Water Action Volunteers

Volunteer Monitoring Factsheet Series

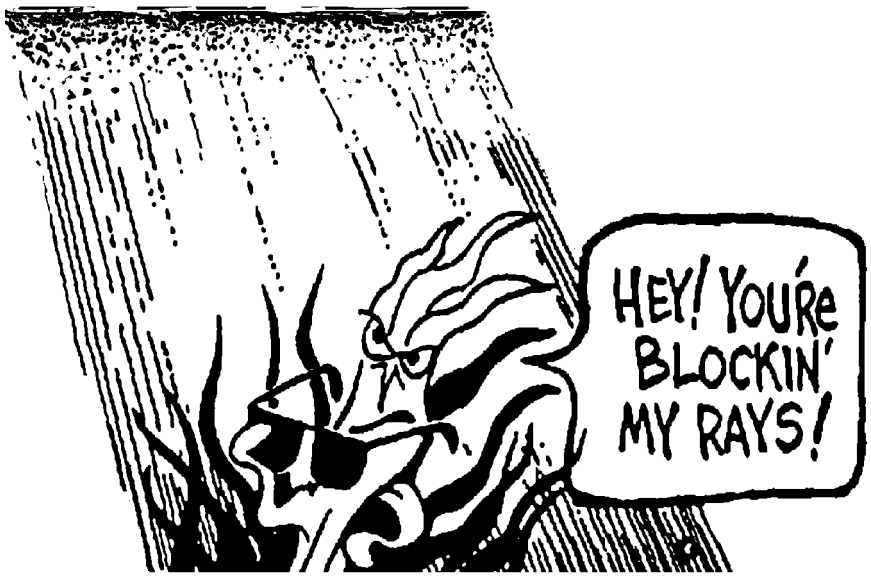
2006

Transparency

A Water Clarity Measure

Why are we concerned?

- Water clarity is one of the most obvious measures of water quality.
- Water clarity can be a useful indicator of runoff from construction sites, fields, logging activity, industrial discharges and other sources.
- Monitoring transparency before, during and immediately after rain can provide a useful picture of potential runoff problems.



Time Needed:

20 minutes

Equipment Needed:

— hipboots (if wading)
— bucket
— stirring stick
— tape measure/yard stick
— transparency tube
— waterproof gloves
— form to record data
— pen/pencil
— nylon stocking (optional)

When to Measure:

Check with your local coordinator for schedules.

Definition of Terms

Turbidity: The amount of suspended particles in the water.

Transparency: A measure of water clarity.

Transparency Tube: A tube with a black and white disc in the bottom, which is marked in centimeters or inches along its side. It is used for assessing the clarity of stream water.

Suspended Material: Small particles floating in the water.

Sediment: Soil or other bits of eroded material that run off land and settle in still water.

NTU: Nephelometric Turbidity Units, which is a measure of the amount of light scattered by suspended material in the sample.

Background on Turbidity / Transparency

Murky water is easily seen as unhealthy. However, natural substances which are not harmful to the water can sometimes make water appear brown and murky. How do we know if the murky water is a cause for concern? Scientists have found a way to quantify the cloudiness of water by measuring its turbidity, which refers to the amount of suspended particles in the water. These small particles of soil, algae or other materials generally range in size from the microscopic level to about one millimeter, (about as thick as a pencil lead). More free-floating particles cause greater turbidity, resulting in less light penetration through the water. This hinders photosynthesis, necessary for healthy aquatic plant growth and production of dissolved oxygen. The water also becomes warmer because the suspended particles absorb heat, and warmer water holds less dissolved oxygen than cold water. The faster a stream flows, the more energy it has and the more sediment it can carry. Sources of turbidity include:

Think Like A Scientist!

Follow the directions VERY CAREFULLY! Accuracy is a must for valid data comparisons.

- erosion from fields, construction sites
- urban runoff from rainstorms and melting snow
- eroding stream banks
- large number of bottom feeders (such as carp) which stir up bottom sediments
- excessive algal growth

Since we assess water clarity visually, we don't directly measure how many suspended particles are in the water. Instead we measure the *transparency* of the water, which takes into account both color and suspended particles.

Collecting the Sample

In general, collect the sample away from the river bank in the main flow area. Be careful not to collect water that has sediment from bottom disturbances (toss out the sample and try again if you get bottom sediment in your sample).

Wading Streams

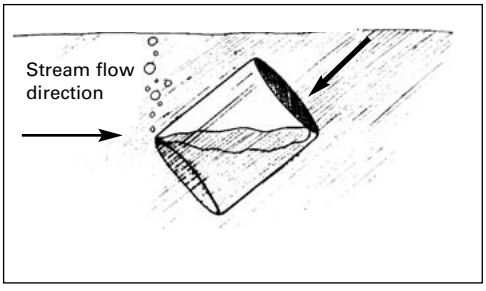
- Walk into the water downstream from the sampling location. Be careful not to stir up the bottom sediment upstream of your sampling location.
- Face upstream (into the current) in the middle of the stream.
- Collect your water sample by plunging your bucket or bottle 8-12 inches beneath the surface or halfway down from the surface. Scoop away from your body and into the current.
- Return to shore with the large sample.

From Shore

- To collect a sample from the shore, use a bucket or sample bottle attached to a pole. Scoop from below the surface in the upstream direction. Be careful not to stir up the sediment upstream of your sample.

From a Bridge

- If you are collecting a sample from a bridge, lower the bucket and get a sample from below the surface.



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It's important to scoop your bucket down and into the current flow. Avoid sampling surface water.

Using the Transparency Tube

** If you are using a transparency tube with tubing and a valve at the bottom, for steps 4 - 7, do the following instead: Fill the tube all the way with your water sample. Then, working with a partner as needed, open the valve clamp to release water slowly, until you are just able to see the disk at the bottom, and close the clamp. Note where the water level is on the measurements marked on the tube, and record.

1. Remove large objects from the water sample. (Filter through nylon stocking if necessary.)

2. Using the stirring stick, stir the sample for 15 seconds to suspend all materials.

3. Stand out of direct sunlight. If you cannot get to a shady place, use your body to cast a shadow on the tube.

4. Slowly pour a small amount of sample into the tube. ** see note above

5. Look for target disk on the bottom of tube. If disk is visible, add water until it just disappears.

6. If target disk is not visible, pour water off a little at a time until disk is *just* visible.

7. Use a tape measure or yard stick to measure from disk at bottom of tube to top of water level.

8. Record measurement on data sheet. Indicate on data sheet if you measured in cm. or in.

9. Dump contents of tube on ground.

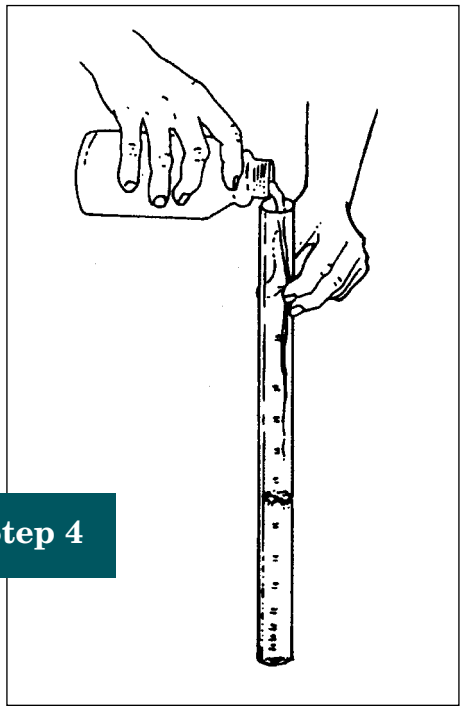
10. Repeat steps 2 through 9.

11. Record the second measurement on the data sheet. Indicate if you measured in cm. or in.

12. Add both of the readings, divide by 2, and record.

13. Use turbidity value conversion chart to determine the turbidity value from the average measurement (step 12).

14. Record the turbidity value for your average measurement on the data sheet.



Step 4

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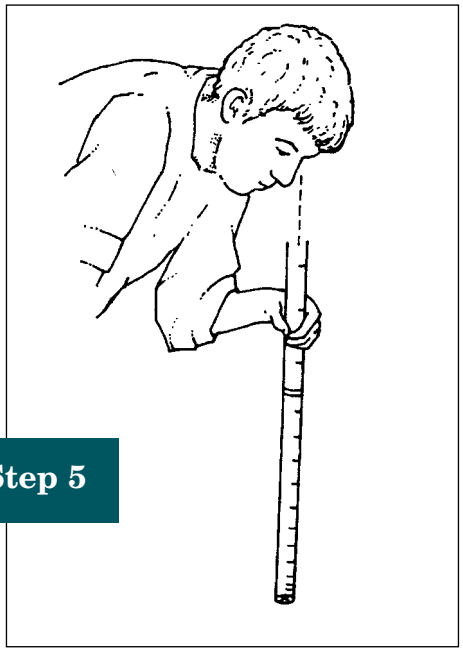
Fill turbidity tube slowly with your sample until you no longer see the disk.



Step 5

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Try to stand out of sunlight when taking your measurements.

Transparency Value Conversion Chart

Centimeters	Inches	Transparency Value*
6.4 to 7.0	2.5 to 2.75	240
7.1 to 8.2	2.76 to 3.25	185
8.3 to 9.5	3.26 to 3.75	150
9.6 to 10.8	3.76 to 4.25	120
10.9 to 12.0	4.26 to 4.75	100
12.1 to 14.0	4.76 to 5.5	90
14.1 to 16.5	5.6 to 6.5	65
16.6 to 19.1	6.6 to 7.5	50
19.2 to 21.6	7.6 to 8.5	40
21.7 to 24.1	8.6 to 9.5	35
24.2 to 26.7	9.6 to 10.5	30
26.8 to 29.2	10.6 to 11.5	27
29.3 to 31.8	11.6 to 12.5	24
31.9 to 34.3	12.6 to 13.5	21
34.4 to 36.8	13.6 to 14.5	19
36.9 to 39.4	14.6 to 15.5	17
39.5 to 41.9	15.6 to 16.5	15
42.0 to 44.5	16.6 to 17.5	14
44.6 to 47.0	17.6 to 18.5	13
47.1 to 49.5	18.6 to 19.5	12
49.6 to 52.1	19.6 to 20.5	11
52.2 to 54.6	20.6 to 21.5	10
>54.7	>21.6	<10

What Do These Turbidity / Transparency Values Mean?

All streams have background turbidity/transparency, or a baseline standard for a natural amount of turbidity /transparency. Fish and aquatic life that are native to streams have evolved over time to adapt to varying levels of background water clarity. For example, native fish and aquatic life in the Mississippi River are very happy with their murky environment. What causes problems in any stream or river are unusual concentrations of suspended particles and how long the water stays at a deviated level. When you collect transparency samples, it is important to note any fluctuations in values, which can help detect trends in water quality.

Time is probably the most influential factor in determining how turbidity affects the aquatic environment. The longer the water remains at unusually high values, the greater effect it has on fish and other aquatic life. Fish in particular become very stressed in waters that remain highly turbid for a long time. Signs of stress include increased respiration rate, reduced growth and feeding rates, delayed hatching and in severe cases, death. Fish eggs are ten times more sensitive to turbidity than adult fish. To further understand how time and turbidity impact fish, look at the graph that is included: “Relational Trends of Fresh Water Fish Activity to Turbidity Values and Time”.

High turbidity levels affect humans, too. Acceptable turbidity levels for recreation is 5 NTU and acceptable levels for human consumption ranges from 1-5 NTU.

Water Action Volunteers is a cooperative program between the University of Wisconsin-Extension and the Wisconsin Department of Natural Resources. For more information, contact the Water Action Volunteers Coordinator at 608/264-8948.

*Roughly NTUs

UW Extension

WISCONSIN DEPT. OF NATURAL RESOURCES

— Chart developed by Kevin Fermanich