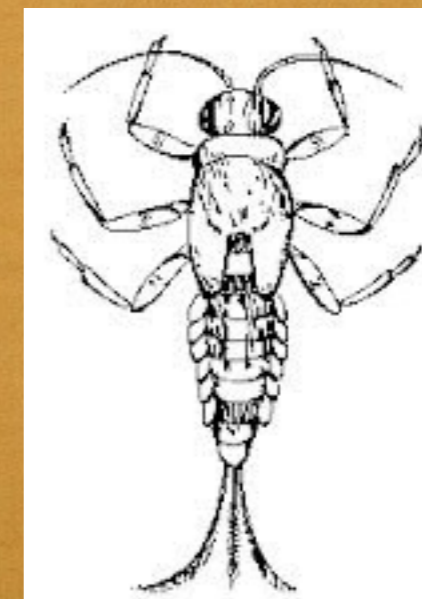# EQ # 3- Macroinvertebrates

How do they help Indicate Stream Health?

Measuring Water Quality

- The <u>water quality</u> (or "ecological health") of a stream can be <u>assessed</u> by <u>measuring the presence</u> or <u>absence of the aquatic insects living or NOT living in the water.</u>

- This type of survey is called a <u>bioassessment</u>. It gives an indication of how well the water can sustain life.

- Our water insect surveys are called <u>Macroinvertebrate Surveys</u>.

Definitions
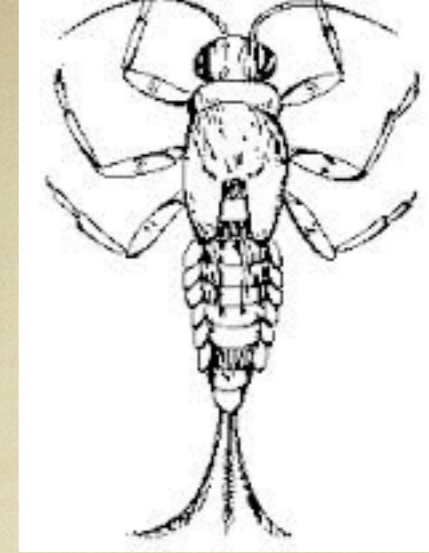
- **Macroinvertebrates**-An <u>insect without a backbone</u>. It is <u>visible to the eye</u>, without a microscope

  - Macros make good indicators because they don't move much and are sensitive to pollution

- **biodiversity**- <u>the number of individuals and different types</u> of animals living in an area; an important indicator of environmental health

- <u>ecological health</u>- <u>the ability of an area to sustain animal life</u>; a diverse community of organisms.

Why are Macros considered bioindicators?

- Spend up to 1 year in stream

- Have little mobility

- Generally abundant

- Primary food source for many fish

- good indicators of localized conditions

COLLECTING A SAMPLE

- Students collect samples using nets in the stream

- Orient your net so stream water flows into it; long side down

- disturb the substrate and vegetation upstream of your net to loosen up the bugs

- Fill tub with clear water and Dip / dink net contents in a tub and see what you got!

Pollution Tolerance

- **Pollution tolerance score-** a number given to each macroinvertebrate that indicates its pollution tolerance or intolerance

- Sort and count your bugs. Score your bugs based on their status indicated on the data sheet...

  - Pollution Sensitive = 3 pts each

  - Wide Range = 2 pts each

  - Pollution Tolerant = 1 pt. each

Work on Data Sheet

- Record Taxa / order for each common name

- Add up totals for each insect

- Figure % of Total sample numbers and record

WRITE THE THREE CATEGORIES

3 Categories of
Stream Macroinvertebrates
(Note: some species of the Families listed below
can have species in a lower group.)

Group 1 - pollution sensitive (3pts)
(require higher DO, neutral pH, cold water)
Ex. mayflies, stoneflies, caddisflies

Group 2 – somewhat pollution tolerant (2 pts)
Ex. scuds, dragonflies, damselflies

Group 3 - pollution tolerant (1 pt)
(can tolerate low oxygen, lower/higher pH, warmer water)
Ex. aquatic worms, midge larva

Use Trays to Sort & Count

Get your data sheet

- Grab your data sheet and sit near your team

- Record the common names of the species you found on Monday or Tuesday this week.

- Look up their Scientific Names and record on your data sheet.
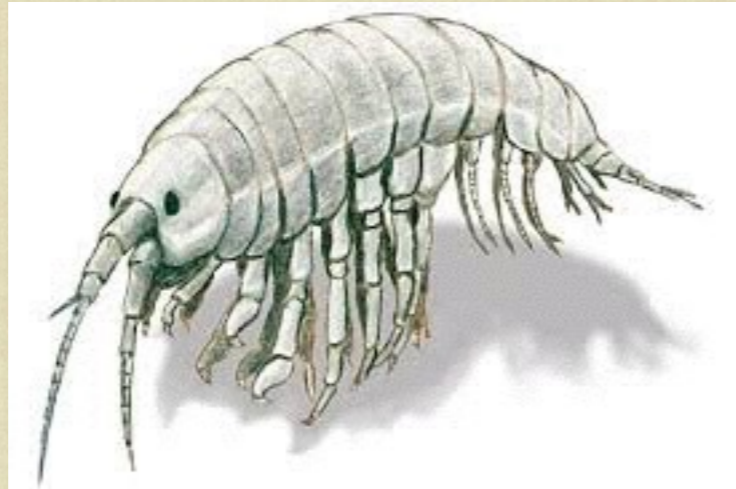
Add to your data

- For practice, we will now add the names of the following macros on to your data sheet.

- Work with your team to ID each of the following common macros to your sheet

WHAT AM I?

Water boatman

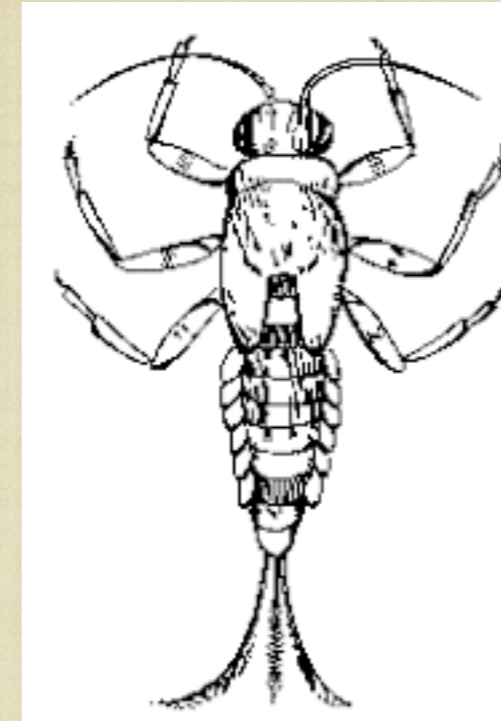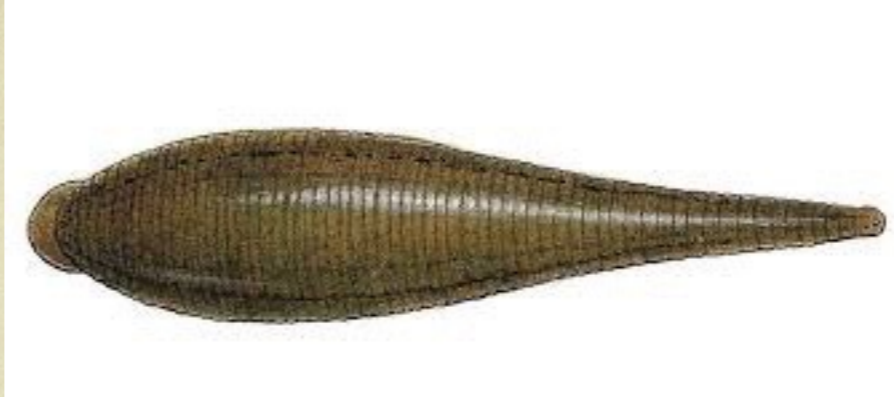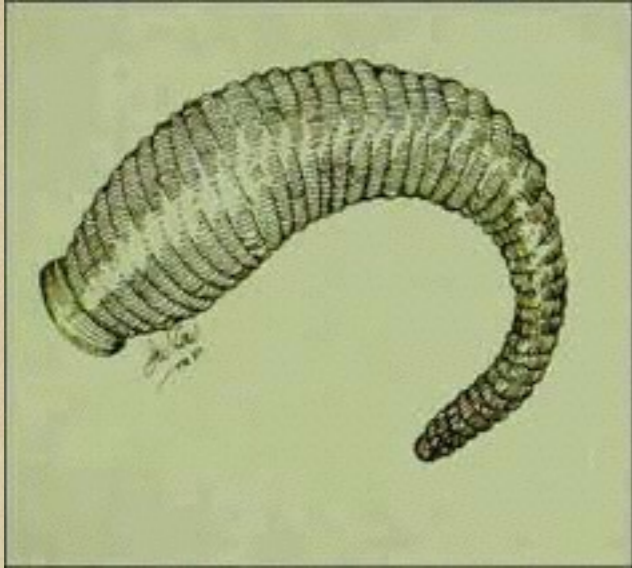# What am I?

SCUD

Wнат ам I?

MAYFLY!

DAMSELFLY

- How is it different from a mayfly?

- Mouth-It's hinged to reach out and grab prey

- Tail- Is actually a gilled tail; short. Mayfly tails are long and thin.
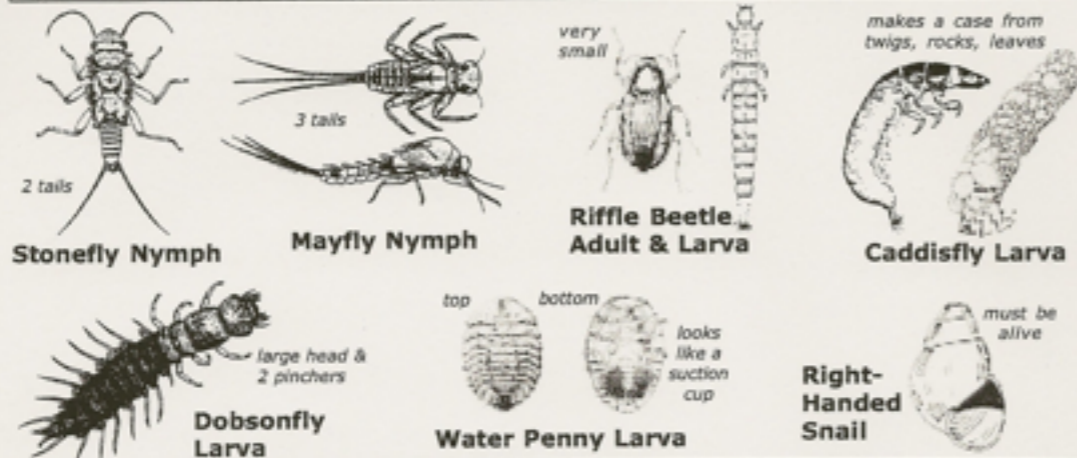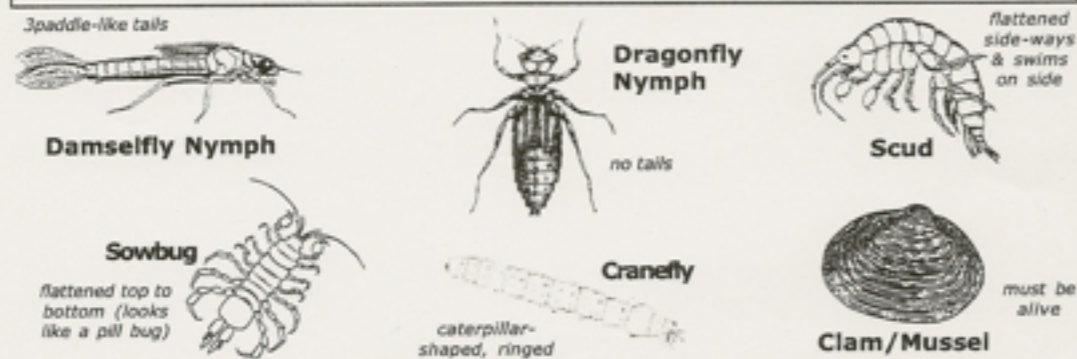
LEECH!

CADDISFLY LARVAE

STONEFLY

Dobson Fly

Macroinvertebrate Identification Key

GROUP 1 – Very Intolerant of Pollution

Stonefly Nymph — 2 tails

Mayfly Nymph — 3 tails

Riffle Beetle Adult & Larva — very small

Caddisfly Larva — makes a case from twigs, rocks, leaves

Dobsonfly Larva — large head & 2 pinchers

Water Penny Larva — top, bottom, looks like a suction cup

Right-Handed Snail — must be alive

GROUP 2 – Moderately Intolerant of Pollution

Damselfly Nymph — 3 paddle-like tails

Dragonfly Nymph — no tails

Scud — flattened side-ways & swims on side

Sowbug — flattened top to bottom (looks like a pill bug)

Cranefly — caterpillar-shaped, ringed

Clam/Mussel — must be alive

GROUP 3 – Fairly Tolerant of Pollution

Midge Larva — visible head & prolegs

Planaria — 2 eye spots & very small

Black Fly Larva — one end is swollen

Leech — flattened & segmented

GROUP 4 – Very Tolerant of Pollution

Aquatic Worms — segmented

Left-Handed Snail — must be alive

Rat-tailed Maggot

Blood Worm Midge Larva — bright red

100

www.HoosierRiverwatch.com
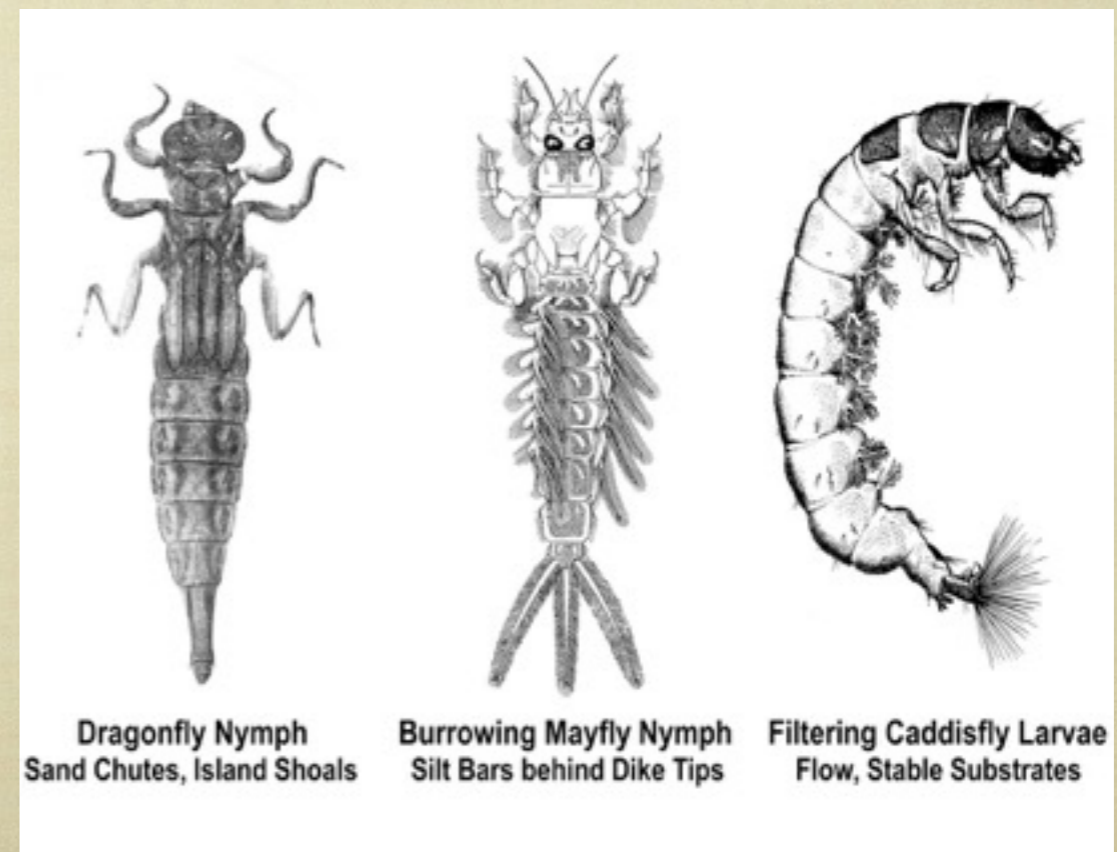
Pollution tolerance

- Each type of bug found gets a point value

- Bugs that are more <u>sensitive</u> (<u>pollution intolerant</u>) <u>get higher points</u>

- <u>The higher the overall score, the better the water quality</u>

Sensitive	Somewhat Sensitive	Tolerant
Pollution sensitive organisms found in good water quality.	Somewhat pollution tolerant organisms can be in good or fair water quality.	Pollution tolerant organisms can be in any quality of water.
caddisfly larvae	beetle larvae	aquatic worms
hellgrammite	clams	blackfly larvae (simuliidae)
mayfly nymphs	crane fly larvae	leeches (hirudinae)
gilled snails	crayfish	midge larvae
riffle beetle adult	damselfly/dragonfly nymphs	pouch (and other) snails
stonefly nymphs	scuds	
water penny larvae	sowbugs	
	fishfly/alderfly larvae	

Save our Streams Program, Izaak Walton League of America

Dragonfly Nymph
Sand Chutes, Island Shoals

Burrowing Mayfly Nymph
Silt Bars behind Dike Tips

Filtering Caddisfly Larvae
Flow, Stable Substrates

POLLUTION TOLERANCE INDEX (PTI)

- ADD UP YOUR TOTALS FOR EACH TYPE OR **TAXA** (SENSITIVE, WIDE-RANGE AND TOLERANT)

- THE **PTI** IS THE FINAL VALUE BASED ON THE TYPE AND NUMBER OF MACROINVERTEBRATES YOU FOUND IN YOUR SAMPLE

- THE PTI IS AN OVERALL INDICATOR OF WATER QUALITY HEALTH IN A STREAM--THE **HIGHER** THE NUMBER, THE **BETTER**

ACTIVITY: SURVEY

- GO TO A TUB AND RECORD THE NUMBER AND TYPE OF MACROINVERTEBRATES IN THE SAMPLE IN YOUR FIELD NOTEBOOK

- ONCE IDENTIFIED, COMPLETE THE PTI SHEET TO DETERMINE STREAM QUALITY

  - USING YOUR PTI DATA SHEET, INDICATE YOUR BUGS FOUND BY THEIR TAXA

  - ADD TOTAL TAXA IN EACH GROUP

  - MULTIPLY TAXA BY POINTS

  - GET A PTI SCORE FOR EACH GROUP

Common problems

- Sample size is too small—Ideally samples should have 50-100 bugs!

- Macros are mis-identified- this can lead to inaccurate results

TEST

A

B

C