

The background features a large, faded circular seal of the United States Environmental Protection Agency (EPA). The seal contains the text "UNITED STATES" at the top, "EPA" in the center, and "ENVIRONMENTAL PROTECTION AGENCY" at the bottom. There are also stars on either side of the "EPA" text.

Bioremediation of Diesel Range Organics in the Suisun Marsh

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Region 9 FOSC

Background

- Pipeline spill occurred on April 27, 2004
- Greater than 100,000 gallons of diesel fuel released to a wetland
 - Area is approximately 242 acres in size and is managed as a duck hunting clubs
 - Water levels controlled by levees and gates
 - Responders designated 2 divisions: A (a brood pond) and B (a shooting area)







Incident Command

Unified Command

FOSC – USCG/U.S..EPA
SOSC – CA DFG
RP – Kinder Morgan EP

JIC – KMEP,
CA DFG OSPR,
EPA

Safety –
KMEP, USCG PST

Liaison
KMEP, EPA, OSPR

Finance

Logistics
KMEP, Contractors

Planning
KMEP, Contractors

Operations
KMEP, Contractors

Environmental Unit
CA DFG

Area A Crew

Area B Crew

Response Strategies

- Mechanical
 - Booming, absorbent materials, skimming, and excavation
 - Water level management
 - Tide gate adjustments were utilized to drain Division B











Response Strategies

- An evaluation of cleanup alternatives determined that bioremediation was highly feasible and cost effective
 - Add polyphosphate (Div A) & di-ammonium phosphate (Div B) to affected soils to facilitate biodegradation of diesel in soil
 - Tilling for aeration

Response Coordination

- State:
 - Department of Fish & Game and Regional Water Quality Control Board
- Federal:
 - NOAA, U.S. Fish & Wildlife Service
 - Endangered Species Issues
 - DOI
 - Cultural and Historic Properties Issues
 - Regional Response Team
 - Approval of nutrient addition





Will bioremediation work.... before winter arrives?

- Heterotrophic plate count and respirometry study (KMEP – lead)
 - High populations of TPH degraders present
 - Populations increase in presence of oxygen
- Bench-scale tests (EPA – lead)
 - Up to 40% degradation observed in bench flasks after 14 days
- Preparations!
 - Construction
 - Mouse catching







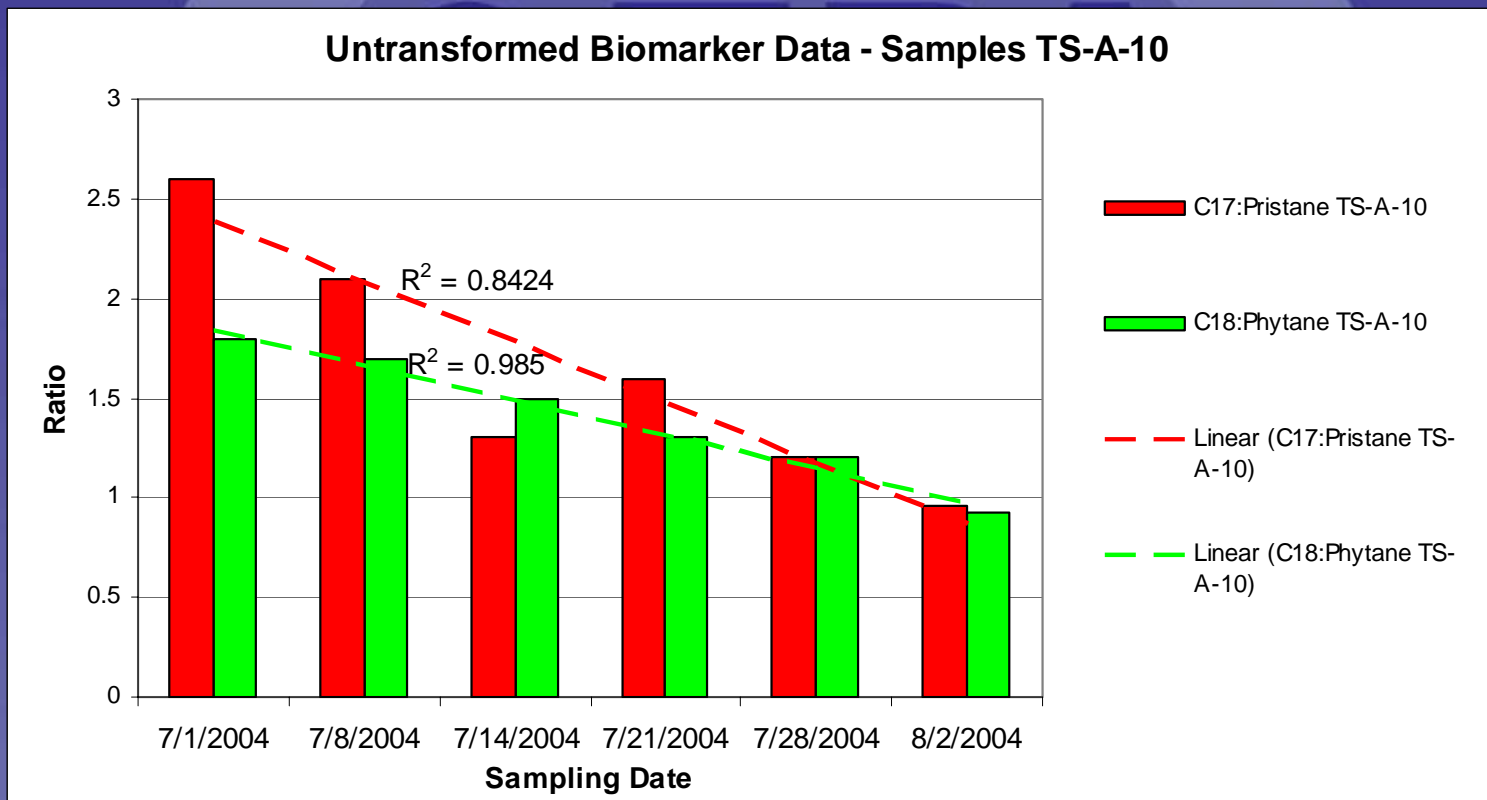
Monitoring

- Water and soil samples collected regularly by EPA and KMEP
 - Effectiveness of response measures will be determined by decreases in Total Petroleum Hydrocarbon (TPH analysis) and by “sheen tests”
 - Bioremediation will be measured specifically by Modified GC/MS “fingerprint” analysis
 - Biomarker ratios will be derived
 - C17:Pristane
 - C18:Phytane
 - Pristane:Phytane

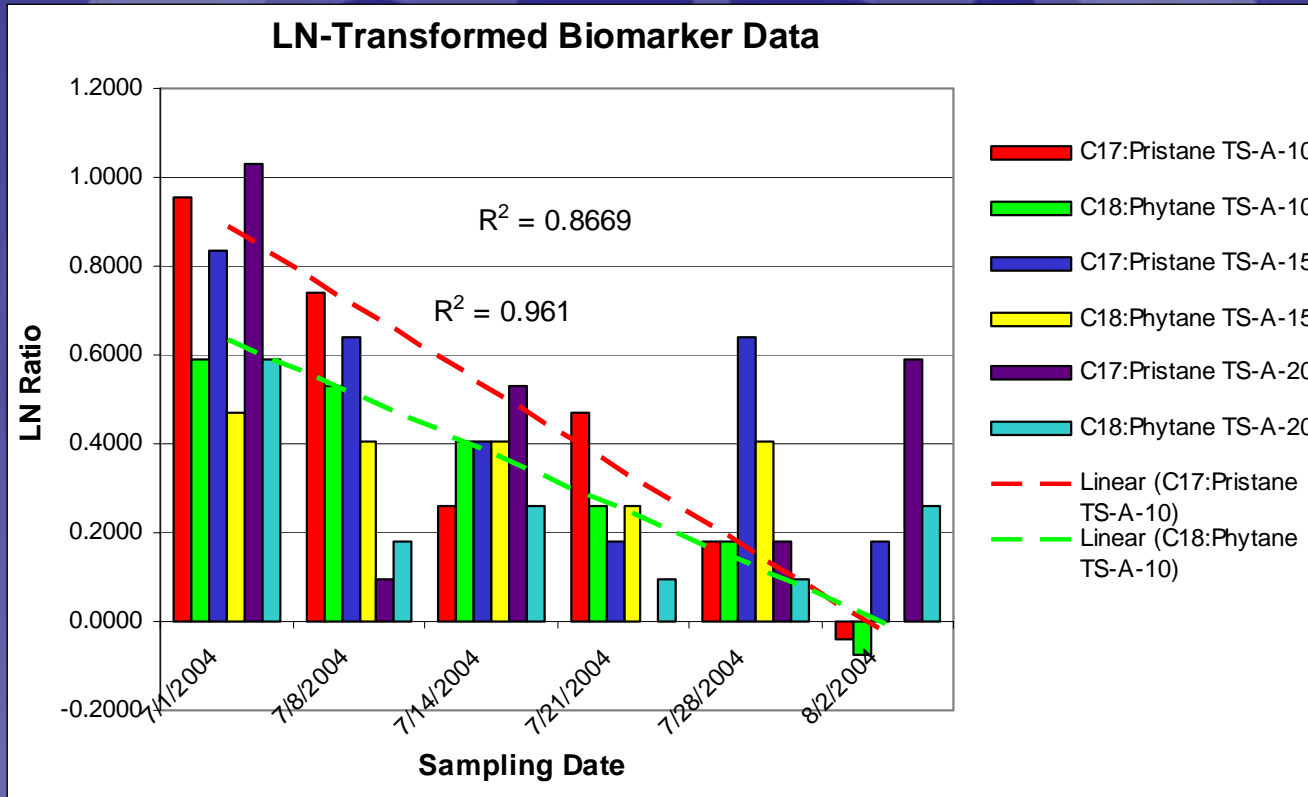
Soil Sampling Results (Division A)

Mean Concentration	8653	1907	1380	606	352
Time (days)	T0	T27	T32	T62	T99
Percent Removal	NA	77.96	84.04	92.99	95.93
Maximum Concentration	160000	13000	8700	1600	860

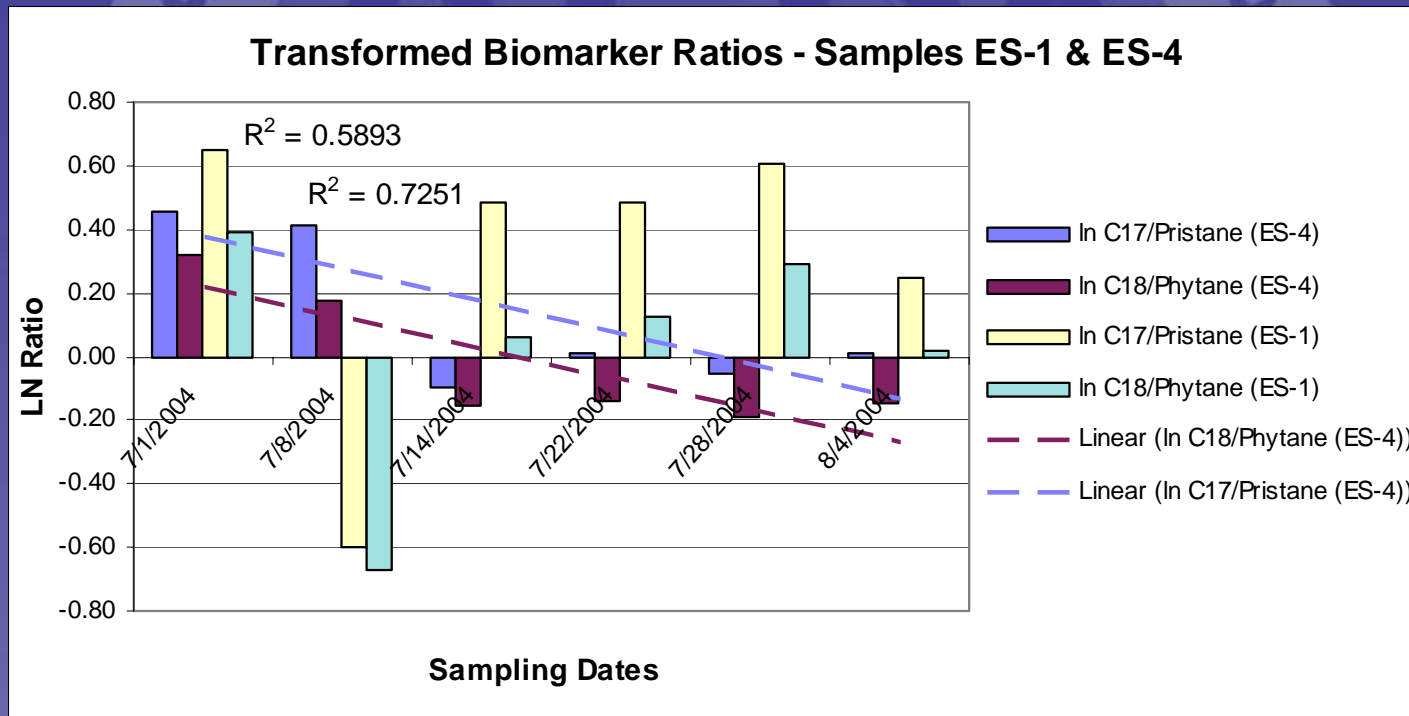
Biomarker Ratio Trends – Division A



Biomarker Ratio Trends – Division A



Biomarker Ratio Trends – Division B



Bioremediation Lessons Learned

- Start early!
 - A more timely application of nutrients in future spills will allow for improved evaluation.
- Response measures achieved interim remediation goals but raise questions
 - Was nutrient addition necessary?
- Consider other lines of evidence prior to crediting the specific approach as clearly successful.
 - TPH data should be normalized to reduce potential errors.

Keep in Touch

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