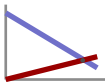


Biodiversity

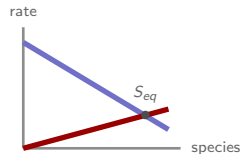
AP Environmental Science ■ Unit 2

AP Environmental Science



What we will cover

- 1 What biodiversity is
- 2 Ecosystem services
- 3 Island biogeography
- 4 Ecological tolerance
- 5 Disruptions and adaptation
- 6 Ecological succession



What biodiversity is

Biodiversity 生物多样性 is the variety of life, at three levels: genetic, species, habitat.

More diversity $\Rightarrow$ more resilience.
Diversity = richness $\times$ evenness.



Coral reef: high richness and evenness

Ecosystem services

Nature's free work for people, in four groups:

Provisioning 供给

goods: food, water, wood

Regulating 调节

clean air, flood control, pollination

Cultural 文化

beauty, recreation, spirit

Supporting 支持

soil, photosynthesis, cycling

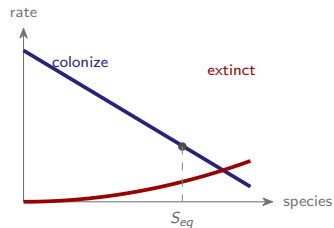
A wetland that cleans water for free is worth the treatment plant we would otherwise build.

Island biogeography

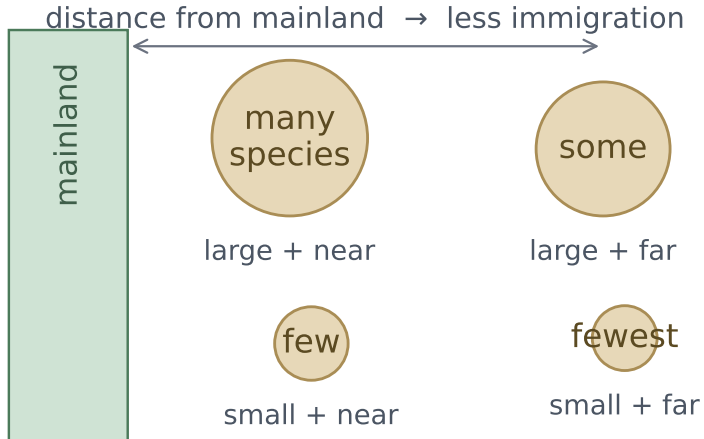
Island species number is a balance of two rates:

- **colonization** 定居 – new arrivals
- **extinction** 灭绝 – species dying out

Richest islands are **large & near**; isolation breeds **endemic species** 特有种 found nowhere else.



Island biogeography

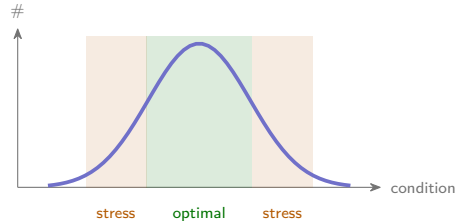


Ecological tolerance

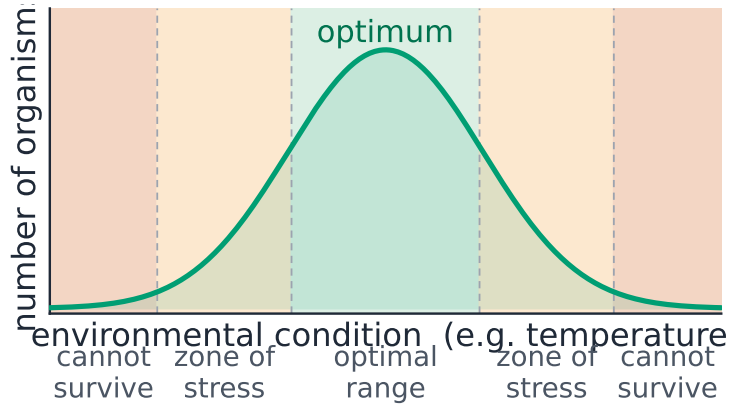
Every species survives only within a **range of tolerance** 耐受范围:

- **optimal range** 最适范围 in the middle
- a **zone of stress** 胁迫区 on each side
- limits beyond which it dies

A population's range is wider than one organism's – individuals vary.



Ecological tolerance



Disruptions and adaptation

Disruptions: periodic, episodic (wildfire), random. Adaptation by natural selection: structural, physiological, behavioral.

When the environment changes, selection can favour a different trait.



Episodic disruption: wildfire resets succession

Ecological succession

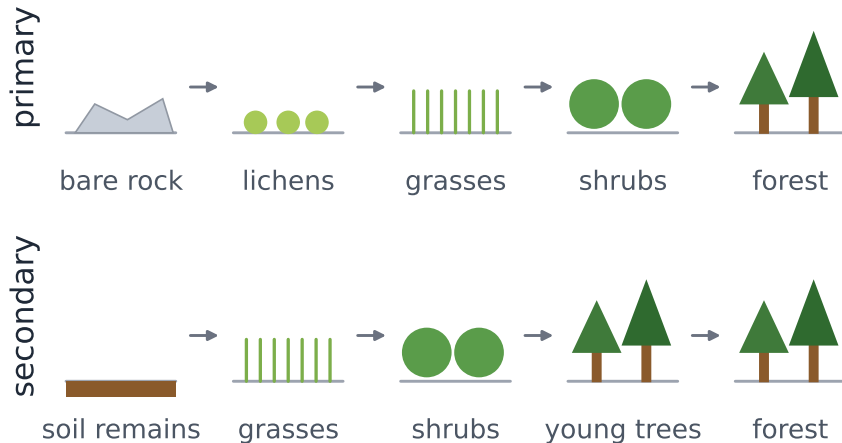
Life returns in a predictable order:
pioneer → climax.

Primary starts on bare rock; secondary keeps the soil – far faster.



Pioneer lichen on bare rock

Ecological succession



Worked example – species diversity

Wood A has 100 birds of 1 species; Wood B has 100 birds evenly split across 4 species. Compare their diversity.

- **Richness** = number of species: A has 1, B has 4.
- **Evenness** = how equally individuals are spread: B is perfectly even.
- B wins on **both** $\Rightarrow$ **B is far more diverse**.
- Higher diversity $\Rightarrow$ more **resilience**: if one species fails, others fill its role.

Diversity = **richness** + **evenness**. A monoculture has richness 1 and no evenness – which is exactly why a single pest can destroy a whole crop.

Unit 2 – key takeaways

1

Biodiversity

genetic/species/habitat; richness
× evenness

2

Services

provisioning, regulating, cultural,
supporting

3

Islands & tolerance

large+near hold most; optimal vs
stress zones

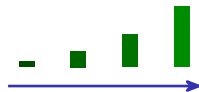
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Succession

primary (bare rock) vs secondary;
pioneer to climax

Check yourself

- 1 Name the two numbers that together give species diversity.
- 2 Which island holds more species: large-near or small-far?
- 3 What is a species found nowhere else called?
- 4 Which succession keeps the soil and so is faster?



Answers 1. richness and evenness 2. large-and-near 3. endemic 4. secondary succession