INSIGHT INTO THE SEDIMENT BUDGET FOR THE JONES BEACH AREA ON THE SOUTH SHORE OF LONG ISLAND FROM LONG RANGE PROFILES

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Introduction

The intent of this paper is to contrast estimates of coastal erosion created from subaerial beach profiles with those made from complete subaqueous profiles. It will be shown that estimates from subaerial profiles can give significantly misleading results. In some cases, the shoreline trends identified from subaerial profiles can in fact be erroneously identified as depositional when in fact they are erosional. The data that was obtained for this study, along with the methodology used and the results will be discussed in this paper.

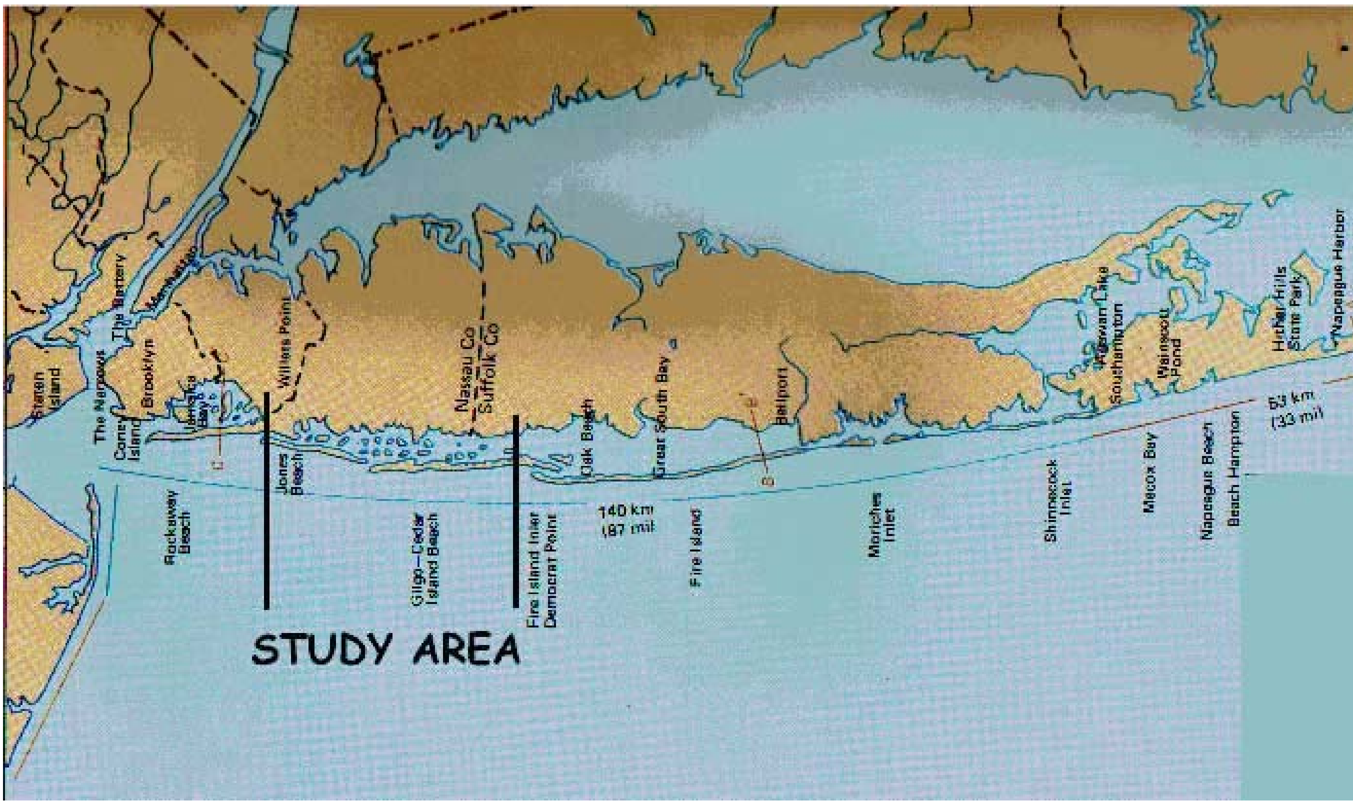

Figure 1: Map indicating location of study. Profiles analyzed are located down drift (west) of
Fire Island Inlet on Jones Beach Island but do not span the entire island.

The area of study is located forty miles southeast of New York City on Jones Beach Island, which includes Jones Beach, Tobay Beach, Gilgo Beach and Cedar Island Beach. (Figure 1) Fire Island Inlet is located to the east of Cedar Island Beach and Jones Inlet defines the westernmost end of Jones Island. This area consist mostly of glacial outwash that has been reworked since the Wisconsin retreat (Taney, 1961)

Thirteen complete surveys of 6 profiles were taken during the following years: 1951, 1961, 1962, 1995 and 1998. This series of long term, subaqueous, beach profiles was used to quantify beach erosion during those time periods. The results were compared to the results of Strong (1995), which attempted to determine shoreline trends using only shoreline intercept information derived from subaerial profiles. Many beach nourishment and dredging projects were completed within the time period that profiles were collected. Where recorded, these projects were carefully assessed and accounted for although the shoreline trends identified were made independently of these projects.

Methods

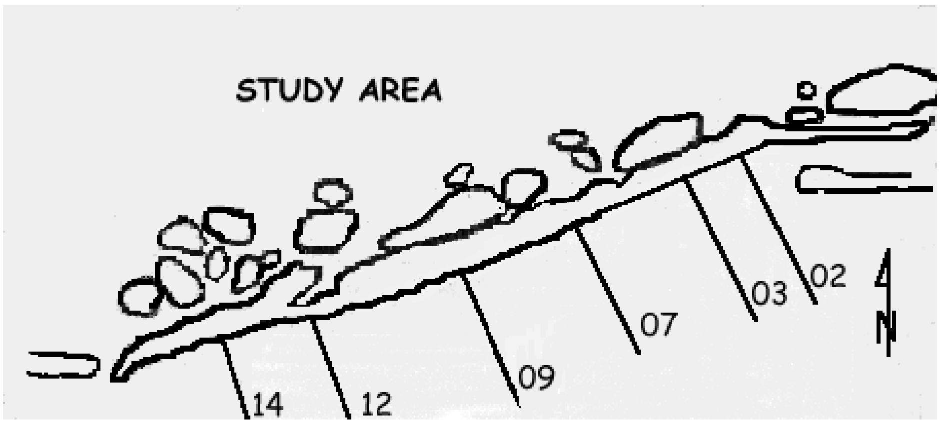

Figure 2: Map of range lines studied in report.

The profiles for 1951, 1961 and 1962 were obtained from United States Army Corps of Engineers surveys and were hand digitized. Six profiles, 02, 03, 07, 09, 12, and 14 were studied during these years (Figure 2). Digitized data was converted into real units and the profiles were written in ISRP format. These files were then imported into BMAP (Sommerfeld, 1994). The 1995 and 1998 profiles were also obtained from USACE surveys, and were already available digitally in ISRP format. Range numbers; 13, 16, 22, 28, 37 and 41 represent the data for 1995 and 1998. These surveys were matched to the corresponding profiles for the 1951, 1961 and 1962. (Table 1)

51- 62 Profile Number	Range(survey) Number
02	13
03	16
07	22
09	28
12	37
14	41

The vertical datum for the 1951, 1961 and 1962 profiles was mean low water (MLW). In order to make these profiles relative to NGVD (1929), the surveys were raised by 0.7218 ft. The horizontal monument, that the data was obtained from on several of the earlier profiles, did not match the 1995 and 1998 surveys. The following horizontal adjustments were applied to the earlier profiles (1951, 1961 and 1962 only) in order to have a common horizontal reference; profile 02 (+223.67ft.), profile 03 (+103.76ft.), profile 09 (+374 ft.). Profiles 07, 12 and 14 were not adjusted horizontally. All adjustments were performed in BMAP.

Profile comparisons, volume reports and cut and fill reports were generated on BMAP for all profiles, comparing the inter-survey changes for each individual profile. Only those profiles that extended further seaward than 4000 ft. were considered, therefore the 1962 profiles for 07, 09, 12 and 14 were not used. The purpose of this comparison was to determine beach sediment volume changes over the period 1951 to 1998.

The results obtained in this study was compared to the results presented in Strong (1995). Strong did not attempt to calculate a sediment budget due to the lack of offshore (subaqueous) data. However sediment volume changes were estimated using a constant equilibrium profile type approximation adopted from the USACE that states, to advance a beach 1-foot, 1yd^3/(ft beach width) of sand is needed. Strong examined 125 surveys within 15 profiles along the Jones Island area during the years 1950-1995. The authors of this work only considered those profiles, which matched the ones used in the present study. Strong states in his paper that the results of his study indicate that the eastern portion of Jones Island (represented by profiles 02 07) is accreting. The middle section (represented by profiles 08-11) is eroding and the western side (represented by profiles 12-18) is accreting.

The following results were obtained using the subaqueous data for each of the long-range profiles from the years 1951-1998.

Results

A "volume report" was generated on BMAP for each profile out to the 30 ft. offshore contour. Profile 02 showed accretion from the years 1951-1961. There was some erosion occurring during 1961-1962, then accretion again from 1962-1998. The overall trend from 1951-1998 showed this area accreting. Profile 03 indicates continual erosion from 1951-1998, as do all the remaining profiles 07, 09, 12 and 14. It should be noticed that these results represent total changes over this period, no attempt has been made to aportion observed erosion or deposition to natural or man made effects such as beach nourishment, sand mining or dredging.

In order to test how these results would compare with the results derived from subaerial profiles, a "profile comparison report" was generated on BMAP for each of the profiles using only the subaerial data. In this case, profile 02 shows erosion occurring from 1951-1998. Profile 03 shows accretion during the years 1951-1995. Profile 07 shows accretion during 1951-1995, some erosion occurs in 1961. Profile 09 shows accretion during 1951-1995. Profile 12 shows overall erosion during 1951-1995. Profile 14 indicates accretion during 1951-1995.

Along with each report, an accompanying graph was generated and analyzed.

Conclusion

Examining the graphs and reports for each profile, the following conclusion were made for each area: Profile 02, located in the Cedar Beach area shows an accretion spike occurring in the 1951 graph at approximately 2300ft. This profile is just down drift from the 5000 ft long Democrat Point jetty on Fire Island. Observations indicate that the jetty impoundment area was full by 1950 and downdrift bypassing of sediment presumably began soon after this time. The "overflow" of sand may have accumulated around 2300 feet of profile 02. The drop in the beach volume between 1961 and 1962 may reflect inlet changes due to the Ash Wednesday Storm of 1962. Accretion occurs again between 1962 and 1998. Repeated nourishment has occurred within this area during that period. The overall trend indicates accretion to this area.

Profile 03, also located in the Cedar Beach area shows erosion from 1951-1961 and then an accretion occurring from 1961-1962 around 2300ft. From 1962-1998 it drops again. The overall long term trend indicates erosion. Profile 07, located on Gilgo Beach, shows continual erosion from 1951-1995. The analysis of subaerial profiles indicates long-term accretion in this area. Profile 09, located on Tobay Beach, shows accretion from 1951-1961 and erosion from 1961-1995. There was a nourishment project conducted during 1961 in this area. The overall trend indicates erosion. Profile 12 indicates continual erosion to this area. Looking at the subaerial report, this area indicates accretion. Profile 14 shows continual erosion from 1951-1995. According to the subaerial reports, this area is accreting.

Several major storms occurred to the study area in 1968, 1969, 1970 and 1971. Complete recover to the beach occurred within a month of each storm, therefore their impact did not play a major role.

The results demonstrate the misleading results which can be obtained from relying on subaerial data to determine shoreline trends, even when the information spans close to 50 years. The importance of obtaining complete subaqueous beach profile for developing sediment budgets and identifying erosion processes for a shoreline is clear. False and inconsistent indications of shoreline erosion or accretion can occur when considering either subaerial volume changes or shoreline intercept data.

References

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