Vegetation Recovery of Coastal Salt Marshes Impacted by the Deepwater Horizon Oil Spill

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Northern Barataria Bay Study Sites
Heavily Oiled Marshes
(January 2011)
Moderately Oiled Marshes
(January 2011)
Three Oil Categories:

- Reference Marshes
- Moderately Oiled Marshes
- Heavily Oiled Marshes

Ten Sampling Events:

- 2011 (Jan & Oct)
- 2012 (April & Nov)
- 2013 (April, Sept & Nov)
- 2014 (April & Nov)
- 2015 (June)
Objective

Evaluate the impact of the Deepwater Horizon oil spill on salt marsh vegetation and assess the subsequent recovery.
Total Petroleum Hydrocarbons (0-2cm)

Soil TPH Concentration (mg/g dry soil) vs. Months After Spill for RF, MD, and HV sites.

Oil: p<0.0001
Time: p<0.0001
Oil*Time: p<0.05
Total Live Aboveground Biomass

Oil:  p<0.0001
Time: p<0.0001
Oil*Time: p<0.0001
Live Aboveground Biomass of *S. alterniflora*

- **Oil**: p < 0.01
- **Time**: p < 0.0001
- **Oil*Time**: p < 0.005
Live Stem Density of *S. alterniflora*

Oil:  p=0.12  
Time:  p<0.0001  
Oil*Time:  p<0.0001
Live Aboveground Biomass of *J. roemerianus*

- **Oil:** $p<0.005$
- **Time:** $p<0.0005$
- **Oil*Time:** $p<0.005$

**Graph Description:**
- The graph shows the live aboveground biomass (g/m²) of *J. roemerianus* over different months after a spill.
- The x-axis represents months after the spill, ranging from 9 to 62.
- The y-axis represents the biomass in g/m², ranging from 0 to 1000.
- Three conditions are compared: RF (green), MD (orange), and HV (black).
- Significant differences are indicated by circles around the bars for each condition.

**Statistical Significance:**
- The oil treatment has a significant effect on live aboveground biomass.
- Time also has a highly significant effect.
- The interaction between oil and time is also significant.
Live Stem Density of *J. roemerianus*

Oil: $p<0.005$
Time: $p<0.0005$
Oil*Time: $p<0.05$
Live Belowground Biomass in 0-6 cm soil

Oil: p<0.0001
Time: no sig.
Oil*Time: no sig.
Soil Shear Strength in 0-6 cm soil

Oil: $p<0.05$
Time: no sig.
Oil*Time: $p<0.0001$
Conclusions

- TPH in heavily oiled marshes was significantly higher although it decreased with time.
- Vegetation has generally recovered in moderately oiled marshes within 2-3 years.
- For heavily oiled marshes, *Spartina* recovered in about 3 years. However, no recovery of *Juncus* occurred. Overall vegetation did not fully recover 5 years after the spill.
- Vegetation structure changed from a mixed *Spartina-Juncus* community to mostly *Spartina*.
- Impacts of heavy oiling on belowground biomass and soil shear strength potentially affect marsh stability.
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