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Our Reference
Constructed Wetlands Guidance – Bat and
Lizards

Constructed Wetland Toolbox Guidelines - Bat and Lizard Habitat Enhancement

Hi Andrea and Stuart,

Please find enclosed our text relating to how constructed wetlands can be enhanced, where practical, for bats and lizards.

1. Constructed wetlands – habitat enhancement

Constructed wetlands provide a wider range of benefits other than their primary function for stormwater detention. They can provide enhanced habitat for local native species and to some degree compensate for historical loss of natural wetlands.

When enhanced through design, constructed wetlands can provide suitable habitat for important local native wildlife such as long-tailed bats (*Chalinolobus tuberculatus*) and copper skink (*Cyclodina aenea*)¹.

1.1 General design features

1.1.1 Location

The location of constructed wetlands can contribute towards their long term value for wildlife such as bats and lizards. They should be located close to existing natural features which for these species include gullies, shelterbelts, bush stands, streams and existing lakes or ponds. Wetlands can be used to fill gaps in habitat contiguity and may contribute to existing habitat corridors, providing connectivity for the movement of animals throughout the landscape. Planting should also be connected to surrounding areas of native vegetation and mature trees to encourage movement of wildlife.

1.1.2 Existing features

- Retain existing vegetation where possible. Retention of mature trees (native or non-native) and native vegetation (remnant forest and regenerating scrub) should be prioritised. Mature trees and standing dead wood are particularly hard to replace in the short term and these provide important roosting habitat for bats.
- Native and non-native groundcover can be important for lizards and the value of this habitat to lizards should be considered prior to clearance or alteration.

1.1.3 Wetland design

- Maximise the length of shoreline and depth variability profile by making them irregular or convoluted. This will increase aquatic biodiversity values including habitat complexity for plants and insects, which in turn will provide improved foraging habitat for bats and lizards.

¹ AECOM lizards surveys for Southern Links project recorded the presence only of Copper Skink in the Peacocks area. The guidance provided here would also apply to most native skink species.

- Native fruiting and nectar producing plants will provide food for birds and insects and in turn encourage foraging bats and lizards.

1.2 Bat specific recommendations

1.2.1 Lighting design

Bats are thought to be sensitive to light and may avoid well-lit urban or rural areas. It is therefore important to provide dark corridors of habitat for bats to move through the environment and dark foraging areas for bats to feed. The following recommendations should be implemented for constructed wetlands:

- Where possible the wetlands should be located within dark corridors near to existing watercourses/gullies and along unlit roads, away from areas that are the subject of high light levels e.g. roads junctions or pedestrian crossings.
- Where lighting is unavoidable, warm white LEDs are currently considered the most appropriate for reducing impacts on nocturnal insects and bats. Where lights are located near wetlands, where possible, these should include directional shades to prevent light spill onto dark corridors.

1.2.2 Vegetation

Long-tailed bats typically forage along forest edges and glades. Tall vegetation surrounding wetland areas, well connected to surrounding habitat will therefore create suitable edge habitat for foraging bats.

1.2.3 Roost locations

- Bats roost in cavities within the main trunk or limbs of large mature trees. In the HCC area they have adapted to use exotic tree species. Therefore retention of surrounding mature trees is crucial to provide roosting opportunities for bats.
- Suitable cavity features will take many years to develop in newly planted areas, so where necessary artificial roosting boxes can be installed, away from human disturbance. Bats in Hamilton are known to use artificial roosts and these boxes can be designed to exclude other species that may compete with bats for cavities such as eastern rosella, house sparrow, starlings or prey on bats e.g. rats and possums.

1.2.4 Pest control

Introduced mustelids, rats, possums and cats all potentially prey on long-tailed bats. Where possible, pest control for mustelids, rats, possums within and around constructed wetlands will greatly assist in the success of habitat enhancement actions.

1.3 Lizard specific recommendations

Copper skinks are a habitat generalist, requiring a mix of open habitat and also dense cover or forested areas. Habitat complexity is important as it provides a variety of habitats needed for basking, foraging, dispersal and to seek refuge from predators.

1.3.1 Vegetation

The following types of vegetation can provide good habitat features for lizards within and around constructed wetlands:

- Species which accumulate a skirt of dead foliage or bark, or clump forming species such as tree fern, cabbage trees, flax and exotic grasses such as kikuyu and pampas provide cover and refuge for Copper skinks.
- Native divaricating shrubs or plants with spikes provide protection and cover from predators.
- Groundcover in the forest such as ferns, provide cover and refuge for lizards under forest canopy. Groundcover is particularly important in newly planted areas which are often prohibitively sparse for lizard dispersal.

1.3.2 Refugia

- Well shaded damp refuges such as log piles and rock piles will provide cool damp crevices to ensure copper skinks do not overheat or dehydrate and to provide critical refuge from predators.

1.3.3 Pest control

- Mammalian predators such as cats, rodents and hedgehogs are known to prey on lizards and reduce their population numbers in many regions. Where possible, pest control of these species within and around constructed wetlands will greatly assist in the success of habitat enhancement actions.

Yours sincerely,



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