



FIGURE 4.18 Deltas grow as sediment accumulates at the mouth of a river, but once the river changes course, the delta gradually deteriorates into islands and offshore shoals. Storms and hurricanes play a significant role in reshaping the sediment. (From Penland *et al.* 1988.)

producing the natural array of wetland types and natural distribution of plants and animal species. Perhaps the best advice we can give humans is not to build their homes in areas that flood regularly or burn regularly.

4.3.9 Frosts can convert mangrove swamp to salt marshes

Cold can also kill plant tissues and change wetlands. One important transition point in coastal wetlands is the temperature threshold at which mangroves can, or cannot, survive. At this threshold, herbaceous wetlands become wooded wetlands. This transition point occurs at about 32° North latitude and 40° South latitude (Stuart *et al.* 2007). Pulses of cold weather kill mangroves. For example, in the 1980s, cold winter weather killed mangrove forests (*Avicennia germinans*) in Florida, and it is estimated that 30 years will be required for recovery (Stevens

et al. 2006). Similar events occurred in Louisiana. Hence, frost sets the latitudinal limits of mangal (Figure 4.19).

A warmer climate with rising sea levels might allow mangroves to expand northward into what are now cypress marshes, as well as possibly changing cypress swamps into mangrove swamps. However, this scenario requires several cautions. If an increase in mean temperature is accompanied by an increase in variation in temperature, it is possible that cold pulses flowing from the north will remain sufficiently frequent to kill mangroves. Other factors associated with warmer climates include rising sea levels, increased hurricane frequency, and increased salinity from evapotranspiration. Overall, however, models suggest that if global temperatures rise, the area of mangroves in areas like Florida is likely to increase with time, probably at the expense of freshwater wetlands (Doyle *et al.* 2003).