

Nets That Let the Right Animals Go

Learning target: I can use evidence from a passage to explain how fishing-net designs reduce by-catch and to judge them by scientific, economic and social criteria.

Reading with evidence

About 40 min

Individual

MS-LS2-5 · practice

MS-ETS1-1 · practice

reading

writing

discussion

Name _____

Date _____

Period _____

Directions

Read the whole passage once to get the big picture. Then read it again with a pencil: underline each criterion or constraint you find and put a star next to each piece of evidence. Answer the questions using the passage. When a question names a paragraph, your answer must use information from that paragraph, either in your own words or as a short quotation in quotation marks.

You will need: This worksheet, Pencil, Highlighter (optional)

Nets That Let the Right Animals Go

[1] Every fishing net is a kind of filter. The size of the openings in its mesh decides which animals stay inside and which slip out. A net with tiny holes keeps almost everything, including young fish that have not yet had a chance to breed. Animals caught by accident while people fish for something else are called **by-catch**. By-catch can include undersized fish, sea turtles, dolphins, sharks and seabirds. Some are thrown back alive, but many are already injured or dead by the time the net comes up.

[2] Lake Malawi, in southeastern Africa, is home to hundreds of species of fish called cichlids, more than almost any other lake on Earth. Families along its shores depend on fish for food and income. As the number of people living near the lake grew, so did the fishing, and near some villages the small cichlids that eat snails became scarce. Those snails carry the young stage of a parasitic worm that causes bilharzia (also called schistosomiasis), a disease that can make people sick for years. When researchers compared sites along the shore, they found that where snail-eating fish were common, snails were fewer and fewer children were infected. Where the fish had become scarce, snails and infections were more common.

[3] One design response is a net with larger holes. Bigger fish are still caught for food and sale, but small snail-eaters can swim through and survive. The design had to fit tight constraints. It had to be cheap, easy to make and repair, and it had to let families keep fishing, because many have no other source of food or money. Notice, though, what kind of evidence supports the plan. The shoreline comparisons show a pattern, not the result of a controlled experiment, so other differences between sites might also matter. The real test is to keep counting snails and infections after the nets change.

[4] Far from Africa, shrimp fishers along the southeastern coast of the United States and in the Gulf of Mexico drag cone-shaped nets called trawls through the water near the sea floor. For years, sea turtles swam into the trawls and drowned. Engineers, working with fishers, developed the **turtle excluder**

device, or TED: a grid of bars sewn into the neck of the net. Shrimp are small enough to pass between the bars into the bag at the back, but a turtle bumps into the grid and slides out through a flap. U.S. rules have required many shrimp trawlers to use TEDs since the late 1980s. To be approved, a new design must let out at least 97 percent of the turtles in official tests.

[5] The story of the TED shows that a solution is judged by more than one kind of criterion. **Scientific** criteria ask whether it protects the species and the ecosystem. **Economic** criteria ask what it costs and whether people can still earn a living. **Social** criteria ask whether people will accept it, whether it is fair and whether it can be enforced. Many shrimpers opposed TEDs at first because they feared losing part of their catch, and some early designs really did let shrimp escape. Designers kept changing the spacing of the bars, the angle of the grid and the size of the opening. Better designs also push out sticks, trash and some unwanted animals such as rays, which can make the catch cleaner.

[6] No net is perfect. A larger mesh still catches some small fish, and a TED only works if it is installed and kept in good shape. Turtles also face threats that nets cannot fix, such as plastic trash and the loss of nesting beaches. That is why engineers compare competing designs with data, choose the best one for now, and keep testing. Healthy fish and turtle populations are part of the biodiversity that keeps ecosystems working, and those ecosystems feed people and, at Lake Malawi, even help hold back a disease.

Part A: Find the evidence

1. As it is used in paragraph 1, **by-catch** means:

- ☐ A. Fish that are sold at the market
- ☐ B. Animals caught by accident while fishing for something else
- ☐ C. Fish too large to fit through the net
- ☐ D. Animals that eat snails

2. Paragraph 2: describe the pattern researchers found when they compared sites along Lake Malawi's shore. Include both what they found where snail-eating fish were common and where they were scarce.

3. Use paragraphs 2 and 3 to write the cause-and-effect chain that starts with 'more people near the lake' and ends with 'more children infected'. Use at least four arrows.

4. Paragraph 4: explain how a TED keeps turtles out of the bag while letting shrimp in. What difference between the two animals does the design depend on?

5. True or false: According to the passage, a controlled experiment has proven that larger-hole nets reduce bilharzia at Lake Malawi. Correct the statement if it is false.

☐ True ☐ False Explain your thinking:

Part B: Judge the designs

6. Use the passage to fill in how each design does on each kind of criterion. Write 'not stated' if the passage gives no evidence.

Larger-mesh nets (Lake Malawi)	Turtle excluder devices (shrimp trawls)
Scientific: protects which species or ecosystem service?	
Economic: cost or effect on income	
Social: acceptance, fairness or enforcement	

7. Paragraph 5: why did many shrimpers oppose TEDs at first, and how did designers respond? Explain what this shows about testing and revising a solution.

8. Paragraph 3 says the evidence for the larger-mesh nets 'shows a pattern'. Why does the author say the real test is to keep counting snails and infections? Name one other difference between sites that could also affect infections.

9. Paragraph 6 says 'No net is perfect.' Give one limit of each design that the passage names.

10. Paragraph 6 links healthy fish and turtle populations to ecosystem services. Name one ecosystem service from the passage, explain how a net design protects it, and explain why protecting biodiversity matters for that service.

A criteria sorter for the margins

As you reread, write S, E or So in the margin next to each sentence that names a scientific (S), economic (E) or social (So) concern. For q6, copy those margin notes into the table. For q3, start with 'more people near the lake → more fishing →' and keep going one step at a time until you reach children.

Design a test for the Lake Malawi nets

Plan a study that could show whether larger-mesh nets really lower bilharzia, not just match it. Decide which villages would switch nets and which would keep their old nets, what you would measure (snail-eating fish, snails, infections in children), how often, and for how long. Explain how your plan handles one other difference between villages, such as how often people wade in the water or whether they have clean water at home.