DP Biology – D4.2 (HL extension)

Succession

- What allows ecosystems to remain stable indefinitely?
- Which human changes put ecosystem stability at risk?

HL statements D4.2.11–14. Textbook pp. 814–819.
Image: lichen on bare rock. Daniel Schwen, CC BY-SA 4.0.



Objectives for each class

Class	Statements	By the end of the class, you can...
1	D4.2.11	Explain what ecological succession is and what drives it
2	D4.2.12	Describe the changes that take place during primary succession
3	D4.2.13–14	Explain cyclical succession, climax communities and arrested succession

Ecological succession

D4.2.11

- **Succession**: a directional change in the species of a community over time
- Each community changes conditions, which suits the next
- Driven by **abiotic** changes: water, temperature, soil, fire, floods
- Driven by **biotic** changes: competition, herbivores, food-web changes

Type	Starts on
Primary	Bare rock, lava, sand: no soil
Secondary	Soil left after fire, flood or clearing

Try it

Classify: a field abandoned by farmers; a new volcanic island.

Key idea

Both types usually move from a pioneer community, through intermediate stages, towards a climax community.

Primary succession

D4.2.12

Bare rock: no soil → **Pioneers: lichens and mosses break down rock** → Thin soil: grasses and small herbs root → Deeper soil: shrubs, then fast-growing trees → Climax community: for example, forest



A pioneer on bare rock. Daniel Schwen, CC BY-SA 4.0.

How each stage helps the next

Pioneers trap dust and add dead organic matter, forming soil. Soil holds water and minerals, so larger plants can root. Their shade and leaf litter change conditions again, and they outcompete the earlier species.

What increases during primary succession

D4.2.12

Feature	Early stages	Late stages
Size of plants	Small	Large trees
Primary production	Low	High
Species diversity	Low	High
Complexity of food webs	Short, simple chains	Many links
Nutrient cycling	Little; nutrients easily lost	Much; nutrients held and recycled

Try it

Sketch how soil depth and the number of plant species change with time.

Cyclical succession

D4.2.13



Barnacles on a rocky shore. Stemonitis, free use.

- In some ecosystems, communities replace each other in a repeating cycle, with no single fixed climax
- Example: on some New Zealand rocky shores, barnacles, then algae, then mussels settle in turn
- When the mussels fall off, bare rock is free again

Barnacles settle on bare rock → Crust-forming algae colonize → Mussels settle and smother them → Mussels detach: bare rock again

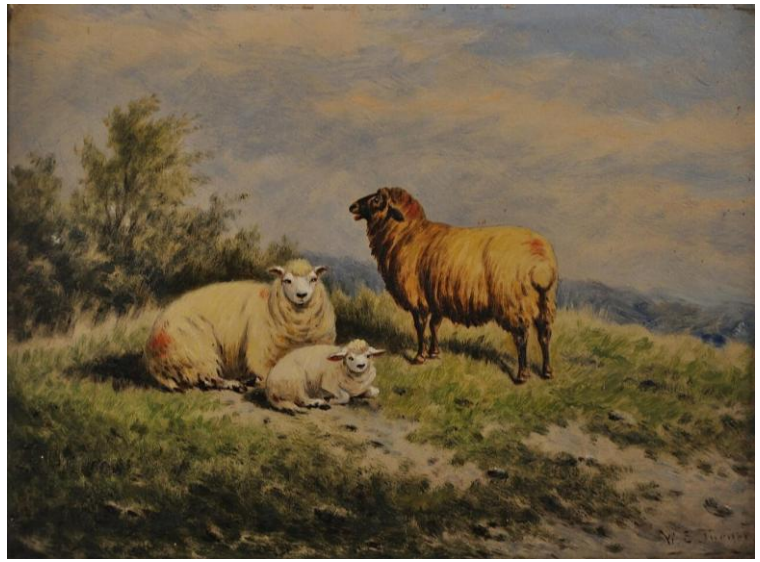
Also

Regular fires in Australian bush reset communities; grass trees flower soon after burning.

Climax communities and arrested succession

D4.2.14

- A **climax community** is stable and in balance with its climate and soil, until a disturbance
- Humans can stop succession before this point: **arrested succession**



Sheep at pasture, painting. William E. Turner, public domain.

Stopping the pressure lets succession restart: why many rewilding projects remove grazers or block drains.

Grazing

Livestock eat seedlings of shrubs and trees, so they never grow up. Grassland remains where forest would have developed.

Draining wetlands

Removing water for farming, housing or peat dries the soil. Species adapted to waterlogged, anaerobic soil are lost, and the natural community cannot develop.

Check that you can explain

1. What succession is, and its abiotic and biotic causes
2. The difference between primary and secondary succession
3. How pioneers make conditions suitable for later species
4. Five features that increase during primary succession
5. What cyclical succession is, with an example
6. How grazing and draining wetlands arrest succession

Exit activity: 5 minutes

On your own and without notes. Hand this in as you leave.

1. Distinguish between primary and secondary succession.
2. Explain the role of pioneer species.
3. Explain how grazing livestock arrests succession.

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Sheep grazing.jpg – William Eddowes Turner – Public domain

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