# WATER QUALITY TESTING Part 1 and 2

**Part 1: Live Benthic Macroinvertebrates**

What can water bugs tell us about pollution? During this hands-on lab, students will learn how pollution affects aquatic life. Using live macroinvertebrates from a local stream, students will gather data to complete a biological analysis of water quality and discuss simple steps that they and their families can take to improve water quality.

**Part 2: Chemical Test Kits**

How does your local stream or lake measure up? Using a variety of real water quality testing equipment to gather current data, student scientists will evaluate the health of a local water body. Students will learn about sources of pollution and discuss steps they can take at home to maintain water quality and reduce pollution in their local watershed.

**Lesson Reminders**

Two-part lesson: For this lesson series, we'll need to visit your class on two separate occasions. Please make sure your second lesson is booked - our calendars may fill up quickly!

Field experience option: These lessons are available for classroom presentations, but there is a possibility of making it an outdoor lesson if you have access to a body of water. Your presenter might be able to meet your classrooms outside near a lake, river, stream, detention pond, etc. for part of this lesson. Please email us BEFORE at **education@snohomishcd.org** for more information about Water Quality field experiences.

**Learning Targets**

Part 1: I can explain how pollution affects the salmon food web.
I can explain how macroinvertebrates are an indicator of water quality.
I can identify macroinvertebrates using a dichotomous key.

Part 2: I can use scientific testing equipment accurately.
I can interpret data to decide how healthy the water is for salmon.
I can explain several ways to improve or monitor water quality in Snohomish County.

**NGSS**

This lesson complements Next Generation Science Standards listed below:

**MS-LS2-1** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

**MS-LS2-4** Construct an argument supported by empirical evidence that changes to a physical or biological components of an ecosystem affect populations.

**MS-ETS1-1** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking in to account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

**MS-ESS3-3** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

**Science Kits**

This lessons complements the following science kits:

Diversity of Life | Populations and Ecosystems | Ecosystems | Environments Microworlds | Organisms: From Macro to Micro

**Questions?**

Contact Sound Education at the Snohomish Conservation District.:
528 91st Ave NE, Ste A,
Lake Stevens, WA 98258-2538

Phone 425-377-7021

education@snohomishcd.org
www.snohomishcd.org/sound-education

# Calculate the River's Water Quality Based on Macroinvertebrates

1. Identify the macroinvertebrates you collected. Use the picture guide in this document.
2. In the chart below, put a check next to the name of all the macroinvertebrates you found.
3. Add up the number of checks in each column. This is the number of **TAXA** (different kinds of) macroinvertebrates that belong to that group.
4. Multiply the number of taxa by the group's weighting factor. This gives you the **GROUP SCORE**.
5. Add up all the group scores. This will give you the **TOTAL GROUP SCORE**.
6. Add up the number of taxa from all the columns. This is the **TOTAL NUMBER OF TAXA**.
7. Divide the <u>total</u> group score (from step 5) by the <u>total</u> number of taxa (from step 6). This will give you the **WATER QUALITY INDEX** for your river.
8. Using the table at the bottom right of the page, find how the river's water quality index ranks.

| | GROUP 1<br>Intolerant to pollution | GROUP 2<br>Moderately intolerant to pollution | GROUP 3<br>Fairly tolerant to pollution | GROUP 4<br>Very tolerant to pollution |
|---|---|---|---|---|
| **Macro-invertebrates** (check all the ones you found) | Alderfly ____<br>Dobsonfly ____<br>Snipe Fly ____<br>Stonefly ____ | Caddisfly ____<br>Clam/Mussel ____<br>Cranefly ____<br>Crayfish ____<br>Damselfly ____<br>Dragonfly ____<br>Mayfly ____<br>Riffle Beetle ____<br>Water Penny ____ | Black Fly ____<br>Midge ____<br>Right-handed or other snails ____<br>Scud ____<br>Sowbug ____ | Aquatic worm ____<br>Blood worm midge ____<br>Leech ____<br>Left-handed snail ____ |
| **# of TAXA** (add up checks) | | | | |
| **WEIGHTING FACTOR** | x 1 | x 2 | x 3 | x 4 |
| **GROUP SCORE** (TAXA x weighting factor) | = | = | = | = |

| | |
|---|---|
| **TOTAL GROUP SCORE** (add up the group scores from all the columns) | |
| **TOTAL NUMBER OF TAXA** (add up the number of taxa from all columns) | |
| **WATER QUALITY INDEX** (total group score ÷ total number of taxa) | |

| Water Quality (circle one) | |
|---|---|
| **Excellent** | 1.0 – 2.0 |
| **Good** | 2.1 – 2.5 |
| **Fair** | 2.6 – 3.5 |
| **Poor** | greater than 3.6 |

Group 1 – These organisms are generally considered to be intolerant to pollution


Alderfly Larva

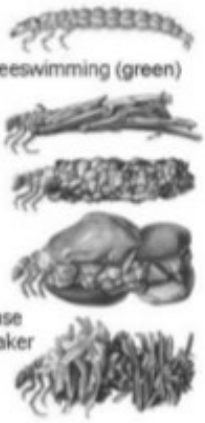

Dobsonfly Larva


Snipe Fly Larva


Stonefly Larva

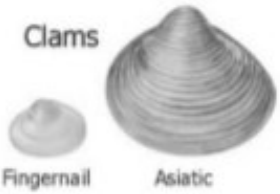
Group 2 – These organisms are generally considered to be moderately intolerant to pollution

Caddisfly Larvae

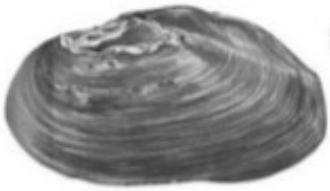

Freeswimming (green)

Case Maker

Clams


Fingernail

Asiatic

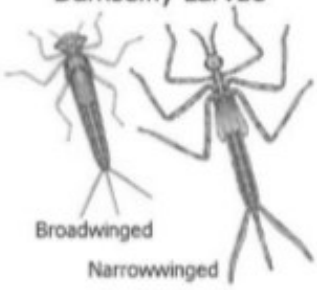


Mussels


Zebra Mussel


Water Penny

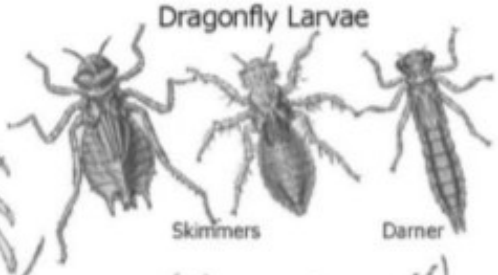
Damselfly Larvae


Broadwinged

Narrowwinged


Crayfish

Dragonfly Larvae


Skimmers

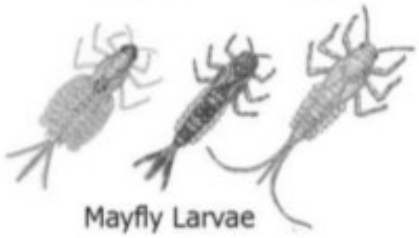
Darner

Riffle Beetle


Larva

Adult


Cranefly Larva

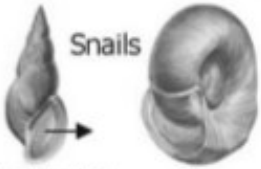

Mayfly Larvae

Group 3 – These organisms are generally considered to be fairly tolerant to pollution


Black Fly Larva


Midge Larva

Snails


Right-Handed

Orb


Scud


Sowbug

Group 4 – These organisms are generally considered to be very tolerant to pollution


Aquatic Worm


Bloodworm Midge Larva (bright red)


Leech


Left-Handed Snail

Other Aquatic Organisms (These organisms are not used as water quality indicators)


Crawling Water Beetle


Giant Water Bug


Backswimmer


Whirligig Beetle


Water Strider


Waterboatman


Planaria


Water Scavenger Beetle


Water Scorpion

Test site: _____ Date: _____

Scientist: _____ (that's you!) Weather: hot/cold sunny/cloudy dry/raining

| Parameter (What you are testing) | Method used to measure | Washington State Surface Water Quality Standards | Your Reading | Does your reading meet standards? |
|---|---|---|---|---|
| **Dissolved Oxygen** units: **mg/L (ppm)** |  | At least 8.0 mg/L | | |
| **Temperature** units: **°C** |  | Max. 17.5°C | | |
| **Turbidity** units: **NTUs** |  | Max. 15 NTUs | | |
| **Phosphate** units: **mg/L (ppm)** |  | Max. 1 mg/L | | |
| **pH** units: **pH units** |  | 6.5-8.5 | | |

Test site: _____ Date: _____

Scientist: _____ (that's you!) Weather: hot/cold sunny/cloudy dry/raining

| Parameter (What you are testing) | Method used to measure | Washington State Surface Water Quality Standards | Your Reading | Does your reading meet standards? |
|---|---|---|---|---|
| **Dissolved Oxygen** units: **mg/L (ppm)** |  | At least 8.0 mg/L | | |
| **Temperature** units: **°C** |  | Max. 17.5°C | | |
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| **Phosphate** units: **mg/L (ppm)** |  | Max. 1 mg/L | | |
| **pH** units: **pH units** |  | 6.5-8.5 | | |

**Part 2: Chemical Test Kits**