Impacts of the Deepwater Horizon Oil Spill on the Salt Marsh Vegetation of Louisiana: Technical Memorandum

Mark W. Hester [1]*, Jonathan M. Willis[1], Shahrokh Rouhani[2], Marla Steinhoff[3], Mary Baker[3]

[1] Institute for Coastal and Water Research, Department of Biology, University of Louisiana at Lafayette, Lafayette, LA 70504

[2] NewFields Companies, LLC, 1349 W. Peachtree Street, Suite 2000, Atlanta, GA 30309

[3] National Oceanic and Atmospheric Administration, Assessment and Restoration Division 7600 Sand Point Way NE, Seattle, WA 98115

*Corresponding author: mhester@louisiana.edu

The Louisiana mainland marsh coastal wetland vegetation (CWV) study conducted as part of the Deepwater Horizon oil spill Natural Resource Damage Assessment included a total of 78 sites established in areas with varying extents of vertical plant tissue oiling and reference areas. CWV plots were established between 1.5 and 24 meters inland of the shoreline interface depending on the inland penetration oiling and documented significant injury to the plant productivity and health of salt marshes exposed to oiling. Marsh sites experiencing trace or greater vertical oiling of plant tissues displayed reductions in live cover and live peak standing crop, particularly in the marsh edge (zone 1), for the majority of this four year study (Fig. 1 and Fig. 2). In Louisiana mainland herbaceous salt marshes, the weighted average reductions of plant oiling class compared to the reference class ranged between 11 and 53 percent for live aboveground biomass and between 15 and 42 percent for live cover (table 1). Elevated chlorosis of plant tissue, as estimated by a vegetation health index, was detected for marsh sites with trace or greater vertical oiling in the first two years of the study. The highest plant oiling classes suffered the most significant impacts, but all degrees of oiling showed adverse effects with impacts being greatest along the marsh edge (zone 1). More interior areas (zones 2 and 3), comprising much greater acreages, were also adversely affected. Key environmental factors, such as hydrologic regime, elevation, and soil characteristics, were generally similar across plant oiling classes, indicating that the observed injury to plant health and productivity was the result of plant oiling and not potential differences in environmental setting. Although fewer significant impacts to health and productivity were detected in the latter years of the study, this is due in part to decreased sample size occurring as a result of shoreline erosion in the region and should not be misconstrued as indicating full recovery of the ecosystem.

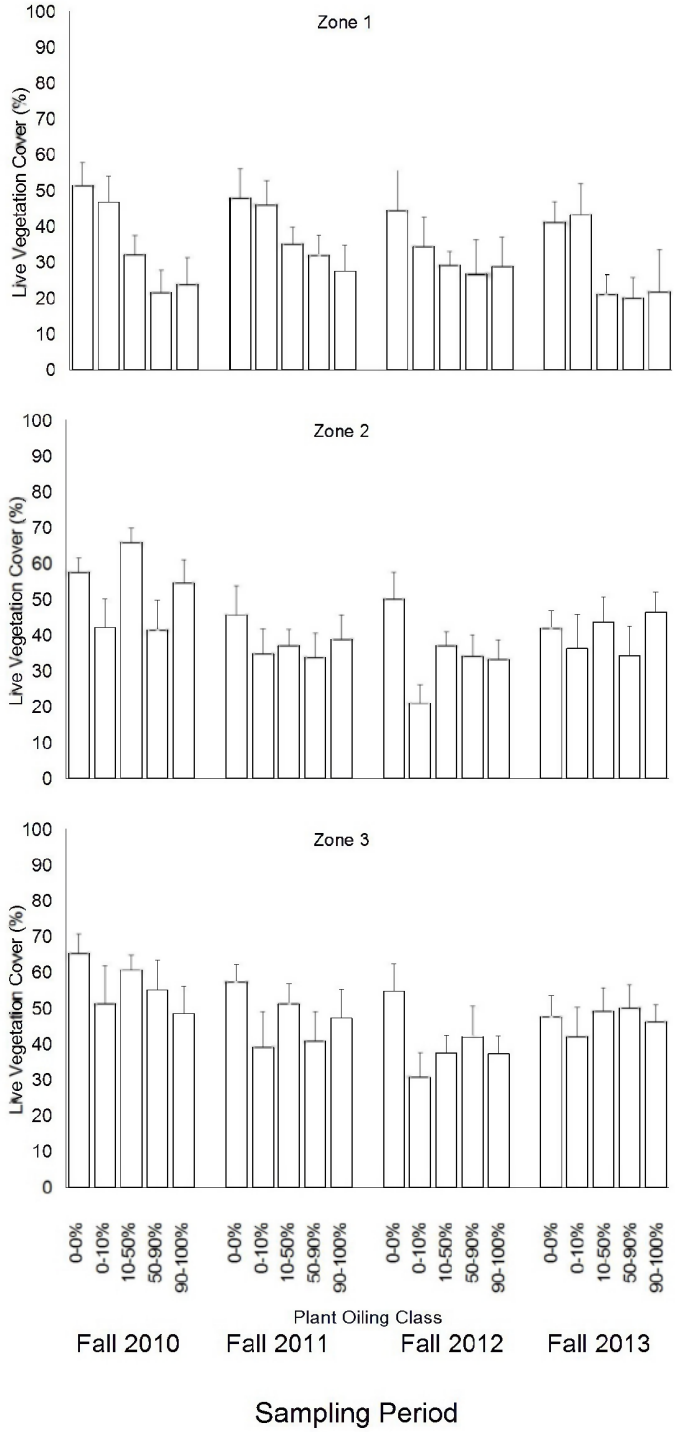

Figure 1. The effect of plant oiling class, zone, and sampling period on live vegetation cover (mean +/- 1 standard error).

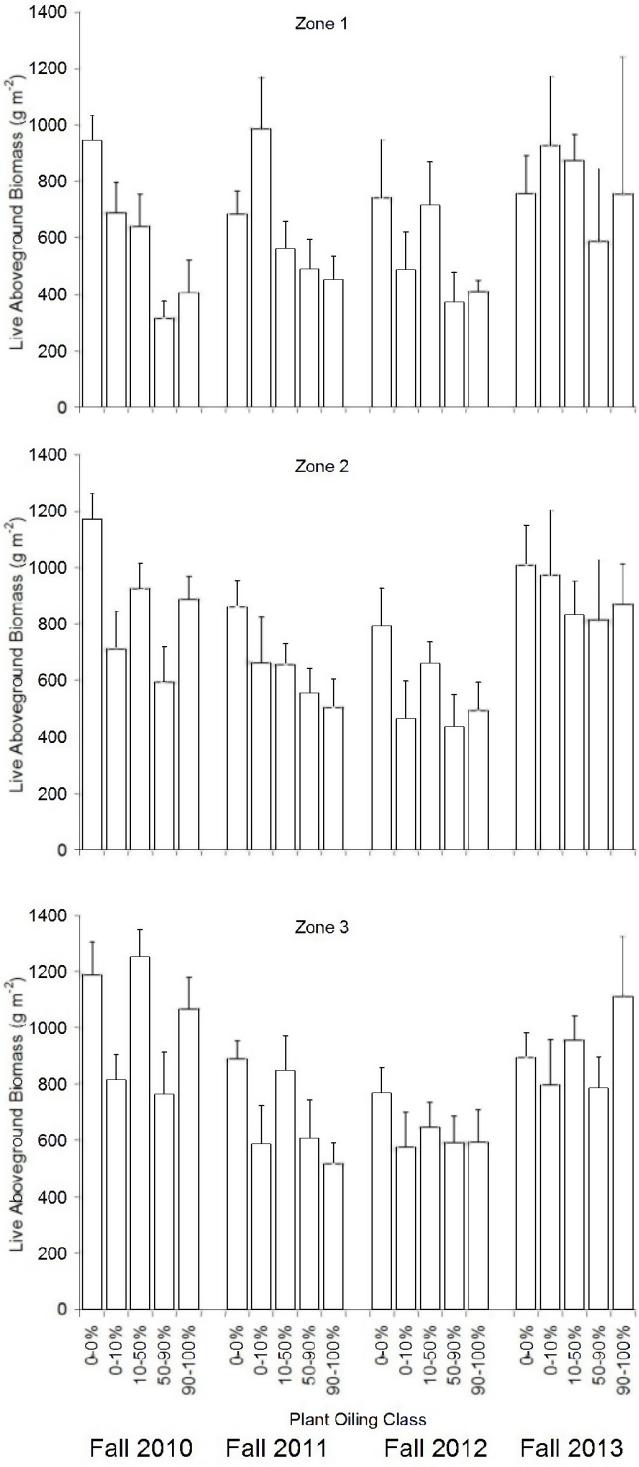

Figure 2. The effect of plant oiling class, zone, and sampling period on live aboveground biomass (mean +/- 1 standard error).

Table 1. Injury to wetland vegetation as a weighted average across all zones of percent reduction in live cover and live aboveground biomass (AGB) relative to seasonal and basin specific reference values for Louisiana mainland herbaceous CWV sites for each survey. Maximum values for each PA plant oiling category are highlighted.

Survey	PA Plant Oil Category	Live Cover (Avg % change relative to reference)	Live AGB (Avg % change relative to reference condition)
Fall 2010	90-100%	29.9	38.6
	50-90%	35.8	53.2
	10-50%	15.3	10.6
	0-10%	21.9	25.6
Spring 2011	90-100%	26.5	Not sampled
	50-90%	26.0	
	10-50%	5.8	
	0-10%	21.1	
Fall 2011	90-100%	20.6	49.8
	50-90%	37.7	40.7
	10-50%	14.4	7.6
	0-10%	10.3	0.0
Fall 2012	90-100%	41.1	42.2
	50-90%	0.0	0.0
	10-50%	0.0	0.0
	0-10%	42.4	35.7
Fall 2013	90-100%	8.6	14.9
	50-90%	0.0	32.9
	10-50%	0.0	1.9
	0-10%	13.9	0.0