

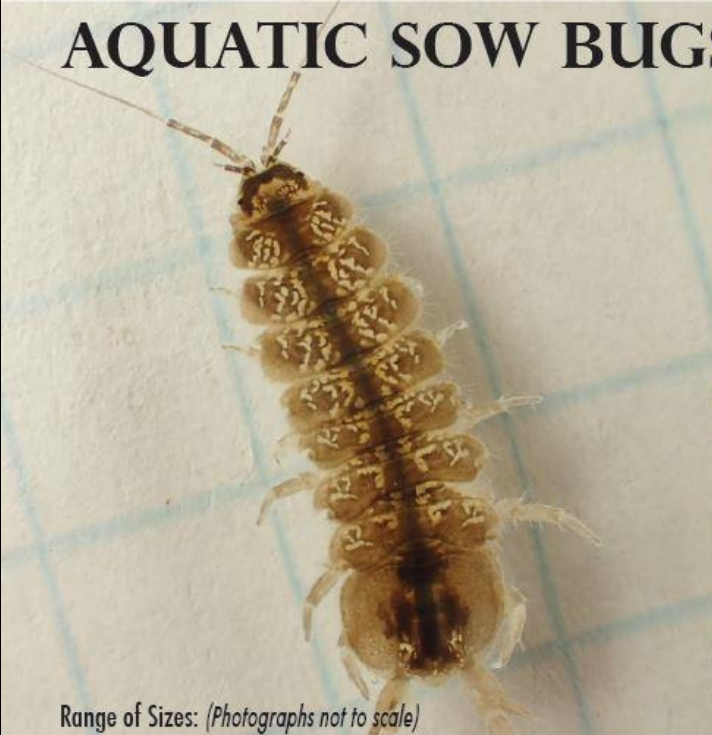
Students Collect, Identify, and Produce Identification Cards for Aquatic Macroinvertebrates at Harrold Campus, DCMO BOCES, Sidney Center, NY



This project was made possible with funds from the Catskill Watershed Corporation in partnership with New York City Department of Environmental Protection

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AQUATIC SOW BUGS



Range of Sizes: *(Photographs not to scale)*



AQUATIC SOW BUGS

Order *Isopoda* Family *Asellidae*

Animals photographed on card were collected from:
Perrin's Pond, Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 14 legs
- Look similar to pillbugs (roly polies)
- Flattened body
- Two pairs of antennae, one longer than the other
- Most commonly gray
- Speckled markings on body

Pollution Sensitivity

Somewhat Tolerant of Pollution

These animals will survive in large numbers with little competition from other macroinvertebrates in waters that are degraded and polluted.

Ecology & Interesting Features

- Avoid light by hiding underneath rocks and debris
- Omnivores
- Females carry eggs in a pouch on their body
- In some lakes they are a significant part of a trout's diet
- Animals of the order Isopoda live in fresh water, salt water, and on land.

The grid displayed in the image is ¼".

Aquatic Macroinvertebrate -Digital Card Project

DCMO BOCES - Harrold Campus

Visual Communications Program

Kerry Mack, Instructor

Security and Law Enforcement Program

Gary Ramsey, Instructor

Conservation and Equipment Technology Program

Zach Whittaker, Instructor

Ed Engelman, Science Instructor/ Grant Project Leader

engelmae@dcmoboces.com

Michelle Burke, English Language Arts Instructor

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BLADDER SNAIL



BLADDER SNAIL

Class *Gastropoda*

Family *Physidae*

Animals photographed on card were collected from:
Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- No legs
- One shell
- Tentacles

Pollution Sensitivity

Somewhat tolerant of pollution

Bladder snails thrive in a polluted environment. Finding some bladder snails in a stream does not mean the stream is polluted. However, having a large number of bladder snails is a sure sign of pollution. Can survive in polluted waters because they breathe air.

Ecology & Interesting Features

- Gastropoda means stomach foot
- Large, rapid temperature changes are not beneficial to these snails
- They breathe with lungs or a gill inside the shell
- Eat parasites
- The pink oval on the left picture is the snail's mouth

A special thank you to;



Alene Onion, NYS Department of
Environmental Conservation Water
Assessments by Volunteer Evaluators
(WAVE) Coordinator,

and

Faith Zerbe , Delaware Riverkeeper
Network Water Watch Director,



for their support and thoughtful feedback on drafts of
the macroinvertebrate identification cards.

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BRUSH-LEGGED MAYFLIES



Range of Sizes: *(Photographs not to scale)*



BRUSH-LEGGED MAYFLIES

Order *Ephemeroptera* Family *Isonychiidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 6 legs
- Front legs have a double row of long hairs
- Gills are oval shaped and on abdominal segments 1-7
- Long hairs on the margins of the tail filaments

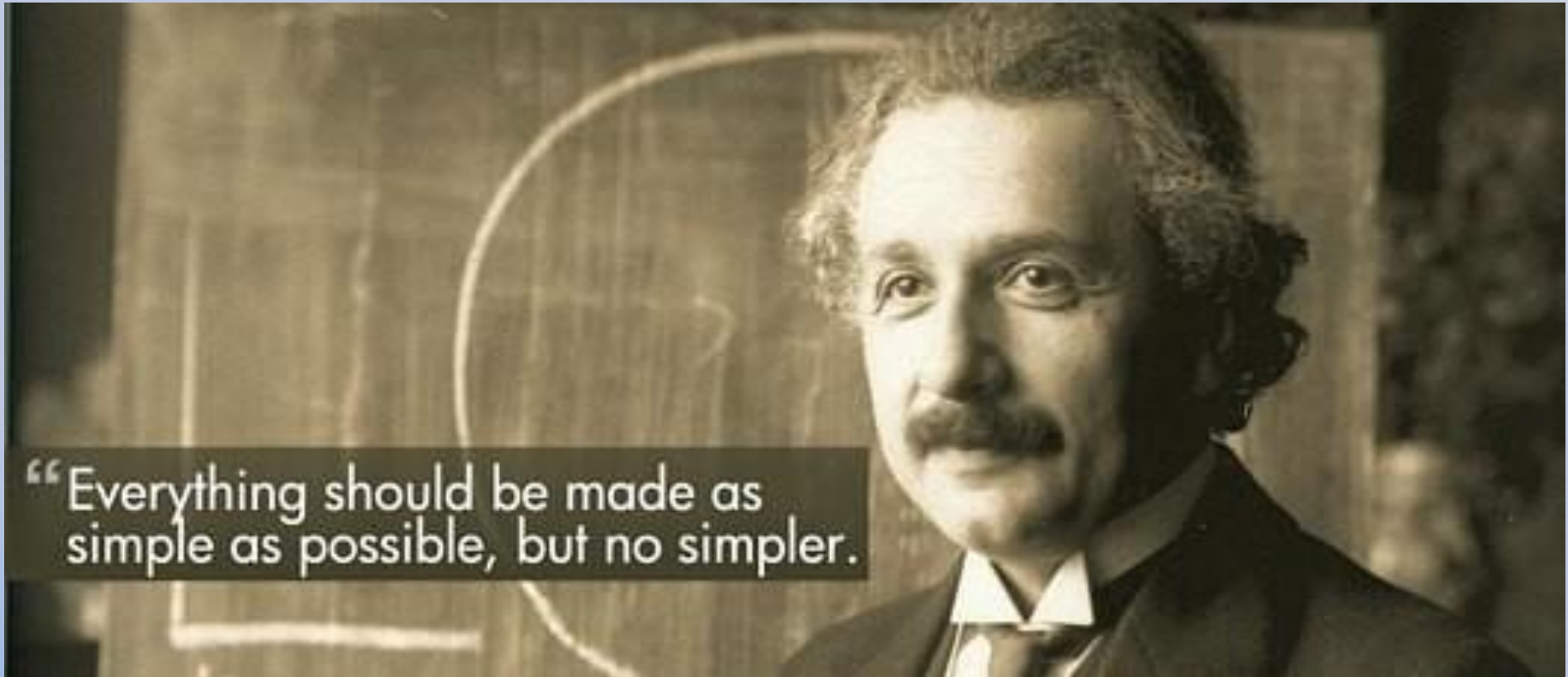
Pollution Sensitivity

They are not able to live in polluted water.
Members of this family are among the
most desired macroinvertebrate indicators
of clean water.

Ecology & Interesting Features

- Use the hairs on forelegs to collect and filter their food
- Feed on algae, diatoms, and detritus
- Grab onto the substrate with middle and rear legs, raise forelegs into the current, and catch their food

Guiding words for this project:



“Everything should be made as simple as possible, but no simpler.”

Albert Einstein

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CLUB-TAIL DRAGONFLIES



Range of Sizes: *(Photographs not to scale)*



CLUB-TAIL DRAGONFLIES

Order *Odonata*

Family *Gomphidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 6 legs
- 3 short projections on the last section of the abdomen
- 4 antennal segments with one much larger than the others
- Body shape varies from long and cylindrical to broad and flattened

Pollution Sensitivity

Somewhat Sensitive

Somewhat sensitive, Some are very sensitive, while others are somewhat tolerant.

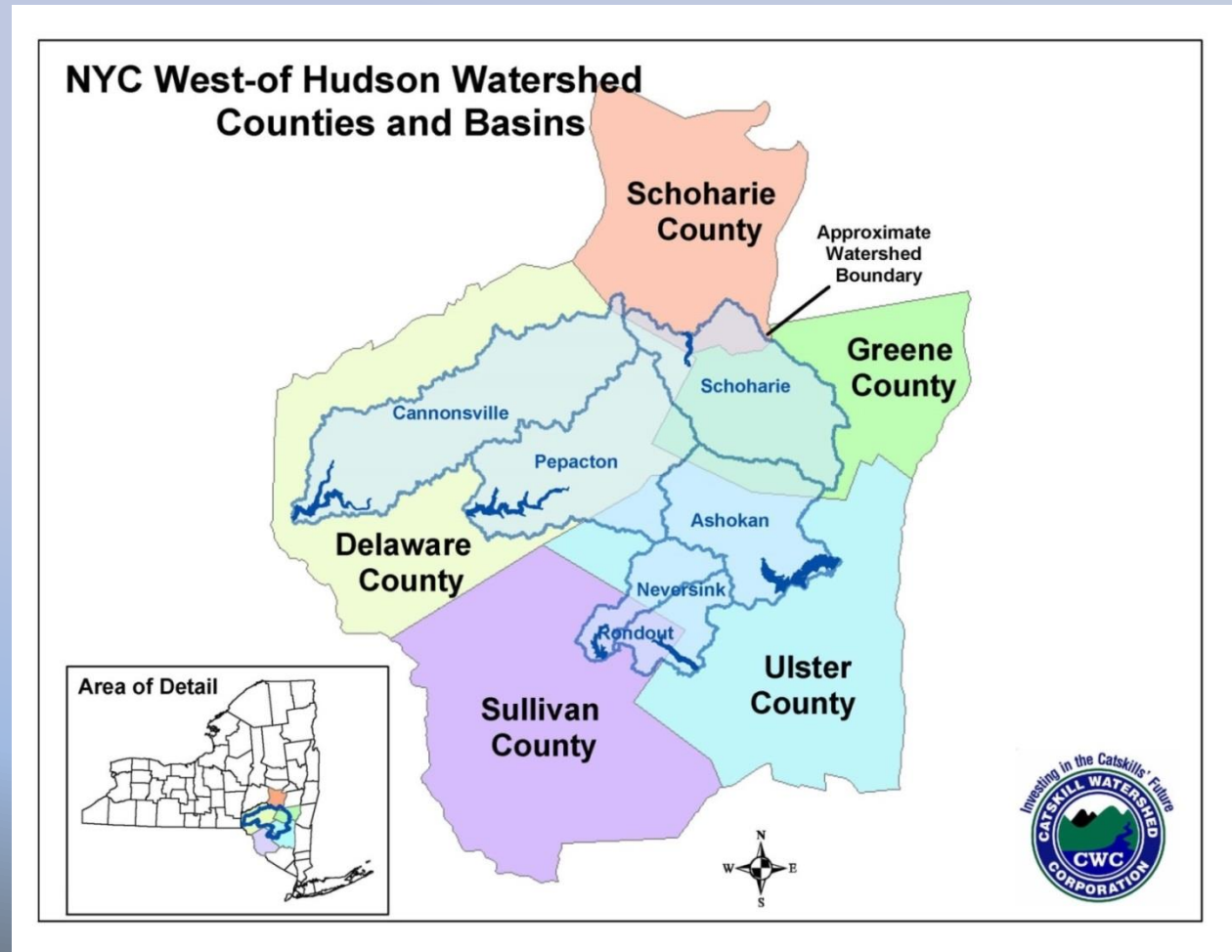
Ecology & Interesting Features

- Primarily burrowers, some sprawlers
- Engulfer-predators
- Larvae are able to breathe oxygen dissolved in the water while they are mostly buried underneath sediments since their abdomen extends up above the stream bottom
- Most species require 2 years in the larval stage

The grid displayed in the image is $\frac{1}{4}$ ".

The Setting:

All macroinvertebrates that appear on the identification cards were collected from the Trout Creek and Cannonsville Reservoir Watersheds.

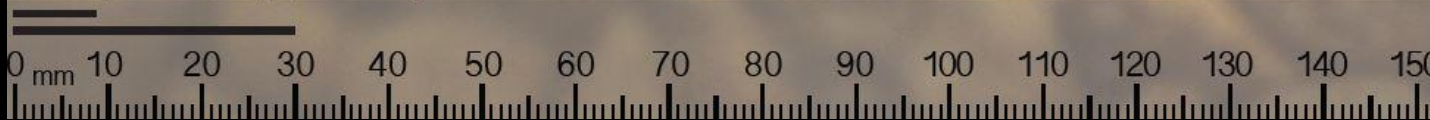


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COMMON NET-SPINNER CADDISFLIES



Range of Sizes: *(Photographs not to scale)*



COMMON NET-SPINNER CADDISFLIES

Family *Trichoptera* Order *Hydropsychidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir, West Branch
Delaware River Watershed

Major Identifying Features

- 6 legs
- Branched gills
- 3 hard plates on thorax
- Brush-like prolegs at rear end

Pollution Sensitivity

Facultative

They are very common in streams that have a moderate level of pollution especially from nutrient enrichment.

Ecology & Interesting Features

- Build silk retreats attached to rocks and stones
- Create silk nets against the stream to catch food
- Poke head out of retreats to gather food from their nets
- Mature larvae build cocoons similar to their retreats
- May also live below dams

The grid displayed in the image is ¼”.

Trout Creek (near Route 206)



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COMMON STONEFLIES



Range of Sizes: *(Photographs not to scale)*



COMMON STONEFLIES

Order *Plecoptera*

Family *Perlidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir, West Branch
Delaware River Watershed

Major Identifying Features

- 6 legs
- Finely branched, hair-like gills can be found on all 3 thoracic segments
- The abdomen has 2 thin tail filaments
- Usually has an eye-catching pattern

Pollution Sensitivity

Intolerant of Pollution

They are not able to live in polluted water. Members of this family are among the most desired macroinvertebrate indicators of clean water.

Ecology & Interesting Features

- Predator
- Eat midges, black flies, mayflies, caddisflies, other stoneflies, beetles, moths, and crustaceans
- Found in various sized streams and rivers

The grid displayed in the image is $\frac{1}{4}$ ".

What is a macroinvertebrate?

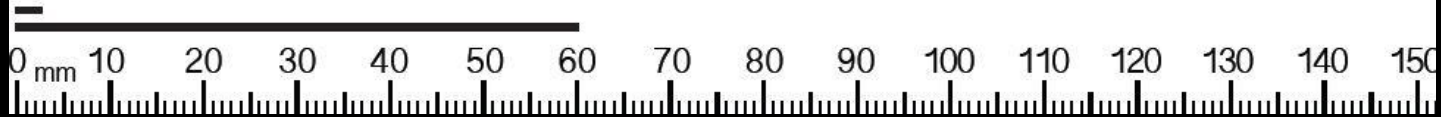
They are organisms without backbones, which are visible to the eye without the aid of a microscope.

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CRANE FLIES



Range of Sizes: *(Photographs not to scale)*



CRANE FLIES

Order *Diptera* Family *Tipulidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- Head retracts into the thorax
- 8-segmented abdomen
- Bodies are grub-like
- Skin thin and tough
- Bodies covered with microscopic hairs

Pollution Sensitivity

Facultative

They are able to survive under a variety of conditions from relatively stress free to moderately polluted waters.

Ecology & Interesting Features

- Can tie their body in knots to anchor themselves to stone
- Feed on decomposing plant material
- Spiracles used for uptake of oxygen
- Known also as leather jackets

Note: A mayfly is hitching a ride on the abdomen of the crane fly in the photo on the reverse side of this card.



Not
Macroinvertebrates



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CRAYFISH



Range of Sizes: *(Photographs not to scale)*



CRAYFISH

Order *Decapoda* Family *Cambaridae*

Animals photographed on card were collected from:
Trout Creek, Connonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 10 legs
- Large lobster-like claws on first pair of legs
- Head and thorax are fused into cephalothorax
- Cephalothorax has pointed protective structure at the front

Pollution Sensitivity

Facultative

They are able to survive under a variety of conditions from relatively stress free to somewhat polluted waters.

Ecology & Interesting Features

- Crayfish are omnivores. They will crush snails with their claws and eat the soft parts, as well as consume carrion, decaying vegetation, live plants and algae that they scrape from rocks.
- They are usually found in streams hidden between rocks and gravel and in other hidden spaces.
- When they are alarmed they can often escape by speedily swimming backwards using their paddle-like structures at the end of their abdomen.
- If a predator grabs the leg of a crayfish, they often escape by allowing their leg to break off. The next time that they molt, the missing leg is regenerated.

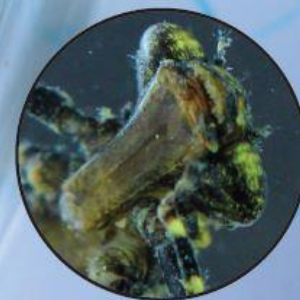
The grid displayed in the image is ¼”.

Am I a macroinvertebrate?



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DARNER DRAGONFLIES



Range of Sizes: *(Photographs not to scale)*



DARNER DRAGONFLIES

Order *Odonata* Family *Aeshnidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir, West Branch
Delaware River Watershed

Major Identifying Features

- 6 legs
- Flat jaw
- The 6 to 7 segments of the antennae are about the same size
- Abdomen has 3 short projections

Pollution Sensitivity

Somewhat sensitive—Somewhat tolerant
They can live in very thick muddy water.

Ecology & Interesting Features

- Live in plant life in the sides of ponds and lakes
- Capture their prey by stalking
- Jaw is held tightly against the body when not in use
- Arm-like jaw
- The lower jaw is used to hold on to prey while mouth parts tear prey into consumable bites

The grid displayed in the image is ¼”.

I'm an aquatic macroinvertebrate!

Before I develop wings, I live beneath the surface of streams or ponds.



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FINGER-NET CADDISFLIES



Range of Sizes: *(Photographs not to scale)*



FINGER-NET CADDISFLIES

Order *Trichoptera* Family *Philopotamidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 6 legs
- Mouth is T-shaped and soft
- Top of the head is brownish orange with no markings
- The first segment is hardened with a black edge at the back
- The second and third segments are soft
- No gills on the abdomen

Pollution Sensitivity

Intolerant of Pollution

They are not able to live in polluted water. These macroinvertebrates require water with high levels of oxygen. There is a range of intolerance from somewhat sensitive to very sensitive within this family. Members of this family are among the most desired macroinvertebrate indicators of clean water.

Ecology & Interesting Features

- Build long tube-shaped nets
- Eat the bacteria and fungal slime that grow on their nets
- Found under rocks and logs

Collecting Aquatic Macroinvertebrates Doing the “Macro Shuffle”



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FLATHEAD MAYFLIES



Range of Sizes: *(Photographs not to scale)*



FLATHEAD MAYFLIES

Order *Ephemeroptera* Family *Heptageniidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 6 legs
- 2-3 long, thin tail filaments extend from the abdomen
- Gills along the abdomen vibrate quickly
- Flat head
- Flat legs
- Head is normally widened

Pollution Sensitivity Intolerant of Pollution

Most of the flathead mayflies are sensitive to pollution.

Ecology & Interesting Features

- Cling to surfaces in flowing waters
- Majority feed as scrapers
- Found in cool fast flowing streams
- Cling to cobbles, boulders, and bedrock in streams
- Low profile and claws allow them to hold their position in swift currents

The grid displayed in the image is ¼".



Security and
Law
Enforcement
Students
finding and
separating
the macro-
invertebrates

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GIANT STONEFLIES



Range of Sizes: *(Photographs not to scale)*



GIANT STONEFLIES

Order *Plecoptera*

Family *Pteronarcyidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 6 legs
- 2 thin tails project from the rear
- Thorn-like gills
- 2 claws located at the end of each segmented leg
- Large thorax plates with markings

Pollution Sensitivity

Intolerant of Pollution

They are very sensitive to water pollution.
Members of this family are among the most desired
macroinvertebrate indicators of clean water.

Ecology & Interesting Features

- Found in running waters including seeps, springs, streams, and rivers
- Commonly prey on midges and black flies
- Do not have large populations of larvae

The grid displayed in the image is ¼”.

Security and Law Enforcement students identifying the macroinvertebrates



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FREE-LIVING CADDISFLIES



Range of Sizes: *(Photographs not to scale)*



FREE-LIVING CADDISFLIES

Order *Trichoptera* Family *Rhyacophilidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 6 legs
- Most have bright green, fleshy bodies
- Body ends in 2 hooks
- Only first segment on body covered by hardplate

Pollution Sensitivity

Intolerant of Pollution

Most need very clean water, but some can survive in slightly silty running water.

Ecology & Interesting Features

- Darker green heads
- Turn purple in alcohol
- Feed on small invertebrates
- Some feed on fish eggs
- Move in fast water by anchoring itself to stones with a silk thread that it produces
- Reside primarily in the faster portions of streams
- Body resembles glass beads strung together

The grid displayed in the image is ¼”.

An on-line guide was used by students to identify the aquatic macroinvertebrates.

Heptageniidae

Common Name: Flathead Mayflies

Feeding Group: Scrapers

Tolerance Value: 4 (Moderate)

Habitat: Flathead mayflies are most common in slow to fast flowing streams where they occur on the surface of rocks, logs, vegetation, and leaves.

Size: Small to large (5-20 mm)

Characteristics: Body, head, and legs (femora) flattened; mouthparts not visible from dorsal view; gills present on abdominal segments 1-7; only short setae present on caudal filaments.

Notes: Flathead mayflies are very common in streams in the Upper Midwest. They are well adapted for swift flowing waters. Their bodies, head, and legs are flattened which reduces drag by forcing water over the organism. Most of these mayflies feed on algae and microorganisms growing on rocks. One genus of heptageniid mayfly has only two tails, but can be separated from stoneflies by the presence of a single tarsal claw at the end of each leg.

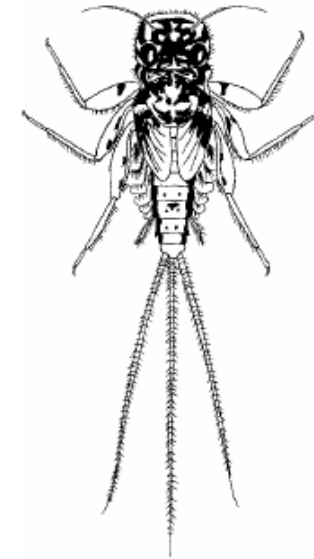


Figure 4.47:
Stenonema exiguum
(Heptageniidae)
larva, Dorsal View.

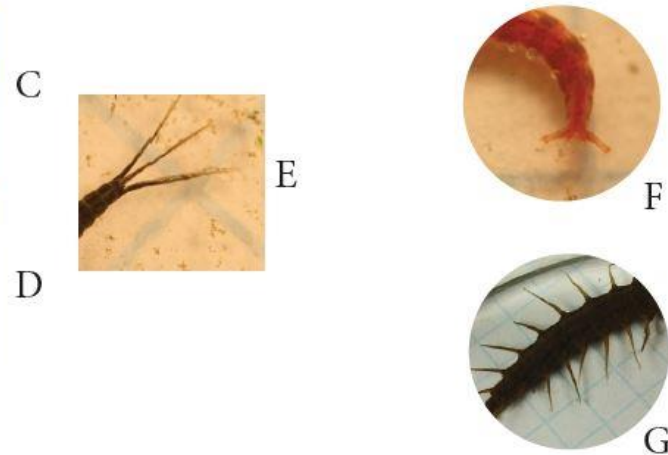
Links to entire University of Minnesota *Guide to Aquatic Invertebrates*
<http://edengelman.com/Macro/UMNguidebook.html>

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GILLS



NOT GILLS



Range of Sizes: *(Photographs not to scale)*



What's a Gill?

- They are thin membranes or filament-like structures that allow a macroinvertebrate to take oxygen dissolved in water into their body for respiration.
- Many gills are branched or show branching within the filament.
- Some gills are paddle shaped, forked, fringed, pointed, or tuft shaped.

A - Water Penny

B - Narrow-Winged Damselflies

C - Common Stoneflies

D - Prong-Gilled Mayflies

What's not a Gill?

- Filaments not primarily involved with respiration.
- Branched structures within non-gill filaments are rarely observed.

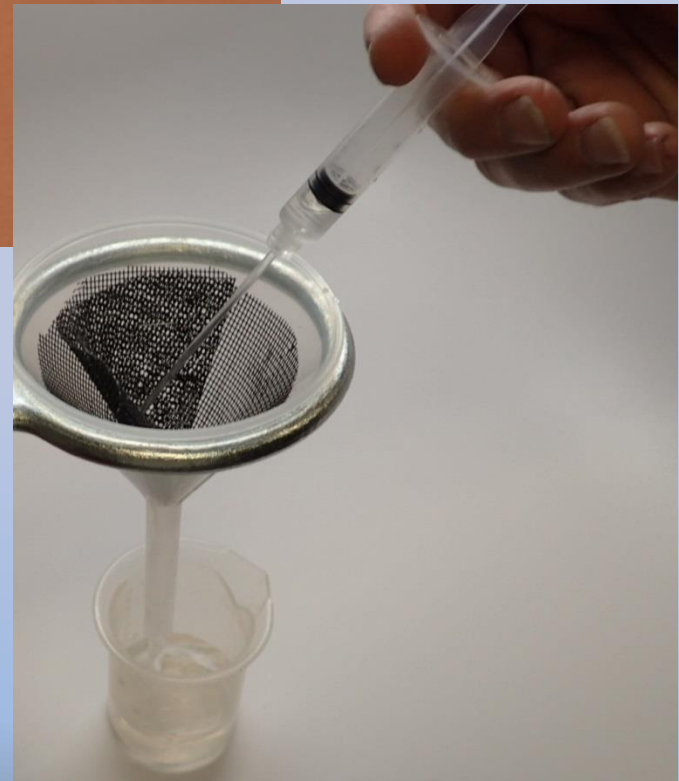
E - Non-Biting Midges

F - Hellgramite

G - Predacious Diving beetle



Macroinvertebrate Bathing Station

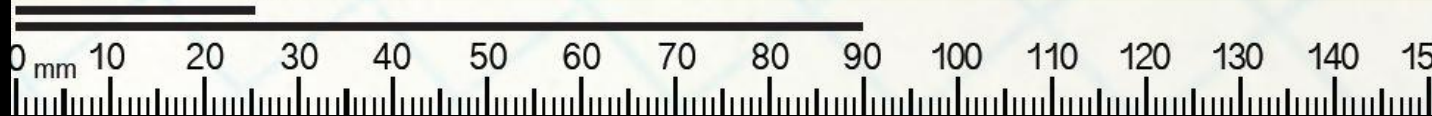


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HELLGRAMITE



Range of Sizes: *(Photographs not to scale)*



HELLGRAMITE

Order *Megaloptera* Family *Corydalidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir, West Branch
Delaware River Watershed

Major Identifying Features

- 6 legs
- Visible antennae
- 25-90 mm in size
- 2 hooks at the back end
- 2 strong pincers on head
- 10 paired filaments on abdomen

Pollution Sensitivity

Intolerant - Tolerant of Pollution

A few of the corydalid species can be tolerant while others are extremely intolerant.

Hellgramites located in still water (such as ponds) are most likely tolerant, while those located in a river most likely intolerant.

Ecology & Interesting Features

- Usually live under rocks in streams near riffles
- Can be used as bait for fishing
- May deliver painful bites
- Long, smooth body
- Hunt at night for prey
- Predators

The grid displayed in the image is ¼".

Tools to handle macroinvertebrates:
spoon, spatula, soldering flux brushes,
pipettes, and watercolor brushes

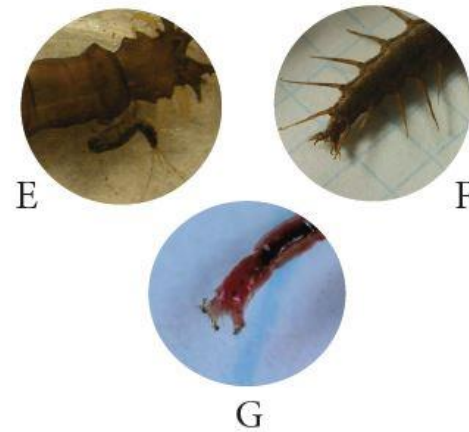


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LEGS



NOT LEGS

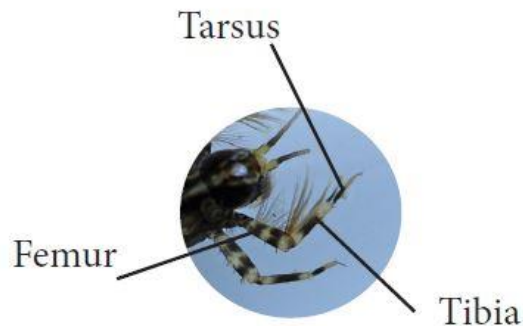


Range of Sizes: *(Photographs not to scale)*



What's a leg?

- Articulated jointed appendage



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What's not a leg?

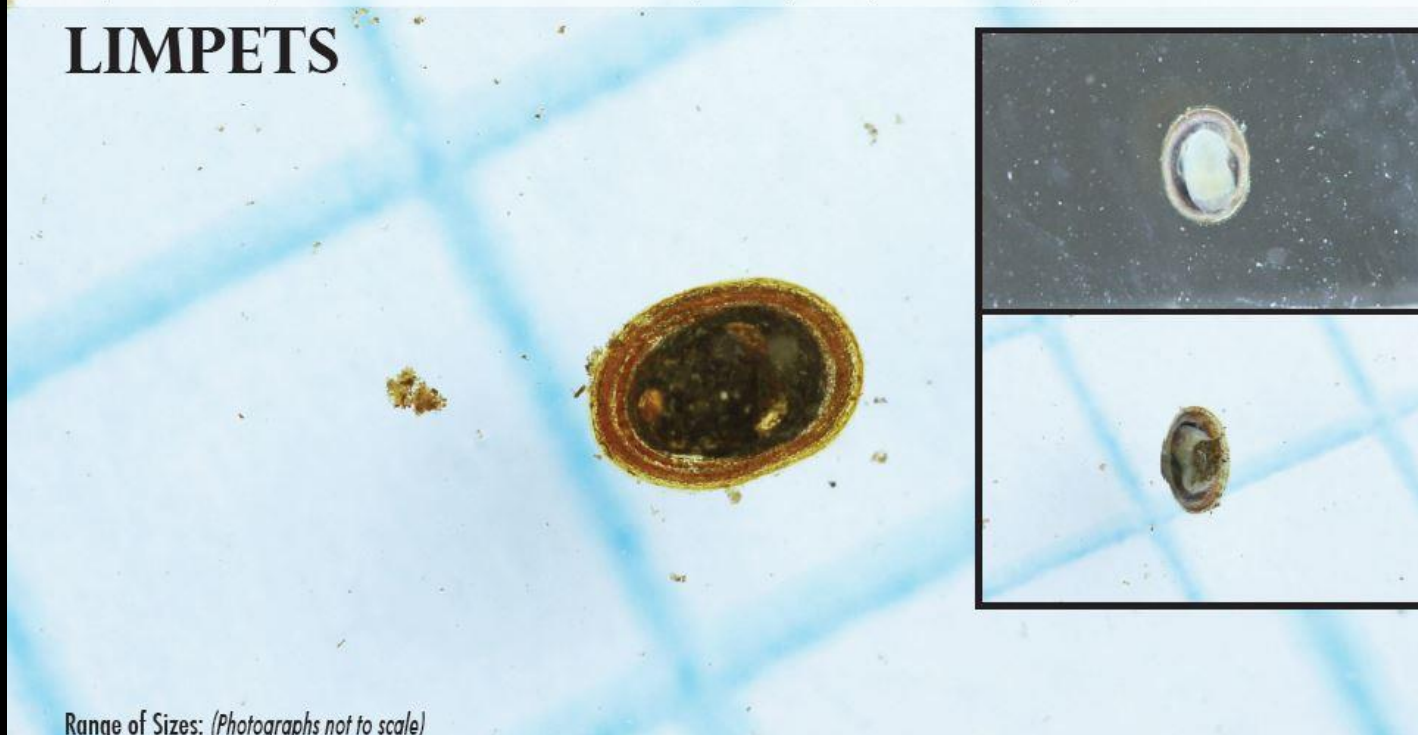
- Traction nub
- Filaments
- Proleg
- Traction nubs as shown in image E:
(on reverse side of card) A fleshy bump that assists the macroinvertebrate by pushing against the substrate
- Filaments as shown in F:
(on reverse side of card) A slender threadlike body part
- Proleg as shown in G:
(on reverse side of card) A structure that serves a similar function to a leg but generally fleshy in appearance

Lens and glass cleaning supplies



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LIMPETS



Range of Sizes: *(Photographs not to scale)*



LIMPETS

Class *Gastropoda* Family *Ancylidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir, West Branch
Delaware River Watershed

Major Identifying Features

- No legs but a “foot” used to attach to surfaces
- Growth rings that form a concentric shape on shell
- Shell has larger opening than most gastropods
- Body lacks an operculum

Pollution Sensitivity Tolerant of Pollution

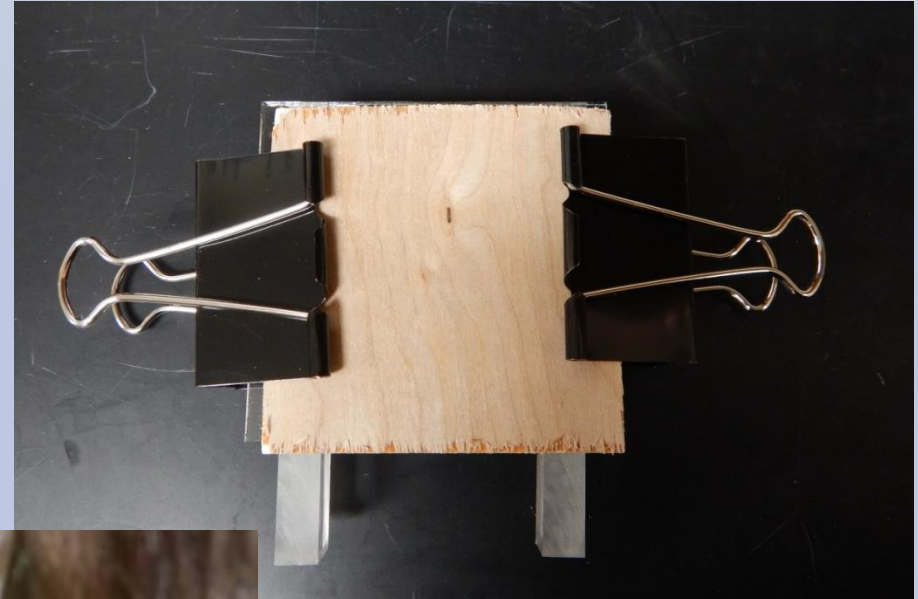
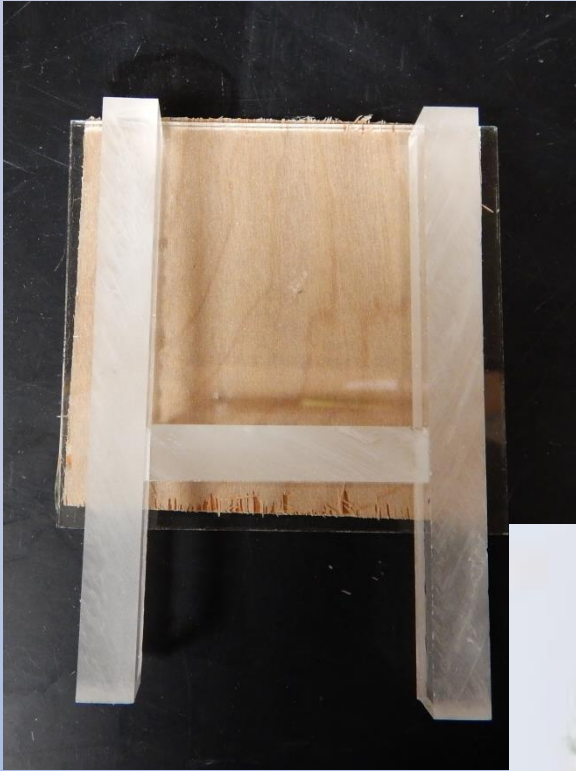
They are able to live in polluted water.
These macroinvertebrates are not indicators
of clean water.

Ecology & Interesting Features

- Scrapers
- Classified with lunged gastropods but lack an air cavity
- Those found in faster streams have a more cone-shaped shell
- Appear in many vegetated water habitats
- Attach to a variety of firm surfaces and soft surfaces
- Usually found in lakes, ponds, and slow moving streams

The grid displayed in the image is ¼”.

Building and using a micro-aquarium



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NARROW-WINGED DAMSELFLIES



Range of Sizes: *(Photographs not to scale)*



NARROW-WINGED DAMSELFLIES

Order *Odonata*

Family *Coenagrionidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 6 legs
- Abdomen with 3 wide gills
- Lower lip is shaped like a triangle, short and stout

Pollution Sensitivity

Tolerant of Pollution

These animals will survive in large numbers with little competition from other macroinvertebrates in waters that are degraded and polluted.

Ecology & Interesting Features

- They live in ponds, lakes, swamps, marshes, and ditches
- Often found in standing waters on living aquatic plants or tangles of dead vegetation
- Climbers, some sprawlers and clingers
- Lay their eggs in plants

The grid displayed in the images is ¼”.

Preparing for a photo shoot



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NON-BITING MIDGES



Range of Sizes: *(Photographs not to scale)*



NON-BITING MIDGES

Order *Diptera* Family *Chironomidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir, West Branch
Delaware River Watershed

Major Identifying Features

- No true legs
- 2 prolegs on first segment
- 2 prolegs on last segment
- Some are colored bright red
- Some are white to dark green in color
- Head is round and separate from thorax
- Capsule-like hardened head

Pollution Sensitivity

Tolerant of Pollution

These animals will survive in large numbers with little competition from other macroinvertebrates in waters that are degraded and polluted.

In cleaner water the larvae will be a paler color but will be a blood red in more polluted water.

Ecology & Interesting Features

- Collector/gatherers and predators
- Important food source for insects, fish and birds
- Red coloring comes from hemoglobin (stores oxygen)
- Found in soft sediment and other aquatic habitats
- Sometimes these animals are called “bloodworms”

The grid displayed in the image is ¼”.

Collection & Identification of the Aquatic Macroinvertebrates by Security & Law Enforcement and Conservation Programs
Photography & Design by Visual Communication Program and CTE Science • DCMO BOCES - Robert W. Harrold Campus • Sidney Center, NY



A photo shoot
with the
macroinvertebrate
inside a micro-
aquarium

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PREDACEOUS DIVING BEETLES



Range of Sizes: *(Photographs not to scale)*



PREDACEOUS DIVING BEETLES

Order Coleoptera *Family Dytiscidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed.

Major Identifying Features

- 6 legs
- Two claws on each leg
- Legs have 5 segments

Pollution Sensitivity

Facultative

They are mostly able to live in polluted water.
They are able to survive under a variety
of conditions, from relatively stress free
to moderately polluted waters.

Ecology & Interesting Features

- Hunts and feeds as a piercer-predator
- Inject a fluid that kills and liquefies the organs and muscles of their prey. Dissolved fluid is sucked out for nourishment.
- Eat worms leeches, crustaceans, true fly larvae, dragonfly larvae, tadpoles, salamanders, and fish
- Most live in ponds or slow moving streams
- Found in a wide variety of aquatic habitats



A damselfly
nymph
faces the
camera
from a
micro-
aquarium

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RIFFLE BEETLE



Range of Sizes: *(Photographs not to scale)*



RIFFLE BEETLE

Order *Coleoptera*

Family *Elmidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 6 legs
- 9 abdominal segments
- Rigid outer shell

Pollution Sensitivity

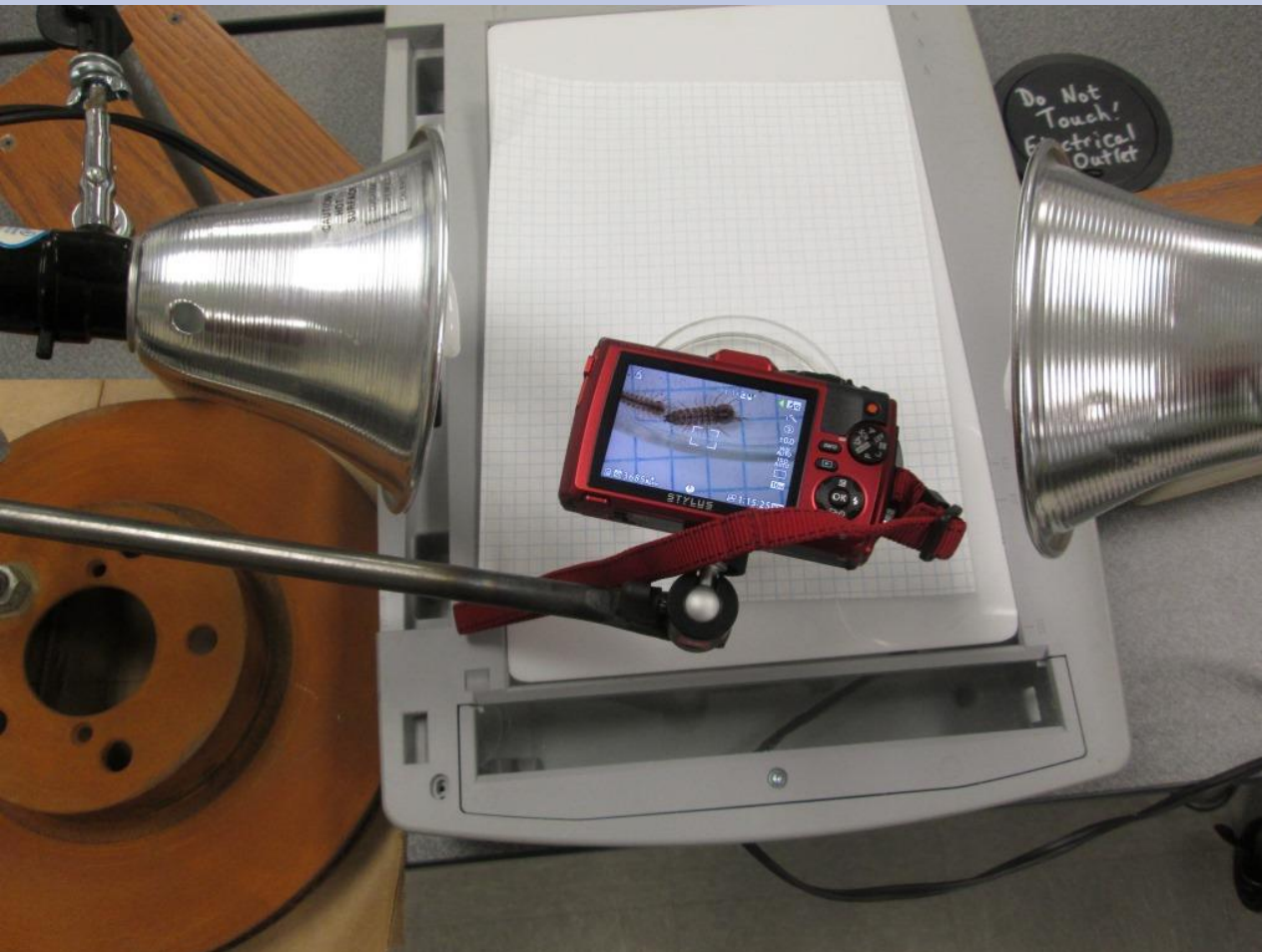
Mostly Facultative

They are not able to survive polluted water.
Many species of riffle beetles require habitats
with high levels of dissolved oxygen.

Ecology & Interesting Features

- Live in swift moving water under rocks or logs
- Gills are in a special compartment near the end of the abdomen
- Gills can be retracted to prevent injury
- Brief flying period during adult phase
- Generally cling and crawl slowly
- Collect and gather food from detritus and surface films of algae, bacteria, and fungi

Keeping the camera still is critical for good macro photography



The camera and table-top ball head is supported by a shop-made rod with flattened end. The rod is bolted to the ball head which is held by a lab type clamp in a brake rotor stand.

This publication is made possible with funds from the Catskill Watershed Corporation in partnership with New York City Department of Environmental Protection.

SADDLE CASE-MAKER CADDISFLIES



Range of Sizes: *(Photographs not to scale)*



**SADDLE CASE-MAKER
CADDISFLIES**

**Order *Trichoptera*
Family *Glossosomatidae***

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 6 legs
- Antennae are too small to be seen
- Abdomen ends in two hooks
- Abdomen has no filaments
- Case is flat on bottom and round on top
- Head is made of thick, hard skin
- Abdomen is made of thin, soft skin
- Two legs at the end of the abdomen have a claw

**Pollution Sensitivity
Intolerant of Pollution**

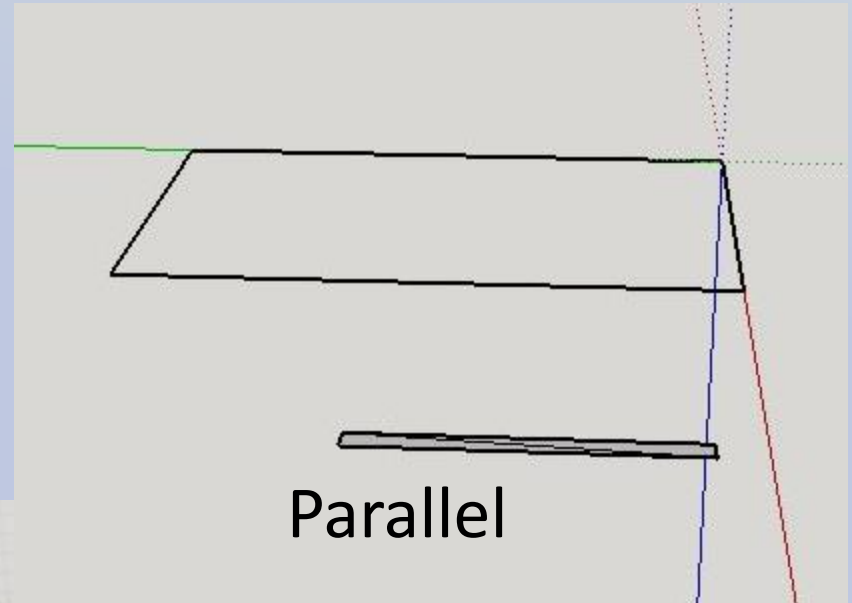
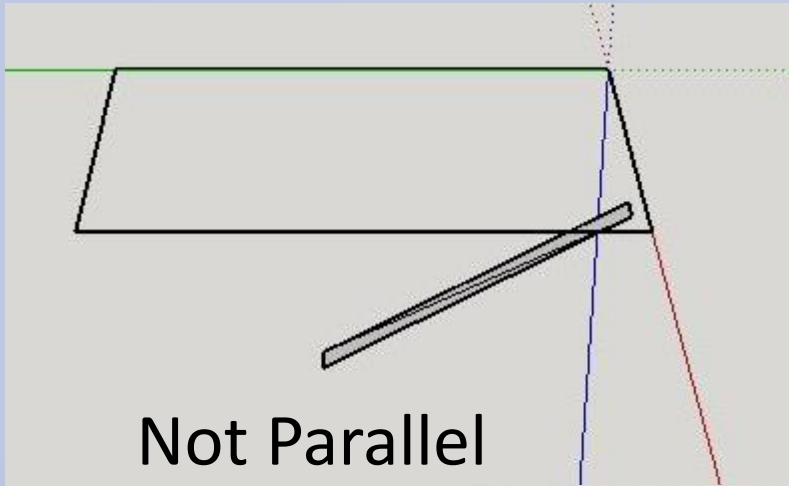
They are not able to live in polluted water.
Members of this family are among the most desired
macroinvertebrates indicators of clean water.

Ecology & Interesting Features

- Build a dome-shaped larval case made of small stones or wood for shelter
- New case made after each shedding
- Use silk to make a pupal cocoon around themselves
- Cocoon is brown, semi-transparent capsule
- Reproduce about two times per year
- Adults come out of the cocoon late spring to early fall
- Live in cool streams
- Scrapers located on the first set of legs used to free algae that grows on stones for food

The grid displayed in the image is ¼".

Points of interest should be parallel to the viewfinder



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SMALL MINNOW MAYFLIES



Range of Sizes: *(Photographs not to scale)*



SMALL MINNOW MAYFLIES

Order *Ephemeroptera* Family *Baetide*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir, West Branch
Delaware River Watershed

Major Identifying Features

- 6 legs
- Antennae 2-3X longer than the width of the head
- Gill shape is varied
- 2-3 caudal filaments

Pollution Sensitivity

Moderately Tolerant of Pollution

They are mainly facultative, others in this family vary from somewhat sensitive to very tolerant.

Ecology & Interesting Features

- Collector/gatherers and scrapers
- Often very small
- Very common in polluted streams
- Found in a variety of habitats

The grid displayed in the image is $\frac{1}{4}$ ".

Collection & Identification of the Aquatic Macroinvertebrates by Security & Law Enforcement and Conservation Programs
Photography & Design by Visual Communication Program and CTE Science • DCMO BOCES - Robert W. Harrold Campus • Sidney Center, NY

Image taken with a camera with focus stacking



Northern Case-Maker Caddisflies

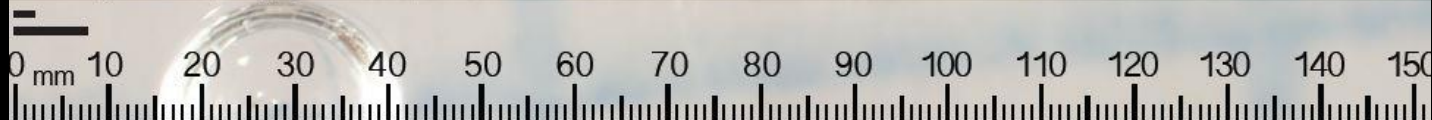
Image taken in microscope mode with focus stacking feature with the Olympus TG-3 camera

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SMALL SQUARE-GILL MAYFLIES



Range of Sizes: *(Photographs not to scale)*



SMALL SQUARE-GILL MAYFLIES

Order *Ephemeroptera* Family *Caenidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 6 legs
- 2 moving square plates cover gills on abdomen
- Gills are on abdomen segments 3–6
- Abdomen has 3 short projections

Pollution Sensitivity High Tolerance

They can live in very thick, muddy water.

Ecology & Interesting Features

- Live in slow moving streams or at the edge of lakes and wetland
- Operculate gills protect the other gills
- Operculate gills wave up and down to clear sediments
- Are gatherers that feed mostly on decaying plants
- Sometimes feed on decaying animals
- Can have many generations a year mostly in warm waters in the far south

The grid displayed in the image is ¼".

Collection & Identification of the Aquatic Macroinvertebrates by Security & Law Enforcement and Conservation Programs
Photography & Design by Visual Communication Program and CTE Science • DCMO BOCES - Robert W. Harrold Campus • Sidney Center, NY

Don't overheat your live specimen!



By using compact fluorescent lighting for your photography vs incandescent bulbs, you reduce the risk of overheating your live samples.

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STRONG CASE-MAKER CADDISFLIES

Range of Sizes: *(Photographs not to scale)*



STRONG CASE-MAKER CADDISFLIES

Order *Trichoptera* Family *Odontoceridae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir, West Branch
Delaware River Watershed

Major Identifying Features

- 6 legs
- Anal prolegs hold case
- Size is medium (9-20 mm)

Pollution Sensitivity Intolerant of Pollution

They are not able to live in polluted water. These macroinvertebrates are the most desired as they are indicators of clean water with high levels of oxygen.

Ecology & Interesting Features

- Larvae can consume algae, plant or animal matter, and other floating particles
- Can be predaceous (eat other animals)
- Classified as scraper feeders
- Often larvae are grouped together on cobbles
- Well-adapted to burrowing
- Cases constructed of sand and rock particles
- Cases hard enough to protect from predators
- Usually blend or attach to surrounding boulders or stones
- Burrow in waterbed for protection and to collect particles until case is made
- Adults only consume liquid similar to sap or nectar

The grid displayed in the image is ¼”.

Visual Communications students designing and crafting the cards using Photoshop, InDesign and exporting files in pdf format

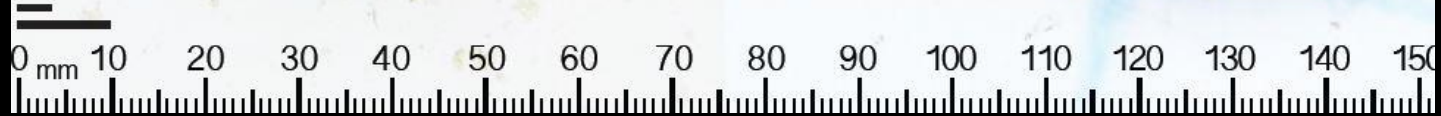


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WATER PENNY



Range of Sizes: *(Photographs not to scale)*



WATER PENNY

Order *Coleoptera* Family *Psephenidae*

Animals photographed on card were collected from:
Trout Creek, Cannonsville Reservoir,
West Branch Delaware River Watershed

Major Identifying Features

- 6 legs
- Legs are hidden underneath
- Flattened body
- Oval-shaped
- Copper-colored

Pollution Sensitivity

Facultative

They are able to survive under a variety of conditions from relatively stress-free to moderately polluted waters.

Ecology & Interesting Features

- Feed as scrapers (eat small algae off rocks)
- Attach to rocks in areas with fast currents
- Body shape acts as a suction cup
- Breathe through gills located on underside of body
- Live underneath rocks by day
- Move to the tops of rocks at night

The grid displayed in the image is ¼".