PLANT-SOIL RELATIONS ON MARINE DREDGE MATERIAL[1]

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Abstract: The eastern US generates hundreds of millions of cubic meters of dredge material annually which are disposed of in landfills, placed in "spoil" islands or sited for beneficial use. One beneficial use includes upland placement of dredge material in large containment basins for conversion into agricultural production. Currently, upland placement requires extensive monitoring and management, especially when the dredge material has adverse properties (i.e. high in soluble salts). Use of naturally invading plant communities as indices for soil quality/development is a feasible way to reduce the costs of intensive sampling and to improve crop selection for the material at various stages of development. In 2010, a large basin (~25 ha) containing de-watered marine dredge material was selected at the Shirley Plantation, Charles City, VA. A test crop, winter wheat (*Triticum aestivum*), was seeded across the basin in the fall of 2009. The objectives of this study were two-fold: (1) to use vegetation community characteristics and crop yields as indices of soil quality; and (2) to incorporate the information into a simple GIS database for future management of the containment basin by the landowner. Plant communities were mapped using a Trimble© GPS unit and above-ground biomass plots were clipped for wheat yield estimates. Soils were sampled in a grid across the basin and analyzed for soluble salt parameters (EC and Cl^-). Vegetation/crop and soil properties were then incorporated into the GIS database using ArcMap©. Salt tolerant species, including Barnyard grass (*Echinochloa crus-gali*), common knotweed (*Polygonum arenastrum*), German millet (*Setaria italica*), and lambsquarters (*Chenopodium album L.*), were observed along the perimeter of the basin where surface EC and Cl^- values were high (10-17 dS m^{-1}; 2000-5000 mg L^{-1}), while winter wheat was the dominant species on the interior of the basin (EC: 4-6 dS m^{-1} and Cl^-: 200-500 mg L^{-1}). Although the database is still being developed, preliminary results indicate that GIS is a helpful tool to integrate soil plant data via spatial analysis to optimize land management practices.

Additional Key Words: Soil salinity, electrical conductivity, halophytes, geographic information systems.

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