

Population Biologist: Changes in an Ecosystem

NGSS Standard: MS-LS2-4



Adventure Description:

In this adventure, you will think like a population biologist and study the reasons behind population decline in tropical ecosystems.

Activity

Teacher note: This lesson takes 3-5 days. You will do the experiment on one day and then wait 3-5 days before you can collect the data. Keeping the bags warm will make the fruit decay faster, meaning students can see results faster.

Step 1: Background Information on population biologists (5 minutes)

- Show [Video: Changes to an Ecosystem](#).
- As a class, discuss how population biologists study how populations in a specific ecosystem change over time. By studying changes in populations, biologists can learn how different organisms in the ecosystem affect each other. For example:
 - If tiny zooplankton in an area of the ocean start to die off because of pollution, the small fish that eat them will start to die. This means that the sharks that eat the small fish will need to look for other types of food and will move to other areas.
 - If sharks move into a new area looking for food, they will eat small fish in this new area. With less small fish, more zooplankton can grow in this new area.

Step 2: Activity Set Up (5 minutes)

- Explain to students that they are going to see how changes to an ecosystem can affect the population of that ecosystem. For example, emperor penguins are adapted to live in the very cold climate of Antarctica. If Antarctica was suddenly much warmer, emperor penguins would probably not survive. To test how changes to an ecosystem affect a population living in there, students will set up an experiment to see what happens when bacteria are grown in different temperatures.
- When left-over food scraps are left sitting in a bag, they start to decay. This is because bacteria on the fruit eat the fruit and produce gas. The fruit serves as a habitat for the bacteria. The fruit, bacteria, and gas combine to create a mini ecosystem.
- To do this, students will observe the changes in decaying fruit under the following conditions.
 - 1 - Room temperature
 - 2 - Hotter temperature
 - 3 - Colder temperature
 - 4- Bleach added

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- Provide students with **Handout: Decaying Fruit Ecosystem**. As a class read through the steps.
- Explain to students that each group will test bananas under 4 different conditions to see how the changes effect the ecosystem.
- Teacher note: In step 2, students will need to take pictures of their bags. Tell students what devices to use and where to store the pictures (e.g., upload to Google Drive, email it).
- Divide students into pairs or small groups.
- Provide each group with the following:
 - 4 Ziploc bags
 - Permanent marker
 - 1 very ripe banana
 - 1 cup warm water
 - Smartphone or tablet to take pictures

Step 3: Setting Up Experiment (20+ minutes)

- Have students complete Step 1.
 - Teacher note : Bacteria will produce the most gas when they are at a temperature that is not too hot or too cold. Because of this it is most likely that the room temperature samples will produce the most gas. The hot bag will be too hot for the bacteria. The cold bag will be too cold for the bacteria. The bleach in the bleach bag will kill the bacteria and produce no gas at all.
- Next have students complete Step 2.
- As students are working, discuss the following:
 - What change do students think will make the bacteria produce gas faster? Which change do they think will make the bacteria produce gas slower? (The temperature needs to be just right. If its too hot or cold the bacteria will not produce as much gas. If bleach is added, it will kill the bacteria and they won't produce any gas.)
 - What role does bacteria have in the ecosystem? (They eat the fruit and produce a gas.)
 - How can you tell which bacteria produces gas fastest? (Bacteria that produces gas the fastest is the one that produces the most gas.)

Step 4 : Making Observations and Discussion (10+ minutes)

- This step should be completed 3-5 days after the experiment is set up.
- Have groups make observations of their bags and complete Step 3 on their handout.
 - Teacher note: Have students look at the pictures they previously took to compare results.

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- When students are finished with Step 3, have a class discussion about the following:
 - Which condition do bacteria produce gas the fastest (produced the most gas) and the slowest (produced the least gas)?
 - Groups should see that the room temperature bag let bacteria produce gas fastest and produced more gas. The bag with the bleach killed the bacteria and produced no gas.
 - How did changing the conditions effect different parts of the ecosystem?
 - Colder: Slowed down bacteria so slowed down the decay of the banana and reduced the amount of gas.
 - Room Temperature: Sped up bacteria growth so sped up the decay of the banana and increased the amount of gas.
 - Hotter: Bacteria were too hot so slowed down the decay of the banana and reduced the amount of gas.
 - Bleach: Killed the bacteria so stopped the decay of the banana and no gas was produced.

Materials List

Provided online:

- Video: Changes to an Ecosystem
- Handout: Decaying Fruit Ecosystem

Not Provided (Each student or group needs):

- 4 ziploc bags
- Permanent marker
- 1 very ripe banana
- 1 cup warm water
- Warm spot in room (like a window sill or near a heat lamp)
- Refrigerator
- 1 tsp bleach
- Smartphone or tablet to take pictures

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