

Bear Creek Jigsaw: Twelve Cards, One Stream Food Web

Learning target: I can work with a team to assemble a stream food web from organism cards, trace where matter and energy go, and predict the direct and indirect effects of a disturbance.

Collaborative investigation

About 55 min

Jigsaw

MS-LS2-3 · practice

MS-LS2-4 · practice

collaboration

visual modeling

discussion

Name _____

Date _____

Period _____

Directions

Work in home groups of four. Step 1 (expert round, 10 minutes): each member takes one expert set of three cards (Set A: cards 1-3; Set B: cards 4-6; Set C: cards 7-9; Set D: cards 10-12), reads them, and meets with the students from other groups who hold the same set to agree on what each card eats and what eats it. Step 2 (home round, 20 minutes): return to your home group, teach your cards, lay all twelve on the desk and connect them with yarn or drawn arrows from food to eater. Complete the group record. Step 3 (disturbance round, 15 minutes): draw one disturbance card from your teacher and predict its effects. Step 4 (individual, 10 minutes): answer Part C alone.

You will need: Twelve cards per group, cut from the card sheet, Three disturbance cards per class, cut from the callout, Yarn or string (about 3 m) and tape, or a large sheet of paper and markers, Group record table, Pencils

Twelve organism cards from Bear Creek, a Sierra foothill stream

1 Card 1: Algae on the rocks

A thin green-brown film of tiny producers coating every sunlit stone. Makes its own food from sunlight, carbon dioxide dissolved in the water, and nutrients in the water. Eaten by mayfly nymphs, snails and tadpoles.

2 Card 2: Streamside willows

Producers growing on the bank. Make their own food from sunlight, carbon dioxide and water. Their fallen leaves drop into the creek every autumn and are eaten by caddisfly larvae and crayfish after bacteria and fungi have softened them.

3 Card 3: Bacteria and fungi in the gravel

Decomposers. Feed on droppings, dead leaves and the remains of every other organism in the creek. Release carbon dioxide and nutrients into the water, where algae and willow roots can take them up.

4 Card 4: Mayfly nymphs

Young insects that cling to stones and scrape algae off the rock. Eaten by stonefly nymphs and rainbow trout.

5 Card 5: Caddisfly larvae

Young insects that build cases of sand and twigs and shred fallen willow leaves. Eaten by stonefly nymphs and rainbow trout.

6 Card 6: Snails

Slow grazers that rasp algae from the rocks. Eaten by crayfish.

7 Card 7: Stonefly nymphs

Young insects that hunt among the stones. Eat mayfly nymphs and caddisfly larvae. Eaten by rainbow trout.

8 Card 8: Tadpoles

Young Pacific tree frogs in quiet pools. Eat algae. Eaten by rainbow trout and garter snakes.

9 Card 9: Crayfish

Clawed animals on the bottom. Eat fallen willow leaves, snails and dead animals. Small crayfish are eaten by rainbow trout; crayfish of all sizes are eaten by belted kingfishers.

10 Card 10: Rainbow trout

The creek's main fish. Eat mayfly nymphs, caddisfly larvae, stonefly nymphs, tadpoles and small crayfish. Small trout are eaten by garter snakes and belted kingfishers.

11 Card 11: Garter snake

A streamside snake that swims well. Eats tadpoles and small trout. Nothing in this creek model eats the garter snake.

12 Card 12: Belted kingfisher

A bird that dives from branches. Eats small trout and crayfish. Nothing in this creek model eats the kingfisher.

Part A: Expert round (one set per person)

1. Your expert set: _____. For each of your three cards, write its role (producer, consumer or decomposer), how many arrows should point **into** it, and how many should point **out** of it (not counting arrows to the decomposers).

Part B: Home group task

1. Lay out the twelve cards with the two producers at the bottom, the decomposers to one side, and the kingfisher and garter snake at the top.
2. For every 'eaten by' statement on a card, lay a piece of yarn (or draw an arrow) from the food to the eater. Count your arrows; the key number is 17.
3. Add a dashed arrow from every organism to the decomposers, and one arrow from the decomposers to the water (nutrients and carbon dioxide released) that leads back to the producers.
4. Complete the group record table.
5. Draw one disturbance card from your teacher and predict the direct and indirect effects on at least four populations. Every member must be able to explain one prediction.
6. Prepare to show a neighboring group one food chain of at least four arrows and one indirect effect.

Group record (fill in)

Organism	Role	Eats (arrows in)	Eaten by (arrows out)
Algae			
Willows (fallen leaves)			
Bacteria and fungi			
Mayfly nymphs			
Caddisfly larvae			
Snails			
Stonefly nymphs			
Tadpoles			
Crayfish			
Rainbow trout			
Garter snake			
Belted kingfisher			

Disturbance cards (teacher cuts these apart) — Disturbance 1: A hot, dry summer shrinks the creek and cuts algae growth in half. Disturbance 2: Warm water kills most of the rainbow trout. Disturbance 3: A landslide buries the willows, so no leaves fall into the creek this autumn.

- Group answer: Write the longest food chain in your web that starts at algae and ends at the kingfisher. How many arrows does it have? Then name the **two** organisms that are top predators in this model and explain why there are two.

- Group answer: Disturbance number _____. Predict the effect on four populations. For each, say whether the change is direct or indirect and trace the path.

Up, down or little change?	Direct or indirect?	Path through the web (name the populations in between)
Population 1: _____		
Population 2: _____		
Population 3: _____		
Population 4: _____		

4. Group answer: Trace the matter in one willow leaf through at least three organisms and back to a producer. Then say where the energy that was in the leaf ends up.

Part C: Individual accountability (complete alone)

5. The crayfish card lists three foods: living snails, fallen willow leaves and dead animals. Explain why one organism can sit at more than one trophic level. Then number the levels in the chain algae → snails → crayfish → kingfisher and state which level the crayfish is on in that chain.

6. Pick a disturbance your group did **not** draw. Predict one direct effect and one indirect effect, and trace the indirect one.

7. Your web has 17 feeding arrows but only two producers. Using the energy pyramid idea, explain why the creek can support thousands of mayfly nymphs but only one or two kingfishers.

8. A classmate says the willows are not really part of the creek food web because they grow on land. Use your cards to argue whether the willows belong in the model, and describe what would happen to the caddisfly larvae and crayfish if they were left out.

Arrows from the 'eaten by' line

Every card tells you where its arrows go: the 'eaten by' sentence lists the eaters. Lay the yarn from the card you are holding to each eater it names. Do not lay yarn for 'eats' sentences; those arrows will be laid by the group members holding the food cards. If your count is not 17 at the end, check the trout card first: it should have five arrows coming in and two going out.

Add a disturbance that comes from outside

Invent a fourth disturbance that enters the creek from outside the system, such as fertilizer washing in from a field upstream or a road culvert that blocks fish from moving. Write the disturbance card in the same style as the three provided, predict its effects on at least four populations with direct and indirect labels, and explain which arrow in the web it changes first. Trade with another group and compare predictions.