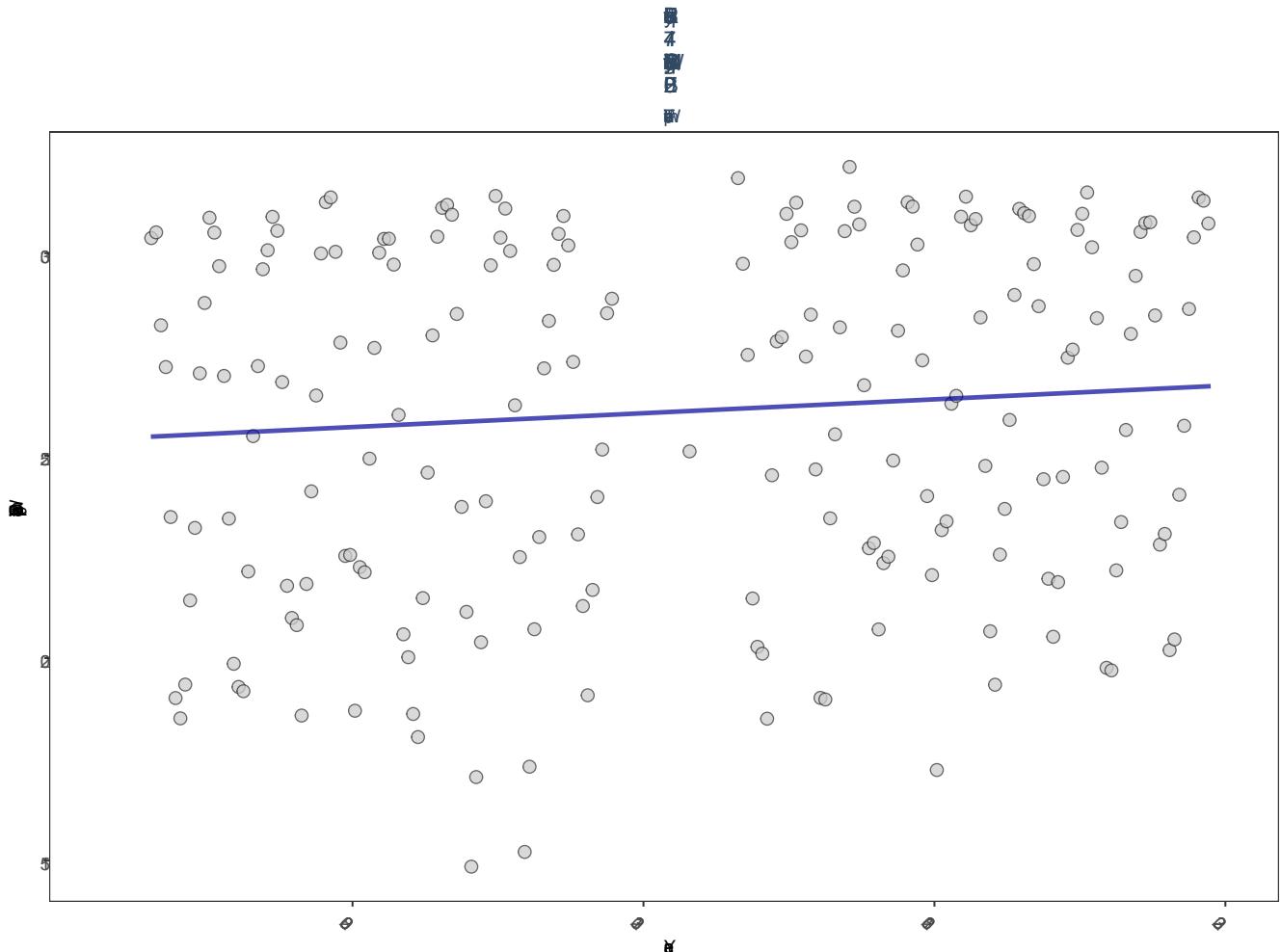


RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	616625	19	26.8	TRUE	0.2539	0.0000	0.06213652	25.56719	6.9882	0.8	1

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

SennIntercept is intercept value at beginning of record for monitoring location

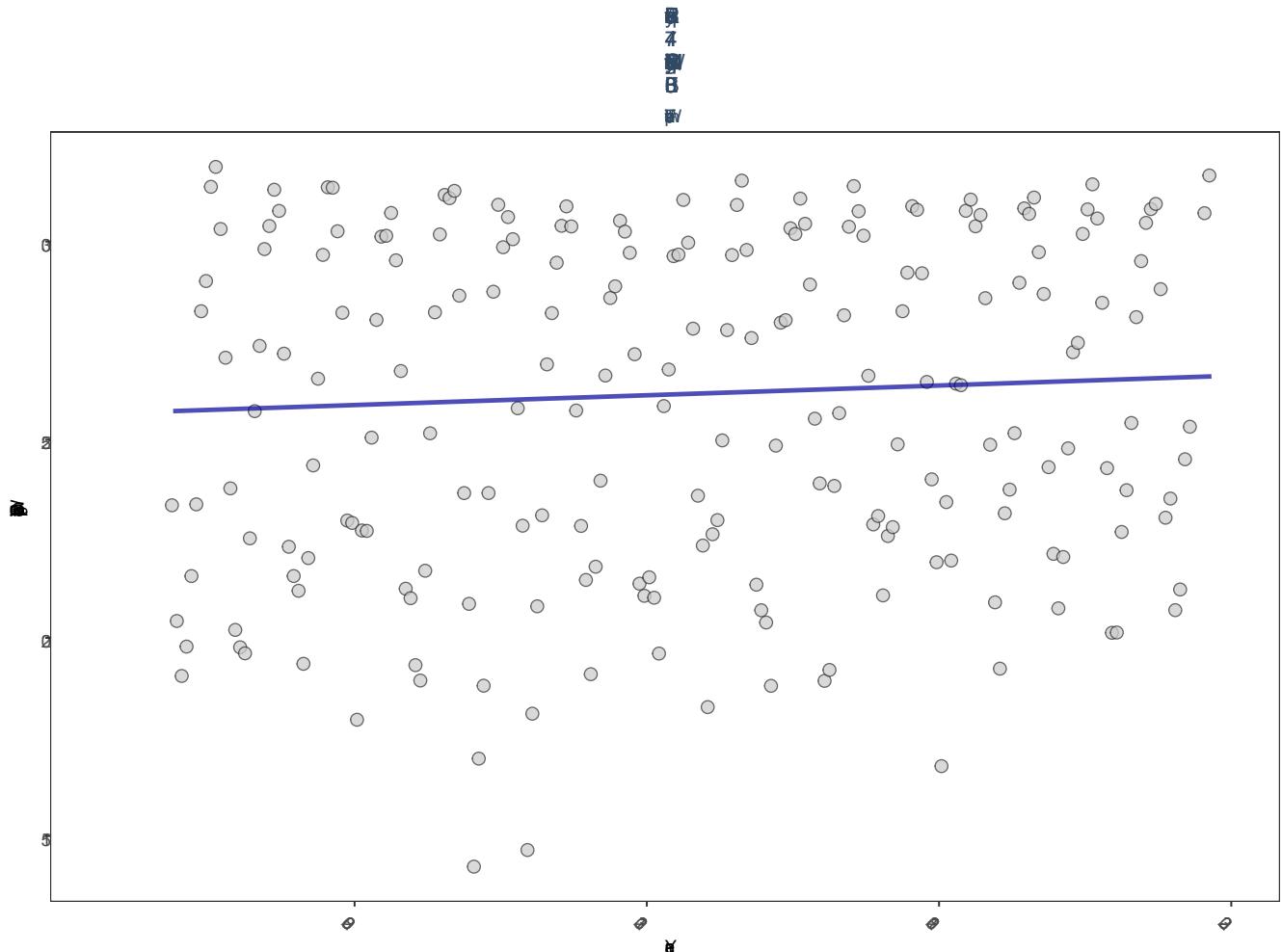
EB02



p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

EB03



RelativeDepth	N_Data	N_Years	Median	Independent	tau	p	SennSlope	SennIntercept	ChiSquared	pChiSquared	Trend
bottom	572084	19	26.5	TRUE	0.1722	0.0006	0.04927919	25.67835	7.636	0.7455	1

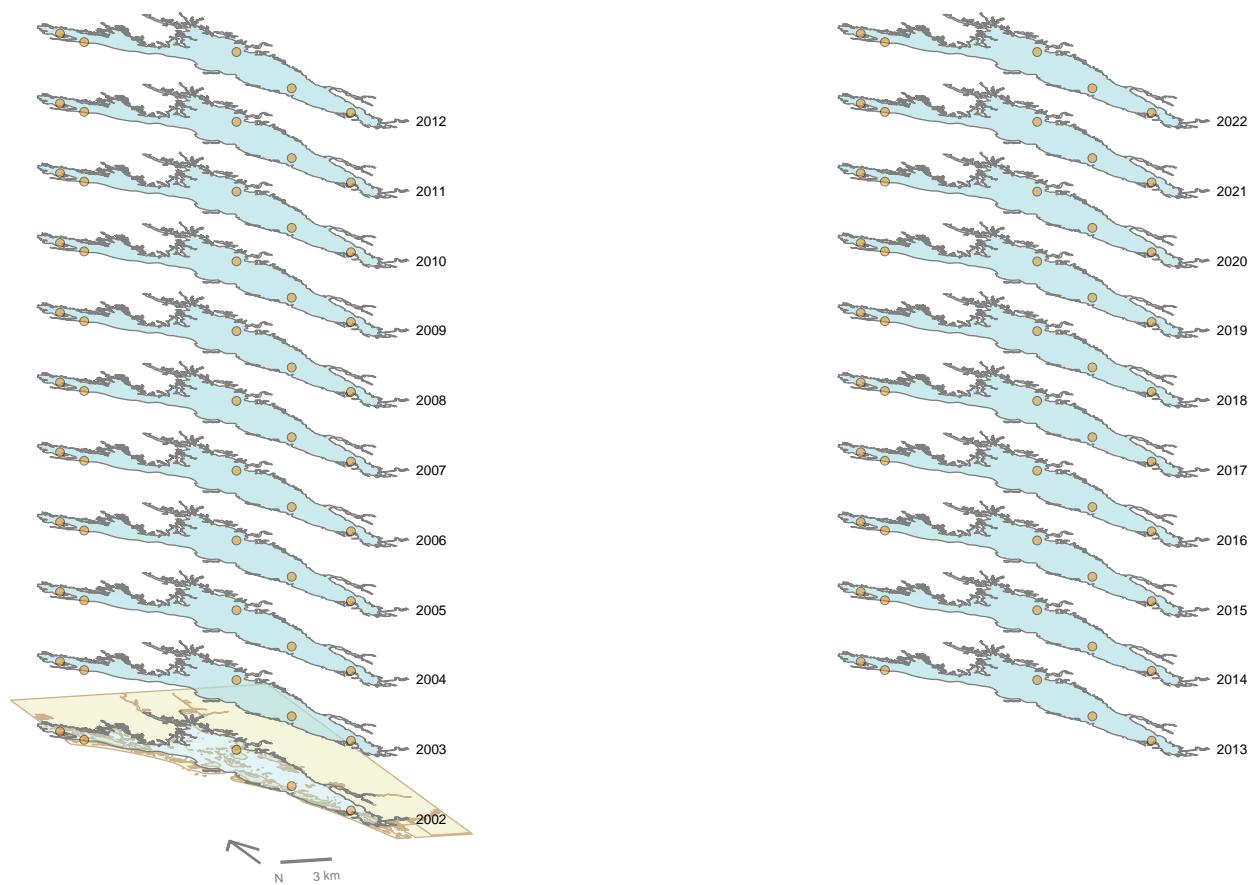
p < 0.00005 appear as 0 due to rounding.

SennIntercept is intercept value at beginning of record for monitoring location

Submerged Aquatic Vegetation

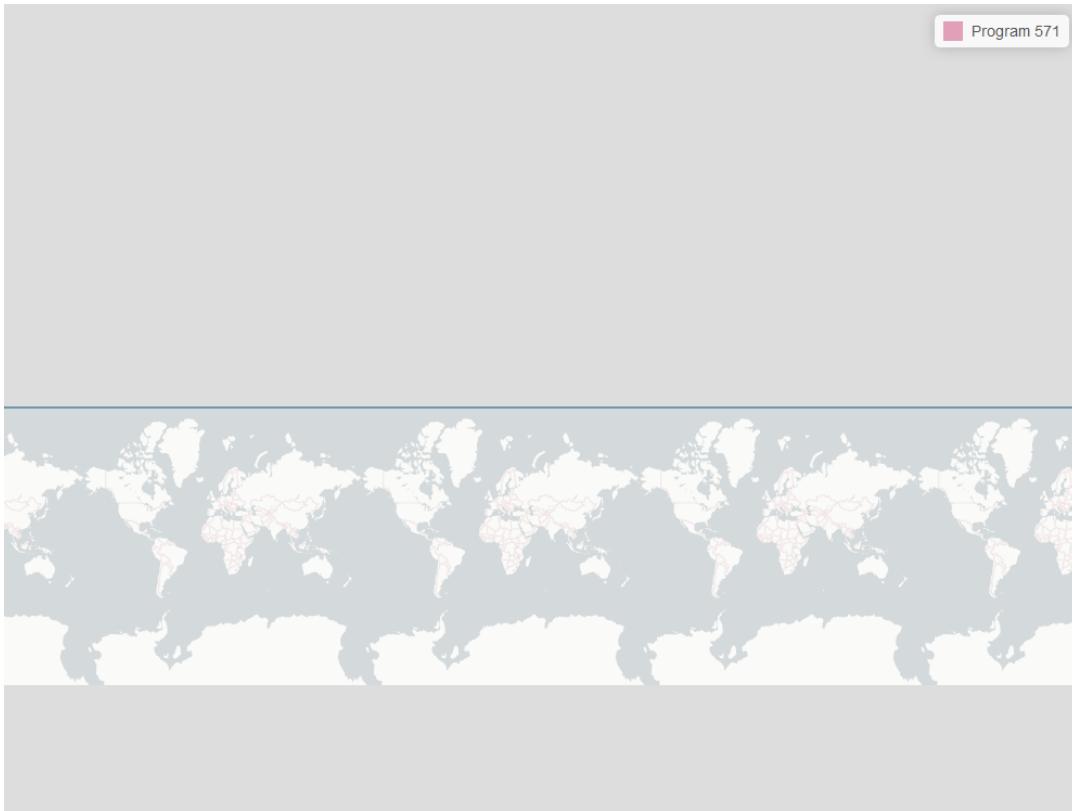
The data file used is: **All_SAV_Parameters-2023-Oct-12.txt**

Estero Bay Aquatic Preserve
Sample Locations – SAV Percent Cover



Program name
● Estero Bay Seagrass Monitoring

Sampling locations by Program:



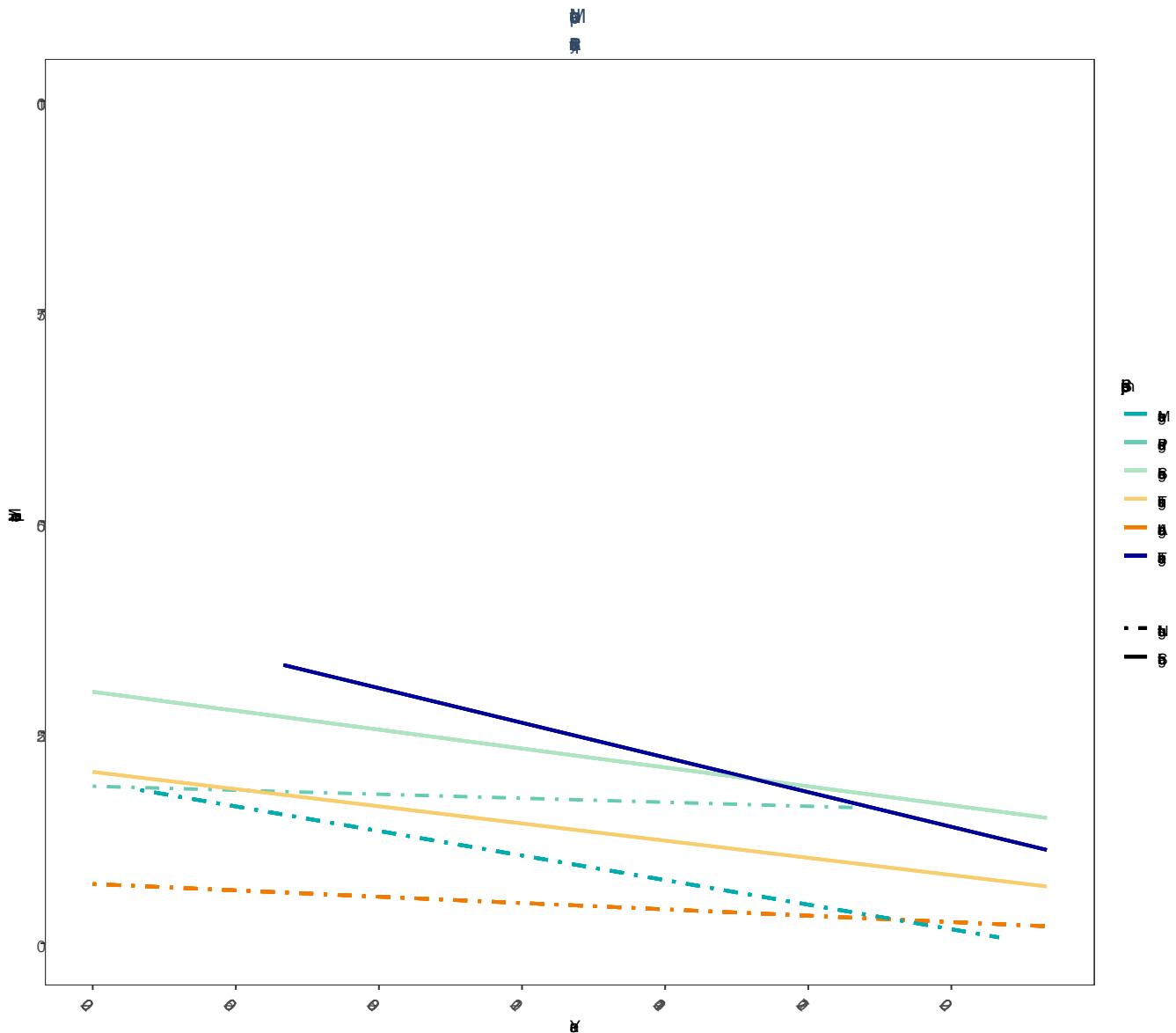


Table 29: Percent Cover Trend Analysis for Estero Bay Aquatic Preserve

Species	Trend Significance (0.05)	Period of Record	LME_Intercept	LME_Slope	p
Attached algae	No significant trend	2002 - 2022	9.0354	-0.2507	0.3843
Drift algae	No significant trend	2002 - 2022	18.6207	-0.2207	0.4153
Manatee grass	No significant trend	2003 - 2021	26.9391	-0.9721	0.3518
Paddle grass	No significant trend	2002 - 2018	19.9126	-0.1586	0.8100
Shoal grass	Significantly decreasing trend	2002 - 2022	35.8422	-0.7484	0.0042
Star grass	Model did not fit the available data	2002 - 2022			
Total seagrass	Significantly decreasing trend	2006 - 2022	49.5110	-1.3725	0.0183
Turtle grass	Significantly decreasing trend	2002 - 2022	25.7820	-0.6800	0.0270
Unidentified Halophila	Model did not fit the available data	2003 - 2015			

