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November 6, 2017: Sigma Xi Distinguished Lecturer: Beth Middleton, Ph.D.

October 18, 2017



**November 6, 2017
Biological Science, 1109**

Beth Middleton, Ph.D., is a research ecologist with the Wetland and Aquatic Research Center, U.S. Geological Survey in Lafayette, LA. Her research focuses on how increased hurricane activity related to climate change may alter wetlands across large geographical areas. Her most recent studies are on hydrologic remediation and vegetation response, and she applies those findings to natural resource conservation. She is a Sigma Xi Distinguished Lecturer, and President of the Society of Wetland Scientists.

11:15 a.m. Presentation Abstract: Wind and salt: reassembly of coastal vegetation following hurricanes

After hurricanes, coastal wetlands affected by saltwater surge, flooding and wind may have different recovery trajectories. For example, four North American hurricanes have differed in their effects on tidal baldcypress swamps. In 2017, Hurricane Harvey flooded Big Thicket National Preserve (TX) with copious amounts of freshwater while

Hurricane Irma subjected St. Marks National Wildlife Refuge (FL) to wind damage. Earlier storms such as Hurricanes Katrina and Sandy had different storm signatures because of high winds and salinity intrusion, respectively. One set of vegetation structure studies compared salt water, freshwater flooding and wind-driven impacts of these hurricanes along coastal wetland gradients along the Gulf and Atlantic Coasts. In these studies, *T. distichum* was resilient to wind and prolonged freshwater inundation, but not to salinity. Seed bank studies of various vegetation and gradient types examined the responses of multiple species to various water regimes (unflooded but saturated vs. flooded to 8 cm) and salinity levels (0, 1, and 5 ppt). In these studies, post-hurricane environments of flooding and salinity mostly suppressed regeneration in these coastal wetlands, even at low salinity levels (1 and 5 ppt). Overall, these studies indicate that hurricanes differ in their ability to drive long term changes in vegetation depending on the levels of structural damage and subsequent regeneration. The resulting trajectories of forest composition will depend on the individualistic responses of species to post-hurricane environments and the frequency and intensity of these disturbances.

4:00 p.m. Presentation Abstract: Climate, land-use change and wetlands

The nature of climate and land-use change will dictate approaches to successful wetland conservation. The Intergovernmental Panel on Climate Change suggests that future wetlands may have increased episodes of drought and flooding, extreme temperatures and high CO₂. Along sinking coasts, especially freshwater wetland species may be impacted by increased salinity intrusion, flooding, and hurricane activity. These days, increasing human demand for freshwater is having a major impact on both inland and coastal wetlands. The focal issue of this talk is on freshwater tree death on the coast of Texas where drought, over-extraction of water, and other causes has led to an inadequate supply of freshwater to wetlands. Research has examined minimum flows of water necessary to maintain the function of riverine wetlands in situations where water extraction has reduced freshwater flow. My very recent work is on the role of mega-flooding events (e.g., Hurricane Harvey and Irma) to freshen groundwater along the Gulf Coast of the United States. Emerging research along the Mississippi (US) and Murray Rivers (Australia) suggest that even short periods of freshwater flow improve the health of freshwater trees in salt-water intruded estuaries, so that precipitation may produce the same health improvement. Another threat to these forests is a lack of regeneration, and relict forests are emerging in the southeastern US. More research directed toward solutions to climate-induced problems may help managers develop approaches to vegetation stress in future restored and natural wetlands. Another idea that may need reconsideration is that of the reestablishment of presettlement conditions, which may be an unattainable target for restoration in future environments. Management problems can only be resolved through the dialogue of members of the public and professions skilled in multidisciplinary team-work. Overall, the essential fix is the fostering of a strong land-people connection.