# Ecological Impact Assessment (EcIA)

## EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems

2nd EDITION
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# Foreword to 2nd Edition

Version 1 of these Guidelines was released in March 2015. Feedback and comments were received until mid-2016 from a range of individuals, professional bodies and interest groups, and these contributions have assisted in the improvement of guidance and updating of text.

Comments have prompted a review of thinking on some matters, and expansion of the text to ensure that meanings are clear, and methods well-explained.

Areas "most commented-on" were:

- the process of placing a value on species, vegetation/habitats/ecosystems and/or sites for Impact Assessment purposes;
- the potential for over-reliance on the matrix in decision-making; and
- the need to emphasise that these Guidelines are not just for use by ecologists working for a project developer or proponent, but are also intended to assist ecologists and planners processing applications in councils to check if all expected information is generally present and treated in an appropriate way.

The layout, style and format of the original are retained so that comparison between the two versions is possible. In this 2nd Edition (previously known as Version 2) substantial changes have been made in some areas to:

- emphasise the focus of these Guidelines on RMA section 88/ Schedule 4 (leading to modification of Chapter 5 in particular);
- stress ecological description and analysis as a basis for impact assessment and management; and
- review the use of matrices as summary tables for ecological description and assessment.

The Glossary has been expanded considerably although the list remains limited to those ecological terms used regularly in EcIA. The Quality Planning website[1] defines other terms which may be useful in ecological impact assessment.

A decision was made not to expand the Guidelines to encompass coastal-marine ecosystems at this stage. In part, this was because the authors felt that the 2nd Edition should be a revision of Version 1, and produced as quickly as possible to ensure continuity of use. Also, the environmental law, ecology and ecological knowledge of these two environments differ in many ways from the terrestrial and freshwater environments, and we felt that their inclusion needed further consideration. This mirrors the approach to EcIA in Western Australia. EIANZ hopes to find authors with expertise and available time to prepare guidance for the coastal-marine area in the near future.

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1 http://www.qualityplanning.org.nz/index.php/planning-tools/indigenous-biodiversity/key-terms#glossary

# Editor's preface 2nd Edition

Ecological Impact Assessment (EcIA) is a process for identifying, quantifying and evaluating the potential impacts of defined actions on ecosystems or their components; and providing a scientifically defensible approach to ecosystem management.

In 2015, EIANZ published "Ecological Impact Assessment Guidelines, Version 1" to address a gap in guidance on this topic for professional ecologists operating under the Resource Management Act (RMA) in New Zealand. The Guidelines were prepared by a group of experienced ecologists, working voluntarily over about a two-year period.

Rather than undertake a potentially lengthy period of external peer review, we decided to publish Version 1 and seek feedback from people using the Guidelines in practice, whether as working ecologists or as participants in RMA processes. Based on the responses received during 2016, a small group of contributors has prepared this 2nd Edition.

I am very grateful to everyone who has helped to write and review both the original and 2nd Edition of the Guidelines. Once again, all the contributors gave their time voluntarily in spite of their own workloads and family commitments. The assistance of their employers is also acknowledged.

Stephen Fuller, Scott Hooson, Mark Sanders and Graham Ussher are the principal contributors. Over the last 18 months they have reviewed, critically revised, discussed, written and rewritten the text to bring their collective expertise and practical experience to the 2nd Edition. Some of the Version 1 authors were unable to help with this update, but their foundation thinking was much appreciated, as were discussions with a large number of ecologists, planners and impact assessment professionals throughout the period.

We were very appreciative of the comments from respondents which were extremely valuable in identifying gaps and suggesting amendments which we have tried to accommodate where appropriate.

Craig Pauling (Te Hihiri-Strategic Adviser, Boffa Miskell Ltd) kindly helped us to consider the role of Manawhenua values in EcIA, and guided writing on that topic. Dean Chrystal (Director, PLANZ Consultants) reviewed our ecological perspectives on the RMA and planning matters.

In the initial stages Caroline McParland's enthusiasm, and knowledge of the IEEM Guidelines, helped to start the process but in 2012 she returned to the UK. Caroline is now Technical Director with Jacobs, UK and provided valuable comments as a peer reviewer to the 2nd Edition. Dr Mike Young (CEnvP, MEIANZ Ecology Special Interest Section) reviewed the document on behalf of EIANZ (Australia).

These peer reviewers provided valuable critiques to ensure that these Guidelines are in keeping with UK and Australian ecological assessment, while reflecting the unique New Zealand circumstances presented by the Resource Management Act.

Production was further assisted by Merryn Hedley (Boffa Miskell Ltd) who proofread the 2nd Edition, and reviewed the referencing system; and Ambyr Wood who was responsible for layout and presentation.

Throughout the editing process EIANZ support for the development of the 2nd Edition has continued through Central Office staff Di Buchan (EIANZ Vice-President NZ), past-Presidents of the NZ Chapter, Keith Calder and Ian Boothroyd, and current NZ Chapter President Kevin Tearney.

Dr Judith Roper-Lindsay.
CEnvP, FEIANZ, MCIEEM.

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# Glossary

**Abundance:** the number of individuals of a taxon or taxa in an area, volume, population or community. (Lincoln, Boxshall, & Clark, 1998).

**Additionality:** a biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place. This is because conservation actions already planned and funded, in place, or required by law do not deliver any extra biodiversity gains to balance biodiversity lost at an impact site (Refer Chapter 7, BBOP principle 5).

**Assemblage:** a collection of plants or animals that are typically associated with particular environmental conditions.

**Assessment of Environmental Effects (AEE):** the process of preparing a written statement identifying the effects of a proposed activity or activities on the environment. If the proposal is going to have negative effects, it is also the process of identifying how these can be avoided or reduced. (MFE website, http://www.mfe.govt.nz/publications/rma/aee-guide-aug06, Sept 2014). The report prepared to document the process and outcomes is often also called an 'AEE'. See also EIA.

**Baseline conditions:** the conditions that would pertain in the absence of a proposed action. To characterise baseline conditions it is necessary to quantify natural variation (Treweek, 1999).

**Biodiversity (biological diversity):** 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, 1992a).

**Biodiversity offsetting:** measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground (Guidance on Good Practice Biodiversity Offsetting in New Zealand, (New Zealand Government, 2014)) . This document provides definitions of biodiversity type, biodiversity components and biodiversity attributes used in offset design.

**Business and Biodiversity Programme (BBOP):** an international collaboration between companies, financial institutions, government agencies and civil society organisations. The members are developing best practice in following the mitigation hierarchy (avoid, minimise, restore, offset) to achieve no net loss or a net gain of biodiversity (BBOP website, http://bbop.forest-trends.org ).

**Community:** any group of organisms belonging to a number of species that co-occur in the same habitat or area and interact through trophic and spatial relationships; typically characterised by reference to one or more dominant species (Lincoln et al., 1998).

**Compensation:** a form of mitigation in which loss or degradation of a natural resource is compensated for by its creation or recreation at an alternative site. (Treweek, 1999)

**Certified Environmental Practitioner (CEnvP) Scheme:** a scheme that aims to ensure that talented, skilled and ethical environmental professionals are given due recognition in line with their professional counterparts from engineering, accounting, planning and architecture. (CEnvP website, http://www.cenvp.org/)

**Continuing Professional Development (CPD):** the means by which people maintain their knowledge and skills related to their professional lives. (Wikipedia http://en.wikipedia.org/wiki/Continuing_professional_development, Sept 2014)

**Cumulative effects:** changes to the environment that are caused by an action in combination with other past, present, and future human actions (Canadian Environmental Assessment Agency https://www.ceaa-acee.gc.ca/default.asp?lang=En&n=B7CA7139-1&offset=3&toc=show). Sometimes referred to as "cumulative impacts".

An adverse cumulative effect is an effect that, when combined with other effects, is significant only when it breaches a threshold (RMA Quality Planning website, http://www.qualityplanning.org.nz/index.php/consents/environmental-effects).

**Diversity:** a measure of the number of species or habitats, in a community, assemblage or sample; low diversity refers to few species or habitats, high diversity to many species or habitats. (based on (Lincoln et al., 1998))

**Diversity index:** a measure of the number of species or habitats in a community, assemblage or sample and their relative abundance. (based on Lincoln et al. (1998)).

**Disturbance:** disruption of normal process or behaviour. In community ecology disturbance is defined as an event that displaces organisms, opening up space, which can be colonized by individuals of the same, or different species. (Treweek, 1999)

**Ecology:** the scientific study of plants and animals and their interactions with the physical and biological environment.
*"The scientific study of the interactions that determine the distribution and abundance of organisms"* (Krebs, 1994, p.3)

**Ecological assessment:** the process of describing the quantitative and qualitative aspects of habitats or ecosystems and assigning value to them, or to the ecological features comprising them. Ecological assessment may be repeated over time to monitor changes in state.

**Ecological features:** specific aspects of ecosystems that are described and evaluated; the term includes components (e.g. species, habitats), processes (e.g. gene flow, nutrient cycling) and functions (e.g. roosting, feeding, establishing territory).

**Ecological Impact Assessment (EcIA):** the process of identifying, quantifying and evaluating the potential impacts of defined actions on ecosystems or their components. If properly implemented it provides a scientifically defensible approach to ecosystem management (Treweek, 1999).

**Ecological integrity:** the degree to which the physical, chemical and biological components (including composition, structure and process) of an ecosystem and their relationships are present, functioning and maintained close to a reference condition reflecting negligible or minimal anthropogenic impacts (Schallenberg et al., 2011).

**Ecological value:** the importance of ecological features or their components (such as species, habitats, processes, ecosystems, community composition) determined by their rarity, vulnerability and role in ecosystem functioning.

**Ecosystem:** a dynamic complex of plant, animal, and microorganism communities and their non-living environment interacting as a functional unit. (Millennium Ecosystem Assessment, 2005)

**Effect:** the outcome to an ecological feature from an impact. See also "impact" (Chartered Institute of Ecology and Environmental Management (CIEEM), 2016). The terms "impact" and "effect" are used interchangeably in some publications but this is not consistent with the IAIA definition. The RMA also states:
*3. Meaning of effect*
*In this Act, unless the context otherwise requires, the term effect includes—*

> *(a) any positive or adverse effect; and*
> *(b) any temporary or permanent effect; and*
> *(c) any past, present, or future effect; and*
> *(d) any cumulative effect which arises over time or in combination with other effects— regardless of the scale, intensity, duration, or frequency of the effect, and also includes*
> *(e) any potential effect of high probability; and*
> *(f) any potential effect of low probability which has a high potential impact.*

(Section 3: amended, on 7 July 1993, by section 3 of the Resource Management Amendment Act 1993 (1993 No 65).)

As an example, while the removal of podocarp trees is an impact, the effect is the loss of roost sites for bats.

**Elasticity:** a measure of the rapidity of restoration of a stable state following ecosystem disturbance (Treweek, 1999)

**Endemic:** (of a plant or animal) belonging to a specified area or region.

**Environmental compensation:** any action (work, services or restrictive covenants) to avoid, remedy or mitigate adverse effects of activities on a relevant area, landscape or environment, as compensation for the unavoided and unmitigated adverse effects of the activity for which consent is being sought. (JF Investments Limited v Queenstown Lakes District Council, Environment Court C48/2006)

**Environmental Impact Assessment (EIA):** the process of identifying the future consequences on the environment of a current or proposed action (IAIA website, http://www.iaia.org/, Sept 2014). See also "AEE".

**Habitat:** the place and resources occupied and used by a population of organisms. (Treweek, 1999)

**Home range:** the area habitually used by an individual or species to fulfil its requirements for food, shelter and a place to breed; excursions beyond this area are rare (adapted from Treweek, 1999).

**Impact:** an action resulting in changes to an ecological feature. For example, construction activity which removes a patch of old podocarp trees. See also "effect" (Chartered Institute of Ecology and Environmental Management (CIEEM), 2016). The terms "impact" and "effect" are used interchangeably in some publications.

> **Direct impact:** an outcome that is directly attributable to a defined action. (Treweek, 1999)
>
> **Indirect impact:** an impact that is attributable to a defined action or stressor, but that affects an environmental or ecological component via effects on other components. Indirect effects are often, but not necessarily, time-delayed or expressed at some distance from their source (Treweek, 1999). Also known as "secondary impacts".

**Indicator:** any representative component, used to provide surrogate measurements reflecting the likely behaviour of other components.

**Intrinsic value:** in relation to ecosystems, means those aspects of ecosystems and their constituent parts which have value in their own right, including—

> (a) their biological and genetic diversity; and
> (b) the essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience

(RMA S1 definitions and S7(d) other matters)

**Indigenous:** describing a plant or animal species which occurs naturally in New Zealand. A synonym is 'native'. (NZ Biodiversity Strategy –Glossary, https://www.doc.govt.nz/biodiversity , Sept 2014).

**Mahinga kai:** traditional and customary food species and natural resources, the places where these are obtained and the practices used in doing so. Literally means 'to work the food'.

**Manawhenua:** iwi, hapū, whānau or individual holding customary authority over land or territory or resources, associated with the possession, occupation and use of land and resources. Aligns with Section 6e of the Resource Management Act 'the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga'

**Māori Manawhenua values:** the worth put on historic, cultural, spiritual, and biophysical aspects of the environment by Māori; often they are expressed in a spatial or geographic context. In the EcIA process, these should be considered at the project and effects scale. (Based on http://www.landcareresearch.co.nz/science/living/indigenous-knowledge)

**Mātauranga Māori:** the knowledge, comprehension or understanding of everything visible and invisible existing in the universe' (from http://www.landcareresearch.co.nz/science/living/indigenous-knowledge)

**Mitigation:** the process of preventing, avoiding, or minimising adverse impacts by: (i) refraining from a particular action; (ii) limiting the degree of an action; (iii) repairing, rehabilitating or restoring the affected environment; (iv) providing substitute resources (Treweek, 1999).

**Native:** see "indigenous".

**No net loss:** (of biodiversity) the point at which habitat or biodiversity losses equal their gains, both quantitatively and qualitatively. (Treweek, 1999)

**Permitted baseline:** a concept designed to disregard effects on the environment that are permitted by a plan or have been consented to (RMA Quality Planning website).

**Precautionary:** the precautionary principle is expressed in the Rio Declaration (United Nations, 1992b), which stipulates that, *'where there are threats of serious or irreversible damage, lack of full scientific evidence shall not be used as reason for postponing cost-effective measures to prevent environmental degradation'*.

Rather than using the term 'precautionary principle', it is preferable to explain precisely what assumptions have been made and why, and to present an analysis of the implications of these assumptions. The term does not appear in the RMA. Its use in the NZ consenting process is discussed in http://researcharchive.vuw.ac.nz/xmlui/bitstream/handle/10063/5199/thesis.pdf?sequence=1 .

**Receptor:** any ecological feature or component affected by a particular action or stressor (Treweek, 1999).

**Rehabilitation:** practice of restoring or creating physical and biological habitat conditions and ecosystem functioning, to enable desired ecosystem development to occur.

**Replaceability:** a measure of the extent to which a habitat or ecosystem can be restored or reconstructed (Treweek, 1999).

**Resilience:** the ability of a species, community, or ecosystem to respond and adapt to external environmental stresses (NZ Biodiversity Strategy – Glossary, https://www.doc.govt.nz/biodiversity , Sept 2014). See also elasticity.

**Restoration:** practice of renewing and restoring degraded, damaged, or destroyed ecosystems and habitats in the environment by active human intervention and action.

**Stability:** the ability of an ecosystem to maintain some sort of equilibrium in the presence of perturbations (Treweek, 1999).

**Vulnerability:** exposure to contingencies and stress, and the difficulty in coping with them. Three major dimensions of vulnerability are involved:

- exposure to stresses, perturbations, and shocks;
- the sensitivity of people, places, ecosystems, and species to the stress or perturbation, including their capacity to anticipate and cope with the stress; and
- the resilience of the exposed people, places, ecosystems, and species in terms of their capacity

(Millennium Ecosystem Assessment, 2005)

This should not be confused with the IUCN definition of "vulnerable" in relation to threatened taxa.

**Zone of influence:** the areas/resources that may be affected by the biophysical changes caused by the proposed project and associated activities.

# 1 Introduction

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# Key Points

**1.1 Ecological Impact Assessment** (EcIA) is an independent, stand-alone, and specific scientific process for identifying, quantifying and evaluating the potential impacts and effects of defined actions on ecosystems or their components. It provides a scientifically defensible approach to ecosystem management in the context of development.

EcIA should be integrated with environmental impact assessment for **projects, strategies or policies** that have potential effects on ecosystems or biodiversity features.

Good, clear EcIA practice is important for ecologists employed by a project developer or proponent as well as for local authority staff receiving applications and ecologists working for stakeholder organisations or individuals.

These Guidelines are intended to be high level and should assist in a range of assessments, large and small, simple and complex. It is expected that, depending on the scale of your project and the ecological complexity of the project site, some sections of the Guidelines will be less relevant than others and some may not be applicable at all. These are matters that will become clear at the project scoping stage.

1.2 After the need for an EcIA has been determined through screening, the **key steps** are:

- Scoping
- Describing ecological features through detailed investigations
- Evaluating ecological features
- Assessing potential and actual effects
- Establishing impact management options
- Developing monitoring requirements

1.3 The ecologist should be aware of manawhenua values in relation to a project, and work with a specialist to ensure that these values contribute to an overall ecological understanding.

1.4 EcIA is required to assist decision-making under the Resource Management Act, Conservation Act and other New Zealand legislation. When contributing to an Assessment of Environmental Effects for a resource consent application, the EcIA should address the matters set out in s88 and Schedule 4 of the RMA. It should address matters in National Policy Statements, National Environmental Standards, Regional Policy Statements, and Regional and District Plans.

1.5 These Guidelines draw on international and New Zealand guidance and are linked to those being developed by New Zealand Transport Agency.

# 1.1 What is Ecological Impact Assessment?

In defining Ecological Impact Assessment, Treweek states:

> *"EcIA is firmly rooted in ecological science, drawing on traditional techniques of survey, monitoring, functional analysis and predictive modelling. In addition however, EcIA requires evaluation of the implications of any predicted outcomes. It is this aspect of evaluation which distinguishes EcIA from the pure science of ecology and which has created demand for new approaches to the ways in which ecological information is handled...Ecological outcomes must therefore be translated into a common language or scale for comparison with other findings, whether these are of a social, economic or political nature. In short, EcIA should provide a scientifically defensible rationale for decision making and for environmental management" (Treweek, 1999).*

The purpose of EcIA is to provide reliable information about, and interpretation of, the ecological implications of any project or policy, from inception to operation and, where appropriate, decommissioning. In New Zealand, the ecological impact assessment process contributes to the preparation of an Assessment of Environmental Effects (AEE) supporting an application under the Resource Management Act 1991, the Resource Management Amendment Act 2013 and other pieces of legislation.[2] An Ecological Impact Assessment report may be prepared as part of an AEE or as a separate document depending on the nature and scale of a proposal.

For a larger project, an EcIA report may be one of a series of technical reports prepared as part of investigations, design and consenting stages. Best practice is to avoid impacts before mitigating them, so for larger projects the ecologist should be part of a project team and involved in many aspects of the development of proposals and options. The findings of the EcIA process will be used by the planner and the legal team preparing the full AEE under section 88 and Schedule 4 of the RMA. The ecologist may be required to assist the planner to understand some ecological aspects, especially the assessment of ecological effects.

For a small project, an ecological impact assessment may be carried out easily and quickly, and be based on existing information; the report in that case may be relatively short and be appended to the AEE produced by the project planner.

An EcIA should investigate and describe those ecological features which are potentially impacted upon by a proposal. This should be done to a level of detail that corresponds with the scale and significance of the effects that the activity may have on those ecological features[3]. The EcIA report can then form part of an application for, for example, a resource consent[4]. A similar process would be required for a s127 application (application to change an existing consent(s)), a Notice of Requirement for a designation, and a privately requested plan change.

Part 2, s5 of the RMA states:

> *"Sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—*
> *(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
> *(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
> *(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment."*

[2] "Ecological assessment" is not the same as Ecological Impact Assessment. Ecological assessment is the process of describing and assigning value to ecological features and can be used as a basis for other activities such as monitoring or for prioritising resources for management.
[3] Schedule 4 of the RMA
[4] S88 of the RMA

The High Court recently found (NZHC 52, 2017), that Part 2 matters should have been taken into consideration in drawing up objectives, policies and rules in any Regional or District Plan, so that decision makers addressing resource consents should not have recourse to Part 2 matters. However, for other applications, this may not be so. The ecologist should discuss the extent to which Part 2 matters should be addressed through an EcIA with the project planner.

EcIA is one of the many sub-sets of Impact Assessment (IA) and, as such, shares the common framework of concepts that guide impact assessment. EcIA practitioners may well need to synchronise their approaches to facilitate information sharing and integrated assessments. Terms such as "scoping" and "assessment" (for example) have specific meanings to IA practitioners. The International Association for Impact Assessment (IAIA) provides a range of guides and publications including some which will help the specialist assessor, for example http://www.iaia.org/uploads/pdf/What_is_IA_web.pdf.

An ecologist should be involved in the early project discussions with the proponent and his/her advisors about whether ecological issues are likely to be such that an EcIA will be needed and, if so, at what level or scale (screening). In its simplest form, an assessment may determine at the scoping stage that potential and actual effects will be minor or negligible, and further investigations are unnecessary.

These Guidelines are intended to be high level and have been developed to contain sufficient detail to assist in all types of assessment, large and small, simple and complex. Depending on the scale of a project and the ecological complexity of the project site, some sections will be less relevant than others and some may not be applicable at all. These are matters that will become clear for the specific project at the project scoping stage.

Good EcIA practice is important for ecologists practising in a range of roles. Local authority ecologists receiving applications should be able to review and audit an EcIA report. Stakeholder organisations or individuals should be able to see the approach and processes that have been followed in preparing one.

Local authority consents staff need to receive a good quality EcIA report in order to assist in making a decision on whether to notify a consent application, either fully or with limited notification, where there are effects on ecological components. Notification is undertaken when the effects of the proposed activity are considered to be more than minor – a rigorous assessment of effects is needed to guide consent staff on this, even if the proposal is small in scale. Only 3% of consent applications were notified in the period 2012/2013 (the latest period for which figures are available)[5] (Ministry for the Environment, 2014b)

Although EcIA is commonly used for large developments or major activities, it might equally apply to any occasion where change must be assessed; for example, as part of adaptive management of protected areas or of biodiversity across whole landscapes; assessing the potential impacts of proposed local authority plans; or Strategic Environmental Assessment (SEA)[6]. EcIA should be integrated with project or policy development, and complement or link to work in other disciplines being carried out in undertaking an Environmental Impact Assessment (EIA) or preparing an AEE.

There are numerous publications, methodologies and tools for describing, evaluating and monitoring ecosystems, and many of these are referenced in the following chapters. This guide does not repeat them or advocate for one over another. It is left to the practitioner to select and justify use of those methods s/he employs in their assessment based on their experience, professional judgement, and the applicability of their method to the project site and scale of assessment.

[5] http://www.mfe.govt.nz/publications/rma/resource-management-act-two-yearly-survey-local-authorities-20122013
[6] Strategic Environmental Assessment is widely undertaken in UK and EU countries (see www.unep.ch/etu/publications/textONUbr.pdf), but less often in New Zealand.

## 1.2 Key steps in EcIA

In its simplest form, the EcIA framework assists the ecologist to:

- Contribute to project shaping where possible with the goal of avoiding or minimising effects
- Understand the scope or scale of the project design
- Describe and assign value to ecological features and components potentially impacted
- Describe and determine the magnitude of effects
- Combine value and magnitude to assess the level of effect
- Use descriptions, values and impact assessment to determine the nature and scale of impact management.

The key stages in EcIA are summarised in **Table 1.** EcIA is an iterative process (see **Figure 1**). This means that the stages may be reviewed and/or repeated when project designs change in response to findings of ecological investigations (as well as to inputs from other disciplines).

A broad review of the need for, and potential scope of, an ecological impact assessment is often carried out as part of initial project development by a generalist environmental advisor or planner and may be called **screening**. An ecological impact assessment should be made whenever a proposed activity or policy has potential effects on ecosystems or their components.

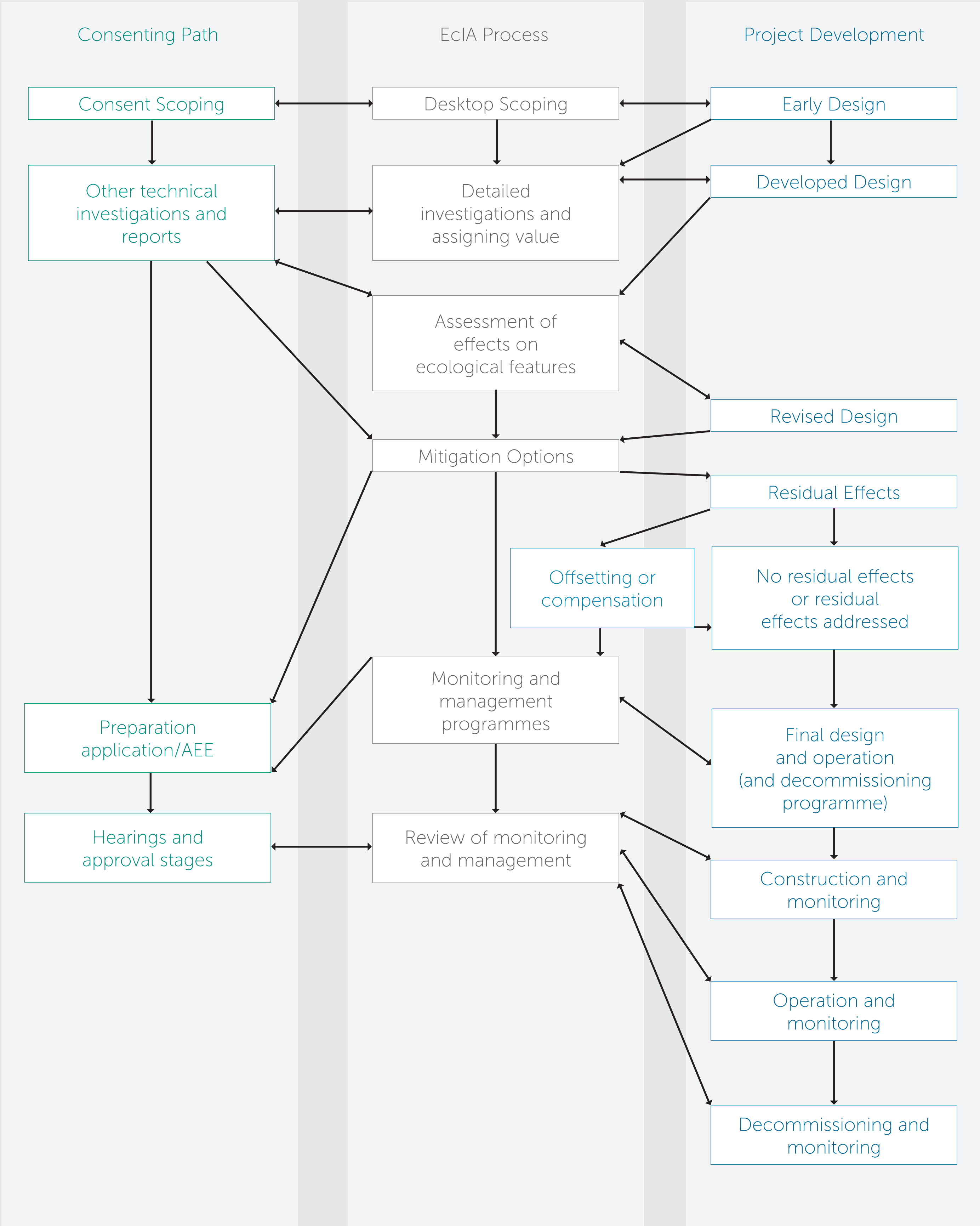
**Table 1. Steps in the ecological impact assessment process**

| | WHY? | WHAT? |
|---|---|---|
| **Scoping. A preliminary ecological assessment at the early planning stage which forms the basis for selecting those valued ecological resources to be subject to detailed assessment due to potentially serious impacts, and for early identification of impact strategies. The results of scoping often feed into "project shaping" where project design is reviewed and possibly modified.** | To focus further investigations<br>To prioritise allocation of resources<br>To identify possible "fatal flaws"<br>To feed into project design through project shaping | Overview of ecological components and project<br>Initial assessment of important ecological components<br>Initial identification of issues<br>Gap analysis |
| **Description. Work carried out during the detailed planning and design stages, to identify and describe ecological features within the zone of influence.** | To give scientific basis for evaluation, impact assessment and impact management<br>To feed into project design and AEE | Ecological details – understanding the ecosystems involved<br>Qualitative and quantitative aspects<br>Mapping and describing |
| **Evaluation. Determining the ecological value or importance of features of interest within the zone of influence.** | To determine how features might be susceptible to project activities<br>To guide the nature and extent of impact management<br>To eliminate areas or features of low ecological value from further consideration<br>To feed into project AEE | The relative importance of the ecological components<br>The attributes that contribute to the importance ranking of those ecological components |
| **Assessment of impact/effects. Identification and prediction of potential positive and adverse effects of the activity, and their degree of effect; determining the need for impact and effect avoidance, remedy and mitigation, as well as other management opportunities such as enhancement.** | To determine the nature of project effects<br>To determine the magnitude of project effects<br>To feed into project AEE | The ways in which project activities could impact on ecological features<br>The level of potential/actual effects on ecological components |
| **Impact management. Establishing measures needed to avoid, remedy or mitigate adverse impacts and effects, and their likely success; then assessment of the residual effects. If significant negative effects are still likely, it may be necessary to consider the need for, and value of, ecological compensation or biodiversity offsetting. The positive impacts and effects of such compensation proposals should be rigorously assessed.** | To describe how the adverse ecological effects of the project be avoided, remedied, mitigated or otherwise managed.<br>To describe positive ecological effects<br>To feed into project AEE | Impact management measures that address RMA requirements |
| **Monitoring. Developing appropriate monitoring requirements and management strategies, programmes or plans.** | To record what needs to be monitored, when, and how, so that predicted impacts, effects and impact management actions can be evaluated. | Monitoring programme and feedback into any adaptive management programme. |

Figure 1 illustrates the link between EcIA stages and commonly used project development and consenting phases. The process of scoping, investigation, analysis of results and feedback into the project, should be iterative so that ecological outcomes can be optimised. This should lead to a more efficient progression of the proposal through the resource consent process. The earlier an ecologist is involved, the earlier ecological factors can be considered and the project design and development process can become more efficient. In practice, the steps in environmental and ecological assessment processes are often not so clear-cut or linear for a range of reasons. As a project develops, changes in scope, area, timing or other factors may require further investigation and reassessment.

Particularly for a large-scale proposal, other impact assessment work is likely to be taking place at the same time as an EcIA, for example a Landscape and Visual Assessment, Stormwater Assessment, and/or Cultural Impact Assessment. The ecologist needs to be aware of these pieces of work to ensure that the principles, methods and findings are integrated with the EcIA where appropriate.

**Figure 1.** **Ecological Impact Assessment process in the project life-cycle.**



## 1.3 Manawhenua values

The expressions "Māori values" or "manawhenua values" recognise the special relationship which Māori communities have, and/or have had, with the environment, species, specific sites or areas, and changes affecting them. While these guidelines focus on the ecological values placed on species, habitats, ecosystems and places by western scientific analysis, it is acknowledged that Mātauranga Māori offers a complementary perspective on indigenous ecological components. It is not the role of the ecologist to assess impacts on these components. However, it is important that the ecologist is aware of the values, and works with any specialist who might be working on the project through carrying out a cultural impact assessment or has a relationship with iwi. It is good to engage with iwi and understand the cultural values placed on species and ecosystems that may form part of the overall ecological understanding and assessment.

Māori value indigenous species for a variety of reasons with two key components being whakapapa (or genealogical and ancestral connection) and mahinga kai (food and resource gathering practices). A great deal of information has been accumulated on ecological aspects about the places that support, or once supported, these species, due the continuity of use or occupation of these places. This information is sometimes called "traditional ecological knowledge" in international literature, while in New Zealand it makes up part of what is called "Mātauranga Māori". It is usually not recorded in scientific publications, but retained orally or published in historic documents, often associated with land purchases or settlements. For example, lists of species at specific sites were documented for the Smith-Nairn Royal Commission in 1879 as part of investigations into the Kemps Purchase of Canterbury. Mātauranga Māori can therefore contribute to building up a picture of changes in species or habitats over a period of time not covered by scientific observations. Some Treaty Settlements also include specific 'Taonga Species' lists that identify species of particular significance to specific iwi or hapū. These lists and the mechanisms associated with them can therefore provide information of relevance to ecological assessments.

If a cultural impact assessment (CIA) is being carried out for the project, the ecologist can work with the person or iwi/hapū doing that work to collect ecological information and to build that into the EcIA. At the impact management stage, management of impacts on cultural values and on ecological values may involve similar goals and there may be synergies around approaches to achieving those goals.

If the proponent has chosen not to carry out a CIA, and depending on the nature of the project and zone of influence, the ecologist should consider if specialist advice on manawhenua values is needed. At the Scoping stage, the ecologist can make a preliminary investigation of manawhenua values by desktop research, and this is described in Chapter 3. If this information is insufficient for further investigations, the ecologist should advise their client that a CIA may be needed (see Chapter 4). At this stage, it would be appropriate to engage with the local iwi or hapū..

In Chapter 5, the Guidelines discuss how manawhenua values may be considered when making an ecological evaluation. Effects on those values can only be assessed by the appropriate iwi or hapū, or by working in collaboration with manawhenua. Manawhenua in this document/context refers to the particular iwi and/or hapū that are recognised as maintaining traditional and contemporary associations and authority or mana with the particular location being considered. It is important to note that there may be more than one iwi or hapū involved in this. If this is the case, it will be necessary to work with all of them. It is also worth noting that some iwi and hapū have created specific organisations and consultancies to deal with resource management and environmental issues, such as Mahaanui Kurataiao Ltd, Kai Tahu Ki Otago Ltd and Te Ao Marama Incorporated in Te Waipounamu (the South Island).

Te Puni Kōkiri (Ministry of Māori Development) maintains the Te Kāhui Māngai website which provides a directory of iwi and Māori organisations that can be identified by regions and on an interactive map. This is a good guide for identifying manawhenua in a particular location and can be found at http://www.tkm.govt.nz/. Local councils may also be able to assist, as well as other consultants and specialists who work with iwi, hapū and Māori organisations.

# 1.4 Legislation

## 1.4.1 Introduction

Although the primary legislation relating to an EcIA is the RMA, the ecologist undertaking an assessment should seek guidance from a resource management lawyer or planner on legislation relevant to the project being assessed. The ecologist should also be aware of the contents of specific New Zealand legislation relating to ecological or biodiversity features and values, and make their client aware of the range of responsibilities; for example, the need to have permits to handle wildlife (under the Wildlife Act 1953) should the project go ahead. It is important to remember that the EcIA process and report(s) do not make the decision about whether a proposal should go ahead – the purpose is to provide information that will assist the decision-maker to make their decision under the relevant piece of legislation. Appendix 1 provides information about relevant national legislation. Regional and district plans are discussed in the next section.

## 1.4.2 Section 88 and Schedule 4

Developing your EcIA requires a good understanding of both the proposal, and of the requirements of Schedule 4 of the RMA. Schedule 4 specifies the information that must be provided and the questions that must be answered to ensure a consent application lodged under s88, is sufficient and complete. In relation to an EcIA, the key sections of Schedule 4 are as follows:

Clause 1 requires that any information required by this schedule (including an assessment under clause 2(1)(f) or (g),) must be specified in **sufficient detail** to satisfy the purpose for which it is required.

Clause 2 details the information that must be provided with an application as a whole.
*(1) An application for a resource consent for an activity (the activity) must include the following:*
> *(a) a description of the activity:*
> *(b) a description of the site at which the activity is to occur:*
> *(f) an assessment of the activity against the matters set out in Part 2:*
> *(g) an assessment of the activity against any relevant provisions of a document referred to in section 104(1)(b).6.*

Clause 6 requires the assessment of the activity's effects on the environment to include:
> *(a) if it is likely that the activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity:*
> *(b) an assessment of the actual or potential effect on the environment of the activity:*
> *(c) if the activity includes the use of hazardous installations, an assessment of any risks to the environment that are likely to arise from such use:*
> *(d) if the activity includes the discharge of any contaminant, a description of—*
> > *(i) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and*
> > *(ii) any possible alternative methods of discharge, including discharge into any other receiving environment:*
>
> *(e) a description of the mitigation measures (including safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effect:*
> *(f) identification of the persons affected by the activity, any consultation undertaken, and any response to the views of any person consulted:*
> *(g) if the scale and significance of the activity's effects are such that monitoring is required, a description of how and by whom the effects will be monitored if the activity is approved:*
> *(h) if the activity will, or is likely to, have adverse effects that are more than minor on the exercise of a protected customary right, a description of possible alternative locations or methods for the exercise of the activity (unless written approval for the activity is given by the protected customary rights group).*

Clause 7 requires an assessment of the activity's effects on the environment to address:
> *(c) any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity:*
> *(d) any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations:*

Guidance on the interpretation of s88 and Schedule 4 can be found in *A guide to section 88 and Schedule 4 of the Resource Management Act 1991* (Ministry for the Environment, 2014a). In interpreting the requirements of Schedule 4, the ecologist should also refer to the definition of 'effect' (see Glossary) which identifies those things that constitute an effect.

### 1.4.3 Regional and District Plans

Regional Policy Statements, National Policy Statements, National Environmental Standards, and Regional and District Plans provide the most immediate and relevant regulatory framework for assessing effects on ecological features and values and implementation of the RMA. The ecologist should be aware of Plan provisions relating to ecological features in the area in which the project is being undertaken and its zone of influence.

Regional and District Plans can be viewed online and in some cases interactive maps are available. Websites and contact details for each council can be obtained through http://www.localcouncils.govt.nz or http://www.lgnz.co.nz/home/nzs-local-government/new-zealands-councils/

While plans differ, some key matters that the ecologist should check in undertaking an EcIA are:

- Maps and/or Schedules of areas of ecological value. These have different names in different places, including Significant Natural Areas (SNA), Areas of Significant Conservation Value (ASCV), Sites of Ecological Significance (SES), and Ecological Heritage Sites (EHS). These sites have planning status and can provide good basic information about the locality. It is important to consider the values for which such sites were originally listed and/or mapped in current ecological terms. It is important to remember that ecologically valuable sites may be present, but not listed for political or other reasons; for example, in some places, sites were only listed in a plan after the landowner gave approval.
- Policies and Rules associated with the mapped/listed areas of ecological value. There may be constraints on activities to protect ecological values that are relevant to the proposal.
- Criteria for identification of areas of ecological significance or value (in relation to section 6(c) RMA). Often these are given in a plan.
- General rules related to land or water use in the zone of influence. These may set standards for matters such as permitted activities, mitigation activities, monitoring or non-notification.
- Biodiversity offsetting policy in relevant plans. Few plans have policy on offsetting in place yet, but as the concept and its implementation develop, more are likely to do so. The Proposed National Policy Statement on Indigenous Biodiversity prescribes the need for this policy to be developed by territorial local authorities, but is not operative. The Government has published guidance for biodiversity offsetting in New Zealand: http://www.doc.govt.nz/publications/conservation/biodiversity-offsets-programme/. The BioManagers Group of the Regional Council Biodiversity Working Group is currently preparing guidance for local government decision-makers.

Regional Councils have recently considered adapting their approach to management of biodiversity (Willis, 2017) and this may result in changes to policies and plans throughout the country.

## 1.5 Other guidance

These Guidelines draw on other published sets of guidelines.

The *"Ecological Impact Assessment Guidelines: First Working Draft"* (Environment Institute of Australia and New Zealand, 2010) are available on the EIANZ website and provide a good discussion of some of the key elements of biodiversity management and EcIA in general. These remain a "draft" and are not intended to give detailed practice guidance. They provide the general background to the New Zealand document; but for ecologists working in New Zealand, the NZ Guidelines 2015 and 2018 supersede the 2010 Guidelines.

The Institute of Ecology and Environmental Management (IEEM[7]) produced the *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal 2nd Edition in 2016* (Chartered Institute of Ecology and Environmental Management (CIEEM), 2016), updating the *Guidelines for Ecological Impact Assessment in the United Kingdom* (Institute of Ecology and Environmental Management, 2006). These have been widely adopted as best practice in the UK and complement the 2010 *Guidelines for Ecological Impact Assessment in Britain and Ireland: Marine and Coastal* (Institute of Ecology and Environmental Management, 2010) (http://www.cieem.net/publications-info).

The Quality Planning website provides a good overview of many aspects from the planner's perspective[8].

In August 2014 the EIANZ Impact Assessment Special Interest Section released *Draft Guidelines for Impact Assessment* (see http://www.eianz.org/aboutus/impact-assessment) which addresses the broader impact assessment process.

The New Zealand Transport Agency (NZTA) is currently preparing guidelines for ecological impact assessment which will draw on these EIANZ EcIA Guidelines, and tailor them to give specific direction for application on Transport Agency projects. NZTA notes that while the EIANZ document primarily focusses on the RMA process there are a number of EcIA actions required in a Transport Agency project's development before the consenting process occurs. For Transport Agency projects, different levels of detail are required from the EcIA depending on the project development phase, and nature and complexity of both the project and the natural environment it could affect.

NZTA and these EcIA Guidelines authors have worked to ensure that the guidance presented in the two documents align.

[7] In 2013 IEEM became the Chartered Institute of Ecology and Environmental Management, CIEEM.
[8] http://www.qualityplanning.org.nz/index.php/planning-tools/indigenous-biodiversity/describing-and-evaluating- biodiversity-values

# 2 Professional practice and EcIA

# 2 Professional Practice and EcIA Key Points

**2.1** An ecologist paid to undertake or review an Ecological Impact Assessment is a professional, and therefore has important responsibilities to their clients and **professional** colleagues. This includes ecologists working for a project proponent, on policy implementation or in consent processing.

**2.2** A professional ecologist **must comply** with the law, and should also be:
- **An expert** – competent and skillful, working within the widely accepted paradigms and knowledge base of the profession
- **Ethical**, trustworthy, reliable and committed to the profession
- Dedicated to their **professional development** both for him/herself and for those people who are affected by their work

A professional ecologist must also provide a service to their **client (or employer)**, while acting in the best interests of the public or society and the natural environment.

**2.3** The **EIANZ** *Code of Ethics and Professional Conduct* addresses:
- Promotion of ecological **conservation principles**
- Advocating for the use of **objective scientific and technical knowledge** in describing, evaluating, protecting and managing ecological values
- Considering the knowledge, information and **views of all stakeholders** on ecological matters
- **Seeking advice** from others in relation to areas outside their expertise and working collaboratively with other professionals in multi-disciplinary teams

Circumstances where the ecologist may need to address **conflict** between ecological science and RMA requirements are discussed.

In carrying out their work, a professional ecologist should consider:
- **Conflicts of interest** – real and perceived
- Personal **bias**
- **Facts, professional judgment and personal opinion**
- Maintenance of their personal **professional integrity**

**2.4 Duties** to their employer or client (whether in the public or private sector) include:
- Making them **aware** of the full range of ecological components of the project, especially any major ecological values and/or risks associated with the project
- Respecting obligations of **confidentiality and privacy**
- Providing **accurate and clear information and advice**, making ecological information as accessible and understandable to them as possible
- Ensuring that they are aware of the **limitations** of any ecological work caused by timing or resourcing issues outside your control
- Acting professionally in relation to **time and financial management**

**2.5** It is important to recognise the **limits** of your skills and undertake **continuing professional development (CPD).**

## 2.1 Introduction

This section focuses on the role of an ecologist as a professional, with particular reference to working on EcIA.

Because ecosystem functioning and biodiversity are critical to the whole environment and to people, now and in the future, it is sometimes difficult for an ecologist to separate his or her role as a scientist and technical advisor from his or her personal opinions and concerns about environmental management. Many ecologists would argue that the two cannot and/or should not be separated.

In undertaking ecological impact assessment, it is important to acknowledge the different aspects and to provide professional judgment rather than personal opinion.

Without employers or clients to pay fees or salaries, there is no profession. In this chapter the term 'client' is used to cover providers of long term employment and short term contracts or consultant work. It encompasses the ecologist preparing an EcIA report, the specialist providing information about a specific ecological aspect, and the ecologist advising local authority planning staff receiving an application and EcIA report.

Some people are concerned that if an ecologist (or indeed, any professional) is paid to give advice, then that advice will be shaped to suit the person paying them. Equally, an ecologist working *pro bono* for an organisation or community may be considered to be a supporter of that group and its wider objectives. In this chapter, the ways in which an ecologist should conduct him/herself to avoid these perceptions (or realities) are discussed.

It is equally important that an ecologist reviewing or auditing an EcIA report on behalf of a local authority acts in a professional way, meeting high standards of technical and ethical behaviour. This chapter of the Guidelines applies to all ecologists, not only those working as consultants.

## 2.2 The professional ecologist

Being paid to be an 'ecologist' is a profession, so all work needs to adhere to good professional practice.

Compliance with the law in relation to ecological impact assessment is a minimum standard. In New Zealand, an ecologist will usually be carrying out an ecological impact assessment as part of an application under the Resource Management Act 1991, but as discussed in Chapter 1, other legislation may be involved. *The Environment Court of New Zealand Practice Note*[9] provides clear guidance for preparation of evidence, and can also be used to guide general professional actions. A new Practice Note came into effect on 1 December 2014.

The EIANZ *Code of Ethics and Professional Conduct* (Environment Institute of Australi a and New Zealand, 2012) provides guidance for all aspects of environmental practice. However, this can be in conflict with requirements of New Zealand legislation, as discussed later (Section 2.3). The New Zealand Ecological Society is a Constituent Organisation of the Royal Society of New Zealand, which has a *Code of Professional Standards and Ethics* (Royal Society of New Zealand, 2012). While the RSNZ recommends its Code to all practitioners, the Code is not binding on members of Constituent Organisations unless that Organisation makes it a condition of its own membership.

Being 'professional' means:

- Being an expert (defined by qualifications, ongoing professional development and practice)
- Being competent and skilful
- Being trustworthy, reliable and committed to your profession
- Being dedicated to your professional development, both for yourself and for those people who are affected by your work
- Working within the widely accepted definitions, insights and knowledge base of the ecological profession
- Working within one's area of expertise and acknowledging the source when relying on other, identified evidence
- Behaving in an ethical way

It also means providing a service to your client (or employer), while acting in the best interests of the public or society and the natural environment. This is where an ecologist may find it hard to achieve the balance between providing advice to inform a client's EcIA brief and project requirements, and their understanding of the natural environment. Clear enunciation and documentation of ecological values, the significance of potential adverse effects, and the adequacy of mitigation are essential for giving professional advice.

EIANZ also produces Position Statements which members can use to clarify their thinking and support arguments, which are available on the Institute's website (https://www.eianz.org/resources/position-statements). There are currently (April 2018) Position Statements on:

- Biodiversity (October 2009)
- Climate Change (May 2007)
- Energy (March 2007)
- Social aspects of sustainability (2014)
- Sustainability (October 2006)
- Water (March 2007)

These are regularly updated and added to.

[9] http://www.justice.govt.nz/courts/environment-court/documents/environment-court-practice-notes-2014

## 2.3 Ethics and professional conduct in ecological impact assessment

The EIANZ *Code of Ethics and Professional Conduct* (Environmental Institute of Australia and New Zealand, 2012) serves the needs of the wide range of disciplines and expertise found in environmental practitioners in the Institute. Based on the Code, when involved in an EcIA, a professional ecologist should:

1. Promote ecological conservation principles:
   a. integrity of the natural environment and the health, safety and well-being of the human community and future generations
   b. consideration of the whole-ecosystem context, not just components such as threatened taxa
   c. stewardship/kaitiakitanga: humans as custodians rather than owners
   d. recognition of representativeness; how well the ecosystem fits in with natural patterns and processes in the ecological district, region, country and beyond?
   e. recognition and nurturing of special natural features
   f. recognition of the degree of vulnerability and resilience of the ecosystem
   g. recognition of the degree of natural sustainability of the ecosystem; what human input is required long term?
   h. no net loss of ecosystems, ecosystem processes, ecosystem services or biodiversity components; seek maintenance of existing levels of indigenous biodiversity and enhancement where possible

2. Advocate for the use of objective scientific and technical knowledge in describing, evaluating, protecting and managing ecological values.

3. Consider the knowledge, information and views of all stakeholders on ecological matters.

4. Seek advice from others in relation to areas outside their expertise and work collaboratively with other professionals in multi-disciplinary teams.

5. Adopt the *Environment Court of New Zealand Practice Note* (Environment Court, 2014)

6. Follow the High Court Code of Conduct Schedule 4 High Court rules, September 2017 [10]

7. Principle 1h, above, is not a requirement of the RMA 1991. While some documents (e.g. *Proposed National Policy Statement on Indigenous Biodiversity, and Canterbury Regional Policy Statement 2013*) and plans set out policies in relation to net loss and gain of indigenous biodiversity, the RMA itself does not. An ecologist needs to be aware of the potential tension between promoting conservation principles, and the legislation under which an assessment is being prepared, and to clearly state the basis on which particular assessments or judgments are being made.

**Conflicts of interest** should always be declared. A conflict of interest arises where an ecologist employed on a project has an interest which conflicts (or might conflict, or **might be perceived to conflict**) with the interests of the employer. Examples of this are: working for or having worked for a competitor; having a pecuniary interest such as shares or performance incentives; having a relative working for the local authority processing the application; or being a member of an NGO with direct interest in the application. The key question to ask when considering whether an interest might create a conflict is: **Does the interest create an incentive for the employee or contracted person to act in a way which may not be in the best interests of the employer or client?** If the answer is 'yes', a conflict of interest exists and the ecologist should discuss this with their employer to investigate options to declare and address the potential conflict, rather than not carry out the work. The existence of the incentive is sufficient to create a conflict. Whether or not the ecologist employee / contractor would actually act on the incentive is irrelevant.

[10] http://www.legislation.govt.nz/regulation/public/2016/0225/latest/DLM6953324.html

**Personal bias** should also be declared. This arises when an ecologist is a personal friend, relative or associate of the employer or client – a relationship that might (or might be perceived to) bias the interpretation of potential ecological effects unduly in favour of the interests of the employer or client.

**Facts, professional judgment and personal opinion** should be distinguished. Ecologists understand interconnectedness in the environment. They are skilled in assigning ecological value to biodiversity components and identifying potentially harmful activities through the environmental impact assessment process. The IAIA Special Publication No. 3 Biodiversity in Impact Assessment says:

> *"Biodiversity matters to everyone. Its loss impoverishes the environment and reduces its capacity to support people now and in the future. Impact assessment can help to ensure development is compatible with the conservation and sustainable use of biodiversity". (International Association of Impact Assessment (IAIA), 2005)*

Ecologists generally (though not universally) have a personal commitment to ensure that loss of biodiversity is minimised. It is important that this personal commitment is clearly differentiated from professional judgment and advice.

Through appropriate impact management action, there may be opportunities to actively improve biodiversity at a project site or within a larger area; given the state of indigenous biodiversity in New Zealand, ecologists should seek improvement where appropriate. It is the EIANZ position that an ecologist needs to first consider and determine the legal and statutory requirements for impact management associated with a proposal to ensure that, at a minimum, those requirements are met. If opportunities exist to enhance biodiversity further, then the ecologist can present those options to a client with a recommendation.

Personal interest in a particular species, group or location developed over a long period of study should not be allowed to cloud professional judgement. Peer review and use of objective measures of assessment can help to separate personal bias from professional perspectives.

Of great importance is **professional integrity**. The ability to state an impartial ecological view is vital for credibility and avoidance of conflict. This can be difficult to achieve in a litigious setting, where expert witness briefs may be limited in scope and/or employers/clients may apply pressure for the evidence to support their particular case. In such polarised situations, it is best to stick to ecological facts and holistic perspectives, to avoid being lured or manoeuvred into a perceived intellectual capture by the employer or client. *The Environment Court of New Zealand Practice Note* (Environment Court, 2014) notes that material gaps or omissions in evidence should be declared – the same should apply to undertaking impact assessment.

In ecology it is rarely possible, if ever, to prove that a particular outcome will definitely occur, so uncertainty and differences in opinion are acceptable traits of an investigation. Variation in judgement may also reflect real environmental variation but opinions are only valid when they are based upon appropriate evidence or knowledge based on considerable professional experience, peer review and cross-referencing.

Expert professional judgment develops with time and experience. An ecologist should recognise their lack of expertise in an area and not make judgments or assessments on those areas on which they feel inexperienced. The ecologist should recognise and openly acknowledge any limitations to their study, for example in relation to constraints around timing of surveys, or access to all or part of the project site. Others in the project team or mentors outside the project or company should be consulted.

An ecologist's findings should address only ecological matters, and not incorporate areas outside their expertise. The ecologist should clearly spell out the implications of their findings to assist decision-makers to make the decision, rather than attempt to direct the decision itself.

## 2.4 Employers and clients

The ecologist advising a project proponent has a duty to his or her client:

- To have a good understanding of the project for which the assessment is being done prior to accepting the job
- To make the client aware of the full range of ecological components of the project, even if not explicitly briefed to do so (for example, permit or biosecurity aspects that may arise during construction or operation)
- To make the client aware as soon as possible of major ecological values and/or risks associated with the project
- To be honest and trustworthy – to avoid misrepresentation or obfuscation
- To respect obligations of confidentiality and privacy
- To provide accurate information and advice in a clear written, illustrated or verbal form; to consider the recipient and to make the ecological information as accessible and understandable to them as possible
- To explain ecological work and conclusions fully and answer questions openly
- To ensure that the client is aware of the limitations of any ecological work caused by timing or resourcing issues outside the ecologist's control (and notified where possible before work is carried out)
- To act professionally in relation to time-keeping, incurring expenses and invoicing

In relation to EcIA work, the ecologist working within a local authority has a duty to:

- To have a good understanding of the project for which the assessment is being done
- To be aware of the full range of ecological components of the project, (for example, permit or biosecurity aspects that may arise during construction or operation)
- To be honest and trustworthy – to avoid misrepresentation or obfuscation in discussions with other staff, the applicant or in reporting
- To respect obligations of confidentiality and privacy
- To ensure that the scale of assessment carried out is appropriate for the proposal
- To provide accurate information and advice in a clear written, illustrated or verbal form; to consider the recipient and to make the ecological information as accessible and understandable to them as possible
- To explain ecological work and conclusions fully and answer questions openly
- To act professionally in relation to time-keeping and other administrative matters

An ecologist should promote the highest standards of ecological investigation and advice to the client and to other members of any team working on a project.

Clients using the services of an ecologist often have a poor understanding of the natural environment – the ecologist should be able to explain their subject clearly, especially in relation to the uncertainty surrounding assessment of effects on ecosystems and biodiversity. A client may seek to limit the amount of time spent on investigations. This may be to reduce costs or through failing to appreciate the type of work needed. A professional ecologist should always use best practice methods of investigation and analysis, and must make the client aware of the issues that might arise should time and cost restrictions prevent the ecologist from using such methods.

Sometimes, a client may not agree with the findings in an ecological report or recommendations put forward, and seek changes in content or wording, posing an ethical dilemma for the ecologist. While each situation will be different, the ecologist's general options to deal with these situations include:

- To discuss the points at issue with the client for clarification of meaning and implications in relation to the project; and/or
- To discuss the matter with ecological colleagues for review of content and/or format.

It is likely that issues can be resolved through these sorts of discussions; formal mediation could be a further step.

Many clients (especially government departments) will have their own 'environmental policy' or similar documentation. An ecologist should find out whether this exists, and what it says, as part of taking on a project. Any potential conflicts between the project and the client's in-house environmental policy should be identified and acted on as soon as possible.

## 2.5 Continuing Professional Development

A professional ecologist should keep up to date as far as practicable – the focus should be on his or her area of particular interest and expertise. It is important for ecologists carrying out EcIA to be familiar with the relevant sections of the RMA and Conservation Act, and to follow reforms to this legislation. An ecologist should also be familiar with relevant policy documents. However, the ecologist should seek the assistance of a lawyer or planner for a detailed interpretation of legislation.

It is important for an ecologist to work with specialist sub-consultants or colleagues in areas where he or she is not skilled or does not have the appropriate level of understanding. Seeking assistance to provide better advice should not be considered a negative, but instead a benefit through information and knowledge sharing.

There is no organisation specifically representing professional ecologists in New Zealand which means that opportunities for continuing professional development (CPD) have to be actively sought. EIANZ is the leading professional body for environmental practitioners in Australasia – it has a Special Interest Section for Ecology. The EIANZ database of members, certified practitioners (CEnvPs), contacts and subscribers lists over 150 professional ecologists. Ecological topics feature strongly at EIANZ conferences and workshops in both countries.

The trans-Tasman 'Certified Environmental Practitioner' (CEnvP) Scheme recognises experienced ecologists through both a general certification and a specialist 'Ecology' certification process. Certification is gained through application, referee reports, ethical behaviour, work experience, interview and a commitment to undertaking 100 'points' of Continuing Professional Development (CPD) over each two-year period.

To ensure that standards of professional practice are maintained it is important that an ecologist undertakes CPD, regardless of whether they have a CEnvP certification or not.

CPD can also provide an opportunity to meet other ecologists and professionals, which can contribute to best practice standards of work.

The New Zealand Ecological Society and the Ecological Society of Australia are organisations that promote the study of all aspects of ecology. They hold annual conferences and occasional joint conferences, where ecologists can come together, present research results and exchange ideas. They publish journals and newsletters. These organisations thereby set standards for ecological competence, without having defined guidelines or criteria for professionalism. Membership of the relevant Ecological Society is a significant requirement for practising ecologists in New Zealand and Australia.

# 3 Scoping

# 3 Scoping
# Key Points

**3.1 Scoping** an EcIA is the process of determining the broad type and nature of biodiversity and ecological features, and the potential effects of a project or development. This guides the appropriate scale and scope of further investigations, impact management, and monitoring which will make up the full ecological impact assessment. Scoping also feeds into project shaping and helps to identify any "fatal flaws" early in the project.

3.2 At this stage, the lead ecologist needs to cast a **wide net** over the project, ecological values, issues and options **to inform the client** in relation to project design, risks, timing and financial resources. The scale and scope of scoping will depend on the nature of the project – for a small project only a desktop scoping exercise may be required.

Ecological findings and recommendations at this stage should be **documented**, even if a scoping report is not requested.

**Liaison** with other project team members is important to ensure that environmental information is shared and that there is a **common understanding** of the project components. A **map defining boundaries** of areas such as zones of influence, study area, and project site is essential.

Project features to investigate include:

- Proposed **activities and methodologies** throughout construction, operation and decommissioning
- **Location** and **spatial extent** of activities
- **Timing and duration**
- **Quantities and areas** involved

Project scoping often presents the best opportunity to avoid adverse effects since it is undertaken early in the project development process. Through **"Project shaping"** there can be discussions with other team members to identify project constraints which can lead to **adjustments in project design**. This is useful in projects where alternative sites, routes or options are being considered.

At this stage the project should be mapped to identify the **Zone of Influence, project site** and **project footprint** as a basis for further ecological work.

Scoping should **report** on:

- Existing ecological features and values
- Potential effects and ecological issues, including potentially fatal flaws
- Identification of ecological components requiring further study and those for which there is little or no risk of adverse effects
- Options for project development (project shaping), impact management and monitoring
- Requirements for full or further investigations and reporting to meet legislation

3.3 Methods will include:

- **Desktop** /online searches and review of published information
- **Site visit**
- Establishing **ecological values** based on limited data
- **Limited consultation** with stakeholders and local experts

3.4 The ecologist has to address the **limitations** that may be imposed on Scoping in relation to time/timing, resources, early stage project development and lack of integrated planning between project team members.

# 3.1 Introduction

## 3.1.1 Screening

In some countries, such as Australia and the UK, the first step in the EcIA process required by law is **'screening'** where the need for an assessment process is determined. In the UK an environmental impact assessment is not always required by law, but the need is triggered by size and nature of a project, and whether or not it is in a sensitive area. The formal process is set out in the EIA Directive 2014/52/EU, amended May 2014 (European Parliament & Council of the European Union, 2014, p.1) . In Australia, too, different types of project trigger the need for an EIA.

In New Zealand, screening is a general assessment of the need for an EcIA, carried out prior to embarking on RMA processes. Any application for resource consent must provide some environmental information through an Assessment of Environmental Effects; the type and extent of information depends on circumstances as set out in Schedule 4 of the Resource Management Amendment Act. An ecologist should consult with the client's legal and planning advisors to clarify the type of application and therefore the type and level of detail required for an individual application.

## 3.1.2 Scoping Process

**Scoping** discussed in this Chapter refers to the first step in an ecological impact assessment carried out in association with a project for which consent under the RMA or Conservation Act is required. It aims to focus subsequent investigations and community input; to feed into project shaping and design; and to identify any possible "fatal flaws" early in the project.

Scoping may also be referred to as 'gap analysis' or 'fatal flaws analysis'.

# 3.2 Matters to cover in scoping

## 3.2.1 General Context

Ecological Scoping is the process of determining the broad type and nature of biodiversity and ecological features and the potential effects of a project or development. It is a guide to the appropriate scale and scope of further investigations, project development, impact management and monitoring carried out during the full ecological impact assessment.

Scoping may be carried out by an experienced ecologist working alone, or a team. The need for specialist ecological input at this stage will depend on individual skills, the diversity of the environment and the complexity of the project.

The scale of scoping will depend on the scale of the project. For many smaller projects only some of the steps and matters described in this Chapter will be needed and the decision on what is appropriate will be based on the ecologist's experience, the make-up of the rest of the project team (to provide other technical inputs) and the project timetable and budget. (Budget should not constrain the ecologist's findings and reporting, but may limit the practicality of some steps, such as site work).

The nature of scoping may also depend on the applicant or client's own project staging and in-house assessment framework or requirements. For example, the NZTA has specific project staging, unique to that organisation, into which an ecologist may have to fit the EcIA process.

Through initial site and desktop investigations, an ecologist can make preliminary observations of key biodiversity and ecological features, particularly with regard to threatened species, and the constraints or opportunities these may pose to the project. A wide net should be cast over ecological features, values, processes, effects and options to provide a base for making decisions about the development of both the project and the EcIA. Information from a wide range of sources – desktop and site-based – should be collated and analysed.

Scoping is also an essential step in informing the project proponent of further surveys or investigations, stakeholder consultation, statutory implications, design and mitigation options and monitoring requirements, at an early stage in project development. At this stage, the legal and statutory context of a proposal should be reviewed; at minimum, the requirements of the RMA, Conservation Act, Wildlife Act and Biosecurity Act should be considered.

It is also used to gather available information about the scale of the biodiversity and ecological values and effects, on which to base time and costs estimates for further ecological work (and its integration into project development). Often this preliminary information gathering has been done by a consultant as part of developing an offer of service or bid for a job; or by a company's ecologist in preparing a contract brief. Time and funds spent on project scoping can prove valuable in early identification of issues and opportunities that can be addressed efficiently through later project design or operational changes.

While a scoping report is not always required by a client or regulatory body, it is a valuable discipline to record clearly all data, information and analysis so that it can be referred back to later in the assessment process. Scoping should be described in a final EcIA Report. It is also necessary in preparing evidence or answering questions at a hearing, or when the question of alternatives is raised, to be able to explain why certain ecological matters were omitted or included in full investigations and assessments.

At this stage too, the use of peer reviewer(s) should be considered. Peer review, especially in a complex project, provides the lead ecologist and client with an independent appraisal of strategy, methods and reporting.

The CIEEM *Guidelines for Preliminary Ecological Appraisal* (Chartered Institute of Ecology and Environmental Management (CIEEM), 2013) provide some site and deskwork guidance relevant to Scoping in New Zealand, but are generally tailored to the UK planning provisions.

## 3.2.2 Project team

Liaison with other environmental practitioners involved in the project should occur as early as possible. Ideally, the project manager will convene a meeting of all professionals at the start of the project, but this is not always done. The ecologist should make contact with project staff or consultants involved in land and water investigations to ensure consistency around base information, assessment methods and project development options. Liaison with the person or consultants working on the cultural impact assessment with local manawhenua is also appropriate. If a specific cultural impact assessment is not being carried out as part of the project, the ecologist should be aware of the value placed on indigenous species and sites and their use by manawhenua and include these values in their initial information gathering exercise. Direct engagement with manawhenua should also be considered and discussed with your client and/or project team.

It is important at the scoping stage that ecological investigations are based on a correct understanding of parameters such as water quantity and quality, underlying geological or soil conditions, landscape attributes, and cultural values. The ecologist should also make other environmental practitioners aware of any need for specific data or information collection as part of their own investigations. For example, if water flows are to be monitored for baseline data collection, the ecologist may want to suggest a monitoring point relating to potential ecological values to assist in scoping.

## 3.2.3 The project

It is critical to understand the project being assessed. This is sometimes difficult at the earliest scoping stages, since the project itself may be in an early development stage. However, for scoping purposes the ecologist needs to know answers to:

- What is the project about? For what activities are consents being sought? Are these activities continuous or occurring at certain times? What aspects cannot be changed (e.g. location of resources such as rocks) and which are more flexible (e.g. access road)? A map drawn up by the project proponent is needed at this stage to avoid any misunderstanding about locations and areas.

- What is the location of the activity or activities and for what duration? What will construction activities be and what will operational activities be? If relevant, what decommissioning activity is planned? Does the project have effects away from the project site?

- What is the spatial extent – how much land or water? This should include activities away from the project site even if not covered by consent application, since these more distant activities may have ecological/biodiversity effects.

- At what time of year is construction work planned, and will works have any seasonal or annual differences?

- What quantities of water or climatic/weather conditions are required? What land, water, geological, soil or other environmental conditions constrain or determine the project location and/or operation?

### 3.2.4 Project shaping and constraints mapping

Project scoping often presents the best opportunity to avoid adverse effects and is undertaken early in the project development process. During project scoping there is often a high level of collaboration between the various professions; project constraints are being considered; and project design is less advanced and can often be influenced. This process is typically called "project shaping".

As the project develops beyond the shaping phase, design becomes increasingly fixed, the opportunities for avoidance diminish, and the focus turns to minimising effects where possible and remedying or mitigating those that can't be avoided or minimised.

Often the outcome of the project shaping process is a constraints map. The objective of the constraints mapping process is to identify environmental and physical constraints to the project location and design, and make recommendations for design options to avoid significant effects on important ecological features/resources at an early stage. Constraints mapping is not intended to provide a comprehensive breakdown of all activities associated with the project and their associated development constraints. Its purpose is to guide project planning, design and development activities in a way that protects the integrity and the long-term viability of the ecological values within the project area through avoidance and impact minimization. It is likely that "fatal flaws" for a project would be identified and discussed at this stage.

Project shaping is important where a number of project alternatives have to be refined through an iterative process; for example, where road route alignment options have to be investigated, reviewed and progressively eliminated through considering a wide range of factors including engineering, social, financial and ecological. The form of the EcIA will take into account the scale of options, the project decision-making framework, and the findings of investigations by other disciplines.

### 3.2.5 Defining spatial scale and extent

Before describing the site, it is helpful to define and map the boundaries of the site, activities and effects. These vary greatly between projects, activities and ecological components and processes, and relevant spatial extent has to be decided according to the project and ecological features being assessed.

- The 'zone of influence' (ZOI) refers to all land, water bodies and receiving environments that could be potentially impacted by the project. It includes the Project Site and any environments beyond the Project Site where 'indirect effects' such as discharges may extend (sometimes called the Study Area). The extent of the ZOI will depend on:
  - species, communities and ecosystems likely to be affected; and
  - the temporal and spatial scale of potential effects on them.

  The extent of the ZOI should be revisited during the course of scoping and investigations as more information becomes available. It extends the potentially impacted area to provide for description and assessment of effects on mobile species (e.g. migratory fish or birds), up or downstream habitats (e.g. in river systems) and on regional or national populations (e.g. of rare plant species).

- The Project Site is a subset of the ZOI. It is primarily a planning definition that includes the property or properties within which consents for an activity or activities are being sought. These boundaries will be determined (as appropriate) by land parcel boundaries or in some cases by a designation.

  The Project Site will encompass the maximum extent of all works, both permanent and temporary, and therefore defines the limit of direct effects on the site's ecology (sometimes called the Project Envelope).

- The Project Footprint is a subset of the Project Site. It describes the physical extent of permanent works, but not of temporary works. For example, in a roading project it is common to have a 'construction corridor' which will be disturbed by permanent and temporary construction works (the Project Site), within which a permanent 'road corridor' will be the final road alignment (the Project Footprint).

Areas impacted by temporary works can be remediated and provide opportunities for mitigation. Permanent works (a building, road, flooded valley, etc.) represent the extent of loss that must be mitigated or offset.

As the project develops, there may also be 'exclusion zones' or 'buffer zones' which are specific areas that are specifically excluded from the project site (often as a result of surveys, in order to protect existing ecological values).

The Zone of Influence will be defined by species, populations and communities according to their sensitivity to change. Existing knowledge of the ecology and conservation status of features likely to be affected can be used to determine boundaries. For example, impacts on waterways might affect species downstream of the Project Site; impacts on prey species may affect predators that travel hundreds of metres to feed; impacts on vegetation may affect populations of birds that migrate many kilometres to breed at the Project Site. More guidance on defining ZOI boundaries is given in CIEEM 2016 (Chartered Institute of Ecology and Environmental Management (CIEEM), 2016).

### 3.2.6 Ecological features and values

The scoping process should identify ecological features and values of the study area or ZOI, including those values recognised through statutory processes and publications. The depth to which this can be done will depend on the scale of the project. For a smaller project, it may not be possible to do a site visit at the scoping stage (for example, due to financial constraints or access constraints), and this information will have to be gathered at the desktop level only. A preliminary map of vegetation types or habitat types should be prepared, together with a list of biota – this map could be used as a basis for later site investigations. Preliminary assessments should be made of:

- Ecological values in the ZOI based on national, regional or local databases or publications
- Biodiversity quantity/area (although this may be only an estimate at the preliminary stage)
- Ecological trends and vegetation/habitat quality
- Ecological services provided by the study area
- Complex areas such as terrestrial/freshwater transitional zones
- Cultural values associated with species, habitats, or ecosystems

### 3.2.7 Effects and issues

The preliminary assessment of effects should be based on what is known about the nature of the project and values established during scoping investigations. At this stage, the aim is to identify:

- Key potential adverse (and beneficial) effects on ecological features and biodiversity values
- The issues that they raise for project design, construction, and operation to feed into project shaping (see below)
- Any issues for the consultation and consenting processes including fatal flaws

The ecologist needs to ensure that these outcomes are presented clearly to help the project proponent understand their implications. This may be in the form of a report or memo. Simple mapping of key areas of potential value will assist in project decision making and planning further investigations.

It is also important to identify the limitations around the information on which these preliminary assessments are made (see Section 3.4 below)

### 3.2.8 Addressing adverse effects

The RMA states that every person *"...has a duty to avoid, remedy or mitigate any the adverse effect on the environment..."* (RMA 1991, s17) and this is fundamental to the way that adverse effects are addressed.

The meaning and use of some words associated with 'mitigate' are still developing through case law[11] and the ecologist should be familiar with current interpretations and take legal advice in using the terms. Mitigation actions can include restoration, rehabilitation, and minimising adverse effects. When adverse effects cannot be mitigated, biodiversity offsetting or compensation should be considered. This is discussed further in Chapter 7 Impact Management.

In practical terms, the ecologist's role is to identify those ecological values which are so high that impacts on them should be avoided by the project; and to provide advice on other impact management options for achieving the best outcomes for indigenous biodiversity in those situations where avoidance is not possible.

At the scoping stage, the ecologist should indicate general options to avoid, remedy, or mitigate the potential adverse effects on ecological and biodiversity values. It is important to discuss avoidance at the scoping stage, since it is likely that the project development is also at an early stage when changes may be more easily made. A client may explicitly ask for a 'fatal flaws' analysis; i.e. are there any aspects of the proposal that make it impossible to avoid, remedy or mitigate adverse effects?

Legal or planning advice should be taken where words such as 'reasonable' or 'practical' are used in relevant statutory documents to describe the extent to which each of the actions is applicable or acceptable.

[11] See *Biodiversity offsets: The latest on the law* (Christensen & Baker-Galloway, 2013) and NZHC 1346 Royal Forest and Bird Protection Society Inc vs Buller District Council.

At the scoping stage, options to address effects that should be discussed with the proponent and project team include:

- **Avoidance:** ways in which the project might be modified to avoid effects on areas or features of ecological value. Further investigation may be needed to refine the boundaries of areas to be avoided. Avoidance will need to consider the nature of the activity, sensitivity of the ecological features concerned, and the financial implications of avoidance and any residual adverse effects.

- **Minimisation:** refining areas disturbed by construction or operation to minimise effects on areas of biodiversity or ecological values. Adverse effects may also be minimised through restricting timing or duration of activities, or by screening, shielding or buffering areas from disturbance.

- **Remediation/restoration/rehabilitation:** these terms encompass options for work carried out at the project site or close to the adverse effects and include: transplanting, translocating fauna, planting to enhance existing vegetation or create new areas of indigenous vegetation, plant and animal pest management/control, physical habitat enhancement, flow regime modifications, fencing, and site protection.

- **Biodiversity offsetting:** at the scoping stage of an EcIA, the ecologist should consider whether offsetting is likely to be needed as part of the package of actions required to address potential adverse effects of the project. If an offset is likely to be needed, then the ecologist needs to discuss this with the project proponent and legal and planning advisors, and to advise on the way that this will influence further investigations and consultation. The selection, assessment and procurement of an offset site or sites may be a complex and time-consuming process, and this needs to be allowed for in project planning.

- **Compensation:** current interpretation of compensation is that it is a positive effect (in this case on biodiversity values) achieved through actions undertaken as part of the project but at another site.

At the Scoping stage a preliminary list of monitoring requirements should be drawn up (see Chapter 8).

### 3.2.9 Full assessment

The Scoping process will determine the need for, scope, and extent of further investigations to enable a comprehensive assessment of effects to be carried out. The Scoping should identify gaps in information which require:

- Further site work, noting need for seasonal or regular visits to try to establish patterns or trends

- Additional expertise in: specific biodiversity topics such as herpetofauna, invertebrates, soil organisms, and dendrochronology; ecological context, such as hydrological patterns, geology or soils; and historical or cultural topics, such as traditional uses of species or sites or fossil records

- Background/desktop research: for example, to enable a better understanding of trends in ecology; restoration and rehabilitation techniques for specific plants or animals; past land or water uses associated with the project site; and aerial photographic history of change

- Consultation: general consultation about biodiversity/ecological values as part of overall project consultation; stakeholder consultation as part of any biodiversity offset programme; consultation with tangata whenua in relation to taonga species or traditional uses on site; and consultation with local amateur naturalists or professional scientists who have specific knowledge of the project site and ZOI, their biodiversity values or the potential effects of the project.

Scoping will enable the ecologist to prepare a methodology and programme for carrying out the full assessment and based on this, to refine the scope of work, time and costs associated with the assessment, including preparation of reports. In practice, much of the preliminary work for this is likely to have been done when a company ecologist or consultant prepared the initial job contract or bid/proposal.

## 3.3 Methods for Scoping

### 3.3.1 Introduction

Scoping is intended to provide a relatively quick appraisal of the potential ecological effects of a proposal to feed into project shaping and future investigations. To do this efficiently, the ecologist should select from a range of tools and methods to work at both the site and desktop levels. The information gathered here can also be incorporated into the main baseline information where appropriate.

Links to the most commonly used desk-top sources of published information are given in Appendix 2 and the reader should refer to the more detailed discussions in Chapters 4 and 5 of these Guidelines. At the scoping stage, information sources to consider include:

- Aerial photos held by the project proponent, or from Google, Bing websites or those held by local authorities
- Local authorities' websites, publications, databases and GIS viewers, regional and district strategies, policies and plans, SNA assessments
- Iwi management plans
- LIDAR or other digital information held by the proponent for the project area
- National databases and GIS viewers: for example, Land Environments of New Zealand (LENZ), Freshwater Ecosystems of New Zealand (FENZ), Landcover database (LCBD), Protected Natural Area (PNA) programme reports, threat lists for species (see Appendix 6) and ecosystem types (see Appendix 4)
- Landcare Research Manaaki Whenua Māori plant use database
- Cultural impact assessments or other cultural values reports (for site, species, habitat or ecosystem data)
- Reports including AEEs and EcIAs, produced for other projects in the area
- Scientific journals and interest group publications. Published local lists or maps of occurrences and distributions, such as may appear in regional or district plans, botanical journals, and the Ornithological Society atlas
- Discussion with local experts – both professional and amateur naturalists (this may be limited by confidentiality requirements at the scoping stage)
- Preliminary site visits

## 3.3.2 Filtering

One outcome of the scoping process may be to identify and filter the ecological elements of the site. This enables the ecologist to eliminate, or carry out only simple investigations on, some elements where it is clear there is little or no risk of an adverse effect. Further investigations and analysis can instead focus on the ecological components where adverse effects are likely or certain.

The process of filtering requires that all ecological elements are identified, and sufficient information is gathered on each, so that an informed determination of risk can be developed and justified. Ongoing investigations will then provide sufficient information to confirm that risk exists (or not); and assess risk to those elements where a degree of risk is confirmed.

An example is a site with a large number of bird species. Filtering may first exclude introduced species, then native species which are not threatened and which are widespread and common within the ecological district or region. Other species may be filtered out because of specific habitat requirements, on the basis that their habitat is not at risk within the ZOI. This will result in a reduced list of species where the risk of adverse effects is indeterminate and more detailed analysis is required. A similar approach can be used for terrestrial and freshwater communities and habitats. All values "filtered out", and the rationale for doing so, should be documented for future reference.

Following the scoping stage, filtering will continue to be refined up until completion of site investigations and analysis.

## 3.3.3 Site visit

A site visit at the scoping stage is desirable but not always practicable. Ideally the scoping site visit will assist in reviewing site boundaries as well as in becoming familiar with the location itself and ecological features of the project site. It is usually best to undertake the site visit after some initial desktop investigations have been done, including studying aerial photographs. For sites that are difficult to access or there are other constraints, high-quality aerial photography may approximate a site visit. The limitations of not visiting the site should be noted. At this stage, a preliminary vegetation or habitat map should be drawn up and a description of the existing environment developed.

A basic scoping site check-list for a simple site is presented in Appendix 3 and encompasses terrestrial and aquatic features – it should be modified as appropriate for the scale of the project. This lists the information that should be sought during an initial scoping site survey and forms the basis of a Record Sheet that can be taken into the field, as well as being the basis of a more comprehensive site record sheet and database that can be developed during the course of later investigations.

### 3.3.4 Identifying project constraints & opportunities

Constraints mapping is typically a broad scale, desktop-based assessment tool. Mapping typically relies on existing reports and surveys, and layers within local geographic information datasets (GIS), and there may be limited ground truthing where existing data is deficient. A range of sources are listed above (3.3.1)

At the scoping stage, the published lists and datasets should enable a simple/general biodiversity or ecological value to be assigned to species and ecosystem types found within or adjacent to the Project Site. However, because different publications have different ways of describing, ranking, valuing or scoring species, ecosystems and sites, the ecologist will need to use a system to make these comparable and consistent. For example, to establish comparability between a species considered to be 'Nationally Threatened – Vulnerable' and an ecosystem type considered 'Critically Endangered'.

At the Scoping stage, a precautionary approach to assigning relative values for species and ecosystems should be taken.

As a guide, Table 2 suggests the ecological components to consider when assigning value at the Scoping stage. Habitats and communities that provide opportunities for site enhancement are identified. Other categories can be included according to the specific project environment.

**Table 2. Ecological components to consider during Scoping.**

| Components to consider |
|---|
| Nationally Threatened species, found in the ZOI or likely to occur there, either permanently or occasionally. |
| Naturally Rare Ecosystems considered Critically Endangered, Endangered or Vulnerable (Holdaway, Wiser, & Williams, 2012) |
| Habitats supporting threatened species |
| Species listed as At Risk – Declining, found in the ZOI or likely to occur there, either permanently or occasionally |
| Locally[12] rare[13] or locally distinctive species or ecosystems |
| Species listed as any other category of At Risk, found in the ZOI or likely to occur there, either permanently or occasionally |
| Nationally and locally common indigenous species |
| Indigenous communities, species not threatened |
| Indigenous communities, highly modified and marginalised |
| Exotic plant communities with limited habitat value |
| Invasive weedlands |
| Freshwater systems |
| Waterways with high MCI[14] and good water quality but not appearing to support any of the above species |
| Waterways having low MCI and low water quality |

The values assigned during Scoping will be reviewed and refined following site investigations as part of the full assessment (see Chapter 5). In particular, where an initial assessment relies on a species or habitat which is considered "likely to occur", the species' presence or absence should be confirmed by the full EcIA work.

Distinctive species can include those:

- at the extremes of their distributions
- in restricted outlier populations
- likely to be new or undescribed
- forming assemblages that are unique or otherwise exemplary
- that are short-range endemics

It is important to document any changes to the project design that have been driven by environmental constraints, and any associated project shaping, for inclusion in the EcIA report.

[12] "Locally" should refer to the Ecological District unless the relevant Regional or District Plan provides an alternative definition.
[13] Terms such as "rare", "common" or "uncommon" should be defined at the Ecological District scale, using expert judgment where no published assessment exists.
[14] Macroivnvertebrate community index. http://www.mfe.govt.nz/sites/default/files/mci-user-guide-may07.pdf

### 3.3.5 Consultation

As well as being an important part of project development and the consenting process, consultation during the scoping stage is a useful tool for gathering local and professional input on ecological values. Consultees may also provide innovative ideas for mitigation or compensation. It is more appropriate for discussions to be held with individuals or small groups, than in large public meetings or similar situations. Where a cultural impact assessment is being carried out, the ecologist should discuss the option of engaging with local iwi or hapū in relation to ecological values as part of that assessment.

For reasons of project confidentiality, it may not be possible to consult with the public during the scoping stage of a confidential project; however, some consultation with statutory organisations on a confidential basis may be sought (with the approval of the proponent/client). This can provide information about the proposal's location or similar developments to provide a context for assessing cumulative effects. The local or central government organisations may also provide an indication of the regulatory position on the proposal, and biodiversity or ecological issues.

As part of the Scoping reporting, there should be a summary of consultation done and an outline of further consultation needs. The later stages of assessment should demonstrate how the consultees' comments have been addressed or explain why they have not been.

## 3.4. Scoping issues

A statement may be needed about the certainty or confidence levels associated with findings or predictions made in situations where the scoping stage has been influenced by limitations.

In the early stages of a project, all aspects of the project activities may be ill-defined. The ecologist needs to recognise this, and when investigating or reporting, state the parameters that have been used.

A key element will be how the zone of influence of a project is determined. This will differ for different ecological features and for different development activities, and mapping it out or defining it underpins the whole evaluation and impact assessment process that follows. This zone of influence should form the spatial scope of the scoping assessment although it may be modified for the full assessment. It is important to be clear on the project site boundaries so that scoping of ecological and biodiversity values and effects is consistent with other assessments or investigations being undertaken concurrently and with the AEE.

Similarly, it is important to ensure that a consistent temporal scope is used when discussing whether or not effects are permanent or temporary. In projects with a decommissioning phase, such as wind farms, the temporal scope can often be defined by the time from the start of construction to the end of decommissioning (including any rehabilitation).

Timing, frequency and duration of surveys are critical factors for EcIAs, especially in relation to mobile fauna, ephemeral waterways, and annual plants and vegetation communities. The cost of carrying out repeat surveys over a period of months, seasons, or even years can be high. However, inadequate data can add risk to a project and good decision-making. Project scoping will help determine what data must be obtained and what data would be nice to have. If survey work has to be constrained by time or budget, then this must be taken into account in the design of the assessment methodology and identified as a limitation.

The assessment process is iterative. Ideally, project proponents and their development teams will be prepared to review project design, construction or operation in the light of Scoping findings and then provide time for re-assessment. The ecologist should be professional in keeping their client informed of findings that may be significant for the project, and presenting information in a timely and effective manner. However, occasionally the proponent may not take the Scoping report advice into consideration in project development. At this point the ecologist may have to reconsider their further involvement in the project team.

# 4 Description of existing environment

# 4 Description of existing environment Key Points

**4.1** The description of the ecological features and processes in the existing environment is a critical basis for assigning a value to biodiversity and ecological features and for a comprehensive assessment of effects. It builds on the initial findings of the Scoping stage.

The data collected for an EcIA should ultimately establish the ecological value and sensitivities of ecosystems and their components, so that the effects of a proposal on those components can be assessed, according to s88 and Schedule 4 of the RMA.

It should also contribute to determining whether the ecosystem components within a project site make all or part of the area "significant", to enable a person or TLA to meet the requirements of section 6(c) of the RMA.

The detailed description should include information on:

- The **spatial context i**n which the project is set or may have effects, and within which ecological values will be considered
- The **physical environment**
- **Flora, fauna, ecological processes and ecosystem services**

**4.2** The description should use the **Ecological Districts** framework to set the spatial context, unless another is more appropriate to the type of environment and likely effects.

**4.3 Physical environment** and **cultural values** data may be supplied by other professionals working on the project, and the ecologist should liaise with them to ensure that relevant environmental information is provided.

**4.4** The **biological components** or features should be described in terms of **sites, species, habitats and ecosystems** and information should be taken from both existing sources and from field surveys specifically carried out for the ecological impact assessment. **Ecological function and health (condition)** descriptions will require both these types of sources.

Sources of existing information will include: publications, databases, websites and individuals or organisations. Existing information should be reviewed to ensure its adequacy for the proposal being assessed, regarding its age or currency, accuracy, and completeness. The relevant regional or district plan may provide information on sites or species identified as having value within the territorial boundary. The ecological information on **significant natural areas or protected natural areas** should be assessed from the perspective of an EcIA.

A site survey is almost always needed to prepare a comprehensive description of the environment. Many survey methods are available for specific biological features and some of these are recognised as 'standard'. The rationale for **choice of survey method** and any variations from standard should be well documented, as well as any assumptions or limitations.

The description of the existing environment should balance the use of text, tables, maps, and graphics with more detailed results in appendices or attached/linked reports.

It must collect and detail sufficient information on species, communities and ecological systems so that ecological value can be determined and the magnitude of effects can be quantified and mitigated. Ultimately, this phase of the EcIA must gather sufficient information such that the **requirements of s88 and Schedule 4 can be satisfied.**

# 4.1 Introduction

A description of the existing environment is the basis for evaluation of the importance or value (Chapter 5) of the environment, and an assessment of impacts and effects (Chapter 6). Although not explicitly stated in the RMA, a good description of the existing environment is an essential basis for preparation of an Assessment of Environmental Effects (RMA s88 and Schedule 4). The existing environment is the baseline against which proposed changes will be assessed and any future monitoring will be conducted. The description of the site must consider it in a wider ecological context; the Ecological Districts framework is widely considered to form the most appropriate basis for this.

In New Zealand, the term 'existing environment' is by convention used to refer to the ecological features being assessed in an Ecological Impact Assessment. The RMA term 'receiving environment' is also used, particularly when referring to the adverse effects of a discharge or emission. A description of the existing environment should describe ecological features or components, and reflect the fact that the spatial and temporal zone of influence of an activity will vary among different biological and physical components and processes. It should also include descriptions of past and ongoing changes to the site or sites and systems, i.e. the trends and processes occurring in the absence of the proposal being assessed.

Typically, a description of the existing environment will review existing information and/or collect new information in order to:

- Place the ecological features and/or site within a broad spatial context, usually with reference to existing spatial schema, such as Ecological Districts or Land Environments of New Zealand (LENZ).
- Describe and interpret the physical environment and processes of the features/site (e.g. soils, geology, topography, climate, hydrological features, geomorphological processes).
- Describe and interpret the flora and fauna that potentially would be affected, at appropriate organisational and temporal scales (e.g. species, communities, ecosystems).

The planning concept of "permitted baseline" is used to describe a potential future environmental state, which has developed through activities permitted as of right or those that do not require a resource consent. The ecologist needs to consider the permitted baseline in order to describe the potential "future ecological environment" and to assess effects at that time, and should discuss this with the project planner or legal advisor if in any doubt.

The EcIA process must primarily:
**Establish the ecological value and sensitivities of the ecosystem and its components, so that the effects of a proposal on those components can be assessed, according to s88 and Schedule 4, RMA.**

The purpose of EcIA is to provide information about, and interpretation of, the ecological implications of a project upon all ecological components of a site, irrespective of "significance". (Section 1.4.2 of these Guidelines sets out the legislative basis for this). An EcIA process must consider the integrity and sensitivity of the ecological components, and the resilience of the site, to the proposed activities. These matters often require detailed descriptions of species, communities and habitats not required for a s6(c) assessment. The assessment may also require study over a number of months to account for seasonality of flora and fauna. Ultimately the site must be known in sufficient detail to quantify all potential adverse effects and develop management tools to remedy and mitigate those effects.

As part of that, where a territorial authority has not already done so, the proponent must:
**Determine whether the ecosystem components within a project site make all or part of the area "significant", to enable a person or TLA to meet the requirements of section 6(c) RMA;**

The purpose of identifying significant sites and giving them a s6(c) label such as Significant Natural Areas (SNA), Ecological Heritage Sites (EHS), or Sites of Ecological Significance (SES) is to provide guidance to the applicant and council planners on the application of policies, rules and methods around appropriate use, protection or maintenance or whatever terms are used in a particular Plan. Identification of 'significant' sites within a project area provides important context to assist the ecologist in the development of an EcIA but does not in itself provide sufficient information to be used as the basis for an EcIA as required by Schedule 4.

## 4.2 Spatial frameworks

To provide a meaningful description of a site, it is necessary to place it within its broader ecological context. While regional and district plans can provide the statutory framework for assessing sites, they do not usually correspond to ecological boundaries. The Ecological Districts framework is now widely accepted as the most appropriate system for assessment of terrestrial ecological features. The local authority planning policy framework around a species, habitat or ecosystem should reflect its status within the Ecological District, not the territorial local authority boundary.

However, a good description of a site's features needs to be discussed with reference to some or all of the following national frameworks for terrestrial and freshwater ecosystems[15]:

- Ecological Regions and Districts (McEwen, 1987). A system of 85 Regions encompassing 268 Ecological Districts. Ecological Districts are areas that have characteristic landscapes and biological communities. They form the basis of ecological description and protected area planning.

- Land Environments of New Zealand (LENZ) (J. R. Leathwick et al., 2003). A quantitatively-based classification of New Zealand's terrestrial environments and environmental parameters (https://lris.scinfo.org.nz/search/?q=lenz). May have limited use at the site scale.

- New Zealand Land Cover Database (LCDB). A digital map of the land surface of the country based on satellite imagery. Version IV is at https://lris.scinfo.org.nz/layer/412-lcdb-v40-land-cover-database-version-40/. May have limited use at the site scale.

- The Land Resource Information (LRI) System. http://lris.scinfo.org.nz/layer/76-nzlri-land-use-capability/ This is administered by Landcare Research and includes the New Zealand Land Resource Inventory (NZLRI), the National Soils Database (NSD) and information on Fundamental Soil Layers (FSL). Land Use Capability units are based on the LRI polygons. Although this is an older system, it contains land-use information not provided in more recent databases.

- The River Environment Classification (REC). The REC maps rivers that have a similar character across New Zealand. https://www.mfe.govt.nz/fresh-water

- Freshwater Ecosystems of New Zealand (FENZ). This geo-database provides an independent, national representation of the biodiversity values and pressures on New Zealand's rivers, lakes and wetlands. http://www.doc.govt.nz/conservation/land-and-freshwater/freshwater/freshwater-ecosystems-of-new-zealand/

[15] For brief reviews of these and other classification frameworks, see Singers & Rogers(2014) and https://www.biodiversity.govt.nz/resources/environments/

## 4.3 Physical environment and processes

A description of the existing environment needs to include a description of the physical environment and processes because these influence, and can be influenced by, the biological processes that 'play out' on or in this physical environment. The level of detail required regarding the physical environment will vary with the nature and scale of the activities being assessed, and the ecological features present within the project site. For smaller projects, the ecologist may simply need to describe these features from existing data sources.

Larger projects (e.g. damming, diverting water, road construction, or mining) may result in substantial alteration of the physical environment and/or physical processes. In these larger, multi-disciplinary projects, ecologists will often need to synthesise and interpret multiple sources of information from a range of disciplines (**Table 3**). This will usually entail collaboration with other experts throughout the EcIA process to ensure first, that the necessary physical data is collected and provided in a suitable form for the ecological description and assessment; and second, that the ecologist has correctly interpreted the data.

Table 3 **Components and processes commonly described in 'Description of existing environment'**

| Feature | Examples of sources of information |
|---|---|
| Geomorphological features and processes – landforms/topography, and fluvial, glacial, hill slope, tectonic, volcanic and other processes. In some cases, detailed analyses of slope, aspect, and elevation may be required to inform vegetation and habitat descriptions and assessments. | • Aerial/satellite photographs<br>• Topographic maps<br>• General geomorphological descriptions in existing books and reports<br>• Geological maps (e.g. QMAP)<br>• Site-specific survey data e.g. LIDAR (typically prepared by other specialists) |
| Soils – New Zealand soil classifications are described at http://www.nzsoils.org.nz/ | • NZ Soil portal (Landcare Research website) https://soils.landcareresearch.co.nz<br>• Soil maps<br>• Regional councils (e.g. Grow Otago) |
| Climate – temperature, rainfall, seasonal patterns, prevailing winds.<br>Hydrological features and patterns – river flows, lake levels | • Regional council websites<br>• NIWA/Metservice<br>• Rainfall maps<br>• Site-specific surveys and/or compilations of existing data (typically prepared by other specialists) |
| Land use | • Land tenure<br>• Field observations<br>• Land Use Capability maps |
| Noise | • Field observations<br>• Other specialist reports |
| Lighting | • Field observations<br>• Other specialist reports |

# 4.4 Biological components

Whilst the overall description of freshwater and terrestrial environments should provide a holistic account of the ecological features and/or sites, it is usually convenient to start by breaking the description down by sub-categories. Where appropriate these include:

- Terrestrial vegetation; indigenous and exotic, including non-vascular plants
- Birds
- Bats
- Herpetofauna
- Terrestrial invertebrates
- Freshwater fish
- Freshwater invertebrates
- Freshwater plants
- Ecosystem processes and trends
- Ecosystem services

## 4.4.1 Review of existing information

A description of the existing environment will usually entail, at a minimum, a review of the existing ecological information sourced at the scoping stage. A more intensive search of peer-reviewed scientific literature and the 'grey' literature (unpublished, non-peer-reviewed reports etc., which must be treated with particular caution) should be carried out, focusing on topics raised through scoping. Extensive collections of more detailed/primary data can now be accessed on-line via various web services and user interfaces[16]. Important sources of data are listed in Appendix 2. Key starting points are:

From the scoping stage (see 3.3.1):

- Aerial photos
- Local authorities' websites, publications, databases and GIS viewers, regional and district strategies, policies and plans, SNA assessments
- Iwi management plans
- National databases and GIS viewers
- Landcare Research Manaaki Whenua Māori plant use database
- Cultural impact assessments or other cultural values reports (for site, species, habitat or ecosystem data).
- Scientific journals and interest group publications
- Discussion with local experts
- Preliminary site visits

[16] many are summarised at: http://www.doc.govt.nz/Documents/getting-involved/volunteer-or-start-project/funding/tfbis/biodiversity-data-landscape-diagram.pdf)

At the national level:

- The Terrestrial and Freshwater Biodiversity Information System (TFBIS) Programme provides access to fundamental data and information about terrestrial and freshwater biota and biodiversity http://www.doc.govt.nz/tfbis.
- Databases for birds, fish, amphibians and reptiles, invertebrates, weeds and pests

At the regional or local levels:

- University theses
- Botanical Society publications and members
- NZ Ornithological Society publications and members
- Fish and Game New Zealand
- Museum records (for historical trends)
- Regional council databases and geospatial data layers

If a cultural impact assessment is not being carried out as part of the project, the ecologist might choose to advise the applicant to do so. The ecologist should consider engaging with the local iwi or hapū using the findings from the scoping stage, to gather further ecological information about their knowledge of the site and cultural values. The client, planner or legal advisor may already have established a relationship with manawhenua and therefore should be approached about this; if not, the ecologist might seek the help of a cultural advsor. As noted in Chapter 1, Te Puni Kōkiri run Te Kāhui Māngai website (http://www.tkm.govt.nz/) which has a map and directory of recognised iwi/hapū and Māori organisations to assist in identifying the appropriate local point of contact. District and regional councils may also be able to assist in this, as well as other consultants that specialise in working with, and on behalf of, iwi and hapū.

All data sources, including personal communications and websites, should be cited and acknowledged.

### 4.4.2 Significant Natural Areas (SNAs)

Significant Natural Areas (SNAs) are sites which have been identified by survey, or by desktop analysis and remote sensing, and are considered to be 'significant' under section 6(c) of the RMA based on interpretation of a set of criteria developed for that purpose.[17]

In EcIA the term "significant" should be reserved for use in the context of section 6(c) assessments. It is not used in the determination of ecological value or importance which is described in Chapter 5.

In classifying these sites as 'significant', Councils have determined that their protection is a matter of national importance. Part 2, Section 6(c) of the RMA requires that:

> *In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:*
>
> .....
>
> *(c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna;*

Some councils have carried out comprehensive SNA surveys and may include schedules of identified sites in their policies or plans. Others have not yet carried out or completed surveys, or may provide a method and criteria in their plans or policies, but require applicants to carry out their own assessments of significance.

[17] In early planning documents significant sites that were identified but not protected were referred to as significant natural areas (SNAs). There are now many local variants on the term including Areas of Significant Conservation Value (ASCV), EHS, SES. For convenience, these Guidelines use SNA as a generic term.

If a section 6(c) significance assessment has not been carried out by the council for the site under investigation, then this will have to be done as part of the EcIA. The 6(c) assessment must use any methods and criteria set out in a relevant district plan or regional plan or policy. If criteria are not provided by the council, it is recommended that the ecologist present and discuss recommendations for a method and 6(c) assessment criteria, and get agreement with council officers, before commencing the assessment. There are a number of methods that could be applied.

If the council has conducted an SNA survey, and the site, or a part of it, is identified as "significant" under s6(c), it is likely that there is some level of ecological information about the site that may be available for use in making an assessment of ecological impacts. Further, there may be specific policies and rules applying to "significant sites" that will need to be considered and may influence impact management.

The Department of Conservation published *Department of Conservation guidelines for assessing significant ecological values* in May 2016 (Davis, Head, Myers, & Moore, 2016). This document recognises that "significance" has a specific meaning under RMA but notes that "importance is about the relative value of areas, habitats, species or ecosystems and priorities for their protection and management". They note that "Ecosystems considered to be important will almost always be ecologically significant". By implication this applies to specific sites as well as ecosystems. This seems to be consistent with the general approach taken in these EcIA Guidelines for ecological features. It is important to reiterate that these EcIA Guidelines recognise that "significant" is determined by regional or district plan criteria, and the need to pass a threshold test, not through impact assessment.

Bellingham et al. (2017) have recently set out the EIANZ position on the criteria for both 6(c) (significance assessment) and ss 30 & 31 (functions of local government to maintain indigenous biodiversity). This paper highlights the different requirements of different sections of the RMA – in particular in relation to biodiversity and ecological function aspects. Maseyk and Gerbeaux (2015) discuss advances in identification and assessment of ecologically significant habitats in two areas of contrasting biodiversity loss in New Zealand.

## 4.4.3 Protected natural areas

A protected natural area is any area of indigenous vegetation or habitat that has statutory protection. The protection may be in perpetuity (e.g. National Park), or for the life-time of an agreement (e.g. covenant) or plan (e.g. district plan).

Usually the process of identifying and protecting areas requires the compilation of a range of information describing the site and its ecological values which will provide important context to development of the EcIA. The protected status of an area does not in itself influence the ecological values and effects; but will need to be considered in addressing impact management.

Policy for protected natural areas will detail acceptable (or unacceptable) activities within the protected site, based on the requirements of the relevant regulation (i.e. act, consent, management plan, or covenant document). This provides important context for the AEE planner and may influence aspects of an ecological impact assessment and the information gathered.

There are two forms of protected natural area:

1. Sites with statutory projection including National Parks (National Parks Act 1980), reserves (Reserves Act 1977), conservation areas (Conservation Act 1987), marine reserves (Marine Reserves Act 1971), Regional Parks (Local Government Act 2002), National Trust open space covenant (administered by the QEII National Trust), consent notices; and voluntary covenants/encumbrances on a title; and
2. Sites identified as significant natural areas following section 6(c) investigations, and scheduled in regional or district plans. These can be protected through current policies, objectives, standards and rules.

## 4.4.4 Adequacy of existing information

Having reviewed existing information, it will be necessary to determine whether this information provides an adequate basis for the Ecological Impact Assessment, or whether further information needs to be collected. Factors to consider in making this determination include:

- How comprehensive, up to date and reliable is the existing information? E.g. have recent surveys been undertaken, using contemporary best-practice methods?
- Will any particular species/habitat/vegetation type be affected? If not, less detail is required.
- What is the expected magnitude of effects and how sensitive are the particular species or communities? E.g. detailed species characterisation of cultivated cropland/pasture is probably not required, whereas an indigenous wetland that will be affected would require a detailed survey.
- Can a species' presence, absence or abundance be reliably predicted based on knowledge of the species habitat requirements and distribution? If so, a survey may not be required. E.g. where a Project Site provides no suitable habitat for a particular species or group.
- How well-documented are complex areas such as ecotones and other transitional communities?

The rationale behind these decisions should be recorded at the time, and detailed in the written report. When these decisions are made in consultation with stakeholders, a formal record of their agreement (or otherwise) should be kept by all parties.

## 4.4.5 Biological surveys

In most cases, existing information will not be sufficient to support a reliable assessment of ecological impacts, and additional biological surveys will be required.

In general, more reliable and specific information (and therefore more thorough surveys) will be required where ecological risks are higher. Methods should be selected carefully and clearly described (in full or by citation of standard methods). The description of method should include: spatial scale; sampling design; sampling methods; location, duration and timing of surveys; equipment and personnel (including any training given); and data treatment.

Numerous detailed methods exist for various organisms and communities, and methods are regularly being revised and updated, and from time to time new methods are developed. Ecologists need to ensure that they are up to date with current accepted practice when deciding what survey methods to employ. Survey methods for various taxa and ecosystems are too numerous to list here, but a good starting point for overviews and links to the details of key methods is the Department of Conservation inventory and monitoring toolbox (http://www.doc.govt.nz/getting-involved/run-a-project/our-procedures-and-sops/biodiversity-inventory-and-monitoring/). Other useful links to methods can be found on the websites of Landcare Research, the Ministry for the Environment, and professional societies such as the NZ Freshwater Sciences Society. Recent ecological assessments of similar projects should also be referred to, as should the New Zealand ecological literature. Methods involving sampling and statistical analysis may be necessary in projects of greater complexity.

The ecologist needs to develop a methodology that samples local populations of flora and fauna, and the various community and ecosystem processes, sufficiently to ensure that the data are robust and adequate for assessment. Samples should be representative of the population of interest, and sufficient data should be collected to allow statistical analysis if required. If the job is large and complex, advice from a bio-statistician should be sought early during planning.

The rationale for the choice of methods should be clearly explained. This is particularly important if standard methods (for example, transects, kick sampling, 5-minute bird counts, pan traps) are not used, if new methods are developed, or if the particular methods have been agreed on through consultation with stakeholders. Drones can now provide aerial survey information but limitations and regulations need to be understood.

Where existing data is used (e.g. that collected by councils as part of State of Environment (SOE) sampling or a section 6(c) assessment) the assessment should recognise any data limitations that may exist. SOE methodologies are typically focused on collecting small amounts of data rapidly from a large number of locations, which is effective at a district or regional scale but has limited application at the scale of an individual site.

Decisions about the type and amount of information required, and survey and analysis methods, will be have been made initially at the scoping stage of the EcIA. However, characterisation of the existing environment is often an iterative process, particularly on larger projects where initial findings inform decisions about the need for further surveys. Where methods have changed over time, the changes and the reasons for the changes should be explained.

Assumptions and limitations of the methods (including any problems encountered) and resultant data and conclusions should be described and discussed. It is often helpful to include a separate 'Data Limitation' section in written reports (including in any summary) that explicitly discusses these limitations.

It is important to indicate when a report and any recommendations have been prepared using limited data. For some assessments there will not be time or capacity for full site surveys of all plant and animal groups, and the time of year/season of the scoping site work may limit the chances of seeing the full range of biota that use the project site (or the project's ZOI). Weather conditions or access issues may also limit survey work. Data collection may have been restricted by the scope of the client's brief and funding.

Approvals to undertake certain biological survey methods may be required (e.g. animal ethics, authority to handle wildlife under the Wildlife Act 1953, collecting on DOC public conservation land).

When developing the study methodology for an ecological impact assessment, a matter to consider and discuss with the client is whether the sampling could be designed to fulfil anticipated baseline sampling requirements necessary for effects monitoring in the future. This is likely to require a greater quantity of data and incur greater cost, but can save time and money in the long run if consents are granted.

### 4.4.6 Scope of biological description

Depending on the size and type of project, the description of the terrestrial and freshwater components of the environment may include:

- A description of the vegetation including species lists and classification of vegetation types. The level of detail provided will vary, but may range from broad narrative description, to formal vegetation classification (e.g. following Atkinson (1981); Johnson and Gerbeaux (2004); and Singers and Rogers (2014)).

- A more detailed analysis of the areas of various vegetation types may be required, typically presented as tables listing vegetation type, area, and percentage of the Project Site (or sub-site) occupied. This should be supported by a vegetation map of the same vegetation types. A clear legend, easily-read scale (that is 1:100,000 not 1:98,574) and north pointer are essential.

- A representative set of photographs, with clear captions pointing out important vegetation and other features. Set photopoints may be established if likely to be useful through the project.

- An evaluation of existing vegetation condition and comments on likely future condition, taking account of influences such as grazing, fire, pest animals, invasive plants, and land use practices. Where historical data is available, comment on vegetation history and changes should be included.

- Descriptions of fauna, which may range from simple records of present/not recorded through to detailed quantitative data. (Note: 'not recorded' does not necessarily demonstrate absence). Mammals, birds, fish, herpetofauna and invertebrates should all be covered.

- Information on how animal species presence or abundance varies over time (e.g. in relation to tides, day/night, feeding resources, breeding or migration seasons), or in relation to other factors such as weather and availability of food (on and off-site)

- Assessments of the quantity and quality of type of habitat available for fauna at various times of year or life-cycle (e.g. breeding, spawning, foraging, refugia, nursery sites, roosting sites, pre-migration 'staging' sites, terrestrial and aquatic migration routes).

- For both flora and fauna, comments on notable species or communities e.g. species at limits of distributional range, new records, lack of records of expected species. Are the species/communities typical/representative/distinctive?

- Explicit description and discussion of Threatened, At Risk and Locally Uncommon species, or other species of conservation concern (e.g. trans-equatorial migrant bird species).

- Description and threat status of ecosystem types found – threat status is a work in progress nationally; may be available regionally in Auckland, Waikato and any other region where data exists at appropriate level. Information about ecotones/transitional ecosystems is scarce.

- Comments on the ecological context of the communities, including notes on the location of important vegetation and habitats in the general vicinity.

- Comments on the recreational use of the biological resources of an area for fishing, hunting or other recreational activities (drawn from any recreation or social impact assessment work for the project).

- Comments on the cultural value of the biological resources of an area (drawn from the cultural impact assessment work for the project).

Ecological assessments often contain valuable new information and methodologies. Every effort should be made to ensure that such information can be made available to the public domain, in the spirit of contributing to collective ecological knowledge as well as drawing upon it. Data should be contributed to national databases where they exist (e.g. the NZ Freshwater Fish Database, NatureWatch). For some organisms (e.g. lizards), this may be a requirement of the survey or collection permit. At the same time, the ecologist should be aware of the potential danger of making information available (e.g. location of geckos or other threatened species). The ecologist should seek the approval of the client and the land owner before releasing any project information.

# 5 Assigning value or importance

# 5 Assigning value
# Key Points

**5.1** The ecological values and relative importance of the ecological components of the environment must be assigned in order to make **informed judgements with regard to avoidance or alternatives;** to assess the **level of predicted effects** on the affected ecological features; and to quantify those effects so that **appropriate impact management** can be designed or recommended. The values of all components must be recognised in a consistent manner. A component may be a site or an area of vegetation/habitat/community or a species.

This is an area in which the meanings of words used must be particularly clear. 'Value' and 'importance' are used synonymously here. **'Significance'** has a particular meaning under the RMA where a site, vegetation or habitat is considered either 'significant' or not; the term is used here only in this context. Ecological values (and their management options) occur along a continuum and an EcIA needs to recognise this.

Other values, for example **cultural or educational**, may be discussed but not incorporated directly into ecological evaluation

Ecological values of sites, species, habitats, communities or ecosystems are ranked – the range **"very high" to "negligible"** is suggested for most cases but a wider range may be used. Full discussion of the rationale behind any rankings must be provided in an EcIA Report.

**5.2** Unless prescribed otherwise by the relevant planning policy, a method is proposed to consider the **attributes** that contribute to ecological value in terms of four **"matters"**:

- **representativeness,**
- **rarity/distinctiveness,**
- **diversity and pattern,** and
- **ecological context.**

These terms are given wider meaning for EcIA than they might have in traditional conservation assessment (for example under RMA s6(c)). Overall value has both **quantitative and qualitative "attributes".**

The values assigned to different components can be combined to give a **single site** value if required; it is important not to suppress values and potential impacts on specific components. The ecological basis of **previously assigned** values (such as Significant Natural Area status) needs to be analysed in terms of impact and effect assessment and management.

The **spatial scale** against which ecological components are valued will depend on the project zone of influence and existing frameworks and evaluations. Ecological District and national scales may need to be evaluated depending on the specific components.

**5.3** There is no unifying set of attributes for assigning value to **freshwater ecosystems** in New Zealand although those used for terrestrial systems can be applied and modified. International evaluations (e.g. Ramsar criteria) and threatened species classifications apply.

**5.4** An ecologist cannot assign or assess **manawhenua value** to an ecological feature – this can only be done by manawhenua or the iwi and hapū of the particular location. Indigenous species or areas of indigenous vegetation or habitat valued by manawhenua can also have recreational, landscape, education, spiritual or **other values**. Ecological information may feed into these values, but it is important that they remain distinct in the overall decision-making process.

**5.5 Ecosystem services** provided by species, habitats or ecosystems affected by the project are considered to be societal values, and require specialist advice since the topic is still not well understood in New Zealand.

# 5.1 Introduction

## 5.1.1 Overview

The previous chapters set out the requirements to describe and characterise the 'existing environment'. The next step is to use that knowledge to identify the ecological values and determine the relative importance of the ecological components of the environment. This is necessary to be able to make informed judgements with regard to avoidance or alternatives (See Chapter 3); to assess the level or seriousness of predicted effects on the affected ecological features (See Chapter 6); and to quantify those effects so that appropriate impact management can be designed or recommended (Chapter 7). In some cases, the component may be a single species; in others, the affected components may include communities, habitats and/or ecosystems. The values of all these must be recognised in a consistent manner.

In this document, the term 'value' is used synonymously with 'importance', but is not the same as 'significant'. The term 'significance' has a particular meaning under section 6(c) of the RMA, and should be reserved for use in that context according to the relevant regional and/or district plan provisions (discussed in 4.1 and 4.4.2). Significant / not significant is a binary condition – there are no degrees of significance. But the ecological value or importance of an area is a continuum, ranging from (for example) none to very high.

In general, an area of high or very high ecological value is likely to reach the threshold to be considered 'significant' under s6(c) criteria, although the threshold for "significant" may not be consistently applied across different local authority boundaries. However, within a Project Site, some communities or habitats may not be 'significant' but must still be described and assessed. This is because an ecological impact assessment requires the identification and description of any effects on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity of the project.

In this chapter, a method is proposed for assigning value to the elements found within a Project Site, determined by the species, habitats and ecosystems occurring there. It uses attributes that are broadly consistent with those commonly used for s6(c) significance assessment. It also includes a number of attributes not normally used for significance assessment, but which enable ecological values to be ranked (relative importance), rather than an area being simply assessed as 'significant' or 'not significant'. We also present a method for evaluating freshwater systems.

It is important to note here that EcIA as required for RMA and allied New Zealand legislation, differs from EcIA carried out under UK legislation (and described in the CIEEM Guidance, (2016)) in the areas of assigning value and assessing impacts/effects. In the UK an EcIA is not required for all project proposals and:

> *"In EcIA it is only essential to assess and report significant residual effects (those that remain after mitigation measures have been taken into account)"* (Chartered Institute of Ecology and Environmental Management (CIEEM), 2016 p.21)

> *"Significance is a concept related to the weight that should be attached to effects when decisions are made. For the purpose of EcIA, 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' ……or for biodiversity in general."* (Chartered Institute of Ecology and Environmental Management (CIEEM), 2016 p.24)

In New Zealand, s88 and Schedule 4 require full description and assessment of ecological features.

## 5.1.2 A matrix approach to summarise values and effects

Ecological features can be considered at a range of spatial and organisation scales (e.g. species, ecosystems, land environments) which are discussed below. Diverse methods have been applied in New Zealand to assign value at these various scales, ranging from descriptive narratives, to highly structured formal evaluations such as threatened species lists for individual species, and the Land Environments of New Zealand classification (J. R. Leathwick et al., 2003). (See Appendix 7).

Ecological impact assessment involves description and analysis of complex scientific data and evaluations and their integration into the RMA planning framework to assist decision-makers. These Guidelines propose the use of a matrix framework to summarise the findings of detailed investigations, to integrate the ecological evaluations, and to provide the overall assessments of effects on ecological features that are required for the impact assessment process. The framework is based on guidelines developed by the Institute of Ecology and Environmental Management (Regini, 2000, 2002). The approach involves three main steps:

1) Ecological values are ranked on a scale of Negligible, Low, Moderate, High, or Very High
2) The magnitude of effects on these values is ranked on a similar scale
3) The overall level of effect is determined by a combination of value and the magnitude of the effect.

This chapter deals with the first of these steps. Steps 2 and 3 are addressed in Chapter 6.

This matrix framework does not replace the need for rational interpretation of ecological data based on a sound understanding of environmental principles; an impact assessment always requires professional ecological judgement. The EcIA report must explain the judgement; in simple cases a matrix approach may be an unnecessary addition. Placing ecological interpretation within a standard framework should lead to more consistent and transparent assessments of effects. The approach may be especially suitable for large, complex projects. An example of this is the *Transmission Gully Project Technical Report #11*: Assessment of ecological effects (Boffa Miskell Ltd, 2011), which used this approach to bring together extensive data on a wide range of ecological features.

### 5.1.3 Questions of spatial scale

Questions relating to spatial scale often arise, especially when dealing with impacts that may be spread over large spatial scales, sometimes in a fragmented manner: what size units of vegetation or habitat should be considered? At what spatial scale should they be evaluated e.g. local, regional, national, or international? Ecological Districts provide the most appropriate scale for terrestrial assessments, but the ecologist and planner together need to consider how local authority boundaries should be addressed in relation to Ecological District boundaries.

Decisions about which ecological features, and at what level of organisation and spatial scale to evaluate them, are influenced by the assessment of effects and mitigation requirements. The values and effects on individual species should not be overlooked or amalgamated or averaged; but where there are likely to be effects of a similar level, requiring similar mitigation actions, these can be addressed together at the community or assemblage level. For example, an area or site (such as a wetland) is likely to contain a variety of habitats, vegetation types, and plant and animal communities and assemblages, having different values. For example, a wetland dominated by introduced rushes and herbs may support a nationally threatened bird species; this would mean that values, effects and impact management of wetland habitat and bird species would require separate assessments.

These should be treated separately or grouped according to value, likely seriousness of effects, and mitigation opportunities for components.

The EcIA should consider assessing value at a range of scales:

- Feature/Site. E.g. what role does a particular species play in the wetland on the site? Is it permanent resident or does it migrate?
- Ecological District. E.g. what is the status of that species in the Ecological District?
- National. E.g. what is the national threat status of that species?

Generally, the magnitude of effects will be assessed at the same scales as the value assessment. (See 6.3.1)

There are no consistent definitions of 'local' or 'regional'. Assessments vary between using the local authority boundaries (where generally, District = local, Region = regional) and Ecological Region and District boundaries, as the spaces within which value is assessed. The latter system is most appropriate in ecological terms. However, there may be circumstances where due to overlaps or distances between Ecological District/Region and local authority boundaries, an ecological feature that is common throughout an Ecological District is rare in a particular local authority area, or vice versa. The EcIA report should note this, so that it can be taken into account in the decision-making process.

### 5.1.4 Levels of ecological organisation

An overall assessment of the ecological value of a site is determined from the ecological values of species, vegetation types, habitats and ecosystems there.

For any given site, it is conventional to assign value at some or all of the following levels of ecological organisation:

- Species (or in some cases sub-species or taxonomically indeterminate taxa)
- Assemblages or communities of plants and/or animals, especially when considering vegetation and soils ('vegetation types')
- Habitats of fauna. Whilst habitat may be determined by vegetation, it also includes abiotic components. Some habitats may contain little or no vegetation (e.g. scree, sand or gravel spits, some freshwaters). Vegetation of low value in itself may provide habitat for high value fauna.

Genetic and molecular levels of ecological organisation are not usually considered by EcIA.

Different systems will be used at the different levels of ecological organisation (e.g. for evaluating vegetation types and for individual plant species). These are discussed in the following sections, and summarised in Appendix 7.

The values and effects on individual species should not be overlooked or amalgamated or averaged; but where there are likely to be effects of a similar level of significance, requiring similar impact management actions, these can be addressed together at the community or assemblage level.

Vegetation types and habitats that were fully investigated at the scoping stage and could be identified as common, unthreatened, resilient and unlikely to be affected by the proposal, or as exotic and of limited ecological or biodiversity value, should not require further detailed evaluation. As in all cases, the ecologist should be confident that no important features were overlooked at the scoping stage. These often provide opportunities for mitigation. Similarly, species which are common, widespread and not threatened may not require further evaluation unless the presence or abundance of the species within the Project Site can be shown to be ecologically significant.

When preparing an EcIA report, it is convenient to address these levels of organisation for terrestrial and freshwater systems separately. However, it is also important that these assessments can be drawn together to provide an overall higher-level assessment of value for a site or area.

# 5.2 Assigning value to terrestrial areas

## 5.2.1 Communities, habitats and ecosystems

The overall ecological value of a site is determined by the values of species, communities, habitats and ecosystems found there. Ecological value has aspects of both quantity (rarity or extent) and quality (integrity, functionality or condition). O'Connor et al. (1990) described a range of matters that should be considered in evaluating areas for their nature conservation value and management, and more recently Geneletti (2006) reviewed a range of approaches and criteria. Wildlands (2013) developed guidance for Canterbury Regional Council (based on that followed in other local authorities) for application under RMA s6(c), grouping criteria into four "Matters": representativeness, rarity/ distinctiveness, diversity and pattern, and ecological context. They also developed a set of "Criteria"[18] needed to decide the extent to which an area or site exemplifies each matter and thus meets (or does not meet) the thresholds for "significant".

As set out earlier, assigning value for impact assessment requires a more nuanced evaluation than that applied under RMA s6(c). Recognising degrees of importance, the evaluation should still use the same four broad ecological "matters", but consider a wider range of "attributes" that contribute to them rather than binary criteria.

**Table 4** sets out the matters and attributes based on those described by O'Connor et al. (1990). These attributes are broadly consistent with the majority of significance criteria used by councils, but extend to cover matters not normally considered when just assessing 6(c) significance. In particular, ecological condition /quality are important in ecological impact assessment since they contribute to the way in which an activity might affect a feature. These other attributes include consideration of matters specified in Schedule 4, and a site's intrinsic values (RMA part 2 Section 7(d)).

Once each ecological feature (vegetation type, habitat and/or ecosystem) has been identified for assessment, a value is assigned for each of the four matters through considering the relevant attributes. In the simplest form, the values could be high, moderate, low, or very low; in more complex projects a 5 or 6-point scale may be developed.

[18] Criteria are principles or standards by which something may be judged or decided (Oxford Dictionary)

**Table 4 Attributes to be considered when assigning ecological value or importance to a site or area of vegetation/habitat/community.**

| Matters | Attributes to be considered |
|---|---|
| Representativeness | Criteria for representative vegetation and aquatic habitats:<br>• Typical structure and composition<br>• Indigenous species dominate<br>• Expected species and tiers are present<br>• Thresholds may need to be lowered where all examples of a type are strongly modified<br>Criteria for representative species and species assemblages:<br>• Species assemblages that are typical of the habitat<br>• Indigenous species that occur in most of the guilds expected for the habitat type |
| Rarity/distinctiveness | Criteria for rare/distinctive vegetation and habitats:<br>• Naturally uncommon, or induced scarcity<br>• Amount of habitat or vegetation remaining<br>• Distinctive ecological features<br>• National priority for protection<br>Criteria for rare/distinctive species or species assemblages:<br>• Habitat supporting nationally Threatened or At Risk species, or locally[19] uncommon species<br>• Regional or national distribution limits of species or communities<br>• Unusual species or assemblages<br>• Endemism |
| Diversity and Pattern | • Level of natural diversity, abundance and distribution<br>• Biodiversity reflecting underlying diversity<br>• Biogeographical considerations – pattern, complexity<br>• Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation |
| Ecological context | • Site history, and local environmental conditions which have influenced the development of habitats and communities<br>• The essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience (from "intrinsic value" as defined in RMA)<br>• Size, shape and buffering<br>• Condition and sensitivity to change<br>• Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material<br>• Species role in ecosystem functioning – high level, key species identification, habitat as proxy |

[19] Locally – defined as within Ecological District

## a. Representativeness

Evaluation should focus on the extent to which the vegetation, habitats and taxa described at a site, are typical or characteristic of the structure and composition that would naturally be found in a community of that type within the ecological district or region. 1840 is a commonly used baseline against which representativeness is assessed since there are often documents, paintings and other records from this time. Oral evidence from tangata whenua may extend the baseline to an earlier period.

An unmodified or more natural site or area is likely to be a better representative example than a more modified one; some people consider that representativeness is broadly equivalent to "naturalness".

Evaluation requires a standard, or baseline to compare those attributes which are typical and characteristic at the Ecological District scale. This may include identification of one or more reference sites.

Several national datasets provide predictive models (LENZ Potential Vegetation, Singers & Rogers, 2014) which can assist in identifying representative communities of the landform within which the ecologist is working. However, these datasets have limitations when working at finer scales and the ecologist needs to verify their accuracy or validity to their project site.

## b. Rarity and distinctiveness

Rarity is a measure of the scarcity of species, communities, habitats or ecosystem types encountered in a specified district or region. Rarity may be natural or due to human-induced factors, so the reason for rarity needs to be understood and described.

The purpose of this criterion is to identify species, habitats, or ecological features which, by way of limited distribution are more prone to local or national loss or extinction. Therefore their conservation is a priority, and their presence potentially raises the value of a site.

It is important to apply this criterion within a local context (i.e. Ecological Districts and Regions), as some biota or ecological features can be uncommon locally, but common elsewhere (e.g. bellbird in the upper North Island); but also, where necessary, to apply it at a national level (e.g. migratory birds).

Any evaluation requires an analysis of the wider area, and thus an ecologist undertaking an EcIA usually must draw upon existing databases, listings and local knowledge.

## Ecosystems and Habitats

The threat status of originally rare ecosystems are presented in Holdaway, Wiser & Williams (2012) which identifies 18 critically endangered, 17 endangered, and 10 vulnerable ecosystems.

In addition, the Government's "Protecting our Places" (Ministry for the Environment and Department of Conservation 2007a, 2007b) identifies four national priorities for biodiversity protection and adds three further categories to those described by Holdaway et al. (2012) as follows:

1. To protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV) that have 20% or less remaining in indigenous cover.
2. To protect indigenous vegetation associated with sand dunes and wetlands; ecosystem types that have become uncommon due to human activity.
3. To protect indigenous vegetation associated with "originally rare" terrestrial ecosystem types not already covered by priorities 1 and 2.
4. To protect habitats of acutely and chronically threatened indigenous species.

Note that National Priority 1 uses Land Environments of New Zealand (LENZ), the Land Cover Database (LCDB) and a national database of land protection status to determine the extent of historic plant communities which are still extant, and therefore determine the degree of rarity or threat. LENZ and LCDB only provide information on the extent of historic plant communities through the *Predicted Potential Vegetation of New Zealand* (J. Leathwick, McGlone, Walker, & Briggs, 2004) and LCDB only provides broad land cover classes. It can provide information on how much indigenous cover remains within an area, and therefore how much has been lost. The Threatened Environment Classification (Walker, Cieraad, & Barringer, 2015) provides this data on a national scale and is more frequently used now.

Other sources such as Singers and Rogers (2014) at a national level, or PNA surveys carried out at an Ecological District level, can also be used in this way and for some sites the vegetation classifications may be more accurate. All resources should be reviewed for applicability to your site and a decision made on which is more representative of the communities within the Ecological District. As with any national dataset, the ecologist needs to verify the accuracy and validity in relation to their project site.

Comprehensive descriptions of Ecological Regions or Districts are not common. In some places a Protected Natural Area Programme (PNAP) survey may have been carried out and give an assessment of threat to species; however, many PNA surveys and reports are now out of date. The relevant District or Regional Plan may identify species considered to have local importance (but in practice, few do). If neither of these exist, the current local conservation value of a species found at a site can be assessed through consultation with local experts in a range of plant and animal groups. This may include members of local interest groups such as botanical and ornithological societies. Herbarium or museum records may also be referenced.

### Species

The focus of assigning value to plant and animal species is usually 'conservation concern' at the national level since there is an accepted system for assessing this, but the concern at local level should also be considered in an EcIA (i.e. addressing locally rare/uncommon species) where there is sufficient local knowledge to do so.

The system for classifying threats to New Zealand species, by assessing risk of extinction, is the NZ Threat Classification System (see Appendix 6), described in the Department of Conservation manual (Townsend et al., 2008). The information provided contributes to an assessment of rarity of individuals and the condition or health of populations. This system and the expert assessments, published regularly, form a guide to species that should be considered under this criteria in an EcIA. There may be valid reasons to disagree with the threat status of a specific species, such as insufficient or new information. If so, the ecological impact assessment needs to justify and provide evidence as to why the published status should not be accepted.

**Table 5** identifies factors to consider in assessing species value.

Table 5 **Factors to consider in assigning value to terrestrial species for EcIA**

| Determining factors | |
|---|---|
| Nationally Threatened species, found in the ZOI either permanently or seasonally | Very High |
| Species listed as At Risk – Declining, found in the ZOI, either permanently or seasonally | High |
| Species listed as any other category of At Risk, found in the ZOI either permanently or seasonally | Moderate |
| Locally (ED) uncommon or distinctive species | Moderate |
| Nationally and locally common indigenous species | Low |
| Exotic species, including pests, species having recreational value | Negligible |

In assigning value to a species during EcIA, it is important to emphasise that 'low value' does not mean 'no value'. Species of low value may still be at risk of adverse effects and require mitigation action. Equally, species of 'no value' may be of greater importance in terms of ecosystem function. These values should be considered under diversity and context.

## c. Diversity and pattern

Diversity is a measure of the number of different types of species or habitat types that exist in a given area (Geneletti 2006). In the NZ context this criterion covers the extent to which the expected range of diversity, and abundance and distribution of species and habitats is present for the relevant Ecological District.

Natural diversity includes both physical and biological diversity, and ecological processes. In general, larger areas contain more diversity, but some areas with lower fertility or minimal altitudinal range, naturally have low diversity. Evaluation of this criterion needs to consider that in many cases a mosaic of connected habitats is required to support the range of life history stages of many freshwater species and mobile terrestrial species.

Pattern is a measure of the extent to which the distribution of biological components across the landscape reflects natural underlying physical patterns. Species and community composition change along environmental gradients and this is reflected in ecological patterns. For example, altitudinal sequences and ecotones are particularly important zones for species and community diversity.

Environmental gradients can also be temporal. For example, in river ecosystems, flood events create spatially and temporally variable biophysical features to which invertebrate and fish communities respond.

Abundance relates primarily to species and refers to the relative representation of a species in a particular ecosystem. It may include consideration of density where the population of that species can be determined.

In considering these values, the limitations of the typical EcIA must be taken into account. Where long-term research on populations and taxa is not practical it is often necessary to use habitat as a proxy for species presence, distribution (and pattern) and abundance at a site. This should be identified.

## d. Ecological context

Ecological context is a wide-ranging matter. In RMA Section 6(c) assessments, “ecological context” is usually used to describe a site’s role in ecosystem functioning through its relationship with its surroundings. This criterion covers the maintenance of indigenous biodiversity in relation to the size and shape of an area, how it is buffered from the surrounding anthropogenic landscape, and how areas important for ecological processes or fauna or flora life history stages are connected. Context and buffering usually are applied together, as they are inter-related.

In addition, island biogeographical considerations are to be considered where a site has a role as a stepping stone or corridor, providing for migration, dispersal and the exchange of genetic material between close and isolated remnants or distant ecosystems.

For EcIA, ecological context also requires an understanding of the physical components of the site itself, the local environmental conditions, and the site’s history, all of which will have influenced and explain the presence, development and form of the site and of the ecological components within it. This assists in understanding the ecological functions performed by elements of the site and the site’s health, condition, fragility and resilience.

This understanding is key to understanding the site’s sensitivity to change in the presence of the project activities, and to identifying the indicators of change which are required as part of the next stage (impact assessment), the identification of impact management options (Chapter 7) and effects monitoring (Chapter 8).

Size is the measure of the extent of a habitat or community. Larger areas have greater natural diversity and carrying capacity, and are, proportionally, less affected by edge effects. Buffers around core areas of ecological value help to reduce external influences and maintain their values. This is relevant to EcIA because, all other things being equal, larger sites tend to be more resilient to change than smaller sites.

Despite this, it is known that some fauna are able to survive in very small and degraded habitats (e.g. some lizards and less-mobile invertebrates), emphasising the need to take a broad approach. A similar approach is needed for some threatened plants.

Fragility refers to the degree of sensitivity of species or ecosystems to environmental changes. The more fragile a community or habitat is, the greater is the requirement for higher level impact management and a good understanding of those aspects that contribute to its fragility.

In assessing ecological context, it is important that the role of the species in the community or ecosystem is understood, as well as its abundance and/or distribution. A plant or animal may not be rare or threatened, but may play a key role in ecological structure or processes. This information is needed to take into account the way in which an impact may affect the plant or animal, and therefore the way an impact may be managed, rather than the effect on numbers/rarity alone.

While it may not be under threat, a species of plant or animal can also have value because of the part it plays in ecosystem functioning or resilience at a particular site. At a particular site or in a specific context the potential effects of a proposal may be on a relatively common species that has a key role in an ecosystem.

Introduced species have lower ecological value under the RMA, but still need to be evaluated because they can have ecological value in certain circumstances. This includes value as habitat for indigenous species.

This evaluation is most straightforward for plants or where the animals are resident within the area covered. However, for migratory or highly mobile species the assessment will need to consider the importance of the area for their life-cycle. E.g. an occasional record of a single bird would warrant a different value from regular visits by breeding birds. The relative values should be explained. The occurrence of a species is not usually enough on its own to inform impact assessment. An EcIA must assess the importance of a place in supporting a species throughout the season, year or lifetime.

Knowledge about species' use of a site or area will almost always be incomplete. At the scoping stage, the EcIA must identify the important species and use the full assessment stage to gather sufficient information to assess their values. If this cannot be done, or there is uncertainty about the presence of a species, it must be noted, and an expert assessment of value made and taken into consideration when assessing effects.

### 5.2.2 Assessing terrestrial sites or areas using EcIA data

The values assigned to different subsets can be combined to give a single site value. Combining values should be done in a way that avoids suppressing project impacts on individual features or components.

The very high, high, moderate, low, negligible[20] values given to each ecological feature for each "matter" (based on **Table 4**) then feed into a scoring system to give an overall value for each area assessed or the full Project Site. There are many permutations of scoring from all high to all negligible and again the ecologist's expert judgment is used to assign them. **Table 6** provides a broad guide to how a combined score could be determined from the four individual "matter" scores. Appendix 10 shows all possible combinations of score.

Table 6. **Scoring for sites or areas combining values for four matters in Table 4.**

| Value | Description |
|---|---|
| Very High | Area rates High for 3 or all of the four assessment matters listed in **Table 4**.<br>Likely to be nationally important and recognised as such. |
| High | Area rates High for 2 of the assessment matters, Moderate and Low for the remainder, or<br>Area rates High for 1 of the assessment maters, Moderate for the remainder.<br>Likely to be regionally important and recognised as such. |
| Moderate | Area rates High for one matter, Moderate and Low for the remainder, or<br>Area rates Moderate for 2 or more assessment matters Low or Very Low for the remainder<br>Likely to be important at the level of the Ecological District. |
| Low | Area rates Low or Very Low for majority of assessment matters and Moderate for one.<br>Limited ecological value other than as local habitat for tolerant native species. |
| Negligible | Area rates Very Low for 3 matters and Moderate, Low or Very Low for remainder. |

Whatever scale and categories are used should be explained and documented in the EcIA report.

[20] Any value range may be used, providing there is consistency across the matrices

# 5.3 Assigning value to freshwater habitats

## 5.3.1 Attributes

In the same way as a terrestrial ecosystem is evaluated, the ecological value of a location, reach, stream, river, catchment, lake or wetland is determined by the values of species, communities and habitats found there and the ecological context (typically catchment or sub-catchment) in which they exist and interact. The ecological values of freshwater ecosystems similarly have aspects of both quantity (rarity or extent) and quality (integrity, functionality or condition). Wetlands may be considered as either terrestrial or aquatic ecosystems and should be assessed according to the dominant character. Ausseil et al. (2008) discuss evaluation of wetland ecosystems of national importance for biodiversity.

Some regulatory documents identify and specify the ecological value of specific freshwater locations. Regional policy statements, regional plans and/or district plans for the Project Site or ZOI location should be consulted first to determine what matters to consider and criteria to use to meet regulatory requirements. If there is a Water Conservation Order in place on the relevant waterway there will be very specific policy and rules in place to guide an EcIA.

Although a wide range of metrics and measures are used in the assessment of freshwaters there is no unifying set of attributes used to assign value or significance. Measures that are considered when assigning ecological value to a freshwater site do fall broadly into the matters discussed in 5.2 and detailed in **Table 4** although the application of these attributes varies widely between regions and is somewhat inconsistent amongst practitioners. **Table 7** indicates how some of the matters commonly recognised in terrestrial ecosystem evaluation may be applied in freshwater ecosystems.

Table 7. **Matters that may be considered when assigning ecological value to a freshwater site or area**

| Matters | Attributes to be assessed |
|---|---|
| Representativeness | • Extent to which site/catchment is typical or characteristic<br>• Stream order<br>• Permanent, intermittent or ephemeral waterway<br>• Catchment size<br>• Standing water characteristics |
| Rarity/distinctive-ness | • Supporting nationally or locally[21] Threatened, At Risk or uncommon species<br>• National distribution limits<br>• Endemism<br>• Distinctive ecological features<br>• Type of lake/pond/wetland/spring |
| Diversity and pattern | • Level of natural diversity<br>• Diversity metrics<br>• Complexity of community<br>• Biogeographical considerations - pattern, complexity, size, shape |
| Ecological context | • Stream order<br>• Instream habitat<br>• Riparian habitat<br>• Local environmental conditions and influences, site history and development<br>• Intactness, health and resilience of populations and communities<br>• Contribution to ecological networks, linkages, pathways<br>• Role in ecosystem functioning – high level, proxies |

[21] Locally – defined as Ecological District

Ecological impact assessment in freshwater ecosystems has been less reliant on the traditional range of conservation and Section 6(c) assessment criteria than similar work on terrestrial ecosystems. Even where criteria for the assignment of 'significance' exist within a regulatory plan, the practice for freshwater practitioners is to default to measured and observed attributes recorded from a stream reach under investigation. In part, this is because qualitative and quantitative indicators and metrics that include a scale or ranking for developing a hierarchy have been developed by freshwater ecologists. Because any assignment of significance or value to freshwater ecosystems (especially stream ecosystems) is based on empirical information (unlike terrestrial ecosystems which rely on descriptive information and overlays of information), greater reliance is placed on the captured information rather than subjective criteria. This has led to assessments being closely aligned with s88 and Schedule 4 requirements.

### 5.3.2 Stream Ecological Valuation (SEV)

The Stream Ecological Valuation (SEV) was developed by the then Auckland Regional Council in 2004 in response to the rate of loss of small waterways in the Auckland Region. The SEV is a method for scoring the ecological condition of Auckland streams and for quantifying environmental compensation. It is not in itself a method for assigning value to a stream; but the SEV score can be used to contribute to an assessment of ecological value. The SEV was developed for application to permanent streams (and has recently been revised (Neale, Storey, & Rowe, 2017) and extended in application to intermittent streams (Neale, Storey, & Quinn, 2016)) in Auckland, and has not been tested for use in other regions, although regulatory authorities in some regions are adopting the SEV as a practice. Most typically the outcome of the SEV is used in the development of an Ecological Compensation Ratio (ECR) that can be used for quantifying the offset required for the loss of stream habitat and function (see Chapter 7 for further explanation).

### 5.3.3 Ecological integrity of freshwater ecosystems

Schallenberg et al. (2011) consider that measures of Ecological Integrity (see Glossary) integrate a wide range of ecological values related to the structural and functional processes of ecosystems. The concept and implementation of measures of ecological integrity as part of assigning value or significance has not found common practice in New Zealand. Nevertheless, Schallenberg et al. (2011) considered four attributes to assess ecological integrity of New Zealand freshwaters:

- Nativeness – the degree to which an ecosystem's structural composition is dominated by the indigenous biota characteristic of the particular region.
- Pristineness – relates to a wide array of structural, functional and physico-chemical elements (including connectivity), but is not necessarily dependent on indigenous biota constituting structural and functional elements.
- Diversity – richness (the number of taxa) and evenness (the distribution of individuals amongst taxa); link to a possible reference condition; the use abundance weighting; and geographical scale.
- Resilience (or adaptability) – quantifying the probability of maintaining an ecosystem's structural and functional characteristics under varying degrees of human pressure or stressors such as climate change.

Ecological integrity can be used as a "measure" of the condition of a freshwater ecosystem.

## 5.4 Manawhenua values

An ecologist cannot assign or assess “cultural” or more specifically “manawhenua” value to an ecological feature – this can only be done by manawhenua or the iwi and hapū of the particular location. Identification of potential cultural values is important, but should be confirmed and/or assessed by, or in conjunction with, manawhenua.

Indigenous species or areas of indigenous vegetation or habitat valued by manawhenua can also have recreational, landscape, education, spiritual or other values. Ecological information may feed into these values, but it is important that they remain distinct in the overall decision-making process.

Where related values exist, the ecologist should note that a species or place has manawhenua value when compiling his/her report and refer to relevant sources or documentation. This can be expanded and even confirmed via direct engagement with manawhenua or by working alongside those undertaking a cultural assessment as part of a project.

Sources of information that may assist with identifying manawhenua values associated with ecological features include: iwi management plans (often held by local authorities or published by iwi and/or hapū authorities); cultural impact assessments; historical texts (such as those by Elsdon Best and Herries Beattie); Waitangi Tribunal reports; Treaty Settlement Acts and taonga species lists and provisions; and research papers (where these involve manawhenua). Further websites and texts that may provide information are listed in **Appendix 2**.

The Waitangi Tribunal Report – Ko Aotearoa Tēnei (WAI 262) also provides an overview of the relationship Māori have with the environment and in particular taonga and taonga species. This can be found at: https://waitangitribunal.govt.nz/news/ko-aotearoa-tenei-report-on-the-wai-262-claim-released/

# 5.5 Assigning value to ecosystem services

Chapter 5 to this point has focused on determining the intrinsic value of species, habitats and ecosystems; that is, values which are separated from any economic or social return to people.

In the simplest definition, ecosystem services are 'benefits that people obtain from ecosystems'. The values placed on ecosystem services may thus be considered as socio-economic values, rather than intrinsic ecological values, although ecosystem services link closely with the "life-supporting capacity of ecosystems" (RMA S 5(2) (b)) – the capacity to support human life as well as plant or animal life.

Early frameworks considered that there were four types of ecosystem services:

- Support (or habitat) services; e.g. habitats for plants and animals on which other services are based; genetic diversity
- Regulating services; e.g. pollination, bio-control, erosion and flood control
- Cultural services; e.g. for recreation and tourism; culturally or spiritually important ecosystems and habitats
- Provisioning services; e.g. habitats for food species; drinking and irrigation water; bio-prospecting and research areas

But more recent literature recognises that "support services" encompasses the biological components that give rise to regulating, cultural and provisioning services [22] (which it may be appropriate to think of as the intrinsic values) and work now focusses on three areas.

The Millennium Ecosystem Assessment (2005)[23] highlighted the importance of these services, while The Economics of Ecosystems and Biodiversity initiative[24] (TEEB) is one of many organisations working to quantify and develop accounting methods for them. In New Zealand research is being carried out at Lincoln and Massey Universities, and Landcare Research has undertaken research for the Sustainable Business Council[25] relating to the dependence of businesses on ecosystem services. For further information and valuation of ecosystem services an expert in this particular area should be consulted.

The science and policy around ecosystem services is developing rapidly. An ecologist carrying out an EcIA needs to recognise ecosystem services but it is unlikely that a rigorous assessment can be carried out within the scope of an EcIA for most projects. For some larger projects, it may be more appropriate to address ecosystem services as part of social or economic impact assessments.

Healthy ecosystem services depend on healthy ecosystems. These Guidelines consider that in assessing potential effects on ecosystems and identifying appropriate impact management to avoid, remedy or otherwise mitigate adverse effects, an EcIA will address the issues of ecosystem health that are fundamental to the services they provide to humans.

Accordingly, these Guidelines propose that an ecologist should not include an assessment of effects on ecosystem services in an EcIA unless the local authority under which the application is being processed requires it. In that case, if the ecologist does not have expertise in the area themselves, they should work with a person who does.

[22] New Zealand Ecological Society feedback on Ecological Impact Assessment Guidelines V1. June 2016
[23] http://en.wikipedia.org/wiki/Ecosystem_services
[24] http://www.teebweb.org/resources/ecosystem-services/ 20 http://www.sbc.org.nz
[25] http://www.sbc.org.nz

# 6 Assessing effects

# 6 Assessing effects
## Key Points

**6.1** The **nature and level** of **actual or potential effects** of activities for which consent is being sought should be addressed. **Positive and adverse** effects, and cumulative effects, should be considered. The assessment will inform the nature and scale of impact management required.

An **assessment requires:**

- A description and discussion of all effects
- A discussion of the likelihood of those effects occurring; and
- A rationale for assessing the level of effects

**Matrices** are proposed as a way of summarizing these complex descriptions and analyses.

**6.2** Direct and indirect **activities** may occur through:

- Construction
- Operation
- Decommissioning

**6.3** Effects should be **characterised** in terms of:

- Predictability of change and effects
- Confidence in predictions
- Direct or indirect nature of effects
- Positive and beneficial as well as adverse
- Spatial scale or extent
- Temporal scale
- Duration
- Reversibility
- Timing
- Risk and uncertainty

**Ecological change** should consider:

- Key features of ecological structure and function
- Potential changes to the features
- Changes that might take place should the proposed actions not occur

**6.4** The approach proposed for New Zealand is that the **level** of an effect is determined by a combination of the **magnitude** of the effect and the **value** of the affected ecological component.

**Magnitude of effect** is a measure of the extent or scale of the impact and the degree of change that it will cause. A typical scale of magnitude ranges from very high/severe to negligible. The scale should be explained for each assessment context.

**Level of effect** is determined by the magnitude of effect and the value of the affected biodiversity or ecological component. A typical scale ranges from very high to negligible, depending on the magnitude and nature of the effect and the importance of the affected ecological feature. The scale should be explained for each assessment context. Positive effects should also be assessed.

**6.5 Cumulative effects** should be described for direct and indirect effects over a larger area; a longer period of time; or due to interactions with other actions; and include other past, existing and future actions.

**6.6** The scale and nature of adverse effects guide the design and implementation of impact management and monitoring.

# 6.1 Introduction

This chapter looks at ways of assessing the nature and level (or seriousness) of the potential effects of a proposal (including its different component activities) on ecological values[26]. In a larger project an assessment of effects may be carried out initially at the scoping stage to provide feedback into the early stages of project design. It is repeated throughout project development as further investigations are carried out. Assessments of effects inform decisions about the nature and scale of mitigation or impact management (see Chapter 7).

'Significance of effect' is not used here as an ecological term. The link between the level (or seriousness) of adverse ecological effect and concept of 'significant adverse effect' as used in the RMA is discussed.

The level of adverse effects or positive (or beneficial) effects on an ecological feature or process is determined by:

- the magnitude of the effect,
- the nature of the effect, and
- the ecological value of the feature or component.

"Magnitude" of effect is a measure of the extent or scale of the impact and the degree of change that it will cause; "nature" refers to the way in which a specific impact will affect a feature or component. Ecological value may have a temporal component (e.g. seasonality) so effects may have a temporal component.

The benefits of "positive ecological effects" that are incorporated into a proposal or project's design tend to be overlooked in New Zealand assessments, or at most considered as a peripheral feature of the assessment. These Guidelines include consideration of positive effects in the assessment process and this is discussed in Section 6.4.30

As discussed previously, the ecologist must use the thorough description of ecological components and processes within the zone of influence and an understanding of the proposed activities to decide what ecological features or components the assessment will consider. For example, whether to assess effects on a site (e.g. reach of a stream), plant communities (e.g. riparian vegetation, emergent vegetation) or individual species (e.g. a nationally threatened plant within that riparian community).

The assessment of effects should have:

- a thorough description and discussion of all potential effects (including cumulative effects) on ecological features;
- a discussion of the likelihood of those effects occurring; and
- a clear rationale for assessing the level or seriousness of effects.

In the following sections, matrices are proposed as a way to assist ecologists to summarise assessments so that they are clear and can be compared with other environmental evaluations as appropriate. Matrices alone are insufficient, and must always be used in conjunction with thorough discussion to show how the scores have been allocated to the matrix cells and how evaluations have been made. This is especially important when evaluation is not clear-cut and may fall 'between the cells' of a matrix.

The matrices are intended to assist informed and robust assessment. The results cannot simply be taken on face value; they must be grounded in good data and the outputs must be interrogated and justified.

The words which result from each table – very high, high, medium, low, and negligible – are short-hand for the ecological implications, which should be discussed and justified within the assessment text. Similarly, there is often a level of risk or uncertainty associated with every assessment that must be acknowledged appropriately.

Fundamentally, the matrix is not a substitute for sound professional judgement and good science, but can be used to guide assessments of effects and demonstrate to those reading assessment documents that a repeatable, logical process has been applied to the data.

[26] Note: the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines (2013) and Regini (2000) use the term 'sensitivity' instead of 'value'.

# 6.2 Activities and effects during the project lifecycle

## 6.2.1 Describing activities

The ecologist must identify and describe the specific effects potentially caused by activities (either singly or in combination). To obtain this information it is reasonable to expect the applicant or project planner to provide a detailed project scope. If the project is large enough to require a project engineer, the ecologist should also seek a detailed construction methodology.

It is not sufficient to know what activities will occur. To satisfy the requirements of Schedule 4 the scope and scale of any activity likely to impact on ecological features must be quantified. The ecologist must be clear about:

- what activities will be undertaken;
- where they will be carried out;
- how they will be carried out;
- when (including duration and when the activities may cease);
- by whom they will be carried out;
- what safeguards and contingency plans are proposed;
- any rehabilitation that will be undertaken; and
- what monitoring will be carried out and what will be monitored.

This includes both construction and operational activities for which consent (or other planning permit, concession etc.) is required. The regulatory body may also require information about, and assessment of, effects of decommissioning.

The ecologist should only assess the effects of the activity for which consent is being sought. If there is any doubt about potential effects of the activity, or if the scope of the application is not clear, the ecologist should seek guidance from the project planner or legal advisor. Activities that may not require RMA consent, but which may affect animal health or welfare governed under other legislation (e.g. Wildlife Act 1953) should be considered.

Activities may be temporary or permanent/on-going; and the effects they may cause may be:

- temporary (especially, but not always during construction), e.g. access roading to pylon sites
- permanent (especially those associated with the operation of something that has been constructed), e.g. stormwater management system, road
- direct, e.g. removal of vegetation
- indirect, e.g. landform shaping affecting waterways
- off-site, e.g. at a workers' accommodation site

Sometimes, 'mitigation' activities that reduce the adverse effects at the site may be considered to be part of the project from its inception. This may be a matter of legal requirement or best practice (e.g. stormwater treatment to maintain water quality) or project design (e.g. enhancement of a waterway through a residential subdivision.)

If, at the project shaping stage, the potential adverse effects have been clearly defined and the necessary avoidance, remedy and mitigation has been integrated into the project design, then the assessment of the level of effect can be based upon the project as mitigated.

If, however, any aspects of mitigation are uncertain, it may be necessary to provide an assessment of the level of effect both with, and without mitigation, for that element of the project design.

Either approach is acceptable as long as the components are clearly defined.

## 6.2.2 Construction activities likely to affect ecological features

These will vary in detail according to the purpose of the construction activity (e.g. road, building, jetty, wind farm) but there are general types of activity that have effects on ecological values:

- Excavation and earthworks, including waterway diversion
- Abstraction, drawdown or reinjection of water
- Import of soil and other fill materials
- Use of machinery and vehicles (including aircraft) on site – compaction, noise, hazardous chemicals, dust
- Increase in human activity associated with construction – noise, fire risk, pest and weed introduction, litter, facilities and services
- Vegetation clearance in construction corridors and access areas
- Construction of stormwater management structures

## 6.2.3 Operational activities likely to affect ecological values

These too will be specific to the proposal being assessed, but generally effects on ecological values will be associated with:

- Use of noisy equipment/machinery/vehicles
- Use of artificial light at night
- Discharging to water or land
- Taking water from the surface or groundwater
- Presence of structures (e.g. turbines, dams, bridges, culverts)
- Introduction or increased presence of humans (e.g. workers, tourists, recreational visitors)
- Management associated with environmental enhancement (e.g. indigenous planting, pest control, legal protection)

## 6.2.4 Decommissioning activities likely to affect ecological values

Because decommissioning is likely to occur in the distant future, it will not be possible to describe in detail its activities and effects. Many decommissioning activities will be those associated with construction (deconstruction). Other effects may arise through the removal of environmental enhancement management or cessation of activities that were having adverse effects.

## 6.3 Describing the effects on ecological features

### 6.3.1 Parameters

When describing or characterising the potential effects on ecological features from activities at any stage, the following aspects must be considered:

**Predicting impacts and effects.** Identifying the actual or potential impacts and effects requires the ecologist to:

- Understand the ecological processes at work, including the trends in the absence of the proposal; and
- Understand the ways in which the project activities might interact with, interfere with or change the ecological processes.

This might be achieved through experience of, or researching, previous similar situations and applying assessments to the current situation (with careful regard to possible differences in context). An experienced ecologist may use his or her accumulated knowledge, but must be clear in reporting exactly how that knowledge applies in a particular situation. A team approach can be most useful, including professionals from other disciplines in discussions (e.g. hydrologists, engineers, physical scientists) to ensure that potential impacts are identified.

**Confidence in predictions**. Given the data available on all aspects of the project and the ecological features studied, the ecologist should give an indication of the confidence in the predicted effects; that is, the likelihood of them occurring in the way predicted. Some things will be certain, e.g. vegetation clearance will reduce the population of some species by a proportion that can be measured or estimated; other effects will be less certain, e.g. the potential effects of a wind turbine on a migratory bird species is more difficult to predict. Modelling tools can assist in predicting effects and the level of effects (e.g. stormwater run-off models that predict the amount of sediment likely to reach a waterway). However, the limitations of any model must be documented and predictions used with appropriate levels of caution. When using model (or any other) information provided by a third party, the ecologist must ensure s/he has a good understanding of that model and its limitations.

**Direct or indirect.** As well as direct effects on ecological components and processes found or occurring within the zone of influence, are there potential indirect effects caused by changes brought by the project? (e.g. pest incursions into adjacent lands facilitated by the construction of vehicle tracks that provide corridors for invasion). Recent work has characterised "enigmatic impacts" which can be thought of as impacts that are hard to detect and mitigate, and overlooked by standard methods (see https://tinyurl.com/ycx3ao4z).

**Positive or beneficial** environmental effects, as well as adverse effects, should be assessed. Note that social and economic effects, whether positive or negative, do not have a bearing on EcIA.

**Spatial scale or extent.** As with the assessment of significance and value, the process for determining the appropriate extent of the feature and the scale of the magnitude of effect must be considered and documented. Over what area will the impact act? What area of habitat or vegetation type could be affected? This should firstly be expressed in terms such as study area, corridor, project footprint, or zone of influence, which were established at the start of the assessment process. Distance of the effect from the activity causing it is not a measure of the level of ecological effect.

Generally, it is recommended that an assessment at the scale of the feature (e.g. contiguous dunes, wetland system, forest community) should be done.

Similarly, if a significance assessment or an assessment of the ecological value of the site has been carried out at the scale of an Ecological District, an assessment of the magnitude of effect should also be assessed at that scale.

If an ecological feature or species is considered of high or very value at a national scale (for example, threatened species, naturally uncommon ecosystems) then the assessment should also look at the magnitude of effect at that scale.

Assessing magnitude of effect at the spatial scale of the effect is not recommended, since it does not assist in developing impact management options. For many activities, this is a narrow perspective on the effect on ecological value and provides no information about the impact of the effect in the context of the local ecosystems, or in the context of the site's value. For example, removal of $10m^2$ kanuka at the edge of a $20m^2$ stand for an access road may reduce the site's kanuka cover by 50%; but if the surrounding land supports extensive kanuka, and the species is common in the Ecological District, the wider context of that clearance needs to be considered.

**Temporal scale**. Will the effect be temporary or permanent; continuous or occasional? At the start of the assessment process, timescales should have been established and defined; ideally these should tie in with project stages but this is not always possible. The timescales should make sense in ecological terms (e.g. relating to periods such as life cycles or vegetation regeneration times).

**Duration**. This is the time for which the effect will last and should be measured in ecological timescales as well as human timescales (e.g. fish life cycles). An assessment must describe the circumstances if an activity may be short in duration but the effect on a population or community may be long term, see **Table 9**.

**Reversibility**. Are the potential effects reversible – either totally or partially? This can apply to both positive and adverse effects. An irreversible (permanent) effect is one from which recovery is not possible within a reasonable timescale; a reversible one (temporary) is an effect for which natural recovery may be possible or for which there is a commitment for mitigation action at the site (e.g. rehabilitation of ground cover).

**Timing**. How will the timing of undertaking activities and occurrence of their effects relate to plant or animal cycles and patterns? At what time of year will they occur and how does this relate to events such as breeding or migration?

**Risk and uncertainty.** The EcIA process is itself uncertain, since long term outcomes cannot be proved. In New Zealand there are gaps in knowledge about biodiversity (distributions, occurrences, trends etc.) and ecological processes and relationships. Many of these are fundamental to evaluation and assessments of effects on ecological values. It is not reasonable or, indeed, possible for a project proponent to fill in many of these gaps (e.g. population trends or regional species distributions). The ecologist must take a reasoned approach to uncertainty around both the availability of data and the delivery of forecast outcomes, and the risk this poses to biodiversity (and possibly to the project). Expert opinion must be used to make assessments, evaluations and predictions where there is insufficient information. Where uncertainty is high the ecologist should take a conservative approach to the assessment. The way in which such analysis has been done should be documented.

### 6.3.2 Potential effects on ecological features

When characterising effects the ecologist should refer to a wide range of aspects of ecological structure and function. Appendix 8 gives examples of matters to consider – broadly these include:

- Physical resources/environment
- Stochastic processes
- Ecological processes
- Human influences on ecological patterns and processes
- Historical context
- Ecological relationships
- Ecosystem properties

These features may be affected directly or indirectly or cumulatively through any activities causing disruption, such as:

- Fragmentation or isolation e.g. by removal of vegetation
- Loss/ mortality e.g. by contamination, earthworks, impact with structures
- Food chain effects e.g. by loss of food species
- Disturbance e.g. through increased human access, construction vehicles, noise
- Barriers e.g. through damming, roading
- Removal, reduction of physical resource e.g. by abstraction of water, removal of vegetation
- Change in physical resource e.g. through change to flow regime/patterns, run-off

# 6.4 Evaluation of the level of effects

## 6.4.1 Overview of method

The approach proposed for New Zealand is that the level of an effect is determined by a combination of the magnitude of the effect and the value of the affected ecological component. Magnitude is determined by a combination of scale (temporal and spatial) of effect and degree of change that will be caused in or to the ecological component. Criteria for determining magnitude are proposed in **Table 8** but these may be modified according to the nature of a particular project and the ecological context. In particular, it may be appropriate to add intermediate ranks (e.g. moderate-high, low-moderate) or a numerical rank may be preferred. It may be a plan or regulatory authority requirement that a scale used in the planning documents against which the project application will be assessed, be used.

The magnitude of effects ranges from negligible to very high. Where the ecologist is confident about the actual effects, it is relatively easy to describe these and the extent to which an ecological feature would be impacted. But where there is more uncertainty, a more cautious approach may need to be taken, and a worst case scenario assumed. If this uncertainty involves an ecological component of high value, then a precautionary approach should be taken.

The types and magnitude of effects lie along a continuum, but matrices can assist in clarifying the evaluation of the level of effects. Matrices must always be accompanied by discussion and interpretation of the information they summarise, and the limitations and uncertainty associated with their use. The matrices proposed here are based on Regini (2000, 2002), used in developing the IEEM Guidelines. They do not appear in the issued IEEM Guidelines (Institute of Ecology and Environmental Management, 2006; Chartered Institute of Ecology and Environmental Management (CIEEM), 2016), where a more discursive approach is adopted.

## 6.4.2 Criteria for describing magnitude of effect

The proposed criteria consider the extent of the effects on ecological components on the site or in the zone of influence. At this stage too, the contribution of the particular example of the ecological component to the wider population or ecosystem must be considered: what would be the implication of loss of this example? (e.g. does the component (whether population or individual) represent a high proportion of the known population?)

**Table 8** shows how the loss, change or deviation from the existing or baseline ecological quantity and quality conditions can be described in terms of the extent and duration of alteration to describe the magnitude of the effect. A scale of very high to negligible is suggested. 'Existing' and 'baseline' conditions may be the same; however, they may differ when the existing environment is expected to change before the activity causing an effect takes place. The concept of "permitted baseline" refers to future conditions that could develop through activities permitted or not requiring a resource consent, and may be the context of the AEE to which the EcIA will contribute. The ecologist should discuss the appropriate "existing" or "baseline" conditions in more complex situations with the planner or legal advisor.

Ecological experience is needed to assess terms such as 'major' and 'minor' and these terms should be explained or defined in the report text. Major and minor are often expressed as a percentage change in area or number; changes in condition require more qualitative characterisation. The ecologist may set out the numerical or other measures used to determine terms such as "very major alteration", "very high proportion" and "fundamentally changed". The choice depends on having an understanding of the practical effects on key ecological components and key impacts.

Table 8. **Criteria for describing magnitude of effect** (Adapted from Regini (2000) and Boffa Miskell (2011))

| Magnitude | Description |
|---|---|
| Very high | Total loss of, or very major alteration to, key elements/features/ of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR<br>Loss of a very high proportion of the known population or range of the element/feature |
| High | Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR<br>Loss of a high proportion of the known population or range of the element/feature |
| Moderate | Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR<br>Loss of a moderate proportion of the known population or range of the element/feature |
| Low | Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR<br>Having a minor effect on the known population or range of the element/feature |
| Negligible | Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR<br>Having negligible effect on the known population or range of the element/feature |

In considering the magnitude of effect, the timescale of potential effects must be considered. **Table 9** shows the recommended timescales.

Table 9. **Possible timescales for duration of effects** [27]

| | |
|---|---|
| **Permanent** | • Effects continuing for an undefined time beyond the span of one human generation (taken as approximately 25 years) |
| **Long term** | • Where there is likely to be substantial improvement after a 25 year period (e.g. the replacement of mature trees by young trees that need > 25 years to reach maturity, or restoration of ground after removal of a development) the effect can be termed 'long term' |
| **Temporary** | • Long term (15-25 years or longer – see above)<br>• Medium term (5-15 years)<br>• Short term (up to 5 years)<br>• Construction phase (days or months) |

### 6.4.3 Criteria for describing level of effect on an ecological feature

An approach for assigning value to ecological features (species, vegetation communities, habitats, ecosystems and/or sites) was set out in Chapter 5; and for describing the magnitude of each effect on each feature in 6.4.2.

To determine the overall level of effect on each ecological feature, the score or rating for magnitude of effect (**from Table 8**) is next combined with the appropriate value of the ecological feature (**Table 4**, **Table 5**, **Table 6** or **Table 7**) and summarised in **Table 10**. In this table, cells with low or negligible levels of effect indicate low risk to ecological values, but not low ecological value *per se*.

"Positive effects" are added into this table. Many projects offer, as part of their design, positive effects on ecological values that are not part of managing adverse effects (e.g. removal of stock from native shrublands or control of willows). These should be recorded and considered as part of the overall assessment and analysis. Assessment of "positive benefits" was integral in the original UK EcIA concept (Regini 2000, 2002).

[27] Note that in some environments (low fertility) or involving some species (slow growth rates, long lived, low fecundity) 25 years may be an underestimate so that context should be considered.

Table 10. **Criteria for describing level of effects** (Adapted from Regini (2000) and Boffa Miskell (2011))

| Ecological Value ▶ Magnitude ▼ | Very high | High | Moderate | Low | Negligible |
|---|---|---|---|---|---|
| Very high | Very high | Very high | High | Moderate | Low |
| High | Very high | Very high | Moderate | Low | Very low |
| Moderate | High | High | Moderate | Low | Very low |
| Low | Moderate | Low | Low | Very low | Very low |
| Negligible | Low | Very Low | Very low | Very low | Very low |
| Positive | Net gain | Net gain | Net gain | Net gain | Net gain |

As with the previous summary tables, the outcomes lie along a continuum. Matrices can assist in clarifying the evaluation of the level of effects. They must always be accompanied by discussion and interpretation of the information they summarise and the limitations and uncertainty associated with their use.

An ecologist is often asked, when making an assessment under the RMA to score or rate the degree or extent of an effect on an ecological feature using RMA terminology; e.g. assessing an adverse effect as 'significant', 'minor' or 'less than minor'. The RMA requires an applicant for a resource consent to consider alternative locations when there are "significant adverse effects", so determining the level of effect in this context can be very important. It may also be a determining factor in matters such as notification of an application.

It is not considered the role of an ecologist to conclude an ecological impact assessment using legal or planning terms. However, the ecologist doing the work should be prepared to answer questions on this topic and assist the planner in coming to a determination about aligning ecological and legal or planning terms.

Level of effect can then be used as a guide to the extent and nature of the ecological management response required (including the need for biodiversity offsetting) [28]. The relevant Regional or District Plan may specify the required impact management for "adverse effects", residual adverse effects" or "significant adverse effects" or use other wording – the ecologist's response should take this into consideration. In the absence of such direction, the level of impact management could be:

- Project effects in the 'Very High adverse' category are unlikely to be acceptable on ecological grounds alone (even with compensation proposals). Activities having very high adverse effects should be avoided. It is not the ecologist's role to make determinations with regard to project viability. The ecologist should present an objective and scientifically robust assessment of the effects of the project to assist the applicant in coming to an informed decision about project viability. Where very high adverse effects cannot be avoided, a net biodiversity gain would be appropriate.

- Options in the 'High and Moderate adverse' category represent a level of effect that requires careful assessment and analysis of the individual case. Such an effect could be managed through avoidance, design, or extensive offset or compensation actions. Wherever adverse effects cannot be avoided, no net loss of biodiversity values would be appropriate.

- Low and Very Low categories should not normally be of concern, although normal design, construction and operational care should be exercised to minimise adverse effects. If effects are assessed taking impact management developed during project shaping into consideration, then it is essential that prescribed impact management is carried out to ensure Low or Very Low level effects.

[28] The circumstances under which biodiversity offsetting is required may be set out in the relevant Regional or District Plan; it is also set out in the Guidance on good practice biodiversity offsetting in New Zealand (New Zealand Government, 2014).

- Very low level effects can generally be considered to be classed as 'not more than minor' effects.

Impact management is discussed in Chapter 7.

The value of 'Positive' effects needs to be considered on a case by case, feature by feature basis and should be considered in a similar way to the "net gain" sought through biodiversity offsetting. The relevant Regional or District Plan may prescribe how "net gain" should be measured; if not, a methodology and justification for the level of gain that is predicted will be required as part of the assessment.

The Quality Planning website proposes a slightly different set of criteria (see http://www.qualityplanning.org.nz/index.php/consents/environmental-effects). There, a scale for determining the 'extent' of adverse environmental effects of a proposal (as opposed to effects on an ecological or biodiversity feature) is proposed. In this, effects range from 'Nil effects' to 'Unacceptable adverse effects' (**Table 11**). This approach is used when deciding whether an application should be considered on a notified, limited or non-notified basis, and also in determining if an activity is appropriate under ss 104 and 105 of the RMA. It may be helpful to use this scale of evaluation where ecological factors may be critical to such planning decisions. While positive effects are taken into consideration, 'mitigation' does not include biodiversity offsetting in these matters.

Table 11. **Extent of adverse effects of a proposal** (from QP website, Feb 2014)

| | |
|---|---|
| Nil Effects | No effects at all |
| Less than Minor Adverse Effects | Adverse effects that are discernible day-to-day effects, but too small to adversely affect other persons |
| Minor Adverse Effects | Adverse effects that are noticeable but that will not cause any significant adverse impacts |
| More than Minor Adverse Effects | Adverse effects that are noticeable that may cause an adverse impact but could be potentially mitigated or remedied |
| Significant Adverse Effects that could be remedied or mitigated | An effect that is noticeable and will have a serious adverse impact on the environment but could potentially be mitigated or remedied |
| Unacceptable Adverse Effects | Extensive adverse effects that cannot be avoided, remedied or mitigated |

# 6.5 Cumulative effects

*"Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and future human actions."* (Canadian Environmental Assessment Agency, 2014). There are many definitions, but this simple one encompasses the fundamental aim of assessing cumulative effects.

In 2003 a UNEP Working Group noted: *"However, there is often little understanding among regulatory authorities and developers of the concept of cumulative effects. This is also true in part for environmental impact assessment practitioners"* (UNEP, 2003).

An assessment of cumulative ecological effects of a proposal should:

- Assess effects over a larger (e.g. 'regional') area that may cross jurisdictional boundaries; this includes effects due to natural perturbations affecting environmental components as well as other human actions.
- Include other past, existing and future (i.e. reasonably foreseeable) actions beyond the specific project in question.
- Consider effects on valued ecological features or attributes due to interactions with other actions, and not just the effects of the single action under review.
- Evaluate the level of cumulative effects in consideration of other than just local, direct effects.

Cumulative effects are not necessarily very different from direct or indirect effects examined in an EcIA; in fact, they may be the same; e.g. where the EcIA considers the various components of a project footprint together such as a quarry and its access road. Cumulative effects assessment ensures that assessment is considered at an Ecological Region or District scale where appropriate. The assessment must determine:

- how large an area around the action should be assessed
- how long in time,
- how to identify 'reasonably foreseeable' future actions, and
- how to practically assess the often complex interactions among the actions

As in the case of assessment of direct and indirect effects, a combination of matrices and descriptive text is recommended. The magnitude/significance matrices described above can be adapted according to the scale and nature of the proposal being assessed.

Jellyman et al. (2000) describe how the cumulative effects of a variety of land and water use decisions, together with complex ecological interactions, have led to the loss of the trout fishery in the Horokiwi Stream over a period of 50 years.

In assessing cumulative ecological effects, the ecologist should be aware that in planning terms there may be a slightly different interpretation of adverse cumulative effects: *An adverse cumulative effect is an effect that, when combined with other effects, is significant only when it breaches a threshold* (RMA Quality Planning website). This should be discussed with the project planner if there is any tension between the level of ecological effect noted and the threshold given in a policy or plan.

## 6.6 Effects and impact management

The scale and nature of adverse effects guide the design and implementation of impact management and monitoring. Where there are effects that cannot be managed through avoiding, minimising, or remedying (including restoration and rehabilitation) then an offset or compensation may be needed.

The case was argued by opponents of Mt Cass Windfarm (Christensen & Baker-Galloway, 2013) that **any** effects on a significant ecosystem (in that case a naturally uncommon karst ecosystem) would result in unacceptable loss. However, the Court noted that the **extent and nature** of the disturbance caused must also be taken into account when considering whether offsetting is appropriate or not. In that case, the small scale of disturbance and disruption was considered insufficient to rule out offsetting. This illustrates the need to be comprehensive in describing effects as well as simply assigning values in a matrix.

# 7 Impact management

# 7 Impact management
# Key Points

**7.1** From an ecological management perspective, 'impact management' includes the full range of actions taken to address adverse effects on indigenous biodiversity and ecosystems. The extent of impact or effects management is determined by the level of effects.

Case law determines that biodiversity offsetting or other forms of off-site environmental enhancement are not 'mitigation' since they do not act at the point of impact, but elsewhere, to create a positive effect. New Zealand case law has determined that offsets are not a form of environmental compensation.

Impact management must where possible meet regulatory standards; and enable **maintenance of existing** levels of indigenous biodiversity.

**7.2** Practical measures must:
- avoid
- remedy (remediate, restore, rehabilitate, reinstate)
- mitigate (minimise, moderate, alleviate, reduce)
- offset
- compensate

Other additional or **supporting conservation actions** may be taken. Projects, environment, and biodiversity context differ; there is no single recipe for impact management and implementation, and innovative approaches and outcomes should be considered. In particular there is a **continuum of potential actions** between biodiversity offsetting and compensation. This covers no net loss of like biodiversity values to out-of-kind arrangements which benefit dissimilar biodiversity and, possibly, other environmental components. In practice, a package of impact management actions is likely to provide the best options for biodiversity.

**7.3 Biodiversity offsets** are "Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken." (New Zealand Government, 2014)

International **guidance on biodiversity offsets** is produced by the Business and Biodiversity Offset Programme (BBOP) and national guidance issued by the New Zealand Government. A number of Regional and District Policy Statements and Plans now contain provisions.

When considering offsets as part of impact management, an ecologist should first consider **relevant local authority policies and plans**; the Guidance on good practice biodiversity offsetting in New Zealand then provides guidance on good practice process and methods for implementation, including accounting systems.

**7.4** The question of **how much** impact management effort is needed is an expert judgment **guided by**:
- National standards or policy
- Regional/District policy
- Significance of ecological values adversely impacted
- Level of ecological effects
- Feasibility of implementation
- Costs, benefits and likelihood of success

**7.5** An ecological compensation ratio (ECR) has been developed specifically as a means of guiding the quantification of compensation for the loss of permanent stream habitat and function.

**7.6 Adaptive management** t is a tool that addresses the uncertainty and risk around impact prediction and management in indigenous ecosystems. It should be a rigorous process, and can be set up through specific resource consent conditions.

# 7.1 Introduction

Where an impact is predicted to result from a development, there is an opportunity to manage the impact. In practical terms, impact management covers a broad range of actions taken to address adverse effects (including avoidance), and ranges from controlling the source of the impact to managing the exposure of the affected species or environments.

The term 'impact management' is used here to encompass all the options that an ecologist must consider in order to manage potential adverse impacts and effects on biodiversity and ecosystems with the aim of:

- meeting the relevant regulatory standards, objectives and policies; and
- seeking to maintain existing levels of indigenous biodiversity, and enhance them where possible (see Principle 1h in Chapter 2).

In relation to impact management, Part 2, section 5(2)(c) of the RMA requires:

- avoiding, remedying, or mitigating any adverse effects of activities on the environment

The terms 'avoiding, remedying, or mitigating' are not defined in the RMA which has led to some confusion.

Most definitions of mitigation (e.g. Canter (1996)) suggest that impact management approaches (in environmental impact assessment generally) should be implemented sequentially, with avoidance measures assuming priority:

- Avoiding the impact altogether, by modifying design or operations or seeking an alternative location
- Minimising the impact by limiting the degree or magnitude of an action, or implementing best practice treatment of controls to minimise impact
- Rectifying impacts through repair, reinstatement or restoration of the affected site
- Offsetting residual impacts by replacing or enhancing substitute resources or environments
- Compensating for the impact by providing substitute resources for implementation elsewhere or for a different purpose

The ecological management terms used in these Guidelines are aligned with wording in the RMA (and other policy) terms in **Table 12**. In the area of biodiversity offsets, the terms used in New Zealand and Australia (and in some cases internationally) differ. These Guidelines discuss the terms and their application in the New Zealand context. Impact management measures are described further in the next section.

Table 12. **RMA and ecological impact management terms** (adapted from Treweek (1999))

| RMA and policy | Ecological impact management measures |
| --- | --- |
| Avoid | Avoidance |
| | • Sensitive design<br>• Siting based on least damage criteria<br>• Avoidance of key areas (e.g. protected habitat) – seek alternative location<br>• Avoidance of key periods (e.g. breeding or migrating season(s))<br>• Preventing impact generating activities |
| Remedy | Remediation, rehabilitation, restoration, reinstatement at affected site |
| | • Reinstatement of habitat<br>• Reseeding habitat<br>• Restoration of damaged habitat<br>• Rehabilitation of site conditions and habitats<br>• Decommissioning of infrastructure<br>• Restoration of damaged biophysical processes |
| Mitigate | Minimisation, moderation, reduction, alleviation of adverse effect on affected features |
| | • Emission controls<br>• Noise and light barriers<br>• Screens<br>• Oil interceptors<br>• Controlled access during construction<br>• Wildlife bridges, tunnels, ecoducts<br>• Vehicle speed limits and usage restrictions (e.g. no night driving)<br>• Wildlife fences<br>• Biosecurity procedures (e.g. pest and weed checks, vehicle washings)<br>• Treatment of wastewater discharges<br>• Stormwater treatment<br>• Translocation of plants and/or animals<br>• Translocation of habitat<br>• Erosion and sediment control methods<br>• Installation of barriers to exotic fish encroachment on natural areas<br>• Removal, storage and reinstatement of habitat/species |
| Biodiversity offsetting for residual adverse effects | Providing long term protection for alternative habitat areas to ensure no net loss of biodiversity (or net gain) – not at point of impact |
| | • Restoration offset<br>• Averted loss offset<br>• Enhancement offset |
| Environmental compensation for residual adverse effects | Compensation for biodiversity and ecological function |
| | • Creating new habitat on alternate sites that differs from that at the point of impact<br>• Providing funding for alternate ecological enhancement actions at another site<br>• Providing protection and enhanced ecological management of an area, without ensuring no net loss of biodiversity |
| Supportive conservation actions | Education |
| | • Research<br>• Public awareness-raising activities<br>• Raising local community capacity to carry out biodiversity conservation work |

In June 2013, Justice Fogarty (NZHC 1346) noted that:

"The usual meaning of 'mitigate' is to alleviate, or to abate, or to moderate the severity of something."[24]

In practice, most forms of impact management have commonly been collectively termed 'mitigation' or represented in a comprehensive 'mitigation package'. In common with overseas practice, increasingly additional mechanisms (and terminology) for impact management are being introduced in New Zealand so that terms often change.

Justice Fogarty also notes that offsets do not 'mitigate' because they are not carried out at the point of impact; rather, offsets offer a positive, new effect, one which did not exist before, and is not at the point of impact.

The term 'mitigation hierarchy' is avoided here because it often incorporates 'mitigation' in the hierarchy, which is a tautology. However, the order of priority for ecological impact management is:

a. Avoid
b. Remedy
c. Mitigate
d. Offset
e. Compensate
f. Supporting actions

This chapter covers:

- The types of impact management measures (including offsets) – the focus is on ecological responses to effects
- The ecological aspects of setting an order of priority for impact management actions
- The role of biodiversity offsetting

[29] NZHC 1346 para 72

# 7.2 Impact management measures

## 7.2.1 Avoidance

The avoidance of impact on biodiversity or ecological values is the most effective element of managing adverse effects and presents the least risk of loss of ecological values. It can be spatial (e.g. through locating the proposal or a component of the proposal somewhere else to avoid sensitive habitat or vegetation); or temporal (e.g. avoiding an activity during bird migration or roosting periods which will reduce impacts on bird populations and recruitment).

For avoidance to be successful, ecological impacts need to be considered during the early stages of a project so that modification of design and operations can be taken into consideration. However, avoidance through project redesign can occur at any stage of the project. Avoidance can gain particular impetus when the practicalities or costs of mitigation and ecological enhancement (offsetting or compensation) become apparent. Although the avoidance of ecological impacts is considered early in some sectors of industry, there can be some reluctance to implement it if alternative impact management approaches are available. Where potential impacts on ecological values present a high risk of not obtaining operating consents, it can be worthwhile to undertake project redesign.

When proponents can clearly demonstrate the opportunity cost (especially in dollar terms) of proceeding with a particular avoidance strategy, as opposed to the original strategy, it is one of the few ways of demonstrating that a genuine attempt at avoidance has been made. Proponents (and the ecologists advising them) are often subject to considerable scrutiny when making claims of 'avoidance'.

Legal protection status may require that specific areas are avoided. At a local level, in most cases protection or regulation follows the recognition of significant ecological or natural areas (SNAs), generally identified and mapped in Council regulatory documentation or via published and unpublished records.

For some activities based on natural resources, complete avoidance may not be possible since their location is dependent on the location of the resource (e.g. quarrying specific materials; ski-field development). In some cases, it may be possible to manage some impacts through timing of specific actions. In others there will be unavoidable adverse effects on biodiversity and ecosystems.

Avoidance of impacts carries the greatest certainty of outcome for biodiversity within the proposed project footprint. Where risk and uncertainty form an important part of the impact management assessment process, avoidance should be given the highest priority over other steps of the impact management 'hierarchy' for which outcomes are less certain and risk of failure more likely i.e. remedying, mitigating, offsetting or compensation.

### 7.2.2 Restoration, rehabilitation, remediation

These are remedying measures taken to improve degraded or removed ecosystems following exposure to impacts that cannot be completely avoided. Although the terms restoration, rehabilitation and remediation are often used interchangeably, the meaning of each in practice is quite specific.

- Restoration attempts to return an area to the original ecosystem that occurred before impacts.
- Rehabilitation aims to restore basic ecological functions and/or ecosystem services (e.g. through planting vegetation alongside streams to carry out riparian functions; or enhancement planting within remnant forest). Rehabilitation can also enable production land uses to occur.
- Remediation is the action of trying to improve the condition of an ecosystem, especially in reference to the reversal or stopping of damage to the environment. It encompasses actions taken to promote regeneration.

Remediation, rehabilitation and restoration are typically needed towards the end of a project's lifecycle, but it may be possible to implement them either prior to commencement or during construction (e.g. through stockpiling topsoil) and operation of a development, particularly if ecological areas impacted during construction are not needed during operational phases of a project and can be remedied. Early initiation of these steps is essential. Progressive rehabilitation is recommended for larger projects.

### 7.2.3 Mitigation: minimisation (moderation, reduction)

Following the RMA impact management hierarchy, these are the measures taken to reduce the duration, intensity and/or extent of impacts that cannot be completely avoided or remedied. They generally revolve around project design and operation rather than location. Effective minimisation can eliminate some negative impacts. Examples include implementing best practice guidelines for storm water management, earthworks and sediment management; air quality controls and treatment prior to discharge; designing infrastructure to reduce the likelihood of fatalities or injury to wildlife; reducing barriers to plant dispersal and animal movements; or building wildlife crossings on roads.

### 7.2.4 Mitigation: translocation, relocation, rescue

Any transfer of plants or animals from a development footprint (i.e. salvage and relocation) requires integrated and preparatory planning to ensure that the plant/animals are in good condition prior to the move and that a suitable receiving environment is well-established prior to transfer. Transfer of indigenous species of animal will require a permit from the Department of Conservation if the relocation distance is over 500m. Unless the species is protected by the Wildlife Act 1953, a relocation (movement less than 500m) can be done without a permit. These elements must be considered early in the EcIA process as they can involve considerable time requirements for procedural processing and implementation.

### 7.2.5 Biodiversity offset

As considered by the hierarchy, avoidance, remedy and the components of mitigation serve to reduce, as far as possible, the impacts that a development may have on the ecological character, community and function of an area. Often these steps are sufficient to provide overall mitigation for the potential or actual impacts of a planned project. However, in some cases, even after best attempts have been carried out and effectively applied, there are residual adverse effects on biodiversity or ecological values that cannot be mitigated. To address these, additional steps may be required to deliver No Net Loss or a Net Positive Impact of biodiversity or ecological values.

Biodiversity offsets are measures taken to counterbalance any residual adverse impacts after implementation of the hierarchy. Biodiversity offsets are of three main types: "restoration offsets" which aim to rehabilitate habitat (e.g. through revegetation); "enhancement offsets", which aim to restore degraded habitat (e.g. through control of pests or weeds or by enrichment planting), and 'averted loss offsets' which aim to reduce or stop biodiversity loss (e.g. future habitat degradation) in areas where this is predicted. Offsets are often complex and expensive, require time to plan for and implement, and are not carried out until management options addressing earlier steps in the hierarchy (in particular, avoidance of adverse effects) have been exhausted. In New Zealand, offsets for residual adverse effects on freshwater habitat and species have been addressed through the Stream Ecological Valuation (SEV) and ecological compensation framework (see 7.5 below). Offsetting for residual effects on terrestrial and wetland biodiversity offsets is still in development in New Zealand, with no universally agreed accounting and exchange system. *The Guidance on Good Practice Biodiversity Offsetting in New Zealand* (New Zealand Government, 2014) and the Business and Biodiversity Offset Programme are the primary information sources. A guide to the application of biodiversity offsetting under the RMA is currently (2017) in development by Local Government New Zealand and builds on the New Zealand Government guidance.

### 7.2.6 Compensation

This term is used when positive actions to protect and/or enhance biodiversity values take place as a result of the project and positive outcomes for biodiversity are predicted and/or achieved, but 'no net loss of biodiversity' cannot be ensured or other key principles of a biodiversity offset cannot be met. Environmental compensation may be carried out at the site of the adverse activity or elsewhere(Brown, Clarkson, Barton, & Joshi, 2014). In practice, compensation can be wide-ranging and may include: actions to protect and/or enhance biodiversity values at a site distant from the site of the adverse effects (possibly in a different Ecological District or LENZ environment); biodiversity/ ecological research or education initiatives; interpretation and access initiatives related to biodiversity and ecological features; and funding for existing or new community biodiversity projects.

### 7.2.7 Supporting conservation actions

These are additional measures taken by the proponent which have positive effects on biodiversity. However, they are difficult to quantify and often difficult to link to the effects of the proposal being assessed. These qualitative outcomes do not fit easily into the mitigation hierarchy, but may provide crucial support to mitigation actions. For example, awareness activities may encourage changes in government policy that are necessary for implementation of novel mitigation; research on threatened species may be essential to designing effective minimisation measures; or capacity building might be necessary for local stakeholders to engage with biodiversity offset implementation.

# 7.3 Biodiversity offsets

## 7.3.1 Introduction

Internationally, ten principles for biodiversity offsetting were developed by the Advisory Committee of the Business Biodiversity Offsets Programme (see Appendix 9). These include principles on science, social, culture and policy matters and provide a comprehensive foundation when offsetting is considered in jurisdictions where established environmental laws are absent or ineffective. The ten principles establish a framework for designing and implementing biodiversity offsets and verifying their success.

In New Zealand, several of these principles, especially those regarding cultural and social consultation and the mitigation hierarchy, are already embedded within the RMA, particularly in s88 and Schedule 4.

Six key principles form the foundation for offset application in New Zealand (see **Table 13** )[30]. These are also emphasised as fundamental aspects in overseas applications of offsetting. These six principles provide a checklist of design considerations and emphasise the features of a well-developed and well-applied offset.

By properly applying all of these principles, a project can be considered to have maintained the ecological features of the development site. The resulting package of biodiversity protection, enhancement and restoration, can be considered a no net loss biodiversity offset that effectively addresses the residual ecological effects of the project.

Where a project's ecological effects cannot be fully offset in accordance with these principles, ecological compensation can be pursued such that a package of offset and alternative initiatives (compensation) are provided. Environmental compensation should, as far as is practicably feasible, adhere to the key principles and underlying scientific approach for offset development. It is best ecological practice to seek to first apply a full offset in accordance with these principles, and only move to environmental compensation where a full offset is not practicably obtainable.

More principles around offsetting identify core considerations for New Zealand – specific guidance is found in:

- Guidance on Good Practice Biodiversity Offsetting in New Zealand (New Zealand Government, 2014)
- Norton and Warburton (2015) which identifies 7 key conditions that should be fulfilled when using offsetting to enhance biodiversity values through the funding of invasive species control programmes
- Norton (2008) which provides 6 principles for New Zealand specific application, and
- Gardner et al. (2013) which provides 4 key principles relating to scientific considerations of offsetting, including adhering to the mitigation hierarchy, equivalence of exchange, additionality of offset management and permanence of biodiversity benefits.

[30] See also the New Zealand Government's Guidance on Good Practice Biodiversity Offsetting in New Zealand. www.doc.govt.nz/about-us/our-policies-and-plans/

Table 13. **Key principles of biodiversity offsetting as applied in New Zealand** (adapted from BBOP (2012)).

| Principle | Explanation |
|---|---|
| Limits to offsetting | Many biodiversity values are not able to be offset, and if they are impacted then they will be permanently lost. These situations include where:<br>• residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected, and<br>• there are no technically feasible or socially acceptable options by which to secure gains within acceptable timeframes.<br>In either situation, an offset would be inappropriate. This principle reflects a standard of acceptability for offsetting, and should not be seen as a pathway to allow uncompensated losses. The project should be redesigned wherever possible to avoid effects that cannot be offset. |
| No net loss | The goal of a biodiversity offset is a measurable outcome that can reasonably be expected to result in no net loss, and preferably a net gain of biodiversity. A no net loss outcome requires that at a specified point in time biodiversity values will be returned to the point they would have been if the impact and offset had not occurred. No net loss is measured by type, amount, and (in some accounting models) condition, and requires explicit statements describing: a) the elements of biodiversity for which a no net loss outcome is sought; b) the assumed background biodiversity trajectory against which no net loss is evaluated and c) the time horizon within which a no net loss outcome is to be achieved. |
| Landscape context | The design of a biodiversity offset should consider the landscape context of both the impact site and the offset site, taking into account interactions between species, habitats, and ecosystems, spatial connections, and system functionality.<br>Consideration of landscape context is captured in the assessment of ecological equivalence across space and time. |
| Additionality | A biodiversity offset must achieve gains in biodiversity above and beyond gains that would have occurred anyway in the absence of the offset. This requires evaluating the change in biodiversity value under both a 'with offset' and a 'without offset' scenario to estimate the amount of additional gain that can be attributable to the offset action.<br>Some aspects of an offset proposal may meet additionality rules, while other proposed actions may not. In such cases, only the amount of gain that can be demonstrated to be additional should count towards the overall offset. |
| Permanence | The biodiversity benefits at an offset site should be managed with the objective of securing outcomes that last at least as long as the impacts, and preferably in perpetuity. To achieve or sustain gains long term requires a well-designed monitoring and reporting programme and an adaptive management approach to adjust management as necessary. |
| Ecological equivalence | Ecological equivalence describes the degree to which the biodiversity gain attributable to an offset is balanced with the biodiversity losses due to development across type, space, and time; and therefore, whether the exchange achieves no net loss. Assessing ecological equivalence requires the biodiversity at both the impact and the offset site to be described and measured to quantify losses and gains. Demonstrating ecological equivalence differentiates biodiversity offsetting from environmental compensation. |

### 7.3.2 Biodiversity offsetting policy

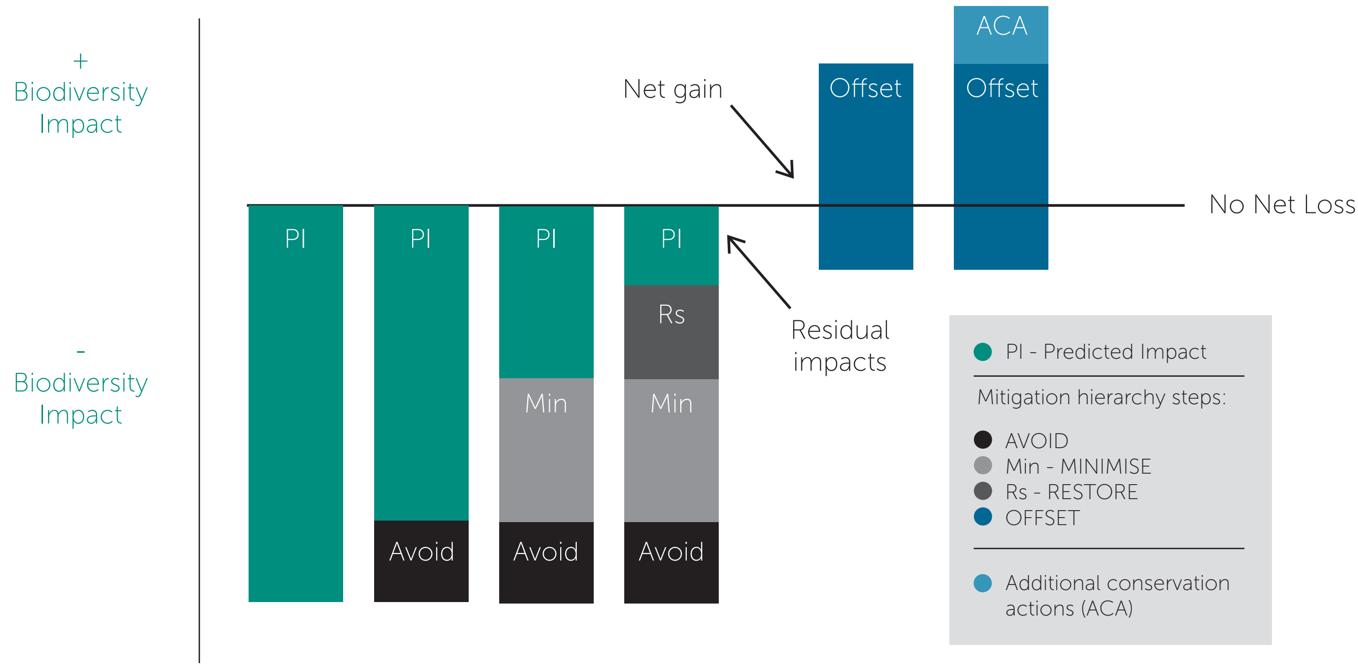
The Department of Conservation developed *Guidance on Good Practice Biodiversity Offsetting in New Zealand* on behalf of the New Zealand Government, was released by the Minister of Conservation in July 2014 (New Zealand Government, 2014)[31].

It defines biodiversity offsets as:

*"Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground"* (New Zealand Government, 2014)

**Figure 2** illustrates the application of the hierarchy of mitigation measures in biodiversity offsetting as described by BBOP (Business and Biodiversity Offsets Programme (BBOP), 2009). Although the words used differ from those under the RMA, the underlying avoidance/mitigation principles are the same. Working from the left: at each of the first four stages a step is applied to the Predicted Impacts of a proposal: avoidance; minimisation; and finally restoration (or remediation). At this point, there remain unmitigated residual impacts so there is a net loss of biodiversity. By developing an offset, the net loss is turned into a net gain; and this is increased with the further additional (supporting) conservation actions.

Figure 2 **Impact management for net biodiversity gain.**
(from: Business and Biodiversity Offsets Programme (BBOP), 2009, p. 60)
Adapted from Rio Tinto and Australian Govt




[31] (http://www.doc.govt.nz/publications/conservation/biodiversity-offsets-programme/ ).

As illustrated in **Figure 2**, it is important to note that biodiversity offsetting should be used as part of a suite of impact management actions focusing initially on avoidance, remedying and mitigation. By itself, and especially at an individual project level, biodiversity offsetting, even when planned and implemented effectively, is still likely to result in net loss of ecological values from the project area and landscape.

Offsetting that is voluntarily applied by business, which includes all adverse effects at a site and seeks to provide a net positive impact outcome, is more likely to result in overall positive benefits to biodiversity.

Regulatory provision for biodiversity offsetting varies amongst territorial authorities. In locations where there is no regulatory requirement to do otherwise, offsetting considers only significant adverse effects (not activities for which their effects are deemed insignificant) and many projects avoid regulatory constraints on development impacts if activities are within permitted thresholds. Therefore, even the best no net loss impact management may contribute to local or regional decline of biodiversity.

Some local authorities may require offsetting to address any residual adverse effects (e.g. Canterbury Regional Policy Statement, Policy 9.3.6 (Environment Canterbury, 2013). Others require that only effects that are significant should be offset (e.g. the Christchurch Replacement District Plan (Christchurch City Council, 2016)).

The *Proposed National Policy Statement on Indigenous Biodiversity* (Ministry for the Environment, 2011) also defined offsetting and followed closely (but not exactly) the BBOP and New Zealand Government definitions. No date is available for the release of a revised or final NPS.

Some local authorities (e.g. *Canterbury Regional Policy Statement*, (Environment Canterbury, 2013)) have developed policy for offsets (which may or may not correspond with national and international approaches). Policy is also being developed for councils across New Zealand as part of the local government guidance to biodiversity offsetting (in prep. 2017).

The science and practice of biodiversity offsetting is evolving internationally. The Business and Biodiversity Offsets Programme has developed a framework and its website (http://bbop.forest-trends.org/) provides a large amount of information and data on principles, practice, pilot studies and standards.

At this stage, then, it appears that in considering offsets as part of impact management, an ecologist should first consider relevant local authority policies and plans. The *Guidance on Good Practice Biodiversity Offsetting in New Zealand* then provides guidance on good practice process and methods for implementation. However, it is important to note that each project, environment, and biodiversity context is different so that there is no single recipe for implementation. Innovative approaches and outcomes should be considered.

A number of issues have arisen including in relation to:

- Offsetability (Pilgrim et al., 2013) /limits to offsetting – how to determine whether a biodiversity feature is so valued that it cannot be offset. The NZ guidance gives more information on this.
- Measuring and accounting for biodiversity loss and gain – how to measure net values and calculate future values at an offset site, determine equivalence of exchange between biodiversity types (is it like for like?), and apply accounting frameworks to provide risk-adjusted exchanges over time.
- Offset site – how to locate similar sites and achieve measurable biodiversity.
- Certainty – how to be sure that offset management work is ecologically and financially feasible, and provides guarantees of permanence of conservation gains into the future.
- Environmental compensation – where do offsets fit in relation to environmental compensation?

Scientific accuracy, consistency, transparency, consultation and documentation are essential in considering offsets as part of the impact management package, and for clearly communicating where effects management comprises biodiversity offsetting or environmental compensation.

A conceptual representation of the continuum between biodiversity offsetting and environmental compensation is provided below. This illustrates states between an offset that achieves no net loss of equivalent biodiversity values, and out-of-kind compensation arrangements where the biodiversity lost may be replaced by something dissimilar and be based on judgements that may or may not include consideration of benefits for biodiversity.

For many projects, the exacting technical requirements of a full biodiversity offset may not be achievable, and the effects management 'package' may comprise solutions along the continuum represented in **Figure 3**.

Figure 3 **The environmental compensation continuum.**

**For each element of biodiversity of interest**


**Offset**

- The residual effect can be and is proposed to be offset to a no net loss level, and in accordance with all of the offset principles

**Trading Up**

- Exchange benefits rarer biodiversity than that lost
- Meets the key offset principles, except equivalence
- No standard metrics available to facilitate exchanges

**Compensate**

- Not all of the residual effect can be, or is proposed to be, offset to a no net loss level, and in accordance with the offset principles
- May offer non-biodiversity benefits (including financial or labour) in exchange for the biodiversity loss
- May exchange very different biodiversity to that lost (i.e. the trades may be out-of-kind), including biodiversity of lesser conservation concern than lost

### 7.3.3 Accounting model for offsets

There are general good practice principles to consider when developing a formal biodiversity offset. These relate to valuation (numerical accountings) of biodiversity so that trades between impact and offset sites can be shown to be equitable. Attributing numerical values to biodiversity enables a common metric (or way of measuring things) to be applied across types and scales. Metrics are used as part of a biodiversity offset model or decision framework to evaluate the overall net balance, or equity, of exchanges between the development site and the offset site. The components that comprise an offset model include:

- Metrics that measure the state of the parts of biodiversity for which no net loss is sought,
- A currency that converts the metrics to a universal value by which biodiversity can be compared, aggregated and traded (where appropriate) across types and places,
- An accounting system, which considers the net loss or gain of biodiversity at the site. The accounting calculation at the offset site also considers the risks and uncertainties inherent in predicting future trajectories of biodiversity change, and the likelihood of success of management applied to generate gains, and
- A spatial analysis (usually conducted in conjunction with the accounting model, or as an iterative process), to select sites that meet the requirements of an offset site, in terms of available area to manage and the presence of the same or similar biodiversity (equivalence).

The output of the accounting model is an estimate of the area that needs to be managed under a given management regime, and for a period of time, which is likely to provide biodiversity gains that fully balance the predicted losses at the development site.

It is important to remember that an offset accounting model is a decision-support tool, not a decision-making tool in its own right. Any model outputs should be regarded as contributing to discussions of appropriate compensation, as model outputs do not in themselves represent a management solution.

# 7.4 How much mitigation is necessary?

One of the key questions around ecological impact management is "how much mitigation is needed?" This relates to the amount of ecological work needed to ensure no net loss and the nature of work needed to meet regulatory requirements. It is closely associated with the cost of doing such work to the proponent, so must be discussed openly between proponent and ecologist/consultant.

The ecologist should propose the amount of compensatory ecological enhancement that they consider necessary to address the damage or loss through adverse effects and meet relevant regulatory requirements. They should be prepared to put a cost on implementation of this work (including long term management needed) and to discuss this with the proponent/client. They should also be prepared to discuss this with consenting authority staff (reporting officers) and in any hearing by Commissioners or Environment Court judges.

The need for compensation/offsetting should be identified as early as possible in the assessment process – ideally at scoping.

The assessment of biodiversity value affected and the scale of adverse effects guides what action is needed and where.

As a guide, the amount of enhancement effort and activity needed is guided by:

1. National standards or policy; and
2. Regional/district policy; and
3. Significance of ecological values adversely affected; and
4. Level of ecological effects; and
5. Feasibility of implementation; and
6. Costs and benefits and likelihood of success of impact management

The proponent's ability and willingness to pay to meet no net loss may be a contributing factor and the ecological and consenting consequences should be discussed with the Project Team. Ability and willingness to undertake biodiversity enhancement work beyond that needed to meet regulatory purposes should also be discussed.

There is no published guidance on what area, habitat, vegetation, or number of plants or animals need to be protected, restored or otherwise managed to mitigate or adequately compensate for effects on a specific area or number subject to adverse effects. This remains something that is the subject of expert judgment and stakeholder consultation for each project and environment, taking into account the factors listed above.

With regard to communities, habitats and ecosystems there is some guidance in "Protecting our Places" (Ministry for the Environment & Department of Conservation, 2007b) which identifies four National Priorities for Biodiversity Protection. The national priorities are:

- *National Priority 1: To protect indigenous vegetation associated with land environments (defined by LENZ at Level IV) that have 20 percent or less remaining in indigenous cover.*

- *National Priority 2: To protect indigenous vegetation associated with sand dunes and wetlands; ecosystem types that have become uncommon due to human activity.*

- *National Priority 3: To protect indigenous vegetation associated with "originally rare"*[32] *terrestrial ecosystem types not already covered by priorities 1 and 2.*

- *National Priority 4: To protect habitats of acutely and chronically*[33] *threatened indigenous species.*

[32] Based on Williams et al. (2007) and now call "naturally uncommon ecosystems"

[33] Although changes have taken place in the naming used in classifying threatened species, in practice species that in 2007 were considered Acutely and Chronically Threatened would still be in the 'Threatened' or 'At Risk' categories under the new system. (Townsend et al., 2008).

Where there are multi-ecosystem type impacts, policy directives such as 'like for like' and 'no net loss' generally distinguish between the different types of impact management required (e.g. quantification of impacts on a remnant forest are separate from impacts on a riparian margin or a wetland). It follows that any compensatory impact management (offset, conservation actions, compensation) needs to be clearly distinguished for each ecosystem type. In some cases, 'trading up', where impacted values are compensated for by improvements to values of higher conservation priority in a 'like for unlike' offsetting exchange, may be permitted, encouraged or even required as part of a formal offsetting assessment. It should be noted that the *Guidance on Good Practice Biodiversity Offsetting* in New Zealand is a bit more circumspect on this topic, indicating that *"A like for unlike exchange is not therefore considered to be a no net loss biodiversity offset although, depending on the circumstances, it may still contribute to conservation gains at the offset site."* (New Zealand Government, 2014, p. 22)

Projects requiring EcIA often provide opportunities for environmental enhancement above and beyond measures to avoid, remedy and mitigate effects. It is good practice to identify and encourage the uptake of such opportunities. At the same time, however, it needs to be recognised that enhancement may not be required under law or in planning documents. Enhancement should be identified as such and not presented as avoidance, remediation or mitigation.

Double dipping occurs where the management of impacts on one ecosystem type are counted again as management of impacts on a different ecosystem type. For example, the planting of 2ha of stream margin as offset for the loss of a waterway cannot be again counted as 2ha for the offset planting for the removal of an area of wetland habitat. An evaluation of the additional value generated by proposed management should thus form a key consideration of the offset's contribution towards managing adverse effects on specific ecological values. This ensures that management proposals are truly additional to work that would be undertaken anyway in the absence of the project, and to avoid double dipping where multiple, overlapping advantages may accrue from single management actions.

Double dipping is sometimes incorrectly used to challenge or reject an integrated mitigation package developed for a project by several disciplines working collaboratively. For example, development of a planting regime that provides both visual screening, and mitigates for loss of habitat, is not double dipping. Similarly, a properly designed and managed stormwater treatment wetland can also become a biodiversity hot spot for fish, birds and insects.

## 7.5 Stream ecological compensation ratio (ECR)

In response to the loss of small streams in the Auckland region, the then Auckland Regional Council developed an ecological compensation ratio (ECR) as a means of guiding the quantification of compensation for the loss of permanent stream habitat and function (Storey et al., 2011). More recently, Auckland Council has developed a similar method for assessing compensation needs for impacts on intermittent streams (Neale et al., 2016). The ECR is derived from the stream ecological valuation score which is derived from a suite of attributes that assess stream condition. As offset environmental compensation is aimed at 'like for like' then the purpose of the stream ECR is to restore specific functions and values of the same kind that are going to be lost. In terms of stream ecological function, 'in-kind' includes streams of the same stream order and streams that are close to the development site. The purpose is to help safeguard against the cumulative loss of certain stream types within catchments and to assist with maintaining habitat connectivity and function.

Details of the ECR as applied to streams in the Auckland region can be found at: http://www.aucklandcouncil.govt.nz/SiteCollectionDocuments/aboutcouncil/planspoliciespublications/technicalpublications/tr2011009streamecologicalvaluation.pdf

# 7.6 Adaptive management

## 7.6.1 What is adaptive management?

Despite all best efforts, understanding and managing the impacts of development on natural resources often involves high levels of uncertainty and complexity; and decisions about impact management are based on expert opinion and related assumptions. In undertaking an EcIA, the ecologist has to seek ways of ensuring the best outcome for biodiversity in the long term. A better understanding of impacts and effects is needed, and this can be gained through trial and improvement.

Overcoming these difficulties often requires ongoing learning and a capacity to alter courses of action in response to new knowledge and understanding. This requires scientific, social and technical insights, and the capacity to generate knowledge and adjust actions based on that learning. Frequently, decision-makers impose a condition requiring 'adaptive management' as part of the impact management process. It is important that ecologists understand what this requires on their part.

Adaptive management, developed in the USA during the 1970s, has been defined as *"an integrated, multidisciplinary and systematic approach to improving management and accommodating change by learning from the outcomes of management policies and practices"* (Holling, 1978). It can equally be described as 'a process of learning by doing'. By its nature it is an iterative process through which greater understanding of natural resource systems can be developed, and management approaches tested over time, until the best management options are reached.

It is the precautionary approach to environmental management that has, at least in part, given rise to the adaptive management approach. This provides for ongoing monitoring of the effects of an activity, in order to promote careful and informed environmental decision-making, on the best information available. The use of adaptive management in New Zealand has developed through a number of Environment Court cases dealing with the impacts of proposed developments.

The following principles must be satisfied for the adaptive management to be appropriate[34]:

a. There will be good baseline information about the receiving environment;
b. The conditions provide for effective monitoring of adverse effects using appropriate indicators;
c. Thresholds are set to trigger remedial action before the effects become overly damaging; and
d. Effects that might arise can be remedied before they become irreversible.

[34] Board of Inquiry Decision: New Zealand King Salmon requests for Plan Changes and Applications for Resource Consents. EPA 2014.

## 7.6.2 Components of adaptive management

Adaptive management is likely to mean integration of ecological information with that from other professionals involved in the project. Components of adaptive management include:

- Taking a holistic/consultative approach, acknowledging that biodiversity is part of a complex system with bio-physical, social and economic components
- Identifying the values and interests of all stakeholders
- Understanding the bio-physical, social and economic dimensions of the problem and the impacts of management regimes on all stakeholders and cumulative effects assessment
- Developing models based on a collective understanding of the stakeholders, which are used to assess gaps in information and predict outcomes from alternative management strategies
- Developing natural resource management plans (sometimes in conjunction with stakeholders) to meet outcomes and generate new information to fill any gaps
- Specifically including feedback loops from monitoring back to research, objective-setting, policy development and planning
- Monitoring and evaluating the adaptive management process is integral to the process itself
- Implementing management plans, usually anticipating that results will be monitored, information analysed, and management adapted
- Modifying the management strategy on an ongoing basis, as the system is more comprehensively and collectively understood
- Implementing management strategies as processes lead to better understanding of the natural resource base

This integrated and iterative process enables further refining of the actions to be taken, leading ultimately to best management practice.

Monitoring is an important part of adaptive management and the monitoring programme needs to be tailored to provide data and information relevant to the management. Feedback from monitoring has to be evaluated in relation to existing management in order to make adjustments for improvement and any new management regime. Therefore the monitoring needs of an adaptive management proposal may differ from those of other aspects of impact management.

### 7.6.3 Conditions warranting the application of adaptive management

Not all resource management decisions can or should be adaptive.

Whether or not a biodiversity management problem calls for adaptive management is an important question that should, as much as is possible, be addressed early in the project development; on occasions, the need for adaptive management may emerge during the consultation or decision-making process. Strong, specific consent conditions and a requirement for preparation of a management plan prior to work commencing may be used to give more certainty around adaptive management proposals. If used in circumstances where adaptive management is not appropriate, there is a risk that projects fail to achieve expected improvements; such failure may have less to do with the approach itself than with the inappropriate contexts in which it is applied (Gregory, Ohlson, & Arvai, 2006).

In some cases, investment in trials or research as part of the EcIA process may be warranted. For example, where information is lacking about the significance of a species or the merits of proposed impact management methods, trials may clarify issues or solutions and greatly reduce the uncertainty and risk associated with proposed enhancement programmes.

Ultimately, adaptive management should be regarded as a risk management approach where information is lacking, whereas targeted trials can be regarded as risk minimisation or elimination strategies that add confidence in the efficiency and performance of proposed mitigation or enhancement initiatives.

There is a large resource of published material on adaptive management. Williams and Brown (2012) provides a comprehensive overview for the ecologist requiring more details.

# 8 Monitoring

# 8 Monitoring
# Key Points

**8.1** Monitoring of effects and outcomes of impact management is good practice, but not always required by regulators.

Monitoring can provide information about ecological values, and enable better decision-making in future. The lack of monitoring of effects and impact management may be obscuring biodiversity losses, globally and locally.

**8.2** The purposes of EcIA monitoring are to:

- **Observe and measure** (to the extent possible) the actual **effects** of the proposal assessed on ecological values and biodiversity, to determine the accuracy of predictions of potential effects.
- **Observe and measure the progress and outcomes** of impact management carried out in relation to ecological values and biodiversity affected by the proposal assessed, to provide feedback on their implementation to the proponent and consenting authority.
- **Enable better outcomes** for ecological values and biodiversity, by informing future assessments, impact management and decision-making.

**8.3** Types of monitoring include:

- Census
- Survey
- Surveillance
- Ecological state

**8.4** Different aims include:

- To detect **breach** of a consent condition
- To determine an **adverse effect** on the ecosystem, habitat, community or species
- To obtain **early warning** of environmental deterioration
- To determine whether ecosystem or habitat conditions or community or species populations are being **maintained, improved, or are deteriorating**
- To determine **compliance** with a specific outcome value or standard
- To determine the **success** or otherwise of anticipated mitigation or restoration outcomes

Ecological characteristics and project impact management outcomes need to be considered alongside any existing monitoring programmes when designing the programme for a particular project.

# 8.1 Introduction

It is good practice to develop a monitoring programme to review impact assessment outcomes and measure the success (or otherwise) of the implementation of the agreed impact management.

Monitoring can occur during the implementation of impact management, at the end, or for a period of time after the completion of impact management, or even a combination of all three. It will involve some measurements prior to the commencement of the development to form the baseline against which any anticipated changes or enhancements are measured; or indeed to confirm that there are no changes, impacts or effects.

However, RMA Schedule 4 clause 1(i) states:

> *"where the scale or significance of the activity's effect are such that monitoring is required, a description of how, once the proposal is approved, effects will be monitored and by whom"*

This presents a tension between good ecological management practice and statutory requirements in relation to the amount and nature of monitoring needed, which should be discussed between ecologist and client/employer.

Globally, including in New Zealand, there is a concern that a lack of monitoring is obscuring biodiversity losses. Monitoring outcomes of impact assessment and consent conditions around biodiversity is not widely carried out (Brown et al., 2014). The most recent Survey of Local Authorities (Ministry for the Environment, 2014b) reports that 80% local authorities say they have limited resources for monitoring and enforcement, making it difficult to meet expectations for those processes.

Design of a monitoring programme that is ecologically rigorous, and provides useful information for impact management is an important component of EcIA, but one that is often undervalued. A project proponent may be reluctant to pay for monitoring after a project is implemented, while a consenting authority may not have the staff resources to ensure post-consent monitoring is carried out. Invariably, the long time scales required to obtain ecologically meaningful data pose a problem for adequate resourcing of monitoring programmes.

This chapter:

a. Outlines and define the types of monitoring that may be triggered by an ecological impact assessment.
b. Outlines considerations for developing and designing a monitoring programme.

## 8.2 Purpose of monitoring

In the context of ecological impact assessment, the purpose of monitoring is to:

- Observe and measure (to the extent possible) the actual effects of the proposal assessed on ecological values and biodiversity, to determine the accuracy of predictions of potential effects.
- Observe and measure the progress and outcomes of impact management carried out in relation to ecological values and biodiversity affected by the proposal assessed, to provide feedback on implementation to the proponent and consenting authority.
- Enable better outcomes for ecological values and biodiversity, by informing future assessments, impact management and decision-making.

# 8.3 Types of monitoring

Although monitoring is now regarded as an essential component of impact assessment in New Zealand, there is a variety of types of monitoring with specific meaning. Different types of monitoring aim to address different ecological questions and serve to meet different management or regulatory needs, including whether previously formulated standards (e.g. National Standards) are being met. As part of any ecological impact assessment some or all aims may be addressed at various times and localities during the investigation.

Different types of monitoring include:

- **Census:** Typically refers to population counts which may be used in monitoring programmes.
- **Survey:** An exercise in which a set of standardised observations is taken from a site (or series of sites) within a short period of time to furnish qualitative or quantitative data. This form of 'monitoring' is typically carried out at the commencement of an assessment of environmental effects but may be repeated during or after development. Typically survey monitoring may form a baseline of the ecological condition of a location or localities for future consideration.
- **Surveillance**: A continued programme of surveys systematically undertaken to provide a series of observations over time. Observations may include reference or control sites.
- **Ecological state of ecosystems:** An assessment of the integrity of ecosystems or ecosystem health in relation to a specific impact. This form of monitoring may also be defined as state of environment monitoring but is different (see below). Similar attributes may be measured in each type of monitoring. Observations may include reference or control sites.
- **State of the environment (SOE) monitoring:** Monitoring undertaken to detect trends over a period of time and usually across a wide area, such as a local authority region or district. Observations may include reference or control sites. State of the environment monitoring is generally not used to measure the success of specific impact management. However, it may provide information about trends in the wider environmental context against which proposal-related trends can be assessed. SOE monitoring is not discussed further in this document.

Each of the above types will have specific advantages dependent on the objective of the study and the overall question being asked. A clear understanding of the purpose of the monitoring is therefore necessary, along with an understanding of how the information will finally be used (see below). In New Zealand, monitoring is often a mix of the kinds defined above, each occurring at different stages of a sampling programme.

# 8.4 Design of monitoring programmes

## 8.4.1 Objectives and purpose of monitoring

What might the aims of a monitoring programme be? Several possible aims relevant to the assessment of the impacts and effects are considered below.

- To detect every single breach of a particular consent condition
- To determine whether there is a significant adverse effect on the ecosystem, habitat, community or species
- To obtain early warning of environmental deterioration by monitoring to detect change in ecosystem, habitat, community or species or a combination of some or all
- To determine whether ecosystem or habitat conditions or community or species populations are being maintained, improved, or are deteriorating as a result of the development
- To determine compliance with a specific outcome value or standard
- To determine the success or otherwise of anticipated mitigation, restoration or biodiversity offsetting outcomes

Each monitoring objective will require a different sampling programme design in order to obtain defensible results. Detection or monitoring of spatial biological pattern, natural spatial environmental pattern or natural temporal environmental change, are all confounding influences (or noise) as far as achieving the stated objective is concerned. Study designs therefore must facilitate the making of appropriate comparisons through the collection of relevant data, elimination of confounding effects and the selection of appropriate analyses.

A sampling strategy to meet the given objective must consider the number and locations of sampling sites, sampling methods, sampling frequency, sample replication, sample processing protocols and the need for qualitative, quantitative, semi-quantitative or relative abundance data. Before embarking on any monitoring programme, there should be an appropriate level of confidence that the programme will have sufficient ongoing funding to deliver usable results.

## 8.4.2 Study design and the use of statistics in monitoring programmes

Study design and the use of statistics in monitoring programmes is beyond the scope of these Guidelines. The user is referred to other literature for more detailed information on the subject (e.g. Downes, Barmuta, Fairweather, Faith, & Keough, 2002; Lindenmayer & Gibbons, 2012; Lindenmayer & Likens, 2010; Southwood & Henderson, 2000; Spellerberg, 2005). Monitoring programmes invariably involve studying patterns of distribution and abundance of organisms in order to detect environmental changes, and to infer the causes of change by associating biological changes with corresponding changes in biotic or abiotic variables. Given the number of factors that can confound monitoring results, and the weight that can be placed on monitoring data in future decision-making, it is strongly recommended that a biostatistician is consulted as early as possible in the design of a monitoring programme (ideally, before even the first baseline survey is conducted at the site).

### 8.4.3 Considerations for monitoring

Several elements need to be considered for any monitoring programme:

- Sample site selection
- Sampling frequency
- Sampling methods
- Sample size and sample replication
- Qualitative, semi-quantitative or quantitative data?
- Statistical testing and data analyses
- Use of remote sensing balanced by field observations

Cost-effective ecological monitoring as part of EcIA should focus on matters that are key to the proposed impact management:

- Ecological value of the affected species, habitats, ecosystems, targeting valued ecological features
- Predicted effects of proposal and expected frequency/duration of effects, targeting the effects on valued ecological features
- Life-cycles and movements of species affected, to ensure the monitoring programme reflects temporal and spatial patterns
- Predicted outcomes of impact management and timing of their expected occurrence, setting realistic target dates and goals at different stages of impact management
- Existing monitoring programmes in place relating to the site or affected ecological feature, to avoid duplication but allowing for synergies
- Requirements for feeding results back into adaptive management programme or consent authority
- National, regional or local conservation goals, strategies or policies, to identify gaps in data that might be filled through EcIA monitoring.

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# Appendix 1
## Legislation

The Conservation Act 1987, Crown Minerals Act 1991 and the Wildlife Act 1953 are the statues most widely applicable to Ecological Impact Assessment after the RMA, and are summarised below. Other acts of more restricted scope which may be relevant include the Biosecurity Act 1993, Hazardous Substances and New Organisms Act 1996, Fisheries Act 1996, Freshwater Fisheries Act 1983, Overseas Investment Act 2005, Environmental Reporting Act 2015, and Marine and Coastal Area (Takutai Moana) Act 2011.

The purpose of the Environmental Reporting Act 2015 is to require regular reports on New Zealand's environment. The Act makes responsibilities for independent, fair and accurate environmental reporting explicit, and sets the broad framework for the scope of reporting and timing for reporting products. The latest reports can provide contextual information for a specific project.

The Resource Management Act legislation requires an assessment of effects on ecological values (EcIA) as part of an assessment of environmental effects (AEE) (refer in particular to RMA section 88 (2) and Schedule Four 2(c)) when an application is prepared. Proposals to amend the RMA were approved under the Resource Management Amendment Act 2013. Different sections of this Amendment Act will commence at different times so that it is important to consult a lawyer or planner to ensure all relevant aspects are addressed. Under the RMA, the use of land is essentially permissive; applications for consent will not be required unless the contemplated activity is regulated by a planning document, such as a district plan (s 9). Conversely, discharges to the environment and most activities relating to water will require consent unless expressly authorised (ss 14-15)[35].

### National Policy Statements

National Policy Statements (NPS) and National Environmental Standards are developed to guide local authorities in implementing the RMA and setting consistent standards across the country. They must be considered when carrying out an EcIA, although not all will be relevant to ecological matters.

Currently the following National Policy Statements (see MFE website[36]) are in place (October 2017):

- National Policy Statement on Urban Development Capacity
- National Policy Statement for Freshwater Management
- National Policy Statement for Renewable Electricity Generation
- National Policy Statement on Electricity Transmission
- New Zealand Coastal Policy Statement

Work has been done on a proposed National Policy Statement for Indigenous Biodiversity. The NPS on Freshwater Management and the NZ Coastal Policy Statement (NZCPS) are particularly important for EcIA in the relevant environments. Policy 11 of the NZCPS addresses protection of indigenous biodiversity in the coastal environment.

MfE also provides NPS guidance for councils implementing these NPSs, including:

- NPS Freshwater Management guidance (addressing various topics)
- NPS for Renewable Energy Generation 2011 (Implementation Guide)

### National Environmental Standards

National environmental standards, also listed on the MFE website[37], should also be considered.

The following standards are in force (October 2017) as regulations:

- National Environmental Standards for Air Quality
- National Environmental Standard for Sources of Drinking Water
- National Environmental Standards for Telecommunication Facilities

[35] http://www.mfe.govt.nz/rma
[36] http://www.mfe.govt.nz/rma/central/nps/
[37] http://www.mfe.govt.nz/rma/rma-legislative-tools/national-environmental-standards

- National Environmental Standards for Electricity Transmission Activities

- National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health

The following standards are at various stages of development, ranging from initiating consultation to being legally drafted.

- Proposed National Environmental Standard on Ecological Flows and Water Levels

- National Environmental Standard on Plantation Forestry (comes into effect on 1 May 2018)

- Proposed National Environmental Standard for Marine Aquaculture

- Proposed National Environmental Standard for the Outdoor Storage of Tyres

The **Conservation Act 1987 (CA)** has a number of functions, all aimed at managing conservation areas (defined in s 2) held by the Crown. The Act established the Department of Conservation (DOC), the New Zealand Conservation Authority and Conservation Boards. The Department is to manage all conservation areas in accordance with general policy statements and where applicable, more specific conservation management strategies, conservation management plans and freshwater fisheries management plans.

The CA requires applications for all activities on conservation land, bar certain exceptions. These exceptions include: mining activities authorised under the CMA (below, but note that an access arrangement will still need to be obtained from DOC); other activities specifically authorised by the CA; and recreational activities (e.g. tramping). Section 17S sets out the requirements for an application under the Act. Effects are defined in s 2 as having the same meaning as under the RMA. The application will be assessed (s 17U) both in terms of the effects and mitigation measures proposed (as under the RMA), but additionally, cannot be granted if the proposed activity is contrary to the purposes for which the land is held, or the provisions of the CA. There are various 'classes' of conservation land, determined by the purposes for which they are managed. Alternative locations are given greater prominence than under the RMA (s 17U(4)), which may be relevant to the scope of an ecological assessment under this Act.

The **Crown Minerals Act 1991 (CMA)** is aimed at the management of Crown-owned minerals. It replaces a number of statutes, including the Mining Act 1971, the purpose of which was *"to provide improved facilities for the development of mineral resource"*; the Petroleum Act 1937; and the Coal Mines Act 1979. The CMA was developed separately from the RMA, as it was reported that *"any form of an extractive industry is essentially not sustainable in the pure sustainable definition"* (Minister of Energy, NZ Parliamentary Debates (1991) p 3040). Applications for mining will often include applications under the CMA and RMA. Section 9 of the CMA requires compliance with the RMA, which will require consent be sought under the relevant district and regional plans as appropriate. Its focus is reflected in s 12, which sets out the purpose of the minerals programmes.

The **Wildlife Act 1953** deals with wild animals and birds, and the management of game. It will be most relevant to activities that affect wildlife deemed protected under the Act (refer s 3 and schedules 1-5 which categorise species). The Department of Conservation has a useful guide to working through the Act on its website (http://www.doc.govt.nz/about-doc/role/legislation/wildlife-act/). Most native species are absolutely protected, which means a permit is required to disturb, handle, kill or possess them. This may apply both in terms of construction or operation of activities, but also in terms of mitigation – for example, the possession of threatened species for translocation away from impact sites. Special protection is provided to all wildlife in wildlife sanctuaries (s 10; sanctuaries may be created under s 9, or under the Reserves Act 1977).

## Iwi Management Plans

The Quality Planning website[38] provides information about iwi management plans and their place in considering matters under the RMA. An iwi management plan (IMP) is a term commonly applied to a resource management plan prepared by an iwi, iwi authority, rūnanga or hapū.

IMPs are generally prepared as an expression of rangatiratanga to help iwi and hapū exercise their kaitiaki roles and responsibilities. IMPs are a written statement identifying important issues regarding the use of natural and physical resources in their area. While the Resource Management Act 1991 (RMA) does not define IMPs, it refers to these plans as 'planning documents recognised by an iwi authority'.

IMPs are often holistic documents that cover more than RMA matters. An IMP may also be referred to as an iwi or hapū natural resource or environmental management plan.

IMPs may address a single issue or resource such as freshwater or Māori heritage, or provide a regional assessment of issues of significance to iwi/hapū in a given area. They may provide important ecological resource information for an EcIA as well as guidance about engagement with the local iwi/hapū.

Examples (from Quality Planning website): Mahaanui Iwi Management Plan 2013; Te Awanui: Tauranga Harbour Iwi Management Plan 2008 ; Hapū/Iwi Management Plan of Nga Ariki Kaiputahi 2012.

The contents of an iwi management plan (IMP) will depend on the priorities and preferences of the iwi/hapū preparing the plan. IMPs are often used by iwi/hapū to express how the sustainable management of natural resources can be achieved based on cultural and spiritual values. They often detail how the iwi/hapū expect to be involved in the management, development and protection of resources, and outline expectations for engagement and participation in RMA processes.

At a minimum, an IMP should identify the area of interest (rohe) to the iwi/hapū preparing the plan and state the resource management issues of significance to tangata whenua within that area.

38 http://www.qualityplanning.org.nz/index.php/supporting-components/faq-s-on-iwi-management-plans

# Appendix 2
## Key sources of ecological data in New Zealand

### General sources

- Aerial photos from Google and Bing websites, as well as photos held by local authorities
- Google Scholar/Google and other search engines
- Local authorities' websites, publications, databases and GIS viewers
- Scientific journals and interest group publications
- University theses
- Museum records (especially for historical trends)

| Organisation | Subject area | Link or database |
|---|---|---|
| Landcare Research | National vegetation survey | http://www.landcareresearch.co.nz/resources/data/national-vegetation-survey-nvs |
| | Land environments (LENZ) | http://www.landcareresearch.co.nz/resources/maps-satellites/lenz |
| | Next generation ecosystem classification | http://www.landcareresearch.co.nz/science/plants-animals-fungi/ecosystems |
| | Naturally uncommon ecosystems of New Zealand | http://www.landcareresearch.co.nz/science/plants-animals-fungi/ecosystems |
| | New Zealand Lizards Database | http://www.landcareresearch.co.nz |
| | Systematics Collections Data | https://scd.landcareresearch.co.nz/ |
| | General | http://www.landcareresearch.co.nz/resources/data |
| | Māori plant use Database | https://maoriplantuse.landcareresearch.co.nz/WebForms/default.aspx |
| NIWA | River Environment Classification (REC) | http://www.niwa.co.nz/our-science/freshwater/tools/rec |
| | NZ freshwater fish database (NZFFD) | http://www.niwa.co.nz/freshwater-and-estuaries |
| | General | http://www.niwa.co.nz |
| Department of Conservation | Terrestrial and Freshwater Biodiversity Information System (TFBIS) Programme provides access to fundamental data and information about terrestrial and freshwater biota and biodiversity | http://www.doc.govt.nz/tfbis |
| | Freshwater Ecosystems of New Zealand (FENZ) incorporates Waters of National Importance, WONI) | http://www.doc.govt.nz/conservation/land-and-freshwater/freshwater/freshwater-ecosystems-of-new-zealand/ |
| | Electronic Atlas of the Amphibians and Reptiles of New Zealand | http://www.doc.govt.nz/conservation/native-animals/reptiles-and-frogs/reptiles-and-frogs-distribution-information/electronic-atlas/ |
| | BioWeb Herpetofauna. Administered by DOC | Available to registered users. Hosts data from the Amphibian and Reptile Distribution Scheme (ARDS) and SpecCard Access database |
| | Wetlands | http://www.doc.govt.nz/about-doc/role/international/ramsar-convention-on-wetlands/nz-wetlands-of-international-importance/ |
| | Wetlands of Ecological and Representative Importance (WERI) | Database held by DOC. Mostly 1980s, dated |
| | Protected Natural Area (PNA) programme reports (for some areas, some outdated) | http://www.doc.govt.nz/publications/conservation/land-and-freshwater/land/ ; http://www.biodiversity.govt.nz/pdfs/funded_projects_2.pdf |
| | New Zealand Threat Classification System | http://www.doc.govt.nz/publications/conservation/nz-threat-classification-system/ |
| | Ecological Regions and Districts | Ecological regions and districts of New Zealand. 3rd rev. Ed W Mary McEwen. New Zealand Biological Resources Centre Publication no 5. 1987. Department of Conservation Wellington. |
| | Sites of Special Wildlife Interest (SSWI) | Mostly 1980s, dated |

| Organisation | Subject area | Link or database |
|---|---|---|
| Ministry for the Environment | Land Cover Database (LCDB) | http://www.mfe.govt.nz/land |
| Others | NZ topographic map series | http://www.nztopomaps.com/ |
| | New Zealand Plant Conservation Network | http://www.nzpcn.org.nz/ |
| | Botanical Society publications | http://www.nzpcn.org.nz/page.aspx?publications_Bot-soc_journals |
| | New Zealand Virtual Herbarium | http://www.virtualherbarium.org.nz |
| | Fish and Game New Zealand | http://www.fishandgame.org.nz/ |
| | Nature Watch | http://naturewatch.org.nz/ |
| | NZ Birdsonline (includes cultural values) | http://www.nzbirdsonline.org.nz/ |
| | eBird NZ | http://ebird.org/content/newzealand/ |
| | Ornithological Society | http://osnz.org.nz/ Atlas of Bird Distribution in New Zealand 1999-2004. Published by the Ornithological Society of New Zealand. Wellington. Underlying data may also be available from the OSNZ on request. |
| | Walking Access Maps New Zealand | https://www.wams.org.nz/wams_desktop/index.html Include useful map layers of roads, tracks and property boundaries |

Sources of information about Manawhenua values in relation to natural features include:

- Ngā Tipu Whakaoranga http://www.landcareresearch.co.nz/resources/data/nga-tipu-whakaoranga-maori-plant-use-database
- NIWA Kaitiaki Tools Mahinga Kai Species https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/species
- Te Papa Atawhai / Department of Conservation http://www.doc.govt.nz/Documents/getting-involved/nz-conservation-authority-and-boards/nz-conservation-authority/maori-customary-use-summary.pdf
- Māori Bird Lore and Māori Healing and Herbal – Murdoch Riley (Riley, 1994, 2001)
- Ikawai: Freshwater Fish in Māori Culture and Economy – Bob McDowall (McDowall, 2011)

# Appendix 3
## Basic site survey checklist

**LOCATION**
- Site name
- Site reference number
- Location – NZTM coordinates
- GPS waypoint reference number
- Property/ownership details
- Access details – how to get there, who to contact

**PHYSICAL ENVIRONMENT** - general
- Land cover
- Land use
- Adjacent land cover and land uses
- Geology
- Soils
- Landforms on site
- Waterways/water bodies
- Infrastructure

**BIOLOGICAL ENVIRONMENT**

**Terrestrial habitats with vegetation**
- Communities/vegetation types
- Dominant species in tiers, and cover estimates
- Condition – weeds, pests, modifications, evidence of threats
- Sketch map (or aerial photograph mark up) with GPS points for significant features/species
- Fauna observed

**Terrestrial habitats without vegetation**
- Ground cover/habitat type
- Fauna observed

**Aquatic habitat**
- Dimensions
- Flow characteristics, turbidity, basic water chemistry
- Substrate characteristics
- Vegetation species and cover
- Fauna observed

**PHOTOGRAPHS**
- Number and GPS

**COMMENTS AND GENERAL DESCRIPTION NOTES**

# Appendix 4
## Threatened naturally uncommon ecosystems

(from Holdaway, Wiser, & Williams (2012))

| Critically Endangered | Endangered | Vulnerable |
|---|---|---|
| Shell barrier beach | Active sand dune | Coastal cliffs on mafic rock |
| Coastal turf | Dune deflation hollow | Screes of calcareous rock |
| Old tephra plains | Stony beach ridge | Young tephra plains and hill slopes |
| Inland sand dunes | Shingle beach | Boulder fields of calcareous rock |
| Outwash gravels | Stable sand dune | Cliffs, scarps and tors of mafic rocks |
| Inland saline | Coastal cliffs on calcareous rock | Cliffs, scarps and tors of calcareous rocks |
| Leached terraces | Ultramafic sea cliffs | Moraine |
| Fumaroles | Volcanic dunes | Lake margins |
| Geothermal stream sides | Sandstone erosion pavements | Blanket mire |
| Geothermal heated ground | Frost hollows | Estuary |
| Geothermal hydrothermally altered ground | Volcanic boulder fields | |
| Seabird guano deposits | Sinkholes | |
| Seabird burrowed soil | Dune slacks | |
| Marine mammal influenced sites | Domed bog (Sporadanthus) | |

# Appendix 5
# Matters and criteria – examples

Canterbury Regional Policy Statement
(operative January 2013)

Appendix 3. Criteria for determining significant indigenous vegetation and significant habitat of indigenous biodiversity.[34]

**Representativeness**

1. Indigenous vegetation or habitat of indigenous fauna that is representative, typical or characteristic of the natural diversity of the relevant ecological district. This can include degraded examples where they are some of the best remaining examples of their type, or represent all that remains of indigenous biodiversity in some areas.

2. Indigenous vegetation or habitat of indigenous fauna that is a relatively large example of its type within the relevant ecological district.

**Rarity/Distinctiveness**

1. Indigenous vegetation or habitat of indigenous fauna that has been reduced to less than 20% of its former extent in the Region, or relevant land environment, ecological district, or freshwater environment.

2. Indigenous vegetation or habitat of indigenous fauna that supports an indigenous species that is threatened, at risk, or uncommon, nationally or within the relevant ecological district.

3. The site contains indigenous vegetation or an indigenous species at its distribution limit within Canterbury Region or nationally.

4. Indigenous vegetation or an association of indigenous species that is distinctive, of restricted occurrence, occurs within an originally rare ecosystem, or has developed as a result of an unusual environmental factor or combinations of factors.

**Diversity and Pattern**

1. Indigenous vegetation or habitat of indigenous fauna that contains a high diversity of indigenous ecosystem or habitat types, indigenous taxa, or has changes in species composition reflecting the existence of diverse natural features or ecological gradients.

**Ecological Context**

1. Vegetation or habitat of indigenous fauna that provides or contributes to an important ecological linkage or network, or provides an important buffering function.

2. A wetland which plays an important hydrological, biological or ecological role in the natural functioning of a river or coastal system.

3. Indigenous vegetation or habitat of indigenous fauna that provides important habitat (including refuges from predation, or key habitat for feeding, breeding, or resting) for indigenous species, either seasonally or permanently.

## Auckland City Unitary Plan

**Schedule 3 Significant Ecological Areas – Terrestrial schedule**

http://unitaryplan.aucklandcouncil.govt.nz/Images/Auckland%20Unitary%20Plan%20Operative/Chapter%20L%20Schedules/Schedule%203%20Significant%20Ecological%20Areas%20-%20Terrestrial%20Schedule.pdf

[34] Guidelines for interpretation and use of these criteria are on the Council's website: http://ecan.govt.nz/publications/Plans/ecological-significance-indigenous-vege-canterbury.pdf

# Appendix 6
# References/location of current threatened species information

## New Zealand Threat Classification System (Summarised from Townsend *et al.* (2008))

| Threatened taxa |
|---|
| 1. Nationally Critical |
| 2. Nationally Endangered |
| 3. Nationally Vulnerable |
| At Risk taxa |
| 1. Declining |
| 2. Recovering |
| 3. Relict |
| 4. Naturally Uncommon |
| Not Threatened |

International migrant birds (categorised as 'migrant') should also be considered, and the IUCN system referred to where necessary[35]. The New Zealand Threat Classification System is specifically designed for New Zealand, and should be used in preference to other systems such as the IUCN system, unless there are good reasons not to (although the New Zealand system is complementary to the more global views of IUCN). Expert assessments of levels of threat and conservation concern of different plant and animal groups are made periodically, and lists published. The most up to date lists should always be used, see below.

The NZ Threat Classification System is applied at the national level. In many cases it is also important to assess the value of a species at a local level, for example identifying it as "locally uncommon" or "locally rare" and this can be difficult to do. Where a plant that is widespread in other parts of the country (and therefore not on the national Threatened Species list) is not common in the Ecological Region or District in which the site being assessed is located some assessment of its value must be made.

Conservation status reports are updated regularly. Current threatened species lists can be found at: http://www.doc.govt.nz/nztcs

[35] http://www.iucnredlist.org/

Those available in April 2018 for the main plant and animal groups are:

**Vascular plants**
de Lange, P.J.; Rolfe, J.R.; Champion, P.D.; Courtney, S.P.; Heenan, P.B.; Barkla, J.W.; Cameron, E.K.; Norton, D.A.; Hitchmough, R.A. (2013): Conservation status of New Zealand indigenous vascular plants, 2012. New Zealand Threat Classification Series 3. Department of Conservation, Wellington. 70 p.

**Reptiles**
Hitchmough, R.; Barr, B.; Lettink, M.; Monks, J.; Reardon, J.; Tocher, M.; van Winkel, D.; Rolfe, J. 2016: Conservation status of New Zealand reptiles, 2015. New Zealand Threat Classification Series 17. Department of Conservation, Wellington.

**Bats**
O'Donnell, C.F.J.; Christie, J.E.; Lloyd, B.; Parsons, S.; Hitchmough, R.A. (2013). The conservation status of New Zealand bats, 2012, New Zealand Threat Classification Series 6. Department of Conservation, Wellington. 8 p.

**Birds**
Hugh A. Robertson, Karen Baird, John E. Dowding, Graeme P. Elliott, Rodney A. Hitchmough, Colin M. Miskelly, Nikki McArthur, Colin F.J. O'Donnell, Paul M. Sagar, R. Paul Scofield; Graeme A. Taylor. (2017). New Zealand Threat Classification Series 19. 27 p.

**Frogs**
Newman, D.G.; Bell, B.D.; Bishop, P.J.; Burns, R.J.; Haigh, A.; Hitchmough, R.A. (2013): Conservation status of New Zealand frogs, 2013. New Zealand Threat Classification Series 5. Department of Conservation, Wellington. 10 p.

**Freshwater Invertebrates**
Grainger, N.; Collier, K.; Hitchmough, R.; Harding, J.; Smith, B.; Sutherland, D. (2014): Conservation status of New Zealand freshwater invertebrates, 2013. New Zealand Threat Classification Series 8. Department of Conservation, Wellington. 28 p.

**Fish**
Goodman J.M., Dunn, N.R., Ravenscroft, P.J., Allibone, R.M., Boubee, J.A.T., David, B.O., Griffiths, M., Ling, M., Hitchmough, R.A. and Rolfe, J.R. (2013). Conservation Status of New Zealand Freshwater Fish, 2013. New Zealand Threat Classification Series 7. Department of Conservation, Wellington.

# Appendix 7
## The main systems used in New Zealand to assign ecological value, at various levels of ecological organisation and spatial scale

| System | Comments and reference |
|---|---|
| Criteria for significance under RMA s 6(c) | • Background in international conservation evaluation literature<br>• Various adaptations in New Zealand: O'Connor et al. (1990), Norton & Roper-Lindsay (2004), a plethora of 'offshoot' interpretations in district plans etc.<br>• Regional and district planning documents with criteria and schedules |
| NZ Threat Classification system and lists | • Preferred over IUCN.<br>• Updated from time to time – planning documents may refer to older versions, so need to reflect current versions as well as any in planning documents<br>• Represent 'best endeavours' by panel of experts, but can be limited information.<br>• See reference for full list of current appraisals.<br>• http://www.doc.govt.nz/publications/science-and-technical/products/series/new-zealand-threat-classification-series/ |
| Recommended Areas for Protection (RAP) under PNAP programme | • Technical Advisory Group, PNA Programme (1986) Myers, Park, & Overmars, (1987) |
| Local systems | • E.g. O'Donnell (2000) evaluation of water bird habitats in Canterbury Rivers<br>• Auckland City Proposed Unitary Plan |
| RAMSAR<br>Wetlands of National Importance (WONI) | • http://www.doc.govt.nz/about-doc/role/international/ramsar-convention-on-wetlands/nz-wetlands-of-international-importance/ |
| SSWI, WERI | • Represent 'best endeavours' by panel of experts, but can be limited information. |
| Wetlands of National Importance (WONI) | • See reference for full list of current appraisals. |
| SSWI, WERI | • Created under Wildlife Act (1953) so take a dated view on ecological values but can provide good base information |
| National Priorities for Protecting Rare and Threatened Indigenous Biodiversity | • No statutory status, but widely referred to and implicitly referred to in Canterbury Regional Policy Statement |
| Threatened Land Environment Classification | • http://www.landcareresearch.co.nz/resources/maps-satellites/threatened-environment-classification |
| NZ River Environment Classification | • http://www.niwa.co.nz/our-science/freshwater/tools/rec |
| Stream Evaluation System | • Maybe has status in some planning documents<br>• Designed primarily for soft-bottomed streams in Auckland, so be wary when using in other habitats |
| Originally Rare Ecosystems | • Williams et al. (2007)<br>• Holdaway, Wiser, & Williams (2012) |
| RAMSAR and World Heritage Convention | • International obligations<br>• http://www.ramsar.org/<br>• http://whc.unesco.org/en/guidelines/ |

# Appendix 8

## Examples of ecological structure, function, components and processes to consider when describing potential effects

**Physical resources/environment**

- Habitat for territory, hunting/foraging/feeding, shelter and roost sites, breeding sites; nursery sites; spawning runs; corridors for migration, dispersal; stepping stone sites
- Food and water
- Soil minerals, nutrients, processes
- Solar radiation and gaseous resources
- Climate change refugia

**Stochastic processes**

- Flooding
- Drought
- Wind/storms
- Disease
- Eutrophication
- Erosion, deposition and other geomorphological processes
- Fire
- Climate change and irregular/rare events

**Ecological processes**

- Population dynamics, cycles
- Survival rates and strategies
- Reproduction rates and strategies; dispersal, migration and genetic exchange
- Competition
- Predation
- Seasonal and life-cycle behaviours
- Vegetation dynamics, colonisation, succession, regeneration, competition and nutrient cycling

**Human influences on ecological patterns and processes**

- Farming practices – grazing, mowing, application of pesticides and herbicides, drainage, irrigation, earthworks, fertilising, nutrient run-off/leaching, vehicle use, introduction of plant and animal species
- Pollution/contamination/eutrophication
- Recreation, tourism and access disturbances
- Pests
- Conservation and restoration activities
- Water abstraction, diversion, damming, reinjection, impedance of fish passage

**Historical context**

- History of flora, fauna, vegetation and habitats over pre-European and pre-human timeframes
- Natural patterns of change
- Uses and management by tangata whenua

**Ecological relationships**

- Food webs, predator-prey links, herbivore plant links, herbivore-carnivore links
- Adaptation, dynamism, uncertainty and unpredictability
- Ecological role, function
- Species and guilds; decomposer, primary producer, herbivore, parasite, predator, keystone species
- Ecosystem services

**Ecosystem properties**

- Fragility, stability, carrying capacity and limiting factors, productivity, community dynamics
- Connectivity, patchiness, fragmentation, mosaic; networks, corridors
- Population numbers; meta-populations; minimum viable populations; sex-age ratios

# Appendix 9
## Principles for biodiversity offsets

From BBOP G*uidance Notes to the Standard on Biodiversity Offsets* (Business and Biodiversity Offsets Programme (BBOP), 2012) http://www.forest-trends.org/documents/files/doc_3099.pdf

**Principle 1. Adherence to the mitigation hierarchy:** A biodiversity offset is a commitment to compensate for significant residual adverse impacts on biodiversity identified after appropriate avoidance, minimisation and on-site rehabilitation measures have been taken according to the mitigation hierarchy.

**Principle 2. Limits to what can be offset:** There are situations where residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected.

**Principle 3. Landscape context:** A biodiversity offset should be designed and implemented in a landscape context to achieve the expected measurable conservation outcomes taking into account available information on the full range of biological, social and cultural values of biodiversity and supporting an ecosystem approach.

**Principle 4. No net loss:** A biodiversity offset should be designed and implemented to achieve in situ, measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity.

**Principle 5. Additional conservation outcomes:** A biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place. Offset design and implementation should avoid displacing activities harmful to biodiversity to other locations.

**Principle 6. Stakeholder participation:** In areas affected by the development project and by the biodiversity offset, the effective participation of stakeholders should be ensured in decision-making about biodiversity offsets, including their evaluation, selection, design, implementation, and monitoring.

**Principle 7. Equity:** A biodiversity offset should be designed and implemented in an equitable manner, which means the sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a development project and offset in a fair and balanced way, respecting legal and customary arrangements. Special consideration should be given to respecting both internationally and nationally recognised rights of indigenous peoples and local communities.

**Principle 8. Long term outcomes:** The design and implementation of a biodiversity offset should be based on an adaptive management approach, incorporating monitoring and evaluation, with the objective of securing outcomes that last at least as long as the development project's impacts and preferably in perpetuity.

**Principle 9. Transparency:** The design and implementation of a biodiversity offset, and communication of its results to the public, should be undertaken in a transparent and timely manner.

**Principle 10.** Scientific information, and, where applicable, traditional knowledge, shall be utilised when designing and implementing the offset.

# Appendix 10
## Attributes matrix

| Matter 1 | Matter 2 | Matter 3 | Matter 4 | SCORE BAND |
|---|---|---|---|---|
| High | High | High | High | Very high (Upper) |
| High | High | High | Medium | Very high (Mid) |
| High | High | High | Low | Very high (Lower) |
| High | High | Medium | Medium | High (Upper) |
| High | High | Low | Low | High (Mid) |
| High | Medium | Medium | Medium | High (Lower) |
| High | Medium | Low | Low | Moderate (Mid) |
| Medium | Medium | Low | Low | Moderate (Lower) |
| High | Low | Low | Low | Moderate (Upper) |
| High | Very Low | Very Low | Very Low | Low (Upper) |
| Medium | Low | Low | Low | Low (Mid) |
| Low | Low | Very Low | Very Low | Low (Lower) |
| Medium | Very Low | Very Low | Very Low | Negligible (Upper) |
| Low | Very Low | Very Low | Very Low | Negligible (mid) |
| Very Low | Very Low | Very Low | Very Low | Negligible (Lower) |

This table shows all possible combinations of four scores for four "matters". The "SCORE BAND" column shows the overall score for a single area using the approach shown in **Table 6**. (Chapter 5).

# Assigning Ecological Value to Marine Benthic Habitats

ECOLOGICAL IMPACT ASSESSMENT

EIANZ guidelines for use in Aotearoa New Zealand: terrestrial, freshwater, and marine ecosystems

Addendum Module 1

# Assigning Ecological Value to Marine Benthic Habitats

## Introduction

In 2015 EIANZ published 'Ecological Impact Assessment: Guidelines for use in New Zealand: terrestrial and freshwater ecosystems' and followed this with a second edition in 2018. The purpose of the guidelines is the provision of a consistent framework for the assessment of effects of resource use and management on ecosystems and their values in Aotearoa New Zealand. These guidelines have proved to be highly utilised with a large uptake amongst practitioners, and for the most part helpful in decision-making.

Since their publication some aspects of impact assessment practice and natural resource management have progressed. Recent hearing decisions, expert commentary, and feedback from practitioner experience has led EIANZ to consider that the time is right for another look at what improvements can be made to the guidelines. This is particularly timely with pending changes to Aotearoa New Zealand's environmental use and management legislation.

EIANZ intends to update the guidelines through a series of modules or addenda, each one related to a specific topic, that will replace or be added to the guidelines and will be available online at EIANZ.

This Addendum Module 1 to the guidelines introduces marine ecosystems to the EcIA, a notable omission from the guidelines published earlier, which dealt only with terrestrial and freshwater ecosystems. This module 'Assigning Ecological Value to Marine Benthic Habitats' largely follows the form of values assessment for terrestrial and freshwater ecosystems by providing a hierarchy of ecosystem characteristics set against a hierarchy of ecological values ranging from Negligible to Very High values.

### Where this module is placed in the guidelines.

'Assigning Ecological Value to Marine Benthic Habitats' contributes to Chapter 5 of the EcIA Guidelines. Chapter 5 sets out the importance of assigning ecological values to ecological components of the environment to make informed judgements about avoidance or alternatives; to assess the level of predicted effects; and to quantify those effects so that appropriate impact management can be designed or recommended. The explanations within Chapter 5 of the EcIA guidelines are relevant to marine benthic habitats and provide guidance on when and how to use these values assessments.

# Assigning value to marine benthic habitats

## Attributes

In the same way as terrestrial and freshwater ecosystems are evaluated, the ecological value of a location (e.g., estuary, rocky reef, saltmarsh, intertidal and subtidal habitat) is determined by the assemblage and function of species, communities and habitats found there as well as the ecological context of the location. The ecological values of marine ecosystems have aspects of both quantity (rarity or extent) and quality (integrity, functionality or condition) and equally the value attributes include both qualitative and quantitative metrics to measure the quantity of quality of the habitats in question.

Some regulatory documents identify and specify the values and significance of specific marine locations, such as Significant Ecological Areas (SEAs). Marine reserves or no-take areas, regional policy statements, regional plans and/or district plans for the Project Site or ZOI location should be consulted first to determine what matters to consider and criteria to use to meet regulatory requirements.

Although a wide range of metrics and measures are used in the assessment of marine ecosystems there is no unifying set of attributes used to assign ecological values. Measures that are considered when assigning ecological value to a marine site do fall broadly into the matters discussed in section 5.2 and detailed in Table 4 Chapter 5 (Roper-Lindsay et al., 2018), although the application of these attributes varies widely and is somewhat inconsistent amongst practitioners. Table 1 of this module indicates how some of the broadscale habitat characteristics commonly recognised in terrestrial ecosystem evaluation may be applied in marine ecosystems.

## Marine Ecology/Habitat Classification Systems

There are many marine habitat classification systems that could be used to inform values and impact assessments. The selection of a classification system will be relevant to the type of existing environment potentially affected. Several marine habitat classifications have been carried out for New Zealand each with a variety of attributes and, as at the time of writing, include:

- BOMEC, 2012 (Leathwick et al., 2012)
- Benthic Protected Areas (Clark et al., 2019)
- Marine Reserves, 2016 (Ministry for the Environment, 2016b)

- DoC Marine Mammal Sanctuaries, 2016 (Ministry for the Environment, 2016a)

Most Common habitat types in Coastal Waters, 2011 (Ministry for the Environment, 2011)

- NZ Seafloor Community Classification, 2020 (Stephenson et al., 2021)
- NZ Benthic Marine Habitat Ecosystem Service Potential Matrix, 2019 (Geange et al., 2019)
- Estuarine health national approach (Clark et al. (2019) Marine Pollution Bulletin 150, 110602)
- Functional Integrity – for both soft sediment and rocky shores (de Juan et al (2018), Journal of Environmental Management 228:319-327).
- Habitat Suitability Modelling for protected coral species. NIWA report WLG2014-69. Department of Conservation.

The habitat classification examples are not a finite list and are provided to give guidance to determine what habitat is involved in the ecological assessment. Fine scale criteria are provided later (Table 2) in this guidance document.

**Table 1. Broadscale attributes that may be considered when assigning ecological value to a marine site, habitat or area.**

| Matters | Broadscale attributes |
|---|---|
| Representativeness | 1. Extent to which a site is typical or characteristic of a natural example of the habitat type e.g. estuary, open high energy sandy beach, subtidal reef<br>2. Site/habitat size<br>3. Indigenous species dominate<br>4. Expected species and tiers are present |
| Rarity/distinctiveness | 1. Supporting nationally or locally[1] Threatened, At Risk or uncommon species<br>2. National distribution limits<br>3. Endemism<br>4. Distinctive ecological features<br>5. Type of marine environment |
| Diversity and pattern | 1. Degree of natural diversity / habitat modification<br>2. Diversity metrics/indices<br>3. Complexity of community<br>4. Biogeographical considerations - pattern, complexity, size, shape<br>5. Temporal life history or seasonal habitat usage |
| Ecological context | 1. Local environmental conditions and influences, site history and development<br>2. Intactness, health and resilience of populations and communities<br>3. Contribution to ecological networks, linkages, pathways<br>4. Role in ecosystem functioning<br>5. Sensitivity to change<br>6. Project is within New Zealand's Coastal Marine Area (CMA) (under RMA legislation) or Exclusive Economic Zone (EEZ) (under EEZ legislation). |

EcIA in marine ecosystems has been less reliant on the current Resource Management Act (RMA) criteria in Section 6(c)[2] than similar assessments applied to terrestrial ecosystems. Even where criteria for the assignment of 'significance' exist within a regulatory plan, the established practice for marine practitioners is to default to measured and observed attributes recorded from the Project area under investigation. In part, this is because qualitative and quantitative indicators and metrics that include a scale or ranking for developing a hierarchy have been developed by marine ecologists.

[1] Locally – defined as Ecological District

[2] RMA Section 6(c) - The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna

This has led to marine benthic habitat assessments being closely aligned with RMA s88 and Schedule 4[3] requirements.

## Ecology Characteristics used to guide assessment of marine benthic ecological value

In keeping with the current EcIA guidelines a set of largely qualitative broadscale and fine scale attributes that characterise marine ecological values (for rocky/hard substrate habitats and soft sediment habitats respectively) in New Zealand has been established ranging from Very High to Negligible value estuarine and marine benthic habitats (Tables 1-3). These value assessments can be applied to different marine habitats to help inform a statement of ecological value.

Tables 2 and 3 include fine scale assessment of infauna and epifauna invertebrates, macroalgae, sediment grain size and oxygenation, sediment contaminants, sedimentation rate, water quality, marine vegetation, invasive species, habitat modification and threat status of marine species. Typically, while not all attributes assessed for a habitat type are contained within one level of ecological value in the tables, the approach used for terrestrial EcIA (Table 6 of the 2018 EIANZ Guidelines) could be used. The reasons for both the selection and the exclusion of the broadscale or fine scale ecological attributes/characteristics should be agreed with relevant stakeholders prior to any assessment and be set out early in the assessment of effects (e.g., methods section).

We suggest a broad scale assessment of ecological value of the site could be undertaken initially, depending on the project scale and complexity (Table 1), to guide marine assessments, followed by a fine scale assessment (Tables 2 and 3) for detailed marine assessments.

The fine scale tables have been applied to assessments and have broadened over time to include the attributes listed above. Furthermore, earlier versions of the marine ecological values assessment have been used in resource consents and Notice of Requirement applications under the RMA with outcomes accepted by decision makers at Council Hearings, Environment Court and Boards of Enquiry (see Box 1 below).

The ecologist should use their own expertise and experience to determine overall ecological value based on a balance of value attributes.

[3] Information required in an application for resource consent

### Table 2: Qualitative and quantitative fine scale attributes for assigning ecological values for rocky/hardshore benthic habitats

| ECOLOGICAL VALUE | ATTRIBUTE | VERY HIGH TO NEGLIGIBLE |
|---|---|---|
| **VERY HIGH** | Rocky/artificial substrate abundant, providing very high topographic complexity | |
| | Very low sediment cover on rocky substrate | |
| | Very high diversity and abundance of sessile benthic organisms for the habitat type | |
| | Very high diversity and abundance of mobile macroinvertebrates for the habitat type | |
| | Sessile and mobile benthic organisms comprise many sensitive taxa. Invasive, opportunistic and/or disturbance tolerant species largely absent or low abundance. | |
| | Biogenic habitat formations (e.g., perennial algal canopies, shellfish aggregations) have very large spatial extent and very low patchiness | |
| | Very high diversity and abundance of fish[4] for the habitat type | |
| | Threatened or At Risk marine species[2] present and may be abundant | |
| | Large areas of threatened ecosystem type present | |
| | Habitat unmodified | |
| | Water quality contaminant concentrations typically at or better than ANZG 99% species protection level and/or scored as 'Excellent' on a recognised Water Quality Index (WQI). | |
| **HIGH** | Rocky/artificial substrate abundant, providing high topographic complexity | |
| | Low sediment cover on rocky substrate | |
| | High diversity and abundance of sessile benthic organisms for the habitat type | |
| | High diversity and abundance of mobile macroinvertebrates for the habitat type | |
| | Sessile and mobile benthic organisms comprise many sensitive taxa. Invasive, opportunistic and/or disturbance tolerant species largely absent | |
| | Biogenic habitat formations (e.g., perennial algal canopies, shellfish aggregations) have large spatial extent and low patchiness | |
| | High diversity and abundance of fish for the habitat type | |
| | Threatened or At Risk marine species[2] present | |
| | Threatened ecosystem type present | |
| | Limited habitat modification | |
| | Water column contaminant concentrations typically between ANZWQG 95% and 99% species protection levels and/or scored as 'Good' on a recognised WQI | |
| **MODERATE** | Rocky/artificial substrate provides moderate topographic complexity | |
| | Moderate sediment cover on rocky substrate | |
| | Moderate diversity and abundance of sessile benthic organisms for the habitat type | |
| | Moderate diversity and abundance of mobile macroinvertebrates for the habitat type | |
| | Sessile and mobile benthic organisms comprise both tolerant and sensitive taxa | |
| | Biogenic habitat formations (e.g., perennial algal canopies, shellfish aggregations) have moderate spatial extent and moderate patchiness | |
| | Moderate diversity and abundance of fish for the habitat type | |
| | Few Threatened or At Risk marine species[2] present | |
| | Few Threatened ecosystems present | |

[4] Species of fish and other large fauna can be separated into individual values assessment, depending on the scale of the activity and the species present.

| | | |
|---|---|---|
| | Moderate habitat modification | |
| | Water column contaminant concentrations typically between ANZWQG 90% and 95% species protection levels and/or scored as 'Fair' on a recognised WQI | |
| **LOW** | Rocky/artificial substrate provides limited topographic complexity | |
| | High sediment cover on rocky substrate | |
| | Low diversity and abundance of sessile benthic organisms for the habitat type, but high cover of opportunistic macroalgae possible | |
| | Low diversity and abundance of mobile macroinvertebrates for the habitat type | |
| | Sessile and mobile benthic organisms comprise mostly invasive, opportunistic and disturbance-tolerant taxa, with very few sensitive taxa present | |
| | Biogenic habitat formations (e.g., perennial algal canopies, shellfish aggregations) absent, but biogenic habitat formers may be present in low abundance | |
| | Low diversity and abundance of fish for the habitat type | |
| | No Threatened or At Risk marine[2] species present | |
| | No Threatened ecosystem type present | |
| | High habitat modification | |
| | Water column contaminant concentrations typically between ANZWQG 80% and 90% species protection levels and/or scored as 'Marginal' on a recognised WQI | |
| **NEGLIGIBLE** | Rocky/artificial substrate sparse, providing limited topographic complexity | |
| | Rocky substrate smothered by sediment | |
| | Very low diversity and abundance of sessile benthic organisms for the habitat type | |
| | Very low diversity and abundance of mobile macroinvertebrates for the habitat type | |
| | Sessile and mobile benthic organisms comprise only invasive, opportunistic and disturbance-tolerant taxa, with no sensitive taxa present | |
| | Biogenic habitat formations (e.g., perennial algal canopies, shellfish aggregations) absent | |
| | Very low diversity and abundance of fish for the habitat type[5] | |
| | No Threatened or At Risk marine species[6] present | |
| | No Threatened ecosystem[7] type present | |
| | Very High habitat modification | |
| | Water column contaminant concentrations typically at or worse than ANZWQG 80% species protection levels and/or scored as 'Poor' on a recognised WQI | |

[5] Species of fish and other large fauna can be separated into individual values assessment, depending on the scale of the activity and the species present.

[6] Marine mammals and coastal birds have been excluded as a characteristic of marine habitats as separate specialist experts in marine mammals and coastal birds should be engaged. Marine mammals and coastal birds can form part of the characteristics around presence of 'Threatened' or 'At Risk' species when supported by a relevant expert.

[7] As per (Holdaway et al., 2012) for this parameter in all levels of ecological value.

### Table 3: Qualitative and quantitative fine scale attributes for assigning ecological values for soft sediment benthic habitats[8]

| ECOLOGICAL VALUE | ATTRIBUTE | VERY HIGH TO NEGLIGIBLE |
|---|---|---|
| **VERY HIGH** | Benthic invertebrate community typically has very high diversity, species richness and abundance for the habitat type | |
| | Benthic invertebrate community is dominated by taxa that are sensitive to organic enrichment, contaminants and mud e.g. rated as 'Excellent' using the Auckland Council (AC) or National Benthic Health Model (BHM)[9] or similar index | |
| | Invasive opportunistic and disturbance tolerant species absent[10] | |
| | Marine sediments typically comprise < 20% silt and clay grain sizes[11] (mud) or rated as 'Excellent' using the AC BHMmud or similar index | |
| | Surface sediment oxygenated to >5 cm depth[12] with no anoxic sediment present | |
| | Annual average sedimentation rates typically less than 1 mm above background levels [13] | |
| | Contaminant concentrations in surface sediment significantly below DGV and AC ERC-Orange effects threshold concentrations[14]. | |
| | Contaminant concentrations in shellfish at or below natural background levels or not above conservative laboratory detection limits | |
| | Water column contaminant concentrations typically at or better than ANZWQG 99%<br>species protection level and/or scored as 'Excellent' on a recognised Water Quality Index (WQI)[15] | |
| | Fish community typically has very high diversity, species richness and abundance[16] | |
| | Native estuarine vegetation or macroalgae community intact and provides significant habitat for native fauna | |
| **HIGH** | Benthic invertebrate community typically has high diversity, species richness and abundance for the habitat type | |
| | Benthic invertebrate community contains many taxa that are sensitive to organic enrichment, contaminants and mud. E.g. rated as 'Good' using the AC or National BHM or similar index | |
| | Invasive opportunistic and/or disturbance tolerant species largely absent | |
| | Marine sediments typically comprise <40% silt and clay grain sizes or rated as 'Good' using the AC BHMmud or a similar index | |
| | Surface sediment oxygenated up to 5cm depth | |
| | Annual average sedimentation rates typically less than 2 mm above background levels | |
| | Contaminant concentrations in surface sediment rarely exceed DGV | |

[8] Methodologies and considerations for measuring a number of these attributes can be found within the "National Estuary Monitoring Protocol" and "Managing Upstream" project reports. Go to https://environment.govt.nz/publications/ to search for the latest versions.

[9] Hewitt, J E., Lohrer, A M and Townsend, M (2012). Health of estuarine soft-sediment habitats: continued testing and refinement of state of the environment indicators. Prepared by NIWA for Auckland Council. Auckland Council technical report, TR2012/012

[10] https://www.marinebiosecurity.org.nz/

[11] Silt and clay percentage of sediment adjusted to be consistent with BHMud Model

[12] Robertson, B.M, Stevens, L., Robertson, B., Zeldis, J., Green, M., Madarasz-Smith, A., Plew, D., Storey, R., Oliver, M. 2016. NZ Estuary Trophic Index Screening Tool 2. Determining Monitoring Indicators and Assessing Estuary Trophic State. Prepared for Envirolink Tools Project: Estuarine Trophic Index, MBIE/NIWA Contract No: C01X1420. 68p.

[13] Townsend and Lohrer (2015). ANZECC Guidance for Estuary Sedimentation. Prepared for Ministry for the Environment by NIWA

14 ANZG (2018) Default Guideline Value concentrations, or Auckland Council's Environmental Response Criteria contaminant threshold concentrations (Auckland Regional Council TP168, 2004)

[15] E.g., Ingley, R (2021). Coastal and estuarine water quality state and trends in Tāmaki Makaurau / Auckland 2010-2019. State of the environment reporting. Auckland Council technical report, TR2021/02.

[16] https://www.mpi.govt.nz/legal/legislation-standards-and-reviews/fisheries-legislation/maps-of-nz-fisheries/

| | | |
|---|---|---|
| | concentrations and AC ERC-Orange effects threshold concentrations. | |
| | Where shellfish are present, flesh has contaminant concentrations close to natural background levels or not above conservative laboratory detection limits | |
| | Water column contaminant concentrations typically between ANZWQG 95% and 99% species protection levels and/or scored as 'Good' on a recognised WQI | |
| | Fish community typically has high diversity, species richness and abundance | |
| | Native estuarine vegetation or macroalgae community dominated by native species and provides high quality habitat for native fauna | |
| | Nuisance phytoplankton or macroalgal blooms may occur infrequently at a limited spatial scale | |
| | Threatened or At Risk marine species present | |
| | Threatened ecosystem types present | |
| | Physical habitat largely unmodified | |
| **MODERATE** | Benthic invertebrate community typically has moderate species richness, diversity and abundance for the habitat type | |
| | Benthic invertebrate community has taxa both tolerant and sensitive to organic enrichment, contaminants and mud present E.g. rated as 'Fair' using the AC or National BHM or similar index | |
| | Few invasive opportunistic and/or disturbance tolerant species present | |
| | Marine sediments typically comprise less than <60% silt and clay grain sizes or rated as 'Fair' using the AC BHMmud or similar index | |
| | Shallow depth of oxygenated surface sediment to 1-2 cm depth | |
| | Annual average sedimentation rates typically less than 5 mm above background levels | |
| | Contaminant concentrations in surface sediment generally below DGV and AC ERC-Red effects threshold concentrations[17] | |
| | Where shellfish are present, flesh has low to moderate contaminant concentrations present compared to natural background levels | |
| | Water column contaminant concentrations typically between ANZWQG 90% and 95% species protection levels and/or scored as 'Fair' on a recognised WQI | |
| | Fish community typically has moderate species richness, diversity and abundance | |
| | Native estuarine vegetation and macroalgae community dominated by native species and provides moderate habitat for native fauna | |
| | Nuisance phytoplankton or macroalgal blooms may occur sporadically over a moderate spatial scale | |
| | Few Threatened or At Risk marine species present | |
| | Few Threatened ecosystems present | |
| | Physical habitat moderately modified | |
| **LOW** | Benthic invertebrate community degraded with low species richness, diversity and abundance for the habitat type | |
| | Benthic invertebrate community dominated by organic enrichment tolerant, contaminant tolerant and mud tolerant organisms with few/no sensitive taxa present e.g. rated as 'Marginal' using the AC or National BHM or similar index | |
| | Invasive, opportunistic and/or disturbance-tolerant species dominant | |
| | Marine sediments dominated by silt and clay grain sizes (>60%) or rated as 'Marginal' using the AC BHMmud or similar index | |
| | Surface sediment predominantly anoxic (lacking oxygen) | |
| | Annual average sedimentation rates typically less than 10 mm above background levels | |

[17] Auckland Council's Environmental Response Criteria contaminant threshold concentrations (Auckland Regional Council TP168, 2004).

| | | |
|---|---|---|
| | Elevated contaminant concentrations in surface sediment, between ANZG Default Guideline Values (DGV) and GV-High effects threshold concentrations | |
| | Where shellfish are present, flesh has moderate contaminant concentrations present compared to natural background levels | |
| | Water column contaminant concentrations typically between ANZWQG 80% and 90%<br>species protection levels and/or scored as 'Marginal' on a recognised WQI | |
| | Fish community depleted with low species richness, diversity and abundance | |
| | Native estuarine vegetation and/or macroalgae community provides minimal/limited habitat for native fauna. | |
| | Nuisance phytoplankton or macroalgal blooms may occur commonly over a moderate scale | |
| | No Threatened or At Risk marine species present | |
| | No Threatened ecosystem present | |
| **NEGLIGIBLE** | Physical habitat highly modified | |
| | Benthic invertebrate community dominated by organic enrichment tolerant, contaminant tolerant, and mud tolerant organisms with no sensitive taxa present. E.g. rated as 'Poor' using the Auckland Council or National[18] Benthic Health Models or similar indices | |
| | Invasive, opportunistic and disturbance tolerant species highly dominant | |
| | Marine sediments dominated by silt and clay grain sizes (>80%) or rated as 'Poor' using a BHMmud or similar index | |
| | Surface sediment anoxic (lacking oxygen) | |
| | Annual average sedimentation rates typically greater than 10 mm above background levels | |
| | Elevated contaminant concentrations in surface sediment, above ANZG Guideline Values – High (GV-High) effects threshold concentrations[19] | |
| | Where shellfish are present, flesh has moderate-high contaminant concentrations Present compared to natural background levels | |
| | Water column contaminant concentrations typically at or worse than ANZWQG 80%<br>species protection levels and/or scored as 'Poor' on a recognised WQI | |
| | Fish community depleted with very low species richness, diversity and abundance[20] | |
| | Native estuarine vegetation or macroalgae absent or so sparse as to provide very limited ecological value | |
| | Nuisance phytoplankton or macroalgal blooms may occur frequently over a large spatial scale | |
| | No Threatened or At Risk marine species present[21] | |
| | No Threatened ecosystems present | |
| | Physical habitat extremely modified | |

[18] D.E. Clark, J.E. Hewitt, C.A. Pilditch, J.I. Ellis (2020). The development of a national approach to monitoring estuarine health based on multivariate analysis. Marine Pollution Bulletin, Volume 150.

[19] ANZG (2018) Australian and New Zealand Guidelines for Freshwater and Marine Water Quality (replaced previous ANZECC guidelines)

[20] Species of fish and other large fauna can be separated into individual values assessment, depending on the scale of the activity and the species present

[21] Marine mammals and coastal birds have been excluded as a characteristic of marine habitats as separate specialist experts in marine mammals and coastal birds should be engaged. Marine mammals and coastal birds can form part of the characteristics around presence of 'Threatened' or 'At Risk' species when supported by relevant experts

## Examples of use

Earlier versions of the tables of fine scale attributes assigning ecological value to marine benthic habitats (Tables 2 and 3) have been successfully applied to several 'Assessments of Ecological Effects' in New Zealand for a variety of different projects. The examples listed in Box 1 have all been submitted as part of applications for resource consents or Notification of Requirement under the RMA.

**BOX 1: Examples of Assessment of Ecological Effects applying ecological values to marine habitats.**

Ara Tūhono Pūhoi to Wellsford Road of National Significance (RoNS), Pūhoi to Warkworth section
Section https://www.nzta.govt.nz/assets/projects/puhoi-to-warkworth-application/docs/assessment-report-marine.pdf

Transmission Gully Project
https://www.nzta.govt.nz/assets/projects/transmission-gully-application/docs/technical-report-10.pdf

Mackay's to Peka Peka Expressway
https://www.nzta.govt.nz/assets/projects/mackays-to-peka-peka-application/docs/technical-report-31.pdf

Warkworth to Wellsford. Marine Ecology and Coastal Avifauna Assessment
https://www.nzta.govt.nz/assets/projects/ara-tuhono-warkworth-to-wellsford/marine-ecology-and-coastal-avifauna-assessment.pdf

East West Link Road
https://www.nzta.govt.nz/assets/projects/east-west-link-application-to-the-environmental-protection-authority-epa/Technical-Report-16-Ecological-Impact-Assessment-Part-2-of-2-Ch4-6.pdf

Kaiwharawhara Wellington Ferry Terminal
https://www.epa.govt.nz/assets/Uploads/Documents/Fast-track-consenting/Kaiwharawhara/Application-documents/Appendix-14-Benthic-Marine-Ecology-Assessment.pdf

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### Authorship

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