PROJECT FACT SHEET

CONTRACT TITLE: Conduct Elemental Analysis or Restored Drill Site Cuttings Used in Hydrologic Regimes

ID NUMBER: DE-AF22-96BC14995

B & R CODE: AB0555000

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CITY: Hammond **STATE:** LA
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CONTRACT PERFORMANCE PERIOD:
01/26/1996 to 12/20/1997

PROGRAM: Environmental-Gas
RESEARCH AREA: Environmental

FUNDING ($1000'S)	DOE	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	75	0	75
FISCAL YR 1998	0	0	0
FUTURE FUNDS	0	0	0
TOTAL EST'D FUNDS	75	0	75

OBJECTIVE: Analyze and synthesize data on marsh creation, using restored drill cuttings, from an intensive mesocosm project that will emulate field conditions.

PROJECT DESCRIPTION:

Work to be performed: One hundred forty four 200-liter vessels, fully networked to four 3000-liter supply vessels, have been constructed and are being subjected to a 2x3x4x6 factorial treatment arrangement. Specifically, two nutrient conditions (fertilized, not fertilized), three hydrologic regimes (moist-but-not flooded, permanently flooded, and daily tidal cycle), four substrates (100% restored drilled cuttings from SWACO process, 100% restored cuttings from Cameron process, restored cuttings (Cameron) capped with dredge spoil, and 100% top soil (control)), and six vegetative conditions (five species of wetland vegetation and the non-vegetated control) are completely cross classified in the experiment. For all treatment combinations, soil, surface water, interstitial water, and plant tissue were subjected to elemental analysis (Al,Ca, Cd, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, P, Pb, and Zn), and NO3/NO2 and NH4 nitrogen. Instantaneous measurements of photosynthesis were conducted at least as frequently as the elemental analyses. Traditional mysid toxicity tests were performed. In addition, we monitored pH and vertical profiles of Eh (redox potential) in the sediments/soil substrates. At the end of the growing season (late October, 1997), above-ground and below-ground vegetation were harvested and dried for resource partitioning analysis.

PROJECT DESCRIPTION (Continued)

Background: Southeastern Louisiana University is unique in the United States in that it houses two mesocosm facilities designed for projects involving wetlands. These mesocosm facilities each contain one hundred forty four 200-liter vessels, fully networked to four 3000-liter supply vessels. The temperature-controlled facilities are capable of manipulating hydrologic conditions from stagnant, to tidal, to continuous flow (riverine). The individual mesocosms are large enough to enable natural root and shoot development of herbaceous vegetation and, therefore, provide results that should extrapolate to field conditions with far greater accuracy than traditional small-pot greenhouse experiments. Furthermore, the insulated mesocosms provide natural soil-temperature profiles enabling soil metabolism also to emulate field conditions.

PROJECT STATUS:

Current Work: Final data analysis and report preparation is underway.

Scheduled Milestones:

Construct mesocosm facility, apply substrates, fine-tune hydrologic regimes, and acclimate vegetation	06/96
Conduct elemental analyses	
Conduct photosynthetic measurements	
Harvest above- and below ground biomass for final assessment	10/97
Analyze and synthesize information gleaned, prepare final report	11/97
Convene meeting of interested parties	04/99
Publish results in referred journal and present findings at appropriate conferences	06/98

Accomplishments: The results obtained thus far are promising with regard to the low toxicity of restored drill cuttings (particularly the Cameron substrate) and their ability to support healthy wetlands vegetation. Water extraction, acid digestion, and interstitial water samples from the restored drill cuttings yielded elemental analyses that fell within the Louisiana Department of Natural Resources 29B (EPA 29B) guidelines. The Cameron drill cuttings are remarkably similar to dredge spoil which is currently being used as a wetlands creation substrate. THe few elements that were extracted into the interstitial water were primarily cations (Ca, K, Mg) and were not elevated to a level that would pose a threat to wetlands productivity. Swaco drill cuttings remained high in aluminum with concomitant high pH, which likely resulted in limited plant productivity through hindered nutrient uptake. Toxicity trial results based on mysid shrimp showed that both Swaco and Cameron had acceptable toxicity levels (LC50) at all percentages of suspended particulate phase (6% to 100%). It is important that the permanently flooded hydrologic regime supported healthy growth in most of the species tested because the pending field demonstration project will be impounded to restrict hydrologic exchange with the surrounding wetlands for at least one year. Cameron drill cuttings supported higher rates of photosynthesis, across species, than Swaco drill cuttings. Biomass measured at the end of year one showed that average biomass production on the Cameron substrate was essentially identical to that on the dredge spoil. Wiregrass had the highest overall photosynthetic rates across substrates and exceeded other species on both drill cuttings substrates. In short, results from this mesocosm project indicate that a field demonstration project utilizing restored drill cuttings is feasible and will likely result in the creation of healthy and stable wetlands.