

**Coastal Land Loss Panel
Gulf of Mexico Regional Meeting
New Orleans, Louisiana
7-8 March, 2002**

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Question: We know that nutrient enrichment from upstream agricultural and other activities is a cause of harmful algal blooms and hypoxic events. However, there are other factors such as channeling rivers by levees that contribute as well. Do you have any thoughts about how we could or should implement a whole system plan rather than dealing with causative factors on a one-by-one basis?

Response: In most watershed/river/ocean interactions, there is an integration of landscape changes over many years and more recent introductions of nutrients over the last half century. For instance, the Mississippi River basin landscape started to change dramatically in the mid-1850s as settlers moved across the land, cutting down trees and developing row crop agriculture. There was also channelization and leveeing of the Mississippi River itself. All these factors were well established by about the 1930s. The major shifts in the offshore marine ecosystem as a result of nutrient loads began to appear in the 1970s as the nutrient levels in the Mississippi River began to climb dramatically. These inputs post-dated most of the landscape alterations. The altered landscape functions much less efficiently than a natural landscape, and on top of this alteration humans are adding more nutrients, double to triple the loads of a half century ago. A comprehensive view of watershed management must be undertaken to consider the possible landscape alterations along with a concerted effort to reduce the flux of nutrients from the land and air. Focusing on causative factors one-by-one is not appropriate, but focusing on all the causative factors in a comprehensive management plan is imperative. One of the Committee on Environment and Natural Resources (CENR) reports clearly outlined what amount of nitrogen could be reduced by which mitigation activities. Of the total the following reductions could be affected by various management strategies: farm nitrogen management, 35%; manure management, 19%; alternative cropping systems, 19%; tertiary water treatment plants, 1%; re-creating wetlands within the Mississippi River basin, 12%; riparian buffer strips, 12%; coastal diversions of Mississippi River water, 2%. It would not be productive to focus on one or a few at a time. There are also some mitigation activities that would be more cost effective over the long-term but are expensive to begin with. These issues need to be balanced in a comprehensive management plan.