Date: 15 August 2024

New Zealand Bat Recovery Group Advice Note – Planting to provide roosts for bats in the long-term

Background:

This advice was developed on request from several Councils who wished to understand which plants would be useful to include in planting plans or lists to provide roosts for bats in the long term.

Things to consider when designing a planting plan intended to provide bat roosts:

This Advice Note does not provide a complete list of species. Species that are ecologically appropriate to the site and unlikely to create weed infestations should be chosen. All plantings should maximise establishment success by selecting species that occur naturally close to the planting site.

Not all planted trees will provide roosts for bats in the long term because they may not create features that will support bats (such as cavities, broken branches or trunks, hollows, or peeling bark) and because, even if they do, bats may not find them suitable, or even locate them. This means that the number of trees planted should greatly exceed a 1:1 ratio of trees planted to trees lost when the planting is to replace potential roosts that will be removed, felled, or pruned.

Planting could include indigenous or exotic species known to be used as roosts. Species that are prone to forming hollows or cavities in trunks will be especially useful as long-term roosts.

A planting programme should initially include a mix of fast-growing locally sourced pioneer species to establish a canopy and suppress weed competition. This mix can include those fast-growing species (e.g. tī kōuka, kānuka, houhere), that provide habitat for bats in the short-term (e.g. 10-100 years, including potential bat roosts towards the end of this period). Once some cover is established, species that are slower growing (e.g. tōtara, rimu, kahikatea), that will provide roosts in the longer term (e.g. 80-800 years plus), should be added to the planting mix. When deciding the makeup of the planting mix, it is important to include species that age/senesce at different rates. This is because they will become and stop being potential bat roosts over different timeframes[1]. This will help meet the aim of allowing a series of potential bat roosts to develop over a long period.

Generally, faster-growing and early successional species are thought to be less dense woods with lesser thermal insulation. This may result in roosts with poorer insulation. When populations only have access to these types of roosts, they may

[1] For example, the following might become and then stop being potential roosts over shorter timeframes e.g., tī kōuka, mamaku; whilst for these species this might take place over longer timeframes e.g., tōtara, rimu.

have relatively poor reproductive success and survival e.g., Geraldine, compared with Eglinton Valley, where slower growing trees with cavities that better buffer ambient temperatures are available for bats to use[2]. This means deciding on the mix of vegetation is important. It is important to include faster-growing vegetation to provide potential roosts in the medium term, and slower-growing vegetation to provide roosts that better buffer ambient temperatures in the long term.

Given the long time before any of these species are likely to provide roosts, the first priority should be to retain vegetation that is already present.

The list of species that follows does not include all species that may be used by bats as roosts.

[2] Sedgeley JA, O'Donnell CFJ. 2004. Roost use by long-tailed bats in South Canterbury: examining predictions of roost-site selection in a highly fragmented landscape. New Zealand Journal of Ecology 28(1): 1-18

<u>Potentially suitable species are set out below:</u>

- In the northern North Island (approximately north of a line from Kawhia to East Cape), these could include tī kōuka[*] (cabbage tree; *Cordyline australis*), ribbonwood[*] (manatu; *Plagianthus regius*), kānuka[*] (*Kunzea* species[†]), kauri (*Agathis australis*), kohekohe (*Didymocheton spectabilis*), tītoki (*Alectryon excelsus*), pōhutukawa (*Metrosideros excelsa*), hard beech (*Fucospora truncata*), pūriri (*Vitex lucens),* taraire (*Beilschmiedia tarairi*), tawa (*Beilschmiedia tawa*), mangeao (*Litsea calicaris*), rewarewa (*Knightia excelsa*), karaka (*Corynocarpus laevigatus*), tōtara (*Podocarpus totara*), miro (*Prumnopitys ferruginea*), matai (*Prumnopitys taxifolia*), kahikatea (*Dacrycarpus dacrydioides*), rimu (*Dacrycarpus cupressinum*), pukatea (*Laurelia novae-zelandiae*), and mamaku (*Cyathea medullaris*).

- In central and southern North Island (excluding the central Volcanic Plateau, which is described below), and northwest South Island, these could include tī kōuka[*], hinau (*Elaeocarpus dentatus*), kānuka[*] (mainly *Kunzea robusta*[†]), tawa, ribbonwood[*] (manatu; *Plagianthus regius*), northern rata (*Metrosideros robusta*), kohekohe, tītoki, rewarewa (*Knightia excelsa*), karaka (*Corynocarpus laevigatus*), tōtara, miro, matai, kahikatea, tawa, red beech (*Fucospora fusca*), hard beech, black beech (*Fucospora solandri*), pukatea, mamaku, and houhere[*] (*Hoheria sextylosa* throughout, and *Hoheria angustifolia* in low rainfall areas of east coast).

- On the central Volcanic Plateau, subject to altitude, these could include tī kōuka[*], hinau, kānuka[*] (*Kunzea serotina*), Halls tōtara (*Podocarpus laetus*), northern rata, miro, matai, kahikatea, rimu, mountain beech (*Fucospora cliffortioides*), red beech and silver beech (*Lophozonia menziesii*).

- In the South Island, west of the divide, these could include: tī kōuka[*], ribbonwood[*] (manatu; *Plagianthus regius*), hinau, southern rata (*Metrosideros umbellata*) northern rata, tōtara, Halls tōtara, miro, matai, kahikatea, rimu, red beech, silver beech, hard beech, kamahi and mamaku. The southern beech species are not appropriate for sites between the Taramakau and Paringa Rivers (Beech gap).

- In the South Island, east of the divide, these could include tī kōuka[*], ribbonwood[*] (manatu; *Plagianthus regius*), hinau, kānuka[*] (mainly *Kunzea robusta* in coastal areas, and mainly *Kunzea serotina*[*] in montane/inland areas[†]), southern rata, tōtara, Halls tōtara, miro, matai, kahikatea, rimu, mountain beech, black beech, (*Fucospora solandri*), red beech, silver beech and narrow-leaved houhere (*Hoheria angustifolia*).

- Exotic species that are known to provide opportunities for bat roosting include macrocarpa (*Cupressus macrocarpa*), poplar (*Populus alba*), oak (*Quercus* spp.), *Pinus radiata*, *Acacia melanoxylon*, *Liriodendron tulipifera*, *Eucalyptus* spp., and willow spp. Poplars, oak, and eucalypts can be planted throughout New Zealand, if the appropriate species or cultivar for local conditions is selected. Note that for some of these slower-growing tree species, trees may not be used as roosts until 50+ years after planting.◆

- While these, and other, exotic species may be planted in some urban or highly modified rural environments, they should not be planted in or near any natural areas due to their potential impact on natural habitats. Advice from a suitably qualified ecologist should be sought before considering planting exotic species.

- Exotic species should generally only be considered if there is a need for rapid replacement of natural tree roosts (due to the faster growth of many exotics over natives) or if only exotics are to be planted for other reasons. Any plantings of exotics as potential bat roost trees need to consider their longer-term management, including compatibility with indigenous vegetation growth (if a mix of indigenous and exotics is to be planted), and if there will be eventual removal or intentional alteration of the exotics (e.g. poisoned standing to create dead spars, or arboricultural work to create artificial cavities). A plan showing how future management will be ensured is recommended.

- Regional Council pest plant species lists should be consulted when developing a planting plan. Some willow cultivars, which long-tailed bats are known to use as roosts, are classified as pest plants by some regional councils.

- Plans for management of each planting site should also ensure that trees are not removed/pruned as a matter of course when they senesce sufficiently to provide potential bat roosts, because their removal/pruning will mean that the aim of creating potential roosts is not met.

<u>Footnotes:</u>

[*] Fast-growing, include at least one of these in each planting for bat habitat.

Coastal only - northern rata (*Metrosideros robusta*) inland

[†] Mainly *Kunzea robusta* (including on well-drained loams). Ensure that planting stock is eco-sourced from naturally occurring populations in the same habitat type in the ecological district/region where the planting is being undertaken (refer to de Lange 2014 for natural extent of each *Kunzea* species to ensure an appropriate species is used). Note that the taxonomic split of *Kunzea* has not been widely adopted in the nursery trade and most *Kunzea* species are sold as *Kunzea ericoides.*

◆ For example, long-tailed bats were first observed using *Acacia melanoxylon* and *Liriodendron tulipifera* as roosts at least 50 years after the trees were planted (Borkin and Parsons 2011). Some relatively well-known oak trees near Cambridge that are thought to contain bat roosts were likely planted in the 1880s or 1890s.

Selection of references that discuss the use of exotic vegetation by long-tailed bats:

Alexander A. 2001: Ecology of long-tailed bats *Chalinolobus tuberculatus* (Forster, 1844) in the Waitakere Ranges: implications for monitoring. *Unpublished MApplSc thesis*. Lincoln University, Lincoln, New Zealand. 97 pp.

Borkin K.M. and Parsons S. 2011: Sex-specific roost selection by bats in clearfell harvested plantation forest: improved knowledge advises management. *Acta Chiropterologica 13*(2): 373-383.

Dekrout A. S. 2009: Monitoring New Zealand long-tailed bats (*Chalinolobus tuberculatus*) in urban habitats: ecology, physiology and genetics. *Unpublished PhD Thesis*. University of Auckland, Auckland, New Zealand. 168 pp.

Gillingham N.J. 1996: The behaviour and ecology of long-tailed bats (*Chalinolobus tuberculatus* Gray) in the central North Island. *Unpublished MSc Thesis*. Massey University, Palmerston North, New Zealand. 115 pp.

O'Donnell C.F.J. 2001: Advances in New Zealand Mammalogy 1990-2001: Long-tailed bat. *Journal of the Royal Society of New Zealand 31*: 43-57.

Sedgeley J.A. and O'Donnell C.F.J. 1999: 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 J.A. and O'Donnell C.F.J. 2004: Roost use by long-tailed bats in South Canterbury: examining predictions of roost-site selection in a highly fragmented landscape. *New Zealand Journal of Ecology 28*(1): 1-18.

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