

A wide-angle photograph of a desert landscape. The foreground and middle ground are dominated by sand dunes with distinct, rhythmic ripples. The sand is a warm, golden-brown color. In the distance, the dunes rise into a clear, pale blue sky. The horizon line is low, emphasizing the vastness of the desert. The word "Habitat" is centered in the middle of the image in a white, sans-serif font.

Habitat

What is habitat?

- All those physical attributes of the environment that make an area habitable for a species
- Not a resource, but a sum of all resources for that species
- Differs for each species







Resources

- Something an animal (or plant) needs to grow, reproduce or survive
- Food
- Water
- Shelter (cover)
- Range of environment
 - Temperature
 - Snow
- Species-specific
 - Den/burrow sites
 - Nesting sites



Kirtland's warbler





- Summer █
- All Year █
- Winter █

- Kirtland's warbler nests in young Jack pine stands with grassy openings
- Jack pine requires fire for cones to open and seeds to shed
- Suppression of fires (even natural ones) caused a failure of reproduction of pine
- Nesting habitat disappeared



Nest parasitism



Characteristics of habitat

- Heterogeneous
- Certain habitats raise an individual's fitness while others decrease it
- Individuals can assess habitat quality and select among different patches
- Source-sink dynamics
- Ecological traps

Habitat selection

- Habitat used to a greater extent than its availability = selection
- Habitat used to a lesser extent than its availability = avoidance
- Can be tested statistically

Resource Selection Functions

- Recently developed tool
- Quantifies habitat selection behavior based on habitat characteristics
- Example: rufous bristlebird
 - from point transects, recorded presence (1) or absence (0) of that species
 - recorded locations using GPS
 - characterized habitats at points using GIS
 - using logistic regression modeling of many habitat variables, constructed a model to predict presence of birds based on habitat characters
 - birds preferred vertical complexity in vegetation
 - birds avoided areas far from streams or coasts and areas with bright sunlight
 - conclude birds prefer dense habitat close to water

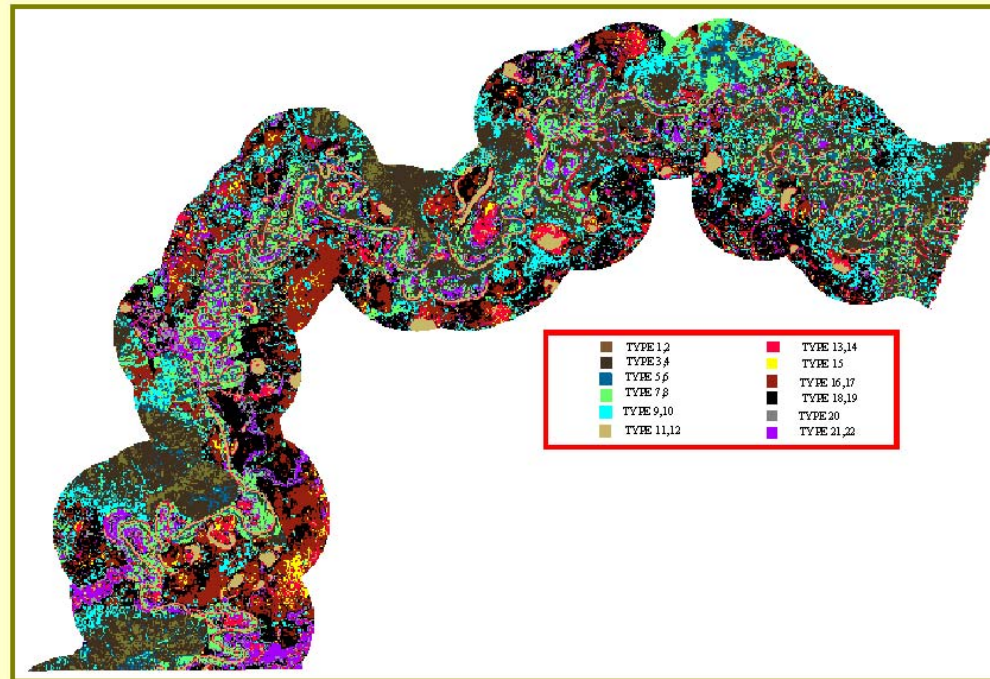
Innoko Moose Example

- Study area:
 - Innoko National Wildlife refuge in Alaska.
- Data:
 - Used locations (within 100m) were moose locations observed during line transect surveys
 - Landsat TM coverages
 - Available locations were a large sample of locations in Innoko NWR
- Reference: Erickson, McDonald, and Skinner (1998) “Resource Selection Using GIS Data: A Case Study”, Journal of Agricultural, Biological, and Environmental Statistic (JABES), v3, p. 296-310



Innoko Moose Example

- Vegetation map (available locations)



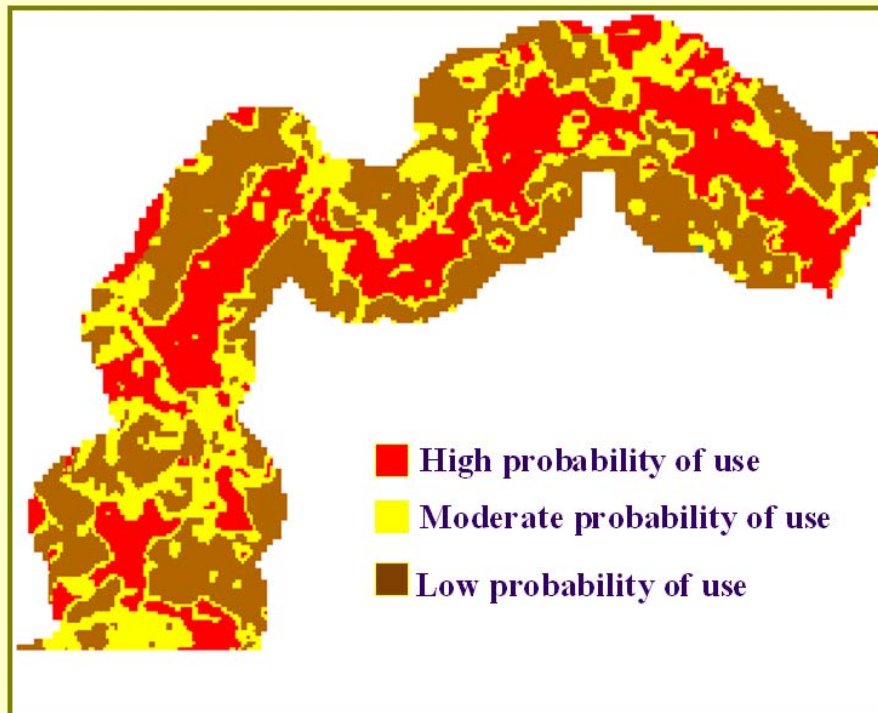
Innoko Moose Example

- 22 habitat variables measured at each location
- Two sample case:
 - 1 sample of used locations
 - 1 sample of available locations
- Assume the sample of available locations was taken first without replacement



Innoko Moose Example

- Results: a map of the HSF



Density dependence

- Everyone wants to be in the good habitat
- Increases competition
- Habitat quality decreases as it becomes more crowded
- What to do?

Ideal free distribution

Fig. 5.9 Schematic diagram of the ideal free distribution. As density in the preferred habitat 1 increases, suitability declines to a point indicated by the light broken line where it equals that in the poorer habitat 2 (60 units). At this point it pays some individuals to use habitat 2.

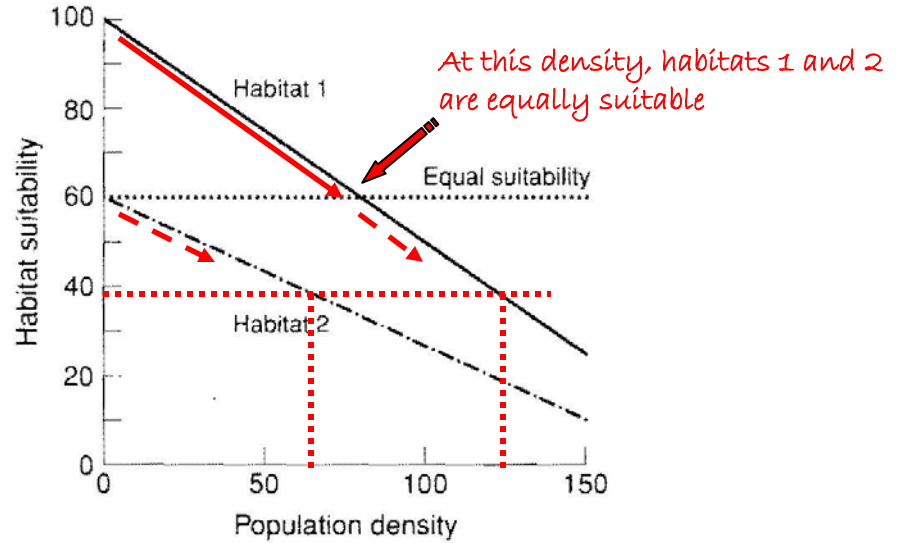
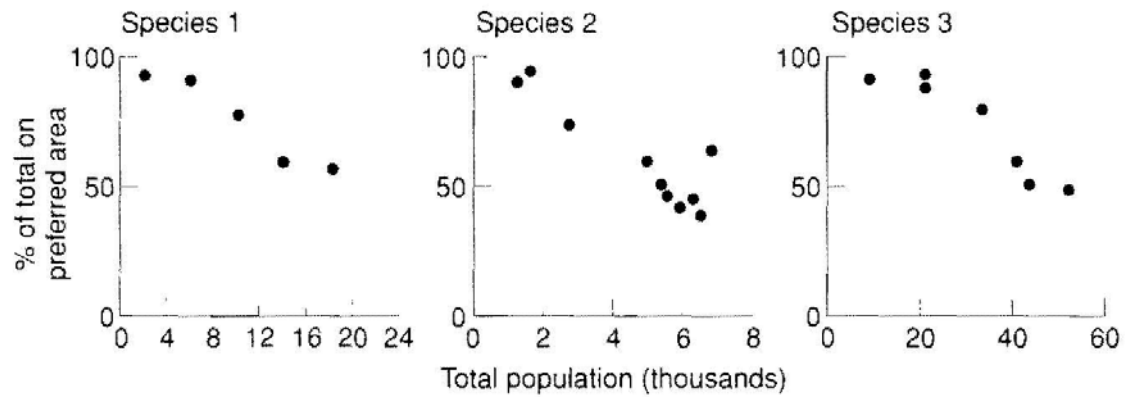


Fig. 5.10 Use of preferred habitats by three different bird species declines as population size increases. (After Sutherland 1996.)



Freedom vs despots

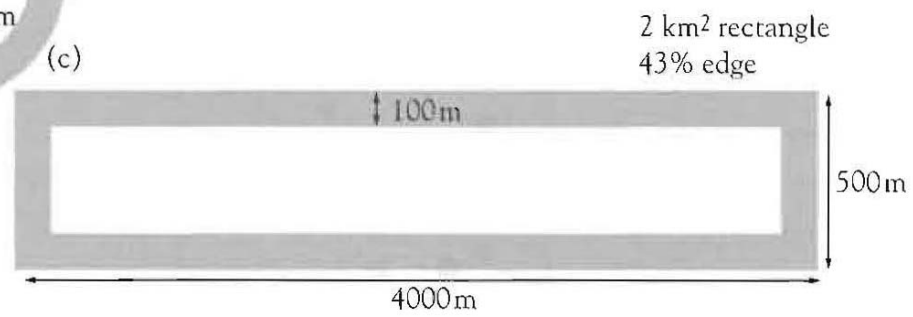
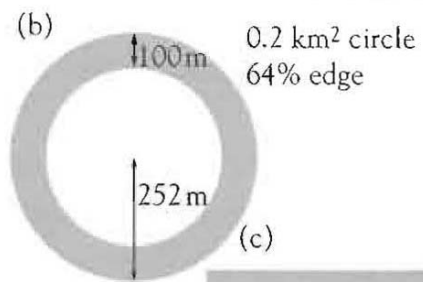
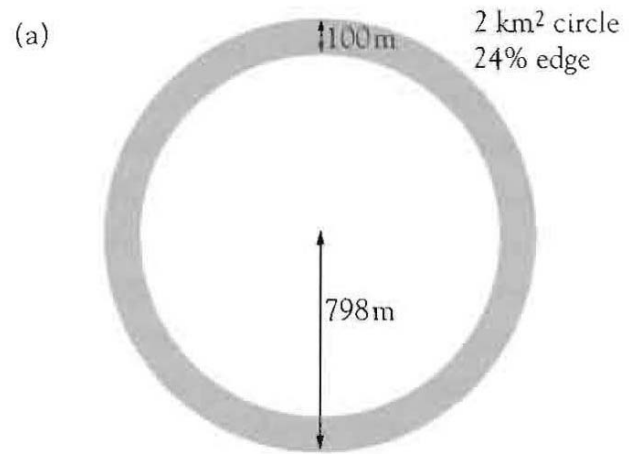
- Ideal free distribution assumes any animal can move in to any habitat patch
- Not really applicable in real world
- Ideal despotic distribution more realistic
- Assumes behaviorally dominant animals will secure best habitats and exclude others to some degree
- Territoriality is the most extreme case

Source-sink dynamics

- Sources are better-quality habitats
 - produce more individuals than habitat can hold
 - creates emigration (dispersers)
- Sinks are poorer-quality habitats
 - serve as habitat for dispersers
 - populations therein exist only as long as there is an immigration source

Edge effects

- Positive effects
 - close juxtaposition of different resources
- Negative effects
 - increased parasitism or predation (cowbirds)
 - increased exposure to abiotic effects



Ecological traps

- attractiveness of a habitat increases relative to its value to animal fitness
- fitness benefit declines while attractiveness remains same
- animal prefers habitat to its own detriment