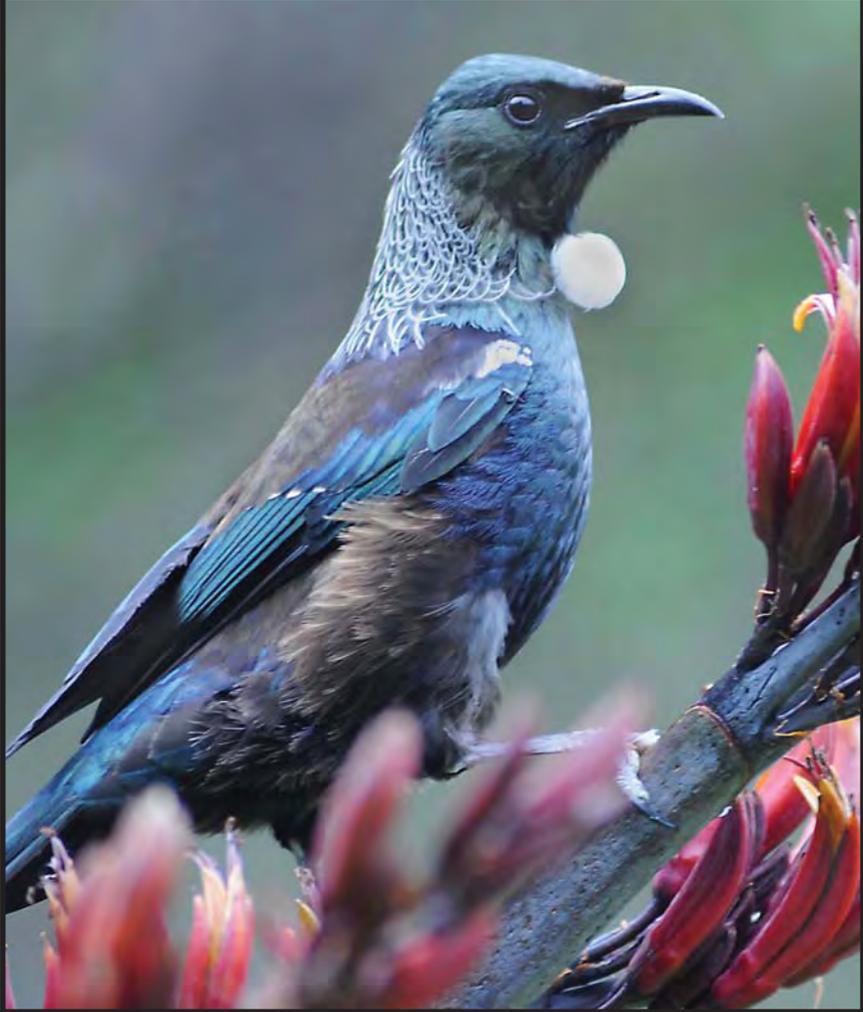


Backyard Biodiversity in Canterbury



Compiled by
Al Check & Mike Bowie



Mike Bowie



Mike Bowie



Mike Bowie

(Top) Orb web spider, Tussock butterfly, Stinkhorn fungus.

Compiled by Al Check and Mike Bowie.

Published by Lincoln University with the help of funding from Brian Mason Scientific and Technical Trust.

Acknowledgements:

Steve Wratten, Jon Sullivan, Colin Meurk, Ruth Guthrie, Barry Donavon, Marieke Lettink, Shaun Ogilvie, Kerry-Jayne Wilson, John Marris, Ellen Cieraad, Phil Cochrane, Shelley Gabites, Dianne Calvert.

First edition April 2009.

Second edition June 2009.

ISBN 978-0-86476-214-6 (print).

ISBN 978-0-86476-215-3 (pdf).

Copyright Lincoln University 2009.

<http://www.lincolnenvirotown.org.nz/resources.php>

Cover photo: tūī on NZ flax (Chook Searles).

Back cover: Jewelled gecko (Marieke Lettink).



Jon Sullivan



Stan Molles



Jon Sullivan

(Top) Common copper butterfly, kererū and mānuka beetle.

Contents

- Introduction..... 4
- What is biodiversity? 5
- Attracting native birds..... 6
 - Profile: Bellbird..... 7
- Invertebrates 8
- Lizards/Karara 10
 - Profile: Jewelled gecko 11
- Nature's services 12
 - Profile: Insect pollinators..... 13
- Shelterbelts 14
 - Profile: Cabbage tree 15
- Riparian planting 16
- Refuges to enhance biodiversity 17
- Resources and web links 18 -19



BRIAN MASON
scientific & technical trust





Mike Bowie

About this booklet

This booklet is for the people and their communities who live within the Canterbury area. It provides readers with an insight into what biodiversity is, and describes the benefits of having a diverse range of plants, animals and birds that form healthy ecosystems. Benefits include improved pollination, pest control, water filtration, as well as cultural and aesthetic values, providing a sense of identity and place for all New Zealanders. By choosing to grow native plants in our backyards, schools, communities and rural landscapes, a positive environmental change will occur, for our future and for our children's future. This will help threatened or endangered native species to exist in viable populations with lower risks of extinction.

Natural History of Canterbury

Canterbury was once covered by a diverse range of forest, scrub, grassland and wetlands which was home to a variety of native birds, bats, fish, lizards, invertebrates and plants. Some of Canterbury's flora and fauna is not found anywhere else in the world and has evolved in isolation for millions of years.

Extensive modification from human land use has led to the loss of large areas of habitat. As a result there has been a catastrophic decline in the range and abundance of native fauna and flora. Native plants are now limited to approximately 0.5% of the Canterbury Plains.

Birds such as tūī are no longer seen on the plains and kererū are largely restricted to remnants of native forest. New Zealand's endemic long-tailed bat was once abundant around the Christchurch area, but is now found only in small isolated populations in the South Island including Canterbury.

Biodiversity (biological diversity) is the diversity of living things. A more in-depth view might include the genetic diversity within a species, e.g., how different are tūī on Banks Peninsula compared with those on the West Coast.

Native ecosystems

Populations of plants, animals, insects and birds that interact together are known as communities. These communities, along with the physical environment in which they live are known as ecosystems e.g., rivers, forests, tussock lands, wetlands and even suburban backyards.

The greater the diversity of an ecological system the better its chances of being resilient to impacts such as climate change or invasion by pests. It is the native and endemic species of a region that are most significant. However, it is important to make the distinction between species richness (number of species) and biodiversity (each nation's unique contribution to the world's genetic, species and ecosystem variation). Introducing foreign species to New Zealand does not increase biodiversity; indeed biodiversity (New Zealand's contribution to it) is generally diminished by competition, predation and grazing by introduced species causing contraction of indigenous species' ranges and genetic diversity, and even extinction.

People and biodiversity

New Zealand's biodiversity is unique but extremely vulnerable. To conserve this biodiversity New Zealanders need to value it. Over hundreds of years the tangata whenua have developed a close relationship with New Zealand's native plants, birds and other biota for food, weaving, clothing, carving, shelter and medicine. This relationship is bound by whakapapa (ancestry) between Māori and plants, animals, water and the land. Māori have a responsibility, an obligation of guardianship (Kaitiakitanga), to look after the natural world. If the natural world is healthy, then so too is the mana of the Māori people and their communities. Society at large has come to share similar views on the importance of nature and all agree that life without biodiverse landscapes would be bleak and barren.



Attracting native birds

Planting native trees that provide a food source for birds may attract them to your area. Some birds such as tūī, bellbird and kererū will travel some distance to search for flowers and fruit.

Fantails like forested areas to feed on flying invertebrates such as flies, moths and wasps. Grey warblers also use forested areas to feed on invertebrates taken from vegetation.

What do native bush birds require?

- Adequate forest-like habitat.
- Year round food source.
- Safe breeding and roosting sites.
- Help from you and your community to restore and preserve forested areas.



Jennifer Poutney

Fantail (above) and grey warbler (below) rely on insects in their diet.



Lincoln University



Mike Bowie

Karamu (*Coprosma robusta*) attracts native birds such as silvereyes.

What can you do?

- Plant a variety of native plants that provide fruit, nectar and harbour insects year-round.
- Attract insects for birds to feed on by establishing dense areas of native plants.
- Control predators of native birds such as possums, cats, rats, and mustelids (i.e., stoats, weasels & ferrets).
- Avoid using insecticide sprays.

Plants that attract native birds



Waxeye (Dianne Calvert)

PROFILE: Bellbird (Korimako) *Anthornis melanura*

Facts about the bellbird

- Bellbirds are unique to New Zealand.
- Bellbirds require a variety (5+) of plant species in their area to provide high energy food such as fruit and nectar throughout the year. This is essential for breeding and raising their chicks.
- Planting native trees provides nesting sites for bellbirds and habitat for invertebrates that they feed on. Chicks in the nest are fed exclusively on invertebrates.
- Bellbirds aid plant pollination and seed dispersal.



Chook Searles

Bellbird feeding on NZ flax flower. Note pollen on crown.



Mike Bowie

Kōwhai (*Sophora microphylla*) in flower.

Plant species that attract bellbirds

- Kōwhai (left) and NZ flax (above) provide a good source of nectar from late winter through to summer.
- Planting coprosmas, fivefinger, broadleaf, cabbage trees, and kahikatea provides fruit that is valuable in autumn when nectar supply is scarce.
- Safe flowering exotic species such as banksia, some eucalypts, and tree lucerne contribute to regular year-round food supply.

Did you know?

- Bellbirds mop up the nectar from flowers such as flax and kōwhai using a specially adapted brush-like tongue.
- Bellbirds and tūī play an important role in the pollination of native mistletoe. They open the flower bud by twisting the end, then drink the nectar while pollinating the flower.
- Male and female bellbirds differ by the stripe above the eye. It is white in females, yellow in juveniles and absent in males.



Alastair Robertson

Bellbird feeding on native mistletoe.

Invertebrates (animals without a backbone e.g. insects, spiders, snails, worms)

Changes to the landscape such as the removal of native forest vegetation has reduced the distribution of many invertebrate species. However, native butterflies, bees, beetles, spiders, snails and slugs will soon re-colonise areas if some of their original habitat is restored. A diverse range of invertebrates in a healthy ecosystem provides food for beneficial predatory insects, native birds and other services such as pollination.

What do invertebrates require?

- Some invertebrates require specific leaves, stems and fruit from plants for food.
- A suitable habitat that provides protection from predators and optimum conditions for reproduction to occur.
- A balanced soil and leaf litter composition for species that assist with decomposition, essential for ecosystem function.

Did you know?

- Many native plants that have white, scented flowers are pollinated by moths at night.
- Approximately 50% of New Zealand invertebrate species remain undescribed by science. There may well be unknown native species living in your garden.



Mike Bowie



Jon Sullivan



Mandy Barron

Caterpillars of yellow and red admiral butterflies (top and bottom) feed on native tree nettle/ongaonga (*Urtica ferox*) and introduced nettles (centre).



Mike Bowie



Mike Bowie

The nocturnal native leaf-vein slug (*Pseudaneitea* sp) (above left) and most ground beetles, such as this carabid (*Megadromus antarcticus*) (above), use cool, damp areas such as under logs as refuge. Wooden discs can simulate these conditions in the absence of logs (bottom left).



Mike Bowie

What can you do to increase invertebrate diversity?

- Plant coprosmas, hebes, pittosporums and other native shrubs to provide habitat.
- Provide cool sheltered areas with undisturbed vegetation.
- Use wooden discs as substitutes for woody debris such as logs.
- Avoid using insecticide sprays.



Mike Bowie

Caterpillars of the common copper butterfly feed on pōhuehue (*Muehlenbeckia* species).



Mike Bowie

The harmless native trap door spider (*Cantuarua parrotti*) lives in underground tunnels below vegetation.

Praying mantis often deposit their egg cases on open trunk trees like kōwhai, native broom, lancewood and cabbage tree.



Jon Sullivan

Soil & leaf litter diversity

Soil, essential for plants and land living animals, requires humus and organic matter for healthy structure, fertility and moisture retention. Leaf litter, droppings, and animal remains are broken down to nutrients and taken up by plants. This very important function in the ecosystem is undertaken by a myriad of microbes and invertebrates, all with their own special roles.

Functions of some soil and leaf litter organisms:

- Microbes (bacteria and fungi): recycle nutrients and provide a food source for animals.
- Earthworms: renew, aerate, drain and mix nutrients throughout soils.
- Springtails and mites play a major role in decomposition and nutrient cycling, and are a food source for soil predators. Mites reduce leaf matter down into small pieces for microbes to consume.



Al Check

Microscopic view (x20 magnification) of diversity found at Mahoe Reserve, Lincoln. Invertebrates include pseudoscorpion, mites, springtails and many others.

What can you do to increase soil and leaf litter invertebrates?

- Spreading, or better, digging in compost made from your garden and kitchen waste encourages decomposers and adds nutrients to the soil.
- Place natural mulch or wool carpet around young plants to retain moisture, reduce weed problems and activate microbial activity.
- If you allow leaf litter to build up under trees it provides habitat for specialised invertebrates, provides food for other animals and returns nutrients back to the soil.

Lizards/Karara

Facts about lizards

- There are more than 90 species found in New Zealand. All except one species are endemic (found only in NZ).
- It is illegal to collect lizards. They are protected by law.
- Lizards like undisturbed areas with lots of cover.
- Lizards disperse seeds and may pollinate flowers.
- Their diet includes small invertebrates, nectar and fruit.
- Geckos have a wide head with velvet-like skin while skinks are more sleek with smooth skin.
- All South Island skinks are active by day (diurnal). Geckos are either active by day, or by night (nocturnal).



McCann's skink.

Marieke Lettink



Southern Alps gecko.



Common skink.



Canterbury gecko.

Marieke Lettink

What can you do?

- Plant native plants that attract lizards, providing berries and insects through the seasons.
- Enhance lizard habitat by adding concrete blocks, bricks, stones or rocks for protection from predators. These also store heat that cold-blooded lizards absorb.
- Establish an Onduline lizard lodge or wooden disc in your garden (see enhancing biodiversity page for details).
- Control predators of lizards in garden areas such as cats, mustelids (stoats, weasels and ferrets), hedgehogs and rodents.

Did you know?

- NZ lizards are long-lived. One gecko found in Canterbury was estimated to be 42 years old.
- Geckos and skinks have exceptional senses of smell, eyesight and hearing.

Plants that attract lizards — provide food and protection

Mikimiki (*Coprosma propinqua*)

Porcupine shrub (*Melicytus alpinus*)

Pōhuehue (*Muehlenbeckia species*)

Mānuka (*Leptospermum scoparium*)

Tussocks provide cover

Thick leaved coprosma (*Coprosma crassifolia*)

Shrubby tororaro (*Muehlenbeckia astonii*)

Matagouri (*Discaria toumatou*)

Kānuka (*Kunzea ericoides*)



Lizards, such as the jewelled gecko (centre), feed on coprosma berries (left) and the fleshy fruits of pōhuehue vines (right); both shrubs also provide excellent protection from predators.

Lizard profile: jewelled gecko/moko-kākāriki (*Naultinus gemmeus*)

- The jewelled gecko is present on Banks Peninsula and in some other isolated areas of the South Island. Remaining populations are threatened by habitat loss, predation and poaching.
- By providing habitat that offers food and protection, linked together with corridors containing native plants, vines and shrubs, we may one day see this spectacular gecko back on the Canterbury plains.



A juvenile jewelled gecko on flowering matagouri.

Facts about the jewelled gecko

- Jewelled geckos are listed as threatened by the Department of Conservation.
- They are arboreal (tree dwelling) lizards found only in the South Island.
- Being well camouflaged helps them avoid predators.
- Mature jewelled gecko (4 yrs) give birth to one to two young each year.

Nature's services

What are nature's services?

- These are the services or functions that ecosystems perform, from which people derive economic value. Examples include food, pollination, shelter from trees, soil formation, bio-control of pests and aesthetic value.
- People destroy ecosystems and the services they provide by practising intensive agriculture. Oil based substitutes such as fertilisers and pesticides are used instead, but these cause considerable environmental harm, use lots of energy to produce and are unsustainable.
- By planting native plants you will contribute to natural ecosystem function and maintenance of the unique character of New Zealand.

Benefits of creating native habitat

- Suitable habitat attracts native invertebrates, lizards and birds that prey on pests and pollinate plants.
- Improvement in air and water quality.
- Adds organic matter, improving soil formation and fertility.
- Reduces pesticide and fertiliser use and costs by enhancing natural biocontrol of pests and naturally fertilising through increased decomposition.
- Activates the decomposition of plants and animals within the nutrient cycle.
- Cultural recognition of indigenous species.
- Provides sustainable resources e.g. fibre from flax.

Did you know?

- Some parasitic wasps prey on pest aphids, which live on crops. The wasps lay their eggs inside the aphid, and the growing larvae kill the aphids, thereby reducing aphid numbers. The adult wasps live longer and infect more aphids when there are nectar-bearing flowers available. This is an example how nature's services can reduce pesticide use and costs.
- In 1994, the annual value of New Zealand ecosystem services derived from native species was estimated to be approximately \$30 billion.

For a working example of nature's services and biodiversity in the local wine industry view the Greening Waipara project at: <http://www.bioprotection.org.nz/sustainable-bioprotection>



Mike Bowie

Native plants operate as filters and stabilisers along waterways.



Mike Bowie

Worms play a key role in soil formation, drainage, aeration and nutrient cycling.



Dianne Calvert

Common blowflies (Calliphoridae) also play a significant role in pollination and breaking down organic matter.

Nature's services profile: Insect pollinators

Insects play a vital role in providing ecosystem services to humans. Many of New Zealand's native insects pollinate native trees and shrubs, as well as many introduced plants. Pollinators include native bees, butterflies, flies, beetles and moths. Planting native trees and shrubs on your property will provide essential habitat for native insects, while leaving some bare areas will support ground nesting native bees.

Facts about native pollinators

- New Zealand has 27 endemic bee species.
- Native bees are smaller and not as brightly coloured as honeybees. They are usually solitary and live in holes in the ground or in narrow tunnels in twigs and plant stems. Although they do not produce honey, they have an important ecological role in plant pollination.
- Native butterflies use their long retractable coiled tongue (proboscis) to extract nectar from flowers, in the process contributing to plant pollination.
- The larvae of hoverflies feed on aphids, mealybugs, small caterpillars and their abundance can be increased by planting flowering plants within and around crops and gardens.
- Hoverfly species found within cabbage trees and flax are also predators of other insects.



Brad Howlett

A native bee *Leioproctus fulvescens* on onion flower.



Mike Bowie

Hoverfly *Melangyna novaezelandiae* on *Brachyglottis* flower.

Plants to attract native pollinators

- Kānuka (*Kunzea ericoides*)
- Mānuka (*Leptospermum scoparium*)
- Koromiko (*Hebe salicifolia*)
- Cabbage tree (*Cordyline australis*)

Mānuka flowers (right) attract native bees.



Jon Sullivan

Did you know?

The varroa bee mite (*Varroa destructor*) which arrived in the South Island in 2006 threatens to impact private and commercial honey bee hives. This will affect the pollination of crops across the Canterbury region.

New Zealand's native insect pollinators of flowering plants such as native bees and hoverflies are not susceptible to varroa mite, they are solitary and do not produce commercial quantities of honey.

Shelterbelts

Shelterbelts and hedges containing native plants provide valuable protection for crops and livestock, and attract wildlife such as birds, lizards and invertebrates. Locally sourced plants or seeds are preferable as they are suited to local conditions. Consideration should be given to plant height, frost tolerance and soil moisture at each planting site. Weeding and watering over the first two years increases chances of survival.

Benefits of native plants for shelter

- Provide shelter, protection and food for native birds, lizards and invertebrates.
- Leaf litter from plants encourages native predatory insects and decomposers.
- Provide a seed source for regeneration — dispersed by birds and lizards.
- Provide nectar for beneficial insects such as native bees, hoverflies and parasites.
- Native shelterbelts are wildlife corridors. Linked together by neighbouring properties, they allow wildlife to move between areas.

Native plants for shelter

Cabbage tree (*Cordyline australis*)

NZ flax (*Phormium tenax*)

Broadleaf (*Griselinia littoralis*)

Golden akeake (*Olearia paniculata*)

Kōhūhū (*Pittosporum tenuifolium*)

Lemonwood (*Pittosporum eugenoides*)

Tororara (*Muehlenbeckia astonii*)

Ribbonwood (*Plagianthus regius*)

Kānuka (*Kunzea ericoides*)

Lacebark (*Hoheria augustifolia*)

Karamū (*Coprosma robusta*)

Kōwhai (*Sophora microphylla*)

Mikimiki (*Coprosma propinqua*, *C. virescens*, & *C. crassifolia*)

Koromiko (*Hebe salicifolia*)

Tōtara (*Podocarpus totara*)



NZ Flax and cabbage trees (above) provide shelter and food for wildlife.

Al Check



Pōhūhū (*Muehlenbeckia complexa*) provides dense hedging and protection for lizards and invertebrates.

Mike Bowie

PLANT PROFILE: Cabbage tree (*Cordyline australis*)

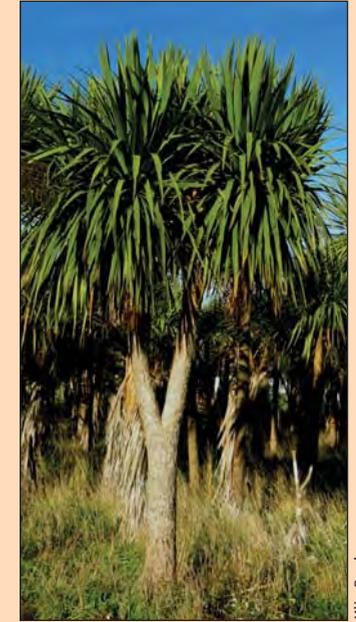
Cabbage trees (*Cordyline australis*) are one of the most widely recognised New Zealand native plants. They host many other species. Planting cabbage trees as part of native restoration will contribute much to the conservation of birds, lizards and invertebrates.



Al Check

Facts about cabbage trees

- The flowers provide nectar for tūī (*Prosthemadera novaeseelandiae*), bellbird (*Anthornis melanura*), invertebrates and lizards, and the fruit is an important source of food for birds such as the kererū (*Hemiphaga novaeseelandiae*).
- Dead leaves at the base of the growing crowns provide a sheltered and moist microhabitat for invertebrates as well as refuge for lizards and nesting sites for native birds such as bellbirds.
- Ten species of native invertebrates feed exclusively on this plant, including species of moth, bug, fly, beetle and mite.
- Each invertebrate utilises different parts of the plant. Some species chew on, or suck sap from the leaves, while others live within the tissue of the flower stems, leaves or the woody trunk and branches.



Mike Bowie

Cabbage tree (*Cordyline australis*) (above), and in flower (top).

Did you know?

The bright green native cabbage tree looper caterpillar (*Epiphyryne verriculata*) lives and feeds within the crowns of green leaves, creating a characteristic pattern of damage of long channels, notches and holes in the leaves (see picture). The adult moth is camouflaged, with striped wing markings which mimic the pattern and colour of the veins of dead cabbage tree leaves, against which it rests during the day.



Jon Sullivan



Mike Bowie

Cabbage tree looper (*Epiphyryne verriculata*) caterpillar (left) and adult moth (right).

Riparian planting

The riparian zone is the area of vegetation either side of a stream, drain, pond or wetland that protects the river and enhances habitat for fish, invertebrates, lizards and birds.

- Plants provide protection and food for nesting birds.
- Planting alongside streams forms corridors for wildlife to move up and down the waterway.
- Shade provides fish and aquatic insects with stable water temperatures and reduces algae.
- Riparian zones trap nutrients attached to sediment, reducing the risk of algal blooms. These are a health hazard to humans, dogs and native wildlife.
- Riparian zones protect water quality for sensitive species by filtering and storing water through the soil before it gets to streams.
- Trees and shrubs protect and stabilise stream banks.
- Plants provide shade for stock and protection from being trapped in swampy areas.



Harts Creek streamside restoration, Leeston.

Al Check



Angus McIntosh



Stephen Moore



Stephen Moore



Kerry-Jayne Wilson

Canterbury mudfish, freshwater crayfish, and long-finned eel are affected by habitat loss throughout Canterbury.

An increase in scap (bottom) is a success story of wetland habitat restoration.

What can you do?

- Participate in community wetland restoration projects. Visit <http://www.canterburybiodiversity.org.nz>
- Plant a variety of native plants that provide habitat for a range of wildlife.
- Visit and learn about wetlands, lakes and streams.

Did you know?

Canterbury mudfish survive when the water dries up by hiding underneath logs or debris and re-emerge when rain falls.

The threatened long-finned eel has been in New Zealand for millions of years. Adults have been known to live to 80 years. They migrate to the Pacific Ocean to breed and die. Their young return to New Zealand and migrate up rivers.

Refuges to enhance biodiversity

Invertebrates and lizards require suitable habitat for shelter and protection from predation. We can simulate this habitat by using artificial methods such as wētā motels, wooden discs and lizard lodges. These help a species establish in an area while native plants mature. It also provides a means to monitor changes in biodiversity and observe insects and lizards colonising an area.

Wētā motels

Hollowed-out untreated wooden blocks (pine, oregon, etc) called 'wētā motels' can be used to simulate the natural cavities found in mature trees used by native tree and cave wētā, spiders, leaf-vein slugs and pseudoscorpions. For instructions on how to make wētā motels visit <http://www.lincolnnvirotown.org.nz/resources/php>

Wooden discs

Discs of untreated pine, macrocarpa or other woods can be used to simulate the fallen logs found in mature native forests. The discs are dried and placed on bare soil; native invertebrates and lizards can be monitored by carefully lifting the discs and counting the individuals.

Lizard lodges

Placing two sections of corrugated Onduline separated by 1cm dowel provides lizards, both skinks and geckos, a safe, warm environment, and protection from potential predators such as rodents, hedgehogs, cats and mustelids.

You can make a difference...

By recording the presence of species in your backyard it allows changes in biodiversity to be monitored. Over time, monitoring can demonstrate that planting natives will provide habitat that can increase biodiversity.

You can contribute to the appreciation and survival of local biodiversity by participating in this monitoring. The New Zealand Biodiversity Recording Network is a new web-based program which invites you to record sightings online of many terrestrial species.

Visit <http://www.nzbrn.org.nz>



Wētā motel placed in tree.

Al Check



Tree wētā (*Hemideina femorata*) in wētā motel.

Mike Bowrie



Wooden disc.

Mike Bowrie



Lizard lodges.

Mike Bowrie



Geckos occupy lizard lodges.

Marieke Lettink

Resources

General

- The natural history of Canterbury. 2008 Third edition. Canterbury University Press.
- The friendly kiwi garden — Reintroducing native plants and animals by Tabitha Becroft & Claire Watkins (2008). Reed Publishing (NZ) Ltd, Auckland.
- Going native: making use of New Zealand's plants edited by Ian Spellerberg and David Given. (2004) Canterbury University Press.
- Ignatieva *et al* (2008). How to Put Nature into our neighbourhoods <http://www.mwpress.co.nz/store>
- Which native plant can I grow here? by Andrew Crowe (2004). Penguin Group (NZ).
- Flight of the Huia: ecology and conservation of New Zealand's frogs, reptiles, birds and animals by Kerry-Jayne Wilson (2004). Canterbury University Press.
- Attracting birds and other wildlife to your garden in New Zealand by Gordon Ell (2009). New Holland Publishers.

Birds

- The field guide to the birds of New Zealand by Barrie Heather and Hugh Robertson (2000). Penguin Books (NZ) Ltd.
- Department of Conservation: <http://www.doc.govt.nz/conservation/native-animals/birds>

Invertebrates

- Which New Zealand Insect? by Andrew Crowe (2002). Penguin books (NZ) Ltd.
- New Zealand insects and their story by Richard Sharell (1982). Collins, Auckland.
- Life in the soil. A guide for naturalists and gardeners by James Nardi (2007). The University of Chicago Press.

Lizards

- Lizards of Banks Peninsula by Marieke Lettink and Tony Whitaker. Department of Conservation.
- Attracting lizards to your garden. Options for Canterbury. Department of Conservation. <http://www.doc.govt.nz/conservation/native-animals/reptiles-and-frogs/lizards>

Shelter and riparian

- Establishing shelter in Canterbury with nature conservation in mind : a practical guide — for the true Cantabrian by Colin Meurk (2003). http://www.lincoln.ac.nz/story_images/1118_1118_1118_shelte_s9795.pdf
- Plant selection guide and techniques for planting streamside areas. <http://www.ccc.govt.nz/Parks/TheEnvironment/StreamsidePlantingGuide.pdf>

Web Links

Nature

- Learn more about Canterbury nature at <http://www.canterburynature.org>
- Department of Conservation <http://www.doc.govt.nz/conservation/native-animals>
- NZ biodiversity recording network <http://www.nzbrn.org.nz>
- Information and activities for children and students <http://www.doc.govt.nz/upload/documents/getting-involved/students-and-teachers/themes/native-plants-native-places.pdf>

Restoration

- Ecological restoration in New Zealand <http://www.bush.org.nz/planterguide>
- Motukarara conservation nursery <http://www.doc.govt.nz/conservation/native-plants/motukarara-conservation-nursery>
- Sanctuaries of New Zealand <http://www.sanctuariesnz.org>

Community

- Canterbury biodiversity <http://www.canterburybiodiversity.org.nz>
- Te Ara Kakariki: Greenway Canterbury <http://www.kakariki.org.nz/>
- Mahoe Reserve, Lincoln http://www.lincolnenvironment.org.nz/Mahoe_Reserve
- Biodiversity and ecosystem (nature's) services project in Canterbury <http://bioprotection.org.nz/greening-waipara>
- Tūi to town: restoration project in Marlborough. http://www.marlborough.govt.nz/enviromonitoring/tui_town.cfm
- Conservation volunteers <http://www.conservationvolunteers.org.nz/>
- New Zealand's biodiversity strategy 2000 <http://www.biodiversity.govt.nz>

Native plants

- New Zealand plant conservation network <http://www.nzpcn.org.nz>
- Choosing the right plant for the right place <http://www.landcareresearch.co.nz/services/greentoolbox>
- Native plant communities on the Canterbury plains <http://www.doc.govt.nz/upload/documents/conservation/native-plants/motukarara-nursery/2-plant-communities.pdf>
- How to put nature in our neighbourhoods. Ignatieva et al. (2008). http://researcharchive.lincoln.ac.nz/dspace/bitstream/10182/553/1/landcare_ignatieva.pdf

Waterways

- Streamside planting guide <http://www.ccc.govt.nz/Parks/TheEnvironment/streamside.asp>
- Managing waterways on Canterbury farms <http://www.ecan.govt.nz/NR/rdonlyres/4B9BC0E7-8482-4D03-8AE6-DBB07966038A/0/Managingwaterways.pdf>

