

EnviroTEACH

An environmental education resource for teachers

Term 1 – 2018

From the editor

Kia ora! This issue of Enviroteach focuses on the birds, insects and other animals that pollinate our plants. These animals play a vital role in the health and survival of our native ecosystems. They also make a surprising contribution to our horticultural and agricultural systems.

Read on to learn about explosive flowers and where you can see them in Southland. Find out why, without the help of flies, we probably wouldn't be able to grow carrots or onions! Read about Environment Southland's High Value Area programme which offers landowners free ecological surveys of native habitats on private land. Be inspired by stories from schools around Southland that are doing their bit to save our pollinators.

New Zealand is regarded as a hotspot for biodiversity. Our plants and animals evolved over millions of years without any mammalian predators and we have many unique species that occur nowhere else in the world.

In Southland we're blessed with extraordinary biodiversity in places like Fiordland and Stewart Island, and in our native forests, wetlands, scrublands, tussocks, alpine meadows and herb fields. These special areas provide refuges and food for native birds and wildlife and ecosystem services such as water filtration,



▲ Hoverfly on a flower at More's Reserve, Riverton. Photo: Phil Bendle

erosion control and flood protection. Sadly, New Zealand also has one of the highest percentages of threatened species in the world.

Biodiversity has become an important focus for Environment Southland; about a third of our work contributes to managing biodiversity across the region. We're keen to work with schools, landowners and community groups who are interested in learning about and protecting Southland's biodiversity. Contact us if you'd like to discuss the possibilities.

I hope you enjoy this issue and I wish you all the best for the year ahead.

Pat Hoffmann

*Environmental education officer,
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In this issue

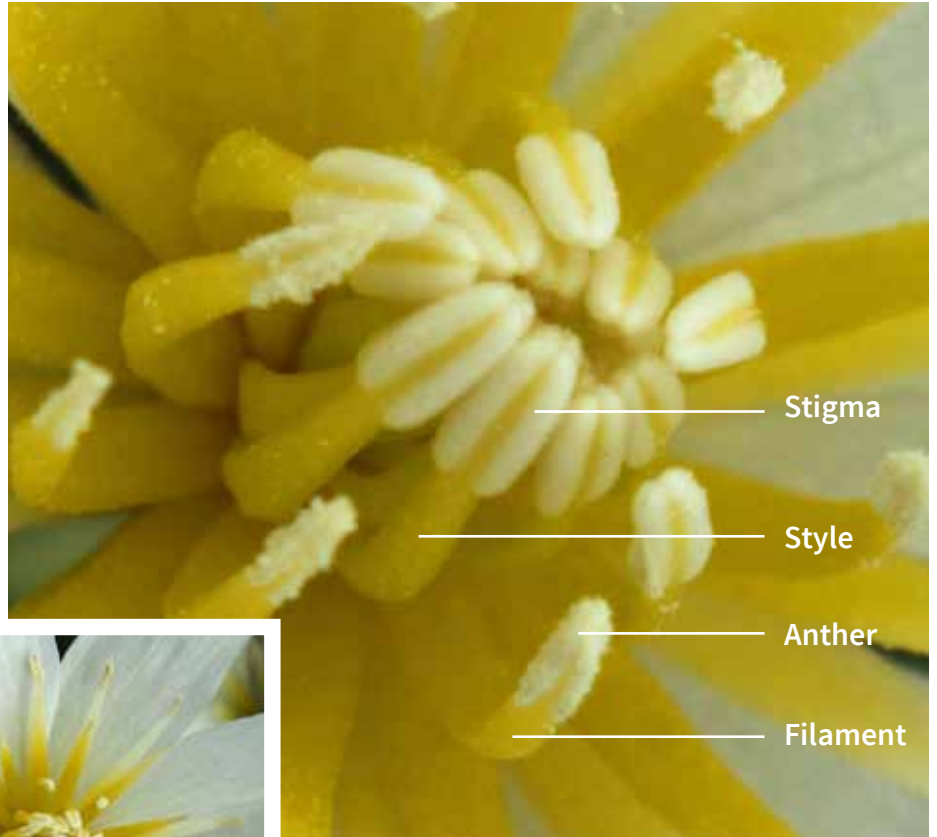
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What is pollination?

Pollination is the process in which pollen grains move from the male parts of a flower (the anthers) to the female part (the stigma) of the same flower or another flower of the same species. After pollination, the pollen grains germinate on the surface of the stigma, and grow via pollen tubes down the style to the ovules, where fertilisation occurs. Successful fertilisation produces embryos and eventually seeds and fruits.

Pollen cannot move from the anthers to the stigma on its own, so flowers rely on pollinators to move the pollen. Plants have evolved a range of strategies to improve their chances of being pollinated. In New Zealand, most plants are pollinated by animals such as insects, birds, bats and geckos, and some are pollinated by the wind (e.g. grasses, maize, many coprosma species, beech) or by water (aquatic plants).



▲ Native clematis flower. Photo: Lianne Kooiman



▲ A bumblebee pollinating a flower while feeding on nectar. Photo: Boi Rickertsen



ACTIVITY

Get your students to carefully pick a selection of flowers from your school garden. Help them to identify the parts of the flower that are involved in pollination.

Why is pollination important?

Native biodiversity

Pollination is essential for the health and survival of New Zealand's flora and fauna because flowers need to be pollinated before they can produce seeds that may grow into new plants, and because many animals feed on the seeds or fruits that are produced as a result of pollination. Native plants evolved with and were originally pollinated only by native animals (insects, birds, lizards and bats) or the wind. There is growing concern that the loss of native pollinators from our ecosystems could have serious consequences for the survival of plants such as mistletoes that rely on specific animals to pollinate them.

Horticulture and agriculture

Horticulture and agriculture rely on pollination too for the production of fruit and seeds. It's been estimated that around two-thirds of our fresh fruit and vegetables require pollination by animals. According to Federated Farmers, about \$3 billion of our Gross Domestic Product is directly attributable to the intensive pollination of horticultural and speciality agricultural crops by honeybees. Unfortunately, reliance on honeybees is becoming increasingly risky due to the spread of varroa mites and other diseases.



▲ Mistletoe at Breaksea Sound, Fiordland. Photo: Shaun Cunningham

Mistletoe

Mistletoes are semi-parasitic native plants that grow on other plants and get their water and nutrients from their host plants.

Mistletoes have a very unusual pollination system involving “explosive” flowers. To get to the nectar, a bird such as a tūi or a bellbird has to twist open a flower. The petals spring open and the bird gets sprayed with pollen. The pollen can then be transferred to the next flower the bird visits. Amazingly, a tiny native bee can also pollinate the flower by twisting open the flowers.

Some of the largest beech mistletoes in the country can be found in Southland. Look out for them in Fiordland, Borland, Tuatapere Domain, Lake Mavora, Manapouri and along the lakeshore at Te Anau.

Unfortunately, New Zealand mistletoes are in serious decline, partly due to the declining numbers of native birds that can pollinate their flowers and disperse their seeds.



ACTIVITY

Help your students to investigate which of the food plants in their own diets require pollination to produce fruits and seeds.

Fortunately, there are many species of ‘wild pollinators’ that can also pollinate crops, including introduced bumblebees, native bees and flies. Although wild pollinators are not directly managed by people (unlike honeybees), they provide pollination services “for free” and play a surprisingly important role in our economy. One study completed in 2014 calculated that the economic contribution of wild pollinators is worth around \$3,000 per hectare.

Another study found that “non-bee” insects (such as flies, wasps, beetles, butterflies and moths) are just as important as honeybees for the pollination of crops. It is therefore very important that we understand and make efforts to sustain populations of wild pollinators on agricultural land. One way to achieve this is to provide refuges for wild pollinators by creating or maintaining areas of natural vegetation on or near farms.

New Zealand's native pollinators

New Zealand has a unique set of animal pollinators. Many of them are endemic, occurring nowhere else in the world. Most of our native plants are pollinated by insects such as solitary bees, moths, butterflies, flies,

beetles and birds. Our most important pollinators in both natural and agricultural systems are bees and flies.

A few native plants like pōhutukawa, flax and mingimingi are pollinated by native lizards.

Pōhutukawa and rewarewa flowers produce copious amounts of nectar to attract short-tailed bats.



▲ Native bee on pōhutukawa. Photo: Ngaire Hart



▲ Gadsfly on the weedy shrub *Cotoneaster lacteus*. Photo: Ashleigh Pos



▲ Red Admiral on pear blossoms.

Bees

In New Zealand and worldwide, bees are the most important pollinators of flowers in both natural and agricultural systems. We have 32 species of native bees and several introduced bees.

Flies

Flies are important pollinators for many plants worldwide. In New Zealand, native flies frequently visit the flowers of native plants as well as economically important plants like onions, brassicas, radishes, carrots and white clover.

Moths & butterflies

New Zealand has a huge number of moth species (over 1,800) but very few butterfly species. Not much is known yet about their importance as pollinators.



▲ Tūi. Photo: Shaun Cunningham



▲ Kererū. Photo: Bronwyn Auckram

Native birds

For some native plants (e.g. kowhai, flax, kākā beak and tree fuchsia) the most effective pollinators are nectar-feeding birds, particularly the tūi, bellbird and silvereye. These plants have flowers that are specifically adapted to attract birds.



ACTIVITY

Take your students into the school grounds to observe and record which animal pollinators visit the flowers in your gardens.



Threats to our pollinators



▲ Native bee (left) and European honey bee (right). Photo credit: Ngaire Hart

Around the world and in New Zealand, extensive land-use changes and intensification of agriculture have led to decreases in flower abundance and diversity, and declining pollinator populations. Ongoing habitat loss has become a serious problem for threatened species of plants and animals. Both natural and agricultural systems have suffered losses of pollinators. The most obvious ones are the decline of feral (unmanaged) honeybees in agricultural ecosystems and the decline of birds and bats in natural ecosystems.

In agricultural systems, the loss of feral honeybees has led to increased dependence on managed beehives for pollination. Unfortunately these are also under threat from:

- Varroa mites and other bee diseases
- Increasing resistance to treatments
- Misuse of pesticides, particularly systemic pesticides that show-up in the pollen
- Land-use changes leading to a shortage of nutritious floral resources for pollinators

In the absence of honeybees, the only viable alternative pollinators we have for agriculture are bumblebees, one group of native bees (*Leioproctus*) and some flies.

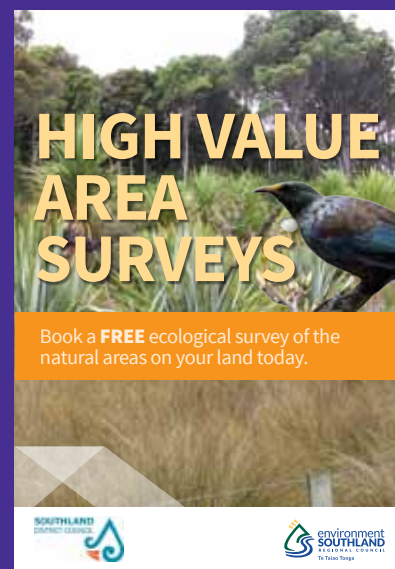
If our animal pollinators continue to decline, there will be serious consequences for natural ecosystems too. The decline in bird populations is already a serious threat, particularly for plants that are specifically adapted to bird pollination. Bats and lizards have severely declined too. There is even some concern for our insects - that the introduction of large numbers of honey bee hives to natural areas may cause problems for native insects by forcing them to compete for limited supplies of nectar and pollen.

High Value Areas

Environment Southland has set up the High Value Area (HVA) programme to carry out free ecological surveys of native habitats on private land in Southland. Landowners receive a free ecological report which outlines the plants and animals identified on their property, threats to native biodiversity, maps identifying areas of ecological significance, and recommendations for managing natural areas.

If you think you may have a high value area on your property, contact Environment Southland to book a free HVA survey.

For more information visit our website – www.es.govt.nz



How can we help pollinators in Southland?

▼ Find out what animals live in your school grounds



▲ Students from Knapdale School made their own aspirators to help them collect small insects without harming them.



▲ Students from Lochiel School set out tracking tunnels to find out what lives in their school grounds.

▼ Help control possums and other pests



▲ Contractor carrying out possum control work in a QEII covenant.

▼ Help protect a local natural area



▲ Students from Heddon Bush School plant native seedlings at 'The Donut', a local area of bush with a QEII Covenant.

► Create bird-friendly spaces and lizard refuges in your school grounds



▲ Tūi enjoying a bird feeder and native plants in a garden at Omaui. Photo: Tess Brosnan

► Plant more pollinator-friendly plants

Plant more pollinator-friendly plants in your school grounds, home garden, or on neighbouring farms. There's a large range of exotic and indigenous trees and shrubs that will provide pollen and nectar for pollinators. They can be planted in shelterbelts, around woodlots and along stream edges. Environment Southland's land sustainability team can provide advice on pollinator-friendly planting options for Southland conditions. Contact us or visit www.fedfarm.org.nz and search 'Trees for Bees'.

► Improve habitat for pollinators

Adapt your property management techniques to allow populations of wild pollinators to build up in your garden so they will be on site in sufficient numbers when you need them for pollination. Maintaining a high diversity of wild pollinators will prevent us from becoming over-reliant on honeybees.

► Grow your own native plants



▲ Students from Pukerau School learnt how to grow their own native plants.

More information

Contact Environment Southland for information and advice on implementing these and other ideas.

- Our biodiversity programme leader, Ali Meade, biosecurity officers and land sustainability officers can provide a range of advice on protecting species and enhancing habitats for pollinators.
- Ask about our Environmental Enhancement Fund as you may be eligible for financial assistance. The fund can be used to kickstart projects that aim to enhance, restore and maintain natural areas. Preference is given to applicants who have had an HVA survey completed on their property.

Educational resources & learning opportunities

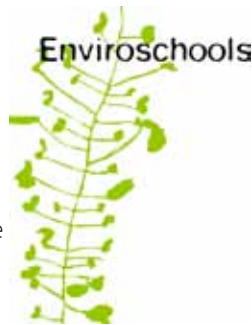
▶ Environmental education support for schools

Are you interested in exploring this topic further with your class? Environment Southland's environmental education officers, Pat Hoffmann and Mark Oster, are teacher-trained and able to assist you with your environment-focused learning programmes. We can help you with your planning, give a talk to your class, do some activities at your school, or accompany you on a field trip. Environment Southland offers these services to all schools in Southland, free of charge.

To find out more or to make a booking, contact us on 0800 76 88 45 or email education@es.govt.nz.

▶ Enviroschools

Enviroschools across New Zealand are learning and taking action for biodiversity through the Living Landscapes theme area. Contact us to learn more about the Enviroschools programme, how it works, and how your school can become an Enviroschool.



▶ Classroom-based activities

Visit the science learning hub to find some excellent resources and activities, e.g. Pollination Pairs activity: www.sciencelearn.org.nz/resources/90-pollination-pairs

▶ Field trip

Visit the threatened plants garden at the Southland Community Nursery in Otatara to find out more about mistletoes and other threatened plants in Southland. The garden is open by prior arrangement, phone 03 213 1161.

www.southlandcommunitynursery.org.nz/get-inspired/threatened-plants-garden

▶ Training

The Monarch Butterfly New Zealand Trust offers a butterfly gardening/habitat course. For more information go to www.monarch.org.nz/projects/certified-butterfly-gardenhabitats/butterfly-gardening-course

▶ Educational game

Jil Hemming from Kākāriki Games has just released a new educational game called "Flight of Pollen." It's a multi-level, multi-player board game with rules based on the real behaviour, characteristics and interactions of our Aotearoa/New Zealand flora, fauna and the elements – www.kakarikigames.co.nz.

More information

- Department of Conservation - information about mistletoes: www.doc.govt.nz (search 'Mistletoe')
- Department of Conservation - an overview of what is known about competition between honey bees and native bees in New Zealand: www.doc.govt.nz – (search 'Honeybees')
- Forest and Bird - lizard-friendly gardening: www.forestandbird.org.nz – (search 'Lizard-friendly gardens')
- Landcare Research: www.landcareresearch.co.nz – (search 'Pollination in New Zealand')
- Māori perspectives: <http://nzetc.victoria.ac.nz> – (search 'Origin of insects')
- NZBees - information about New Zealand's native bees, what they look like, how to find them, their lifecycles and favourite flowers: www.facebook.com/NZBees
- Plant and Food Research - www.plantandfood.co.nz – (search 'Pollination systems')
- Trees for Bees: www.treesforbeesnz.org – (Click on 'publications' and select 'Regional planting guide : Southland')