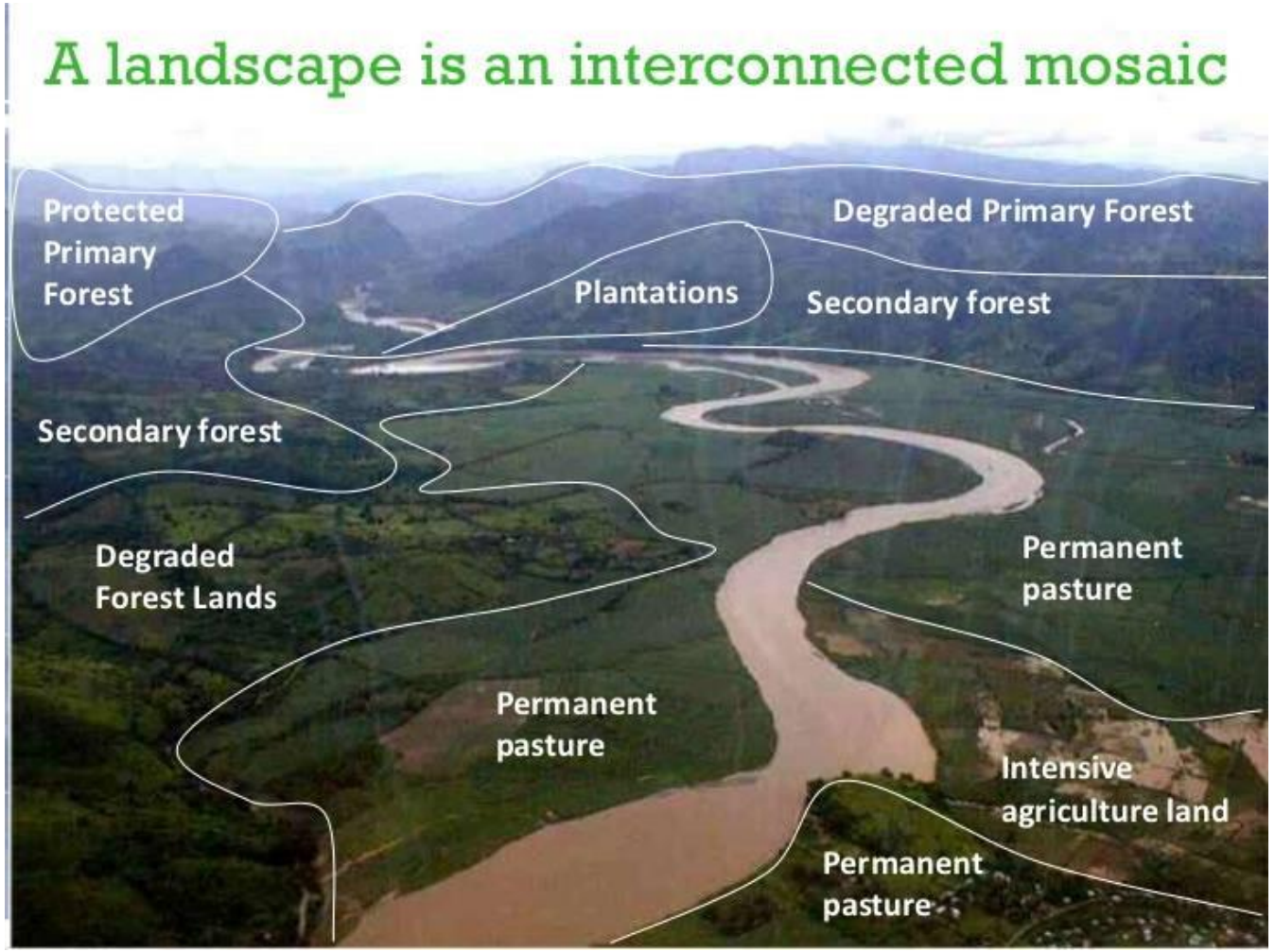
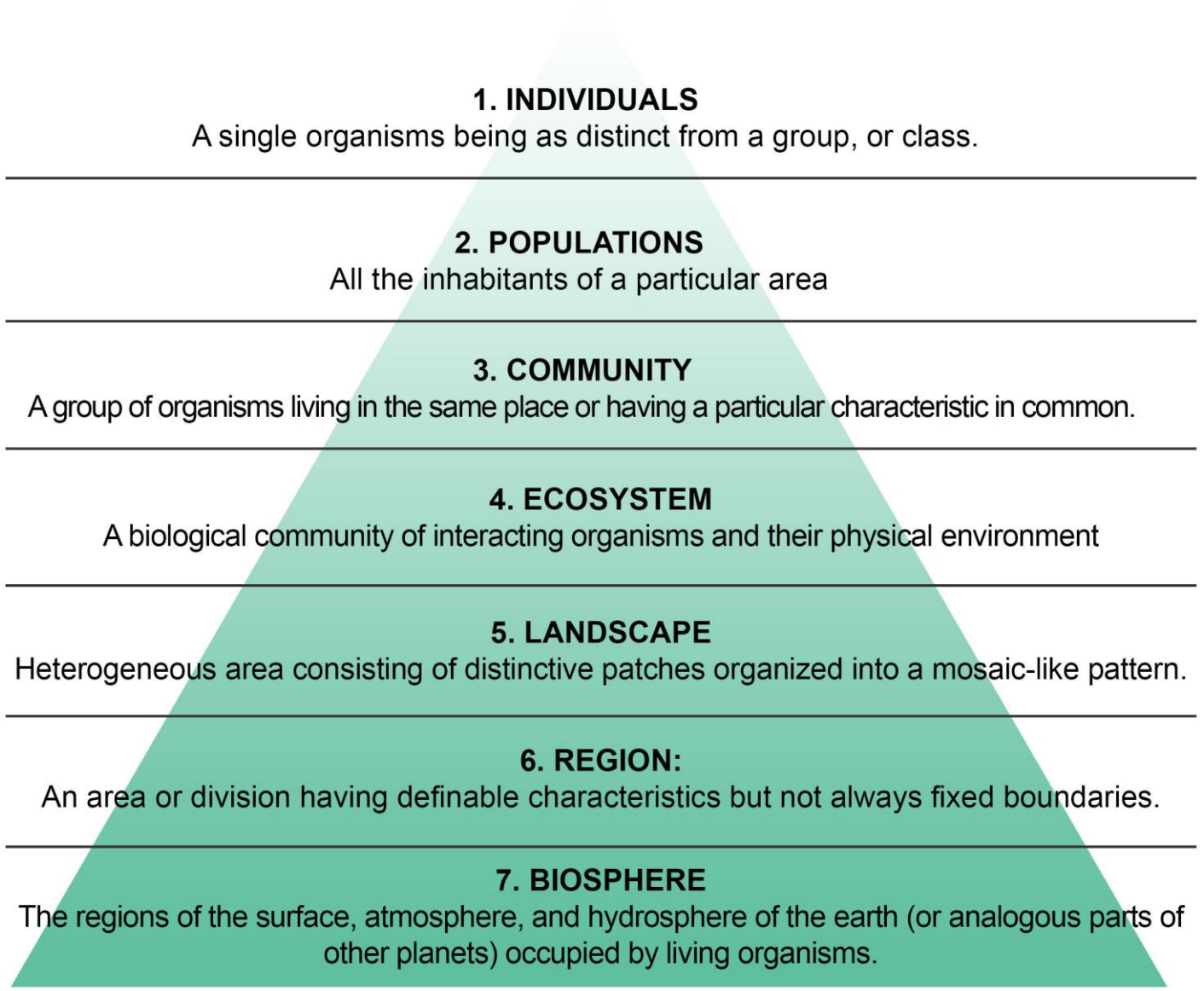
LANDSCAPE ECOLOGY

A **landscape** is a heterogeneous area consisting of distinctive patches—which landscape ecologists refer to as landscape elements—organized into a mosaic-like pattern.



Landscape ecology is defined as "the science and art of studying and influencing the relationship between spatial pattern and ecological processes across hierarchical levels of biological organization and different scales in space and time" (Wu and Hobbs 2007).

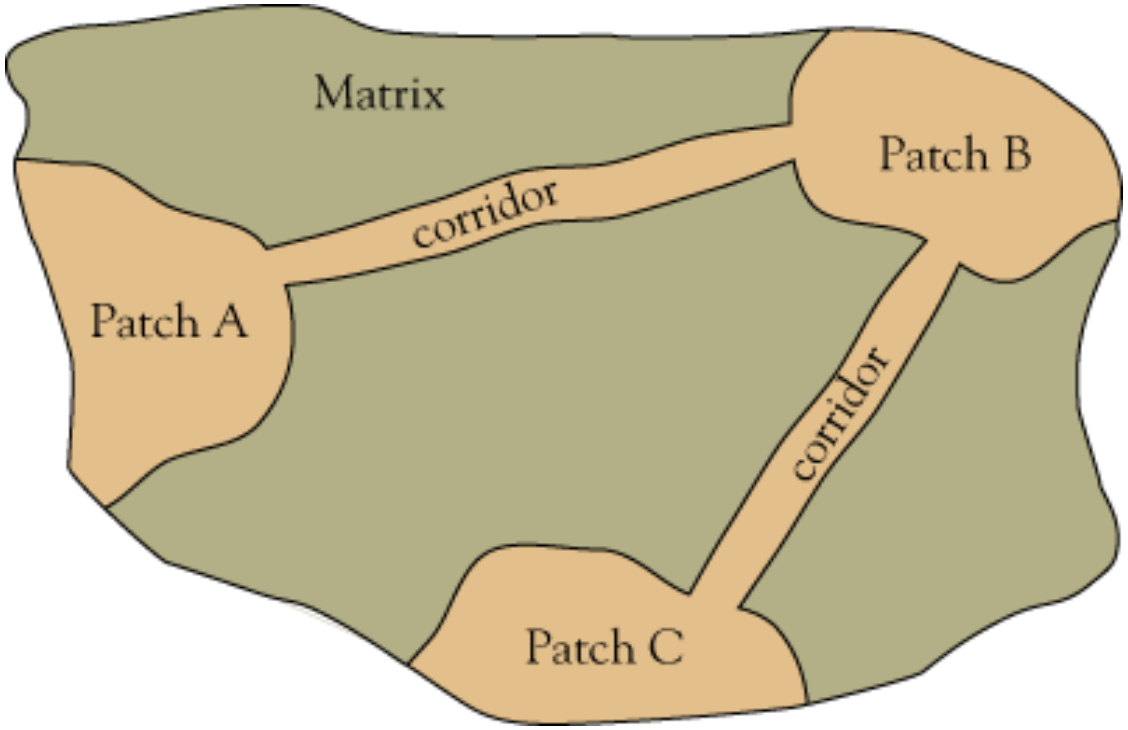


Landscape structure includes the size, shape, composition, number, and position of patches, or landscape elements, in a landscape.

The area can be terrestrial or aquatic

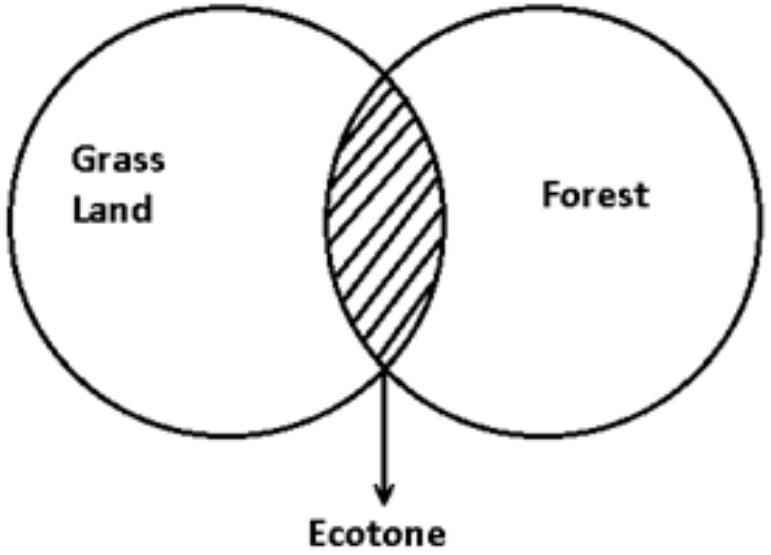
It can be changes from few meter squares to km squares.

A **patch** is a relatively homogeneous area that differs from its surroundings— for example, an area of forest surrounded by agricultural fields. The patches within a landscape form the mosaic that we call landscape structure. The background in this mosaic is called the matrix, the element within the landscape that is the most continuous, spatially.



The edges between agricultural lands and forest habitats are **ecotones**, which are characterized by physical and biological transitions from one ecosystem type to another. Ecotones often support a mix of species from both ecosystems, for which they represent a transition, plus some species unique to the ecotone.

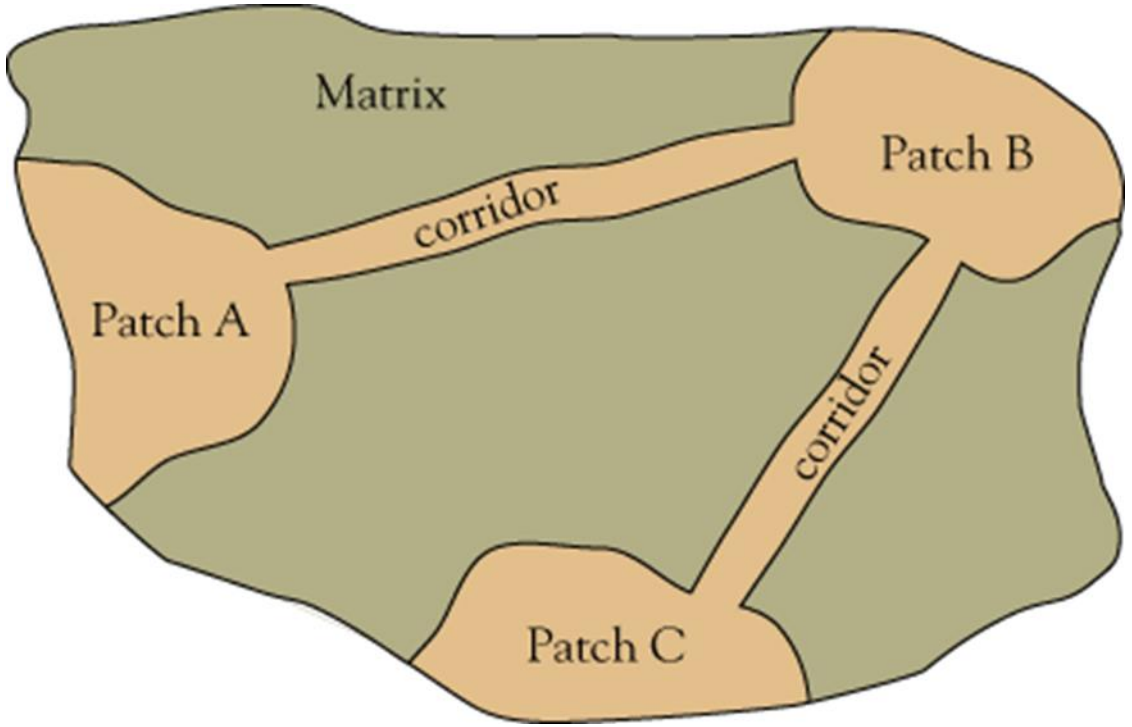
Ecotones are often areas of distinctive ecological conditions and higher species richness compared to the ecosystems on either side of an ecotone—a phenomenon referred to as **edge effect**. The species associated with ecotones are often called “edge” species, while those associated with the interiors of ecosystems away from an ecotone are called “interior” species.

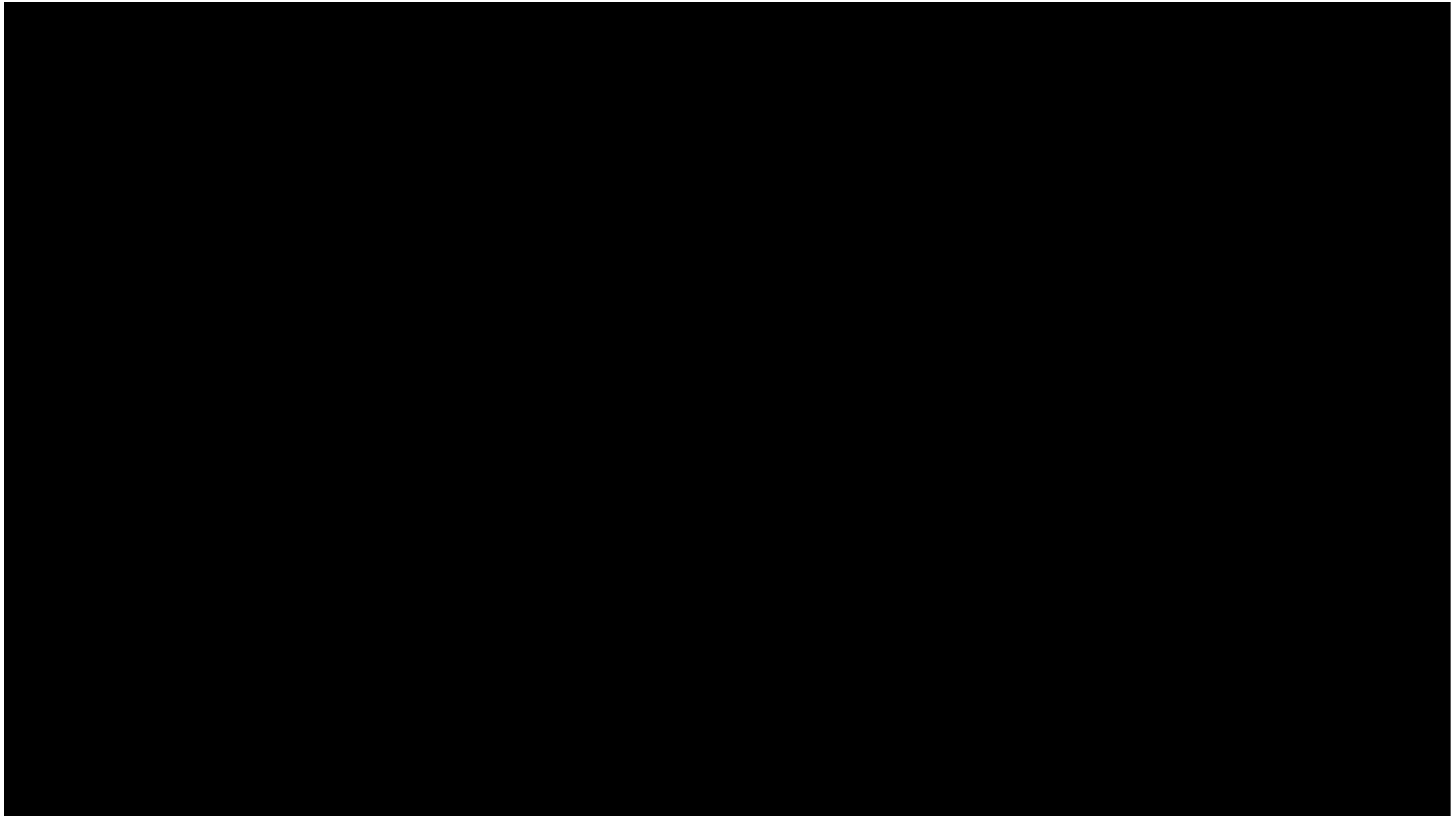


Landscape structure influences processes such as the flow of energy, materials, and species across a landscape. Landscape ecologists study how the size, shape, composition, number, and position of ecosystems in the landscape affect landscape processes.

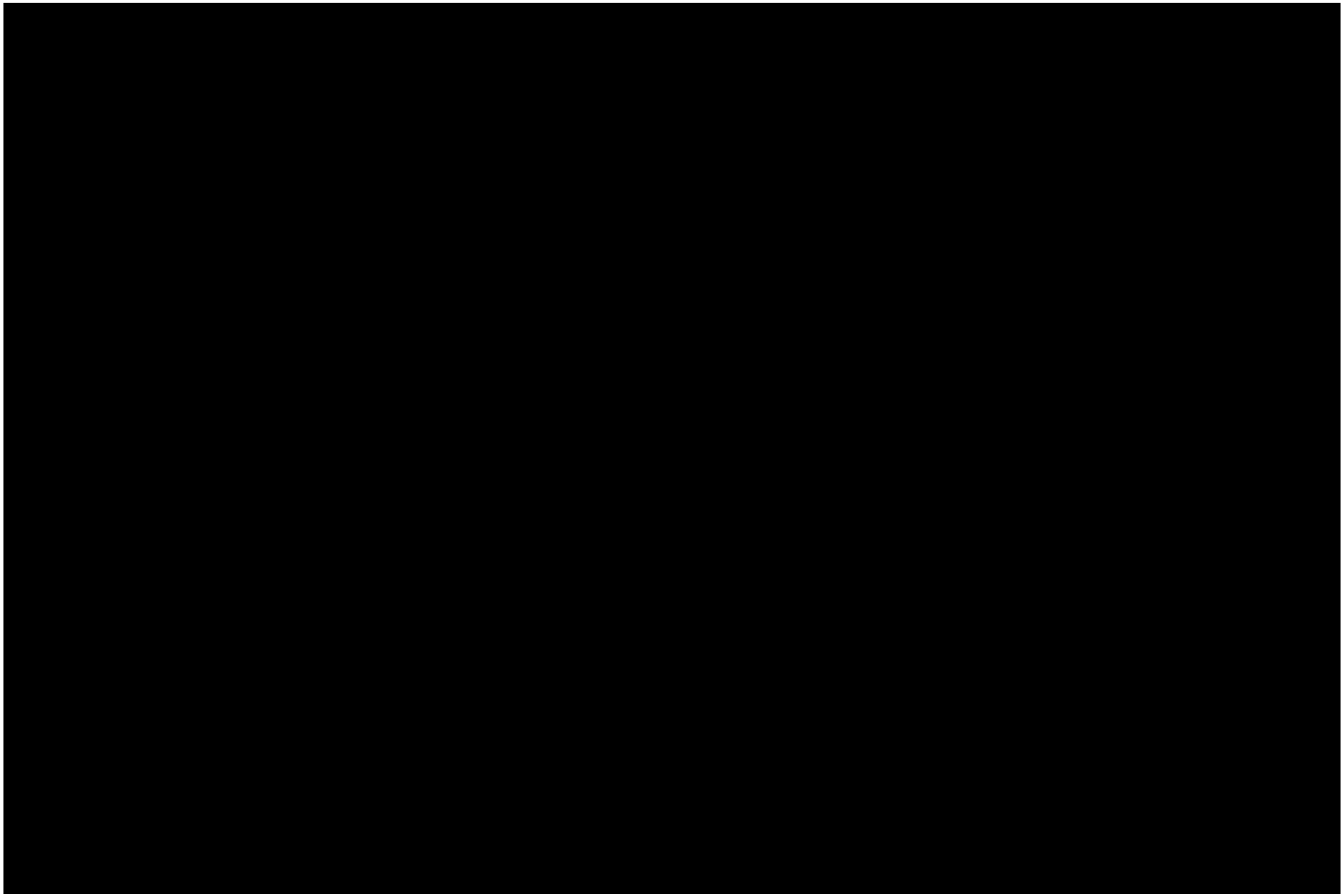
Habitat Corridors and Movement of Organisms

Habitat corridors can facilitate the movement of organisms between otherwise isolated habitat fragments.





VIDEO



VIDEO

GEOGRAPHIC ECOLOGY

Area, Isolation, and Species Richness

On islands and habitat patches on continents, species richness increases with area and decreases with isolation.

Island Isolation and Species Richness

There is often a negative relationship between the isolation of an island and the number of species it supports. However, because organisms differ substantially in dispersal rates, an island that is very isolated for one group of organisms may be completely accessible to another group.

The Equilibrium Model of Island Biogeography

Species richness on islands can be modeled as a dynamic balance between immigration and extinction of species.

What mechanisms might increase species richness on large islands and reduce richness on small and isolated islands? MacArthur and Wilson (1963, 1967) proposed a model that explained patterns of species diversity on islands as the result of a balance between rates of immigration and extinction. This model is called the **equilibrium model of island biogeography**.

How might numbers of species on an island affect the rate of extinction?

MacArthur and Wilson (1963) predicted that the rate of extinction would rise with increasing numbers of species on an island for three reasons:

(1) the presence of more species creates a larger pool of potential extinctions;

(2) as the number of species on an island increases, the population size of each must diminish; and

(3) as the number of species on an island increases, the potential for competitive interactions between species will increase.

According to the equilibrium model it was predicted that,

(1) island diversity is the outcome of a highly dynamic balance between immigration and extinction and

(2) the rates of immigration and extinction are determined mainly by the isolation and area of islands.

In other words, the equilibrium model predicts that the **species composition on islands is not static but changes over time**. Ecologists call this change in species composition **species turnover**.