

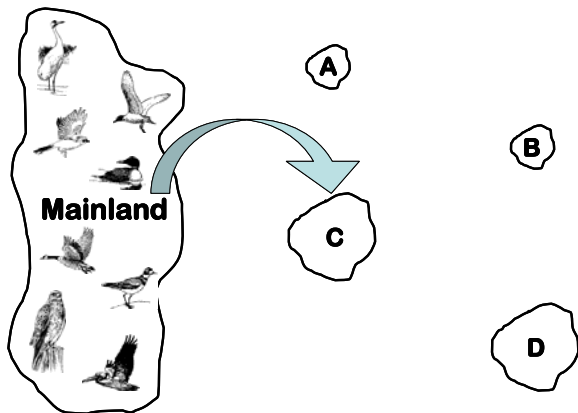
ISLAND BIOGEOGRAPHY

The study of biogeography attempts to explain why species are distributed as they are and why diversity (number of species) varies from one place to another. One area of biogeography investigates the relationships surrounding diversity on islands. Islands can be oceanic (like the one on the right), or more generally, they can be a patch of habitat surrounded by a different type of habitat. Mountain tops are great natural examples of habitat islands, and forest fragments are a common unnatural example resulting from urban land development. As humans continue to develop the landscape, more habitat islands or fragments will be created, and the principles of island biogeography will continue to be useful for species conservation.



The theory of island biogeography (*put forth by MacArthur and Wilson in 1967*) predicts the number of species on an island. The number of species on an island is affected by island size and distance from the nearest neighboring island or mainland.

Visualize four islands that differ in their size and distance from a mainland. Picture different bird species leaving the mainland and colonizing each of the islands.



Which island should have more species,

Island A or B? A (closer)

Island C or D? C (closer)

Island A or C? C (larger)

Island B or D? D (larger)

Don't know? The activity will help.

(Discuss answers now or after activity. Using a target analogy helps. Large and close targets get "hit" more than small and far targets. More "hits" leads to more species.)

Objective:

To simulate species dispersal on islands which vary in size and distance from mainland (source populations) to actively learn the principles of island biogeography.

Materials:

- 2 small rugs (islands)
- 2 large rugs (islands)
- Duct tape (to mark mainlands)
- Measuring tape, ruler, or yardstick to measure out distances
- Approximately 150 (10 per student) marbles (species)

Instructions:

- 1) Pick four locations within the classroom to serve as mainlands, where students will sit. Mark these locations with duct tape, a chair, book, or another object.
- 2) From two of the mainlands, measure out a distance of 5.5 ft and place a small rug at one of these locations and a large rug at the other. From the other two mainlands, measure a distance of 11 ft and place the remaining two rugs at each of these spots.
- 3) Assign students to each of the four mainland locations in an equal distribution.
- 4) Distribute 10 marbles to each student.
- 5) Explain to students that they are to roll (on the ground; no throwing) each of their marbles (one at a time) towards their island.
- 6) Explain to students that if a marble is knocked off of the island by another marble, this species goes extinct.
- 7) When each group is finished, have them report the number of species that successfully colonized their island.
- 8) Then have students collect their marbles from their islands. Each student should again have 10 marbles.
- 9) The students are to then go to the next island on their right and repeat the activity.
- 10) This rotation will be completed when students visit each of the four islands once.
- 11) When the activity is completely over, add the numbers of species that made it to each of the islands and place these four values in a table on the board.
- 12) Ask the students to complete the graph they are given on their handout, labeling the y-axis and creating bars to represent the values found for each island.
- 13) Discuss the resulting pattern.

Discussion Points:

- 1) Given the resulting pattern, how does decreasing island size affect the number of species? (*fewer species on smaller islands*) How does increasing the distance from island to mainland affect the number of species? (*fewer species on more distant islands*)
- 2) How might the principles of island biogeography apply to species conservation? (*As humans develop the landscape, habitat islands or fragments are left behind. These fragments are almost always smaller in size and further apart and thus contain fewer species. Sometimes habitat corridors are used to compensate for increases in fragment distance resulting in species loss.*)

- 3) There are many other examples of island habitats in nature beyond mountain tops and forest fragments. In the eastern part of the U.S., glades are a common type of island habitat. Glades are fire-maintained, prairie-like, island habitats that exist in a “sea” of forest (pictured below). Regulation of natural and man-made fires has resulted in the loss of these island habitats, and many of the unique plants and animals that can only be found in glade habitats in the eastern U.S. are threatened by extinction. If you had the opportunity to preserve some glade habitat to prevent species from going extinct, would you choose to preserve a single large glade habitat or several small habitats?
(There is no wrong answer, if justified. Generally, different species conservation goals require different preservation strategies. More specifically, with respect to the current exercise, larger glade habitats will preserve more species than small glade habitats unless different species exist on different small glades. In that case, preserving many small glades, each with different species, might conserve just as many species as a single large glade.)

