Introduction

The shorelines of the eastern USA and the Gulf of Mexico are under attack by rising sea level and increasingly severe storms, both of which are linked directly to atmospheric and oceanic temperature rise (Elsner et al., 2008). Along resort and other urbanized coastlines, storm destruction and shoreline erosion have been countered by reinforced reconstruction of beachfront housing and increased ‘shore protection’ measures such as seawalls and beach nourishment (Pilkey and Cooper, 2004). The US Gulf Coast in particular has experienced increased shoreline erosion since the mid-1990s because of hurricanes and elevated Gulf of Mexico waters. Along the Florida Panhandle (north-west Florida), for example, beaches that had never been nourished (Destin, Ft Walton Beach, Navarre Beach, Pensacola Beach, Perdido Key) prior to 1990 all saw their virgin white-sand beaches succumb to post-storm dredged-material disposal in the 1990s and early 2000s. While care was taken that the nourishment sands approximated the colour and texture of the natural sands (colour according to the Munsell soil charts), it was clear to many that a new era had begun. Long-term Gulf Coast resorts had been put into a position of fighting (or at least working with Mother Nature) to preserve the natural resource that attracted the tourists and residents to the sites to begin with. In Walton County, Florida, Hurricane Dennis in 2005 caused so much bluff erosion that dozens of permit waivers were granted to allow property owners to sink sheetpile buffers into the sand to preclude loss of structures to the surf.

While resorts across the Atlantic and Gulf Coasts of the USA fight to preserve their attractions and their existence, probably the most vulnerable of resorts is Grand Isle, Louisiana, 80 km (50 miles) due south of New Orleans (Fig. 15.1). A resort destination for two centuries, Grand Isle is slowly succumbing to the combined effects of subsidence, sea level rise, shoreline
erosion and the onslaught of frequent hurricanes. This chapter examines the physical setting, the historical touristic evolution, the physical degradation, human adaptation and the current role of the sinking fishing destination of Grand Isle.

Fig. 15.1. Regional setting of Grand Isle (Meyer-Arendt, 1987b).
The Study Area

Grand Isle is a barrier island, 10 km (6 miles) long and about 1 km (0.6 miles) wide (Fig. 15.2). It formed by erosion of a former Mississippi River delta at the mouth of Bayou Lafourche and subsequent north-eastward transport of eroded sands. A sand spit formed, and after it broke off from the mainland, Grand Isle was formed. The island has followed a pattern of realignment characterized by natural erosion along its western half and accretion on its eastern half. The west end of the island is barely above sea level and thus frequently subject to overwash in which extensive silty sand deposits wash across the island (most recently following hurricanes Gustav and Ike in 2008). A complex of low beach ridges forms much of the island, along with higher (up to 2 m, or 6 ft) ridges (cheniers) that are colonized by live oak trees (Quercus virginiana). The back-barrier zone is dominated by frequently inundated saltmarshes. A fishing community became established on the island in the late 1700s, right at that nodal point between reaches of shoreline erosion and shoreline accretion (Stielow, 1977; Meyer-Arendt, 1987a, b).

Fig. 15.2. Physical setting of Grand Isle (Meyer-Arendt, 1987b).
Historic Tourism Development

Grand Isle became a tourist destination in the early 19th century, primarily for wealthy south Louisiana planters and the New Orleans elite. Its tourism evolution has been described in terms of a resort cycle model by Meyer-Arendt (1985) and is briefly summarized here (Fig. 15.3).

Fig. 15.3. Urban development on Grand Isle, 1877–1983 (Meyer-Arendt, 1987b).
Grand Isle’s tourism exploration stage began in the early 19th century, as its economy progressed from fishing and smuggling to one of sugarcane and cotton cultivation. The island’s summer visitors were primarily wealthy New Orleanians and South Louisiana planters who were the occasional guests of Grand Isle plantation owners. By the 1850s, the first summer cottages had been built, as well as a small boarding house (Evans et al., 1979).

During this early period, building on the island was designed to accommodate the recurring problems of shoreline erosion and storms. Houses and village shops, usually built of imported cypress with their floors elevated 2–3 feet (0.6–0.9 m) off the ground, were located behind the cheniers that offered protection from wind and waves. Residents were forbidden to cut the oaks that grew on these ridges and new trees were planted regularly. Driftwood was left on the beach to discourage erosion and residents gathered only enough wood to meet basic needs for fuel. Boat docks were located on the protected backside, where levees and drainage ditches controlled bayside flooding.

The Civil War and salinization of the soil put an end to the island’s plantation economy. The old Barataria Plantation was converted to the Grand Isle Hotel and 38 slave quarters became guest cottages (Fig. 15.3A). A mule-drawn tram carried sea-bathers to the beach, where they could change in bathhouses. Visitors could reach the island in 8 h by steamship from New Orleans, and by the 1880s many well-to-do south Louisianians were glad to escape the stifling summer heat and humidity to this ‘idyllic subtropical isle’, as author Kate Chopin (1899) called it.

It was during this time that the pattern of touristic settlement began to change, shifting away from the bay and interior portions of the island toward the beach. But fear of storms discouraged tourists from staying in the beach cottages past the beginning of hurricane season and the driftwood remained in place to help retard shoreline erosion.

The development stage of Grand Isle’s resort cycle lasted about 70 years. The first phase saw the construction of the luxurious Ocean View Hotel (over 400 feet/120 m long and ‘two blocks from the beach’), 60 new bathhouses, and a new railroad on the lower Mississippi River that, with steamship connections, shortened the trip from New Orleans to 4 h. Hotel and cottage construction began to concentrate along the shorefront. This phase lasted until 1893, when an October hurricane destroyed the Ocean View Hotel and most tourism infrastructure and took 12 lives. This was the most severe hurricane ever to hit Louisiana; at nearby Cheniere Caminada, where the hurricane made landfall, 700 lives were lost and only four of 400 buildings were left standing. The damage on Grand Isle was so devastating that the island was unable to recover for many years.

The second phase of development, from 1893–1945, was marked by ephemeral spurts of recreational development, but also more hurricanes, two world wars and the stock market crash of 1929. Severe hurricanes in 1909 and 1915 again destroyed incipient tourism redevelopment. Real-estate moguls from New York and Florida proposed various schemes, including a seawall for hurricane protection and even a monorail to New Orleans, but interest languished in the face of the nation’s preoccupation with World War I. During the Roaring
Twenties the Grand Isle Tarpon Rodeo was established, and new beach cottages were built. But in the 1930s, many islanders were forced by the Depression to sell their property to real-estate speculators who had Florida-style development on their minds. About 1500 acres (600 ha) were subdivided into holiday home sites, and a network of streets was laid (Fig. 15.3B). A large beachfront hotel, the Grand Isle Inn, was built at the island’s east end, and many additional beach cottages went up.

A highway to the island was completed in 1934, which allowed visitors easy automobile access to the beach. Soon all recreational activity focused on the beachfront (Fig. 15.3C). The beach was cleaned of driftwood, which was burned, and beach ridges were levelled to provide more home sites and a better view of the sea (Conatser, 1969). From 1945–1960, the beachfront became crowded with summer beachfront homes (known as ‘camps’ in Louisiana). Several large hotels and numerous rental cottages provided accommodation for tourists. An information centre promoting the island was established in New Orleans, and lobbying for a state park on the beach began. On weekends as many as 10,000 tourists came to the island (Stielow, 1977).

Tourism vis-à-vis the environment

As post-war tourism increased at Grand Isle, so did shoreline erosion. The removal of driftwood and the levelling of beach ridges had increased the rate of erosion. In the early 1950s, as recreational development boomed, the problem became even worse, and public pressure for erosion control measures increased (Coleman, 1985).

In response, the state built a series of 14 timber groins along the beachfront where erosion threatened the highway. Unfortunately, the groin field proved to be even more damaging. The groins increased downdrift erosion, so that there was no net accretion of sand in those areas under normal conditions, and during storms, the intense scouring of sand around the groins worsened beach erosion. Over a million cubic yards of sand were pumped in from offshore to augment the beach in the mid-1950s, but in less than a year, almost half of it was lost via littoral drift to the eastern end of the island, which gained markedly in width and volume as result. In 1956, Hurricane Flossy carried most of the rest of the fill into the back-bay area or offshore. In 1958 and 1959, a jetty constructed at the east end of the island successfully trapped sand, but the built-up beach here did not benefit the western and central parts of the island where touristic development was most concentrated.

Grand Isle’s tourism development began to slow in the early 1960s, primarily because of severe beach deterioration, the ramshackle quality of its tourism infrastructure and improved highway access to the more attractive seaside resorts of Mississippi, Alabama and Florida. When Grand Isle incorporated in 1963, a comprehensive city plan recommended land-use guidelines and erosion control. But the land-use proposal was ignored and available funds allowed only periodic beach renourishment.
Category-3 Hurricane Betsy struck Grand Isle in 1965, causing a 3 m (10 ft) storm surge that crossed the island and destroyed nearly everything in its path. The western beach was severely eroded up to the coastal highway, sand several feet thick washed across the island, and the business district was destroyed. Many hundreds of people were left homeless.

The hurricane's impact wasn't all negative, however: low-interest loans and insurance payments encouraged quick reconstruction, the small recreational business district sprouted new motels, and the beach was augmented with sand for the eastern end of the island. The 'facelift' given the island by Betsy revitalized its tourist industry for a few years, but by 1975, Grand Isle had again slipped into equilibrium. A concrete revetment built by the Corps of Engineers in 1971 stabilized the coastal highway at the western end but also caused erosion to homes downdrift of the project. Mobile homes that had been brought to the island as temporary post-Betsy shelters became permanent housing and gave the island a makeshift appearance. When Grand Isle was damaged by another hurricane in 1974, its future as a resort looked bleak.

A mid-1980s resort rejuvenation?

In the mid-1980s it briefly appeared that a rejuvenation of sorts was going to offset the serious environmental degradation caused by relative sea level rise and shoreline erosion. In 1984, using sand dredged from offshore, the US Army Corps of Engineers undertook a major beach restoration project at Grand Isle. A sand levee was created – an artificial dune 11 ft (3.3 m) above sea level, stabilized with vegetation. The levee was fronted by a wide beach, 225 ft (68 m) deep and running the length of the island. Grand Isle State Park facilities were expanded with an observation tower, a concession shop and a 400-ft (122 m) fishing pier. The project was completed in early 1985 (Meyer-Arendt, 1987a).

As a result of the touted benefits of this project, interest in Grand Isle perked even before construction began. The island’s first condominiums and a modern marina were built, summer camp construction increased, and plans were made to build a major new hotel and to expand recreational development into the back-barrier wetlands (Coastal Environments, Inc., 1986). Various newspapers throughout the state carried stories about the ‘new’ Grand Isle, with such titles as ‘The Cajun Riviera’ and ‘Grand Isle is Back and Ready for Boom’.

Unfortunately for Grand Isle, 1985 was a record hurricane season, as Danny, Elena and Juan all caused major damage to the island. Winds and storm surges flattened the new levee (in places) and scoured the beach, sending tonnes of sand sprawling across the island. Some agreed that the beach nourishment and levee construction project minimized property damage, but it was clear that Grand Isle’s hopes for tourism rejuvenation had been dashed (Gill, 1986).

Whether this rejuvenation would have been a flash in the pan, a brief renewal after Hurricane Betsy, or a genuine renaissance, in which wise management would have forestalled resort decline indefinitely is unfortunately now a moot question.
Since 1985 conditions at Grand Isle have deteriorated both physically and tour-
istically. Elevated water levels in the Gulf of Mexico and periodic hurricanes
(including Katrina in 2005 and Gustav in 2008 and their associated storm
surges), coupled with land subsidence, have taken a severe toll on the resort.

Since 1985, there has been great public (and political) awareness of land
loss and shoreline erosion in Louisiana, and the little resort of Grand Isle lies at
the epicentre of environmental problems. Whereas New Orleans may command
the attention of the international media after an event such as Hurricane
Katrina (2005), Grand Isle may be seen more as a bellwether of the environ-
mental condition of south Louisiana. Indirectly the causes for environmental
degradation may be deltaic subsidence and global warming, but direct causes
include (relative) sea level rise, erosion (along both the Gulf and the bay sides),
increased hurricane activity and human-induced physical changes (Gonzalez
and Törnqvist, 2006). A survey of elevation benchmarks by the National Geodetic
Survey found that Highway 1 (the main highway leading to Grand Isle) had
subsided as much as 1 foot (0.3 m) between 1982 and 2002 (NOAA, 2003).

In the early 2000s, Louisiana has moved beyond producing studies of the
problems and disseminating information to the general public. The state is mov-
ing toward implementing various sorts of restoration projects, including diverting
sediments into regions of wetland loss and combating erosion via breakwaters,
riprap revetments and beach nourishment. In 2009, the US Army Corps of Engi-
neers presented its draft Louisiana Coastal Protection and Restoration (LACPR)
plan, although that has already been criticized for not offering a ‘comprehensive
long-term plan for structural, nonstructural, and restoration measures across
coastal Louisiana’ (NRC, 2009). Rosati and Stone (2009) outline design guide-
lines for major portions of the Louisiana shoreline. Most of these restoration
efforts are targeted for unpopulated areas, but Grand Isle holds a special place in
the hearts of south Louisianians.

Grand Isle has had various beachfront ‘makeovers’ since the hurricane
season of 1985, and in most cases it was a generous infusion of federal funds
that made this possible. Renourishment of the beach and patching of the bro-
ken sand levee has been undertaken numerous times, most recently in 2008
following Hurricane Gustav (Fig. 15.4). Although few, if any, scientific studies
touted the benefits of rocks on the beach, in the 1990s several barge-loads of
rocks were placed both offshore and on the beach, giving the visage of Grand
Isle an almost-Zenlike appearance, especially when the surrounding beach is
freshly raked (Fig. 15.5). Extensive offshore breakwaters have been placed
along the north-east Gulf side of the island as well as along much of the bay-
side (Fig. 15.6). Bencaz and Birdseye (1990) found that Grand Isle had actu-
ally increased in area since 1945 because of the extensive beach nourishment
and also that bayside erosion was much worse than Gulf-side erosion. In any
case, Grand Isle is environmentally vulnerable to sea level rise and shoreline
erosion, and engineering works may just be stopgap measures to offset a natural
decline (Fig. 15.7)
Fig. 15.4.  Post-Hurricane Gustav sand levee, Grand Isle (photo by author, 2009).

Fig. 15.5.  Rocks on beach, central Grand Isle (photo by author, 2009).
Fig. 15.6. Offshore breakwater, bayside of Grand Isle (photo by author, 2009).

Fig. 15.7. Recreation on a shrinking beach, Grand Isle (photo by author, 1991).
In terms of tourism, Grand Isle does not appear that much different today than it did in the past. The landscape of 2010 is eerily similar to that of the post-hurricane season of 1986. Periodic levelling of the island by hurricanes ensures – thanks to federally-subsidized insurance payouts – continuous new post-storm construction (Fig. 15.8). In the mid-1980s, there were plans to construct an elaborate resort complex in the back-barrier wetlands, on the property of the antebellum Barataria Plantation (Coastal Environments, Inc., 1986), but a recession and difficulty in obtaining wetlands construction permits halted this development (Fig. 15.3D). In 2010, a smaller-scale version of this back-barrier development (a residential canal subdivision named Queen Bess Bay) was under construction.

But the built environment masks the true human landscape beneath. The beach-goers are now rare on Grand Isle, having moved to nicer Gulf Coast beaches east of Louisiana (notably in the Florida panhandle). Grand Isle State Park has experienced steady declines in visitation, and even its closing (following Hurricane Gustav in August 2008) has not impacted island tourism revenues significantly (Fig. 15.9). A sociological study of local residents in 2004 found that in spite of strong place attachment to Grand Isle, many were resigned to abandoning the island in view of continued sea level rise and related environmental degradation (Burley et al., 2004).

It has been suggested that coastal communities that face inundation due to climate change (e.g. rising sea level) have three options: protection, accommodation and retreat (Few et al., 2007). Grand Isle has shifted from a strategy of protection to one of accommodation. Hard and soft structural protection has

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**Fig. 15.8.** A typical recreational stilt camp, Grand Isle (photo by author, 2009).
proven to be stopgap at best, and although it may always remain a political priority, its effectiveness cannot be guaranteed. Accommodation via home-raising, roof-fastening and other defence mechanisms against water and wind – as well as rebuilding after every storm – appears to be the dominant adaptation strategy. Retreat – in the sense of moving buildings and roads back from the shorefront – is not an option because of the low (and sinking) physical setting (although individual residents are abandoning the island and retreating to higher ground further inland in Louisiana).

What may become left behind on Grand Isle is a fishing destination. Fishermen are concerned less about resort aesthetics than they are about good fishing (Fig. 15.10). Grand Isle has always been a destination for fishermen, and the Grand Isle Tarpon Rodeo is billed as the ‘oldest deep-sea fishing rodeo in the USA’ (Meyer-Arendt, 1985). But over time, and definitely since 1985, the non-fishing resort functions have gradually dwindled away to but a tiny portion of the overall resort economy. There are few restaurants (why would fishermen order fish in a restaurant, anyway?), and the most popular was for sale in 2009. The few modest motels on the island mostly cater to fishermen and proudly display fishing emblems on their façades. There are elevated stilt-trailer camps geared almost exclusively to fishermen. Most residential properties, many of which are mobile homes (caravans) or pre-manufactured housing raised on pilings as high as 14 ft (4.3 m) or more above sea level, are owned by fishermen. Even the fancier vacation homes are owned by wealthier recreationists attracted to fishing. The only vacant areas upon which to develop new housing on Grand Isle are in the back-barrier, where the residential-canal subdivision is currently being developed. While lots are being pre-sold for this ‘gated waterfront community’ in the ‘heart of Grand Isle’, it is hard to imagine this neighbourhood catering to anyone other than seasonal recreational fishermen.

![Grand Isle State Park visitation, 1988–2009](image_url)

**Fig. 15.9.** Grand Isle State Park visitation, 1988–2009 (Louisiana State Parks, 2009).
Summary

Grand Isle is an old seaside settlement with a resort tradition dating back over two centuries. This long tradition of tourism may be traced to the island’s relative proximity to New Orleans, at one time the second most populous city in the USA. But Grand Isle’s location in the heart of a subsiding Mississippi River deltaic plain has made it vulnerable to sea level inundation and tropical storms and hurricanes. Its tourism economy long characterized by cycles of boom and bust (related both to economic as well as environmental factors), Grand Isle has declined ever since a brief boom in the mid-1980s when a protective sand levee and wide beach were built. But structural protection alone is not ensuring the survival of the resort community. Beach tourists have shifted their sun-sand-sea-surf attentions elsewhere, and long-term residents are abandoning their multi-generational home island. Some residents and recreational fishermen are adapting to the environmental degradation by living with periodic onslaught of hurricanes and storm surge and rebuilding anew after every catastrophe. Whether this pattern can be sustained forever – or even until 2100 – remains to be seen.

Postscript

To compound the environmental problems that Grand Isle faces, on 20 April 2010 the BP-owned Deepwater Horizon mobile offshore drilling unit exploded – less
than 70 miles (110 km) from the island—and the ruptured pipe sent millions of
gallons of oil and gas into the Gulf of Mexico. By the end of May, the oil had
washed ashore on the beaches and in the wetlands surrounding Grand Isle, effect-
tively ruining the summer tourist season, the fishing industry and the island econ-
omy in general. In summer 2010, as the oil continued to flow, the only bright spot
in the economy was the BP-funded cleanup and remediation effort. While this
appears to be the ‘nail in the coffin’ for Grand Isle, the resort island has been
resilient in the past. I suspect it will slowly recover from this disaster, even as it
slowly sinks into the Gulf.

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