Science Learning Packet
Grade 7:
Populations & Resources, Lesson 5

science learning activities for SPS students during the COVID-19 school closure.

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Due to the COVID-19 closure, teachers were asked to provide packets of home activities. This is not intended to take the place of regular classroom instruction but will help supplement student learning and provide opportunities for student learning while they are absent from school. Assignments are not required or graded. Because of the unprecedented nature of this health crisis and the District's swift closure, some home activities may not be accessible.

If you have difficulty accessing the material or have any questions, please contact your student's teacher.

Lesson 5

Active Reading Strategies

Title Pre-Think and Pre-Scan
Highlight unit science words
Circle unfamiliar words and ideas and write definitions/ notes about them that you find out in the text
Write in the margins to identify questions, and "a-ha!" moments
Underline evidence that helps us answer the question: **What causes more births in a**

Chapter 1: Reproduction Requires Energy

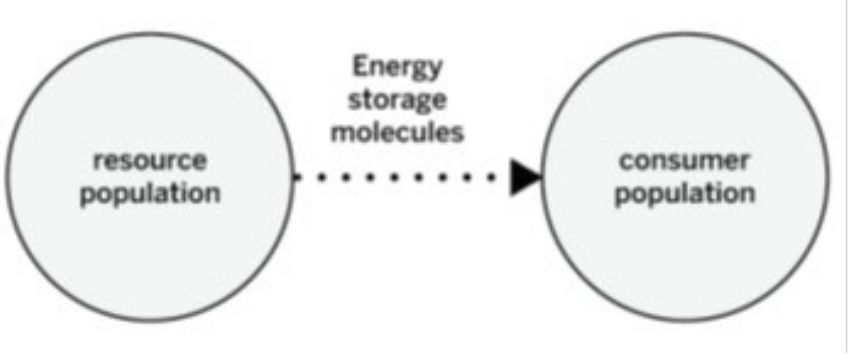
Reproduction is a lot of work. Some organisms travel thousands of miles to find a mate, the right place to lay eggs, or the right spot to give birth. They might work hard to attract mates using songs, movements, and other displays. Other organisms might fight fierce battles to win their mates and the chance to reproduce. Often this is just the beginning of the job: Many organisms work hard to protect their eggs, find food for their young, and do everything else that may be required for successful reproduction.

No matter what an organism goes through to reproduce, the process requires lots of energy. In fact, **for many organisms, reproduction requires more energy than anything else in their lives**. Some don't even survive—reproduction requires so much energy that these organisms reproduce and then die. Whether reproduction is relatively easy or extremely difficult, every organism needs energy in order to reproduce. Without energy, there can be no reproduction.

Organisms get the energy they need from energy storage molecules such as glucose, starch, and fat. These molecules store energy that can be released in the bodies of organisms when they need it. Plants and other producers can make their own energy storage molecules through photosynthesis, but other organisms can't do that—to get energy storage molecules, they need to eat food.

What is food, really? Food is the body parts of organisms that contain molecules, such as energy storage molecules, that other organisms need. "Consumer population" is the term ecologists use to talk about a population that eats other organisms for food. Ecologists call a population that is eaten for food a "resource population." Every consumer population gets its energy storage molecules from a resource population.

To learn about some specific populations and how they get the enormous number of energy storage molecules they need to release energy for reproduction, **read ONE or more of the chapters that follow that interest you**.

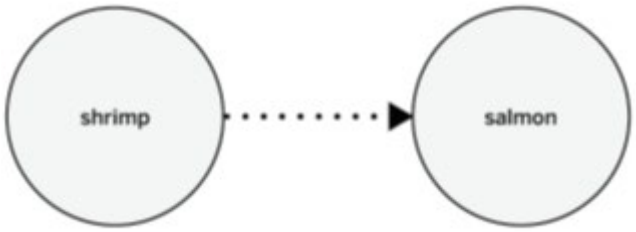


Consumer populations eat resource populations to get the energy they need to reproduce.

Chapter 2 Sockeye Salmon: Dying to Reproduce

The sockeye salmon of the Snake River in Idaho literally work themselves to death in order to reproduce! For these salmon, reproduction requires so much energy that they die in the process. However, if they are lucky, they will each leave thousands of offspring behind.

These Sockeye salmon begin their lives in the fast-flowing Snake River in the mountains of Idaho. While they are young, the salmon follow the Snake and Columbia rivers all the way to the Pacific Ocean, where they spend most of their lives. In the ocean, they eat shrimp, squid, eels, and other fish to get energy storage molecules. They eat as much of these resource populations as they can—they need to eat enough to fuel a journey back to the area of the Snake River where they hatched. This is where they will reproduce.



Shrimp are one resource population for sockeye salmon. Sockeye salmon get some of their energy storage molecules by eating shrimp.

Returning to the place where they were hatched is an energy-intensive journey of hundreds of miles! Using scent to find their way, the salmon follow the Columbia River and then the Snake River back to the place where they hatched. They swim up the river, struggling against the current. In some places, waterfalls block their way. The salmon jump as high as 3.5 meters (12 feet) in the air to get up and over these waterfalls, using huge amounts of energy. Finally, they find the right place to reproduce.

Even after their long, hard journey, the work of reproduction is not over for sockeye salmon—they still have to battle one another for the chance to reproduce. Females fight each other to get the best nesting spots and males fight each other for access to females. All that fighting uses even more energy.

The female salmon dig nests in the gravel at the bottom of the stream to lay their eggs in. Each female makes four or five nests and lays as many as 1,200 eggs in each one. Laying so many eggs also requires lots of energy. After the female lays her eggs, the male places his sperm over them, and the female buries the nest with more gravel. Once they have mated, the exhausted salmon guard the eggs for as long as they can before dying there in the stream.

During the entire process of reproduction, salmon need to release energy from energy storage molecules. They release energy from fat that they stored in their bodies during their time eating in the ocean.

Chapter 3 Emperor Penguins: Reproducing in the Coldest Place on Earth

Reproducing in harsh conditions as emperor penguins do requires large amounts of energy. © iStock.com/Bernard Breton

For the emperor penguin population near Ragnhild, Antarctica, reproduction requires an enormous amount of energy. They reproduce in one of the harshest environments on Earth: the thick shelf of ice that forms around Antarctica each winter. Just surviving in this environment takes lots of energy, and reproducing there takes even more. Temperatures often drop below –34 degrees Celsius (–30

degrees Fahrenheit), with strong winds and violent storms. In these harsh conditions, emperor penguins spend months working hard to raise just one chick at a time.

For this population of emperor penguins, the work of reproduction begins with a walk across miles of ice to reach their breeding grounds. Once there, the penguins pair up and mate, and each female lays a single egg on the ice. The male quickly and carefully rolls the egg onto the top of his feet, where he will keep it warm under a flap of skin. The male must keep the egg balanced on his feet until it hatches more than 2 months later. Through the freezing-cold Antarctic winter, male emperor penguins act like living heaters, using energy to warm the eggs with their body heat.

Meanwhile, the female penguins must walk all the way back to the ocean to find food for themselves and for the chicks that will soon hatch. By this time in the winter, more ice has frozen and widened the ice shelf around Antarctica. Female penguins may have to walk across more than 50 miles of ice to reach the water! Walking so far in the freezing cold requires lots of energy. In the ocean, the female penguins catch and eat squid, small fish, and tiny ocean creatures called krill. These resource populations provide the energy storage molecules they and their offspring need to survive.

Once full, the female penguins walk back to the breeding grounds, where their partners are warming their eggs. The chicks there have finally hatched and are ready to eat the food their mothers bring. The male and female penguins now take turns: one holds the chick on its feet to keep it warm while the other walks to the ocean to hunt. In the ocean, the penguins catch as much food as they possibly can. They need to catch enough for their own energy needs as well as extra food to feed their hungry chicks.

The penguin pair shares the work of raising the chick for several more weeks, until the chick can survive on its own. During this time, the penguins' bodies release energy from energy storage molecules—all the fat they built up while they were feeding in the ocean. Reproduction is hard work for the emperor penguins near Ragnhild, requiring more energy than any other part of their lives.

Chapter 4 Fireflies: Reproducing Brilliantly

It's easy to see that fireflies use energy for reproduction: they actually light up to attract a mate! The glow of fireflies comes from a chemical reaction that happens inside their bodies. It takes energy for fireflies to turn the glow on and off. There are many types of fireflies living in colonies all over the world. One well-known population is a population of Blue Ghost fireflies living in Dupont State Forest in North Carolina.

Fireflies are insects that light up to attract a mate. Darwin Dale/Science Source

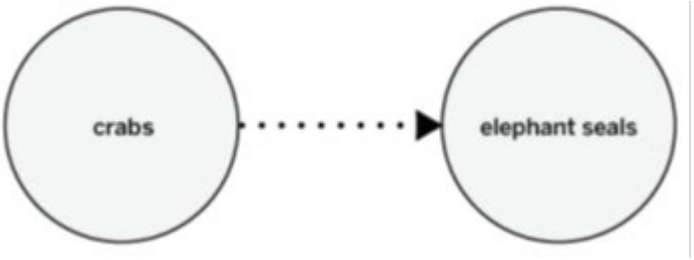
Fireflies turn their glow on and off in patterns that other fireflies recognize. They find each other using light signals. Females usually sit on leaves and flash, while males flash as they fly around searching for females. Male Blue Ghost fireflies are known for using long, slow flashes as they fly. Of course, flying also requires energy. Male and female fireflies flash signals to each other as the male gets closer and closer to the female. Eventually, they mate. After mating, each female firefly lays about 100 eggs in the soil. It takes energy to produce so many eggs!

The firefly eggs hatch into wingless larvae that live in the soil. Fireflies spend most of their lives as larvae, eating insects, snails and slugs. These resource populations provide the firefly larvae with lots of energy storage molecules, which they store in their bodies in the form of fat. When they are ready, the larvae build mud chambers for themselves and hole up inside. In the chambers, the larvae transform into adults with wings, ready to fly away and mate.

The energy storage molecules that the fireflies store up as larvae come in handy when it's time for them to reproduce: after eating for most of their lives, the fireflies' bodies can release energy from the energy storage molecules they built up in their bodies during that time. In fact, adult Blue Ghost fireflies do nothing but mate and lay eggs, so all of their energy goes into reproduction.

Chapter 5 Elephant Seals: Fighting to Reproduce

For male elephant seals, reproduction is an exhausting battle. These enormous animals fight over mating territories in long, noisy, bloody clashes. For male elephant seals, just winning the chance to reproduce takes enormous amounts of energy.



Reproduction requires energy for female elephant seals, too. The females produce rich milk for their babies. In order to produce plenty of milk, female elephant seals have to catch lots of fish and crabs to eat. Hunting and nursing a baby seal take lots of energy!

Elephant seals spend about ten months of the year in the open ocean, hunting and eating so they can store up enough energy storage molecules to keep them going during reproduction. Elephant seals eat many different types of fish, including rays and small sharks, as well as octopuses and crabs. These resource populations provide the energy storage molecules elephant seals need to reproduce.

Even though elephant seals spend most of their time in the water, they reproduce on beaches. One population of elephant seals does all its reproduction work on a beach called Piedras Blancas, on the central coast of California. The males arrive at Piedras Blancas beach first and begin staking out territories—areas of the beach that belong to them. The very biggest males, which may be 7 meters (20 feet) long and weigh more than 3,600 kg (8,000 pounds), take the best spots on the beach. Holding beach territory is important, because when females arrive, they will choose an area of the beach and eventually mate with the male who controls that territory. To keep his territory, a male has to fight off any other males who challenge him. The fights begin with threats: the males rear up and make roaring noises with their long, trunk-like snouts. If neither male backs down, they clash together, hitting each other on the neck and chest with sharp teeth. Males rarely die in these battles, but they often end up injured and bloody—and each fight requires lots of energy.

Male elephant seals fight each other to control the best areas on the beach. The male who controls the beach can mate with the female seals who spend time there. © iStock.com/eoind

In order to mate with the females on his stretch of beach, a male has to defend his territory by winning fight after fight over the course of several months. All that effort takes energy— and the seal's body gets its energy from the energy storage molecules it stored up during its time eating in the ocean. These males may win the chance to reproduce with a dozen or more females, but there's a high energy cost for it. During the months a male spends mating and defending his beach, he may lose about one third of his body weight!

Analysis Questions:

What do organisms need in order to reproduce?

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What is a consumer population? What is a resource population?

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What are different ways that different organisms' reproduction uses energy?

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How do organisms get energy storage molecules that they need to survive?

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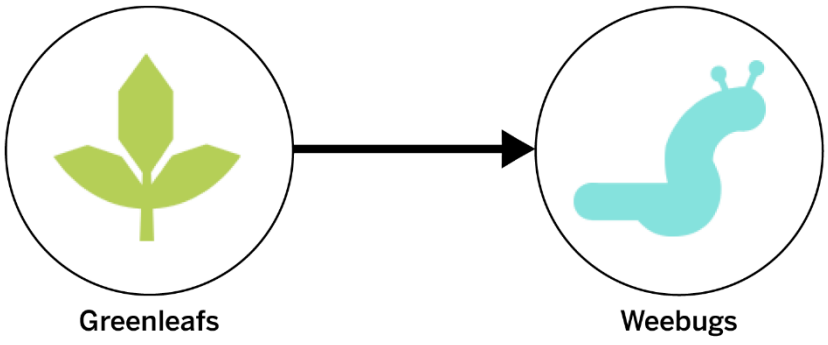
If you do have access to the internet, log into Amplify- on the top right-hand corner click the three lines and access the Populations and Resources Digital Model (use 3-Population mode).

Take a few minutes to click around and see how it works. **Explore in what ways you can increase the number of births of a population**.

Let's focus on the increasing the number of births in the Weebug population.



Weebugs get energy storage molecules from eating greenleafs. What change to the greenleaf population could increase the number of births in the weebug population?

- **Increase Greenleafs**
- **Decrease Greenleafs**

What will be your independent/ manipulated variable? _____

What will be your dependent/ responding variable? _____

What will be your controlled variable(s)?_____

<u>Tips for a Successful Test:</u>

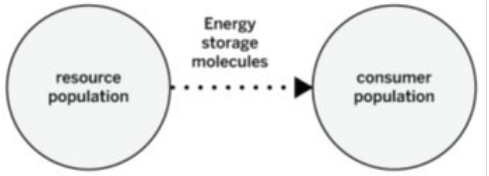
1. Launch the Populations and Resources Simulation (use 3 Populations mode).

2. Press Play, run the Sim for 20 time units, and then press Pause so you can make your changes.
3. Open Food Web Overlay in the bottom left hand corner.
4. Make your change to the greenleaf population.
5. Observe how the number of energy storage molecules in the greenleaf population changes as you make the change. *(Hint: Make a big change to see the biggest effect.)*
6. Lock the greenleaf population.
7. Press Play and run the Sim for at least 20 more time units.
8. Press Analyze in the top right hand corner and use the range window to **review the number of births during the 20 time unit range just before and during the 20 time unit range after the change**.
9. Record your observations

The number of weebug births before my change	The number of weebug births after my change	Other observations

Key Concepts

- Within a population, organisms are always being born and dying.
- A system can be stable even as things are being added to and removed from it. If the amounts being added and being removed are not equal, then the system will change.
- If the number of births and deaths in a given time are equal, then the population size will be stable.
- If there are more births than deaths in a given time, then the size of the population will increase. If there are fewer births than deaths, then the size of the population will decrease.
- Organisms need to release energy from energy storage molecules in order to reproduce.
- Organisms in **consumer populations** get energy storage molecules from eating organisms in **resource populations**.
- The more energy storage molecules available to a population, the more the organisms in that population can reproduce.



The diagram above is a food web. It shows what eats what. The arrow points towards the thing that is **eating and gaining energy storage molecules.**

Check In:

How can a change to births affect the population size? (*pick one)*

- ☐ An increase in births always leads to an increase in the population size.
- ☐ An increase in births leads to an increase in the population size if there are more births than deaths.
- ☐ An increase in births leads to an increase in the population size if there are fewer births than deaths.

What do you think we would need evidence about to know whether the number of births could be increasing in the moon jelly populations?

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