



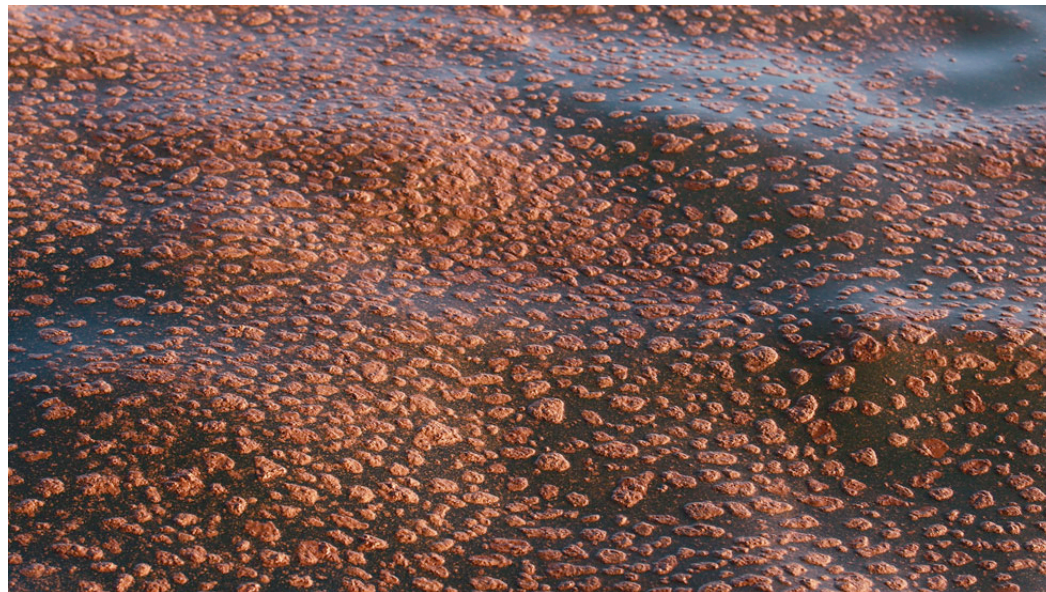
Shoreline response strategies for emulsified MC252 oil

John H Pardue

Civil & Environmental Engineering, LSU

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Emulsion or “mousse”- primary form of oil at coast



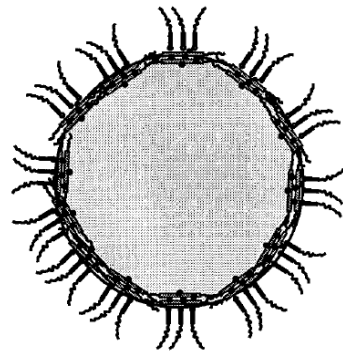


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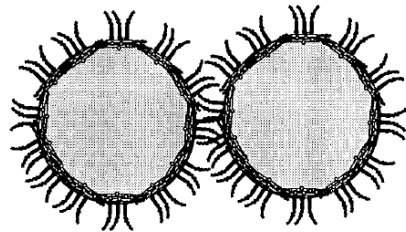
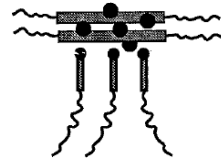
Hurricane Alex- late June 2010
TS Bonnie- late July 2010

Stability of oil:water emulsions



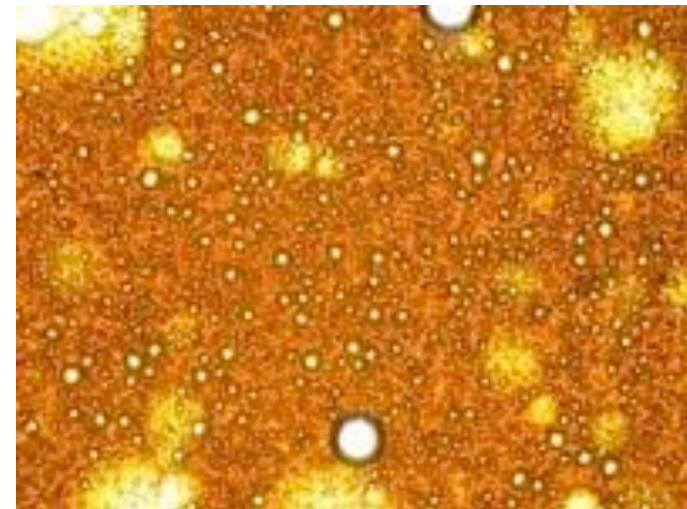
Asphaltene-Stabilized Water Droplet

Partially Resin-Solvated Asphaltene Aggregate



Droplets Resist Fusion Due to Steric Stabilization

Stable emulsions form due to surface-active components: asphaltenes and resins



From McLean and Kilpatrick, 1997

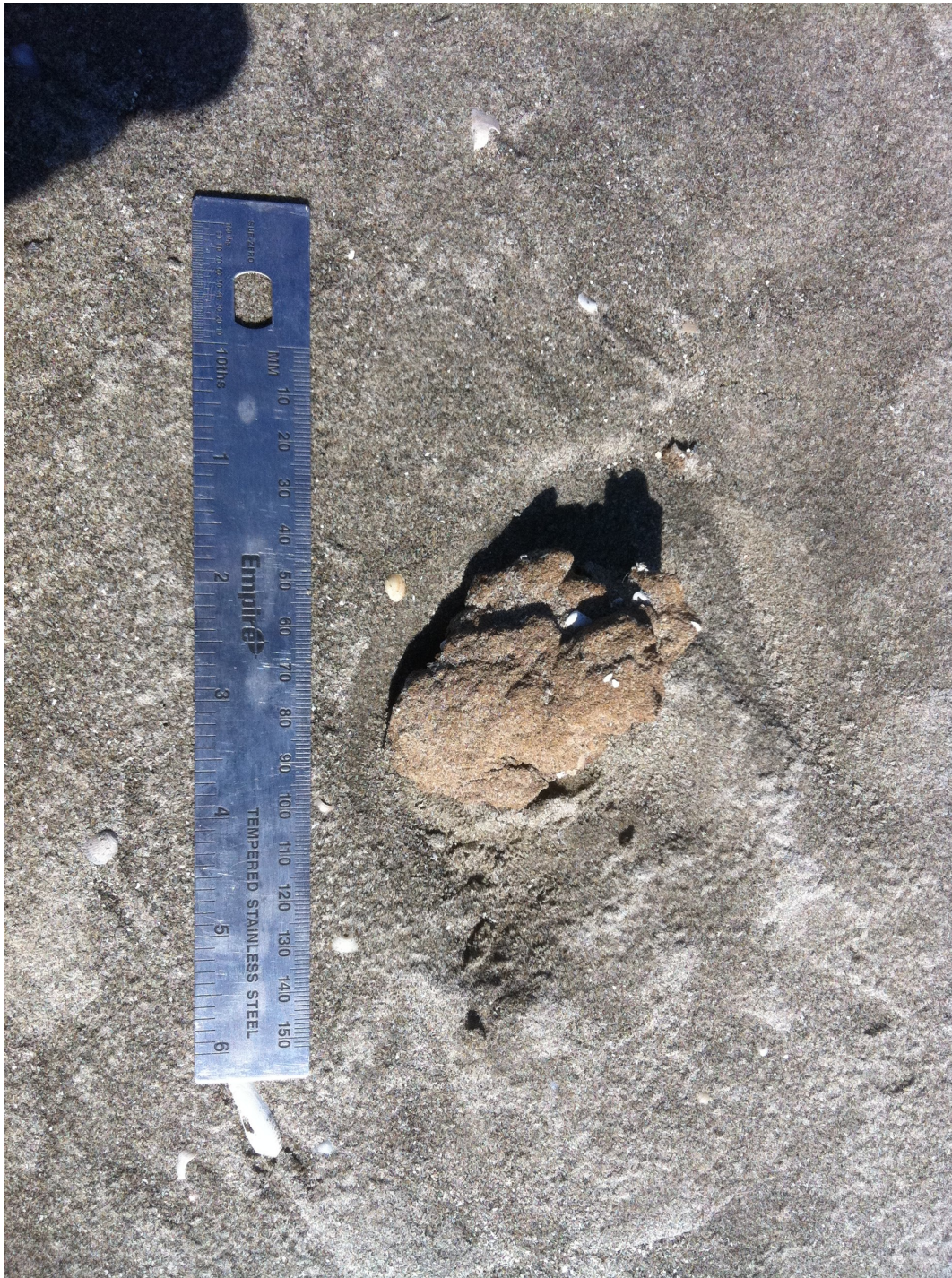
Questions?

- Fate of emulsified oil across an coastal headland elevational gradient
 - Natural recovery processes
 - Factors that limit biodegradation
- Response strategies
 - Efficiency of manual removal approaches
 - Acceleration of marsh biodegradation processes





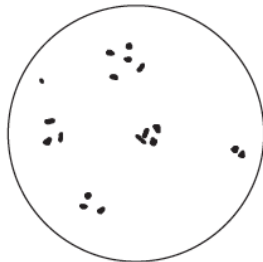
Small surface residue balls on supratidal beach surface, Fourchon Beach, LA



Characterization

Dimensions; porosity; density;
salinity; N/P; oxygen
microprofiles; full PAH, alkane,
biomarker profiles;
sulfate

N=118



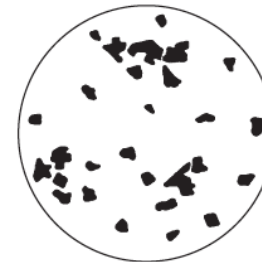
1%



3%



5%



10%



20%



30%



40%



50%

PERCENT COVER ESTIMATION CHARTS

34

From NOAA SCAT job aid

Gulf ↑



Plot 1.B.5/12
November 4, 2010

1 m

Gulf ↑

1. Image
2. Subsample individual oil pieces

1 m



Gulf ↑

1. Image
2. Subsample individual oil pieces



B



A

1 m



Gulf ↑

1. Image
2. Subsample individual oil pieces
3. Composite (top 2")



B



A

1 m





	A x	B y	C Perim	D Area
26	5.3568297	3.368422		
27	5.1936022	3.4277774		
28	5.0303747	3.4574552		
29	4.9858581	3.6058438		
30	4.674242	3.7839102		
31	4.4071424	4.0064931		
32	4.4219813	4.0064931		
33	4.4219813	4.0064931		
34	4.3923036	4.021332	7.2121555	2.2107263
35	21.471835	6.2174837		
36	21.308608	5.9800619		
37	21.442158	5.7871567		
38	21.560868	5.4607017		
39	21.917001	5.3716685		
40	22.184101	5.4903794		
41	22.287973	5.4013463		
42	22.4512	5.3419908		
43	22.673783	5.5497349		
44	22.673783	5.7426401		
45	22.362167	5.9207065		
46	22.184101	5.9058676		
47	21.857646	5.9207065		
48	21.783451	6.1136117		
49	21.724096	6.2620003		
50	21.590546	6.3065169		
51	21.471835	6.2026449		
52	21.471835	6.2174837	4.0992328	0.7305966
53	15.773712	3.9026211		
54	15.877584	4.2142372		
55	15.684679	4.3774647		
56	15.565968	4.5258533		
57	15.447257	4.3774647		
58	15.387901	4.125204		
59	15.387901	4.0361708		

Image processing, allowing individual measurements of projected areas and surface coverage of oil pieces

4.4% coverage







Findings to date

- Position on the landscape which determines geochemical conditions and subsequently rate and extent of bioremediation
- Moisture content limits biodegradation in supratidal; oxygen mass transfer limits biodegradation in the intertidal and subtidal
- Aggregates are stable—transported over the beach surface into the marsh buried in the profile



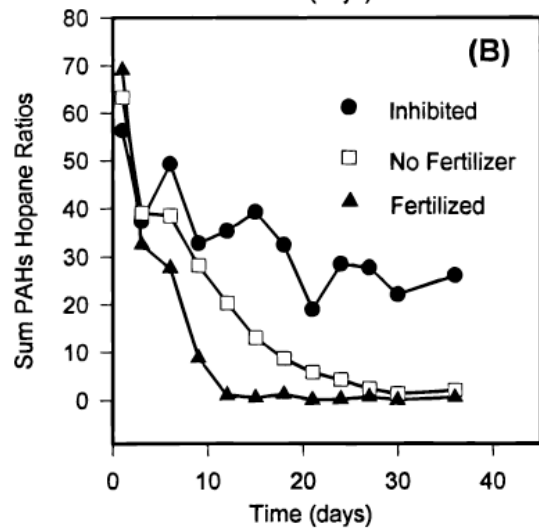
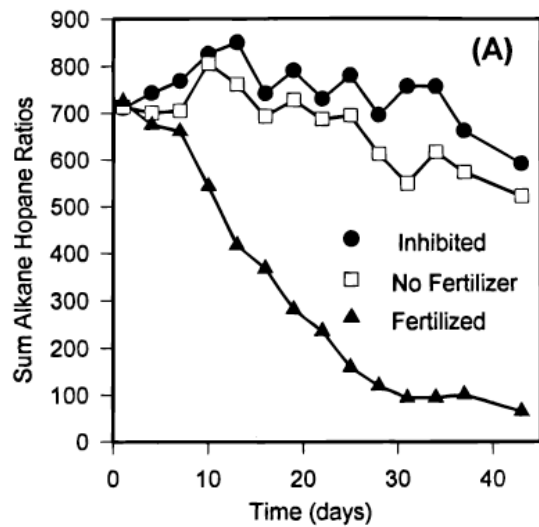
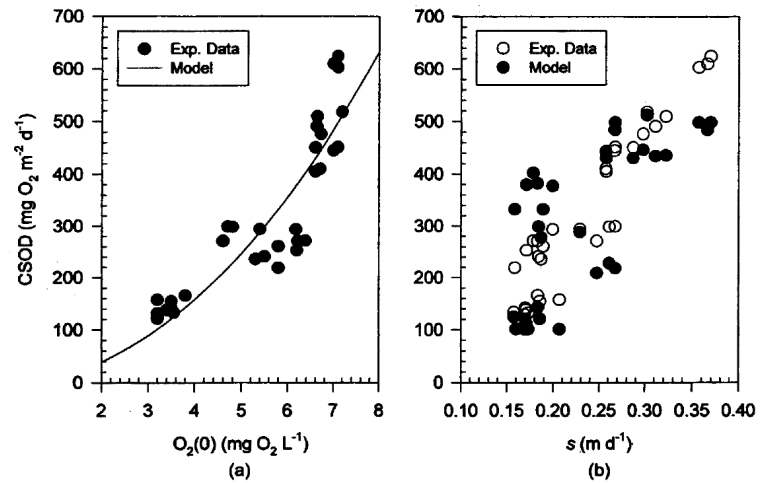
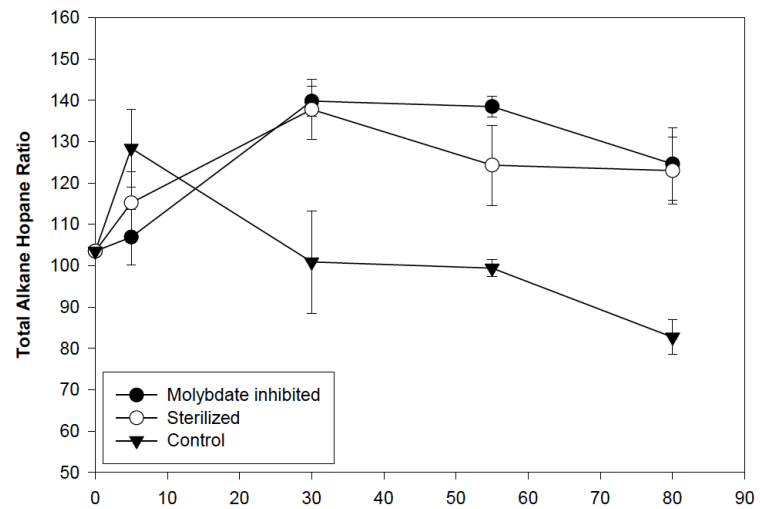


FIGURE 1. (A) Total (C15–C44) alkane hopane ratio versus time in aerated microcosms. (B) Total PAH (phenanthrene, C1–C2; naphthalene, C1–C2) hopane ratio versus time.

Aerobic biodegradation



Geochemical biodegradation modeling



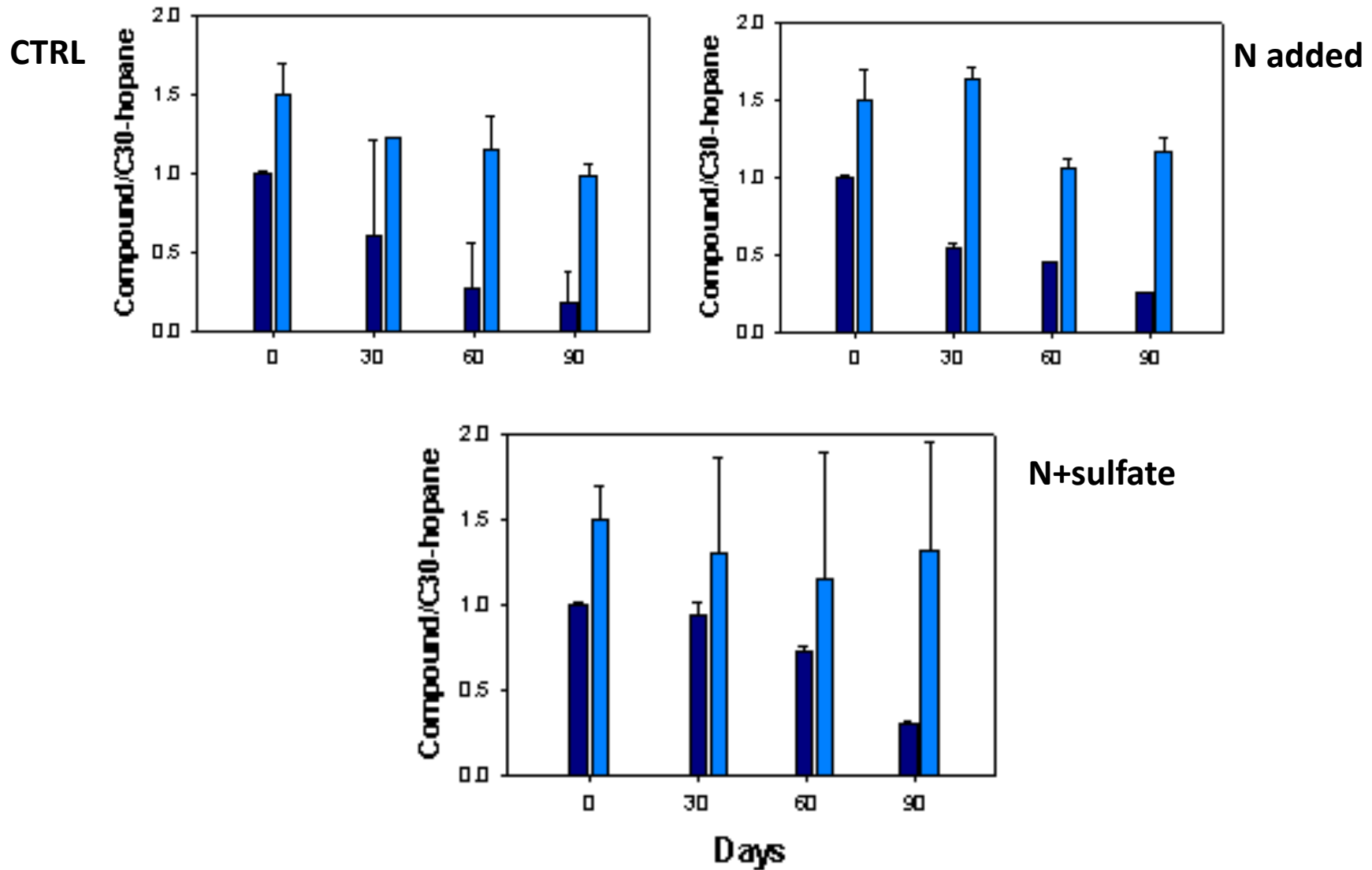
Anaerobic biodegradation





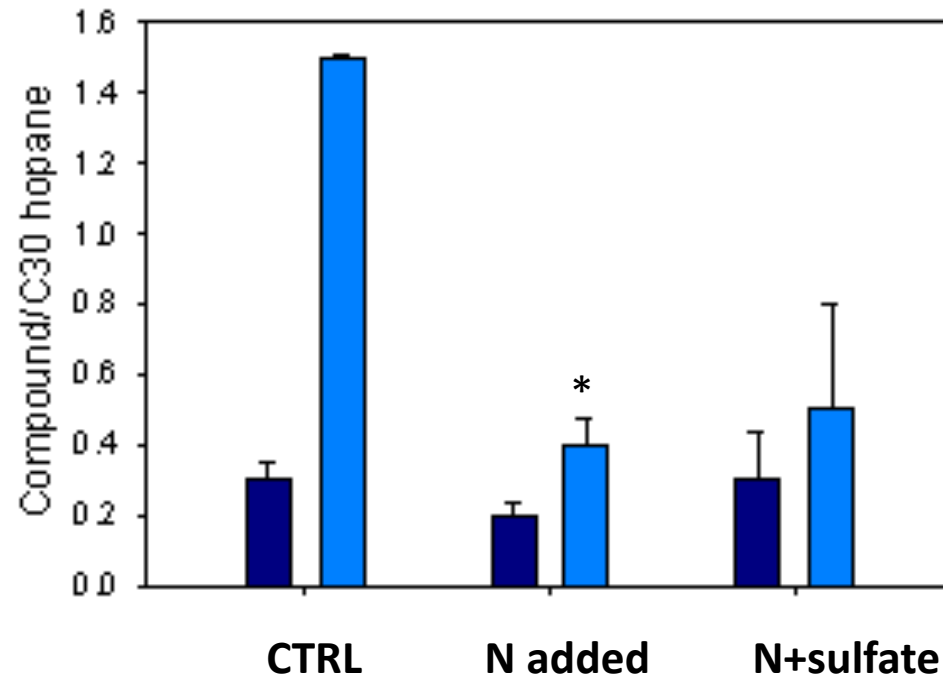
SHORT-TERM

Phenanthrene and C1-phenanthrene

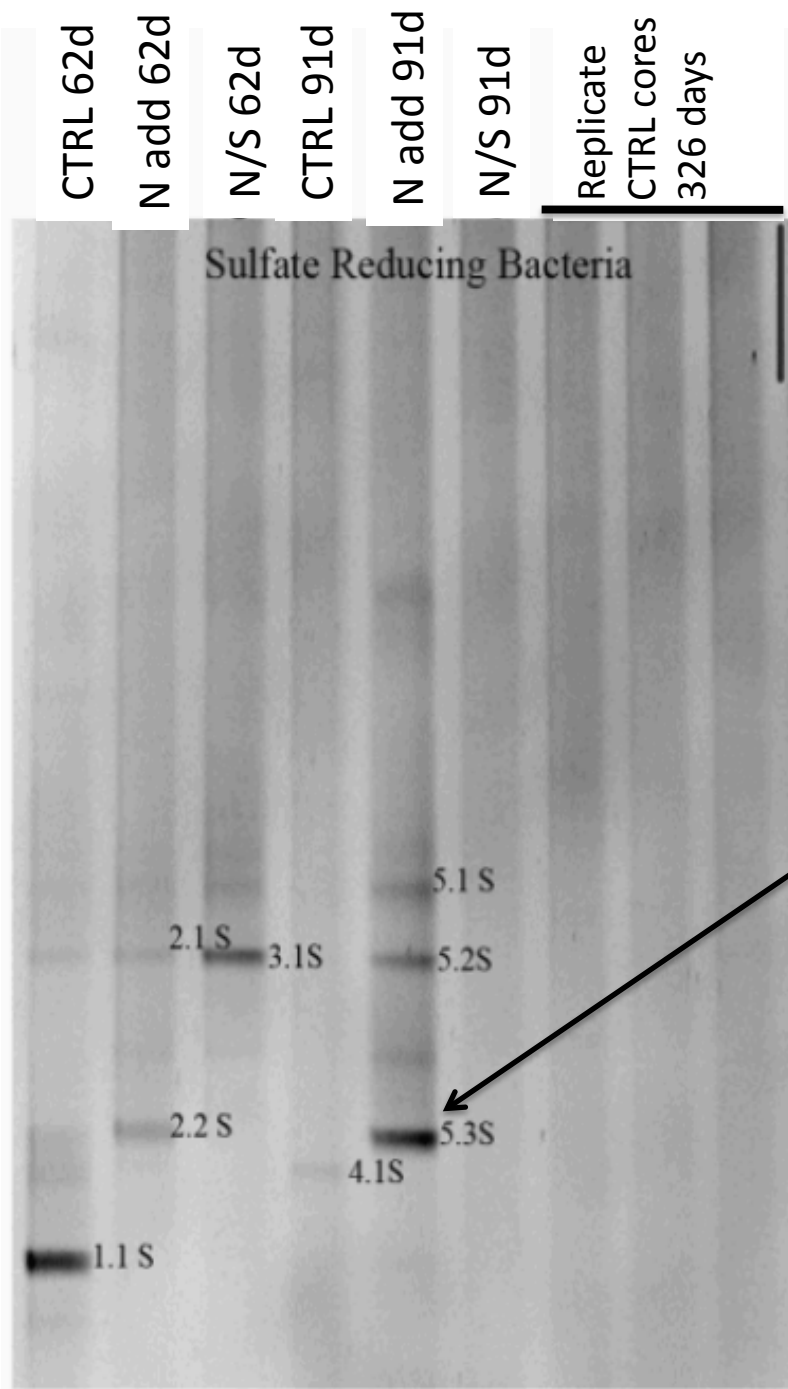


LONGER-TERM

Phenanthrene and C1-phenanthrene



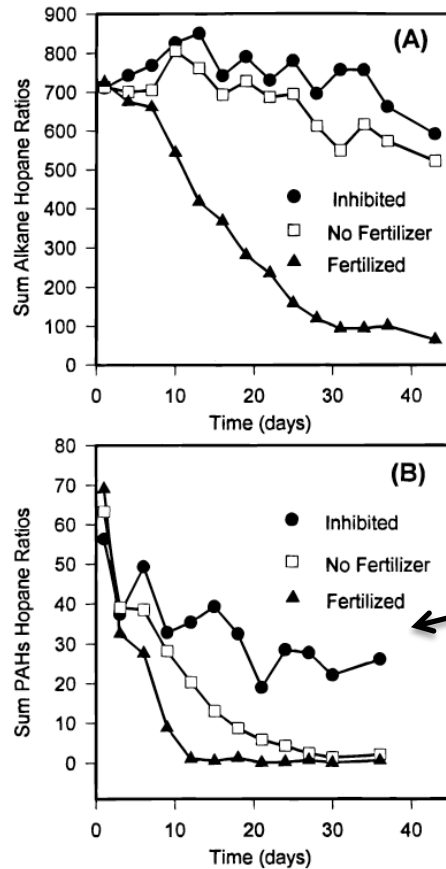
after 326 days



DGGE-SRB on 0-2 cm soil samples

All sequenced bands were identified as *Anaerolinea spp* (Chloriflexi)
Similarity indices ranging from 0.71-0.75

Future directions



Resolve differences in PAH degradation studies in marshes

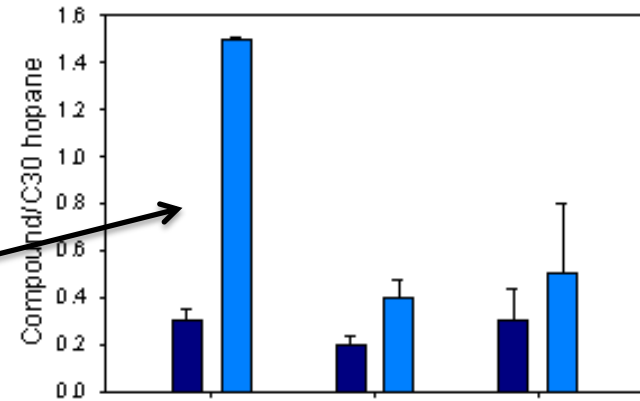


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Questions??

