Eglinton Valley Lesser Short-Tailed Bat Monitoring Programme 2013

Department of Conservation
Te Papa Atawhai

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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 Natural Heritage Management System (NHMS) species optimisation programme lists several key actions to protect and monitor the lesser short-tailed bat population in the Eglinton Valley.

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 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 2013 field season, shows the population trends gathered to date and lists recommendations for 2014.

The results for January 2013 were:

- Automatic readers and dataloggers were set up at all known occupied roosts and PIT-tagged bats recorded
- The highest count of bats emerging from two roost trees, via video recordings, was 841. This number is lower in comparison to previous years and may be attributed to late breeding
- A proportion of the population (206 bats) were marked with PIT-tags, bringing the total PIT-tagged to 1495. 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
- Several video counts of roost emergence were carried out
- The annual “Birds, Bats and Barbeques” event was successful in advocating bat conservation to the local community

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 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 2013 lesser short-tailed bat monitoring field programme ran from the 7th to the 29th of January. The aims of the programme were to:

- Catch and attach transmitters to a large number of bats of different ages and sexes to find more 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 age identification of bats during PIT tagging sessions
- 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
- 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.

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).
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, as part of the Department of Conservation 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 or short-tailed bats at a roost tree.

4. Results

4.1 Catching bats

Six bats, four lactating adult females, one non-breeding adult female and one adult male were captured and had transmitters attached to them this season, during four mist-netting sessions. Three different mist-netting sites were used: the Knobs Flat M1 site, Plato Creek, and a new site at Smithy Creek. The first three mist-netting sessions failed to catch any breeding females, and the team were unable to mist-net for four nights due to heavy rain and subsequent flooding. It took six nights before an adult lactating female was caught, which led the team to a new communal roost (M45), opposite Smithy Creek, close to known roost M33. The total number of roost trees found since 1997 has increased to 89.

4.2 Video counts

Emergence was recorded from 2 roost trees over 14 nights. The largest count was 841 individual bats, the total of 2 roost trees occupied in one night. The video counts over the years can be seen in figure 1.

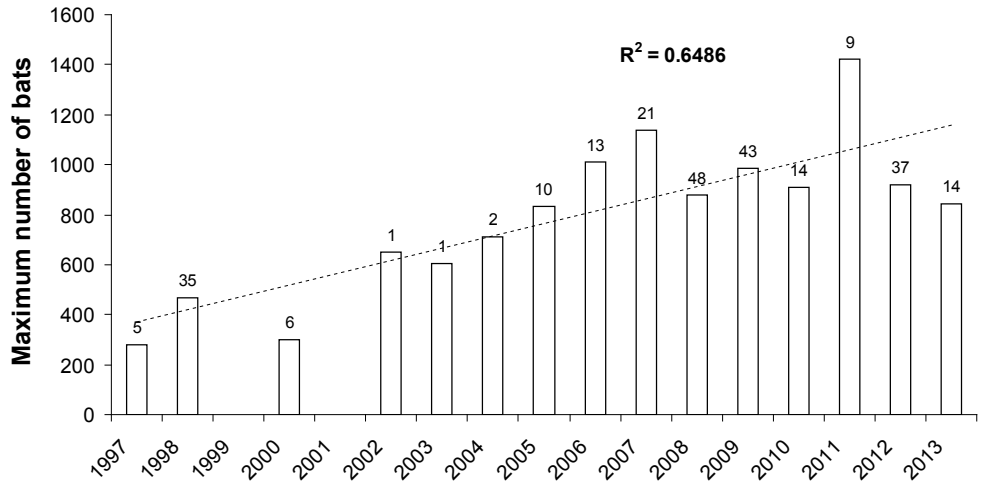


Figure1. Graph showing maximum number of bats exiting roosts per year. Maximum number is the highest count recorded that year at either a single roost tree or the sum of roosts occupied simultaneously. The figure above each bar is the number of video counts. Note this method is an index only, it is not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

Table1. Emergence count data, January 2013

Roost	Date	Count	Total count both roosts	Notes
M45	15/01/13	302		
M65	18/01/13	809		Recording ended at 11pm instead of 12 midnight
M45	18/01/13	32	**841**	
M65	19/01/13	536		Recording ended at 11pm instead of 12 midnight
M45	19/01/13	72	608	
M65	20/01/13	326		Bats left tree after harp - trapped
M45	20/01/13	79	405	
M45	21/01/13	83		
M45	22/01/13	292		
M45	23/01/13	166		
M45	24/01/13	195		
M45	28/01/13	459		
M45	29/01/13	379		
M45	30/01/13	454		

4.3 PIT-tagging bats

A total of 206 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 1495 (Table 2).
All previously PIT- tagged bats handled were healthy and the majority of tags were in the correct position, between the shoulder blades.

Table 2. Number and composition of bats PIT-tagged per year

Age, sex and reproductive status when tagged	2006	2007	2008	2009	2010	2011	2012	2013	Total
Adult female	5	128	44	60	95	93	71	124	620
Adult male	2	59	49	56	48	41	35	31	321
Juvenile female	5	48	16	9	51	48	45	25	247
Juvenile male	1	39	20	13	55	45	71	26	270
Other (unknown age or sex)	1	5	20	8	1	0	2	0	37
Total bats tagged	**14**	**279**	**149**	**146**	**250**	**227**	**224**	**206**	**1495**

4.4 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 2013). The survival between 2006 and 2007 is not available as the 2006 sample size is too small. Data for 2013 is not yet available as data is needed from 2014 to compare between years.

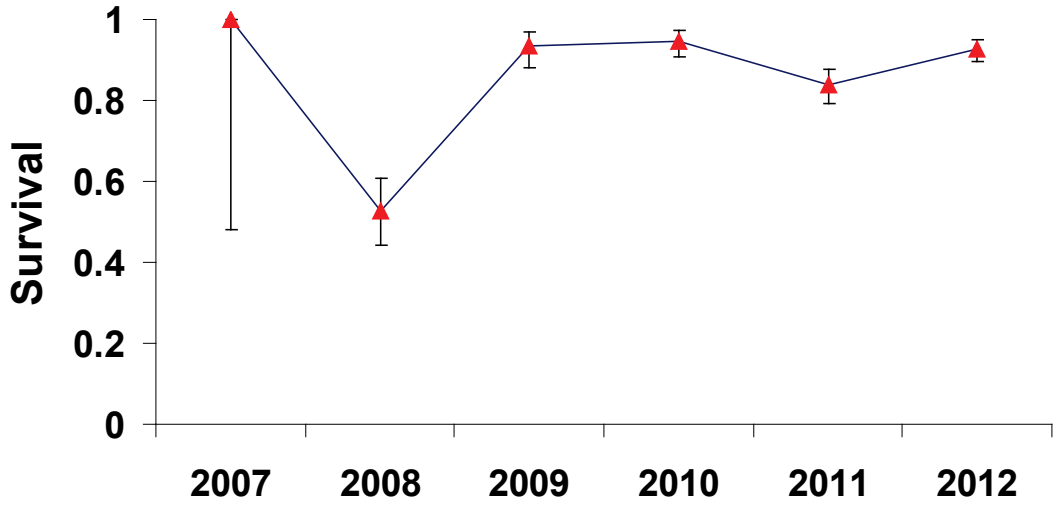


Figure 2. Results from mark -recapture analysis, showing survival between years for lesser short-tailed bats from 2008-2012.

4.5 Advocacy

The "Birds, Bats, Barbeques" event was popular and successful despite marginal weather and not having a trap-able long-tailed bat roost. A long-tailed bat was captured the previous evening and was shown to the participants. Those who had adequate footwear were taken across the river to a short-tailed bat roost to view a PIT-tagging session.

5. Discussion

5.1 Catching bats

Although bats were caught on the first night of mist-netting, it took six nights to capture an adult lactating female, and eight days to find a communal roost. It appears the short-tailed bat colony in the Eglinton Valley bred later than usual this year, consequently breeding females were more difficult to capture, they may have been less mobile with younger babies. The reasons for late breeding are not known, a cold wet spring may have caused the female bats to delay implantation. There was heavy rain on the 9th and 10th of January which caused the Eglinton river to flood, making it unable to be crossed for several days, so we had limited sites and nights available for mist-netting.

5.2 Video counts of roost trees

There were less video counts conducted this year than last year, due to the delay finding a communal roost, as well as only two communal roosts found. In 2012 a total of four communal roosts were located and bats were in two roosts most nights and even three roosts on one night. This year we knew of two roosts being occupied simultaneously for only three nights. Bats left the second roost (M65) after a PIT-tagging session, and we did not locate a second roost.
Two video counts unfortunately finished one hour earlier than programmed to causing incomplete counts. This was remedied by setting the time to finish an hour later, but is something to be aware of for next season.

The highest number of bats emerging from two roost trees this year was 841. This number is lower in comparison to previous years and may be attributed to the late breeding; juveniles did not emerge from the communal roost tree until the end of the month. After juvenile bats began to emerge the counts increased slightly at the only roost tree we knew of, M45, however numbers still remained relatively low, compared to previous seasons. The roost tree M31 was lost during winter 2011, either to snowfall or wind damage. It is not known if any bats died in this event. M31 housed the highest number of bats counted, 1423 and is a significant loss for the population, other trees may not be able to accommodate such large numbers.

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 at the roost trees gives us more information about the demographics of the population. This year demonstrated that if relying on video counts alone and not catching at roost trees, we would not have known about the late dispersal of the juveniles. We will continue to use this method in 2014 however we are open to discussion on whether we continue this method in the future.

5.3 PIT-tagging and monitoring bats

Reaching the target of 200 new bats PIT-tagged per annum became difficult this year, due to a high proportion of recaptures. All bats captured in the first five PIT-tagging sessions were adults, of which most were PIT- tagged, indicating that at least 50% or more of the population are PIT-tagged, which is our aim. Juveniles did not emerge until late January; therefore we rested PIT- tagging sessions for a week to wait until juveniles began to emerge. One PIT-tagging session at the end of this week resulted in us meeting the target, PIT-tagging a total of 51 juvenile bats. This number is low when compared to previous years, so we may have benefitted from doing at least one more capture, however this late in the season two members of our team had moved on to other commitments, leaving only two PIT-taggers. Despite this, Warren managed to PIT-tag the majority of the bats that evening by utilising two handlers in a production line fashion. This technique increases efficiency, although it requires more trained handlers, of which we currently have few. It would be worth trialling this method next season, as well as training more handlers.

We have had some issues with data transfer from PIT-tagging sessions. Because individual PIT-tag numbers are entered manually from the field sheets into the database, it is easy to make mistakes. This can be remedied by using a scanner which can be downloaded straight into the database, eliminating this problem. Scanners need to be purchased and operational prior to next season.

It is important to note that due to the juveniles being late to emerge from roost trees this year, survival estimates from 2012-2013 may show a decrease.

5.4 Advocacy

The "Birds, Bats, Barbeques" event and any additional bat show and tell event are always well received and beneficial to bat conservation. We have tried to avoid taking people across the river at these events in the past, however if a long-tailed bat roost is unavailable, it is well worth taking people to view a short-tailed bat roost which are often across the river. Therefore at events in the future we should ensure participants are briefed to be prepared to cross the river to see bats.
A secondary bat handling event aimed at involving key stakeholders similar to one we conducted in 2012 would be beneficial to reinstate if time allows in 2014.

6. Recommendations

During the 2014 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
- Improve sex and age identification of bats during PIT- tagging sessions
- Improve data transfer from the field to the database using scanners
- Continue PIT-tagging training for DOC staff members and trial the use of two handles to one PIT-tagger
- Continue to train a select group of local handlers to assist PIT-tagging sessions
- 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 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

- The lesser short-tailed bat population in the Eglinton Valley is currently the only population being actively protected by pest control on mainland South Island

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, Linda Kilduff, Jo Marsh and Moira Pryde. Thank- you to all those who helped during PIT-tagging sessions and the birds, bats barbeque event: Dane Simpson, Gerard Hill, Lara McBride, Pete Young, Sue Lake, Simon Marwick, Abby Wangeman, Anna Star, Leigh Marshall, Em Oyston, Lyndsay Murray, 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 Michelle Gutsell and Lindsay Wilson for management support. Thank-you to Moira Pryde for data analysis and her work with Graeme Elliott on the short-tailed bat database. Thanks also to Stu Cockburn for his help with technical equipment.

8. References

Hill, G. 2013. Threatened species protection in the Eglinton Valley, annual report 2012/13. Unpublished report, Department of Conservation, Te Anau.(DOCDM-1222347).

Lloyd, B. 1995. A report on a trial of the effects of forearm banding on captive short-tailed bats *Mystacina tuberculata*. Unpublished Science & Research Report, Department of Conservation, Wellington.

O'Donnell, C.F.J.; Christie, J.E., Hitchmough, R.A., Lloyd, B. & Parsons, S. 2010. The conservation Status of New Zealand Bats. 2009. New Zealand *Journal of Zoology* **37:** 297-311.

Pryde, M.A.; Lettink, M. & O'Donnell, C.F.J. 2006. Survivorship in two populations of long-tailed bats (*Chalinolobus tuberculatus*) in New Zealand. New Zealand *Journal of Zoology* **33:** 85–95.

Pryde, M.A.; O'Donnell, C.F.J. & Barker, R.J. 2005. Factors influencing survival and long-term population viability of New Zealand long-tailed bats (*Chalinolobus tuberculatus*): Implications for conservation. *Biological Conservation* **126**: 175–185.

Sedgeley, J.A. & Anderson, M. 2000. Capture and captive maintenance of short-tailed bats on Whenua Hou and monitoring of wild bats during the kiore eradication programme winter 1998. Internal Report, Department of Conservation, Invercargill. Pp. 47.

Sedgeley, J. & O'Donnell, C. 2006. Results and recommendations from transponder trials in lesser short-tailed bats. Unpublished Report, RD&I, Department of Conservation, Christchurch.(DOCDM-25790).

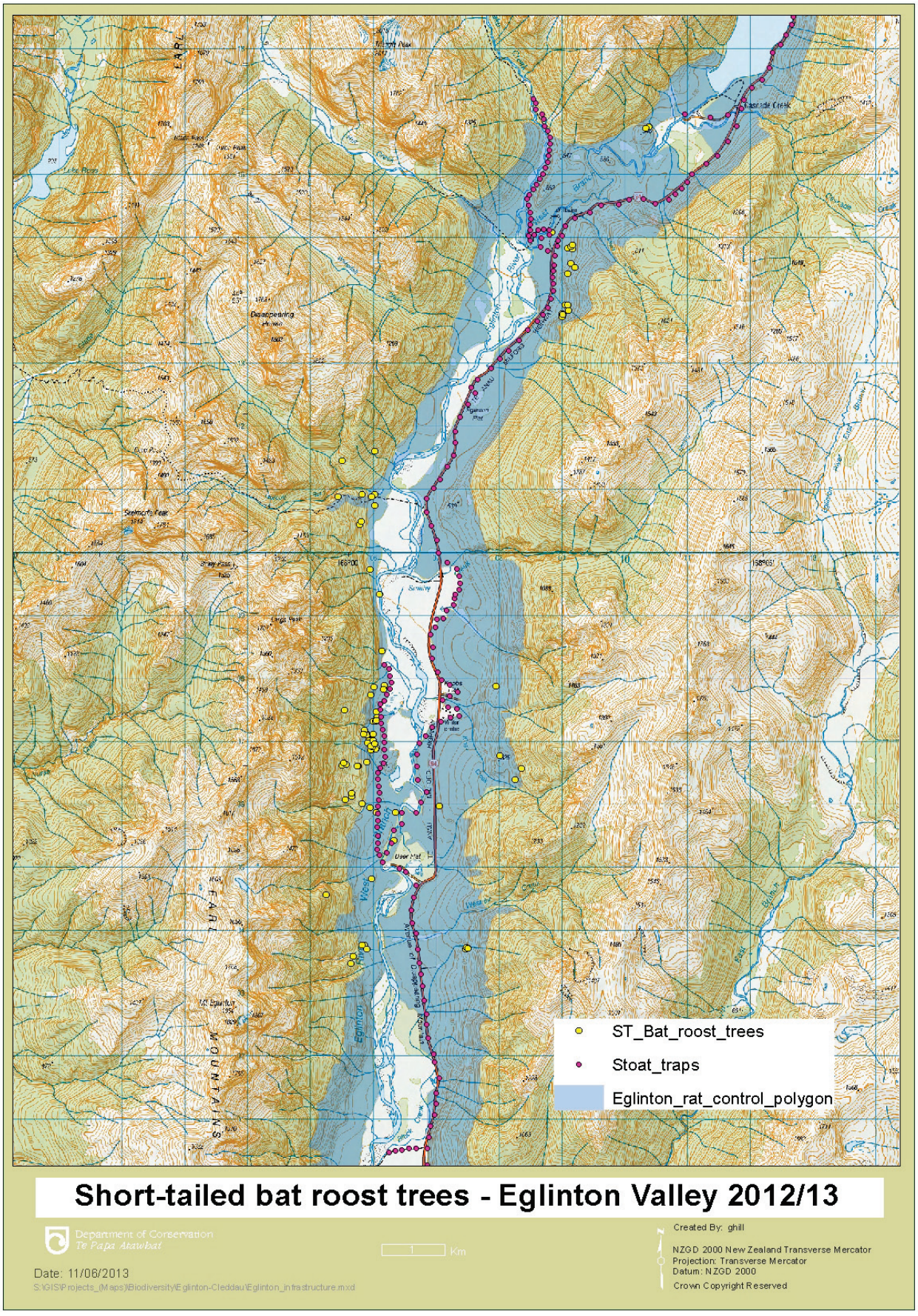
Sedgeley, J. & O'Donnell, C. 2007. Use of Passive Integrated Transponder tags to Mark and Monitor Lesser Short-tailed Bats in the Eglinton Valley. Report to DOC Animal Ethics Committee (2007). Unpublished Report, RD&I, Department of Conservation, Christchurch. (DOCDM-129363).

Sedgeley, J. 2008. Eglinton Valley lesser short-tailed bat monitoring programme. (Report for Operation Ark Meeting April 2008). Unpublished Report, R&D, Department of Conservation, Christchurch. (DOCDM-270947).

Sedgeley, J.; O'Donnell, C., Lyall, J., Edmonds, H., Simpson, W., Carpenter, J., Hoare, J. & McInnes, K. 2012. DOC Best Practise Manual of Conservation Techniques for Bats. Inventory and Toolbox: Bats (http://www.doc.govt.nz/Documents/science-and-technical/inventory-monitoring/im-toolbox-bats/im-toolbox-bats-doc-best-practise-manual-of-conservation-techniques-for-bats.pdf

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
Te Papa Atawbat
Date: 11/06/2013
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NZGD 2000 New Zealand Transverse Mercator
Projection: Transverse Mercator
Datum: NZGD 2000
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