THE MEADOWS CENTER
FOR WATER AND THE ENVIRONMENT

TEXAS STATE UNIVERSITY

Addendum B to the Water Quality Monitoring Manual

Transparency Tube Procedures

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Training Requirements

Texas Stream Team supports certification programs in the "core" field parameters covered in the Texas Stream Team Water Quality Monitoring Manual. Core parameters include: pH, dissolved oxygen, specific conductivity, temperature, and field observations. In addition, there are two tests associated with water transparency. The first is the Secchi Disk, a measure of water clarity. The second is the Transparency Tube which is used to measure water transparency and/or turbidity.

Texas Stream Team incorporates the Transparency Tube method into the core water quality monitoring trainings and certification program. The trainings provide volunteers with the opportunity to be evaluated on monitoring techniques, ensuring reliable, high quality data collection.

Scope and Application

Goal

The goal of transparency testing is the determination of baseline conditions of turbidity and to identify abnormally turbid environmental events when they occur. Baseline conditions are the expected normal environmental conditions for that water body, including an expected range of values for each parameter established by substantial observation. Specialized monitoring plans may also be set up by partner groups and monitors to target data collection for locations and/or environmental conditions that do not serve as baseline environmental conditions data.

Monitoring Site Identification

Texas Stream Team monitors will perform transparency tests on streams, creeks, lakes, swimming beaches, reservoirs, estuaries, and springs. Depending on the body of water, the Transparency Tube procedure can be seen as an alternative, or addition to, the Secchi Disk measurement. Some water bodies may be too shallow or flowing too swiftly to determine an accurate Secchi Disk measurement. In shallow water, the Secchi Disk can often hit the bottom before transparency can be assessed. The tube can measure transparency depths greater than the actual depths of a shallow body of water. Also, if the water is flowing too swiftly, the Secchi Disk may be dragged downstream, making it hard to take a reading.

Monitors will develop sampling strategies to suit their schedule; sampling frequency will vary accordingly. It is suggested that monitors sample at least once a month, while attempting to conduct monitoring events the same time of day each month.

Abnormal Data Collection Results

Test results may also be used to identify potential turbidity problems associated with point and nonpoint pollution sources. The data collector should follow procedures laid out in the Communication Plan when abnormal data results occur. Any observed values consistently exceeding the standards designated by the Texas Commission on Environmental Quality (TCEQ) can be used to assist Clean Rivers Program Partners and watershed planners in identifying particular areas where sources of pollution may be a concern and/or additional professional data may need to be collected.

Data Communication

Data are communicated by the Texas Stream Team to partners and other relevant groups via data reports, pollution concern forms, an online data viewer, presentations at steering committee meetings and regional meetings, and newsletter articles.

Summary of Method

Materials mixed and suspended in water reduce its clarity and make the water turbid. Turbidity is a measure of water clarity, specifically, of how much the solid matter suspended in water decreases the passage of light through the water.

Sources of turbidity are primarily sediment from disturbed or eroded soil. But microscopic plankton also contribute to high turbidity when their numbers are increased due to excess nutrients and sunlight. In addition to blocking out the light needed by submerged aquatic vegetation, suspended sediment can carry nonpoint source pollution such as nutrients and pesticides throughout the water system. Suspended particles near the water surface absorb additional heat from sunlight, raising surface water temperature. Settling sediment can bury benthic (bottom dwelling) creatures and fish eggs.

Moderately low levels of turbidity may indicate a healthy, well-functioning ecosystem in which plankton flourish at a reasonable level to form the foundation of the food web. High turbidity is an indicator of either runoff from disturbed or eroded soil or blooms of microscopic organisms due to high nutrient inputs.

Transparency Tubes consist of two main pieces: the tube with measurement markings in increments of every two millimeters and the release spout with a valve at the base of the tube.

Method Overview

With this method, a sample of water is collected in one of two ways: wading into the body of water (if safe to do so), or pouring water collected from a bucket grab into the tube using a tea pitcher or large measuring cup. Samples are collected as close to one foot (30 cm) water depth as possible. The water is then slowly drained from the tube until the black and white pattern becomes visible, indicating the level of transparency.

Data Range and Accuracy

Monitors should fill the Transparency Tube up to the top with water. This assures the most accurate reading because the maximum transparency is assumed at first; then releasing water works toward the actual transparency. If the black and white pattern is visible with a full tube, then water transparency is greater than the highest measurement on the Transparency Tube. This is to be indicated on the data sheet by writing a “greater than” (>) symbol before writing in the maximum measurement on the tube. There are shorter tubes available for water with historically higher turbidity, as it will take less water to cloud the black and white pattern. Record the value in meters with two significant digits if necessary (i.e. 2.32 m). The Transparency Tubes are accurate up to the millimeter.

Reason for Method Selection

Australia’s Department of Conservation developed this tool (USEPA Volunteer Stream Monitoring Methods Manual). The Transparency Tube has been adopted for use in other programs including, the Tennessee Valley Authority (TVA) Clean Water Initiative and the

Minnesota Pollution Control Agency (MPCA). The utilization of the Transparency Tube is allowed by the EPA as described in the "Volunteer Stream Monitoring: A Methods Manual" and is also allowed by the TCEQ Surface Water Quality Monitoring Department as described in the "Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods." The EPA method involves collecting the sample in a bucket, and the TCEQ procedure involves collecting the sample directly in the tube. The Texas Stream Team method incorporates both methods depending on the safety of the water body. The bucket is used when a water body is not safe enough for the monitor to sample while standing in the stream.

Monitoring Supplies & Equipment

Equipment List

1) one sample bucket
2) one pitcher or large measuring cup
3) one Transparency Tube.

Depending on the water body's history of turbidity, monitors will either use the small tube (.6 m) or the large tube (1.22 m).

Collection Procedures

1.0 **Sample Site Location** – Transparency Tube samples should be collected at the monitor's usual Texas Stream Team core parameter monitoring site.

1.1 **Collecting Sample –** Samples for the Transparency Tube procedure should be collected after core parameter sample collection is complete. This way, wading into the water to collect a sample in the Transparency Tube will not disturb water conditions for other tests.

If it is safe, wade into the water downstream of the sampling location to avoid disturbing the substrate. The sample should be collected as close to one foot (30 cm) deep as possible. Samples are collected with the open end of the tube facing upstream.

If wading into the water body is unsafe due to swiftly moving water, flood conditions, water contamination, or other reasons, collect the sample water with a bucket grab sampling technique. Pour the sample into the Transparency Tube via a pitcher or measuring cup until the Transparency Tube is full of water. Please note in the comments field if procedure is altered due to unsafe conditions.

2.0 **Recording Results** –

2.1 – Take the water-filled Transparency Tube or bucket into the shade so the sunlight does not directly penetrate the water. Direct sunlight can make turbid water seem more

transparent. If no shade is available, the shadow cast by standing in between the sun and tube is sufficient. Sunglasses should not be worn.

If using a bucket, carefully stir or swish the water until it is homogenous, taking care not to produce air bubbles (these will scatter light and affect the measurement). Then pour the water slowly in the tube.

2.2 – Make a tight seal on the open end of the tube with your hand to swirl the water. This keeps sediment from settling on the top or bottom of the tube. It may be necessary to fully invert the tube to fully agitate the sediment. Carefully invert if necessary. Bubbles generated from over-agitation may skew the measurement results. The sample may need to be swirled or inverted several times during testing as the sediment may be sucked down the tube by opening the release valve.

2.3 – Begin to release water from the tube using the valve at the bottom in increments of 1 centimeter while waiting to see the black and white pattern. Once the pattern can faintly be seen, record this depth in meters (ex: .22 m). If the black and white pattern can be seen without releasing any water, simply record "greater than (tube maximum measurement)."

2.4 – Pour the water in the tube back into the body of water downstream from where it was extracted or into nearby vegetation. Fully open the release valve to avoid crimping along the release line.

2.5 – Rinse the tube thoroughly twice with tap water while allowing water to also run through the release valve to clean it as well.

2.6 – To dry, lean the tube upside down to reduce water spots. Attempt to keep the plastic sleeve on the tube to protect it from scratches. Upon re-use, change the location of the release valve to avoid long term crimp and wear on the tube.