5 Ecosystems and biodiversity

This chapter lists the questions about ecosystems and biodiversity that we would like addressed. We present a summary of the analysis of the official data that addresses those questions. We then outline the initiatives to address our ecosystems and biodiversity information needs.

> Ecosystems and biodiversity are essential to New Zealand. Biodiversity is the biological variability among living organisms within terrestrial, aquatic, and marine ecosystems. Human well-being is dependent upon 'ecosystem services' provided by nature, such as water and air purification; fisheries; timber; nutrient cycling; and the aesthetic, recreational, and spiritual benefits gained from the environment. Pressures resulting from population growth, changing diets of people, urbanisation, climate change, and many other factors can cause biodiversity to decline and ecosystems to be degraded. The loss of other valuable ecosystems can directly impact on food, fresh water, and energy security (European Commission, 2013).
>
> The *Convention on biological diversity* defines biological diversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (United Nations, 1992).
>
> The services that nature provides us with, like clean water, clean air, fertile soil, food, are not only crucial for the well-being of human-kind; they also represent an astronomical economic value (Gerben-Jan Gerbrandy, nd).

Biodiversity boosts ecosystem productivity where each species, no matter how small, has a role to play.

Ecosystems and biodiversity questions

This section presents the enduring questions and the supplementary enduring questions on ecosystems and biodiversity.

Enduring questions

To what extent is the native (indigenous) biodiversity of New Zealand being protected and sustained?

Supplementary enduring questions

A. How and where is the diversity and condition of indigenous species changing?[1]

B. How and where is the diversity and condition of indigenous ecosystems changing?

C. What impact does change to the diversity and condition of indigenous species and ecosystems have on natural capital[2] and the provision of ecosystem services?[3]

D. What is driving the change[4] to the diversity and condition of indigenous species and ecosystems, where does it occur, and how is it changing over time?

E. What ecosystem services[5] are currently provided by New Zealand's terrestrial and freshwater environments, and how are these predicted to change in the future?

F. What and where is the impact of change to culturally significant indigenous taonga (treasured) species, mahinga kai (customary food gathering areas and practices), and ecosystems, and what is being done to protect and sustain them?

G. What and where is environmental protection effort[6] being undertaken to protect and sustain the diversity and condition of indigenous species and ecosystems, including people and agencies, time and capital and how effective are the different efforts?

Notes

1. Changes include how and where the threats to indigenous biodiversity are changing, such as threats from exotic weeds and pests, human activity resulting in habitat loss, land use intensification, climate change, and air pollution.

2. Natural capital includes renewable and non-renewable resources in ecosystems (eg indigenous forests).

3. Ecosystem services are grouped into four main types – provisioning services (eg providing food), regulatory services (eg when oceans act as a carbon sink), supporting services (eg nutrient cycling), and cultural services (eg the enjoyment visitors gain from marine reserves).

4. Changes include how and where the threat to indigenous biodiversity is changing (eg threats from exotic weeds and pests, human activities resulting in habitat loss, land use intensification, climate change, and air pollution).

5. Ecosystem services are grouped into four main types – provisioning services (eg providing food), regulatory services (eg when oceans act as a carbon sink), supporting services (eg nutrient cycling), and cultural services (eg the enjoyment visitors gain from marine reserves). Coastal and marine environment ecosystem services are considered in that Coastal and marine area.

6. Environmental protection effort includes remediating environmental damage, resource management, expenditure, areas protected under regulation and legislation, damage avoidance, research, and minimising natural hazards.

Gap analysis

Table 10 summarises how well official information (including Crown research institute data) informs the supplementary enduring questions on ecosystems and biodiversity. See appendix 3 for details of the analysis process.

Table 10

How well official data informs supplementary enduring questions on ecosystems and biodiversity

Supplementary enduring question (SEQ)	Question topic	Level at which official data informs SEQ
A	Changes to the diversity and condition of indigenous species	Medium
B	Changes to the diversity and condition of indigenous ecosystems	Medium
C	Impacts on natural capital and ecosystem services	Low

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Table 10 continued

How well official data informs supplementary enduring questions on ecosystems and biodiversity

Supplementary enduring question (SEQ)	Question topic	Level at which official data informs SEQ
D	Drivers of changes to the diversity and condition of indigenous species	Medium
E	Ecosystem services provided	Low
F	Impacts of changes to culturally significant indigenous species, and ecosystems	Low
G	Environmental protection effort	Low

We scored five data sources as highly informing the supplementary enduring questions:

- Natural Heritage Management System
- National Vegetation Survey databank
- Freshwater ecosystems of New Zealand
- Plant Pest Information Network
- Forest health database.

Ecosystems and biodiversity initiatives

In these initiatives, biodiversity excludes exotic species. However, exotic species may be included in ecosystems services information. For example, exotic trees may provide a high-quality ecosystem service in preventing soil erosion.

EB1 Establish an ecosystems and biodiversity data forum

New Zealand's native biodiversity is unique, born of long isolation as small islands in a vast ocean.

The high percentage of endemic species (those found nowhere else in the world), make New Zealand's native biodiversity both special and highly vulnerable. The initiative that received the highest priority at the workshop was to create an ecosystems and biodiversity forum. Specifically, this involves setting up a national biodiversity data forum similar to the land and water forum. The current issue for ecosystems and biodiversity governance is no overarching coordination or strategic direction. The will to lead this initiative is needed and multiparty / agency participation is essential for such a forum to succeed. Department of Conservation with the wider Natural Resources Sector (NRS) may have an important role here.

Membership and leadership of the forum may include:

- Crown research institutes (CRIs) – continue to advise the best approach to national environmental reporting
- Local Government New Zealand – coordinate regional council data nationally
- regional government
- Department of Conservation – with support from Statistics NZ acting as leading data custodian through the Official Statistics System
- non-governmental organisations involved in data collection and storage

- museums (such as Te Papa Tongarewa)
- Citizen Science New Zealand – assist systematic biodiversity data collection.

It is common across this domain plan for a top-ranked initiative to concern leadership and governance.

The first task of this initiative is to identify an agency to coordinate and lead the forum. This lead agency will report on the status and trends in biodiversity and ecosystem services, and oversee and coordinate regional, national, and international reporting. The forum will create a stakeholder-led collaborative vision and determine the way forward (see Land and Water Forum, 2012, for how this may work).

There is an extensive biodiversity chapter in the Ministry for Primary Industries' Aquatic environment and biodiversity annual review 2012 that relates to this initiative.

The forum could:

- govern forum processes, such as how to approach collaboration and how to measure success
- have a lead role in ecosystems and biodiversity research, data provision, and collaboration
- provide strategic direction on data collection, storage, and reporting
- establish collaboration processes for all involved in bio data capture and storage
- provide technical expertise, such as in the architecture of data storage
- conduct a collaborative 'state of New Zealand's biodiversity' research project to provide information on defining our current biodiversity and its status
- coordinate members and actions.

Should this forum adopt an advisory function for national biodiversity and ecosystems data, it may help clarify and standardise the following about the topic:

- definitions
- methodologies
- assessments.

An initial co-benefit will be improving the link between data providers and users and coordinating data sharing, reuse, and integration.

EB2 Invest in key databases, collections, and systems

Invest in and maintain key databases, collections, and systems, to support decision-making and to answer the supplementary enduring questions across the eco-systems and biodiversity domain.

Specifically this initiative involves:

- identifying data voids and obtaining targeted funding for filling high-priority gaps
- identifying key datasets and dedicating long-term funding to ensure their continuity
- funding and implementing technical architecture for methods and data
- funding and maintaining ecosystem and biodiversity monitoring systems, IT systems, and supplementary systems
- ensuring commitment to maintaining systematic biodiversity data collection and attendant databases.

This initiative is related to EB1, establish an ecosystems and biodiversity data forum.

EB3 Identify repeat measures to answer supplementary enduring questions

Identify and establish unbiased repeat measures and methods to answer each supplementary enduring question, using existing systems where possible. Doing this work will improve the statistical reporting of environmental issues about this topic and the Official Statistics System. Part of this work may be to review the supplementary enduring questions due to developments in this area.

This initiative moves beyond the gap analysis process, in that it aims to identify systems that will consistently provide data that answers the supplementary enduring questions. There is a need to identify the indicators, baseline, and trend data needed for each question.

To successfully achieve this initiative we need to complete an assessment of each biodiversity database to know:

- what the database holds
- what their strengths are
- what are the data limitations for databases both inside, and possibly outside of, the Official Statistics System.

The Ministry for Primary Industries' *Aquatic environment and biodiversity annual review* contributes to this work.

Collaborative research projects that define our current biodiversity and answers the supplementary enduring questions may further inform on the state of New Zealand's biodiversity. We should keep in mind that any biodiversity indicators we use to answer the supplementary enduring questions (relating to terrestrial, freshwater, and marine biodiversity) should also be meaningful to Māori.

The following supplementary enduring questions need further information.

Supplementary enduring question D, on the drivers to changes to ecosystems and biodiversity could include for example, Statistics NZ asking animal health boards about possum numbers – are they declining or increasing? What is the rate of damage on indigenous vegetation and indigenous species? In this example, we want to know if possums are driving change and by how much, although this data is very specific to possums.

Supplementary enduring question G is about environmental protection efforts. Statistics NZ can inform this by collating information from the QE II Trust and Councils to determine how much land is protected for biodiversity purposes, such as covenanted lands, regional parks, and esplanade reserves. Department of Conservation also has information on the amount of land in the natural estate. Currently, this legally protected land is a variable of the native land cover collected by the Ministry for the Environment. Also available is information on land identified by councils as significant natural areas or indigenous vegetation. The QEII Trust can also provide data on nationwide costs.

Department of Conservation supports the regional councils' initiative to adopt systematic terrestrial monitoring under the Natural Heritage Management System. Department of Conservation (DOC) and Landcare Research are supporting regional councils to adopt a similar approach, to lead monitoring across non-DOC land. An assessment may be needed on whether a more pragmatic stratified approach is needed.

A review of the enduring questions after a reporting cycle may be useful and could be led by Statistics NZ. The Natural Resources Sector may assist in assessing each enduring question for data required. More information on how existing data contributes to questions would need to be discussed with CRIs. Statistics NZ could lead these discussions.

This initiative could link strongly to EB1, establish an ecosystems and biodiversity data forum, depending on the terms of reference established for the forum.

EB4 Implement a biodiversity information architecture

Develop biodiversity information architecture / infrastructure, for example, similar to the Atlas of Living Australia. The Atlas of Living Australia has information, analysis, maps, and data on all known species in Australia.

This initiative relates to initiative EB2, invest in key databases, collections, and systems, as funding is needed to implement the technical architecture for methods and data measuring ecosystems and biodiversity. It also relates to EB1, establish an ecosystems and biodiversity data forum.

This initiative also needs to build the infrastructure that integrates with existing data. Doing this will create a portal for this data and will make it useful to more users.

EB5 Assess the value of ecosystems and biodiversity (see also LN4, undertake ecosystem services assessment)

Assess the value of ecosystems and biodiversity to New Zealand. These values extend to the cultural, social, and environmental aspects as well as economic values, and may differ among sectors and communities in the country.

Values initiatives also appear in other topics, such as freshwater (see chapter 7). There are many interests in the natural environment and values may compete against each other.

Determining the value of ecosystem services in New Zealand, across all values, is a component of this initiative. We can achieve this by doing case studies that focus on areas of current attention, for example, water quality and its links to dairy farming. At a higher level these studies could focus on the value of ecosystem services from the environment to New Zealand as a whole.

Cross-departmental research projects about ecosystems services exist (including work completed by former Biosecurity NZ), which inform risk-assessment decisions on the impact of introducing new species to the New Zealand environment.

EB6 Develop a national information portal

Develop a national portal to enable access and sharing of information. This initiative would be enhanced with the use of common data measuring and reporting processes, such as those mentioned in initiatives EB9, align ecosystems and biodiversity database, and EB15, develop metadata standards.

EB7 Develop indicators reflecting Māori values

Develop ecosystems and biodiversity indicators that reflect Māori values. This may build on the concepts that were developed around Māori values of water, and extending these across a more holistic system.

EB8 Develop a portal listing all existing projects

Develop a portal that lists all existing projects, initiatives, and efforts on ecosystems and biodiversity. Having this portal will make organisations aware of the data, maximise its benefits, and avoid duplication.

EB9 Align ecosystems and biodiversity database

Align ecosystems and biodiversity collection and reporting databases that are similar. This will standardise data collection and reporting. The Terrestrial and Freshwater

Biodiversity Information System, run by Department of Conservation, will likely support work like this to improve the coherence of information management

EB10 Evaluate ecosystem and biodiversity goals

Evaluate existing national biodiversity and ecosystems goals to specify more clearly what we are aiming for.

EB11 Develop capacity and capability

Develop the capacity and capability of people to answer future ecosystems and biodiversity questions. This initiative also includes supporting citizen science for the benefit of New Zealand.

EB12 Identify key datasets and custodians

Identify the key datasets, their custodians, funding security, and quality, including fitness for purpose.

EB13 Facilitate local government working with DOC

Facilitate regional and district councils, and others working with Department of Conservation (DOC), to help provide data on ecosystems and biodiversity.

EB14 Define New Zealand's biota

Develop a strategy for advising and defining New Zealand's biota. This strategy will be created by the lead agency of the ecosystems and biodiversity forum. This would perhaps extend the work already underway at Landcare Research for defining biota and the New Zealand Organisms Register.

EB15 Develop metadata standards

Develop a standard for ecosystems and biodiversity metadata. Having a standard will enhance the use of data-sharing portals, such as that proposed in initiatives EB6, develop a national information portal, and EB9, align ecosystems and biodiversity database.

EB16 Develop the analysis and feedback loops

Develop the analysis and feedback loops for ecosystems and biodiversity reporting. This initiative relates to databases initiatives EB6, develop a national information portal; EB8, develop a portal listing all existing projects; and EB9, align ecosystems and biodiversity database. It also relates to EB1, establish an ecosystems and biodiversity data forum.

Ecosystems and biodiversity initiatives table

Table 11 lists the ecosystems and biodiversity initiatives by priority, estimates of their complexity, and the supplementary enduring questions they address.

Table 11

Ecosystems and biodiversity initiatives by priority, complexity, and supplementary enduring question (SEQ) addressed

Initiative number	Initiative name	Priority rank	Complexity	Helps inform which SEQ
EB1	Establish an ecosystems and biodiversity data forum	1=	Complex	All
EB2	Invest in key databases, collections, and systems	1=	Complex	All
EB3	Identify repeat measures to answer supplementary enduring questions	3	Complex	All
EB4	Implement a biodiversity information architecture	4=	Complex	A, B, D, F
EB5	Assess the value of ecosystems and biodiversity (see also LN4)	4=	Highly complex	C, E, F
EB6	Develop a national information portal	6	Moderate	All
EB7	Develop indicators reflecting Māori values	7=	Highly complex	F
EB8	Develop a portal listing all existing projects	7=	Moderate	All
EB9	Align ecosystems and biodiversity database	7=	Moderate	All

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Table 11 continued

Ecosystems and biodiversity initiatives by priority, complexity, and supplementary enduring question (SEQ) addressed

Initiative number	Initiative name	Priority rank	Complexity	Helps inform which SEQ
EB10	Evaluate ecosystems and biodiversity and goals	7=	Moderate	All
EB11	Develop capacity and capability	11=	Complex	All
EB12	Identify key datasets and custodians	11=	Complex	All
EB13	Facilitate local government working with DOC	13=	Complex	All
EB14	Define New Zealand's biota	13=	Complex	A, D, F
EB15	Develop metadata standards	13=	Moderate	All
EB16	Develop the analysis and feedback loops	13=	Moderate	All