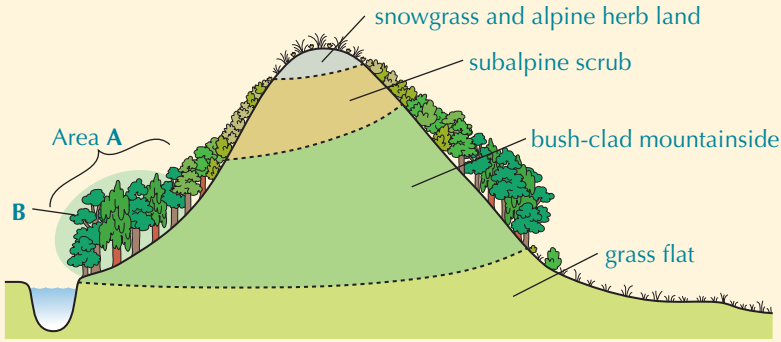
Activity 23B: Communities

1. **a.** Define the term *biological community* and name the three patterns associated with a biological community.
   b. Distinguish between the following pairs of terms:
   i. primary succession and secondary succession
   ii. zonation and stratification
   iii. vines/lianes and epiphytes.
2. Compare the typical growth form of a plant in the canopy layer with that in the shrub layer.
3. The diagram following shows the distribution of vegetation on a mountain.



   a. Name the community pattern shown in ***Area A*** and the main environmental factor responsible for it.
   b. Name the layer of trees labelled ***B*** and identify three abiotic factors that they must be tolerant to.
   c. Name the community pattern shown by the change in vegetation with altitude up the mountain. Identify two abiotic factors that might be responsible for this pattern.
   d. Suggest reasons for differences shown in this pattern between one side of the mountain and the other.
4. The following flow chart relates to an area of native bush following a landslide.

Bare ground and mosses
Level A

↓

Grasses and teatree
Level B

↓

Trees emerging above ferns
Level D

↓

Ferns and small seedling trees
Level C

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a. Identify the type of succession occurring here.
b. Give the name for the first plants that occur and explain any adaptations they must have for living here.
c. Name the mature community that results.
d. Explain how three physical factors would change from Level A to Level D.
e. Explain why animals do not arrive until the area is well colonised (e.g. Level B).

5. The following table shows the percentage abundance of some of the plants growing on an area of sand dunes.

Plant species (% abundance)	Distance from high-tide mark (m)									
	0	50	100	150	200	250	300	350	400	450
Pingao	0	12	16	14	8	0	0	0	0	0
Spinifex	0	0	9	18	26	14	8	0	0	0
Marram grass	0	3	8	15	16	16	7	2	0	0
Hare's tail	0	0	0	0	6	6	3	0	0	0
Cassinia	0	0	0	0	8	13	15	4	1	0
Coprosma	0	0	0	0	0	0	0	0	6	10

a. Identify the community pattern shown in these data.
b. Describe environmental factors that might cause this pattern.
c. Explain ways in which the plants can change the environment of the sand dunes.

6. The table below gives a time line for succession on the moraine from the Franz Josef glacier on the West Coast of the South Island.

Vegetation	Approximate time scale (years)
Recently exposed moraine	0
Moss – herbs	5
Mixed scrub – tutu	25
Low mixed forest	100
Rata – kamahi forest	500
Kamahi – mixed podocarp forest	2 000
Mature kamahi – rimu forest	5 000 to 10 000

a. Explain whether this is primary or secondary succession.
b. Explain why it takes up to 5 000 years before mature forest with large canopy trees such as rimu occurs.

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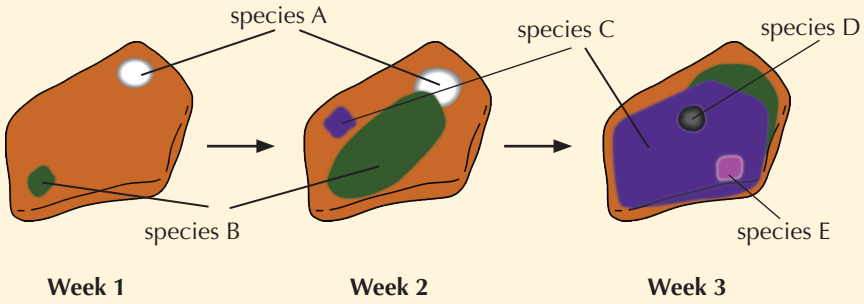
7. A student set aside a piece of moist pumpkin under a trough in the laboratory, and, over a period of three weeks, observed the growth of a number of different moulds. The student recorded her observations as in the diagrams that follow:



a. Give a reasoned opinion as to what the community pattern shown in the diagram is.

b. Provide an explanation for the disappearance of ***Species A***.

Activity 23B answers: Communities

1. a. A biological community consists of all the living organisms within a specific area (e.g. a lake or forest) and their interrelationships.

   b. i. Primary succession refers to the development of a mature community on an area of bare land which has never had previous life there, while secondary succession refers to the development of a mature community on an area of bare land that has previously had life there. Secondary succession is typically much faster than primary succession.

   ii. Zonation refers to the distinct horizontal bands of life forms that occur at differing altitudes, while stratification refers to the distinct vertical layers (strata) of plants that occur within a plant/forest community.

   iii. Epiphytes are perching plants that spend their whole life living on a host tree (no connection to the ground), while vines/lianes are plants that have roots in the ground and grow up a host tree.

2. A plant in the canopy layer will have a tall central trunk with a crown of leaf-bearing branches at the top, while a shrub has a branching stem with leaves all over the plant.

3. a. Stratification – changing light intensity.

   b. Canopy – high light intensity/temperature/wind speed.

   c. Zonation – lower temperature/more exposure/less soil water/higher wind speed higher up the mountain (or vice versa).

   d. The left side of the mountain in the diagram is likely to be the south or west side of the mountain which faces the prevailing winds where conditions tend to be colder/windier/wetter than the other/north or east side. Vegetation zones will extend higher up the mountain in the warmer, less harsh conditions on the northern or eastern sides (or vice versa).

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4. **a.** Secondary succession.
   b. Pioneer plants; they need a high (physiological) tolerance to high temperatures/winds/light intensity because they are not sheltered from conditions by other plants; they need a high tolerance to dehydration as conditions are harsh and the soil likely to be low in water; they need a strong root system to anchor in unstable soils.
   c. Climax community.
   d. Temperature at ground level decreases from ***Level A*** to ***Level D*** because taller plants shade the ground (layers); wind speed at ground level decreases as the taller plants reduce the speed of the wind; humidity increases at ground level as the taller sheltering plants trap moist air; light intensity decreases at ground level as the taller plants block some light from reaching the ground.
   e. Animals do not arrive until there is a good plant cover; because animals need the plants for food and shelter/nest sites.
5. **a.** Succession.
   b. As distance from the high-tide mark increases, soil stability/fertility/moisture all increase; ground temperature/wind speed/light intensity all decrease; humidity increases.
   c. The roots of plants growing in the sand/soil will increase its stability; leaf litter and plants dying and decomposing will increase soil fertility; the plants growing taller will decrease the temperature/light intensity/wind speed for plants germinating/growing beneath them.
6. **a.** Primary succession; because moraine is land created by glaciation and has not had plants growing on it before.
   b. It takes a long time for the environment to change and the soil to become fertile enough to allow the species of the climax community to live there; this is because temperatures are cold so chemical processes are slow; decomposition is slow so it takes a long time for soil fertility to increase; the large canopy trees of the climax community are very slow growing (e.g. rimu).
7. **a.** The pattern is succession; because the species composition is changing over time (from Week 1 to Week 3), with one species replacing another/others (e.g. *Species A* is replaced by *Species B* which is replaced by *Species C*).
   b. *Species A* is being outcompeted by *Species B* for resources such as food or living space / *Species B* grows more vigorously than *Species A* and smothers it / *Species B* is changing the environment, making the environment unsuitable for the growth of *Species A*.

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