Belle Fontaine 1986 to 2000

Belle Fontaine is the last natural beach on Mississippi's mainland Coast (Oivanki, 1994). Recent development, bulkheading and generally rising sea levels have combined to create a situation where erosion threatens homes, roads, and public infrastructure. The bulk of development on the beach is on a set of Holocene beach ridges that originate from an older– Pleistocene age – bluff consisting of fine to medium sands (Gulfport and/or Prairie Formation). Much of the sediment making up the present beach ridges is the direct result of bluff erosion in the past several thousand years (Otvos, 1985). Subsequent armoring of the bluff and beach ridge shorelines along with longshore structures (groins) has cut the sediment supply drastically. The beach is no longer functioning as a self-sustaining natural system; it has effectively become a large sand box with an open end to the Mississippi Sound. Unfortunately, there only appears to be a limited area offshore of the beach with enough sandy sediment (Oivanki, 19940) (Schmid, 1999) to help buffer sediment losses. At some point the system will need to be "re-charged" with sediment or completely armored with a unified line of defense, such as a set of offshore breakwaters or a seawall. Each option has advantages and drawbacks. The second option is less favorable from an environment/esthetic standpoint and more expensive; the first option, however, has a lower protection value. Deciding on a final solution will not be an easy task.

This report is meant to update shoreline change data and highlight areas of higher erosion, and thus potentially higher flooding risks from storms (Lana, 1998). The 1986 shoreline data is from NOAA Coastal Service Center and is based on aerial photography; the 2000 Global Position System (GPS) data is from the Mississippi Dept of Environmental Quality, Office of Geology.

The pattern of areas with more than 10 m (33 ft) of shoreline retreat between 1986 and 2000 (Figure 1) is consistent with areas that have smaller (thinner or with lower elevations) Holocene beach ridge segments on the western portion of the area (Figure 2). The beach ridge pattern suggests that there are two sets, one formed earlier in the Holocene and one that (the present shoreline) is forming today. Where the two sets cross, the beach is fairly robust and has a lower overall retreat rate, which was, in most cases, less than 0.5 m/yr (1.5 ft/yr). The other area with a higher level of shoreline retreat is along the bluff line to the east of the water tower. This area is now nearly all bulkheaded, and in fact, the shoreline retreat happened between 1986 and 1993. The shoreline in this area has not changed appreciably since 1993; in many cases it has moved seaward since 1993. The total amount of shoreline retreating by more than 10 m between 1986 and 2000 is 2.2 kilometers. The length of surveyed shoreline with infrastructure and homes is 7.3 kilometers; so about 30% of the shoreline with upland infrastructure has eroded 10 m (33 ft) since 1986.

A number of studies are ongoing in the Belle Fontaine area (i.e. Ervin Otvos and Corp of Engineers). Several important questions remain. Of those, the quantity and quality of offshore sediment for use in renourishment is paramount, as the system will likely require an addition to compensate for the loss of sediment normally (or naturally) contributed by bluff erosion. Moreover, a better idea of how much and where sediment is

lost or gained from the offshore (the open end) is necessary to better quantify the sediment budget and plan for future efforts.

References

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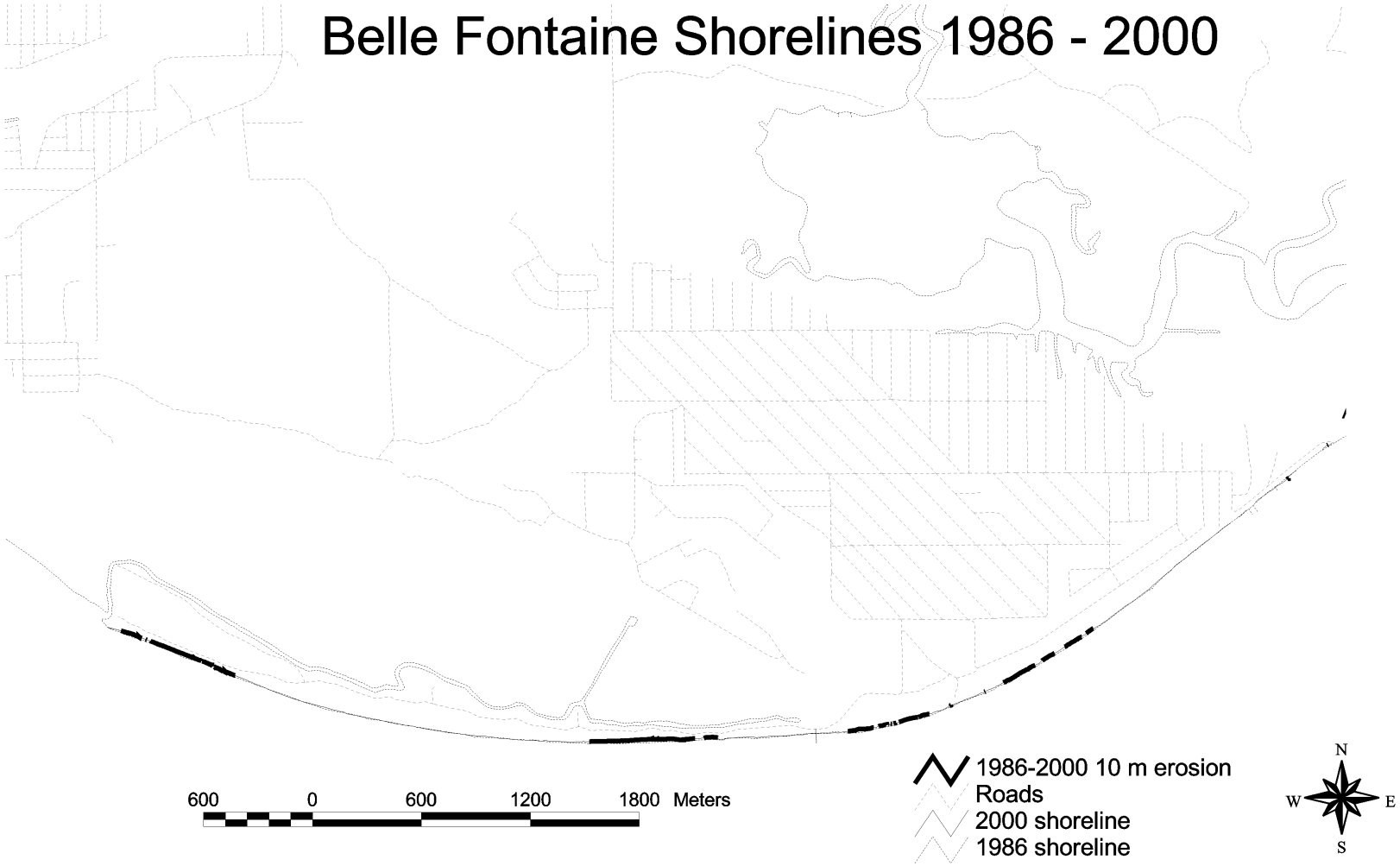

Figure 1. Shoreline retreat patterns measured from 1986 to 2000.

Figure 2. Aerial photograph of the Belle Fontaine beach; north is up. Notice the width and extent of the sand ridges (white on image) running along and also at an angle to the beach.