DEVELOPING CONCEPTUAL MODELS OF COASTAL WETLAND RESTORATION: ENVIRONMENTAL DRIVERS OF ECOLOGICAL SUCCESSION

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Restoration ecology includes the development of diagnostic capabilities for ecological systems that are based on ecological theory of succession and ecosystem development. These diagnostic capabilities are presently limited by the ability of scientists, engineers, and managers to: 1) anticipate ecological responses of ecosystems to specific manipulations or site conditions; 2) monitor responses of ecosystems at sufficient space and time scales to validate these responses; and 3) modify designs and operations of rehabilitation projects according to the response of ecosystems to obtain specific goals. One of the most difficult tasks in restoring ecological systems is to first perform diagnostics as to what factors are responsible for deteriorating conditions (or health) of the ecosystem. Better early diagnostics would allow managers and engineers to select the proper set of conditions for site remediation techniques necessary to rehabilitate habitats toward a specifically defined goal. Thus, a fundamental need of restoration ecology is cause and effect monitoring leading to development of diagnostic tools that can be used to predict, monitor, and validate the response of ecosystems to rehabilitation criteria. Restoration ecology requires a monitoring program that will investigate the successional trajectories of ecosystems in response to a specific evaluation as to what has caused ecosystem damage. This presentation will focus on conceptual and simulation models that presently describe successional trajectories of coastal wetlands of Louisiana. The objective is to evaluate whether these models and paradigms adequately describe abnormal conditions that may have contributed to the “brown marsh” phenomenon of summer 2000. Destabilization of marsh sediments has been historically related to chronic waterlogging stress that is linked to reductions in plant growth. Yet marsh damage during the severe drought over the last 12 months suggests that water levels have been below average in the coastal zone of Louisiana. Thus, conceptual models that explain marsh dieback due to waterlogging stress may not be appropriate to explain the patterns of brown marsh observed during the summer of 2000. This presentation will focus on integrating hydrologic and biogeochemical processes that affect marsh stability, and are likely to be modified by environmental drivers.