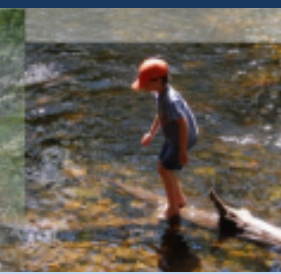


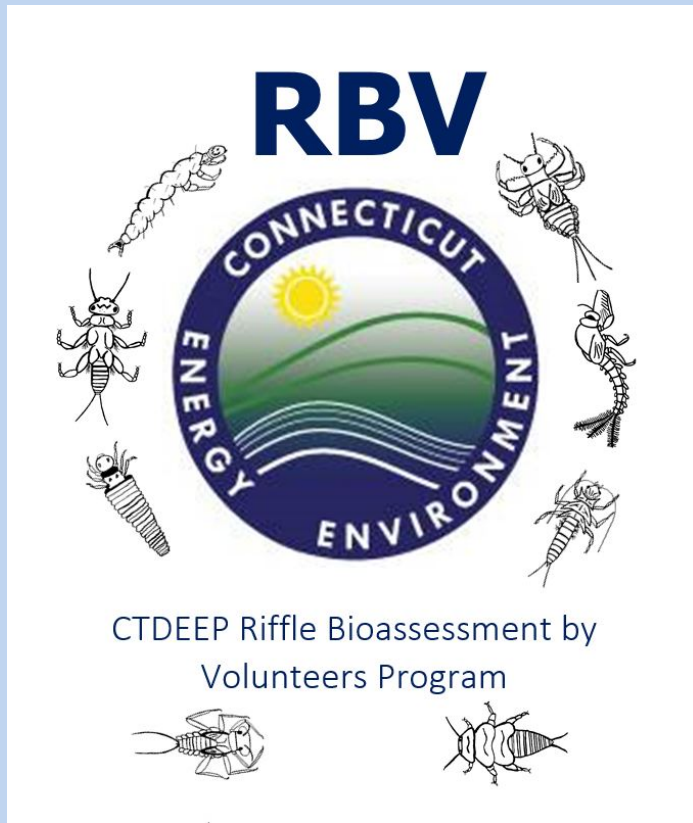


Connecticut Department of Energy and Environmental Protection



Connecticut Department of
**ENERGY &
ENVIRONMENTAL
PROTECTION**

Riffle Bioassessment by Volunteers (RBV) *Volunteer Training*



*A CT DEEP Tier 2
Volunteer Water Quality Monitoring Network
www.ct.gov/deep/rbv*

Last revised 10/09/2015



Connecticut Department of Energy and Environmental Protection

Training Topics

Part 1: Program Background & Overview

Part 2: RBV Methods & Procedures

Part 3: Field Safety

Part 4: The RBV Organisms



Riffle Bioassessment by Volunteers (RBV)

Volunteer Training Presentation:
Part 1 - Program Background & Overview



A CT DEEP Tier 2
Volunteer Water Quality Monitoring Network
www.ct.gov/deep/rbv

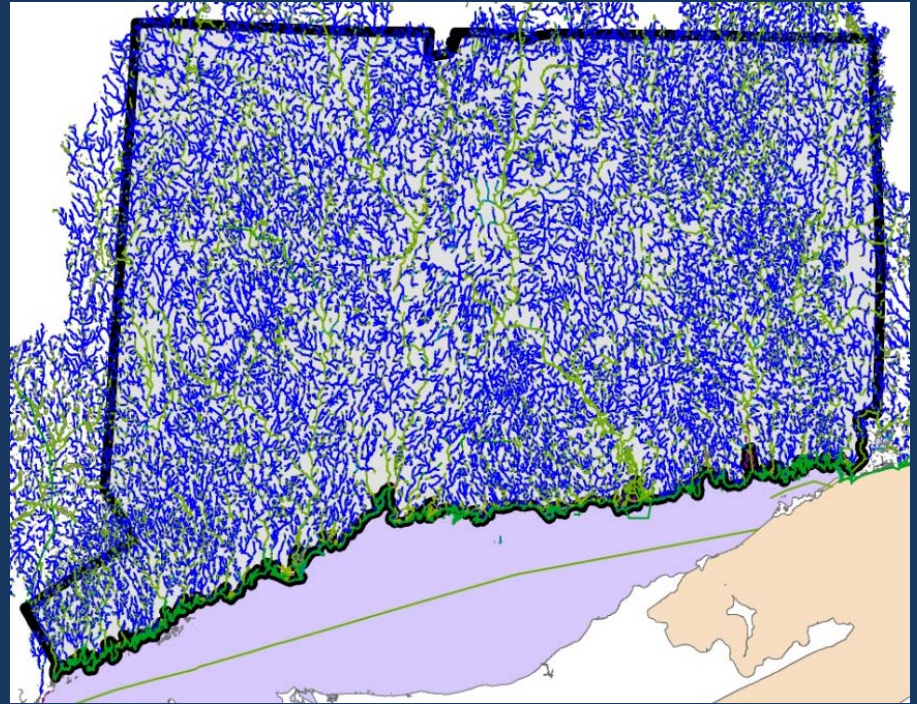
Last revised 10/09/2015



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The Need for RBV: So Many Stream Miles!

- CT has ~5,830 miles of rivers and streams
 - That's about the length of the US-Canada and US-Mexico borders combined!
- CT DEEP conducts annual monitoring of CT's waters
 - Able to directly monitor and assess on average only about 20% of all streams and rivers.



The Need for RBV: So Many Stream Miles!

- RBV was developed by CT DEEP in 1999
 - Provides volunteers with a relatively fast, low technology macroinvertebrate collection and identification method
 - Allows volunteers to generate data usable by CT DEEP for state and Federal water quality assessment purposes
 - Increases the number of stream miles assessed by CT DEEP during each two-year reporting cycle
- Between 1999-2014, RBV volunteers have collected more than 3,100 samples!
 - Over 280 'Four or More' samples submitted
 - On average 20 active local programs per year – monitor over 100 stations per year together



What the RBV Program IS...

- A relatively quick, easy to learn 'citizen science' volunteer program coordinated by the State of Connecticut.
- A simple screening tool that uses macroinvertebrates to find and document good water quality in your local streams.
- A way to help your community and the State collect meaningful data.
- An opportunity to explore some beautiful locations in your community with other like-minded individuals!



Why Use Macroinvertebrates to Study Water Quality?

- They are in almost every stream in CT
- They have limited mobility and therefore 'absorb' water quality conditions around them
- Their response to water quality is very well known and documented
- They are easy to capture
- They recover rapidly from sampling



The RBV Organisms

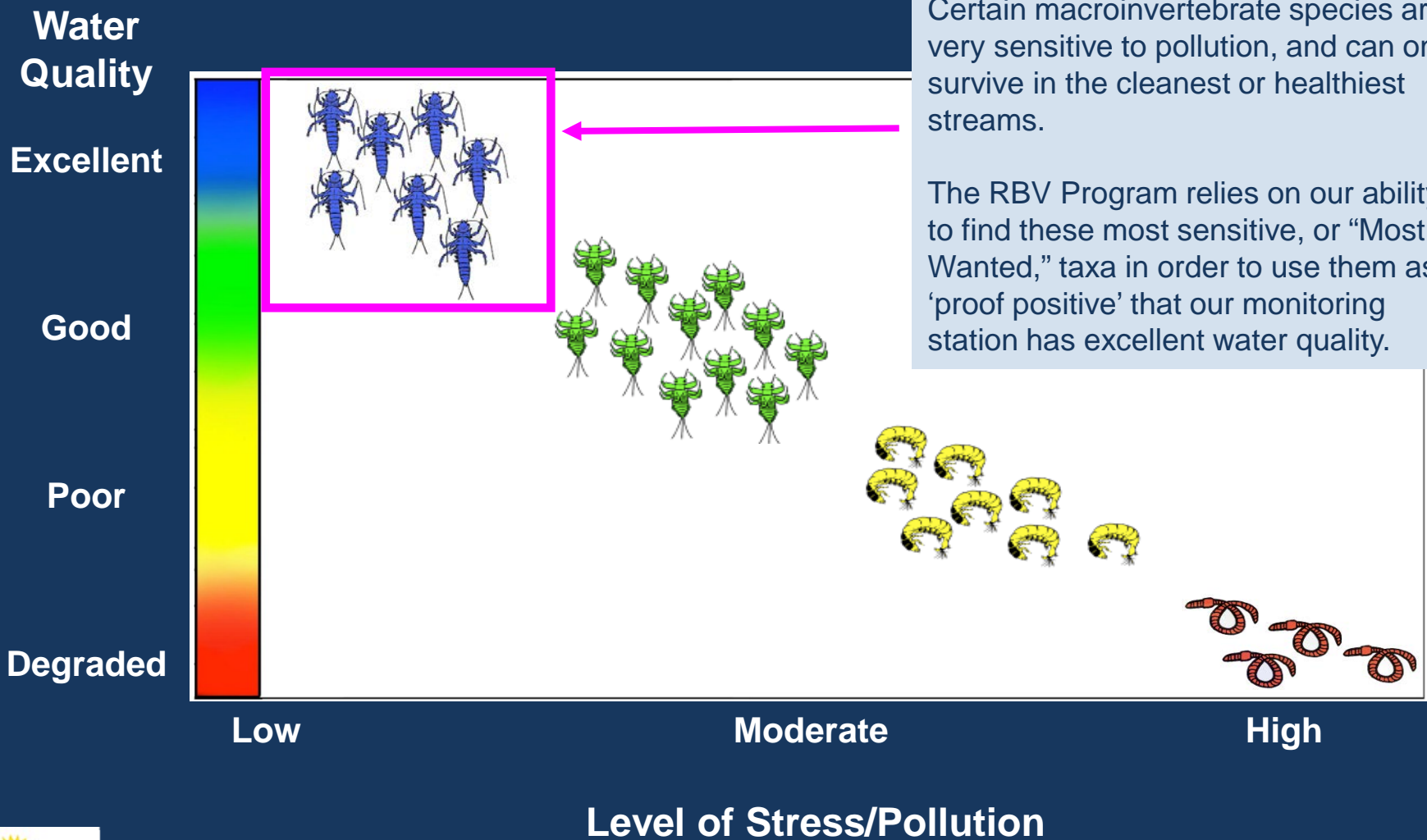
28 RBV organism 'types' selected for inclusion in the program based upon:

- Known pollution sensitivities
- Easily identified
- Relatively common with statewide distribution
- Unique identifying features such as color, shape or behavior

MOST WANTED (Most Sensitive to Pollution)	1 "Body-Builder" Mayfly <i>Drunella</i> sp.	2 Brush-Legged Mayfly <i>Isonychia</i> sp.	3 2-Tail Flathead Mayfly <i>Epeorus</i> sp.	4 Roach-Like Stonefly Plecoptera	5A Common Stonefly Perlidae	5B Giant Stonefly <i>Pteronarcys</i> sp.	5C Misc. Small Stonefly Plecoptera	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MOST WANTED (Most Sensitive to Pollution)	6A Saddle-Case Caddis <i>Glossosoma</i> sp.	6B Cornucopia Case Caddis <i>Apatania</i> sp.	7 Free-Living Caddis <i>Rhyacophila</i> sp.	8A Humpless Caddis <i>Brachycentrus</i> sp.	8B Plant Case Caddis <i>Lepidostoma</i> sp.	# Most Wanted Types: 5+	Water Quality: EXCEPTIONAL: Fully Supporting Aquatic Life Use Goals EXCELLENT: Likely Supporting Aquatic Life Use Goals NOT DETERMINED: More Info Needed	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
MODERATELY SENSITIVE (Moderately Sensitive to Pollution)	9 Common Netspinner Hydropsychidae	10 Fingernet Caddis Philopotamidae	11 3-Tail Flat Head Mayfly <i>Stenonema</i> sp.*	12 Water Penny <i>Psephenus</i> sp.	13A Dobsonfly <i>Corydalus</i> sp.	13B Fishfly <i>Nigronia</i> sp.	14A Dragonfly Anisoptera	14B Damselfly Zygoptera
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LEAST WANTED (Least Sensitive to Pollution)	15 Scud Amphipoda	16 Aquatic Sow Bug Isopoda	17 Leech Hirudinea	18 Non-Biting Midge Chironimidae	19 Black Fly Simuliidae	20 Snail Gastropoda	21 Aquatic Worm Oligochaeta	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OTHERS	22 Crayfish Decapoda	23 Crane Fly Tipulidae	24 Riffle Beetle Elmidae	25 Small Minnow Mayfly Baetidae	26 Aquatic Snipe Fly <i>Atherix</i> sp.	27 Flatworm <i>Planaria</i> sp.	28 Mussel/Clam Unionoida	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Why Use Macroinvertebrates to Study Water Quality?



Certain macroinvertebrate species are very sensitive to pollution, and can only survive in the cleanest or healthiest streams.

The RBV Program relies on our ability to find these most sensitive, or “Most Wanted,” taxa in order to use them as ‘proof positive’ that our monitoring station has excellent water quality.



CT's Healthy Stream Treasure Hunt

The “Four or More Rule”: RBV is a ‘treasure hunt’ for the State’s healthiest streams. We are looking for those streams that have 4 or more “Most Wanted” macroinvertebrate types at them. These macroinvertebrates are very sensitive to pollution, so if we find them it is strong evidence that the stream is very clean!



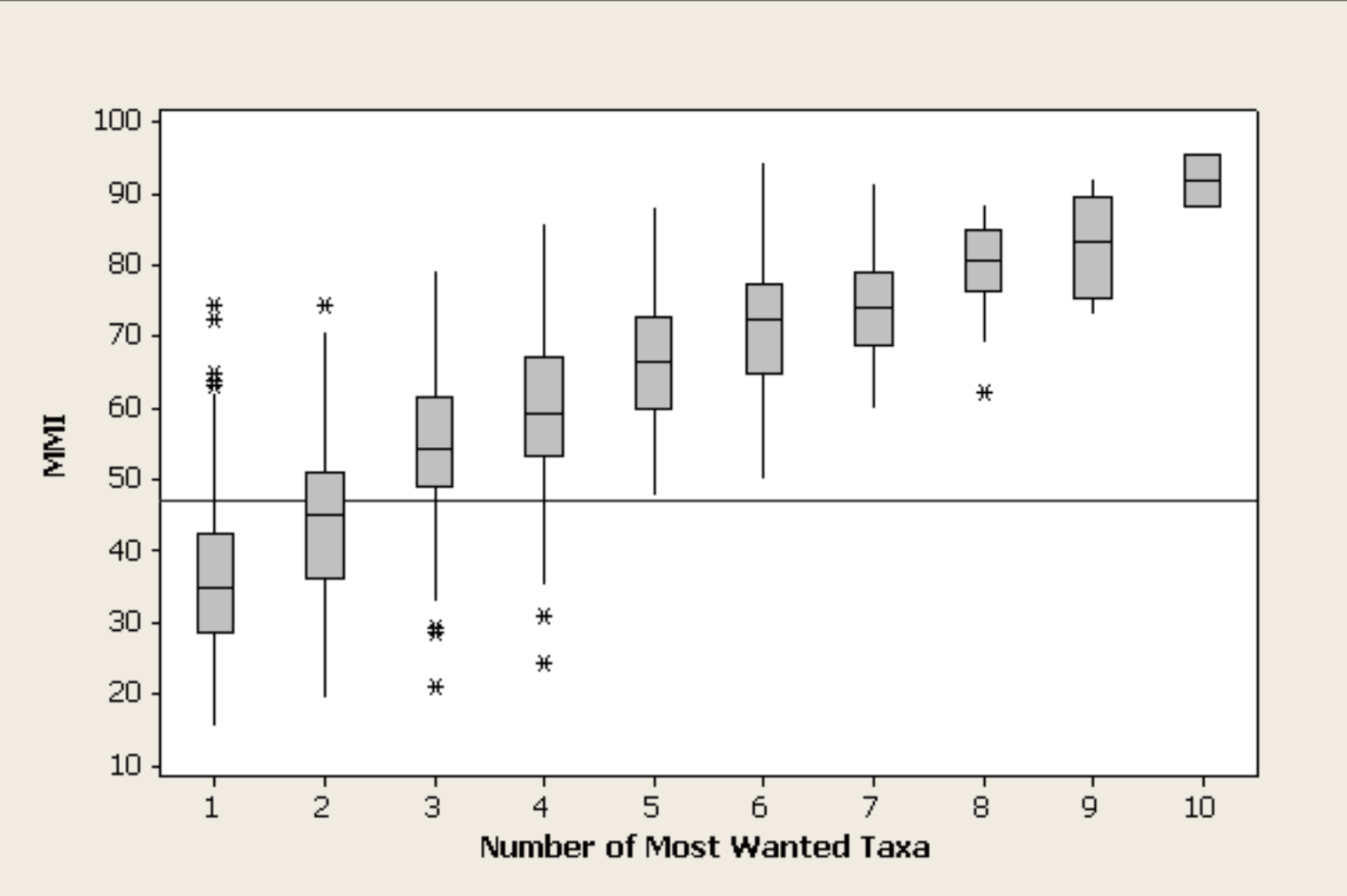
MOST WANTED (Most Sensitive to Pollution)	1	2	3	4	5A	5 B	5 C
	"Body-BUILDER" Mayfly <i>Drunella sp.</i>	Brush-Legged Mayfly <i>Isonychia sp.</i>	2-Tail Flathead Mayfly <i>Epeorus sp.</i>	Roach-Like Stonefly Peltoperlidae	Common Stonefly Perlidae	Giant Stonefly <i>Pteronarcys sp.</i>	Misc. Small Stonefly Plecoptera
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

MOST WANTED (Most Sensitive to Pollution)	6A	6 B	7	8A	8 B	# Most Wanted Types:	Water Quality:
	Saddle-Case Caddis <i>Glossosoma sp.</i>	Cornucopia Case Caddis <i>Apatania sp.</i>	Free-Living Caddis <i>Rhyacophila sp.</i>	Humpless Caddis <i>Brachycentrus sp.</i>	Plant Case Caddis <i>Lepidostoma sp.</i>		
						4	EXCELLENT: Likely Supporting Aquatic Life Use Goals
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0-3	NOT DETERMINED: More Info Needed



How Does the '4 or More' Rule Work?

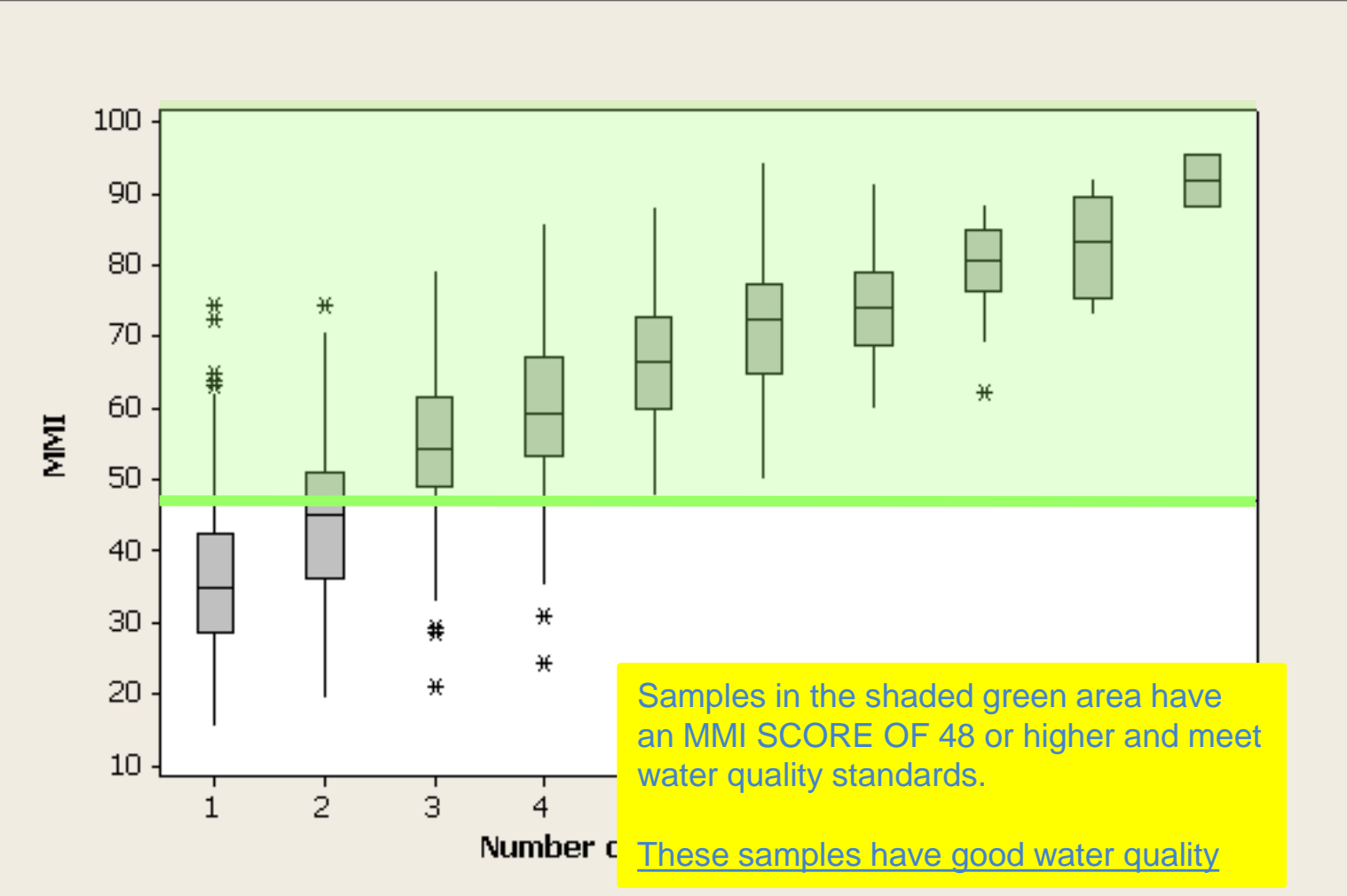
Shown at right are over 1,000 macro-invertebrate samples collected by DEEP between 1999-2011 as part of the general statewide monitoring program (e.g. not RBV samples).



How Does the '4 or More' Rule Work?

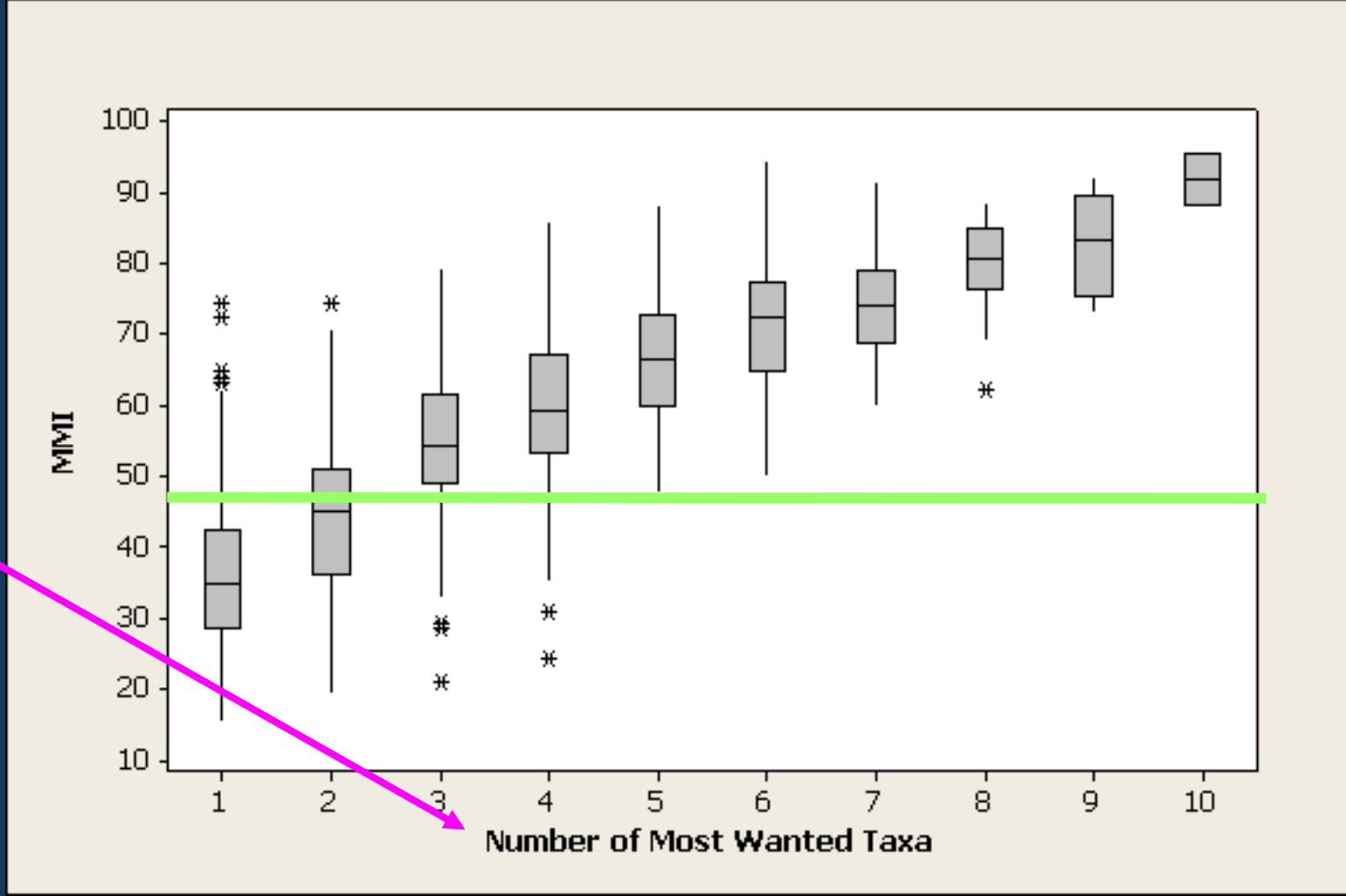
For each sample CT DEEP calculates a **multi-metric index (MMI) score** to determine if the water quality is good enough to meet state standards.

A MMI score of 48 or higher is needed to pass State water quality requirements.



How Does the '4 or More' Rule Work?

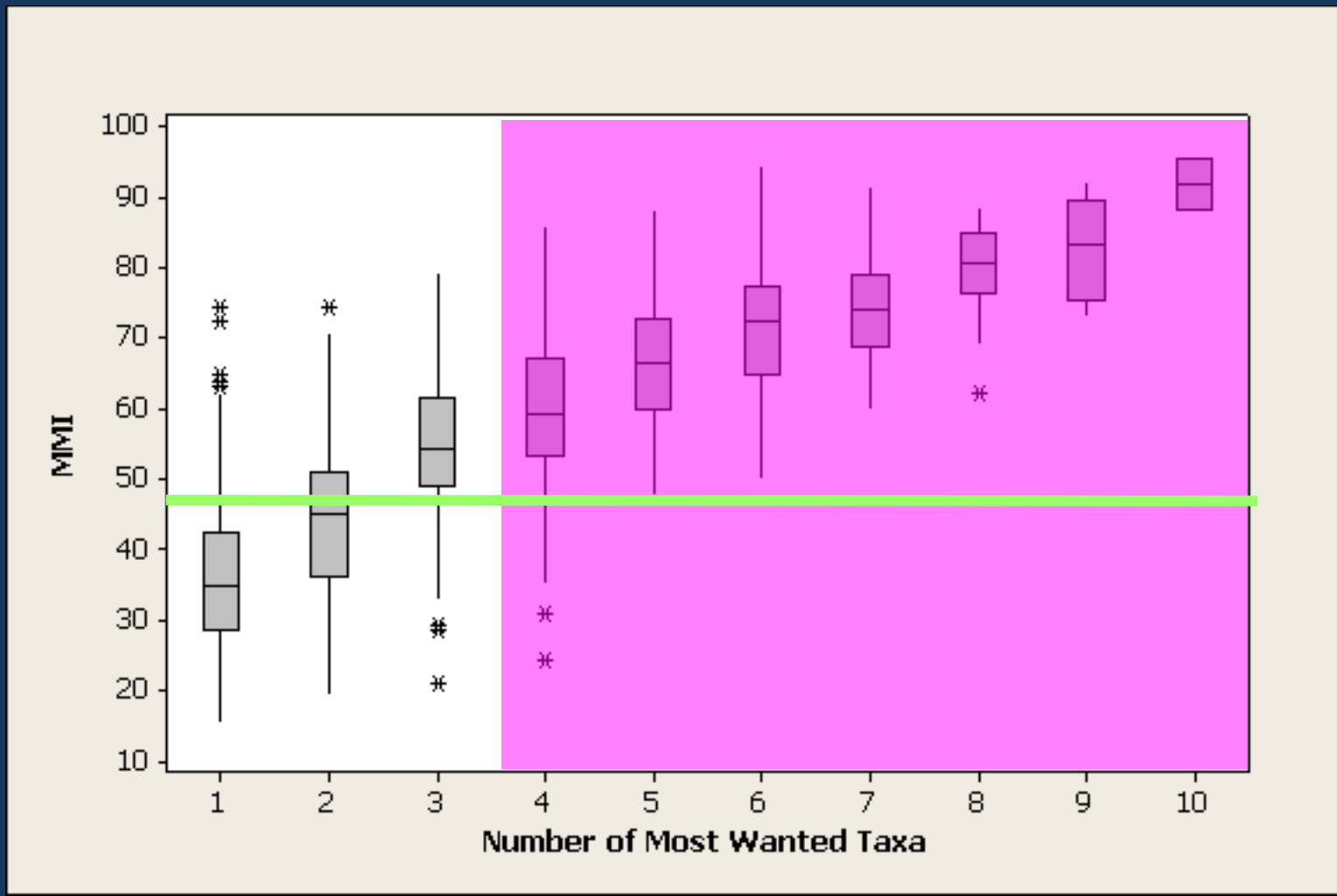
The samples in the chart are grouped by the number of RBV most wanted types they contained (bottom axis).



How Does the '4 or More' Rule Work?

The pink box highlights samples with 4 or more Most Wanted RBV types.

>99%* of these '4 or More' samples also had an MMI score greater than 48, indicating they were collected from sites with excellent water quality.



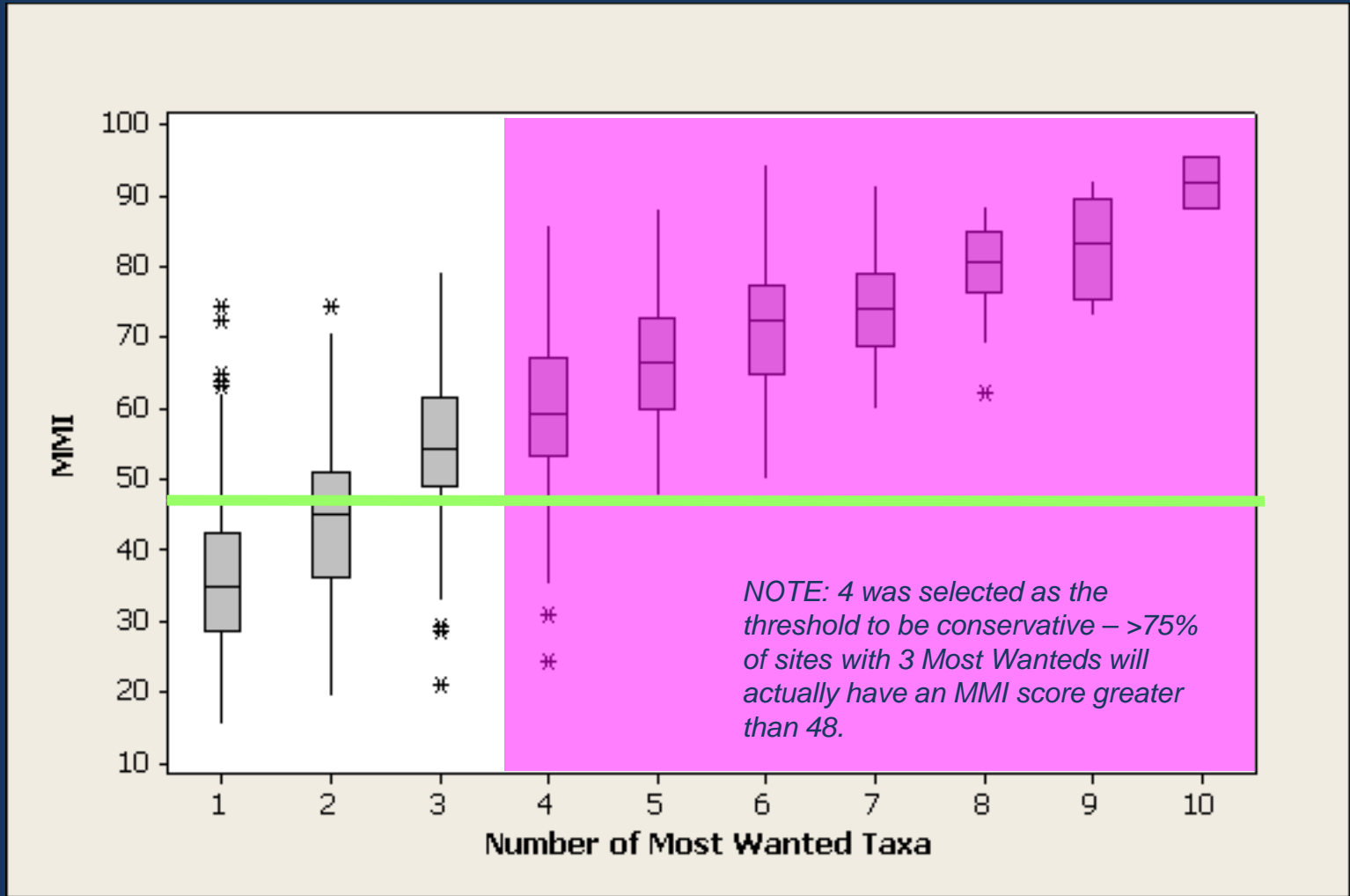
*7 out of 1152 samples had 4 Most Wantedes but an MMI score less than 48; all were sites that we would not use RBV on (e.g. large rivers)



How Does the '4 or More' Rule Work?

RBV
Program
Basis:

If we find 4
or More
Most
Wanted
Types in an
RBV sample,
it can be
used as
evidence of
excellent
water
quality.

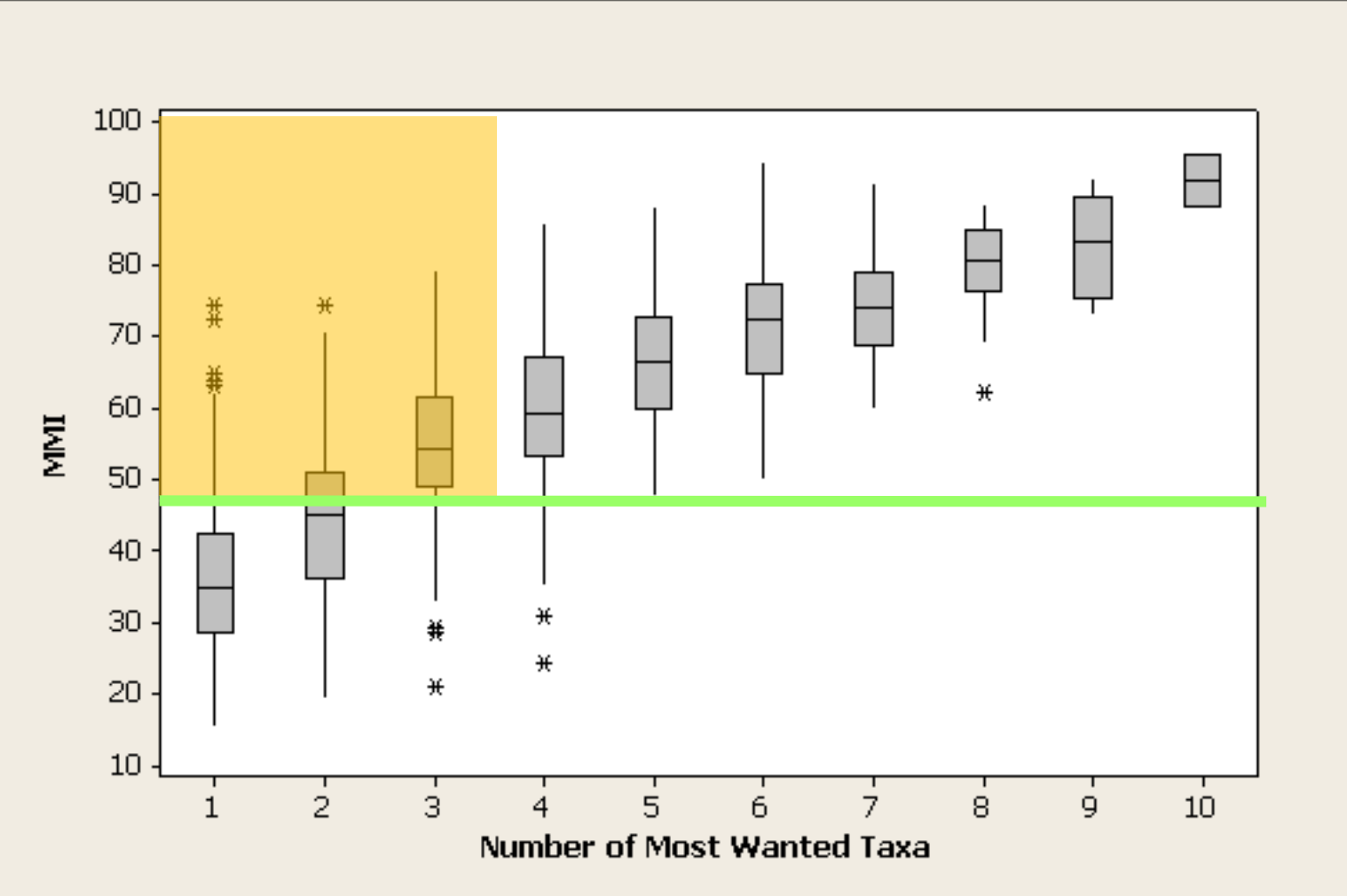


*The 7 samples that had 4 Most Wanted Taxa but an MMI score less than 48 were very large rivers that we would not use RBV on.

Does <4 Most Wanted Indicate Bad Water Quality?

NO!!!

Low numbers of most wanted types is not a reliable indicator of reduced water quality.



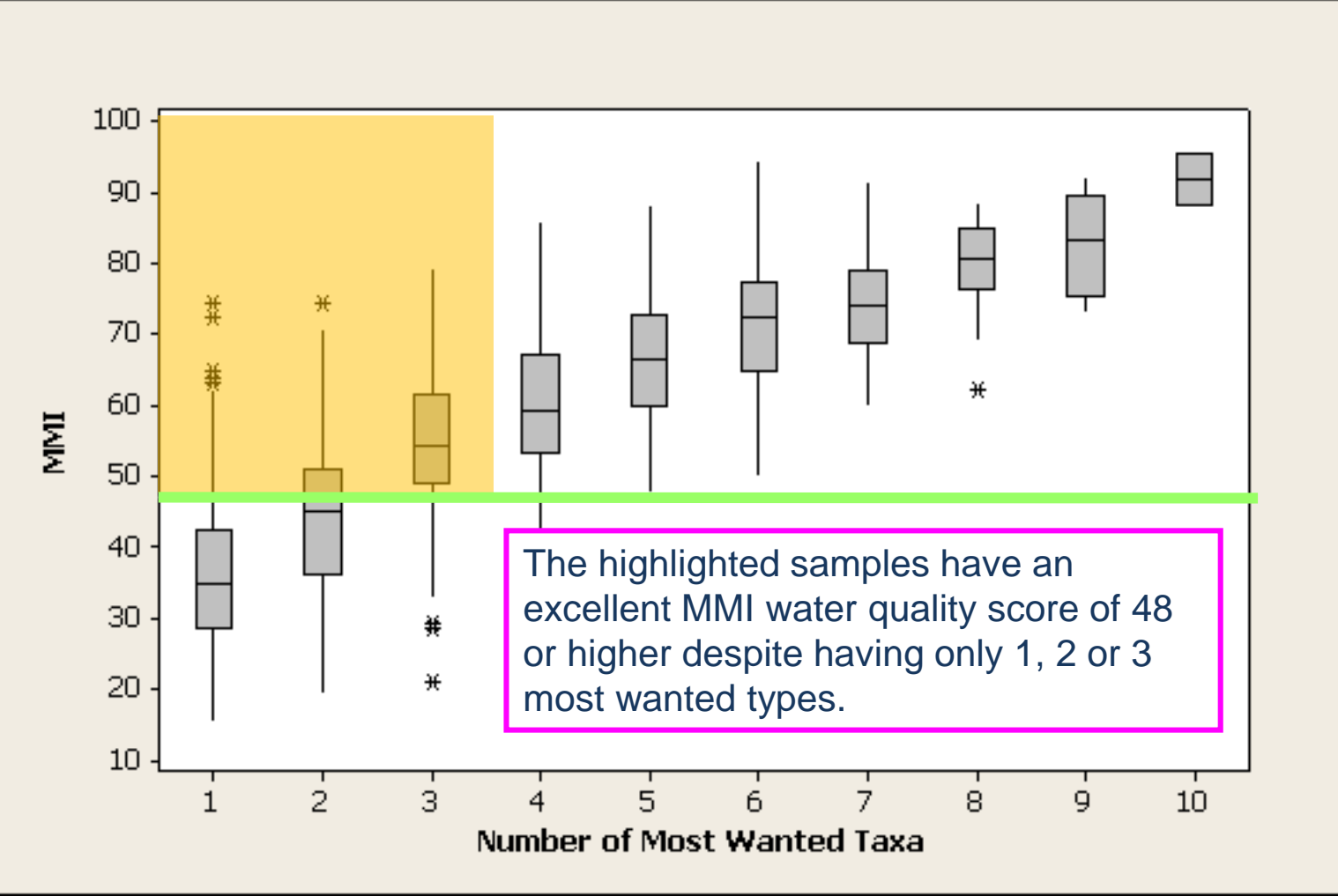
**The 7 samples that had 4 Most Wanted but an MMI score less than 48 were very large rivers that we would not use RBV on.*



Does <4 Most Wanted Indicate Bad Water Quality?

NO!!!

Because CT has so many species of macroinvertebrates and the 26 RBV types represent only a tiny fraction of these, not all sites with good water quality will have 4 or More RBV Most Wanted taxa present.



Where Do We Use RBV?

Not all waterbodies can be successfully monitored with RBV – we are primarily looking to document high quality headwater streams.

RBV monitoring locations must be:

- Smaller streams and rivers, approximately 1st-3rd order in size (<15 mi² watershed)
- Characterized by plenty of riffle habitat
- Free of discharges, dams, or other obvious factors that would reduce water quality.
- Flow year-round under normal conditions

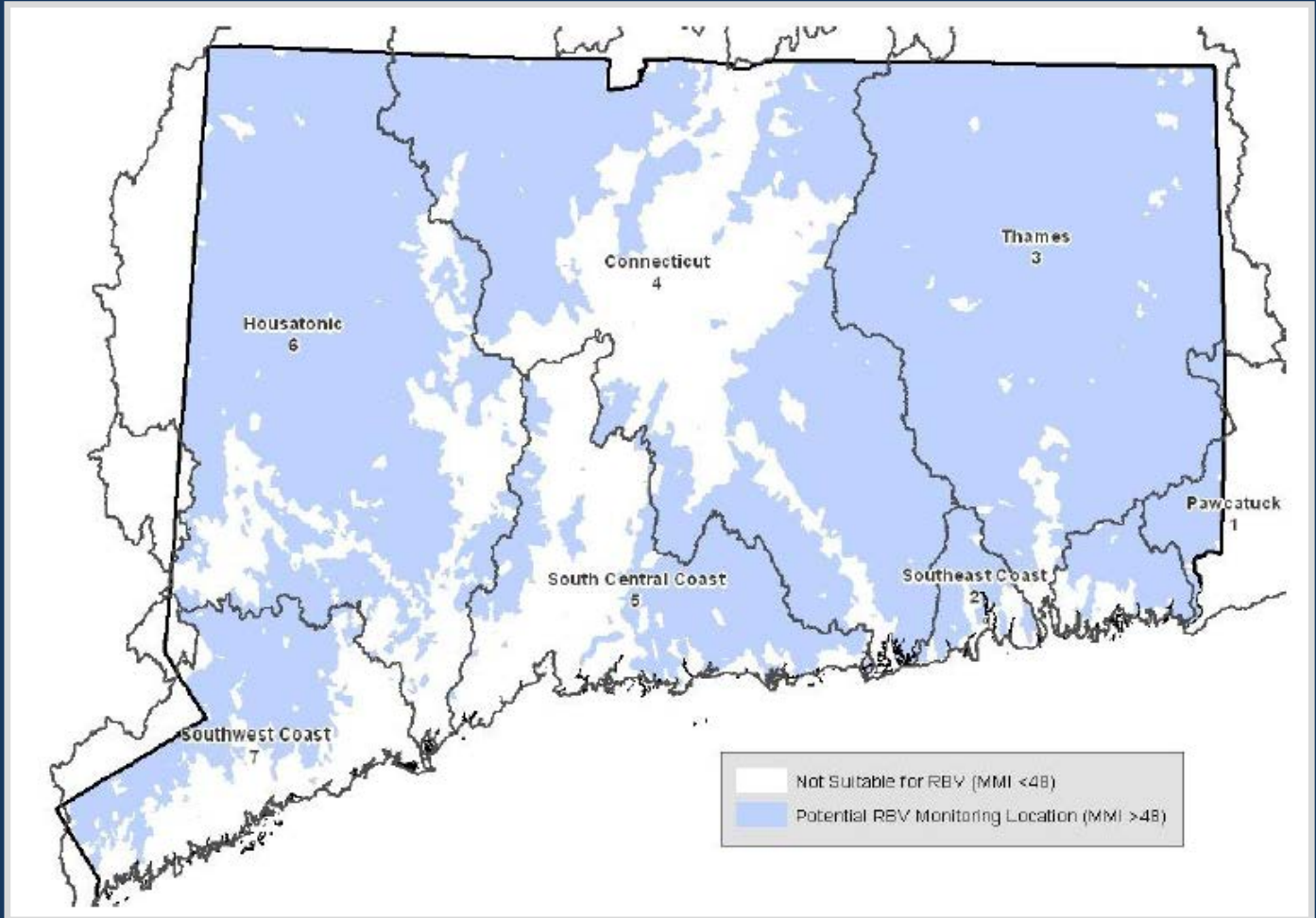
Don't forget - we are on a treasure hunt for Connecticut's healthiest streams!



Recommended RBV Monitoring Regions

RBV is a 'treasure hunt' for CT's healthiest streams!

Volunteers will be targeting streams predicted to have an MMI score of 48 or greater (i.e. predicted to have excellent water quality.)



Want to Learn More? Go to the Website!

RBV Webpage:
www.ct.gov/deep/rbv

- Additional Overview Information
- Annual Summary Reports
- State Coordinator Information
- Copies of Training Presentations
- Downloadable field materials



The screenshot shows the RBV webpage with a navigation menu including Home, About Us, Programs & Services, Publications, Forms, and Contact Us. The main content area features the title "Riffle Bioassessment by Volunteers (RBV) Program" and a sub-header "A CT DEEP Tier 2 Volunteer Water Quality Monitoring Network". A large photograph shows volunteers in a stream. Text sections include "About the Program:", "Do Volunteers Need to have Previous Experience Monitoring Streams?", and "Where Can I Use the RBV Program?". A sidebar on the left contains links for "Water Resources", "Water Quality", "Water Quantity", "Watershed Management", "Wetlands", "Regulating Water Usage and Water Discharges", "Environmental Protection Begins With You", "Water Main Page", and "Main Menu". A vertical menu of utility links is also present, such as "Report an Environmental Concern/Problem", "Calendar of Events", "Laws and Regulations", "Maps and GIS Data", "No Child Left Inside", and "The Official CT State Parks & Forests Outdoors Guide GPS Mobile App".



Connecticut Department of Energy and Environmental Protection

Riffle Bioassessment by Volunteers (RBV)

Volunteer Training Presentation:

Part 2 – RBV Methods & Procedures



A CT DEEP Tier 2

Volunteer Water Quality Monitoring Network

www.ct.gov/deep/rbv

Last revised 10/09/2015



Connecticut Department of Energy and Environmental Protection

The Field Team

RBV volunteers sample in groups referred to as “Field Teams.”

- Groups consist of at least 2 volunteers (‘team members’) typically no more than 5
- Each field team is supervised by a **Field Team Leader**
 - Experienced volunteer (at least 1 year of prior experience)
 - Assigned to team by Local RBV Coordinator; reports to the Local RBV Coordinator
 - Responsible for reviewing and submitting field data package (photos, datasheet, voucher) at end of sample



Experienced Volunteer – 1 or more years of training and experience within past two years.

New Volunteer – no prior RBV experience OR has not participated in more than 2 years

Youth Volunteer – anyone under 18 regardless of past experience; refer to local program rules regarding participation limitations



Overview of the RBV Protocol

- Site selection (set up)
- Site photographs and GPS
- Collect (scrub & kick)
- Process (observe & Sort)
- Identify
- Voucher
- Submit
- Congratulations!



Monitoring Station Selection



****Sites are selected in advance by the Local RBV Coordinator****

- **RBV Site Requirements:**
 - Safely accessible by volunteers
 - Characterized by riffle habitat
 - Small, perennial 1st-3rd order streams (no large rivers!!)
 - Not listed as impaired or immediately downstream of a discharge or dam

***Ideal Sites are headwater streams thought to be high quality but which have not been monitored or assessed by DEEP within the past two years.**





RIFFLES!!



Step 1: Site Set Up



Establish the Sampling Station:

- Select an appropriate riffle area

NOTE:

If sampling at a road crossing – sample **UPSTREAM** of the crossing whenever possible



Step 1: Site Set Up

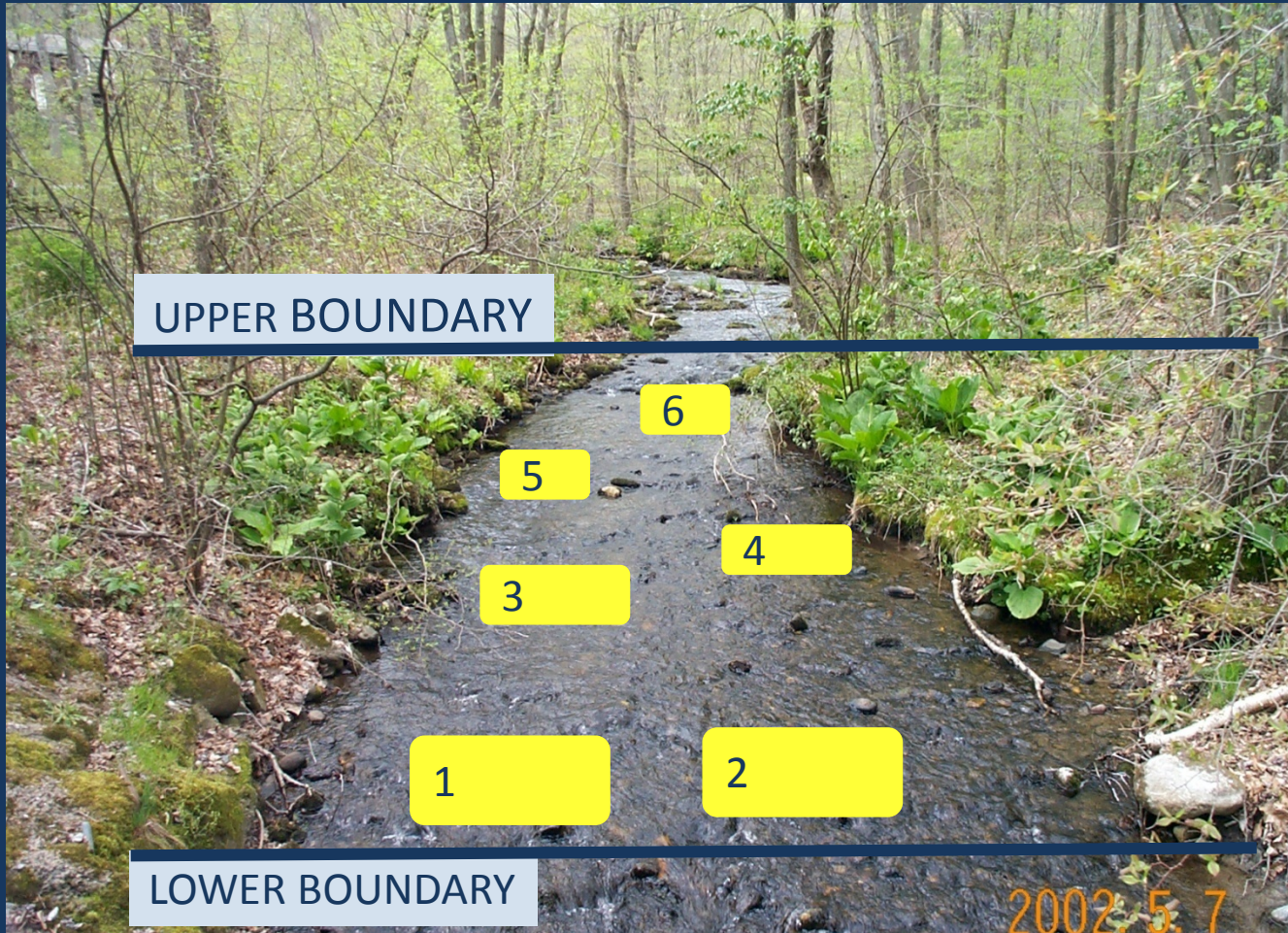


Establish the Sampling Station:

- Select an appropriate riffle area
- Define the upper and lower boundaries of the riffle



Step 1: Site Set Up



Establish the Sampling Station:

- Select an appropriate riffle area
- Define the upper and lower boundaries of the riffle
- Visualize where you can put the net into the water 6 times



Note: One Site may require several riffles



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Note: One Site may require several riffles



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Step 2: Site Photographs & GPS Location

- For each site take two photographs:
 - Stand in the middle of your riffle and face **upstream** → take photo #1
 - Turn 180 degrees so that you are now facing **downstream** → take photo #2



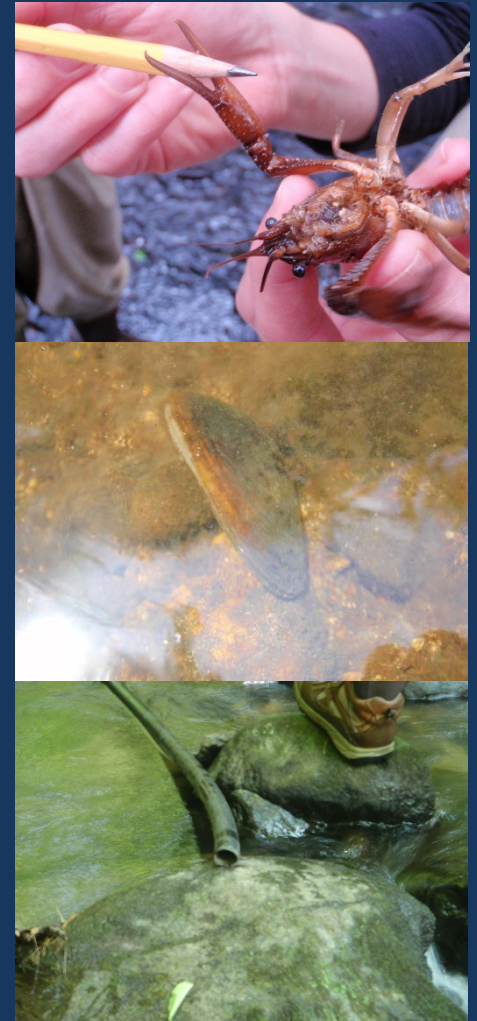
Example upstream site photograph

Remember: The goal is to take a photograph to document the area from which you will collect the sample!



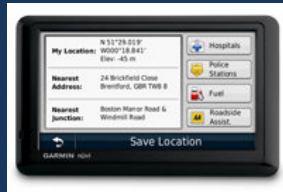
Step 2: Site Photographs & GPS Location

- Take photographs the same day as conducting the RBV event
- Try to capture the field conditions at the time of sampling - Include as much of the riparian vegetation and upstream/downstream area as possible
- Take additional photographs of unusual or unique features as needed



Step 2: Site Photographs & GPS Location

- Use a GPS unit or cell-phone with GPS feature to collect the latitude and longitude of the site. Record the lat/long on your datasheet!!



Step 2: Site Photographs & GPS Location

- Record the site latitude/longitude information on your datasheet.



Revised 10/01/2015

****DEEP STAFF USE ONLY - PLEASE DO NOT WRITE IN THIS TOP GRAY SECTION****

Review Date: _____ AWQ Site #: _____
Review By: _____ Stream: _____
Most Wanted: _____ VolMon Group #: _____

PLACE SITE INFORMATION STICKER HERE

CT DEEP RBV Program -- Field Data Sheet

Stream Name:	Latitude:	Longitude:	Take Photos of the Stream Facing:	
			<input type="checkbox"/> Upstream of Site	<input type="checkbox"/> Downstream of Site
RBV Site Location (i.e. '100m downstream of Route 44 crossing):			Collection Date:	
Site Town:	Volunteers' Names (First & Last):		Organization Responsible for Volunteers:	

BEFORE TURNING IN THIS DATASHEET PLEASE MAKE SURE THAT ALL BLUE FIELDS ABOVE ARE COMPLETE

DIRECTIONS: Using the RBV Sorting Guide and the RBV Field Identification Cards, identify the macroinvertebrate types in your sample. Check off each macroinvertebrate type found in your sample. (Note: 'sample' = 6 kicks or the 3 trays from one site combined). Complete a voucher label with the information above and place it into the voucher container. Fill the container part way with isopropyl rubbing alcohol. Place 2-3 representatives of each type into the voucher container. Add additional isopropyl alcohol to the voucher container to insure there is no air in the container; seal tightly.

WANTED (sensitive to contamination)	1	2	3	4	5A	5B	5C
	"Body-Builder" Mayfly <i>Drunella</i> sp.	Brush-Legged Mayfly <i>Isonychia</i> sp.	2-Tail Flathead Mayfly <i>Plecoptera</i> sp.	Roach-Like Stonefly Peltoperidae	Common Stonefly Perlidae	Giant Stonefly <i>Pteronarcys</i> sp.	Misc. Small Stonefly Plecoptera

- Check off the boxes on the datasheet to confirm you have taken each of the required site photographs.



Step 3: Collect (Scrub & Kick!!)



Collect aquatic macroinvertebrates from each of the six locations within your site. Scrub any rocks within the net first before kicking the area in front of the net vigorously (max 2 minutes per kick). Kick in a “Z” pattern for 1 minute. Empty the contents of each pair of kicks into a white tray.



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Step 3: Collect

- Collect Samples from Locations 1 & 2
- EMPTY CONTENTS OF KICKS 1&2 INTO TRAY A



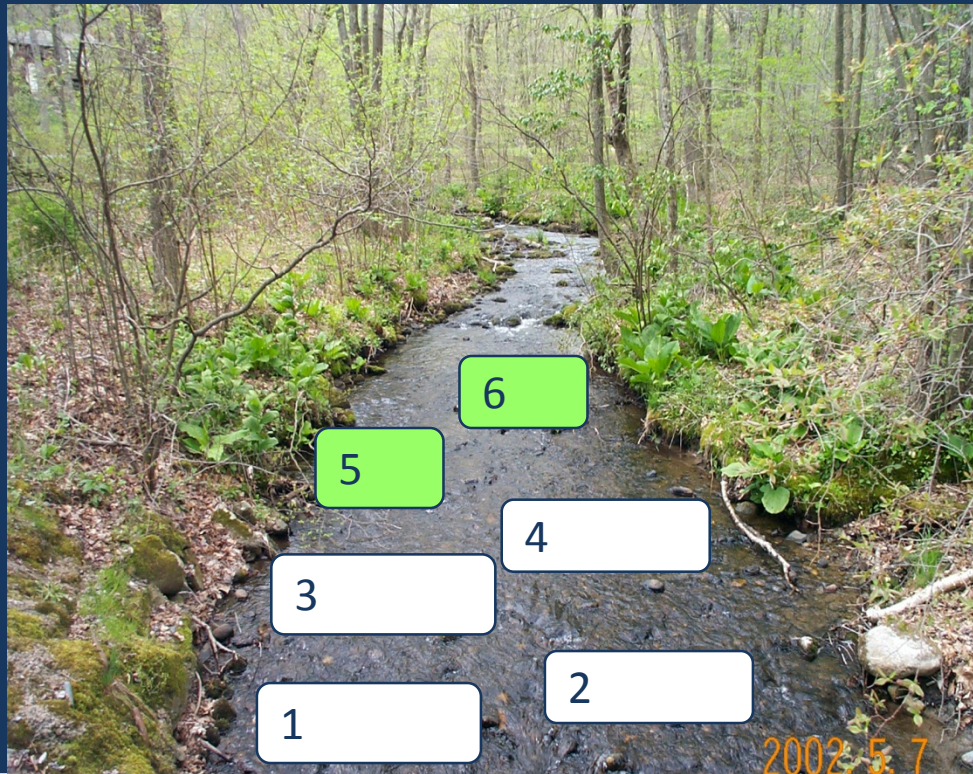
Step 3: Collect

- Collect Samples from Locations 3 & 4
- EMPTY CONTENTS OF KICKS 3&4 INTO TRAY B



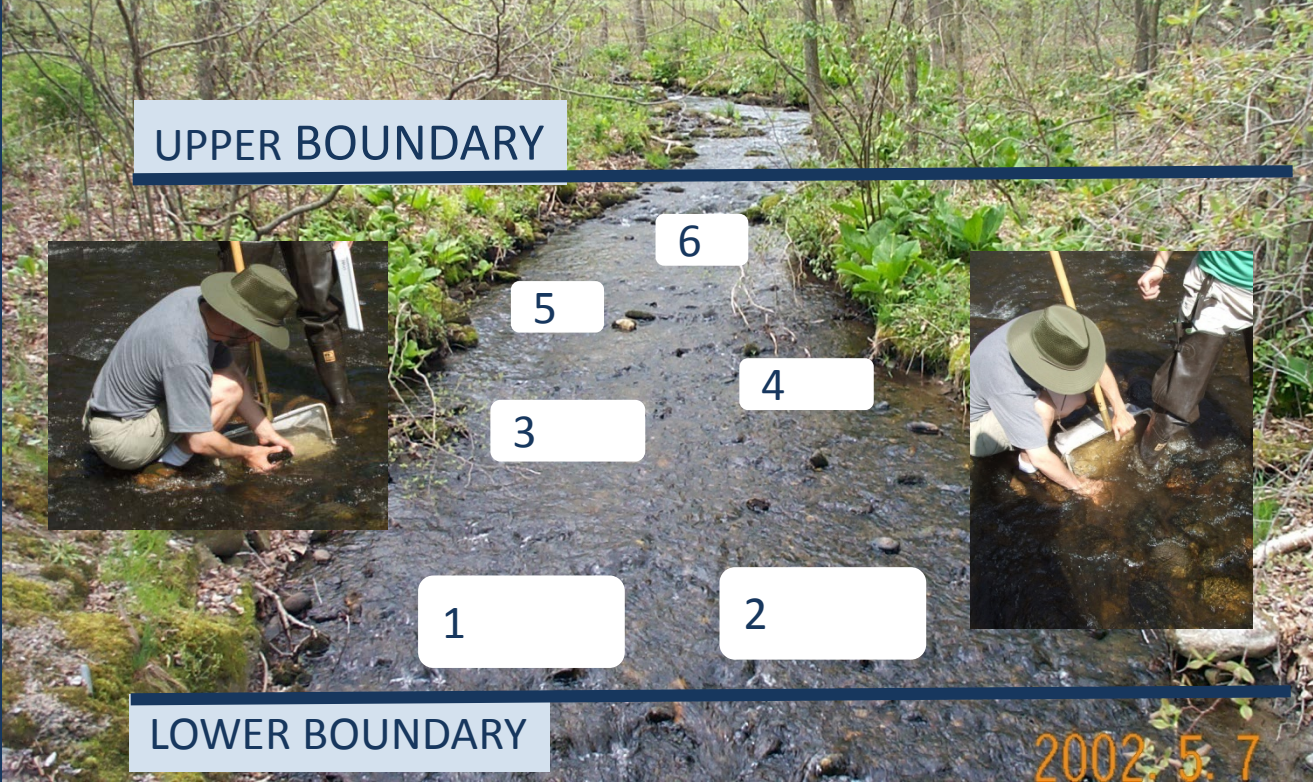
Step 3: Collect

- Collect Samples from Locations 5 & 6
- EMPTY CONTENTS OF KICKS 5&6 INTO TRAY C



Step 3: Collect

The sample collection is complete when there are 3 trays each with the contents from 2 locations (6 kicks total)



Step 4: Process the Sample (Sorting)



- Use tweezers and spoons
- Pick out organisms and place in ice cube tray
- Sort similar looking organisms into the same cube
- Look carefully – some are very small and/or camouflaged
- Experienced team leaders oversee the process



Step 4: Sorting



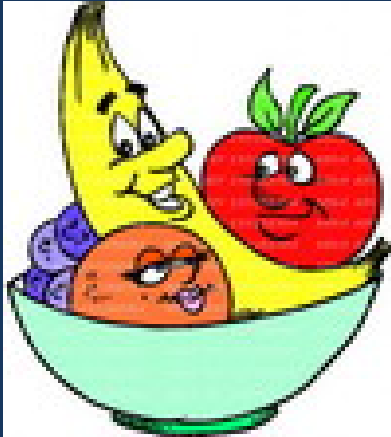
Processing is complete when you have found as many of the different TYPES as possible and put representatives of each type into the ice cube trays



Step 5: Identify the Macroinvertebrates



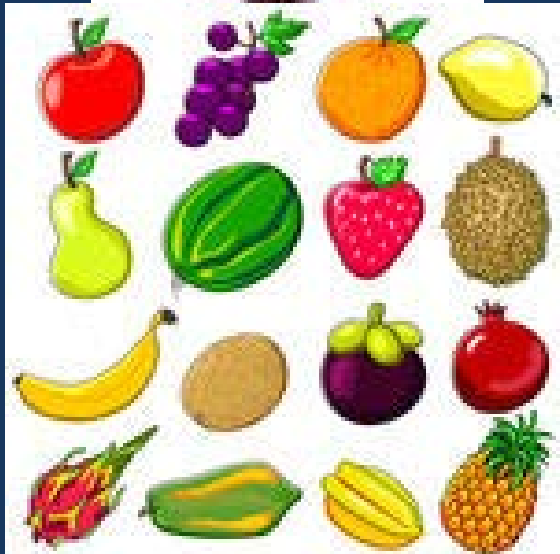
Step 5: Identify the Macroinvertebrates



Do not stress over identifications!!
RBV volunteers are not expected to identify 100% of all organisms correctly!

Sorting your sample into different types and then adding 2-3 of each type to your voucher - *even if you don't know what they actually are* - is what is most important.

RBV is like making a fruit bowl from a big pile of random produce...

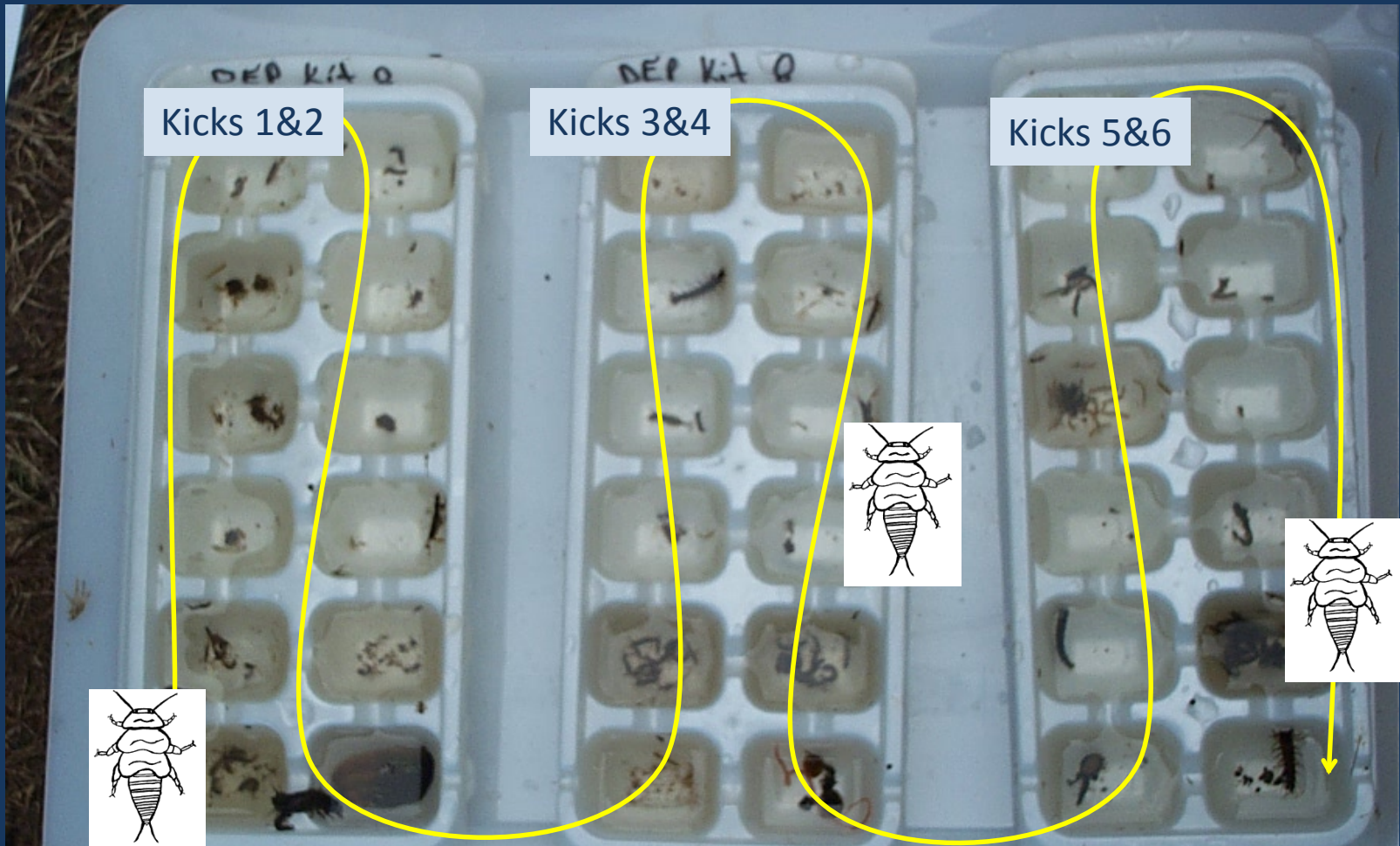


You probably know many of the fruit shown at left but there are also probably a few you aren't sure about, right?

So imagine you were given a big pile of these different fruits and someone needs your help making a fruit bowl for display. The display needs to contain at least one of each type of fruit - would you be able to sort the pile into similar looking fruits and then place 2-3 of each type of fruit into a bowl? Sure you could! 😊



Step 5: Identify



Start with the one ice cube well and weave your way through, identifying the organisms as you go. Check off each organisms you identify on the data sheet.

Connecticut Department of Energy and Environmental Protection



3-Part Identification Process



Step 1 –MACROINVERTEBRATE SORTING GUIDE

Step 2 –FIELD IDENTIFICATION CARDS

Step 3 – Check off DATASHEET

CT DEEP RBV Program: Macroinvertebrate Sorting Guide

REMOVE THE BEST MATCHING FIRST OPTION (A OR B) TO BEGIN. THEY WILL LEAVE THE ARROWS TO MAKE A LIST OF FINAL CANDIDATES. THIS LIST OF CANDIDATES MAY BE CONSULTED TO CORRELATE WITH PANEL NUMBERS IN THE FIELD IDENTIFICATION CARDS TO MAKE A FINAL DETERMINATION.

Start Option A: The Organism is WIDE or FLAT with MEDIUM to LARGE LEGS

Describe the organism's TAILS:

- 3 Long Thin Tails**
 - Panel 1: *Dixaella* (Mayfly)
 - Panel 2: *Isocoryba* (Mayfly)
 - Panel 11: *Sinemima* (Mayfly)
- 2 Long Thin Tails**
 - Panel 3: *Epeorus* (Mayfly)
 - Panel 4: *Polyperla* (Stonefly)
 - Panel 5A: *Perlidae* (Stonefly)
 - Panel 5B: *Psephenidae* (Stonefly)
 - Panel 5C: *Perlidae* (Plecoptera)
- NO Long Thin Tails**
 - Panel 14A: *Anisoptera* (Dragonfly)
 - Panel 13B: *Nereis* (Worm)
 - Panel 15: *Amphipoda* (Amphipod)
 - Panel 16: *Dorida* (Onychopoda, Sow Bug)
 - Panel 13A: *Carydalis* (Dobsonfly)

Builds a Shelter/Case

- Panel 6A: *Glossosoma* (Caddisfly)
- Panel 6B: *Agatania* (Caddisfly)
- Panel 8A: *Trichoptera* (Caddisfly)
- Panel 8B: *Trichoptera* (Caddisfly)

Does the organism have a SHELTER/CASE?

- With Legs**
 - Panel 7: *Rhyacophila* (Caddisfly)
 - Panel 9: *Hydroptilidae* (Caddisfly)
 - Panel 10: *Ptilonotus* (Caddisfly)
- Without Legs**
 - Panel 12: *Hydropsyche* (Caddisfly)
 - Panel 18: *Chironomidae* (Midge)
 - Panel 19: *Ceratopoda* (Black Fly)
 - Panel 20: *Gerris* (Water Bug)
 - Panel 21: *Chironomidae* (Worm)
- Hidden Legs**
 - Panel 12: *Procladius* (Water Penny Beetle)
- No Shelter/Case**
 - Panel 10: *Ptilonotus* (Caddisfly)

START Option B: The Organism is ROUND or CYLINDRICAL with SMALL or NO LEGS

Describe the organism's LEGS:

- With Legs**
 - Panel 12: *Procladius* (Water Penny Beetle)
- Without Legs**
 - Panel 18: *Chironomidae* (Midge)
 - Panel 19: *Ceratopoda* (Black Fly)
 - Panel 20: *Gerris* (Water Bug)
 - Panel 21: *Chironomidae* (Worm)
- Hidden Legs**
 - Panel 12: *Procladius* (Water Penny Beetle)

NOTE: Additional macroinvertebrates are listed as "Others" at the bottom of the datasheet. If you don't see your critter on this chart, review the Other Field ID cards to see if any match.

1

Common Stonefly Most Sensitive **5A**

KEY FEATURES

- Flat body with obvious, segmented legs. Some specimens (not all) have a tortoise-shell pattern on the head and thorax.
- Two long tails at the end of the abdomen.
- Two sets of wing pads.
- Rounded thoracic plate.
- Gill tufts resembling armpit hairs at the base of each leg.

Taxonomic Information

Order: Plecoptera
Family: Perlidae
Genus: All

Ecological Information

Tolerance Value = 1
Feeding Group = Predator
Stream Habitat = Burrowed in substrate

Key Behaviors

- Very active crawler, highly mobile (Watch out—they will crawl out of your ice cube trays!)
- May hide on like colored objects in the tray.
- May be observed doing "push-up" in the tray. (This helps circulate water over their gills.)

Important Notes

When present in a sample, this organism will crawl out of the debris. Don't be confused by size or color - often different sizes will be collected at the same site and coloration can vary quite a bit between organisms (darker and/or larger versions of common stoneflies are often misidentified as the Giant Stonefly (see panel 5B)).

Size and Color

Size: 8 mm
Color: Variable. Light yellowish, brown to very dark, some with a tortoise-shell pattern.

2

CT Dept. of Energy & Environmental Protection
Agile Assessment by Volunteers Program
www.ct.gov/deep/ev

CT DEEP RBV Program - Field Data Sheet

Project Name: _____ Date: _____

Location: _____

Observer: _____

Time of Day: _____

Stream Habitat: _____

Number of Sites: _____

Number of Samples: _____

3

PLEASE DROP OFF ORIGINAL DATASHEETS, VOUCHERS, SITE PHOTOGRAPHS AND VOLUNTEER TRAINING SIGNAL SHEETS TO: Meghan Lutz, CT DEEP Volunteer Monitoring Coordinator, 5000 Lakeville Road, 2nd Floor, Torrington, CT 06860

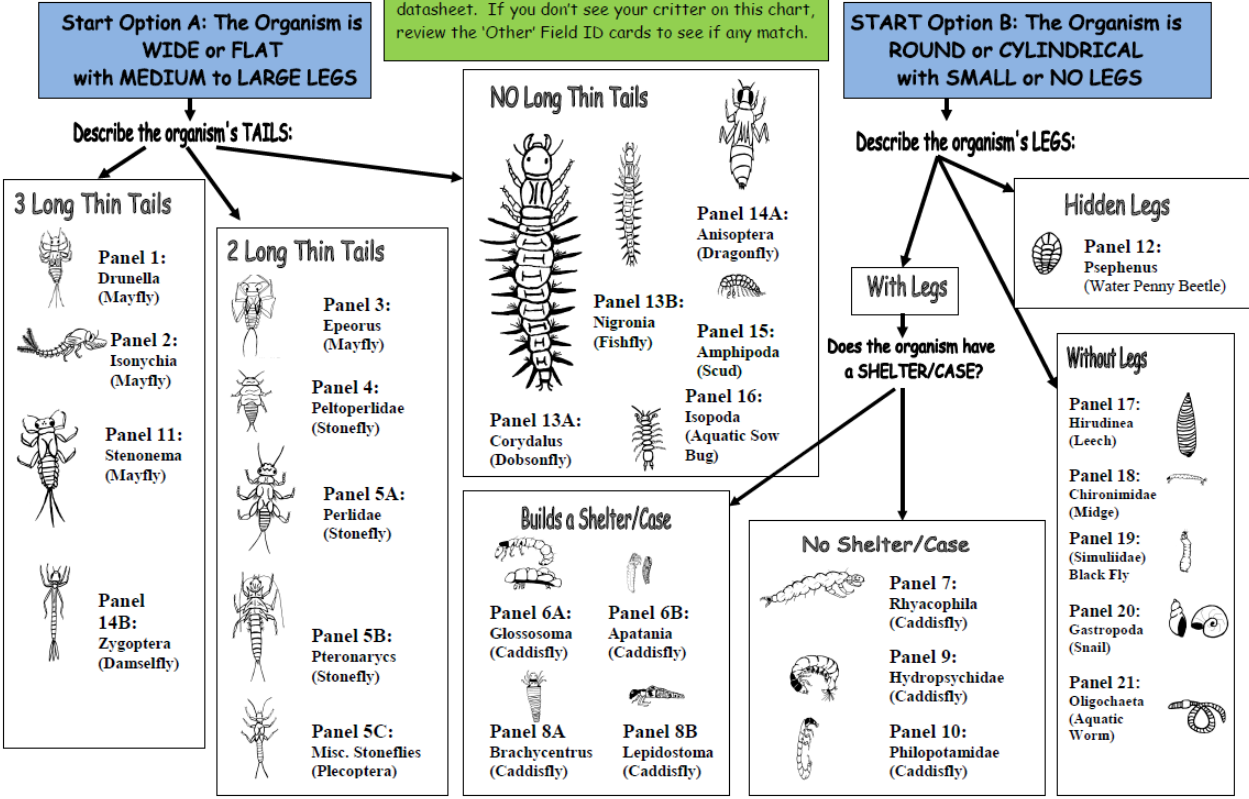


Start with the Sorting Guide

CT DEEP RBV Program: Macroinvertebrate Sorting Guide

CHOOSE THE BEST STARTING POINT (OPTION A OR B) TO BEGIN, THEN FOLLOW THE ARROWS TO REACH A LIST OF 'FINAL CANDIDATES' FOR WHO YOUR CRITTER MAY BE. CONSULT THE CORRESPONDING PANEL NUMBERS IN THE FIELD IDENTIFICATION CARDS TO MAKE A FINAL DETERMINATION.

NOTE: Additional miscellaneous macroinvertebrates are listed as "Others" at the bottom of the datasheet. If you don't see your critter on this chart, review the 'Other' Field ID cards to see if any match.



Last revised 08/13/2016

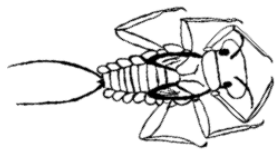
STEP 1:
Use the sorting guide and field ID cards to identify each type of macroinvertebrate present in your sample.

Note the numbers on the ID cards correspond to those on the sorting guide and datasheet.



Review Field Identification Cards

Two-Tailed Flathead Mayfly Most Sensitive **3**



KEY FEATURES

- Extremely flat, almost translucent body, long thin legs.
- Small round gills on the sides of the abdomen.
- Two Long thin tails at the end of the abdomen (easily broken)
- Single set of wing pads.
- Wide flat head, obvious eyes.

Taxonomic Information

Order: Ephemeroptera
 Family: Heptageniidae
 Genus: *Epeorus*

Ecological Information

Tolerance Value = 0
 Feeding Group = Scraper
 Stream Habitat = Cobble and organic substrates

Key Behaviors

- This mayfly nymph crawls very fast on the surface of stones.
- Will move quickly in the tray and try to hide under any leaves or sticks present.
- *Epeorus* may try to swim by wiggling side to side.

Important Notes

The best way to find *Epeorus* is to carefully 'wash off' cobbles in the net before kicking. When present, these mayflies will scurry along the surface of the rock. Because of the body color and shape, they can be very difficult to spot. *Epeorus* can be extremely abundant when conditions are appropriate.

Size and Color

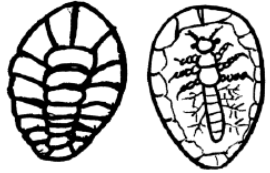
Size: 2-10 mm
 Color: Tan to dark brown, sometimes with lighter gills and markings on the legs and head.

Photographs courtesy of (top to bottom): Kelsey Quartuccio / CT DEEP, DEEP files, author unknown; NY DEC Biomonitoring Unit; DEEP files, author unknown

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Water Penny Beetle Moderately Sensitive **12**



KEY FEATURES

- Small, flat, disc-shaped organism.
- Uniform in color
- Head and legs only visible from ventral view (i.e. from underneath)

Taxonomic Information

Order: Coleoptera
 Family: Psephenidae
 Genus: *Psephenus*

Ecological Information

Tolerance Value = 4
 Feeding Group = Scraper
 Stream Habitat = Attached to rocks in fast flows

Key Behaviors

- Cling very well to rocks and smooth surfaces such as the sorting tray (see image at left)
- May glide along the bottom of the tray
- May curl up when disturbed

Important Notes

Water penny beetle larvae are common in RBV samples, but can be very hard to locate in the field due to their cryptic nature. Look very closely at any cobbles in your sample area; water penny beetle larva will adhere strongly to rock surfaces. They are very distinctive due to their penny like shape and coloration. These organisms can be locally abundant when conditions are appropriate.

Size and Color

Size: 3-10 mm
 Color: Uniform in color. Ranges from golden to dark brown.

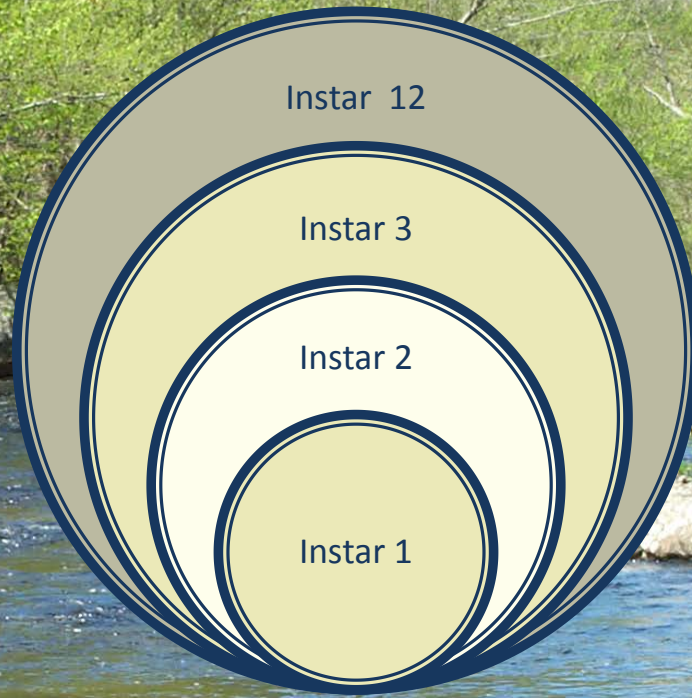
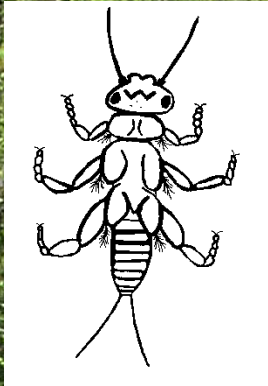
Don't be Fooled by This Imposter!

- Often confused with the False Water Penny (*Eubriidae*). *Eubriidae* is more ovoid in shape and has a serrated or more jagged outer edge.

Photographs courtesy of (top to bottom): Jake Renkert / The Marvelwood School (top three), Meghan Lally/CT DEEP, The Marvelwood School/Kent Conservation Commission RBV program; The

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Don't be fooled by size!



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Check off ID on Datasheet

Complete the top of your datasheet!!!

Check to make sure the top of your datasheet is complete.

Check off all of the macroinvertebrate types that were present in your sample (all 6 kicks combined).



Revised 10/01/2016

“DEEP STAFF USE ONLY - PLEASE DO NOT WRITE IN THIS TOP GRAY SECTION”

Review Date: _____ AWQ Site #: _____
 Review By: _____ Stream: _____
 # Most Wanted: _____ VolMon Group #: _____

PLACE SITE INFORMATION STICKER HERE

CT DEEP RBV Program -- Field Data Sheet

Stream Name: _____ Latitude: _____ Longitude: _____ Take Photos of the Stream Facing: _____
 Upstream of Site Downstream of Site

RBV Site Location (i.e. "100m downstream of Route 44 crossing"): _____ Collection Date: _____

Site Town: _____ Volunteers' Names (First & Last): _____ Organization Responsible for Volunteers: _____

BEFORE TURNING IN THIS DATASHEET PLEASE MAKE SURE THAT ALL BLUE FIELDS ABOVE ARE COMPLETE.
 DIRECTIONS: Using the RBV Sorting Guide and the RBV Field Identification Cards, identify the macroinvertebrate types in your sample. Check off each macroinvertebrate type found in your sample. (Note: "sample" = 6 kicks or the 3 trays from one site combined). Complete a voucher label with the information above and place it into the voucher container. Fill the container part way with isopropylrubbing alcohol. Place 2-3 representatives of each type into the voucher container. Add additional isopropyl alcohol to the voucher container to insure there is no air in the container; seal tightly.

MOST WANTED (Most Sensitive to Pollution)	1	2	3	4	5A	5B	5C
	Body-Slender Mayfly Drimella sp.	Brush-Legged Mayfly Isonychia sp.	2-Tail Flathead Mayfly Epeorus sp.	Rosah-Like Mayfly Plecoptera	Common Stonefly Perlidae	Ghost Stonefly Pteronarcys sp.	Wise, Small Stonefly Pisicoptera
MOST WANTED (Most Sensitive to Pollution)	6A	6B	7	8A	8B	# Most Wanted Types:	Water Quality:
	Saddle-Case Caddis Glossosoma sp.	Cornucopia Case Caddis Apatania sp.	Free-Living Caddis Rhyacophila sp.	Humpless Caddis Brachycentrus sp.	Plant Case Caddis Leptostoma sp.	5+ 4 0-3	EXCEPTIONAL: Fully Supporting Aquatic Life Use Goals EXCELLENT: Likely Supporting Aquatic Life Use Goals NOT DETERMINED: More info Needed
MODERATELY SENSITIVE (Moderately Sensitive to Pollution)	9	10	11	12	13A	13B	14A, 14B
	Common Netspinner Hydropsychidae	Fingernet Caddis Philopotamidae	3-Tail Flat Head Mayfly Zironema sp.	Water Penny Psephenus sp.	Dobsonfly Corydactylus sp.	Flahfy Nigronia sp.	Dragonfly Anisoptera Damselfly Zygoptera
LEAST WANTED (Least Sensitive to Pollution)	15	16	17	18	19	20	21
	Scud Amphipoda	Aquatic Sow Bug Isopoda	Leech Hirudinea	Non-Biting Widge Chironomidae	Black Fly Simuliidae	Small Gastropoda	Aquatic Worms Oligochaeta
OTHERS	22	23	24	25	26	27	28
	Crayfish Decapoda	Crane Fly Tipulidae	Riffle Beetle Elmidae	Small Minnow Mayfly Baetidae	Aquatic Snipe Fly Atherix sp.	Flatworm Planaria sp.	Mussel/Clim Unionida

COORDINATORS PLEASE DROP OFF ORIGINAL DATASHEETS, VOUCHERS, SITE PHOTOGRAPHS AND VOLUNTEER TRAINING SIGN-IN SHEETS TO:
 Meghan Lally, CT DEEP Volunteer Monitoring Coordinator, WPLR Bureau, 2nd Floor, 79 Elm Street, Hartford, CT
 RBV Program information is available at www.ct.gov/deep/rbv



Step 6: Prepare a Voucher



CRITICAL STEP!!

- Steps To Create and Preserve a Voucher Collection of RBV Organisms:
 1. Complete your label and insert it into your container.
 2. Fill the container half way with preservative (alcohol).
 3. Put 2-3 of each RBV organism type found into the container (no mussels or crayfish).
 4. Add any unknown organisms to the container.
 5. Fill the container the remaining way with preservative.
 6. Optional: complete and tape a second label to the outside of the voucher container.
 7. Seal tightly for transport and give to your Field Team Leader.

RBV VOUCHER

Stream: Burnap Brook
Location: 50 m upstream Rt 6
Town: Andover
Date: 10/15/15
Organization: Andover Stream Club
Collectors: M. Lally & P. Lally



Step 6: Prepare a Voucher



****THE VOUCHER IS YOUR DATA –
THE VOUCHER IS THE PROOF THAT
AN ORGANISM TYPE WAS
PRESENT IN YOUR SAMPLE****

IMPORTANT:

- Use only pencil to write!! The preservative will dissolve ink.
- Site information on the voucher label and the datasheet **MUST** be the same.
- Be sure to fill your container **COMPLETELY** with preservative before sealing.
- Do not use baby jars or containers with ribbed sides (e.g. water or sports drink bottles).

RBV VOUCHER

Stream: Burnap Brook
Location: 50 m upstream Rt 6
Town: Andover
Date: 10/15/15
Organization: Andover Stream Club
Collectors: M. Lally & P. Lally



Step 7: Crayfish & Mussels

- Crayfish and mussels should not be placed in the voucher!!
- Photograph any live crayfish found and return to the stream.
- Live mussels should be left in place if observed – photograph if possible.
- **If empty mussel shells are found (dead mussels), place them in a plastic bag with a completed RBV voucher label and submit with your RBV materials to your Local RBV Coordinator.



Step 8: Submit Data, Voucher, Photos

- For each site monitored, **the Field Team Leader is responsible for submitting** the following to their Local RBV Coordinator:
 - **Two digital photographs** for each site monitored: one facing upstream and one facing downstream from the center of your sampling area.
 - **One preserved and labelled RBV voucher** per site. Remember to place a COMPLETE label inside the container and fill completely with preservative. A second label can be taped to the outside if desired.
 - **One datasheet** per site. Make sure to complete ALL fields, and write legibly!
 - Optional: labelled mussel specimens, additional site/critter photographs



Questions?



Connecticut Department of Energy and Environmental Protection

Riffle Bioassessment by Volunteers (RBV)

Volunteer Training Presentation:

Part 3 – Field Safety



A CT DEEP Tier 2

Volunteer Water Quality Monitoring Network

www.ct.gov/deep/rbv



Connecticut Department of Energy and Environmental Protection

Safety Considerations

SAMPLE SAFELY:

Your personal safety and that of your teammates is more important than the data!!!

If you do not feel safe, DO NOT continue.

- Confirm with your Local RBV Coordinator that you have permission to access private property before doing so.
- Do not interact with any pets, wildlife (other than your RBV organisms!), or livestock you encounter.
- Know what poison ivy looks like and how to avoid it.
- Don't sample during dangerous flows or bad weather. If it starts to thunder or lightening while sampling, stop sampling and leave to safety.

Report any safety concerns immediately to your Field Team Leader. The Field Team Leader will relay any concerns or incidents to the Local RBV Coordinator within 24 hours of sampling.



Safety Considerations

WADING IN THE STREAM:

- Slippery, unstable rocks
- Unexpected deep spots
- Cold water
- Fast water

→ Walk slowly and carefully. Bring a towel and a change of clothes (just in case!). Don't sample under high flow conditions.

COLLECTING THE ORGANISMS:

- Hidden sharp debris – glass, metal, other objects
- Unhappy critters (crayfish, large dobsonflies, snakes)

→ Protect your fingers and toes! Wear waders and rubber gloves while sampling.



Tips to Minimize Issues in the Field

- RBV volunteers will NEVER sample alone. NO EXCEPTIONS.
- The Field Team Leader serves as site supervisor while in the field.
- Travel in the field in pairs – don't walk in the woods alone
- Bring a cell phone and store emergency numbers and the number of your coordinator in your phone before you leave
- Use common sense and trust your 'gut' – if something does not feel right, leave the site!
- Bring plenty of snacks and fluids with you



Tips to Minimize Issues in the Field

- Have hard copy site maps – don't assume your GPS will work in the field!
- Check with your coordinator before heading out in the field. Your coordinator may tell you to postpone due to high flows or weather concerns.
- Assign someone to check on you and/or notify help if you have not contacted them by an agreed upon time
- Talk to your Local RBV Coordinator regarding any health concerns. If you have physical limitations, severe allergies, asthma, etc. RBV may not be a safe activity for you.



Questions?



Connecticut Department of Energy and Environmental Protection

Riffle Bioassessment by Volunteers (RBV)

Volunteer Training Presentation:

Part 4 – The RBV Organisms



A CT DEEP Tier 2

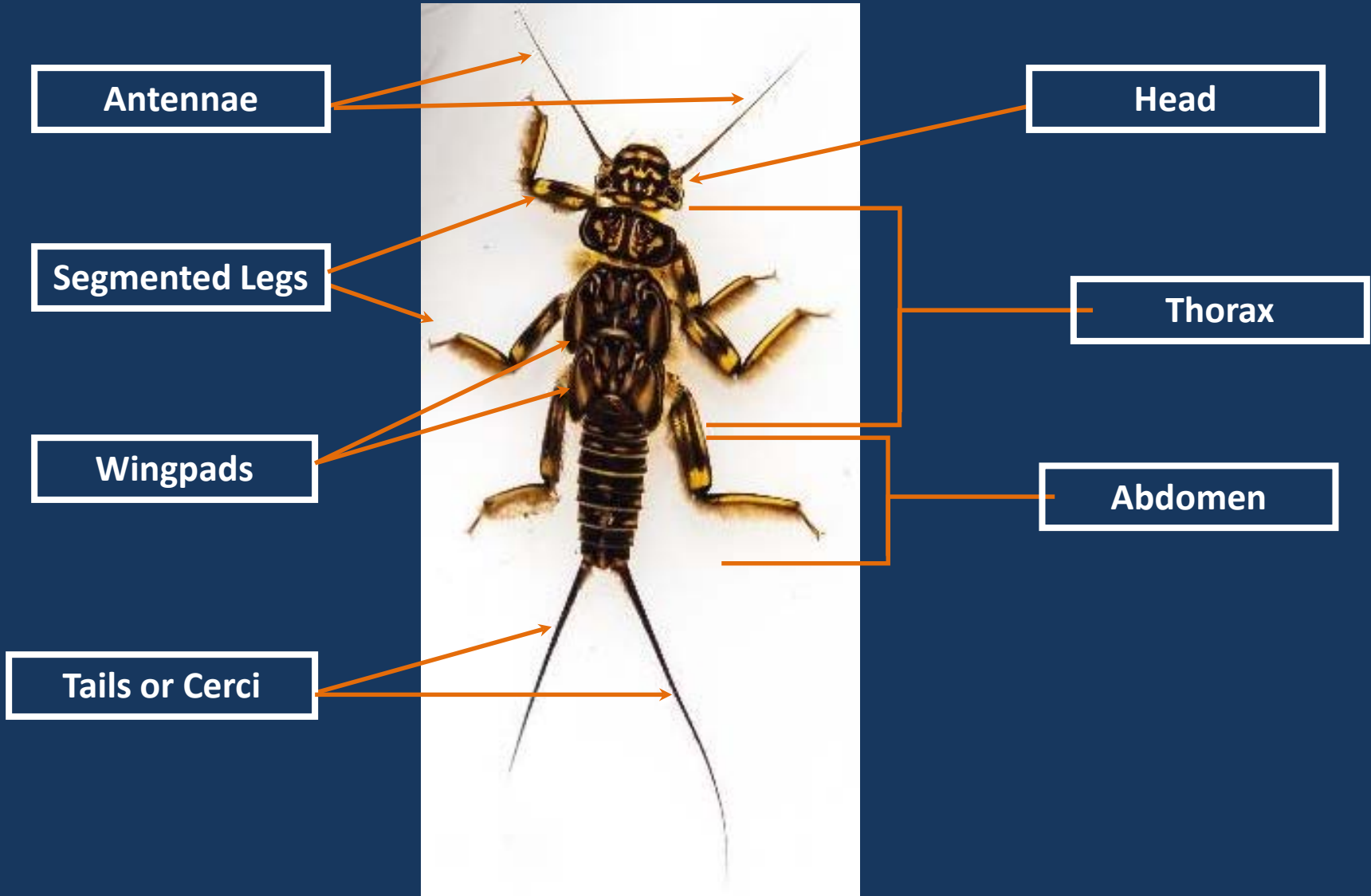
Volunteer Water Quality Monitoring Network

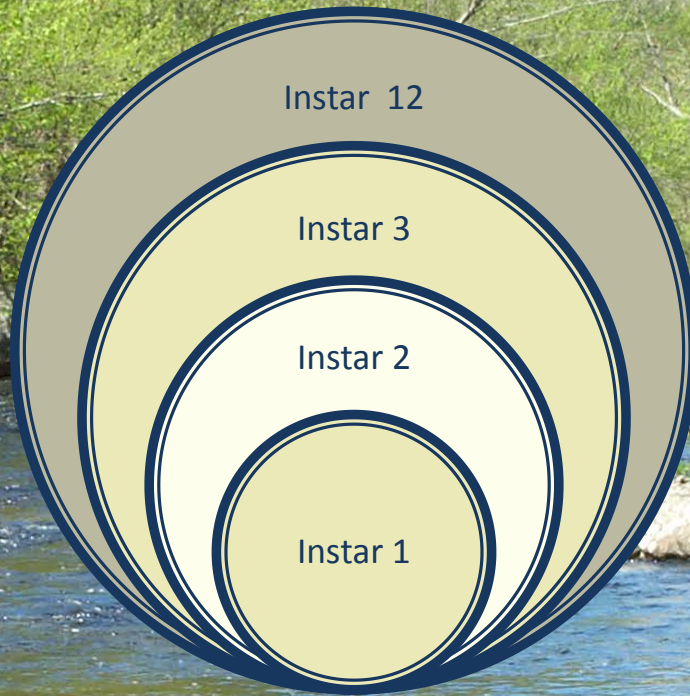
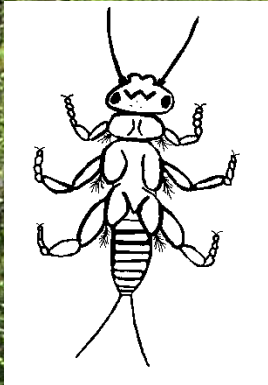
www.ct.gov/deep/rbv



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Insect Anatomy Overview











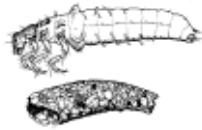





Don't be fooled by size!



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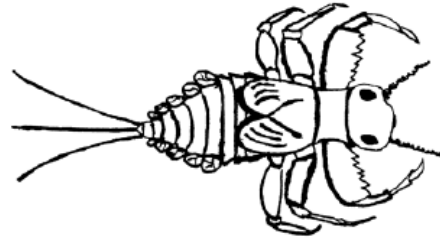
"Most Wanted" Macroinvertebrates

MOST WANTED (Most Sensitive to Pollution)	1	2	3	4	5A	5 B	5 C	
	"Body-Builder" Mayfly <i>Drunella sp.</i>	Brush-Legged Mayfly <i>Isonychia sp.</i>	2-Tail Flathead Mayfly <i>Epeorus sp.</i>	Roach-Like Stonefly Peltoperidae	Common Stonefly Perlidae	Giant Stonefly <i>Pteronarcys sp.</i>	Misc. Small Stonefly Plecoptera	
								
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	MOST WANTED (Most Sensitive to Pollution)	6A	6 B	7	8A	8 B	# Most Wanted Types:	Water Quality:
		Saddle-Case Caddis <i>Glossosoma sp.</i>	Cornucopia Case Caddis <i>Apatania sp.</i>	Free-Living Caddis <i>Rhyacophila sp.</i>	Humpless Caddis <i>Brachycentrus sp.</i>	Plant Case Caddis <i>Lepidostoma sp.</i>	5+	EXCEPTIONAL: <i>Fully Supporting</i> Aquatic Life Use Goals
							4	EXCELLENT: <i>Likely Supporting</i> Aquatic Life Use Goals
<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0-3	NOT DETERMINED: More Info Needed	



Body-Builder Mayfly

Most Sensitive **1**



KEY FEATURES



- The first section of the front legs look like muscular biceps being flexed.
- Front legs have a serrated edge.



- Flat body with obvious legs.
- Single set of wing pads.
- Three hair-like tails at the end of the abdomen.
- Small, round gills on the side of the abdomen

Taxonomic Information

Order: Ephemeroptera
Family: Ephemerellidae
Genus: *Drunella*

Ecological Information

Tolerance Value = 0
Feeding Group = Scraper
Stream Habitat = On rocks or coarse organic substrates

Key Behaviors

- This mayfly nymph will crawl among leaves, stones, and other debris in the tray.
- Occasionally *Drunella* may swim by slowly undulating back and forth.

Important Notes

This organism can be confused with other members of the Ephemerellidae family. The distinguishing characteristic of *Drunella* is the enlarged front legs, each with a serrated margin along the front edge. These mayfly can be very abundant under appropriate conditions, however they typically emerge in the spring and are therefore uncommon in RBV samples.

Size and Color

Size: 6-15 mm
Color: Tan to dark brown, legs may have orange or yellow bands



1
"Body-Builder" Mayfly
Drunella sp.



Photographs courtesy of (top to bottom): Kelsey Quartuccio/CT DEEP; Kelsey Quartuccio/CT DEEP; Jake Renkert/The Marvelwood School

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Brush-Legged Mayfly

Most Sensitive **2**



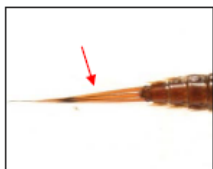
KEY FEATURES



- Streamlined body, taller than wide.
- Often with a "humped back" or "S-shaped" appearance when swimming.



- Front legs have a double row of long hairs on the inside edge.
- Single set of wing pads.
- Small, round gills on the side of the abdomen.



- Three feather-like tails at the end of the abdomen.

Taxonomic Information

Order: Ephemeroptera
Family: Isonychidae (Oligoneuriidae)
Genus: *Isonychia*

Ecological Information

Tolerance Value = 2
Feeding Group = Collector-Filterer
Stream Habitat = Moderate to fast flows, rock surfaces

Key Behaviors

- This mayfly nymph is an extremely strong swimmer. It swims by undulating back and forth very rapidly.
- This mayfly will often stand on rocks, leaves and sticks.

Identification Notes

There is only one genera (*Isonychia*) of Isonychidae in Connecticut. *Isonychia*, often called "Minnow Mayflies" by experienced volunteers, are very strong swimmers. The three tails are made up of a series of fine hairs that act like an oar on a boat, propelling the mayfly through the water. No other mayfly has a double row of fine hairs on the front legs.

Size and Color

Size: 8-17 mm
Color: Light brown to dark brown body, sometimes with yellow or white markings



2

Brush-Legged Mayfly *Isonychia* sp.



Photographs courtesy of (top to bottom): Kelsey Quartuccio/CT DEEP; Jake Renkert/The Marvelwood School; NY DEC Biomonitoring Unit; Jake Renkert/The Marvelwood School

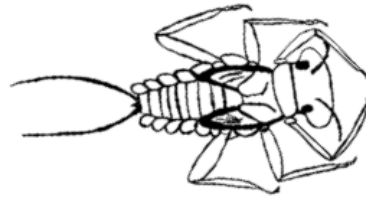
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Two-Tailed Flathead Mayfly

Most Sensitive

3



KEY FEATURES



- ❑ Extremely flat, almost translucent body, long thin legs.



- ❑ Small round gills on the sides of the abdomen.
- ❑ Two Long thin tails at the end of the abdomen (easily broken)



- ❑ Single set of wing pads.
- ❑ Wide flat head, obvious eyes.

Taxonomic Information

Order: Ephemeroptera
Family: Heptageniidae
Genus: *Epeorus*

Ecological Information

Tolerance Value = 0
Feeding Group = Scraper
Stream Habitat = Cobble and organic substrates

Key Behaviors

- This mayfly nymph crawls very fast on the surface of stones.
- Will move quickly in the tray and try to hide under any leaves or sticks present.
- *Epeorus* may try to swim by wiggling side to side.

Important Notes

The best way to find *Epeorus* is to carefully 'wash off' cobbles in the net before kicking. When present, these mayflies will scurry along the surface of the rock. Because of the body color and shape, they can be very difficult to spot. *Epeorus* can be extremely abundant when conditions are appropriate.

Size and Color

Size: 2-10 mm
Color: Tan to dark brown, sometimes with lighter gills and markings on the legs and head.



3

2-Tail Flathead Mayfly

Epeorus sp.



Roach-Like Stonefly

Most Sensitive **4**



KEY FEATURES



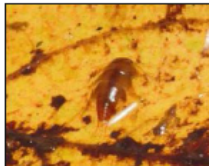
- Tear-drop shaped body with a uniformly shiny brown exoskeleton.
- Two short tails at the end of the abdomen.



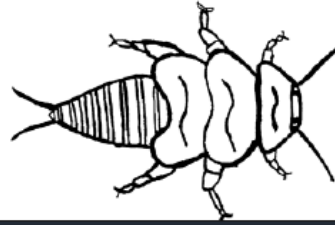
- Two sets of wing pads.



- No gills on the sides of the abdomen.



- Commonly found on leaves



Taxonomic Information

Order: Plecoptera
Family: Peltoperlidae
Genus: All

Ecological Information

Tolerance Value = 0
Feeding Group = Shredder
Stream Habitat = In and on coarse organic substrates

Key Behaviors

- This stonefly nymph is commonly found crawling in and amongst leaf packs in riffle areas. To locate, peel apart leaves in any packs present!
- Typically not observed swimming in the tray.

Important Notes

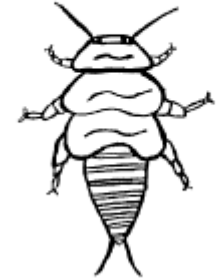
Peltoperlids are very intolerant of environmental stresses. Its characteristic inverted tear drop shape, short tails, and head which is broadly joined to the thorax, differentiate the Roach-Like Stonefly from other stoneflies.

Size and Color

Size: 6-11 mm
Color: Light to dark brown, uniform



4 Roach-Like Stonefly Peltoperlidae



Common Stonefly

Most Sensitive **5A**



KEY FEATURES



- ❑ Flat body with obvious, segmented legs. Some specimens (not all) have a tortoise-shell pattern on the head and thorax.
- ❑ Two long tails at the end of the abdomen.



- ❑ Two sets of wing pads



- ❑ Rounded thoracic plate



- ❑ Gill tufts resembling armpit hairs at the base of each leg.

Taxonomic Information

Order: Plecoptera
Family: Perlidae
Genus: All

Ecological Information

Tolerance Value = 1
Feeding Group = Predator
Stream Habitat = Burrowed in substrate

Key Behaviors

- Very active crawler, highly mobile. (Watch out – they will crawl out of your ice cube trays!)
- May hide on like colored objects in the tray.
- May be observed doing “push-ups” in the tray. (This helps circulate water over their gills.)

Important Notes

When present in a sample, this organism will crawl out of the debris. Don't be confused by size or color - often different sizes will be collected at the same site and coloration can vary quite a bit between organisms. Darker and/or larger versions of common stoneflies are often misidentified as the Giant Stonefly (see panel 5B).

Size and Color

Size: 8-30 mm
Color: Variable. Light yellowish, brown to very dark, some with a tortoise-shell pattern.



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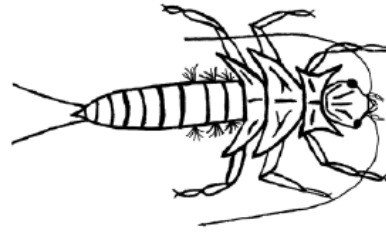
5A

Common Stonefly
Perlidae



Giant Stonefly

Most Sensitive **5B**



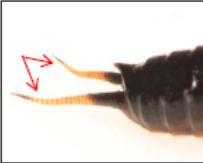
KEY FEATURES



- ❑ Robust body, typically dark but occasionally with white or yellow markings.



- ❑ Pointed edges along the sides of the abdomen.



- ❑ Two, short tails at the end of the abdomen.



- ❑ First thoracic plate is rectangular with flared edges
- ❑ Two sets of wing pads, very angular in shape.



- ❑ Gill tufts on the thorax and the sides of the first three sections of the abdomen.

Taxonomic Information

Order: Plecoptera
Family: Pteronarcyidae
Genus: *Pteronarcys*

Ecological Information

Tolerance Value = 0
Feeding Group = Shredder
Stream Habitat = Fast flowing, high-gradient riffles

Key Behaviors

- This stonefly nymph is not very active. If it moves at all, it will crawl very slowly around the tray.
- May curl into a C-shape and pretend to be dead when disturbed.

Important Notes

Pteronarcys is often confused with the Common Stonefly (Panel 5A) as both can grow to be quite big. The Giant Stonefly is distinguished easily by its relatively sluggish activity level and more armored appearance. Don't be fooled by size – all giant stoneflies must start out small! Typically, only a few Pteronarcyidae are collected at any site when conditions are appropriate.

Size and Color

Size: 35-50 mm
Color: Brown to black, sometimes with white or yellow tail tips

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5 B

Giant Stonefly
Pteronarcys sp.



Miscellaneous Small Stoneflies

Most Sensitive **5C**

SMALL STONEFLY FAMILIES



- Small Winter Stoneflies¹ (*Capniidae*)
 - Often dark
 - Legs short
 - Abdomen slightly wider at middle



- Green Stoneflies¹ (*Chloroperlidae*)
 - No distinctive color patterns
 - Tails shorter than the abdomen is long



- Rolled-winged Stoneflies (*Leuctridae*)²
 - Long, slender body
 - Short legs
 - Abdomen same width along length



- Nemourid Stoneflies¹ (*Nemouridae*)
 - Long legs (tips extend to the tip of the abdomen or beyond)



- Perlodid Stoneflies³ (*Perlodidae*)
 - Very similar to the Common Stonefly but without gill tufts near the base of the legs

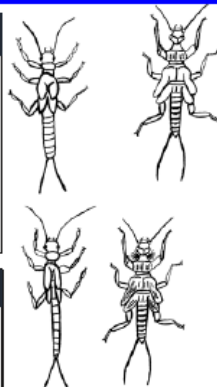


- Winter Stoneflies (*Taeniopterygidae*)⁴
 - Wing pads form a distinct triangle
 - Typically only present in late November RBV samples

General Identification

The following characteristics are universally true of the stonefly families at left:

- Two tails
- Two tarsal claws ('toes') at the end of each leg
- Dorsally flattened
- Small in size



Taxonomic Information

Order: Plecoptera
 Family: See families at left
 Genus: All within families at left

Ecological Information

Tolerance Value = See below
 Feeding Group = See below
 Stream Habitat = Fast moving water, under rocks/debris

	Tolerance Value	Feeding Group
<i>Capniidae</i>	1	Shredder
<i>Chloroperlidae</i>	1	Predator
<i>Leuctridae</i>	0	Shredder
<i>Nemouridae</i>	2	Shredder
<i>Perlodidae</i>	2	Predator
<i>Taeniopterygidae</i>	2	Shredder

Important Notes

All stoneflies are intolerant of organic pollutants and therefore indicate high water quality.

Size and Color

Size: 4-10 mm average (*Taeniopterygidae* can reach up to 15 mm))
 Color: Variable. Many light brown or cream colored



5 C Misc. Small Stonefly Plecoptera

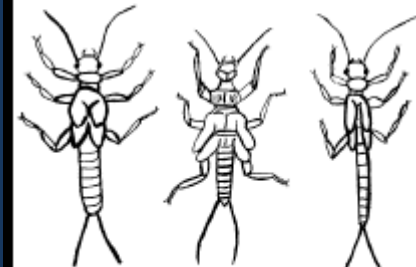


Photo courtesy of NY DEC



Photo courtesy of NY DEC

Photographs courtesy of: ¹Donald S. Chandler – www.discoverlife.org; ²Author unknown; ³Unknown – <http://aquaticinsectsofcentralvirginia.blogspot.com>; ⁴Jake Renkert – The Marvelwood School



Saddlecase Maker Caddisfly

Most Sensitive **6A**



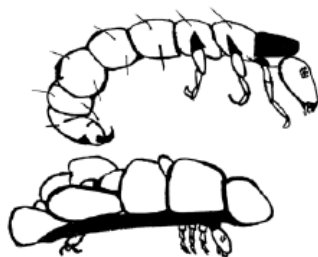
KEY FEATURES



- ❑ Small oval stone case made of sand grains and/or tiny pebbles, resembles a saddle or a turtle shell. (Case is NOT tube-shaped.)
- ❑ Underside of case has two round openings.



- ❑ Larva body is maggot-like and slightly C-shaped.
- ❑ Larva has a light (white to light brown) body with a dark head and legs.
- ❑ End of the abdomen has an attached 'butt plate' (red arrow)



Taxonomic Information

Order: Trichoptera
Family: Glossosomatidae
Genus: *Glossosoma*

Ecological Information

Tolerance Value = 0
Feeding Group = Scraper
Stream Habitat = Exposed upper surfaces of rocks

Key Behaviors

- This caddisfly larva is often attached to the surface of rocks in fast current.
- *Glossosoma* may not move at all while in the tray. If it does, it will crawl very slowly along the bottom of the tray.

Important Notes

Glossosoma is often confused with other small stone case building caddisflies. Unlike other caddisfly cases, the *Glossosoma* case is not tube shaped but rather resembles a turtle shell with only a thin 'strap' of pebbles holding the case around the organism. Keep an eye out for both the case and the organism in your tray as the two are easily separated.

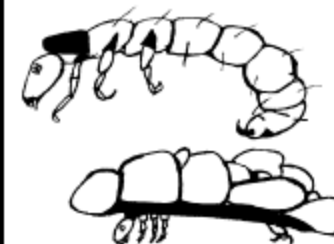
Size and Color

Size: 3-10 mm
Color: White to light brown, with dark head, legs and butt plate



6A

Saddle-Case Caddis
Glossosoma sp.



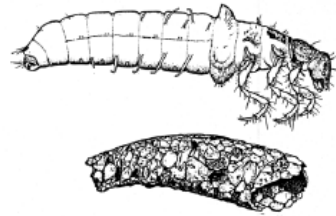
Photographs courtesy of (top to bottom): NY DEC Biomonitoring Unit; Kelsey Quartuccio/CT DEEP; Jake Renkert/The Marvelwood School

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Cornucopia-Case Caddisfly

Most Sensitive **6B**



KEY FEATURES



- ❑ *Tiny* light-bodied organism
- ❑ Hunched appearance when in case.
- ❑ Triangular head with dark legs.
- ❑ Very small, delicate case made of sand grains
- ❑ Case is cone-shaped like a Thanksgiving cornucopia.



Don't be Fooled by This Imposter!



- ❑ The Strong Case-Maker Caddisfly (*Odontoceridae*) also makes a case of small grains of sand. To tell the two apart, inspect the case closely. *Odontoceridae* cases are very difficult to break apart and are the same width at both ends. In comparison, the *Apatania* case is quite small (see above), more easily broken apart, and noticeably wider at the opening than at the other end.

Taxonomic Information

Order: Trichoptera
Family: Apataniidae
Genus: *Apatania*

Ecological Information

Tolerance Value = 3
Feeding Group = Scraper
Stream Habitat = Fast flowing, shallow riffles

Key Behaviors

- This caddisfly larva is tiny and therefore easily overlooked, however if you watch your tray closely you may see a tiny sand horn walking around the bottom!
- Resembles a tiny hermit crab in that it drags its case along as it walks.

Important Notes

This organism is commonly confused with other stone case building caddisflies including *Glossosoma*. The easiest distinguishing characteristic is that that *Apatania* is VERY tiny, typically smaller than the width of your pinky nail. This caddisfly can be abundant under appropriate conditions. Look very carefully in your trays for these tiny caddisfly larvae!

Size and Color

Size: 2-6 mm
Color: Light colored body with dark head



6 B
Cornucopia Case Caddis
Apatania sp.

A line drawing of the *Apatania sp.* larva and its cone-shaped case, similar to the one in the main section but with a different perspective.



Photographs courtesy of (top to bottom): NY DEC Biomonitoring Unit; Jake Renkert/The Marvelwood School; DEEP file photo, author unknown

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Courtesy of NY DEC

Free-Living Caddisfly

Most Sensitive **7**



KEY FEATURES



- ❑ Nicknamed "Michelin Man" caddisfly due to its smooth, lumpy abdomen
- ❑ Six short legs near the head



- ❑ Hard tan or yellow and brown patterned head with a single thoracic plate.



- ❑ Armored plate and two hooks at the end of the abdomen, somewhat loosely attached



Taxonomic Information

Order: Trichoptera
Family: Rhyacophilidae
Genus: *Rhyacophila*

Ecological Information

Tolerance Value = 0
Feeding Group = Predator
Stream Habitat = Fast flowing, high-gradient riffles

Key Behaviors

- Clings very well to the net.
- Moderately active organism; will crawl or wiggle in the tray.
- Will try to hide under objects.

Important Notes

Rhyacophila is called the 'free-living' caddisfly because larvae of this genus do not build a case until they are about to pupate. (At which point they will build a loosely constructed stone shelter.) This organism is often found among aquatic mosses. A key field characteristic is the bright green or lavender abdominal coloring.



Size and Color

Size: 10-30 mm
Color: Variable. White, green, purple



7

Free-Living Caddis
Rhyacophila sp.



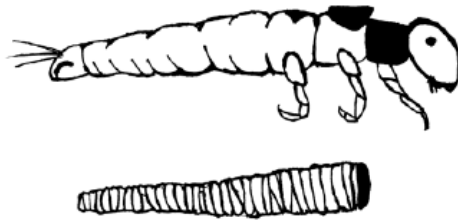
Photographs courtesy of (top to bottom): Jake Renkert/The Marvelwood School; Jake Renkert/The Marvelwood School; NY DEC Biomonitoring Unit; Jake Renkert/The Marvelwood School; Jake Renkert/The Marvelwood School

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Humpless Case Maker Caddisfly

Most Sensitive **8A**



KEY FEATURES



- Case Construction:**
- Case constructed of thin strips of plant material assembled with a square opening.
 - Wider at head opening than at tail end.



- Macroinvertebrate Features:**
- Light colored body with dark head and legs.
 - Very long legs
 - No abdominal humps.



Taxonomic Information

Order: Trichoptera
Family: Brachycentridae
Genus: *Brachycentrus*

Ecological Information

Tolerance Value = 1
Feeding Group = Shredder
Stream Habitat = Upper surfaces of rocks

Key Behaviors

- Typically *Brachycentrus* does not move in the tray. If it does move, it will carry its case with it as it slowly crawls along.

Important Notes

This caddisfly can be very abundant under the appropriate conditions. Look carefully for *Brachycentrus* when the sample contains old leaves, sticks or bark. The cases may be attached to sticks, leaves or larger rocks.

Size and Color

Size: 10-17 mm
Color: Light body with dark head and legs



8A Humpless Caddis *Brachycentrus* sp.



Plant Case Maker Caddisfly

Most Sensitive **8B**



KEY FEATURES



Case Construction:

- Builds a case out of small, rectangular or square pieces of bark or wood (no sand grains).
- Case is typically slightly wider at the head end.

Macroinvertebrate Features:

- Light colored body with dark head and legs.
- Lateral humps present on the first section of the abdomen.



Taxonomic Information

Order: Trichoptera
Family: Lepidostomatidae
Genus: *Lepidostoma*

Ecological Information

Tolerance Value = 1
Feeding Group = Shredder
Stream Habitat = Accumulated plant debris on bottom

Key Behaviors

- Typically does not move in the tray. If it does move, will carry its case with it as it slowly crawls.

Important Notes

This caddisfly can be very abundant under the appropriate conditions, particularly in forested areas. Look carefully for *Lepidostoma* when the sample contains old leaves, sticks or bark. The cases may be attached to sticks, leaves or larger rocks.

Size and Color

Size: 7-15 mm
Color: Light body with dark head and legs



8 B
Plant Case Caddis
Lepidostoma sp.











Photographs courtesy of (top to bottom): Jake Renkert/The Marvelwood School; NY DEC Biomonitoring Unit; Jake Renkert/The Marvelwood School

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“Moderately Wanted” Macroinvertebrates

MODERATELY (Moderately Sensitive to Pollution)	9	10	11	12	13 A	13 B	14A	14B
	Common Netspinner Hydropsychidae	Fingernet Caddis Philopotamidae	3-Tail Flat Head Mayfly <i>Stenonema sp.*</i>	Water Penny <i>Psephenus sp.</i>	Dobsonfly <i>Corydalus sp.</i>	Fishfly <i>Nigronia sp.</i>	Dragonfly Anisoptera	Damselfly Zygoptera
								
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Common Netspinner Caddisfly

Moderately Sensitive

9



KEY FEATURES



- ❑ Series of three dark plates on the dorsal side of the thorax below the head.



- ❑ Fluffy gills on the underside (ventral sections) of the abdomen.



- ❑ Two paintbrush-like tails with hooks at the end of the abdomen.
- ❑ May have a 'dirty' or hairy appearance



Taxonomic Information

Order: Trichoptera
 Family: Hydropsychidae
 Genus: All

Ecological Information

Tolerance Value = 4
 Feeding Group = Collector-filterer
 Stream Habitat = Rock surfaces, woody debris, plants

Key Behaviors

- Extremely active, wiggles violently back and forth
- Gregarious, will form clumps of 2-4 in the tray
- May cling strongly to the net!

Important Notes

Hydropsychidae is probably one of the most common organisms encountered during benthic sampling. These can be extremely abundant under appropriate conditions. Because some are greenish in color they may be confused as *Rhyacophila* (Panel 7). Hydropsychidae have a dark plate above each pair of legs & fluffy gills on the underside of the abdomen, *Rhyacophila* does not.

Size and Color

Size: 13-18 mm
 Color: Light brown to black, sometimes with green tint

Photographs courtesy of (top to bottom): NY DEC Biomonitoring unit; The Marvelwood School & Kent Conservation Commission RBV Program; Jake Renkert / The Marvelwood School; Becky Martorelli / Quinnipiac River Watershed Association; Jake Renkert / The Marvelwood School

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9 Common Netspinner Hydropsychidae

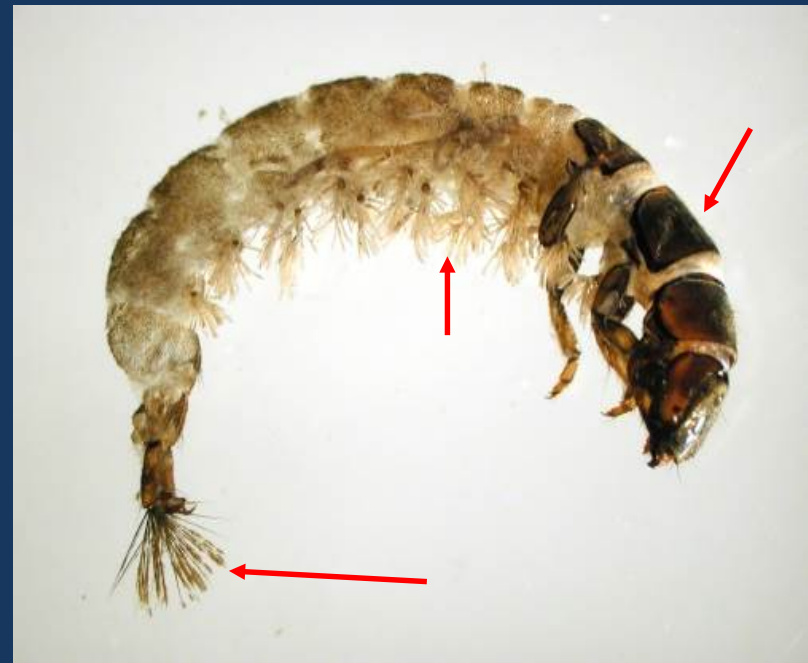
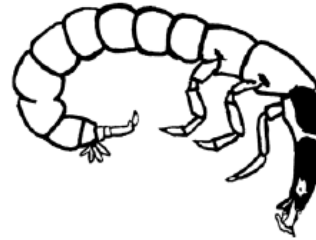


Photo courtesy NY DEC

Fingernet Caddisfly

Moderately Sensitive

10



KEY FEATURES



- ❑ Elongate, slender worm-like body.
- ❑ No gills on or along the abdomen.
- ❑ Two hooks at the end of the abdomen.



- ❑ Bright orange head with a transparent, t-shaped upper lip.



- ❑ Black border along the back edge of pronotum (the plate located behind the head capsule.)



Photographs courtesy of (top to bottom): NY DEC Biomonitoring unit; The Marvelwood School/Kent Conservation Commission RBV program; The Marvelwood School/Kent Conservation Commission RBV program; The Marvelwood School/Kent Conservation Commission RBV program; Jake Renkert / The Marvelwood School

Taxonomic Information

Order: Trichoptera
Family: Philopotamidae
Genus: *All*

Ecological Information

Tolerance Value = 3
Feeding Group = Collector-filterer
Stream Habitat = Undersides of rocks in high gradient

Key Behaviors

- Extremely active, wiggles violently back and forth.
- Gregarious, will form clumps of 2-4 in the tray.
- Very active, will crawl around the bottom of the tray.

Important Notes

Philopotamidae is a very common organism encountered during RBV sampling, and can be extremely abundant under appropriate conditions.

Size and Color

Size: 13-17 mm
Color: Yellow-orange, bright yellow, beige, white, or transparent

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10

Fingernet Caddis Philopotamidae

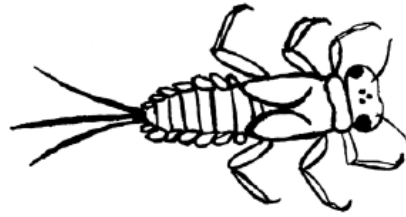
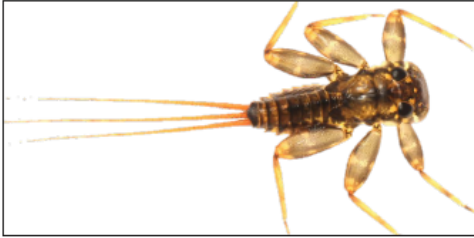


Photo courtesy NY DEC

Three-Tailed Flat Headed Mayfly

Moderately Sensitive

11



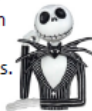
KEY FEATURES



- Extremely flattened body.
- Small, oval or square-shaped gills along the sides of the abdomen.
- Three very long tails at the end of the abdomen. (Tails are fragile and can break off giving the appearance of only one or two.)



- Head is flat with large eyes on top.
- Resembles 'Jack Skellington' from Nightmare Before Christmas.



- Single set of wing pads.

Taxonomic Information

Order: Ephemeroptera
Family: Heptageniidae
Genus: *Stenonema* and *Maccaffertium*

Ecological Information

Tolerance Value = 4
Feeding Group = Scraper
Stream Habitat = On/underneath cobbles and organics

Key Behaviors

- Very mobile; can move and swim fast when in water.
- Doesn't move well in the net
- It will try to hide on any flat dark colored object like stones, leaves, and other invertebrates

Important Notes

Very common across Connecticut. Flat headed mayflies can be found by slowly lifting the cobbles out of the water. They may run to the other side of the rock. Be careful not to confuse this organism with the two-tailed version (*Epeorus*/Panel 3); the legs, gills, and tails of the flat headed mayfly tend to break off during the collection process.

Size and Color

Size: 5-20 mm
Color: Light golden brown to dark brown, often with spots or stripes on the legs and body



11

3-Tail Flat Head Mayfly

Stenonema sp.*



Photographs courtesy of Jake Renkert / The Marvelwood School

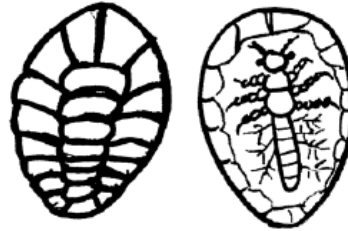
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Water Penny Beetle

Moderately Sensitive

12



KEY FEATURES



- ❑ Small, flat, disc-shaped organism.
- ❑ Uniform in color
- ❑ Head and legs only visible from ventral view (i.e. from underneath)



Don't be Fooled by This Imposter!



- ❑ Often confused with the False Water Penny (*Eubriidae*). *Eubriidae* is more ovoid in shape and has a serrated or more jagged outer edge.

Taxonomic Information

Order: Coleoptera
Family: Psephenidae
Genus: *Psephenus*

Ecological Information

Tolerance Value = 4
Feeding Group = Scraper
Stream Habitat = Attached to rocks in fast flows

Key Behaviors

- Cling very well to rocks and smooth surfaces such as the sorting tray (see image at left)
- May glide along the bottom of the tray
- May curl up when disturbed

Important Notes

Water penny beetle larvae are common in RBV samples, but can be very hard to locate in the field due to their cryptic nature. Look very closely at any cobbles in your sample area; water penny beetle larva will adhere strongly to rock surfaces. They are very distinctive due to their penny like shape and coloration. These organisms can be locally abundant when conditions are appropriate.

Size and Color

Size: 3-10 mm
Color: Uniform in color. Ranges from golden to dark brown.



12
Water Penny
Psephenus sp.



Photographs courtesy of (top to bottom): Jake Renkert / The Marvelwood School (top three); Meghan Lally/CT DEEP; The Marvelwood School/Kent Conservation Commission RBV program; The

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Dobsonfly

Moderately Sensitive

13A



KEY FEATURES



- ❑ Elongate body with a pair of long soft spine-like appendages on each section of the abdomen.
- ❑ Can be extremely large (up to 4 inches)



- ❑ Large pinching mouth parts.
- ❑ Will bite sampling spoons and your fingers so watch out!



- ❑ Two prolegs at the end of the abdomen, each with two hooks.



- ❑ Tufts of fluffy gills at the base of each abdominal projection.

Taxonomic Information

Order: Megaloptera
Family: Corydalidae
Genus: *Corydalis*

Ecological Information

Tolerance Value = 6
Feeding Group = Predator
Stream Habitat = Under loosely embedded stones

Key Behaviors

- Very mobile, will be very active crawling or wiggling in the tray
- Will curl their abdomen around your finger if picked up
- May cling to the net
- May pinch! Use caution when handling!

Important Notes

Dobsonflies are very common in RBV samples. These macroinvertebrates are sometimes called "Hellgrammites" by fishermen and are a trout favorite! *Corydalis* is often confused with *Nigronia* (Panel 13B). The Dobsonfly can be distinguished by its larger size, darker brown color, and the presence of fluffy gill tufts on the underside of the abdomen.

Size and Color

Size: 25-90 mm
Color: Variable. Brown to nearly black

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Photographs courtesy of Jake Renkert / The Marvelwood School

13 A

Dobsonfly *Corydalis sp.*



Fishfly

Moderately Sensitive

13B



KEY FEATURES



- ❑ Elongate body with a pair of long soft spine-like appendages on each section of the abdomen.



- ❑ Large pinching mouth parts.



- ❑ Two prolegs at the end of the abdomen, each with two hooks.



- ❑ No gills at the base of the abdominal projection.

Taxonomic Information

Order: Megaloptera
Family: Corydalidae
Genus: *Nigronia*

Ecological Information

Tolerance Value = 4
Feeding Group = Predator
Stream Habitat = Under loosely embedded stones

Key Behaviors

- Very mobile, will be very active crawling or wiggling in the tray
- Will curl their abdomen around your finger if picked up
- May cling to the net
- **May pinch! Use caution when handling!**

Important Notes

Very common in RBV samples. *Nigronia* is often confused with *Corydalis* (Panel 13A). The fishfly can be distinguished by its smaller size, more reddish color, and absence of fluffy gill tufts on the underside of the abdomen.

Size and Color

Size: 25-50 mm
Color: Variable. Light brown to reddish orange.

13 B

Fishfly

Nigronia sp.



Dragonfly

Moderately Sensitive

14A

General Identification

The following characteristics are universally true of the dragonfly families below:

- Robust body
- Three short spike-like tails
- Two sets of wing pads
- Very large eyes
- Extendable lower jaw



DRAGONFLY FAMILIES



- ☐ **Darter Dragonfly** (*Aeshnidae*)
 - Very common
 - Usually very dark and almost black
 - Elongate body with small thin legs



- ☐ **Biddie Dragonfly** (*Cordulergastridae*)
 - Somewhat common
 - Light brown; robust, hairy appearance
 - Deeply rounded labium extends out almost half the length of the body



- ☐ **Club Tail Dragonfly** (*Gomphidae*)
 - Very common
 - Short antennae similar in shape to a Q-tip
 - Adapted for burrowing into the substrate to wait for prey



- ☐ **Common Skimmer Dragonfly** (*Libellulidae*)
 - Rare – prefers ponds and wetlands

Taxonomic Information

Order: Odonata (Suborder Anisoptera)
 Family: All families at left
 Genus: All genera within families at left

Ecological Information

Tolerance Value = See below
 Feeding Group = See below
 Stream Habitat = Typically among rocks and vegetation, or burrowed in soft substrate

	Tolerance Value	Feeding Group
<i>Aeshnidae</i>	3	Predator
<i>Cordulergastridae</i>	3	Predator
<i>Gomphidae</i>	1	Predator
<i>Libellulidae</i>	9	Predator

Important Notes

Dragonfly nymphs can be very common when conditions are appropriate. They are very mobile and move with jet propulsion or by walking. There are several types of dragonflies found in riffle areas, however the majority of species live in slow moving or standing water.

Size and Color

Size: 8-42mm
 Color: Variable. Light brown to nearly black



14A
 Dragonfly
 Anisoptera



Damselfly

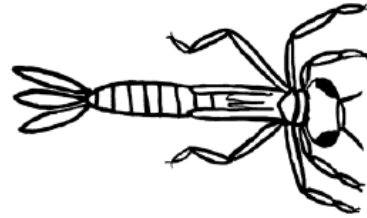
Moderately Sensitive

14B

General Identification

The following characteristics are universally true of the damselfly families below:

- Slender, delicate body with long legs.
- Three long feather-like caudal gills at the end of the abdomen that resemble tails.
- Two sets of wing pads.
- Very large eyes and extendable lower jaw.



DAMSELFLY FAMILIES



- ❑ **Broad Winged Damselfly (*Calopterygidae*)**
 - First antennae segment is very long, almost half the length of the antenna
 - Uncommon in RBV samples; prefers low gradient habitat



- ❑ **Narrow Winged Damselfly (*Coengrionidae*)**
 - Two-toned gills at end of abdomen
 - Occasionally in RBV samples; prefers rocks and vegetation in moderate to slow flowing waters



- ❑ **Spread Winged Damselfly (*Lestidae*)**
 - Lower lip (labium) is long and slender
 - Gills at end of abdomen are very dark and thick
 - Rare in RBV samples; prefers thick vegetation in very slow flows

Taxonomic Information

Order: Odonata (Suborder Zygoptera)
 Family: All families at left
 Genus: All genera within families at left

Ecological Information

Tolerance Value = See below
 Feeding Group = See below
 Stream Habitat = Slow or standing water, on vegetation

	Tolerance Value	Feeding Group
<i>Calopterygidae</i>	5	Predator
<i>Coengrionidae</i>	9	Predator
<i>Lestidae</i>	9	Predator

Important Notes

These larvae are very active and will move by wiggling side to side.

Damselflies are rare in riffle areas; the majority of species live in slow moving or standing water. If you find a lot of damselflies in your sample check that you are in the right habitat for the RBV program.

Size and Color

Size: 13-50mm
 Color: Variable. Yellow to dark brown. Sometimes with patterns.

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14B

Damselfly Zygoptera




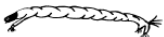
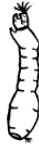

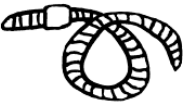


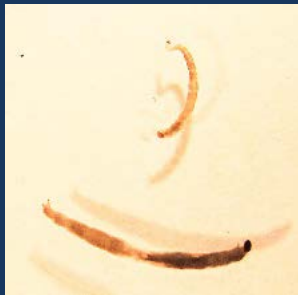
Photo courtesy NY DEC

Photographs courtesy of Jake Renkert (top); NY DEC (middle); DEEP files, author unknown (bottom)

“Least Wanted” Macroinvertebrates


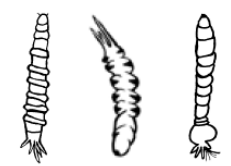
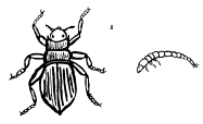






LEAST WANTED (Least Sensitive to Pollution)	15	16	17	18	19	20	21
	Scud Amphipoda	Aquatic Sow Bug Isopoda	Leech Hirudinea	Non-Biting Midge Chironimidae	Black Fly Simuliidae	Snail Gastropoda	Aquatic Worm Oligochaeta
							
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



“Others” Commonly Collected During RBV



OTHERS	22	23	24	25	26	27	28
	Crayfish Decapoda	Crane Fly Tipulidae	Riffle Beetle Elmidae	Small Minnow Mayfly Baetidae	Aquatic Snipe Fly <i>Atherix sp.</i>	Flatworm <i>Planaria sp.</i>	Mussel/Clam Unionoida
	 <p><i>*Photograph and return all crayfish to the stream</i></p> <input type="checkbox"/>	 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	 <input type="checkbox"/> <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <p><i>*Photograph and return all mussels to the stream</i></p> <input type="checkbox"/>





Connecticut Department of Energy and Environmental Protection

