Instructions for the Streambank Erosion Calculator

Necessary Field Tools

The following equipment is required:

- Measuring tape
- Pin or anchor (e.g., survey flag) to secure the measuring tape in the streambed or bank
- Survey rod
- Survey flags
- One of the following for depth measurements:
    1. Stiff measuring tape
    2. Additional survey rod
    3. Straight measuring device marked at 6-inch (0.5-foot) intervals

Note: The use of waders is recommended. Conduct measurements by walking within the stream channel where conditions are safe. Do not perform measurements immediately following a rain event.

Determining Reaches

1. Delineating Stream Reaches

1. Walk the entire length of the project area along the stream channel.
2. Observe and identify distinctly different reaches based on:
    - Changes in bank height
    - Changes in erosion depth
    - Areas with erosion on one bank versus both banks
3. Mark the boundaries of each distinct reach using survey flags.
4. Distinguish between pool and riffle sections as separate reaches if erosion severity differs significantly.

2. Separate Measurements by Bank Condition

For each distinct reach, you will record one complete set of measurements (length, average height, and average depth as described below).

- If erosion is present on **one bank only**, record one set of measurements for that reach and indicate that one bank is eroding.
- If erosion is present on **both banks**, record one set of measurements for that reach and indicate that both banks are eroding.

Do not measure each bank separately within the same reach unless the banks differ significantly enough to be classified as separate reaches. Document each reach as a separate entry on the spreadsheet.

Measurements for each Reach

1. Measuring Length

1. Identify the upstream and downstream limits of the eroded reach.
2. Secure the measuring tape at 0.0 feet at the upstream limit.
3. Measure the horizontal length of the reach (a straight-line distance along the ground, not along the slope of the bank):
    - If both banks are eroded, measure along the deepest part of the stream channel (thalweg).
    - If only one bank is eroded, measure along the base (toe) of the eroded bank.
4. Record the total horizontal length on the worksheet.

2. Measuring Bank Height

1. At intervals of approximately 50–100 feet (depending on total reach length), measure the height of the eroded bank.
2. Record each height measurement.
3. Calculate the average height:
    - Add all height measurements.
    - Divide by the number of measurements taken.
4. Record the average height on the worksheet.

3. Measuring Bank Depth

1. Place the survey rod from the top of the bank to the toe of the bank at the existing bank angle.
2. At the toe:
    - If deposition is present, estimate the location of the original toe and measure from that point.
3. At the top of the bank:
    - If sloughing has occurred, measure from the point where stable natural vegetation begins.
4. Take at least two depth measurements:
    - One approximately one-third of the distance from the bottom.
    - One approximately one-third of the distance from the top.
5. Calculate the average depth:
    - Add all depth measurements.
    - Divide by the number of measurements taken.
6. Record the average depth on the worksheet.

4. Number of Years Eroded

For the column titled “Number of Years Eroded”:

1. Estimate the duration of erosion using:
    - Information from the landowner/operator
    - Visual indicators of erosion activity
2. Indicators of recent erosion may include:
    - Exposed fibrous roots with attached soil
    - Mineral seepage from former root zones
    - Iron oxide bacteria (reddish algal appearance)
    - Fresh depositional patterns
    - Sparse or recently established vegetation on deposits
3. Indicators of longer-term stability may include:
    - Established vegetation on depositional features
    - Woody vegetation such as willow seedlings
4. Use fractional values for recent erosion:
    - 0.5 years for six months
    - 0.25 years for three months
5. If recording a reach with no erosion, enter “1” to avoid division-by-zero errors.

Soil Weight Assumptions

A standard soil unit weight of **90 pounds per cubic foot** is used in the default calculation.
This value was derived from soil bulk density data from stream-adjacent soils across coastal plain, piedmont, and mountain regions, converted to English units. Bulk density values showed general consistency across most stream-associated soil types.

Users may input a custom soil bulk density value in the lower portion of the worksheet if site-specific data are available.

Factors Used in the Tool

Bank erosion volume is calculated using:

- Length
- Height
- Depth
- Number of eroding banks
- Duration of erosion

All field measurements (length, height, depth) should represent averaged values for each reach.

Calculation Method

1. Volume (cubic feet) = Length × Height × Depth
2. Total Weight (pounds) = Volume × Soil Unit Weight
3. Total Weight (tons) = Total Weight (pounds) ÷ 2000

Record all results in the appropriate worksheet fields.

Example (see Excel worksheet for data input and final results):

Reach A: 75 ft long by 3.5 ft high by 0.75 ft deep (9 inches), both banks eroding, average bulk density, eroded over a 6 month (0.5) year period

Reach B: 40 ft long by 2.25 ft high by 0.5 ft deep, one side eroding, average bulk density, eroded over a one year period

Reach C: No erosion present (still use one year on the spreadsheet for the "Number of Years Eroded" section)

Reach D: 100 ft long by 1.5 ft high by 1 foot deep, one side eroding, average bulk density, eroded over a two year period