

▶▶▶ SUBGROUP SPOTLIGHT

The Wetlands group is investigating the role of coastal wetland plant taxonomic and genetic diversity on resilience. Oiling has been shown to produce immediate, negative impacts on Gulf of Mexico wetlands, including reductions in plant biomass and changes in species composition¹. Higher plant biodiversity (i.e. more plant species and more genetic variation within species) may enhance resistance to and recovery from the impacts of oiling. The Wetlands group has hypothesized that the positive effects of increased diversity on ecosystem function will be greater in oiled than in non-oiled habitats.

Field Investigations: Surveys for plant density, **productivity** (above and below ground) and macrofauna abundance are being conducted seasonally on marsh plants and mangroves in the Chandeleur Islands. The common marsh plant, smooth cordgrass (*Spartina alterniflora*), is being measured for percent cover, shoot density, height, number of flowers and genetic diversity while the black mangrove (*Avicennia germinans*) is being measured for plant height, canopy width, percent cover and pneumatophore density. Productivity measurements for smooth cordgrass consist of tagging shoots (above ground) and measuring root growth into a sediment plug (below ground); black mangrove productivity measurements consist of leaf tagging (above ground) and pneumatophore density (proxy for below ground growth). Leaf tissue was also collected from both plants for nutrient analysis (carbon, nitrogen, phosphorus) to compare to levels recorded throughout the mesocosm experiment (see below). Macrofauna is being collected by suction sampling at the marsh/water interface and analyzed for abundance, biomass and community composition. Both smooth cordgrass and black mangrove are considered **foundation species** or ecosystem engineers and therefore play a critical role in the structure and function of coastal wetlands.

Mesocosm experiments: Mesocosm experiments were designed to test the direct effects of oiling on plant productivity when plant species diversity and plant genetic diversity varied. Mimicking the coastal wetland community of the Chandeleur Islands smooth cordgrass and black mangroves were used both individually and in a combination. Plant genetic diversity treatments include **monocultures** (i.e. single **genotype**) and **polycultures** (multiple genotypes) of smooth cordgrass. Measurements on a variety of plant metrics including growth, density, nutrient content and reproduction were collected.

Figure 1 shows the experimental design for the five plant treatments set up in the Sea Lab's mesocosms. The various treatments were randomly assigned to experimental tubs within both oiled and non-oiled (i.e. control) mesocosms.



Wetlands group PI Dr. Heck collecting macrofauna with the suction sampler. (Photo/ACER)



Preparation for the experiment at the Sea Lab's mesocosm facility. (Photo/ ACER)

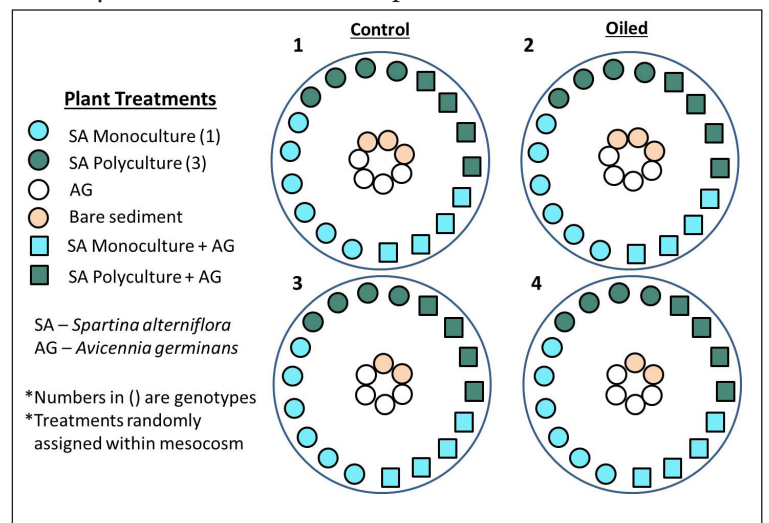


Figure 1. Design for the mesocosm experiments. Treatments were randomly assigned to tubs within each mesocosm. Treatments in graphic grouped for clarity.

▶▶▶ Results to date

Mesocosm experiments were completed in September 2016 a year post oiling. Plant productivity data was collected in September and December 2015 and April, June and September 2016. Results from the April collection (Figure 2) for smooth cordgrass (*Spartina alterniflora*) plant density showed that oil had negative effects on both single species and mixed species treatments but that the magnitude of the oil effect on stem density was lessened by plant species diversity.

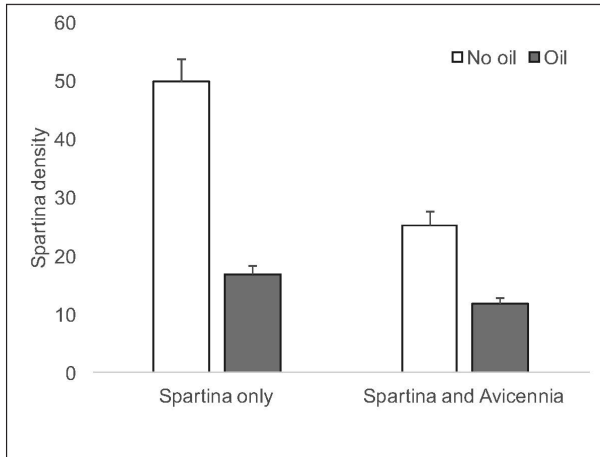


Figure 2. Changes in *Spartina alterniflora* stem density with single species and mixed species treatments in oiled and non-oiled mesocosms.



Wetlands co-PI Randall Hughes measures smooth cordgrass height during mesocosm experiments. (Photo/ACER)

KEY WORDS

foundation species - a species with a significant role in structuring the community by physically modifying the environment; also referred to as 'ecosystem engineers'

genotype - the genetic makeup of an organism which includes the number and type of genes present

monoculture - a group of plants consisting of a single species with a single genotype (see below)

polyculture - a group of plants consisting of a single species with many genotypes (see below)

productivity - rate of change in plant biomass (i.e. amount of plant biomass made over time)

▶▶▶ Species studied



(Photo/ACER)

Smooth cordgrass - A perennial native grass common along the southeastern and Gulf coasts; foundation plant for coastal wetlands due to its ability to structure habitat, provide food and stabilize shorelines.



(Photo/ACER)

Black mangrove - A subtropical woody shrub that occurs in salt marshes along the Gulf of Mexico; filters and traps sediment within coastal wetlands, helps to reduce wave energy and also provides nursery habitat.

LITERATURE CITED

1. Lin, Qianxin, and Irving A. Mendelsohn. "Impacts and recovery of the Deepwater Horizon oil spill on vegetation structure and function of coastal salt marshes in the northern Gulf of Mexico." *Environmental Science & Technology* 46.7 (2012): 3737-3743.

ABOUT US

The Alabama Center for Ecological Resilience (ACER) Consortium investigates how biodiversity influences an ecosystem's ability to resist and recover from disturbance, focusing on impacts of the 2010 Deepwater Horizon oil spill on coastal ecosystems in the northern Gulf of Mexico.

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