

Monarch Survival Simulation

Scientific Background

Adult female Monarch butterflies produce several hundred eggs during their lifetimes, but most of the eggs do not survive to become adults. Scientists expect that, on average, a mating pair of Monarch butterflies should replace itself by leaving two offspring that are able to reproduce for the next generation.

Monarch butterflies face many hazards at every life cycle stage. Monarch butterfly eggs may be eaten by ants and spiders. Monarch caterpillars may be eaten by stink bugs, wasps, and birds. They may also be killed by tachinid fly parasitoids. Birds and mice prey upon adult Monarch butterflies. The butterflies may be killed by cars and extreme weather. Habitat destruction and insecticides threaten all stages of the butterflies. If milkweed plants are removed by mowing or are killed by herbicides, Monarch butterflies have no place to lay their eggs and the caterpillars lose their only food source.

Monarch butterflies' success in being able to reproduce can change from year to year. In the best years, the number of Monarch butterflies may increase because conditions are favorable. Under poor conditions, when fewer than the average of two successfully reproducing offspring survive to the next generation, the number of Monarch butterflies decreases. This may lead to extinction if the pattern continues over generations.

In the Monarch Survival Simulation, students help a Monarch butterfly to survive and lay eggs to produce enough offspring for the next generation. This activity can be found by navigating to the Monarch Butterfly screen, then clicking the blue jay icon at the bottom of the screen.

Vocabulary

- adult
- egg
- generation
- hazard
- life cycle
- offspring
- predator
- reproduction
- caterpillar
- environment
- habitat
- insecticide
- mate (verb)
- parasite
- prey
- sexual maturity

*Vocabulary definitions can be found in the **Backyard Bugs** Glossary.*

Thinking Question

What can humans do to control the hazards we cause that can harm Monarch butterflies at all of their life cycle stages? What can we do to control the natural hazards that can harm Monarch butterflies at all of their life cycle stages?

Exploratory and Extension Activities

Additional Exploratory and Extension activities are available in the Backyard Bugs Teacher's Guide.

Survival Math

Have students use appropriate math skills (subtraction or division) to calculate the survival rate of Monarch butterflies.

These are some suggested problems:

If 30 Monarch butterfly eggs were laid, and 3 eggs did not hatch, 14 caterpillars were eaten by birds and spiders, 4 caterpillars were killed by the tachinid fly parasitoid, and 6 butterflies were eaten by birds, how many of the eggs survived?

If 250 Monarch butterfly eggs were laid and two successfully reproducing adult butterflies survived, what percentage of the eggs survived to become adults? (Hint: Divide the number of Monarch butterflies that survived by the number of eggs that were laid. Then multiply the answer by 100 to find the percentage.)

Monarch Butterfly Migration

Using a map of North America and colored pins or dots, plot the migration path of a population of Monarch butterflies. Use data found at Journey North ("Engaging Students in a Global Study of Wildlife Migration") (www.learner.org/jnorth) or other resources.

Using a world map and colored pins or dots, identify the countries around the world where Monarch butterflies have been sighted. Have students name the country, its capital, and the continent it is found on.

Prompt students to include the following information:

Which countries would you expect to have large Monarch butterfly populations?

Which countries do not appear to have Monarch butterfly populations?

Why do you think Monarch butterflies are not found in a country or region?

Name: _____

Monarch Survival Simulation, Part 1

Use the Monarch Survival Simulation. Check the boxes that apply.				
Factors that Endanger Monarchs	Egg	Caterpillar	Chrysalis	Butterfly
Bird Predators				
Cold Weather, Hail and Snowstorms				
Collision with a Motor Vehicle				
Herbicides				
Insecticides				
Lack of Milkweed Plants				
Lack of Wildflowers				
Mouse Predators				
Other Insects				
Parasites				
Roadside Mowers				
Spiders				

Name: _____

Monarch Survival Simulation, Part 2

Why do Monarch butterfly females lay up to 500 eggs?

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What might happen if all 500 Monarch butterfly eggs survived to become adults?

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What might happen if, on average, each male and female Monarch butterfly replaced itself?

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What might happen if, on average, each male and female Monarch butterfly left fewer than two offspring that are able to reproduce?

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What are some of the hazards for Monarch butterflies that are caused by people?

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Answer Key

Monarch Survival Simulation, Part 1

Use the Monarch Survival Simulation. Check the boxes that apply.				
Factors that Endanger Monarchs	Egg	Caterpillar	Chrysalis	Butterfly
Bird Predators		√	√	√
Cold Weather, Hail and Snowstorms	√	√	√	√
Collision with a Motor Vehicle				√
Herbicides	√	√		√
Insecticides	√	√	√	√
Lack of Milkweed Plants		√		√
Lack of Wildflowers				√
Mouse Predators		√	√	√
Other Insects	√	√		
Parasites		√	√	√
Roadside Mowers	√	√	√	√
Spiders	√			

Answer Key

Monarch Survival Simulation, Part 2

Why do Monarch butterfly females lay up to 500 eggs?
<i>Many Monarch butterfly eggs do not survive to become adults. At the egg stage, Monarch butterflies may be eaten by ants and spiders. Monarch caterpillars may be eaten by stink bugs, wasps, and birds. They may also be killed by the tachinid fly parasitoid. All life cycle stages of the Monarch butterfly can be killed by insecticides. Predators of adult Monarch butterflies are birds and mice. Adult Monarch butterflies may be killed by cars and hail. If milkweed plants and wildflowers are removed by mowing or are killed by herbicides, Monarch butterflies have no host plants to lay their eggs on. They would also have no nectar to drink.</i>
What might happen if all 500 Monarch butterfly eggs survived to become adults?
<i>If more than two successfully reproducing offspring survive to the next generation then the population increases. This means that the number of insects increases. If all the eggs laid by an insect such as the Monarch butterfly survived, there would be an overpopulation of that insect.</i>
What might happen if, on average, each male and female Monarch butterfly replaced itself?
<i>Scientists expect that, on average, each male and each female insect, such as the Monarch butterfly, should replace itself by leaving two offspring that are capable of reproducing. That way, the two offspring are able to produce the next generation. If two successfully reproducing offspring survive to the next generation then the population has replaced itself. This means the size of a population would not increase or decrease. It would stay about the same.</i>
What might happen if, on average, each male and female Monarch butterfly left fewer than two offspring that are able to reproduce?
<i>If fewer than two successfully reproducing offspring survive to the next generation then the population declines or decreases in size. If this pattern over a period of time, the insect might become extinct. There are many factors that influence whether or not a population becomes extinct.</i>
What are some of the hazards for Monarch butterflies that are caused by people?
<i>Some people-made hazards include herbicides, insecticides, motor vehicles, and mowers.</i>