

SEACAR SAV Analysis

Last compiled on 10 July, 2025

Contents

Important Notes	1
Alligator Harbor Aquatic Preserve	2
Apalachicola Bay Aquatic Preserve	6
Apalachicola National Estuarine Research Reserve	10
Banana River Aquatic Preserve	14
Big Bend Seagrasses Aquatic Preserve	18
Biscayne Bay Aquatic Preserve	22
Boca Ciega Bay Aquatic Preserve	26
Cape Haze Aquatic Preserve	30
Cockroach Bay Aquatic Preserve	34
Esteros Bay Aquatic Preserve	38
Florida Keys National Marine Sanctuary	42
Fort Pickens State Park Aquatic Preserve	46
Gasparilla Sound-Charlotte Harbor Aquatic Preserve	50
Indian River-Malabar to Vero Beach Aquatic Preserve	54
Indian River-Vero Beach to Ft. Pierce Aquatic Preserve	58
Jensen Beach to Jupiter Inlet Aquatic Preserve	62
Lemon Bay Aquatic Preserve	66
Loxahatchee River-Lake Worth Creek Aquatic Preserve	70
Matlacha Pass Aquatic Preserve	74
Mosquito Lagoon Aquatic Preserve	78
Nature Coast Aquatic Preserve	82
Pine Island Sound Aquatic Preserve	86

Pinellas County Aquatic Preserve	90
Rookery Bay Aquatic Preserve	94
Rookery Bay National Estuarine Research Reserve	98
St. Andrews Aquatic Preserve	102
St. Joseph Bay Aquatic Preserve	106
St. Martins Marsh Aquatic Preserve	110
Terra Ceia Aquatic Preserve	114
Summary of SEACAR_SAV_BB_script_website.R	117

Important Notes

The purpose of this script is to provide a report summary of SAV analysis. The script used for analysis is SEACAR_SAV_BB_script_website.R.

All scripts and outputs can be found on the SEACAR GitHub repository:

https://github.com/FloridaSEACAR/SEACAR_Trend_Analyses

This script is based off of code originally written by Stephen Durham with comments by Marcus W. Beck. Modified by Tyler Hill.

The file being used for the analysis is: **All_SAV_Parameters-2025-Mar-06.txt**

Alligator Harbor Aquatic Preserve

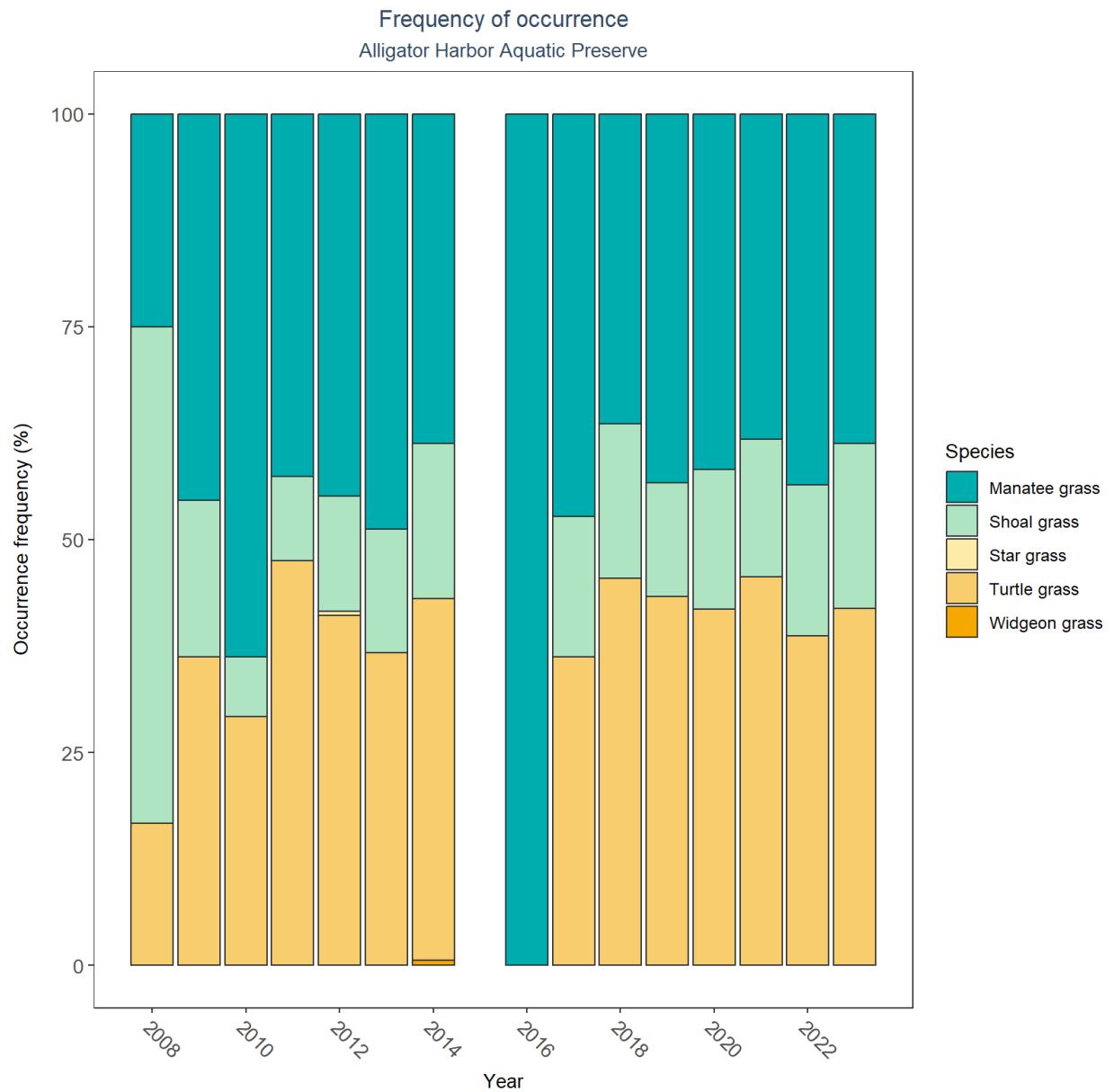


Figure 1: Frequency of occurrence for various seagrass species in Alligator Harbor Aquatic Preserve

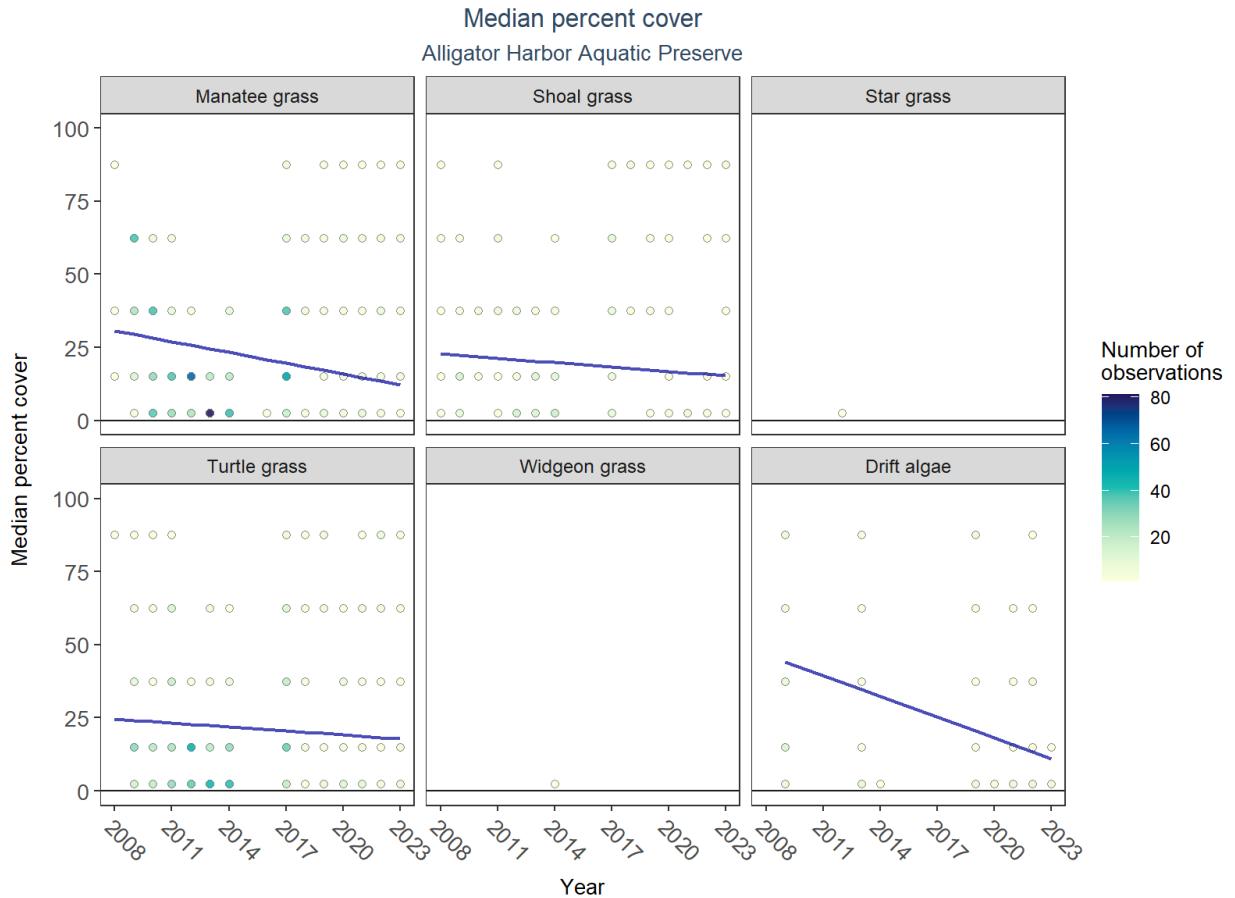


Figure 2: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 1: SAV LME Results for Alligator Harbor Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Significantly decreasing trend	2009 - 2023	79.40	-2.36	0.03
Shoal grass	No significant trend	2008 - 2023	29.79	-0.50	0.47
Star grass	Insufficient data to calculate trend	NA	NA	NA	NA
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	Insufficient data to calculate trend	NA	NA	NA	NA
Manatee grass	Significantly decreasing trend	2008 - 2023	47.86	-1.23	0.03
Turtle grass	No significant trend	2008 - 2023	30.97	-0.45	0.38

Annual decreases in percent cover were observed for manatee grass (-1.2%) and drift algae (-2.4%). No detectable change in percent cover was observed for shoal grass and turtle grass. Trends in percent cover could not be evaluated for star grass and widgeon grass due to insufficient data.

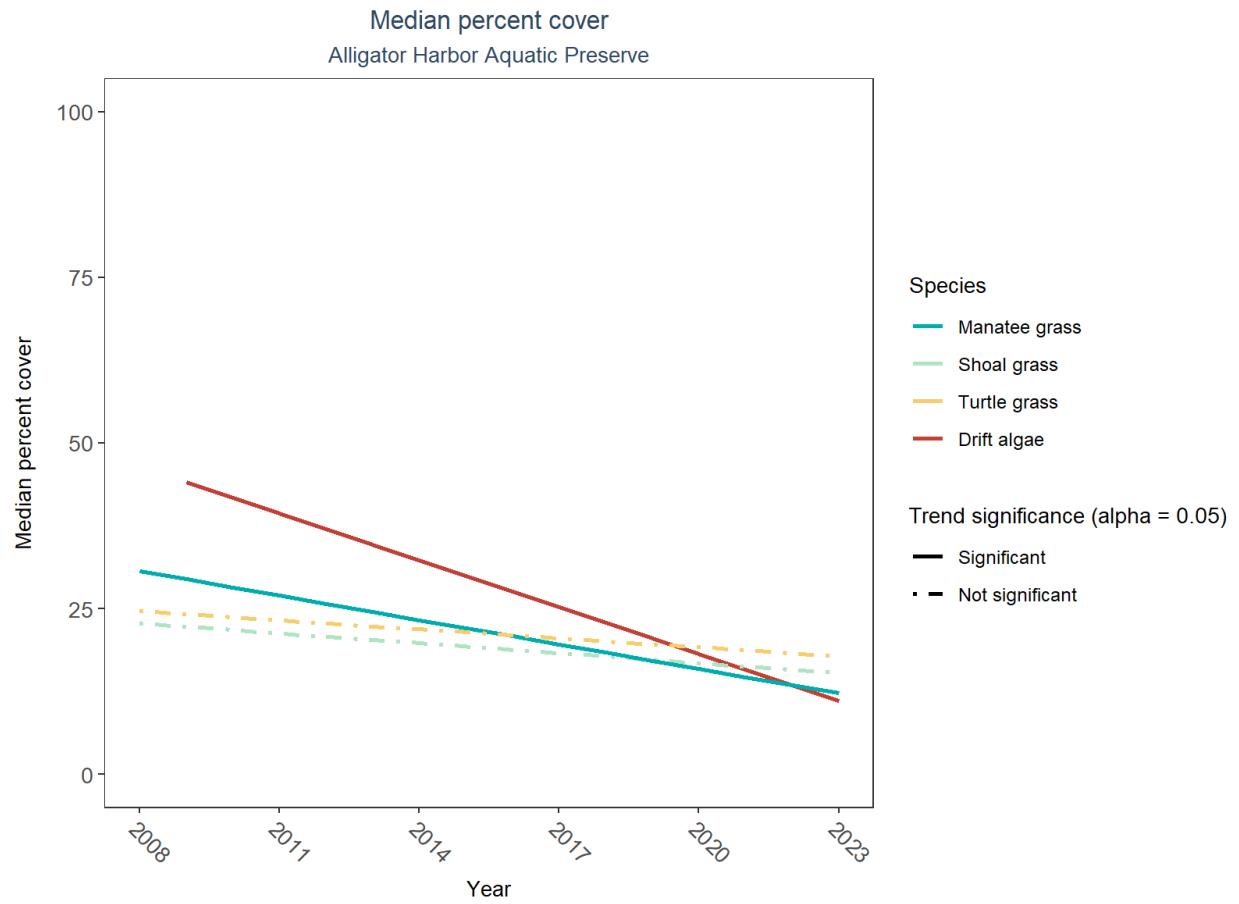


Figure 3: Trends in median percent cover for various seagrass species in Alligator Harbor Aquatic Preserve - simplified

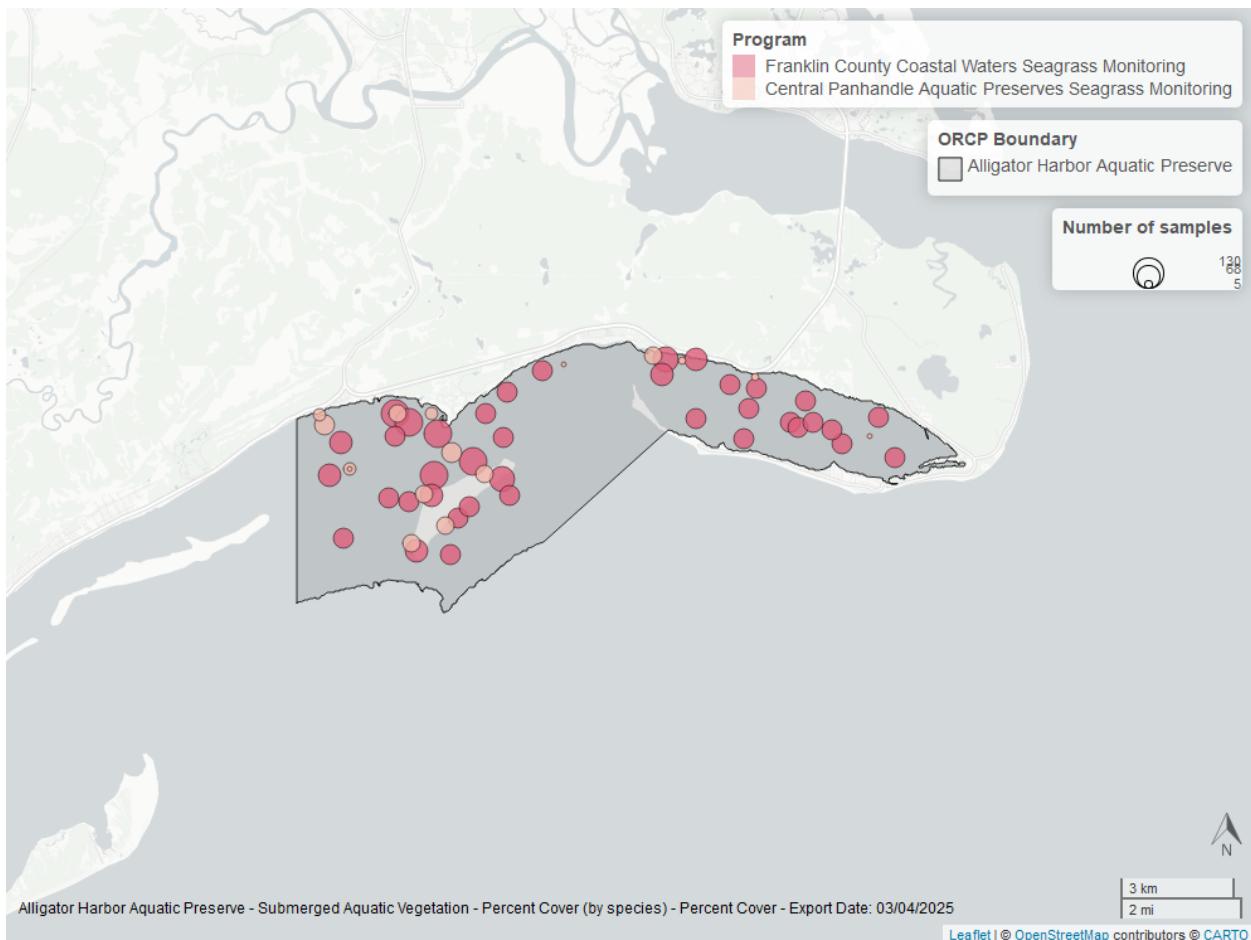


Figure 4: Map showing SAV sampling sites within the boundaries of *Alligator Harbor Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Apalachicola Bay Aquatic Preserve

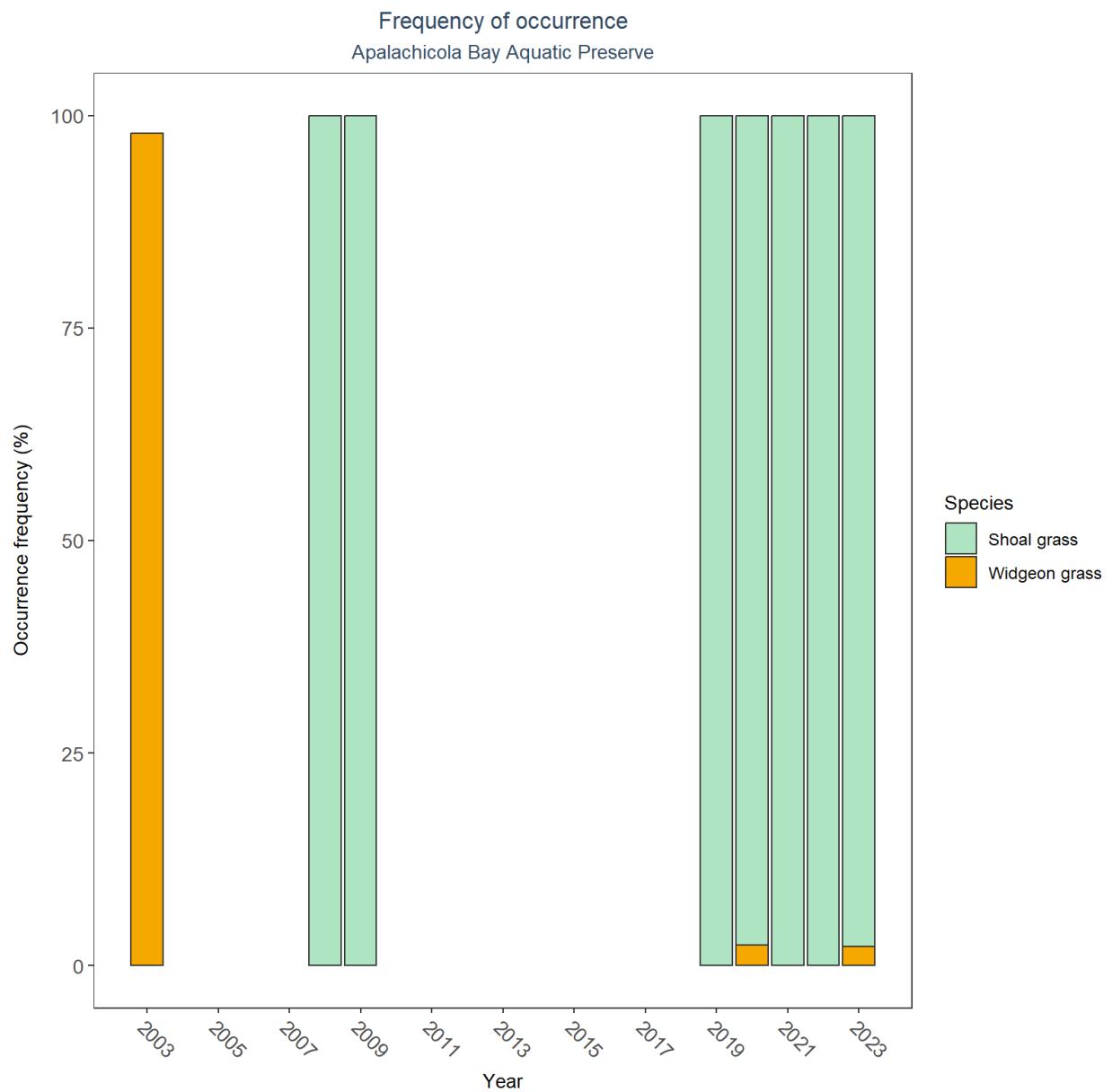


Figure 5: Frequency of occurrence for various seagrass species in Apalachicola Bay Aquatic Preserve

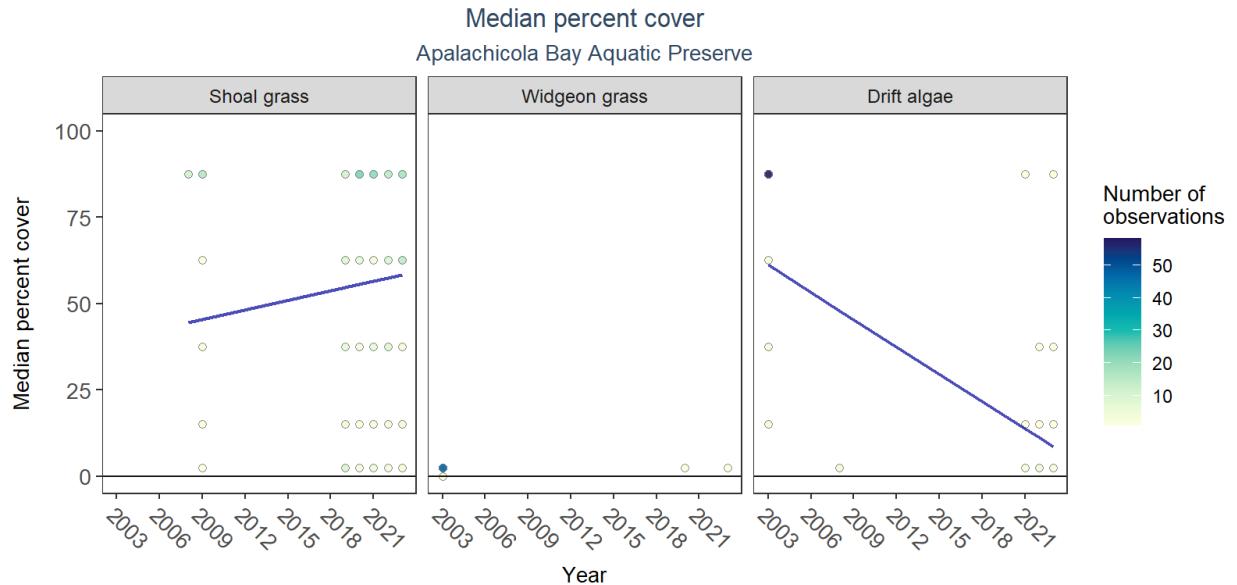


Figure 6: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 2: SAV LME Results for Apalachicola Bay Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Significantly decreasing trend	2003 - 2023	84.82	-2.63	0.00
Shoal grass	No significant trend	2008 - 2023	31.69	0.92	0.49
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	Insufficient data to calculate trend	NA	NA	NA	NA

An annual decrease in percent cover was observed for drift algae (-2.6%). No detectable change in percent cover was observed for shoal grass. Trends in percent cover could not be evaluated for widgeon grass due to insufficient data.

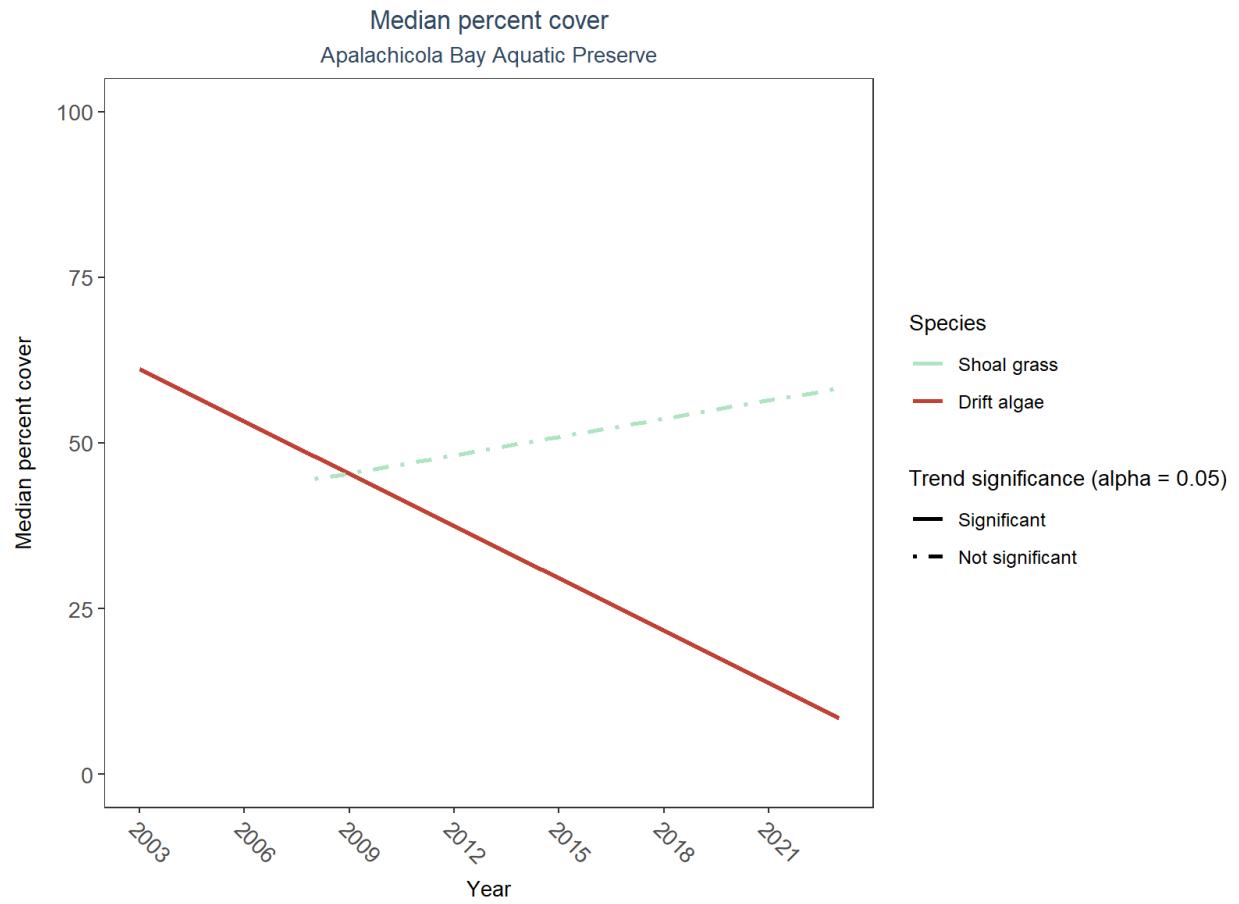


Figure 7: Trends in median percent cover for various seagrass species in Apalachicola Bay Aquatic Preserve - simplified

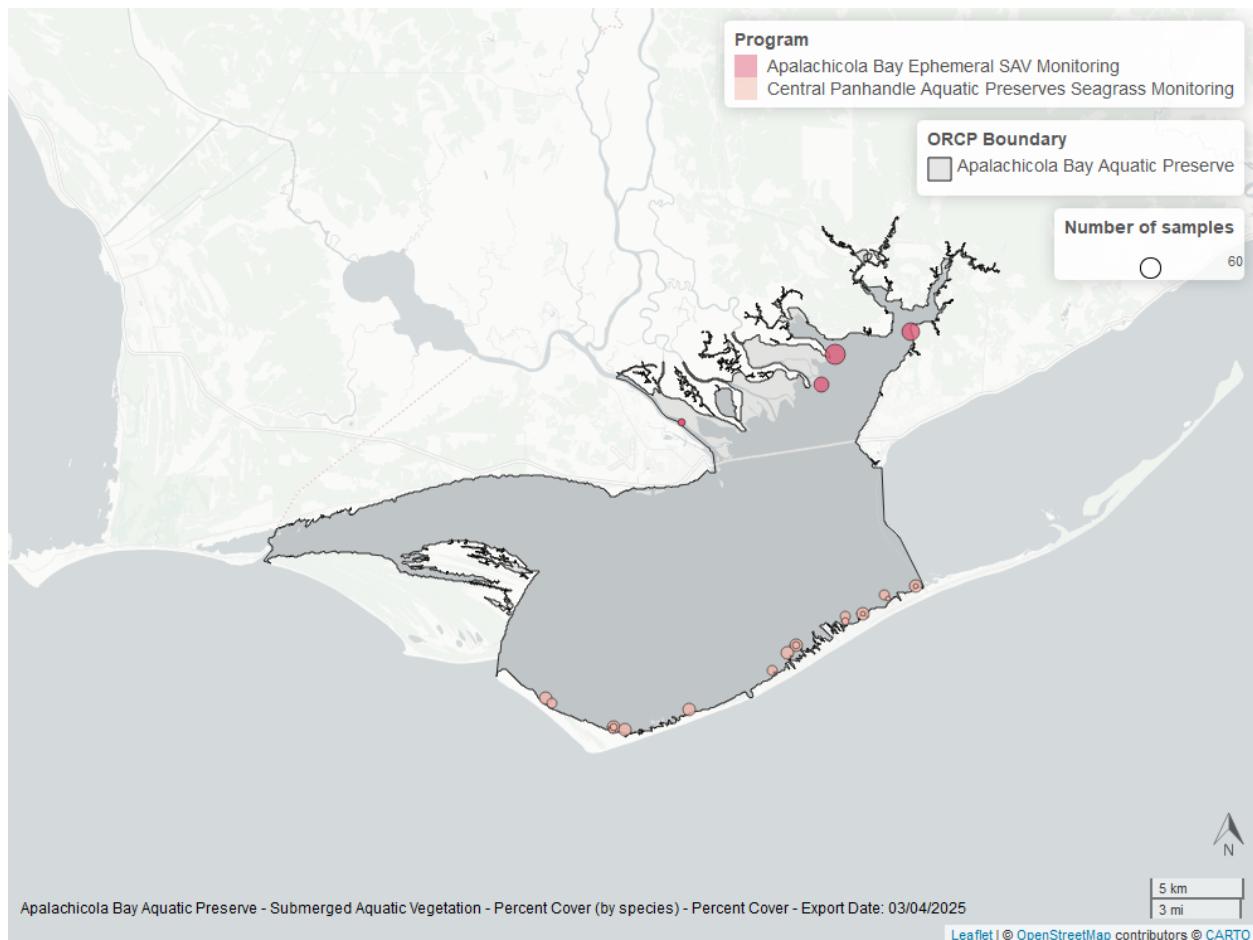


Figure 8: Map showing SAV sampling sites within the boundaries of *Apalachicola Bay Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Apalachicola National Estuarine Research Reserve

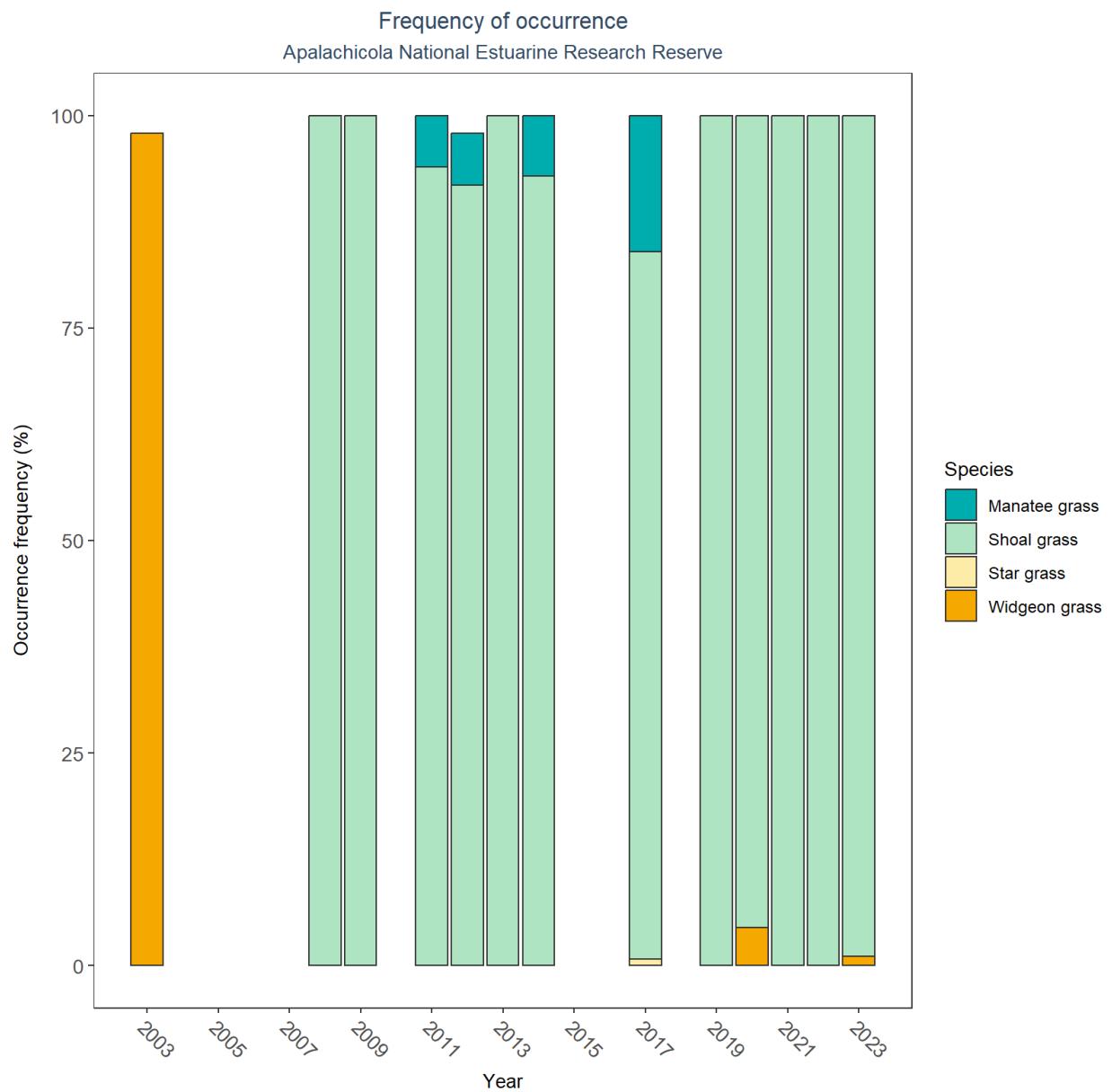


Figure 9: Frequency of occurrence for various seagrass species in Apalachicola National Estuarine Research Reserve

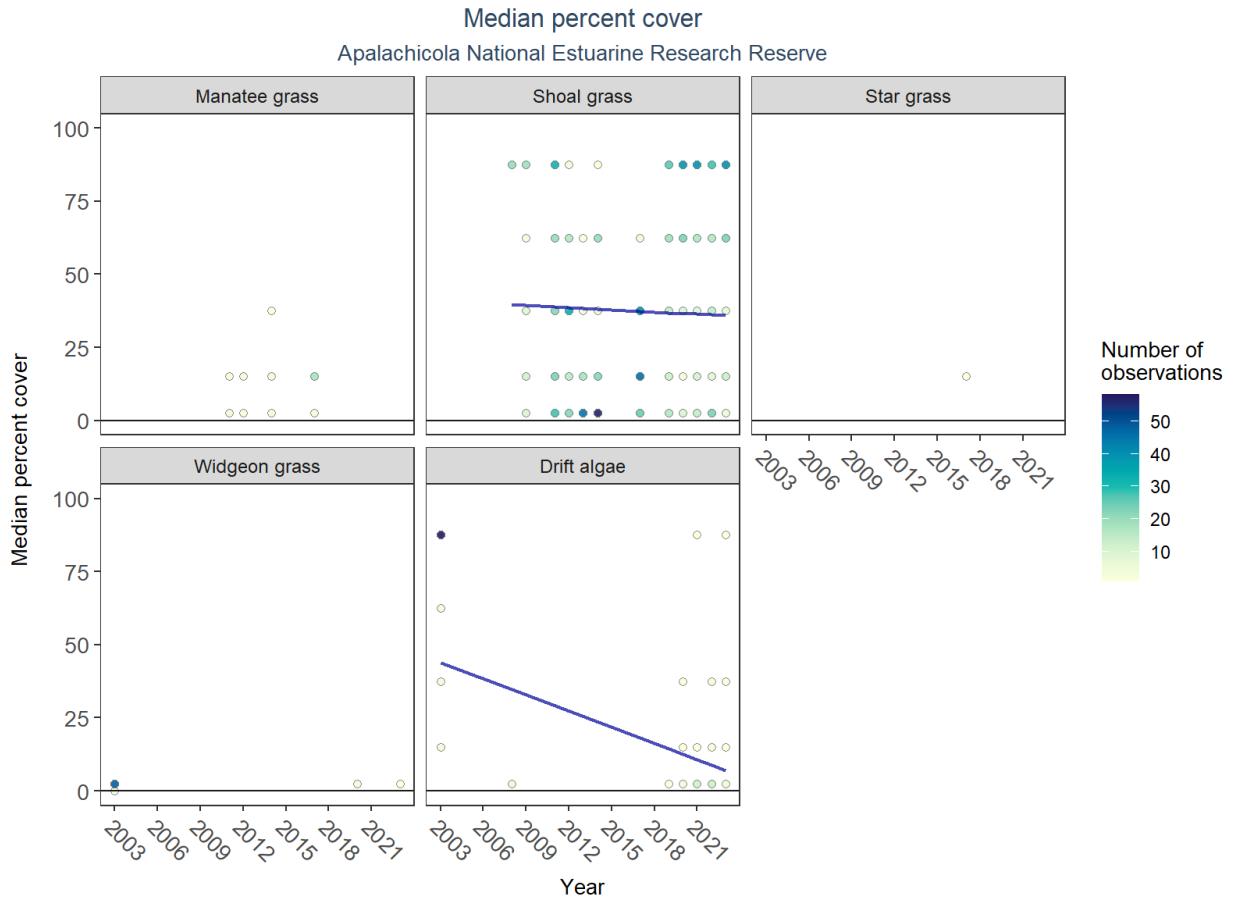


Figure 10: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 3: SAV LME Results for Apalachicola National Estuarine Research Reserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Significantly decreasing trend	2003 - 2023	60.31	-1.84	0.03
Shoal grass	No significant trend	2008 - 2023	42.98	-0.24	0.73
Star grass	Insufficient data to calculate trend	NA	NA	NA	NA
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	Insufficient data to calculate trend	NA	NA	NA	NA
Manatee grass	Insufficient data to calculate trend	NA	NA	NA	NA

An annual decrease in percent cover was observed for drift algae (-1.8%). No detectable change in percent cover was observed for shoal grass. Trends in percent cover could not be evaluated for manatee grass, star grass, and widgeon grass due to insufficient data.

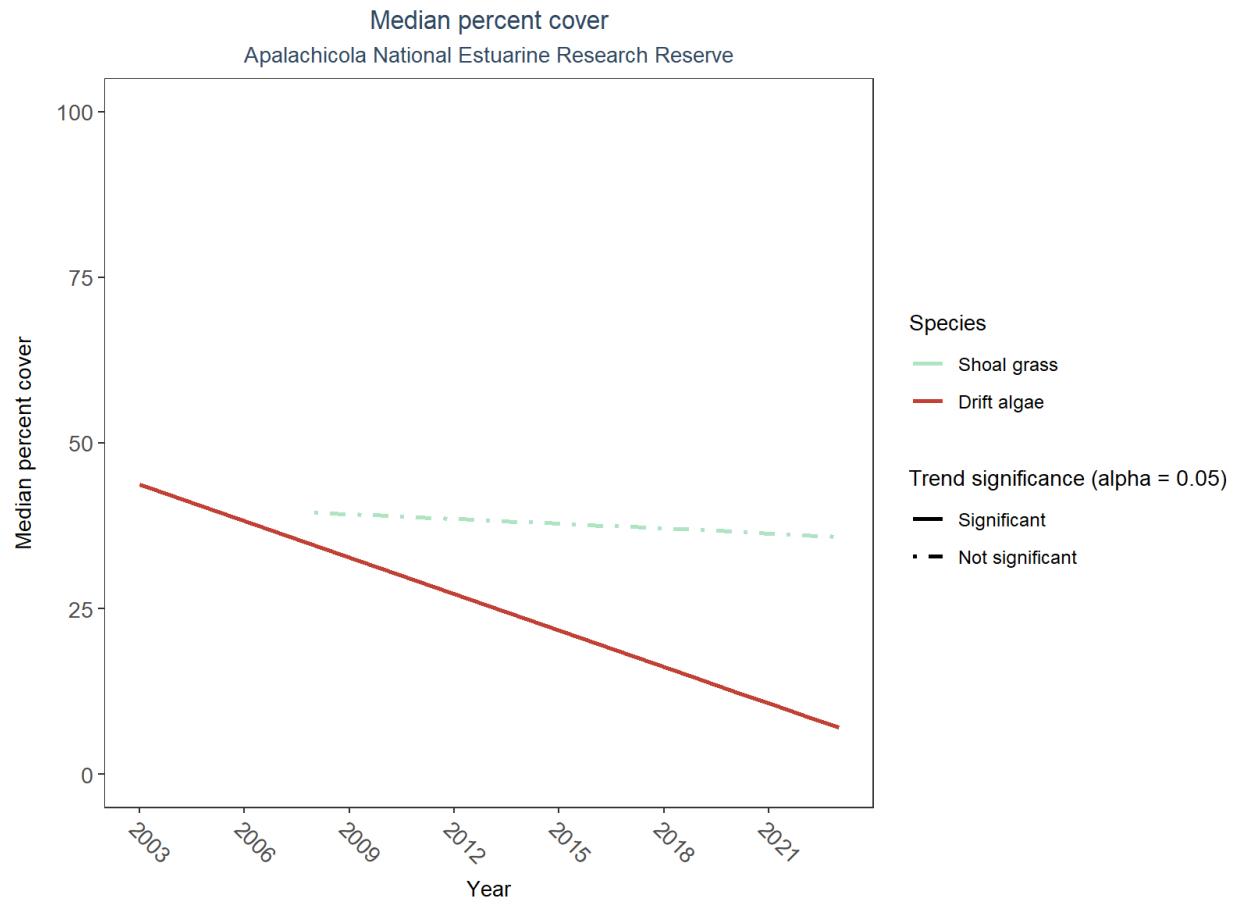


Figure 11: Trends in median percent cover for various seagrass species in Apalachicola National Estuarine Research Reserve - simplified

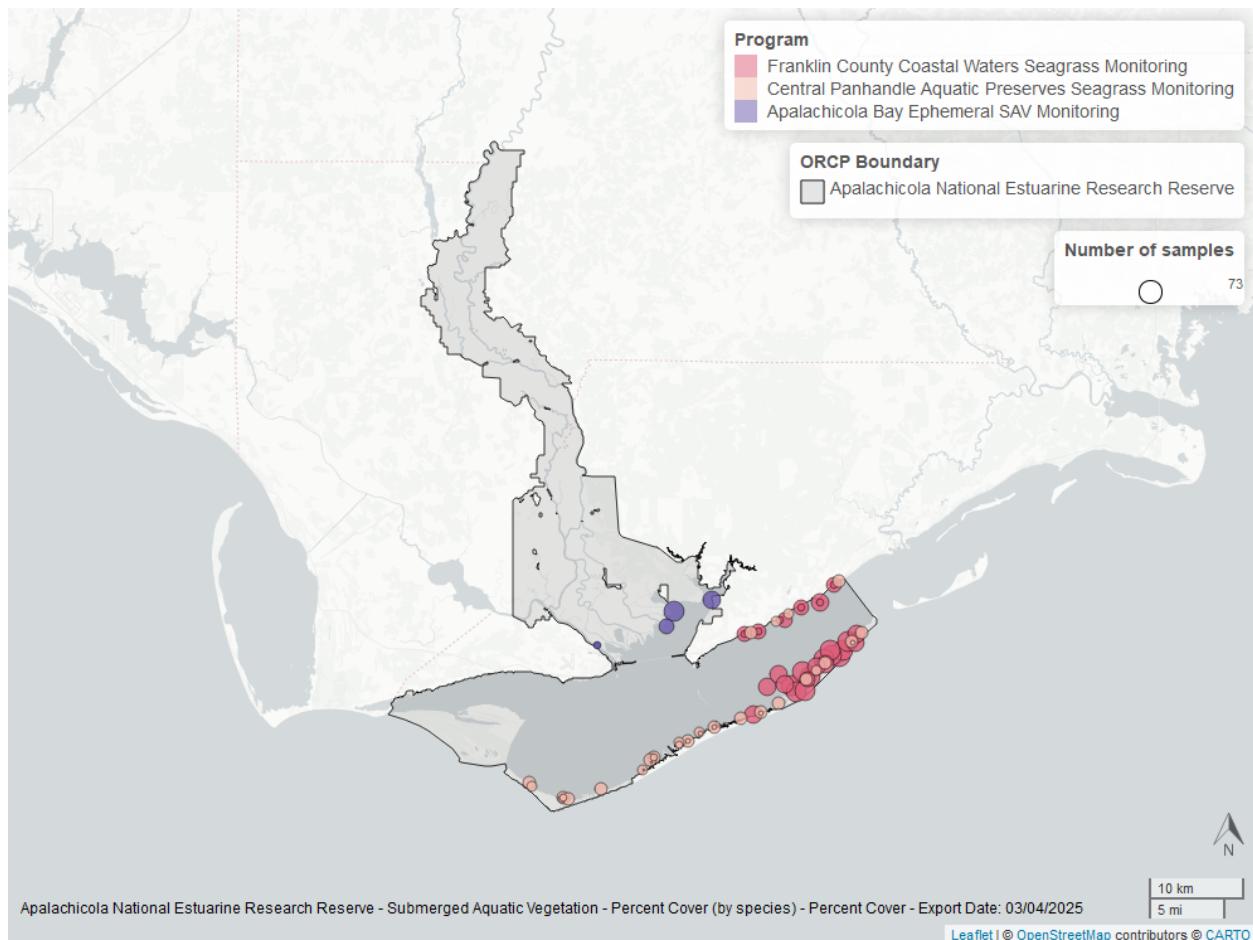


Figure 12: Map showing SAV sampling sites within the boundaries of *Apalachicola National Estuarine Research Reserve*. The point size reflects the number of samples at a given sampling site.

Banana River Aquatic Preserve

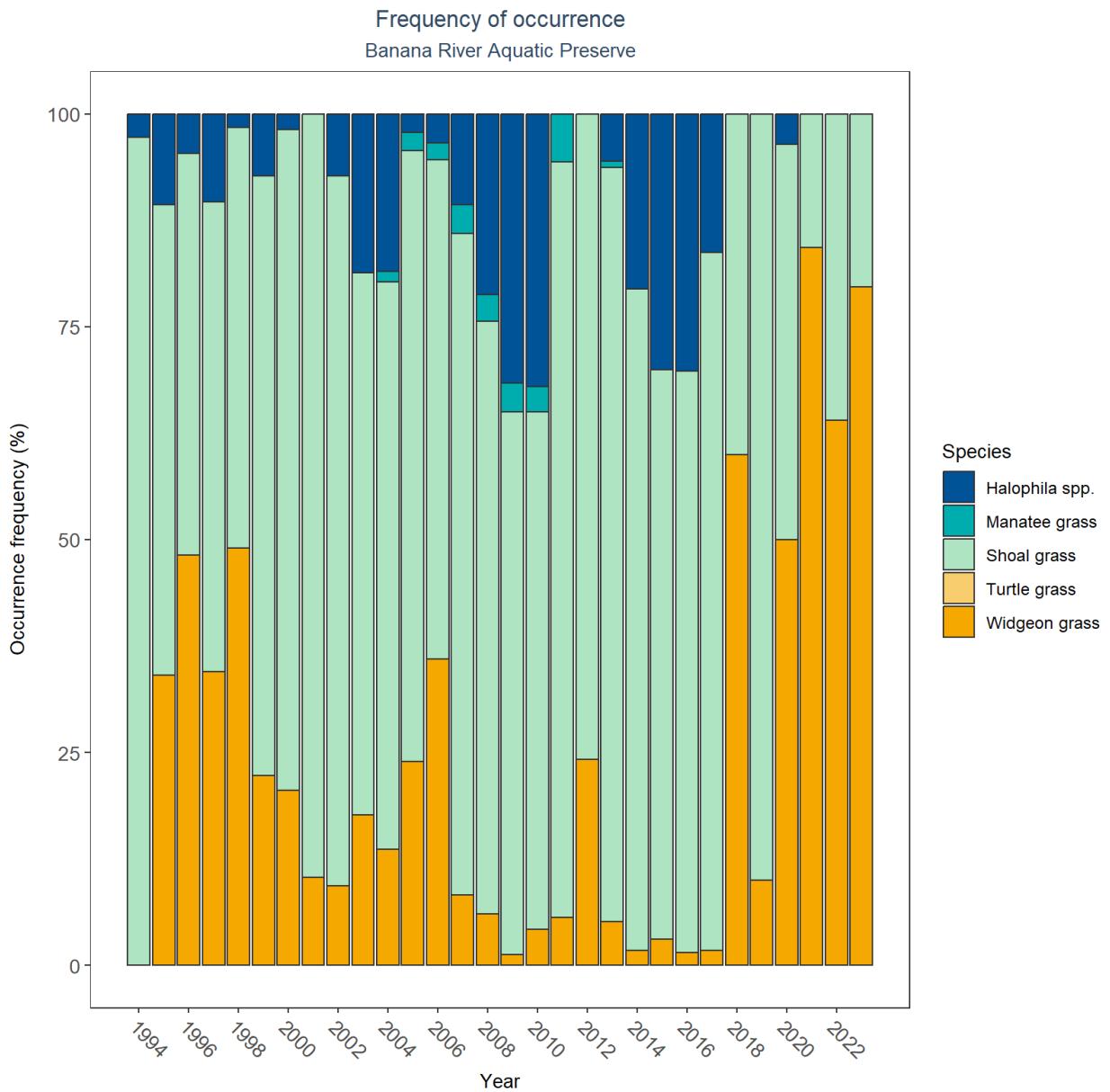


Figure 13: Frequency of occurrence for various seagrass species in Banana River Aquatic Preserve

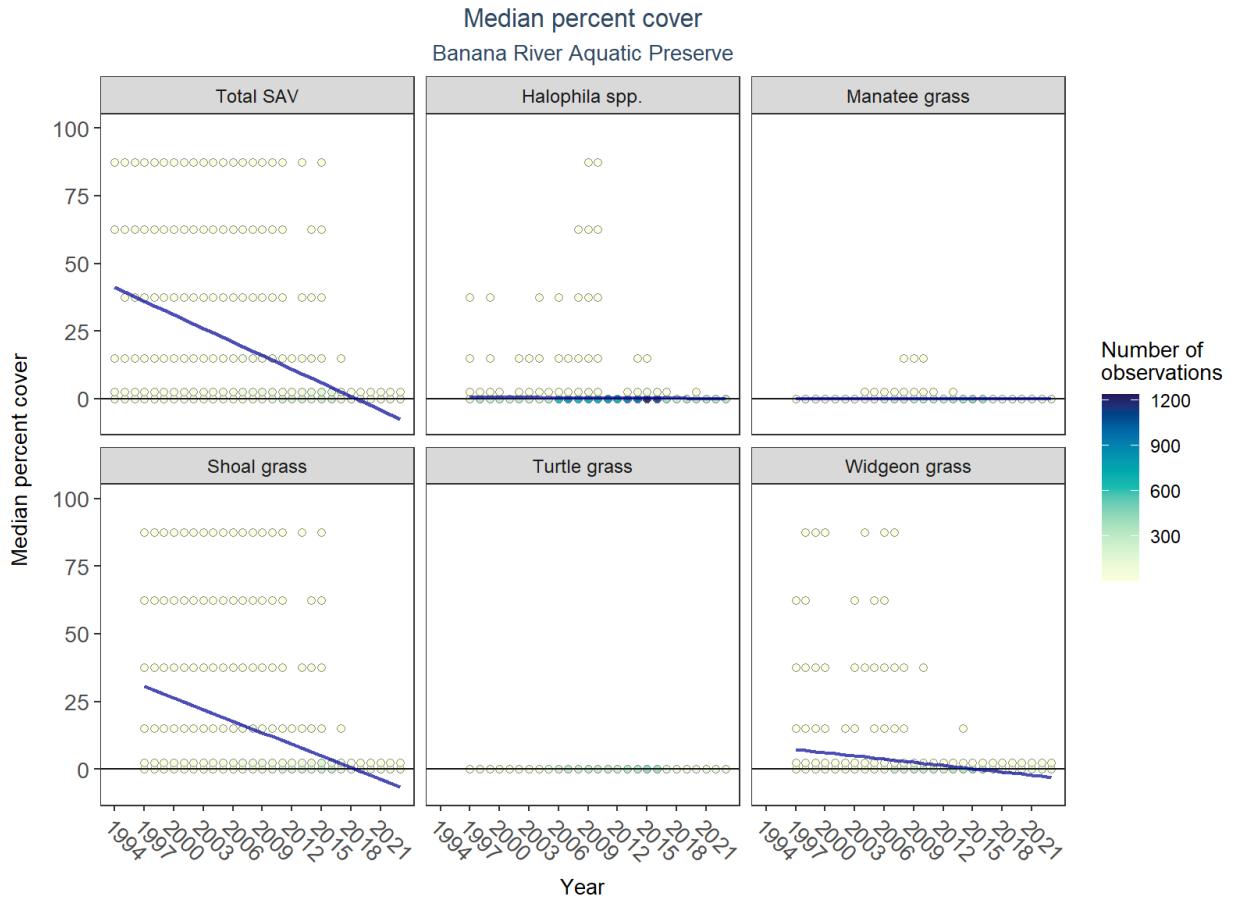


Figure 14: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 4: SAV LME Results for Banana River Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Insufficient data to calculate trend	NA	NA	NA	NA
Shoal grass	Significantly decreasing trend	1997 - 2023	34.82	-1.42	0.00
Halophila spp.	Significantly decreasing trend	1997 - 2023	0.59	-0.02	0.00
Widgeon grass	Significantly decreasing trend	1997 - 2023	8.53	-0.40	0.00
Manatee grass	No significant trend	1997 - 2023	0.09	0.00	0.09
Turtle grass	Model did not fit the available data	NA	NA	NA	NA
Total SAV	Significantly decreasing trend	1994 - 2023	41.12	-1.67	0.00
Total seagrass	Insufficient data to calculate trend	NA	NA	NA	NA

Annual decreases in percent cover were observed for total SAV (-1.7%), *Halophila* spp. (-0.0%), shoal grass (-1.4%), and widgeon grass (-0.4%). No detectable change in percent cover was observed for manatee grass. Trends in percent cover could not be evaluated for total seagrass and drift algae due to insufficient data, and the model could not be fitted for turtle grass.

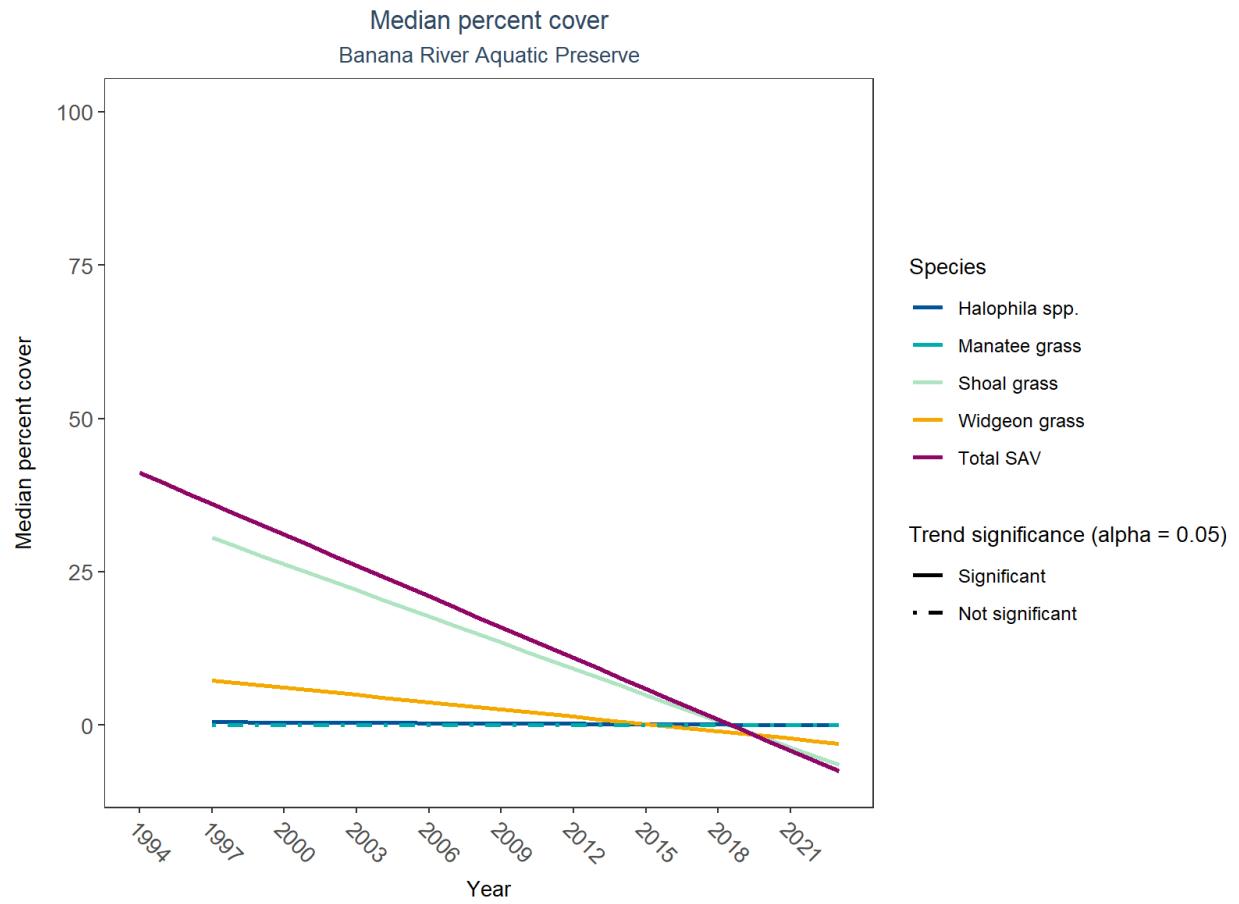


Figure 15: Trends in median percent cover for various seagrass species in Banana River Aquatic Preserve - simplified

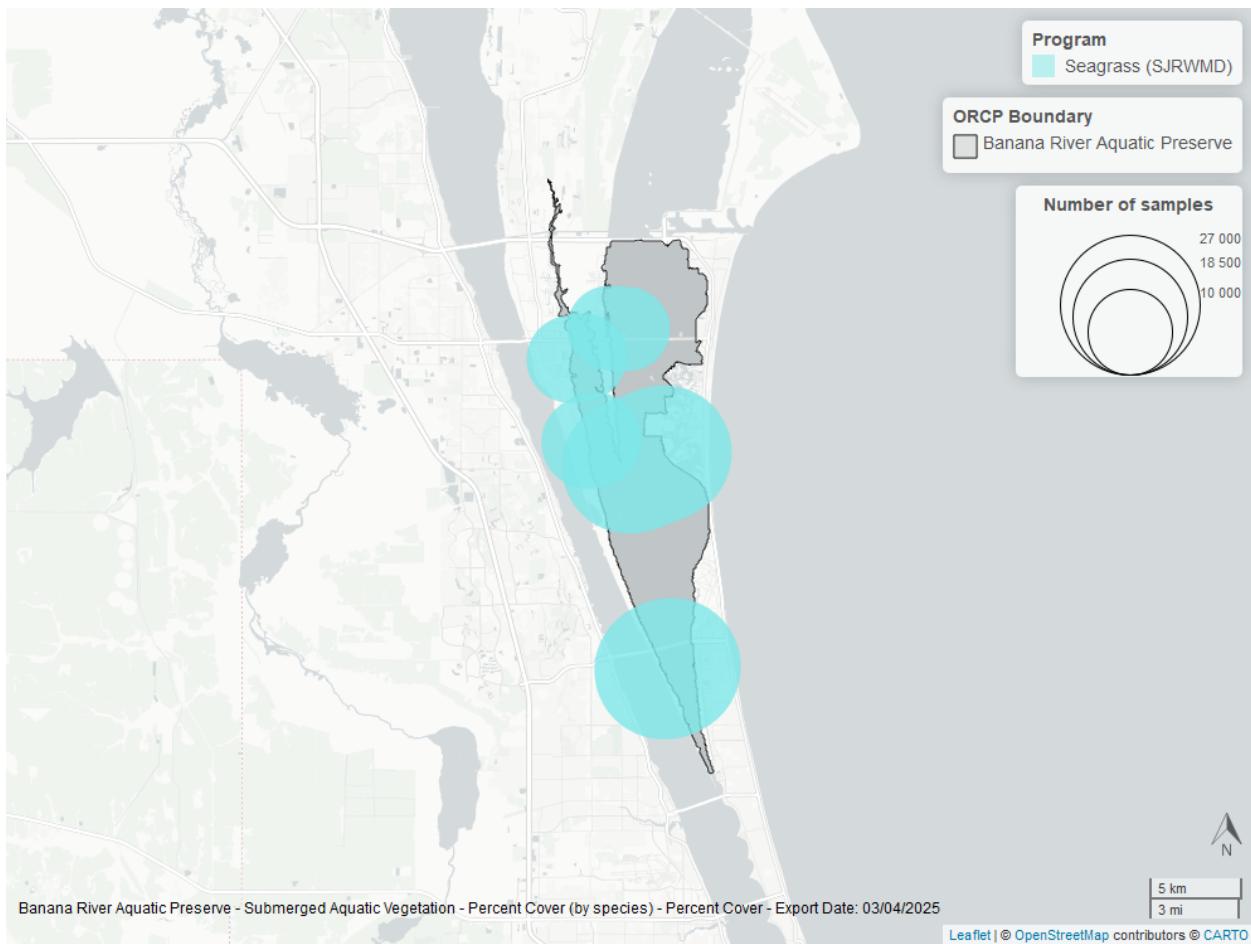


Figure 16: Map showing SAV sampling sites within the boundaries of *Banana River Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Big Bend Seagrasses Aquatic Preserve

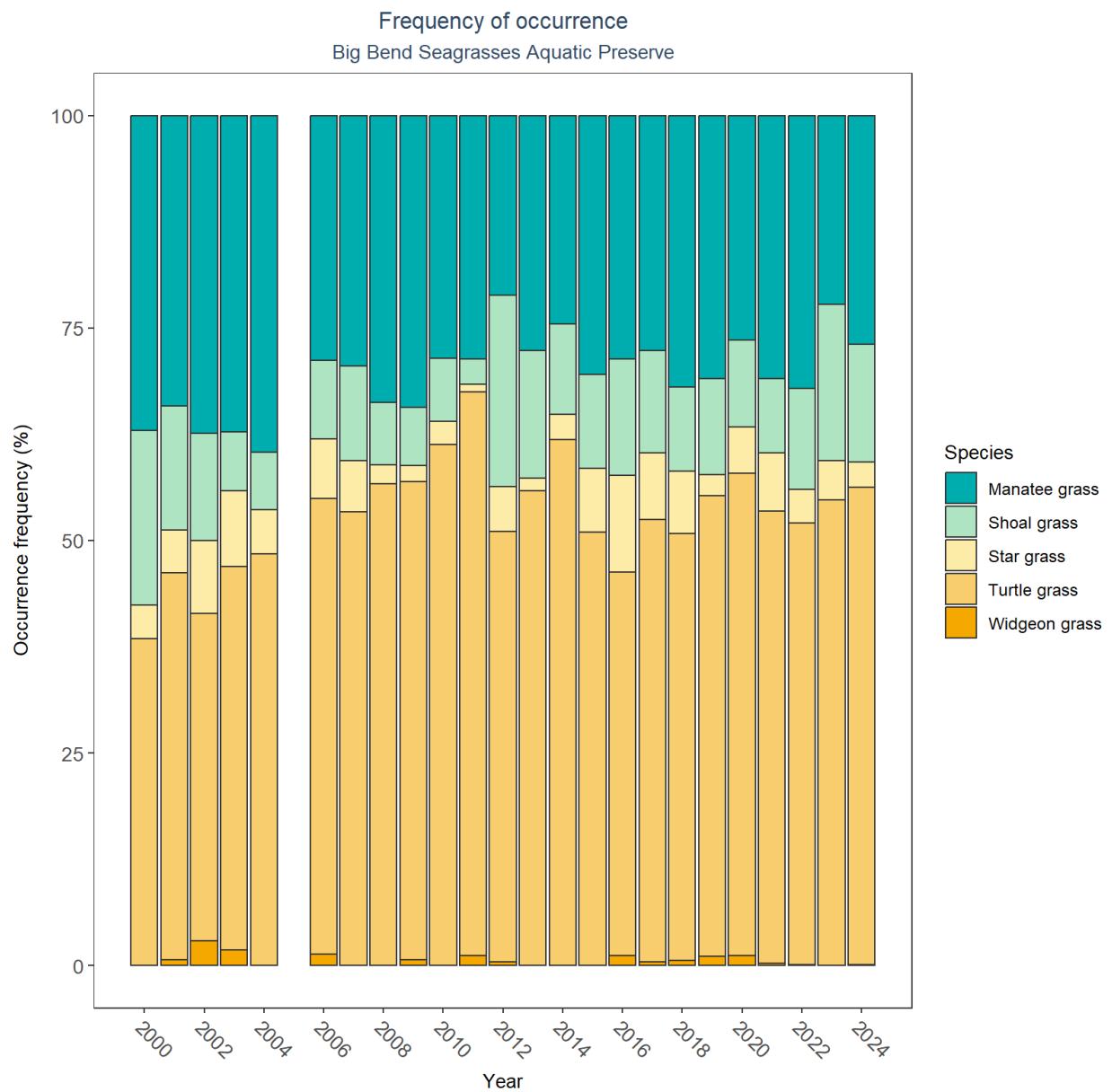


Figure 17: Frequency of occurrence for various seagrass species in Big Bend Seagrasses Aquatic Preserve

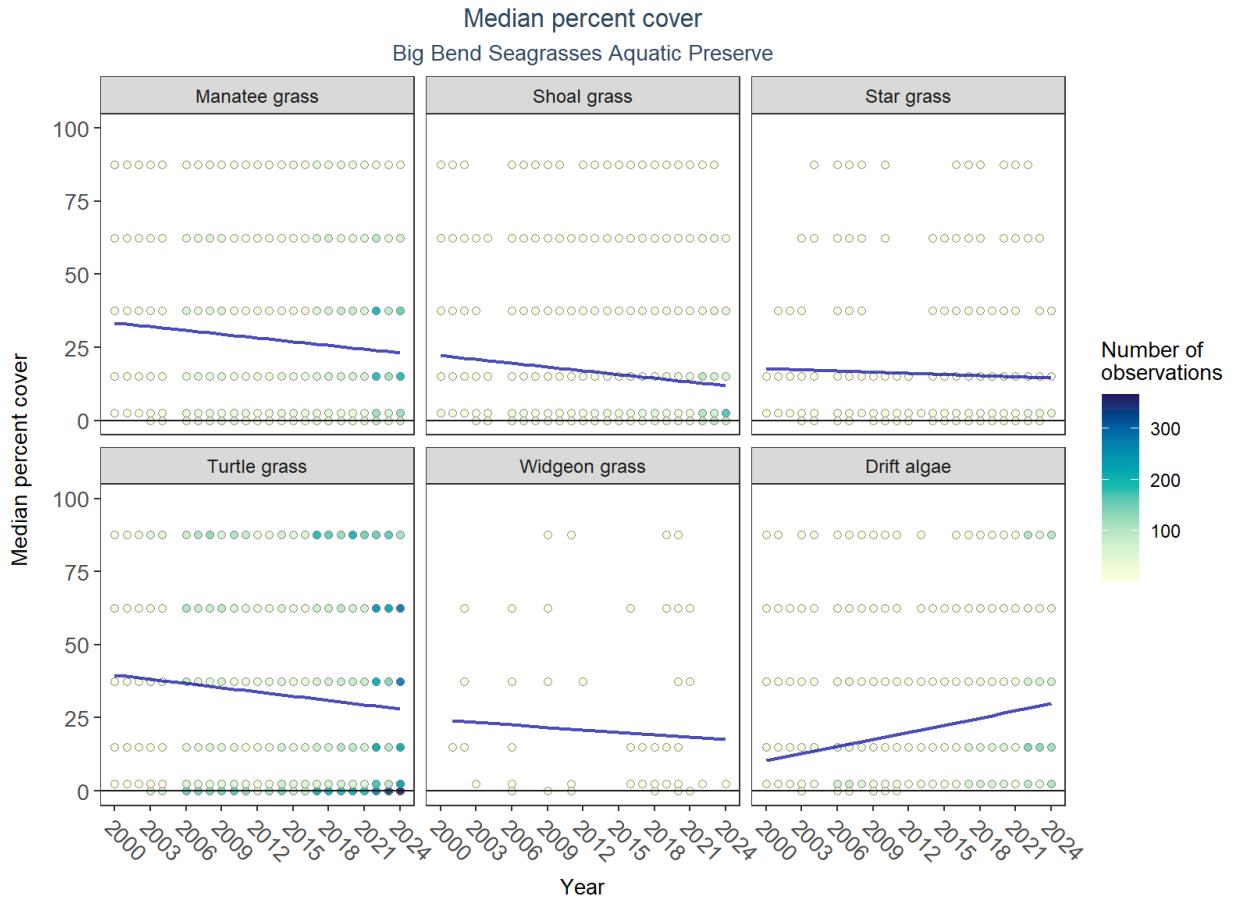


Figure 18: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 5: SAV LME Results for Big Bend Seagrasses Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Significantly increasing trend	2000 - 2024	5.45	0.81	0.00
Shoal grass	Significantly decreasing trend	2000 - 2024	24.83	-0.43	0.00
Star grass	No significant trend	2000 - 2024	18.55	-0.13	0.31
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	No significant trend	2001 - 2024	25.94	-0.28	0.60
Manatee grass	Significantly decreasing trend	2000 - 2024	35.95	-0.43	0.00
Turtle grass	Significantly decreasing trend	2000 - 2024	42.52	-0.48	0.00

An annual increase in percent cover was observed for drift algae (0.8%). Annual decreases in percent cover were observed for manatee grass (-0.4%), shoal grass (-0.4%), and turtle grass (-0.5%). No detectable change in percent cover was observed for star grass and widgeon grass.

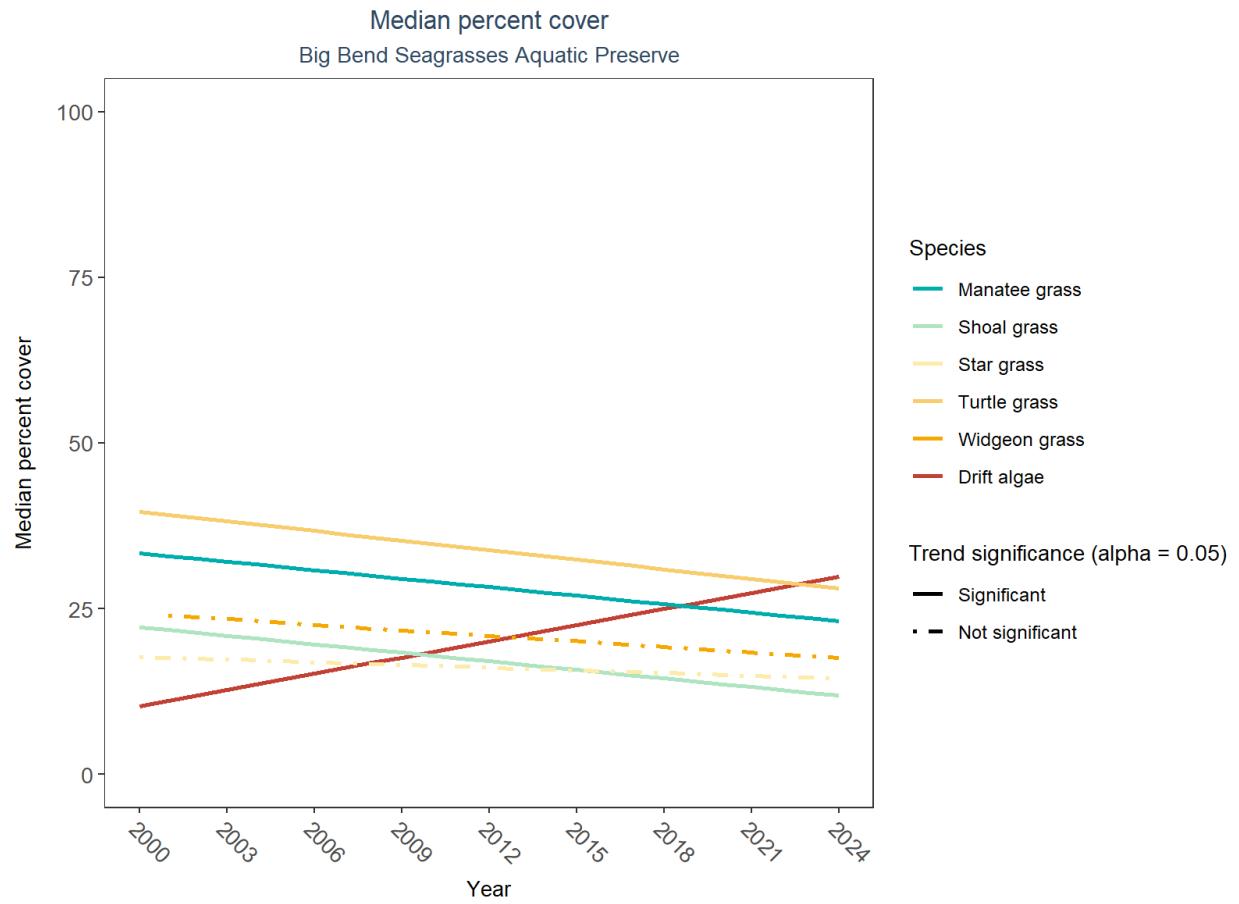


Figure 19: Trends in median percent cover for various seagrass species in Big Bend Seagrasses Aquatic Preserve - simplified

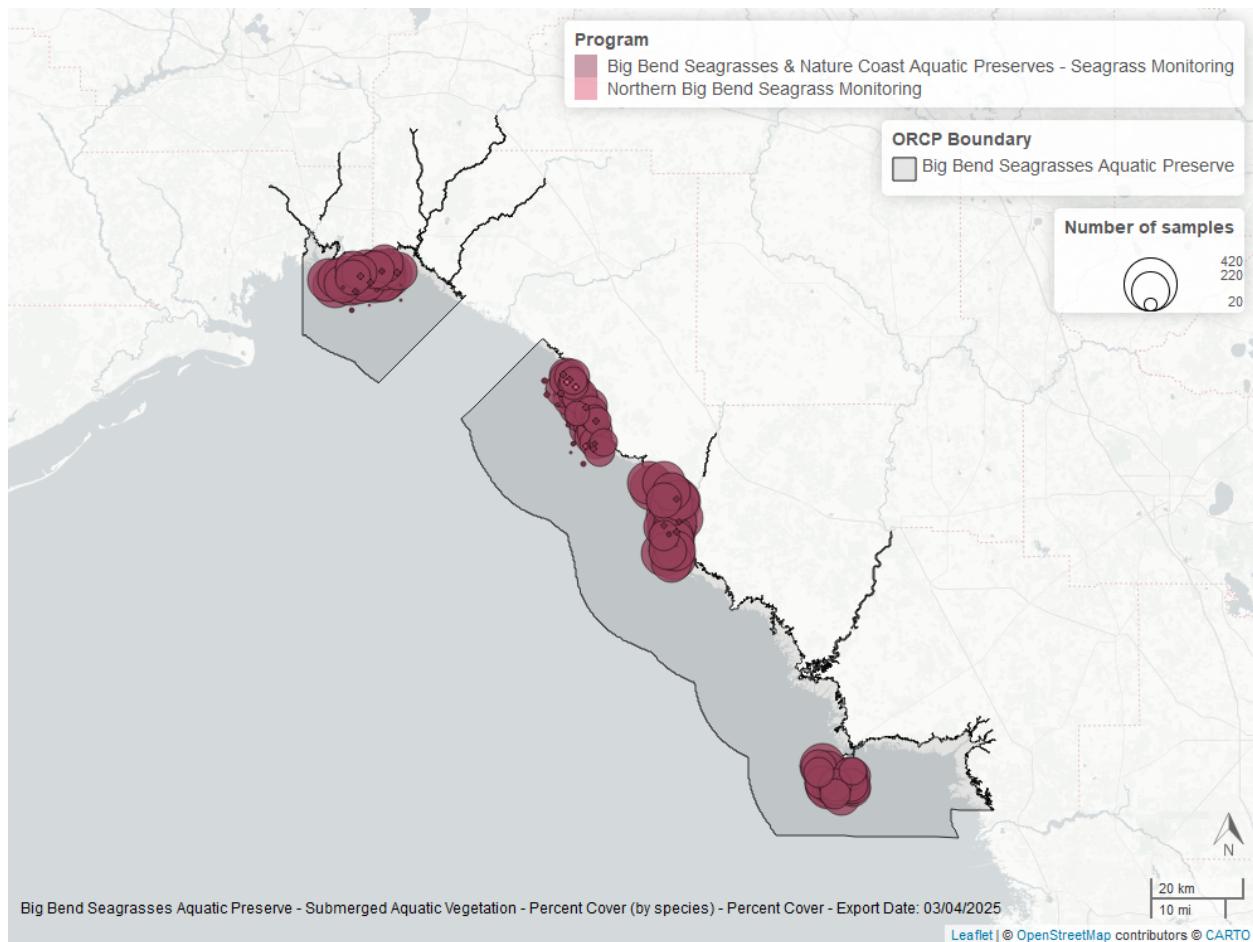


Figure 20: Map showing SAV sampling sites within the boundaries of *Big Bend Seagrasses Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Biscayne Bay Aquatic Preserve

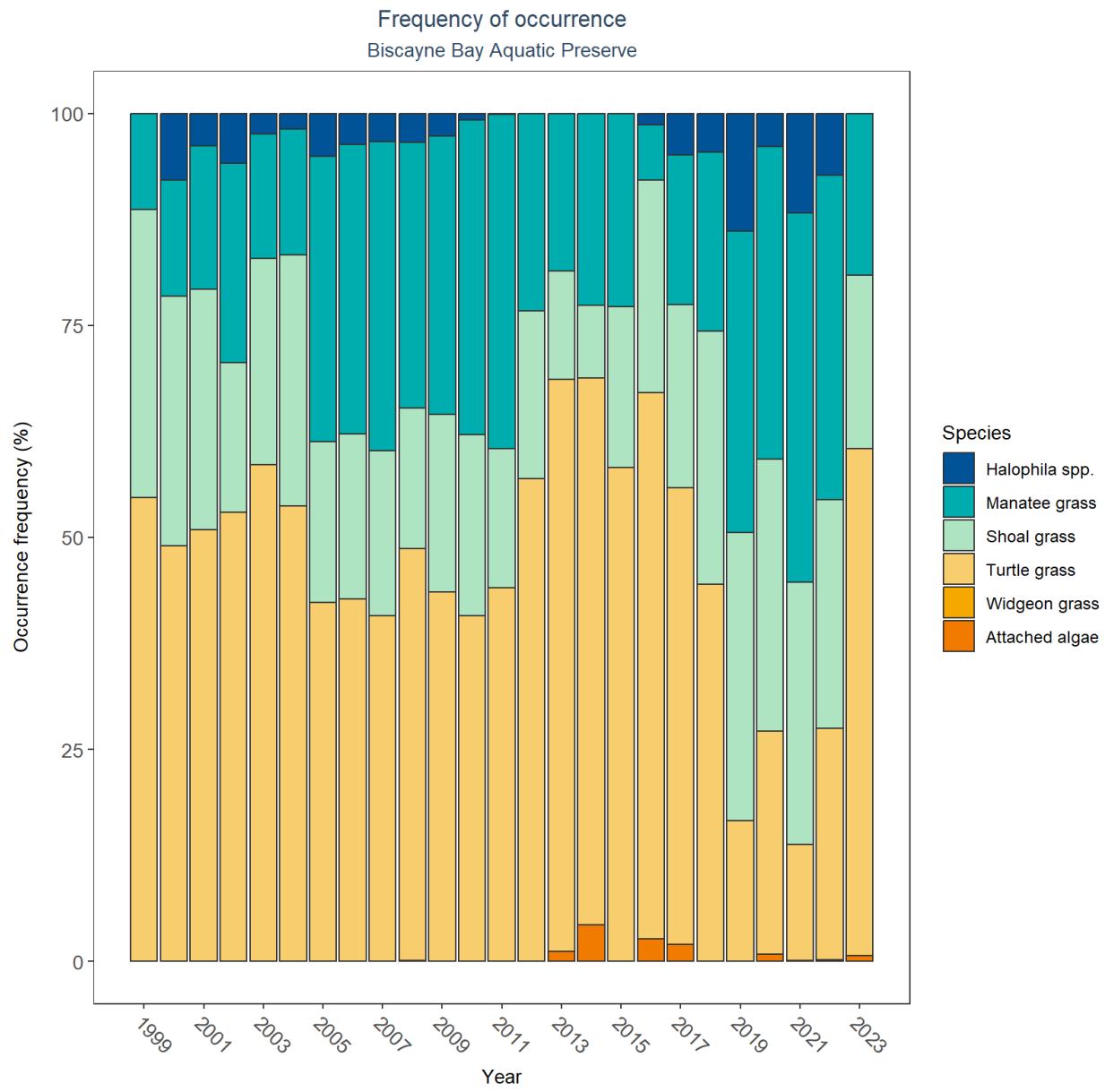


Figure 21: Frequency of occurrence for various seagrass species in Biscayne Bay Aquatic Preserve

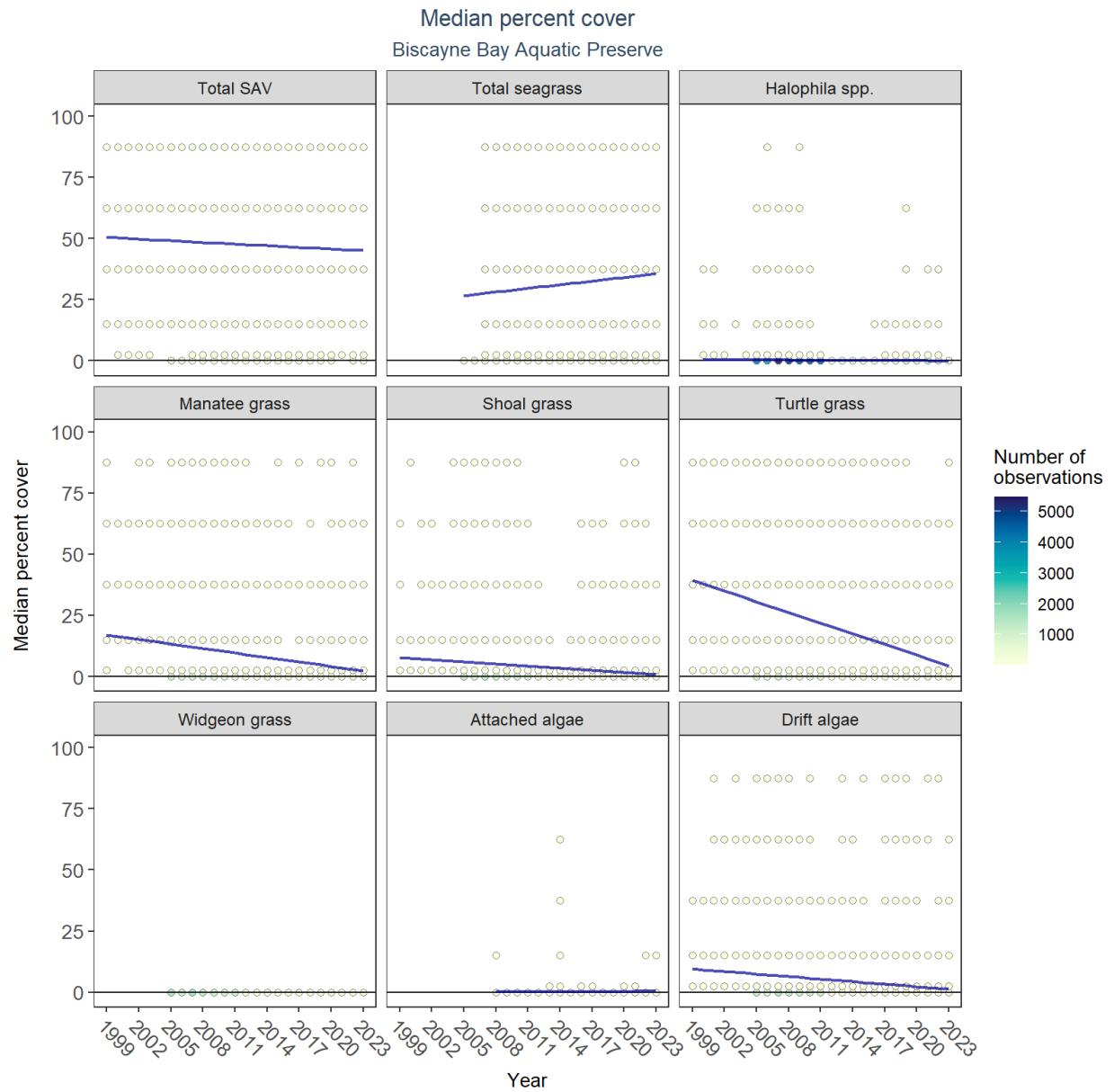


Figure 22: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 6: SAV LME Results for Biscayne Bay Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Attached algae	Significantly increasing trend	2008 - 2023	-0.25	0.02	0.04
Drift algae	Significantly decreasing trend	1999 - 2023	11.24	-0.34	0.00
Shoal grass	Significantly decreasing trend	1999 - 2023	9.26	-0.29	0.00
Halophila spp.	Significantly decreasing trend	2000 - 2023	0.59	-0.02	0.02
Widgeon grass	Model did not fit the available data	NA	NA	NA	NA
Manatee grass	Significantly decreasing trend	1999 - 2023	20.08	-0.61	0.00
Turtle grass	Significantly decreasing trend	1999 - 2023	46.55	-1.45	0.00
Total SAV	No significant trend	1999 - 2023	51.58	-0.22	0.24
Total seagrass	Significantly increasing trend	2005 - 2023	21.15	0.50	0.01

Annual increases in percent cover were observed for total seagrass (0.5%) and attached algae (0.0%). Annual decreases in percent cover were observed for *Halophila* spp. (-0.0%), manatee grass (-0.6%), shoal grass (-0.3%), turtle grass (-1.4%), and drift algae (-0.3%). No detectable change in percent cover was observed for total SAV. The model could not be fitted for widgeon grass.

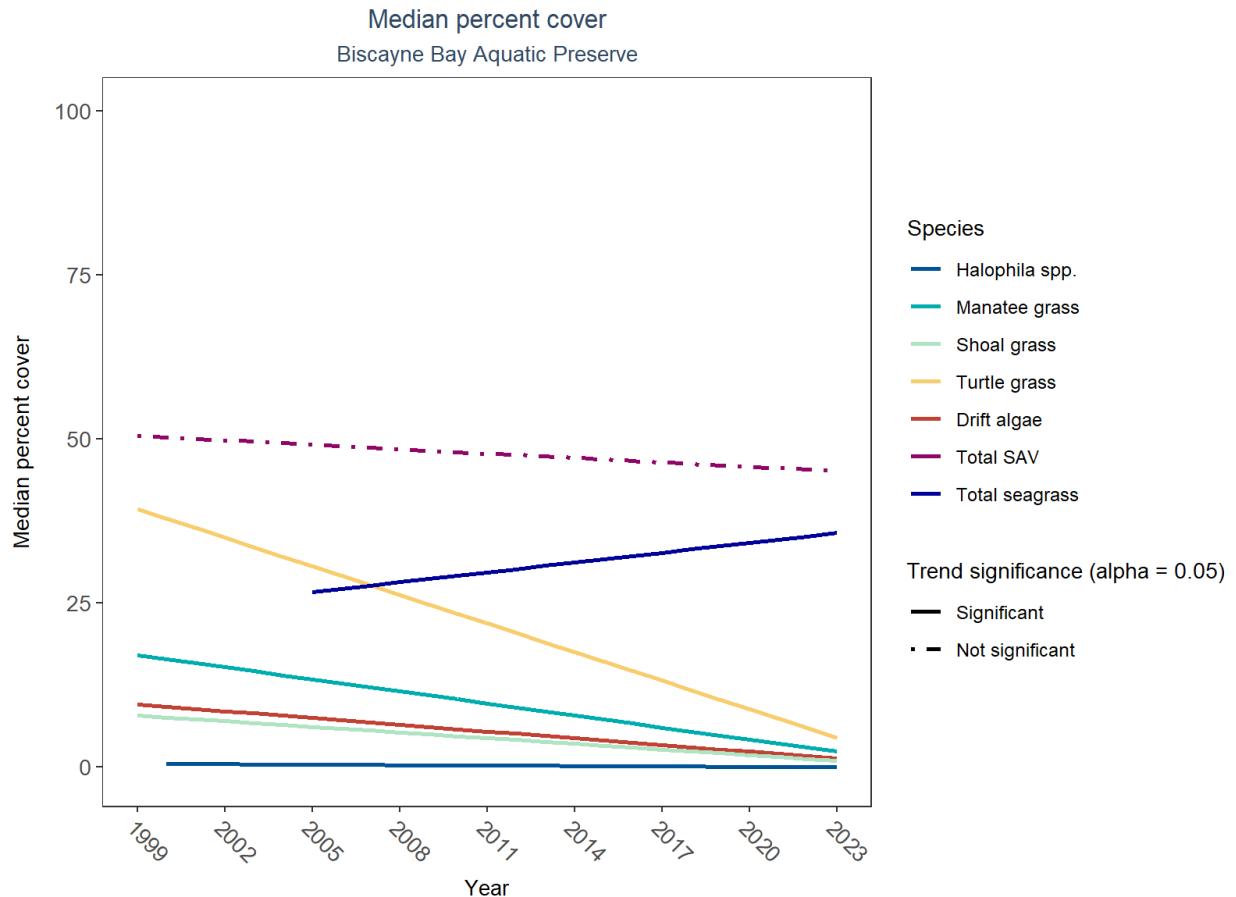


Figure 23: Trends in median percent cover for various seagrass species in Biscayne Bay Aquatic Preserve - simplified

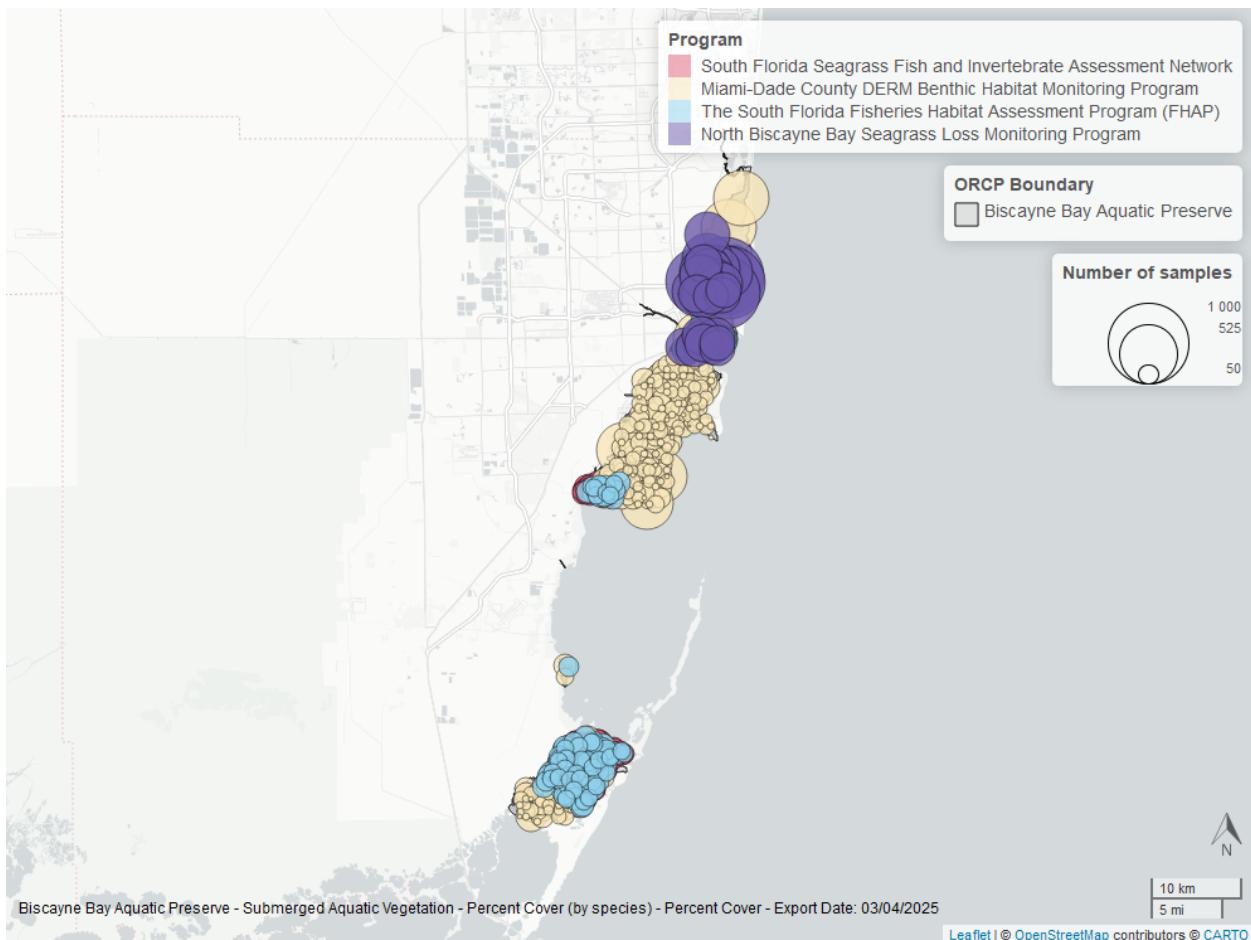


Figure 24: Map showing SAV sampling sites within the boundaries of *Biscayne Bay Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Boca Ciega Bay Aquatic Preserve

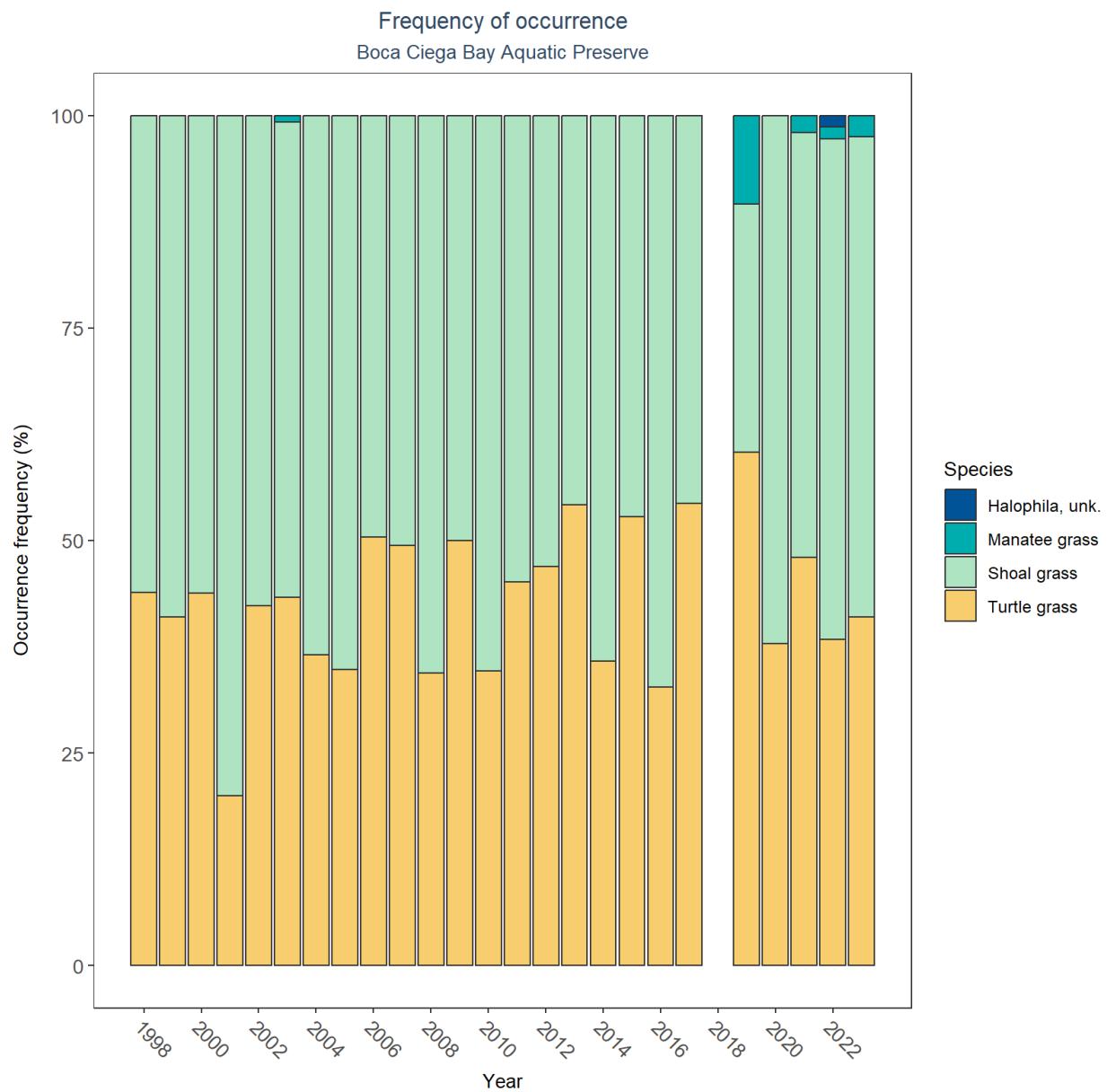


Figure 25: Frequency of occurrence for various seagrass species in Boca Ciega Bay Aquatic Preserve

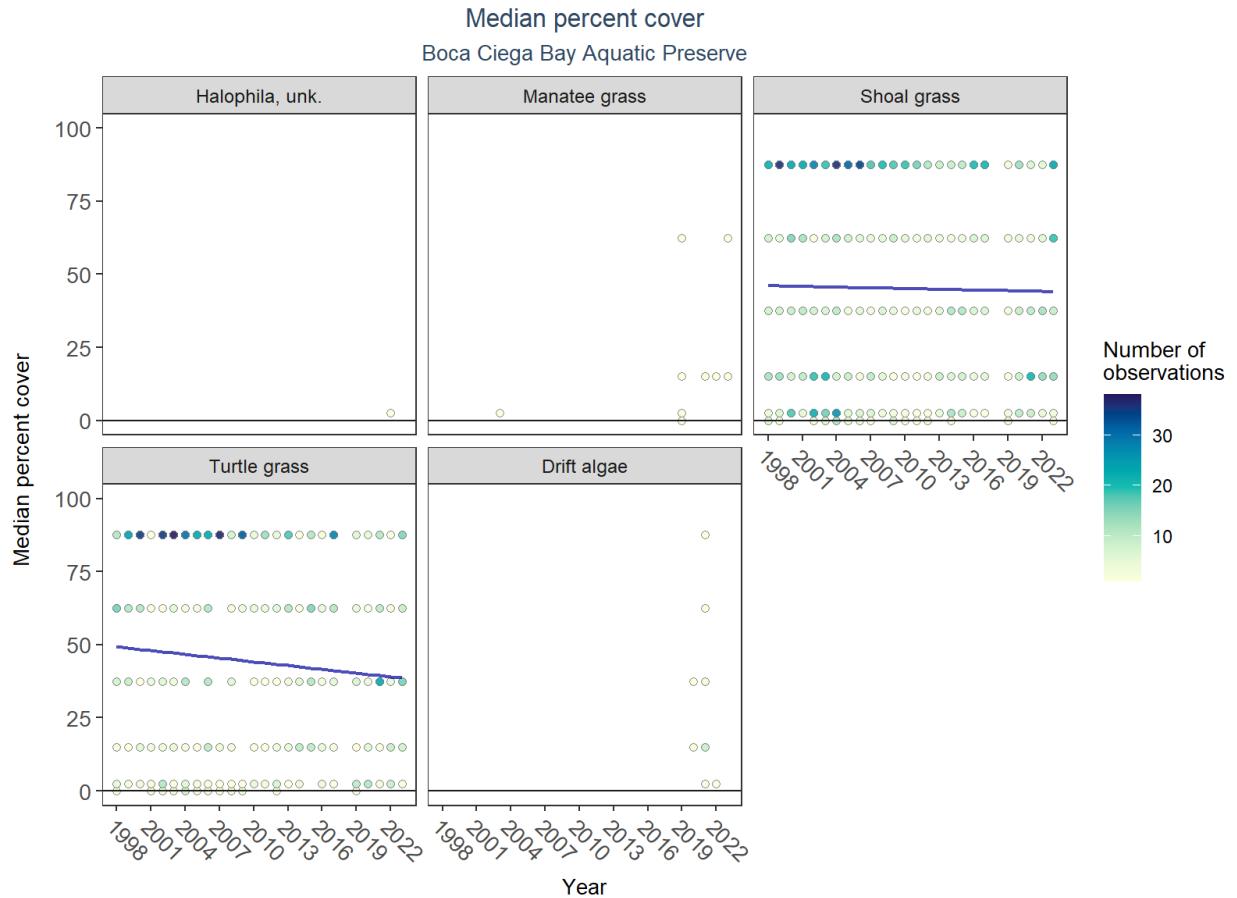


Figure 26: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 7: SAV LME Results for Boca Ciega Bay Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Insufficient data to calculate trend	NA	NA	NA	NA
Shoal grass	No significant trend	1998 - 2023	46.38	-0.08	0.68
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Manatee grass	Model did not fit the available data	NA	NA	NA	NA
Turtle grass	No significant trend	1998 - 2023	50.99	-0.43	0.13
Halophila, unk.	Insufficient data to calculate trend	NA	NA	NA	NA

No detectable change in percent cover was observed for shoal grass and turtle grass. Trends in percent cover could not be evaluated for unknown *Halophila* and drift algae due to insufficient data, and the model could not be fitted for manatee grass.

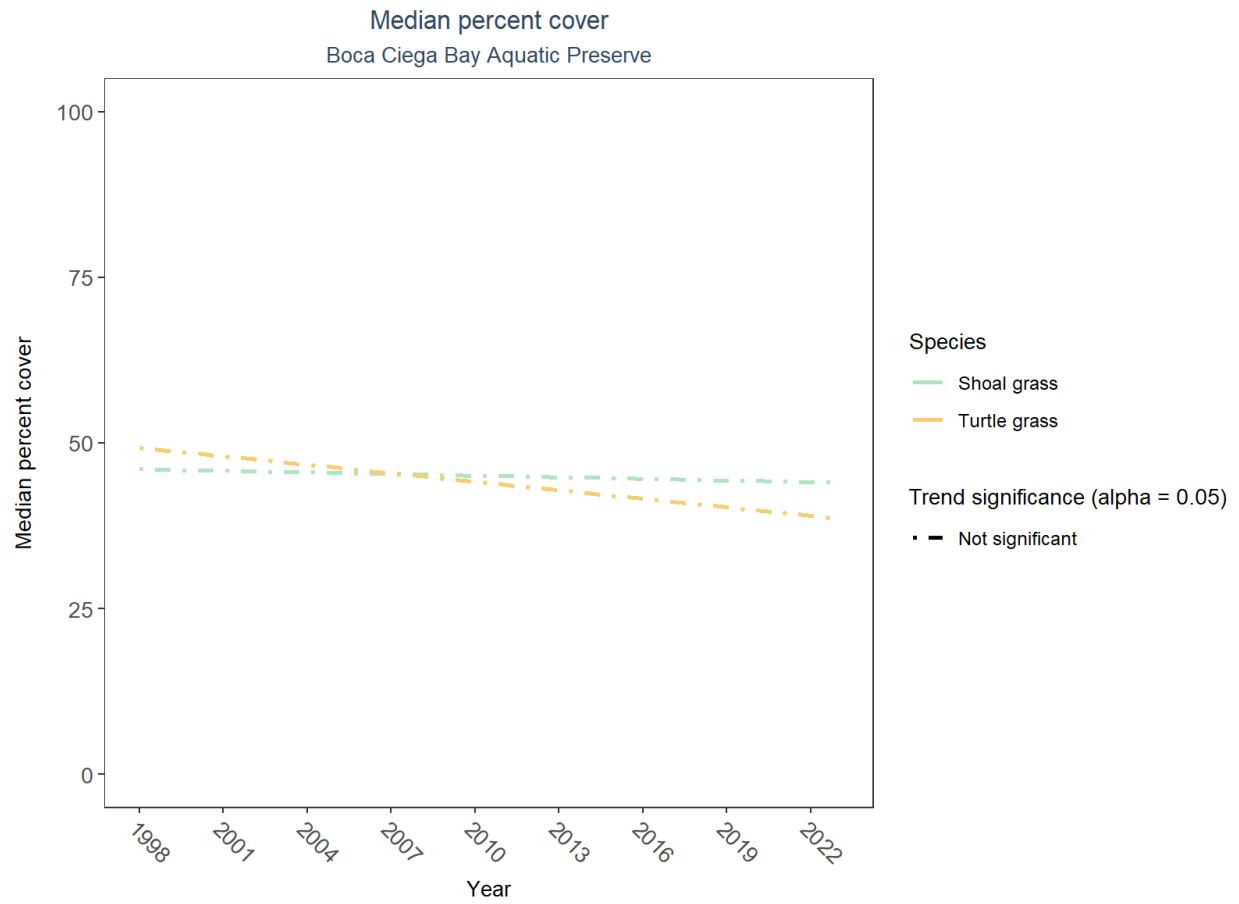


Figure 27: Trends in median percent cover for various seagrass species in Boca Ciega Bay Aquatic Preserve - simplified

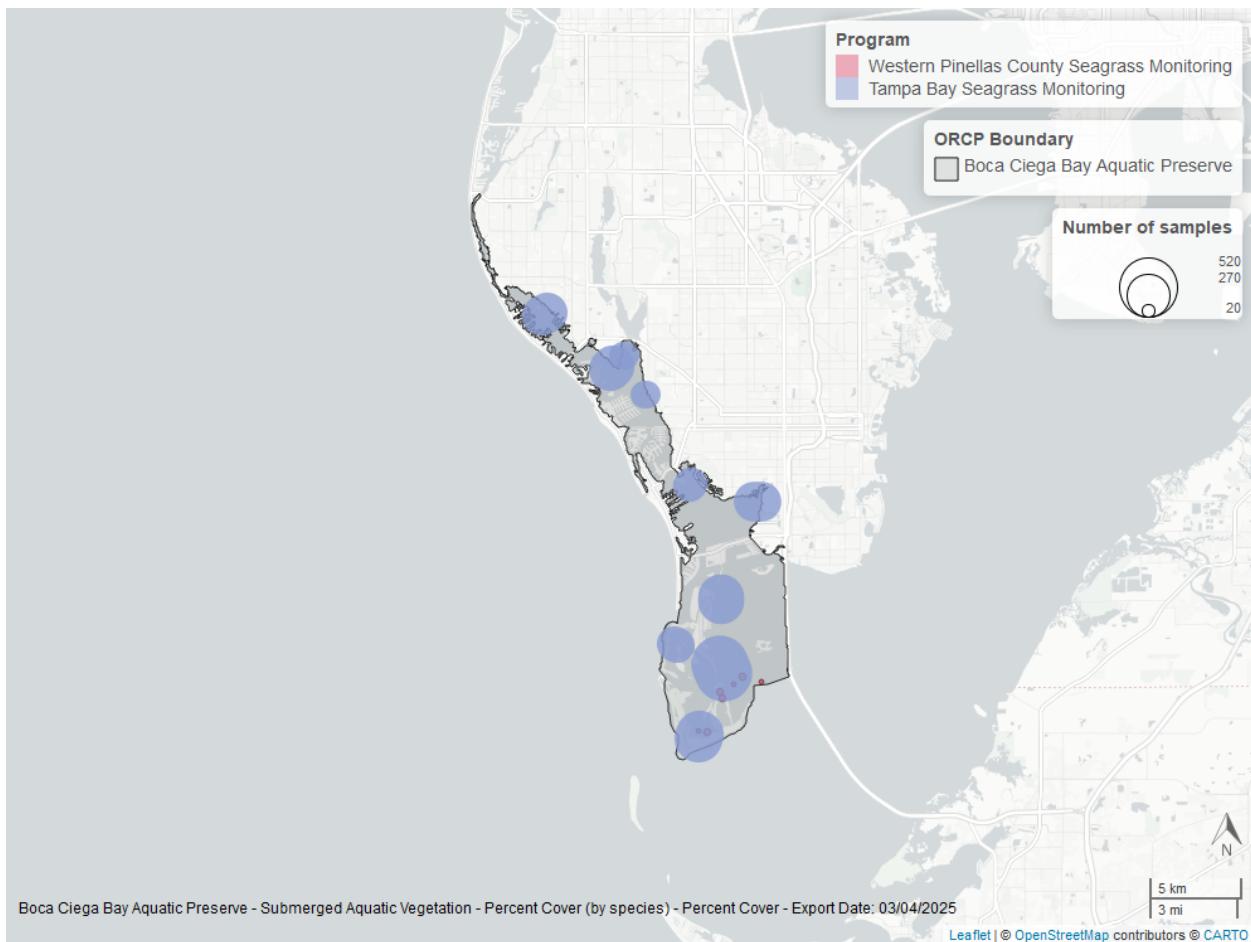


Figure 28: Map showing SAV sampling sites within the boundaries of *Boca Ciega Bay Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Cape Haze Aquatic Preserve

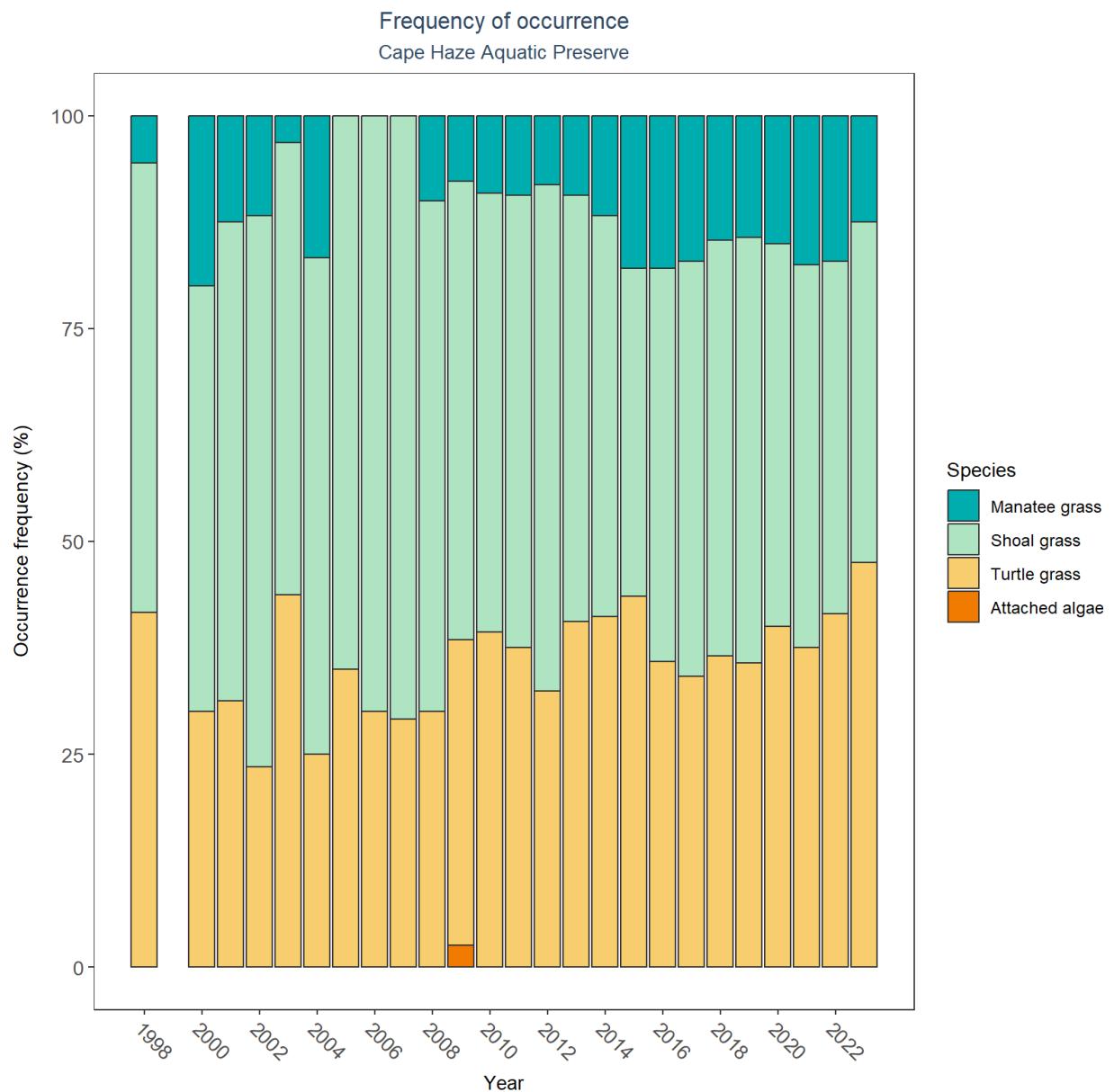


Figure 29: Frequency of occurrence for various seagrass species in Cape Haze Aquatic Preserve

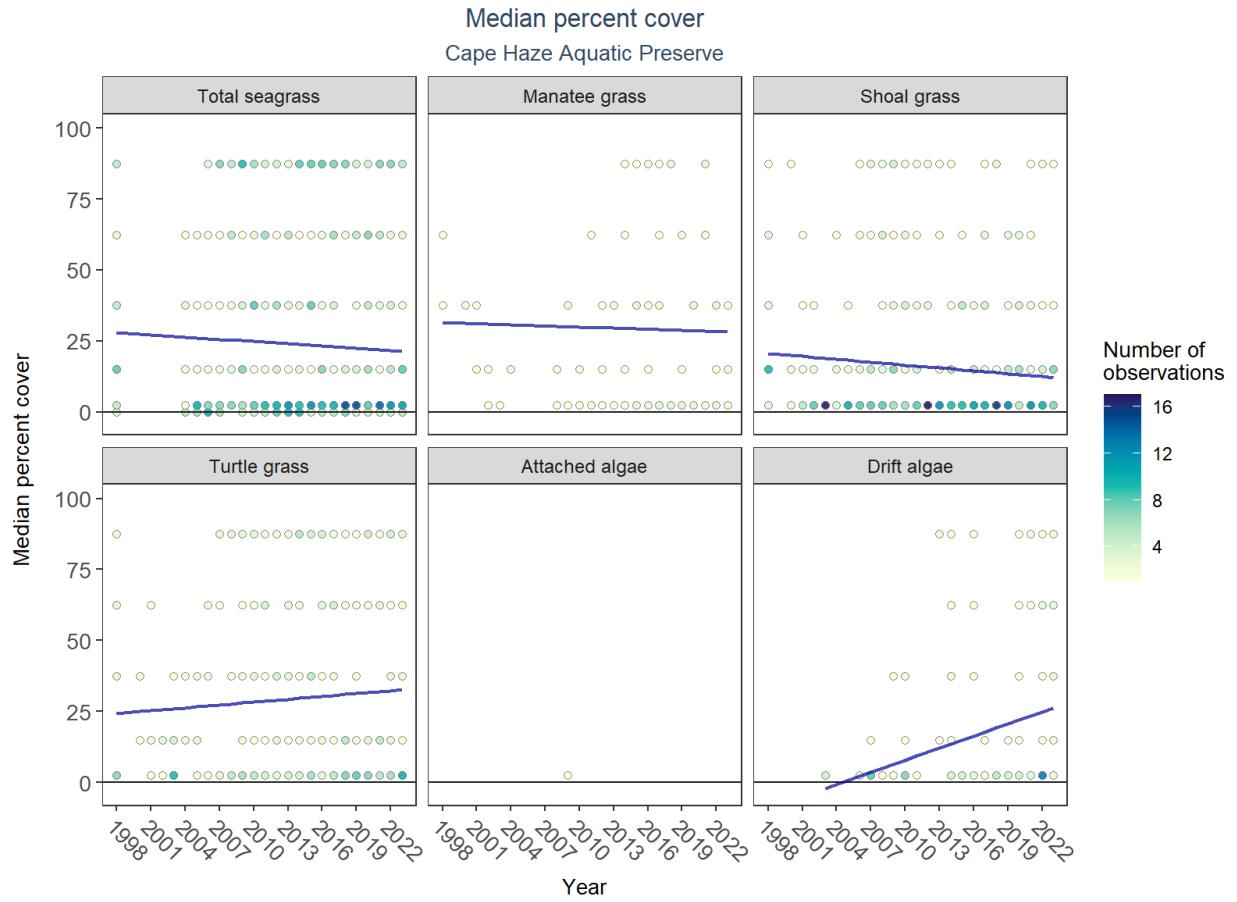


Figure 30: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 8: SAV LME Results for Cape Haze Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Attached algae	Insufficient data to calculate trend	NA	NA	NA	NA
Drift algae	Significantly increasing trend	2003 - 2023	-14.78	1.41	0.00
Shoal grass	No significant trend	1998 - 2023	22.01	-0.34	0.37
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Manatee grass	No significant trend	1998 - 2023	32.01	-0.13	0.90
Turtle grass	No significant trend	1998 - 2023	22.93	0.34	0.29
Total seagrass	No significant trend	1998 - 2023	29.15	-0.27	0.51

An annual increase in percent cover was observed for drift algae (1.4%). Total seagrass, manatee grass, shoal grass, and turtle grass showed no detectable change in percent cover. Trends in percent cover could not be evaluated for attached algae due to insufficient data.

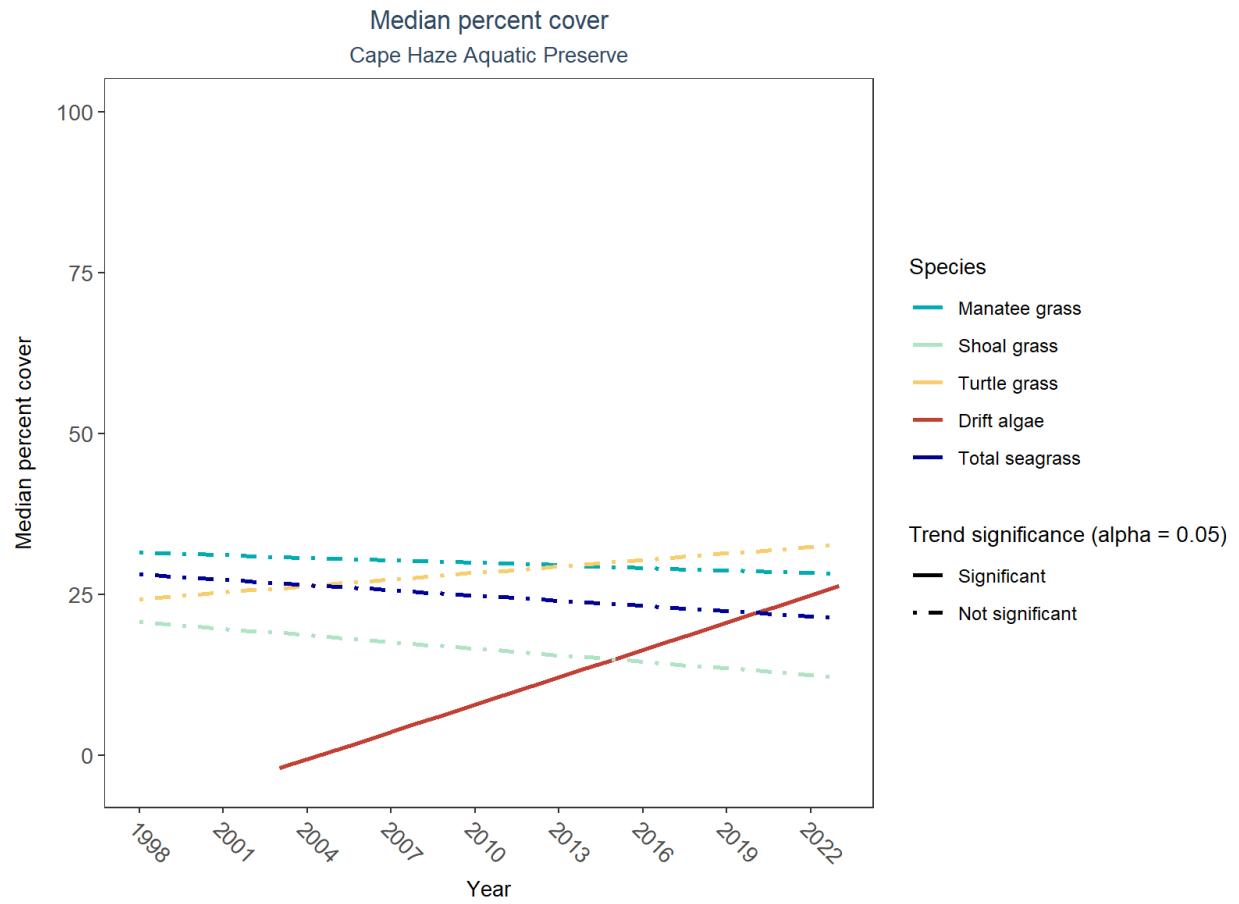


Figure 31: Trends in median percent cover for various seagrass species in Cape Haze Aquatic Preserve - simplified

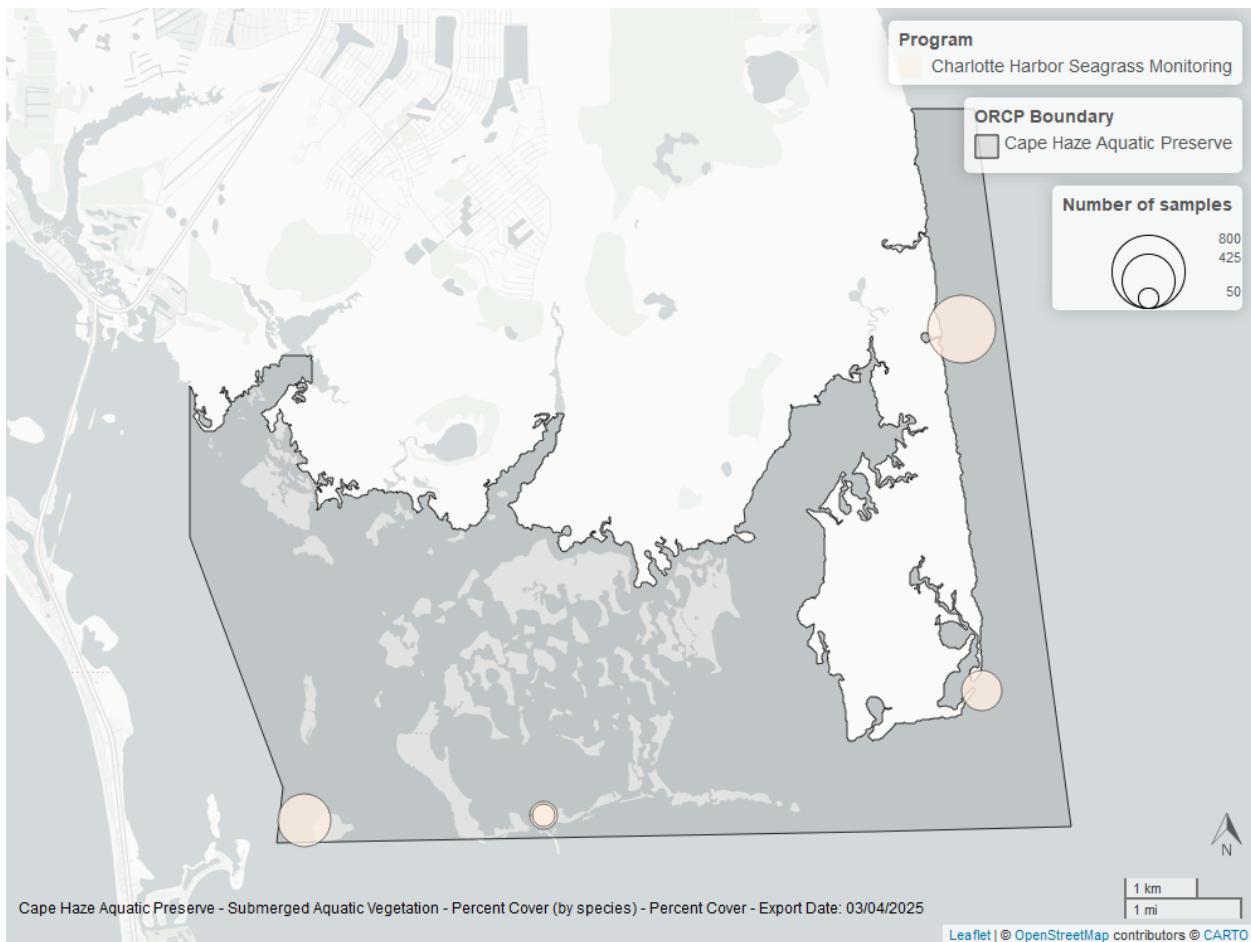


Figure 32: Map showing SAV sampling sites within the boundaries of *Cape Haze Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Cockroach Bay Aquatic Preserve

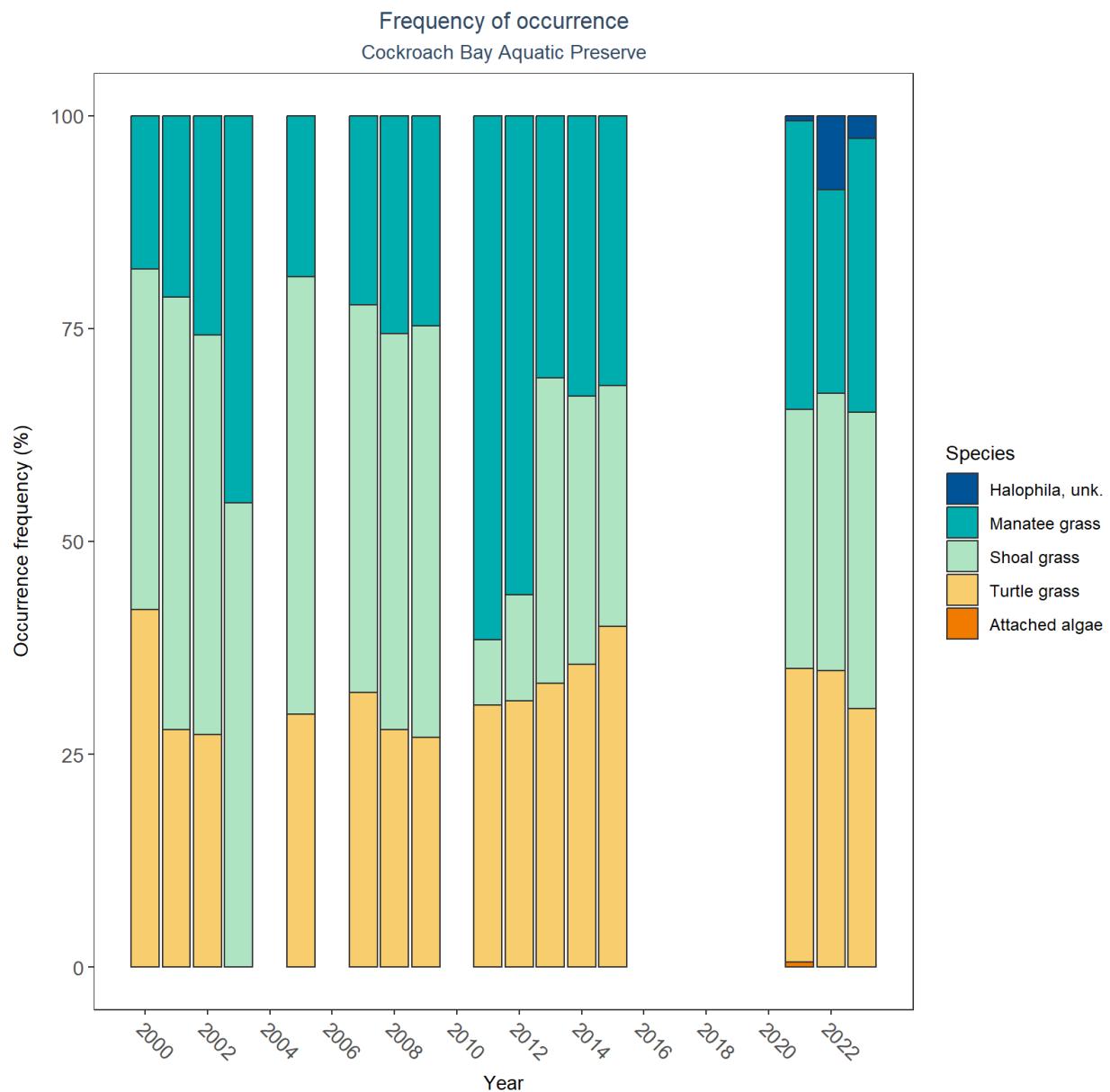


Figure 33: Frequency of occurrence for various seagrass species in Cockroach Bay Aquatic Preserve

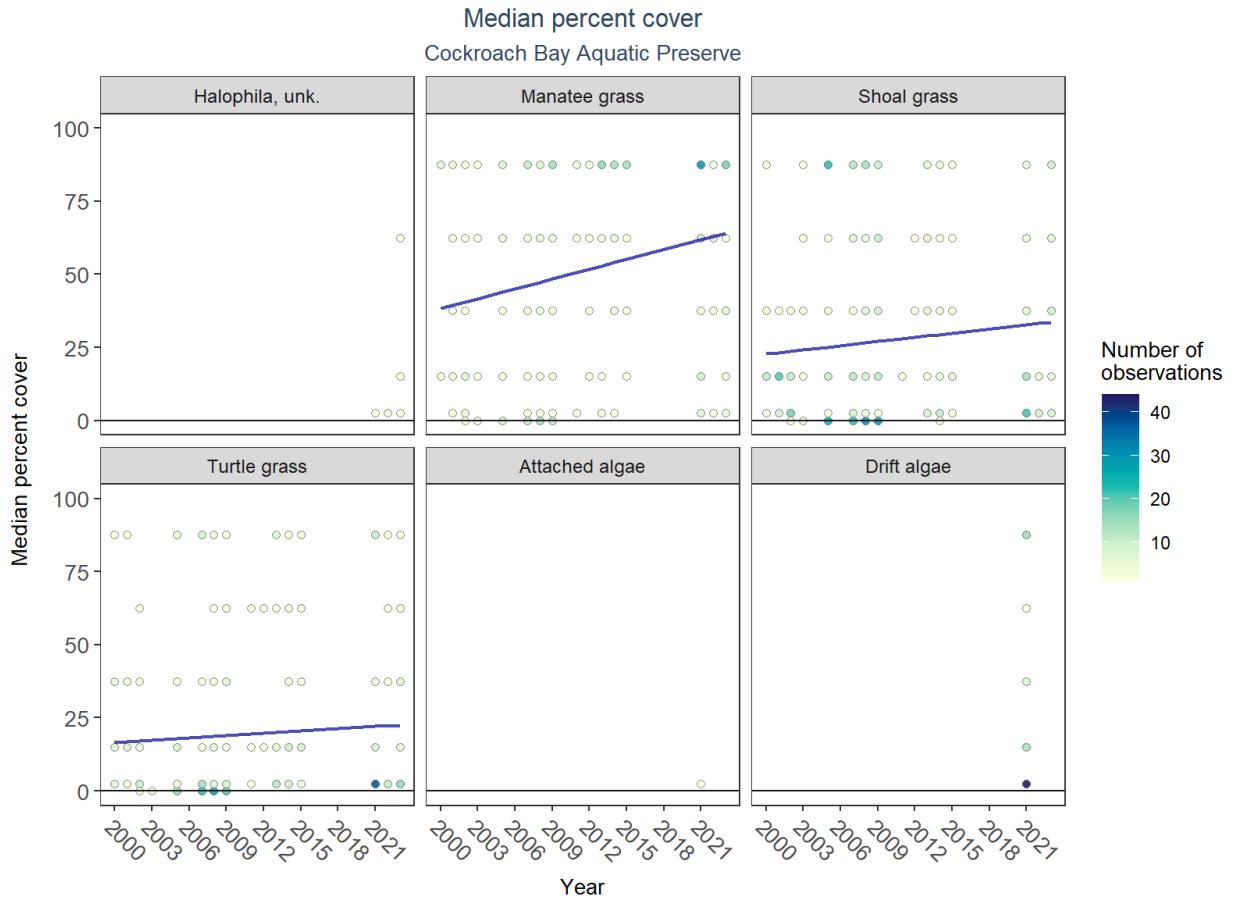


Figure 34: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 9: SAV LME Results for Cockroach Bay Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Attached algae	Insufficient data to calculate trend	NA	NA	NA	NA
Drift algae	Insufficient data to calculate trend	NA	NA	NA	NA
Shoal grass	Significantly increasing trend	2000 - 2023	19.90	0.47	0.04
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Manatee grass	No significant trend	2000 - 2023	31.55	1.12	0.05
Turtle grass	No significant trend	2000 - 2023	15.05	0.26	0.21
Halophila, unk.	Insufficient data to calculate trend	NA	NA	NA	NA

An annual increase in percent cover was observed for shoal grass (0.5%). No detectable change in percent cover was observed for manatee grass and turtle grass. Trends in percent cover could not be evaluated for unknown *Halophila*, attached algae, and drift algae due to insufficient data.

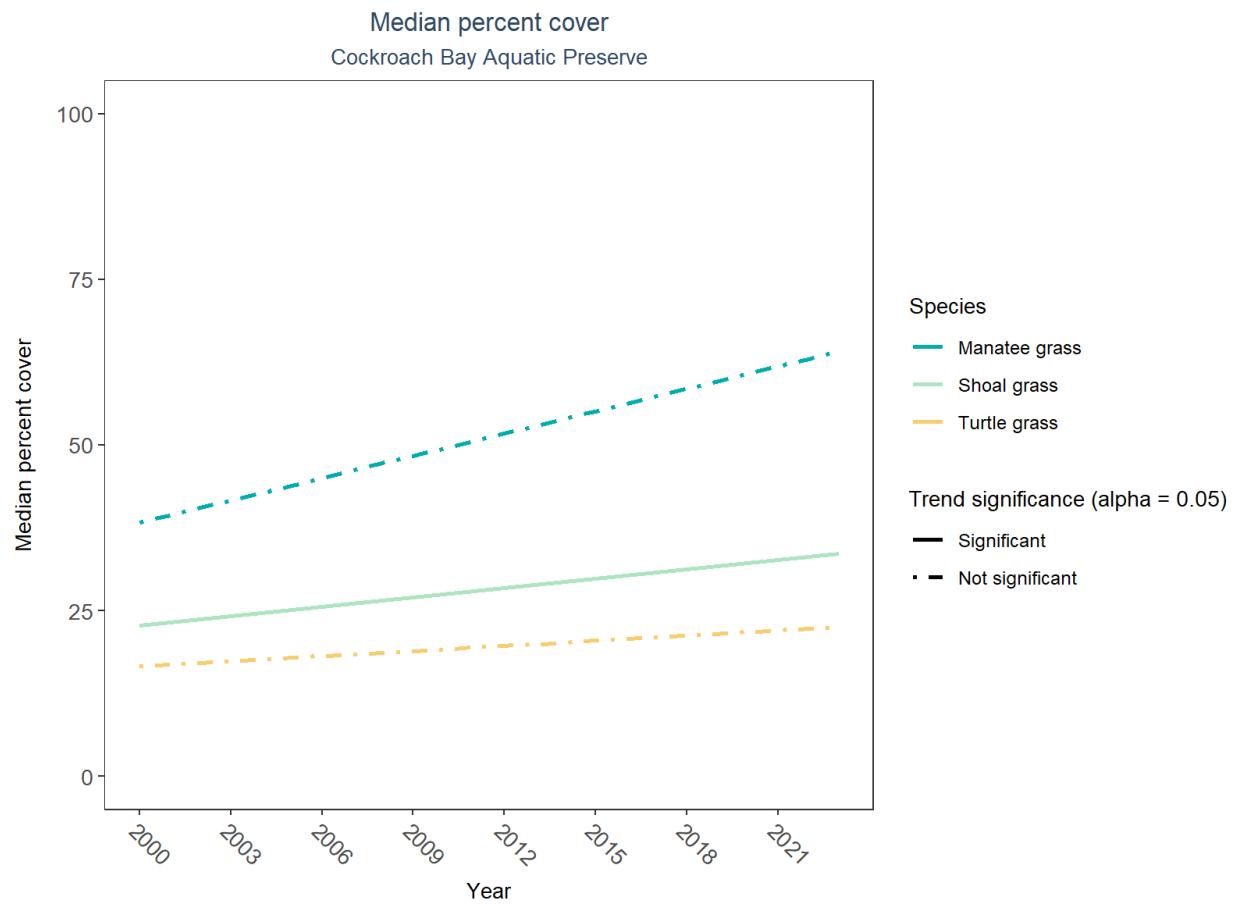


Figure 35: Trends in median percent cover for various seagrass species in Cockroach Bay Aquatic Preserve - simplified

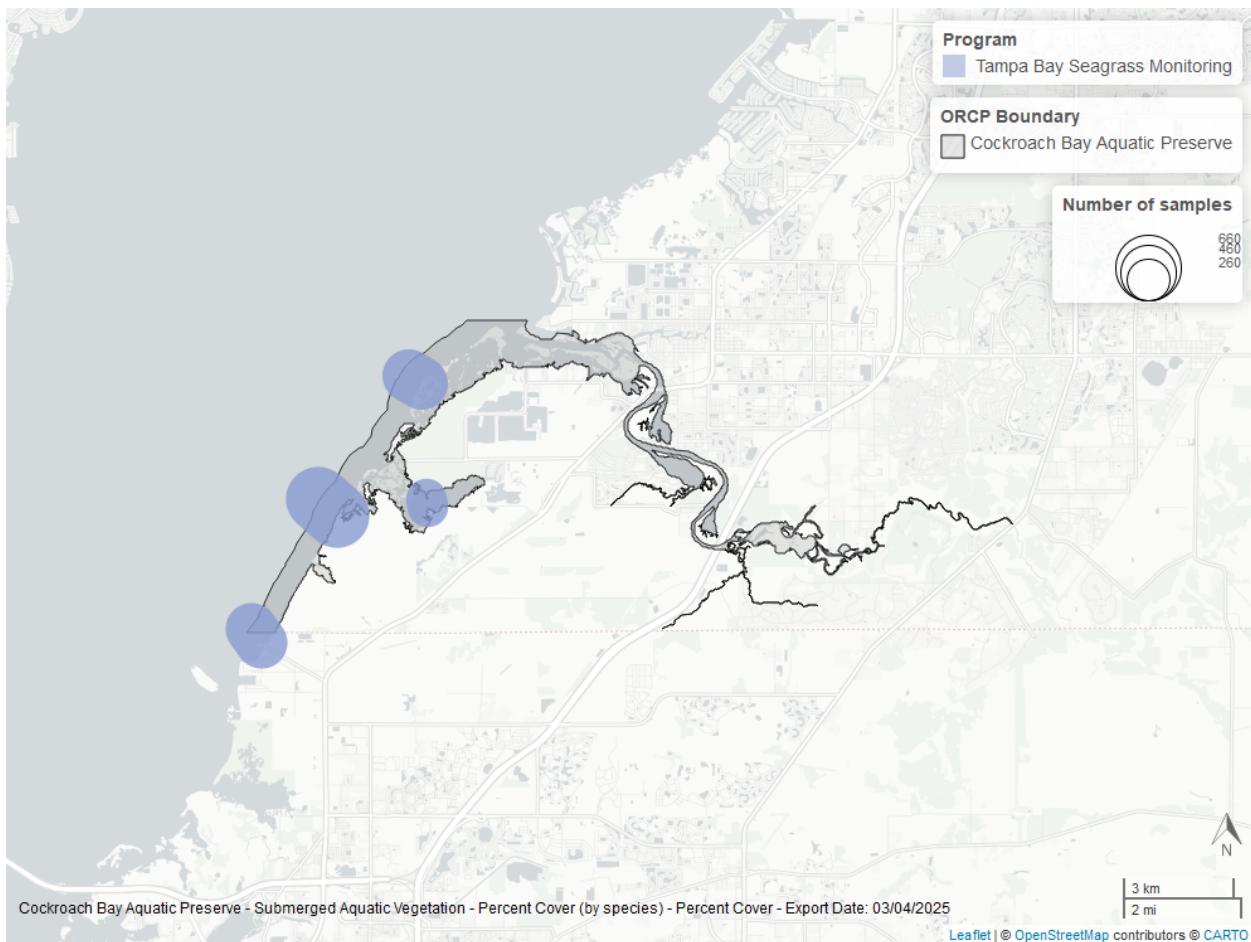


Figure 36: Map showing SAV sampling sites within the boundaries of *Cockroach Bay Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Estero Bay Aquatic Preserve

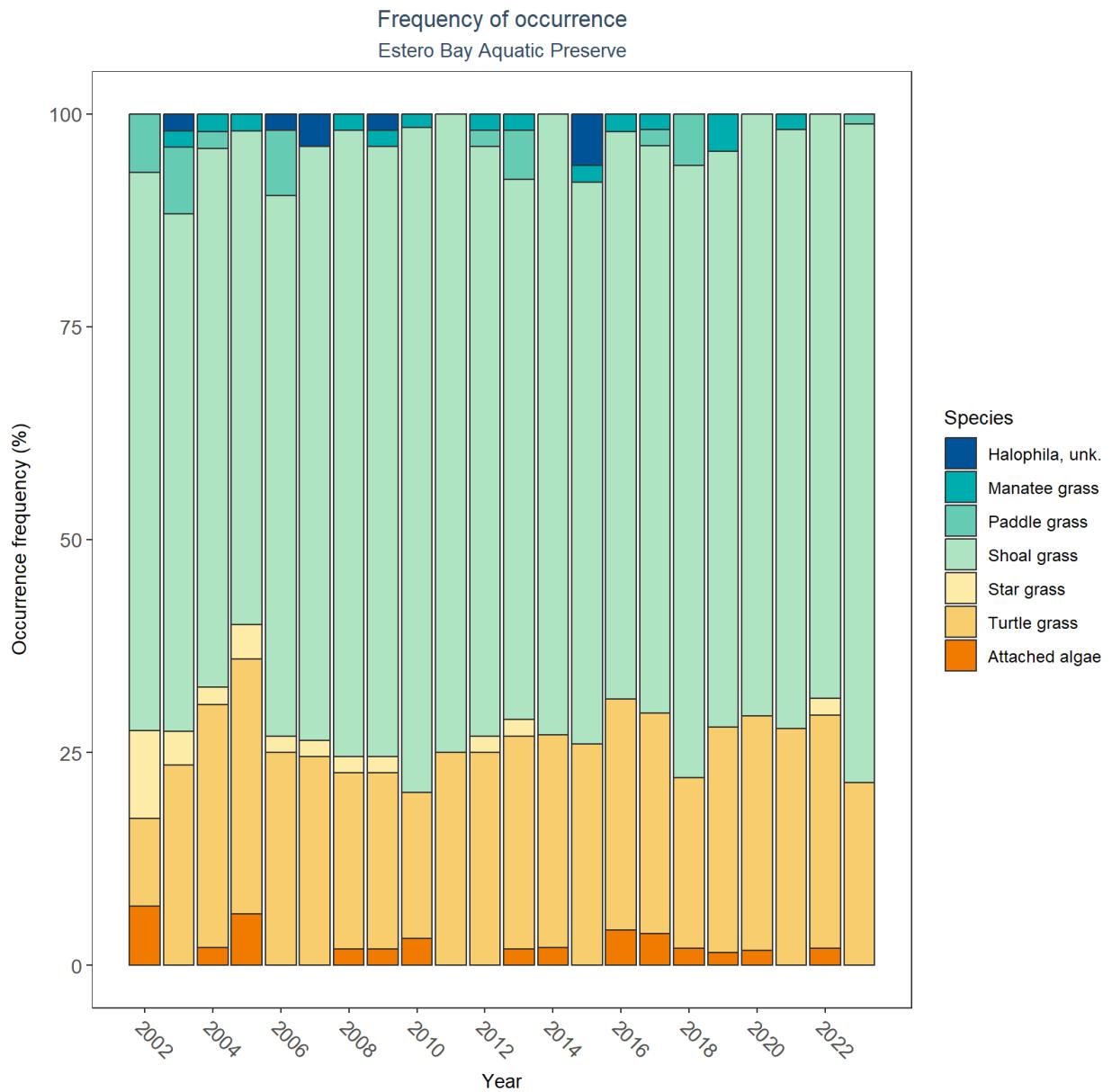


Figure 37: Frequency of occurrence for various seagrass species in Estero Bay Aquatic Preserve

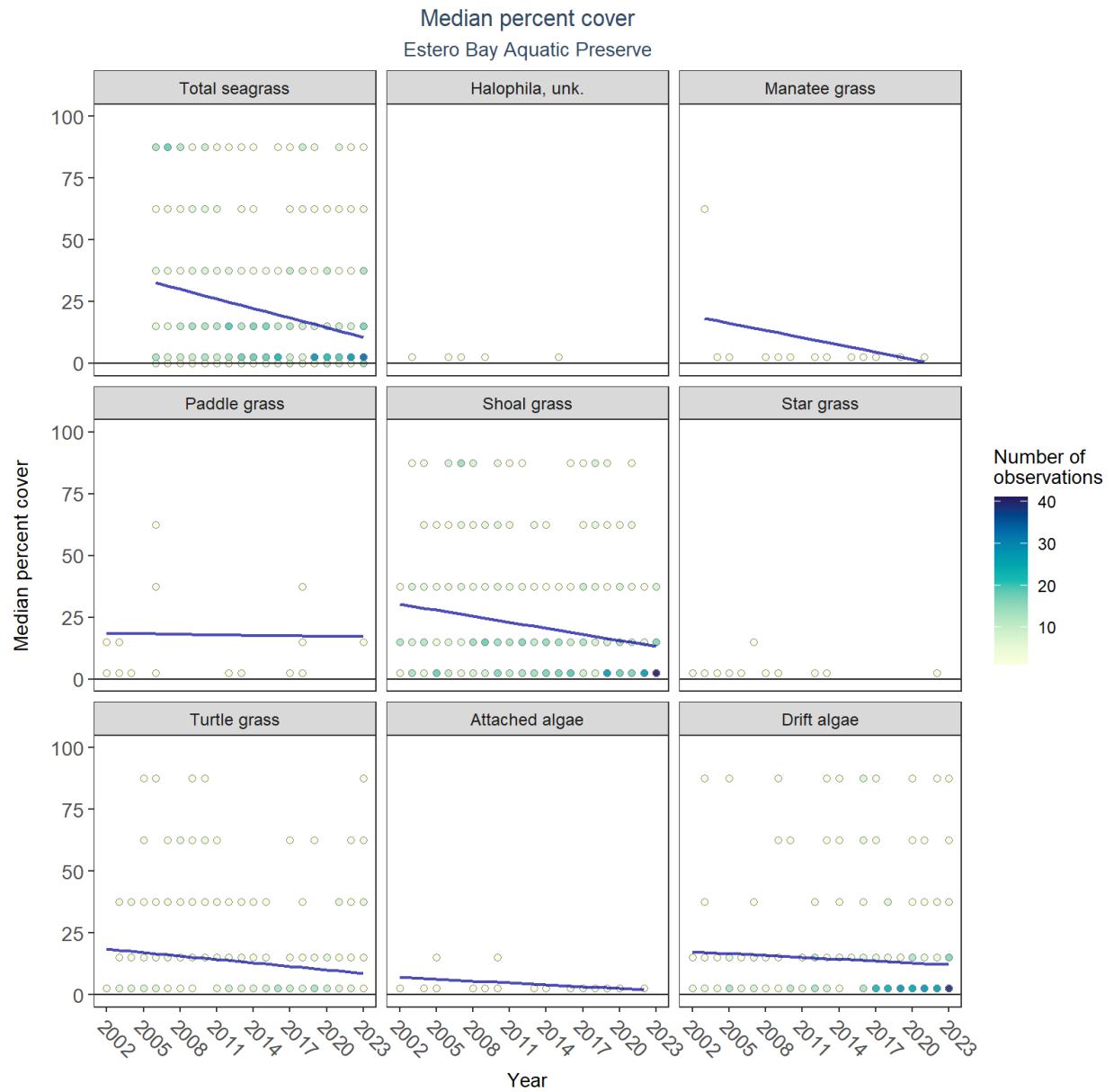


Figure 38: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 10: SAV LME Results for Estero Bay Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Attached algae	No significant trend	2002 - 2022	9.04	-0.25	0.38
Drift algae	No significant trend	2002 - 2023	19.40	-0.25	0.38
Shoal grass	Significantly decreasing trend	2002 - 2023	36.88	-0.82	0.00
Paddle grass	No significant trend	2002 - 2023	18.90	-0.06	0.92
Star grass	Model did not fit the available data	NA	NA	NA	NA
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Manatee grass	No significant trend	2003 - 2021	26.94	-0.97	0.35
Turtle grass	Significantly decreasing trend	2002 - 2023	22.27	-0.47	0.02
Total seagrass	Significantly decreasing trend	2006 - 2023	48.10	-1.29	0.02
Halophila, unk.	Model did not fit the available data	NA	NA	NA	NA

Annual decreases in percent cover were observed for total seagrass (-1.3%), shoal grass (-0.8%), and turtle grass (-0.5%). Manatee grass, paddle grass, attached algae, and drift algae showed no detectable change in percent cover. A model could not be fitted for unknown *Halophila* and star grass.

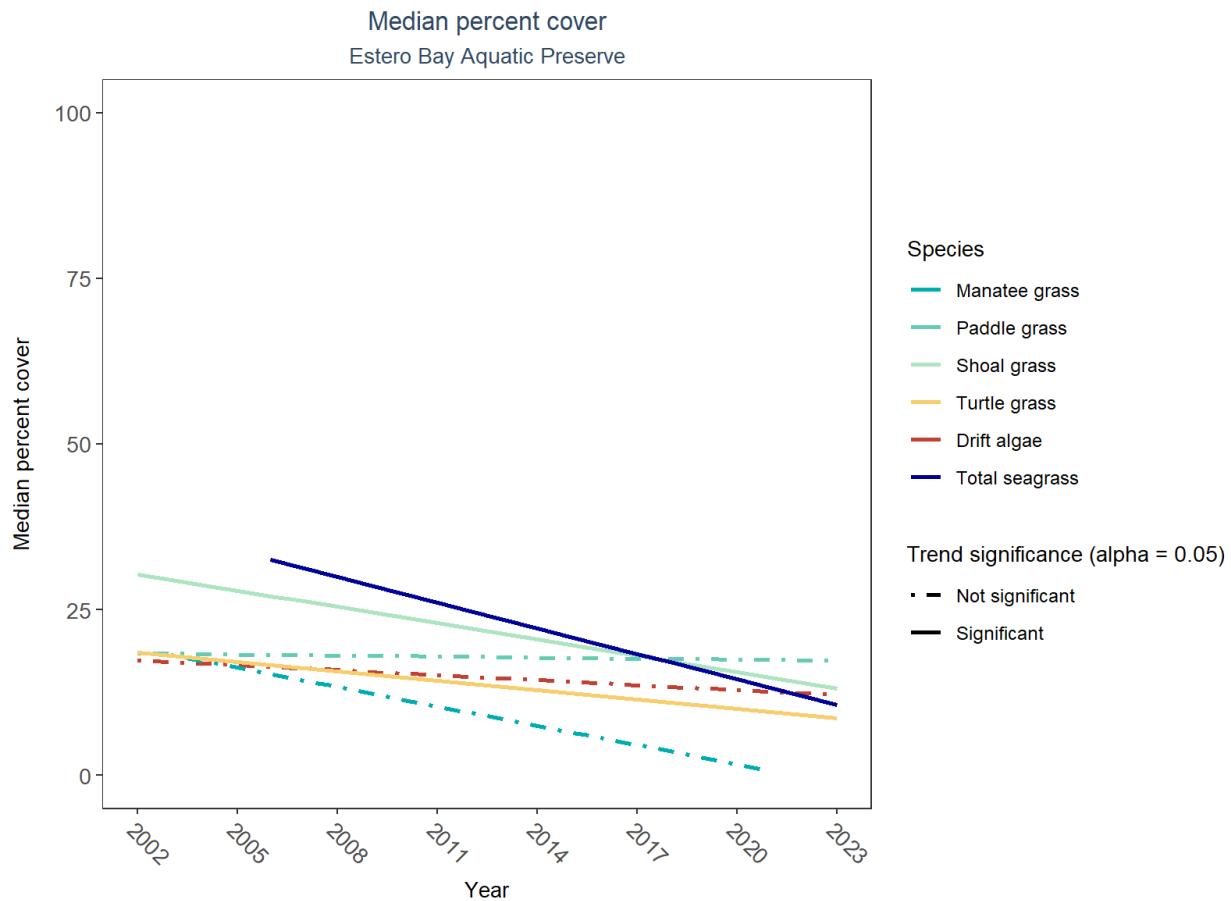


Figure 39: Trends in median percent cover for various seagrass species in Estero Bay Aquatic Preserve - simplified

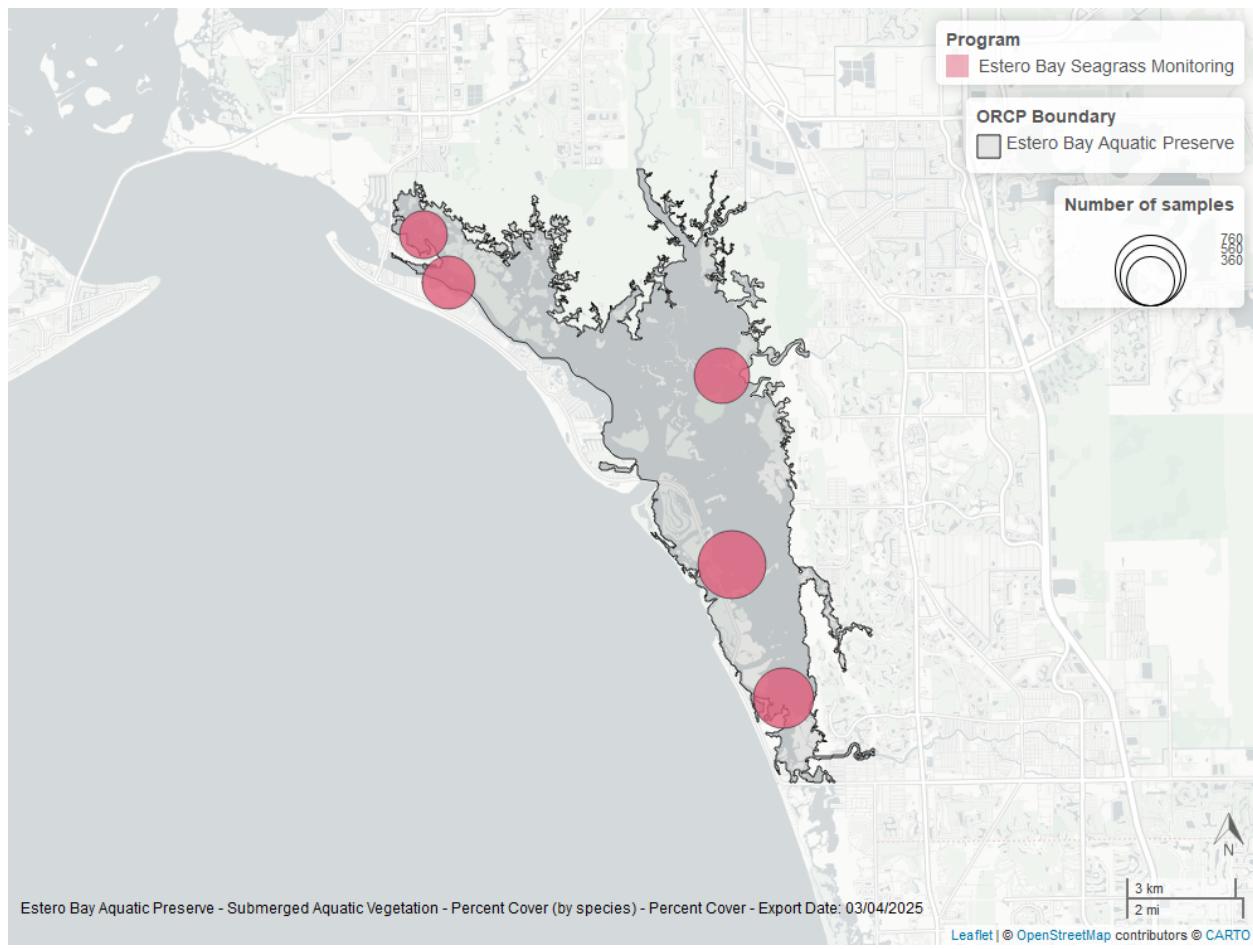


Figure 40: Map showing SAV sampling sites within the boundaries of *Estero Bay Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Florida Keys National Marine Sanctuary

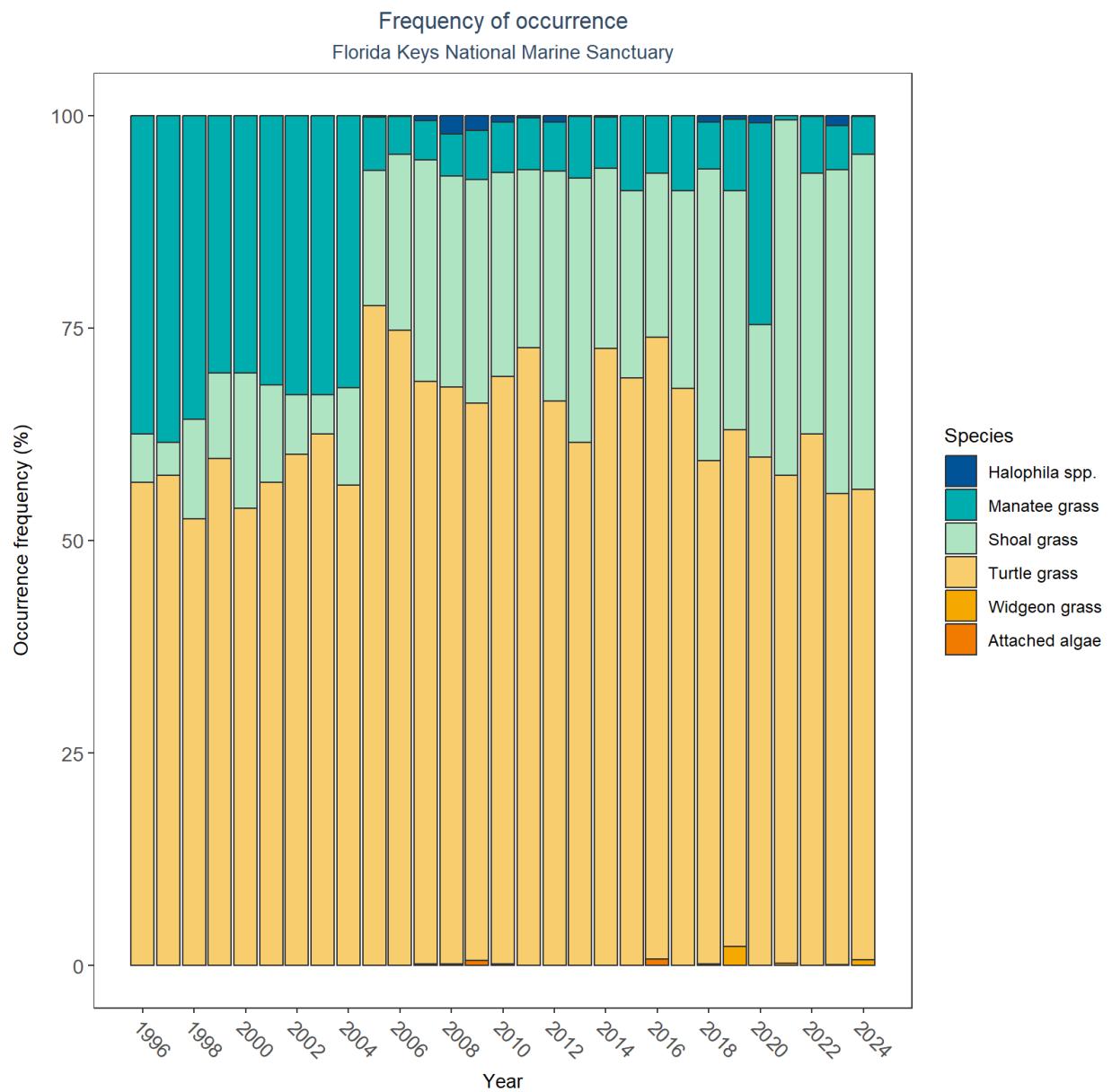


Figure 41: Frequency of occurrence for various seagrass species in Florida Keys National Marine Sanctuary

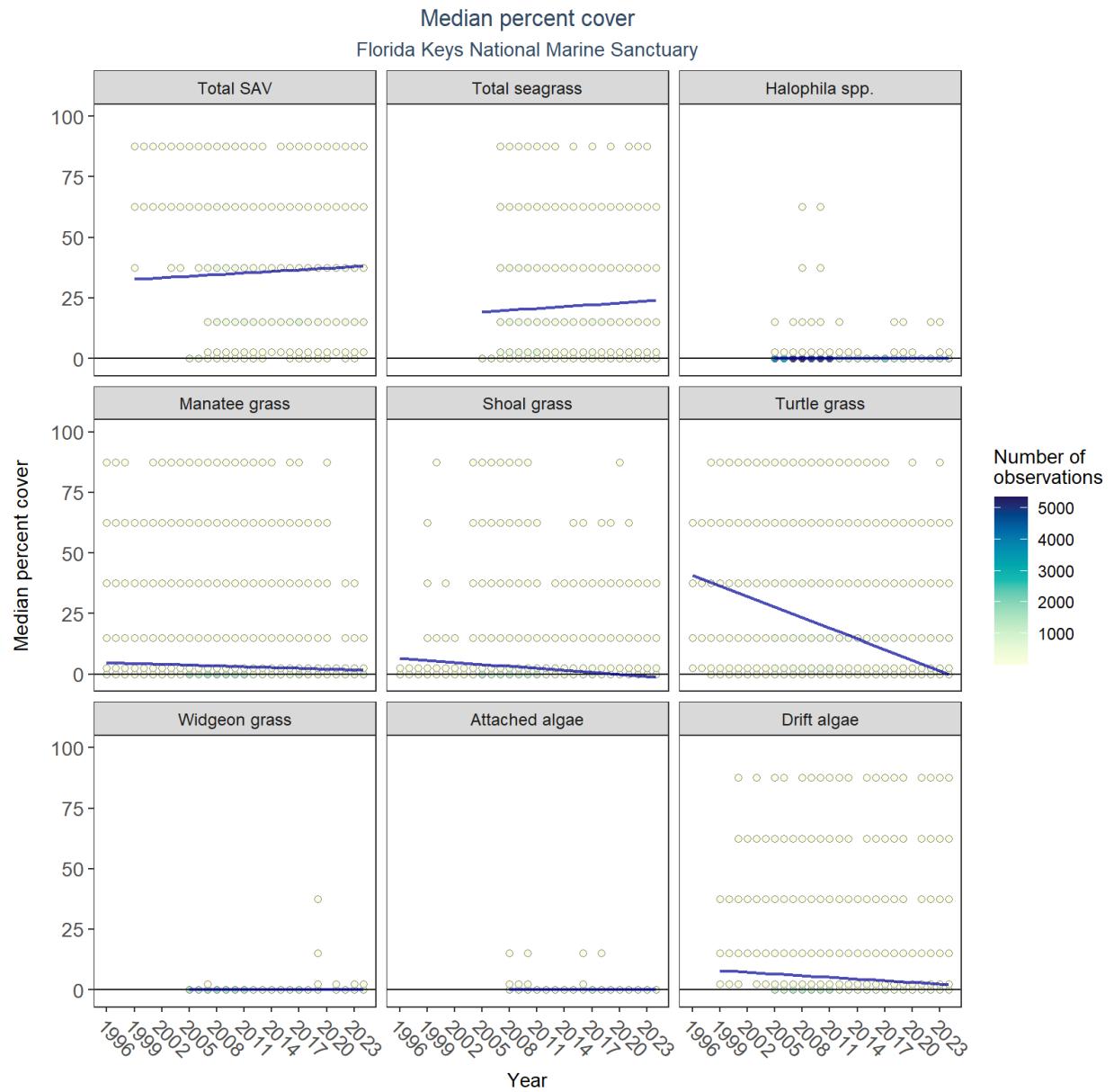


Figure 42: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 11: SAV LME Results for Florida Keys National Marine Sanctuary

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Attached algae	No significant trend	2008 - 2024	0.08	0.00	0.22
Drift algae	Significantly decreasing trend	1999 - 2024	9.15	-0.23	0.00
Shoal grass	Significantly decreasing trend	1996 - 2024	7.08	-0.27	0.00
Halophila spp.	No significant trend	2005 - 2024	0.07	0.00	0.33
Widgeon grass	No significant trend	2005 - 2024	-0.04	0.00	0.10
Manatee grass	Significantly decreasing trend	1996 - 2024	4.92	-0.11	0.02
Turtle grass	Significantly decreasing trend	1996 - 2024	43.82	-1.46	0.00
Total SAV	No significant trend	1999 - 2024	31.53	0.22	0.17
Total seagrass	Significantly increasing trend	2005 - 2024	16.41	0.25	0.01

An annual increase in percent cover was observed for total seagrass (0.2%). Annual decreases in percent cover were observed for manatee grass (-0.1%), shoal grass (-0.3%), turtle grass (-1.5%), and drift algae (-0.2%). Total SAV, *Halophila* spp., widgeon grass, and attached algae showed no detectable change in percent cover.

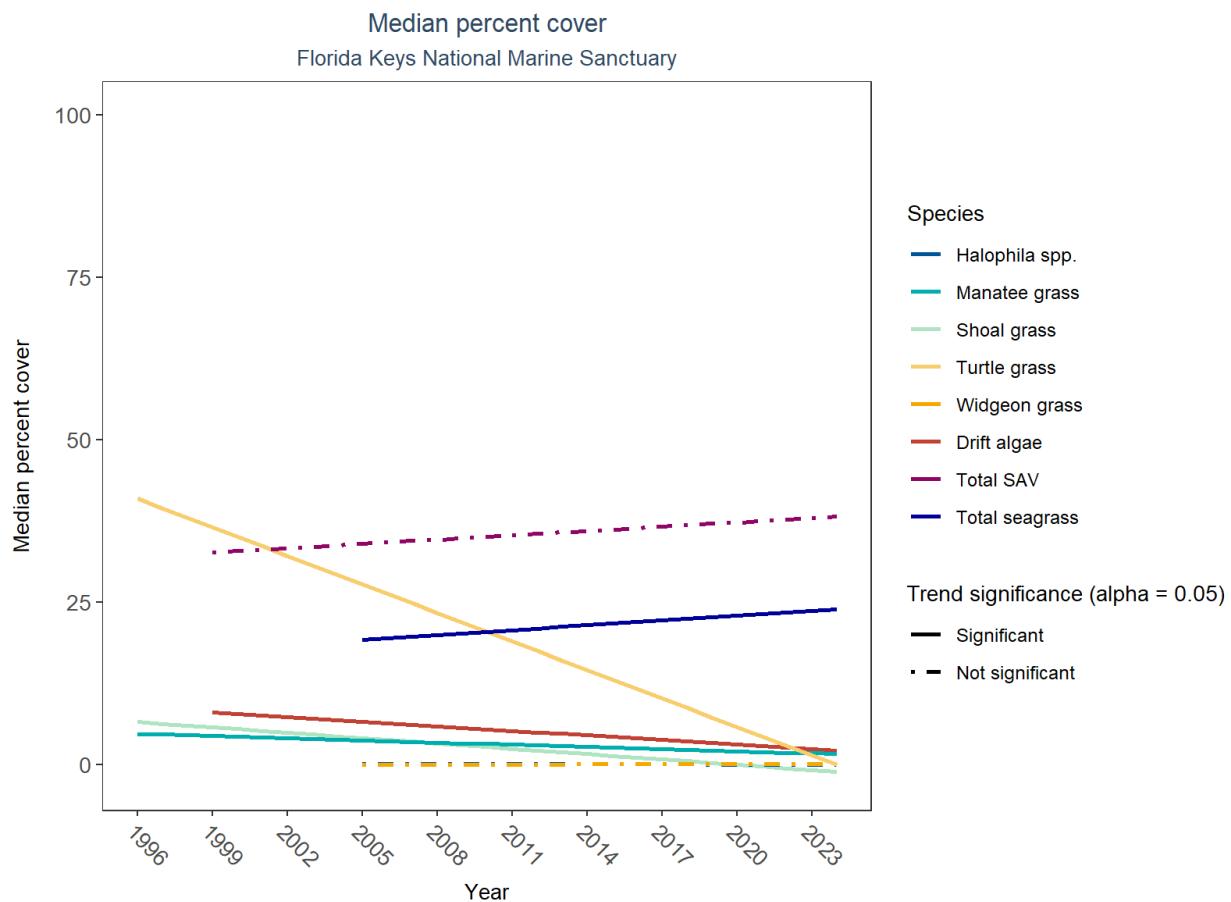


Figure 43: Trends in median percent cover for various seagrass species in Florida Keys National Marine Sanctuary - simplified

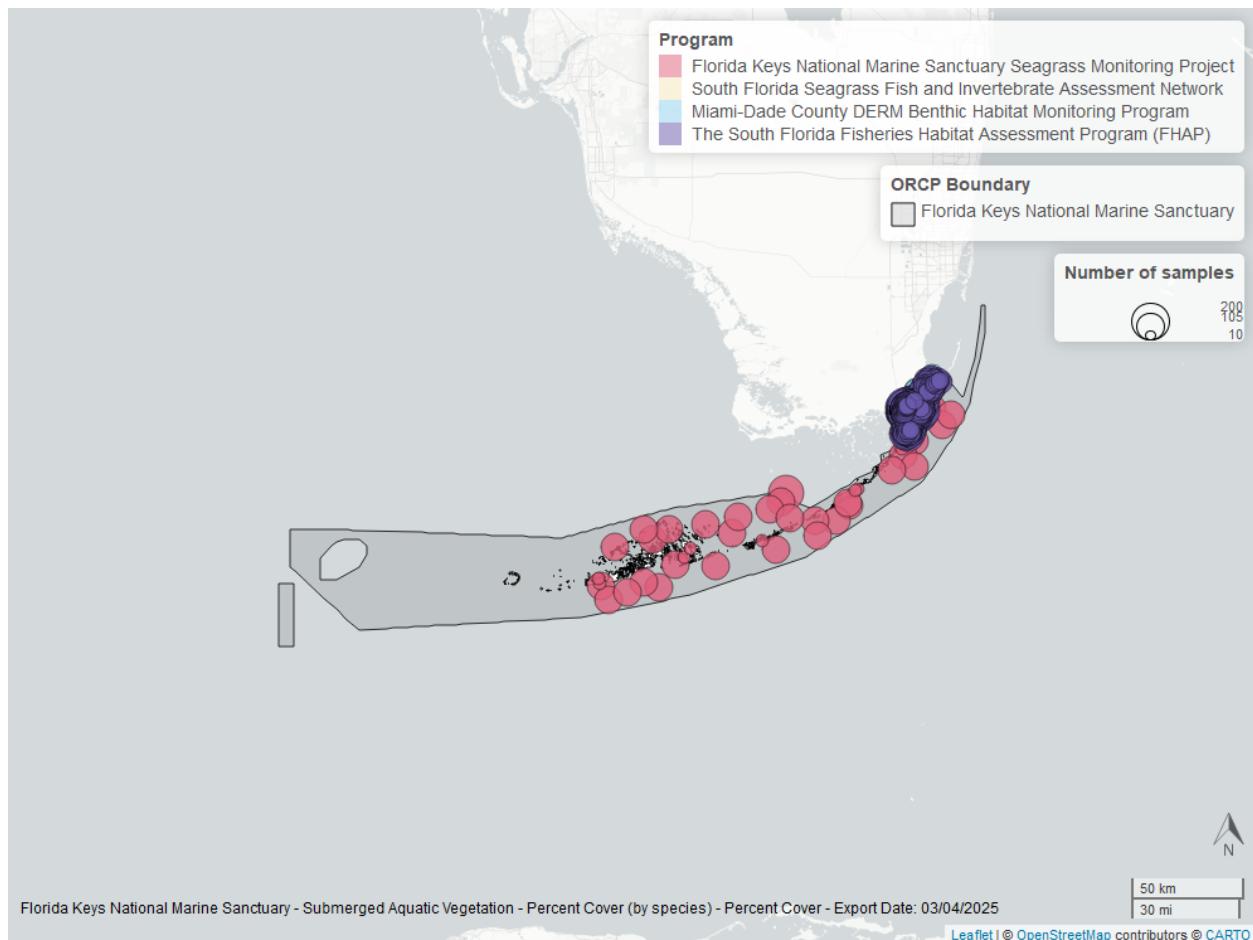


Figure 44: Map showing SAV sampling sites within the boundaries of *Florida Keys National Marine Sanctuary*. The point size reflects the number of samples at a given sampling site.

Fort Pickens State Park Aquatic Preserve

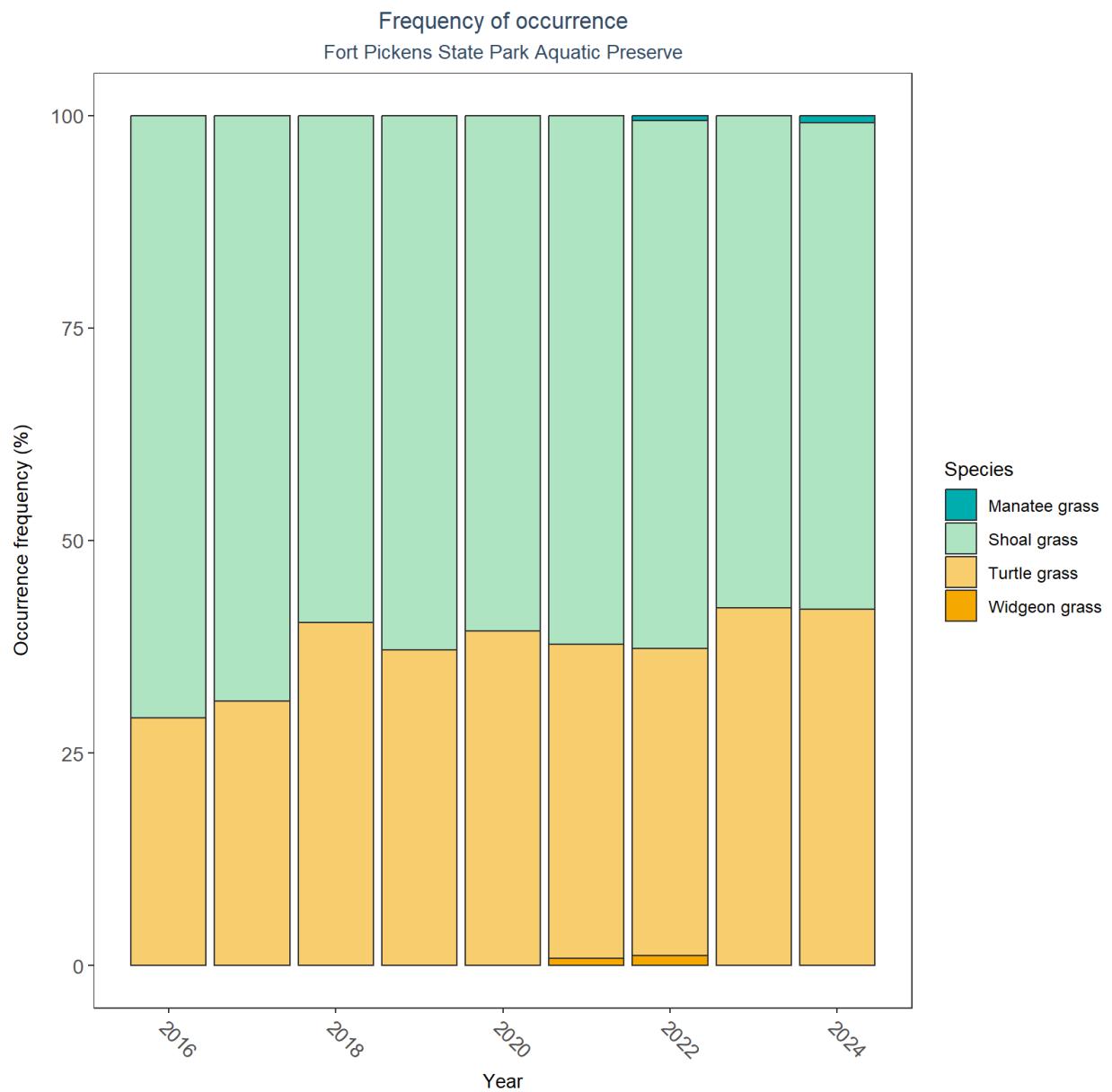


Figure 45: Frequency of occurrence for various seagrass species in Fort Pickens State Park Aquatic Preserve

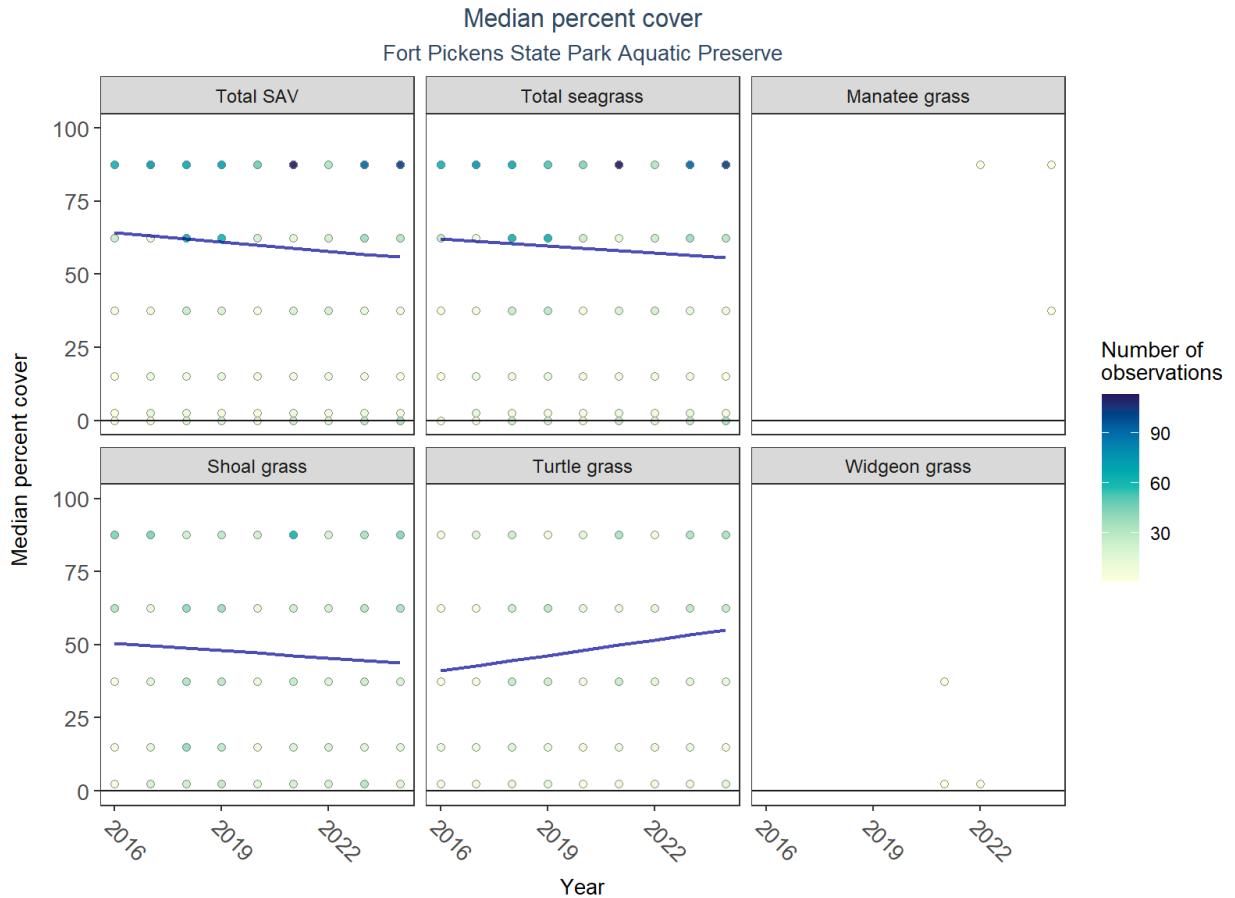


Figure 46: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 12: SAV LME Results for Fort Pickens State Park Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Shoal grass	Significantly decreasing trend	2016 - 2024	69.27	-0.85	0.05
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	Insufficient data to calculate trend	NA	NA	NA	NA
Manatee grass	Insufficient data to calculate trend	NA	NA	NA	NA
Turtle grass	Significantly increasing trend	2016 - 2024	2.35	1.76	0.01
Total SAV	No significant trend	2016 - 2024	86.90	-1.03	0.14
Total seagrass	No significant trend	2016 - 2024	79.99	-0.81	0.27

An annual increase in percent cover was observed for turtle grass (1.8%). An annual decrease in percent cover was observed for shoal grass (-0.8%). No detectable change in percent cover was observed for total SAV and total seagrass. Trends in percent cover could not be evaluated for manatee grass and widgeon grass due to insufficient data.

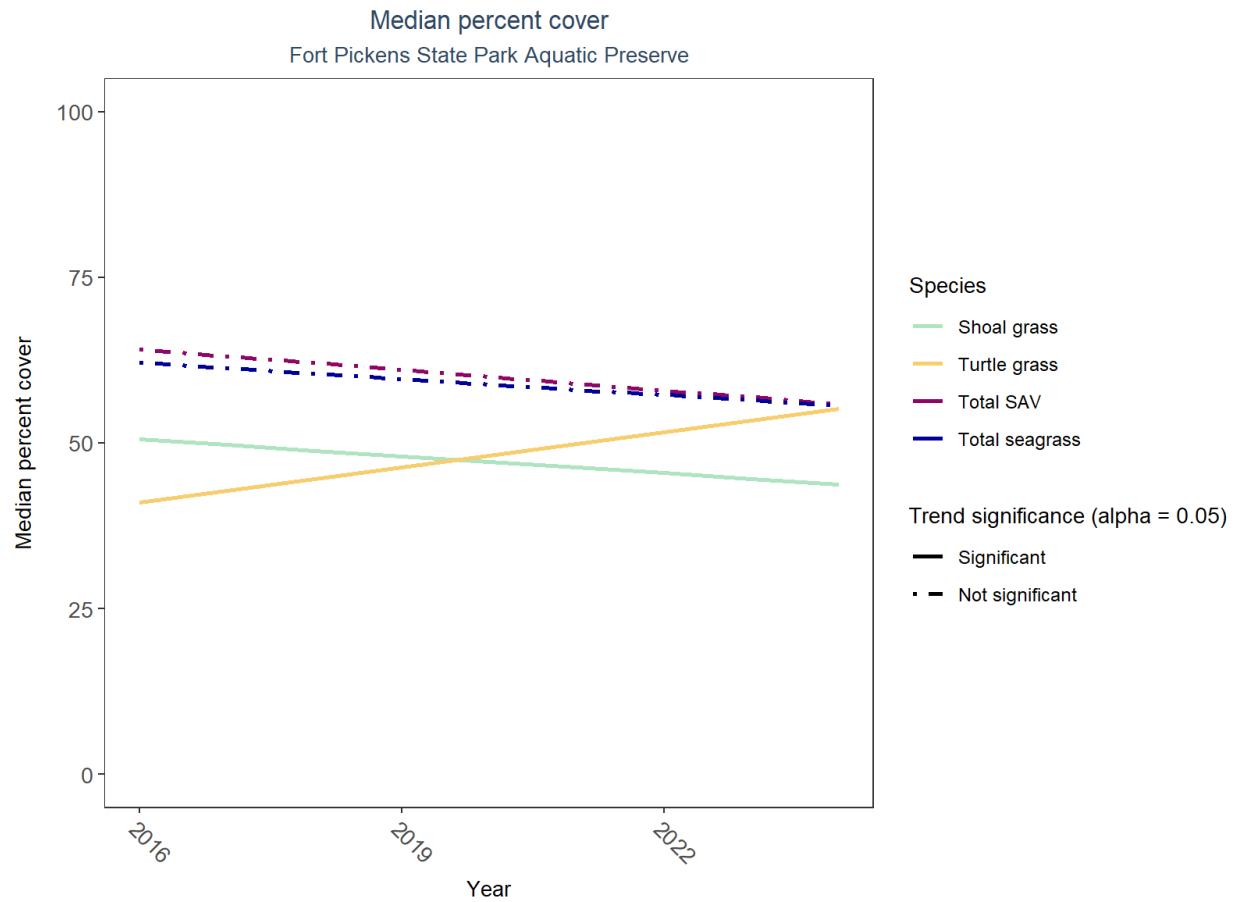


Figure 47: Trends in median percent cover for various seagrass species in Fort Pickens State Park Aquatic Preserve - simplified

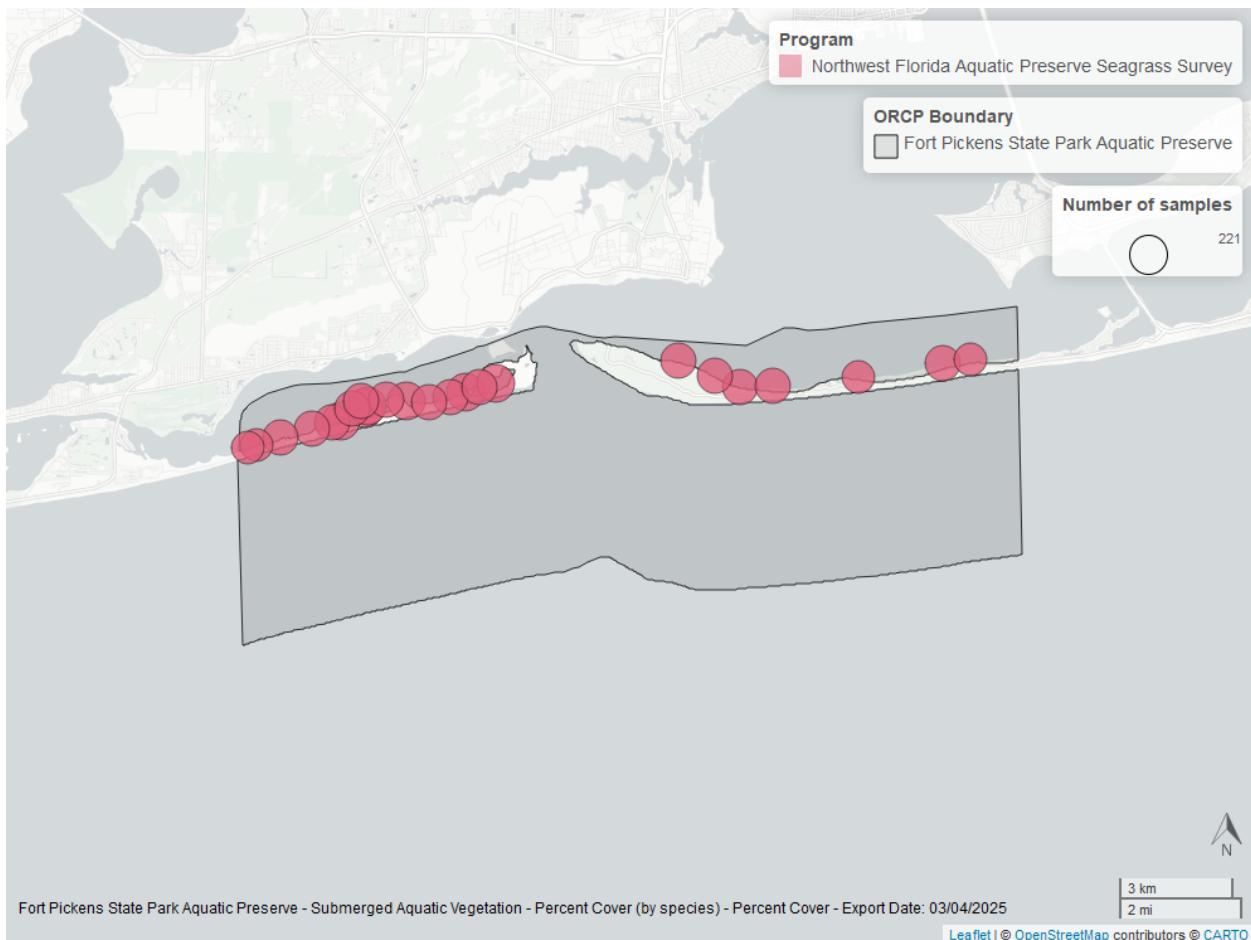


Figure 48: Map showing SAV sampling sites within the boundaries of *Fort Pickens State Park Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Gasparilla Sound-Charlotte Harbor Aquatic Preserve

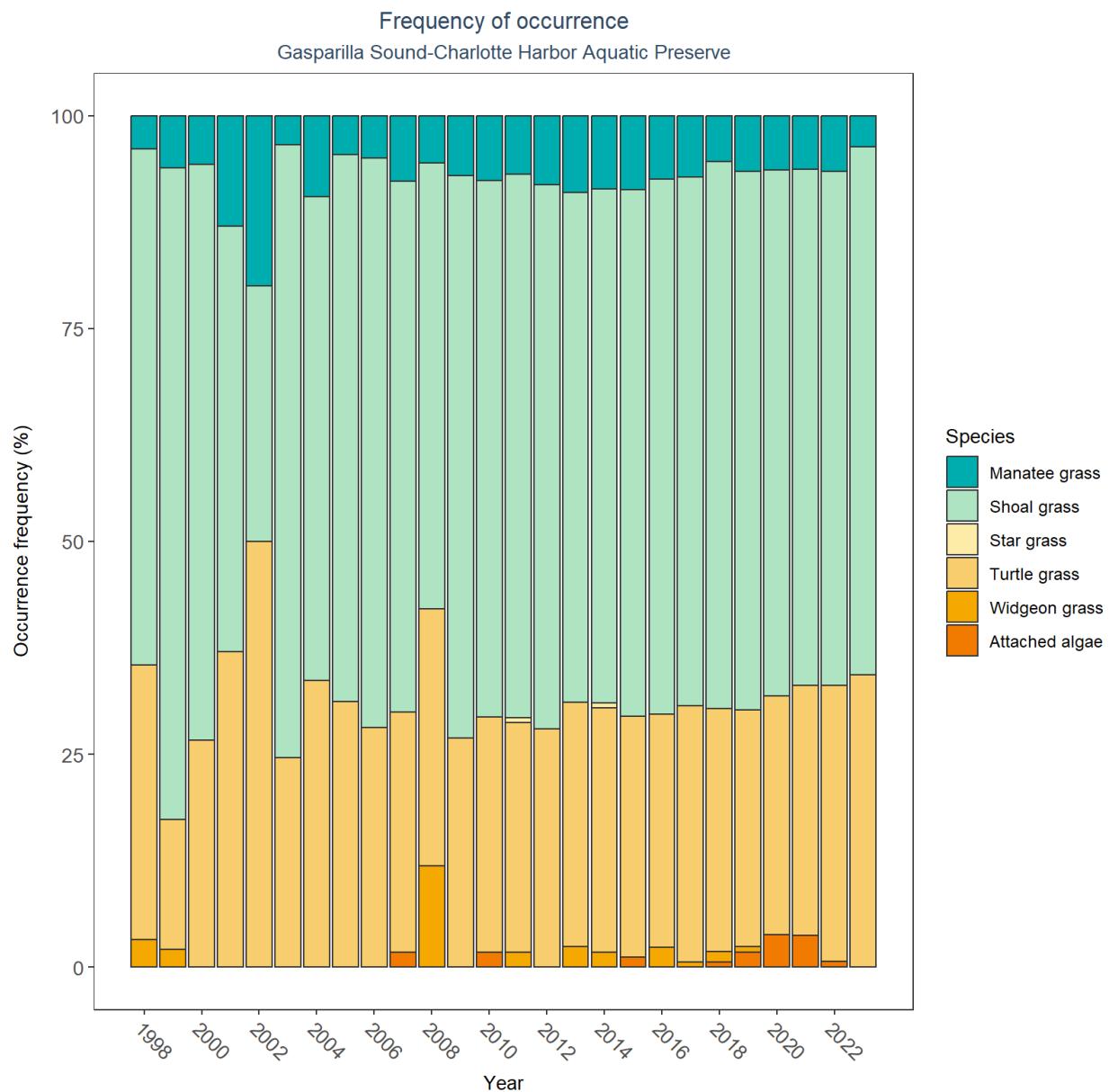


Figure 49: Frequency of occurrence for various seagrass species in Gasparilla Sound-Charlotte Harbor Aquatic Preserve

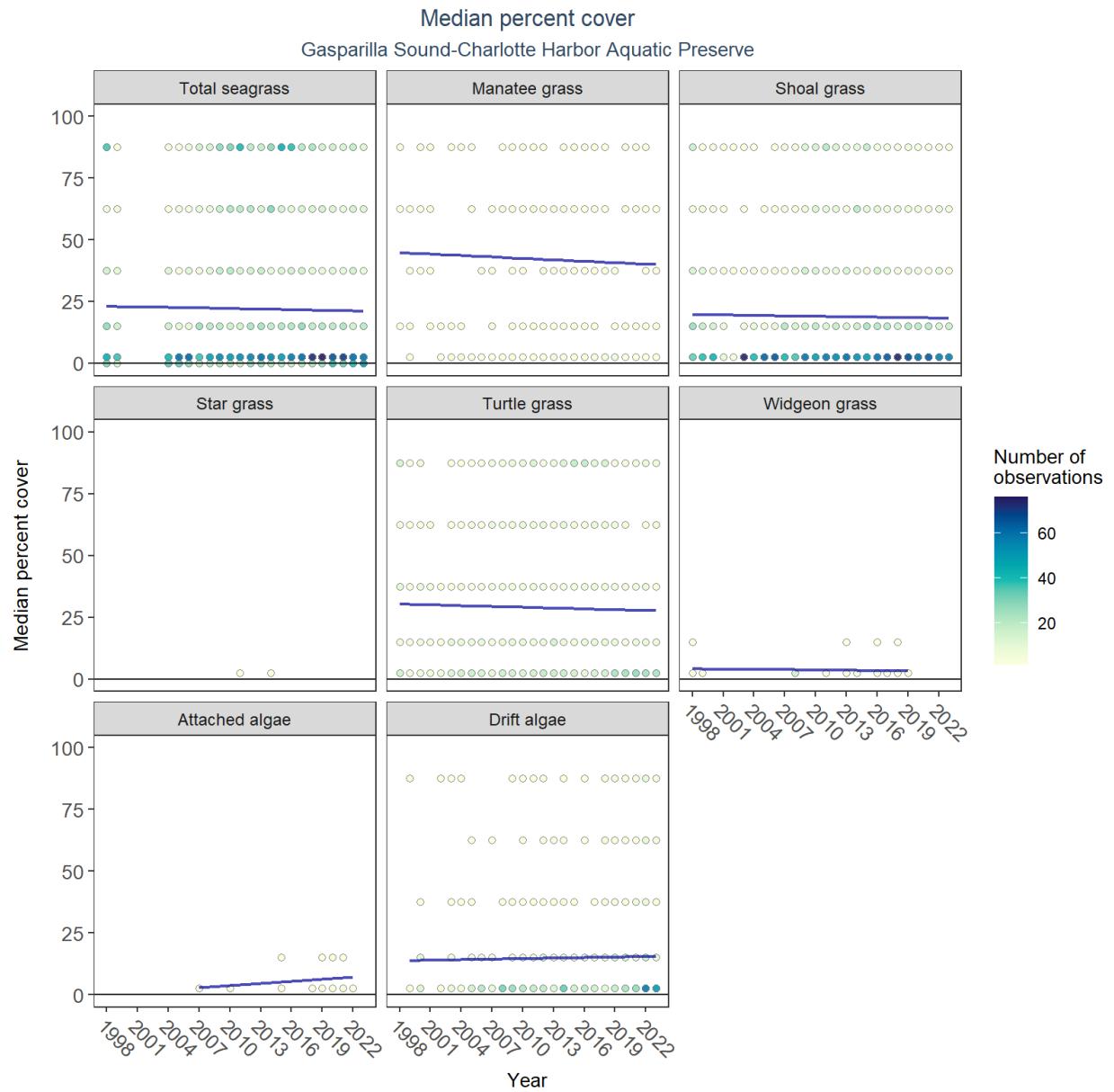


Figure 50: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 13: SAV LME Results for Gasparilla Sound-Charlotte Harbor Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Attached algae	No significant trend	2007 - 2022	-0.74	0.28	0.32
Drift algae	No significant trend	1999 - 2023	13.43	0.07	0.77
Shoal grass	No significant trend	1998 - 2023	19.92	-0.06	0.44
Star grass	Insufficient data to calculate trend	NA	NA	NA	NA
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	No significant trend	1998 - 2019	4.26	-0.04	0.80
Manatee grass	No significant trend	1998 - 2023	45.59	-0.20	0.74
Turtle grass	No significant trend	1998 - 2023	30.78	-0.11	0.57
Total seagrass	No significant trend	1998 - 2023	23.46	-0.08	0.29

Total seagrass, manatee grass, shoal grass, turtle grass, widgeon grass, attached algae, and drift algae showed no detectable change in percent cover. Trends in percent cover could not be evaluated for star grass due to insufficient data.

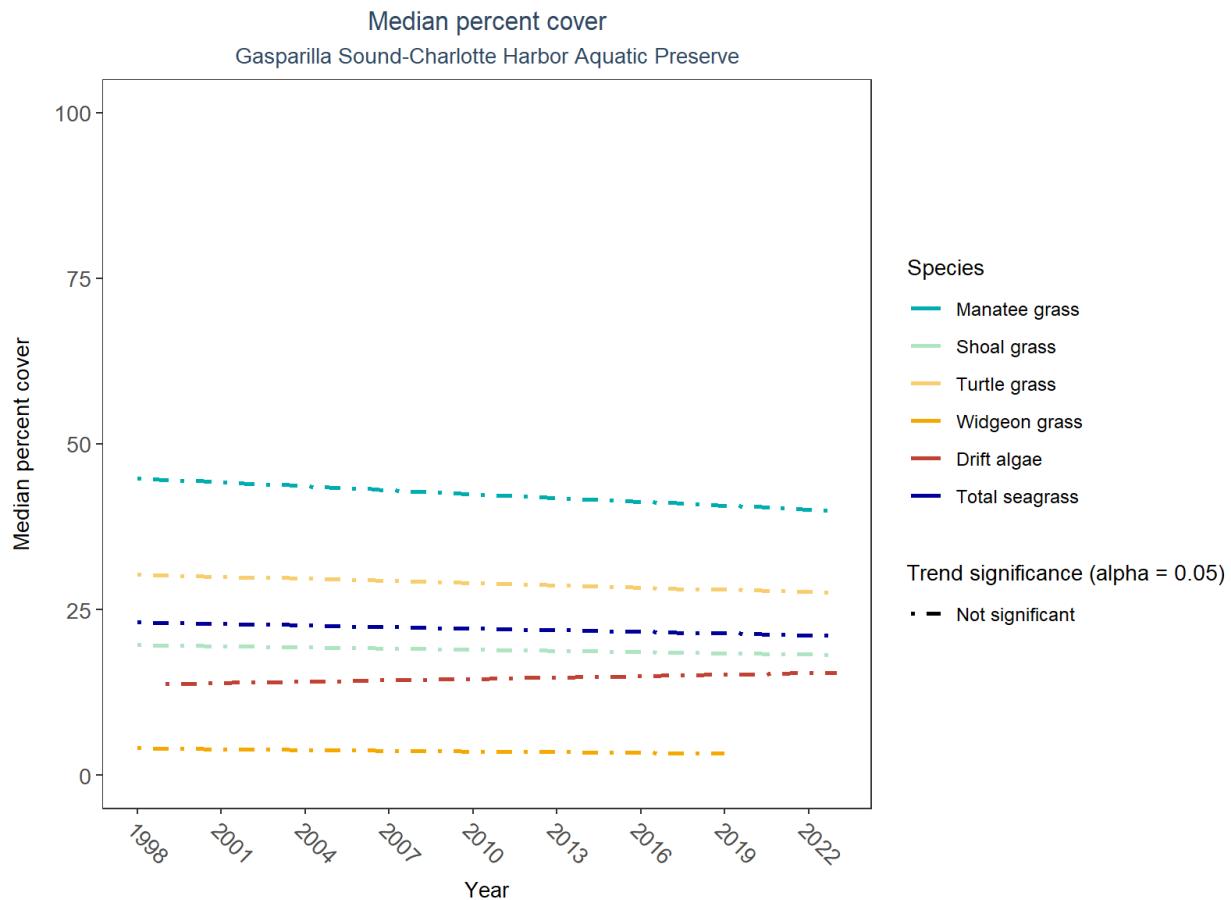


Figure 51: Trends in median percent cover for various seagrass species in Gasparilla Sound-Charlotte Harbor Aquatic Preserve - simplified

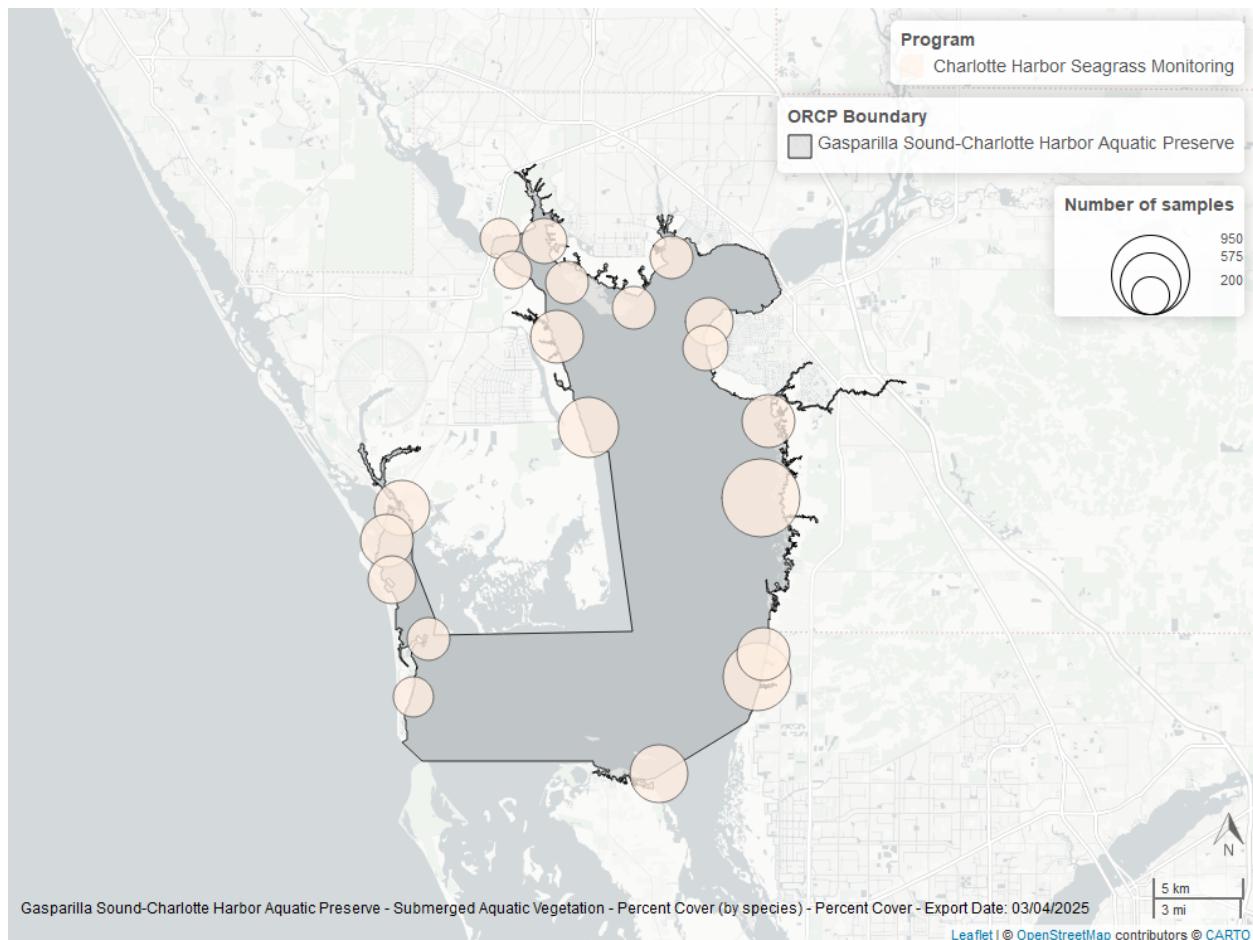


Figure 52: Map showing SAV sampling sites within the boundaries of *Gasparilla Sound-Charlotte Harbor Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Indian River-Malabar to Vero Beach Aquatic Preserve

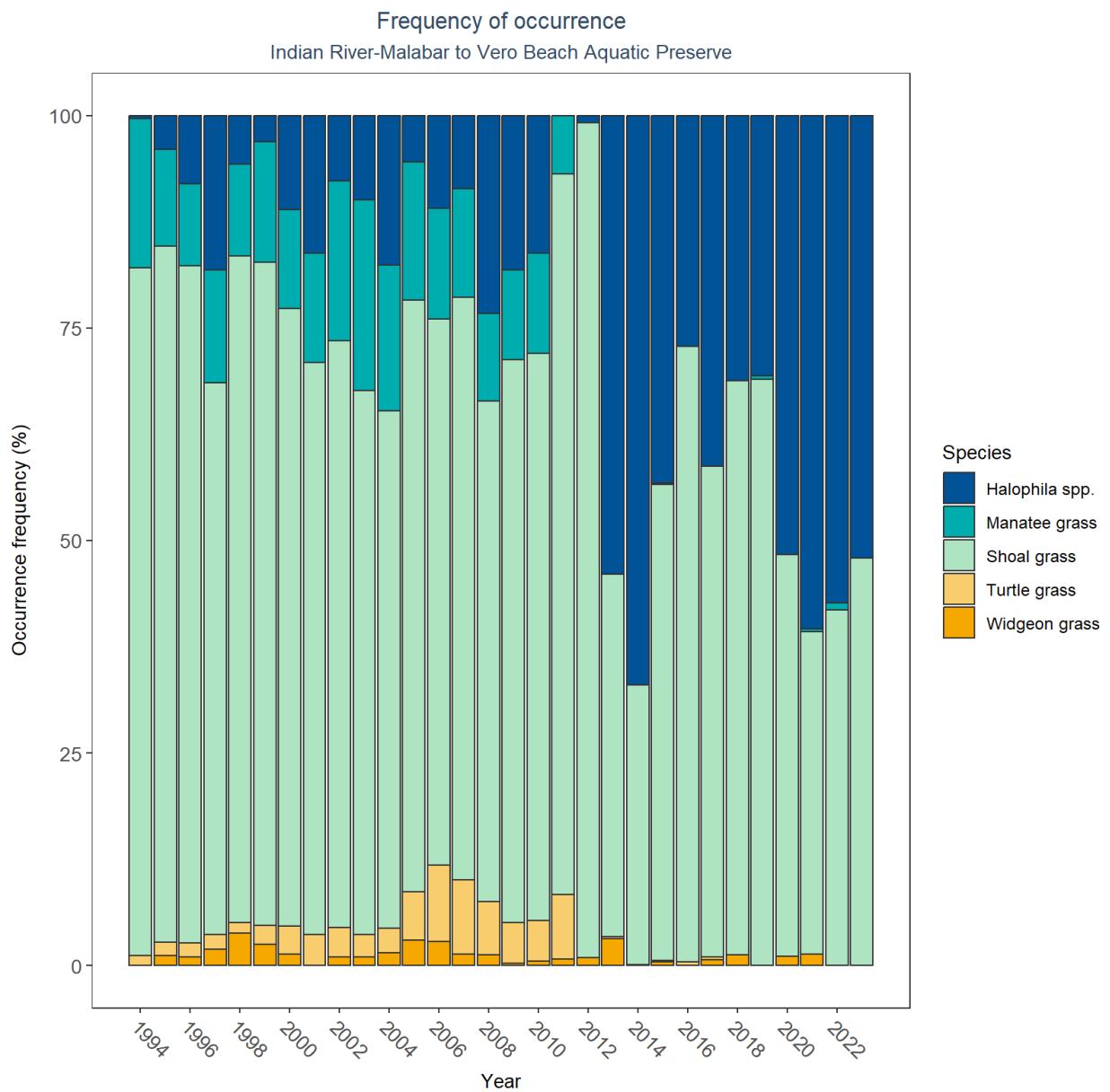


Figure 53: Frequency of occurrence for various seagrass species in Indian River-Malabar to Vero Beach Aquatic Preserve

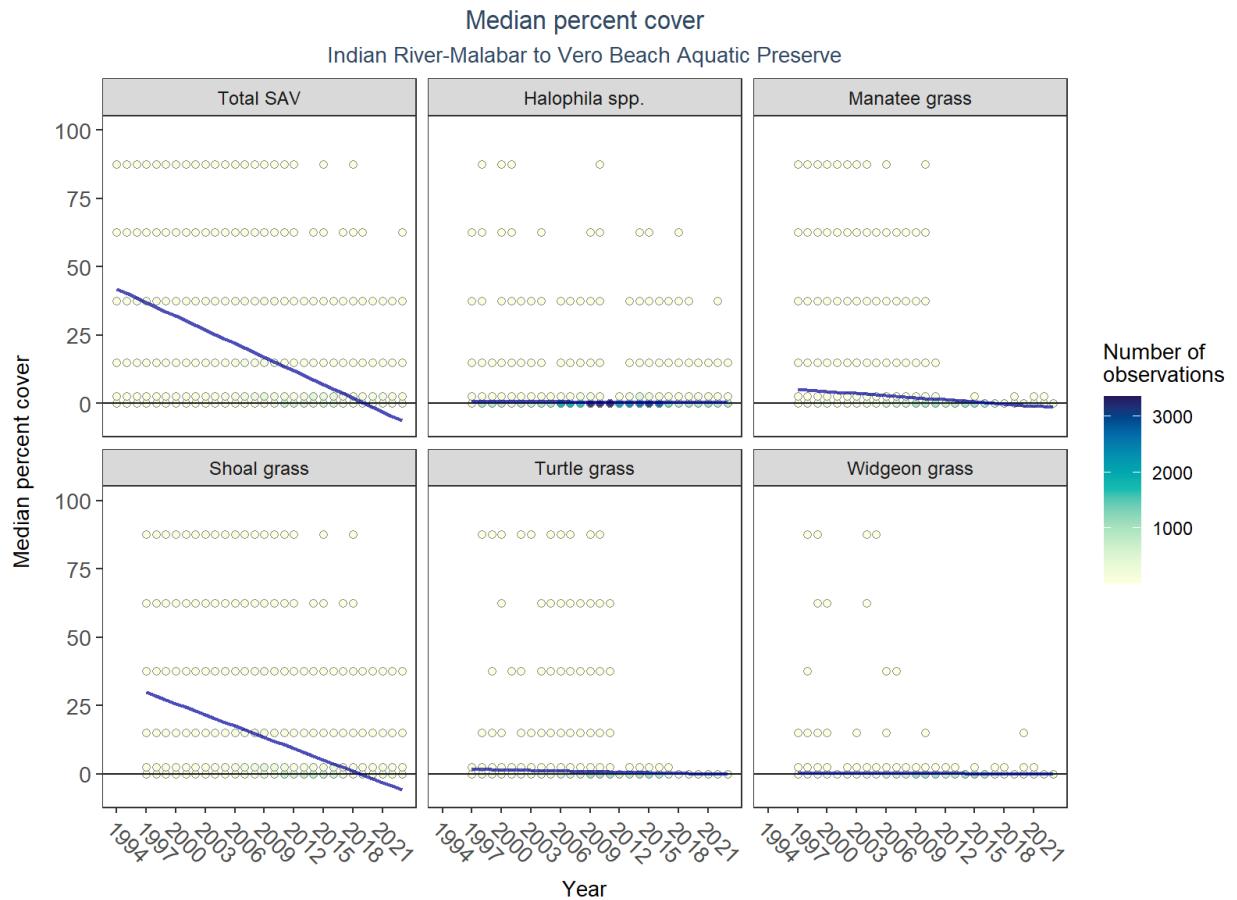


Figure 54: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 14: SAV LME Results for Indian River-Malabar to Vero Beach Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Insufficient data to calculate trend	NA	NA	NA	NA
Shoal grass	Significantly decreasing trend	1997 - 2023	33.96	-1.37	0.00
Halophila spp.	No significant trend	1997 - 2023	0.57	-0.01	0.36
Widgeon grass	No significant trend	1997 - 2023	0.26	-0.01	0.10
Manatee grass	Significantly decreasing trend	1997 - 2023	5.90	-0.25	0.00
Turtle grass	No significant trend	1997 - 2023	1.81	-0.07	0.10
Total SAV	Significantly decreasing trend	1994 - 2023	41.89	-1.66	0.00
Total seagrass	Insufficient data to calculate trend	NA	NA	NA	NA

Annual decreases in percent cover were observed for total SAV (-1.7%), manatee grass (-0.2%), and shoal grass (-1.4%). *Halophila* spp., turtle grass, and widgeon grass showed no detectable change in percent cover. Trends in percent cover could not be evaluated for total seagrass and drift algae due to insufficient data.

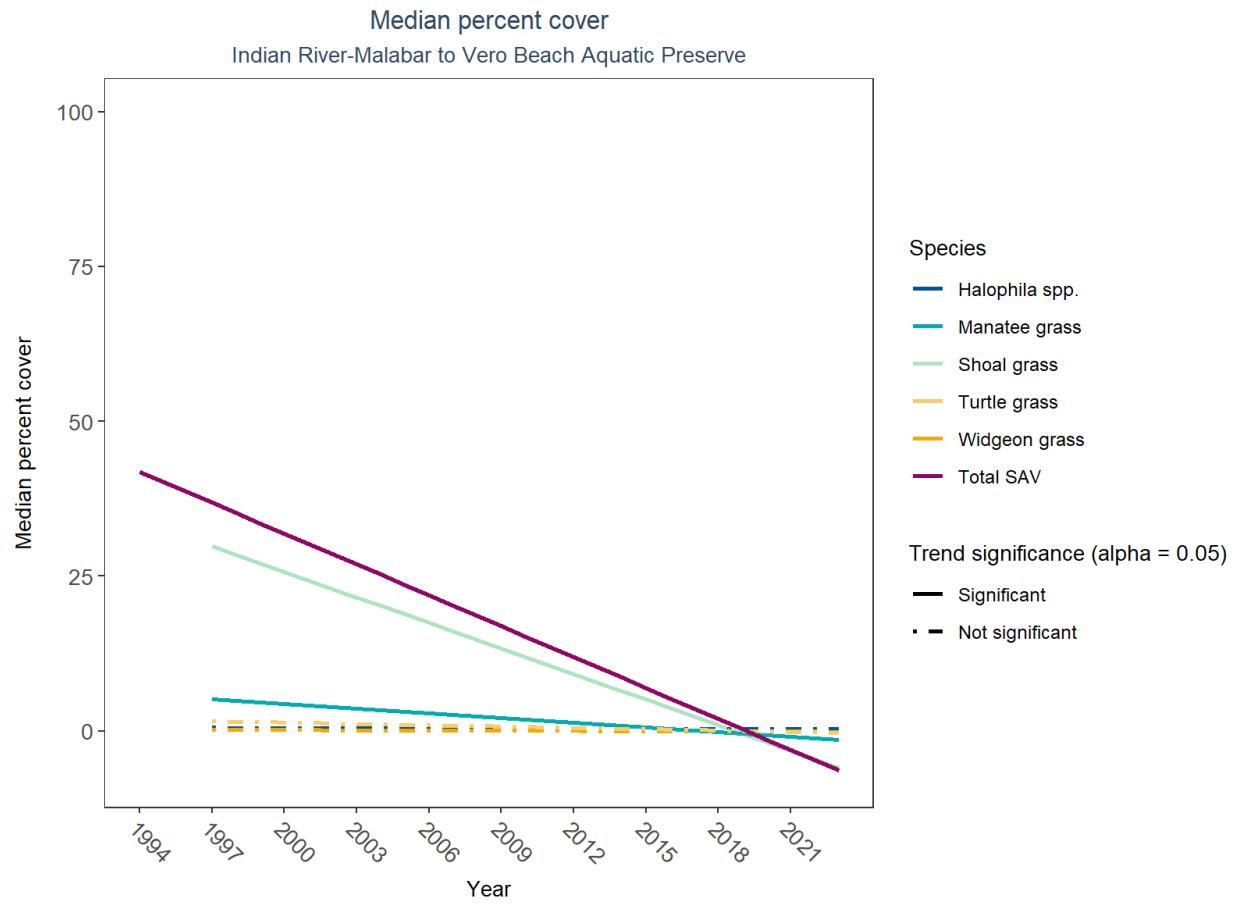


Figure 55: Trends in median percent cover for various seagrass species in Indian River-Malabar to Vero Beach Aquatic Preserve - simplified

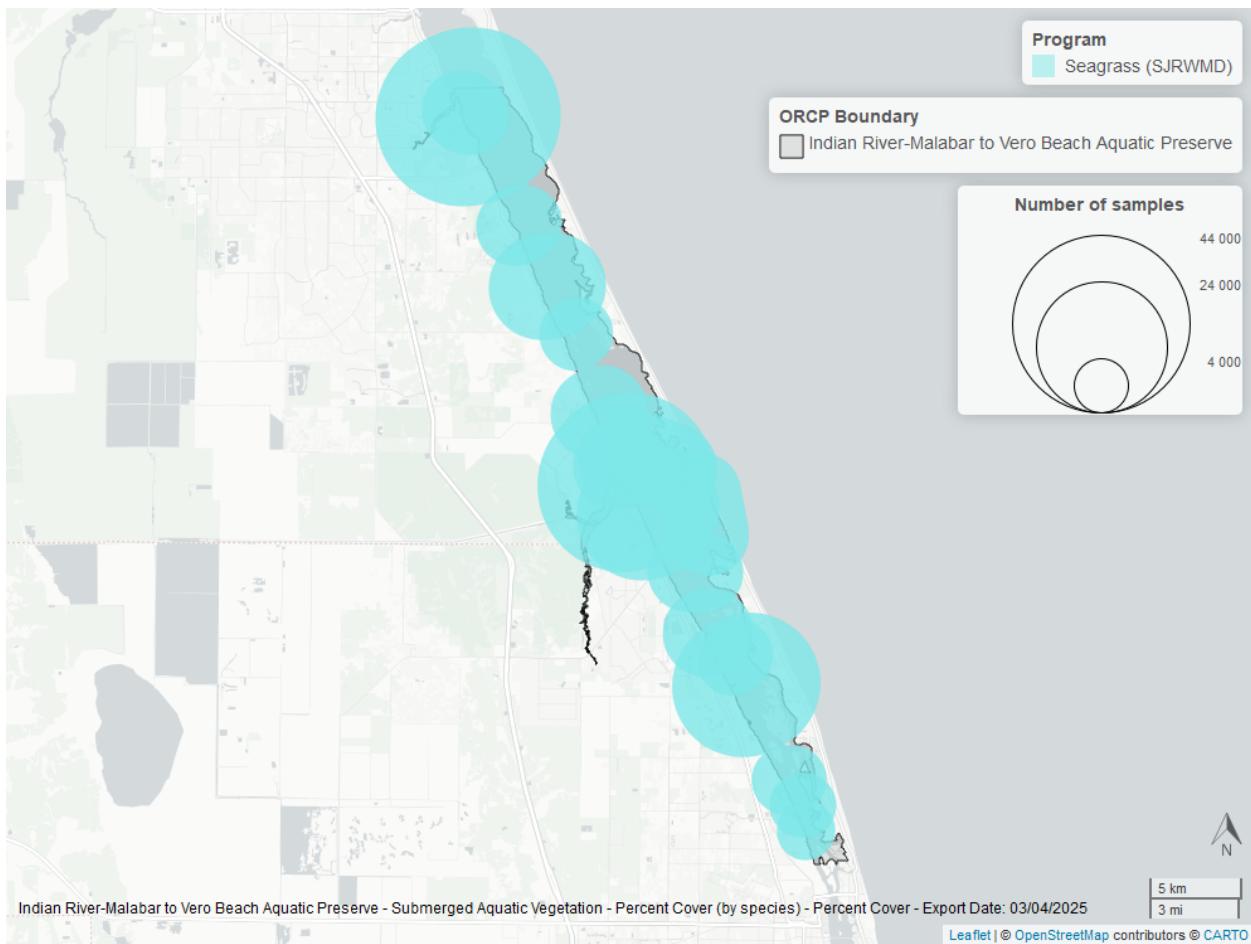


Figure 56: Map showing SAV sampling sites within the boundaries of *Indian River-Malabar to Vero Beach Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Indian River-Vero Beach to Ft. Pierce Aquatic Preserve

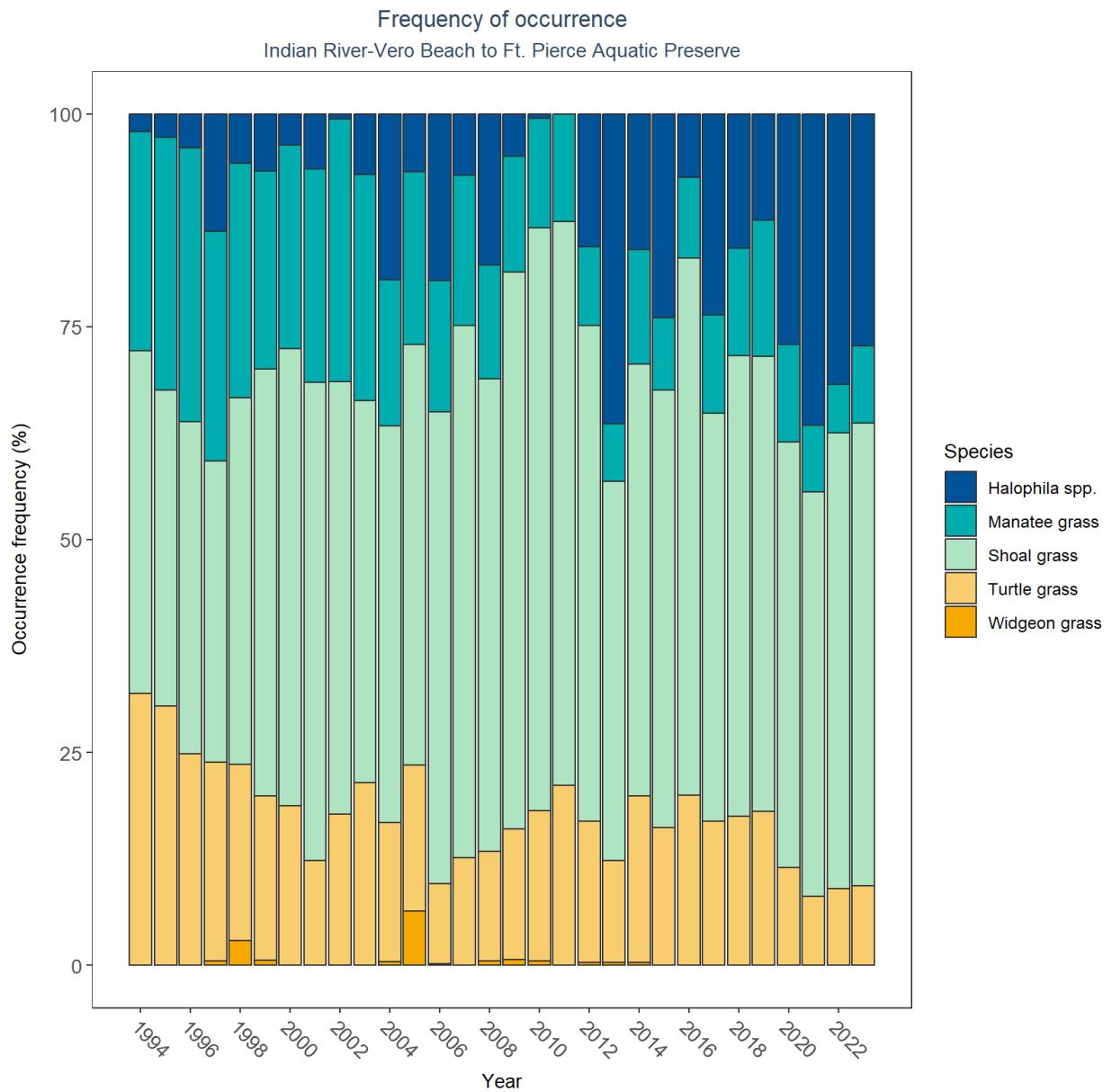


Figure 57: Frequency of occurrence for various seagrass species in Indian River-Vero Beach to Ft. Pierce Aquatic Preserve

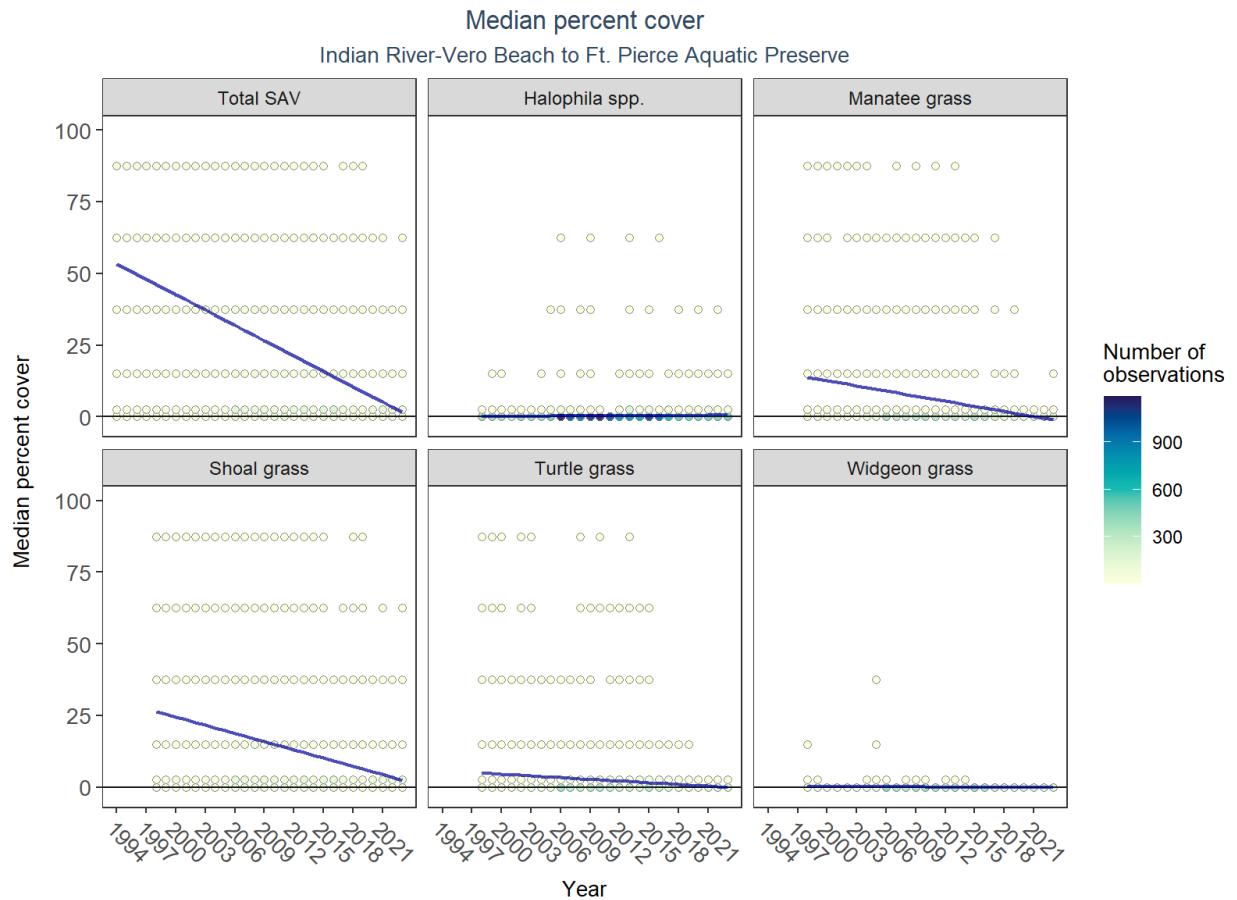


Figure 58: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 15: SAV LME Results for Indian River-Vero Beach to Ft. Pierce Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Insufficient data to calculate trend	NA	NA	NA	NA
Shoal grass	Significantly decreasing trend	1998 - 2023	30.26	-0.96	0.00
Halophila spp.	Significantly increasing trend	1998 - 2023	0.04	0.02	0.03
Widgeon grass	No significant trend	1998 - 2023	0.14	-0.01	0.12
Manatee grass	Significantly decreasing trend	1998 - 2023	16.15	-0.59	0.04
Turtle grass	Significantly decreasing trend	1998 - 2023	5.77	-0.20	0.02
Total SAV	Significantly decreasing trend	1994 - 2023	53.32	-1.78	0.00
Total seagrass	Insufficient data to calculate trend	NA	NA	NA	NA

An annual increase in percent cover was observed for *Halophila* spp. (0.0%). Annual decreases in percent cover were observed for total SAV (-1.8%), manatee grass (-0.6%), shoal grass (-1.0%), and turtle grass (-0.2%). No detectable change in percent cover was observed for widgeon grass. Trends in percent cover could not be evaluated for total seagrass and drift algae due to insufficient data.

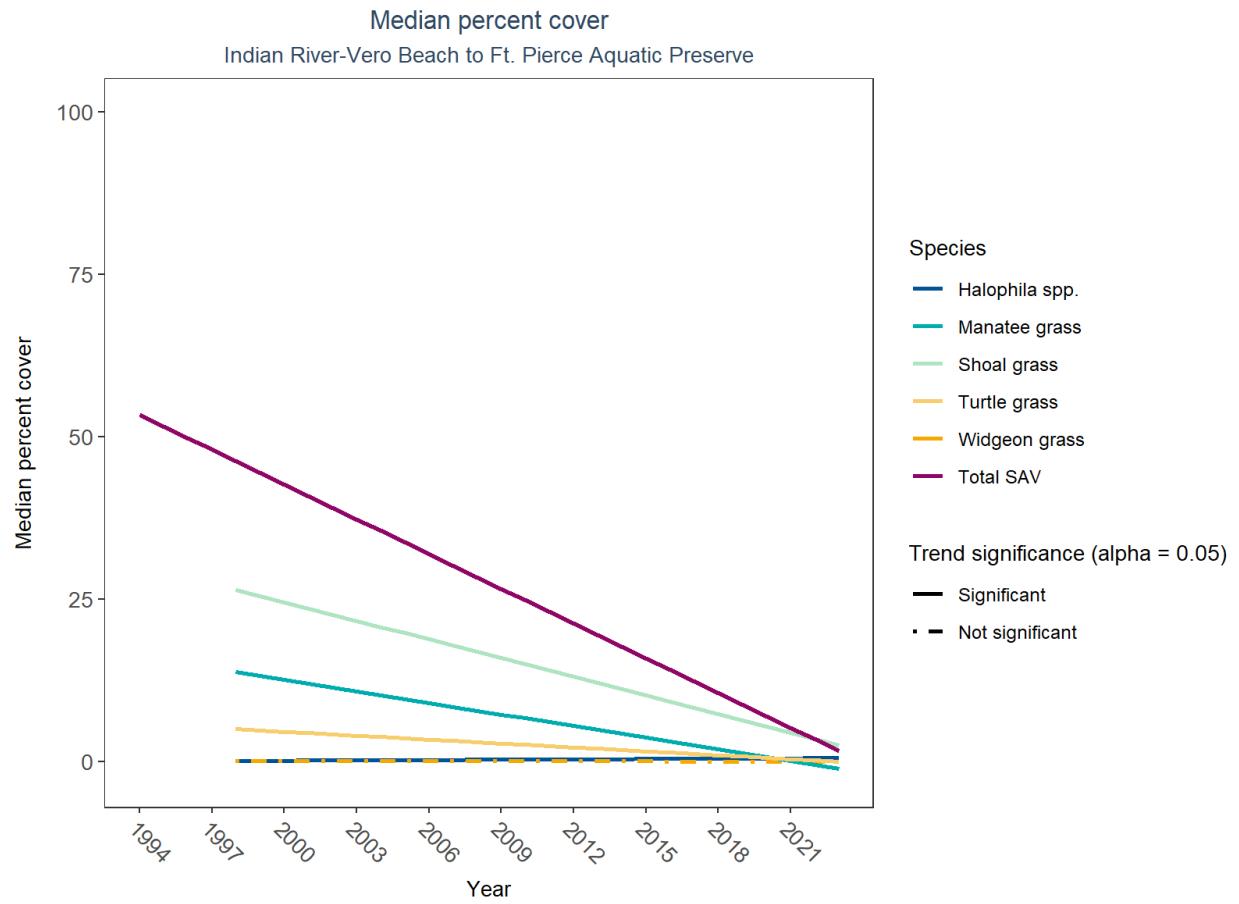


Figure 59: Trends in median percent cover for various seagrass species in Indian River-Vero Beach to Ft. Pierce Aquatic Preserve - simplified

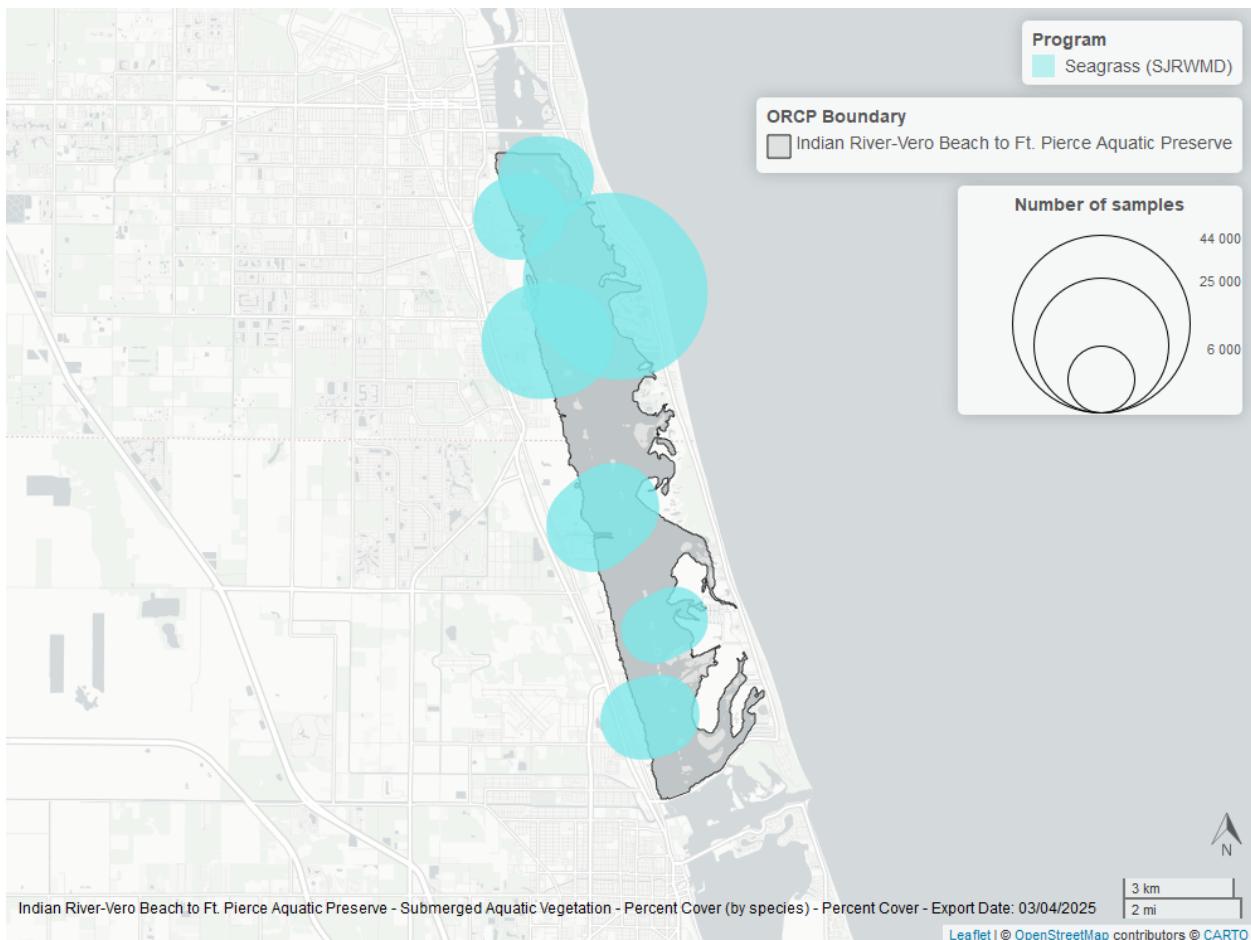


Figure 60: Map showing SAV sampling sites within the boundaries of *Indian River-Vero Beach to Ft. Pierce Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Jensen Beach to Jupiter Inlet Aquatic Preserve

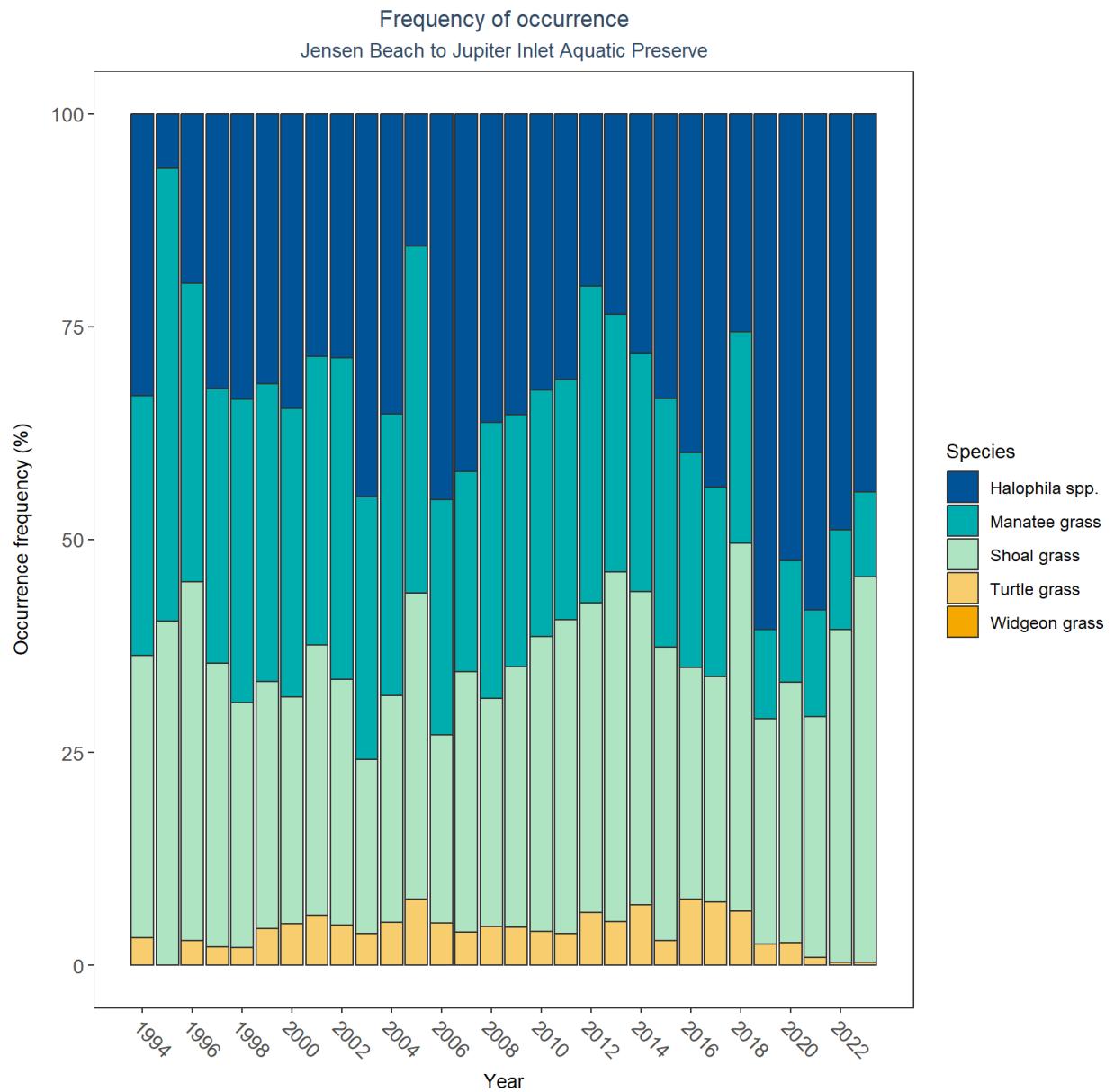


Figure 61: Frequency of occurrence for various seagrass species in Jensen Beach to Jupiter Inlet Aquatic Preserve

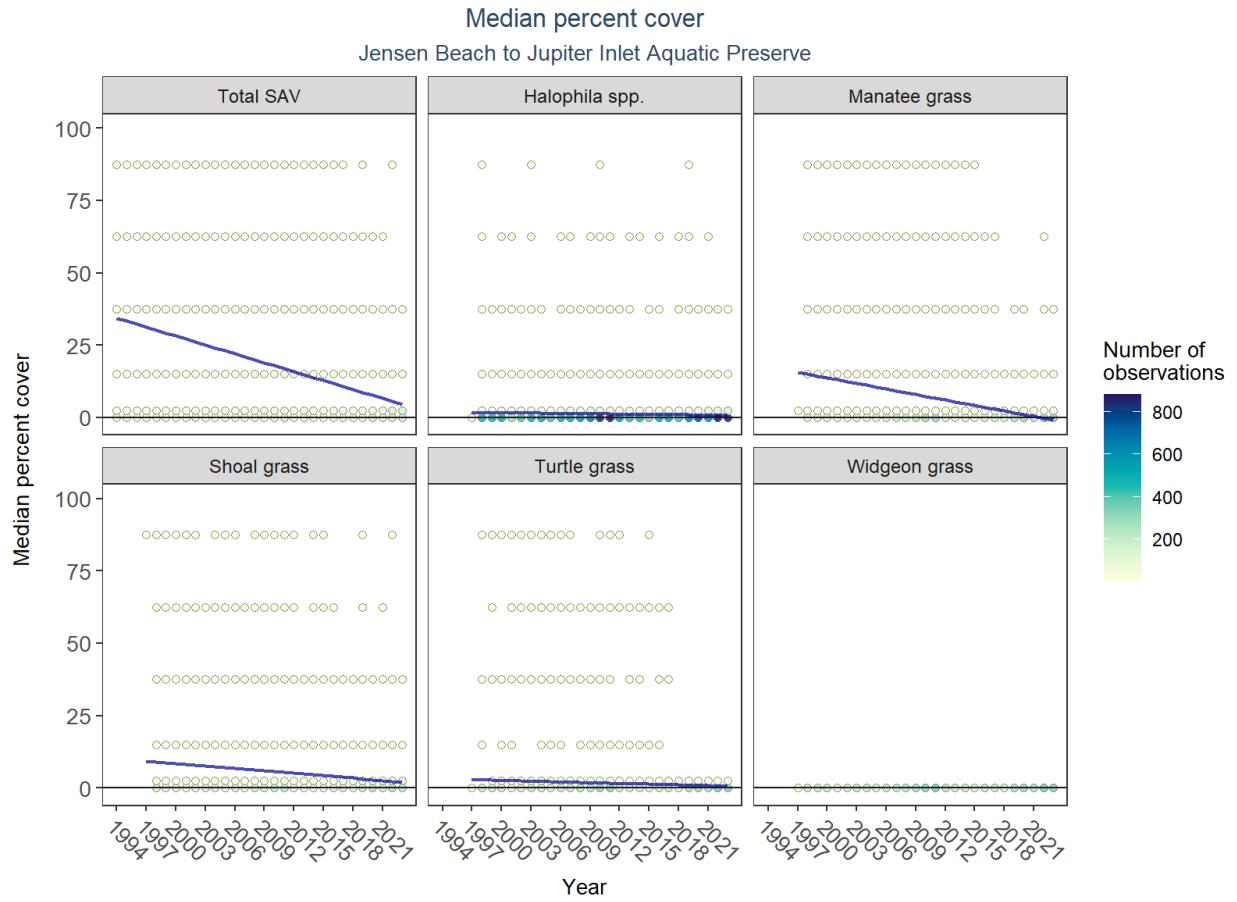


Figure 62: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 16: SAV LME Results for Jensen Beach to Jupiter Inlet Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Insufficient data to calculate trend	NA	NA	NA	NA
Shoal grass	Significantly decreasing trend	1997 - 2023	10.04	-0.27	0.00
Halophila spp.	Significantly decreasing trend	1997 - 2023	1.83	-0.04	0.02
Widgeon grass	Model did not fit the available data	NA	NA	NA	NA
Manatee grass	Significantly decreasing trend	1997 - 2023	17.50	-0.63	0.00
Turtle grass	No significant trend	1997 - 2023	3.09	-0.09	0.06
Total SAV	Significantly decreasing trend	1994 - 2023	34.35	-1.02	0.00
Total seagrass	Insufficient data to calculate trend	NA	NA	NA	NA

Annual decreases in percent cover were observed for total SAV (-1.0%), *Halophila* spp. (-0.0%), manatee grass (-0.6%), and shoal grass (-0.3%). No detectable change in percent cover was observed for turtle grass. Trends in percent cover could not be evaluated for total seagrass and drift algae due to insufficient data, and the model could not be fitted for widgeon grass.

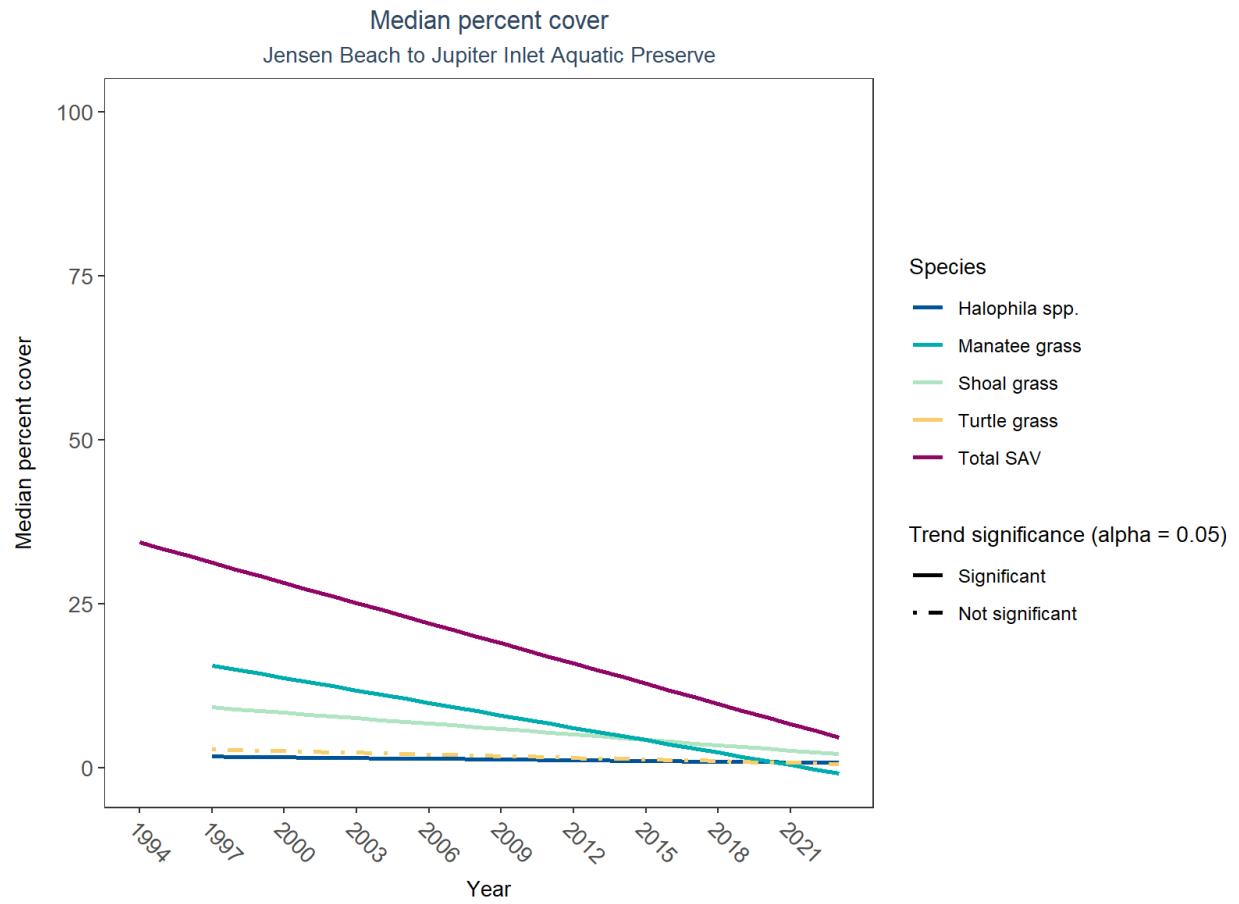


Figure 63: Trends in median percent cover for various seagrass species in Jensen Beach to Jupiter Inlet Aquatic Preserve - simplified

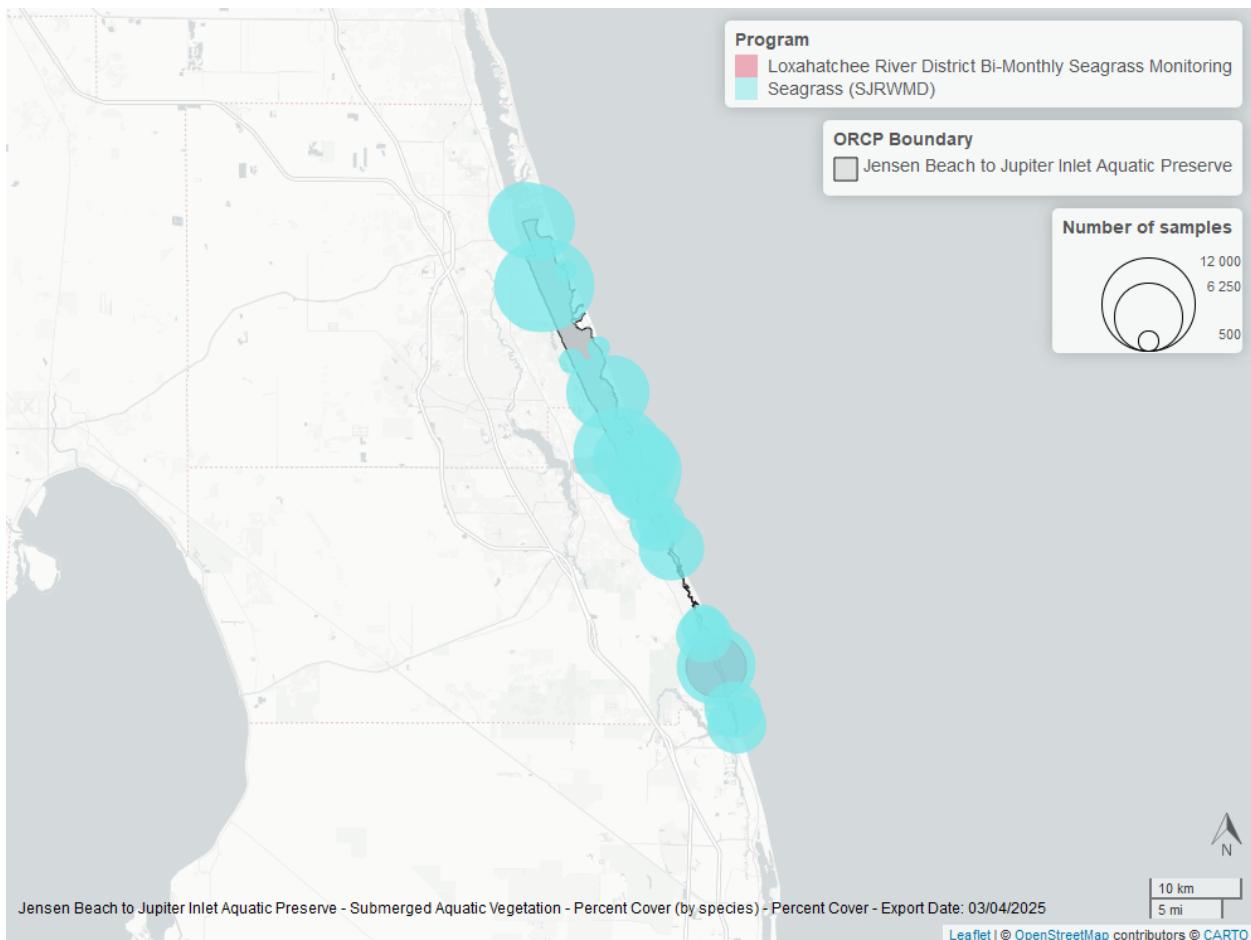


Figure 64: Map showing SAV sampling sites within the boundaries of *Jensen Beach to Jupiter Inlet Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Lemon Bay Aquatic Preserve

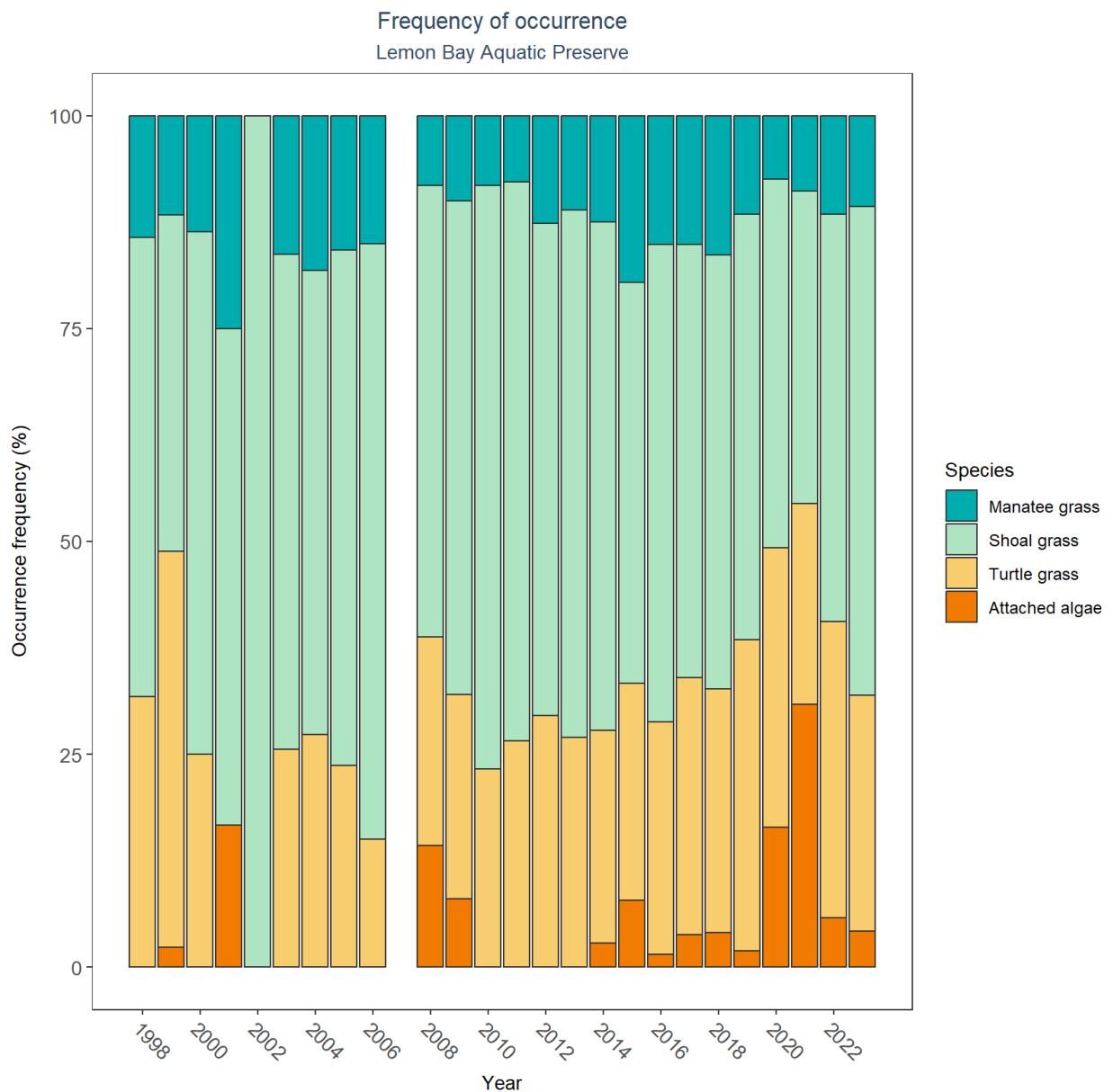


Figure 65: Frequency of occurrence for various seagrass species in Lemon Bay Aquatic Preserve

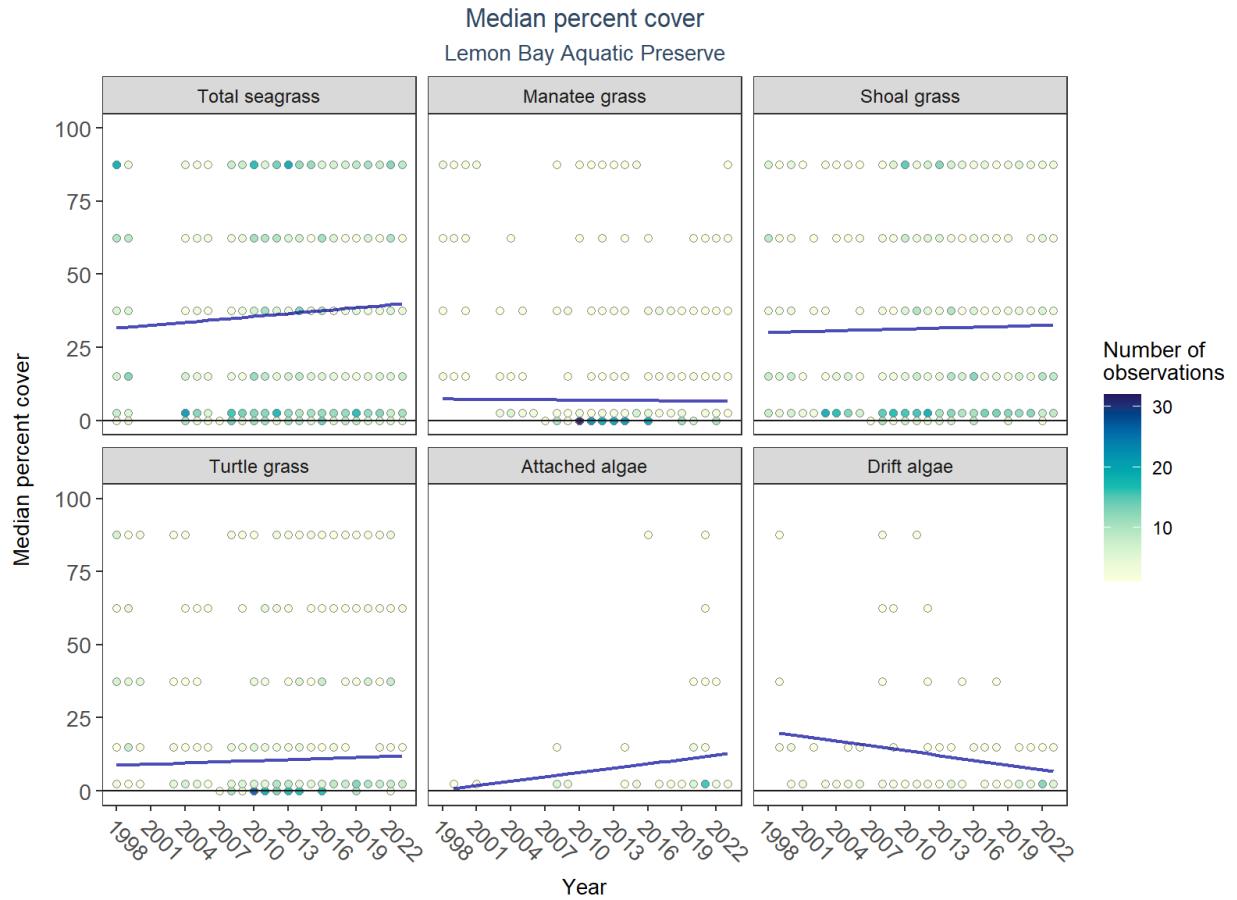


Figure 66: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 17: SAV LME Results for Lemon Bay Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Attached algae	No significant trend	1999 - 2023	-1.57	0.49	0.24
Drift algae	Significantly decreasing trend	1999 - 2023	22.65	-0.55	0.02
Shoal grass	No significant trend	1998 - 2023	29.64	0.10	0.57
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Manatee grass	No significant trend	1998 - 2023	7.42	-0.03	0.91
Turtle grass	No significant trend	1998 - 2023	8.24	0.13	0.79
Total seagrass	No significant trend	1998 - 2023	30.28	0.33	0.39

An annual decrease in percent cover was observed for drift algae (-0.6%). Total seagrass, manatee grass, shoal grass, turtle grass, and attached algae showed no detectable change in percent cover.

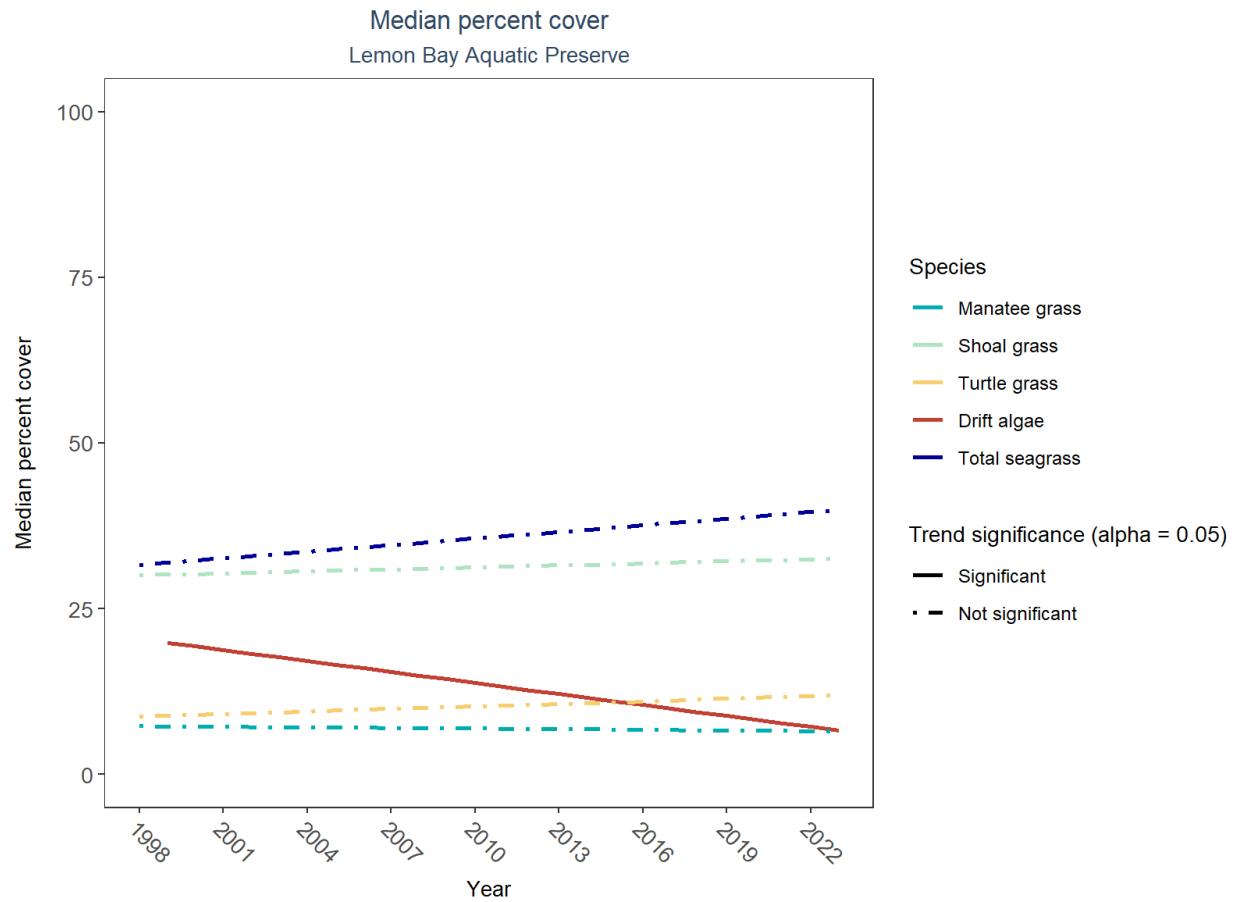


Figure 67: Trends in median percent cover for various seagrass species in Lemon Bay Aquatic Preserve - simplified

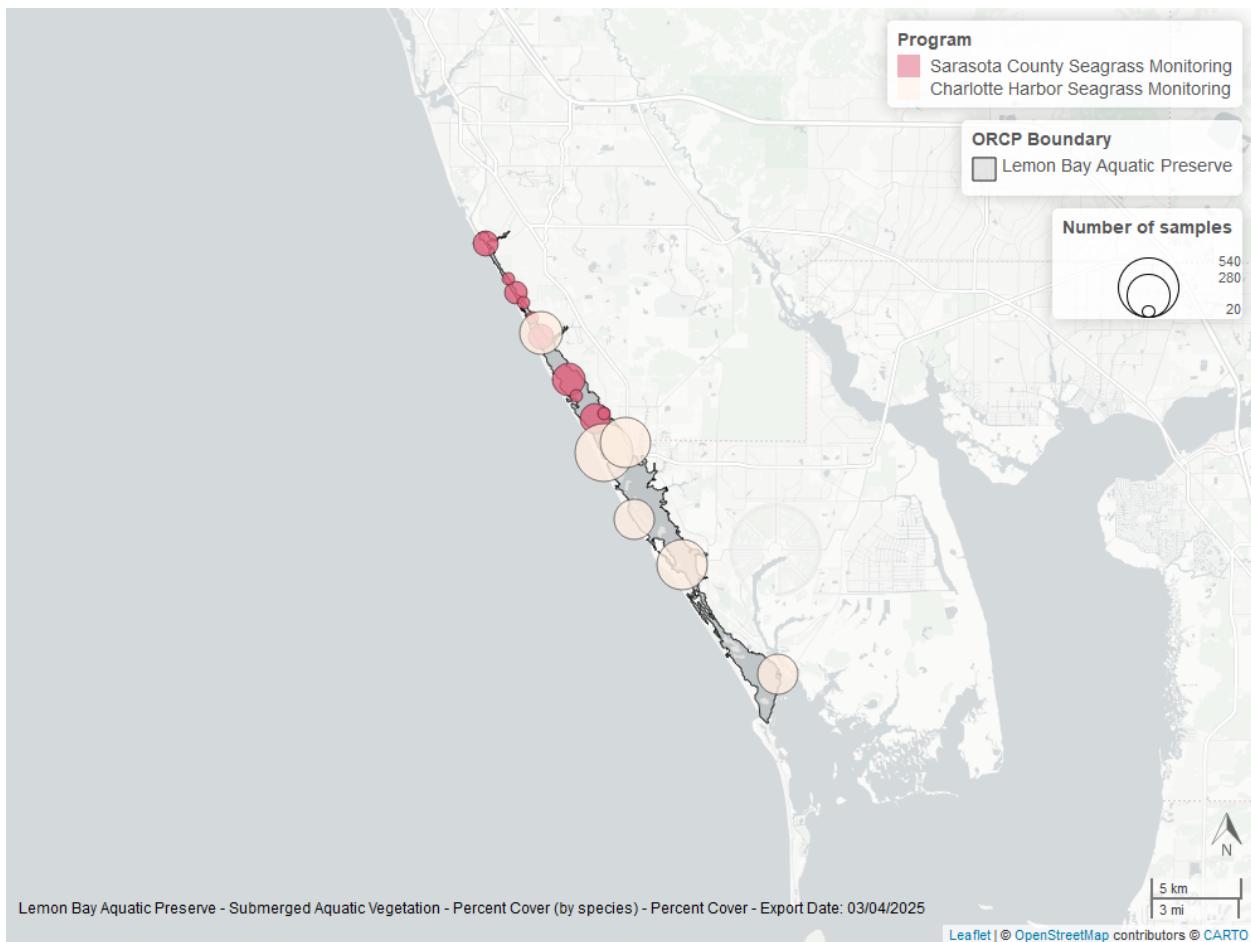


Figure 68: Map showing SAV sampling sites within the boundaries of *Lemon Bay Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Loxahatchee River-Lake Worth Creek Aquatic Preserve

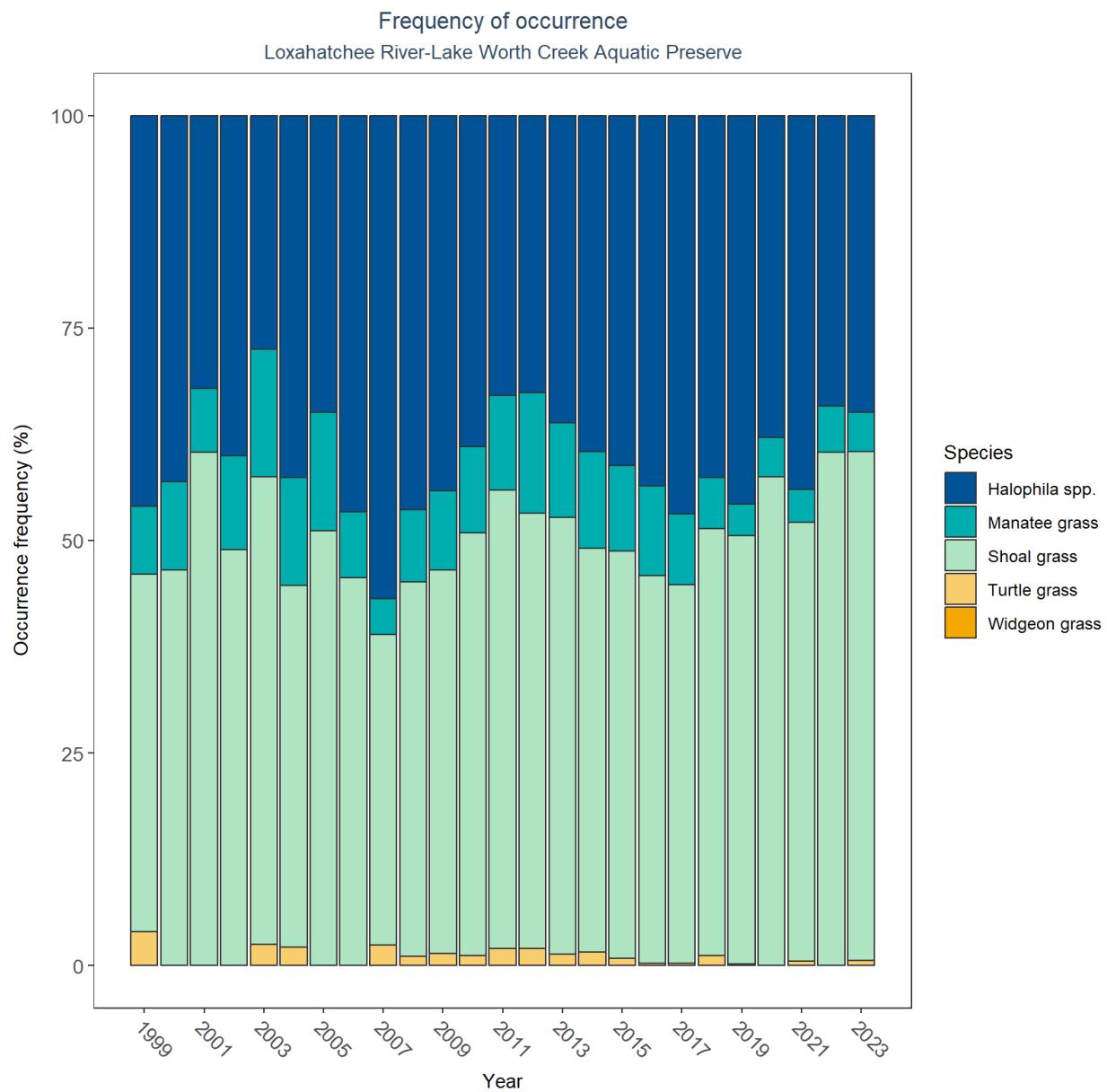


Figure 69: Frequency of occurrence for various seagrass species in Loxahatchee River-Lake Worth Creek Aquatic Preserve

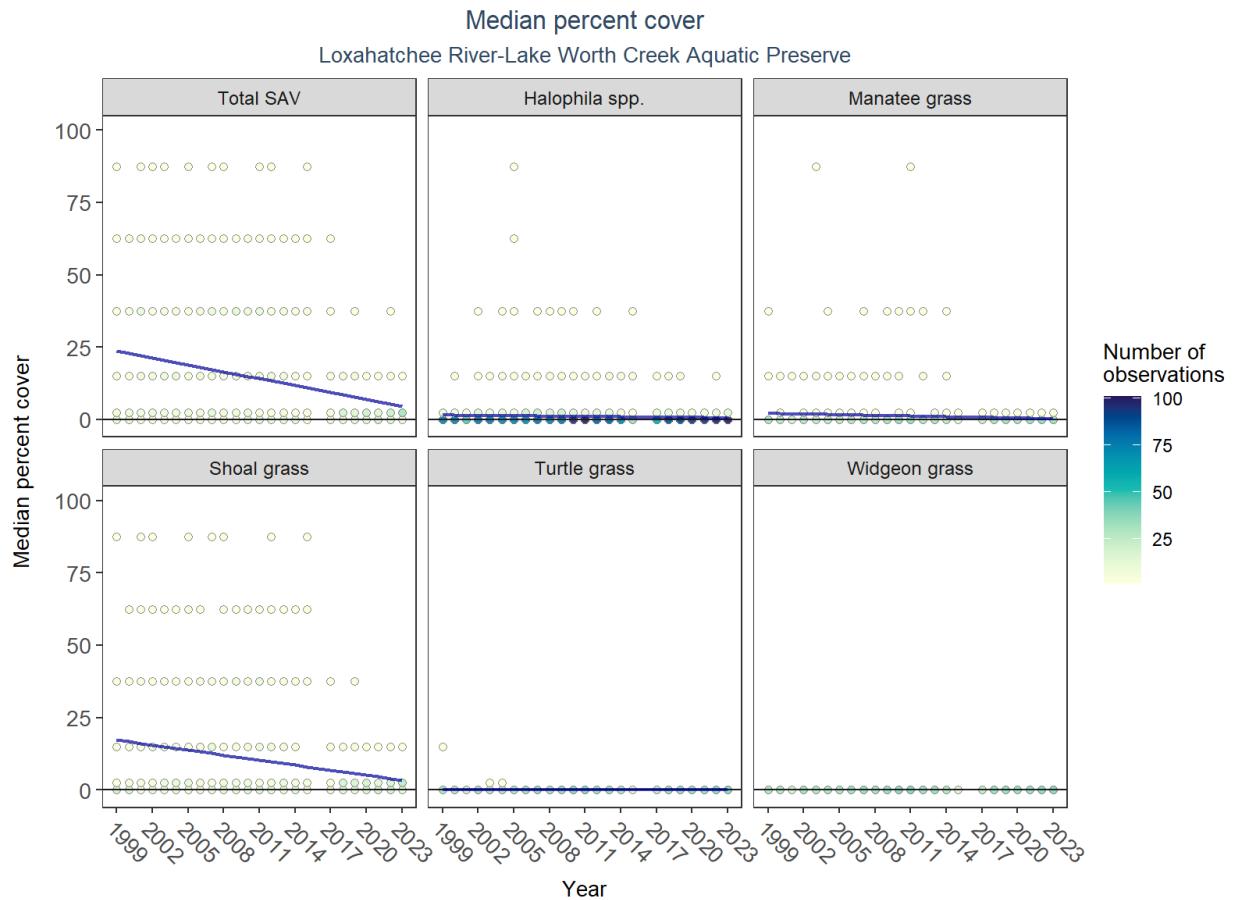


Figure 70: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 18: SAV LME Results for Loxahatchee River-Lake Worth Creek Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Insufficient data to calculate trend	NA	NA	NA	NA
Shoal grass	Significantly decreasing trend	1999 - 2023	20.16	-0.58	0.00
Halophila spp.	Significantly decreasing trend	1999 - 2023	1.71	-0.04	0.00
Widgeon grass	Model did not fit the available data	NA	NA	NA	NA
Manatee grass	No significant trend	1999 - 2023	2.54	-0.08	0.35
Turtle grass	No significant trend	1999 - 2023	0.10	0.00	0.30
Total SAV	Significantly decreasing trend	1999 - 2023	27.60	-0.79	0.00
Total seagrass	Insufficient data to calculate trend	NA	NA	NA	NA

Annual decreases in percent cover were observed for total SAV (-0.8%), *Halophila* spp. (-0.0%), and shoal grass (-0.6%). No detectable change in percent cover was observed for manatee grass and turtle grass. Trends in percent cover could not be evaluated for total seagrass and drift algae due to insufficient data, and the model could not be fitted for widgeon grass.

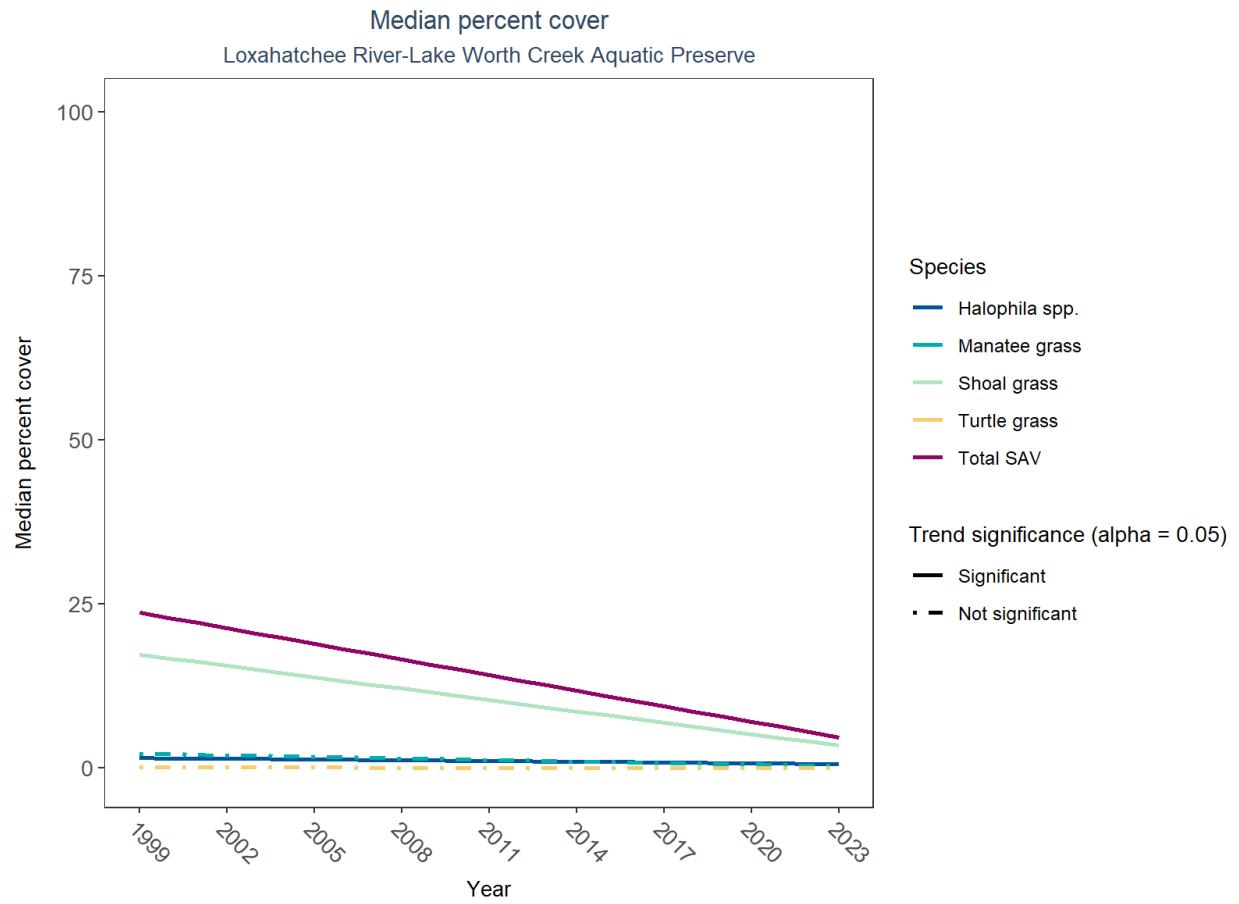


Figure 71: Trends in median percent cover for various seagrass species in Loxahatchee River-Lake Worth Creek Aquatic Preserve - simplified

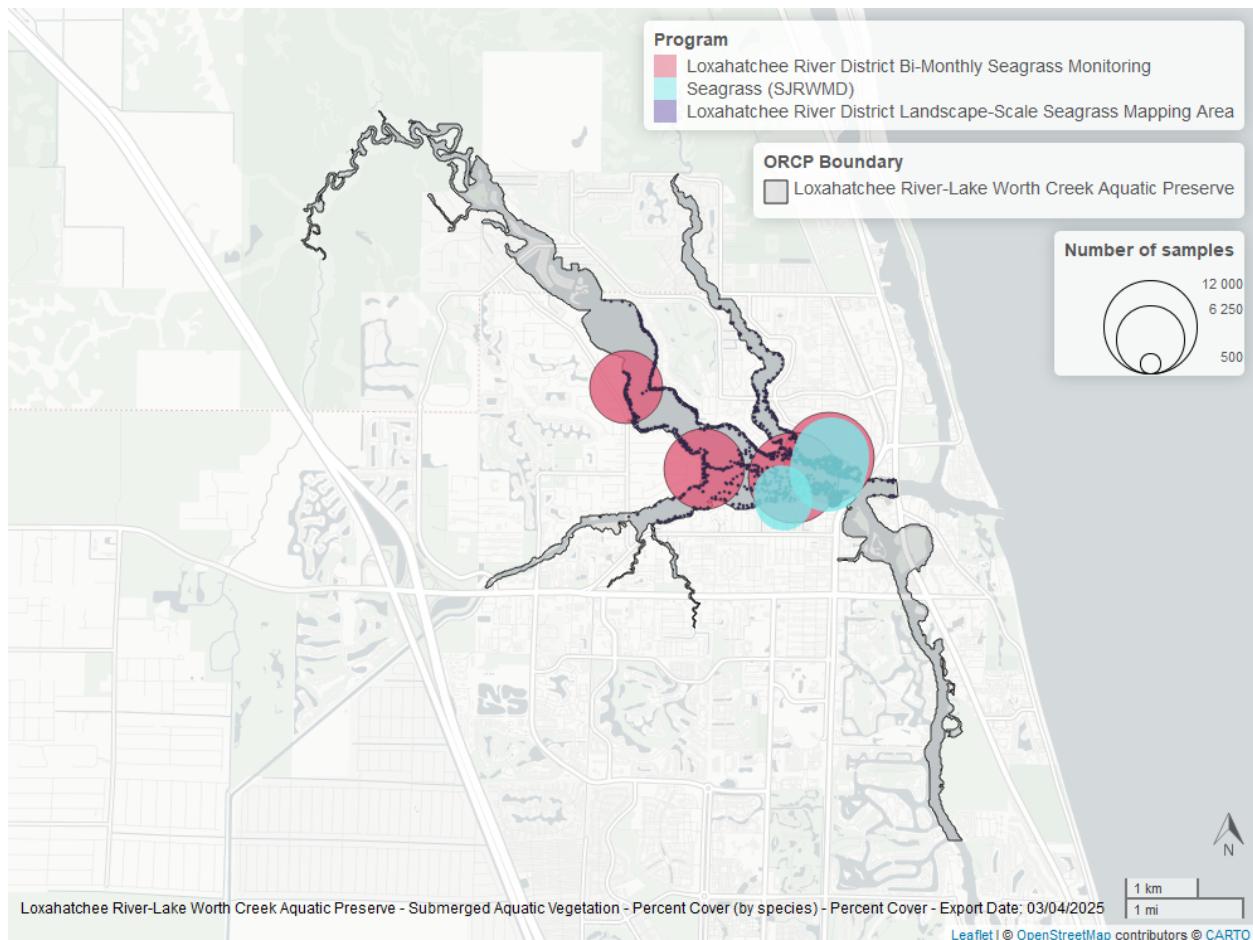


Figure 72: Map showing SAV sampling sites within the boundaries of *Loxahatchee River-Lake Worth Creek Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Matlacha Pass Aquatic Preserve

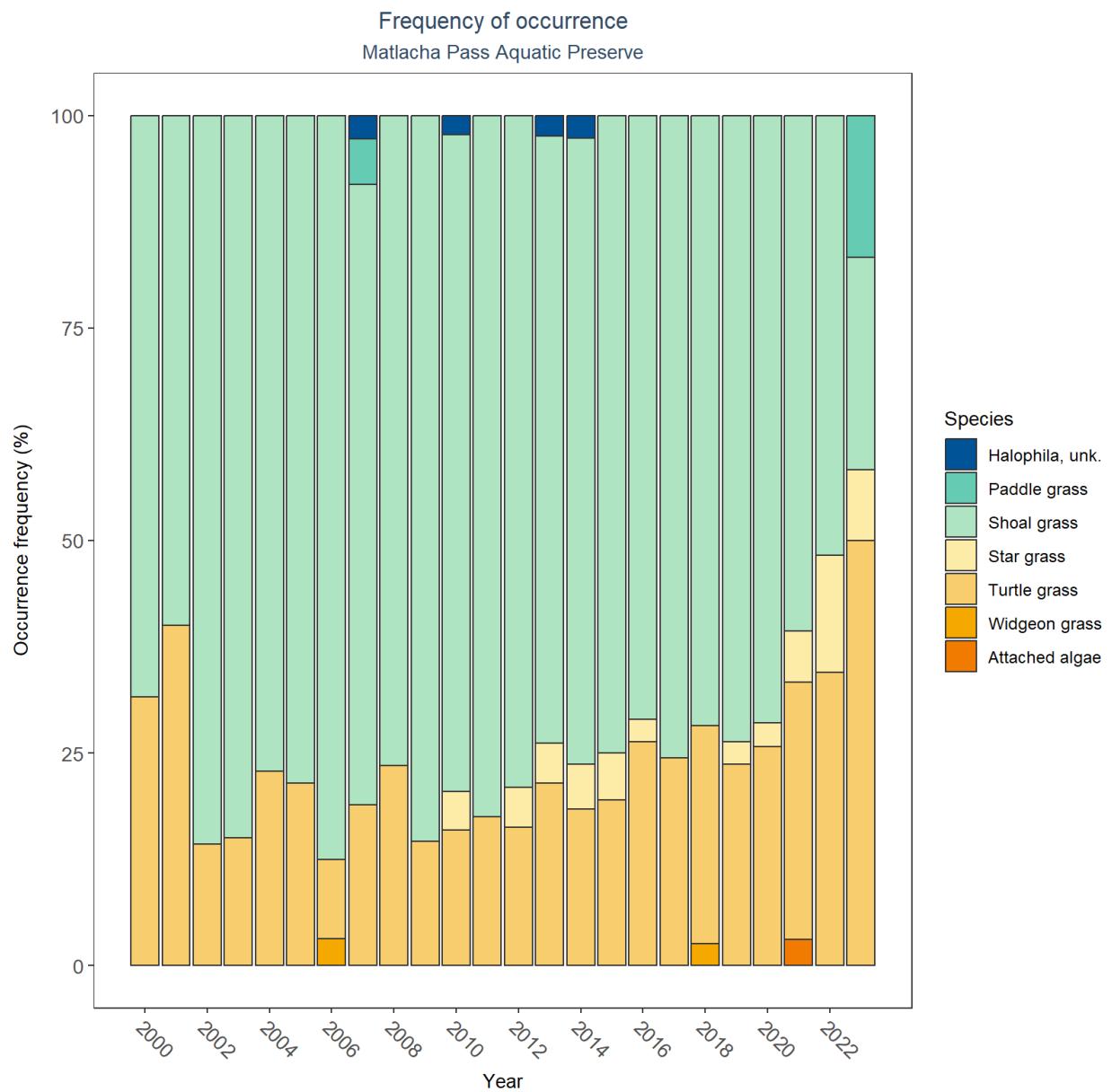


Figure 73: Frequency of occurrence for various seagrass species in Matlacha Pass Aquatic Preserve

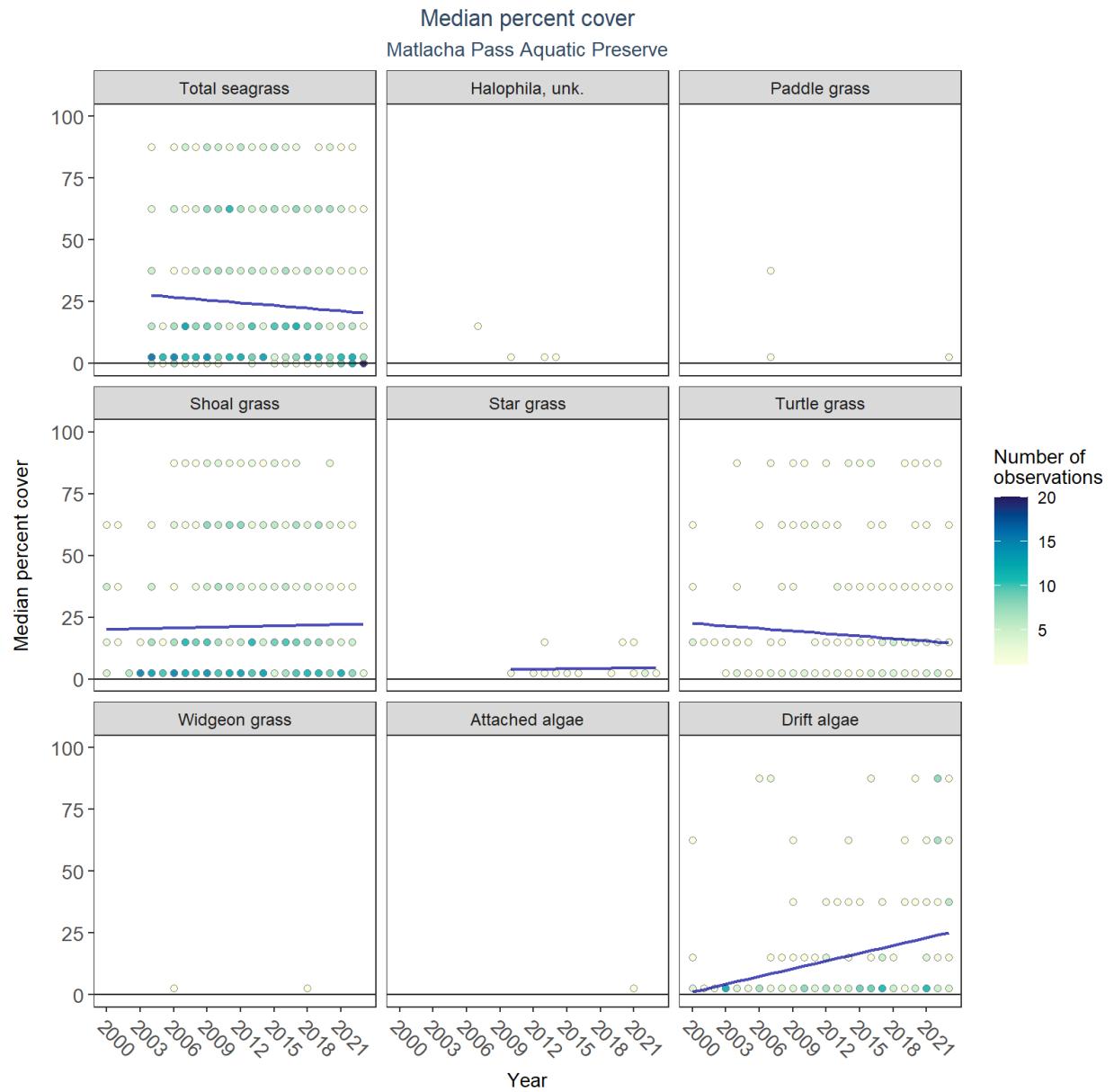


Figure 74: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 19: SAV LME Results for Matlacha Pass Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Attached algae	Insufficient data to calculate trend	NA	NA	NA	NA
Drift algae	No significant trend	2000 - 2023	-5.16	1.05	0.13
Shoal grass	No significant trend	2000 - 2023	19.52	0.09	0.85
Paddle grass	Insufficient data to calculate trend	NA	NA	NA	NA
Star grass	No significant trend	2010 - 2023	2.64	0.07	0.78
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	Insufficient data to calculate trend	NA	NA	NA	NA
Turtle grass	No significant trend	2000 - 2023	24.63	-0.34	0.36
Total seagrass	No significant trend	2004 - 2023	31.25	-0.37	0.31
Halophila, unk.	Insufficient data to calculate trend	NA	NA	NA	NA

Total seagrass, shoal grass, star grass, turtle grass, and drift algae showed no detectable change in percent cover. Trends in percent cover could not be evaluated for unknown *Halophila*, paddle grass, widgeon grass, and attached algae due to insufficient data.

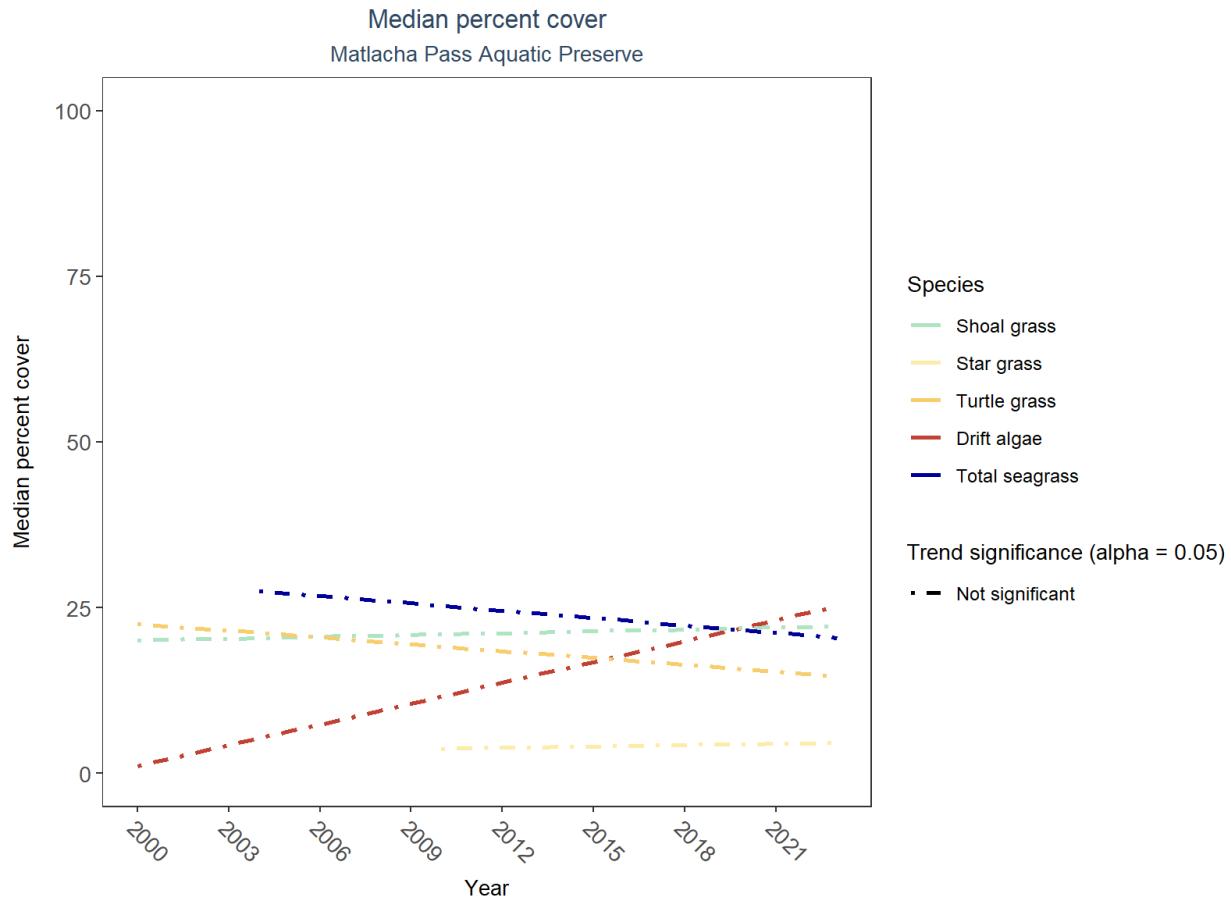


Figure 75: Trends in median percent cover for various seagrass species in Matlacha Pass Aquatic Preserve - simplified

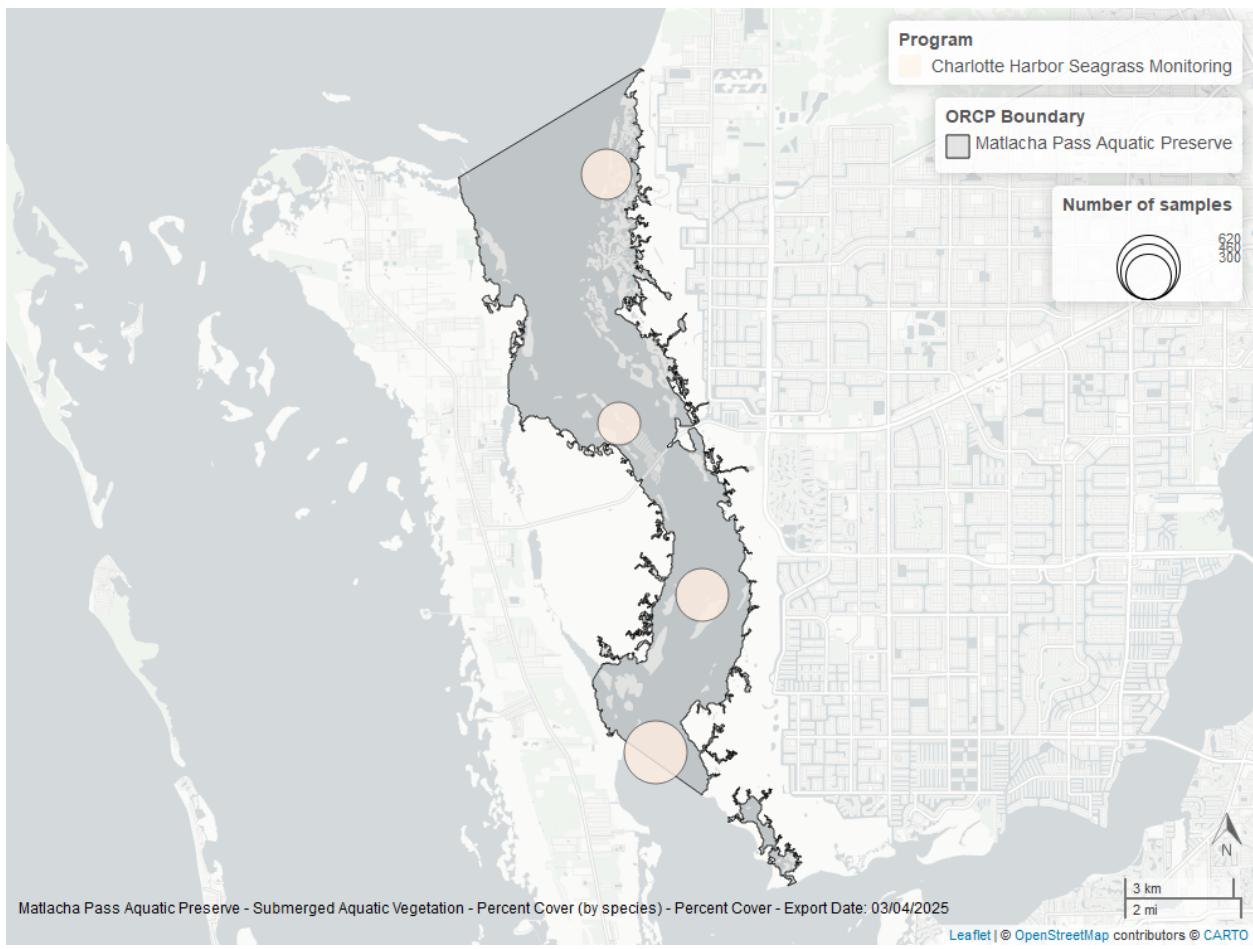


Figure 76: Map showing SAV sampling sites within the boundaries of *Matlacha Pass Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Mosquito Lagoon Aquatic Preserve

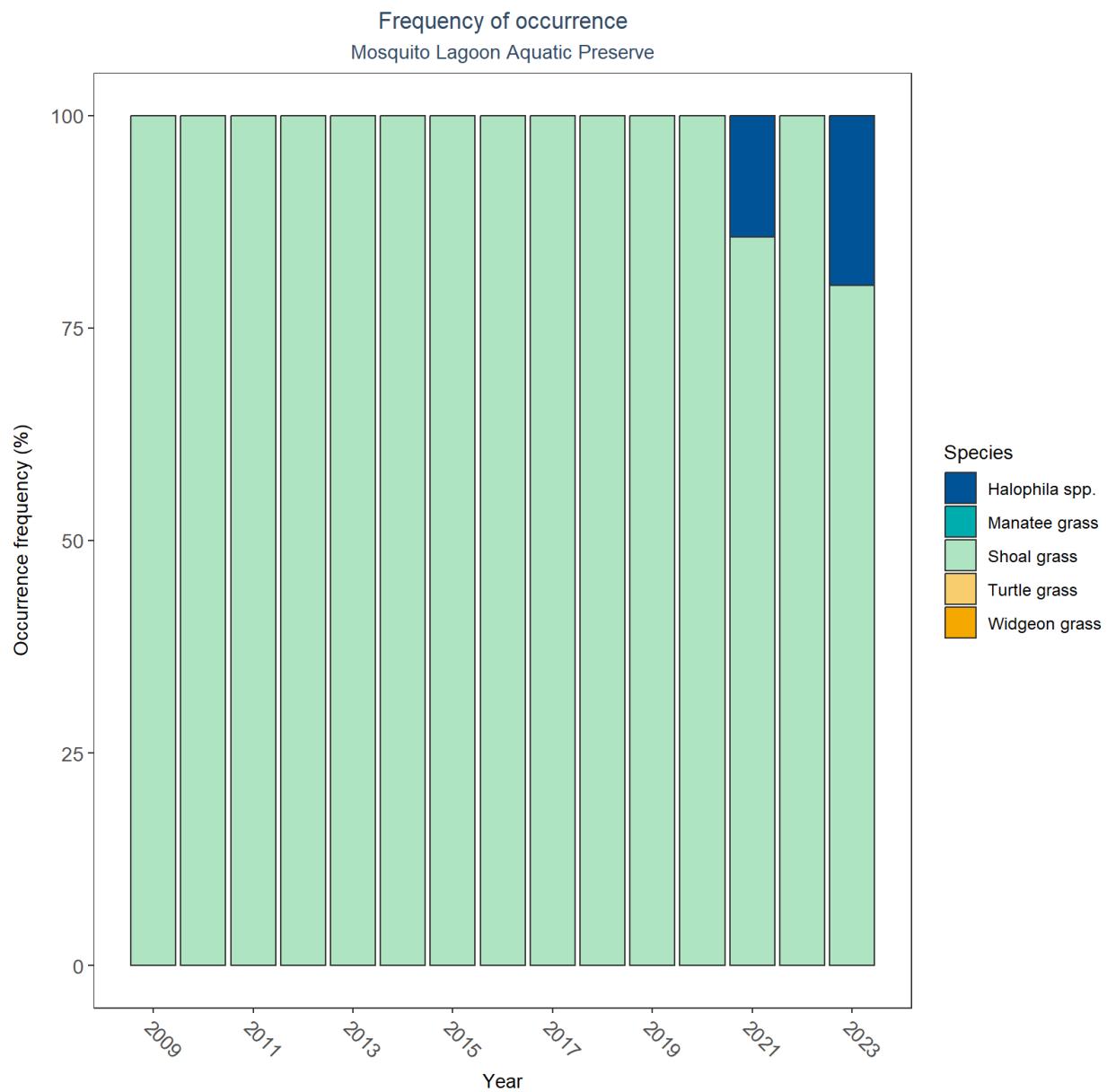


Figure 77: Frequency of occurrence for various seagrass species in Mosquito Lagoon Aquatic Preserve

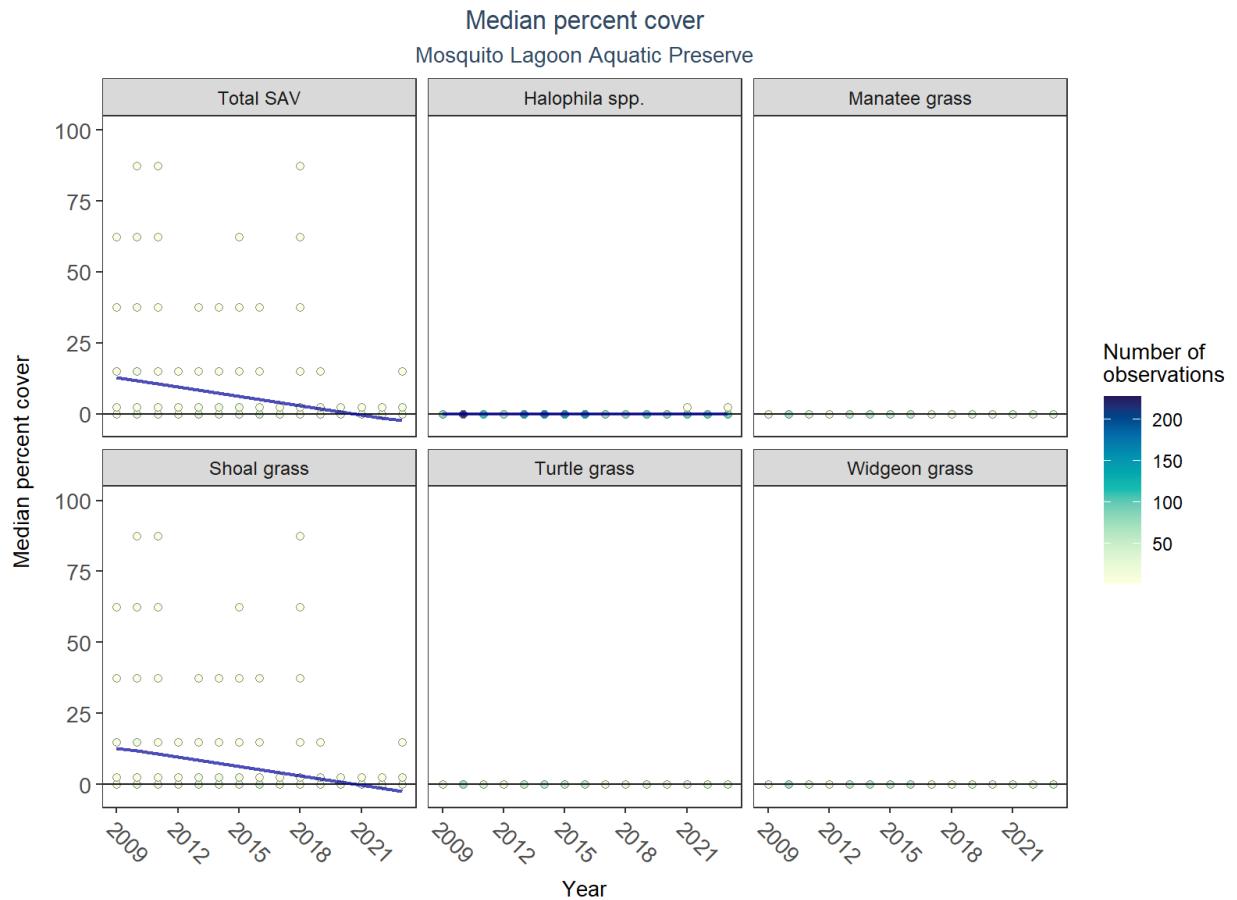


Figure 78: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 20: SAV LME Results for Mosquito Lagoon Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Insufficient data to calculate trend	NA	NA	NA	NA
Shoal grass	Significantly decreasing trend	2009 - 2023	29.17	-1.09	0.01
Halophila spp.	No significant trend	2009 - 2023	-0.05	0.00	0.32
Widgeon grass	Model did not fit the available data	NA	NA	NA	NA
Manatee grass	Model did not fit the available data	NA	NA	NA	NA
Turtle grass	Model did not fit the available data	NA	NA	NA	NA
Total SAV	Significantly decreasing trend	2009 - 2023	29.11	-1.09	0.01
Total seagrass	Insufficient data to calculate trend	NA	NA	NA	NA

Annual decreases in percent cover were observed for total SAV (-1.1%) and shoal grass (-1.1%). No detectable change in percent cover was observed for *Halophila* spp. Trends in percent cover could not be evaluated for total seagrass and drift algae due to insufficient data, and a model could not be fitted for manatee grass, turtle grass, and widgeon grass.

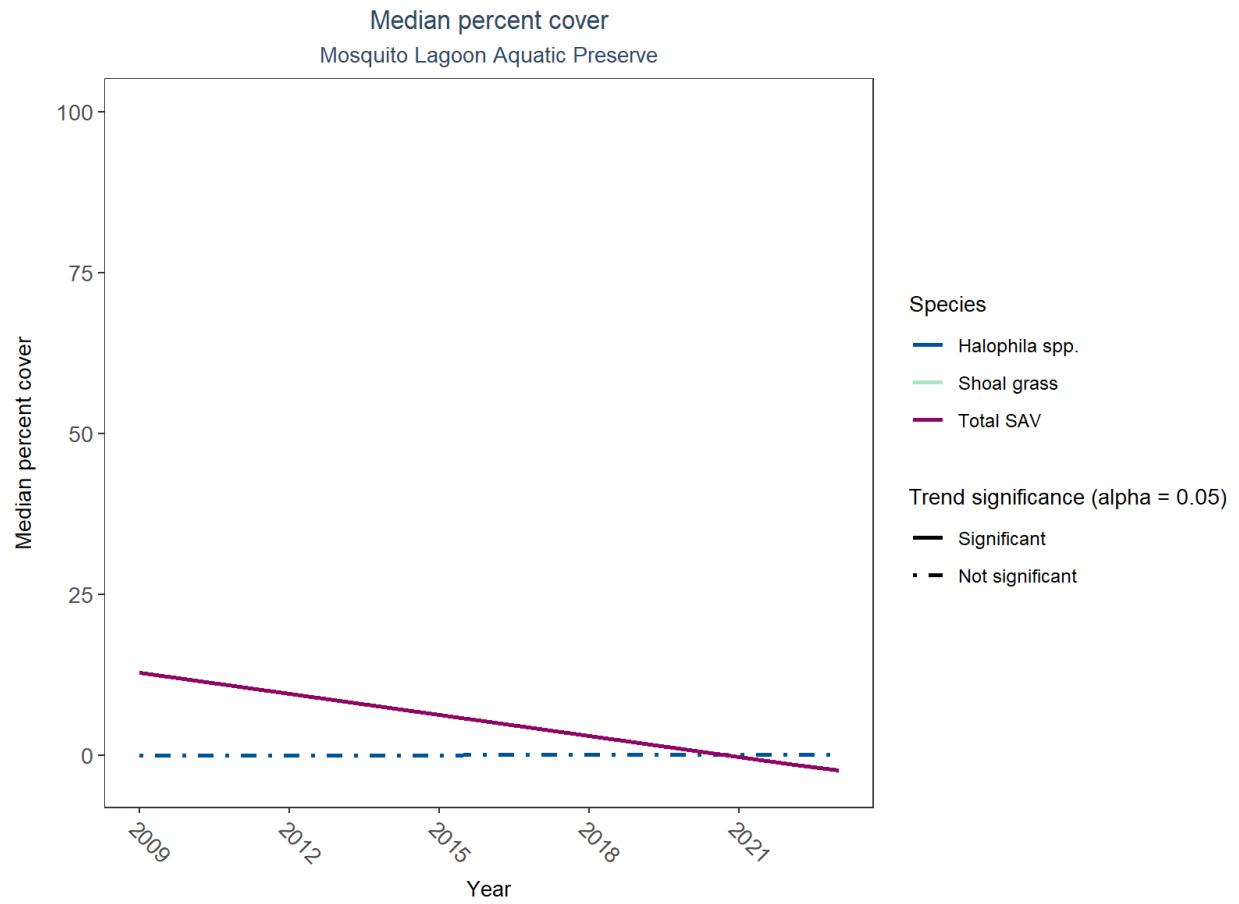


Figure 79: Trends in median percent cover for various seagrass species in Mosquito Lagoon Aquatic Preserve - simplified

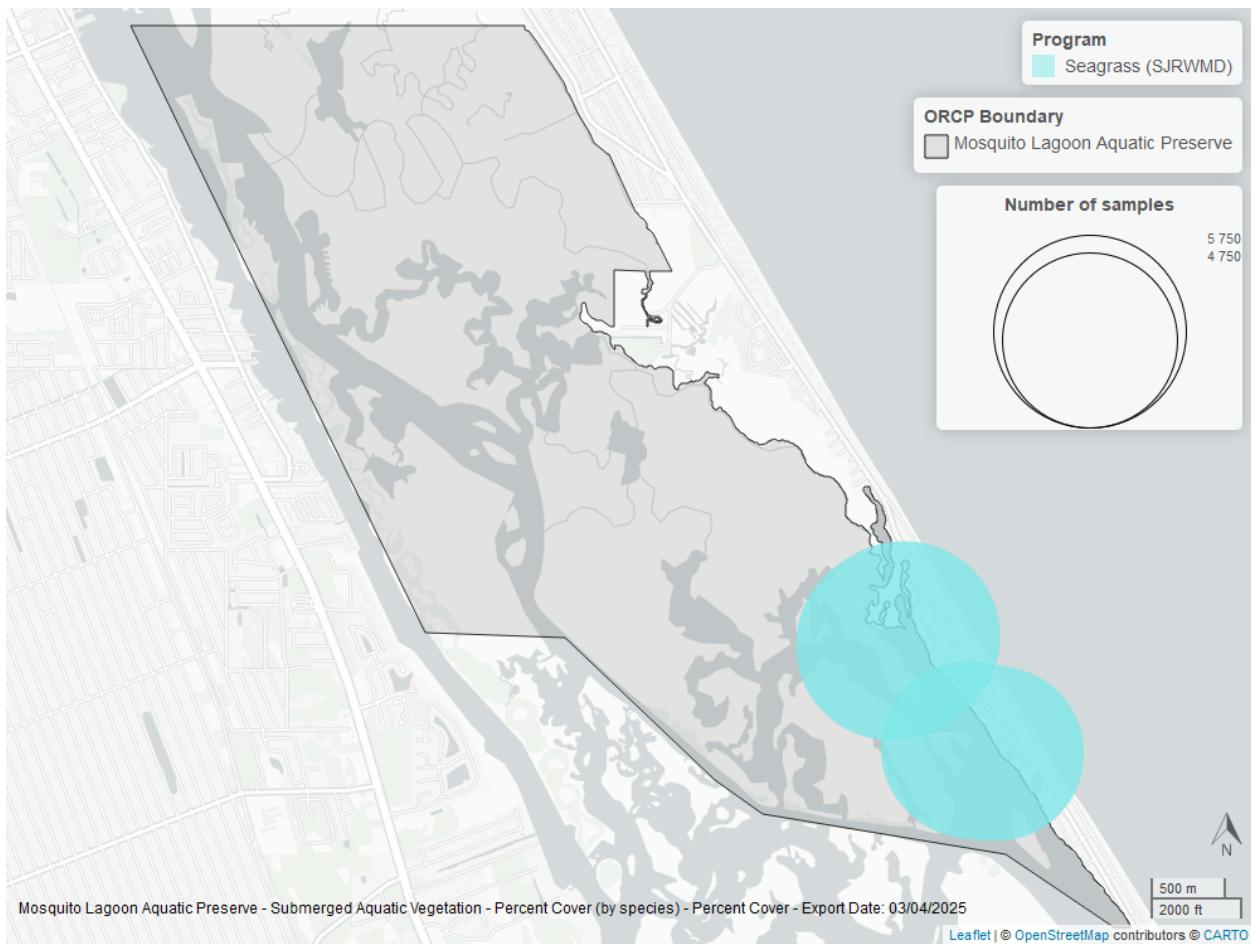


Figure 80: Map showing SAV sampling sites within the boundaries of *Mosquito Lagoon Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Nature Coast Aquatic Preserve

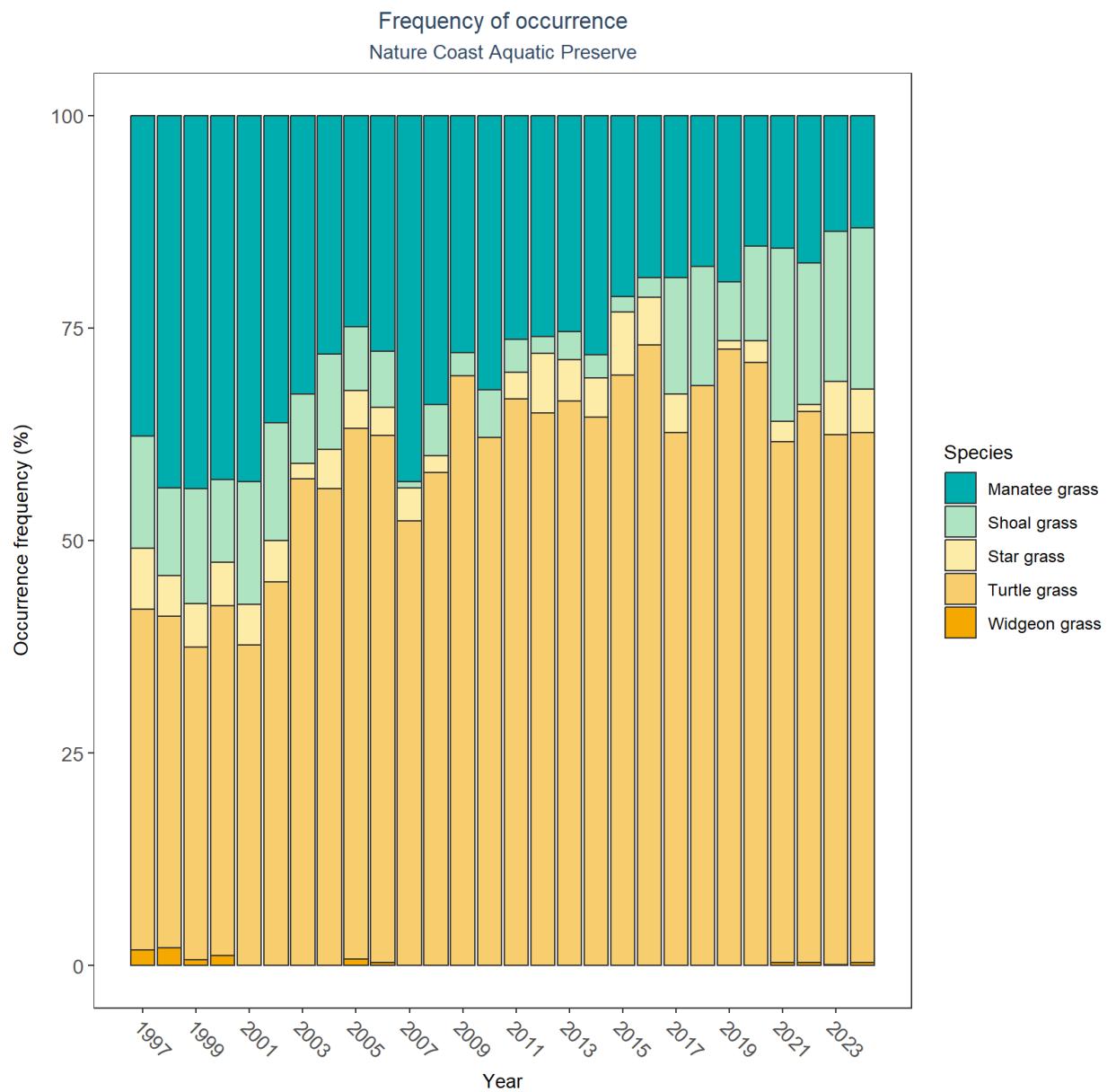


Figure 81: Frequency of occurrence for various seagrass species in Nature Coast Aquatic Preserve

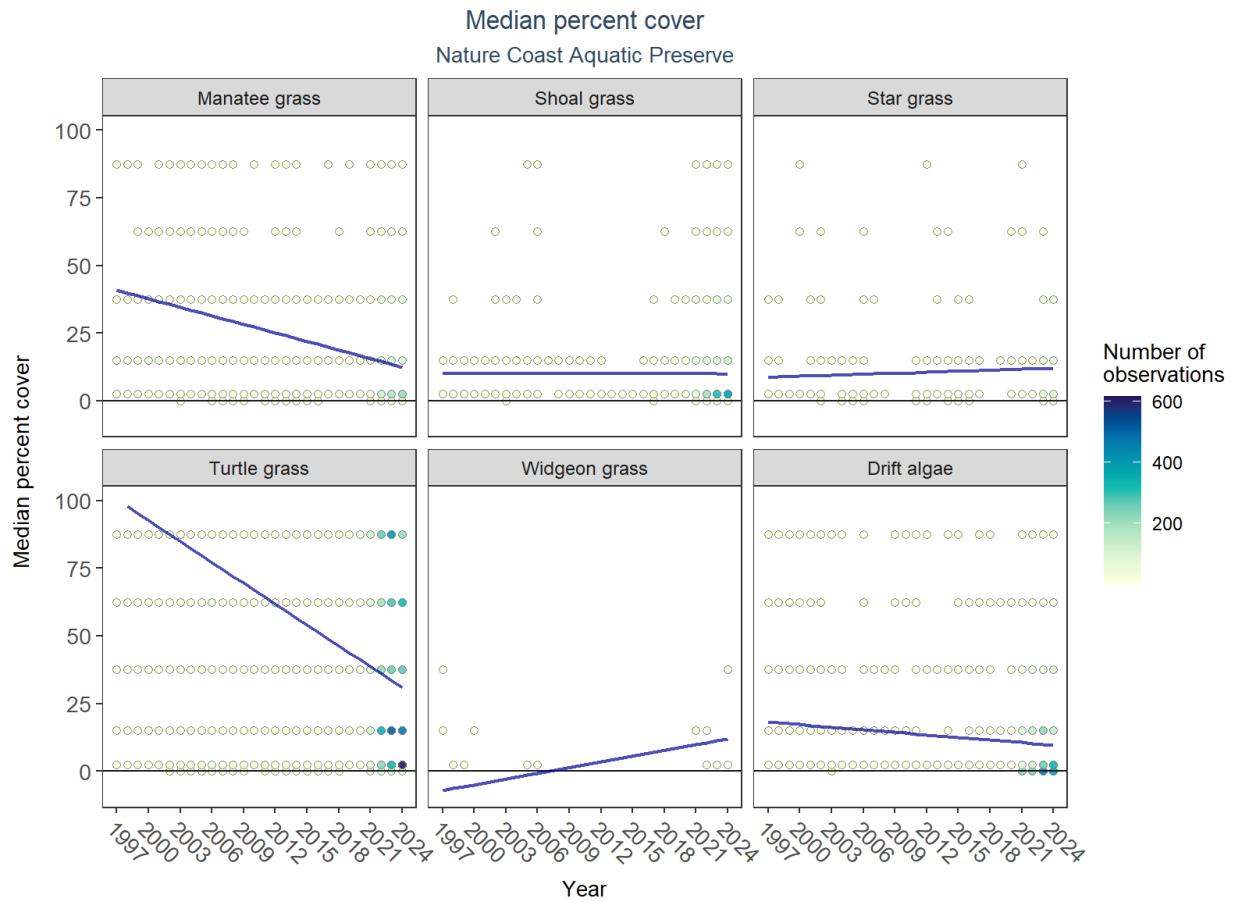


Figure 82: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 21: SAV LME Results for Nature Coast Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Significantly decreasing trend	1997 - 2024	19.15	-0.32	0.02
Shoal grass	No significant trend	1997 - 2024	10.22	-0.01	0.87
Star grass	No significant trend	1997 - 2024	8.35	0.12	0.29
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	No significant trend	1997 - 2024	-9.23	0.70	0.75
Manatee grass	Significantly decreasing trend	1997 - 2024	44.07	-1.05	0.01
Turtle grass	Significantly decreasing trend	1997 - 2024	108.01	-2.57	0.00

Annual decreases in percent cover were observed for manatee grass (-1.0%), turtle grass (-2.6%), and drift algae (-0.3%). Shoal grass, star grass, and widgeon grass showed no detectable change in percent cover.

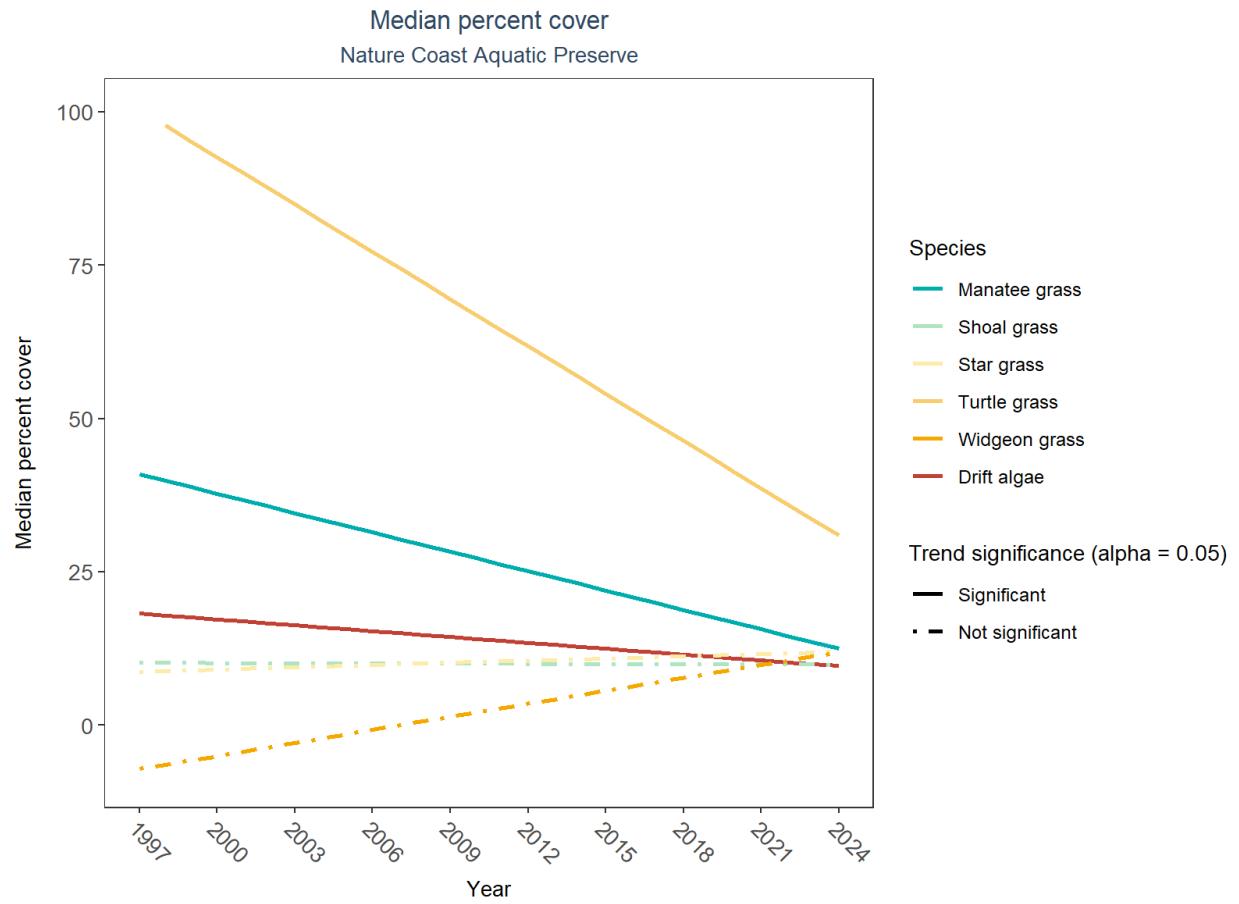


Figure 83: Trends in median percent cover for various seagrass species in Nature Coast Aquatic Preserve - simplified

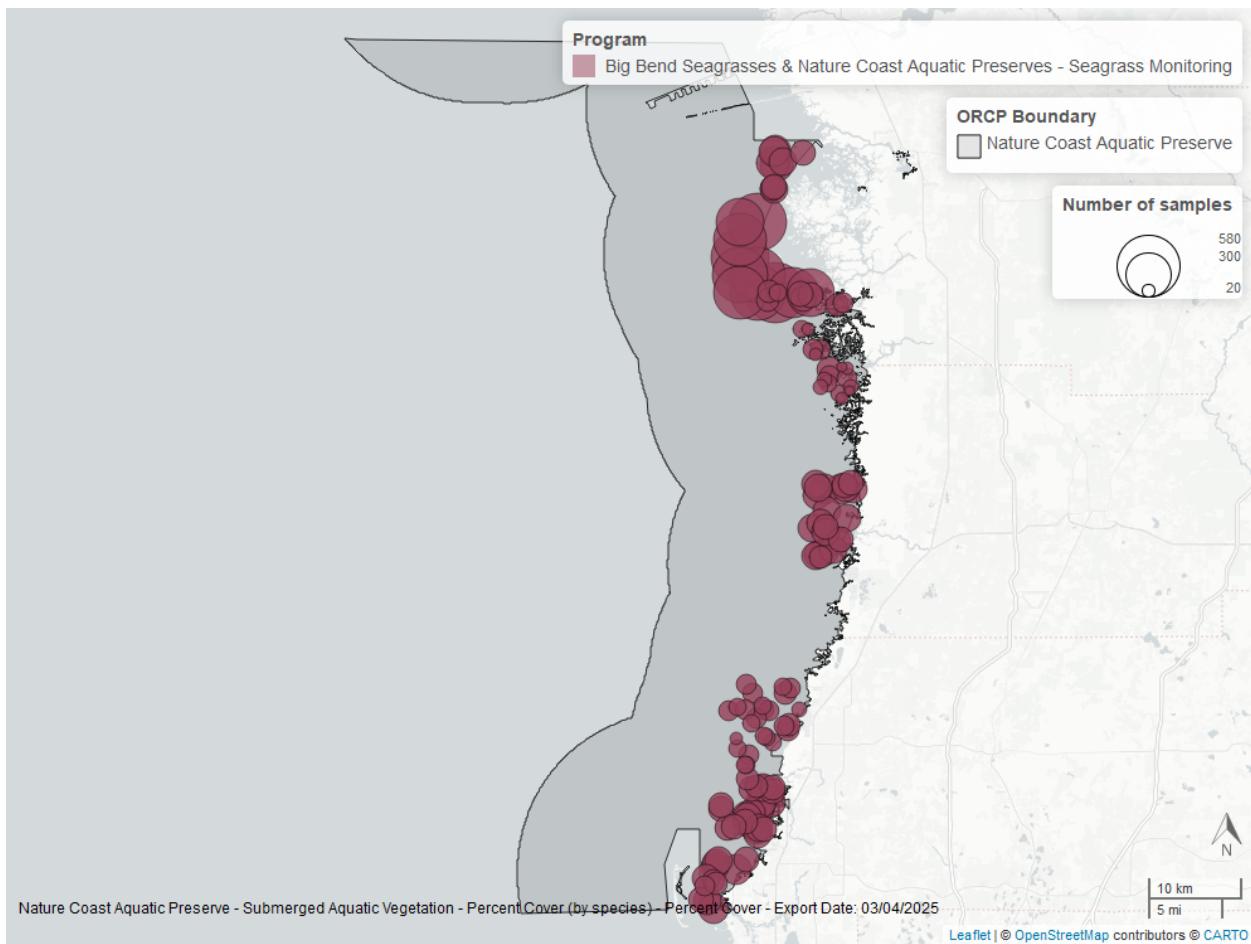


Figure 84: Map showing SAV sampling sites within the boundaries of *Nature Coast Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Pine Island Sound Aquatic Preserve

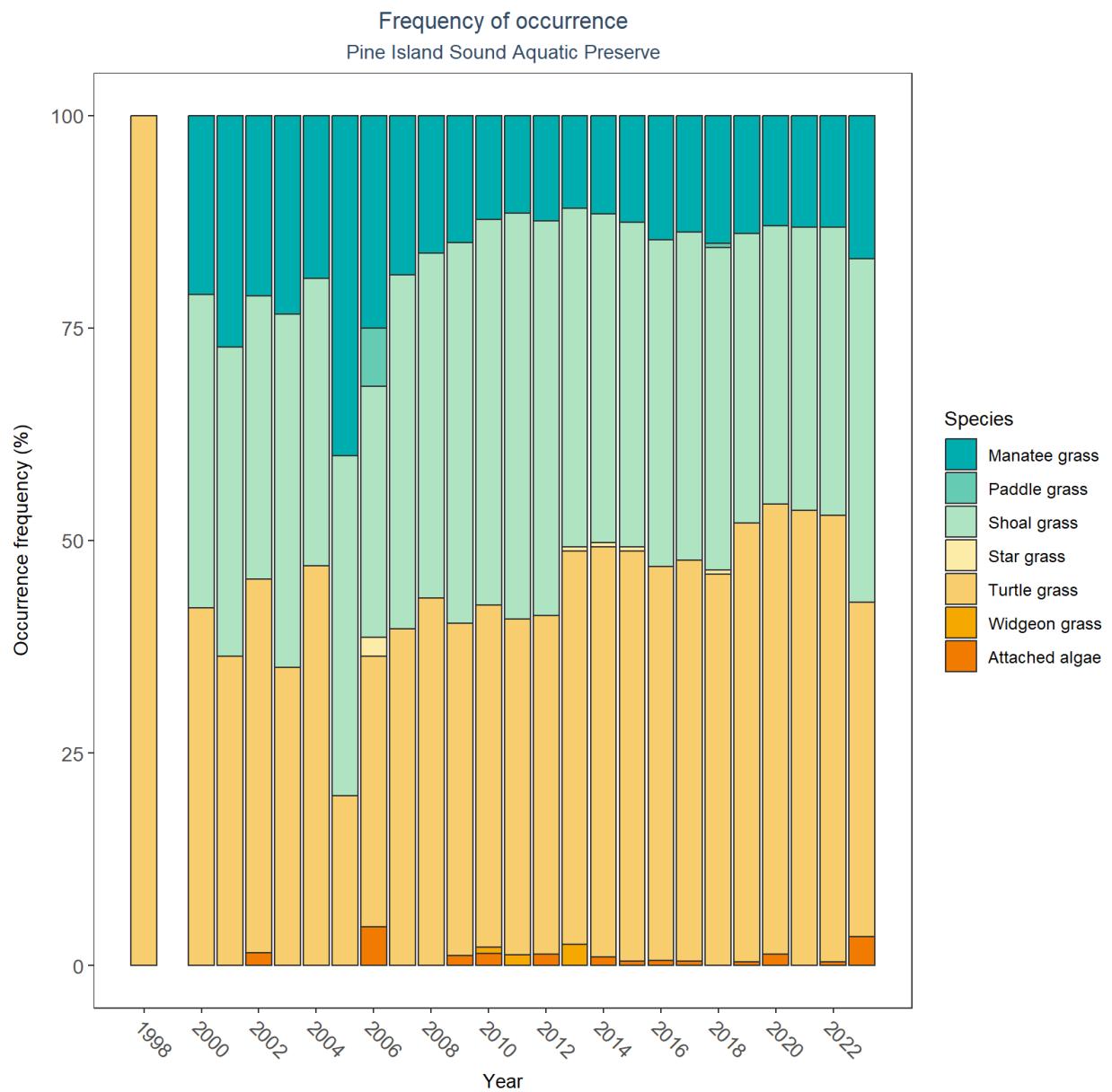


Figure 85: Frequency of occurrence for various seagrass species in Pine Island Sound Aquatic Preserve

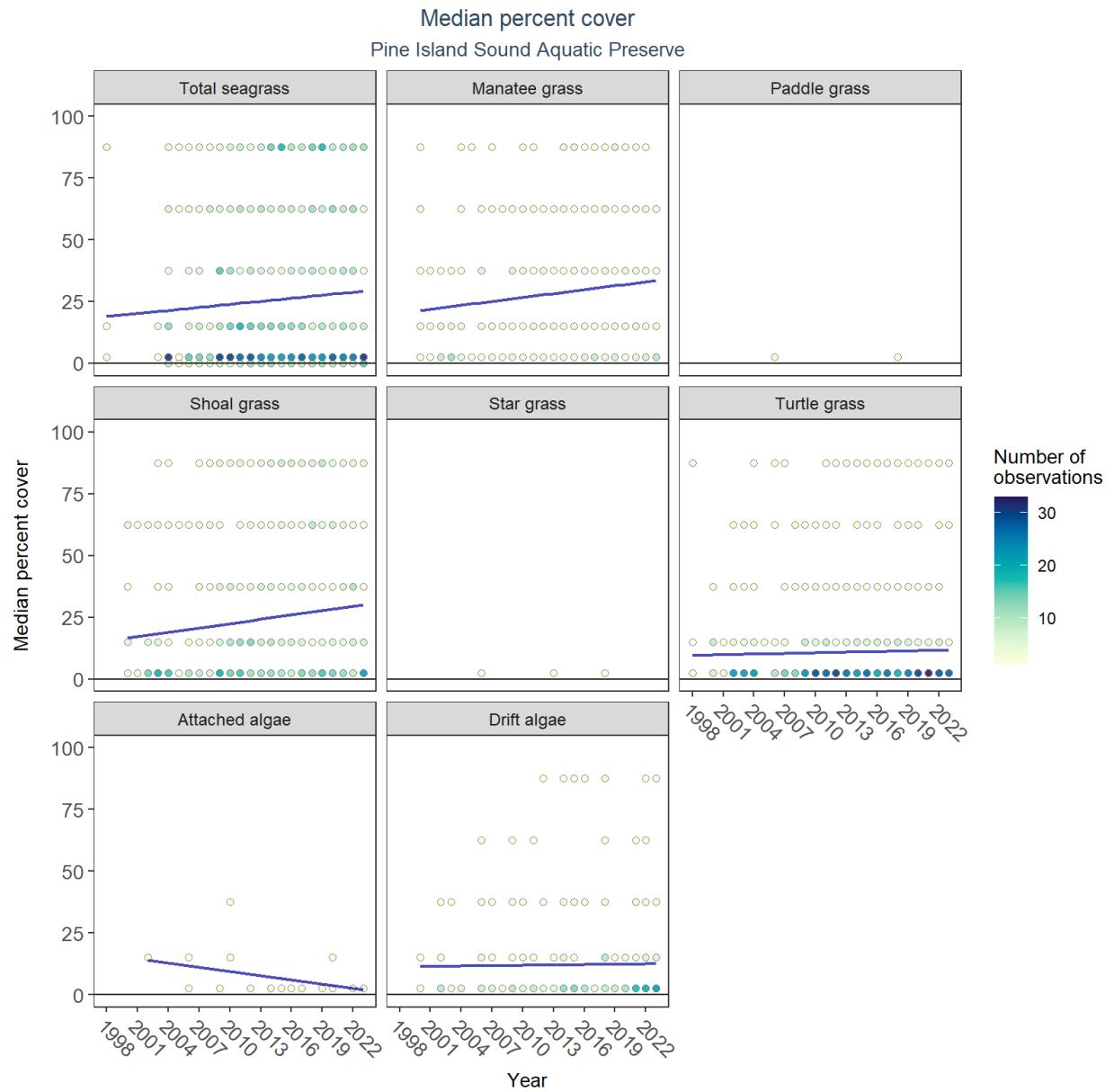


Figure 86: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 22: SAV LME Results for Pine Island Sound Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Attached algae	No significant trend	2002 - 2023	18.49	-0.57	0.07
Drift algae	No significant trend	2000 - 2023	11.10	0.05	0.80
Shoal grass	No significant trend	2000 - 2023	13.10	0.58	0.15
Paddle grass	Insufficient data to calculate trend	NA	NA	NA	NA
Star grass	Insufficient data to calculate trend	NA	NA	NA	NA
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	Insufficient data to calculate trend	NA	NA	NA	NA
Manatee grass	No significant trend	2000 - 2023	18.25	0.53	0.13
Turtle grass	No significant trend	1998 - 2023	9.21	0.08	0.54
Total seagrass	No significant trend	1998 - 2023	17.27	0.41	0.20

Total seagrass, manatee grass, shoal grass, turtle grass, attached algae, and drift algae showed no detectable change in percent cover. Trends in percent cover could not be evaluated for paddle grass, star grass, and widgeon grass due to insufficient data.

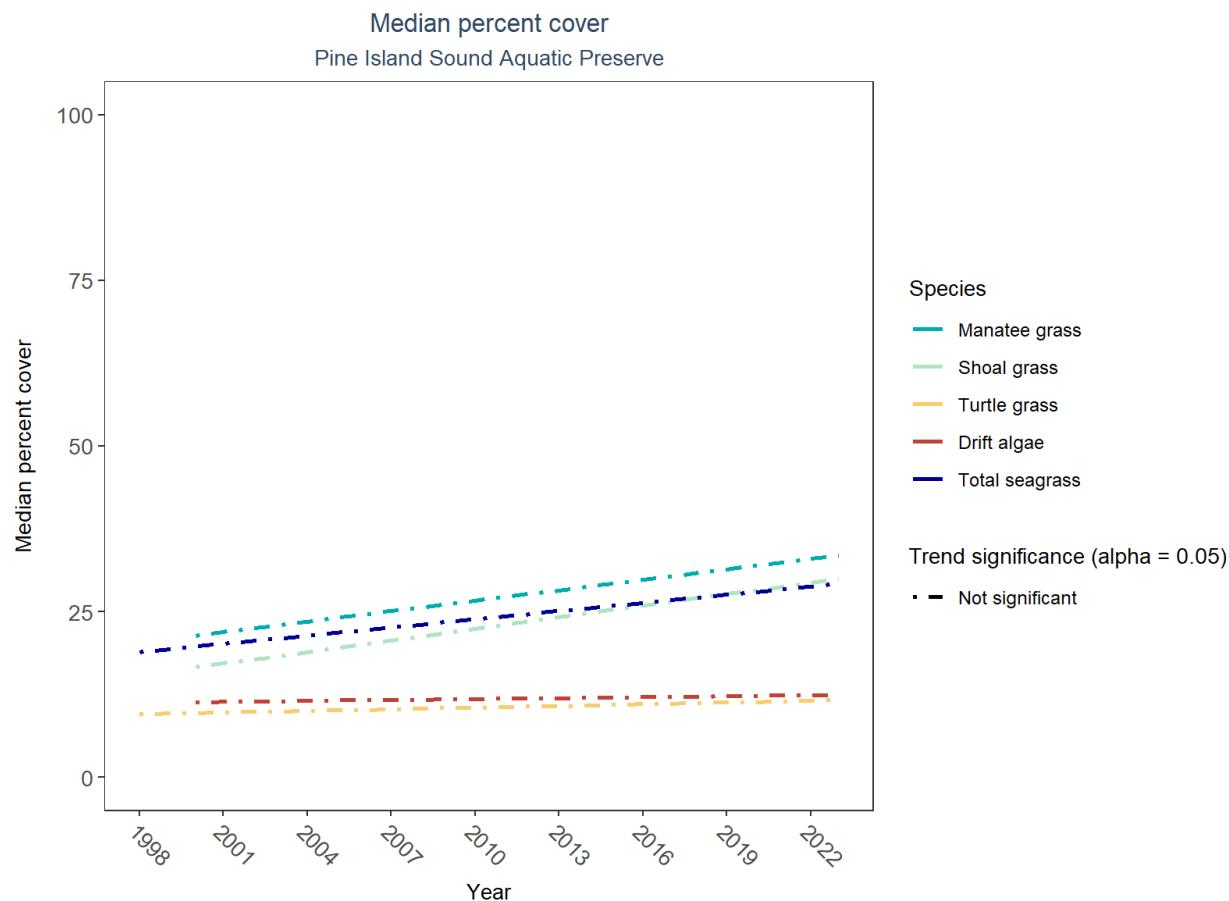


Figure 87: Trends in median percent cover for various seagrass species in Pine Island Sound Aquatic Preserve - simplified

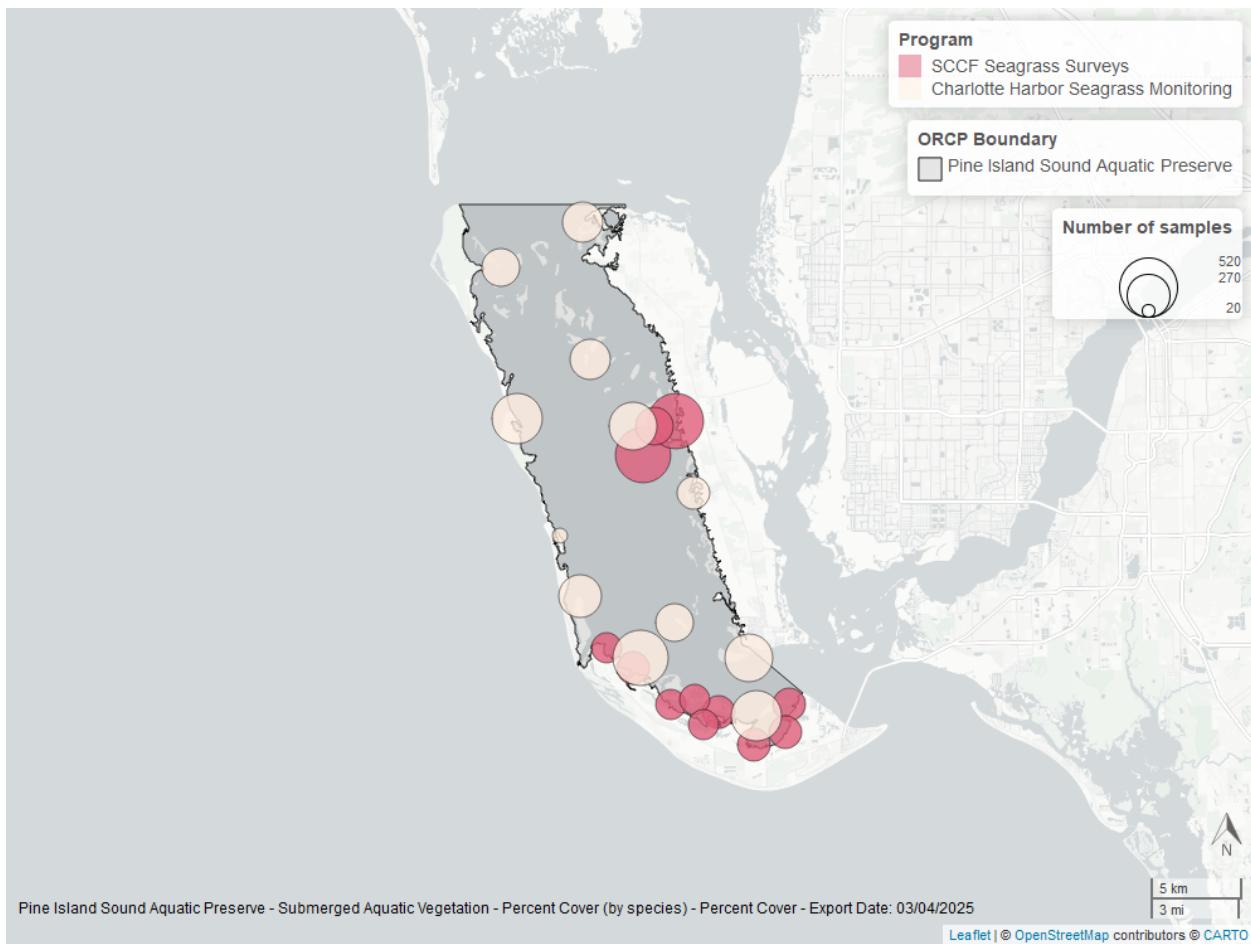


Figure 88: Map showing SAV sampling sites within the boundaries of *Pine Island Sound Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Pinellas County Aquatic Preserve

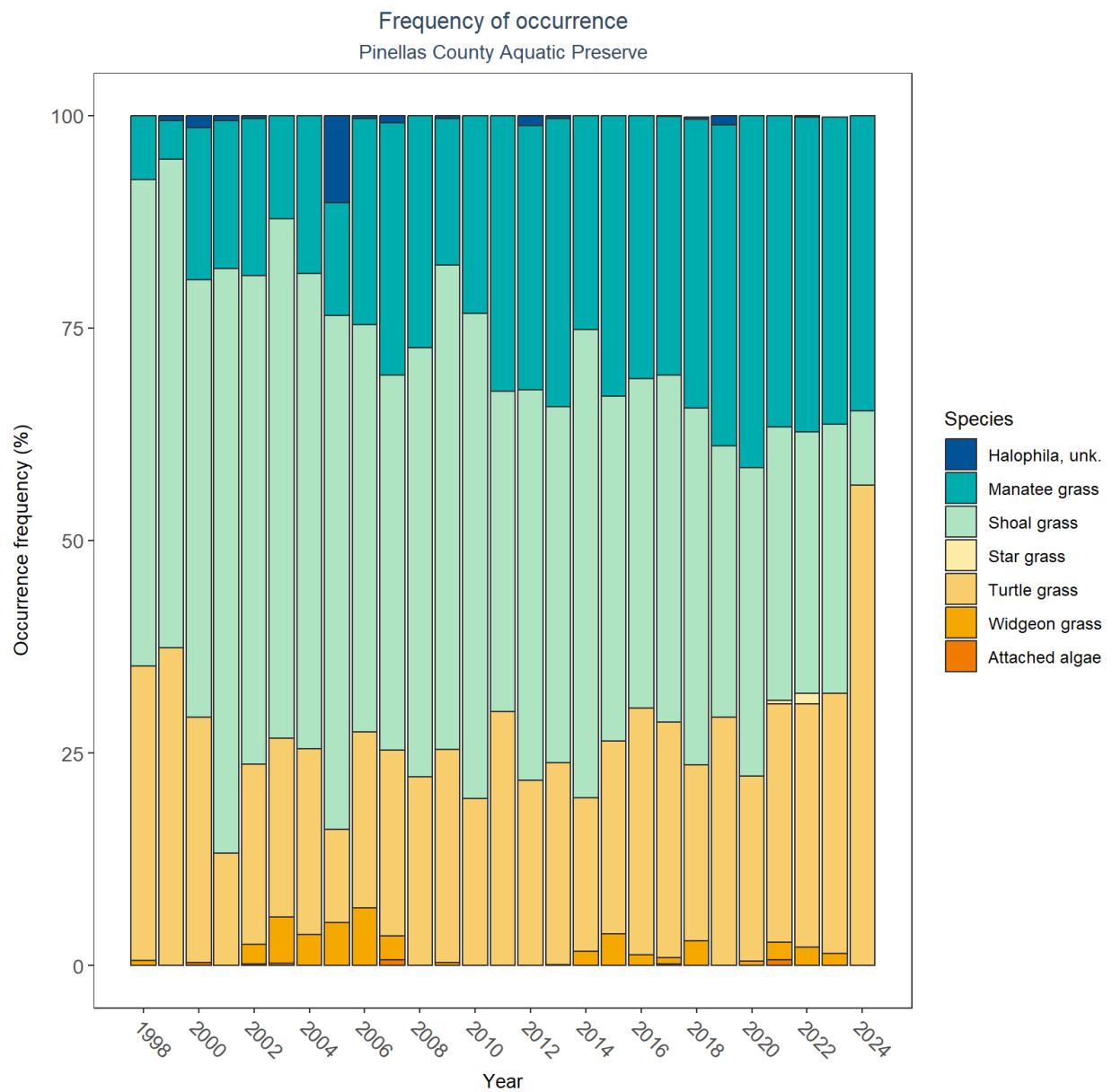


Figure 89: Frequency of occurrence for various seagrass species in Pinellas County Aquatic Preserve

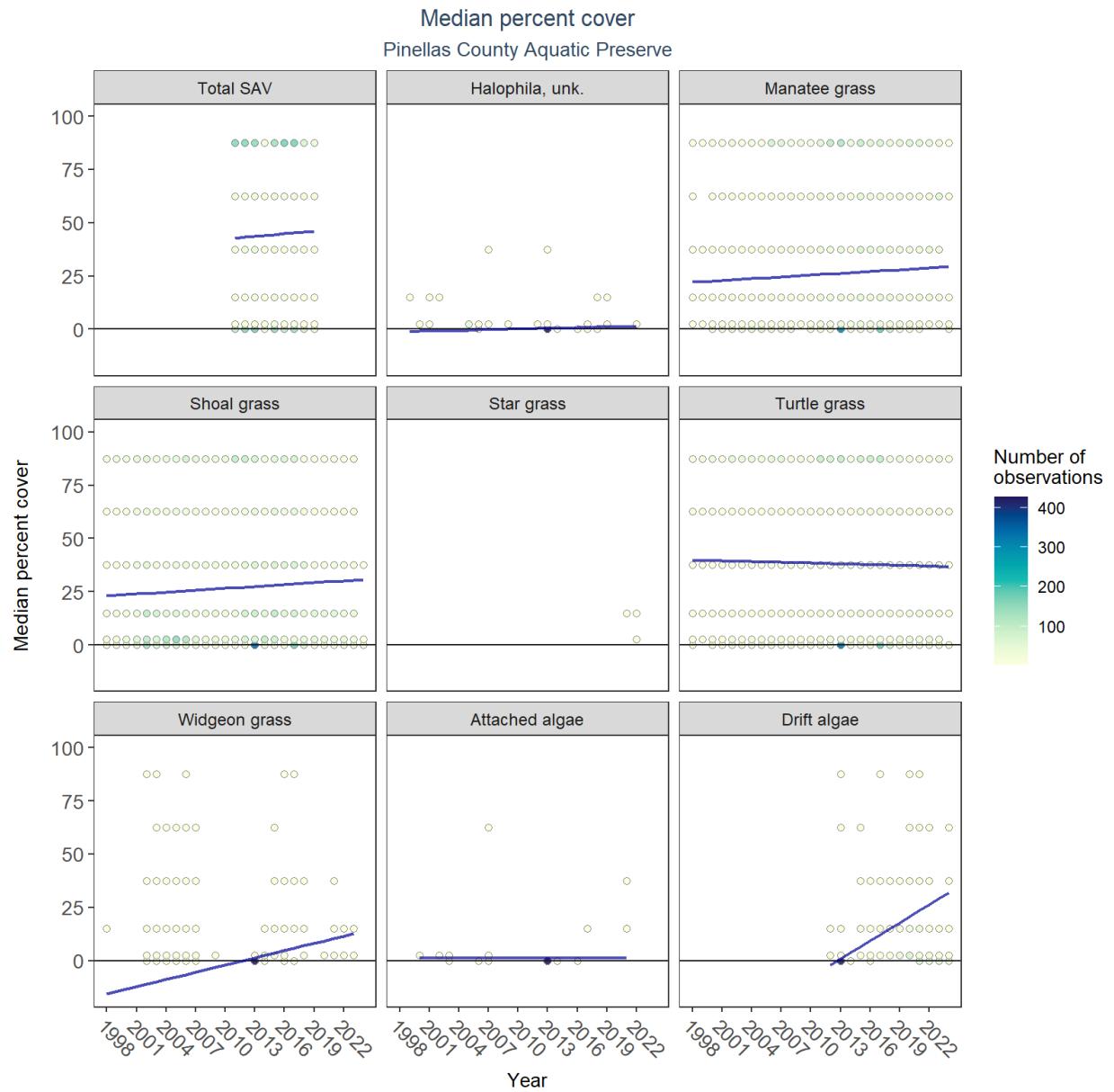


Figure 90: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 23: SAV LME Results for Pinellas County Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Attached algae	No significant trend	2000 - 2021	1.35	-0.01	0.96
Drift algae	Significantly increasing trend	2012 - 2024	-52.91	2.83	0.00
Shoal grass	Significantly increasing trend	1998 - 2024	21.83	0.30	0.03
Star grass	Insufficient data to calculate trend	NA	NA	NA	NA
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	No significant trend	1998 - 2023	-20.19	1.13	0.38
Manatee grass	No significant trend	1998 - 2024	20.96	0.28	0.22
Turtle grass	No significant trend	1998 - 2024	40.31	-0.12	0.49
Total SAV	No significant trend	2011 - 2019	35.61	0.42	0.57
Halophila, unk.	No significant trend	1999 - 2022	-1.64	0.11	0.66

Annual increases in percent cover were observed for shoal grass (0.3%) and drift algae (2.8%). Total SAV, unknown *Halophila*, manatee grass, turtle grass, widgeon grass, and attached algae showed no detectable change in percent cover. Trends in percent cover could not be evaluated for star grass due to insufficient data.

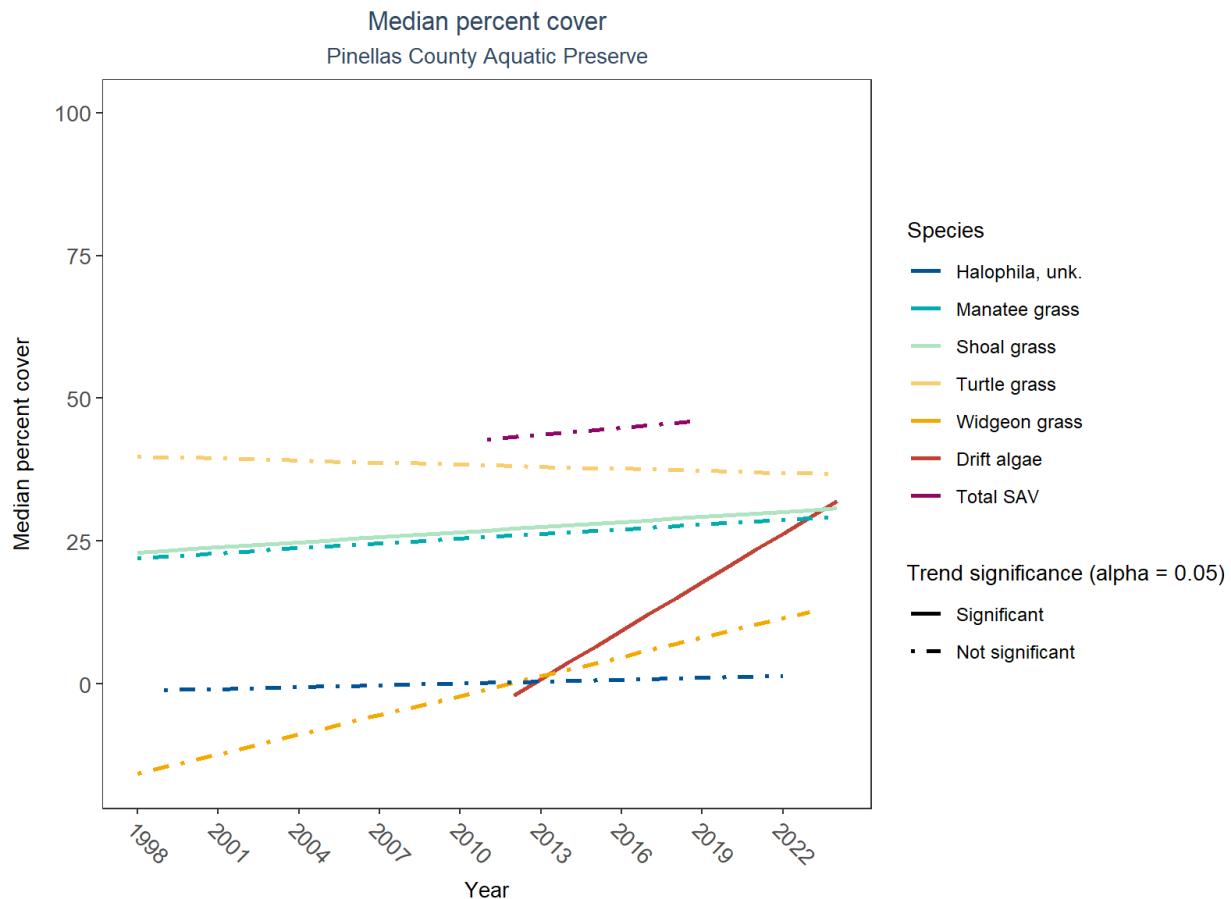


Figure 91: Trends in median percent cover for various seagrass species in Pinellas County Aquatic Preserve - simplified

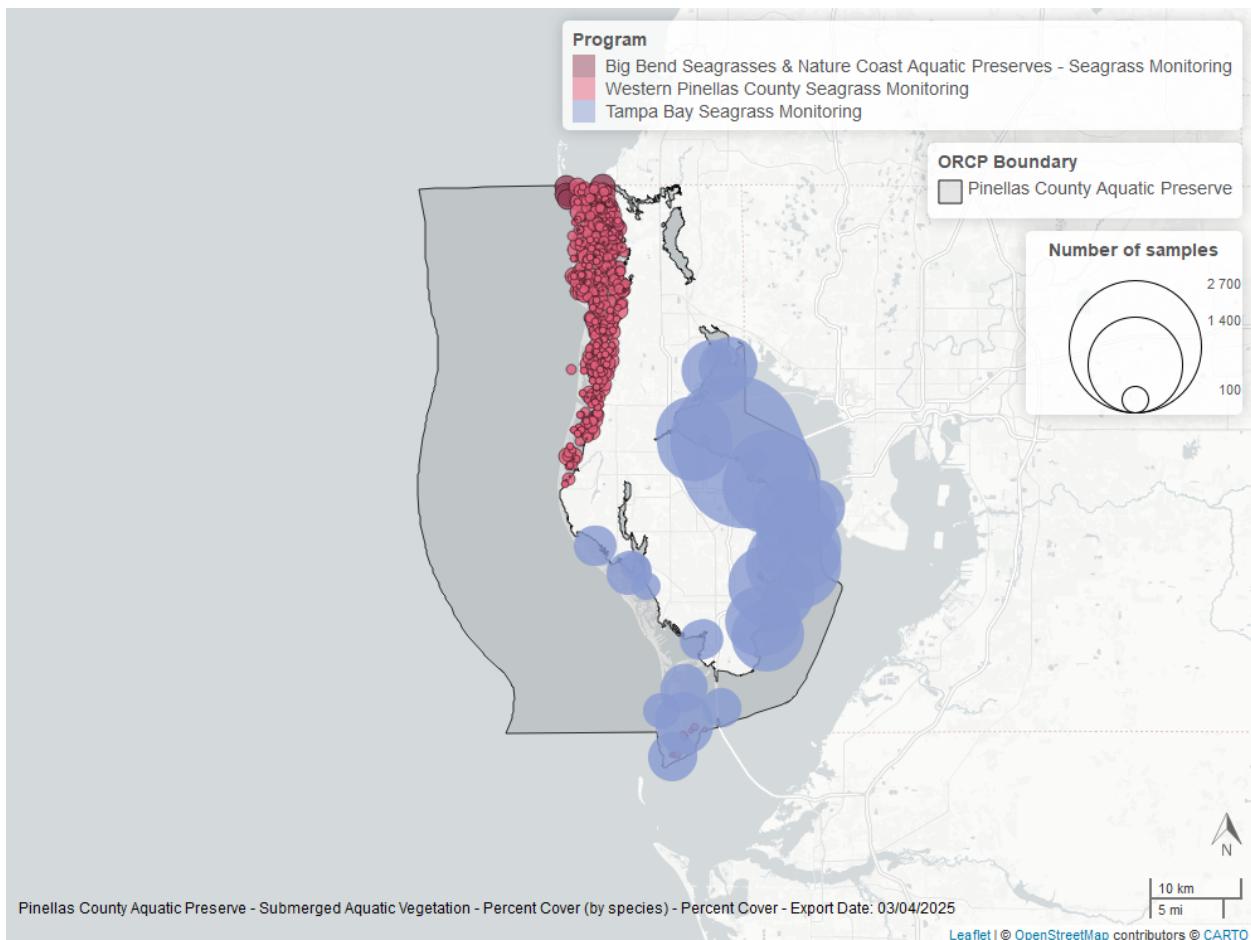


Figure 92: Map showing SAV sampling sites within the boundaries of *Pinellas County Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Rookery Bay Aquatic Preserve

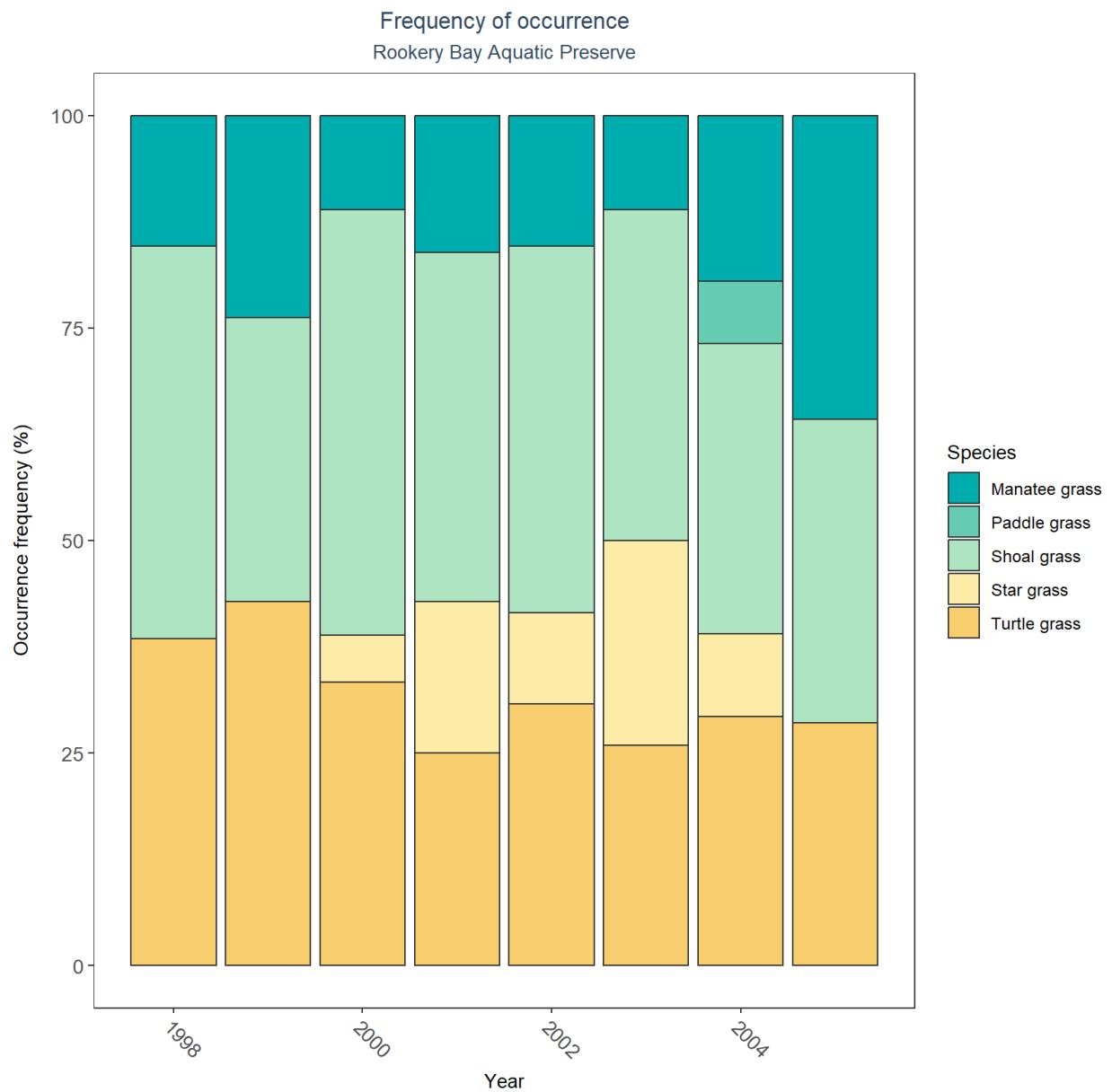


Figure 93: Frequency of occurrence for various seagrass species in Rookery Bay Aquatic Preserve

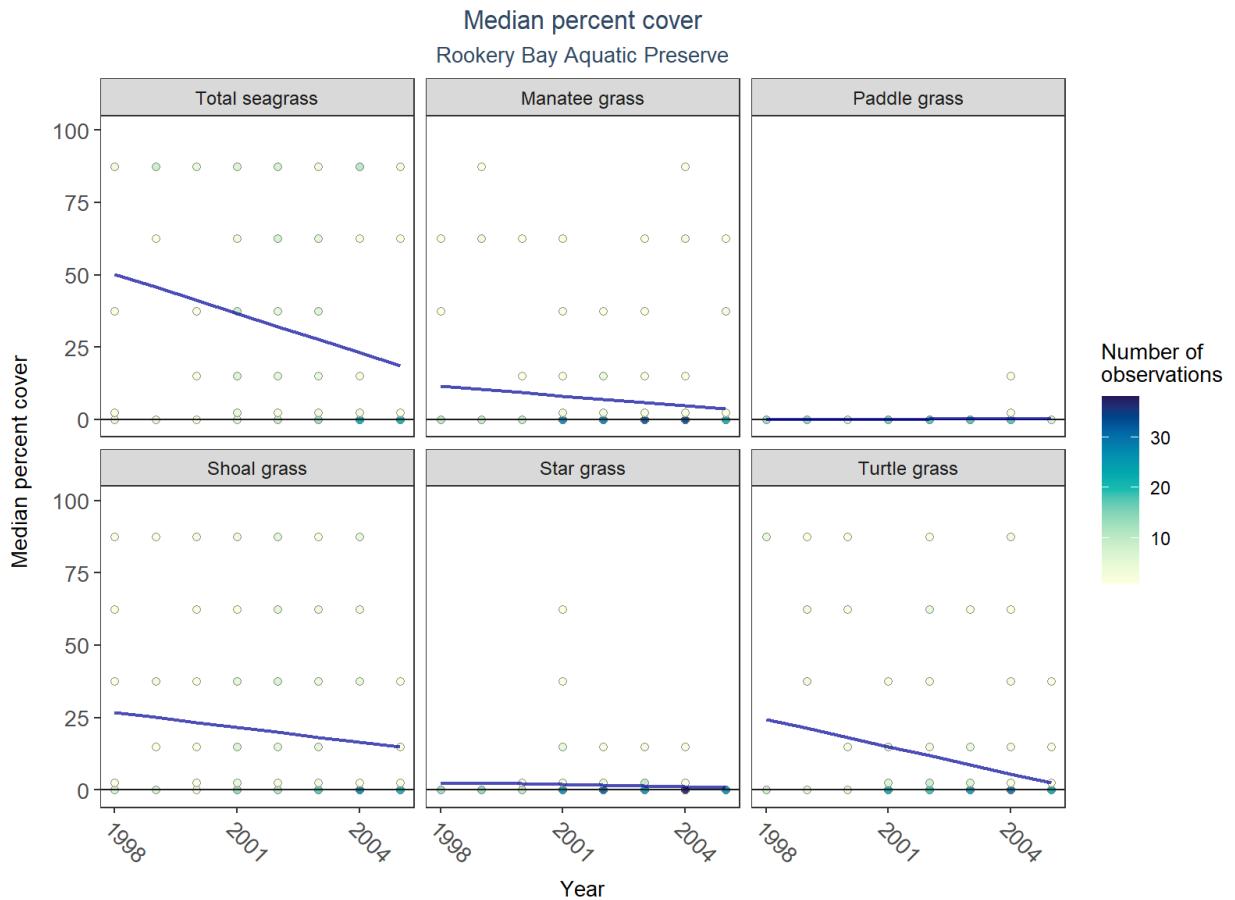


Figure 94: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 24: SAV LME Results for Rookery Bay Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Shoal grass	No significant trend	1998 - 2005	33.63	-1.71	0.25
Paddle grass	No significant trend	1998 - 2005	-0.44	0.08	0.36
Star grass	No significant trend	1998 - 2005	3.53	-0.23	0.44
Manatee grass	No significant trend	1998 - 2005	16.10	-1.13	0.40
Turtle grass	No significant trend	1998 - 2005	36.99	-3.14	0.07
Total seagrass	Significantly decreasing trend	1998 - 2005	68.37	-4.52	0.02

An annual decrease in percent cover was observed for total seagrass (-4.5%). Manatee grass, paddle grass, shoal grass, star grass, and turtle grass showed no detectable change in percent cover.

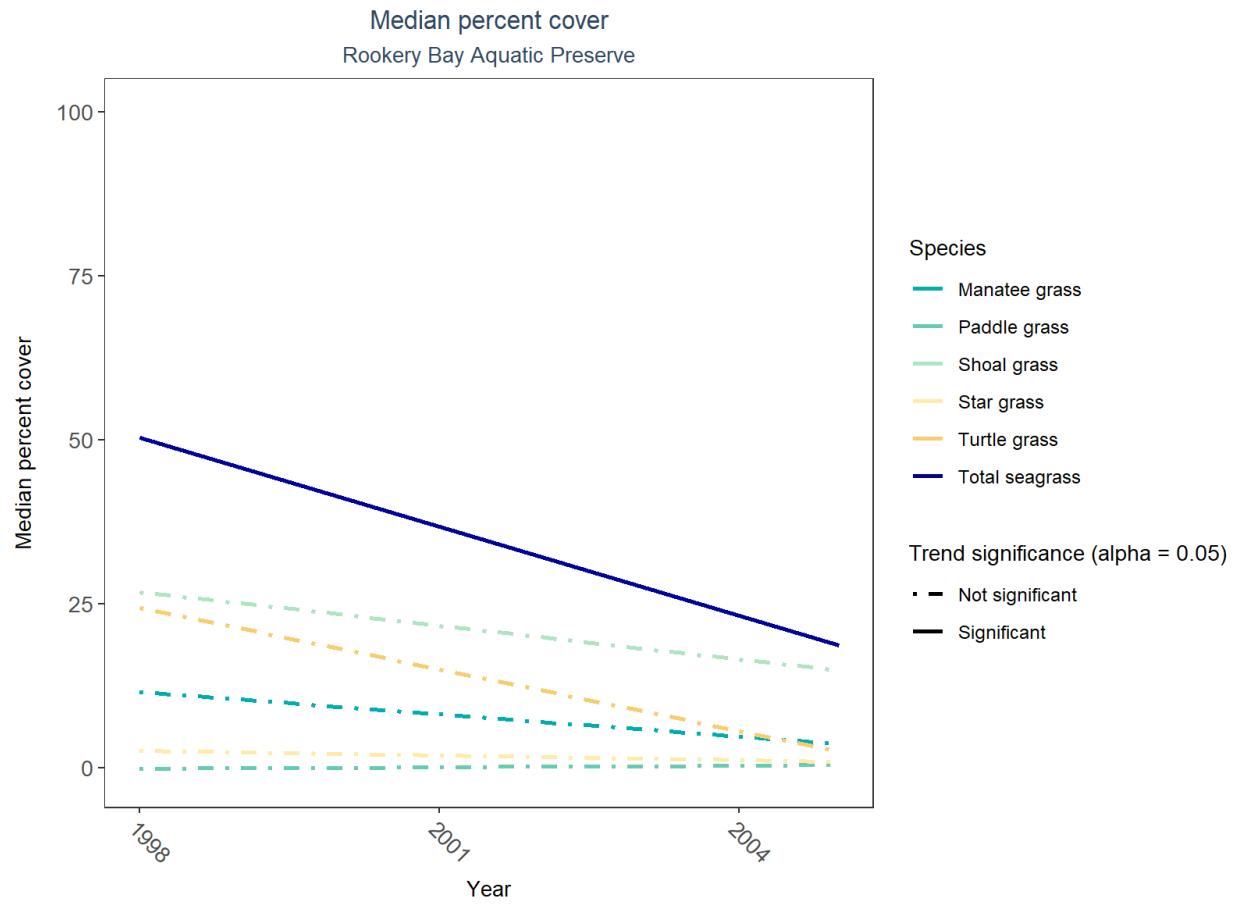


Figure 95: Trends in median percent cover for various seagrass species in Rookery Bay Aquatic Preserve - simplified

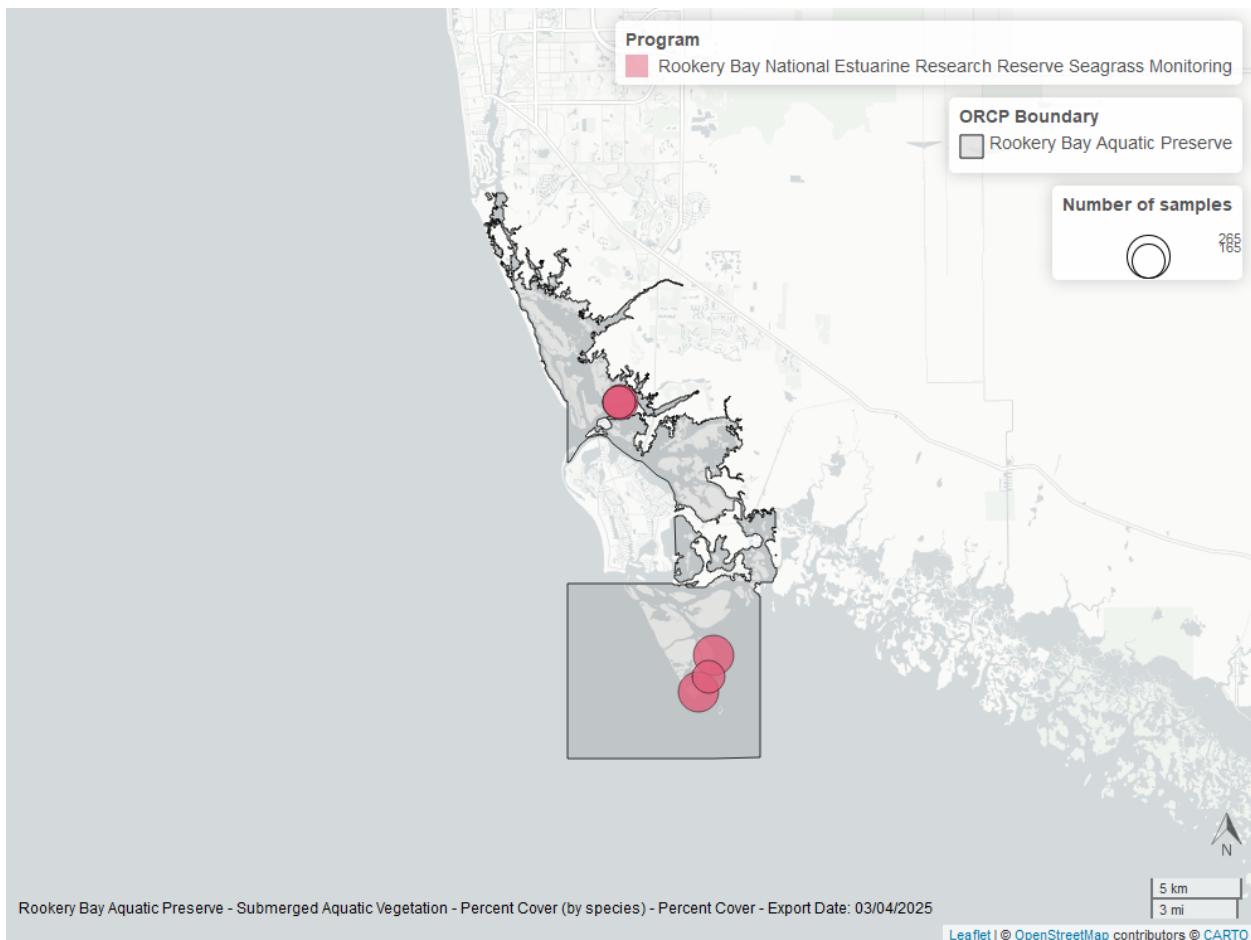


Figure 96: Map showing SAV sampling sites within the boundaries of *Rookery Bay Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Rookery Bay National Estuarine Research Reserve

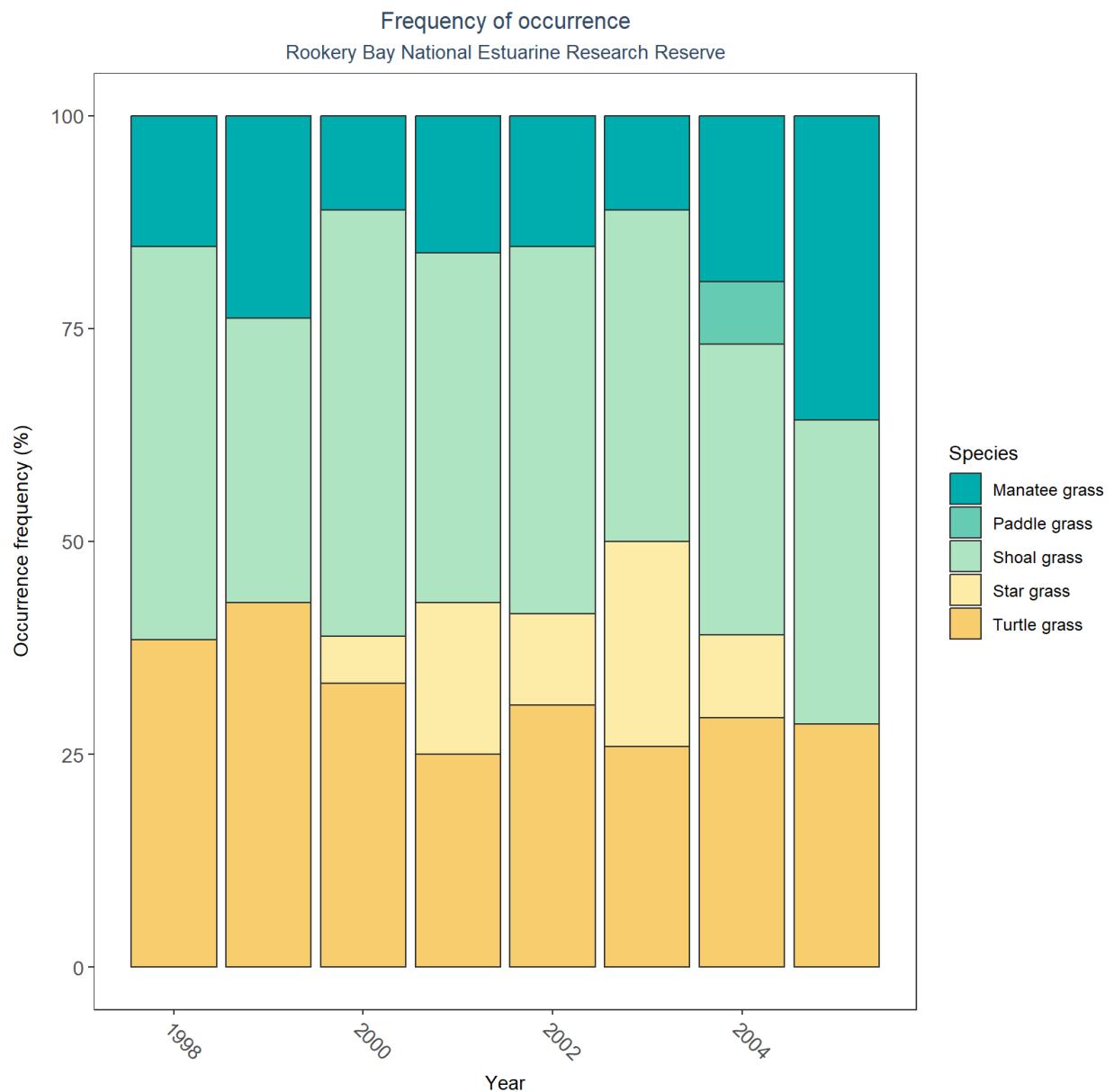


Figure 97: Frequency of occurrence for various seagrass species in Rookery Bay National Estuarine Research Reserve

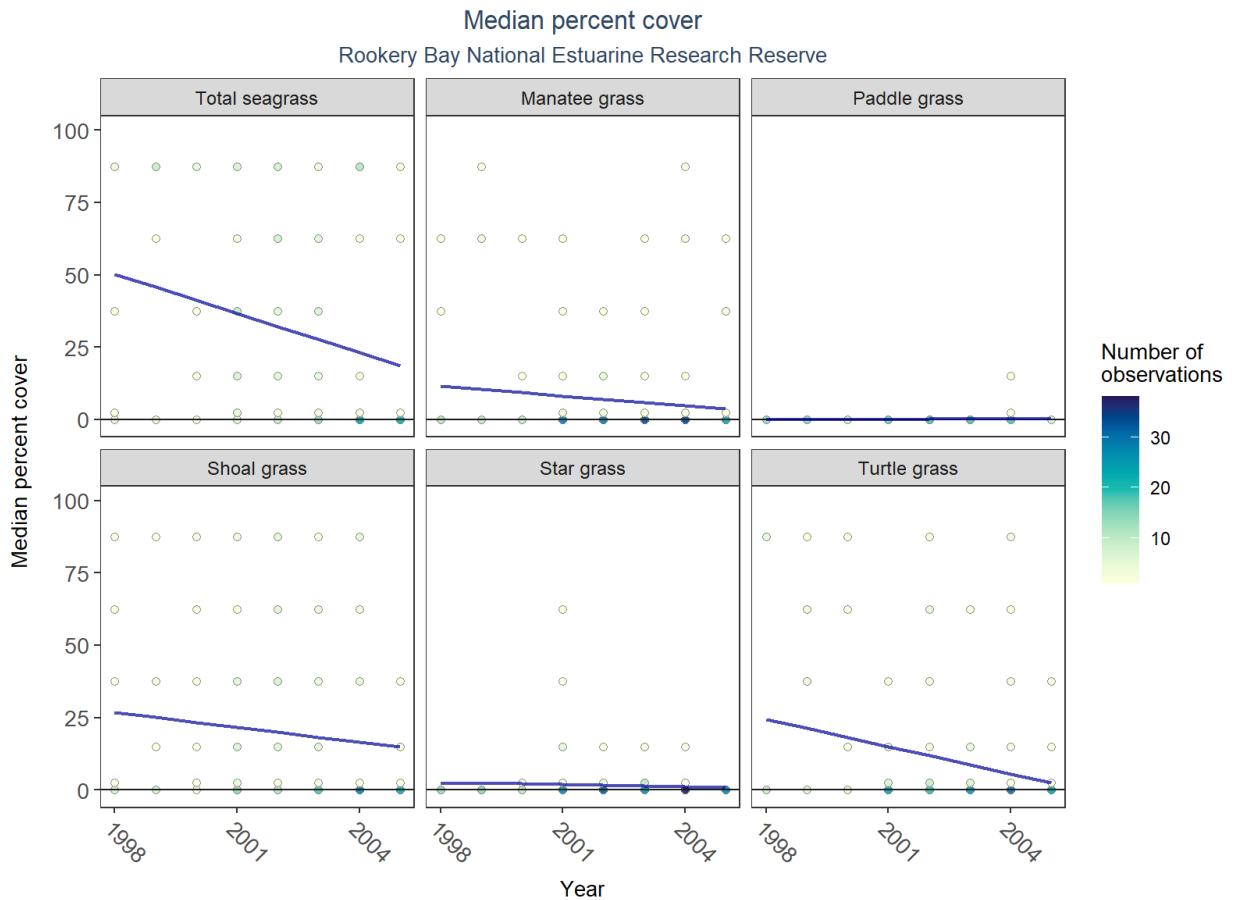


Figure 98: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 25: SAV LME Results for Rookery Bay National Estuarine Research Reserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Shoal grass	No significant trend	1998 - 2005	33.63	-1.71	0.25
Paddle grass	No significant trend	1998 - 2005	-0.44	0.08	0.36
Star grass	No significant trend	1998 - 2005	3.53	-0.23	0.44
Manatee grass	No significant trend	1998 - 2005	16.10	-1.13	0.40
Turtle grass	No significant trend	1998 - 2005	36.99	-3.14	0.07
Total seagrass	Significantly decreasing trend	1998 - 2005	68.37	-4.52	0.02

An annual decrease in percent cover was observed for total seagrass (-4.5%). Manatee grass, paddle grass, shoal grass, star grass, and turtle grass showed no detectable change in percent cover.

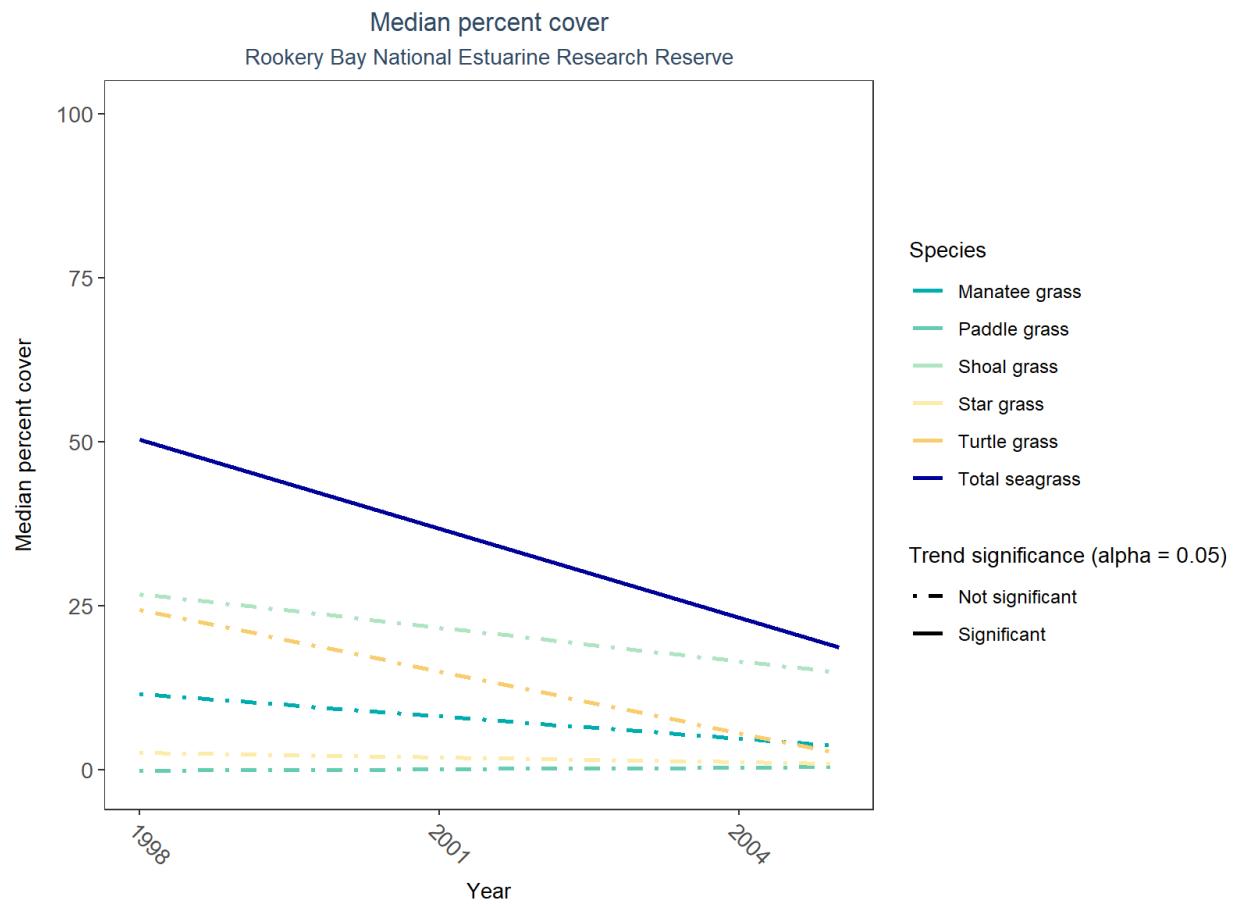


Figure 99: Trends in median percent cover for various seagrass species in Rookery Bay National Estuarine Research Reserve - simplified

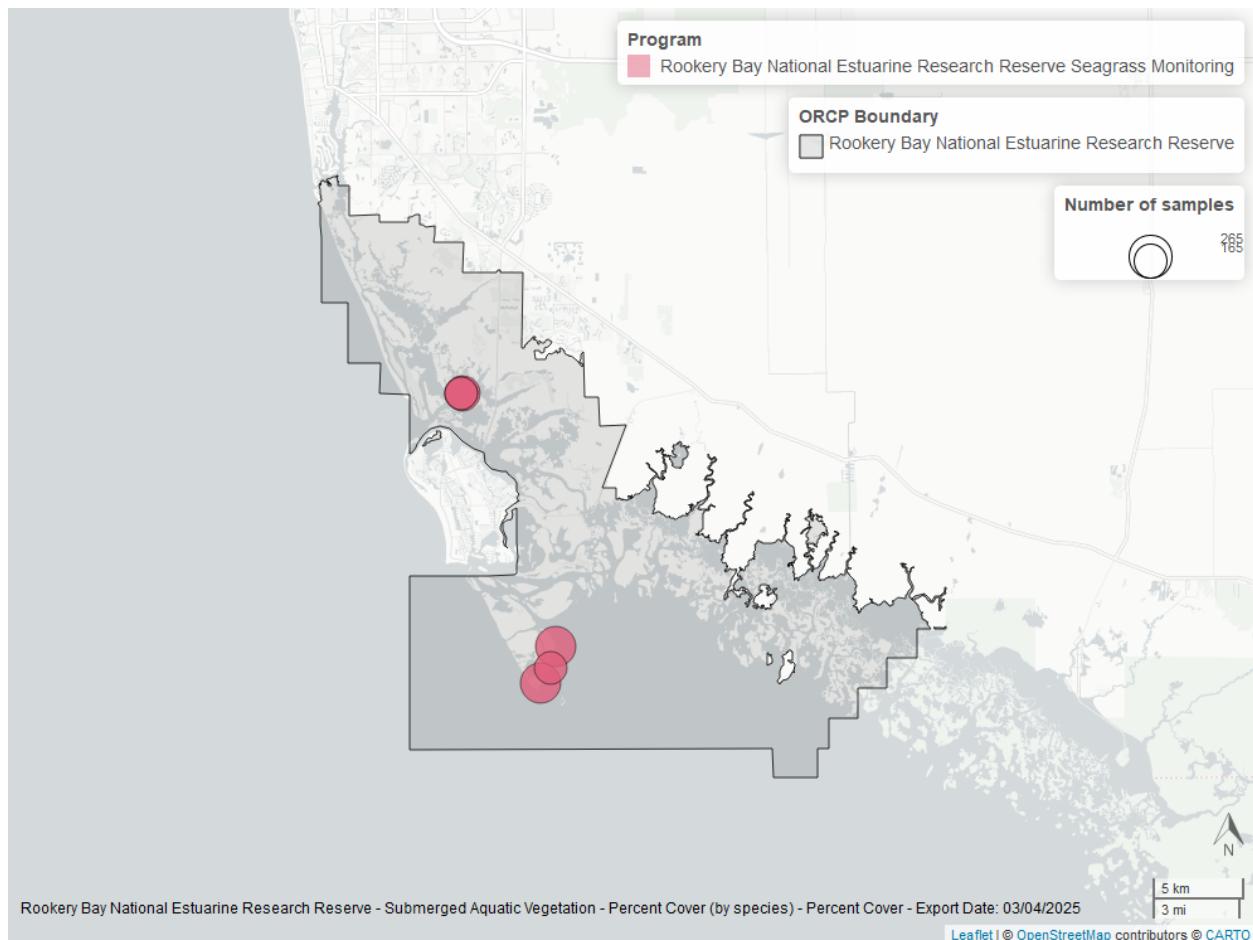


Figure 100: Map showing SAV sampling sites within the boundaries of *Rookery Bay National Estuarine Research Reserve*. The point size reflects the number of samples at a given sampling site.

St. Andrews Aquatic Preserve

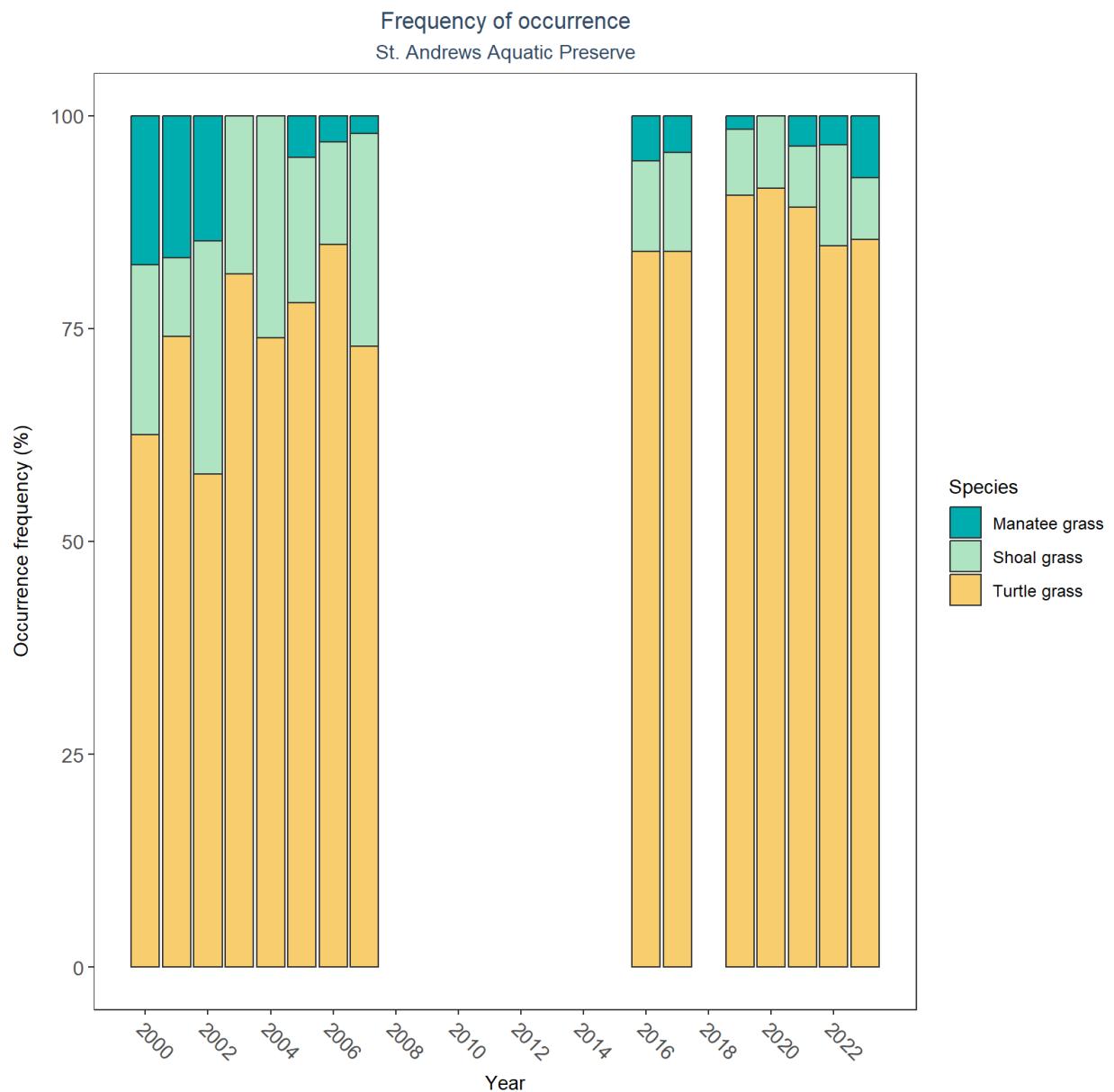


Figure 101: Frequency of occurrence for various seagrass species in St. Andrews Aquatic Preserve

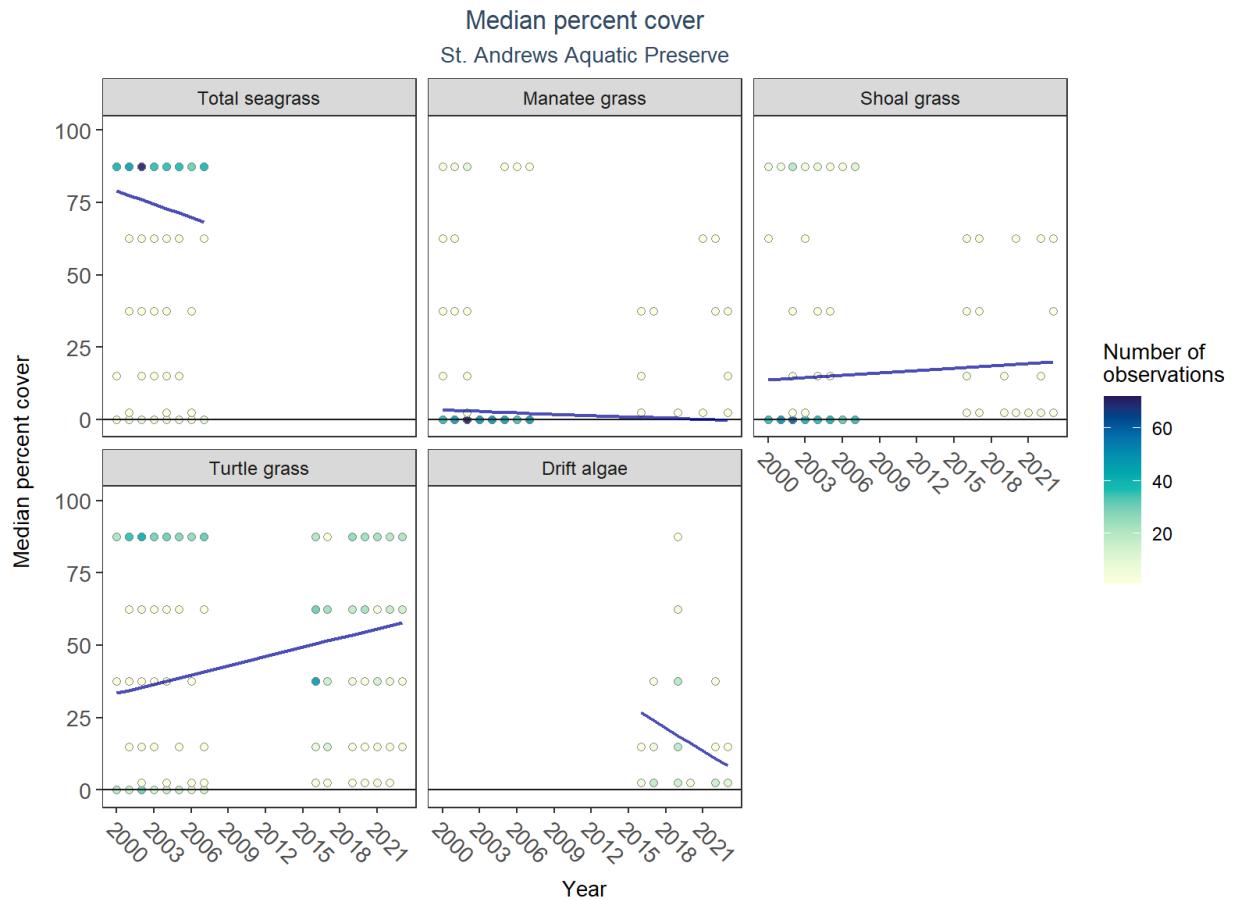


Figure 102: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 26: SAV LME Results for St. Andrews Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	No significant trend	2016 - 2023	84.42	-2.62	0.07
Shoal grass	No significant trend	2000 - 2023	11.99	0.27	0.49
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Manatee grass	No significant trend	2000 - 2023	4.17	-0.15	0.82
Turtle grass	No significant trend	2000 - 2023	27.04	1.06	0.13
Total seagrass	No significant trend	2000 - 2007	88.14	-1.52	0.15

Total seagrass, manatee grass, shoal grass, turtle grass, and drift algae showed no detectable change in percent cover.

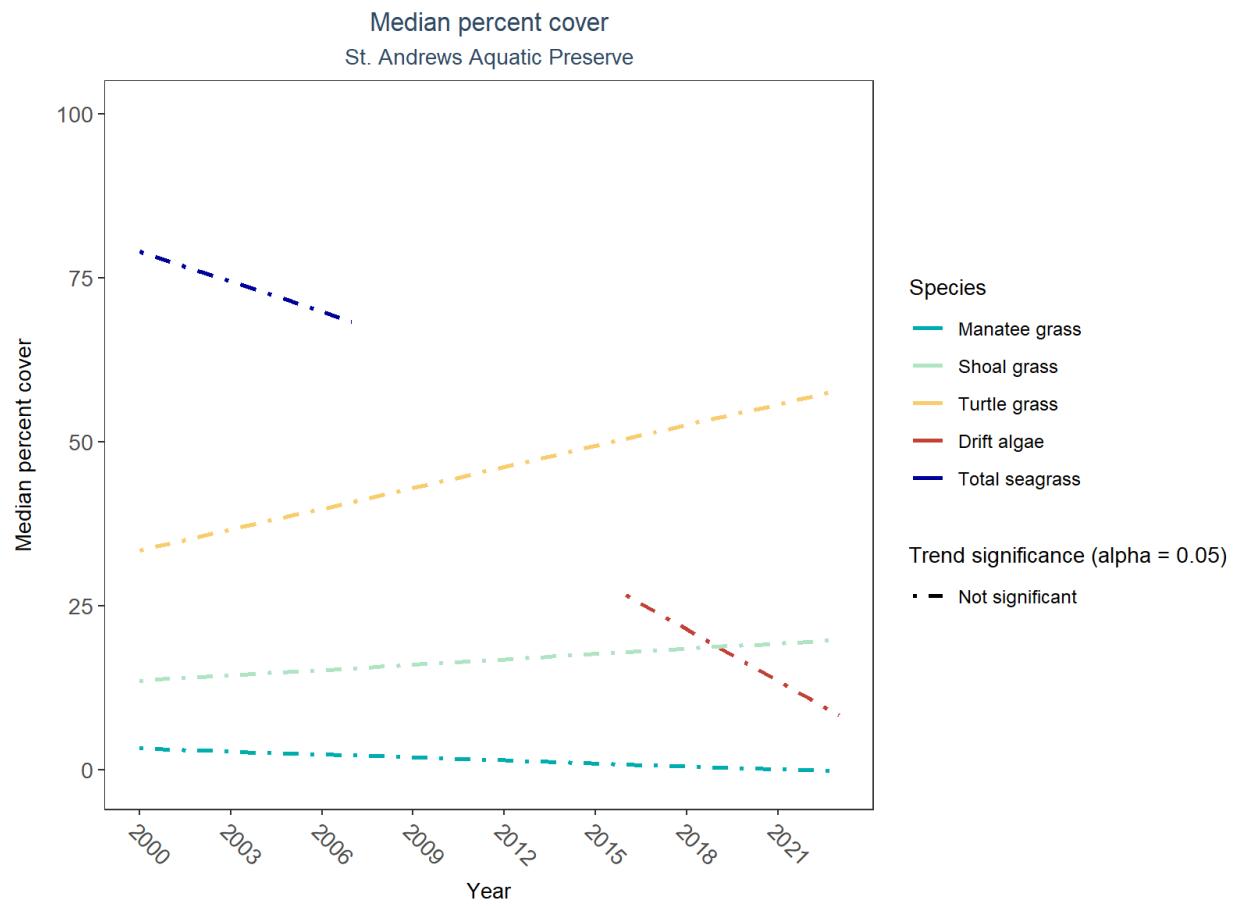


Figure 103: Trends in median percent cover for various seagrass species in St. Andrews Aquatic Preserve - simplified

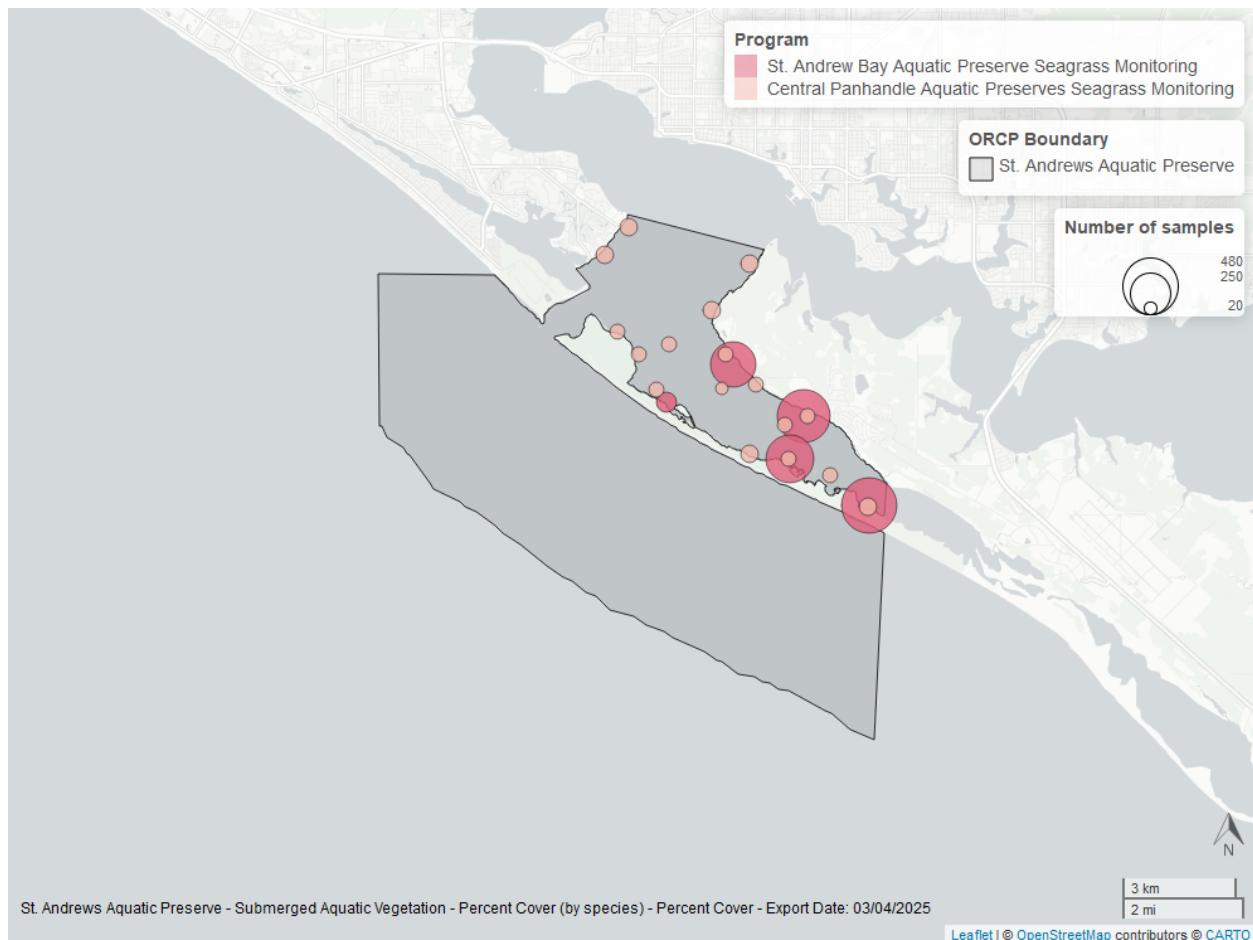


Figure 104: Map showing SAV sampling sites within the boundaries of *St. Andrews Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

St. Joseph Bay Aquatic Preserve

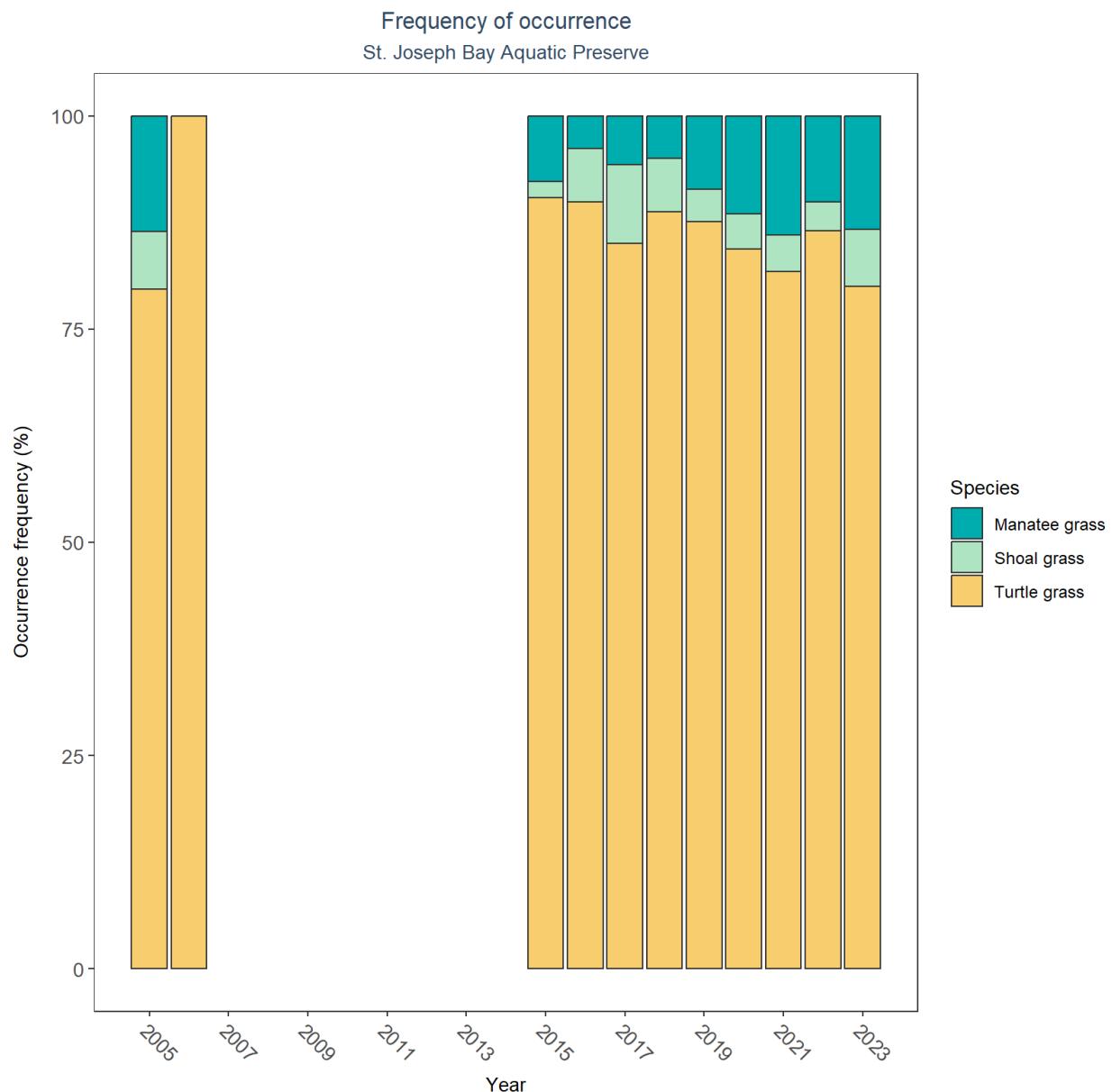


Figure 105: Frequency of occurrence for various seagrass species in St. Joseph Bay Aquatic Preserve

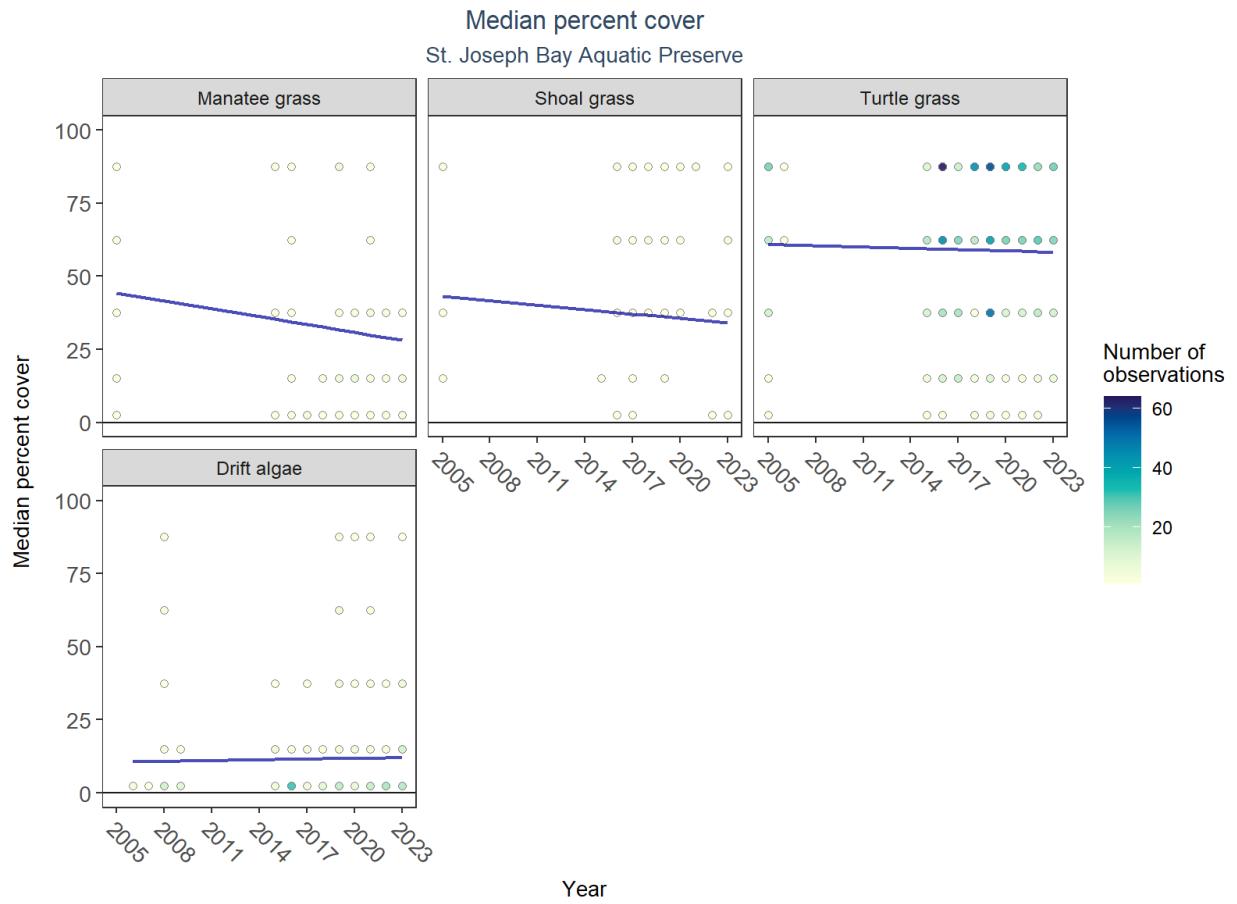


Figure 106: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 27: SAV LME Results for St. Joseph Bay Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	No significant trend	2006 - 2023	9.61	0.08	0.83
Shoal grass	No significant trend	2005 - 2023	48.45	-0.49	0.50
No grass in quadrat	Insufficient data to calculate trend	NA	NA	NA	NA
Manatee grass	No significant trend	2005 - 2023	54.20	-0.90	0.26
Turtle grass	No significant trend	2005 - 2023	62.38	-0.14	0.69

Manatee grass, shoal grass, turtle grass, and drift algae showed no detectable change in percent cover.

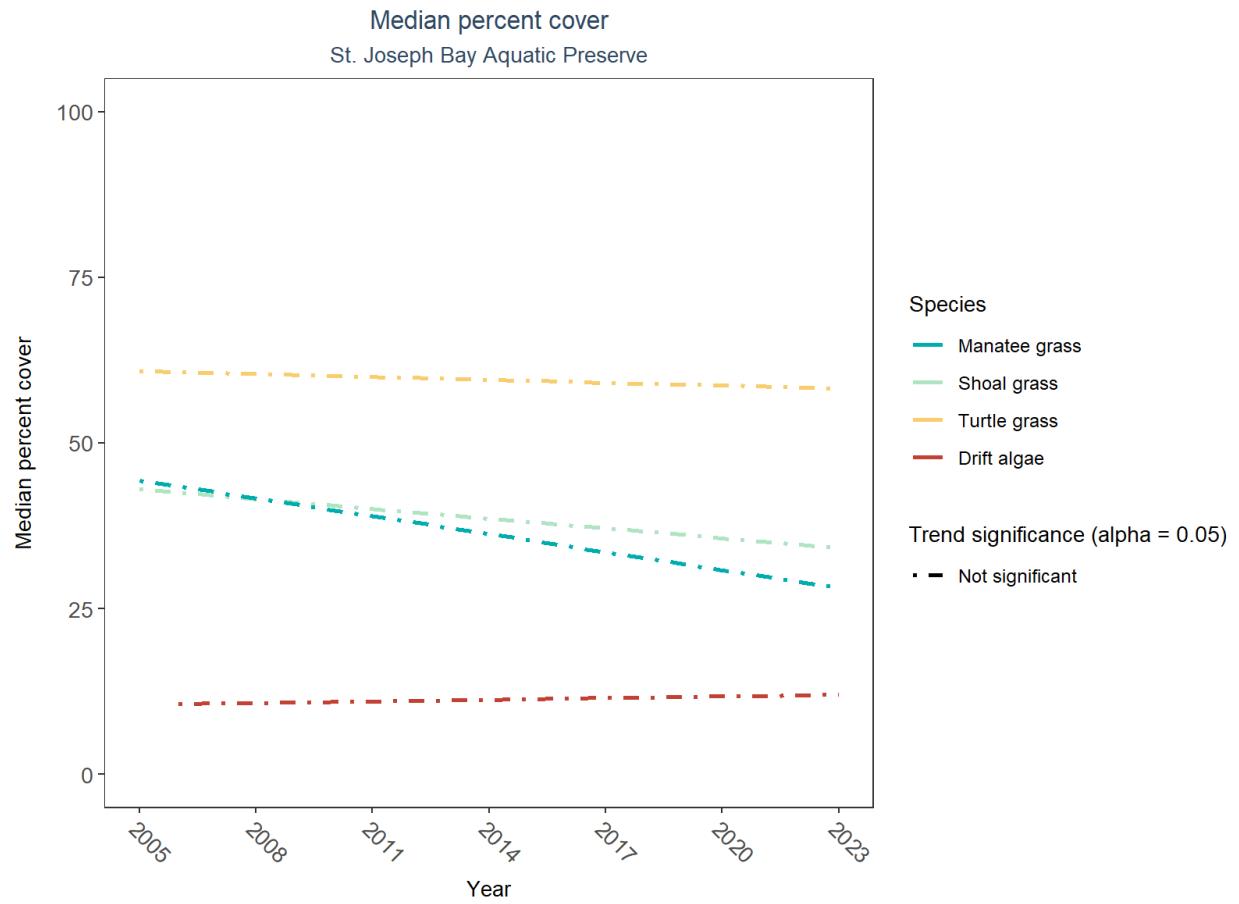


Figure 107: Trends in median percent cover for various seagrass species in St. Joseph Bay Aquatic Preserve - simplified

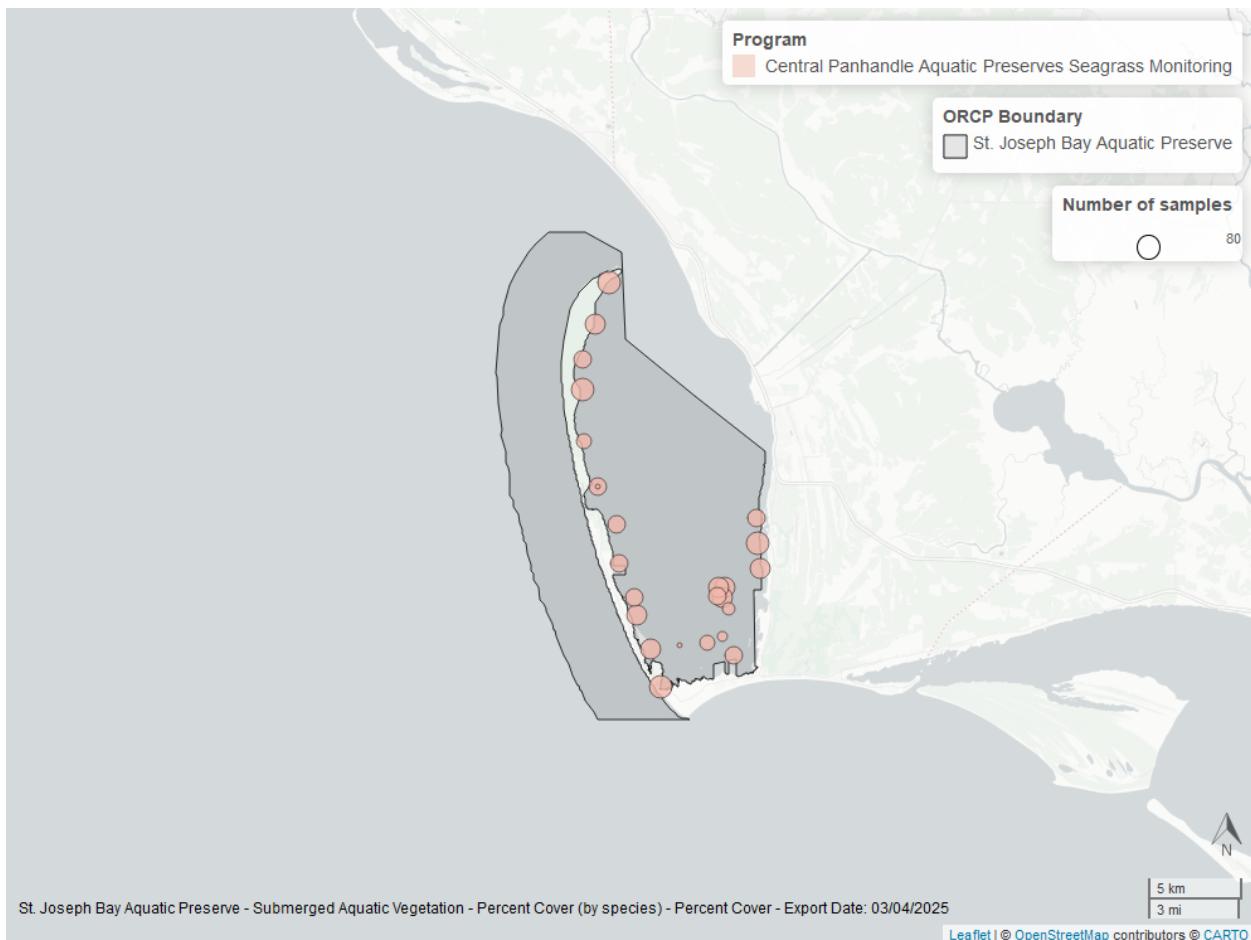


Figure 108: Map showing SAV sampling sites within the boundaries of *St. Joseph Bay Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

St. Martins Marsh Aquatic Preserve

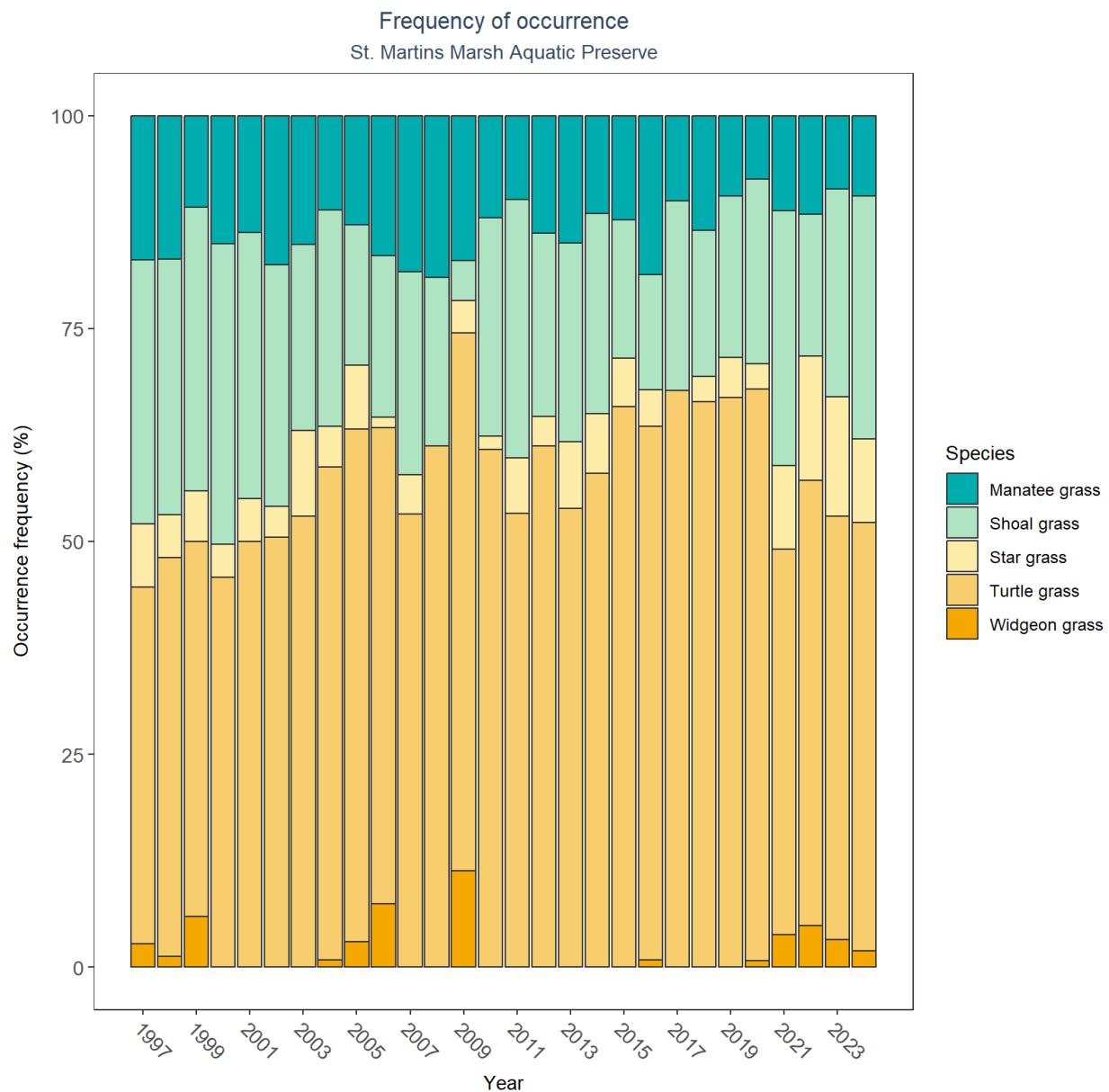


Figure 109: Frequency of occurrence for various seagrass species in St. Martins Marsh Aquatic Preserve

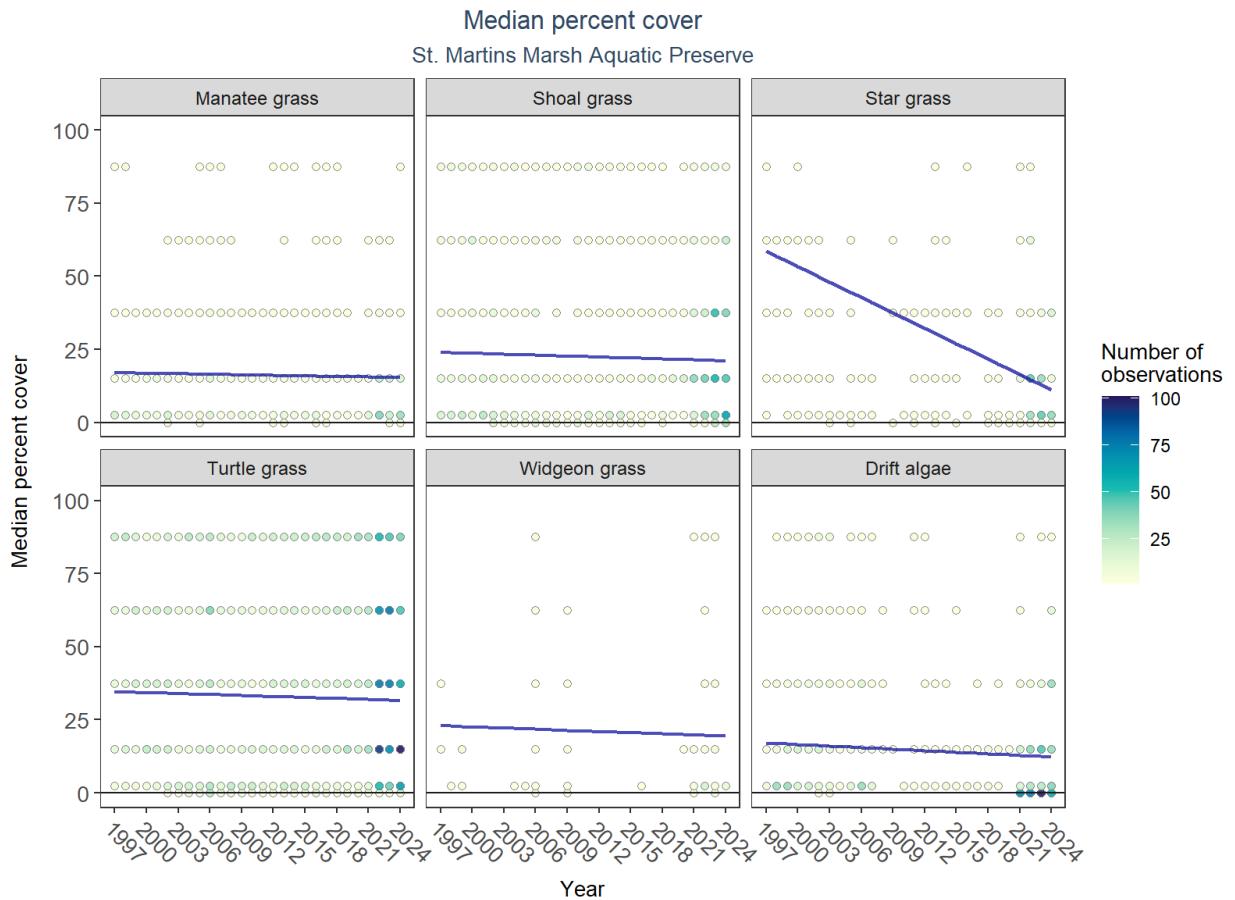


Figure 110: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 28: SAV LME Results for St. Martins Marsh Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	No significant trend	1997 - 2024	17.60	-0.18	0.21
Shoal grass	No significant trend	1997 - 2024	24.32	-0.11	0.55
Star grass	No significant trend	1997 - 2024	63.88	-1.76	0.09
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	No significant trend	1997 - 2024	23.39	-0.13	0.72
Manatee grass	No significant trend	1997 - 2024	17.22	-0.06	0.74
Turtle grass	No significant trend	1997 - 2024	34.98	-0.11	0.47

Manatee grass, shoal grass, star grass, turtle grass, widgeon grass, and drift algae showed no detectable change in percent cover.

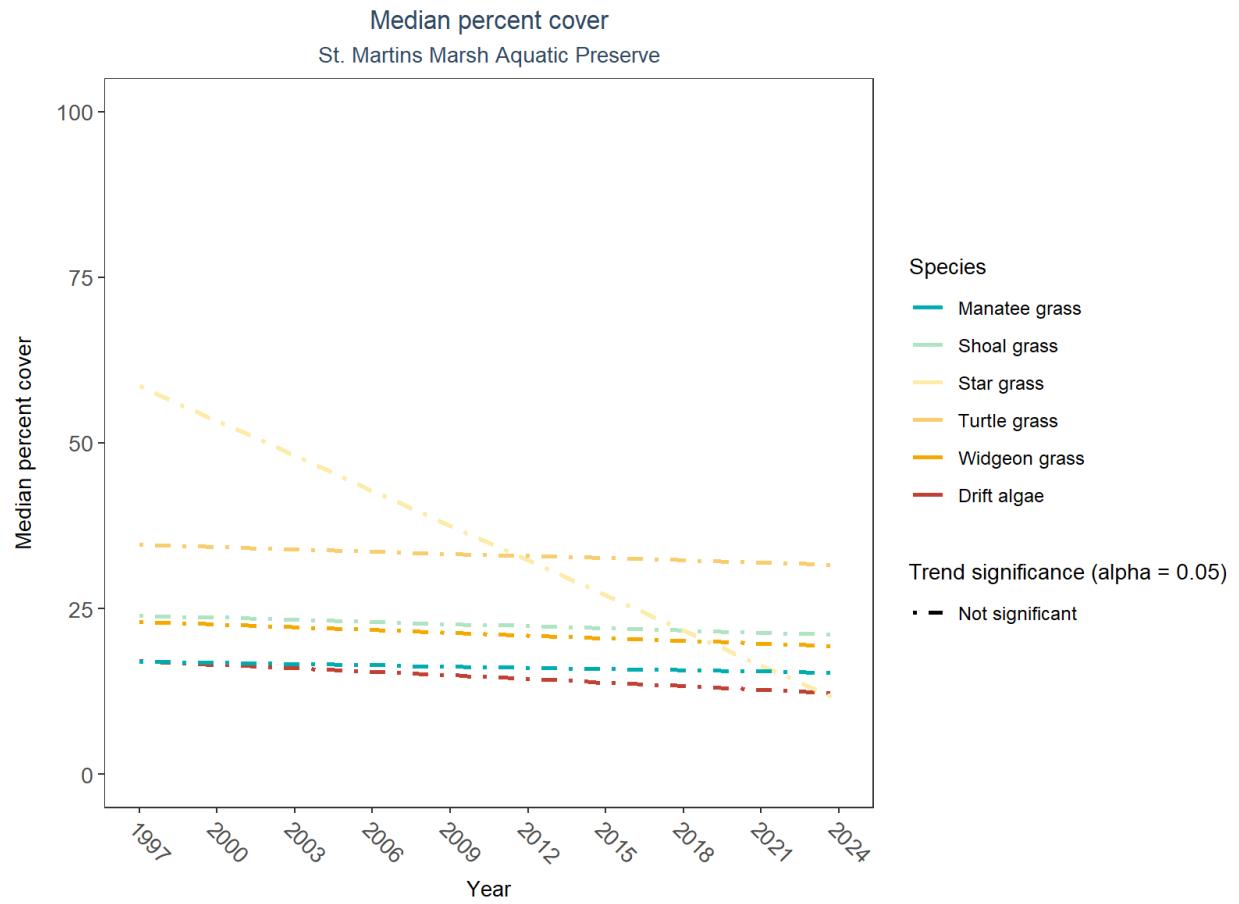


Figure 111: Trends in median percent cover for various seagrass species in St. Martins Marsh Aquatic Preserve - simplified

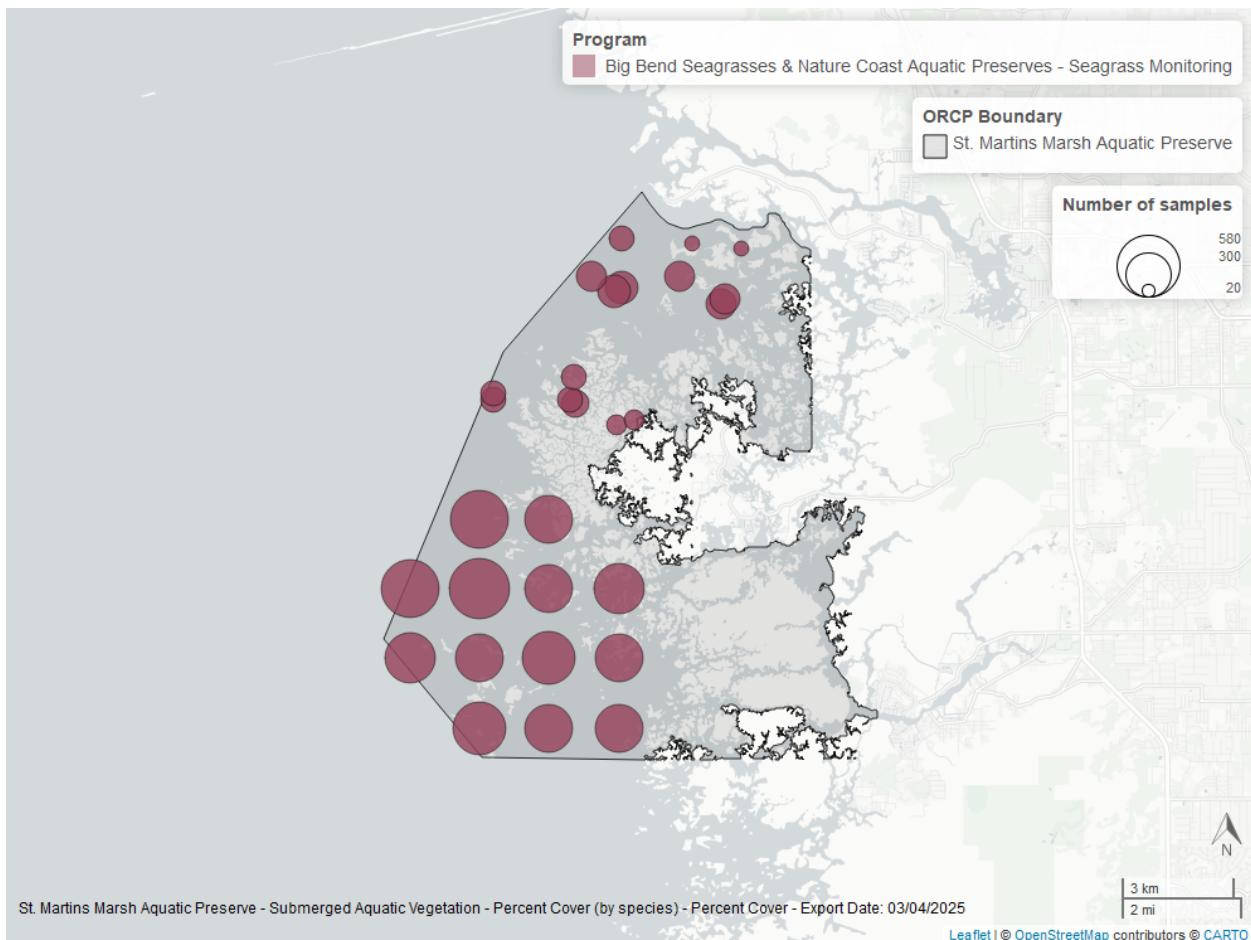


Figure 112: Map showing SAV sampling sites within the boundaries of *St. Martins Marsh Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Terra Ceia Aquatic Preserve

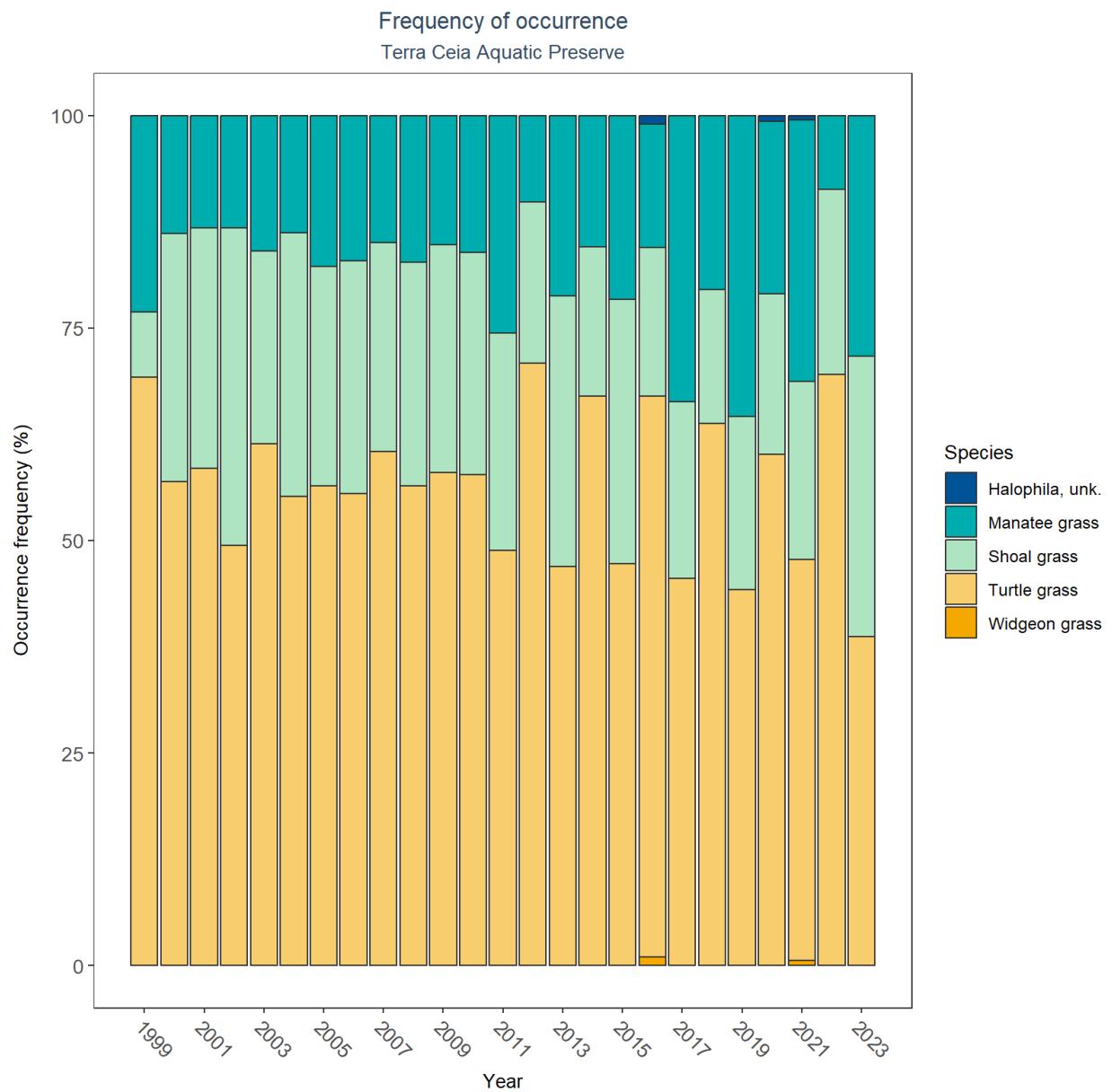


Figure 113: Frequency of occurrence for various seagrass species in Terra Ceia Aquatic Preserve

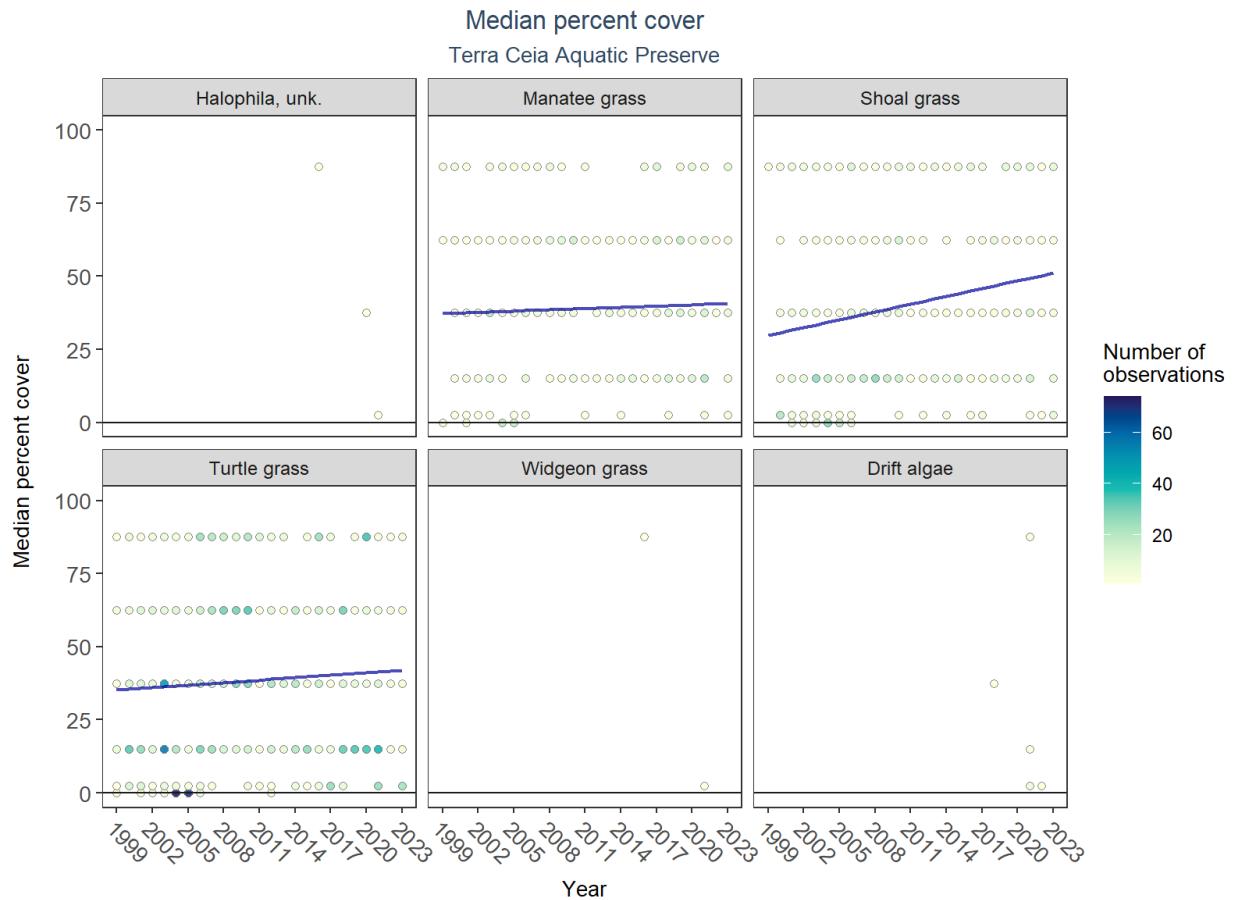


Figure 114: Scatter plots of median percent cover of submerged aquatic vegetation over time by group. Plots for time series that included five or more years of observations show the estimated trend as a blue line.

Table 29: SAV LME Results for Terra Ceia Aquatic Preserve

Species	Statistical Trend	Period of Record	LME Intercept	LME Slope	p
Drift algae	Insufficient data to calculate trend	NA	NA	NA	NA
Shoal grass	Significantly increasing trend	1999 - 2023	25.36	0.89	0.00
No grass in quadrat	Model did not fit the available data	NA	NA	NA	NA
Widgeon grass	Insufficient data to calculate trend	NA	NA	NA	NA
Manatee grass	No significant trend	1999 - 2023	36.54	0.14	0.71
Turtle grass	No significant trend	1999 - 2023	33.79	0.28	0.39
Halophila, unk.	Insufficient data to calculate trend	NA	NA	NA	NA

An annual increase in percent cover was observed for shoal grass (0.9%). No detectable change in percent cover was observed for manatee grass and turtle grass. Trends in percent cover could not be evaluated for unknown *Halophila*, widgeon grass, and drift algae due to insufficient data.

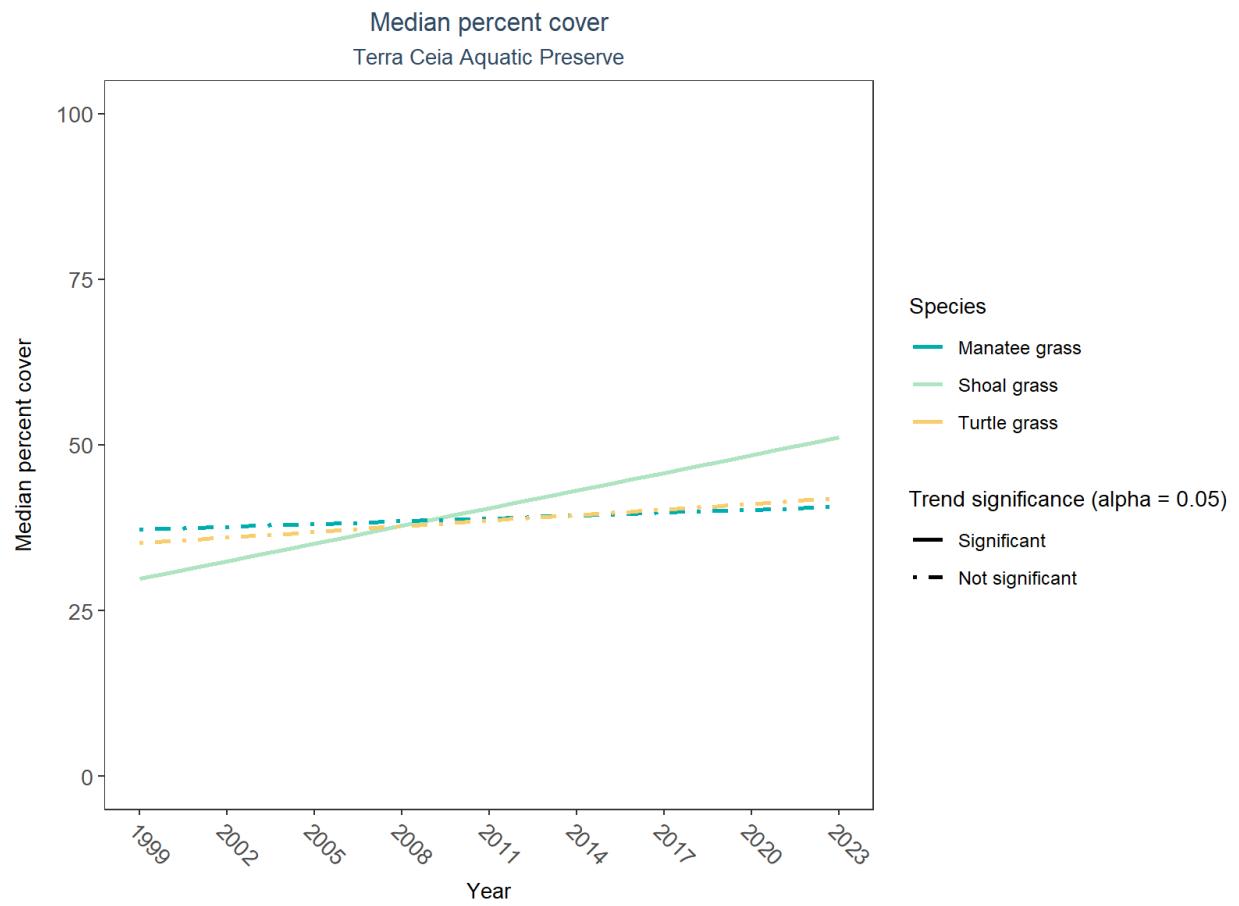


Figure 115: Trends in median percent cover for various seagrass species in Terra Ceia Aquatic Preserve - simplified

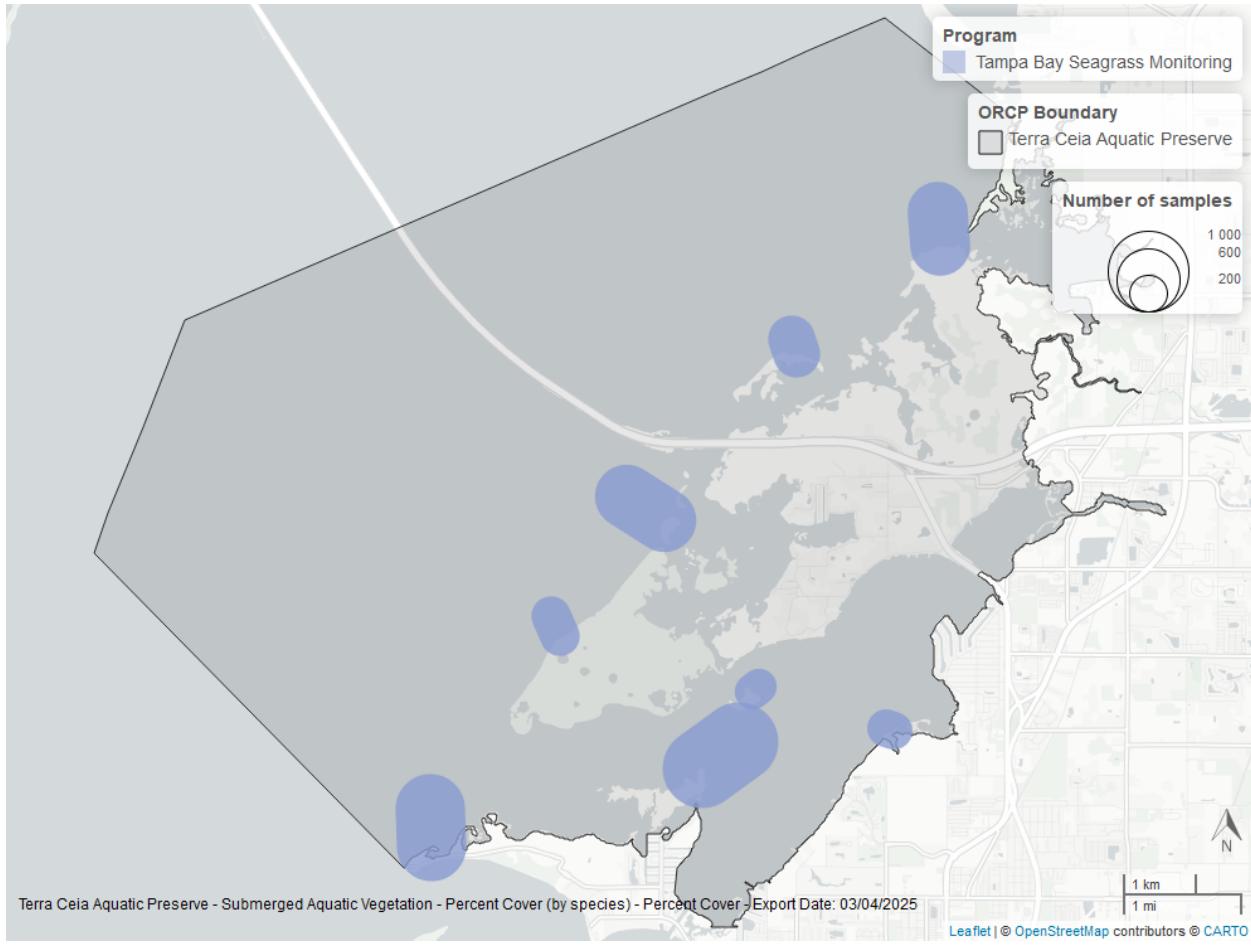


Figure 116: Map showing SAV sampling sites within the boundaries of *Terra Ceia Aquatic Preserve*. The point size reflects the number of samples at a given sampling site.

Summary of SEACAR_SAV_BB_script_website.R

- Objective: Import and format SAV data, create summary plots and maps of changes over time, model changes over time using Bayesian and mixed-effects models. Results are separate for each managed area, species, and parameter (e.g., Braun Blanquet, percent cover, etc.).
- Packages: bayesplot, brms, broom.mixed, data.table, grid, gridExtra, gtable, nlme, scales, sf, tictoc, tidybayes, tidyverse
- File inputs: All_SAV_Parameters-2024-Sep-19.txt, seacar_dbo_SampleLocation_Point.shp, seacar_dbo_SampleLocation_Line.shp, ORCP_Managed_Areas.shp, Counties_-_Detailed_Shoreline.shp, MApolygons_corners.csv
- Steps by line number:
 - 1 - 40: load libraries and import SAV file, create necessary sub-folders.
 - 43 - 132: format SAV data including renaming columns, removing NA values, and reformatting abundance/cover values. For the latter, this included removal of NA values and those out of range, and ensuring appropriate values for Braun Blanquet, modified Braun Blaunqet, percent occurrence, and percent cover.
 - 136: Import ManagedArea.csv to obtain abbreviated ManagedAreaNames.
 - 139 - 193: function for plotting model predictions (multiplots).
 - 196 - 288: function for plotting model predictions with simplified trendlines on a single plot

(trendplots).

- 292 - 307: function used throughout script to allow for swift modification of species labels between “common” and “scientific” names. The script defaults to using scientific throughout the backend (i.e. .rds objects with species names default to scientific), with the `usenames` variable (line 468) converting the display of species names to the desired display type.
- 310: `EDA` variable to specify what the script should produce. Setting to “plots” creates data exploration plots.
- 313: `scope_plots` variable can be set to `TRUE` or `FALSE`. Set to `TRUE` to render spatio-temporal scope plots for each ManagedArea. Resulting plots are placed in the ‘`output/Figures/SAV_temporal_scope_plots/`’ folder.
- 323 - 324: create failedmods data table to store failed model results.
- 327 - 499: setup parameter list and objects for looping through parameters to create models and summary output, parameters include Braun Blanquet, median percent cover, visual percent cover, percent occurrence, frequency of occurrence. Write results to output .xlsx files.
 - * 351 - 395: setting up palettes for both species (`spcols`) and ProgramNames (`prcols`).
- 517 - 1192: loop through parameters to create models and summary output, the following is an outline of steps in this loop.
 - * 530 - 1518: loop through managed areas using parameter from outside loop
 - * 539 - 553: create and save plot of parameter score for managed area over time by species
 - * 555 - 568: create and save plot of parameter score for managed area over time by program ID
 - * 570 - 583: create and save plot of parameter score for managed area over time grouped by species, by program ID
 - * 585 - 598: create and save plot of quadrat sizes for managed area over time by species
 - * 600 - 613: create and save plot of quadrat sizes for managed area over time by program ID
 - * 615 - 628: create and save plot of method for managed area over time by species
 - * 630 - 643: create and save plot of method for managed area over time by program ID
 - * 645 - 659: create and save plot of method for managed area by quadrat size and species
 - * 661 - 675: create and save plot of method for managed area by quadrat size and program ID
 - * 677 - 707: create and save plots of grid values over time by species and program ID if data available
 - * 709 - 739: create and save plots of depth values over time by species and program ID if data available
 - * 743 - 759: create and save a plot legend of species
 - * 762 - 785: loop through species to create and save a plot of parameter score over time
 - * 787 - 808: create and save a plot of totals for the species of parameter score over time
 - * 811 - 827: create and save a plot legend of species
 - * 830 - 853: loop through species to create and save a plot of parameter score as boxplots over time
 - * 855 - 875: create and save a plot of boxplots for the species of parameter score over time
 - * 898 - 908: setup empty objects for model results
 - * 912 - 1029: Loop through species to fit models, with separate exception statements for different parameters. The modeling workflow is similar for each parameter, with minor exceptions. The general goal of each is to assess trends in a parameter over time for a particular species and managed area. Each workflow includes error handling if models did not converge, produces summary tables of model fit, and summary plots showing model result. The models vary in the Gaussian distribution family for the response variable depending on parameter. Random effects (e.g., for LocationID) are used for all models.
 - * 1033 - 1124: create base plot of seagrass percent cover data over time for managed area. Add model fits if applicable, and saves object
 - 1036 - 1046: reads and sets modeled data for plots
 - * 1127 - 1185: create and save barplots of parameter results for managed area over time by species, only for Braun Blanquet and percent cover, save model results from prior loops
 - * 1197 - 1265: export .png of all plot types, setting height dynamically for `multiplots`.
 - * 1273 - 1277: zip all images into subfolders and create `SAV_Figures_[usenames].zip` where

`usenames` is either “scientific” or “common” based on the `usenames` variable setting.