Simulation of Habitat Islands Lab

Introduction:
Habitats, of various types, once covered thousands of acres of land in the United States and many other countries. These habitat areas are being reduced to small fractions of their original size as humans turn more wild lands into urban and suburban areas, farms and pastures, highways, and other areas. These habitat "patches" are like islands of safety for the animals and plants that need the area to survive; these organisms are often surrounded by a sea of unsuitable habitat. When a habitat is fragmented like this, it becomes a series of little habitat islands that are various sizes and various distances from each other. There is often a larger habitat area that serves as a source of new individuals for the smaller habitat islands.   For islands in the ocean, the mainland would serve as a source of new individuals. For habitat islands on land, national forests may serve as a source of new individuals. There are 156 protected national forests in the U.S., such as the Ocala National Forest. A national forest might serve as a source population of squirrels that migrate through farmland in order to reach the forest habitat islands.

1.   Explain what is meant by habitat islands.
2.   What role do larger habitat areas play in maintaining biodiversity within the habitat islands?

Lab Simulation:
A 10,000 acre part of the Ocala National Forest has been leased to the Igotubabe Lumber Company. As part of the leasing agreement, the lumber company agrees to leave a 1,000 acre island in the center of the forest uncut. In addition, they will leave several patches of forest totaling about 1,000 acres uncut.

Your group will be the forestry science team appointed by the government to determine what kind of forest islands are the most desirable in order to save native fauna and flora, which may migrate between habitat islands. Your choices are:
   A. islands that are near the source population and small in size
   B. islands that are near the source population and large in size
   C. islands that are far away from the source population and small in size
   D. islands that are far away from the source population and large in size

Your team will use the following materials to carry out the biogeography simulation:
100 organisms = "counters" (beans) and Habitat Island Patterns (circles). The "counters" represent individuals of a migrating species that have ventured out to the islands from the source population. The chances of a counter landing on a paper island represent the same chances a migrating organism has of colonizing a real habitat island.

3. Hypothesize which island you think will have the greatest species diversity (species richness) and the greatest species abundance.

4. What is the difference between species diversity and species abundance?

5. Rank the four types of islands (A, B, C, and D in the list above) in the order you think they should be ranked, from the one you expect to have the most species surviving to the one you expect to have the least species surviving. Writing A, B, C, and D are fine, unless you want to write it all out.
   1. _____
   2. _____
   3. _____
   4. _____

Procedure:

- Cut out the circles described below:
    Brown = largest circle = Source population = 10 inches diameter
    Green and Yellow = two medium sized circles (7 inches diameter): Green = near, Yellow = far
    Blue and Red = two small circles (both 4 inches diameter): Blue = far, Red = near

- Find a spot on the floor where you have room to work. Place/tape down the circles in the following manner:
    o Brown circle in center of area
    o Red Circle 1 inch due North of Brown circle
    o Green Circle 1 inch due West of Brown circle
    o Yellow Circle 6 inches due South of Brown circle
    o Blue Circle is placed 6 inches due East of Brown circle.

- Hold all the counters (beans) in a cup **one meter** above the center point of the Source Population. Drop all the counters.
- Record the number of counters that land on each of the islands. These are organisms that made it to the island and survived. Counters that did not land on an island are organisms that encountered unsuitable habitat. For example, a forest mouse may get eaten by a hawk while crossing farmland.
- Put all of the counters (beans) back into your cup.
- Drop the counters and record the number that landed on each island four more times. Once you have done this, find the average number of counters that landed on each island.

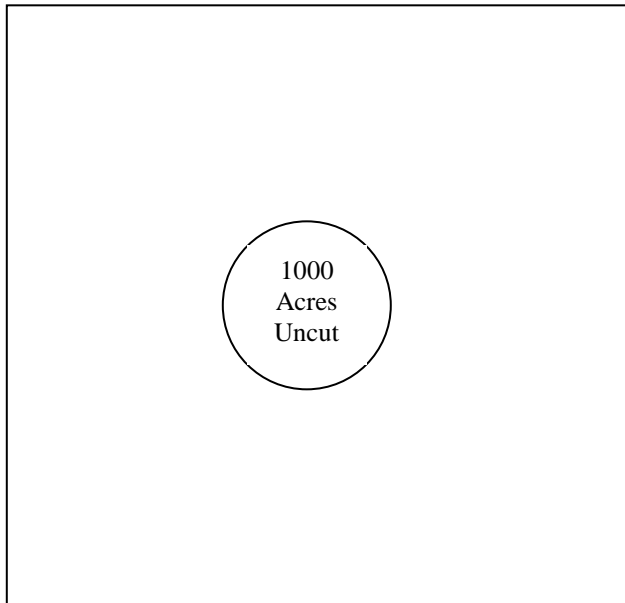| Drop Number	Brown	Green	Yellow	Blue	Red	Number Died
1						
2						
3						
4						
5						
AVERAGE						

Data Analysis:

6. Rank the four types of islands again this time based on your own data. The island, on which the most counters landed, on average, is the island that has the highest species survival, and the island, on which the least counters landed, on average, is the island that has the lowest species survival. You will provide this data to the government to support your recommendations for the national forest.
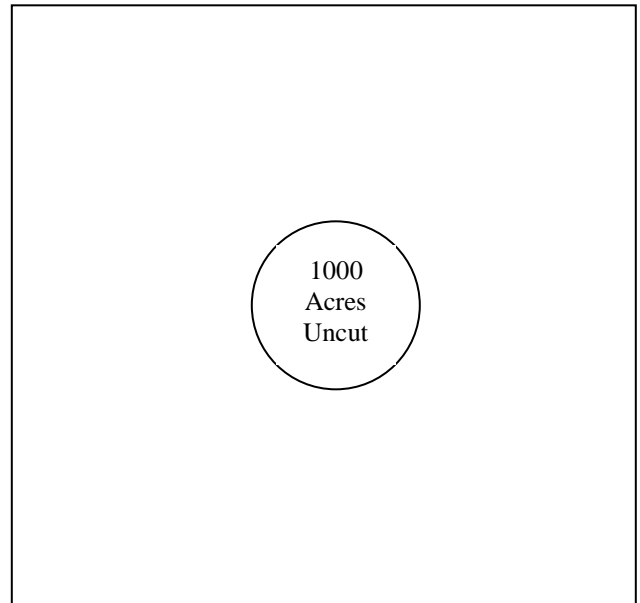NEW DATA DRIVEN RANKINGS
1. _____
2. _____
3. _____
4. _____

7. Does your data support the distance effect of Island Biography Theory? Explain. (Page 316)

8. Does your data support the area effect of Island Biography Theory? Explain. (Page 316)

9. A 10,000 acre part of the Ocala National Forest has been leased to the Igotubabe Lumber Company. As part of the leasing agreement, the lumber company agrees to leave a 1,000 acre island in the center of the forest uncut. In addition, they will leave several patches of forest totaling about 1,000 acres uncut.   Using what you learned in this activity, provide the Igotubabe Lumber Company your recommendation for the distribution of the uncut acres.   As part of your recommendation, draw TWO aerial view maps that show the location of the uncut areas. MAP 1 should show where you propose the uncut acres be located in order to increase biodiversity. MAP 2 should provide a "what NOT to do" example to the Lumber Company.

MAP 1

MAP 2

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│                      │        │                      │
│        ╭────╮        │        │        ╭────╮        │
│        │1000│        │        │        │1000│        │
│        │Acres        │        │        │Acres        │
│        │Uncut        │        │        │Uncut        │
│        ╰────╯        │        │        ╰────╯        │
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10. Give three reasons why it is important to preserve biodiversity. (Pages 310-312)