

Drought and DNA

Trace how inherited variation can change a plant population.

LS.11.a "mutation, adaptation, natural selection, and extinction change populations;"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Circle the words **mutation**, **natural selection**, **adaptation**, and **extinction**. Underline the nearby sentence that explains how each process changes, or can change, a population.

Silver-Leaf Plants in a Drying Grassland

- ① On a dry grassland, a population of silver-leaf plants grew from seeds scattered by wind. Most plants lost water quickly through their leaves. During cell division, a random mutation occurred in one seedling's DNA. The change caused that plant to grow a slightly thicker waxy coating on its leaves. The mutation did not appear because the weather was dry or because the plant needed it. It was an inherited variation that could be passed to offspring.
- ② Several years later, a long drought dried the soil early each summer. Plants with the thicker coating lost less water and were more likely to survive long enough to make seeds. They did not choose this trait. Because they produced more offspring than plants with thinner coatings, the mutation became more common over many generations. Natural selection had changed the population. The population's greater ability to survive dry conditions was an adaptation, not a change that happened to every individual during its lifetime.
- ③ Not every population can adapt quickly enough. On a nearby hillside, the same kind of plant had no seeds carrying the waxy-coating mutation. When an unusually severe drought lasted for four years, its plants died before producing new seeds. No members of that hillside population remained, so that population became extinct. Extinction removes a population or species from an area, while natural selection changes the traits that are common among survivors. Mutations supply variations, but environmental conditions affect which variations persist.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 What caused the thicker waxy coating to appear in one seedling, and could that trait be passed to offspring?

2 Why did plants with thicker waxy coatings become more common during the drought?

3 Why does the passage describe the thicker waxy coating as an adaptation?

4 What happened to the hillside population, and what conditions led to that result?

3 YOUR TURN _____ Your own words

Invent a new population and an environmental change. Write 4 or 5 sentences explaining a random inherited mutation, how natural selection changes trait frequency, the resulting adaptation, and a possible extinction if no helpful variation remains.

PART 1 • READ AND MARK

Circle the words **mutation**, **natural selection**, **adaptation**, and **extinction**. Underline the nearby sentence that explains how each process changes, or can change, a population. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What caused the thicker waxy coating to appear in one seedling, and could that trait be passed to offspring?	A random mutation in the seedling's DNA caused the thicker coating. The inherited variation could be passed to offspring.
2	Why did plants with thicker waxy coatings become more common during the drought?	They lost less water, survived long enough to make more seeds, and produced more offspring than plants with thinner coatings. Over generations, natural selection made the mutation more common.
3	Why does the passage describe the thicker waxy coating as an adaptation?	It increased the population's ability to survive dry conditions over generations. It was not a trait that every individual developed during its lifetime.
4	What happened to the hillside population, and what conditions led to that result?	The hillside population became extinct because it had no seeds with the waxy-coating mutation, and a severe four-year drought killed plants before they produced new seeds.

PART 3 • YOUR TURN (SAMPLE ANSWER)

In a population of pond fish, a random DNA mutation gives some fish larger gills. When warm water holds less oxygen, fish with larger gills survive and reproduce more often, so natural selection makes the mutation more common over generations. Larger gills become an adaptation in this population because they help many fish survive the low-oxygen water. If oxygen levels fall so far that no fish can survive and reproduce, the population could become extinct.

Accept scientifically accurate examples that clearly distinguish a random inherited mutation from a trait gained during life. In the open response, look for a cause-and-effect explanation of mutation, natural selection, adaptation, and possible extinction.