Water, Growth, and Numbers

Teacher		**Class**	Grade 7
Subject	Science	**Topic**	Resources and populations in ecosystems
Date		**Room**	
Lesson length	60 minutes	**Country**	United Kingdom

Students learn how water changes individual growth and population size. They measure seedlings, graph data, and write claims with evidence.

Curriculum links

- Availability and use of resources may lead to competition and cooperation. [1]
- Changes in the environment may increase or decrease population size. [1]
- Explain the effect resource availability has on populations in ecosystems. [2]

Learning objectives

- Students will analyze seedling data to show how water affects growth.
- Students will explain cause and effect for abundant and scarce resources.
- Students will use data points as evidence for population claims in ecosystems.

Success criteria

- I can graph water and growth data with labeled axes.
- I can explain abundant versus scarce effects on populations.
- I can support a claim with two data points.

What students already know

Ask: What do organisms need to grow? Listen for food, water, air and shelter. Show two seedling cups and ask for one quick prediction.

Key words

resource	something an organism needs to live and grow, such as food, water, or shelter [7]
population	all members of one kind of living thing living in the same place [8]
limited resource	something needed for life that can run out [7]
competition	when organisms both try to get the same thing that is in short supply [5]
scarce	when there is very little of something to use [5]

Materials

- Slides 1-12 with projector and speakers
- 3 pre-grown cups of seedlings with two-week water records
- rulers in inches
- paper towels
- pre-made table with cup, water amount, and height columns
- pencils and graph paper
- whiteboard and markers

Before the lesson

- Grow 3 seedling cups with abundant, medium, and scarce water for two weeks and label water amounts
- Test Slide 6 Video clip 1 (0:00–3:38) for sound and picture
- Print pre-made data tables and graph paper for each pair
- Set out rulers in inches, paper towels, and seedling cups for measuring
- Check for seed or soil allergies and plan hand-washing

Lesson outline

0–5 min **Starter** 5 min · Whole class

Recall what organisms need and hook students with different seedling growth.

YOU DO

1. Show Slide 1 and read the title question: How food, water, and space change who survives.
2. Hold up tall and tiny seedling cups and say the hook: Same seeds, same soil, same window — so why is one cup tall and one cup tiny?
3. Show Slide 3 cards for Food, Water, and Oxygen and Air and ask what each gives.
4. Take 3-4 quick predictions about which cup got more water.

STUDENTS DO

1. Look at seedlings and Slides 1-3.
2. Call out needs: food, water, oxygen and air, shelter.
3. Make a prediction about water and height.

Say: Look at these cups. They had the same seeds and soil. Something about resources made them different. Today we will analyze data on resources and population size and explain what happens when resources are abundant and scarce.

Ask: What do organisms need to grow? (Food, water, oxygen and air, shelter and space.) · Food Gives energy for growth and making offspring. What does water do? (Needed for body processes and plant growth.)

Check understanding: Thumbs up if you can name two resources. If many are unsure, re-read the three Slide 3 cards together.

Support: Point to the picture cards on Slide 3 while naming each need. **Stretch:** Ask what data would prove water caused the difference, not light.

Use: Slides 1-3

5–17 min **Teaching** 12 min · Whole class

Explain limited resources, abundant versus scarce effects, and competition.

YOU DO

1. Show Slide 4 and define organism as one living thing and population as all of one type in one area [8].
2. Show Slide 5 vote question, take a quick show of hands, then play Video clip 1 on Slide 6.
3. Teach Slide 7 compare: abundant means Faster individual growth, More offspring survive, Population numbers rise quickly; scarce means Slower growth, fewer offspring.
4. Model the seedling example with numbers on the board.

STUDENTS DO

1. Vote on which resource to track first and explain choice.
2. Watch video and listen for what makes a resource limited.
3. Copy abundant versus scarce effects into notes.

Say: Resources include food, water, oxygen, and shelter [7]. A limited resource is one that is not available in endless supply [7]. As populations get bigger, limited resources can start to run out [7]. Then organisms with similar needs may compete for limited resources [5].

Worked example: Cup A got plenty of water every day. Average height = 5 inches. Cup C got very little water. Average height = 2 inches. Claim: Less water limited growth. Evidence: height fell from 5 inches to 2 inches when water was scarce. Access to resources constrains growth and reproduction [5].

Ask: What makes a resource limited? (It can run out and does not meet demand as numbers grow.) · If water becomes scarce, what happens to growth and numbers? (Individual growth slows, fewer offspring survive, and population numbers fall [1][5].) · Why does competition increase when a resource is scarce? (Many organisms need the same food, water, or space and there is not enough [5].)

Check understanding: Mini whiteboards: write one effect of abundant and one of scarce. Reteach with Slide 7 if effects are mixed up.

Support: Keep Slide 7 compare visible and underline Faster versus Slower growth. **Stretch:** Ask whether extra water helps forever or another resource becomes limiting next.

Use: Slides 4-7, Video clip 1 (0:00–3:38)

17–42 min **Main activity** 25 min · Groups

Measure, graph, and use seedling data as evidence for water effects.

YOU DO

1. Show Slide 9 task: Graph both lines and label axes with numbers. Compare growth and note competition for water. Write claim plus two data points as evidence.
2. Demonstrate measuring stem height in inches from soil to top, then drying hands and table with paper towels.
3. Hand out pre-made tables and graph paper and circulate as groups measure each cup twice and average.
4. Stop at 20 minutes for two groups to share graphs and evidence sentences.

STUDENTS DO

1. Measure seedling stems in inches and record water amount and height.
2. Make a bar graph of average height per cup with labeled axes and numbers.
3. Write one claim with two data points as evidence and compare competition for water.

Say: Measure each cup carefully in inches. Record water amount and height in your table. Make a quick bar graph of average height per cup. Then write one evidence sentence linking water to growth. Use numbers from your graph.

Worked example: Cup 1 water: 4 oz daily, heights 5 and 5 inches, average 5 inches. Cup 3 water: 1 oz daily, heights 2 and 2 inches, average 2 inches. Bar graph shows 5, 3, 2 inches. Sentence: When water went down from 4 oz to 1 oz, height went down from 5 inches to 2 inches, so scarce water limited growth.

Ask: What is your claim and what two numbers prove it? (Scarce water limited growth, for example 5 inches with plenty of water versus 2 inches with little water.) · Where did competition show up? (Seedlings in the same cup with similar needs competed for limited water [5].)

Check understanding: Walk the room checking graphs have labeled axes and two numbers in the sentence. Provide the model sentence frame if many miss evidence.

Support: Give a pre-made table with columns for cup, water amount, and height plus sentence starters for the claim. **Stretch:** Have students predict what would happen to height if water was cut in half again and explain why.

Use: Slide 9

42–52 min **Discussion** 10 min · Pairs

Connect seedling evidence to population booms and crashes when resources change.

YOU DO

1. Show Slide 10 photo and read: A locust swarm grows huge when food and water are plentiful, then shrinks when food runs out.
2. Explain that locust swarms show how resource availability directly controls how large or small populations can become over time [6].
3. Show Slide 11 question and give pairs 4 minutes to discuss cause and effect and what data would prove it.
4. Build a class cause-and-effect chain on the board from rain to plants to plant-eaters.

STUDENTS DO

1. Study the locust photo and link plentiful versus scarce food to numbers.
2. In pairs discuss the two mouse groups and decide what happens and what counts prove it.
3. Add one arrow and number to the class chain.

Say: Our seedlings showed individual growth. Populations do the same. Plenty of food and water means more offspring survive and numbers rise quickly. When food runs out, growth slows and numbers fall. Changes in the environment may increase or decrease population size [1].

Worked example: Year 1: high rain, many plants, 80 plant-eaters counted. Year 2: low rain, few plants, 25 plant-eaters counted. Chain: less rain -> less food -> fewer plant-eaters survive and reproduce, so population drops from 80 to 25.

Ask: Two mouse groups need the same seeds and seeds become scarce. What happens next, and what data would prove it? (They compete, growth slows, fewer young survive, and counts drop; seed counts and mouse counts over time prove it.) · Did rain affect individual growth, population numbers, or both? (Both: individuals grow less and fewer offspring survive, so numbers fall [5].)

Check understanding: Cold-call pairs for one data point as evidence. If answers lack numbers, prompt: What changed first, resources or population?

Support: Highlight two points on the example numbers and provide prompts like What changed first, resources or population. **Stretch:** Have students argue whether individual growth or population numbers changed first, using the numbers.

Use: Slides 10-11

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52–60 min **Plenary** 8 min · Whole class

Check key ideas and fix confusion about limited resources and scarce water.

YOU DO

1. Show Slide 12 quiz: What is a limited resource? Give one example.
2. Confirm the answer: A resource that can run out, like food, water, or space.
3. Ask what happens when water is scarce and link back to seedling bars and mouse data.
4. Preview exit ticket and collect graphs.

STUDENTS DO

1. Answer quiz questions aloud and correct definitions.
2. Compare seedling evidence to locust and mouse examples.
3. Complete exit ticket on paper.

Say: A limited resource is one you can use up. Today our evidence was seedling height in inches. Plenty of water meant tall plants. Scarce water meant short plants and fewer offspring surviving. That is cause and effect you can prove with numbers.

Ask: What is a limited resource? Give one example. (A resource that can run out, like food, water, or space.) · When water is scarce, what happens to growth and population? (Growth slows, fewer offspring survive, and numbers drop [5].)

Check understanding: Exit ticket answers plus thumbs up for I can use data as evidence for a claim. Reteach scarce versus abundant tomorrow if needed.

Support: Provide the quiz answer bank and the sentence frame: When ___ went down, ___ went down. **Stretch:** Ask students to name a second resource that could limit the same population and how to test it.

Use: Slide 12

Common mistakes

Mistake	How to spot it	How to fix it
Thinking scarce resources only make individuals smaller, not populations smaller.	Claim mentions height but no numbers of organisms or offspring.	Point to Slide 7: scarce means Slower growth, fewer offspring and numbers fall, because growth and population increases are limited by access to resources [5].
Thinking populations can grow forever if animals want to.	Graph line keeps rising after food runs out.	Show locust data: as populations get bigger, limited resources can start to run out [7], and competition slows growth or causes declines [6].
Confusing competition with fighting rather than needing the same resource.	Says animals only compete by chasing or biting.	Restate that organisms with similar requirements may compete for limited food, water, or space, even plants competing for water and light [5][1].

Support

- Pre-made table with columns for cup, water amount, and height plus sentence starters for the claim.
- Word bank with food, water, oxygen, shelter, grow, reproduce and labeled axes model.

Stretch

- Predict what would happen to height if water was cut in half again and explain why.
- Predict next season locust numbers if plants regrow and justify with the trend.

For the LSE or teaching assistant

Stay with the measuring groups. Help read rulers in inches, average two heights, and use sentence starters to link water amount to height with numbers.

Safety

- Check for seed or soil allergies before handling seedlings.
- Have students wash hands after handling soil and wipe spills with paper towels.

Check for understanding

Question	Answer
Cup A averaged 5 inches tall with plenty of water. Cup C averaged 2 inches with little water. What is your claim with evidence?	Scarce water limited growth; height fell from 5 inches to 2 inches when water was scarce.
What is a limited resource? Give one example.	A resource that can run out, like food, water, or space.

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Mouse food drops from plenty to very little. Predict mouse numbers and name the data that would prove it.	Numbers will drop; counts of food and mice over time will both go down, showing cause and effect.

Homework

Record water and height of one plant at home for a week and bring two numbers as evidence.

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