

Polychlorinated Biphenyls (PCBs) in Georgia Coastal Environments and Populations September 3, 2014

Lorraine C. Backer, PhD

David Mellard, PhD

Health Studies Branch, National Center for Environmental Health
Eastern Branch, Agency for Toxic Substances and Disease Registry

Outline

❑ PCBs in Coastal Georgia Environments

- LCP Chemicals
- Fish advisory areas
- Seafood

❑ PCBs in Coastal Populations

- Sapelo Island
 - Study description
 - Study findings

❑ Next Steps

PCBs in Coastal Georgia

- ❑ **Soil at the LCP Chemicals Superfund Site in Brunswick, GA**
- ❑ **Fishing advisory areas**
 - Brunswick
 - Near Sapelo Island
- ❑ **Distribution**
 - Total PCBs
 - PCB congener 206
- ❑ **Seafood samples from coastal Georgia**
 - Brunswick
 - Sapelo Island

PCBs at LCP Chemicals Superfund Site

- ❑ **Aroclors detected in soils at LCP**
 - 1016
 - 1221
 - 1248
 - 1254
 - 1260
 - 1268
- ❑ **Target EPA Action Level for total PCBs at LCP**
 - 25 ppm

Frequency of Aroclors Detected in Soils at LCP

Frequency of detection for various Aroclors in soil.			
Substance	# Detections	# Samples	Frequency
Aroclor 1016	2	891	0.2
Aroclor 1221	1	902	0.1
Aroclor 1232	0	902	0.0
Aroclor 1242	0	902	0.0
Aroclor 1248	2	902	0.2
Aroclor 1254	81	902	9.0
Aroclor 1260	37	902	4.1
Aroclor 1268	171	852	20.1

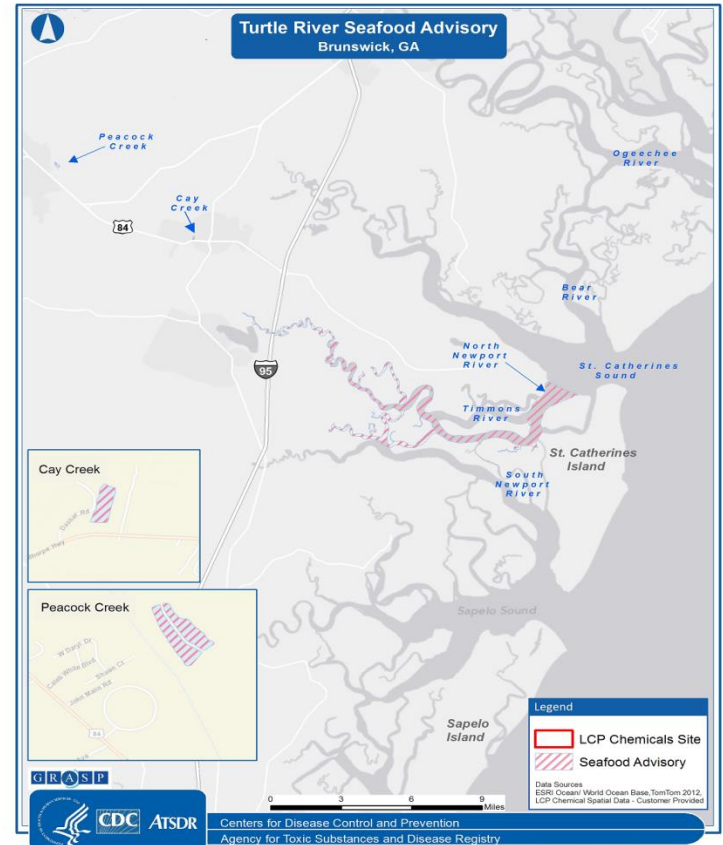
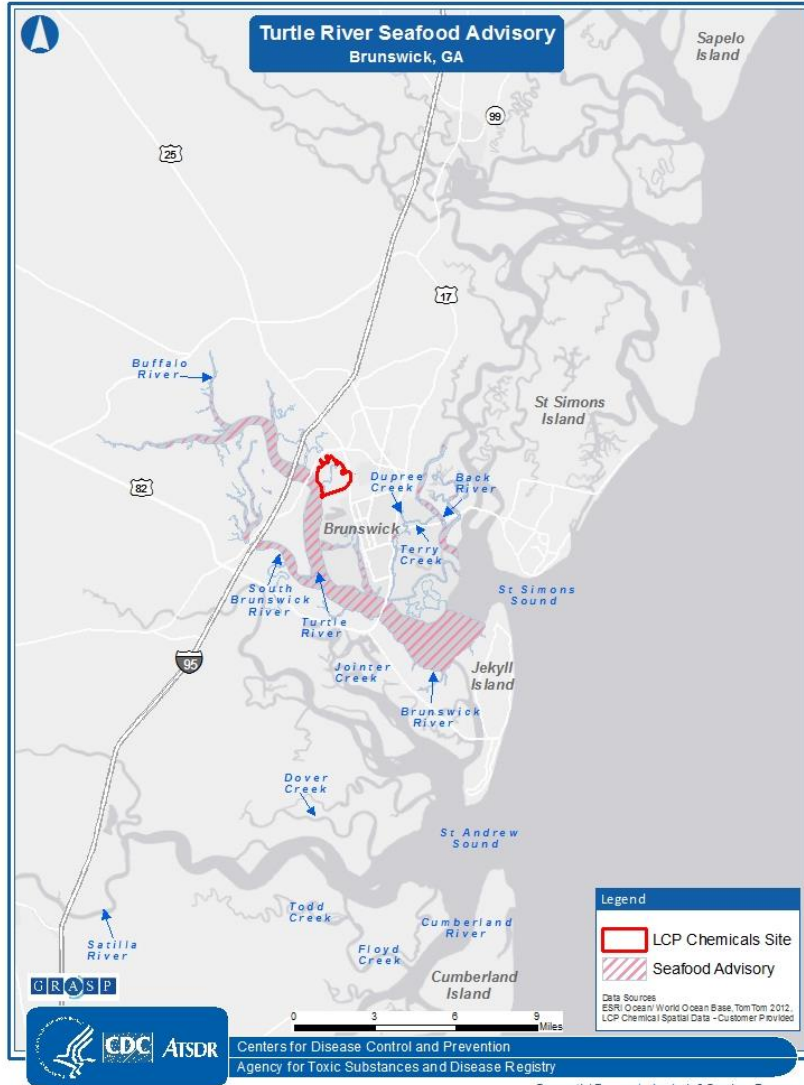
Aroclor 1268 concentration generally much higher than 1254 and 1260 concentrations

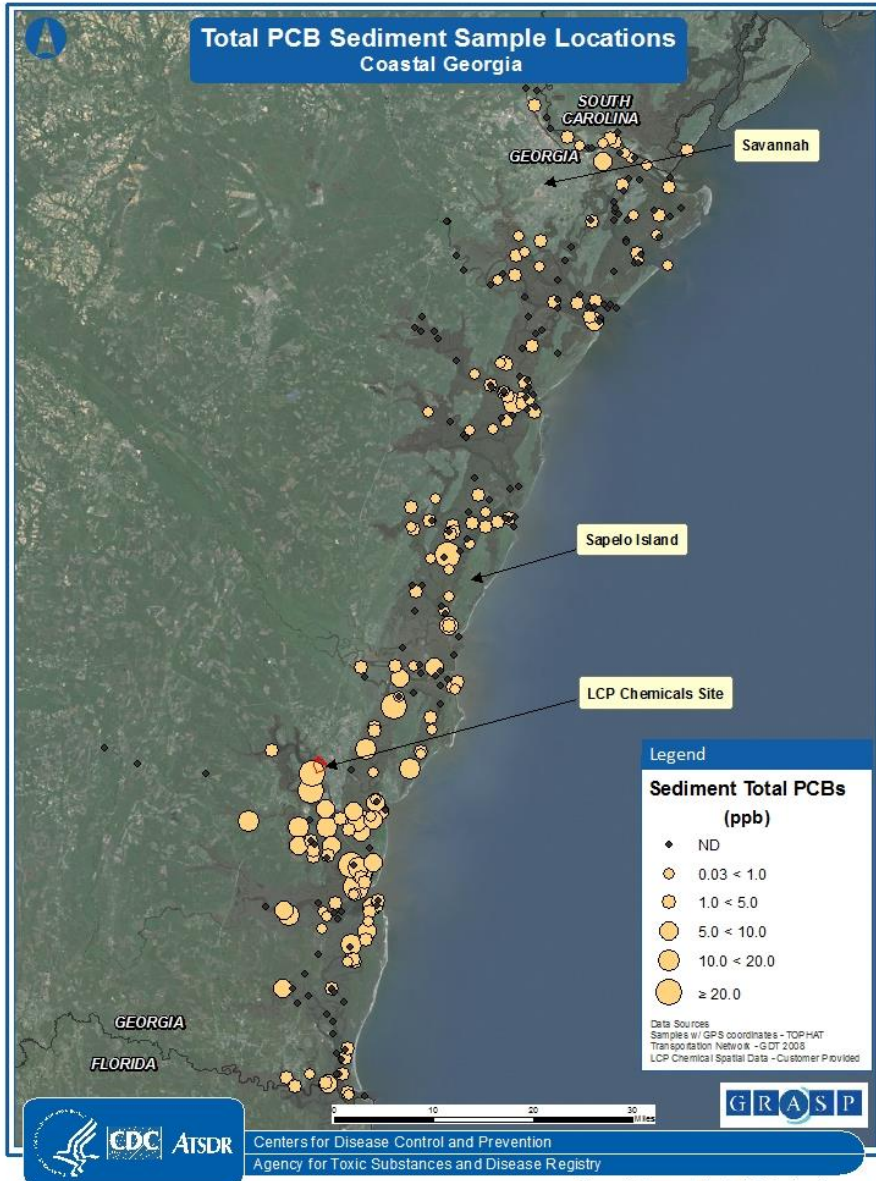
Source: ATSDR Public Health Assessment for the LCP Chemicals Superfund Site, 2014

Aroclors 1268, 1260, and 1254 Congeners

Aroclor 1268	Aroclor 1260	Aroclor 1254
206 (>50%)	180	101
209	153	138
208	138	119
199	149	52
196	170	153
202	101	149
187	194	106
194		44
180+193		
201		

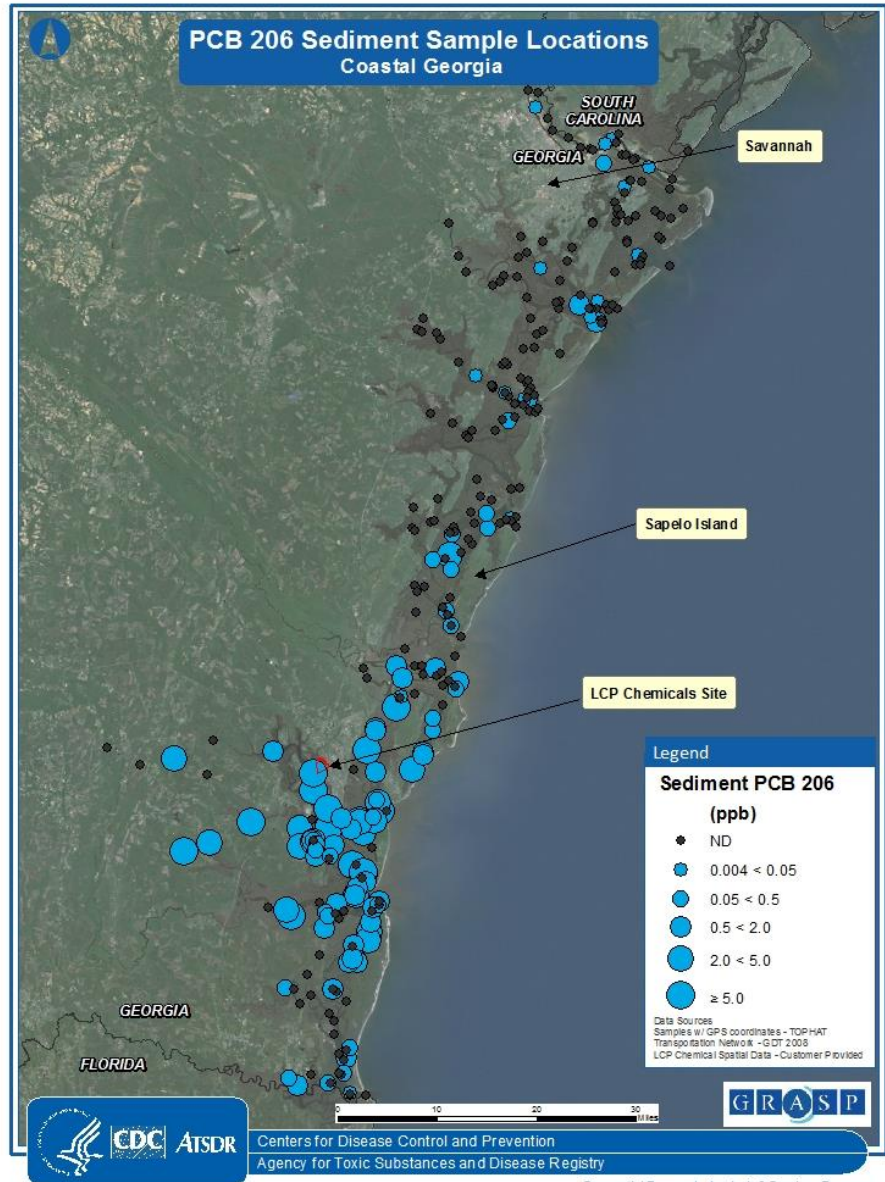
Coastal Georgia Fishing Advisory Areas



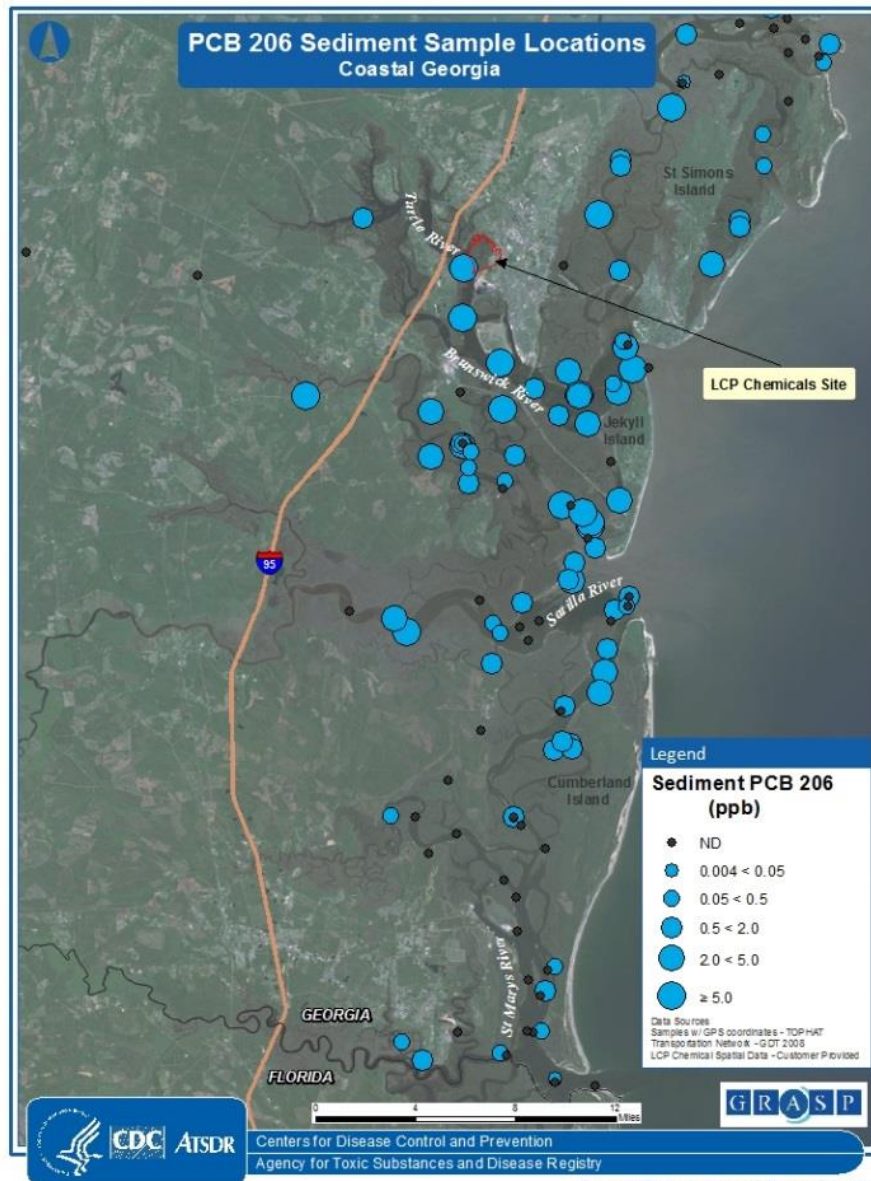


Source for all PCB sediment maps.
 EPA's National Coastal Database

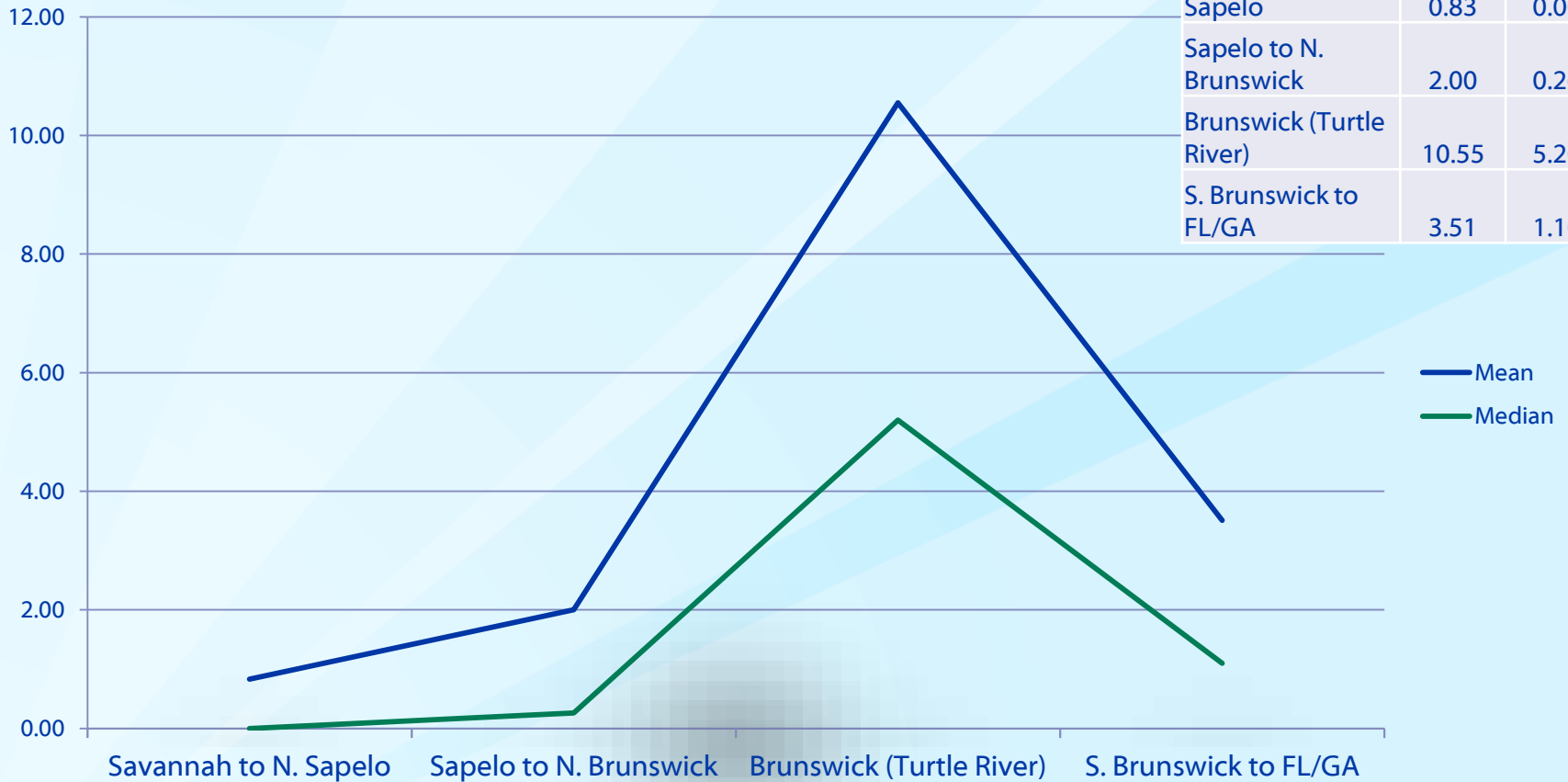
<http://www.epa.gov/emap2/nca/html/data/index.html>



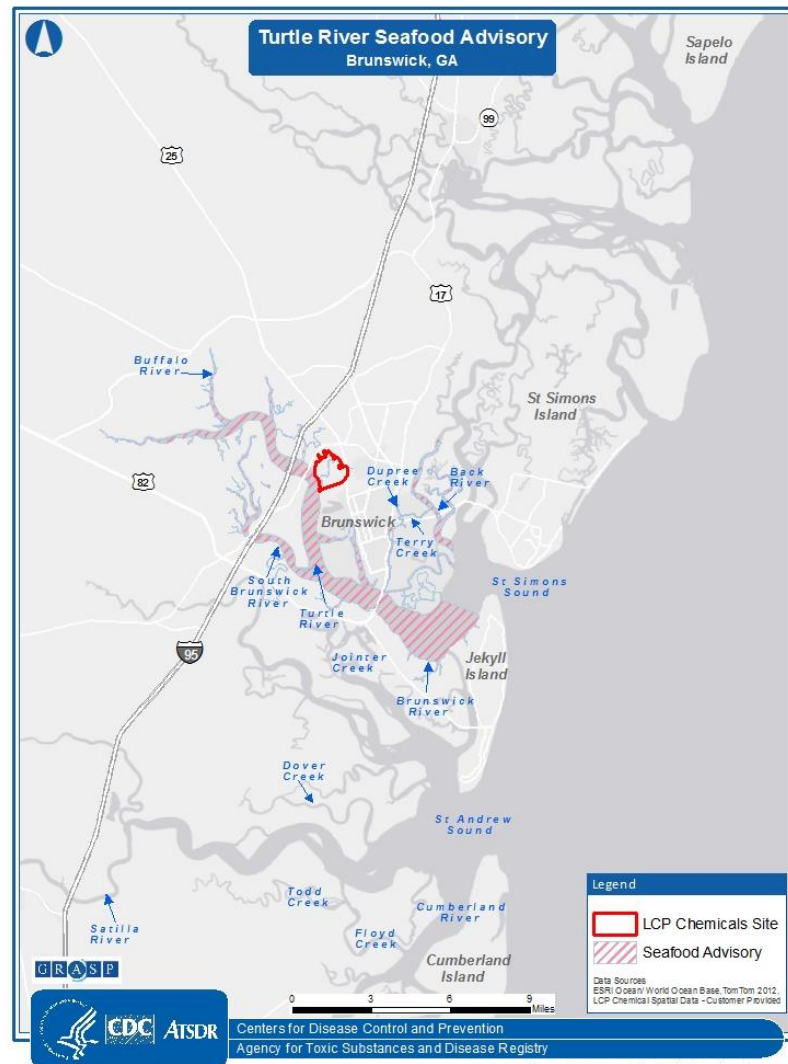
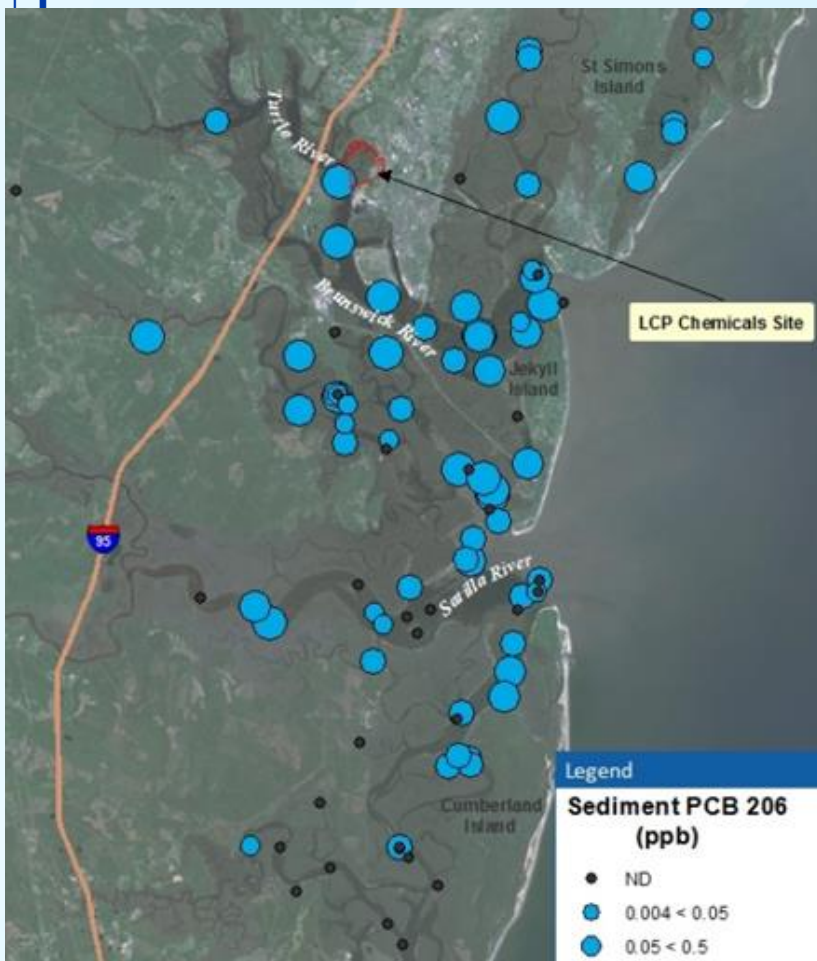
PCB 206
 most abundant
 congener in
 Aroclor 1268



Total PCB Sediment Levels in ppb



Turtle River Fish Advisory



Burnett Creek and Altamaha Canal

Burnett Creek

Cowpen Creek

Turtle River

LCP Chemicals
(Marsh & Dry Land)

Altamaha Canal



Recent Seafood Samples from the Turtle River system

Location and Date	Aroclor 1268 concentrations in mg/kg-wet weight (ppm-ww)				
	Red Drum	Mullet	Sea Trout	Blue Crab	Shrimp
Altamaha Canal* 2011	0.02	0.25	0.08	0.015	0.015
Burnett Creek** 2012 Blackdrum 0.113 S.Kingfish 0.2 (Whiting)	0.035	NA	0.39	NA	NA

* Skin-on fillets; Source: ATSDR PHA for the LCP Chemicals Superfund Site, 2014

** Composite samples, skin-on fillets, except red drum (single sample):
Source: ATSDR/GA DPH Health Consultation, Burnett Creek Fish Tissue, Brunswick Wood Preserving, Brunswick, GA

PCBs in Fish from the Turtle River System, 2002-2012

Location and Date	PCB concentrations in mg/kg-wet weight (ppm-ww)				
	Red Drum	Mullet	Sea Trout	Blue Crab	Shrimp
Altamaha Canal, 2011 (Aroclor 1268 only)	0.02	0.25	0.08	0.015	0.015
Burnett Creek, 2012 (Aroclor 1268 only)	0.035	NA	0.39	NA	NA
Lower Turtle River south of the site, 2002	0.11	0.36	NA	0.1	0.1
Upper Turtle River (north of LCP), 2002	0.25	1.4	NA	0.16	0.1
Middle Turtle River (adjacent to LCP), 2002	0.14	2.6	NA	0.02	0.23

Source: ATSDR Public Health Assessment for the LCP Chemicals Superfund Site, 2014

Comparison of Brunswick and Sapelo Island Seafood

Date and Location	Total PCB concentrations mg/kg-wet weight (ppm-ww)					
	Red Drum	Diff	Mullet	Diff	Sea Trout	Diff
2010 Sapelo Island*	0.007		0.004		0.0095	
2011 Altamaha Canal (Brunswick)	0.02	3	0.25	63	0.08	8
2012 Burnett Creek (Brunswick)	0.035	5	NA	NA	0.39	41
2002 Turtle River (Brunswick)	0.16	23	2.5	625	NA	NA

* Sapelo Island fish data collected by NCEH as part of their investigation at Sapelo Island

Environmental Contaminants in Coastal Populations

❑ Purposes

- Conduct pilot studies
- Compare results in people with what is known about dolphins

❑ Method

- Targeted 3 coastal communities with offshore resident dolphins
 - Sapelo Island, Georgia; Biscayne Bay, Florida; Charleston Harbor, South Carolina
- Inclusion criteria:
 - Have resided in the community for at least 5 years
 - Consume at least two meals of locally-caught seafood each week
- Recruited 9 study participants in each community to:
 - Complete questionnaire unique to each community
 - Provide blood samples and seafood for analysis
 - PCBs, PFOAs, PBDEs, heavy metals, and chlorinated pesticides

Sapelo Island Study Results

- ❑ The discussion will be limited to our findings regarding PCBs**

Demographics of Sapelo Island Study Participants

Characteristic	Median (range)
Age (years)	51 (21-74)

Characteristic	Number (percent)
Race	
Black	6 (67 %)
White	3 (33 %)
Sex	
Female	1 (11%)
Male	8 (89 %)
Residence	
On Sapelo Island	8 (89 %)
On mainland across estuary	1 (11%)

Fishing Areas of Sapelo Island Study Participants

Little Moses Hammock (1)

Lumber Landing (3)

Community Landing (3)

Marsh Landing (4)

Lighthouse (3)

Mud River (2)

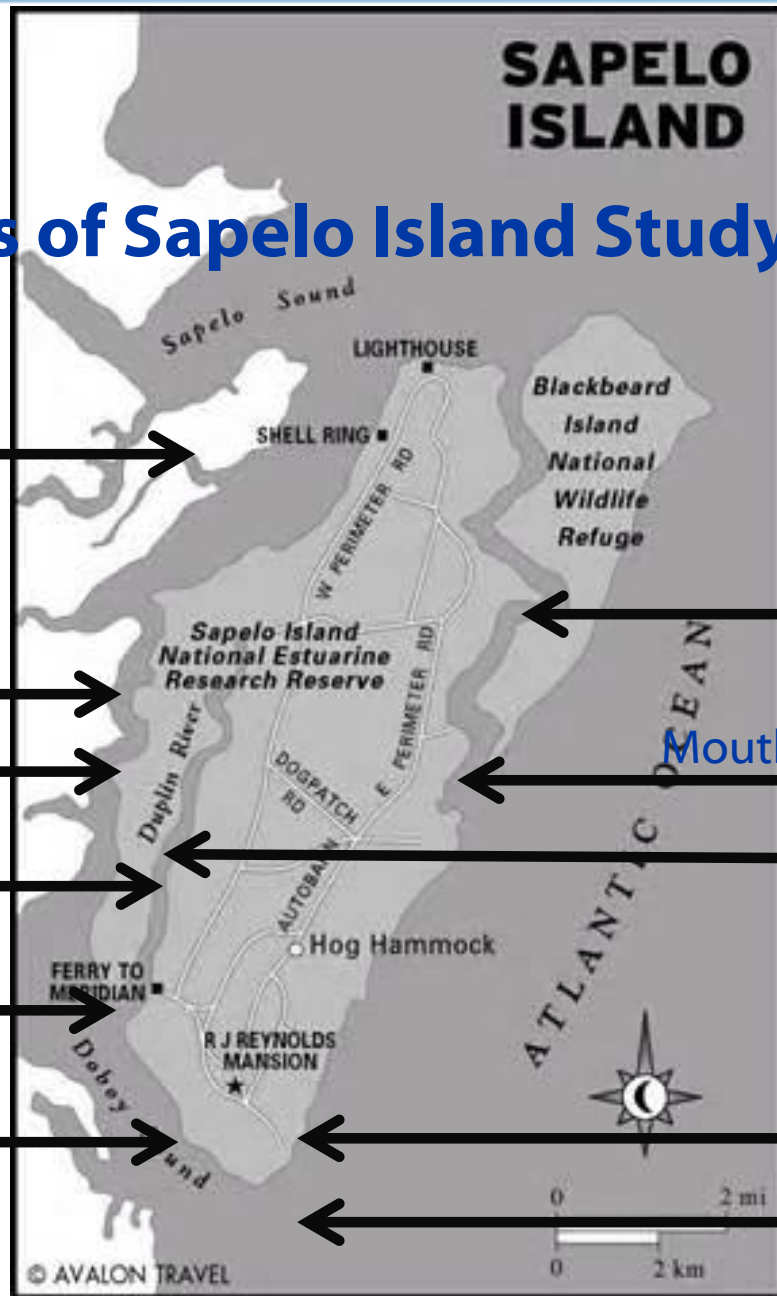
Raccoon Bluff (2)

Mouth of Blackbeard Creek (1)

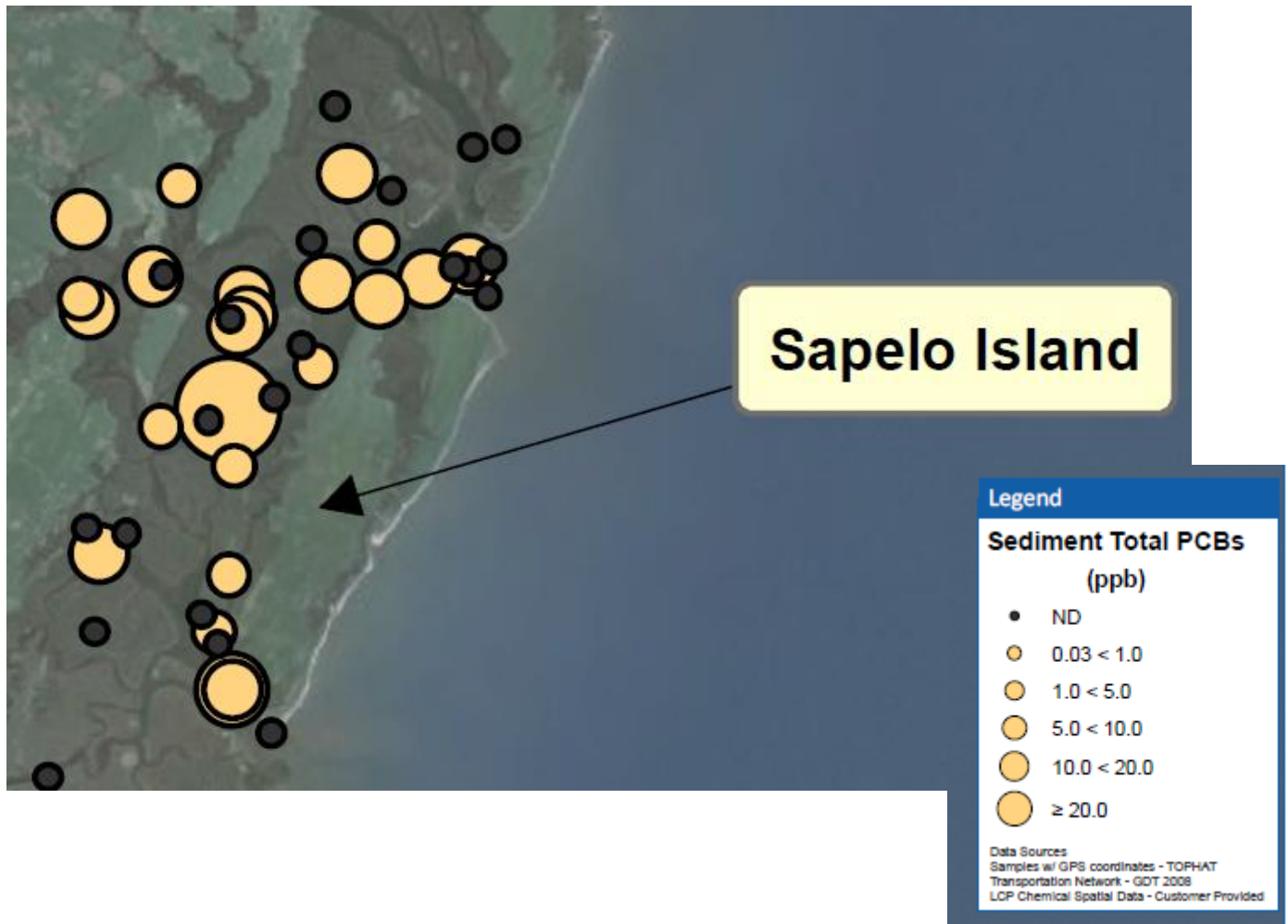
Duplin River (2)

Nanny Goat Beach (2)

Southeastern Coast (2)



Sapelo Island Total PCBs in Sediment



Local Seafood Consumption by Sapelo Island Study Participants

Characteristic	Number
Eats 2-3 meals of locally-caught seafood/week	9 (100 %)
Has eaten locally-caught seafood for > 5 years	9 (100 %)
Eats seafood meals of:	
6 oz	5 (56 %)
9 oz	4 (44 %)
Eats seafood meals of*:	
Filet with skin removed	1 (11 %)
Filet with skin on	3 (33 %)
Whole fish (gutted)	5 (56 %)
Whole fish (not gutted)	1 (11 %)
Fish eggs	4 (44 %)

* Responses not mutually exclusive

Species of Fish Eaten by Sapelo Island Study Participants

Species	Number of People
Red drum	1 (11 %)
Catfish	1 (11 %)
Shark	1 (11 %)
Brim/spot	2 (22 %)
Flounder	2 (22 %)
Sheepshead	3 (33 %)
Croaker	6 (67%)
Mullet	6 (67 %)
Spotted sea trout	7 (78 %)
Spot-tailed bass/red fish	9 (100 %)
Whiting	9 (100 %)

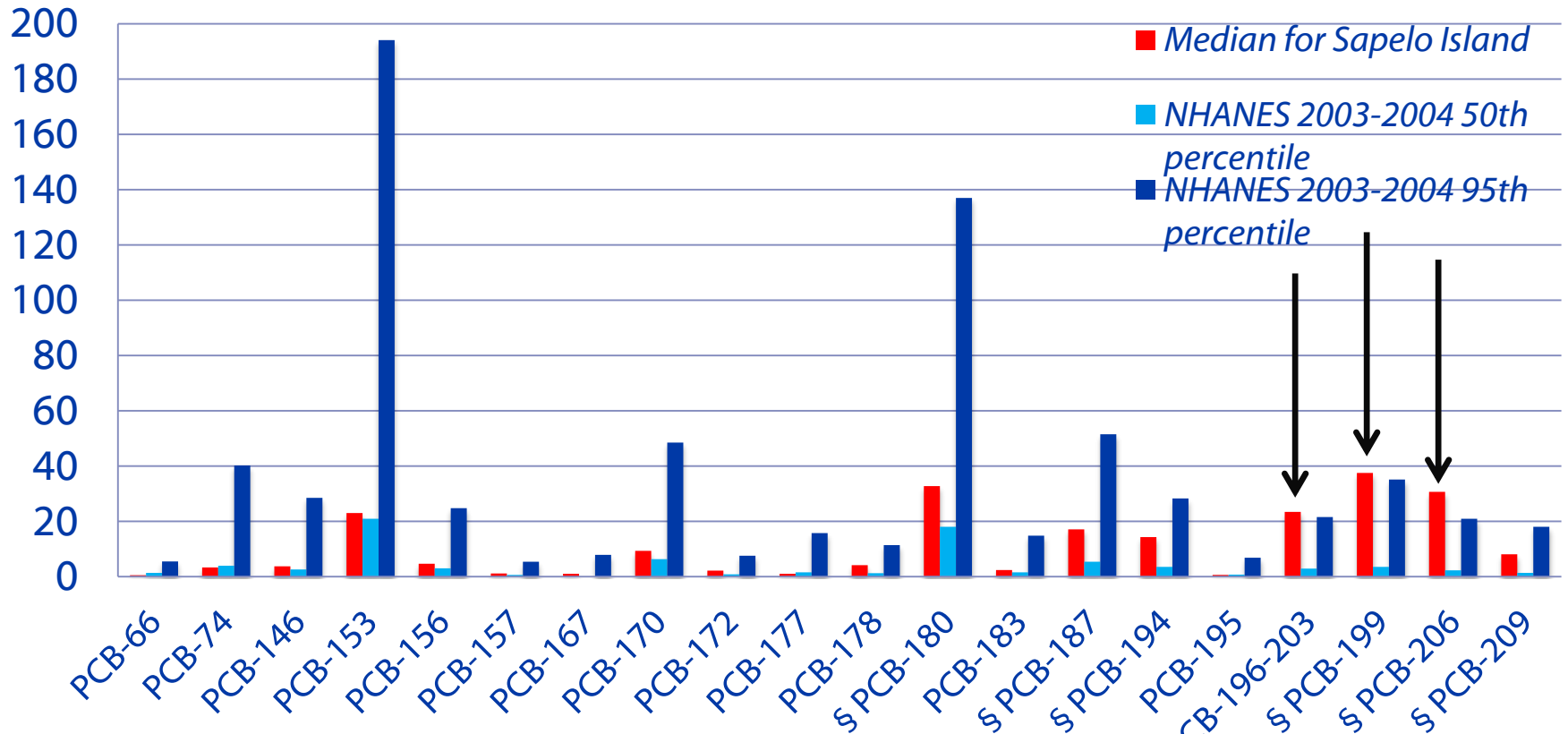
Local Meat Consumption by Sapelo Island Study Participants

Animal	Number
Venison	1 (11 %)
Duck	1 (11 %)
Raccoon	2 (22 %)

Knowledge of Fish Advisories in Sapelo Island Study Participants

Characteristic	Number of People
Aware of Georgia fish advisories?	
Yes	5 (56%)
No	4 (44 %)
Since you became aware of the advisories, did you change your habits of catching or eating seafood? (N = 5)	
Yes	2 (40 %)
No	3 (60 %)

PCB concentrations (ng/g lipid) for those PCBs tested in both Sapelo Island participants' blood specimens (medians) and NHANES 2001-2002, Non-Hispanic Blacks* (50th and 95th percentiles, matched on age group)



*Comparison values from NHANES 2001-2002, non-Hispanic blacks 20 years old and older. US Department of Health and Human Services. 2005. Third National Report on Human Exposure to Environmental Chemicals. July.

Study Limitations

- ❑ **The pilot study sample size was small (n =9).**
- ❑ **We analyzed legacy chemicals**
 - They accumulate in tissues over time
 - Cannot determine when exposure occurred
- ❑ **However, we did find that human and dolphin specimens contain qualitatively similar environmental contaminants (dolphin data not shown).**

Conclusions

- ❑ **Aroclor 1268 appears to be widespread around Brunswick, GA.**
- ❑ **Based on sediment and fish samples, contamination from LCP Chemicals Superfund Sites may have migrated along the Georgia coast.**
- ❑ **The current fishing advisory for the Turtle River system may not adequately cover other contaminated rivers and creeks around Brunswick, GA.**
- ❑ **Residents of Sapelo Island have been exposed to specific PCB also found at the LCP site.**

Now that we know more about the extent of PCB contamination along the Georgia coast, what should we do next?

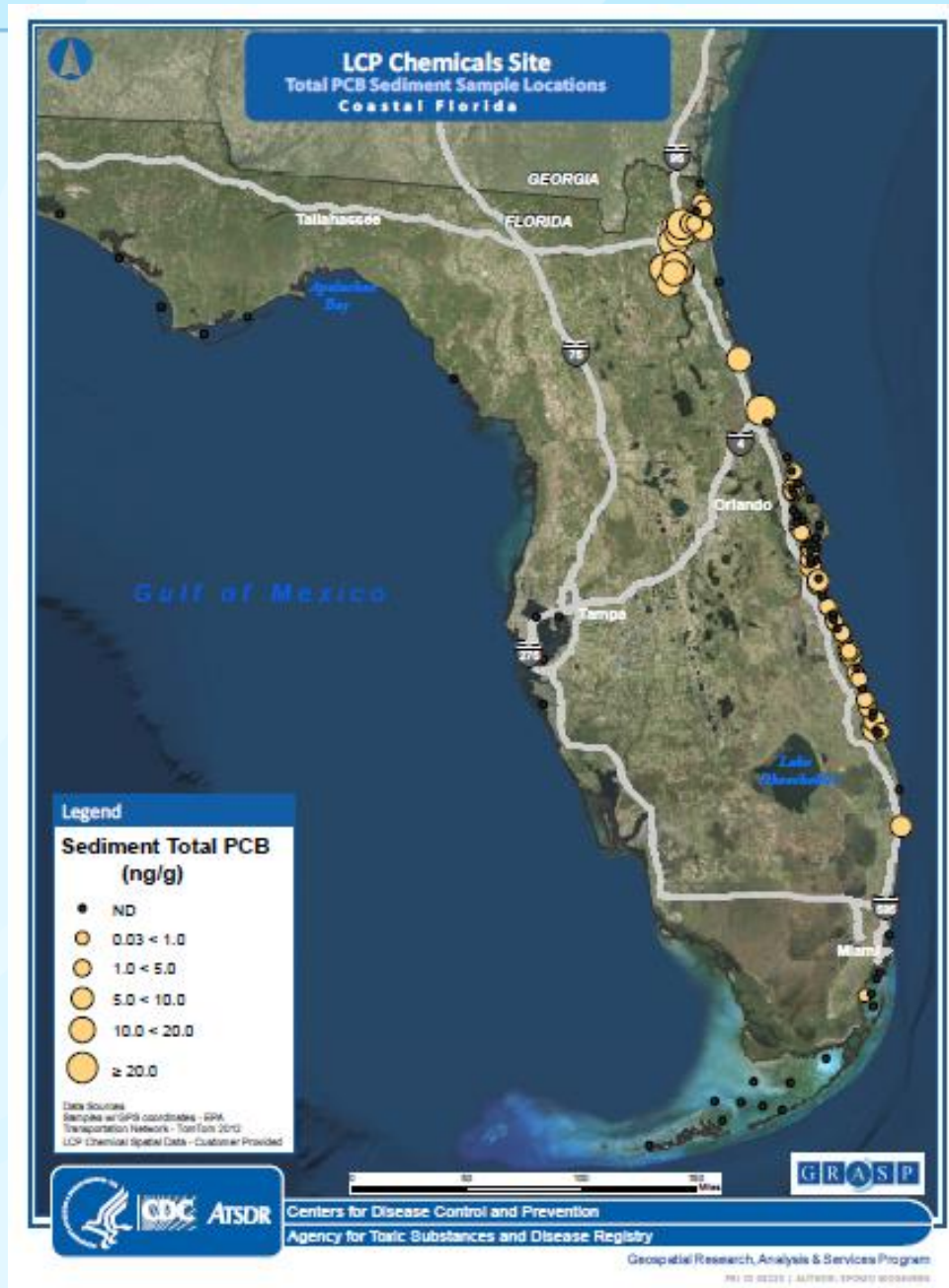
- More fish sampling?
- More sediment sampling?
- Extend the fish advisory area?

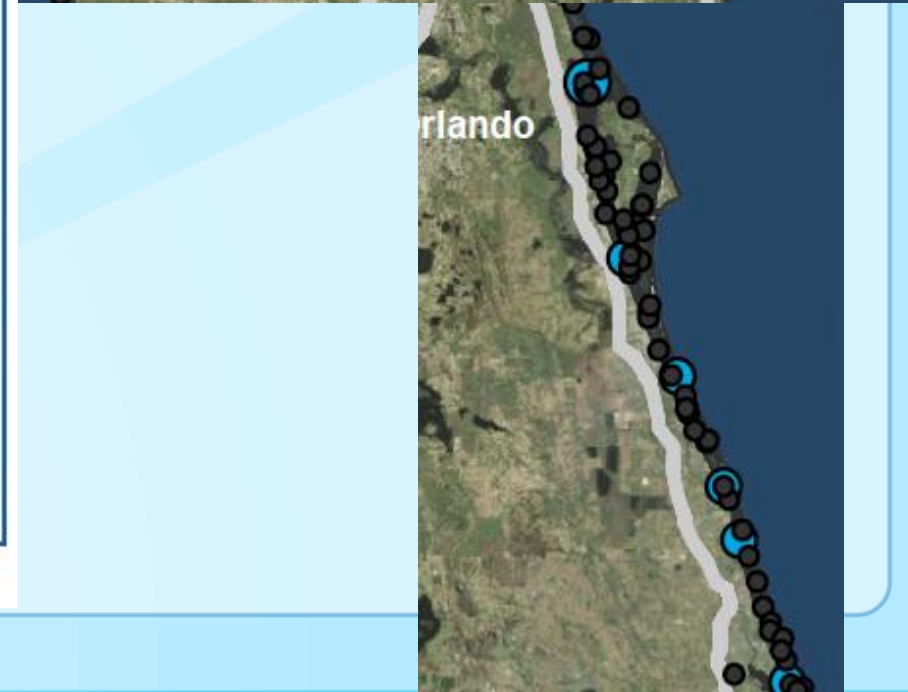
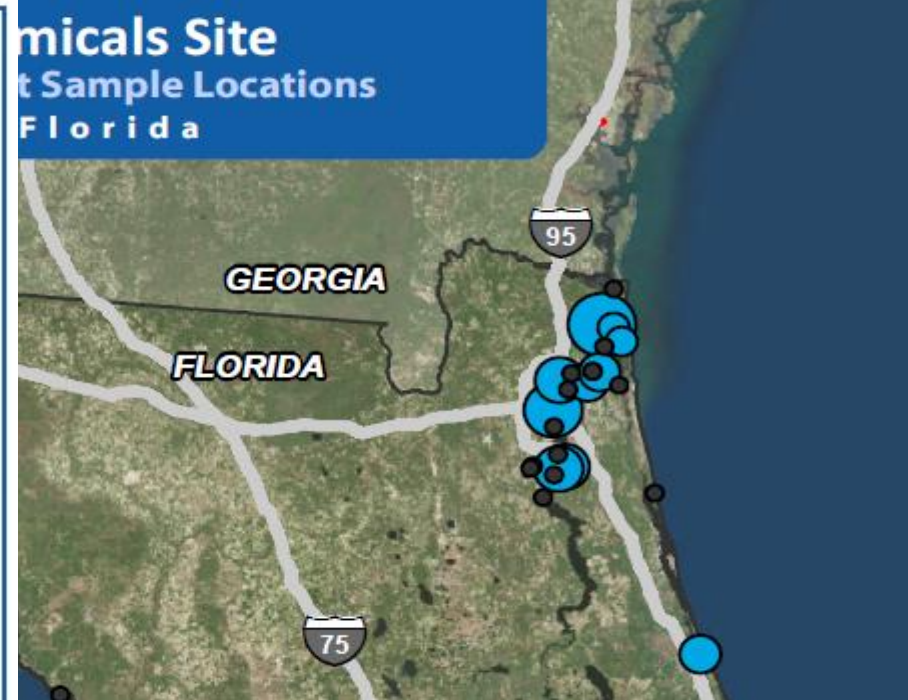
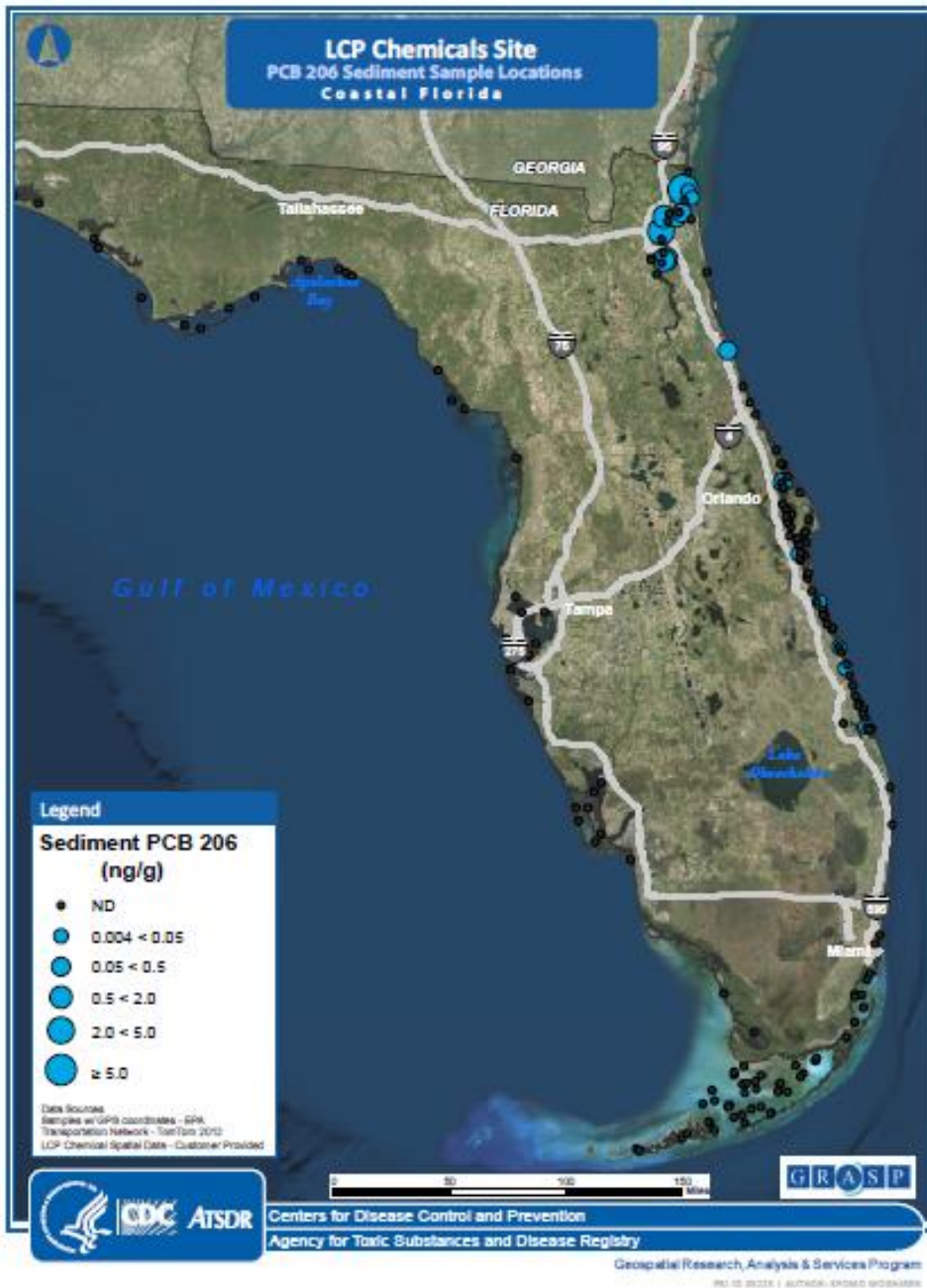
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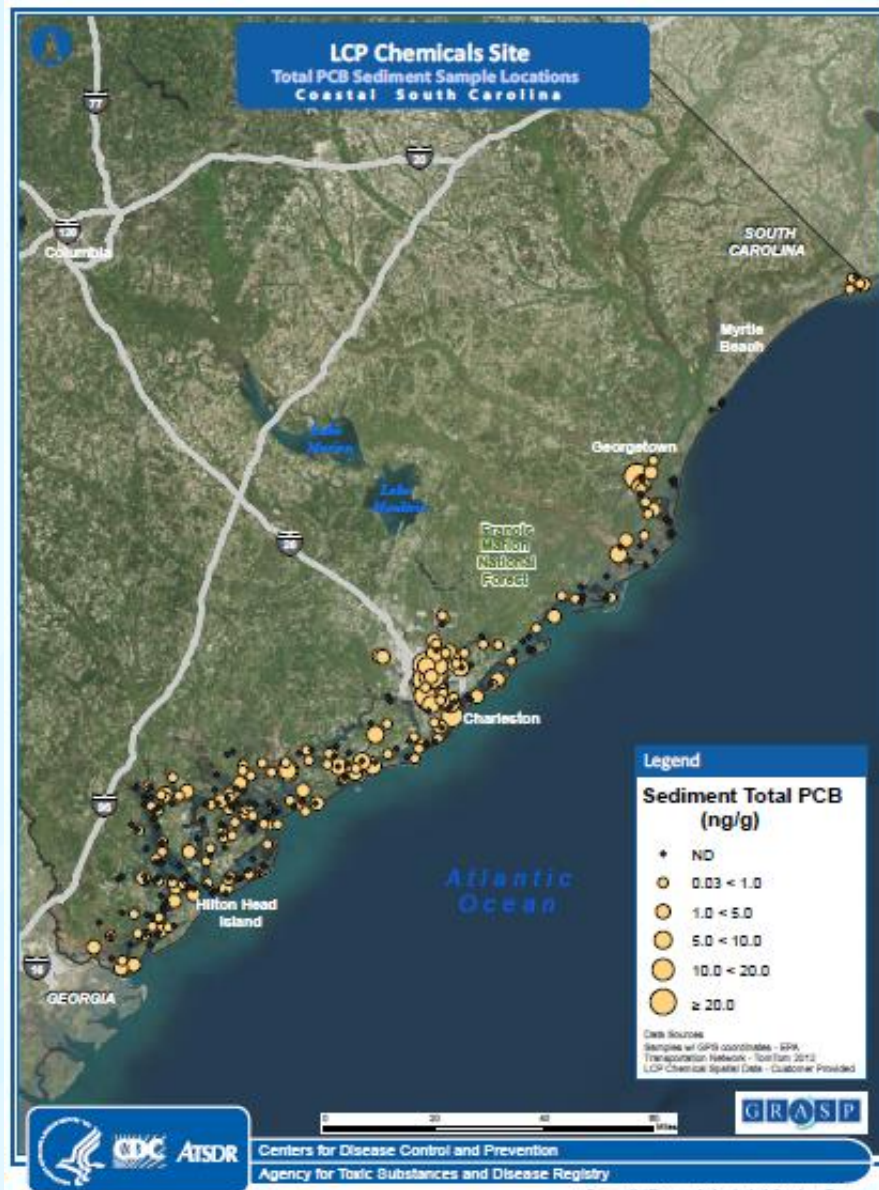
Extra Slides

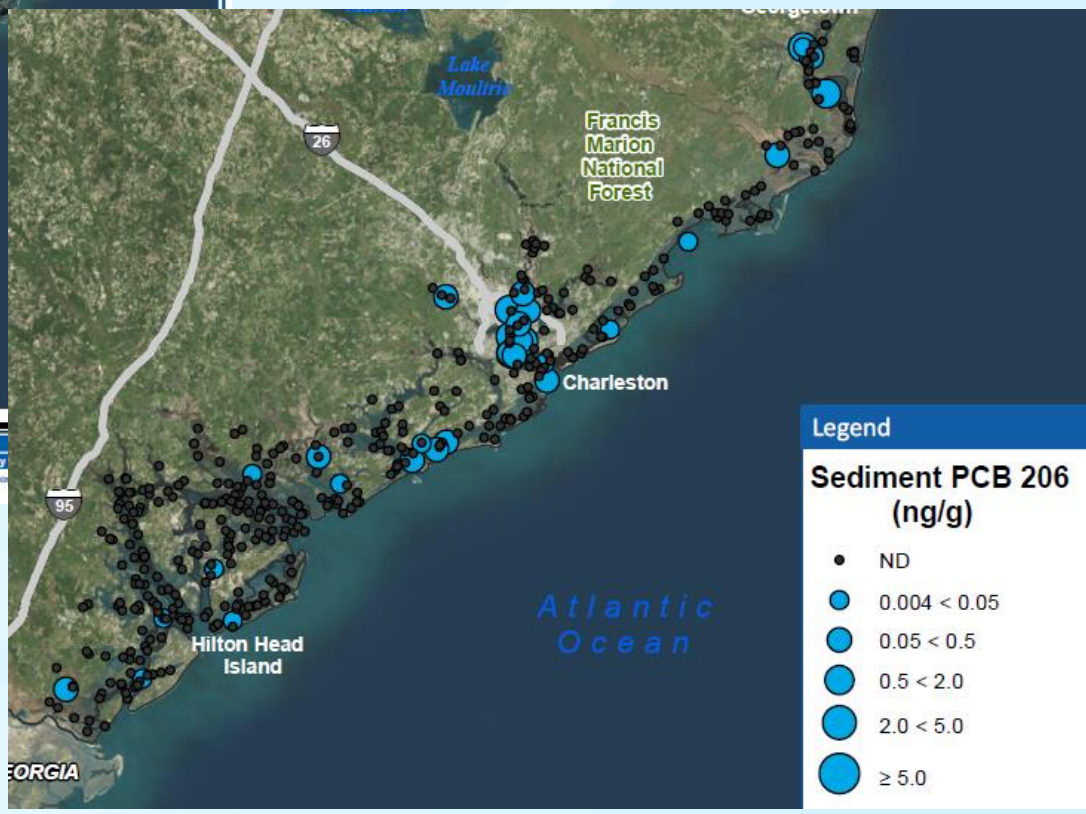
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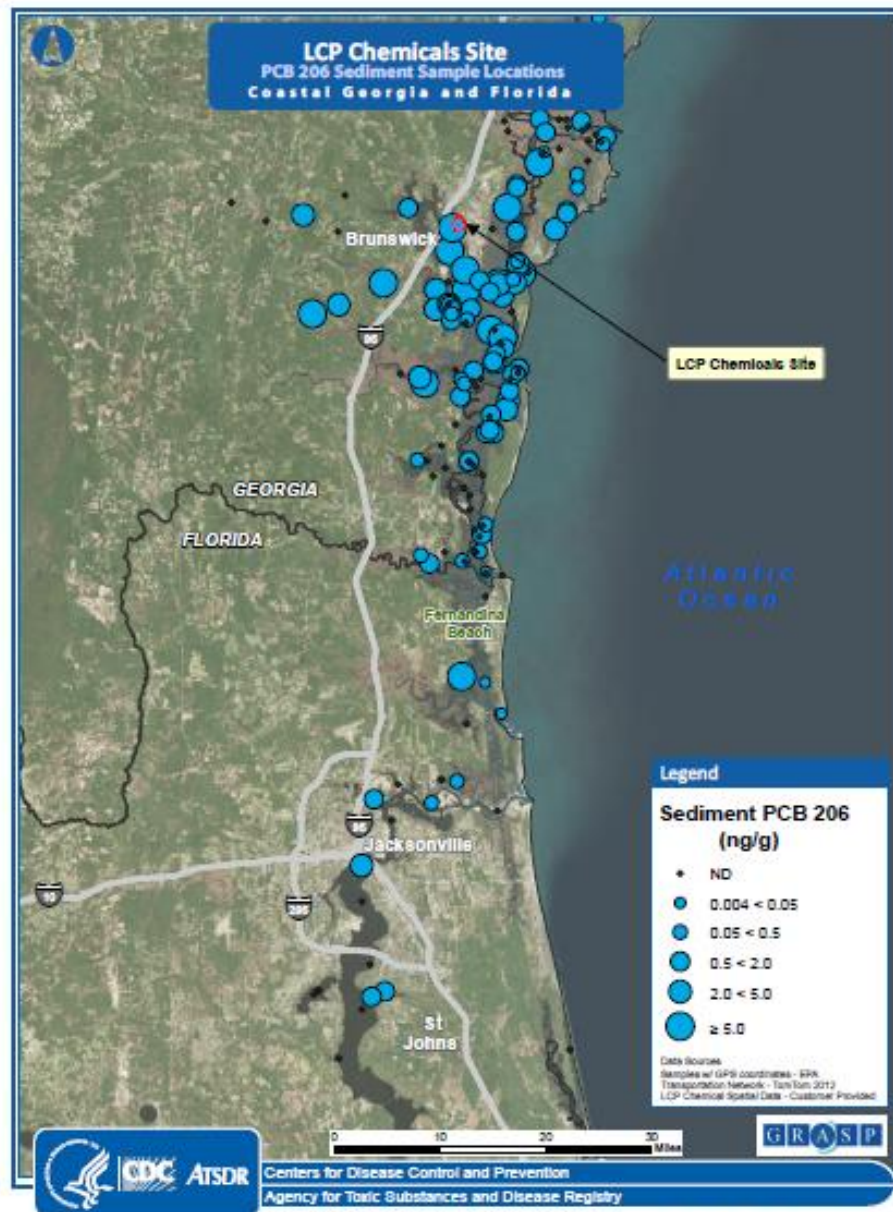
- ❑ **PCBs along Florida and South Carolina Coast**











Aroclor 1268

PCB Congener Non-Cancer Toxicity

PCB-180 ^a	BMI	Highest BMI with intermediate exposures (quartile 2)
PCB-187 ^a	HDL cholesterol levels	Lowest levels with intermediate exposures (quartile 2)
PCB 196–203	Diabetes incidence	Highest risk in groups with intermediate exposures (quartile 2)
PCB-196	Endometriosis	Decreased risk in groups with intermediate exposures (quartile 3)

Source: Vandenberg LN, Colborn L, Hayes TB et al. 2012. Hormones and endocrine-disrupting chemicals: Low-dose effects and nonmonotonic dose responses. *Endocrine Reviews* 33(3);378-455.