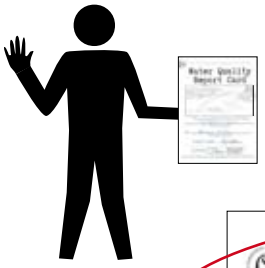
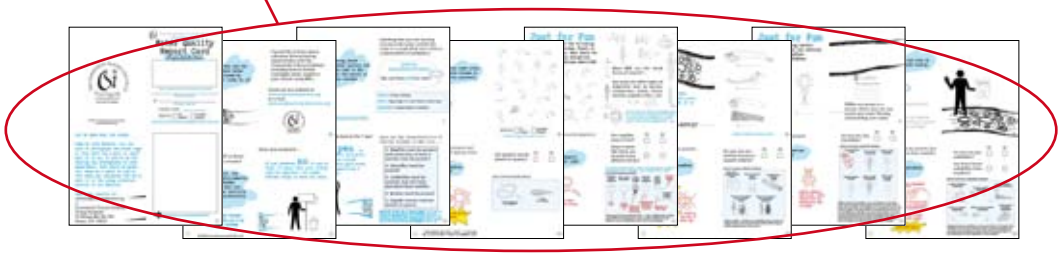


Directions for printing and constructing the CSI Biomonitoring Water Quality Report Card booklet at home:

THE COMMUNITY SCIENCE INSTITUTE
Partnering with communities to protect water

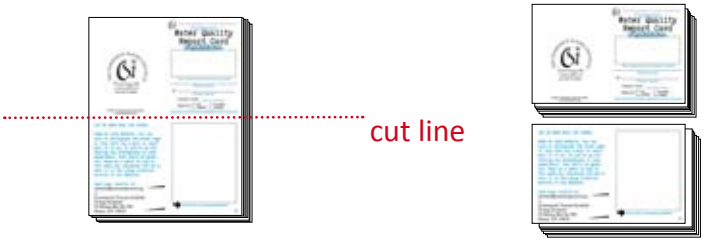


1. Print "CSI-WaterQualityReportCard-FormattedToPrintAsBooklet" file using the following settings:

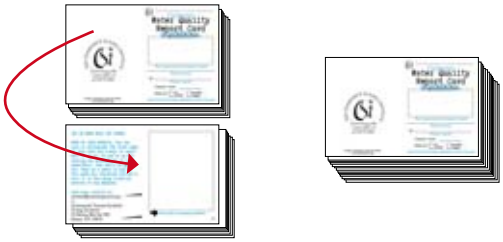
Double-sided ("flip over" or equivalent setting that results in both sides of each page sharing the same top edge)

* Check print settings to be sure that pages will print at actual size and NOT be scaled to fit the printable area.

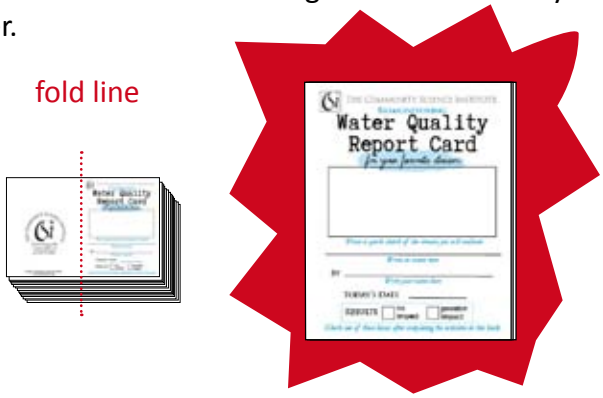
2. Cut stack of double-sided printouts in half lengthwise (5.5 inches down the 11 inch height)



3. Place the top stack on top of the bottom stack (the Water Quality Report Card title page should be on the right hand side of the top sheet of the stack.



4. Fold the entire resulting stack of sheets in half lengthwise and *Voila*! you should now have a booklet with the pages in the proper order.



5. After checking to make sure that the pages are rightside up and in the proper order, you can staple or sew through all of the pages along the fold line, if desired, to keep the booklet from coming apart. If the pages aren't in the proper order, go back and make sure you've followed the above steps exactly .

THE COMMUNITY SCIENCE INSTITUTE

BIOMONITORING

Water Quality Report Card

for your favorite stream

Draw a quick sketch of the stream you will evaluate

Write its name here

BY _____

Write your name here

TODAY'S DATE _____

RESULTS ☐ no impact ☐ possible impact

Check one of these boxes after completing the activities in this book

THE COMMUNITY SCIENCE INSTITUTE

Partnering with communities to protect water

LET US KNOW WHAT YOU FOUND!

SEND US YOUR RESULTS. You can scan or photograph the front page of this book and e-mail or snail mail it to us. If you're up for sharing any photographs of your experience, that would be great too. Send us a photo of you at the creek you evaluated and we'll post it in the young scientist section of our website.

Send your results to:
adrianna@communityscience.org
or
Community Science Institute
Young Scientists
95 Brown Rd, Ste 283
Ithaca, NY 14850

Draw a picture of one organism you find here

Did you know that you can learn a lot about water quality in a stream by observing what lives in it?

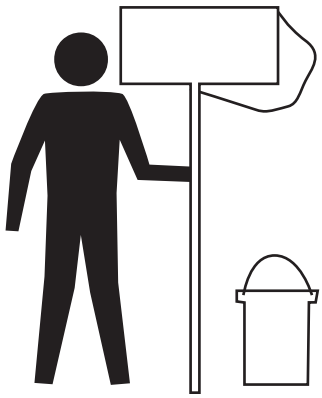
If you'd like to learn about volunteer biomonitoring opportunities with the Community Science Institute, including how to further investigate water quality in your stream using BMI...

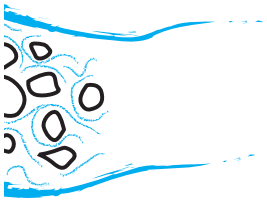
Check out our website at
www.communityscience.org
or e-mail
adrianna@communityscience.org

THE COMMUNITY SCIENCE INSTITUTE
CSI
Partnering with communities to protect water

stions you answered....

If you answered **no** to any of them, it means that your stream *might* be impacted, but needs further study to know for sure.





What can BMI tell us about water quality in a stream?

In New York State, the Department of Environmental Conservation (NYSDEC) has determined that non-impacted streams typically have 5 BMI characteristics in common*.

Non-impacted Stream
is basically another way to say
"Healthy" Stream

*NYSDEC Stream Biomonitoring SOP 2014, p.20

Thanks for caring about streams and water quality and for taking the time to find out more about the health of this particular stream!

Anything that you see moving around underwater amidst the rocks in a creek (that isn't a fish or a salamander) is probably a

BENTHIC MACROINVERTEBRATE

We call them BMI for short.

Benthic = Bottom-dwelling

Macro = Big enough to be seen without a microscope

Invertebrate = Animal without a backbone

Answers to "Just for Fun" Activities: 1. stonefly, 2. mayfly, 3. caddisfly, 4. mayfly, 5. caddisfly, Possible impact, due to caddisflies outnumbering mayflies.

Look back at the 7 ques

If you answered yes to all of them, that's fantastic! It means that your stream probably has pretty good water quality and is supporting a diversity of life.

Here are the characteristics of healthy streams in New York...

1. Mayflies must be present and numerous; at least 3 species must be present
2. Stoneflies must be present
3. Caddisflies must be present, but not more abundant than mayflies
4. Beetles must be present
5. Aquatic worms must be absent or sparse.

HELPFUL HINT: You might want to bring some equipment to the creek with you for this next part (such as a small paintbrush, white plastic container and magnifying glass). You can brush organisms gently off of the bottoms of rocks into a white container with some water in it and take a closer look at them with a magnifying glass. When the organisms are still on the rocks, they're often camouflaged and hard to see.

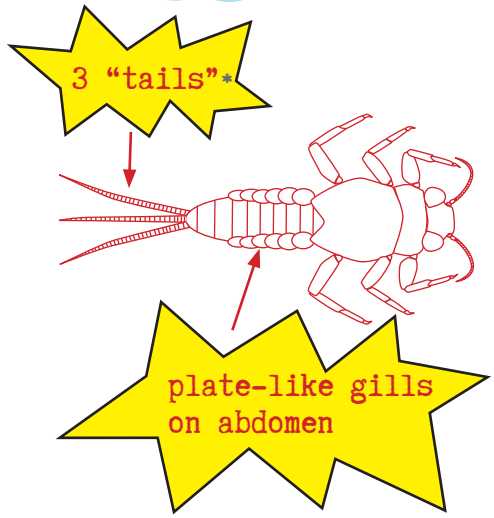
Try turning over some rocks in your favorite stream to find some BMI for yourself.

RESULTS ☐ no impact ☐ possible impact

Answers to "Just for Fun activities are on page 29.

1. Mayflies must be present and numerous; at least 3 species must be present.

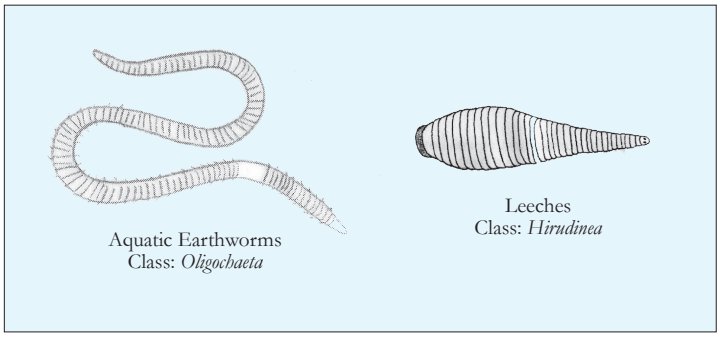
What do mayflies look like?



* some species only have 2 "tails" – if you only see 2 tails be sure to check for abdomenal gills

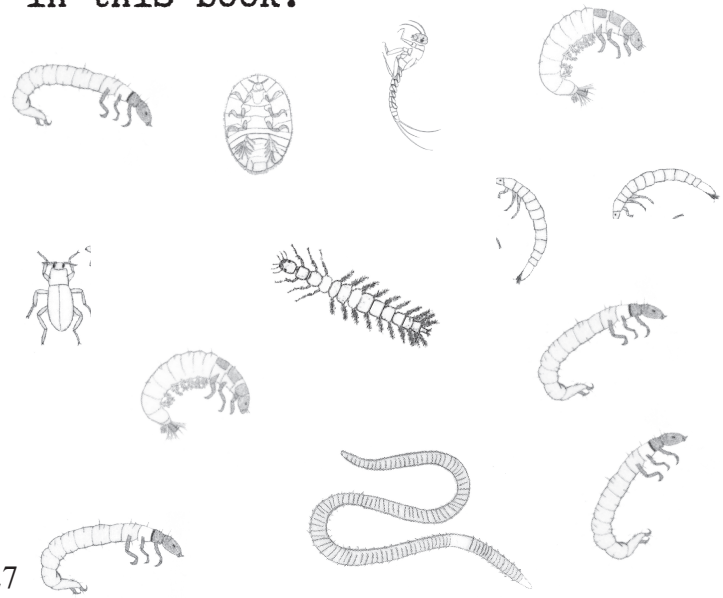
Are aquatic worms absent or sparse? YES ☐ NO ☐

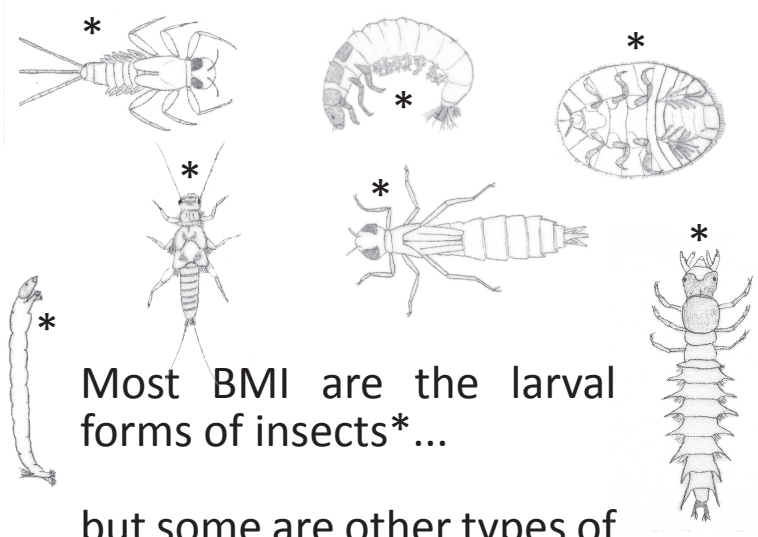
Some Common Aquatic Worms



Just for Fun

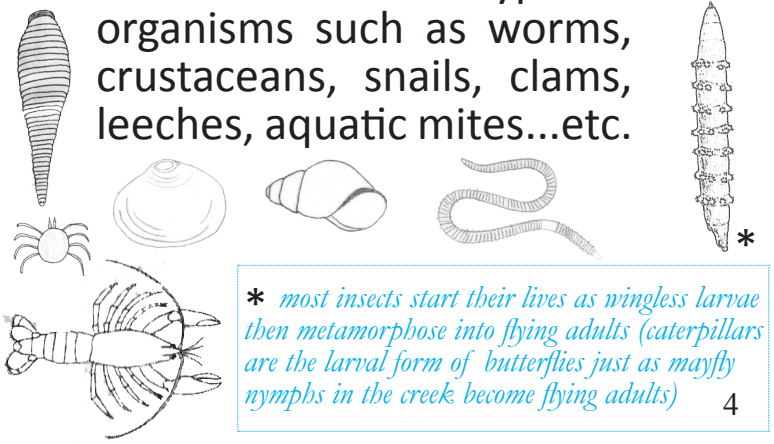
Pretend you found the following organisms in a stream. Based on what you see here, what would be your water quality evaluation based on the technique described in this book?





Most BMI are the larval forms of insects*...

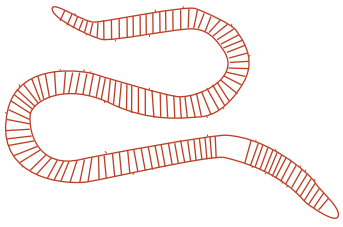
but some are other types of organisms such as worms, crustaceans, snails, clams, leeches, aquatic mites...etc.



* *most insects start their lives as wingless larvae then metamorphose into flying adults (caterpillars are the larval form of butterflies just as mayfly nymphs in the creek become flying adults)*

5. Aquatic worms must be absent or sparse.

What do aquatic worms look like?



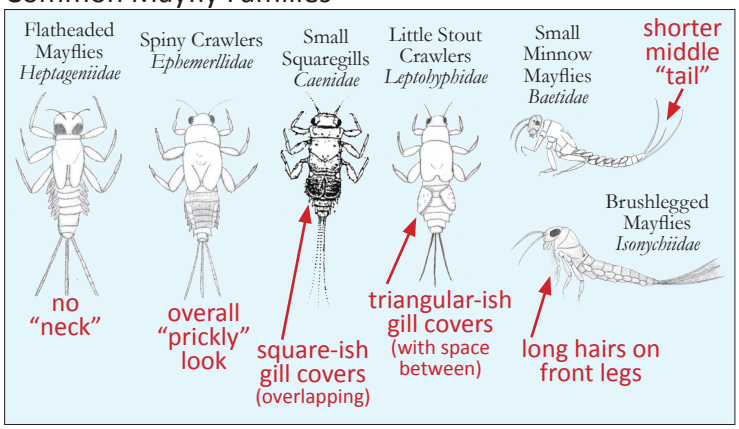
they all have segmented bodies

Are mayflies easy to find? YES ☐ NO ☐

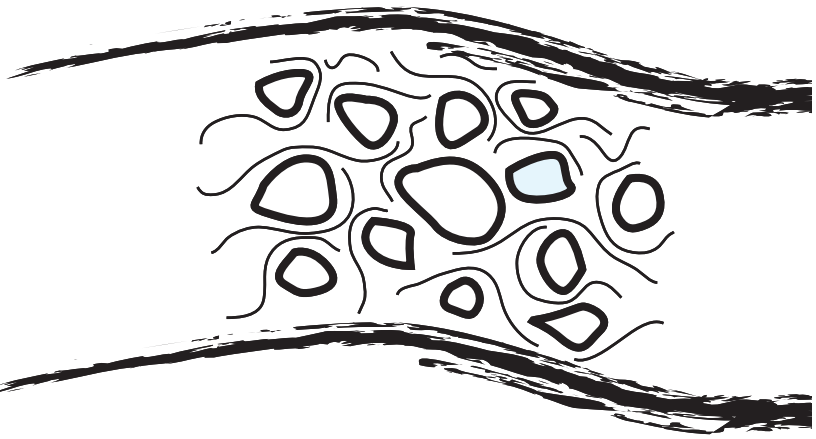
Does it seem like there are at least three different kinds? YES ☐ NO ☐

Some mayflies have flattened bodies and cling to rocks while others have streamlined, swimming forms. Here's a sampling of some of the different kinds of mayflies.

Common Mayfly Families

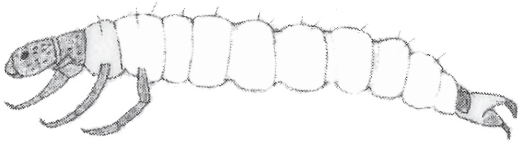


These pictures show mayfly *families* — each mayfly *family* is made up of different mayfly *species*. If you can find 3 different mayfly families, you can confidently answer YES to this question.



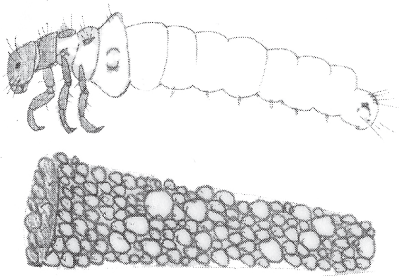
HELPFUL HINT:
The easiest place to find BMI is in RIFFLES.

What is a RIFFLE? .....



3._____

4._____

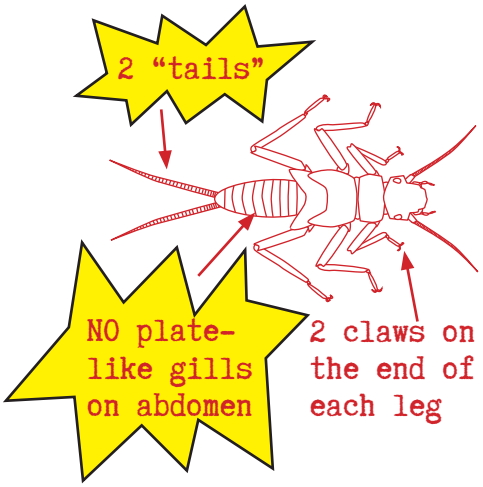


5._____

Answers to "Just for Fun activities are on page 29.

2. Stoneflies must be present.

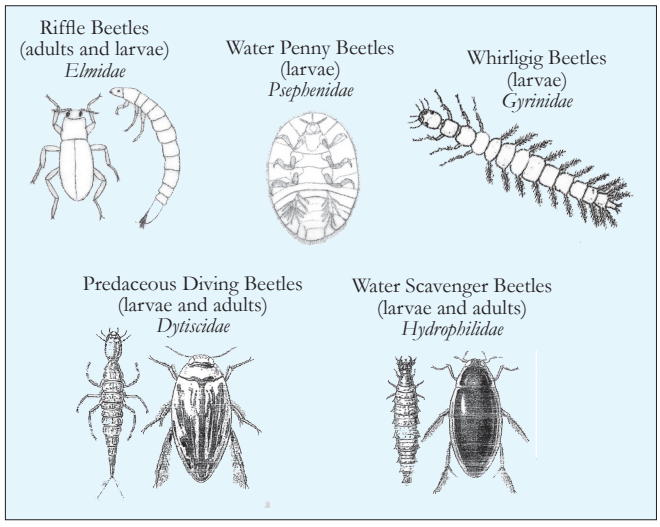
What do stoneflies look like?



Do you see any beetles (larvae or aquatic adults)?

YES ☐ NO ☐

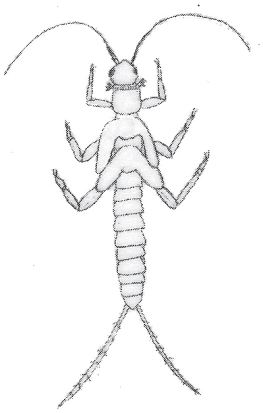
Some Common Beetle Families



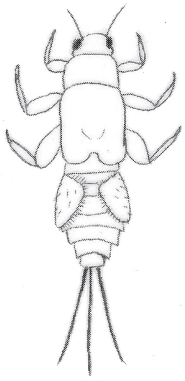
Unlike mayflies, stoneflies and caddisflies whose adults are winged insects, you may find some adult beetles living in creeks alongside their young larvae.

Just for Fun

Color the following benthic macroinvertebrates and identify them as either Mayflies, Stoneflies or Caddisflies.



1. _____



2. _____

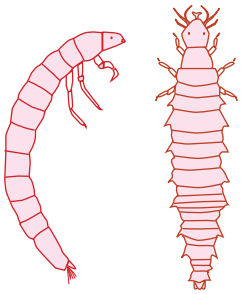
Listen

You can often hear them!

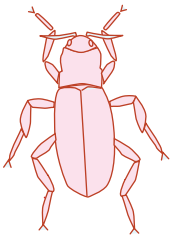
Riffles are places in a stream where you can see (and hear) water flowing and burbling over rocks.

4. Beetles must be present

What do beetles look like?



larvae have jointed legs and often have dark, stiff bodies

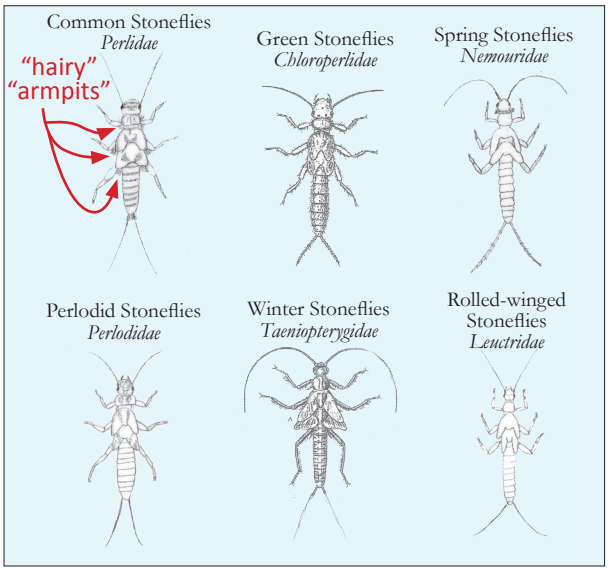


adults usually have hard, black bodies and are distinctly oval in shape

Do you see any stoneflies?

YES ☐ NO ☐

Some Common Stonefly Families

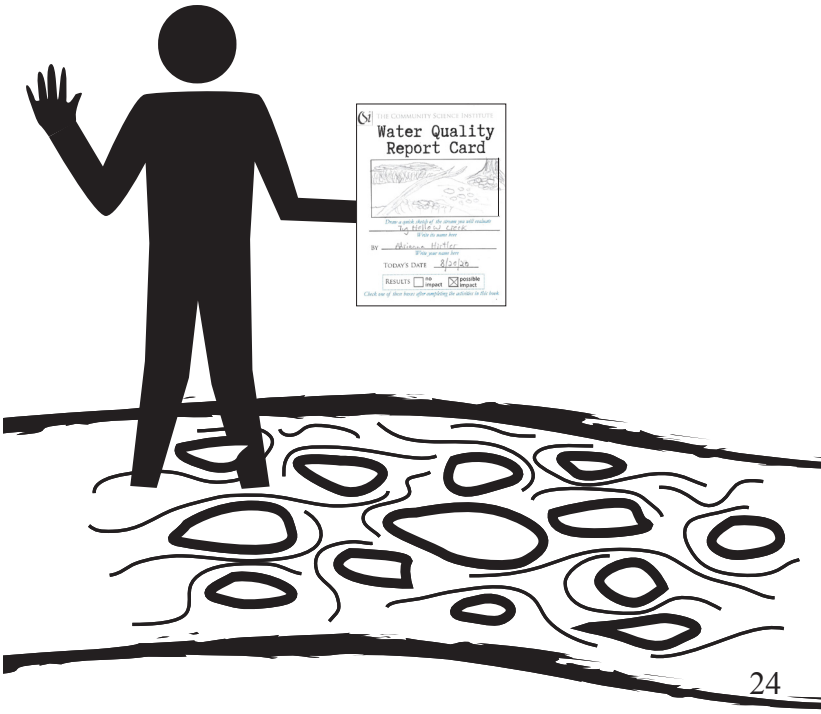


Different kinds of stoneflies are usually harder to tell apart (even just to family) than mayflies, but there usually aren't as many of them either. Just finding one is enough to answer YES to this question. Counting "tails" is usually the easiest way to tell the difference between stoneflies and mayflies. The most common stonefly family (common stoneflies) have finely-branched gills where each of their legs attach making them easy to recognize (it looks like they have hairy armpits).

Find a riffle and pick up one of its rocks slowly.

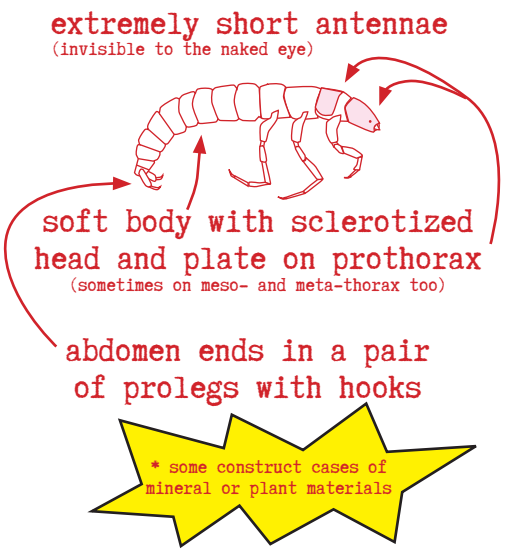
Did you see anything scurry or swim away?

Now look closely at the bottom of the rock while holding it out of the water. Anything moving?



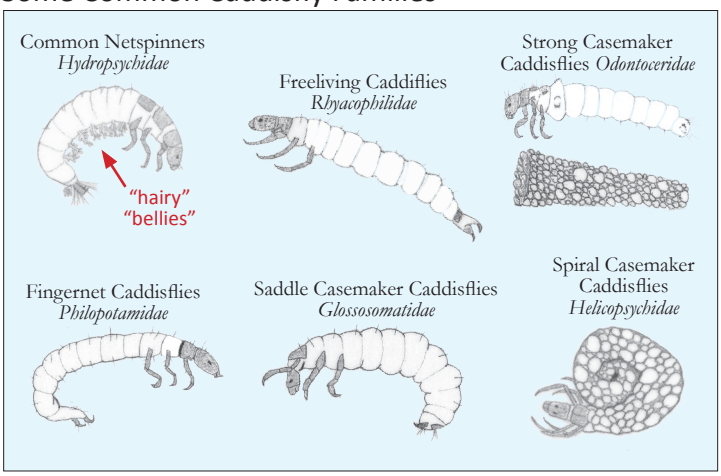
3. Caddisflies must be present, but not more abundant than mayflies.

What do caddisflies look like?



	YES	NO
Do you see any caddisflies?	☐	☐
Are there fewer caddisflies than mayflies?	☐	☐

Some Common Caddisfly Families



Different kinds of caddisflies can be even harder to tell apart than stoneflies, but the most common family (Common Netspinners) are quite easy to identify to family due to the branched gills on the ventral part of their abdomens ("hairy bellies").