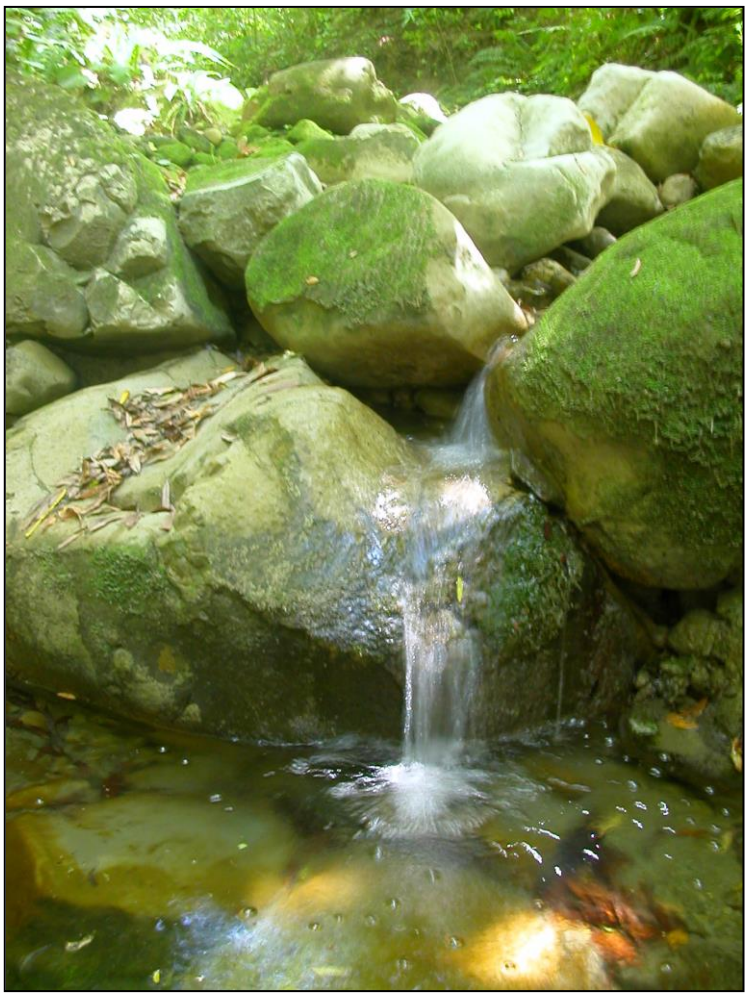
April 2014

Longbush Reserve Habitat Restoration



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1.0 Introduction

It is estimated that New Zealand broke away from the Gondwana super-continent approximately 80 million years ago. New Zealand's isolation produced a vast number of endemic species which evolved into their own complex ecological relationships, processes and niches. These unique ecosystems existed for many millennia prior to human occupation, undisturbed and evolving in the absence of large predatory, terrestrial mammals.

Prior to human arrival, the Waimata Valley would have been fully forested, the slopes cloaked with dense semi-coastal forest, with black beech and northern rata on the hills. Pukatea, kohekohe, puriri, tawa, rewarewa and karaka dominated the lower hill slopes. The sub-canopy and shrub layers are likely to have included dense stands of nikau, *Coprosma* and *Pseudopanax* species, mahoe, kiekie and supplejack with a variety of fern and orchid species present on the forest floor.

The wildlife on the Poverty Bay alluvial plains and surrounding foothills and valleys was extremely diverse prior to man's arrival. Several moa species were found in the region including *Dinornis novaezealandiae and Anomalopteryx didiformis (Huynen, Lissone, Sawyer, Lambert, 2006*). Moa bones are still regularly found in swamps and on Poverty Bay headlands. Other species such as Haast's eagle and a flightless goose were recorded by early Maori (Mackay 1966).

Fig 3: Grey faced petrel at Nicks Head Station, Kiwi and weka at Motu, Gisborne (*Photos: Ecoworks NZ Ltd*.)

Brown kiwi (*Apteryx australis*), kaka (*Nestor meriodonalis*), kakapo (*Strigops hibroptilus*), huia (*Heteralocha acutirostris*), kokako (*Calleaus cineria wilsoni*), weka (*Gallirallus australis*) and a wide range of bush birds were common.

On the headlands and coastal areas tuatara and a diverse range of gecko and skink species were abundant, and millions of petrels (*Pterodroma spp*.) and shearwaters (*Puffinus spp.)* flew inland each night to nesting burrows, in turn fertilising the forest with guano.

The forest at night was extremely noisy, and alive with birds, reptiles and macro invertebrates such as tree and cave weta. Today's critically endangered plants, such as kakabeak (*Clianthus puniceus)*, William's broom (*Carmichaelia williamsii*), Cook's scurvy grass *(Lepidium olearaceum*) and *Plantago picta* were likely to have been abundant with a lack of mammalian browsers present.

Figure 4: Over 200 moa bones recently excavated from a wetland in Gisborne. The find included the largest moa ever to have lived, *Dinornis novaezealandia* which stood over 3.5 metres tall (*Photo: Ecoworks NZ Ltd*.)

With the arrival of early Maori in 1200-1300 A.D came the kiore or Pacific rat (*Rattus exulans)* and the kuri (dog). When Europeans arrived they brought a vast range of mammalian predators and browsers such as stoats (*Mustela erminea*), ferrets (*Mustela furo*), possums (*Trichosurus velpecula*), goats (*Capra hircus*), pigs (*Sus scrofa*), cats (*Felis catus*), Norway (*Rattus norvegicus*) and ship rats (*rattus rattus*), hedgehogs (*Erinaceus europaeus occidentalis)* and mice (*Mus muscalus*). New Zealand's wildlife had not evolved to cope with mammalian predators and many species became locally extinct by the 1930's in Poverty Bay; mainly as a result of predation and the loss of forest, wetland and coastal habitat.

Early Maori and later European settlers cleared much of the original forest cover for cropping and living space. Maori settlers introduced the kuri (dog) and kiore (pacific rat). European settlers followed with a wide range of mammalian pest species, including ferrets, stoats and weasels (mustelids), possums, cats, ship and Norway rats, house mice and hedgehogs. Such predatory mammals, which were introduced during the late 18th and early 19th centuries, would have devastated much of the indigenous fauna.

From 1910-1930, introduced predator populations became established in all corners of the New Zealand mainland and many species such as titi, kiwi, huia and piopio became extinct or headed for either total or local extinction from the Gisborne Region. Titi (grey-faced petrel) were last recorded on Te Kuri (Young Nicks Head) and at Waiherere about 1930. Anecdotal evidence from Urutawa Forest indicates that huia were still present up until the 1930's. Some of the last confirmed moa sightings were recorded in Gisborne.

Intensive bush felling began in the Poverty Bay District during 1880, reaching its peak between 1890 and 1910 (*PNA Survey Report*, *Turanga Ecological District*, Dept of Conservation, 1991).

Today less than 1% of the original indigenous forest remains in Poverty Bay and over 50 species of wildlife have become extinct; a sad record after only 126 years of intensive development and modernization in Poverty Bay. In just a few seconds on the geological time scale this landscape was transformed from a diverse, unique and ancient ecosystem to a landscape uninhabitable for many endemic wildlife species.

Project Rationale and Objectives

Longbush Ecosanctuary is regarded as an 'Ark' for endemic wildlife in the Poverty Bay Region. It currently holds a greater species diversity and density than any other forest area in the region.

It is located at the southern end of the Waimata Valley, just 8 km north-west of Gisborne city. It lies within the Waiapu Ecological District in the East Coast Ecological Region, and covers an area of c. 120 ha.

Despite human modification, the biodiversity values of the Longbush/Waikereru area are still very high, and regionally significant.

In 2005 Longbush Reserve was recognised as a Priority 1 RAP (recommended area for protection) by the Department of Conservation. Conservation action is a high priority at Longbush/Waikereru as many of the species present are classified as threatened with Category A, B or C rankings (Tisdall 1994).

It is vital that the investment in pest and weed control in this ecologically significant, diverse site is maintained, so that the recovery of its ecosystems can continue into the future.

The Longbush Ecosystem Restoration Project has a number of objectives, these are:

1) To restore and enhance the largest area of fully protected indigenous forest in Poverty Bay (113 ha).

2) To protect and enhance threatened endemic wildlife populations within Longbush Reserve, i.e. grey, forest and green gecko, NZ falcon, long tailed bat, Auckland tree weta, kereru, bellbird.

3) To protect and restore the botanical diversity of the site by controlling all vertebrate pests and eradicating all invasive weed threats. Also to provide a protected environment suitable for the re-introduction of threatened East Coast plant species, i.e. Cook's scurvy grass, Williams broom and kowhai-ngutu-kaka

4) To re-create a pristine indigenous forest environment representative of an ecosystem which would have occurred at this site over 800 years ago.

5) To extend the area of available habitat for threatened species by re-planting and retiring the hill country surrounding Longbush Reserve, and to work with community groups, the Department of Conservation and other Private Landowners to re-introduce locally extinct species such as North Island robin, weka, brown kiwi and rifleman.

6) To provide a pristine, semi-coastal forest environment for schools and other educational institutions to encourage and foster environmental education activities in the Tairawhiti Region.

7) To protect all archaeological sites at Longbush through the control of invasive weed species and a suitable stock grazing regime.

During April 2003, Ecoworks NZ Ltd. was asked to instigate a pest control programme within Longbush Reserve. A control programme was immediately established targeting all invasive weed species and the suite of predatory mammals at Longbush. Best practice trap design and spacing methodology was utilised at this site in an effort to protect all extant endemic species, including weta, reptiles and forest bird species.

This control methodology is described in detail within this document and specific control lines are illustrated in Appendix 1.0. Ecoworks NZ Ltd. maintains a close

relationship with the Department of Conservation and other pest control agencies to ensure that efficient and best practice control methods are utilised on a cost effective and sustainable basis.

A kill trap regime is in place at Longbush. Because of the long and narrow shape of Longbush, the reserve receives a relatively high level of re-invasion from possums, feral cats, mustelids and rats. This is can be seen from the trap catch results (refer Appendix 3.0).
The current regime will be ongoing and is complemented with night shooting to maintain low hare and rabbit numbers in the area to protect native plantings. Night shooting also acts as an indicator of possum abundance within Longbush Reserve.

This control programme has been extremely effective to date. Auckland tree weta numbers appear to be extremely high. Most artificial weta roosts are full. No possum bark scratching or ring barking has been detected for over two years. Kohekohe have fruited prolifically during the last three summers and the density and distribution of *Gastrodia* orchids has increased by 300% since 2003. This is a good indicator species as the tubers are a preferred target food species for rats and possums.

Some of the wildlife found at Longbush Reserve, Clockwise, grey gecko, green tree gecko, tree weta, rewarewa flower.

2.0 Mustelid Control (ferret, Stoat, Weasel)

Mustelids are major predators of wildlife in New Zealand. Their prey includes invertebrates, reptiles, native fish, birds and even our endemic bat species. Stoats in particular are the primary predator of juvenile kiwi and other ground nesting bird species. They can range hundreds of kilometres during their lifetime and populations can grow to 'plague' proportions following beech mast and mouse population increases.

Stoats can swim over 900 metres, climb into mature forest canopy and are quick enough to catch rabbits. They are aggressive and determined predators.

All three species of mustelid are present at Longbush. Because mustelids are so secretive the trapping programme must be established using an effective and recognised methodology and traps must remain in place over the long term. Unlike other vertebrate pest species traps can't be moved to specific sites to target an individual animal which has been observed. If trap lines are set up well initially, at the correct spacing and locations then this will effectively control mustelids throughout the whole farm.

Trap catch rates will generally peak during December and January when juveniles are dispersing. Female mustelids in New Zealand breed from September onward. They will give birth to one litter of 4-9 offspring per annum. The females within the litter are impregnated by a male prior to leaving the nest. Therefore mustelid populations (particularly stoats) increase rapidly. During the following autumn and into early winter 90% of the year's offspring will die. Catch rates will generally slow during March with another rise in late April-May with hungry animals due to a reduction in invertebrate and rodent availability. Catch rates will slowly tail off over winter and begin to climb again during September the following year.

2.1 Trap Type

At this stage the most effective control method for use on all species of mustelids is the 'DOC 200' kill trap. Two traps (double set) are placed in the centre of a wooden tunnel and baited with a single, holed hen's egg. Number six Fenn traps are an effective alternative however are considerably more expensive and have generally been replaced with the DOC 150, 200 and 250 traps during the last three years.

2.2 Wooden Set

The set is a wooden tunnel 600mm in length. It is constructed of treated H3 radiata pine. Both 200 x 25mm for the sides and 250 x 25mm rough sawn H3 for the base. The box is screwed together using square drive screws.

The lid is made of 17mm plywood and cut 600 x 250mm. A warning sign **must** be stencilled on the lid with black spray paint:

DANGER TRAPS
PLEASE DO NOT TOUCH
LONGBUSH RESERVE.

A plastic triangular track marker must also be screwed to the lid with the trap number on it. The lid is screwed at diagonally opposite corners with a square drive 40mm screw to prevent access to anyone other than the trapper.

2.3 Netting Hole size

In areas where wildlife requires protection, i.e. tuatara, kiwi, weka etc a double mesh screen is required. These screens also help direct mustelids onto the trap 'trip plates'. Twelve millimetre aviary mesh is stapled to each end of the tunnel and another cut is made 150mm inside the tunnel with a second mesh screen. Entrance holes are cut diagonally in each mesh screen to prevent the direct entry of wildlife which you are trying to protect. In sensitive areas a hole 50mm x 40mm will allow access to all mustelids (including ferrets) and keep out protected wildlife.

In areas where sensitive wildlife is not present larger holes can be cut up to 90 x 90mm to allow access for hedgehogs and large Norway Rats.

Fig 1: Weasel in a Fenn tunnel. Only one mesh screen is in place. Traps sitting square, tunnel floor is clear of debris and warning sign is present.

Where people are present a warning sign must be posted at entry points to the trapping block and the tunnels themselves should be attached to a tree or fence post with a chain and staple or coach bolt to prevent theft.

2.4 Trap and Tunnel Management

(1) Wooden tunnels must be set on a level surface. They must be firmly sitting on the ground.

(2) Trap lids must sit flat and firm. Buckled lids must be replaced.

(3) The traps must be set in the centre of the tunnel. They need to be placed on either side of the egg with springs on opposite sides of the tunnel (refer Fig 2). The traps must be positioned so that trap arms are 20mm away from the egg and sitting square in the box. Correct trap placement in the tunnel is vital when trapping stoats.

(4) A no.5 hen's egg is positioned dead centre of the tunnel. The egg sits in a 20mm hole drilled into a small piece of ply and screwed to

the floor of the tunnel. A hole is placed in the top end of the egg before it is placed into the trap tunnel (refer Fig 2). White hens eggs should be used if available. Eggs require changing every 2 weeks in summer and monthly in winter. During winter months alternate baiting should take place using salted rabbit meat.

Fig 2: Fenn Traps sitting square in a tunnel and placed 20 mm either side of the bait. Note- trap springs on opposite sides of tunnel.

(5) Trap tunnels need to be scraped clean of rat hair, hedgehog spines and other foreign matter, inside and out. Use a paint scrapper to clean the tunnel floor during <u>each</u> trap check.

(6) If using Fenn Traps the brass trap 'dog' and the hook must be lightly filed at least fortnightly so that they are free of corrosion and trip efficiently under the lightest touch, i.e. weasel.

(7) The tin trap plate must also be scraped clean both top and bottom removing built up grime. The trap plate hinges and underside must be checked and cleared of cobwebs and other debris so that it operates easily. If the trap plate is not sitting flush with the trap arms when set it will require modifying.

(8) Set all traps extremely finely and on the very tip of the brass dog so that the lightest touch from a weasel is enough to trigger and catch quickly and smoothly.

(9) Again, the tunnel must be clean and clear of debris including grass at the entrance way, rat hair, hedgehog spines etc. Traps need to be kept clean and free of unwanted debris allowing un-restricted access for mustelids and so that they can see an easy escape route at the opposite end of the tunnel.

If trapping in grassland use a 1% Round-up mix around the tunnel. Spray 600mm out from either end of the tunnel and a strip 200mm wide along the sides of the tunnel. This means grass will not inundate the trap between checks and the trap will look well presented.

2.5 <u>Trap Spacing and Placement</u>

Trap Tunnels need to be spaced at a distance of 200 metres. This can be measured with the motorbike odometer or by counting your steps. Sometimes trap tunnels are positioned closer than 200 metres to protect high value sites. Generally any less and it is inefficient and any more and female stoats and weasels can be missed because of their smaller territory.

Trap lines are run centrally along valley floors, preferably near a stream or down ridges and major spurs on hill country. Valley systems require only one line to

be run centrally along its floor even if a major river system is present. Small to moderate sized rivers and streams are no barrier or deterrent to the movement of mustelids.

Traps must be placed in accessible and visible locations. Visual and olfactory senses both play a role in attracting mustelids. It also means you can find the trap again. If valleys, ridges or spurs are not present then traps should be placed on forest edges, animal runs or stock tracks. These are natural routes which different animal species in the area will prefer to use. A good site to position tunnels is near log piles, stock or possum runs/trails, clay banks, or natural features which hold prey species or routes which mustelids and/or other animals may tend to use.

Trap tunnels must be free of grass and vegetation in and around the tunnel and more importantly the tunnel entrance.

2.6 Trap Catch Recording

All trap catches must be recorded. The data to be recorded must include:

1) Species
2) Trap No.
3) Sex
4) Date Caught

2.7 Species Identification

Ensure you can identify the three species of mustelid in New Zealand effectively prior to commencing a trapping programme. Ferrets are the largest mustelid reaching lengths of 550 mm and are generally black and crème with a black facial mask. Stoats are smaller weighing on average 340 grammes. They are chestnut brown with a white-crème belly and have a bushy tail with a black tip. The white belly fur forms a smooth line laterally along the body. Weasels are the smallest mustelid to be introduced to New Zealand they are similar to a stoat but have several discerning features. They are smaller than stoats, the creme coloured belly fur forms an irregular lateral line along the body, and a weasel does not have a black bushy tail. The ears are also smaller and more rounded in proportion to the head.

2.8 Mustelid Population Monitoring

Mustelid population indexing has been undertaken with mixed results throughout New Zealand. It is still largely a developing science with various methodologies being tried within DOC Mainland Island Sites (i.e. Hurunui MI) and by Landcare Research.

Tracking tunnel indexing has been used in many areas using meat baits. This has been proven to produce variable results (*pers.com* P.Dilkes, DOC, Eglinton Valley Yellow Head Research).

Figs 3-5: Stoat Ferret

Weasel

Residual population monitoring for mustelids is not planned for Longbush. This is due to the small size of the current protected area

2.9 Bi-Catch

Several species are captured within mustelid tunnels as bi-catch to any control operation. Hedgehogs are the most common and can be found from coastal areas to beech forest. They are voracious consumers of invertebrates. An adult hedgehog can eat 60 grammes of invertebrates each night. It is believed that hedgehogs can have an impact on invertebrate populations which can impact on kiwi and other native which is dependent on invertebrates. Controlling hedgehogs by mustelid trapping will be beneficial for the farm.

Other bi-catch species can include Norway rats, blackbirds, starlings, thrushes, green bell frogs and occasionally young rabbits.

3.0 Feral Cat Control

Feral cats in New Zealand are a severe threat to native and endemic fauna.

They are known to kill many NZ species of wildlife including kereru, kiwi, petrels, skinks and geckos, kakapo, saddleback, stitchbird, weta and even native fish species.

Cats are long lived and can have a large territorial range. Radio tagged males in the Whitikau Valley; Opotiki had a territory of 350 hectares (*Ecoworks NZ Ltd*., 2004). The largest feral cats captured at Motu have been in the 4 kg range. One caught at Waikaremoana during 2003 weighed 6kg.

3.1 Trap Type

Connibear 110mm kill traps are the most effective kill trap on the market at present. These traps are best operated in conjunction with live capture cage traps and leg hold traps. Individual cats can be shy of a specific trap design therefore varying the trapping methodology is vital. The inclusion of a shooting programme will also assist with the control of a resident population. Leg hold traps have been used during eradication and control programmes throughout New Zealand for many years. Leg holds are an effective tool, particularly with trap shy individuals, however it is a legal requirement to check each trap within a 24 hour period. Therefore it is a time consuming method.

Kill traps are effective and require minimal input to effectively maintain cats at low densities.

3.2 Bait Type

Baits include either finely chopped pilchard, beef mince, seafood flavoured tinned cat food, or minced rabbit/hare. The fish based baits must have tuna fish oil applied to them.

A small quantity of bait is positioned in front of the trap forks as a 'taste' for the cat. The majority of the bait is positioned behind the trap forks on a tin plate.

Pre-feed must also be laid on the ground below or in front of the trap and on the ramp leading up to the trap itself.

One large piece of bait is not effective as it can be dragged away by rodents or a cat in one action. Minced or finely cut bait requires the cat to return several times meaning more chance of capture.

Important– Ensure that the cat cannot remove all of the bait without hitting the trap forks. The bait plate must be set at the correct height.

3.3 **Connibear Raised Set**

When kill traps are set in an area where farm dogs, children, ground nesting birds or other protected species are present then traps need to be set at least 1 metre above ground level. In weka areas traps need to be 1.6 metres above ground level.
Traps are set at the top of a wooden ramp. The ramp is an 800mm length of 150 x 25mm H3 radiata. It runs at a 10-15º angle and extends from the tree, 40mm below the trap, and the lower end is nailed into the top of a 50 x 50mm tanalised wooden fence batten driven into the ground to a depth of 200mm (Refer photo attached).

Fig 6: Correctly set raised cat set designed so that the animal is caught by the neck and hangs free in the trap.

3.4 **Connibear Ground Set**

Ground sets are placed where no other protected species, farm animals, domestic pets or children will be present. The setting procedures are identical to section 7.2.2 however the bracket is screwed to a fence or tree 120 mm above ground level. No ramp is used.

Baiting procedures are also similar. Pre-feed bait must also be laid on the ground in front of the trap.

3.5 **Connibear Box Trap**

This will be the preferred trap type at Longbush Reserve as people may be present within the reserve it is the safest trap type. A box trap is a large plywood box with a connibear trap positioned at one end of the box. The box is made of tanalised H3, 17mm plywood. The dimensions are 400(width) x 400 (height) x 800 (long). This box is most suitable when trapping farmland areas where stock may be present.

Both ends of the box are covered with 13mm square aviary mesh batten stapled in place. The mesh at one end of the box has a hole cut into it at bottom centre, which is 250mm x 250mm to allow un-hindered access for cats.

The other end of the box is closed with a central piece of ply to hold the trap bracket.

Fig 7: Feral cat in a box trap.

3.6 **Trap Maintenance**

Traps must be checked and maintained weekly. In summer baits are fly blown quickly and need regular replacing.

Again, baits should be cut finely and pre-feed should be scattered on the ground around the trap to encourage incoming cats and build their confidence around a foreign object.

Rat traps should be run nearby (within 5 m) to control rats which will take fish baits readily without tripping the Connibear trap.

When checking and re-baiting Connibear traps always trip the trap and rub the trap jaw which the locking bridle attaches to with your finger. Oil from your skin is sufficient to keep this operating easily, rub the jaw tightly several times with index finger and thumb. If it is severely corroded, use Emery Paper or a file to remove any rust.

3.7 **Trap Spacing and Position**

Traps should be spaced at 300 metre intervals or at a density of 1 per 10 hectares. Traps should be positioned near established walkways or animal runs and tracks as cats prefer using human walk tracks, roadsides, sheep tracks, animal runs etc. Small blocks of forest <5 ha should contain at least one trap unless high intensity trapping is required to protect target species, i.e. brown teal.

In larger blocks of forest, traps should be positioned on dry ridges or existing game trails or trapper's tracks. Cats generally prefer dry ridges, spurs and faces. Traps should also be established on the perimeter of larger blocks. This is an area where there is often a greater diversity of wildlife and therefore numbers of rodents are high, producing an attractive feed site for feral cats.

Coastal areas should have traps positioned behind the high tide mark.

3.8 **Warning Signs**

Warning signs must be visible at public access points into the control area to warn visitors about the presence of kill traps.

3.9 **Trap Catch Recording**

All trap catches must be recorded. The data to be recorded must include:

1) Date Caught
2) Trap No. & Location
3) Sex
4) Any other relevant details, weight, colour, gut content.

3.10 Monitoring

Currently no population monitoring methodology exists in New Zealand to determine pre control or residual populations of feral cat. Trap catch results and night shooting results will indicate the level of feral cats existing on the farm. The recommended trapping methods are accepted and effective control methods for this species.

4.0 Possum Control

4.1 Introduction

There are numerous control methods used for possum control in New Zealand. In this situation we are dealing with small forest areas requiring a sustained control method over a long period which operates even when staff are not on site.

For large scale control operations there are many companies and contractors undertaking possum control. It is a competitive market requiring a relatively minimal skill level to do a satisfactory job.

Large control operations are generally tendered by DOC, Local Authorities and the Animal Health Board to either reduce the density of TB vectors in an area or for biodiversity conservation reasons. Possum densities in contract blocks are monitored using trap catch indicies. Contractors are the required to reduce the density of possums to a designated level dependent on the outcome required. If they fail to reach the required target after the final monitor they will either return to complete the job or pull out and head to the next contract.

Because we are working in small forest areas we primarily use leg hold traps and night shooting to quickly reduce the resident population followed by the installation of permanent kill traps to eliminate any transient animals entering the block at a later date.

4.2 Leg Hold Traps

Legs hold traps used by Ecoworks NZ Ltd. are Victor 1.5's.

Traps are set at 50-75 metre spacing throughout and/or surrounding the control block. Ground sets should not be used at this site due to the presence of kiwi in the area.

Traps are set on boards (150 x 25mm) and brackets fixed to mature trees. Target trees such mahoe, karamu, five finger, corokia, karaka, kohekohe or willow should be selected. These species are generally feed target species in coastal areas.

Call trees are also a target tree used for trapping. These trees are generally on a slight angle or lean over-looking a valley or other canopy vegetation where a male possum can call effectively to surrounding areas, indicating his territory to others and attracting females. These trees can generally be identified by the amount of bark scratching and droppings on the main trunk.

A lure is then applied directly behind the trap onto the tree bark. This can include a wide variety of scents but the primary base for the lure is white flour. Essence additives generally used with good effect include, eucalyptus, banana, cinnamon, nutmeg, cloves or icing sugar.

4.3 Longbush Timm's Traps

Timm's possum traps will be spaced at 100 metre intervals throughout the length of Longbush Reserve. Additional traps will be kept positioned at target areas such as recent native plantings etc. Traps will be baited with sliced apple and lured with flour based lure using eucalyptus, banana, cinnamon, nutmeg, cloves or icing sugar as additional scent attraction. Flour is applied both onto the apple bait inside the trap and onto a nearby tree. The Timm's trap is ideal for a popular reserve situation where people maybe present. It is a very effective kill trap if managed well; it is easy to set and does not pose a significant risk to people.

Connibear cat traps can also be utilised for possum control throughout the reserve. They can be baited for possums using 'Biscats' cat biscuits and peanut butter mixed together and applied to the tin plate behind the trap. This has been a very successful bait combination with this trap as possums are readily attracted to peanut butter, feral cats will also target this bait.

Effective pre-feeding and the sustained use of lures will attract possums over 200 metres to a trap

4.4 Warning Signs

Warning signs must be visible at public access points into the control area to warn visitors about the presence and duration of cyanide use and kill traps operating. Visitors to the farm must also be made aware of vertebrate pest operations. This should be summarised within the Bentzen Farm Health and Safety Plan.

4.5 Trap Catch Recording

All trap catches must be recorded. The data to be recorded must include:

1) Date Caught
2) Trap No. & Location
3) Sex
4) Any other relevant details, weight, colour, gut content.

This information gives the trapper and landowner information about catch rates, high catch areas and allows more effective planning and expenditure of funds at a later date. Good data management and analysis allows managers to determine the best value for each dollar spent on the hill.

4.6 Monitoring

The trapper managing this operation will rapidly get an indication of possum densities. Possum sign such as bark scratching or chewing, foliage browse or faeces sign in forest areas, night shooting results (kills/hunter man hour) and kill trap tallies will indicate possum densities.

Residual Trap Catch (RTC) Monitoring can be undertaken if required. However because of the small size of the reserve (<20 ha) we do not believe this would be beneficial at this stage. This is a nationally standardised method of indexing possum

abundance. For forest areas ranging from 50-500 hectares this entails running 50 Victor leg hold traps at 20 metre spacing for three fine nights on a random transect line. The percentage catch rate less the number of sprung traps is used as a relative index of abundance. A target of <2% is targeted for most conservation based control operations.

With small control operations such as this the trap catch results will indicate possum densities. This combined with night shooting will determine the effectiveness of the operator.

How many possums you catch is not important, it is how many are left behind.


Fig 8 & 9: Possum Kills in Timm's and Connibear Traps.

5.0 Rodent Control

5.1 Species Identification

Four species of rodent are found in New Zealand.

-Norway Rat (*Rattus norvegicus*)
-Ship Rat (*Rattus rattus*)
-Kiore (Pacific) Rat (*Rattus exulans*)
-Mouse (*Mus musculus*)

The most significant rodent threat to wildlife on Bentzen Farm will come from ship and Norway rats, and mice. Kiore were introduced by early Maori and are now extremely rare on mainland New Zealand.

5.1.1 Ship Rat

Ship rats are the most wide spread and abundant rat species in New Zealand. They are generally arboreal (tree climbers) and will nest above ground in the tree canopy where they predate birds, invertebrates and reptiles. They also consume large volumes of seeds, berries, fruit and shoots. They are voracious predators and have been recorded attacking mature forest bird species such as kereru and kokako.

5.1.2 Norway Rat

The Norway rat is also known as the water or brown rat. They are burrowers and can grow to over 500 grammes in weight. They prefer to feed on invertebrates, worms, bird's eggs and gastropods in or around waterways. They are poor climbers and do not pose a significant threat to forest birds or most gecko species. They are most common in warmer climates to about 400 metres a.s.l. They are avid consumers of bird's eggs and generally make up a large percentage of mustelid tunnel bi-catch species in coastal areas. They are distinct from ship rats in that they are generally larger and have a brown coat with crème belly fur. They have a rounded snout and their ears do not reach their eyes when pulled forward over the face.

Fig 7: Large Norway rat captured in a mustelid tunnel, Nicks Head Station, Gisborne.

5.1.3 House Mouse

The mouse is most abundant in rank grassland sites where grass seed and invertebrates are plentiful. Though the mouse is small (c.30 g) it is a major predator of native skinks, gecko, weta, carabid beetles and other invertebrates. The total biomass of mice particularly in marginal or grassland habitat can have a severe and detrimental impact on native biodiversity. Mice populations in the Gisborne area reach their maximum point during March each year.

5.2 Control Plan

The control of rodents at Longbush will be a key part of the overall pest control programme. The primary forest and regenerating successional vegetation will improve and restore more rapidly with the control of rodents, particularly ship rats. Rats consume seed material, flowers and shoots; as well as the birds, invertebrates and reptiles which pollinate and disperse seed material.

A mixture of ground and tree set snap traps will be established on a 50 metre spacing throughout the reserve. The tree set traps (Fig 9:) target ship rats and ground set traps will target Norway rats. Traps will be baited with peanut butter and rolled oats and cleared everyday immediately after installation then every 6-8 weeks onward.

Traps will be predominantly tree set Victor professional snap traps. They will be spaced at 50 metre intervals and screwed to mature canopy trees (refer Fig 9). Tree sets are considerably faster to clear and re-bait and in this area will not have a detrimental effect on forest bird species. These will also be alternated with Colecalciferol baits stapled to trees.

Fig 9: Tree set snap trap targeting arboreal ship rats (Longbush Reserve, Ecoworks NZ).

Initially all traplines will be baited and cleared daily for a period of 14 days. Once the population has been reduced, traps will be cleared and re-baited every 6-8 weeks.

5.6 Mouse Control

At this stage no targeted mouse control is planned. Snap trapping is ineffective to control mouse populations. Effective control requires establishing bait stations on a 17-25 metre grid (*Todd, Miskelly & Merton*, D.O.C, Mana Island Mouse Baiting Trials, 1989) or aerial poison operations which is only permitted on offshore islands. This requires considerable resourcing to set up and manage.

Some limited control maybe looked at in the future using bait stations at Longbush on a 50 metre spacing throughout the length of the reserve. Brodificoum bait blocks inside secure wooden boxes as pictured below would effectively control mice and provide even more protection for invertebrates and young reptiles.

Baiting records should also be maintained by the pest control operator. These record bait station No., bait applied, amount removed etc to allow more efficient management of the baiting programme and ensure there is no wastage as it can be a costly resource.

Fig 8: Racumen Bait Station inside protective wooden box.

5.7 Warning Signs

Warning signs must be visible at public access points into the control area to warn visitors about the presence of bait and/or kill traps. Visitors must be made aware of vertebrate pest control operations.

5.8 Trap Catch Recording

All trap catches must be recorded. The data to be recorded must include:

1) Date Caught
2) Trap No. & Location
3) Sex
4) Any other relevant details, weight, colour, gut content.

Fig 9: Ship Rats are major consumers of forest birds, invertebrates, such as weta and NZ's threatened reptiles.

6.0 Lagomorph control (Hares and Rabbits)

Hares and Rabbits are primarily a threat to native forestation projects and can modify habitats which would otherwise be utilised by native species such as common skinks.

Lagomorphs can cause a considerable amount of damage to native plantings and cost a project in lost trees. Hares in particular will strip trees of leaf material, eat the central stems and shoots of seedlings and have been recorded bark chewing native and citrus crop trees.

The most effective control method is to undertake night shooting for both hares and rabbits. Pindone poison can be a useful tool in difficult to access areas where non target species are not present. Live or leg hold traps are also useful for the control of rabbits at tunnel entrance ways or feed sites however they can become time consuming and require daily clearing.
Night shooting is the only effective method of controlling hares. While staff or contractors are targeting hares they will control rabbits at the same time.

Initial night shooting will require a weekly effort to knock the resident population down. Non controlled coastal sites will produce an average hunter kill rate of approximately 5 hares/hunter hour. The control level which should be targeted and maintained is <1 hare/hunter hour.

Hares are highly mobile but will have a territory and preferred feed areas. Often an individual will be recorded at the same location on consecutive days. They will also roost inside mature forest areas during the day particularly during hot weather or during rain. They will generally begin to feed and become more mobile from about 4pm onward.

Every operator has his or her preferred control method. Night shooting is very effective using a semi-automatic or pump action shotgun and number 2 shot. Mini magnum ammunition is particularly effective allowing an effective range of over 75 metres.

Landowners and residents need to be made aware of shooting operations and a licensed operator needs to adhere to the Firearms Safety Code of Practice. Again kills must be recorded as well as the number of hours spent hunting to record kill rates for landowners and managers.

7.0 Invasive Weed Control

Invasive weed control operations have been underway at Longbush Reserve by Jeremy and Anne Salmond and Ecoworks NZ Ltd. since the property was purchased during 2000.

Weed control contributes in a significant way to the strategic restoration objectives for Longbush Reserve (refer pg 5).

Eighteen species of adventive weed have been recorded at Longbush Reserve; many of which are regarded as highly invasive and five are listed in the National Plant Pest Accord. These include old mans beard, pampas, Mexican daisy, Japanese honeysuckle, and wandering Jew (*Tradescantia*).

Infestations from these species have arrived at Longbush in a number of ways. Species such as Tradescantia, periwinkle and lily appear to have arrived in garden waste which has been disposed of on the adjacent roadside. Others such as willow, pampas and Mexican Daisy appear to have been transported as seed material by the Waimata River and other nearby streams. They have affected the reserve in a number of ways:

1) By forming a dense weed mats in turn suppressing the regeneration of indigenous seedling species, particularly in the central part of the reserve which initially contained significant infestations of *Tradescantia* and periwinkle.

2) By shading and suppressing canopy and seedling regeneration, particularly in 'Dog Gully' where a heavy infestation of Old Man's Beard was found.

During 2003, Ecoworks NZ Ltd. commenced a sustained campaign to control and eventually eradicate all invasive weed species at Longbush. The adventive species found at Longbush includeD:

Species	Specific Name	Species	Specific Name
Blackberry	*Rubus fruiticosis*	Jerusalem cherry	*Solanum diflorum*
Briar Rose	*Rubus*	Mexican Daisy	*Erigeron karvinskianus*
Cotoneaster	*Contoneaster glaucophyllus*	Old Man's Beard	*Climatis vitalba*
German Ivy	*Senecio mikanioides*	Pampas Grass	*Cortaderea selloana*
Japanese Honey Suckle	*Lonicera japonica*	Periwinkle	*Vinca major*
Plum tree	*Prunus spp.*	Wandering Jew	*Tradescantia fluminensis*
Alder	*Aldus acuminata*	Willow	*Salix fragilis*
Silver Poplar	*Populus alba*	Fig	*Ficus spp.*
Variagated thistle	*Silybum marianum*	Scotch Thistle	*Cirsium vulgare*

The following table outlines the successful control methodology which has and will continue to be used on each of the described species. Appendix 2.0 illustrates the approximate location of the dominant weed infestations within Longbush Reserve.

Species	Control Method Used	Annual Control Period
Blackberry	Spray, Tordon Brushkiller, 60mls/10 litres + 10mls Pulse + 10mls Dye.	November and April – Full walk through of arboretum area and Pa Hill and general inspection along river margin.
Briar Rose	Spray, Tordon Brushkiller, 60mls/10 litres + 10mls Pulse + 10mls Dye.	Spot Spray all Year.
Cotoneaster	Stump cut and Paint, 10 g Escort/5 litres + 10 mls Pulse + 10mls dye.	Spot Spray all Year.
German Ivy	Spray Escort, 5g/10 litres + 10 mls Pulse + 10 mls dye.	Spot Spray all Year.
Japanese Honey Suckle	Spray 100mls/ 10 litres Glyphosate (Roundup) + 10 mls dye, or vine cut and paint with Glyphosate.	Spot Spray all Year. Regen not recorded since 2003.
Plum tree	Stump cut and paint, Grazon or Tordon 20%	Spot Spray all Year.
Alder	Stump cut and paint, Grazon –neat (100%), or bore chainsaw bar into trunk and fill with 12% Grazon mix.	Weed Break put in place between Waimata River and Reserve during 2005. Some trees yet to be removed once vehicle access is possible during dry summer conditions.
Silver Poplar	Stump cut or ring bark and scarf below ring and paint Grazon – neat (100%) with paint brush.	Summer inspection of Alder Gully, regenerating seedlings cut and painted with Grazon.
Variegated thistle	MCPA or Versatile 1%-100mls/10 litres + pulse + dye	Summer spraying, post October. Particularly around recent plantings.
Jerusalem cherry	Spray Grazon, 40 mls/10 litres + 10 mls Pulse + 10 mls dye	Spot Spray all Year
Mexican Daisy	Spray 0.3% (30mls/10 litres) Glyphosate (Roundup) + dye.	Summer spraying, post October. Particularly around recent plantings, arboretum, streams at southern end of reserve.
Old Man's Beard	Spray or cut and paint vine 1.5% Glyphosate + pulse + dye.	Summer inspection of Dog Gully, regenerating seedlings cut and painted with Glyphosate.
Pampas Grass	Spray, full coverage, 1.6% Glyphosate + pulse + dye.	November and April –general inspection along river margin, reserve, boundary, spray and hand pull young plants.
Periwinkle	Spray 2.5% (250 mls/10 litres) Glyphosate (Roundup), + pulse + dye.	Spot Spray all Year.
Wandering Jew	Spray 60mls Grazon/10 litres + pulse + dye.	Ongoing spot spray all year.
Willow	Stump cut and paint 1 litre Glyphosate + 200 mls Penetrant/10 litres water.	Regenerating saplings <20 m from reserve fence on Waimata River are controlled. Many mature trees are supporting the river bank during winter flood events.
Fig	Stump cut and paint with Vigilant Gel.	Summer cut and paint.
Scotch Thistle	MCPA or Versatile 1%-100mls/10 litres + pulse + dye	Summer spraying, post October. Particularly around recent plantings.

To date over 90% of the weed infestations have been removed from within Longbush Reserve. This includes c.1.4 hectares of Tradescantia, mature vines of old mans beard and c.2800 m² of periwinkle. Dog Gully still requires some intensive control to eradicate Tradescantia from the steep valley sides above the stream; Tradescantia has been removed from most of the reserve and now requires follow up surveillance and spot spraying.

Jerusalem cherry was extremely prevalent at the northern end of the reserve and has been controlled through sustained spot spraying and hand pulling of young plants.

Old man's beard was well established at Dog Gully. The mature vines were cut and painted and this species has almost been eradicated. Surveillance and spot spraying takes place to control seedlings which are now rare.

The bulk of the control now requires spot spraying by walking through the reserve on a systematic basis spot spraying targeted regeneration of adventive species. Tradescantia, Jerusalem cherry and alder are the most common regenerating species within Longbush. On the forest margins, blackberry, pampas and Mexican Daisy are the most invasive and rapidly regenerating species.

The weed infestation locations are mapped on pages 27-34. These maps outline the major weed infestations within and surrounding Longbush, not including Pa Hill and the current pasture and Arboretum areas. The majority of the weeds illustrated have now been controlled, however these maps have been produced to provide historical information regarding major infestations and key areas which should be included in surveillance monitoring and control operations. Seed material can remain dormant for a considerable period of time therefore ongoing monitoring is required.

8.0 CONCLUSION

In this project, we aim to restore the black beech and northern rata forest that was once dominant in the hills, and care for the rare riverside bush. We have been granted $10,000 pa. from the Clark Trust in Gisborne for this purpose, but this sum cannot sustain ongoing intensive pest and weed control over 120 hectares of hilly terrain.

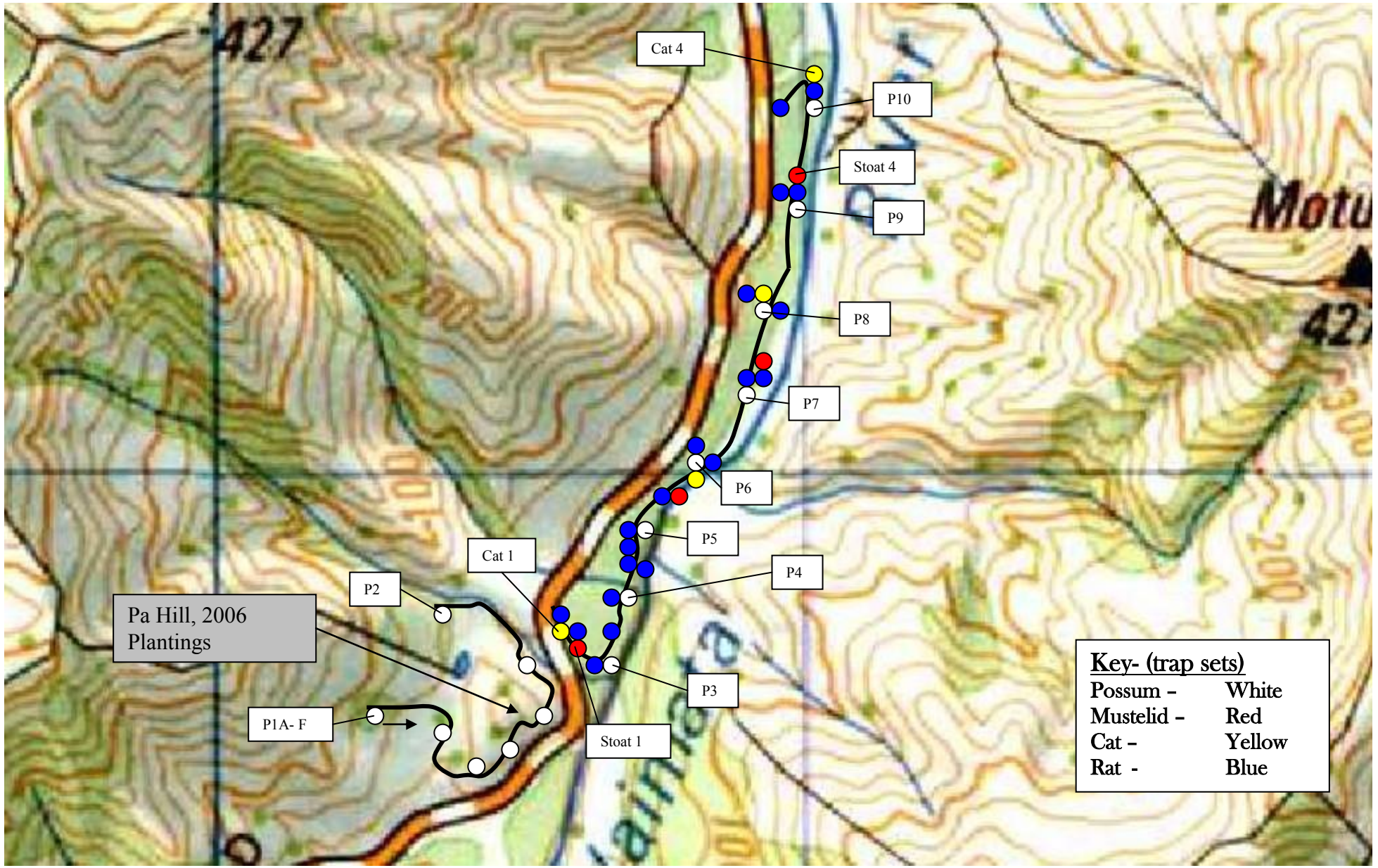
The Longbush Ecosanctuary is a fine example of community collaboration and partnership. The site is managed in close partnership with the community, including iwi, involving a great deal of voluntary contribution and effort.

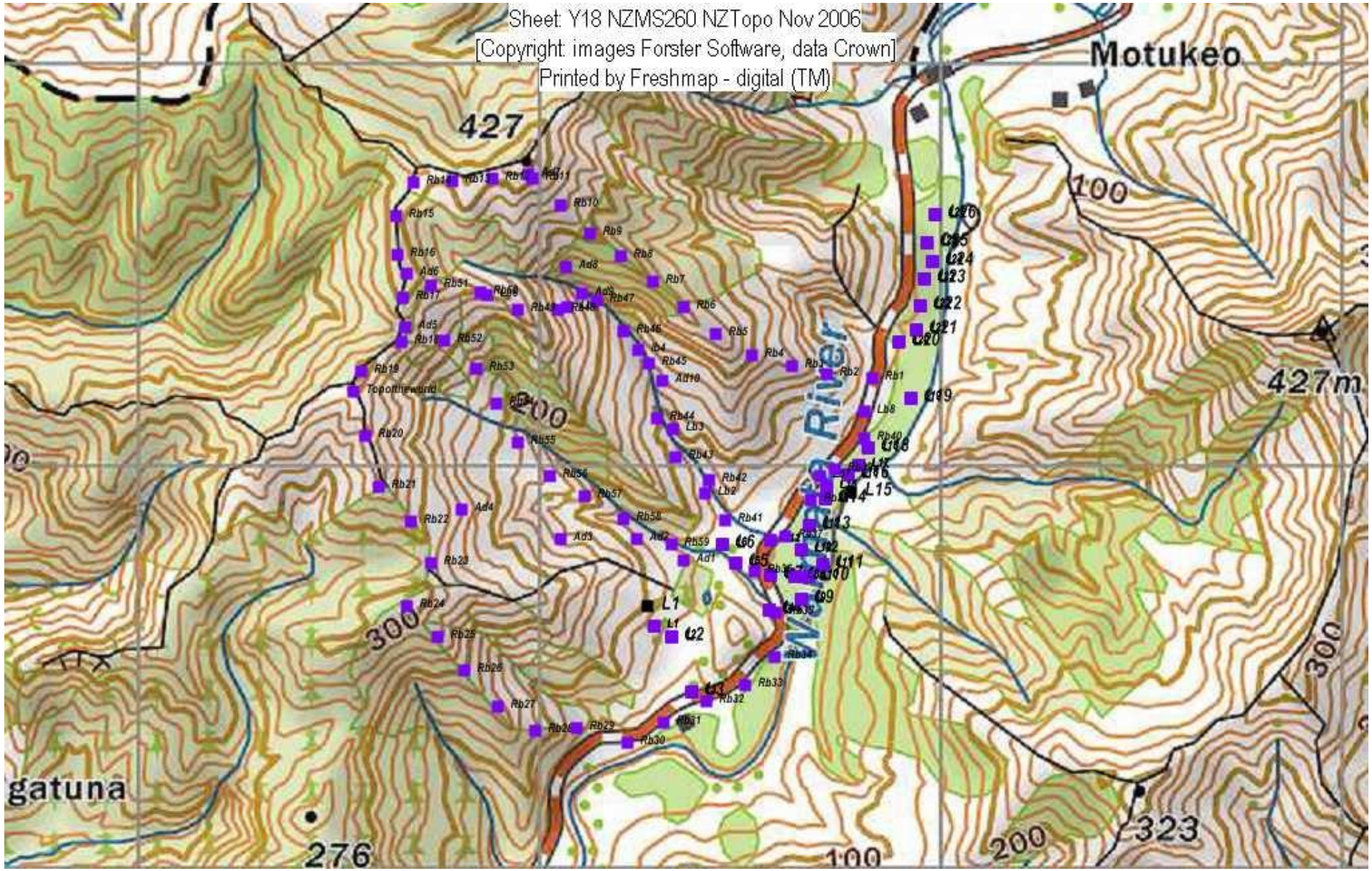
At Longbush, an innovative Welcome Shelter has been recently designed and funded, and is being built entirely by volunteers. When it is finished, this $1.5 million structure will have been erected with a zero budget, a remarkable achievement in this far from affluent community. Over time, the black beech forest will create an impressive and beautiful habitat for kiwi and weka, right behind the Welcome Shelter (see attached).

Along with the Orchiston Harakeke collection, the restoration of titi and native robins, the freshwater ecosystems and the riverside and black beech forests, the Welcome Shelter creates a focus for public enjoyment and use of the site, and for educational activities.

By creating a place where community appreciation of and care for New Zealand's indigenous flora and fauna is fostered, Longbush Ecosanctuary makes a major contribution to Government's Biodiversity Strategy in a part of the country where few sites of this kind survive, or are accessible to the public.

Appendix 1.0 – Pest Control Trap locations, Longbush Reserve

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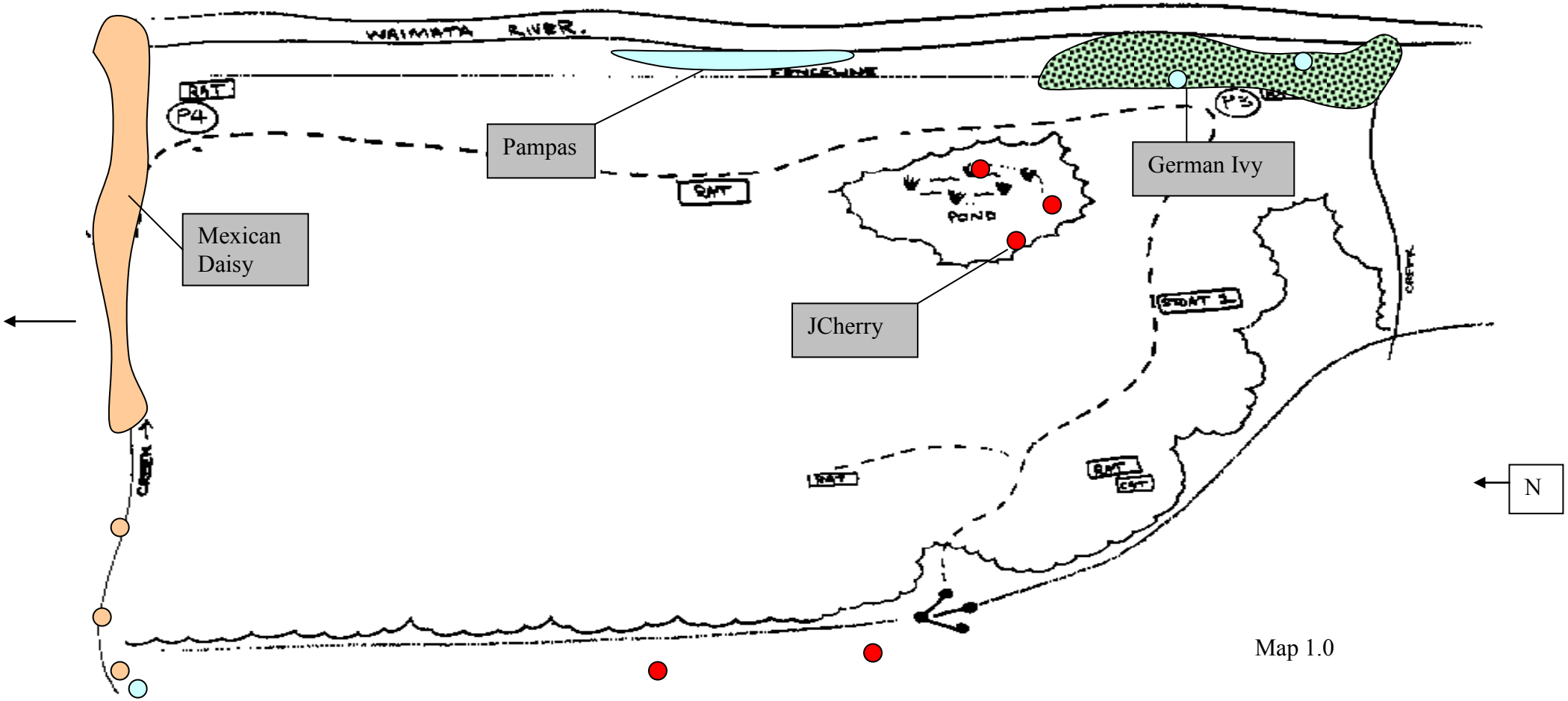
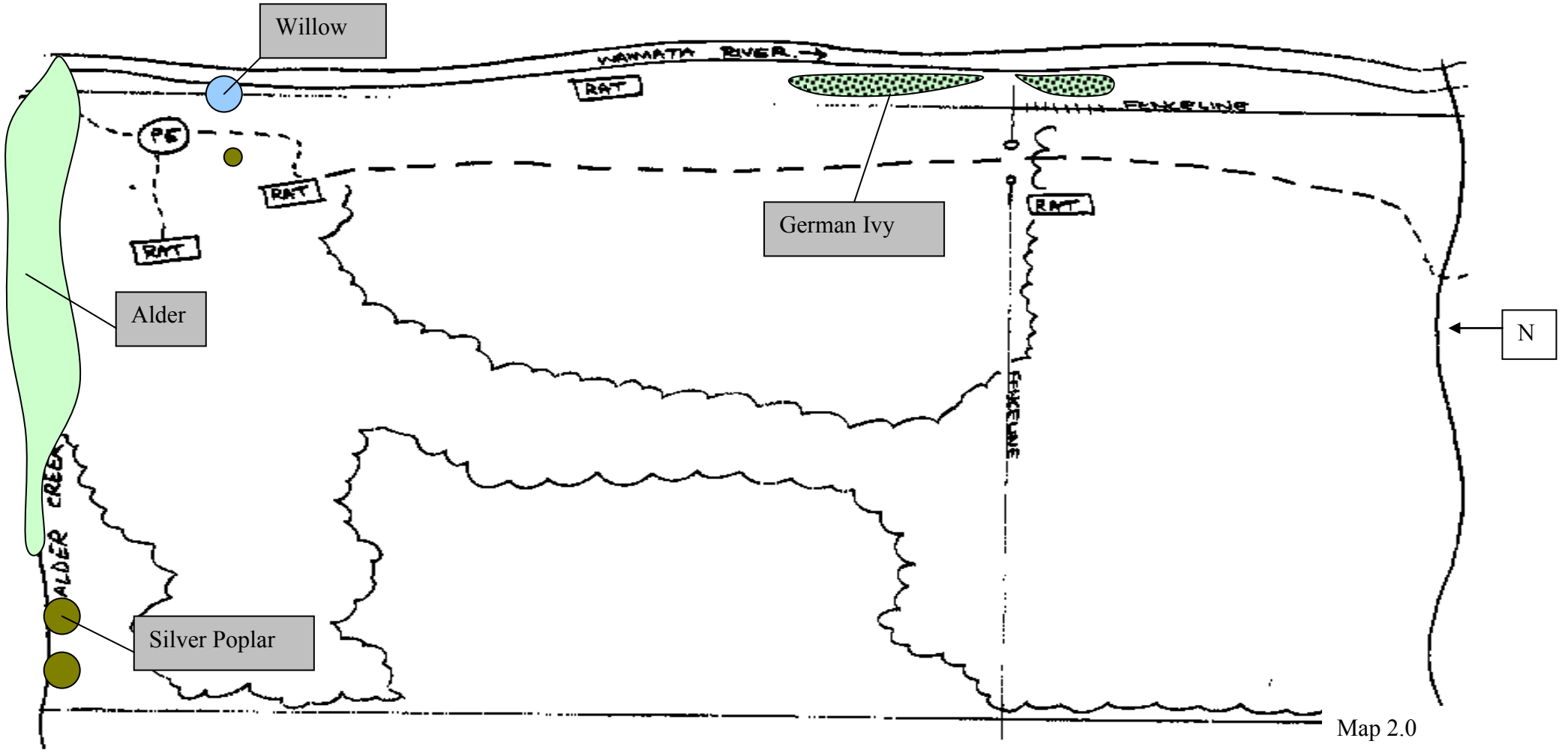
[Copyright: images Forster Software, data Crown]
Printed by Freshmap - digital (TM)
Motukeo
427
100
427m
200
300
323
276
River
gatuna

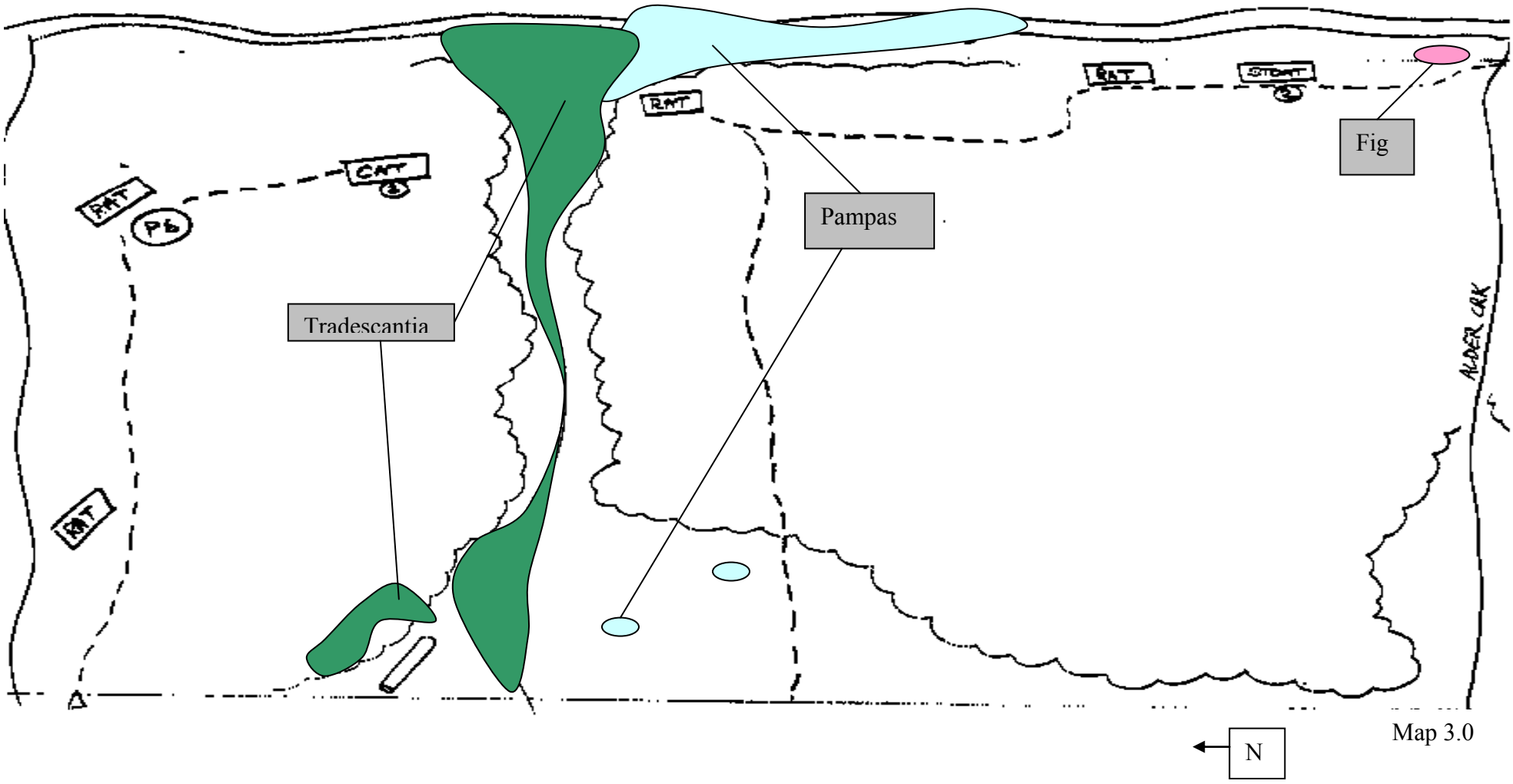
Appendix 2.0 – Weed Maps, Longbush Reserve.



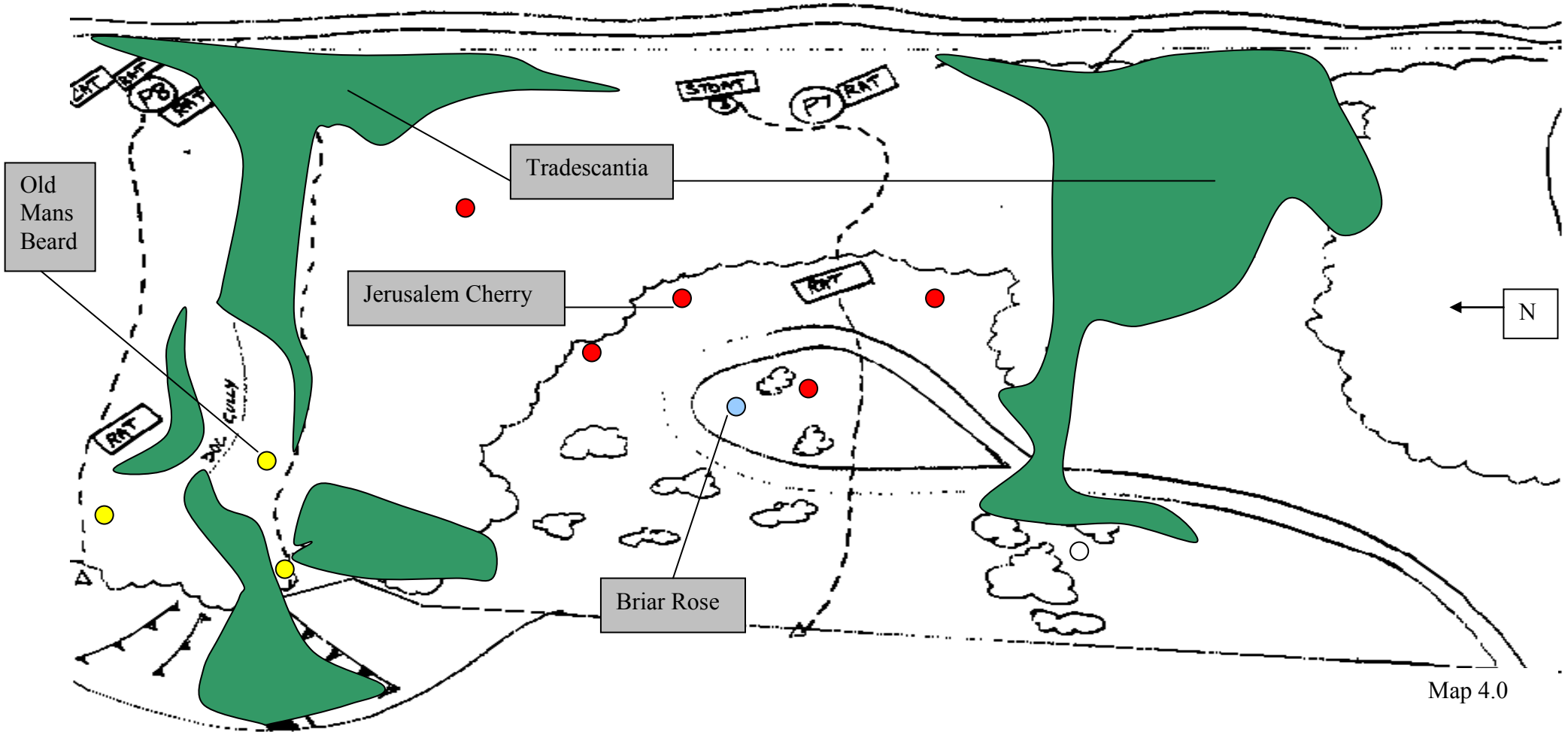
Map 1.0


Willow
German Ivy
Alder
Silver Poplar
N
WAIMATA RIVER
RAT
RAT
RAT
RAT
PE
FENCELINE
FENCELINE
ALDER CREEK

Map 2.0



Map 3.0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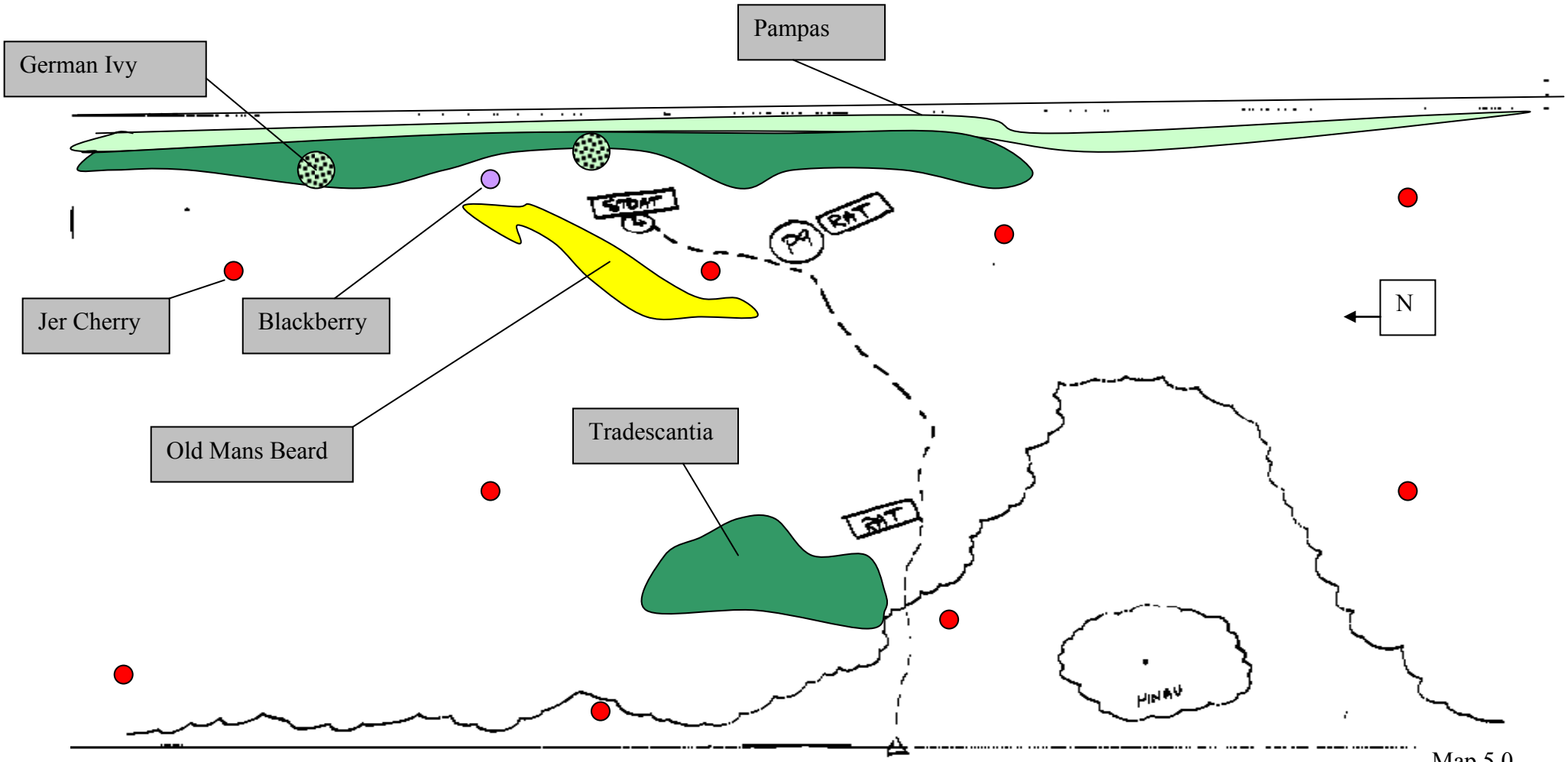
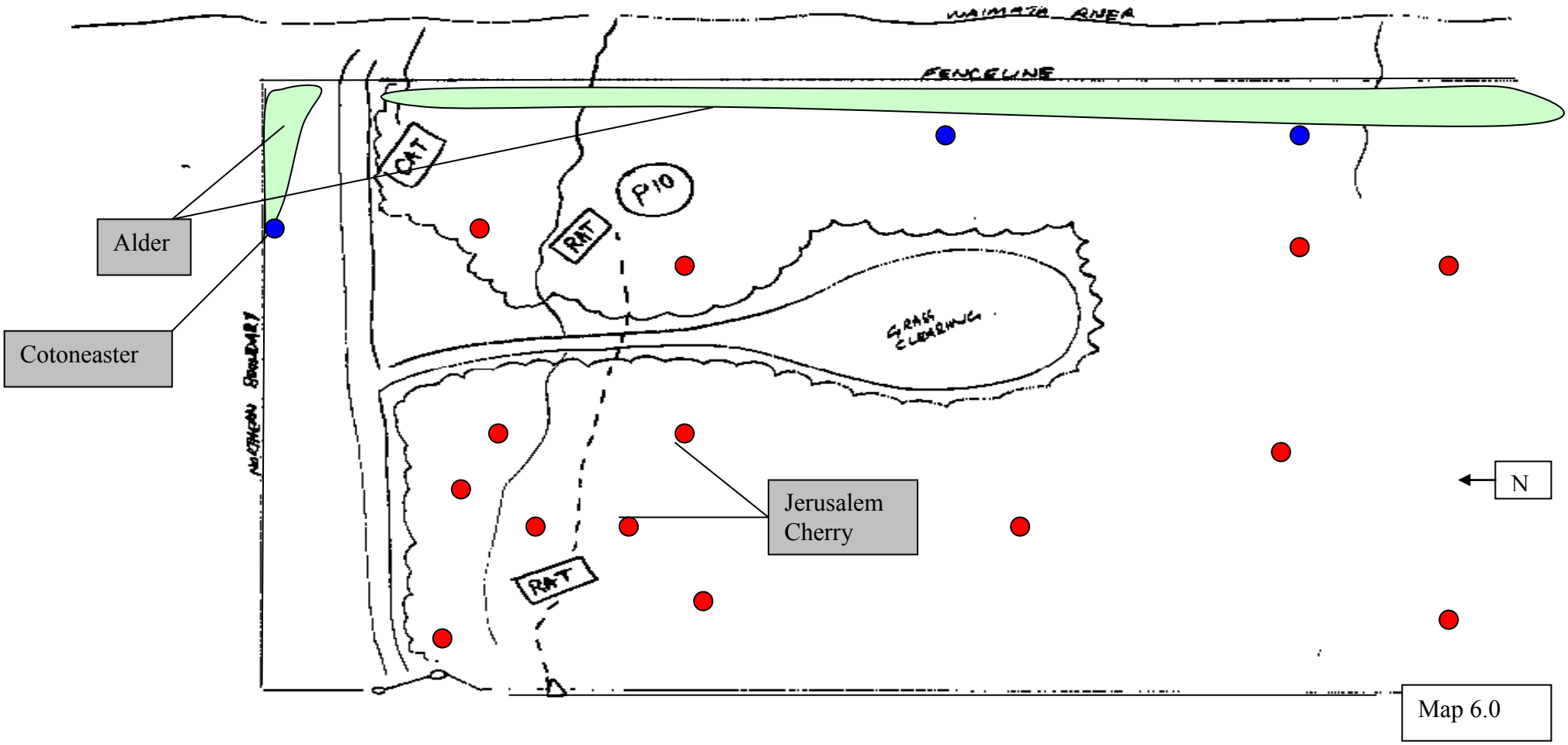
Tradescantia
Jerusalem Cherry
Briar Rose
N
RAT
P8
P7
STOAT
Dog Grass

Map 4.0


German Ivy
Pampas
Jer Cherry
Blackberry
Old Mans Beard
Tradescantia
STOAT
RAT
RAT
N
HINAU

Map 5.0


WAIMATA RIVER
FENCELINE
CAT
P10
RAT
GRASS CLEARING
RAT
Alder
Cotoneaster
Jerusalem Cherry
N
Map 6.0

Appendix 3.0 – Weed Control Maps, Location Key.