

Macroinvertebrate Activities & Resources

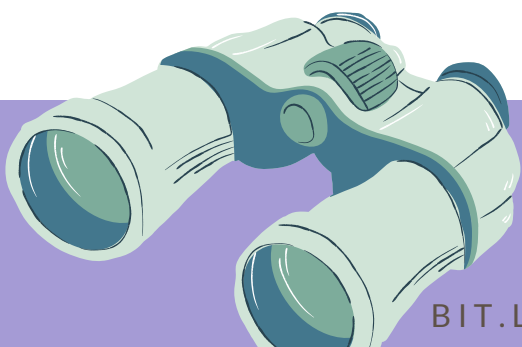
What's a Macro?

WATCH THE MACROINVERTEBRATE MAYHEM VIDEO (FOLLOW LINK BELOW) TO ANSWER THE FOLLOWING QUESTIONS:

WHAT IS A
MACROINVERTEBRATE?

SKETCH AND LABEL 3 SPECIES OF MACROS ABOVE

WHAT IS AN
INDICATOR
SPECIES?



[BIT.LY/MACROYOUTUBE](https://bit.ly/macroyoutube)



Tolerance Chart

BENTHIC MACROINVERTEBRATE WATER QUALITY BIO-INDICATORS

SENSITIVE: Good WQ

CADDISFLY
Case: 10-40 mm
Body: 9-23 mm



MAYFLY
3-18 mm



STONEFLY
8-30 mm



WATER PENNY
3-10mm



TOLERANT: Fair WQ

ALDERFLY LARVA
10-25 mm



CRANEFLY LARVA
10-25mm



DRAGONFLY NYMPH
10-40 mm



WATER SNIPE FLY LARVA
10-18 mm



VERY TOLERANT: Poor WQ

BLACKFLY LARVA
5-8 mm



LEECHES
4-450 mm



MIDGE LARVA
3-25 mm



POUCH SNAIL
5-20 mm



Macro Matching

Match the Aquatic Bugs to the type of Stream they can live in.

Draw a line from the group of bugs on the left to the appropriate stream on the right.

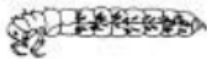
Group 1: These bugs cannot live in water with low pH or Metals.



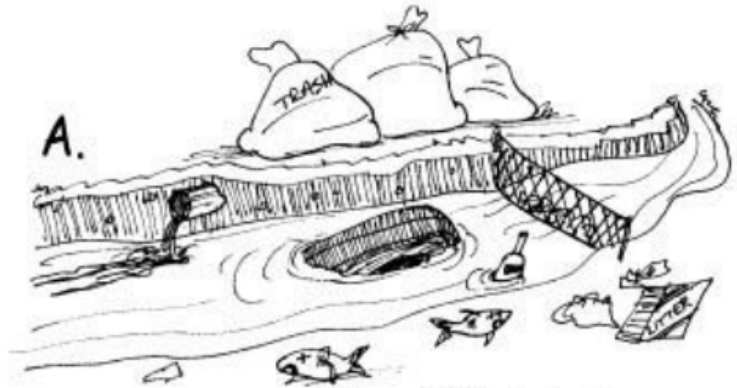
Mayfly nymph



Stonefly nymph

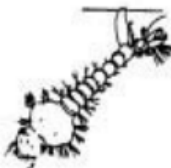


Caddisfly larvae



A Very Polluted Stream.

Group 2: These bugs can tolerate water with low pH or Metals.



Mosquito larvae



Water strider



Scud



A Very Clean Stream.

Group 3: These bugs thrive in water with low pH or Metals.



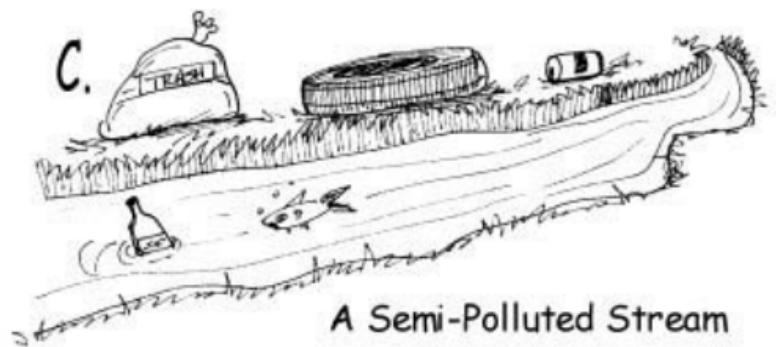
Rat-tailed maggot



Black fly larvae



Sludge worm

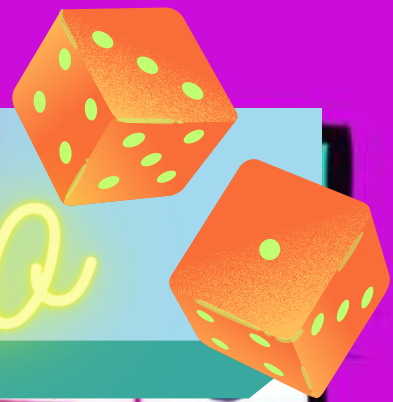


A Semi-Polluted Stream

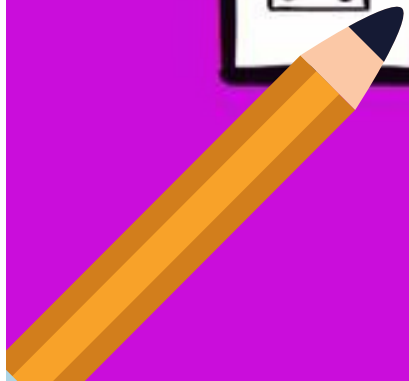
EPCAMR (c)

Roll a Macro!

Roll a macro



	Head	Body	Legs	Eyes	Other
					 tail
					 tail
					 antennae
					 antennae
					 mouth
					 antennae



Roll the dice and draw the corresponding body part to create your own macroinvertebrate.



Macroinvertebrate Report

MACROINVERTEBRATE REPORT



Choose a species of macroinvertebrates to research and report on.

SPECIES NAME:

HABITAT:

DIET:

FUN

FACT:

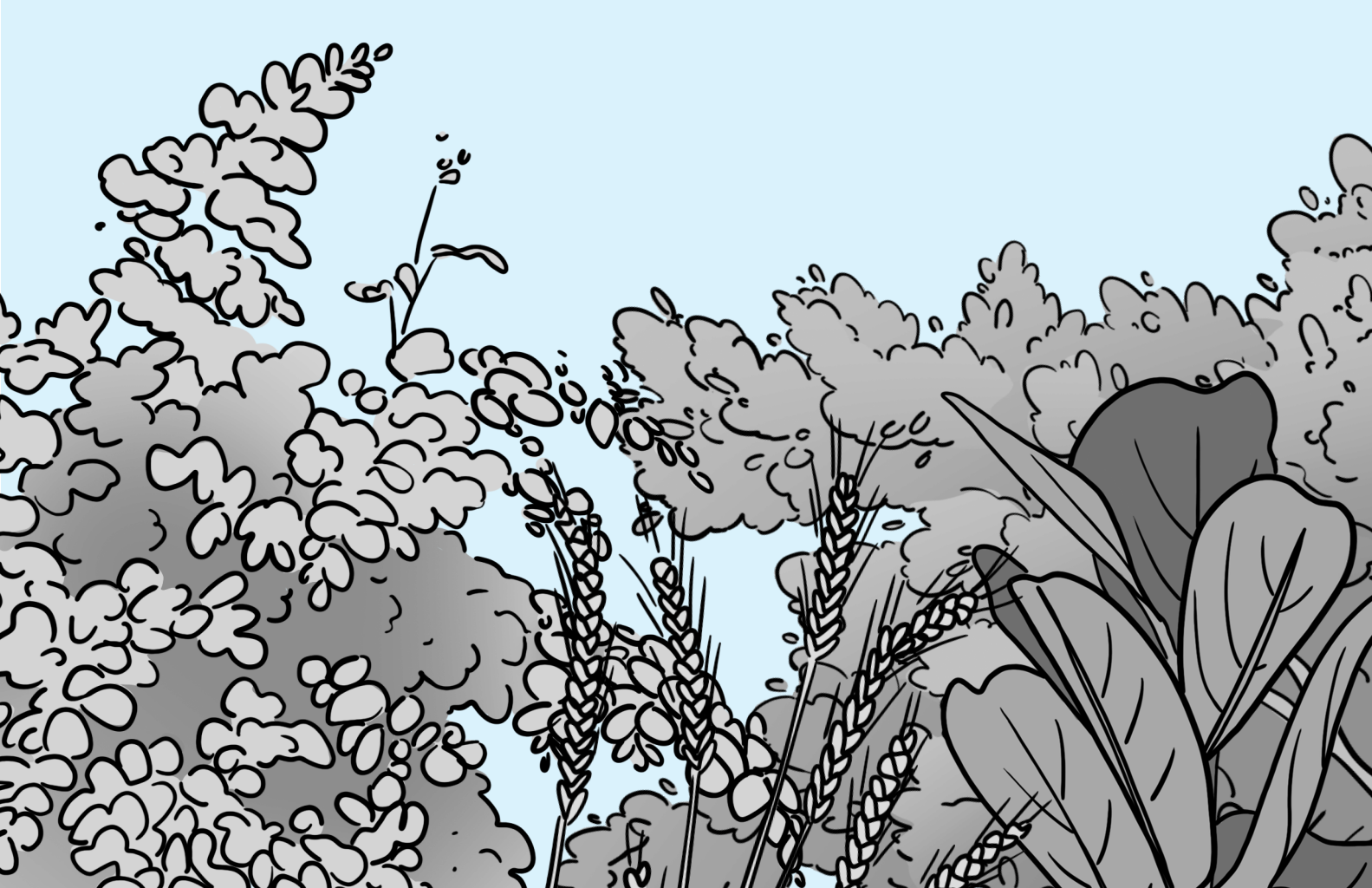


DRAW A PIC OF YOUR MACROINVERTEBRATE

Macro Math Game



Macroinvertebrate Discovery Games



Macroinvertebrate Cards

What is a macroinvertebrate?

“Macro” means big enough that we can see the creature without a microscope. “Invertebrate” means the creature is lacking a spine. In this case we are looking at aquatic insects.

Why should we investigate the macroinvertebrates in the water?

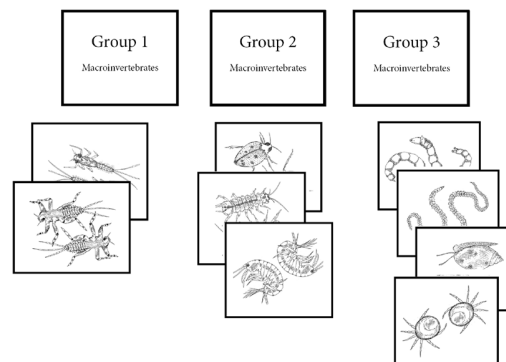
These creatures are an important food source for young salmon fry growing in our rivers, lakes, and streams. We want to make sure there is plenty of food for our salmon. Additionally, these macroinvertebrates are sensitive to pollution and can show us how polluted the water is. If we find creatures from groups 1, 2 and 3: the water is very clean. If we find creatures only from groups 2 and 3 it means the water is polluted at a medium level. And if we find creatures only from group 3, the water is heavily polluted.

How to Use

Begin by printing the cards double sided (flip on long edge). Cut out the following macroinvertebrate cards. One side shows the picture of a macroinvertebrate, flip it over to learn its name, pollution tolerance level, and other fun facts!



Shuffle the cards and pull out 10. The following cards represent a sample found in Discovery Creek. Take a moment to identify the macroinvertebrates using the dichotomous key “Key to Macroinvertebrates in the River”. Find out what their pollution tolerance levels are using the “Pollution Tolerance Index” sheet. Then complete the biotic index sheet to determine how healthy Discovery Creek is based on the sample you’ve collected. Try this multiple times by shuffling and pulling out a new sample.



Alternative Games

Option 2: Stack it!

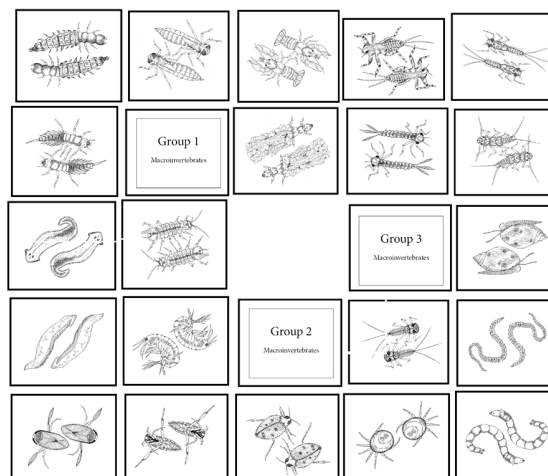
Organize all cards into their pollution tolerance group by guessing. Place them in piles or lines beneath the title card. Once finished, check to see if you got them right! Try again until you get them correct.

Option 3: Guess the Critter!

Do you know these creatures by name? Place all cards on a table picture up. Challenge a friend at identifying the macroinvertebrates. Take turns guessing and flipping cards. The person who collects the most macroinvertebrates wins!

Option 4: Habitat Investigation!

Visit a waterway near you and search for aquatic insects. Lay out the cards for the macroinvertebrates you found. Use these cards to determine how polluted your chosen waterway is. Pair this with our “Habitat Investigation” activity.



Scientist Name(s): _____

Date: _____ Time: _____ Weather: _____

Group 1 Species	Number	Group 2 Species	Number	Group 3 Species	Number
Caddisfly Larvae		Dragonfly Nymph		Water Boatman	
Mayfly Nymph		Damselfly Nymph		Backswimmer	
Stonefly Nymph		Alderfly Larvae		Snails	
Dobsonfly Larvae		Amphipods (Scuds)		Isopod	
		Crawling Water Beetle		Midge Larvae	
		Water Mite		Tubifex Worm	
		Crayfish		Flatworm	
Total Number of Species:		Total Number of Species:		Total Number of Species:	
Multiple total number x 3: (index value)		Multiple total number x 2: (index value)		Multiple total number x 1: (index value)	

Stream Quality Assessment

Total Number of Species
(Sum of 3 group totals)

Cumulative Index Value
(Sum of 3 group index values)

Check the box next to the corresponding Cumulative Index Value to determine Stream health

Excellent
(> 22)

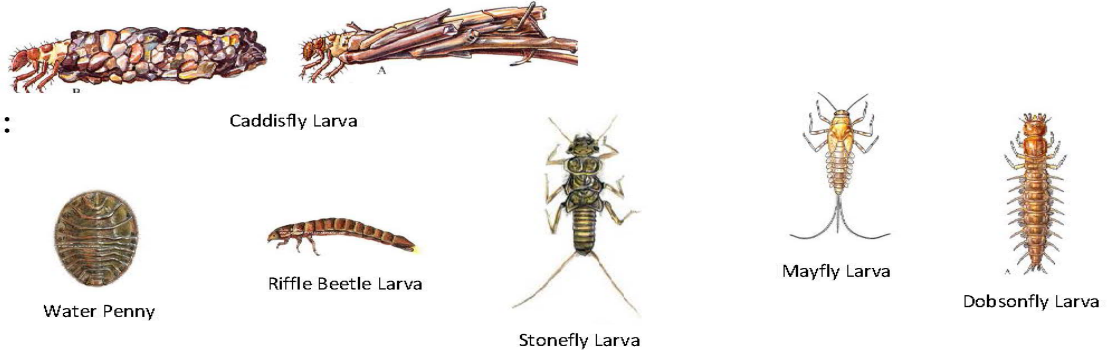
Good
(17 – 22)

Fair
(11 – 16)

Poor
(< 11)

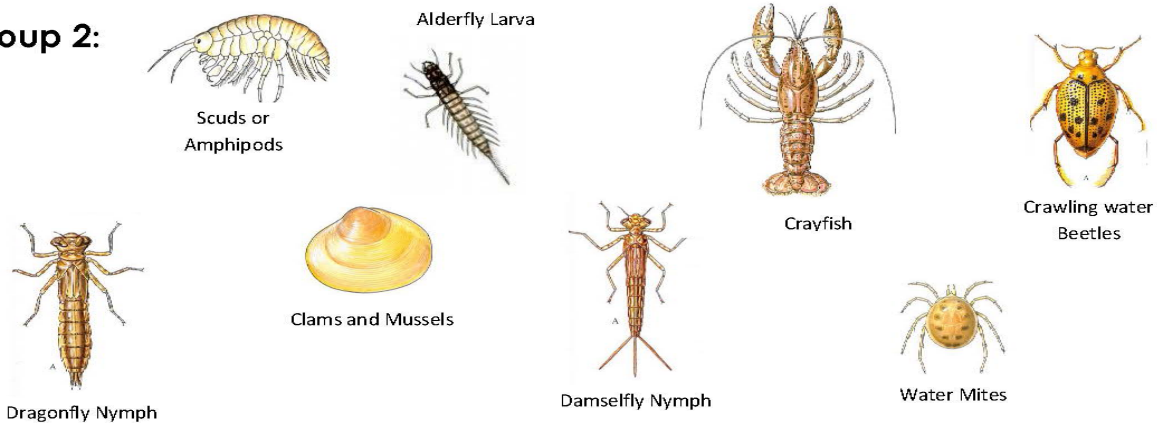
Macroinvertebrate: Pollution Tolerance Index

Group 1:



Group one macroinvertebrates **CANNOT** tolerate pollutants in the water. They need **cold, clean** and **clear** water to survive.

Group 2:



Group two macroinvertebrates can tolerate **SOME** pollutants in the water and can live in **medium** water quality conditions

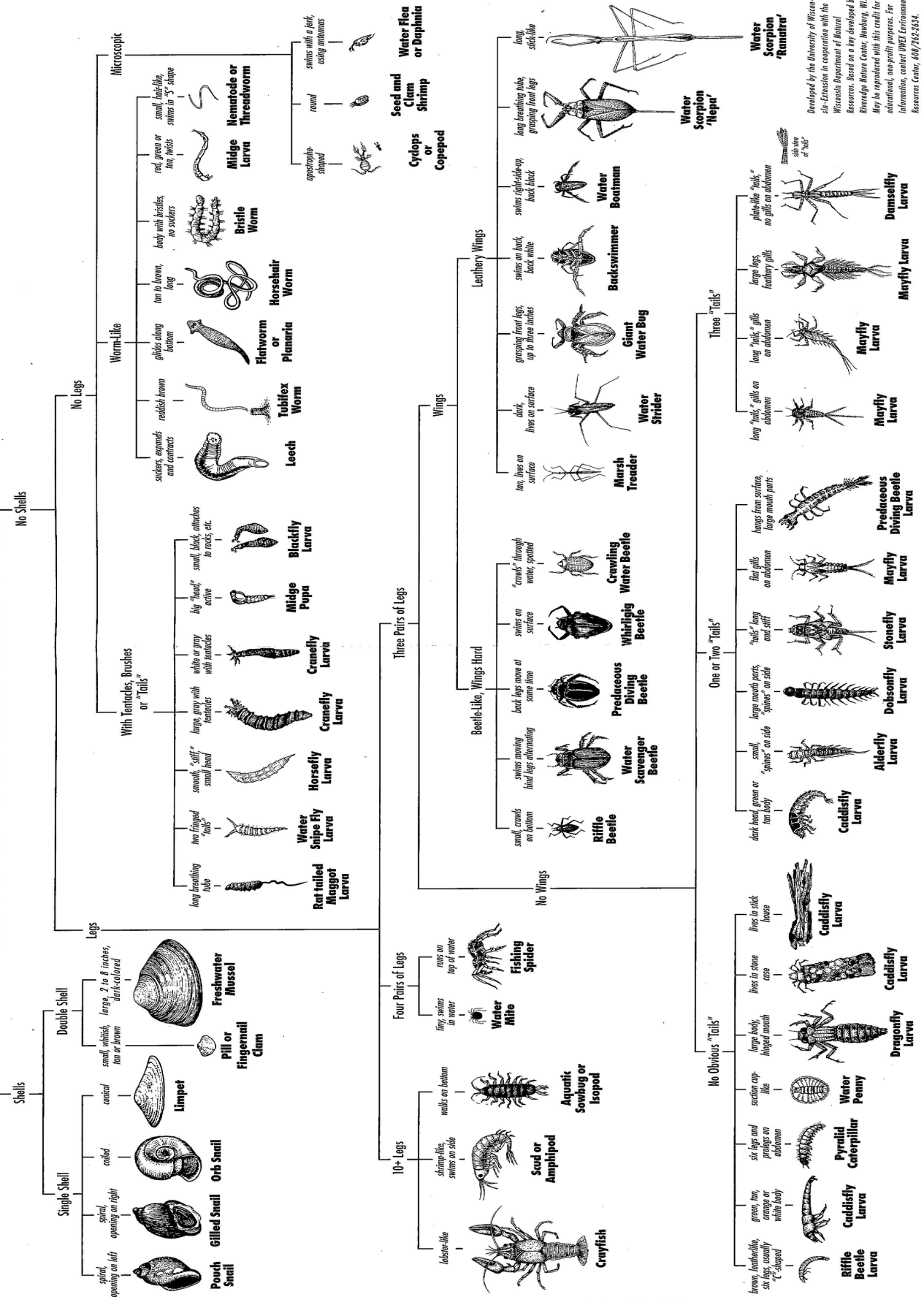
Group 3:



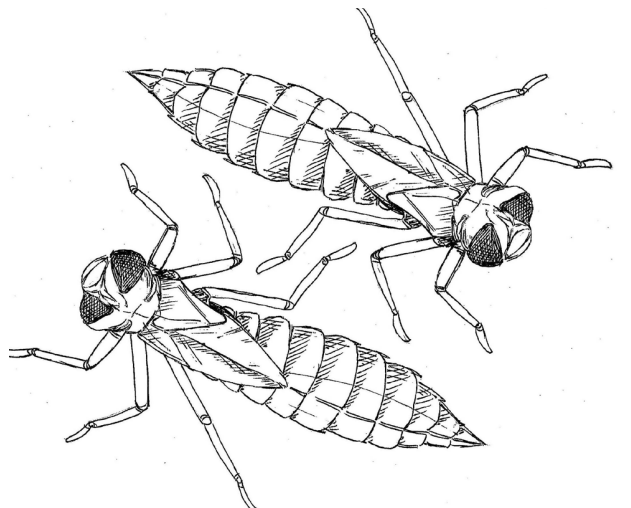
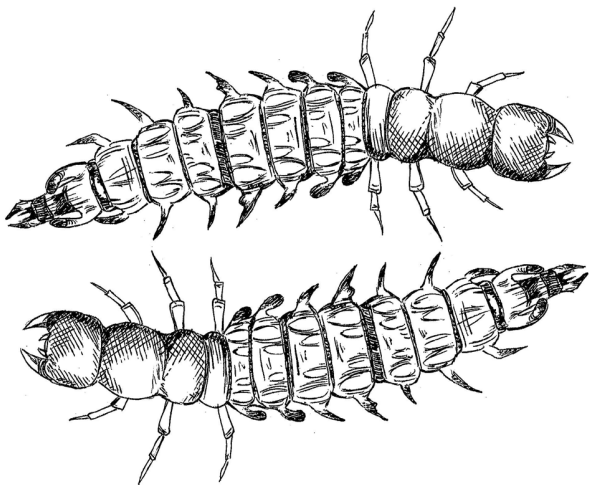
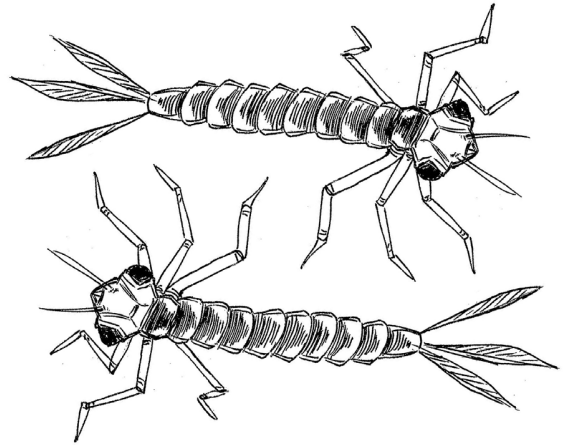
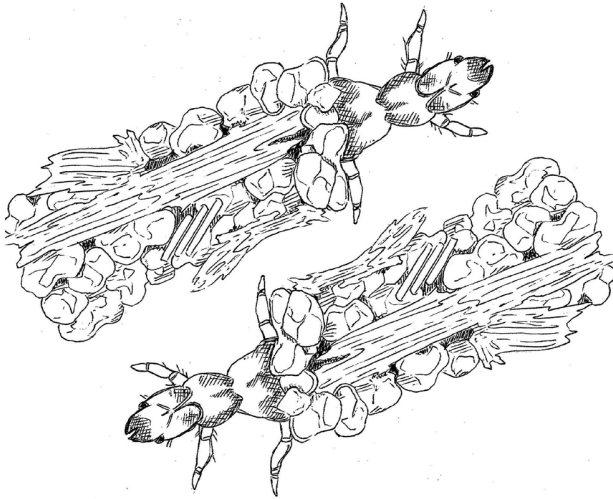
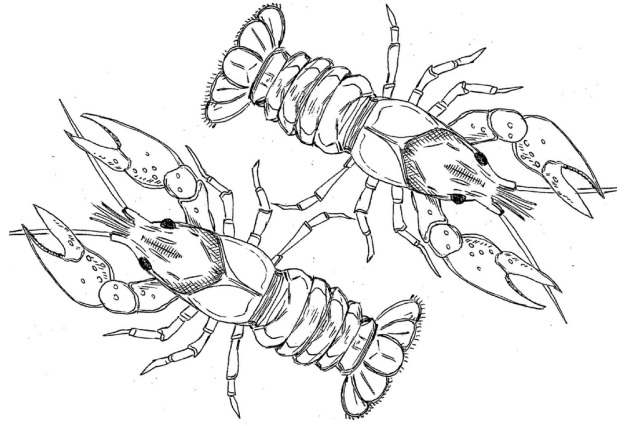
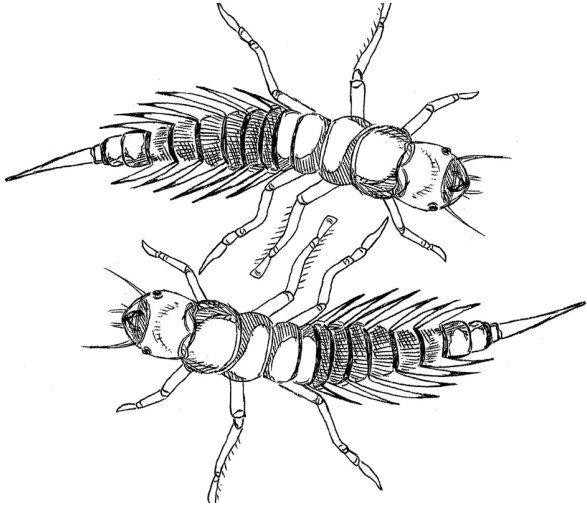
Group three macroinvertebrates **CAN** tolerate pollutants in the water and **poor** water quality conditions.

Key to Macroinvertebrate Life in the River

(Sizes of illustrations are not proportional.)



Developed by the University of Wisconsin-Extension in cooperation with the Wisconsin Department of Natural Resources. Based on a key developed by Riverside Nature Center, Neenah, WI. May be reproduced with this credit for educational, non-profit purposes. For information, contact UWEX Environmental Resource Center, 609/782-2333.



Crayfish

Pacifastacus leniusculus

Group 2

Washington has one native crayfish species called the signal crayfish.

They are invasive in Europe.

Can grow up to 17 centimeters long and live up to 20 years.

Alderfly Larvae

Sialidae

Group 2

There are about 66 species of alderfly on Earth.

They live in water for 1-2 years before crawling onto land and growing wings.

They live three weeks as an adult, and stay close to home.

Damselfly Nymph

Zygoptera

Group 2

Damselflies look like small dragonflies and are closely related. The males are brighter in color than the females.

Fossils that look like damselflies have been found as old as 250 million years.

They eat mosquitoes.

Caddisfly Larvae

Trichoptera

Group 1

Caddisflies build homes out of debris using silk from their saliva.

The homes have been turned into jewelry.

Once an adult, they become food for nocturnal birds, bats, amphibians, and small mammals.

Dragonfly Nymph

Anisoptera

Group 2

Dragonflies can live in the water for up to 5 years.

You can tell a dragonfly from a damselfly by looking at their wings. Dragonflies hold their wings flat and away from the body. Damselflies hold their wings folded along their bodies.

Dobsonfly Larva

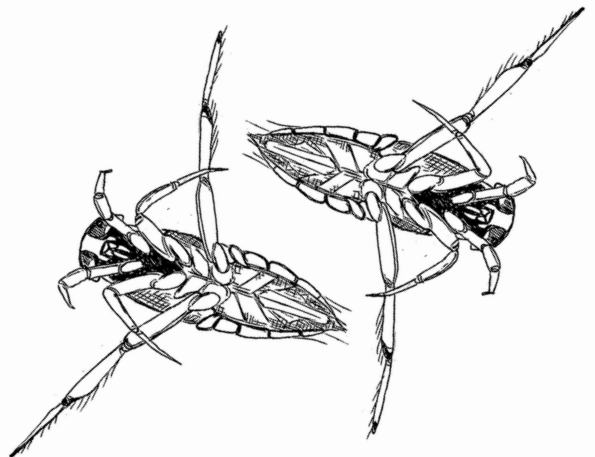
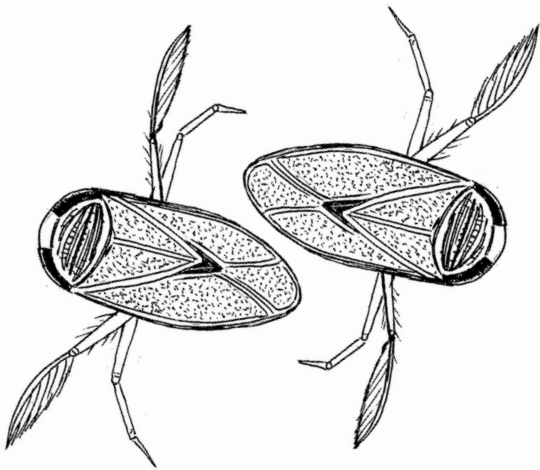
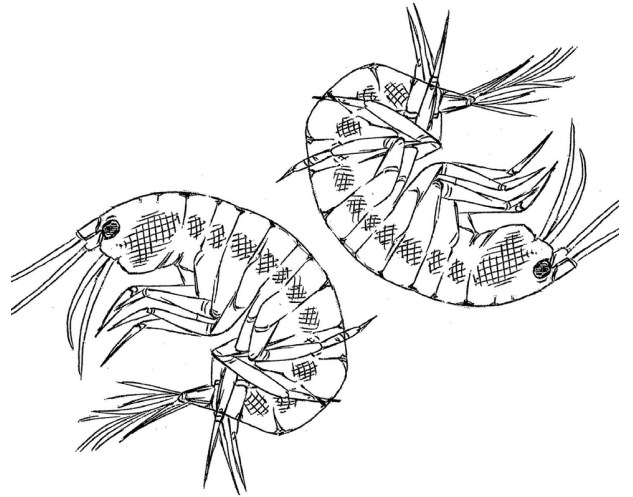
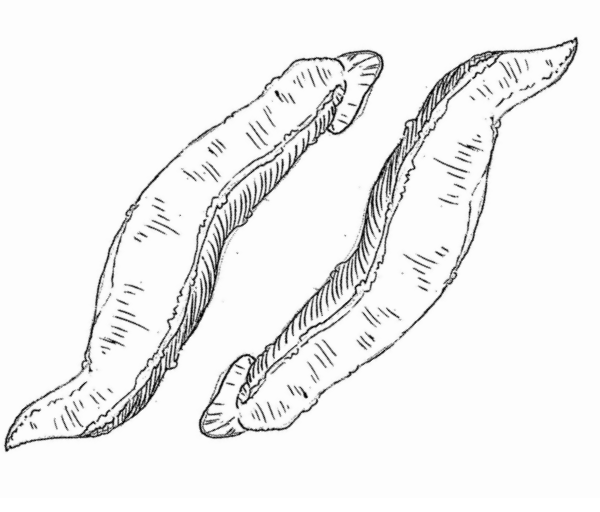
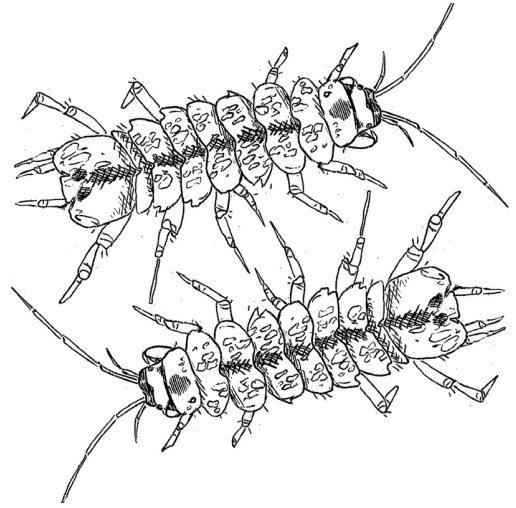
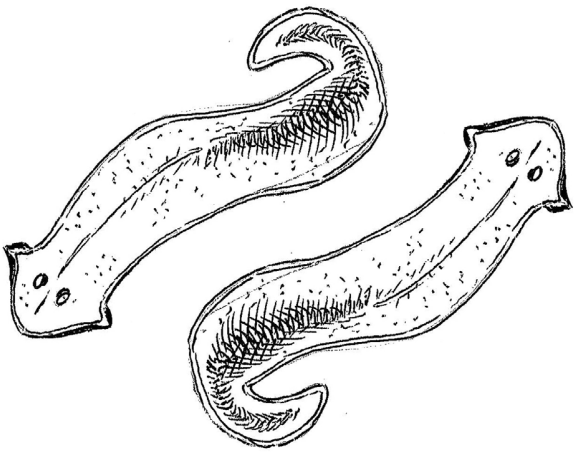
Corydalinae

Group 1

There are about 60 species.

Adult dobsonflies are some of the largest insects in North America. With a wingspan can be 7 inches long.

The adults are nocturnal and are seldom seen.



Isopod

Asellidae

Group 2

Isopods can be found on land, in freshwater, and saltwater. 500 species are found in freshwater.

Isopods are detritivores, herbivores, carnivores, parasites, and filter feeders.

“Isopoda” means “equal foot” in Greek.

Flatworm

Platyhelminthes

Group 3

There are 20,000 species of flatworms.

They are carnivores and scavengers.

The largest flatworms are only a few centimeters long.

Scud

Amphipoda

Group 2

Also called “amphipods” meaning “different foot” in Greek.

A type of crustacean, and a cousin to crabs.

Typically less than 10 millimeters long.

Leech

Hirudinea

Group 3

Leeches are parasitic animals related to earthworms.

The majority of leeches live in freshwater and suck blood from their host.

Leech fossils are 500 million years old.

Backswimmer

Notonectidae

Group 3

There are about 500 species of backswimmers.

They use an oxygen bubble within them to stay bouyant.

You’ll find them near the surface swimming upsidedown.

Water Boatman

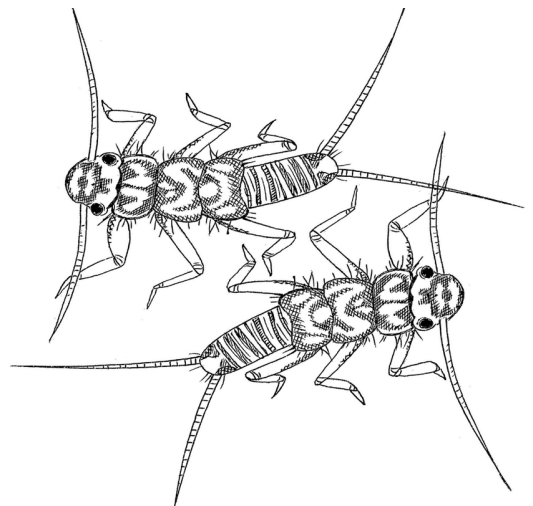
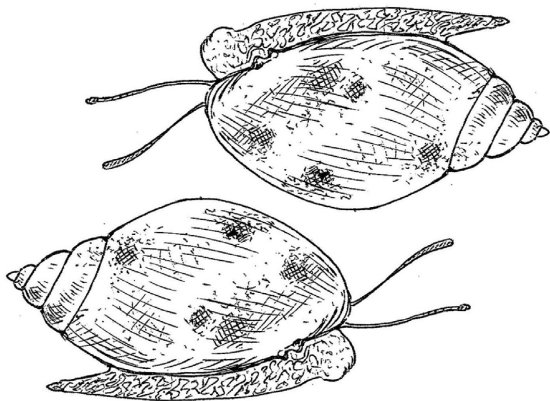
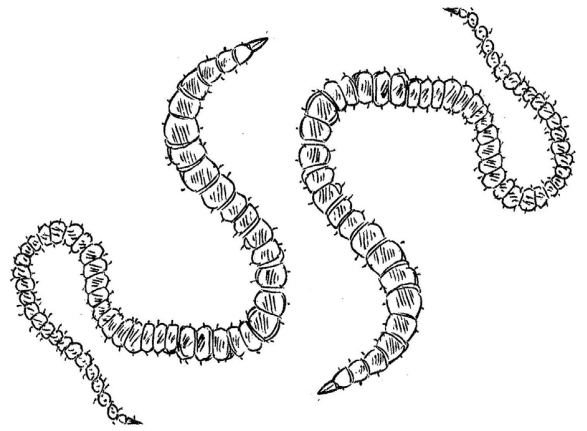
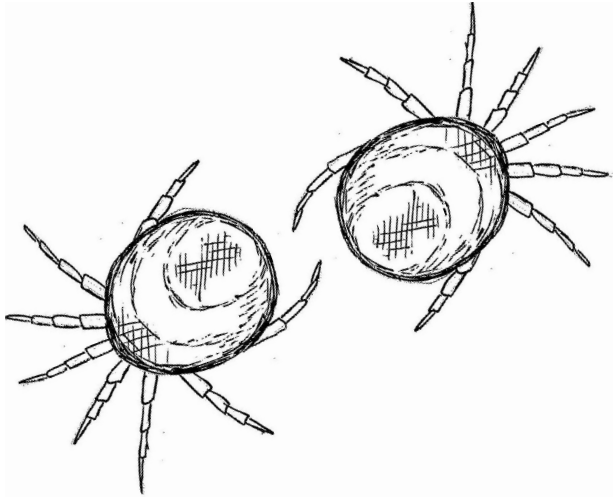
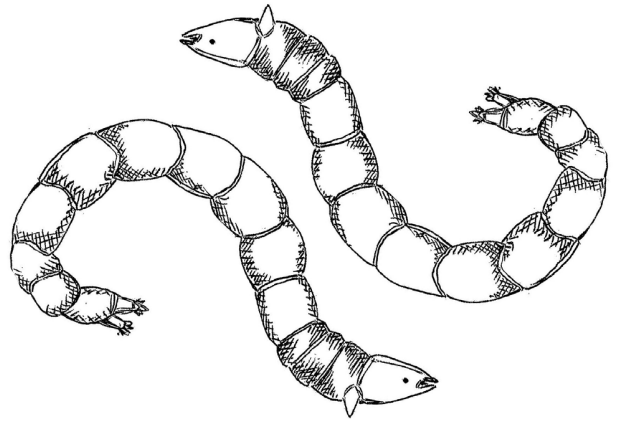
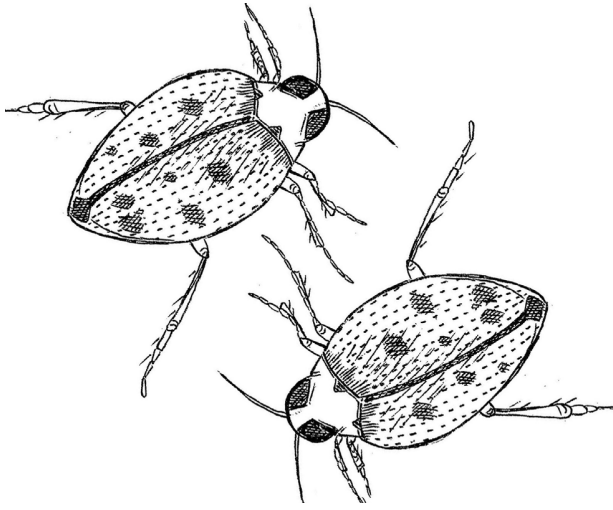
Corixidae

Group 3

Closely related to backswimmers. While backswimmers swim upsidedown, water boatmen swim right side up.

Their hind legs are covered with hairs and move like boat oars.

Common prey to amphibians.



Midge Larvae

Chironomidae

Group 3

Midges are small flies including mosquitoes.

They are an important food source for amphibians and small birds.

Midges can be found practically everywhere on Earth.

Crawling Water Beetle

Haliplidae

Group 2

These aquatic beetles are clumsy swimmers and prefer to crawl.

They live in vegetation along the water's edge.

They eat insect eggs, small crustaceans like amphipods, and algae.

Tubifex Worm

Tubifex

Group 3

Also called "sludge worms" or "sewage worms" because they can be found in heavily polluted habitats.

They are hermaphroditic and an individual has both male and female reproductive parts.

Water Mite

Hydrachnidia

Group 2

Can be colored with bright red, orange, blue, green, and yellow.

The young are parasitic and can be found attached to mosquitoes.

They are found on every continent except Antarctica.

Stonefly Nymph

Plecoptera

Group 1

"Plecoptera" means "braided-wings" in Greek.

The nymphs live in the water for 1-4 years before growing wings.

A female can lay 1,000 eggs which they drop into the water from the air.

Pouch Snail

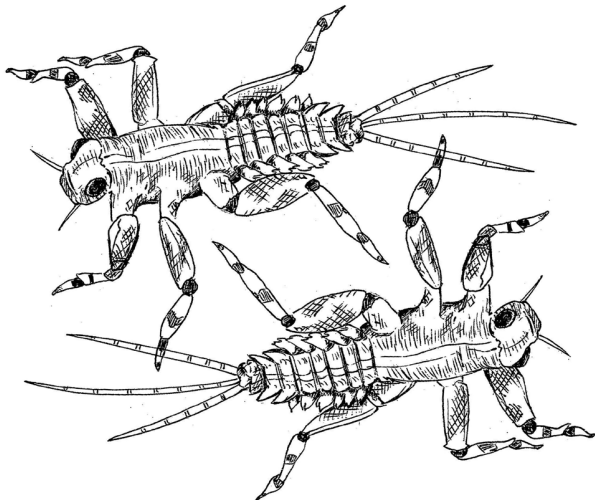
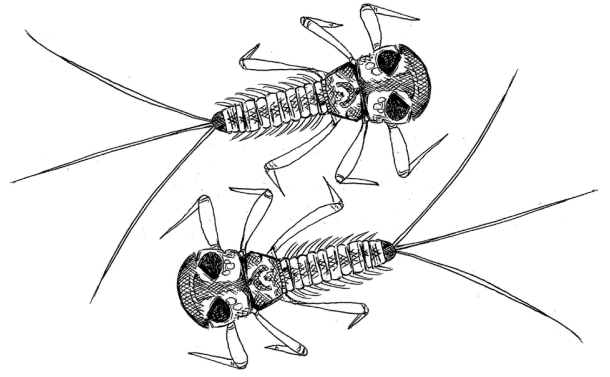
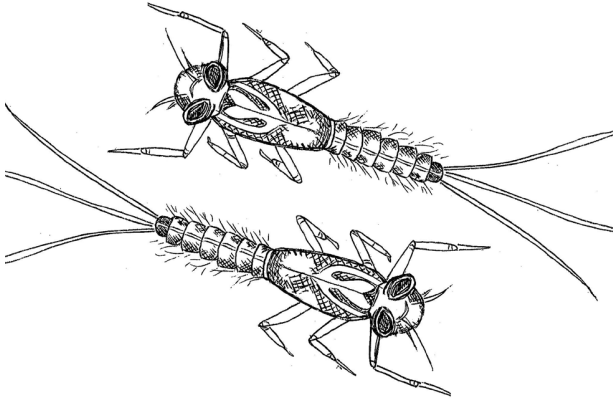
Physidae

Group 3

Also called "bladder snails" or "tadpole snails".

Many species are used in aquariums and pet store displays.

They are widespread, abundant, and tolerant of pollution.



Group 1

Macroinvertebrates

Group 2

Macroinvertebrates

Group 3

Macroinvertebrates

Flathead Mayfly Nymph

Heptageniidae

Group 1

The most abundant mayflies in flowing water.

Their flat bodies are adapted to cling to rocks in strong currents.

They eat algae, and scrap it off rocks.

Minnow Mayfly Nymph

Baetidae

Group 1

Their streamlined bodies make them excellent swimmers.

They are brown and green and can appear slightly translucent. This helps them camouflage among rocks and plants.

They live in the water for several years.

These macroinvertebrates
CANNOT tolerate pollutants
in the water.

They must have high
water quality to survive:
cold, clean, and clear water.

Spiny Crawler Mayfly Nymph

Drunella

Group 1

There are at least 20 species of *Drunella* mayflies.

Mayflies have four life stages and go from egg to nymph, subimago, and adult.

Mayflies are commonly used as inspiration and models for fishing lures.

These macroinvertebrates
CAN tolerate pollutants in
the water.

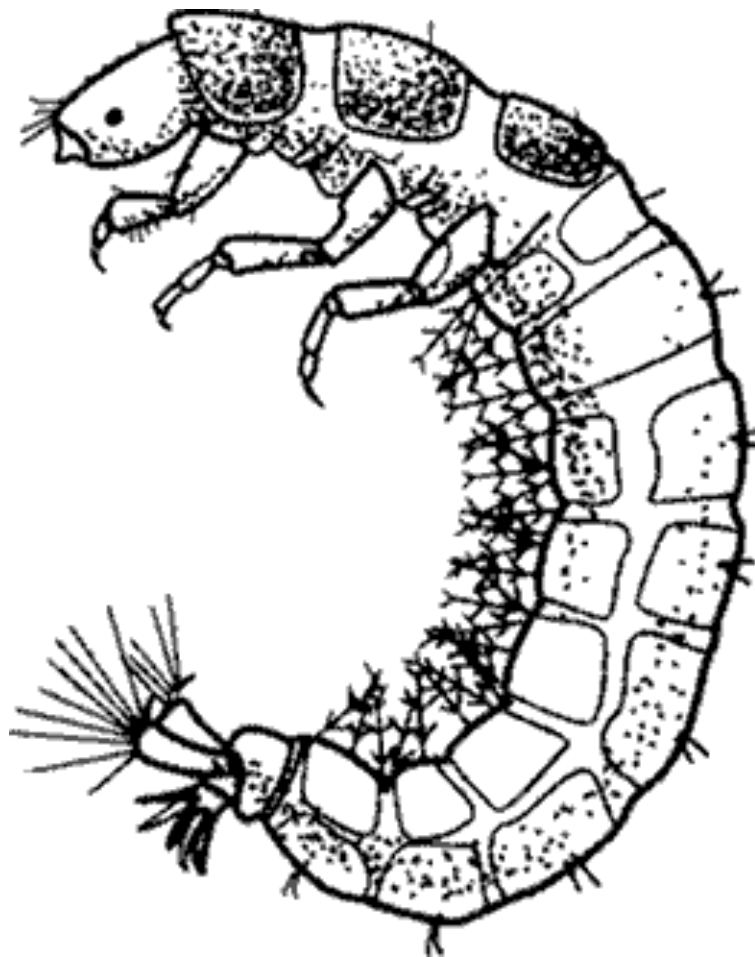
They can live in poor,
medium, and high water
quality conditions.

These macroinvertebrates
can tolerate **SOME**
pollutants in the water.

They can live in
medium and high water
quality conditions.

Macroinvertebrate Coloring Pages

Caddisfly larva

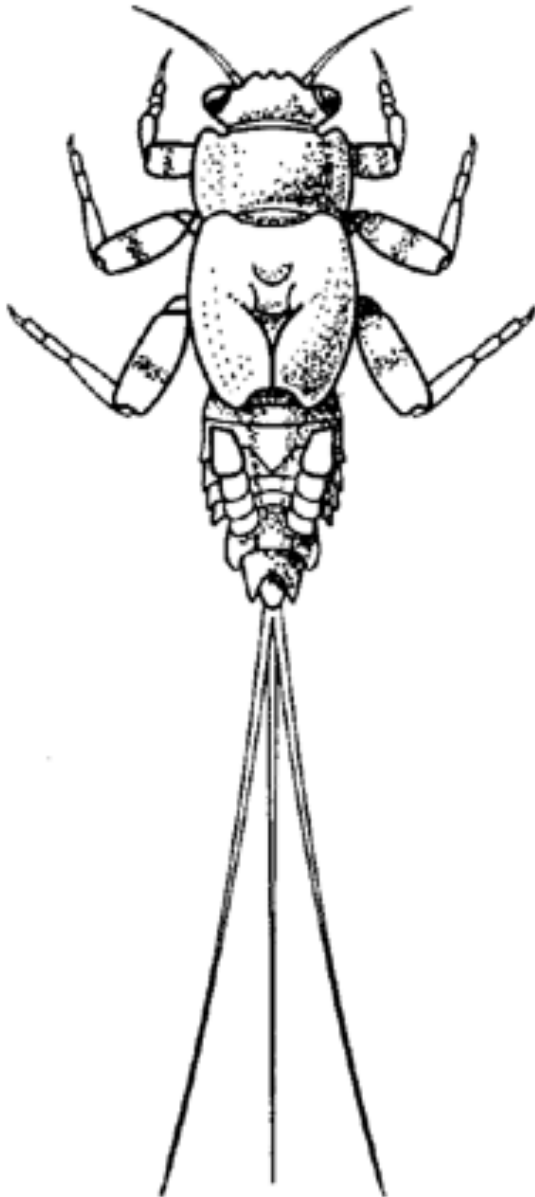


Point Rating: 3

- **Size: 10 mm**
- **Description:** Caddisfly larvae are builders. They make sticky silk from their spit and use it to spin webs for trapping other insects. Other species use the silk as glue that they mix with sand, twigs or grass to form a protective case. Most species have gills and get oxygen from the water that circulates through the case. They are most abundant near well-aerated streams and fast flowing water. When larvae morph and hatch into flying adults it is usually in a big group and the fish love it!
- **Point value : 3**

Larvae are especially sensitive to pollution. Found only in streams that are clean and have high levels of dissolved oxygen.
- **Key characteristics:**
 - Segmented legs
 - Six legs
 - Elongated body
 - Hooked, tail-like extensions
 - Protective mud and rock, or grass casing
 - Adults have wings that are covered with fine hair

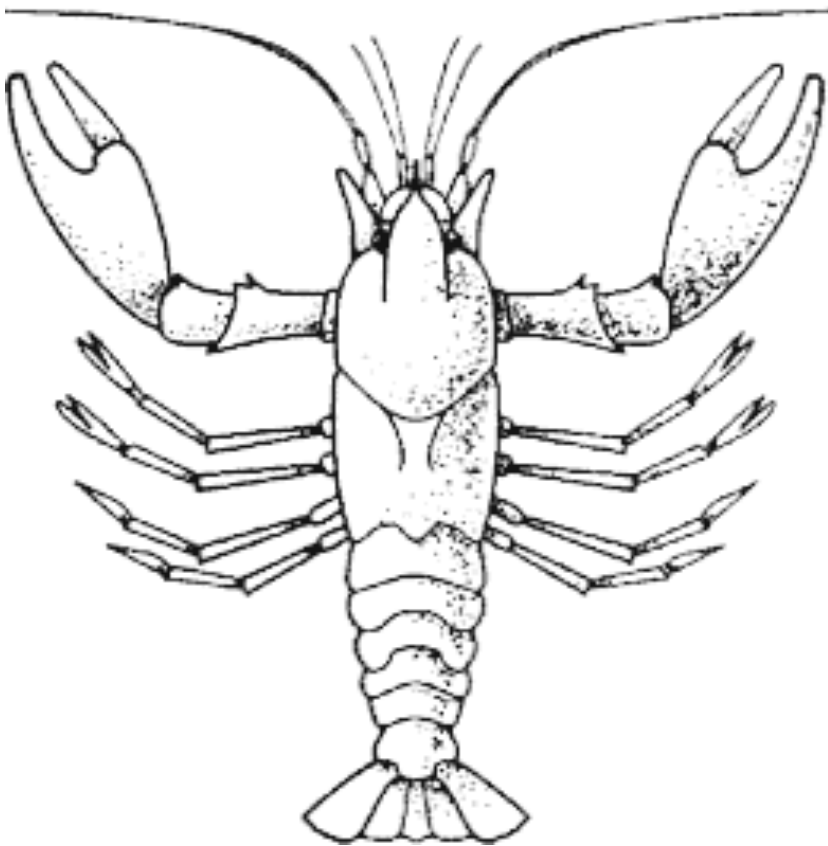
Mayfly larva



- **Point Rating: 3**
- **Size: up to 1 inch**
- **Description:** A detritivore, (eater of rotting leaves and twigs) or herbivore who grazes on tiny algae. This insect is crucial prey for salmon. The larvae hang out on rocks in fast currents, or they bury themselves in soft bottoms. They have abdominal gills that range from plates to feathery depending on the species. The greatest diversity of mayflies are found in cool, swift flowing streams.
- **Point value : 3**
They are very sensitive to pollution. Found only in clean and moving streams.
- **Key characteristics:**
 - Segmented legs
 - Six legs
 - Elongated body
 - Two to three tails
 - Feather-like gills, or plate-like gills

Crayfish

- **Point Rating: 2**
- **Size: 40 mm**
- **Description:** Also known as “crawdads,” crayfish hide under rocks and leaves during the day, and forage on the stream bed at night. They run backward when threatened and use their front claws for protection. They also use their claws to cut up food. Unlike other insects, crayfish do not metamorphose into flying forms. They complete their entire life cycle in the water.



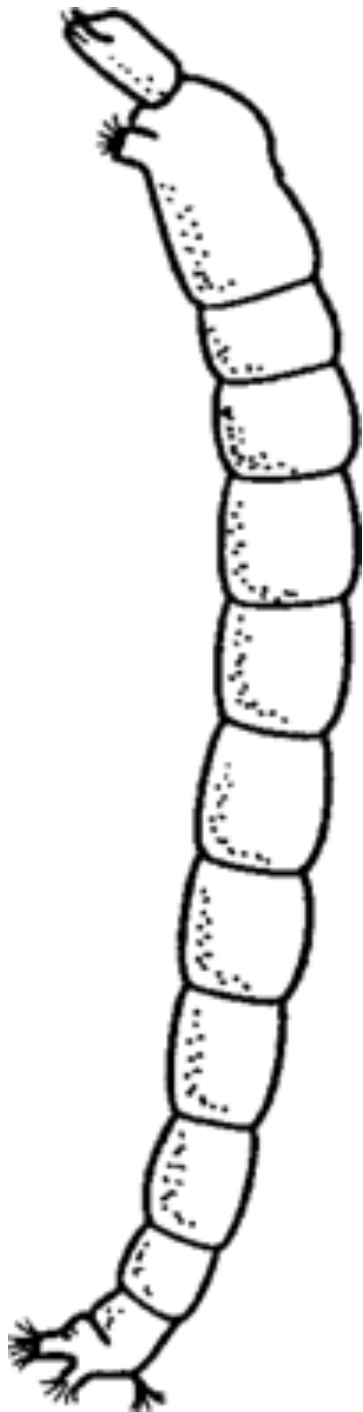
Point value : 2

Somewhat sensitive to pollution. Find them in fair quality water.

Key characteristics:

- Eyes stand out from the body
- Two or four antennae
- Plate-like shell covering body
- Dark red, orange or brown
- 10 legs, two are claws!
- Females may be seen with eggs or young clinging to the underside of their abdomen
- May live to be seven years old!

Midge Larva



- **Point Rating: 1**
- **Size: 8 mm**
- **Description:** The midge is a fly of the class Dintera, meaning having two wings. Like nearly all true flies, midges hatch as aquatic maggots. They are usually about a centimeter long.
- **Point value : 1**

They are not sensitive to pollution and are found in all but the most polluted aquatic conditions.
- **Key characteristics:**
 - One pair of tiny, fleshy legs below the head and one pair on the back end
 - Digestive tract can be seen inside the body as a thin dark line
 - Thin, slightly curved, segmented, inch worm-like body
 - Distinct, dark head

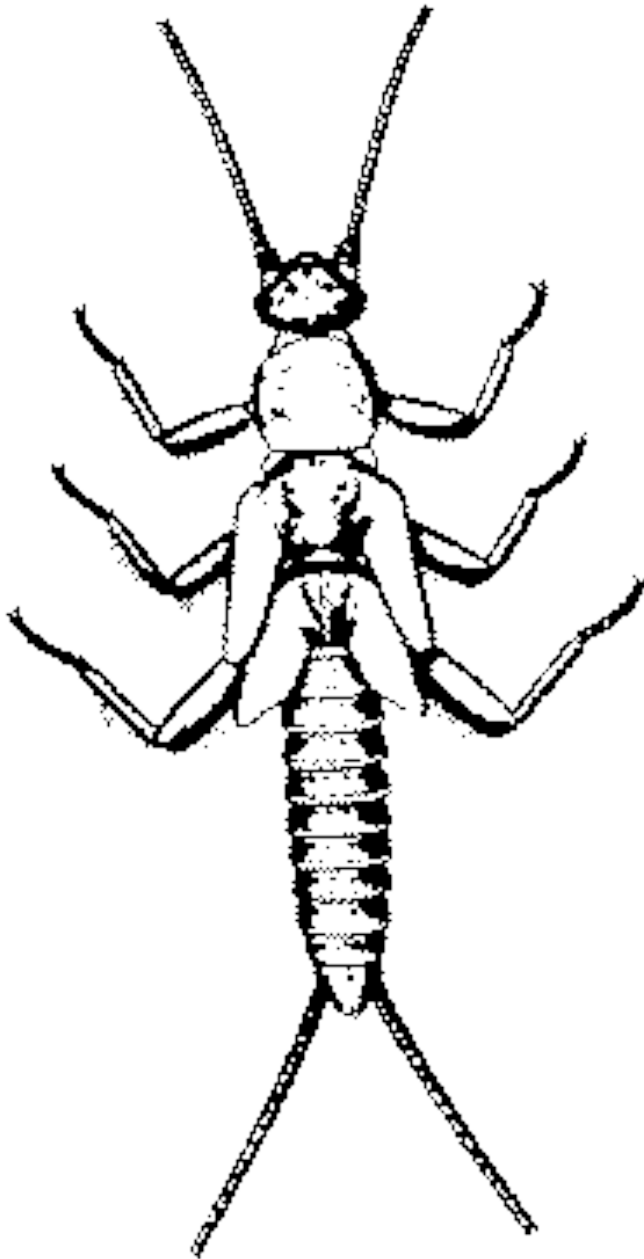
Black Fly Larva



- **Point Rating: 1**
- **Size: 10 mm**
- **Description:** They move by drifting downstream on silken threads that extend from the tip of the abdomen. You can find them stuck with an attachment disk to rocks, sticks or other debris in streams.
- **Point value : 1**

They are not sensitive to pollution and can live in any quality of water.
- **Key characteristics:**
 - segmented body
 - head is usually black, brown, tan or green
 - Attachment disks, like small suckers on the end of the abdomen
 - one leg-like appendage directly under the head
 - back end of body widens and is bulbous
 - no legs
 - tiny gills by head filter food from water

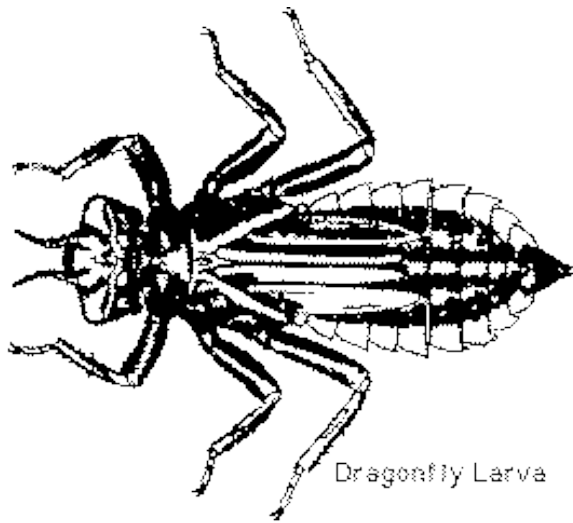
Stonefly larva



- **Point Rating: 3**
- **Size: up to 1 inch**
- **Description:** There are about 500 known species in North America, they predate on other insects, and also feed on fungi, and bacteria on rotting organic material. They spend three months to three years maturing in cool, clean streams with high levels of dissolved oxygen. Stonefly nymphs have fixed gills that can only extract oxygen in moving water. If they get trapped in still water they will die quickly.
- **Point value : 1**

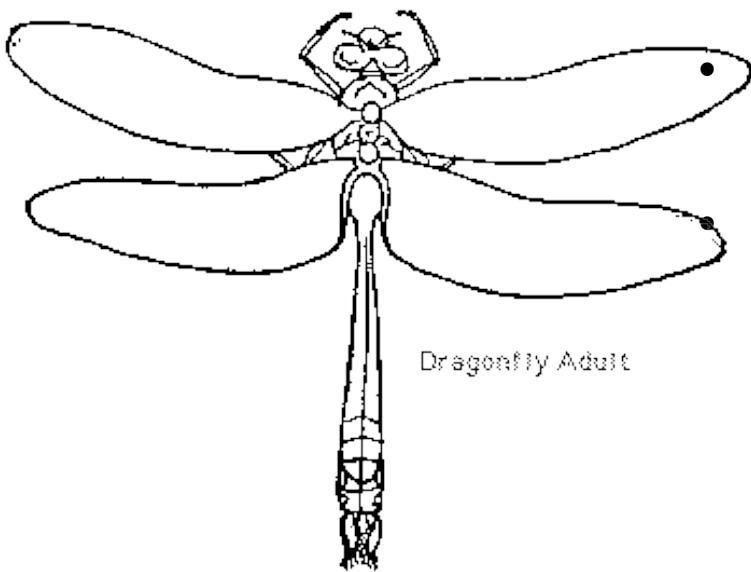
They are very sensitive to pollution and only survive in clean, cool, riffled water.
- **Key characteristics:**
 - Six segmented legs on middle section of body.
 - Each leg has two hooks on the end
 - Gills often located on or behind each leg
 - Two long antennae
 - Two hair-like tails that are sensory feelers

Dragonfly larva



Dragonfly Larva

- **Point Rating: 2**
- **Size: 10 mm**
- **Description:** They eat mosquitoes, midges, flies, bees and butterflies. Most of their life is spent in the aquatic larval stage, breathing through internal gills and using extendable jaws to catch other insects, or even tadpoles. The larval stage may last as long as five years, and when the larva is ready to metamorph it climbs up a reed at night. Exposure to the air causes the larva to begin breathing, the skin splits behind the head, the adult crawls out of its old larval skin, and as the sun rises the wings start to pump and it flies off to feed on insects.



Dragonfly Adult

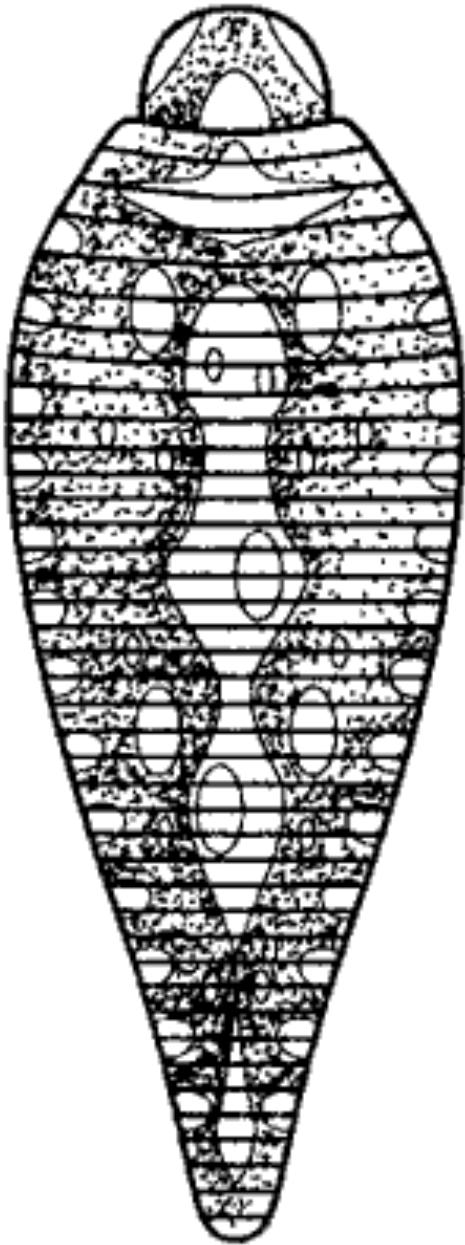
Point value : 2

They are mildly sensitive to pollution.

Key characteristics:

- Large scoop-like lower lip
- Large eyes
- Wide oval or round abdomen that may end in three wedge-shaped extensions
- Internal gills
- Six long segmented legs on upper middle section of body

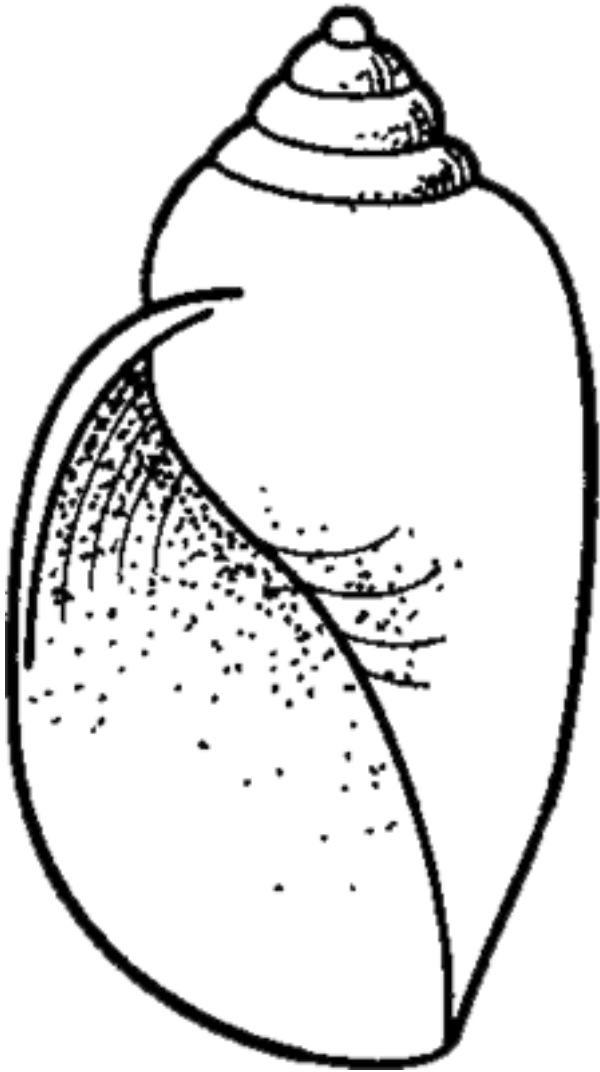
Leech



- **Point Rating: 1**
- **Size: 20 mm**
- **Description:** There are more than 64 species of freshwater leeches. Find them swimming in slow-moving water. A scavenger, and parasite that lives by attaching itself to other animals and sucking their blood, usually fish and frogs. Only a few species parasite on humans, and the leeches that do attach to humans are not found in fast moving water or riffle areas. In the past doctors thought they could cure a patient's illness by sucking out the bad blood with leeches and they are still used today to speed the healing of wounds.
- **Point value : 2**

They are not sensitive to pollution and can live in almost any quality of water.
- **Key characteristics:**
 - Worm-like segmented body
 - No segmented legs
 - No distinct head
 - No hard shell
 - Suckers at each end of wide, flat body

Pond snail



- **Point Rating: 1**
- **Size: 20 mm**
- **Description:** Some snails have gills that are sensitive to pollution, but the pond snail has no gills. It gets its oxygen directly from the air and stores it in its shell. This means that the pond snail is not as sensitive to polluted water as are other types of snails.
- **POINT VALUE: 1**
Pond Snails are not sensitive to pollution and can live in almost any water.
- **LISTING OF KEY CHARACTERISTIC**
 - No segmented legs
 - No distinct head
 - Hard shell
 - Single coiled shell
 - Shell opens to the left

Macro Memory Game

Aquatic Macroinvertebrates *playing cards*



Introduction

The Aquatic Macroinvertebrates playing cards are designed to help young people become familiar with some of the most common bugs found in local waterways.

The pack includes background information relating to the classification of aquatic macroinvertebrates, along with some suggested activities to assist student learning about macros from local environments.

Three classic card games (memory, go fish, and snap) have been adapted for use with the cards, and instructions of how to play are included in this pack. We encourage participants to modify the rules or develop their own games and activities using the cards.

Please **print two copies** of each of the card sheets (or four if you want to expand the playing time of the games). They are designed to be double-sided. If your printer doesn't allow double-sided printing, print out the face cards first and then flip the paper and run it through again to print the back of the cards. Cut out the cards along the lines, one species per card. You might like to print them on card to make them more durable.

Although these cards are a great way to develop young people's interest in the environment, they are not intended to be a substitute for getting out of the house or classroom to investigate local ecosystems. Please visit our website to download free identification charts and other resources to assist in your learning.

Furthermore, we have produced card packs for other creatures, such as common urban and bushland birds, which you may like to combine with these cards to expand the three classic games and learn more about our ecosystems.

We sincerely hope you enjoy playing the games and trust that you will learn a little more about the wonderful creatures living in the Green Adelaide region.

Classification

Background information

Many kinds (species) of macro-invertebrates can be found in our waterways. Each species has its own unique features and it may be grouped with other species that have similar features.

There are a huge number of different aquatic macro-invertebrates, but many of the common ones in SA can be sorted into just a few major groups. There are seven groups represented in this pack of cards, each with their own unique characteristics:

Flatworms

- no legs
- flat, unsegmented soft bodies
- a blind gut with single opening for feeding and excreting (or waste is excreted directly out of the body wall)
- eyespots to detect light.

Annelid/Segmented worms (e.g. earthworms, freshwater worms & leeches)

- no legs
- soft bodies; segmented a bit like a string of sausages
- some, like leeches, have suckers at each end that they use to aid movements or for eating
- *Note:* some insect larvae are often called worms (e.g. bloodworm) but are not real worms.

Molluscs (e.g. octopus, squid, snails & clams)

- soft unsegmented body, often with a protective shell or shells
- although the body is unsegmented, it is loosely divided into 3 parts – foot, visceral mass (holds body organs) and mantle (tissue that covers visceral mass and secretes the shell).
- some have legs (e.g. squid & octopus).

Arachnids (e.g. spiders, mites & scorpions)

- segmented body split into two parts (cephalothorax & abdomen)
- four pairs of jointed walking legs plus two pairs of feeding legs (eg pincers on scorpion)
- no antennae or wings
- shed their exoskeleton to grow.

Crustaceans (e.g. crabs, lobsters, shrimp)

- segmented body, usually with the head and thorax fused together
- chitinous "crusty" exoskeleton – thick like a crab or thin like a water flea
- many pairs of jointed legs
- shed their exoskeleton to grow.

Springtails

- soft, segmented body made up of three parts (head, thorax and abdomen)
- three pairs of legs, one pair of antennae
- no wings
- spring-loaded tail used in jumping
- water-repellant hairs and scales to keep afloat on the surface of the water.

Insects

- segmented body made up of three parts (head, thorax and abdomen)
- three pairs of jointed legs – larvae may have extra legs (pro-legs) without joints to help them move around
- usually two pairs of wings
- usually have some form of metamorphosis from juvenile to adult (many flying insects have aquatic stages in their lifecycle)
- shed their exoskeleton (outer skin) to grow.

Macroinvertebrate features activity

On the board write the names of the seven macro groups included in this pack (Flatworm, Segmented worm, Mollusc, Arachnid, Crustacean, Springtail and Insect).

Give each student a card and ask them to work out which group their animal belongs to.

As a group, brainstorm the features of the macros in each of these groups.

What things do the macros in each group have in common? Write these on the board

Macroinvertebrate art activity

Give out one card to each student.

Ask them to draw or make a model of the bug on their card (or enlarge and photocopy the bug cards).

Put up signs around the classroom showing the seven macro groups and display students' models or drawings near these signs.

Macroinvertebrate environments activity

Using student drawings, models or the cards themselves, create a river or wetland scene on the classroom floor.

Use a tarp or cloth as the water.

Use any other materials at hand to represent reeds, trees, shrubs, grasses, rocks, snags and soil which help make a healthy watery habitat.

Add the bug cards, models or drawings.

Once the area is set up, add other animals (students could play these roles) such as fish, birds, frogs and turtles.

Discussion points could include:

- Who eats who?
- What happens if cows are allowed to eat and drink along the river?
- What happens when chemicals are dumped in the river?
- What can you do to help keep the river environment clean and healthy?
- What happens if dog poo, litter, oil or detergent is allowed to wash into the river?

Bug Hunt

A game of memory and observation.

NUMBER OF PLAYERS: Unlimited.

OBJECTIVE: To collect as many matching sets as you can.

HOW TO PLAY

Shuffle all cards and lay them face down on the floor or table. Cards must not touch each other, but can be placed in any order or direction.

The youngest player chooses who goes first.

The first player picks any two cards and shows them to the other players. If they match, keep the matched set and select two more cards. Continue this way until two non-matching cards are selected.

If the cards do not match, they must be returned face-down to their original positions. The next player then takes their turn.

WINNING

The winner is the player with the most matching sets when all cards have been matched or when the time limit is reached.

The key to winning is to remember where the cards are located.

Go Fish

Based upon the traditional card game.

NUMBER OF PLAYERS: 2 to 6.

OBJECTIVE: To get rid of all of your cards.

HOW TO PLAY

Shuffle cards and deal equally face-down to all players, with one extra hand dealt for the pile. If there aren't enough cards for all players to get an equal number, the extras get placed on the pile (i.e. an equal number of cards for each player, but more cards in the pile).

If you only have two copies of each card, students must make up sets consisting of both identical cards. If you printed four copies, students need four identical cards to make a set.

Without letting other players see their cards, players look at their cards and group them into sets. If players are dealt a full set, these are placed face up in front of them. Completed sets must be shown to other players.

Play starts with the player sitting clockwise next to the dealer.

The player asks any other player for a particular card, but the asking player must have at least one of the cards making up that set. If the player asked has that particular card, it must be handed over. The asking player can then ask any other player for another card.

Once a player gets all cards for a completed set, they must be placed face up in front of them. Completed sets must be shown to other players.

This continues until the player asks for a card that is not held by the player being asked. The asked player then calls **GO FISH** and the asking player must pick up a card from the pile. Play is then passed to the asked player.

WINNING

The first player to discard all of their cards by making sets is the winner.

Snap!

Based upon the traditional card game.

NUMBER OF PLAYERS: 2 or more.

OBJECTIVE: To be the only player remaining holding cards.

HOW TO PLAY

Shuffle cards and deal equally face-down to all players. If there are not enough cards for all players to get an equal number, the extras get placed on a central pile (i.e. an equal number of cards for each player, with all extra cards in the pile).

Players are not allowed to look at their cards. The youngest player chooses who goes first.

The first player turns over their top card and places it face up on the central pile, or creates a new pile if there are no cards on the pile.

If the card played is the same as the top card on the pile, players must call out **SNAP** and place their hand on the pile. The first player to do so wins the pile and places them at the bottom of their deck. It is then their turn to play a card.

In a 2-person game, if the cards do not match and a player calls "Snap!" they forfeit the cards to the other player.

In a 3 or more-person game, if the cards do not match and a player calls **SNAP** they forfeit a turn and cannot rejoin the game until there has been a successful **SNAP**. The cards remain in the pile.

If the card played does not match the top card on the pile, the next player turns over their top card and places it face up on the central pile.

When a player has no more cards in their hand, they are eliminated from the game. Play continues until only one player has cards or until the designated time limit is reached.

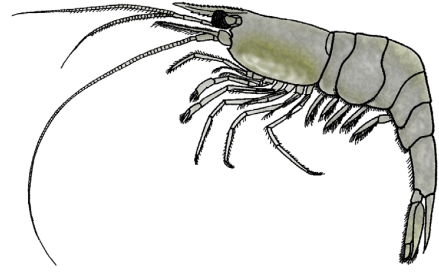
WINNING

The winner is the only player with cards remaining or is the one with the most cards when the time limit is reached.



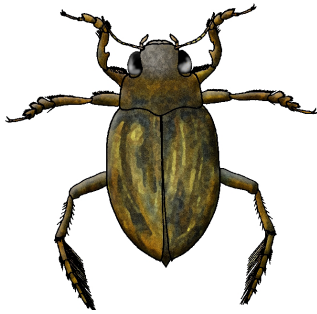
Backswimmer

I am a carnivore who likes to suck the body juices of other insects, tadpoles and small fish!



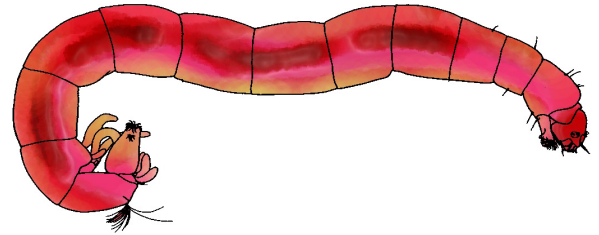
Freshwater Shrimp

I mainly eat rotting vegetation, bacteria and algae. I use my first two pairs of legs to grab the food and put it in my mouth.



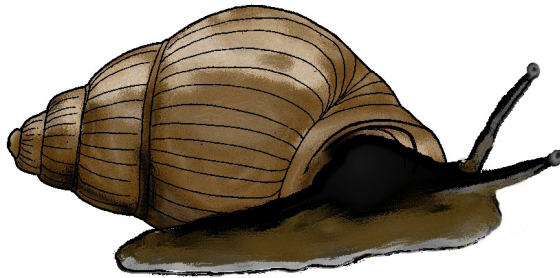
Predacious Diving Beetle

I have chewing mouthparts which helps me eat other aquatic invertebrates, small fish and tadpoles!



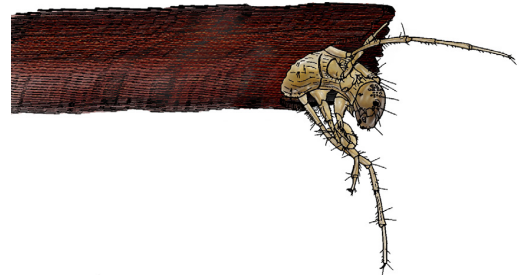
Non-biting Midge larva

I am red because of iron in my blood which helps me live in water low in oxygen. Sometimes I called a Bloodworm.



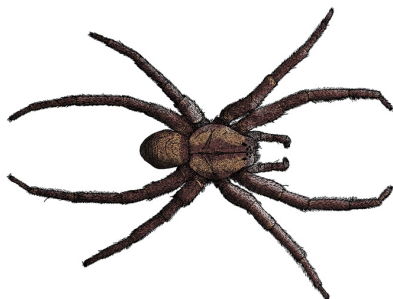
Freshwater Snail

I am a herbivore and I scrape algae from the surface of rocks and plants.



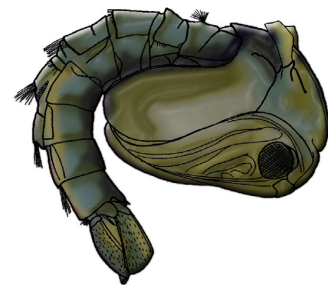
Caddisfly larva

I build myself a protective case out of leaves, sand, reeds or sticks. I am very sensitive to pollution.



Fishing Spider

I dive beneath the surface of the water to hunt. Fine hairs on my abdomen trap air bubbles so I can breathe underwater.



Mosquito pupa

As a pupa I do not eat at all, so I had make sure I ate enough when I was a larva to make it through to becoming an adult!

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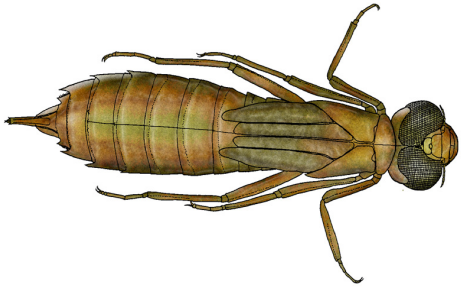


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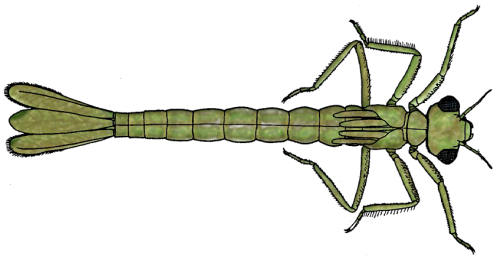
Dragonfly nymph

My gills are inside my bottom, so I have to pump water in and out of it to breathe. I can also jet propel through the water!



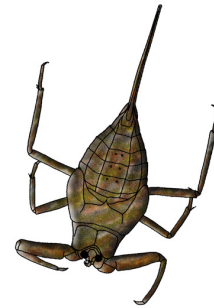
Soldier Fly larva

I hold my tail at the surface and breathe through little holes. The hairs help to repel water so that I don't suffocate.



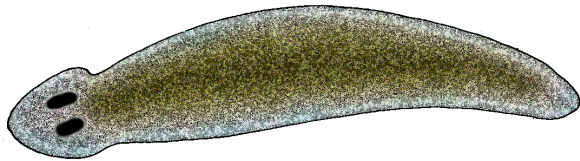
Damselfly nymph

The three tails at the end of my body are actually gills that help me to breathe. I eat other insects, fish and tadpoles.



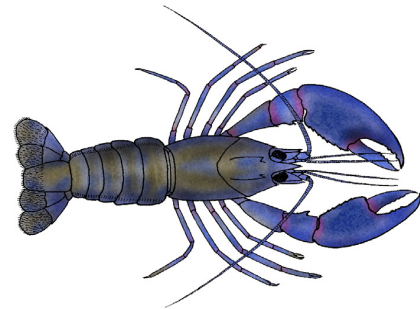
Water Scorpion

I'm not really a scorpion, I'm an insect. My long tail works like a snorkel so I can breathe underwater when hunting.



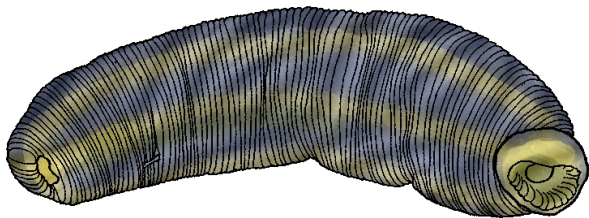
Flatworm

I like to eat decomposing plant matter and my mouth is in the middle of my body. I also use it to get rid of my waste!



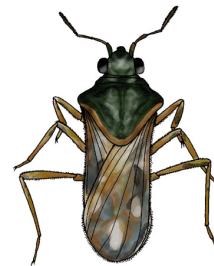
Yabbie

I have a hard exoskeleton which I will shed as I grow. In very clean water I can turn blue, but in muddy water I'm brown.



Leech

I mainly feed on the blood and juices of snails and other aquatic animals. I have suckers at each end of my body.



Small Water Strider

I run on the surface hunting small animals. My mouth is like a straw which I use to stab prey and drink their juices with.

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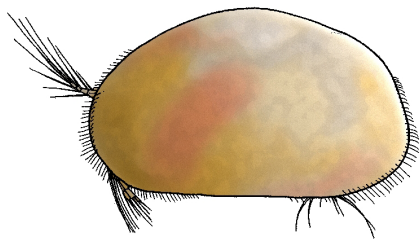


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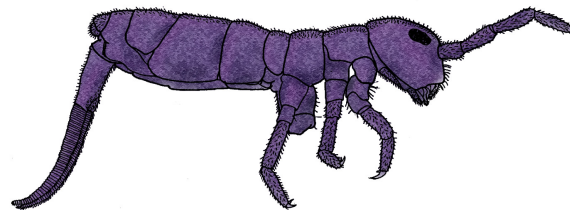


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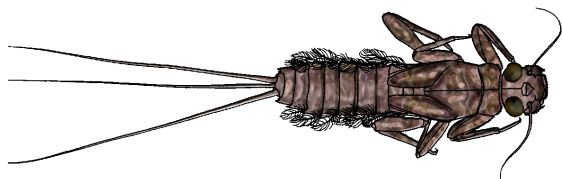
Seed Shrimp

I use my antennae for locomotion and I have a hinged, bivalve shell that I can close up around me.



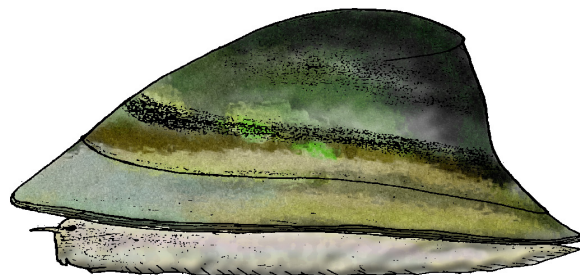
Springtail

I'm only about 3mm long but my spring-loaded tail lets me jump over 30cm in the air to avoid danger!



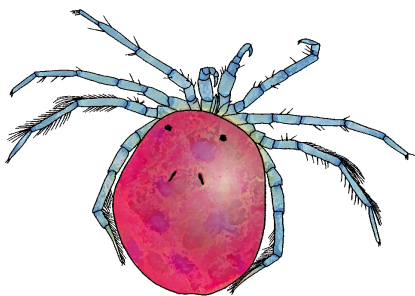
Mayfly nymph

As a nymph I may take two years to develop, but once I turn into an adult I may only live for a few weeks.



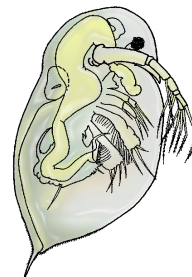
Freshwater Limpet

My cone-shaped shell which points backwards at the top is designed to help me live in fast-flowing water.



Water Mite

I feed on small animals by sucking their juices. When I'm a baby I only have six legs but when I grow up I have eight.



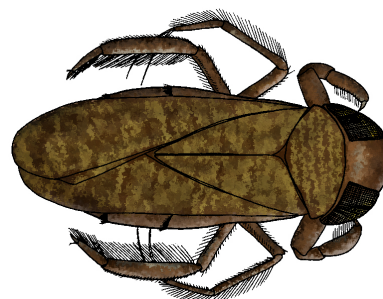
Water Flea

Unlike the fleas on a dog, I won't bite you. I eat by filtering small items out of the water with the hairs on my legs.



Whirligig Beetle

I'm a strong swimmer and can dive to avoid predators. I'm often seen swimming in groups on the surface of the water.



Water Boatman

If you listen you may hear me call. Males rub their legs or beaks to make a loud click which attracts females.

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