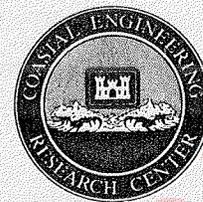


Coastal Engineering Technical Note



ESTIMATION OF WAVE GROWTH AND DECAY OVER FLOODED LAND COMPUTER PROGRAM: WAVFLOOD (MACE-9)

PROGRAM PURPOSE: The computer program WAVFLOOD applies Camfield's method as presented in Section IV-VI of the Shore Protection Manual (SPM 1984) to approximate wave growth or decay over flooded, vegetated land.

Unlike a sandy sea bottom which offers minimal friction, the vegetation introduces friction that acts against the waves and varies with water depth. Consequently, a wave grows more slowly and decays more rapidly over a vegetated bottom. It is noted that the methodology adopted has not been verified with either field or laboratory data. The program assumes that the user provides the wave height and period at the seaward edge of the area in question.

PROGRAM APPLICATION: The distance across the flooded region (see Figure 1) in the direction of wave travel must be known as well as the water depth at the area of interest. This area must be divided into segments to satisfy three criteria. First, the change in depth across a segment must not exceed one-fourth the depth at the beginning of the segment. Second, the difference in friction effects from beginning to end of the segment must be less than one-fourth the friction effect at the beginning. And third, the change in wave height across the segment due to wave growth or decay must be less than one-half the wave height at the segment beginning. These conditions are evaluated by WAVFLOOD and warning messages will be printed if the criteria are not met. Therefore, the user successively estimates a segment length until the above limitations are met. The depth at the beginning and end of each segment can be determined by assuming a constant bottom slope within the segment. More care must be taken if bottom conditions are extremely irregular. For example, if the flooded area has a steep slope, the segments will need to be much shorter than for a mild slope in order to meet the stated criteria.

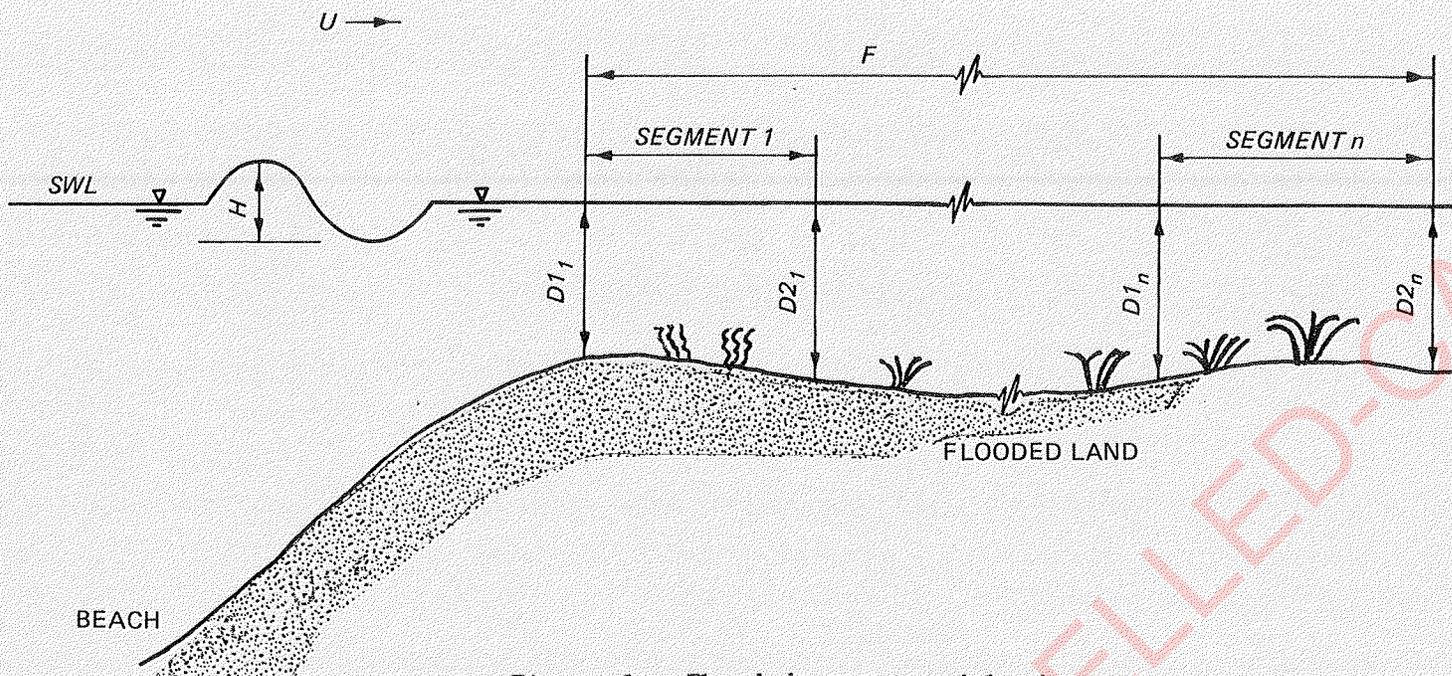


Figure 1. Flooded, vegetated land.

- F = distance across flooded land in the direction of wave travel
- D1 = depth at beginning of segment
- D2 = depth at end of segment
- H_i = initial wave height
- T_i = initial period
- U = windspeed

After the windspeed and initial wave height and period are input, calculations proceed to the individual segments where segment length, initial depth, end depth, and vegetation conditions must be input. A choice of four bottom friction factors (Figure 3-37, SPM, 1984) are given which range from a smooth sandy bottom to an area covered with trees. The user chooses the one that best describes the present segment and the wave status and final height is printed before execution continues with the next segment.

PROGRAM CAPABILITY: This program is written in Microsoft BASIC for the IBM PC and uses English, metric, or nautical units.

INPUT:

1. Location
2. Initial wave height (ft or m)
3. Initial wave period (sec)
4. Depth at beginning of area in question (ft or m)
5. Distance across the area in the direction of wave travel (ft, m, statute mi, km, or nautical mi)
6. Windspeed (mi/hr, ft/sec, km/hr, m/sec, or knots)

7. Segment lengths (ft, m, statute mi, km, or nautical mi)
8. Segment initial depths (ft or m)
9. Segment end depths (ft or m)
10. Vegetation (friction) conditions

SAMPLE PROBLEM: A flooded coastal area is covered with thick stands of tall grass. The water depth at the seaward edge of the area is 7 m (23 ft), and at the landward edge of the area the depth is 4 m (13 ft). The distance across the area in the direction of wave travel is 3,050 m (10,000 ft). The wave height at the seaward edge of the area is limited to 0.9 m (3 ft) by the flooded beach dune system seaward of the area being considered, and the wave period is 2.6 sec. The windspeed is 70 miles per hour. (Example 6, Chapter 3, SPM, 1984)

WAVE AND PERIOD DECAY/GROWTH

VERSION 7-85

USE UPPER CASE FOR ALL RESPONSES

USE COMMAS BETWEEN INPUT VARIABLES

PRESS ANY KEY TO CONTINUE

LOCATION OF FLOODED AREA? SAMPLE PROBLEM

WAVE HEIGHT AND WATER DEPTH UNITS

1-FEET

2-METERS

WHICH UNIT ? 1

INITIAL WAVE HEIGHT? 3

DEPTH AT SEAWARD EDGE OF FLOODED AREA? 23

INITIAL PERIOD IN SECONDS? 2.6

UNITS FOR DISTANCE ACROSS FLOODED AREA

1-FEET

2-METERS

3-STATUTE MILES

4-KILOMETERS

5-NAUTICAL MILES

WHICH UNIT ? 1

DISTANCE ACROSS FLOODED AREA IN THE DIRECTION OF WAVE TRAVEL? 10000

WINDSPEED UNITS

1-MILES/HOUR

2-FEET/SECOND

3-KILOMETERS/HOUR

4-METERS/SECOND

5-KNOTS

WHICH UNIT ? 1

WINDSPEED ? 70

