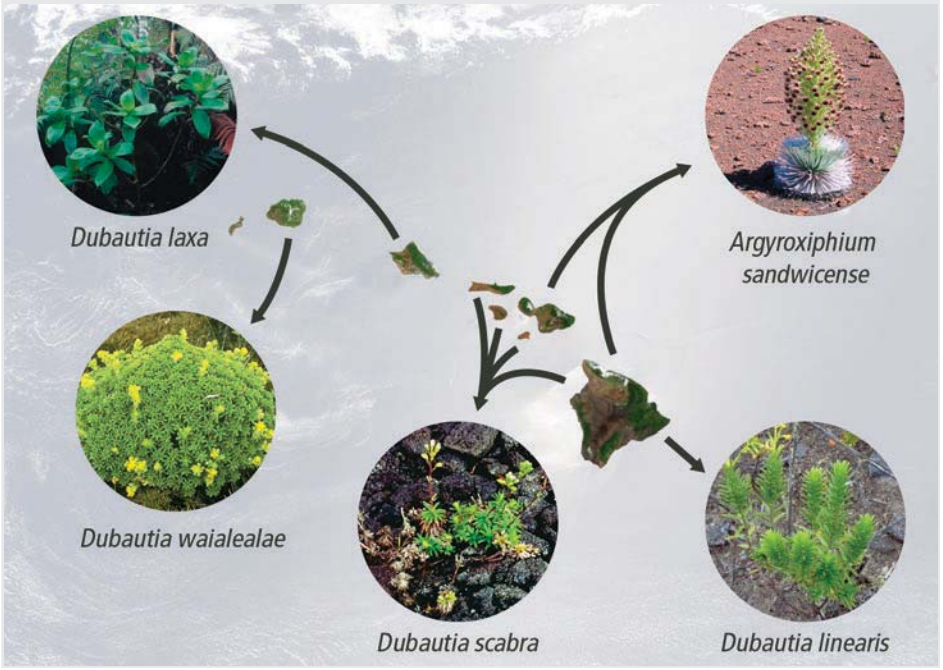
Lesson Self-Check

CAN YOU EXPLAIN IT?

FIGURE 16: Plants in the silversword alliance are descendants of a common ancestor.



The silversword alliance in the Hawaiian Islands is the product of the adaptive radiation of a tarweed ancestor. Each species in the silversword alliance is adapted to use a particular ecological niche. The radiation has caused extreme differences in the characteristics of each plant even though they are all very closely related.

Explain The plants in the silversword alliance have a common ancestor. Refer to the notes in your Evidence Notebook to explain how they developed different characteristics. In your answer, consider how changes or differences in the environment affect the emergence and disappearance of species.

Scientists think that this plant family came from a species similar to Muir's tarweed. This alpine shrubland species is found in California and Mexico. It has barbed fruits, and scientists think that it might have been carried to Hawaii by a bird. Over the course of millions of years, this single ancestral species evolved into over 30 separate species.

Three distinct lines of genetic evidence—including analyses of nuclear ribosomal DNA, chloroplast DNA, and a comparison of two specific developmental gene sequences—support the idea that this group of plants came from a mainland ancestor. Because there were so few species that originally colonized the newly formed Hawaiian Islands, there were plenty of habitats open to new species. Over time, the original tarweed species adapted to the conditions in these different environments, leading to a diversification of characteristics. Each plant is well adapted to its habitat as shown by their diverse sizes and shapes, ranging from small shrubs and mat-like formations to large trees and vines.

CHECKPOINTS

Check Your Understanding

1. Two tree species that grow on the Monterey Peninsula in California are very closely related. However, they have different pollination periods. Which type of reproductive isolation do these two tree species exhibit?
   - **a.** adaptive radiation
   - **b.** geographic isolation
   - **c.** temporal isolation
   - **d.** physical isolation

2. What environmental changes caused by climate change may be leading to the extinction of corals? Select all correct answers.
   - **a.** extreme weather
   - **b.** air pollution
   - **c.** ocean acidification
   - **d.** rising sea temperature

3. What adaptations in an isolated population would likely contribute to speciation? Select all correct answers.
   - **a.** higher-pitched alarm call
   - **b.** adoption of daytime feeding over nighttime feeding
   - **c.** female enzyme targets eggs fertilized by individuals outside of the isolated populations
   - **d.** development of different sexual anatomy
   - **e.** higher temperature range tolerance

4. Why are island systems favorable to adaptive radiation?

5. How can extinctions and expansions occur in the same habitat? Explain your answer.

6. Give examples of how climate change may lead to the emergence, expansion, and extinction of species.

7. Draw a map that shows a parent population, a geographically isolated population, a behaviorally isolated population, and a temporally isolated population of the same species.

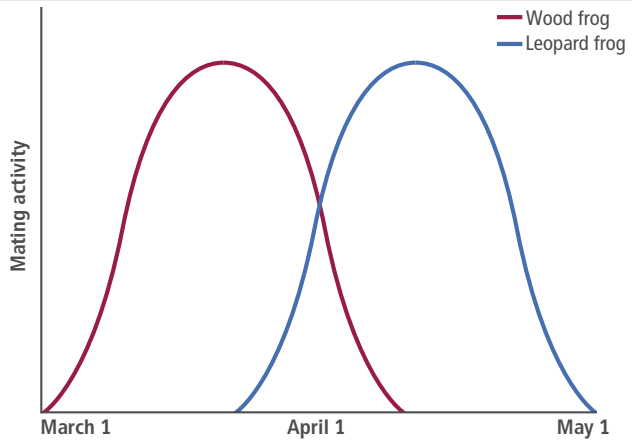
8. What are some of the causes of background and mass extinctions?

9. What process keeps the number of total species on Earth from growing exponentially through speciation?

10. Use the following words to complete this statement:
    adapted, common ancestor, niches
    A species of lizard arrived on an island after a big storm. The population expanded into all of the empty _____ on the island. Speciation occurred as populations _____ to different environments. Over 20 descendant species trace their lineage back to a _____.

Use the graph in Figure 17 to answer Question 11.

FIGURE 17: Reproductive Isolation



11. Wood frogs and leopard frogs are found in the same ecosystems, but they do not interbreed. Use evidence from the graph to explain what type of reproductive isolation these frogs exhibit.

MAKE YOUR OWN STUDY GUIDE

In your Evidence Notebook, design a study guide that supports the main idea from this lesson:

Changes in the environment can lead to the emergence of a new species, the expansion of some species, and the extinction of some species.

Remember to include the following information in your study guide:

- Use examples that model main ideas.
- Record explanations for the phenomena you investigated.
- Use evidence to support your explanations. Your support can include drawings, data, graphs, laboratory conclusions, and other evidence recorded throughout the lesson.

Consider how cause and effect is demonstrated by the sequences of events that lead to speciation, expansion, and extinction.