

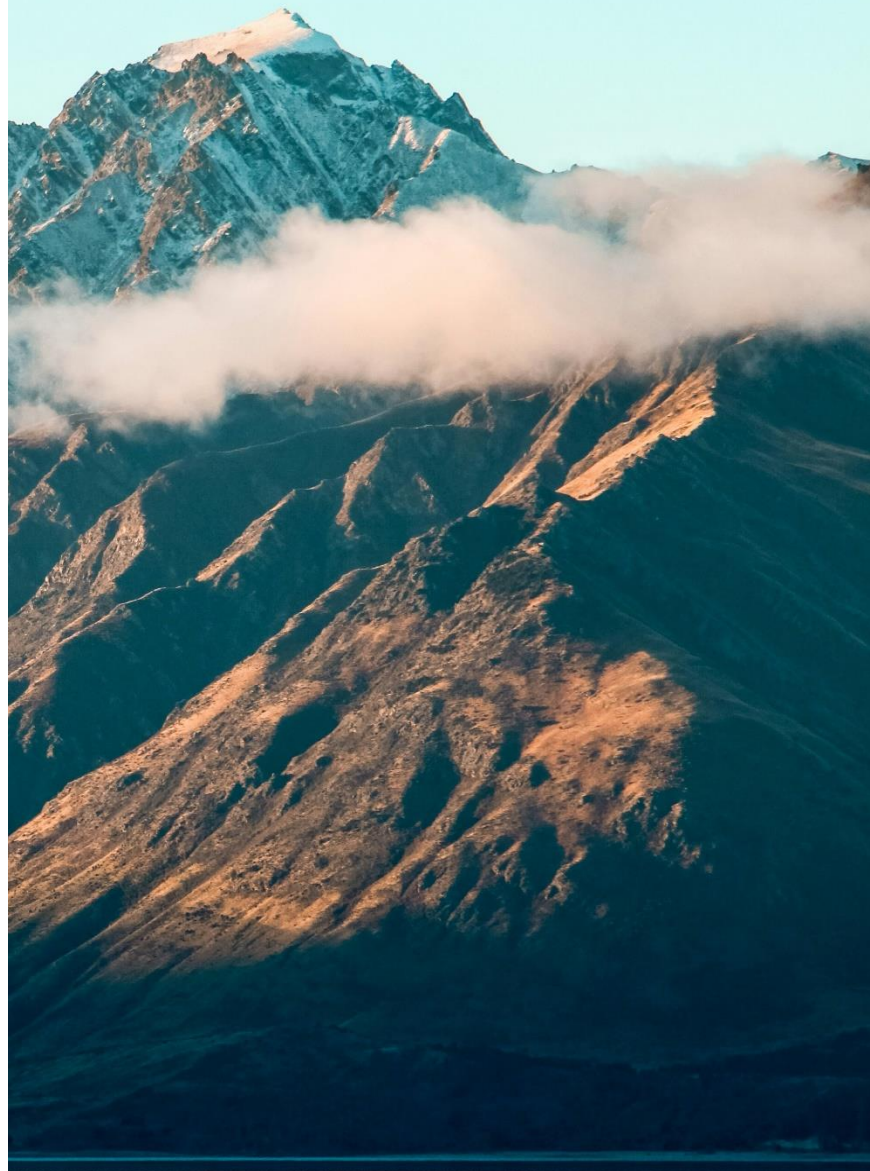
LAKE HĀWEA CATCHMENT ACTION PLAN

“All stakeholders of Lake Hāwea will work together, using an evidence-based approach to improve water quality, ecosystem function, biodiversity, and recreational enjoyment for future generations.”

Lake Hāwea Stakeholder Group

Otago Regional Council

May 2025



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PROJECT PURPOSE

RATIONALE

The Lake Hāwea Stakeholder Group (LHSG) is concerned about the lack of organisational cohesion when working towards environmental goals, declining water quality, and the lack of native biodiversity within the CAP area. This plan has been developed to support coordination and focus on achieving environmental improvement.

A Catchment Action Plan (CAP) is a plan for the management and conservation of an entire catchment or catchments. It is a long-term plan that builds on the work that communities and local government are already doing to protect and manage their natural environment and serves as a focus for new actions and projects. The CAPs are not prescribed by regulation, nor are they making any rules. The planning process is based on the Open Standards for the Practice of Conservation (Open Standards) method and is guided by the corresponding planning software, Miradi. The Open Standards process provides an evidence-based planning framework that helps achieve lasting impacts.

SCOPE

Spatial scope: The spatial extent of the Lake Hāwea CAP includes not only Lake Hāwea and its catchment, but also extends onto Hāwea Flat. This project boundary was chosen so that the residential areas of the community are spatially included in the scope. The total area of the CAP is 1436 km².

Time scope: The timeline of actions is from 2024 – 2034.



Figure 1. The spatial boundary of the Lake Hāwea Stakeholder Group Catchment Action Plan

VISION & MISSION

The LHSG long-term vision for the Hāwea area is:

“All stakeholders of Lake Hāwea and its catchment will work together, using evidence-based approaches to improve water quality, ecosystem function, biodiversity, and recreational enjoyment for future generations.”

The LHSG long-term mission for the Hāwea area is:

“The stakeholder group will be a group that is collaborative, has open communication, and shares resources. Showing that by working together, we can achieve improved community wellbeing and positive environmental outcomes for the CAP area.”

LAKE HĀWEA STAKEHOLDER GROUP VALUES

Our community and future generations: We value the community, relationships, and sense of place that our lake and catchment bring together.

Local economy: We value the farming and tourism-based economy in our catchment and lake.

Recreation: We value the outstanding recreational opportunities around us.

Native vegetation: We value the beauty and terrestrial and aquatic habitats that native vegetation provides. It also helps to filter runoff and to cycle nutrients and enhance biodiversity.

Native wildlife: Native wildlife provides us with a connection to nature, and we value seeing native birds and lizards living in our catchment and the biodiversity of native species in Lake Hāwea.

Healthy lake: We value the beauty, ecosystem functions, biodiversity, and ecosystem services of the lake.

Native fish, eels, and introduced fish species: We value the large trout and salmon populations in the lake and tributaries, along with longfin eels and other native fish species.

MANA WHENUA

Mana whenua were not involved in writing this CAP.

Kāi Tahu ki Otago Rūnaka hold mana whenua status in the Hāwea area. The area is of deep cultural significance to the rūnaka. The importance of Lake Hāwea is recognised by a statutory acknowledgement in the Ngāi Tahu Claims Settlement Act 1998, which describes the Kāi Tahu association with the lake as follows:

Hawea is one of the lakes referred to in the tradition of “Ngā Puna Wai Karikari o Rakaihautu” which tells how the principal lakes of Te Wai Pounamu were dug by the rangatira (chief) Rakaihautu. Rakaihautu was the captain of the canoe, Uruao, which brought the tribe, Waitaha, to New Zealand. Rakaihautu beached his canoe at Whakatū (Nelson). From Whakatū, Rakaihautu divided the new arrivals in two, with his son taking one party to explore the coastline southwards and Rakaihautu taking another southwards by an inland route. On his inland journey southward, Rakaihautu used his famous kō (a tool similar to a spade) to dig the principal lakes of Te Wai Pounamu, including Hawea.

For Ngāi Tahu, traditions such as this represent the links between the cosmological world of the gods and present generations, these histories reinforce tribal identity and solidarity, and continuity between generations, and document the events which shaped the environment of Te Wai Pounamu and Ngāi Tahu as an iwi.

The name Hawea may derive from Hawea, tupuna (ancestor) of the Waitaha hapū, Ngāti Hawea.

Hawea was traditionally noted as a rich tuna (eel) fishery, with many thousands of the fish once being caught, preserved and transported back to the kāinga nohoanga (settlements) of coastal Otago. The tūpuna had considerable knowledge of whakapapa, traditional trails and tauranga waka, places for gathering kai and other taonga, ways in which to use the resources of Hawea, the relationship of people with the lake and their dependence

on it, and tikanga for the proper and sustainable utilisation of resources. All of these values remain important to Ngāi Tahu today.

The mauri of Hawea represents the essence that binds the physical and spiritual elements of all things together, generating and upholding all life. All elements of the natural environment possess a life force, and all forms of life are related. Mauri is a critical element of the spiritual relationship of Ngāi Tahu Whānui with the lake.¹

The Queenstown Lakes Proposed District Plan 2015 recognises Lake Hāwea as a wāhi tūpuna (site of cultural significance). The Proposed District Plan also recognises the following wāhi tūpuna associated with the lake:

- Orokotewhātu (the land around The Neck) is a wāhi tūpuna. It was also the site of the Manuhaea nohoaka (seasonally occupied place) and kaika (village, settlement), which
- was important for mahika kai, tūāhu (ritual site), wāhi tapu (sacred site), and mauka (mountains).
- Paetarariki & Timaru (slopes and lake margins around southern Lake Hāwea) are wāhi tūpuna, with significance for nohoaka, mahika kai, kaika, and ara tawhito.
- Turihuka (Dingle Burn delta and peninsula) is a wāhi tūpuna important for mahika kai and kaika.

Manuhaea kaika was renowned within Kāi Tahu:

The tribally well-known kāinga nohoanga (settlement) and kāinga mahinga kai (food-gathering place) is located on the eastern side of “The Neck”, the narrow isthmus of land separating lakes Hāwea and Wānaka. Manuhaea was renowned for a small lagoon where tuna (eels) were gathered. Other foods gathered at Manuhaea included weka, kākāpō, kiwi, kea, kākā, kererū and tūī; there were also potato, turnip, and kāuru māra (gardens).

Manuhaea was one of the kāinga attacked by Te Pūoho during the 1836 Ngāti Tama southern attack on Ngāi Tahu. The inhabitants escaped over Ōmakō (the Lindis Pass) and down the Waitaki River. One of the survivors, Rāwiri Te Maire, became an invaluable source of information on the Ngāi Tahu history of the interior of Te Waipounamu. In 1868 a 100 hectare fishery easement was allocated by the Native Land Court, abutting the lagoon at Manuhaea.

Despite the cultural and historical significance of Manuhaea, the lagoon and part of the fishery easement were submerged when Lake Hāwea was artificially raised in 1958 to store water for hydroelectric power generation.²

In recognition of its cultural significance, an area of land at Manuhaea was set aside as a Conservation Area through the tenure review process.

The fishery easement is located along SH6 and is mapped in the Proposed Otago Regional Policy Statement 2021. There is also a 13.5 ha block of Māori freehold land adjoining the lakeshore at Bushy Point.

There are three nohoaka entitlements located in the CAP area. These entitlements under the Ngāi Tahu Claims Settlement Act 1998 provide a right of seasonal occupation and use for Kāi Tahu whānui on specified areas of Crown-owned land near water bodies for harvest of natural resources.³ At these sites, Ngāi Tahu iwi members experience the landscape as their tūpuna did and rekindle the traditional practices of gathering food and other natural resources (ngaitahu.iwi.nz). The three nohoaka are located at:

- Western lakeshore east of Bushy Point
- Timaru Creek
- QLDC reserve adjacent to the boat harbour

¹ Ngāi Tahu Claims Settlement Act 1998, Schedule 30.

² Retrieved April 2025 from Ngāi Tahu Ka Huru Manu Atlas: <https://kahurumanu.co.nz/cultural-mapping-story/protecting-ngai-tahu-history/>

³ Ngāi Tahu Claims Settlement Act 1998, s 255-268

STAKEHOLDERS

The CAP was created by the LHSG. The group consists of 11 individuals, representing a broad range of organisations, groups, and industries that are active in the Lake Hāwea CAP area (see list below). Some stakeholders were involved at all stages of the planning process and workshops, whilst others were involved as availability allowed. The process of developing the CAP together with the stakeholders was facilitated by the Otago Regional Council's (ORC's) Catchment Group Planner.

Stakeholders who were directly involved:

- Landholders who are part of the Hāwea Farmer Catchment Group
- Guardians of Lake Hāwea
- Hāwea Community Association
- WAI Wānaka staff
- Otago Catchment Community
- Queenstown Lakes District Council
- Contact Energy
- Otago Fish and Game
- Land Information New Zealand
- Otago Regional Council Catchment Advisor
- Upper Clutha Wilding Tree Group

Stakeholders who were not directly involved, but whose values and interests were considered within the plan are:

- Department of Conservation
- Hāwea township business owners
- HCA Thursday (Foreshore) Group volunteer planting and weeding crew
- Tourist operators (some landowners involved also operate tourism ventures)
- Tourists and day visitors
- Wānaka backyard trapping

PHYSICAL PROFILE OF SPATIAL SCOPE

Climate: The Hāwea area has a temperate, alpine climate. Summers are mild, with temperatures averaging 20-25°C. Winters are cold, with temperatures often below freezing at night and occasional snowfall down to the Hāwea township. Due to the proximity of the area to the Southern Alps, the rainfall is 700mm per annum, and strong winds are common, especially in spring.

Significant waterbodies: Lake Hāwea, Hunter River, Craig Burn, Sawyer Burn, Neck Creek, Timaru Creek, Dingle Burn, Dingle Burn wetlands, and Hāwea River.

Lake Hāwea: Lake Hāwea and its catchment are an area of Outstanding Natural Landscape. It is a deep glacial lake, 141 km² in area, 31 km long and ~8 km wide, dammed at the outlet of the Hāwea River in 1958, resulting in depth increasing by ~18 m to a maximum of ~384 m (~40 m below sea-level at its deepest basin). Contact Energy is consented by ORC to operate the lake through an 8 m height range as part of the management of the lake as a hydroelectric generation storage source. Contact energy is also required to manage erosion around the lake. When this plan was written, the new 5-year Contact Energy foreshore management plan was under consultation. Water quality in the lake is very good (microtrophic) but declining, especially over the last decade, most likely due to the impacts of catchment land use. Lake Hāwea is the main water source for the aquifer through the gravel moraine. The lake level and quality directly affect the aquifer; there is some lag time between the two as the water filters through.

Geology: Over-steepened glacial valley within actively faulted green schist and semi-schist rock, forming steep, rugged mountainous terrain. Quaternary fluvioglacial deposits, including alluvial sediment and till, form the Hāwea Flat area. Large alluvial fans, i.e., triangle-shaped deposits of gravel, sand, and even smaller pieces of sediment deposited by river flow, occur around the edge of the lake. In the Hunter Valley, there is an extensive braided riverbed built by the Hunter River.

Soils: The primary soil type is brown soil, with lesser coverage of raw and podzol soils. Brown soils are well-drained and ideal for forests and both native and exotic grasslands. High, wet altitudes over schist bedrock have podzol soil, with raw soils found on steep, rocky slopes in the mountains that experience intense erosion. The area experiences high sedimentation levels in some of its rivers due to a combination of natural erosion and erosion due to historical land clearance.

Main land uses: The CAP area supports multiple land uses, including agriculture, urban living, recreation, and tourism, which are essential for the community's quality of life. Productive land use is dominated by sheep and beef dry-stock farming, deer farming, some dairy farming, and small-scale forestry. The catchment also contains a large area of conservation estate, which covers 68% of the CAP area (976 km²).

BIODIVERSITY PROFILE OF SPATIAL SCOPE

Native biodiversity within the CAP area is rich and diverse. It encompasses a wide range of ecosystems, from alpine peaks to beech forests, wetlands, braided riverbeds, and the deep lake environment. The variety of ecosystems provides a multitude of habitats which support numerous plant, bird, fish, lizard, invertebrate species, and micro-organisms. Various species are taoka to mana whenua and/or are rare or threatened. The area's native biodiversity lies largely within the conservation estate, the lake, and extends to large pastoral properties. The diverse native biodiversity contributes to the scenic beauty of the catchment and provides opportunities for connecting with nature and supports recreation and tourism activities. The biodiversity of smaller urban, lake foreshore, and on-farm plantings, as well as naturally regenerating vegetation areas, adds to the overall plant biodiversity of the catchment. Revegetation and planting projects provide an accessible connection to biodiversity for the community. The lake represents large, relatively unstudied aquatic ecosystems from shallow nearshore habitats to the deep basin. Its flora and fauna range from top predator tuna/longfin eels down to a likely extensive biodiversity of micro-organisms, including, for example, the 10-micron invasive planktonic diatom *Lindavia intermedia* (Lake snow).

ECOSYSTEM VALUES AND GOALS

INTRODUCTION

The ecosystems presented in this plan were chosen by the LHSG and are based on the knowledge of the community. The goals for each ecosystem detail the desired future state of the ecosystem.

LAKE HĀWEA

GOAL FOR THE FUTURE HEALTH

By 2034, the area covered by the Lake Hāwea CAP will support healthy freshwater ecosystems (lake trophic index <2) with thriving habitats for native wildlife, and clean, safe swimming water for future generations.

Indicators for this goal:

- Lake Hāwea hosts an increasing population of Pūteketeke / crested grebe, with over 32 adults nesting in 2034.
- Lake Hāwea continues to maintain trout and salmon stocks large enough to support recreational fishing demand.
- The population of tuna/ long fin eels in Lake Hāwea has increased.
- Lake Hāwea has very good water quality, microtrophic conditions and a trophic level index that does not exceed TLI⁴ score 2 in any year.
- Lake Hāwea has excellent swimming water with an *E.coli* l long term 95th percentile *E. coli* trend less than 130 cfu/100 ml.
- Lake Hāwea is free of invasive aquatic weeds and pest aquatic organism invasions are prevented.

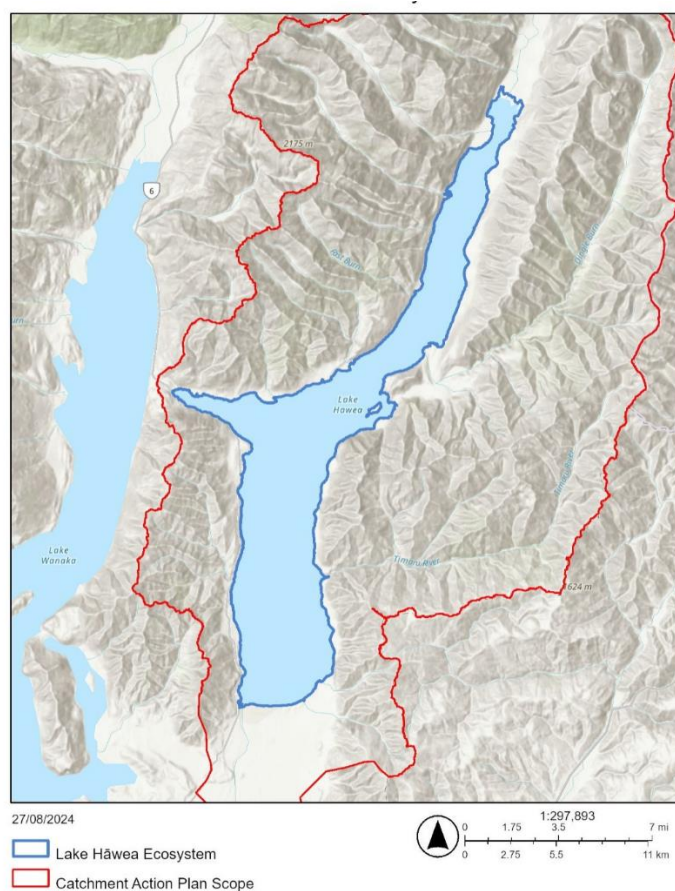


Figure 2. Map showing spatial extent of Lake Hāwea.

LHSG VALUES

When we improve Lake Hāwea, we also improve:

- Native wildlife
- A healthy lake
- Recreation
- Local economy
- Native fish, eels, and introduced fish species
- Our community and future generations

PRESSURES

For each of the ecosystems, the LHSG identified the pressures that act on the health of that ecosystem. In this CAP, a “[pressure](#)” is usually a human activity that directly affects one or more of the ecosystems. These pressures will cause a “stress” on an ecosystem.

- Introduction and/or increase of unwanted aquatic organisms
- Unnatural lake level fluctuation
- Presence of predatory fish species
- Hāwea dam and dam network
- Agricultural runoff
- Presence of invasive pest plants and animals (terrestrial pests)
- Increased stormwater load
- High number of boats

See Appendix 2 for the situation model of pressures and stressors on the Lake Hāwea ecosystem.

STRATEGIES

Strategies that will help us achieve our health lake goal are listed below. For further detail on each strategy, refer to the “Strategies” section of the CAP.

- [Sustainable farming](#)
- [Freshwater invasive species management](#)
- [Fish species interactions](#)
- [Stormwater improvement](#)
- [Planting for biodiversity](#)

RIVERS AND STREAMS

OUR GOAL FOR THE FUTURE HEALTH

By 2034, the Hāwea River as well as all tributaries to Lake Hāwea support healthy freshwater ecosystems with thriving habitats for a range of native species.

Indicators for this goal:

- Streams and rivers in the Lake Hāwea CAP area have excellent water quality. The NOF band ratings from the New Zealand National Objectives Framework (NOF; <https://environment.govt.nz/acts-and-regulations/freshwater-implementation-guidance/nof/>) for monitored rivers (Timaru River, The Neck Creek, and Craig Burn) are maintained or improved.

- The Hāwea River has excellent, improving water quality. The NOF band ratings for Hāwea River at Camphill Bridge are maintained at A-band. The degrading trend of total nitrogen, ammoniacal nitrogen, chlorophyll a, and secchi disk depth is lessening.
- The number of populations of koaro / climbing galaxiid in mountain streams has increased.
- An increase in braided river bird breeding success and population size and species diversity at the Hunter River mouth

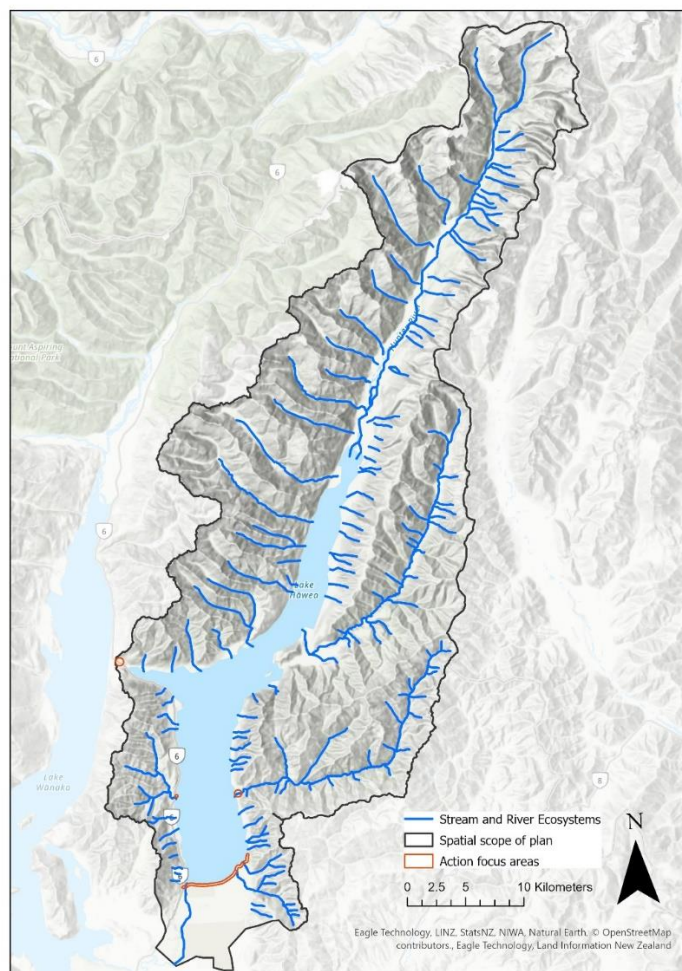


Figure 3. Map showing spatial extent of stream and rivers.

LHSG VALUES

When we improve the rivers and streams, we also improve:

- Native wildlife
- Healthy lake
- Recreation
- Local economy
- Native fish, eels, and introduced fish species
- Our community and future generations

PRESSURES

For each of the ecosystems, the LHSG identified the pressures that act on the health of that ecosystem. In this CAP, a “[pressure](#)” is usually a human activity that directly affects one or more of the ecosystems. These pressures will cause a “stress” on an ecosystem.

- Hāwea dam and dam network
- Agricultural runoff
- Introduction and/or increase of unwanted aquatic organisms
- Presence of invasive pest animals
- Presence of predatory fish species

See Appendix 2 for situation model of pressures and stressors on the river and stream ecosystems.

STRATEGIES

Strategies that will help us achieve our goal are listed below. For further detail on each strategy, refer to the “Strategies” section of the CAP.

- [Fish species interactions](#)
- [Freshwater invasive species management](#)
- [Planting for biodiversity](#)
- [Sustainable farming](#)

GRAVEL DELTAS

OUR GOAL FOR THE FUTURE HEALTH

By 2034, the gravel deltas support healthy ecosystems with thriving habitats for a range of native species.

Indicators for this goal:

- Tūturiwhatu / dotterels are safely and successfully nesting on the beach at Craig Burn
- An increase in native plants and decrease of lupins on the alluvial fan beaches surrounding Lake Hāwea

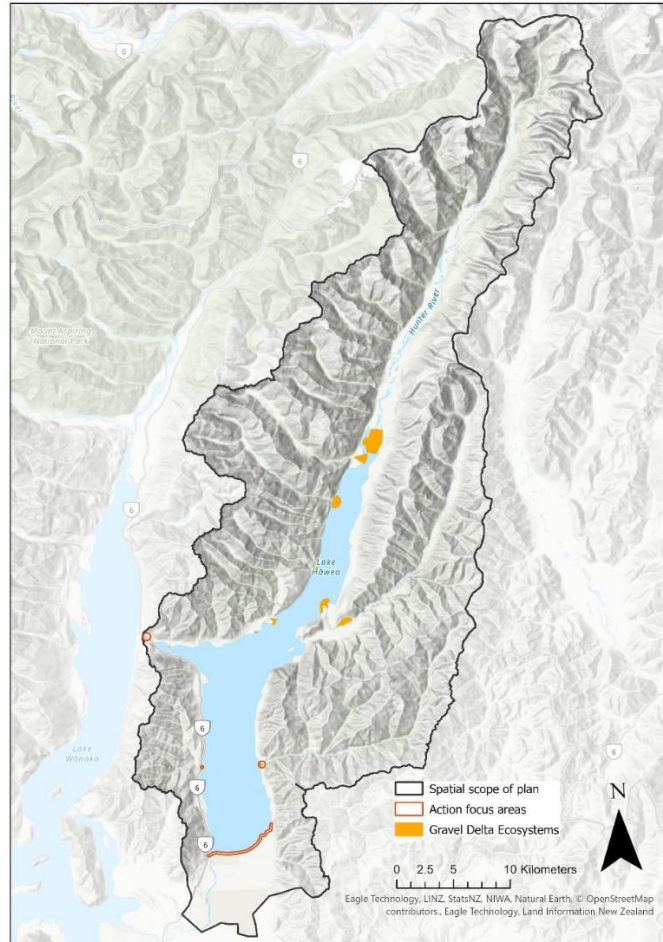


Figure 4. Map showing spatial extent of gravel deltas

LHSG VALUES

When we improve the braided riverbed and gravel deltas, we also improve:

- Native wildlife
- Recreation
- Our community and future generations
- Native vegetation

PRESSURES

For each of the ecosystems, the LHSG identified the pressures and stressors that act on the health of that ecosystem. In this CAP, a “[pressure](#)” is usually a human activity that directly affects one or more of the ecosystems. These pressures will cause a “stress” on an ecosystem.

- Presence of invasive pest animals
- Presence of invasive pest plants
- Unnatural lake level fluctuation
- Inappropriate driving on gravel beaches

See Appendix 2 for a situation model of pressures and stressors on the gravel delta ecosystems.

STRATEGIES

Strategies that will help us achieve our goal are listed below. For further detail on each strategy, refer to the “Strategies” section of the CAP.

- [Collaborative terrestrial pest animal work](#)
- [Collaborative terrestrial pest plant work](#)
- [Planting for biodiversity](#)

WETLANDS

OUR GOAL FOR THE FUTURE HEALTH

By 2034, the wetlands in the CAP area are enhanced by an increase in native plants and animals present.

Indicators for this goal:

- Manuhea The Neck wetlands have less pest plants and more raupō
- Matuku-hūrepo / bittern are regularly visiting Manuhea The Neck wetlands

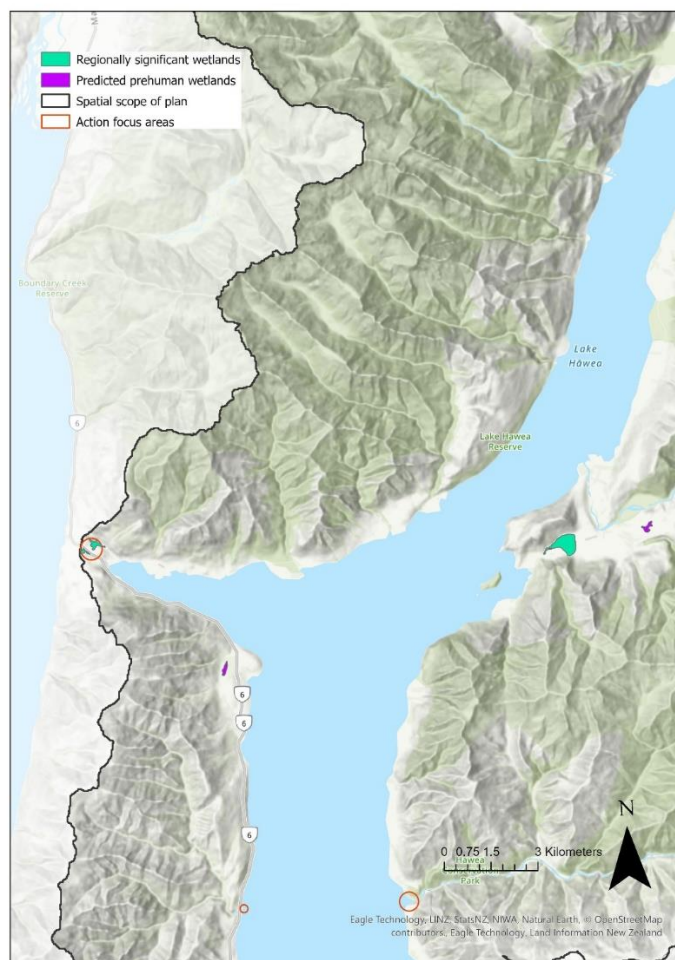


Figure 5. Map showing spatial extent of wetlands

LHSG VALUES

When we improve the wetland ecosystems, we also improve:

- Native wildlife
- Recreation
- Local economy
- Native fish, eels, and introduced fish species
- Our community and future generations
- Native vegetation

PRESSURES

For each of the ecosystems, the LHSG identified the pressures and stressors that act on the health of that ecosystem. In this CAP, a “[pressure](#)” is usually a human activity that directly affects one or more of the ecosystems. These pressures will cause a “stress” on an ecosystem.

- Presence of invasive pest plants
- Presence of invasive pest animals

See appendix 2 for situation model of pressures and stressors on the wetland ecosystems.

STRATEGIES

Strategies that will help us achieve our goal are listed below. For further detail on each strategy, refer to the “Strategies” section of the CAP.

- [Collaborative terrestrial pest animal work](#)
- [Collaborative terrestrial pest plant work](#)
- [Sustainable farming](#)
- [Planting for biodiversity](#)

GREY SCRUB

OUR GOAL FOR THE FUTURE HEALTH

By 2034, the environment within the CAP area is enhanced by an increase in native plants and animals present.

Indicators for this goal:

- Coverage of grey scrub vegetation has increased within the focus area at Hāwea southern foreshore
- Titipounamu / Rifelman and Korimako / Bellbird, Riroriro/Grey Warbler are occasionally seen and heard at the Hāwea southern foreshore, and Tūi are commonly seen and heard
- Skinks are commonly seen at the Hāwea foreshore

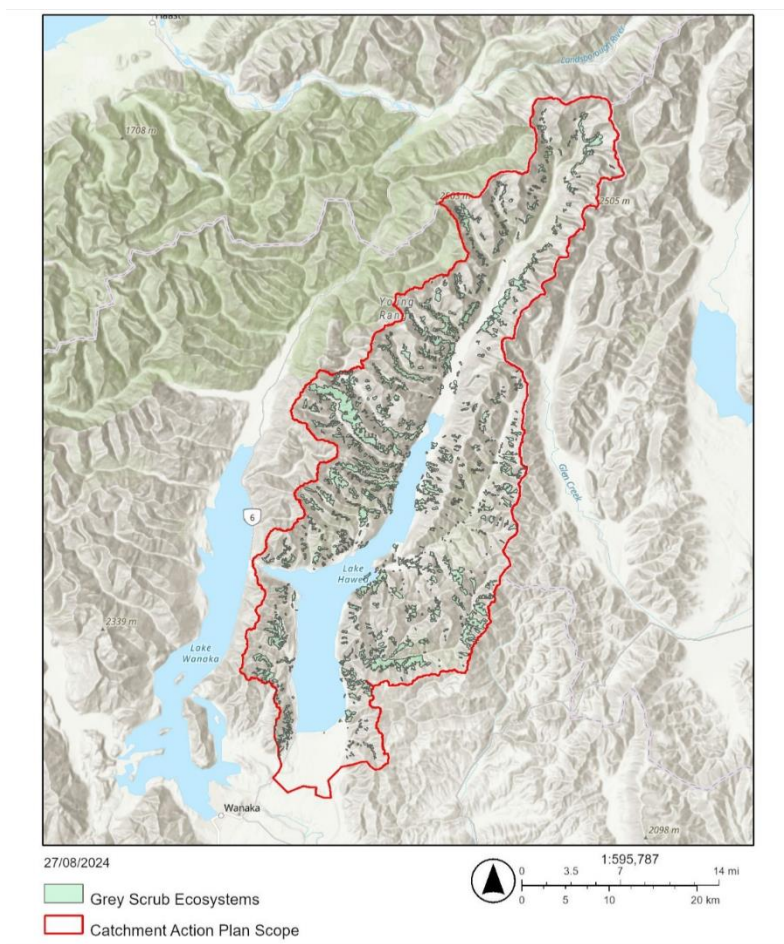


Figure 6. Map showing spatial extent of grey scrub

LHSG VALUES

When we improve the grey scrub ecosystem, we also improve:

- Native wildlife
- Recreation
- Local economy
- Our community and future generations
- Native vegetation

PRESSURES

For each of the ecosystems, the LHSG identified the pressures and stressors that act on the health of that ecosystem. In this CAP, a “[pressure](#)” is usually a human activity that directly affects one or more of the ecosystems. These pressures will cause a “stress” on an ecosystem.

- Presence of invasive/pest animals
- Litter/Waste (includes freedom camping)
- Presence of invasive/pest plants

See Appendix 2 for a situation model of pressures and stressors on the grey scrub ecosystems.

STRATEGIES

Strategies that will help us achieve our goal are listed below. For further detail on each strategy, refer to the “Strategies” section of the CAP.

- [Collaborative terrestrial pest animal work](#)
- [Collaborative terrestrial pest plant work](#)
- [Planting for biodiversity](#)
- [Sustainable farming](#)

BEECH AND PODOCARP-BROADLEAF FOREST

OUR GOAL FOR THE FUTURE HEALTH

By 2034, the environment within the CAP area is enhanced by an increase in native plants and animals present.

Indicators for this goal:

- Mohua / yellowhead are present throughout the beech forests
- Edge areas of beech forest are regenerating with successful seedling to sapling growth and a strong understory
- Catkins mistletoe is flowering at Kidds Bush in the springtime
- Three areas of podocarp-broadleaved forest have been planted around the lake shore



Figure 7. Map showing spatial extent of beech forest.

LHSG VALUES

When we improve the beech forest ecosystem, we also improve:

- Native wildlife
- Recreation
- Local economy
- Our community and future generations
- Native vegetation

PRESSURES

For each of the ecosystems, the LHSG identified the pressures and stressors that act on the health of that ecosystem. In this CAP, a “[pressure](#)” is usually a human activity that directly affects one or more of the ecosystems. These pressures will cause a “stress” on an ecosystem.

- Presence of invasive pest animals
- Presence of invasive pest plants

See Appendix 2 for a situation model of pressures and stressors on the beech and podocarp-broadleaved forest ecosystems.

STRATEGIES

Strategies that will help us achieve our goal are listed below. For further detail on each strategy, refer to the “Strategies” section of the CAP.

- [Collaborative terrestrial pest animal work](#)
- [Collaborative terrestrial pest plant work](#)
- [Planting for biodiversity](#)
- [Sustainable farming](#)

PRESSURES

In this plan, a “pressure” is usually a human activity that directly affects the ecosystems. The previous section showed that many of the pressures affect more than one ecosystem, although they may cause different types of stress on the ecosystem. Below is a summary table showing the ecosystems and pressures in the Lake Hāwea CAP area. The LHSG considered the **scope**, **severity**, and **irreversibility** of each pressure. Each pressure was rated on its scope, severity, and irreversibility. **Scope** refers to the proportion of the ecosystem that is likely to be affected within 10 years under current circumstances. **Severity** attempts to categorize the level of damage to the ecosystem. **Irreversibility** is the degree to which the effects of a given pressure can be undone. The blanks show that a particular pressure does not act on an ecosystem. The summary pressure rating provides a guide to the cumulative effect of the pressures across multiple ecosystems and the summary ecosystem rating indicates how affected the ecosystems are by the pressures in the area.

Table 1. Summary of ecosystems and pressures in the Lake Hāwea CAP area (2024).

Ecosystems	Beech & Podocarp Forest	Gravel deltas	Grey Scrub	Lake Hāwea	Rivers & Streams	Wetlands	Summary threat rating
Pressures							
Agricultural runoff				Medium	Medium		Medium
High number of boats				Low			Low
Hāwea dam and dam network				Medium	High		Medium
Inappropriate driving on exposed lakebed		Low					Low
Increased stormwater load along southern foreshore				Low			Low
Introduction and/or increase of unwanted aquatic organisms				Very High	Medium		Very High
Litter/Waste (includes freedom camping)			Low				Low
Presence of invasive/pest animals	High	Low	High	Medium	Medium	High	High
Presence of invasive/pest plant	Medium	High	Low	Medium		Very High	High
Presence of predatory fish species (Trout and Salmon)				High	Low		Low
Unnatural lake level fluctuation		Medium		High			Medium
Summary ecosystem ratings	Medium	Medium	Medium	High	High	High	Very High

Note: The Hāwea wastewater treatment plant poses a potential risk to the Hāwea river and septic tanks pose a potential risk to the Hāwea basin aquifer. The Hāwea wastewater treatment plant is monitored by QLDC monthly and audited by ORC annually. The Hāwea basin aquifer is monitored at 3 sites every 3 months by ORC.

STRATEGIES

This plan has eight strategies which cover aspects of the environment and natural resources in the CAP area. Actions required to implement the strategies have been suggested. The LHSG identified four focus areas around the lake to initiate or build on collaborative projects; Hāwea foreshore, Craig Burn river delta, Timaru River mouth, and Manuhaea / The neck wetlands. Specific suggested actions for each focus area can be found under the applicable strategies. The LHSG recognises the significance of Timaru River Mouth area and Manuhaea to mana whenua and will not proceed with any actions without engagement with mana whenua. The comments in the focus area tables under each strategy are suggestions of actions that could take place to improve the focus areas. The monitoring of all actions will be captured in the 'living' plan hosted online in the CAP Hub.

The strategies in this plan are defined as "A set of one or more activities or actions with a common focus created to either restore ecosystems or reduce pressures. A strategy outlines a specific set of activities."

STRATEGY 1: COLLABORATIVE TERRESTRIAL PEST ANIMAL WORK

DESCRIPTION

This strategy aims to decrease the negative impacts that invasive introduced mammals have on the CAP area ecosystems and endangered species through coordinated control of their numbers in focus areas.

Aotearoa New Zealand has over 90 introduced vertebrate species and introduced mammals have become major predators of Aotearoa New Zealand's birds, invertebrates, plants, reptiles, and even freshwater fish. The CAP area is home to mōhua / yellowhead, geckos, and countless other organisms that are affected by introduced mammals.

Strategy type: pressure reduction

STRATEGY OBJECTIVES AND OUTPUTS

The objectives of this strategy are:

- Increase collaboration of pest animal control work and information flow between the major landowners and key stakeholders, including any contracted parties carrying out work on landholders' behalf
- Access expert advice on the most effective methods and design of pest animal control work
- Reduce the population of pest animal species in proximity to native bird habitats and nesting sites

The outputs of this strategy are:

- Pest animal control work group meetings to discuss work plans, coordination, and reporting outputs
- Coordinated control activities
- Assessments and reports on project success

ACTIONS

This is an "across area" strategy covering the whole CAP area:

- Establish a collaborative pest control group, including private and public landholders, and parties contracted to carry out control work and to regularly assess project success.
- Develop a CAP wide pest/predator management plan, connecting with Southern Lakes Sanctuary and ORC Biosecurity for advice.

See appendix 3 for focus area specific actions.

ASSUMPTIONS MADE

- Control of browsing mammals will support the regeneration of native vegetation
- Control of predatory mammals will protect populations of threatened native species
- Control of pest animals will improve water quality through decreased sedimentation and decreased *E.coli* levels

STRATEGY MEASURES

The progress of this strategy will be monitored by the following measurements:

- Trapping, shooting, chew card, and tracking tunnel results
- Area under introduced mammal control

PEOPLE INVOLVED

- Private Landholders
- Hāwea Catchment Group
- ORC biosecurity team
- QLDC
- LINZ
- Southern Lakes Sanctuary
- HCA/Guardians of Lake Hāwea
- Parties contracted and engaged to undertake trapping, shooting and bait laying
- Wānaka backyard trappers
- Community volunteers undertaking trapping
- Recreational hunters and commercial hunting operations

STRATEGY 2: COLLABORATIVE TERRESTRIAL PEST PLANT WORK

DESCRIPTION

Of the 25,000 exotic plants that humans have introduced to New Zealand, 3,000 have been found growing wild and 1,800 have become environmental weeds ([Parliamentary Commissioner for the Environment 2021](#)). Some weeds are site specific; some are ecosystem specific and some live on the boundaries between ecosystems. This strategy aims to decrease the negative impacts that invasive exotic plants have on ecosystems through coordinated removal of weeds in targeted areas.

Strategy type: pressure reduction

STRATEGY OBJECTIVES AND OUTPUTS

The objectives of this strategy are:

- Increase collaboration of pest plant control work, communication, and information flow between the major landholders, including any contracted parties carrying out work on landholders' behalf
- Access expert advice on the most effective methods and design of pest plant control work
- Permanently reduce coverage of invasive plant species

The outputs of this strategy area:

- Pest plant control work group meetings
- Coordinated control activities

ACTIONS

This is an “across area” strategy covering the whole CAP area:

- Establish a collaborative pest control group, including private and public landholders, and parties contracted to carry out control work. Within this group, establish mechanisms to share resources such as helicopter spraying runs, and coordinate between contractors.
- Connect with Hāwea Flat school and enviroschools to build local children’s knowledge on which plants are pests.

See appendix 3 for focus area specific actions.

ASSUMPTIONS MADE

- Long-term resourcing will be secured for continued weed control and that the community and contractors have the time and will to do the work

STRATEGY MEASURES

THE PROGRESS OF THIS STRATEGY WILL BE MONITORED BY THE FOLLOWING MEASUREMENTS:

- Annual area of pest plant control per focus area
- Annual area of pest plant control

PEOPLE INVOLVED

- Private Landholders
- Hāwea Catchment Group
- ORC biosecurity team
- HCA
- QLDC
- LINZ
- Parties contracted and engaged to undertake pest plant control work
- Other community volunteers undertaking planting and related pest plant control

STRATEGY 3: FRESHWATER INVASIVE SPECIES MANAGEMENT

DESCRIPTION

Many freshwater invasive pest species, both plant and animal, have found their way to Aotearoa New Zealand. In the CAP area there are two main actions as part of this strategy: the Check, Clean Dry programme and the lake survey programme. The Check, Clean, Dry programme (CCD) is a Ministry for Primary Industries initiative aimed at preventing the spread of aquatic pests such as didymo and lagarosiphon. The ORC operates this programme throughout the Central Otago region, encompassing all water bodies and rivers frequented by water users and members of the public. The Hāwea Lake survey programme is run by ORC. Due to the variation in lake depth, it is much harder for lagarosiphon to become established.

Strategy type: pressure reduction

STRATEGY OBJECTIVES AND OUTPUTS

The objectives of this strategy are:

- Educate water users regarding invasive aquatic pest such as didymo and lagarosiphon and encourage users to follow the CCD method and its key messaging

- To ensure pest species are excluded from Hāwea through monitoring

The outputs of this strategy area:

- Public education materials
- Annual incursion survey report

ACTIONS

This is an “across area” strategy covering the whole CAP area:

- Regular ORC biosecurity checks
- Increase check clean dry signage
- ORC check, clean, dry advocates to visit Hāwea in summer
- eDNA for detection of new aquatic pests
- Develop information flow about aquatic pest detections from ORC biosecurity to stakeholders

ASSUMPTIONS MADE

- Long term resourcing will continue for incursion monitoring and check, clean, dry advocates

STRATEGY MEASURES

- A lake survey is completed annually
- eDNA samples are taken annually
- Check, clean, dry programme is completed annually

PEOPLE INVOLVED

- ORC biosecurity team
- QLDC
- LINZ

STRATEGY 4: PLANTING FOR BIODIVERSITY

DESCRIPTION

The land surrounding the lake provides a habitat for native birds and many native skinks and geckos (some rare). If effort is put into regenerating native forest, alongside the pest animal strategy, native terrestrial and freshwater birdlife should start to increase with many more birds seen and heard. Most of the sediment, nutrients, organic, and biological inputs into freshwater bodies in the CAP area come from runoff. Riparian planting is proven to reduce all those inputs from entering water bodies by filtering out contaminants, stabilizing land, increasing species habitat, and shading water. This strategy has two main parts: riparian planting and planting for native wildlife. Depending on the location, the plant species may overlap, in others they will be very different. Please refer to local knowledge or ORC planting guides to ensure the right species end up in appropriate locations.

Strategy type: ecosystem enhancement

STRATEGY OBJECTIVES AND OUTPUTS

The objectives of this strategy are:

- Increase the amount of food and habitat available for native wildlife
- Increase native plant coverage in focus sites once the weeds have been removed
- Increase water filtration by planting in riparian areas.

The outputs of this strategy area:

- Increased plantings
- Planting of natives for long-term management

ACTIONS

This is an “across area” strategy covering the whole CAP area:

- Support the existing volunteer planting activities by helping with funding applications and connection with resources
- Engage the tourist and visitor community in native planting activities

See Appendix 3 for focus area specific actions.

ASSUMPTIONS MADE

- Increasing the amount of food species and habitat will increase the number and variety of native wildlife
- Increasing riparian planting will decrease sediment, nutrients, organic, and biological inputs from entering waterways, in turn increasing water quality

STRATEGY MEASURES

The progress of this strategy will be monitored by the following measurements:

- Area planted
- Survival rate of plantings
- Photo points

PEOPLE INVOLVED

- Private Landholders
- Hāwea Catchment Group
- Contact Energy
- HCA/ Foreshore group / Guardians of Lake Hāwea
- QLDC
- LINZ
- Mana Whenua

STRATEGY 5: FISH SPECIES INTERACTIONS

DESCRIPTION

There are 3 key aspects to this strategy;

- Protection of native fish from introduced predatory fish, trap and transfer of tuna / longfin eels to assist with migration and enhancement of trout and salmon spawning areas. Trout were introduced in 1867 and Salmon were introduced in 1875 and both are prized by anglers for sport and food. For this reason, part of the strategy aims to enhance trout and spawning areas.

- Equally, the introduction of trout and salmon have been detrimental to native freshwater fish and invertebrates. The current NPS-FM requires identification and mapping of desired native and introduced fish species to allow the enabling and restricting of fish passage. The ORC has begun some of this work with input from mana whenua, Fish & Game, DOC, and fisheries managers.
- The third aspect of this strategy is the trap and transfer of pre-migratory tuna / longfin eel from Lake Hāwea to below Roxburgh dam and elvers from below Roxburgh dam to Lake Hāwea. Contact Energy is responsible for this aspect of the strategy as it is required under their consent conditions.

Strategy type: ecosystem enhancement and pressure reduction

STRATEGY OBJECTIVES AND OUTPUTS

The objectives of this strategy are:

- Maintain spawning grounds and habitat
- Protect native fish/eel populations and habitats from predatory fish
- Identify areas where it is appropriate to enhance the habitats of recreational fish
- Support Contact Energy's release into Lake Hāwea of longfin elvers transported from below Roxburgh dam, and CE's capture in Lake Hāwea of migratory adults for release below Roxburgh dam

The outputs of this strategy area:

- The habitats of native fish are protected and diadromous native species can move between the sea and fresh water
- Where appropriate, the habitats of introduced fish are enhanced
- Populations of indigenous fish are enhanced and protected by barriers from predatory fish

ACTIONS

This is an "across area" strategy covering the whole CAP area:

- Identify areas that are important for native and introduced fish species
- Work with landowners to document the location and assess barriers
- Contact Energy to continue the tuna / longfin elver trap and transfer program with effort to increase tuna / longfin eel population in Lake Hāwea

ASSUMPTIONS MADE

- Contact Energy can catch mature pre-migratory longfin eels each year

STRATEGY MEASURES

The progress of this strategy will be monitored by the following measurements:

- Mapping of native and introduced fish completed
- Number of populations detected
- Number of areas enhanced for fish spawning
- Number of areas protected by barriers from predatory fish
- Number of elvers and pre-migratory eels transferred each year

PEOPLE INVOLVED

- Fish and Game
- ORC

- Contact Energy
- Hāwea Catchment group
- Local landowners
- DOC

STRATEGY 6: STORMWATER IMPROVEMENTS

DESCRIPTION

Stormwater systems are designed to prevent flooding by collecting rainwater and directing it into natural waterbodies. As it runs over the ground and impervious surfaces it picks up pollutants, these pollutants often end up in popular swimming areas. Part of the Hāwea township stormwater enters the lake via stormwater drains at the lake edge, bringing with it any sediment, pollutants, or litter that have entered stormwater drains. Mitigations to stormwater drains and education of the public are required to decrease this pressure.

Strategy type: pressure reduction

STRATEGY OBJECTIVES AND OUTPUTS

The objectives of this strategy are:

- Increase in run-off water quality discharging from stormwater outlets around Lake Hāwea camp and along foreshore between hotel and John Creek

The outputs of this strategy area:

- Increased public awareness of ‘only rain down the drain’
- Increased plantings around stormwater outlets
- Understanding of nature and extent of stormwater flow into the lake along southern foreshore between Lake Hāwea camp and John Creek

ACTIONS

Actions for this strategy:

- Planting of stormwater retention wetland
- Only rain down the drain public awareness campaign

ASSUMPTIONS MADE

- Public awareness and plantings at the stormwater outlets will be enough to improve the quality of water entering the lake from the stormwater outlets

STRATEGY MEASURES

The progress of this strategy will be monitored by the following measurements:

- Water quality samples taken from stormwater discharge
- Number of plants planted
- Photo points

PEOPLE INVOLVED

- QLDC
- Guardians of Lake Hāwea
- ORC
- Hāwea community association
- WAI Wānaka

STRATEGY 7: SUSTAINABLE FARMING

DESCRIPTION

Farmers work within many rules and regulations and follow industry standards, all of which regulate the effects that farms can have on the environment. This uncertainty around the rules puts pressure on farmers, including those who go over and above the regulations and standards.

Across the country, catchment groups have successfully worked to support farmers to collectively make a positive difference in their area. This strategy is to enable these catchment groups to support their members to effect positive change.

This is a pressure reduction strategy.

STRATEGY OBJECTIVES AND OUTPUTS

The objectives of this strategy are:

- A farming community that feels connected to each other and the wider catchment stakeholders and supported in their work
- Farming landscapes are biologically diverse, freshwater quality is protected, our soils are healthy, and the sector has a carbon footprint that is sustainable in the long term
 - Protecting and enhancing terrestrial biodiversity on farms;
 - Adapting to a changing climate;
 - Land management actions that improve water quality
 - Productive soil and winter grazing management

The outputs of this strategy will be:

- Farmers understand and optimise the natural resources of their farms to profitably produce high quality food and fibre
- Every property has a plan for managing the environmental risks and opportunities on their farm
- The Catchment Group is open about our challenges and talks about how we are addressing them individually and collaboratively
- The Catchment Group has the confidence and ability to demonstrate their contribution to the environment

ACTIONS

This is an “across area” strategy covering the whole CAP area:

- Encourage and support farms with continual improvement of farming practices
 - Promoting best management practices
- Biodiversity enhancement (these actions are also supported in other strategies see – [planting for biodiversity](#) and [fish species interactions](#))
- Pest and weed management (these actions are also supported in other strategies see – [collaborative terrestrial pest plant work](#) and [collaborative terrestrial pest animal work](#))

ASSUMPTIONS MADE

- Focused and collective action will improve water quality. Evidence for this will come from the water monitoring that is already taking place. However it is important to remember that seeing changes in these measurements could take 15-20 years.

STRATEGY MEASURES

The progress of this strategy will be monitored by the following measurements:

- Biodiversity enhancement
- Water quality enhancement

PEOPLE INVOLVED

- Landowners
- Lake Hāwea Catchment Group
- Supported by OCC, NZ Landcare Trust, ORC's catchment advisors. The Water Quality State of the Environment is monitored by ORC
- Technical advice available from levy groups, specialised sales staff, and trusted farm advisors

STRATEGY 8: REGENERATIVE TOURISM AND RECREATION

Tourism and recreation are a large part of the economy within the CAP area. International and national tourists can impact the environment through their careless human behaviours. Having opportunities for tourists to engage or financially contribute to conservation activities could help to lessen their impacts on the environment.

Strategy type: pressure reduction and ecosystem enhancement

STRATEGY OBJECTIVES AND OUTPUTS

The objectives of this strategy are:

- Foster a regenerative tourism model that enhances the ecological integrity of Lake Hāwea while providing meaningful experiences for visitors

The outputs of this strategy area:

- A collaborative stewardship framework that includes local businesses, community members, and tourists
- Educational resources that promote understanding of local ecosystems, cultural heritage, and sustainable practices
- Active participation opportunities for visitors in conservation efforts, such as revegetation and habitat restoration projects

ACTIONS

- Develop a Stewardship Program: Create a platform for stakeholders to coordinate efforts in promoting sustainable tourism practices
- Educational Initiatives: Launch campaigns that educate tourists about the local environment, farming culture, and conservation needs through workshops, guided tours, and interpretive signage
- Visitor Engagement Opportunities: Implement programs where tourists can contribute to local conservation efforts by participating in activities like planting trees or maintaining trails
- Cultural Tours: Organize tours that highlight local farming practices and cultural significance of the area to foster appreciation and respect
- Feedback Mechanism: Establish a system for gathering feedback from both visitors and locals to continuously improve tourism practices

ASSUMPTIONS MADE

The progress of this strategy will be monitored by the following measurements:

- Tourists are receptive to engage in conservation activities when they are made aware of their impact on the environment
- Local stakeholders are willing to collaborate and share resources for the benefit of the community and environment
- Educational initiatives will effectively increase awareness and encourage responsible behaviour among visitors

STRATEGY MEASURES

The progress of this strategy will be monitored by the following measurements:

- Number of visitors involved in conservation activities or contributing to funding initiatives
- Number of visitors with increased awareness levels of local ecosystems and cultural practices
- Number of local community members with negative perceptions of tourism impacts on their community and environment

PEOPLE INVOLVED

- Lake Hāwea Stakeholder Group Members: Collaborate on strategy development and implementation
- Wānaka Tourism Representatives: Partner to align tourism initiatives with regional goals
- Local Business Owners: Engage in stewardship programs and educational initiatives
- Community Associations: Facilitate communication between residents and tourists
- Conservation Groups: Provide expertise on ecological restoration projects
- Department of Conservation Staff: Offer guidance on best practices for conservation efforts
- Hāwea Flat School

MONITORING AND RESEARCH

MONITORING

We monitor the plan's strategies and ecosystem indicators to see if the strategies are making an impact on the health of the ecosystems. Monitoring is a vital part of adaptive management, which allows plans to be written based on the best available knowledge and continuously improved based on the monitoring results. As the plan progresses, strategies and actions can be improved based on the results of the monitoring. The monitoring data will be reported on the plan's online hub.

See Appendix 5 for details on monitoring.

RESEARCH

Having the most up to date and relevant research is required to make the most impactful changes to improve biodiversity and water quality. The Guardians of Lake Hāwea believe that both, urgent investment and action are required to better provide evidence-based management of the lake and its catchment to avoid ongoing degradation of lake health. Although this document is written with the most up to date information, lacking a depth of understanding of how the pressures impact the CAP area can impede the ability to effectively manage the pressures. The ORC has set up a Deep Lakes Technical Advisory Group, which is focusing on prioritizing research needs for informed decision-making targeted towards policy and lake restoration.

Some examples of relevant questions suggested by the Guardians of Lake Hāwea include:

- What's driving *Lindavia* (lake snow) and what has happened to pico-cyanobacteria that were main indigenous primary producers before lake snow seemed to take over?
- What are the key species of benthic and planktonic communities – from micro to macro? Distribution and abundance? Biomass? Biodiversity? Seasonality?
- What are the most useful metrics or indices of biodiversity (e.g. submerged plant index - LakeSPI? Macroinvertebrate Community Index (MCI)? Fish index of biotic integrity (IBI)?) How are these changing?
- What are measures/maps of distribution and abundance of macro-organisms (fish, birds), aquatic native, and invasive plants?
- What are levels of primary productivity (Chlorophyll-*a*)? What are the main biological players? Seasonally? Why is Chlorophyll-*a* increasing? What are spatial/temporal nutrient levels (N & P), microbial communities, water transparency?
- What are the key actions we must take to halt and reverse the decline of water quality of the lake and the ecosystem health of the catchment?
- What are the roles of pest plants and animals (lake snow, *Daphnia pulex*, Canadian pondweed, Canada geese etc.)?

REVIEW

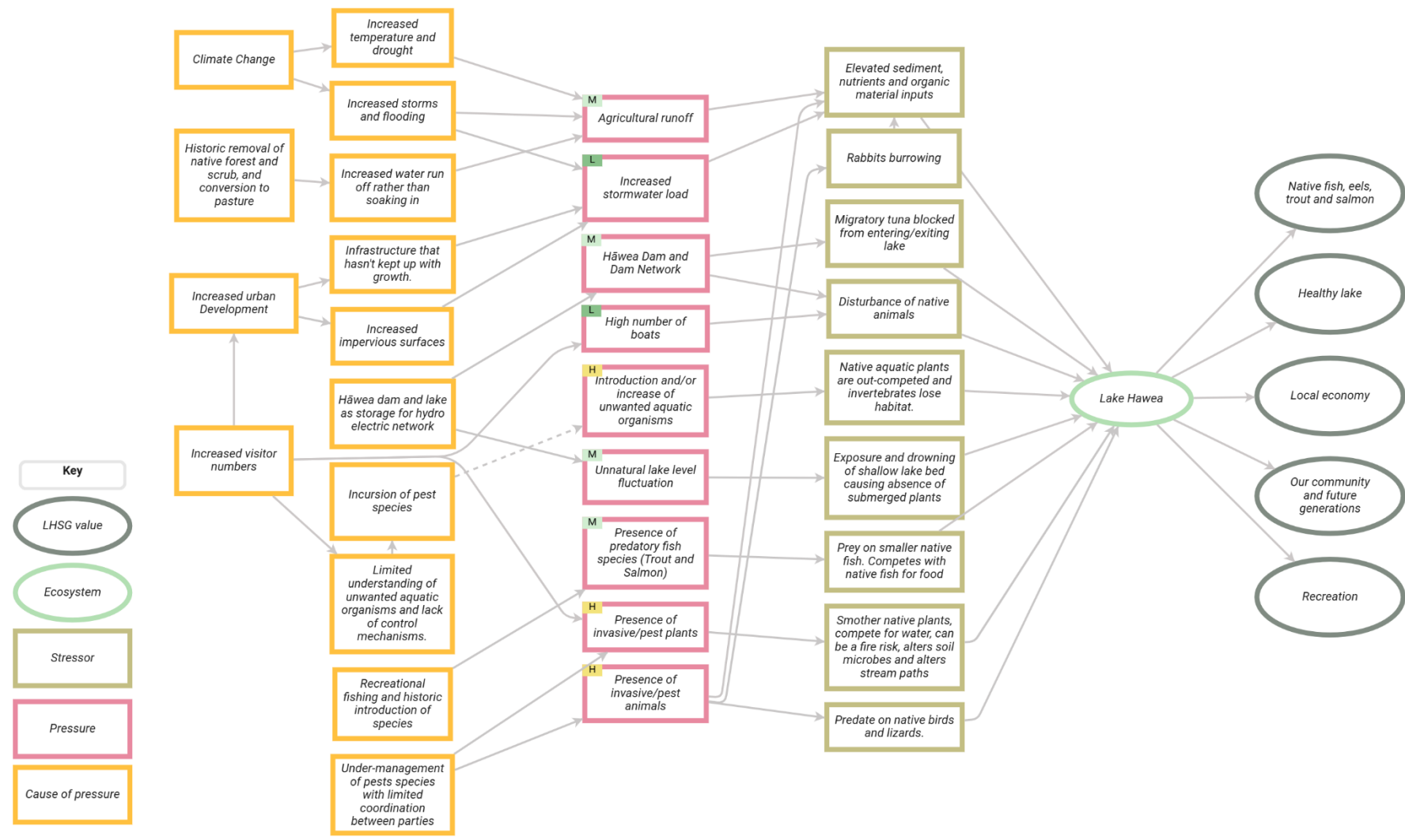
This plan is based on the principles of adaptive management, which recognises that knowledge of an ecosystem will always be incomplete. However, incomplete knowledge should not be a barrier to work towards protecting and enhancing the environment. Adaptive management plans are based on the best available evidence, from science, from Mātauraka Māori, and evidence provided by the community.

Adaptive management requires plans to be monitored and reviewed regularly, to allow new information as well as the lessons from current iterations of the plan to be incorporated into future plans and practice. This includes outputs and information from the Deep Lakes Technical Advisory Group and the Upper Lakes CAP.

Appendix 1.

Vision	All stakeholders of Lake Hāwea to work together, using an evidence-based approach to improve water quality, ecosystem function, biodiversity and recreational enjoyment for future generations													
LHSG values	Local economy		Recreation		Healthy lake		Our community & future generations		Native wildlife		Native vegetation		Native fish & eels	
Important ecosystems	Lake Hāwea		Rivers & streams		Gravel deltas		Wetlands		Grey scrub		Beech & podocarp forest			
Ecosystem goals	The area covered by the CAP will support healthy freshwater ecosystems (lake trophic index <2) with thriving habitats for native wildlife, and clean, safe swimming water for future generations		The Hāwea River as well as all tributaries to Lake Hāwea support healthy freshwater ecosystems with thriving habitats for a range of native species		The gravel deltas support healthy ecosystems with thriving habitats for a range of native species		The wetlands in the CAP area are enhanced by an increase in native plants and animals present		The CAP area environment is enhanced by an increase in native plants and animals present		The CAP area environment is enhanced by an increase in native plants and animals present			
	- Pūteketeke population - Trout & Salmon population - Tuna/Longfin eel trap & transfer counts - Lake TLI4 - Lake SPI - E.coli long term trend - Invasive aquatic organisms		- NOF band ratings for Timaru River, Craig Burn Stream, The Neck Stream, and Hāwea at Camphill Bridge - Number of streams with Koaro - Braided river bird diversity and population		- Tūturiwhatu/ dotterel count - Coverage of lupin plants - Coverage of native grasses		- Matuku-hūrepo/ bittern presence - Native/invasive plant ratio - Raupō coverage and height		- Native shrub coverage at focus areas - Bird sightings - Skink sightings		- Mohua/ yellowhead observations - Seedling to sapling ratio - Catkins Mistletoe flowering - Podocarp-broadleaf plantings			
Ecosystem indicators														
Pressures	Agricultural run-off	Increase stormwater load	Hāwea Dam & Dam network	High number of boats	Inappropriate driving on exposed lake bed	Introduction and/or increase of unwanted aquatic organisms	Unnatural lake level fluctuation	Presence of predatory fish species	Litter & waste	Presence of invasive/pest animals	Presence of invasive/pest plants			
Strategies	Collaborative terrestrial pest animal work				Collaborative terrestrial pest plant work			Freshwater invasive species management			Fish species interactions			
Strategy measures	- Annual area of pest plant control per focus area - Annual area of pest plant control within the CAP area				- Trapping, shooting, chew card and tracking tunnel results - Area under introduced mammal control			- A lake survey is completed annually - eDNA samples are taken annually - Check, Clean, Dry program is completed annually			- Mapping of native and introduced fish completed - Number of populations detected - Number of areas enhanced for fish spawning - Number of areas protecting by barriers from predatory fish - Number of elvers and pre-migratory eels transferred each year			
Strategies	Planting for biodiversity				Stormwater improvements			Sustainable farming			Regenerative tourism & recreation			
Strategy measures	- Area planted - Survival rate of plantings - Photos points				- Water quality samples taken from stormwater discharge - Number of plants planted - Photo points			- Biodiversity enhancement - Water quality enhancement			- Number of visitors involved in conservation activities or contributing to funding initiatives - Number of visitors increased awareness level of local ecosystems - Number of local community members with negative perceptions of tourism impacts on their community and environment			
Foundational actions	Public consultation, engagement education, capacity building and knowledge sharing						Identify suitable management and control methods							
Supporting mechanisms	Policies and regulations, industry standards and current work programmes													

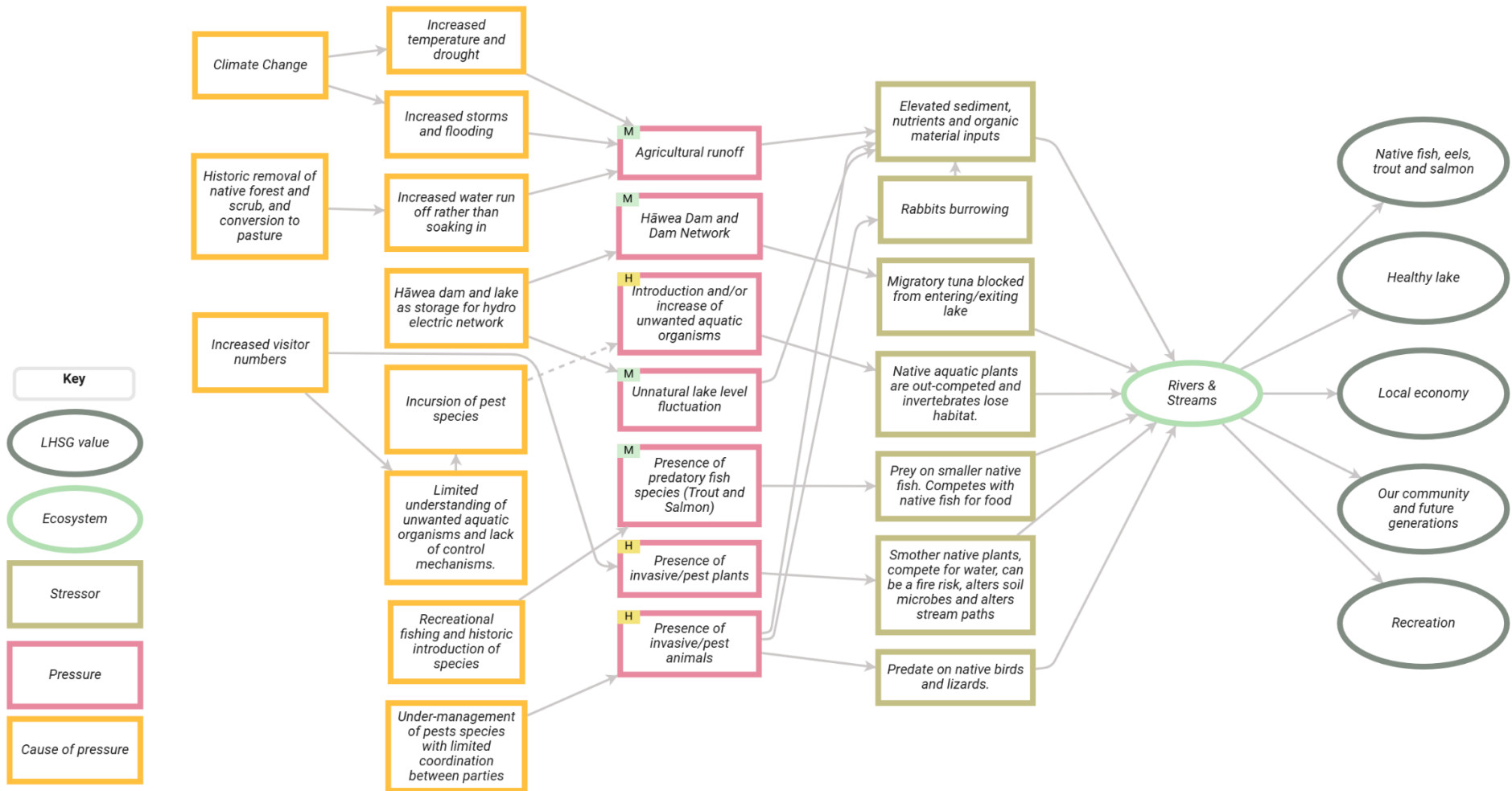
LAKE HAWEA SITUATION MODEL DIAGRAM



The situation diagram: A situation diagram shows the current links between causes of pressures (in yellow), the pressures (in pink), stressors (in olive), ecosystems (in green), and Lake Hāwea Stakeholder Group values (in grey). These pressures will cause a “stress” on an ecosystem, and the stressors are shown in olive. The yellow rectangles show the factors that contribute to the pressures. The stressors cause changes to the food webs and/or nutrient cycling of an ecosystem.

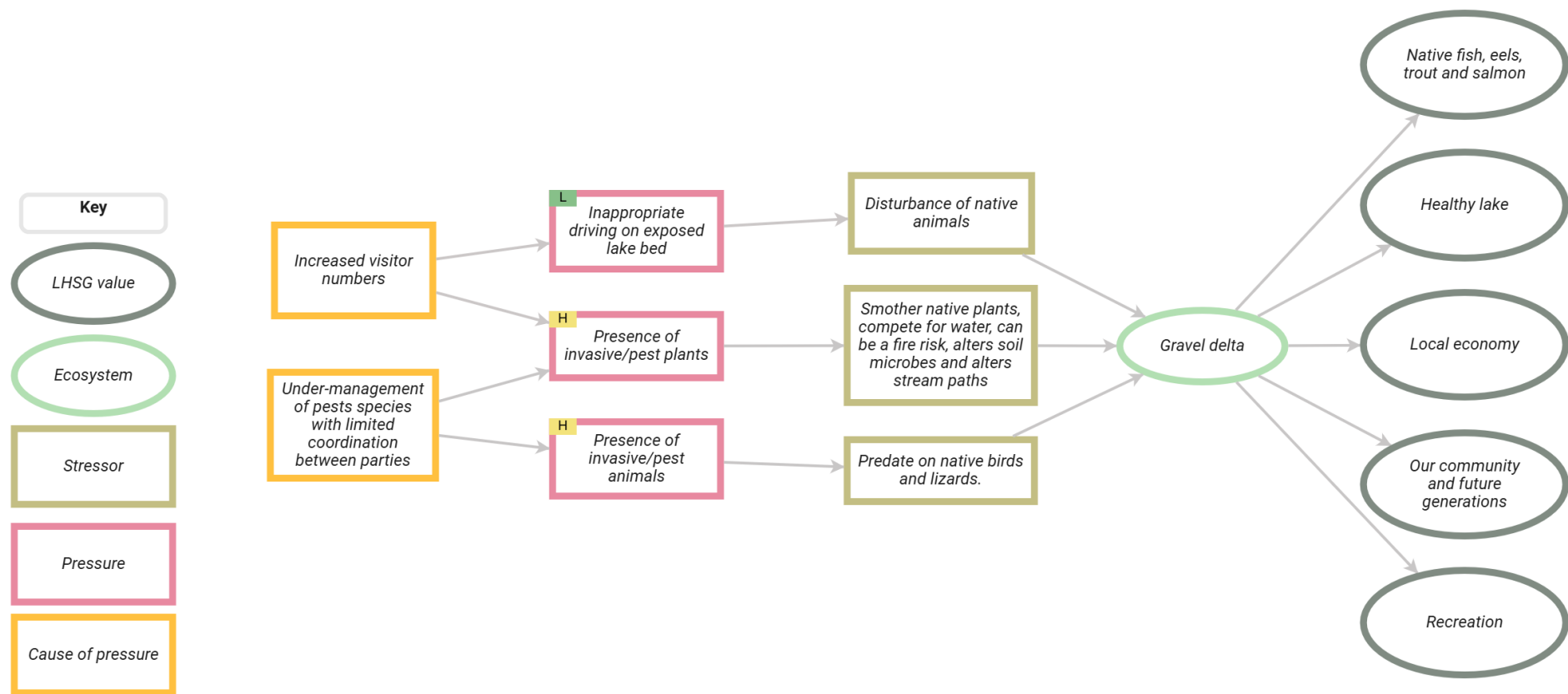
Appendix 2.

RIVERS AND STREAMS SITUATION MODEL DIAGRAM



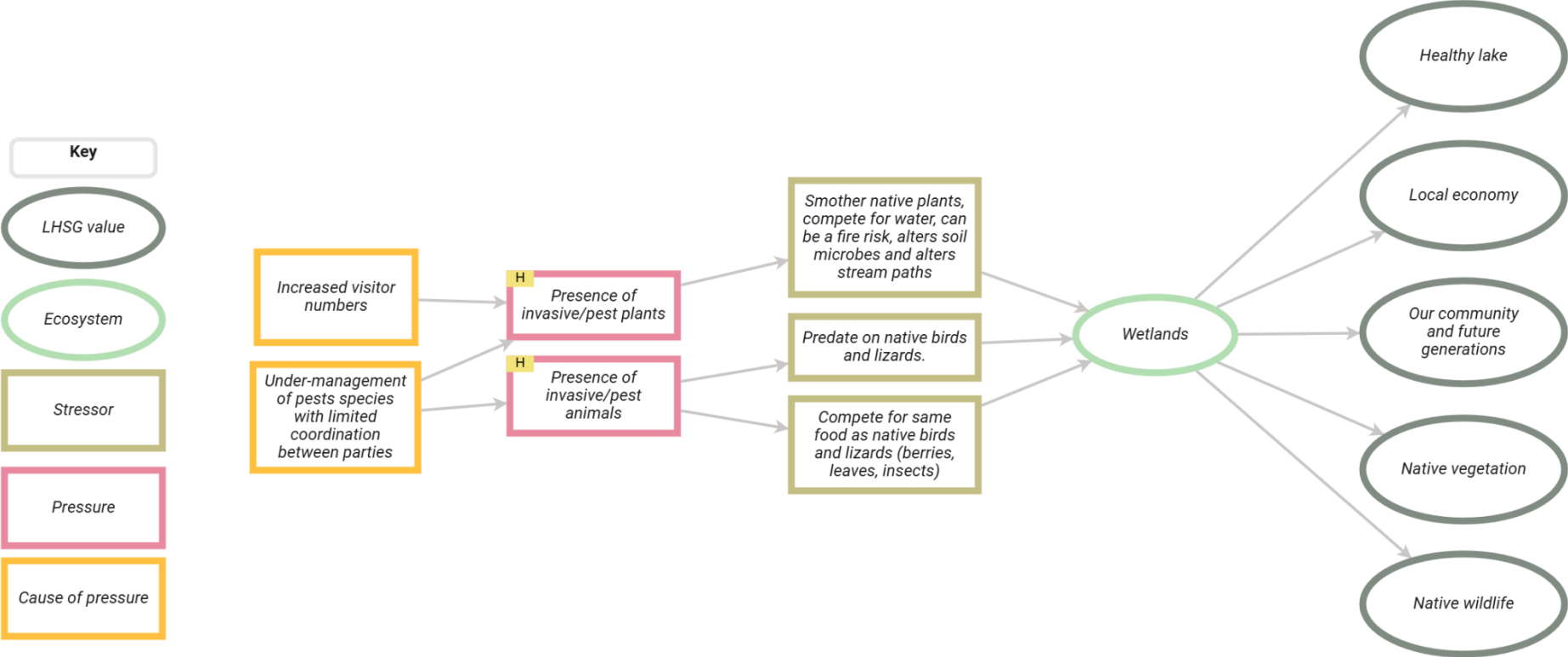
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GRAVEL DELTAS SITUATION MODEL DIAGRAM



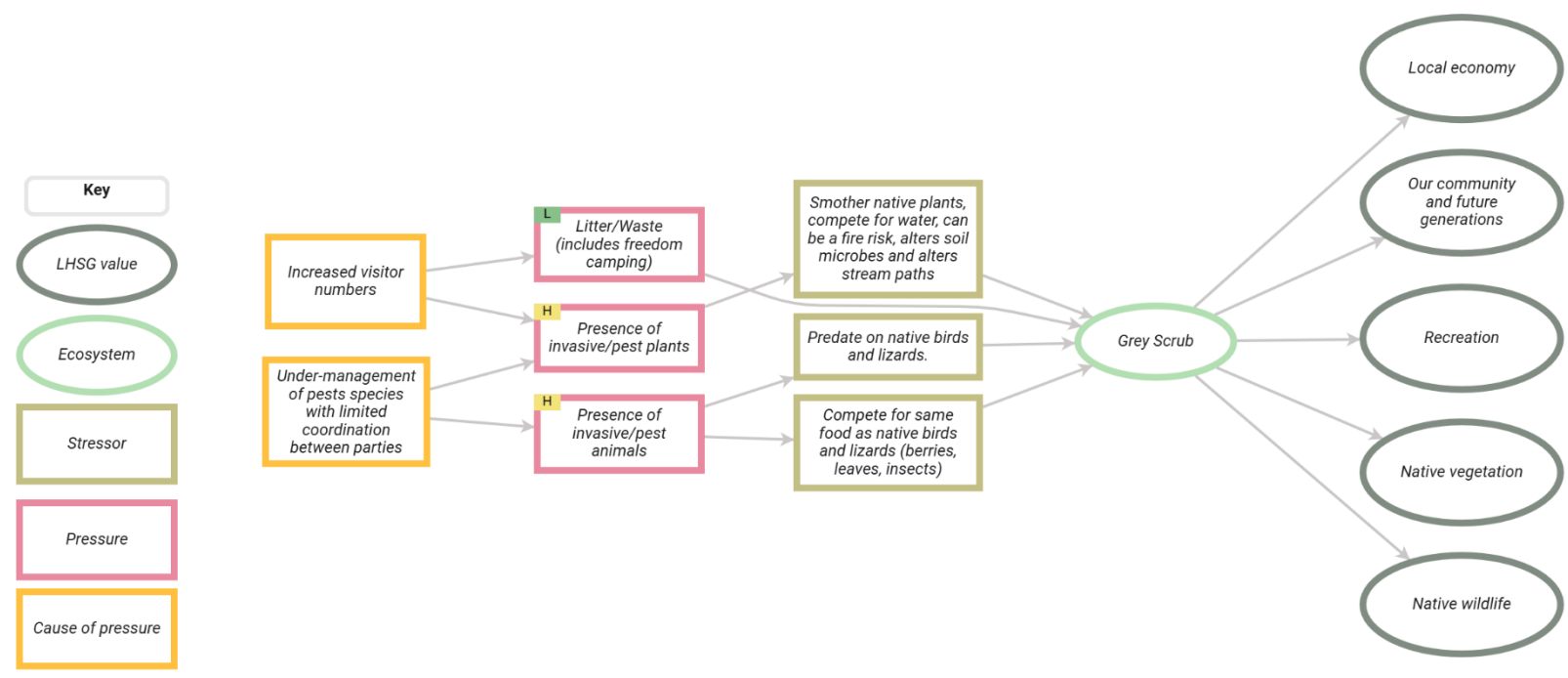
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WETLANDS SITUATION MODEL DIAGRAM



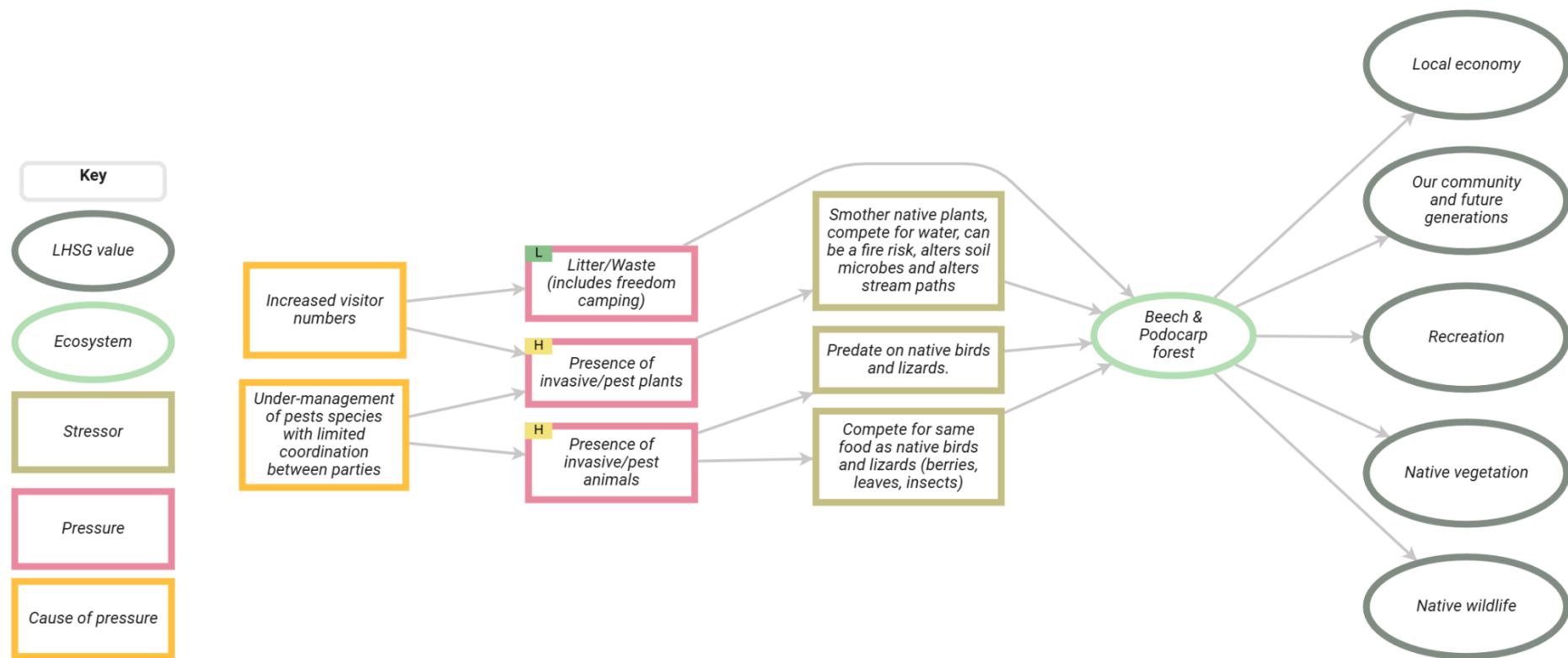
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GREY SCRUB SITUATION MODEL DIAGRAM



The situation diagram: A situation diagram shows the current links between causes of pressures (in yellow), the pressures (in pink), stressors (in olive), ecosystems (in green), and Lake Hāwea Stakeholder Group values (in grey). These pressures will cause a “stress” on an ecosystem, and the stressors are shown in olive. The yellow rectangles show the factors that contribute to the pressures. The stressors cause changes to the food webs and/or nutrient cycling of an ecosystem.

BEECH AND PODOCARP FOREST SITUATION MODEL DIAGRAM



The situation diagram: A situation diagram shows the current links between causes of pressures (in yellow), the pressures (in pink), stressors (in olive), ecosystems (in green), and Lake Hāwea Stakeholder Group values (in grey). These pressures will cause a “stress” on an ecosystem, and the stressors are shown in olive. The yellow rectangles show the factors that contribute to the pressures. The stressors cause changes to the food webs and/or nutrient cycling of an ecosystem.

Strategy actions covering the CAP area

1. Collaborative terrestrial pest animal work

- Establish a collaborative pest control group, including private and public landholders, and parties contracted to carry out control work and to regularly assess project success.
- Develop a CAP wide pest/predator management plan, connecting with Southern Lakes Sanctuary and ORC Biosecurity for advice.

2. Collaborative terrestrial pest plant work

- Establish a collaborative pest control group, including private and public landholders, and parties contracted to carry out control work. Within this group, establish mechanisms to share resources such as helicopter spraying runs, and coordinate between contractors.
- Connect with Hāwea Flat school and enviroschools to build local children's knowledge on which plants are pests.

3. Freshwater invasive species management

- Regular ORC biosecurity checks
- Increase check clean dry signage
- ORC check clean dry advocates to visit Hāwea in summer
- eDNA for detection of new aquatic pests
- Develop information flow about aquatic pest detections from ORC biosecurity to stakeholders

4. Planting for biodiversity

- Support the existing volunteer planting activities by helping with funding applications and connection with resources.
- Engage the tourist and visitor community in native planting activities.

5. Fish species interactions

- Identify areas that are important for native and introduced fish species
- Work with landowners to document the location and assess barriers
- Contact Energy to continue the longfin elver trap and transfer program with effort to increase longfin eel population in Lake Hāwea

6. Stormwater improvements

- Planting of stormwater retention wetland
- Only rain down the drain public awareness campaign
- Reporting of visible lake pollution (e.g. sediment plumes) to ORC pollution hotline

Appendix 3.

7. Sustainable farming

- Encourage and support farms with Continual Improvement of farming practices.
- Promoting best management practices
- Biodiversity Enhancement (these actions are also supported in other strategies see – planting for biodiversity and fish species interactions)
- Pest and Weed Management (these actions are also supported in other strategies see – collaborative terrestrial pest plant work and collaborative terrestrial pest animal work)

8. Regenerative tourism and recreation

- Develop a Stewardship Program: Create a platform for stakeholders to coordinate efforts in promoting sustainable tourism practices.
- Educational Initiatives: Launch campaigns that educate tourists about the local environment, farming culture, and conservation needs through workshops, guided tours, and interpretive signage.
- Visitor Engagement Opportunities: Implement programs where tourists can contribute to local conservation efforts by participating in activities like planting trees or maintaining trails.
- Cultural Tours: Organize tours that highlight local farming practices and cultural significance of the area to foster appreciation and respect.
- Feedback Mechanism: Establish a system for gathering feedback from both visitors and locals to continuously improve tourism practices.

Appendix 3.

Craig Burn

Strategy:	Collaborative terrestrial pest animal work	Collaborative terrestrial pest plant work	Planting for biodiversity	Fish species interactions
Key target pest animals	Stoats, ferrets, feral cats, possums, hedgehogs, rats, mice.	Lupin and broom at gravel delta.	Consult a subject matter expert before choosing plants.	Koaro/climbing galaxiid in the upper reaches
Key stakeholders	DOC, HCA, WAI Wānaka, LINZ, QLDC, ORC Biodiversity staff, LHCG			
Pre work assessments	Assess gravel delta for freshwater bird nesting sites. Map nesting zones.	Mapping of lupin-prone spots and assessment for other pest plants.	Access for planting may be difficult.	Mapping of natural barriers excluding trout from streams eDNA sampling to detect additional populations of galaxiids
Key action	Predator trap lines	Cut and gel large lupin and broom. Hand pulling or spot spraying of pest seedlings/smaller pest plants.	Planting, irrigation, and plant protection	Monitoring of natural barriers to ensure trout remain out of galaxiid habitat Assessment of habitat, and riparian planting and/or erosion control as required.

LHCG – Lake Hāwea Catchment Group, HCA – Hāwea Community Association, QLDC – Queenstown Lakes District Council, ORC – Otago Regional Council, DOC – Department of Conservation, LINZ – Land Information New Zealand, F&G – Fish and Game, WBT – Wānaka Backyard Trapping, UCWTG – Upper Clutha Wilding Tree Group

Lake Hāwea southern foreshore

Strategy:	Collaborative terrestrial pest animal work	Collaborative terrestrial pest plant work	Planting for biodiversity	Stormwater Improvements
Key target pest animals	Rabbits, stoats, ferrets, feral cats, possums, hedgehogs, rats, mice.	Gorse, briar and buddleia	Consult a subject matter expert before choosing plants.	Stormwater outlets along the Hāwea southern foreshore
Key partner	Mana whenua			
Key stakeholders	HCA, LHCG, Foreshore Group, Guardians of Lake Hāwea, Contact Energy, QLDC, WAI Wānaka, DOC, LINZ			
Pre work assessments	Mapping of current and planned planting.	Gather community knowledge. Mapping of current and planned weed management	Sufficient pumping of water for irrigation of seedlings required on dry exposed shore. Protection from rabbits and browsers (including stray stock) required.	Sampling and analysis of stormwater discharge
Key action	Rabbit shooting and baiting Predator trap lines	Cut and gel large pest plants. Hand pulling or spot spraying of pest seedlings/smaller pest plants.	Planting, irrigation, and plant protection	Planting of stormwater retention wetland Only rain down the drain public awareness campaign Reporting of visible lake pollution (e.g. sediment plumes) to ORC pollution hotline

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Timaru River mouth

Strategy:	Collaborative terrestrial pest animal work	Collaborative terrestrial pest plant work	Planting for biodiversity
Key target pest animals	Stoats, ferrets, feral cats, possums, hedgehogs, rats, mice.	Broom on slopes and at lake shore. Lupin at gravel delta. Wilding pines.	Consult a subject matter expert before choosing plants.
Key partner	Mana whenua		
Key stakeholders	DOC, HCA, WAI Wānaka, LINZ, QLDC, LHCG		
Pre work assessments	Assess gravel delta for freshwater bird nesting sites. Map nesting zones.	Assess re-occurring spots of broom (i.e. Where needs to be sprayed every year)	Sufficient pumping of water for irrigation of seedlings required on dry exposed shore. Protection from rabbits and browsers (including stray stock) required.
Key action	Predator trapping	Spraying of broom and lupin (helicopter for slopes). Lancing of wilding pines.	Planting, irrigation, and plant protection

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Manuhaea/The Neck wetlands

Strategy:	Collaborative terrestrial pest animal work	Collaborative terrestrial pest plant work	Planting for biodiversity
Key target pest animals	Feral browsers (eg goats), stoats, ferrets, feral cats, possums, hedgehogs, rats, mice.	Various weeds within the upper wetlands (peaty wetland).	Consult a subject matter expert before choosing plants.
Key partner	Mana whenua		
Key stakeholders	DOC, HCA, WAI Wānaka, LINZ, LHCG		
Pre work assessments	Assess existing fencing of wetland and ability to exclude feral browsers. Map fencing.	Assess pest plant coverage at upper and lower wetlands.	Access for planting may be difficult.
Key action	Fencing Predator trap lines	Hand pulling and/or cut and gel of pest plants within wetland.	Planting, irrigation, and plant protection

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Appendix 4.

Stakeholders									Involved groups				
Strategies	LHCG	HCA	WAI Wanaka	Contact Energy	QLDC	ORC	DOC	LINZ	F&G	WBT	UCWTG	<u>Ospri</u>	Lake Wanaka Tourism
Collaborative terrestrial pest animal work	X				X					X		X	
Collaborative terrestrial pest plant work	X	X		X	X	X	X	X			X		
Freshwater invasive species management						X		X					
Planting for biodiversity	X	X		X					X				
Stormwater improvements		X	X		X								
Erosion control				X									
Sustainable farming	X												
Regenerative tourism & recreation		X											X

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Appendix 5.

INDICATOR	WHO RECORDS THE DATA	HOW IS THE DATA PUT INTO GIS
Lake Hāwea		
Pūteketeke population	Pūteketeke census 28 Jan 2024	Survey123
Trout and salmon population	Fish & Game	Survey123
Tuna/longfin eel trap and transfer counts	Contact energy	Survey123
Lake TLI ⁴ score	ORC	Automatic
Lake SPI score	ORC	Automatic
E. coli long term trend at swimming bay	ORC	Automatic
Invasive aquatic organisms' detection	ORC	Automatic
Rivers and streams		
NOF band ratings for Timaru River	ORC	Automatic
NOF band ratings for Hāwea River	ORC	Automatic
NOF band ratings for Craig Burn Stream	ORC	Automatic
NOF band ratings for The Neck Stream	ORC	Automatic
Number of streams with Koaro	ORC, LHCG, DOC, F&G	Survey123
Braided river bird diversity and population	DOC	Survey123
Gravel deltas		
Tūturiwhatu dotterel count		
Coverage of lupin plants		
Coverage of native grasses		
Wetlands		
Native/invasive plant ratio		
Raupō coverage and height		
Matuku-hūrepo bittern presence		
Grey Scrub		
Native shrub coverage at focus areas		
Bird sightings		
Skink sightings		
Beech and podocarp forest		
Mohua/yellowhead observations		
Seedling to sapling ratio		
Catkins Mistletoe flowering		
Podocarp-broadleaf plantings		

Appendix 5.

STRATEGY MEASURE	WHO RECORDS THE DATA	HOW IS THE DATA PUT INTO GIS
Collaborative terrestrial pest plant work		
Trapping, shooting, chew card and tracking tunnel results	TrapNZ – trap nz report	Automatic if given access to data
Area under introduced mammal control	LHSG	Survey 123
Collaborative terrestrial pest animal work		
Annual area of pest plant control per focus area	LHSG	Survey123
Annual area of pest plant control within CAP area	LHSG	Survey123
Freshwater invasive species management		
A lake survey is completed	ORC	Automatic
eDNA samples are taken	ORC	Automatic
Check, Clean, Dry program is completed	ORC	Automatic
Planting for biodiversity		
Area planted	LHSG	Survey123
Survival rate of plantings	LHSG	Survey123
Photo points	LHSG	Survey123
Fish species interactions		
Mapping of native and introduced fish completed	ORC, F&G, DOC	Automatic
Number of native fish populations detected	ORC, F&G, DOC	Automatic
Number of areas enhanced for fish spawning		Survey 123
Number of areas protected by barriers from predatory fish	ORC, F&G, DOC	Automatic
Stormwater improvements		
Water quality samples taken from stormwater discharge	HCA, WAI Wanaka	Survey123
Number of plants planted	HCA	Survey123
Photo points	HCA	Survey123
Sustainable farming		
Biodiversity enhancement	HCG	Survey123
Water Quality enhancement	HCG	Survey123
Regenerative tourism & recreation		
Number of visitors involved in conservation activities or contributing to funding initiatives		
Number of visitors increased awareness level of local ecosystems		
Number of local community members with negative perceptions of tourism impacts on their community and environment		