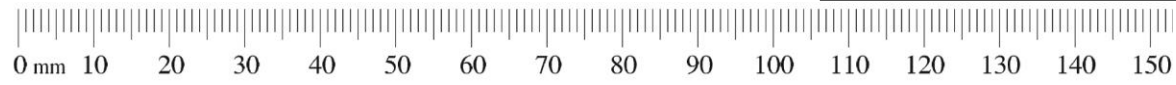
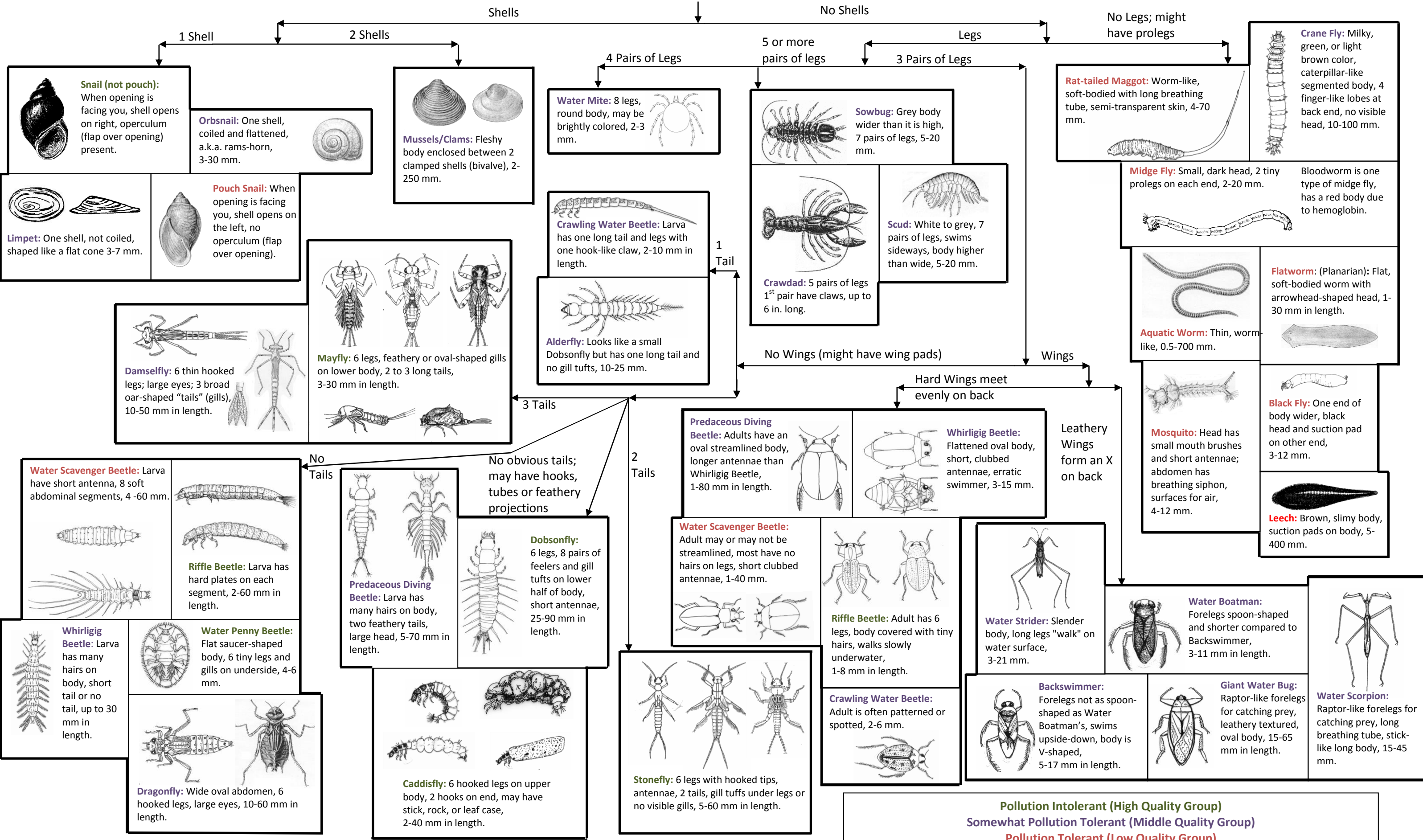


IOWA BENTHIC MACROINVERTEBRATE FLOW CHART



Pollution Intolerant (High Quality Group)

Common Name	Common Habitats	Breathing Method	Feeding Group	Unique characteristics or behaviors
Caddisfly	Riffles	Absorb dissolved oxygen with gills on abdomen & through the skin.	Predators, Shredders, Grazers, & Collectors	Some types can build a portable case out of natural materials by making silk thread.
Dobsonfly	Fast flowing water, under rocks, logs and leaf packs	Absorb dissolved oxygen with gills on abdomen & through the skin.	Predators	Hunt for prey at night. They live as larvae in the water 1-3 years and shed their skin throughout this period.
Mayfly	Found in all habitats	Absorb dissolved oxygen with gills.	Collectors & Grazers	Can hatch in large numbers all at once. Very large hatches on the Mississippi River can be seen on satellite images.
Riffle Beetle	Riffles	Larvae absorb dissolved oxygen through the skin. Adults trap atmospheric oxygen in patches of water resistant hairs.	Collectors & Grazers	Adults trap enough atmospheric oxygen in one trip to the surface that they live their entire lives underwater. Their wings waste away once they begin their adult lives underwater.
Snail (not pouch)	On aquatic vegetation, sand, gravel, & other solid surfaces	Absorb dissolved oxygen with gills.	Mostly Grazers	
Water Penny Beetle	Riffles	Absorb dissolved oxygen with gills.	Grazers	Nocturnal.
Stonefly	Riffles with coarse substrates (gravel, cobbles and boulders)	Absorb dissolved oxygen with gills.	Collectors & Predators, while a few are Grazers	They do pushups or wag their abdomens from side to side to move water across their gills to increase their dissolved oxygen absorption.

Somewhat Pollution Tolerant (Middle Quality Group)

Common Name	Common Habitats	Breathing Method	Feeding Group	Unique characteristics or behaviors
Crawling Water Beetle	Slow moving waters, among aquatic vegetation or algae	Trap atmospheric oxygen under their front wings and under a flattened section of their hind legs.	Shredders, some are Predators	
Backswimmer	Slow moving water, at the water surface or in the water	Trap atmospheric oxygen in hairs on the abdomen, under their wings and between their head and thorax.	Predators	Swim upside down. They are strong fliers.
Water Boatman	Calm waters	Trap atmospheric oxygen in hairs on the abdomen, under their wings and between their head and thorax.	Collectors	Can remain under water for an extended period by moving hind legs over their trapped air bubble to increase the diffusion of dissolved oxygen into the bubble.
Predaceous Diving Beetle	Slow moving waters mostly	Trap atmospheric oxygen under their wings.	Predators	The larvae are often called Water Tigers. They inject their prey with a liquid that dissolves its insides then the larva sucks up the liquid leaving behind the outer skin of the prey.
Damselfly	Waters with moderate to no flow	Absorb dissolved oxygen with three paddle-like gills at the end of their abdomen.	Predators	When dissolved oxygen levels get low they rise to the water surface to absorb atmospheric oxygen through their skin.
Whirligig Beetle	Adults at water surface	Larvae absorb dissolved oxygen with gills; Adults breathe atmospheric oxygen when at the water surface and trap it under their wings when diving.	Predators	Have divided eyes & can see both above the water and below the water. Their erratic swimming creates waves that echolocate food. They produce defensive excretions that smell like apples.
Dragonfly	Waters with moderate to no flow	Absorb dissolved oxygen with gills lining a chamber in the abdomen. Can rise to the surface and absorb atmospheric oxygen through the skin.	Predators	Their lower lip is an elbowed extendable grasping mouth piece used to catch prey that they ambush or stalk. They can eat larval fish and tadpoles.
Crane Fly	Found in all habitats	Breathe atmospheric oxygen with spiracles at the end of their abdomen.	Shredders	They break down leaves and detritus making energy & nutrients available. They can digest cellulose with the aid of bacteria in their gut. Adults look like large mosquitoes but do not bite.
Water Scorpion	Slow moving waters	Breathe atmospheric oxygen with a breathing tube at the end of their abdomen.	Predators	They cannot swim and move so slowly that algae, protozoa, and mites will grow on their skin.
Crawdad	Found in all habitats	Absorb dissolved oxygen with gills.	Shredders, Grazers, & Predators	When attacked they can break off their clawed first legs by contracting muscles. The leg will re-grow over time but will be smaller than the original leg.
Giant Water Bug	Slow moving waters	Breathe atmospheric oxygen with two flat structures at the end of the abdomen. Trap atmospheric oxygen under their wings to dive.	Predators	Catch large prey such as fish and frogs. Have venomous salivary enzymes that paralyze their prey. Some males carry the eggs providing dissolved oxygen and cleaning them with their legs.
Alderfly	All habitats, prefer areas with soft bottoms	Absorb dissolved oxygen with gills on abdomen & through the skin.	Predators	They are burrowers and can be found as deep as 35 cm.
Mussels/Clams	Moderate flow, sand, and/or gravel substrate that is stable	Absorb dissolved oxygen with gills and mantle.	Filter Feeders	Often the largest invertebrates in terms of body mass in freshwaters. Freshwater mussels have a parasitic larval stage.
Sowbug	All habitats, prefer areas with abundant hiding places	Absorb dissolved oxygen with gills.	Collectors, Shredders, & Predators	Females hold the eggs and young in a pouch on the underside of her body for up to 30 days after hatching.
Orbsnail	Soft, silty substrates	Obtain atmospheric oxygen through a lung-like structure.	Collectors & Grazers	
Water Mite	Found in all habitats	Absorb dissolved oxygen through the skin.	Predators & External Parasites	Have a very complex life cycle with many stages of development including a 6-legged parasitic stage. Their hosts are most often aquatic insect larvae.
Scud	Found in all habitats	Absorb dissolved oxygen with gills.	Collectors, Shredders, Grazers, & Predators	Express the behavior called negative phototaxis, meaning they avoid bright light.
Water Strider	Found in all habitats	Breathe atmospheric oxygen with spiracles like terrestrial insects.	Predators	They walk on water with surface tension, claws on their legs, and an excreted wax.
Limpet	Riffles	Absorb dissolved oxygen through the skin and with a projection from their foot.	Grazers	

Pollution Tolerant (Low Quality Group)

Common Name	Common Habitats	Breathing Method	Feeding Group	Unique characteristics or behaviors
Mosquito	Prefer still waters	Breathe atmospheric oxygen with a siphon at the end of their abdomen.	Collectors	Unofficial Iowa State Insect.
Water Scavenger Beetle	Slow moving waters	Trap atmospheric oxygen under their wings and in hairs on their underside.	Predators & Collectors	They are voracious eaters.
Pouch Snail	Soft, silty substrates	Obtain atmospheric oxygen through a lung-like structure.	Mostly Grazers	
Midge Fly	Found in all habitats	Absorb dissolved oxygen through the skin.	Collectors, Grazers, & Predators	Most diverse and abundant family of aquatic insects.
Leech	Found in all habitats	Absorb dissolved oxygen through the skin.	Predators	Most are not bloodsuckers.
Rat-tailed Maggot	Slow moving waters	Breathe atmospheric oxygen with a long telescoping breathing tube at the end of their abdomen.	Collectors	Often found in areas with a lot of decaying organic matter. Adults are called Flower Flies.
Flatworm	Found in all habitats	Absorb dissolved oxygen through the skin.	Predators & Collectors	Capable of regeneration.
Aquatic Worm	Found in all habitats	Absorb dissolved oxygen through the skin.	Collectors	Can live in areas with very low dissolved oxygen.
Black Fly	Found in flowing waters	Absorb dissolved oxygen through the skin.	Collectors	Can move across the substrate much like an inchworm.