

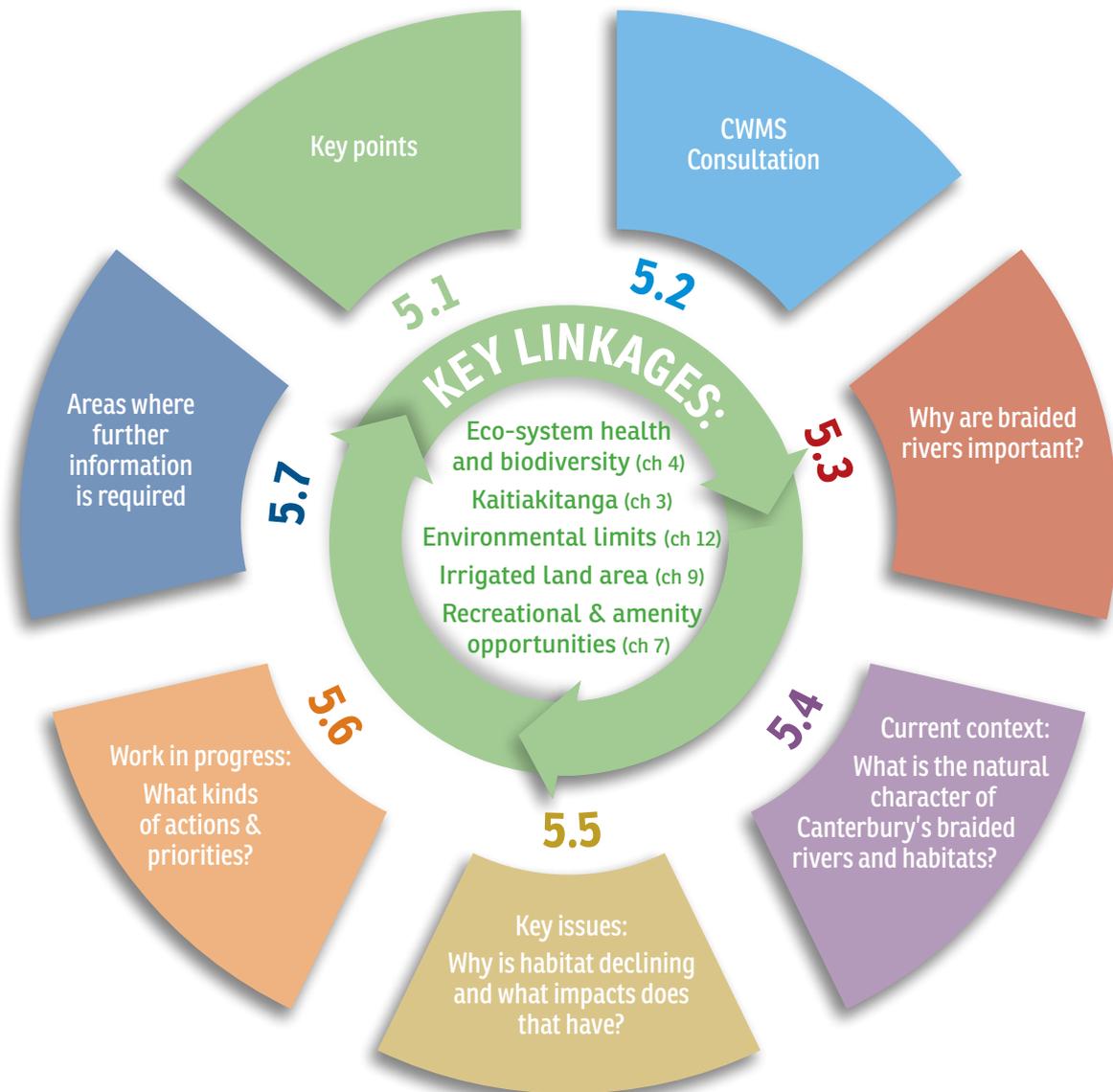


Rakaia River

## NATURAL CHARACTER OF BRAIDED RIVERS

5

# CHAPTER LAYOUT



## CWMS Targets from 2010:

- Maintain the upper catchments of alpine braided rivers as largely natural ecosystems and landscapes
- No new dams on the main-stem of major alpine braided rivers
- Maintain active floodplains, flow variability and sediment movement - including during river protection works, land-use change or deliberate vegetation stabilisation
- Support the dynamics of river mouth and coastal processes
- Implement actions to correct the decline in useable braided river bird habitat

## 5.1. KEY POINTS IN THIS CHAPTER

### KEY POINTS

- Canterbury’s braided rivers are internationally and nationally significant, and provide outstanding habitat for many rare birds, fish, plants and other species
- Canterbury has the largest number of braided rivers in New Zealand. The seven alpine rivers that contribute 88% of the flow within the region are all braided (Clarence, Waiau, Hurunui, Waimakariri, Rakaia, Rangitata and Waitaki Rivers). Their protection and use requires careful consideration
- The braided character of rivers is at risk from agricultural encroachment and engineering works. Many rare species are at risk from recreational use, introduced predators and weed species, and engineering works.
- The dynamic nature of braided rivers is highly important. Flow of gravel is critical to the braided nature of these rivers. Storage dams on main rivers can have major impacts on braided rivers. Control of water quality and maintenance of water flow variability is essential.

### KEY POINTS

- Braided river-mouths are culturally significant for Ngāi Tahu, provide an important habitat for many species, and are important for coastal gravel nourishment. The movement of gravels and working and reworking of sediments to form islands, plains, river mouths and coastal beaches all contribute to sustaining the mauri of that braided river system – the “working ability” of a river.
- Braided rivers are highly valuable for a wide range of recreational activities and an important tourist attraction.
- The Waitaki River, as the ancestral river of Ngāi Tahu, is of paramount importance.

## 5.2. MATTERS RAISED IN CWMS CONSULTATION

Braided rivers and their bird species are important to many Cantabrians, and like biodiversity in general, they form a fundamental part of the cultural identity and heritage of Ngāi Tahu, of subsequent settlers, and of the Canterbury community today. Some submitters call for extra protection, research and enhancement for braided rivers and their species, and some believe that “we must be prepared to lose some of our large areas of braided river to achieve economic growth”. Many people made comments about protecting braided rivers, and “recognise[ing] the constant meandering of Canterbury’s braided rivers” (*Environment Canterbury 2009*).

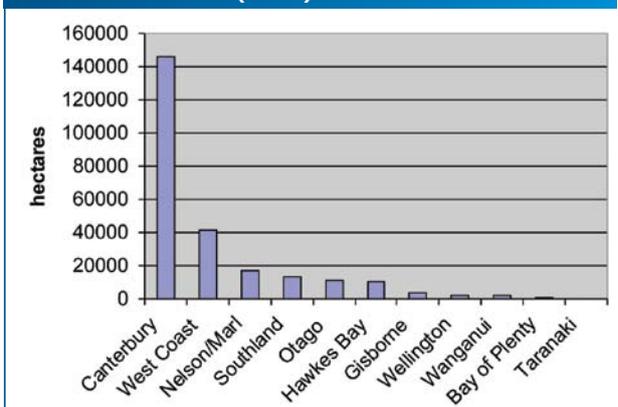
## 5.3. WHY ARE BRAIDED RIVERS IMPORTANT?

Braided rivers are iconic natural landscapes, found in only a few places around the world; Alaska, Canada, the Himalayan region, and New Zealand’s South Island have excellent examples (*DoC 2010*). Braiding refers to multiple water channels around more or less ‘permanent’ gravel islands (which are usually covered, and often modified in size and shape, during severe floods) (*Environment Canterbury 2010*). During the last major ice age 25,000 to 10,000 years ago, huge glaciers gouged and bulldozed millions of tonnes of rock off the spine of the Southern Alps. As the ice began to retreat, streams and rivers carried this alluvial outwash down the valleys of the east coast and deposited it to form flat basins between the mountains and the coastal plains. The processes of geological uplift, erosion and alluvial transport continue today and maintain these braided river systems (*Department of Conservation 2006*). Geological uplift, erosion and water carrying sedimentation downstream are all important features of New Zealand’s braided rivers (*Department of Conservation*). Figure 8 shows the distribution of braided rivers nationally.

Unique characteristics of braided rivers include multiple channels, flow instability, high gradients, high levels of sediment supply and movement, constant channel movements, and seasonally rich food supplies. These processes provide outstanding feeding and nesting habitat for braided river birds and other fauna. All birds,

and individual species, have synergistic and sometimes overlapping needs. These include multiple channels (for feeding in/over and for providing protection on islands from invading predators), suitable flow regime, ‘bare’ shingle islands for nesting, and large areas of habitat for territorial species. For wrybills this is up to several hectares per pair (*Hughey 2006*).

**Figure 8: Distribution of braided rivers nationally.**  
Source: O’Donnell (2010).



## 5.4. THE CURRENT CANTERBURY CONTEXT: WHAT IS THE NATURAL CHARACTER OF CANTERBURY'S BRAIDED RIVERS AND HABITATS?

In Canterbury, the seven alpine rivers that contribute 88% of the flow within the region – Clarence, Waiau, Hurunui, Waimakariri, Rakaia, Rangitata, and Waitaki – are all braided. Other foothill rivers are also braided or have braided reaches.

### 5.4.1. BRAIDED RIVER BIRDS

Amongst the wide range of bird communities (guilds) on Canterbury rivers, some species are particularly vulnerable, as shown in Table 8.

**Table 8: Conservation status of key braided river species.**

BIRD SPECIES	STATUS	UNIQUE FEATURES
Tarapirohe – black-fronted tern	Threatened – nationally endangered	<ul style="list-style-type: none"> <li>Lives and breeds inland, only visiting coast in autumn and winter</li> <li>Terns are classed by Ngāi Tahu as a taonga species</li> </ul>
Tarāpuka – black-billed gull	Threatened – nationally endangered	<ul style="list-style-type: none"> <li>Visit the coast only in winter after breeding season</li> <li>Choose different sites and rivers for breeding each year</li> </ul>
Ngutu pare – wrybill	Threatened – nationally vulnerable	<ul style="list-style-type: none"> <li>Small birds that are well camouflaged amongst stones</li> <li>Probably most specialised braided river wading bird</li> <li>Affected by high levels of predation and habitat loss</li> <li>Pairs defend a territory and nest alone</li> </ul>
Turiwhatu – banded dotterel	Threatened – nationally vulnerable	<ul style="list-style-type: none"> <li>In North island breed mostly on harbours and beaches, in south on braided rivers and river terraces</li> <li>Many migrate to Australia in the winter</li> <li>Each pair defends a territory and nests alone</li> </ul>
Kakī – Black stilt	Threatened – nationally critical	<ul style="list-style-type: none"> <li>Taonga species</li> <li>Confined to Mackenzie Basin</li> <li>One of the rarest waders in the world</li> </ul>
Tōrea – South Island pied oystercatcher	At risk – declining	<ul style="list-style-type: none"> <li>Breeding pairs very territorial, display with shrill piping calls when other birds or people come too close</li> <li>Long bill allows it to probe deep into mud, sand or under pebbles</li> <li>In winter flock to harbours of North and South Islands to feed</li> </ul>

Source: Hughey 2006 and Department of Conservation 2010.

The birds of the braided rivers choose variable breeding sites from year to year, meaning that it is important to ensure that nesting birds are protected from people and predation along the entire length of the river (e.g. predator trappings and signage to inform river users).

Braided river-bird surveys help to provide information for planning, monitoring policy effectiveness, and tracking environmental trends. The box shows some data for the Waiau River in 2008 and 2009. The number of black-billed gulls has declined substantially, whereas wrybill, black-fronted terns and banded dotterel had small increases, probably indicative of the fact that braided river birds choose different breeding sites each year.

### Environment Canterbury's Waiau river-bird surveys

NUMBER OF BIRDS	2008	2009
<b>Wrybill</b>	11	17
<b>Black-fronted terns</b>	520	823 - Internationally significant populations
<b>Black-billed gulls</b>	2035	307 - Very mobile; depends on survey timing
<b>Banded Dotterel</b>	451	531

The Waiau is an 'outstanding' river for key threatened braided river birds (Schmechel 2008).

## 5.4.2. BRAIDED RIVER INVERTEBRATES AND LIZARDS

Invertebrates are animals without a backbone, and are a diverse group ranging from spiders and jellyfish through to insects and worms. Invertebrates provide vital ecosystem services, including recycling nutrients and maintaining soil structure. They are an important food source for many native birds, and some are pollinators of plants, vital to the plant's continued survival. All invertebrates form part of a complex web of interactions, and the loss of a species can have a widespread effect on the system in which it lives.

Braided rivers and wetlands are home to many aquatic invertebrates including dobsonflies, mayflies, stoneflies, caddisflies, waterboatmen, red coat damselflies, and sandflies. Wingless larvae live beneath rocks. All of these insects are also a food source for fish and birds. There is a need for more information about terrestrial invertebrates in braided rivers. Some, like the robust grasshopper, are only found in the upper Waitaki Basin. Another threatened grasshopper endemic to the Upper Waitaki Basin is the grasshopper *Sigaus minutus*.

Lizards also make use of river-terrace boulder habitat to live and breed such as the McCann's skink/mokomoko which likes to use dry rocky areas for basking in the sun. The long-toed skink, scree skink, spotted skink and jewelled gecko, all found in braided rivers, all have threatened species classifications ([Department of Conservation 2001 and 2010](#)).



Jewelled gecko

## 5.4.3. BRAIDED RIVER PLANTS

As described already, braided riverbeds are highly dynamic, changing physically and spatially over time. Many habitats are present, including freshly deposited silts and sands, exposed gravel islands and bars, older stabilised terraces, backwaters and discrete wetlands ([Davis 2001](#)). A variety of native plants are found in the catchments of braided rivers and while many of the individual plants are found in other types of rivers and habitats, it is the ever-changing mosaic of plants at different successional stages that makes Canterbury's braided riverbeds so distinctive and ecologically significant ([Davis 2001](#)). A variety of growth forms and species are present, including rosette herbs (e.g. *Geranium sessiliflorum*), grasses (e.g. Lindsay's Poa), mat plants or cushion plants (e.g. mat daisies), creeping shrubs (e.g. creeping pohuehue) and upright shrubs (e.g. matagouri) ([Davis 2001](#)). Examples of a few studies are described below:

Meurk and Williams (1989) reviewed the literature and identified around 300 plant species typical of Canterbury braided riverbeds. 55% of these were indigenous and 44% of the total were associated with more stable terraces and river margin wetlands. In the lowland sections of the braided rivers, introduced species were characteristically dominant.

A more recent survey found over 300 native plant species, 35 mosses and liverworts and 41 lichens in the Mackenzie Basin braided rivers. 23 different threatened plants were recorded from upper Waitaki riverbeds and wetlands in the same survey ([Department of Conservation 2010](#)).

In the Hakatere Conservation Park, ground orchids grow amongst the tussocks and since the removal of grazing, uncommon species are beginning to appear, such as the mat daisy (*Raoulia species*), the mat broom (*Carmichaelia uniflora*) and creeping pohuehue (*Muehlenbeckia axillaris*) which are important food sources for native butterflies and moths ([www.amazingspace.co.nz/amazing/HakatereConservationPark/](http://www.amazingspace.co.nz/amazing/HakatereConservationPark/)).

The headwaters and upper section of the Rangitata River are considered outstanding for indigenous riverbed, riparian and wetland plant communities, and for indigenous invertebrate habitat. These sections of the river have outstanding ecological and scientific values because of the diversity of their communities, their naturalness and the presence of threatened plants ([Davis 2001](#)).

Many factors influence plant distribution, including the frequency and size of floods, the type and age of substrates, the availability of water and propagules (seeds or other vegetative material) and human uses such as grazing and river control works ([Davis 2001](#)).

## 5.4.4. BRAIDED RIVER FISH

See Chapter 4 for more information on native fish species, many of which are found in braided rivers.

## 5.5. KEY ISSUE: POTENTIAL ADVERSE EFFECTS ON BRAIDED RIVERS

As a result of the introduction and invasion of weeds, predators, exotic fish, and human activities, braided rivers and their bird species, plants, native fish and insects are under threat. Table 9 shows 'threats' to braided river ecosystems including engineering works, recreation activities, introduced predators and plant and algae species, and agriculture and irrigation. An integrated management programme is essential if future problems are to be avoided.

**Table 9: Adverse effects on braided river ecosystems.**

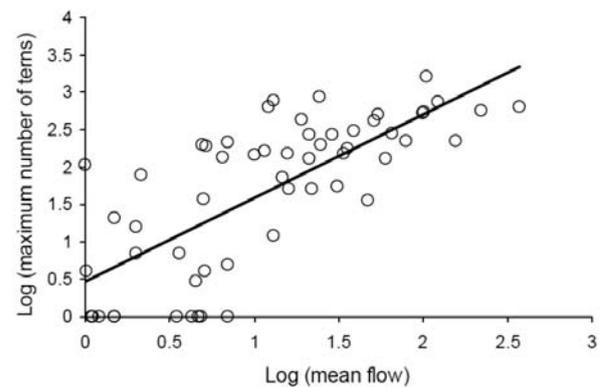
THREAT	IMPACTS
<b>Engineering works</b> Dams, water diversion, water and gravel abstraction, drainage of wetlands	→ Changes in natural river flows and natural character of rivers Flooded habitat Diverted water Water removed from wetlands Potential loss of riparian wetlands and back/side braids which are the habitats that can be safely accessed and fished Altered river habitat Loss of island habitats as they become joined to the main riverbank
<b>Recreation activities</b> Fishing, camping, boating, kayaking, wildlife watching, 4WDs	→ Disturbed habitat and nesting areas Prolonged disturbance can cause nest desertion Introduction of plant and animal pests
<b>Introduced predators</b> Feral cats, hedgehogs, ferrets, stoats, weasels, rats, introduced fish species	→ Prey on native birds, fish, lizards and insects
<b>Introduced plant and algae species</b> Willows, Russell lupins, elder, wattle, didymo etc See Appendix 5.9.4 for DoC statistics on major rivers with weed encroachment and relationship with river flows	→ Invade river beds Stabilise naturally dynamic water channels Trap silt Displace low-growing native plants Cover feeding and breeding areas Provide cover for predators Reduce visibility wading birds need for nesting Reduce amount and quality of habitat (didymo)
<b>Water abstraction</b>	→ Reduced flows Changes to braided channels Loss of quality and quantity of habitat Loss of wetlands
<b>Activities in riparian/flood plain area</b>	→ Displacement of alluvial riverbed Displacement of indigenous flora and fauna Water contamination Trampling or grazing of native plants

Source: Department of Conservation 2006 and 2010, Hughey 2006, O'Donnell and Hoare 2011).

A recent study counted black-fronted terns from 2313 km of surveys on 84 rivers throughout their breeding range. Rivers on which declines in tern numbers have occurred have relatively low flows ( $<30\text{m}^3/\text{s}$ ) (Figure 9). Based on the study's results, the authors predict that if flows were reduced significantly on higher-flow rivers, rates of population decline would accelerate (D'onnell and Hoare 2011).

The flow of gravel is particularly critical to the braided nature of these rivers. Storage dams have major impacts on braided rivers. Control of water quality and maintenance of water flow variability is essential.

**Figure 9: Relationship between mean river flow and maximum number of terns counted on braided rivers (O'Donnell and Hoare 2010, p. 35).**



*Generalisation of the relationship between mean river flow ( $\text{m}^3/\text{s}$ ) and the maximum number of terns counted on braided rivers ( $n=57$  rivers for which data were available). Data are expressed on a log scale to better illustrate trends.  $R^2=0.54$ .*

## 5.6. WORK IN PROGRESS

A number of projects are underway in Canterbury to protect and enhance braided-river ecosystems and species. Such projects typically include:

- Weed control (e.g. preventing weeds, surveillance, removal)
- Sustained predator control
- Rules for habitat protection (e.g. legal protection of waterways, firewood cutting rules)
- Adequate environmental flows to sustain fauna
- Protected areas networks (e.g. to protect a representative range of rivers. Most threatened biodiversity does not occur in reserves or on DoC land)
- Community conservation initiatives
- Recreation management (e.g. restricted access for four wheel drives)
- Communication and education for river users (e.g. improved signage)
- Regional action plans
- Develop inventories of what still remains
- Fencing of stock to keep them out of waterways.

Many of these activities are methods for achieving the CWMS targets to enhance and protect braided river habitats and species.

**Appendix 5.9.2 describes a Canterbury project that is already underway – the Project River Recovery in the MacKenzie Basin.**

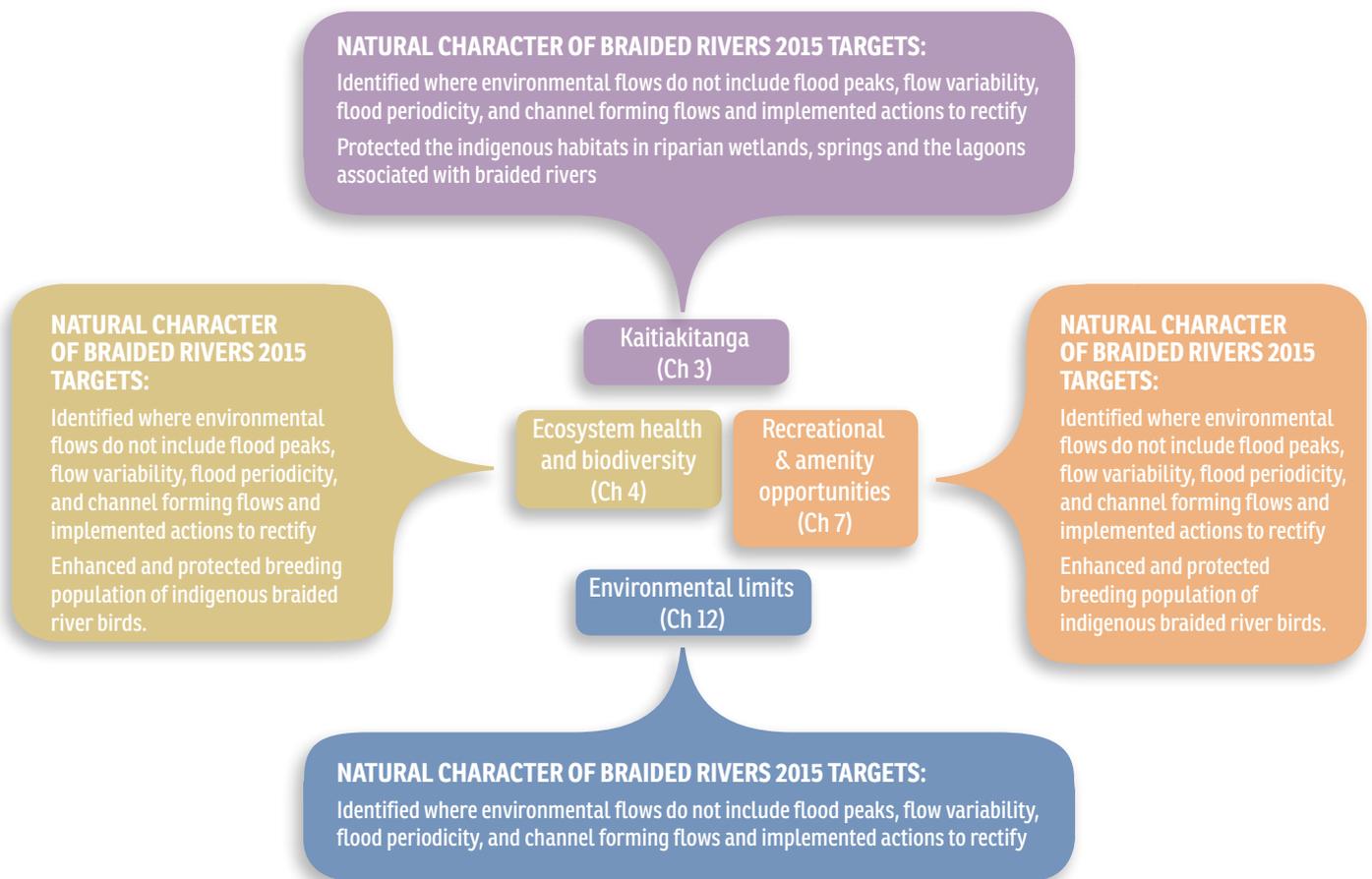
An essential aspect of CWMS zone and regional committee discussions and decisions will be on how to maintain active floodplains and flow variability through mechanisms such as environmental flow regimes, river protections works, land-use controls and vegetation stabilisation. The 2010 CWMS targets state that there will be no new dams on the main-stem of major alpine braided rivers. 2015 targets specify the protection of indigenous habitats in riparian wetlands, springs and lagoons associated with braided rivers, and the enhancement and protection of indigenous braided river birds. The diagram on the following page shows important links between work underway for 2015 braided river targets and other CWMS targets.



Planting along the Halswell River

## 5.7. STRONG LINKS WITH OTHER CHAPTERS IN THIS DOCUMENT

The diagram below shows important links between work underway for 2015 'natural character of braided rivers' targets and other CWMS targets.



## 5.8. AREAS WHERE FURTHER INFORMATION IS REQUIRED

### AREAS WHERE FURTHER INFORMATION IS REQUIRED:

- Information on location and extent of floodplains, & river-bed habitat status & flora/fauna.
- Information on the importance of mid-range flows for in-stream values.
- Information on flows and amount of river material to maintain river mouths and coastal environments.
- Information about the importance of braided rivers to coastal lagoons and estuaries.
- Information about the relationship between flows and predation of braided river birds.
- Information about the relationship between flows and the river bird breeding season.
- Information about links between groundwater systems and braided river flows.
- Information about the interrelationships between the flow related needs of braided river birds and the flow related needs of other native biodiversity e.g. life cycle needs of fish.
- Information about predator-prey relationships.
- Need for methods for designing a predator control programme for medium to large rivers that works to achieve the same outcomes as natural river flows.

### IMPORTANT QUESTIONS FOR COMMITTEES AND STAKEHOLDERS TO THINK ABOUT:

- How can we use the water in Canterbury's braided rivers for irrigation, hydro-generation, and recreation, while at the same time protecting and enhancing their significant braided character?
- Are there some rivers that require additional protection e.g. through Water Conservation Orders or regional rules to protect their natural character?
- How can we set flow regimes to take into account the protection of braided river species, and the natural character of rivers?
- How can we fund the protection and enhancement of braided river habitat and species?

## 5.9. APPENDIX: SUPPORTING INFORMATION FOR BRAIDED RIVERS

### 5.9.1. REFERENCES AND WEBSITES

**Davis, M. (2001).**

***Vegetation of the Rangitata River and Environs.***

Evidence provided for the Rangitata Water Conservation Order.

**Department of Conservation (2001).**

***Protecting New Zealand's Invertebrates. Factsheet available at [www.doc.govt.nz/upload/documents/conservation/native-animals/invertebrates/ooo-invertebrates-factsheet.pdf](http://www.doc.govt.nz/upload/documents/conservation/native-animals/invertebrates/ooo-invertebrates-factsheet.pdf).***

Accessed November 2010.

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***Braided Rivers of Canterbury.*** Canterbury Conservancy: Christchurch.

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***Life on a braided river. Brochure available at [www.doc.govt.nz/upload/documents/conservation/native-animals/birds/sea-and-shore/life-on-a-braided-river.pdf](http://www.doc.govt.nz/upload/documents/conservation/native-animals/birds/sea-and-shore/life-on-a-braided-river.pdf).***

Accessed September 2010.

**Department of Conservation (2010).**

***River life. Explore the ecology of braided rivers in the Mackenzie Basin. Education resource 2010.***

Available at [www.doc.govt.nz/publications/getting-involved/for-teachers/conservation-education-resources/river-life/](http://www.doc.govt.nz/publications/getting-involved/for-teachers/conservation-education-resources/river-life/). Accessed October 2010.

**Environment Canterbury Regional Council (2009).**

***Draft Canterbury Water Management Strategy Report on Submissions.***

Environment Canterbury: Christchurch.

**Environment Canterbury Regional Council (2010).**

***Canterbury Regional Landscape Study Review. Final Report July 2010.***

Prepared for Environment Canterbury by Boffa Miskell.

**Hughey, K. (2006).**

***Native birds and their habitat needs on Canterbury Rivers.***

Powerpoint presentation to Environment Canterbury.

**Meurk, C.D. and Williams, P.A. (1989).**

***Plant Ecology of Braided Rivers of Canterbury.***

Botany Division, Department of Scientific and Industrial Research, Christchurch.

**O'Donnell, C.F.J. (2010).**

***Threatened fauna of the Canterbury Region.***

Powerpoint presentation at Braid – Braided River Aid) meeting.

**O'Donnell, C.F.J. and Hoare, J.M. (2010).**

***Meta-analysis of status and trends in breeding populations of black-fronted terns (*Chlidonias albostratus*) 1962-2008.***

New Zealand Journal of Ecology 35 (1), New Zealand Ecological Society.

**O'Donnell, C.F.J. (2011).**

***Meta-analysis of status and trends in breeding populations of black-fronted terns (*Chlidonias albostratus*) 1962 – 2008.***

New Zealand Journal of Ecology, 35 (1) 2011.

**Schmechel, F.A. (2008).**

***Braided river bird surveys of the Waiau River and eight smaller Canterbury rivers, spring 2008.***

Environment Canterbury Report No. Ro8/92.

**Useful websites:**

**Department of Conservation** [www.doc.govt.nz](http://www.doc.govt.nz)

**Canterbury Biodiversity**

[www.canterburybiodiversity.org.nz](http://www.canterburybiodiversity.org.nz)



Tasman River, Aoraki/Mt Cook

## 5.9.2. SPECIFIC EXAMPLE OF A BRAIDED RIVER PROJECT

### Project River Recovery – Mackenzie Basin

In 1989, a number of organisations began talks to find ways to meet the needs of all Waitaki water users, while recognising the importance of the area for power generation, leading to the ECNZ Waitaki Water Rights Working Party Agreement, signed in 1990.

The Project River Recovery (PRR) was created in 1990 in recognition of the importance of braided river and wetland ecosystems in the Mackenzie Basin. PRR is managed by DoC and funded by Meridian Energy Ltd, explicitly recognising the impacts of hydroelectric power generation on braided rivers and wetlands. The project aims to enhance braided river and wetland ecosystems in this area, and to maintain populations of native plants and animals.

Current objectives include removing problem weeds, enhancing wetlands, building knowledge of natural heritage in braided river ecosystems, testing effectiveness of large-scale predator control, facilitating research to improve understanding of the ecology of braided river systems, and increasing public awareness of braided rivers and associated wetlands. [www.doc.govt.nz/conservation/land-and-freshwater/freshwater/upper-waitaki-braided-rivers/project-river-recovery-work](http://www.doc.govt.nz/conservation/land-and-freshwater/freshwater/upper-waitaki-braided-rivers/project-river-recovery-work)

## 5.9.3. THE ROYAL FOREST AND BIRD PROTECTION SOCIETIES WORK ON BRAIDED RIVERS

The Royal Forest and Bird Protection Society, established in 1923, has objectives to preserve and protect the indigenous flora and fauna and natural features and landscapes of New Zealand for their intrinsic worth and for the benefit of all people. Forest and Bird and the Department of Conservation are promoting the adoption of the Rakaia and Rangitata Rivers, the Ashburton Lakes, Upper Ashburton River/Hakatere and the surrounding high country as a UNESCO World Heritage Site; aiming to recognise the unique nature of the braided river systems associated with the Ashburton District.

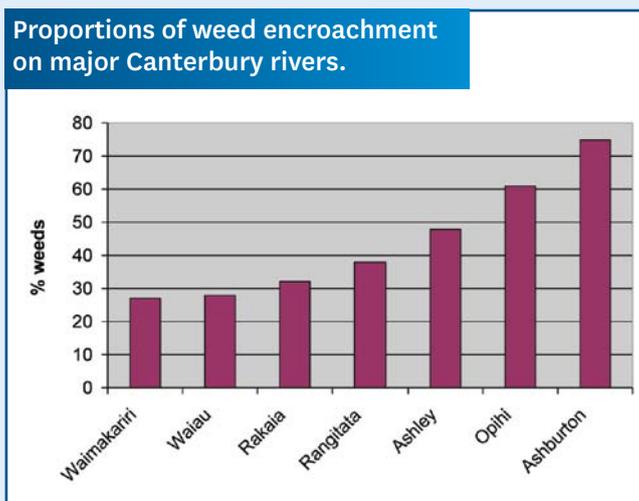
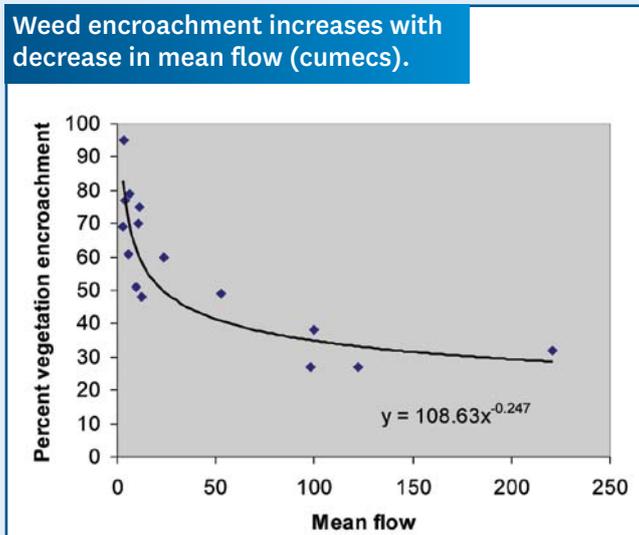
Forest and Bird note the following potential adverse effects of water infrastructure development on indigenous vegetation and associated habitats: (Note these examples relate to infrastructure for hydro-electricity generation on the Rakaia River).

- Construction and earthworks can destroy indigenous plants and associated invertebrate, lizard and bird habitat that lie in its path
- Disturbance of nationally significant indigenous vegetation (less than 0.5% of original indigenous vegetation remains on the Canterbury Plains)
- Concerns that some mitigation options will fall short of the need to replicate, in some measure, the diversity, composition, structure and scale of existing plant communities.

Forest and Bird would like to see full surveys of plants, invertebrates, lizards and birds that may be affected by proposed schemes, and corresponding restoration management plans covering planting, maintenance, and weed and pest control.

## 5.9.4. DEPARTMENT OF CONSERVATION STATISTICS

The graph below shows that weed encroachment in braided rivers typically increases with decrease in mean flow (cumecs). The second graph shows the proportions of weed encroachment on major Canterbury rivers (*Sourced from various presentations by the Department of Conservation*).



Southern Crested Grebes, Banks Peninsula