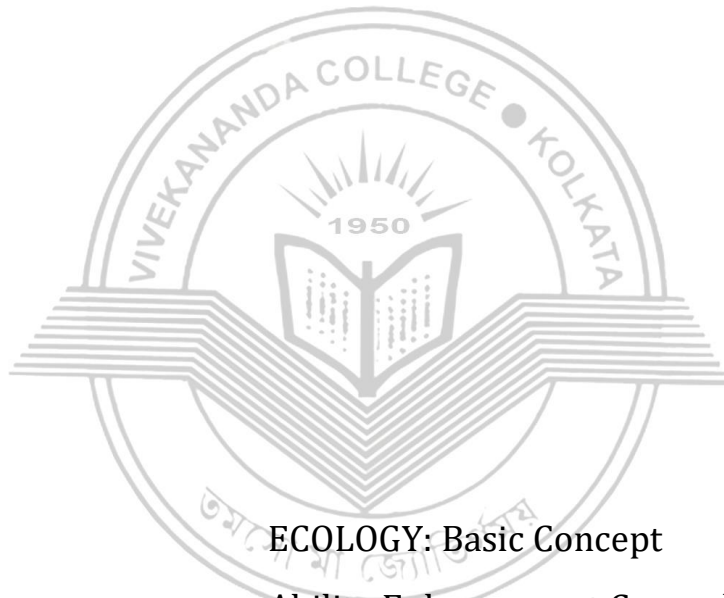


VIVEKANANDA COLLEGE  
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NAAC ACCREDITED 'A' GRADE



Topic: ECOLOGY: Basic Concept  
Course Title: Ability Enhancement Compulsory Course  
[Environmental Studies]  
Paper: AECC – 2  
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Name of the Department: ENVIRONMENTAL SCINECE

## *What is Ecology ?*

- Ecology is the study of how organisms interact with each other and their environment.
- German biologist Ernst Haeckel first defined “oekologie” less than a decade after Charles Darwin published “On the Origin of Species by Means of Natural Selection” in 1859.
- Ecology’s primary goal is to understand the distribution and abundance of organisms. How do interactions with other organisms and the physical environment dictate why certain species live where they do, and how many individuals live there?

## *Levels of Ecological Study :*

In ecology, researchers work at five main levels:

(1) organisms, (2) populations, (3) communities, (4) ecosystems, and (5) the biosphere. The levels aren’t rigid or exclusive; researchers routinely draw on multiple levels—including lower levels—to explore a particular question.

## *Levels of organisation:*

### *Organismal Level:*

- At the organismal level, researchers explore the morphological, physiological, and behavioral adaptations that allow individuals to live in a particular area.
- For example, after spending four or five years feeding and growing in the ocean, sockeye salmon travel hundreds or thousands of kilometers to return to the stream where they hatched. Females create nests in the gravel stream bottom and lay eggs. Nearby males compete for the chance to fertilize eggs as they are laid. When breeding is finished, all the adults die. Biologists want to know how these individuals interact with their physical surroundings and with other organisms in and around the stream.
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### *Autecology:*

Autecological theory is focused on species as the most important unit of biological organisation, as individuals across all populations of a particular species share species-specific adaptations that influence their ecology. This particularly relates to reproduction, as individuals of a sexual species share unique adaptations (e.g. courtship songs, pheromones) for recognising potential mates, and share a fertilisation mechanism that differs from those in all other species.

### *Synecology:*

A subfield of ecology concerned with the relations between groups of organisms or coexisting biological communities.

Synecology = Community Ecology

- In ecology, a community refers to an ecological unit composed of a group of organisms or a population of different species occupying a particular area, usually interacting with each other and their environment.
- Synecology is focused on understanding the interactions of groups of organisms or species within a community. It studies the distribution, structure, demography, and abundance of these organisms coexisting in a community.
- For instance, it may look into the symbiotic relationships occurring in a community such as competition, mutualism, commensalism, and predator-prey population dynamics.

### *Population & Community Ecology :*

**A Population is a group of individuals of the same species that lives in the same area at the same time.**

When biologists study population ecology, they focus on how the number and distribution of individuals in a population change over time.

**Group of individuals of different species interacting with each other at a particular area at a time.**

**A biological community consists of populations of different species that interact with each other within a particular area.**

Community ecologists ask questions about the nature of the interactions between species and the consequences of those interactions. Research might concentrate on predation, parasitism, and competition or explore how communities respond to fires, floods, and other disturbances.

### *Ecosystem Ecology :*

- Ecosystem is an extension of organismal, population, and community ecology. An ecosystem consists of all the organisms in a particular region along with nonliving components.
- An ecosystem is a functional unit consisting of all the living beings of an area and the non-living components of their environment, interacting to form a stable system.
- These physical and chemical, or abiotic (literally, “not-living”), components include air, water, and the nonliving parts of soil.
- At the ecosystem level, biologists study how nutrients and energy move among organisms and through the surrounding atmosphere and soil or water.

### *Components of Ecosystem:*

#### **Abiotic Components :**

- The most fundamental observation about the range, or geographic distribution, of organisms is simple: No one species can survive the full array of environmental conditions present on Earth.
- **Temperature** is particularly important in determining ranges because temperature has a big impact on the physiology of organisms, and organisms are limited in their ability to regulate their own temperatures.
- *Thermus aquaticus* can thrive in hot springs with temperatures above 70°C because its enzymes do not denature at near-boiling temperatures. But the same cells would die instantly if they were transplanted to the frigid waters near polar ice—even though vast numbers of other microbes are present. The cold-water species have enzymes that work efficiently at near-freezing temperatures.

#### **Biotic Components:**

The ability of a species to persist in a given area is often limited by biotic (“living”) factors—meaning interactions with other organisms.

As an example, consider the distributions of hermit warblers and Townsend’s warblers along the Pacific Coast of North America. Both hermit warblers and Townsend’s warblers live in evergreen forests. Experiments have shown that male Townsend’s warblers directly attack male

hermit warblers and evict them from breeding territories. The geographic range of Townsend’s warblers has been expanding steadily at the expense of hermit warblers. These observations support the hypothesis that a biotic factor— competition with another species—is limiting the range of hermit warblers.

