

Aquatic Stream Habitats

Lesson Abstract

Summary: This lesson consists of both in class and on stream site activities providing students with an opportunity to combine their present knowledge of stream environments with first-hand observations as an individual, team, or class. Students make connections between their expanding knowledge of aquatic habitats and watershed conditions.

GLE: 4.1.A.6, 4.1.B.6, 4.1.D.6, 4.3.C.6, 5.3.A.6

Subject Areas: Science, Communication Arts, Fine Arts

Show-Me Standards: Goals – 1.1, 1.3, 2.1, 4.6
Strands – SC 1, 2, 4, 5, 7, 8; CA 4, 6; FA 1

Skills: Observation, record keeping, illustration

Duration: 2 to 3 class periods (50 minutes)

Setting: Classroom and stream site

Key Vocabulary: Aquatic, macroinvertebrates, watershed, land use, riparian zone, sediment, pool, riffle, root wad, erosion

Rationale:

- All wildlife is dependent on aquatic habitats for their source of water.
- The quality of the water in an aquatic habitat partly determines the types and abundance of both aquatic and terrestrial organisms.
- Wildlife is a vital component of outdoor recreation and ecosystem stability.
- Wildlife is dependent on the quality of water the same as humans are.
- The diversity of aquatic organisms living within a stream channel reflect the overall health of a stream's watershed conditions and the riparian corridor adjacent to the stream.
- Aquatic organisms vary in their sensitivity to pollution and disruptions in their aquatic ecosystems and adjacent riparian corridors.
- A close examination of a stream's aquatic habitat provides the observers with information regarding land use practices and other human activities.

Student relevance:

- Students directly observe a stream's aquatic habitat.
- Students apply content knowledge directly to the aquatic habitat chosen for the activity.
- Students make direct observations to speculate on watershed conditions surrounding the given stream.

Learning Objectives:

Upon completion, students will be able to . . .

- Observe the physical conditions of the given area.
- Record observations.
- Make connections between observations and aquatic habitat conditions.
- Identify, compare, and contrast components of an aquatic ecosystem, both natural and human.
- Identify, compare, and contrast components of an aquatic ecosystem, both natural and human.
- Identify aquatic habitat components that function as food, shelter, water, and space.

Students Need to Know:

- How to define, explain and identify plant and/or animal habitats.
- How to identify wildlife.
- How to identify and describe human-made structures in a stream channel.
- How to observe and record findings.
- The connection between aquatic life and the conditions of a stream channel, riparian corridor, flood plain, and watershed.

Teachers Need to Know:

- General aquatic organisms in the area chosen for the activity (if possible, contact a local or regional MDC aquatic specialist to assist your activity.)
- The aquatic functions of pools, riffles, riparian corridors, stream bottom materials, root wads, erosions, and general fish feeding behaviors.

Resources:

The following materials are available from the Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180, (573)751-4115.

Aquatic Field and Classroom Activities

Fishing for Answers: The Challenge of Conserving Aquatic Resources, 1991

Fishing for Answers: Teacher's Edition, 1991 (Under revision)

Missouri Fishes (poster with 18 species)

Life Within the Water, 1992

Missouri Crayfish

Water Plants for Missouri Ponds (Ask for pricing)

Sewall, Susan Beyer. *Hooked on Science: Ready to Use Discovery Activities for Grades 4-8*. Center for Applied Research in Education, 1990.

Materials Needed for Lesson:

Handouts

Aquatic Habitat Observations for Streams

Stream Insects & Crustaceans (Blue Bug Card)

Other Materials

Stream Team Macro Invertebrates ID card set (New)

Note cards or equivalent cut paper

Poster board or equivalent sized paper (one for every four students)

Markers

Notebooks with writing instruments

Color Pencils

Underwater view bottles (one for every two to three students)

Construction of bottles (see *Hooked on Science* by Susan B. Sewall):

- 1) Cut the top portions off of clear two-liter plastic soda bottles.
- 2) Apply masking tape around the cut edges of the bottles to prevent the plastic from cutting students.

Optional materials

Clipboards

Camera and film

Trash bags

Bottom dredges (buckets or cans with ropes tied on and holes on the bottom)—see MDC publication *Aquatic Field and Classroom Activities* (one for every three to four students)

Kick nets or seining nets (contact local or regional MDC office)

Procedure:

Part One: Circulating Current Knowledge (classroom activity)

- Provide each student with 3 to 5 note cards and a marker.
- Ask students to write down (using marker) one term or phrase on each card that reflects their knowledge of stream environments. (This segment is done independently and silently.)
- Ask students to group their like cards with another student, then ask them to team up with another pair and group their cards.
- Repeat this process until all the cards from the class are grouped together.
- Go over each group of cards with the class and make connections, corrections, and clarifications as needed.

- Construct a concept map from the card piles (example: water, fish, rocks, currents, bugs) showing the “current” knowledge the class just “circulated” and “pooled.”
- Sum up the concept map and explain to students that they are going to visit a stream aquatic habitat and observe these components.
- Go over the handout *Aquatic Habitat Observations for Streams* with students for the field trip activity.
- Introduce and model the procedure for using aquatic wildlife sampling and observation equipment (underwater view bottles, bottom dredges, kick nets, and/or seining nets).
- Instruct students on appropriate dress for the trip (old clothes, shorts, river shoes, old tennis shoes, or rubber boots) and provide permission slips.

Part Two: Stream Aquatic Habitat Observations (field trip activity)

- Transport students and supplies to the site (if needed, arrange for an MDC resource person, STREAM TEAM staff person or active volunteer, or parent volunteers to attend).
- Go over safety precautions and appropriate conduct before allowing students off the bus (require that all students stay within a designated area at all times and not enter the stream without permission).
- Instruct students to complete the *Aquatic Habitat Observations* handout in pairs.
- Combine pairs into teams of four and ask everyone to share and compare their observations.
- Instruct students to add additional observations of their new team members to their handouts.
- Call on each team to discuss their observations and to note same, similar, and different observations.
- Tell students to add and clarify observations on their own handout.
- Explain to the class that they have “circulated” their “current” observations and discuss how these observations differ from the activity conducted in class.
- Demonstrate how to use an underwater viewing bottle (place the base of the bottle in the water and look directly down into the top of the bottle).
- Provide one underwater viewing bottle to each team of students.
- Allow students to observe shallow (knee high or less) underwater environments.
- Ask students to record their observations on their handout.
- Have students rotate to different areas of the stream as time and appropriate conditions exist, note additional observations.
- Have students collect and identify water critters with provided resources.
- Optional – Have a designated student or adult take pictures of collected critters, the stream channel, the riparian corridor, and other observations for extension activities in class at a later date.
- Demonstrate how to use the bottom dredge by pulling the dredge along the bottom of a shallow area to collect sediments and organisms.
- Have each team use the dredge and observation and record their collections.
- Demonstrate, use, and record observations from other sampling devices.
- Sum up the class findings and collect materials before returning to school.

- Ask students to note the land use practices that they see in the watershed as they travel back to school.
- Optional – Pick up trash before leaving.

Part Three: Connecting Current Knowledge (classroom activity)

- Ask students to read over their *Aquatic Habitat Observations* handout that they completed in the field.
- Review the class's combined observations through questioning.
- Have each team reconstruct their direct observations by drawing on poster board or large paper a picture of the entire habitat they observed.
- At the bottom of their drawing have students write a statement about the health of the aquatic habitat.
- Ask each team to share their posters with the rest of the class.
- Ask students to draw, chart, or list the land use activities from the trip. Have students include point and nonpoint sources pollution.
- Ask teams to share their observations and inferences.
- During discussion, ask questions to make connections between the aquatic habitat ecosystem health of surrounding land use practices.
- Optional – Repeat this process for another stream site with a significantly different health.

Evaluation Strategies:

- Have students keep a journal of their observations.
- Have students write a story, newspaper article, poem, song, or skit about their findings.
- Have students create a concept map of their findings which connects their current knowledge.

Extension Activities:

- Have students use a topographic map of the stream site and outline the stream's watershed.
- Have students make an inventory of the watershed (use the *STREAM TEAM Inventory Guide available on line*). www.mostreamteam.org
- Have students repeat the lesson for areas in a stream that are above and below a known point source pollution.
- Train students in biomonitoring of macroinvertebrates.
- Devise a set of interview questions for anglers. Conduct the interviews and compile the results.
- Compare and contrast the flowing aquatic habitat to other freshwater aquatic habitats such as larger rivers, ponds, lakes, and wetlands.

Suggested Scoring Guide:

Aquatic Stream Habitats

Teacher Name: _____

Student Name: _____

CATEGORY	4	3	2	1
Contributions	Routinely provides useful ideas when participating in the group and in classroom discussion. A definite leader who contributes a lot of effort.	Usually provides useful ideas when participating in the group and classroom discussion. A strong group member who tries hard!	Sometimes provides useful ideas when participating in the group and in classroom discussion. A satisfactory group member who does what is required.	Rarely provides useful ideas when participating in the group and in classroom discussion. May refuse to participate.
Focus on the task	Consistently stays focused on the task and what needs to be done. Very self-directed.	Focuses on the task and what needs to be done most of the time. Other group members can count on this person.	Focuses on the task and what needs to be done some of the time. Other group members must sometimes nag, prod, and remind to keep this person on-task.	Rarely focuses on the task and what needs to be done. Lets others do the work.
Problem Solving	Actively looks for and suggests solutions to problems.	Refines solutions suggested by others.	Does not suggest or refine solutions, but is willing to try out solutions suggested by others.	Does not try to solve problems or help others solve problems. Lets others do the work.
Monitors Group Effectiveness	Routinely monitors the effectiveness of the group and makes suggestions to make it more effective.	Routinely monitors the effectiveness of the group and works to make the group more effective.	Occasionally monitors the effectiveness of the group and works to make the group more effective.	Rarely monitors the effectiveness of the group and does not work to make it more effective.
Preparedness	Brings needed materials to class and is always ready to work.	Almost always brings needed materials to class and is ready to work.	Almost always brings needed materials but sometimes needs to settle down and get to work .	Often forgets needed materials or is rarely ready to get to work.
Working with Others	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.

Rubric Made Using: **RubiStar** (<http://rubistar.4teachers.org>)

Aquatic Habitat Observations for Streams

Directions: Make observations about the following items located in or near the stream environment. Record these observations in the provided areas. Use all of your senses to make observations.

Riparian Corridor

Land use -

Vegetation -

Wildlife signs –

Signs of human use -

Ground cover -

Soil –

Stream Channel

Bottom sediments -
(type & approximate sizes)

Erosion signs -

Gravel bars –

Channel width -

Channel path -

General depths –

Pools -

Riffles -

Currents –

Root wads -

Logs -

Boulders –

Fish feeding behaviors –

Food, Water, Shelter, and Space

Identify each item above as either food, water, shelter, or space for stream aquatic habitats. Use these symbols: food *, water +, shelter ^, and space #.
Note: Some items may serve more than one function.

Aquatic Habitat Worksheet (continued)

Underwater Viewing Bottle

Describe and illustrate what you observed (use any provided resources for identification of organisms). Be as specific as time permits.

Bottom Dredge

Describe and illustrate the living and nonliving things that you dredged from the stream's bottom (use any provided resources for identification of organisms). Be as specific as time permits.

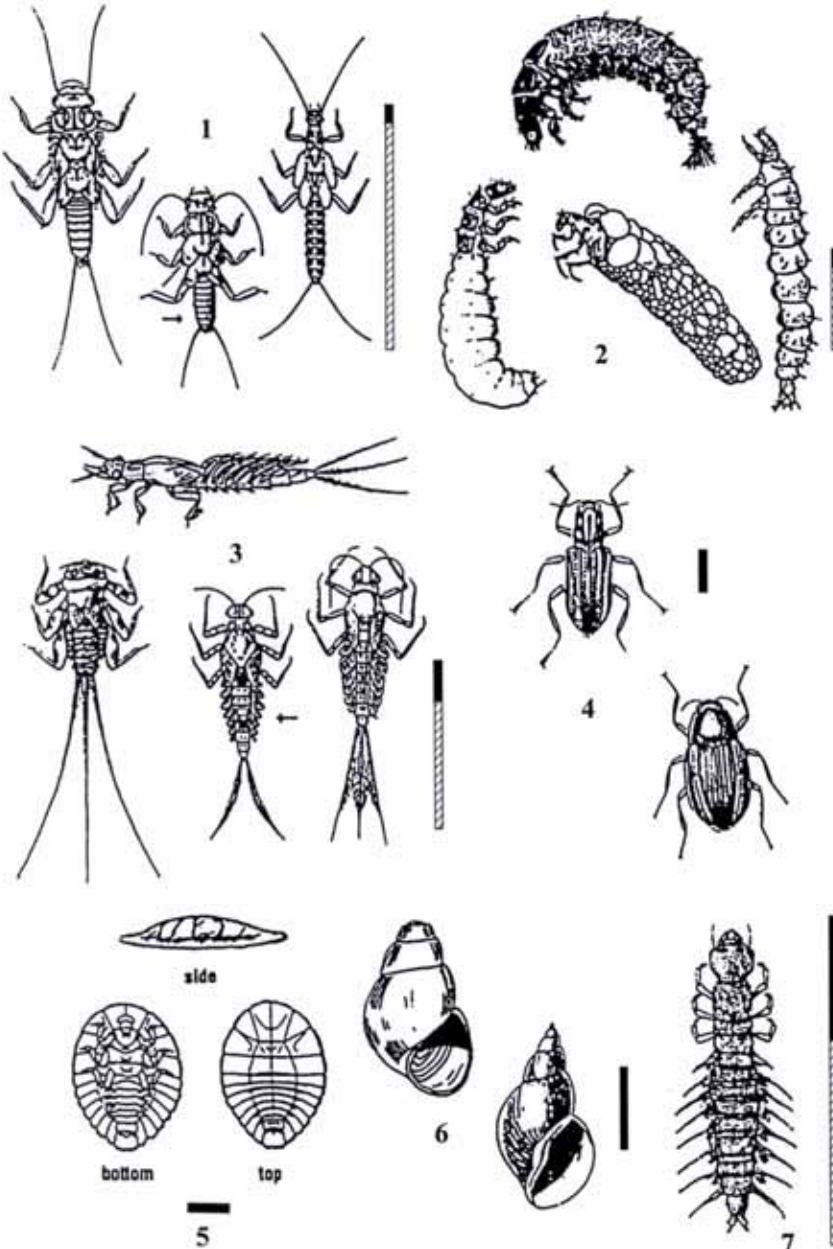
Other Sampling Devices

On the back of this sheet record observations from other devices used in this activity.

Stream Insects & Crustaceans

GROUP ONE TAXA

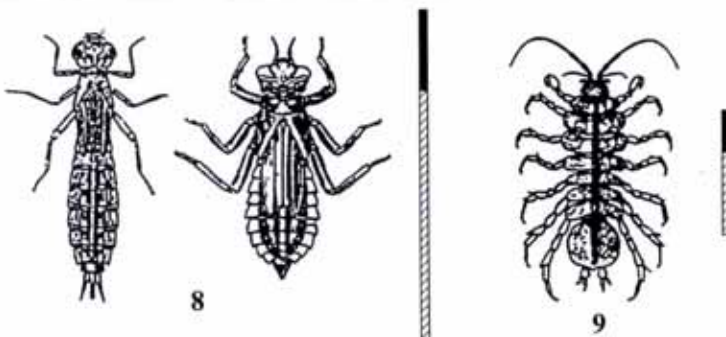
Pollution sensitive organisms found in good quality water.



- 1 Stonefly nymph: Order *Plecoptera*. 1/8" - 1 1/2"; 6 legs with hooked tips; 2 hairlike tails. Smooth (no gills) on abdomen (see arrow). May have gills on thorax under the legs.
- 2 Caddisfly larva: Order *Trichoptera*. Up to 1"; 6 legs on thorax; 2 hooks at end of abdomen. May be in a stick, rock, or leaf case with its head sticking out. May have fluffy gill tufts on lower half.
- 3 Mayfly nymph: Order *Ephemeroptera*. 1/4" - 1"; brown, moving, platelike, or feathery gills on abdomen (see arrow); 6 large hooked legs; antennae; 2 or 3 long, hairlike tails. Tails may be webbed together.
- 4 Riffle Beetle: Order *Coleoptera*. Adult: Tiny, 6 legged beetle; crawls slowly on the bottom. Larva: Entire length of body covered with hard plates; 6 legs on thorax; uniform brown color. Combine number of adults & larva when reporting total counts.
- 5 Water Penny larva: Order *Coleoptera*. 1/4"; flat saucer-shaped body, like a penny; segmented with 6 tiny legs underneath. Immature beetle.
- 6 Gilled Snail: Class *Gastropoda*. Shell opening covered by thin plate called operculum. When pointed up and opening facing you, the shell opens to right. Do not count empty shells.
- 7 Dobsonfly larva (hellgrammite): Family *Corydalidae*. 3/4" - 4"; dark-colored; 6 legs, large pinching jaws; eight pairs feelers on lower half of body with paired cottonlike gill tufts along underside of lateral filaments; short antennae; 2 tails and 2 pairs of hooks at back end.

GROUP TWO TAXA

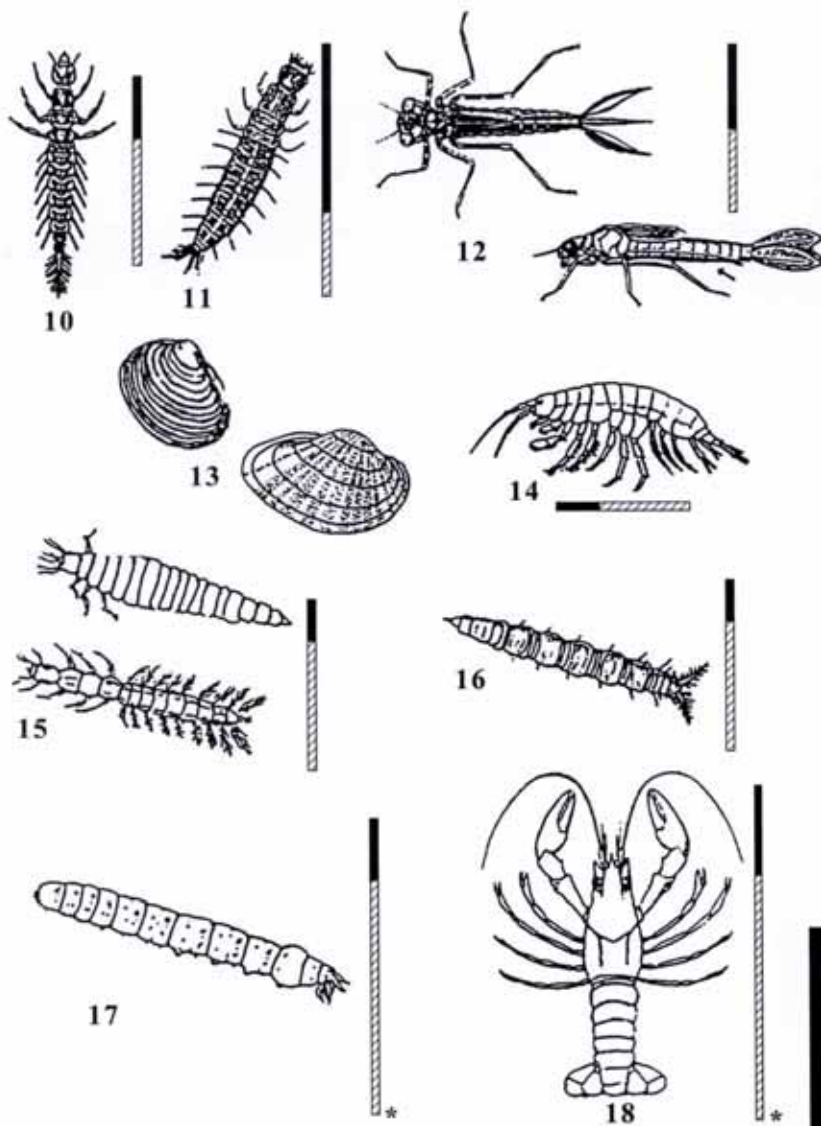
Somewhat pollution tolerant organisms can be in good or fair quality water.



- 8 Dragonfly nymph: Suborder *Anisoptera*. 1/2" - 2"; large eyes, 6 hooked legs. Wide oval to round abdomen, masklike lower lip.
- 9 Sowbug: Order *Isopoda*. 1/4" - 3/4"; gray oblong body wider than it is high, more than 6 legs, long antennae, looks like a 'roly poly.'

Save Our Streams

*May be larger.
-Solid bar indicates aprox. minimum size. Combined solid and stripped bar is approx. maximum size.-



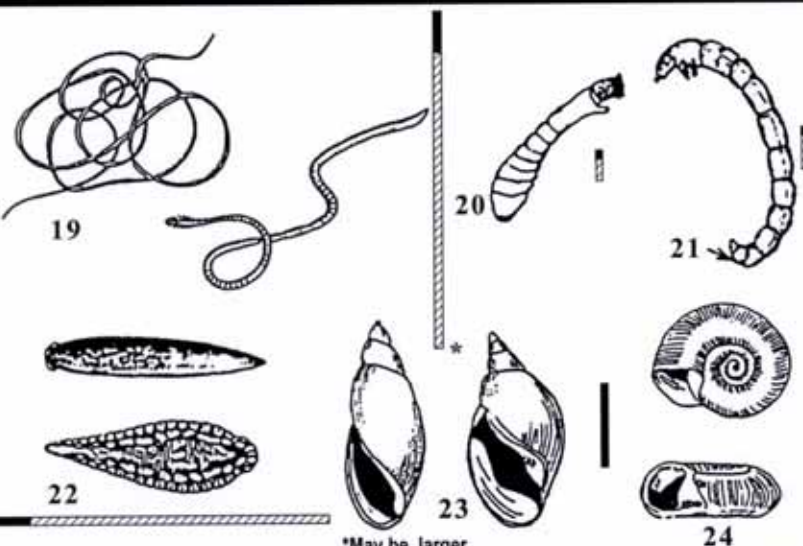
GROUP TWO TAXA continued

- 10 Alderfly larva: *Family Sialidae*. 3/8" - 1"; looks like small hellgrammite but has 1 long, thin, branched tail at end of abdomen (no hooks). No gill tufts underneath the lateral filaments on abdomen.
- 11 Fishfly larva: *Family Corydalidae*. Up to 1 1/2"; lateral filaments on abdomen. Looks like small hellgrammite but often a lighter reddish-tan color, or with yellowish streaks. No gill tufts underneath.
- 12 Damselfly nymph: *Suborder Zygoptera*. 1/2" - 1"; large eyes; 6 thin hooked legs; 3 broad oar-shaped tails; body positioned like a tripod. Smooth (no gills) on sides of lower half of body (see arrow).
- 13 Clam/Mussel: *Class Bivalvia*. Do not count empty shells.
- 14 Scud: *Order Amphipoda*. 1/4" - 3/4"; white to gray, body higher than it is wide; swims sideways; more than 6 legs; resembles small shrimp.
- 15 Other Beetle larva: *Order Coleoptera*. 1/4" - 1"; light-colored; 6 legs on upper half of body; feelers; antennae; obvious mouthparts. Diverse group.
- 16 Watersnipe Fly larva: *Family Athericidae (Atherix)*. 1/4" - 1"; pale to green; tapered body; many caterpillarlike legs; conical head; two feathery 'horns' at back end.
- 17 Crane Fly larva: *Suborder Nematocera*. 1/3" - 4"; milky, green, or light brown; plump caterpillarlike segmented body. May have enlarged lobe or fleshy fingerlike extensions at the end of the abdomen.
- 18 Crayfish: *Order Decapoda*. Up to 6"; 2 large claws, 8 legs, resembles small lobster.

GROUP THREE TAXA

Pollution tolerant organisms can be in any quality of water.

- 19 Aquatic Worm/Horsehair Worm: *Class Oligochaeta/ Phylum Nematomorpha*. Aquatic worm: 1/4" - 2"; can be very tiny, thin wormlike body. Horsehair Worm: 4" - 27"; slender, can be tangled.
- 20 Black Fly larva: *Family Simuliidae*. 1/8" - 3/8"; one end of body wider. Black head, suction pad on end.
- 21 Midge Fly larva: *Suborder Nematocera*. Less than 1/4"; distinct head; wormlike segmented body; pair of tiny pro-legs under head and tip of abdomen.
- 22 Leech: *Order Hirudinea*. 1/4" - 2"; flattened muscular body, ends with suction pads.
- 23 Pouch Snail and Pond Snails: *Class Gastropoda*. No operculum. Breathe air. Shell usually opens on left. Do not count empty shells.
- 24 Other snails: *Class Gastropoda*. No operculum. Breathe air. Snail shell coils in one plane. Do not count empty shells.



*May be larger.

-Solid bar indicates approx. minimum size. Combined solid and striped bar is approx. maximum size.-



09/05
STR 250