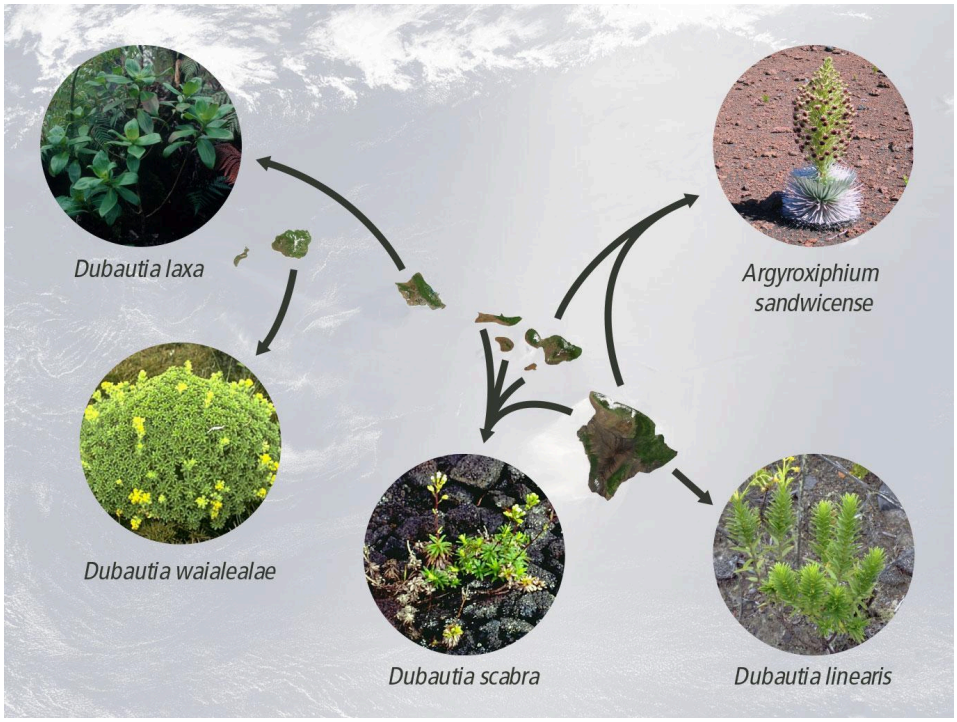
Lesson 9.2: Changes in Species

Objective	• Evaluate the evidence supporting claims that changes in environmental conditions may result in: 1) increases in the number of individuals of some species, 2) the emergence of new species over time, and 3) the extinction of other species.

Engage



If you were asked to compare the plants in the photos, you might note that they look very different from one another. These plants are all members of the *silversword alliance*, a group of over 30 related species native to the Hawaiian Islands. Like other groups of related species, the silversword alliance shows huge variety in appearance even though the plants are closely related. In fact, all of the plants in this group are thought to be descended from a single tarweed species found in the dry shrublands of California and Mexico.

Predict: *These plants have a common ancestor.* ***How did they develop different characteristics?***

Exploration 1: Mechanisms of Speciation

What is a ***species***?

What evidence do we have that species change over time?

Speciation (p. 435)

What is ***speciation***?

How does speciation work? Use an example to explain.

How can physical separation cause speciation?

Reproductive Isolation (p. 436-437)

_____ _____ occurs when members of different _____ can no longer _____ successfully.

Complete the table describing the types of isolation that may lead to reproductive isolation.

Isolation	Description	Example
Geographic/ Physical		
Behavioral		
Temporal/ Timing		

Adaptive Radiation (p. 438)

_____ through the _____ of one _____ species into many _____ species is called _____ _____.

What is one example of ***adaptive radiation***?

For adaptive radiation to take place, there must be _____ by a species that leads to _____ .

How did the extinction of the dinosaurs trigger the adaptive radiation of mammals?

Identify which type of isolation is being described in each example.

G = Geographic T = Temporal B = Behavioral

1. _____Two species of fireflies have a unique pattern of flashes that attracts a mate.
2. _____Two species of plants sprout from the ground at different months of the year.
3. _____Two species of frogs call from the water at the pond's edge for a female.
4. _____Two species of squirrels get stranded on either side of a grand canyon.
5. _____Two species of mountain lions live in a forest on either side of a large river.
6. _____Two species of song birds call from a tree for a potential mate.
7. _____Two species of bowerbirds construct elaborate nests to attract a mate.
8. _____Ten species of finches live on the Galapagos Islands.
9. _____Two species of foxes mate in different seasons.
10. _____Two species of beetles come out at different times of day.

Exploration 2 & 3 – Expansion & Extinction of Species

Climate Change & Species Adaptation

After watching the video Can Wildlife Adapt to Climate Change (4:46), answer the questions below.

1. What is the genetically dominant form of plumage in tawny owls?

   A. Brown
   B. White
   C. Purple
   D. Grey

2. What environmental Change has driven pitcher plant mosquitoes to delay dormancy?

   A. More water
   B. Warmer temperatures
   C. More pitcher-plants
   D. Longer Days

3. How are wild thyme plants evolving in response to climate change?

   A. Growing higher on the hillside
   B. Producing more herbivore-repellent oils
   C. Producing more flowers
   D. Producing more seeds

4. How many species have been identified as evolving in response to climate change?

   A. 20
   B. 55
   C. 6.7 Million
   D. 200

5. How are humans helping wildlife adapt to climate change?

   A. Helping species move to better climates
   B. Setting aside climate refuges for protection
   C. Updating existing parks to account for climate change
   D. All of the above

6. How do you think "plastic", or non-heritable, changes like those listed in the lesson could help organisms adapt to climate change? How do you think they may be limited?

7. Some organisms may not be able to evolve fast enough to climate change to survive. How might this affect this biodiversity on Earth and why is this so important to consider?

8. Humans will have to adapt to climate change too. Predict the future for those people living in areas that will be most affected (e.g. coastal areas, those in warmer climates, Arctic areas).

Natural _____ changes such as droughts can lead to the _____ of a species' range.

Increasing Populations (p. 439)

Read the example involving the barred owl. Why has the range that it lives in expanded over time?

What change occurs in the range of the barred owl after it moved through Canada's boreal forests in the 1940s?

Climate Change and Species Expansion (p. 440)

How can climate change lead to the expansion of a species?

How have the grizzly territories changed?

How are polar bears threatened by the expansion of the grizzlies?

Extinction of Species

What is ***extinction***?

Complete the table to compare background extinctions and mass extinctions.

Background Extinction	Mass Extinction

Evidence shows that _____ does not always move at the same _____.

How many mass extinctions does the fossil record show have occured in the past 600 million years?

Climate Change and Extinction (p. 443)

Why do scientists believe we are already undergoing a mass extinction?

Describe how the following changes are problematic for existing species:

- Increasing Sea Temperature

- Ocean Acidification

- Extreme Weather Events

What is ***coevolution***?

Give at least one example of each type of coevolution.

- *Evolutionary Arms Race*

- *Patterns in Speciation*

In _____, natural selection forms _____ structures and _____ in organisms that are not closely related.

1. The process in which a single species or a small group of species evolves into diverse forms that live in different ways is called

A. coevolution.
B. adaptive radiation.
C. macroevolution.
D. convergent evolution.

2. The process by which unrelated organisms come to resemble one another is

A. coevolution.
B. adaptive radiation.
C. macroevolution.
D. convergent evolution.

3. What contributed to the adaptive radiation of mammals?

A. the evolution of plants
B. the decrease in ocean depth
C. the extinction of most dinosaurs
D. continental drift

4. Which of the following is an example of convergent evolution?

A. bird's wing and fish's fin
B. shark's fin and dolphin's limb
C. human's arm and bird's wing
D. human's leg and dolphin's limb