Ecological studies can begin at the level of a single organism. Investigations might be designed to determine how the individual interacts with its environment, and how factors in the environment affect its growth, feeding habits, and reproduction. Non-living factors or influences on organisms, such as amount of sunlight, temperature, and strength and direction of wind are called **abiotic**. Factors caused by the presence and roles of other living things are called **biotic**.

Organisms do not live in isolation. Organisms usually group with others of the same species. All of the members of the same species, living in the same ecosystem or habitat, are referred to as a **population**. For example, all the pike in a lake form a population.

Since there is usually more than one species in an ecosystem, there is also more than one population. The collection of all the populations of all the species in an ecosystem or habitat is called the **community** of organisms. The community in the lake might include populations of pike, perch, tadpoles, mosquito larvae, and algae, among others.

When studying a community, an ecologist would study how biotic factors affect each population. For example, an ecologist studying a forest community might examine the interactions between different types of plants and animals in the area.

Ecologists can extend their study beyond the community of organisms to the physical environment. When they do so they begin investigating ecosystems. An ecosystem includes the community of living things and its physical environment. For example, in studying a forest ecosystem, an ecologist could examine how much sunlight reaches the forest floor, and what affect it has on the plants and animals that live in the ecosystem.

Ecotones and Biodiversity

Ecosystems rarely have sharp boundaries, and organisms can move back and forth from one ecosystem to another. There is often a grey area between ecosystems where organisms from both ecosystems interact with each other. These transition areas or **ecotones** (**Figure 2**) contain species from both bordering ecosystems, so they often contain greater biodiversity (more species) than either ecosystem.

Ecosystems with greater biodiversity tend to be less fragile. For example, if a predator has to rely on a single species as a food source, its very existence is tied to the survival of the prey. In ecotones and other diverse areas there are more species, and a predator may have an alternative if something happens to the population of its main prey. It should come as no surprise that the ecotones, by providing alternative food sources, guard against extinction.

Understanding Concepts

1. In your own words, define the term "ecology."
2. List four biotic and four abiotic factors in:
   - **(a)** a freshwater ecosystem, such as a lake
   - **(b)** a terrestrial ecosystem, such as a forest
3. Describe how a population differs from a community, using your own examples.
4. Describe how an ecosystem differs from a community, using your own examples.
5. Predict whether you would find more species in a forest, an open field, or the forest-grassland ecotone between them. Explain your prediction.
6. **Figure 3** shows changes in the size of the populations of *paramecia* (single-cell organisms) placed in three different beakers.
   - **(a)** Compare the growth of Species 1 in Beaker A with the growth of Species 2 in Beaker B.
   - **(b)** What evidence suggests that the populations of *paramecia* affect each other?
   - **(c)** Suggest a conclusion that can be drawn from the population changes in Beaker C.

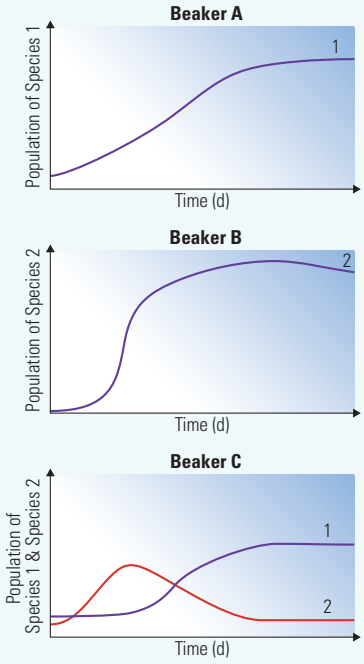

Figure 3
Graphs showing changes in populations of *paramecia* in three beakers

Challenge

1 An understanding of how abiotic factors affect communities is a good basis for understanding ecosystems. What abiotic factors must be controlled to ensure ideal playing conditions for golfers?