The Meadows Center for Water and the Environment
Texas State University

Texas Stream Team

ADVANCED FIELD GUIDE – STREAMFLOW & TURBIDITY

Equipment Needed

- Turbidity Tube (60 cm or 120 cm)
- Bucket (optional)
- Yard or meterstick (with standard units)
- Timer (stopwatch, cell phone, or wristwatch)
- Whiffle ball or other floating object such as a rubber duck, stick, leaf, etc.
- Measuring tapes (2)
- Water shoes/sandals or waders

Streamflow

Flow Gauge Station Method

1. Check if the monitoring site is ≤0.25 mile of a stream gauge. You can check the United States Geological Society, International Boundary and Water Commission's, or your local river authority to see a list of flow gauging stations.
2. Measure the distance from the monitoring station using free software such as Google Earth, implementing the measurement tool.
3. If the monitoring site is ≤0.25 mile of a gauge, record the *Discharge* from the gauge for the same day and approximate time the monitoring event was conducted. Record the *Flow Measurement Method* on the Monitoring Form.
   a. If the nearest gauge is >0.25 mile of the monitoring site, proceed with the protocols below to estimate streamflow discharge.

Streamflow Estimate Method

Never measure streamflow in swiftly moving, deep water, or in hazardous weather conditions. Take a buddy with you for safety purposes. If you are concerned for your safety, do not proceed.

1. Select a cross section of the waterbody with laminar flow to measure, avoiding pools, ripples, backflows, etc., that would impact the waterbody's true flow. Choose a section between 5 – 20 feet wide if possible.
2. Measure the width of the waterbody in feet. Measure only the water from the edge of the left bank to the edge of the right bank. Round to the nearest 0.25 inch and document on Monitoring Form.
3. Measure the depth of the waterbody at the midpoint of 2 feet wide increments along the entire width of the waterbody. Average the depth measurements and document on Monitoring Form.
4. Measure 10 feet downstream (following the current) from the centroid of flow.
5. Calculate the time it takes for an object to travel downstream. There are two ways to do this:
   A. Buddy method is used if you have a buddy.
      1. Have one person stand upstream at the beginning of the 10-foot measurement, and the other downstream.
      2. The person upstream drops the whiffle ball/floating object into the current.
      3. The person downstream times how long it takes the object to travel 10 feet using the timer, then retrieves and returns the object to the starting point. Record the time on the Monitoring Form.
      4. Repeat the process 3X and average the recorded times.
   B. Sampling alone is used if you do not have a buddy.
      1. Mark where the 10-foot measurement is downstream. You can insert a stick into the sediment so that it is visible above the water surface, or stack rocks. Be sure to remove any sticks/rocks after completing the measurement.
      2. Stand upstream (at the beginning of the 10- foot measurement). Instead of a whiffle ball, use a dry stick or a natural object that can float to prevent littering.
      3. Drop the floating object into the current.
      4. Use the timer to time how long it takes the object to travel 10 feet. Record the time on the Monitoring Form.
      5. Repeat the process 3X and average the recorded times.
6. Divide the distance (10 ft) by the average time to calculate the *Velocity*.
   a. Velocity (ft/sec) = 10 (ft) ÷ Average Time (sec).
7. Calculate and record the *Discharge* in cubic feet per second (cfs).
   a. Discharge (cfs) = Width of Waterbody (ft) x Average Depth (ft) x Average Velocity (ft/sec)

Turbidity

1. Collect the turbidity water sample by selecting a method most applicable to your monitoring site:
   A. Bucket Grab is used if the centroid of flow is not accessible, or it is not safe to get in the water.
      1) Rinse bucket and tube 2X with sample water.
      2) Use a bucket to collect sample water. Do not disturb the streambed or kick up any sediment. Carefully pour the water collected in the bucket into the tube immediately after collection to prevent settling of suspended materials.
   B. Sample Directly from Waterbody if the centroid of flow is accessible and safe.
      1. Standing in the centroid of flow of the waterbody and downstream of the tube, rinse the tube 2X then dip the tube into the water facing upstream to fill. Do not disturb the streambed or kick up any sediment.
2. Holding the tube vertically, look down the tube from the top to see if the disk at the bottom is visible. If disc is not visible, release water until visible and record the water level in meters on Monitoring Form. If the tube is filled to the top and the disk is completely visible, record the measurement as > the maximum tube length (i.e., >1.2m or >0.6m depending on the length of the tube used).
3. Use the table below to convert the measurement from meters to nephelometric turbidity units (NTUs). Record the value on the Monitoring Form.

Distance from bottom of tube (m)	NTU	Distance from bottom of tube (m)	NTU
<0.0625	>240	>0.2875 to 0.3125	24
0.0625 to 0.07	240	>0.3125 to 0.3375	21
>0.07 to 0.08	185	>0.3375 to 0.3625	19
>0.08 to 0.095	150	>0.3625 to 0.3875	17
>0.095 to 0.105	120	>0.3875 to 0.4125	15
>0.105 to 0.12	100	>0.4125 to 0.4375	14
>0.12 to 0.1375	90	>0.4375 to 0.4625	13
>0.1375 to 0.1625	65	>0.4625 to 0.4875	12
>0.1625 to 0.1875	50	>0.4875 to 0.5125	11
>0.1875 to 0.2125	40	>0.5125 to 0.5375	10
>0.2125 to 0.2375	35	>0.5375 to 0.575	9
>0.2375 to 0.2625	30	>0.575 to 0.6	8
>0.2625 to 0.2875	27	> 0.6	6

Source: Utah Water Watch, Turbidity Tube Conversion Chart

* 1 meter = 100 centimeters

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