Aquatic Insects and Water Temperature

Ectotherms (thermoconformers) – conform to temperature of the environment

Stenotherms – live at narrow range of environmental temperatures

Most stream insects are “cold stenotherms” – Why???
Aquatic Insects and Oxygen

Problems putting the insect respiratory system in water!

Air: 20%  Water: maximum ~15 ppm (0.0015%)

Spiracles will flood if kept open.

If they are closed, how get air into tracheae?

How speed up diffusion of oxygen across respiratory membranes?
Solution #1 - Nevermind! Open tracheal systems (use atmospheric oxygen)

Breathing tubes

Transportable air bubbles

Compressible air bubbles - require excursions to the surface (ponds)

Highly evolved cuticular structures (plastron)
Solution #2 - Closed tracheal systems

Cutaneous respiration vs. tracheal gills

Respiratory regulators vs. conformers
Water quality assessment using stream invertebrates

Based on intolerance for low oxygen (or high temperature)

Hilsenhoff Biotic Index (0 – 10)

EPT – least tolerant taxa
Ephemeroptera, Plecoptera, Trichoptera

Chironomidae – most tolerant