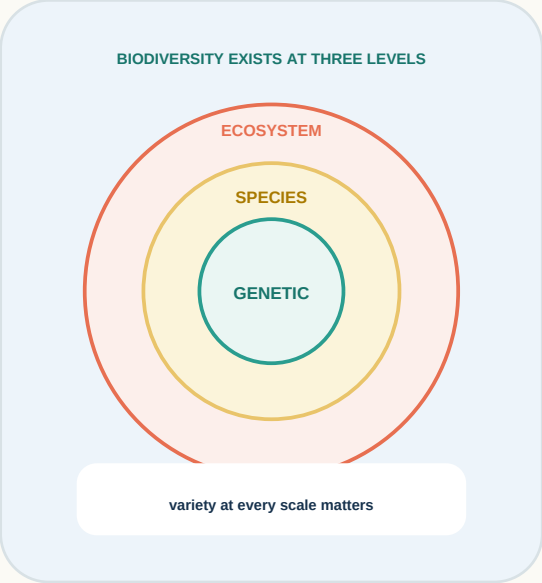
AP BIOLOGY | UNIT 8

TOPIC 8.6

Biodiversity

Biological variety at genetic, species, and ecosystem levels helps shape ecosystem structure, function, and resilience.



THE BIODIVERSITY-RESILIENCE CHAIN

VARIATION
genes + species

→

FUNCTIONS
different roles

→

RESPONSES
more pathways

→

RESILIENCE
better recovery

BY THE END, YOU SHOULD BE ABLE TO...

1. Distinguish genetic, species, and ecosystem diversity.
2. Explain how producers, keystone species, and environmental factors maintain diversity.
3. Predict how adding or removing a component changes ecosystem structure and resilience.

CENTRAL IDEA

Greater diversity often gives an ecosystem more ways to maintain function or recover after change, but it does not make the system immune to disturbance.

1 Biodiversity spans genes, species, and ecosystems

Each level contributes different forms of variation and different ways for biological systems to respond to change.

GENETIC DIVERSITY

Variation in inherited information among individuals of the same species.

EXAMPLE

different alleles within a population

SPECIES DIVERSITY

Variation in species identities and their relative abundances in a community.

EXAMPLE

many species with balanced abundance

ECOSYSTEM DIVERSITY

Variation in habitats, communities, and ecological processes across an area.

EXAMPLE

forests, wetlands, reefs, and grasslands

COMPONENTS THAT SUPPORT ECOSYSTEM DIVERSITY

PRODUCERS

Capture energy and build organic molecules that support food webs.

KEYSTONE SPECIES

Have ecosystem effects that are large relative to their abundance.

ABIOTIC FACTORS

Light, water, temperature, nutrients, and physical habitat set conditions.

BIOTIC FACTORS

Interactions among organisms alter survival, reproduction, and resource use.

KEYSTONE DOES NOT MEAN MOST ABUNDANT

A keystone species may be rare, yet its removal can reorganize a food web, release prey or competitors, and reduce diversity. Its defining feature is disproportionate effect.

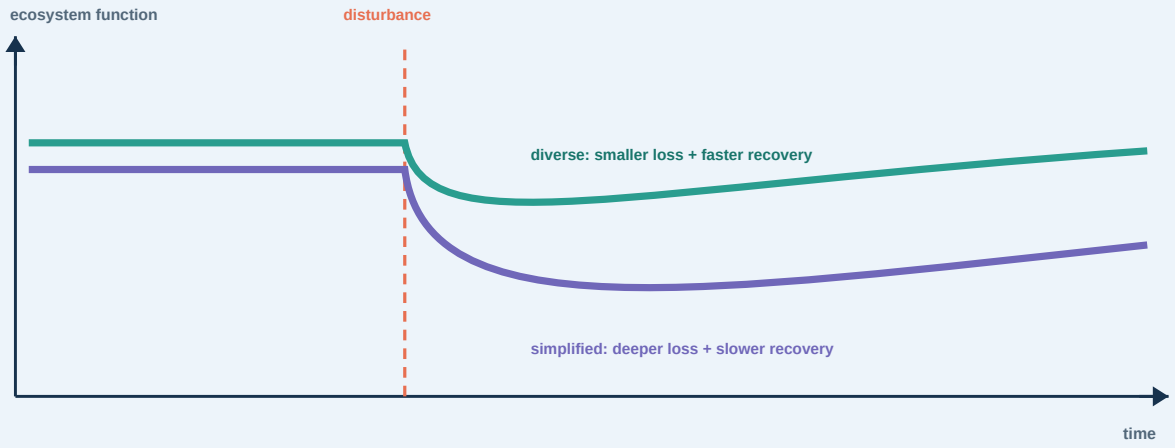
SYSTEM VIEW

Ecosystem diversity depends on interactions among living and nonliving components. Changing one component can propagate through energy flow, nutrient cycling, and population relationships.

2 Diversity often increases resilience to environmental change

Resilience is the ability to maintain or recover ecosystem structure and function after a disturbance.

CONCEPTUAL RESPONSE TO DISTURBANCE



ADDING OR REMOVING A COMPONENT

REMOVE A KEYSTONE PREDATOR

SHORT TERM

prey abundance can rise quickly

LONG TERM

overconsumption can reduce producers and restructure the food web

ADD A NEW ECOSYSTEM COMPONENT

SHORT TERM

resource use and interactions change

LONG TERM

selection, abundance, and community structure may shift

CAUTION **Greater biodiversity often supports resilience, but disturbance intensity, timing, and which components are lost also matter.**

PREDICTION RULE

1. Identify the component and its ecological role.
2. Trace direct effects on energy, resources, or interactions.
3. Extend the chain to long-term structure, diversity, and resilience.