Eglinton Valley Lesser Short-Tailed Bat Monitoring Programme 2014

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Cover image credit (James Reardon): Lesser short-tailed male bat in singing tree, Eglinton Valley

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Summary

The population in the Eglinton Valley is one of only two known populations of lesser short-tailed bats (*Mystacina tuberculata*) on mainland South Island. The Bat Recovery Group recognises the lesser short-tailed bat population in the Eglinton Valley as a priority for management, with the aim of maintaining long-term security of the population.

The Eglinton Valley has been identified as a biological management unit (BMU) and is an ecologically important site due to the host of threatened species within it; mohua, kaka, kakariki, and both species of bats. A continuous stoat control and periodic rat and possum control programme is in place, to protect these species. Outcome monitoring of the lesser short-tailed bats complements the suite of threatened species monitoring in the Eglinton Valley, resulting in a unique project with one of the longest histories and the broadest scope in the country. The Eglinton Valley lesser short-tailed bat monitoring programme is a long-term investment with the main aim of monitoring the population trend over time using the mark-recapture method, and analyse data using Program MARK to assess the effectiveness of predator control in the valley.

This report outlines the results of the January 2014 field season, shows the population trends gathered to date and lists recommendations for 2015.

The results for January 2014 were:

- Automatic readers and dataloggers were set up at all known occupied roosts and 894 PIT-tagged bats were recorded
- The highest count of bats emerging from two roost trees, via video recordings, was 1357
- A proportion of the population (245 bats) were marked with PIT-tags, bringing the total PIT-tagged to 1740. Recaptures indicate we have PIT-tagged more than 50% of the current population
- Age identification was improved during PIT- tagging sessions, and more staff were trained as PIT-taggers
- Data transfer was streamlined using new hand held scanners
- The annual "Birds, Bats and Barbeques" event was successful in advocating bat conservation to the local community
- TV One filmed a capture at a roost and discussed mast events in lead up to the Battle For Our Birds campaign
- A Science Communication student from Otago University filmed both bat projects for her thesis
- PHD candidate Gillian Dennis took blood from short-tailed bats in the Eglinton to compare coagulation times to the Pureora population, where levels of the poison diphacinone have been detected
- Two independent collections of bat flies were made in an attempt to establish populations

1. Introduction

The South Island lesser short-tailed bat is ranked under the New Zealand Threat Classification System as nationally endangered (O'Donnell et. al., 2010). Both species of bats in New Zealand are vulnerable to predators throughout the year; in summer when they congregate in large colonies, and during winter when they may remain inactive (in torpor) within roosts.
The Eglinton Valley lesser short-tailed bat monitoring programme is a long-term project. Informal monitoring began in 1997 when lesser short-tailed bats were discovered in the Eglinton Valley for the first time. Initially, the bats were monitored in an ad hoc fashion by conducting counts at roost sites using infra-red video-cameras and VHS SD card recorders to record bats as they exit their roost trees at night. Sampling effort has varied considerably from year to year, but a focused video-monitoring programme began in 2005. Video-monitoring of roost emergence is a useful monitoring tool; however it has limitations as it is almost certainly an under-estimate of the lesser short-tailed bat population. Bats often emerge from several holes in a roost tree and frequently move roost sites. Roost exit counts are therefore not thought to be as sensitive at detecting changes in populations as mark-recapture analysis.
Mark-recapture analysis of banded long-tailed bats (*Chalinolobus tuberculatus*) in the Eglinton Valley detected changes in populations that other monitoring methods (such as transects) failed to pick up (Pryde et al., 2005; Pryde et al., 2006).

Mark-recapture analysis requires animals to be individually identified in order to calculate estimates of population size and survival. Forearm banding with uniquely numbered metal bands is the accepted technique for long-term marking of long-tailed bats. However, captive trials using a range of bands on lesser short-tailed bats indicated that bands caused swelling in forearm tissue and unacceptable damage to both forearm and wing (e.g. Lloyd, 1995; Sedgeley & Anderson, 2000). For this reason there is an urgent need to develop alternative marking techniques.

The lesser-short-tailed bat monitoring began in 2006 as collaboration between Dr Jane Sedgeley, Te Anau Area Office and specialist staff; Kate McInnes, DOC wildlife vet and wildlife health technician and Stu Cockburn, conservation electronics manager. The original aim of this study was to assess if passive integrated transponder tags (PIT-tags, transponders or micro-chips) are suitable for marking and monitoring population trends in lesser short-tailed bats in the Eglinton Valley. We decided to continue with the existing video-monitoring programme in order to evaluate the relative merits of each technique.

An initial trial of PIT-tagging captive held bats, and the ensuing six years of PIT-tagging bats in the field has led us to be confident that we have successfully pioneered the PIT-tagging procedure for lesser short-tailed bats. The focus of the project is now long-term monitoring of the population trends in relation to pest management.

Invasive animal pests such as stoats, cats, rats and possums are controlled to protect a range of threatened native species present in the valley. Monitoring of mustelid/rodent abundance and survival of several threatened species is conducted each year. Long-tailed bats (*Chalinolobus tuberculatus*) in the Eglinton Valley appear to be increasing slowly following a number of 1080 and

pindone operations in bait stations aimed at controlling rats. However, because both species of bats only give birth to single young, once a year, recovery will be slow and difficult to detect in the short term, hence requiring a long-term commitment.

The size and scope of the rat control has varied over the years, and currently consists of a 100x100m bait station grid covering 4800ha of the Eglinton Valley. See Hill (2013) or dme://docdm-1222347 for the Threatened Species Protection in the Eglinton Valley Annual Report 2012/13.

2. Objectives

The 2014 lesser short-tailed bat monitoring field programme ran from the 6th to the 24th of January. The aims of the programme were to:

- Catch and attach transmitters to female bats to find roosts
- Set up automatic readers and dataloggers at all roosts found and record PIT-tagged bats
- Insert new Passive Integrated Transponder (PIT) tags into at least 200 bats
- Improve the number and quality of video counts to evaluate monitoring techniques
- Train several people to PIT-tag bats
- Train several local "bat handlers" to assist PIT-tagging sessions
- Improve data collection during PIT-tagging sessions by utilising scanners
- Analyse population data to date using mark-recapture
- Advocate bat conservation to the local community

3. Methods

3.1 Catching bats

Lesser short-tailed bat roosts are located by following radio-tagged bats, however occasionally roosts are found by checking known roost trees for signs of occupation (smell and or noise). Bats are caught by setting up a mist-net in known bat habitat and calling them in with a bird squeaker, imitating the sound of a bat 'singing'. Once a bat is caught it has a transmitter (model: BD2A, weight: <0.8g) attached to its back between the shoulder blades with contact adhesive. It is preferable to put transmitters on adult lactating female bats because they are more likely to return to a maternal roost, whereas non-breeding females and males will use solitary roosts more often.

Two collections of bat flies were made at roosts as well as from mist-netted bats, by masters student Cassie Mark from Massey University and independant contractor Brian Lloyd (for Professor Rudolf Meier at the Department of Biological Sciences, National University of Singapore) in an attempt to establish populations and collect samples for phlyo-genetic work.

3.2 Video counts

Once a roost tree is located, the tree is climbed using single rope technique (SRT). An infrared LED camera is mounted near the roost hole(s) and is used in conjunction with an SD card recorder set at a specified time to record emergence. Alternatively, if an infrared LED camera cannot be used, i.e. if the tree is rotten or roost holes too large, a handi-cam is mounted on a tripod, with an external infrared light source. SD cards or handi-cam tapes are collected daily and watched either on computer or television screen to count bats emerging from the roost hole. Counts are recorded on a roost count sheet: dme://docdm-131425. Roost location and roost count data are stored in dme://docdm-563061 and in the lesser short-tailed bat database held both at the Te Anau Area Office, and at the Science and Technical Office, Christchurch.

3.3 PIT-tagging bats

Five or more PIT-tagging sessions are conducted at communal roost trees throughout the month of January, to reach the required target of 200+ PIT-tagged bats per annum.
PIT-tags used in lesser short-tailed bats are 12mm long and just under 2mm in diameter. They are inserted under the skin (subcutaneously) using a 12 gauge needle and Henke jet injection gun. A minimum of three people are required to PIT-tag bats, one person to hold the bat (the handler), one to insert the tag (the injector) and the third to record the data and prepare needles (the recorder). All bats captured are scanned using a purpose built scanner. If the bat is a re-capture, the scanner will read and store its data and the bat can be released. If the bat is new, the bat is PIT-tagged, scanned and the age and sex is selected on the scanner. Paper copies of the data are taken also.
Best practise techniques for PIT-tagging bats can be found in the Best Practise Manual for Conservation Techniques for Bats (Sedgeley et. al., 2012) or dme://docdm-131465. PIT-tagging and tag recovery data are stored in the lesser short-tailed bat database.

3.4 Monitoring PIT-tagged bats

Radio frequency identification (RFID) uses a signal transmitted between a PIT-tag and a reading device, such as a hand-held scanner or an antenna and datalogger.
Once a roost tree is located it is climbed to affix antenna around the roost hole, which is linked to a datalogger. The dataloggers are set up to start and stop recording at specific dates and times using software on either a mini field computer or a standard computer or lap-top. As tagged bats move in and out of the roost the reader registers the tag and the logger automatically records the tag number along with the date and time. This set-up allows us to collect information remotely over two or three days (dependant on memory space and battery power). The datalogger units are designed to run either a single antenna (single logger) or two antennae for use when there is more than one roost hole (dual logger).
More detailed information about setting up RFID equipment can be found in dme://docdm-379889.
PIT- tag recovery data are stored in the lesser short-tailed bat database.

3.5 Advocacy

Every January, Department of Conservation, Fiordland district organises an event called “Birds, Bats and Barbeques” for members of the public to learn and be involved with bat work in the Eglinton Valley. Talks are given about the work during a barbeque and participants join the team catching and monitoring long-tailed bats or short-tailed bats at a roost tree.

TV One approached us to film at a short-tailed bat roost in the Eglinton in a story to explain the masting cycle, a precursor to media coverage about the Battle for our Birds campaign.

A student, Sarah Cull Luketina from the Masters in Science Communication course, Otago University approached us to film both bat projects in the Eglinton Valley.

3.6 Research

Anticoagulant rodent poisons act by prolonging blood coagulation or clotting time, which may result in excessive internal or external bleeding and ultimately death. Delivered safely, rodent control using anticoagulant poisons is likely to benefit bats, but unconventional baiting practices can put bats at risk.

In 2009 a number of short-tailed bats at Pureora in the North Island died during a rodent control operation when anticoagulant paste baits were laid without using bait stations. It seems likely that these unusual bats, which hunt for food on the ground as well as in the air, ate forest floor insects that had fed on the poison baits.

Since the bat deaths at Pureora, only hard pellets in bait stations have been used to deliver rodent poisons there. No further bat deaths have been recorded, but could low doses of poison still be entering the food chain and having more subtle adverse effects on the bat population over the long-term?

To address this question, Gillian Dennis, a PhD student from Massey University who is researching the Pureora bat deaths, joined our team during January 2014 for three nights of short-tailed bat catching in Fiordland. With the help of Massey University wildlife vet Danielle Sijbranda, Gillian sampled a small volume of blood from numerous Fiordland bats and used a portable coagulation monitor to measure how many seconds it took for the blood samples to clot.

4. Results

4.1 Catching bats

Three bats, two lactating females and one non-breeding female, were captured and had transmitters attached to them this season. One new roost tree was discovered, bringing the total number of roost trees found since 1997 to 90.

Both populations of bat flies did not establish in captivity. Eggs were produced but none hatched and all flies died, however samples were collected for impending phylo-genetic work.

4.2 Video counts

Emergence was recorded from 3 roost trees over 8 nights (two roosts were occupied simultaneously over three nights). The largest count was 1357 individual bats from two roost trees. The video counts over the years can be seen in figure 1.

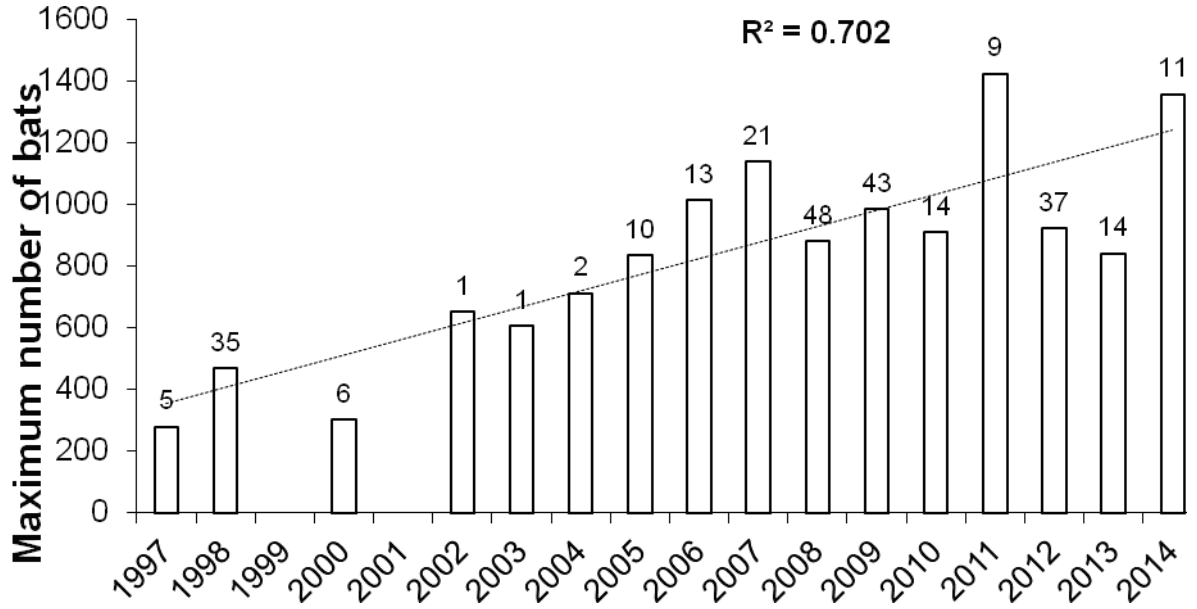


Figure1. Graph showing maximum number of bats exiting roosts per year. Maximum number is the highest count recorded that year at either a single roost tree or the sum of roosts occupied simultaneously. The figure above each bar is the number of video counts. Note this method is an index only, it is not a true representation of the population.

4.3 PIT-tagging bats

A total of 245 new bats of a range of age, sex and reproductive classes were PIT-tagged. This brings the total number of lesser short-tailed bats tagged in the Eglinton Valley to 1740.
All previously PIT- tagged bats handled were healthy and the majority of tags were in the correct position, between the shoulder blades.

Captures of short-tailed bats in the Eglinton Valley 2006 - 2014

Year	total recorded	recaps	New	AF	AM	JF	JM	unknown
2014	894	649	245	90	58	45	52	0
2013	758	552	206	124	31	25	26	0
2012	833	609	224	71	35	45	71	2
2011	666	439	227	93	41	48	45	0
2010	561	311	250	95	48	51	55	1
2009	377	231	146	60	56	9	13	8
2008	240	91	149	44	49	16	20	20
2007	285	6	279	128	59	48	39	5
2006	14	0	14	5	2	5	1	1
Total pit-tagged			1740					

4.4 Monitoring PIT-tagged bats

Survival analysis to date indicates the lesser short-tailed bat population in the Eglinton Valley are stable to increasing. The low survival rate in 2008 is likely to be related to the high rat numbers

experienced in 2006/07. The slightly lowered survival in 2011 may reflect the increase in rats, which were subsequently controlled. Data for 2014 is not yet available as survival analysis needs to compare between years.

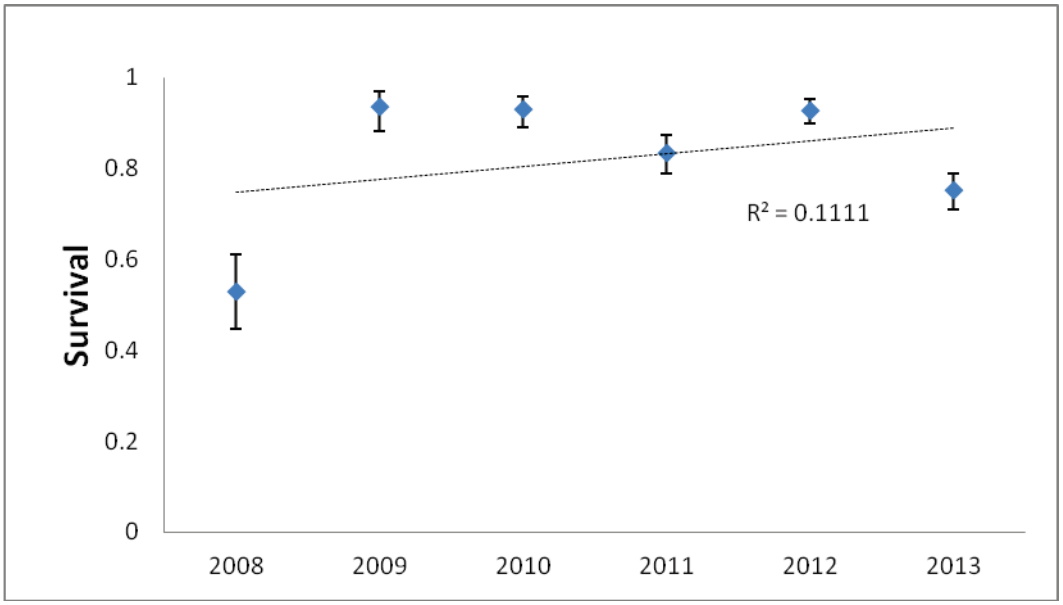


Figure 2. Results from mark -recapture analysis, showing survival between years for lesser short-tailed bats from 2008-2013.

4.5 Advocacy

The "Birds, Bats, Barbeques" event was held on the 17th January. The weather was cooler this season and long-tailed bats were not as active, therefore a group of people were taken across the river to a short-tailed bat roost.

TV One's Megan Martin and cameraman interviewed the team and filmed catching short-tailed bats at a roost.

Sarah Cull Luketina filmed both bat projects and interviewed the teams, as well as other bat projects around the country. The film will be available in November.

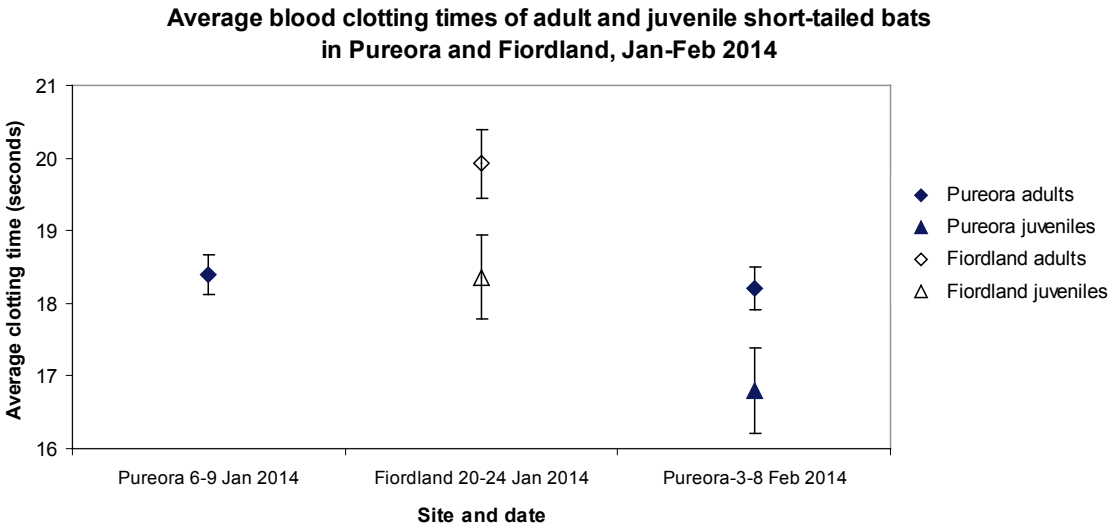
Forest & Bird organised a Bat Conference in the Rai Valley in March, which we attended and presented the short-tailed bat project.

The average clotting time of blood from the Fiordland bats, which were not exposed to any poison this season, was then compared to the average clotting time of blood that was taken from Pureora bats during a rodent control operation (using pellets and bait stations). If rodent poison was affecting the Pureora bats we would expect them to have significantly longer blood clotting times than the Fiordland bats.

4.6 Research

Gillian Dennis found was that the average blood clotting times of bats from the Pureora and Fiordland populations were almost the same (in fact the average clotting time of blood from Pureora bats was very slightly *shorter* than that of Fiordland bats) (see graph), thus confirming that the

changes to baiting practices at Pureora were effective at protecting short-tailed bats from undesirable impacts during rodent control operations.



5. Discussion

5.1 Catching bats

The Plato creek mist-net site was used at the beginning of the season to catch a bat, due to the river not being able to be crossed. This is a secondary mist-net site, as the "M1" site across the river from Knobs Flat is usually the most successful. We had difficulty gaining a signal for several days at the beginning of the season, even with two bats with transmitters. It is thought bats "sulk" and go to a solitary roost some distance away. It took 6 days before the first roost was found. It may be worth setting up mist-net sites on the true left of the river opposite near Knobs Flat to use when the river is high.

5.2 Video counts of roost trees

The video monitoring is not a true representation of the population; it is an index only, with large variation. The PIT- tagging technique and survival analysis has proved to be the optimum monitoring technique. The video monitoring does give us an indication of numbers during the season, however capturing bats at the roost trees gives us more information about survival and the demographics of the population.

5.3 PIT-tagging and monitoring bats

This year we used purpose built scanners which increased accuracy of the data. We also kept paper copies of the data to account for any technological issues.

5.4 Advocacy

The “Birds, Bats, Barbeques” event was able to go ahead even though the long-tailed bats were not active on the night, due to an active short-tailed bat roost. The participants need to be pre-warned that they may have to cross a river at night.
The media coverage on TV One was well received and explained the mast cycle and the vulnerability of bats to rats and stoats. The footage taken by Sarah for her Science Communication Masters thesis will be produced in November 2014.

6. Recommendations

During the 2015 field season we aim to:

- Catch and attach transmitters to adult breeding female bats to find as many communal roosts as possible
- Set up automatic readers and dataloggers at all roosts found and monitor registrations throughout January
- Continue insertion of new Passive Integrated Transponder (PIT) tags into at least 200 bats
- Continue PIT-tagging and handler training for appropriate people
- Continue video-count monitoring of roost trees
- Analyse data using mark-recapture to ascertain population trend
- Advocate bat conservation to the local community and stakeholders in the form of hands on events and involvement of media

We recommend the Eglinton lesser short-tailed bat project continues in its current form as a long-term project for the following reasons:

- The population trend of lesser short-tailed bats in the Eglinton Valley is a key outcome measure of the pest management in this area
- Mark-recapture analysis is a robust monitoring method which, over time, detects changes in populations that other monitoring methods fail to pick up
- Annual marking of a proportion of the lesser short-tailed bat population is required for the mark-recapture method
- Outcome monitoring of the lesser short-tailed bats complements the suite of threatened species monitoring in the Eglinton Valley, resulting in a unique project with one of the longest histories and the broadest scope in the country
- The lesser short-tailed bat population in the Eglinton Valley is currently the only known population in existence on mainland South Isalnd, and being actively protected by pest control
- The lesser short-tailed bat project in the Eglinton Valley is currently the only population of Southern lesser short-tailed bats being studied, and skills developed are being used to set up similar projects around the country

7. Acknowledgements

Thank-you to all who were involved in this season's fieldwork: Thanks to the lesser short-tailed bat monitoring team; Warren Simpson, Moira Pryde and Jane Tansell. Thank- you to all those who helped during PIT-tagging sessions and the birds, bats barbeque event: Dane Simpson, Gerard Hill, Sam Gibson, Emily Martin, Chloe Corne, Catie Helm, Sarah Knight, Chris Phillips, Gilbert Mingham, Phil Marsh, Em Oyston, Glen Greaves, Pete Dilks, Colin O'Donnell, Cassie Mark and all other folk who got roped in at short notice. Thank-you to Gillian Dennis and her team who went about their work in a very professional manner. Thanks to the filming teams Braydon Moloney and Sarah Cull Luketina and Megan Martin and her cameraman. Thank - you to the long-tailed bat team for their support, in particular Colin O'Donnell. Thanks to Gerard Hill and his team for predator control. Thank – you to Lindsay Wilson for management support. Thank- you to Moira Pryde for data analysis and technical support. Thanks also to Stu Cockburn for his help with technical equipment.

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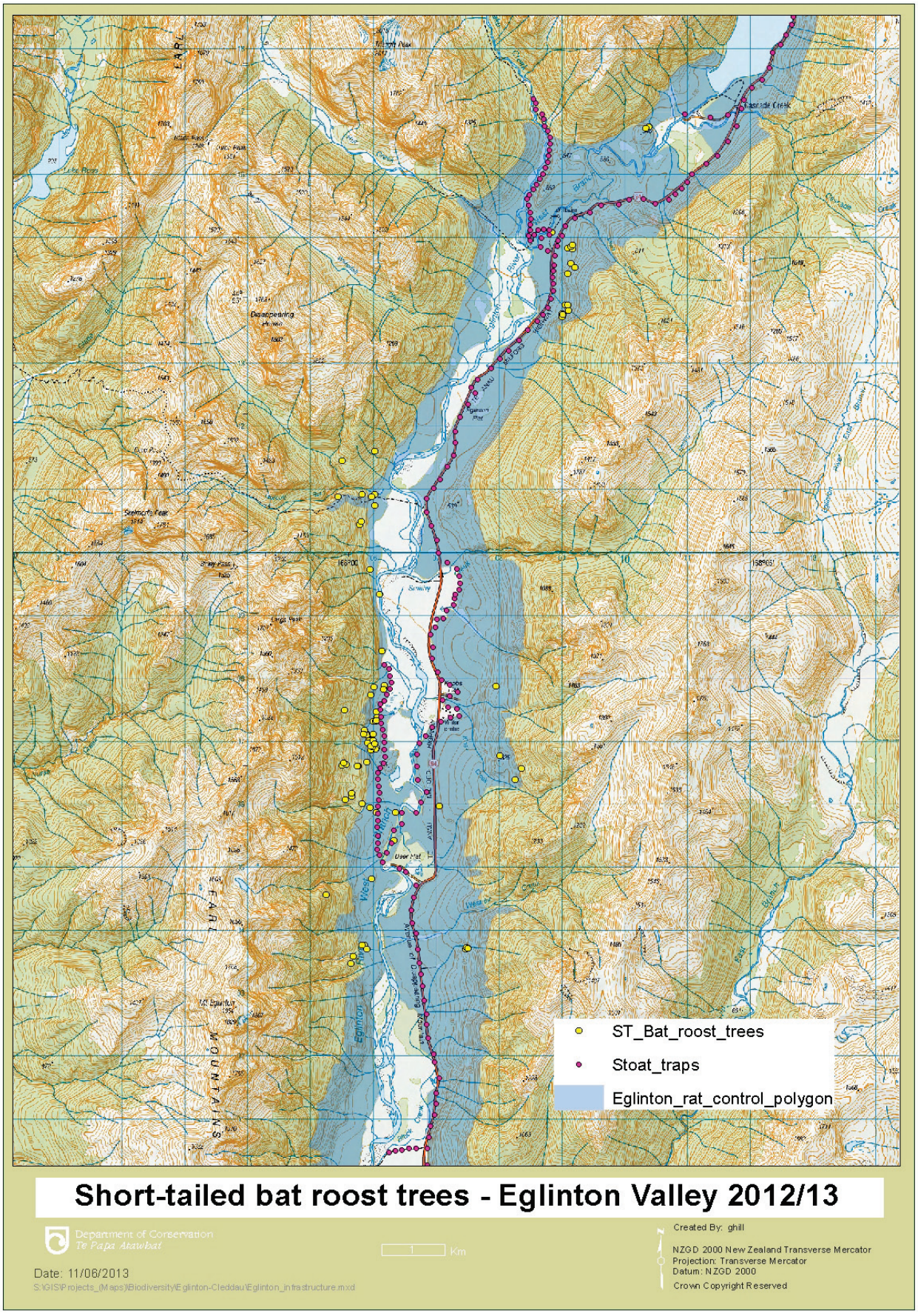
See dme://docdm-268687 "Eglinton Valley Research: Lesser short-tailed bats home page" for links to all reports, data, maps etc mentioned in this report and other material relevant to the Eglinton Valley lesser short-tailed bat monitoring programme.

Appendix 1. Map of Lesser Short-tailed Bat roost trees and Predator Control in the Eglinton Valley 2013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Short-tailed bat roost trees - Eglinton Valley 2012/13
Department of Conservation
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