

MAP 4484 Modeling in Mathematical Biology: Spatial Ecology

1. Given a population of animals in a two-dimensional habitat, calculate the probability of an animal being found in a given area.

Solution: The probability of an animal being found in a given area can be calculated using the density of the population and the size of the area. The probability is equal to the density of the population multiplied by the size of the area.

2. Calculate the expected number of animals in a given area given the population density and the size of the area.

Solution: The expected number of animals in a given area can be calculated using the population density and the size of the area. The expected number is equal to the population density multiplied by the size of the area.

3. Determine the optimal habitat size for a given species given the population density and the size of the area.

Solution: The optimal habitat size for a given species can be determined by calculating the carrying capacity of the habitat. The carrying capacity is the maximum number of individuals that can be supported in a given area. The optimal habitat size is the size of the area that can support the maximum number of individuals.

4. Calculate the dispersal rate of a species given the population density and the size of the area.

Solution: The dispersal rate of a species can be calculated using the population density and the size of the area. The dispersal rate is equal to the population density divided by the size of the area.

5. Determine the optimal dispersal rate for a given species given the population density and the size of the area.

Solution: The optimal dispersal rate for a given species can be determined by calculating the dispersal rate that maximizes the population growth rate. The optimal dispersal rate is the rate that maximizes the population growth rate.

6. Calculate the expected number of animals in a given area given the population density, the size of the area, and the dispersal rate.

Solution: The expected number of animals in a given area can be calculated using the population density, the size of the area, and the dispersal rate. The expected number is equal to the population density multiplied by the size of the area multiplied by the dispersal rate.