MANAGEMENT OF *LAGAROSIPHON MAJOR* IN THE WAITAKI CATCHMENT

FIVE-YEAR PLAN 2003 - 2008

Prepared for Land Information New Zealand

by

Landward Management Ltd
PO Box 5627

DUNEDIN

August 2003

EXECUTIVE SUMMARY

This five-year Management Plan is for the containment of the lakeweed *Lagarosiphon major* on Crown-owned lakebeds and riverbeds in the Waitaki Catchment. The objective of the plan is to contain existing *Lagarosiphon* colonies in The Ahuriri Arm of Lake Benmore, and tributaries of the Ahuriri catchment. The Plan also proposes appropriate monitoring and reporting systems.

The highest priority for lakeweed control is the prevention of its spread to other areas of the Waitaki catchment, regardless of whether they are Crown-owned or not. An emergency response plan is outlined for dealing with new outbreaks. In addition, public awareness of the risks of lakeweed transfer to uninfected areas is recognised in the Plan as an important aspect of lakeweed control.

Control of existing lakeweed infestation in the Crown-owned lakebeds of Lakes Dunstan and Wanaka will focus on the suppression of Lagarosiphon colonies to prevent its spread to uninfected parts of the catchment, especially downstream. Available control methods are outlined, along with the required resource consent and other regulatory approvals for their use. Methods of monitoring and reporting lakeweed control operations are also provided.

A timetable for Lagarosiphon containment is provided, along with a list of organisations which LINZ will formally consult with when developing its annual Lagarosiphon containment programme. In particular, Land Information New Zealand will work closely with Te Runanga O Ngai Tahu, who have a statutory function of participation in the management of most water bodies affected by this Plan.

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INTRODUCTION

Lagarosiphon major (South African oxygen weed) is a noxious weed that has become established in the Waitaki Catchment, believed to be through the escape the weed from ornamental ponds near Omarama. Once established, the weed is impossible to eradicate. It can quickly establish itself in new waterways. Rapid reproduction and dispersal of stem fragments allows it to become fully established in a water body within two years of the initial introduction, the invasion being limited only by the plant's habitat requirements.

Lagarosiphon can grow to depths of 4 metres. Depth limitation is caused by hydrostatic pressure, which at depths over 4 metres is too great for the plant to translocate nutrients from the roots to the growing stems. In addition, the plant cannot grow in areas where there is significant wave action. Generally, where there is a wind-fetch of over 4 kilometres, the plant will not thrive. A further habitat requirement is low turbidity (clear water). Turbid or shady areas of a waterway are unlikely to have significant infestations of the plant. *Lagarosiphon* is not normally enhanced or limited by nutrient concentration, except where this may affect water clarity.

Lagarosiphon disrupts the recreational and amenity values of lakes and rivers by blocking boat and ski-lane access, making swimming areas unpleasant, and forming rotting mats on shorelines which are unpleasant to smell and view. *Lagarosiphon* has severe deleterious effects on native aquatic plant communities, displacing native plants in sheltered areas to depths of 4 metres. Lagarosiphon is also likely to have a severe adverse effect on hydro-electricity generation through blockage of power intakes and reduction of water velocity through canals. Similar adverse effects will occur in irrigation canals.

Land Information New Zealand (LINZ) has responsibilities for managing aquatic plant pests (principally the oxygen weed *Lagarosiphon major*) on Crown-owned riverbeds and lakebeds. This work is carried out on behalf of the Crown. LINZ activities include:

1. Reduction of the risk of *Lagarosiphon* spread to adjacent and as yet non-infested waterways.

2. *Lagarosiphon* control to maintain appropriate amenity values at key sites.

In this Management Plan, the priority is to contain existing Lagarosiphon growths at existing sites in the Ahuriri Catchment and the Ahuriri Arm of Lake Benmore, and to refine techniques for control using available technology. The Plan also proposes appropriate monitoring and reporting systems, to ensure priorities reflect relative needs.

Statement of Intent

The principal objective of this Plan is to control *Lagarosiphon* lakeweed in the Waitaki catchment, and prevent its spread to other non-infested waterways in the South Island.

The specific objectives of this Plan are:

1. To update the knowledge of *Lagarosiphon* density and distribution throughout the Waitaki catchment, and within waterbodies where it is known to occur.

2. To contain existing *Lagarosiphon* growths to the Ahuriri Arm of Lake Benmore and the Ahuriri catchment.

3. To keep informed of new technology initiatives for *Lagarosiphon* control and, for the next 5 years.

4. To achieve maximum cost-effectiveness in meeting objectives 1, 2 and 3.

5. To outline an early response plan to manage new *Lagarosiphon* outbreaks.

This Plan will be continually reviewed. The review will entail evaluation of the annual programmes, including monitoring and reporting requirements, and will form the basis of a new Plan for the following five years.

Significant aquatic habitats in Canterbury remain free of *Lagarosiphon* infestation. Despite this, lakes in Canterbury Region are under threat from *Lagarosiphon* transfer. These are listed in Table 2.

Table 2: Lakes under threat of *Lagarosiphon* infection in Canterbury Region.
NB: Some of these lakes are not administered by LINZ.

Lake	**Infection Risk**	**Conservation impacts**	**Amenity impacts**	**Risk of transfer to other lakes**
Canterbury				
Lake Benmore	5	3	4	5
Lake Aviemore	4	2	3	5
Lake Waitaki	4	2	5	1
Lake Middleton	3	3	4	3
Lake Ohau	2	4	2	3
Kellands Ponds	2	1	3	3
Lake Alexandrina	2	4	2	1

Key to rankings: 0 = minimal effect; 5 = maximum effect.

The main method of *Lagarosiphon* dispersal between lakes is through accidental transmission by people. *Lagarosiphon* can survive out of water for some days (depending on the weather), and only a few centimetres of the plant stem are needed for propagation. *Lagarosiphon* can be transferred by boat bilges, boat trailers, anchors, fishing tackle and other water-based recreational equipment. In addition, *Lagarosiphon* can be transferred through such activities as direct discharge from ornamental ponds and aquaria, and subsequent cleaning.

The potential for the accidental transmission of *Lagarosiphon* to non-infested Lakes in the Canterbury Region, principally those in the Waitaki catchment, is very high. In the case of the Ahuriri River and Lake Benmore, prevention of this transmission can be achieved only through a rapid-response plan to contain Lagarosiphon from the Waitaki catchment.

POLICY AND ADMINISTRATION

Canterbury Regional Pest Management Strategy (RPMS)

The Crown is the legal owner of the beds of Lakes Benmore, Aviemore and Waitaki, the Ahuriri River and the Lower Waitaki River. LINZ is the Government Agency responsible for biosecurity management of these lake beds. Implementation of the provisions of the Canterbury RPMS is undertaken by Environment Canterbury (Ecan). While the Crown is not bound by the policies of the RPMS, the Plan does provide a framework for *Lagarosiphon* control under the Biosecurity Act 1993.

The Canterbury RPMS is currently undergoing renewal. The revised RPMS outlines certain provisions for the control of *Lagarosiphon* in parts of Canterbury. This includes an exclusion from various water bodies (see Appendix 1), including parts of the Upper Waitaki catchment. The revised RPMS also encourages *Lagarosiphon* to be controlled for amenity purposes in other areas.

Canterbury Transitional Regional Plan

This Plan outlines the Resource Management Act 1991 (RMA) framework for the various methods of lakeweed control. Rules are outlined in the Plan which allow some methods to be used without a resource consent (that is, they are permitted activities), while other methods require a consent (that is, they are controlled, discretionary or non-complying activities). Rules which apply to various control methods are outlined in Table 1.

Table 1. Rules that apply to various weed-control methods in Otago Region.

Method	Rule
Hand weeding	Permitted activity
Backhoe (minor drainage ditches)	Permitted activity
Backhoe (other waterways)	Discretionary activity
Diquat gel herbicide	Discretionary activity
Bottom lining	Discretionary activity
Suction dredging	Discretionary activity
Lake level manipulation	Discretionary activity

NB: Other conditions apply to these activities in the Transitional Regional Plan. These are outlined in the specific sections of this Plan.

Ngai Tahu Claims Settlement Act 1998

This Act provides for a mechanism called a statutory acknowledgement. The intent of statutory acknowledgement's are to ensure that Ngai Tahu's cultural, spiritual and traditional values associated with statutory acknowledgement areas are addressed by local and regional council's, in their implementation of the RMA.

Areas with statutory acknowledgements identified as directly threatened by Lagarosiphon infestation in this Plan include (but are not restricted to):

Mahi Tikumu (Lake Aviemore)
Te Ao Marama (Lake Benmore)
Waitaki River

Areas with statutory acknowledgements identified as indirectly threatened by Lagarosiphon infestation in this Plan include (but are not restricted to):

Hakataramea River
Lake Ohau
Lake Pukaki
Takapo (Lake Tekapo)

A map of some of these special areas is provided in Appendix 2. The presence of *Lagarosiphon* has the potential to significantly downgrade values such as mauri and mahinga kai, in these waterways, and adjacent special areas. LINZ will continue to work with Te Runanga o Ngai Tahu and runanga (Arowhenua, Waihao and Moeraki) to ensure these potential effects are minimised through the provisions of this Plan.

Canterbury Natural Resources Regional Plan (NRRP)

This Plan is still in draft form, with only the first two chapters having reached "proposed plan" status. Chapter 2 (Ngai Tahu Management of Natural Resources) provides the framework for Ngai Tahu involvement in the sustainable management of natural resources in Canterbury Region. Chapters 7 (Water Quality), 8 (beds of lakes and rivers) and 9 (wetlands) are still being developed.

LINZ will continue to make submissions on all of these NRRP chapters to ensure they are consistent with the objectives of this Plan.

Other Plans

Various other strategies and plans exist which mention the control of invasive weeds and other pests. A National Pest Plant Accord has been developed to prevent the sale, distribution, or propagation of specified pest plants, including *Lagarosiphon*. The focus of the Accord is to ensure that control of pest plants via Sections 52 and 53 of the Biosecurity Act apply to plants nation-wide, as opposed to only certain regions – depending on whether the pest has been included in the RPMS for that region.

Other planning documents which mention the need for *Lagarosiphon* control include the Department of Conservation (DoC) Canterbury Conservancy Management Strategy, and the Department of Conservation Strategic Plan for Managing Invasive Weeds (Owen 1998a). DoC lists the prevention of *Lagarosiphon* invading new lakes in the South island as a priority for weed control (Owen 1998b).

A recent review of the management of biosecurity risks to the environment has been produced by the Parliamentary Commissioner for the Environment (2001). This document lists the strengths, weaknesses and opportunities of the present biosecurity systems in New Zealand, and provides an introduction to the principles which need to be developed for the Government's draft Biosecurity Strategy.

METHODS FOR CONTAINING *LAGAROSIPHON* IN THE WAITAKI CATCHMENT

1. Hand Weeding

Hand weeding can be an effective weed removal option, but only for small infestations where plant shoots are sporadic and patches do not exceed 1 square metre (Clayton 1993). Hand weeding needs to be done by experienced divers, as loss and dispersion of weed fragments allows for rapid regrowth and further spread. This method does not normally eradicate the weed, as subterranean rhizomes are usually left behind, which can quickly re-sprout and grow to nuisance levels again.

Lagarosiphon presence in Lake Benmore is probably too extensive for hand weeding to be a viable option. Costs of hand weeding can exceed $10,000/hectare, and the effectiveness in this lake would be minimal. For these reasons, hand weeding is not recommended for Lake Benmore and the Ahuriri River, except in small, discreet areas as a back-up to other control techniques.

2. Backhoe

The use of a backhoe to clear weed from shallow areas, especially boat ramps, has previously been used in small drainage ditches on Buscot Stream (an infected tributary of the Ahuriri River). Backhoes have also been used for Lagarosiphon control in Lake Dunstan, near Old Cromwell Beach. This method may have some value in those areas that are shallow enough and close enough to the streambank or shoreline to allow access for a backhoe. However, fragments of *Lagarosiphon* can easily break off during excavation and reinfest the site. In addition, disturbance of the site can create a suitable habitat for Lagarosiphon fragments to take root and form new colonies.

3. Weed Cutter

Mechanical weed cutters have been used for lakeweed control in many areas of New Zealand. However, cutting creates numerous weed fragments, mats and rafts. Even when these fragments are collected and bagged, some inevitably escape to cause further colonisation. Therefore, a weed cutter cannot be used to eradicate *Lagarosiphon* from a site.

A further disadvantage of weed cutting is the quick regrowth to nuisance levels, because cutting stimulates the plant to regrow. Under good growing conditions, *Lagarosiphon* which has been cut to 2 metres below the surface can regrow back to the surface in three months. Furthermore, the new growing stem has only a weak attachment to the main (cut) stem. This allows large numbers of new stem fragments to break off and wash up on the shore when a strong wind is blowing, causing unsightly and smelly shoreline deposits and significant problems with weed transfer around boat ramps.

4. Diquat gel ("Aquagel")

In New Zealand, the only herbicide currently registered for use in aquatic situations is diquat. The aqueous form of this herbicide is marketed as "Reglone", and the gel form is marketed as "Aquagel". Discharge of diquat in gel form is a discretionary activity in the Canterbury Transitional Regional Plan (see Section 2.2).

Diquat is a contact herbicide that desiccates and eventually kills all parts of the growing plant it contacts. It does not, however, kill parts of the plant under the substrate, and the rhizomes usually regrow as new plants within 1-2 years.

"Diquat" has been the herbicide of choice for about 20 years, especially in relation to the control of nuisance growths of *Lagarosiphon* in Lakes Rotorua, Rotoiti and Tarawera in the North Island. The Marlborough District Council has used diquat gel, to provide limited control of aquatic weeds in drains in the Blenheim District.

Application of diquat gel ("Aquagel") will normally result in two to two and a half metres of *Lagarosiphon* dieback if applied correctly. Aquagel is not subject to aerial drift due to wind, which means that non-target plants growing on the shore are at a substantially lesser risk of being damaged.

The persistence and environmental effects of diquat have been extensively studied both overseas and within New Zealand. At the approved rates used (2.4 litres/hectare), diquat is virtually non-toxic to vertebrates (including fish) and invertebrates (Pimentel 1971). Studies have shown that when diquat is applied to open water, it disappears rapidly, and loses its bio-availability, because it binds to suspended particles in the water (Gillett 1970). For example, 22 days after a weed infested artificial lake was treated, only 1% of the applied diquat remained in the water, and 19% was absorbed into the lake sediments (Howard 1991).

Diquat's half-life is less than 48 hours in the water column, and is in the order of 160 days in lake sediments, due to its low bio-availability. Diquat does remain "locked" in lake sediments, with a half-life of about 1000 days (Wauchope *et al* 1992). However, the chemical binds strongly with the sediments in the lake, which renders it biologically inactive (Tucker 1980). Studies in New Zealand indicate that diquat does not accumulate in the lake macroinvertebrate food-chain (Wells and Clayton 1996, HortResearch 2001). Diquat herbicide has been the primary method of weed control in the Rotorua lakes and Waikato River for over 25 years. In Otago, the use of diquat in gel form is a permitted activity, so no resource consent is required, subject to a number of conditions.

Recently "Aquagel" has been used by LINZ in the Ahuriri Arm of Lake Benmore, and has given a very good measure of control, with all growths suppressed to the point where propagules have not formed. This technique should allow a suitable degree of suppression for up to 12 months.

Diquat gel has the advantage of being able to suppress extensive areas of *Lagarosiphon* quickly at a relatively low cost. However, application conditions and methods are critical for its success. Application must be under optimal weather conditions, with no wind, and reasonably clear water. Application rates must be at 2.4 litres of active herbicide per hectare, with a gel formulation and equipment able to accurately deliver this rate consistently over the treatment area. Consistent results are achieved when the gel is not dispersed through the action of a propeller.

There have previously been public concerns by the Omarama community over the use of herbicides in the Ahuriri River. The main issue was the loss of valued riverbed plant species and loss of landscape values in the river. Some new irrigation intakes are planned for the Ahuriri Arm of Lake Benmore, and the lower Ahuriri River. Herbicide application will be timed to avoid irrigation periods.

5. Other approved herbicides

This five-year plan will be automatically updated to incorporate any new *Lagarosiphon* control and/or eradication techniques which may become available for authorised use. However, it is likely that any new chemical or biological control methods will require resource consent approval. If effective alternative herbicides or biological control methods are to be used, they will also require the appropriate registration. Therefore, before proceeding with herbicide control initiatives, the necessary approvals for new methods will be sought from the relevant territorial authorities (District and/or Regional Councils), and Crown agencies.

New herbicides may be available which act systemically, killing the entire plant (including rhizomes) and thereby allowing eradication of all colonies. LINZ will investigate the potential for use of new herbicides as they become available, and undertake to facilitate their registration for use in water, if they show potential in eradicating Lagarosiphon without causing significant adverse environmental effects.

6. Bottom lining

Polythene bottom lining can be used in small, discreet areas where other techniques cannot be used (e.g. narrow drainage ditches on Buscot Stream). A resource consent may be necessary for liner placement. Costs are in excess of $15,000 per hectare (Clayton *et al* 2000). For these reasons, use of this technique in Lake Benmore is not recommended, except in small, discrete areas, and subject to obtaining the necessary resource consents.

7. Suction dredging

Suction dredging uses a venturi suction pump which uproots the *Lagarosiphon* plant and discharges it into a collection bag. When filled, the bag is tied off and taken to shore, and the weed is disposed of at a landfill. Suction dredging is a useful technique where there are small, discreet areas of limited weed growth. It has been used for total removal of the plant where small fragments are not dislodged back into the water. However, suction dredging does not normally achieve this, and cannot be used in hard-bottomed or rocky lakebed substrates.

Suction dredging is a discretionary activity in the Canterbury Transitional Regional Plan. Therefore, a resource consent for this technique is required.

The cost of suction dredging can be high. Clayton *et al* (2000) describes cost estimates of $15-20,000 per hectare in the Rotorua lakes. Costs in Lake Wanaka are in the order of $5000 – 20,000 per hectare, depending on the site.

For these reasons, suction dredging is not recommended for Lake Benmore, except for small, discrete areas as a back-up to other control techniques.

8. Public awareness

Environment Southland, LINZ, Otago Regional Council, DoC and Meridian Energy have developed a public awareness campaign to raise boat users' awareness of the danger of accidental *Lagarosiphon* transfer to other lakes. The campaign objectives are

- to communicate with the boating public visiting the lake regions of Southland, Otago and parts of South Canterbury during the summer months.

- to have boat users regard *Lagarosiphon* as a significant weed that seriously damages lakes, and that can dramatically reduce their enjoyment of boating activities.

- to persuade boat users to thoroughly check their boats and equipment immediately after removal from a lake, ensuring that all weed is cleaned off.

LINZ will assist this public awareness campaign, and will encourage participation in this campaign by other organisations where possible.

9. Monitoring of high-risk areas

LINZ will monitor high-risk sites in Lakes Benmore, Aviemore, Waitaki, connecting waterways and the Lower Waitaki and will report any known new outbreaks to the relevant territorial authority. A 24-hour public freephone will be made available for the reporting of suspected new outbreaks of Lagarosiphon in these waterways.

The public freephone number is (0508) 244746.

PROGRAMME DEVELOPMENT

LINZ will develop a draft programme for Waitaki Catchment Lakeweed Control in July-August each year. The draft programme is to be developed in conjunction with LINZ other biosecurity commitments such as the programmes for *Nassella*, rabbit, Old Mans Beard and brushweed control.

As is normal practice, the draft programmes will be distributed to territorial authorities, Te Runanga O Ngai Tahu, Federated Farmers and other interested parties in accordance with LINZ requirements.

The Draft Lakeweed Programme will be submitted to the following parties before 31st August each year, prior to LINZ approval of the final programme:

- Waitaki District Council
- Waimate District Council
- Central South Island Fish and Game Council
- Department of Conservation
- Environment Canterbury
- Waitaki Lakes Shoreline Authorities Committee
- Upper Waitaki Working Group
- Ahuriri Community Board.
- Waitaki Lakes and Rivers Committee Inc.
- Te Runanga O Ngai Tahu.
- Waihao Runanga.
- Moeraki Runanga.
- Meridian Energy Ltd.
- Forest and Bird Protection Society

Consultees will be asked to submit comments on the draft programme within 14 days. The final programme will be submitted to LINZ for funding approval before 30th September each year.

Control operations will normally be tendered to independent contractors. This will normally occur in September each year, so that control operations can start by 1st October. Physical control operations will be normally expected to be completed by 1st December each year.

MONITORING AND REPORTING

The purpose of *Lagarosiphon* monitoring in the Waitaki catchment is to:

1. Check for new *Lagarosiphon* outbreaks in uninfected water bodies.

2. Assess the need for *Lagarosiphon* control in an area.

3. Assess the effectiveness of *Lagarosiphon* control operations.

Monitoring and reporting systems need to be as comprehensive and cost effective as possible, so they can assist present and future weed control planning.

A Weeds Work Record Sheet has been developed for *Lagarosiphon* control operations and inspections (Appendix 3). These records will be collated and stored by the LINZ biosecurity service provider, and referred to in the future as a formal record of weed control operations on lake beds included in the Lakeweed Control Programme.

Control operations will normally occur during the months September to November (inclusive). All *Lagarosiphon* control operations will be inspected at least once prior to control and once after the control operation is completed. Inspections may include visual or dive surveys of the control site, along with collection of grab samples of lakeweed. The post-control inspection will be carried out approximately 6 weeks after control has finished. An annual report on the outcomes of the programme will be provided to LINZ by the 30th April each year.

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APPENDIX 1 – Extract from revised Canterbury Regional Pest Management Strategy

8.7 Lagarosiphon

8.7.1 Location and distribution

Lagarosiphon major (lagarosiphon) is a submerged, bottom-rooted perennial, which can form monospecific growths up to five metres tall upon reaching the water surface. It propagates through stem fragments being carried on water currents, boats, aquarium and pond escapes and deliberate planting.

8.7.2 Adverse effects

Lagarosiphon is a potential threat to the aquatic environment because it forms dense, monospecific colonies. These, by definition, exclude other parts of the aquatic ecosystem, further slows water and wave movement and cause local deoxygenation.

While most slow moving water ecosystems are already heavily modified in New Zealand, it still represents a threat to the remaining biodiversity in these ecosystems. Lagarosiphon also poses a serious threat to the recreational and aesthetic values of lakes and water bodies. It can block boat and ski lane access, catch on fishing gear and obstruct swimming. Stinking, rotting mats of lagarosiphon on the shoreline makes recreational areas
unpleasant.

8.7.3 Objectives

Over the duration of the Strategy, protect the biodiversity values associated with water bodies in the Canterbury region by:

(a) preventing the establishment of lagarosiphon in those water bodies outlined in Appendix 5; and

(b) containing lagarosiphon present in any other water body.

8.7.4 Principal measures to achieve the objectives

Environment Canterbury will take the following principal measures to achieve the stated objectives.

(a) Environment Canterbury will regularly inspect water bodies at risk to Lagarosiphon infestation to determine its presence. The frequency of inspection will depend on the proneness of the water bodies to the plant pest.

(b) Environment Canterbury will carry out or facilitate control operations to destroy lagarosiphon found in water bodies outlined in Appendix 5. Appropriate physical or chemical measures will be used in an efficient and cost-effective manner.

(c) Environment Canterbury will encourage the management of lagarosiphon in the water bodies not identified in Appendix 5 to contain or lessen the extent of the present infestations.

(d) Land occupiers and other persons will be encouraged to report to Environment Canterbury the presence of lagarosiphon in any water body.

(e) Environment Canterbury will provide advice and education to the community to increase awareness of the nature and threats posed by lagarosiphon.

(f) Environment Canterbury will use enforcement measures where land occupiers or other persons do not comply with the rules in the Strategy.

8.7.5 Alternative measures to achieve the objectives

An alternative measure to achieve the objectives would be to make occupiers of water bodies responsible for destroying or containing lagarosiphon. However, early detection of lagarosiphon by occupiers is difficult. Therefore, land occupier responsibility by regulation is unlikely to lead to early detection and successful control. There are no alternative measures that provide for satisfactory inspection, education and advice outcomes.

8.7.6 Strategy rule for lagarosiphon

Land occupiers and other persons shall not sell, propagate or distribute any Lagarosiphon plant or parts thereof. A breach of this rule creates an offence under Section 154(r) of the Biosecurity Act 1993, or may result in default work under section 128 of the Act, or both.

Explanation

The purpose of this rule is to prevent water bodies currently clear of lagarosiphon becoming infested through human-assisted activities. Examples of such activities include selling plants commercially or at fairs, the multiplication of plants for personal or commercial use or any distribution through recreational uses or other uses of water bodies.

Appendix 5 Lagarosiphon schedule

The following schedule outlines the water bodies that will be protected from Lagarosiphon infestation.

(a) Lake Ohau and the tributaries that flow into it.

(b) Lake Pukaki and the tributaries that flow into it.

(c) Lake Alexandrina and the tributaries that flow into it.

(d) Lake Tekapo and the tributaries that flow into it.

(e) Lake Heron and the tributaries that flow into it.

(f) Lake Coleridge and the tributaries that flow into it.

(g) Waimakariri River above the gorge at Woodstock, including the lakes and tributaries that flow into it above the gorge.

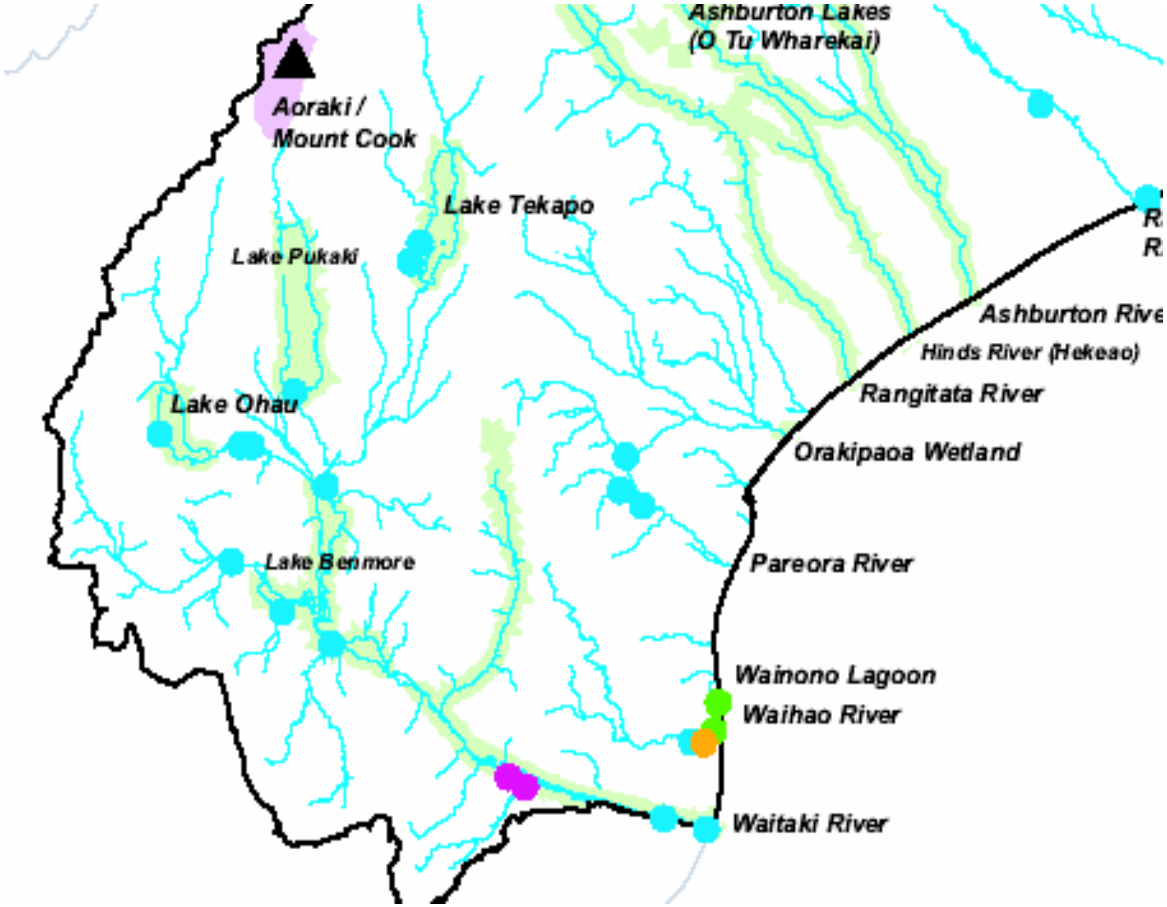
(h) Ashley River above the Ashley Gorge Road bridge, including the lakes and tributaries that flow into it above that point.

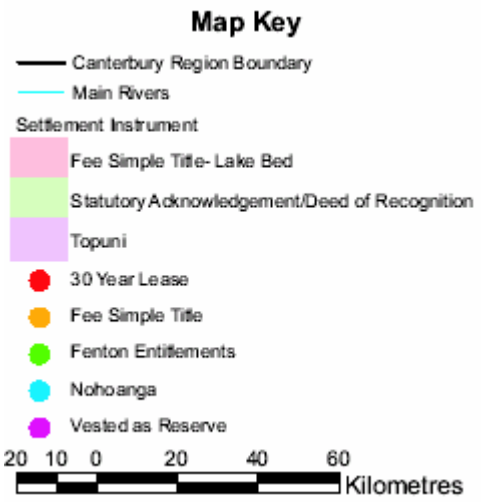
(i) Hurunui River above SH 7, including the lakes and tributaries that flow into it above that point.

(j) Waiau River above the Waiau/Hanmer confluence, including the lakes and tributaries that flow into it above that point.

(k) Clarence River above the Clarence/Acheron confluence, including the lakes and tributaries that flow into it above that point.

Appendix 2: Sites of Significance to Ngai Tahu (from: Proposed Canterbury Natural Resources Regional Plan Chapter 2)





Appendix 3

CROWN LANDS LAKEWEED OPERATIONS RECORD

NB: Please attach a map of the area of operations.

PROGRAMME REFERENCE Number:

DATE: **TIME:**

RECORDED BY:

WEATHER:

AREA DESCRIPTION (see programme)

AREA TREATED (HA):

WATER WEEDS WORKED ON:

METHOD USED - (eg. mechanical/chemical/other):

COMPLETION DATE:

PROBLEMS/COMMENTS:

FUTURE CONTROL REQUIREMENTS: