Macroinvertebrate Identification Cards

Groundswell

Lesson plans and classroom connections available online at:
www.gvsu.edu/groundswell/lessonplans

1A

Photographs courtesy of Bob Henricks[1] (top); Dmccabe[2] (bottom)

1B

Photograph courtesy of Bob Henricks[3]

Macroinvertebrates can be used as biological indicators of water quality. These identification cards were created by Brenda Perry, Biology and Math Facilitator at Kent Innovation High School, through partnership with Groundswell and the Lower Grand River Organization of Watersheds and with support from the Great Lakes Fishery Trust, the Great Lakes Stewardship Initiative, the Wege Foundation, and Grand Valley State University.

This set is intended to be used with activities and lesson plans available at
www.gvsu.edu/groundswell/lessonplans

1A

Case Building Caddisfly - Order: Trichoptera

Size: 7-40 mm

Food Source: Algae (scraping from surfaces), Decaying plants (shredding)

Stream Habitat: moves cases to find food

Breathing Type: tracheal gills

Important Notes: Cases serve as shelter; Caddisflies attach cases to leaves, wood, or rocks

1B

Dobsonfly (Hellgrammites) - Order: Megaloptera
Family: Corydalidae

Size: 25 – 90 mm

Food Source: Hunts other macroinvertebrates (predator)

Stream Habitat: Underneath rocks, submerged logs, and debris in swift river currents

Breathing Type: Gills on abdomen

Important Notes: Prime bait for smallmouth bass fishing; Hellgrammites resist capture by pinching human fingers that try to pull them from water

1C

Photographs courtesy of Ian Alexander[4] (top) and Bob Henricks[5] (bottom)

1D

Photographs courtesy of NOAA[6]

1E

Photographs courtesy of Jason Neuswanger[7]

1C

Mayfly - Order: Ephemeroptera

Size: 5 – 20 mm 

Food Source: Algae (scraping from surfaces), Decaying plants (collectors)

Stream Habitat: Rocky bottoms

Breathing Type: Feathery gills on abdomen

Important Notes: Very fast mover; Has three tails that easily break off; Some say they look like “Jack Skellington”

1D

Mystery Snail (Right Handed) - Order: Gastropoda
Family: Viviparidae

Adult Size: 3 – 65 mm 

Food Source: Feeds on small pieces of decaying matter in soft sediments

Stream Habitat: Flowing water

Breathing Type: Gill breathers

Important Notes: They have a plate called an operculum used like a door to close the shell opening; Are very sensitive to pollution and need lots of oxygen in the water

1E

Stonefly - Order: Plecoptera

Size: 8 – 30 mm 

Food Source: Decaying plants (shredders) and/or act as predators

Stream Habitat: Boulder surfaces, cobble/gravel, and leaf packs

Breathing Type: Gills on thorax and abdomen

Important Notes: Some species communicate by drumming to attract mates

1F

(Top View) (Bottom View)

Photographs courtesy of Jason Neuswanger[7]

1G

Photograph courtesy of Jason Neuswanger[7]

2A

Photographs courtesy of Jason Neuswanger[7]

1F

Water Penny - Order: Coleoptera
Family: Psephenidae

Size: 3 – 10 mm

Food Source: Algae (scraper)

Stream Habitat: Clings to rocks and hard surfaces in fast water

Breathing Type: Gills on abdomen

Important Notes: Color is copper like a penny; Head and legs are only visible from underside

1G

Snipe Fly - Order: Diptera, Family: Athericida

Size: 10 – 20 mm

Food Source: Other insects, prefers mayflies (predator)

Stream Habitat: Riffles and runs with cobble bottom

Breathing Type: Spiracles (openings) on last segment

Important Notes: Does not have real legs, instead has appendages called prolegs; The head is on the pointed end and the two tail-like structures are the end of the abdomen

2A

Alderfly - Order: Megaloptera, Family: Sialidae

Size: Max 25 mm

Food Source: Hunts other macroinvertebrates (predator)

Stream Habitat: Likes soft bottoms with lots of dead material

Breathing Type: Gills on abdomen

Important Notes: Looks similar to dobsonflies but smaller. Unlike dobsonflies, has a single long filament at the end of the abdomen that looks like a tail

2B

Photograph courtesy of Udo Schmidt[8]

2C

Photograph courtesy of Erin Hayes-Pontius[9]

2D

Photographs courtesy of Jason Neuswanger[7] (left) and Toby Hudson[10] (right)

2B

Riffle Beetle (Adult) - Order: Coleoptra
Family: Elmidae

Size: 1-8 mm

Food Source: Feeds on dead plant material and algae (collector-gatherers and scrapers)

Stream Habitat: Rocks, hard surfaces in fast-moving water.

Breathing Type: Keeps an air bubble (plastron) under hardened top wings (elytra) that diffuses oxygen from water

Important Notes: Needs high levels of dissolved oxygen in the water to breathe

2C

Riffle Beetle (larvae) - Order: Coleoptera
Family: Elmidae

Size: 8 – 16 mm

Food Source: Dead plant material (collector-gatherers) and algae growing on hard surfaces (scraper)

Stream Habitat: Found crawling on stones and woody debris in the riffle zones of freshwater streams.

Breathing Type: Gills at end of abdomen

Important Notes: Entire body is hardened and will roll up like an armadillo if threatened

2D

Black Fly - Order: Diptera, Family: Simuliidae

Size: 5 – 10 mm

Food Source: Uses 'brush-like' mouthpart to collect tiny organisms and debris out of the water (collector-filterer)

Stream Habitat: Attaches to hard smooth surfaces in swift currents.

Breathing Type: Gills

Important Notes: Cannot swim; Crawls around the surface in a motion similar to inchworms

2E

2F

Photograph courtesy of Jason Neuswanger[7]

2G

2E

Snuffbox Mussel - Order: Unionoida
Family: Unionidae

Size: Up to 70 mm 

Food Source: Algae, bacteria, decaying material, and microscopic animals from water (filterer)

Stream Habitat: Areas with a swift current; Often will burrow deep in sand, gravel or cobble

Breathing Type: Gills

Important Notes: Young snuffbox mussels (glochidia) live on gills of logperch; Federally endangered - do not remove!

2F

Cranefly - Order: Diptera, Family: Tipulidae

Size: 5 – 100 mm

Food Source: Decaying plant matter (shredder)

Stream Habitat: Burrow in river bottom and leaf packs

Breathing Type: Spiracles (openings) used for oxygen uptake

Important Notes: Tie their bodies in knots to anchor to a stone; Most are very large, around 2 inches

2G

Crayfish - Order: Decapoda

Size: 5– 60 mm

Food Source: Living or dead vegetation, aquatic worms, insects, and snails (scavengers and predators)

Stream Habitat: Found in shallow (1-2 m) water; Like to burrow in substrate or under rocks

Breathing Type: Gills on head and thorax

Important Notes: Ecosystem engineers, creating tunnels that other organisms use as habitats

2H

Photograph courtesy of Jason Neuswanger[7]

2I

Photograph courtesy of Jason Neuswanger[7]

2J

Photographs courtesy of Jason Neuswanger[7]

2H

Damselfly - Order: Odonata, Suborder: Zygoptera

Size: 13 – 50 mm 

Food Source: Other aquatic insects (predator)

Stream Habitat: Prefer slow or standing water

Breathing Type: Three long featherlike gills at end of abdomen that look like tails

Important Notes: Similar to dragonfly larvae except more slender and long external gills.

Important Notes: Adult wings rest above body; adults cannot walk on legs – only used for perching and catching prey

2I

Dragonfly - Order: Odonata, Suborder: Anisoptera

Size: 8 – 42 mm 

Food Source: Eats whatever it can catch (predator)

Stream Habitat: Typically among rocks and vegetation; Some like riffles, but most prefer slow moving water

Breathing Type: Gills located internally at end of abdomen

Important Notes: Adult wings rest to sides of body; Adults cannot walk on legs – only used for perching and catching prey

2J

Net Spinning Caddisfly - Order: Trichoptera, Family: Hyrdopsychidae

Size: 13 -18 mm 

Food Source: Feeds mainly on other insects caught in their nets (collector-filter)

Stream Habitat: Rock surfaces, woody debris, and plants.

Breathing Type: Fluffy gills on underside of abdomen

Important Notes: Can make sound by rubbing their femur, similar to a grasshopper, to communicate with other net spinning caddisflies

2K

Photograph courtesy of Jason Neuswanger[7]

2L

Photograph courtesy of Andrew Hoffman[11]

3A

Photograph courtesy of Jason Neuswanger[7]

2K

Scud - Order: Amphipoda

Size: 5 -20 mm

Food Source: Dead and decaying plant and animal matter (collector-gatherer)

Stream Habitat: Likes loose stream bottoms and cool, shallow streams

Breathing Type: Gills on thorax

Important Notes: Swim very fast on their sides when disturbed; Fish like to eat them and often fly fishers will make lures to mimic them

2L

Sowbugs - Order: Isopods, Family: Asellidae

Size: 5 -20 mm

Food Source: Dead plant matter (collector-gatherer)

Stream Habitat: Prefers slow water and avoids light by hiding under leaves or other debris.

Breathing Type: Gills

Important Notes: Trout like to eat these; There are similar looking land dwelling isopods (wood lice & pillbugs) that can be found under rocks and woody debris

3A

Aquatic Worms (Tubifex) - Order: Oligochaeta

Size: 1-150 mm

Food Source: Dead and decaying matter (collector-gatherer)

Stream Habitat: In and on fine soft materials

Breathing Type: Through their skin

Important Notes: Can live in polluted waters with very little oxygen; Look similar to land worms but smaller and more delicate

3B

Photograph courtesy of Lower Grand River Organization of Watersheds

3C

Photograph courtesy of Jason Neuswanger[7] (large) and Amada44[12] (insert)

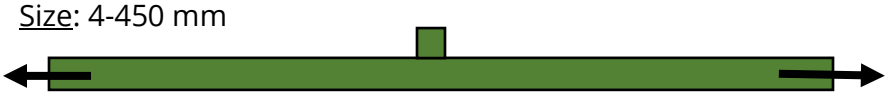
3D

Photograph courtesy of H. Zell[13]

3B

Leech - Order: Hirudinea

Size: 4-450 mm



Food Source: Some are parasites on fish and amphibians; Other species are predators on insects and other invertebrates

Stream Habitat: Slow or standing water among debris

Breathing Type: Through their skin

Important Notes: There are at least 40 species of leeches in Michigan; Chemicals that leeches use to prevent blood-clotting have proven to be valuable medicines

3C

Non- Biting Midge - Order: Diptera
Family: Chironomidae

Size: 5 – 25 mm

Food Source: Decaying matter; Some build nets to capture food (collector-gatherer)

Stream Habitat: Bottom of stream, often in leaves or other dead plant materials

Breathing Type: Through their skin

Important Notes: Can be white or red; Red midges are more tolerant to poor water conditions

3D

Pouch (Left Handed) Snail - Class: Gastropoda
Family: Physidae

Size: 3 - 60 mm

Food Source: Graze on plant material, scavenge dead organisms, or scrap algae off hard surfaces

Stream Habitat: On rock surfaces and fine sediments

Breathing Type: Can breathe by going up to surface for air

Important Notes: Also called sinistral snails as their opening is on the left side indicates possibly poor water quality

3E

Photograph courtesy of Judy Gallagher[14]

3F

Photograph courtesy of James Gathany[15]

Information & Photo Sources:

2016 Michigan Clean Water Corps Field Techniques & Bug ID presentation for Groundswell

BioKids Critter Catalog, http://www.biokids.umich.edu

CT Dept. of Energy & Environmental Protection Riffle Bioassessment by Volunteers Program www.ct.gov/deep/rbv

Great Lakes Sea Grant Extension Office

Field Guide – Aquatic Invertebrates. Missouri Department of Conservation. https://nature.mdc.mo.gov/discover-nature/field-guide/search?f[0]=field_fg_types:5583

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Elliott, J. Malcolm. The ecology of riffle beetles Coleoptera: Elmidae. Freshwater Biological Association, The Ferry Landing, Far Sarwey, Ambleside, Cumbria LA22 0LP, UK. Email: MElliot@fba.org.uk. 5 November 2008. https://www.fba.org.uk/journals/index.php/FRJ/article/viewFile/107/36

[1]Bob Henricks from Charlottesville, United States (https://commons.wikimedia.org/wiki/File:Uenoid_caddisfly_larva,_Neophylax_mitchelli_(8489904984).jpg), "Uenoid caddisfly larva, Neophylax mitchelli (8489904984)", CC BY-SA 2.0

[2]Dmccabe (https://commons.wikimedia.org/wiki/File:Phryganeidae_larva.jpg), CC BY-SA 4.0

[3]Bob Henricks from Charlottesville, United States (https://commons.wikimedia.org/wiki/File:Hellgrammite,_Nigronia_fasciata_(12226348236).jpg), "Hellgrammite, Nigronia fasciata (12226348236)" CC BY-SA 2.0

[4]Ian Alexander (https://commons.wikimedia.org/wiki/File:Mayfly_nymph_dorsal_view_wing_buds_paired_gills.JPG), CC BY-SA 4.0

3E

Giant Water Bug - Order: Hemiptera
Family: Belostomatidae

Size: Up to 51 mm 

Food Source: Predators of small aquatic animals such as insects and crayfish, but also frogs, fish, and even young turtles and snakes; Feed by injecting a saliva that paralyzes and digests their prey; the bug sucks the resulting liquid

Stream Habitat: Slow moving waters

Breathing Type: Breathe air using snorkel-like tubes that extend from their hind end

Important Notes: also known as toe biters

3F

Mosquito - Order: Diptera Family: Culicidae

Size: 6 – 13 mm 

Food Source: Algae and other microscopic organisms by using brushes that surround their mouth (filter feeders)

Stream Habitat: Still/calm water; Typically hang upside down just below the water surface

Breathing Type: Breathe air through tubes at the end of the abdomen

Important Notes: Can go from larva to adult in 2-3 days

[5]Bob Henricks from Charlottesville, United States (https://commons.wikimedia.org/wiki/File:Flatheaded_mayfly,_genus_Leucrocuta_(7390211552).jpg), "Flatheaded mayfly, genus Leucrocuta (7390211552)", CC BY-SA 2.0
[6]National Oceanic and Atmospheric Administration (NOAA), https://www.glerl.noaa.gov/seagrant/GLWL/Benthos/Mollusca/Gastropods/Viviparidae.html
[7]Jason Neuswanger, http://www.troutnut.com
[8]Udo Schmidt (https://www.flickr.com/photos/coleoptera-us/22714922701/in/album-72157623977401151/), "Stenelmis canaliculata (Gyllenhal, 1808)", CC BY-SA 2.0
[9]Erin Hayes-Pontius (https://commons.wikimedia.org/wiki/File:Elmidae_Larvae.jpg), "Elmidae Larvae", CC BY-SA 3.0
[10]Toby Hudson (https://commons.wikimedia.org/wiki/File:Black_Fly_colony_Andrazza.jpg), "Black Fly colony Andrazza", CC BY-SA 3.0 AU
[11]Andrew Hoffman (https://www.flickr.com/photos/71701055@N00/8514056605/), "Lirceus sp (Aquatic Isopod)", CC BY-NC-ND 2.0
[12]Amada44 (https://commons.wikimedia.org/wiki/File:UIRW-003.jpg), „UIRW-003", CC BY 3.0
[13]H. Zell (https://commons.wikimedia.org/wiki/File:Physella_acuta_01.JPG), "Physella acuta 01", CC BY-SA 3.0
[14]Judy Gallagher (https://commons.wikimedia.org/wiki/File:Giant_Water_Bug_-_Lethocerus_species,_Caves_Branch_Jungle_Lodge,_Armenia,_Belize.jpg), "Giant Water Bug - Lethocerus species, Caves Branch Jungle Lodge, Armenia, Belize", CC BY 2.0
[15]James Gathany, CDC (https://commons.wikimedia.org/wiki/File:Culex_sp_larvae.png), "Culex sp larvae", CC BY 2.5