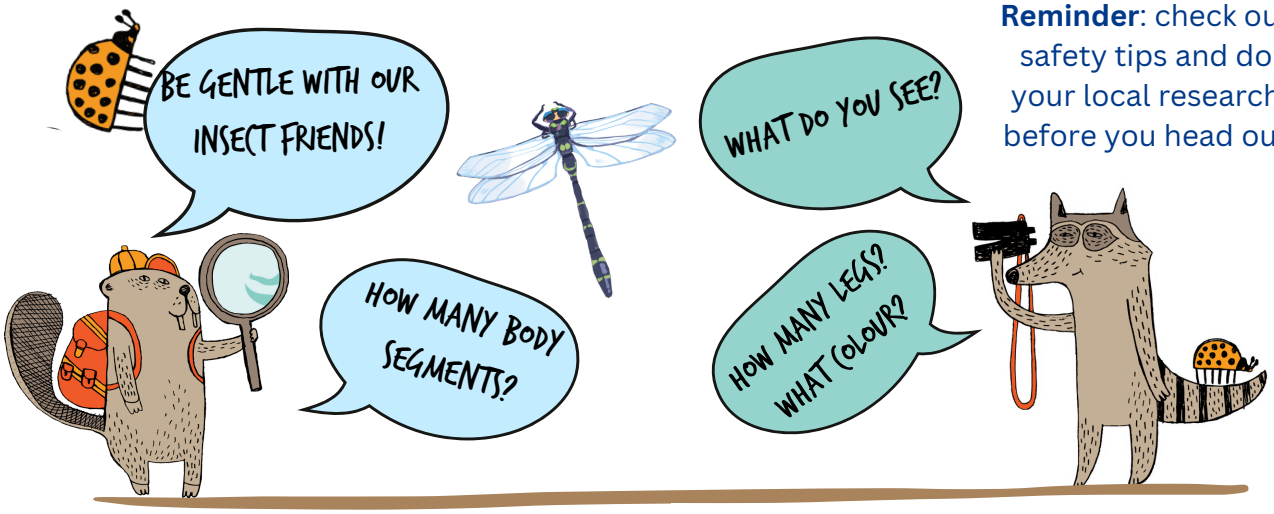
ACTIVITY: AQUATIC MACROINVERTEBRATES

DISCLAIMER: This activity is a simplified and modified version of the citizen science methodology described in the Pacific Streamkeepers handbook (link), which is itself a simplified version of the methodology used by professional biologists (the Benthic index of Biological Integrity or B-IBI).

This activity is not about the accuracy of the results and is more about practicing and developing an in-depth view of nature, to notice details, to handle wildlife with care and to be curious!



Reminder: check our safety tips and do your local research before you head out

ACTIVITY: AQUATIC MACROINVERTEBRATES

THIS ACTIVITY HAS THREE PARTS: 1. COLLECTION 2. IDENTIFICATION 3. SCORING

DISCUSSION NOTES:

Discussion leaders: what is one thing that you would you like everyone to take away from today? Write this down and let it help shape your explorations today!

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PART 1: COLLECTION

THIS ACTIVITY HAS THREE PARTS:

1. COLLECTION
2. IDENTIFICATION
3. SCORING

Collection:

- Depending on the conditions of your stream or wetland, collection can take between 15 minutes to 1 hour. Usually 15 to 20 minutes should suffice, but some people really enjoy collecting!

- If you have a large group, you might want to assign some of them to work on sorting and identification after the first 15 minutes of collection.

- It helps to organize collection by breaking up into small teams of 2 or 3. each team should have a net and access to a bucket (the bucket can be shared between a few teams, depending on how closely you are working).

- Too many people in the water can negatively affect your results, and likely harm a higher number of invertebrates.

- Be gentle in the water and try not run around and make it cloudy

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PART 2: IDENTIFICATION

Identification:

- This involves finding the bugs collected in the buckets, sorting them into the ice cube trays, and identifying and counting those sorted organisms.
- It helps if you work in teams for this as well, as it ensures that all the organisms are recorded.
- This requires a gentle hand to collect and sort without injuring your bugs. Using paint brushes or turkey basters for smaller bugs and clinging bugs and spoons for the others is recommended.
- Demonstrate how to use a turkey baster and allow them to practice on inanimate objects (like small twigs). Only use the turkey baster for organisms whose bodies are smaller than the opening hole
- Children will require numerous reminders to record what they have identified and found. It helps to have an adult with each group of children to ensure that recording happens and is done accurately.

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PART 3: SCORING

DON'T FORGET YOUR FIELD SHEETS!

POLLUTION TOLERANCE INDEX FORMULA

[3 x (# of category 1) + 2 x (# of category 2) + (# of category 3)]

3x (_____) = (A)_____ +
Category 1

2 x (_____) = (B)_____ +
Category 2

(_____) = (C)_____
Category 3

Add together A + B + C = _____
your score

Scoring
Good = >22
Acceptable = 22-17
Marginal = 16-11
Poor = <11

Your Score (POLLUTION TOLERANCE SCORE): _____

TOTAL COUNT OF STREAM BUGS = _____
(# of individual bugs your group collected)

TOTAL COUNT OF STREAM BUG TYPES = _____
(how many different kinds of bugs you found)

CHECK YOUR FIELD SHEETS FOR ANSWERS

TOTAL COUNT OF PREDATORS: _____

WANT AN EASIER WAY TO FIND OUT YOUR SCORE?
USE the Creek Critters app!

HOW TO: TIPS AND TRICKS

1. Find an area of a stream with riffles and pools and select a few to sample. As sampling occurs sediment will be washed downstream, so organize your collection accordingly—your samplers will move upstream when they finish collecting in one spot.
2. Use your nets and large buckets pre-filled with stream water. Collect your samples

COLLECTION: if you <u>are in a stream:</u>

- Start at the downstream section of you pool or riffle.
- Person 1: Put your net so that the bottom of it is either just below the substrate or tightly on top of it.
- Person 2: Carefully shake the gravel or disturb the sediment that is up to half a metre in front of the net. Any organism that comes loose should flow into your net.
- Person 1: Pull up your net
- Person 1 & 2: Carefully look into the net for anything that is squiggling around. It can help to put your hand under the net to make the bottom of the net more flat. If you see any bugs, carefully use your free hand to turn your net inside out, and swish it in the water in your collection bucket. Handle all organisms carefully so that you don't injure them! Continue with this method until your have covered the whole riffle or pool. Take turns!

COLLECTION: If you are in a wetland:

- Choose a section of the shoreline, about 2 m or less in length.
- Carefully enter the water (substrate can be soft and you will likely sink, so always do this with a partner who can rescue you if you are sinking more than you expected!) or stand on the edge of the shore.
- Run your net in a sweeping motion close to the substrate. Most of the organisms will be in the top layer of the sediment or will be clinging to plants. It can be tough to not get a net full of mud at first, so you may need to move your sampling area after a few tries.
- Carefully check your net, looking for squiggling movement. Keep an eye out for Water Scorpions or Giant Water Bugs as they both have a painful stinger, and ask an adult to handle your net if you have caught one.

3. Carefully pour your bucket into several square tubs and wait for the water to settle.
4. Using your sampling tools (paint brushes, turkey basters, and plastic spoons) collect individual bugs and place them in the ice cube tray.
5. Using your microscopes and magnifying glasses and ID sheets, identify your bugs and count them.
6. Gently release bugs to the same area in which you found them.

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FIELD SHEET: CATEGORY 1

Location: _____

Date: _____

NatureKids BC Club Name: _____

Pollution Tolerance	Number Counted (Name & tally them)	Common Names
 **Category 1** (Intolerant of pollution) 		**Mayfly**
		Stonefly
		Caddisfly
		Dobsonfly
		Riffle Beetle
		Gilled Snail
		Water Penny
	TOTAL:	

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FIELD SHEET: CATEGORY 2

Date &Location:_____

Pollution Tolerance	Number Counted (Name & tally them)	Common Names
 **Category 2** (Somewhat tolerant of pollution)		**Alderfly larva**
		Aquatic Beetle
		Aquatic Sowbug
		Clam or Mussel
		Cranefly larva
		Damselfly nymph
		Dragonfly nymph
		FIshfly larva
		Scud
		**Watersnipe fly larva**
	TOTAL:	

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FIELD SHEET: CATEGORY 3

Date&Location:_____

Pollution Tolerance	Number Counted (Name & tally them)	Common Names
 **Category 3** (Tolerant of pollution)		**Aquatic Worm**
		Blackfly larva
		Flatworm
		Leech
		Midge larva
		Phantom Midge larva
		Planarian
		True Bug Adult (water boatmen, water strider, giant water beetle, water scorpion and backswimmer)
		**Water Mite**
	TOTAL:	

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SIGNS OF A HEALTHY STREAM BUG BY BUG

Finding **more pollution intolerant stream bugs** in your collection is a sign of a healthy stream

Finding **more predators** in your collection of stream bugs is a sign of a healthy stream

Finding **more stream bugs that have gills** is a sign of a healthy stream

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CONVERSATION

IMPORTANT SAFETY TIPS

It is always important to make sure that you have safe access to your freshwater source, whether it is a stream, river, lake or wetland.

Here are a few things to keep in mind:

- Water access points may have undercut or eroding banks. Make sure to check your entry points for your safety and to avoid damaging the stream edges.

- Depending on how quickly water is flowing, even ankle deep water might knock you off your feet. We do not recommend doing this activity near rivers that have significant depth and flow to cause anyone who might fall in to be carried by the current.

- Always work with a partner or group. Do not work in or near water alone.

- Even in clear water, rocks might have an algal layer that can make them slippery!

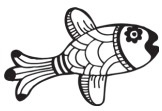
- If your stream is fed by mountains/ snow melt be careful during spring melt, as water levels might change very suddenly.

- Wetlands and some lake shores often have soft bottoms. You need to find out how soft the bottom is before you wade in. Use a large stick and check how deeply you can press it into the mud.

FOR NATURE AND FOR US

- Check online resources and reach out to local mentors, stewards, stream keepers and parks offices for up to date and seasonal information in your area.

Local resources can also help you decide if there is a place or time you should NOT go into a certain stream because you would be disturbing local wildlife during a critical time.



Example: if your stream is salmon bearing, you should not go into the water or disturb the banks during spawning season.

WHAT ELSE WOULD YOU INCLUDE IN YOUR PRE-EVENT SAFETY CHECK?

- WEATHER, AND POTENTIAL CHANGES IN WEATHER
- SEASON
- TRANSPORT
- INDIVIDUAL NEEDS: MEDICATION, FEAR OF WATER, GETTING WET...
- BACK UP: DO YOU HAVE IT? NATURE MENTORS?
- ?
- ?

Alderflies_megaloptera-larva_dorsal

Alderflies_megaloptera-larva_ventral

Alderfly Larva

Look for filaments on abdomen (they look like legs but they aren't! You can tell that they are not legs because they don't move like the legs do).

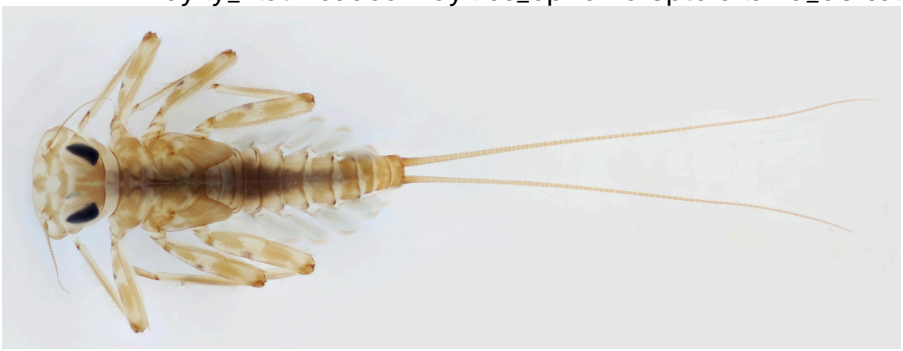
Engulfer / **Predator**

Mayflies

There are many species with slightly different head and body shapes.
They have 2 or 3 tails,
plate or hairlike gills along the side of their abdomen
single tarsal claw.

Collector / Gatherer
Scraper / Grazer

Mayfly_Flat Headed Mayflies_ephemeroptera-larva_dorsal



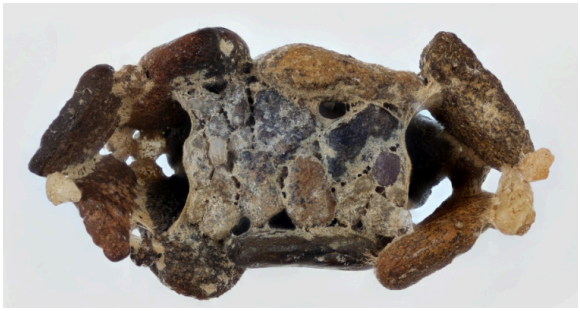
Mayfly_Flat Headed Mayflies_ephemeroptera-larva_ventral

Caddisfly_Saddle Casemaker Caddisflies_trichoptera-larva_lateral

Caddis Fly

Small head and legs are visible at one end of the protective case. The case is made of materials found in the surrounding environment and silk from its body.

Caddisfly_Saddle Casemaker Caddisflies_trichoptera-larva_case



Scraper / Grazer

Stonefly_Common Stone Flies_plecoptera-larva_dorsal

Stone Fly

Note the double tarsal claw on feet gills and on thorax (not abdomen).

Stonefly_Common Stone Flies_plecoptera-larva_dorsal

Engulfer / **Predator**

Water Striders_hemiptera-adult_dorsal

Water Boatmen_hemiptera-adult_dorsal

True Bug Adults:

Water Boatmen, Water Strider, Giant Water Beetle, Water Scorpion and Backswimmers...

most are predators but not all!

Piercer / **Predator**

Piercer / **Herbivore**

Dragonfly Nymph

Look for them under rocks and piles of decaying leaves in the water. They like slower moving water and you can also find them in lakes.

Engulfer / **Predator**

Dragon Fly_Spotted Darners_odonata-larva_dorsal

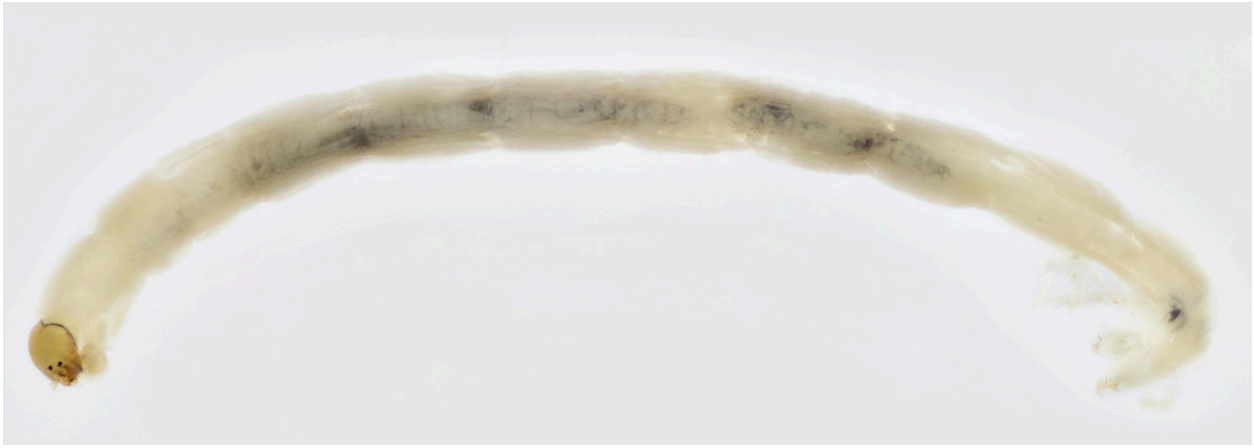
Dragon Fly_Spotted Darners_odonata-larva_ventral

Midge Larva

They are in the same genus as blood worms but move differently and are not bright red. Good for fish food commercially or in your own aquarium!

Collector / Filterer
Collector / Gatherer
Shredder / Herbivore

Midges_Non-Biting Midges_diptera-larva_lateral



Scud

Shrimp-like amphipod that swims on its side.

Collector / **Gatherer**

Scuds_ Scuds, Amphipods, Sideswimmers_amphipoda-adult_lateral

NEED MORE BUG ID PHOTOS?

We have used photos from www.macroinvertebrates.org

Free download of high resolution photos. Feel free to top up the image bank from here. Printing has been tested in library computers and it's clear!