

2: Biosecurity – Levels 3 & 4

Connecting and protecting



Connecting and protecting

Students are introduced to ecosystems, biodiversity and the interconnectedness of living and non-living things. The importance of biosecurity is explored as students are encouraged to consider the impact of pests and diseases on ecosystems. Underpinning this work is the notion of Ki uta ki tai – a whole-of-landscape approach, understanding and managing interconnected resources and ecosystems from the mountains to the sea.

Firstly, make sure students know (in basic terms) what each requirement is about – the italicised notes provide some brief additional information.

Key understandings:

- Ecosystems are interconnected and biosecurity plays an important role in keeping New Zealand ecosystems functioning effectively.
- Exclusion, eradication and management are used in New Zealand to help combat the invasion of introduced pests and diseases.

What lives here?

Carry out a study of a local ecosystem. Choose a location with your students and visit it at least one day a week for a few months. Students can:

- Keep a field journal in which they keep notes of their observations. This will help them to identify the plants, insects, birds and other animals that inhabit the ecosystem.
- Test the soil or water for acidity or pollutants.
- Make plaster casts of animal tracks.
- Sketch or take photographs to create a visual file or display.
- Create a web page to share the ecosystem with the community, using time lapse photography.

Ecosystems are the interaction of living things and their physical environment

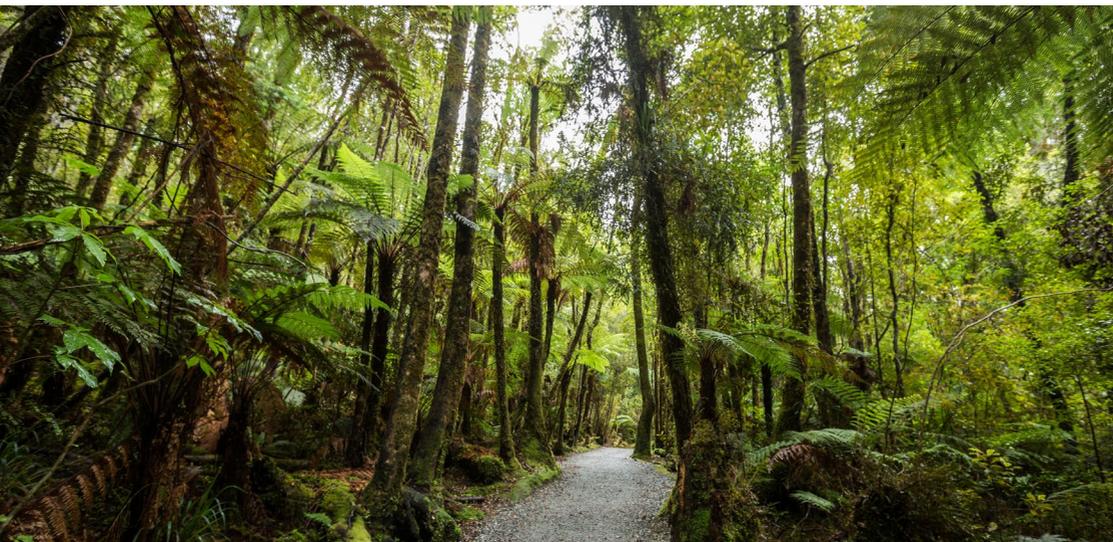
Help students to understand that for an ecosystem to work all living things have to eat, and they eat because they need energy. The interdependence of an ecosystem, as represented by a food chain or web, has to do with the transfer of energy – as an animal eats another animal or plant, energy is transferred.

- Watch the [Feed me: Classifying Organisms video](#).
- Classify plants, herbivores, carnivores and omnivores.
- Compare rural and urban and coastal and bush ecosystems.
- Discuss whether humans are included or excluded from ecosystems. Discuss the effects of humans on ecosystems.
- Play [Biodiversity battleships](#).

All parts of an ecosystem are interconnected

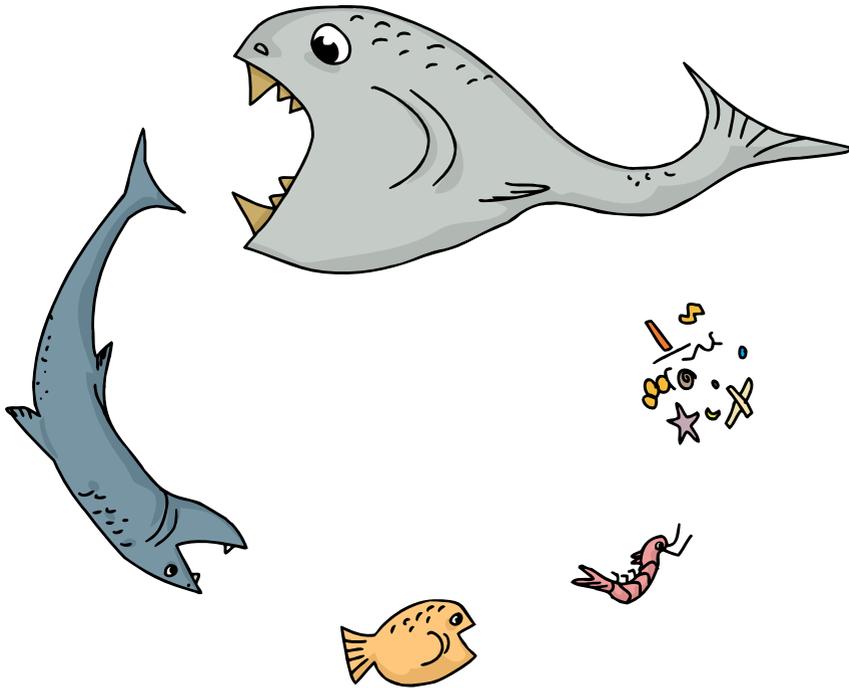
Students can explore this understanding by revisiting basic food chains and exploring food webs.

- Create [food chains](#) or webs from a collection of seemingly random images.
- Use [Popplet](#) to create food webs from any world ecosystem.
- Create a physical food web with [this food web game](#).
- Create a [geoboard food web](#).



Related resource

[Food Chains](#) – Interactive Learning Sites for Education



The interconnectedness of Māori and the living world

Share the narrative of [Ranginui and Papatūānuku](#) with the students. Get students to look for more traditional stories about birds, places, animals or plants. There are many myths and legends about Taonga species (native flora and fauna of significance to Māori) and students can look for stories that explain the place of birds in particular ecosystems. Students can publish or animate some of these stories as a school resource to explain the natural history of their local area.

Throughout this learning, students can explore Māori values and beliefs that act as guidelines for the management of ecosystems.

Explore the following key concepts:

Whakapapa – (genealogy, lineage, descent)

- What is this land's history? How long has it been like this?

Mana – (prestige, status, spiritual power, charisma – mana is a supernatural force in a person, place or object)

- How do you see the mana of this area? Do you see any challenges to the Mana?

Kaitiakitanga – (guardianship, trusteeship)

- Who looks after the land? Why does it need to be looked after?

Tapu – (sacred, prohibited, restricted, forbidden)

- Is there a spiritual or cultural reason, such as the presence of a taniwha or urupā, that this area is tapu? Is there an ecological reason, such as the presence of a threatened species, that this site is tapu?

Mauri – (the essential quality and vitality of a being or entity – a term also used for the ecosystem in which this essence is located)

- What living or non-living thing could represent the mauri of the land? What can or has destroyed the mauri of a local ecosystem?

Rāhui – (to put in place a temporary ritual prohibition, closed season, ban)

- Has there been a rāhui in the local area? What were the reasons for it? What effect did the rāhui have?

Keeping our ecosystems safe

Help students understand that pests and diseases can harm our environment and we have biosecurity systems in place to protect it.

- Students can watch the movie clip [Biosecurity 2025 –protecting to grow New Zealand](#) and can discuss what each of the terms mean: exclusion, eradication or management.
- Examine the history of biosecurity in NZ – What did the first arrivals bring? <https://www.nzonscreen.com/title/ghosts-of-gondwana-2001>
- Make a timeline of the introduction of invasive species into New Zealand. What patterns can you see? Which species of introduced plants or animals have become invasive and why? How have these impacted on Taonga species?
- There is no such thing as a zero biosecurity risk, despite the many measures put in place to mitigate the arrival of unwanted pests and diseases. Students can look for information on the websites of organisations such as the Ministry for Primary Industries (MPI), regional or local councils, or the [New Zealand Biosecurity Institute](#) to build a profile of biosecurity breaches that have occurred in their local area, and what action has been taken to eradicate them and stop them happening again. This brief exploration will give the students a reference point when they examine risks to biodiversity and biosecurity in more detail.



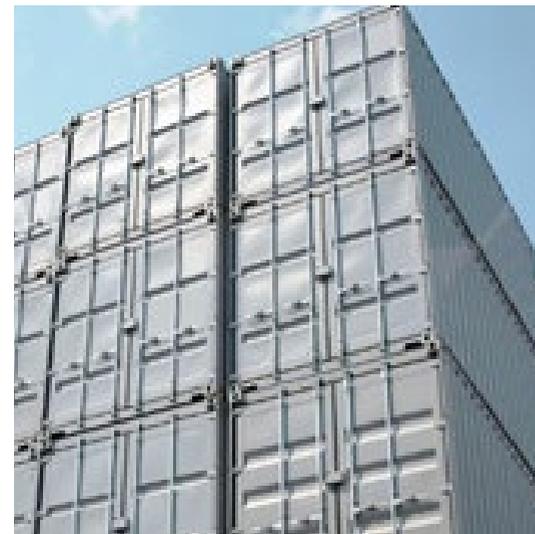
The Biosecurity system – everybody has a role

New Zealand's geographical isolation and strong biosecurity system keeps many pests and diseases out of our country. This has allowed our primary industries, environment, and economy to flourish.

Help students investigate breaches of biosecurity and their impact across New Zealand. Lead students to understand the different roles people play in upholding biosecurity systems.

Focus questions:

- What unwanted pests or diseases have affected, or could affect New Zealand?
- Whose responsibility is it to take care of biosecurity?
- What biosecurity measures protect our environment from harm and keep it safe?



Biosecurity in your community

Using an app such as [padlet](#), students can collaborate online with each other and with others in their community. Build up a class database, collecting information about species that could affect your region if they entered New Zealand. Discover:

1. Examples of invasive pests or diseases.
2. Examples of introduced pests.
3. The characteristics of successful invasive pests and diseases.
4. Different ways pests and diseases may be introduced to the environment.
5. The effects of pests and diseases on the environment, the economy, society, health and things of Māori cultural value.
6. Why invasive species may be more successful than native species.
7. Rank pests and diseases according to their potential to cause damage, and predict what damage they could cause economically and socially to your community if not managed or eradicated.

Investigate the types of biosecurity breaches that could happen in the future. New threats, such as the harlequin ladybird and brown marmorated stink bug may thrive in the specific conditions and ecosystems of the local community. Students can:

- Gauge the perceived risk of a new threat and write a biosecurity plan to minimise the spread and the effects of these pests. They could then design a DIY biosecurity detection kit.
- Design information for visitors or new immigrants to New Zealand that explains New Zealand's unique ecosystem and its reliance on strict biosecurity measures.
- Explore technologies that support our biosecurity. How do we practise and use technology to combat biosecurity threats?
- Explore the impact of climate change on biosecurity risk in New Zealand.



Related resources

- [MPI Registers and lists](#) – Registers and lists of pests and diseases, and organisations associated with identifying them.
- [Alerts](#) – Some of the major threats, pests and diseases facing New Zealand's primary sector.
- [New Zealand biosecurity by numbers](#) – A graphic representation of biosecurity in Aotearoa.

Managing risk

Pests are introduced to New Zealand, sometimes intentionally and sometimes accidentally with other imports. However, not all introduced species are pests (such as most popular garden and crop plants and imported animals), and others might only become pests after being here for many years (such as the [Pheonix Palm](#)).

1. For home learning, ask the students to examine their own garden, or a local park and reserve. Ask them to count the number of different plant species they can see. Then investigate the list of invasive or weed plants in your area (using websites such as [Weedbusters](#), [Department of Conservation](#) and Massey University's [weed database](#)), to show students that statistically, a vast number of introduced plants do little harm.
2. Students can identify whether there have ever been any biosecurity problems in the local area that have/could have affected primary industries, using internet searches, newspapers, and information from government organisations such as MPI, DOC and local and regional councils. From media or official reports of the time, investigate the reactions of the community to the problem, and how it was managed. Try to find the origin of the pest or disease, and how it could have entered the country, as well as how it was reported. Ask students to search the MPI website to find out their responsibilities as community members, and what action they can take if needed.
3. Who is involved in biosecurity management? And where? Students can research the roles the following people play in biosecurity activities, and then show in a class diagram how collective actions fit into a national strategy:
 - MPI (surveillance, response, pest management)
 - Local councils
 - Department of Conservation
 - Industry
 - Non-government organisations and charities
 - Community groups
 - Iwi
 - Individuals

4. The **Biosecurity Act 1993** provides the legal framework to help keep pests and diseases out of New Zealand, as well as how to respond, and manage them, if any do make it into the country. Divide the class into four biosecurity teams:
 - Pre-border risk management
 - Border management
 - Readiness and response
 - Long-term pest management
5. Using the database created earlier, choose a pest or disease that could affect your local area. Each biosecurity team needs to work together to find out as much about their assigned task as they can, and develop a strategy and **Biosecurity surveillance guide** that shows how all four teams would need to work together to combat a biosecurity threat.

Related resource

Surveillance programmes – MPI is always looking for pests and diseases that might have arrived from overseas.

Investigating plant pests in your green space – an education resource from DOC.

Pest control and animal welfare

1. Discuss the ethical issues around killing one species to protect another. Why do we value some species above others?
2. Investigate a current-events story about pest control. Explore different kinds of trapping and animal pest control. Following the steps in **Making a tracking tunnel**, students create their own tracking tunnel. Explore the **welfare performance** and implications of different pest control methods, especially restraining and kill traps, and how animal welfare considerations can be integrated into practices such as hunting, trapping and pest control. Note the requirements within the **Animal Welfare Act 1999**.

Related resources

- **Video: How do we stop invasive species?** (May be more suitable for Level 4 students).
- **Invaders** – an interactive game where players eradicate pest species in four different countries.
- **The Global Invasive Species Database** – this website discusses invasive species around the world.
- **Investigating animal pests in your green space** – an education resource from DOC.

Kaitiakitanga

The relationship of tangata whenua to the land and waterways is one of guardianship and protection, to ensure sustainability for future generations. Taonga tuku iho refers to the intergenerational protection of highly valued taonga. This protection passes through generations, in a caring and respectful manner.

Focus questions

Tikanga is closely aligned with kaitiakitanga. Where possible, talk to local hapū or iwi to explore the tikanga of the local environment.

- How did Māori influence early Pākehā and their treatment of resources? Has this changed?
- How did trade and early enterprise change the guardianship of the land?
- Are there local places that are or have been tapu?
- Do Māori now have any customary rights over the resources in the local area?
- How do the notions of kaitiakitanga translate into contemporary tikanga Māori?
- In what ways are tikanga and biosecurity compatible?

What is Kaitiakitanga – past, present and future

1. Explore the lives of the earliest peoples and their relationship with the land. Compare and contrast the difference in levels of guardianship of the land over time.
2. Explore contemporary notions of kaitiakitanga and any changes that have occurred over time. Challenge the students to examine their own actions around land, animals and waterways, and to plan ways to renew their relationships with the land, supporting tikanga and kaitiakitanga.
3. Kaitiakitanga is about people and their relationship and connection to the land. Students examine some of the technological changes in the use and maintenance of their local environment that have happened over time. What can happen to a place when we have fewer workers and more machines?

Related resource

Honeydew: The Food of the Ngahere – How mātauranga Māori is helping an endangered ecosystem recover.

Kaitiakitanga in practice

Use a local waterway to practice kaitiakitanga. Visit a part of the waterway with the students.

1. How is the land beside the water used? A riparian strip will cover the land right at the water's edge. Further back, the land will often show signs of human intervention. Students can sketch and label a map of land use around the waterway. Note whether farms or reserves are fenced or if there is dense planting between the land and water to discourage animals entering the water.
2. Before your visit, contact the local regional council for information about animals and plants that live in the waterway. If there are introduced species, find out if they were introduced deliberately or accidentally, and how they have affected the local ecosystem. While you are there, photograph any animals you see and estimate their population.
3. Collect and identify **freshwater algae**, using the Landcare research guide; any noxious weeds growing in or close to the water; and take a number of water samples.

When you return to class:

4. Test water for **nitrate**, found in farm fertilisers, identify how it might have entered the waterway.
5. **Too Much of a Good Thing?** looks at the effect of fertilisers on algal growth by stimulating growth in a water sample collected from a waterway. This resource is more appropriate for Level 4 students.
6. Rate the health of the waterway and identify the human impacts that have contributed to that rating. The listed resources, as well as their observations, will support students to complete this task.
7. Ask the students how could you become an advocate for this waterway? How could this help your role in upholding the biosecurity system in your region?

Related resources

- **Tōku Awa Koiora** – This study investigates the restoration of the lower half of the Waikato River. Kaitiaki are working to restore and protect the health and well-being of the river.
- **H2Whoah | Protecting New Zealand's Precious Waterways**. This website features local waterways, with ways suggested to protect them.
- **Living Water** is a partnership between Fonterra and DOC, working together to improve biodiversity and water quality across New Zealand.

Why is biodiversity important for biosecurity?

1. Students design a way for schools in the local community to get a better understanding of biosecurity in New Zealand. Organise a local 'biosecurity officer' group to play an active role in safeguarding your region. Make sure you connect with local iwi, council, DOC and MPI to support and inform your actions.
2. Individually or in groups develop a product or system to monitor the entry or spread of a pest or disease identified as an issue for your region.

