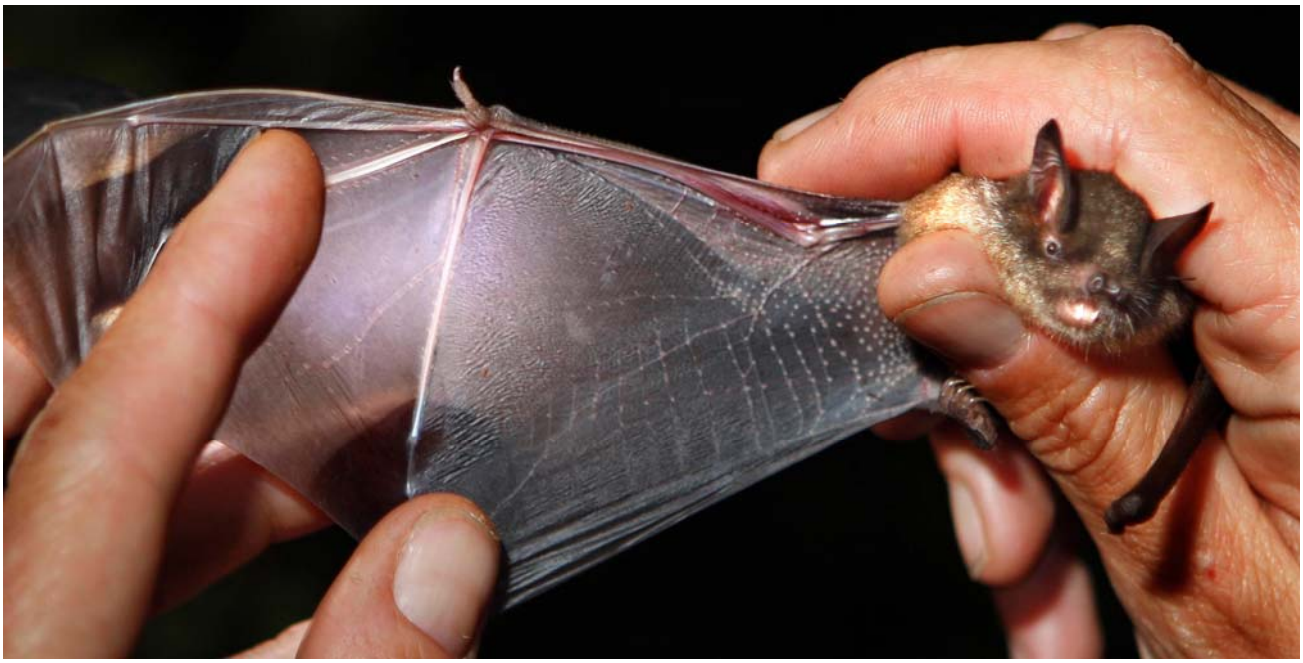
# Eglinton Valley
# Lesser Short-Tailed Bat
# Monitoring Programme 2012



Department of Conservation
*Te Papa Atawbai*

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# Eglinton Valley Lesser Short-Tailed Bat Monitoring Programme 2012

Hannah Edmonds, Department of Conservation, Te Anau Area Office

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*Cover image credit (Barry Harcourt):* Lesser short-tailed bat, January 2008



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# Summary

The South Island lesser short-tailed bat is ranked by the Department of Conservation as nationally endangered. Bats 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 population in the Eglinton Valley is one of only two known populations of lesser short-tailed bats 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 national NHMS species optimisation programme lists several key actions to protect and monitor the lesser short-tailed bat population in the Eglinton Valley.

Long-tailed bats 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, then recovery will be slow and difficult to detect in the short term, hence requiring a long-term commitment.

The Eglinton Valley 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 compliments 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 following aims:

- Monitor population trend over time using the mark-recapture method, and analyse data using Program MARK
- Monitor population trend over time using roost emergence counts via video recording, as a secondary monitoring method
- Highlight bat conservation to the local community via evening bat monitoring events

This report outlines the results of the January 2012 field season, shows the population trends gathered to date and lists recommendations for 2013 and the future.

# 1. Introduction

The Eglinton Valley lesser short-tailed bat monitoring programme is a long-term project. Informal monitoring began in 1997 when lesser short-tailed bats (*Mystacina tuberculata*) were discovered in the Eglinton Valley for the first time. Initially, the bats were monitored 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 frequently move roost sites making it difficult to find or film at all potential roost trees. Roost exit counts are therefore not thought to be as sensitive at detecting changes in populations as mark-recapture analyses.
Mark-recapture analysis of banded long-tailed bats (*Chalinolobus tuberculatus*) in the Eglinton Valley detected changes in populations that other monitoring methods failed to pick up (Pryde et al., 2005; Pryde et al., 2006).

Mark-recapture analyses require 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 in its current form began in 2006 as collaboration between Dr Jane Sedgeley, DOC Science & Technical Group, Christchurch, Te Anau Area Office and specialist staff; the DOC Veterinarian, Kate McInnes and Stu Cockburn from the DOC Electronics Workshop. The original aim of this study is 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 levels and ensuing management.

Invasive animal pests are controlled to protect a range of threatened native species present in the valley. Pest species targeted for control include stoats, cats, rats, and possums. Monitoring of mustelid/rodent abundance and survival of several threatened species is conducted each year.
Although the size and scope of the rat control has varied over the years, a 100x100m bait station grid now covers 4800ha of the Eglinton Valley. See Hill (2012) or dme://docdm-1053026 for the Threatened Species Protection in the Eglinton Valley Annual Report 2011/12.

The 2012 lesser short-tailed bat monitoring field programme ran from the 9th to the 27th of January. The aims of the programme were to:

- Catch and attach transmitters to a larger number of bats of different ages and sexes to find more roosts

- Set up automatic readers and dataloggers at all roosts found and monitor registrations throughout January/February
- Insert new Passive Integrated Transponder (PIT) tags into at least 200 bats
- Improve age identification of bats during PIT tagging sessions
- Improve the number and quality of video counts to evaluate monitoring techniques
- Train several people (one student, 3 DOC staff members) to PIT-tag bats
- Train a several local "bat handlers" to assist PIT-tagging sessions
- Analyse population data to date using mark-recapture
- Advocate bat conservation to the local community

The results were:

- Six bats of different ages and sexes were captured and had transmitters attached
- Automatic readers and dataloggers were set up at all known occupied roosts (except for one rotten tree) and registrations were monitored throughout January
- PIT tags were inserted into 222 bats
- Age identification was improved during PIT- tagging sessions
- Many more video counts were done
- One DOC staff and one PHD student were trained to PIT- tag bats
- Two DOC staff began training to PIT-tag bats
- One DOC staff was trained to handle bats
- One DOC staff began training to handle bats
- Data was analysed using mark-recapture
- Advocacy effort was increased with a bat handling event for invited community members, as well as the annual birds, bats and barbeques event
- Data collection was improved with the keeping of an electronic diary, and keeping the database up to date

# 2. Methods

### *2.1 Video counts*

Lesser short-tailed bat roosts are located by following radio-tagged bats, however occasionally roosts are located by checking known roost trees for signs of bats. 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.
Once a roost tree has been 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.

### *2.2 PIT-tagging bats*

Four 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).
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.
To date trained PIT-taggers for the Eglinton Valley lesser-short tailed bat project are: Jane Sedgeley, Kate McInnes, Warren Simpson, Hannah Edmonds, Linda Kilduff, Jane Tansell and Jo Hoare. It is important to note that these people are trained PIT-taggers, not trainers. Training is done predominantly by Kate McInnes, with help from Warren Simpson, Hannah Edmonds and Linda Kilduff who have the most relevant experience and are co-authors of the section on PIT-tagging bats in the Best Practise Manual for Conservation Techniques for Bats (Sedgeley et. al 2012).

### *2.3 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.

### *2.4 Advocacy*

Every January, as part of a Summer Visitor Programme the Community Relations team from Te Anau Area Office organises an event called Birds, Bats and Barbeques for members of the public to learn and be involved with the bat work in the Eglinton Valley. Talks are given about the work during a barbeque and later participants join the team catching and monitoring long-tailed bats at a roost tree. This year, due to a change in team functions and responsibilities, the Biodiversity Team, with input from the Community Relations Team organised the event.

The lesser short-tailed bat team with the help of the Community Relations team also organised a separate event for selected members of the local community, to a night of lesser short-tailed bat monitoring this season. The aim of this event was to highlight bat conservation to members of the public who either have minimal involvement with bats, or are in a position to educate others.

# 3. Results

## *3.1 Video counts*

Six bats: two lactating adult females, three juvenile males and one juvenile female were captured and had transmitters attached to them to find communal roosts this season. The two transmitters on the adult females unfortunately failed early. One new roost tree was discovered (M43), at Knobs Flat, close to other known roost trees. The total number of roosts found since 1997 has increased to 88. Emergence was recorded from 6 roost trees over 28 nights. The largest count was 927 individual bats, the total of 3 roost trees occupied in one night. The video counts over the years can be seen in figure 1.

Two known roost trees were found fallen, possibly due to heavy snowfall during winter. One of these roost trees was M31, a large hollow red beech tree which housed the highest ever emergence count of 1423 bats in 2011.

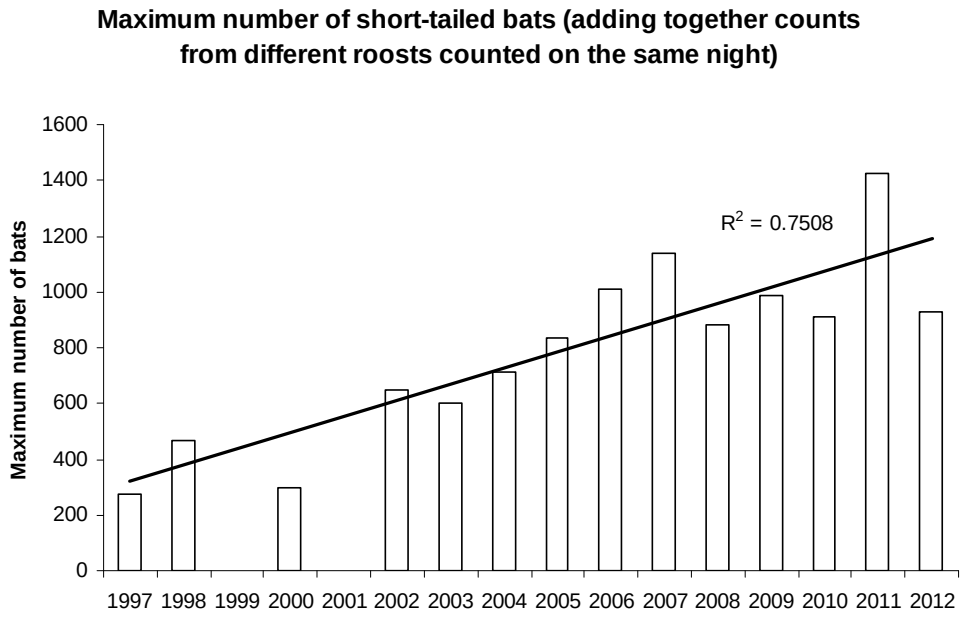


**Figure1.** Graph showing maximum number of bats exiting roosts per year. Maximum number is the highest count recorded that year at either a single roost tree or the sum of roosts occupied simultaneously.

**Table1.** Emergence count data, January 2012

| Date | Roost tree(s) | Number of bats |
|---|---|---|
| 10/01/12 | M43 | 522 |
| 11/01/12 | M43,M28 | 535 |
| 12/01/12 | M43,M28 | 431 |
| 13/01/12 | M43, (vid on M28 not working) | 124 |
| 14/01/12 | M43, M28 | 431 |
| 15/01/12 | M43 | 433 |
| 16/01/12 | M43, M28 | 592 |
| 19/01/12 | M43, M1 | 257 |
| 20/01/12 | M43, M3, M1 | **927** |
| 21/01/12 | M1 | 25 |
| 22/01/12 | M1, M43 | 10 |
| 23/01/12 | M67 | 649 |
| 24/01/12 | M67,M32 | 430 |
| 25/01/12 | M67, M32 | 460 |
| 26/01/12 | M67 | 392 |

## *3.2 PIT-tagging bats*

A total of 222 new bats of a range of age, sex and reproductive classes were PIT-tagged. This brings the total number of bats ever tagged to 1287 (Table 2).
All previously PIT- tagged bats handled were healthy and the majority of tags were in the correct position, between the shoulder blades.
Three staff as well as one PHD student had training in PIT-tagging lesser short-tailed bats this season. Sarah King (DOC Whirinaki) and Cory Toth (PHD student, Pureora) were trained predominantly by Kate McInnes and deemed competent. Training began for Jo Whitehead (DOC Te Anau) and Moira Pryde (DOC S&R, Christchurch). Further handler training was given to Gerard Hill and handler training began for Sinead Mulhern, both from DOC Te Anau.

**Table2.** Number and composition of bats PIT-tagged per year

| **Age, sex and reproductive status when tagged** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **Total** |
|---|---|---|---|---|---|---|---|---|
| Adult female | 4 | 128 | 45 | 19 | 89 | 92 | 71 | 448 |
| Adult male | 2 | 59 | 50 | 28 | 45 | 41 | 35 | 260 |
| Juvenile female | 4 | 48 | 25 | 45 | 57 | 48 | 43 | 270 |
| Juvenile male | 2 | 39 | 29 | 33 | 57 | 25 | 71 | 256 |
| Other (unknown age or sex) | 3 | 4 | 0 | 23 | 1 | 20 | 2 | 63 |
| **Total bats tagged** | **15** | **278** | **149** | **148** | **249** | **226** | **222** | **1287** |

## *3.3 Monitoring PIT-tagged bats*

Initial survival analysis shows low survival (53%) in 2008, likely to be related to the high rat numbers in 2006/07. The slightly lowered survival in 2011 may reflect the increase in rats, which were subsequently controlled. Results show high survival in other years. Recapture rates were consistently high for all years (M. Pryde pers.comm). The survival between 2006 and 2007 is not available as the 2006 sample size is too small. The 2012 survival rate will be verified with the 2013 season's data therefore it is not shown on the graph.

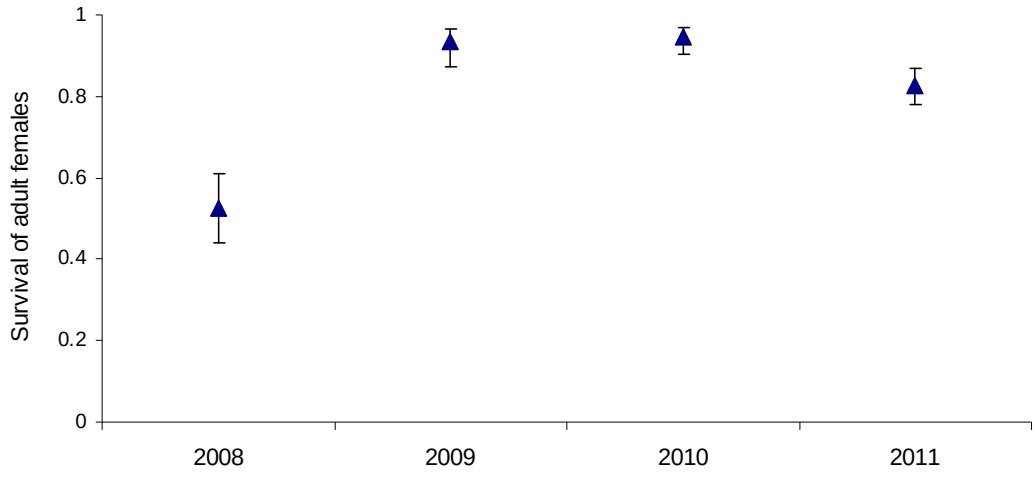

Figure 2. Results from mark -recapture analysis for lesser short-tailed bats from 2008-2011.

### *3.4 Advocacy*

The birds, bats and barbeque event was popular and successful despite a date change due to bad weather. Of the two potential long-tailed bat roosts we had available that night, one was a communal roost and emerging bats were caught in a harp trap. We also managed to catch a lesser short-tailed bat in a mist-net and brought it to show the group, so they could see both bat species.

The additional event for selected community members at a lesser short-tailed bat roost was also successful, and we received positive feedback. Prior to bats emerging from the roost tree, participants were given a tree climbing demonstration. Once bats began emerging, participants could see bats being caught in a mist net, where they were given the opportunity to release a bat, and view bats emerging via a video monitor. A professional photographer, Keri Moyle from "Signs of Life" was present at this event.

## 4. Discussion

### *4.1 Video counts of roost trees*

More video counts of emergence at different roost trees were achieved this year, as opposed to last year when bats seemed to inhabit two roost trees for most of the month. We also attached transmitters to more bats this year to ensure we weren't missing any roosts. Staff were available over the weekend to keep video units running at roost trees, which also increased counts.

The loss of two known roost trees is significant, especially roost tree M31, which has housed more than a thousand bats in the past.

### *4.2 PIT-tagging and monitoring bats*

The PIT-tagging sessions went well this year, even with the added workload of: training two new PIT-taggers, beginning PIT-tagging training for two staff, and handler training for two staff. Obviously this amount of training puts added pressure on the team, however it was alleviated by Kate spending time training Cory prior to January, and Sarah having had relevant experience.
More time was needed to train Moira and Jo, who were new to PIT-tagging, and we aim to complete their training in 2013. It is preferable to have one person training new PIT-taggers so they learn one technique, rather than getting confused being shown several different ones.
Handler training is also very important, and we often struggle to get enough experienced handlers for PIT-tagging sessions, especially as it is often at short notice. Staff need to have time and commitment in their work programme for this important job.

There have been notable errors in aging bats, the problem most likely occurs during the end of January when the joints of young bats have started to fuse, and therefore start to look more like adults. There were also issues with sex identification, possibly because the female lesser short-tailed bats have a pronounced clitoral pad above the vagina, but it is smaller and more domed than a penis. We recommend that bat handlers are given better training during PIT-tagging sessions and that they seek second opinions for any bats whose age or sex is questionable. We will use a check sheet of photographs of wing joints for age classification, and males and females for sex classification during

PIT-tagging sessions in 2013. We will also use a list of bats with incomplete records such as misidentification regarding age, sex or PIT-tag number to update records if they are re-captured.

One issue we had this year was something we have fortunately not encountered before. A bat was found with an injured wing joint, which was possibly caused when it was removed from the harp trap bag. The removal of bats from the harp trap bag into smaller bags for processing can be a chaotic event, with hands and bats everywhere. To prevent injury to bats we recommend only two experienced bat handlers, one per side, attend the harp trap and remove bats slowly and carefully.

### *4.3 Advocacy*

Both advocacy events were successful and very well received. There is a certain amount of time required to organise these events, and the lesser short-tailed bat team is reliant on the wider Biodiversity Team, with support from the Community Relations Team to achieve this.

The birds, bats and barbeque event will happen in January 2013, and if time permits the lesser short-tailed bat team would like to organise a separate event for selected members from DOC Te Anau.

# 5. Recommendations

During the 2013 field season we aim to:

- Catch and attach transmitters to a large number of bats of different ages and sexes to find as many 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
- Improve sex and age identification of bats during PIT- tagging sessions
- Update incomplete records of bats during PIT-tagging sessions
- Continue and improve the number and quality of video counts to evaluate monitoring techniques
- Continue PIT-tagging training for two DOC staff members
- Continue to train a select group of local "bat handlers" to assist PIT-tagging sessions
- Handle bats with utmost care, particularly when removing from harp trap bags
- Analyse data using mark-recapture to ascertain population trend
- Advocate bat conservation to the local community

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

- Video counts of roost emergence is a valuable method to use in conjunction with mark-recapture as it gives up to date information, whereas mark-recapture has a lag effect from year to year
- Outcome monitoring of the lesser short-tailed bats compliments 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

# 6. Acknowledgements

Thank you to all who were involved in this season's fieldwork: Thanks to the lesser short-tailed bat monitoring team; Warren Simpson, Linda Kilduff, Jo Whitehead, Moira Pryde, as well as the extra help from Sarah King and Cory Toth. Thank- you Kate McInnes for PIT-tagging training and support and to all those who helped during PIT-tagging sessions: Dane Simpson, Gerard Hill, Jono More, Jo Carpenter, Jason van Wetering, Maddie van Wetering, Donna Worthy, Lara McBride, Pete Young, Chris Birmingham, Vaughn Filmer, Aviva Stein, Daniel Savage and all other folk who got roped in at short notice. Thank - you to the long-tailed bat team for their support, in particular Colin O'Donnell. Thank- you to Sabine Bernert and Keri Moyle for their photographs. Thank – you to Michelle Gutsell, Caroline Carter, Lindsay Wilson and Janette Charteris for organising and assisting with the Birds Bats and Barbeque event. A special thank-you to Moira Pryde for data analysis and creating the short-tailed bat database with Graeme Elliott, and her patience in helping us drive it.

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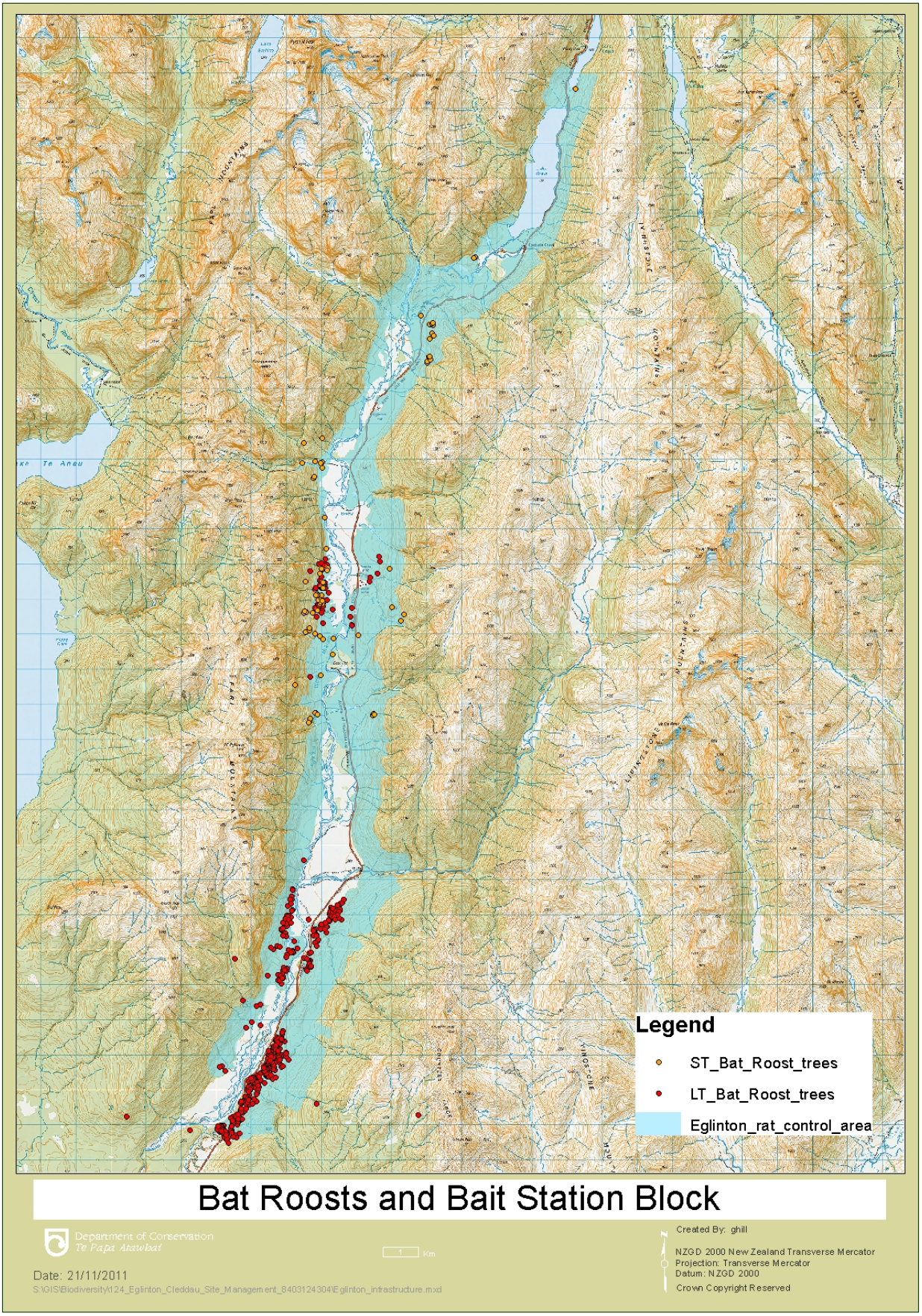
See dme://docdm-268687 “Eglinton Valley Research: Lesser short-tailed bats home page” for links to all reports, data, maps etc mentioned in this report and other material relevant to the Eglinton Valley lesser short-tailed bat monitoring programme.

# Appendix 1: Map of Bat roosts and rat control in the Eglinton Valley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Bat Roosts and Bait Station Block
Department of Conservation
Te Papa Atawbai
Km
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