

Testing the Kalihi Stream's Water Quality

Lesson 10

Objectives

The student will be able to do the following:

- Recall and define types of water quality tests and connect them to water quality parameters
- Use water quality tests with Kalihi Stream water
- Analyze data in relation to their hypotheses and make conclusions about water quality

Materials

- Water quality testing materials, separated per group
- Directions for at least two tests for each group (make two copies of each direction sheet)
- Cups
- Buckets (2 – one for collecting stream water, one for dumping used tests)
- Gloves (if desired)
- Clipboards and pencils for outside work

Background

This unit follows the introduction to water quality testing and expects students to know how to carry out water quality tests. This unit allows students the opportunity to test their hypotheses and to determine what the water quality of the Kalihi Stream is at the time of the test.

Advance Preparation

For each of distribution, it is best to have all tubes and tests separated for each group. For 5 groups, tests can be separated into the materials for dissolved oxygen, nitrate, phosphate, pH, turbidity, and coliform.

Each group should have a copy of the directions for their corresponding test.

The coliform test will take two days to develop, so it is best to start the test before a weekend day.

Procedure

1. Remind students of the tests they did on tap water and introduce the upcoming activity which will have them doing the same thing with stream water. Given time limitations, it is best to divide up the tests and head outside directly.
2. Emphasize safety rules – such as no one allowed in or near stream unless directed by teacher, no one to drink water, no one with any cuts to put water on skin, etc.
3. Head outside. Teachers and students should have tests, cups, clipboards, directions, pencils, gloves, and buckets.

4. The teacher or other adult should fill one bucket with stream water. The students should observe this process, paying attention to where the water is being collected (e.g., in the shade? Is there any trash near it?, etc.)
5. Break students into groups and distribute each test kit.
6. Have each group fill up a cup of water from the bucket.
7. Each group should have at least two tests to do. There are five tests that students can easily do: nitrate, phosphate, pH, dissolved oxygen, and turbidity. Of these, nitrate, phosphate, and dissolved oxygen each take five minutes to develop. Tests should be distributed such that each group has two different tests, so that one test is a long test and one is a short test. Students should be careful to look at the test tablet and use the right one for the right test.
8. Groups should carry out their tests, noting results on the worksheets. Because there are only limited interpretive cards, students will need to come to teachers for assistance with interpreting each test result.
9. Start at least two coliform tests per class.
10. Have the teacher or another adult do the temperature test, which requires getting near or into the stream. Test the temperature in two locations – shady and sunny, ideally twice (ideally two sunny and two shady locations).
11. Groups will have to reuse the beakers, so after they are done with one test, they should dump out the test into the other beaker. They should use stream water (from their cups) to rinse out the beakers between each successive use. All water quality tests except for coliform are non-toxic and can be disposed of in any sink or toilet with plenty of water. The exception is coliform. Do not open coliform tests after starting the tests.
12. Once tests are finished, students should go back inside and each group should report their results, which should be written on the board. As there will be two results for each test, there is the opportunity to work on averages.
13. Use the average to determine average water quality.
14. Students should compare their results with their hypotheses and discuss whether they supported their hypotheses (and why or why not).
15. Coliform tests should be checked in a couple of days.

Oxygen in the Water (Dissolved Oxygen)

- Everything needs oxygen to survive – even animals in the water.
- This tests checks to see if there is enough oxygen in the water.
- Lots of bacteria or rotting plants can cause oxygen to be too low.

Directions:

1. Fill a cup with stream water
2. Put the thermometer in the water and hold it there for one minute.
3. **Write down the temperature here:** _____
4. Fill the small glass tube up with water
5. Look at your tablets carefully. Drop in two of the test tabs with “**DO**” into the tube
6. Cover the tube
7. Mix the tube until the tablets have disappeared. This will take 4 minutes.
8. Wait 5 minutes until the water in the tube changes color.
9. **Write down the color here:** _____
10. Ask your teacher for help in figuring out what ppm and % is in the water
11. **Write down the ppm number here:** _____
12. **Write down the % here:** _____
13. **Write down the Water Quality Rank here:** _____
14. When you are done, and the teacher says, pour out the water into the bucket and start another test if you have one.
15. Make sure all of your trash is collected!

Too many nutrients (Nitrate)

- Too much nitrate is a type of pollution that can come from fertilizer.
- This tests checks to see if there is any nitrate in the water.
- Some nitrate is good for plants and animals, but too much nitrate can make people sick.

Directions:

1. Fill a cup with stream water
2. Fill the test tube half way – to the 5 line.
3. Look at your tablets carefully. Add one tablet for “**NITRATE**”.
4. Cover the tube well.
5. Mix the tube until the tablet has disappeared.
6. Wait 5 minutes until the water in the tube changes color.
7. **Write down the color here:** _____
8. Ask your teacher for help in figuring out what the ppm number and water quality are:
9. **Write down the ppm number here:** _____
10. **Write down the Water Quality here:** _____
11. When you are done, and the teacher says, pour out the water into the bucket and start another test if you have one.
12. Make sure all of your trash is collected!

Water that is just right (pH)

- Some things are an “acid” – like lemon juice or vinegar. Some things are a “base” – like soaps. Water should be right in the middle – just right.
- This test tells you what the pH of your water is.
- pH can change depending on what is in the water. Too many soaps or fertilizers can cause the water to be too basic. Runoff from trash can cause the water to be too acidic.

Directions:

1. Fill a cup with stream water
2. Fill the test tube almost all the way – to the 10 line.
3. Look at your tablets carefully. Add one tablet for “**pH WR**”.
4. Cover the tube well.
5. Mix the tube until the tablet has disappeared.
6. Wait a few minutes until the water in the tube changes color.
7. **Write down the color here:** _____
8. Ask your teacher for help in figuring out what the pH number is:
9. **Write down the pH number here:** _____
10. **Write down the Water Quality here:** _____
11. When you are done, and the teacher says, pour out the water into the bucket and start another test if you have one.
12. Make sure all of your trash is collected!

Too many nutrients (Phosphate)

- Too much phosphate is a type of pollution that can come from soaps.
- This tests checks to see if there is any phosphate in the water.
- Some phosphate is good for plants and animals, but too much phosphate can make people sick.

Directions:

1. Fill a cup with stream water
2. Fill the test tube almost all the way – to the 10 line.
3. Look at your tablets carefully. Add one tablet for “**PHOS**”
4. Cover the tube well.
5. Mix the tube until the tablet has disappeared.
6. Wait 5 minutes until the water in the tube changes color.
7. **Write down the color here:** _____
8. Ask your teacher for help in figuring out what the ppm number and water quality are:
9. **Write down the ppm number here:** _____
10. **Write down the Water Quality here:** _____
11. When you are done, and the teacher says, pour out the water into the bucket and start another test if you have one.
12. Make sure all of your trash is collected!

Too much dirt (Turbidity)

- Dirt and sediment in the water can hide other pollution like bacteria.
- This tests checks to see how much dirt is in the water.
- Some dirt in water is natural and ok, but too much is a type of pollution.

Directions:

1. Look on the outside of the white container for the "turbidity test fill line"
2. Fill the container up with stream water to the line. Use your cup to fill the container.
3. Look down into the container at the black and white circle.
4. Does the circle look very sharp (black and white)? Or is it a little bit fuzzy or gray?
5. **Write down the color here:** _____
6. Ask your teacher for help in figuring out what the turbidity number and water quality are:
7. **Write down the ppm number here:** _____
8. **Write down the Water Quality here:** _____
9. When you are done, and the teacher says, pour out the water into the bucket and start another test if you have one.
10. Make sure all of your trash is collected!