



Team Leader, Identifier, Experienced Monitor Refresher 2026

Introductions
Roles and Reminders
Best Practices
Chemical Tests Review
Identifier Review

Team Leader Reminders

- Fully fill out data forms – including
 - Ending time – if you forget, I will make it 2hrs
 - Year!!
 - Date/site on tally sheet
 - Double check volunteer names (first & last)
 - Reach observations (any feedback?)
- Reach photos: Flickr
- Over 100 organisms
- Review for new volunteers, pair with experienced monitor, chance to learn and practice skills
- Please bring all four blue tables.
 - Green chairs & tables optional
 - Measuring tape is optional, if you know your site

Volunteer Names - First AND Last Names

Date: _____ Site: _____

Start Time: _____ End Time: _____

Chemical Data

Water Temperature: _____ Celsius Weather: _____

Air Temperature: _____ Celsius Last Rainfall: _____
(e.g. <24hrs, yesterday, 2d ago, 3d ago, or >3d ago)

pH: _____ Dissolved Oxygen: _____

Nitrate: _____ Phosphate: _____

Nitrite: _____

Reach Photos: Taken by (name) _____ Were any bugs preserved & taken? _____
Please upload to Flickr.

Reach Observations

Water Clarity and Vegetation. Circle one for each line:

- Water Clarity: Clear Slightly turbid (cloudy) Turbid (very cloudy) Opaque (no light transmission)
- Are riffles free of fine sediment: Yes Mostly Somewhat No
- Canopy trees shade the stream and riparian area: Fully Partially A little None
- Understory trees and shrubs are present: Full/healthy shrub layer Partial A little None
- Herbaceous plants are present: Full/healthy herbaceous layer Partial A little None
- Invasive plants are present (Which invasives? Write in.) Significant Partial A little None

Notable changes in sediment, banks, or habitat over the last year? _____

Date: _____

Site: _____

of nettings: _____

Total individuals collected: (100, +/- 10%)

of nettings from: _____ edge _____ riffles _____ other (explain) _____

Running Count or Tray Subtotals

Name of Macroinvertebrate	Tolerance Value	Order	Family
Small Minnow Mayfly	4	Mayfly Ephemeroptera	Baetidae
Netspinner Caddis	6	Caddisfly Trichoptera	Hydropsychidae
Fingernet Caddis	3	Trichoptera	Philopotamidae
Midge 1 (white/gray)	6	True fly, Diptera	Chironomidae
Midge 2 (red)	9	True fly, Diptera	Chironomidae
Black Fly	6	True fly, Diptera	Simuliidae
Crane Fly	3	True fly, Diptera	Tipulidae
Dance fly, mosquito and other true flies (Diptera) on back			
Damselfly (Narrow-wing)	9	Odonata Zygoptera	Coenagrionidae
Damselfly (Broad-wing)	5	Zygoptera	Calopterygidae
Damselfly (Spread-wing)	9	Zygoptera	Lestidae
Dragonfly	9 to 1	Odonata Anisoptera	Likely Libellulidae. See p. 2 for families
Left-handed Snail	8	Snail Gastropoda	Physidae
Ramshorn Snail	7	Snail Gastropoda	Planorbidae
Other snail			
The next 4 are at a "Class" level		Class	
Clam	8	Bivalvia	Sphaeriidae, Corbiculidae
Aquatic Worm	8	Oligochaeta	Lumbriculidae
Flatworm	8	Tricladida	
Leech	8	Hirudinea	Erpobdellidae, Glossiphoniidae

Date: _____

Site: _____

Macroinvertebrate	Value	Order/Family												
Hellgrammite	5	Megaloptera Corydalidae												
Crayfish	5	Decapoda Cambaridae												
Aquatic Sowbug	8	Isopoda Asellidae												
Scud	8 to 6	Amphipoda												
Scud	6	Crangonyctidae												
Scud	6	Gammaridae												
Scud	8	Talitridae												
Beetles		Coleoptera												
Predaceous Diving Beetle	6	Dytiscidae												
Riffle Beetle	4	Elmidae												
Water Scavenger Beetle	5	Hydrophilidae												
Other True Flies		Diptera												
Mosquito	8	Culicidae												
Dance Fly	6	Empididae												
Dragonfly family-level ID		Odonata Anisoptera												
Clubtail Dragonfly, 124	1	Gomphidae												
Darner Dragonfly, 125	3	Aeshnidae												
Skimmer Dragonfly, 126-7	9	Libellulidae												
Cruiser Dragonfly	3	Macromiidae												
Spiketail Dragonfly	3	Cordulegastridae												
Petaltail Dragonfly	4	Petaluridae												
Emerald Dragonfly	5	Corduliidae												

Free Sort/Notes:

New Gloves – Preferences?

- As gloves get worn out, they need replacements
- Trying out more quick-drying glove options
- Please share any feedback and preferences, pros and cons of each type!



New Bowls – 1-2 to try out, give me feedback!

- 1-2 per shed to try out
- Have at least one monitor try it out, or all monitors take turns taking a scoop
- Shallow dip - ONLY fill to permanent marker line (equivalent of a regular scoop, just flatter)
- Benefits – no cervices/corners, wider search area, like a small tub
- If we like them, I will get more.



Best Practices

Have fun!

- Enter from downstream end
- Return rocks to riffles
- Pair new volunteers with experienced volunteers for sampling & IDs
- ‘Just right’ amount of water in trays
- Not too much water/sediment in tubs
- Make sure someone checks the nets!!!
- Keep trays & tubs out of the sun
- Minimize bias: Don’t cherry pick
- Use the small bowl to move water in sample tub before scooping
- Teach good pipette use to new monitors
- Watch your small bowl as you pour out, check discard bin! Critters from the discard bin can be counted as part of the overall tally.
- Use spoon with loupe for good magnification and focus
- Return critters to the streams
- Look through the source bin for our “Free Sort” once all the trays are full. These are recorded in the Notes of the tally sheet but are not counted.

Identifier Roles and Reminders

- Encourage learning
- Double check IDs
- Remind monitors to check their discard bins
- Use magnifying glasses and microscopes
- Check tricky macroinvertebrates with TL and me as needed
- Take photos & video of tricky macroinvertebrates
- Help implement best practices for sampling, sorting, identifying
- Help remind monitors of good ID practices – don't rely on color, size, movement alone, make sure you're also counting legs, looking at the abdomen, etc.

Thoughts/Discussion/Questions?

Chemical Tests

1. Go to the stream
2. Test strips
3. Temp readings & data sheet
4. Dissolved oxygen & phosphate
5. Cleanup



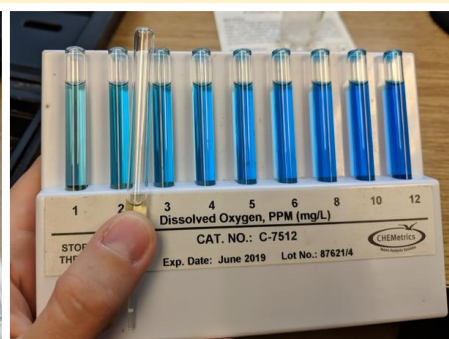
1



2



3



4-5



Discard



1



2



3



4



5-6



6



6



Discard

1. Go to the stream.

Bring one 250ml beaker and both thermometers.

- Air temp: Hang a thermometer ~3ft up from the ground on a tree branch.
- Water temp: Put the other thermometer in the stream, in the main flow of water. Anchor with a rock on the string.
- Collect water in the 250ml beaker and bring it back to the table. Use this water for the remaining chemical tests.
- The thermometers need to stay at least three minutes. Leave them for now.



2. Start with the two test strips. First pH, then Nitrite/Nitrate.

pH Test Strip

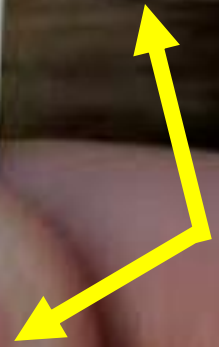
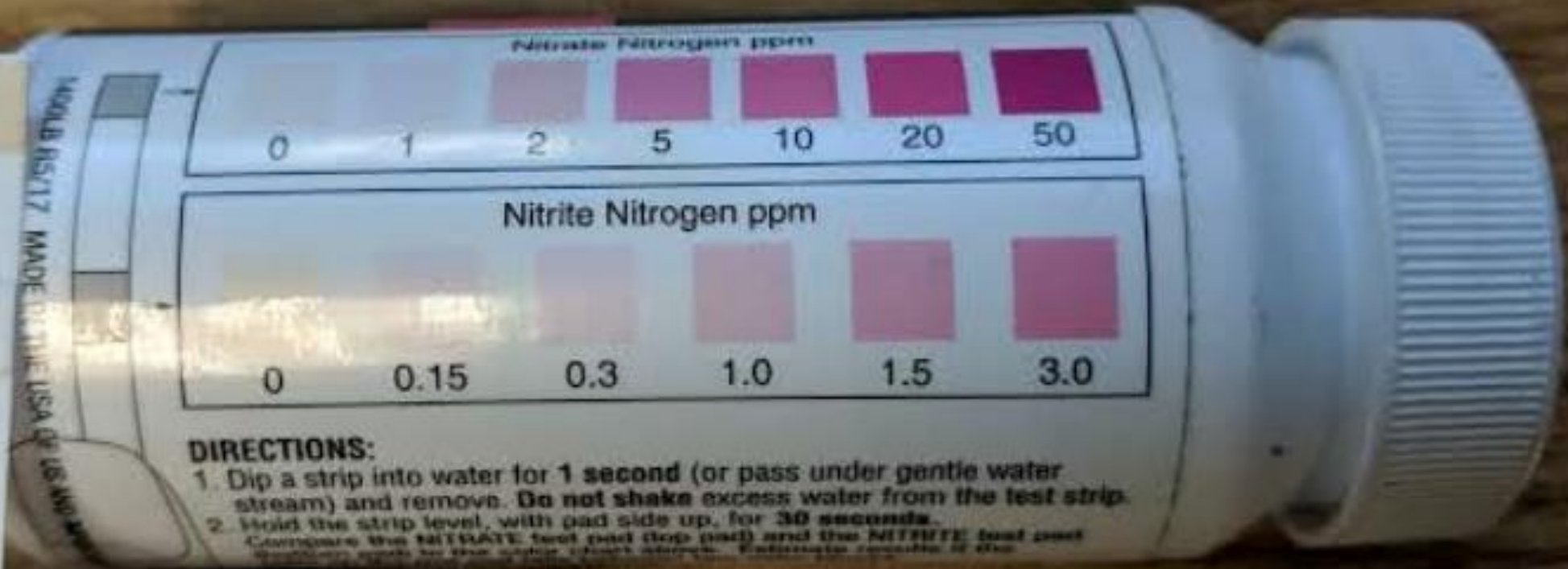
- Put pH strip in 250ml beaker.
- Let it sit until the color stops changing (1-10 min).
- While you're waiting, do the nitrite/nitrate test.
- Starting color is orange. Match all three colors as best as you can. It's okay to choose a value between two comparators.



Nitrite and Nitrate: Read all instructions first before starting!

1. Dip a strip into water for 1 full second and remove.
2. Do not shake excess water from test strip!
2. Hold strip level (parallel to ground), pad side up, for 30 seconds.
3. Compare pad at end with nitrate color guide. Compare the pad closer to the middle with nitrite guide. Shown in photo on the right.
- Starting color: white, off-white. Match the colors as best as you can. It's okay to choose a value between two comparators.
- Discard & Cleanup: Put the used test strips in the 70ml tube.





3. Take temperature readings, fill out data sheet.

- Go back to the stream.
- Look at thermometers and record air and water temperatures (in C) on the data sheet.
- Bring thermometers back to the table.
- Fill out the fields on the data sheet for weather, streamside habitat, etc. Check with the team leader that they took reach photos.

4. Dissolved Oxygen and Phosphate

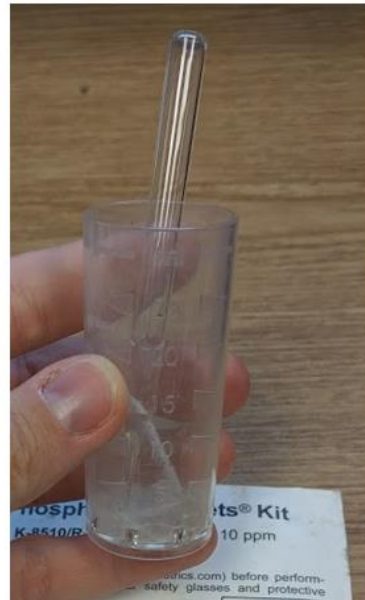
First, put on blue gloves for these tests. You will be handling sharps and drops of sulfuric acid.

Dissolved Oxygen:

1. Open the kit. Find the 25ml sample cup. Pour 25ml of stream water from beaker into sample cup. Try not to add oxygen when dipping or pouring.
 2. Put ampoule in cup (tip down). Push it down to snap the tip. Allow it to fill with stream water.
 3. Gently mix the ampoule by inverting it 2-3 times.
 4. Let it sit and wait 2 minutes for color changes.
 5. Compare with color standards. Starting color: light yellow
- Discard ampoule, glass pieces, liquid in sharps container.



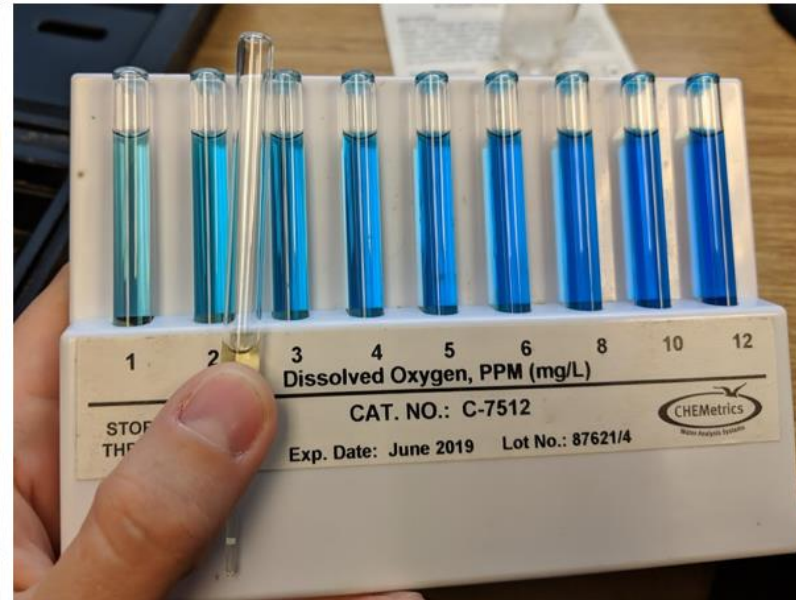
1



2



3



4-5



Discard

4. Dissolved Oxygen and Phosphate (cont'd)

Again, please make sure you are using the gloves for this. You will be handling sharps and drops of sulfuric acid.

Phosphate:

1. Open the kit. Find the 25ml sample cup. Pour 25ml of stream water from beaker into sample cup.
2. Add 2 drops activator solution (sulfuric acid). Put the black cap on the cup, shake/mix. Then take the cap off.
** This is the extra step for phosphate.
3. Put ampoule in cup (tip down). Snap the tip to fill it.

4. Gently mix the ampoule by inverting it 2-3 times.
5. Dry the ampoule and wait 2 minutes for color changes.
6. Compare with the low range color comparator. Place ampoule in middle of tube and hold up to the light. Values are written on the sides. Starting color: clear
7. Discard ampoule, glass pieces, liquid in sharps container.



1



2



3



4



5-6



6



6



Discard

5. Cleanup

- Put everything back in the chemical test bag and place next to the crate.
- Extra stream water from 250ml beaker can be poured out.
- Liquid from 25ml cups should be discarded in sharps containers.
- Once you're done, help with setup by filling ice cube trays with water, setting up chairs and tables, etc. Thanks!

Questions on chemical tests?

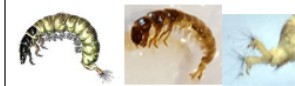
Tips & Reminders:

- Read all the instructions for each test before starting it. The nitrate/nitrite test has particularly quick turnarounds.
- Thermometers and pH strips take time – you can advance the other tests while you are waiting. Just don't forget the thermometers!
- For the P and DO test, the color hue of the comparators is slightly different from the test (teal vs. blue). Try to look for a similar color saturation level when comparing.

Identifier Review

Arlington Macroinvertebrates ID Card

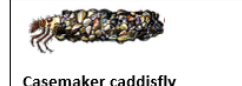
Note: COLOR IS NOT DIAGNOSTIC! Colors change from transparent to darker through their life cycle. Green, yellow, orange, or red colors can be a clue but never the sole identifier. Tolerance values range from 0 (most sensitive) to 9 (most tolerant). Images not to scale.



Netspinner caddisfly
Order Trichoptera, Family Hydropsychidae
 6 legs, 2 hooked tails, feathery gills on abdomen. Head and 3 thorax segments armored. Movement: head down, tail up, side-to-side. Common in Arl. Tolerance value 6.



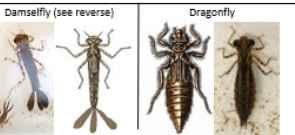
Fingernet caddisfly
Order Trichoptera, Family Philopotamidae
 6 legs, 2 hooked tails, smooth abdomen. Head and 1st thorax segment armored. Movement: pulls head up and back. Common at Windy, Gulf, Donaldson Run. Tolerance value 3.



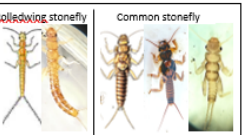
Casemaker caddisfly
Order Trichoptera, many families
 6 legs, found in stick, rock, leaf, or sand grain case. Tolerance values 1-4. Typically found only at reference site. Use Voshell book to identify to family level.



Mayfly, Order Ephemeroptera
 2-3 long hair-like tails, 6 legs, gills on abdomen, wingpads. Tolerance value 4.
Small minnow mayfly: abdomen curved up; middle tail shorter/hard to see or curved down; circular gills; common in Arlington.
Flatheaded mayfly only at reference site.



Damselfly & Dragonfly, Order Odonata
 6 legs, large lower jaw, large eyes, wingpads.
Damselfly: 3 broad oar-shaped tails (gills), middle tail held higher in water (like a propeller).
Dragonfly: Wide, oval to round abdomen. Tolerance values 1-9 (dragonfly). See reverse for family-level detail.



Stonefly, Order Plecoptera
ONLY FOUND AT REFERENCE SITE
 6 legs, 2 hair-like tails, wingpads. no gills on abdomen. Tolerance values 0-2.
Rollingwing stonefly (TV 0) and **common stonefly** (TV 1) seen at reference site, not in Arlington.



Midge, Order Diptera
Family Chironomidae
 Head armored, 2 sets of prolegs near head and end, smooth abdomen. Grey midge tolerance value 6. Red midge tolerance value 9. Movement: snap, flip, or figure 8, head to tail.



Black Fly, Order Diptera
Family Simuliidae
 Bowling pin shaped, sucker on bottom end. Proleg near head. Head armored. Tolerance value 6.



Crane Fly, Order Diptera
Family Tipulidae
 Plump and maggot-like. Fleshy lobes at bottom end. May have prolegs along body. Head is not visible. Tolerance value 3.



Other True Fly, Order Diptera
 From left-right, mosquito (TV 8), dance fly (TV 6), dixid midge (TV 1), and others. Use Voshell book to help ID.



Aquatic Worm
Class Oligochaeta
 Segmented, wormlike body, can be thin. Tol value 8.



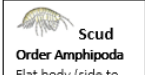
Flatworm/Planera
Order Tricladida
 Flat, soft body, triangular head, cross-eyed eyespots. Tolerance value 8.



Leech
Order Hirudinea
 Segmented body, suction cups on both ends. Tolerance value 8.



Sowbug
Order Isopoda
 Flat body (top to bottom), >6 legs, resembles a pill bug. Tolerance value 8.



Scud
Order Amphipoda
 Flat body (side to side), swims sideways, >6 legs, resembles a small shrimp. Tolerance value 6-8.



Crayfish, Decapod
Family Cambaridae
 2 large claws, 8 legs, resembles a small lobster. Tol value 5.

Adapted from Izaak Walton League Virginia Save Our Streams ID Card. Illustrations from Voshell, 2001. Guide to Common Freshwater Invertebrates of North America. MacDonald and Woodward Publishing Co. **Spring 2026 Version**



Hellgrammite, Megaloptera
 Six legs, large pinching jaws, 8 pairs feelers on abdomen, 2 hooks on tail/1 single spiky tail. Tolerance value 5.



Lunged Snails
Class Gastropoda
 No operculum. With helix pointed up, shell opens to the right, shell opens to the left. Tolerance value 7-8.



Gilled Snails, Class Gastropoda
 With helix pointed up, shell opens to the right. Operculum covers shell opening. Tolerance value 4.



Clams, Class Bivalvia
 Fleshy body between two clamped-together shells. Tolerance value 8.



Beetles, Order Coleoptera
 From left, water penny (oval body), riffle beetle adult (small black beetle), and larvae (armored body & 6 legs), predaceous diving beetle and others. Use Voshell book for family level ID. Tolerance values 4-7.



Midge
 Armored head



Black Fly
 Armored head



Fingernet
 Head + 1 Thorax Segment



Netspinner
 Head + 3 Thorax Segments



Riffle Beetle
 Entire body

Armoring

Damselfly Family-Level Identification (Order Odonata, Suborder Zygoptera)



Narrowwing 1
Family Coenagrionidae
Genus Argia
 Even antennae segments. Short, stocky body. Rounded tails. Lower lip triangular or trapezoidal & thick. Tolerance value 9.

Narrowwing 2
Family Coenagrionidae
Genus Enallagma/other
 Even antennae segments. Slender body. Long, thin tails. Lower lip triangular or trapezoidal. Tolerance value 9.

Broadwing
Family Calopterygidae
 Long first antennae segment. Long abdomen and long, spider-like legs. Tolerance value 5.

Spreading damselfly
Family Lestidae
 Even antennae segments. Long, thin spoon-shaped lower lip extends past 2nd set of legs. Head elongated and oval. Tail veins in parallel lines. Tolerance value 9.

DO NOT COUNT

(Do not add to totals, do write in notes on data form)



Pupae Above: midge pupae
Water strider, Bottom left
Copepod, Ostracod Bottom right: Copepods with egg sacs
 Copepods

Dragonfly Family-Level Identification, Order Odonata, Suborder Anisoptera



Darner
Family Aeshnidae
 Flat lower lip. 6-7 antennae segments slender, even. Diamond-shaped body. TV 3.

Clubtail
Family Gomphidae
 Antennae short, club-shaped, 4 segments. Flat lower lip. Abdomen often flat. TV 1.

Skimmer 1/Emerald
Family Corduliidae
 Spoon-shaped lower lip, deep crenulations. Median groove present. Tolerance value 5.

Skimmer 2
Family Libellulidae
 Spoon-shaped lower lip, shallow crenulations. No median groove. Tolerance value 9.

Spiketail
Family Cordulegastridae
 Spoon-shaped lower lip has deep-toothed dentations. Tolerance value 3.

Adapted from Izaak Walton League Virginia Save Our Streams ID Card. Illustrations from Voshell, 2001. Guide to Common Freshwater Invertebrates of North America. MacDonald and Woodward Publishing Co. (Additional photo credits on images.) **Spring 2026 Version.**

Arlington Macroinvertebrates ID Card

Note: COLOR IS NOT DIAGNOSTIC! Colors change from transparent to darker through their life cycle. Green, yellow, orange, or red colors can be a clue but never the sole identifier. Tolerance values range from 0 (most sensitive) to 9 (most tolerant). Images not to scale.



Netspinner caddisfly

Order Trichoptera, Family Hydropsychidae

6 legs, 2 hooked tails, feathery gills on abdomen. Head and 3 thorax segments armored. Movement: head down, tail up, side-to-side. Common in Arl. Tolerance value 6.



Fingernet caddisfly

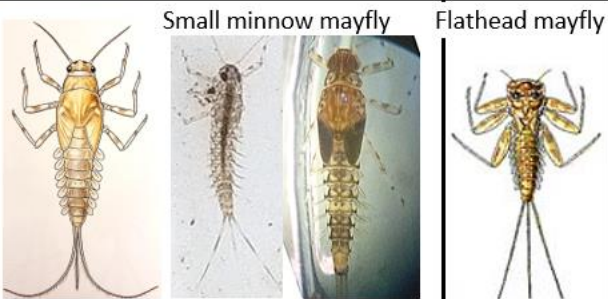
Order Trichoptera, Family Philopotamidae

6 legs, 2 hooked tails, smooth abdomen. Head and 1st thorax segment armored. Movement: pulls head up and back. Common at Windy, Gulf, Donaldson Run. Tolerance value 3.



Casemaker caddisfly

Order Trichoptera, many families
6 legs, found in stick, rock, leaf, or sand grain case. Tolerance values 1-4. Typically found only at reference site. Use Voshell book to identify to family level.

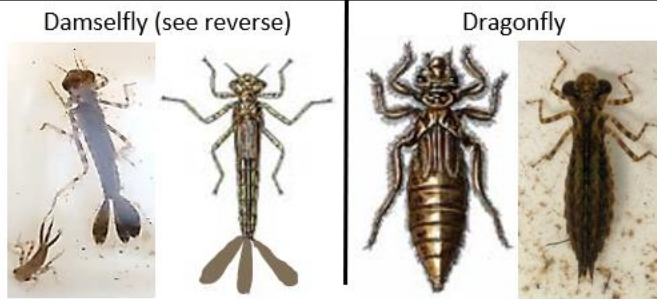


Mayfly, Order Ephemeroptera

2-3 long hair-like tails, 6 legs, gills on abdomen, wingpads. Tolerance value 4.

Small minnow mayfly: abdomen curved up; middle tail shorter/hard to see or curved down; circular gills; common in Arlington.

Flatheaded mayfly only at reference site.



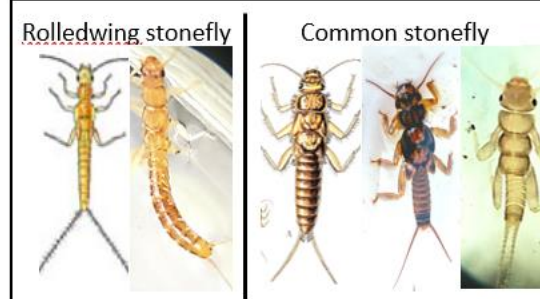
Damselfly & Dragonfly, Order Odonata

6 legs, large lower jaw, large eyes, wingpads.

Damselfly: 3 broad oar-shaped tails (gills), middle tail held higher in water (like a propeller).

Dragonfly: Wide, oval to round abdomen
Tolerance values 1-9 (dragonfly).

See reverse for family-level detail.



Stonefly, Order Plecoptera

ONLY FOUND AT REFERENCE SITE

6 legs, 2 hair-like tails, wingpads, no gills on abdomen. Tolerance values 0-2.

Rolledwing stonefly (TV 0) and **common stonefly** (TV 1) seen at reference site, not in Arlington.



Midge, Order Diptera

Family Chironomidae

Head armored, 2 sets of prolegs near head and end, smooth abdomen. Grey midge tolerance value 6. Red midge tolerance value 9. Movement: snap, flip, or figure 8, head to tail.



Black Fly, Order Diptera

Family Simuliidae

Bowling pin shaped, sucker on bottom end. Proleg near head. Head armored. Tolerance value 6.



Crane Fly, Order Diptera

Family Tipulidae

Plump and maggot-like. Fleshy lobes at bottom end. May have prolegs along body. Head is not visible. Tolerance value 3.



Other True Fly, Order Diptera

From left-right, mosquito (TV 8), dance fly (TV 6), dixid midge (TV 1), and others. Use Voshell book to help ID.

Flatworms and other non-insects



Aquatic Worm

Class Oligochaeta

Segmented,
wormlike body, can
be thin. Tol value 8.



Flatworm/Planera

Order Tricladida

Flat, soft body,
triangular head,
cross-eyed eyespots.
Tolerance value 8.



Leech

Order Hirudinea

Segmented body,
suction cups on
both ends.
Tolerance value
8.



Sowbug

Order Isopoda

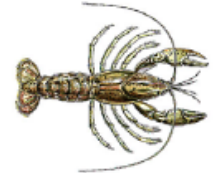
Flat body (top to
bottom), >6 legs,
resembles a pill bug.
Tolerance value 8.



Scud

Order Amphipoda

Flat body (side to
side), swims
sideways, >6 legs,
resembles a small
shrimp. Tolerance
value 6-8.



Crayfish, Decapod

Family Cambaridae

2 large claws, 8 legs,
resembles a small
lobster. Tol value 5.

Adapted from Izaak Walton League Virginia Save Our Streams ID Card. Illustrations from Voshell, 2001. Guide to Common Freshwater Invertebrates of North America. MacDonald and Woodward Publishing Co. **Spring 2026 Version**



Hellgrammite, Megaloptera

Six legs, large pinching jaws, 8 pairs feelers on abdomen, 2 hooks on tail/1 single spiky tail. Tolerance value 5.



Lunged Snails

Class Gastropoda
No operculum. With helix pointed up, shell opens to the left. Tolerance value 7-8.



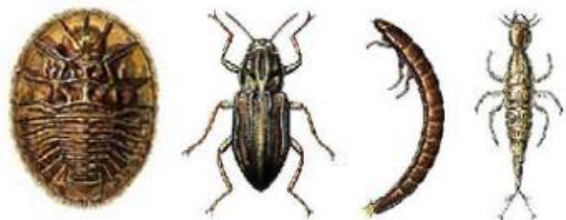
Gilled Snails, Class Gastropoda

With helix pointed up, shell opens to the right. Operculum covers shell opening. Tolerance value 4.









Clams, Class Bivalvia

Fleshy body between two clamped-together shells. Tolerance value 8.



Beetles, Order Coleoptera

From left, water penny (oval body), riffle beetle adult (small black beetle) and larvae (armored body & 6 legs), predaceous diving beetle and others. Use Voshell book for family level ID. Tolerance values 4-7.

					
Midge Armored head	Black Fly Armored head	<u>Fingernet</u> Head + 1 Thorax Segment	<u>Netspinner</u> Head + 3 Thorax Segments	Riffle Beetle Entire body	
Armoring					

Damselfly Family-Level Identification (Order Odonata, Suborder Zygoptera)



Lower lip from below; Tails

Narrowwing 1
 Family Coenagrionidae
 Genus Argia
 Even antennae segments. Short, stocky body. Rounded tails. Lower lip triangular or trapezoidal & thick. Tolerance value 9.



Narrowwing 2
 Family Coenagrionidae
 Genus Enallagma/other
 Even antennae segments. Slender body. Long, thin tails. Lower lip triangular or trapezoidal. Tolerance value 9.



Broadwing
 Family Calopterygidae
 Long first antennae segment. Long abdomen and long, spider-like legs. Tolerance value 5.



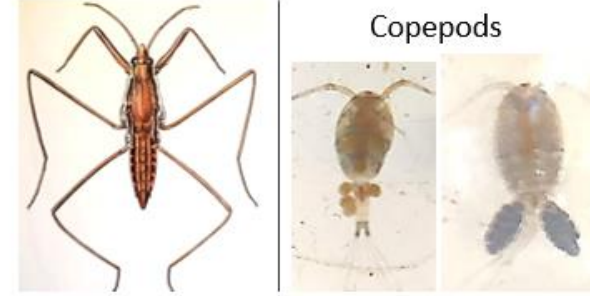
Spreadwing damselfly
 Family Lestidae
 Even antennae segments. Long, thin spoon-shaped lower lip extends past 2nd set of legs. Head elongated and oval. Tail veins in parallel lines. Tolerance value 9.

DO NOT COUNT

(Do not add to totals, do write in notes on data form)





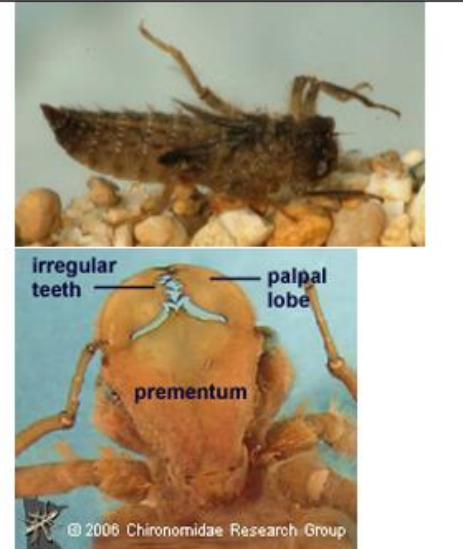


Pupae Above: midge pupae
Water strider, Bottom left
Copepod, Ostracod Bottom right: Copepods with egg sacs



Copepods

Dragonfly Family-Level Identification, Order Odonata, Suborder Anisoptera

				
<p>Darner Family <u>Aeshnidae</u> Flat lower lip. 6-7 antennae segments slender, even. Diamond-shaped body. TV 3.</p>	<p>Clubtail Family <u>Gomphidae</u> Antennae short, club-shaped, 4 segments. Flat lower lip. Abdomen often flat. TV 1.</p>	<p>Skimmer 1/Emerald Family <u>Corduliidae</u> Spoon-shaped lower lip, deep crenulations. Median groove present. Tolerance value 5.</p>	<p>Skimmer 2 Family <u>Libellulidae</u> Spoon-shaped lower lip, shallow crenulations. No median groove. Tolerance value 9.</p>	<p>Spiketail Family <u>Cordulegastridae</u> Spoon-shaped lower lip has deep-toothed dentations. Tolerance value 3.</p>

Adapted from Izaak Walton League Virginia Save Our Streams ID Card. Illustrations from Voshell, 2001. Guide to Common Freshwater Invertebrates of North America. MacDonald and Woodward Publishing Co. (Additional photo credits on images.) **Spring 2026 Version.**

Identifier Refresher Worksheet

- Do your best.
- The worksheet is intended as a learning and discussion tool.
- View the recording to see the answers 😊

Thank you!

Looking forward to getting started
with our stream monitoring year!