

Background

Ashburton district is bounded by the Main Divide to the west and the Rakaia and Rangitata Rivers to the north and south respectively. The district covers 6175 square kilometres, with approximately 47 percent in hill country and 53 percent in plains. The plains have been formed by deposition of gravels from the hill country by the Rakaia, Rangitata and Ashburton Rivers and deposition of wind-blown silt and sand (loess). There is subsequently a mosaic of soil types in the district, characterised by the depth of gravel and the amount of overlaying loess deposits. They vary in age from 20,000 years on the high terraces to 3000 years on the low terraces (see Molloy, 1988).



Ashburton District

Kindly provided by Environment Canterbury

The Ashburton climate and water situation, like all of Canterbury, is strongly influenced by the Southern Alps to the west. Moisture-laden air from the Tasman Sea brings high rainfall to the West Coast and the hill country and alpine catchments of the Rakaia, Rangitata and Ashburton Rivers. The westerly air stream deposits considerable rain on the western side of the alps and a rain shadow is carried over the alps to deposit rain on the eastern side to varying extents,

depending on the strength of the weather pattern. The drier air is warmed as it descends in altitude and this warm, dry air forms the characteristic drying nor'westers of the Canterbury Plains. These are most commonly experienced in spring and early summer. In winter, the region is exposed to cold southerlies which often bring snow to the foothills and, less frequently, to coastal areas. The climate of the region is one of relative extremes, with dominant effects being the cold southerlies, drying nor'westers, summer drought, and occasional flooding of the major rivers.

The vegetation of Ashburton district was originally influenced by fluctuations of climate between glacial and interglacial periods, most recently with the onset of the current interglacial period, about 10,000 years ago. Up until the 13th century both the hill country and plains were forested, most of which was destroyed by extensive fire at the time of Maori settlement (McGlone, 2004). By the time of European settlement in the 1850s the landscape was dominated by tussock grassland. Large estates were developed for extensive sheep production and cereal cropping. Subdivision of these estates began in the 1880s, with progressive development of dryland sheep farming and cropping on the heavier soils.

Present situation

Water is the lifeblood of the region, and holds a wide range of cultural, spiritual, ecological and economic values to the people of Canterbury. The Canterbury rivers, from their headwaters to the sea, have traditionally provided important sources of mahinga kai for the Ngai Tahu people. The health of the mahinga kai is taken as a fundamental 'environmental indicator' of the health of the whole natural system. In the case of the Hakatere (Ashburton) River this is seen to have been detrimentally affected over the last century or so (Goodall, 2001). The development of farming, and increased population over the last 150 years, has seen significant changes to some of the rivers and increasing demand for water use for multiple purposes. Water from the main rivers has long





Rakaia River
Kindly provided by Ashburton District Tourism

been seen as the key to development of farming in the Canterbury region. The Ashburton River provided water for the development of a stock-water system that has evolved over the last 130 years. The Rangitata Diversion Race irrigation scheme was developed in the late 1950s, bringing border-dyke irrigation water to most of Ashburton District. By the late 1980s there was increasing pressure on the surface water resources of Canterbury, but a belief that groundwater would provide for future increases in demand. Since that time there has been a rapid intensification of farming, including extensive develop-

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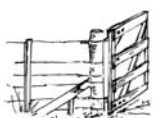
ment of dairy farming. Current demand for water is such that all surface water is over-allocated, as is most of the ground water in Ashburton District. Environment Canterbury has developed a Natural Resources Regional Plan for the whole region, within which they have sought to balance the multiple demands for water (see <http://www.ecan.govt.nz/Plans+and+Reports/NRRP/About-Nrrp.htm>, last access 10/3/05; also Boffa Miskell, 2001; Miller, 2004). Included in the plan are strict controls on further allocation of surface and groundwater, particularly in areas where it is over-allocated. Minimum flow levels have been set for all rivers. In the case of the Ashburton River this includes plans to increase flows by piping stock-water. There are also restrictions on planting exotic forest plantations in some catchment areas.

Linked to the water situation on the Canterbury plains are the value of trees for water conservation and the future management of the high country catchments that feed the rivers and aquifers.

The importance of trees on the Canterbury plains was recognised by the earliest settlers in the 1850s. Shelter plantings were strongly promoted in the 1970s and 80s by the former catchment boards, with research support from the former DSIR. Environment Canterbury continues to support planting of trees, both for shelter and for other benefits including wetland protection and enhancement, erosion control and biodiversity enhancement. Individuals, communities and organizations such as the



Canterbury Plains Kindly provided by Ashburton District Tourism



Farm Forestry Association and Landcare Trust are also active in supporting tree planting for multiple benefits. Two principal benefits of strategic tree planting in Canterbury are water conservation, and shelter and shade for stock. One consequence of some large dairy conversions over the last decade has been the removal of established shelter and installation of centre-pivot irrigation.

The future management of the high country, which forms nearly half the total area of the district, is likely to involve a balance between ecologically sustainable management alongside management for economic benefits (see <http://www.linz.govt.nz/rcs/linz/pub/web/root/core/CrownProperty/highcountryobjectives/index.jsp>, last access 10/3/05). A report on land use potentials identifies a more-or-less even split between land (high country and pastoral lease) that could potentially be freehold and land that could be set aside for conservation (Lynn et al., 2003). The original (pre-human) forest cover is identified as a potential starting point for consideration of 'what might constitute a stable and biodiverse landscape cover'. If such an outcome is desirable it would require 'innovative management and careful integration with the wider productive landscape', and would take a long time to establish (see McGlone, 2004). The effects of such changes on the hydrology of the rivers and aquifers of Canterbury could be significant, although have not been quantified.

There is a strong sense of community in Ashburton District which has been tested with changes in the social structure of rural communities and through the multiple demands on water. As with communities throughout New Zealand there is the potential for even greater challenges in the future with climate change.

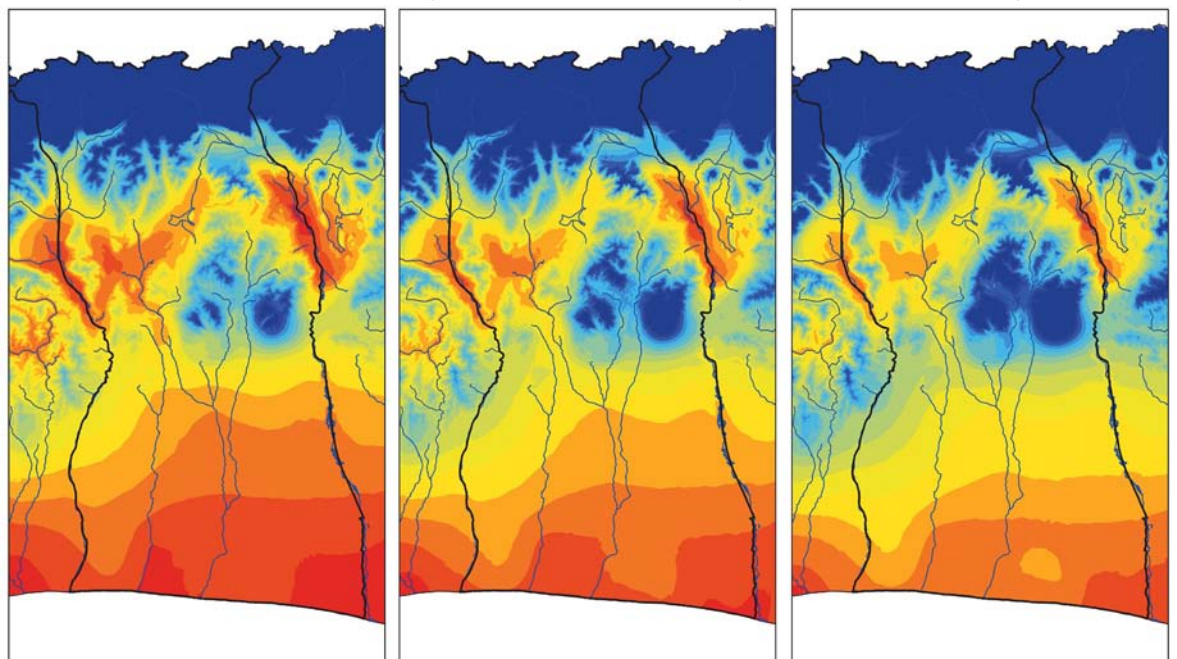
Possible effects of climate change

Water is the critical issue, present and future, for Ashburton District. How land-use changes and water-resource decisions are managed will have a significant influence on the balance of positive and negative effects that may arise with climate change.

Important climate change effects that could arise include:

- Less water in all rivers and streams, except the major rivers that are sourced in the Main Divide. A possible 10 percent decline in average rainfall by 2050 could have severe impacts on available water over time. Information from NIWA suggests greatest decreases are likely to occur in coastal areas of Canterbury.
- More water in the Rakaia, Rangitata and Ashburton Rivers is a possibility, depending on precipitation changes in the Main Divide. If more frequent westerly conditions prevail there could possibly be more precipitation in the mountains.

This map and the ones on the next page show changes in average rainfall and temperature in the Ashburton and neighbouring catchments for the October to March period. They are derived from data obtained by Landcare Research, Private Bag 3127, Hamilton.



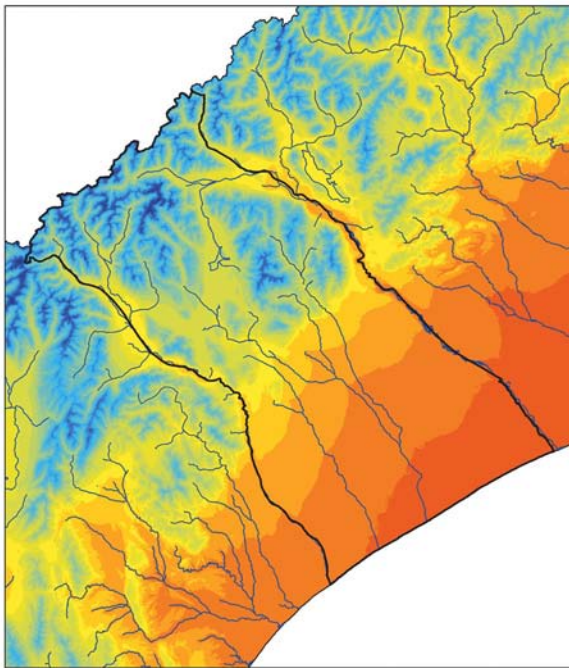
Total rainfall (October-March inclusive) -10% Total rainfall (October-March inclusive) Total rainfall (October-March inclusive) +10%

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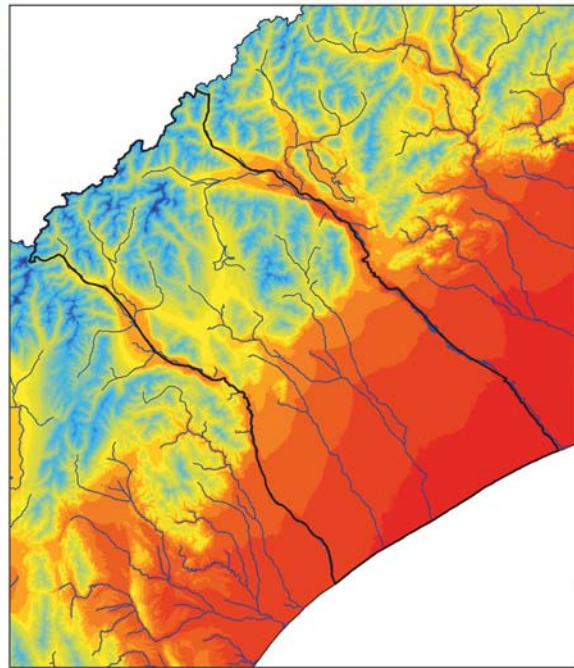
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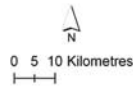




Mean temperature (October-March inclusive)



Mean temperature (October-March inclusive) +1°C



- Drought and flood risk – Ashburton District has experienced extremes of drought and flood in the past. These will occur again in the future, but possibly with greater frequency and severity. The potential for increased drought risk is highlighted in work completed through the CLIMPACTS research programme (see Kenny et al., 2001). More extremes of rainfall, particularly in the Main Divide, could increase flood risk.
- The potential for higher organic matter turnover with higher temperatures could have significant impacts on the low-carbon soils of Canterbury (see Tate et al., 1996).
- There could be new pest and disease threats.
- Yields of temperate crops and pasture could increase with higher atmospheric carbon dioxide. However, these yield increases would, in the case of wheat for example, require increases in nitrogen fertiliser and sufficient water (see Jamieson and Cloughley, 2001).
- Changes in land use are likely to be influenced by climate change. Warmer average conditions will increase options over time, but water will be the key.

Other possible changes: As with all other areas in New Zealand, there is pressure from subdivision in rural areas. Changes in social structure are already evident from the development of dairy farming which has already impacted on local communities.

Community thoughts on adaptation

The global capacity has been reached or passed. We therefore need to work within the limits of available resources. A global perspective is needed – think global, act local.

Nationally, we need a deregulated free market economy. Links need to be made between the economy, social and climatic conditions, with a focus on sustainability.

In Ashburton District the key issue is the future management of water resources. An optimistic view is that with people working together this can be resolved for the benefit of all.

Water

There are two views regarding the future of water. The first is that with a whole-catchment management approach and increased efficiency of use there ought to be enough water for everyone. The second is that more water is needed. Specific issues include storage, depleted wells, flood risk, negative effects of nitrates.

Catchment management

The mountains, plains and sea are interconnected. Freshwater into the sea needs to be maintained for the future viability of fisheries. The high country has potential for conservation; opportunities for tourism, reserves, recreation.

Underlying the hill country tenure review has been a detailed evaluation of the ecological



potential of the land. This provides valuable information for considering a future with climate change, where the focus needs to be a whole-catchment management picture. What is the optimum balance between productive land use and managed return to woody vegetation for the long-term benefit of the entire catchment? Unfortunately, questions such as these are sidelined by concerns from different parties about both public and private ownership.

Water use and supply

Greater efficiency is the key. Strategies are needed to reduce water demand (improve efficiency of use) and to budget all of the water. People need to be challenged on their production per litre of water. They need to be aware of the negative effects of overuse and benefits of efficient use. Individual households should be required to retain rainwater.

Riparian management

River protection works are needed. Rehabilitate wetlands. Remove willows from the rivers and plant riparian margins with natives to improve river flows.

More water

Options for more water include piping water from the West Coast and large storage dams in the foothills. Storage dams could be multiple-purpose, providing water for irrigation as well as increased capacity for power generation. A piped water supply to the plains could also provide a source of energy (gravity is a source of energy). Money from electricity generation would help pay the cost of storage dams. To appease the conservationists, dams should be located away from river beds – with water channelled off.

Making it happen

Get things going with water budgets and tree planting as soon as possible. Whatever options are taken there is a financial cost involved. There is also risk associated with proactive change (you may not get it right). The key thing is that community agreement is needed.

Diversification

Reduce on-farm vulnerability through different pasture and fodder species and more widely through land-use planning (eg, residential development on less productive land). Population spread needs to be limited.

Biosecurity

More border protection is needed to prevent potential pest and disease threats moving south.

Trees

More shelter trees are needed on the plains. Incentives are needed for appropriate shelter. Riparian plantings need to be actioned on a large scale.

Soil

Forward planning is needed on land use options, to protect elite soils from the pressures of population growth and to provide protection from erosion.

Energy

We have two huge resources, gravity and sunshine hours. We need to take advantage of both of these as much as we can.

Tourism

A warmer climate will affect ski resorts. Less snow is being overcome at present with snow-makers. Longer-term there may be a need to look at diversifying with more walking tracks and conservation reserves.

Coast

Low-lying coastal areas could be more vulnerable to surface water flooding.

Positives for the future

- A warmer climate will increase production in the foothills zone.
- There could be more water in the main rivers.
- New crops will be possible.
- Science and technology will provide new

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information to enable more to be grown on less land.

There are some positive things happening now including:

- Increased awareness of the need for water use efficiency and conservation. ECAN are working to manage limited resources, particularly water.
- Awareness of climate change in future planning and positive dialogue about the future, such as through the adaptation workshop held in Ashburton and summarised here.
- Greater sensitivity to weather extremes.
- Landcare and environmental groups and actions associated with their activities.
- The District Plan.
- Talk of conservation reserves.

Good ideas for a resilient future

Build resilience through social, economic and environmental sustainability. This needs to be developed through information, knowledge and awareness – the wider population needs to be better informed to enable people to change and adapt. We need to be better at storage of resources (not just water) for times of shortage. Long-term planning is required.

- Greater water use efficiency (taking into account economics) and removal of inefficiencies (eg, willows). Being smarter with water overall.
- Monitoring, of water and other indicators.
- Education and consultation – schools; field days (farmers learn from farmers); all sections of the population need to be engaged.
- Shared responsibility between urban and

rural communities (eg, roof-water collection for use in gardens etc.).

- Appropriate shelter plantings can increase production.
- Use gravity to generate electricity from stored water.
- Conservation of soils is needed, with a focus on protecting elite soils.
- Conservation park in the upper catchment.

There are different points of view on the idea that the Regional and District Plans need to be reviewed/revised to make them living documents, capable of allowing adjustment to rapid change. Two key points are:

- 1) The climate will change quicker than we can react.
- 2) The perception of regulations/plans etc as barriers to progress needs to be overcome. The RMA needs to be seen as a hurdle that can be crossed.

Implementation

Awareness, education, and consultation are the key. Get people to understand that they have a responsibility. There are lots of things people can do. Coordinate non-sectional interests and get goodwill going between people. There's nothing that can't be solved. Replace negative language with positives – barriers prevent action, hurdles can be overcome. We need to see the RMA as a necessary hurdle, not a barrier. There is a bright future ahead but we need to be wiser and smarter.

- Education is needed, through schools (educate the next generation), resource care and water user groups.
- Smart adaptation and innovation will lead to multiple benefits, including mitigation benefits.
- Plains Canterbury is different from more localised catchments in other parts of New Zealand. The issues, particularly related to water, are on a larger geographic and social scale. Support from national government is needed.
- The process of innovation and change could be sped up, for example, by developing monitor farms that are focused on adaptation to the future (with climate change and other factors).
- Shelter is very important.
- We have the luxury of choice. So long as we have this we will always have different opinions and take longer to reach agreement. Choice can lead us to being reactive rather than proactive.



Build resilience through social, economic and environmental sustainability. Awareness, education and consultation are the keys. There are lots of things people can do. There is a bright future ahead but we need to be smarter and wiser.



A view from Central Otago

A final workshop was held with a group of Central Otago farmers in March 2005. This affirmed information shared by farmers from Bay of Plenty to Canterbury over the previous two years. Key issues identified were water, the need for closer rural/urban interactions, the need for better communication and education, and bureaucratic impediments. Key points identified for developing a more resilient region are:

1. Education and communication.
2. A better bureaucratic framework. Deregulation with quality standards/codes of practice.
3. A more collaborative approach which needs a willingness of all parties to come together.

