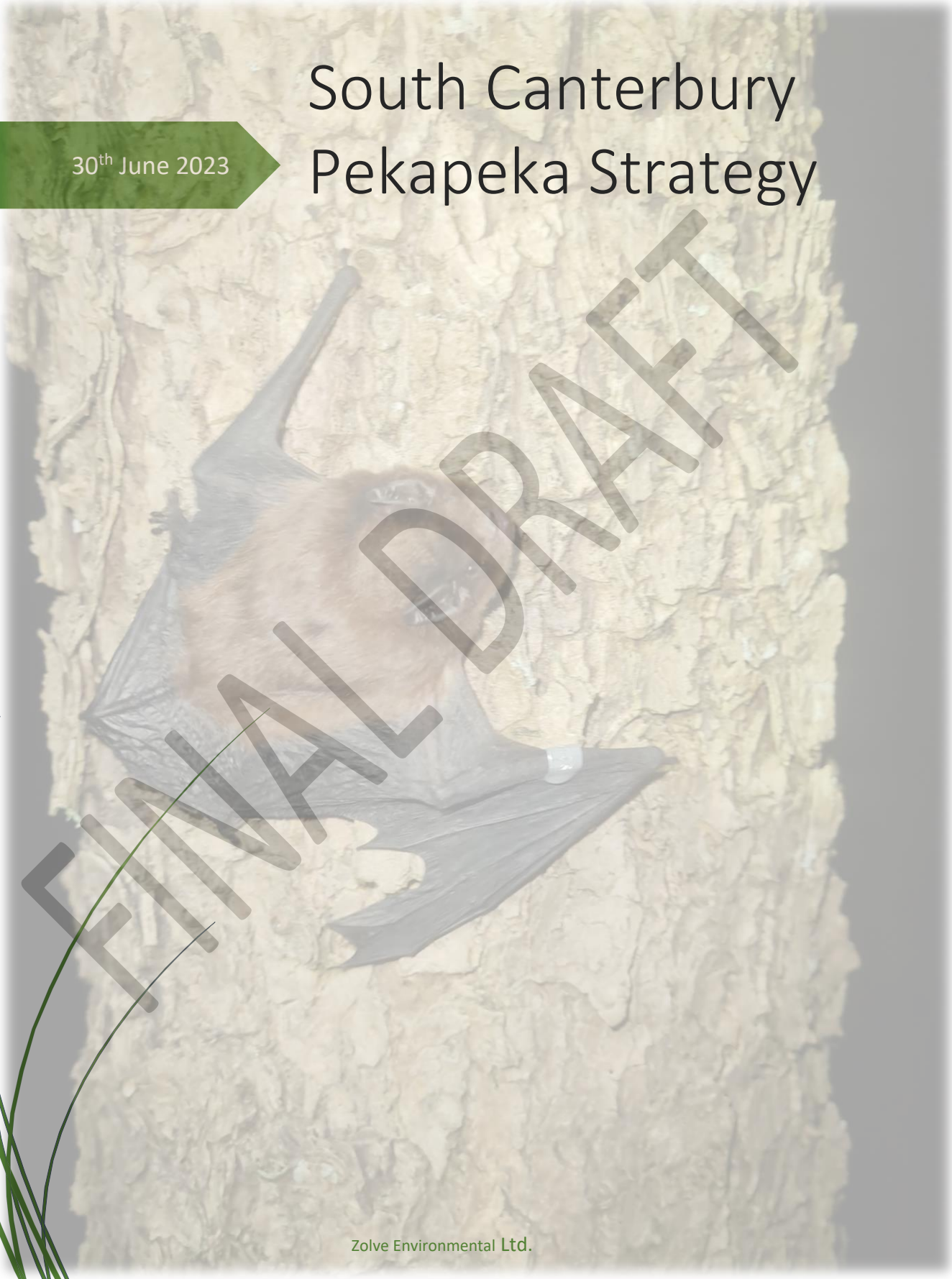
APPENDIX A

South Canterbury Pekapeka Strategy

30th June 2023



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Zolve Environmental Ltd.

Project Name:	South Canterbury Pekapeka Strategy		
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Prepared for:	Department of Conservation- Rob Carson-Iles		
Author(s):	Zac Robinson		
Reviewed By:	Jemma Hippolite		
Authorised By:	Zac Robinson Managing Director		

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Revision	Prepared By	Description	Date
2	Zac Robinson	Second version final draft	06-09-2023

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Executive Summary:

The South Canterbury Pekapeka strategy aims to set the direction and alignment of all Pekapeka work within the South Canterbury Region. The objectives outline a structure for consistency within the current activities and opportunities to expand and be the leading species protection program within South Canterbury. Utilising the Pekapeka program (protection of a highly mobile species) this may lead to enhancement of biodiversity and ecosystems around the region with subsequent benefits to a wide range of other indigenous flora and fauna.

The overarching objectives of this strategy are to:

1. Implement strategic alignment across the program.
2. Secure organisational commitment to ensure continuity and expansion of the program.

These are to be the foundation of which Predator free South Canterbury is achieved across a transformed landscape where conservation and productive land use can be achieved collaboratively.

Our Vision Statement is:

To have abundant populations of the indigenous taonga species Pekapeka, thriving and expanding through pest free habitats, spilling into rural and urban communities of South Canterbury.

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Introduction & Objectives:

Pekapeka, New Zealand Long Tailed Bat (*Chalinolobus tuberculatus),* are considered *Threatened-Nationally Critical*[1] within the New Zealand Threat Classification System (NZTCS). The South Canterbury Pekapeka is one of the most fragile colonies of Pekapeka remaining in New Zealand with estimates of approx. 300 breeding females remaining, and in early 2000s doubt over whether this colony would survive. While the program appears to not have been viewed as high priority on a national level, the recovery of Pekapeka has continued to succeed. This is due to the support of local communities and businesses alongside passionate individuals which has seen it become one of the largest species protection programs in South Canterbury.

The South Canterbury Pekapeka program has been built on partnerships between the public sector, private sector, and individual landowners. Over the last 7 years the program has developed extensively, led by the Long-tailed Bat Working Group (LTBWG) which is an informal group consisting of representatives of key stakeholder groups.

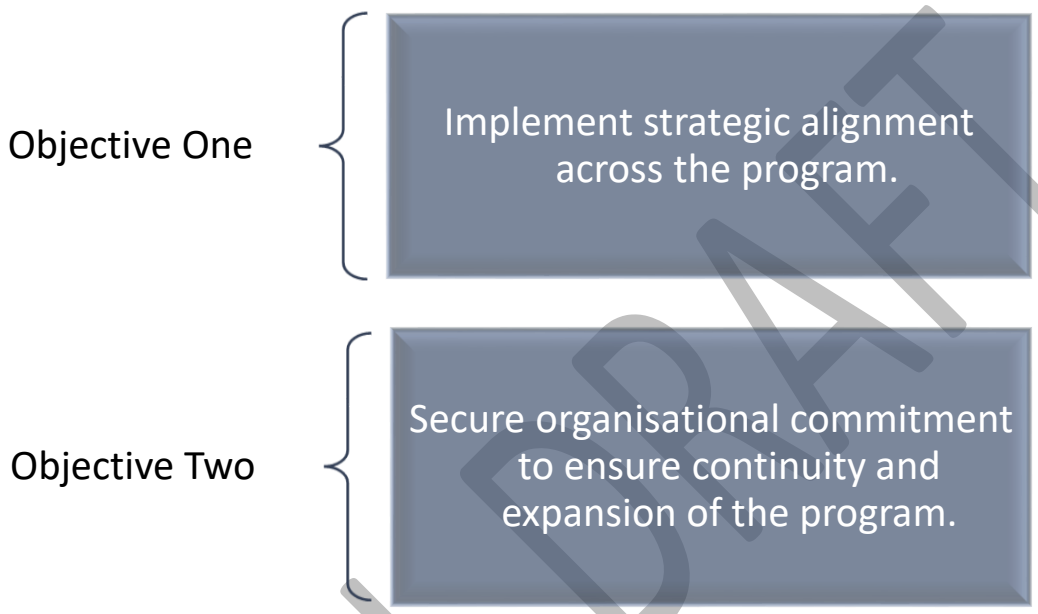
The program has been focused in three key areas:

[1] Threatened- Nationally Critical is the most severely threatened classification under the NZTCS meaning the species is facing an immediate high risk of extinction.

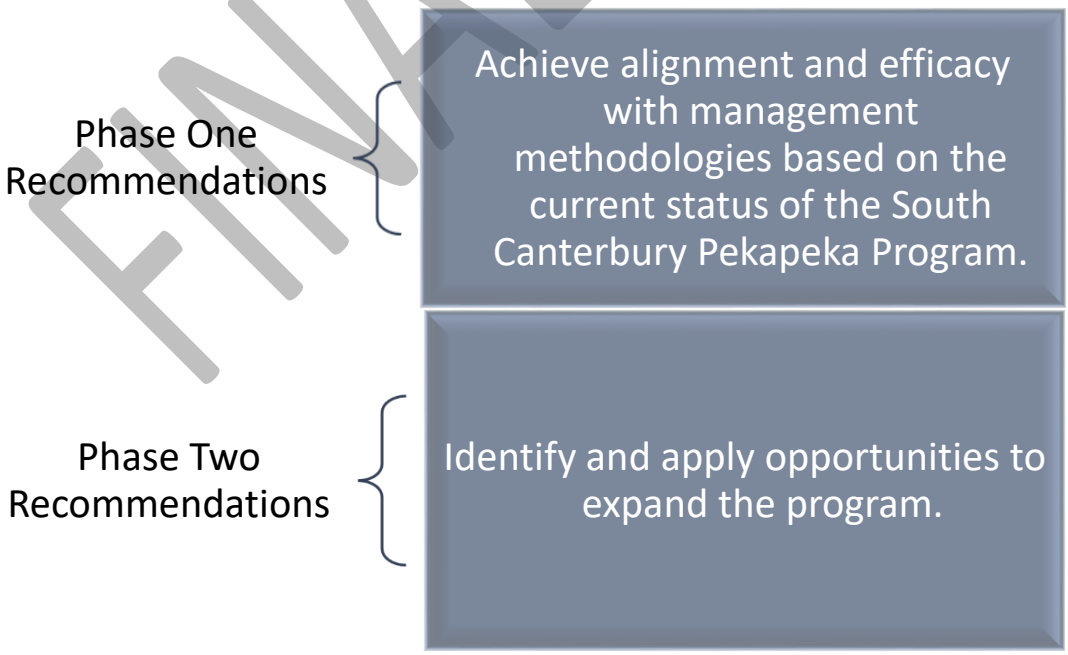
- Habitat identification and protection
- Behaviours and monitoring
- Community engagement and awareness

Although there has been some significant progress in these areas, there are some inconsistencies particularly between habitats and pest control options.

The two objectives of the South Canterbury Pekapeka Strategy are as follows:



To achieve these objectives, recommendations have been included in this strategy as an 'Operational Plan'. Recommendations have been collated into two phases:



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Stakeholders:

There are a number of stakeholders involved in the program, varying in scale. The key directives and workplans for the program are agreed by the LTBWG with other community groups also undertaking work in some of the colonies.

There is a number of other community groups carrying out restoration and pest control programs in the vicinity of known Pekapeka habitats, however these are not directly involved in the program and have been excluded from this list. (Refer to recommendations section for further information).

Table 1 The Long tail Bat Working Group, in alphabetical order, with a brief description of their involvement with the program.

Members	**Role/ Involvement**
Arowhenua Runanga	Provide advice and direction from a mana whenua perspective. Pekapeka are considered a significant Taonga species to this Runanga.
Department of Conservation	Provide direction and support both financially and in-kind to the Pekapeka Program, including annual mark and re-capture monitoring, roost counts and data analysis.
Environment Canterbury	Financially support the Kakahu Habitat Pest Control Program, and support education and advocacy.
Forest & Bird	Provide expertise and guidance on the program. Involved directly with the Talbot Forest Working Group programs and historically involved in Pekapeka studies in the region.
High Country Contracting	Pest control experts who provide advice and services to a number of pest control programs within Pekapeka habitats.
LINZ	Financially support protection and enhancement work within the Opihi and Te Ngawai habitats.
Port Blakely	A large forest owner with key Pekapeka colonies within their Geraldine and Raincliff forests. Port Blakely have been a significant contributor to the Pekapeka Program for a number of years including financially and in-kind pest control, monitoring and habitat management.
Timaru District Council	Provided regulatory support through proposed District Plan rules for Pekapeka habitats. Also managing Significant Natural Areas (SNA) through the district and operating an educational Pekapeka Program through the local museum.

Below is a list of other pest control programs within South Canterbury that may be contributing to Pekapeka protection.

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Table 2 Alphabetical List of Community and Industry groups currently supporting pest control programs in South Canterbury, with a brief outline of activities carried out by each.

Group	Community Work
Arowhenua Runanga	Mana Whenua, trapping and restoration of the lower Rangitata river.
Blandswood Residents Association	Trapping in Blandswood Village at the base of Mt Peel.
Forest & Bird Conway's Bush Reserve Woodbury	Restoration of Conway's Bush Reserve, near the Waihi River. Animal and pest plant control.
Geraldine Golf Course	Initiating a trap line near the Orari River.
Geraldine Trapping Alliance	Finds funds for traps to distribute and to support local trapping groups.
South Canterbury Conservation Trust	Managing Kakahu Bush a QE II covenant (approx. 200Ha with support of DOC., ongoing animal and plant pest control.
NZ Deer Stalkers Association	Trapping of the Opihi River.
Orari River Protection Group (ORPG)	Trapping, weed control, and bird monitoring of the Orari River. Advocacy
Peel Forest Outdoor Centre	Trapping at the facilities ECO Centre land by the Rangitata River.
Pleasant Point Golf Course	Initiating a trap line near the Opihi River.
Pleasant Point Lions	Trapping in Pleasant Point Domains and a running of a trap library.
Project Peel	Small group of 10-12 volunteers undertaking restoration work in the Mt Peel area, including some trapping.
Upper Waihi Group	Animal and plant pest control of the upper Waihi River.
Talbot Forest Working Group Geraldine	Animal and plant pest control in and around Talbot Forest Scenic Reserve. Pekapeka habitat protection and advocacy. Facilitating annual Pekapeka viewings for the public during the summer.

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Current Status of South Canterbury Pekapeka:

Scale & Geophysical Attributes:

The current habitable Pekapeka area as identified in planning maps is approx. 23,500ha. This area runs along the foothills of Four Peaks Range and is bordered by the Rangitata River in the North and the Opihi River in the South. Within this area is a range of land-uses including agriculture & farming, forestry, and indigenous forests.

It is well documented that indigenous vegetation in low altitude parts of Timaru District is substantially depleted. The plains are almost entirely developed for agricultural use. The majority of the downlands are also developed, with the city of Timaru extending across a large portion of the Timaru Downs and lifestyle blocks across the Geraldine Downs. A few areas of remnant indigenous vegetation, and numerous areas of regenerating vegetation, are present in gullies and on steep (mostly south-facing) slopes. Larger remnants of indigenous forest and extensive areas of regenerating forest and scrub are present in foothills and valleys. (Harding, 2016).

Current Colonies:

South Canterbury supports the only known Pekapeka population on the East Coast of the South Island. However, known colonies are limited to specific locations as mentioned below.

They are scattered along the willow lined Rivers and forest remnants and limestone areas. The South Canterbury Pekapeka have diversified to utilize mostly exotic tree species as roosts.

'Geraldine is one of the few towns in New Zealand where it is possible to see Pekapeka. They flit like large butterflies at dusk as they emerge from giant totara and matai in Talbot Forest'. (Conservation, n.d.)

Currently there is approx. 250 known Pekapeka roost trees. The majority of these roosts are located in 7 separate locations *Refer to appendices 1- Pekapeka Colonies- Overview*.

1. Peel Forest
2. Talbot Forest, Geraldine Township
3. Māori Gully
4. Raincliff Forest
5. Kakahu
6. Hanging Rock/ Opihi River
7. Tengawai River

A number of colonies have some form of predator control and management in place, and strong advocacy and community support from public, and private sector and landowners. However, the efficacy of the management methodologies is not well known or aligned at present.

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Current Colony Management:

Table 3 Peel Forest Colony Management outline

Location	Peel Forest Public Conservation Land (PCL)

Landowner(s)	Predominantly Department of Conservation (DOC) with some private land holdings.
Colony description & activity	Previous monitoring has identified Pekapeka activity however no roosts have been identified.
Pest control type	Some volunteer predator trapping by Project Peel volunteers.
Monitoring	No ongoing Pekapeka or pest monitoring at present
Advocacy	Nil
Funding	Pest Control funded by Project Peel.

Table 4 Talbot Forest Colony Management outline

Location	Talbot Forest, Geraldine Township
Landowner(s)	DOC, Timaru District Council (TDC) & some private land holdings.
Colony description & activity	5 roosts identified through monitoring however limited information on colony size and activity known at present.
Pest control type	Limited volunteer trapping supported by Talbot Forest Working Group
Monitoring	No ongoing monitoring at present.
Advocacy	Interpretation signage installed on walking tracks and advocacy carried out by Talbot Working Group. Public Pekapeka watching events have been held which saw full turnouts. This colony is easily accessible for public, therefore an excellent place to raise awareness and engagement with the public.
Funding	Pest control funded by Talbot Working Group.

Table 5 Māori Gully Colony Management outline

Location	Māori Gully, Geraldine Forest
Landowner(s)	Port Blakely
Colony description & activity	80ha Podocarp remanent forest. Forest has been classified as a Significant Natural Area (SNA) since 2013 under the TDC District plan. It is also labelled as a High Conservation Value Forest (HCVF) under international sustainable forestry certification.

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	Pekapeka GPS tracking showed activity in the area however Pekapeka weren't captured in harp nets[2] until 2019. There is currently an effort in identifying roosts (currently 8 identified) and obtaining roost counts to calibrate acoustic population monitoring using Automatic Bat Monitors (ABMs). In 2022 'prospect' ABM Monitoring in a new area of the Geraldine Forest (Borrell Creek headwaters) identified high Pekapeka activity indicating potential roost trees. Further investigation work is required; however, it is assumed this is also the Māori Gully colony due to the proximity.
Pest Control Type	Approx. 150 bait station networks are throughout area. Annual poison control is undertaken targeting possums, rats and mustelids, deployed prior to maternal roosting timeframes with the objective to reduce pest numbers during the colonies most vulnerable period.
Monitoring	Annual Pekapeka population monitoring (year five scheduled 2023/24). Annual pest monitoring, both pre-application and post-application. 2022 monitoring program extended to study reinvasion frequency and efficacy of control with the objective of alignment with maternal roost periods. Ongoing harp netting and GPS tracking to identify maternal roost trees and undertake roost counts.
Advocacy	Article in the 2019 TDC SNA Report, ongoing support from stakeholders and neighbours and annual reports provided by Port Blakely to all relevant stakeholders.
Funding	Port Blakely funded. An additional $10,000.00 funding was provided by the TDC SNA Contestable fund in 2019 to help with establishment of a bait station network.

Table 6 Raincliff Forest Colony Management outline

Location	Raincliff Forest, Middle Valley Road
Landowner(s)	Port Blakely & various other private land holdings.
Colony description & activity	83ha Exotic (Old Crop) mixed species forest. Forest is registered with Heritage NZ as an archaeological site due to the age and history. Forest is open to the public with walking and mountain bike tracks established. 23 known roost trees- active feeding and foraging areas. Population was thought to be around 30 breeding females in 2017. In 2019 this may have dropped to 15 breeding females.

[2] Harp Nets are a monitoring tool used to capture Pekapeka for banding and GPS tracking. It is commonly used to track maternal roost locations.

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Pest Control Type	Good Nature Trap Network (100m by 100m grid) targeting rats and mustelids. Leg-hold trapping program targeting possums prior to Pekapeka breeding season is undertaken, when pre-monitoring indicates higher possum activity.
Monitoring	Annual Pekapeka population monitoring (year five scheduled 2023/24, and annual pest control monitoring (wax tags & ink tunnel monitoring).
Advocacy	Previously held public Pekapeka watching evenings in the forest. Interpretation signage also installed at the carpark.
Funding	Port Blakely funded.

Table 7 Kakahu Colony Management outline

Location	Kakahu, Hall Road, Geraldine
Landowner(s)	Predominately DOC & some private land holdings.
Colony description & activity	Approx 40 roost trees identified, objective to obtain enough roost counts to calibrate the acoustic population monitoring data.
Pest Control Type	Trapping network targeting possums, rats and mustelids and annual pesticide operation undertaken.
Monitoring	Annual Pekapeka population monitoring (year 5 scheduled 2023/24).
Advocacy	Nil
Funding	Environment Canterbury (ECan) funded.

Table 8 Hanging Rock Colony Management outline

Location	Hanging Rock, Opihi River between Hazelburn and Opihi Roads.
Landowner(s)	Land Information New Zealand (LINZ) & private land holdings.
Colony description & activity	Approx. 70 roost trees identified. Monitoring in the 202/21 season indicated that there were approx. 27 breeding females between Hanging Rock and Collett Road to the east.
Pest Control Type	Nil
Monitoring	Annual Pekapeka population monitoring (year 5 scheduled 2023/24).
Advocacy	Nil
Funding	Nil- monitoring is undertaken by DOC.

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Table 9 Tengawai River Colony Management outline

Location	Tengawai River, Pleasant Point, between Bishop and Tengawai Roads.
Landowner(s)	LINZ & private land holdings.
Colony description & activity	Approx. 40 roost trees identified. Monitoring in the 2021/22 season indicated approx. 18 breeding females showing the population has not declined since 2017. Over 100 artificial roosts have been installed to increase roosting habitat for this colony.
Pest Control Type	Predator trapping targeting possums, rats and mustelids.
Monitoring	Annual Pekapeka population monitoring (year five scheduled 2023/24) Fortnightly monitoring of artificial roost boxes to identify presence or absence of Pekapeka activity.
Advocacy	Interpretation signage installed and public information evenings have been held on site.
Funding	LINZ funded.

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Regulatory Considerations:

Significant Natural Areas:

Significant Natural Area Surveys began in the Timaru District in 2013, undertaken by ecologist Mike Harding on behalf of TDC. At completion of the survey project in 2016, 772 SNAs covering a total area of 7260 hectares had been established and mapped. (Harding, 2016).

A high number of these SNAs are located on private property and have regulatory protection, however there is currently no regional direction for landowners for protecting and/or enhancing these areas. Funding is available for projects through TDC.

A landscape scale proposal could utilise the highly valued biodiversity areas for a wider purpose, providing opportunity for private landowners. This would mean engaging and being rewarded for providing this eco-system service, allowing potential predator control instead of only regulatory constraints.

Timaru District Council Proposed District Plan Rules:

Below is the proposed district plan rule relating to Pekapeka:

"ECO-R4- Clearance of trees in the Long-Tailed Bat Protection Area

Activity status: Permitted

PER-1

The trees being cleared:

were planted for timber production (plantation forest and woodlots); or

are within a domestic garden; or

are causing an imminent danger to human life, structures, or utilities and the clearance is undertaken in accordance with advice from a suitably qualified arborist; or

PER-2

The tree is:

a native tree with a trunk circumference of less than 31.5cm, when measured at 1.5m above ground level; or

an exotic tree, excluding willow, with a trunk circumference of less than 70cm, when measured at 1.5m above ground level greater; or

any willow tree with a trunk circumference of less than 120cm, when measured at 1.5m above ground level.

Activity status where compliance not achieved: Restricted discretionary

Matters of discretion are restricted to:

whether, upon specialist assessment by a suitably qualified ecologist, the tree/s proposed to be removed is habitat for long-tailed bats; and

the extent to which the removal of tree/s would impact on the ability of the long-tailed bat protection area to provide for the habitat needs of the bats; and

the extent to which the long-tailed bat protection area has been previously modified by the removal of bat habitat;

the reasons for removal of the tree and any alternatives considered; and any measures to avoid or mitigate the adverse effects." (Timaru District Council Proposed Plan- ECO Chapter, n.d.)

Environment Canterbury Regional Code of Practice – Defences against water and drainage schemes

Rule 3.2.5 of the Canterbury Code of Practice for defences against water and drainage schemes includes specific requirements in long-tailed bat habitat areas. The details of these rules are as follows:

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No known roost trees may be removed for flood protection works. Known roost trees have been mapped, and many have signs and aluminum bands in place to indicate that it is a roost tree.

• Prior to being used in flood protection work, trees must be assessed for the likelihood of being a roost tree. An initial on the ground assessment using the following criteria must be carried out to determine if further assessment is required.

Criteria:

• Circumference of the trunk or largest limb of the tree is 120cm or greater (see note below for measuring multi-stemmed trees); and

• Tree is aged 15 years and older; and

• Tree has visible gnarls, nooks, holes, splits, dead wood, broken spars, and rough or peeling bark; and

• Tree is generally "misshapen" Measuring trees – at a height 1.5m above ground level, measure the trunk or if the tree is multi-stemmed, measure the largest limb.

• If the tree meets the above criteria, an assessment will be made by an independent assessor who will determine if the tree is likely to be a roost tree. Note: In the first instance, if the tree does meet these criteria, search for alternative trees that can be used. If no other trees are available, then engage an independent assessor. (Canterbury, 2019)

National Policy Statement for Indigenous Biodiversity

The National Policy Statement for Indigenous Biodiversity was gazetted on 7th July 2023 and became operative on the 4th of August 2023. This includes specific requirements for Highly Mobile Fauna of which Pekapeka are listed. The specific rules are as follows:

3.20 Specified Highly Mobile Fauna

(1) Where information about areas used by specified highly mobile fauna is available, every regional council must record areas outside SNAs that are highly mobile fauna areas, by working together with tangata whenua (in the manner required by clause 3.3), any potentially affected landowners, territorial authorities in its region, and the Department of Conservation.

(2) If it will help manage adverse effects on specified highly mobile fauna, regional councils must include in their regional policy statements (where practicable) a map and description of each highly mobile fauna area in the region.

(3) Local authorities must include objectives, policies, or methods in their policy statements and plans for managing the adverse effects of new subdivision, use, and development on highly mobile fauna areas, in order to maintain viable populations of specified highly mobile fauna across their natural range.

(4) Local authorities must provide information to their communities about:

a. highly mobile fauna and their habitats; and

b. best practice techniques for managing adverse effects on any specified highly mobile fauna and their habitats in their regions and districts. (Environment, 2023)

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Risks to the Program

Risks to the species survival are well known (predation and habitat loss), and there are known tools available to mitigate those risks, however the survival of the program itself is more uncertain. As this program has not been considered a high priority for Pekapeka recovery nationally, and lacks any long-term financial support through central government, there is risk it may cease. However, due to the support of passionate people and communities it has prospered, making one of the most well-known species protection programs in South Canterbury.

There is also a potential risk that support from the community and impacts to the social license of the program. The latest Proposed TDC Plan has included rules regarding Pekapeka habitat which may cause some restrictions to landowners. Recommendations for mitigation are included in below.

Pekapeka are a highly mobile species. Current habitat and predator control are fragmented and focused on the known colonies, however outside of these areas Pekapeka have very little protection. To ensure the protection and/or enhancement of the species, a broader landscape-scale program is recommended.

Security of continual funding and organisational commitment is considered the most significant risk to the South Canterbury Pekapeka Program. Organisation commitment risk is referring to the ongoing support for the program by all key stakeholders and ensure roles and responsibilities are clarified and implemented.

Financial Support

The tables below outline both current financial support systems in place, as well as potential financial support systems which could assist implementation of the expansion project.

Table 10 Alphabetical list of current key financial and in-kind providers.

Provider	Details
Department of Conservation	Financially support the purchasing of monitoring tools and equipment. Also, significant in-kind resources provided throughout the monitoring season.
Environment Canterbury	Financially support the Kakahu habitat and in-kind through advocacy efforts.
Land Information New Zealand	Financially support habitat protection and enhancement in a number of river colonies.
Port Blakely	Financially support Raincliff, Māori Gully and Kakahu habitats. Also, provided funding for monitoring equipment purchasing and in-kind through advocacy efforts.
Talbot Forest Working Group	In-kind support through advocacy and education programs and habitat management.
Timaru District Council	Financially supported Māori Gully habitat through the successful application of a Category One (landowner initiated) SNA fund.

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Table 11 Alphabetical list of potential funding opportunities for the expansion and security of the SC Pekapeka Program.

Funding Stream	Suitability & Details
Alpine Energy Community Fund	A community fund to support local groups with projects that promote and support development in the region.
Catchment Group Funding	Potentially available for any Pekapeka habitat programs within catchment areas.
Environment Canterbury Zone Funding	Suitable for biodiversity projects within the region. The Kakahu habitat predator control is currently funded by ECan.
Ministry for the Environment Community Fund	Administered by Department of Conservation, this fund supports community-led conservation projects on public and private land.
Predator Free 2050	Suitable for landscape scale predator project funding.
Timaru District Council Biodiversity Fund	Annual funding available for Significant Natural Areas (SNA) protection and/or enhancement.
Transpower Community Care Fund	Funding for local projects within the 2km of overhead lines, a number of known habitats would be eligible for this.

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Operational Plan

Below outlines the recommended actions to deliver the objectives of the South Canterbury Pekapeka Strategy, in support of the South Canterbury Pekapeka Program.

Due to Pekapeka mobility, phase two recommendations primarily focus on delivering an expansion project through identification of new habitats, pest control and monitoring resulting in the development of biodiversity corridors/ linkages between known habitats and the identification of new habitats and/or colonies.

Execution of both phase one and phase two recommendations will increase the potential for moving the program into a landscape-scale project. If successful, this will have significant biodiversity and ecosystem benefits for the region and potentially position the group to secure alternative funding streams to ensure long-term security of the program.

Phase One Recommendations: Achieve alignment and efficacy with management methodologies based on the current status of the South Canterbury Pekapeka Program.

Category	**Recommendation**	**Reasoning**	**Outcomes & Considerations**
Governance	• Re-establish the LTBWG. • Develop a Term of Reference to include membership, assigned chairperson and cadence for meetings. • Review options to become a registered trust or a subsidiary group under another trust already established in the region. • Identify roles and responsibilities for each Pekapeka project and reporting requirements.	The re-establishment of the LTBWG will provide the competency in delivering the strategic direction and progress the South Canterbury Pekapeka Program into a significant project for the district. It will also increase the potential for successful funding applications and provide a pathway for additional community groups to support and participate whilst ensuring alignment to the overall strategy.	As all members are currently volunteers, resourcing to deliver these recommendations needs to be considered. A 0.5 full-time equivalent (FTE) could be employed as a coordinator for the group and/or operate under another subsidiary who has the capacity to assist with resourcing. An additional option is to resource internally, given members have capacity to do so.

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Governance	• Secure organisational commitment from members of the LTBWG through a signed charter.	Current membership and support are predominantly driven by the volunteers involved. Staff turn-over may see engagement decrease. By organisations binding through a charter, this provides security and commitment.	Signing a charter doesn't uphold organisations to commit to ongoing funding but more-so support, engagement, and advocacy for the program.
Funding	• Review opportunities for TDC to lead Pekapeka habitat programs through their SNA Fund [3] (category two) where colonies are located within SNA's.	Previously, private landowners have been successful in securing funding under Category One for Pekapeka habitat. TDC could take a led on these projects through their Category two funding stream which would show alignment through SNA and threatened species protection.	An assessment of Pekapeka colonies and SNA overlay will be required. Project management and contractor resources will be required should TDC provide Category two funding.
Collaboration	• Identify other values of known Pekapeka habitat (QEII, SNA, Recreational) and review options for alignment/ shared costs for any predator control and/or habitat enhancement.	A number of known Pekapeka habitats are also providing other biodiversity values and/or work programs. Alignment of these work programs may result in cost reductions and efficiencies.	This may also engage a wider range of stakeholders; a review of current programs could be completed with the current resources within the LTBWG.
Habitat and Pest Control	• Develop a Standard Operating Procedure for pest monitoring at each colony where active pest control exists. Adopt Wax Tag Index (WTI) with a target (e.g., below 5%).	Once current pest control methodologies are reviewed and implemented documenting a Standard Operating	Having a documented plan for each pest control program will improve opportunities to engage

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[3] Timaru District Council Significant Natural Area Fund is funding that is provided to manage, enhance and protect SNA's. The fund is delivered through two categories:

1. **Category One- landowner and community led projects (budget of $30,000 per annum)** to assist and actively encourage landowners and members of the Timaru District community to manage, protect and enhance significant natural areas.
2. **Category Two- Council Initiated Projects (budget of $70,000 per annum)** to enable Council to take an active role in managing, protecting and enhancing significant natural areas.

		Procedure will ensure consistency with implementation. This may include: ○ Timeframes of control and monitoring ○ Roles and Responsibilities ○ Funding commitments ○ Reporting	other community groups/ stakeholders, supporting the implementation whilst ensuring consistency. Include research review to analysis what percentage targets allow for successful maternal roosting periods.
Planning, Reporting and Data analysis	• Develop an annual work plan prior to each season and identify roles and responsibilities, focus areas and resources available. • Create a seasonal report collating all population, prospecting and pre-harvesting monitoring information, and predator control habitat updates. Ensure the report is consistent and distributed to all relevant stakeholders. • Through I.T frameworks facilitate information and data sharing capabilities.	Having consistent planning and reporting will provide annual direction measurables. It will also enable the program to engage with a wider stakeholder group and encourage support on individual tasks.	Annual work plan and reports will require input from all stakeholders however, resources may be required to populate and distribute.

Phase Two Recommendations: Identify and apply opportunities to expand the program.

Category	**Recommendation**	**Reasoning**	**Outcomes & Considerations**
Advocacy	• Develop a communication and advocacy plan including: ○ Website and online resources.	Currently there is no specific outlet for information on the program. Creating a communication plan and resources will allow us to engage with a wide range of stakeholders consistently.	Creating branding/ logo for the program will also assist in improving recognition and awareness.

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	○ Branding and/or logo development specific to the South Canterbury Pekapeka Program. ○ Information resources for landowners and industries.		
	• Further develop relationships with mana whenua.	Pekapeka are sacred Taonga. Further development with Arowhenua Runanga will allow for the practice of responsibilities as kaitiaki and educate landowners in the practice of Kaipupuri.	Consideration needs to be given for Arowhenua Runanga availability and resourcing.
	• Identify and engage with large land holders/ managers and catchment groups within the Pekapeka expansion project areas.	This may improve the social license of the program and allow for advocacy and advice to be shared. It may also allow for opportunities to enhance and expand the program through monitoring and habitat protection.	Recommend a consistent communication package/ advise for these engagements.
	• Attend/hold community conservation events to promote the program.	Previous community events/ bat watching evenings proved very successful with strong uptake from the public.	Recommend planning for minimum one event per maternal roost season. In addition, there may also be potential for members of the LTBWG to attend/ present at relevant conferences.
	• Become a coordinated voice for the SC Pekapeka Program.	Having a coordinated voice for Pekapeka within South Canterbury will support alignment, engagement, and social license.	This could be included in a communication plan.

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Expansion Project	• Pekapeka Prospect[4] Monitoring- Assess potential habitat areas within the known Pekapeka Landscapes and develop an annual prospect monitoring plan. • Develop a 'Prospect' monitoring plan and standard to ensure consistency. Include ABM distribution, time of year and habitat type.	Currently there is a robust ABM Population monitoring program in place for all known colonies, however prospect monitoring is Ad hoc. There is high potential for other colonies to be in the area but not yet known which will support the expansion project objectives.	Prospect monitoring should be included in annual plans to ensure availability of ABM monitors and resources. Prospect monitoring should also be included in annual reporting and could be utilised for resource consent applications.
	• Utilising prospect monitoring data and ecological reports, identify potential habitat/ biodiversity corridors between known Pekapeka habitats across private and public land.	As mentioned Pekapeka are a highly mobile species and use a vast range.	Stakeholder engagement and approval to undertake surveys is required. Where possible, align corridors with SNA areas through the district.
	• Assess the ecosystem health of known and new habitats and where applicable enhance, through appropriate indigenous restoration.	Suitable species planting will likely improve eco system health. , encouraging further Pekapeka distribution.	Recommend utilising Arowhenua Runanga eco-sourcing nursery. There may also be potential for funding through the Emissions Trading Scheme (ETS)[5] program.
	• Develop predator control plans for expansion areas, include cost/benefit analysis.	Understanding suitable predator control programs will support the overall protection and enhancement of the Pekapeka Program.	Designing and developing fit for purpose predator control programs will require funding. Restrictions such pesticide use will also require consideration.
	• Prepare an indicative business case for the delivery of a landscape scale predator control program (expansion project).	This will position the group to apply for significant national funding opportunities.	This stream of work will require funding and resourcing.

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[4] Pekapeka Prospect Monitoring is monitoring using a variety of tools to identify Pekapeka habitat and roosting areas that was previously unknown.
[5] The ETS provides funding streams through the afforestation of indigenous vegetation and the sequestration of carbon.

	• Prepare funding applications for the LTBWG and/or private landowners to execute the Pekapeka expansion project.	Current funding capacity within the program would not be adequate to cover any significant expansion. Support by the LTBWG would potentially strength private applications and show alignment.	A consistent approach to all applications would be beneficial. Any conflict of interest would have to be raised and documented as part of the application.
	• Support research and development into all Pekapeka management methodologies including collaboration with other groups within New Zealand.	To ensure the program is utilising the most up to date research and development regarding monitoring, Pekapeka behaviours, artificial roost opportunities and predator control.	Engagement and collaboration with other groups is critical to ensure we are at the forefront of all management methodologies.
	• Support employment and training opportunities with local contractors and education providers.	Engage with local contractors and education providers to utilise the program as a pathway for an apprenticeship scheme into environmental services[6]. This could also provide opportunity for local iwi.	Discussions with providers such as Te Pūkenga is required to understand the options available.
	• Engage with local community groups, schools or industry to sponsor a habitat/ predator program	To assist with resourcing, review opportunities for local groups to undertake predator control (where suitable) through a 'sponsor a habitat' program[7].	This will require supervision to ensure predator control/ trap checking is completed consistently and correctly. Restrictions on what control can be undertaken by community groups will also be required. This may be an opportunity for local industries to improve their social license through involvement in this program.

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[6] It appears there is no current apprenticeship program for environmental / pest control careers, however a review to look at options is recommended.
[7] This program is not yet established, yet would be an opportunity to resource some of the pest control activities going forward.

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Appendices

1. Pekapeka Colonies- Overview Map
2. Pekapeka Habitat Map

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APPENDIX B

Protocols for minimising the risk of felling bat roosts

(Bat Roost Protocols (BRP))

Version 2: October 2021 approved by the New Zealand Department of Conservation's Bat Recovery Group

The use of these protocols should be a final step in the avoid/remedy/mitigate hierarchy. Avoidance of felling bat roost trees should be the first step in any project.

Purposes of this document:

1. To outline why protection of roosts is important for the persistence of New Zealand bats and why removal of known and potential roosts should be avoided.
2. Where roost removal cannot be avoided, to set out the minimum requirements and protocols for removing trees in areas where bats are present, to minimise the risk of killing bats.

This protocol does not eliminate the risk to bats of death or injury because bats or active bat roosts can be missed. The best way to eliminate risk of felling an active roost is to **avoid** felling any known or potential roosts.

Context

The status of New Zealand bats

New Zealand's two extant bat species (pekapeka) are classified as threatened.

Long-tailed bats are classified as 'Nationally Critical' because the species is likely to have a 70% decline in numbers within three generations.

Lesser short-tailed bats comprise three subspecies. The northern subspecies is classified as 'Nationally Vulnerable' because there are 1000-5000 mature individuals and the predicted decline in numbers is 10-50% within three generations. The central subspecies is 'Declining' because there are 20 000-100 000 mature individuals, and the predicted decline is 10-50% within three generations. The southern subspecies is 'Recovering' because there are 1000-5000 individuals, and the predicted increase is >10% within three generations.

Threats to bats

This document deals specifically with roost protection; however, roost protection is only part of the wider issue of habitat loss. Habitat loss through land clearance, habitat degradation, fragmentation and disturbance and loss of roosts reduces roosting, foraging and socialising areas. Individual bats and colonies are also threatened by the local felling of individual trees.

Bats have large home ranges which can include unprotected peri-urban habitat. Protecting habitat and maintaining connectivity of vegetation are crucial for bats being able to persist and flourish in the environment.

Predation and competition by introduced predators: mustelids, rats, cats, and possums have all been implicated in the decline of bats[1].

Roosts are critical to the survival of bats

Roosts are where bats gather to shelter during the day and at night. They are used to socialise, mate, give birth, and raise young. Bats have very specific requirements when they are choosing roosts and are not just choosing any

[1] O'Donnell CFJ; Christie JE; Hitchmough RA; Lloyd B; Parsons S 2010. The conservation status of New Zealand bats, 2009. New Zealand Journal of Zoology 37: 297– 311.

tree[2]. The specialised features of roosts make them rare and almost irreplaceable in any landscape or habitat type except over very long-time frames. People sometimes falsely suggest that "bats can just move to another tree". This is not the case, particularly where trees suitable as roosts are limited[3].

Bats demonstrate high site fidelity to existing roosts and their specific roosting areas, and they move on a rotation among these. Because roost trees are likely to be rare, and are occupied to fulfil specialised requirements, felling breeding roost trees even when bats are absent will have a significant negative effect. If the number of suitable roosts and their surrounding habitat is reduced in the landscape, bats are forced to use roosts that are less thermally efficient. This means they will use more energy to survive, resulting in reductions in survival and lower reproductive success. In this way, roost removal is likely to result in higher risk of local extinction.

Bats can roost in native or exotic vegetation – therefore it should not be presumed that exotic species such as pine trees will not support bats. Roosts, including maternity roosts, have been found in many exotic species including, but not limited to, pine, poplar, oak, and acacia species, black locust, willow, eucalyptus and Tasmanian blackwoods.

Bats are at risk of being injured or killed when trees are felled

If a tree is felled with a bat in it, it is highly likely that the bat will be injured or killed, although this may not be apparent at the time because injuries, such as bruises and fractures, which would hinder bats' ability to fly well, may take time to be obvious.

The highest risk of injuring or killing bats or trapping them within their roosts is when they are heavily pregnant, when young are still dependent on the roost (late November – February) and when bats are more likely to be in torpor (May – September). Heavily pregnant bats are slower and less agile, and young bats cannot fly, so their chances to escape are reduced when roost trees are felled. Also, it is possible that if the larger female-dominated maternity roosts are cut down when females are raising their young to independence (October-March), a whole colony of bats could be destroyed at one time.

During winter bats use torpor (a type of hibernation) more often than during other times of year, so if trees are cut down in winter, bats may be unable to rouse from torpor and to fly away in time to escape. Additionally, it is significantly harder, sometimes impossible, to detect bats roosting in trees during torpor. For these reasons, trees with potential bat roost features must not be cut down in winter. Bats also use torpor for short periods during summer, for example, if the weather gets cold, so the risk of killing or injuring bats that cannot escape falling trees exists at any time of the year.

Bat roost protocols and the RMA

The occurrence of bats and bat habitat is a matter of 'significance' under Section 6(c) of the Resource Management Act (RMA). Bat roost protocols have become a standard part of bat management plans that may be required under RMA consents. Where developments require consents, and bats (a threatened species) are present, the developments should 'Avoid' impacting bats and bat habitat. Bat roost protocols only attempt to minimise the number of bats killed by tree felling, therefore implementing bat roost protocols where bats are present should be considered a last resort after following the RMA hierarchy of "avoid, remedy, mitigate, offset, compensate".

[2] Whilst we use the word tree frequently in this document, we acknowledge that bats also use non-tree vegetation as roosts and the terms tree and vegetation should be considered as interchangeable in the context of this document. We acknowledge that there are also non-vegetation roosts that are used and require protection. These include rocky bluffs, caves and occasionally buildings.

[3] Many references available, for example, Borkin KM; Parsons S. 2011. Sex-specific roost selection by bats in clearfell harvested plantation forest: improved knowledge advises management. Acta Chiropterologica 13(2): 373-383; Borkin KM; O'Donnell CFJ; Parsons S. 2011. Bat colony size reduction coincides with clear-fell harvest operations and high rates of roost loss in plantation forest. Biodiversity and Conservation 30; Sedgeley JA; O'Donnell CFJ 1999b. Roost selection by the long-tailed bat, *Chalinolobus tuberculatus*, in temperate New Zealand rainforest and its implications for the conservation of bats in managed forests. Biological Conservation 88:261–276; Sedgeley JA; O'Donnell CFJ 2004. Roost use by long-tailed bats in South Canterbury: Testing predictions of roost site selection in a highly fragmented landscape. New Zealand Journal of Ecology 28:1-18.

This protocol has therefore been framed following the RMA hierarchy by first focusing on the avoidance of effects, helping to identify and avoid the removal of roost trees, and to minimise the risk to bats of death or injury if avoidance is not possible. This approach is usually informed by gathering data on bats in the local areas and seeking advice from a competent bat ecologist.

Identifying and protecting *both active and inactive (i.e., trees used by bats at other times of year) roosts* by avoiding their removal is an important step in supporting the survival and persistence of bats.

Bat roost protocols and the Wildlife Act 1953

NZ bats are absolutely protected species under the Wildlife Act 1953. It is an offence to catch alive or kill, hunt, possess, molest, or disturb bats under the Act. Any projects where tree or vegetation removal overlaps with the occurrence of bats, there is a risk of killing or injuring any bats that may be present. Following the bat roost protocols minimises the chance of killing or injuring bats.

Bat roost protocol

When and how to use the protocol

Whenever vegetation removal is proposed in areas where bats are potentially present and where their habitat may be impacted, follow the decision tree (Figure 1) below as a guide to what sort of action should be undertaken. The decision tree is designed firstly to avoid felling bat roost trees, secondarily aimed at moving roost trees, and only if unavoidable, felling roost trees (but only once vacated).

None of the methods of inspecting roosts described below eliminates the risk of failing to identify bats when they are present. Therefore, techniques such as filling in cavities with expandable foam are not supported as a tool. This is because there is a risk of trapping bats that have not been detected within cavities. In addition, this method removes roosts from the landscape that bats are dependent on.

Definitions

Competencies: a set of competencies developed by the NZ Bat Recovery Group[4] to ensure that anyone working with bats is competent to do so. Contact bathandler@doc.govt.nz for a list of competencies and requirements to become an authorised competent bat worker.

Competencies referred to in this document:

2.1 Bagging storage, handling, measuring, weighing, sexing, aging, temporary marking and releasing appropriately:
For long-tailed bats: 50 individuals
For short-tailed bats: 50 individuals

3. High risk activities – Roost felling (all of these competencies include the understanding of what to do when bats are found during tree felling as per Appendix 6 of 'Initial veterinary care for New Zealand Bats' https://cdn.ymaws.com/www.nzva.org.nz/resource/resmgr/docs/other_resources/Initial_Vet_Care_NZ_Bats.pdf)

- 3.1 Assessing roost tree use using Automatic Bat Monitors - Demonstrate correct timing, placement, and interpretation of data for 10+ times according to DOC's Tree Felling Protocols.
- 3.2 Undertake roost watches/emergence counts at 10+ occupied roosts where the entrance is visible.
- 3.3 In at least two different forest/habitat types, including the forest/habitat type where trees are going to be assessed: evaluate 10+ potential roost features in trees (e.g., cavities, peeling bark, epiphytes).

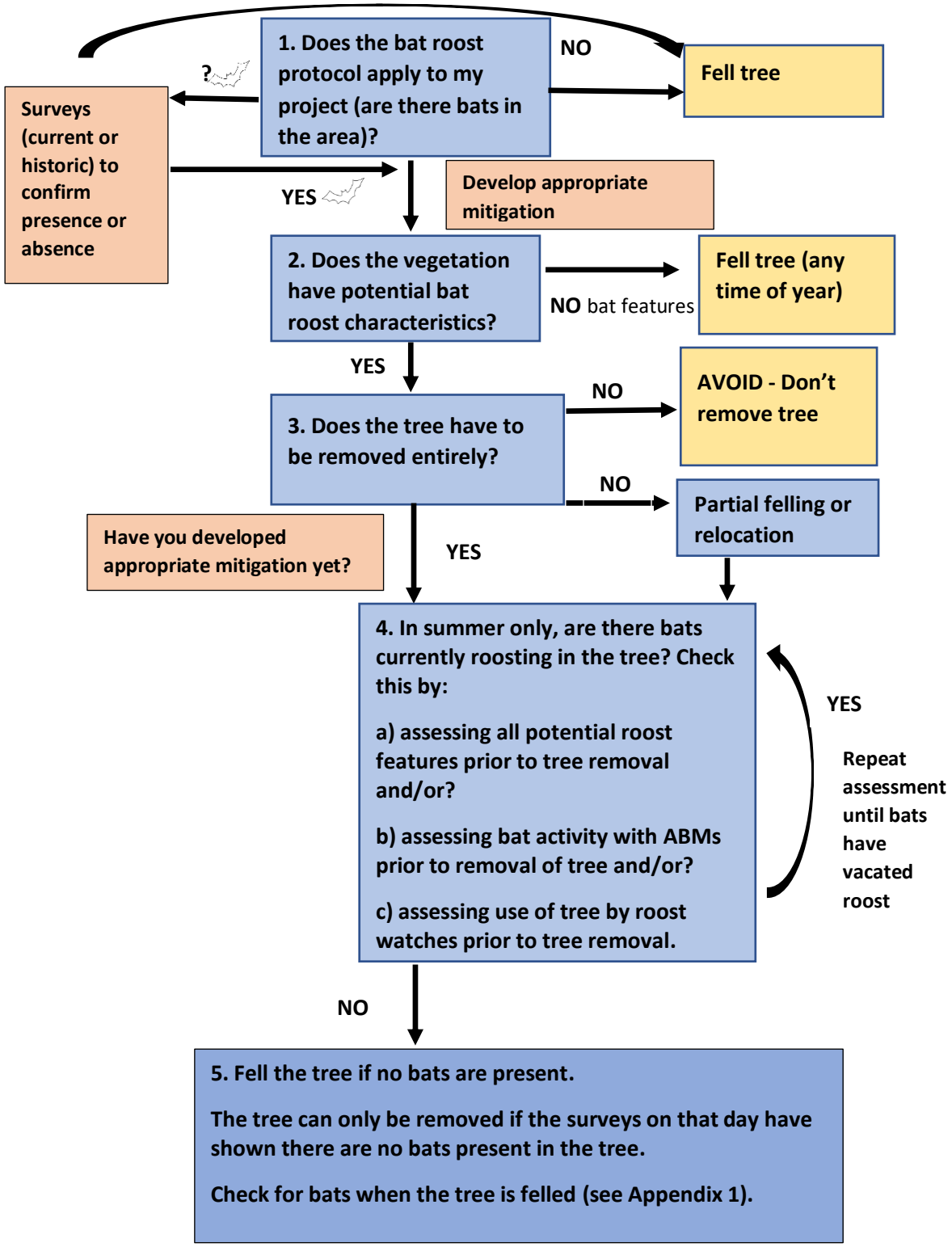
Authorised competent bat worker: A bat worker who has met the required ethical standards to be registered as a competent, authorised bat worker by the New Zealand Bat Recovery Group for the work which they are undertaking.

ABM: automated bat monitoring unit/detector

[4] A group of bat specialists that advise on bat issues and assess bat competencies

Figure 1. Tree removal in bat areas flow chart

Each numbered step relates to a step in the Decision Tool for Tree Removal. Follow each step fully in the text to work through the process.



Mitigation/compensation

If trees are felled and habitat lost, then compensation measures should be considered to address the adverse effects. What these measures should be is beyond the scope of this document. Provision of artificial roosts in the short-term and planting for the long-term are some of the methods commonly used in development projects, but their effectiveness is untested and a future research need.

Step by step decision tool for tree removal in bat areas (to be used in conjunction with Figure 1).

Step 1. Does the bat roost protocol apply to my project?	Response	Who can make this assessment?	When?
a) Is there known bat activity within a radius of 25 km of the vegetation to be removed (see [5] and [6] notes below)?	a) If Yes, proceed to b If No, consider whether survey work needs to be done.	Evidence can come from on-the-ground surveys and reports from the national DOC database, consultants, and/or other credible sources. Evidence should be interpreted by an experienced bat ecologist.	Any time
b) Are bats present in the Project Area?	b) If Yes, go to step c If unknown, undertake comprehensive survey if bats are likely to be present. If no bats are present after comprehensive survey, you do not need to follow protocol.	If surveys are required to support the assessment, then these will need to be designed by an experienced bat ecologist to adequately cover the Project Area[7] (see note below).	Acoustic surveys to determine presence should be undertaken when bats are most active and environmental conditions are suitable (October 1st to April 30th)[8]. Surveys undertaken at other times of year are considered less reliable for determining absence.
c) Is the tree known to provide a roost location for bats? (Previous knowledge).	c) If yes, go to step 3 If no (but bats are present in the project area), go to step 2.		

Notes for Step 1

1a) Bats are a highly mobile species. Long-tailed bats can have home ranges (the areas that they regularly use) as wide as 19km, and short-tailed bats about 24km. Three colonies of long-tailed bats in the Eglinton Valley collectively had a home range of 100km^2.

[5] The largest home range span for the long-tailed bat in the Eglinton Valley was 19 km (O'Donnell 2001. J. Zool., Lond. 253, 253-264).

[6] The largest home range span for the lesser short-tailed bat in the Eglinton Valley was 23.6 km (O'Donnell et al. 1999. New Zealand Journal of Ecology 23(1): 21-30).

[7] Adequately covering the project area means including all habitat that are likely to be used by bats bearing in mind that the detectors most commonly used (DOC-manufactured AR4s) have an estimated 30-60m radius within which they can record bats.

[8] Borkin K.M. 2010. Ecology of New Zealand's Long-tailed bat (*Chalinolobus tuberculatus*) in exotic plantation forest. Unpublished PhD thesis, University of Auckland.

When assessing whether bats might be present at a site you have to consider any surveys that have been done in the wider area, how long ago the surveys were done and whether more surveys are required.

1b) If you are doing a new survey then you should design the survey to cover the project area. Examples of surveys are shown in the Bat Inventory and Monitoring Toolbox (https://www.doc.govt.nz/our-work/biodiversity-inventory-and-monitoring/bats/). See 'Bats: Counting away from bat roosts: bat detectors on line transects' and 'Counting away from bat roosts: automatic bat detectors'.

Send bat data (processed csv files and GPS locations) to batdatabase@doc.govt.nz on a standard spreadsheet available by emailing this address.

Step 2. Does the vegetation proposed to be removed have potential bat roost characteristics?	**Response**	**Who can make this assessment?**	**When?**
a) Is the tree ≥15 cm DBH (Diameter at Breast Height)[9]?	If yes, further assessment is required (2b). If no, the vegetation can be removed at any time[10].	Anyone who can measure a tree DBH.	Any time
b) On visual inspection, does the tree (dead or alive) have features that indicate roost potential? These features include: • hollows • cavities • knot holes • cracks • flaking, peeling, and decorticating bark • epiphytes • broken or dead branches or trunk • cavities/hollows/shelter formed by double leaders This may require climbing the tree if you can't see all the tree from the ground.	If yes go to step 3 If unsure, further assessment is required. This may include climbing the tree. If no potential roost features are present, the vegetation can be removed at any time[11], but if upon felling you find a bat follow section 5.	Anyone that can identify these features.[12] If further assessment required, then use an approved person at Competency Level 3.3.	Visual inspections can occur at any time. If there are **NO** potential roost features, felling can occur at any time of year.

[9] This diameter at breast height is based on dimensions of roosts used by south Hamilton long-tailed bats that were identified by Dekrout (2009, Unpublished PhD thesis, University of Auckland) - the smallest roosts were 15.5 cm DBH; but note that in South Canterbury Sedgeley and O'Donnell (2004, New Zealand Journal of Ecology 28(1): 1-18) found that 25% of long-tailed bat roosts were smaller than 18.8 cm DBH.
[10] Note that there may be roosts that have smaller diameter at breast height (DBH). If any vegetation is suspected to have a bat roost present, then removal shall be halted immediately, and protocols reviewed.
[11] All surveys to assess whether trees are potential roosts shall take place within 6 months of final felling dates. If felling does not take place within this time then assessments will be repeated. This is intended to account for any changes in trees which may occur over time.
[12] It is intended that training on identifying roost features will be developed.

Step 3. Does the tree have to be removed entirely?	Response	Who can make this assessment?	When?
a) Is the only option to remove the tree entirely?	If yes, continue to step 4 If no, consider leaving the tree in place, cutting off specific limbs only or relocating the tree. If any felling, partial felling (where the part to be felled has potential bat roost features) or tree relocation takes place you **MUST** proceed to step 4. If a roost (active/inactive) is confirmed, then advice should be obtained at a project level in writing from DOC before proceeding.	Project leader	Any time

Notes for Step 3

Trees must only be relocated when bats are absent and when standard automated bat monitoring unit (ABM) weather conditions are met (see notes section 4b for appropriate weather conditions), and in consultation with an authorised bat ecologist with all competencies of level 3: 'High risk activities – Roost felling'.

Step 4. Are there bats currently roosting in the tree? (Follow a or b or c or a combination)	Response	Who can make this assessment?	When
a) Are potential features being used by roosting bats? A tree climber may be required to check all features (see notes for 4a below). If roost is occupied repeat 4a another day until roost is vacated.	If yes, **THE TREE MUST NOT BE FELLED UNTIL BATS HAVE VACATED IT**. If no, the tree can be removed on the day of the tree inspection following step 5. If bats continue to use the roost, then the tree must not be cut down until the bats leave the roost. At this point re-consider again	An approved person at Competency Level 3.3 or an experienced tree-climber (e.g., an arborist) working with an approved person at Competency Level 3.3. If the latter, the tree climber must provide information along with photographs or video footage, to the approved person at Competency Level 3.3 who assesses and decides whether the tree can be removed.	October 1st to April 30th when the temperature is 7°C or greater at official sunset in the South Island or 10 °C or greater in the North Island.

	whether this tree must be felled. Advice must be obtained at a project level in writing from DOC prior to felling the tree.	If roosts are known or confirmed through this process, then this information must be communicated to the nominated DOC bat ecologist for this project.	
b) Is bat activity recorded at any time during two consecutive, valid survey nights preceding tree felling[13]? At least two nights are required as it is possible for bats to enter or leave a roost without echolocating, or to not leave the roost for a night.	<u>If yes (bats are detected)</u>, survey must continue on subsequent nights[14] until no bat activity is recorded for two consecutive nights (to indicate bats have left the area) prior to felling. **OR** roost features of each tree must be visually assessed via climbing as in 3. <u>If bat activity is consistent in the area and 2 nights with zero bat passes cannot be obtained</u>, Go to 4c or 4a. <u>If no bats are detected for two consecutive nights</u>, the vegetation can be removed on the day immediately following the survey nights using the method in 5.	An approved person at Competency Level 3.1	October 1st to April 30th and when conditions meet the requirements for standard ABM weather conditions (see 4b notes).
c) Are bats observed entering the vegetation? This involves watching vegetation to identify bats returning to or exiting roosts. It should only be used in combination with previous ABM monitoring (4b) (see notes 4c for method). At	<u>If yes (bats are seen at either watch)</u>, it is a confirmed roost. Removal of a roost should be avoided to minimise effects	An approved person at Competency Level 3.2[15].	Between October 1st and April 30th only **AND** when weather parameters meet

[13] Le Roux et al (2013) found that in and around Hamilton "The longest consecutive monitoring period without bat detections at each site was three nights during winter." Le Roux et al 2013. New Zealand Journal of Zoology (2013): Spatial and temporal variation in long-tailed bat echolocation activity in a New Zealand city, New Zealand Journal of Zoology, DOI: 10.1080/03014223.2013.827125.

[14] Subsequent nights may be those immediately following bat detection or later dates.

[15] If more than one person is required for a roost watch at a tree, a minimum of one approved person at Competency Level 3.2 must be present on site for the duration of the roost watch to supervise.

least two nights are required as it is possible for bats to enter or leave a roost without being detected, or to not leave the roost for a night.	of vegetation removal on bats. Techniques used previously to ensure previously active roosts are no longer active have included the following: Watches must continue on subsequent nights until no bats are observed entering or exiting the roost for two consecutive nights (to indicate the roost is no longer active) prior to felling. <u>If no bats are observed entering or exiting for two consecutive nights</u>, the vegetation can be removed on the day immediately following the survey nights using the method in 5.		the roost watch requirements.

Notes for Step 4.

4a) Tree climbing and inspection

Care must be taken while climbing trees to avoid disturbing, removing or destroying tree features with bat roost potential such as sections of loose bark or cavities in dead wood. Using mobile elevated platforms can be a good option. Bats are less likely to be active over colder periods, so climbing to check whether bats are present in potential roost features must take place between October 1st to April 30th when the temperature is 7 °C [16] (South Is) or 10 °C (North Is) or greater at official sunset on the night previous to inspection.

A tree climber may be required to check all potential bat roost features:

- Can bats be seen? An endoscopic camera should be available for this step and every possible corner of each potential roosting feature inspected, i.e., cavity/crack etc. Cracks, holes, and splits may lead to cavities or may be superficial. A cavity may be wet indicating no/low potential as a bat roost.

[16] O'Donnell CFJ 2000. Influence of season, habitat, temperature and invertebrate availability on nocturnal activity of the New Zealand long-tailed bat (*Chalinolobus tuberculatus*). New Zealand Journal of Ecology 207-221.

- Can bats be heard? Search of tree features should be accompanied by use of a hand-held bat detector. If bats are present and not in torpor, then detection of presence listening at 25 kHz (for social calls) and 40 kHz (for echolocation calls) may help to determine if long-tailed bats are present. Short-tailed bat social calls are often audible or detected at 25-27 kHz.
- Is guano present or urine staining?

4b) ABM survey work

Bat activity is to be recorded using ABMs. Location of ABMs must provide sufficient coverage to be able to determine if bat roosts are present in one or more of the trees[17]. 'Valid' survey nights must have the following features:

- Begin one hour before official sunset and end one hour after official sunrise.
- Temperature 10°C or greater for the first four hours after official sunset time for the North Island and 7°C for the South Island[18].
- Precipitation < 2.5 mm in the first 2 hours after official sunset, and < 5 mm in the first 4 hours after official sunset.

Prior to the commencement of surveys, ABMs must be checked for correct operation at a site where bat activity is known to be regular, or by using the DOC – Bat Recorder Tester (Tussock Innovation Ltd) phone app made for this and available from Google Play Store. Faulty or suspect ABMs must not be deployed, and ABMs must be redeployed if faults occur.

4c) Roost watches

The following weather conditions define a valid night for roost watches:

- Temperature greater than 10°C all night between official sunset and sunrise for the North Island and 7 °C for the South Island.
- Precipitation < 2.5 mm for each two-hour period between official sunset and sunrise

Roost watches should include the deployment of ABMs and analysis of data for the night of the roost watch.

Emergence watches

- Each tree must be watched initially from sunset until it becomes too dark to see by sufficient people to observe all potential exit points. This must be supported by the use of handheld detectors. The aim of emergence watches is to identify potential roost locations within the vegetation. Infra-red and thermal imaging cameras may be useful in this process.

[17] Department of Conservation-manufactured AR4 bat detectors are considered likely to detect long-tailed bats only over short distances i.e., up to 30-60 m distant from the detector (S. Cockburn, Department of Conservation, pers. Comm.). This is similar to detection distances of other detector types.

[18] South Island temperatures are based upon O'Donnell (2000) as above. North Island temperatures are based on data collected in Kinleith plantation forest, centred around Tokoroa, Central North Island; Smith D, Borkin K. 2017. Appendix B: Influence of climate variables on long-tailed bat activity in an exotic conifer plantation forest in the central North Island. P 136-145. In: Smith, D, K Borkin, C Jones, S Lindberg, F Davies and G Eccles (2017). Effects of land transport activities on New Zealand's endemic bat populations: reviews of ecological and regulatory literature. NZ Transport Agency research report 623. 249pp.

Roost re-entry watches

The time when bats return to roosts can vary based on temperature and time of year.[19,20]

- Observers must then return the next morning and watch the tree to determine whether bats return to the vegetation.
- Roost re-entry watch timing should be based on patterns of activity recorded onsite with ABMs, i.e., as a guide watches should begin two hours prior to when the last passes were recorded on the ABMs on previous nights and finish one hour after official sunrise time. Where this information is not available and at minimum, watches shall begin two hours prior to official sunrise until one hour after sunrise. Infra-red and/or thermal imaging cameras may be useful as a supplementary tool in this process.

The methods above (Climbing and inspecting; ABM use and roost watches) can be implemented as in steps 4.

If bats are sighted, or sign detected, or a roost (active/inactive) is confirmed, the approved bat ecologist, as soon as possible, shall:

- Call the tree felling supervisor to inform them which affected tree(s) cannot be felled due to detection of bat sign.
- Send an email to the site manager, and a bat ecologist representing the council and DOC detailing the results of the survey and outlining the measures for protection or relocating the roost tree.
- A record (including photos) of any vegetation containing bat roosts shall be kept detailing the date; size, location and species of tree or other vegetation; roost type, e.g., cavity, peeling bark, broken branch; detail outlining how presence of bats was confirmed; the number of bats present; and species present, if known.

Step 5. Fell the tree if no bats present	**Response**	**Who can make this assessment?**	**When**
NB: Vegetation removal must take place on the day of tree inspection or the day immediately following night surveys that confirm that there are no bats present.			
a) If you have undertaken a visual inspection of the vegetation (following step 4a, then the vegetation can be removed **ONLY ON THE DAY OF INSPECTION** and meets the valid weather conditions (defined in notes 4c) at official sunset the day prior to inspection. If you have undertaken ABM surveys or roost watches 4b or 4c the vegetation can be removed **ONLY ON THE DAY IMMEDIATELY FOLLOWING SURVEY COMPLETION** (i.e., if the survey ends in morning the tree can be felled the same day only).		People who are familiar with the document shown in footnote[21], and physically able to check/inspect tree for signs of bats once felled.	When the inspection method chosen allows.

[19] Dekrout AS 2009. Unpublished PhD thesis. University of Auckland, New Zealand Pp 168.
[20] Griffiths R. 2007. Activity patterns of long-tailed bats (Chalinolobus tuberculatus) in a rural landscape, South Canterbury, New Zealand. New Zealand Journal of Zoology, 34:3, 247-258, DOI: 10.1080/03014220709510083.
[21] https://cdn.ymaws.com/www.nzva.org.nz/resource/resmgr/docs/other_resources/Bat_Care_Advice.pdf

Trees must be inspected for signs of bats once felled and before removing from the site, if safe to do so. Follow Appendix 1 if bats are detected during vegetation removal.			

Appendix 1. If bats are detected during tree relocation or removal

NB: Vegetation removal must take place on the day of tree inspection or the day roost watches or two consecutive nights of ABM data have confirmed that there are no bats present. If practical, trees are to be inspected for signs of bats once felled and before removing from site. People inspecting trees should be familiar with the Bat Care Advice document shown in footnote[22] and able to check/inspect tree for signs of bats once felled.

If during the felling of a tree bats are detected, felling of that tree must stop immediately if safe to do so, and DOC and an approved bat ecologist at Competency Level 2.1 must be consulted.

If bats do not fly away or are potentially injured/found on the ground, felling can only re-start once permission has been obtained from DOC after consultation with an approved bat ecologist at Competency Level 2.1.

If bats are detected once the tree has been felled**,** all further work must stop, and DOC and an approved bat ecologist at Competency Level 2.1 must be contacted. The felled tree must be thoroughly inspected by the approved bat ecologist for further bats**.**

If any bats are found on the ground or in the tree once felled, place the bat in a cloth bag in a dark, quiet place at ambient (or slightly warmer) temperature and take to a veterinarian for assessment as soon as possible. A maximum of two bats should be kept in one bag. After delivering the bat to the vet, contact an approved bat ecologist at Competency Level 2.1 in consultation with the vet and DOC (0800 DOC HOT, 0800 362 468).

Bats must be kept for three days under observation and must be kept out of torpor for this time. Additional detail is found at the links provided in this footnote[23]. Vets must euthanise bats whose injuries are causing suffering and are not likely to heal sufficiently to allow rehabilitation and return to the wild. The approved bat ecologist at Competency Level 2.1 and vet must consult with DOC to consider appropriate rehabilitation options where suffering is minimal and chances of return to the wild are high.

Euthanised bats or any dead bats (or bat parts) found must be handed to DOC.

[22] https://cdn.ymaws.com/www.nzva.org.nz/resource/resmgr/docs/other_resources/Bat_Care_Advice.pdf

[23] https://cdn.ymaws.com/www.nzva.org.nz/resource/resmgr/docs/other_resources/Initial_Vet_Care_NZ_Bats.pdf

APPENDIX C

Protocols for minimising the risk of felling occupied bat roosts

(Bat Roost Protocols)

Version 4: October 2024 approved by the New Zealand Department of Conservation's Bat Recovery Group

The use of these protocols is only one step in the RMA effects management hierarchy i.e., avoid, remedy, mitigate. Avoidance of felling bat roost trees should be the first step in any project. Using this protocol only reduces the likelihood of killing or injuring bats present in roosts at the time of felling. It does not avoid, remedy or mitigate any other effects.

Purposes of this document:

1. To outline why protection of roosts is important for the persistence of New Zealand bats and why removal of known and potential roosts should be avoided.
2. Where tree removal cannot be avoided, to set out the minimum requirements and protocols for removing trees in areas where bats are present, to minimise the risk of killing bats.

This protocol does not eliminate the risk to bats of death or injury because bats or active bat roosts can be missed. The best way to eliminate risk of felling an active roost is to **avoid** felling any known or potential roosts.

Context

Bat roost protocols and the Wildlife Act 1953

Aotearoa New Zealand bats are absolutely protected species under the Wildlife Act 1953. It is an offence to catch alive or kill, hunt, possess, molest, or disturb bats under the Act. Any projects where tree or vegetation removal overlaps with the occurrence of bats, there is a risk of killing or injuring bats that may be present. Following the bat roost protocol reduces the likelihood of killing or injuring bats.

Bat roost protocols and the RMA

The occurrence of bats and bat habitat is a matter of 'significance' under Section 6(c) of the Resource Management Act (RMA). Bat roost protocols have become a standard part of bat management plans that may be required under RMA consents. Where developments require consents, and bats (a threatened species) are present, the developments should 'Avoid' impacting bats and bat habitat. Where this is not possible, the effects management hierarchy must be followed with attempts made to "remedy, mitigate, offset, and compensate" for impacts on bats and bat habitat.

Bat roost protocols are not considered an appropriate management measure to address bat roost habitat loss, as they only attempt to reduce the risk of bats being killed by tree felling. Therefore, implementing bat roost protocols where bats are present should be considered a last resort after following the RMA effects management hierarchy.

This protocol has therefore been framed following the RMA effects management hierarchy by first focusing on the avoidance of effects, helping to identify and avoid the removal of roost trees, and to minimise the risk to bats of death or injury if avoidance is not possible. This approach is usually informed by gathering data on bats in the local areas and seeking advice from someone who has been certified as competent by DOC to assess roost use by bats using bat detectors, identify potential roost features, and undertake emergence watches.

Identifying and protecting *both active and inactive (*i.e., trees used by bats at other times of year) roosts by avoiding their removal is an important step in supporting the survival and persistence of bats.

Effects management/compensation

If trees are felled and habitat lost, then compensation measures should be considered to address the adverse effects. What these measures should be is beyond the scope of this document. Provision of artificial roosts in the short-term and planting for the long-term are some of the methods commonly used in development projects, but their effectiveness is untested and understanding this is future research need**e**d.

The status of Aotearoa New Zealand bats

Aotearoa New Zealand's two extant bat species (pekapeka) are classified as threatened.

Long-tailed bats are classified as 'Nationally Critical' because the species is likely to have a 70% decline in numbers within three generations.

Lesser short-tailed bats have three subspecies. The northern subspecies is classified as 'Nationally Vulnerable' because there are 1000-5000 mature individuals and the predicted decline in numbers is 10-50% within three generations. The central subspecies is 'Declining' because there are 20 000-100 000 mature individuals, and the predicted decline is 10-50% within three generations. The southern subspecies is 'Recovering' because there are 1000-5000 individuals, and the predicted increase is >10% within three generations.

Threats to bats

This document deals specifically with roost protection; however, roost protection is only part of the wider issue of habitat loss. Habitat loss through land clearance, habitat degradation, fragmentation and disturbance and loss of roosts reduces roosting, foraging and socialising areas. Individual bats and colonies are also threatened by the local felling of individual trees.

Bats have large home ranges which can include unprotected peri-urban habitat. Protecting habitat and maintaining connectivity of vegetation are crucial for bats being able to persist and flourish in the environment.

Predation and competition by introduced predators: mustelids, rats, cats, and possums have all been implicated in the decline of bats[1].

Roosts are critical to the survival of bats

Roosts are where bats gather to shelter during the day and at night. They are used to socialise, mate, give birth, and raise young. Bats have very specific requirements when they are choosing roosts and are not just choosing any tree. The specialised features of roosts make them rare and almost irreplaceable in any landscape or habitat type except over very long-time frames. People sometimes falsely suggest that "bats can just move to another tree". This is not the case, particularly where trees suitable as roosts are limited[2].

Bats demonstrate high site fidelity to existing roosts and their specific roosting areas, and they move on a rotation among these. Because roost trees are likely to be rare, and bats choose which of their roosts to occupy to fulfil specialised requirements, felling roost trees even when bats are absent will have a significant negative effect. If the number of suitable roosts and their surrounding habitat is reduced in the landscape, bats are forced to use roosts

[1] O'Donnell CFJ; Christie JE; Hitchmough RA; Lloyd B; Parsons S 2010. The conservation status of New Zealand bats, 2009. New Zealand Journal of Zoology 37: 297– 311.

[2] Many references available, for example, Borkin KM; Parsons S. 2011. Sex-specific roost selection by bats in clear-fell harvested plantation forest: improved knowledge advises management. Acta Chiropterologica 13(2): 373-383; Borkin KM; O'Donnell CFJ; Parsons S. 2011. Bat colony size reduction coincides with clear-fell harvest operations and high rates of roost loss in plantation forest. Biodiversity and Conservation 30; Sedgeley JA; O'Donnell CFJ 1999b. Roost selection by the long-tailed bat, *Chalinolobus tuberculatus*, in temperate New Zealand rainforest and its implications for the conservation of bats in managed forests. Biological Conservation 88:261–276; Sedgeley JA; O'Donnell CFJ 2004. Roost use by long-tailed bats in South Canterbury: Testing predictions of roost site selection in a highly fragmented landscape. New Zealand Journal of Ecology 28:1-18.

that are less thermally efficient. This means they will use more energy to survive, resulting in reductions in survival and lower reproductive success. In this way, roost removal is likely to result in higher risk of local extinction.

Bats can roost in native or exotic vegetation – therefore it should not be presumed that exotic species such as pine trees will not support bats. Roosts, including maternity roosts, have been found in many exotic species including, but not limited to, pine, poplar, oak, and acacia species, black locust, willow, eucalyptus and Tasmanian blackwood.

Bats are at risk of being injured or killed when trees are felled

If a tree is felled with a bat in it, it is highly likely that the bat will be injured or killed, although this may not be apparent at the time because injuries, such as bruises and fractures, which would hinder bats' ability to fly well, may take time to be obvious.

The highest risk of injuring or killing bats or trapping them within their roosts is when they are heavily pregnant, when young are still dependent on the roost (late November – February) and when bats are more likely to be in torpor (a type of hibernation in May – September). Heavily pregnant bats are slower and less agile, and young bats cannot fly, and when they are new to flying are not very agile, so their chances to escape are reduced when roost trees are felled. Also, it is possible that if the larger female-dominated maternity roosts are cut down when females are raising their young to independence (October-March), a whole colony of bats could be destroyed at one time.

If trees are cut down when bats are in torpor, bats may be unable to rouse from torpor and to fly away in time to escape. Additionally, it is significantly harder, sometimes impossible, to detect bats roosting in trees during torpor. For these reasons, trees with potential bat roost features must not be cut down in winter. Bats also use torpor for short periods during summer, for example, if the weather gets cold, so the risk of killing or injuring bats that cannot escape falling trees exists at any time of the year.

Bat roost protocol

When and how to use the protocol

Whenever vegetation removal is proposed in areas where bats are potentially present and where their habitat may be impacted, follow the decision tree (Figure 1) below as a guide to what sort of action should be undertaken. The decision tree is designed firstly to avoid felling bat roost trees, secondarily aimed at moving roost trees, and only if unavoidable, felling roost trees (but only once vacated).

None of the methods of inspecting roosts described below eliminates the risk of failing to identify bats when they are present. Therefore, techniques such as filling in cavities with expandable foam are not supported as a tool. This is because there is a risk of trapping bats that have not been detected within cavities.

Definitions

Competencies: a set of competencies developed by the NZ Bat Recovery Group[3] to ensure that anyone working with bats is competent to do so. Contact bathandler@doc.govt.nz for a list of competencies and requirements to become an authorised competent bat worker.

Competencies referred to in this document:

2.1 Bagging, storage, handling, measuring, weighing, sexing, aging, temporary marking and releasing appropriately:

For long-tailed bats: 50 individuals

For short-tailed bats: 50 individuals

3. High risk activities – Roost felling (all of these competencies include the understanding of what to do when bats are found during tree felling as per Appendix 6 of 'Initial veterinary care for New Zealand Bats')

3.1 Assessing roost tree use using Automatic Bat Monitors - Demonstrate correct timing, placement, and interpretation of data for 10+ times according to DOC's Tree Felling Protocols.

[3] A group of bat specialists that advise on bat issues and assess bat competencies

3.2 Undertake roost watches/emergence counts at 10+ occupied roosts where the entrance is visible.

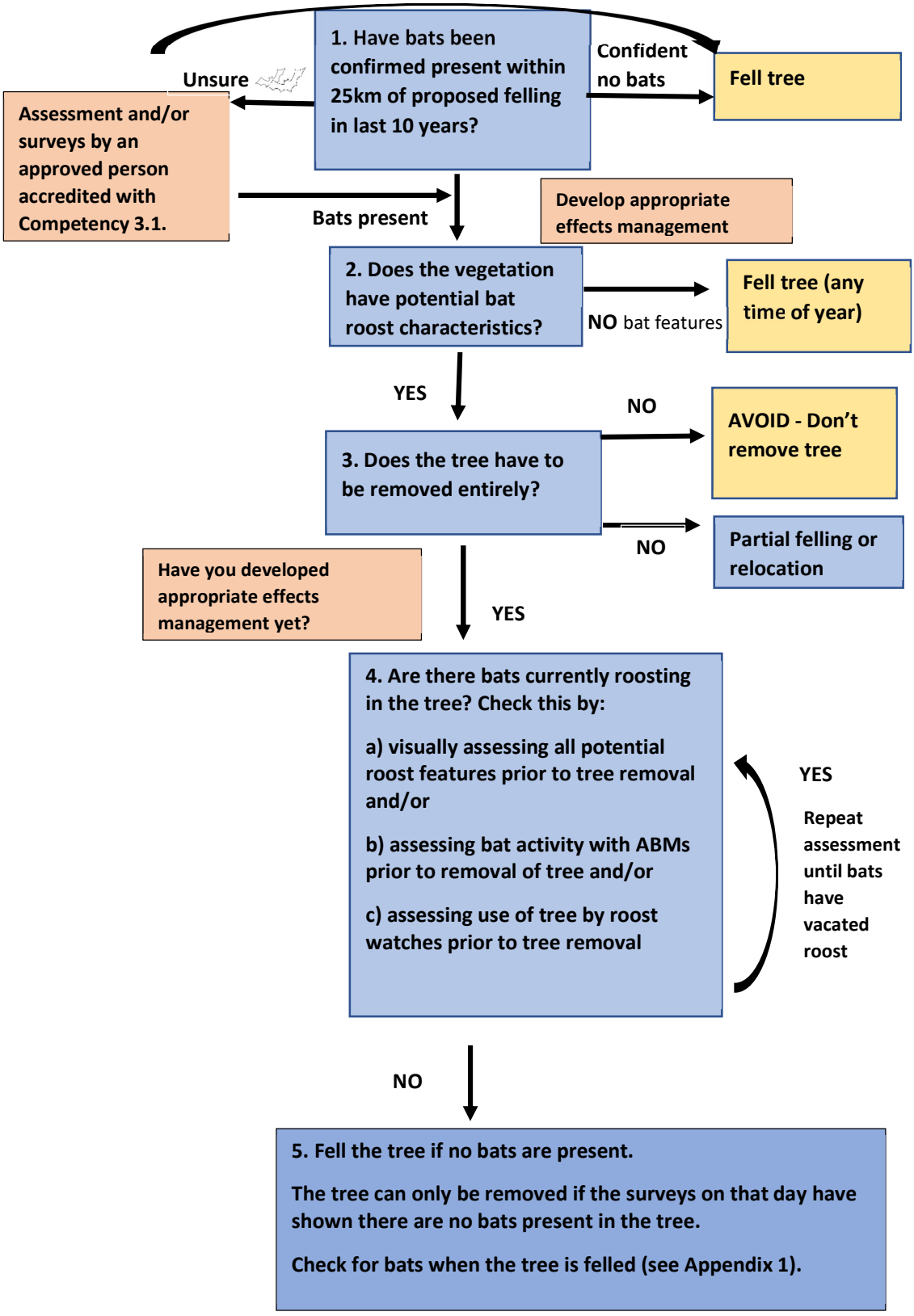
3.3 In at least two different forest/habitat types, including the forest/habitat type where trees are going to be assessed: evaluate 10+ potential roost features in trees (e.g., cavities, peeling bark, epiphytes).

These are minimum requirements and rely on an accredited trainer to provide written endorsement to the Bat Recovery Group that the right level of competency has been achieved.

ABM: automated bat monitoring unit/detector

Figure 1. Tree removal in bat areas flow chart

Each numbered step relates to a step in the Decision Tool for Tree Removal. Follow each step fully in the text to work through the process.



Step by step decision tool for tree removal in bat areas (to be used in conjunction with Figure 1).

Step 1. Does the bat roost protocol apply to my project?	Response	Who can make this assessment?	When?
a) Is there known bat activity within a radius of 25 km of the vegetation to be removed (see [4] and [5] notes below)?	a) If Yes, proceed to b If No, consider whether survey work needs to be done.	Evidence can come from on-the-ground surveys and reports from the national DOC database if within the last 10 years, consultants, and/or other credible sources. Evidence should be interpreted by an experienced bat ecologist.	Any time
b) Are bats present in the Project Area i.e. where trees are planned to be felled?	b) If Yes, go to step c If unknown, undertake comprehensive survey if bats are likely to be present. If no bats are present after comprehensive survey, you do not need to follow protocol.	If surveys are required to support the assessment, then these will need to be designed by approved person accredited with Competency 3.1. to determine presence around trees due to be felled.	Acoustic surveys to determine presence should be undertaken when bats are most active and environmental conditions are suitable (October 1st to April 30th)[6]. Surveys undertaken at other times of year are considered less reliable for determining absence.
c) Is the tree known to provide a roost location for bats? (Previous knowledge).	c) If yes, go to step 3 If no (but bats are present in the project area), go to step 2.		

Notes for Step 1

1a) Bats are a highly mobile species. Long-tailed bats can have home ranges (the areas that they regularly use) as wide as 19km, and short-tailed bats about 24km. Three colonies of long-tailed bats in the Eglinton Valley collectively had a home range of 100km^2.

[4] The largest home range span for the long-tailed bat in the Eglinton Valley was 19 km (O'Donnell 2001. J. Zool., Lond. 253, 253-264).

[5] The largest home range span for the lesser short-tailed bat in the Eglinton Valley was 23.6 km (O'Donnell et al. 1999. New Zealand Journal of Ecology 23(1): 21-30).

[6] Borkin K.M. 2010. Ecology of New Zealand's Long-tailed bat (*Chalinolobus tuberculatus*) in exotic plantation forest. Unpublished PhD thesis, University of Auckland.

When assessing whether bats might be present at a site you have to consider any surveys that have been done in the wider area, how long ago the surveys were done and whether more surveys are required.

1b) If you are doing a new survey then you should design the survey to cover the project area. Examples of surveys are shown in the Bat Inventory and Monitoring Toolbox (https://www.doc.govt.nz/our-work/biodiversity-inventory-and-monitoring/bats/). See 'Bats: Counting away from bat roosts: bat detectors on line transects' and 'Counting away from bat roosts: automatic bat detectors'.

Send bat data (processed csv files and GPS locations) to batdatabase@doc.govt.nz on a standard spreadsheet available by emailing this address.

Step 2. Does the vegetation proposed to be removed have potential bat roost characteristics?	**Response**	**Who can make this assessment?**	**When?**
a) Is the tree ≥15 cm DBH (Diameter at Breast Height)[7]?	If yes, further assessment is required (2b). If no, the vegetation can be removed at any time. There may be roosts that have smaller DBH. If any vegetation is suspected to have a bat roost present, removal shall be halted immediately, and protocols reviewed.	Anyone who can measure a tree DBH.	Any time
b) On visual inspection, does the tree (dead or alive) have features that indicate roost potential (Potential Roost Features/PRFs)? These features include: • hollows • cavities • knot holes • cracks • flaking, peeling, and decorticating bark • epiphytes • broken or dead branches or trunk • cavities/hollows/shelter formed by double leaders	If yes go to step 3 If unsure i.e. cannot assess due to foliage or limited access, further assessment is required. This may include climbing inspection of the tree. If no potential roost features are present, the vegetation can be removed at any time[8],	Approved person accredited with Competency 3.3.	Visual inspections can occur at any time of the year, but within 6 months of final felling dates. This accounts for any changes in trees that may occur over time. If there are **NO** potential roost features, felling can occur at any time of year.

[7] This diameter at breast height is based on dimensions of roosts used by south Hamilton long-tailed bats that were identified by Dekrout (2009, Unpublished PhD thesis, University of Auckland) - the smallest roosts were 15.5 cm DBH; but note that in South Canterbury Sedgeley and O'Donnell (2004, New Zealand Journal of Ecology 28(1): 1-18) found that 25% of long-tailed bat roosts were smaller than 18.8 cm DBH.
[8] All surveys to assess whether trees are potential roosts shall take place within 6 months of final felling dates. If felling does not take place within this time, then assessments must be repeated. This is intended to account for any changes in trees which may occur over time.

• Artificial roost boxes	but if upon felling you find a bat follow section 5.		
Step 3. Does the tree have to be removed entirely?	**Response**	**Who can make this assessment?**	**When?**
a) Is the only option to remove the tree entirely?	If yes, continue to step 4 If no, consider leaving the tree in place, cutting off specific limbs only or relocating the tree. If any felling, partial felling (where the part to be felled has potential bat roost features) or tree relocation takes place you **MUST** proceed to step 4. If a roost (active/inactive) is confirmed, then advice should be obtained at a project level in writing from DOC before proceeding.	Project leader (i.e. the accountable decision-maker for the project)	Any time

Notes for Step 3

Trees must only be relocated when bats are absent and when standard automated bat monitoring unit (ABM) weather conditions are met (see notes section 4b for appropriate weather conditions), and in consultation with an ecologist with all competencies of level 3: 'High risk activities – Roost felling'.

Advice in writing can be given on behalf of the Operations Manager of the DOC District you are working in. If you do not know the contact details for this office, you can phone 0800 ASK DOC (0800 275 362) or email info@doc.govt.nz . In emergencies, phone 0800 DOC HOT (0800 362 468).

Step 4. Are there bats currently roosting in the tree? (Follow a or b or c or a combination)	**Response**	**Who can make this assessment?**	**When**
a) Are potential features being used by roosting bats? A tree climber may be required to check all features (see notes for 4a below). If roost is occupied repeat 4a another day until roost is vacated.	If yes, **THE TREE MUST NOT BE FELLED UNTIL BATS HAVE VACATED IT**. If no, the tree can be removed on the day of the tree inspection following step 5.	An approved person accredited with Competency 3.3 or an experienced tree-climber (e.g., an arborist) working with an approved person accredited with Competency 3.3.	October 1st to April 30th when the temperature is 7°C or greater at official sunset in the South Island or 8°C or greater in the North Island.

	If bats continue to use the roost, then the tree must not be cut down until the bats leave the roost. At this point reconsider whether this tree must be felled. Advice must be obtained at a project level in writing from DOC prior to felling the tree. If you do not know the contact details for the office, you can phone 0800 ASK DOC (0800 275 362) or email info@doc.govt.nz.	If the latter, the tree climber must provide information along with photographs or video footage, to the approved person accredited with Competency 3.3 who assesses and decides whether the tree can be removed. If roosts are known or confirmed through this process, then this information must be communicated to the nominated DOC or Council bat ecologist for this project.	
b) Is bat activity recorded at any time during two consecutive, valid survey nights preceding tree felling[9]? At least two nights are required as it is possible for bats to enter or leave a roost without echolocating, or to not leave the roost for a night.	If yes (bats are detected), survey must continue until no bat activity is recorded for two consecutive nights (to indicate bats have left the area) prior to felling **OR** roost features of each tree must be visually assessed via climbing. If bat activity is consistent in the area and 2 nights with zero bat passes cannot be obtained, Go to 4c or 4a. If no bats are detected for two consecutive nights, the vegetation can be removed on the day immediately following the	An approved person accredited with Competency 3.1	October 1st to April 30th and when conditions meet the requirements for standard ABM weather conditions (see 4b notes).

[9] Le Roux et al (2013) found that in and around Hamilton "The longest consecutive monitoring period without bat detections at each site was three nights during winter." Le Roux et al 2013. New Zealand Journal of Zoology (2013): Spatial and temporal variation in long-tailed bat echolocation activity in a New Zealand city, New Zealand Journal of Zoology, DOI: 10.1080/03014223.2013.827125.

	survey nights using the method in 5.		
c) Are bats observed emerging or re-entering the tree? This involves watching roost features to identify bats returning to or exiting potential roost features. It should only be used in combination with previous ABM monitoring (4b) (see notes 4c for method). At least two consecutive emergence and re-entry watches should occur at dusk and dawn immediately preceding the felling as it is possible for bats to enter or leave a roost without being detected, or to not leave the roost for a night. It is strongly recommended that a night vision aid is used for emergence watches to reduce the risk of missing bats if they leave after it becomes too dark to see.	<u>If yes (bats are seen at either watch)</u>, it is a confirmed roost. Removal of a roost should not occur. <u>If no bats are observed entering or exiting for two consecutive</u> dusk and dawn watches, the vegetation can be removed on the day immediately following the final dawn watch using the method in 5.	An approved person accredited with Competency 3.2. If more than one person is required for a roost watch at a tree, a minimum of one approved person accredited with Competency 3.2 must be present on site for the duration of the roost watch to supervise.	Between October 1st and April 30th only **AND** when weather parameters meet the roost watch requirements.

Notes for Step 4.

4a) Tree climbing and inspection

Care must be taken while climbing trees to avoid disturbing, removing or destroying tree features with bat roost potential such as sections of loose bark or cavities in dead wood. Using mobile elevated platforms can be a good option. Bats are less likely to be active over colder periods, so climbing to check whether bats are present in potential roost features must take place between October 1st to April 30th when the temperature is 7 °C [10] (South Island) or 8°C (North Island) or greater at official sunset on the night before inspection.

A tree climber may be required to check all potential bat roost features.

- Can bats be seen? An endoscopic camera should be available for this step and every possible corner of each potential roosting feature inspected, i.e., cavity/crack etc. Cracks, holes, and splits may lead to cavities or may be superficial. A cavity may be wet indicating no/low potential as a bat roost. Ensure that the tree climber is provided guidance from the competent bat worker about bat identification and care required when probing endoscopes into potential roosting features which may disturb bats.
- Can bats be heard? Search of tree features should be accompanied by use of a hand-held bat detector. If bats are present and not in torpor, then detection of presence listening at 25 kHz (for social calls) and 40 kHz (for echolocation calls) may help to determine if long-tailed bats are present. Short-tailed bat social calls are often audible or detected at 25-27 kHz.
- Is guano present or urine staining? See Appendix 1.

[10] O'Donnell CFJ 2000. Influence of season, habitat, temperature and invertebrate availability on nocturnal activity of the New Zealand long-tailed bat (*Chalinolobus tuberculatus*). New Zealand Journal of Ecology 207-221.

4b) ABM survey work

ABMs are to be used to record bat calls. Location of ABMs must provide sufficient coverage to be able to determine if bat roosts are present in one or more of the trees. Department of Conservation-manufactured AR4 bat detectors are considered likely to detect long-tailed bats only over short distances i.e., up to 30-60 m distant from the detector (S. Cockburn, Department of Conservation, pers. comm.). This is similar detection distances of other detector types. Ensure the survey design Note that rain and wind can affect detectability because the sounds can have the same frequencies as bat calls. These sounds are picked up by bat detectors, potentially obscuring bat calls.

'Valid' survey nights must have the following features:

- Begin one hour before official sunset and end one hour after official sunrise.
- Temperature 8°C or greater for the first four hours after official sunset time for the North Island and 7°C for the South Island[11].
- Ideally no to very little precipitation within the first 4 hours after official sunset, although a light mist or occasional drizzle may be acceptable as assessed by an ecologist accredited with Competency 3.1.
- No to light wind within the first four hours after official sunset.

Prior to the commencement of surveys, ABMs must be checked for correct operation at a site where bat activity is known to be regular, or by using the DOC – Bat Recorder Tester (Tussock Innovation Ltd) phone app made for this and available from Google Play Store. Faulty or suspect ABMs must not be deployed, and ABMs must be redeployed if faults occur.

4c) Roost watches

The following weather conditions define a valid night for roost watches:

- Temperature greater than 8°C all night between official sunset and sunrise for the North Island and 7 °C for the South Island.
- Ideally no to very little precipitation within the first 4 hours after official sunset, although a light mist or occasional drizzle may be acceptable as assessed by an ecologist accredited with Competency 3.1.

Roost watches should include the deployment of ABMs and analysis of data for the night of the roost watch.

Emergence watches

- Each tree must be watched from at least 1 hour prior to sunset in the South Island and from ½ hour prior to sunset in the North Island until it becomes too dark to see by sufficient people to observe all potential exit points. This must be supported using handheld detectors, and consider the use of night vision aids which can detect

[11] South Island temperatures are based upon O'Donnell (2000) as above. North Island temperatures are based on Borkin et al. 2023. Influence of weather on long-tailed bat detection in a North Island exotic forest. New Zealand Journal of Ecology, Vol. 47, No. 1.

bats once it becomes too dark to see. The aim of emergence watches is to identify potential roost locations within the vegetation. Infra-red and thermal imaging cameras will be useful in this process.

Roost re-entry watches

The time when bats return to roosts can vary based on temperature and time of year.[12,13]

- Observers must then return the next morning and watch the tree to determine whether bats return to the vegetation.
- Roost re-entry watch timing should be based on patterns of activity recorded onsite with ABMs, i.e., as a guide, watches should begin two hours prior to when the last passes were recorded on the ABMs on previous nights and finish one hour after official sunrise time. Where this information is not available and at minimum, watches shall begin two hours prior to official sunrise until one hour after sunrise. Infra-red and/or thermal imaging cameras may be useful as a supplementary tool in this process.

The methods above (Climbing and inspecting; ABM use and roost watches) can be implemented as in steps 4.

If bats are sighted, or sign detected, or a roost (active/inactive) is confirmed, the approved person with the appropriate competencies, as soon as possible, shall:

- Call the tree felling supervisor to inform them which affected tree(s) cannot be felled due to detection of bat sign.
- Send an email to the site manager, and the local DOC office if an active roost is found, detailing the results of the survey and outlining the measures for protection or relocating the roost tree. Advice must be obtained at a project level in writing from DOC prior to felling the tree. If you do not know the contact details for the office, you can phone 0800 ASK DOC (0800 275 362) or email info@doc.govt.nz.
- A record (including photos) of any vegetation containing bat roosts shall be kept detailing the date; size, location and species of tree or other vegetation; roost type, e.g., cavity, peeling bark, broken branch; detail outlining how presence of bats was confirmed; the number of bats present; and species present, if known.

Step 5. Fell the tree if no bats present	**Response**	**Who can make this assessment?**	**When**
NB: Vegetation removal must take place on the day of tree inspection or the day immediately following two consecutive emergence/re-entry surveys that confirm that there are no bats present.			
a) If you have undertaken a visual inspection of the vegetation (following step 4a, then the vegetation can be removed **ONLY ON THE DAY OF INSPECTION** and meets the valid weather conditions (defined in notes 4c) at official sunset the day prior to inspection.		An approved person accredited with the relevant competency (based on method used) who are familiar with the 'Bat First Aid and veterinary care' documents shown	When the inspection method chosen allows.

[12] Dekrout AS. 2009. Unpublished PhD thesis. University of Auckland, New Zealand Pp 168.
[13] Griffiths R. 2007. Activity patterns of long-tailed bats (Chalinolobus tuberculatus) in a rural landscape, South Canterbury, New Zealand. New Zealand Journal of Zoology, 34:3, 247-258, DOI: 10.1080/03014220709510083.

If you have undertaken ABM surveys or roost watches 4b or 4c the vegetation can be removed **ONLY ON THE DAY IMMEDIATELY FOLLOWING SURVEY COMPLETION** (i.e., if the survey ends in morning the tree can be felled the same day only). Trees must be inspected for signs of bats once felled and before removing from the site, if safe to do so. Follow Appendix 2 if bats are detected during vegetation removal.		in footnote[14], and physically able to check/inspect tree for signs of bats once felled.	

[14] Initial Veterinary Care for NZ Bats UPDATED 2023.pdf (doc.govt.nz) and Bat Care Advice for first responders 2023.pdf (doc.govt.nz)

Appendix 1. Identification of guano.

Bat droppings ('guano') will superficially look like rodent droppings, being dark in colour and a similar size and shape to a large grain of rice. Bat droppings will easily crush under pressure (e.g., when squeezed between fingers) and will disintegrate into a dusty/crumbly substance in comparison to smearing (rodents). Where beetles form part of the bat's diet, crushed droppings can look shiny/glittery due to the presence of elytra. Larger colonies may leave piles of guano at the bottom of the roosting feature (Figure 1). Where individuals or small colonies are present, it is likely that only individual pieces of guano may be found, therefore careful inspection is needed.

Figure 1: Guano at the base of communal long-tailed bat roost. Photo: M. Choromanski

Appendix 2. If bats are detected during tree relocation or removal

NB: Vegetation removal must take place on the day of tree inspection, or the day roost watches have been completed or two consecutive nights of ABM data have confirmed that there are no bats present at that time. If practical, trees are to be inspected for signs of bats once felled and before removing from site. People inspecting trees should be familiar with the Bat Care Advice document shown in footnote[15] and able to check/inspect tree for signs of bats once felled.

If during the felling of a tree bats are detected, felling of that tree must stop immediately if safe to do so, and DOC and an approved person accredited with Competency 2.1 must be consulted.

If bats do not fly away or are potentially injured/found on the ground, felling can only re-start once permission has been obtained from DOC after consultation with an approved person accredited with Competency 2.1.

If bats are detected once the tree has been felled**,** all further work must stop, and DOC and an approved person accredited with Competency 2.1 must be contacted. The felled tree must be thoroughly inspected by them for further bats**.**

If any bats are found on the ground or in the tree once felled, place the bat in a cloth bag in a dark, quiet place at ambient (or slightly warmer) temperature and take to a veterinarian for assessment as soon as possible i.e. that day. A maximum of two bats should be kept in one bag. After delivering the bat to the vet, contact an approved person accredited with Competency 2.1 in consultation with the vet and DOC (0800 DOC HOT; 0800 362 468).

[15] Initial Veterinary Care for NZ Bats UPDATED 2023.pdf (doc.govt.nz) and Bat Care Advice for first responders 2023.pdf (doc.govt.nz)

Bats must be kept for three days under observation and must be kept out of torpor for this time. Additional detail is found at the links provided in this footnote[16]. Vets must euthanise bats whose injuries are causing suffering and are not likely to heal sufficiently to allow rehabilitation and return to the wild. The approved person accredited with Competency 2.1 and the vet must consult with DOC to consider appropriate rehabilitation options where suffering is minimal and chances of return to the wild are high.

Euthanised bats or any dead bats (or bat parts) found must be handed to DOC and is a legal requirement under the Wildlife Act. If the bat is held for longer than 12 hours, store it in a food grade safe glass jar in the freezer to preserve the bat's smell for the potential use of training conservation dogs.

[16] Initial Veterinary Care for NZ Bats UPDATED 2023.pdf (doc.govt.nz) and Bat Care Advice for first responders 2023.pdf (doc.govt.nz)

APPENDIX D

ABM monitoring data relating to a harvesting operation in Raincliff Forest

Pre-Harvesting Information

2 ABM's deployed 13th October 2022 – 20th October 2022 for Pre-Harvest Monitoring.

7x Pekapeka recordings (only 1 ABM had activity).

No activity recorded during dawn/ dusk timeframes.

Post Harvesting Information

4 ABM's deployed 13th October 2023- 30th October 2023 for Post-Harvest monitoring.

121x Pekpeka recordings (1x ABM failed)

ABM 16: 42 Recordings

ABM 26: 29 Recordings

ABM 37: 50 Recordings

8x recordings between 5am and 8am

40x recordings between 9pm- 10pm

73x recordings between 13th October 2023- 20th October 2023.

APPENDIX E

R.T.E Management Plan – Long Tailed Bat

Mgmt Plan Number: RTE-01
R.T.E Species: Long-tailed Bat (Pekapeka)
PBL Forest Location: Raincliff, Geraldine, potential woodlots.
Threat Status: Threatened- Nationally Critical

CURRENT STAKEHOLDERS:

- Damien Bromwich – Department of Conservation
- Khan Adam – High Country Contracting
- Rob Carson- Iles – Department of Conservation
- Mark Geddes- Planning Manager Timaru District Council
- Long tailed Bat Working Group (LTBWG)

MANAGEMENT PRIORITIES:

- Continual pest control operations in South block, Maori Gully and Raincliff for LTB Habitat protection.
- Protection of native forest remnants, and therefore potential roosts, as per standard practice around native forest areas.
- Increase awareness and education within the community and forest industry.
- LTB Population Monitoring-To gauge success of habitat protection work
- Pre-Operational Monitoring- To identify new LTB Habitats and manage accordingly within harvesting/ forestry operations.

R.T.E Management Plan – Long Tailed Bat

SPECIES DESCRIPTION:

Figure 1 LTB With transmitter attached- Raincliff

Long-tailed bats (LTB) are essentially aerial insectivores. They inhabit the forest edges, feeding above the canopy on moths, midges, mosquitoes and other small flying insects. They can be detected along forest margins and roads, over farmland, around streams, fire ponds and lakes. While preferring to roost within indigenous tree species, LTB roosts have also been found in exotic species (e.g. willows and Douglas firs, old pines), limestone caves, and occasionally in buildings.

LTB's roost both solitarily and communally, with roost sites generally being used for less than 2 days. The composition and numbers of bats using a particular roost can vary from night to night.

LTB's begin to leave their roosts within half an hour of dusk. Peak activity occurs in the first two hours of twilight, and just before dawn. Bats can range widely (e.g. home range of 50-70 km^2) and can undertake flights of 10-15 km in search of roosts and foraging sites. Bat activity during spring and summer is high and similar with a drop through autumn till only occasional passes occur in winter. Bat activity generally ceases in temperatures below 5°C.

Little is known about longevity and the breeding behaviour of LTB's. It is thought that LTB's produce only one young each year, usually early in December. Young bats take their first flights in the following January. LTB echolocation calls are loudest around 40 kHz but they can be detected over the entire frequency range of the Bat Box III

PORT BLAKELY

HABITATS

Raincliff Forest

Figure 2 Raincliff Pest control and Roost Trees

Raincliff Forest is located ten kilometres east of Fairlie. The forest was planted in 1888-1889 and consists of a wide range of exotic tree species, with a corridor along Middle Valley Road through the middle of the forest that includes numerous specimen trees, in particular a large number of Californian redwoods.

Due to the age and reasons for planting the forest is deemed to be an archaeological site and is under the protection of Heritage NZ. There is also a number of public walking and biking tracks through the forest.

Roost Trees: There is 16 known roost trees within the Raincliff forest. These trees are all GPS marked and protected from any operations. Each tree has a predator 'band' around the trunk and is marked with a 'Bat Roost Tree' Sign. Refer to red points in figure 1.

Pest Control: There is a full network of Good Nature self-setting traps throughout Raincliff forest. These traps are targeting Possums, Rats/ Mice, and Mustelids. The traps are set out in a 100m grid and are re-baited and gassed approx. every 3 months. Refer to the 'T' in figure 1. for location of traps.

There is also pest monitoring using wax tags and ink tunnel methods undertaken to gauge success of pest control program. When monitoring data indicates high numbers an additional leg hold possum control operation is undertaken.

Geraldine South:

Geraldine South forest is located adjacent to the the Hanging Rock and Kakahu Forest areas and has been identified by DoC as an important remnant provider feeding ground and roosting habitat for the SI long-tailed bat.

Roost Trees: There is a number of Known roost trees within the adjacent DOC property.

Pest Control: These areas have been incorporated into a targeted predator control programme which was established in 2003 as part of Environment Canterbury's Animal Pest Threats to Biodiversity programme. PBNZ has been undertaking pest control operations in conjunction with this programme since 2010 in order to target specific LTB pest species.

Maori Gully- Geraldine Forest:

Maori Gully is approx. 83Ha indigenous remnant forest located within Geraldine Forest off Te Moana Road. The valley is classified an Significant Natural Area (SNA) by the Timaru District Council in 2012. During the 2019/2020 LTB monitoring season the first mark and recapture work successfully caught a male LTB confirming a new colony in the valley.

Roost Trees: The location of maternal roost trees in Maori Gully is not yet known.

Pest Control: Port Blakely deployed an extensive bait station network throughout the area in 2019 with control methods used prior to LTB maternal roost timeframes. This is a co-funded effort with Timaru District Council as part of the SNA contestable fund allocation.

MONITORING:

LTB Monitoring is undertaken for the following:

- Pre-operational Monitoring to identify potential roost trees prior to harvesting (refer to Operational Procedure below).

- 'Prospecting' locating new habitats and/or colonies. Refer to the annual reports for details of where recent prospect monitoring has occurred.

- Population monitoring- to monitor trends of established and known LTB populations.

Beginning in 2019 course data population monitoring will be undertaken using the Automated Bat Monitors (ABM's). This will be undertaken annually at the same locations and dates. After 5 years data should indicate population trends. Refer to the GIS mapping for location of population monitoring. This is being completed in Raincliff and Maori Gully.

Automated Bat Monitoring (ABM) Procedure:

- Automated bat monitors can only be deployed during the spring/summer (October-March) period when bats are no longer in semi-hibernation.
- Monitors are to be deployed for 7 nights.
- Monitoring shall avoid heavy rain events or windy/stormy weather
- Date, GPS Location, number of passes and device number shall be recorded.
- All data will be analysis using the *'Bat-search'* software.
- Monitoring data will be communicated to DOC to obtain approval to proceed with planned operations or undertake further assessments if required.

Where pest control is implemented pest monitoring also occurs to ensure target species and applicable control measures are applied.

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COMMUNITY ENGAGEMENT, EDUCATION AND AWARENESS:

Since 2018 we have held Community Bat Evenings in the Raincliff forest. This is a free event that begins at dusk in Pleasant Point and people are bused to the forest to go on an informative walk looking at the pest control methods, roost trees, monitoring devices and ideally see bats in their natural habitat. These events have proved a success with over 120 people participating in 2018 over two nights. We have also completed a number of public awareness project including school talks and promoting LTB awareness within other industries.

Port Blakely developed a 'How to guide' flier for the wider forestry community targeted at identifying potential roost trees prior to harvest and the steps to follow.

OPERATIONAL PROCEDURE:

The following steps are to be undertaken prior to any harvesting or forestry activities in potential Long-tailed bat habitats:

- Undertake potential bat habitat assessment as part of harvest planning.
- Trees are to be assessed using the following criteria to identify potential roost trees:
    - Circumference of the trunk or largest limb is 120cm or greater
    - Tree(s) is aged 15 years or older
    - Tree(s) have visible gnarl, nooks, holes, splits, deadwood and rough peeling bark
    - Tree(s) is generally ugly (damaged, broken tops)
- If the above criteria are met Port Blakely will notify DOC to undertake further assessment and deploy automated bat monitors.
- Any identified bat roost trees will be marked/ GPS'd and left standing.

REPORTING:

Annual reporting will be completed following the end of bat season and provided to all relevant stakeholders including a summary in our Public Information Report.