Measuring Beach Profiles

Phyllis E. Rumpp & George W. Rumpp

Background

Using low-cost equipment and a natural horizon, the shape or profile of a beach may be measured.

Periodic measurement of beach faces can be a valuable asset to monitoring the erosion and depositional patterns of beaches. The primary concern has to do with erosion, but any changes may be monitored with a fair degree of accuracy and precision.

Continuous measurements probably occur on too few beaches, with research relying on photographic records. Expensive surveying equipment may be used (and at times may be very helpful if a natural horizon cannot be found) but is really not needed.

Materials

Transit Rods: One pair, each approximately 2 inches square and eight feet long, made of a single "2 x 4" cut in half lengthwise. Two rods may be made that are identical to each other. A hole approximately ½ inch in diameter should be drilled through the very center of each pole. This will serve as a sighting device. (The hole is not necessary, but does simplify the process. The worker may simply sight along the edge of the pole.)

The poles should be painted white and marked in decimeters from the center using black paint, with minus values marked above the hole and plus values marked below the hole. The marks should be on the same side as the hole.

We have used aluminum poles from a volleyball game for transit rods. This will work as long as the measurements are marked on them so that each pole matches the other. A permanent felt-tipped marker worked fine for this.

Line: Use a heavy twine or light rope that will not stretch to measure the distance between the poles. Polyethylene is light, will not stretch too much, and may be purchased in white or yellow colors. Mark the twine in increments of one meter each. This may be done with a marker or by wrapping black plastic tape around the line. If you are ambitions, a knot may be tied in the line at the proper increments.

Line Level and Line: (Optional) A small line level may be used if you do not have a clear sight on the horizon or for measuring elevation changes between parallel profiles. The line for this should be lightweight and is not acceptable for measuring distance between the poles.

Sight Marker: This may be an old ping pong paddle, book or student. Something to set at the original starting point (or other location) so that the rods may be kept moving in a straight line.

Procedure

Figure 1 Measuring the

profile of Coast Guard Beach, Cape Cod, Massachusetts. June, 1997.

Select a starting point: This should be a location easily found later (like next month or next year). A GPS value may be helpful. The best way is to establish a base line some distance (100 meters or more) from the point of the profile. This base line is not likely to be affected over several years of erosion. In any case, a good, permanent object could be the point. On a beach with a dune structure, you should start at the base of a dune since working on the dune will hasten its erosion.

Set the first transit at the starting point. Take the second transit and move it to a location closer to the water, following a line perpendicular to the water line. You may use an even increment of distance (such as 5 meters) but we prefer moving to the next point of change in elevation pattern (such as the edge of a berm or center of a depression), but rarely more than 10 meters. Use the line to measure the distance, keeping the transits vertical and the line perpendicular to the transits. The person at the first transit sights through the hole to the second transit and reads the value on the second transit where the horizon appears on the transit. This is a level line. If the person can not make out the numbers due to distance, the person at the second transit can be guided to move their finger until they point to the mark on the transit.

Following the first measurement, move the first transit to the new location closer to the water. Keep the second transit in place as it will now serve the same role as the first transit. Place the marker at the site of the first transit as a guide to allow the profile to follow a straight line. Repeat this process, leapfrogging over each transit for subsequent measurements.

If a horizon is not available, use the line level. Use the separate lighter line with the level. One end of this line must be at the sight of the first transit with the line pulled taut between the two transits. The line level is hung on the line at the center of the line and the line is moved up and down at the second transit until the level reads as level. Another person is necessary to do this. When the line is level, its position at the second transit marks the elevation change. Do not use large increments of distance if you use the line level; 5 meters is optimum.

Optional: If multiple profiles are to be prepared, they may be done in several ways. First, they may radiate from one point at an angle of from 5 to 15 degrees. Preferably, they may be measured parallel to each other, with starting points based on a straight line at intervals of 50 to 100 meters, depending upon the local topography. Unless the starting line can be verified as level, then the elevation changes will need to be measured (probably using the line level).

When to stop: How wet do you want to get? You can measure to sea level (arguably defined as the glistening part of the sand when the waves retreat) or go into the water. Warm weather allows more of the latter, but boots and wet suits can be useful in colder weather. In any case, note sea level when you reach it.

A recorder should be taking down the data.

Suggested format for the data:

Heading:

Beach location, Date, Time, Tide Status, Other useful or interesting observations.

Data Table Headings:

Change of Elevation Cumulative Change in Elevation Distance Cumulative Distance

Analysis

Data may be entered into a spreadsheet with a graphing capability and allowed to graph the beach profile for you. Programs with a three-dimensional capability can take multiple profiles and create a picture of the beach face for you.

Profiles may also be created manually on graph paper.

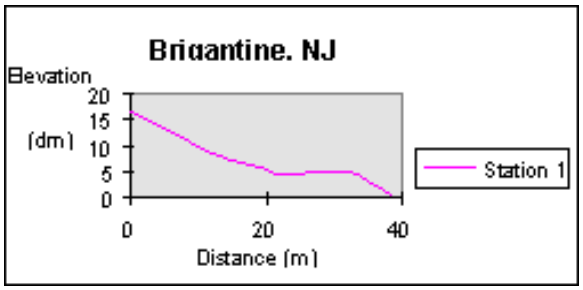

Figure 2 A simple profile of a location in Brigantine, NJ, in March, 1997

The values you measured will generally be negative values from the starting point. These may be adjusted to reflect your own needs in terms of the graphs you wish to produce or how you wish to view them . For example, if the starting point is referred to as "0" and sea level appears at -53 decimeters and a distance of 120 meters, you may want to change them to represent sea level as "0" and your actual starting point as an elevation of 53 decimeters at a distance of 120 meters from the water line.

Data kept on a spreadsheet allows easy comparison with subsequent profiles.

Carefully measured multiple, parallel profiles may be recreated on cardboard or firm stock, cut out, and used to create a physical model of the beach.

Beach Profile Results

A data base of beach profiles has been created on this website. You may download selected files. Several formats are available. Select the one that fits your hardware.

Go To Seastar Data

If you would like your results added to the database (which is part of the purpose of this project) send them by email to the website's email address:

Seastar@mciu.org

The format of the data should be for Microsoft Excel or comma-delimited.

A text file describing the data and providing supporting information and references should be sent along. This file should be in Microsoft Word format (for Windows) or in ASCII text.

Direct questions to the URL above for additional information.

Return to Seastar Oceanography Homepage.

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