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LONG-TERM SHORELINE CHANGES
IN THE
VILLAGE OF EAST HAMPTON: 1838 to 1990

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Introduction

The beach in East Hampton Village has been surveyed every four to eight weeks since 1979 by the Marine Sciences Research Center (MSRC) of the State University of New York at Stony Brook, NY. The surveys have recorded the shape of the beach, its width and its volume from accurately known locations and elevations. The 921 beach profiles measured since 1979 comprise one of the longest, continuously active series of beach observations in the country and the only set of measurements for East Hampton. Because of the exceptionally long period of direct observation, the behavior of the beach has been documented under a full range of diverse conditions of waves, tides and weather. Since each measurement was precisely located, the surveys provide, for the first time, a record of the Village shoreline during the last decade that can be compared to the available historical record of shoreline positions over the past 152 years.

Conclusion on 152 years of the East Hampton Village Beach, 1838-1990

The shoreline position at the Village of East Hampton has been stable over the past 152 years. Over the last 10 years, however, the MSRC surveys have found that the beach has widened by about 90 feet. The beach to the west of the Village, between the Main Beach and Georgica Pond is wider today than it was in 1838. East of the Village Main Beach, the beach is narrower today than it was in 1838, but the beach everywhere is generally wider now than it was when maps were made in 1891 and 1933 or when aerial photographs were taken in 1938, 1962 and 1979. At

some time during the 1980's, the beach has been at least as wide as it was when mapped years ago at all measurement stations. There has been no measurable accretion that can be attributed solely to the groin which was constructed in the mid-1960's by Hook Pond. Other groins were constructed at the same time at Georgica Pond; the beach has built up here and for nearly 1000 feet to the east, representing about 6% of the Village's shoreline. Any differences between the shorelines as recorded on maps of 1838, 1891 and 1933 or as photographed in 1938, 1962 and 1979 can be accounted for by the natural interannual cycle of erosion and accretion that the MSRC has monitored over the last decade.

Analysis

The available data on the East Hampton beaches begins in 1838. The historical shoreline positions were compiled by Leatherman and Allen for the National Parks Service using the latest computerized techniques. As part of their study, Leatherman and Allen remapped the shoreline through the East Hampton Village as it was determined by maps in 1838, 1891 and 1933, and by aerial photographs in 1938, 1962 (after a major storm) and 1979, just before the decade-long series of precise, MSRC surveys began. Differences in the historical shoreline could be detected but only now, with the results of the detailed surveys, can the relative importance of those differences be assessed for the East Hampton shore.

The MSRC surveys during the 1980's accurately mapped the shoreline position at mean sea level regardless of wave or tide

conditions at the time of the survey. The aerial photographs were taken at random stages of the tide and weather conditions and the shoreline position that was mapped from the aerial photographs was near the high water mark reached just before the photograph was taken. The shorelines on old maps were determined likewise by indicators of high tide on the beach when the mapmakers walked along the shore. The shorelines on both the aerial photographs and the old maps are subject to some uncertainty due to the unpredictable vagaries of the high water position. Despite the differences in the way the shoreline was determined in each of these methods, the various shoreline positions can be compared since the shoreline at high tide is expected to be with about a dozen feet of the shoreline at mean sea level.

The results of this comparison are shown in Figures 1 to 6. In 1838, the mapped shoreline was about 350 feet from the MSRC benchmark near the Hook Pond groin (that is, station 2, figure 1). The 1838 beach seems exceptionally wide especially since the beach was only about 85 feet wide in 1891. Even so, on one occasion during the past 10 years, the beach measured at this station was wider than it was in 1838. After 1838, the widest, historical beach was found here in the 1938 aerial photographs. In 1938 the beach was about 180 feet wide; it had been narrower in 1981 and 1933 and it would be narrower again in 1962 and 1979. During the 1980's, the measured beach width was larger than the width in 1938 eighty-three percent of the time. It was always wider than the beaches measured in 1891 and 1933 and only once was it as narrow as the beach after a storm in 1962. A

comparison of the historical shorelines with the measured beach width west of the Hook Pond groin gave similar results (station 5, figure 2).

Station 9 is west of the Main Beach near Drew Lane. Historically, the narrowest beach was found in 1979. The beach was always wider in the 1980's than it was when the aerial photograph was taken in 1979 (figure 3). About 40 percent of the time during the last decade, the beach here has been wider than at any time before 1979. Stations 10 and 13 between the Main Beach and the parking lot at Georgica Beach showed similar results (figures 4 and 5). The beach near the Georgica groins (station 7, figure 6) has been wider than any of the historical shorelines about ninety percent of the time during the past decade. It has always been wider in the last 10 years than when the shoreline was determined in 1962, 1938, 1933, 1891 or 1838. This is most likely an effect of the groins themselves.

Although comparisons of maps and aerial photographs show changes in the shoreline position, these differences are within the range of the natural seasonal changes documented by the MSRC surveys. Statistically only if the difference between two shoreline positions is greater than 304 feet can it be said with confidence that the shoreline has experienced significant long-term erosion or accretion. This has not been the case in the study area in East Hampton Village between 1838 and 1990, so that differences in the historical shoreline position cannot be taken as evidence of long-term erosion or accretion with the possible exception of accretion at the Georgica groins.

Historical Perspective

During the last ice age, about 20,000 years ago, so much water was frozen in the continental glaciers that sea level was some 400 feet lower than it is today and what is today East Hampton beach was then some 70 miles from the ocean. Sea level rose as the ice melted and the shoreline retreated northward pushed by the flooding sea. The transgression was rapid at first but it has proceeded more slowly over the past six thousand years. The rise of sea level, and the consequent migration of the shoreline, was not necessarily steady and continuous. There is evidence that it occurred in fits and starts with periods of relative stability punctuated by periods of rapid change. The shoreline position at East Hampton has remained relatively stable over the past 152 years and measurements show that the beach has widened by about 90 feet over the last decade.

The behavior of the shoreline is influenced by the supply of sediment as well as the conditions of waves, tides, storms and sea level changes. A period of rapid erosion might load the littoral sand budget with sediment and beaches could subsequently accrete for a long time, even in the face of a continued rise in sea level. In these ways, stable shorelines could persist for hundreds of years, depending on the particular conditions, or cycles of accretion could span decades even in the face of a continued rise in sea level.

BIBLIOGRAPHY

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- Zimmerman, M.S., H.J. Bokuniewicz and L. McTiernan. 1989. Beach conditions at East Hampton, NY, January through December 1988, Appendix XV of Special Report 38, Marine Sciences Research Center, State University of New York, Stony Brook, NY, 41 pp.
- Zimmerman, M.S., H.J. Bokuniewicz, L. McTiernan and C.E. Schubert. 1990. Beach conditions at East Hampton, NY, January through December 1989, Appendix XVI of Special Report 38, Marine Sciences Research Center, State University of New York, Stony Brook, NY, 31 pp.

Figures Caption

Each figure shows the measured width of the beach between 1979 and 1990 (broken line). The sloping straight line on each figure indicates the multi-year trend in beach width. The horizontal lines represent the historical shoreline at each station as recorded in the years labeled along the righthand side of the figure.

Beach Width, East Hampton, NY

station #2

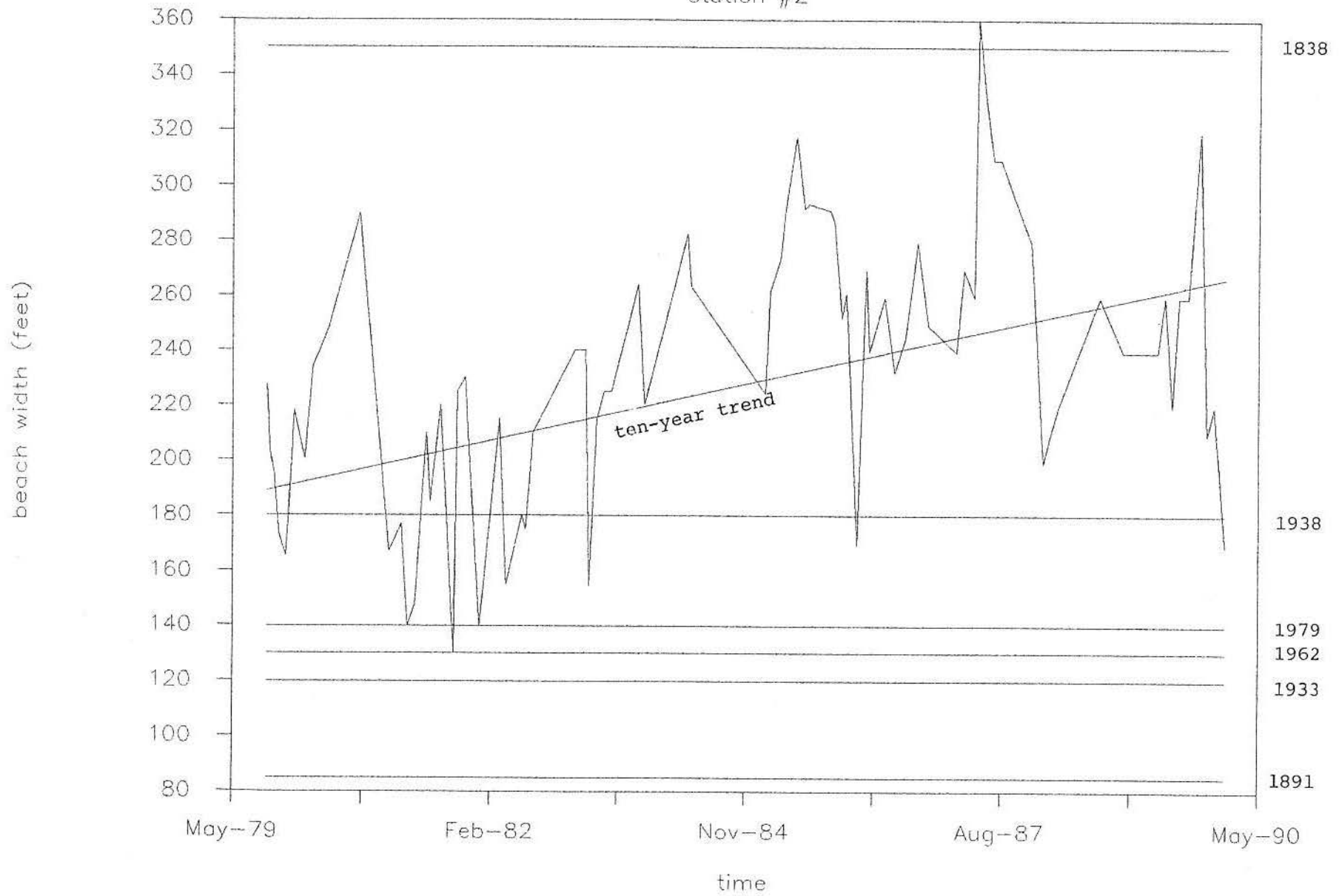


Figure 1.

Beach Width, East Hampton, NY

station #5

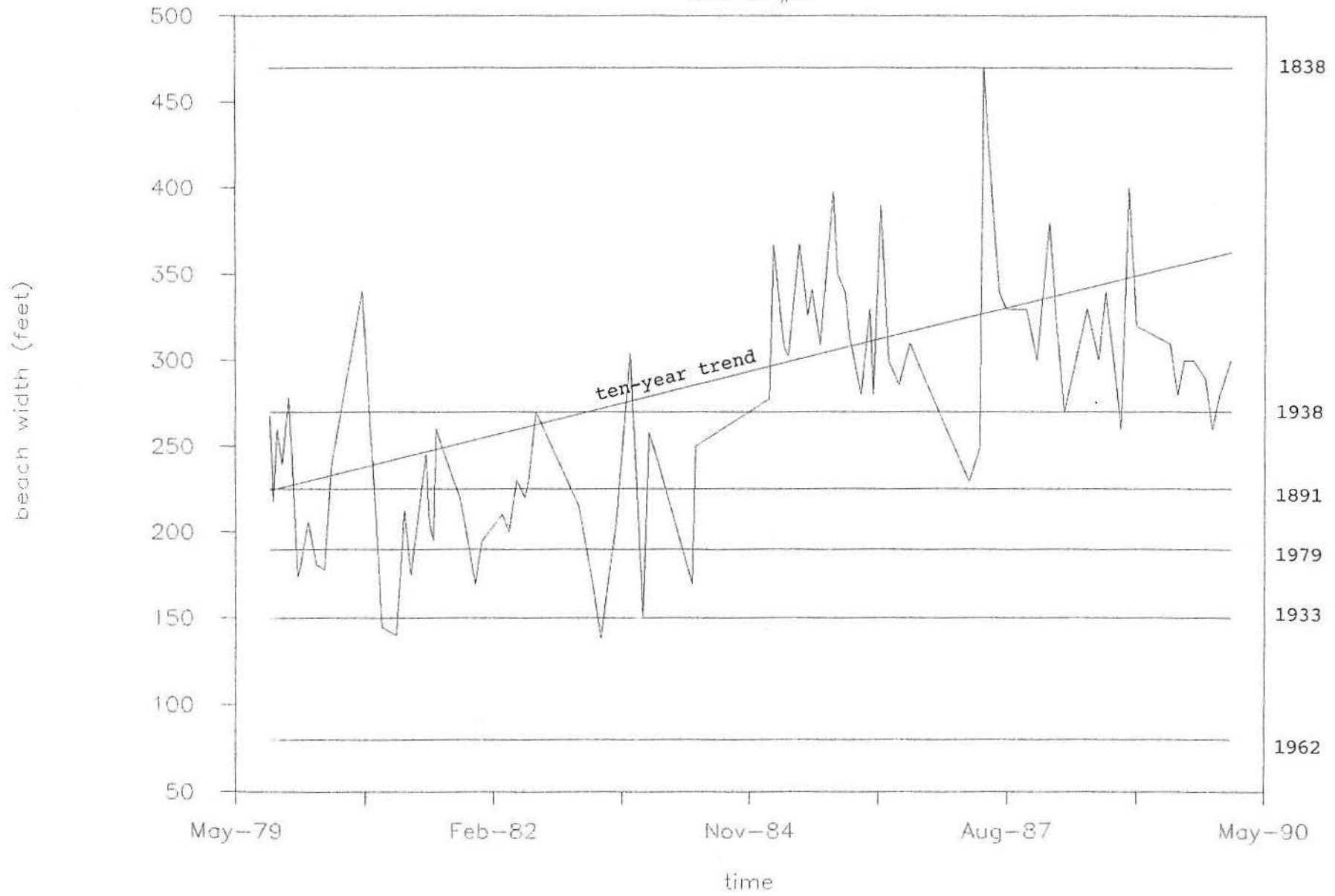


Figure 2.

Beach Width, East Hampton, NY

station #9

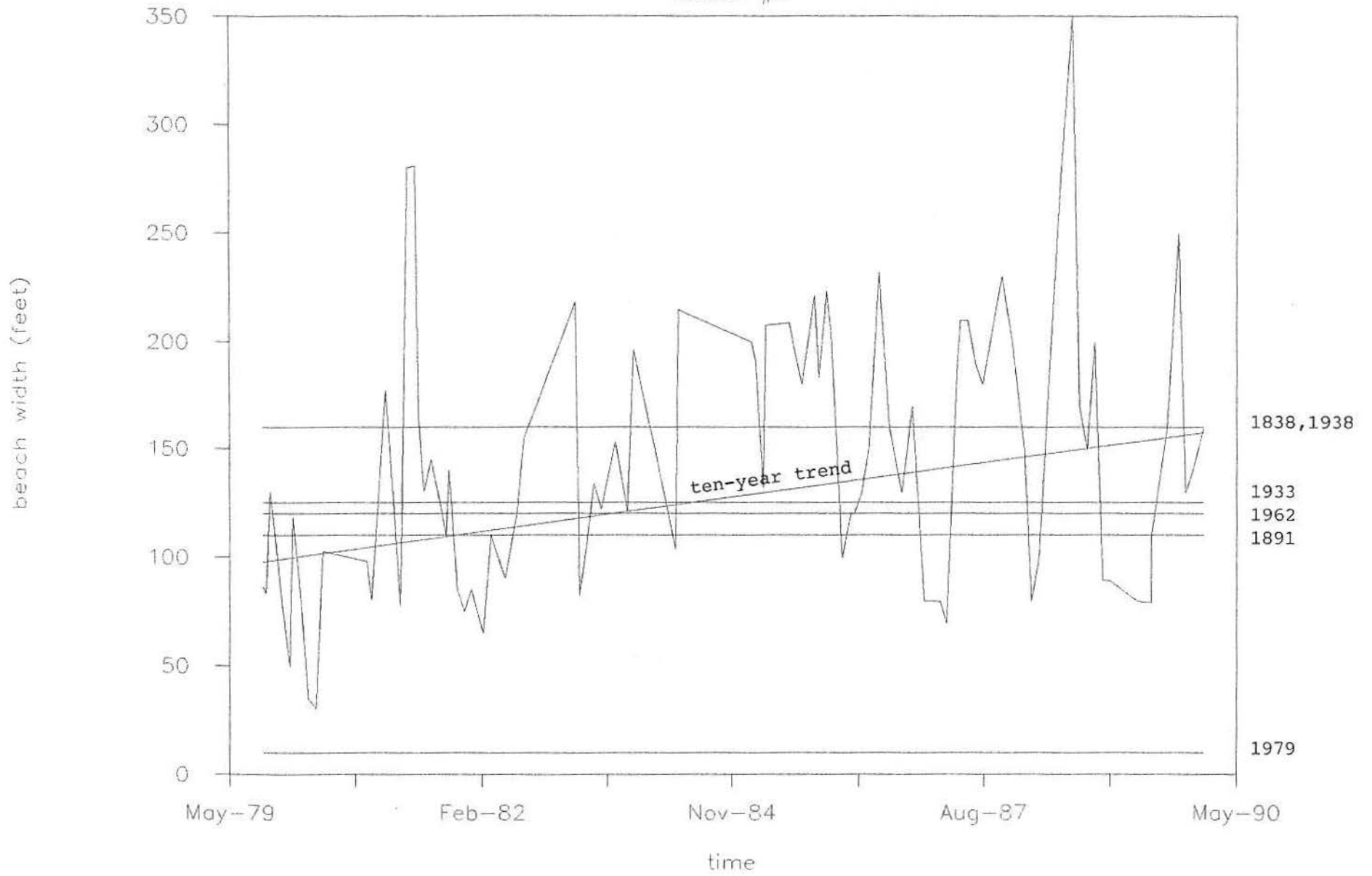


Figure 3.

Beach Width, East Hampton, NY

station #10

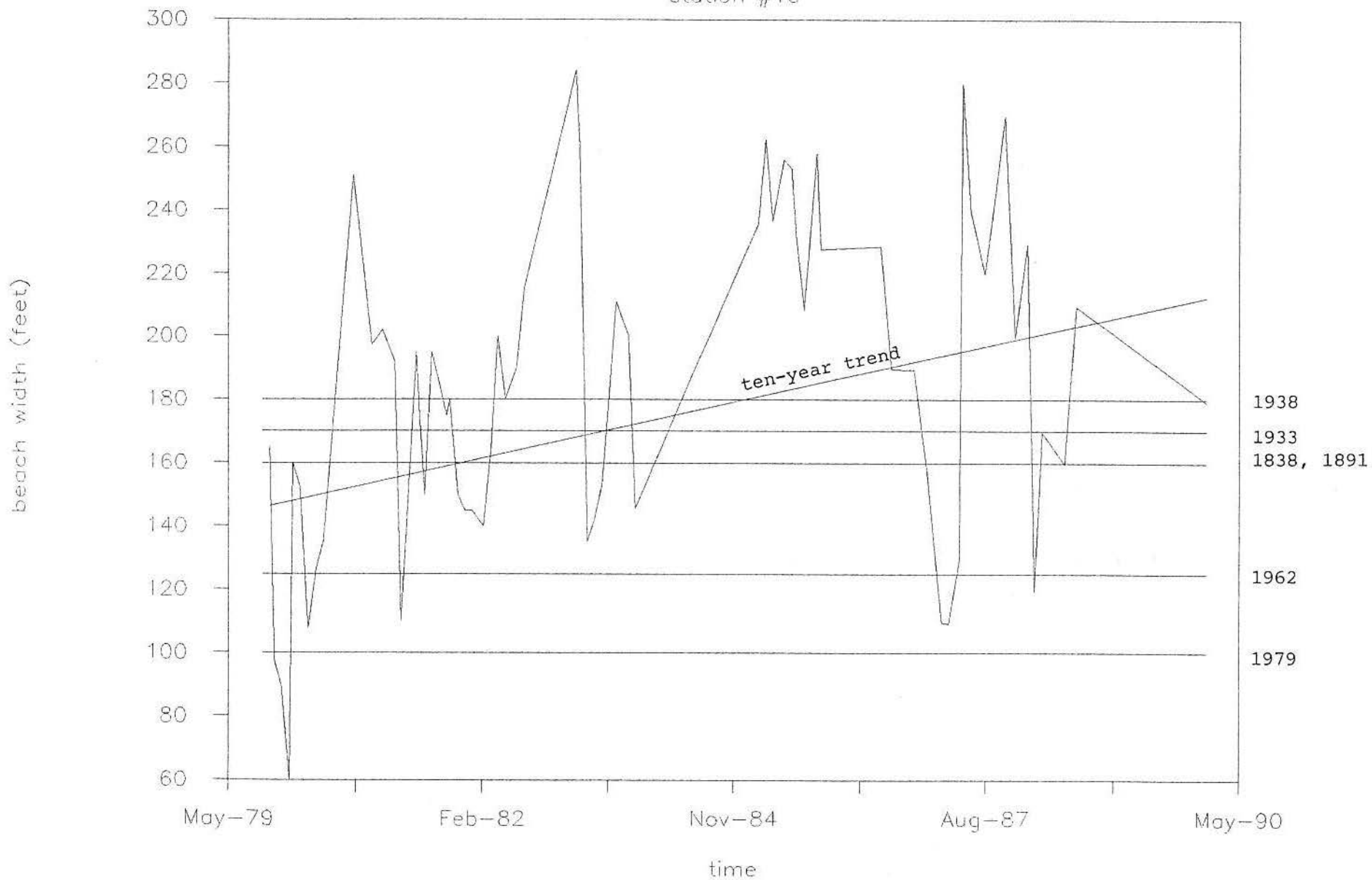


Figure 4.

Beach Width, East Hampton, NY

station #13

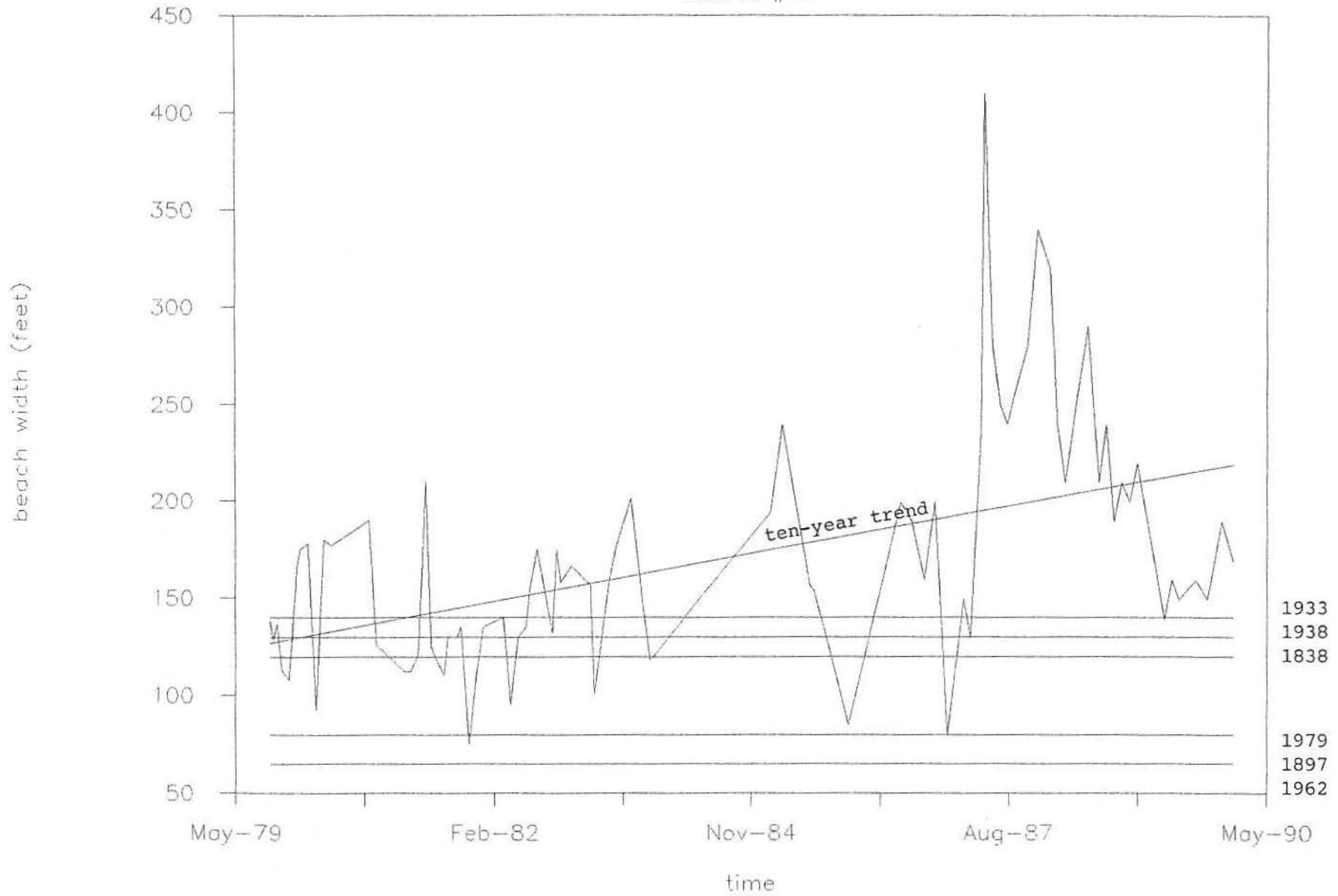


Figure 5.

Beach Width, East Hampton, NY

station #17

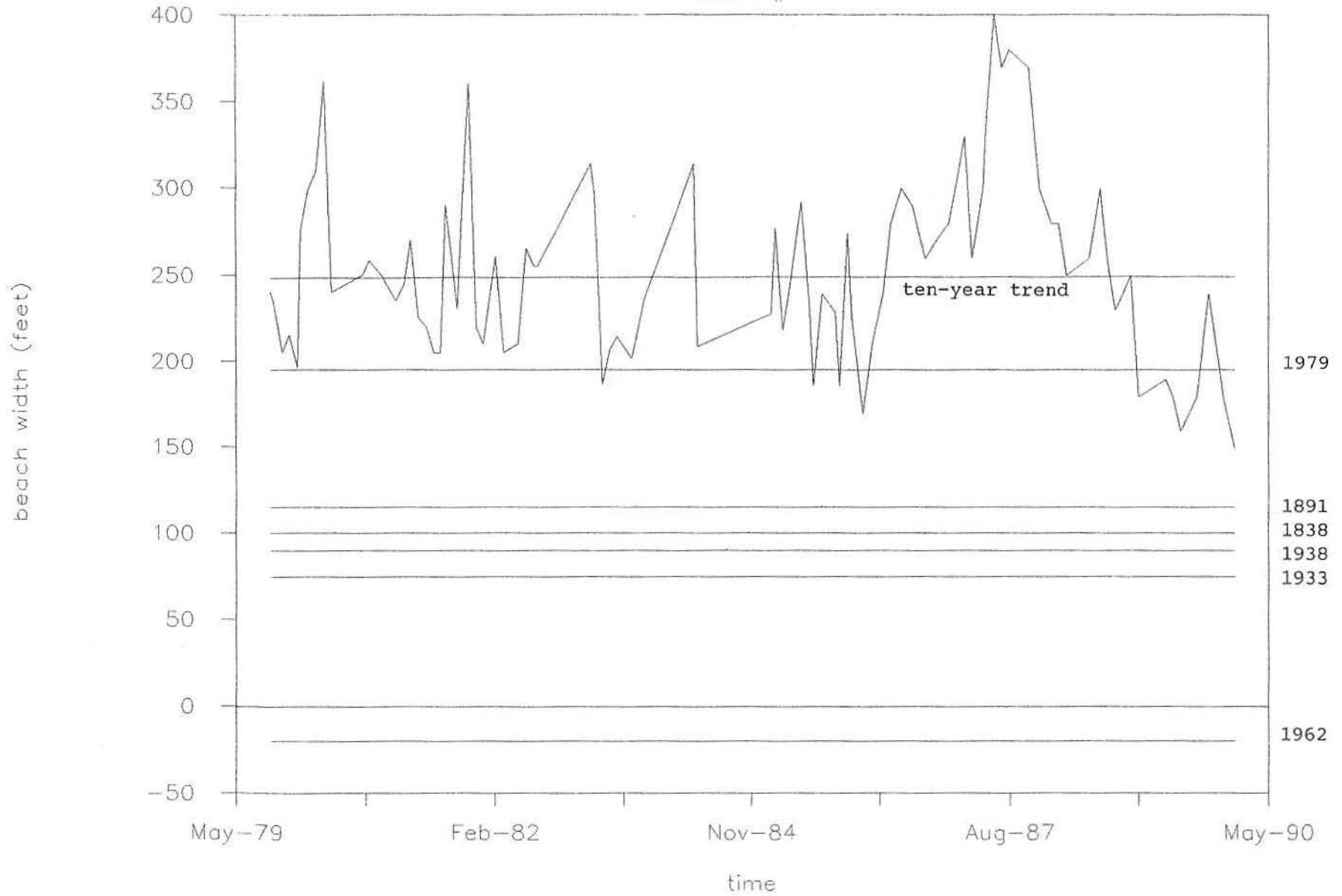


Figure 6.