



Wainuiomata Mainland Island Strategic Plan 2006 -2016

Developed by the Wainuiomata Mainland Steering
Committee

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Executive summary

An area of 1,200ha within the Wainuiomata River catchment was defined for an intensive restoration project, or 'mainland island', in 2004. This area, like the wider area of the Wainuiomata and Orongorongo Water Collection Areas (WCA), is owned by Greater Wellington and contains some of the best un-logged native forest in the lower North Island. Particular features are the number of large rata in good condition, the age and size of its rimu and matai, and a 'manuka fen' wetland.

The location of the mainland island within a WCA, that supplies about a fifth of the region's water supply, has both advantages and some constraints. The site has been the subject of continuous control of some pest animals and plants and access has been tightly controlled, both of which have had benefits for biodiversity. The same managed access is a constraint, meaning that community involvement and visitation will be minimal, and toxin use will also be constrained.

This plan sets out a goal and a series of objectives for the mainland island over a 10-year period within an agreed vision to: 'Maintain and restore the Wainuiomata Mainland Island Ecosystem to a healthy functioning state and sustain those ecological processes that support its indigenous biodiversity, whilst maintaining a pure, clean water source.' The goal is to control pests to enhance the site's present fauna and flora and to re-introduce species no longer present as conditions allow. The emphasis is placed on biodiversity conservation, rather than community involvement and visitation, considered appropriate within a vital WCA.

Pest animals currently being controlled are possums through trapping, rodents through poisoning by diphacinone, and deer, goats and pigs through hunting. A trapping network for mustelids, particularly stoats, is being developed. The control of pest plants is organised across the whole water collection area. Monitoring of birdlife and vegetation will allow the benefits of pest control to be shown.

Several birds have been identified for possible re-introduction during the term of this plan. North Island robins and kokako will require rats and possums to be in very low numbers, and kiwi and kaka will require successful control of stoats.

Access to the site will continue to be strictly managed under a WCA Access Plan which permits small numbers of people to visit the WCA. Further opportunities for community involvement and education may be developed in the adjacent Recreation Area.

The plan makes recommendations on staffing, management and reporting issues to ensure the long-term sustainability of the mainland island. It demonstrates Greater Wellington's commitment to enhancing the biodiversity of the region by taking a lead on its own land.

1. Introduction

This draft Strategic Plan has been developed by staff of Greater Wellington and various consultants. Its purpose is to assist in determining the future direction of an intensive ecosystem restoration project or ‘Mainland Island’ being developed within the Wainuiomata/Orongorongo Water Collection Area and to ensure that issues around the use of this site are addressed.

This plan recognises 6 areas (**Figure 1**):

1. The Wainuiomata Water Catchment
2. The Orongorongo Water Catchment
3. The Wainuiomata/Orongorongo Water Collection Area (which combines 1 and 2)
4. The Mainland Island
5. The Wainuiomata Recreation Area
6. The Water Operational Area (consisting of water intakes and treatment plant).

The Wainuiomata/Orongorongo Water Collection Area, comprises parts of the upper catchments of the Orongorongo and Wainuiomata Rivers. The Orongorongo catchment area is approximately 10km long by 5km wide and the Wainuiomata catchment 5.5km long and 4.5km wide. The WCA extends to 7373ha bounded to the east by the Rimutaka Ranges with adjacent peaks up to 860m, to the north and west by privately-owned farmland and to the south by the Wainuiomata Recreation Area and the Rimutaka Forest Park.

The Mainland Island is a specific part (1200ha) within the WCA consisting of the catchment of the West Branch of the Wainuiomata River and Skull Gully Stream, between the boundary fence and Long Ridge, including Drummond Ridge, which has been chosen for an intensive multi-species pest control regime. The Wainuiomata Recreation Area runs alongside the access road to the WCA and was set aside as a recreation area in 1985.

This plan is focussed on the Mainland Island (MI) but needs to address this as part of the wider WCA for several reasons:

- Much of the information in the site description in Annex 2 covers all of the WCA as that is how it has been collected.
- Some of the pest animal and plant control that is important to the MI is carried out across the wider site as part of its management as a water collection area.
- Activities within the MI need to be carried out in a way that fits within the wider objectives of the WCA.

Thus it will present information on the biodiversity of the full WCA and its overriding objective to provide a water supply of high standard, while focusing on the mainland island and the strategy for its future.

The plan also considers the Recreation Area as the site in which visitor access and facilities can be provided to satisfy much of the community's interest in learning about the work in the Mainland Island and the water collection and treatment facilities. There is also potential for the community to become involved in pest control or monitoring there.

2. Water collection

The location of the mainland island within the Water Collection Area has important consequences. The primary purpose of the area is the provision of raw water of the highest possible quality and all activities must fit within this. This leads to some constraints on the way that the mainland island is operated. However at the same time some activities aimed at maintaining water quality contribute directly to the objectives of the mainland island.

The two key objectives for the Water Collection areas are:

- To maintain the water collection areas in a manner that maximises the quality of the raw water and thus minimises the extent of treatment required to meet the requirements of any adopted standards for drinking water.
- To ensure that the management of the water collection areas complements and enhances Greater Wellington's vision of a *Sustainable Region*.

2.1 Description

Water collection for the Wainuiomata Water Treatment Plant (WTP) is sourced from five intakes, three of which are in the Orongorongo Valley and two in the Wainuiomata Valley. The main intake on the Wainuiomata River is below the Mainland Island area. The Wainuiomata Treatment Plant was built in 1993 and has a capacity of 60 millions of litres per day. Typical production is 30 million litres per day (a fifth of the regional total). There is no untreated water storage at Wainuiomata so if river conditions are unsuitable for treatment the plant must be turned off temporarily.

Management of the collection of water will vary over time in response to current best practice and water quality targets. The present target is to retain the A1 grading of Drinking Water Standards for New Zealand set by the Ministry of Health.

Currently, water catchments are managed to provide the first barrier to waterborne disease by controlling pest numbers, limiting land use and access and maintaining healthy vegetation. The Parks Department are contracted to the Water Supply Department to manage and monitor forest health within the WCA.

The treatment process at the WTP consists of dissolved air flotation and filtration to remove particles and colour from the water, followed by the addition of chlorine and fluoride.

2.2 Contribution to mainland island objectives

A diversified native land cover is the ideal vegetation for an active WCA. The diversity means that if any pest or disease targets a species, or group of

species, it is less likely to impact on the vegetation cover as a whole and thus adversely affect water quality.

The following activities are in place to help maintain this cover in good condition:

- Monitoring to detect the arrival of any new biological threats (e.g. plant diseases, pest insects) (detailed in section 6)
- Measures to prevent the spread of pest plants (section 6)
- Control of pest animals (possums and ungulates) and pest plants – (sections 7.1 & 7.2).
- Controls on access by people and vehicles (section 10)

This plan assumes that the current levels of pest control and monitoring will be maintained. Thus for example deer, goats and pigs will continue to be controlled to low numbers within the WCA, which makes it possible to aim to keep the mainland island effectively free of them.

2.3 Constraints on mainland island management

There are two key constraints: access and the use of toxins.

Access is governed by a Council-approved Area Access Plan (section 10) which facilitates access for management and research purposes but restricts use by the public.

There are tight controls on the use of toxins. Aerial drops of 1080 are used as part of management across the whole WCA to control possums. Water is not collected for a period after an operation until permission to recommence is given by the public health authority. Rules govern the use of chemicals for weed control, including a provision requiring the mixing of these outside the collection area. A significant process was followed to obtain approval to use diphacinone for rat control within the mainland island, including the involvement of the Medical Officer of Health, and the development of a Risk Management Plan. This plan required water testing to give assurance that there were no chemical residues at the intake.

2.4 Skull Gully dam investigations

Skull Gully was identified as a potential dam and water impoundment site in the 1980s and is being re-investigated as part of a current planning exercise, to enable a higher utilisation of the WTP and to meet projected demand. If this were to go ahead a significant area of some of the best forest on the river flat within the mainland island would be lost together with a wetland.

The surface area of the impounded water would be about 44 hectares, which, along with a margin, would have to be cleared of all vegetation. Because the dam is proposed to be constructed from roller compacted concrete, there may be borrow pits for construction materials, and disposal areas for unsuitable overburden, as well as the construction of access roads and facilities associated with the dam.

If a dam is built, it could coexist with the mainland island and would provide a water feature, possibly creating other habitats. However the opening up of the forest canopy in this manner would potentially put other vegetation at risk, both from exposure to the weather, and from competing species.

Skull Gully is one of three dam sites being investigated.

Damage to the mainland island area can be minimised by adopting a number of best practices for dam construction.

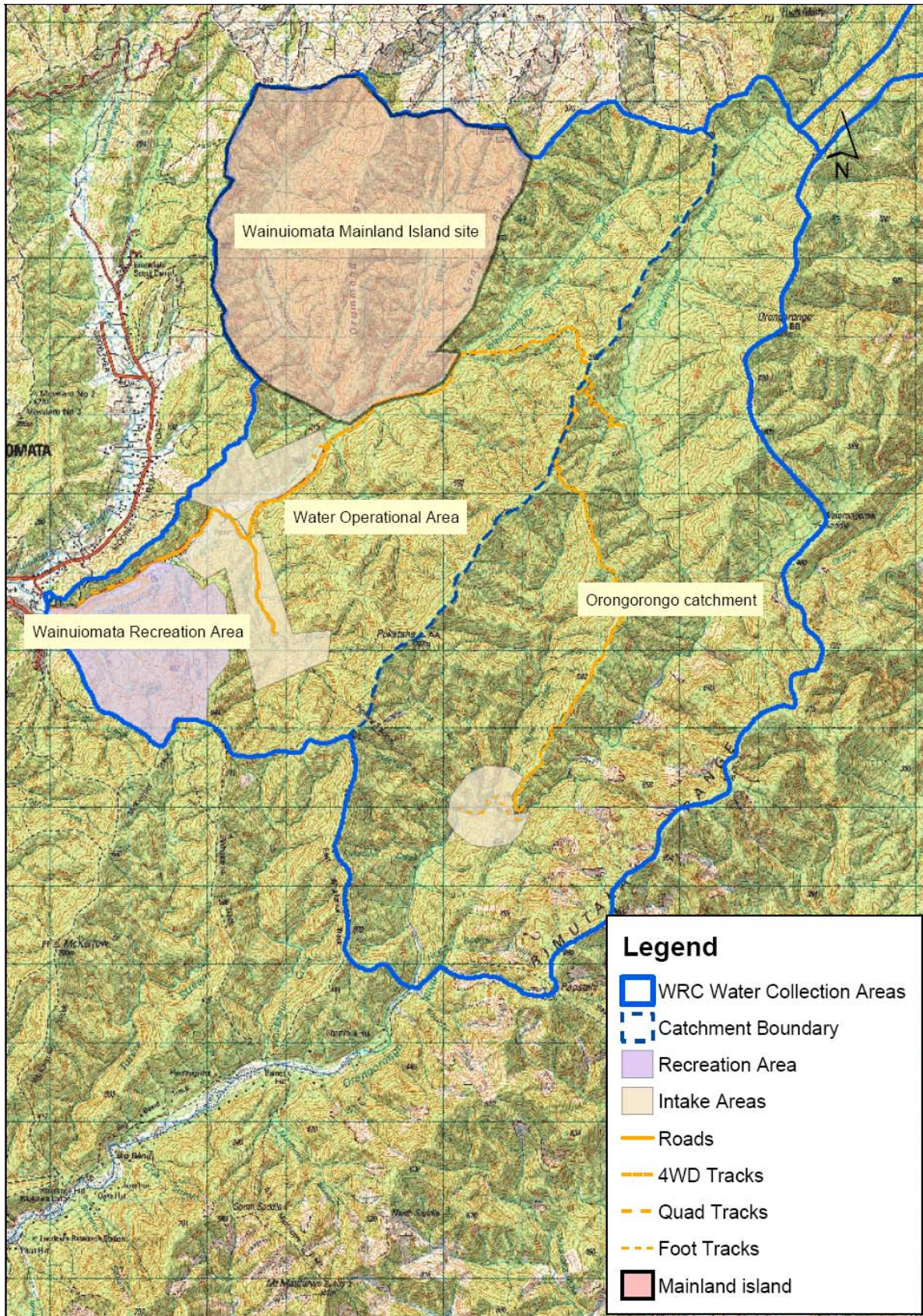


Figure 1: Project areas

3. Plan development process

The process involved in developing this plan has been as follows:

- Funding was secured for this purpose in the 2003 LTCCP.
- Dr David Butler was contracted in September 2005 as a consultant to prepare a draft plan.
- An initial workshop involving staff of Parks & Forests, Water Group, Biosecurity Departments and the consultant was held at Greater Wellington on 21st September 2005.
- Following the submission of an initial draft plan, the consultant made a field visit in mid-December 2005 and attended meetings of the Technical Group and Steering Committee.
- Discussions were initiated with local iwi in early 2006 and possum fur recovery opportunities are one issue that interest was expressed in.
- A second draft of the plan was circulated in early March 2006 and a further workshop with all staff involved was held on the 16th March.
- A third draft was circulated on 8th May and this final draft submitted on 22 June 2006.

The following staff have been involved in the planning process: Philippa Crisp (project leader), Ray Clarey, Glen Falconer, Scott Farrell, Jaap Knechtmans, Barry Leonard, Mark McAlpine, Alastair McCarthy, John Morrison, Fraser Oliver, Tim Porteous, Owen Spearpoint, Murray Waititi, Ken Wright.

4. Site description

The WCA was chosen as the site within which to establish a mainland island after a detailed process (Annex 1.4) which identified it as having the highest ecological values of Greater Wellington's large forest areas forming a significant refuge for the region's native bird species. It comprises one of the largest areas of un-logged lowland podocarp forest in the lower North Island with the age and stature of its rimu and matai and its kahikatea stands particularly significant.

The area was purchased by Wellington City Council in 1878 and has been managed since then for water supply purposes. While this has involved the construction of structures and roads and some alteration of natural water flows, such management has benefited the site's biodiversity in several ways. It prevented significant logging of the forest, exerted some control of the larger herbivorous mammals and restricted access.

An area in the Wainuiomata River catchment was subsequently selected as the Mainland Island following an investigation of different options in August

2002 and its final extent of 1200ha was determined at a meeting of the MI Technical Group in November 2004. This area was chosen based on:

- Its high biodiversity values - an area of forest that had never been logged and contained large numbers of rata in good condition (because it had been hunted for possums for fur in the past) and a 'manuka fen' wetland.
- Its regional significance – it continues a significant area of a habitat type identified as of 'conservation concern' (see Annex A2.2).
- Its accessibility – 4WD access to three boundaries
- Its size – a minimum of 1000ha was sought
- Its status as Council-owned land – it is held under the Wellington Regional Water Board Act, 1972.

5. Vision, goals and objectives

5.1 Vision

A 10-year timeframe has been set for this initial plan, after which a review will take place. Ten years should indicate what is possible, identify more of the issues involved, and make it easier to define a longer-term 50- or 100-year vision in detail. The following has been agreed as the vision at this point:

Maintain and restore the Wainuiomata Mainland Ecosystem to a healthy functioning state and sustain those ecological processes that support its indigenous biodiversity, whilst maintaining a pure, clean water source.

The emphasis is placed on biodiversity conservation, rather than community involvement and visitation, considered appropriate within a vital Water Collection Area. This distinguishes this restoration project from others within the region, like Karori Sanctuary or Pukaka Mount Bruce, with which it will not be competing.

A key driver for the project is to demonstrate that Greater Wellington leads by example in the protection and management of biodiversity aiming to make a positive difference on its own land not just maintain the status quo.

5.2 Goal

Control pest animals and plants to low levels to enhance the fauna and flora already present in the mainland island

and, as site conditions allow,

*re-introduce appropriate locally extinct species
thereby restoring the wholeness and character of
this ancient forest.*

The sustained control of pests is expected to lead to measurable improvements in the vigour of the forest canopy and the regeneration of seedling/sapling layers, and increase the abundance of native birds, invertebrates and reptiles.

A process for considering re-introductions will be developed to allow all key stakeholders to have input. Re-introductions will largely be matched to the conditions in the site, particularly the numbers of key pests, and the resources available at any time. An initial priority will be put on those requiring no or minimal additional management.

5.3 Objectives

This section lists project objectives under six headings: Biosecurity, Pest Animal Control & Monitoring, Pest Plant Control & Monitoring, Re-introductions of Indigenous Species, Access, and Advocacy, Education and Research. The supporting information and details behind each can be found in later sections as specified.

The project currently has funding through to the end of the 2008/09 financial year. Objectives are thus generally tied into this period.

5.3.1 Biosecurity

(See section 6)

1. Keep the site free of new pest animals or plants.
2. Monitor to detect the early arrival of any new pests.
3. Undertake control of any pests that are present according to the threats they pose and available funding. (Current priorities are identified in the next two objectives).

5.3.2 Pest animal control and monitoring

(See section 7.1)

Objectives are listed for the mainland island area while noting the current targets of control across the whole WCA, assuming that this effort will continue. Should this not happen at some point, then additional resources will be required to maintain the targeted low pest numbers within the mainland island. These resources could be applied within the mainland island to control animals when they arrive there or more widely to reduce the number of such arrivals.

1. Possums: Control to near zero density maintaining <2% RTC at all times. Assumption: possums will continue to be controlled to 5% RTC in the balance of the WCA.
2. Rats: Control to <5% tracking tunnel index. Assumption: rat numbers will be periodically reduced in the balance of the WCA through 1080 aerial drops.
3. Goats: Manage to near zero density. Assumption: goats will continue to be controlled to low levels throughout the balance of the WCA by hunting.
4. Deer: Manage to near zero density. Assumption: deer will continue to be controlled to low levels throughout the balance of the WCA by hunting.
5. Pigs: Manage to near zero density. Assumption: pigs will continue to be controlled to low levels throughout the balance of the WCA by hunting.
6. Mustelids: Test the efficacy of a planned regime to reduce to near zero density by comparing tracking tunnel indices with non-treatment area.
7. Feral cats: Assess numbers through periodic trapping to determine the need for specific control.
8. Other pest mammals: Keep under review the need and practicality of controlling hedgehogs and mice.
9. Introduced birds: Manage introduced birds to keep the site free of different species or control them there according to the threats they pose.
10. Pest invertebrates: Develop a baiting programme to control European wasps now that a registered bait is available.
11. Review options for pest control in the Recreation Area as a buffer to reduce invasion.

5.3.3 Pest plant control and monitoring

(See section 7.2)

1. Pest plants – carry out the tasks identified in the applicable Pest Plant Control Plan (2002-07, Parks & Forests, Greater Wellington).

5.3.4 Re-introductions of indigenous species

(See section 9)

1. Re-introduce those species that are appropriate to the current management and monitoring regime when conditions are suitable.

2. Evaluate opportunities to introduce further species requiring some extension or expansion of the current regime as funding allows.

5.3.5 Access and recreation

(See section 10)

1. Maintain public access to the WCA at levels as approved by Council. This is currently set out in the Area Access Plan.
2. Develop the Recreation Area as a focus for public use when practical.

5.3.6 Advocacy, education and research

(See section 11)

1. Promote the native biodiversity gains resulting from the mainland island to encourage long-term support for the project and for the community to take their own restoration initiatives.
2. Maintain controlled community involvement in the mainland island for management purposes
3. Review opportunities for further involvement of the community, particularly in the development of the Recreation Area.
4. Develop relationships with conservation and community groups to encourage the two-way transfer of knowledge and skills.
5. Review the environmental education opportunities provided by the project.
6. Establish links nationally with similar mainland multi-pest control restoration projects to share issues, solutions and skills.
7. Allow for limited research to take place within the mainland island recognising that access is to be limited. Priority will be given to projects that can improve the way Greater Wellington manages its native ecosystems.

6. Project funding and schedule

Funding for the project is currently budgeted as follows:

Financial Year

2005/06	\$110,000
2006/07	\$30,000
2007/08	\$30,000
2008/09	\$110,000

Activities scheduled for these years are shown in Table 1 (shaded).

Immediate future funding will need to be confirmed during 2008/09 and the programme then adjusted for the balance of the plan period. It should not be necessary to review the plan at this point, but to do so in 2015/16.

A restoration project like this is a long-term initiative that requires consistent, ongoing funding or its gains will be lost. Thus within this period there needs to be an effort to obtain a commitment to longer-term funding from Greater Wellington and other sources to continue progress towards attaining the vision.

YEAR	ACTIVITIES
2005/06	Establishment of current control and monitoring regimes.
2006/07	Continue 2005/06 control & monitoring regimes Complete the establishment of the stoat control regime. Undertake first trapping of feral cats.
2007/08	Continue 2005/06 control & monitoring regime Initiate stoat control
2008/09	Continue 2005/06 regime & stoat control Re-introduce North Island robins (<i>Petroica australis longipes</i>) if rat numbers have been held successfully within their target in preceding years. Confirm future funding.
2009/2010	Adjust the programme to fit the funding secured from this point forwards
2009/2015	Undertake further re-introductions if relevant pests are under control, recovery group support obtained and resources allow. Likely species: kokako (<i>Callaeas cinerea wilsoni</i>), kaka (<i>Nestor meridionalis septentrionalis</i>), kiwi (<i>Apteryx australis mantelli</i>).
2015/2016	Complete review of this plan.

Table 1: Project schedule

It should be recognised that rapid advances are being made in pest control as more agencies and individuals become involved in restoration projects throughout the country. New techniques are likely to become available within the term of this plan which will alter what is achievable.

Section 14.1 provides a brief discussion of possible future directions including further increasing the intensity of the pest control effort or expanding the area treated.

7. Biosecurity

Biosecurity is a term that covers the safeguarding of New Zealand's economy, environment and public health from the risks of introduced pests and diseases. The key activity is trying to prevent the arrival of new pest plants and animals and diseases. However it also involves getting rid of, and controlling those that are already here.

Preventing new pests arriving at the mainland island is part of a wider issue that starts at the country's borders. Now that significant resources are being invested in improving the state of native biodiversity within the mainland island, it becomes all the more important to prevent such arrivals. Actions that can be taken locally are assessing the risks of different pests reaching the site and identifying pathways that they might 'use' to get there, then establishing monitoring to detect such arrivals early while eradication of them is possible.

In terms of assessing risks, the Regional Pest Management Strategy (Greater Wellington, 2003), provides a list of pest plants that are a regional problem some of which are not present in the WCA and thus priorities for surveillance.

One potential pathway for weed seeds and pest invertebrates to enter the site is on vehicles. A Wheel Wash designed and installed by Water Group staff at the entrance to the WCA reduces this risk for the wider site including the mainland island.

Aerial surveys – introduced insects and pathogens

One current surveillance programme involves two-yearly aerial surveys conducted in conjunction with ground-based forays to specific sites to search for infestations of introduced fungi and insects, the most recent ones in 2004/05 and due again in February/March 2007. No major infestations of new organisms or affected areas have been recorded.

8. Pest control and monitoring

The key mammalian pests threatening the native biodiversity of the site are possums, ungulates (goats, deer and pigs), rats and mustelids (primarily stoats). In each case this section will summarise their impacts, and identify the control and monitoring being undertaken within the mainland island and the wider WCA. Monitoring will be separated into:

- result monitoring – changes in the numbers of the pest targeted by control
- outcome monitoring – changes in native biodiversity as a result in changes in the numbers of the pest

The different pests vary in the threat that they pose to the achievement of the project's vision and in how easy they are to control to low numbers. These aspects are covered in the species accounts below.

It is expected that bird abundance and seedling growth will be two more obvious outcomes of the control of pests within the mainland island. While there are a range of outcome monitoring techniques in use across the wider WCA, the outcome of the mainland island work will largely be measured through the use of bird monitoring and ungulate browse plots.

A non-treatment site has been identified to the south (Figure 2) as an area of similar vegetation to the mainland island. Bird monitoring sites and ungulate browse transects (additional to those used in the wider WCA) have been established in both the mainland island and in the non-treatment site (see 8.1 and 8.2). This means that ‘natural’ changes in animal and plant populations (in the non-treatment site) can be compared to changes resulting from management within the mainland island. It is acknowledged that the non-treatment site selected is close to the mainland island and may in future be less useful as a comparison site because of the overflow of birds or other effects of the mainland island management. It was difficult to avoid this, as the non-treatment site selected is the only similar habitat type of a suitable size for monitoring within the WCA.

8.1 Animals

8.1.1 Possums

(a) **The issue:**

Possums are typically viewed as plant eaters and they pose a significant threat to the native forest cover of the whole catchment through selectively browsing some species like rata. Their control is also part of an initiative to reduce the incidence of Tb in cattle in adjacent farmland. However, they are now recognised as significant nest predators of birds and eat native invertebrates including large land-snails, so they are a target for more intensive control within the mainland island.

(b) **Past management:**

Possum trappers using traps and cyanide culled possums in the Wainuiomata Water Collection Area from 1935 to 1990. When the possum skin prices dropped in the late 1980’s, possum recovery operations fell, resulting in an increase in possum numbers. Trappers were paid to trap and poison possums using cyanide in the early 1990’s, but the first intensive possum control in the area took place in 1999 when an aerial 1080 operation was completed. Possum numbers were lowered from 13.5% to 1.9%.

Residual Trap Catch (RTC) (the number of possums caught per 100 traps laid over a set period) at that time. The bait was not sown around the water intakes during that operation and possums re-infested from those areas over time (as well as from neighbouring land).

A monitor completed in 2004 showed that possum numbers had returned to 15.5% RTC. A second 1080 operation took place in August 2005 and this time approval was obtained to fly the complete site including the intakes contributing to a very successful result. The post-operation monitor at the end of the month recorded only 0.1% RTC, assisted by a long spell of good weather after the drop.

Possums were controlled on the neighbouring land on the northern and eastern boundaries through Tb operations of the Animal Health Board (AHB) in 2002, 2003, 2004 and 2006. Control is also planned by the AHB on the western boundary.

(c) Current management and targets:

Wider WCA – Periodically reduce possum populations to below 5% RTC using the current regime.

The WCA is now part of a Council-land possum control program, where the large forested blocks are treated using 1080 on a five-yearly rotational basis. The target following each such operation is a 5% RTC. However possum numbers may be reduced well below this, as they were in the 2005 operation, and then are expected to reach levels well in excess of this in intervening years.

Mainland Island – Zero density in the core to maximum of 2% RTC.

Maintenance control in the mainland island uses Warrior™ traps with 'hard extruded' cereal baits. Most of the site is covered by traps on a 300 x 300m grid, however this density is increased in a 400m buffer right around the MI where traps are placed at every rodent bait station (see 7.1.2) providing a 150 x 100m grid. Traps around the perimeter and the four main tracks are serviced monthly and on all other lines two-monthly. There are options to add more traps attached to the new boundary fence on the north-western side.

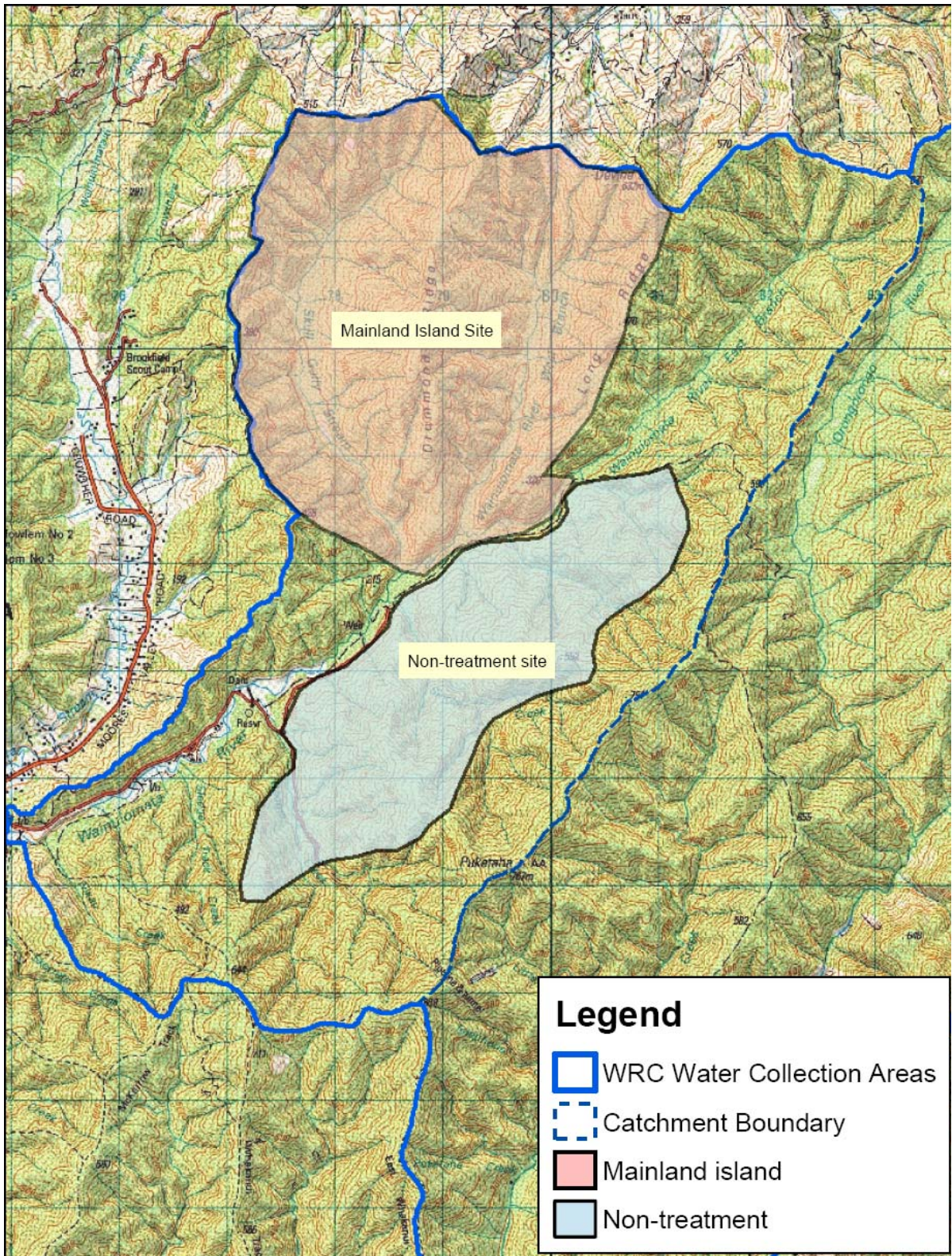


Figure 2: Mainland island and non-treatment sites

(d) Result monitoring:

Monitoring using the standard RTC protocol will be undertaken annually in autumn in the mainland island and every second year in the non-treatment area. (A buffer will be set to place monitoring lines away from the edges of the mainland island). The wider WCA will be monitored every 4 years in relation to the 5-yearly 1080 drops.

(e) Outcome monitoring: (details in section 8)

Rata are monitored across the Wainuiomata Catchment using photography though only a few sample trees are located on the edge of the mainland island. Fruit-falls plots are used to assess possum damage on tawa and hinau and ungulate browse plots also pick up possum droppings and some possum-related browse.

8.1.2 Rats

(a) The issue:

Two rat species, the ship rat (*Rattus rattus*) and the Norway rat (*R. norvegicus*) will be present within the site but the former is the key forest pest. Ship rats eat the fruit and seeds of native plants inhibiting regeneration, take the eggs and young of birds and feed on native invertebrates including land snails. Numbers will fluctuate significantly both seasonally and annually in response to food supply and may increase dramatically during masting of beech or podocarps.

(b) Past management:

Rats have not been targeted for management with the WCA though numbers would have been lowered every five years as a result of 1080-based possum control operations. A targeted poisoning programme was begun in the mainland island in 2005.

(c) Current management and target:

Mainland Island - maximum tracking tunnel index of 5%.

An intensive bait station regime has been developed in the mainland island in addition to wider 1080 drops. A 100 x 150m grid was created by cutting and marking lines through the forest 150m apart (Figure 3). The toxin chosen was diphacinone which was applied as Ditrac blocks (five 28g blocks placed on a wire rod) inside Pelifeed bait stations. The first bait station fill took place in October 2005 with half the lines completed in one day (14 people on the ground & 2 driving). Stations are being checked monthly or two monthly.

(d) Result monitoring:

Monitoring of rodents and mustelids utilises tracking tunnels with four lines of 25 stations 50m part. It was started in May 2002, run quarterly in 2003/04 then six-monthly in 2004/05. A return to quarterly monitors has been recommended to check the effectiveness of rat control in the mainland island and whether this needs to be enhanced or altered.

Monitoring showed that the 1080 drop in August 2005 was very effective at reducing rat numbers (Figure 4).

(e) Outcome monitoring:

Bird monitoring will provide the main indicator of the effectiveness of rat control. Five minute bird counts and distance sampling of tomtit and NZ pigeon will be undertaken annually in the mainland island and in the non-treatment site.

Detailed studies elsewhere have shown that keeping rats below the 5% tracking tunnel index results in significantly higher nesting success of robins and kokako and increasing populations. The same should be true of North Island tomtits among other species present within the site.

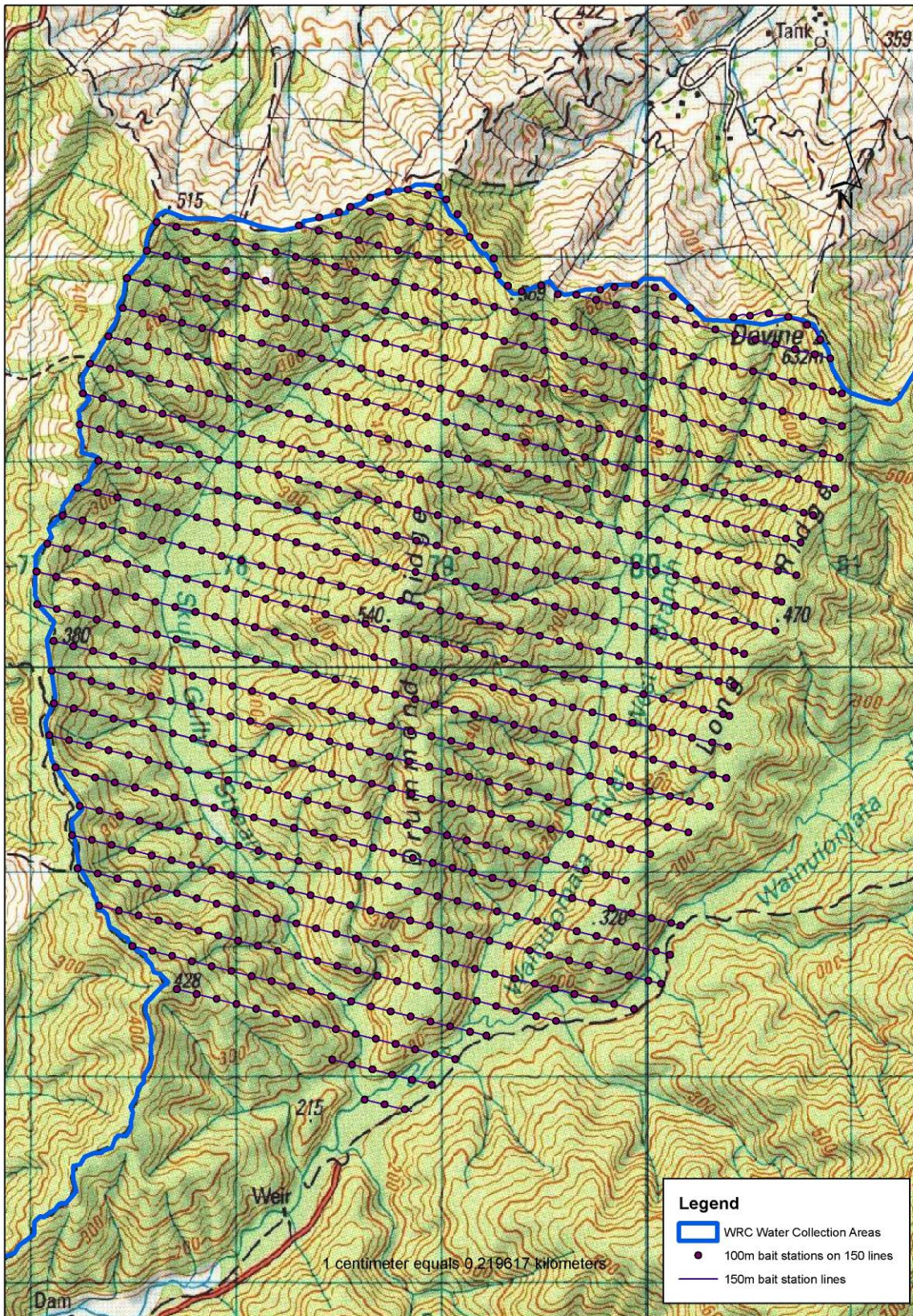


Figure 3: Mainland island bait station grid

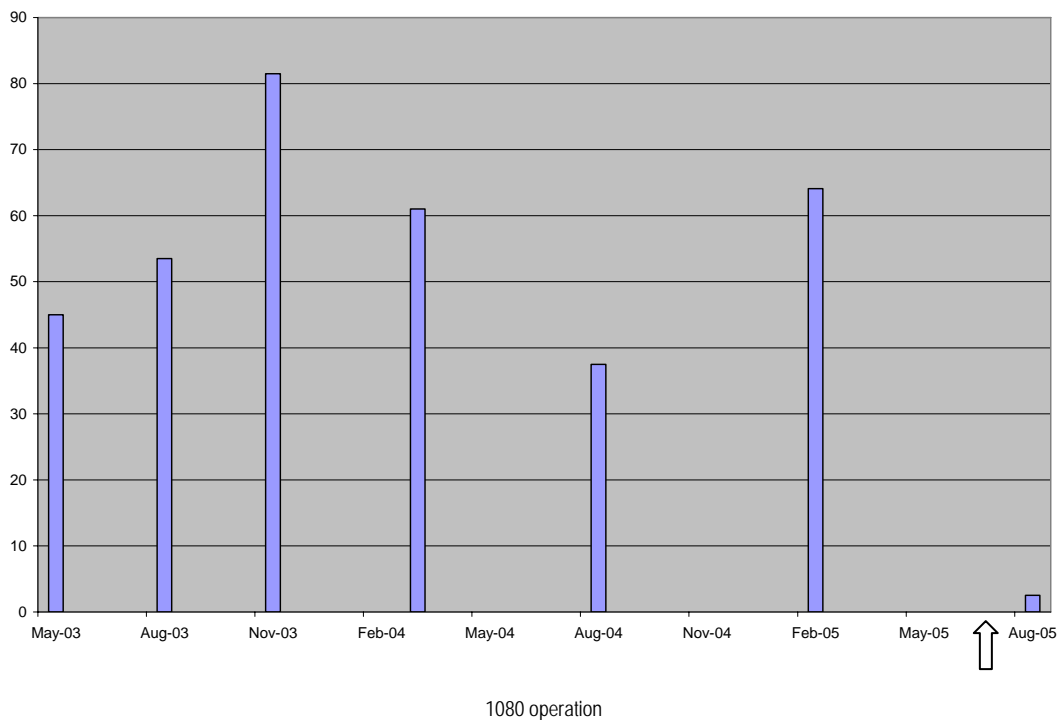


Figure 4: Rat tracking prior to and after the August 2005 1080 possum control operation in the Wainuiomata/Orongorongo water collection area

(f) Toxin monitoring:

A water testing regime has been set up to check for any diphacinone toxin. Initially water at the intake was to be tested weekly, reducing to monthly if none was detected after 4 weeks and then three monthly if none was detected after six months.

8.1.3 Goats

(a) The issue:

Goats are selective browsers significantly damaging under-storey vegetation up to two metres above the ground, and they can use steep slopes where loss of vegetation results in serious erosion. They thus threaten the vegetation cover of the WCA and its water quality.

(b) Past management:

Goat control operations began in the Orongorongo in the late 1920s because of the obvious damage being caused to the forest. In 1933, two men were paid to kill goats for 2 months in the Orongorongo catchment. Recent professional hunting of ungulates began in the WCA in 2001. By the end of June 2004, 441 goats had been culled professionally from the area with a further 33 goats killed during an annual hunting ballot.

(c) Current management and targets:

The WCA - fewer than one goat culled per two hunter days.

The WCA is now part of an ongoing goat control operation where Judas goats are used in selected sites after intensive ground hunting has been completed. Judas goats wear collars fitted with transmitters, allowing them and other animals with which they ‘mob up’ to be located for control. Judas goats work well in the Wainuiomata catchment but there are problems in Orongorongo with some moving to the Wairarapa side of the Rimutaka Range.

(d) Mainland Island – as low as practical

The current aim is to have numbers under tight control within the MI within 3 years. Sightings and sign will be monitored during filling of rodent bait stations, intensive hunting with contract hunters then carried out, followed by a re-monitor during the next fill. A target as number sighted per bait station fill may be established from that point forward. It is intended to work towards having no Judas goats present in the MI over time.

(e) Result monitoring:

Sightings and sign recorded during fills of rodent bait stations and other staff activity within the mainland island. Kills per hunter/day recorded in the wider WCA.

(f) Outcome monitoring:

Ungulate browse plots have been established within the mainland island and in the non-treatment site and these will be measured annually. Ungulate browse plots are also used across the WCA (section 8).

8.1.4 Red Deer

(a) The issue:

One deer species, red deer (*Cervus elaphus*), is present in the WCA following three initial liberations between 1896 and 1911. Red deer are browsers that prevent the regeneration of favoured plant species, significantly changing forest structure and composition. The non-replacement of canopy species can potentially lead to canopy collapse with major consequences for erosion and water quality within the WCA. Deer also have the potential to spread Tb.

(b) Past management:

Deer numbers in both catchments were very high during the 1920s and 30s, and in 1929 the caretaker/ranger at Wainuiomata shot 300 deer. From the 1930s to the 1970s caretakers at Wainuiomata were

supplied with ammunition and were expected to keep deer numbers down. In 1970s, annual hunting operations by the New Zealand Forest Service began, but ungulate control became more intermittent in the 1980s and 90s, with Department of Conservation hunters providing some hunting pressure. An analysis of deer pellet monitoring data showed deer numbers in 1998 to moderately high to high (McGlinchy, 1998).

During the 1080 possum control operation in 1999, a trial was completed to assess whether it was possible to maximise deer by-kill more effectively using 1080 sown in strips. The results of this trial were inconclusive (Meenken and Sweetapple, 2000). In 2001, a public hunting ballot system was set up to allow hunters access to the closed water collection area during the “Roar”. The water collection area was divided into 10 hunting blocks and hunting periods allocated for each block. For the five years from 2001 to 2005, 47 deer were shot during the Roar, with an average of 10 deer shot per year. A further 43 deer have been shot as by-kill during professional hunting operations.

(c) Current management and targets:

The WCA - fewer than one deer per 200ha

Deer are shot by contract goat hunters, by members of the public as part of the annual balloted hunt and by staff. Some may also be killed during aerial 1080 possum control operations.

A major initiative has been a new 18km deer fence on the north-western and western boundaries of the WCA built at a cost of \$500,000. This prevents the influx of deer from farmland and also assists in reducing numbers by including several ‘exit jumps’ which deer can jump down but not back up again. The fence is built on Greater Wellington land so the public have no legal access to it. The fence also controls the ingress of pigs and goats.

(d) Mainland Island – as low as practical

Specific hunting efforts may be undertaken if monitoring suggests that this is needed.

(e) Result monitoring:

As for goats. It is recognised that deer behaviour may change with increased people activity making them harder to detect.

(f) Outcome monitoring: (details in section 8)

Monitoring of ungulate browse plots shows evidence that seedlings are reaching a certain height then being lost. It has been suggested

that low deer numbers will be needed for three years to show significant changes in this pattern, though species such as hinau and miro are likely to need ten or more. A single deer enclosure in the mainland island provides a measure of forest structure without ungulate impacts.

8.1.5 Pigs

(a) The issue:

Feral pigs will eat the leaves and fruits of native plants – large amounts of hinau fruits may form over half the contents of faeces - contributing to species decline. In digging for roots they turn over the alluvial soils in the valley floors increasing erosion during flooding. They also are major predators of large native invertebrates including land snails. Finally, they can interfere with ground-laid baits and traps.

(b) Past management:

There are few records of pig hunting efforts, though the water collection area was a popular poaching area in earlier years. Professional pig hunters were employed in 2001, after complaints were received from neighbours about pigs from the catchment causing damage to their pasture. Nearly 100 pigs have been culled professionally from the area by the end of June 2004, with a further 19 pigs killed during the public hunting ballot. In 2004/05 22 pigs were taken.

(c) Current management and targets:

The WCA - fewer than one pig culled per 2 hunter days.

Pigs are targeted by hunters using dogs and also killed by contract goat hunters and during the annual hunt. Hunting effort has to be reduced immediately after

1080 operations when dogs are at risk from picking up the poison from animal carcasses. It is planned to make the hunting more reactive, so that after each fill of rodent bait stations hunters will immediately go into areas where pigs were seen during this operation. The lower parts of the deer fence on the north-western boundary has been reinforced with denser mesh and additional wires to prevent pig access.

(d) Result monitoring:

Monitoring will continue to be kills per hunter effort within the WCA with sightings and sign noted during bait station fills used as an addition within the mainland island.

(e) **Outcome monitoring:** (details in section 8)

Monitoring will be undertaken using the ungulate browse plots and by recording sign seen in fruit-fall plots.

8.1.6 Mustelids

(a) **The issue:**

All three species of mustelids are present in the wider area, stoats (*Mustela erminea*), weasels (*M. nivalis*) and ferrets (*M. furo*). Stoats are widespread and the most significant threat to native fauna in the forest habitat, while ferrets and weasels are on the margins of the site in lower numbers. Stoats are a threat both to ground birds and to those that nest above ground, particularly hole-nesters. Numbers will fluctuate significantly from year to year depending on the abundance of the rodents that are their main prey.

(b) **Past management:**

Mustelids have not been targeted for management in the past though some will have been killed by secondary poisoning following 1080 drops.

(c) **Current management and targets:**

Stoats are not yet being tackled within the mainland island until it is certain that rats can be controlled using current methods. The reason for this is that rat numbers have been recorded to increase at some other sites when stoats only have been controlled.

However a control regime is currently being set up with DOC 200 traps set in tunnels 200m apart on main routes and access lines to approximately a kilometre apart. All traps are expected to be in place by the end of 2006 and operated in 2007 provided that rat numbers are not unusually high – given that there is some evidence that controlling stoats can lead to an increase in rat numbers.

Stoats are being controlled by trapping in an area directly to the south of the WCA where brown kiwi have recently been introduced by the Rimutaka Forest Park Trust.

(d) **Result monitoring:**

Mustelids have been monitored in tracking tunnels since May 2002 (Figure 5).

8.1.7 Feral Cats

Feral cats are a threat to birds and reptiles in the mainland island. The initial plan is to assess their numbers and locations by baiting the Warrior traps set for possums with meat once a year, either every trap or alternative ones. All sightings of cats in the MI are to be recorded as a way of assessing their numbers and distribution.

8.1.8 Mice

Mice are not currently being targeted within the mainland island but any response to rat control will be monitored in the tracking stations. They can access the Ditrac rat stations where their activity is revealed as feeding dust not droppings, but there may be some doubts about the palatability and toxicity of this bait to mice. If mouse numbers increase following rat control, as they have done in some other situations, there could create problems by taking large amounts of the bait intended for rats.

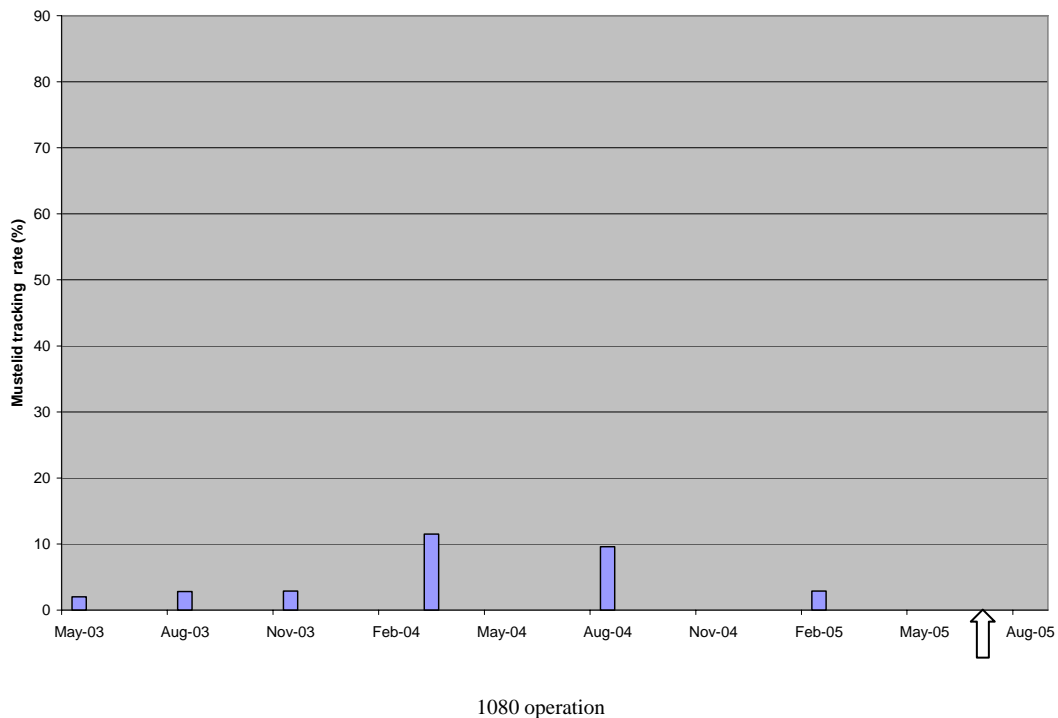


Figure 5: Mustelid tracking prior to and after the August 2005 1080 possum control operation in the Wainuiomata/Orongorongo water collection area

8.1.9 Rabbits

Rabbits are present outside the boundaries of the WCA within the Recreation Area and around the Treatment Plant. Numbers do build up to become an issue at times when control may be initiated. The rabbit calcivirus disease (RCD) has occurred in the area and may recycle from time to time. Greater Wellington is unlikely to use RCD as a biocide due to restrictive use

protocols and would utilise shooting or Pindone carrot baits as a first preference.

8.1.10 Dogs

The only dogs permitted in the WCA are those being used for management purposes, e.g. pig hunting.

8.1.11 Hedgehogs

Hedgehogs are not currently targeted though there is some suggestion of an increase shown by tracking tunnel monitoring. Hedgehogs can access some Ditrac stations and would be caught in DOC 200's once these are set for stoats.

8.1.12 Wasps

Wasp control could be considered both to reduce the risks for staff and to benefit the native biodiversity. Wasps build up into high numbers in summer in parts of the forest dominated by beech and other species supporting honeydew, and are likely to have significant impacts on the native invertebrates on which they feed. Recording the numbers of stings received by staff and visitors could be one monitoring technique.

A control protocol based on the use of fish or meat baits containing the insecticide Fipronil has been developed by the Department of Conservation for honeydew beech forests at Nelson Lakes National Park. A similar regime could be used at Wainuiomata now that the toxin 'Extinguish' is available, though it should be applied experimentally as it might need to be modified to be fully effective in the different habitat found here.

8.1.13 Introduced birds

It is planned to keep the area free of **magpies** by shooting and trapping.

Rosellas are present in large enough numbers for eradication to be impractical. However numbers will be monitored through 'slow walk' transects and 5-minute counts to see if the population increases following pest control in the mainland island and whether some specific rosella control is then needed.

8.1.14 Pest plants

Pest plants are being managed across the full WCA. Continuation of this work will ensure that the mainland island remains free of their impacts.

A pest plant survey of the WCA was completed in February 2001. A botanical survey undertaken early in 2002 also noted the presence of exotic plants where they were seen. The pest plant infestations given the highest priority for control were buddleia in the Wainuiomata catchment and escaped

garden plants at the old house site in the Orongorongo catchment: honeysuckle, Mexican daisy, ivy, Spanish heath, *Montbretia*, and Kaffir lily (*Clivia*).

Since 2001, buddleia has been removed from the Wainuiomata catchment upstream of the weir and work is continuing on this pest plant around Morton Dam and along the sides of George Creek (Wainuiomata/Orongorongo Pest Plant Control Plan 2002-2007). Pampas, wilding pine and roadside weeds, such as gorse, foxglove and ragwort have also been controlled. While the interior of the forest is free of pest plants, Spanish heath is present on most of the Orongorongo slips and Himalayan honeysuckle is common along the Moore's Valley boundary.

The Wainuiomata Recreation Area has been more modified than the rest of the catchment and many pest plant infestations are present, including holly, convulvulus, Japanese honeysuckle, ivy, banana passionfruit and buddleia. An old dumpsite by the Ranger's house had other species e.g. *Tradescantia*.

Within the MI itself the focus is on ensuring that all buddleia and wilding pines have been removed, re-checking previously infested sites (e.g. Himalayan honeysuckle in Skull Gully), and responding to any weeds reported.

8.1.15 WCA Pest Plant Control Plan

A pest plant control plan for the WCA was published in 2003 covering a programme through to 2007. This includes distribution maps of the main pest plants and categorises plants into three groups:

1. Control immediately
2. Control later if funds or resources become available
3. Leave (either because threat is not great or there are no control methods)

Priority is accorded to various species associated with the old house site; pine, buddleia, pampas; Himalayan honeysuckle and gorse at an illegally disturbed site in Skull Gully; and seedlings along the access road (gorse, Himalayan honeysuckle, foxglove, ragwort and Spanish heath).

Target: No re-infestation of treated sites. Any new sites detected will be immediately assessed with a view to treatment.

9. Monitoring of native species

Many of the initial large-scale restoration projects on the mainland, such as the Department of Conservation's six Mainland Islands, spent a significant proportion of their funds (up to 60%) on monitoring. The knowledge gained means that we now know a great deal about the interactions between key pests and native species. The Wainuiomata project can thus concentrate most of its resources on control and largely assume that if pests are reduced to

certain prescribed levels then the desired improvements in the state of the biodiversity will occur.

9.1 Mainland island monitoring

9.1.1 Birds

Bird monitoring is largely aimed at determining whether a general response is being achieved not looking at particular species in detail, though some distance sampling of two of the more common species currently in the WCA (tomtit and NZ pigeon) will be undertaken.

Forty five-minute bird count stations have been set up in the mainland island and another forty in the non-treatment site. The five-minute bird counts are completed twice during spring (first established in November 2005). Distance sampling of tomtit and NZ pigeon is completed after the five-minute bird count in each case. Wider WCA bird monitoring is discussed in 8.2.4.

9.1.2 Ungulate browse plots

Ungulate browse plots have been installed in the mainland island and non-treatment site in May/June 2006. Five lines of 10 plots have been established in both areas (i.e. a total of 100 plots). The method used for these plots is described in Burns *et. al*, 1995 and monitoring will be undertaken every two years. Seedlings are browsed by rats and possums as well as goats and deer and it is anticipated that a significant increase in seedling abundance will be seen in the mainland island.

Target: Less than 10% of palatable species showing sign of grazing.

9.2 Wider water collection area monitoring

The monitoring detailed below was set up across the whole WCA as part of Parks and Forests contract with the Water Group. Some of these established monitoring operations will provide information about the health of the native species within the mainland island.

9.2.1 Fruit fall plots

Tawa and hinau fruit-fall plots have been used annually to assess possum numbers, as a clear correlation has been seen between possum re-infestation and the incidence of fruit damage. Results show high possum damage on tawa (66% of fruit damaged) and hinau (77% damaged) in 2005 prior to the 1080 operation (compared to as low as 3% and 12% respectively the year after the previous operation). All of the tawa fruit-fall plots happen to be located in the mainland island site, together with c.5 of c.15 hinau ones. Plot locations will be re-assessed in relation to the mainland island and its non-treatment area to determine if changes need to be made. The technique used is described by Hanford (2002).

Target: Possum and rat damage to tawa and hinau fruit is less than 5%.

9.2.2 Permanent vegetation plots

Permanent 20 by 20m vegetation plots measure changes in the forest structure over time. Eight plots were set up across a variety of vegetation types inside the catchment in 1997, according to the method described in Allen, 1993. Only one plot is in the mainland island; this is an exclosure plot (an area fenced off from ungulates) with two associated control plots that were installed in 1996. All plots were re-measured in the summers of 2000/01 and 2004/05 and are programmed for re-measurement on a five-yearly basis from February/March 2010/11. There was a marked increase in basal area (a measure of tree growth) and the number of stems per ha in the exclosure plot over that time, but that trend was not seen in the unfenced plots, where those variables stayed relatively constant (Landcare Research, 1996).

Target: No loss in basal area.

9.2.3 Rata digital photography

Northern rata (*Metrosideros robusta*) foliage is a preferred food for possums and is being used as an indicator species. Forty selected trees have been monitored since 1996 using digital photo analysis and a series of foliar density scores. The method is described in Hanford, 2002. Little change has been seen in foliage density in the past three years – a contrast to the past situation without possum control when many trees died. This monitoring is under review and could be moved to biennial. A number of the monitored rata trees are located in the mainland island.

Target: Mean foliage density is maintained at greater than 70%.

9.2.4 Birds - wider WCA

Birds have been monitored in the WCA since 1999. "Slow walk" transects were measured a number of times each spring using the method described in Hanford, 2002. A significant increase in total bird counts was seen in 2000 following a 1080 operation in 1999. Tomtit, tui, grey warbler and fantail showed a significant increase in numbers recorded. This monitoring may not be continued as the transects are on the edge of the mainland island and will be affected by the management of that area.

9.2.5 Ungulate browse plots – wider WCA

Ungulate browse plots were installed in the water collection area in 2002 to measure the outcome of ungulate hunting. These plots were re-measured in 2004 and an increase in the number of highly palatable seedlings growing past browse height could be seen. Twelve transect lines of 20 plots each were established in 2002 – two of these lines are in the mainland island and two in the non-treatment site. Extra ungulate browse lines have been installed in 2006 for the mainland island as detailed in 8.1.2.

Target: Less than 10% of palatable species showing sign of grazing.

9.2.6 Phenology

Monthly flowering and fruiting of 19 specific tree species has been recorded since October 2001 along the side of the road through the WCA.

10. Re-introductions

The re-introduction of species lost from an area is a key element in some large-scale restoration projects. They generally require enhanced levels of pest control which would require more resources on the ground and could also involve a major planning process to obtain the necessary approvals if the use of a different poison is advocated. Re-introductions can also be a major time commitment in themselves depending on the requirements for extra management including monitoring or supplementary feeding. A measured and logical approach to this issue is thus proposed.

10.1 Re-introduction process

Within the ten years of this plan, two approaches are proposed:

- Reintroduce those species that require no more management than that in place at any time.
- Offer the site to the Department of Conservation as a potential re-introduction site for threatened species and invite the Recovery Groups that manage them to consider this option in their planning. The management & monitoring required would need to be compatible with WCA requirements.

The list of potential species for re-introduction identifies two bird species, robin and kokako, that could be re-introduced if the current management regime keeps rat and possum numbers as low as it aims to do. A further two species, kaka and North Island brown kiwi, are identified that depend on the successful introduction of the planned stoat control regime. Rarer species like saddleback and stitchbird, largely confined to pest-free islands, are likely to require a more intensive pest control regime than that proposed.

10.2 Species for re-introduction

10.2.1 Birds

Table 2 lists those four species identified as potential reintroductions within the duration of this plan and comments on the pests that are the key threats to them and how effectively they need to be controlled. There are many other factors to be considered before the translocation of a species is approved, such as the suitability of the habitat, and impacts on the source population, and a detailed proposal has to be submitted to DOC using its Translocation Guidelines.

Species	Comments	Management & Monitoring Requirements
N.I. Robin	Rat tracking tunnel indices (TTI) need to be below 5% as the key determinant.	Current management may be sufficient. Minimal monitoring.
N.I. kokako	Rats need to be below 5% TTI and possums in very low numbers.	Current pest management may be sufficient though release aviaries may be required. Monitoring of individually marked birds likely to be needed.
N.I. Brown kiwi	Stoats, ferrets, dogs and cats need to be controlled to low levels.	Will depend on successful control of stoats. Monitoring of individually marked birds with transmitters likely to be needed.
N.I. kaka	Stoats and possums need to be controlled to low levels.	Will depend on successful control of stoats. Monitoring of individually marked birds with transmitters likely to be needed.

Table 2: Initial candidates for possible re-introduction.

Staff have identified further species that could be candidates for re-introduction in later years such as blue duck (*Hymenolaimus malacorhynchos*), North Island weka (*Gallirallus australis greyi*), Brown teal (*Anas aucklandica*) and North Island saddleback (*Philesturnus carunculatus rufusater*).

10.2.2 Other groups

No clear candidates have been identified to date for other groups.

In the case of reptiles and invertebrates this is due to two issues. Firstly it is difficult to identify which species used to be there and secondly to determine whether some have been lost or remain in very low numbers.

Good information is available on the flora and no missing species have been identified for sure. Woodrose (*Dactylanthus taylorii*) might be a candidate as it was recorded in the past in the Wairarapa and mistletoes could be another as they have not been recorded in recent surveys.

Limited survey work has been done for bats. Long-tailed bats (*Chalinolobus tuberculatus*) are quite likely to be present but short-tailed bats (*Mystacina tuberculata*) may require re-introduction. Low numbers of rats and stoats will be important for these species.

11. Access and recreation

Access to the WCA has been tightly managed to maintain the highest possible water quality using the following provisions:

- Access controlled at the entrance adjacent to Wainuiomata Water Treatment plant
- All visitors signed in and out and their access restricted to areas related to purpose of visit
- Gates to WCA kept locked
- Boundaries patrolled regularly
- Access with vehicles only permitted by special arrangement
- Dogs not permitted except those used by professional hunters
- Access is generally permitted for WCA maintenance, pest control, an annual balloted animal cull, and scientific assessments and research
- All contractors obtain their access through Greater Wellington staff
- Public access to the WCA only as a limited number of guided trips

The principles and policy applying to access are contained within a WCA Access Plan (2000). This policy is currently reviewed on an annual basis.

11.1 Guided public trips

Recreational public access has been managed with an annual maximum numbers put on trips and guiding ratios as follows (Council Decision 03.440 of 26/8/03):

- Wainuiomata :

- 12 trips of 60 people (11km including viewing of tunnel)
- Guiding ratio of 1:15
- Orongorongo
 - 6 tours of 15 people (21km long walk)
 - Guiding ratio 2:15 (one guide must be a GW staff member)

There are currently enough trips to meet public demand, indeed it is quite an effort to book and fill them, and it is likely that these levels will be maintained. A loop track could be built on flat land at the toe of Long Ridge between the two branches of the Wainuiomata River to provide access to the mainland island as part of these trips, if this was considered appropriate.

11.2 Development of recreation area

The public do not currently have access to the lower dam but developments are planned to create new facilities in this area that will provide a focus for community interest in the mainland island (see section 12).

11.3 Other issues

The Wainuiomata River currently has to be waded at the apex of the mainland island at the confluence of the east and west branches. There has been preliminary discussion on a proposal to build a suspension bridge over the east branch to facilitate bait station servicing.

12. Advocacy, education & research

12.1 Advocacy

It is important for an intensive restoration project like this to develop strong political and community support to ensure that it continues and develops over a sufficiently long time-frame. The aim should be for people to share the vision and recognise the constraints, so that they do not expect the same amount of access that they might have to similar restoration areas not used for water collection. However pest control around the accessible Recreation Area could provide them with a similar experience with enhanced birdlife, almost as they would find in the mainland island itself.

Involving the community in the work of the mainland island is not a priority for this restoration project, unlike others such as the Karori Sanctuary. Its use as an active water collection area creates constraints on the numbers of people entering the site. However there are significant opportunities for involvement in the development of the Recreation Area (see section 12) and some assistance is currently provided by volunteers in managing the mainland island.

It would be valuable if Greater Wellington staff working in the advocacy field developed a brief strategy for the project identifying the target audiences, the methods to reach them and the key messages to share. Such a strategy is all the more important as the site will generally not be accessible.

One message, stated earlier, is for Greater Wellington taking a lead on conservation on its own land and looking to improve the situation not just maintain the status quo.

The site should become its own advocate over time as visitors see the improvements in the health of the forest and its wildlife. The reintroduction of iconic species such as kiwi and kokako would obviously provide major opportunities for advocacy in the future. Reports and press releases that pick up on monitoring results, e.g. increases in birds counted, will be important from the outset. The aim will be to promote the benefits and gains being achieved not build public expectations of access to the site. Such reports could also include other projects involving bio-security staff working on Council or private land.

Education (below) can be considered an important part of advocacy because restoration is a long-term activity and will depend on the next generation to continue the work started now.

12.2 Education

Greater Wellington currently has a school-based environmental education programme. This includes *'Take Action for Water'*, a four week teaching programme to help 8-12 year olds understand and care for freshwater in the Wellington region.

Some local primary schools undertake their stream studies within this programme in the Recreation Area, comparing the healthy aquatic ecosystem found there with a more polluted site downstream.

Classes also do an introduction to plants on a bush walk at the site (Sledge Track) as part of learning to understand biodiversity and harakeke (flax) planting projects have been done in the past. Some funds were put into the site office as a potential classroom.

The opportunities that the mainland island project provides for education need to be looked at in detail along with Greater Wellington staff involved with this area of work. The focus of education should be the Recreation Area where schools can visit to gain understanding of the mainland island and also get physically involved in some of the restoration work, e.g. monitoring rodents there with tracking tunnels. The project ties closely in with one theme of the Council's education programmes, giving the pupils the understanding that they can take action and responsibility, i.e. 'this is your world – you can do something about it.' The mainland island also aims at maintaining or restoring ecosystem function which is another programme theme, explaining how the ecosystem works and what nature provides.

12.3 Research

Currently there is no intention to devote significant project funds to research. As mentioned earlier, the project will make full use of findings made

elsewhere on the interactions between pests and native species rather than repeat such studies. The site is not also appropriate for trialling of pest control techniques because of the emphasis on water collection which restricts the use of toxins and mitigates against large teams of people working within the site.

Liaison will be maintained with research providers (e.g. Victoria University) to identify opportunities for them to carry out research within the site. The following have been identified as possible projects or criteria to be used to determine priorities:

- Continuing studies of the land snail *Wainui urnula*
- Studies on the management of a core of intensive pest control within a wider landscape
- Studies to increase understanding of the links between ecosystem health and clean water
- Studies for which the site provides a unique opportunity to learn something new.

Greater Wellington will continue to receive proposals which will be considered by the Technical Group and the Steering Committee. As is a matter of course, permission for entry will be requested from the Water Supply Department.

13. Recreation area

The Recreation Area is a separate entity to the WCA and MI and will be the subject of its management plan. However some comments are included here because of the potential for it to act as a focus for public interest in the MI.

A draft Concept Plan for the Wainuiomata Recreation Area was completed in February 2002 (Figure 6) and funding for development was provisionally earmarked for 2006/07 but not confirmed. This plan takes advantage of a planned decommissioning of the Lower Dam and lowering of its associated spillway (due in May 2007). A significant area of wetland will be developed behind the dam and some excavation work has been undertaken for this including the formation of islands.

The potential for increased use of this area for education and advocacy has already been mentioned. A plan for pest animal control within and adjacent to the Recreation Area needs development as resources allow. Extending trapping and poisoning grids should increase the native birdlife that visitors will encounter in the area. It would also allow sightings of rarer species as they become introduced to the mainland island, providing people a chance to experience the elements of a 'restored' forest without pressure to enter the WCA itself. Finally there could be opportunities to introduce wetland species such as brown teal or pateke.

14. Project administration and reporting

14.1 Staffing

The project currently relies significantly on cooperation between different divisions of Greater Wellington. While this has benefits in fostering closer working relationships, it creates difficulties when it comes to organising tasks and assigning responsibilities. Very few staff members have hours specifically dedicated to mainland island work.

It would be beneficial if a position was created as a Mainland Island Coordinator to provide full-time oversight and coordination of the project. Given the current pattern of funding (Section 5) the 2008/09 financial year may be the earliest that this position could be created unless other sources can be found. An annual work plan would be developed to identify the other staff involved and their responsibilities, and they would have the necessary time prescribed in their job descriptions.

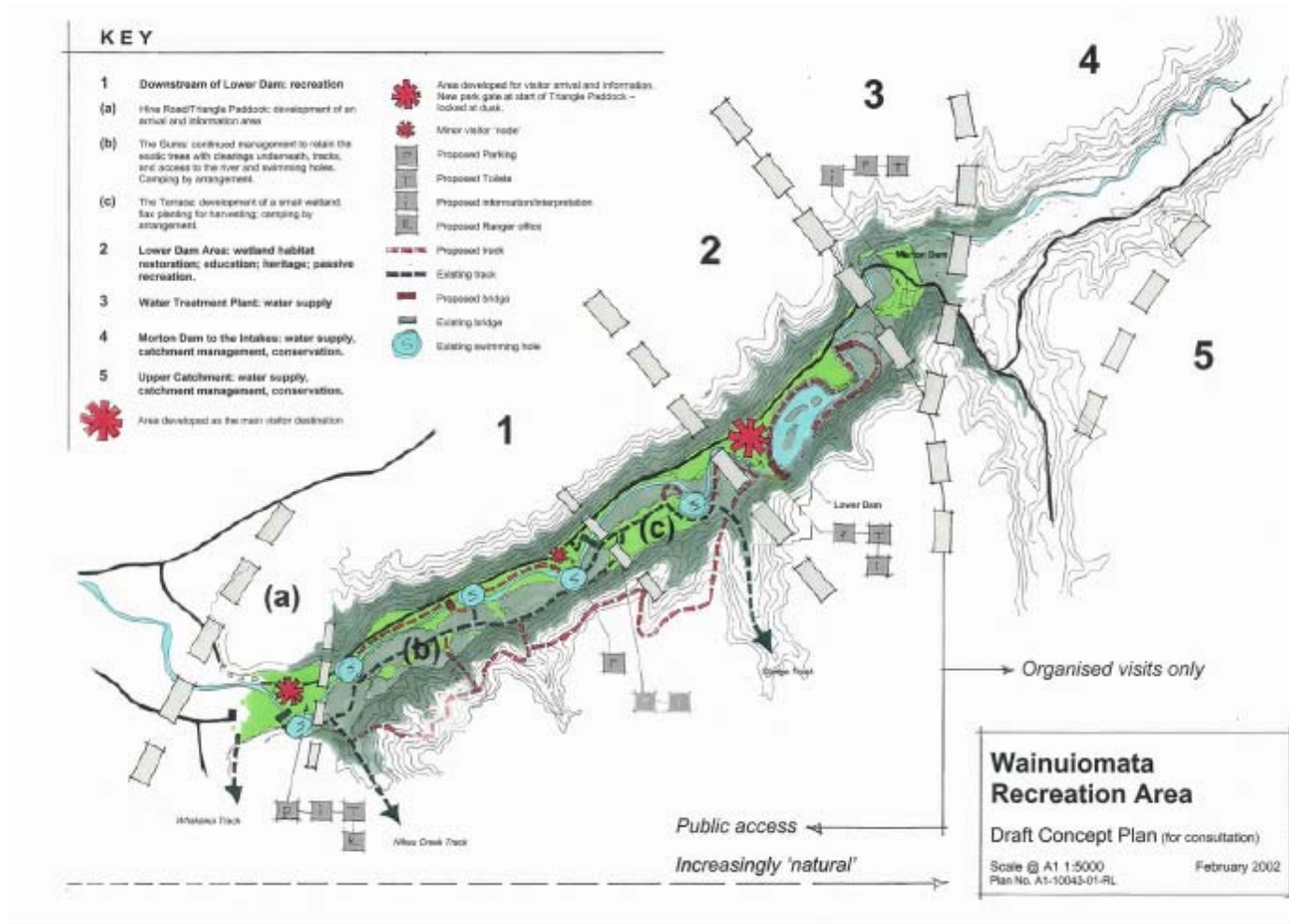


Figure 6: Draft concept plan for the Wainuiomata Recreation Area

Some of the project tasks such as the periodic fills of the rodent bait stations could be assigned to contractors or even volunteers. Possible disadvantages of this are that there might be new people each time who would take longer to do the task, get lost, require a lot more supervision and auditing, and also not collect the same casual observations that someone familiar with the site would note. Cross-divisional relationships and training opportunities for a range of staff would also be lost.

14.2 Committees and decision-making

The management of the mainland island is based on two staff committees.

A Mainland Island Steering Committee made up of representatives of Water Supply, Parks & Forests, Environment Management and Catchment Management is the main decision-making forum for the project.

A Mainland Island Technical Group consisting of Parks & Forests and Biosecurity Department representatives oversee the technical side of the project and make recommendations which go up to the Steering Group if a decision is required.

The Steering Committee ensures that the interests of the Water Division are represented when the management of the mainland island is being discussed. There is not currently a system in place to ensure that the reverse occurs, i.e. to allow the interests of the mainland island to be formally considered when decisions are made about the WCA.

The Council is currently considering a mechanism to deal with such issues. It may be possible that the Biodiversity Coordinating Committee Group could perform a function in this regard.

14.3 Reporting

Currently Parks produce 3-monthly reports for the WCA. It is suggested that separate mainland island reports are produced on the same schedule.

An Annual Report should be produced on the mainland island detailing the work undertaken and the results obtained from monitoring. This would be used for advocacy both within Greater Wellington and outside.

An Annual Operational Plan should also be produced containing targets and detailed protocols for all the pest control and monitoring activities to achieve these. Once this is done for the first time, it becomes a relatively simple task to update it each year as many of the protocols are unlikely to change significantly.

This Strategic Plan will need to be subject to review. It has been written with a ten-year timeframe ending in 2016 so clearly would need review in 2015. However funding is currently only approved through to the 2008/09 financial year. It is hoped that increased funding may be available in subsequent years, but there may be a need to review this plan in 2009 to match the funding approved at that point.

14.4 Linkages

There will be benefits in project staff maintaining linkages with other restoration projects both within the region and nationally, to share issues and solutions. There is a huge amount of such work being undertaken nationally at present so that techniques are continually being refined and new approaches developed.

An informal group known as ‘Sanctuaries of New Zealand’ is under development with some support from Landcare Research within a Foundation for Research, Science & Technology-funded project, and membership of this group should be considered.

15. Future issues

15.1 Future directions

The biodiversity benefits of a project like this depend on some key elements:

1. The consistency of the pest control regime
2. The intensity of this regime
3. The area over which the regime operates.

A number of projects around the country are exploring these issues and their results could influence future directions at Wainuiomata.

Most projects do not maintain a consistent approach throughout the year but, for example, reduce the frequency with which traps are checked in winter when fewer target animals are present. However a more cost-effective approach may be to vary the effort significantly from year to year, pulsing the control effort to coincide with known or anticipated times of peak pest abundance. This can be particularly appropriate in beech forests or others in which rodent numbers largely fluctuate in relation to the mast seeding or fruiting of certain tree species.

In general the more intensive the regime and the larger area it covers the greater the benefits. Clearly there are opportunities to extend the mainland island at this site - taking in the non-treatment area would be one example which would have the advantage of providing data before and after management. Increasing the intensity of the regime reducing given pests to even lower levels does allow for the re-introduction of increasingly vulnerable native species. There is a particular opportunity within the WCA to explore ways of managing a site through the use of one or more cores of intensive effort, surrounded by areas of less intensive effort.

15.2 Modifying the deer fence

It has been suggested that the ungulate fence on the northern, north-western boundaries of the site could be further developed. The length of it could be increased to surround more of the WCA or the mainland island within it, and it could be modified to exclude further pests. Either option would require significant further funding. The site is also very exposed to wind and salt spray so there could be difficulties with any modifications, e.g. a finer mesh or solid metal band to exclude rodents.

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This plan was drafted by Dr David J. Butler of David Butler Associates Ltd.

Annex 1: Justification

1. Summary of process

The concept of Greater Wellington developing a Mainland Island on land it owns has had quite a long history as set out below. The process of its development has been a robust one. Following initial support from Councillors for the concept, a detailed investigation was done of different site options, advice was obtained from the Department of Conservation (DOC) which had developed several MI's nationally, and a preferred option of Wainuiomata submitted and approved.

1.1 Key milestones

Prior to 1999 – Idea discussed among staff for several years

April 2001 – Concept put to Councillors at Biodiversity Workshop – general support

Mid-2001 – Biodiversity Co-ordinating Group established a sub-committee to look at site options

May-2002 – MI workshop held for staff and councillors – discussed options – Alan Saunders (DOC) guest speaker

Aug 2002 – Long Term Council Community Plan (LTCCP) workshop – preferred option of Wainuiomata accepted

July 2003 – Funding provided through 2003-2013 LTCCP

1.2 History of biodiversity loss

The Wellington Region has lost 72% of its original forest cover to agriculture, horticulture, settlements, roads and railways. A much higher proportion of lowland forest has gone and what remains is found in many scattered remnants. This loss of habitat coupled with the spread of introduced mammalian predators and competitors has led to the familiar pattern of species loss, particularly well documented in the case of birds. A range of species such as kokako, saddleback, weka and stitchbird are now restricted to fenced sanctuaries or offshore islands, and a further range including kaka are heading in the same direction unless action is taken.

1.3 Feasibility of restoring mainland forest ecosystems

The past twenty or so years has seen the rapid development of techniques that allow for the declines in biodiversity in mainland forests to be halted or reversed, largely by the control of introduced mammals. Techniques are now available to reduce possums, rats and stoats to low enough numbers over large enough areas for their impacts on native fauna to be minimised. They can even be removed altogether by eradication from within fully pest-proof fenced sites like Karori Sanctuary.

Pest control is expensive and ongoing and there are insufficient resources to apply this across all the forests of the region. It is thus necessary to rank sites and determine the intensity of control that will be applied to each. Halting the declines of the species remaining in the forests requires significant effort, but reversing these, i.e. bringing back those more vulnerable species that have been lost from an area, requires a great deal more.

1.4 Ranking of sites

A Key Native Ecosystem programme (KNE) was introduced in Wellington in 1996 under the Regional Pest Management Strategy operable at that time. This was later refocused using new criteria with the involvement of Landcare Research & DOC and ranked 7000 forest remnants according to distinctiveness, importance, natural character and size among others. Several forest areas owned by Greater Wellington ranked highest in this analysis and the Wainuiomata catchment was the best of the best.

It was decided to put more effort into higher value KNE's including integrated pest management there. One site, a mainland island (also referred to as a 'Super KNE') would be identified to receive the highest levels of pest control and thus contribute significantly to the goal of improving biodiversity on GW land. Five options were considered: Kaitoke Regional Park, Wainuiomata – Orongorongo WCA's, East Harbour Regional Park, Hutt Catchment, and Akatarawa Forest. The Wainuiomata – Orongorongo WCA was preferred and within this c1000ha within the Wainuiomata catchment chosen based on:

- its high biodiversity values (old forest)
- secure tenure
- pest control underway and plans being developed for an ungulate-proof fence on part of the boundary
- access manageable to create a 'special place' experience.

Alterations of the boundaries of the site for logistical reasons have led to the MI being finalised as an area of 1200ha.

Annex 2: Site description

1. Climate

Rainfall varies from 1952mm at the Wainuiomata intake to over 4000mm in the headwaters of the Orongorongo River. Summer temperatures average 16°C but can approach 30°C at some sites occasionally.

The river valleys in the site face due south and are thus sheltered from the prevailing northwesterly winds. Winter frosts are thus regular and southerly storms with winds gusting to 160km/hour are not unusual. (Source: AMP). Snow is also not uncommon and can make access difficult in the upper parts of the WCA for days at a time.

Heavy salt deposition can occur due to strong winds over long periods particularly around the equinoxes.

2. Geology and Soils

Figures 7 and 8 show the geology and soils of the WCA and serve to emphasise the differences between the Wainuiomata and Orongorongo Catchments.

3. Ecological values

The W/O WCA is part of the Tararua Ecological District, which covers the Akatarawa, Tararua and Rimutaka Ranges. It is characterised by the steep, dissected greywacke and argillite hills, high rainfall and strong westerly winds (McEwen, 1987).

Six environments of the most detailed LENZ¹ classification level are found in the Wainuiomata water collection area (Figure 9). The bulk of the catchment falls into the 'central hill country' and 'central mountains' classifications. One environment of conservation concern² is found in the Wainuiomata WCA including parts of the MI. This environment only occurs in the Wellington region and just 20% is left under natural cover (around 350ha). It is found on the terraces along the Wainuiomata River and its protection has been defined as of high importance.

4. Vegetation and flora

Figure 10 shows the main forest types within the WCA based on field mapping using a recently-developed protocol (Pacific Eco-Logic 2006).

The Wainuiomata catchment contains one of the largest areas of un-logged lowland podocarp forest in the lower North Island and it is regarded as being

¹ Land Environments New Zealand (LENZ) is an environmental classification system that groups together sites with similar environmental conditions based on factors like landform and climate. It defines a large number of such 'environments', at different levels of classification, which are expected to support similar groups of plants and animals, provided they have not been substantially modified by human activity. (For further information visit www.landcareresearch.co.nz).

² H1.2d – a particular environment within H1.2, recent well-drained soils of low fertility from mixed alluvium, mild temperatures found in undulating hills in Taupo and the Wairarapa. (Ministry for the Environment, 2002).

nationally representative of this forest type (BRWR, 1984). The age and stature of the rimu and matai dominants present in the valley is noteworthy and various surveys and ranking systems have highlighted the importance of the ecological values of this area. Contiguous with the Rimutaka Forest Park the water collection area forms one of the largest tracts of forest in the lower North Island - only the Tararua Forest is larger.

On the valley floors in both the Wainuiomata and Orongorongo catchments, the podocarp forest is composed of rimu, miro, matai and rata towering over a canopy of kamahi, hinau, rewarewa and maire. Closer to the waterways in the Wainuiomata catchment, the forest also contains matai, kahikatea and tawa. As altitude increases, the podocarp forest grades into a beech community. Around 500m, silver beech becomes dominant over a canopy of kamahi, miro, Hall's totara and hinau. In some areas of the Wainuiomata catchment, black and hard beech are the dominant species. Above 600m in both catchments, silver beech forest becomes predominant. One notable element of the flora is *Metrosideros robusta* (northern rata) which is the dominant emergent in the eastern Wainuiomata. This is not nationally or regionally threatened but of importance as a keystone species in the forests of the lower North Island. *Raukawa edgerlyi* and *Brachyglottis kirkii* - very sparse species in the region - also occur in small numbers in this forest.

The first official botanical survey was completed in 2002 (Mitalfe & Horne, 2002). These botanists noted the substantial area of un-logged forest, as well as the great age, height and girth of many of the dominant tree species. The abundance and size of the epiphytes, especially in the Wainuiomata catchment was highlighted. On one traverse, 57 fern and allied species were recorded. This represents almost a third of the New Zealand fern and allied species flora. A moss survey of the Wainuiomata & Orongorongo WCA has been underway for the past two years. Peter Beveridge has collected 185 moss species from the area, 63 of which had not previously been recorded in the southern Tararua District. One species, *Zygodon gracillimus*, recorded four times so far in the catchment, is a new record for the Wellington land district (the area south of Lake Taupo). Other rare moss species are *Rhaphidorrhynchium leucocytus*, *Racomitrium curiosissimum* and *Isopterygium limatum*.

5. Wetlands

Two wetlands are present in the Wainuiomata/Orongorongo WCA. The upper Orongorongo valley contains the only montane-alluvial wetland in the region. It is the most pristine wetland in the region of any significant size and has been mapped as two areas of Fen wetland in a recent survey (Spearpoint, 2003). Key species include the regionally rare sedge *Baumea sp.* along with *Gahnia* (*Gahnia xanthocarpa*) and a sparse shrubland of manuka (*Leptospermum scoparium*). The second wetland is a manuka fen in Skull Gully. Dominant species present include kahikatea, swamp coprosma and *Carex secta*. There are also two wetlands in the Wainuiomata Recreation Area. These are the old Wainuiomata Dam and a small sedge/flax wetland in Sledge Gully.

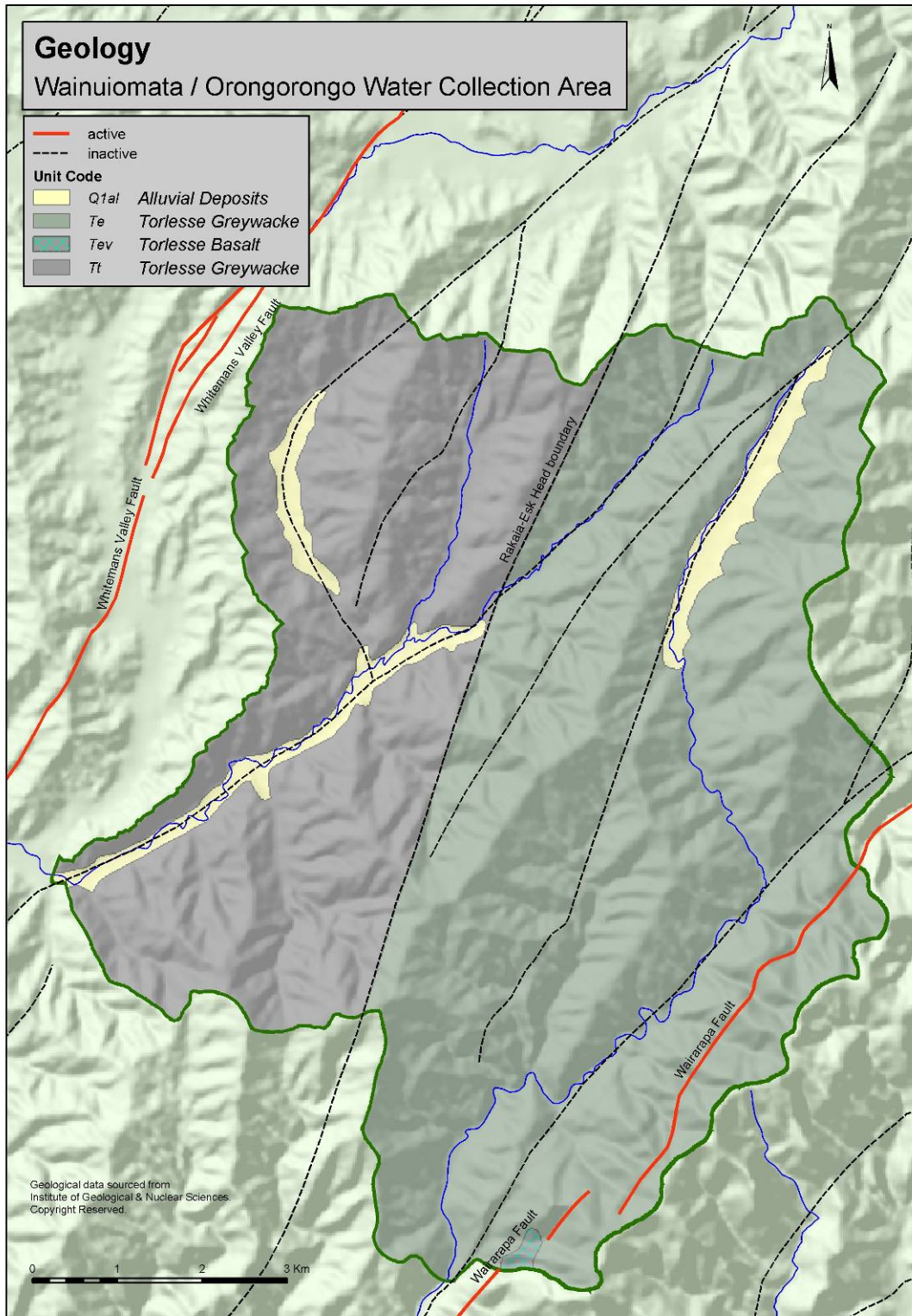


Figure 7: Wainuiomata/Orongorongo water collection area geology

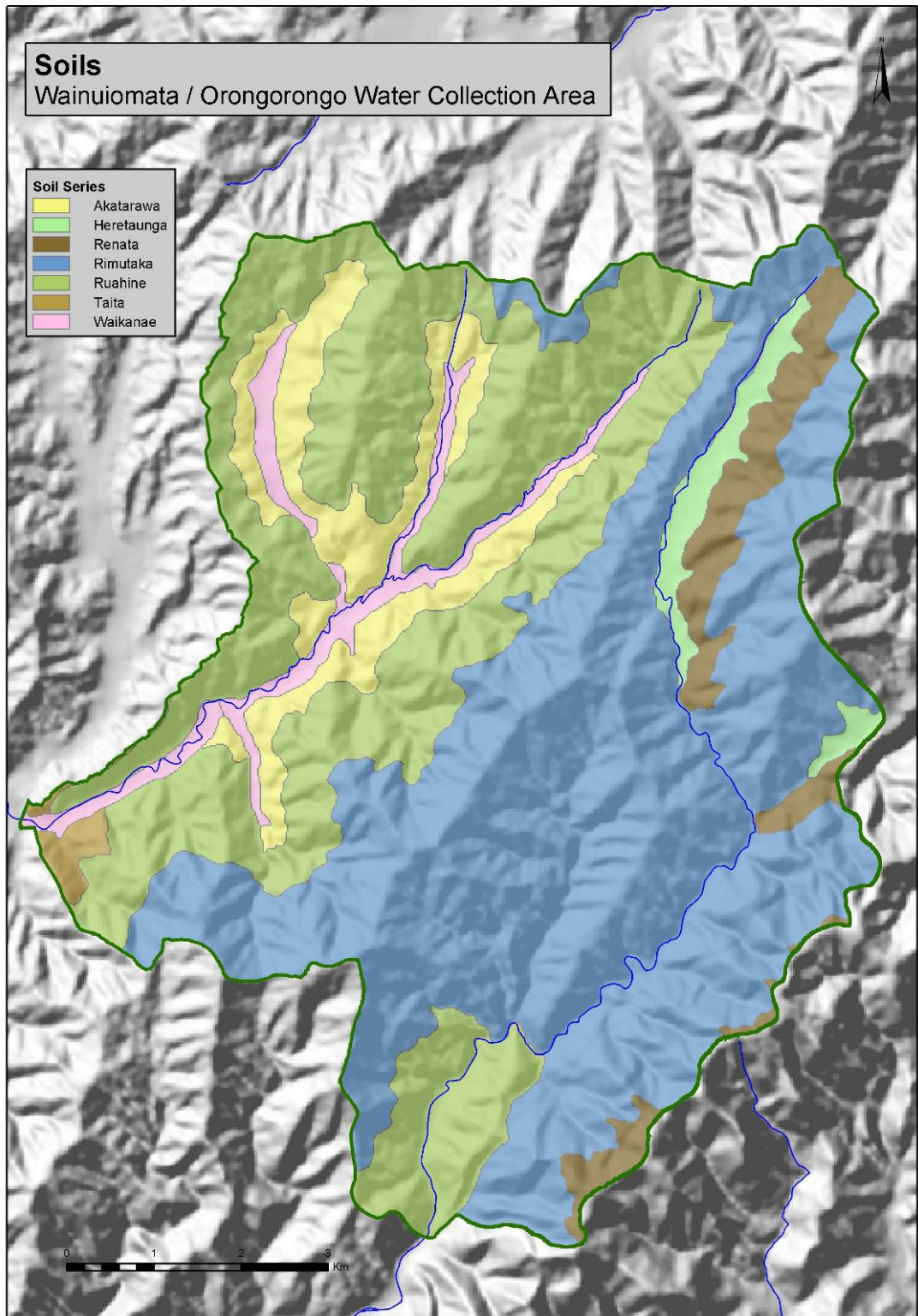


Figure 8: Wainuiomata/Orongorongo water collection area soils

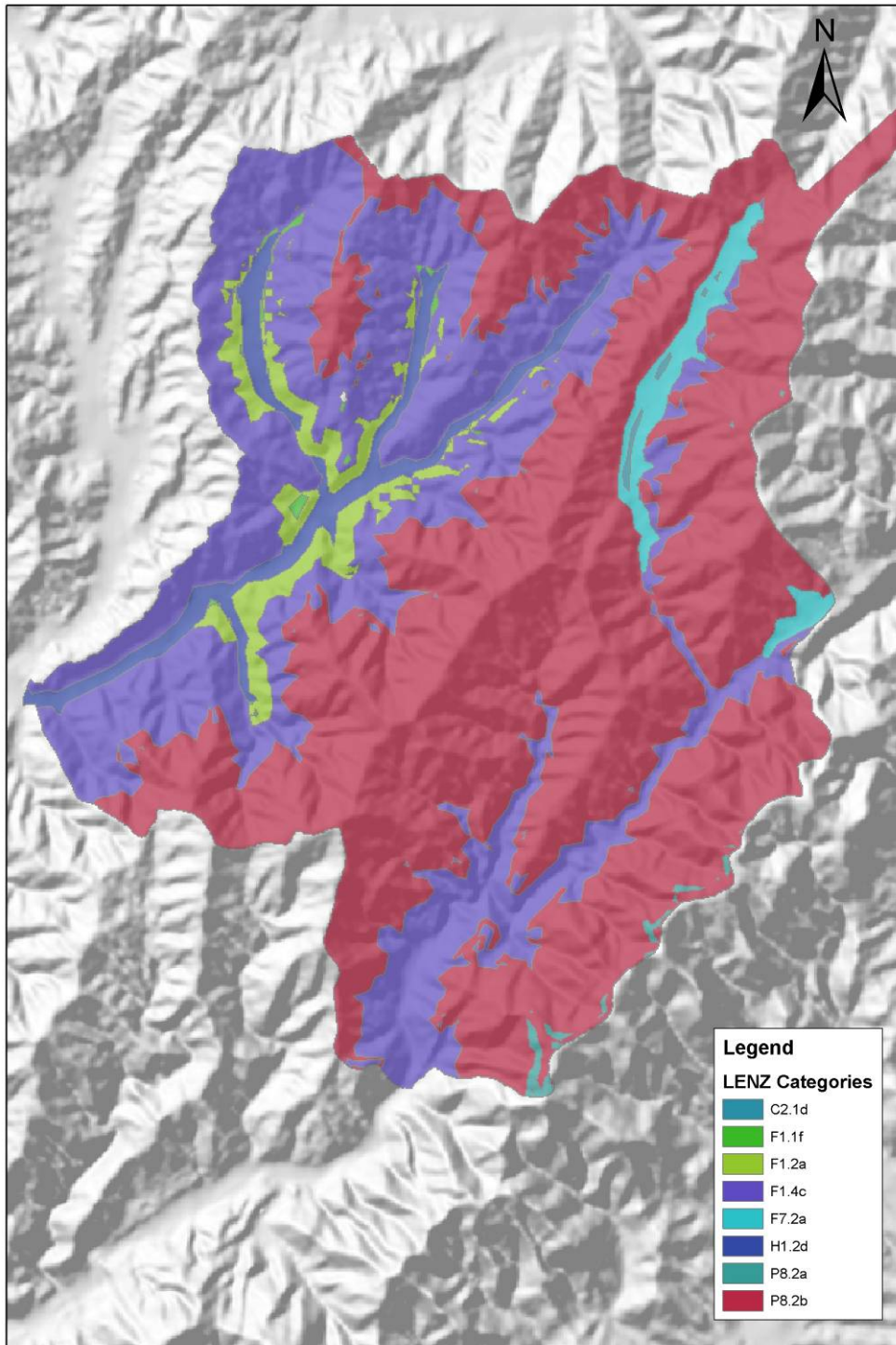


Figure 9: Wainuiomata/Orongorongo water collection area Land Environments of New Zealand categories

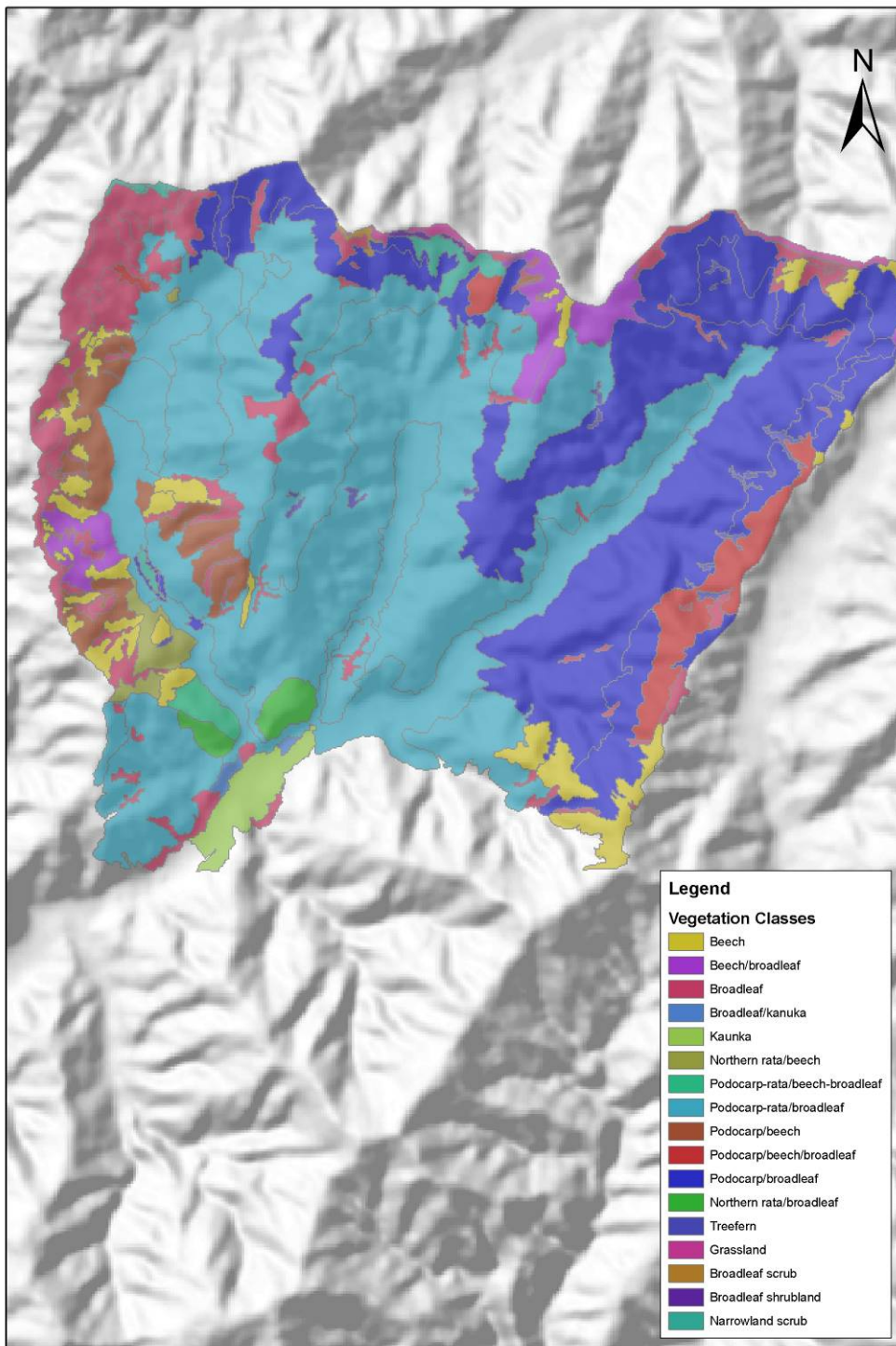


Figure 10: Vegetation classes in the Wainuiomata catchment – Primary division

6. Fauna

The Wainuiomata/Orongorongo WCA is part of a large tract of forest which is a significant refuge for the region's native bird species. The whole of the Rimutaka Range which includes this WCA is regarded as a high value forested site and a site of special wildlife interest (Parrish, 1984). Detailed ecological studies of native fauna were carried out by Landcare Research in the lower Orongorongo catchment (outside the water collection area) over many years (Brockie, 1992).

6.1 Birds

Twenty bird species have been recorded in the WCA since annual bird monitoring began in 1999 (Table 3), 16 native and four introduced.

Table 3: Birds recorded in the Wainuiomata/Orongorongo Water Collection Area

Species	Native (N) or Introduced (I)	Threatened Status of Native Species*
NZ Falcon	N	Nationally vulnerable
Yellow-crowned parakeet - kakariki	N	Gradual Decline
NZ Pigeon – kereru	N	Gradual Decline
Long-tailed cuckoo	N	Gradual Decline
Tui	N	Not threatened
Tomtit, North Island	N	Not threatened
Rifleman	N	Not threatened
Shining Cuckoo	N	Not threatened
Grey Warbler	N	Not threatened
Fantail	N	Not threatened
Bellbird	N	Not threatened
Whitehead	N	Not threatened
Silvereye	N	Not threatened
Kingfisher	N	Not threatened
Black shag	N	Not threatened
Paradise duck	N	Not threatened
Rosella – <i>Platycercus eximius</i>	I	
Blackbird	I	
Chaffinch	I	
Song Thrush	I	

* Source: Department of Conservation (2002).

The highest bird densities on Greater Wellington land have been recorded in this water collection area. The most common birds seen or heard are tui, tomtit and grey warblers with an average density of 2-3 birds per hectare and fantail, rifleman and kereru are also reasonably common.

A noticeable increase in native bird numbers was seen in 2000 after a 1080 operation was completed in 1999. The greatest increases were seen in grey warbler, rifleman, shining cuckoo, tomtit and tui numbers. As rat numbers have built up again, bird numbers have been declining over time.

6.2 Freshwater fish

Surveys have been carried out at a variety of sites within the WCA by a number of organisations including Greater Wellington (NIWA; Wellington Fish & Game, 1996; Joy & Death, 2002). Small populations of a number of species have been identified including the shortjawed kokopu. This species is classified as being in gradual decline.

Nine species of fish occur in the Wainuiomata catchment and twelve in the Orongorongo (Strickland & Quarterman, 2001). The Orongorongo catchment is an important area for fish conservation as it is almost entirely unmodified, though the intake dam has been shown to limit the movement of all but two species within the catchment (Joy & Death, 2002) - koaro and longfinned eel are both able to climb up its damp surfaces.

Redfin, bluegill and common bullies have frequently been found in the Wainuiomata river system south of the Water Collection Area and redfin and bluegill bullies have been found at the Orongorongo River mouth. Many of these records date back to the 1960's and recent surveys found only redfin bully in the Orongorongo and no bullies in the upper reaches of the Wainuiomata.

There is a nationally significant population of dwarf galaxids (*Galaxias divergens*) upstream of the Morton Dam. The Department of Conservation has advised against the construction of a fish passage at the Lower Dam to safeguard the dwarf galaxid population (Greenfield, 2004).

6.3 Reptiles

Two species of arboreal gecko have been identified in the Orongorongo forest in Brockie (1992) and are likely to be living in the WCA, the green gecko (*Nautilis elegans*) and the forest gecko (*Hoplodactylus* sp.). Forest dwelling skinks: brown (*Oligosoma nigriplantare*) and copper skink (*Cyclodina aenea*) are also thought to be present. No lizard surveys have been completed in the WCA itself.

6.4 Invertebrates

The snail species *Wainui urnula* has been studied in the Wainuiomata catchment. Densities of 30 snails per 100m² were found in the litter layer in 1990 (Bokeloh, 1990). An invertebrate study of the Orongorongo swamp was

completed by Victoria University students in 2001, while a Masters student sampled moth fauna in the same year. Other studies completed include aquatic invertebrate sampling as part of water quality measurements (Penny, 1976). A diverse and abundant fauna dominated by *Potamopyrgus antipodarum*, Chironomidae and Deleatidium and including a large variety of Trichoptera was present in the catchment.

In the nearby Orongorongo research area, leaf litter from rata-rimu forest was found to contain 91 invertebrate species, while 81 species were recorded in upland beech litter (Brockie, 1992). Many species of weta, butterflies, dragonflies, moths, cicadas, earthworms and spiders were also noted in that study.