

Students Identify and Photograph Macroinvertebrates ... and You Can, Too!

Ed Engelman, *DCMO BOCES*

(Delaware-Chenango-Madison-Otsego Board of Cooperative Educational Services)



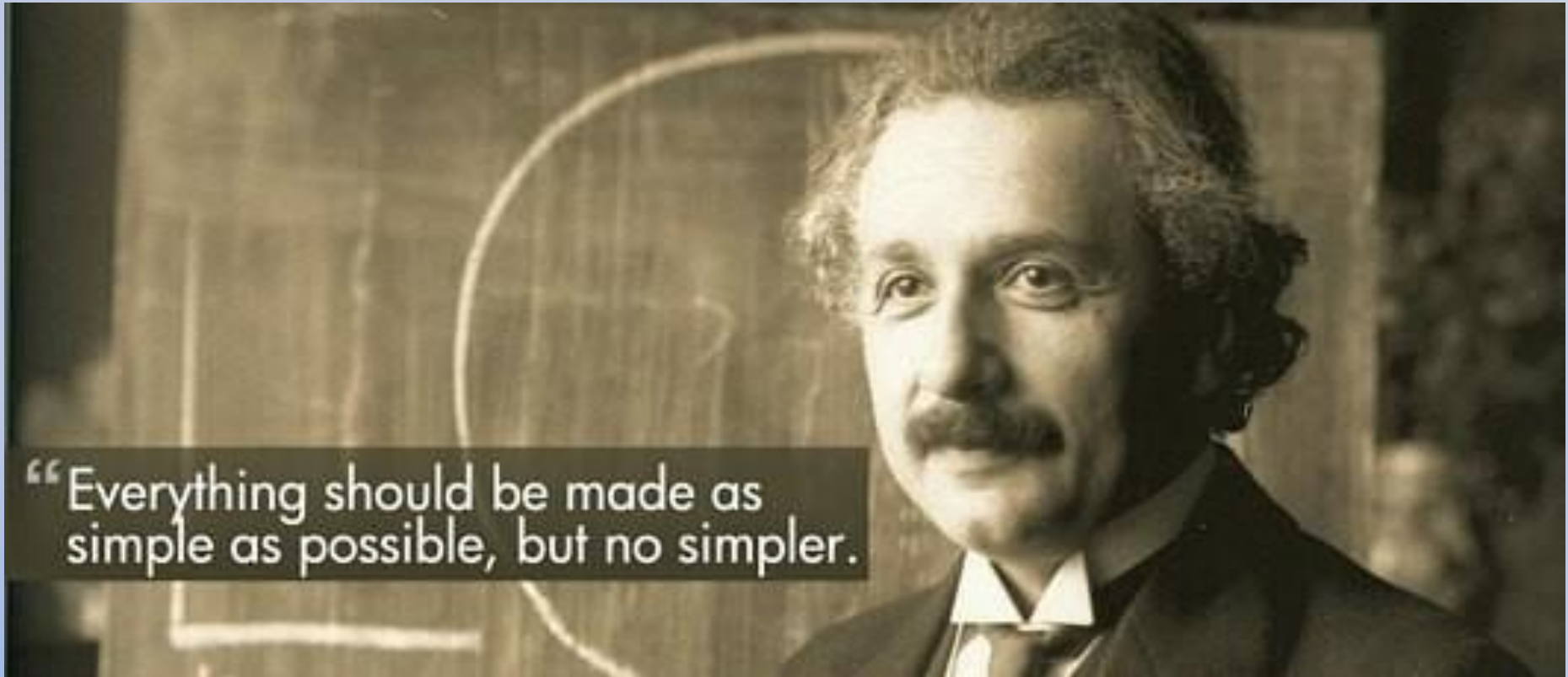
**This project was made possible with funds from the Catskill Watershed Corporation
in partnership with New York City Department of Environmental Protection**

3.14.15



Happy Pi Day!

Happy Birthday



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

Albert Einstein

Aquatic Macroinvertebrate Digital Card Project

DCMO BOCES - Harrold Campus
Visual Communications Program
Security and Law Enforcement Program
Conservation and Equipment Technology Program

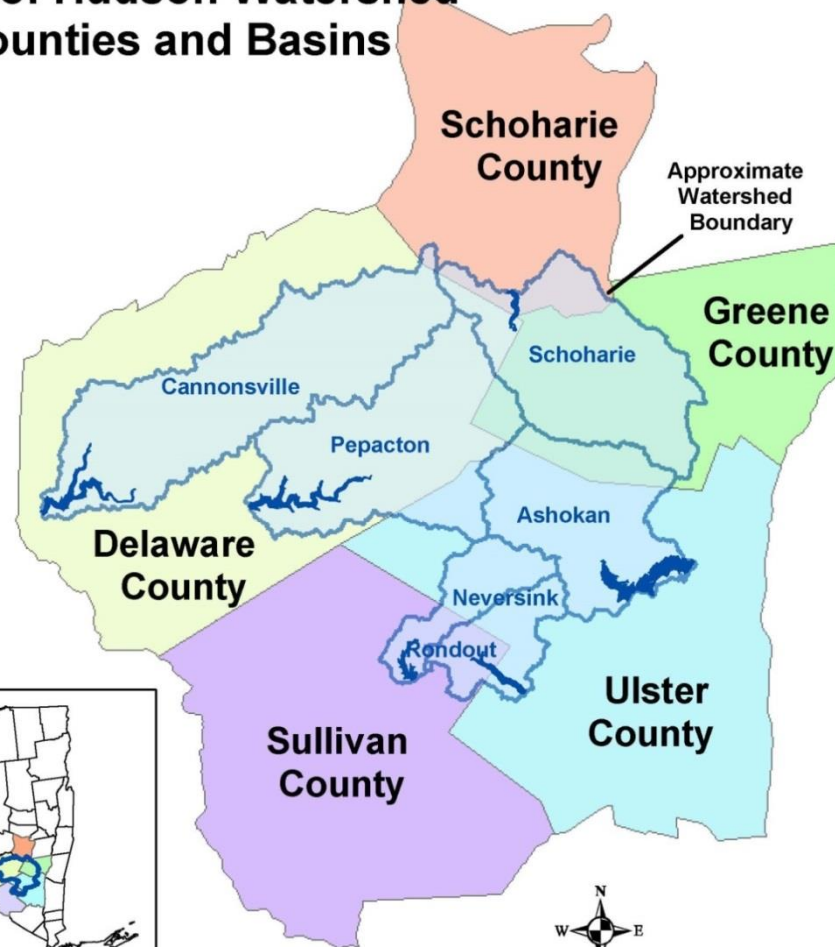
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Environmental Protection

Aquatic Macroinvertebrates Digital Card Project

Project Overview
Photographic Techniques
Macroinvertebrate Identification
???

The Setting

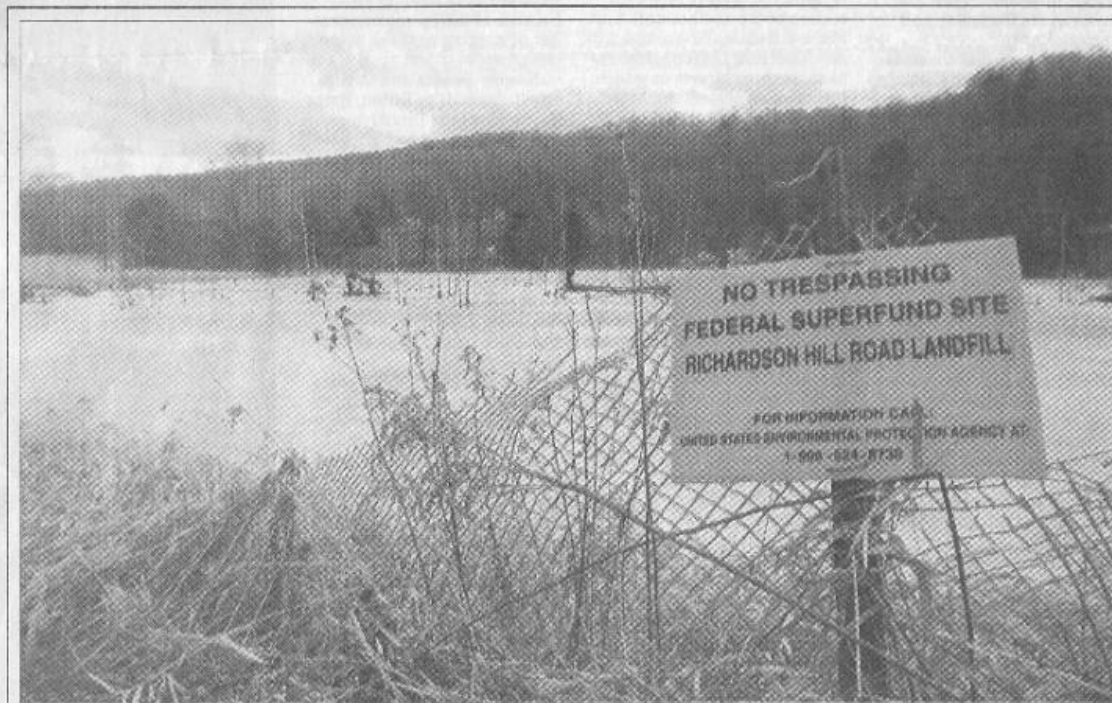
NYC West-of-Hudson Watershed Counties and Basins



Area of Detail



February 2002 - before the cleanup
(within the watershed of the Trout Creek sampling location)



Star photo by Anita Briggs

This federal Superfund site, shown Thursday on Richardson Hill Road in Sidney, remains toxic 15 years after being designated.

After 15 years site still toxic





What is a
Macroinvertebrate?



Not
Macroinvertebrates

Am I a macroinvertebrate?



What is an
Aquatic
Macroinvertebrate?

I'm an aquatic macroinvertebrate!



Collecting Aquatic Macroinvertebrates Doing the “Macro Shuffle”



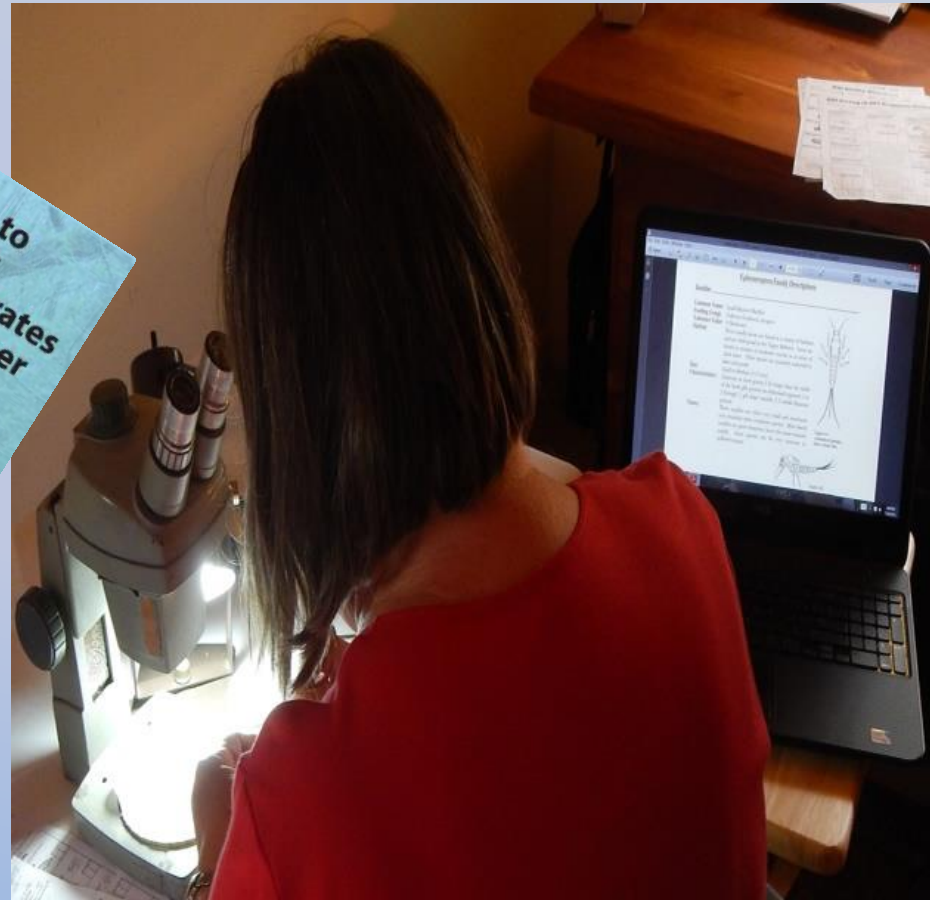
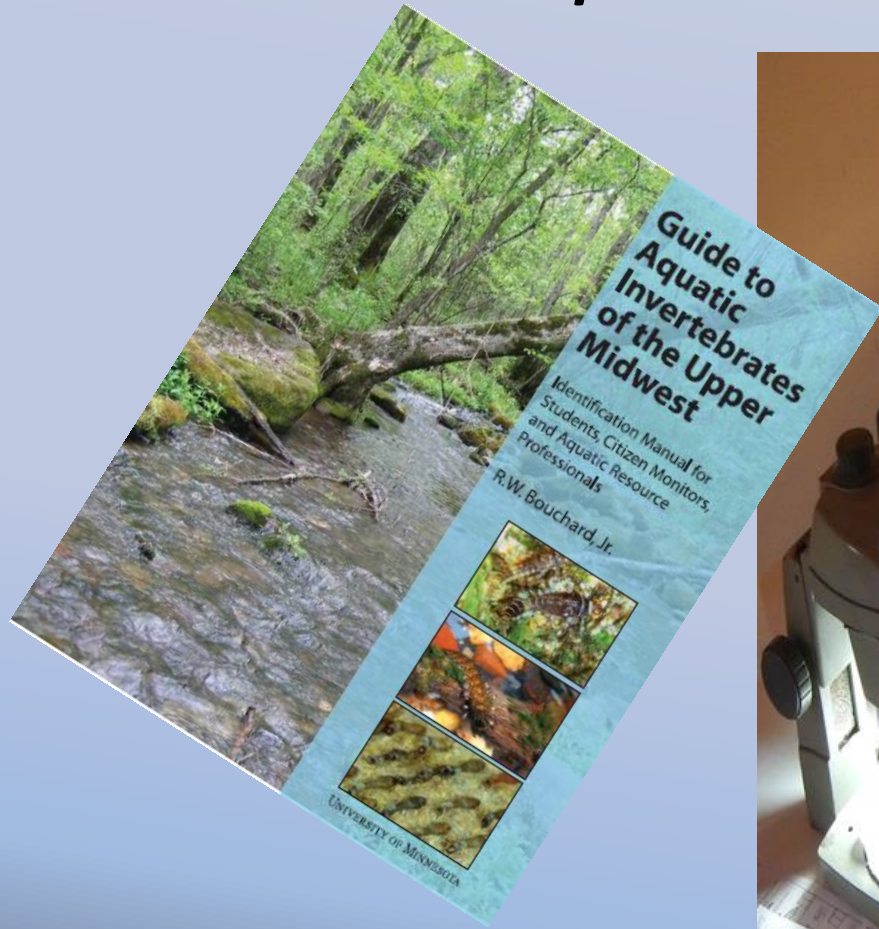


Security and
Law
Enforcement
Students
finding and
separating
the macro-
invertebrates

Security and
Law Enforcement
students identifying the
macroinvertebrates



Guide to Aquatic Invertebrates of the Upper Midwest Identification Manual for Students, Citizen Monitors, and Aquatic Resource Professionals



<http://edengelman.com/Macro/UMNguidebook.html>

4

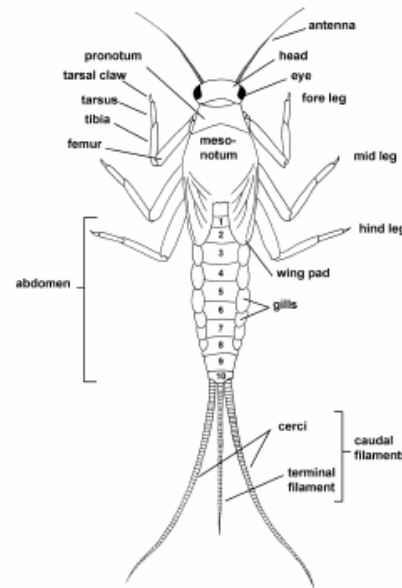
ORDER EPHEMEROPTERA

Mayflies

Mayfly larvae are found in a variety of locations including lakes, wetlands, streams, and rivers; however, they are most common and diverse in lotic habitats. They are common and abundant in stream riffles and pools, at lake margins and in some cases lake bottoms. All mayfly larvae are aquatic with terrestrial adults. In most mayfly species the adult only lives for 1-2 days. Consequently, the majority of a mayfly's life is spent in the water as a larva. The adult lifespan is so short there is no need for the insect to feed and therefore the adult does not possess functional mouthparts. Mayflies are often an indicator of good water quality because most mayflies are relatively intolerant of pollution. Mayflies are also an important food source for fish.

Ephemeroptera Morphology

Most mayflies have three caudal filaments (tails) (Figure 4.1) although in some taxa the terminal filament (middle tail) is greatly reduced and there appear to be only two caudal filaments (only one genus actually lacks the terminal filament). Mayflies have gills on the dorsal surface of the abdomen (Figure 4.1), but the number and shape of these gills vary widely between taxa. All mayflies possess only one tarsal claw at the end of each leg (Figure 4.1). Characters such as gill shape, gill position, and tarsal claw shape are used to separate different mayfly families.



EPHEMEROPTERA

Figure 4.1: Dorsal view of ephemeropteran larva.

http://wrc.umn.edu/prod/groups/cfans/@pub/@cfans/@wrc/documents/asset/cfans_asset_115805.pdf

8(7'). Head and body flattened (Figs. 4.26, 4.27) **Heptageniidae p. 58**



Figure 4.26: Heptageniidae larva, Lateral View.



Figure 4.27: Head of *Stenonema exiguum* (Heptageniidae) larva, Dorsal View.

8'. Head and body not flattened (Fig. 4.28) 9

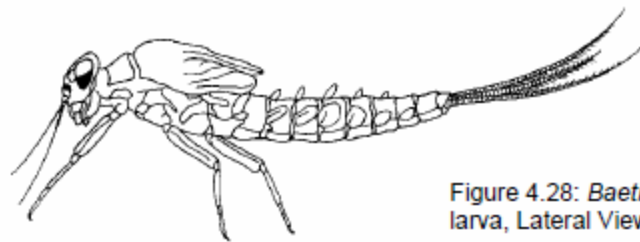


Figure 4.28: *Baetis* sp. (Baetidae) larva, Lateral View.

- http://wrc.umn.edu/prod/groups/cfans/@pub/@cfans/@wrc/documents/asset/cfans_asset_115805.pdf
http://wrc.umn.edu/prod/groups/cfans/@pub/@cfans/@wrc/documents/asset/cfans_asset_115805.pdf

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.

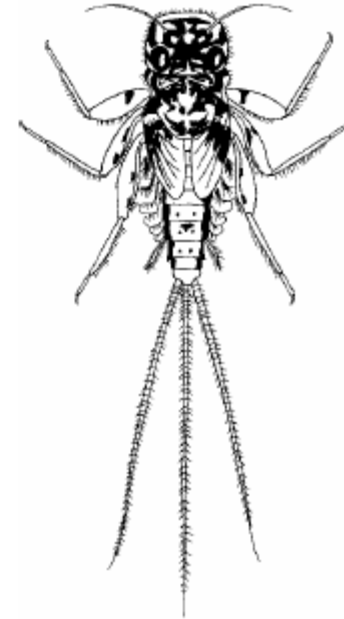
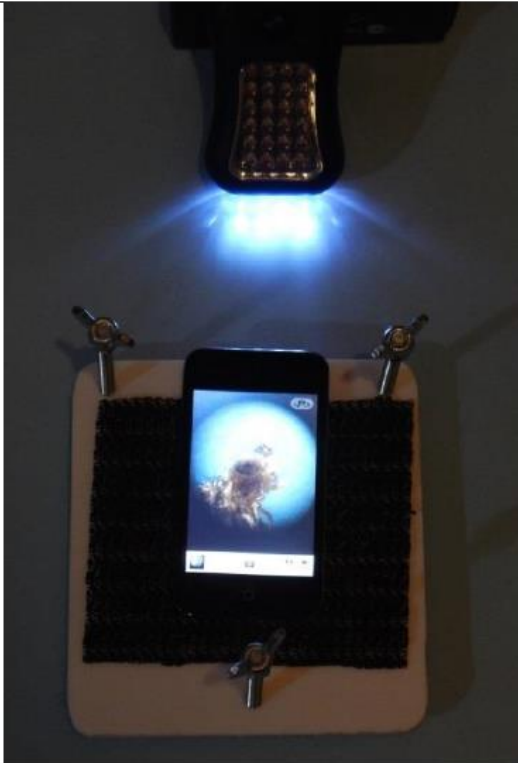


Figure 4.47:
Stenonema exiguum
(Heptageniidae)
larva, Dorsal View.

http://wrc.umn.edu/prod/groups/cfans/@pub/@cfans/@wrc/documents/asset/cfans_asset_115805.pdf

If you can't figure out the identity of the macroinvertebrate that you are viewing, take clear pictures of it and email it to someone who may be able to help!



A 3 leg Smart D Scop with an iPod 3 (above) shows the eye of a caddisfly on the screen illuminated by a LED flashlight.



The caddisfly eye in the image above, was taken with the setup shown on the left.

<http://edengelman.com/smartDscope/smartDscope16P.pdf>

Life is like a Camera

Just *focus* on what's important.

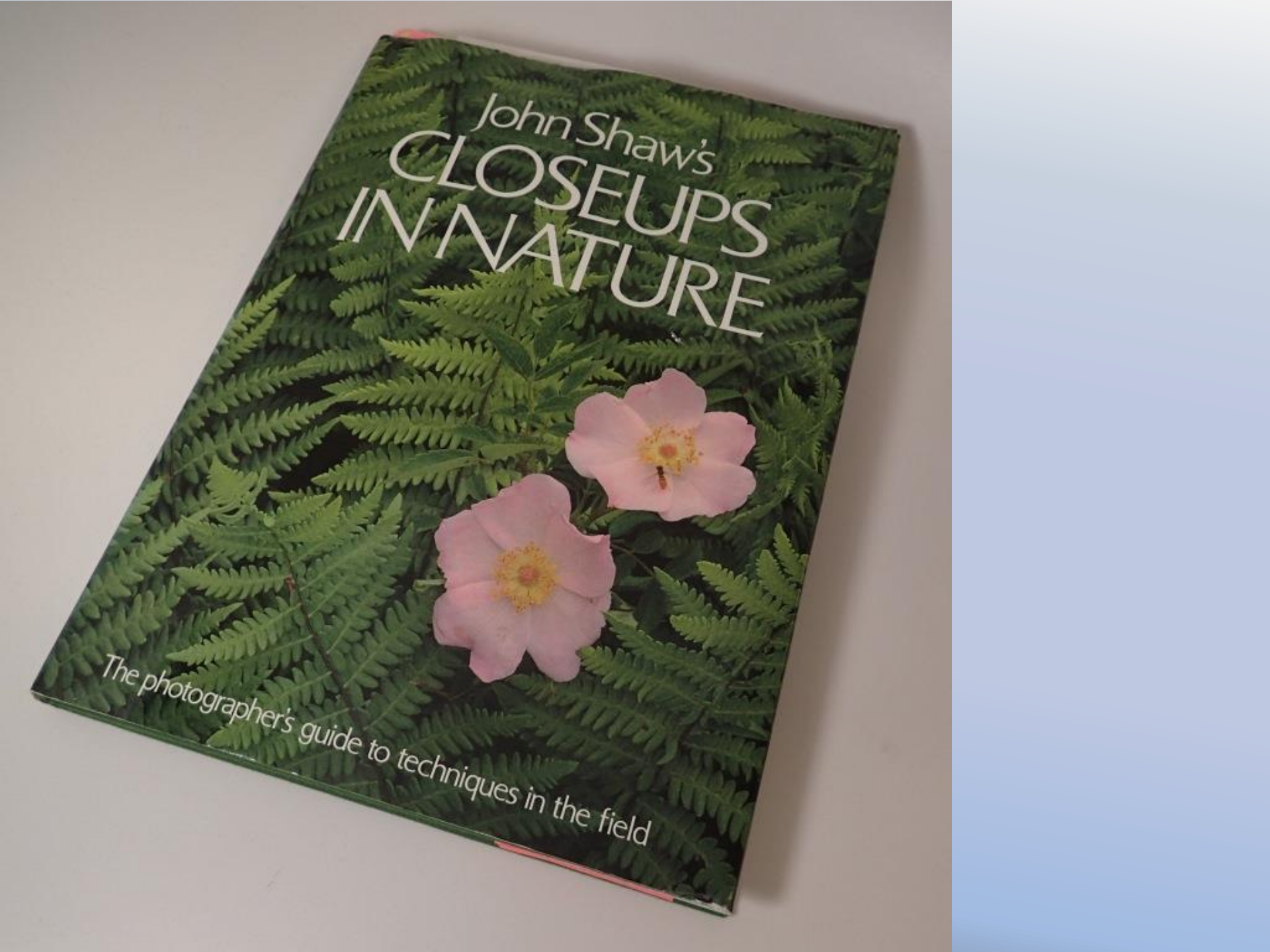
Capture the good times.

Develop from the *negatives*.

And if things don't turn out.

Just take another shot.





John Shaw's
**CLOSEUPS
IN NATURE**

The photographer's guide to techniques in the field

Macroinvertebrate Bathing Station



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



Lens and glass cleaning supplies





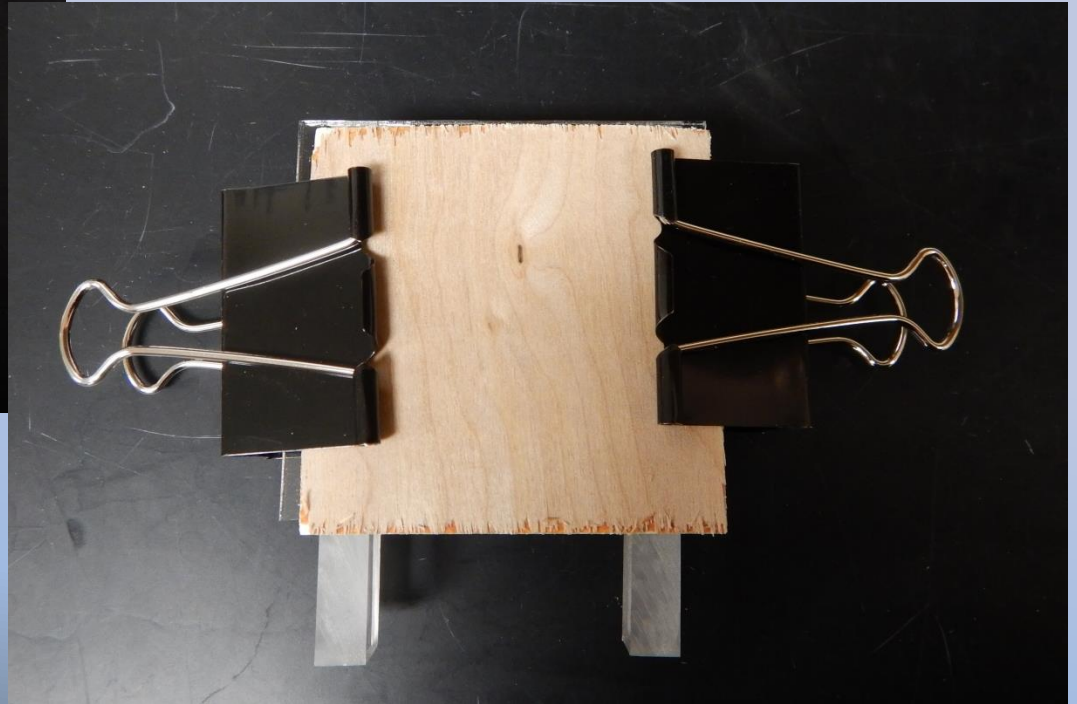
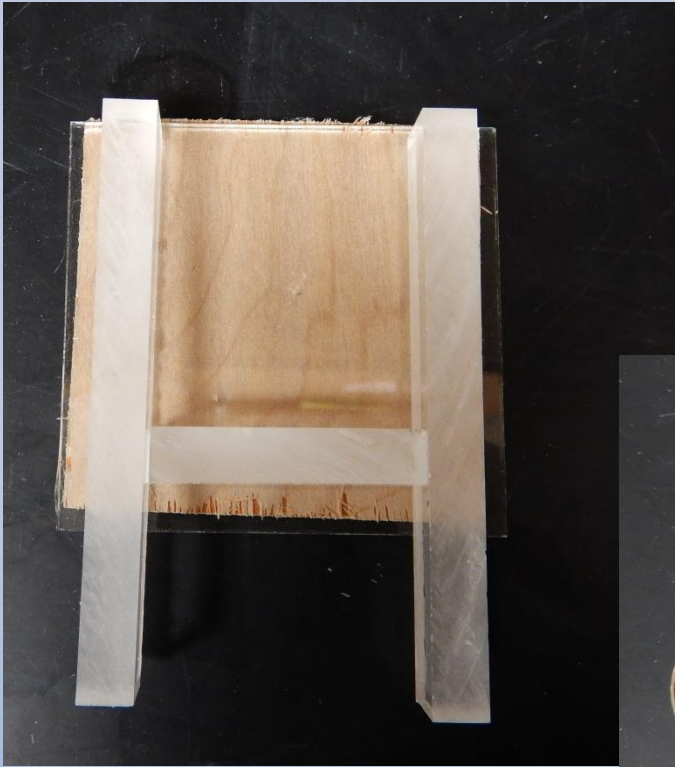




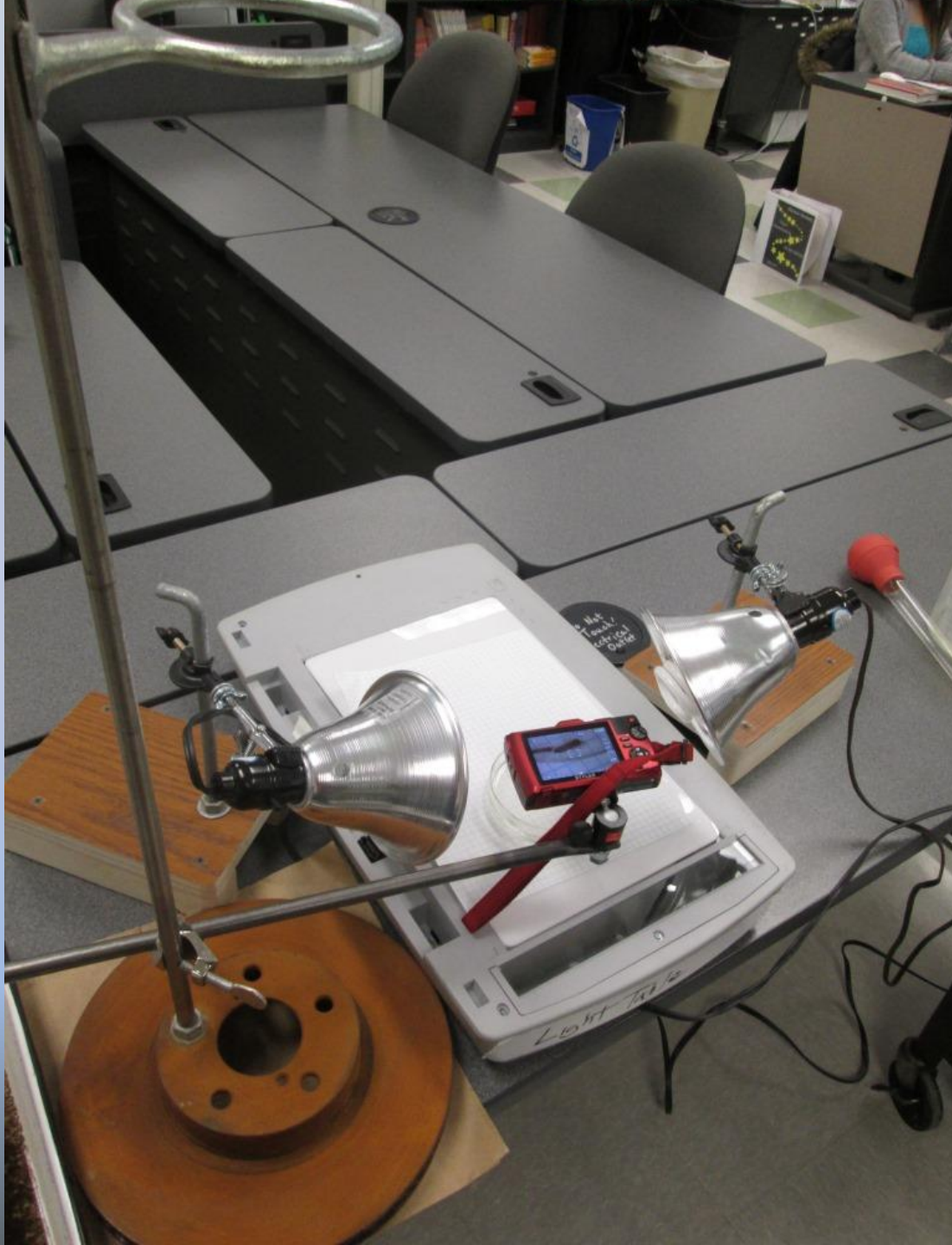


Micro-
aquarium

Building a micro-aquarium.



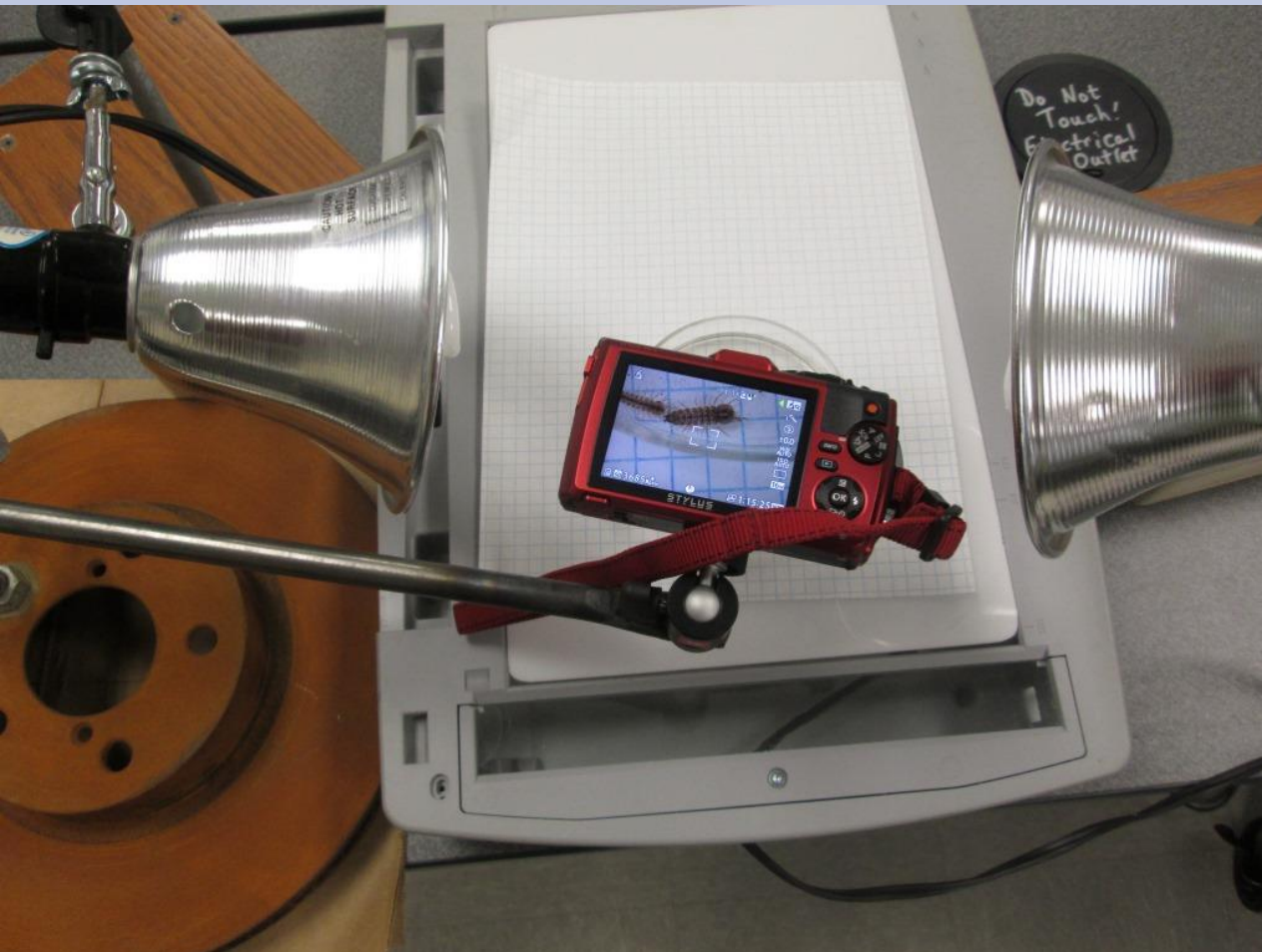




Camera stand
made from steel
rods, rod clamps,
and automotive
brake rotor.

Light stand from
“J” bolts, and
test tube clamp,
with wood base.

OLYMPUS TG-3 DIGITAL CAMERA on a OBEN BD-0 TABLE TOP BALL HEAD



The camera and Table-Top Ball Head is supported by a shop-made rod with flattened end with hole to accept the Ball Head held by a lab type clamp in a brake rotor stand.



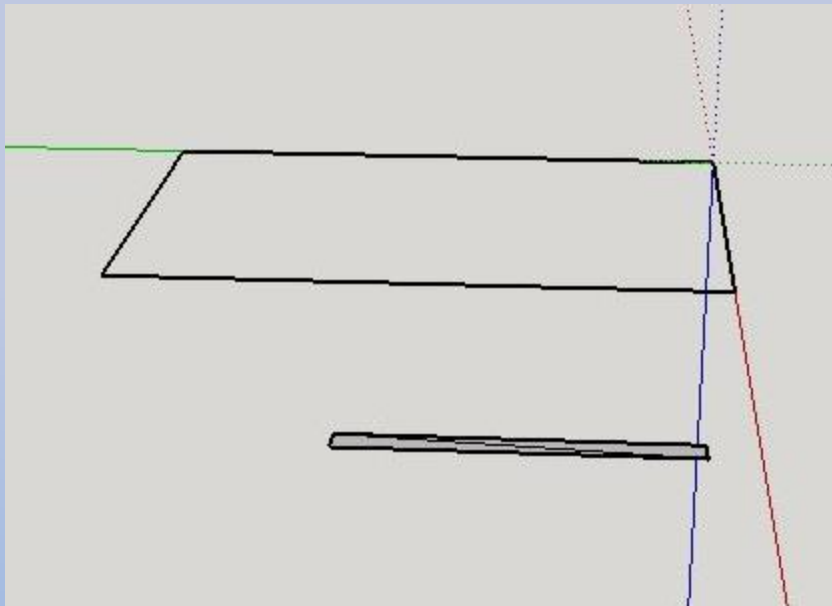
Tripod with home-made camera bracket



Points of interest should be parallel to the LCD Screen/Viewfinder/Film



Parallel



Not Parallel

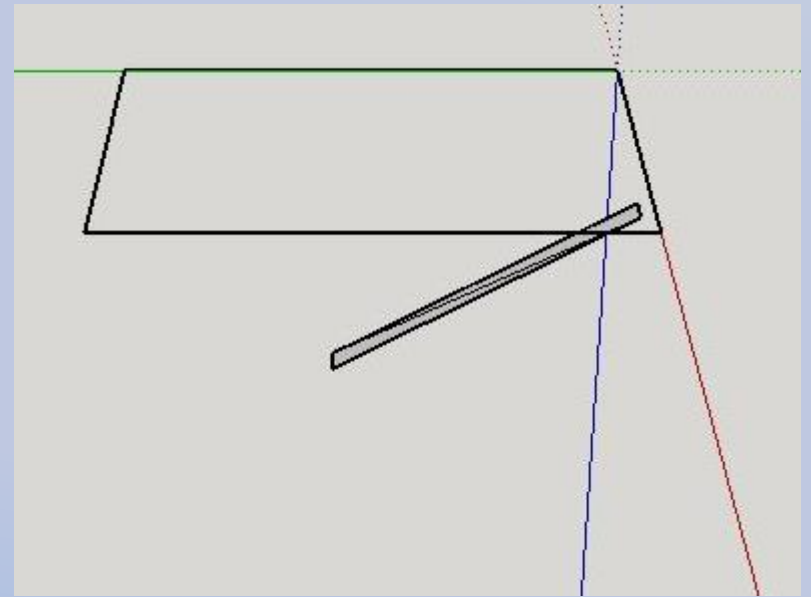


Image taken with OLYMPUS TG-3 Point and Shoot Camera with Focus Stacking



Northern Case-Maker Caddisflies

EIKO SPIRAL FLUORESCENT 27w 5000K



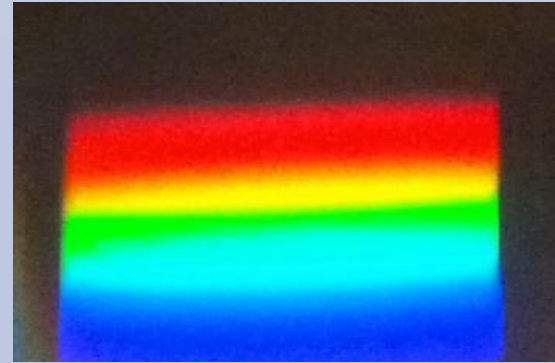
By using compact fluorescent lighting for your photography vs incandescent bulbs, you reduce the risk of overheating your live samples.

Spectra

Daylight



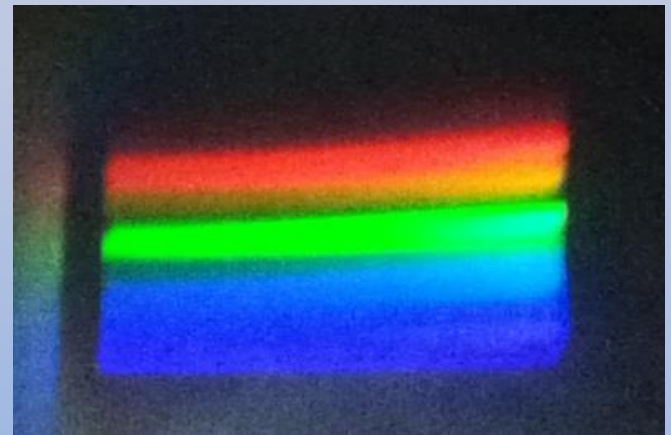
Incandescent



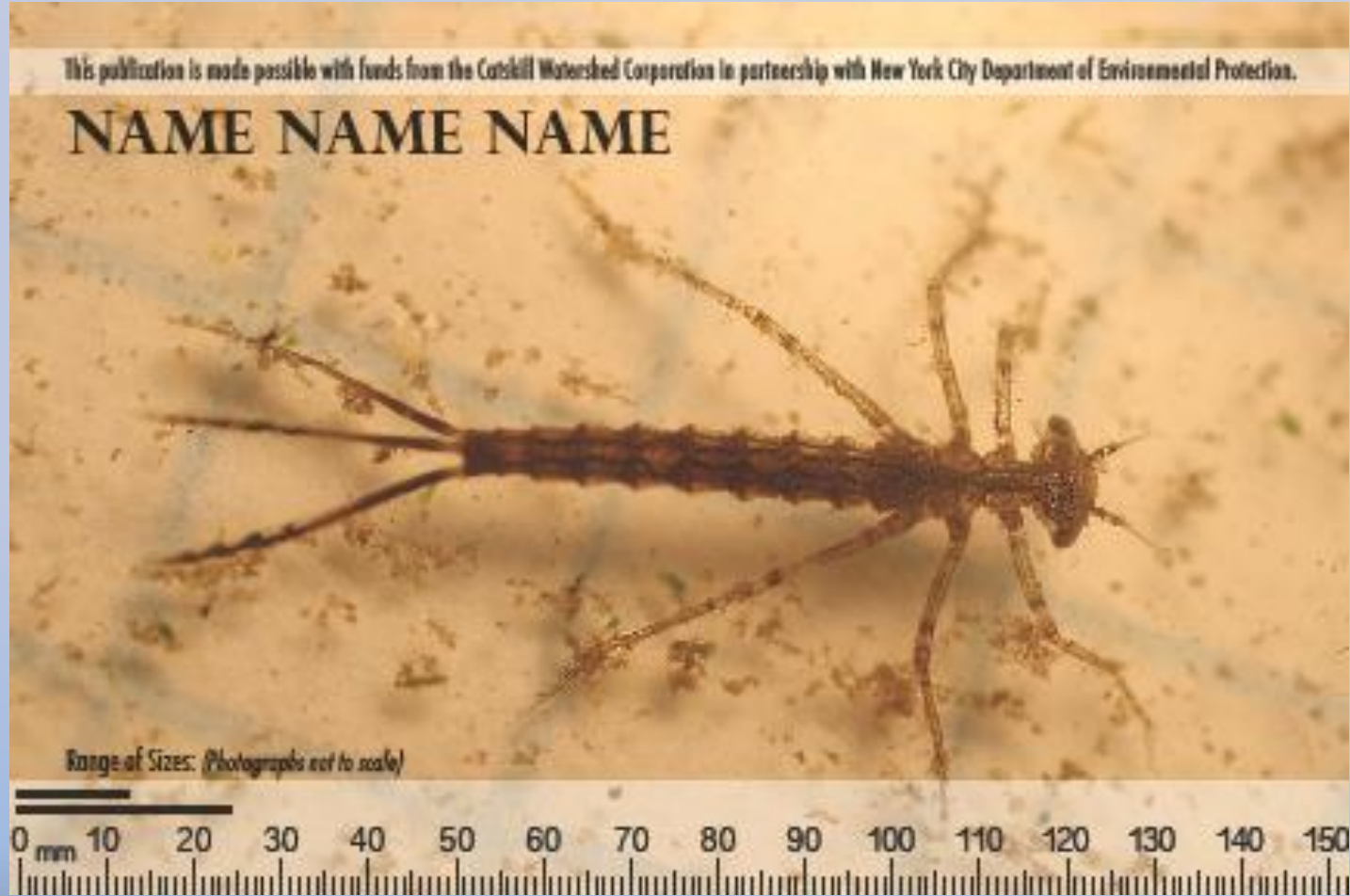
3,000K CFL



5,000K CFL



Next Step: Design a Template



Kerry Mack

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



Important note: The following macroinvertebrate identification cards are a preliminary draft. For the workshop presentation on March 15, the images shown here were linked to the preliminary draft pdf of each macroinvertebrate card.

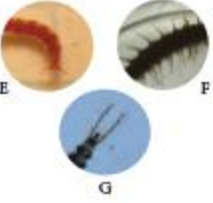
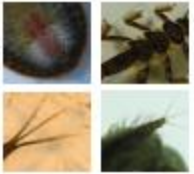
The final digital cards will be available before the end of this school year (June , 2015). If you would like a set of the digital cards email Ed Engelman at engelmae@dcmoboces.com

You will be notified when they become available and will be provided a link to the download site(s).


Special Cards

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

GILLS **NOT GILLS**





Range of Size: (Photographs not to scale)




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LEGS **NOT LEGS BUT LOOK LIKE LEGS**

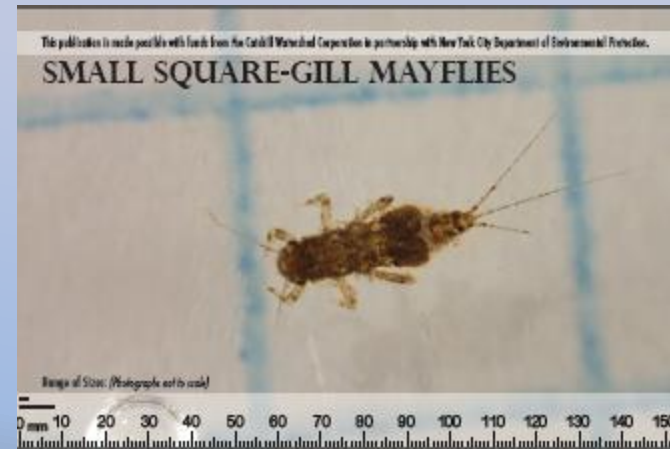
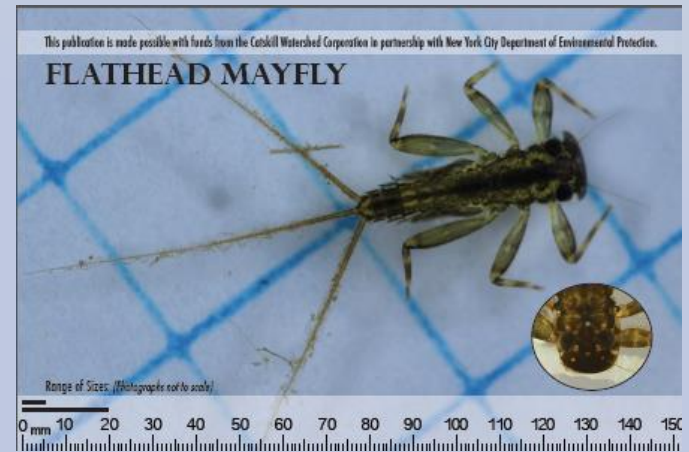


(Photographs not to scale)



EPHEMEROPTERA

Mayflies



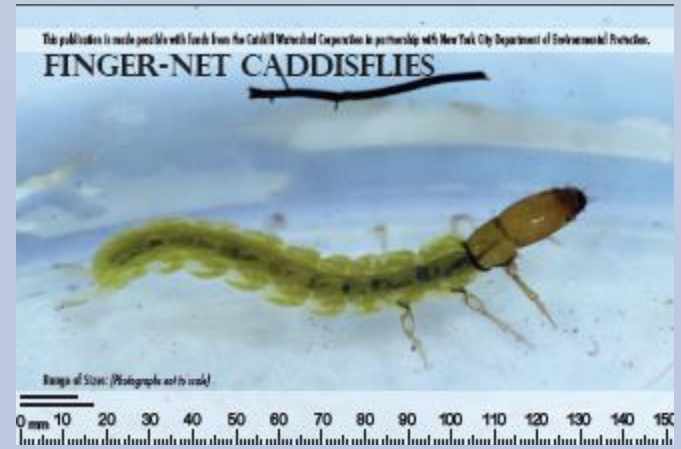
PLECOPTERA

Stoneflies



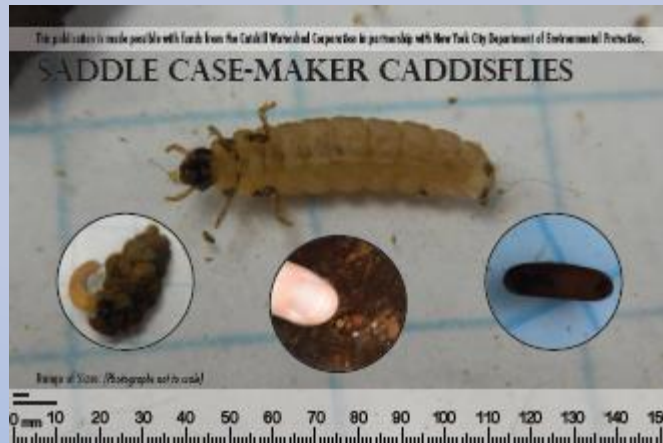
TRICHOPTERA

Caddisflies



TRICHOPTERA (Continued)

Caddisflies



ODONATA

Dragonflies & Damselflies



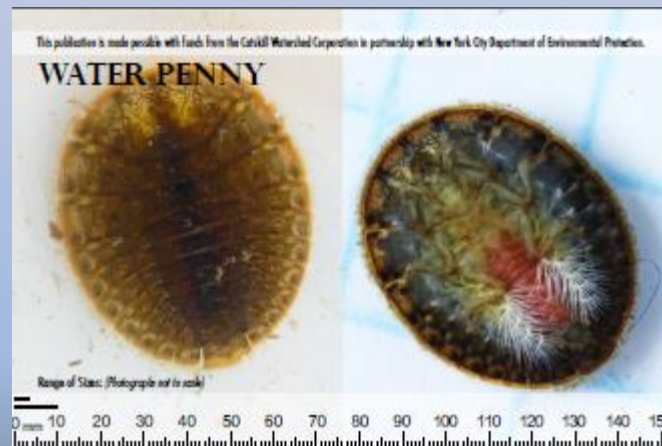
MEGALOPTERA

Fishflies, Alderflies, Dobsonflies

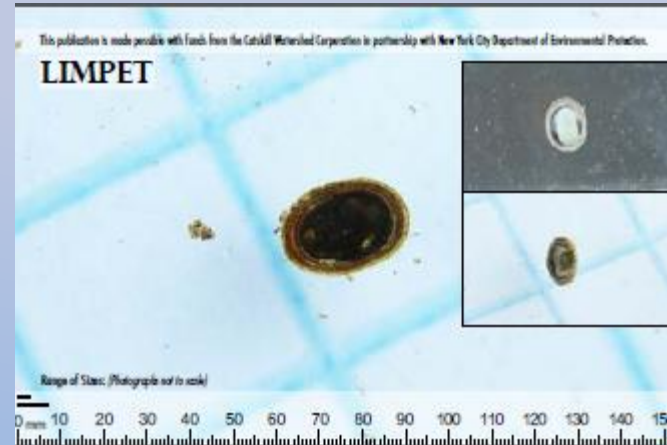
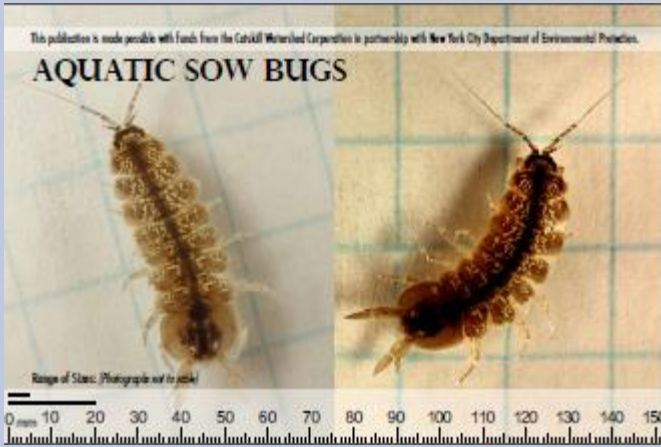


COLEOPTERA

Aquatic Beetles

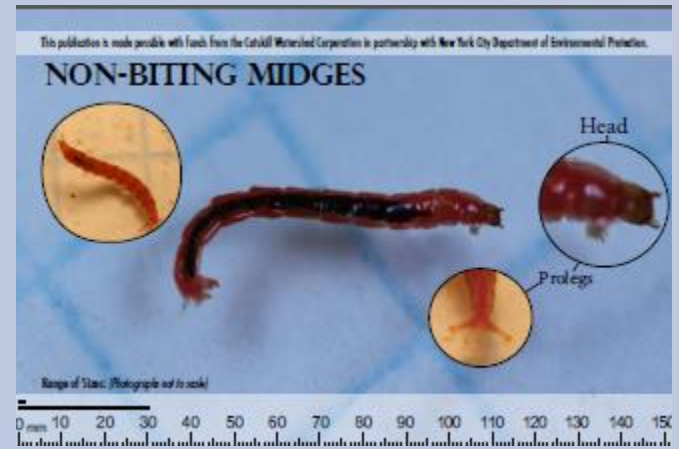


Non-Insect Macroinvertebrates



DIPTERA

Aquatic and Semiaquatic True Flies



THANK YOU

QUESTIONS ?



[https://www.flickr.com/photos/107447394@N07/sets/
72157641718340454/](https://www.flickr.com/photos/107447394@N07/sets/72157641718340454/)