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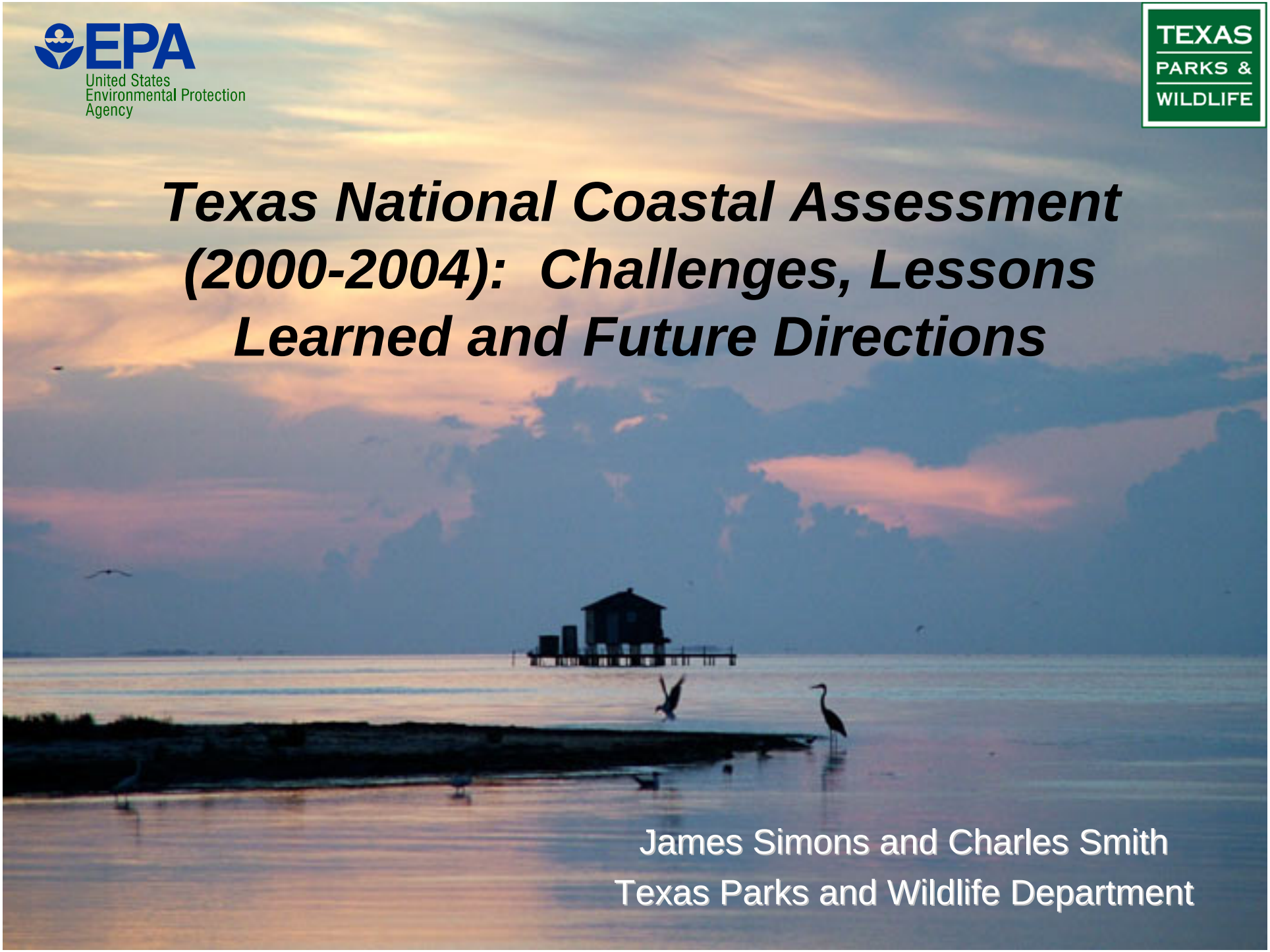
Texas National Coastal Assessment (2000-2004): Challenges, Lessons Learned and Future Directions



James Simons and Charles Smith
Texas Parks and Wildlife Department

EPA United States Environmental Protection Agency

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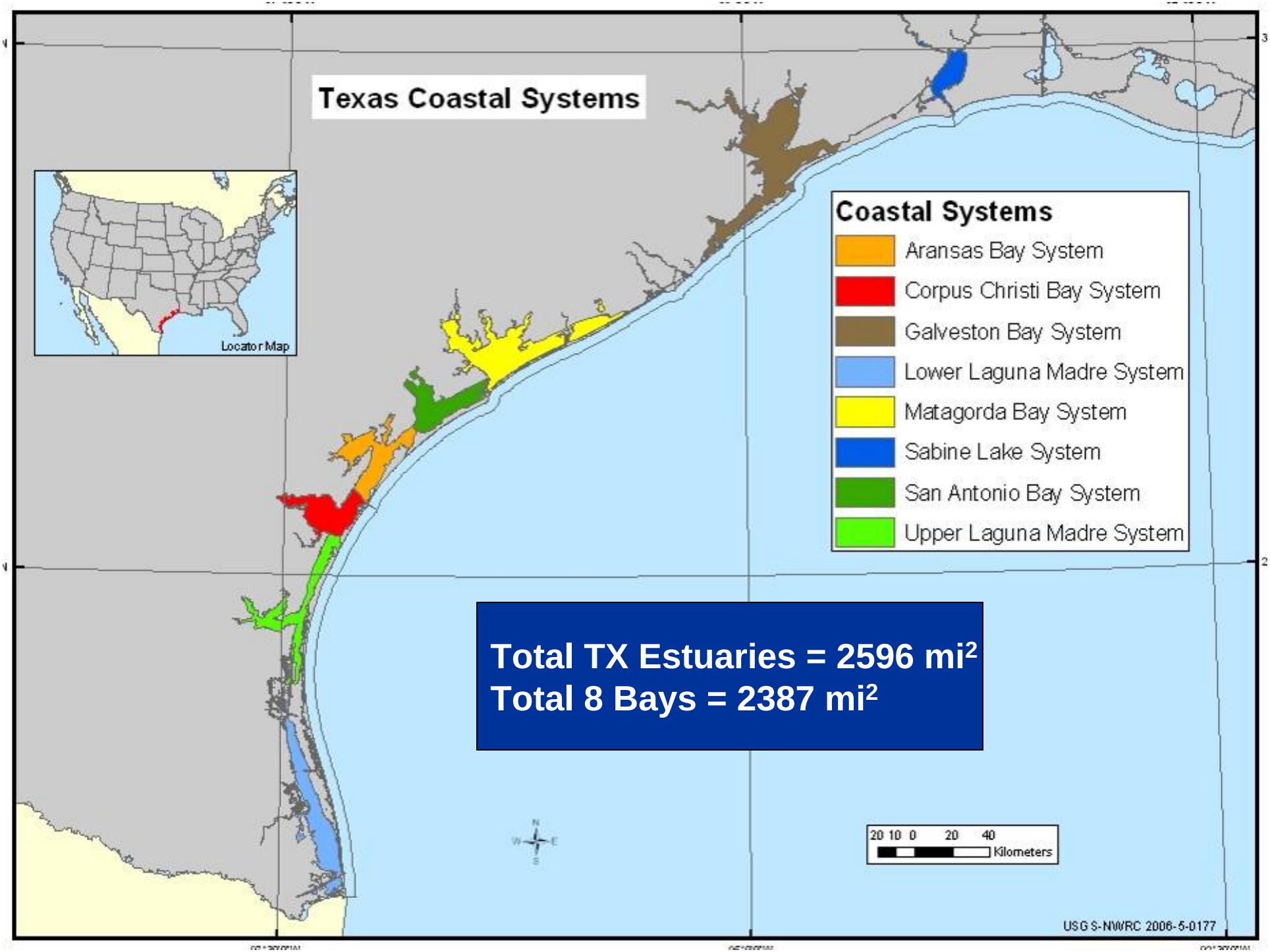
Outline

- Introduction
- Challenges
- Lessons Learned
- Future Directions



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Texas NCA Surveys

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- Estuaries surveyed annually 2000-2006
- Each station sampled once during summer (Jul-Sep)
- Water column profiles
  - DO, temperature, pH, salinity, light
  - Nutrients, TSS, chlorophyll a
- Sediment chemistry, toxicity, TOC, GS
- Benthic infauna community
- Benthic fish and macro-invertebrate community
- Fish tissue chemistry

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Challenges

- Meshing NCA sampling with the CF Division's FIM program, ie *Why are we doing this?? We're the Fish and Wildlife Agency!!*

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Challenges

- Meshing NCA sampling with the CF Division's FIM program, ie *Why are we doing this?? We're the Fish and Wildlife Agency!!*
- Design issues, ie *Why such a long coastline and so few stations?*

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Texas Collaborators

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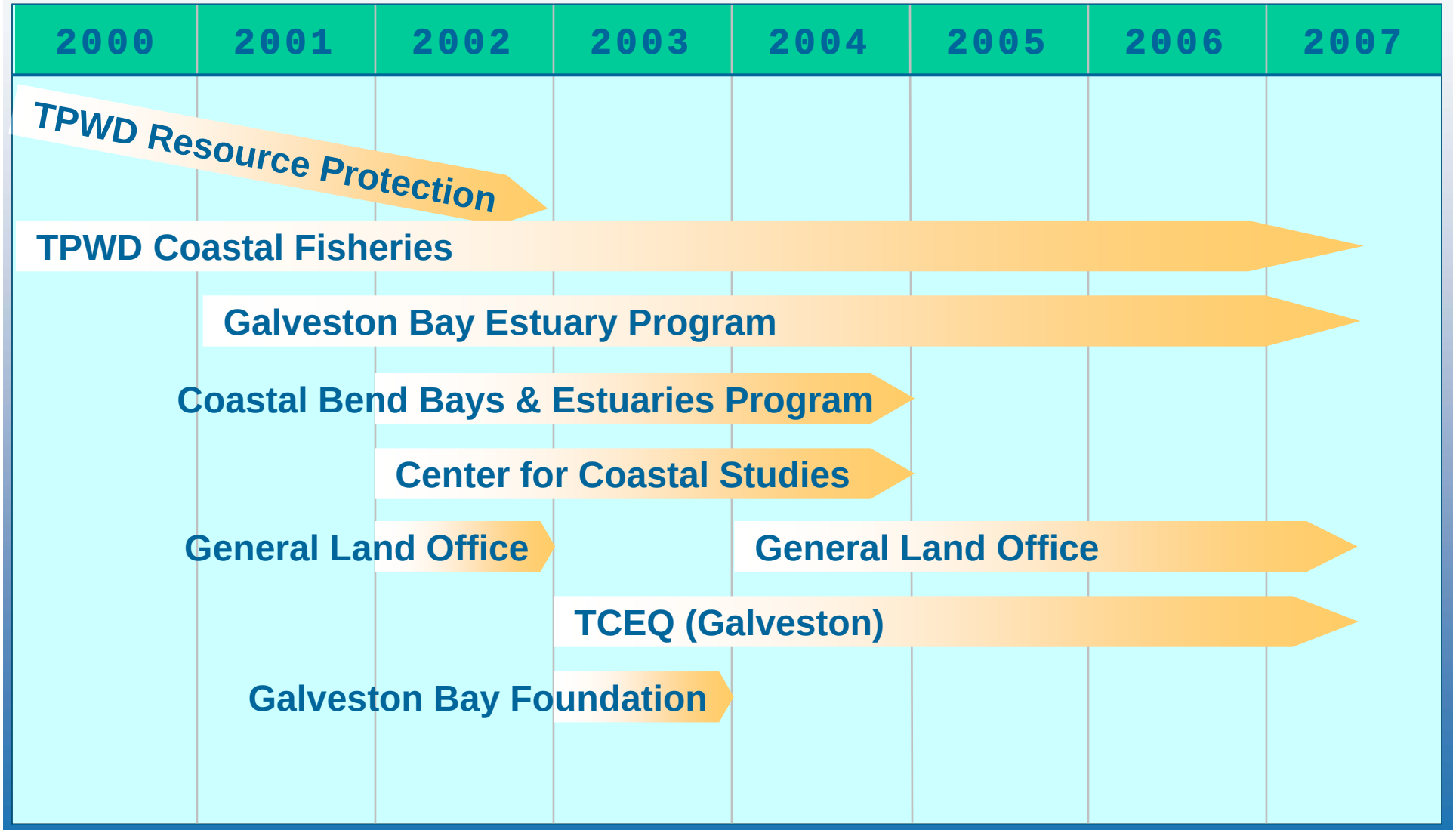

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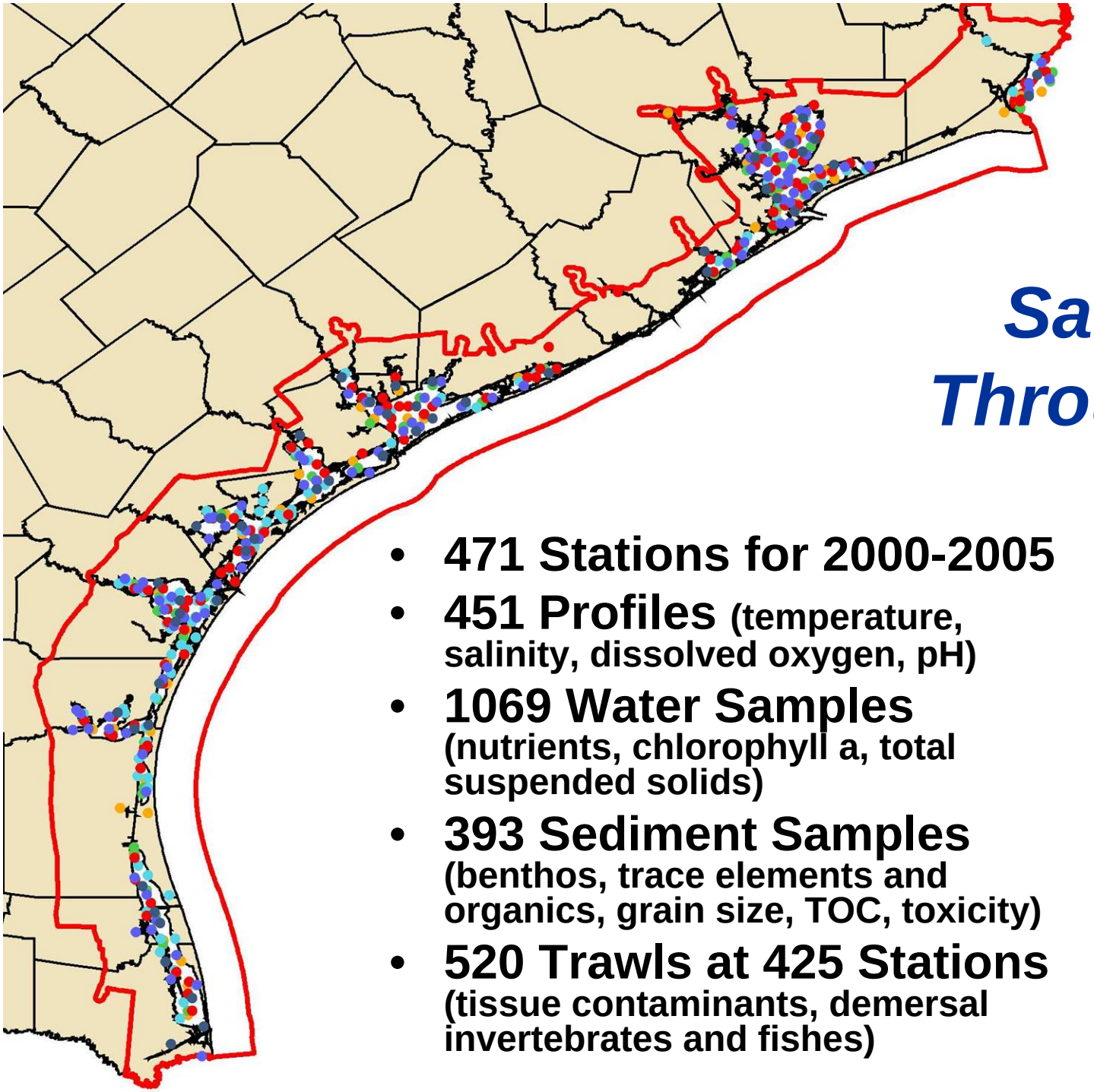
NCA – Texas Survey Design

- Incorporate existing TX Fisheries Monitoring Sites
- Designs
  - 2000 – 50 sites statewide
  - 2001 – 59 sites statewide
  - 2002 – 50 TPWD, 50 CBBEP
  - 2003 – 40 TPWD, 30 CBBEP
  - 2004 -- 35 TPWD, 32 CBBEP, 37 GBEP
  - 2005 & 2006 – 50 sites statewide



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Sampling Through 2005

- **471 Stations for 2000-2005**
- **451 Profiles** (temperature, salinity, dissolved oxygen, pH)
- **1069 Water Samples** (nutrients, chlorophyll a, total suspended solids)
- **393 Sediment Samples** (benthos, trace elements and organics, grain size, TOC, toxicity)
- **520 Trawls at 425 Stations** (tissue contaminants, demersal invertebrates and fishes)

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Challenges

- Meshing NCA sampling with the CF Division's FIM program, ie *Why are we doing this?? We're the Fish and Wildlife Agency!!*
- Design issues, ie *Why such a long coastline and so few stations?*
- **Shallow water lagoons, ie. *We can't get there from here!!***

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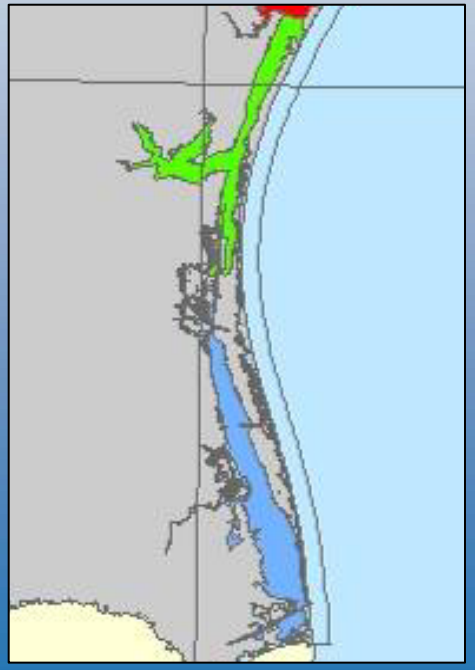
Sampling shallow water lagoons

- Upper and Lower Laguna Madre have extensive areas less than 1m deep, and very large areas less than 0.5m deep.
- Even though these areas were less than the 1m NCA minimum, since they represented such a large percentage of these lagoons, they were sampled using airboats.



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Challenges

- Meshing NCA sampling with the CF Division's FIM program, ie *Why are we doing this?? We're the Fish and Wildlife Agency!!*
- Design issues, ie *Why such a long coastline and so few stations?*
- Shallow water lagoons, ie. *We can't get there from here!!*
- **Using NCA to do 305b reporting.**

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Challenges to using NCA data for 305(b)

- State Regulations
  - 305(b) data from > 1 season
    - NCA data only collected in summer
  - 305(b) data from multiple samples per site
    - NCA – each station sampled only once
  - Water Quality Standards
    - NCA doesn't include bacteria, water chemistry
- NCA state cooperating agency is not always the state 305(b) agency
  - NCA – TPWD; 305(b) – TCEQ

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Bio-bags streamline benthos sampling

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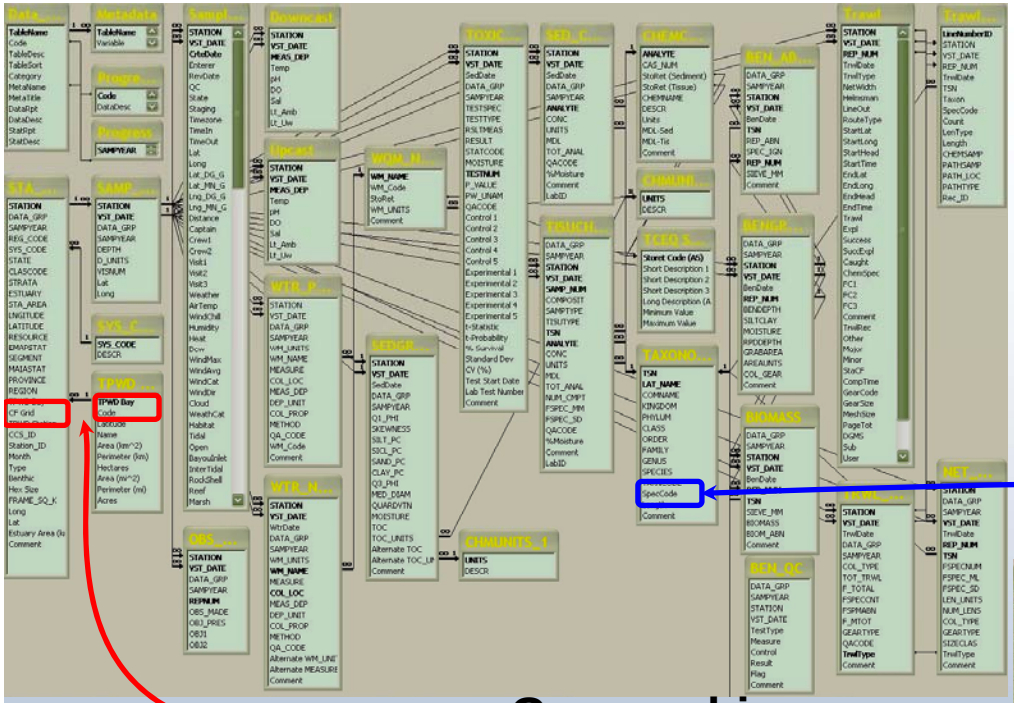
Lessons Learned

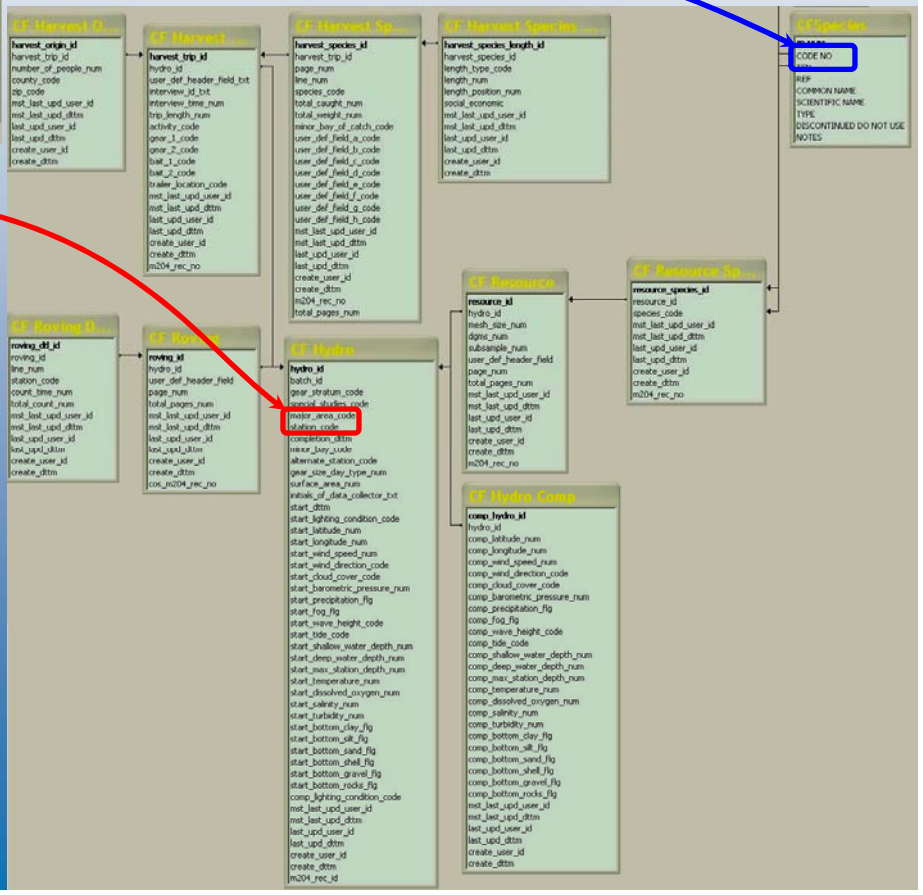
- Value of a good database
- Water clarity index
- NCA and 305(b)
- Patterns along the coast

US EPA ARCHIVE DOCUMENT



Taxonomic

Geographic



Making the Connections between NCA and Resource Monitoring Data

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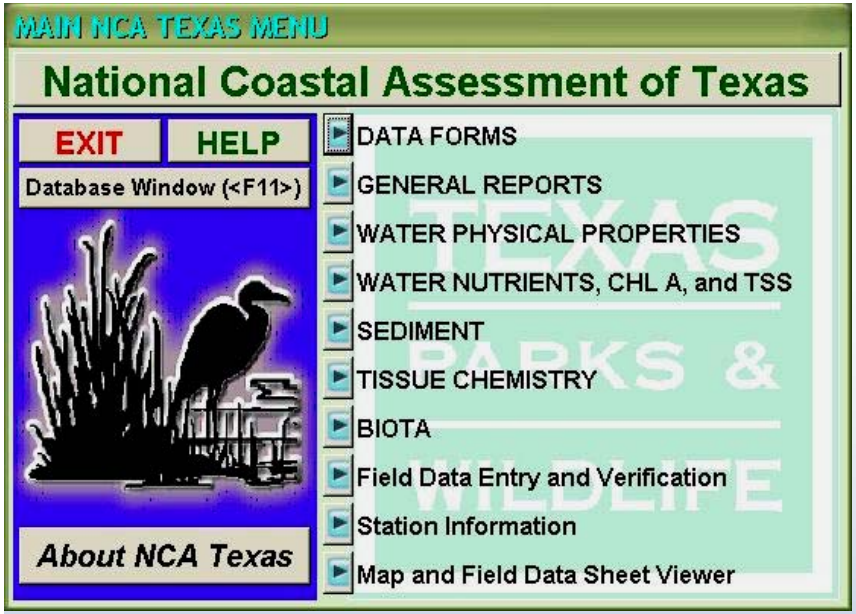
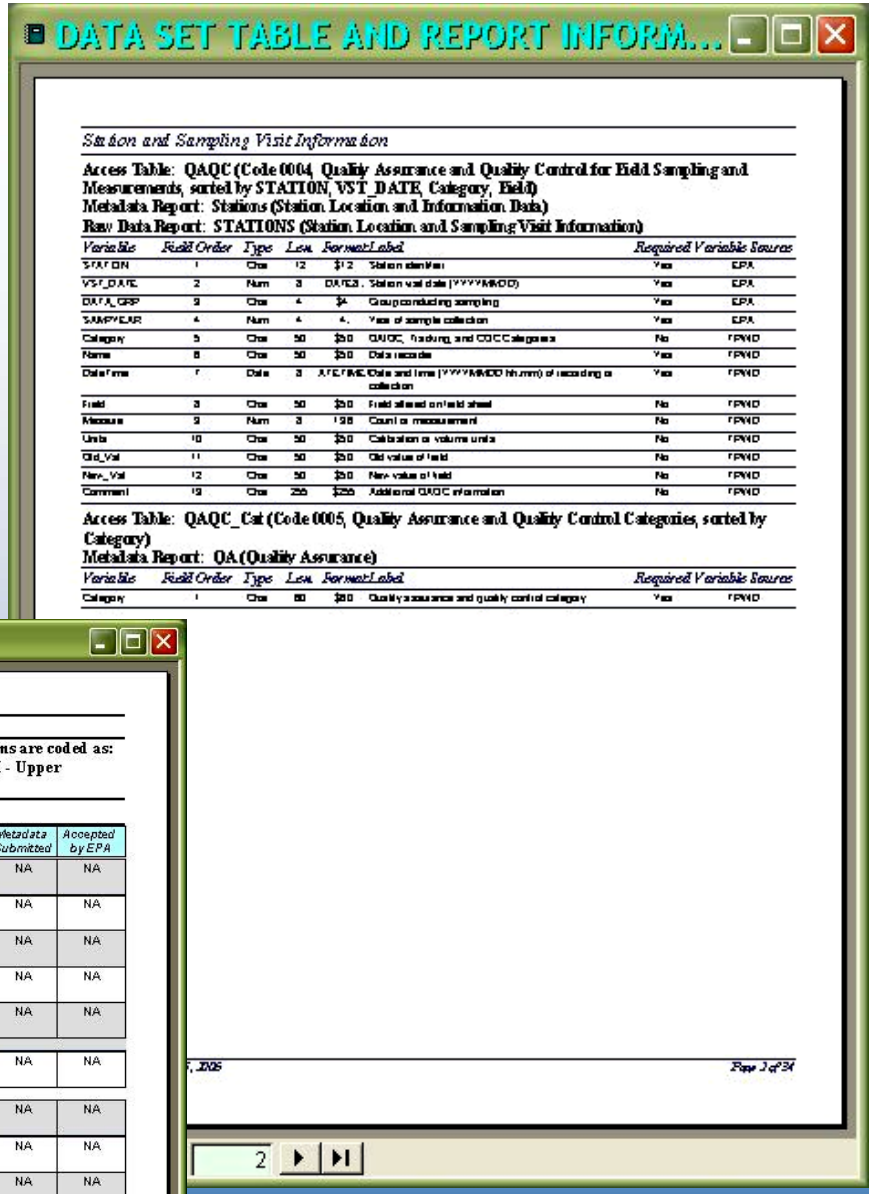
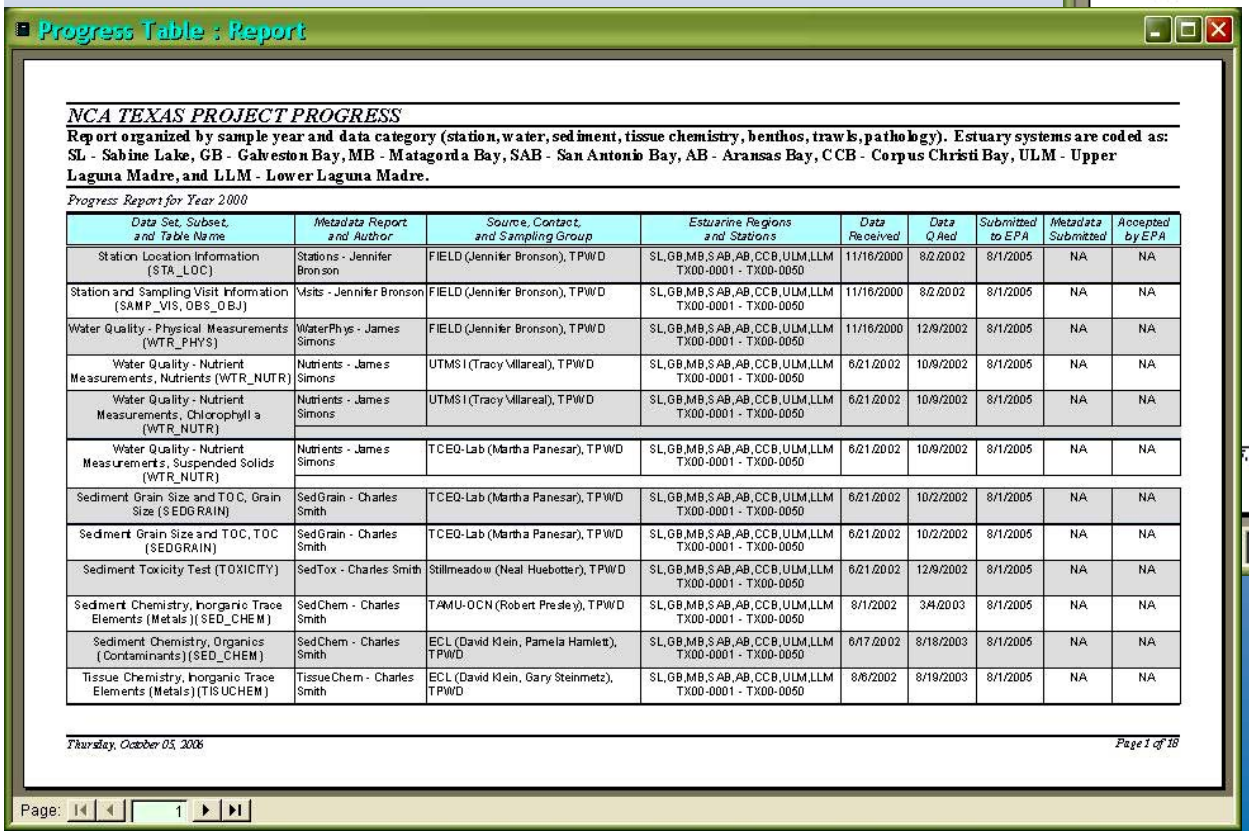
US EPA ARCHIVE DOCUMENT







Database also used for project management, documentation, data input, and quality assurance.

US EPA ARCHIVE DOCUMENT

SEDIMENT

National Coastal Assessment of Texas

EXIT | HELP

Database Window (<F11>)

About NCA Texas

- Grain Size and Total Organic Carbon
- Grain Size and TOC Quality Control
- Toxicity
- Toxicity Quality Control
- Chemistry Summary
- Chemistry Data
- Chemistry Quality Control
- Chemical Compounds

SEDIMENT CHEMISTRY - Raw Data

NCA TEXAS SEDIMENT CHEMISTRY - Raw Data

CH-R: Non Detect - Indicates that the concentration of an analyte was too low to detect. In these cases, the QA code of CH-R is used, and the concentration is reported as 0.

Station: TX00-0001; Wednesday, September 06, 2000; Moisture: 19.1 %; Lab ID: 2795

Analyte Name	Code	Concentration	Units	MDL	DA Code
hexachlorobenzene	BCLBNZ	12.03	ng/g dry wt	1	
acenaphthene	ACENTH	0	ug/g dry wt	0.01	CHR
acenaphthylene	ACENTH	0	ug/g dry wt	0.01	CHR
silver	AG	0.13	ug/g dry wt	0.001	
aluminum	AL	3320	ug/g dry wt	10	
aldrin	ALDRIN	0	ng/g dry wt	1	CHR
alum of siliconsa	ALKANE_	0	ug/g dry wt		CHR
alpha-chlordane	ALPHAC	1.24	ng/g dry wt	1	
anthracene	ANTHRA	0	ug/g dry wt	0.01	CHR
arsenic	AS	1.93	ug/g dry wt	0.05	
benz[a]anthracene	BENANT	0	ug/g dry wt	0.01	CHR
benzo[a]pyrene	BENAPY	0	ug/g dry wt	0.01	CHR
benzo[b]fluoranthene	BENZOB	0.03	ug/g dry wt	0.01	
benzo[k]fluoranthene	BENZOK	0.02	ug/g dry wt	0.01	
benzo[g,h,i]perylene	BENZOP	0	ug/g dry wt	0.01	CHR
biphenyl	BIPHENY	0	ug/g dry wt	1	CHR
cadmium	CD	0.29	ug/g dry wt	0.001	
chrysene	CHRYSE	0.03	ug/g dry wt	0.01	
chromium	CR	14.70	ug/g dry wt	0.05	
copper	CU	3.45	ug/g dry wt	0.15	
dibenz[a,h]anthracene	DIBENZA	0	ug/g dry wt	0.01	CHR
dibenzothiophene	DIBENZO	0	ug/g dry wt	0.01	CHR
dieldrin	DIELDRI	0	ng/g dry wt	1	CHR
2,6-dimethylnaphthalene	DIMETH	0	ug/g dry wt	0.01	CHR
endosulfan	ENDOSU	0	ng/g dry wt	1	CHR
endrin	ENDRIN	0	ng/g dry wt	1	CHR
iron	FE	9800	ug/g dry wt	5	
fluoranthene	FLUORA	0.12	ug/g dry wt	0.01	
fluorene (9h-fluorene)	FLUORE	0	ug/g dry wt	0.01	CHR
heptachlor	HEPTAC	0	ng/g dry wt	1	CHR
heptachlor epoxide	HEPTAE	1.25	ng/g dry wt	1	
mercury	HG	0.09	ug/g dry wt	0.001	
indeno[1,2,3-c,d]pyrene	INDENO	0	ug/g dry wt	0.01	CHR
lindane	LINDANE	50.87	ng/g dry wt	1	
1-methylnaphthalene	MENAP1	0	ug/g dry wt	0.01	CHR
2-methylnaphthalene	MENAP2	0	ug/g dry wt	0.01	CHR
1-methylphenanthrene	MEPHEN	0	ug/g dry wt	0.01	CHR
mirex	MIREX	58.97	ng/g dry wt	1	
manganese	MN	58.80	ug/g dry wt	0.01	
naphthalene	NAPH	0	ug/g dry wt	0.01	CHR
nickel	NI	7.73	ug/g dry wt	0.01	
4,4'-DDD	OPDDD	38.89	ng/g dry wt	1	
4,4'-DDE	OPDDE	34.72	ng/g dry wt	1	
4,4'-DDT	OPDDT	24.78	ng/g dry wt	1	
lead	PB	51.30	ug/g dry wt	0.05	
PCB congener 101/90	PCB101	0	ng/g dry wt	1	CHR
PCB congener 105	PCB105	0	ng/g dry wt	1	CHR
PCB congener 118/106/118	PCB118	0	ng/g dry wt	1	CHR
2,3',4,4',5-pentachlorobiphenyl	PCB123	0	ng/g dry wt	1	CHR
2,2',3,3',4,4'-hexachlorobiphenyl	PCB128	0	ng/g dry wt	1	CHR
2,2',3,4,4',5,5'-heptachlorobiphenyl	PCB180	0	ng/g dry wt	1	CHR
2,2',3,4,4',5,5'-heptachlorobiphenyl	PCB189	0	ng/g dry wt	1	CHR
PCB congener 77/110	PCB77	0	ng/g dry wt	1	CHR
PCB congener 82	PCB82	0	ng/g dry wt	1	CHR
2,2',4,4'-tetrachlorobiphenyl	PCB47	0	ng/g dry wt	1	CHR
2,2',5,5'-tetrachlorobiphenyl	PCB52	0	ng/g dry wt	1	CHR
2,2',3,5'-tetrachlorobiphenyl	PCB66	0	ng/g dry wt	1	CHR
2,3',4,4'-tetrachlorobiphenyl	PCB77	0	ng/g dry wt	1	CHR
PCB congener 87	PCB87	0	ng/g dry wt	1	CHR
phytane	PHYTAN	0	ng/g dry wt		CHR
4,4'-DDD	PPDDD	1.23	ng/g dry wt	1	
4,4'-DDE	PPDDE	1.22	ng/g dry wt	1	
4,4'-DDT	PPDDT	1.04	ng/g dry wt	1	
pristane	PRISTAN	0	ug/g dry wt		CHR
pyrene	PYRENE	0.10	ug/g dry wt	0.01	
antimony	SB	0.21	ug/g dry wt	0.05	
selenium	SE	0.07	ug/g dry wt	0.01	
tin	SN	1.87	ug/g dry wt	0.07	
tetrachloro	TRICH	1.13	ng/g dry wt	1	
toxaphene	TOXAPH	0	ng/g dry wt	1	CHR
trimethylnaphthalene	TRIMETH	0	ug/g dry wt	0.01	CHR
zinc	ZN	60.00	ug/g dry wt	0.08	

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Page: 1

SEDIMENT CHEMISTRY - Statistics and ...

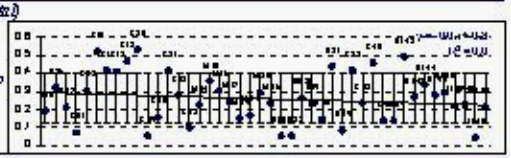
NCA TEXAS SEDIMENT CHEMISTRY - Statistics and Stations for Year 2000

Report organized by inorganic and organic compounds divided into groups with the compounds alphabetized within groups. Graph error bars represent ± 1 Standard Deviation. Estuary systems are ordered from north to south and coded as: S - Sabine Lake, G - Galveston Bay, M - Matagorda Bay, SA - San Antonio Bay, A - Aransas Bay, C - Corpus Christi Bay, UL - Upper Laguna Madre, and LL - Lower Laguna Madre. National Status and Trends contaminant criteria (http://ccma.nos.noaa.gov/NSandT/sedimentquality.html): ERL - Effects Range Low, ERM - Effects Range Median, SQC - Sediment Quality Criteria.

Inorganic - trace element (non-metal)

selenium (SE)

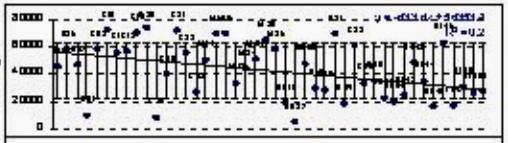
Units	Average Concentration	Sample SD
ug/g dry wt	0.24	0.13
Range	Count	MDL
0.05 - 0.59	44	0.01



Inorganic - trace element metal

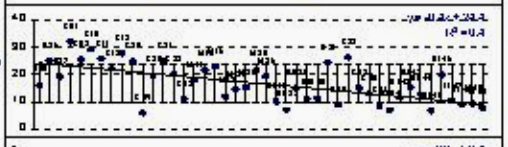
aluminum (AL)

Units	Average Concentration	Sample SD
ug/g dry wt	42088	20282
Range	Count	MDL
4520 - 72800	44	10



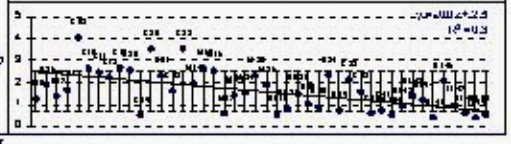
lead (PB), ERL - 47 µg/g dry wt, ERM - 220 µg/g dry wt

Units	Average Concentration	Sample SD
ug/g dry wt	16.47	12.13
Range	Count	MDL
5.31 - 51.20	44	0.05



tin (SN)

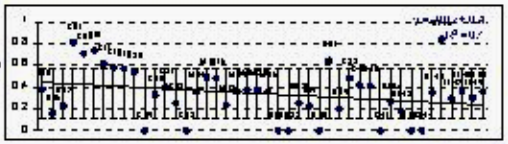
Units	Average Concentration	Sample SD
ug/g dry wt	2.40	0.94
Range	Count	MDL
0.53 - 4.07	44	0.07



Inorganic - trace element metalloid

antimony (SB)

Units	Average Concentration	Sample SD
ug/g dry wt	0.14	0.23
Range	Count	MDL
0 - 0.94	44	0.05



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Page: 1

Reports for raw data and descriptive statistics.

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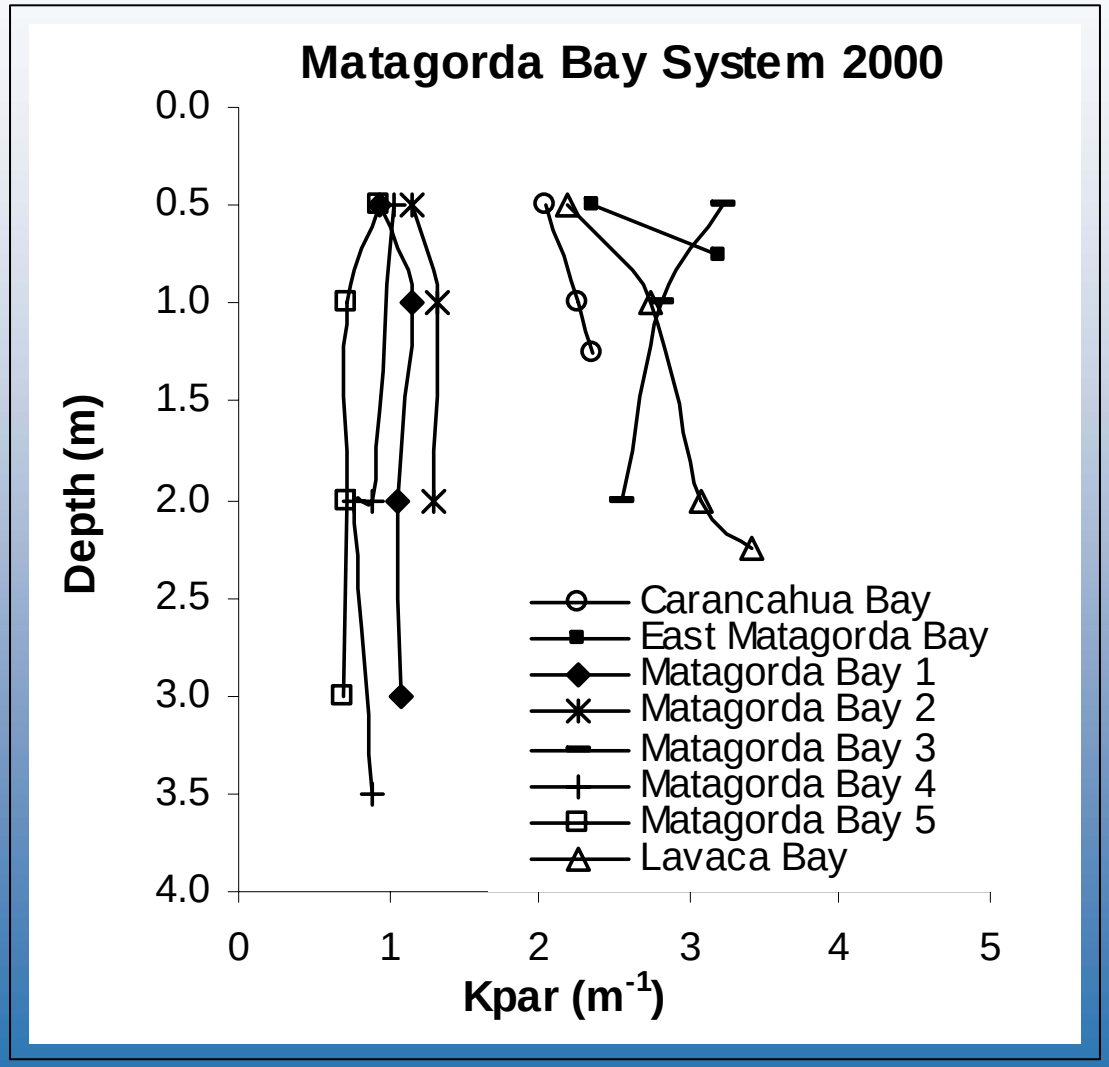
Water clarity index



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What if we used NCA data for 305b?

- Can use attainment be determined from NCA data?
- Do good/fair/poor equate to use support categories 1-5?
- How do we translate NCA ecological assessment to designated use support attainment?

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National Coastal Assessment & 305(b)

- NCA – Ecological Assessment of Condition
  - Water Quality
  - Biological Condition
  - Sediment Quality
  - Tissue Contaminants
- 305(b) – Water Quality Inventory
  - Attainment of Designated Uses
  - Causes of non-attainment
  - Potential Sources

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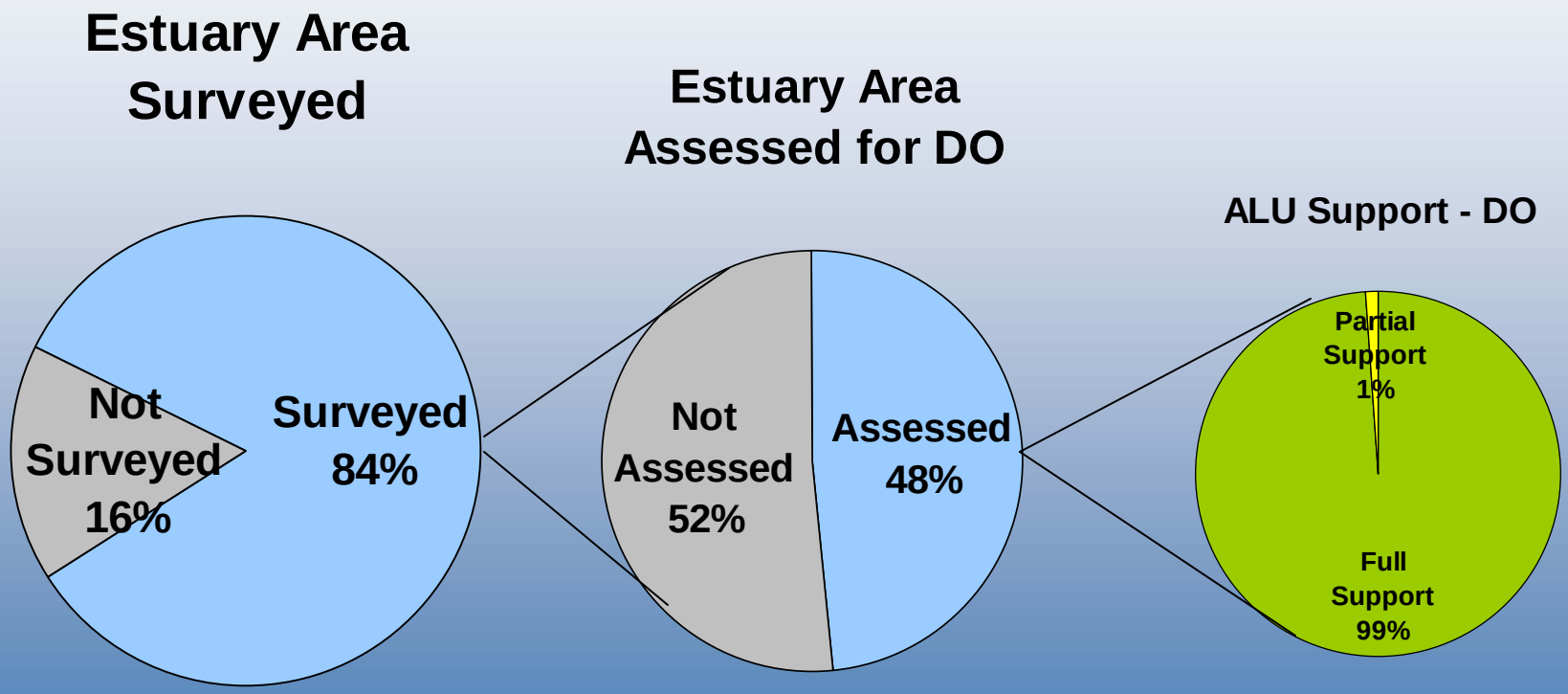
TX Estuaries – 2002 305(b)



Total estuaries = 2394 mi^2

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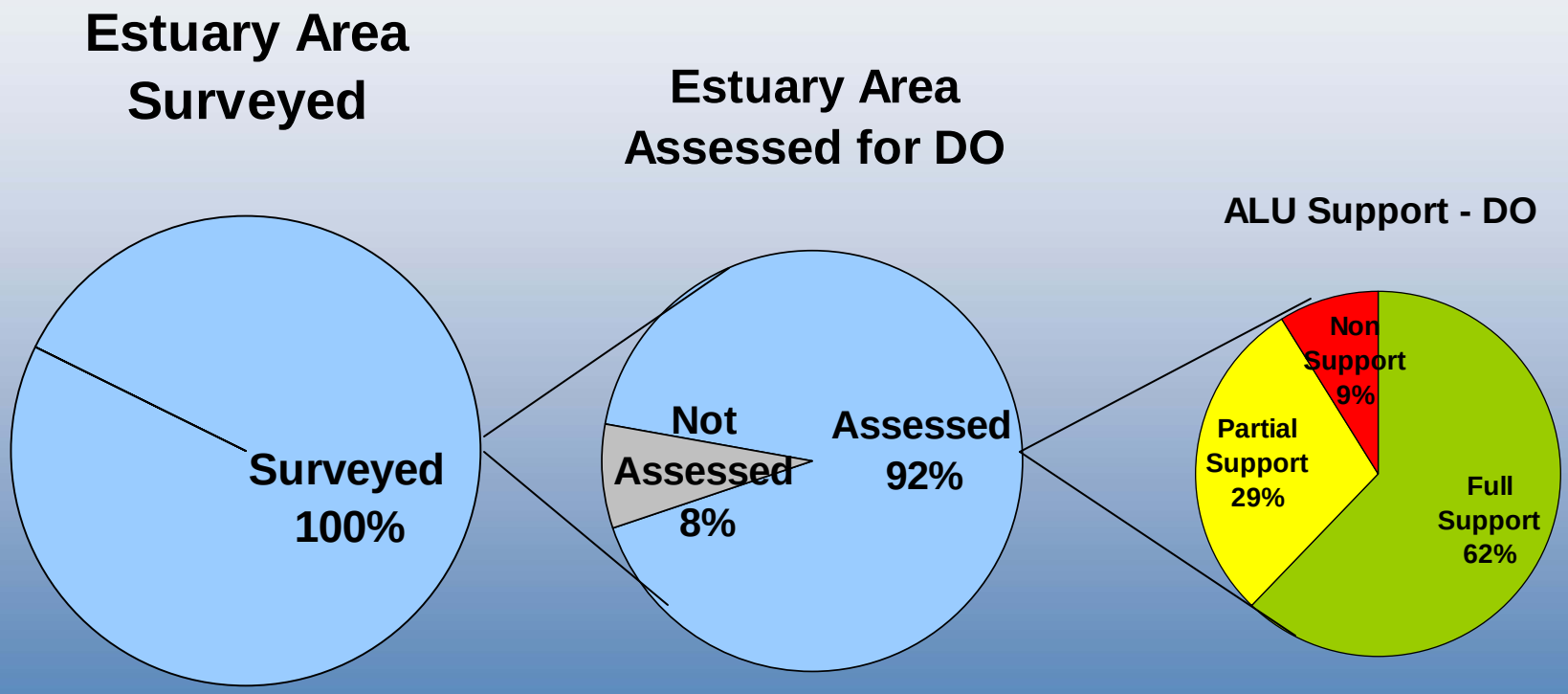
TX Estuaries - NCA 2000-2003



Total estuaries = 2596 mi^2

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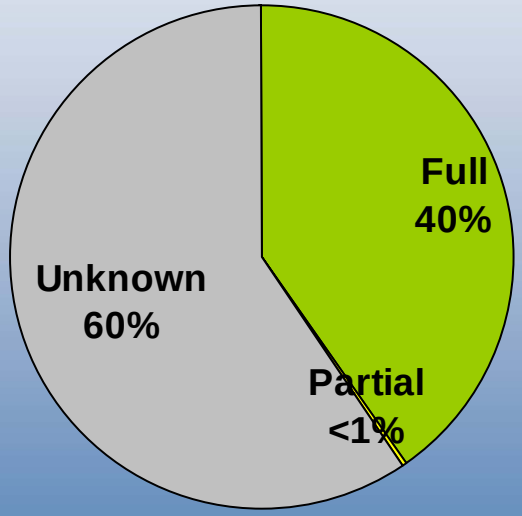
TX 305(b) vs TX NCA

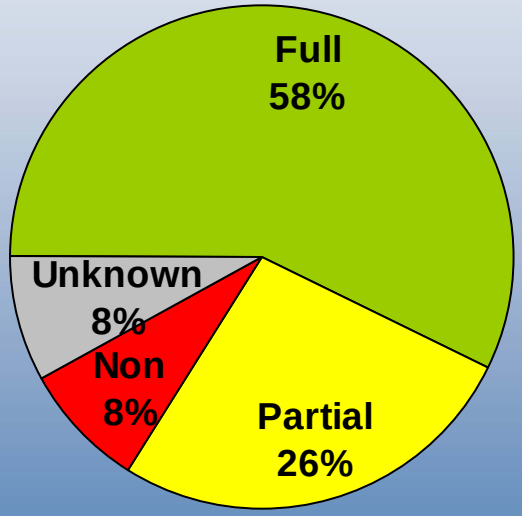
TX 305(b) - 2002
ALU DO Assessment



Total estuaries = 2394 mi²
Total assessed = 971 mi²

=?

TX NCA 2000-2002
DO Assessment



Total estuaries = 2596 mi²
Total assessed = 2397 mi²

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Estuary	Area (mi^2)	% Meeting DO Criteria	% Not Meeting DO Criteria	ALU Support
Sabine Lake	126.2	100	0	Full
Galveston Bay	577.9	100	0	Full
Matagorda Bay	463.6	89	11	Partial
San Antonio Bay	212.7	71	29	Non
Aransas Bay	242.3	91	9	Full
Corpus Christi Bay	220.3	92	8	Full
Upper Laguna Madre	223.9	86	14	Partial
Lower Laguna Madre	319.9	91	9	Full

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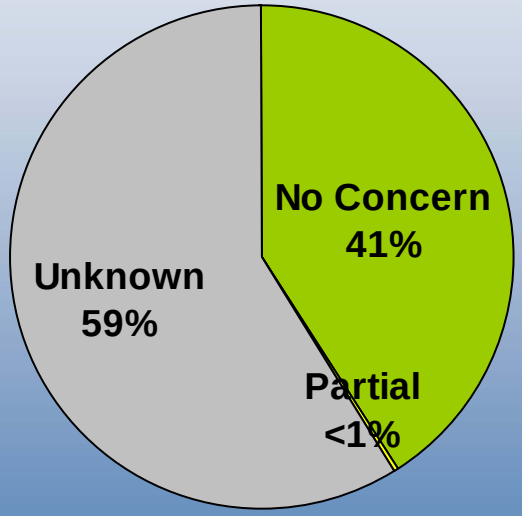
TX 305(b) vs TX NCA

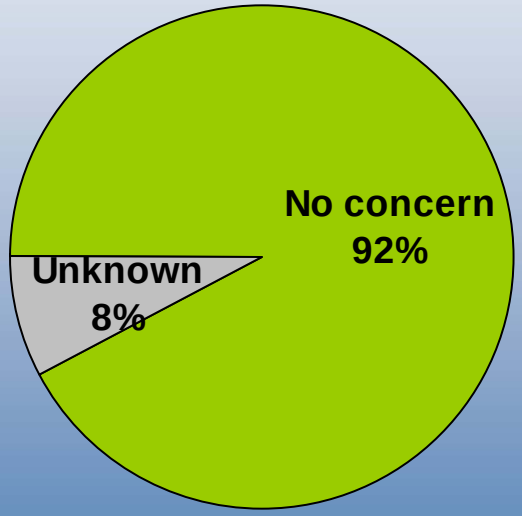
TX 305(b) - 2002 Nitrogen Concern



Total estuaries = 2394 mi²
Total assessed = 987 mi²

=?

TX NCA 2000-2002 Nitrogen Assessment



Total estuaries = 2596 mi²
Total assessed = 2397 mi²

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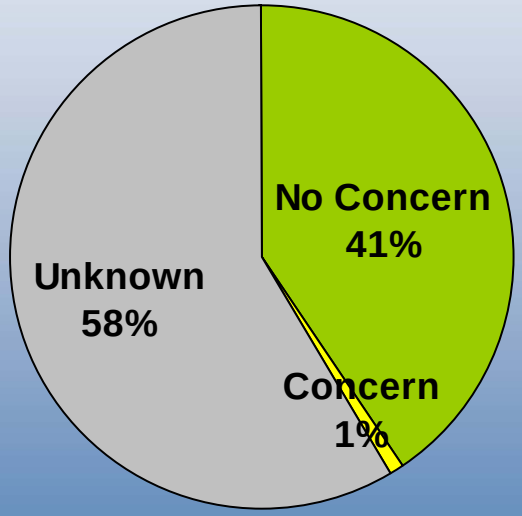
TX 305(b) vs TX NCA

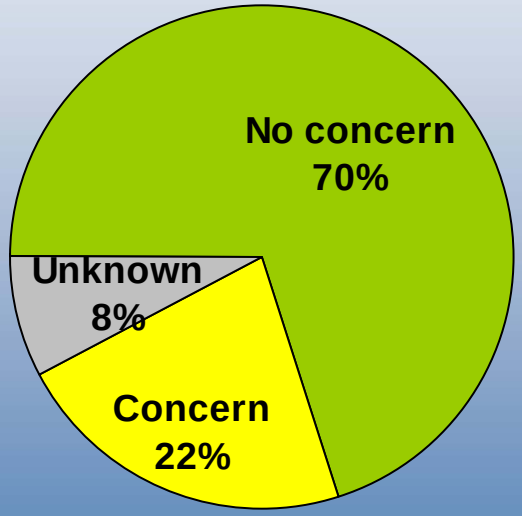
TX 305(b) - 2002 Phosphate Concern



Total estuaries = 2394 mi²
Total assessed = 966 mi²

=?

TX NCA 2000-2002 Phosphate Assessment



Total estuaries = 2596 mi²
Total assessed = 2397 mi²

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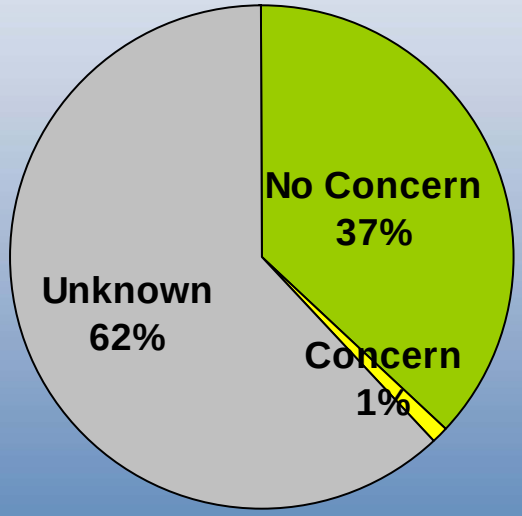
TX 305(b) vs TX NCA

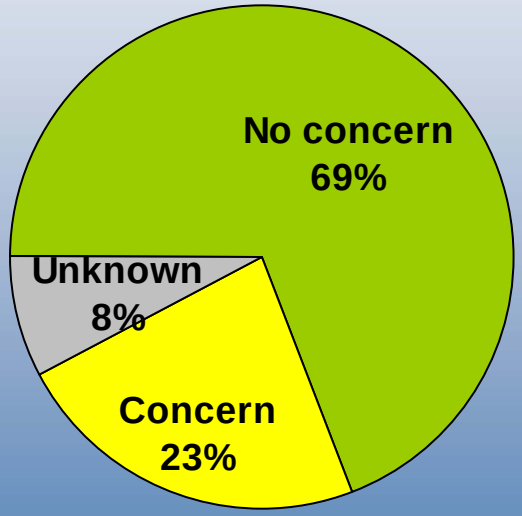
TX 305(b) - 2002 Chlorophyll Concern



Total estuaries = 2394 mi²
Total assessed = 913 mi²

=?

TX NCA 2000-2002 Chlorophyll Assessment



Total estuaries = 2596 mi²
Total assessed = 2397 mi²

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Secondary Concerns

TX NCA Estuaries - % Area > Screening Level (Concern if > 25%)				
Estuary	Ammonia	Nitrate + Nitrite	Ortho-phosphate	Chlorophyll
Sabine Lake	0	0	0	20
Galveston Bay	4	2	29	55
Matagorda Bay	0	0	0	36
San Antonio Bay	0	7	0	50
Aransas Bay	0	0	0	4
Corpus Christi Bay	0	0	0	31
Upper Laguna Madre	4	0	0	25
Lower Laguna Madre	0	0	0	9

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Coastal Patterns

- Salinity and dissolved oxygen
- Nutrients and chlorophyll a
- PCA analysis of nutrients
- Sediment Organic Contaminants
- Sediment Pb and As
- Tissue DDTs and PCBs
- Arsenic contamination in tissues and sediments

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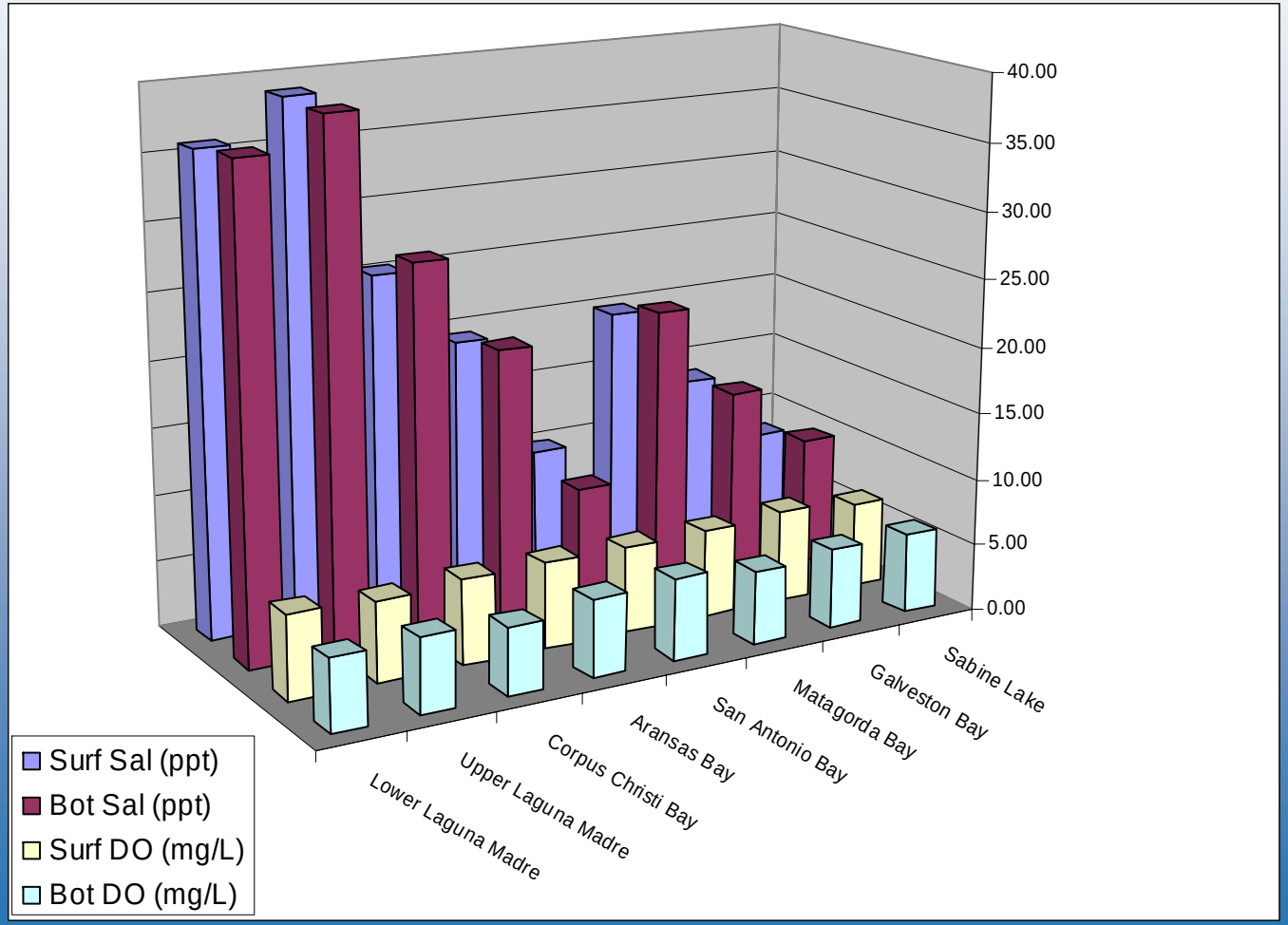
Salinity and Dissolved Oxygen



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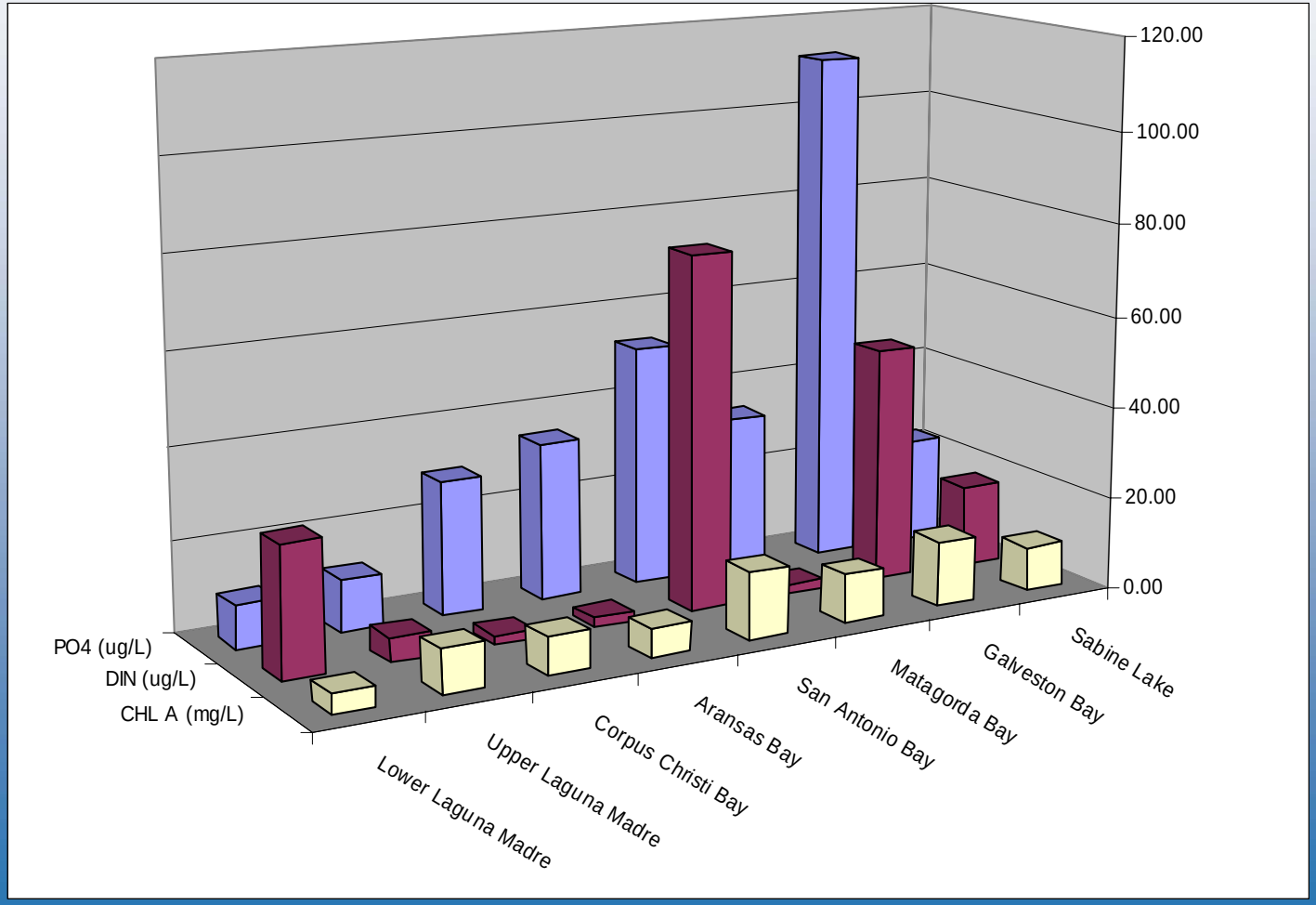
Water nutrients and chlorophyll a



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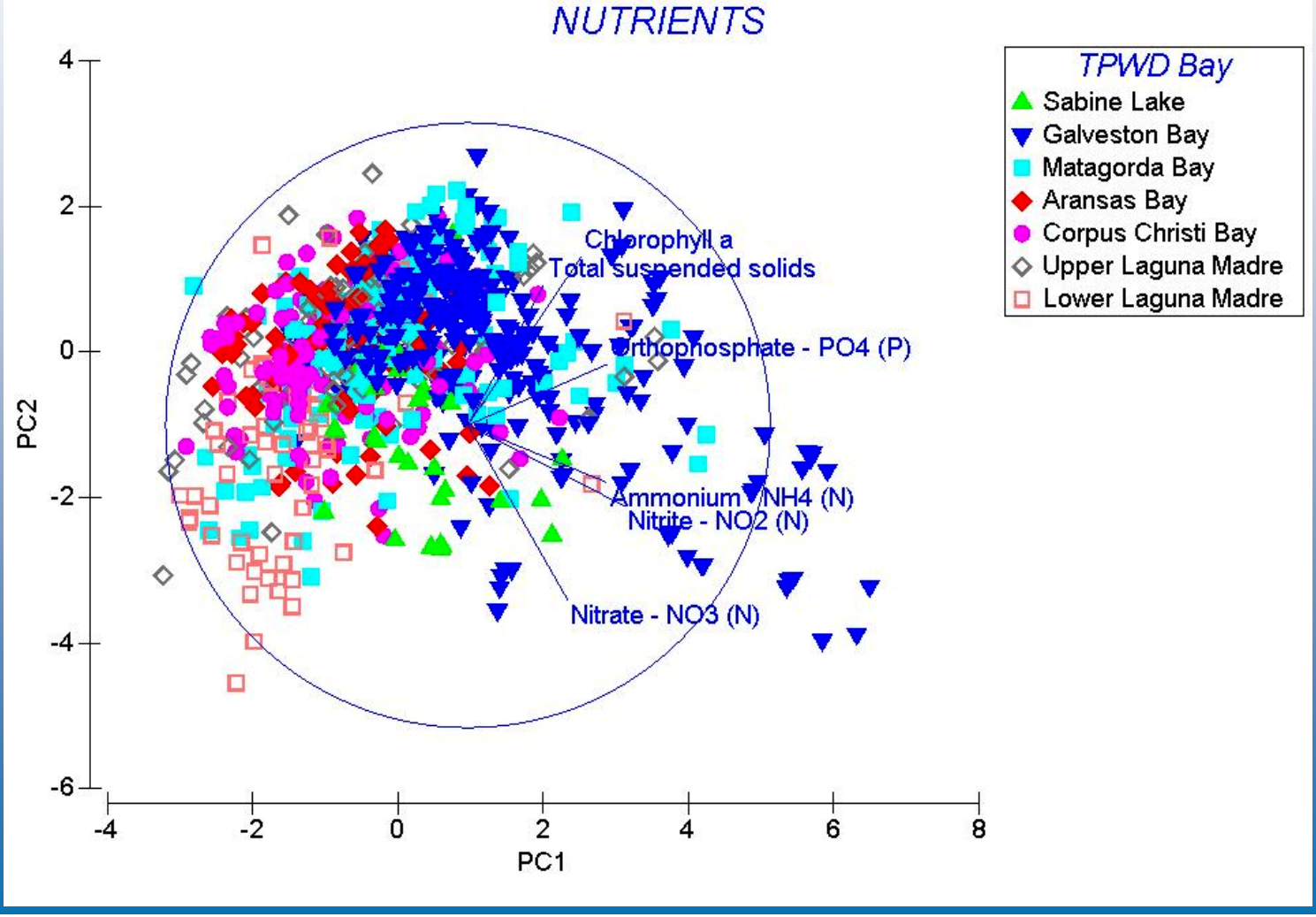
Ecosystem Characterization: Nutrients increase from south to north along the Texas Coast.



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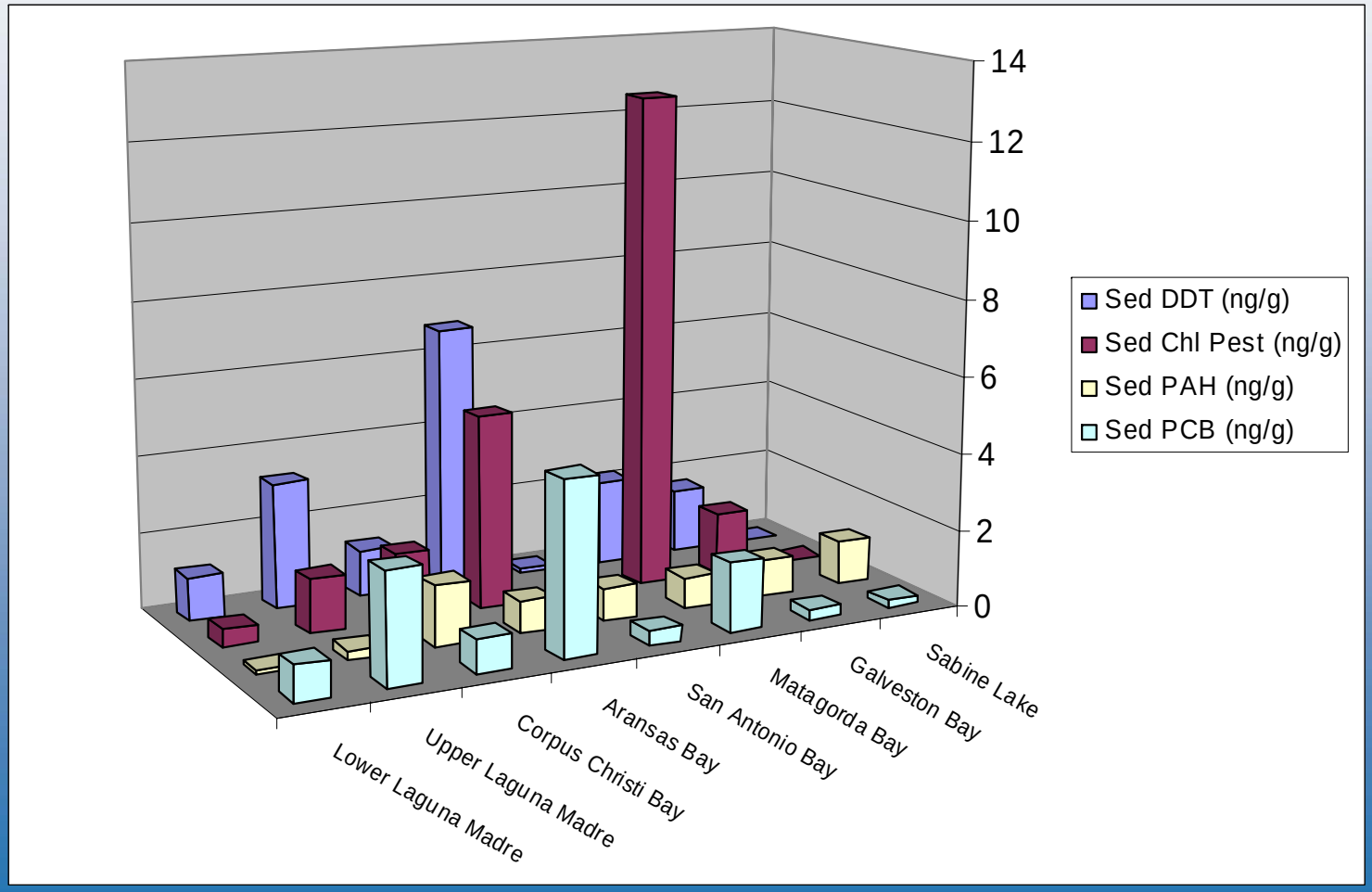
Sediment Organic Contaminants



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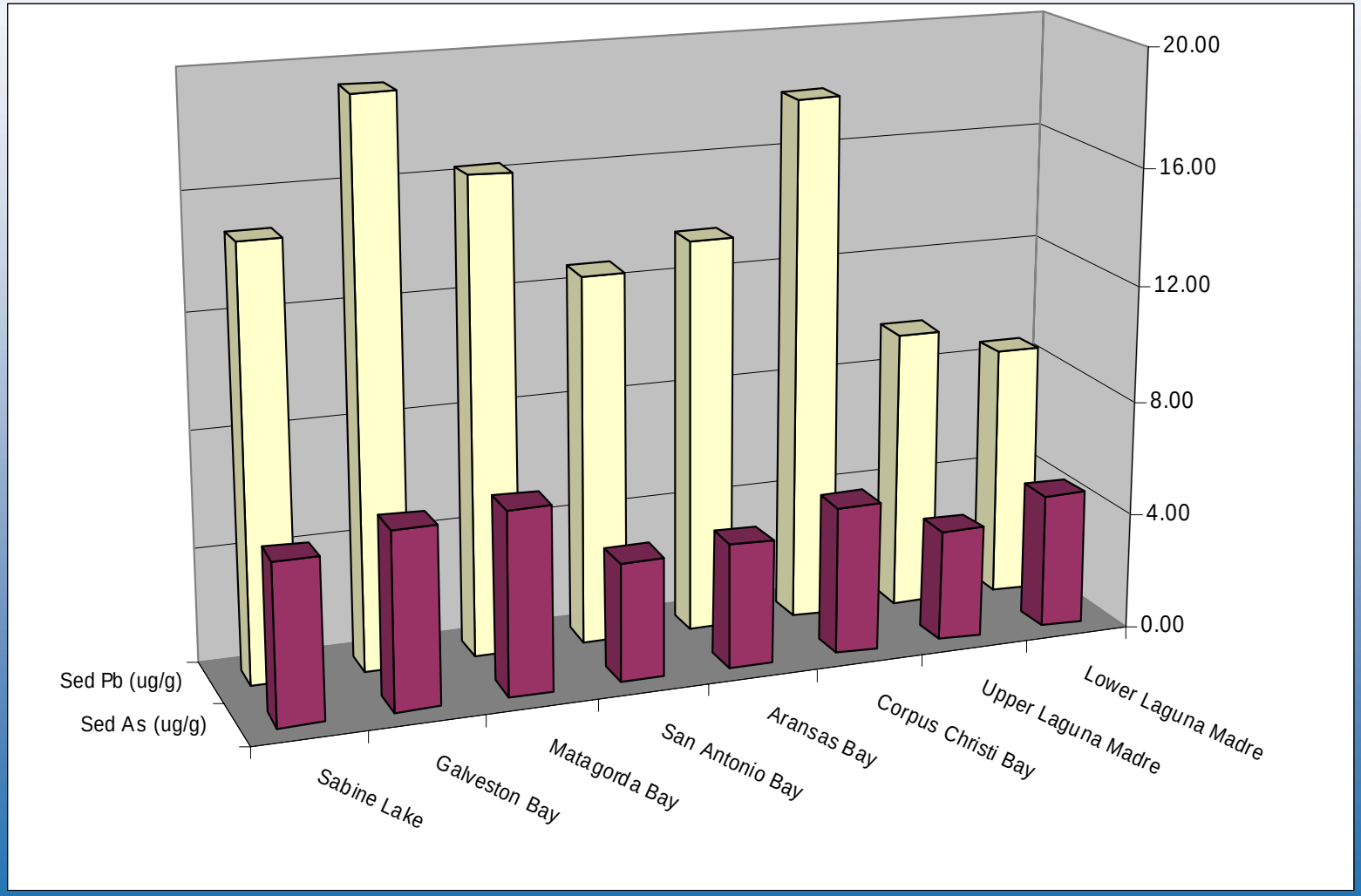
Sediment Pb and As



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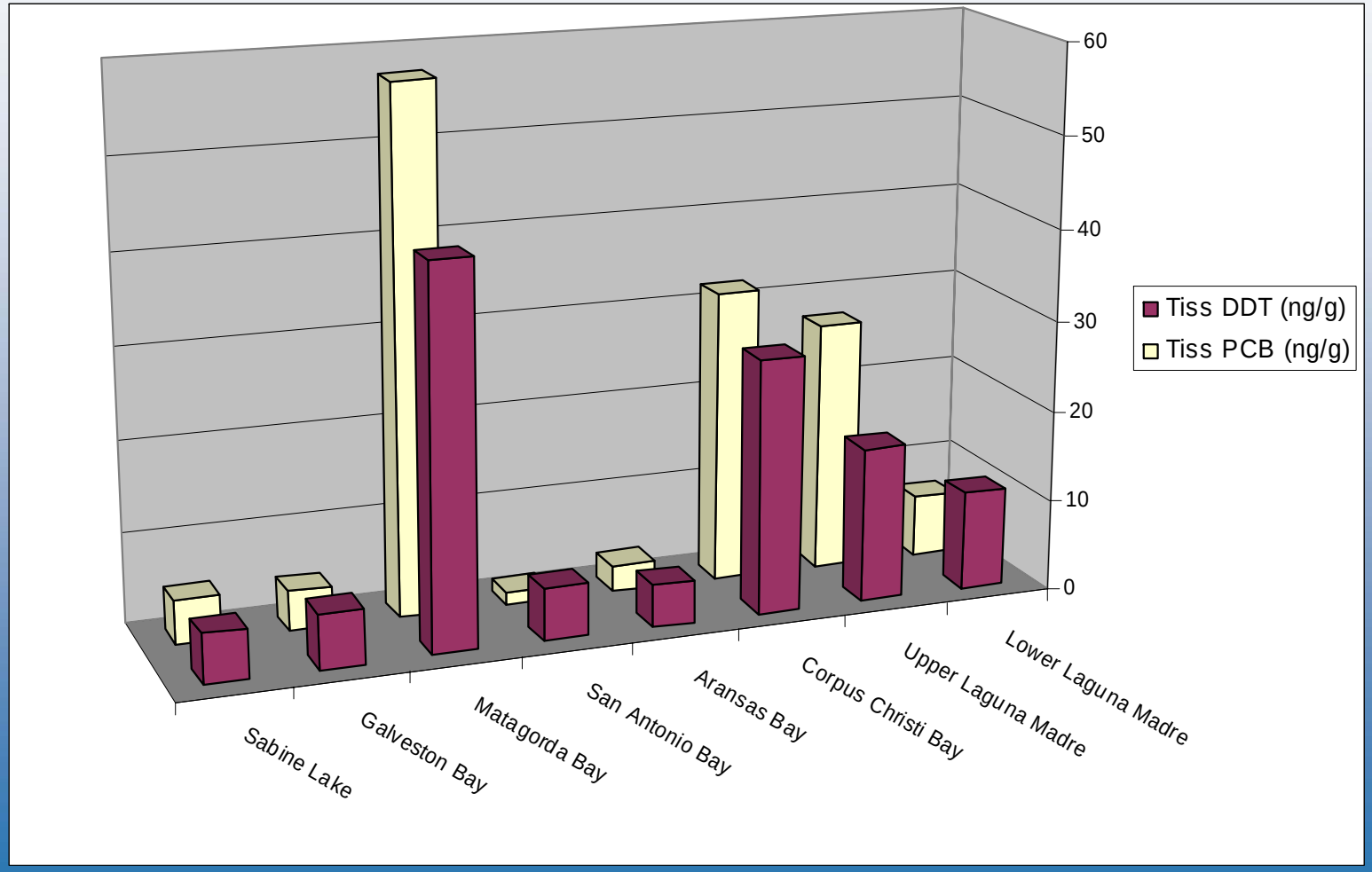
Tissue DDTs and PCBs



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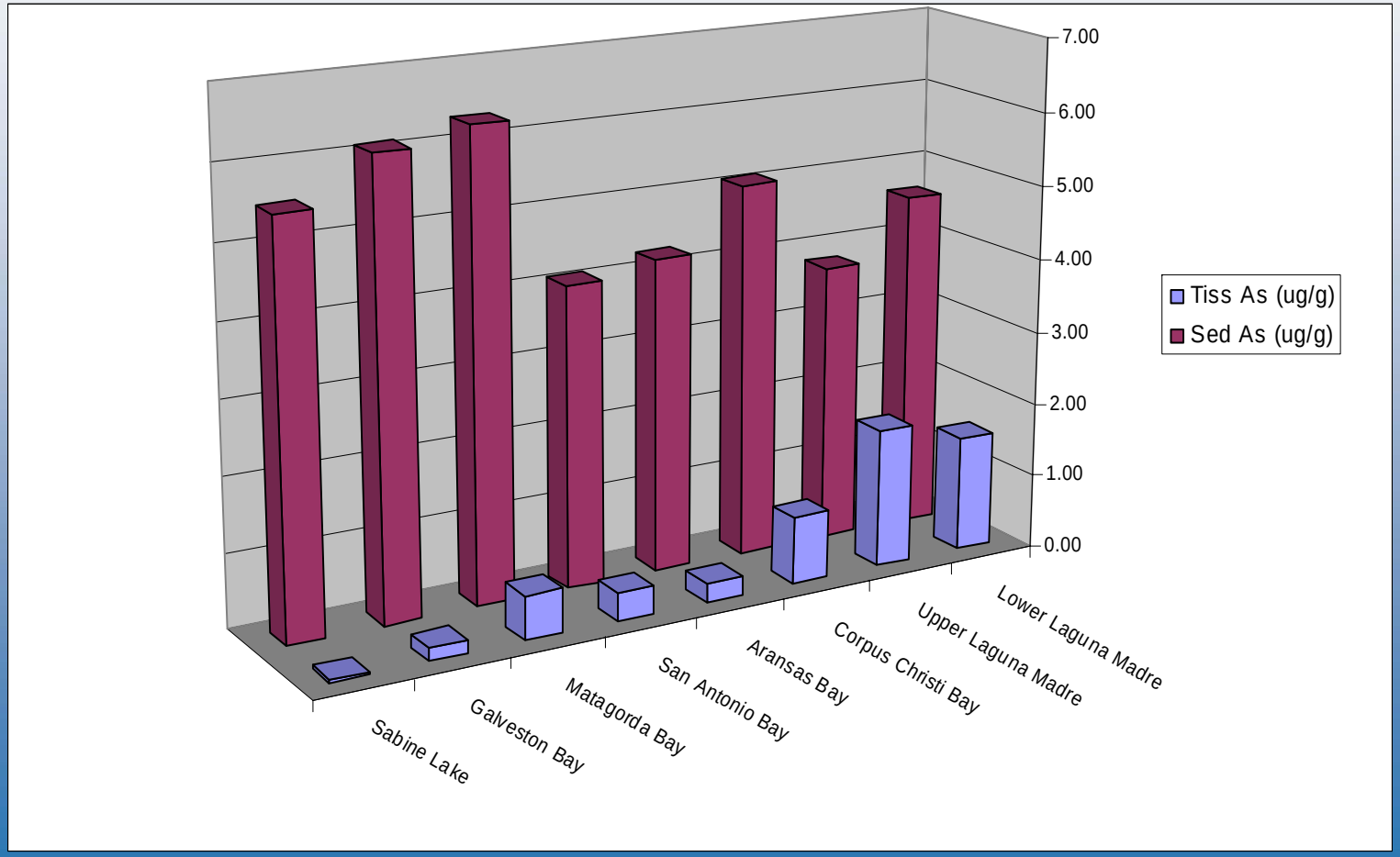
Arsenic contamination in tissues and sediments



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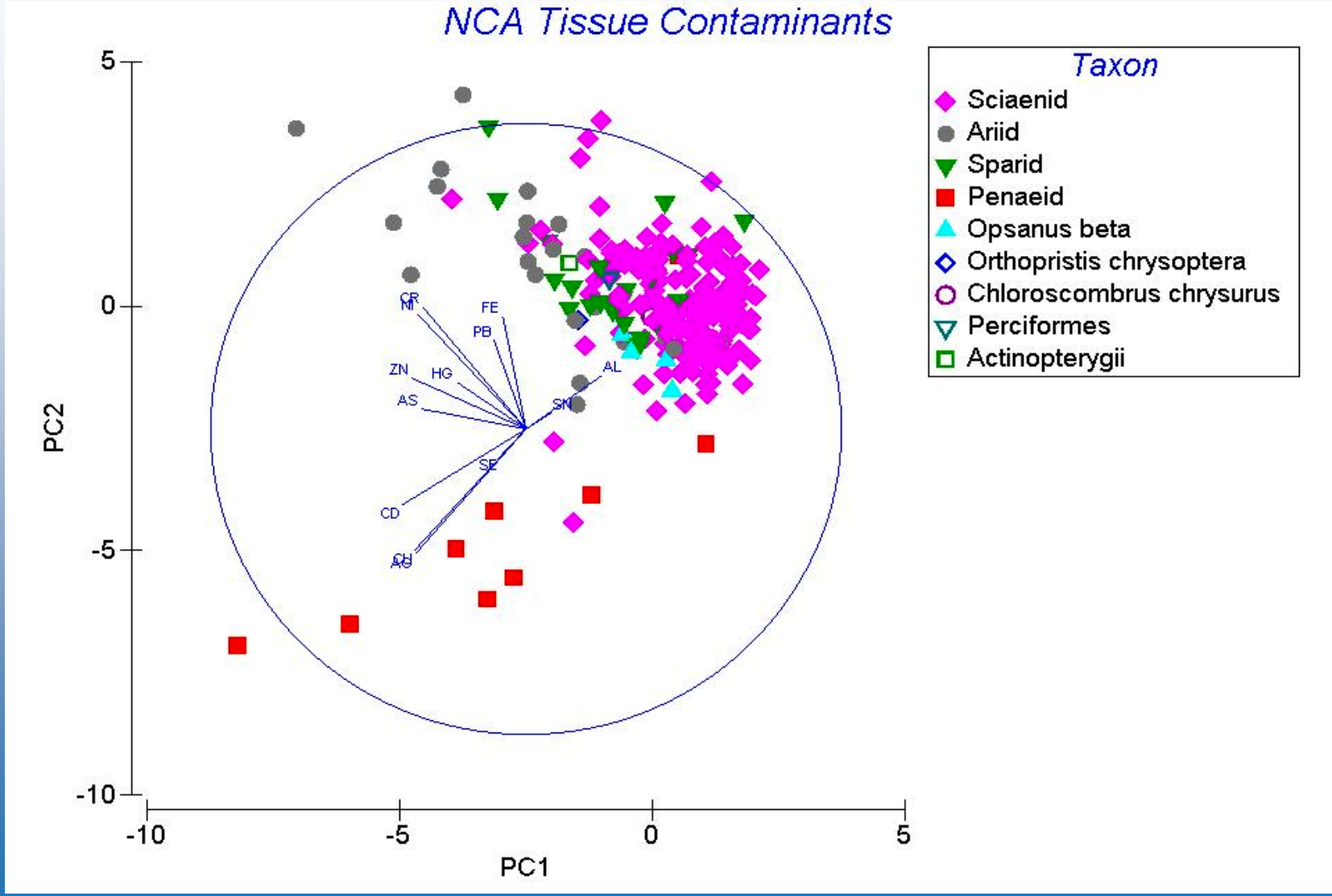
Ecosystem Characterization: Tissue contaminants segregate along taxa



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Future Directions

- Ecosystem-based Management

  (TPWD's CF Division)
- Texas Coastal Assessment

  (TCEQ, TPWD partnership)

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Recent Relevant Policies, Plans and Guidance

- TPWD – *Land and Water Resources Conservation and Recreation Plan* (August 2002)
- EPA – *Elements of a State Water Monitoring and Assessment Program* (March 2003)
- NOAA – *Strategic Guidance for Implementing an Ecosystem-based Approach to Fisheries Management* (May 2003)
- US President – Executive Order: *Facilitation of Cooperative Conservation* (August 26, 2004)
- EPA – *2006 - 2011 EPA Strategic Plan* (2006)

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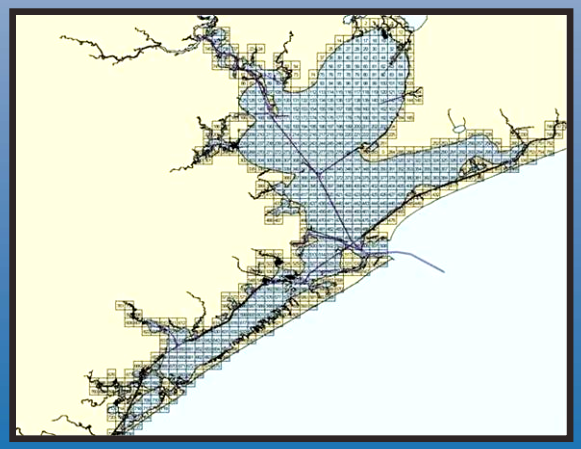
The Near Future - 2007

- 50 Stations to be sampled across the coast, including the 18 TCEQ stations in Galveston Bay.
- Water, sediment, and benthic characterization as in the past with the exception of tissue contaminants, sediment organics and sediment toxicity.
- Random sampling based on the TPWD Coastal Fisheries grid selection.
- Sampling during index period of 1 July to 31 August.



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  Brien Nicolau, Erin Hill, Alex Nunez

- CSG

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