



Module #3

Calculating Water Quality Index

Adapted and excerpted from *Field Manual for Water Quality Monitoring: An Environmental Education Program for Schools* by Mark M. Mitchell and William B. Stapp

Materials

water sample bottle
gloves (optional)
ice and cooler (optional)
Coliscan Easygel test kit from
http://www.micrologylabs.com/Home/Our_Methods
dropper
incubator (optional)

BACKGROUND INFORMATION

The presence of fecal coliform (fecal bacteria) in aquatic environments may indicate that the water has been contaminated with the fecal material of man or other animals. Fecal coliform bacteria can enter rivers through direct discharge of waste from mammals and birds, from agricultural and storm runoff, and from the main human sewage. However their presence may also be the result of plant material, and pulp or paper mill effluent.

Untreated organic matter that contains fecal coliform can be harmful to the environment. Aerobic decomposition of this material can reduce dissolved oxygen levels if discharged into rivers or waterways. This may reduce the oxygen level enough to kill fish and other aquatic life. Reduction of fecal coliform in wastewater may require the use of chlorine and other disinfectant chemicals. Such materials may kill the fecal coliform and disease bacteria. They also kill bacteria essential to the proper balance of the aquatic environment, endangering the survival of species dependent on those bacteria. So higher levels of fecal coliform require higher levels of chlorine, threatening those aquatic organisms.

FECAL COLIFORM

Try to avoid sampling stagnant areas of rivers. The extended rod sampler is an effective device for obtaining a sample in the current. If sampling rivers in which little current exists, push the sample bottle underwater away from your body, thereby creating a current.

A. FECAL COLIFORM Sampling Procedures

1. Remove the stopper or cap just before sampling and avoid touching the inside of the cap.
2. If sampling by hand, use gloves and hold the bottle near its base. Plunge it (opening downward) below the water surface, then turn the bottle underwater into the current and away from you.
3. Avoid sampling the water surface because the surface film often contains greater numbers of fecal coliform bacteria than is representative of the river.
4. Also avoid sampling the sediments for the same reason, unless this is intended. The same general sampling procedures apply when using the extended rod sampler.
5. When collecting samples, leave some space in the sample container (an inch or so) to allow mixing of the sample before-pipetting.

It is a good idea to collect several samples from any single location on the river to minimize the variability that comes with sampling for bacteria. If possible, sterilization should occur between sampling sites. *Ideally, all samples should be tested within one hour of collection. If this is not possible, the sample bottles should be placed in ice and tested within six hours.*

B. FECAL COLIFORM Testing Procedure Detection of Water-Born Coliform and Fecal Coliforms with Coliscan Easy Gel

This new process for coliform and fecal coliform testing does not require an incubator or water bath.

1. Use a sterile, calibrated dropper to collect a 1 ml water sample and deposit the sample into bottle containing liquid coliscan medium (this procedure may be done in the field and the coliscan-water mix can be kept on ice until returning to the lab).
2. Pour the coliscan water mix into a pre-treated petri dish and swirl to cover entire bottom of petri dish.

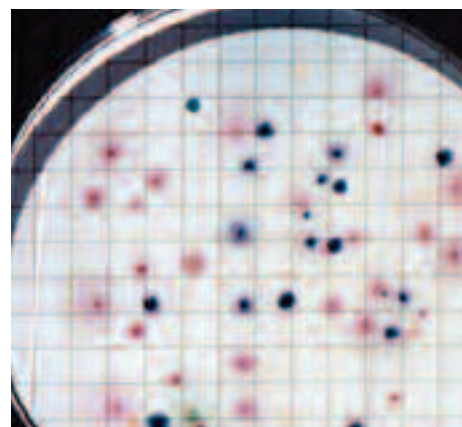


photo of Coliscan Easy Gel from micrologylabs.com



3. Place the petri dish containing the coliscan-water mix in a warm place and incubate for 24-48 hours (this is best done in a place such as an incubator which holds the temperature in a range of 850-950° F).
4. Count the red colonies in the petri dish as coliforms and the purple colonies as fecal coliforms (*E. coli*). (White or blue-green colonies should be noted, but they are not classified as coliforms or fecal coliforms).

Gels can be obtained from: Micrology Laboratories, LLC., P.O. Box 340, Goshen, Indiana, 46527-0340, or call toll free 888-EASYGEL

C. FECAL COLIFORM Calculating the Results

To compute the Q-value for the fecal coliform test, follow these steps:

1. Find the weighting curve chart (below);
2. Locate your test result on the bottom (horizontal or “x” axis) of the chart;
3. Interpolate the Q-value for your test result using the following steps;
4. From your test result value on the horizontal (“x”) axis of the chart, draw a vertical line up until it intersects the weighting curve line;
5. From this point of intersection, draw a horizontal line to the left hand side (the vertical or “y” axis) of the chart;
6. Where this horizontal line intersects the vertical (“y”) axis of the chart, read off the value. This is the Q-value for this test; it should be recorded in Column B on the WQI chart on the Calculating Water Quality Index (Module 10).

The Q-value for each test should then be multiplied by the weighting factor listed in the chart on the Water Quality Index page. Record the product of this calculation in Column D of the chart.

