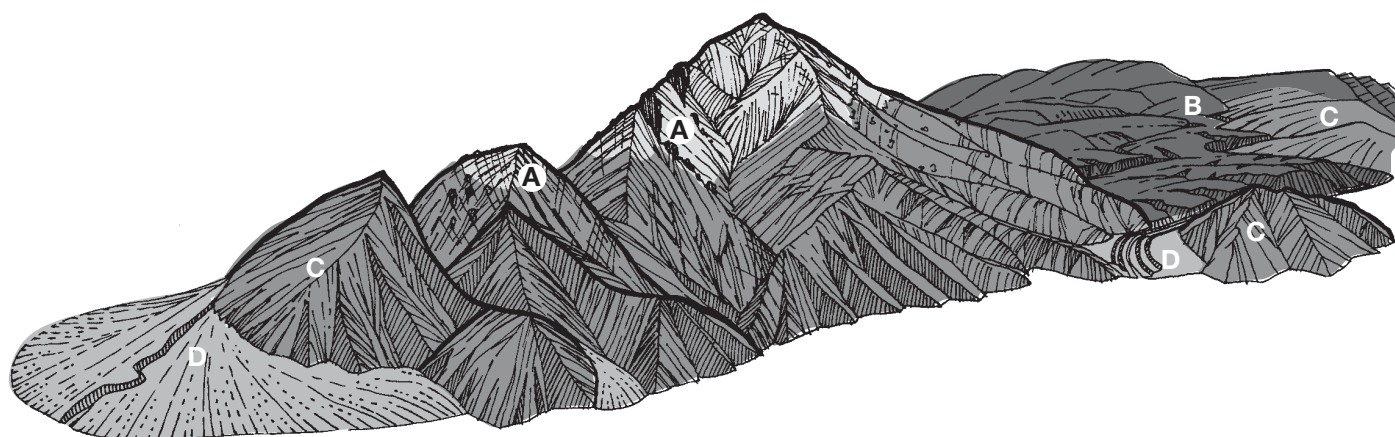
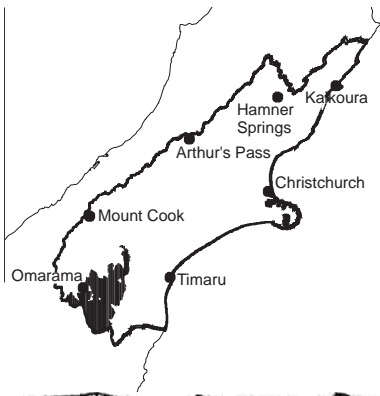


(b) High country: dry mountain ranges



Land form	Resource composition (biota, soil, water)	Natural stresses	Induced changes/disturbances
A Upper mountain slopes > 1200 m: steep to very steep	<ul style="list-style-type: none"> • Snow tussock grasslands, alpine herbfields, scree, fellfields. • Rainfall moderate: 1000 - 1600 mm • Yellow-brown earths. Topsoil generally thin, with rock outcrops. Discontinuous scree. • Cloud, fog, snow 	<ul style="list-style-type: none"> • Low temperature restricts rate of plant recovery • Periods of moisture stress • Fluvial erosion in small drainage channels • Wind erosion • Freeze-thaw activity • Dessication • Snow debris avalanche 	<ul style="list-style-type: none"> • Farm tracks • Extensive grazing
B Elevated plateau: 750 - 1450 m. Steep - moderately steep	<ul style="list-style-type: none"> • Chionochloa macra and short tussock, subalpine shrubland. • Rainfall: 1000 mm. Winter snowpack significant source of downstream flow. • Yellow-grey and yellow-brown earths: reasonably deep, relatively infertile - phosphorus and sulphur deficient. 	<ul style="list-style-type: none"> • Freeze/thaw activity • Low temperatures and soil infertility restricts rate of plant recovery • Strong winds 	<ul style="list-style-type: none"> • Farm tracks • Extensive grazing, some semi-intensive grazing on developed land • Vegetation burning • Medium-high rabbit proneness at lower altitudes - occasional rabbit plagues
C Lower mountain and hill slopes < 1200 m: rolling - steeply rolling	<ul style="list-style-type: none"> • Depleted short tussock & matagouri; hieracium, except on driest sites; Echium dominates in driest, lower areas. • Rainfall low: 450-1000 mm • Thin topsoil with rock outcrops: dry yellow-grey, yellow-brown and brown-grey earths; low organic matter, sulphur deficient, phosphorus deficient at wetter end of zone. 	<ul style="list-style-type: none"> • Freeze/thaw activity • Low moisture • Low winter temperatures restrict rate of plant recovery • Wind erosion - strong drying wind (dessication) • Occasional fluvial erosion 	<ul style="list-style-type: none"> • Farm tracks • Extensive grazing, some semi-intensive grazing on developed land • Vegetation burning • High rabbit proneness - occasional rabbit plagues
D Alluvial fans, terraces, floodplains: flat - rolling	<ul style="list-style-type: none"> • Introduced pasture species, some short tussock, scabweed, matagouri. • Rainfall often < 600mm. • Dry yellow-brown, yellow-grey and brown-grey earths, recent soils: sulphur deficient. 	Low moisture Wind erosion - dessication	<ul style="list-style-type: none"> • Farm roads and tracks • Cultivation for limited cropping, pasture improvement • Intensive grazing, some extensive grazing • Vegetation burning • High rabbit proneness - occasional rabbit plagues • Irrigation canals



Location

Canterbury Dry Mountain Ranges, e.g., Hawkdun, Wether, Ewe, St Cuthbert, Benmore & Kirkliston Ranges



snow tussock grasshopper-dry mountain ranges.

Nature

- Steep & dissected mountains, hills, and block mountains with rolling, rounded summits.
- Low annual rainfall, includes some of the driest parts of Canterbury.
- Intact snow tussock grasslands remaining at high altitudes, depleted short tussock with extensive bare ground on lower slopes.

Resource Values

- Tourism opportunities, focused on the Waitaki system and the grand and dramatic setting.
- Remnant indigenous tussock and shrublands.
- Fine merino wool.

Effects/trends

- Loss of intertussock vegetation leading to areas of bare ground and scree.
- Transition from snow tussock to more palatable blue and hard tussock in dry areas and cushion species on exposed ridges.
- Very slow decline in soil nutrient status

Key issues for soil conservation

- Erosion risk: extensive grazing
- Reduced system resilience due to reduced vegetation cover, biomass and soil organic matter.
- Related issues:
- Reduced indigenous biodiversity

- Some loss of *C. macra*, opening up of tussock, intertussock species replaced by low shrubs and some expansion of bare ground
- Slow soil nutrient decline.
- Wilding pine spread.

- Erosion risk: extensive grazing
- Soil quality: nutrient decline
- Pest management (rabbits)
- Change of landscape / natural character (wilding pines)
- Related issues:

- Increased vegetation cover with land development
- Decline in organic matter and nutrient status in undeveloped areas (carbon, nitrogen, sulphur)
- Increase in hieracium, especially on shady faces
- Tendency for weed invasions (e.g., *Echium*, briar)
- Persistent bare ground
- Ongoing soil loss by wind erosion

- Erosion risk: extensive grazing
- Soil quality: loss of surface cover, soil nutrients, soil organic matter, soil biology in undeveloped areas
- Pest management (rabbits)
- Reduced system resilience due to reduced vegetation cover, moisture stress and limited rates of plant recovery.
- Related issues:
- Reduced indigenous biodiversity

- Extensive replacement of short tussock with introduced pasture species.
- In non-irrigated areas, prone to vegetation loss during extreme conditions or with overgrazing.
- Loss of topsoil in cultivated areas. Decline in organic matter and nutrients (sulphur) due to erosion.
- Some improvement in soil quality on developed land

- Erosion: cultivation, rabbits
- Soil quality: loss of surface cover, soil nutrients, soil organic matter and soil biology in undeveloped areas.
- Pest management (rabbits)
- Related issues:
- Reduced indigenous biodiversity