# Answers to Exercise 31
Edge Effects and Ecological Traps

1. The total population increases exponentially and does not reach *K* within 50 years. This positive growth occurs because there is a significant amount of core habitat, and 80% of the juveniles attempt to breed in the core habitat where birth and survival rates are high. Equilibrium is not reached within 50 years because neither habitat type reaches *K*. At first, the population size decreases in the edge habitat, and slightly increases in the core, indicating that the core is functioning as a source habitat and the edge is functioning as a sink. By Year 9 the edge population begins to increase.This is because at this point, there are enough juveniles produced in the system so that the 20% preferring edge habitat more than offsets the mortality of adults in the edge habitat, causing the population in the edge to increase.


Population Size with a Post-Breeding Census
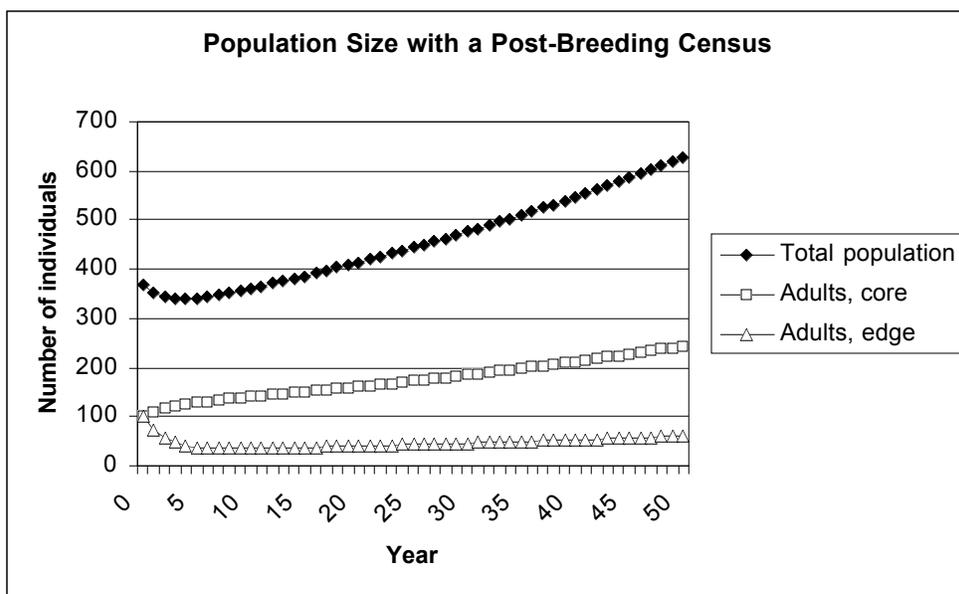
2. When the selection for core habitat is 0.7, the entire system declines to extinction.

Population Size with a Post-Breeding Census
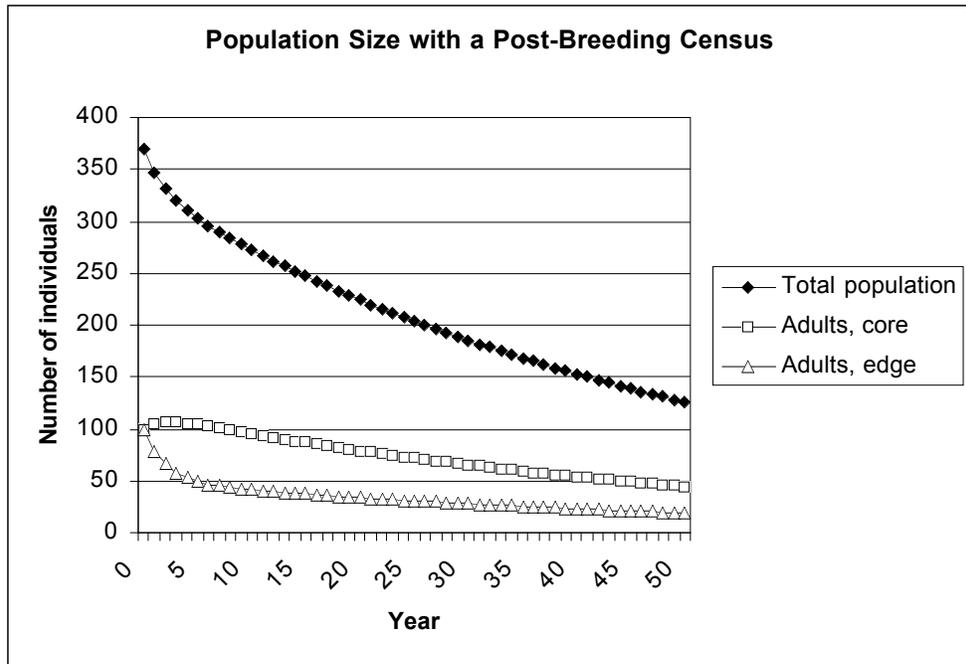
This indicates that enough of the new adults actively seek edge for breeding, which places enough individuals in the edge habitat so that the whole system does not produce enough young to sustain the population. In this case, the sink edge habitat functions as a trap and "drains" the population away from core habitat, leading to extirpation.

3. When $b = 2.0$ the population goes extinct. When $b = 2.5$ the population increases exponentially in the 50 year period. When $b = 2.75$ the population reaches K. With a substantial number of young being produced in the core, and 50% of these individuals seeking breeding territories in the edge, K is reached first in the edge habitat because it is less abundant. The new adults seeking breeding territories in the edge that are unsuccessful then attempt to breed in the core, pushing the core population towards K very quickly.

Population Size with a Post-Breeding Census

New Adults Seeking Breeding Territories in Preferred Habitat
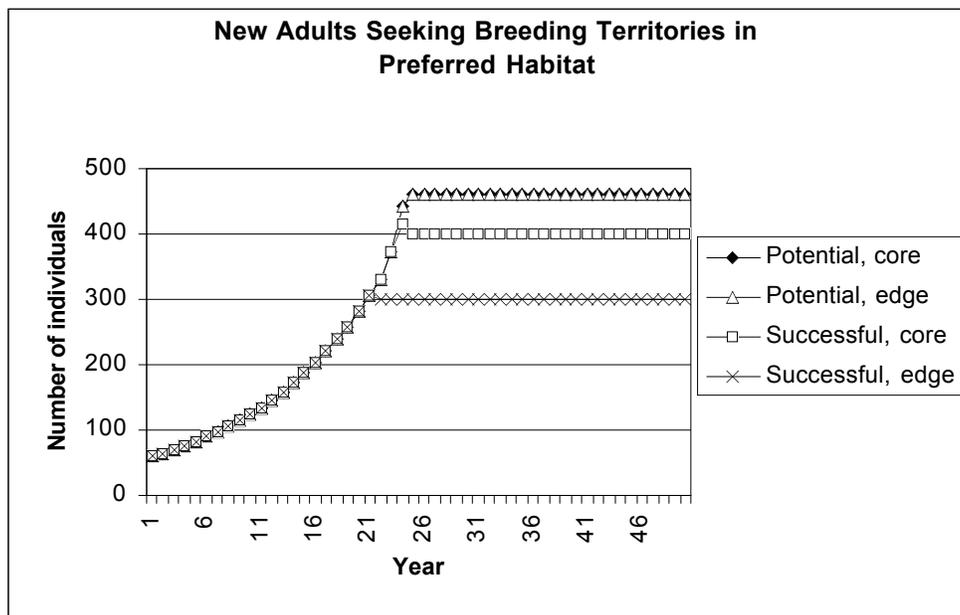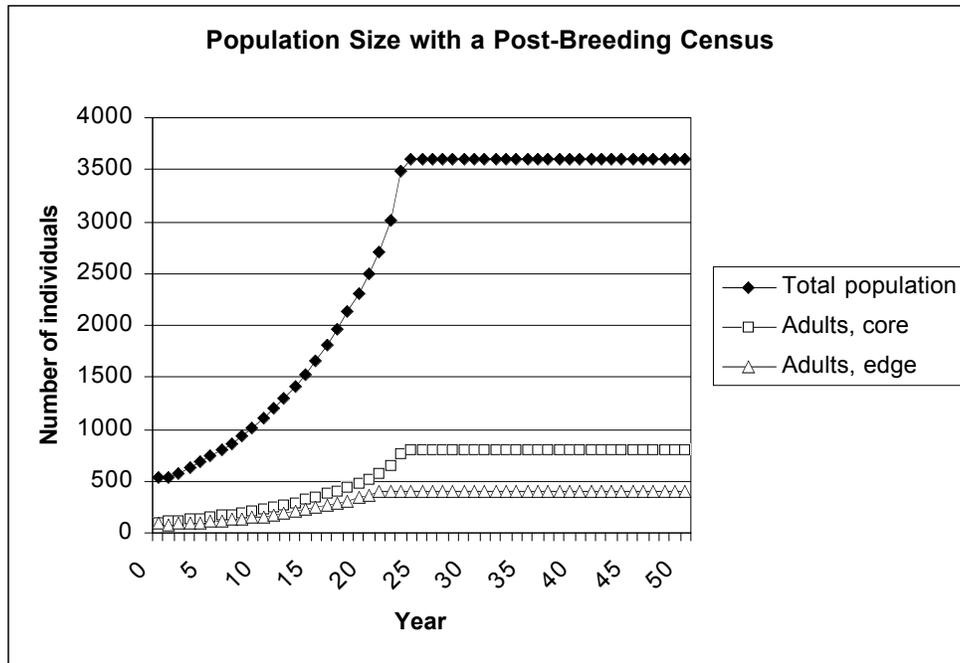
4. Under the conditions given, when the birth rate in the core is 2.75 individuals per individual per year, there must be 420 hectares of core habitat to sustain the population. However, if α is less than 0.42, the population will go extinct. Thus, persistence is very sensitive to habitat selection for the high quality habitat.

Population Size with a Post-Breeding Census