Guide to Macroinvertebrate Identification

Introduction

The groups of animals found in leaf packs, rocks, woody debris and other areas of streams, rivers, ponds and wetlands are collectively called benthic macroinvertebrates. Benthic refers to the ability to cling to bottom surfaces such as rocks, leaves or roots. Macroinvertebrates are animals without a backbone that can be seen with the naked eye.

These bottom-dwelling animals include crustaceans, mollusks and annelids but most are larvae of aquatic insects (arthropods). Macroinvertebrates are an important link in the food web between the producers (leaves, algae) and higher consumers such as fish. They are the key indicators of biological integrity in a wide variety of aquatic environments.

All insects go through a series of changes (metamorphoses) during their life cycle. Insect life cycles can be grouped as either complete or incomplete metamorphoses. Incomplete metamorphosis lacks the pupae stage and the nymph and adult are more similar in appearance. A complete metamorphosis includes a pupae stage. The adult and larva tend to look very different from each other. Most aquatic insects remain underwater in the immature stages and leave the stream only as adults. The life cycles of the insect groups of macroinvertebrates can range from a few months to several years.

Macroinvertebrate Groups

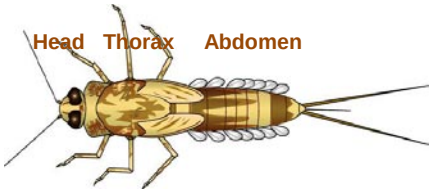
Arthropoda	**Crustacea**	**Mollusca**	**Annelida**	**Platyhelminthes**
Ephemeroptera	Decapoda	Gastropoda	Oligochaeta	Turbellaria
Plecoptera	Isopoda	Bivalvia	Hirudinea	
Trichoptera	Amphipoda			
Odonata				
Coleoptera				
Megaloptera				
Diptera				

Stress tolerance scale
Low (L) 0-3, Moderate (M) 4-6, High (H) > 6

The images found in this guide are courtesy of the Xerces Society for Invertebrate Conservation. The society has several excellent field guides and their CD-ROM provides a wealth of information about macroinvertebrates. For more information about the society, visit http://www.xerces.org. The images do not represent actual size, proportion and in some cases colors of those found in this region. They are provided to show common physical characteristics (morphological features) that will help you determine their identity. In many cases more precise dichotomous keys may be needed to verify the correct identification.

Size categories
> 50 Very large (VL); 50-30 Large (L); 29-10 Medium (M); 10-5 Small (S); < 5 Very small (VS)

WV Save Our Streams' Benthic Macroinvertebrate Field Guide

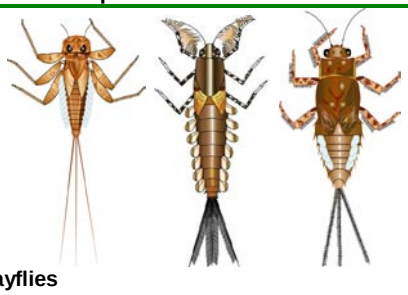


Small minnow mayfly

What is an insect? An insect is an invertebrate (an animal with no spine) that has three-pairs of legs (except Diptera) and three body divisions; the head is the location of the mouth, antenna and eyes; the thorax is the attachment site for the legs and wing pads; and the abdomen, which often has a variety of structures attached including filaments gills and tails. Gills are usually leaf-like, plate-like, or thin filaments. Tails can be long and thin, hairy, webbed or paddle-like. Most of the **benthic macroinvertebrates** you will encounter during stream surveys are aquatic larva or nymphs of insects. Most adult stages are not aquatic but the beetles are the exception. The majority of the insects are described and illustrated on page one and the top of page two; non-insect group descriptions and Illustrations begin on the next page.

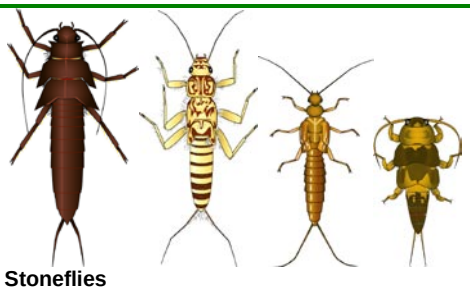
Insect Groups

Instructions provided at the bottom of page two



Mayflies

(Order **Ephemeroptera**): Three-pairs of legs with a single hook at the end; three some-times two tail filaments; gills attached to the abdomen, which may sometimes be covered and difficult to see. Mayflies exhibit several types of move-ments (or habits); swimmers, clingers, crawlers and burrowers. (**VS-M**) (**M**)



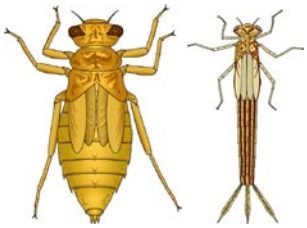
Stoneflies

(Order **Plecoptera**): Three-pairs of legs with two-hooks at the end; two tail filaments; no gills attached to the abdomen but some kinds may have gills near the top of the abdomen; gills if visible, mostly on the legs and thorax. (**S-VL**) (**M**)

Case-building caddisflies

(Order **Trichoptera**): Grub-like soft body and a hard head; Three-pairs of legs located on the upper third of the body; tail is small and usually forked, sometimes fringed with hairs; gills are scattered on the underside of the abdomen. The case (retreat) is a relatively solid structure made of a variety of stream-bed materials held together by silk. (**VS-L**) (**M**)

Dragonfly **Damselfly**



Dragonflies and Damselflies

(Order **Odonata**): Three-pairs of legs; large eyes; long spoon-like jaws; no tails on the abdomen. Dragonflies have a broad shaped abdomen, while the Damselfly abdomen is much narrower. Damselfly gills are attached to the end of the abdomen, they look like tails. (**M-VL**) (**M**)

Hellgrammite **Alderfly**

Fishflies and Alderflies

(Order **Megaloptera**): Three-pairs of legs; large pinching jaws; eight-pairs of filaments attached to the sides of the abdomen. Fishflies also called **hellgrammites** have a two-hooked tail, whereas Alderflies have a single tapered tail and are usually much smaller and lighter in color. (**M-VL**)

Common netspinner **Finger-net** **Free-living**

Net-spinning caddisflies

(Order **Trichoptera**): Similar characteristics as above but the abdomen usually has more abundant gills, especially the **common netspinner** (family **Hydropsychidae**). The net-spinner's retreat is also made of a variety of streambed materials, which are held together more loosely by fine strands of silk. The **free-living caddisfly** (right) does not build a case or net. (**S-L**) (**M**)

Water penny **Riffle beetles** **Whirligig beetle**

Beetles

(Order **Coleoptera**): Three-pairs of legs; body usually covered by a hard exoskeleton. The Most common kinds collected are the **water penny** and **riffle beetles** (left-right), but others kinds are also found. (**VS-L**) (**M**)

True flies

(Order **Diptera**): Usually the body is segmented with some type of visible features either along the body, or at the head or tail regions (i.e. head, tails, prolegs, whelps etc.). This order is the only aquatic insect without fully developed legs in the larval stages. Dipterans are very diverse order with many aquatic varieties. Several common kinds are described here. (**M**)

Non-biting midge

(Order **Diptera**; family **Chironomidae**): Segmented body with a visible head; two leg-like projections at the front and rear. Sometimes they are bright **red** in color. (**VS-M**)

Crane fly

(Order **Diptera**; family **Tipulidae**): No legs, no visible head; plump body with lobes along the segments; may have structures that look like tentacles, lobes or one bulb at the end of the body. (**S**-**VL**)

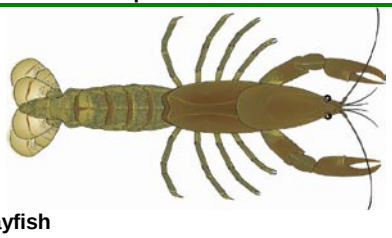
Black fly

(Order **Diptera**; family **Simuliidae**): Body has a bowling-pen shape (lower is wider than the upper); there are multiple brushes/fans on the head and a ring of hooks on the abdomen. (**VS**-**M**)

Watersnipe fly

(Order **Diptera**; family **Athericidae**): Plump body, looks very much likes a caterpillar; on the underside there are structures that look similar to legs but are not segmented; the tail is forked and fringed with hairs. (**S**-**L**)

Non-Insect Groups

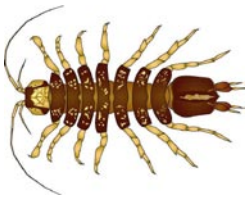


Crayfish

(Class **Crustacea**; order **Decapoda**): Five pairs of legs, the first two usually have large claws; large flipper-like structure at the end of the abdomen. (**M**-**VL**)

Scud/Sideswimmer

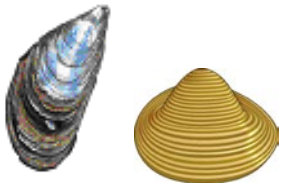
(Class **Crustacea;** order **Amphipoda**): Seven pairs of legs, the first two may be claw-like; body is somewhat higher than it is wide. Usually swims with a sideways motion. (**S**-**M**)



Aquatic sowbug

(Class **Crustacea;** order **Isopoda**): Seven pairs of legs, the first two may be claw-like; very long antenna; body is wider than it is high, giving the animal a fairly flattened appearance. (**S**-**M**)

Mussel **Clams**



Clams and **Mussels**

(Class **Bivalvia**): Fleshy body enclosed between two-hinged shells; the shape and ridge spacing of the shells can determine different kinds. **Mussels** are usually larger than clams and have dark colored oblong shells. (**VS**-**VL**) (**M**)

Operculate snails

(Class **Gastropoda**; sub-class **Prosobranchia**): Fleshy body enclosed by a single shell, which is usually coiled in an upward spiral. The opening of the shell is covered by an operculum (door). (**VS**-**L**) (**M**)

Non-operculate snails

(Class **Gastropoda**; sub-class **Pulmonata**): Fleshy body enclosed by a single shell, which is sometimes coiled upward but also may lie flat or have a conical shape. The opening of the shell is not covered by an operculum. (**VS**-**L**) (**M**)

Aquatic worms

(Phylum **Annelida**; class **Oligochaeta**): Body is long with numerous segments along its entire length; has no visible head or tail. (**VS**-**VL**)

Leeches

(Phylum **Annelida**; class **Hirudinea**): Body is long and thin or slightly widened; 34–segments along its length, but there appears to be many more. (**S**-**VL**)

Flatworms

(Class **Turbellaria**): Soft elongate body without segment; head triangular shaped with eyes on top, which give the animal a cross-eyed appearance. (**VS**-**L**)

http://www.dep.wv.gov/sos

Sizes illustrated not proportional

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Instructions: Identification is easier when the organism is viewed in the same orientation as its illustration. Illustrations are drawn mostly in top and side views; the water penny is shown in underside view. The (**M**) symbol indicates that multiple kinds may be collected from the group (Order or Class). Use **morphological** features as your basis for identification; the size and color are often variable and influenced by environmental factors. Only a few of the many kinds possible are illustrated. (**Size range in mm**)

Size categories: > 50 Very large (**VL**); 50 - 30 Large (**L**); 29 -10 Medium (**M**); 10 - 5 Small (**S**); < 5 Very small (**VS**)

Note: This field guide will help you identify common aquatic invertebrate classes and orders, and a few families. You should always refer to a more complete guide for verification of family level identification. Eventually, you will be able to identify a wide variety of families in the field.

Illustrations courtesy of the Cacapon Institute (http://www.cacaponinstitute.org/) and artist Jennifer Gillies; used with permission

Macroinvertebrate identification

Order **Ephemeroptera** (Mayflies)

Distinguishing characteristics:

- Wing pads present on the thorax.
- One claw occurs on the end of the segmented legs.
- Gills occur on at least some of the abdominal segments.
- Gills are attached mainly to the sides of the abdomen, but sometimes extend over the top and bottom of the abdomen.
- Gills consist of either flat plates or filaments.
- Three long thin tails usually occur at the end of the abdomen, but only two tails on some kinds.

Family: **Baetidae**

Small minnow mayfly

Antennae two times longer than the width of the head; gills variable in shape and attached at abdominal segments one through seven; two or three caudal (tail) filaments. Found in a variety of aquatic habitats from the riffles of rivers and streams to lakes and wetlands. (M) [S-M]

Family: **Ephemerellidae**

Spiny crawler mayfly

Gills present of the first abdominal segment but absent from the second; gills usually present on the remaining segments; two or three caudal filaments. Found in a wide variety of aquatic habitats but much more common in swift rocky areas of streams and rivers. (L) [S-M]

Family: Isonychiidae

Brushlegged mayfly

Forelegs have a double row of setae (hairs); gills oval shaped and present on abdominal segments one through seven; long hairs on the margins of the caudal filaments. Found in streams and rivers in moderate current areas often associated with rocks and tangles of vegetation. (L) [S-M]

Family: **Heptageniidae**

Flatheaded mayfly

Body, head and legs are flattened (femora); gills present on abdominal segments one through seven; usually three caudal filaments, but some have two. Found in riffles where they attach to rocks, logs and leaves. (L) (S-M)

Family: **Leptophlebiidae**

Pronggilled Mayfly

Gills on abdominal segments two through seven forked and variable in shape; gills on the first segment finger-like; short hairs usually cover the caudal filaments. Found in swift and slow moving streams and rivers on rocks, leaf packs and submerged roots. (M) (S-M)

Additional Ephemeroptera families are often collected. If these can be identified, record the number of taxa on your survey data sheet.

Order **Plecoptera** (Stoneflies)

Distinguishing characteristics:

- Long thin antenna project in front of the head.
- Wing pads are often present, but may be visible only on older larvae.
- Three pairs of segmented legs extend from the thorax.
- Two claws are located at the end of the segmented legs.
- Gills usually occur only on the thorax region, usually on the legs or bottom of the thorax, or there may be no gills
- There are usually no gills on the abdomen, but there are exceptions, with some families having a few gills on the upper abdomen.
- Gills are either single or branched filaments.
- Two long thin tails project from the rear of the abdomen.

Family: **Perlidae**

Common (golden) stonefly

Usually large and strikingly patterned; finely branched gills present on all thoracic segments; wing pads diverge slightly from the midline. Found in fast areas of streams in rivers on rocks and submerged logs. (L) (M-L)

Family: **Perlodidae**

Patterned stonefly

Strikingly patterned and colored similar in appearance to **Perlidae**; hind wing pads divergent; no gills on the thoracic segments. Found in fast flowing streams and rivers under rocks, submerged logs and leaf packs. (L) (S-L)

Family: **Pteronarcyidae**

Giant stonefly

Very large and usually dark brown in color; finely branched gills on all thoracic segments plus the first two abdominal segments. Found in swift flowing streams in rivers, mostly in the areas of snags and leaf packs. (L) (M-VL)

Family: **Capniidae**

Small winter stonefly

Slender elongated body; front of thorax slightly wider than the abdomen; wing pads not divergent from the midline; abdominal segments separated by a membranous fold. Found in small and medium sized rivers and streams with gavel-cobble substrates and fast flows. (L) (VS-M)

Family: **Peltoperlidae**

Roach-like stonefly

Small stout body; rear divergent wing pads; thoracic segments are oval or triangular shaped and cover much of the upper body; some have fine gills on the front legs. Found in fast flowing water on roots, leaf packs and rocks. (L) (S-M)

Additional Plecoptera families are often collected. If these can be identified, record the number of taxa on your survey data sheet.

Order **Trichoptera** (Caddisflies)

Distinguishing characteristics:

- Head has a thick hardened skin.
- No wing pads occur on the thorax.
- Top of the first thorax always has a hardened plate, in some kinds the second thorax has a hardened plate or all three have hardened plates.
- Three pairs of segmented legs extend from the thorax.
- Abdomen has a thin soft skin.
- Single or branched gills on the abdomen in many kinds, but some have no gills.
- Pair of prolegs with one claw on each, is situated at the end of the abdomen.
- Larvae may live in various kinds of retreats (cases or nets) made of a variety of streambed materials such as fine gravel, sand, pieces of wood or leaves cut into squares.

Family: **Philopotamidae**

Finger net caddisfly

Labrum (structure between the mouthparts) is t-shaped and membranous; head capsule large usually orange in color; only first thoracic segment is hardened; abdominal gills usually absent. Builds a long tube-shaped net. Found in flowing waters from small streams to rivers. (M) (S-M)

Family: **Hydropsychidae**

Common netspinning caddisfly

Top of all thoracic segments hardened; most abdominal segments have tufts of finely branched gills; anal prolegs terminate into a brush of hairs. Creates a net made of a variety of materials held together by fine strands of silt. Found in a wide variety of aquatic habitats. (M) (S-M)

Family: **Rhyacophilidae**

Free-living caddisfly

First thoracic segment is hardened; abdominal gills variable; hardened plate on top of abdominal segment nine; distinctive anal prolegs with large claws; are often **bright green** in color. This family does not build a case or net, but uses silk strands to attach itself to substrates. Found in flowing water and are more common in clear fast-moving streams and rivers. (L) (M-L)

Family: **Limnephilidae**

Northern case caddisfly

Antennae between the eyes and the mouth; first two thoracic segments hardened; dorsal and lateral humps on first abdominal segment; hardened plate on the top of abdominal segment nine; abdominal gills variable. Cases are built from a variety of materials largely influenced by the available materials. Found in a wide variety of aquatic habitats. (M) (M-L)

Family: **Leptoceridae**

Longhorned case caddisfly

Antennae prominent; first two thoracic segments hardened; hind legs are usually longer than the front legs; abdominal gills variable. Cases are built from a variety of materials and vary considerably; the most common is a stone/sand case resembling a long tube. Found in many types of aquatic habitats and can be especially common in small lakes and wetlands. (L) (M-L)

Additional Trichoptera families are often collected. If these can be identified, record the number of taxa on your survey data sheet.

Family: **Glossosomatidae**

Saddle case caddisfly

First thoracic segment is hardened; hardened plate on top of abdominal segment nine. Case resembles a tortoise shell. Found in cool clear streams and sometimes, larger coldwater rivers. (L) (VS-S)

Family: **Brachycentridae**

Humpless case caddisfly

Antennae close to the margins of the head capsule; first two thoracic segments with hardened plates; no humps on abdominal segments; gills simple or lacking. Case is elongated and made of strips of materials, resembles a log cabin. Found in flowing waters from small springs to large rivers often associated with rocks, logs and aquatic moss. (L) (M-L)

Order **Odonata**

- Sub-order **Anisoptera** (Dragonflies)
- Sub-order **Zygoptera** (Damselflies)

Distinguishing characteristics:

- Lower lip (labium) is long and elbowed to fold back against the head when not feeding, thus concealing the mouthparts.
- Wing pads are present on the thorax.
- Three pairs of segmented legs extend from the thorax.
- No gills on the sides of the abdomen, but in some kinds (damselfly) there are three flat gills at the end of the abdomen.
- Bodies are long and slender (damselfly) or long and stout or somewhat oval (dragonfly).
- Three pointed structures may occur at the end of the abdomen (dragonfly) forming a pyramid shaped opening.
- Head is narrower (dragonfly) or wider (damselfly) than the thorax.

Family: **Cordulegastridae**

Spiketail Dragonfly

Often appear hairy; prementum large, covering much of the underside of the head, usually triangular shaped. Usually burry in soft sands of small streams. (M) (M-L)

Additional Odonata families are sometimes collected. If these can be identified, record the number of taxa on your survey data sheet.

Family: **Calopterygidae**

Broadwinged Damselfly

Lower portion of labium (prementum) diamond shaped; first antennal segment longer than all the others together; middle gills shorter than the lateral two; no visible veins on the gills. Occur at the edges of rivers and streams in overhanging root masses and vegetation. (H) (M-L)

Order **Coleoptera** (Beetles)

Distinguishing characteristics:

- Head and body of adults usually with thick hardened skin; some kinds, but especially the larvae have a soft-skinned abdomen.
- No wing pads on the thorax in most larvae, but may be visible on adults.
- Three pairs of segmented legs extend from the thorax in most, but some kinds have no segmented legs.
- No structures or projections from the sides of the abdomen in most kinds, but some may have flat plates or filaments.
- No prolegs or long tapering filaments at the end of the abdomen.

Family: **Elmidae**

Riffle beetle (adult)

Hard bodied, slender sometimes clubbed antennae; the forewings have numerous rows of indentations; legs are long compared to body. Found in riffles usually attached to rocks or logs, sometimes found along lakeshores. (M) (VS-S)

Family: **Psephenidae**

Water penny (larva)

Body flattened with thoracic and abdominal segments expanded so that the legs and head are obscured from above; legs terminate into a single claw. The adult is not aquatic. Found in fast water of streams and rivers attached or lying flat on the surfaces and sides of rocks. (L) (S-M)

Family: **Elmidae**

Riffle beetle (larva)

Legs with four segments and a single claw; nine abdominal segments some with a cavity that protect the hind gills. Found most often in riffles attached to rocks or logs, also sometimes found along lakeshores. (M) (VS-S)

Family: **Dryopidae**

Long-toed water beetle

Adults are hard bodied with very short comb-like antennae (may not be visible); they are similar in appearance to the riffle beetle (**Elmidae**). Found in riffles attached to rocks and logs. The larva is terrestrial. (M) (VS-S)

Additional Coleoptera families are sometimes collected. If these can be identified, record the number of taxa on the survey data sheet.

Order **Megaloptera** (Fishflies and Alderflies)

Distinguishing characteristics:

- Head and thorax has thick hardened skin, while the abdomen has thin soft skin.
- Prominent chewing mouthparts project in front of the head.
- No wing pads on the thorax.
- Three pairs of segmented legs extend from the thorax.
- Seven or eight pairs of stout tapering filaments extend from the thorax.
- End of the abdomen has either a pair of prolegs with two claws on each proleg (fishfly), or a single long tapering filament with no prolegs (alderfly).

Family: **Corydalidae**

Fishfly (hellgrammite)

Elongate dorsally flattened body; large jaws on the head, projecting forward; first eight abdominal segments and segment ten with paired lateral filaments; abdomen terminates in fleshy appendages bearing hooks. Found mostly in riffle areas of streams and rivers. (L) [L-VL]

Family: **Sialidae**

Alderfly

Elongate dorsally flattened body; large jaws on the head, projecting forward; first seven abdominal segments and segment with paired lateral filaments; abdomen terminates into a single long hairy filament. Found in a wide variety of aquatic habitats often associated with depositional areas. (M) [S-M]

Order **Diptera** (True flies)

Distinguishing characteristics:

- Head may be a capsule-like structure with thick hard skin.
- Head may be partially reduced so that it appears to be part of thorax, or it may be greatly reduced with only the mouthparts visible.
- No wing pads occur on the thorax.
- Pro-legs may extend from various sections of the thorax and abdomen in some kinds.
- No segmented legs in the larval forms.
- Thorax and abdomen composed of entirely soft skin, but some kinds may have hardened plates scattered on various body features.

Family: **Chironomidae**

Non-biting midge (Midge)

Hardened clearly visible head; long worm-like body; two pairs of prolegs with terminal hooks. Some kinds may be **bright red** in color. Found in all types of aquatic habitats often very abundant in disturbed conditions. (H) (VS-M)

Family: **Ceratopogonidae**

Biting midge (punkie)

Variable characteristics occur in this family, often similar in appearance to **Chironomidae**; usually a distinct head is visible with small mandibles. Often associated with soft sediments of standing or slow moving water, but also occur in riffles. (H) (VS-M)

Family: **Simuliidae**

Black fly

Head hardened and rounded bearing a pair of labral fans (mouth brushes); prolegs on lower thorax; lower third of the abdomen is swollen (vase-like) and terminates in a ring of hooks. Found in rivers and streams with moderate to very fast current, often associated with large rocks. (M) (VS-M)

Family: **Tipulidae**

Crane fly

Rounded head capsule, often reduced and barely visible; ventral welts on some abdominal segments; abdomen terminates into a disc surrounded by lobes or tentacle-like projections of varying shapes. Found in a variety of habitats from lakes and wetlands to fast moving areas of streams and rivers. (M) (M-L)

Family: **Athericidae**

Watersnipe Fly

Body long (caterpillar-like); head reduced but may be visible; prolegs on most abdominal segments; abdomen ends in a fringed tail. Found in a variety of aquatic habitats but more common in fast moving areas of streams and rivers. (L) (S-M)

Family: **Tabanidae**

Horse fly (deer fly)

Body spindle shape both ends tapered; head reduced usually not visible; creeping welts with small hooks present on abdominal segments one through seven; no prolegs. Found in soft sands of lakes and wetlands but are also common buried in the gravels of riffles. (H) (M-L)

Family: **Empididae**

Dance fly

Body elongated; head reduced or pulled into the thorax; prolegs present on most abdominal segments; prolegs longer on segment eight; abdomen is blunt on the end or terminates in welts. Found in a variety of aquatic habitats from slow to fast moving water of rivers and streams. (M) (M-L)

Family: **Blephariceridae**

Net-wing midge

Head fused with thorax and first abdominal segment; six abdominal segments with deep constrictions between segments; gill tufts present ventrally. Often can be found in extremely fast water, such as waterfalls, but also occurs in slower riffles. (L) (VS-S)

Additional Diptera families are sometimes collected. If these can be identified, record the number of taxa on your survey data sheet.

Class **Crustacea** (Crayfish, Scuds and Sowbugs)

Distinguishing Characteristics:

- More than three pairs of legs extend from the thorax.
- The first several pairs of legs may have a hinged claw, which is often enlarged as in the Decapods.
- Bodies strongly flattened from top to bottom or from side to side.
- Abdomen consists of individual segments or the segments may be fused to form a thoracic shield.
- Some kinds have a broad flipper on the end of the abdomen.

Order: **Decapoda**

Crayfish

Body mostly dorsally flattened; two-pairs of antennae one longer than the other; five-pairs of legs, first three-pairs with hinged claws and the first pair of claws are greatly enlarged; abdomen terminates in a flipper-like structure. Found in lakes and wetlands but probably more common in rivers and streams. (M) (M-VL)

Order: **Amphipoda**

Scud (sideswimmer)

Has a shrimp-like appearance; body flattened from side to side; one pairs of antennae of equal length; seven-pairs of walking legs, first two claw-like the remaining are simple. Has a habit of swimming sideways. Found in lakes and wetlands, rivers and streams. (M) (S-M)

Order: **Isopoda**

Sowbug

Body dorsally flattened; two-pairs of antennae one longer than the other; seven-pairs of legs, the first is claw-like and slightly enlarged, and the others have a simple pointed claw. Looks similar in appearance to its terrestrial cousin, the pill bug (potato bug). Found in lakes and wetlands, rivers and streams. (H) (S-M)

Class: **Gastropoda** (Snails)
Sub-class **Prosobranchia** (Operculate snails)

Distinguishing Characteristics:

- Flat lid-like structure called an operculum that can seal the body of the snail inside the shell.
- The whorls of the shell bulge out distinctively to the sides (inflated). Most have their opening on the right when the narrow (dextral) end is held up.
- Shells are often extended into a spiral shape.

Family: **Bithyniidae**

Bithynid snail

Shell is whorled and bulges out to the side (inflated); opens to the right when the narrow end is held up; operculum can cover the entire opening of the shell and has concentric lines. Found in fast and moderate flow areas of rivers and streams, and sometimes in lakes and wetlands. Similar families (Viviparidae and Hydrobiidae). (M) [M-L]

Sub-class **Pulmonata** (Non-operculate snails)

Distinguishing Characteristics:

- There is no operculum.
- The whorls of the shell do not distinctly bulge out to the sides.
- Often the shells of most kinds are shaped like a low flat cone or coiled flat instead of being extended in a spiral shape.
- Mostly opens to the left when the narrow end is held up, but there are some exceptions.

Family: **Physidae**

Pouch snail

Shell is high, spiraled, with a slight bulge; opens to the left when the narrow end is held up; no operculum. Found in fast and moderate flow areas of rivers and streams, and sometimes in lakes and wetlands. (H) [S-L]

Other Pulmonates called limpets (family Ancylidae), have a low flat shell that is not spiraled.

Class **Bivalvia** (Mussels and clams)

Distinguishing Characteristics:

- Two shells opposite of each other and strongly connected by a hinged ligament.
- The shell is thick and strong or thin and fragile in some kinds.
- Growth rings are placed far apart and are distinctly raised, or very close together and hardly raised at all.
- The foot usually consists of two tubular structures, called siphons that can often be seen protruding from the shell.
- The body is soft tissue, often pinkish or gray in color.
- Mussels have an oblong rough, often-dark color, whereas most clams are smaller and have a more rounded shape.

Family: **Unionidae**

Mussel

Largest of the bivalves; shell usually dark in color, variable in shape but maybe somewhat oblong; has many indentations and ridges on the tops and sides of the shell. Found in rivers and streams and larger lakeshores. (L) [M-VL]

Family: **Pisidiidae**

Pea (fingernail) clam

Shell very small and rounded, light colored; ridges spaced close together and are usually not raised. **Corbiculidae** is the larger non-native family that can be distinguished by its raised ridges and size. Found in rivers and streams, wetlands and lakes usually buried in soft sediments. (M) [S-M]

Phylum **Annelida** (Worms and leeches)

Distinguishing Characteristics:

- Body is soft, muscular and cylindrical in shape.
- Body consists of many similar, round ring-like segments arranged in rows.
- Numerous segments along the entire length, number often depends upon the kind.
- Leeches have distinct suckers situated on the bottom of the body, one at the front and one at the rear.
- No eyespots or small barely visible eyespots present.
- The class Turbellaria (flatworms) is also included here, but they are members of the phylum Platyhelminthes.

Class: **Oligochaeta**

Aquatic worm

Body elongated (worm-like); divided into many segments most having bundles of small hairs; no eyespots or suckers present. Found in rivers and streams, wetlands and lakes usually buried in sandy or mud sediment, but also commonly found in riffles of streams and rivers. (H) (S-VL)

Class: **Hirudinea**

Leech

Body dorsally flattened with 34 segments, which are divided so there appears to be more; suction disks present on one or both ends; eyespots may be present. Found in slow flow areas of rivers and streams, wetlands and lakes usually buried in sandy or mud sediment. (H) (S-VL)

Class: **Turbellaria**

Flatworm

Body flattened dorsally; no segments; two eyespots near the head giving the animal a cross-eyed appearance. Found in slow flow areas of rivers and streams, wetlands and lakes usually buried in sandy or mud sediment. (H) (VS-M)

Note: Turbellarians are not annelids

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