Black Earth Creek & Limnology Minifacts & Analysis

Sheet 10

Turbidity Levels & Water Quality

Information on Turbidity Levels & Water Quality

Introduction

Color and clarity are the most obvious signs of water quality. From beer commercials to tourism brochures "cool, clear water" is synonymous with "the best."

Many things can change the color of stream water. A startling, but harmless color change, is the coppery brown you might see in the Wisconsin River and many northern rivers in the state. Hemlock trees growing in northern bogs produce tannic acid, the same stuff tanneries use to preserve leather and turn it brown. It also colors the water that flows out of bogs and into streams and rivers. Iron and manganese dissolved in water can also color it naturally. Industrial water discharged into streams and illegally dumped wastes can cause color changes too.

Two primary causes of clarity loss in water are **algae** and **sediments**.

A. Algae

Streams, especially slow-moving ones, may look greenish because the water is filled with microscopic, one-celled algae plants. These suspended plants are a basic food source for many small water organisms—such as insect larvae and water fleas that feed newly hatched fish. You may see other types of algae in colonies. They look like green or blue scums, stringy green hair, moss, or plants and often attach themselves to rocks and tree branches in the stream.

(Streams may also look green when they are covered with floating duckweed. This tiny plant is easy to identify. It has only two leaves shaped like elephant ears, and a dangling stem/root.)

One-celled algae grow by dividing in half—two to ten times a month, depending on temperature and sunlight. Each time they divide they double their numbers. At ten times a month one cell could form a population of 1015 (that's 1,000,000,000,000,000) in a single season! Fortunately plenty of creatures graze on algae.

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Nutrients like nitrogen and phosphorus help feed the algae, encouraging them to multiply. These nutrients wash into streams from urban streets and yards, and from farm fields. They come from fertilizers, fallen leaves, pet and livestock wastes, and travel with sediment into the water.

B. Sediment

Sediment is anything else the stream water can carry—from small pebbles that roll and bounce along the stream bottom to a tiny particle of silty soil that may not settle out until the stream flows into a lake or pond. The faster a stream moves, the more energy it has and the more sediment it can carry.

Rain carries soil off construction sites and cultivated fields. It becomes sediment in nearby streams, turning them gray brown and murky. Carp rooting for food stir up bottom muck. Particles of soil, decomposed plants, and decayed water organisms float again, clouding the stream. Stream sediments are highest in spring. This is when soil may be bare and when more water is moving across exposed ground from melting snow and frequent rains.

If you like to stay indoors when it rains, you may never see streams carrying their sediment load. Water runoff carries soil into streams. Because there is more water moving and it is moving more quickly it disturbs bottom sediments. When the flow slackens, suspended particles drop out and the water looks clear again.

Just a few storms cause most of the problem. A researcher who measured sediments daily for 12 years in Dane County's Black Earth Creek found that in most years, half of the total sediment yield occurred in less than six days.

Other sources of sediment—waste-water from sewage treatment plants, industry, and food processing plants, water carrying animal manure and many other pollutants can also cloud and color streams. Under current state and federal regulations most of these sources are supposed to be under control. However, accidents—and "intentionals"—happen.

C. Cloudy water causes trouble

Some creatures feed on algae and sediments. They filter them out of the water (fresh water clams) or collect them off the bottom (mayflies). But cloudy water that is too full of suspended material causes a number of problems for organisms living there:

1. **Heat raises water temperature**—Cloudy water absorbs more sunlight, raising the water temperature. Warmer water can't carry as much oxygen.

2. **Shade limits plant growth**—Sunlight can't get through to rooted aquatic plants. Fewer plants mean less photosynthesis to release oxygen. It also means fewer homes and hiding places for insects and small fish.

3. **Congestion clogs respiration**—Particles clog fish gills depriving them of oxygen which stunts their growth.

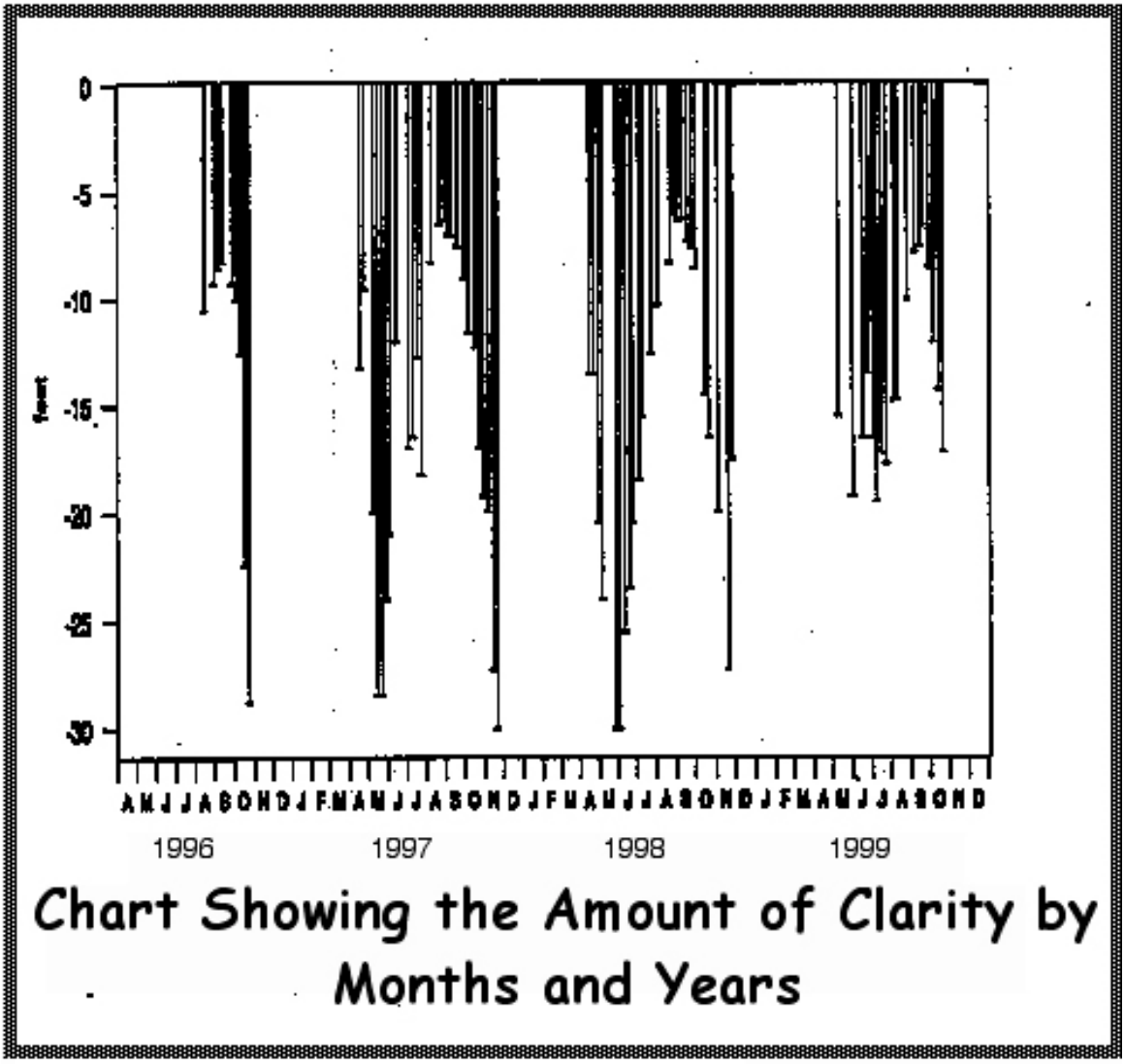

Chart Showing the Amount of Clarity by Months and Years

4. **Cloudiness hides food**—Many desirable sport and pan fish are sight feeders. Cloudy water blinds them to their prey. Less desirable fish like carp and bullheads feed by feel, so they can live better in cloudy water.

5. **Deposits change habitat**—When sediment settles out and accumulates on the stream bottom it may smother fish and insect eggs, and suffocate newly-hatched insect larvae. It fills in between rocks. This eliminates living spaces for immature aquatic insects and covers spawning beds for some fish species. It also fills pools, which are important stream habitat areas and makes the stream shallower.

6. **Sediment can also carry with it nutrients, pesticides and metals**. The nutrients, like phosphorus from fertilizers, feed algae and encourage them to multiply. Pesticides and metals may be released into the water and become part of the bottom muck. Aquatic organisms that feed on muck take the materials into their bodies. When they are eaten by bigger organisms, the toxins accumulate.

Water Depth	Secchi Disk Visibility	Turbidity Rating
For Water Over 4 Feet	Disappears in less than 1 foot (30 cm)	*Turbid*
For Water Over 4 Feet	Disappears in less than 1 to 2 feet (31 to 60 cm)	*Moderately Turbid*
For Water Over 4 Feet	Disappears in less than 2.1 to 4 feet (61 to 120 cm)	*Slightly Turbid*
For Water Over 4 Feet	Visible at more than 4 feet (121 cm or more)	*Clear*
For Water that is less than 2 Feet	Disappears at less than 1 foot (less than 30 cm)	*Turbid*
For Water that is less than 2 Feet (Secchi disk on the bottom)	Visible but black/white boundary not defined clearly	*Moderately Turbid*
For Water that is less than 2 Feet (Secchi disk on the bottom)	Visible with black/white boundary clearly defined	*Clear*
2 to 4 feet of water	Disk disappears in less than 1 foot (less than 30 cm)	*Turbid*
2 to 4 feet of water	Disk disappears between 1 and 2 foot (30 to 60 cm)	*Moderately Turbid*
2 to 4 feet of water (Secchi disk on the bottom)	Visible but black/white boundary not clearly defined	*Slightly Turbid*
2 to 4 feet of water (Secchi disk on the bottom)	Visible black/white boundary clearly defined	*Clear*