



Project River Recovery

Strategic plan 2006-2012

PROJECT RIVER RECOVERY REPORT 04/05



Department of Conservation
Te Papa Atawhai



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Strategic plan 2006-2012

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Preface

Project River Recovery is a Department of Conservation (DOC) programme that aims to protect or restore rivers and wetland ecosystems in the upper Waitaki Basin. Project River Recovery is funded by Meridian Energy Limited (previously Electricity Corporation of New Zealand [ECNZ]) under a compensatory agreement that recognises the adverse effects of hydroelectric power development on these rivers and wetlands.

This strategic plan is a guiding document that follows and builds on the Project River Recovery Strategic Plan 1998–2005. Its main purpose is to describe the long-term vision, guiding principles, and strategic approach the project will take over the next seven years. It also provides an overview of Project River Recovery's origins and achievements to date, and describes the Project's relationship with Meridian Energy, other administering agencies and other DOC projects. The strategic plan does not prescribe detailed workplans and actions; these are listed in other documents which are already completed or will be prepared during the course of this strategy.



Raoulia australis, a mat daisy - Chris Woolmore

Cover photo: Hopkins River - Chris Woolmore

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Summary

- Project River Recovery (PRR) is a Department of Conservation (DOC) programme that aims to maintain and enhance river and wetland habitats in the upper Waitaki Basin.
- PRR is funded by Meridian Energy Limited (previously the Electricity Corporation of New Zealand [ECNZ]) under a compensatory agreement that recognises the adverse effects of hydroelectric power development on rivers and wetlands.
- The compensatory agreement was signed in November 1990 and is tied to the term of ECNZ's water rights, which expire on 30 April 2025. Project River Recovery began operations in late 1991.
- The compensatory agreement states that PRR's objective is "to carry out jointly agreed programmes of wetland habitat restoration and enhancement with the goal of providing habitat and conditions equivalent to or greater than the net loss of habitat and conditions attributable to the Waitaki hydro-electric power development".
- DOC and Meridian Energy review Project River Recovery's funding and direction every seven years.
- The second seven-year period ended on 30 June 2005, and the third seven-year period runs from 1 July 2005 to 30 June 2012.
- A water allocation Plan for the Waitaki River is currently being prepared.
- This plan may change Meridian's consents to take and use water in the Waitaki River. The outcome of this process will not be known until September 2005 at the earliest. Because PRR's compensatory funding agreement with Meridian is tied to these consents, Meridian and DOC have agreed that funding be reviewed on an annual basis until outcomes of the water allocation process are clear.
- Meridian Energy agreed on 31 May 2005 to fund Project River Recovery at a rate of \$412,000 for the 2005/06 year, with a CPI adjustment for the previous twelve months.
- Future funding of PRR will be negotiated once the Waitaki water allocation process is complete.
- Project River Recovery and Meridian Energy aim to maintain and build on their constructive, mutually beneficial relationship.
- Project River Recovery will continue to maintain close working relationships with Environment Canterbury, Land Information New Zealand and local territorial authorities.
- This strategic plan outlines PRR's origins and achievements to date, describes its long-term vision, guiding principles and objectives.
- PRR's objectives for its third seven year phase of operation are to:
 1. Maintain indigenous vegetation and protect or restore riverbed and wetland habitat by removing problem weeds.
 2. Explore opportunities to enhance wetland protection in the upper Waitaki Basin

3. Continue to build knowledge of natural heritage in braided river ecosystems.
4. Test the effectiveness of large-scale predator control for population recovery of braided river fauna.
5. Facilitate research by external agencies to improve our understanding of the ecology of braided river systems.
6. Increase public awareness of braided rivers and associated wetlands.

Murchison River



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background



Murchison River



Colobantbus strictus, stiff pincushion - Chris Woolmore

Background

Water in the Waitaki catchment has been used since 1935 to generate electricity for the national grid. The Waitaki power scheme was developed between 1935 and 1985 and currently comprises eight power stations producing approximately 8000 GWh annually, depending on inflows. The Waitaki power scheme generates approximately 20 - 25 % of New Zealand's power annually, with Lakes Tekapo and Pukaki providing approximately 65% of the country's hydro storage capacity.

The construction and commissioning of the upper Waitaki section of this network in the 1970s required ECNZ to obtain a number of consents for building the structures and taking the water needed for power generation. These rights to use water were due to expire in 1990, and in 1988 the Waitaki Catchment Commission initiated discussion over the renewal of ECNZ's water rights. Consultation was undertaken by forming the ECNZ Waitaki Water Rights Working Party, which comprised a range of water users: ECNZ, Upper Waitaki District Council, Waitaki Catchment Commission, MAF Fisheries, DOC, Omarama and Upper Waitaki Federated Farmers, Ngāi Tahu, Otago Canoe and Kayak Club, Transit New Zealand, Royal Forest and Bird, New Zealand Salmon Anglers Association, Waitaki Valley and South Canterbury Acclimatisation Societies, Opihi Augmentation Society, Ministry for the Environment, and DSIR Hydrology Centre. The working party assessed the concerns and proposals of water users during 18 months of consultation. As a result of the working party process, several compensatory agreements between ECNZ and individual user groups were drawn up.

One of these was the Compensatory Funding Agreement between ECNZ and Department of Conservation which explicitly recognised the impacts of hydro electric power generation and established Project River Recovery. An alternative habitat enhancement proposal - to put four cumecs of water back down the Pukaki River - was rejected by ECNZ and DOC as it would have provided a smaller conservation gain. All members of the working party endorsed the ECNZ-DOC agreement. The objective as stated in the agreement is:

"to carry out jointly agreed programmes of wetland habitat restoration and enhancement with the goal of providing habitat and conditions equivalent to or greater than the net loss of habitat and conditions attributable to the Waitaki hydro-electric power development."

DOC and ECNZ signed the agreement in November 1990, and Project River Recovery began operations in late 1991. Meridian Energy took over responsibility for this agreement from ECNZ on 1 April 1999. The term of the agreement is tied to the term of Meridian Energy's water rights, which expire in 2025. Project River Recovery's funding and direction is reviewed every seven years.

Meridian Energy is currently funding Project River Recovery at \$412,000 per annum (including GST). At the time of writing, funding over the next seven year period has yet to be finalised due to uncertainties regarding the outcome of a water allocation plan being developed for the Waitaki River. Because the

plan may alter Meridian's consents to take and use water in the Waitaki River, and the compensatory funding agreement with PRR is tied to these consents, Meridian and the Department have agreed to review PRR's funding annually until the water allocation process is complete. The Water Allocation Board is expected to make a final decision on the plan in September 2005. The agreed level of funding for the 2005/06 year is \$412,000 with a CPI adjustment for the previous twelve months. Once outcomes of the water allocation process are clear, funding for the remainder of the next seven year period will be negotiated with Meridian.

Over the last fourteen years Project River Recovery has achieved some outstanding results, notably through preservation and restoration of braided river and wetland habitat, increasing our understanding of the abundance and ecology of important riverbed plants and animals and passing our knowledge of braided river ecosystems on to schools and universities. Specific achievements include:

- Maintaining over 35,000 hectares of near-pristine braided river habitat by targeted removal of problem weeds before they become widespread. By concentrating on protecting high quality habitats PRR has achieved greater conservation benefits than using the same resources to restore small sections of heavily modified or degraded riverbed.
- Establishment of a comprehensive weed surveillance system to detect and deal with new incursions of weeds. There are weeds in other Canterbury rivers with the potential to have significant impacts in upper Waitaki river systems. Developing an effective surveillance system allows PRR to intervene at an early stage of weed invasion, while control is still achievable, or completely prevent establishment of high risk plants.
- Contributing to our understanding of braided river and wetland ecosystem composition, structure and functioning by undertaking or facilitating research. PRR research publications are listed in the PRR bibliography (Sanders 2000) and in annual reports since 1998. Some research highlights are outlined below.
- Investigating the potential adverse impacts of herbicide use on aquatic systems and demonstrating that PRR control programmes have no significant effect on water quality or aquatic invertebrate fauna and that the chemicals used do not persist in soils. This research demonstrates that PRR's herbicide management practices are having a minimal impact on the environment.
- Construction and successful management of over 80 hectares of new wetlands.
- Obtaining definitive video evidence of mammalian predators as the main cause of mortality in black-fronted tern and banded dotterel populations in upper Waitaki rivers, and isolating feral cats, ferrets and hedgehogs as the key predator species. This key piece of research removed uncertainty about the cause of decline in upper Waitaki wading bird populations and provides the foundation for future large-scale predator management.
- Completion of plant community and threatened plant surveys, greatly increasing knowledge of the relative distribution of plant communities in upper Waitaki braided rivers, identifying the regional distribution of weeds

R. Morris



Feral cat

D. Merton



Hedgehog

P. R. Clerke



Ferret

and recording new locations of 26 threatened plant species. Resource surveys play a key role in informing management decisions. The information obtained from this work has contributed to PRR's strategic approach to weed control. It will also form the basis for classifying habitat of riverbed fauna and managing threatened plant populations.

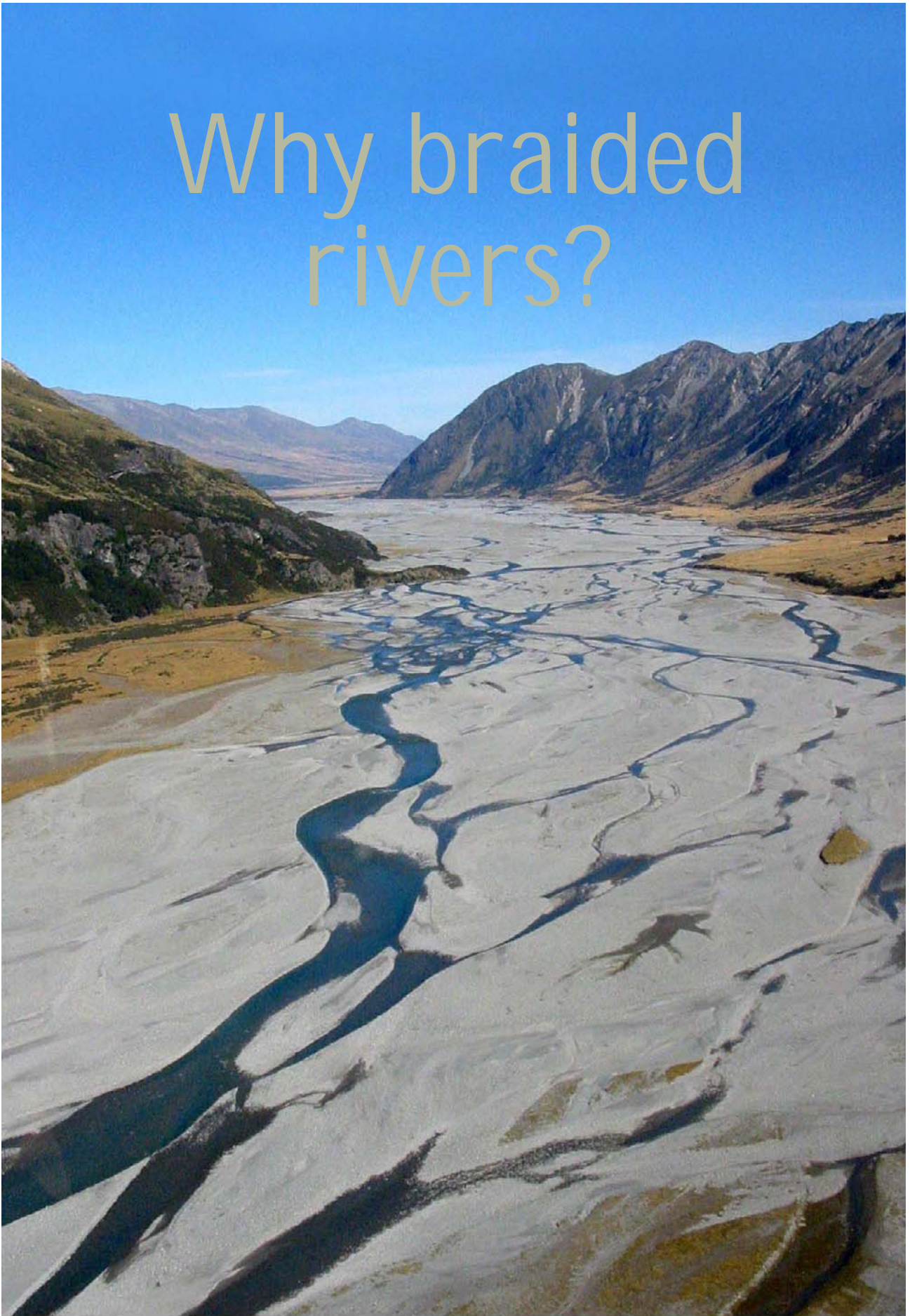
- Completion of comprehensive river and wetland bird surveys throughout the upper Waitaki Basin. These surveys provide a baseline against which future changes in bird populations resulting from management activity and/or 'natural' change can be compared.
- Supporting PhD research into ecology of the black-fronted tern, which has greatly increased our understanding of this threatened species and will inform future management for the recovery of black fronted tern populations.
- Preparing and distributing a wide range of attractive braided river resource materials, and incorporating a study of PRR into the senior Canterbury and Otago high schools' curricula.
- Publication of the *Braided River Field Guide* and a significant contribution to the publication of Neville Peat's and Brian Patrick's popular book, *Wild Rivers*.
- Raising the profile of braided rivers, as unique and valuable systems, among policy-makers, ecologists, conservation groups, the general public, and various stakeholders.

Appendix I contains a more detailed summary of progress against objectives set in the 1998-2005 strategic plan.



Black-fronted tern and nest - D. Veitch

Why braided rivers?



Hopkins River



Colobantbus strictus, stiff pincushion - Chris Woolmore

Why braided rivers?

Braided rivers are defining features of the east coast of the South Island. Following the end of the last glaciation some ten thousand years ago, rivers carried gravels and silts down the mountain valleys of the east coast and deposited them to form flat inter-montane basins and coastal plains. Locally, rivers of the Tekapo, Pukaki, Ohau, and Ahuriri catchments deposited the sediments that form the floor of the upper Waitaki Basin. The processes of geological uplift, erosion, and alluvial transport continue today to maintain our familiar, braided rivers – rivers characterised by their wide gravel beds, numerous sinuous channels, and highly variable flows. World-wide, only Alaska, Canada and the Himalayas have similar extensive braided rivers.

Whilst braided rivers are geologically unusual, their plant and animal communities are unique. Numerous species have specialised to varying degrees for life in New Zealand braided rivers. Perhaps most specialised are wrybills/ngutu pare, which breed only on uniformly sorted, unvegetated, flat gravel expanses. Black-fronted terns/tarapirohe, Caspian terns, black-billed gulls/tarāpuka, South Island pied oystercatchers/tōrea, pied stilts/poaka, banded dotterels/turiwhatu, black-fronted dotterels, and black stilts/kakī are less specialised, and breed both on braided rivers and associated side channels and wetlands.

At least sixteen other bird species, including Australasian bitterns, marsh crake, various cormorants (shags), gulls, terns, and herons, characteristically breed and forage in Canterbury's braided rivers and adjacent wetlands. Occasionally, uncommon Asian migrants such as the white-winged black tern are also sighted in Canterbury rivers.

Under a classification system which ranks New Zealand plants and animals according to their threat of extinction (Molloy et al., 2002 and Hitchmough, 2002) a number of birds found in the basin are under threat: kakī, Australasian bittern, black-fronted tern, grey duck, Caspian tern and wrybill are acutely threatened; black-billed gull and banded dotterel are chronically threatened and marsh crake and black shag are at risk. The rivers and wetlands of the upper Waitaki Basin are a stronghold for many of these birds.

In addition to birds, braided rivers are important habitat for numerous other endemic animals. McCann's skink/mokomoko, long-toed skink, common skink/mokomoko, scree skink, spotted skink, jewelled gecko and Southern Alps gecko have been recorded at various locations throughout the upper Waitaki Basin, making use of dry rocky areas and boulder-field habitat in riverbeds. Long-toed skink have a threat classification of at risk and scree skink, spotted skink and jewelled gecko are chronically threatened.

Two migratory and eight non-migratory native freshwater fish are found in upper Waitaki rivers and streams. Two of the non-migratory fish are recently described species with localised distributions. Bignose galaxias are only found in upper Waitaki tributaries, and lowland longjaw galaxias are known from a stronghold in north Otago and six outlying sites in the upper Waitaki. They have threat classifications of data deficient and acutely threatened, respectively.

Other non-migratory fish include upland and common bullies, Canterbury galaxias, alpine galaxias and upland longjaw galaxias. Longfin eel and kōaro (whitebait species) are the only native fish in the upper Waitaki which normally migrate to the sea to spawn. Upland long-jawed galaxias and long-finned eel have a threat classification of chronically threatened.

Our braided rivers also support a diverse but poorly known terrestrial invertebrate community. Several notable macro-invertebrates have been described and many others require further taxonomic work. Of those that we know about, robust grasshoppers were rediscovered in the early 1980s and are known from only a few sites in and near the Ohau, Pukaki, and Tekapo Rivers. They have a threat classification of acutely threatened. Another short-horned grasshopper, *Sigauss minutus*, is also endemic to upper Waitaki Basin riverbeds and has a threat classification of chronically threatened; also of interest is the presence of an uncommon caddisfly, *Psilochorema foliobarpa* in the Tasman River.

Chris Woolmore



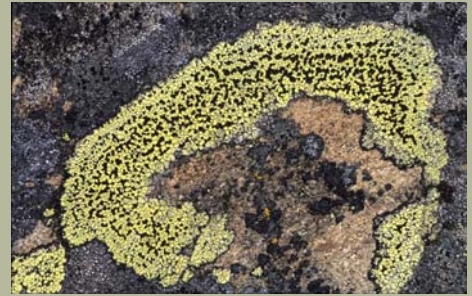
Encrusting lichens, *Neofuscelia* spp. and *Placopsis* spp.

Chris Woolmore



Muehlenbeckia epbedroides, a threatened prostrate shrub

Chris Woolmore



Rhizocarpon geographicum, mosaic lichen

W. Hutchinson



Gobiomorphus breviceps, upland bully

Chris Woolmore



Wrybill chick

Chris Woolmore



Sigauss australis, a subalpine grasshopper



Racomitrium crispulum, a moss

Wetlands in the upper Waitaki Basin further increase the diversity of vertebrate and invertebrate animals. The spectacular giant mountain and yellow-spotted dragonflies are examples.

Despite the apparent sparseness of riverbeds, over three hundred hardy yet beautiful native plant species, thirty five mosses and liverworts and forty one lichens form mosaics of distinctive communities in the riverbeds and adjoining wetlands of the upper Waitaki rivers. Typical early pioneer species include various encrusting lichens, mosses, tiny cushion plants, willow herbs and wispy native grasses. With time, these plants form blankets of plant cover and other tussocks and woody shrubs slowly establish, in turn becoming the dominant plants. The whole process is dynamic, often being disrupted by changing river channels and scouring floods resulting in the mosaic of vegetation development typical of braided riverbeds. Some eye-catching species include the prostrate shrub, *Helichrysum depressum*, with its cryptic grey foliage and contrasting white fluffy seed heads, *Pimelia prostrata* a native daphne with a profusion of small white scented flowers and the cushion plant *Myosotis uniflora* with tight cushions of delicate white or lemon flowers. Twenty five plants have a threat classification, one is acutely threatened, nine are chronically threatened, fifteen are at risk and a further two are classified as data deficient - or require more information to make an assessment of their threat status.



Long-toed skink - B. W. Thomas

challenges facing braided rivers & wetlands



Godley River - Chris Woolmore



Pied oystercatcher/tōrea
D. Veitch

3. Challenges facing braided rivers and wetlands

Braided rivers of the upper Waitaki Basin and the plants and animals they support are facing a variety of influences and impacts from external, usually human induced, sources.

Water control (i.e. abstraction and damming) for hydro-electric power generation has caused a major reduction in the amount and quality of braided river habitat and associated stable side channels and wetlands in the Tekapo, Pukaki and Ohau Rivers. Dam construction has affected the ability of long finned eel and koaro to move freely between inland rivers and the coast where they spawn. Long-finned eels are becoming uncommon in the upper catchment, whereas kōaro have adapted and formed land-locked populations, probably using the lakes instead of the sea to spawn. Raising natural lake levels or creating artificial lakes has inundated a further 7400 hectares of braided riverbed and 3900 hectares of wetlands (Wilson G.H., 2000). Water control has also reduced the size and frequency of floods, and changed the timing of floods in affected rivers, reducing substrate disturbance and allowing vegetation to establish more quickly.

Not only water control is having an adverse impact on braided river fauna. A suite of introduced mammals, (mainly cats, ferrets, hedgehogs and stoats) prey on riverbed fauna. Large invertebrates, lizards, nesting adult birds, eggs and chicks are all part of the diet of these predators. For many species the level of sustained predation is affecting population viability as rates of adult mortality exceed replacement by juveniles.

River engineering works are commonly used to protect important structures or economically productive land uses within or adjoining braided riverbeds. The effect of these works is to constrain the river, either by stabilising banks or narrowing the floodplain available for peak flows to spread across. This can affect river flows, changing the way braid channels erode and reform, or altering the floodplain sediment supply. The use of exotic trees such as willow in engineering works can also act as sources for further spread of problem plants into the floodplain. All of these actions significantly reduce the amount and quality of braided river habitat.

Land use intensification and pastoral development has resulted in an estimated loss of 90% of wetlands, a process which continues as wetlands are drained, damaged by stock or the natural hydrology impacted by groundwater abstraction and vegetation clearance. Similarly, pastoral development has displaced whole sections of alluvial riverbed succession sequences. Of particular concern are the displacement of indigenous communities by pasture grasses on more fertile alluvial surfaces and the trampling effects of stock in wetlands.

Thousands of exotic plant species have been introduced to New Zealand for ornamental or productive use, or arrived as unknown immigrants in imported goods. The number of introduced species that have established and are spreading in the wild now equals the total number of species in our indigenous

plant flora. In riverbeds the diversity and quantity of exotic vegetation is thought to increase as the duration and intensity of human occupation along their margins increases. Many of these plants are colonising weeds which are able to out-compete native plants and preferentially occupy a range of river floodplain environments, displacing plant communities and adversely affecting the quality and quantity of habitat available for native animals especially adapted to open, sparsely vegetated riverbeds.

The adverse effects of these threats are often inter-related, complex and more than additive in their cumulative impact. For example, a reduction in river flow can reduce quantity and quality of feeding habitat for wading birds, as well as allowing predators access to islands previously safe for fauna. Lower flows also lead to increases in vegetation cover which in turn destroys open gravel nesting habitat and provides better cover for predators.

Lastly, human activity can also affect the quality of braided river systems. The productive use of land is rapidly changing in the upper Waitaki basin, pastoral practices are moving away from extensive grazing to more intensive



Yellow tree lupins invading open river gravels

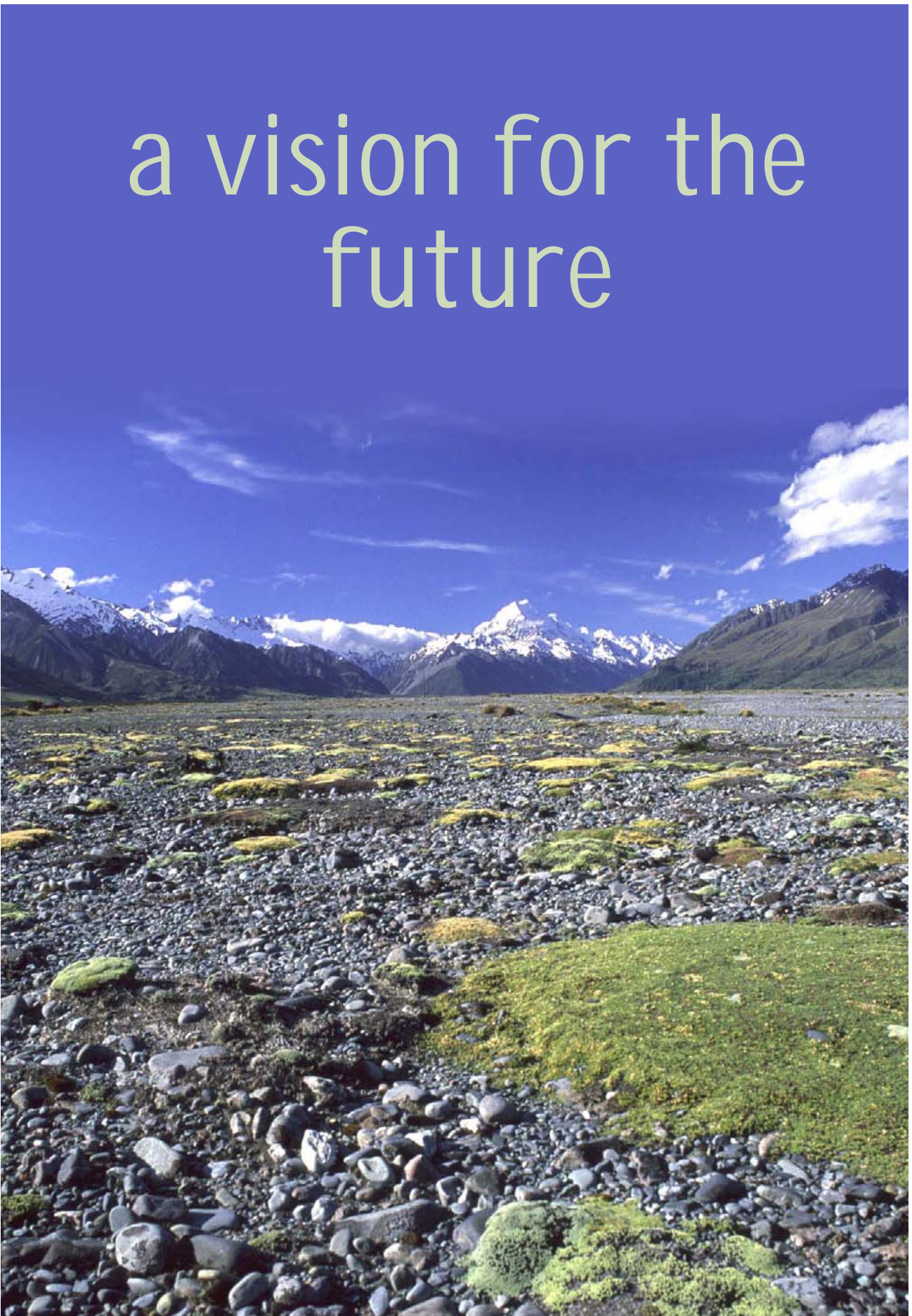
management systems reliant on water abstraction for irrigation. Water abstraction can adversely affect the quality and quantity of habitat available for plants and animals as well as the physical functioning of braided river systems. Stock intensification can also affect quality of habitat by increasing the levels of nutrients entering waterways from fertilisers or animal effluent. Similarly, many more people are choosing to visit or live in the upper Waitaki with a clear focus on recreational pursuits. Recreational activities in riverbeds can have unintended impacts on fragile vegetation or disrupt nesting birds and other fauna, especially as demand for these activities increases. The proliferating use of four-wheel drive vehicles in riverbeds is of particular concern.

The braided rivers and associated wetlands of the upper Waitaki Basin, with their unique flora and fauna, are precious parts of New Zealand's natural heritage which are worth protecting. The challenge is to retain this unique heritage while accommodating the varied uses and economic demands we place on braided river systems.



River engineering works - willow plantings

a vision for the future



Tasman River - Chris Woolmore



Luzula celata, a threatened woodrush - Chris Woolmore

A vision for the future

New Zealanders will value and enjoy braided river ecosystems and wetlands as a unique and integral part of their natural heritage. In the upper Waitaki Basin people will have a good general knowledge of the plants and animals in their braided rivers, and local communities will support demonstrably successful, ongoing and sustainable conservation programmes. Braided rivers and wetlands will be recognised as key elements in the expansive and iconic landscape of the upper Waitaki.

Braided rivers above the upper Waitaki glacial lakes will remain in essentially pristine condition because problem exotic plants such as lupins, gorse, broom, wilding conifers and willows are being maintained at near zero densities. Below the lakes, weeds in large sections of the Ahuriri, Tekapo and Ohau Rivers will be managed in an economically and ecologically sustainable manner. These rivers will be augmented by a network of carefully managed and highly productive natural and constructed wetlands. Indigenous plants will flourish and form high quality habitats for native fauna as we maintain weed-free and weed-controlled ecosystems. The productivity of birds, lizards and invertebrates will be high as a result of ongoing, cost effective predator management at key sites and native freshwater fish will thrive in high quality habitats.

As a result of an active and ongoing research programme, we will have a good understanding of the ecology of braided river and wetland ecosystems. Findings of this research will have been published in peer reviewed scientific literature and disseminated in accessible styles and formats to a range of audiences. PRR's work in braided rivers and wetlands will be valued for its contribution to science and education, as well as nature conservation.

People will visit these rivers and wetlands to enjoy seeing pristine braided river ecosystems with many more wading birds, invertebrates, lizards and other fauna than they can see now. Ecotourism will be contributing to the local economy by bringing visitors to share enjoyment of these places in an ecologically sensitive manner.

While achieving these outcomes we will be benefiting from strong and mutually beneficial working relationships with Meridian Energy Limited, the community of the upper Waitaki Basin, Environment Canterbury, Land Information New Zealand and research institutions. We will have expanded our knowledge of wetland and braided river ecosystems, and Project River Recovery will be recognised nationally and internationally as a highly successful conservation and research programme.

our focus



Tasman River - Chris Woolmore



Wrybill/ngutu pare
M. F. Soper

5. Our focus

During the seven-year term of the previous strategic plan, PRR made some outstanding contributions to habitat protection, predator research and raising community awareness of braided river ecosystems. Our objectives for the period 1 July 2005 to 30 June 2012 will consolidate and improve on this progress, expand our knowledge of braided river ecology and provide new initiatives for wetland protection. Specifically we will:

1. Maintain indigenous vegetation and enhance habitat by removing problem weeds.

Explanation: Invasive exotic plants have severe, adverse impacts on the composition and extent of indigenous plant communities and quality and quantity of habitat for fauna. PRR has adopted three key approaches when dealing with weeds. First priority is early detection and removal of new problem weeds arriving in the upper Waitaki Basin before they become established (e.g. false tamarisk). Second priority is eradication or containment of established problem weeds which are present in very low numbers in the upper Waitaki Basin (e.g. yellow tree lupin, buddleia) and third priority is to remove widespread problem weeds from selected sites with important natural heritage values (e.g. main river headwaters, Cass River and parts of Tekapo, Pukaki and Ohau Rivers).

Focus for 2005–2012: PRR will continue with this strategic approach to weed control, concentrating on consolidating gains made over the last 14 years. New weed control initiatives may be undertaken if they can be fully resourced and are sustainable. Direction for existing and future weed control is provided by the *Project River Recovery Weed Control Plan*.

2. Explore opportunities to enhance wetland conservation.

Explanation: Wetlands have greatly diminished in extent in Canterbury since European settlement. They support specialised plant communities and fauna and are often closely linked with the floodplains and tributaries of braided rivers in the upper Waitaki Basin. Many of the remaining wetlands face a range of ongoing threats such as drainage, weed invasion and incremental clearance for economic use. Although PRR has been successful in constructing and managing artificial wetlands, it is far more cost effective to conserve existing examples.

Focus for 2005–2012: PRR will build on the thesis work of Gareth Wilson to identify important wetlands in the upper Waitaki Basin and explore a range of mechanisms for protecting them. The existing constructed wetlands at Waterwheel and Ruataniwha will be maintained, but no new artificial wetlands will be built.



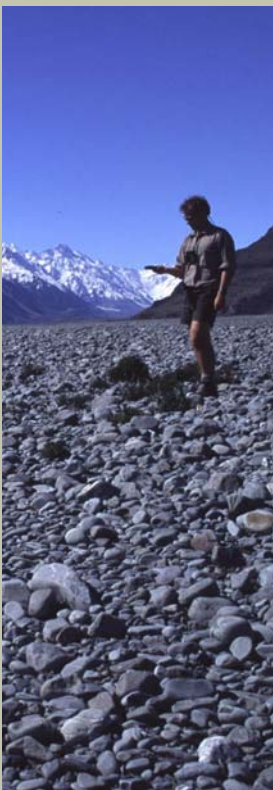
Aquatic invertebrate sampling



Bignose, *Galaxias macronasus*



Russell lupins invading riverbed



Weed surveillance

3. Continue to build knowledge of natural heritage in braided river ecosystems.

Explanation: PRR has built up a good knowledge of the distribution and abundance of birds using or depending on braided river habitat for feeding, breeding and nesting. In recent years we have improved our knowledge of threatened plants and plant communities occupying braided rivers, and the distribution of indigenous freshwater fish in upper Waitaki rivers. Our understanding of the other fauna present and the ways in which they are making use of habitat is less certain. We need to expand our knowledge of the plants and animals inhabiting and using braided rivers to inform management decisions and enable us to evaluate future change as a result of our actions. In particular, very little is known of the invertebrate and lizard fauna and their habitat requirements in braided rivers. Similarly, the population ecology of many native freshwater fish is still poorly understood.

Focus for 2005–2012: Over the next seven years we will consolidate our existing knowledge base by continuing to monitor changes in bird populations, expand our understanding of factors influencing the composition of plant communities, distribution of threatened plants and problem weeds in riverbeds, explore improved methods for rapid assessment of terrestrial invertebrate fauna and fill gaps in freshwater fish distribution surveys.

We will also seek to improve our baseline knowledge of fauna by increasing our understanding of the population ecology of selected invertebrates and freshwater fish.

4. Test the effectiveness of large-scale predator control.

Explanation: Predators are known to adversely affect the population viability of many braided river birds and are likely to be having similar impacts on a range of other fauna, especially large invertebrates and lizards. Relationships between predators, prey, and habitat are complex and in many cases are not fully understood. Further research on the inter-relationships between predator ecology, habitat quality and type, and their prey range is required but is probably beyond the capacity of PRR to achieve with current resources. To date efforts to protect braided river fauna have focused on relatively small-scale control operations during critical breeding periods - these have met with limited success. An alternative approach, using existing predator control techniques on a large-scale, over longer timeframes, may be sufficient to achieve recovery of fauna which is meaningful at a population level. Smaller scale predator programmes for colony nesting birds such as black fronted tern may also be effective.

Focus for 2005–012: Over the next seven years PRR will continue to explore the effectiveness of different predator control scenarios to benefit fauna. A key project will be a joint Kaki Recovery Programme / PRR five-year investigation to explore the effectiveness of large-scale predator control aimed at improving survivorship of a range of fauna. PRR will also seek to support and facilitate fundamental predator research by external agencies.

5. Facilitate research by external agencies to improve our understanding of the ecology of braided river systems.

Explanation: Research led by PRR in the upper Waitaki Basin has helped to improve understanding of fauna ecology, fauna / predator interactions and effectiveness of management actions. Whilst this effort has been beneficial, many research issues are complex or of such scale that they are beyond the capacity of PRR to achieve. Developing a working relationship with academic or research institutions would be a mutually beneficial way of addressing key research issues.

Focus for 2005–2012: Over the next seven years PRR will foster and support development of mutually beneficial research with key academic or research institutions. A focus of this research will be to improve our understanding of indigenous plant and animal ecology in braided river systems and mechanisms of interaction with introduced plants and predators.

6. Continue to increase public awareness of braided rivers and wetlands.

Explanation: The aim of PRR's public awareness work has been to encourage appreciation of the special plants and animals of braided river ecosystems and increase awareness of the challenges they are facing. By increasing awareness and appreciation of these systems PRR expects to improve public support for their protection and management throughout the country, with a focus on upper Waitaki rivers. Over the last fourteen years PRR has put a large amount of effort into producing written material, community consultation and incorporating resource material into school curricula. Whilst this work has been well received there is huge scope to increase PRR's public awareness effort.

Focus for 2005–2012: PRR will continue to update and improve resource material developed over the last 14 years. Particular attention will be given to, firstly improving braided river resource material and incorporating it into secondary school curricula, and secondly to promoting PRR successes and the benefits of braided river restoration to the wider community.

Stoat predated nest



guiding principles



Black-billed gull colony



Banding chicks

6. Guiding principles

We believe that Project River Recovery will be most likely to succeed if we adopt the following guiding principles.

1. **Integrated habitat, ecological community and species management**

Braided river and wetland ecosystems comprise plants, invertebrates, lizards, fish, and birds that interact with each other and with the physical environment. PRR will take a whole system approach to braided river management by maintaining and enhancing high quality riverine and wetland habitats, filling gaps in our knowledge of the plants and animals characterising braided rivers and wetlands, and managing indigenous plants and animals that are known to be threatened, endangered, or declining in range or abundance.

2. **Science-informed work**

We know much about the ecology of wetlands and braided rivers and the threats that they face. Even so, our ability to manage these ecosystems is still limited by gaps in our knowledge of the ecosystems, and the effectiveness of different management options. To manage wetlands and braided rivers while improving our understanding of the system as quickly as possible we will adopt an adaptive management approach, using conventional ecological science to fill knowledge gaps and monitoring management outcomes to inform future decisions.

3. **Monitoring to enable cost-benefit analysis**

Monitoring key ecological components allows Project River Recovery to answer critical questions about the populations we manage. For example, are black-fronted tern populations increasing, remaining static or decreasing in number and why? Monitoring also allows us to measure operational efficiency (e.g. what percentage of weeds were removed), financial costs (e.g. how much did weed control cost) and conservation gains (e.g. how did weed control affect bird productivity).

4. **Close liaison with the community**

Protection and enhancement of our wetlands and braided rivers will depend, to a large extent, on the support and co-operation of the local community. We will foster this support and co-operation by involving the community in Project River Recovery and by keeping them well informed of our work. In particular, we will consult with the community early in the planning stages of major work.

5. **Excellence**

Project River Recovery has a key role to play in the protection and restoration of New Zealand braided rivers. We relish the opportunity to lead in braided river restoration management and development of best practice. In achieving this goal we will aim for excellence in every aspect of our work – planning, community relations, staff management, research, and most importantly, achieving results ‘on the ground’.



7. Project River Recovery's relationship with Meridian Energy

We wish to maintain and build on our constructive and mutually beneficial relationship with Meridian Energy. We believe that public awareness of braided river conservation can be greatly enhanced by jointly promoting braided river issues with Meridian Energy. We will formally meet with Meridian Energy in February and August each year to jointly agree on the annual work programme and to review progress. Liaison group meetings (including all key stakeholders) will also provide an opportunity to review progress and discuss issues with Meridian Energy.

8. Project River Recovery's relationship with other organisations

PRR has also developed close working relationships with other organisations over the last fourteen years. Much of the work we undertake is situated in riverbeds administered by Land Information New Zealand (LINZ), but other agencies also have a regulatory or management interest in riverbed activities. ECAN manages fairways of the Tekapo, Ohau and Pukaki Rivers to mitigate risk of flooding and Mackenzie District Council has an interest in management of legal roads in or adjoining riverbeds. We will continue to develop and improve working relationships with these agencies. The Tekapo-Pukaki-Ohau working group has been set up to allow annual meetings between LINZ, ECAN, Meridian Energy and district council staff to discuss and review work programmes in the Tekapo, Ohau and Pukaki riverbeds. We also meet annually with LINZ agents to discuss and review weed control programmes in other upper Waitaki rivers.

9. Project River Recovery's relationship to other DOC work

The Department of Conservation Strategic Business Plan, *Restoring the Dawn Chorus 2002 - 2005*, states the Department's vision as "New Zealand's natural and historic heritage is protected, people enjoy it and are involved with the Department in its conservation". To fulfil this vision the Department has developed an approach that focuses on quality tools, standards and principles, and the monitoring and review of progress. Co-operation with iwi and community are also identified as key ingredients in achieving effective management. Project River Recovery embraces the Department's vision, management approach, and commitment to co-operation with iwi and the community.

PRR's work in the upper Waitaki Basin includes weed control, wetland protection, and research on predators and native fauna of rivers and wetlands. This work complements many of the outcomes identified in the Statement of Intent for departmental work over the 2004-2007 period, in particular, 'halting the decline of natural heritage' and "restoring and protecting native species". PRR has an ecosystem focus, aiming to benefit a wide range of indigenous



plants and animals in braided river systems of the upper Waitaki Basin. In contrast the department has much wider management responsibilities and by necessity tends to focus its resources on protecting those communities or species components which are under greatest threat. PRR liaises closely with a range of DOC programmes in the upper Waitaki Basin dealing with plant threats and species protection. A good example is one of the largest DOC initiatives in the upper Waitaki Basin, the Kaki Recovery Programme. This is a single-species programme focused on managing the critically endangered kaki. Project River Recovery and the Kaki Recovery Programme liaise closely, and kaki undoubtedly benefit from PRR's braided river work, however the two projects have different goals, are managed separately and are financially independent.

10. Acknowledgements

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Appendix 1: Progress on PRR's objectives as specified in its Strategic Plan 1998 - 2005

OBJECTIVE 1. INCREASE THE AREA OF WEED-FREE BRAIDED RIVER HABITAT AND ASSOCIATED WETLANDS IN THE UPPER WAITAKI BASIN

		PROGRESS TO DATE
Target 1.1	Produce an upper Waitaki Basin Braided River Weed Control Plan by 30 June 1999.	Achieved.
Performance measure 1.1	Upper Waitaki Basin Braided River Weed Control Plan produced by 30 June 1999.	Achieved.
Target 1.2	Control all target weeds (lupins, willows, gorse, and broom) to < 10 ha in rivers that are still in relatively pristine condition, namely, the Tasman (in conjunction with Aoraki Area Office), Godley, Macaulay, Cass, upper Ahuriri (above Longslip Creek confluence), Hopkins, and Dobson Rivers by 30 June 2005. Note that willows will be left at some sites to protect assets.	Achieved.
Performance measure 1.2	Weed cover of < 10 ha as recorded on an accurate and regularly updated weed map/database.	Most sites are presently monitored by visual inspection. Photo points and aerial photography have been established as monitoring tools in the Ahuriri River. A GPS- and GIS-based database is being developed.
Reporting 1.2	PRR annual report will contain results of weed control in these rivers by 30 July each year.	Achieved.
Target 1.3	Control all target weeds to < 10 % cover in the Ahuriri (below State Highway 8), and lower Ohau Rivers, and in the lower 2 km of the Pukaki River and at Tern Island in the upper Ohau River.	Not achieved. Lupin strategy in Lower Ahuriri needs reviewing in light of situation above SH8.
Performance measure 1.3	Less than 10 % weed cover as revealed by aerial photometric methods (these methods to be trialled in 2000).	Photo methods trialled successfully.
Reporting 1.3	PRR annual report will contain results of weed control in these rivers by 30 July each year.	Achieved. Weed control information is contained within this report.

Target 1.4	Control all target weeds to < 10 % cover in the Tekapo River excluding extensive areas of willows planted by CRC along the margins of the river that are not subject to weed control.	Achieved in the upper Tekapo. A separate weed control strategy needs to be developed for the lower Tekapo.
Performance measure 1.4	Less than 10 % weed cover as revealed by aerial photometric methods (these methods to be trialled in 2000).	Visual inspection.
Reporting 1.4	PRR annual report will contain results of weed control in these rivers by 30 July each year.	Achieved. Weed control information is contained within this report.
Target 1.5	Investigate options for long-term lupin control in the mid-Ahuriri River (between SH8 and Longslip Creek) by 30 June 2005.	Lupin removal by floods following willow removal will be monitored.
Performance measure 1.5	An option for long-term lupin control is developed which is financially sustainable by 30 June 2005.	Need to review this objective.
Reporting 1.5	Written report by 30 June 2005.	Not commenced yet.
Target 1.6	Reduce willows to < 10 ha in the upper and mid-Ahuriri River (excluding willows retained by agreement with stakeholders) by 30 June 2005.	Commenced in July 2004.
Performance measure 1.6	Less than 10 ha willow cover as revealed by aerial photometric methods (these methods to be trialled in 2000).	Commenced in July 2004. Aerial photography is an appropriate technique to measure willow cover.
Reporting 1.6	PRR annual report will contain results of willow control in the mid-Ahuriri by 30 July each year.	Commenced in July 2004.
Target 1.7	Remove all willows, except those agreed to be retained through consultation with the landholders, at Birchwood, Ben Avon, Ben Omar, Mt Gerald, and Glentanner wetlands. Remove invading saplings every two to three years.	Partly achieved. Achieved at Ben Avon and Mount Gerald. Ongoing follow up required at other sites.
Performance measure 1.7	No willows above 2 m in height (other than mature tree that we agreed to retain) as revealed by inspection of wetlands every two to three years.	Partly Achieved
Reporting 1.7	PRR annual report will contain the results of willow control in these wetlands by 30 July each year.	Achieved.
Target 1.8	Control all target weeds to < 1 % cover, and maintain low vegetation in Ruataniwha, Waterwheel, Mick's Lagoon, and Mailbox Inlet wetlands.	Achieved.

Performance measure 1.8	Target weeds controlled to < 1 % cover annually.	Visual inspection.
Reporting 1.8	PRR annual report will contain the results of weed control in these wetlands by 30 July each year.	Achieved.
Target 1.9	Develop aerial photographic methods of measuring changes in weed abundance in riverbeds with Terralink New Zealand Ltd by 30 June 2000.	Achieved.
Performance measure 1.9	A tool that accurately measures changes in weed abundance in riverbeds will be developed by 30 June 2000.	Achieved.
Reporting 1.9	Written report by Terralink New Zealand Ltd 30 June 2000.	Achieved.
Target 1.10	Eradicate yellow tree lupin from the upper Waitaki Basin and prevent re-invasion.	Commenced and ongoing.
Performance measure 1.10	Less than 5 'new' sightings of yellow tree lupin per year.	Achieved to date.
Reporting 1.10	PRR annual report will contain the results of the eradication programme in the upper Waitaki Basin by 30 July each year.	Achieved.
OBJECTIVE 2. INCREASE OUR KNOWLEDGE OF THE EFFECTS OF DIFFERENT PREDATORS ON NATIVE FAUNA, AND DEVELOP MORE EFFECTIVE PREDATOR MANAGEMENT TECHNIQUES.		
PROGRESS TO DATE		
Target 2.1	Monitor nests of braided river birds with video equipment to identify predators and quantify their relative impacts, and describe any predator guild changes following the release of rabbit haemorrhagic disease (RHD).	Video photography project achieved. This target has changed. Relative predator impacts were identified but not predator guild changes. The effort required to obtain measures of predator guild change was not justifiable.
Performance measure 2.1	Predator identity, relative impacts and guild changes will be identified by 30 June 2005.	Achieved.
Reporting 2.1	Relative impacts of various predators to be identified in a report by 30 October 1999. Scientific paper by 30 June 2000. PRR annual report will contain results of video research.	Achieved.

Target 2.2	Support research (with partial funding and supervision) to determine the main causes of black-fronted tern & banded dotterel egg and chick mortality, from July 1998 to July 2001.	Achieved.
Performance measure 2.2	The main causes of black-fronted tern & banded dotterel egg and chick mortality are identified by 31 December 2001.	Achieved.
Reporting 2.2	Produce an unpublished report and scientific paper that identifies causes of egg, chick, and adult mortality of banded dotterels and black-fronted terns by 31 December 2001.	Achieved
Target 2.3	Support research to determine hedgehog diet, abundance and home range, from February 1998 to June 1999.	Achieved.
Performance measure 2.3	Hedgehog diet, abundance and home range in riverbed sites in the upper Waitaki Basin determined by 30 June 2000.	Achieved.
Reporting 2.3	Produce an unpublished thesis by 31 December 1999. Submit for publication, by 31 December 2000, scientific papers that describe hedgehog diet and home range.	Partly achieved. Diet paper written. Home range paper unlikely to be written and not a high priority.
Target 2.4	Investigate the efficacy of poisoning rabbits with Pindone applied in bait stations by 30 June 1999.	Achieved.
Performance measure 2.4	Bait stations are scientifically proven or disproved to be effective means of transferring poison to rabbits by 30 June 1999.	Achieved.
Reporting 2.4	Report on rabbit bait-take from bait stations as a potential predator management tool by 31 December 1999. Scientific paper on rabbit bait-take from bait stations submitted for publication by 30 June 2000.	Achieved.
Target 2.5	Investigate the effects on bird breeding success of the Ruataniwha wetland predator fence, and low-intensity trapping within it, by 30 June 2005.	Achieved
Performance measure 2.5	Bird breeding success is scientifically proven or disproved to be significantly higher within predator fences by 30 June 2005.	Achieved.

Reporting 2.5	Bird abundance and breeding success, and mammalian predator abundance, within and outside predator-proof fences will be reported in PRR annual reports. A final report will be completed by 30 June 2005.	Achieved
Target 2.6	Review research carried out between 1 July 1998 and 30 June 2005.	Need to review this objective.
Performance measure 2.6	Research review carried out by 31 December 2005.	Need to review this objective.
Reporting 2.6	Written report by an independent scientist by 31 December 2005.	Need to review this objective.
<hr/> <p>OBJECTIVE 3. CONSTRUCT HIGH QUALITY WETLAND HABITAT FOR WATER BIRDS IN THE UPPER WAITAKI BASIN AND MAINTAIN PREDATOR FENCES AT SELECTED SITES</p> <hr/>		
PROGRESS TO DATE		
Target 3.1	Construct wetlands at lower Ruataniwha, and adjacent to Lake Poaka (Waterwheel wetland) and evaluate the costs and benefits of wetland construction. Undertake further wetland construction only if cost-benefit analysis is favourable.	Achieved.
Performance measure 3.1	Lower Ruataniwha and Waterwheel wetlands constructed by 30 June 2000.	Achieved.
Reporting 3.1	Report on progress in PRR annual reports, until completed.	Achieved.
Target 3.2	Maintain predator fences at upper Ruataniwha, Mick's Lagoon, and Mailbox wetlands.	Achieved.
Performance measure 3.2	Predator fences are maintained annually.	Achieved.
Reporting 3.2	Report on maintenance programme in PRR annual reports.	Achieved.
Target 3.3	Produce a managed wetland management plan by 30 June 2000.	Achieved in August 2000.
Performance measure 3.3	Managed wetland management plan by Waitaki Basin, by 30 June 2000.	Achieved.

OBJECTIVE 4. INCREASE PUBLIC AWARENESS OF BRAIDED RIVERS AND ASSOCIATED WETLANDS, LOCALLY, NATIONALLY AND INTERNATIONALLY

PROGRESS TO DATE

Target 4.1	Increase understanding and support for PRR among the local community and Iwi, between 1 July 1998 and 30 June 2005, by maintaining open and frequent communication. For example, by discussing PRR work in both formal and informal settings, producing newsletters, erecting interpretation panels, producing media releases, hosting field trips, and meeting with the PRR liaison group.	Ongoing.
Performance measures 4.1	Increased understanding and support for PRR among the local community and Iwi, between 1 July 1998 and 30 June 2005 is achieved and measured by 31 December 2005.	Absence of opposition to projects and feedback positive. Still hard to quantify.
Reporting 4.1	Report on local community support and co-operation in PRR annual reports.	Ongoing.

Target 4.2	Communicate PRR and braided river conservation issues to the widest possible audience nationally and internationally.	Ongoing.
Performance measure 4.2	Increased understanding and support for PRR nationally and internationally, between 1 July 1998 and 30 June 2005 is achieved and measured by 31 December 2005.	Commenced.
Reporting 4.2	At least five presentations at national conferences, and five scientific publications between 1 July 1998 and 30 June 2005. Report on visitor impacts on the Tekapo Delta by 30 June 1999. Project River Recovery home page on the Internet by 30 June 2005. Resource kit for schools and popular book on braided river conservation by 30 June 2005.	Presentations not achieved. Publications achieved. Report is completed . Internet home page is completed but needs updating . Resource kit for schools is completed and Wild Rivers book is completed .

OBJECTIVE 5. INCREASE OUR UNDERSTANDING OF THE ECOLOGICAL COMMUNITIES OF WETLANDS AND RIVERS IN THE UPPER WAITAKI BASIN

PROGRESS TO DATE

Target 5.1	Support research to identify human-induced changes in wetlands and braided rivers in the upper Waitaki Basin to be completed by 30 June 2000.	Achieved.
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Performance measure 5.1	Research to identify human-induced changes in wetlands and braided rivers in the upper Waitaki Basin is completed by 30 June 2000	Achieved.
Reporting 5.1	Detailed unpublished thesis, including extensive maps and photographs that describes human-induced changes in wetlands and braided rivers in the upper Waitaki Basin, by 30 June 2000.	Achieved.
Target 5.2	Trial methods to measure changes in robust grasshopper abundance by 30 June 1999.	Achieved.
Performance measure 5.2	Methods to measure changes in robust grasshopper abundance are trialled and are accepted or rejected as useful by 30 June 1999.	Achieved.
Reporting 5.2	Report on the efficacy of methods of measuring changes in robust grasshopper populations by 30 June 1999.	Achieved.
Target 5.3	Characterise plant and animal communities (including invertebrates and native fish) to test whether managing for birds also confers benefits on other components of braided river ecosystems.	Plant survey completed - worthwhile in own right.
Performance measure 5.3	Management for birds is scientifically proved or disproved to benefit plant and animal communities (including invertebrates and native fish) in the upper Waitaki Basin by 30 June 2005.	Objective has been abandoned.
Reporting 5.3	Written report by 30 June 2005.	Objective abandoned.