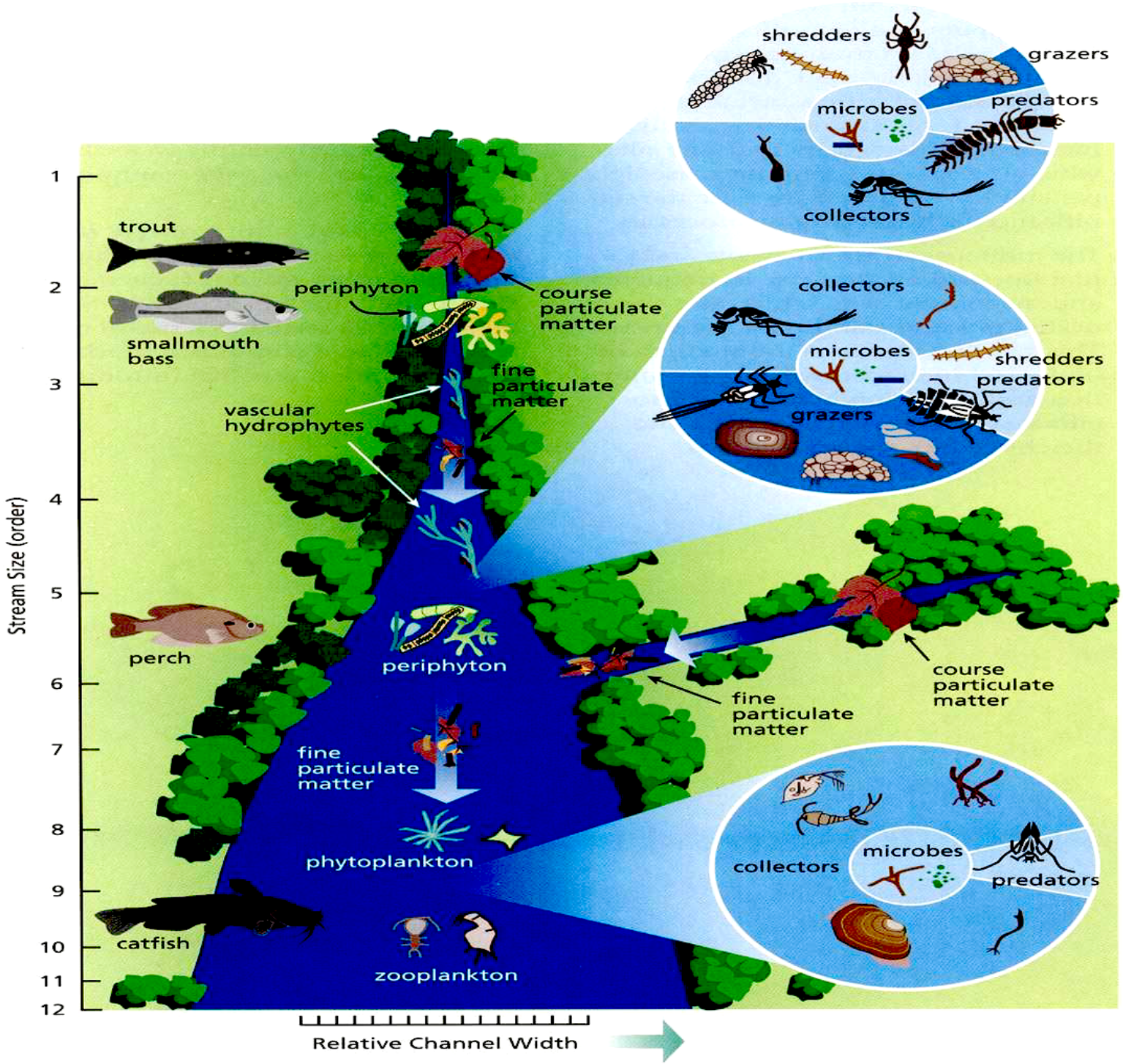
Macroinvertebrates as Bioindicators of Stream Health



What is a Macroinvertebrate?


shredders
grazers
microbes
predators
collectors
trout
periphyton
course particulate matter
smallmouth bass
collectors
microbes
shredders
predators
grazers
fine particulate matter
vascular hydrophytes
perch
periphyton
course particulate matter
fine particulate matter
fine particulate matter
phytoplankton
collectors
microbes
predators
catfish
zooplankton
Stream Size (order)
1
2
3
4
5
6
7
8
9
10
11
12
Relative Channel Width

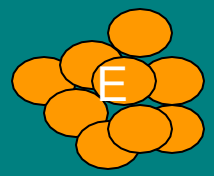
Aquatic Pupae

Terrestrial Winged Adults

Macroinvertebrate Life Cycle

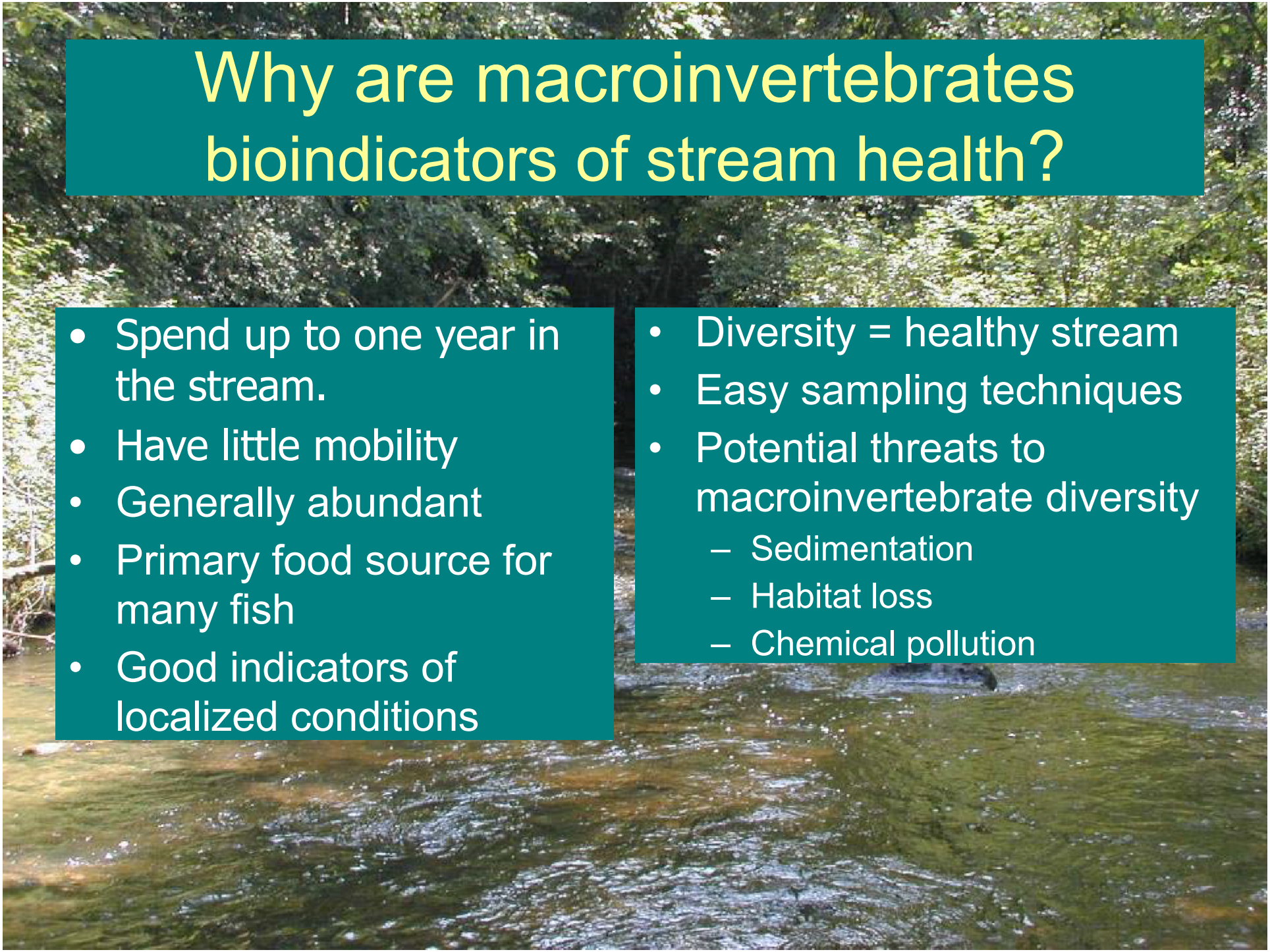
Ex. Midge

Aquatic Larvae



Aquatic Eggs

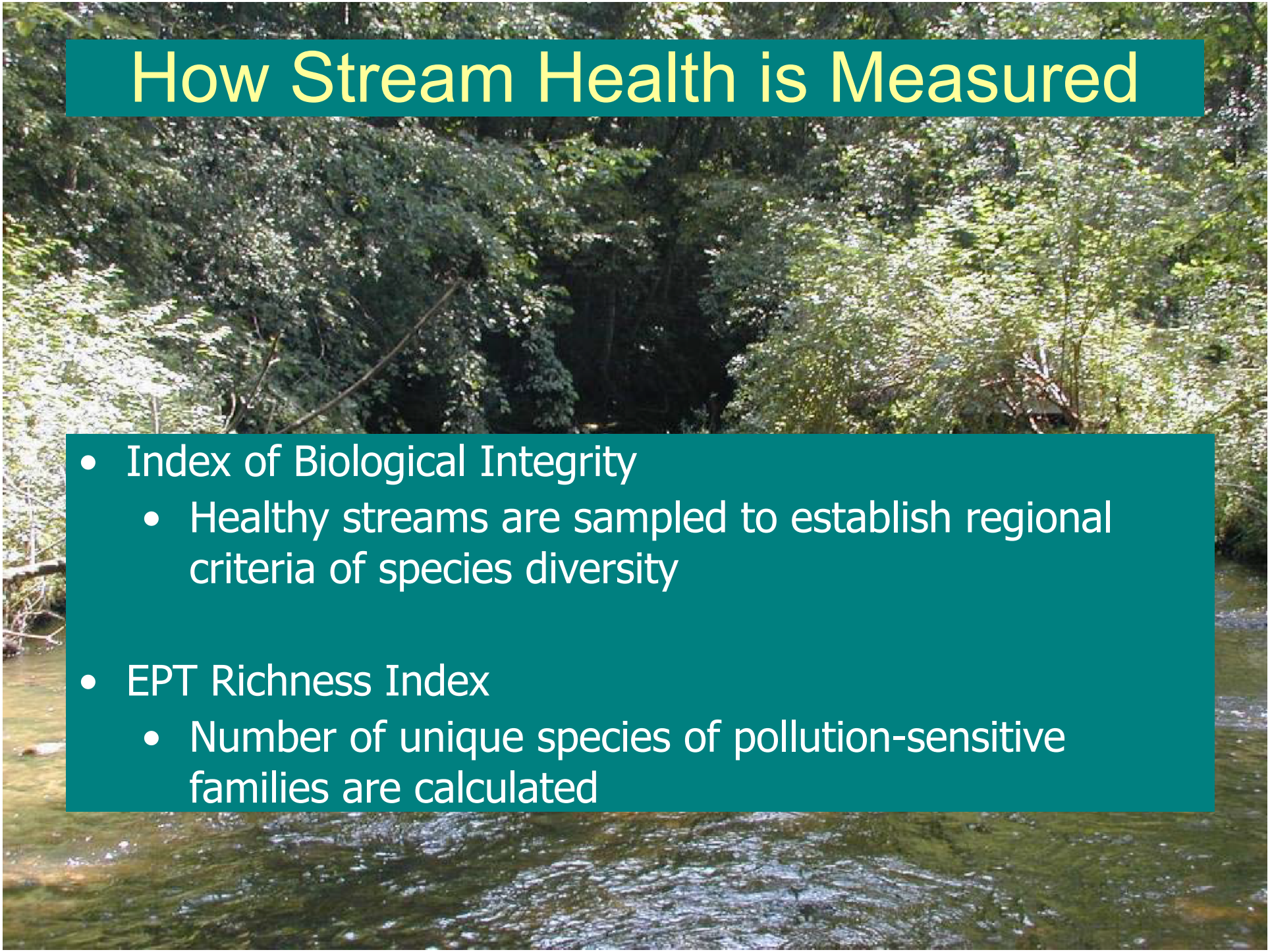
Complete Metamorphosis



Why are macroinvertebrates bioindicators of stream health?

- Spend up to one year in the stream.
- Have little mobility
- Generally abundant
- Primary food source for many fish
- Good indicators of localized conditions

- Diversity = healthy stream
- Easy sampling techniques
- Potential threats to macroinvertebrate diversity
  - Sedimentation
  - Habitat loss
  - Chemical pollution



How Stream Health is Measured

- Index of Biological Integrity
  - Healthy streams are sampled to establish regional criteria of species diversity
- EPT Richness Index
  - Number of unique species of pollution-sensitive families are calculated

Collection & Identification of Macroinvertebrates

Group 1 - pollution sensitive

Caddisflies (Trichoptera)

Caddisfly cases – of wood, gravel, sand grains, etc.

Figure 14.58. *Dicosmoecus* larval case

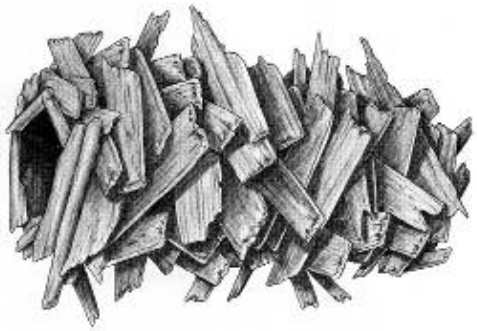


Figure 14.59. *Limnephilus* larval case

Figure 14.60. *Limnephilus* larval case

Figure 14.61. *Pycnopsyche* larval case

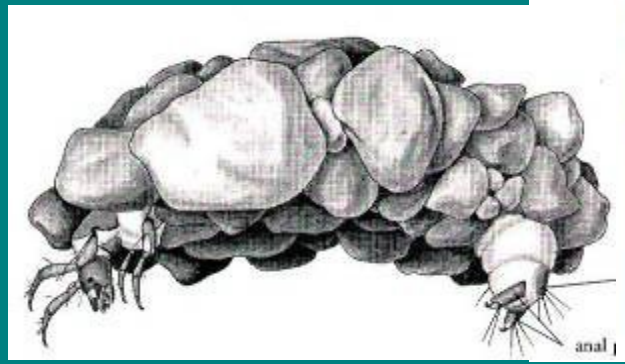
Figure 14.62. *Apatania* larval case

Figure 14.63. *Neophylax* larval case

Figure 14.64. *Farula* larval case

Figure 14.65. *Manophylax* larval case

3mm

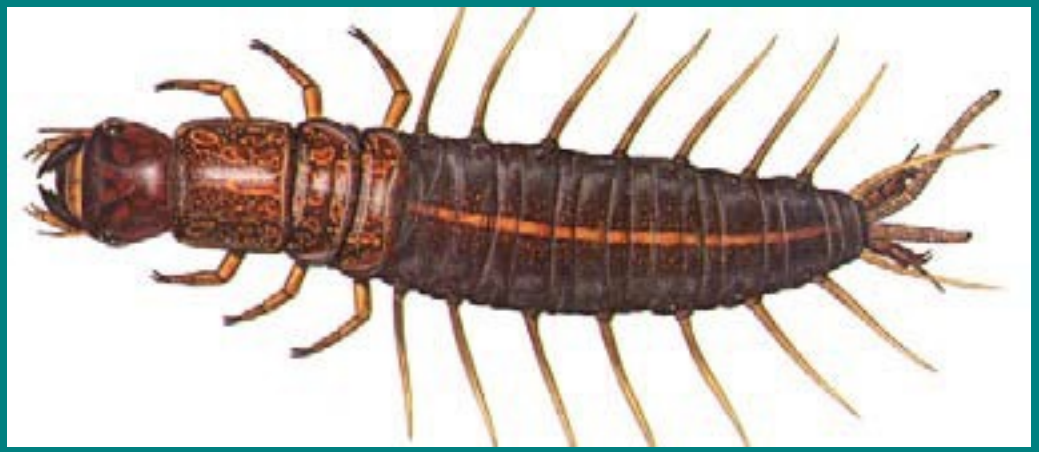


Group 1 - pollution sensitive

Hellgramites (Megaloptera)

Group 1 - pollution sensitive

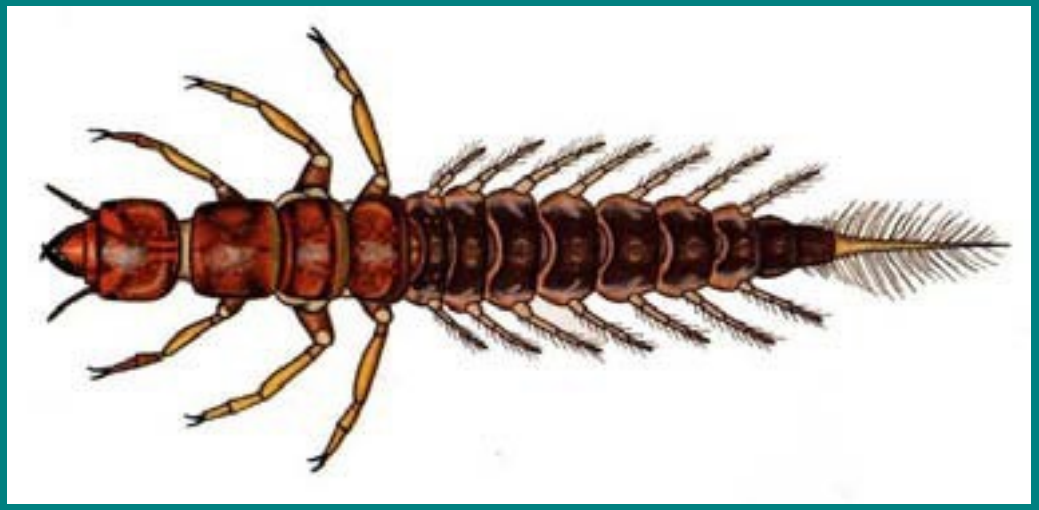
Two Megalopterans: Note the Differences!



Hellgrammite (Dobsonfly)

- No distinct, single tail
- Generally larger

Group 2 – somewhat pollution tolerant

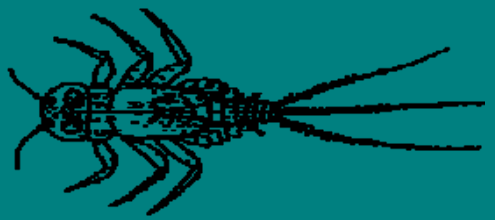


Alderfly (Fishfly)

- Distinct, single tail
- Generally smaller

Group 1 - pollution sensitive

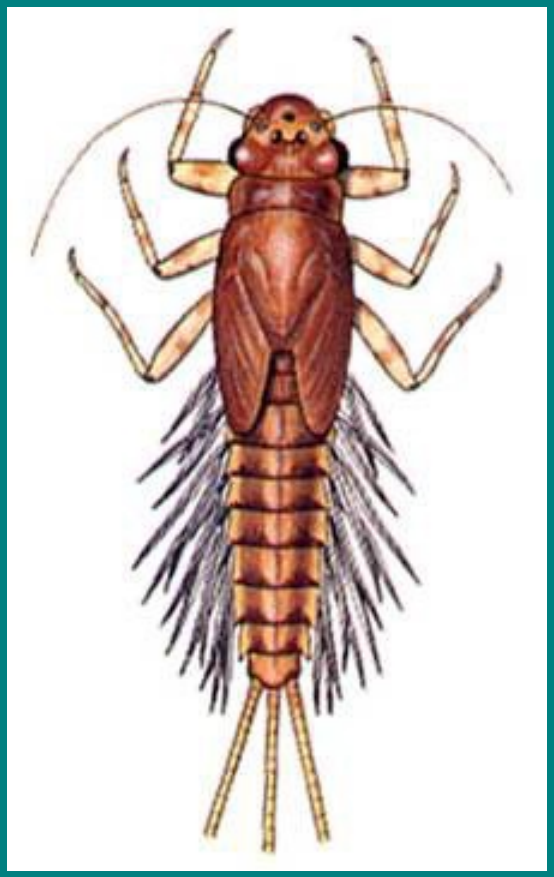
Mayflies (Ephemeroptera)



Mayfly nymph
.5-6 cm length, including tails.

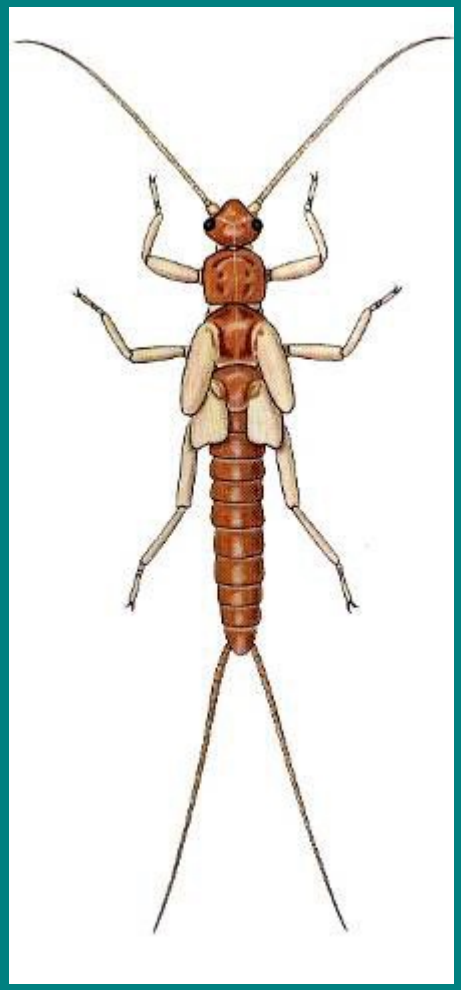
Group 1 - pollution sensitive

Mayflies

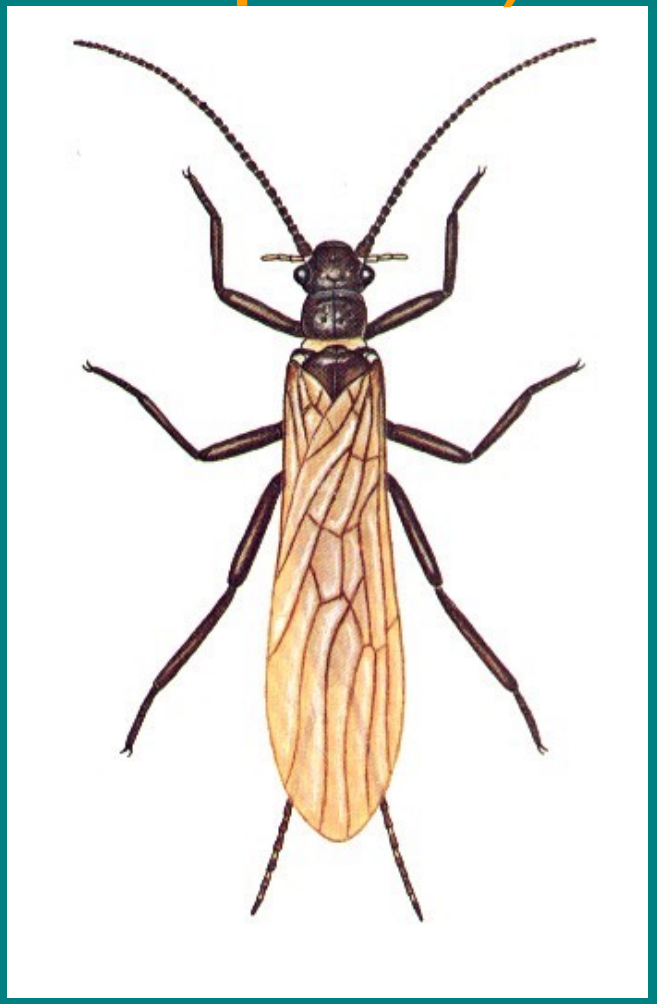


Group 1 - pollution sensitive

Stoneflies (Plecoptera)



Auqatic Nymph



Terrestrial Adult

Group 1 - pollution sensitive

Stoneflies

Group 1 – pollution sensitive

Water Penny larva

WATER PENNIES
(Psephenidae)

Figure 13.41. Eubriinae larva (ventral)

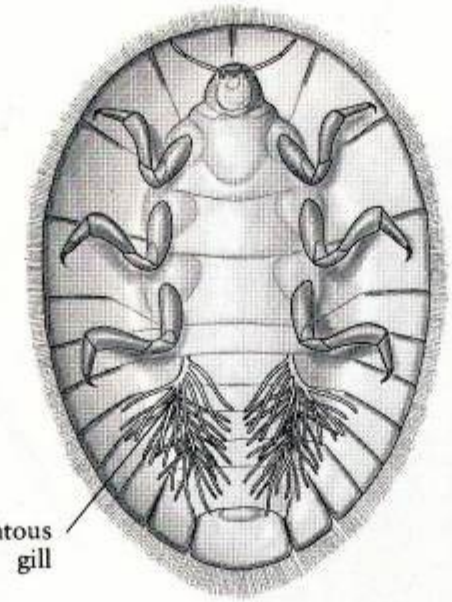


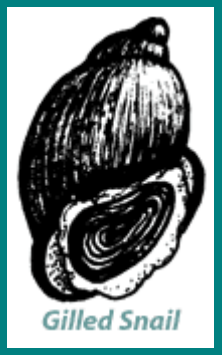
Figure 13.42. Psepheninae larva (ventral)

Figure 13.43. *Psephenus* adult

Group 1 - pollution sensitive

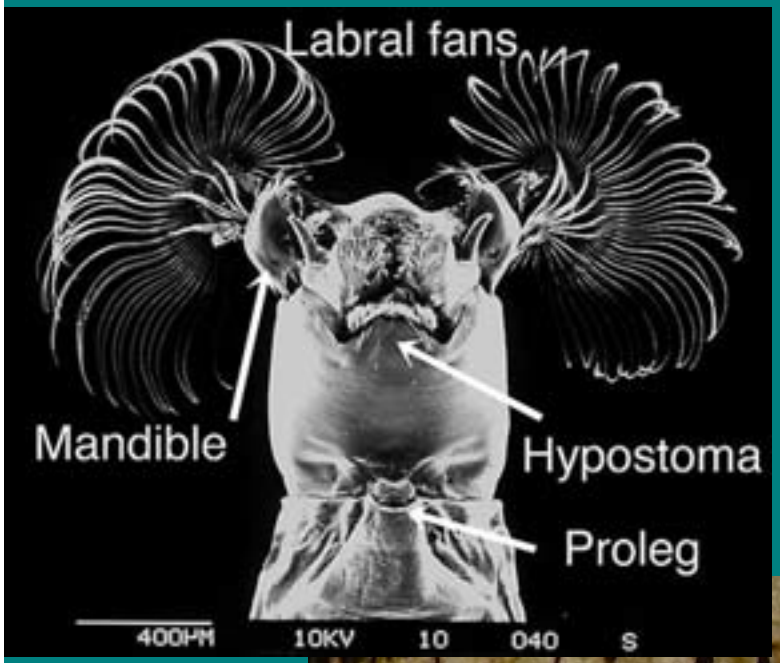
Gilled Snail

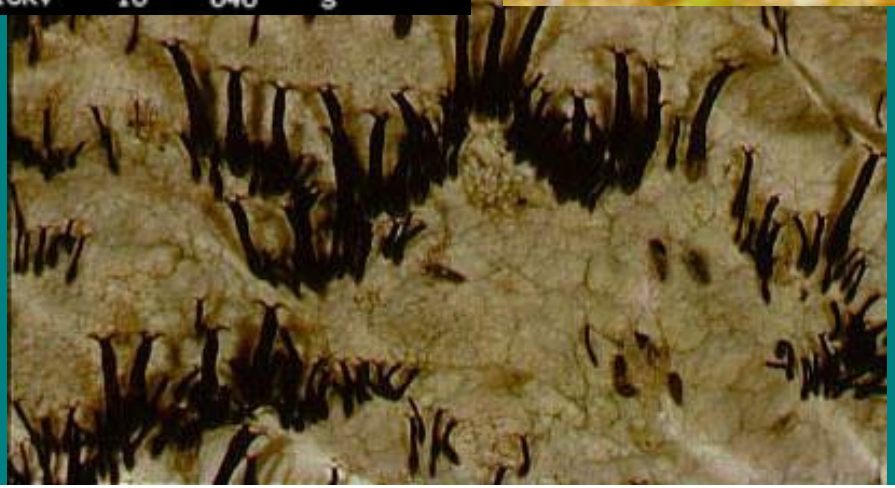
- Have an operculum or plate-like door that protects the opening of the shell and can be quickly closed to avoid predators.
- Coiled shells that usually open on the right-hand side.

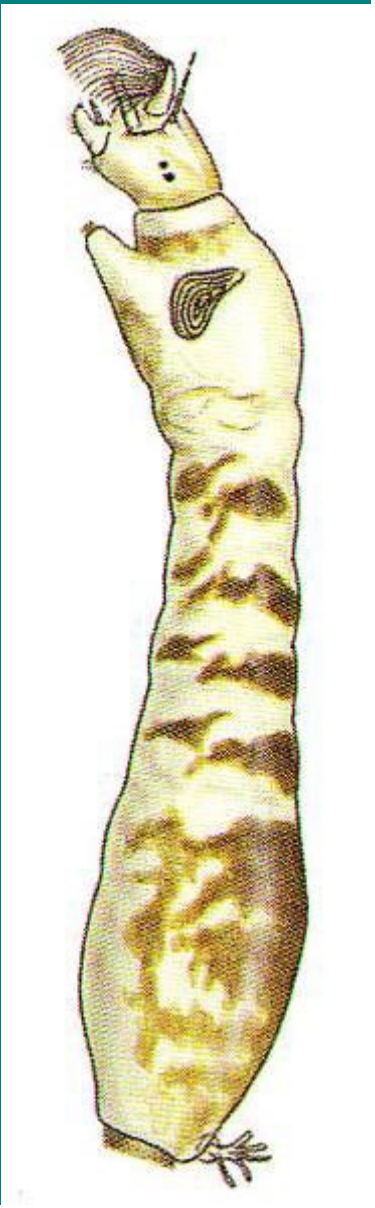


Group 2 – somewhat pollution tolerant

Black Fly





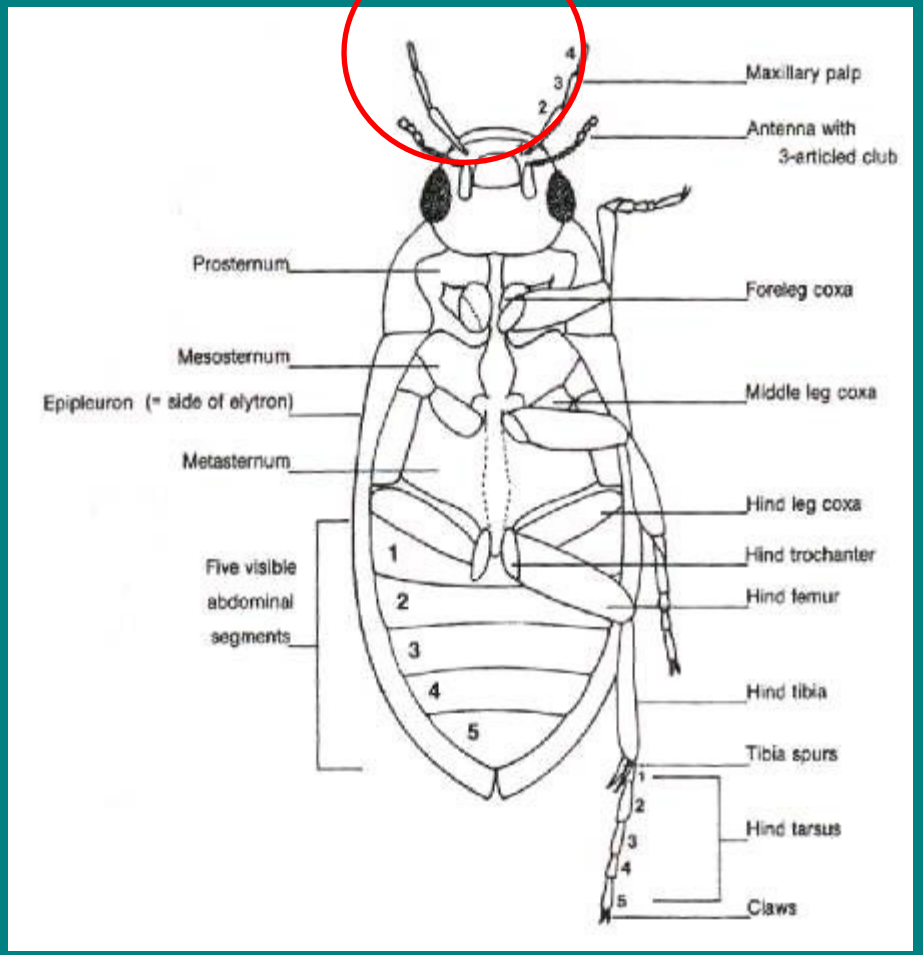


Group 2 – somewhat pollution tolerant

Adult Beetles (Coleoptera)

Group 2 – somewhat pollution tolerant

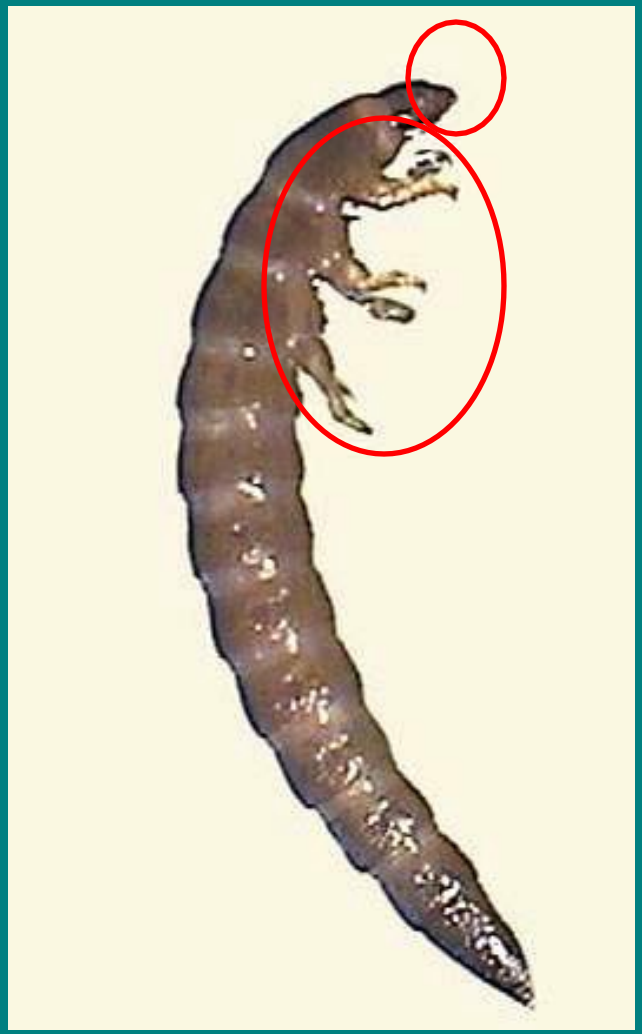
Adult Beetles



- Shell-like wings
- Chewing mouthparts

Group 2 – somewhat pollution tolerant

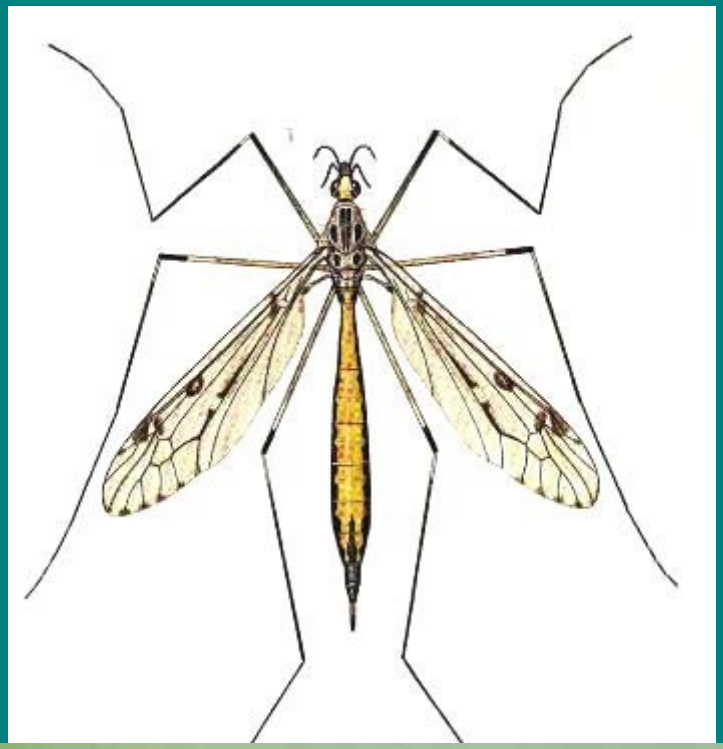
Beetle larvae



Chewing or biting mouthparts

3 Pairs of legs

Generally well sclerotized



Group 2 – somewhat pollution tolerant

Crane Fly

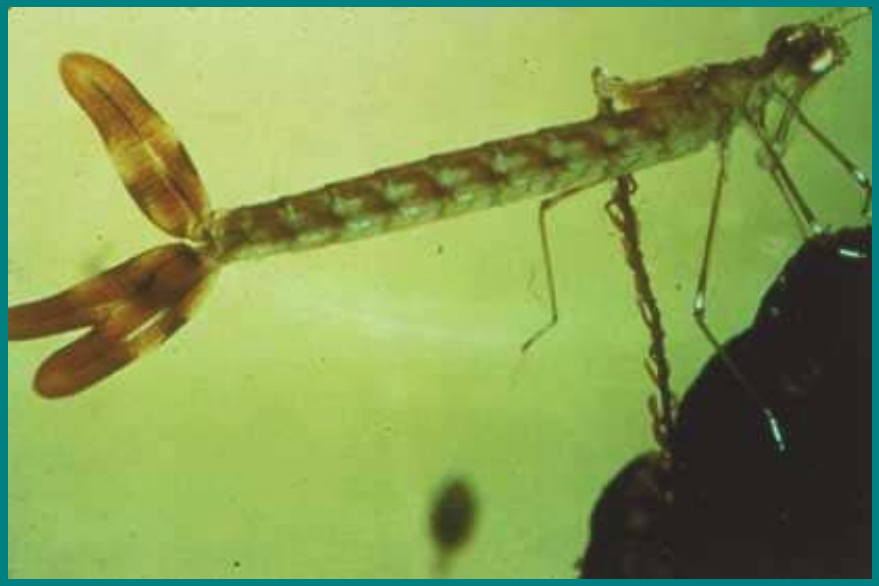
- .8-5 cm length

Group 2 – somewhat pollution tolerant

Dragonflies and Damselflies (Odonata)

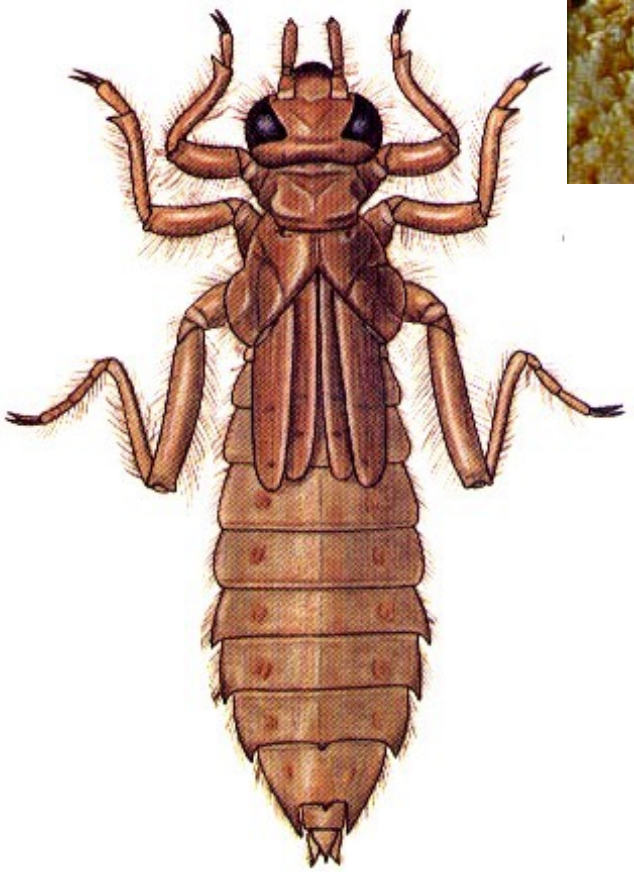
Group 2 – somewhat pollution tolerant

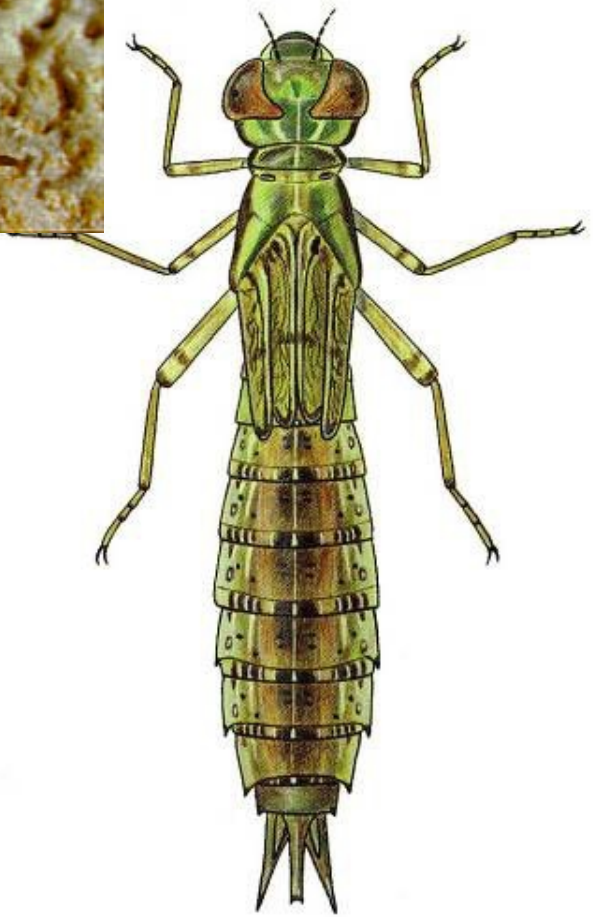
Damselflies

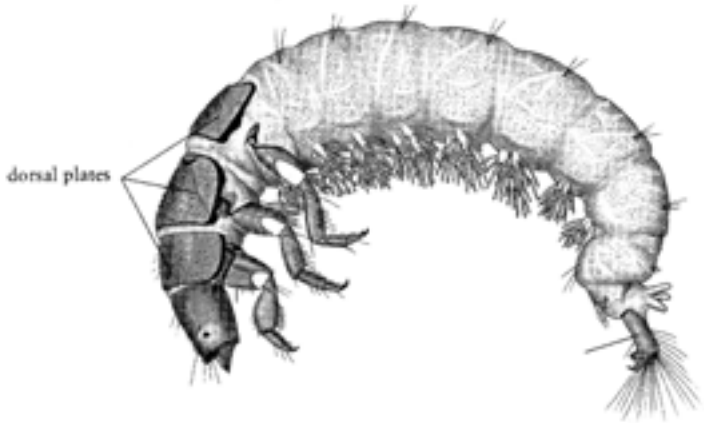


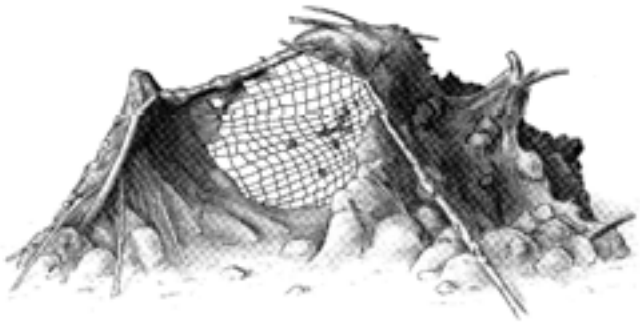
Group 2 – somewhat pollution tolerant

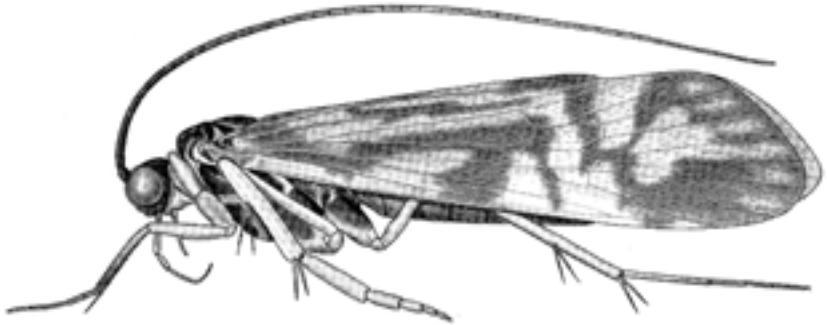
Dragonflies











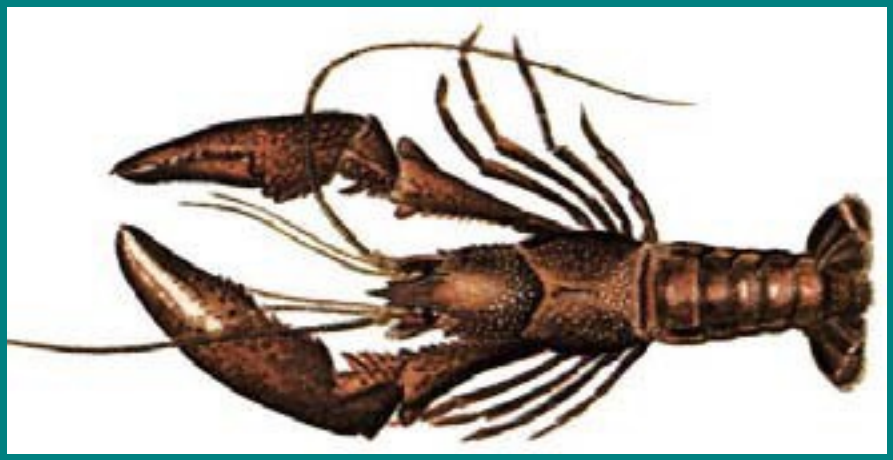
Group 2 – somewhat pollution tolerant

Net-spinning Caddisfly

Hydropsychidae

Group 2 – somewhat pollution tolerant

Crayfish



Group 2 – somewhat pollution tolerant

Amphipods (scuds)

- .5-1 cm length

Group 2 – somewhat pollution tolerant

Clams

Group 2 – somewhat pollution tolerant

Isopods (Sow Bugs)

- **,8-2 cm length**

Group 3 – pollution tolerant

True Bugs (Hemiptera)

Wings hardened near the base and membranous everywhere else

Adult beetles

Tube-like sucking mouthparts

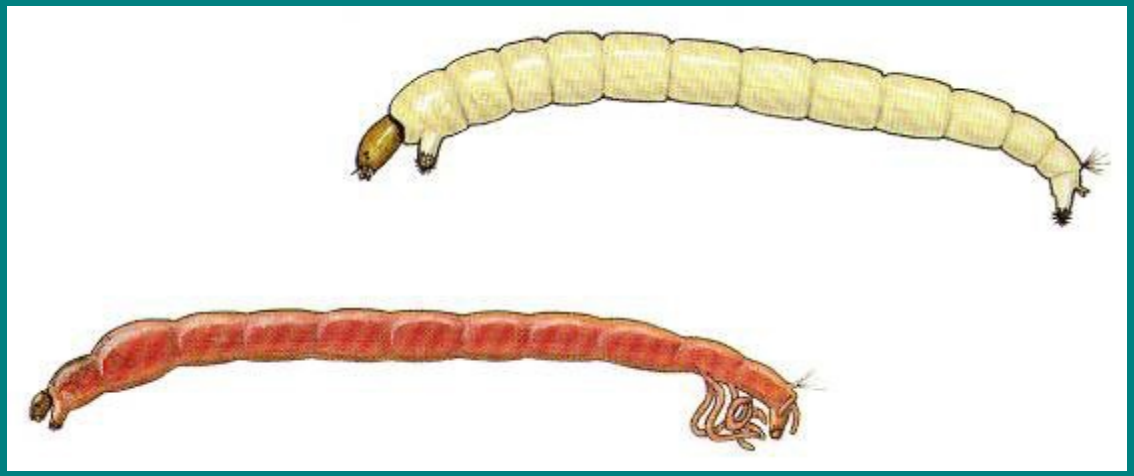
Group 3 - pollution tolerant

Water Striders, Backswimmers, Water Bugs (counterclockwise)

- Get oxygen from the air.
- Do not depend upon dissolved oxygen in the water.

Group 3 - pollution tolerant

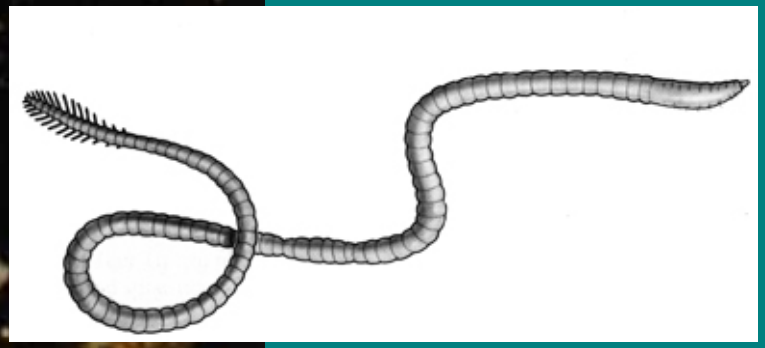
Midges



- Up to 1.5 cm in length.

Group 3 - pollution tolerant

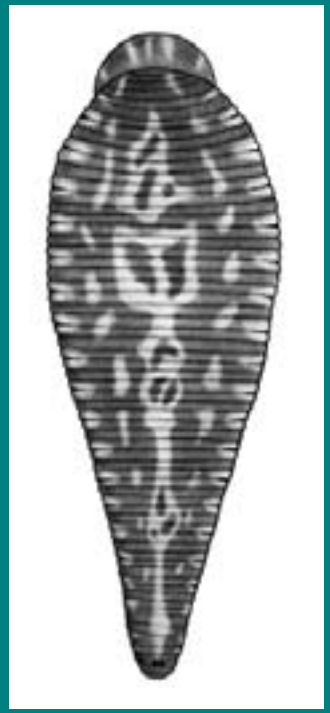
Aquatic Worms (Oligochaeta)



Note the segments!

Group 3 - pollution tolerant

Leeches



Group 3 - pollution tolerant

Pouch Snails

- Do not have a plate-like covering over the shell opening.
- Has shell that spirals with opening usually on your left side, or shell that is coiled in one plane, or shell that is dome or hat shaped with no coils.