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Ecological consequences for swamp forests of geomorphological development in the Mississippi River Delta as recorded in baldcypress tree rings

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Over the past 200 years, the Mississippi River Delta has been converted from a free-slowing fluvial system with diffuse distribution of fresh water and sediments to a regulated system where flow is concentrated and large areas of wetland are isolated from river inputs and subject to land subsidence. Site-specific research has documented localized effects of these changes on wetland ecological functions, but predicting ecological responses at large scales to future river management and climate change requires assessing the relative importance of multiple hydrological and climatological variables across the range of ecosystem conditions. This work uses 17 baldcypress tree-ring chronologies from across the delta to describe responses of swamp forests to historical changes linked to geomorphological and hydrological changes. Swamps isolated from riverine inputs experienced decreased productivity and mortality because of stagnant flooding or saltwater intrusion. Swamps where river flow is concentrated generally experienced increased growth, but conversion to other ecotypes is hastened by deep flooding or rapid aggradation. The most rapid changes occurred during mutli-year droughts and flooding cycles; these episodic stresses were reversible only when swamps were connected to periodic riverine inputs. Increasing connectivity and aggradation using river diversions appears to be required if swamp forests are to be maintained against rising sea level.