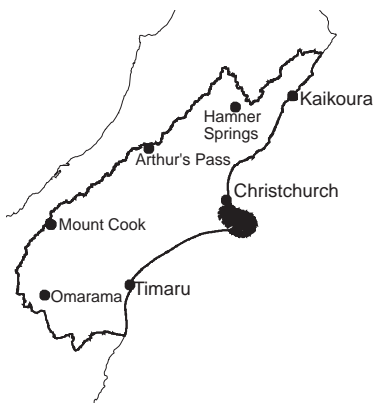


(g) Banks Peninsula



	Land form	Resource composition (biota, soil, water)	Natural stresses
A	<p>Summit crests, upper rocky dip and scarp slopes, coastal cliffs</p>	<ul style="list-style-type: none"> • Volcanic rocks dominate, with minor loess. Steep to very steep. • Silver tussock amongst pasture grasses. • Rainfall 1000-1400 mm. Cloud, fog, occasional snow. • Topsoil generally thin, with rock outcrops. 	<ul style="list-style-type: none"> • Low temperatures and exposure to wind limit plant growth.
B	<p>Lower loess mantled slopes</p>	<ul style="list-style-type: none"> • Relatively thick colluvium slopes, particularly on N & W faces. • Introduced pasture grasses, oversown and topdressed short tussock (mostly silver tussock), regrowth hardwood forest in gullies, remnant podocarp forest. • Rainfall 600 - 1000 mm. • Soil naturally erodible (tunnel gullies & slips typical), particularly when forest removed. Loess soils - low natural fertility; volcanic soils - high natural fertility. • Steep, short streams, some spring-fed, often with severe summer low flows. 	<ul style="list-style-type: none"> • Some large-scale mass movement erosion following sustained wet conditions. • Desiccation, particularly on N & W faces.
C	<p>Poorly drained valley floors, flood plains, lagoons, harbourhead dunes</p>	<ul style="list-style-type: none"> • Flat, poorly drained. • Introduced pasture species and crops. Remnant wetland and salt marsh species. • Rainfall 600 mm. • Mix of gley (moderate fertility) & sandy (low fertility) soils. 	<ul style="list-style-type: none"> • High water tables. • Saline influence in coastal margins. • Tsunami



Location

Includes both Banks Peninsula and the Port Hills.



totara-kereru-banks peninsula

Nature

- Twin dissected volcanic cones; loess mantled lower slopes; indented, exposed coastline with deep harbours and sheltered, shallow bays.
- Many small catchments drain directly into harbour and estuarine areas.
- Originally tussock clad upper slopes, with lower slopes of mixed podocarp and broadleaf forest. Remnant indigenous vegetation now disjointed and highly modified.

Resource Values

- An important recreational area, especially for Christchurch.
- Predominantly pastoral, but with diverse speciality land uses.
- Once a major centre for Maori settlement - many mahinga kai and wahi tapu sites.
- Intensive urban development in some coastal areas.
- Sites of cultural significance protected.

Induced changes/disturbances

- Extensive & semi-intensive grazing.
- Few farm tracks & roads.
- Uncontrolled wild animals (possums, goats, rabbits)

Effects/trends

- Change from tall to silver tussock (historical).
- Localised loss of vegetation cover and habitat

Key issues for soil conservation

- Related issues:
- Loss of indigenous biodiversity and habitat.

- Some farm tracks & roads.
- Semi-intensive to intensive grazing.
- Increasing diversification of use (e.g., pastoralism to forestry / horticulture).
- Minor pasture cultivation for pasture renewal.
- Removal of forest and shrub remnants, especially in gullies and waterway margins.
- Vegetation clearance (including burning and mechanical clearance).
- Stock water dams, ponds.
- Channel maintenance adjacent to urban areas.
- Continuing urbanisation & rural-residential development.
- Uncontrolled wild animals (goats, possums, rabbits).

- A few forest restoration projects under way.
- Spread of gorse.
- Increase in tunnel gully and soil slip following forest removal.
- Increased demand for water.
- Pesticide and microbial contamination of spring-fed streams.

- Erosion risk: earthworks, vegetation clearance, intensive horticulture / cultivation, intensive and semi-intensive grazing.
- Soil quality: Potential long term soil nutrient depletion in undeveloped pastoral areas; Potential acidification of yellow grey earths.
- Pest management: goats, possums, rabbits.

Related issues:

- Loss of indigenous biodiversity / habitat degradation: Continued clearance of remnant bush, particularly riparian bush / fragmentation.
- Change in landscape and natural character.
- Water quality degradation: pesticides, nutrients, sediment - of particular concern where surface water used for drinking.
- Water yield: potential reduction in stream flows with extensive exotic forestry.

- Drainage / channel maintenance.
- Semi-intensive to intensive grazing.
- Some arable and horticultural use.

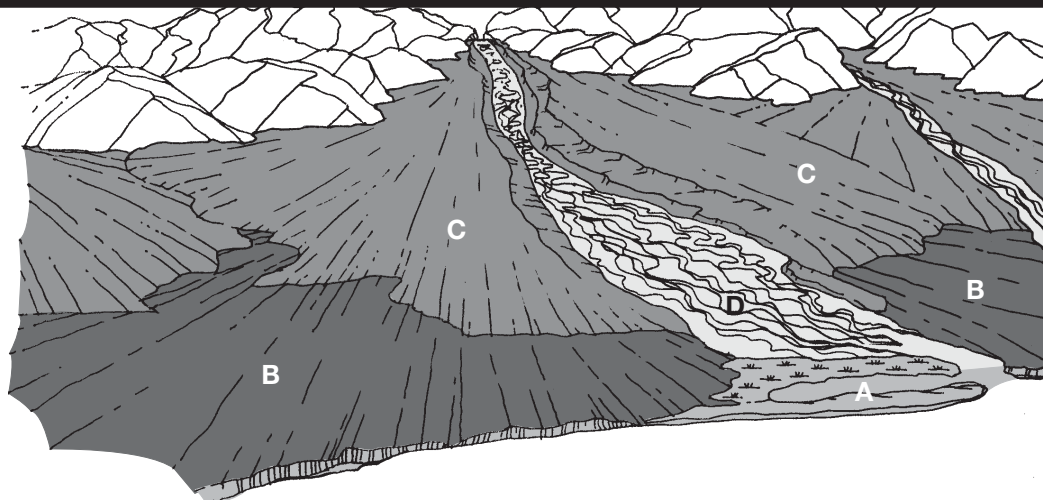
- Loss of wetlands.
- Sedimentation of harbours and sheltered bays.
- Improved soil quality with increased fertility, organic matter.
- Reduced water quality

- Erosion risk: intensive cropping, sand mining.
- Water quality degradation: sediment, localised microbial.

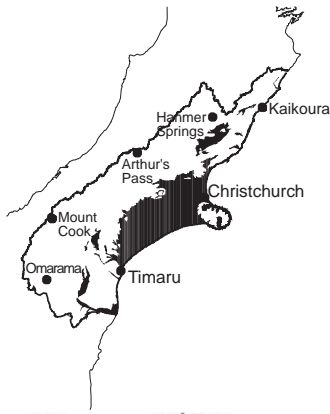
Related issues:

- Loss of indigenous biodiversity and habitat: wetlands, harbours / bays (sedimentation).

(h) Canterbury Plains



	Land form	Resource composition (biota, soil, water)	Natural stresses
A	Coastal fringe, including coastal wetlands, estuaries & lagoons	<ul style="list-style-type: none"> • Sand dunes, interdune wetlands, sand plains, gravel beach ridges & bars, saline lakes, lagoons, estuaries & fringe wetlands. Sea cliffs on mid and north Canterbury coast. • Marram on front dunes; saltmarsh & sedgeland vegetation around wetland and lake margins; mix of native & introduced coastal species & forestry elsewhere. • Rainfall 600 - 800 mm. • Predominantly saline soils, yellow-brown sands, organic and gley soils. 	<ul style="list-style-type: none"> • Coastal inundation of gravel beaches fronting low lying coastal hinterland to north and south of Timaru. • High water tables. • Tsunami / coastal storm surge events. • Coastal erosion due to coastal processes: coastal cliffs, mixed sand/gravel beaches, sandy beaches.
B	Naturally poorly drained plains (tends to be lower plains)	<ul style="list-style-type: none"> • Naturally poorly drained lower fans & swamps. • Predominantly improved pastures & arable crops in drained areas. Remnant flax, toi-toi, & rushland swamp vegetation in undrained areas. • Rainfall 600 - 800 mm. • Soils strongly mottled & gleyed (alluvium) or peat. • Spring-fed streams. Significant groundwater resource - water table close to surface (can be within 10 m). 	<ul style="list-style-type: none"> • Seasonally high water tables in undrained areas leading to seasonal surface flooding
C	Naturally well drained plains (tends to be upper plains) & inland basins (e.g., Culverden, Hakataramea)	<ul style="list-style-type: none"> • Well drained fans and associated high & intermediate river terraces. • Predominantly improved pastures, arable crops, plantation forestry. Tiny remnants of savannah vegetation, short tussock, kowhai, manuka. • Rainfall 700 - 1000 mm. • Gravels, variable loess & alluvium resulting in soils of variable depth & stoniness with a naturally weak structure (predominantly yellow-grey earths). • Braided sections of alpine-sourced rivers. Significant groundwater resource: depth to aquifers much greater than in B above, can be as deep as 100 m. 	<ul style="list-style-type: none"> • Strong drying winds. • Periods of moisture stress.
D	Recent floodplains (both alpine-sourced braided rivers and foothill rivers)	<ul style="list-style-type: none"> • Active riverbeds & associated floodplains, low terraces & marginal wetlands. • Mix of poplars, willows, gorse and broom within active beds; remnant rush /sedge in marginal wetlands. Improved pasture, arable crops, plantation forestry on adjacent floodplains and terraces. • Rainfall 600 - 1000 mm. • Active river gravels & recent alluvial soils. • Zone of interconnected ground and surface water: groundwater flows to surface water in upper reaches, surface water flows to groundwater in lower reaches. 	<ul style="list-style-type: none"> • Strong, drying winds. • Periods of moisture stress. • Flooding & associated gravel deposition outside natural channels. • Bank erosion and reworking of river bed gravels.



Location

Includes the broad Canterbury Plains, extending north from Timaru through to Amberley, and the inland basins, such as Culverden and Hakataramea.



cabbage tree-pukeko-plains

Nature

- Extensive plains composed of multiple intersecting gravel fans. Exposed to strong, hot, dry north-west and strong westerly winds.
- Prominent braided rivers with extensive flood plains and significant estuarine zones. Spring-fed streams. Extensive, mainly unconfined, aquifers.
- Very little indigenous vegetation remains (pre-European savannah, podocarp forest and extensive wetlands).

Resource Values

- Human activity in Canterbury is concentrated on the Plains - includes major urban and rural settlements, intensive agricultural and industrial land uses.

Induced changes/disturbances	Effects/trends	Key issues for soil conservation
<ul style="list-style-type: none"> • Vegetation clearance. • Roads, tracks & vehicle disturbance in dunes . • Mining, groundshaping, building sites. • Increased urbanisation and industrial development around Christchurch & Timaru cities. • Drainage of coastal lagoon margins, wetlands. • Lake and river mouth opening. • Dune restoration. • Recreational activities. • Gravel extraction from beaches and rivers. • Upstream dams affect sediment supply. • Increase in plantation forestry. 	<ul style="list-style-type: none"> • Spread of wilding pines and lupins. • 70 % of Canterbury coast is eroding. • Most sandy beaches are prograding. • Increased nutrient concentrations in coastal lagoons, estuaries and lakes. • Changed hydrological regime in lagoons with managed mouth openings. • Loss of indigenous habitat, particularly wetlands & coastal dunes. • Upstream land uses and point discharges are sources of water quality contaminants. 	<ul style="list-style-type: none"> • Erosion risk (dune migration): Vegetation clearance, mining, groundshaping, building sites earthworks, vehicles in foredunes, grazing of foredunes. • Hazards: coastal erosion, inundation, storms. <p>Related issues:</p> <ul style="list-style-type: none"> • Water quality degradation: nutrients, microbial. • Loss of indigenous biodiversity / habitat: dunes, estuary, coastal fringe wetlands. • Loss of mahinga kai. • Change in landscape: spread of forestry and lupins.
<ul style="list-style-type: none"> • Extensive drainage network. • Cultivation. • Intensive grazing, especially dairying. • Stubble burning. • Frequent use of fertilisers and pesticides. • Replacement of wetland and other indigenous habitat with crops and pasture. • Removal of existing shelter belts with installation of irrigation systems. 	<ul style="list-style-type: none"> • Loss of organic matter due to drainage, especially of peat soils. • Soil contamination - DDT, cadmium residues. • Reduced seasonal flooding in drained areas. • Increased nutrient and microbial concentrations of surface water bodies. • Shallow unconfined aquifers vulnerable to contamination. • Aquatic and wetland habitat loss, especially in spring-fed streams. • Seasonal smoke. 	<ul style="list-style-type: none"> • Erosion risk: intensive cropping. • Soil quality: contamination (cadmium), <p>Related issues:</p> <ul style="list-style-type: none"> • Water quality degradation: nutrients, microbial. • Loss of indigenous biodiversity: wetlands, aquatic and riparian habitat. • Loss of mahinga kai. • Air quality degradation: (periodic)- stubble burning.
<ul style="list-style-type: none"> • Extensive network of stock water and irrigation races. • Intensification of land use: particularly dairying and deer farming. • Removal of existing shelter belts. • Cultivation - often intensive • Groundshaping (border dyking). • Stubble burning. • Extensive well network. • Frequent use of fertilisers and pesticides. • Intensive grazing, including increased dairying. • Intensive irrigation. 	<ul style="list-style-type: none"> • Overgrazing during droughts in inland basins exacerbating wind erosion. • Increased soil nutrient levels & improved soil structure in pastoral areas. • Soil contamination - DDT, cadmium residues. • Increased nutrient and microbial concentrations of surface water bodies, and unconfined aquifers. • Some areas of increased nitrates and pesticide concentrations. • Almost total loss of indigenous habitat (savannah vegetation) & loss of ecological links between coast and hills. • Seasonal smoke. 	<ul style="list-style-type: none"> • Erosion risk: intensive arable use, mixed cropping, intensive grazing in inland basins during drought conditions. • Soil quality: risk of soil structure decline due to continuous cropping; contamination (cadmium). <p>Related issues:</p> <ul style="list-style-type: none"> • Water quality degradation: nitrates, other nutrients, microbial, pesticides. • Loss of indigenous biodiversity / habitat : manuka / kanuka. • Air quality degradation: (periodic) - stubble burning
<ul style="list-style-type: none"> • Cultivation - often intensive. • Gravel extraction. • Channel clearance, including vegetation removal, maintenance & straightening works. • Tree planting within beds and berms for river control and production. • Intensive grazing, including dairying. • Stop banks development and maintenance. • Recreational activities, e.g., 4WD vehicles, boating. • Major zone of point source discharges. • Urban / rural-residential development. 	<p>Riverbeds</p> <ul style="list-style-type: none"> • Loss of indigenous vegetation within beds & margins. • Narrowing of active riverbed. • Initial trend of fairway clearance. More recent invasion of fairway with gorse and broom. • Clogging of minor riverbed channels, particularly outside of rating districts. <p>Adjacent floodplains, terraces</p> <ul style="list-style-type: none"> • Risk of wind erosion in areas with cultivated soils. • Improved soil structure under pasture. • Soil contamination - DDT, cadmium. • Wetland loss 	<ul style="list-style-type: none"> • Erosion risk: cropping, market gardening, intensive horticulture. • Soil quality: Contamination (DDT, cadmium). <p>Related issues:</p> <ul style="list-style-type: none"> • Pest management: weeds in riverbeds, leads to flood hazard and pest refuge. • Flood hazard due to human settlement. • Loss of indigenous biodiversity / habitat: riparian, wetland habitat. • Loss of mahinga kai. • Changes in natural character: particularly aquatic & riparian environments. • Water quality degradation