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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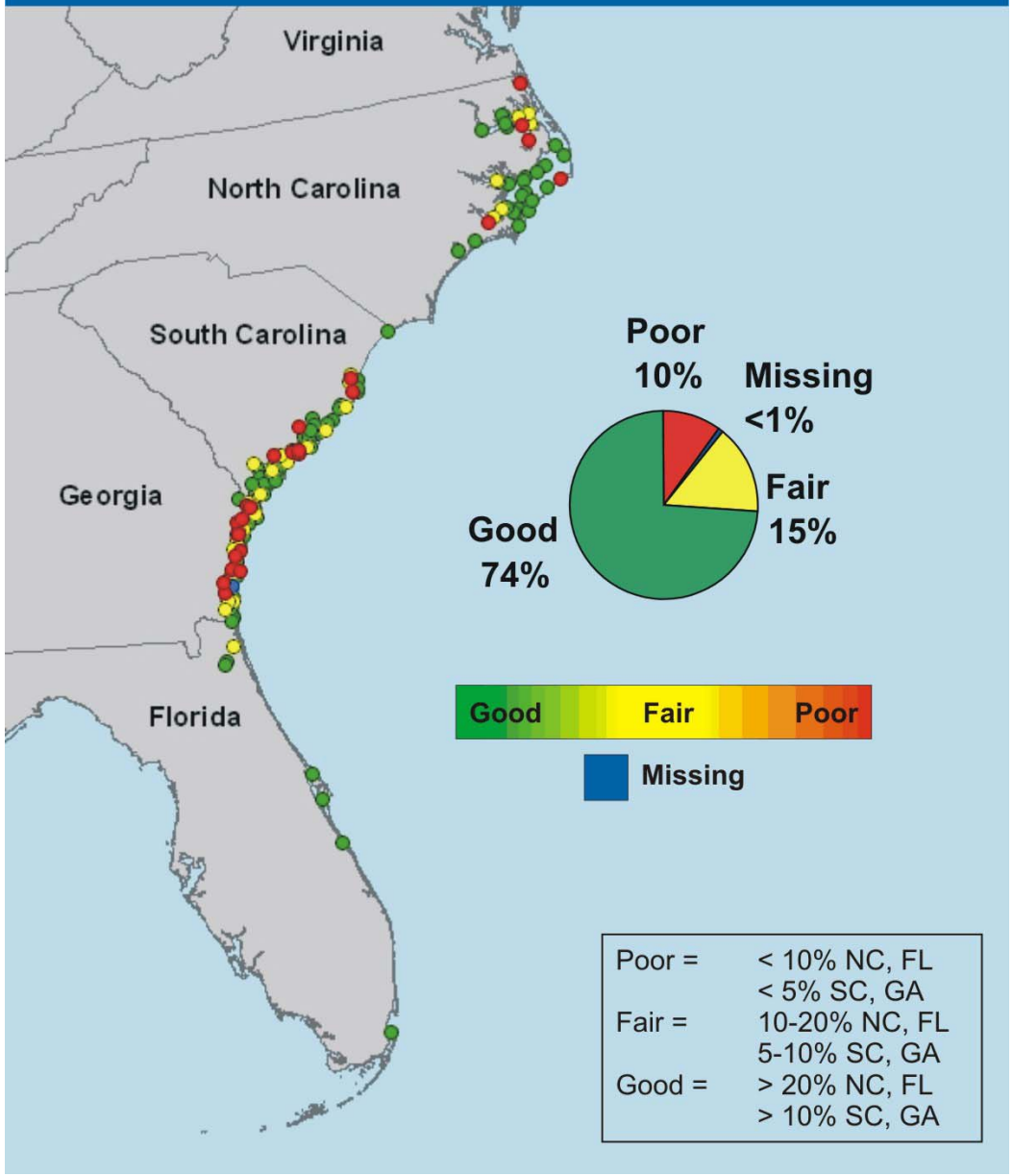
Water Clarity - Southeast (2000)



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Microsoft Excel - waterclarity index 62403.xls

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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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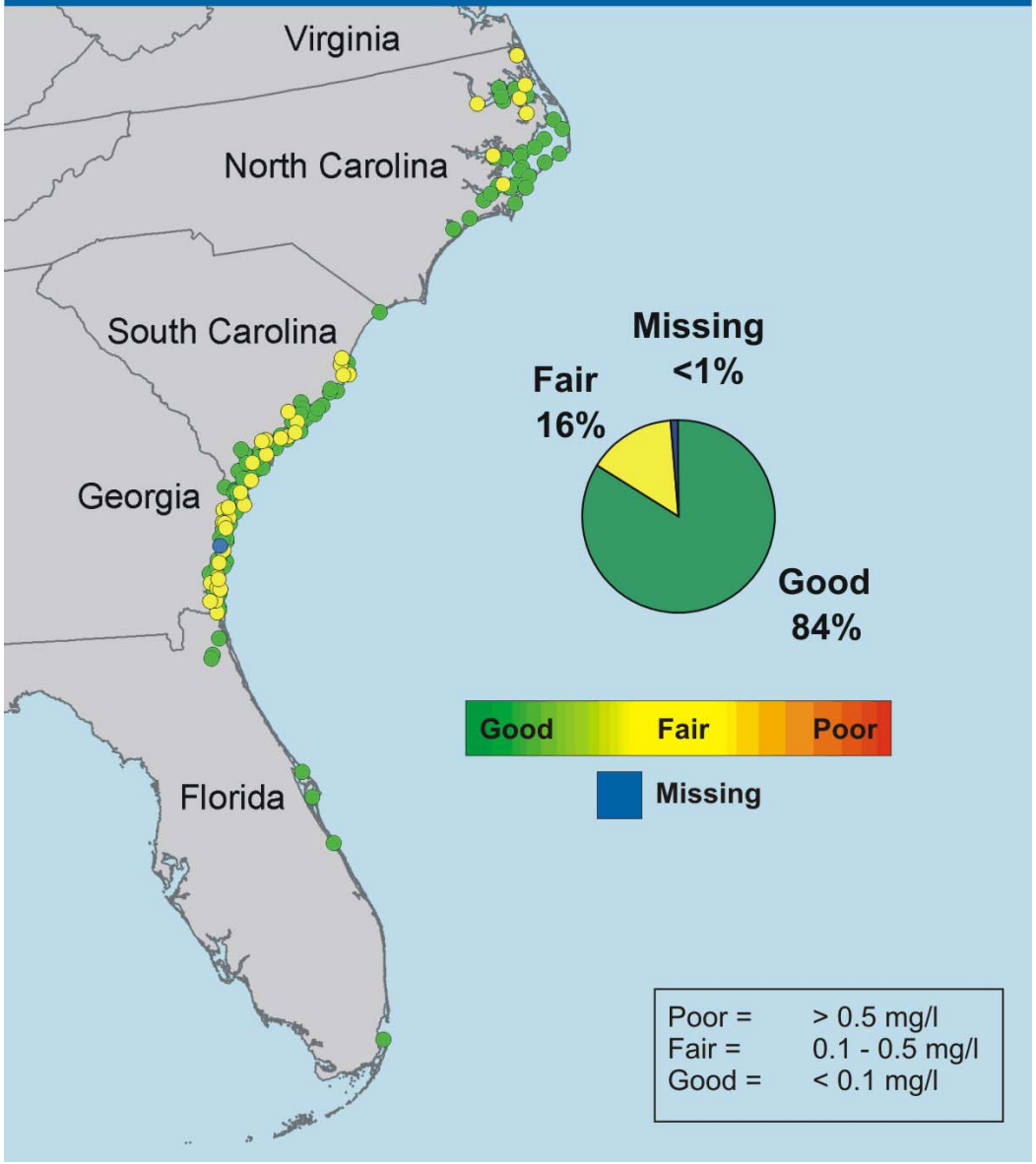
Nitrogen - Southeast (2000)



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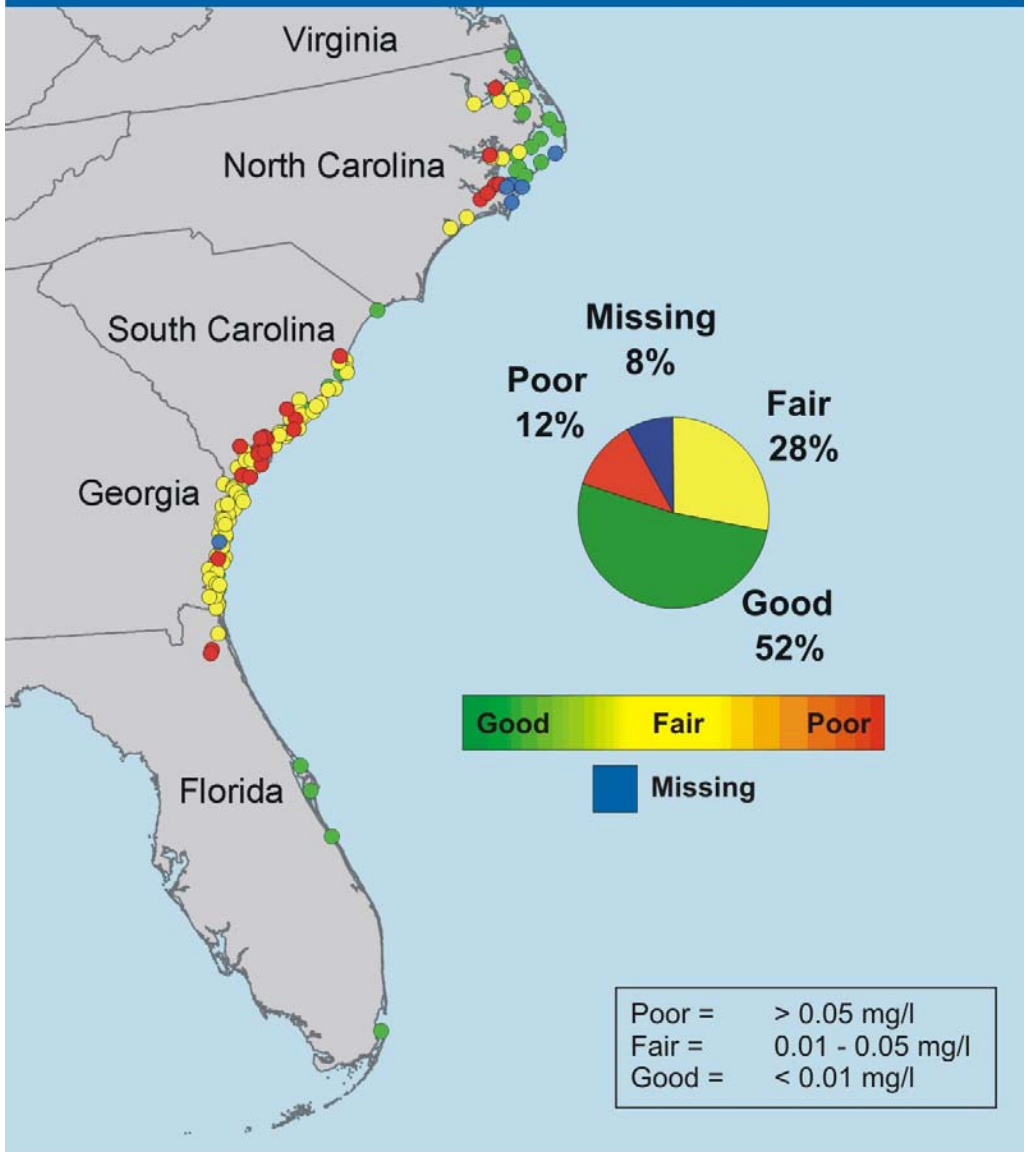
Phosphorus - Southeast (2000)



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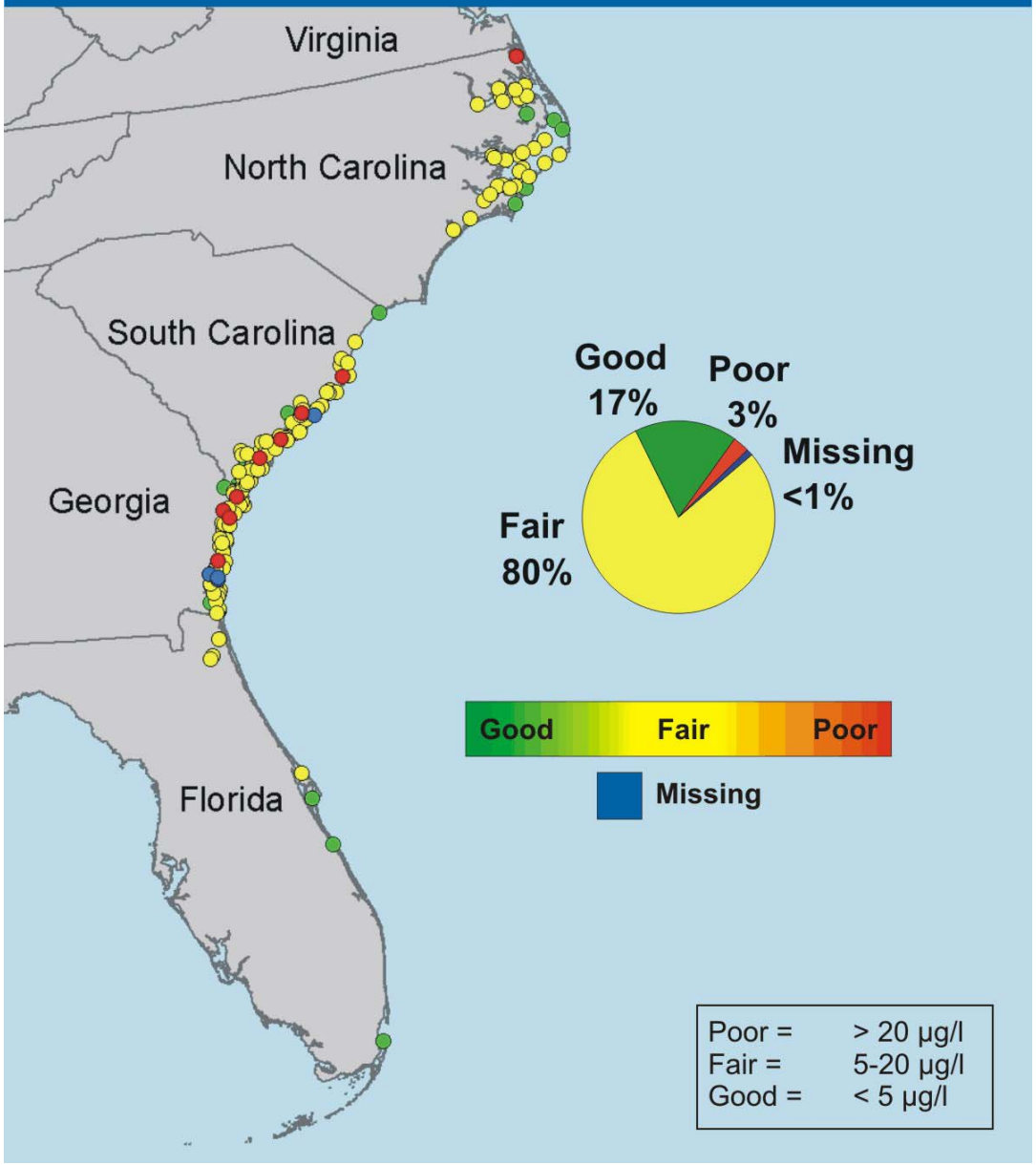
Chlorophyll α- Southeast (2000)



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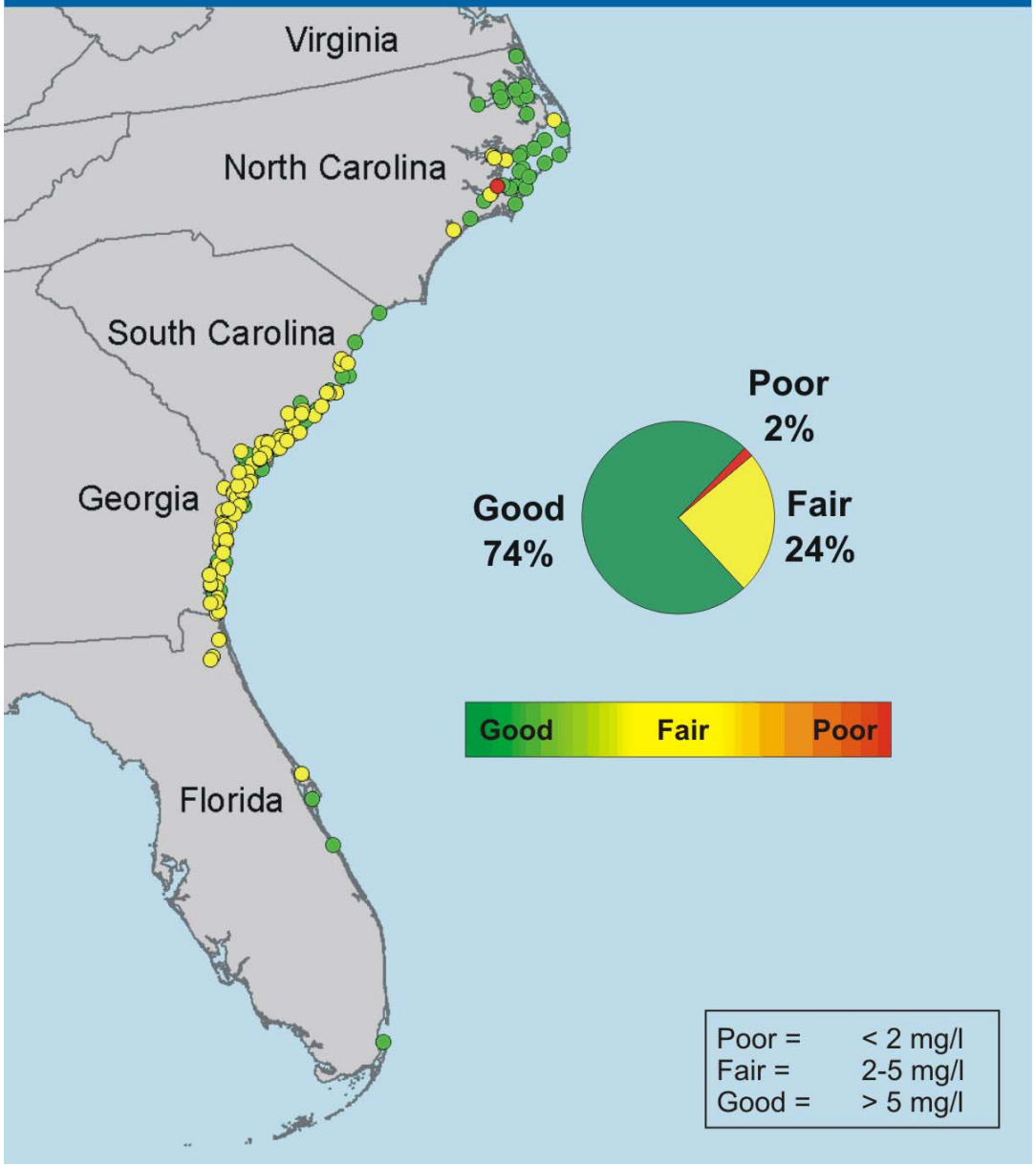
Dissolved Oxygen - Southeast (2000)



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Microsoft Excel - JulyEutrophicationIndex.xls

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O1 = New Nitrogen

	A	D	E	F	G	H	I	J	O	P	Q	R	S	T
1	SiteID	Stratum A	Status	Nest1_WT	LON	LAT	ESTUARY	TREND_SITE	New Nitro	Color Cod	New Phosph	Color Code2	EutroIndex	Color Code
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

Sheet1 Sheet2 Sheet3

Ready NUM

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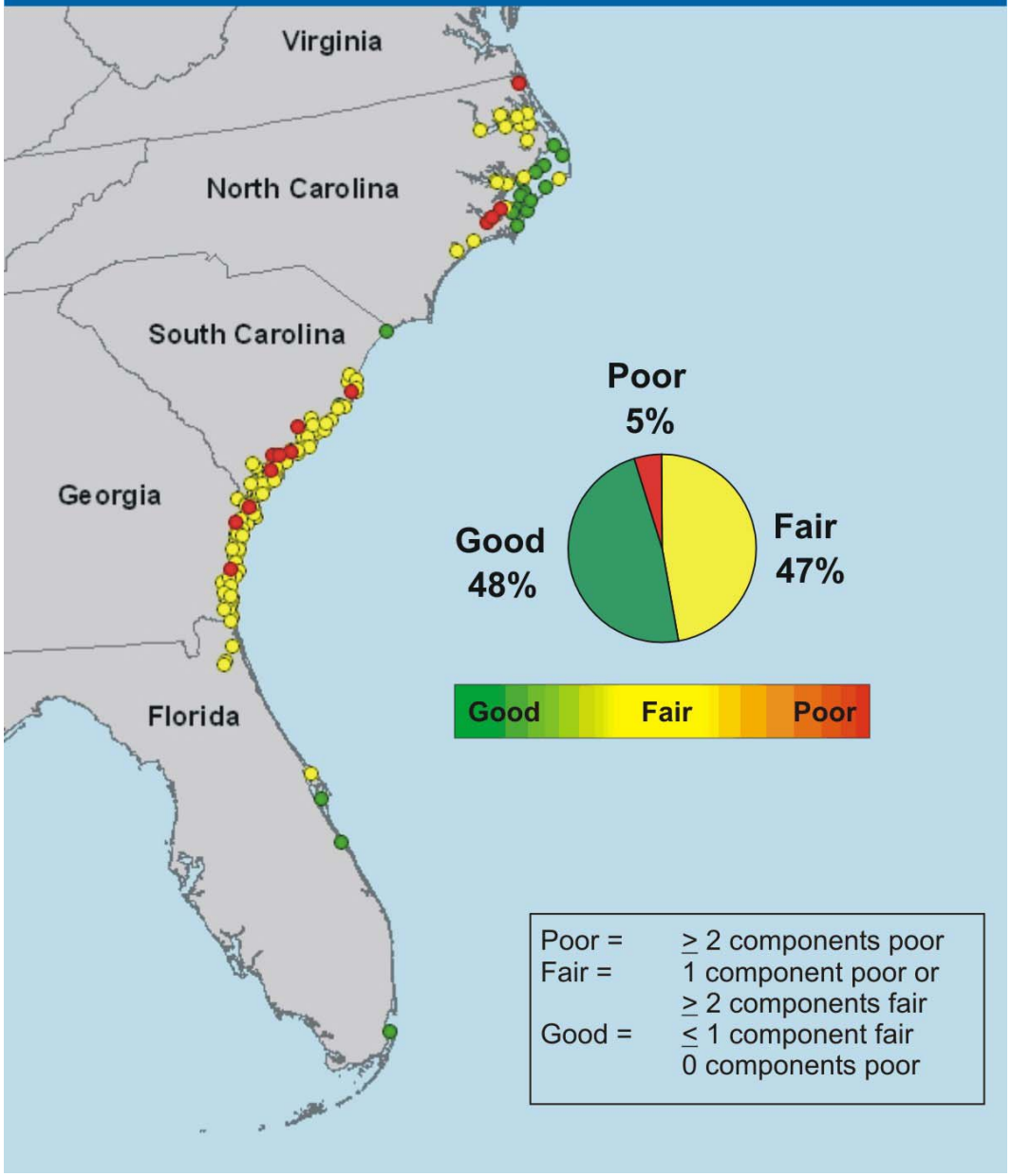
Water Quality Index - Southeast (2000)



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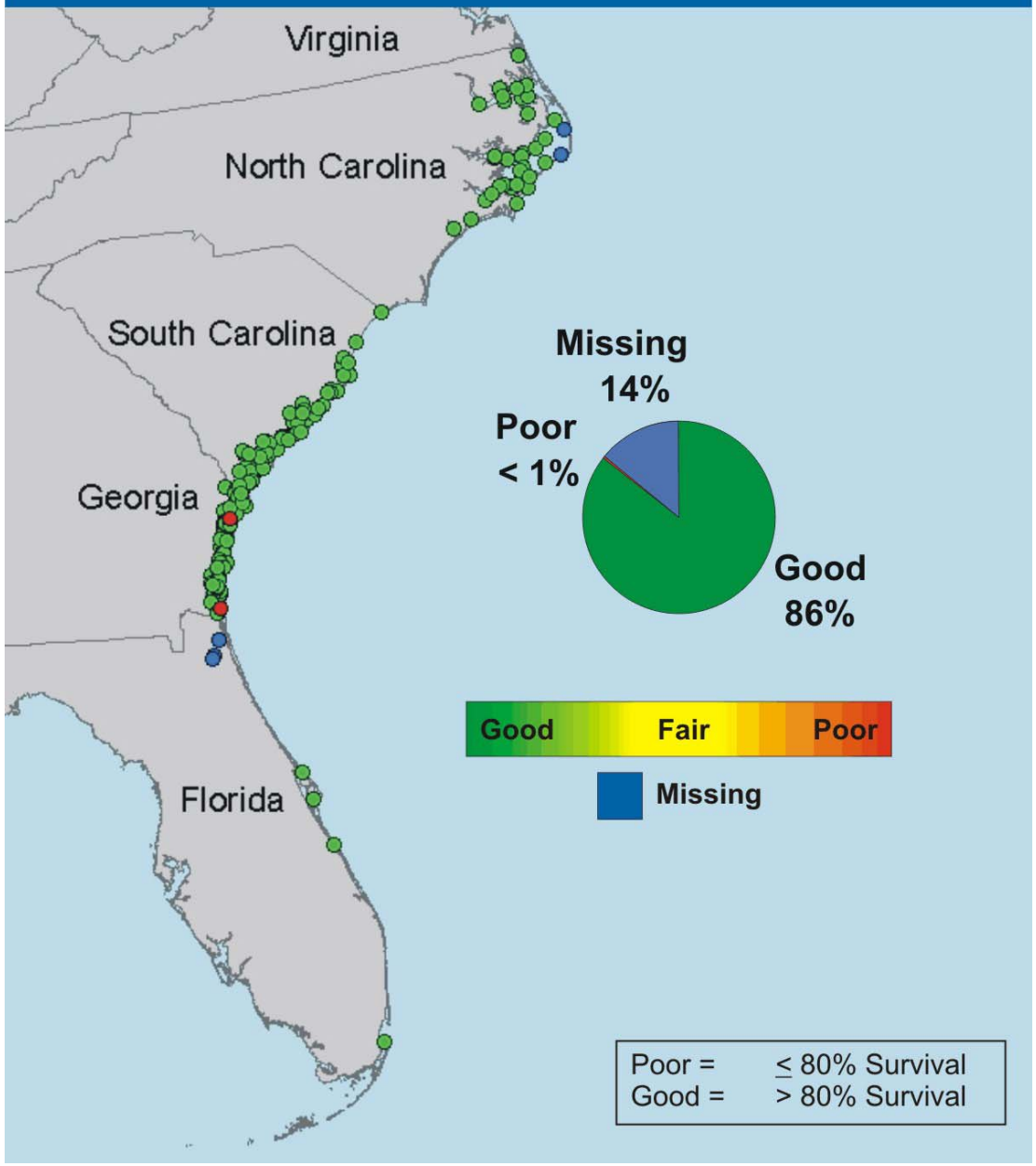
Sediment Toxicity - Southeast (2000)



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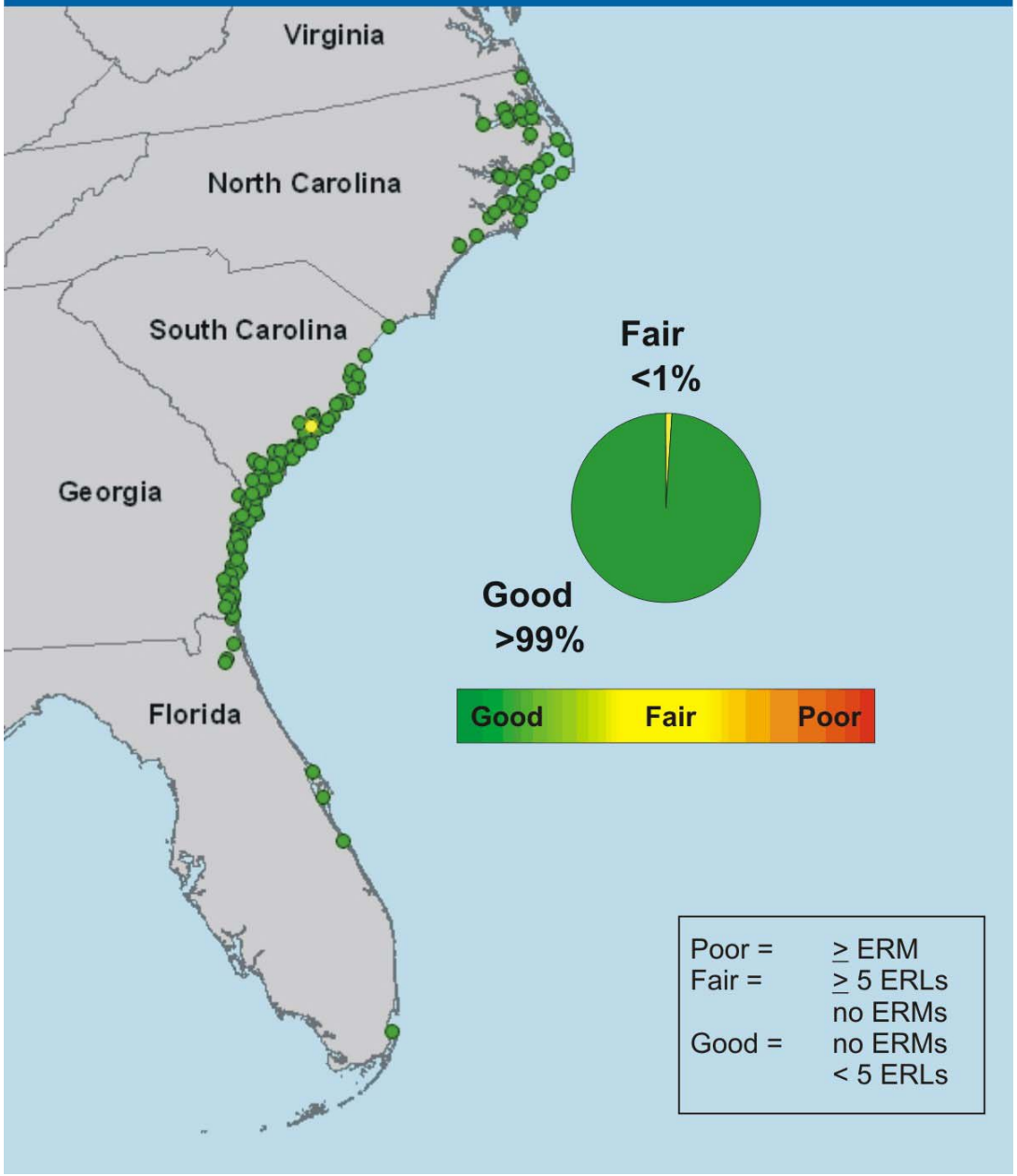
Sediment Contamination - Southeast (2000)



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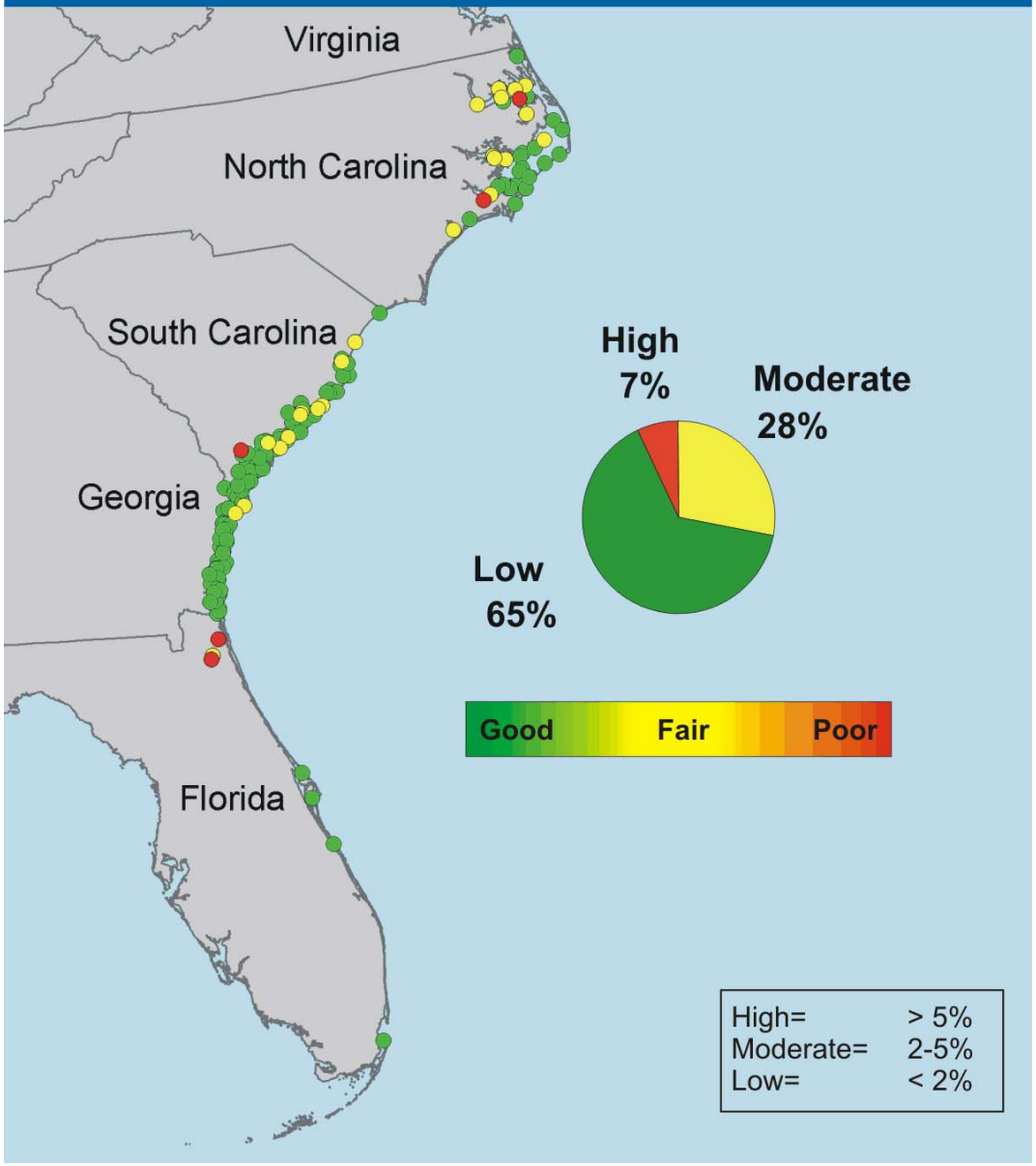
Total Organic Carbon - Southeast (2000)



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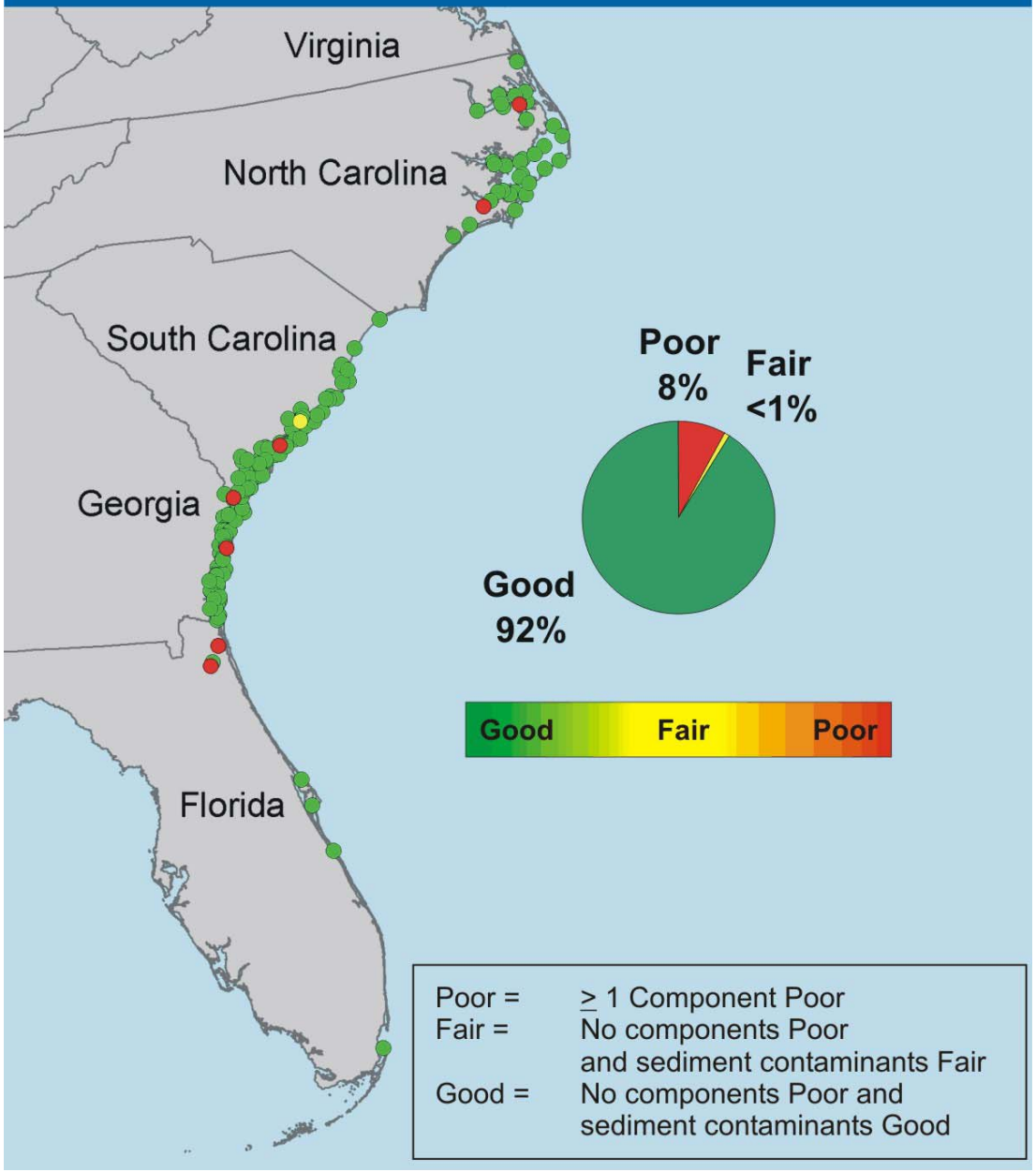
Sediment Quality Index- Southeast (2000)



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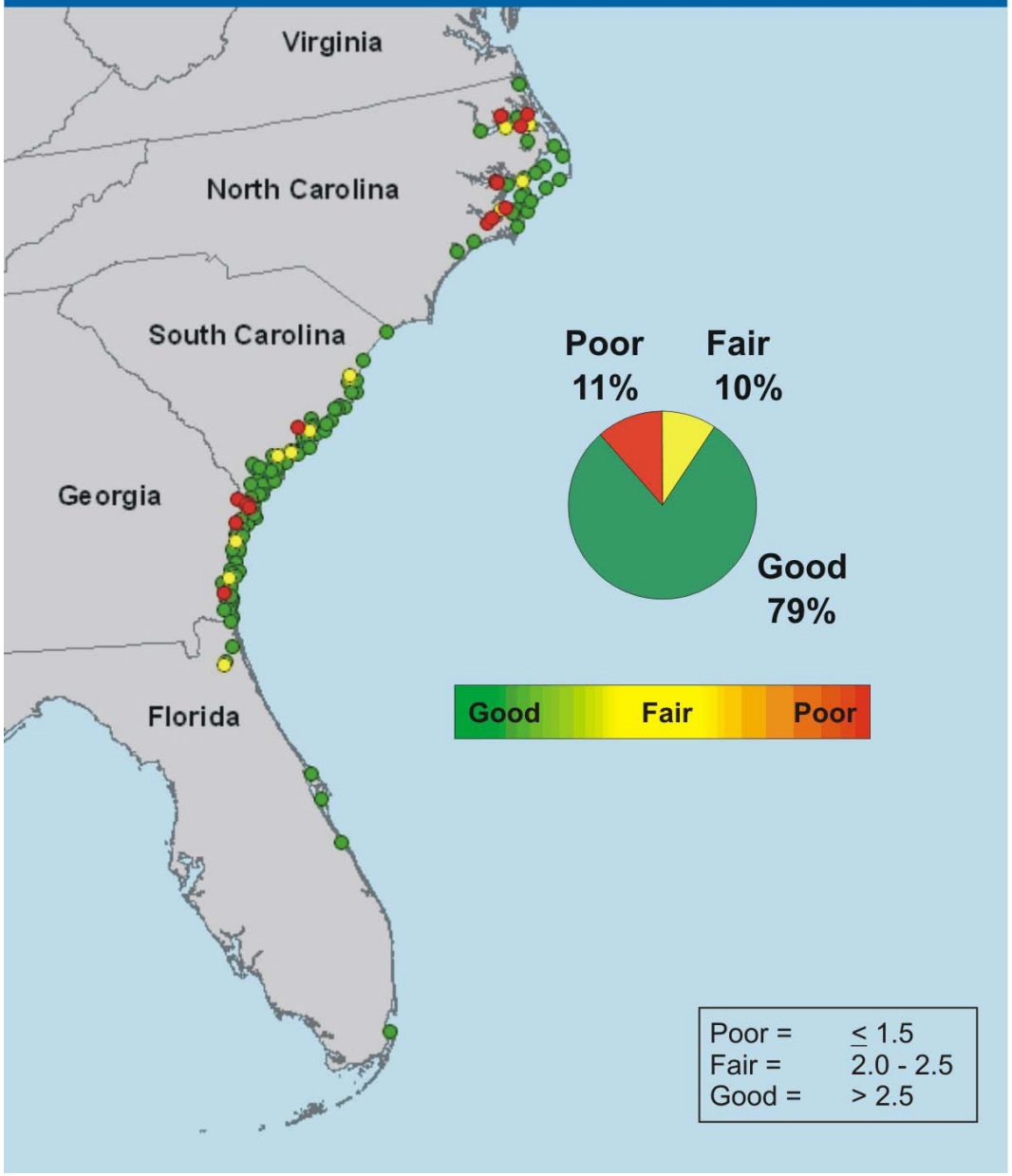
Benthic Index - Southeast (2000)



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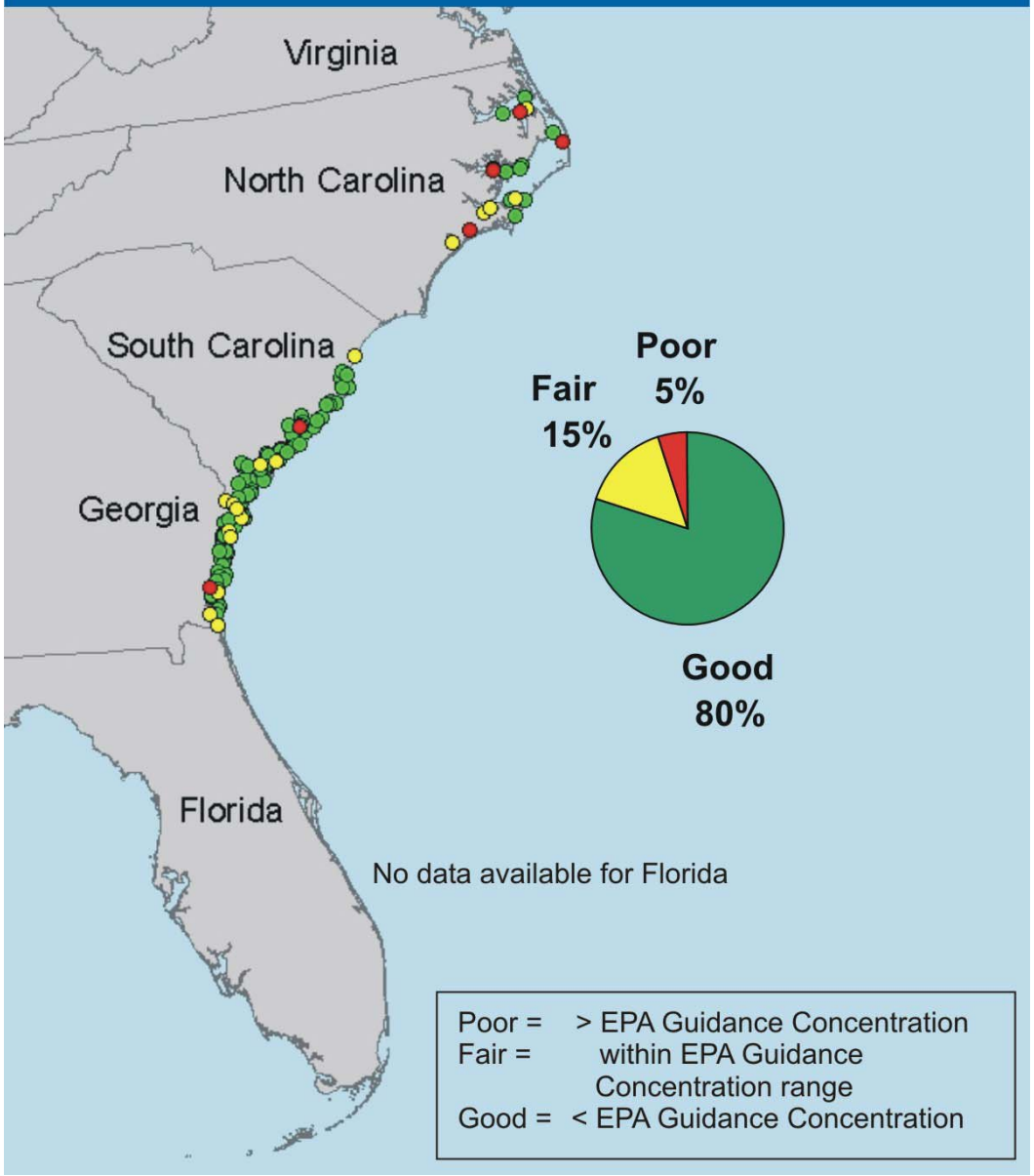
Tissue Contaminants - Southeast (2000)



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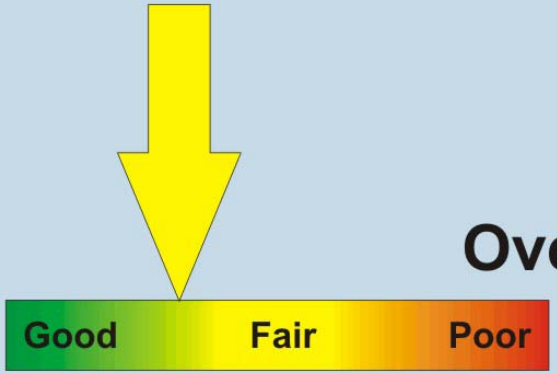
Overall Condition - Southeast (2000)



Overall Score (3.8)

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

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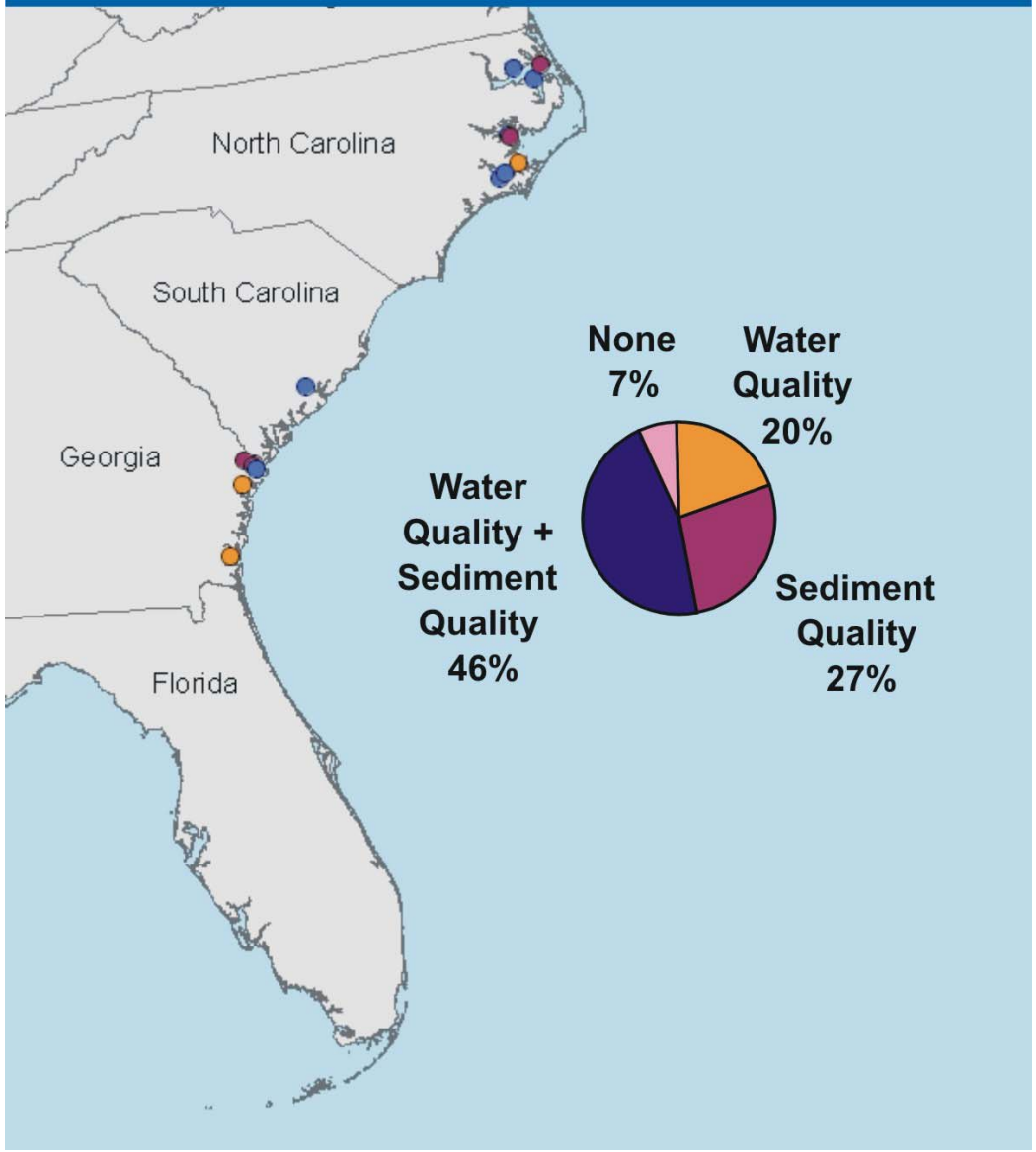
Poor Water/Sediment Quality Indicators that Co-Occur with Low Benthic Diversity

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

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U.S. Environmental Protection Agency

National Coastal Assessment

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EPA United States Environmental Protection Agency

NATIONAL COASTAL ASSESSMENT

The US EPA's National Coastal Assessment (also known as Coastal 2000) is a five-year effort to survey the condition of the Nation's coastal resources by creating an integrated, comprehensive coastal monitoring program among the coastal states.

To answer broad-scale questions on environmental conditions, EMAP and its partners have collected estuarine and coastal data from hundreds of stations along the coasts of the continental United States. EMAP's National Coastal Assessment comprises all the estuarine and coastal sampling done by EMAP beginning in 1990. This includes the sampling done in the biogeographic provinces as well as data from the Regional EMAP (REMAP) studies done by EPA Regional Offices. These data can be retrieved and stations mapped from applications under NCA Data.

Local intranet