



# Aquatic Life of Small Streams: A Critical Criterion For NRPA Stream Determinations

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*Protecting Maine's Air, Land and Water*

# Overview

- Aquatic macroinvertebrates of small streams
- Monitoring water quality with macroinvertebrates
- Impacts of urbanization on small streams

# THIS IS A STREAM IF IT HAS...

A channel between defined banks and any **two** of the following:

1. Blue line on current USGS topo map
2. Continuous water flow for 6-months
3. Mineral or parent material bed
4. Contains aquatic plants
5. Contains aquatic animals



Tom Danielson





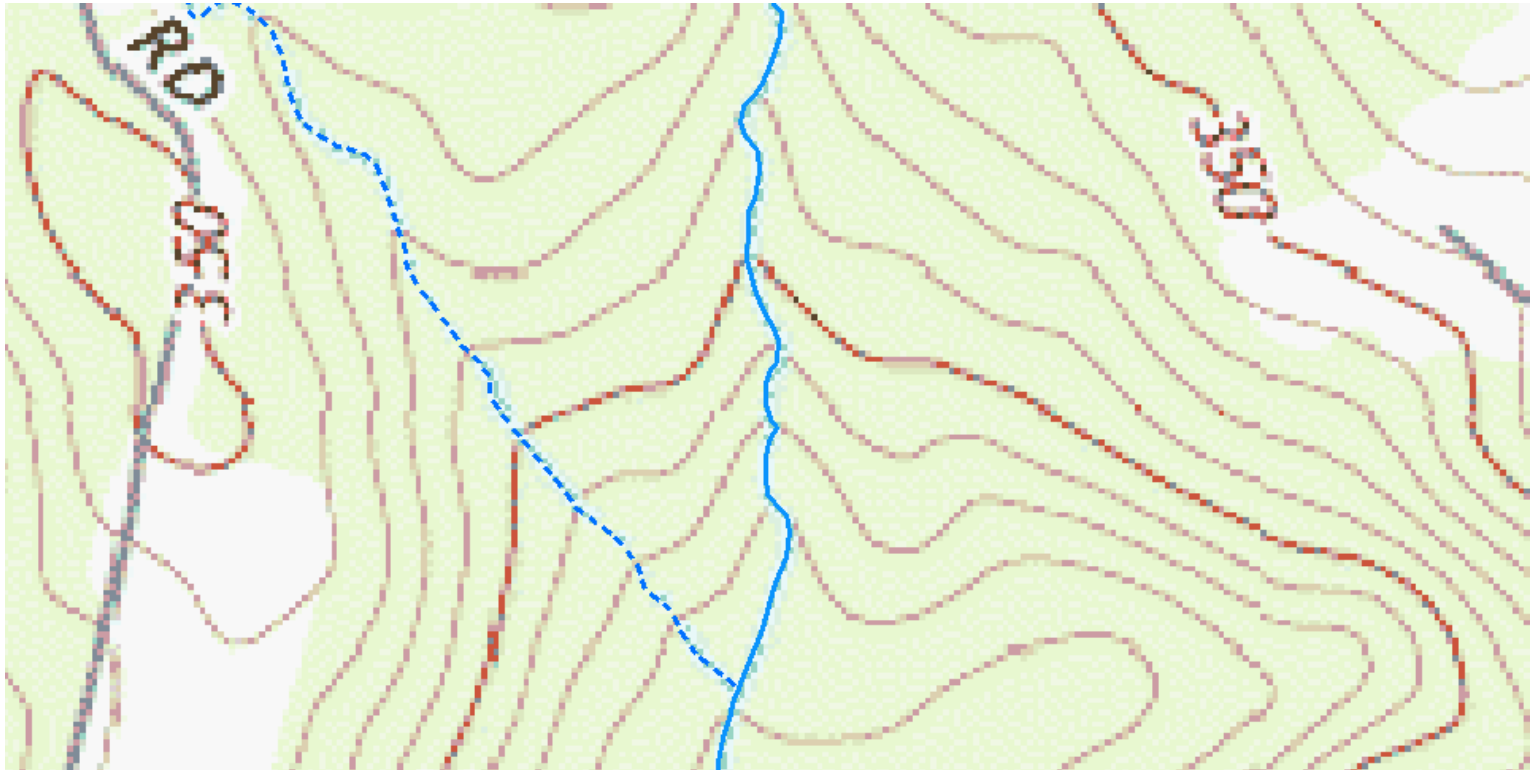
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# 1. Blue line on USGS Map



7.5-minute series topographic map

## 2. Continuous Flow for 6 Months

- “It contains or is known to contain flowing water continuously for a period of at least 6 months of the year in most years”
- Includes winter months
- “*In most years*”

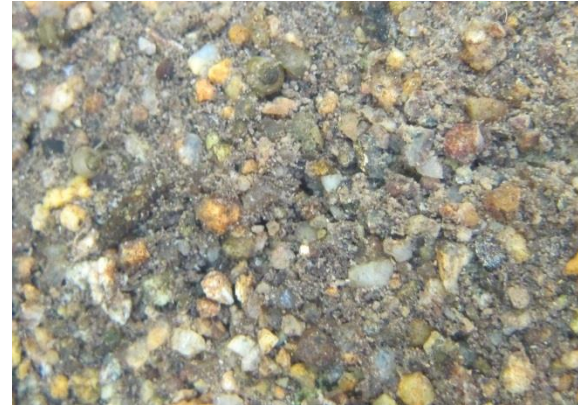


# 3. Mineral or Parent Material Bed

**Rocks**



**Sand**



**Silt, Mud**



**Bedrock**



## 4. Contains Aquatic Plants

- “The channel contains aquatic vegetation and is essentially devoid of upland vegetation”
- aquatic vegetation include plants that usually grow on or below the surface of the water for most of the growing season in most years



## 5. Contains Aquatic Animals

- “The channel contains aquatic animals such as fish, aquatic insects or mollusks in the water or, if no surface water is present, within the stream bed.”

# Case Studies



# Perennial Stream

- ✓ Channel with defined banks
- ✓ Mineral channel substrate
- ✓ Blue line on topo map
- ✓ Aquatic animals



# Intermittent Stream

Dries up in summer

- ✓ Channel with defined banks
- ✓ Mineral channel substrate
- ✓ Aquatic animals



# Low Gradient Stream

- ✓ Channel with defined banks
- ✓ Aquatic life
- ✓ Aquatic plants











# This is a NRPA Stream

- Channelized segment of a brook
- Natural channel away from the road (upstream / downstream)





# Not NRPA Streams

- Grassy swale
- Ditch or other drainage way constructed, or constructed and maintained, solely for the purpose of draining stormwater





# Not a NRPA Stream





# Fish in Small Streams

**Brook Trout**



**Creek Chub**



**Blacknose Dace**



**Ninespine Stickleback**



# Two-lined Salamanders “brook salamanders”



**Adult**



**Larvae**

Carl Brune

gills

# Northern Dusky Salamander

**Adult**



Terry Hibbits

**Larvae**



Carl Brune

gills



# Northern Spring Salamander

Adult



CT DEEP

Larvae



Carl Brune

gills



# Aquatic Macroinvertebrates

- Animals without backbones that can be seen without the assistance of magnification
  - insects
  - worms
  - leeches
  - crustaceans
  - mollusks

# Tools



# Where to Look in Small Streams



# Mollusks

## Snails



Great Lakes Sea Grant

## Mussels



Kurt Stepnitz

## Limpets



FWGNA

## Fingernail Clams



G & Ph Poppe



# Crustaceans (10 or more legs)

**Crayfish**



Hazel Galloway

**Isopods**



nwnature.net

**Amphipods**



Biodiversity Institute of Ontario

# Worms and Leeches

## Aquatic Earthworms



ANEBO

## Leeches



Aphotofauna

## Planaria

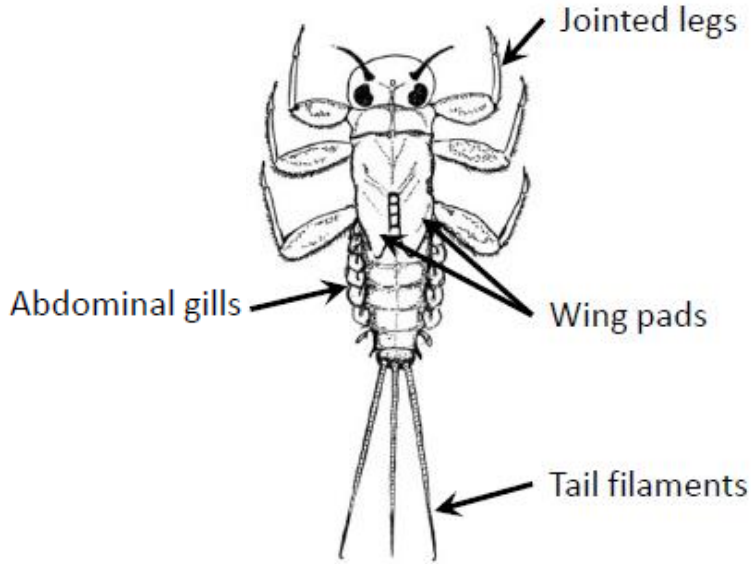


Eduard Solà

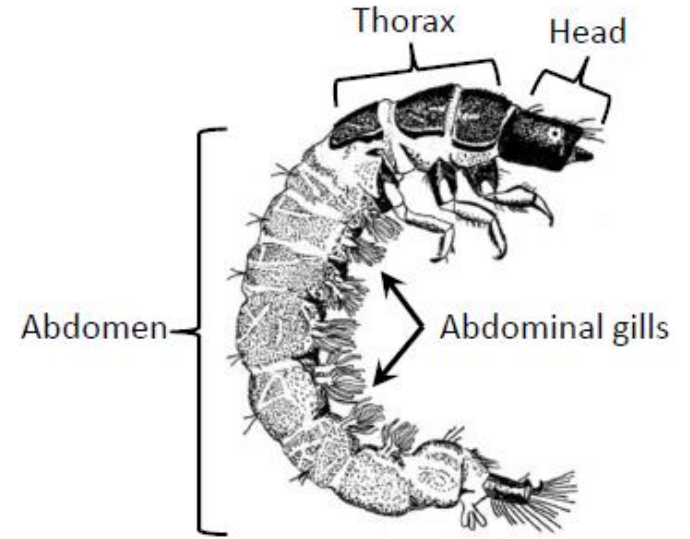
# Aquatic Insects



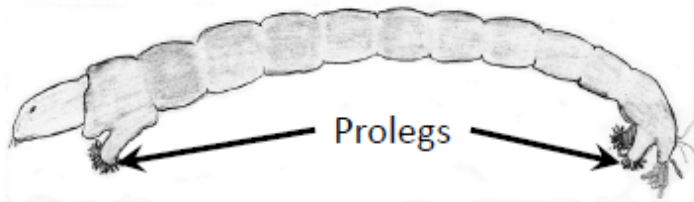
**1 Has Legs  
Has Wing Pads**



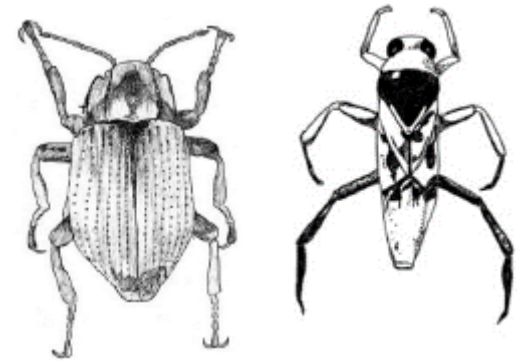
**2 Has Legs  
No Wing Pads**



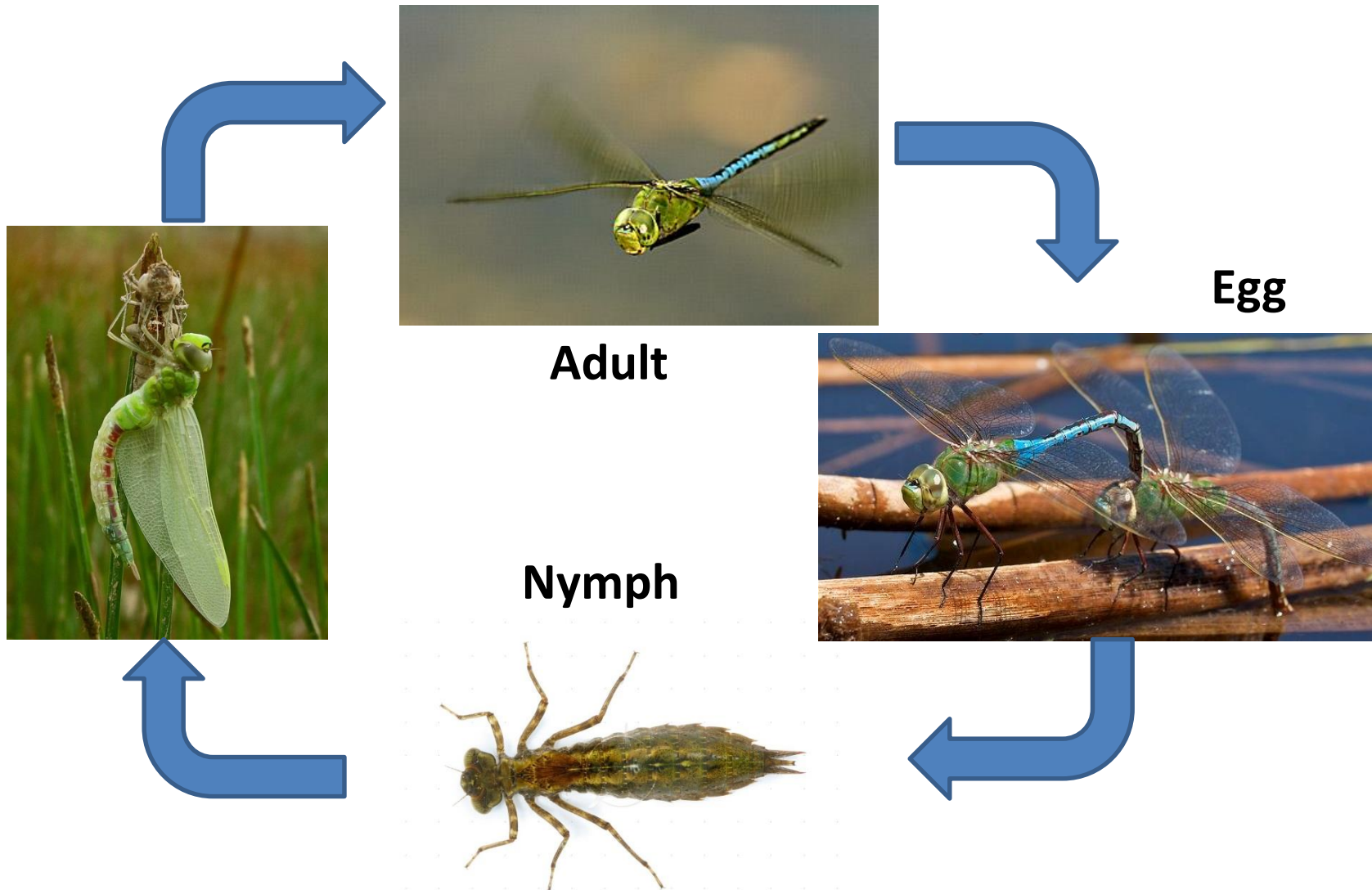
**3 No Legs  
No Wing Pads**



**4 Adult**



# Group ① with Wing Pads INCOMPLETE METAMORPHOSIS



# Instars

cm



by Andy Holt

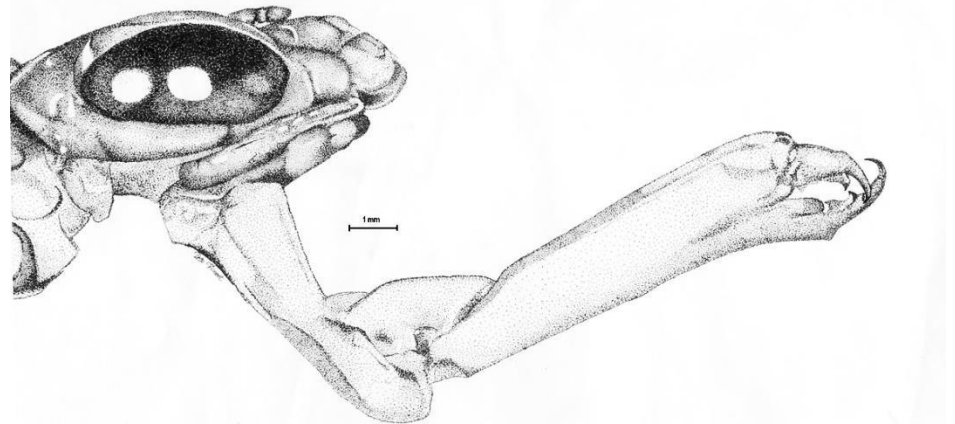
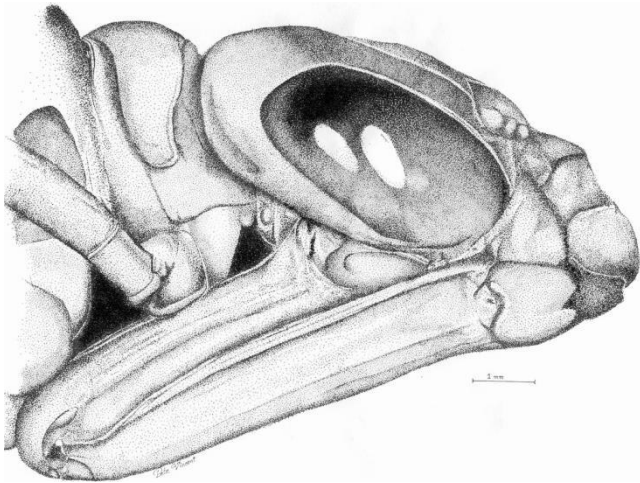


# Emergence



by Andy Holt

# Dragonfly Labium



by denmarkpfp



Jan Hamrsky



# Dragonflies in Small Streams

Dragonhunter **HG**



Clubtail



Spiketail



Skimmer **LG**



Darner



Petaltail **Springs**



# Damselflies

**Nymph**



3 gills

wing pads

**Adult**



Images by R.S. Krotzer

# Damselflies in Small Streams

**Jewelwing**      **HG**



**Narrowwinged**



**Spreadwinged**      **LG**





# Mayflies

## Nymph



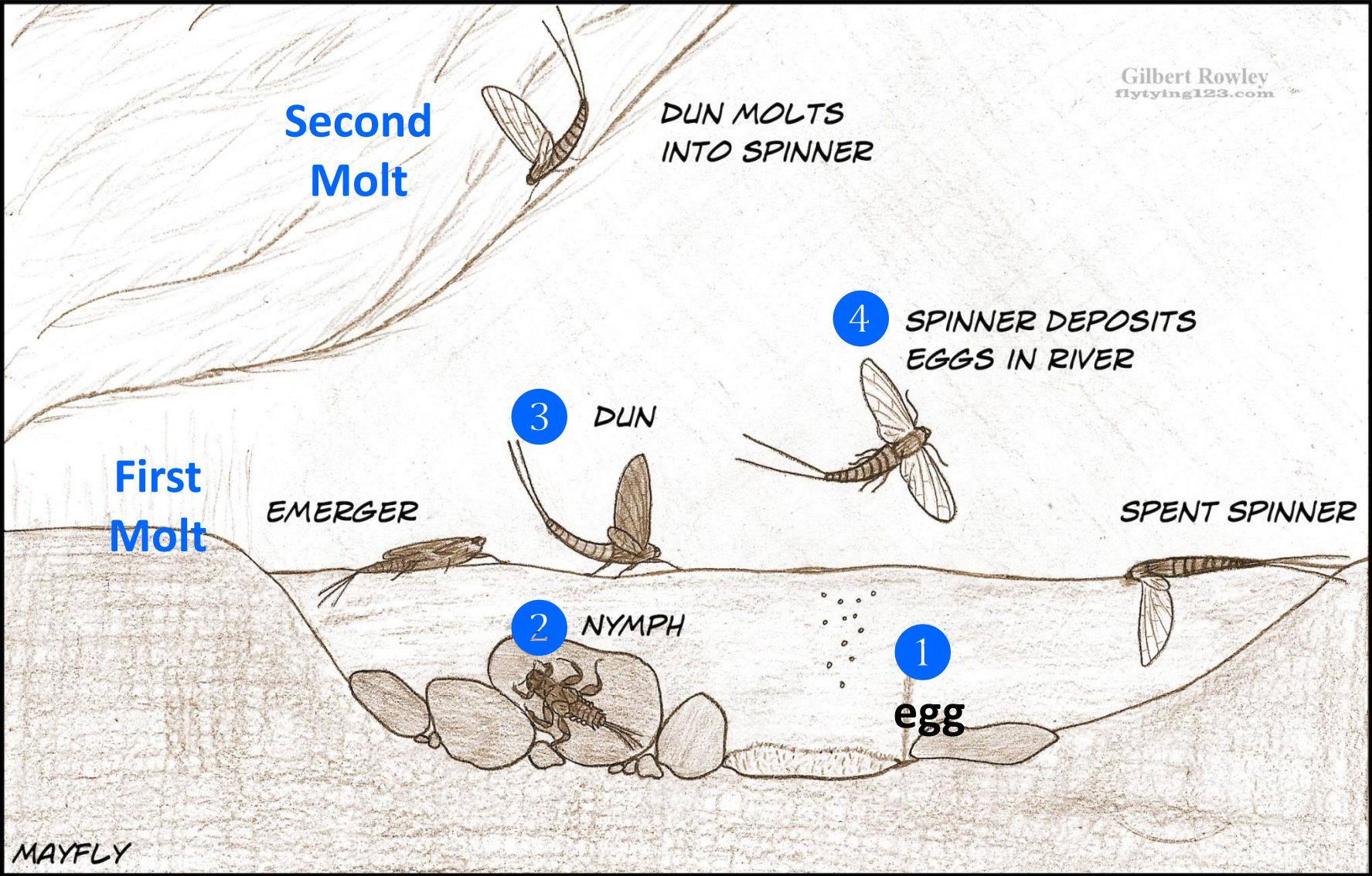
usually  
3 tails

gills on  
abdomen

## Adult



# Mayfly Life Cycle



# Mayflies in Small Streams

Flat-headed **HG**



Brush-legged



Small squaregill **LG**



Small minnow



Spiny crawler



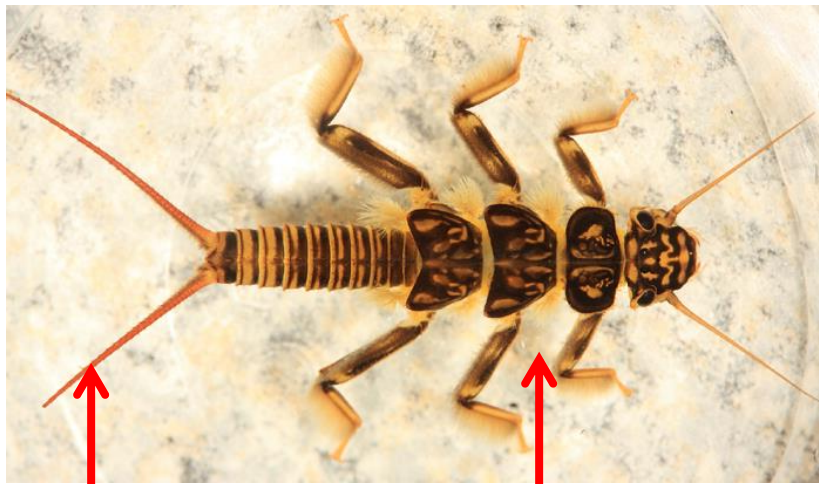
Prong-gilled **LG**





# Stoneflies (Plecoptera)

## Nymph



2 tails

some have  
hair-like gills  
near legs

## Adult



Images by Tom Walker

# Stoneflies in Small Streams

**Rolled-winged**



**Winter**



**Roachlike Springs**



**Slender Winter**



**Nemourid**



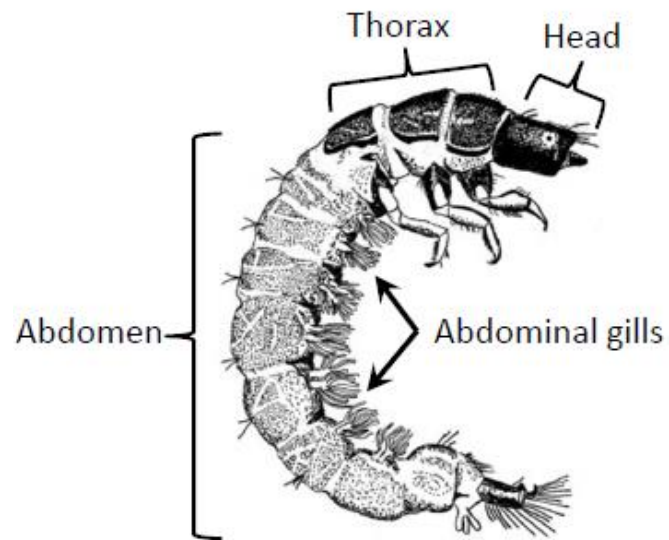
**Giant**



Images by Don Chandler, Tom Walker, and Bob

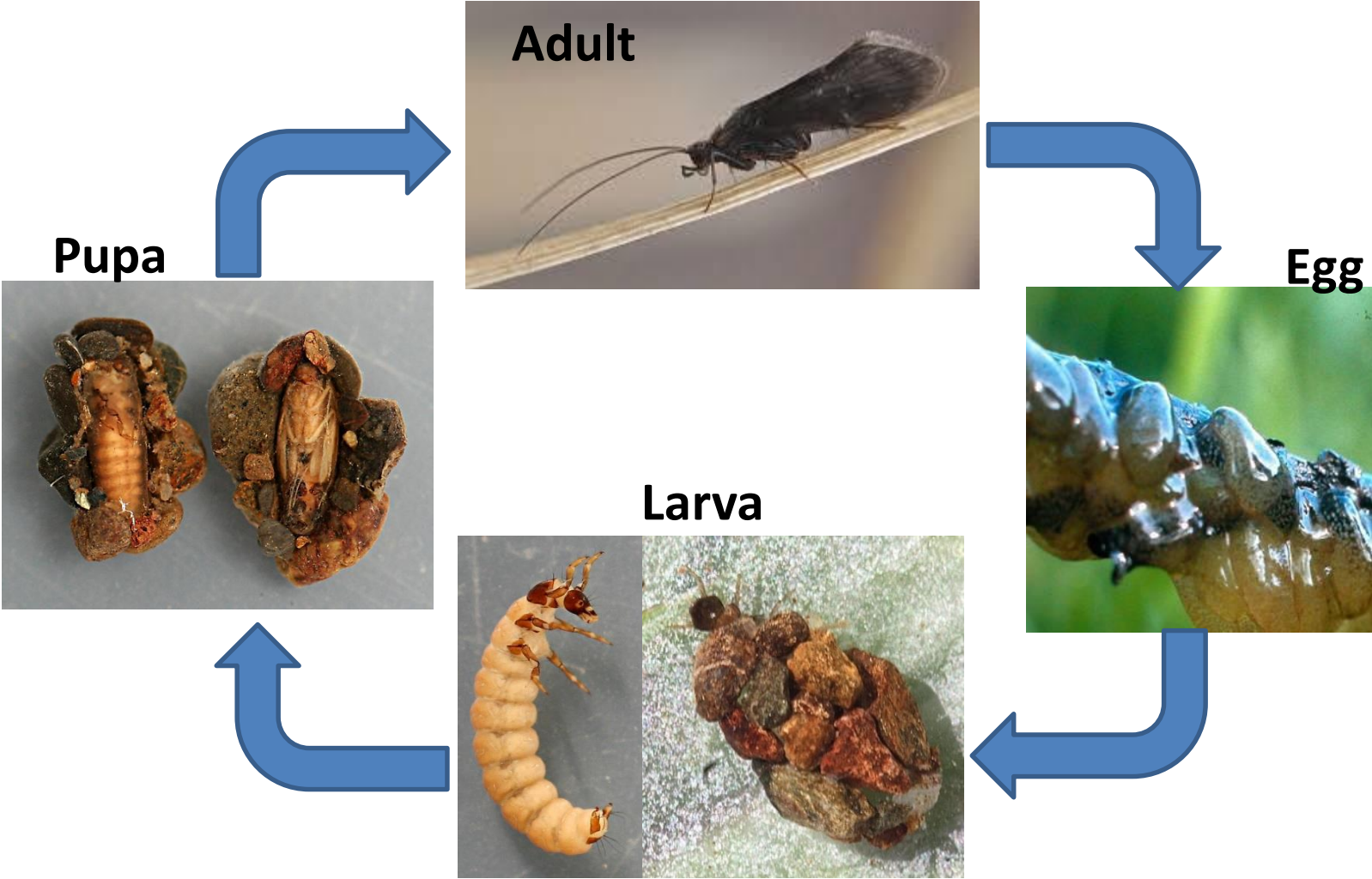
# Group 2

**Has Legs**  
**No Wing Pads**





# COMPLETE METAMORPHOSIS



Images by Rick Hafele, Troutnut, and the Freshwater Recorders and Schemes Project,

# Caddisflies (Trichoptera)

Larvae



2 claws

some have  
hair-like gills

Adult



# Caddisfly Cases

## Lepidostomatid



University of Iowa

## Northern Case Makers



ophis



Robert Henricks

## Lepidostomatid



Mark Melton

## Northern Case Makers



Tom Murray



Robert Henricks



# Caddisflies that Make Nets

Common Netspinner

HG



some have  
hair-like gills

Tubemaker

HG



2 claws

# Caddisfly Nets

## Common Netspinner



Jan Hamrsky

# Dobsonflies & Fishflies

HG

Larvae



LG



Lyle J Buss

Adult



Lyle J Buss

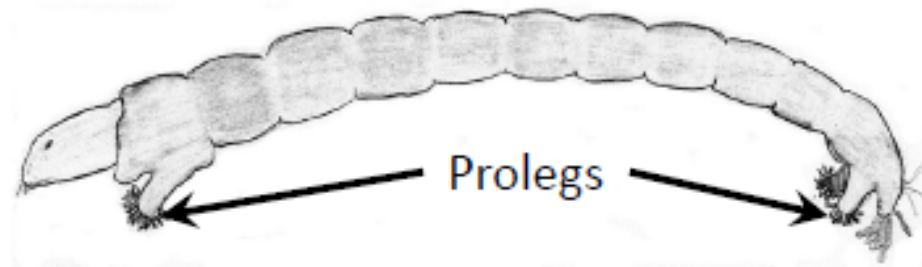


Lyle J Buss



# Group 3

No Legs  
No Wing Pads



# True Flies

## Midge



Tom Murray

## Cranefly



Takimata

## Blackfly **HG**



nwnature.org

Larvae

Adult



Mardon Erbland



R Berg



metrioptera

# Group 4 - Adults



Drawings by Stroud Water Research Center



# Beetles

## Riffle Beetle **HG**



Ophis

## Diving Beetle **LG**



Tom Murray

## Whirligig Beetle **LG**



Tom Murray

Larvae

Adult



MJ Hatfield



Andrew McKorney



Joyce Gross

# True Bugs

(Mostly in Low Gradient Streams)

**Water Boatman**



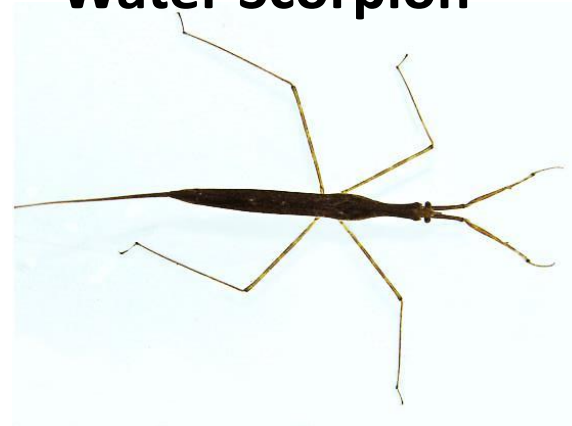
**Backswimmer**



**Creeping Water Bug**




**Water Scorpion**



# Most Likely in Small Streams







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**www.maine.gov/dep**