ASSESSING THE ECOLOGICAL CONDITION OF SOUTHEAST U.S. ESTUARIES

James Harvey

U.S. EPA/ORD/NHEERL

2004 EMAP Symposium

May 3-6, 2004

RESEARCH & DEVELOPMENT

Building a scientific foundation for sound environmental decisions

- Corey Garza
- Linda Harwell
- Tom Heitmuller
- Virginia Engle
- Lisa Smith
- John Macauley
- Kevin Summers

- http://www.epa.gov/emap/nca/index.html
- http://www.epa.gov/nheerl/arm/
- http://www.epa.gov/owow/oceans/nccr2/index.html

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"***Good News - Based on my years in the environmental movement, I think the Agency does an exemplary job of protecting the nation's public health and quality of the environment. Bad News - I can't prove it."***

Former EPA Administrator William Reilly 1989

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Public Questions

- Can I swim in it?
- Can I fish in it?
- Can I eat the fish?
- Is it safe?
- What are you doing to make it better?

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Agency-level Questions

- What are the current conditions of our ecosystems?
- Where and how is the condition improving or declining?
- What stresses are associated with declines?
- Are our management programs and policies working?

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National Coastal Assessment

- Build state capacity for monitoring condition and transfer our technology
- Develop the scientific basis for consistent, unbiased, cost-effective measurement of the condition of the Nation's aquatic ecosystems

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Selection of Indicators

- Biotic Condition Indicators
- Exposure Indicators
- Habitat Indicators
- Stressor Indicators

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Sampling Stations - Southeast (2000)

North Carolina Department of Environment and Natural Resources

South Carolina Department of Natural Resources

Georgia Department of Natural Resources

Florida Fish and Wildlife Conservation Commission

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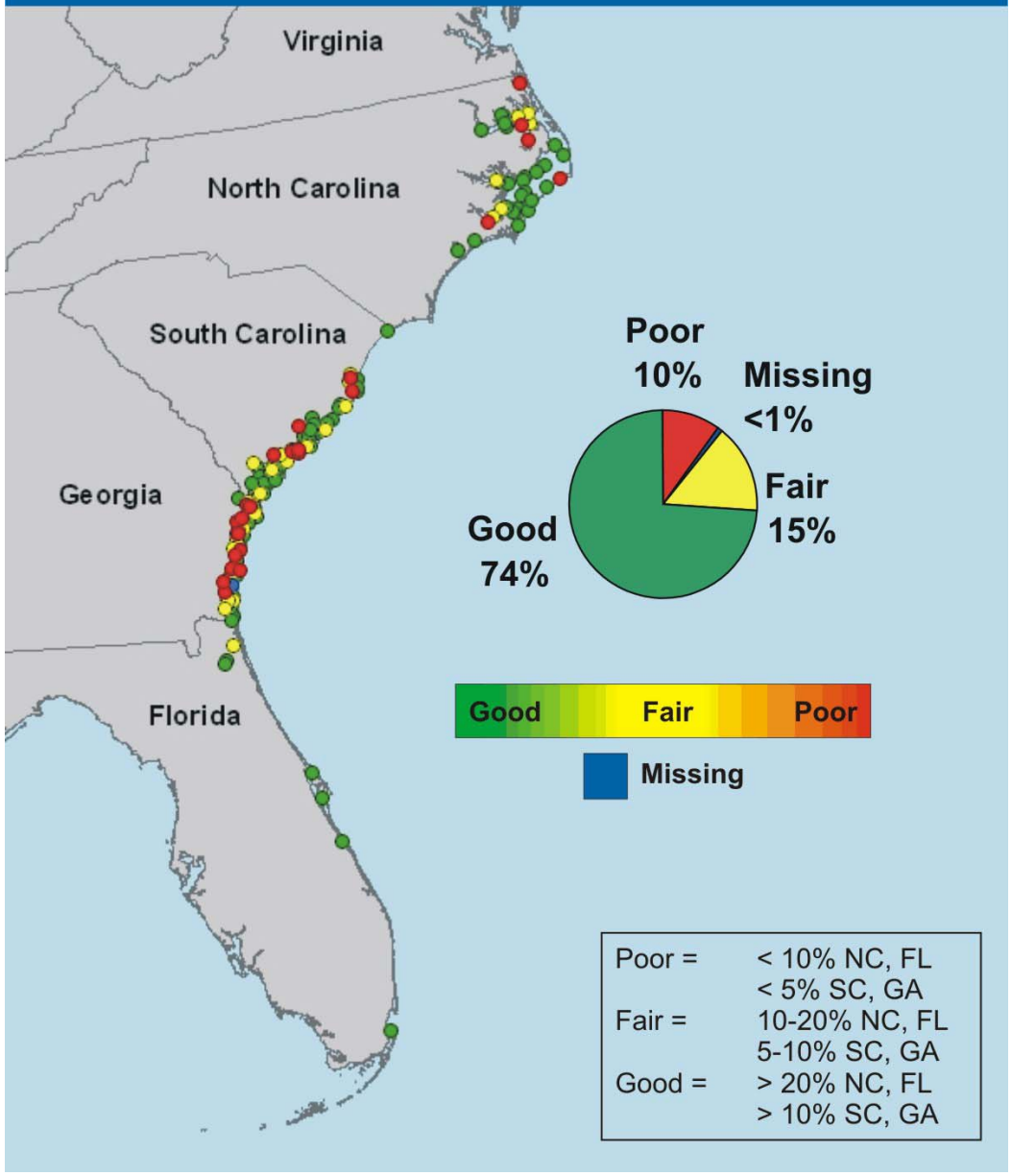
Water Clarity - Southeast (2000)



Poor =	< 10% NC, FL < 5% SC, GA
Fair =	10-20% NC, FL 5-10% SC, GA
Good =	> 20% NC, FL > 10% SC, GA

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Microsoft Excel - waterclarity index 62403.xls

File Edit View Insert Format Tools Data Window Help

Arial 10

S2 = =IF(Q2<M2,1,IF(Q2>L2,3,2))

	A	B	C	F	G	H	J	K	L	M	O	Q	S
48	GA00-0040	4.08432	SAPELO RIVER	31.57615	-81.3135	0.55	0.05	.10	2.995732	2.302585	1	1.818182	1
49	GA00-0041	2.7432	ALTAMAHU RIVER	31.33272	-81.3864	0.5	0.05	.10	2.995732	2.302585	1	2	1
50	GA00-0042	1.8288	ALTAMAHA SOUND	31.29798	-81.2851	0.75	0.05	.10	2.995732	2.302585	1	1.333333	1
51	GA00-0043	3.41376	HAMPTON RIVER	31.288	-81.3793	0.55	0.05	.10	2.995732	2.302585	1	1.818182	1
52	GA00-0044	3.9624	MAKAY RIVER	31.24317	-81.4222	0.65	0.05	.10	2.995732	2.302585	1	1.538462	1
53	GA00-0045	6.4008	HAMPTON RIVER	31.23917	-81.3245	2	0.05	.10	2.995732	2.302585	1	0.5	1
54	GA00-0046	3.59664	MAKAY RIVER	31.239	-81.422	0.6	0.05	.10	2.995732	2.302585	1	1.666667	1
55	GA00-0047	7.0104	ST. SIMEON SOUND	31.13805	-81.4212	0.75	0.05	.10	2.995732	2.302585	1	1.333333	1
56	GA00-0048	2.62128	JOINTER CREEK	31.0785	-81.5309	0.9	0.05	.10	2.995732	2.302585	1	1.111111	1
57	GA00-0049	1.76784	JEKYLL SOUND	31.01023	-81.4551	1.4	0.05	.10	2.995732	2.302585	1	0.714286	1
58	GA00-0050	2.77368	ST. MARYS RIVER	30.72582	-81.5067	0.8	0.05	.10	2.995732	2.302585	1	1.25	1
59	NC00-0001	1.79832	CORRITUCK SOUND	36.442	-75.9669	0.5	0.1	.20	2.302585	1.609438	1.4	2.8	3
60	NC00-0002	3.6576	PERQUIMANS RIVER	36.11515	-76.3218	1.5	0.05	.10	2.995732	2.302585	1	0.666667	1
61	NC00-0003	1.2192	BULL BAY	35.96442	-76.3012	1.1	0.05	.10	2.995732	2.302585	1	0.909091	1
62	NC00-0004	1.524	LITTLE ALLIGATOR RIV	35.953	-76.0539	0.5	0.05	.10	2.995732	2.302585	1	2	1
63	NC00-0005	1.03632	WEST BLUFF BAY	35.33278	-76.1762	0.9	0.05	.10	2.995732	2.302585	1	1.111111	1
64	NC00-0006	0.39624	WEST BAY	34.982	-76.377	0.7	0.05	.10	2.995732	2.302585	0.39624	0.566057	1
65	NC00-0007	0.4572	WEST BAY	34.96365	-76.4536	0.8	0.05	.10	2.995732	2.302585	0.4572	0.5715	1
66	NC00-0008	0.51816	NEUSE RIVER	34.88863	-76.8621	0.5	0.05	.10	2.995732	2.302585	0.51816	1.03632	1
67	NC00-0009	0.33528	WHITE OAK RIVER	34.72935	-77.1035	0.6	0.05	.10	2.995732	2.302585	0.33528	0.5588	1
68	NC00-0010	0.9144	NEW RIVER	34.62697	-77.3663	0.5	0.05	.10	2.995732	2.302585	0.9144	1.8288	1
69	NC00-0011	1.524	ALLIGATOR RIVER	35.95948	-75.9504	0.75	0.05	.10	2.995732	2.302585	1	1.333333	1
70	NC00-0012	3.5052	ALLIGATOR RIVER	35.76793	-76.0042	0.75	0.05	.10	2.995732	2.302585	1	1.333333	1
71	NC00-0013	1.64592	PAMLICO RIVER	35.36983	-76.6032	1	0.1	.20	2.302585	1.609438	1.4	1.4	1
72	NC00-0014	1.70688	PAMLICO RIVER	35.30047	-76.4317	1.2	0.1	.20	2.302585	1.609438	1.4	1.166667	1
73	NC00-0015	1.43256	PAMLICO RIVER	35.34328	-76.5901	1	0.1	.20	2.302585	1.609438	1.4	1.4	1
74	NC00-0016	1.85928	NEUSE RIVER	35.02123	-76.5423	1.3	0.1	.20	2.302585	1.609438	1.4	1.076923	1
75	NC00-0017	1.73736	NEUSE RIVER	35.01768	-76.6194	1	0.1	.20	2.302585	1.609438	1.4	1.4	1
76	NC00-0018	0.36576	CORE SOUND	34.93876	-76.2376	1.2	0.1	.20	2.302585	1.609438	0.36576	0.3048	1
77	NC00-0019	1.3716	NEUSE RIVER	34.93855	-76.7504	1.3	0.1	.20	2.302585	1.609438	1.3716	1.055077	1
78	NC00-0020	0.3048	CORE SOUND	34.77522	-76.4284	1	0.1	.20	2.302585	1.609438	0.3048	0.3048	1
79	NC00-0022	5.57784	ALBERMARLE SOUND	36.08522	-75.9393	0.5	0.1	.20	2.302585	1.609438	1.4	2.8	3
80	NC00-0023	5.69976	ALBERMARLE SOUND	36.07052	-76.0863	1	0.1	.20	2.302585	1.609438	1.4	1.4	1
81	NC00-0024	6.2484	ALBERMARLE SOUND	36.01022	-76.3141	1.8	0.1	.20	2.302585	1.609438	1.4	0.777778	1
82	NC00-0025	3.6576	ALBERMARLE SOUND	35.98807	-76.6713	1.5	0.1	.20	2.302585	1.609438	1.4	0.933333	1

Sheet1

Ready NUM

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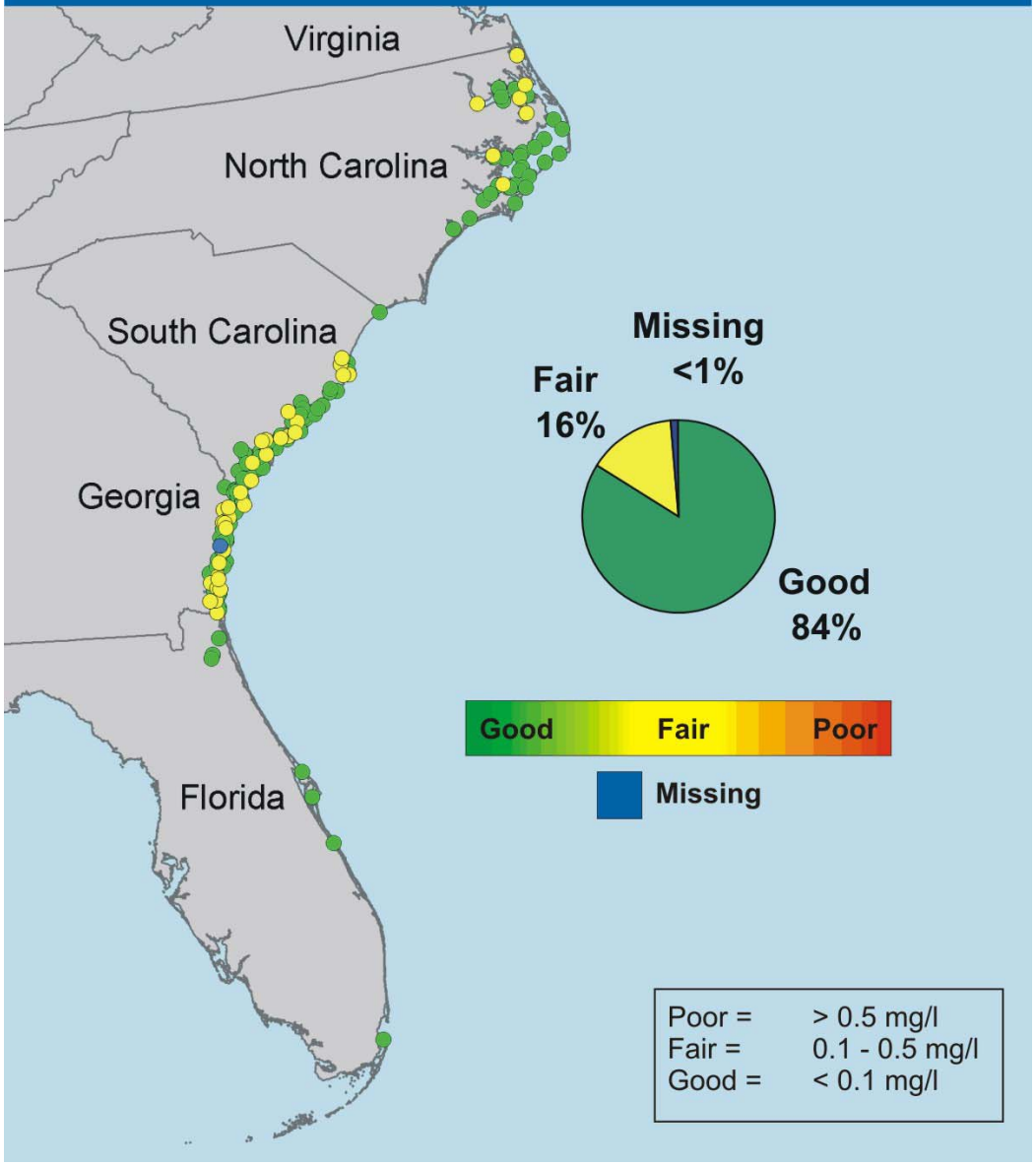
Nitrogen - Southeast (2000)



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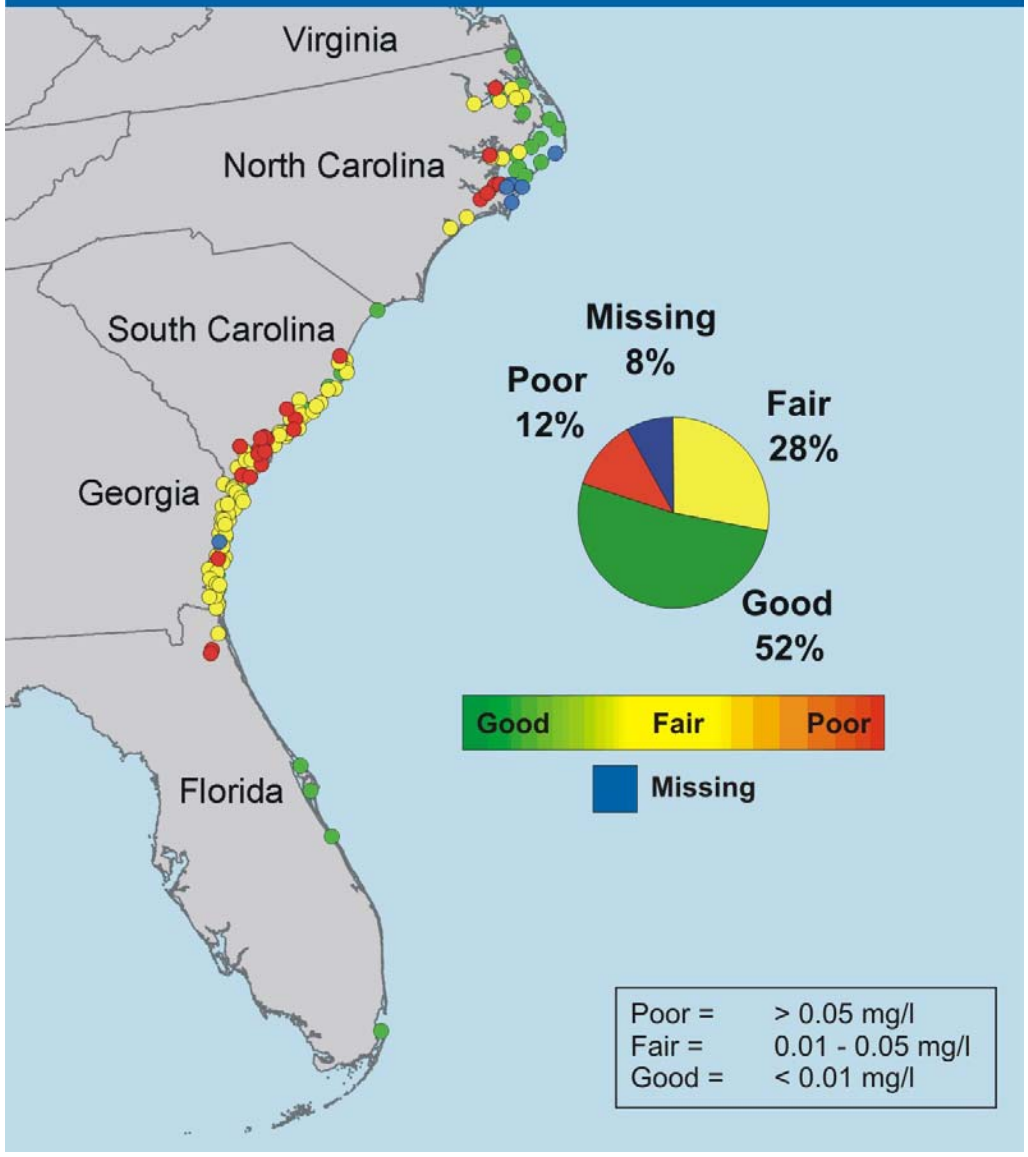
Phosphorus - Southeast (2000)



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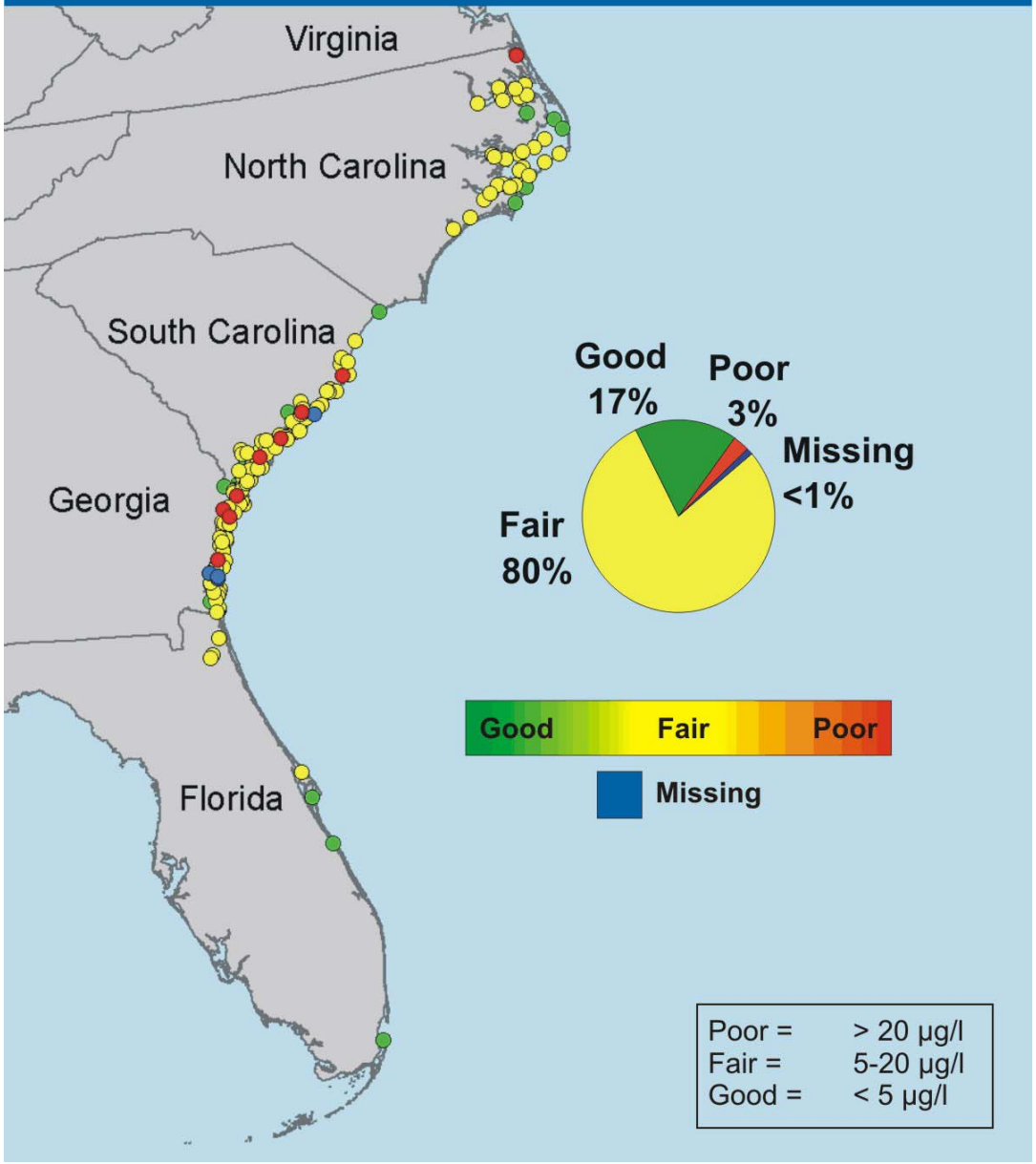
Chlorophyll α- Southeast (2000)



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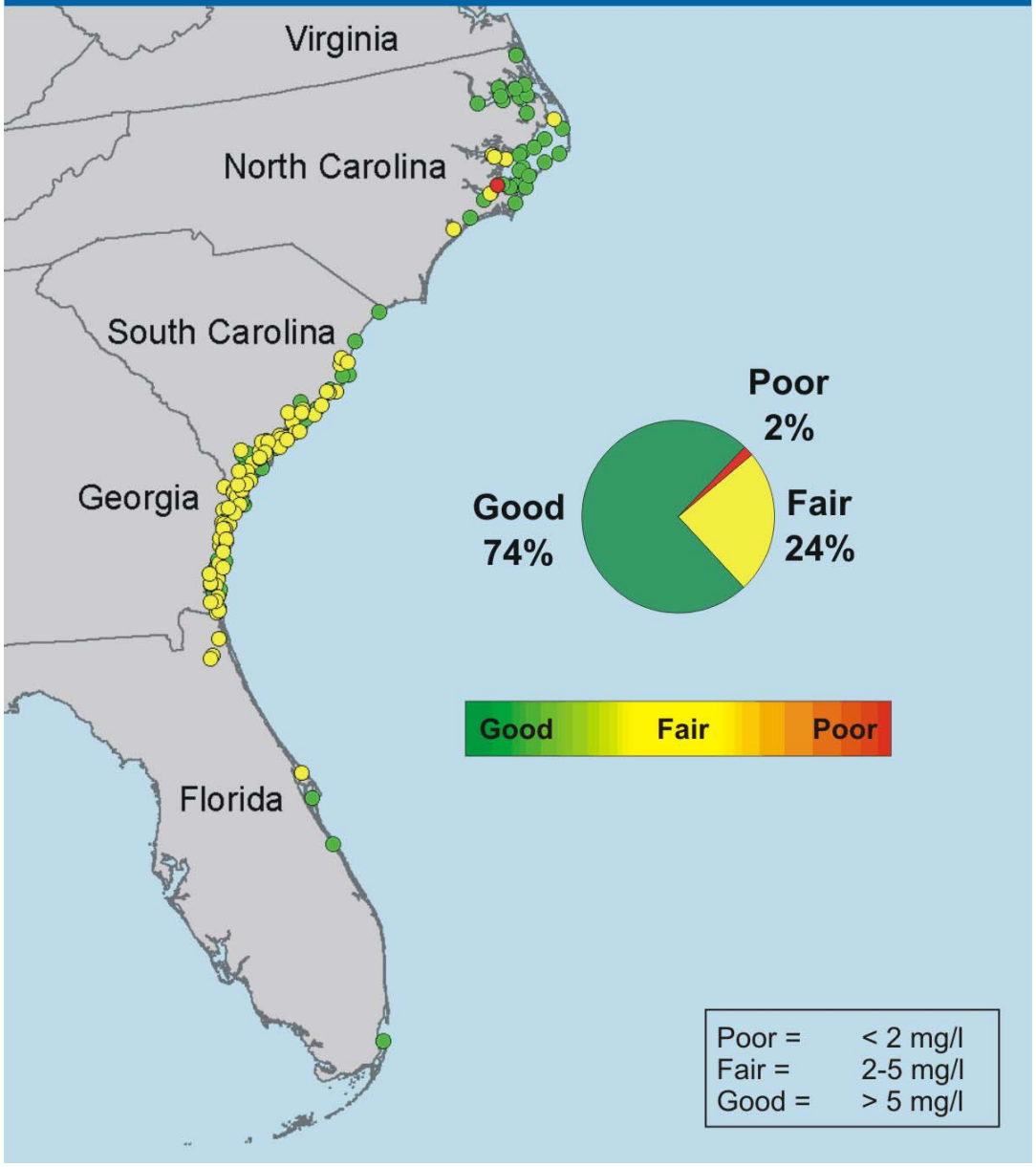
Dissolved Oxygen - Southeast (2000)



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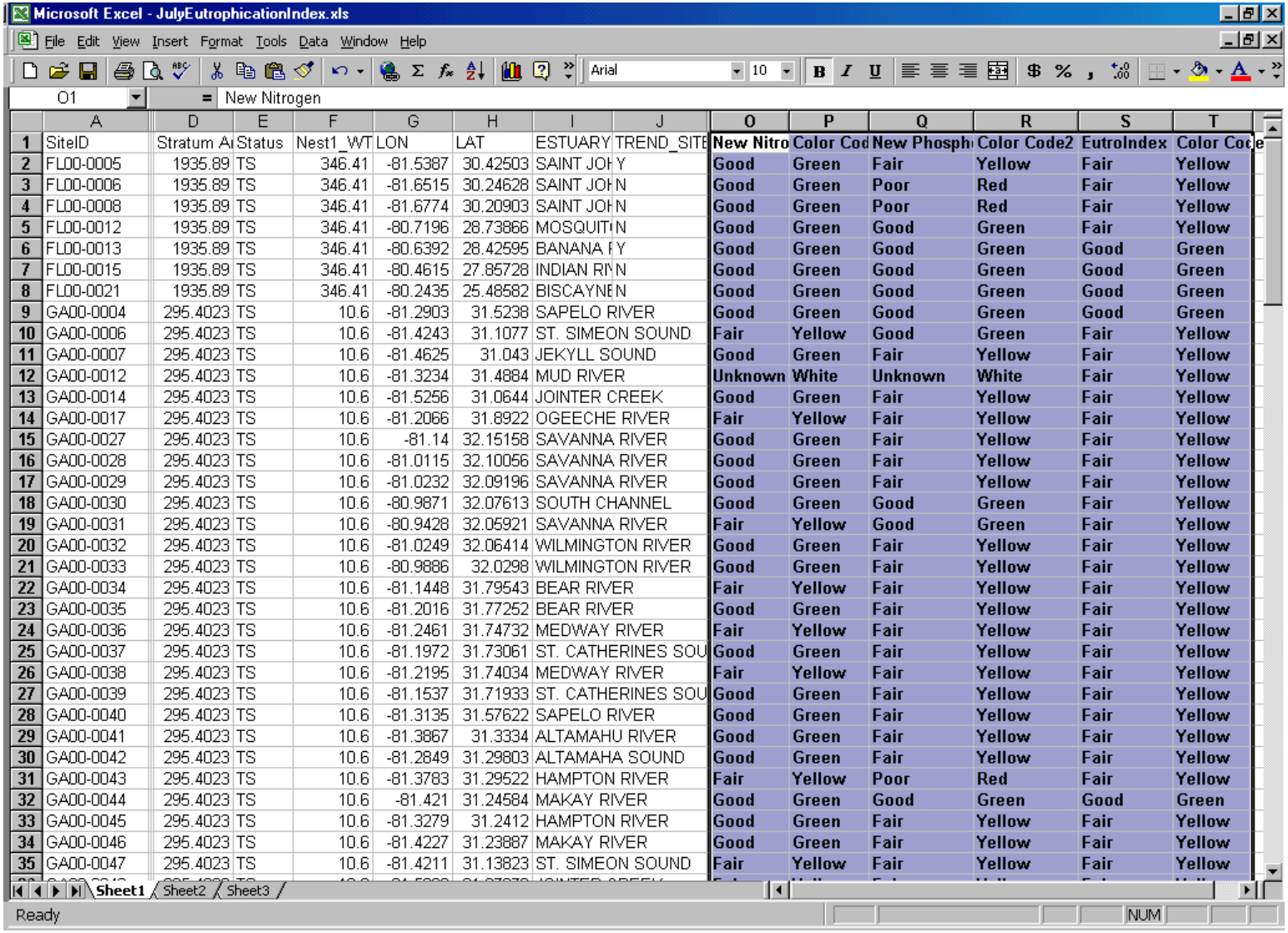

	A	D	E	F	G	H	I	J	O	P	Q	R	S	T
1	SiteID	Stratum Ar	Status	Nest1_WT	LON	LAT	ESTUARY	TREND_SITE	New Nitro	Color Cod	New Phosph	Color Code2	EutroIndex	Color Cod
2	FL00-0005	1935.89	TS	346.41	-81.5387	30.42503	SAINT JOH	Y	Good	Green	Fair	Yellow	Fair	Yellow
3	FL00-0006	1935.89	TS	346.41	-81.6515	30.24628	SAINT JOH	N	Good	Green	Poor	Red	Fair	Yellow
4	FL00-0008	1935.89	TS	346.41	-81.6774	30.20903	SAINT JOH	N	Good	Green	Poor	Red	Fair	Yellow
5	FL00-0012	1935.89	TS	346.41	-80.7196	28.73866	MOSQUITO	N	Good	Green	Good	Green	Fair	Yellow
6	FL00-0013	1935.89	TS	346.41	-80.6392	28.42595	BANANA R	Y	Good	Green	Good	Green	Good	Green
7	FL00-0015	1935.89	TS	346.41	-80.4615	27.85728	INDIAN RI	N	Good	Green	Good	Green	Good	Green
8	FL00-0021	1935.89	TS	346.41	-80.2435	25.48582	BISCAYNE	N	Good	Green	Good	Green	Good	Green
9	GA00-0004	295.4023	TS	10.6	-81.2903	31.5238	SAPELO RIVER		Good	Green	Good	Green	Good	Green
10	GA00-0006	295.4023	TS	10.6	-81.4243	31.1077	ST. SIMEON SOUND		Fair	Yellow	Good	Green	Fair	Yellow
11	GA00-0007	295.4023	TS	10.6	-81.4625	31.043	JEKYLL SOUND		Good	Green	Fair	Yellow	Fair	Yellow
12	GA00-0012	295.4023	TS	10.6	-81.3234	31.4884	MUD RIVER		Unknown	White	Unknown	White	Fair	Yellow
13	GA00-0014	295.4023	TS	10.6	-81.5256	31.0644	JOINTER CREEK		Good	Green	Fair	Yellow	Fair	Yellow
14	GA00-0017	295.4023	TS	10.6	-81.2066	31.8922	OGEECHE RIVER		Fair	Yellow	Fair	Yellow	Fair	Yellow
15	GA00-0027	295.4023	TS	10.6	-81.14	32.15158	SAVANNA RIVER		Good	Green	Fair	Yellow	Fair	Yellow
16	GA00-0028	295.4023	TS	10.6	-81.0115	32.10056	SAVANNA RIVER		Good	Green	Fair	Yellow	Fair	Yellow
17	GA00-0029	295.4023	TS	10.6	-81.0232	32.09196	SAVANNA RIVER		Good	Green	Fair	Yellow	Fair	Yellow
18	GA00-0030	295.4023	TS	10.6	-80.9871	32.07613	SOUTH CHANNEL		Good	Green	Good	Green	Fair	Yellow
19	GA00-0031	295.4023	TS	10.6	-80.9428	32.05921	SAVANNA RIVER		Fair	Yellow	Good	Green	Fair	Yellow
20	GA00-0032	295.4023	TS	10.6	-81.0249	32.06414	WILMINGTON RIVER		Good	Green	Fair	Yellow	Fair	Yellow
21	GA00-0033	295.4023	TS	10.6	-80.9886	32.0298	WILMINGTON RIVER		Good	Green	Fair	Yellow	Fair	Yellow
22	GA00-0034	295.4023	TS	10.6	-81.1448	31.79543	BEAR RIVER		Fair	Yellow	Fair	Yellow	Fair	Yellow
23	GA00-0035	295.4023	TS	10.6	-81.2016	31.77252	BEAR RIVER		Good	Green	Fair	Yellow	Fair	Yellow
24	GA00-0036	295.4023	TS	10.6	-81.2461	31.74732	MEDWAY RIVER		Fair	Yellow	Fair	Yellow	Fair	Yellow
25	GA00-0037	295.4023	TS	10.6	-81.1972	31.73061	ST. CATHERINES SOU		Good	Green	Fair	Yellow	Fair	Yellow
26	GA00-0038	295.4023	TS	10.6	-81.2195	31.74034	MEDWAY RIVER		Fair	Yellow	Fair	Yellow	Fair	Yellow
27	GA00-0039	295.4023	TS	10.6	-81.1537	31.71933	ST. CATHERINES SOU		Good	Green	Fair	Yellow	Fair	Yellow
28	GA00-0040	295.4023	TS	10.6	-81.3135	31.57622	SAPELO RIVER		Good	Green	Fair	Yellow	Fair	Yellow
29	GA00-0041	295.4023	TS	10.6	-81.3867	31.3334	ALTAMAHU RIVER		Good	Green	Fair	Yellow	Fair	Yellow
30	GA00-0042	295.4023	TS	10.6	-81.2849	31.29803	ALTAMAHA SOUND		Good	Green	Fair	Yellow	Fair	Yellow
31	GA00-0043	295.4023	TS	10.6	-81.3783	31.29522	HAMPTON RIVER		Fair	Yellow	Poor	Red	Fair	Yellow
32	GA00-0044	295.4023	TS	10.6	-81.421	31.24584	MAKAY RIVER		Good	Green	Good	Green	Good	Green
33	GA00-0045	295.4023	TS	10.6	-81.3279	31.2412	HAMPTON RIVER		Good	Green	Fair	Yellow	Fair	Yellow
34	GA00-0046	295.4023	TS	10.6	-81.4227	31.23887	MAKAY RIVER		Good	Green	Fair	Yellow	Fair	Yellow
35	GA00-0047	295.4023	TS	10.6	-81.4211	31.13823	ST. SIMEON SOUND		Fair	Yellow	Fair	Yellow	Fair	Yellow

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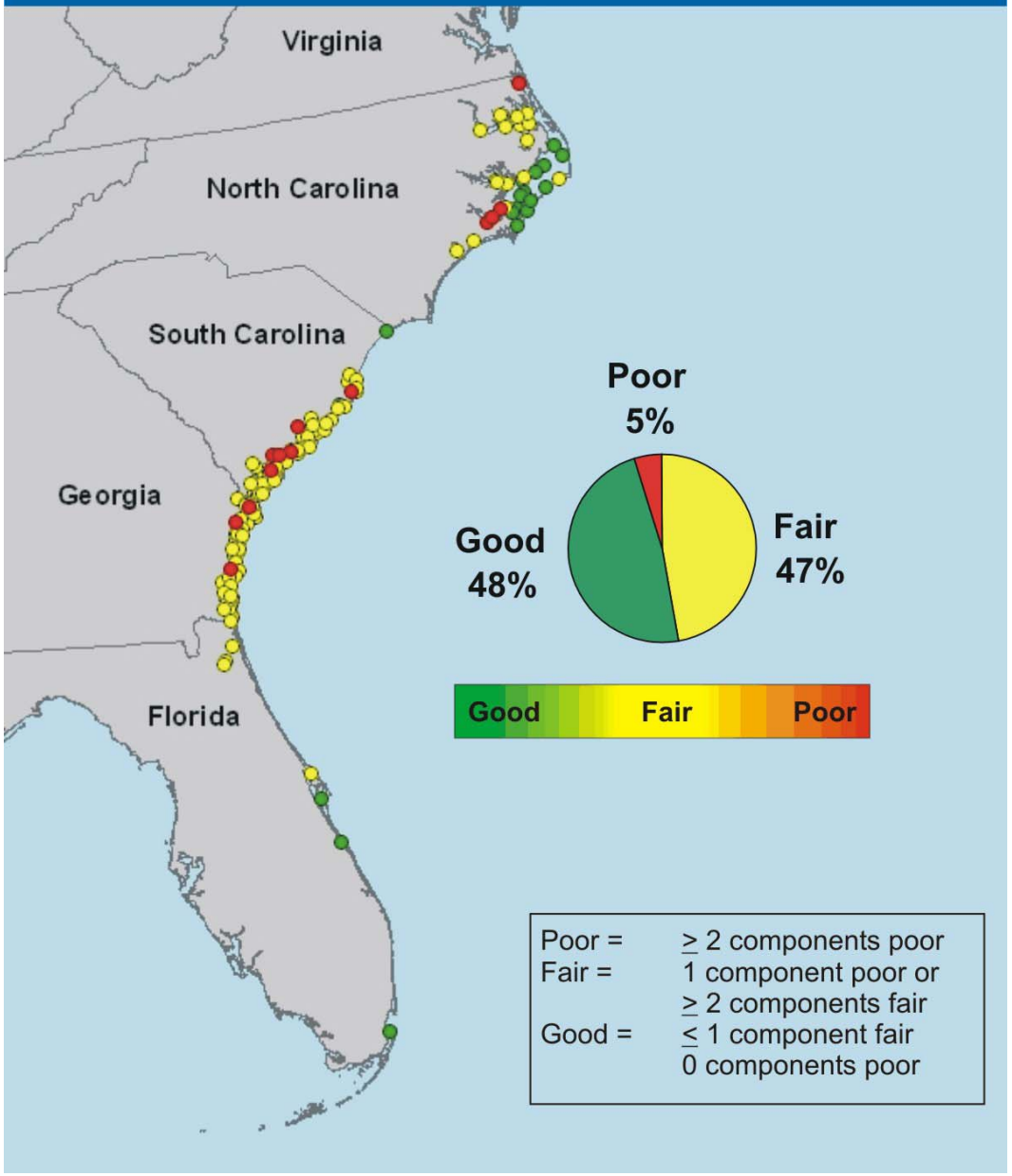
Water Quality Index - Southeast (2000)



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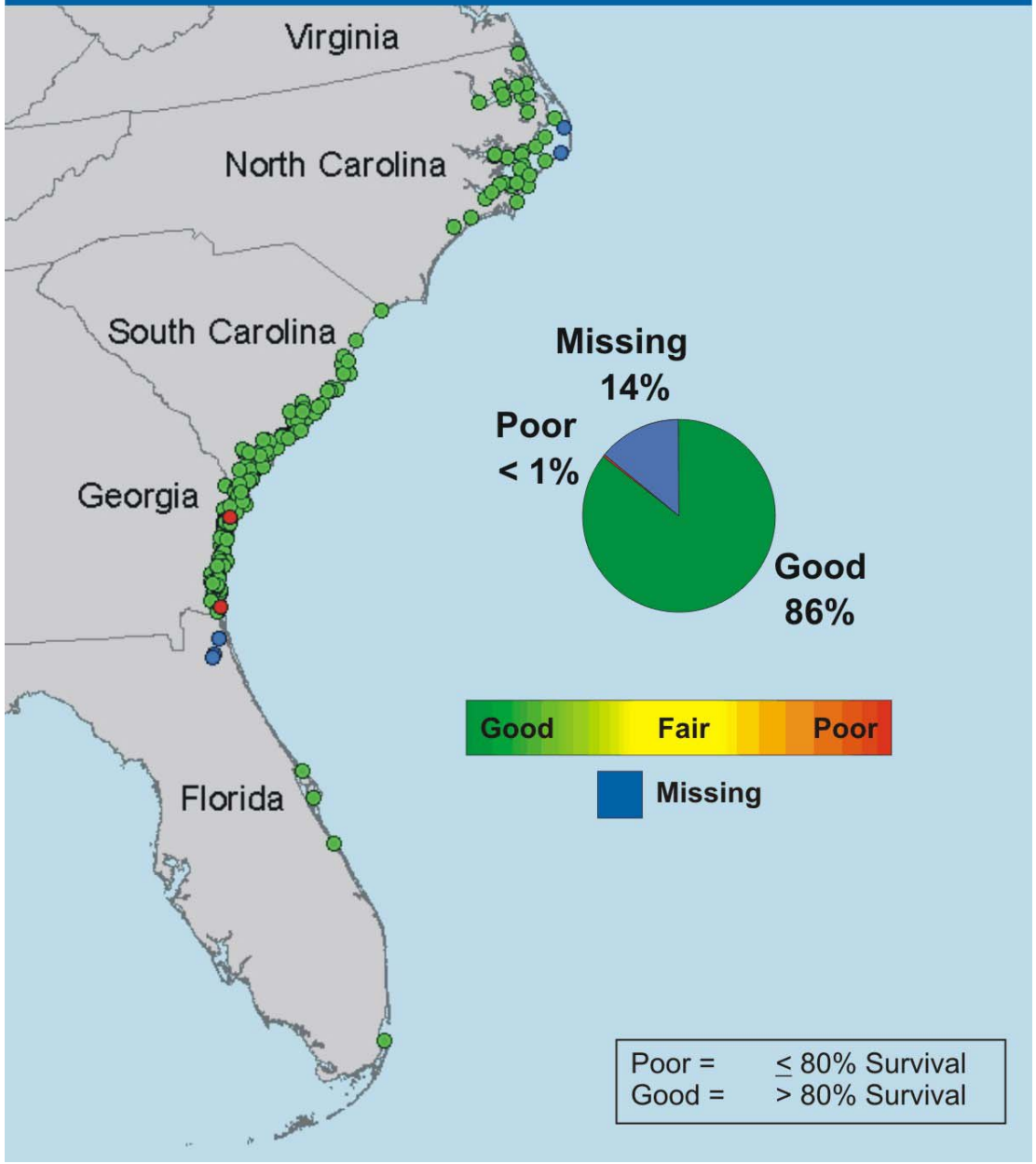
Sediment Toxicity - Southeast (2000)



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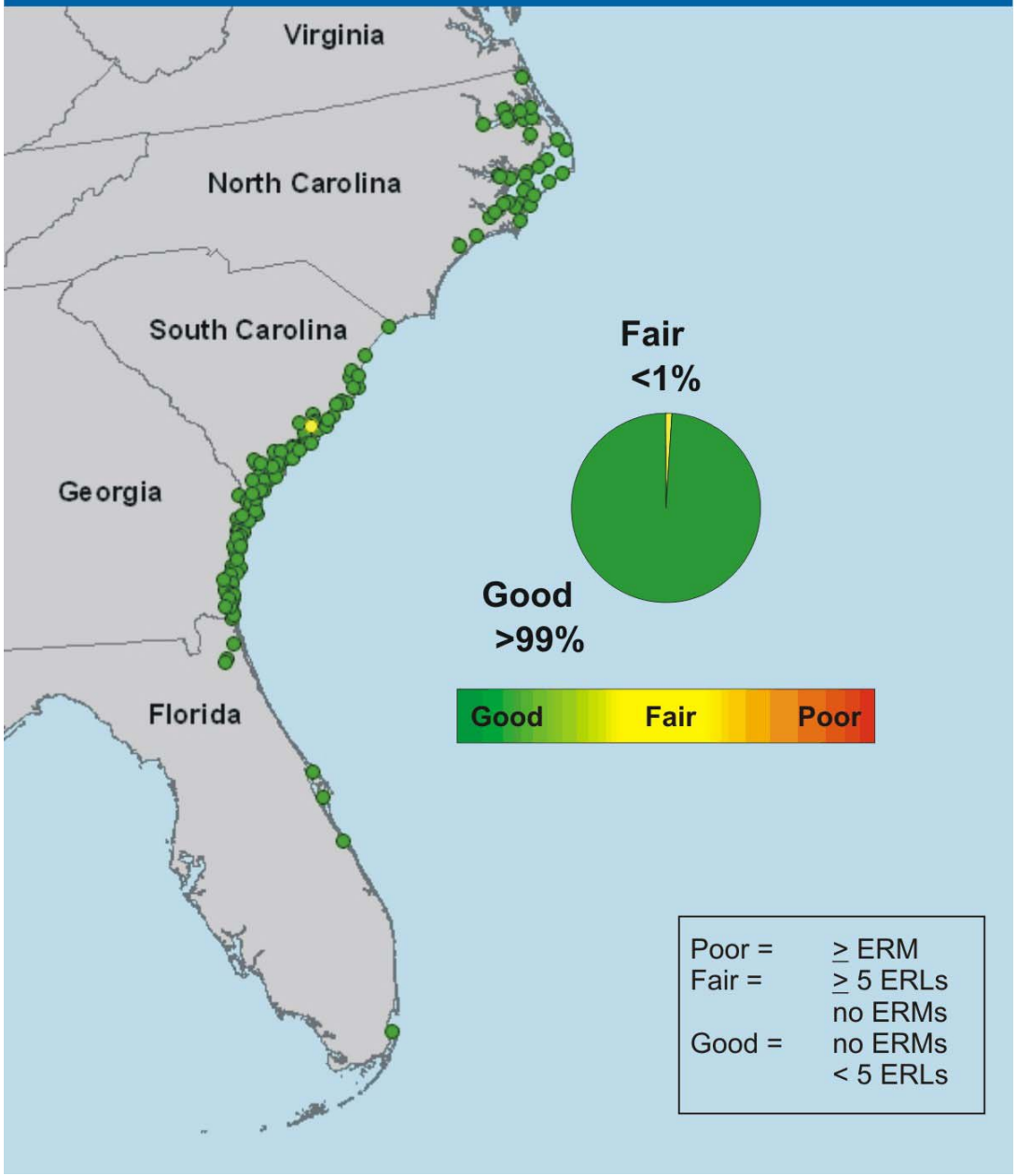
Sediment Contamination - Southeast (2000)



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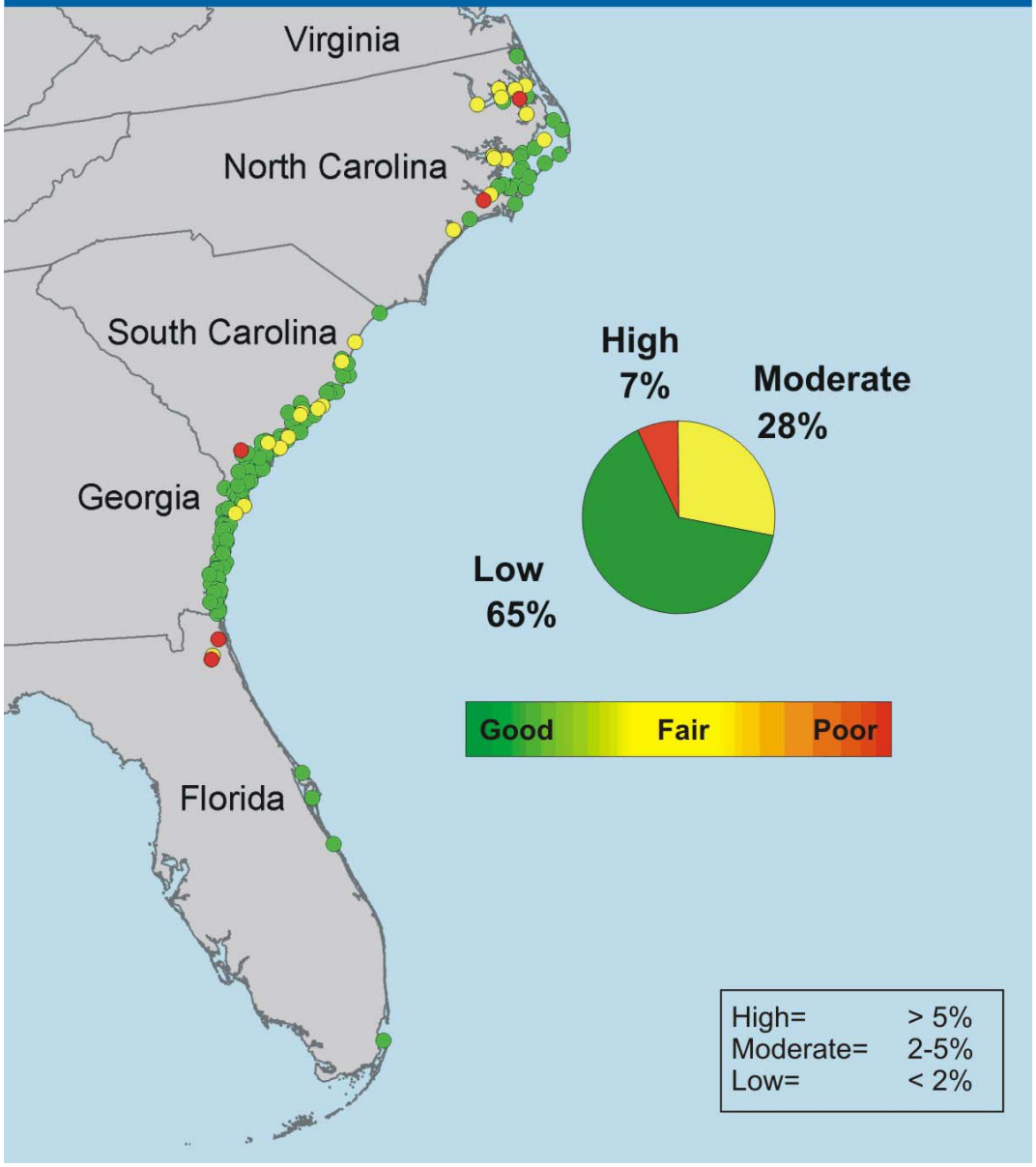
Total Organic Carbon - Southeast (2000)



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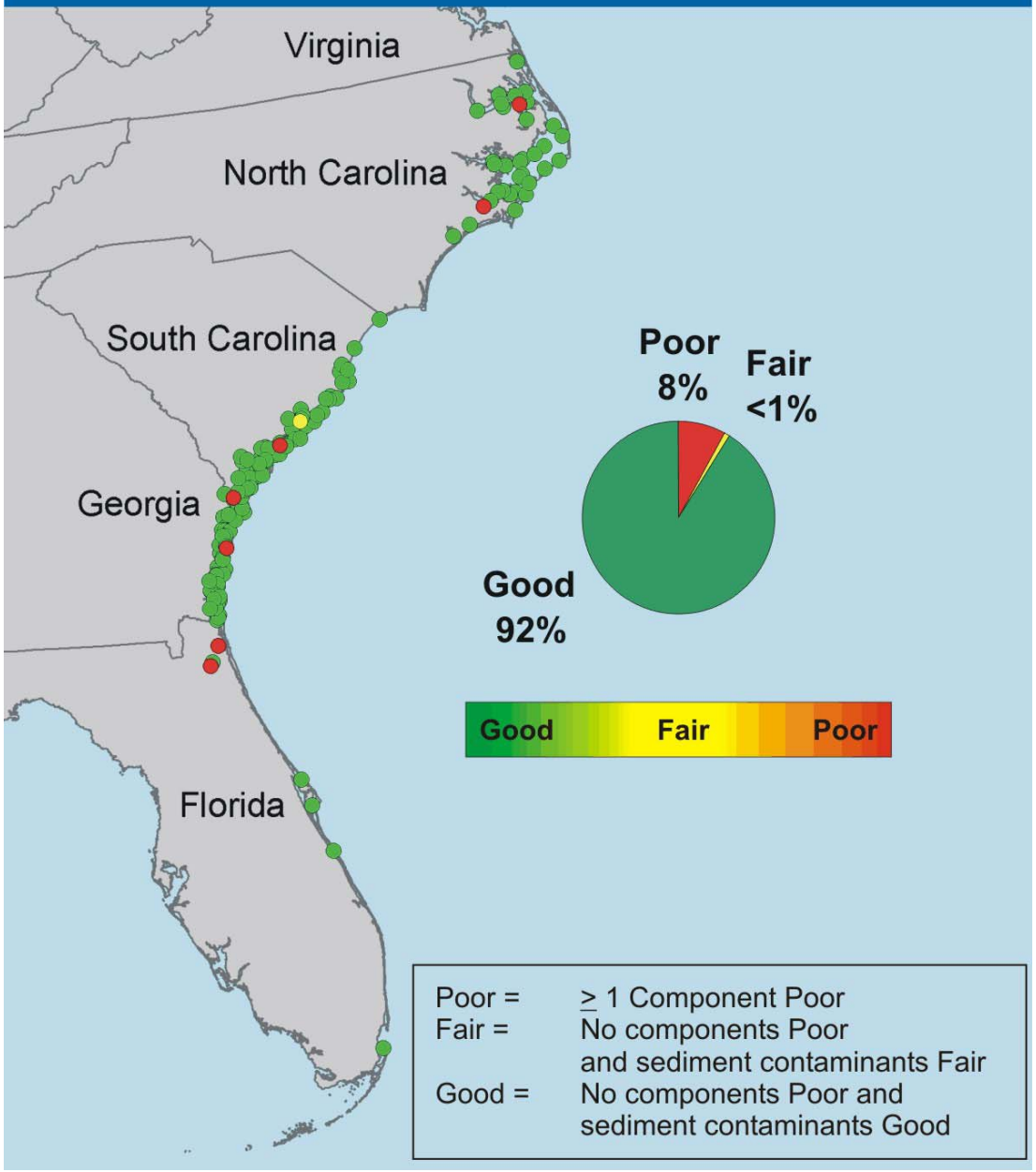
Sediment Quality Index- Southeast (2000)



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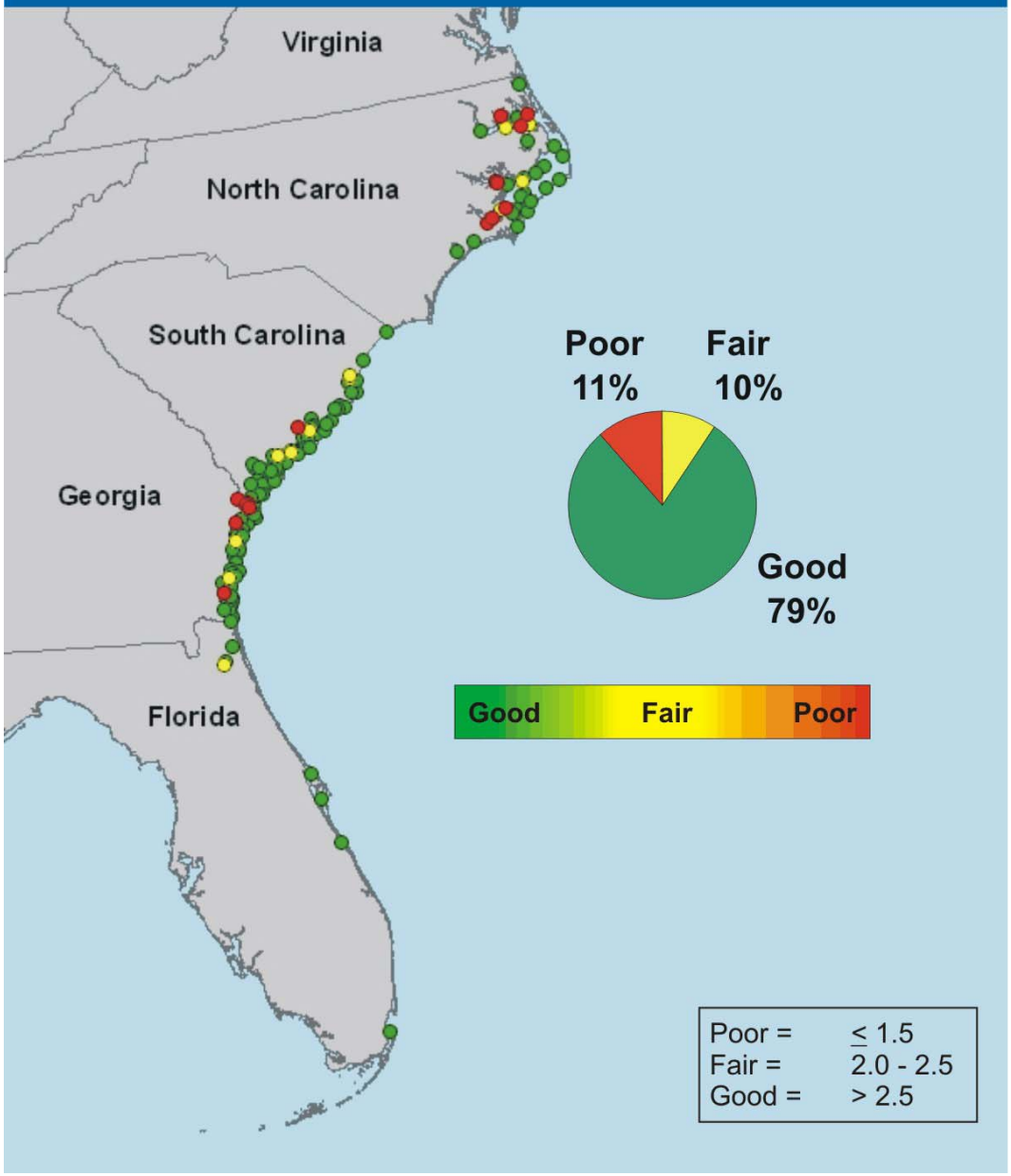
Benthic Index - Southeast (2000)



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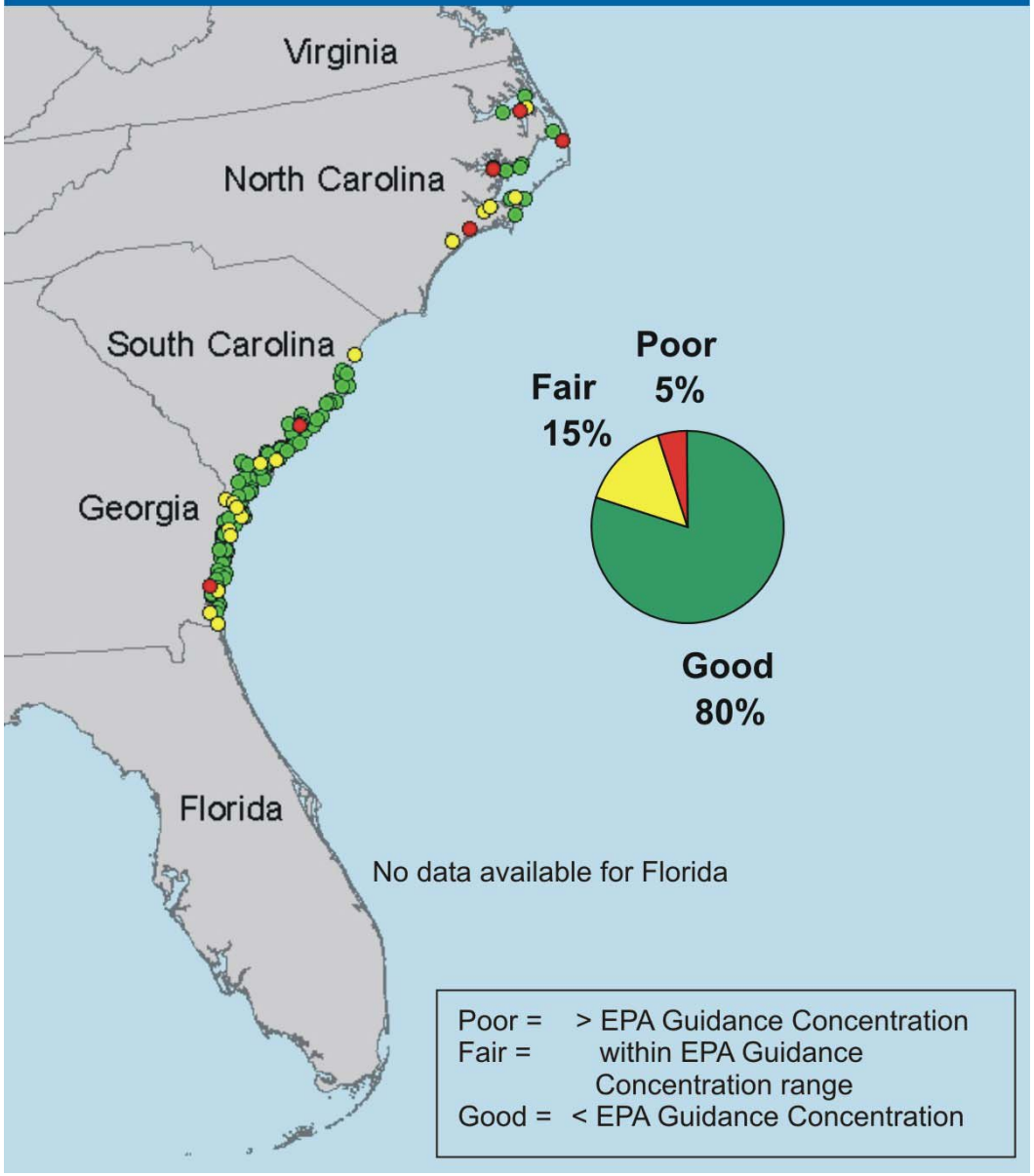
Tissue Contaminants - Southeast (2000)



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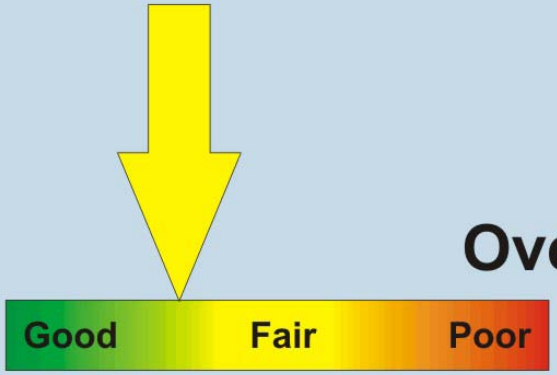
Overall Condition - Southeast (2000)



Overall Score (3.8)

- **Coastal Wetlands (3)**
- **Water Quality Index (4)**
- **Sediment Condition (4)**
- **Benthic Condition (3)**
- **Fish Contaminants (5)**

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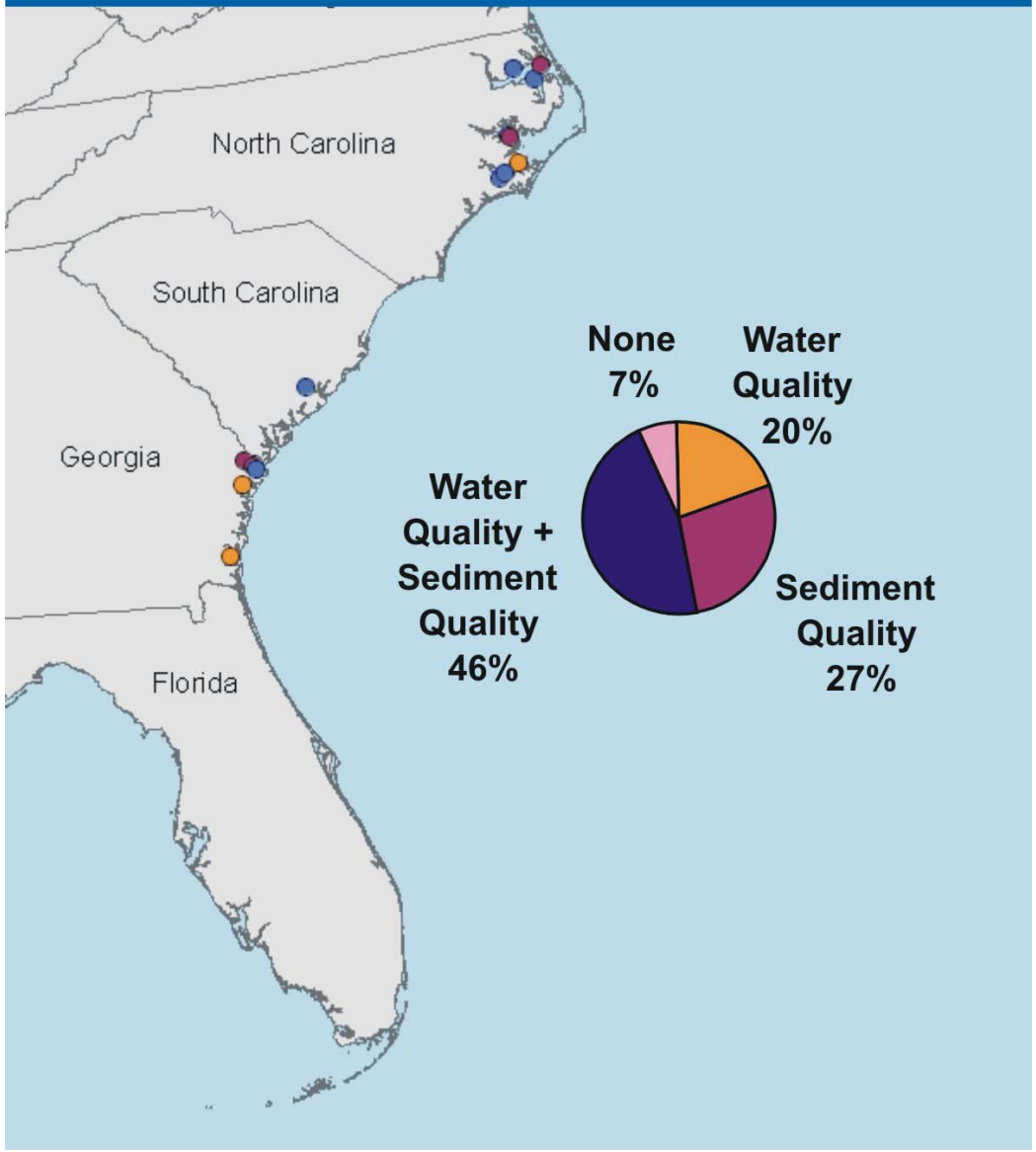
Poor Water/Sediment Quality Indicators that Co-Occur with Low Benthic Diversity

Southeast (2000)



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Summary

- Overall condition is fair to good
- Less than 5% of the area of SE estuaries is in poor condition, based on DO, sediment toxicity, and sediment chemical contamination.
- Water quality index is a potential concern with 52% of the area rated as fair or poor.

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Summary

- Benthic index rated 11% area as poor.
- Although only 2% and 12% of SE were rated in poor condition for Chl*a* and phosphorus, 80% and 28% were rated as fair, respectively.

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Thank you