

A lush forest scene with a waterfall cascading over mossy rocks. The water is white and frothy as it falls, surrounded by dense green foliage and ferns. The foreground shows large, dark rocks covered in green moss, with water flowing over them.

Treasuring Our Biodiversity

An EDS Guide to the protection of New Zealand's
indigenous habitats and species

Lucy Brake and Raewyn Peart

ENVIRONMENTAL DEFENCE SOCIETY

Treasuring Our Biodiversity

**An EDS Guide to the protection of New Zealand's
indigenous habitats and species**

Environmental Defence Society Publications

EDS Guide Series

Strengthening Second Generation Regional Policy Statements (2011)

Managing Freshwater (2010)

Managing the Marine Environment (2010)

The New Zealanders' Guide to the Resource Management Act 1991 3rd edition (2008) in association with Craig Potton Publishing

The Community Guide to Landscape Protection under the Resource Management Act 1991 (2005)

The Community Guide to Coastal Development under the Resource Management Act 1991 (2005)

Landscape Planning Guide for Peri-urban and Rural Areas (2005)

Other publications

Wonders of the Sea: The Protection of New Zealand's Marine Mammals (2012)

Safeguarding our Oceans: Strengthening Marine Protection in New Zealand (2012)

Governing our Oceans: Environmental Reform for the Exclusive Economic Zone, EDS Policy Paper (2011)

Improving Environmental Governance: The role of an Environmental Protection Authority in New Zealand, EDS Policy Paper (2009)

Building Castles in the Sand: The Transformation of New Zealand's Coast (2009) in association with Craig Potton Publishing

Beyond the Tide: Integrating the Management of New Zealand's Coast 2nd edition (2009)

Beyond the RMA: An In-depth Exploration of the Resource Management Act 2001 (2007)

Looking Out to Sea: New Zealand as a Model for Oceans Government (2005)

A Place to Stand: The Protection of New Zealand's Natural and Cultural Landscapes (2004)

Reclaiming our Heritage: The New Zealand Landscape Conference (2003)

Ordering publications

Publications can be ordered online at www.eds.org.nz,
by phone at +64 9 835 4350 or by writing to:

Environmental Defence Society Incorporated
P O Box 95 152
Swanson
Auckland 0653
New Zealand

Treasuring Our Biodiversity

An EDS Guide to the protection of New Zealand's
indigenous habitats and species

Lucy Brake and
Raewyn Peart

First published 2013

Published by:
Environmental Defence Society Incorporated
P O Box 95 152
Swanson
Auckland 0653
New Zealand
Phone (09) 835 4350
manager@eds.org.nz
www.eds.org.nz
www.rmaguide.org.nz

ISBN 978-0-9876660-0-0

This book is copyright. Apart from any fair dealing for the purpose of private study, research, criticism or review, as permitted under the Copyright Act, no part may be reproduced by any process without the permission of the publishers.

© Environmental Defence Society Incorporated 2013

Artwork: Neale Wills – Wilsy Design & Production

Cover image: New Zealand bush (*Source: Neale Wills*)



contents

- xviii Figures
- xxviii Acronyms and abbreviations
- xxix Preface
- xxxi Acknowledgements

Part One – Overview of biodiversity management in New Zealand

- 3 **One – Introducing New Zealand's biodiversity**
- 4 Evolution of an isolated world
- 5 A legacy of loss
- 6 Valuing biodiversity
- 7 Our biodiversity under threat
- 8 Habitat destruction
- 8 Invasive species
- 8 Climate change
- 9 Indigenous forests
- 9 Indigenous grasslands
- 9 Wetlands
- 9 Productive land
- 10 Urban environments
- 10 Freshwater
- 11 Coastal
- 11 Marine
- 12 Summary
- 12 References and further reading

- 15 **Two – Biodiversity policy framework**
- 17 International policy framework
- 18 Convention on Wetlands of International Importance

19	World Heritage Convention
21	Convention on International Trade in Endangered Species of Wild Flora and Fauna
21	Convention on Migratory Species of Wild Animals
22	Convention on Biological Diversity
23	United Nations Convention on the Law of the Sea
25	National policy documents
25	New Zealand Biodiversity Strategy
26	Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land
27	National implementation tools
27	Threat classification systems
28	Habitat mapping
29	References and further reading
31	Three – Biodiversity management agencies
33	Minister and Department of Conservation
34	Minister and Ministry for the Environment
35	Minister and Ministry for Primary Industries
36	Land Information New Zealand
36	Environmental Protection Authority
37	Maritime New Zealand
38	Queen Elizabeth II National Trust
39	Regional councils
40	Territorial authorities
40	Iwi and hapū
41	Four – Biodiversity management under the RMA
42	Overview
43	Purpose of the RMA
44	Matters of national importance
46	Other matters
47	Treaty of Waitangi
47	National policy statements
48	National environmental standards
49	Water conservation orders
50	Regional policy statements
50	Regional plans
51	District plans
52	Identifying significant areas and habitats

53	Conservation lots
53	Consent conditions
54	Biodiversity offsetting
56	References and further reading
59	Five – Biodiversity protection under national policy statements
60	National Policy Statement for Freshwater Management
61	New Zealand Coastal Policy Statement
62	Extent of the coastal environment
64	Objectives
64	Key concepts and terms
65	Maintaining or enhancing natural biological processes
67	Maintaining or enhancing natural physical processes
68	Protecting representative or significant natural ecosystems and sites of biological importance
69	Protecting indigenous biological diversity
70	Improving coastal water quality
72	Reducing sedimentation
74	Restoring natural character
76	References and further reading
79	Six – Incorporating biodiversity protection into local government plans
80	General considerations for RMA plans
81	Regional policy statements
82	Regional plans
83	Regional coastal plans
85	District plans
86	Long term council community and annual plans
88	References and further reading
89	Seven – Additional legal mechanisms to protect habitats
90	Overview
92	Protection of habitats on Crown-owned land
92	Conservation Act 1987
94	National Parks Act 1990
95	Reserves Act 1977
96	Crown Pastoral Land Act 1998
98	Protection of habitats in the marine area
98	Marine Reserves Act 1971
99	Fisheries Act 1996
100	Marine Protected Areas Policy and Implementation Plan 2006

101	Protection of habitats on private land
101	Voluntary protection
102	Covenants
103	Rates relief
103	Protection under the RMA
103	Protective provisions in plans
104	Esplanade reserves and strips
105	Financial contributions
105	Environmental compensation
105	Development contributions
106	Other legal mechanisms
106	Overseas Investment Act 2005
106	Forests Act 1949
107	References and further reading
109	Eight – Additional legal mechanisms to protect species
110	Wildlife Act 1953
112	Marine Mammals Protection Act 1978
114	Trade in Endangered Species Act 1989
115	Native Plants Protection Act 1934
117	Nine – Managing unwanted species and new organisms
118	Biosecurity Act 1993
119	Importation of risk goods
120	Surveillance
120	Legislative reform
120	Pest management
120	National pest management strategy
121	Regional pest management strategy
121	Implementation of pest management strategies
121	Small-scale management programme
122	Hazardous Substances and New Organisms Act 1996
122	Voluntary partnerships and initiatives
123	Useful websites
123	References and further reading
125	Ten – Voluntary tools
126	Overview
126	Types of voluntary tools and mechanisms
126	Strategic planning
127	Biodiversity education and advocacy

128	Regional biodiversity forums
129	Land or conservation covenants
130	Central government funding programmes
131	Local government funding incentives
132	Community care
134	Voluntary pest management partnerships and initiatives
135	Community environmental monitoring programmes
136	Summary
139	Eleven – Māori and biodiversity
140	Overview of Māori perspectives and values
140	Māori world view
140	Māori creation story
141	Polynesian settlement
141	Important concepts
144	Key issues for Māori
144	Land loss and biodiversity decline
144	Loss of marine biodiversity and kaimoana
145	Loss of traditional biodiversity knowledge
145	Reduced ability to apply traditional knowledge
146	Lack of constructive management partnerships
146	Summary of key issues
147	Description of approaches and responses
147	New Zealand Biodiversity Strategy
148	Resource Management Act 1991
149	Fisheries Act 1996
151	Iwi management plans
151	Co-management arrangements
153	Contestable funds
153	Collaborative research
154	Case Studies
154	Manararoa/Ototu Trust
154	Ngāi Tahu natural resource management
155	Recommendations for best practice
156	Useful websites
157	References and further reading
161	Twelve – Opportunities for public involvement
162	Overview
163	Preparing policies and plans

163	Resource Management Act plans
164	Local Government Act plans
164	Conservation strategies and plans
165	Reserve management plans
165	Fisheries plans
166	Population management plans
166	Pest management strategies
166	Summary
168	Making rules and regulations
168	National environmental standards
168	Marine reserves
169	Fisheries sustainability measures
169	Marine protection rules
169	Marine mammals sanctuaries
169	Import health standards
170	Summary
171	Deciding individual proposals
171	Resource consents
171	Offshore dumping permits
172	Concessions
172	Preliminary tenure review proposals
172	Marine mammals permits
172	New organisms permit
173	Summary
174	Publicly-initiated processes
174	Private plan changes
174	Reporting offences
175	Declarations and enforcement orders
175	Judicial review
176	References and further reading

Part Two – Managing biodiversity within New Zealand’s special environments

179	Thirteen – Indigenous forests
180	Life in the forest
180	Forest processes
180	Trees
181	Other flora
183	Birds
183	Invertebrates

184	Reptiles and frogs
184	Ecosystem services
184	Threats
185	Invasive species
187	Fragmentation of forest habitats
189	Climate change
189	Summary of threats
190	Description of regulatory management approaches
190	Protection of areas of significant indigenous forest
190	Logging
191	Activity rules and consent conditions
191	Description of non-regulatory approaches
191	Community organisations
192	Education and information
193	Financial incentives
193	Case Studies
193	Wairere Farm bush protection
194	Banks Peninsula Conservation Trust
195	Recommendations for best practice
195	Useful websites
196	References and further reading
199	Fourteen – Indigenous grasslands
201	Life in the grasslands
202	Native grasses
202	Plants
203	Birds
203	Lizards
204	Invertebrates
205	Threats
205	Burning
206	Pastoral farming
207	Invasive mammals
208	Invasive plants
209	Summary of threats
209	Description of regulatory management approaches
210	Rules in district plans
210	Conditions of resource consent
210	Description of non-regulatory approaches
210	Management of wilding pines

211	Voluntary land covenants
211	Incorporation of grasslands into public conservation land
212	Carbon sequestration
213	Case Studies
213	Tekapo Scientific Reserve
214	New Zealand Wilding Conifer Management Group
215	Recommendations for best practice
216	Useful websites
216	References and further reading
219	Fifteen – Wetlands
220	Life in wetlands
221	Bogs
221	Fens
221	Swamps
221	Geothermal wetlands
222	Lacustrine wetlands
222	Riverine wetlands
223	Plutonic wetlands
224	Threats
224	Land conversion and catchment activities
224	Other activities
225	Invasive plants and animals
226	Summary of threats
227	Description of regulatory management approaches
228	National Policy Statement for Freshwater Management
228	Regional and district plans
229	Conditions of resource consent
229	Description of non-regulatory approaches
230	Education and community awareness
231	Funds and grants
232	Restoration initiatives
232	Case Studies
232	Lakeland Farm
234	Arawai Kākāriki wetland restoration programme
235	Waiatarua Reserve
	Biodiversity on Zespri kiwifruit orchards
236	Recommendations for best practice
237	Useful websites
237	References and further reading

241	Sixteen – Productive land
243	Value of biodiversity to productive land
243	Diversity of life found on productive land
244	Plants
244	Trees
244	Invertebrates
245	Birds
245	Threats
245	Expansion and intensification of agriculture
246	Invasive species
247	Poor land management practices, including increasing use of agro-chemical inputs
249	Climate change
249	Summary of threats
249	Description of regulatory management approaches
250	Regional and district planning
251	Pest management strategies
251	Description of non-regulatory approaches
251	Land covenants
252	Financial incentives
252	Land care groups
253	Incorporating biodiversity into land management practices
255	Developing indicators for managing biodiversity in agriculture
256	Linking with the market
257	Case Studies
257	Kowhai Farm, Canterbury Region
257	Greening Waipara Project
258	Biological control of insect pests
259	Recommendations for best practice
259	Useful websites
260	References and further reading
265	Seventeen – Urban environments
267	Life in the city
267	Birds
268	Plants
268	Fish
269	Invertebrates
269	Reptiles
269	Introduced mammals

269	Threats
269	Habitat loss and fragmentation
271	Pest species
272	Impervious area
273	Contaminated urban run-off
274	Summary of threats
274	Description of regulatory management approaches
275	Regional and district plans
276	Conditions of resource consent
276	Tree protection rules
277	Description of non-regulatory approaches
278	Green infrastructure
279	Weed management
280	Education
280	Community initiatives
281	Case Studies
281	Project Twin Streams
282	Karori Sanctuary
283	Recommendations for best practice
284	Useful websites
285	References and further reading
289	Eighteen – Freshwater
291	Life in freshwater
291	Invertebrates and insects
292	Fish
292	Birds
293	Plants
294	Groundwater biota
294	Threats
295	Clearance of riparian habitat
295	Deteriorating water quality
297	Introduced species
297	Damming of freshwater habitats
298	Other activities
300	Summary of threats
301	Description of regulatory management approaches
301	National Policy Statement for Freshwater Management
302	Water conservation orders
302	Regional planning

303	District planning
304	Conditions of resource consent
305	Description of non-regulatory approaches
305	Integrated catchment management
305	Recovery plans
305	Education
306	Case Studies
306	Canterbury Water Management Strategy
308	Project River Recovery
309	Recommendations for best practice
309	Useful websites
310	References and further reading
315	Nineteen – Coastal
316	Life in dunes
317	Dune plants
318	Birds of the dunes
319	Dune invertebrates and lizards
320	Life in estuaries
320	Estuary plants
321	Birds of estuaries
322	Fish and invertebrates in estuaries
322	Life on rocky coasts
323	Rocky coast plants
323	Birds of the rocky coast
323	Marine mammals of the rocky coasts
324	Threats to dunes
325	Invasive plants
326	Grazing mammals
326	Urban development
327	Threats to estuaries
327	Coastal development
329	Sedimentation
329	Other impacts
330	Threats to rocky coasts
331	Human activities
332	Threats from climate change
333	Summary of threats
334	Description of regulatory management approaches
334	New Zealand Coastal Policy Statement 2010

335	Regional and district plans
335	Resource consent conditions
336	Description of non-regulatory approaches
336	Coastal management strategies
337	Biodiversity strategies
338	Integrated coastal management
338	Education and raising awareness
339	Community care groups
340	Funding initiatives
341	Case Studies
341	Yellow-Eyed Penguin Trust
342	Uretara Estuary Managers
343	Recommendations for best practice
344	Useful websites
344	References and further reading
347	Twenty – Marine
349	Life in the ocean
349	Marine habitats
350	Marine mammals
351	Seabirds
352	Fish
352	Invertebrates
353	Threats
353	Impact on targeted fish populations
354	Disruption of marine ecosystems
354	Damage to seabed habitats
354	Impacts on marine mammals, turtles and birds
355	Invasive species
356	Impacts from other marine activities
356	Pollution
356	Summary of threats
357	Description of regulatory management approaches
357	International agreements
358	Legislative framework
359	Marine Protected Areas
359	Fisheries Act 1996
359	Resource Management Act 1991
360	Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012

361	Biosecurity Act 1993
361	Description of non-regulatory approaches
361	Regional partnerships
362	Ocean mapping
362	Marine spatial planning
363	Case Studies
363	Fiordland Marine Guardians
364	Top of the South Marine Biosecurity Partnership
365	Recommendations for best practice
365	Useful websites
366	References and further reading
371	Twenty-one – Conclusion

Figures

- 4 1.1 Estuarine environments support a huge variety of species and are an essential component of New Zealand's unique biodiversity
- 6 1.2 The ground-dwelling native green hooded orchid is an example of the wide range of species found in New Zealand's forest environments
- 7 1.3 The extensive logging and clearance of New Zealand's native forest has transformed this country's biodiversity
- 8 1.4 The possum is one of the most damaging of the introduced species; in particular, they cause significant destruction of native forests
- 10 1.5 The urbanisation of Auckland, and the patterns of land settlement seen within this city, have resulted in major changes to biodiversity
- 11 1.6 A typical example of mussel farming, which can lead to a wide range of potential environment effects on marine biodiversity
- 16 2.1 Summary of key elements of New Zealand's biodiversity policy framework
- 18 2.2 Miranda in the Firth of Thames is one of New Zealand's six wetlands protected under the Ramsar Convention
- 20 2.3 The Tongariro National Park, a World Heritage Site, is safeguarded because of its natural and cultural values
- 23 2.4 Wetlands are incredibly diverse environments; as such their protection is required under the Convention on Biological Diversity
- 24 2.5 Sea anemones are just one of the many forms of sea life that suffer from the effects of marine pollution
- 25 2.6 Dunelands, and the native sand binding grasses that are a key part of this habitat, are one of the most modified natural ecosystems in New Zealand
- 32 3.1 Summary of management agencies, management focus and key legislation
- 38 3.2 The Waingawa wetland area is protected by a QEII Trust covenant
- 42 4.1 Summary of mechanisms for biodiversity protection under the RMA

44	4.2	Structure of Part 2 of the RMA
45	4.3	The Kawhia coastline is an example of natural character requiring preservation and protection under the NZCPS 2010
46	4.4	A lowland river ecosystem holds intrinsic values which need to be given regard to under section 7 of the RMA
48	4.5	The National Policy Statement for Freshwater Management provides guidance on the management of rural land adjacent to freshwater environments, such as this in Mangere
51	4.6	Regional plans contain policies and rules on appropriate activities on rural land and the resulting effects, such as this rural property near Takaka
61	5.1	Emerald Lake in the Tongariro National Park is an example of an outstanding freshwater body
62	5.2	Summary of biodiversity protection under the NZCPS 2010
63	5.3	Example of the coastal environment
64	5.4	NZCPS 2010 Objective 1
66	5.5	Seagrass meadows in the Kaipara Harbour have become severely degraded by human activities, which has consequently impacted upon juvenile fish species that use this area as a nursery
67	5.6	Waves are a natural physical process of the coastal environment
68	5.7	Intertidal areas are sites of biological importance
69	5.8	NZCPS 2010 Policy 11 'Indigenous biological diversity (biodiversity)'
71	5.9	NZCPS 2010 Policy 21 'Enhancement of water quality'
72	5.10	NZCPS 2010 Policy 22 'Sedimentation'
73	5.11	Sediment plume at the end of a river
74	5.12	NZCPS 2010 Policy 14 'Restoration of natural character'
75	5.13	Replanting of dune areas help restore the coastal environment
80	6.1	Matters for councils to consider when preparing plans
84	6.2	Estuary environments need to be protected by appropriate provisions in a regional coastal plan
87	6.3	Environment Canterbury Annual Plan 2010/11
90	7.1	Summary of legal mechanisms to protect habitats
92	7.2	Protection status categories for conservation areas
93	7.3	Stewart Island/Rakiura Conservation Management Strategy

- 95 7.4 Mount Cook National Park is one of 14 national parks around New Zealand
- 96 7.5 Classification of reserves under the Reserves Act
- 97 7.6 Indigenous grasslands of the high country
- 98 7.7 Tawharanui Marine Reserve in Auckland is protected under the Marine Reserves Act
- 100 7.8 A family enjoying some recreational fishing from the beach
- 101 7.9 West Coast Subantarctic Islands
- 102 7.10 Land covenants are a useful tool for protecting important biodiversity values, such as this QEII Trust covenant on land in the Hawkes Bay
- 104 7.11 Esplanade reserves are essential for providing public access to and along the coastal marine area
- 106 7.12 The logging of native forests is managed under the Forests Act
- 110 8.1 Summary of legal mechanisms to protect specific species
- 111 8.2 Examples of the Wildlife Act schedules identifying species which can be hunted
- 113 8.3 The common dolphin is protected, to some degree, under the Marine Mammals Protection Act
- 115 8.4 Native orchids have some protection under the Native Plants Protection Act
- 118 9.1 Koi carp, which are an invasive introduced fish and contribute to poor water quality, being removed from a river
- 119 9.2 Biosecurity functions of different management organisations
- 127 10.1 Biodiversity Strategy for the Canterbury Region
- 128 10.2 Auckland Council's Managing Weeds programme
- 129 10.3 A landowner workshop discusses covenants
- 130 10.4 Summary of the main grants and funds available for biodiversity protection
- 131 10.5 La Fontaine Stream Enhancement Project
- 132 10.6 Tinui School children dune planting as part of Conservation Week, Castlepoint Scenic Reserve
- 134 10.7 Landcare Trust volunteers planting at Lake Komakorau
- 135 10.8 Children from Pongakawa School doing a snorkel survey at Pilot Bay, Mount Maunganui
- 137 10.9 Summary of the main non-regulatory biodiversity protection and enhancement mechanisms, their benefits and weaknesses, and opportunities for public involvement
- 141 11.1 Treaty Marae, Waitangi

142	11.2	Summary of important concepts and their relationship to biodiversity
146	11.3	Summary of the key issues for Māori and resulting effects
147	11.4	Bus shelter in the form of a traditional storage platform, Wigram Air Base, Christchurch
148	11.5	An anchor stone with traditional carvings representing captains of canoes, Harbour Link, Tauranga
149	11.6	Carving depicting a traditional narrative of Te Taurikura, The Lakes Development Pyes Pa, Tauranga
150	11.7	A mātaimai reserve around Mount Maunganui protects both customary and recreational fishing in this area
152	11.8	The Waikato River Authority, which oversees the management of the Waikato River, is an example of co-management
155	11.9	Ngāi Tahu's special relationship with Akaroa Harbour's biodiversity is recognised through the Christchurch City Council's Biodiversity Strategy
155	11.10	Summary of the approaches and best practice recommendations
162	12.1	Summary of opportunities for public involvement
165	12.2	Trampers in the bush enjoy the opportunity to visit a conservation area, which has a conservation management strategy in place to provide for such recreational use
166	12.3	Opportunities for public participation in the preparation of policies and plans affecting biodiversity
168	12.4	The Cape Rodney-Okakari Point Marine Reserve at Leigh, near Auckland, was the first marine reserve put in place and provided for scientific research into marine ecosystems
170	12.5	Opportunities to participate in the development of rules and regulations affecting biodiversity
173	12.6	Opportunities to participate in the determination of individual applications affecting biodiversity
181	13.1	Beech form part of the two most common forest types in New Zealand
182	13.2	Ferns are an important part of the diverse flora found in indigenous forests
183	13.3	North West Nelson tree weta, near Cave Brook, Goulund Downs, Kahurangi National Park
185	13.4	Burning open land for future clearing in the 1960s

- 186 13.5 Introduced weeds, like these shown, pose a significant threat to native forest systems
- 187 13.6 The recently identified kauri dieback disease is killing kauri tree stands throughout the upper North Island
- 188 13.7 Example of a fragmented forest
- 189 13.8 Summary of the main causes of biodiversity loss in native forests and the potential effects on habitats, ecosystems and species
- 191 13.9 Waikato Regional Pest Management Strategy
- 192 13.10 Auckland replanting guide
- 194 13.11 The Banks Peninsula has a wide range of biodiversity and landscape values requiring protection
- 195 13.12 Summary of the management approaches and best practice recommendations
- 200 14.1 Tongariro National Park supports an important area of indigenous grasslands
- 201 14.2 Broad indigenous tussock grassland types
- 202 14.3 Sand tussock, Onoke Spit, Southern Wairarapa
- 203 14.4 Otago Skink, Macraes Flat, Otago
- 204 14.5 The Mackenzie Basin has indigenous grasslands which are facing a range of threats, in particular clearance of native vegetation
- 205 14.6 Changes to extent of indigenous grasslands since 1840
- 206 14.7 Farming of indigenous grasslands has significantly impacted on their biodiversity values
- 207 14.8 Grazing in tussock land results in serious adverse effects on the native vegetation
- 208 14.9 Wilding pines transform indigenous grasslands. This plant pest can be a significant challenge to control as it rapidly colonises grazed areas
- 209 14.10 Summary of the main causes and potential effects of biodiversity loss in indigenous grasslands
- 210 14.11 Example of rules in the Mackenzie District Plan protecting indigenous grasslands
- 212 14.12 Setting aside areas of tussock grass in public conservation land supports protection of biodiversity values
- 213 14.13 Indigenous grasslands of the Tekapo Reserve
- 214 14.14 The New Zealand Wilding Conifer Management Group assists landowners with managing the problem of wilding pines

215	14.14	Summary of the management approaches and best practice recommendations
220	15.1	Example of a wetland
222	15.2	Giant cane rush (<i>Sporadanthus ferrugineus</i>), a rare plant now found only in a few wetlands in the Waikato Region
223	15.3	The importance of wetlands
225	15.4	Stock allowed into wetlands can increase the sediment and nutrient load and be detrimental for wildlife
226	15.5	Invasive plants can have significant adverse effects on wetland biodiversity values
226	15.6	Summary of the main threats to biodiversity in wetlands
227	15.7	Farewell Spit in the South Island is an example of important wetland areas needing management approaches designed to protect and conserve the biodiversity values
230	15.8	Educating communities about the importance of wetlands and their native flora and fauna can assist with protecting these special environments
231	15.9	Volunteers involved in a community planting day for the O Tu Wharekai Wetland restoration project, Lake Heron, Canterbury
232	15.10	Planting underway at Lake Komakorau
233	15.11	Lake Komakorau after restoration works
234	15.12	Mid Kopuku Arm, high water level for summer, Whangamarino Wetland, Maramarua, Waikato
234	15.13	Summary of the main management tools used in each wetland
235	15.14	Waiatarua Reserve
236	15.15	Summary of the management approaches and best practice recommendations
242	16.1	An example of typical productive land in rural New Zealand
246	16.2	The clearance of land can result in significant declines in biodiversity values
247	16.3	The application of chemicals is one method to control weeds and pests on productive land
248	16.4	Fertilisers applied to farm land can devastate native plants, insects and animals, both on the land and in adjacent waterways
249	16.5	Summary of the main causes of biodiversity loss on productive land and the potential effects on habitats, ecosystems and species

- 251 16.6 Predator proof fence, Ellen Elizabeth Preece Covenant, Caravan Bush, Pitt Island, Chatham Island
- 252 16.7 Landcare restoration site at Lake Komakorau
- 253 16.8 Phacelia strip to improve biological control
- 254 16.9 Lizard lounges provide additional habitat for lizards
- 255 16.10 Ideas from the Kowhai Farm trials for enhancing biodiversity and land production through a range of land management practices
- 257 16.11 Kowhai Farm trial reporting on achieving good biodiversity outcomes
- 258 16.12 Greening Waipara newsletter
- 259 16.13 Summary of the management approaches and best practice recommendations
- 266 17.1 Example of an older style garden
- 267 17.2 Birds, such as this pūkeko, can be commonly found throughout New Zealand's urban areas
- 270 17.3 Earthworks in urban environments can lead to habitat loss and fragmentation, as well as cause damage to species living in adjacent streams and rivers
- 271 17.4 Domestic cats can damage and kill a range of native species, including birds and lizards
- 272 17.5 Urban stormwater discharged into streams can impact on native species by increasing flooding and sedimentation
- 273 17.6 Contaminated runoff from industrial areas has major impacts on biodiversity values
- 274 17.7 Summary of the main causes of biodiversity loss in urban environments and the potential effects on habitats, ecosystems and species
- 275 17.8 Councils can manage and control the way urban stormwater is discharged through regional and district plans
- 277 17.9 Notable tree
- 278 17.10 Stormwater detention ponds have been incorporated into the Whisper Cove development at Snells Beach, north of Auckland
- 279 17.11 Street plantings, such as those at the Wynyard Quarter, provide additional bird and insect habitat
- 280 17.12 Waitakere community weed project
- 281 17.13 Project Twin Streams
- 282 17.14 Fuchsia Walk, Central Valley, Karori Reservoir Wildlife Reserve

- 283 17.15 Summary of the management approaches and best practice recommendations
- 290 18.1 The Hochstetter's Frog is an example of the diverse array of species supported by freshwater systems
- 293 18.2 The pateke duck is endemic to New Zealand and is found in many of New Zealand's lowland freshwater environments
- 295 18.3 Clearance of river banks reduces the availability of shade and resources for native freshwater species
- 296 18.4 Cows in Kakaho Stream, Pauatahanui Inlet, Wellington Region
- 297 18.5 Introduced plants in freshwater systems can have significant detrimental impacts on native species through competition and predation
- 298 18.6 Dams in freshwater environments act as barriers for fish and change the natural dynamics of the systems further downstream
- 299 18.7 Mixture of land uses can impact upon freshwater quality, such as adjacent to McLaren Falls Park
- 300 18.8 Summary of the main causes and potential effects of biodiversity loss in freshwater systems
- 301 18.9 Rakaia River and surrounding farmland
- 303 18.10 The nutrient discharges in Lake Taupo are being addressed under Variation 5 of the Waikato Regional Plan
- 306 18.11 An example of a high country river which falls under the Canterbury Water Management Strategy
- 307 18.12 The Canterbury Water Management Strategy sets the direction for the management of high country lakes
- 308 18.13 Aerial view of Hopkins and Dobson River junctions, Mackenzie District, part of Project River Recovery
- 309 18.14 Summary of the management approaches and best practice recommendations
- 317 19.1 Dune systems can support extensive plant and wildlife communities
- 318 19.2 New Zealand dotterel adult and chick, DOC camping ground, Mimiwhangata, Northland
- 319 19.3 Spotted skink, *Oligosoma lineocellatum* (juvenile), Mana Island
- 320 19.4 Mangrove plants support a wide variety of coastal dwelling species

- 321 19.5 Estuaries provide important food sources for many wading birds
- 322 19.6 Rocky coastlines are dominated by salt and wind tolerant plants
- 324 19.7 Seal populations use the rocky shore as a resting place
- 325 19.8 Invasive plants, such as this marram grass, can dominate native plant communities and alter the ecosystem dynamics
- 326 19.9 Seawall built on a sand dune
- 328 19.10 Urban development in estuaries introduces a whole range of threats to these fragile ecosystems
- 329 19.11 Increasing sediment in rivers can cause major problems for fish, invertebrate and plant species
- 330 19.12 Possum damage to pohutukawa leaves
- 331 19.13 Damage to beach from Rena disaster
- 333 19.14 Summary of the main causes and potential effects of biodiversity loss in coastal environments
- 334 19.15 NZCPS Policy 11(a) categories and examples of coastal species
- 337 19.16 Implementing the Whangerai Coastal Management Strategy via structure plan mapping
- 339 19.17 Northland's Coast and Us programme
- 340 19.18 Volunteers at the Waikanae Estuary Care Group open day, Kapiti Coast
- 341 19.19 Yellow-eyed penguin juvenile, Enderby Island, Auckland Islands
- 342 19.20 Uretara Estuary
- 343 19.21 Summary of the management approaches and best practice recommendations specific to coastal environments
- 348 20.1 White Island, off the Eastern Bay of Plenty, is part of New Zealand's unique marine environment
- 350 20.2 New Zealand fur seal habitat, Red Rocks near Wellington
- 351 20.3 New Zealand's seas are a marine mammal 'hot spot' for species such as this common dolphin
- 352 20.4 Seabirds are commonly seen in New Zealand's marine areas
- 353 20.5 Fishing net being released from a boat
- 355 20.6 New Zealand fur seal with plastic netting around its neck, Gisborne
- 356 20.7 Summary of the main causes and effects of biodiversity loss in marine environments
- 358 20.8 Banks Peninsula Marine Mammal Sanctuary

360	20.9	Canterbury Regional Coastal Plan
361	20.10	Ships can cause pollution through discharging ballast water or carrying invasive species on their hull
363	20.11	Fiordland
364	20.12	Nelson marine environment
365	20.13	Summary of the recommendations to protect marine biodiversity and the tools to achieve this

Acronyms and abbreviations

Bonn Convention	Convention on Migratory Species of Wild Animals
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
EDS	Environmental Defence Society
EEZ	Exclusive economic zone
EEZ Act	Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012
IUCN	International Union for the Conservation of Nature
LTCCP	Long term council community plan
MPA Policy	Marine Protected Areas Policy and Implementation Plan 2006
NIWA	National Institute of Water and Atmospheric Research
NZCPS 2010	New Zealand Coastal Policy Statement 2010
QEII Trust	Queen Elizabeth the Second National Trust
PCBs	Polychlorinated biphenyls
Ramsar Convention	Convention on Wetlands of International Importance
RMA	Resource Management Act 1991
UNCLOS	United Nations Convention on the Law of the Sea
World Heritage Convention	Convention Concerning the Protection of the World Cultural and Natural Heritage

Preface

This Guide has been written for people who want to know more about how to promote effective management of New Zealand's biodiversity, and who would like to achieve better outcomes than are currently being realised. It is also designed to assist people engaged in activities impacting on biodiversity, including private landowners. The Guide focuses on what 'good practice' biodiversity management might look like rather than what the minimum environmental requirements are under the relevant legislation. It is therefore designed to help New Zealanders collectively secure the future of the country's rich biodiversity heritage.

Content of guide

The first part of the Guide introduces the subject of biodiversity in New Zealand and provides an overview of how biodiversity is managed and by whom. It then sets out the legal framework within which management decisions are made, identifies some of the voluntary tools available, and describes opportunities for public involvement. The second part of the guide describes approaches to biodiversity management within eight distinct habitats: indigenous forests, indigenous grasslands, wetlands, productive land, urban environments, freshwater, coastal, and marine.

Companion guides

There are six companion volumes to this Guide:

- *The New Zealanders' Guide to the Resource Management Act 1991*, which provides more detailed information about participating in processes under the Resource Management Act 1991 (RMA)
- *Managing Freshwater: An EDS Guide*, which provides detailed information on the management of freshwater resources
- *Managing the Marine Environment: An EDS Guide*, which provides detailed information on the management of the marine area, and the impact of catchment management on marine habitats and species
- *Strengthening Second Generation Regional Policy Statements: An EDS Guide*, which describes how an effective and consistent approach can be applied to the development of second generation regional policy statements

- *The Community Guide to Coastal Development under the Resource Management Act 1991*, which provides detailed information on managing coastal development under the RMA, including impacts on biodiversity
- *The Community Guide to Landscape Protection under the Resource Management Act 1991*, which provides detailed information on addressing landscape management issues under the RMA

Web-based versions of all guides can be found at www.rmaguide.org.nz. Hard copies can be obtained from the Environmental Defence Society Incorporated, PO Box 95 152 Swanson, Auckland, 0653. See www.eds.org.nz for more details.

Disclaimer

The material in this guide is provided in good faith, but with no guarantee as to it being comprehensive or accurate. The Guide is not a substitute for proper professional advice where that is needed.

Environmental Defence Society

The Environmental Defence Society is a non-profit environmental advocacy organisation consisting largely of resource management professionals. Issues in relation to the management and protection of biodiversity are a major focus of the Society's work. If you would like to find out more about the Society, or support its environmental programmes, please visit the Society's website at www.eds.org.nz.

Acknowledgements

The Environmental Defence Society would like to thank the Ministry for the Environment and ZESPRI International Limited for supporting the production of this Guide.

The Society would also like to thank the Ministry for the Environment, the Department of Conservation and the following people for their support by contributing to, and/or peer reviewing, the contents of this Guide:

- Glen Arrowsmith, Global Marketing Manager, ZESPRI International Limited
- Auckland Council – Team Leader, Natural Heritage Environmental Strategy and Policy; Senior Advisor, Biodiversity; Specialist, Natural Heritage Environmental Strategy and Policy; and Planner, Environmental Programmes
- Abbie Bull, Resource Planner (former), Environmental Defence Society
- Karen Denyer, Executive Officer, National Wetland Trust
- Nick Edgar, Chief Executive Officer, New Zealand Landcare Trust
- Natasha Garvan, Solicitor, Environmental Defence Society
- Stephen Fuller, Technical Director: Ecology, Boffa Miskell Limited
- Alistair Mowat, Innovation Leader – Sustainability, ZESPRI International Limited
- Kate Mulcahy, Senior Oceans Researcher, Environmental Defence Society
- Matiu Park, Associate Principal: Ecologist/Planner, Boffa Miskell Limited
- Tim Park, Biodiversity Coordinator, Greater Wellington Regional Council
- Monica Peters, Waikato Regional Coordinator, New Zealand Landcare Trust
- Shad Rolleston, Māori Resource Management Planner
- Melanie Russell, Senior Adviser, National Coordination, Ministry for Primary Industries
- Dr Harpinder Sandhu, Research Fellow, School of the Environment, Flinders University
- Kelsey Serjeant, Solicitor (former), Environmental Defence Society
- Gary Taylor, Chairman, Environmental Defence Society
- Erik Van Eynhoven, Principal Adviser Conservation, Ministry for Primary Industries
- Dr Susan Walker, Ecologist, Landcare Research

- Pip Wallace, Convenor Environmental Planning Programme, School of Social Sciences, The University of Waikato
- Steve Wratten, Professor of Ecology, Bio-Protection Research Centre, Lincoln University
- Dr Shane Wright, Senior Lecturer in Biogeography, The University of Auckland

The final contents of the Guide remain the responsibility of the authors.

PART ONE

OVERVIEW OF BIODIVERSITY MANAGEMENT IN NEW ZEALAND

*It is that range of biodiversity that we must care for
– the whole thing – rather than just one or two stars.*

Sir David Attenborough



Ahuriri River (Raewyn Peart)

one

Introducing New Zealand's biodiversity

*Biodiversity is the greatest treasure we have ...
Its diminishment is to be prevented at all cost.*

Thomas Eisner, Scientist

Biodiversity is often thought of as simply the diversity of species. However, this fails to do justice to the term. Biodiversity refers not only to individual species, but to a far more holistic consideration of the wider processes and cycles that support all of life on Earth.¹ Biodiversity was first introduced as a resource management concept at the Rio Earth Summit in 1992, referring in broad terms to ‘the variety of life’. The Convention on Biological Diversity 1992 defines biodiversity as ‘the variability among living organisms from all sources, inter alia, terrestrial, marine and aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and ecosystems’.²

Evolution of an isolated world

New Zealand’s biodiversity is amongst the most varied and unique in the world. Since the New Zealand landmass separated from the rest of Gondwanaland, 82 million years ago, its animals and plants have developed in isolation from the rest of the world.

There are three key components to New Zealand’s ecosystems: land (such as the kauri forests in the North Island); freshwater (including the braided river systems in the South Island); and coastal and marine (such as the saltmarsh areas found around the country). These ecosystems and their associated species evolved with few mammalian predators. This meant that New Zealand’s species were able to retain unusual characteristics such as flightlessness.



Figure 1.1 Estuarine environments support a huge variety of species and are an essential component of New Zealand’s unique biodiversity (*Raewyn Peart*)

One of the defining factors of New Zealand's indigenous species is that a high percentage of them are endemic (found only here). For example, half a dozen islands in the Hauraki Gulf have a greater level of endemism than the whole of Great Britain.³ This means that many species within New Zealand cannot be protected and conserved in their natural environment anywhere else in the world.

A legacy of loss

First inhabited by humans less than one thousand years ago, New Zealand is now home to over four million people who have come from all over the world. But for a country that was one of the last places in the world to be settled, it has a disastrous history of indigenous biodiversity loss. The main reason for this, in the first few centuries of human settlement, was the destruction of native forests and their replacement with grasslands. Later, intensive human occupation resulted in the conversion of forests to farmland, and extensive modification of many other ecosystems including wetlands, dunes and rivers.

A growing appreciation of the importance of natural resource management and conservation has changed attitudes towards the protection of indigenous biodiversity. The substantial reform of New Zealand's environmental management system in the late 1980s saw progress towards managing some of the threats to biodiversity. However, there is still much to be done if the country is to improve the fate of many of its unique ecosystems, habitats and species.

The World Wildlife Fund's report 'Beyond Rio', prepared for the Earth Summit 2012,⁴ reveals some disturbing facts about New Zealand's biodiversity:

- More than 60 per cent of native freshwater fish, as well as the only freshwater crayfish and mussel species, are now threatened with extinction
- More than 3,800 New Zealand terrestrial, freshwater and marine species are listed as threatened, almost four times as many as were listed in the 1990s
- Seven of New Zealand's ten official 'indicator species' for measuring biodiversity status are threatened
- Iconic species, such as Maui's dolphins and New Zealand sea lions, are listed as 'nationally critical'
- Almost two-thirds of New Zealand's seabirds are listed as threatened with extinction

Valuing biodiversity

Despite extensive losses, New Zealand's biodiversity continues to make a significant contribution to overall global diversity with an estimated 80,000 species, many of which are endemic.⁵ The New Zealand Biodiversity Strategy 2000 recognises that it is not only species that are important, but also the ecosystems they live in. The ecological diversity that this country enjoys is part of its biological wealth.

Ecosystems perform a wide range of functions which are important to humans because they deliver essential services.⁶ Many of these have both direct and indirect benefits,⁷ including: production of food and medicine; pollination of crops; biological control of pests, weeds and diseases; improvement of soil formation and its microbial activity; increased nutrient retention; improved air and water quality; erosion prevention; and capture of carbon dioxide by plants.

A number of studies have been undertaken to place a total monetary value on New Zealand's indigenous biodiversity, with an estimate documented in the Biodiversity Strategy at around \$230 billion in 2000. These values include:

- *Economic benefits* - including the provision of ecosystem services (such as fertile soils, pollution control, clean water and flood control) as well as fisheries and tourism



Figure 1.2 The ground-dwelling native green hooded orchid is an example of the wide range of species found in New Zealand's forest environments (*Raewyn Peart*)

- *Social benefits* - such as the importance of biodiversity to New Zealanders as part of our national identity and for its contribution to recreational values
- *Cultural benefits* - the importance of biodiversity to Māori and customary uses

New Zealand's latest National Report to the United Nations Convention on Biological Diversity (reporting period 2005-2009) notes that the Department of Conservation is investigating the importance of conservation management in sustaining the provision of ecosystem services.

Our biodiversity under threat

The effects of human activities on biodiversity have increased so greatly that the rate of species extinctions is rising to hundreds or thousands of times the background level
– United Nations Earth Watch

Although there is greater recognition of the importance of New Zealand's biodiversity, and there have been localised successes in protecting it, overall biodiversity decline has not been reversed. Pressures currently come from two key threats: habitat destruction and invasive species. In addition, climate change is now emerging as a threat to the restoration and protection of indigenous biodiversity.



Figure 1.3 The extensive logging and clearance of New Zealand's native forest has transformed this country's biodiversity (*Hauling logs in the bush, Manuni. Price, William Archer, 1866-1948: Collection of post card negatives. Ref: 1/2-001298-G. Alexander Turnbull Library, Wellington, New Zealand. <http://beta.natlib.govt.nz/records/22538559>*)

Habitat destruction

It has taken only one thousand years of human occupation to fundamentally reshape New Zealand's ecosystems and the pace does not appear to be slowing. Between 1997 and 2002 native land cover decreased by 16,500 hectares.⁸

Of New Zealand's entire land area, 63 per cent has been converted for human occupation and use.⁹ It is estimated that nearly 90 per cent of wetlands have been modified for land development.¹⁰ Forests have been cleared, estuaries filled in and rivers drained, all degrading ecosystems in the process. This intensive transformation of landscape and habitats is one of the most significant contributors to New Zealand's increasing loss of biodiversity.

Invasive species

The rapid colonisation of New Zealand by exotic species has dramatically altered the country's biodiversity. It has led to an increase in the total number of species and means that New Zealand has the most introduced mammals in the world, and the second highest number of introduced birds. In 2000, there were more introduced vascular plant species than native species. Invasive species pose a significant threat to indigenous biodiversity due to several factors including predation and competition for space and resources.

Climate change

Biodiversity management in New Zealand, including the Biodiversity Strategy and the proposed National Policy Statement on Indigenous



Figure 1.4 The possum is one of the most damaging of the introduced species; in particular, they cause significant destruction of native forests (Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d)

Biodiversity, has been slow to address the impacts of climate change on biodiversity. Climate change has the potential to significantly affect a wide range of habitats and species and subsequently biodiversity values. Predicted changes in temperature and rainfall patterns, together with a rise in sea levels, will impact habitat availability and range for native and introduced species. There is little doubt that the consequences of a changing climate will have an impact at all levels of the biodiversity spectrum, including genes, species and ecosystems.¹¹

Indigenous forests

New Zealand's forest ecosystems support a diverse array of flora and fauna. Logging and land clearance have completely destroyed much of the country's native forest and its associated biodiversity. Forest clearance has had the greatest impact on lowland forests, significantly reducing some forest types. Today the greatest threats to native forests come from damage caused by invasive species, the fragmentation of forest habitats, and the lack of intact forest buffers.

Indigenous grasslands

New Zealand's indigenous grasslands have been, and remain, a significant component of the country's native plant cover and ecology. Fire has been used extensively to facilitate movement of grazing animals and to convert tussock grassland into improved pasture. Ongoing grazing has degraded indigenous grassland communities. The conversion of tussock land has also brought exotic pasture grasses and weed species to these areas, many of which threaten the regeneration of native species.

Wetlands

Today, 90 per cent of New Zealand's original wetlands have been lost, with many of the remaining wetlands degraded by weed invasion, stock access, modifications and barriers to fish migration.¹² The ongoing grazing and drainage of wetlands for urban and rural development is further reducing this scarce habitat type and introduced species continue to invade these areas.

Productive land

New Zealand's productive land plays a crucial role in the country's economy. The biodiversity found within these environments supports important ecosystem services that are under significant pressure from human activities. Changing land uses and land cover, the introduction of invasive species and poor land management practices (including increasing inputs of agro-chemicals), all pose

a threat to the remaining indigenous biodiversity found on productive land. Climate change will significantly influence the way productive land in New Zealand is managed and its impact on biodiversity.

Urban environments

At the beginning of the 21st century, more than 80 per cent of New Zealanders lived in an urban area. Patterns of land settlement, and the urbanisation of the country, have had a significant impact on habitats and species. Fragmentation of habitats, the introduction of pest species, an increase in impervious surfaces and contaminated urban runoff are all challenges facing biodiversity within urban environments.



Figure 1.5 The urbanisation of Auckland, and the patterns of land settlement seen within this city, have resulted in major changes to biodiversity (*Raewyn Peart*)

Freshwater

Most aquatic life in New Zealand's waterways is developed in heavily shaded forest conditions, meaning that the ongoing clearance of native forests and riparian habitat has had a significant impact on freshwater biodiversity. Deterioration in water quality is also a major threat to freshwater ecosystems. New Zealand's freshwater bodies have been increasingly invaded by a large number of aquatic plants and pest fish. Many human activities within the catchments of waterways continue to have a major impact on indigenous freshwater biodiversity.

Coastal

Coastal ecosystems are some of the most highly modified areas of New Zealand. As a result of habitat degradation, and the introduction of a large number of pest species, a complete sequence of indigenous vegetation from the coast to the mountains (and all its associated biodiversity), is now largely absent in this country. Development of coastal land, invasive plants and animals, sedimentation of coastal waterways, contaminated runoff and a range of other human activities are all damaging sensitive coastal habitats and species. Climate change is predicted to have a significant impact on the coastal ecosystems that remain, particularly estuaries.

Marine

New Zealand has a diverse marine environment, with high levels of endemism. Activities such as dredging and trawling can disrupt sea floor and other marine habitats. Other activities which can impact on marine biodiversity include aquaculture, mining, dumping and the establishment of structures in the marine area. Invasive marine pests can destroy the habitats of native species and compete with them for food and space. Some of the marine areas under greatest stress are estuaries and large river mouths near urban areas, which have become polluted and degraded by human activities, such as land use, land reclamation and coastal development.



Figure 1.6 A typical example of mussel farming, which can lead to a wide range of potential environment effects on marine biodiversity (*Raewyn Peart*)

Summary

The key threats discussed above are having a serious impact on New Zealand's indigenous biodiversity. As we improve our management of land clearance, protect habitats and respond to invasive species, new challenges, including climate change, are likely to become more dominant. The biggest difficulty we now face is how to slow down, and ultimately halt, the on-going decline in this country's indigenous biodiversity. This guide seeks to provide accessible information on how this can practically be achieved.

References and further reading

Department of Conservation and Ministry for the Environment, 2000, *The New Zealand Biodiversity Strategy: Our chance to turn the tide, Whakakōhukihukitia Te Tai Roroku Ki Te Tai Oranga*, Department of Conservation and Ministry for the Environment, Wellington

Green W and B Clarkson, 2005, *Turning the tide? A review of the first five years of the New Zealand Biodiversity Strategy*, The Synthesis Report submitted to the Biodiversity Chief Executives in November 2005, Wellington

Ministry for the Environment, 2007, *Environment New Zealand 2007*, Ministry for the Environment, Wellington

United Nations, 1992, *Convention on Biological Diversity*, available at <http://www.cbd.int/convention/text/>

World Wildlife Fund, 2012, *Beyond Rio: New Zealand's environmental record since the original earth summit*, World Wildlife Fund for Nature, Wellington

Endnotes

- 1 <http://www.biodiv.de/index.php?id=13&L=1#1.1>
- 2 <http://www.cbd.int/convention/text/>
- 3 Department of Conservation and Ministry for the Environment, 2000
- 4 World Wildlife Fund, 2012
- 5 Ministry for the Environment, 2007
- 6 <http://www.lincoln.ac.nz/Research-at-Lincoln/Research-themes/Ecosystem-Services/Ecosystem-Services-Introduction/>
- 7 http://bioprotection.org.nz/system/files/Kowhai_Farm_Report.pdf
- 8 Ministry for the Environment, 2007
- 9 Department of Conservation and Ministry for the Environment, 2000
- 10 Department of Conservation and Ministry for the Environment, 2000
- 11 Green W and B Clarkson, 2005
- 12 Ministry for the Environment, 2007



A typical Northland rural landscape (*Raewyn Peart*)

two

Biodiversity policy framework

A framework of international conventions and national policies provide guidance on how biodiversity is to be managed in New Zealand. There are also a number of tools that are important for implementing these policies. New Zealand is party to several international agreements which place obligations on the government to protect New Zealand's biodiversity. The foremost of these is the Convention on Biological Diversity, but there are also others which play an important role. New Zealand also has national policy statements which provide additional guidance on how biodiversity is to be managed under the Resource Management Act 1991 (RMA). These are described in more detail in Chapter 5.

Policy/Implementation tool	Key Elements
International Policy Framework	
International Plant Protection Convention (1952)	Aims to prevent the introduction and spread of plant pests at an international level
Convention on Wetlands of International Importance (1971)	Provides for coordinated action to conserve wetlands
The Convention Concerning the Protection of the World Cultural and Natural Heritage (1972)	Protects cultural and natural heritage of outstanding universal value
Convention on International Trade in Endangered Species of Wild Fauna and Flora (1975)	Controls trade in endangered species
Convention on Migratory Species of Wild Animals (1979)	Provides for coordinated action to conserve migratory species throughout their range
Convention on Biological Diversity (1992)	Addresses conservation of biological diversity, sustainable use of its components, and the fair and equitable sharing of the benefits arising out of genetic resources
United Nations Convention on the Law of the Sea (1994)	Defines rights and responsibilities of nations in their use of the world's oceans. Establishes guidelines for management of marine resources
National policy documents	
New Zealand Biodiversity Strategy (2000)	Provides an overall framework for action to redress biodiversity loss in New Zealand
Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land (2007)	Establishes four national priorities for the protection of biodiversity on private land

New Zealand Coastal Policy Statement (2010)	Establishes objectives and policies for protection of biodiversity within coastal environments
National Policy Statement for Freshwater Management (2011)	Establishes objectives and policies for protection of biodiversity within freshwater environments
Proposed National Policy Statement on Indigenous Biodiversity	Establishes draft objectives and policies for protection of biodiversity outside the crown estate
Population Management Plans	Establishes the maximum allowable level of fishing-related mortality for protected species
Recovery Plans	Statements on conservation of particular plants or animals over a defined period of time
National implementation tools	
Threat classification systems	Identify species at risk and in need of protection
Habitat mapping	Assists with identifying terrestrial habitats at risk and in need of protection
Freshwater Ecosystems of New Zealand	Geo-database on biodiversity values of, and pressures on, New Zealand's rivers, lakes and wetlands
New Zealand Marine Environment Classification	GIS-based environmental classification of New Zealand's marine area
Figure 2.1 Summary of key elements of New Zealand's biodiversity policy framework	

International policy framework

International conventions cannot be directly enforced through New Zealand courts, unless their provisions are incorporated into national legislation. However, they do still have some legal effect. Where the meaning of a provision in a piece of legislation is unclear, a presumption of statutory interpretation requires that it is interpreted in a way which is consistent with New Zealand's international obligations, so far as the wording allows. In addition, international conventions can have considerable moral force within the country. The government does not usually wish to be seen as acting in contravention of the country's international obligations.

Convention on Wetlands of International Importance

The Convention on Wetlands of International Importance (known as the Ramsar Convention) provides a framework for the conservation and wise use of wetlands worldwide. The Ramsar Convention was initiated in 1971, and New Zealand became a party in 1976. It remains the only international convention which deals with a specific ecosystem type.

The concept of the 'wise use' of wetlands is at the heart of the convention. It is defined as 'the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development'.¹ It applies to all wetlands in the country, including marine wetlands.

New Zealand currently has six wetlands protected under the convention:

- Farewell Spit at the top of the South Island
- Firth of Thames in the Hauraki Gulf
- Kopuatai Peat Dome on the Hauraki Plains
- Manawatu Estuary near Foxton
- Awarua Waituna Lagoon in Southland
- Whangamarino wetland in the northern Waikato



Figure 2.2 Miranda in the Firth of Thames is one of New Zealand's six wetlands protected under the Ramsar Convention (*Raewyn Peart*)

In 2001, the Office of the Auditor General undertook a review of how effectively New Zealand was meeting its international obligations under the Ramsar Convention, as well as under other conventions. This report found significant deficiencies, stating that the degradation of wetlands had been worse than it ought to have been. In particular, wetlands on privately owned land were identified as being at risk. It also identified poor allocation of policy responsibility which had led to inconsistent implementation of policy at a regional level.² The report recommended better drafting of national legislation to more clearly outline the national strategy for planning, implementation, compliance and monitoring of wetland protection.³ It also called for a lead agency to develop and implement wetland policy.

Management of wetlands in New Zealand has progressed in the last ten years following this review. Important ecosystems of New Zealand have been identified, including important wetlands. A number of policy developments, including the National Policy Statement for Freshwater Management 2011 and progress on the Proposed National Environmental Standard on Ecological Flows and Water Levels should help improve the management of wetlands in the future.

World Heritage Convention

The Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention) was adopted by UNESCO in 1972. It arose from international concern about the loss of outstanding natural and cultural heritage, and ‘that deterioration or disappearance of any item of cultural or natural heritage constitutes a harmful impoverishment of the heritage of all nations of the world’.⁴ New Zealand became a party to the convention in 1984.

The convention seeks to protect cultural and natural heritage of ‘outstanding universal value’. Each contracting party is obliged to identify such heritage within its territory. The convention establishes a World Heritage Committee which considers areas nominated by governments and decides which will be inscribed on the World Heritage List. When submitting properties for inscription, governments are required to demonstrate full commitment to their preservation, including that adequate long-term protective measures are in place.

New Zealand currently has three World Heritage Sites:

- *Te Wāhipounamu South West New Zealand* – inscribed as a natural site in 1986, with the size of the site increased in 1990
- *Tongariro National Park* – inscribed as a natural site in 1990 and then for associated cultural values in 1993

- *Subantarctic Islands* – inscribed as a natural site in 1998



Figure 2.3 The Tongariro National Park, a World Heritage Site, is safeguarded because of its natural and cultural values (*Raewyn Peart*)

In 2007, the Department of Conservation submitted to the World Heritage Committee a tentative list of additional sites which it considered could meet the world heritage site criteria. This included six natural sites which were identified as high priority for immediate listing:

- Kahurangi National Park, Farewell Spit, Waikoropupu Springs and Canaan Karst System
- Kermadec Islands and Marine Reserve
- Whakarua Moutere (North-East Islands)
- Canterbury High Country Braided Rivers and Lakes
- Rotorua Geyser Fields and Geothermal Sites
- Stewart Island/Rakiura Archipelago

In addition, the Department of Conservation's submission proposed that the waters and seabed of the fiords in Fiordland should be added to Te Wāhipounamu South West New Zealand World Heritage Area. It also identified the Auckland volcanic field as a high priority mixed natural and cultural site.⁵

The main benefit of inscribing sites on the World Heritage List is that it gives their natural and cultural values international profile and highlights the international interest in their on-going protection. The convention also provides for a List of World Heritage in Danger, which identifies inscribed sites which are subject to threat or imminent danger, and this serves to focus international effort on addressing the situation.

Convention on International Trade in Endangered Species of Wild Flora and Fauna

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) aims to ensure that international trade in wild animals and plants does not threaten their survival. It entered into force in 1975 and New Zealand became a party in 1989. CITES has been implemented into national law through the Trade in Endangered Species Act 1989.

CITES establishes a licensing system for the import and export of certain species. Three appendices to the convention list species according to the level of protection required and this determines what trade restrictions are to apply:

- *Appendix 1 Species* – are those threatened with extinction and trade in these is only permitted in exceptional circumstances
- *Appendix 2 Species* – are those for which trade needs to be controlled in order to avoid utilisation incompatible with their survival
- *Appendix 3 Species* – are those which are protected in at least one country which has asked other contracting parties for assistance in controlling trade

Parties to CITES are required to establish a management authority which is in charge of the trade licensing system. In New Zealand, the Department of Conservation has established a CITES Management Authority which issues permits. The New Zealand Customs Service and Ministry for Primary Industries are responsible for control of the movement of CITES species at the border.

Convention on Migratory Species of Wild Animals

The Convention on Migratory Species of Wild Animals (also called the Bonn Convention) aims to conserve migratory species throughout their range. It was first signed in 1979 and entered into force for New Zealand in October 2000.

Migratory species threatened with extinction are listed in Appendix I of the Convention. Migratory species that need, or would significantly benefit, from international co-operation are listed in Appendix II. Contracting parties are obliged to:

- Promote, co-operate in and support research relating to migratory species.
- Endeavour to provide immediate protection for migratory species included in Appendix I
- Endeavour to conclude agreements covering the conservation and management of migratory species included in Appendix II

Such agreements have been concluded for a range of migratory species including the 'Agreement on the Conservation of Albatrosses and Petrels' to which New Zealand is a party along with 12 other nations. This agreement aims to prevent a decline in the birds' populations through the implementation of an action plan to reduce fishing-related mortality and maintain habitats.

Convention on Biological Diversity

The Convention on Biological Diversity was signed by governments at the 1992 Earth Summit held in Rio de Janeiro. The convention arose out of international concern about the rapid loss of biodiversity world-wide. It was a landmark document, being the first global agreement to comprehensively address biodiversity issues.⁶ New Zealand ratified the convention in 1993 and it came into force the same year.

The convention has three main objectives: the conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of the benefits arising out of genetic resources (article 1). In order to achieve these objectives, the convention sets out a range of obligations which contracting parties must meet. These include obligations to (article 8):

- Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity (or adapt existing documents)
- Identify important components of biodiversity and monitor them
- Identify and monitor processes and activities having, or likely to have, significant adverse impacts on biodiversity
- Establish a system of protected areas
- Manage biological resources important for the conservation of biological diversity inside and outside protected areas
- Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species
- Control risks associated with the use and release of living modified organisms
- Prevent the introduction of, and control or eradicate, alien species which threaten ecosystems, habitats or species
- Develop or maintain necessary legislation and regulatory provisions for the protection of threatened species and populations



Figure 2.4 Wetlands are incredibly diverse environments; as such their protection is required under the Convention on Biological Diversity (*Raewyn Peart*)

Every year or so representatives of the parties to the convention meet to discuss implementation and other matters. This is called the ‘Conference of the Parties’. At these meetings additional commitments can be made. Following the Rio+20 Conference in June 2012, the nations of the world recognised the crucial role of biodiversity in ensuring sustainable development and called for greater efforts to implement the Convention on Biological Diversity.⁷ A record of all the decisions of the conference of the parties, and other information about the convention, can be found on the convention website at <http://www.cbd.int>.

Parties to the convention are required to report regularly on their progress towards implementing their obligations. New Zealand filed its fourth report in 2010. This provides much useful information on the current state of biodiversity in New Zealand and how it is being managed. It can be accessed at <http://www.cbd.int/doc/world/nz/nz-nr-04-en.pdf>. The next report is due in 2014.

United Nations Convention on the Law of the Sea

The United Nations Convention on the Law of the Sea (UNCLOS) provides the basis for New Zealand’s jurisdiction over the marine area. It provides for a territorial sea extending seawards for 12 nautical miles and an exclusive economic zone (EEZ) extending out to 200 nautical miles, amongst other

areas.⁸ In exercising its jurisdiction within these marine areas, New Zealand has a general obligation under UNCLOS to ‘protect and preserve the marine environment’ (article 192). This includes taking all measures necessary to ‘prevent, reduce and control pollution of the marine environment ...’ and ‘to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life’ (article 194).

New Zealand also has an obligation to promote the ‘optimum utilisation’ of living resources within the EEZ (article 62). However, this obligation is subject to the requirement to ‘ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation’ (article 61).

New Zealand is a signatory to the 1995 Agreement for the Implementation of the Provisions of UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks. The agreement aims to establish conservation and management objectives for highly migratory fish stocks, and those which inhabit areas straddling national jurisdictions and the high seas, and to govern the behaviour of states fishing for these stocks on the high seas.

Under the agreement, states must promote the optimum utilisation of these stocks both within and beyond the EEZ. Management must comply with detailed minimum international standards, including being based on the precautionary approach and using the best available scientific information. The



Figure 2.5 Sea anemones are just one of the many forms of sea life that suffer from the effects of marine pollution (Raewyn Peart)

agreement also provides a framework for inter-state cooperation promoting the use of regional fisheries management organisations.

Highly migratory stocks targeted by New Zealand fishers include six types of tuna, marlins, swordfish and oceanic sharks. Straddling stocks include orange roughy and the Patagonian toothfish. New Zealand's obligations under the agreement are given domestic effect through the Fisheries Act 1996.

New Zealand is also a signatory to a number of regional fisheries management organisations which manage high seas stocks, including the Convention for the Conservation of Antarctic Marine Living Resources and the South Pacific Regional Fisheries Management Organisation.

National policy documents

New Zealand Biodiversity Strategy

The Biodiversity Strategy was adopted by the government in 2000 in order to help meet New Zealand's international commitments under the Convention on Biological Diversity. It was prepared in response to the alarming state of decline of the country's indigenous biodiversity, which had been highlighted in the 1997 State of the Environment Report.⁹ This document is the principal instrument for implementing the Convention on Biological Diversity at a national level (article 6).



Figure 2.6 Dunelands, and the native sand binding grasses that are a key part of this habitat, are one of the most modified natural ecosystems in New Zealand (*Raewyn Peart*)

The Biodiversity Strategy is intended to provide an overall framework for national action to redress the biodiversity crisis. It includes an ambitious goal which is to ‘halt the decline in New Zealand’s Biodiversity’. This is described more fully as follows: ‘maintain and restore the full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments’ and ‘maintain and restore viable populations of all indigenous species across their natural range and maintain their genetic diversity’.¹⁰

The Biodiversity Strategy includes action plans for ten biodiversity themes including biodiversity on land, coastal and marine biodiversity, freshwater biodiversity, and Māori and biodiversity. Each of these action plans contains a set of objectives and actions required to achieve the overall goals, as well as identification of key players involved in their implementation. The Biodiversity Strategy then identifies nine strategic priorities to focus action:

- Better governance
- Enhance community participation and learning
- Become smarter biodiversity managers
- Strengthen partnerships with Māori
- Sustain indigenous biodiversity in privately managed areas and in freshwater environments
- Enhance protected areas and prospects for threatened species
- Manage the marine environment to sustain biodiversity
- Identify and manage biosecurity risks to indigenous biodiversity
- Maintain the genetic resources of our important introduced species

Although the Biodiversity Strategy is now more than a decade old, and has no statutory weight, it still contains aspirations and objectives of relevance and identifies many actions which need to be taken if biodiversity decline in New Zealand is to be reversed. In 2005, the Biodiversity Strategy was independently reviewed, including an examination of the progress that has been made across all the themes and the achievements from the programmes funded by the 2000 Biodiversity Package.¹¹

Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land

For some years the Ministry for the Environment and Department of Conservation have been developing proposals for a national policy statement on indigenous biodiversity under the RMA. Although these efforts have yet to result in a national policy statement, in 2007 non-statutory guidance was released in the form of a ‘Statement of National Priorities for Protecting Rare and Threatened

Biodiversity on Private Land.’ The full text of the statement can be accessed at <http://www.biodiversity.govt.nz/pdfs/protecting-our-places-detail.pdf>.

The statement sets out four national priorities for the protection of biodiversity on private land and provides additional information on how the vegetation, ecosystem and habitat types can be identified. The national priorities are:

- *National Priority 1* – to protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV), that have 20 per cent 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’ terrestrial ecosystem types not already covered by priorities 1 and 2
- *National Priority 4* – to protect habitats of acutely and chronically threatened indigenous species

National implementation tools

Threat classification systems

Biodiversity management is strongly guided by threat classification systems developed by the International Union for the Conservation of Nature (IUCN) and the Department of Conservation which determine the threat status of species within New Zealand. Threat classification has significant management implications as more care is required to manage impacts on highly threatened species.

Classification of terrestrial environments, derived from the Land Environments of New Zealand and the Land Cover Database, enable the loss of habitat types to be identified on a national, regional and local level. This enables the management response to be focused on those habitats of which a high proportion has been lost or which are naturally rare.

In 1963, the IUCN first conceived the Red List System, for formally identifying and classifying species at risk of extinction. The system has evolved considerably since that time, and now includes the results of an assessment of the conservation status of all mammals, birds, amphibians, sharks, reef-building corals, cycads and conifers. Assessments for all reptiles, fish and some groups of plants and invertebrates are also underway.¹²

Assessed species are placed into one of nine categories along a continuum: extinct, extinct in the wild, critically endangered, endangered, vulnerable, near threatened, least concern, data deficient or not evaluated. There are detailed criteria provided for each of the categories. New Zealand species are included in the Red Data List. The categorisation of any species can be obtained through a search on the Red List website at <http://www.iucnredlist.org>.

There is also a New Zealand specific threat classification system which is managed by the Department of Conservation. This was established in 2002 as a result of concern that the criteria used by the IUCN were not necessarily appropriate to the New Zealand situation. Many New Zealand species were naturally restricted in their distribution which meant that their threat status was exaggerated under the IUCN system.¹³

The New Zealand system uses slightly different criteria to the Red List. Evaluated species are first placed into one of four categories; extinct, threatened, at risk, and not threatened. Those that are threatened or at risk are then placed into a further sub-category, depending on the seriousness of their situation. For example, species which are threatened are classified as nationally critical, nationally endangered or nationally vulnerable.

The status of species is reviewed on a three-year cycle. In the 2008-11 cycle, species listings were published in peer-reviewed journals to give them scientific credibility. But copyright issues meant that the lists could not be placed on the Department of Conservation's website. This made it difficult for people to find out what the conservation status of a particular species was under the New Zealand threat classification system. The information can be obtained by contacting the Department of Conservation directly at threatstatus@doc.govt.nz. In future, the Department plans to release species threat classifications on its website prior to their formal publication in scientific journals.

Habitat mapping

Maps of New Zealand's habitats are currently limited to the Land Environments of New Zealand classification, which maps physical environments, and the Land Cover Database, which describes very broad vegetation classes based on analysis of satellite imagery. When combined, these two products can be used to provide analyses of broad changes in indigenous vegetation cover by environment. Older maps, by the former Forest Service, describe the distribution of native forest classes, but spatial and classification resolution of these maps is too coarse for many applications.

The Ministry for the Environment has prepared maps of land which falls within National Priority 1 (see above) for each region and district. Maps can be accessed at <http://www.mfe.govt.nz/issues/biodiversity/rare/index.html>.

References and further reading

Controller and Auditor-General, 2001, *Meeting international environmental obligations*, Office of the Controller and Auditor-General, Wellington

Cultural and Natural Heritage Advisory Groups, 2006, *Our world heritage: A tentative list of New Zealand cultural and natural heritage sites*, Department of Conservation, Wellington

Department of Conservation and Ministry for the Environment, 2000, *The New Zealand Biodiversity Strategy: Our chance to turn the tide, Whakakōhukihukitia Te Tai Roroku Ki Te Tai Oranga*, Department of Conservation and Ministry for the Environment, Wellington

Glowka L, F Burhenne-Guilmin and H Synge, 1994, *A guide to the convention on biological diversity*, The World Conservation Union, Gland

Green W and B Clarkson, 2005, *Turning the tide? A review of the first five years of the New Zealand Biodiversity Strategy*, The Synthesis Report submitted to the Biodiversity Chief Executives in November 2005, Wellington

Government of New Zealand, 2010, *New Zealand's fourth national report to the United Nations Convention on Biological Diversity*, Department of Conservation, Wellington, available at <http://www.cbd.int/doc/world/nz/nz-nr-04-en.pdf>

Ministry for the Environment, 1997, *The state of New Zealand's environment*, Ministry for the Environment, Wellington

Ministry for the Environment and Department of Conservation, 2007, *Protecting our places: Information about the statement of national priorities for protecting rare and threatened biodiversity on private land*, Ministry for the Environment, Wellington

Townsend A J et al., 2008, *New Zealand threat classification system manual*, Department of Conservation, Wellington

Endnotes

- 1 http://www.ramsar.org/cda/en/ramsar-home/main/ramsar/1_4000_0__
- 2 Controller and Auditor-General, 2001, 44
- 3 Controller and Auditor-General, 2001, 15
- 4 <http://whc.unesco.org/en/conventiontext>
- 5 Cultural and Natural Heritage Advisory Groups, 2006
- 6 Glowka L et al., 1994, ix
- 7 <http://www.cbd.int/doc/press/2012/pr-2012-06-22-rio-outcomes-en.pdf>
- 8 http://www.un.org/depts/los/convention_agreements/convention_historical_perspective.htm
- 9 Ministry for the Environment, 1997
- 10 Department of Conservation and Ministry for the Environment, 2000, 18
- 11 Green W and B Clarkson, 2005
- 12 <http://www.iucnredlist.org/about/red-list-overview>
- 13 <http://www.doc.govt.nz/upload/documents/science-and-technical/bbb8.pdf>



Department of Conservation monitoring the marine environment
(Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

three

Biodiversity management agencies

Biodiversity management in New Zealand is split amongst a range of statutory agencies which operate under numerous pieces of legislation. The different agencies, their areas of management focus, and the legislation they administer, are summarised in Figure 3.1 and described in the sections below. More information about the legislation relevant to biodiversity conservation is contained in the following chapters.

Management Agency	Areas of management focus	Key legislation
Minister and Department of Conservation	<ul style="list-style-type: none"> • Conservation of natural and historic resources • Protected species • Marine protection • Coastal management 	Conservation Act 1987 Marine Mammals Protection Act 1978 Marine Reserves Act 1971 National Parks Act 1980 Native Plants Protection Act 1939 Reserves Act 1977 Resource Management Act 1991 Trade in Endangered Species Act 1989 Wild Animal Control Act 1977 Wildlife Act 1952
Minister and Ministry for the Environment	<ul style="list-style-type: none"> • Administration of the Resource Management Act 1991 • State of environment reporting 	Climate Change Response Act 2002 Environment Act 1986 Hazardous Substances and New Organisms Act 1996 Ozone Layer Protection Act 1996 Resource Management Act 1991
Minister and Ministry for Primary Industries (Biosecurity New Zealand)	<ul style="list-style-type: none"> • Fisheries resources • Environmental impacts of fishing activity • Aquaculture • Invasive non-indigenous species • Forestry and farming activity 	Biosecurity Act 1993 Fisheries Act 1996 Forests Act 1949
Land Information New Zealand	<ul style="list-style-type: none"> • Management and freeholding of high country leasehold land 	Crown Pastoral Land Act 1998 Land Act 1948

Environmental Protection Authority	<ul style="list-style-type: none"> • Hazardous substances and new organisms • Processing resource consent applications of national significance • Environmental consenting in the exclusive economic zone 	<p>Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012</p> <p>Hazardous Substances and New Organisms Act 1996</p> <p>Resource Management Act 1991</p>
Minister of Transport and Maritime New Zealand	<ul style="list-style-type: none"> • Shipping safety • Marine pollution 	Maritime Transport Act 1994
Queen Elizabeth II National Trust	<ul style="list-style-type: none"> • Protection of open space 	The Queen Elizabeth the Second National Trust Act 1977
Regional Councils	<ul style="list-style-type: none"> • Catchment management • Marine management (excluding fisheries) 	<p>Biosecurity Act 1993</p> <p>Local Government Act 2002</p> <p>Reserves Act 1977</p> <p>Resource Management Act 1991</p>
Territorial authorities	<ul style="list-style-type: none"> • Land subdivision and use 	<p>Local Government Act 2002</p> <p>Reserves Act 1977</p> <p>Resource Management Act 1991</p>
Iwi and hapū	<ul style="list-style-type: none"> • All biodiversity resources 	<p>All the above legislation</p> <p>Co-management agreements</p>

Figure 3.1 Summary of management agencies, management focus and key legislation

Minister and Department of Conservation

The Department of Conservation was established by the Conservation Act 1987. It is the lead agency in New Zealand for biodiversity conservation. A large part of the Department's work involves managing Crown-owned conservation land (which comprises over a third of New Zealand's land area) and protecting and rehabilitating endangered indigenous species and habitats.

The Department's role in advocating for the conservation of natural and historic resources is very wide, as the definition of 'natural resources' in the Conservation Act includes living organisms, habitats, ecosystems, landscapes, landform and geological features. The Conservation Act has strong provision

for Māori with section 4 requiring the Act to be interpreted and administered so ‘as to give effect to the principles of the Treaty of Waitangi’.

The Department is headquartered in Wellington and is structured around 11 conservancies that are managed by regional conservators and overseen by independent conservation boards. The work of the conservancies is guided by conservation management strategies prepared for each region. The New Zealand Conservation Authority provides oversight of the Department’s work.

The Department administers much of the legislation within New Zealand which provides for the protection of species and habitats. On land, this includes the Conservation Act, the Reserves Act 1977 and the National Parks Act 1980. In the marine area, it includes the Marine Reserves Act 1971 and the Marine Mammals Protection Act 1978. The Wildlife Act 1953, which protects species on land, in freshwater, and in the marine area, is also administered by the Department, which plays a role in the management of freshwater fisheries and wild animals.

The Minister of Conservation has a specific role in the management of coastal land and the territorial sea under the RMA. The Minister approved the New Zealand Coastal Policy Statement 2010 (NZCPS 2010) which guides, and in some cases directs, the planning and decision-making functions of councils within the coastal environment. The NZCPS 2010 has specific provisions relating to how biodiversity issues are to be managed within this area. These are discussed in Chapter 5.

The Minister of Conservation approves regional coastal plans, prepared by regional councils under the RMA, to the extent that they apply to the coastal marine area. The Department makes submissions on plans and resource consents under the RMA as part of its support for the Minister’s wider coastal management responsibilities.

The Department produces many useful reports, papers and web-based material on biodiversity issues in New Zealand and these can be accessed at www.doc.govt.nz or at www.biodiversity.govt.nz.

Minister and Ministry for the Environment

The Ministry for the Environment was established under the Environment Act 1986. It is the principal advisor to the government on environmental matters within New Zealand and on international matters that affect the country’s environment. The Ministry is focused on developing and providing a national

environmental management system, including laws, regulations, national policy statements and national environmental standards.

A wide range of publications on environmental issues, legislation and policies are produced by the Ministry. This includes best practice guides, technical reports and factsheets, some of which relate directly to biodiversity management, especially on private land. More detail about this guidance and information can be found at <http://www.mfe.govt.nz/publications/>.

The Ministry for the Environment provides financial support to Landcare groups, including the Landcare Trust. It also administers government funding for biodiversity grants under the Community Environment Fund.

Further information can be found at the Ministry for the Environment's website: www.mfe.govt.nz.

Minister and Ministry for Primary Industries

The Ministry for Primary Industries was established in 2012 as a result of a merger between the former Ministry of Fisheries and Ministry of Agriculture and Forestry. The new Ministry leads New Zealand's biosecurity system under the Biosecurity Act 1993. This includes preventing pests and unwanted organisms from entering the country and eradicating or controlling them once they have arrived. These functions are undertaken by Biosecurity New Zealand which is a specialist division located within the Ministry.

The Minister for Primary Industries manages both saltwater and freshwater fisheries under the Fisheries Act 1996, which includes fish, shellfish, seaweed and other aquatic life. The Minister determines a wide range of matters, including what quantity of fish can be caught and where, when and how fishing is to be undertaken. Such matters can have a significant impact on the health of biodiversity in the marine area. The Ministry supports the Minister's decision-making role by commissioning research, managing stakeholder inputs and providing advice. The Ministry also enforces fisheries regulations.

In respect of marine reserves under the Marine Reserves Act, the Minister of Primary Industries (and the Minister of Transport) has a role in deciding whether or not proposed marine reserves should be established. If the Minister does not concur, the proposed marine reserve cannot be created.

The Ministry also oversees the Forests Act 1949 and authorises the logging of indigenous trees on private land through the approval of sustainable forest management plans and permits.

Further information can be found at the Ministry for Primary Industries' website at www.mpi.govt.nz and Biosecurity New Zealand's website at www.biosecurity.govt.nz.

Land Information New Zealand

Land Information New Zealand is a government department responsible for managing Crown-owned property, amongst other things. The department manages high country leases under the Land Act 1948, as well as the process of freeholding high country land under the Crown Pastoral Land Act 1998. The Commissioner of Crown lands has the statutory responsibility for high country land owned by the Crown and has the authority to freehold it under the processes set out in the legislation. The powers of the Commissioner have been largely delegated to staff within the department. Land Information New Zealand is also responsible for the management of 'Unalienated Crown Land', which includes a large proportion of New Zealand's major rivers.

Further information can be found at the Land Information New Zealand's website at www.linz.govt.nz.

Environmental Protection Authority

The Environmental Protection Authority (EPA) was established as a Crown Entity in 2011. It is governed by an independent board whose members are appointed by the Minister for the Environment. The new agency brought together the role of processing matters of national significance under the RMA and the administration of the Hazardous Substances and New Organisms Act 1996.

The EPA determines applications to import or release new organisms and authorises the manufacture, import or export of hazardous substances. It also administers the emissions trading scheme. Under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act), the EPA determines environmental consents for most activities within the exclusive economic zone, but not fishing.

Further information can be found at the EPA's website at www.epa.govt.nz.

Maritime New Zealand

Maritime New Zealand is governed by an independent board appointed by the Governor-General on the recommendation of the Minister of Transport. It manages shipping and marine pollution under the Maritime Transport Act 1994. This includes controlling discharges from ships and offshore installations and the dumping of waste within the EEZ and continental shelf region beyond. All these activities can impact on marine biodiversity.

Maritime New Zealand, on behalf of the Minister of Transport, develops and enforces marine protection rules aimed at preventing pollution incidents. It maintains the country's marine oil spill response strategy. It also supports New Zealand's engagement with the International Maritime Organisation. More information about environmental management under the Maritime Transport Act can be found in the EDS Guide 'Managing the Marine Environment' available at www.eds.org.nz.

The Marine Legislation Bill was introduced on 30 August 2012 and at the time of writing has been referred to the Transport and Industrial Relations Committee. The Bill would make a number of amendments to the Maritime Transport Act. It would also amend the EEZ Act to transfer from Maritime New Zealand to the EPA the regulation of:

- Discharges of production and displacement water and offshore processing drainage
- Discharges of chemicals involved in drilling, production and maintenance activities
- Discharges of oily waste and garbage from offshore installations
- Discharges from production facilities on board mineral mining ships
- Dumping of waste (except emergency dumping)

Generally, approvals for the above discharges and dumping are required for activities which are covered by the scope of the EEZ Act, such as for petroleum operations. Transferring the regulation of discharge and dumping to the EPA under the EEZ Act will enable discharges and dumping to be assessed within the same consenting regime as other activities relating to the wider operation.

Further information can be found at Maritime New Zealand's website at www.maritimenz.govt.nz.

Queen Elizabeth II National Trust

The Queen Elizabeth the Second National Trust Act 1977 established a national trust called the Queen Elizabeth the Second National (QEII) Trust. The QEII Trust is a statutory organisation independent from government and managed by a Board of Directors. The general function of the Trust is 'to encourage and promote, for the benefit and enjoyment of the present and future generations of the people of New Zealand, the provision, protection, preservation, and enhancement of open space' (section 20). Open space is defined in the QEII Trust Act as 'any area of land or body of water that serves to preserve or to facilitate the preservation of any landscape of aesthetic, cultural, recreational, scenic, scientific, or social interest or value'.



Figure 3.2 The Waingawa wetland area is protected by a QEII Trust covenant (*QEII Trust*)

Under the Act, the QEII Trust can negotiate and administer open space covenants (or protection agreements) with landowners; acquire and manage land; provide financial grants for open space projects; and advocate open space protection through advice, research and information. Many open space covenants protect habitats of importance to biodiversity.

Further information can be found at the Queen Elizabeth II National Trust's website at www.openspace.org.nz.

Regional councils

Regional councils are democratically elected bodies constituted under the Local Government Act 2002. There are 11 regional councils throughout the country whose boundaries broadly coincide with water catchment areas. In addition, there are six unitary authorities, which carry out the role of both regional and territorial authority.

The RMA provides for regional councils to undertake a broad role in managing the environment. They have responsibility for managing both catchments and activities in the coastal marine area (which extends seawards 12 nautical miles from mean high water springs). They also have specific functions relating to biodiversity under section 30, including ‘the establishment, implementation, and review of objectives, policies, and methods for maintaining indigenous biological diversity’. Regional councils frequently prepare regional biodiversity strategies and support community implementation initiatives. They manage biosecurity, regional parks (in some regions) and substantial water catchment reserves.

Other functions of regional councils which may affect indigenous biodiversity relate to soil conservation, water quality and quantity, natural hazards, hazardous substances, discharge of contaminants and allocation of natural resources (see section 30(1)(c) of the RMA). The Environment Court has confirmed that section 30 requires every regional council to make objectives, policies and methods for maintaining indigenous biological diversity and that the term ‘methods’ in that section does include rules.¹

Regional councils prepare regional policy statements and plans under the RMA, which can have a significant impact on the way biodiversity threats are managed. Regional councils are also consent authorities under the RMA for water permits (which authorise the taking of water), discharge permits (which authorise discharges into water, air and land) and for coastal permits (which apply to activities within the coastal marine area). Activities authorised under these permits can have significant impacts on biodiversity.

Regional councils play an important role in biosecurity management under the Biosecurity Act. They prepare regional pest management strategies and implement pest control and eradication programmes within their regions. Some regional councils also manage regional parks under the Reserves Act and other legislation. Regional council activities and expenditure are guided by long term plans and annual plans prepared under the Local Government Act.

Further information can be found at www.localgovt.co.nz.

Territorial authorities

Territorial authorities, which include both city and district councils, are also democratically elected bodies constituted under the Local Government Act. There are 61 territorial authorities operating throughout the country. Section 31 of the RMA includes ‘the maintenance of indigenous biodiversity’ as one of the functions of territorial authorities. Their role in biodiversity management is primarily focused on the impacts of land subdivision, use and development.

Territorial authorities prepare district plans under the RMA and make first-instance decisions on subdivision and land use consents. Many territorial authorities manage reserve land and esplanade reserves under the Reserves Act. Similar to regional councils, the activities and expenditure of territorial authorities are guided by long term council community plans and annual plans prepared under the Local Government Act.

Territorial authorities also have an important role in wider biodiversity management, including park management functions, supporting community implementation initiatives and sometimes preparing biodiversity strategies.

Further information can be found at www.localgovt.co.nz.

Iwi and hapū

Iwi and hapū are increasingly applying contemporary forms of kaitiakitanga through involvement in management and decision-making affecting biodiversity. The meaning and implementation of kaitiakitanga is described more fully in Chapter 11. As well as engaging in kaitiakitanga through statutory processes, iwi and hapū are becoming major resource managers in their own right through the fisheries settlement, the aquaculture settlement and individual iwi settlements.

Endnotes

- 1 *Federated Farmers of NZ v Manawatu-Wanganui Regional Council* [2011] NZEnvC 403



The effects from development of the coastal environment are managed under the RMA (*Raewyn Peart*)

four

Biodiversity management under the RMA

Overview

The management of many of the effects of human activities on biodiversity in New Zealand is undertaken within the framework of the RMA. Biological diversity is defined in section 2 of the Act to mean ‘the variability among living organisms, and the ecological complexes of which they are a part, including diversity within species, between species, and of ecosystems’. The overarching purpose of the RMA is the sustainable management of natural and physical resources. It establishes a framework for the integrated management of air, land, freshwater and marine areas.

This chapter outlines and discusses a number of mechanisms that are provided under the RMA to restore and protect indigenous biodiversity, including national policy statements, regional and district statutory plans and biodiversity offsets. Figure 4.1 summarises the purpose and benefits of these mechanisms and provides some examples of their application. The opportunity for public participation in these processes is discussed in Chapter 12.

Mechanism	Effect	Benefit to managing biodiversity
National policy statements	Prescribe objectives and policies on resource management issues of national significance	Provide higher level of guidance Provide greater certainty Promote consistency of approach by councils
Regional policy statements	Provide an overview of resource management issues within a region	Provide a strategic approach Help to integrate decision-making processes Directly influence regional and district plans
Regional plans	Prescribe regional objectives, policies and rules for regional environmental and resource management matters	Can control activities on a regional and catchment-wide level Control activities in the coastal marine area Directly influence district plans for some matters
District plans	Prescribe district objectives, policies and rules for managing effects of land use	Can control activities on a district-wide level Control land use activities
Identification of significant areas and habitats	Spatially identify significant areas within a region or district on maps or schedules within a plan so that they can be protected	Identify areas which are important for biodiversity Can be accompanied by rules to control activities affecting these areas

Conservation lots	Provide that additional lots can be subdivided if areas with important conservation values are protected permanently	Protect significant biodiversity areas in perpetuity
Consent conditions	Place conditions on resource consents	Can protect biodiversity from adverse effects of consented activities
Biodiversity offsetting	Offset residual effects of activities by providing a biodiversity benefit in another location	Helps achieve no net loss of biodiversity

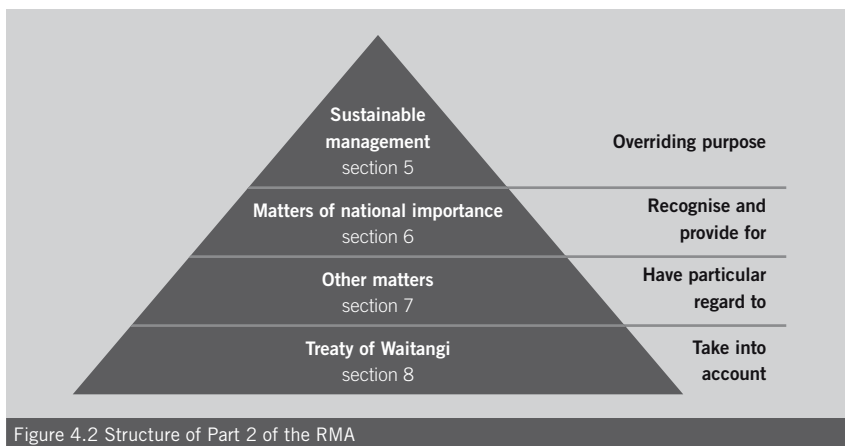
Figure 4.1 Summary of mechanisms for biodiversity protection under the RMA

Purpose of the RMA

Environmental management under the RMA is to be guided, in the first instance, by the purpose and principles set out in Part 2. Section 5 establishes the purpose of the RMA, which is ‘to promote the sustainable management of natural and physical resources’. This is further defined to include:

- (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 on the environment.*

All forms of plants and animals (whether native to New Zealand or introduced) fall within the RMA’s definition of natural and physical resources. Therefore, natural and physical resources need to be managed while sustaining the potential of all forms of plants and animals to meet the reasonably foreseeable needs of future generations. This means that sustainable limits are likely to be required in tools such as national policy statements, national environmental standards and RMA plans. Natural and physical resources also need to be managed while safeguarding the life-supporting capacity of air, water, soil and ecosystems. Therefore, the ability of terrestrial, marine and other aquatic ecosystems to sustain living organisms is integral to the RMA’s purpose.



Matters of national importance

Section 6 of the RMA identifies matters of national importance which decision-makers are required to recognise and provide for. The phrase ‘recognise and provide for’ indicates that decision-makers need to take positive action on these matters for the ‘preservation’ and ‘protection’ of matters of national importance. They can do this through shaping the contents of plans, creating rules within the plans and making decisions on resource consent applications.

The Environment Court has held that, in exercising a district council’s plan-making functions, it is mandatory to identify the matters of national importance. This includes showing the boundaries of the areas and resources concerned¹ such as the coastal environment, areas of significant vegetation and significant habitats of indigenous fauna.

Section 6(a) natural character

The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use and development.

The term ‘natural character’ is not defined in the RMA and can be a difficult concept to grasp because it incorporates a complex mix of physical, ecological, perceptual and cultural elements. There is, however, extensive case law on what

natural character means. The term encompasses the natural world (and natural elements within it), how people perceive it, and what it means to them.



Figure 4.3 The Kawhia coastline is an example of natural character requiring preservation and protection under the NZCPS 2010 (Raewyn Peart)

The NZCPS 2010 provides useful guidance as to what natural character means in the context of the coastal environment. The relevance of this document to biodiversity protection is discussed in Chapter 5. Among the matters it may include are natural elements, processes and patterns; the natural movement of water and sediment; and places or areas that are wild or scenic. Therefore, natural character encompasses important determinants of biodiversity such as the natural processes involved in the life cycles of plants and animals. It also includes the natural processes of erosion and wind dispersal that produce habitat such as river channels, banks, gorges, floodplains and vegetation.

Section 6(c) indigenous vegetation and habitats

The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.

In order to be in a position to identify ‘significant’ indigenous vegetation and habitats, councils need to have sufficient information on the natural resources within their districts or regions and their relative importance.² The Environment Court has held that determining what is ‘significant’ in the context of a district plan requires judgment as to those natural resources in a district (not region or New Zealand wide) which need to be protected. This should include an assessment of the extent to which biodiversity has already been diminished in the district.³ Similarly, a regional council needs to assess the natural resources on a region-wide basis. The Environment Court approved a formulation of criteria for significance under section 6(c), whereby a wetland would be significant if it triggered any one of four criteria including ecological context, representativeness, rarity and distinctiveness.⁴

Voluntary mechanisms on their own do not provide adequate assurance of protection and many councils map significant areas and/or include a schedule of them in their plans. Planning controls, in the form of rules that apply to the specific areas identified on maps or in schedules, are also needed to ensure that the natural resource is protected, as well as being identified.

Other matters

The RMA identifies a set of ‘other matters’ in section 7 to which decision-makers are required to ‘have particular regard’. This creates ‘not just an obligation to hear and understand what is said [on a matter], but also to bring what is said into the mix of decision-making’.⁵ Ultimately, however, the local authority may, in its discretion, reject the matter as insufficiently relevant or worthy of weight.⁶

Many section 7 matters have particular relevance to the management of



Figure 4.4 A lowland river ecosystem holds intrinsic values which need to be given regard to under section 7 of the RMA (*Raewyn Peart*)

biodiversity including kaitiakitanga (section 7(a)) and the intrinsic values of ecosystems (section 7(d)). Kaitiakitanga is defined in section 2 as meaning ‘the exercise of guardianship by the tangata whenua of an area in accordance with tikanga Māori in relation to natural and physical resources’ and includes the ethic of ‘stewardship’. The concept is described more fully in Chapter 11. The term ‘intrinsic values’ refers to the valuing of ecosystems for their inherent worth rather than for any direct benefit they provide for humans. The definition of ‘intrinsic values’ provided in section 2 of the RMA includes biodiversity.

Treaty of Waitangi

Section 8 requires all persons exercising functions and powers under the RMA to ‘take into account the principles of the Treaty of Waitangi’. This includes duties to act reasonably and in good faith and to actively protect Māori interests. Consultation is also a principle of the Treaty, but section 36A of the RMA explicitly states that neither an applicant nor a local authority have a duty to consult any person, which includes Māori, about a resource consent application unless this is required under other legislation.

National policy statements

National policy statements enable central government to prescribe objectives and policies on resource management matters of national significance, relevant to achieving the purpose of the RMA. National policy statements are important tools to provide a higher level of government direction in the plan making process. It is mandatory that regional policy statements, regional plans and district plans give effect to national policy statements (sections 62(3), 67(3) and 75(3)). Consent authorities must also have regard to any relevant national policy statements when considering an application for a resource consent (section 104(1)(b)) or water conservation order (section 207(c)) and a requirement for a designation (section 171(1)(a)) or heritage order (section 191(1)(d)).

There is currently no national policy statement directly on biodiversity. The Ministry for the Environment consulted publicly on a proposed National Policy Statement on Indigenous Biodiversity between January and May 2011. At the time of writing, however, it had not yet been promulgated.

Two other national policy statements have provisions which are important for biodiversity management; the NZCPS 2010 and the National Policy Statement for Freshwater Management. The provisions of relevance to biodiversity in these documents are discussed in Chapter 5.



Figure 4.5 The National Policy Statement for Freshwater Management provides guidance on the management of rural land adjacent to freshwater environments, such as this in Mangere (*Raewyn Peart*)

National environmental standards

The RMA provides for the making of national rules which are called national environmental standards. These are regulations issued under the RMA which prescribe technical standards, methods and other requirements for environmental matters. Regional councils and territorial authorities must enforce these standards, or they can enforce stricter standards when the standard provides for this. In this way, national environmental standards can be used to ensure that consistent minimum standards are maintained throughout all of New Zealand's regions and districts.

The Ministry for the Environment has developed a proposed National Environmental Standard on Ecological Flows and Water Levels. Ecological

flow refers to the amount of water and level of flow required to provide for the healthy ecological functioning of flora and fauna. This standard is designed to assist decision-makers under the RMA to make better decisions on water allocation, so that water is not over-allocated to the detriment of the species that live in the affected water body. As the standard has not yet been finalised it has no legal effect. The proposed standard includes measures to:

- Set interim limits on the alteration to flows and/or water levels for rivers, wetlands and groundwater systems that do not have limits imposed through regional plans
- Provide a process for selecting the appropriate technical methods for evaluating ecological flows and water levels in rivers, lakes and wetlands and groundwater systems

Water conservation orders

A water conservation order can be created for a number of reasons, including to protect the habitat of terrestrial or aquatic species and fisheries, as well as scientific and ecological values. In early 2012 there were 16 water conservation orders in force in New Zealand, in relation to lakes and rivers located all over the country.

Water conservation orders can apply to rivers, lakes, streams, ponds, wetlands, geothermal water or aquifers. They work by placing restrictions on how the regional council can manage the resource in order to protect and maintain water quality and to ensure there is sufficient water quantity and natural flows. In particular, they can restrict management measures that affect:

- Quantity, quality, rate of flow or level of the water body
- Maximum, minimum or range of levels or flows, or the rate of change of levels of flows
- Maximum allocation for extraction or maximum contaminant loading
- Ranges of temperature and pressure in the water body

Anyone can apply for a water conservation order. Once such an order is in place, resource consents granted after its creation must not be contrary to the order. In addition, regional policy statements, regional plans and district plans may not be inconsistent with the order. After a water conservation order has

been in place for two years, any person can apply to revoke or amend it so it does not necessarily provide permanent protection.

Regional policy statements

Regional policy statements, which are prepared by regional councils under the RMA, are designed to provide an overview of resource management issues throughout the region and to identify policies and methods to achieve the integrated management of natural and physical resources (section 59). This enables a strategic and integrated approach to be applied to biodiversity management, which can be considered on a region-wide basis. Regional policy statements assist regional councils to perform their functions under the RMA which include ‘the establishment, implementation and review of objectives, policies and methods for maintaining indigenous biological diversity’ (section 30).

Regional policy statements can include methods, but do not include rules and, therefore, do not have direct impact on activities. However, regional plans and district plans which do have rules are required to ‘give effect to’ regional policy statements. This means that regional policy statements primarily have effect through directing or influencing the content of regional and district plans. Section 62 of the RMA sets out the required content of regional policy statements and this includes stating the local authority responsible for specifying the objectives, policies and methods for the control of the use of land ‘to maintain indigenous biological diversity’.

Regional plans

Most regional plans are optional. A regional council may prepare a regional plan for the whole or part of its region to address its RMA functions (section 65(1)). Regional councils must prepare a regional coastal plan which specifically addresses activities in the coastal marine area.

The RMA provides that no person may use water, air or the coastal marine area in a manner that contravenes a regional rule without holding a resource consent or having existing use status. Regional plans are therefore important documents in managing indigenous biological diversity in terrestrial, freshwater and marine environments.



Figure 4.6 Regional plans contain policies and rules on appropriate activities on rural land and the resulting effects, such as this rural property near Takaka (*Raewyn Peart*)

District plans

A territorial authority (city or district council) must prepare a district plan for its district (section 72). The purpose of district plans is to assist territorial authorities in carrying out their functions under the RMA (section 72).

District plans are focused on managing the effects of land use. Land use can impact on biodiversity through activities such as the clearance of vegetation and earthworks in areas of biodiversity value. Some land uses may cause sediment and pollutants to reach water bodies which may directly affect species, by, for example, clogging of the gills of filter feeders, reducing water quality and smothering benthic habitats.

The RMA provides that no person may use land in a manner which contravenes a rule in a district plan (section 9) and no person may subdivide land unless expressly allowed by a rule in a district plan or a resource consent (section 11). Therefore, district plans have an important role in controlling the impacts of land development on indigenous biodiversity. If no rule is provided

for in the plan, land activities do not generally require consent and therefore cannot be directly controlled.

There are a number of rules local authorities can incorporate into their district plans to address the threats to biodiversity, including those which:

- Control the clearance of vegetation within, and adjacent, to significant habitats
- Control the discharge of contaminants
- Control the level of earthworks and construction of impermeable surfaces
- Control stock access to significant habitats

Identifying significant areas and habitats

As described earlier, section 6(c) of the RMA imparts an obligation on local authorities to recognise and provide for the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna in plans.⁷ When evaluating whether an area is 'significant' the relevant criteria include.⁸

- Representativeness (extent of range of genetic and ecological diversity)
- Diversity and pattern (in relation to ecosystems, species and land forms)
- Rarity factors and/or special features
- Naturalness, intactness, size and shape (affecting the long-term viability of species, communities and ecosystems and amount of diversity)
- Inherent ecological viability and long-term sustainability
- Relationship between natural areas and other areas of more modified character
- Vulnerability of site and management input required to maintain or enhance an area's significance

Some local authorities include criteria for defining areas of significant vegetation and significant habitats (with the actual spatial areas only being identified during the resource consenting process). Rules may then be included to place restrictions on certain activities within areas that meet the criteria. Alternatively, the plan may only include relevant objectives and policies (but not rules), and therefore, not change the consent category of an activity, but require the impacts on the areas to be considered during the assessment of environmental effects undertaken as part of the resource consenting process.

Other local authorities have spatially identified the location of significant areas and habitats within their district and regional plans, using a schedule or map, which is the more certain approach and therefore to be preferred. Some local authorities have adopted a hybrid approach where they have incorporated specific identified areas into plans using a schedule or map and also specify criteria for the identification of additional areas.

The Environment Court has stated that the use of voluntary mechanisms by themselves do not afford adequate assurance of protection for sites of 'high value (botanical)' or 'moderate high value (wildlife)', given that a district plan's schedule of ecological sites could be expanded to accommodate those items.⁹ In the same case, the Environment Court concluded that neither was the scheduling process the complete answer, but part of a raft of mechanisms adopted to assist fulfilment of the RMA's purpose in terms of section 6(c).

Conservation lots

Conservation lot provisions typically allow a landowner to subdivide a lot, which is additional to that provided for by the rules of the district plan, in return for permanent protection of areas of indigenous vegetation or those with high conservation or landscape values. This is usually achieved through covenanting the area which provides legal protection that 'runs with the land' if ownership changes.

Conservation lots can help increase the extent of land protected, but often the resultant areas are small and fragmented, and therefore the overall biodiversity benefit can be low. Assessments of compliance with covenant conditions, undertaken in the Thames-Coromandel district, indicated that compliance was greater for voluntary covenants than for covenants that were required as a condition of consent. Therefore, such mechanisms need to be very carefully designed and the lots properly managed, if real biodiversity benefits are to be achieved.

Consent conditions

Where a regional or district plan requires a resource consent to be obtained for a specific activity, conditions can be placed on the granting of consent to address the impacts on biodiversity of the proposed activity. These might, for

example, require replanting of areas of indigenous vegetation, the exclusion of stock from important habitat, on-going weed and pest control or financial contributions. Where a plan makes provision for financial contributions these can include offsetting the adverse effects of an activity by providing for the protection, restoration or enhancement of biodiversity in another location with similar biodiversity values.

Biodiversity offsetting

The concept behind biodiversity offsetting is that where the adverse effects of an activity on biodiversity cannot be adequately avoided, minimised or remedied, any residual adverse effects can be offset by providing a biodiversity benefit in another location. The goal is to achieve no net loss and ultimately a net gain of biodiversity on the ground.¹⁰

Biodiversity offsets are designed to address ‘residual’ adverse biodiversity impacts from a project. These are the impacts that remain after available avoidance, mitigation and remediation measures have been taken.¹¹ There are limits to where biodiversity offsets are appropriate and they should not be used where irreplaceable ecological values would be lost at the impact site.

The Department of Conservation has recently completed a Biodiversity Offsets Research Programme which forms the basis of a best-practice guidance document being developed for developers and councils on applying biodiversity offsetting in New Zealand. Further information on this programme can be found at <http://www.doc.govt.nz/publications/conservation/biodiversity-offsets-programme>.

The proposed national policy statement on indigenous biodiversity supported the application of biodiversity offsetting when councils were considering resource consent applications. It proposed that, in this case, the following principles should apply (outlined in schedule 2):

- **No net loss:** a biodiversity offset should be designed and implemented to achieve in situ, measurable conservation outcomes which can reasonably be expected to result in no net loss and preferably a net gain of biodiversity
- **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

- **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. It is important that this part of the policy does not allow offsetting to be leveraged against inappropriate and irreversible effects of a development, rather that development should be declined
- **Limits to what can be offset:** there are situations where residual effects cannot be fully compensated for by a biodiversity offset because the biodiversity affected is vulnerable or irreplaceable
- **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
- **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 project's impacts and preferably in perpetuity
- **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

These principles represent seven out of the ten principles established by the Business and Biodiversity Offsets Programme, an international body that is leading the way in researching and implementing biodiversity offsetting around the world. More information can be found in the booklet 'Biodiversity Offset Design Handbook', which is available at http://content.undp.org/go/cms-service/stream/asset/?asset_id=2469107.

Provisions for biodiversity offsets have been incorporated into the Wellington Regional Freshwater Plan through the approval of the New Zealand Transport Agency's Transmission Gully plan change request by a board of inquiry in October 2011. The plan change makes the method of offsetting available for the Transmission Gully project through a new policy, Policy 4.2.33A.¹² More details on the wording of this change and the supporting information can be found at <http://www.epa.govt.nz/Publications/tgpc-proposed-plan-change.pdf>.

However, it should be noted that this change does not require that all of the principles of biodiversity offsetting outlined above are followed and is therefore not considered to be best practice.

The Environment Court and Boards of Inquiry have recently considered a number of issues in their deliberations of cases that are relevant to the subject of biodiversity offsets. A new update on the law around biodiversity offsets prepared by Anderson Lloyd Lawyers offers a useful summary of decisions in light of these issues and the implications this has for projects where the use of biodiversity offsets is being considered.¹³ These issues include how the principle of 'limits to offsets' is applied, if the application of a 'mitigation hierarchy' is consistent with the RMA, when it is appropriate to move onto the next stage in that hierarchy, what level of 'residual effects' requires a biodiversity offset to be considered and whether biodiversity offsets can be considered as mitigation.

References and further reading

Department of Conservation and Ministry for the Environment, 2000, *The New Zealand Biodiversity Strategy: Our chance to turn the tide, Whakakōhukihukitia Te Tai Roroku Ki Te Tai Oranga*, Department of Conservation and Ministry for the Environment, Wellington

Green W and B Clarkson, 2005, *Turning the tide? A review of the first five years of the New Zealand Biodiversity Strategy*, The Synthesis Report submitted to the Biodiversity Chief Executives in November 2005, Wellington

Ministry for the Environment, 2011, *Proposed national policy statement on indigenous biodiversity summary of submissions*, Ministry for the Environment, Wellington

New Zealand Government, 2011, *National policy statement freshwater management*, New Zealand Government, Wellington

Nolan D (ed), 2011, *Environment and resource management law* (4th edition), LexisNexis New Zealand Limited, Wellington

Endnotes

- 1 *Wakatipu Environmental Society Inc v Queenstown Lakes District Council* [2000] NZRMA 59
- 2 *Friends of Shearer Swamp Inc v West Coast Regional Council* [2010] NZEnvC 345
- 3 *Minister of Conservation v Western Bay of Plenty District Council* EnvC Auckland A071/2001, 3 August 2001
- 4 *Friends of Shearer Swamp Inc v West Coast Regional Council* [2010] NZEnvC 345
- 5 *Takamore Trustees v Kapiti Coast District Council* [2003] NZRMA 433 at 455 (HC)
- 6 *Long Bay-Okura Great Park Society Inc v North Shore City Council* EnvC Auckland A078/08, 16 July 2008 at [282]
- 7 *Minister of Conservation v Western Bay of Plenty District Council* EnvC Auckland A071/2001, 3 August 2001.
- 8 *Forest & Bird Protection Society Inc v Central Otago District Council* EnvC Auckland A128/04, 23 September 2004
- 9 *Minister of Conservation v Western Bay of Plenty District Council* EnvC Auckland A071/2001, 3 August 2001, paras 36, 49
- 10 <http://www.doc.govt.nz/publications/conservation/biodiversity-offsets-programme/biodiversity-offsets-programme/what-is-biodiversity-offsetting/>
- 11 <http://www.waikatoregion.govt.nz/PageFiles/21512/March%2015/Mar%2015%20Item%2014%20DOC%20Tabled%20%20Biodiversity%20Offsets%20programme.pdf>
- 12 <http://www.waikatoregion.govt.nz/PageFiles/21512/March%2015/Mar%2015%20Item%2014%20DOC%20Tabled%20%20Biodiversity%20Offsets%20programme.pdf>
- 13 http://www.andersonlloyd.co.nz/uploads/files/Biodiversity_Offsets_-_A_Further_Update_On_The_Law.pdf



The NZCPS 2010 provides policies for protection of important coastal environments (*Raewyn Peart*)

five

Biodiversity protection under national policy statements

National policy statements enable central government to prescribe objectives and policies on resource management matters of national significance, as discussed in Chapter 4. This chapter describes the provisions of two national policy statements of particular relevance to biodiversity: those applying to freshwater and to the coastal environment.

National Policy Statement for Freshwater Management

The National Policy Statement for Freshwater Management took effect on 1 July 2011. It applies to all freshwater resources in New Zealand which include lakes, rivers, streams, wetlands and groundwater. It sets out several objectives for the management of freshwater which directly relate to the protection of biodiversity that is reliant on freshwater bodies. The overarching objective in paragraph A1, which relates to water quality, is ‘to safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems of fresh water, in sustainably managing the use and development of land, and of discharges of contaminants’. Objective C1 is ‘to improve integrated management of fresh water and the use and development of land in whole catchments, including the interactions between fresh water, land, associated ecosystems and the coastal environment.’ This is necessary if the other objectives are to be achieved.

‘Outstanding freshwater bodies’ are defined in the interpretation section as those water bodies with outstanding values, including ecological, landscape, recreational and spiritual values. Objective A2 requires the quality of outstanding water bodies to be protected. It also requires the significant values of wetlands to be protected (as does objective B4 which relates to water quantity). In order to sufficiently protect such water bodies and wetlands, they must be identified in the regional planning instruments, ideally by spatially mapping them. There should also be appropriate policies and methods provided in RMA plans to ensure their protection.

To achieve the objective of improving the quality of degraded freshwater, regional planning instruments must first set freshwater objectives and limits. Once they have been set, water bodies that have been degraded by human activities to the point of being over-allocated can be identified. ‘Over-allocation’ is defined in the policy statement as the situation where the resource has been allocated to users beyond a limit, or is being used to a point where a freshwater objective is no longer being met. Local authorities must then ensure that there are appropriate controls on land use, discharges and water takes to ensure that the quality of freshwater in such water bodies is improved.



Figure 5.1 Emerald Lake in the Tongariro National Park is an example of an outstanding freshwater body (Raewyn Peart)

The role of iwi and hapū in freshwater management is recognised in Objective D1. This seeks to ensure that tangata whenua values and interests are identified and reflected in decision-making on freshwater planning and management. Specific guidance for local authorities is set out in Policy D1 which includes that reasonable steps shall be taken to ‘work with iwi and hapū to identify tangata whenua values and interests in water and freshwater ecosystems in the region’.

Freshwater and biodiversity is discussed in more detail in Chapter 16.

New Zealand Coastal Policy Statement

The NZCPS 2010 is a national policy statement under the RMA. Its purpose is to state policies in order to achieve the purpose of the RMA in relation to the coastal environment in New Zealand (section 56). It is mandatory that other RMA documents, including regional policy statements, regional plans and district plans, give effect to the NZCPS 2010. It is therefore a potentially powerful tool to protect biodiversity in the coastal environment.

The NZCPS 2010 replaces the 1994 document and contains new provisions relating to the protection and management of biodiversity within the coastal environment.

Topic	Detail
Coastal Environment Policy 1	The coastal environment is to be defined with reference to living organisms, including how indigenous coastal species move and where coastal vegetation grows
Strategic planning Policy 7	Protecting biodiversity and coastal ecosystems requires not only avoidance or mitigation at the resource consent stage, but strategic thinking at the planning and policy level, in order to address cumulative effects
Indigenous Biodiversity Protection Policy 11	Policy 11 protects indigenous biological diversity in the coastal environment. It requires the avoidance of all adverse effects of activities on listed matters and the avoidance of significant adverse effects, and the avoidance, remediation or mitigation of other adverse effects, of activities on other listed matters
Spatial identification of inappropriate activities Policies 7 and 11	Regional policy statements and plans should identify areas of the coastal environment where particular activities are inappropriate due to their proximity to taxa, ecosystems, habitats and areas identified in accordance with Policy 11. The most effective and efficient way of identifying such areas is to map them in the relevant planning instrument but they can be identified by other means
Methods for protection Policies 7 and 11	Objectives, policies and rules should then be used to protect such areas from inappropriate activities
Sedimentation Policy 22	Addressing the adverse effects of sedimentation on biodiversity and ecosystems is required to give effect to many of the NZCPS policies, in particular Policy 22
Vegetation clearance and land use Policy 22	Local authorities should identify areas where the natural rate of erosion and sedimentation has been accelerated by vegetation clearance and land use and is subsequently adversely affecting ecosystems in the coastal environment
Reducing sediment loads Policy 22	Opportunities for managing catchments to reduce the sediment load need to be investigated and management measures put in place

Figure 5.2 Summary of biodiversity protection under the NZCPS 2010

Extent of the coastal environment

The coastal environment is not fully defined in the RMA and as a result there is some uncertainty as to where the provisions of the NZCPS 2010 apply. It includes the coastal marine area, as defined in the RMA, which extends to the outer limits of the territorial sea (12 nautical miles from land). The landward extent of the coastal environment is established at a regional and/or district level by local authorities based on a number of considerations.



Figure 5.3 Example of the coastal environment (*Raewyn Peart*)

The Environment Court has defined the ‘coastal environment’ as the area in which the coast is a significant part or element.¹ The Court held that this ‘will vary from place to place and according to the position from which a place is viewed. Where there are hills behind the coast, it will generally extend up to the dominant ridge behind the coast’.²

The demarcation of this area, using maps, is an important task if local authorities are to give effect to the NZCPS 2010 in the coastal environment. However, the Court has observed that the ‘coastal environment’ is an environment, not a zone. This means ‘there will frequently be grey areas and blurred edges’.³

Policy 1 of the NZCPS 2010 requires recognition that the coastal environment comprises several areas including:

- Areas where coastal processes, influences or qualities are significant, including coastal lakes, lagoons, tidal estuaries, saltmarshes, coastal wetlands and the margins of these⁴
- Coastal vegetation and the habitat of indigenous coastal species including migratory birds
- Inter-related coastal marine and terrestrial systems, including the intertidal zone

This means that the coastal environment itself can be defined with reference to living organisms, including how indigenous coastal species move and where coastal vegetation grows.

Objectives

The NZCPS 2010 sets out seven objectives. Objective 1 is the most relevant to biodiversity.



To safeguard the integrity, form, functioning and resilience of the coastal environment and sustain its ecosystems, including marine and intertidal areas, estuaries, dunes and land, by:

- maintaining or enhancing natural biological and physical processes in the coastal environment and recognising their dynamic, complex and interdependent nature;
- protecting representative or significant natural ecosystems and sites of biological importance and maintaining the diversity of New Zealand's indigenous coastal flora and fauna; and
- maintaining coastal water quality and enhancing it where it has deteriorated from what would otherwise be its natural condition, with significant adverse effects on ecology and habitat, because of discharges associated with human activity.

Figure 5.4 NZCPS 2010 Objective 1

Key concepts and terms

In order to appreciate the full scope of Objective 1, it is important to unravel the key biological concepts and terms used.

- *Biological integrity* – this term is associated with how ‘pristine’ an environment is and its function relative to the potential or original state of an ecosystem before human alterations. One definition is ‘the capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity and functional organisation comparable to that of the natural habitat of the region’.⁵

- *Resilience* – resilience has been defined as the capacity of a system to absorb disturbance and reorganise while undergoing change so as to retain essentially the same function, structure, identity and feedbacks.⁶ A resilient ecosystem resists damage and recovers quickly from stochastic disturbances such as fires, flooding, windstorms, insect population explosions and human activities such as deforestation and the introduction of exotic plant or animal species.
- *Disturbances* – disturbances of sufficient magnitude or duration can profoundly affect an ecosystem and may force it to reach a threshold beyond which a different regime of processes and structures predominate.
- *Safeguard* - the objective is to safeguard the integrity, form, functioning and resilience of the coastal environment. Human activities that adversely affect these elements need to be avoided or managed through planning frameworks. Efforts to reduce the risk of undesired shifts between ecosystem states should address land use, nutrient stocks, soil properties, freshwater dynamics and the biomass of long-lived organisms.⁷
- *Sustain* - a key element of Objective 1 is to sustain the ecosystems of the coastal environment. The Planning Tribunal (which has been subsequently replaced by the Environment Court) has stated that sustainable management ‘places the emphasis on ensuring that resources are not used up at a rate greater than their recuperative properties allow. The overriding intention of the legislation is to ensure that successive generations husband the available resources and pass them onto the next in no lesser state than was available to the donor generation’.⁸ This means that the ecosystems of the coastal environment should endure for future generations in the same or better state as they were previously.

Maintaining or enhancing natural biological processes

Objective 1 is to be achieved (in part) by maintaining or enhancing natural biological processes in the coastal environment and recognising their dynamic, complex and interdependent nature. Such processes are numerous and diverse. Examples include the natural movements and migrations of biota, reproduction and relationships between species (such as predation, parasitism, competition and pollination).

The natural biological processes in our coastal ecosystems, and their interdependence, need to first be identified and understood if management measures are to be successful in maintaining and enhancing them. Identifying knowledge gaps and filling them is fundamental.

Example: Kaipara Harbour

Scientific research has indicated that approximately 80 per cent of the West Coast snapper stock is sourced from the Kaipara Harbour. Juvenile snapper have been found strongly associated with sub-tidal seagrass (*Zostera mulleri*) meadows in the Kaipara estuary, which provide substrate and refuge from predation. Seagrass also plays an important role in trapping and stabilising land-derived sediments, thereby improving water clarity and quality by helping to settle and remove contaminants.

Seagrass meadows have been severely impacted by human activities throughout New Zealand and have shown significant declines in spatial extent. Large scale losses have been documented from the Whangarei, Waitemata, Manukau and Tauranga harbours. The causes of this documented decline have been variously attributed to a range of different human activities and natural events. These include increased sedimentation and turbidity, the discharge of untreated sewage and industrial waste, and coastal development.

A further reduction in seagrass coverage in the Kaipara Harbour, could have negative impacts on the harbour's production of juvenile fish, which could subsequently cascade through into the much larger coastal ecosystem. This would ultimately affect the abundance of fish several hundreds of kilometres away.



Figure 5.5 Seagrass meadows in the Kaipara Harbour have become severely degraded by human activities, which has consequently impacted upon juvenile fish species that use this area as a nursery (*Raewyn Peart*)

Over the longer term, coastal managers will need to address knowledge gaps. Key questions to be investigated in the Kaipara Harbour might include: how does modifying habitats affect the relative production of different species such as snapper? How are habitats and systems connected at large spatial scales, especially where impacts at one location may cascade into distant areas through subsequent species movements? How do land-based stressors affect coastal species both directly and indirectly through impacts on nursery habitats including seagrass meadows?

Maintaining or enhancing natural physical processes

Objective 1 is to be achieved (in part) by maintaining or enhancing natural physical processes in the coastal environment and recognising their dynamic, complex and interdependent nature.

These natural physical processes have been significantly altered by vegetation clearance and changes in land use.⁹ Safeguarding the integrity, form, functioning and resilience of ecosystems within the coastal environment (by maintaining natural physical processes) requires local authorities to identify areas where the natural rate of erosion and sedimentation has been accelerated by vegetation clearance and land use and where this is subsequently adversely affecting ecosystems in the coastal environment. Opportunities for managing catchments to reduce the sediment load should be identified and management measures put in place.

Other natural physical processes in the coastal environment which should be maintained under this policy include the ebb and flow of the tide and the shape and movement of sediment. In some places these processes have been altered by development that is too close to the coast.



Figure 5.6 Waves are a natural physical process of the coastal environment (Raewyn Peart)

Much of New Zealand's coastline is subject to erosion and flooding, and this risk will increase as a result of global climate change. In order to combat the risk, hard protection works such as seawalls and groynes have been built in some areas to protect coastal land, buildings and infrastructure such as roads. Hard protection obstructs natural coastal processes (such as tides and movement of sediment), reduces the size of important coastal habitats (such as the inter-tidal area and dunes) and obstructs the ability of natural coastal systems to move inland in response to sea level rise.

Protecting representative or significant natural ecosystems and sites of biological importance

Objective 1 is to be achieved (in part) by protecting representative or significant natural ecosystems and sites of biological importance. The word 'protect' is not defined in the RMA. The High Court has held that 'protection' means to guard against, or take care of.¹⁰

Local authorities will first need to undertake an assessment to identify significant natural ecosystems and sites of biological importance within their jurisdiction. The assessment should include sites within marine areas, intertidal areas, estuaries, dunes and coastal land. Sites of biological importance in the coastal environment may include those that provide habitat for significant life functions such as juvenile nursery habitats, feeding grounds, spawning habitats and areas that provide for the transition from larval to benthic phases during the lifecycle of marine organisms.



Figure 5.7 Intertidal areas are sites of biological importance (*Raewyn Peart*)

To protect sites of biological importance at the resource consent level, local authorities could require buffer zones to be put in place in order to maintain some distance between the site and the works being undertaken. Other

options include scheduling works to avoid ecologically important periods and rehabilitating habitat after completion of the works.¹¹

However, protecting representative or significant natural ecosystems and sites of biological importance requires not only avoidance or mitigation at the resource consent stage, but strategic thinking at the planning and policy level. This could involve a move towards the spatial zoning of coastal ecosystems and consideration of how to regulate human activities and impacts relative to these different zones.

GIS and other technologies are now available that make this approach possible. All field surveys, and associated experimental work, should be spatially explicit so that outcomes can be incorporated into GIS frameworks.

Protecting indigenous biological diversity

Policy 11 of the NZCPS 2010 is the most directly relevant to biodiversity.

To protect indigenous biological diversity in the coastal environment:

- a. avoid adverse effects of activities on:
 - i. indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists;
 - ii. taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;
 - iii. indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare;
 - iv. habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;
 - v. areas containing nationally significant examples of indigenous community types; and
 - vi. areas set aside for full or partial protection of indigenous biological diversity under other legislation.
- b. avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:
 - i. areas of predominantly indigenous vegetation in the coastal environment;
 - ii. habitats in the coastal environment that are important during the vulnerable life stages of indigenous species;
 - iii. indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh;
 - iv. habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes;
 - v. habitats, including areas and routes, important to migratory species; and
 - vi. ecological corridors, and areas important for linking or maintaining biological values identified under this policy.

Figure 5.8 NZCPS 2010 Policy 11 'Indigenous biological diversity (biodiversity)'

There is an internal hierarchy built into Policy 11, in that it requires the avoidance of all adverse effects of activities on the matters referred to in part (a) and the avoidance of only significant adverse effects and the avoidance, remediation or mitigation of other adverse effects of activities on the matters listed in part (b).

The requirement to avoid adverse effects of activities on these areas is a strong policy direction. In case law decided in a different context, the Court held that effects to be considered are any adverse effects regardless of scale and including minor effects.¹² This meaning is also likely to apply to the requirement to 'avoid adverse effects' as the NZCPS adopts the RMA definitions. The RMA defines 'effect' as including 'any...adverse effect...regardless of the scale, intensity, duration, or frequency of the effect...'

Coastal managers now need to familiarise themselves with the New Zealand Threat Classification System lists and the ICUN lists and identify the threatened and at risk species within their jurisdiction that need to be protected from adverse effects. These mechanisms are discussed further in Chapter 2.

Regional policy statements and plans can identify areas of the coastal environment where particular activities are inappropriate due to their proximity to taxa, ecosystems, habitats and areas in accordance with Policy 11. This also helps give effect to Policy 7 which requires councils to 'identify areas of the coastal environment where particular activities and forms of subdivision, use and development are inappropriate' and to provide protection in these areas through objectives, policies and rules. The most effective and efficient way of identifying such areas usually is to map them in the relevant planning instrument.

Buffer areas can be implemented around the relevant taxa, ecosystems, habitats and areas identifying where specified activities should not occur (such as construction of bulkheads, groynes, breakwaters, piers, docks, pipelines and other hard structures; land reclamation and infilling; and dredging and the disposal of dredged spoil. This management measure is also referred to in Policy 6 which requires local authorities to apply buffers around sites of significant indigenous biological diversity unless it would be inappropriate to do so.

Improving coastal water quality

Objective 1 also contains the requirement of 'maintaining coastal water quality and enhancing it where it has deteriorated from what would otherwise be its natural condition, with significant adverse effects on ecology and habitat, because of discharges associated with human activity'.

Policy 21 also addresses water quality in the coastal environment, as outlined below.

Where the quality of water in the coastal environment has deteriorated so that it is having a significant adverse effect on ecosystems, natural habitats, or water-based recreational activities, or is restricting existing uses, such as aquaculture, shellfish gathering and cultural activities, give priority to improving that quality by:

- a. identifying such areas of coastal water and water bodies and including them in plans;
- b. including provisions in plans to address improving water quality in the areas identified above;
- c. where practicable, restoring water quality to at least a state that can support such activities and ecosystems and natural habitats;
- d. requiring that stock are excluded from the coastal marine area, adjoining intertidal areas and other water bodies and riparian margins in the coastal environment, within a prescribed time frame; and
- e. engaging with tangata whenua to identify areas of coastal waters where they have particular interest, for example in cultural sites, wāhi tapu, other taonga, and values such as mauri, and remedying, or, where remediation is not practicable, mitigating adverse effects on these areas and values.

Figure 5.9 NZCPS 2010 Policy 21 'Enhancement of water quality'

This policy requires 'priority' to be given to improving the quality of water where it is having a significant adverse effect on ecosystems or natural habitats. Regional councils must identify such areas and include them in their plans. To comply with Policy 21(b), regional councils must then include provisions in their plans to improve water quality in these areas. Water quality should be restored at least to a state that can support ecosystems and natural habitats, where practicable. As well as benefiting marine species, this has the potential to significantly assist the 60 per cent of native New Zealand fish which have a marine stage in their life cycles (either the adult goes to sea to spawn or the larvae are washed out to sea). Heavily polluted areas of rivers can form barriers preventing fish from travelling between rivers and the sea.

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality contains a water quality management framework that could be useful in implementing this policy. It includes a requirement for the identification of 'environmental values', which are particular values or uses of the environment (such as aquatic ecosystems, recreation, aesthetics, cultural and spiritual) that require protection from the effects of contaminants and inappropriate land management practices.

Associated with each environmental value are guidelines or 'trigger values' for substances that might potentially impair water quality (such as nutrients, sediments and pollutants). These are recommended numerical concentration levels or descriptive statements that will support and maintain the designated environmental value of a particular water body. If trigger values are exceeded there should be further investigation or some form of management response.

In respect of other areas of coastal water, as noted earlier, Objective 1 requires that water quality is maintained. This will require baseline analysis, an understanding of any trends in water quality, and knowledge of the activities that impact on water quality. It will also be necessary to ensure that the background information used to inform the plan provisions recognises that water bodies are interlinked and that coastal water quality is determined by activities and discharges further up the catchment.

Reducing sedimentation

Policy 22 addresses sedimentation in the coastal environment as outlined below. It requires that subdivision, use or development will not result in a significant increase in sedimentation in the coastal marine area, or other coastal water. It also requires sediment loadings in runoff and in stormwater systems to be reduced through controls on land use activities.

1. Assess and monitor sedimentation levels and impacts on the coastal environment.
2. Require that subdivision, use, or development will not result in a significant increase in sedimentation in the coastal marine area, or other coastal water.
3. Control the impacts of vegetation removal on sedimentation including the impacts of harvesting plantation forestry.
4. Reduce sediment loadings in runoff and in stormwater systems through controls on land use activities.

Figure 5.10 NZCPS Policy 22 'Sedimentation'

Changes in sediment regimes (such as turbidity and sedimentation rates), either as a result of land-based or coastal activities, have been identified as one of the most serious threats to the integrity of New Zealand's estuarine and coastal ecosystems.¹³ Therefore this policy is highly relevant to biodiversity.

A number of New Zealand studies have investigated the relationship between vegetation cover and erosion. Compared to pastoral farming, the presence of closed canopy forest significantly reduces the degree of erosion (especially landslides) during large storm events.¹⁴ It has also been shown that streams draining native forest have lower suspended sediment loads, water temperatures, nutrient concentrations and higher water clarities, than those draining pine forest and pasture.¹⁵

The fate of suspended sediments on arriving in the marine environment depends on the coastal geomorphology. In many regions of New Zealand, estuaries and tidal lagoons act as giant sediment traps, and are especially vulnerable to sedimentation and its associated environmental and ecological effects. On more exposed coasts, where rivers discharge directly into the open

sea, the suspended sediment is transported directly out onto the continental shelf, and may be dispersed over large areas.



Figure 5.11 Sediment plume at the end of a river (*Raewyn Peart*)

Sedimentation effects may be direct on the species themselves, and include: clogging of the gills of filter feeders such as cockles, pipi and scallops; decreases in filtering efficiencies; reductions in settlement success and survival of larval and juvenile phases for species such as paua and kina; and reductions in the foraging abilities of finfish such as juvenile snapper.¹⁶ Indirect effects include the modification or loss of important nursery habitats, especially those composed of habitat-forming species such as green-lipped and horse mussel beds, seagrass meadows, bryozoan and tubeworm mounds, sponge gardens and kelps or seaweeds.¹⁷

This policy is reasonably specific in terms of the actions required by local authorities. It could be implemented in a number of ways including:¹⁸

- Acknowledging that the management of sedimentation cannot be left to individual resource consents as it is difficult, if not impossible, to deal with cumulative effects on a case-by-case basis
- Reviewing sedimentation issues ‘from top-of-catchment to harbour’ analysing sediment yield from all sources including stream banks, coastal erosion, stormwater discharges and individual earthworks sites
- Projecting likely sediment yields based on future urban development

- Assessing likely effects of current and projected future sediment levels on coastal ecosystems
- Considering whether current planning controls for earthworks and other sediment-generating activities, such as forestry harvesting, are adequate
- Considering whether there are particular erosion sensitive sites in a catchment which need more careful management and rigorous controls
- Adopting appropriate management measures through provisions in regional policy statements, regional plans, district plans and through conditions attached to resource consents

Restoring natural character

Policy 14 deals with the restoration of natural character in the coastal environment as outlined below.

Promote restoration or rehabilitation of the natural character of the coastal environment, including by:

- a. identifying areas and opportunities for restoration or rehabilitation;
- b. providing policies, rules and other methods directed at restoration or rehabilitation in regional policy statements, and plans; and
- c. where practicable, imposing or reviewing restoration or rehabilitation conditions on resource consents and designations, including for the continuation of activities; and recognising that where degraded areas of the coastal environment require restoration or rehabilitation, possible approaches include:
 - i. restoring indigenous habitats and ecosystems, using local genetic stock where practicable; or
 - ii. encouraging natural regeneration of indigenous species, recognising the need for effective weed and animal pest management; or
 - iii. creating or enhancing habitat for indigenous species; or
 - iv. rehabilitating dunes and other natural coastal features or processes, including saline wetlands and intertidal saltmarsh; or
 - v. restoring and protecting riparian and intertidal margins; or
 - vi. reducing or eliminating discharges of contaminants; or
 - vii. removing redundant structures and materials that have been assessed to have minimal heritage or amenity values and when the removal is authorised by required permits, including an archaeological authority under the Historic Places Act 1993; or
 - viii. restoring cultural landscape features; or
 - ix. redesign of structures that interfere with ecosystem processes; or
 - x. decommissioning or restoring historic landfill and other contaminated sites which are, or have the potential to, leach material into the coastal marine area.

Figure 5.12 NZCPS 2010 Policy 14 'Restoration of natural character'

The terms ‘restoration’ and ‘rehabilitation’ are not defined in the NZCPS 2010 or the RMA. Mechanisms that could be adopted by councils to achieve the Policy include:

- Identifying areas and opportunities for restoration or rehabilitation on the relevant planning maps. This provides a guide to prospective developers as to where there are opportunities to potentially offset adverse effects and achieve a net environmental gain
- Providing policies, rules and other methods directed at restoration or rehabilitation in regional policy statements and regional or district plans. Other methods could include the provision of rates relief where a landowner restores or rehabilitates the natural character of identified areas of the coastal environment
- Where practicable imposing or reviewing restoration or rehabilitation conditions on resource consents and designations, including for the continuation of activities
- Where practicable providing that indigenous habitats and ecosystems are to be restored using local genetic stock



Figure 5.13 Replanting of dune areas help restore the coastal environment (*Raewyn Peart*)

The case law indicates that ‘practicable’ means ‘feasible or able to be accomplished’.¹⁹ In this context it probably means wherever the local authority

has the legal and practical opportunity to impose or review conditions to require restoration or rehabilitation. However, restoration should not be used as a mechanism to obtain consent for something that has other significant impacts such as development affecting outstanding natural coastal landscapes.

References and further reading

Coles R C and M Fortes, 2001, 'Protecting seagrass – approaches and methods', in F T Short and R G Coles (eds), *Global Seagrass research methods*, Elsevier, Amsterdam, 445–463

Folke C, S Carpenter, B Walker, M Scheffer, T Elmqvist, L Gunderson and C S Holling, 2004, 'Regime shifts, resilience, and biodiversity in ecosystem management', *Annual Review of Ecology, Evolution, and Systematics*, 35, 557–581

Inglis G, 2003, 'The seagrasses of New Zealand', in E P Green and F T Short (eds), *World atlas of seagrasses*, University of California Press, Berkeley

Jones H, 2008, *Coastal sedimentation: What we know and the information gaps*, Environment Waikato, Hamilton

Karr J R and D R Dudley, 1981, 'Ecological perspectives on water quality goals', *Environmental Management*, 5, 55–68

Lawrie A, 2006, *Tauranga harbour integrated management strategy*, Environment Bay of Plenty, Whakatane

Ministry for the Environment, 1997, *The state of New Zealand's environment*, Ministry for the Environment, Wellington

Morrison M A, M L Lowe, D M Parsons, N R Usmar and I M McLeod, 2009, 'A review of land-based effects on coastal fisheries and supporting biodiversity in New Zealand', *New Zealand Aquatic Environment and Biodiversity Report No. 37*

Quinn J M and M J Stroud, 2002, 'Water quality and sediment and nutrient export from New Zealand hill-land catchments of contrasting land use', *New Zealand Journal of Marine and Freshwater Research*, 36 (2), 409–429

Walker B H, C S Holling, S R Carpenter and A S Kinzig, 2004, 'Resilience, adaptability and trans- formability in social-ecological systems', *Ecology and Society*, 9(2), 5

Endnotes

- 1 *Northland Regional Planning Authority v Whangarei County* (1977) A4828 (TCPAB). The definition has been applied in *Wilkinson v Hurunui DC EnvC C050/00*. See also *Dudin v Whangarei DC EnvC A022/07*.
- 2 *Northland Regional Planning Authority v Whangarei County* (1977) A4828 (TCPAB)
- 3 *Kaupokonui Beach Soc Inc v South Taranaki DC EnvC W030/08*
- 4 This reflects the position in the case law, see *Coutanche v Rodney DC W094/93* (PT)
- 5 Karr J R and D R Dudley, 1981
- 6 Walker B H et al, 2004
- 7 Folke C et al, 2004
- 8 *Marlborough District Council v Southern Oceans Food Ltd* [1995] NZRMA 220, page 11
- 9 Jones H, 2008
- 10 *Auckland City Council v Logan* unreported, HC Auckland, AP77/99, 1 October 1999
- 11 Coles R C and M Fortes, 2001
- 12 *Duncan v Wanganui District* (1992) 2 NZRMA 101, page 4
- 13 Ministry for the Environment, 1997
- 14 Jones H, 2008
- 15 Quinn J M and M J Stroud, 2002
- 16 Morrison M A et al , 2009
- 17 Morrison M A et al, 2009
- 18 Lawrie A, 2006
- 19 *Union Steam Ship Company of New Zealand Ltd v Wenlock* [1959] NZLR 173



Rural New Zealand (*Raewyn Peart*)

six

Incorporating biodiversity protection into local government plans

Local government plans are an important tool for addressing protection and enhancement of biodiversity, particularly for that located on privately-owned land. These include policy statements and plans prepared under the RMA and plans prepared under the Local Government Act. This chapter is intended to provide guidance for community members and landowners interested in being involved in the preparation and review of local government plans. It is also provided for councils who are keen to ensure that biodiversity is adequately protected within their plans.

The chapter first identifies some general considerations which apply to all RMA plans and then identifies specific issues for each type of plan prepared by councils.

General considerations for RMA plans

The 'Quality Planning Guidance Note on Indigenous Biodiversity' (available at <http://www.qualityplanning.org.nz/plan-topics/indigenous-biodiversity.php>) outlines a number of important priorities that should be considered when preparing objectives, policies, rules and methods that are related to biodiversity protection. In particular, councils need to be aware of what the priorities are for indigenous biodiversity within their region. Key points to inform plan preparation are set out below.¹

Matters for councils to consider when preparing objectives, policies and rules:

- Actual outcomes of current policy and the gaps in policy when compared with the council's aims
- Extent and condition of the indigenous biodiversity remaining within the region or district
- Actual and potential threats and other issues affecting that biodiversity
- Opportunities for preventing biodiversity loss and promoting its recovery where it has been damaged
- Likely future patterns in land use and other economic activity, and how these patterns and activity may affect biodiversity values within the life cycle of the policy
- National policies and other guidance about national priorities
- Underlying level of community understanding and support for indigenous biodiversity

Matters for councils to consider in plan implementation:

- Developing plans in consultation with consents staff to help ensure the provisions can be effectively implemented
- Preparing a plan implementation strategy
- 'Field-testing' policies

- Developing guidelines and training for consents and enforcement staff
- Developing a formal checklist for planners to help them identify matters that need to be addressed for different types of applications and in different environments
- Developing consent condition templates designed to address different types of habitat and activity
- Forming or joining regional (and district) biodiversity forums to share information and ideas

Figure 6.1 Matters for councils to consider when preparing plans

Section 6(c) of the RMA imparts an obligation on local authorities to recognise and provide for the protection of areas of ‘significant indigenous vegetation and significant habitats of indigenous fauna’ in RMA plans.² Setting criteria for identifying and protecting significant natural areas and habitats is discussed in Chapter 4.

Regional policy statements

The following provides a checklist for possible contents of a regional policy statement related to biodiversity protection:

- ✓ Are all the key biodiversity issues and threats within the region and within the scope of regional policy statement included?
- ✓ Do the provisions give effect to all relevant national policy statements?
- ✓ Have areas of indigenous vegetation and habitats that are regionally significant been identified (including those in the terrestrial, freshwater, coastal and marine habitats?)
- ✓ Have the main threats to the ecological health of these areas been identified?
- ✓ Are there objectives related to all the key values, habitats and species?
- ✓ Is clear direction given for formulating regional and district plan objectives, policies and rules to protect biodiversity?
- ✓ Do the policies and methods provide for adequate management of the main threats to biodiversity?
- ✓ Are priority areas for restoration identified?
- ✓ Are the different roles of the regional council and the territorial authorities for biodiversity protection clearly defined?
- ✓ Is an integrated approach adopted which addresses terrestrial, freshwater, coastal and marine biodiversity on a catchment basis?
- ✓ Does it provide for a range of methods (excluding rules)?

- ✓ Is a monitoring programme identified and is it adequate to identify the health and extent of areas of indigenous vegetation, significant habitats, indigenous ecosystems and threatened species and changes to their status?

Regional plans

The following provides a checklist for possible contents of a regional plan related to biodiversity protection:

- ✓ Are all the key biodiversity issues and threats related to the scope of the plan included (for example, does a freshwater plan cover effects of land use activities and effects of channelisation and gravel removal, as well as water takes and point source discharges)?
- ✓ Are all the values effectively mapped?
- ✓ Are there objectives related to all the key values, habitats and species?
- ✓ Are there clear limits on uses that will achieve those objectives (such as limits on water takes, discharges and vegetation clearance)?
- ✓ Do the limits have teeth (for example, breaching them is a prohibited activity)?
- ✓ Are the methods included the best ones to achieve the objectives? Will they be effective?
- ✓ What activities are permitted? Could those activities be contrary to the objectives?
- ✓ What consents are required and do decision-makers have sufficient discretion to address impacts on biodiversity? Can a consent be declined or only conditions placed on it?
- ✓ Are the rules sufficiently tight to ensure that the objectives can be met, taking into account any activities which are likely to be permitted or consented under the plan?
- ✓ Has an integrated approach applying to the whole catchment and marine area been adopted?
- ✓ Are a range of statutory and non-statutory methods provided for, including provision for financial incentives and support for landowners and voluntary community groups restoring biodiversity?
- ✓ Has a monitoring programme been defined and is it adequate to identify the health and extent of areas of indigenous vegetation, significant habitats, indigenous ecosystems and threatened species, including those in freshwater and the marine area, and changes to their status?

Example: Greater Wellington Regional Freshwater Plan

The Greater Wellington Regional Council has rules to protect wetlands in its regional freshwater plan. These include requiring a water permit for a non-complying activity to divert water from any wetland that has a high degree of natural character; requiring land use consent for a non-complying activity to reclaim the bed of any wetland with a high degree of natural character; and requiring a discharge permit for a non-complying activity for the discharge of water or contaminants into a wetland with a high degree of natural character.

Regional coastal plans

The following provides a checklist for possible contents of a regional coastal plan related to biodiversity protection:

- ✓ Is the landward extent of the coastal environment identified on maps?
- ✓ Does the plan direct major uses to the most appropriate locations within the coastal area, or to locations outside the coastal environment?
- ✓ Are all the key biodiversity issues and threats related to the scope of the plan included?
- ✓ Are all the values effectively mapped?
- ✓ Are areas of coastal indigenous vegetation and significant coastal habitats that are regionally significant spatially identified?
- ✓ Are there objectives related to all the key values, habitats and species?
- ✓ Are there clear limits on uses that will achieve those objectives (such as catchment-based limits on discharges of sediment into the marine area)?
- ✓ Do the limits have teeth (for example, breaching them is a prohibited activity)?
- ✓ Are the methods included the best ones to achieve the objectives? Will they be effective?
- ✓ What activities are permitted? Could those activities be contrary to the objectives?
- ✓ What consents are required and do decision-makers have sufficient discretion to address impacts on coastal biodiversity? Can they decline a consent or only put conditions on it?
- ✓ Are the rules sufficiently tight to ensure that the objectives can be met, taking into account any activities which are likely to be permitted or consented under the plan?
- ✓ Is the approach consistent with other regional plans (such as freshwater)?

- ✓Has an integrated approach to managing biodiversity across the land-marine boundary been adopted?
- ✓Are a range of statutory and non-statutory methods promoted, including establishment and support for beach and coast care groups?
- ✓Has a coastal biodiversity monitoring programme been defined and is it adequate to monitor the health and extent of areas of coastal indigenous vegetation, significant habitats, indigenous ecosystems and threatened species and changes to their status?

Example: Bay of Plenty Regional Coastal Environment Plan

The Bay of Plenty Regional Council has used the identification of special zones to protect areas of importance to biodiversity preservation. The Coastal Habitat Preservation Zone in the Bay of Plenty Regional Coastal Environment Plan includes intertidal vegetation and marsh bird habitats that are of international, national and regional significance.



Figure 6.2 Estuary environments need to be protected by appropriate provisions in a regional coastal plan (*Raewyn Peart*)

District plans

The following provides a checklist for possible contents of a district plan related to biodiversity protection:

- ✓ Are all the key biodiversity issues and threats related to the scope of plan included?
- ✓ Is the approach consistent with relevant regional plans?
- ✓ Are all the values effectively mapped?
- ✓ Are areas of coastal indigenous vegetation and significant coastal habitats that are significant within the district spatially identified?
- ✓ Are there objectives related to all the key values, habitats and species?
- ✓ Are there clear limits on uses that will achieve those objectives (such as limits on vegetation clearance)?
- ✓ Do the limits have teeth (for example, breaching them is a prohibited activity)?
- ✓ Are the methods included the best ones to achieve the objectives? Will they be effective?
- ✓ What activities are permitted? Could those activities be contrary to the objectives?
- ✓ What consents are required and do decision-makers have sufficient discretion to address impacts on biodiversity? Can a consent be declined or only conditions placed on it?
- ✓ Are the rules sufficiently tight to ensure that the objectives can be met, taking into account any activities which are likely to be permitted or consented under the plan?
- ✓ Have all the issues that are relevant to biodiversity in the district been incorporated (such as bird strike, lights, pets in subdivisions, disturbance of wildlife and ditch clearance)?
- ✓ Are a range of statutory and non-statutory methods provided for, including provision for financial incentives and support for landowners and voluntary community groups restoring biodiversity?
- ✓ Has a monitoring programme been defined and is it adequate to identify the health and extent of areas of indigenous vegetation, significant habitats, indigenous ecosystems and threatened species and changes to their status?

Example: Central Otago District Plan

In recognition of the significant areas of freshwater within the Central Otago district, the Central Otago District Plan includes areas identified as a 'Water Surface and Margin Resource Area'.³ These are then subject to special provisions and rules. This special zoning has allowed the council to identify these areas as distinct from the general rural areas and promotes integrated management between the adjacent land and the water. This district plan also provides an exemption from its rule governing vegetation clearance within 10 metres of a waterway to permit the removal of any undesirable weeds or plants.

Long term council community and annual plans

The Local Government Act requires councils to prepare Long Term Council Community Plans (LTCCPs) every three years. The intention of these plans is to state a particular community's long term goals and priorities and to set some key performance targets. Each LTCCP should describe a council's financial strategy; outlining how much the council's plan will cost and how it will be paid for. More focused community outcomes are also identified in the LTCCPs. The community outcomes within each LTCCP generally identify particular concerns for that community, such as a desire for cleaner water or for more reserves and parks. These particular outcomes are then used by each council, as well as other organisations and agencies, to guide their planning and activities for the coming years.

Local authorities consult widely with their community when writing their LTCCPs. It is the main opportunity for people to have their say in local decision-making. These plans are important for delivering non-regulatory protection of biodiversity as they allocate resources to protection and restoration projects. They can also assist in regulatory protection by identifying the key biodiversity issues to be addressed by regulation and allocating resources for activities such as enforcement and monitoring.

The enactment of the Local Government Act 2002 Amendment Act 2010 changed the statutory basis for the community outcomes process. Community outcomes are now merged with the long-term planning process.

Each council is also required by the Local Government Act to prepare an annual plan in consultation with the community. The annual plan outlines a council's budget for the coming financial year and shows how it will fund certain activities and services within the wider umbrella of its long term plan. These documents essentially provide for integrated decision-making by coordinating the management of all of a council's resources.

The following provides a checklist for possible contents of a LTCCP or annual plan relevant to biodiversity protection:

- ✓ Which sections of the plan affect biodiversity (for example, check the back parts of the document as well as the main activity chapters, particularly for matters such as sale of assets)?
- ✓ Do those sections collectively cover all the key issues for biodiversity in the area? Have specific issues of concern, such as pest management, been identified?
- ✓ Are the objectives the right ones for protecting and restoring biodiversity?
- ✓ Do the activities listed cover everything the council should be involved in?
- ✓ Is the expenditure increasing or decreasing, and is it focused in the right areas? Have sufficient resources been allocated to biodiversity protection and enhancement, including adequate monitoring of progress?
- ✓ Are the right things being measured and are the performance measures the right ones?
- ✓ Will the council structure, membership of council-owned company boards and other governance arrangements work well for protecting and enhancing biodiversity?
- ✓ Are there any proposed asset or land sales, or major changes to how assets are managed, and do these have implications for biodiversity management?
- ✓ Is there provision for landowner and community-led initiatives?
- ✓ Has council recognised the need to protect and manage biodiversity on council-owned land and as a result of its own activities?

Example: Environment Canterbury Annual Plan 2010/11

One of the key issues for the Environment Canterbury 2010/11 annual plan was pests and biodiversity, in particular animal pests threatening biodiversity values. The council has clearly identified a work programme to incorporate pest management across its services including working with communities to develop community-initiated programmes and undertaking property inspections on pest-prone land. Through this process the council has outlined targets and measures for identifying how effective the programme has been, including a target of a decline in the average number of nassella tussock plants per hectare.⁴ The plan also identifies how the council will fund this work.

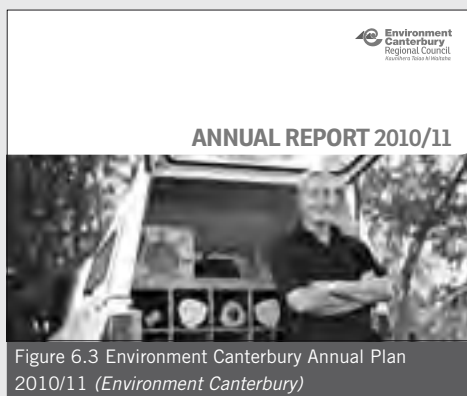


Figure 6.3 Environment Canterbury Annual Plan 2010/11 (*Environment Canterbury*)

References and further reading

Quality Planning Guidance Note on Indigenous Biodiversity, available at <http://www.qualityplanning.org.nz/plan-topics/indigenous-biodiversity.php>

Peart R and P Reaburn, 2011, *Strengthening second generation regional policy statements*, Environmental Defence Society, Auckland

Endnotes

- 1 <http://www.qualityplanning.org.nz/plan-topics/indigenous-biodiversity.php>
- 2 *Minister of Conservation v Western Bay of Plenty District Council* EnvC Auckland A071/2001, 3 August 2001
- 3 http://www.codc.govt.nz/assets/pdfs/DistrictPlan/5_5.pdf
- 4 <http://ecan.govt.nz/publications/Plans/annual-plan-2010-2011-our-contribution-pests-and-biodiversity.pdf>



Dublin Bay Conservation Area
(Crown Copyright: Department of Conservation: Te Papa Atawhai, 2011)

seven

Additional legal mechanisms to protect habitats

Overview

There are a range of legal mechanisms that are available to protect important habitats. On land, areas can be set aside under the Wildlife Act 1953, the Conservation Act 1987, the National Parks Act 1980 and the Reserves Act 1977. Protective mechanisms are also available under the Queen Elizabeth the Second National Trust Act 1977, the Forests Act 1949 and the Crown Pastoral Land Act 1998.

In the marine area, habitats can be protected under the Marine Reserves Act 1971 and the Fisheries Act 1996, amongst other legislation. Government has developed the ‘marine protected areas policy and implementation plan’ in an attempt to provide a cohesive policy framework for the myriad of marine spatial management tools currently available.

The key elements of these legislative instruments are summarised in Figure 7.1. Additional legal mechanisms to protect species are discussed in further detail in Chapter 8. There are many biodiversity protection mechanisms and tools offered by these pieces of legislation; these are discussed in further detail in Part Two of this Guide where they relate to specific habitats.

Legislation	Administered by	Key elements
Protection of habitats on crown-owned land		
Conservation Act 1987	Department of Conservation	<ul style="list-style-type: none"> • Establishment of conservation areas • Preparation of statements of general policy, conservation management strategies and conservation management plans • Creation of marginal strips on sale or disposition of Crown land • Granting of concessions in conservation areas • Management of indigenous freshwater fisheries, including the whitebait fishery
National Parks Act 1980	Department of Conservation	<ul style="list-style-type: none"> • Establishment and management of national parks
Crown Pastoral Land Act 1998	Land Information New Zealand	<ul style="list-style-type: none"> • Control of activities on high country leasehold land • Tenure review and transfer of land into freehold and conservation land, including provision for protective mechanisms on freeheld land
Reserves Act 1977	Department of Conservation	<ul style="list-style-type: none"> • Establishment and management of land-based reserves

Protection of habitats in the marine area		
Marine Reserves Act 1971	Department of Conservation	<ul style="list-style-type: none"> • Establishment of marine reserves
Fisheries Act 1996	Ministry for Primary Industries	<ul style="list-style-type: none"> • Management of the utilisation of marine life • Implementation of sustainability measures including restricting fishing activity in specific areas
Marine Protected Areas Policy and Implementation Plan 2006	Department of Conservation and Ministry for Primary Industries	<ul style="list-style-type: none"> • Identification and creation of a comprehensive and representative network of marine protected areas
Protection Of Habitats On Private Land		
Reserves Act 1977	Department of Conservation	<ul style="list-style-type: none"> • Conservation covenants
Conservation Act 1987	Department of Conservation	<ul style="list-style-type: none"> • Management agreements
Queen Elizabeth the Second National Trust Act 1977	Queen Elizabeth the Second National Trust	<ul style="list-style-type: none"> • Creation and administration of open space covenants on privately-owned land
Resource Management Act 1991	Local government	<ul style="list-style-type: none"> • Protective provisions in plans • Creation of esplanade reserves and strips • Financial contributions • Environmental compensation
Local Government Act 2002	Local government	<ul style="list-style-type: none"> • Development contributions
Overseas Investment Act 2005	Overseas Investment Office	<ul style="list-style-type: none"> • Consideration of whether there will be adequate mechanisms in place for protecting or enhancing existing areas during sale of New Zealand land to overseas investors
Forests Act 1949	Ministry for Primary Industries	<ul style="list-style-type: none"> • Control of logging, milling and export of indigenous timber • Providing standards for sustainable logging • Granting sustainable forest management plans and permits

Figure 7.1 Summary of legal mechanisms to protect habitats

Protection of habitats on Crown-owned land

Conservation Act 1987

The purpose of the Conservation Act, as expressed in its long title, is ‘to promote the conservation of New Zealand’s natural and historic resources, and for that purpose to establish a Department of Conservation’. As well as establishing the Department of Conservation, the legislation provides for the creation of conservation areas. These are areas of Crown-owned land which are declared to be held for ‘conservation purposes’ (section 7).

Conservation areas may be given specific protection requirements through their designation as a conservation park, wilderness area, ecological area, sanctuary area, amenity area, or wildlife management area. Land which is adjacent to a waterbody, which is subject to a water conservation order or which has outstanding wild, scenic, or other natural or recreational characteristics, can be held for the purpose of a watercourse area. The management requirements attached to each of these designations is shown in Figure 7.2.

Protection status	Management requirements
Conservation park	<ul style="list-style-type: none"> Natural and historic resources to be protected Subject to the above, public recreation and enjoyment to be facilitated
Wilderness area	<ul style="list-style-type: none"> Indigenous natural resources to be preserved No building or machinery to be erected No building, machinery or apparatus to be constructed or maintained No livestock, vehicles or aircraft to be taken onto or used No roads, tracks or trails to be constructed
Ecological area	<ul style="list-style-type: none"> Protect the value for which it is held
Sanctuary area	<ul style="list-style-type: none"> Preserve the indigenous plants and animals in their natural state for their scientific or similar purpose
Amenity area	<ul style="list-style-type: none"> Protect its indigenous natural resources and its historic resources Subject to the above, to contribute to and facilitate people’s appreciation of its indigenous natural resources and its historic resources Subject to all of the above, to foster the recreational attributes of the area
Wildlife management area	<ul style="list-style-type: none"> Protect its wildlife (meaning any native animal) and wildlife habitat values (including the capacity for the movement of wildlife, genetic material of indigenous plants, and genetic material of wildlife) Protect its indigenous natural resources and its historic resources

Watercourse area	<ul style="list-style-type: none"> • Protect the wild, scenic, and other natural or recreational characteristics that it has when considered with the river, lake or stream concerned • Management to be coordinated, so far as is practicable, co-ordinated with the administration and management of other watercourse areas
------------------	--

Figure 7.2 Protection status categories for conservation areas

The Conservation Act sets out how conservation areas are to be managed. This must be in accordance with statements of general policy, conservation management strategies, conservation management plans and freshwater fisheries management plans prepared under the same legislation (section 17A). In addition, an area which has a specific designation, as described above, must be managed in accordance with that designation. Every conservation area will be subject to a conservation management strategy and may have a conservation management plan in place.

Each of the conservancy offices hold copies of draft or final versions of local conservation management strategies, and they can also be viewed at public libraries. More information on conservation management strategies can be found at <http://www.doc.govt.nz/about-doc/role/policies-and-plans/conservation-management-strategies-and-plans/>.

The Minister of Conservation can grant concessions for activities undertaken in conservation areas under the Conservation Act. These often provide for eco-tourism activities or sports events. Any person may apply for such a concession. Applications for concessions lasting more than ten years must be publicly notified and members of the public can make submissions on them.

Activities within conservation areas can impact on the biodiversity living there, and this means that the grant of concessions needs to be managed carefully to ensure that biodiversity values of the areas are maintained. The

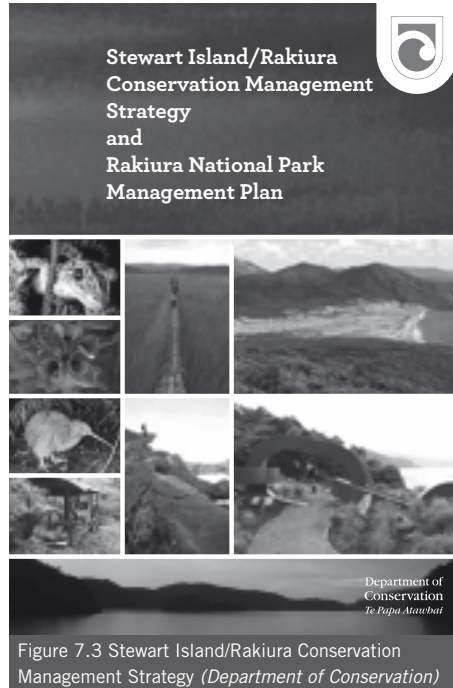


Figure 7.3 Stewart Island/Rakiura Conservation Management Strategy (Department of Conservation)

Minister is required to consider a range of factors when deciding whether or not to grant the concession (section 17U) which include:

- The effects (positive and adverse) of the activity, structure, or facility
- Any measures that can reasonably and practicably be undertaken to avoid, remedy, or mitigate any adverse effects of the activity
- Any relevant environmental impact assessment, including any audit or review
- Any relevant oral or written submissions received

Every year the Department of Conservation receives numerous applications for concessions. For example, during the year ended 30 June 2008 the Department received 1381 applications and 690 applications were approved during the same period. As at 30 June 2009, 4675 concessions for activities in conservation areas were held. These are distributed around the country with the Otago conservancy having the most (961) followed by the West Coast (655) and Canterbury (500). The concessions have been granted for a range of activities with grazing being the most common (871), followed by access (696) and guiding (634).¹

Marginal strips are established under the Conservation Act (section 24) to protect areas adjacent to water bodies and to enable appropriate public access to these areas. These are usually 20 metre-wide riparian areas which extend along and abut the landward margin of the foreshore, the normal level of the bed of any lake not subject to control by artificial means, or the bed of any river or any stream which has an average width of three metres or more. Marginal strips must be reserved from the sale or other disposition of Crown land.

National Parks Act 1980

The purpose of the National Parks Act is 'preserving in perpetuity as national parks, for their intrinsic worth and for the benefit, use, and enjoyment of the public, areas of New Zealand that contain scenery of such distinctive quality, ecological systems, or natural features so beautiful, unique, or scientifically important that their preservation is in the national interest' (section 4(1)).

New Zealand currently has 14 national parks throughout the country and these include some of New Zealand's most iconic protected areas. The Act sets out principles to be applied to the management of national parks in section 4, and these include achieving the purpose as set out above, preserving the parks 'as far as possible in their natural state', and exterminating introduced plants and animals as far as possible. Subject to the management principles, the public are to 'have freedom of entry and access to the parks, so that they may receive in full measure the inspiration, enjoyment, recreation, and other benefits that may

be derived from mountains, forests, sounds, seacoasts, lakes, rivers, and other natural features' (section 4(2)(e)).



Figure 7.4 Mount Cook National Park is one of 14 national parks around New Zealand (*Raewyn Peart*).

As well as providing an invaluable resource for biodiversity protection, national parks underpin New Zealand's international tourism industry. About a third of international tourists visit at least one national park during their time in New Zealand. During 2008, 441,200 international tourists visited the Fiordland national park (the most popular), with 379,300 visiting Westland national park and 201,800 visiting Aoraki/Mount Cook national park.²

Reserves Act 1977

Protected areas called 'reserves' can be established under the Reserves Act. Reserve land is categorised on the basis of its primary purpose as either recreation, historic, scenic, nature, scientific, government purpose or local purpose reserves. Each reserve which is vested in, or controlled and managed by, an administering body such as a local authority is required to have a reserve management plan and to be managed in accordance with the purpose for which it is classified.

Type	Primary purpose
Recreation	<ul style="list-style-type: none"> • Providing areas for the recreation and sporting activities and the physical welfare and enjoyment of the public, and for the protection of the natural environment and beauty of the countryside, with emphasis on the retention of open spaces and on outdoor recreational activities, including recreational tracks in the countryside
Historic	<ul style="list-style-type: none"> • Protecting and preserving in perpetuity such places, objects, and natural features, and such things thereon or therein contained as are of historic, archaeological, cultural, educational, and other special interest
Scenic	<ul style="list-style-type: none"> • Protecting and preserving in perpetuity for their intrinsic worth and for the benefit, enjoyment, and use of the public, suitable areas possessing such qualities of scenic interest, beauty, or natural features or landscape that their protection and preservation are desirable in the public interest; or • Providing, in appropriate circumstances, suitable areas which by development and the introduction of flora, whether indigenous or exotic, will become of such scenic interest or beauty that their development, protection, and preservation are desirable in the public interest
Nature	<ul style="list-style-type: none"> • Protecting and preserving in perpetuity indigenous flora or fauna or natural features that are of such rarity, scientific interest or importance, or so unique that their protection and preservation are in the public interest
Scientific	<ul style="list-style-type: none"> • Protecting and preserving in perpetuity for scientific study, research, education, and the benefit of the country, ecological associations, plant or animal communities, types of soil, geomorphological phenomena, and like matters of special interest
Government purpose	<ul style="list-style-type: none"> • Providing and retaining areas for such Government purpose or purposes as are specified in any classification of the reserve
Local purpose	<ul style="list-style-type: none"> • Providing and retaining areas for such local purpose or purposes as are specified in any classification of the reserve.

Figure 7.5 Classification of reserves under the Reserves Act

Crown Pastoral Land Act 1998

There are three main types of land tenure in the high country that are relevant to biodiversity management, being:

- *Public conservation land* – land owned by the Crown, and managed and administered by the Department of Conservation on behalf of the public.
- *Private land* – private rural land is normally held in freehold title. Freeholding removes the need for Crown consent for a range of land management activities.

- *Crown leasehold land* – the Crown purchased much of the South Island high country from Ngāi Tahu during the 1840s and 1850s.³ Under the Land Act 1948, the Crown retained ownership of the land, with farmers being granted 33-year perpetually renewable pastoral leases. There are also Pastoral Occupation Licences and Special Leases with no right of renewal and the legislative provisions are subtly different for each of these.



Figure 7.6 Indigenous grasslands of the high country (Raewyn Peart)

The concept behind the Crown leasehold approach is that the lessee (farmer) has long-term certainty of tenure, but that the government can place conditions on the use of these fragile lands. As of December 2008, there were approximately 1.7 million hectares of high country in pastoral leasehold tenure. Lessees also require the Crown Commissioner's consent to undertake a range of activities on the land including burning any part of the land, planting any trees or felling any bush or scrub.

During the 1990s, a process commenced to review some of the high country leases. This resulted in farmers obtaining freehold title over part of the land, with the remainder being incorporated into the conservation estate and managed by the Department of Conservation. The process was formalised under the Crown Pastoral Land Act.

To date, one of the main outcomes of the tenure review process has been that the relatively productive lower altitude terraces, fans and basins have been placed in freehold ownership, while the colder, steeper, higher altitude tussock

grasslands have become public conservation land.⁴ As of September 2006, the Crown retained 18 per cent of reviewed land below 800 metres in altitude, and 82 per cent of land above 1000 metres. This indicates that the opportunity to preserve entire altitudinal sequences has generally not been taken, making it more difficult to preserve biodiversity within these high country grassland ecosystems. This is discussed further in Chapter 14.

Protection of habitats in the marine area

Marine Reserves Act 1971

The Marine Reserves Act, administered by the Department of Conservation, provides for the establishment of marine reserves. The long title states that it is an ‘Act to provide for the setting up and management of areas of the sea and foreshore as marine reserves for the purpose of preserving them in their natural state as the habitat of marine life for scientific study’. The Marine Reserves Act applies only to the territorial sea (12 nautical miles from the mean high water mark), and thus marine reserves cannot be established beyond this in the EEZ.



Figure 7.7 Tawharanui Marine Reserve in Auckland is protected under the Marine Reserves Act (Raewyn Peart)

Marine reserves are preserved in their ‘natural’ state, to the extent possible. Although the purpose of marine reserves under the Marine Reserves Act is

for 'scientific study', the establishment of highly protected areas can provide considerable benefits for biodiversity. This is because, with extractive activities such as fishing excluded, targeted species can regenerate and ecosystems can be brought back into balance.

The reserves that have been established under the Act range in size from 2.5 to 7,450 square kilometres, and in total protect 7.6 per cent of New Zealand's territorial sea. However, the vast majority of marine reserves are very small areas which are not networked in any meaningful manner. Large areas of coastal waters, including much of the east coast of the South Island and west coast of the North Island, have no marine reserves. In addition, 99 per cent of the reserve coverage relates to two reserves around the offshore island groups of the Kermadec and Auckland Islands.

A list of current and proposed marine reserves, and information about them, can be found at <http://www.doc.govt.nz/conservation/marine-and-coastal/marine-protected-areas/marine-reserve-information/>. It is widely accepted that the Marine Reserves Act is outdated and needs reform. A Marine Reserves Bill has been before Parliament since 2002. Amongst the changes proposed are updating the purpose of the legislation to refer to biodiversity protection and extending its jurisdiction to include the EEZ. Further information on marine reserves can be found in the EDS publication 'Safeguarding Our Oceans: Strengthening Marine Protection in New Zealand'.

Fisheries Act 1996

The Ministry for Primary Industries administers the Fisheries Act, which has the purpose 'to provide for the utilisation of fisheries resources while ensuring sustainability' (section 8(1)). 'Utilisation' is defined in the Act as having a wide meaning including conservation. 'Fisheries resources' also has a very wide meaning. Provision for the conservation and enhancement of groups or species of marine plants, animals and seabirds is an integral part of the purpose of the Fisheries Act, as is provision for their use and development, to the extent that this enables people to provide for their wellbeing.

Under the Fisheries Act, the Minister for Primary Industries can impose sustainability measures and this can include closing some areas to specified types of fishing activity, after taking into account the effects of fishing on any stock and the aquatic environment. Numerous area-based restrictions have historically been placed on fishing activities, particularly in harbours and coastal areas. Many of these were not originally intended to provide marine biodiversity benefits, but were put in place to deal with issues such as conflicts between recreational and commercial fishers. They may, however, in practice result in improvements in biodiversity.



Figure 7.8 A family enjoying some recreational fishing from the beach (Raewyn Peart)

Marine Protected Areas Policy and Implementation Plan 2006

In 2006 the Department of Conservation and the then Ministry of Fisheries jointly published the Marine Protected Areas Policy and Implementation Plan (MPA Policy). This was intended to give effect to the obligation set out in the Biodiversity Strategy, which required a plan to be developed and implemented in order to establish a network of areas to protect New Zealand's marine biodiversity.⁵

The MPA Policy has no legislative status. Its objective is to 'Protect marine biodiversity by establishing a network of MPAs that is comprehensive and representative of New Zealand's marine habitats and ecosystems.'⁶ This network is intended to protect representative examples of all marine habitats and ecosystems, as well as outstanding, rare, distinctive or internationally or nationally important areas.

The identification of inshore marine protected areas for inclusion in the network was to be undertaken by 14 regional stakeholder groups, which are called Marine Protection Planning Forums. To date, two forums, in the Subantarctic Islands and on the west coast of the South Island, have been formed and completed their work, but the establishment of new forums has been put on hold. Planning for offshore areas (the EEZ) was intended to commence in 2013 at a national level with an expert panel.



Figure 7.9 West Coast Subantarctic Islands (Crown Copyright: Department of Conservation: Te Papa Atawhai, 1989)

Protection of habitats on private land

Voluntary protection

There are a range of voluntary protection mechanisms available to private landowners. A landowner can sell or gift land to a variety of agencies, organisations or trusts for biodiversity protection purposes. An area which is bought or gifted under the Reserves Act will be given a reserve classification.

Management agreements can be entered into by the Department of Conservation and a landholder providing for the conservation of natural or historic resources on private land (section 29 of the Conservation Act). They are not registered against the title and do not bind future owners. They are often used as temporary arrangements preceding a covenant or other protection mechanism.

Landowners may apply to the Minister of Conservation for their land to be declared 'protected private land'. The Minister must be satisfied that the land possesses natural, scientific, scenic, historic, cultural, archaeological, geological or other interests, or indigenous flora or fauna, such that it is desirable to protect the land in the public interest. Unless the agreement specifically provides otherwise, it will be recorded against the title and bind future owners. Once such an agreement is in place the 'offences' contained in the Reserves Act apply to the land as if it was a reserve (section 76 of the Reserves Act).

Covenants

A covenant is a legal agreement between a landholder and a covenanting agency and this can set out how an area's natural values will be protected. This is a legal contract between a landowner and a third party that outlines the way the land will be managed. Entry into such agreements is usually voluntary, but the agreement can be binding in perpetuity if it is included on the property title. Land covenants have grown in popularity in recent years and highlight a very real commitment by many landowners to protect indigenous biodiversity on their land.

The Minister of Conservation, any local authority, or any other approved body, may enter into a covenant with a landowner to provide for the management of that land in a manner that will preserve the natural environment, landscape amenity, wildlife, freshwater life, marine life or historical value. A conservation covenant may be in perpetuity or for a specific term (section 77 of the Reserves Act). Once a conservation covenant is in place the 'offences' contained in the Reserves Act apply to the land as if it was a reserve (section 76 of the Reserves Act).

The Queen Elizabeth the Second National Trust Act 1977 has the general function 'to encourage and promote, for the benefit and enjoyment of the present and future generations of the people of New Zealand, the provision, protection, preservation, and enhancement of open space' (section 20(1)). The Act also establishes a National Trust Fund which serves as a recipient of funding from the government and other sources including private donations.



Figure 7.10 Land covenants are a useful tool for protecting important biodiversity values, such as this QEII Trust covenant on land in the Hawkes Bay (*Nathan Hall*)

The main mechanism available to the QEII Trust to achieve its functions is the establishment of open space covenants over private land. Open space covenants are designed to preserve any landscape of aesthetic, cultural, recreational, scenic, scientific, or social interest or value. These have the effect of constraining the uses which may be made of the land which is subject to the covenant, normally excluding activities such as vegetation clearance, subdivision and development. The covenants are registered on the title and bind future land owners in perpetuity. The QEII Trust monitors adherence to the conditions of the covenants.

More than 3400 landowners are protecting over 110,000 hectares of natural and cultural heritage with QEII Trust covenants.⁷ The QEII Trust also owns 29 properties, which collectively protect 1,686 hectares of significant habitat. The properties have mostly been gifted.⁸ In addition to the legal covenant, the QEII Trust offers assistance with fencing costs, survey costs and practical advice. This is discussed in more detail in Chapter 13 and 16.

Rates relief

Local authorities often provide rates relief in order to encourage property owners to protect and preserve open spaces for the benefit and enjoyment of present and future generations. The Local Government (Rating) Act 2002 provides that certain land is non-rateable, including QEII Trust land and land which is owned by a society or association, which is used for conservation purposes and not for private profit, and which is able to be accessed by the general public (section 8). However, targeted rates for water supply, sewage disposal, or refuse collection are payable (section 9).

Example: Dunedin City rates relief for conservation land

In Dunedin, in order to be considered for rates relief, the land must be protected by a binding covenant or appropriate agreement and the conservation of the land must contribute 'to the benefit and enjoyment of citizens of Dunedin by preserving particular natural or historic or cultural features within the district'. The Dunedin City Council has regard to a number of matters when determining rates remission (for example, the desirability of preserving the particular feature and whether the preservation may be prejudicially affected if rates remission is not granted) and it may impose special conditions on a property owner when granting relief.⁹

Protection under the RMA

Protective provisions in plans

The main mechanism through which habitats can be protected under the RMA

is through including provisions in plans which exclude incompatible activities. This is discussed more fully in chapter 4.

Esplanade reserves and strips

The RMA provides for the creation of esplanade reserves in certain situations. The purpose of esplanade reserves is to:

- Protect conservation values (maintaining or enhancing the natural functioning of the adjacent sea, river or lake, or water quality, aquatic habitats, or protecting the natural values associated with the esplanade reserve, or mitigating natural hazards)
- Enable public access to any sea, river or lake
- Enable public recreational use of the esplanade reserve and adjacent sea, river or lake, where the use is compatible with conservation values

When land is subdivided to create an allotment of less than four hectares, an esplanade reserve 20 metres in width must be set aside along the mark of mean high water springs, along the bank of any river or along the margin of any lake,¹⁰ unless a rule in a district plan or a resource consent provides otherwise. Esplanade reserves are subdivided off the adjacent land and ownership vests in the council.



Figure 7.11 Esplanade reserves are essential for providing public access to and along the coastal marine area (Raewyn Peart)

District councils can require, through a rule in a district plan, that an esplanade reserve of a width greater than 20 metres be set aside, or that an esplanade reserve be required when allotments of four hectares or more are created. However, compensation must be paid for the extra land which is taken. Esplanade strips are an alternative mechanism for protecting riparian land on subdivision. They are created by registration of an instrument between the territorial authority and the subdividing owner. They are registered on the title, but the land within the strip remains in the ownership of the land owner.

Financial contributions

The RMA allows a resource consent to be granted on condition of a financial contribution (section 108). A financial contribution includes money, land or a combination of both and may potentially offer biodiversity protection value. However, a consent authority may only require a financial contribution if the plan or proposed plan specifies purposes for which a contribution may be applied and how the level of contribution is to be determined.

Environmental compensation

A resource consent may be granted on condition that services or works are undertaken, including the protection, planting or replanting of any tree or other vegetation or the protection, restoration or enhancement of any natural or physical resource (section 108). This type of condition is a form of 'environmental compensation' and could effectively provide a biodiversity offset. Environmental compensation should provide, so far as possible, a similar area of comparable conservation value to that which is being lost. It should also provide certainty of protection into the future, usually by vesting the conservation area in a local authority, or through protecting it under binding covenants.

Development contributions

Development contributions may be required by a local authority if a development will require the territorial authority to expend funds to provide appropriate reserves, network infrastructure or community infrastructure for the development (section 199 of the Local Government Act). The contribution may be in the form of money, land or both. A contribution may be used to purchase land to be held for conservation purposes or under a conservation covenant.

Other legal mechanisms

Overseas Investment Act 2005

The Overseas Investment Act requires consent to be gained for a transaction that will result in the acquisition of sensitive land by an overseas person (section 12). The Act lists a number of factors which should be considered when assessing the benefit to New Zealand of an overseas investment in sensitive land. These include whether there are or will be adequate mechanisms in place for protecting or enhancing existing areas of:

- Significant indigenous vegetation
- Significant habitats of indigenous fauna
- Significant habitats of trout, salmon, wildlife protected under the Wildlife Act and game as defined in the Wildlife Act
- Walking access to those habitats by the public or any section of the public (section 17)

Forests Act 1949

Logging of indigenous forest on private land is controlled under the Forests Act. The Act only applies if the logging is for timber production, meaning that forests can be clear felled for other uses unless protected under other legislation such as the RMA. A major amendment to this legislation in 1993 provided a regime to manage the sustainable logging of privately-owned forest. In the main, timber may not be felled except in accordance with a sustainable forest management plan or permit which is approved by the Ministry for Primary Industries.



Figure 7.12 The logging of native forests is managed under the Forests Act (Crown Copyright: Department of Conservation: Te Papa Atawhai, 1981)

References and further reading

Ballantine B, 1991, *Marine reserves for New Zealand*, University of Auckland, Auckland

Bower A, 2008, *Who owns the high country?: The controversial story of tenure review in New Zealand*, Craig Potton Publishing, Nelson

Department of Conservation and Ministry of Fisheries, 2005, *Marine protected areas policy statement and implementation plan*, Department of Conservation and Ministry of Fisheries, Wellington, available at <http://www.biodiversity.govt.nz/pdfs/seas/MPA-Policy-and-Implementation-Plan.pdf>

Harris R (ed), 2004, *Handbook of environmental law*, Royal Forest and Bird Protection Society of New Zealand Incorporated, Wellington

Ministry of Fisheries and Department of Conservation, 2008, *Marine protected areas: Classification, protection standard and implementation guidelines*, Ministry of Fisheries and Department of Conservation, Wellington, available at <http://www.biodiversity.govt.nz/pdfs/seas/MPA-classification-protection-standard.pdf>

Mulcahy K, R Peart and A Bull, 2012, *Safeguarding our oceans: Strengthening marine protection in New Zealand*, Environmental Defence Society, Auckland

Parliamentary Commissioner for the Environment, 2008, *Ecological processes in the South Island pastoral high country*, Report No. 1955, Parliamentary Commissioner for the Environment, Wellington

Parliamentary Commissioner for the Environment, 2009, *Change in the high country: Environmental stewardship and tenure review*, Parliamentary Commissioner for the Environment, Wellington

Peart R and K Mulcahy, 2010, *Managing the marine environment*, An EDS Guide, Environmental Defence Society, Auckland

Endnotes

- 1 <http://www.doc.govt.nz/about-doc/concessions-and-permits/concessions/concession-statistics/>
- 2 <http://www.doc.govt.nz/about-doc/role/maps-and-statistics/visitor-statistics-and-research/national-parks-visitor-statistics/>
- 3 Parliamentary Commissioner for the Environment, 2009, 15
- 4 Parliamentary Commissioner for the Environment, 2008
- 5 Department of Conservation and Ministry of Fisheries, 2005, 8
- 6 Department of Conservation and Ministry of Fisheries, 2005, 10
- 7 <http://www.openspace.org.nz/>
- 8 http://www.openspace.org.nz/Site/About_QEII/default.aspx
- 9 <http://www.dunedin.govt.nz/services/rates-information/protected-land>
- 10 For the purposes of this section, a river means a river whose bed has an average width of 3 metres or more where the river flows through or adjoins an allotment; and a lake means a lake whose bed has an area of 8 hectares or more (s 230(4))



The endangered tuatara requires protection under special legislation
(Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

eight

Additional legal
mechanisms to
protect species

There are four pieces of legislation in New Zealand which are designed to protect threatened species directly: the Wildlife Act 1953, the Marine Mammals Protection Act 1978, the Trade in Endangered Species Act 1989 and the Native Plants Protection Act 1934.

The key elements of these Acts are summarised in Figure 8.1 and then described in the sections below. There are many biodiversity protection mechanisms and tools which these Acts offer; these are discussed in further detail in Part Two of this Guide where they relate to specific species.

Legislation	Administered by	Key elements
Wildlife Act 1953	Department of Conservation	<ul style="list-style-type: none"> • Protects a range of identified wildlife • Establishes wildlife sanctuaries, refuges and management reserves • Provides for population management plans to address fishing-related mortality
Marine Mammals Protection Act 1978	Department of Conservation	<ul style="list-style-type: none"> • Protects all marine mammals from hunting, capture or trade • Requires permits for taking, importing or exporting marine mammals or their products • Provides for population management plans to address fishing-related mortality • Provides for marine mammal sanctuaries • Has rules to control human and vessel interactions with wild marine mammals • Requires permits for commercial marine mammal tourism operations
Trade in Endangered Species Act 1989	Department of Conservation	<ul style="list-style-type: none"> • Requires permits for import and export of endangered species
Native Plants Protection Act 1934	Department of Conservation	<ul style="list-style-type: none"> • Enables native plant species to be protected

Figure 8.1 Summary of legal mechanisms to protect specific species

Wildlife Act 1953

The Wildlife Act, administered by the Department of Conservation, protects all ‘wildlife’ in New Zealand apart from the species identified in schedules 1

to 6 of the Act as shown in Figure 8.2. This means that the default position is that wildlife cannot be hunted unless specifically provided for in the schedules.

The term ‘wildlife’ is defined to mean ‘any animal that is living in a wild state’, with some specific exceptions. The definition of ‘animal’, however, does not include all New Zealand’s fauna. It includes:

- All mammals, excluding domestic animals, rabbits, hares and marine mammals
- All birds, excluding domestic birds
- All reptiles
- All amphibians

Schedule	Species
Schedule 1 - Wildlife declared to be game	Includes the black swan, four species of duck, partridge, pheasant, pukeko and three species of quail (although not those on the Chatham Islands)
Schedule 2 - Partially protected wildlife	Includes the brown skua, little owl and silvereye. Landowners are permitted to hunt these if they are causing damage
Schedule 3 - Wildlife that may be hunted or killed subject to Minister’s notification	Includes a range of species on the Chatham Islands as well as three species of shag, sooty shearwater and weka. These may only be hunted if the Minister has granted permission through formal notification
Schedule 5 - Wildlife not protected	Includes a range of introduced species including cats, dogs, cattle, horses, mustelids and introduced birds, three species of frog, a skink and a turtle
Schedule 6 - Animals declared to be noxious animals	Includes 10 species of deer, possum, wallaby, goat, pig and Himalayan Tahr

Figure 8.2 Examples of the Wildlife Act schedules identifying species which can be hunted

Additional invertebrates have also been included under the protection of the legislation and these are listed in schedule 7. They include specific species of snails, spiders, beetles, weevils, grasshoppers and weta. Schedule 7A sets out marine species which are protected and these include black, gorgonian, and stony corals, as well as hydrozoa (hydra-like animals). Four species of shark are protected (the basking shark, deepwater nurse shark, white pointer shark and whale shark). Two rays are protected (manta ray and spinetail devil ray). Somewhat surprisingly, only two species of bony fish are protected; the giant grouper and spotted black grouper.

It is an offence to hunt or kill protected wildlife. However, protected species may be captured, injured or killed inadvertently or as part of a fishing operation

and the legislation provides a defence against prosecution when this happens, so long as the incident is reported to the relevant authority.

The Wildlife Act makes provision for the establishment of wildlife sanctuaries (where all wildlife is absolutely protected unless there is any provision to the contrary in a Proclamation), wildlife refuges and wildlife management reserves which may be proclaimed by the Governor-General and have rules restricting activities attached.

The Act also makes provision for the development of population management plans where fishing activity inadvertently results in the death of protected species. This is primarily targeted at the protection of seabirds which can become entangled in fishing gear such as hooks, lines and nets. The plans are designed to identify the maximum allowable level of fishing-related mortality for the species, which would allow the following two criteria to be met:

- For threatened species, the mortality level 'should allow the species to achieve non-threatened status as soon as reasonably practicable, and in any event within a period not exceeding 20 years'.
- For other marine wildlife, the mortality level 'should neither cause a net reduction in the size of the population nor seriously threaten the reproductive capacity of the species'.

No population management plans have been approved under these provisions.

Marine Mammals Protection Act 1978

Marine mammals are managed by the Department of Conservation under the Marine Mammals Protection Act and a permit is required to hold a marine mammal in captivity or to remove one from its natural habitat (section 4). Any fishing operation using a purse seine net is required to incorporate an escape panel or aperture in the net which allows any dolphin or porpoise to readily escape. When a marine mammal is accidentally injured or killed the legislation provides a defence against prosecution so long as the incident is reported to the relevant authority.



Figure 8.3 The common dolphin is protected, to some degree, under the Marine Mammals Protection Act (Raewyn Peart)

Similar to the Wildlife Act, this legislation makes provision for the preparation of population management plans for marine mammal species.

In their absence, provisions in sections 15(2) and 11 of the Fisheries Act 1996 have been used to manage the effect of fishing on protected species, including Hector's and Maui's dolphins and New Zealand sea lions. For instance, under section 15(2) the effect of fishing on sea lions is mitigated by setting an annual maximum limit on fishing-related mortality. If this limit is reached, the squid fishery is closed for the season.

In an effort to create an enduring refuge for marine mammals, the concept of marine mammal sanctuaries has been developed. The Department of Conservation is the body with the responsibility for administering and managing marine mammal sanctuaries under the Marine Mammals Protection Act. The concept behind these sanctuaries is to prohibit activities known to harm particular marine mammal species.

Under the Act, the Minister for Conservation can establish marine mammal sanctuaries for the purpose of the protection, conservation and management of marine mammals within the coastal marine area and EEZ. Before a sanctuary can be created, the consent of other Ministers must also be obtained if they control any Crown-owned land, foreshore, seabed or seawater. The Minister

may specify restrictions on activities that may take place in the sanctuary at the time the declaration is made. Whilst a total ban on fishing is unlikely to be found in a marine mammal sanctuary, there should be a restriction on the type of fishing methods that endanger marine mammals, such as set netting and trawling.

There are currently six marine mammal sanctuaries in New Zealand, providing a range of protection measures, including limits on fishing, mining and seismic surveying. New Zealand's first marine mammal sanctuary was created in 1988 to protect the endangered Hector's dolphins around Banks Peninsula. The main purpose of the sanctuary is to prevent the dolphins from being caught in set nets from commercial and recreational fishing operations.¹ Fishing activity in the sanctuary is controlled by regulations promulgated under the Fisheries Act.

The Marine Mammals Protection Regulations, promulgated under the Act, aim to control human interaction with marine mammals in the wild. They set out minimum requirements for behaviour of vessels and people around marine mammals. They also require commercial marine mammal tourism operators to obtain a permit from the Department of Conservation. Permit applications are required to be publicly notified and members of the public have the opportunity of making written submissions on them. There is provision for the Director-General of Conservation to place a moratorium on the issue of any further permits for commercial operations if he or she 'believes on reasonable grounds that it is necessary for the protection, conservation, or management of any marine mammals or any class of marine mammals'.

Further information on the application of the Marine Mammals Protection Act can be found in the EDS publication 'Wonders of the Sea: Protection of New Zealand's Marine Mammals'.

Trade in Endangered Species Act 1989

This legislation implements New Zealand's obligations under CITES, which are discussed in Chapter 2. It has the object of promoting 'the management, conservation, and protection of endangered, threatened and exploited species to further enhance the survival of those species' (section 2). The Act is administered by the Department of Conservation. It establishes a permitting system for the import or export of endangered species. The schedules of the Trade in Endangered Species Act, which identify species endangered, threatened and exploited by trade, reflect those of the CITES agreement itself.

Native Plants Protection Act 1934

This old and little used piece of legislation is still law and allows the Governor-General to declare that native plant species are to be protected. It is an offence for any person to take any protected native plant 'growing on any Crown land, or in any State forest land or public reserve, or on any road or street'. In addition, any person who 'without the consent of the owner or occupier of any private land, takes any protected native plant that is growing thereon', commits an offence. The penalties provided in the legislation are so low – a maximum of \$10 for a first offence, \$20 for a second offence and \$40 for subsequent offences – that it provides no real deterrent.



Figure 8.4 Native orchids have some protection under the Native Plants Protection Act (*Raewyn Peart*)

Endnotes

- 1 <http://www.doc.govt.nz/conservation/marine-and-coastal/marine-mammal-sanctuaries/banks-peninsula/>



Didymo on the edge of the Buller River, West Coast
(Crown Copyright: Department of Conservation: Te Papa Atawhai, 2006)

nine

Managing unwanted species and new organisms

The arrival of unwanted species in New Zealand, and the control or eradication of them once they have arrived, is undertaken under a range of legislation, with the Biosecurity Act 1993 being the principal one. The development and importation of new organisms, through such mechanisms as genetic engineering, is controlled under the Hazardous Substances and New Organisms Act 1996.

Invasive species can have a major impact on indigenous biodiversity through predation, competition, habitat destruction and spread of disease. It is therefore vital that such organisms are prevented from entering and establishing in New Zealand. Tools for managing pest species are discussed in Part Two of this Guide where they relate to specific habitats and environments.

Biosecurity Act 1993

The Biosecurity Act addresses border controls to prevent unwanted organisms from entering the country, surveillance to detect organisms once they have arrived, and control and eradication of pests once they have become established. The Ministry for Primary Industries administers the Act and leads New Zealand's biosecurity system.



Figure 9.1 Koi carp, which are an invasive introduced fish and contribute to poor water quality, being removed from a river (Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

Biosecurity functions are split between the Ministry for Primary Industries and regional councils. The Ministry oversees the implementation of the legislation, undertakes border control, manages national surveillance programmes, carries out responses to incursions and manages several national control programmes. Regional councils undertake monitoring and surveillance and prepare and implement regional pest management strategies. Figure 9.2 summarises these functions.

12A Director-General provides overall leadership	
(1)	The Director-General provides overall leadership in activities that prevent, reduce, or eliminate adverse effects from harmful organisms that are present in New Zealand (pest management).
(2)	The ways in which the Director-General provides leadership include–
(a)	promoting alignment of pest management within the whole biosecurity system
(b)	overseeing New Zealand’s systems for pest management and measuring overall system performance
(c)	facilitating the development and alignment of national pest management plans and national pathway management plans
(d)	promoting public support for pest management
(e)	facilitating communication, co-operation, and co-ordination among those involved in pest management to enhance effectiveness, efficiency, and equity of programmes
12B Regional council provides leadership regionally	
(1)	A regional council provides leadership in activities that prevent, reduce, or eliminate adverse effects from harmful organisms that are present in New Zealand (pest management) in its region
(2)	The ways in which the regional council provides leadership in the region include–
(a)	promoting the alignment of pest management in the region
(b)	facilitating the development and alignment of regional pest management plans and regional pathway management plans in the region
(c)	promoting public support for pest management
(d)	Facilitating communication and co-operation among those involved in pest management to enhance effectiveness, efficiency, and equity of programmes
(3)	A regional council also provides leadership by promoting co-ordination of pest management between regions
Figure 9.2 Biosecurity functions of different management organisations (www.legislation.govt.nz)	

Importation of risk goods

The Ministry for Primary Industries is responsible for controlling the arrival of new species over the border. Part 3 of the Biosecurity Act deals with import risk. A set of standards and regulations govern the movement of various goods to and from New Zealand. These relate to the importing and exporting of plants, animals and other materials which may represent risk goods, including all

products that are derived from plant or animal material. Regulations have also been developed to cover requirements for transportation, including containers and cargo, ships, aircraft and transitional facilities.

Surveillance

Part 4 of the Biosecurity Act deals with surveillance and its purpose is 'to provide for the continuous monitoring of New Zealand's status in regard to pests and unwanted organisms'. The Ministry for Primary Industries has several national surveillance programmes. Passive surveillance is also an important part of this work.

Inspectors are empowered to require relevant persons to provide information 'concerning pests, pest agents, unwanted organisms, or risk goods that the inspector or authorised person believes on reasonable grounds is necessary to ascertain the presence or distribution in New Zealand of pests, pest agents, or unwanted organisms'.

Legislative reform

The Biosecurity Act was reviewed in 2010 and this resulted in a Biosecurity Law Reform Bill being introduced into Parliament in November 2010. Issues that the Bill seeks to address include enabling the use of modern technology to detect and manage risk from imported goods, extending the jurisdiction of the legislation to include the EEZ, and strengthening the tools to deal with pests once they have arrived in the country.

Pest management

National pest management strategy

A national pest management strategy is designed to provide for the coordinated management or eradication of pests. It sets out how pests are to be managed and by which agency. The Biosecurity (National Bovine Tuberculosis Pest Management Strategy) Order 1998 is an example of such a strategy. The objective of the strategy is to manage the organism that causes the disease of bovine tuberculosis across a range of New Zealand terrains.¹

A national pest management strategy has statutory force and can include rules both requiring people to do specific things and prohibiting specific actions. For example, the strategy can require any person to help monitor the presence or distribution of a pest, or to control or eradicate the pest.

In addition, a levy can be imposed through Order in Council to fund the implementation of the strategy.

Regional pest management strategy

Regional pest management strategies are plans which describe why and how various animal and plant pests will be controlled within a particular region. These strategies are a useful tool for managing serious threats to indigenous biodiversity and generally seek outcomes that benefit biodiversity in a local area by managing pests.

Similar provisions apply to regional pest management strategies as those for national strategies. However, in this case the proposal for a strategy is notified by the regional council. During its preparation, the regional council is required to consult with affected Ministers, local authorities, iwi authorities and tribal rūnanga.

Regional pest management strategies must be consistent with statutory plans prepared under the RMA. It is best practice to link the regional pest management strategies to broader biodiversity outcomes specified in these planning frameworks. Pest management makes an important contribution to other council functions, including maintaining and enhancing biodiversity within a region.

The use of regional pest management strategies as a management approach to restore and protect biodiversity within specific environments is discussed in further detail in Part Two where relevant to specific environments.

Implementation of pest management strategies

The national and regional pest management strategies are required to specify which management agency is responsible for their implementation. That agency is required to prepare an operational plan within three months of the strategy being adopted. It is then required to make a report on the plan after each financial year.

Small-scale management programme

A regional council may take action to manage an unwanted organism in the absence of a pest management strategy being prepared. This is to enable timely control to be undertaken when a pest is detected. It is called a 'small-scale management programme' under the legislation and can only be undertaken if the organism can be eradicated or controlled effectively by small-scale measures within three years. The programme must be publicly notified. Under it, regional councils can obtain a range of powers to implement the programme, including powers to search, inspect, seize goods, destroy organisms and give directions.

Hazardous Substances and New Organisms Act 1996

This legislation is managed by the Environmental Protection Authority. The purpose of it is to ‘protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms’.

Similar to the RMA, all persons exercising powers and functions under the Hazardous Substances and New Organisms Act are required to take into account the principles of the Treaty of Waitangi. Under the Environmental Protection Authority Act 2011, a Māori Advisory Committee has been established ‘to provide advice and assistance’ to the Environmental Protection Authority ‘on matters relating to policy, process, and decisions’, including decisions made under the Hazardous Substances and New Organisms Act (sections 18 and 19 of the Environmental Protection Authority Act 2011).

A set of minimum standards are set out in the legislation to ensure that decisions are not made which could harm New Zealand’s biodiversity. When making a decision on whether or not to grant a permit, the Authority must also have regard to the ability of the organism to establish an undesirable self-sustaining population, and the ease with which the organism could be eradicated if it did so. The legislation also provides for applications for conditional release of new organisms, and to import or to develop new organisms in containment, and to field test them. Anyone intending to import a new organism for release, or to release it from containment, is required to obtain prior approval.

Voluntary partnerships and initiatives

There are a number of joint partnerships and initiatives that are in place between government agencies, regional councils and local communities to manage pests. There are also a number of jointly-managed programmes between central or local government and local communities to undertake pest control in localised areas around the country. Support for this type of approach appears to be increasing around the country. These kinds of partnerships are discussed further in Chapter 10.

The Ministry for Primary Industries is involved in a number of joint programmes to address specific biosecurity issues. It currently coordinates one national arrangement and four regional marine biosecurity partnerships aimed at protecting the marine environment from damaging pests. The Fiordland Marine Biosecurity Programme is an example of such a programme. It is a

joint initiative between the Ministry for Primary Industries, the Department of Conservation, Environment Southland and the Fiordland Marine Guardians. It has the aim of protecting the Fiordland area from harmful organisms. This project has included the development of a strategic and operational plan which identifies the actions to be taken by each partner and other parties.² These include developing a code of practice for management of bilge and ballast water for all vessel types and establishing a voluntary Vessel Intentions Register and 'clean vessel' policy for Fiordland.

Useful websites

Environmental Protection Agency – <http://www.epa.govt.nz/new-organisms/about/Pages/default.aspx>

Ministry for Primary Industries – <http://www.mpi.govt.nz/>

The Canterbury Regional Pest Management Strategy – <http://ecan.govt.nz/publications/Plans/canterbury-regional-pest-management-strategy-2011-2015.pdf>

References and further reading

Nahkies G, M Loutit and S Rogne, 2003, *A review of the capability of the Environmental Risk Management Authority (ERMA) relating to the risk management of new organisms*, Ministry for Environment, Wellington, available at <http://www.mfe.govt.nz/issues/organisms/other-work/erma-review/erma-review-of-capability-mar03.pdf>

Sinner J, B Forrest, M O'Brien, R Piola and B Roberts, 2009, *Fiordland marine biosecurity risk management: Operational plan recommendations 2009/10 – 2013/14*, Cawthron, Nelson

Endnotes

1 <http://www.legislation.govt.nz/regulation/public/1998/0179/latest/DLM252639.html>

2 Sinner J et al., 2009



Volunteers planting sand dunes
(Dune planting. Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

ten

Voluntary tools

*I think everyone really needs to understand that we
are a part of the environment, not apart from it.*

Sir Peter Blake

Overview

In addition to the regulatory approaches offered under the legislation, there is a range of non-regulatory (or voluntary) mechanisms and tools that are available to councils, communities and landowners to help them achieve their biodiversity protection goals. This chapter describes some of these mechanisms, highlights the benefits and weaknesses to biodiversity protection that they offer, and provides examples of where and how these tools have been successfully applied.

Types of voluntary tools and mechanisms

Strategic planning

A number of regional councils have prepared regional biodiversity strategies and action plans. These help to co-ordinate activity within a region, for example, through prioritising wetland restoration programmes or protection of forest remnants. These documents also provide direction and guidance to other regional and district planning processes, including long term council community plans, annual plans, regional plans and district plans.

There are generally two steps taken for strategic biodiversity planning at the regional level. First is the preparation of a region-wide strategic plan, and secondly is the preparation of a more focused biodiversity action plan dealing with specific biodiversity matters (such as wetland ecosystems or sand dunes). These strategic documents are not legally binding, but they are an important tool for outlining what the stakeholders, communities and landowners within a region want to achieve. They also play a valuable role in informing statutory processes about threats and desired biodiversity outcomes for the region.

Example: A Biodiversity Strategy for the Canterbury Region

The Biodiversity Strategy for the Canterbury region is a good example of a collaborative community process resulting in a document that guides resource allocation to specific biodiversity initiatives and voluntary efforts, as well as policy and decision-making. This document is also important for informing the statutory plans within this region. See more at <http://ecan.govt.nz/publications/Pages/biodiversity-strategy.aspx> and in Chapter 16.



Figure 10.1 Biodiversity Strategy for the Canterbury Region (*Environment Canterbury*)

Biodiversity education and advocacy

Many government agencies, district and regional councils, research institutions and not-for-profit organisations offer a range of information and resources related to biodiversity management. These help to inform landowners and the wider public on biodiversity restoration activities and how threats to biodiversity can be managed. There is a huge variety in the types of material that are provided by these organisations. They include leaflets, DVDs, newsletters, website resources and media stories. There is also a range of educational workshops, funding sources and training opportunities offered by councils and other groups.

Some organisations work directly with schools and other groups to provide advice on biodiversity management and restoration programmes. A useful booklet has been prepared by the Landcare Trust called 'Benefits of Biodiversity for Farmers' which highlights some of the ways farmers around New Zealand are promoting biodiversity on their land – contact www.landcare.org.nz for a copy.

Example: Education for managing weeds

The Auckland Council provides leaflets that highlight the threat of noxious weeds and draws landowners' attention to what particular weed species look like. The Council has also developed an online programme where landowners can search a website database for invasive plant pests and find information on how to control them. Learn more at http://www.arc.govt.nz/environment/biosecurity/pest-plants/pest-plants_home.cfm and in Chapter 17.



Figure 10.2 Auckland Council's Managing Weeds programme (Auckland Council)

Regional biodiversity forums

The concept behind regional biodiversity forums is that they bring together all parties with an interest in managing biodiversity within a region in order to collaborate and cooperate. The Biodiversity Northland Forum was the first regional biodiversity forum to be established in New Zealand. There are now a number of forums around the country, including Northland, Waikato, Canterbury and Southland Biodiversity Forums. They play an important role in strategic biodiversity management through facilitating interagency partnerships (which jointly prioritise issues and pool resources and funding) and through the exchange of information.

Example: Waikato Regional Biodiversity Forum

The Waikato Biodiversity Forum is a partnership between research and management agencies (including the Department of Conservation), iwi groups, private landowners and communities. It is a voluntary organisation which aims to improve management of biodiversity in the Waikato region. The Forum raises awareness of biodiversity issues through running events and workshops, undertaking advocacy, sharing information, providing an advisory service, educating the public and preparing media articles. Learn more at <http://www.doc.govt.nz/getting-involved/volunteer-join-or-start-a-project/join-a-group/waikato/waikato-biodiversity-forum/>.

Land or conservation covenants

Covenants are described in more detail in Chapter 7. There are a number of different covenant-based mechanisms that can be used by landowners to help protect biodiversity values on their land, including:

- Open space covenants under the Queen Elizabeth II National Trust Act 1977
- Nga Whenua Rāhui kawenata for biodiversity protection on Māori land under the Reserves Act 1977
- Conservation covenants under the Reserves Act 1977 and the Conservation Act 1987
- Wildlife refuges under the Wildlife Act 1963

Conditions attached to subdivision consents granted under the RMA can also be recognised on property titles through the recording of a consent notice and these can restrict land use activities to help ensure that indigenous biodiversity values are maintained into the future.



Figure 10.3 A landowner workshop discusses covenants (NZ Landcare Trust)

Central government funding programmes

Central government has directly supported some biodiversity initiatives undertaken by landowners, councils, communities and iwi through funding sources. It has specific funding for the QEII Trust and a range of contestable funds. Figure 10.4 summarises the main national grants and funds that are available for biodiversity protection and restoration in New Zealand. In general, these types of funds cover the costs of covenanting, surveys, fencing, pest control, revegetation and on-going maintenance.

Agency	Fund/Grant	Contact details
World Wildlife Fund	New Zealand Habitat Protection Fund	http://www.wwf.org.nz/what_we_do/community_funding/habitat_protection_fund/
	Environmental Education Action Fund	http://www.wwf.org.nz/what_we_do/community_funding/funding_for_schools/
	Conservation Innovation Fund	http://www.wwf.org.nz/what_we_do/community_funding/conservation_innovation_fund/
Ministry for the Environment	Biodiversity Advice Fund	http://www.biodiversity.govt.nz/land/nzbs/pvtland/condition.html
	Community Environment Fund	http://www.mfe.govt.nz/withyou/funding/community-environment-fund/
Department of Conservation	Biodiversity Condition Fund	http://www.biodiversity.govt.nz/land/nzbs/pvtland/condition.html
	Nature Heritage Fund	http://www.doc.govt.nz
	Nga Whenua Rāhui	http://www.doc.govt.nz
	Matauranga Kura Taio Fund	http://www.doc.govt.nz
Ministry for Primary Industries	Sustainable Farming Fund	http://www.maf.govt.nz/agriculture/funding-programmes/sustainable-farming-fund/
Department of Internal Affairs	Lottery Environment and Heritage Fund	http://www.dia.govt.nz/Services-Lottery-Grants-Environment-and-Heritage
	Community Organisation Grant Scheme	http://www.dia.govt.nz/Services-Community-Funding-Community-Organisation-Grants-Scheme-(COGS)
New Zealand National Parks and Conservation Foundation	Range of funds and grants available	http://www.nationalparks.org.nz/index_files/Page385.htm

Figure 10.4 Summary of the main national grants and funds available for biodiversity restoration

Local government funding incentives

Contestable funds managed by district and regional councils offer protection and enhancement funding for priority ecosystems and habitats. Councils have also discounted the cost of invasive weed control on private land, provided annual rates relief for covenanted or protected areas, and provided funding for fencing and restoration planting.

The Bay of Plenty Regional Council's Environmental Enhancement Fund provides seed funding for community-based projects that help to improve the environment. The Waikato Regional Council's Environmental Initiatives Fund provides one-off grants to projects, which directly enhance and/or benefit the environment or provide environmental education. The Auckland Council provides contestable environmental funding to support community-led projects that seek to enhance, protect or restore natural environments.



Figure 10.5 La Fontaine Stream Enhancement Project (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2009)

Example: Northland Regional Council Environment Fund

Since 1996 the Northland Regional Council Environment Fund has provided around \$4 million towards projects that enhance and protect the region's environment. It is a contestable fund which assists projects with up to 50 per cent of their total costs. Biodiversity is one of the five priority streams for funding and this specifically targets the restoration and protection of wetlands and lakes through fencing, riparian planting and pest control initiatives. Learn more at <http://www.nrc.govt.nz/Your-Council/Funding-and-awards/Environment-Fund/>.

Example: Key Native Ecosystems Programme

The Greater Wellington Regional Council set up the Key Native Ecosystem Programme, in the mid-1990s, to integrate pest control targeting high value ecosystems on private and public land. Today this funding programme covers hundreds of sites across the region and has dramatically improved ecological condition and function of these areas as a result. Examples of work carried out through this programme include the eradication of pest animals in the Karori Sanctuary (see Chapter 17) and the eradication of possums on the Miramar Peninsula. Learn more at <http://www.gw.govt.nz/key-native-ecosystems-kne-2/>.

Community care

Local voluntary partnerships are an important mechanism through which councils and landowners work together to protect and enhance biodiversity locally. These groups tend to be focused on particular habitats or ecosystems needing restoration, such as wetlands or dune restoration projects. Community care groups are generally funded by councils, government or through a trust of some form.



Figure 10.6 Tinui School children dune planting as part of Conservation Week, Castlepoint Scenic Reserve (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2009)

Coast care groups, which typically involve partnerships between the local community, iwi, councils and the Department of Conservation, undertake projects to help restore sand dunes by replanting native sand binding plants. They also complete projects involving fencing, signage, creating defined beach access routes, weed management, pest control, planting, public education, beach clean ups, and raising public awareness of coastal issues.

There are now significant voluntary efforts underway to restore coastal habitats throughout the country. The projects are increasingly being targeted towards achieving wider biodiversity gains. This shift in approach is now filtering its way into estuaries, with a growing number of estuary and harbour care groups being set up in recent years.

The harbour care groups restore native estuarine plant and bird habitats within local estuaries. They hold working bees to monitor birds, control animal and plant pests, monitor sediment levels in their estuary and, under certain conditions approved by resource consent, control mangroves.² There are harbour care groups spread around the country, including the Whaingaroa (Raglan) Harbour Care Society in the Waikato region and the Apanui Saltmarsh Care Group in the Bay of Plenty region.

Example: Bay of Plenty Coast Care Partnership

This is a community partnership programme run by the Bay of Plenty Regional Council that utilises local support to restore biodiversity in a degraded environment, being the coastline. More information can be found about this programme at <http://www.boprc.govt.nz/sustainable-communities/care-groups/coast-care/>.

The New Zealand Landcare Trust is a non-government organisation focused on sustainable land management. Established in 1996, the Trust works with farmers, landowners and community groups nationwide, to improve sustainability of the natural environment.³ It assists local Landcare groups with their setting up and operational costs, as well as providing them with information and assistance on how to improve land and water management.⁴ The success of these groups is reliant on the establishment of good relationships between the organisation and landowners. The Trust also provides a portal for information sharing about biodiversity management tools and opportunities on productive land. Further information on Landcare groups can be found at <http://www.landcare.org.nz/Landcare-Guide/6-How-to-set-up-a-Landcare-Group>.



Figure 10.7 Landcare Trust volunteers planting at Lake Komakorau (*Monica Peters, NZ Landcare Trust*)

Example: Whakaupoko Landcare Group

This group of more than 100 households in the Waikato region has achieved some great results in protecting biodiversity in their local area through focused pest control. The Whakaupoko Landcare Group is now aiming to bring native birds back to this area following the success of these pest control initiatives. You can learn more about their work at <http://www.landcare.org.nz/News-Features/Features/Whakaupoko-Landcare-Group>, and in Chapter 15 and Chapter 16.

Voluntary pest management partnerships and initiatives

A wide range of groups and individuals have an involvement in pest management, and are integral to achieving success in some areas, as described in Chapter 9.

Example: Sinbad Sanctuary Project

The Sinbad Sanctuary Project is a partnership between the Department of Conservation, the Fiordland Conservation Trust and Southern Discoveries. Sinbad Gully, which is a neighbour to Mitre Peak, is home to a number of very rare lizard species, as well as birds, large weta and other invertebrates. Southern Discoveries volunteers have worked with the Department of Conservation to set and check over pest traps. Learn more at <http://www.southerndiscoveries.co.nz/sinbad-sanctuary-project/sinbad-sanctuary-project>.

Example: Wild Kiwifruit Control

Collaboration between the Bay of Plenty Regional Council⁶ and New Zealand Kiwifruit Growers Incorporated (NZKGI) has resulted in a significant reduction of wild kiwifruit in the Bay of Plenty. This initiative has decreased the threat of losing native forest remnants within the region that provide important ecosystem services such as protection of water catchments. Control is being achieved through a combination of direct removal, landowner responsibility and guidelines for minimising access to waste fruit used for cattle feed by bird species that can disperse seeds. Zespri⁶ is using waste kiwifruit to produce bio-plastic composite materials⁷ for use in the kiwifruit value chain that will assist in reducing the risk of fruit available for seed dispersal.

Community environmental monitoring programmes

Monitoring of the success of biodiversity restoration projects by the community is now becoming increasingly common (such as water quality monitoring, animal pest population monitoring and native restoration plant success monitoring). There are a number of benefits that are realised from this approach, including improving community relationships with councils and the scientific community, and building community awareness of ecosystem processes and the varying threats to them.



Figure 10.8 Children from Pongakawa School doing a snorkel survey at Pilot Bay, Mount Maunganui (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2007)

Example: Monitoring of shellfish in the Hauraki Gulf

The Auckland Council, Waikato Regional Council and the Department of Conservation are collaborating to support community groups, schools, and iwi to carry out annual shellfish monitoring in the Hauraki Gulf. Various community groups are provided with training, practical assistance and equipment to undertake the surveys.

The Cheltenham Beach surveys started in 1993, with more sites being incorporated into the programme in the early 2000s. There are now almost 20 sites that are monitored in this manner every year. The surveys count and measure the dominant kinds of shellfish, such as cockles and pipis. The results contribute to the State of the Environment Report for the Auckland Region as well as provide information to guide decision-making and resource allocation.

Summary

There is a wide range of non-regulatory tools available to support and encourage the efforts of local communities and landowners to protect and restore biodiversity on private and public land. Most councils and a range of not-for-profit organisations offer strong advocacy and education advice to assist with biodiversity initiatives.

Example: Muddy Feet Project

This project on the coastline of the southern Firth of Thames has been recognised by the Hauraki Gulf Forum as a model for integrated, ecosystem-focused action achieved through the use of a range of voluntary tools. Being underway for over 10 years, the Muddy Feet Project initiative has brought together regional councils, district councils, the Department of Conservation and the local community to permanently protect and restore this ecologically significant area (which includes an internationally significant wetland). You can learn more about the Muddy Feet Project at <http://www.arc.govt.nz/environment/coastal-and-marine/hauraki-gulf-forum/forum-projects.cfm#muddy>.

Figure 10.9 provides a summary of the suite of non-regulatory biodiversity enhancement and protection tools currently available and discusses some of the benefits and weaknesses of these tools.

The report prepared by the Hauraki Gulf Forum in 2010, ‘Co-operation, Capacity, Charisma: Enhancing the Hauraki Gulf Environment through Non-regulatory Approaches’, contains a good summary of the range of voluntary mechanisms that are available to communities as well as outlining a number of best practice examples in the Hauraki Gulf.

Mechanism	Benefits	Weaknesses	Opportunities for involvement
Strategic planning	<ul style="list-style-type: none"> • Provides a long term and integrated framework for decision-making • Addresses cumulative effects • Co-ordinates activity • Provides direction to local biodiversity planning • Provides direction for council budgeting for biodiversity-related activity • Provides an agreed approach to protecting biodiversity within a local area 	<ul style="list-style-type: none"> • If developed by council, may not fully coordinate with actions of other agencies • Requires multiple sign offs • May not be incorporated into district and regional RMA documents • Sufficient funding may not be available for implementation • Relatively high level and may not provide guidance to local initiatives 	<ul style="list-style-type: none"> • During preparation and review of the strategies there are normally public consultation and submission processes offered
Education and advocacy	<ul style="list-style-type: none"> • Soft approach to managing biodiversity • Supports and encourages people to make their own decisions • Can be targeted to local issues • Generally this type of information is provided free of charge 	<ul style="list-style-type: none"> • Lacks strength of implementation and enforcement • Can quickly become out of date and potentially offer incorrect advice • Cannot be a stand-alone tool, needs to be incorporated with other mechanisms 	<ul style="list-style-type: none"> • Public can contribute to the development of particular resources by offering information and case studies • Public can recommend topics for inclusion in educational material that are missing
Land and conservation covenants	<ul style="list-style-type: none"> • Supported by landowner • Can be grant/fund assisted • Opportunity for rates relief • Can be a catalyst for wider habitat restoration • Enforceable through legislation 	<ul style="list-style-type: none"> • Cannot be a stand-alone tool, needs to be incorporated with other mechanisms, including weed control and habitat restoration 	<ul style="list-style-type: none"> • Landowner driven • Public can suggest that a covenant be included as a condition of a resource consent • Local community may have opportunity to assist in restoring area • Long term financial support and ongoing monitoring from covenant agencies

Financial incentives	<ul style="list-style-type: none"> • Provides tangible incentive for landowners and community groups to restore habitat 	<ul style="list-style-type: none"> • Needs ongoing funds to be successful • Needs to be well advertised so community groups access funds 	<ul style="list-style-type: none"> • Public can make submissions on the council's long-term and annual plans seeking provisions for funding
Community care groups	<ul style="list-style-type: none"> • Gains support of wider community if properly undertaken • Directly improves and restores specific habitats • Builds social capital for biodiversity management 	<ul style="list-style-type: none"> • May not be funded adequately • Relies on volunteer time and effort to be successful • Needs sustained effort and management 	<ul style="list-style-type: none"> • Community groups are made up of volunteers from local community • Public can partake in one-off projects or be involved in ongoing restoration work
Community monitoring	<ul style="list-style-type: none"> • Raises awareness of biodiversity threats • Empowers communities to take care of local areas • Informs decision-making 	<ul style="list-style-type: none"> • Communities need support from scientific institutions and councils to undertake • May require expensive or complicated tools 	<ul style="list-style-type: none"> • Public can take part in annual monitoring programmes or one-off surveys

Figure 10.9 Summary of the main non-regulatory biodiversity protection and enhancement mechanisms, their benefits and weaknesses, and opportunities for public involvement

Endnotes

- 1 www.openspace.org.nz
- 2 <http://www.doc.govt.nz/getting-involved/volunteer-join-or-start-a-project/join-a-group/bay-of-plenty/estuary-care/>
- 3 <http://www.landcare.org.nz/About-Us/What-we-do>
- 4 <http://www.landcare.org.nz/Landcare-Community>
- 5 http://www.boprc.govt.nz/media/121976/operativeregionalpest_managementplanfor2011-2016webversion.pdf
- 6 www.zespri.com/sustainability-home.html
- 7 www.scionresearch.com/research/manufacturing-and-bioproducts/industrial-biotechnology/bioplastics



Taupo Information Centre carvings depict the story of Ngatoroirangi Toa Matarau. (Shad Rolleston)

e|leven

Māori and biodiversity

From the millions of stars which glide across the night sky, to ocean pathways navigated using currents, winds and the movement of constellations, to forests and wetlands rich in bird life, and coastal fisheries and rivers full of fish, Māori wove stories and genealogies which connected celestial beings.

Te Taiao Māori and the Natural World, 2010

Overview of Māori perspectives and values

Māori world view

The traditional Māori world view is notably different from the European. The very title *tangata whenua*, meaning ‘people of the land’, highlights the pre-eminent importance of the environment to Māori identity.¹ The linkages between the natural world and Māori are explained through genealogy, tribal narratives and mythology. These stories describe various parts of the living and non-living world as being the ancestors of people living today. Collectively, these relationships are known as *whakapapa*, and they represent how Māori place themselves within the world, and how they understand and interact with everything around them.²

Māori creation story

A narrative of the Māori creation story is an appropriate starting point for understanding the Māori concept of kinship between the natural environment and humankind and, ultimately, biodiversity.

There are variations of the creation story originating from the East Coast, the South Island and Wanganui districts. In the Māori tradition the void was the first state of being. The void evolved into various stages and states of darkness, through into the world of light. The supreme creator was *Io-Matua-Kore*. *Ranginui* is the personification of Sky Father and *Papa-tua-nuku*, the Earth Mother. According to tradition, they were locked together in an enduring embrace.³ Their embrace at the dawn of the world gives birth to the first sons of the Māori *whakapapa* (lineage).⁴ Thus creation is encapsulated by the phrase: ‘*ite kore, kite pō, kite aomārama, out of the nothingness, into the night, into the world of light*’.⁵

Tāne (spiritual guardian or *atua* of forests and birds) and his brothers, *Tangaroa* (sea and fish), *Tawhirimatea* (wind and weather), *Tumatauenga* (people and war), *Haumia* (uncultivated food), and *Rongomatane* (cultivated food), now have the freedom to explore their new world. *Tāne* becomes the creator of the forest, creating all the various creatures and plant life. He also creates a female to be his companion by breathing *mauri* into her nostrils. The story illustrates an essential aspect of the Māori world view; that all living things are related by genealogy.

Polynesian settlement

When the first Polynesian settlers arrived in New Zealand they encountered a natural environment significantly different from that of the rest of Polynesia. They had to adjust to the varied climatic conditions and cooler temperatures. The environment determined their dwelling design, clothing, food preparation and storage, and cultivation practices. Central Polynesian traditions emphasised the importance of the ocean. But given the relatively large size of the New Zealand landmass, compared to the small Pacific islands from which they migrated, their focus soon shifted more towards the land.

Understanding Te Waonui-a-Tāne, the great forest of Tāne, became essential to survival. As described in the creation story, Tāne is an important figure in Māori tradition, not only being the god of the forest, but also delivering knowledge and higher consciousness.

Important concepts

The traditional Māori world view considers the well-being of natural resources to be directly related to the well-being of people. Understanding the central elements of this holistic view is an essential part of developing a bicultural approach to biodiversity management. These are summarised in figure 11.2.



Figure 11.1 Treaty Marae, Waitangi (Shad Rolleston)

Concept	Summary of meaning	Relationship to biodiversity
Mauri	<ul style="list-style-type: none"> Mauri is a power that originates from the ancestors.⁶ The concept features in the creation story when Tāne brings Hine to life by breathing mauri into her nostrils. It is a life power, essence and unifying force that exists in all living and non-living things.⁷ Mauri is passed down through the genealogical links, linking all living things with an inseparable bond.⁸ All living things are connected through mauri, so that the health or well-being of one member, affects the health and well-being of all other members.⁹ 	<ul style="list-style-type: none"> Māori believe that we should respect the environment because everything within it has mauri. The mauri must never be weakened, to ensure the on-going health of all things living remains. The notion of mauri does not prohibit human use of the natural environment; it just means that use must be respectful and reasonable.¹⁰ People have to eat and they have to survive but a controlled and sustainable approach is required to ensure the mauri is preserved and the ancestors are respected.
Women and whenua	<ul style="list-style-type: none"> The land gives birth to life just as women do; therefore the earth is synonymous with Papa-tua-nuku, the earth mother.¹¹ The word for land in Māori is whenua, which is the same as the word for placenta.¹² This belief is further illustrated by the cultural practice of burying the placenta in the ground when a baby is born.¹³ It is believed that if the placenta is buried, the child will continue to grow and develop with the nourishment of Papa-tua-nuku, and will maintain his or her connection to a tribal location.¹⁴ 	<ul style="list-style-type: none"> Papa-tua-nuku is a powerful figure, considered a source of nourishment and the foundation of all life, as is the placenta.¹⁵ In this way, Māori see their emotional, intellectual and spiritual wellbeing as coming from the land.¹⁶
Mana	<ul style="list-style-type: none"> There is no direct English translation that adequately describes mana, but some words that are commonly used include authority, status, integrity, prestige and power.¹⁷ Mana is something that is descended from atua,¹⁸ which is commonly translated as 'god'. As Māori are linked by genealogy to these gods, they are better described as ancestors of paramount importance who have a continuing influence.¹⁹ Mana is something that can be inherited or gained by descent, or it can be earned by great acts and personal achievement.²⁰ 	<ul style="list-style-type: none"> If the natural environment is subject to degradation through neglect, unsustainable practices, or even just through great misfortune, tangata whenua lose their mana. A loss of mana results in the weakening of tangata whenua in terms of identity and unity.

Manawhenua	<ul style="list-style-type: none"> • Manawhenua is a geographically specific form of mana.²¹ • It is closely linked to rangitiratanga, the right to exercise authority.²² • It is important to note that authority is not held over the land itself, but enables decisions to be made about its use. • Manawhenua in one locality does not correspond to manawhenua in another. The association is one with a defined area and its inhabitants.²³ • The bonds are further reinforced by a history of whakapapa, to the extent that the land itself is considered an ancestor. • Another way of describing this relationship is turangawaewae, meaning people standing in their land.²⁴ 	<ul style="list-style-type: none"> • There is an entitlement to gather food and resources needed for survival, but severe consequences exist where this entitlement is abused. • Those who have manawhenua bear the responsibility to control human activity.²⁵ • The concept is closely linked to the Māori role as a kaitiaki or guardian,²⁶ because manawhenua provides the authority or jurisdiction to act. • Understanding the importance of this concept for biodiversity protection is central to respecting Māori values and tikanga. • If the status of the tangata whenua is not acknowledged, it is disrespectful to their manawhenua.²⁷
Kaitiakitanga	<ul style="list-style-type: none"> • Kaitiakitanga is derived from the word kaitiaki, meaning guardian.²⁸ • In the spiritual world, atua take on the responsibility of kaitiaki and in doing so may assume the form of an animal, tree or other living thing. • In the physical world, it is people who must perform the role of kaitiaki. • Only those people who hold manawhenua have sufficient control over human activities in their area to perform their role as kaitiaki.²⁹ 	<ul style="list-style-type: none"> • Kaitiaki exercise kaitiakitanga meaning guardianship or stewardship.³⁰ • Kaitiakitanga leads to ways of managing the environment. • Māori also gain mana by performing their role as kaitiaki effectively.
Rāhui and tapu	<ul style="list-style-type: none"> • Tapu is similar to sacred and is a form of spiritual restriction. • Rāhui is a kind of temporary ban, or restriction, imposed on natural resources to protect it from humans, or to protect humans from it.³¹ • A breach of either carries severe consequences. 	<ul style="list-style-type: none"> • Sustainable use of the natural world can be managed through the application of tapu and rāhui. • These concepts were deeply ingrained in society in order to control human consumption and anthropological impact on the environment.

Figure 1.1.2 Summary of important concepts and their relationship to biodiversity

Key issues for Māori

The Māori relationship with indigenous biodiversity has developed over many centuries of reliance upon natural resources for survival. It still remains an integral element of life for many Māori, in particular those living in rural communities, who still have access to traditional resources. In addition to these traditional uses, Māori interest in biodiversity extends beyond geographic and political boundaries to encompass fisheries (including aquaculture), agriculture and forestry. As kaitiaki of the biodiversity of tribal areas they are responsible for the long term survival of ecosystems and native species.³²

Land loss and biodiversity decline

During the pre-European period of early Māori settlement there were some significant biodiversity losses of both flora and fauna. The first stage of decline was a loss of the larger bird species, including the moa which was hunted to extinction. Large tracts of native forest were cleared by burning. By around 1600, approximately one third of the original forests in New Zealand had been replaced by grasslands.³³

Māori lost a vast amount of tribal land during the 19th century.³⁴ The European concept of land ownership does not exist in Māori tradition; rather land is occupied by kin groups and held through stewardship instead of ownership.³⁵ Usage rights are intricately constructed with various rights divided at different familial levels. There may be certain rights applying to the whole iwi, another set of rights for hapū, and then further rights applying to separate whānau.³⁶

For Māori-owned land, which is often under multiple-ownership, the tension between economic development and biodiversity protection is often even stronger because, in many cases, this land has only been returned to iwi under recent settlements. In addition, because this land has not yet been developed to date, it often includes areas that are important for biodiversity protection such as regenerating bush. Yet, for iwi, the need to provide opportunities for economic benefits through land development is more urgent, owing to lack of such opportunities in the past.

Loss of marine biodiversity and kaimoana

For Māori, the coastline and marine environment is traditionally a place to source food and resources, as well as being fundamental to travel and communication. While Māori settlement was not limited to the coast, the coast has always been dominant in living and food-gathering activities. Inland tribes often accessed

kaimoana (seafood) by way of putanga, or corridors to the coast. As coastal and marine biodiversity has become increasingly threatened, Māori have become increasingly concerned about the subsequent impacts on kaimoana. The degradation of marine resources is more evident in urban environments.

Loss of traditional biodiversity knowledge

Historically, only expert individuals, tohunga and wānanga (Māori learning schools) transferred traditional Māori knowledge on biodiversity values and protection. With modern influences, this process has gradually decreased and the transfer of knowledge has increasingly been achieved in the form of recordings, collections and dissemination of mātauranga Māori.³⁷

Mātauranga Māori is a central part of biodiversity management, but the role of this traditional knowledge is not well recognised. Such knowledge is under-utilised and vulnerable to loss. In addition, there is little recognition of the contribution this knowledge could make towards achieving the biodiversity gains being sought in this country. There is also a conflict between sharing of information with the wider public, and the protection of this knowledge from inappropriate use.

Reduced ability to apply traditional knowledge

For many Māori, the ownership and use of mātauranga Māori is critical to moving forward with biodiversity management. The WAI 262 claim is about who controls Māori traditional knowledge, artistry, culture, and the environment that created that culture. It considers what place in contemporary New Zealand living these things should have. The claim encompasses cultural values, such as the obligation of iwi and hapū to act as kaitiaki for traditional knowledge, cultural practices, important places, and flora and fauna significant to Māori.³⁸

The Waitangi Tribunal released its report 'Ko Aotearoa Tenei: Report of the Waitangi Tribunal into claims concerning law and policy affecting Māori culture and identity (Wai 262)' in July 2011.³⁹ It made a series of recommendations that included the establishment of Māori advisory bodies relating to patents and environmental protection.

The Tribunal also recommended amendments to legislation relating to Māori language, resource management, wildlife, conservation, cultural artefacts, environmental protection, patents on plant varieties, and more. The report urged New Zealand to move on to a new era based on genuine partnership.⁴⁰ It is not clear the extent to which these recommendations will be adopted as the government has yet to provide a substantive response to them.

Lack of constructive management partnerships

The review of the Biodiversity Strategy in 2005 identified that the success of the Nga Whenua Rāhui fund has resulted in a significant increase in interest in covenanting Māori-owned land, as well as in improving pest control. However, the review pointed out that there has been minimal change in the engagement and participation of Māori with government agencies and local authorities in regards to managing specific habitats and species. Historically, there has been some tension between the government's approaches to biodiversity management and Māori approaches.

The identification of significant natural areas under s6(c) of the RMA on Māori land has led to conflicts between Māori, and local authorities and conservationists. The identification of significant natural areas can be viewed by Māori as another level of control and compliance. Dialogue between parties is essential in understanding Māori and community biodiversity values.

Summary of key issues

The major issues for Māori and their relationship with biodiversity have generally arisen from the debate around the customary use of native species and the loss of traditional knowledge. Even now, with greater awareness of the important role Māori play in sustainably using biodiversity and the traditional knowledge that is held, these issues generally remain unresolved.

Issue	Effect
Land loss and biodiversity decline	<ul style="list-style-type: none">• Loss of stability and identity for iwi• Loss of food sources• Loss of indigenous materials for traditional activities
Loss of marine biodiversity and kaimoana	<ul style="list-style-type: none">• Loss of food sources• Less ability to exercise kaitiakitanga• Loss of mana
Loss of traditional biodiversity knowledge	<ul style="list-style-type: none">• Remaining knowledge is vulnerable to loss as members of the older generation pass away• Less ability to exercise kaitiakitangi
Reduced ability to apply traditional knowledge	<ul style="list-style-type: none">• Undermines cultural identity• Damages preservation of traditional knowledge• Important resources for customary use are not protected• Access to resources for customary use is not ensured
Lack of constructive management partnerships	<ul style="list-style-type: none">• Māori values, interests and concerns about biodiversity management are overlooked• Constrains achievement of biodiversity protection goals

Figure 11.3 Summary of the key issues for Māori and resulting effects

Description of approaches and responses

Whilst the Māori world view is very different from that of Europeans, Māori aspirations, goals and strategies for biodiversity are not dissimilar; common goals are uniting different groups who have an interest in biodiversity protection.⁴¹ This means it is important that management approaches and responses incorporate the Māori perspective, as well as an ecological, scientific and community perspective.



New Zealand Biodiversity Strategy

The Biodiversity Strategy is a cornerstone document in regards to policy approaches to biodiversity. It includes a separate theme that recognises the traditional relationship of Māori with this country's indigenous biodiversity, and how it continues to play an important role in the lives of many Māori.

Specific aims of the Biodiversity Strategy are to encourage respect and understanding for mātauranga Māori, to build effective working relationships,

and to build greater understanding within the community. There are a number of key objectives, including developing partnerships between Māori and Crown agencies and providing for, and protecting, the role of mātauranga Māori.



Figure 11.5 An anchor stone with traditional carvings representing captains of canoes, Harbour Link, Tauranga (*Shad Rolleston*)

Resource Management Act 1991

Many of the activities which impact on indigenous biodiversity are managed under the RMA. There are specific references within the RMA that require recognition of Māori interests. The RMA also enables the transfer of resource management powers to iwi authorities and the development of joint management agreements. However, the provisions relating to transfer of powers have never been applied under the RMA and only one joint management agreement has been prepared since 2005 with limited effect. The Waikato River Settlement requires joint management agreements to be prepared by iwi and local authorities with interests (customary and jurisdictional) in the river.

The NZCPS 2010 has a number of provisions that are relevant to Māori and biodiversity, including Policy 2(a) which recognises that tangata whenua have ‘traditional and continuing cultural relationships with areas of the coastal environment, including places where they have lived and fished for generations’.

Regional and district planning documents are required to give effect to the NZCPS 2010. To achieve this, the objectives, policies and rules in regional policy statements, regional plans, and district plans need to give weight to particular biodiversity issues and threats of relevance to Māori. Reviews of statutory planning documents offer a timely opportunity for addressing Māori biodiversity concerns.



Figure 11.6 Carving depicting a traditional narrative of Te Taurikura, The Lakes Development Pyes Pa, Tauranga (*Shad Rolleston*)

Fisheries Act 1996

The Minister for Primary Industries and the associated Ministry manage fisheries resources under the Fisheries Act 1996, which includes fish, shellfish, seaweed and other aquatic life. The Fisheries Act also creates opportunities for the practical application of kaitiakitanga through a number of mechanisms, such as the establishment of a taiāpure and the temporary closure of fishing areas to recognise, and make provision for, the use and management practices of tangata whenua. The purpose of a taiāpure is to make ‘better provision for the recognition of rangatiratanga and of the right secured in relation to fisheries by Article II of the Treaty of Waitangi’ (section 174 of the Fisheries Act).

Customary fishing is managed under the Fisheries (Kaimoana Customary Fishing) Regulations 1998 and the Fisheries (South Island Customary Fishing) Regulations 1999. These provide for Māori to manage their non-commercial fishing through the appointment of kaitiaki (guardians) who can issue permits to authorise the harvest of fish in their area. Implementation of these regulations is incomplete around the country.⁴² Many Māori also fish under the general provisions of the amateur fishing regulations.

Mātaitai reserves can be declared under the Fisheries (Kaimoana Customary Fishing) Regulations and the Fisheries (South Island Customary Fishing) Regulations on the application of tangata whenua. These are areas which are recognised traditional fishing grounds with which tangata whenua have a special relationship. Bylaws are put in place which restrict or prohibit fishing in the mātaitai reserve.

The Mount Maunganui Mātaitai reserve, established in 1998, covers the waters surrounding Mount Maunganui and part of Tauranga Harbour. The local Tauranga iwi, Ngaiterangi, Ngāti Ranginui and Ngāti Pukenga, advise the Ministry for Primary Industries directly on how best to manage fishing in the reserve. Commercial fishing is banned within the reserve, but recreational and customary fishing is still allowed and recreational fishing does not require a permit from local Māori.



Figure 11.7 A mātaitai reserve around Mount Maunganui protects both customary and recreational fishing in this area (*Lucy Brake*)

Iwi management plans

The RMA contains special provisions for iwi management plans. They can be prepared by an iwi, iwi authority, rūnanga or hapū. They are holistic documents that identify important issues in regards to the use of natural and physical resources in a particular area. They are generally prepared as an expression of rangatiratanga to help iwi and hapū exercise their kaitiaki roles and responsibilities.

Under the RMA, councils are required to take into account any relevant planning document recognised by an iwi authority and lodged with a local authority. Iwi management plans are an important document to assist councils with meeting their statutory obligations in regards to Māori. They are also valuable working documents for supporting iwi and hapū to effectively participate in environmental planning and policy development.

Iwi management plans address the guardianship and stewardship of natural resources and identify values, concepts and principles for iwi resource management. In particular, the issues of relevance to biodiversity which may be addressed include: customary use, native ecosystems, pest control, species recovery, sacred sites, resource use and development, land use and biosecurity. Iwi management plans can provide the additional benefits of assisting councils and communities to understand tangata whenua values and improving relationships between all parties.

The Ngāi Tahu Murihiku Natural Resource and Environmental Iwi Management Plan 2008, 'Te Tangi a Tauira – The Cry of the People' is a document that has been developed by Ngāi Tahu Murihiku in the Southland region. It reflects the attitudes and values of the four Rūnanga Papatipu o Murihiku – Awarua, Hokonui, Oraka/Aparima and Waihōpai.⁴³ The plan has been developed in collaboration with four territorial authorities and has their endorsement. Te Tangi a Tauira contains a specific section 'Nga Pononga a Tāne a Tangaroa – Biodiversity' which addresses a number of biodiversity concerns. It states that an important focus for Ngāi Tahu Murihiku is to find ways to protect, maintain and improve habitat for all biodiversity, be it in water, riparian margins, native bush or wetlands'. These issues should then filter through to regional and district planning documents.

Co-management arrangements

Co-management is a decision-making system that involves two or more parties. Co-management is part of a broader worldwide trend of indigenous peoples calling attention to the contributions of their knowledge and methods to environmental governance.⁴⁴

The co-management concept encompasses a relationship between government, iwi and/or the local community who all hold an interest in a particular area. The relationship is generally guided by principles of cooperation, openness and honesty. Co-management arrangements relating to indigenous biodiversity will most likely include a joint vision to restore and protect a certain ecosystem or habitat for future generations.

The Waikato Tainui Raupatu Claims (Waikato River) Settlement Act 2010 established the Waikato River Authority as the entity overseeing management of the Waikato River. It consists of ten members appointed from the Waikato River Clean-Up Trust, iwi, and the Minister for the Environment in consultation with relevant Ministers. Other examples of co-management include:

- The Okahu Bay Reserve Board – where Bastion Point and surrounding beaches and parks are managed by the Board which includes representatives from iwi (Ngāti Whatua o Orakei) and Auckland Council.
- The Te Arawa Lakes Settlement 2006 – where title to 13 of the 14 Rotorua Lakes are vested into a trust.
- Te Whiti Park – where the local iwi and the Hutt City Council have an agreement in regards to management of this area.



Figure 11.8 The Waikato River Authority, which oversees the management of the Waikato River, is an example of co-management (*Raewyn Peart*)

Contestable funds

Funding is an important part of the government's efforts to support Māori in their efforts to protect indigenous biodiversity. Two main contestable funds administered by the Department of Conservation are currently available: the Nga Whenua Rāhui Fund and the Mātauranga Kura Taiao Fund.

The Nga Whenua Rāhui Fund offers covenanting options to protect indigenous ecosystems, including native forest habitat, on Māori land. Under this covenanting framework, areas of biodiversity value on Māori land are protected by a type of covenant, called Nga Whenua Rāhui kawenata, using provisions in the Reserves Act. Areas of biodiversity value on Māori land can also be set aside as Māori reservations under the Te Ture Whenua Act 1993. Each of these mechanisms provides on-going funding for expenses such as fencing and weed control. A range of organisations representing iwi and hapū can apply.

The Mātauranga Kura Taiao Fund aims to recognise mātauranga Māori (traditional knowledge) in biodiversity management and it supports iwi, hapū and whanau initiatives. The funding has been made available as part of the implementation package for the Biodiversity Strategy.

Collaborative research

Research can provide access to a whole range of new tools and techniques to help improve biodiversity management. Science provides an opportunity to expand the current knowledge base on indigenous biodiversity. The merging of the mainstream science with Māori science (mātauranga) is important in order to achieve this. By incorporating the Māori perspective, as well as an ecological and scientific perspective, into research on biodiversity, common management approaches and responses can be generated. The Ministry for Science and Innovation encourages research collaboration with iwi and hapū.

Collaborative research projects between Crown Research Institutes, universities and iwi/hapū are important to increase the pool of knowledge on indigenous species and approaches, such as how biology interacts with kaitiakitanga. An example is the collaborative research work between Manaaki Whenua and Te Whare Wānanga o Ngāti Porou between 1998 and 2003 where Māori community goals for enhancing ecosystem health were developed.

Research using performance indicators is increasingly important in biodiversity management. Being able to encompass all aspects of biodiversity is a challenge. By developing specific indicators for habitats that cover Māori values, goals and aspirations (such as key sensitive taonga), community values (such as pest damage), and science (including areas such as hydrology and botany), it is far more likely that biodiversity values will be enhanced and protected.

Case studies

Mangaroa/Ototu Trust

The Mangaroa/Ototu Trust was established to promote sustainable economic, social, cultural and conservation development. It strives for continual improvement of environmental performance on behalf of Te Whānau a Apanui Iwi.⁴⁵ The Trust has undertaken a number of projects assisted by the Nga Whenua Rāhui Fund.

Work to restore both physical and spiritual richness is being carried out in the Mangaroa/Ototu area located in the North Island east of Opotiki. The forest was being progressively degraded due to encroachment by goats and deer, and predation from stoats, rats and possums. The Trust undertook a programme of pest eradication which has restored the forest and increased bird populations. The pest control programme provided the necessary conditions to initiate a second project; to reintroduce the native North Island kōkako.

In 2005, 18 kōkako were released in Ngapukeariki, which had been a natural habitat for the species in the past. As a forest dwelling bird with limited flying ability, the kōkako has been highly susceptible to introduced predators, and it is now classified as an endangered species. One challenge the project had to face early on was how to keep the birds within the pest-controlled area, where they would be safe from predators. Knowing that the birds have a tendency to remain in areas where there are other kōkako, a pair of the birds was kept in a confined area, to encourage the other kōkako to stay close by. The relocation of the kōkako involved considerable planning, discussions between Tūhoe iwi and Te Whānau a Apanui, and coordination with Department of Conservation, to decide how the operation would be carried out.

This case study highlights the benefits that can be realised from collaborative projects which include partnerships with landowners. It also demonstrates the importance of funding to support biodiversity restoration projects.

Ngāi Tahu natural resource management

South Island-based Ngāi Tahu is made up of 18 rūnanga. Te Rūnanga o Ngāi Tahu works on behalf of the iwi to manage administration and monitoring and to deliver social and cultural programmes.

Ngāi Tahu has developed a number of environmental plans and policies including a pounamu management plan, guidelines for beached marine mammals, a freshwater policy and a natural resources management framework, called 'Ki Uta Ki Tai'. Ki Uta Ki Tai, meaning from the mountains to the sea, is used to describe Ngāi Tahu's overall approach to natural resource management.

Ngāi Tahu's management approach includes a culturally-based, environmental monitoring and reporting system, called State of the Takiwa.⁴⁶ It is designed to assess the cultural health of the environment, incorporating traditional concepts such as mauri, alongside scientific methods. The aim is to establish a baseline and to develop policy intended to improve environmental wellbeing. Those sites that are less modified, that are rich in native species, and that have good accessibility and potential for mahinga kai, tend to score well.

The Christchurch City Council's Biodiversity Strategy recognises Ngāi Tahu's special relationship with biodiversity. The importance of the relationship between indigenous species and Māori is also formally recognised through the Ngāi Tahu Claims Settlement Act 1998. This includes a list of taonga species (birds, plants and animals) found with the Ngāi Tahu claim area (Schedule 97), such as the hoiho (yellow-eyed penguin) and the paikea (humpback whales).



Figure 11.9 Ngāi Tahu's special relationship with Akaroa Harbour's biodiversity is recognised through the Christchurch City Council's Biodiversity Strategy (*Raewyn Peart*)

Māori names often bear meaning of significance to biodiversity. The ancient name for Banks Peninsula is Te Pātaka o Rākaihautū which translates to 'a place of abundant resources'. This emphasises the significance of the area and the need to manage it carefully.

This case study highlights the value in iwi preparing environmental management plans. It shows the importance of building strategic partnerships between territorial authorities and iwi groups to ensure that ecologically sustainable cultural use of indigenous biodiversity by iwi is supported.

Recommendations for best practice

Approach	Best practice recommendations
Statutory and policy framework	<ul style="list-style-type: none"> • Use document review cycles as an opportunity to address Māori concerns in regards to biodiversity management • Use māitaitai reserves or tāiapure, where appropriate, to protect biodiversity values of importance to Māori in the marine area
Iwi management plans	<ul style="list-style-type: none"> • Where possible, specifically identify what provisions are required in RMA plans to address local iwi biodiversity issues, so that it is clear to councils what action needs to be taken

Co-management	<ul style="list-style-type: none"> • Each partner needs to come to the table with an open mind, ready to collaborate • Should have fair representation of all groups with an interest in an area • Must have a clear vision • Requires ongoing communication and monitoring to be effective
Contestable funds	<ul style="list-style-type: none"> • Project should be driven by a Māori community or group so it will be sensitive to Māori goals, values and aspirations • Goals and aims of project need to be clear and achievable • Projects are most successful when targeted at local areas or specific biodiversity issues
Collaborative research projects	<ul style="list-style-type: none"> • Projects generally need to be long-term as trust and open discussion between parties takes time to build • Requires regular contact and dialogue between both parties • Use research to develop specific projects which can be implemented to improve biodiversity outcomes or environmental indicators of value to biodiversity protection

Figure 11.10 Summary of the approaches and best practice recommendations

Useful websites

A model of co-management based on the Waikato-Tainui arrangement – <http://policyprojects.ac.nz/phillipanorman/files/2011/10/Waikato-Co-Management-Model1.pdf>

Department of Conservation – <http://www.doc.govt.nz>

Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan 2008 – http://www.qldc.govt.nz/images/content/planning/Te_Tangi_a_Taura_web.pdf

Quality Planning website – http://www.qp.org.nz/plan-topics/faq-iwi-management.php#What_is_an_iwi_plan

The Māori dictionary – <http://www.maoridictionary.co.nz/>

References and further reading

Barlow C, 1991, *Tikangawhakaaro: Key concepts in Māori culture*, Oxford University Press, Auckland

Boast R, A Erueti, D McPhail and N F Smith, 2004, *Māori land law*, Second Edition, LexisNexis NZ Limited, Wellington

Harmsorth G, 2004, 'A Māori perspective on biodiversity restoration', Presentation at Research in Ecological Restoration Workshop, Hamilton

Hong-Key Y, 1986, *Māori mind, Māori land*, Peter Lang Publishing Incorporated, Bonn

Ka'ai T, J C Moorfield, M P J Reilly and S Mosley, 2004, *Ki Te Whaiiao: An introduction to Māori culture and society*, Pearson Education New Zealand Limited, Auckland

Mangaroa and other Blocks Incorporation, n.d., *The Trust*, available at <http://www.mangaroakitekarakara.com/trust/default.asp>

Patterson J, 2000, *People of the land: A Pacific philosophy*, Dunmore Press Limited, Palmerston North

Peart R and K Mulchay, 2010, *Managing the marine environment*, Environmental Defence Society, Auckland

Ryan P M, 2008, *The raupo dictionary of modern Māori*, Penguin Group, Auckland

Shirres M P, 1997, *Tē Tangata: The human person*, Accent Publications, Auckland

Te Ara, 2010, *Tē Taiao Māori and the natural world*, David Bateman Limited, Auckland

Te Rūnanga o Ngāi Tahu, n.d., *State of the Takiwa*, available at <http://www.ngaitahu.iwi.nz/Ngāi-Tahu-Whanui/Natural-Environment/Environmental-Research/State-of-the-Takiwa.php>

The Waitangi Tribunal, n.d., *Time to move beyond grievance in Treaty relationship, Tribunal says*, available at <http://www.waitangi-tribunal.govt.nz/news/media/wai262.asp>

The Waitangi Tribunal, 2006, *WAI 262 The flora and fauna and cultural intellectual property claim*, available at [http://www.waitangi-tribunal.govt.nz/doclibrary/public/wai262/SOI/Wai262SOI\(doc2.314\)small.pdf](http://www.waitangi-tribunal.govt.nz/doclibrary/public/wai262/SOI/Wai262SOI(doc2.314)small.pdf)

Endnotes

- 1 Te Ara, 2010, 9
- 2 Te Ara, 2010, 8
- 3 Shirres M P, 1997, 25
- 4 Te Ara, 2010, 9
- 5 Shirres, M P, 1997, 16
- 6 Patterson J, 2000
- 7 Barlow C, 1991
- 8 Patterson J, 2000
- 9 Patterson J, 2000
- 10 Patterson J, 2000
- 11 Te Ara, 2010
- 12 Ryan P M, 2008
- 13 Shirres M P, 1997
- 14 Barlow C, 1991
- 15 Shirres M P, 1997
- 16 Te Ara, 2010
- 17 Ryan P M, 2008
- 18 Ka'ai T M et al., 2004
- 19 Ka'ai T M et al., 2004
- 20 Hong-Key Y, 1986
- 21 Patterson J, 2000
- 22 Patterson J, 2000
- 23 Ka'ai T M et al., 2004
- 24 Ka'ai T M et al., 2004
- 25 Patterson J, 2000
- 26 Ka'ai T M et al., 2004
- 27 Ka'ai T M et al., 2004
- 28 Te Ara, 2010
- 29 Ka'ai T M et al., 2004

- 30 Ka'ai T M et al., 2004
- 31 Te Ara, 2010
- 32 www.biodiversity.govt.nz
- 33 <http://www.biodiversity.govt.nz/picture/doing/nzbs/part-one/challenges.html>
- 34 Te Ara, 2010
- 35 Patterson J, 2000
- 36 Boast R et al., 2004
- 37 www.biodiversity.govt.nz
- 38 <http://www.waitangi-tribunal.govt.nz/news/media/wai262.asp>
- 39 <http://www.waitangi-tribunal.govt.nz/news/media/wai262.asp>
- 40 <http://www.waitangi-tribunal.govt.nz/news/media/wai262.asp>
- 41 Harmsworth G, 2004
- 42 Peart R and K Mulcahy, 2010
- 43 http://www.qldc.govt.nz/images/content/planning/Te_Tangi_a_Tauira_web.pdf
- 44 <http://policyprojects.ac.nz/phillipanorman/what-is-co-management/>
- 45 <http://www.mangaroakitekaraka.com/trust/default.asp>
- 46 <http://www.ngaitahu.iwi.nz/Ngai-Tahu-Whanui/Natural-Environment/Environmental-Research/State-of-the-Takiwa.php>



A child from Porirua with a Wellington Green Gecko, part of the Conservation Week
(Crown Copyright: Department of Conservation: Te Papa Atawhai, 2009)

twelve

Opportunities for public involvement

Overview

There are many opportunities for members of the public to become involved in statutory processes in order to improve biodiversity outcomes. Some of these processes involve establishing policies that govern decision-making. Others involve developing rules and regulations that apply to activities which impact on biodiversity. Yet other processes involve considering specific proposals to undertake activities.

Type	Key elements	Specific application
Preparing policies and plans	<ul style="list-style-type: none"> • Generally open processes • Councils required to consult with a range of parties prior to notification • Usually opportunities for input outside formal statutory process 	<ul style="list-style-type: none"> • Resource Management Act 1991 policies and plans • Local Government Act 2002 plans • Conservation strategies and plans • Reserve management plans • Fisheries plans • Population management plans • Pest management strategies
Making rules and regulations	<ul style="list-style-type: none"> • Large number of processes • Often process is not prescribed in detail • Many agencies seek public input when in draft stage 	<ul style="list-style-type: none"> • National environmental standards • Marine reserves • Fisheries sustainability measures • Marine protection rules • Marine mammal sanctuaries • Import health standards
Deciding individual proposals	<ul style="list-style-type: none"> • Much more limited opportunities for participation 	<ul style="list-style-type: none"> • Resource consents • Offshore dumping permits • Concessions • Preliminary tenure review proposals • Marine mammal permits • New organisms permits
Publicly initiated proposals	<ul style="list-style-type: none"> • Limited number of processes are available to the public to initiate statutory action 	<ul style="list-style-type: none"> • Private plan changes • Water conservation orders • Reporting offences • Declarations and enforcement orders • Judicial review

Figure 12.1 Summary of opportunities for public involvement

Because there are so many different pieces of legislation applying to biodiversity management, which are administered by a range of statutory authorities, there is little consistency in the processes that apply to different management jurisdictions. In some areas there are quite extensive rights of public participation. In other areas consultation rights are focused on directly affected parties. Where there are no rights of submission or appeal, a statutory decision may still be able to be challenged by initiating judicial review proceedings in the High Court.

Preparing policies and plans

Resource Management Act plans

Members of the public must be given the opportunity to make written submissions on proposed national policy statements. If a board of inquiry process is adopted by the Minister for the Environment, submitters will also have the opportunity to present their case (including submissions and evidence) at a public hearing convened by an independent board of inquiry. The board of inquiry makes recommendations to the Minister who makes the final decision. There are no appeal rights against the Minister's decision on national policy statements, and the only redress is through judicial review proceedings in the High Court.

There is a very open process for public participation in council policy and plan-making under the RMA. Councils are required to consult with a range of parties prior to proposed plans and policy statements being formally notified, including Ministers of the Crown, local authorities and iwi. Councils also commonly consult with a range of other stakeholders and this can be a useful opportunity to have some input outside the formal statutory process. When preparing a plan or a plan change, councils must take into account relevant iwi planning documents which have been lodged with them. This provides an opportunity for tangata whenua to have proactive input into planning initiatives.

Once the proposed policy statement or plan is formally notified, members of the public can make written submissions. The following people and entities are then able to lodge further submissions in support or opposition to the submissions already lodged:

- Any person representing a relevant aspect of the public interest which is likely to include public interest environmental groups

- Any person that has an interest in the proposed policy statement or plan greater than the interest that the general public has which is likely to include owners of land and users of resources directly affected by plan provisions. It is also likely to include iwi and hapū where their interests are directly affected
- The local authority itself

All submitters then have the opportunity to present their case before a council-initiated public hearing. Once the council has made decisions on submissions, any submitter has the right to appeal the decision to the Environment Court. The Court will consider the matter afresh at a public hearing.

Other parties can become party to any appeal (referred to as section 274 parties) only if they can show that they fall within one of the following categories:

- They have lodged a submission at the local authority stage
- They have an interest in the proceedings greater than the public generally (excluding trade competitors). This will normally include neighbours, downstream resource users and iwi authorities. It is uncertain whether public interest groups will be able to become parties under this category as well, due to recent changes to the RMA

Decisions of the Environment Court can be appealed to the High Court on questions of law, but not on the merits. More information on processes under the RMA can be found at www.rmaguide.org.nz.

Local Government Act plans

Long term council community and annual plans are prepared using a special consultative procedure set out in the Local Government Act. This requires the council to give public notice of the proposed plan, to provide members of the public with the opportunity to make written submissions, and to convene a public hearing to hear the submissions. There are no rights of appeal against the decision of the council after considering the submissions.

Conservation strategies and plans

Under the Conservation Act 1987, conservation management strategies and plans guide all of the Department of Conservation's work, including decisions on provision for recreational activities within conservation land, approvals (such as concessions) and biodiversity conservation work. The public process for preparing conservation management strategies and plans is similar. Members

of the public must be given the opportunity to make written submissions on draft documents. Submitters must then also have the opportunity to present their submissions to the Director-General of Conservation in person (for submissions on general policy) or to a meeting consisting of representatives of the Director-General and affected conservation boards (for strategies and plans). There are no rights of appeal.



Figure 12.2 Trampers in the bush enjoy the opportunity to visit a conservation area, which has a conservation management strategy in place to provide for such recreational use (*Raewyn Peart*)

Reserve management plans

Reserve management plans are prepared for each reserve protected under the Reserves Act 1977 by the administering body. Members of the public must be given the opportunity to make written submissions on the draft plan as well as to present the submissions in person. Opportunity may also be given to make written submissions at an earlier stage in the plan preparation process if the administering body publicly notifies an intention to prepare a plan.

Fisheries plans

The Minister for Primary Industries can approve fisheries plans under the Fisheries Act. Before approving a plan, the Minister must consult with representatives of stakeholder groups such as fishers and environmental

organisations. The Minister must also provide for the ‘input and participation’ of tangata whenua (section 12). Although members of the public have no explicit consultation rights in relation to fisheries plans, in practice, draft plans are usually circulated for public comment before approval.

Population management plans

Population management plans can be prepared by the Minister of Conservation for marine mammals under the Marine Mammals Protection Act 1978 and for other wildlife under the Wildlife Act 1953. Members of the public must be given the opportunity to make written submissions on the draft plan and also to present their submissions in person to the Director-General or his or her representatives.

Pest management strategies

National pest management strategies are prepared by the Minister for Primary Industries and regional pest management strategies by regional councils under the Biosecurity Act 1993. Members of the public must have the opportunity to make written submissions on draft pest management strategies and these are heard by a board of inquiry (for national strategies) or the regional council (for regional strategies). The decision of the council on the regional pest management strategy can be appealed to the Environment Court by submitters.

Summary

Policy/plans	Application	Opportunity for public involvement
Resource Management Act 1991		
New Zealand Coastal Policy Statement	Activities within the coastal environment	<ul style="list-style-type: none"> • Written submissions on proposed policy statement • Presentation of submissions and evidence to Board of Inquiry (where the board of inquiry process is adopted)
Other national policy statements	Activities within the scope of the document	
Regional policy statements	Activities within catchments and the territorial sea of the region	<ul style="list-style-type: none"> • Written submissions on proposed policy or plan • Written further submissions by some parties • Presentation of submissions and evidence to council hearing • Appeal to Environment Court
Regional coastal plans	Activities within the territorial sea of the region	
Regional plans	Activities within the catchments of the region	
District plans	Activities within the district	<ul style="list-style-type: none"> • Appeal to High Court on points of law

Local Government Act 2002		
Long Term Council Community Plan and Annual Plan	Regional council and territorial authority activities and budgets	<ul style="list-style-type: none"> • Written submission on proposed plans • Presentation of submissions to council hearing
Conservation Act 1987		
General policy	Natural and historic resources in general	<ul style="list-style-type: none"> • Written submissions on draft policy • Presentation of submissions to the Director-General of Conservation
Conservation management strategies	Conservancy-level natural and historic resources	<ul style="list-style-type: none"> • Written submissions on draft strategy • Presentation of submissions at a meeting of representatives of the Director-General of Conservation and affected conservation boards
Conservation management plans	Conservation areas and national parks	
Reserves Act 1977		
Reserve management plans	Land-based reserves	<ul style="list-style-type: none"> • Written submissions on proposed plan where intention to prepare plan is publicly notified • Written submissions on draft plan • Presentation of submissions to reserve administration body or nominee
Fisheries Act 1996		
Fisheries plans	Fisheries or groups of fisheries	<ul style="list-style-type: none"> • No statutory rights to participate. • Minister must consult with persons or organisations representative of those classes of persons having an interest in the stock or effects of fishing on the aquatic environment in the area concerned including Māori
Wildlife Act 1953		
Population management plans	Wildlife	<ul style="list-style-type: none"> • Written submissions on draft plan • Presentation of submissions to the Director-General of Conservation or his or her representatives
Marine Mammals Protection Act 1978		
Population management plans	Marine mammals	<ul style="list-style-type: none"> • Written submissions on draft plan • Presentation of submissions to the Director-General of Conservation or his or her representatives
Biosecurity Act 1993		
National pest management strategy	Eradication of pests at a national level	<ul style="list-style-type: none"> • Written submissions on proposed strategy • Presentation of submissions to board of inquiry
Regional pest management strategy	Eradication of pests at a regional level	<ul style="list-style-type: none"> • Written submissions on proposed strategy • Presentations of submissions to regional council (or hearings commissioner) • Appeal to Environment Court

Figure 12.3 Opportunities for public participation in the preparation of policies and plans affecting biodiversity

Making rules and regulations

There are a large number of public processes through which rules and regulations are made to manage activities affecting biodiversity.

National environmental standards

National environmental standards are developed under the RMA. There is no prescribed process for the preparation of national environmental standards other than that the public must be given adequate time and opportunity to comment. Usually written submissions will be sought on a proposed standard before it is adopted, but there will not be a public hearing to consider submissions.

Marine reserves

Marine reserves can be established under the Marine Reserves Act 1971. When an application is made to establish a marine reserve, the application is publicly notified and will set out what restrictions will apply within the proposed reserve. Any person can make a written objection to the proposal. The objections are lodged with the Director-General of Conservation.



Figure 12.4 The Cape Rodney-Okakari Point Marine Reserve at Leigh, near Auckland, was the first marine reserve put in place and provided for scientific research into marine ecosystems (*Raewyn Peart*)

Fisheries sustainability measures

Under the Fisheries Act, sustainability measures can be set to provide catch limits; control areas from which fish, seaweed, or aquatic life is taken; and also to control fishing methods and seasons. For the setting of sustainability measures there are no statutory rights of public participation. The Minister for Primary Industries must consult with representatives of groups having an interest in the stock or the effects of fishing on the aquatic environment in the area concerned. This will normally include commercial and recreational fishing interests and environmental organisations. The Minister must also provide for the 'input and participation' of tangata whenua. In practice, the Ministry makes available an initial advice paper and will accept written submissions from any party, before finalising its advice to its Minister.

Marine protection rules

Marine protection rules are developed under the Maritime Transport Act 1994. Members of the public must be given the opportunity to make written submissions on proposed rules, but there is no requirement for public hearings and no appeal rights. In practice, Maritime New Zealand consults widely on proposed marine protection rules, and there is opportunity for members of the public to input, prior to the formal statutory process commencing.

Marine mammals sanctuaries

The Marine Mammals Protection Act 1978 provides for the establishment of marine mammal sanctuaries. Once the Minister of Conservation has notified a marine mammal sanctuary there is an opportunity for members of the public to make written submissions on it. But there is no requirement for a public hearing and no appeal rights. In practice, the Department of Conservation consults widely on marine mammal sanctuary proposals, particularly with affected parties, prior to formal notification.

Import health standards

Import health standards, prepared under the Biosecurity Act 1993, address the import of items into New Zealand that pose a biosecurity threat. There are no statutory rights for the public to participate in the preparation of import health standards, although there is an obligation in the Act for the chief technical officer to consult with representatives of persons having an interest in the standard. In practice, written submissions are sought from the public on draft standards before they are finalised.

Summary

Rules and regulations	Application	Opportunity for public involvement
Resource Management Act 1991		
National Environmental Standards	Specified activities within catchments and the territorial sea	<ul style="list-style-type: none"> • Must be adequate time and opportunity for public comment. Usually written submissions on the proposed standard will be sought
Marine Reserves Act 1971		
Marine Reserves	Spatial area within the territorial sea	<ul style="list-style-type: none"> • Written objections on the proposal to establish a marine reserve
Fisheries Act 1996		
Sustainability measures	Fish stocks and impacts of fishing activity on the aquatic environment within the territorial sea and EEZ	<ul style="list-style-type: none"> • No statutory rights to participate. • Minister for Primary Industries must consult with persons or organisations representative of those classes of persons having an interest in the stock or effects of fishing on the aquatic environment in the area concerned including Māori, environmental, commercial and recreational interests. In practice, written submissions are sought on an initial advice paper
Maritime Transport Act 1994		
Marine Protection Rules	Vessels and/or offshore installations within the territorial sea and EEZ	<ul style="list-style-type: none"> • Written submissions on the proposed rule
Marine Mammals Protection Act 1978		
Marine mammal sanctuaries	Spatial marine area within territorial sea or EEZ	<ul style="list-style-type: none"> • Written submissions on sanctuary after it has been notified by the Minister of Conservation
Biosecurity Act 1993		
Import health standard	International vessels	<ul style="list-style-type: none"> • No statutory submission rights • Consultation with persons who are representative of classes of persons having an interest in the standard. In practice, written submissions are sought from the public on draft standards
Figure 12.5 Opportunities to participate in the development of rules and regulations affecting biodiversity		

Deciding individual proposals

The opportunities to become involved in decisions about individual proposals for activities affecting biodiversity are much more limited than the opportunities provided for in the development of policies and rules.

Resource consents

Under the RMA there are broad rights of participation in resource consents when they are publicly notified. These usually include making written submissions, being heard at a council-initiated hearing, appealing the council's decision to the Environment Court and being heard again, and appealing the Environment Court's decision to the High Court on points of law only. However, typically less than five per cent of consent applications are publicly notified.¹

Matters can be directly referred to the Environment Court for decision on the request of the applicant. In this case there will be no hearing by the council in the first instance. The decision of the Environment Court can be appealed to the High Court on points of law only.

Matters of national importance can be 'called-in' by the Minister for the Environment (or Minister of Conservation for applications within the coastal marine area). In this case there will also be no council hearing in the first instance. The matter will be processed by the Environmental Protection Authority and determined either by the Environment Court or by a board of inquiry appointed by the Minister. The applicant and submitters will have the opportunity to present submissions and evidence in person. Decisions can be appealed to the High Court on points of law only.

There are no appeal rights against a council's decision not to notify a resource consent and the only redress is through initiating judicial review proceedings in the High Court. In cases where the council decides not to publicly notify the application, it may still be given limited notification. This means that parties who are directly affected by the proposal, and who have not given consent, will have the opportunity to lodge a submission and subsequent appeals.

Offshore dumping permits

Under the Maritime Transport Act 1994, a permit must be obtained from the Director of Maritime New Zealand before dumping waste into the EEZ or the continental shelf beyond (section 261). The process to apply for a permit is set out in Part 180 of the Marine Protection Rules and requires applications to be publicly notified if they have more than a minor adverse effect on the marine environment or are clearly in breach of the London Convention. When an

application is publicly notified, interested parties can make written submissions and the Director must have regard to the submissions when reaching a decision. There is no requirement for a public hearing and no appeal rights against decisions not to notify or to grant applications. The only redress is through initiating judicial review proceedings in the High Court.

Concessions

The Minister of Conservation may grant concessions to undertake commercial or recreational activities within conservation areas. Concessions lasting more than ten years must be publicly notified and members of the public can make submissions on them. There is no provision for a public hearing or appeal rights.

Preliminary tenure review proposals

Once a tenure review process has commenced, under the Crown Pastoral Land Act 1998, preliminary proposals must be publicly notified, providing members of the public with the opportunity to make written submissions. There is no provision for a public hearing or appeal rights.

Marine mammals permits

A permit is required under the Marine Mammals Protection Regulations 1992 for commercial operations undertaken for the purpose of taking people 'to view or to come into contact with any marine mammal in New Zealand'. The permit is granted by the Director-General of Conservation. Applications are required to be publicly notified, with members of the public having the opportunity to make written submissions. There is no provision for a public hearing or appeal rights.

New organisms permits

Most applications for a permit to import, release or develop new organisms under the Hazardous Substances and New Organisms Act 1996 are required to be publicly notified. Members of the public have the opportunity to make written submissions and to present submissions and evidence to a public hearing held by the Environmental Protection Authority. The decision of the Authority on permits can be appealed to the High Court on points of law only.

Summary

Application	Activity	Opportunity for public involvement
Resource Management Act 1991		
Resource consent	Activity within the district or region	<ul style="list-style-type: none"> • Statutory right to participate only where application publicly notified • Written submissions on application • Presentation of submissions and evidence to council hearing (where no direct referral or call-in) • Appeal to Environment Court • Presentation of submissions and evidence to Environment Court hearing (or board of inquiry for some call-ins) • Appeal to High Court on points of law
Maritime Transport Act 1994		
Permit	Dumping waste into the EEZ or continental shelf beyond	<ul style="list-style-type: none"> • Statutory right to participate only where application publicly notified • Written submissions on application
Conservation Act 1987		
Concession	Activity within a conservation area	<ul style="list-style-type: none"> • Written submissions on notified concession application
Crown Pastoral Land Act 1998		
Preliminary proposal for tenure review	High country leasehold land	<ul style="list-style-type: none"> • Written submissions on notified proposal
Marine Mammal Protection Regulations 1992		
Permit	Commercial marine mammal tourism operations	<ul style="list-style-type: none"> • Written submission on notified permit application
Hazardous Substances And New Organisms Act 1996		
Permit	Import, release and development of new organisms	<ul style="list-style-type: none"> • Only statutory submission rights when publicly notified • Written submission on application • Presentation of submission and evidence at Environmental Protection Authority hearing • Appeals to the High Court on points of law

Figure 12.6 Opportunities to participate in the determination of individual applications affecting biodiversity

Publicly-initiated processes

In most cases, the initiation of a process to develop new policies or rules (or to amend existing instruments) applying to biodiversity management is left to the statutory authority concerned. Members of the public will need to persuade the relevant Minister, council or agency that a change is needed. However, there are some actions that members of the public can take to initiate statutory action.

Private plan changes

Any person can seek a change to a regional or district plan, including a regional coastal plan under the RMA. Such a request can only be made, however, when the plan is operative. The council can only reject the request for a limited number of reasons specified in the RMA. If none of these apply, the council must process the private plan change, and has the option of adopting the plan change as though it was initiated by the council.

Requesting a private plan change can be an expensive exercise, as the application will need to include an assessment of environmental effects of the proposal, and an assessment of its benefits and costs. Preparing these assessments is likely to require the assistance of environmental professionals. In addition, the council can charge the applicant the full costs of processing the proposed plan change including the costs of the submission process and hearing.

Reporting offences

Another process where members of the public can initiate action to improve biodiversity protection is through reporting issues of concern to the relevant authorities, particularly where there is suspicion of an offence being committed. Before reporting the issue, it is useful to record as much relevant information as possible, including taking photographs or filming a video. Most authorities have hotlines and after hours numbers and these are often prominently displayed on their websites. The following summarises where offences should be reported:

- Pollution incidents should be reported to the regional council.
- Suspected illegal fishing activity and logging of indigenous forest should be reported to the Ministry for Primary Industries.
- Suspected illegal activities inside national parks, conservation areas, marine reserves and marine mammal sanctuaries should be reported to the Department of Conservation.
- Suspected illegal activity within regional parks should be reported to the regional council.

- Suspected illegal activities within local reserves should be report to the city or district council.
- Harm to protected species should be reported to the Department of Conservation.
- Suspected new pest species should be reported to Biosecurity New Zealand.

Declarations and enforcement orders

If an offence has been committed under the RMA, members of the public can seek enforcement of the law through the Environment Court to protect biodiversity, and the declaration procedure is a good first step where the court can confirm that a breach has occurred. More information on this process can be found at www.rmaguide.org.nz.

Judicial review

Judicial review involves challenging the exercise of a statutory discretion. It has been used to challenge decisions such as the establishment of restrictions on fishing activity to protect marine mammals, the decline of a proposal to establish a marine reserve and the failure to notify resource consents under the RMA.

The challenge cannot be based on the merits of the decision, but only on the basis that it was 'unlawful'. In order to overturn a decision on the basis that it is unlawful, it will normally be necessary to establish one of the following grounds:²

- The decision was motivated by an improper purpose, which was not contemplated by the legislation
- The decision-maker took into account irrelevant matters
- The decision-maker failed to take into account relevant matters that were mandatory under the legislation
- The decision was made under an invalid delegation
- The decision-maker made an error of law
- The decision-maker had insufficient information on which to base the decision

It is also possible to challenge a decision on the basis that it was unreasonable. This is a hard test to meet and involves establishing that the decision was 'so unreasonable that no reasonable [decision-maker] could ever come to it'. Another ground on which a decision may be set aside is on the basis that the procedure which the decision-maker followed did not accord with the principles of natural justice, including acting in good faith and listening fairly to both sides.

References and further reading

Kirman C and C Whata, 2005, 'Environmental litigation and dispute resolution, in Nolan D (ed), *Environmental and resource management law*, 4th edition, LexisNexis, Wellington

Ministry for the Environment, 2011, *Resource Management Act survey of local authorities 2010/2011*, Ministry for the Environment, Wellington

Peart R, 2008, *The New Zealanders Guide to the Resource Management Act 1991*, 3rd edition, Craig Potton Publishing, Nelson

Endnotes

- 1 Ministry for the Environment, 2011, 16
- 2 Kirman C and C Whata, 2005, 1024

PART TWO
MANAGING
BIODIVERSITY
WITHIN NEW
ZEALAND'S SPECIAL
ENVIRONMENTS

Without habitat, there is no wildlife. It's that simple.

Wildlife Habitat Canada



Beech forest above Lake Monk, Fiordland National Park
(Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

thirteen

Indigenous forests

By stopping animals going into the bush and with possum control the bush is recovering, and we are now seeing rata flowering and flocks of kereru coming in.

Derek Daniell, Wairere Farm landowner

In pre-human times, New Zealand's land mass was blanketed by forests. Where trees could grow, they did – once covering nearly 80 per cent of the total land area of this country. These forests had been in a process of continual change over countless millennia due to climate cycles, new species arrivals and disturbance events, such as volcanic eruptions. However, the most rapid changes have occurred in the last 700 years of human occupation. Today, indigenous forests cover just over seven million hectares, or approximately 25 per cent of the total land area,¹ and have been extensively modified through land clearance, logging and as a result of the impacts of invasive species.

New Zealand's land mass is home to some unique forest ecosystems; including kauri forests, kahikatea swamp forests, pōhutukawa forests and mixed broadleaved forests. These support a diverse array of flora and fauna that evolved in the almost complete absence of land mammals. Most of New Zealand's native land birds inhabit forest or shrub land.

Life in the forest

Forest processes

Under natural conditions the vegetation within indigenous forests, and consequently the species that inhabit these ecosystems, changes over time. Processes such as disturbance and succession (continual change) resulting from natural events including landslides, falling mature trees and forest fires, lead to bare areas of soil. The first plants to colonise an area of bare soil are lichens, mosses and small herbs. These plants are important for the forest, as they build up the fertility of the soil, which in turn supports smaller hardy trees and shrubs. Succession within a forest system can be primary, which begins with bare rock exposed by a geological activity, or secondary, which is where the soil is open and exposed following a disturbance event in pre-existing forest such as a fire or storm. This process can also occur at multiple scales, from single tree gaps through to catastrophic events.

Trees

Forests in New Zealand are typically made up of mixtures and pure stands of broadleaved, conifer and beech species. The two most common forest types are conifer-broadleaved forest and beech (*Nothofagus*) forest.

Conifer-broadleaved forest in temperate, lowland areas, are the tallest and most complex of New Zealand's forests. At higher altitudes they tend to be

shorter and floristically poorer than the lowland equivalents. There is a huge diversity of species found within this class of forest.

Beech forests cover just under three million hectares of New Zealand and consist of one or more beech species. Beech is the dominant forest cover on the main mountains of the North Island and much of the western South Island, but is absent in most of Northland, near the Manawatū Gorge and in central Westland. Beech forests are generally found at higher elevations where the climate is colder and wetter, growing seasons are shorter, and soils are less fertile. In these areas beech forest replaces conifer-broadleaved forests.



Figure 13.1 Beech form part of the two most common forest types in New Zealand (Raewyn Peart)

Beech trees also grow alongside non-beech species forming mixed beech and conifer-broadleaved forests. These forests cover over 1.4 million hectares and include the hard beech-kauri forest in the Auckland area and beech-podocarp forest in the central North Island.

A useful summary of tree composition in each of these forest types is available at http://www.qualityplanning.org.nz/plan-topics/indigenous-biodiversity/wetlands-2b.php#_Indigenous_forests.

Other flora

Beneath the forest canopy a tier of smaller trees, including tree ferns and nikau palms (which are the southern-most palm species in the world) are found. These then give way to a layer of saplings, shrubs and groundcovers. New Zealand has a very rich diversity of mosses living in the forest habitats. Approximately one fifth of mosses are endemic, including *Epipterygium opararensense*, which has only been found growing on a single boulder in the Kahurangi National Park in the north-west of the South Island.²

Historically, fungi have not been well studied, but in terms of species their numbers significantly outweigh plants. Over 900 species have been recorded growing with the four species of native beech.³ New Zealand has more than 500 species of liverwort and 13 species of hornwort.⁴ The nationally critical liverwort *Frullania wairua* has to date only been found living on the twigs of a threatened rata species *Metrosideros bartelettii*.⁵ Large numbers of liverworts enjoy the moist conditions offered by native forests.

Ferns are mostly found in moist forest areas where there is plenty of water. For a temperate country, New Zealand has an unusually high number of ferns, with approximately 200 species. It is thought that around 40 per cent of these are found only in this country.⁶ The silver fern (*Cyathea dealbata*), also known as ponga, is a national symbol of New Zealand. The ferns found in the forest ecosystems can range in size from just a few millimetres long to huge tree ferns.

Large leaf-like lichens are also common in forests as they like to grow on the damp environments found in tree trunks. A large foliose lichen, *Menegazzia pertransita*, grows on the trunks of beech trees in the wet areas of Fiordland.⁷ Lichens are also found growing on decaying logs and stumps on the forest floor, as well as on the leaves of trees as epiphylls.



Figure 13.2 Ferns are an important part of the diverse flora found in indigenous forests (Raewyn Peart)

Lianes are various climbing and woody vines that are commonly found within New Zealand's forests. Epiphytic plants grow on another plant or object, obtaining moisture from the air, or from the dampness on the surface of their hosts. Common epiphytes within forest ecosystems include the perching lily *Collospermum hastatum* and the bamboo orchid *Earina mucronata*.⁸

Birds

New Zealand's native land birds are most commonly found in forest or shrub land. In some areas exotic forests provide important habitat for native birds. The availability of good quality native forest (including exclusion of predators) is important to the survival of many of the uncommon and threatened bird species of this country, including the kōkako and mohua.⁹ Native forest habitat offers important sources of food and shelter, particularly during winter when the availability of food is at its lowest. The most valuable forests for native birds are the tall lowland conifer and broadleaved forests, as well as the lowland beech forests, because of the complex food webs and diverse habitats offered by these ecosystems.¹⁰

Native birds are a critical part of forest communities, providing important pollination and seed dispersal services. All podocarp species primarily rely on birds for dispersal. Large forest birds, like kererū, distribute the fleshy fruits and berries from trees such as tawa, pūriri, miro and matai found in the conifer-broadleaved forests. Other native species that are important for seed dispersal are tūi, bellbird and silvereye. Increasingly, introduced birds are also playing a key role in seed dispersal.

Invertebrates

Native forests provide habitat for a wide diversity of invertebrates, which are a fundamental part of the forest ecosystem. Invertebrates play an important role in breaking down organic material, recycling nutrients, pollinating plants and providing food for native birds, reptiles, frogs, fish and bats. There are many threatened invertebrate species living within native forest habitats which rely on this biome for their survival.



Figure 13.3 North West Nelson tree weta, near Cave Brook, Goulund Downs, Kahurangi National Park (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2009)

Reptiles and frogs

Geckos and skinks are the only lizards found in this country. While they inhabit a wide range of elevations and environments, many of them are found in the moist conditions offered by native forest habitats. The endangered striped skink *Oligosoma striatum* lives in epiphytes that grow in trees and rotting logs. Tuatara, whilst they appear to be lizards, are from the *Sphenodontia* order which lived amongst the dinosaurs. They like to eat native invertebrates such as weta and worms. The native frogs found in New Zealand (pepeketua) also belong to an ancient genus of frog, *Leiopelma*. The critically endangered Archey's frog *Leiopelma archeyi*, found only in two sites in the Coromandel and west of Te Kuiti, is one of the world's most primitive frogs and is described as a 'living fossil'.¹¹

Ecosystem services

New Zealand's native forest ecosystems play an important role in delivering ecosystem services (described in Chapter 1). There are a number of values and benefits that are derived from indigenous forest ecosystems¹², including:

- Improving water quality
- Reducing soil erosion
- Retaining natural nutrient cycles
- Decreasing air pollution
- Regulating local air temperatures
- Supporting pollinating species
- Supporting biological pest control species
- Regulation of atmospheric carbon levels and temperatures
- Sequestration of atmospheric carbon

Native forests offer a significant potential for storing carbon. As the trees grow, carbon dioxide is absorbed and stored in the forests. A significant amount of carbon is also stored in the soil. Indigenous forests are a far greater carbon store than mono-culture plantation forests; compared hectare for hectare, native forests store around three times as much carbon as pine forests.¹³

Threats

Prior to human settlement, New Zealand was largely forested below the climatic tree line.¹⁴ The arrival of Māori led to significant areas of lowland forest being burned to encourage the growth of bracken fern that was used as a food source,

to make cross-country travel easier, and as a strategy for hunting moa.¹⁵ Forest clearance rapidly increased following the arrival of European settlers.

Early New Zealand landholders were required by law to improve their land, and many achieved this through burning the forest. Primary forest clearance continued into the mid-20th century, and during the 1950s increasing amounts of forest in the mountain ranges was converted to farmland or fast-growing exotic plantations. The net result of exploitation of New Zealand's indigenous forest was the loss of approximately three-quarters of the forest, reducing it from 82 per cent to 23 per cent of the land surface area.¹⁶



Forest clearance has had the greatest impact on lowland forests, reducing some forest types such as kauri to less than one per cent of their former extent. There is a bias in the protected land network towards upland forests and grasslands, which leaves remaining lowland forests vulnerable.

Whilst the widespread clearance of native vegetation has now stopped, the most pressing issue facing the protection and restoration of native forest biodiversity is the damage from invasive species. Other threats include fragmentation of forest habitats and the lack of intact forest edges.

Invasive species

Pest animals have significant adverse impacts on native forest ecosystems. Mammalian pests include brushtail possums, goats, deer, pigs, weasels, ferrets, stoats, cats, hedgehogs and rats. Mammalian pests damage forest ecosystems by browsing on sensitive forest vegetation. Possums present one of the biggest

threats to native forests: they browse on trees and seedlings which lead to large scale devastation. Through possums' eating of the seedlings of native plants, regeneration of the forests is inhibited, a food source for native birds is depleted and there is a detrimental impact on carbon sequestration.

Mammalian pests can eat significant amounts of seed crops of particular plants, which impacts on natural regeneration. They also kill native birds and animals, destroy nesting sites and deplete food sources for native birds. Without predator control, nine out of ten North Island brown kiwi chicks born in the wild will die before they are one year old.¹⁷

Stock browsing and trampling can significantly damage plant species diversity and abundance. Browsing of particular tree species can change the make-up of a forest, causing the loss of palatable species. Livestock also facilitate the invasion of exotic species through seed dispersal and soil disturbance.

At a conservative estimate, New Zealand has at least 19,000 species of introduced vascular plants, of which over 2000 are naturalised and 240 species are recognised as invasive weeds.¹⁸ This contrasts with an entire native flora of little more than 2000 species. Introduced weeds pose a significant threat to indigenous forest systems, particularly small lowland remnants. They modify the forest ecosystems in a number of ways, including smothering native plants and suppressing the natural regeneration of native understory and canopy species.

Through invading the forest area, these weeds produce a flow-



Figure 13.5 Introduced weeds, like these shown, pose a significant threat to native forest systems (*Moth plant with Ginger, Gorse and Passion fruit, Sherwood Heights, Whangarei.* Crown Copyright: Department of Conservation: Te Papa Atawhai, 2001)

on effect that is experienced right through a whole ecosystem. Weeds, such as pampas, bamboo, ginger, gorse and black wattle, invade native forests from nearby urban areas. These invasive plants may also bring with them diseases and viruses which are a potential threat to native plant species. As native plants are displaced, food sources for native birds and invertebrates are lost. Ultimately, the seed dispersing function these birds perform will disappear, potentially leading to the collapse of the forest ecosystem.

Plant pathogens can also have profound impacts on forest ecosystems. A recently identified disease, kauri dieback (*Phytophthora* taxon *Agathis*), is posing a serious threat to kauri forests in the upper North Island. This disease is responsible for killing kauri trees of all ages and it is believed to spread through the soil with soil water flow.¹⁹ As no treatment is yet available, this pathogen has the potential to devastate the country's remaining native kauri forest ecosystems as similar pathogens are now doing elsewhere in North America and Australia.



Figure 13.6 The recently identified kauri dieback disease is killing kauri tree stands throughout the upper North Island (Kauri dieback management programme, Auckland Council)

Fragmentation of forest habitats

As a result of the extensive clearance of native forests, New Zealand's lowland indigenous forests have experienced high levels of loss. This is principally because of the development of pastoral agriculture and production forestry, which now cover between 80 and 90 per cent of low-elevation environments. Forest remnants are small patches of indigenous forest or shrub land which were once part of much larger forest systems. They are ecologically valuable, as they provide reservoirs for native plant seeds allowing natural regeneration.

They often occur in gullies and on steep slopes where they protect soils and streams. They also provide small examples of forest types that are now highly uncommon, such as the kahikatea/matai forest type of the Canterbury Plains.

In most regions, numerous forest fragments remain within the mainly pastoral farming matrix, but they are typically small and isolated. The historical threats of logging and clearance have been replaced by other threats which continue to cause decline in these forest fragments.²⁰

The fragmentation of lowland and coastal forests, especially on private land, is of particular biodiversity concern.²¹ Forest remnants require a greater level of management because they are highly vulnerable to a number of threats, particularly from invasive species. In addition, there is often little opportunity for species to interact between forest areas with the frequent absence of corridors linking these pockets. Forest remnants are also increasingly exposed to effects from surrounding land uses, such as land drainage and spraying.

Fragmentation leads to problematic edge effects. In undisturbed forests, there is normally a gradual transition between forest and grasslands. This transitional area can cover considerable distances. This transition area or 'edge' prevents wind entering the understory by 'lifting' it over the top. With protection from wind, the forest offers a humid microclimate that supports the germination of many native plant species. Forest remnants have a large proportion of their area exposed to the elements, which means the detrimental effects of wind and sun penetrating the understory are significant.²² These effects include increased wind-throw of trees, a drying out of the forest floor, and a greater susceptibility to weed invasions.



Figure 13.7 Example of a fragmented forest (*Raewyn Peart*)

Climate change

A threat that is now emerging is the vulnerability of fragments of native forests to a changing climate and the impacts this has on species diversity and ecosystem processes. The native forests of drier lowland areas of the North Island, and in the lower east of the North Island and Southland, are considered to be the most vulnerable to climate change.²³

Summary of threats

Cause	Potential effect
Introduced animals	<ul style="list-style-type: none">• Alter dynamics and ecosystem processes within the forest• Consume palatable native vegetation• Consume seed crops• Prevent natural re-vegetation• Expose understory to weed invasion• Predate native birds and invertebrates• Destroy nesting sites of native species• Deplete food sources for native birds• Damage native plant diversity and abundance
Invasive weeds	<ul style="list-style-type: none">• Smother and displace native plants• Suppress natural regeneration of understory species• Colonise natural gaps• Destroy native birds' food sources• Impact on the seed dispersing function of native birds• Shade out early regenerating species• Lead to potential collapse of entire forest ecosystem
Fungal pathogens	<ul style="list-style-type: none">• Can target specific species• Kill trees of all ages• Alter forest composition
Fragmentation of forest habitats	<ul style="list-style-type: none">• Reduces habitat for native species• Lack of a transition zone results in damage to forest edges and understory• Increases exposure to invasive species• Reduces corridors for movement of species between forested areas• Increases exposure to effects from land use – including spraying and drainage

Figure 13.8 Summary of the main causes of biodiversity loss in native forests and the potential effects on habitats, ecosystems and species

Description of regulatory management approaches

The 2005 review of the Biodiversity Strategy concluded that voluntary mechanisms to protect terrestrial biodiversity alone are not enough. Prescriptive measures and regulations under the statutory framework are also needed.

Management of native forest remnants on private land falls largely within the framework established by the RMA, including both the NZCPS 2010 (for coastal forests), and the proposed National Policy Statement on Indigenous Biodiversity (once operative). There are benefits to be gained from aligning work on private land with that on public land (whether administered by the Department of Conservation or territorial authorities).

There are a number of statutory mechanisms under the RMA that support the protection of native forest biodiversity on private land. Although indigenous forests are not specifically mentioned in the RMA, some of the more significant ones would fall under the matters of national importance (section 6(c)), which requires ‘the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna’. Councils can also use consent conditions to encourage the use of voluntary covenants, such as those administered by the QEII Trust or established under the Reserves Act 1977.

Protection of areas of significant indigenous forest

Many regional and district plans around the country recognise the importance of protecting native forests through their planning provisions. A current concern is that, although these documents need to spatially identify significant forest areas under RMA section 6(c) and then provide rules for their protection, they do not necessarily do so. Once these areas are protected there is a need for cooperation between the landowner and the council in regards to on-going management.

Logging

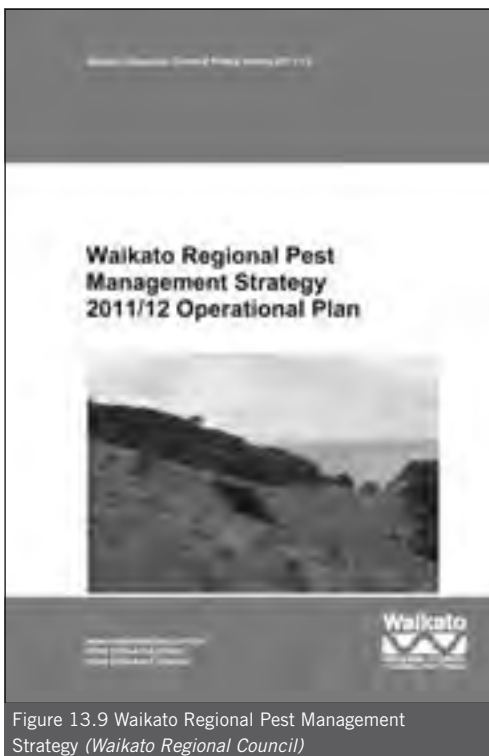
Logging of indigenous forest on private land is controlled by the Forests Act 1949. A major amendment to this legislation in 1993 provided a regime to manage the sustainable logging of privately-owned forests. Timber may not be felled except in accordance with a sustainable forest management plan or permit, which is approved by the Minister for Primary Industries. The export of the timber is also unlawful unless it was taken in accordance with a registered sustainable forest management plan or permit (section 67C) and Schedule 2 of the Forests Act sets out the requirements for sustainable logging practices.

Activity rules and consent conditions

Where a statutory plan requires resource consents to be obtained, rules can be applied and conditions can be placed on the granting of consent to address the impacts on biodiversity of the proposed activity within indigenous forest areas or blocks. For example, a rule in the Nelson Resource Management Plan states that the total of indigenous forest cleared on any one certificate of title in any three year period must not exceed 0.2 hectares, or a resource consent is required.

Conditions can be placed on resource consent for activity within an area of indigenous forest that may impact on biodiversity values. Conditions can prescribe the use of management practices that reduce the risk of weed invasion when forming new tracks or clearing vegetated tracks. They can also require annual plant and animal eradication programmes which apply to specific species. Conditions can also require financial contributions.

Pest management strategies (discussed in Chapter 9) and biodiversity offsetting (discussed in Chapter 4) are also useful tools which can be applied to indigenous forest protection.



Description of non-regulatory approaches

Community organisations

Community networks are a good vehicle to support people who are interested in biodiversity restoration within native forest ecosystems. The New Zealand Landcare Trust is a non-government organisation focused on sustainable land management and

it works with farmers, landowners and community groups nationwide to improve sustainability of the natural environment, including indigenous forest remnants. The New Zealand Native Forests Restoration Trust is one of this country's leading organisations involved in forest restoration. This trust purchases land to protect important species and works with the support of volunteers to restore their habitats.

Education and information

Many territorial authorities have prepared a range of resources to assist with restoration of native forest areas. For example, the Auckland Council has prepared a brochure which provides some basic guidance to people wanting to replant an area of native forest in the Auckland region.

Stock exclusion and weed and pest control play a major role in remnant forest management. A number of different organisations provide advice to landowners and community members on this. The Wellington Regional Council has produced a guide 'Managing Your Bush Block' which provides advice on how to identify threats to remnant forest and the management options available. One of the recommendations of this guide is to undertake an assessment to identify and map all pest plants, to rank the plants in order of the most impact on the bush block, and then to prepare a staged programme to systematically address the problems. The guide also includes an inventory of common weeds and their control.



Figure 13.10 Auckland replanting guide (Auckland Council)

The New Zealand Plant Conservation Network is an excellent resource for information on native and exotic plant species, as well as biodiversity management approaches and links to other resources.

Financial incentives

The use of financial incentives to protect native forest on private land is an important mechanism to achieve protection of biodiversity values. The New Zealand government has provided funds to protect indigenous forest ecosystems through the Nature (formerly Forest) Heritage Fund. There are also nationally available funds that offer support for forest restoration projects on private land, including the Biodiversity Advice Fund and the Biodiversity Condition Fund (discussed in Chapter 10). In addition, a number of regional and local authorities offer funds that provide financial support for biodiversity protection and restoration of native forest areas.

The government has also recently introduced initiatives to address climate change. This includes three carbon forestry schemes which are focused on encouraging landowners to set up both indigenous and exotic forest areas. This is done by the availability of a grant for establishing the forest and by providing the opportunity for forest owners to earn revenue from sequestered carbon (the NZ Emissions Trading Scheme and the Permanent Forest Sink Initiative).²⁴

Voluntary land covenants are a useful tool for protecting blocks of indigenous forest. Funding to support their application is available from QEII Trust and the Nga Whenua Rahui Fund (discussed in Chapter 10).

Case studies

Wairere Farm bush protection

Wairere Farm is a 1,206 hectare operational farm, containing remnant native forest pockets, in the Wairarapa. Since 1988 a 58 hectare QEII Trust covenant has protected four lowland podocarp-hardwood forest remnants, which include large totara, black maire and kahikatea.²⁵ More recently an additional 1.2 hectare covenant has been added.

Whilst the balance of the land is intensively farmed, the protected forest remnants on the farm offer important wildlife corridors for birds, including kereru. The native bush has been stock-free for decades now and so the forest has been able to successfully regenerate. It is representative of the original land cover that would have been found in the Wairarapa, including kamahi, hinau, tawa and rimu.²⁶

The edges of the bush covenant have been planted with a buffer that includes some hardy native species, such as manuka and native vines. These reduce the wind effect and help to keep invasive weeds out. Seasonal animal pest control is carried out prior to bird breeding time.

This case study offers a valuable educational tool for people who are keen to replicate the reforestation efforts. It demonstrates the importance of on-going maintenance and the need to understand the native forest processes to achieve a successful restoration project.

Banks Peninsula Conservation Trust

The Banks Peninsula Conservation Trust was formed in 2001 when the local council made a move towards voluntary methods to conserve natural areas. In 2003 this Trust became the first non-government organisation to be authorised to place conservation covenants on land titles since the QEII Trust was set up over 30 years ago. Its vision includes protecting and caring for the biodiversity, landscapes and character of Banks Peninsula.



Figure 13.11 The Banks Peninsula has a wide range of biodiversity and landscape values requiring protection (*Raewyn Peart*)

The Trust relies on volunteer assistance and community support. It has made significant progress in creating voluntary conservation covenants with landowners to protect and restore native forest on the Banks Peninsula. To date it has registered 45 covenants totalling an area of 420 hectares.

The Trust applies to funding agencies, on the behalf of landowners, for assistance with the costs of surveying and fencing. The organisation is also involved in hosting biodiversity workshops, convening conservation forums, undertaking restoration and weed control, preparing newsletters, and working closely with agencies, landowners and community groups.²⁷ For the last four years the Trust has been working to reintroduce tūi to the Banks Peninsula, which plays an important role in regenerating the native forest ecosystems.

The Trust was awarded a Green Ribbon Award for Protecting Our Biodiversity in 2010 by the Ministry for the Environment, in recognition of its restoration work and the successful collaboration efforts it has made.

This case study is a good example of how a community can come together to achieve biodiversity protection goals through the use of non-regulatory approaches. It also highlights the importance of charitable trusts and community groups in protecting native forest habitats.

Recommendations for best practice

Management approach	Best practice recommendations
RMA plans	<ul style="list-style-type: none"> • Ensure plans spatially identify significant forest areas • Ensure plans include robust rules for protecting forest remnants, including restrictions on modifying native forest vegetation • Ensure plans include provisions for managing a buffer zone between productive land/subdivision and forest areas • Use resource consenting processes to address adverse effects from the use of adjacent land for activities such as grazing, spraying and drainage works
Consent conditions	<ul style="list-style-type: none"> • Restrict modifications to native forest vegetation such as through vegetation clearance or stock grazing • Require an annual plant and animal eradication programme • Require operational practices that will reduce the risk of weed invasion • Require financial contributions where appropriate
Voluntary land covenants	<ul style="list-style-type: none"> • Protect the entire forest ecosystem and surrounding buffer area • Identify funding sources for on-going weed and pest management if required
Education and information	<ul style="list-style-type: none"> • Use demonstration forest restoration projects • Develop best management practices from case studies

Figure 13.12 Summary of the management approaches and best practice recommendations

Useful websites

Greater Wellington Regional Council – <http://www.gw.govt.nz/Managing-your-bush-block/>

New Zealand Plant Conservation Network – <http://www.nzpcn.org.nz/>

The Queen Elizabeth II Trust – <http://www.openspace.org.nz/>

References and further reading

Department of Conservation and Ministry for the Environment, 2000, *The New Zealand Biodiversity Strategy: Our chance to turn the tide, Whakakōhukihukitia Te Tai Roroku Ki Te Tai Oranga*, Department of Conservation and Ministry for the Environment, Wellington

Ewers R M, A Kliskey, S Walker, D Rutledge, J S Harding and R K Didham, 2006, 'Past and future trajectories of forest loss in New Zealand', *Biological Conservation*, 133, 312–325

Fleet H, 1986, *The concise natural history of New Zealand*, Heinemann Publishers, Auckland

Green W and B Clarkson, 2005, *Turning the tide? A review of the first five years of the New Zealand Biodiversity Strategy*, The Synthesis Report submitted to the Biodiversity Chief Executives in November 2005, Wellington

McGlone M S, 1989, 'The Polynesian settlement of New Zealand in relation to environmental and biotic changes', *New Zealand Journal of Ecology*, 12, 115–129

Norton D A and C J Miller, 2000, 'Some issues and options for the conservation of native biodiversity in rural New Zealand', *Ecological Management & Restoration*, 1 (1), 26–34

Porteous T, 1993, *Native forest restoration – A practical guide for landowners*, Commercial Print Limited, Wellington

Stevens G, M S McGlone and B McCulloch, 1988, *Prehistoric New Zealand*, Heinemann Reed, Auckland

Te Ara, 2009, 'Pre-settlement forests', in *An Encyclopedia of New Zealand*, edited by A H McLinktock (ed), originally published 1996

Wardle P, 1991, *Vegetation of New Zealand*, Cambridge University Press, Cambridge

Endnotes

- 1 Department of Conservation and Ministry for the Environment, 2000
- 2 Te Ara, 2009
- 3 <http://www.teara.govt.nz/en/fungi/2>
- 4 <http://www.teara.govt.nz/en/liverworts-and-hornworts>
- 5 http://nzpcn.org.nz/flora_details.asp?ID=4989
- 6 <http://www.doc.govt.nz/conservation/native-plants/ferns/>
- 7 <http://www.teara.govt.nz/en/lichens/2>
- 8 http://www.nzpcn.org.nz/page.asp?flora_vascular_flowering_plants_epiphytes
- 9 <http://www.qualityplanning.org.nz/plan-topics/indigenous-biodiversity.php#abstract>
- 10 <http://www.qualityplanning.org.nz/plan-topics/indigenous-biodiversity/wetlands-2b.php>
- 11 http://www.edgeofexistence.org/amphibians/species_info.php?id=546
- 12 <http://www.doc.govt.nz/upload/documents/science-and-technical/sfc295entire.pdf>
- 13 <http://www.forestandbird.org.nz/saving-our-environment/climate-change-/what-are-the-solutions>
- 14 McGlone M S, 1989
- 15 Stevens G et al., 1988
- 16 Fleet H, 1986
- 17 <http://www.doc.govt.nz/conservation/threats-and-impacts/animal-pests/need-for-pest-control/>
- 18 <http://www.doc.govt.nz/upload/documents/conservation/threats-and-impacts/weeds/strategic-plan-for-managing-invasive-weeds.pdf>
- 19 <http://www.doc.govt.nz/conservation/threats-and-impacts/biosecurity/kauri-dieback/>
- 20 Norton D A and C J Miller, 2000
- 21 <http://www.qualityplanning.org.nz/plan-topics/indigenous-biodiversity.php#abstract>
- 22 Porteous T, 1993
- 23 <http://www.qualityplanning.org.nz/plan-topics/indigenous-biodiversity.php#abstract>
- 24 <http://www.maf.govt.nz/forestry/forestry-in-nz/indigenous-forestry.aspx>
- 25 http://www.openspace.org.nz/Site/Covenant_stories/Stories/Wairere_Farm.aspx
- 26 http://www.openspace.org.nz/Site/Covenant_stories/Stories/Wairere_Farm.aspx
- 27 <http://www.bpct.org.nz/>



Example of tussock grassland habitat (*Raewyn Peart*)

fourteen

Indigenous grasslands

The great tussock grassland ecosystems are this country's equivalent of North America's prairies or the steppes of Russia.

Former Conservation Minister Sandra Lee, 2001

New Zealand's indigenous grasslands have been, and remain, a significant component of this country's native plant cover and ecology. Over the last 10,000 years, during the Holocene period, grasslands formed a mosaic across many parts of the country, interspersed with areas of woody vegetation. The pattern varied according to elevation, topography, slope, aspect and disturbance. Grasslands mainly grew in areas that were colder or drier than those which supported shrubland. Some birds and invertebrates have also adapted over thousands of years to live in such cold and dry habitats.

The use of fire by Māori reduced the extent of forest cover on the main islands from about 80 to around 50 per cent.¹ Grasslands reached their greatest extent in the early 1800s, after Māori fires had burned much of the forest in the drier eastern regions, and before Europeans settled in New Zealand.

At the time of first European settlement, the total extent of indigenous grasslands in New Zealand is assumed to have been around 30 per cent of the total land area. Tussock grasslands dominated the low-alpine zone above the natural treeline and some valley floors in the forested regions with higher soil moisture levels. However, they were most extensive in the rain-shadow region to the east of the Southern Alps.²



Figure 14.1 Tongariro National Park supports an important area of indigenous grasslands
(*Raewyn Peart*)

Life in the grasslands

Tussock grasslands are found from sea level to the alpine zone and fall into the two broad categories shown below.

Type	Extent	Grasses
Short tussock grasslands	<ul style="list-style-type: none"> • Pre-1900s short tussock grassland covered considerable areas of the eastern South Island from sea level up to between 800 and 900 metres high • In many places it invaded areas where forest had been cleared, and tall tussock grassland had been modified by grazing and burning • Large areas also occur to the east of the North Island's central plateau 	<ul style="list-style-type: none"> • The dominant plant species in short tussock grasslands are usually <i>Festuca novae-zelandiae</i> (hard tussock), <i>Poa colensoi</i> (blue tussock), and/or <i>Poa cita</i> (silver tussock). Many other grass species are common in these plant communities. • Hard tussock is the most common. It is deep rooted and dominant on steep, exposed slopes. • Blue tussock grows with the other species. • Silver tussock is shallow rooted and grows in more fertile conditions.
Tall tussock grasslands	<ul style="list-style-type: none"> • Tall tussock communities are found on the central plateau and southward throughout the high country of both the North and South Islands, sometimes above forest • At lower levels tall tussock may be found on coastal hills, as on Banks Peninsula, or on the Southland plains 	<ul style="list-style-type: none"> • Tall tussock grassland is dominated by one or another of the grasses in the genus <i>Chionochloa</i>. These grasses are usually a metre or more high and yellow, green-brown or red-brown in appearance. • Such grasslands are generally found today at higher altitudes and in wetter conditions. • The main tall tussock grassland types are 'snow tussock grasslands' (dominated by <i>Chionochloa rigida</i>), which occur above the current tree line and below the original tree line, and 'copper tussock grasslands' which are found mainly below the current tree line and are dominated by varieties of <i>C. rubra</i>. The alpine zone of the South Island supports a variety of other tall tussock species and grassland types.

Figure14.2 Broad indigenous tussock grassland types

Native grasses

Species that have a ‘tussock’ growth habit, where stems grow fanning up and outward from a central bunch, dominate this environment. The tight clustering of the leaves may have evolved to protect new growth from frost. Tussock leaves grow from the base, not the tip, which means that new growth is protected both by surrounding stems (or tillers) and the leaf litter that encircles each plant. Tussock grasslands are known to retain water well, meaning these grasses can play an important role in reducing flooding within the catchment. These grasses are also valuable for delivering secure water supplies to urban areas as they sustain high water yields through reduced transpiration.³



Figure 14.3 Sand tussock, Onoke Spit, Southern Wairarapa (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2007)

Plants

In addition to the native grasses, this ecosystem type supports a wide range of native plants, some of which are listed as threatened species. The threatened upland shrub *Leonohebe cupressoides* (formally *Hebe cupressoides*), the endangered Hector’s tree daisy (*Olearia hectorii*), native *Peraxilla* mistletoes, and the parasitic mistletoe *Tupeia antarctica* (albeit on scattered shrubs) all live in grasslands.⁴ There are also a large number of indigenous grasses and other herbaceous plants that live within these plant communities.

Birds

There are a number of bird species that rely on native grassland communities for their survival. The endangered Haast Tokoeka kiwi lives in the low-alpine grassland found in the South Island. Tiny rock wrens, from the ancient New Zealand wren family, make nests from tussock grass. New Zealand pipits also prefer tussock grasslands.

Lizards

Grasslands are an important habitat for indigenous lizard species. The South Island's sub-alpine tussocklands are a centre for lizard diversity.⁵ They have various roles within this ecosystem; including pollination, seed dispersal, and acting both as predators and prey. The critically endangered Grand and Otago skinks are two of New Zealand's most distinctive lizards.⁶ They are found in small pockets around Otago, living in very specific habitats, found in the crevices of large outcrops of schist. These two lizards are particularly well adapted to the cold upland tussock communities.



Figure 14.4 Otago skink, Macraes Flat, Otago (Crown Copyright: Department of Conservation: Te Papa Atawhai, 1992)

Invertebrates

Often the species that live within the soil are the least studied but they are just as important as those described above. Invertebrates are an integral part of the ecosystem, as they provide food for many of New Zealand's native birds, and help to maintain soil fertility.

What we do know is that there are litter-dwelling invertebrates, such as mites, as well as miriapods (such as centipedes) that all make their homes in these environments. Larger insects are also present, such as flies and midges (from the order *Diptera*) and bugs (from the order *Hemiptera*). Terrestrial stoneflies (from the order *Plecoptera*) enjoy the damp litter that the South Island's indigenous grasslands offer.⁷ There are 15 native species of grasshopper in New Zealand, most of which spend their lives in alpine zone grasslands. Also found are the large flightless tussock weevils (from the genus *Lyperobius*).

Slugs and snails commonly inhabit these ecosystems. The earthworm family, *Megascolecidae*, lives in native tussock grasslands but only in areas where the vegetation and soil remains undisturbed.⁸ The range and life cycle of these earthworms are not well understood, and little is known about the impact that the destruction of grasslands has on such subsoil species. A large number of the 48 identified native earthworms are found in these areas, including species of *Rhododrilus* in the central North Island and *Maoridrilus* in the east of the South Island.⁹



Figure 14.5 The Mackenzie Basin has indigenous grasslands which are facing a range of threats, in particular clearance of native vegetation (Raewyn Peart)

Threats

An assessment of the conservation status of New Zealand's indigenous grasslands, undertaken in 2002, indicated that just less than 45 per cent of those present in 1840 still persisted, albeit in a variously modified or degraded condition.¹⁰ Tall tussock grassland was identified in the Environment New Zealand 2007 report as one of the native land cover types that has continued to be modified since 1997. It is believed to be one of the five vegetation types to have suffered the greatest loss of cover.

The changes in coverage of various grassland types are outlined below. The extent of each grassland type varies largely with elevation and climate. The drier, lower-elevation grasslands have suffered the greatest reduction. The extent of formal protection of the remaining areas also varies considerably. Protection is greatest in the South Island wet western region. The North Island and eastern South Island areas, not used for extensive pastoral farming, are less protected.

Type	Percentage of pre-1840 remaining	Percentage of this area formally protected
Short-tussock grassland (montane to subalpine)	25%	3%
Tall red/copper tussock grassland (montane to subalpine)	20%	16%
Tall snow tussock grasslands (montane to subalpine)	84%	31%
Tall snow tussock grassland (above the climatic treeline in the low alpine zone)	98%	50%
Lowland sward grassland	2%	very scattered remnants persist

Figure 14.6 Changes to extent of indigenous grasslands since 1840 (Mark A and B McLennan, 2005)

Burning

Since the late 19th century, fire has been used extensively for a range of agricultural purposes. It has been used to facilitate the movement of grazing animals, to promote new tussock growth which is palatable to stock, and to convert tussock grassland into improved pasture. Fire can cause major damage to tussock communities, because it kills the roots of the plants. The grasses can take decades to rebuild their above-ground biomass and energy stores following fire.¹¹

In addition, fire can completely remove bryophyte (moss) cover which ultimately alters the ability of tussock communities to store moisture. When fire is used as an agricultural method, it can cause the loss of tall tussock species, which are then replaced by short tussocks or invasive weeds such as *Hieracium*.¹² Fire prevents regeneration of these plant communities, reduces plant diversity, and negatively impacts on the species that rely on grassland ecosystems for their survival.

Pastoral farming

Pastoral farming occurs on around 40 per cent (six million hectares) of the South Island high country, which generally encompasses the area between the Southern Alps and the eastern foothills extending from Southland to Marlborough.¹³ The traditional stock type is merino sheep, whose thick, fine wool allows the animals to flourish at high elevation. Most farmers also stock some cattle and deer. Average stocking rates have recently been estimated at 1.7 stock units per effective hectare.¹⁴



Figure 14.7 Farming of indigenous grasslands has significantly impacted on their biodiversity values (Raewyn Peart)

Grazing has been well documented to drive a change in vegetation pattern and composition. It results in the alteration of tussock ecosystems, because palatable species are selectively grazed. Less preferred species can then dominate and invasive species are able to gain a foothold in the ecosystem. By reducing the vegetative cover, grazing alters the habitat and food webs of lizards and invertebrates. Overgrazing can significantly reduce biomass production and lead to declining food productivity. In addition, herbivores redistribute nutrients within the grasslands, trample soil and increase soil erosion by removing vegetation cover.



Figure 14.8 Grazing in tussock land results in serious adverse effects on the native vegetation
(Raewyn Peart)

Invasive mammals

Introduced mammals can also create major problems for biodiversity in these ecosystems. Himalayan tahr, chamois, goats, feral sheep and red deer all graze on the grasses. Rabbits and hares are major grazers, as are possums and wallabies.¹⁵ Not only do many of these mammals browse on the grasses themselves, but they predate on the native birds and invertebrates that live there. Some feral animals, such as rabbits, are difficult to control and can easily invade areas where active grazing has been removed.

Invasive plants

The introduction of pastoral land use brought exotic pasture grasses and weeds into these habitats. These include hawkweeds (*Hieracium spp.*), woody weed species, and wilding conifers such as lodgepole pine (*Pinus contorta*) and radiata pine (*Pinus radiata*). *Hieracium* species rapidly invade severely depleted grasslands, especially in Canterbury. Some species can form a ground cover that restricts regeneration of indigenous species. In addition to reducing biodiversity, some of these species directly impact on stream water flows, consume groundwater, and fundamentally transform the landscape.

Wilding pines are a significant problem, particularly in the South Island high country, and in some parts of the North Island. Environment Canterbury estimates that 62,000 hectares of the region contains wilding pines.¹⁶ Seeds from pine plantations can travel up to 30 kilometres on the wind and rapidly colonise grassland.¹⁷ These weeds can be hard to control, especially once they have grown into larger trees. One of the biggest threats from wilding pines is that they rapidly self-colonise grassland where grazing is occurring. Some of the biggest wilding pine invasion problems are found on grazed land in the Mackenzie Basin and Wakatipu. The result is a mono-culture, with little biodiversity value, that completely transforms the landscape.



Figure 14.9 Wilding pines transform indigenous grasslands. This plant pest can be a significant challenge to control as it rapidly colonises grazed areas (Raewyn Peart)

Summary of threats

Cause	Potential effect
Burning	<ul style="list-style-type: none"> • Kills tussock plants outright by killing roots • Damages above-ground biomass and energy stores which can take decades to recover • Removes bryophyte (moss) cover and alters moisture storage capacity • Kills fauna species • Alters habitat for fauna species • Prevents regeneration • Reduces plant diversity
Grazing	<ul style="list-style-type: none"> • Modifies grassland communities • Promotes invasion by weed species • Can significantly reduce biomass production leading to declining productivity • Disrupts food webs
Invasive mammals	<ul style="list-style-type: none"> • Predate on native birds, lizards and invertebrates • Restrict regeneration of native species
Invasive plants	<ul style="list-style-type: none"> • Negatively transform the landscape • Reduce stream water levels • Competitively exclude indigenous plant species • Reduce indigenous species regeneration and persistence

Figure 14.10 Summary of the main causes and potential effects of biodiversity loss in indigenous grasslands

Description of regulatory management approaches

The process of high country tenure review, which is of relevance to managing biodiversity in indigenous grasslands, is covered in Chapter 7.

The main tools available under the RMA to protect grassland biodiversity include policies in regional policy statements, policies and rules in district plans and conditions imposed on the grant of resource consents.

Rules in district plans

Rules can be developed in district plans to protect indigenous grasslands. For example, the Mackenzie District Plan has a set of rules specifically for this purpose as outlined in Figure 14.11.

Activity type	Activity description
Non-complying activity	<ul style="list-style-type: none">• Clearance of more than 10 per cent of the total area of indigenous vegetation cover present on any Site of Natural Significance• Tree planting, other than restoration of native plantings, in Sites of Natural Significance
Discretionary	<ul style="list-style-type: none">• Clearance of more than 100m² of tall tussock• Clearance of more than 100m² per hectare of indigenous vegetation in any continuous 5 year period on land above 900m in altitude• Clearance of more than 100m² per hectare of indigenous vegetation in any continuous 5 year period within any Site of Natural Significance• Clearance of more than 40 hectares of short tussock grasslands, consisting of silver or blue (<i>Poa species</i>), or <i>Elymus solandri</i>, or fescue tussock where tussocks exceed 15 per cent canopy cover

Figure 14.11 Example of rules in the Mackenzie District Plan protecting indigenous grasslands

Conditions of resource consent

When an activity within tussock grassland areas requires resource consent, a council can place conditions on that consent to address protection of biodiversity. A requirement to use locally-sourced indigenous tussock plants for any replanting can assist with protecting the local genetic resources. In addition, local authorities can include conditions banning the burning of grasses for land management purposes in ecologically-important indigenous grassland areas. Covenants on property titles can also be used to ensure the long term management and protection of ecologically-important areas.

Description of non-regulatory approaches

Management of wilding pines

There is a range of technical information available on how to manage wilding pines, such as that provided by the New Zealand Wilding Conifer Management Group.¹⁸ Active removal of wilding pines can be achieved by the hand removal

of small seedlings, by ring barking mature trees, or by cutting down larger trees and coating the stump with poison (such as glyphosate and metsulfuron).

A number of councils, including the Marlborough District Council, incorporate wilding pines within their ecological threats programme. This has the benefit of encouraging and supporting voluntary control initiatives, focused on site-led management approaches. There are also a number of voluntary groups which assist landowners with clearing wilding pines from properties. The Wakatipu Wilding Conifer Control Group is a good example of community focus on this issue. The group receives funding from the Queenstown Lakes District Council, the Department of Conservation, local farmers and local businesses to carry out its activities to control wilding pines and to educate the local community about the issue.

Voluntary land covenants

Voluntary covenants are an important management tool for conserving grassland ecosystems on privately owned or leased land. A large area of land containing tussock ecosystems has already been covenanted by the QEII Trust. Land covenants as a management tool are discussed in Chapters 7 and 10.

Incorporation of grasslands into public conservation land

The process of tenure review, first put in place in 1991, has provided 336,308 hectares of new public conservation land.¹⁹ The government has also purchased a number of high country properties, independent of the tenure review process, for conservation purposes. Four high country conservation parks were created as a result of purchases and tenure review outcomes between 2000 and 2006, totalling over 150,000 hectares. In addition, the government transferred control of the largest high country property, Molesworth Station at 180,476 hectares, from Landcorp to the Department of Conservation in 2005.

These processes have meant that a sizeable proportion of New Zealand's tussock grasslands are now in public ownership. Maintaining and restoring biodiversity values in these areas requires on-going management. Areas of tussock in Molesworth offer a good example of how on-going management can reduce major weed infestations.

Economies of scale are a crucial factor in how much grassland management costs. It can be (and is) done very efficiently over large areas, especially when a single management agency is involved. This is because of the economies of scale that are realised, including from having experienced staff and the right equipment available. The Department of Conservation has coordinated whole-of-district approaches to wilding pine control, covering both private and public land, which has resulted in major cost efficiencies.



Figure 14.12 Setting aside areas of tussock grass in public conservation land supports protection of biodiversity values (*Raewyn Peart*)

Carbon sequestration

The Sustainable Farming Fund is currently funding a group of scientists, farmers and conservationists to look at how carbon is sequestered in tussocks. Elsewhere in the world, research has shown that similar rangeland systems can accumulate additional carbon when grazing is reduced. Recognising this, countries such as the United States of America and Russia have created tradable carbon credits in such ecosystems.²⁰

Tussocks are small, slow growing plants, and so are not obvious candidates for good carbon sequestration potential. However, because New Zealand has large tracts of them in the South Island, they could collectively store large quantities of carbon. This means these habitats could potentially generate valuable carbon credits, should such a market be developed. Whilst the final value placed on any carbon depends on the global market, this process may help protect these ecosystems in the future, as landowners could be incentivised to protect the tussock ecosystem for the carbon credits to be gained.

Case studies

Tekapo Scientific Reserve

The Tekapo Scientific Reserve project is an example of how the removal of grazing, the management of invasive weeds and the targeted replanting of native species can assist in the restoration of indigenous grasslands.



Figure 14.13 Indigenous grasslands of the Tekapo Reserve (Raewyn Peart)

The reserve encompasses just over 1,000 hectares of fescue tussock grassland and related communities in the Mackenzie Basin. The Department of Conservation took over management of the area in 1987, in efforts to retain and enhance its natural conservation values. In 1996, the land was reclassified as a scientific reserve, in order to provide for research into the protection and restoration of tussock ecosystems. It has two major geological features – a terminal moraine and fluvio-glacial outwash surface – which support a wide diversity of soils, fauna and vegetation.²¹

The main threats were from rabbits and a number of invasive weeds, including sweet brier, *Hieracium* species, introduced grasses and wilding trees. In addition, there were some direct human threats from vehicle use in the reserve (four-wheel drive and motorbikes) and fire. When the reserve was initially destocked in the early 1990s, tussock grasses had all but disappeared from the land.

A major biodiversity benefit realised is that the short tussock grass ecosystem being protected is 'grossly under-represented in protected areas elsewhere'. The reserve is also crucial for understanding the long term response of the ecosystem to stock exclusion and pest control and therefore how resilient biodiversity in the wider Mackenzie Basin is.²²

In 2011, a team of ecologists from Landcare Research and the Department of Conservation documented changes to the vegetation within the reserve. They assessed how the different vegetation communities were recovering, without the pressure of grazing. A resurgence in the presence of tussocks, as well as other native species that have previously been grazed by stock, was reported.

This case study highlights how the use of a number of practical management tools can assist in the restoration of a tussock environment. The reserve now provides an important example of how grassland can successfully be retired and restored, with gains for indigenous biodiversity.²³ This project is used as an educational tool, which can be viewed by farmers, the general public and scientists. This is considered to be particularly valuable in the light of possible proposals for irrigation supporting more intensive farming in parts of the Mackenzie Basin.

New Zealand Wilding Conifer Management Group

This organisation was first set up in 2007 as the South Island Wilding Conifer Management Group. It was supported by wilding research project funding from the former Ministry of Agriculture and Forestry's Sustainable Farming Fund. In 2010, the project was completed and the group continued under a wider remit. Current members include the Department of Conservation, forestry companies, a number of affected regional and district councils, conservation groups, research institutes and landowner representatives.



Figure 14.14 The New Zealand Wilding Conifer Management Group assists landowners with managing the problem of wilding pines (*Raewyn Peart*)

For many landowners the issue of wilding pines is a major concern. One of the group's main functions is to provide a central source for information on wilding pines in New Zealand, and on how landowners can best manage this invasive weed on their land. The group provides information on how to prevent the spread of wilding pines, options for operational control strategies, and ideas for post-control management.

The group is currently focusing on creating user-friendly risk maps and working with end users. It is also visiting properties to see wilding pine invasion in action, and to highlight some of the best practice management approaches. One of the benefits of the group's wider remit has been the extension of its activities into the affected parts of the North Island.

This case study highlights how a collaborative approach can assist landowners with achieving biodiversity gains on privately owned land. It also demonstrates how collaborative groups can contribute towards the development of national policy targeted towards managing biodiversity, through lobbying for regulatory changes to support improved control of direct threats.²⁴

Recommendations for best practice

Management approach	Best practice recommendations
RMA plans	<ul style="list-style-type: none"> • Develop rules to manage activities which impact on biodiversity, such as removal of indigenous vegetation, tree planting, pastoral intensification and earthworks • Rules in district and regional plans can include requirements to fence off stock, control invasive pests and plant naturally occurring species • Rules can identify appropriate levels of clearance as related to the total area of indigenous vegetation cover present
Consent conditions	<ul style="list-style-type: none"> • Consent conditions can include requirements to fence off stock, control invasive pests and plant naturally occurring species • Conditions can control the amount of burning that takes place
Management of wilding pines	<ul style="list-style-type: none"> • Targeted removal of both small and large plants • Targeted removal of seed sources for problematic species • Prevention is better than cure – early (pre-seeding) removal is more effective and can be orders of magnitude cheaper than later control measures • Councils can provide advice on control methods • Councils and other organisations can assist with preparing tussock recovery plans
Voluntary land covenants	<ul style="list-style-type: none"> • Covenant as large an area as possible • Protect representative tussock habitats across an altitudinal sequence • Ensure covenant conditions exclude compromising land uses and/or land use change • Work closely with voluntary groups for support and guidance
Incorporation of grasslands into public conservation estate	<ul style="list-style-type: none"> • Should include protection of lower altitude areas (terraces, fans and basins) • Preserve whole altitudinal and landform sequences where possible • Can work well where stock exclusion and rabbit and wilding pine control are feasible

Figure 14.15 Summary of the management approaches and best practice recommendations

Useful websites

Department of Conservation –

<http://www.doc.govt.nz/getting-involved/volunteer-join-or-start-a-project/start-or-fund-a-project/funding/for-landowners/nga-whenua-rahui/>

Land Information New Zealand –

<http://www.linz.govt.nz/crown-property/pastoral-land-tenure-review>

New Zealand Wilding Conifer Management Group –

<http://www.wildingconifers.org.nz>

Queen Elizabeth the Second Trust – <http://www.openspace.org.nz/>

References and further reading

Aspinall J, 2001, 'Issues around use of fire as a land management tool in rural New Zealand', in proceedings of Bushfire 2001, *Australasian Bushfire Conference*, 2001, Christchurch, New Zealand

Barker A P, 1953, *An ecological study of tussock grassland, Hunters Hills, South Canterbury*, New Zealand Department of Scientific and Industrial Research, Wellington

Espie P R, 1997, *Tekapo Scientific Reserve: Ecological restoration*, Conservation Advisory Science Notes No 149, Department of Conservation, Wellington

Ewans R, 2004, *Effects of removing grazing from native grasslands in the eastern South Island of New Zealand: A literature review*, Department of Conservation, Wellington

Holloway J T, 1959, 'Pre-European vegetation of New Zealand', in A H McLintock, *A descriptive atlas of New Zealand*, Government Printer, Wellington

Mark A F and B McLennan, 2005, 'The conservation status of New Zealand's indigenous grasslands', *New Zealand Journal of Botany*, 43, 245-270

Mark A F, 1993, 'Indigenous grasslands of New Zealand', in R T Coupland, *Ecosystems of the world Vol. 8B. Natural grasslands – Eastern Hemisphere*, Elsevier, Amsterdam

Mark A F, P Michel, K J M Dickinson and B McLennan, 2009, 'The conservation (protected area) status of New Zealand's indigenous grasslands: An update', *New Zealand Journal of Botany*, 47, 53-60

Molloy B P J, C J Burrows, C J Cox, J A Johnston and P Wardle, 1963, 'Distribution of subfossil forest remains, eastern South Island, New Zealand', *New Zealand Journal of Botany*, 1

Ministry for the Environment, 2007, *Environment New Zealand 2007*, Ministry for the Environment, Wellington, available at <http://www.mfe.govt.nz/publications/ser/enz07-dec07/>

Parliamentary Commissioner for the Environment, 2008, *Ecological processes in the South Island pastoral high country*, Report No. 1955, Parliamentary Commissioner for the Environment, Wellington

Parliamentary Commissioner for the Environment, 2009, *Change in the high country: Environmental stewardship and tenure review*, Parliamentary Commissioner for the Environment, Wellington

Payton I J, W G Lee, R Dolby and A F Mark, 1986, 'Nutrient concentrations in narrow-leaved snow tussock (*Chionochloa rigida*) after spring burning', *New Zealand Journal of Botany*, 24, 529–537

Walker S, R Price and R T Stephens, 2008, 'An Index of risk as a measure of biodiversity conservation achieved through land reform', *Conservation Biology*, 22, 48–59

Walker S, J B Wilson and W G Lee, 2003, 'Recovery of short tussock and woody species guilds in ungrazed *Festuca novae-zelandiae* short tussock grassland with fertiliser or irrigation', *New Zealand Journal of Ecology*, 27, 179–189

Endnotes

- 1 Molloy B P J et al., 1963
- 2 Mark A F, 1993
- 3 <http://www.doc.govt.nz/upload/documents/conservation/native-plants/tussock-factsheet.pdf>
- 4 https://secure.worldwildlife.org/wildworld/profiles/terrestrial/aa/aa0801_full.html
- 5 <http://www.teara.govt.nz/en/lizards/3>
- 6 <http://www.doc.govt.nz/conservation/native-animals/reptiles-and-frogs/lizards/grand-and-otago-skinks/facts/>
- 7 <http://soilbugs.massey.ac.nz/insecta.php>
- 8 <http://soilbugs.massey.ac.nz/oligochaeta.php>
- 9 <http://www.teara.govt.nz/en/earthworms/1>
- 10 Mark A F and B McLennan, 2005
- 11 Payton I J et al., 1986
- 12 Aspinall J, 2001
- 13 Parliamentary Commissioner for the Environment, 2008
- 14 Parliamentary Commissioner for the Environment, 2008
- 15 Ewans R, 2004
- 16 www.wildingconifers.co.nz
- 17 http://www.pce.parliament.nz/assets/Uploads/Reports/pdf/PCE_Forestry_Handout.pdf
- 18 <http://www.wildingconifers.org.nz>
- 19 Parliamentary Commissioner for the Environment, 2008
- 20 <http://www.maf.govt.nz/environment-natural-resources/funding-programmes/sustainable-farming-fund/sustainable-farming-fund-search.aspx>
- 21 Espie P R, 1984
- 22 <http://www.ourfuture.net.nz/Stories/149>
- 23 <http://www.ruraldelivery.net.nz/2011/10/grassland-recovery/>
- 24 http://www.wildingconifers.org.nz/index.php?option=com_content&view=frontpage&Itemid=1



Re-constructed wetland on private property, Rance's property, Otatara, Southland
(Karen Denyer, National Wetland Trust)

fifteen

Wetlands

It is estimated that wetland areas have reduced by 90 per cent from their original area.

Ministry for the Environment, 2007

Historically, wetlands have been regarded as mere wastelands, useful only for drainage or as rubbish dumps. As a result, many have been extensively modified. Today, however, wetlands are recognised as one of the most productive environments in the world, described by some as ‘cradles of biological diversity’.¹

Wetlands provide many essential ecosystem services (discussed in Chapter 1) that support high concentrations of various plants and animals, contributing significantly to biodiversity values. Some animal species spend their entire life-cycle in wetlands, whilst others rely on the habitat to feed, hide from predators, breed and nest, or for spawning and nursery grounds.²



Figure 15.1 Example of a wetland (Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

Life in wetlands

Wetlands are very diverse, which may explain the broad definitions provided for them within international treaties and the RMA. They vary in wetness, fertility, acidity and salinity. They are influenced by a range of factors including different landforms, substrates, hydrology and vegetation.³ Wetland types are

varied and the type of wetland plays a key role in the variety of fauna and flora found within each habitat. The following descriptions of wetland types in New Zealand, and details of their distinctive features, are provided by the National Wetland Trust of New Zealand.

Bogs

Bogs are low in nutrients, poorly aerated and usually acidic due to being almost constantly water-logged. All the water in bogs comes from rain, which means they do not benefit from the nutrient-laden water flowing from neighbouring or underlying soils. Bogs support a wide range of plants and animals including moss, lichens, rushes, orchids, silver pine and fernbirds. A rare moth is found in bogs in the Waikato. Bogs can be found in Southland, Westland, the Chatham Islands and in the Waikato.

Fens

Fens are marginally higher in nutrient content than bogs. They are enriched by ground water inflow carrying minerals from adjacent soils. They have a peat substrate (the partly decomposed remains of plants and animals which form in wet, oxygen-poor sites). They are able to support a range of vegetation which includes tussock, manuka, tangle ferns and *Baumea* sedges. Fens are found on minor slopes or on the edges of raised bogs.

Swamps

Swamps are much richer in nutrients than bogs and fens, so they can be highly fertile. They benefit from both ground and surface water inflow, carrying nutrients and sediments from adjacent land. A wide variety of plants can be found in swamps including sedges, rushes, reeds, bullrush (raupo), flax and manuka. A number of forest trees live in swamps such as kahikatea, pukatea and cabbage trees (tī kōuka). Swamps tend to be found in low lying areas such as basins, valley floors, deltas and plains. Examples of large swamps can be found at Whangamarino in the Waikato and at Mangarakau in Golden Bay.

Geothermal wetlands

Geothermal wetlands are created by hot water and mud flowing from thermal streams, hot springs and geysers. The fern *Cyclosorus* is commonly found in New Zealand's geothermal wetlands. Excellent examples of geothermal wetlands are found in the Waikato and Bay of Plenty regions.



Figure 15.2 Giant cane rush (*Sporadanthus ferrugineus*), a rare plant now found only in a few wetlands in the Waikato Region (Karen Denyer, National Wetland Trust)

Lacustrine wetlands

Lacustrine wetlands are connected to lakes and ponds. Vegetation in these wetlands includes aquatic plants, algae, floating ferns and herbs. Tall reed-like plants such as club rushes, raupo and giant rushes may occur closer to the edges. The characteristics of lakes associated with lacustrine wetlands vary. Some are of peat origin, like Lake Serpentine in the Waikato. Others are associated with sand dunes, like Lake Wainamu, in west Auckland. They also exist on the margins of lagoons, such as Lake Ellesmere in Canterbury, and are found on the margins of impounded rivers, such as the Waikato hydro lakes. In addition, they are found near volcanoes, such as at Lake Tarawera, and near glaciers, such as those at Tekapo and the Nelson Lakes.

Riverine wetlands

As the name suggests, riverine wetlands are connected to flowing water in rivers and streams. The unique braided river systems of the South Island provide temporarily wet areas. Birds, such as black stilts, feed in these areas. Swampy backwater sections occur behind river levees. Algae are supported on wetland

beds and submerged aquatic plants are abundant. Good examples include the Buller River in Nelson and Ahuriri River in Canterbury. The Waihou River Blue Springs in the Waikato region is an example of abundant submerged plants being supported in riverine wetlands.

Plutonic wetlands

This type of wetland is found mainly in limestone caves and underground streams. Caves in lava tubes also support this form of wetland, as do aquifers. Plant life cannot be sustained due to a lack of light. However, fungi, microbes, insect larvae and some species of fish live there. Such wetlands are best viewed on guided cave tours such as in Waitomo and Takaka.

In addition to the wetland types discussed above there are also a range of smaller scale wetland forms, including ephemeral (temporary) wetlands, and nival wetlands (snow-derived). For a more detailed account of freshwater types, see ‘Wetland types in New Zealand’ by Johnson and Gerbeaux, 2004.

Role	Importance
Water storage	<ul style="list-style-type: none"> • Slow rate of discharge and moderate peak surges • Protect land from floods • Reduce effects of storm runoff and seasonal flooding • Assist with groundwater recharge which in turn feeds high quality water to lakes, rivers and streams
Buffer between land and sea	<ul style="list-style-type: none"> • Provide shoreline protection along margins of lakes and streams • Can absorb action of waves or currents • Secure sediment, preventing erosion and reducing accumulation of deposits in neighbouring waterways, reducing the need for flood and stormwater control structures⁴
Filter pollutants	<ul style="list-style-type: none"> • Help to improve quality of water • Allow toxins and nutrients to settle out • Plants take up a proportion of the nutrients, whilst other contaminants may be transformed into a less harmful substance
High social appeal	<ul style="list-style-type: none"> • High aesthetic value • Opportunities for education, tourism, scientific research and recreation
Cultural importance	<ul style="list-style-type: none"> • Regarded by Māori as taonga (having much cultural and spiritual significance) • Provide important traditional resources, medicinal supplies and food
Carbon sink	<ul style="list-style-type: none"> • Healthy wetlands can be highly effective carbon sinks, absorbing between two and five tonnes of carbon per hectare⁵

Figure 15.3 The importance of wetlands

Threats

Over 90 per cent of New Zealand's wetlands have been drained or filled over the last 150 years.⁶ Some of New Zealand's most threatened natural ecosystems now include lowland wetlands and bogs.⁷ Over half of the remaining freshwater wetlands are on privately owned land.⁸

Land conversion and catchment activities

A demand for land to provide more productive farmland and space for urban development, has led to the reclamation and drainage of lakes, estuaries, wetlands and river margins, as well as the reduction of farm swamps.⁹ In many areas, this has resulted in the almost entire loss of wetland systems, and consequently the biodiversity they support. Land conversion in coastal areas threatens estuarine habitats, which are important to diadromous fish (fish that migrate to and from the sea) and to some commercial fisheries, such as snapper.

In urban catchments wetlands are often polluted by contaminated run-off including zinc from galvanised roofs, oil residues from roads, and also including polychlorinated biphenyls (PCB's), flame retardants and caustic cleaning products. Infrastructure development can also introduce barriers to fish migration.

Use of catchments for forest plantations can cause excess erosion and subsequent sedimentation at harvest, or modify run-off and ground water supply, ultimately damaging wetland ecology. In rural areas, grazing of wetlands damages vegetation, preventing regeneration of native species and exposing these communities to weed invasion. It also disturbs wildlife, damages their habitats and causes soil erosion and compaction.¹⁰ Poor farming practice can also increase the sediment and nutrient load in rivers, streams and wetlands. A loss of vegetation on wetland margins further increases the impacts of extra sediment and nutrients on wetland ecology.

Other activities

Extraction of products such as peat, sand and gravel can alter water levels and encourage weed growth. In some situations this activity has led to greater biodiversity, such as through the valuable habitats now found in some of the gravel pits in the South Island. Whitebaiting and long-finned eel hunting further reduce populations of threatened native fish. Recreational practices such as jet-skiing, hunting or jet-boating can disturb plants and animals, and introduce pests like didymo, if users are careless.¹¹



Figure 15.4 Stock allowed into wetlands can increase the sediment and nutrient load and be detrimental for wildlife (Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

Invasive plants and animals

Weed invasion is one of today's main threats to the survival of wetlands and the species that live in them. Because many wetlands are found near human settlements, and contain low-growing vegetation communities, they are often among the hardest hit by water-tolerant weeds.

Weeds can affect how a wetland's hydrological system functions, impact on nutrient regimes, compete with native plants, and alter important food and habitat resources. Wet tolerant weeds that are tall and shrubby can easily shade out native grasses and rapidly colonise wetland areas. Invasions by exotic plants have a significant ripple effect through an ecosystem: native animals and birds reliant upon native plants will be displaced and ultimately the functions these animals and birds perform, like pollination, also disappear.



Figure 15.5 Invasive plants can have significant adverse effects on wetland biodiversity values
(Crown Copyright: Department of Conservation: Te Papa Atawhai, 1972)

Introduced mammals have caused major damage to many wetland habitats. Animals like rabbits, hares and possums eat wetland plants. Many of the introduced mammals, such as rats and stoats, kill native insects and lizards, and eat native birds and their eggs. Pest fish, such as koi carp, feral goldfish and catfish, can compete with native species, stir up sediments and reduce the water quality of wetlands. More recently infestations of didymo, an exotic alga, are threatening wetlands in the South Island by smothering rocks, submerged plants and other materials.

Summary of threats

Cause	Potential effect
Land conversion	<ul style="list-style-type: none"> • Drains and destroys wetlands • Can increase loss of native plant, animal and insect species • Impacts on fish migration
Catchment activities	<ul style="list-style-type: none"> • Reduce and degrade habitats • Damage vegetation and soil • Increase runoff and sediment • Pollute waterways • Alter and deplete water levels • Encourage invasive weeds and pests • Cause soil erosion • Reduce shade, increasing water temperature

Invasive plants	<ul style="list-style-type: none"> • Compete with native plants • Impact on hydrological cycle • Reduce food resources • Reduce habitat resources • Affect nutrient regime
Invasive animals	<ul style="list-style-type: none"> • Prey on native species • Reduce food and habitat resources for native species

Figure 15.6 Summary of the main threats to biodiversity in wetlands

Description of regulatory management approaches

Now that there is greater awareness and understanding of both the critical importance of wetlands, and their heavily impacted general state, there are a number of strategies and initiatives aimed at improving wetland environments.



Wetlands are defined in the RMA as including ‘permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions’. The RMA requires councils to recognise and provide for ‘the preservation of the natural character of ... wetlands ... and the protection of them from inappropriate subdivision, use and development’ (section 6(a)). This requires the identification of wetlands (where possible) in plans, and the incorporation of restrictive rules to provide for their preservation and protection.

National Policy Statement for Freshwater Management

This National Policy Statement related to the management of freshwater sets out several objectives which directly relate to the protection of wetland biodiversity. It states that there should be appropriate policies and methods provided in RMA plans to ensure that the significant values of wetlands are protected. This document is discussed further in Chapter 5.

Regional and district plans

District and regional planning documents could be expected to include controls on a number of relevant matters, including:

- Filling in of wetlands
- Vegetation clearance both within and surrounding wetlands
- Management of wetland margins
- Piping and culverting of wetlands
- The creation of structures within wetlands
- Mitigation opportunities

The Waikato Regional Plan includes a table of wetlands in the region for which consents are required for drainage within 200 metres of their boundary. The plan also contains a rule which makes the creation of drains within a wetland that is an area of significant indigenous vegetation and/or significant habitat of indigenous fauna, a discretionary activity (and thereby requiring resource consent).

The Greater Wellington Regional Council has included rules to protect wetlands in its regional plans. For example, its regional freshwater plan protects wetlands by:

- Requiring a water permit for a non-complying activity to divert water from any wetland that has a high degree of natural character.

- Requiring a land use consent for a non-complying activity to reclaim the bed of any wetland with a high degree of natural character. The reclamation of the bed of Lake Wairarapa is a prohibited activity, so no application for resource consent can be made.
- Requiring a discharge permit for a non-complying activity for the discharge of water or contaminants into a wetland with a high degree of natural character.

District plans will often contain rules regulating the activities taking place within wetlands or in the vicinity of wetlands, including the clearance of indigenous vegetation and required building setbacks.

Conditions of resource consent

Where a regional or district plan requires resource consents to be obtained for activities on or near to a wetland, conditions can be placed on the granting of consent. These aim to manage the effects of the proposed activity on the wetland environment. For example, discharge permits are likely to be required for discharging water or pollutants into a wetland and conditions can be placed on a discharge consent relating to the amounts discharged daily and any mitigation required.

This mitigation may include the fencing of wetlands to keep stock out of the water and away from the plants, restoring and maintaining wetland vegetation and avoiding fertiliser application directly into a wetland. For the works required to modify the Ohau Channel in Rotorua, the Bay of Plenty Regional Council required that the consent holder replant the affected sites with a range of native pioneer plant species typical of the Ohau Channel Wetland.

Description of non-regulatory tools approaches

A number of regional and district councils are increasingly focusing their efforts on combining statutory mechanisms with non-regulatory tools to manage wetland biodiversity. These include providing educational resources to assist people wanting to understand more about wetlands and offering funding sources to support the protection and restoration of wetlands. Chapter 10 provides a comprehensive description of non-regulatory approaches to biodiversity protection, including wetlands.



Figure 15.8 Educating communities about the importance of wetlands and their native flora and fauna can assist with protecting these special environments (*Karen Denyer, National Wetland Trust*)

Education and community awareness

Many regional councils have factsheets available which identify the different types of wetlands found within their specific region. Other than councils, one of the most visible groups providing educational support on this topic is the National Wetland Trust of New Zealand. The trust was established in 1999 to increase the appreciation of wetlands and their values by all New Zealanders. It is a not-for-profit organisation that aims to:

- Increase public knowledge and appreciation of wetland values through education and biannual symposia
- Increase understanding of the function of wetlands
- Support the commitment of landowners and government agencies alike to protect, enhance and restore wetlands
- Improve recreational opportunities in wetlands by improving access to information on wetlands to visit
- Build and operate a National Wetland Education Centre

Funds and grants

The Department of Conservation is the lead agency for implementing the Ramsar Convention (see Chapter 2), and it provides some funding for wetland restoration projects on private land through the contestable Biodiversity Condition Fund. There are also numerous national grants available for wetland protection and restoration projects which are identified in Chapter 10. These provide funding for a range of activities including planting, weeding and fencing, as well as preparation of a wetlands recovery plan and retirement of wetland areas.

There are also many grants available at a regional and district level through councils and trusts. An example is the Greater Wellington Regional Council Wetland Incentives Programme, which was set up in 2001 as a non-regulatory programme offering advice and funding assistance to private landowners with wetlands, including for fencing, pest animal and environmental weed control, monitoring and restoration planning. A successful example of a project funded by the programme is the Te Hapua wetland complex, where more than 13 private landowners are working closely with the council to progressively control weed infestations, as well as to fence and legally protect almost all of the remaining rare dune wetlands in this area.



Figure 15.9 Volunteers involved in a community planting day for the O Tu Wharekai Wetland restoration project, Lake Heron, Canterbury (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2009)

Restoration initiatives

Retirement of wetlands from grazing, removal of stock from wetland margins and managing introduced pests are cornerstone approaches to returning these ecosystems back to their original condition. Such steps can then be accompanied by other restoration initiatives, including constructing buffers and silt traps, planting native vegetation and improving culverts for fish passage. Land management techniques, such as reducing fertiliser rates and nutrient budgeting, can significantly reduce nitrogen and phosphate inputs into wetlands. This can be very beneficial for native plants, fish, animals and insects living in these habitats.

Many regional councils have prepared practical guidance for landowners and the general public on how to protect and restore wetlands. These guides will clearly describe step-by-step how to plan, design, implement and monitor a wetland restoration project for private landowners. In addition, some councils have prepared biodiversity self-help kits which provide a framework to set goals and objectives for wetland restoration and to develop an action plan, along with offering practical information and advice.

Case studies

Lakeland Farm

Lakes Kaituna and Komakorau are two of more than 30 peat lakes found in the Waikato region. The Lake Kaituna and Lake Komakorau Care Group was set up to help reduce nutrient runoff into these lakes, and to restore the wetland margins and habitat. The Hayes family, who own the adjacent dairy farm, retired 10 per cent of their land area to wetland conservation in efforts to restore the condition of the lakes.



Figure 15.10 Planting underway at Lake Komakorau (*Landcare Trust*)

The project began by fencing out stock, completely retiring the land around the lake margins and creating a wetland buffer to trap silt and nutrients. The drains were also fenced and planted to trap nutrients and sediment and to prevent growth of aquatic weed. Further action involved nutrient budgeting and reducing fertiliser rates. As a result, the annual input of nitrogen dropped by 80 per cent (from 150 to 30 tonnes per hectare) and phosphate reduced from 900 to 650 kilograms per hectare.¹² The Hayes continue to implement new farm management measures to reduce leaching and minimise resource use.

Invasive grey and crack willow were a major problem for the farm and lakes, displacing native habitat and birds and trapping stock. A massive effort, with the assistance of the Care Group, to clear 16 hectares of land overgrown with willow was undertaken. Following this, the native plants and wetland vegetation quickly returned and thrived.¹³ Approximately seven years later, native wildlife has also returned, including grey teals, Australasian bitterns, New Zealand dabchick and native black mudfish. The Department of Conservation is currently considering the release of endangered brown teal into the area.

More recently a Whole Farm Management and Environment Plan has been prepared to set out a holistic management approach for the farm. Large scale silt traps have been constructed, the effectiveness of which are being monitored by the University of Waikato. Members of the Care Group were awarded a Ministry for the Environment Green Ribbon Award for Rural Sustainability in recognition for the care, effort and leadership shown to improve the health of the peat lakes. The Hayes have been recognised as Landcare Ambassadors for their dedication to wetland restoration and advocacy work.



Figure 15.11 Lake Komakorau after restoration works (*Landcare Trust*)

This case study demonstrates the success that can be achieved when combining a private landowner's commitment to restoring biodiversity, with support from a community group. This property is used as a showcase for other property owners as well as for schools, tertiary institutes and other community groups who are keen to see how retirement and restoration of wetland areas works in practice.

Arawai Kākāriki wetland restoration programme

The Department of Conservation administers Arawai Kākāriki (Green waterway), which is a national wetland restoration programme covering three wetland sites.



Figure 15.12 Mid Kopuku Arm, high water level for summer, Whangamarino Wetland, Maramarua, Waikato (Crown Copyright: Department of Conservation: Te Papa Atawhai, 1986)

Launched in July 2007, the programme aims to restore some of the most significant wetlands in New Zealand, and to develop best-practice management and monitoring approaches to inform other wetland restoration projects.¹⁴ All three of the sites differ ecologically and employ slightly different management approaches, which are summarised below.

Wetland	Details	Approaches
Whangamarino (Waikato)	<ul style="list-style-type: none"> • 7,290 hectares • Ramsar site • Second largest bog and swamp complex in North Island • Part of a major flood-control scheme 	<ul style="list-style-type: none"> • Repair of outlet weir • Fencing and exclusion of stock • Monitoring of birds • Deer control • Improved boat ramps • Improved signage • Weed control
Ō Tū Wharekai (Canterbury)	<ul style="list-style-type: none"> • Diverse wetland habitats • One of the best examples of an intact inter-montane wetland system 	<ul style="list-style-type: none"> • Willow and broom control • Native bird monitoring • Managing public access • Ngāi Tahu cultural values inventory and monitoring programme
Awarua Waituna (Southland)	<ul style="list-style-type: none"> • 19,500 hectares • Ramsar site • One of largest remaining wetlands in New Zealand • Incorporates a broad range of wetland types 	<ul style="list-style-type: none"> • Community protection of water quality, including water testing • Macrophyte and fish surveys • Educational resources • Weed control • Riparian planting • Native plant propagation unit • Improved public access • Public restoration projects

Figure 15.13 Summary of the main management tools used in each wetland (Department of Conservation, 2009)

These wetlands are now managed using a collaborative approach, which includes local iwi, councils, other organisations and agencies (such as Fish and Game New Zealand, the National Institute of Water and Atmospheric Research and Landcare Research) and community groups. An important aspect of this restoration programme has been building community awareness and involvement.¹⁵ This includes working with local landowners on fencing and planting and restoring larger areas through weed control and planting. The community and landowners are kept informed of progress at each of the three wetlands, as well as on how to become involved, through fact sheets, public meetings, events and newsletters.

The Whangamarino Wetland was recently awarded a 'Blue Globe' Award in the 2012 Wetland Globes, which is an international competition that recognises best practice in wetland management by agencies and communities. The awards are bestowed at the Ramsar Conferences.

This case study highlights how a collaborative approach can reap significant value for biodiversity protection and restoration, and receive international recognition. The use of a range of non-regulatory tools has been particularly beneficial for this project.

Waiatarua Reserve

Located within the Orakei Basin in the centre of Auckland City, this project is New Zealand's largest urban wetland restoration project. A volcanic eruption around 9000 years ago led to the separation of the Ellerslie-Waiatarua catchment from the sea and a 22-hectare wetland was formed.



Figure 15.14 Waiatarua Reserve (Raewyn Peart)

This wetland supported a diverse array of native species and was an important food gathering place for early Polynesian settlers. During the 1930s, widespread modification of the wetland and the development of the surrounding catchment as Auckland City grew resulted in the long-term reduction in water quality.¹⁶ In the early 1990s an innovative approach to include stormwater treatment within the catchment management plan, set the path for restoration of this urban wetland, including the construction of a network of drains, weirs, bunds and sediment traps. Significant consultation was undertaken to address flood protection for neighbouring properties. Tangata whenua and stakeholder groups were included in the design team. Local nurseries propagated locally eco-sourced plants in water.

Water entering the Orakei Basin is now significantly cleaner, as it is being effectively filtered by the Waiatarua wetland, and there are no longer algal blooms in the Basin. More native birds have been recorded in the area following the restoration. A detailed monitoring and maintenance plan has been put in place. The Auckland Council has created open spaces and wide pathways, with extensive native plantings throughout the Waiatarua Reserve, which is now a popular destination for recreation.¹⁷

This case study demonstrates how urban wetlands can be effectively restored and enhanced by using innovative engineering approaches and through collaboration between many groups.

Biodiversity on Zespri kiwifruit orchards

Zespri co-funded research, undertaken by Landcare Research and the Agriculture Research Group on Sustainability,¹⁸ compared the impacts of different management systems on birds in New Zealand's kiwifruit orchards. Findings from the six year study show that native bird densities are enhanced when pesticide use is reduced and woody vegetation cover is increased. The invertebrate community,¹⁹ also studied in these orchards, showed an increase in richness of functional groups with sustainable practices.

A plant biodiversity study, based on the land title of kiwifruit orchards, has shown that eight per cent of the total land area surveyed can be classified as ecological refuge. About 40 per cent of the plant species within orchard titles were native. Species richness of native plants was observed to be highest in non-managed forest gully systems on orchard land titles. These studies have provided the kiwifruit industry with good land management practices that are increasingly used to enhance native species biodiversity in orchards.²⁰

Recommendations for best practice

Management approach	Best practice recommendations
RMA plans	<ul style="list-style-type: none"> • Identify outstanding wetlands in the regional planning instruments, ideally by spatially mapping them • Identify appropriate policies and methods to ensure that the quality of the significant values of wetlands are protected
Resource consent conditions	<ul style="list-style-type: none"> • Minimise the amount of clearance of established vegetation • Fence off wetlands to reduce stock damage • Reduce the degree of drainage in and around wetlands • Replant with locally sourced native species • Incorporate restoration of riparian margins where relevant • Protect and restore fish passages between wetlands and the sea
Education and community awareness	<ul style="list-style-type: none"> • Seek practical advice on what local wetland plant species support indigenous biodiversity • Seek advice on how to eradicate invasive species • Use successful sites to highlight best practice approaches • Improve wetland access to the public and add educational signage to interpret wetlands for visitors
Restoration initiatives	<ul style="list-style-type: none"> • Understand the type of wetland being restored, including water flows and levels • Fence off from stock • Control weeds and animal pests • Plant riparian edges with appropriate native species • Keep up ongoing maintenance • Involve the local community and iwi/hapū • Remove rubbish and illegal structures to restore natural character

Figure 15.15 Summary of the management approaches and best practice recommendations

Useful websites

Department of Conservation – <http://www.doc.govt.nz/conservation/land-and-freshwater/wetlands/>

Department of Conservation's Wetland Restoration Guide – <http://www.doc.govt.nz/upload/documents/conservation/land-and-freshwater/wetlands/wetland-restoration-guide.pdf>

Waikato Regional Council's Our Wetland Restoration Plan – <http://www.waikatoregion.govt.nz/PageFiles/5799/Wetlandtemplate2.pdf>

National Wetland Trust of New Zealand – <http://www.wetlandtrust.org.nz/>

References and further reading

Department of Conservation and Ministry for the Environment, 2000, *The New Zealand Biodiversity Strategy: Our chance to turn the tide, Whakakōhukihukitia Te Tai Roroku Ki Te Tai Oranga*, Department of Conservation and Ministry for the Environment, Wellington

Gerbeaux P, 2002/2003, 'The Ramsar Convention: A review of wetlands management in New Zealand', *Pacific Ecologist*, No.4 Summer

Johnson P and P Gerbeaux, 2004, *Wetland types in New Zealand*, Department of Conservation, Wellington

MacLeod C J, G Blackwell and J Bengé, 2012, 'Reduced pesticide toxicity and increased woody vegetation cover account for enhanced native bird densities in organic orchards', *Journal of Applied Ecology*, 49, 652–660

Ministry for the Environment, 2007, *Environment New Zealand 2007*, Ministry for the Environment, Wellington

Ministry for the Environment, 2011, *National Policy Statement for Freshwater Management 2011*, Ministry for the Environment, Wellington, available at [http://www.Ministry for the Environment.govt.nz/publications/rma/nps-freshwater-management-2011/index.html](http://www.Ministry%20for%20the%20Environment.govt.nz/publications/rma/nps-freshwater-management-2011/index.html)

Ministry for the Environment, n.d., *Land and Water Forum*, available at <http://www.Ministry for the Environment.govt.nz/issues/water/freshwater/land-and-water-forum/>

Ministry for the Environment, n.d., *Proposed National Policy Statement for Indigenous Biodiversity*, available at <http://www.Ministry for the Environment.govt.nz/publications/biodiversity/indigenous-biodiversity/section32/html/page2.html>

Moller H, A Wearing, C Perley, C Rosin, G Blackwell, H Campbell, L Hunt, J Fairweather, J Manhire, J Bengé, M Emanuelsson and D Steven, 2007, 'Biodiversity on kiwifruit orchards: The importance of shelterbelts', *Acta Horticulturae*, 753, 609-618

NIWA, 2004, *Effects of livestock grazing on wetlands: A literature review*, National Wetland Trust of New Zealand, Auckland, available at <http://www.wetlandtrust.org.nz/documents/grazing.pdf>

Office of the Auditor General, 2001, *Meeting international environmental obligations*, available at <http://www.oag.govt.nz/2001/environment>

Peters M and B Clarkson (eds), 2010, *Wetland restoration: A handbook for New Zealand freshwater systems*, Manaaki Whenua Press, Lincoln, available at <http://www.landcareresearch.co.nz/services/biocons/wetlands/>

Quality Planning, n.d., *Quality Planning guidance note on indigenous biodiversity*, available at <http://www.qualityplanning.org.nz/plan-topics/indigenous-biodiversity.php>

Ramsar Convention, n.d. *The Ramsar Convention on Wetlands*, available at http://www.ramsar.org/cda/en/ramsar-home/main/ramsar/1_4000_0__

Taranaki Regional Council, 2006, *Biodiversity strategy: An operational strategy to guide biodiversity actions of the Taranaki Council*, Taranaki Regional Council, New Plymouth, available at <http://www.trc.govt.nz/biodiversity-strategy>

The Ramsar Convention on Wetlands, n.d., *The Ramsar Convention and its mission*, available at http://www.ramsar.org/cda/en/ramsar-about-mission/main_ramsar/1-36-53_4000_0__ and – <http://www.ramsar.org/cda/en/>

ramsar-Department of Conservation/uments-texts-convention-on/main/ramsar/1-31-38%5E20671_4000_0__

Todd, J H, L A Malone, B H McArdle, J Bengé, J Poulton, S Thorpe and J R Beggs, 2011, 'Invertebrate community richness in New Zealand kiwifruit orchards under organic or integrated pest management', *Agriculture, Ecosystems & Environment*, 141, 32-38

Endnotes

- 1 Office of the Auditor General, 2001, 46
- 2 <http://dnr.wi.gov/wetlands/function.html>
- 3 Johnson P and P Gerbeaux, 2004, 7-9
- 4 <http://dnr.wi.gov/wetlands/function.html>
- 5 <http://www.wetlandtrust.org.nz/whywetlands.html>
- 6 Peters M and B Clarkson, 2010, 2
- 7 Department of Conservation and Ministry for the Environment, 2000, 6
- 8 Ministry for the Environment, 2007
- 9 <http://www.Department of Conservation.govt.nz/conservation/land-and-freshwater/wetlands/threats-to-wetlands/>
- 10 Department of Conservation and Ministry for the Environment, 2000, 48
- 11 <http://www.Department of Conservation.govt.nz/conservation/land-and-freshwater/wetlands/threats-to-wetlands/>
- 12 <http://www.landcare.org.nz/files/file/212/hayes-case-study-updated.pdf>
- 13 <http://www.landcare.org.nz/files/file/212/hayes-case-study-updated.pdf>
- 14 <http://www.Department of Conservation.govt.nz/conservation/land-and-freshwater/wetlands/arawai-kakariki-wetland-restoration-programme/background/>
- 15 <http://www.Department of Conservation.govt.nz/conservation/land-and-freshwater/wetlands/arawai-kakariki-wetland-restoration-programme/background/>
- 16 <http://www.wetlandtrust.org.nz/documents/winter2006.pdf>
- 17 <http://www.aucklandcity.govt.nz/whatson/places/parksonline/detail.asp?pParkId=2235>
- 18 www.argos.org.nz
- 19 www.plantandfood.co.nz/page/our-research/sustainable-production/
- 20 www.zespri.com/sustainability-home.html



Productive land on the East Cape (*Raewyn Peart*)

sixteen

Productive land

Biodiversity protection is increasingly seen as a part of good farming practice rather than as an alternative to it.

Miles Giller, Queen Elizabeth II National Trust Regional Representative

New Zealand's rural land supports a wide range of productive uses including pastoral farming, forestry, horticulture, biofuel and the extraction of minerals. Managing this productive land sustainably is crucial for this country's economic and environmental future. Currently agriculture and horticulture provide a significant source of income to fund New Zealand's economic growth; amounting to over half of New Zealand's export earnings in 2009.¹ This productive land environment also plays a crucial role in New Zealand's culture and society.

Nearly two thirds of New Zealand's land is held in private ownership. Of this, only around 150,000 hectares is protected through legal mechanisms. This can be compared to the around eight million hectares of publicly owned land which is legally protected. Much of New Zealand's rare and threatened native biodiversity is found on private land; some species are now only found on private land.²

Many of the habitat types and species that are under-represented in the public estate depend upon the remaining fragments of habitats on private land for their survival.³ This is most notable in the lowlands where the impact of agricultural intensification is concentrated. This is the area of most concern in regard to biodiversity loss.⁴



Figure 16.1 An example of typical productive land in rural New Zealand (*Raewyn Peart*)

Value of biodiversity to productive land

New Zealand's land-based primary production – farming, forestry, arable (including biofuels) and horticulture – is reliant on the protection and management of biological systems. The variety of species found on productive land (both native and introduced) have many direct and indirect commercial production benefits,⁵ including:

- Production of food, medicine, clothing and timber
- Pollination of crops
- Biological control of pests, weeds and diseases
- Improvement of soil formation and its microbial activity
- Increased nutrient retention
- Improved air and water quality
- Erosion prevention
- Capture of carbon dioxide by plants and carbon by soil

In addition, retaining biodiversity on productive land may assist in marketing goods to the green consumer market and supporting on-farm tourist activities. Therefore, when biodiversity is lost from farmland, it is not just the loss of species of conservation value that is occurring but also the loss of organisms that can provide substantial commercial benefits. This type of biodiversity is often called 'functional agricultural biodiversity' and its functions, increasingly referred to as 'ecosystem services', can be wide-ranging and of much value to landowners.⁶ Much of the production in agriculture depends on these ecosystem functions and processes. Ecosystem services are described in more detail in Chapter 1.

Diversity of life found on productive land

Prior to clearance for productive purposes, rural land supported a wide range of native species. Today, most native flora and fauna have disappeared and the majority of species found on productive land are introduced. Most native species have been marginalised to small pockets of native forest and wetland areas on private land.

New Zealand's primary production is now almost entirely dependent on introduced species. Cows, sheep and pigs make up the bulk of animals found on farms. Other species such as deer, goats and alpacas are increasingly being stocked.

Plants

Grazing is the major activity undertaken on productive land in New Zealand. Pastures, on which the animals feed, contain different types of plants depending on the stock being grazed and the local climate. A number of different types of grasses, legumes and herbs are used by farmers including perennial ryegrass, tall fescue, white clover, lucerne and chicory.

Trees

The forests that originally covered much of New Zealand have been largely lost in lowland areas and replaced with the pasture species identified above. However, the planting of both introduced and native tree species is an important part of productive land management. Trees offer a number of ecosystem services including erosion prevention, shading of animals and crops, provision of shelter belts and flood control. Many landowners plant stands of trees which are used as a carbon store, or once felled are used for firewood and timber, or sold for a profit.

Introduced trees, such as willow, macrocarpa, radiata pine, Douglas fir, gum and poplar species, are commonly used for providing shade, timber and shelter belts. Many introduced trees are used in horticulture, including kiwifruit, avocado, oranges, apples and grapes. In addition, some landowners create ornamental tree collections.

More recently, native trees have been more commonly used on productive land. Landowners are planting native species for flood protection around rivers and stream banks, to provide shelter for stock and to suppress weeds. Species such as pittosporums, ribbonwood, kanuka and manuka are all increasing in popularity as their value both for managing land, and for improving biodiversity values, are recognised.

Indigenous species that live in plantation forests, and in farm forestry plantations, also contribute to the biodiversity values found on productive land. Although these values are seriously damaged when the forests are harvested, while they are growing, and when only a portion of a forest is harvested at any one time, they do provide biodiversity refuges and corridors for native species.

Invertebrates

Earthworms perform an important role in keeping land productive. They break down organic matter, improve soil drainage and recycle nutrients in the soil. On farmland, the total weight of earthworms can be higher than that of all the other animals put together. Most of New Zealand's productive land now contains introduced earthworms, as the native species (of which there are over 170 identified species) have been marginalised to forests.⁷

Also commonly found within productive land are insects which can damage crops. A whole range of introduced weevils, caterpillars, spiders, beetles and mites attack grasses, shrubs, trees and animals and can rapidly pass on diseases. There is also a wide array of invertebrates that are beneficial to productive land as they eat pests and weeds. These include ladybirds, hover flies, lace wings and parasitic wasps.

Some bees, wasps, flies and beetles are important pollinators. There are between two and three thousand bee and wasp species in New Zealand, most of which are native. Native bees make a significant contribution towards pollinating horticultural crops. As well as pollinating plants, the introduced honeybees produce an increasingly diverse range of honey products.

Birds

When most of New Zealand's land was forested, it was home to a wide range of native birds. As a result of the extensive forest clearances and introduction of invasive animal pests, many of these birds are no longer found in rural areas, being marginalised to small pockets of native forest. Those which are now nationally endangered or vulnerable include the black robin, grey duck, South Island kaka, stitchbird, bush falcon, whio (or blue duck) and great spotted kiwi.

Some native species have survived well in this changing environment, such as the pukeko. But introduced birds, such as swallows and starlings, have largely taken over the new habitat created by conversion to pasture and other land types. In addition, a number of game birds have been introduced which can legally be hunted, including partridges, quails, ducks and geese.

Threats

The most pressing issues facing the protection and restoration of native biodiversity on productive land are accelerating land use change, invasive pests and the high level of agro-chemical inputs. All of these are driving farmland towards a low diversity environment. While rural land owners desire to achieve financial returns from their land, it is important that biodiversity on productive land is protected, because of the essential ecosystem services it provides.

Expansion and intensification of agriculture

The expansion and intensification of agriculture is destroying habitats for indigenous species.⁸ Expansion of agriculture into previously forested areas causes a reduction in habitat. Habitat loss remains a primary cause of indigenous

biodiversity decline. Such expansion can leave small pockets of isolated habitat and there is little ability for species to move between them.



Figure 16.2 The clearance of land can result in significant declines in biodiversity values
(Crown Copyright: Department of Conservation: *Te Papa Atawhai*, n.d.)

Unsustainable logging of indigenous forests is also a significant threat to biodiversity. Some commentators suggest that the greatest biodiversity gain will be achieved by returning productive land to native vegetation; ultimately the re-establishment of native forests for sustainable harvesting.⁹

In 2007 the Minister of Conservation and the Minister for the Environment issued a statement which outlined the national priorities for protecting rare and threatened native biodiversity on private land, in an effort to focus conservation efforts on private land where the need is greatest. Whilst some landowners have taken steps to provide formal protection to these habitats, much remains unprotected and at risk.

Invasive species

Although there has been significant progress in the battle against introduced weeds and animals on productive land, the increasing rise in the number of invasive alien species is still recognised as one of the major threats to biodiversity.¹⁰ A sizeable proportion of the projects funded by the Biodiversity Condition Fund (a Government fund for biodiversity protection programmes on private land) are now targeted towards controlling weeds on productive land.

There are three main ways that plant, animal and insect pests can be controlled on productive land and these are often combined:

- Physical control – which involves either manual or mechanical removal
- Biological control – which uses a biological control agent, or another living organism, to manage pests
- Chemical control – which requires the use of herbicides or pesticides (discussed further below)



Figure 16.3 The application of chemicals is one method to control weeds and pests on productive land
(Raewyn Peart)

Landowners themselves are spending millions of dollars each year actively managing productive land areas through weed and pest control.¹¹ The 2005 review of the Biodiversity Strategy noted concerns that there was no apparent increase in research efforts to identify new tools and methods to control pests or to address new invasive species.

Poor land management practices, including increasing use of agro-chemical inputs

Today, many farms are reliant upon the inputs of fertilisers, pesticides and herbicides to run a successful operation. The effects of agricultural chemical use can be long lasting. For example, the pesticide DDT was used by New Zealand farmers during the 1950s and 1960s, primarily to kill grass grub and porina

caterpillars. Although its use on farmland was prohibited in 1970, high levels of DDT accumulated in the country's soils during the years of heavy application. Many New Zealand soils still contain high levels of DDT.

The threat to biodiversity from the dependence on chemicals cannot be understated. The key issues arising from the use of toxic chemicals on productive land include:

- Impacts on the hydrological cycle as toxins run off into the waterways and end up accumulating in the groundwater and marine environment
- Pollution of the soil with the accumulation of heavy metals
- Eradication of insects and beneficial pollinating species which are integral to productive land systems



Figure 16.4 Fertilisers applied to farm land can devastate native plants, insects and animals, both on the land and in adjacent waterways (*Raewyn Peart*)

Other agricultural practices can also have a direct impact on biodiversity. Grazing stock can cause significant damage to remaining tracts of native vegetation. They browse on native plant species, disturb the ground and the native species living beneath the surface, and release large amounts of pollutants into the soil and waterways.

Climate change

Climate change has the potential to significantly affect productive land management and subsequently biodiversity values. Predicted changing temperatures and rainfall patterns, plus a rise in sea levels, will impact on habitat availability and range for native and introduced species. There is little doubt that the consequences of a changing climate will have an impact at all levels of the biodiversity spectrum, including genes, species and ecosystems.¹²

Summary of threats

Cause	Potential effect
Expansion and intensification of agriculture	<ul style="list-style-type: none">• Reduces available space for species• Impacts upon ecosystem processes that support species• Leaves pockets of habitats and isolated species• Reduces interaction between habitats and species• Increases invasive species
Invasive species	<ul style="list-style-type: none">• Predate directly on threatened species• Compete for space and resources with native species• Prevent native species performing ecosystem services
Poor land management practices, including increasing inputs of agro-chemicals	<ul style="list-style-type: none">• Damages native species• Damages soil processes and nutrient cycles• Increases pollutants entering soil and waterways• Increases toxins accumulating in soil, affecting nutrient levels and processes• Facilitates toxins entering the food chain• Destroys pollinating species• Reduces essential ecosystem services

Figure 16.5 Summary of the main causes of biodiversity loss on productive land and the potential effects on habitats, ecosystems and species

Description of regulatory management approaches

Some of our most rare and threatened ecosystems and species are now found only on private land; their long term survival will depend largely on the actions of landowners who will need support from all levels of government, as well as the wider public. The importance of private landowners protecting biodiversity was

highlighted in the five-year review of the Biodiversity Strategy. This identified the on-going loss of rare and threatened biodiversity from private lands as a significant challenge that still needs to be addressed.

With increasing awareness and understanding of the importance of biodiversity as an essential contributor of ecosystem services, there has been a subsequent interest in the role that native habitats and species play within productive land environments. Focus now needs to be placed on managing invasive pests, incorporating native species into land management practices where possible, and enhancing functional agricultural biodiversity.

Management of biodiversity on productive land is carried out at both a regional and local level within the framework established by the RMA, including potentially the proposed National Policy Statement on Indigenous Biodiversity. There are a number of statutory mechanisms under the RMA that support the protection of biodiversity on productive land, including tools to protect significant habitats. Landowners can also be required to manage weeds and pests under the Biosecurity Act 1993. The review of the Biodiversity Strategy found that prescriptive rules are an important part of protecting biodiversity on private land.

Regional and district planning

Regional councils play an important role in biodiversity protection, as regional policy statements provide an important tool for managing the effects of land use on biodiversity. Regional policy statements do not contain rules, but they can provide strong policy direction on how biodiversity issues on private land are to be managed, including through including rules in district plans.

Under section 31(1)(b)(iii) of the RMA, territorial authorities are responsible for controlling the effects of land use to maintain indigenous biological diversity. They can achieve this through including relevant provisions in their district plan (including rules) and through imposing conditions on land use consents as may be required for the operation of productive land.

The Kapiti Coast District Plan includes a schedule that identifies such significant areas on private land and subsequent rules for controlling clearance of vegetation in these areas. The success of such an approach is reliant upon inclusive consultation with farmers, as well as councils offering incentives and advice to support the protection of these sites or areas.

Territorial authorities can help to protect biodiversity on productive private land through rules in district plans, including subdivision provisions, such as the requirement for conservation lots. Conservation lot provisions typically allow a landowner to subdivide a lot, which is additional to that provided for by the rules of the district plan, in return for permanent protection of areas of indigenous vegetation. This tool is discussed in more detail in Chapter 4.

Pest management strategies

Under the Biosecurity Act, regional pest management strategies are plans which describe why and how various animal and plant pests will be controlled within a particular region. These strategies generally seek outcomes that benefit biodiversity in a local area by managing pests on productive land. This tool is discussed further in Chapter 9.

Description of non-regulatory approaches

Land covenants

There are a range of different covenants that can be applied to productive land to protect biodiversity. These are discussed in Chapters 4 and 7. Voluntary land covenants are a contract between a landowner and a third party that prescribes the way the land will be managed. This management tool is discussed in more detail in Chapter 10. It is not simply about fencing off areas: in some areas, such as tussock lands, grazing can be carefully managed to provide good outcomes for biodiversity protection on productive land.

Some councils do not charge rates on land that has been covenanted which reduces the costs of protection for landowners. Where councils do charge rates for protected land, zero rating can be used to reduce the financial burden on farm owners who are protecting biodiversity for the benefit of the wider community.¹³



Figure 16.6 Predator proof fence, Ellen Elizabeth Preece Covenant, Caravan Bush, Pitt Island, Chatham Island (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2002)

Financial incentives

In September 2007 central government committed \$170 million to help deliver a plan of action in regard to climate change and sustainable land management. This, along with the other nationally-funded programmes, has assisted in delivering improved pest management on productive land and supporting increased voluntary protection of areas with important indigenous biodiversity values.

Since 1995 the Ministry for Primary Industries (formerly the Ministry of Agriculture and Forestry) has run a sustainable agriculture facilitation programme focused on encouraging sustainable resource management practices within the agricultural and horticultural sectors. Many regional councils have contestable funds available for landowners to protect biodiversity on productive land. In 2007 these funds amounted to over \$4 million per year.¹⁴

Land care groups

Local voluntary partnerships can make a substantial contribution to protecting and enhancing biodiversity locally. These are discussed further in Chapter 10. Local action for sustainable land management is a positive aspect of how New Zealand approaches management of productive land.



Figure 16.7 Landcare restoration site at Lake Komakorau (*Landcare Trust*)

The Landcare Trust provides a portal for valuable information about biodiversity management on productive land. The Trust has recently produced a useful booklet called ‘Benefits of Biodiversity for Farmers’, which offers successful examples of farmers incorporating biodiversity into their land management practices.

Among the other resources produced by the Trust is a guide for sustainably managing land and enhancing biodiversity for landowners in the Kaimai Mamaku catchments. This guide focuses on some of the best management practices that can be easily incorporated into productive land management, as well as guiding farm owners in planning for longer term investments, and identifying where they can get assistance to realise these.

Incorporating biodiversity into land management practices

Biodiversity has many direct and indirect commercial production benefits, as described earlier in this chapter. Research into the value that native species provide, through supporting essential ecosystem services to productive land, has been undertaken over a number of years. For example, recent research has demonstrated that the total economic value of the biological control of pests, soil formation and mineralisation of plant nutrients is significantly higher in land farmed organically than land farmed non-organically.¹⁵



Figure 16.8 Phacelia strip to improve biological control (*Lincoln University*)

Work currently being undertaken at Lincoln University is investigating options to re-design a number of productive landscape features, including integrating stock shelter, bioenergy sources, and livestock parasite resistance. It is believed that these innovations will deliver an increase in farm income of at least eight per cent by 2020. One area of particular focus is the ecosystem services and biodiversity value offered by shelterbelts, which have traditionally been planted in non-native species. By planting shelterbelts in appropriate native species it is believed that a number of benefits can be realised, including:

- Improved fire resistance
- Reduction in management costs
- Reduction in potential for weed invasions
- Improved provision of ecosystem services
- Improved pasture growth
- Improved rates of carbon sequestration
- Reduced wind exposure
- Increased pollination
- Additional habitat for other native species
- Creation of vital wildlife corridors

A trial that has been underway at Kowhai Farm, Canterbury, for over a decade, has been introducing a number of measures to increase ecosystem services and improve the biodiversity of productive land. This is discussed in more detail in the case studies below.



Figure 16.9 Lizard lounges provide additional habitat for lizards (*Lincoln University*)

Action	Value for land management	Impact on biodiversity values
Planting of native trees and shrubs	<ul style="list-style-type: none"> • Provides shelter for stock and crops • Helps to suppress weeds • Helps to minimise erosion • Supports beneficial insects for pest control 	<ul style="list-style-type: none"> • Enhances pollination • Supports diversity of native species • Offers food supply for native birds and insects • Adds conservation value to land
Paddock margin maintenance using native species	<ul style="list-style-type: none"> • Reduces cost of herbicides • Controls weeds by providing a barrier between crops • Production value of margins potentially increased • Supports beneficial insects for pest control 	<ul style="list-style-type: none"> • Reduces pollutants entering waterways and soil • Contributes to conservation values if using rare native grasses • Offers nesting sites for native birds • Provides a habitat for native insects
Set up permanent paddock ridges for beneficial insects	<ul style="list-style-type: none"> • Establishes an ongoing pest control mechanism • Reduces costs of herbicides • Low maintenance required once established 	<ul style="list-style-type: none"> • Provides a habitat for native insects • Reduces pollutants entering waterways and soil • Increases species diversity of land • Provides food for native birds
Planting native flowering plants	<ul style="list-style-type: none"> • Provides pollen and nectar to support insects that provide biological control of pests • Adds to visual quality of land 	<ul style="list-style-type: none"> • Provides food for native birds • Offers a habitat for native insects
Introducing native invertebrates	<ul style="list-style-type: none"> • Improves quality of soil • Reduces need for chemical inputs • Improves organic carbon levels 	<ul style="list-style-type: none"> • Increases species diversity • Provides food for native birds

Figure 16.10 Ideas from the Kowhai Farm trials for enhancing biodiversity and land production through a range of land management practices (*Biodiversity on Farmland, Ministry for the Environment, n.d.*)

Developing indicators for managing biodiversity in agriculture

As a signatory to the United Nations Convention on Biological Diversity, New Zealand is committed to implement a programme of work that seeks to achieve the objectives of the Convention. The Convention has recognised agricultural biodiversity as part of its programme, and accordingly, parties to the Convention are required to develop their own national strategies and develop resources to manage biodiversity on farmland. Some of the priority areas noted by the Convention are:

- *Pollinators*: horticultural produce and the seed industry depend on pollinators
- *Soil biodiversity*: nutrient cycling and soil health depend on functional soil biodiversity to support food, fodder and fibre production
- *Biodiversity to support natural pest control*: biological control of key pests largely depends on natural enemies, parasitic wasps and predators
- *Crop genetic resources*: plant breeding requires broad genetic resources to develop new lines for future production
- *Livestock genetic resources*: genetic resources to future-proof the livestock industry against various biotic and abiotic stresses are required
- *Wild biodiversity on farmland*: as two-thirds of land in New Zealand is under private ownership, this is the area that can protect wild biodiversity through public-private partnerships

To achieve these objectives, there is a need to develop national and regional indicators for biodiversity on farmland.¹⁶

Linking with the market

There has been steadily increasing demand for sustainably grown produce and farmed animals both within New Zealand and overseas. Sustainably-grown products often cost more than other products because of factors such as lower yields, more labour-intensive production and expensive materials.¹⁷ For these reasons, organic products seek premium prices in a market dominated by low commodity prices for agriculture and horticulture products. For example, organic beef and lamb attracts premiums of around 14 per cent over conventional equivalents.¹⁸ Linking with national and global markets, and marketing sustainably grown produce, can deliver premium prices for a farm.

Case studies

Kowhai Farm, Canterbury Region

In September 2000, a farm trial was developed at Kowhai Farm, a research farm at Lincoln, Canterbury. Kowhai Farm is a mixed cropping farm, where a number of measures have been introduced in efforts to increase the ecosystem services and improve biodiversity. Information signs were added to explain to visitors the importance of biodiversity to the production system.

The range of trees and shrubs planted on the farm were selected based on their role in providing ecosystem services, including suppression of weeds, shelter for stock, pollen and nectar for beneficial insects and reducing soil erosion. The first 18 months generally resulted in good progress in growth of the plantings, but a severe drought in the 2000/2001 summer season led to some losses which were carefully monitored. Because of these losses, nursery shelter species were planted to aid in the establishment of more permanent species.¹⁹



Figure 16.11 Kowhai Farm trial reporting on achieving good biodiversity outcomes

The paddock margin plantings proved to be an effective way to prevent perennial weeds from invading crops at the fence lines. A three metre-wide grass strip around the entire paddock was planted and managed using mechanical, hand-held weed-eaters rather than herbicides. Grasses were added in efforts to out-compete perennial weeds and linseed straw mulch was used to promote plant growth. These margins proved to be valuable refuges for beneficial insects.

A 'beetle-bank' was particularly effective at providing an over-wintering habitat and refuge for spiders and other beneficial insects, such as ground beetles. The 'beetle-bank' showed beetle densities of over 500 per square metre as opposed to fewer than 20 per square metre on non-banked areas.²⁰ From the 'beetle-bank' these insects are able to enter the adjacent paddock and feed on the pests.

Since the work to improve biodiversity at Kowhai Farm has been commenced, the farm has passed the threshold of full BIO-GRO status, New Zealand's leading organic certifier with European Commission certification. This case study provides a positive example of how enhancing ecosystem services through biodiversity can add value to productive land.

Greening Waipara Project

The Greening Waipara project is focused on a grape growing region and is looking at the added value that can be provided by ecosystem services – such as soil fertility, biological pest control and wetlands, which filter vineyard effluent. All of these services are to be provided by growing species that were once common in the area. The project is underpinned by research by Lincoln University, a large number of local wine growers, the Hurunui District Council and Landcare Research.

The Biodiversity Strategy for the Canterbury Region notes that through this work a number of New Zealand native species are showing real promise as a potential companion to grapes; meaning they are offering effective new ecosystem services in what was previously an essentially monocultural system. In addition, some of the species are also considered to have a cultural value, so there is even more benefit gained by including them in the restoration work.



Figure 16.12 Greening Waipara newsletter

Education and awareness-raising is an important part of the Greening Waipara project. Four vineyard biodiversity trails have been set up which offer the public interpretation and information about the biodiversity protection work. Trails have been developed at Mud House, Pegasus Bay, Waipara Springs and Torlesse Wines where the walkways lead visitors through the native plants and vines so they can interact with the biodiversity initiatives. They can see how pollination, pest control, weed suppression and reducing reliance on herbicides and pesticides all add value to the wineries, improve conservation values and support eco-tourism.²¹ The trails are highlighted by the local tourism organisation as a must-see destination.

Prior to its development as a grape-growing region with a monocultural landscape, the Waipara Valley was covered in native vegetation which supported a wide range of native species. This initiative has meant that the local community is reclaiming some of the landscape's former biodiversity.

The project has inspired other wine growing regions, both in New Zealand and overseas, by showing what can be achieved in terms of biodiversity protection, whilst retaining an economically-viable operation.

Biological control of insect pests

Agricultural and horticultural habitats can be manipulated to improve ecosystem services and function, including increasing the availability of pollen, nectar, alternative prey/hosts, or shelter for pests' natural enemies. The conservation bio-control of pests in Australasian vines is an example of where this has been successfully introduced.

Biological control of *Epiphyas postvittana*, which is a common leafroller pest in New Zealand and Australian vineyards, can be achieved by planting flowering buckwheat. Buckwheat plants provide food and habitat sources for the parasitic wasp *Dolichogenidea tasmanica*, which is a natural enemy of the leafroller pest. Sowing some of the spaces in between the rows of vines with buckwheat has been shown in studies to reduce the prevalence of this pest by 50 per cent, which is a level where agricultural sprays are not required, as determined by the New Zealand viticultural industry.

As a result, an investment of \$2 per hectare each year in buckwheat seed, and minimal sowing costs, can lead to savings in annual variable costs of \$250 per hectare per year in New Zealand.²²

Recommendations for best practice

Management approach	Best practice recommendations
Statutory plans	<ul style="list-style-type: none"> • Include objectives and rules which protect these areas, and the native species which depend on them, the from effects of use of productive land • Require use of nutrient budgeting • Require land use consent for activities which singly or cumulatively negatively impact on biodiversity values, such as vegetation clearance or wetland reclamation • Provide for incentives, such as the use of well-designed conservation lot provisions • Carefully design mechanisms to ensure biodiversity benefits are realised
Incorporating biodiversity into productive land management	<ul style="list-style-type: none"> • Use native species to support land management systems • Plant paddock margins with native species • Establish permanent paddock ridges • Plant native flowering plants • Introduce native insects and invertebrates • Monitor progress and change practices as needed • Seek support from research institutes and councils

Figure 16.13 Summary of the management approaches and best practice recommendations

Useful websites

Kowhai Farm – <http://www.lincoln.ac.nz/About-Lincoln-University/University-structure-and-staff/Lincoln-University-subsidiaries/Demonstration-farms/Kowhai-Farm/>

Landcare Trust – <http://www.landcare.org.nz/>

Queen Elizabeth the Second National Trust – <http://www.openspace.org.nz/>

References and further reading

Barton, 2005, 'Continuous cover an introduction', *The New Zealand Tree Grower*, November 2005, available at <http://www.nzffa.org.nz/farm-forestry-model/resource-centre/tree-grower-articles/tree-grower-november-2005/continuous-cover-forestry-an-introduction/>

Beer K, P Caldwell, F Gordon and B Hunter, 2006, *High country tenure review: Implications for the conservation of braided river systems*, University of Otago, Dunedin

Davis P and C Cocklin, 2000, 'Who pays? Habitat protection on private land', *Nature Conservation 5: Nature Conservation in Production Environments*, 468-478

Department of Conservation and Ministry for the Environment, 2000, *The New Zealand Biodiversity Strategy: Our chance to turn the tide, Whakakōhukihukitia Te Tai Roroku Ki Te Tai Oranga*, Department of Conservation and Ministry for the Environment, Wellington

Environment Canterbury, 2008, *A Biodiversity Strategy for the Canterbury Region*, available at <http://ecan.govt.nz/publications/Pages/biodiversity-strategy.aspx>

Environment Waikato, 2008, *The condition of rural water and soil in the Waikato Region: Risks and opportunities*, Environment Waikato, Hamilton, available at <http://www.ew.govt.nz/PageFiles/10480/The%20condition%20of%20rural%20water%20and%20soil%20in%20the%20Waikato%20region%20-%20risks%20and%20opportunitiesSMALL.pdf>

Goldstein J, G C Daily, J B Friday, P A Matson, R L Naylor and P Vitousek, 2006, 'Business strategies for conservation on private lands: Koa forestry as a case study', *Proceedings of the National Academy of Sciences*, 103, 10140-45

Green W and B Clarkson, 2005, *Turning the tide? A review of the first five years of the New Zealand Biodiversity Strategy*, The Synthesis Report submitted to the Biodiversity Chief Executives in November 2005, Wellington

Lee W G, C D Meurk and B D Clarkson, 2008, 'Agricultural intensification: Whither indigenous biodiversity?', *New Zealand Journal of Agricultural Research*, 51(4), 457-460

Meurk C D, S D Wratten and S Sam, 2006, 'Greening Waipara', *Indigena*, 27-30

Ministry for the Environment, 1997, *The state of New Zealand's environment 1997*, Ministry for the Environment, GP Publications, Wellington

Ministry for the Environment, 2000, *Biodiversity and private land*, Final Report of the Ministerial Advisory Committee to the Minister for the Environment, addressing the effects of private land management on indigenous biodiversity, Ministry for the Environment, Wellington

Ministry for the Environment and Department of Conservation, 2007, '*Protecting our places, Introducing the national priorities for protecting rare and threatened native biodiversity on private land*', Ministry for the Environment, Wellington

Ministry for the Environment, 2011, *Proposed National Policy Statement on indigenous biodiversity summary of submissions*, Ministry for the Environment, Wellington

Ministry for the Environment, n.d., '*Biodiversity on farmland: Good management practices*', A report on three years' research on the enhancement of biodiversity on farmland, Ministry for the Environment (partnering with Agriculture New Zealand, Selwyn Sustainable Agriculture Society, Heinz-Wattie and Lincoln University), Wellington

New Zealand Landcare Trust, 2011, *Managing land for the future: A sustainable land management and biodiversity guide for landowners in the Kaimai Mamaku catchments*, New Zealand Landcare Trust, Hamilton

Peart R, 2007, '*Landscape-level biodiversity protection under New Zealand's Resource Management Act 1991*', Paper presented to The Biodiversity Extinction Crisis: An Australasian and Pacific Response Conference, Sydney

Sandhu H S, S D Wratten and R Cullen, 2007, 'From poachers to gamekeepers: perceptions of farmers towards ecosystem services', *International Journal of Agricultural Sustainability*, 5, 39-50

Sandhu H S, S D Wratten and R Cullen, 2010, 'The role of supporting ecosystem services in conventional and organic arable farmland', *Ecological Complexity*, 7, 302-310, available at: <http://www.sciencedirect.com/science/article/pii/S1476945X10000255>

Sandhu H S, S D Wratten and R Cullen, 2010, 'Organic agriculture and ecosystem services', *Environmental Science and Policy*, 13, 1-7

Swaffield S, 2008, '*Sustaining the country: Ideals, opportunities and imperatives for future rural landscapes*', Lincoln University, Christchurch, unpublished

Williams J M, 2000, 'Sustaining biodiversity – a public or private function?' Paper given to the International Landcare 2000 Conference: *Changing Landscapes – Shaping Futures*, Parliamentary Commissioner for the Environment, Wellington

Endnotes

- 1 www.nzinstitute.org
- 2 Ministry for the Environment and Department of Conservation, 2007
- 3 Davis P and C Cocklin, 2000
- 4 Swaffield S, 2008
- 5 Ministry for the Environment, n.d., 9
- 6 Ministry for the Environment, n.d., 9
- 7 <http://www.teara.govt.nz/en/earthworms>
- 8 Lee W G et al., 2008
- 9 Williams J M, 2000
- 10 Green W and B Clarkson, 2005
- 11 <http://www.fedfarm.org.nz/n3224.html>
- 12 Green W and B Clarkson, 2005
- 13 <http://www.fedfarm.org.nz/n3011,90.html>
- 14 Ministry for the Environment and Department of Conservation, 2007
- 15 Sandhu et al., 2010
- 16 Goldstein et al., 2006
- 17 <http://maxa.maf.govt.nz/mafnet/rural-nz/sustainable-resource-use/organic-production/international-developments-in-organic-agriculture/index.htm>

- 18 <http://maxa.maf.govt.nz/mafnet/rural-nz/sustainable-resource-use/organic-production/international-developments-in-organic-agriculture/index.htm>
- 19 Ministry for the Environment, n.d., 11
- 20 Ministry for the Environment, n.d., 19
- 21 <http://bioprotection.org.nz/greening-waipara>
- 22 Sandhu et al., 2010



Auckland city (Raewyn Peart)

seventeen

Urban environments

To a large section of the general public the most interesting question in regard to our native birds is not which of them will survive in inaccessible parts of the backcountry, but which of them will be commonly met with in the cultivated, and even suburban areas.

Edgar Stead, Ornithologist, Christchurch (1927)

When Māori first settled New Zealand, they lived in small rural settlements, which were located near food resources, fresh water and good transport routes. Europeans settled in a similar pattern, preferring areas where there was safe water access and land suitable for agriculture. Since the early 1900s, these small settlements have grown rapidly.

Māori established productive gardens designed to feed their community. The first wave of European settlers also created productive gardens, but later ornamental gardens grew in popularity. These home gardens were dominated by colourful, and unusual introduced species of flowering plants, shrubs and trees. Today, vegetable gardens are becoming favoured in residential areas and home gardens commonly feature a variety of native species, alongside introduced species.



Figure 17.1 Example of an older style garden (*Raewyn Peart*)

At the beginning of the 21st century more than 80 per cent of New Zealanders lived in an urban area.¹ Auckland is by far the largest of these areas, housing more than a third of the national population. The patterns of land settlement, and the urbanisation of New Zealand, have had a significant impact on biodiversity in this country.

Life in the city

The nature of urban biodiversity varies greatly throughout New Zealand. Species presence within urban areas depends on a range of factors, such as climate, food availability and natural distribution limits. There are a number of habitats within urban areas supporting a range of species and ecosystem processes; including waterways, private gardens, urban streams, parks, reserves, urban sanctuaries, public gardens, swales and footpaths.

Birds

The birds found in built-up areas provide an important pollinating and seed dispersal role for urban trees and plants, both indigenous and exotic. In turn, urban parks and gardens with their wide range of plant species, can offer birds a constant food source during the harsh winter months, particularly in the South Island. The 2011 Garden Bird Survey, carried out by Landcare Research in collaboration with the Royal Forest and Bird Protection Society of New Zealand and the Ornithological Society of New Zealand, recorded that the house sparrow is the most commonly found bird species in New Zealand gardens. The next most common species were the starling, blackbird and myna. The only native species in the top ten were tūī, fantail and silvereye.² Silvereye also had the most notable decline in numbers counted from the previous year.



Figure 17.2 Birds, such as this pukeko, can be commonly found throughout New Zealand's urban areas (Raewyn Peart)

Many bird species are commonly found throughout most of New Zealand's urban areas, including the pūkeko, pigeon, ducks and seagulls. Other species have a limited geographic distribution and are found only in specific areas, such as the myna in the northern parts of the North Island.³ This can be due to climatic factors; for example certain plants and animals being predominant on New Zealand's drier east coast, but not the wetter west coast.⁴ In some urban areas, native birds have increased in distribution over the past few years, largely due to local pest control and the planting of native plants.⁵

Plants

Many species of native and introduced plants can be seen throughout New Zealand's cities and towns, such as flax, gorse and cabbage trees. New plant species establish within New Zealand every year. Some plant spores are blown across the Tasman Sea,⁶ other species are either intentionally or unintentionally brought to New Zealand, with quarantine authorities intercepting a number of foreign plants each year.

Many introduced species planted in private gardens 'escape' and end up growing in public areas. For example, between 1988 and 1993, more than 117 foreign flowering plants established themselves in the wild.⁷ In the late 20th century, introduced species were commonly planted along streets and in parks. However, in recent years there has been greater use of native species, with councils planting nikau palms, flax, native grasses and the like. Some councils incorporate rare and threatened species into urban plantings, including those on road reserves and inner city parks. In some cases, large and established introduced trees are being actively removed and replaced with native trees.

Fish

There are countless rivers, streams and creeks flowing through cities and towns. The most common fish found in urban waterways is the shortfin eel. This species is more tolerant of the poor water quality and low shade associated with many urban streams. The shortfin eel is remarkably adaptable; it burrows into silt and climbs over structures to get to food and habitat. The larger longfin eel is more sensitive to degraded habitats, as it requires the shelter provided by stream margin vegetation. Bullies, galaxiid species such as banded kokopu, giant kokopu or inanga, and some introduced fish can also be found in urban waterways.⁸

Invertebrates

Invertebrates are an extremely diverse group, both in form and function, and include organisms such as spiders, insects, crustaceans (such as crayfish), worms and molluscs (such as snails). These species are found in vast numbers within urban areas. Freshwater macroinvertebrates are an important food source for native and introduced fish. Water quality is an important parameter in determining macroinvertebrate presence, with the more sensitive species typically being absent from polluted urban streams. Freshwater macroinvertebrates are also affected by the amount of shade available (and resultant water temperature), oxygen levels in the water and the concentration of sediment.

Reptiles

A surprising number of reptiles can be found in urban areas. Cities can provide nourishing environments for lizards and frogs. Indigenous lizards are important seed dispersers and pollinators of many native plants. Most reptile species are particularly vulnerable to predation by introduced birds and mammals, such as cats and rats.

Introduced mammals

There are a wide range of both wild and domesticated mammals found living in urban areas. Cats, dogs, rats, mice, hedgehogs, possum, stoats and ferrets have all been very successful at inhabiting cities and towns throughout the country. Both the domestic and wild mammals predate on native birds and insects, as well as on a wide range of the introduced species.

Threats

Habitat loss and fragmentation

The activities which typically cause habitat loss and fragmentation in urban environments are:

- Earthworks and construction of new residential and commercial development, roads and other infrastructure
- Infilling and culverting of waterways
- Discharge of contaminants into waterways
- Destruction of riparian and coastal margins

The impact of such activities on biodiversity is often compounded by the associated development of impervious surfaces, stormwater run-off and the introduction of invasive plants and pest animals.



Figure 17.3 Earthworks in urban environments can lead to habitat loss and fragmentation, as well as cause damage to species living in adjacent streams and rivers (*Raewyn Peart*)

Habitat loss affects all species in an area, not just one type.⁹ The loss of habitat, and subsequent loss of resources, food and shelter, is a significant threat to urban biodiversity. Habitat fragmentation produces isolated remnants that have exposed edges, making them particularly susceptible to degradation, especially by invasive pests and weeds.¹⁰

It is not uncommon for homeowners and urban developers to be unaware of the importance of retaining vegetation. Whilst removing a few native trees on one property may be seen as insignificant, when this is multiplied across an entire city, already fragmented areas of natural habitat become even more isolated. Research in the former Waitakere City showed that between 1993 and 2000 up to 30 per cent of vegetation across the city had been lost. This was from subdivision and development, and also from individual trees being felled on a large number of properties.¹¹ Such trees often provide corridors for native birds trying to reach larger forests pockets. They also offer a food source and a supply of resources, such as nesting material. These corridors are important for maintaining genetic diversity.

Pest species

Each year new species continue to become established in New Zealand and some of these become pests, placing native species under additional predation or competition pressure. One of the biggest urban animal pests is the possum, which can eradicate entire species from urban areas. For example, in the Wellington region, red and yellow mistletoe were once widespread, but are now rare, having been heavily browsed by possums. When possums were removed from Kapiti Island, the red and yellow mistletoe flourished, demonstrating the pervasive effect one single pest species can have.¹² Possums also pose a risk to native bird species through predation of nests.

Domestic dogs and cats harm and kill birds and a range of other species including weta, skinks and lizards.¹³ In particular, cats are believed to be responsible for the extinction of more bird species worldwide than any other factor, aside from habitat destruction. They are considered to be a key threat to native birds in New Zealand's urban areas.¹⁴ This has consequences beyond the reduction in the population of a particular species, as birds (such as kererū) play a vital role in dispersing seeds.¹⁵ On the positive side, domestic cats (and some dogs) kill invasive species, including rats and mice.



Figure 17.4 Domestic cats can damage and kill a range of native species, including birds and lizards (Raewyn Peart)

Although introduced species often have negative impacts on biodiversity, this is not always the case.¹⁶ For example, in areas of New Zealand, tree Lucerne (a small spreading evergreen tree) provides an important food source for native birds.

Blackbirds play an important role in the dispersal of native plant seeds.¹⁷ In some situations, exotic trees can play a role in providing corridors, enabling native birds to reach larger forests pockets. Large areas of gorse can in some situations assist native succession, and promote natural regeneration back to native forest, such as those along the Wellington City to Petone coastal escarpment.

Impervious areas

Urban development can place extreme pressure on nearby waterways and their associated biodiversity. Urbanisation increases the amount of impervious surface area on land, through increased roof areas, pavements and carparks. This prevents rainwater from soaking into the soil, and from reaching the groundwater, which results in less water replenishing the groundwater resource. In addition, runoff into streams from paved areas and stormwater outlets occurs more quickly, increasing stream scouring and associated effects. Some native species may struggle to cope with an overload of water and sediment entering habitats and subsequent flooding events. Furthermore, vegetation which normally decreases runoff, through physically slowing down water flows, transpiration and evaporation, is often absent in urban areas.



Figure 17.5 Urban stormwater discharged into streams can impact on native species by increasing flooding and sedimentation (*Raewyn Peart*)

Contaminated urban runoff

Stormwater runoff from urban areas is often highly contaminated, and this can negatively affect stream ecosystems. It can contain bacteria from animal faecal matter, herbicides, pesticides, detergents and other household chemicals. Stormwater drainage systems can also be a source of pollution in urban catchments. Some areas use combined sewer and stormwater drains, which is common in older networks that have not yet been replaced with more modern systems.

Water that contains contaminants can have major impacts on the diversity of habitats and species; including toxic poisoning, loss of the more sensitive species and interference with the food chain. Increasingly, there is concern that this contamination is impacting upon the genetic diversity of multiple generations of aquatic creatures.¹⁸



Figure 17.6 Contaminated runoff from industrial areas has major impacts on biodiversity values
(Raewyn Peart)

Even where separate sewage and stormwater systems are used, sewage can sometimes overflow. Sewage is then discharged into stormwater drains, onto land and into the sea. For example, in the Auckland stormwater network there are around 400 designated sewer overflow points¹⁹ and in 2008 there were 2,479 recorded sewerage overflows in the region during wet weather.²⁰ The associated pollutants and toxins carried in this runoff have a major adverse impact on the state of waterway biodiversity.

Summary of threats

Cause	Potential effect
Habitat loss and fragmentation	<ul style="list-style-type: none"> • Produces isolated remnants that are more susceptible to further degradation and are unlikely to persist without intervention • Exposes native species to invasive species • Reduces corridors for native species • Reduces resources, food supply and shelter for native species • Reduces genetic diversity
Pest species	<ul style="list-style-type: none"> • Predation of native species • Can eradicate entire species • Browsing of native plants • Removal of food sources for native species • Can disrupt the entire food chain
Impervious surfaces	<ul style="list-style-type: none"> • Less groundwater recharge • Higher peak flows in waterways • Less filtration of pollutants and toxins
Urban runoff	<ul style="list-style-type: none"> • Increases pollutants entering rivers, streams, creeks and coastal areas • Increases levels of sediment entering waterways • Reduces diversity of habitats and species • Results in toxic poisoning of species • Sensitive species can be lost • Interferes with food chain • Reduces genetic diversity

Figure 17.7 Summary of the main causes of biodiversity loss in urban environments and the potential effects on habitats, ecosystems and species

Description of regulatory management approaches

An improved awareness of the role biodiversity plays in our towns and cities has brought with it an increased willingness by local communities, landowners, iwi/hapū and councils to restore and protect it. This is important if native species and ecosystems are to be retained. This improved awareness also enables urban dwellers to reconnect with the wider natural environment.

The Biodiversity Strategy provides a strategic mechanism to address biodiversity loss. This document notes that the biodiversity found in urban environments forms part of the national ‘bottom line’, which needs to be protected if we are to maintain indigenous ecosystems and species, and prevent further decline.²¹ One of the main ways this can be achieved is through regulatory controls under the RMA framework.

Regional and district plans

District and regional planning documents could be expected to include controls on a number of relevant matters, including:

- Vegetation clearance
- Management of riparian margins
- Coverage of land with impervious surfaces
- Piping and culverting of streams
- A range of other land use activities
- Mitigation opportunities

For example, the Whangarei District Plan contains rules regulating the clearance of indigenous vegetation, building setbacks from water bodies, the requirement for esplanade reserves and/or strips and the identification of esplanade priority areas.



Figure 17.8 Councils can manage and control the way urban stormwater is discharged through regional and district plans *(Raewyn Peart)*

Conditions of resource consent

Where a statutory plan requires resource consents to be obtained, conditions can be placed on the granting of consent to address the impacts on biodiversity of the proposed activity.

The Horizons Regional Council's One Plan contains a policy which allows the imposition of a financial contribution as a condition of consent, for any type of activity that has significant adverse effects on biodiversity. The purpose of the financial contribution is to offset the adverse effects of an activity by providing for the protection, restoration or enhancement of biodiversity, in a location with similar biodiversity values.

Conditions of consent can be targeted at specific activities or specific habitats, to address how activities in those habitats might impact on biodiversity. For example, the former Waitakere City Council required the use of eco-sourced plants in some residential developments, thus protecting the local genetic resources. Local authorities can also encourage no cats or dogs in ecologically-important urban areas. One way to achieve this is by applicants agreeing to 'no pets' covenants as a condition of subdivision consent. Subsequent buyers of the sections will then be bound by the terms of the covenant.

Covenants on property titles can also be used to ensure the long-term management and protection of trees within certain areas, by restricting individual tree modification, and requiring landowners to take a more active role in the conservation of these areas.

Tree protection rules

Controlling vegetation clearance through rules in the RMA plans is an effective way to directly manage habitat loss and fragmentation. Changes to the RMA, introduced by the Resource Management (Simplifying and Streamlining) Amendment Act 2009, restrict councils' ability to include general protection rules for trees in district plans. Under section 76(4A), rules in district plans 'must not prohibit or restrict the felling, trimming, damaging, or removal of any tree or group of trees in an urban environment', unless they are specifically identified in the plan or located within an area that is a reserve or subject to a conservation management plan or strategy.

The amending legislation defines 'urban environment', to mean an allotment no greater than 4,000 m² that is connected to a reticulated water supply system and a reticulated sewerage system; and on which is a building used for industrial or commercial purposes, or a dwelling.

The term 'tree' is not defined in the RMA but a recent Environment Court decision adopted the dictionary definition of 'a woody perennial plant, typically having a single stem or trunk growing to a considerable height and bearing

lateral branches at some distance from the ground'.²² This means that the restriction applies to trees, as commonly regarded, rather than to shrubs or lower growing vegetation.

The Amendment Act also affects existing tree protection rules in district plans, as section 152 provided that on 1 January 2012, all provisions in district plans which contravened the requirements for rules protecting urban trees would be automatically revoked.



Figure 17.9 Notable tree (*Raewyn Peart*)

Description of non-regulatory approaches

Local authorities, other agencies, landowners and community groups often actively contribute to improving urban biodiversity by undertaking pest control, restoring key urban habitats, maintaining parks, investing in green infrastructure and partially funding voluntary initiatives. Some local councils also offer rates relief in exchange for property owners foregoing subdivision potential in areas of high natural value. Some of the most commonly applied non-regulatory approaches are described below.

Green infrastructure

Green infrastructure refers to a mechanism used to promote biodiversity values across a range of structures within urban environments. By ‘greening’ existing concrete structures, such as roofs and stormwater drains, these areas can offer a refuge for many different species. Open stormwater swales can be incorporated into road edges, pavement verges and islands to provide resources, food, shelter and corridors for species.



Figure 17.10 Stormwater detention ponds have been incorporated into the Whisper Cove development at Snells Beach, north of Auckland (*Raewyn Peart*)

Roof tops comprise between 40 and 50 per cent of the total impervious area in urban settings.²³ This large area of space presents an opportunity for creating a low impact design tool to manage stormwater, as well as a contribution to urban biodiversity through providing a habitat for birds, butterflies and insects. Green roofs consist of vegetated layers placed on top of conventional roofs. They can either be ‘intensive’ systems supporting larger plants and gardens, or ‘extensive’ systems supporting low-growing, drought-resistant vegetation.²⁴

The Auckland Council has endorsed green roofs as an acceptable stormwater management device for the Auckland region and has provided some guidance on how they should be constructed. In some areas, green roofs may be particularly important in providing links with other green habitats, to facilitate wildlife dispersal in urban areas.²⁵ The former Waitakere City Council led by example

with the construction of a green roof on the Waitakere Central Civic Centre building in Henderson.

Rain gardens, tree pits and planter boxes within residential areas, particularly in high-density areas, provide an opportunity to promote native seed dispersal, by ensuring that the plants chosen provide food for birds and insects. It is useful to incorporate threatened plant species, if the conditions are appropriate, as this can support their on-going population regeneration and maintain genetic diversity. The ecological values of such areas are limited by their size, potentially extreme microclimates, and enclosure within hard surfaces.²⁶ The current street side planting at Auckland's Wynyard Quarter includes a number of such species, with a dual role in filtering stormwater runoff prior to entering the Waitemata Harbour.



Figure 17.11 Street plantings, such as those at the Wynyard Quarter, provide additional bird and insect habitat (Raewyn Peart)

Weed management

Weed control is an important part of councils' responsibilities, both on council-owned land (such as parks and reserves) and on private land. As well as undertaking the physical control of weeds, councils can require landowners to remove noxious weeds on private land and provide advice and support. The Auckland Council has placed a number of permanent community weed bins across Waitakere City for local residents to use.

Encouraging landowners to dispose of garden waste properly is essential to reduce the number of invasive weeds. This can include providing information about why garden weeds damage natural areas, as well as offering locations for easy, safe disposal of garden waste. Raising awareness about which garden plants may seriously damage local native environments is also very valuable for achieving biodiversity protection goals. A number of regional councils include leaflets with rates invoices that highlight the threat of noxious weeds, and draw landowners' attention to what they look like and what can be done to remove these particular species.



Figure 17.12 Waitakere community weed project (Auckland Council)

Education

Local authorities also encourage improved biodiversity outcomes by producing guidance material on an increasingly wide range of matters, such as the recommended native species to plant in certain areas, design of low impact storm water systems and simple ways that people can enhance urban biodiversity in their own garden. Councils can tailor this information for local climatic conditions, including identifying what species of plants, and what kind of weed control works best in local areas. Councils can also provide useful information about selecting appropriate garden plants, including those which can provide a food source for birds or which do not compete with native plants.

Community initiatives

The community can significantly improve urban biodiversity through voluntary restoration projects. A wide range of these projects are being undertaken across the urban environments of New Zealand and these are discussed in Chapter 10. The Biodiversity Strategy seeks to encourage and support communities

to achieve 'sympathetic management' of biodiversity by recognising the importance of urban initiatives.

The establishment of 'mainland islands' by landowners and community groups can be an effective way to enhance biodiversity through intensive pest and weed removal, and replanting, in order to restore entire ecosystems.²⁷ The concept behind urban mainland islands is that they provide an opportunity to expand habitat, and to restore rare or under-represented indigenous ecosystems within urban environments.²⁸ As well as protecting biodiversity, these areas offer an opportunity to raise awareness about the plight of species and habitats, in a place that the local public can easily access. They play an important role in restoring wider biodiversity values outside of these areas.

Case studies

Project Twin Streams

In 2003, Project Twin Streams commenced, with the aim of restoring urban streams in West Auckland through the assistance of local communities. The drivers for the project were the high levels of pollution in the discharge from Henderson Creek to the Waitematā Harbour, sporadic flooding, erosion and sedimentation of stream beds and 'unacceptable' levels of sewer overflows during storms.



Figure 17.13 Project Twin Streams (*Raewyn Peart*)

Compared to most other voluntary restoration projects, Project Twin Streams is of a significant size and scale. A grant from the former Infrastructure Auckland funded implementation, which included the restoration of 56 kilometres of stream banks, the purchase of 156 properties threatened by flooding and the construction of a 9.2 kilometre network of walk and cycle ways.²⁹

The restoration of stream banks has involved the removal of rubbish and noxious weeds from streams, such as bamboo, willow and *Tradescantia*, and their replanting with eco-sourced native trees and shrubs. The roots of these new plants are assisting in stabilising stream banks, with a consequent reduction in erosion and sediment production. In addition, the plants act as a buffer between land uses and the waterways, providing a zone where contaminants can be filtered out before stormwater enters the streams. The trees and shrubs also provide new habitat for a range of indigenous species, and shade for streams. This lowers light levels and stream temperatures and consequently reduces algal plant growth.³⁰

Importantly, Project Twin Streams includes a monitoring and evaluation component. Ongoing ecological surveys measure the state of the environment by using biological indicators, such as the presence of birds, bats, lizards, geckos and insects, together with vegetation structure and composition and presence of pests.³¹ Community groups regularly monitor stream water quality to assist in understanding any changes.

A key aspect of Project Twin Streams is community engagement. Members of the community can actively contribute to the project by undertaking riparian planting, or creating works of art, songs or drama, to communicate key messages. Through these and other measures, this project encourages people to better understand the relationship between stream health, and human actions and behaviour.

This case study highlights what community collaboration, coupled with sufficient funding and commitment, can achieve in terms of enhancing urban biodiversity.

Karori Sanctuary

The Karori Sanctuary Trust was established in 1995 to develop the Karori Sanctuary, which comprises 225 hectares of regenerating lowland forest and wetlands. It is near the Wellington city centre and is surrounded by established residential suburbs and scrubland.



Figure 17.14 Fuchsia Walk, Central Valley, Karori Reservoir Wildlife Reserve (Crown Copyright: Department of Conservation: Te Papa Atawhai, 1994)

The Trust is a not-for-profit community-led organisation with a 500-year vision: ‘to restore a corner of mainland New Zealand as closely as possible to the way it was ‘the day before humans arrived’.³² This vision envisages a self-sustaining ecosystem and the restoration of endangered native species on the New Zealand mainland.

The Sanctuary was established because the native fauna in the Wellington region was in general decline, with most species locally extinct, or extremely rare. Remaining native forests in Wellington City were slow to regenerate and there was widespread community support to ‘bring the birds back to Wellington’. In 1999, an 8.6 kilometre predator-proof fence was constructed. This was specifically designed to exclude 14 mammalian pests found in, or near, the Sanctuary and domestic pets.³³ This was followed by an intensive pest eradication programme. Prior to the establishment of the predator-proof fence, it was estimated that possum browsing removed 400 tonnes of vegetation from the sanctuary valley in a year. Due to such habitat loss and predators, native bird species had declined from about 20 to less than 10.³⁴

The Sanctuary is now home to dozens of reptile and amphibian species, with over 30 species of native birds, hundreds of plant species and thousands of invertebrates now flourishing. These include endangered native animals such as the tuatara, little spotted kiwi, saddleback, hihi and giant weta.³⁵ The establishment of the Sanctuary has led to a noticeable improvement in urban biodiversity throughout Wellington City, with once uncommon native birds such as tūi and kākā now regularly seen.

This case study highlights how the restoration of biodiversity can be successfully achieved close to a major urban centre and by a not-for-profit organisation.

Recommendations for best practice

Management approach	Best practice recommendations
RMA plans	<ul style="list-style-type: none"> • Include objectives, policies and rules on issues such as vegetation clearance, management of riparian margins, coverage of land with impervious surfaces, building setbacks from water bodies and piping and culverting of streams • Identify appropriate land use activities • Offer mitigation opportunities
Resource consent conditions	<ul style="list-style-type: none"> • Minimise the amount of clearance of established vegetation • Use permeable surfaces where possible • Incorporate green infrastructure (e.g. swales and wetlands to manage stormwater) • Replant with locally sourced native species • Encourage ‘no pets’ covenants as a condition of subdivision in ecologically important urban areas • Require the active management of indigenous vegetation through the use of covenants or conditions on property titles • Incorporate restoration of riparian margins where relevant

Regional pest management strategies	<ul style="list-style-type: none"> • Ban the sale, propagation and distribution of pest species • Require the removal of noxious weeds on private land
Green infrastructure	<ul style="list-style-type: none"> • Develop council green infrastructure plans • Pre-approve green infrastructure technologies • Provide information on green infrastructure alternatives • Provide incentives for incorporation of green infrastructure into developments
Weed management	<ul style="list-style-type: none"> • Undertake active weed management programmes on council-managed land • Provide landowners with information on noxious weeds and methods for removal • Provide alternative safe options for disposal of garden waste
Education	<ul style="list-style-type: none"> • Provide information relevant to local biodiversity and habitats • Provide practical advice on what plant species support indigenous biodiversity and how to eradicate invasive species • Provide opportunities to connect with, and celebrate, local biodiversity
Community restoration	<ul style="list-style-type: none"> • Identify biodiversity funding opportunities for set up and on-going management • Ensure plants are used that are appropriate for the habitat • Incorporate threatened plant species if conditions are right for long term survival • Use eco-sourced plants • Control weeds and animal pests to the extent possible • Consider use of a predator proof fence where feasible • Communicate and collaborate as widely as possible

Figure 17.15 Summary of the management approaches and best practice recommendations

Useful websites

Canterbury Regional Pest Management Strategy – <http://ecan.govt.nz/publications/Pages/regional-pest-management-strategy.aspx>

Waitakere planting information – <http://www.waitakere.govt.nz/cnlser/pw/greennetwk/pdf/amenity-planting-guideline-gn.pdf>

Landcare Trust – <http://www.landcare.org.nz/>

Auckland Council green roofs – <http://www.aucklandcouncil.govt.nz/SiteCollectionDocuments/aboutcouncil/planspoliciespublications/technicalpublications/tr2010017greenroofsstormwatermitigation.pdf>

Waitakere City weed bins – <http://www.waitakere.govt.nz/abtctit/ne/plantpests.asp#weedbins>

Auckland Council weed database – http://www.arc.govt.nz/environment/biosecurity/pest-plants/pest-plants_home.cfm

References and further reading

Auckland Regional Council, 2003, *Design guideline manual stormwater treatment devices*, Technical Publication 10, Auckland Regional Council, Auckland

Auckland Regional Council, 2010, *Extensive green (living) roofs for stormwater mitigation*, Technical Report 2010 0/17, Auckland Regional Council, Auckland, available at <http://www.aucklandcouncil.govt.nz/SiteCollectionDocuments/aboutcouncil/planspoliciespublications/technicalpublications/tr2010017greenroofsstormwatermitigation.pdf>

Auckland Regional Council, 2010, *State of the Auckland Region*, Auckland Regional Council, Auckland, available at http://www.arc.govt.nz/plans/reports/state-of-the-auckland-region-report-2010_home.cfm

Auckland Council, 2012, *Stormwater*, Auckland Council, Auckland available at <http://www.aucklandcity.govt.nz/council/services/stormwater/about.asp>

Auckland Council, 2012, *Project twin streams*, Project Twin Streams, Auckland Council, Auckland available at <http://www.projecttwinstreams.com/>

Brockie B, 1997, *City Nature*, Penguin Books New Zealand Limited, Auckland

Dawson, B, 2010, *A history of the garden in New Zealand*, Godwit, Random House Publishing, Auckland

Department of Conservation and Ministry for the Environment, 2000, *The New Zealand Biodiversity Strategy: Our chance to turn the tide, Whakakōhukihukitia Te*

Tai Roroku Ki Te Tai Oranga, Department of Conservation and Ministry for the Environment, Wellington

Department of Conservation, 2012, *NZ pigeon kereru threats*, Department of Conservation, Wellington, available at <http://www.doc.govt.nz/conservation/native-animals/birds/land-birds/nz-pigeon-kereru/threats/>

Dunnett N and N Kingsbury, 2008, *Planting green roofs and living walls*, Timber Press, Wellington

Esler A, 2004, *Wild plants in Auckland*, Auckland University Press, Auckland

Forest and Bird, 2012, *Wildlife friendly factsheet*, Forest and Bird, Auckland, available at http://www.forestandbird.org.nz/files/publication_attachments/wildlifefriendlyfactsheet.pdf

Gabites I, 1993, *Wellington's living cloak: A guide to the natural plant communities*, Victoria University Press, Wellington

Hauraki Gulf Forum, 2004, *The Hauraki Gulf State of the Environment Report*, Hauraki Gulf Forum, Auckland

Hawke's Bay Regional Council, 2012, *Urban possum control*, Hawke's Bay Regional Council, Hawke's Bay available at <http://www.hbrc.govt.nz/WhatWeDo/PestControl/UrbanPossumControl/tabid/1129/Default.aspx>

Hughey K, n.d., *Wildlife of urban environments: Some thoughts on the surprisingly un-surprising New Zealand context*, Lincoln University, Lincoln, unpublished

Karori Sanctuary Trust, 2012, *Karori Sanctuary Trust*, Karori Sanctuary Trust, available at <http://www.sanctuary.org.nz/>

Lewis M, R Simcock, G Davidson and L Bull, 2010, *Landscape and ecology values within stormwater management*, prepared by Boffa Miskell Limited for Auckland Regional Council, Auckland, available at <http://www.arc.govt.nz/albany/fms/main/Documents/Plans/Technical%20publications/Technical%20reports/2009%2051-100/TR2009083.pdf>

Waitakere City Council, 2012, *Waitakere Council green roof*, Auckland Council, Auckland, available at <http://www.waitakere.govt.nz/abtcit/ec/ecoinit/greenroof.asp>

Zealandia 2008, 2012, *Zealandia*, Karori Sanctuary Trust, available at <http://www.visitzealandia.com/>

Endnotes

- 1 www.stats.govt.nz
- 2 http://www.landcareresearch.co.nz/research/biocons/gardenbird/results2011/index_2011.asp
- 3 Brockie B, 1997, 15
- 4 Brockie B, 1997, 12
- 5 Ministry for the Environment, 2007, 392
- 6 Brockie B, 1997, 6
- 7 Brockie B, 1997, 6-7
- 8 <http://www.teara.govt.nz/en/freshwater-fish/3>
- 9 <http://www.biodiversity.govt.nz/picture/biodiversity/state/destruction.html>
- 10 Department of Conservation, 2000, 38
- 11 <http://www.waitakere.govt.nz/abtcit/ps/pdf/stateofcity/ch12.pdf>
- 12 Gabites I, 1993, 103
- 13 <http://www.biodiversity.govt.nz/picture/biodiversity/state/pests.html>
- 14 http://www.forestandbird.org.nz/files/publication_attachments/wildlifefriendlyfactsheet.pdf
- 15 <http://www.doc.govt.nz/conservation/native-animals/birds/land-birds/nz-pigeon-kereru/threats/>
- 16 <http://www.biodiversity.govt.nz/picture/biodiversity/state/pests.html>
- 17 Department of Conservation, 2000, 7
- 18 <http://www.niwa.co.nz/freshwater/update/freshwater-update-33-may-2010/stormwater-contaminants-reduce-genetic-diversity>
- 19 Hauraki Gulf Forum, 2004, 73
- 20 Auckland Regional Council, 2010, 60
- 21 Department of Conservation, 2000, 8
- 22 The Auckland Council, Decision of the Environment Court, 129/2011, para 18
- 23 Lewis M et al., 2010
- 24 Lewis M et al., 2010
- 25 Lewis M et al., 2010
- 26 Lewis M et al., 2010
- 27 Department of Conservation, 2000, 35
- 28 Department of Conservation, 2000, 43
- 29 <http://www.projecttwinstreams.com/about/buildingblocks/>

- 30 <http://www.projecttwinstreams.com/about/managingstormwater/>
- 31 <http://www.projecttwinstreams.com/multimedia/research/>
- 32 <http://www.sanctuary.org.nz/>
- 33 http://www.sanctuary.org.nz/Site/Conservation_and_Research/Restoration/The_fence.aspx
- 34 http://www.sanctuary.org.nz/Site/Conservation_and_Research/Restoration/Pest_eradication.aspx
- 35 http://www.visitzealandia.com/Site/Zealandia_Home/Inside/Our_Wildlife/Birds/Default.aspx



Waihou Springs in the Waikato is an example of an important freshwater system (*Daniel Sharp*)

eighteen

Freshwater

We know we are reaching limits in some parts of New Zealand, shown by deteriorating water quality, water shortages, and constraints on our economic opportunities.

Alastair Bisley, Chair, Land and Water Forum

Freshwater is the very essence of life on Earth. New Zealand has more than 70 major river systems, feeding countless streams and creeks, and over 770 lakes covering over 3000 kilometres.¹ They flow through mountains, forests, farmland and cities. Many of these waterways are connected together under the ground.

The freshwater systems in New Zealand support a diverse array of various plants and animals, all of which contribute significantly to biodiversity values. Fish, birds, invertebrates, algae, bacteria and fungi all form part of freshwater ecosystems. These combine to form complex communities and food webs which encompass both the aquatic environment and adjacent land and vegetation. Water quality, temperature, food availability and chemical factors affect the presence of various species.



Figure 18.1 The Hochstetter's Frog is an example of the diverse array of species supported by freshwater systems (Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

Life in freshwater

Types of freshwater bodies include streams, rivers, lakes, ponds, wetlands and groundwater. Each type forms distinct habitats and ecosystems. Broadly, the main distinction is between running and standing waters, which have corresponding differences in flora and fauna.²

Running waters comprise rivers, streams and some groundwater systems. The fauna that inhabit such areas have characteristics which enable them to cope with fast-flowing water including flood flows, mobile beds and periods of high turbidity. Lakes, ponds and some groundwater systems provide standing waters habitats. The structure and chemistry of such areas is affected by the lack of water movement,³ the volume and depth of the water, the source and quantity of freshwater inputs and the extent and composition of wetland vegetation. During summer, many deep lakes separate into two layers: an upper warmer layer with high oxygen content, and a denser colder bottom layer with a high density of nutrients.⁴ In winter, the surface cools, allowing the bottom layer to mix with it, thereby redistributing the oxygen and nutrients.

More information about the types of freshwater bodies can be found in 'Managing Freshwater' - An EDS Guide available at www.eds.org.nz.

Invertebrates and insects

A key feature of the freshwater environment, compared to the marine environment, is the presence of insects. Almost 400 species have been identified in freshwater bodies, including the major insect groups of mayflies, caddisflies and stoneflies.⁵

Insects and invertebrates are an integral part of the food web in these environments, performing a range of functions. 'Shredders' are those species (mainly large insect larvae) which eat dead leaves. 'Browsers' include a diverse range of species, and they 'ingest fine particulate matter, algae and associated bacteria, fungi and slime' from biological films on rocks, stones and plants.⁶ 'Filterers' collect food by sieving fresh water. Predatory invertebrates are also common within freshwater systems, and these can have a substantial impact on prey populations.

Many aquatic insect larvae that are found in running waters 'have flattened bodies and hooked feet to crawl in the thin layer of relatively still water that exists close to the surface of rocks', and others have pads of silk to glue them to rocks.⁷ The caddisfly larvae get their food from the current by weaving seine nets between rocks.⁸

Invertebrates that prefer water with little movement live in lakes or in stable pools in streams and rivers. These include freshwater crayfish and insects such as freshwater snails and worms, midges, mosquitoes and pond skaters. Insects that inhabit standing waters have often evolved streamlined bodies and limbs, designed to enable them to swim more effectively.⁹ A range of insects use the surface tension of still water to hunt, move and breed.¹⁰ Others burrow within the muddy deposits of stream banks and lake beds.

Fish

New Zealand has approximately 38 native fish species, including galaxiids, bullies, lamprey, smelt and eels. There are also a number of introduced species, most notably trout and salmon.¹¹ Freshwater fish species commonly occur together in a group which is generally related to the altitude and geographic location, particularly the distance inland.

Habitat type is also important for some fish species. Depending on their different climbing abilities and tolerances to water flow, turbidity and salinity will define the type of fish communities present. The fish that inhabit still water have developed streamlined bodies, designed to enable them to swim more effectively. In addition, freshwater fish species are generally nocturnal and many have sophisticated sensory perception.

Birds

Many species of waterfowl, herons, shags, grebes, pūkeko and stilts inhabit lakes, lagoons and rivers in New Zealand. In addition, five bird species spend all, or crucial parts, of their life cycle on rivers: these are the whio whio (blue duck), wrybill, black stilt, black-billed gull and black-fronted tern.¹² They are particularly well adapted to these habitats. The whio whio is one of the few species of duck worldwide that has adapted to fast-flowing rivers. While most shag species in New Zealand feed in estuaries, harbours and coastal waters, the range of large black cormorants, little black shags and little shags extends to inland lakes and rivers. These three species and the pied shag also nest and roost in colonies over open water such as inland lakes and slow moving rivers.

Grebes seldom come onto land, and dive for all of their food.¹³ Wrybills and black-fronted terns usually nest only on the braided shingle rivers in the Canterbury region. Pied oystercatchers, and pied stilts also nest in these areas, and breed on some riverbeds and adjacent pasture lands. The braided shingle rivers flow on a wide, flat riverbed through a number of continually changing channels, separated by shingle beds.¹⁴ The Waitaki River braided system is home to the world's rarest wader, the black stilt, as well as the common pied

stilt. Introduced species include Canada geese, mallard ducks and black swans. There are also Australian coots and a number of species of shag.



Figure 18.2 The pateke duck is endemic to New Zealand and is found in many of New Zealand's lowland freshwater environments (*John Heaphy*)

Plants

Freshwater algae prefer slower streams where they can get a hold on rocks and in mud. They play an important role in stream ecosystems for a number of reasons. Algae produce oxygen as a waste product of photosynthesis. They help maintain water quality by absorbing nutrients from waterways, and they are food for small invertebrates and larger fish. Algae are a key indicator of environmental quality because they are so sensitive to changes in temperature and nutrient levels.

There is a vast array of larger plants, known as macrophytes, which live in freshwater environments. Native freshwater plants are usually small, and tend to be in waters that are clean, and generally clear. Species include macroalgae, mosses, liverworts, ferns and vascular plants. Some of the plants live their entire life underwater, others are rooted to the bed but can be seen above the surface and others float on the surface.

These plants provide important habitats and shade for freshwater invertebrates and fish. They are a source of food for a small number of species, including the freshwater koura and the aquatic moth. When they die, the plants decompose and their nutrients enter the nutrient cycle. Over 600 different types of fungi can be found in New Zealand freshwater systems.¹⁵ They play an important role in breaking down organic matter which then becomes food for invertebrates. Exotic plants often grow rapidly when first introduced into a waterway, possibly because they can use nutrients inaccessible to native species.¹⁶

Groundwater biota

Groundwater aquifers support important ecosystems that play a significant role in the maintenance of healthy groundwater resources. These ecosystems are based on organic carbon brought in when surface waters recharge the aquifer.¹⁷ Scientists have recently found that groundwater crustaceans are widespread throughout the groundwater aquifers and that they are very diverse. They are generally colourless and blind, growing up to 25 millimetres long. Scientists have also found that groundwater invertebrates are more abundant in areas close to a pollution source, presumably in response to an increase in food supply. However, when large amounts of pollution build up, it can overwhelm the invertebrates and eventually kill them.¹⁸

Threats

As a result of the degradation of freshwater habitats, the effects of introduced species and harvesting, many freshwater species (particularly birds and insects) have a significantly restricted distribution. The 2005 review of the Biodiversity Strategy notes that, overall, there has continued to be a serious decline in the quality of many freshwater systems. This has had a detrimental effect on biodiversity values.

In 2009, an expert panel updated the threat status of 74 freshwater and estuarine fish present in New Zealand. Fifty-one native taxa were ranked, of which 67 per cent were considered threatened or at risk.¹⁹ A single species was classified as extinct, the New Zealand grayling, which has not been observed since the 1920s. Endemic galaxiids (*Galaxiidae*) dominate the threatened and at risk taxa. The assessment found that most of the threatened native fish species are in Canterbury and Otago. This assessment also concluded that migratory freshwater fish species are declining throughout the country.²⁰

Clearance of riparian habitat

Most aquatic life in New Zealand's waterways developed in heavily shaded forest conditions. Therefore, the clearance of native forests and riparian habitat has had a significant impact on freshwater biodiversity. Habitat modification is cited as one of the reasons for the demise of the grayling, which declined from being relatively common to extinction.²¹



Figure 18.3 Clearance of river banks reduces the availability of shade and resources for native freshwater species (Raewyn Peart)

When vegetation is removed from the banks of waterways, a valuable filter is removed. It also reduces the amount of available shade. In addition, riparian margins are important areas for many types of native flora and fauna, whose habitat is destroyed or degraded by the removal of the vegetation.

Deteriorating water quality

Natural freshwater systems need inputs of sediments, nutrients and organic material and the presence of algae and bacteria. An increase in nutrients can lead to extensive growth of plants and algae. This may lead to eutrophication (excessive plant growth) where bacteria decompose the plant material, using up the available oxygen in the water in the process. This ultimately causes the death of fish, invertebrates and plant life, which are reliant on water-borne oxygen.²² In extreme cases, a freshwater body may become anoxic, which means

it lacks oxygen and is effectively dead. This has happened to a number of lakes in the Rotorua area.

An excess of sediment can choke smaller waterways, causing cobbles and gravel to get stuck in the river bed. It can also increase the level of turbidity of the water (the amount of suspended material) so that it exceeds the tolerances of freshwater flora and fauna. Sediment reduces the amount of light entering the water column, thereby affecting water clarity. This can change vegetation, adversely affect fish habitats, degrade spawning areas and deplete invertebrate populations. Most native species are greatly affected by reductions in water clarity and are very susceptible to the effects of pollution. For example, smelt are particularly sensitive to pollutants, such as ammonia, and high water temperature.

Agricultural runoff, urban wastewater and industrial waste are types of organic material which are detrimental to the health of freshwater bodies and affect biodiversity. Bacteria feed on organic matter, such as effluent. Significant increases in such organic matter, and consequently aerobic bacteria, means less oxygen is available for other plants and animals, and they subsequently die.



Figure 18.4 Cows in Kakaho Stream, Pauatahanui Inlet, Wellington Region (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2006)

Introduced species

Approximately 20 alien species of freshwater fish have been introduced since European settlement. These include trout, salmon, koi carp, catfish, tench, rudd and perch. These introduced species often out-compete indigenous species and have significantly altered aquatic ecosystems.

Invasive exotic plant species are particularly prevalent in lake systems, although the recent spread of didymo shows that our rivers are equally under threat. Introduced weeds can displace native species, upsetting the ecological balance, and leading to a decline in abundance of native vegetation. In the braided rivers flowing east from the Southern Alps, the introduction of lupins and willows has stabilised the river banks, changing the nature of the river by preventing it from spreading across multiple channels.



Figure 18.5 Introduced plants in freshwater systems can have significant detrimental impacts on native species through competition and predation (Raewyn Peart)

Damming of freshwater habitats

The damming of a river or stream can change its natural flow, so a shallow, flowing water environment is modified into a deeper, still water habitat. As a consequence, water temperatures and nutrient levels are likely to increase. Most native fish and invertebrates are not well suited to life in a dammed environment, whereas exotic species are more likely to thrive.

Dams act as barriers to migratory fish, preventing them from accessing upstream habitat. Downstream of the dam, water flow is reduced, which can also cause decreased oxygen concentrations. Algae, and other nuisance plants, may become a problem in dam environments, as the high flows that would normally flush the river system are reduced.



Figure 18.6 Dams in freshwater environments act as barriers for fish and change the natural dynamics of the systems further downstream (*Raewyn Peart*)

Other activities

Braided rivers are particularly susceptible to the effects of abstraction. The taking or diverting of large quantities of water from braided rivers means that there is a reduced flow, making it easier for predators to cross channels to reach mid-stream bird nests. Reducing the flow in a braided river may eliminate some side braids altogether, particularly if the flow can only sustain the main channel. Further, reduced flows means that the flood events, which are needed to regularly clear braided rivers from vegetation, may be less frequent or of different intensities.

Gravel extraction can reduce habitat diversity by altering the composition of the riverbed. After the gravel is removed, finer silt, sediment and exposed bedrock are left behind. This is of particular concern for native invertebrate communities, and the birds and fish they support.

Piping, culverts and bridges can all impact on freshwater habitats and species. The impact is particularly prevalent in urban areas where considerable lengths of stream have been lost or piped. In rural areas waterways have been turned into managed drains which require regular excavation of aquatic weeds with associated impacts on fish life.



Figure 18.7 Mixture of land uses can impact upon freshwater quality, such as adjacent to McLaren Falls Park (*Daniel Sharp*)

Summary of threats

Cause	Potential effect
Clearance of riparian habitat	<ul style="list-style-type: none"> • Destroys valuable filtering material • Reduces shade and increases light reaching the water • Increases water temperatures • Increases run off entering the water • Promotes growth of algae and aquatic weeds • Destroys habitats for native birds and fish
Deteriorating water quality	<ul style="list-style-type: none"> • Reduces water clarity • Upsets regulation of plant growth • Increases eutrophication • Results in the domination of exotic weeds • Can destroy an entire freshwater ecosystem if the water turns anoxic
Introduced species	<ul style="list-style-type: none"> • Outcompete native species • Can upset the ecological balance, significantly altering aquatic ecosystems • Provide cover for introduced predators • Impact on availability of food and resources, such as nesting habitats
Damming of freshwater habitats	<ul style="list-style-type: none"> • Changes natural water flows • Leads to increasing water temperatures • Results in elevated nutrient levels • Encourages invasion by exotic species • Acts as a barrier to migratory fish • Decreases shoreline vegetation, impacting on habitat availability for birds
Taking/diverting water or gravel	<ul style="list-style-type: none"> • Reduces water flows • Encourages invasive species • Reduces habitat availability • Reduces food sources • Alters the composition of riverbeds • Reduces the diversity of invertebrate colonies

Figure 18.8 Summary of the main causes and potential effects of biodiversity loss in freshwater systems

Description of regulatory management approaches

There is a range of management options to deal with these threats. Some require targeted action, whereas others need to be addressed through an integrated management approach. More information about mechanisms and tools to protect freshwater biodiversity can be found in ‘Managing Freshwater: An EDS Guide’, available at www.eds.org.nz.

Water management in New Zealand is largely undertaken within the framework of the RMA. Part 2 of the RMA provides a purpose and set of principles to guide the management of freshwater.

National Policy Statement for Freshwater Management

This National Policy Statement sets out several objectives which directly relate to the protection of freshwater biodiversity. It states that there should be appropriate policies and methods provided in the RMA plans to ensure that ‘outstanding freshwater bodies’ are protected. This document is discussed further in Chapter 5.

The Ministry for the Environment has developed a proposed National Environmental Standard on Ecological Flows and Water Levels. This is discussed further in Chapter 4.



Figure 18.9 Rakaia River and surrounding farmland (Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

Water conservation orders

A water conservation order is a tool provided under the RMA. It can be used to recognise and protect the outstanding amenity or intrinsic values that a water body provides, in either a natural or a modified state. This is discussed in Chapter 4.

Regional planning

Regional plans are the key planning documents for managing the effects on freshwater biodiversity. Whether any particular freshwater body provides significant habitats for indigenous fauna is something that is determined within the context of the region or district.

The requirements of the National Policy Statement for Freshwater Management have implications for freshwater biodiversity and must be given effect in planning instruments under the RMA. As an example, the Northland Regional Water and Soil Plan identifies a number of freshwater bodies as outstanding, including Lake Ora. These are selected through the application of a set of criteria, including whether catchments are dominated by indigenous vegetation and are largely unmodified natural ecosystems or ecological sequences from headwaters to lowlands.

Regional plans can include various types of flows (minimum flows, ecological flows and environmental flows) to establish how much freshwater is available for allocation. The plans determine what activities are able to be undertaken to use, divert or impound freshwater, or to discharge substances into freshwater. When establishing rules, regional councils cannot permit discharges which, after reasonable mixing, will result in significant adverse effects on aquatic life.

Regional councils have a number of specific functions relating to freshwater management. In particular, regional councils can control:

- The use of land for the purpose of the maintenance and enhancement of ecosystems in water bodies
- The introduction or planting of any plant on the bed of a freshwater body
- The establishment, implementation, and review of objectives, policies, and methods for maintaining (freshwater) indigenous biological diversity

For example, the Bay of Plenty Regional Council is faced with spiralling nitrogen and phosphorous inputs into the Rotorua Lakes. The council has amended its Regional Water and Land Plan to include new regulations, collectively known as 'Rule 11', which set nutrient benchmarks for all properties larger than 4,000 square metres in five lake catchments. After these levels are set, landowners

cannot change or intensify land use without fully offsetting the increased nitrogen or phosphorus levels.

Under the RMA, it is also possible to provide for a cap of total nutrient discharges into a water body, and for trading of nutrient discharge rights. Such an approach has been applied to the Lake Taupo catchment in Variation 5 to the Waikato Regional Plan. In Variation 5, nitrogen discharges have been capped at current levels and farmers are being benchmarked to determine their nitrogen discharge allowance, which is the maximum amount of nitrogen that a farm is allowed to produce. The allowance is based on their highest year of discharges between July 2001 and June 2005. The allowance is established using a computer model called 'Overseer'. Discharge rights will be tradable, so that farmers can increase their discharge allowance by buying someone else's rights. This is intended to ensure that total nitrogen discharges from the catchment remain the same, and to also enable land use flexibility through the transfer of rights.



Figure 18.10 The nutrient discharges in Lake Taupo are being addressed under Variation 5 of the Waikato Regional Plan (*Raewyn Peart*)

District planning

District plans are focused on managing the effects of land use, including the effects on freshwater bodies. District plans also control subdivision, the provision of esplanade reserves along the margins of lakes and rivers, and activities on the water surface of rivers and lakes, such as boating.

Providing special zoning for areas that are important to freshwater ecosystems can be a helpful tool to improve management of biodiversity. In recognition of the significant areas of freshwater within the Central Otago district, the Central Otago District Plan includes areas identified as 'Water Surface and Margin Resource Area'.²³ These are then subject to special provisions and rules. This special zoning has allowed the council to identify this area as distinct from general rural areas, and to promote integrated management between the adjacent land and the water.

There are a number of rules that local authorities can incorporate into their district plans to address management of freshwater, including those which:

- Control the clearance of riparian margins
- Control the discharge of contaminants in order to prevent deterioration of water quality
- Control the clearance of vegetation, level of earthworks, and development of impermeable surfaces to reduce the amount of sediment and pollutants reaching water bodies

In addition, councils can impose conditions on the grant of resource consents to ensure that there are sufficient riparian margins provided between contaminants which are discharged onto land and the receiving waterways. Conditions can also be imposed on consents to ensure that there are sufficient fish passages for migratory fish if waters are dammed.

Conditions of resource consent

Where a regional or district plan requires resource consents to be obtained for activities on or near to a freshwater body, conditions can be placed on the granting of consent. These aim to manage the effects of the proposed activity on the freshwater environment.

Discharge permits are likely to be required for discharging water or pollutants into a river or stream and conditions can be placed on a discharge consent relating to the amounts discharged daily and any mitigation required. This mitigation may include restoring and maintaining native vegetation.

Councils can also impose conditions on land use consents requiring the construction of fences to keep stock away from waterways, replanting of riparian margins and building setbacks.

Description of non-regulatory approaches

Integrated catchment management

The complexity around the management of freshwater biodiversity is best addressed through integrated catchment management plans, which encompass land use, discharges, water take and use and other activities affecting the freshwater environment. Such an approach enables better management of the cumulative effects on freshwater biodiversity, compared to other planning approaches, which tend to consider activities and their effects in isolation.

Integrated catchment management plans help to promote better integration between management agencies, and their respective responsibilities, to achieve a co-ordinated, cross-sectoral and ecosystem-based approach. Integrated management can be achieved on a very small scale, such as that promoted by the Central Otago's 'Water Surface and Margin Resource Area', or on a much larger scale, such as the Motueka Integrated Catchment Management programme.

Recovery plans

The Department of Conservation prepares recovery plans which set out actions to be taken to achieve the conservation of a particular species. The plans provide guidance to agencies, tangata whenua, interested parties, landowners and the community on what actions need to be taken and how resources should be allocated. The New Zealand Large Galaxiid Recovery Plan 2003-12 has been developed for large galaxiids including the shortjaw kokopu, giant kokopu, banded kokopu and koaro. The plan identifies that overharvesting of juvenile whitebait, degradation of habitat, barriers to migration and competition with introduced species are the main threats to the New Zealand large galaxiids. Actions in this plan include monitoring, advocacy through statutory processes to protect important habitats, and liaising with landowners.

Education

Many regional councils have fact sheets available on how landowners and the community can take care of freshwater resources. They also undertake regular monitoring of freshwater quality and publish this data to help raise public awareness of water quality issues. For example, the Waikato Regional Council has set up two school programmes which are focused on freshwater monitoring, called 'Rivers and Us' and 'Stream Sense'. A number of district councils' advocate to regional councils and government for increasing resources to be spent on weed management in freshwater systems.

In addition to the role provided by councils, a number of other organisations are heavily involved in freshwater management education. The New Zealand Landcare Trust has published a series of fact sheets which highlight the factors that impact on the survival of New Zealand's unique freshwater fish. The Trust also ran workshops in the Waikato region which demonstrated practical activities that farmers and the public could undertake to protect and enhance local streams.

Case studies

Canterbury Water Management Strategy

The Canterbury Water Management Strategy has been developed based on an integrated and collaborative planning approach. One of the key challenges it seeks to address is the general decline in freshwater biodiversity. In addition, it wishes to address the rapid land use change and intensification that is occurring in the high country, which is threatening important remaining indigenous freshwater habitat.



Figure 18.11 An example of a high country river which falls under the Canterbury Water Management Strategy (*Raewyn Peart*)

There is a strong emphasis throughout the strategy on integrating water and land management, by including the protection of indigenous biodiversity and the enhancement of water quality. This recognises that a 'systems approach' to improving biodiversity is required. It identifies that freshwater habitats are usually part of larger ecosystems, and the state of biodiversity depends on decisions relating to wider catchment decisions, such as flows and water quality standards.

The Strategy sets the strategic direction for the region. Zone committees are to develop integrated plans for each catchment to achieve its goals and direction. A number of goals for ecosystem health and biodiversity are to be achieved either by 2015, 2020 or 2040. For example, by 2020 one of the goals is an upward trend in diversity and abundance of native fish populations. By 2040 the goals include the achievement of all catchment load limits, 100 per cent of lowland and spring-fed streams with at least good ecosystem health, and 80 per cent of other rivers and streams with very good aquatic ecosystem health. An integral part of the Canterbury Water Management Strategy is the five year 'Immediate Steps' programme to protect and restore freshwater biodiversity, which is costing \$10 million.



Figure 18.12 The Canterbury Water Management Strategy sets the direction for the management of high country lakes (*Raewyn Peart*)

This case study highlights how integrated management can achieve positive gains for biodiversity, by setting out clear goals and actions. These can then be implemented by the responsible agency and funding allocated where necessary. This kind of approach also gives the community assurance about how, and when, work will be done.

Project River Recovery

This project was established in 1990 by the Department of Conservation and funded by Meridian Energy Limited. The goal was to maintain and restore braided river and wetland habitat in the South Island's upper Waitaki Basin, to benefit its native plants and animals. A number of threatened species inhabit this area, including the black stilt. Project River Recovery includes intensive weed control, predator control, construction of wetlands and research and monitoring programmes. The project is the largest and longest running of its kind in New Zealand.



Figure 18.13 Aerial view of Hopkins and Dobson River junctions, Mackenzie District, part of Project River Recovery (Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

Monitoring of the long-term population change of the threatened upland longjaw galaxias is undertaken. There are three sites in the Tasman and Hopkins rivers which are checked annually by identifying, counting and measuring the body length of the fish. As part of Project River Recovery around 100 hectares of new wetlands have been created. Water levels in these wetlands are controlled to maximise feeding habitat for braided river birds during the breeding season.

Project River Recovery includes a research component to identify how improvements can be made to manage weeds in braided rivers. In order to restore the freshwater habitat, introduced weeds such as russell lupin, broom, gorse, wilding conifers and crack willow, are being controlled on over 33,000 hectares of riverbed. The Project also involves various predator control methods, as well as monitoring the breeding success of several braided river birds over five years, to assess whether the catchment-wide predator control is effective.

This case study demonstrates how collaborative projects can be set up that restore freshwater habitats through a large integrated approach. In addition, this example offers a way for a company to compensate or offset some of the impact of its activities.

Recommendations for best practice

Management approach	Best practice recommendations
RMA plans	<ul style="list-style-type: none"> • Ensure water flows are sufficient and have the characteristics required to maintain indigenous freshwater species • Control vegetation clearance along waterways, but permit removal of noxious plant species • Identify and protect ecologically significant waterways • Set limits which ensure that water is of sufficient quality to ensure the health of indigenous freshwater species • Create specific zones and rules for waterways and their margins
Resource consent conditions	<ul style="list-style-type: none"> • Minimise the amount of clearance of established vegetation • Protect riparian margins • Replant with locally sourced native species • Minimise sediment and contaminants entering waterways • Require the creation of fish passages for migratory species
Education	<ul style="list-style-type: none"> • Provide practical advice on what plant species support indigenous freshwater biodiversity, and how to eradicate invasive species • Seek assistance from government agencies and research institutions to undertake water quality testing

Figure 18.14 Summary of the management approaches and best practice recommendations

Useful websites

Department of Conservation – www.doc.govt.nz

Landcare Trust – www.landcare.org.nz

Ministry for the Environment – <http://www.mfe.govt.nz/issues/water/freshwater/water-conservation/>

www.cleanwaterways.org.nz

References and further reading

Allibone R, B David, R Hitchmough, D Jellyman, N Ling, P Ravenscroft and J Waters, 2010, 'Conservation status of New Zealand Freshwater fish, 2009', *New Zealand Journal of Marine and Freshwater Research*, 44(4), 271-287

Auckland Regional Council, 2012, *What's all this about dams?*, Auckland Council, Auckland, available at <http://www.arc.govt.nz/albany/fms/main/Documents/Environment/Water/W08%20What%E2%80%99s%20all%20this%20about%20dams.pdf>

Bishop N, 1955, *From the mountains to the sea: the secret life of New Zealand's rivers and wetlands*, Reed, Auckland

Canterbury Mayoral Forum, 2009, *Canterbury Water Management Strategy Strategic Framework*, Environment Canterbury, Christchurch, available at <http://ecan.govt.nz/publications/Plans/cw-canterbury-water-wanagement-strategy-05-11-09.pdf>

Department of Conservation and Ministry for the Environment, 2000, *The New Zealand Biodiversity Strategy: Our chance to turn the tide, Whakakōhukihukitia Te Tai Roroku Ki Te Tai Oranga*, Department of Conservation and Ministry for the Environment, Wellington

Department of Conservation, 2005, *New Zealand large galaxiid recovery plan, 2003–13: Shortjaw kokopu, giant kokopu, banded kokopu, and koaro. Threatened Species Recovery Plan 55*, Department of Conservation, Wellington, available at <http://www.doc.govt.nz/upload/documents/science-and-technical/TSRP55entire.pdf>

Department of Conservation, 2012, *Project river recovery*, Department of Conservation, Wellington, available at <http://www.doc.govt.nz/conservation/land-and-freshwater/freshwater/upper-waitaki-braided-rivers/project-river-recovery-work/>

Environment Canterbury, 2011, *Canterbury water - The regional context*, Environment Canterbury, Christchurch, available at <http://ecan.govt.nz/GET-INVOLVED/CANTERBURYWATER/KEY-DOCUMENTS/Pages/cwms.aspx>

Environment Canterbury, 2012, *Immediate steps*, Environment Canterbury, Christchurch, available at <http://ecan.govt.nz/advice/biodiversity/funding/pages/immediate-steps.aspx>

Fenwick G and M Scarsbrook, 2008, 'Natural purification of groundwater', *Water and Atmosphere*, Vol 16, No 4, available at <http://www.niwa.co.nz/news-and-publications/publications/all/wa/16-4/groundwater>

Ferguson G, A Dakers and I Gunn, 2003, *Sustainable wastewater management: A handbook for smaller communities*, Ministry for the Environment, Wellington, available at <http://www.mfe.govt.nz/publications/waste/wastewater-mgmt-jun03/introduction.pdf>

Green W and B Clarkson, 2005, *Turning the tide? A review of the first five years of the New Zealand Biodiversity Strategy*, The Synthesis Report submitted to the Biodiversity Chief Executives in November 2005, Wellington

Hay J, 2009, *Effects of low flow on dwarf galaxias and their habitat in the Wairau river*, Department of Conservation Research and Development Series 309, Department of Conservation, Wellington, available at <http://www.doc.govt.nz/upload/documents/science-and-technical/drds309.pdf>

McDowall R, 1939, *New Zealand freshwater fishes: A natural history and guide*, Heinemann Reed, Wellington

McDowall R, 2000, *The Reed field guide to New Zealand freshwater fishes*, Reed, Auckland

Ministry for the Environment, 2008, *Proposed national environmental standard on ecological flows and water levels: Discussion document*, Ministry for the Environment, Wellington, available at <http://www.mfe.govt.nz/publications/water/proposed-nes-ecological-flows-water-levels-mar08/index.html>

Moon G, 1994, *The Reed field guide to New Zealand wildlife*, Reed, Auckland

Morris R and A Ballance, 1951, *Rare wildlife of New Zealand*, Random House, Auckland

Parkinson B and G Cox, 1990, *A field guide to New Zealand's lakes and rivers*, Random Century, Auckland

Pearl R, K Mulcahy and N Garvan, 2010, *Managing Freshwater: An EDS Guide*, Environmental Defence Society, Auckland

Reed C and D Murray, 1993, *Black stilt recovery plan*, Department of Conservation, Wellington available at <http://www.doc.govt.nz/upload/documents/science-and-technical/TSRP04.pdf>

Snelder T, B Biggs and M Weatherhead, 2004, *New Zealand river environment classification user guide*, Ministry for the Environment, Wellington, available at http://www.niwa.co.nz/__data/assets/pdf_file/0017/38600/rec-user-guide.pdf

Stokell G, 1955, *Fresh water fishes of New Zealand*, Simpson and Williams, Christchurch

Wardle P, 1991, *Vegetation of New Zealand*, Cambridge University Press, Cambridge

Winterbourn M, 1983, *Freshwater life: streams, ponds, swamps, lakes and rivers*, Reed, Wellington

Endnotes

- 1 Department of Conservation and Ministry for the Environment, 2000
- 2 Winterbourn M, 1983, 9
- 3 Parkinson B and G Cox, 1990, 25
- 4 Parkinson B and G Cox, 1990, 25
- 5 Bishop N, 1994, 30
- 6 Winterbourn M, 1983, 10
- 7 Bishop N, 1994, 30
- 8 Bishop N, 1994, 30
- 9 Winterbourn M, 1983, 9
- 10 Parkinson B and G Cox, 1990, 25
- 11 Bishop N, 1994, 30
- 12 Pearl R et al., 2010, 33
- 13 Moon G, 1994, 88

- 14 Moon G, 1994, 81
- 15 <http://www.teara.govt.nz/en/life-in-fresh-water/2>
- 16 Wardle P, 1991, 300
- 17 Fenwick G and M Scarsbrook, 2008
- 18 Peart R et al., 2010, 41
- 19 Allibone R, et al., 2010
- 20 Allibone R, et al., 2010
- 21 Bishop N, 1994, 31
- 22 Peart R et al., 2010, 62
- 23 www.codc.govt.nz/services/districtplan/



Coastal environment (Raewyn Peart)

nineteen

Coastal

The interlocking and intertwined relationship between plants, animals and the physical environment is part of the balance of nature. Anything that upsets one factor in this equilibrium may very well damage the whole system or, at least, a significant portion of it.

Jacques-Yves Cousteau

Most New Zealanders live within 100 kilometres of the coast, and even more holiday close to the beach. With a long and beautiful coastline, this country enjoys a diversity of unique coastal environments.

New Zealand's coast is dotted with long, sandy white beaches and bays, sheltered estuaries and harbours, exposed rocky headlands, dramatic cliffs, wild dunes and magnificent fiords. The country's climate ranges from the balmy sub-tropical north to the rugged sub-Antarctic south. As a result, the coast is home to a diverse range of flora and fauna, including many species that are found nowhere else on Earth. Although extreme, the Subantarctic islands contain some of the most diverse ecosystems in New Zealand, with much of the flora and fauna being endemic to the region.

As the sea level stabilised around 6000 years ago,¹ coastal processes driven by winds, waves and currents began to sculpt the edges of the coastline. Rocks and cliffs were cut back, bays were carved out of soft rock, harbour entrances were straightened with bars and spits, and pieces of the coast were joined together with sand and gravel.

The milder climate provided by the land-sea interface supports a large number of plant species that do not grow further inland. The coast also supports an unusually wide range of birdlife which act as important ecological engineers carrying nutrients across ecosystems. This section discusses the species of flora and fauna that are found in New Zealand's coastal environments, and is split up into three distinct habitats: dunes, estuaries, and rocky coasts. More information about coastal biodiversity can be found in 'The community guide to coastal development under the Resource Management Act 1991' available at www.eds.org.nz.

Life in dunes

One of the largest unmodified dune systems can be seen at Mason Bay, on the west coast of Stewart Island, where the dunes back the 19 kilometre-long beach.² Nearly complete dune systems also occur on Great Barrier Island and these are associated with intact wetland ecosystems. Between the dunes, where the water table is high, swamps, wetlands and even large coastal lakes can form. The wet sand gives these systems more stability than the surrounding dunes and extensive plant and wildlife communities can become established. Where the hollow between the dunes is free of water, extensive sandy plains can form.



Figure 19.1 Dune systems can support extensive plant and wildlife communities (Raewyn Peart)

Dune plants

The front face of the foredune is usually the most dynamic part of any dune system, and it is here where most sand is trapped by sand-binding plants. These plants are particularly hardy, as they need to survive the forces of wind, waves and salt spray.

A keystone sand-binding plant is the endemic primitive sedge pīngao (*Desmoschoenus spiralis*). Pīngao once covered dunes throughout New Zealand, but has now been greatly reduced and is classified as rare or localised.³ It is regarded as an indicator of duneland biodiversity. Just landward of pīngao another sand-binding plant, kōwhangatara (*Spinifex sericeus*), grows in the North Island and the northern part of the South Island.

Backdunes are typically more stable. Another indigenous sand binder, the sand tussock (*Austrofestuca littoralis*), is often found in these areas. If left undisturbed, these dunes can become covered with woody and herbaceous species. These include cottonwood or rauhini (*Ozothamnus leptophyllus*), and spindly sand coprosma or tātaraheke (*Coprosma acerosa*).

Further back, the wiry branches of pōhuehue (*Muehlenbeckia complexa*) can be found climbing over the sand. *Gunnera arenaria*, a low growing native herb, is especially adapted to hollows and sand flats. *Apodasmia similis* spreads from

a creeping rhizome and dominates in depressions where greater moisture is available. In northern areas, the iconic toetoe (*Cortaderia splendens*) grows in damp dune hollows. Eventually these dunes become stabilised and covered with woody shrub and tree species, forming coastal forest.

Birds of the dunes

Sand dunes are home for some of New Zealand's rarest breeding birds, including the New Zealand fairy tern (tara-iti). This bird nests in small scrapes carved out of shell-covered sand in low-lying areas along the coast. By 1983 the population had been reduced to only three breeding pairs. This has since increased to around ten breeding pairs, but the fairy tern population is still at a precarious level.

The northern New Zealand dotterel (tuturiwhatu) is found mainly on sandy east coast beaches from the Bay of Plenty northwards. Although this bird was once common on sandy coastlines throughout the country, there are now only about 1500 birds surviving. The more common banded dotterel is also seen in sandy dune areas, but travels inland to river systems and also occupies agricultural land.



Figure 19.2 New Zealand dotterel adult and chick, DOC camping ground, Mimiwhangata, Northland (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2009)

Variable oystercatchers (tōrea) and pied oystercatchers are often seen in pairs on sandy beaches, particularly along the north-eastern coast of the North Island and the top of the South Island. The New Zealand pipit (pīhoihoi) is also seen in dune areas above the high tide throughout New Zealand.

Dune invertebrates and lizards

There is a diverse range of invertebrate species that inhabit the coast. The dunes provide habitat for New Zealand's native poisonous spider, the katipō, which weaves its webs in the open dune plants or under driftwood. The spiders eat the shiny black sand scarab (*Pericoptus frontalis*), which also lives in the dunes and is one of New Zealand's largest beetles.

Lizard species found in dunes vary regionally, for example the most prominent dune reptile in the Auckland area is the shore skink (*Oligosoma smithi*). Endemic invertebrates that live in sand dunes include the seashore earwig (*Anisolabis littorea*). The native moths *Ericodesma aerodana*, *Kupea electilis*, *Kiwaia jeanae*⁴ and a number of *Notoreas* moths⁵ are known to be endemic to sand dunes.



Figure 19.3 Spotted skink, *Oligosoma lineocellatum* (juvenile), Mana Island (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2011)

Life in estuaries

Along sheltered coastlines, estuarine areas provide very ecologically productive environments, where fertile sediment washed from the land is trapped in shallow tidal inlets. New Zealand has around 300 estuarine systems, covering over 100,000 hectares.⁶

Mangroves (*Avicennia marina*) create a nutrient-rich environment for other species in these areas, including juvenile fish, and play a crucial role in the life cycle of a number of New Zealand's native fish species. Many international migrant wading birds annually visit New Zealand's food-rich mudflats and coastal lagoons, which are very prominent in Auckland, particularly the Manukau Harbour.

Estuary plants

Estuaries are dominated by salt-tolerant plant species. In northern frost-free areas, large mangrove forests can be seen growing in the intertidal zone of shallow muddy inlets. Mangroves are common in the north, but where they are affected by frost, sea rush wīwī (*Juncus kraussii*) and oioi (*Apodasmia similis*) tend to replace them in marshy coastal areas. Mākaka or saltmarsh ribbonwood (*Plagianthus divaricatus*) forms a dense mat just above the high-tide mark.

Salt meadows containing miniature herbs, such as shore primrose, Māori musk, saltwort and remuremu form around the edges of marshy coastal areas and in places that are affected by salt spray, wave splash or ground water intrusion. Manuka, flaxes and marsh ribbonwood grow on the outer edges of these areas.



Figure 19.4 Mangrove plants support a wide variety of coastal dwelling species (Raewyn Peart)

As the mangroves' roots trap sediment and decaying vegetation, the level of the seabed is gradually raised above the tide, so that other species, such as raupō (*Typha orientalis*) and the New Zealand flax (*Phormium tenax*) grow. Behind these areas more terrestrial vegetation grows, including kahikatea (*Dacrydium dacrydioides*) and New Zealand cabbage trees (tī kōuka).

There are several *Cordyline* species, some extending into the subalpine zone. Cabbage trees would have originally occupied small river flats and wet areas with plants such as harakeke and toetoe. Cabbage trees are now particularly common in regenerating bush and on open pastureland and, along with the pōhutukawa, have become an iconic feature of the New Zealand coast.

Birds of estuaries

One of the commonest migrating birds found in estuaries is the eastern bar-tailed godwit (kūaka), which breeds in Alaska and then heads to New Zealand in spring to feed on small invertebrates in estuarine areas. Kūaka are common, and were a prized food source for Māori. About 60,000 of these birds visit New Zealand each summer, with large numbers feeding in the Kaipara and Manukau Harbours and at Farewell Spit.

The tidal flats of estuaries offer a rich source of food for wading birds. Oystercatchers, godwits, wrybills, pied stilts, herons and Caspian terns (*Sterna caspia*) all spend hours searching the mud for invertebrates. The mangrove and saltmarsh habitats in estuaries are commonly inhabited by a range of swamp birds, such as bittern and banded rail. Species of waterfowl are often seen in estuarine areas, including the brown teal (pāteke), a small indigenous duck.



Figure 19.5 Estuaries provide important food sources for many wading birds (Raewyn Peart)

Fish and invertebrates in estuaries

Estuaries are important spawning and nursery areas for a wide range of fish and shell-fish species. Fish such as sand flounder, kahawai and yellow-eyed mullet use estuaries every day. Other fish, such as snapper, red cod and gurnard, enter estuaries seasonally, coming in as juveniles to feed in the rich, sheltered waters, and heading back out to sea as adults.⁷ Estuaries are also important for a number of native fish that migrate between freshwater systems and salt water, such as adult whitebait or īnanga (*Galaxias* species).⁸

The muddy sediments provide a habitat for worms and algae. This sediment is often rich in organic matter which supports algal growth and provides food for bottom-dwelling and burrowing creatures.

Life on rocky coasts

New Zealand's rugged and rocky coastline is exposed to energy from ocean swells and salt-laden winds. The coastal forests are made up of a range of species which can tolerate salt and wind.

Along the rocky shoreline there is a range of habitat zones and associated species. Lichen live just above the high-tide level, seaweeds live in rocky pools, chitins and limpets graze on seaweeds in the mid tide area, and bivalve molluscs filter food from seawater in the lower tide areas.



Figure 19.6 Rocky coastlines are dominated by salt and wind tolerant plants (*Raewyn Peart*)

Rocky coast plants

On rocky coasts, one of the most prominent plants is the pōhutukawa (*Metrosideros excelsa*). The tree's massive spreading roots can grow into tiny cracks in the rock, enabling it to cling to precarious rocky perches. It attracts nectar-feeding birds, including tūi and kākā, and other animals such as geckos and bats. Pōhutukawa only naturally grow north of a line stretching from Gisborne on the east coast to just north of New Plymouth on the west. In southern areas, where the climate is cooler and more inhospitable, the southern rātā (*Metrosideros umbellata*) occupies a similar niche.

Closer to the shoreline, smaller species are found such as taupata (*Coprosma repens*), the small shore groundsel (*Senecio lautus*) and horokaka, or the New Zealand ice plant (*Disphyma australe*). Taupata, karo (*Pittosporum crassifolium*), pūriri (*Vitex lucens*), karaka (*Corynocarpus laevigatus*), kohekohe (*Dysoxylum spectabile*) and kowhai (*Sophora tetraptera*) are also common in these habitats. Rocky coasts support threatened and rare plants, including the nationally critical coastal peppergrass (*Lepidium banksii*) and nationally endangered plants, including the Cook's scurvy grass (*Lepidium oleraceum*) and New Zealand water cress (*Rorippa divaricata*).⁹

Birds of the rocky coast

New Zealand has been called the 'seabird capital of the world', with eighty-four species of seabirds breeding here, a quarter of the world's total. The rocky coastline provides a critical breeding environment for many of these seabirds. Albatross mainly nest on rocky off-shore islands, but a small number of the large northern royal albatross have made their nests at Taiaroa Head on the Otago Peninsula. Other birds, such as tūi and kākā, use the coastal forests behind the rocky shoreline as a source of food and habitat.

One of the rarest penguins in the world, the yellow-eyed penguin (hoiho), is found only in New Zealand along the southern east coast of the South Island. The blue penguin (kororā), the smallest penguin species in the world, is far more abundant around New Zealand's coastline, particularly along the east coast. The birds nest in burrows dug in the ground, or under vegetation and rocks.

Marine mammals of the rocky coasts

The New Zealand fur seal population, once abundant and now recovering after harvesting by both Māori and European settlers, is estimated to be between 50,000 and 100,000. Seals can be seen along the coastline of the South Island and some southern North Island areas. Seal 'haul outs', important spots for

marine mammals to rest between feeding, include those around the coast of Wellington. The New Zealand sea lion and the southern elephant seal can also be seen around the southern coasts, although the main populations are on the subantarctic islands.



Figure 19.7 Seal populations use the rocky shore as a resting place (*Raewyn Peart*)

Threats to dunes

Coastal ecosystems are some of the most highly modified areas of New Zealand. Habitat degradation, and the introduction of a large number of exotic pest plants and animals, have resulted in very few remaining intact sequences of coastal indigenous vegetation. Coastal ecosystems are also under-represented in the conservation estate, with coastal lowlands comprising less than 10 per cent of the area.

Coastal sand dunes may be one of New Zealand's most threatened natural habitats, being substantially diminished and heavily modified in remaining areas.¹⁰ There has been a reduction in the area of sand dunes of about 70 per cent since the 1950s.¹¹ Historically, the main cause of decline has been dune stabilisation and afforestation. In addition, fire, grazing, exotic species and urban development have significantly modified sand dune vegetation.

Intact sequences of native dune vegetation remain in fragments along the Manawatu coast and at Stewart Island. As a result, numerous sand dune fauna and flora are in decline, including some endemic species which are now nationally threatened.

Invasive plants

During the early and mid-1900s widespread planting of an introduced species, marram (*Ammophila arenaria*) which is a highly effective sand binder, took place. The impact of marram has been particularly severe on the east and south coasts of the South Island and west coast of the North Island. In the Otago Region, all but a few of the remaining areas of sand dunes are dominated by marram. In addition, back dune areas have been increasingly subjected to invasion from introduced plants dispersing from adjacent residential areas.

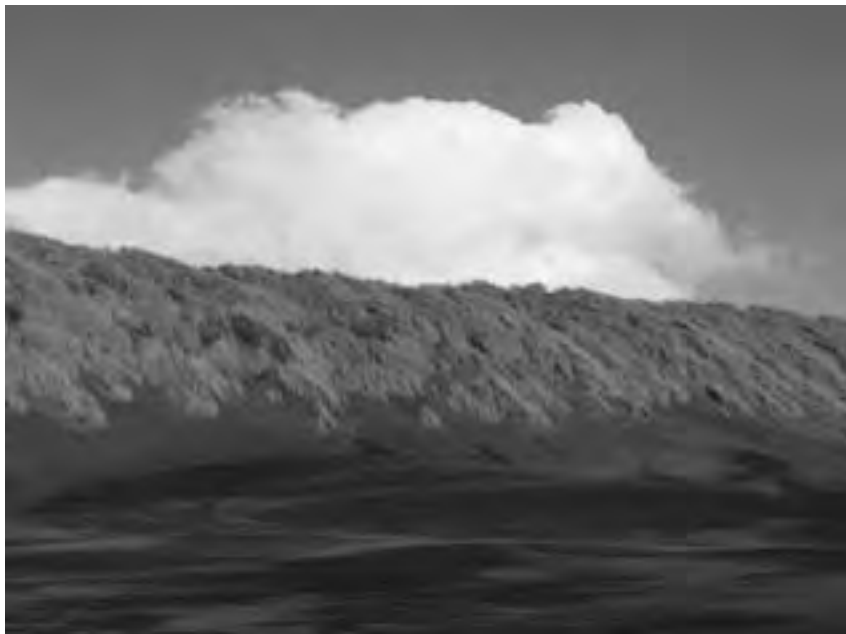


Figure 19.8 Invasive plants, such as this marram grass, can dominate native plant communities and alter the ecosystem dynamics (Raewyn Peart)

Invasive plant species impact upon the biodiversity of dunes by reducing the phases of instability that provides opportunities for specialist native dune building plants. This in turn decreases the diversity of landscape and habitat that is found within these areas. Introduced plants alter the breeding habitat for native bird species.

Weeds that take over dune areas also destroy the habitat of native invertebrates, including the katipō spider which is now threatened with extinction.

Grazing mammals

From the mid-1880s, settlers cleared dunes and introduced grazing animals, such as cattle and sheep. Other mammals, such as rabbits and hares, have also invaded these areas and graze on native sand dune plants. These mammals can cause significant damage to dune plants by trampling on them and uprooting them from the sand. The resulting loss of indigenous vegetation has detrimental flow-on effects for native birds and invertebrates. The removal of native sand-binding plants also leads to dunes being 'blown' inland, which consequently invades inland habitats.

Urban development

One of the more recent threats to coastal biodiversity is from the construction of subdivisions and houses on sand dune systems. Dunes have been flattened to provide building platforms for houses, as well as to improve views. An example of this is at Omaha where development has destroyed over 90 per cent of the breeding habitat of a number of shorebirds.



Figure 19.9 Seawall built on a sand dune (*Raewyn Peart*)

Other structures, such as seawalls, have been built in front of dune systems in efforts to halt erosion and protect landward properties. Public access to dune areas, including the recreational use of vehicles to launch boats, trail bikes and walking also can change the structure of sand dunes.

By modifying entire areas of sand dune, the sequence of indigenous vegetation in these habitats is damaged forever, altering the composition of plant communities, destroying native plants and invertebrates and disturbing nesting birds. These developments also change the dynamics of wave energy, as well as the erosion and accretion processes that would otherwise be naturally occurring.

Threats to estuaries

Estuaries are under enormous development pressure, because the land surrounding these environments is one of the most favoured places for human settlement. This ultimately leads to the construction of a number of structures within and adjacent to estuaries, such as houses, roads, culverts and seawalls. The increasing intensity of land use activities in turn means that various contaminants and other substances are discharged from the land into the water, through run off and direct discharges.

Because of the crucial role that estuaries play, reclamation of these areas and clearance of mangroves has a devastating impact throughout the entire ecosystem. The wading birds that either migrate annually to New Zealand's food-rich mudflats and coastal lagoons, or live here year-round, are impacted upon as their food sources are depleted and habitats altered. The life cycles of a number of New Zealand's native fish species are also disrupted when reclamation of estuaries and clearance of mangroves occurs.

Coastal development

Development of estuaries began with European settlers reclaiming such areas to provide new farmland. Since the 1960s the development of these areas for urban use has been particularly severe, including reclamation, canal developments and the construction of seawalls. Urban development has brought with it a wide range of human activities that have contributed to the decline of many native habitats and species.

A significant threat from coastal development is that it disrupts sensitive ecosystems within transitional estuarine zones, by altering sediment flows and coastal processes, subsequently destroying species and habitats. Coastal development potentially reduces food sources for wading birds. The structures that are built within estuaries can also impact on the ability of freshwater fish to migrate and to access their spawning areas. In addition, increased public

access into sensitive wildlife areas threatens nesting birds, like the brown teal, and invertebrates.

Coastal development also brings with it an increase in the number of invasive weeds that find the estuary environments very hospitable, such as spartina and pampas grass. These pest plants decrease the diversity of the habitat, destroy the breeding habitat for bird species and threaten the habitat of native fish and invertebrate species, including the *Galaxias* species.



Figure 19.10 Urban development in estuaries introduces a whole range of threats to these fragile ecosystems (Raewyn Peart)

A number of other human activities on land can degrade coastal habitats, including land reclamation and the construction of seawalls, culverts and other infrastructure. These can alter the bathymetry of the seabed, shade areas of water, or prevent natural water flows. Effects include, but are not limited to:

- Loss of habitats
- Disruption of sensitive ecosystems within transitional zones
- Alteration of coastal processes and the subsequent impact on species
- Alteration of sediment flows
- Increasing public access into sensitive wildlife areas causing damage

Sedimentation

Around 390 million tonnes of sediment is washed out to the sea every year. Much is sourced from farming, forestry and earthworks. An excess of sediment can affect water depths, water coverage, the type of sediment found on the estuary floor and the turbidity of the water. When an excess of sediment enters the receiving environment it can be suspended in the water, reducing light by affecting water clarity.



Figure 19.11 Increasing sediment in rivers can cause major problems for fish, invertebrate and plant species (Raewyn Peart)

Such environmental impacts can bring about changes in vegetation (such as reducing areas of seagrass), be detrimental to fish habitats, degrade spawning areas and deplete invertebrate populations. As most sediment is deposited in intertidal zones, it is the species that live in these areas that are often most affected by excess sedimentation.¹² This is particularly significant, because healthy intertidal zones support a particularly high diversity of species, in comparison with other parts of the coastal area.

Other impacts

Agricultural run-off, urban wastewater and industrial waste can enter the coastal marine area. This can include faeces from humans and animals, fertiliser, proteins, vegetables, sugars and cleaning soaps. When effluent enters a healthy

aquatic environment, aerobic (oxygen using) bacteria, which occur naturally in the water, will eat the organic material and use up oxygen in the water. Excess sediments and low oxygen in the water above can cause it to become anoxic and unable to support its normal inhabitants. Where excess amounts of nutrients, in particular nitrogen and phosphorus, reach the marine environment the balance of the ecosystem can be upset.

Threats to rocky coasts

Only about ten per cent of the early pōhutukawa coastal forest that was once widespread around New Zealand's rocky coast still survives. Most of the original trees were burnt as coastal land was cleared. More recently, trees have been lost to coastal road-building activities and coastal property owners have removed pōhutukawa to improve their views.¹³

Remaining trees have been attacked by possums and disease and there is very little regeneration. Other rocky shore species struggle from over harvesting, excessive trampling, and habitat disturbance. The topic of threats to indigenous coastal forests, including animal and plant pests, is discussed in more detail in Chapter 13.



Figure 19.12 Possum damage to pōhutukawa leaves
(Crown Copyright: Department of Conservation: Te Papa Atawhai, 1990s)

Human activities

Increased access to the rocky shoreline for recreational activities, such as tramping, fishing and diving, is threatening native rocky shore species. This can result in the poor regeneration of native trees and seedlings that are trampled upon, as well as damage to native fauna that live along the shoreline. Overharvesting of shellfish and rock pool fish is another threat resulting from increased access to the shore. Consequently, habitats are lost and buffers and corridors for native species are destroyed.

Marine activities can also have a direct impact on rocky shore habitats, such as marine transportation, which carries the risk of oil spills. Intertidal rocky shore species can become smothered by any oil coming ashore and the habitats can struggle to recover from oil spills. Birds and marine mammals can also become entangled by rubbish washing up along the shore line (from both marine and land activities).



Figure 19.13 Damage to beach from Rena disaster (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2011)

Threats from climate change

An emerging threat to all of the coastal habitats described above is the impact of climate change. The changing climate in New Zealand is likely to result in increased sea levels and warmer ocean temperatures, which will trigger a number of impacts¹⁴, including:

- Increased coastal erosion
- Increased inundation in many coastal areas
- Significant flooding of low-lying coastal margins
- Significant retreat of sandy shorelines
- Further degradation of remnant natural areas
- Reduction in protective natural buffers
- Increased incidences of sand destabilisation

The impacts of climate change will have a significant effect on coastal biodiversity. General warming and extreme warm events are likely to affect coastal ecosystems, particularly estuaries. The natural defence that the coastal fringe plays in protecting landward habitats cannot be underestimated. McGlone and Walker (2011) have identified that the greatest short term risk to biodiversity from climate change comes from mitigation measures, rather than direct effects. They summarised the predicted impacts on coastal biodiversity as a result of climate change as follows:

- Soft shores (beaches and mudflats) are likely to be more severely affected by sea-level rise than hard (rocky) shores
- New areas of estuary and marshland habitat will generally be created and replace the inundated areas
- Rising sea levels will probably remove large areas of the rich biological habitat represented by existing coastal dunes, estuaries and marshlands
- The most affected ecosystems will be those typical of dune systems, estuaries, and a range of saline, brackish (mixed saline and fresh water) and freshwater lagoons, shallow lakes and marshes. Loss of productive estuarine habitats and biota is likely to accelerate, with the more visible ecological effects being reduced populations and altered migratory patterns of coastal birds, and declines in certain marine fishes
- Warming could extend the potential range of mangroves, but threaten biologically important seagrass (*Zostera* spp.) meadow habitats
- Altered sea conditions will impact on the abundance of marine food and reduce sea and shorebirds ability to access it

Summary of threats

Cause	Potential effect
Land development	<ul style="list-style-type: none"> • Can change the dynamics of wave energy and erosion/accretion processes • Can alter sediment flows • Can disrupt entire ecosystems • Leads to direct destruction of native vegetation and invertebrates • Threatens nesting birds • Disrupts sensitive habitats • Increases public access into sensitive wildlife areas • Increases potential for plant pests to invade native habitats
Invasive plants	<ul style="list-style-type: none"> • Compete with, and displace, native plant species • Decrease landscape and habitat diversity • Remove breeding habitat for native birds • Destroy habitat for native invertebrates • Smother native plants as salt tolerant weeds quickly establish • Result in a loss of food source and habitat for native birds
Introduced mammals	<ul style="list-style-type: none"> • Browse native trees and reduce regeneration of trees • Disturb ecosystem processes • Trample and uproot native plants • Remove natural vegetation cover • Reduce regeneration of trees • Result in a loss of food source and habitat for native birds
Sedimentation	<ul style="list-style-type: none"> • Changes ecosystem processes by altering water depth and coverage • Damages fish habitats • Degrades spawning areas • Smothers and depletes invertebrate populations • Destroys important food sources for birds
Contaminated runoff	<ul style="list-style-type: none"> • Leads to severe reductions in water quality • Causes death of fish and other marine life • Disrupts growth and reproduction cycles of marine organisms • Leads to a toxic food chain
Recreational activities	<ul style="list-style-type: none"> • Results in poor regeneration of trees • Leads to trampling of native plants and rocky shore species • Leads to overharvesting of shellfish and fish species • Increases loss of buffers and corridors • Smothers sessile intertidal species

Figure 19.14 Summary of the main causes and potential effects of biodiversity loss in coastal environments

Description of regulatory management approaches

Most activities that have an environmental impact on the coastal environment are managed under the RMA. This legislation requires all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, to recognise and provide for ‘the preservation of the natural character of the coastal environment and protection from inappropriate subdivision, use and development’ (section 6(a)). This section is implemented through policies and plans prepared under the Act as described below. More information about mechanisms and tools to protect coastal biodiversity can also be found in ‘The community guide to coastal development under the Resource Management Act 1991’ available at www.eds.org.nz.

New Zealand Coastal Policy Statement 2010

The NZCPS 2010 is discussed in detail in Chapter 5. Policy 11(a) requires councils to avoid adverse effects of activities on threatened species and habitats. Figure 19.15 outlines these categories and provides examples of coastal species and habitats.

Policy 11(a) Category	Example
Indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists ¹⁵	<ul style="list-style-type: none"> Nationally critical coastal peppergrass (<i>Lepidium banksii</i>)
Taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened	<ul style="list-style-type: none"> Endangered brown teal (<i>Anas chlorotis</i>)
Indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare	<ul style="list-style-type: none"> Kahikatea forest (<i>Dacrydium dacrydioides</i>)
Habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare	<ul style="list-style-type: none"> Coastal dunelands
Areas containing nationally significant examples of indigenous community types	<ul style="list-style-type: none"> Coastal rock stacks
Areas set aside for full or partial protection of indigenous biological diversity under other legislation	<ul style="list-style-type: none"> QEII Trust covenants on remnant sand dune areas

Figure 19.15 NZCPS 2010 Policy 11(a) categories and examples of coastal species

The NZCPS 2010 also promotes restoration of coastal environments including dunes, saline wetlands, and inter-tidal salt marshes. Policy 14 requires councils to promote restoration or rehabilitation of the natural character of the coastal environment through a number of provisions.

Regional and district plans

Regional coastal plans contain provisions which manage activities in the coastal marine area below mean high water springs. These usually include the identification and 'zoning' of some coastal areas for protection, as well as for specific activities such as ports, wharves, aquaculture, marinas and moorings. Other activities, not specifically provided for, are usually assessed against a set of criteria that are laid out in the plan.

Several regional councils have prepared regional coastal plans that extend over the land and water portions of the coastal environment. They typically contain objectives and policies which apply to the whole area, but rules which apply only to the coastal marine area. This leaves district councils to develop rules to control land-based development, within the guidance provided by the regional plan.

Regional and/or district plans can include a number of mechanisms to help preserve indigenous coastal vegetation and habitats, including:¹⁶

- The identification of significant natural coastal areas on planning maps
- Objectives, policies and rules which restrict development in areas of high ecological sensitivity and in areas with high natural values
- Objectives, policies and rules which promote the restoration of ecologically-important areas such as vegetation corridors and 'stepping stones' for wildlife, riparian areas, coastal margins, and linkages between terrestrial forest, dune systems and estuaries
- Provision for financial and other incentives for landowners to covenant land for coastal biodiversity protection purposes
- Provision of support for the establishment of beach care and coast care restoration groups, and restoration and protection in surrounding catchments
- Provision for the maintenance and enhancement of council-owned coastal reserve land to ensure it is kept in a weed and pest free state

Resource consent conditions

Water quality within estuaries can be preserved and enhanced through providing rules in regional and district plans that control earthworks and vegetation clearance adjacent to estuaries, as well as in the wider catchment environment. Such rules can also provide for generous setbacks from riparian margins for development of land adjacent to estuaries.

Many regional and district plans have effectively described the coastal environments in their area, however they are much weaker in regards to protecting important coastal resources.¹⁷ Objectives and policies that are

designed to protect coastal biodiversity will only be really effective through robust rules, consent conditions and other implementation methods. For example, if areas of high ecological significance are identified on the planning maps, and objectives and policies prepared to protect these, it is unlikely that these will be effective unless there are accompanying rules and consent conditions to control coastal subdivision.

Some of the resource consent conditions that can be used to manage the effects of coastal development on biodiversity values are:

- Controls on extent of earthworks
- Controls on extent and type of vegetation clearance
- Requirements to rehabilitate a site through planting
- Requirements for fencing of estuaries or riparian margins
- Requirements to setback buildings adjacent to the coast
- Requirements for esplanade reserves, esplanade strips or reserve contributions
- Controls on the location and design of structures
- Controls on domestic pets such as cats, dogs and rats

Description of non-regulatory approaches

Coastal management strategies

Some local authorities have recognised the need to develop a coastal management strategy which addresses coastal biodiversity issues. These strategies have no statutory basis, but they can provide a strategic framework to help guide and inform the development of statutory plans.

A strategic approach helps to articulate an overall vision of how a community wishes to see its coast develop and how it should be managed in the future. It can also identify the mechanisms and actions required to achieve this. Coastal management strategies can be given the strength to achieve their vision through incorporation into statutory planning documents (such as district plans, long term council community plans and annual plans).

This type of approach allows for the cumulative impacts of development and activities on biodiversity to be managed in a more holistic manner. In order for these strategies to be successful, a good understanding of likely future development trends, the impacts of potential development, and the sensitivity of different parts of the coastal environment to development, is needed.¹⁸ Several councils, in recognition of the issues in their coastal areas, have prepared coastal

management strategies, including Whangarei District Council, Wairoa District Council, New Plymouth District Council, and Hastings District Council.

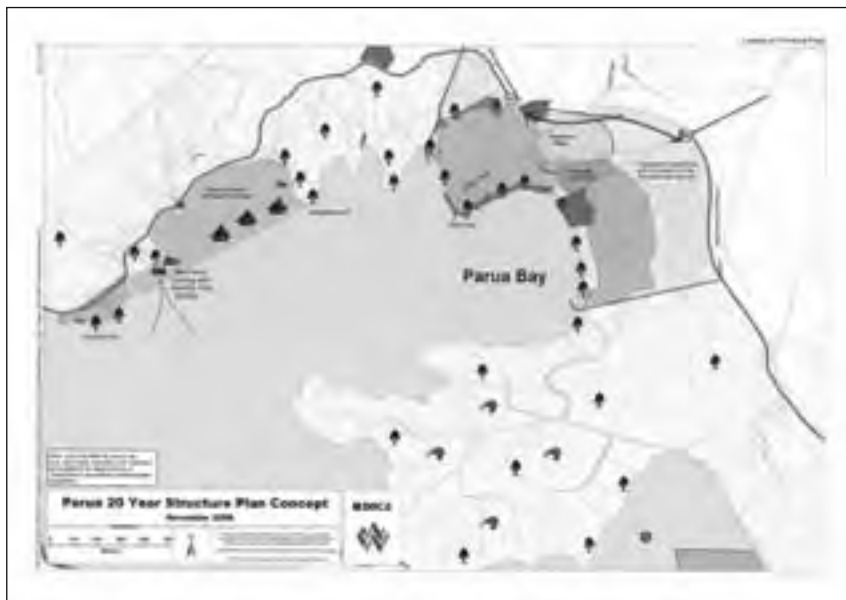


Figure 19.16 Implementing the Whangarei Coastal Management Strategy via structure plan mapping (Whangarei District Council)

Biodiversity strategies

Biodiversity strategies and action plans can be a useful tool for protecting coastal biodiversity. More information on these is provided in Chapter 10. Some local authorities have recognised the need to develop a biodiversity strategy separate from other regional plans and others have addressed marine biodiversity issues within a larger regional plan, such as the Horizons proposed 'One Plan'.¹⁹

The Wellington City Council has prepared a Biodiversity Action Plan which coordinates Wellington City Council's biodiversity activities and identifies local priorities and actions to protect and restore biodiversity, including within the coastal environment. This plan identifies the main issues for Wellington's coastal forest and scarp, coastal fringe and estuaries including identifying threatened species. It provides an action plan and a clear timeline for achieving the actions. For example, it includes an action to protect dunes and coastal ecosystems from vehicular damage through public awareness, prohibited areas, signage and enforcement.²⁰

Integrated coastal management

Human activity in the coastal zone, in general, degrades the coastal marine environment through the unsustainable use of resources and the input of polluted water and sediment. Due to the complex nature of human activity in the coastal zone an integrated, essentially holistic approach is needed to achieve long term sustainability in this environment. The theory behind integrated coastal management is that all potential environmental effects on the coastal marine area, resulting from land use within a catchment and activities within the coastal waters, are taken into consideration and addressed.

This approach requires a collaborative effort across political boundaries, including government departments, regional councils, territorial authorities, private landowners and community groups, to make sure that the planning addresses all land and coastal uses and effects. Consideration of the impacts of agriculture, urban sewage, forestry, and urban stormwater are essential because of the downstream effects caused on coastal environments. Some district plans identify special coastal zones, or identify tighter coastal development controls, in recognition of the sensitivity of the particular environment.

Education and raising awareness

A number of council websites provide information on sand dune restoration, such as coastal planting guides for dunes, as well as advice on managing weeds in areas such as estuaries. The Bay of Plenty Regional Council has developed an array of programmes targeted towards managing dune and estuary environments. The council's 'Backyard buffers' initiative has particular benefit for biodiversity as it promotes restoration of an important habitat for many native species of flora and fauna.

Providing material for schools is another way councils can effectively raise awareness of threats to biodiversity in coastal environments. The Northland Regional Council has developed a number of school initiatives, including the 'Northland's Coast and Us' programme which raises awareness of what plants and creatures live in these areas, what threatens the rocky shores and what can be done to protect these important habitats.²¹



Figure 19.17 Northland's Coast and Us programme (Northland Regional Council)

Not-for-profit organisations and trusts are involved in raising awareness of biodiversity issues on the coast. The Care for our Coast programme, run by the Sir Peter Blake Trust, is designed to inspire and educate people about how best to care for the coastal environment. The trust has prepared proactive teaching resources and clean up kits.

Sand dune restoration education efforts have been facilitated by the Dune Restoration Trust of New Zealand since 2007. The trust's goals are to provide a network for information exchange on sustainable management of dune ecosystems, to facilitate research on dune ecosystems, and to promote public awareness of proven methods for protection, restoration and conservation of dune ecosystems. These kinds of educational resources are valuable to support community efforts that are focused on restoring dune areas.

Community care groups

Recognition of the importance of protecting and restoring indigenous coastal vegetation on dunes has led to a shift from planting introduced species (such as marram), to planting native species (such as spinifex and pingao). Over the last 20 years, groups of volunteers have been working hard on restoration

of local sand dunes, with at least 80 community groups and many hundreds of volunteers currently engaged in ecological restoration of sand dunes.²² In addition, many landowners have been revegetating dune areas on private land. Care groups are discussed in further detail in Chapter 10.



Figure 19.18 Volunteers at the Waikanae Estuary Care Group open day, Kapiti Coast
(Crown Copyright: Department of Conservation: Te Papa Atawhai, 2009)

Funding initiatives

There are a number of national grants available for protection and restoration projects in coastal environments, which are identified in Chapter 10. These provide funding for a range of activities including planting, weeding and fencing, as well as preparation of recovery plans and retirement of areas with high ecological value.

The World Wildlife Fund manages funds that are designed to support communities and schools working on coastal habitat conservation projects. Its Habitat Protection Fund supports not-for-profit community conservation groups in New Zealand, undertaking hands-on ecological restoration or conservation in coastal, dune and estuary environments. Since the fund's launch, the organisation has partnered with volunteer groups on over 400 projects to protect areas of high conservation significance in their communities.²³

Case studies

Yellow-Eyed Penguin Trust

The threatened yellow-eyed penguin is unique to New Zealand. During the 1980s, the number of yellow-eyed penguins dropped dramatically, probably due to loss of coastal habitat and an increase in predator numbers.²⁴ In response to concerns about the likely survival of the species, the Yellow-Eyed Penguin Trust was set up.



Figure 19.19 Yellow-eyed penguin juvenile, Enderby Island, Auckland Islands
(Crown Copyright: Department of Conservation: Te Papa Atawhai, 1988)

Originally focusing on yellow-eyed penguins living on the Otago Peninsula, the group now looks after these penguins throughout the entire South Island and also on Stewart Island. In its first 20 years, the Trust protected yellow-eyed penguin habitat through fencing to protect the nests from wandering stock, planting trees and shrubs, and purchasing land for penguin reserves. The Trust set up a plant nursery which has propagated more than 80,000 native trees and shrubs sourced from local seed.²⁵ These have then been planted in the appropriate habitat to provide more shelter and better nesting sites for the penguins.

The Trust's aim is to restore and enhance this bird's habitat so that numbers are at a self-sustaining level.²⁶ The Trust now owns or manages a number of reserves, each of which has a management plan in place. It also works closely with landowners, advising on fencing and replanting of breeding areas, as well as pest control. The Trust's nursery is so successful that the extra plants grown there are either donated or sold to other community restoration projects.

The education component of the Trust's work is important for achieving many of the desired outcomes. Education kits have been prepared for schools, workshops are facilitated on controlling pests and nursery training days are held to teach people how to grow native plants, including some locally and nationally rare plants. The Trust has won national awards for its coastal habitat restoration work.

This case study highlights that, whilst focusing on one particular species, voluntary efforts to restore habitat can have flow on effects for other native flora and fauna.

Uretara Estuary Managers

A group of local residents in Katikati were concerned about the degradation of their local estuary, including loss of salt marshes, sand flats and habitats for wading and shore birds. In 2005 they set up the Uretara Estuary Managers, with support from the Western Bay of Plenty District Council and the Bay of Plenty Regional Council. The group was particularly worried about the accumulation of sediment, and changes in the character of the Uretara Estuary, that members had witnessed in the last few years.



Figure 19.20 Uretara Estuary (Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

The group started off with extensive pest control along the shore. It has since moved on to planting the riparian margins for erosion control, propagating plants, undertaking regular pest control, trialling methods for mangrove removal and providing support and education for local landowners. The group also makes submissions on policy development in regards to managing coastal environments.

Students from Katikati College assist with water quality monitoring, as well as pest monitoring and control in the adjacent native bush. Bay of Plenty Polytechnic students use the estuary and the restoration work as a basis for research studies, which provides valuable information for on-going projects.²⁷ The Uretara Estuary Managers, together with the Bay of Plenty Polytechnic students, are now using a new Envirolink toolkit developed by The National Institute of Water and Atmospheric Research (NIWA) to monitor the ecological success of the Uretara stream restoration work.²⁸

The community group was recognised for its efforts by a Green Ribbon Award from the Ministry for the Environment for the restoration of the Uretara Estuary. It has since been an inspiration for other estuary care groups wanting to restore and enhance biodiversity in their local areas.

This case study highlights how a collaborative effort, including local residents, landowners, territorial authorities and students, can result in significant gains for biodiversity within a coastal environment. It also demonstrates the importance of starting restoration efforts by addressing the most significant threat first and then moving on to replanting, education and monitoring.

Recommendations for best practice

Management approach	Best practice recommendations
Regional plans including coastal plans	<ul style="list-style-type: none"> • Spatially identify ecologically important coastal habitats including estuaries susceptible to sedimentation • Restrict activities in areas of high ecological sensitivity • Control sediment-creating activities in catchments draining into sensitive estuaries • Include limits on the discharge of sediment and pollutants into sensitive coastal environments
Coastal district plans	<ul style="list-style-type: none"> • Spatially identify significant coastal habitats • Control earthworks, vegetation clearance and construction in the coastal environment, including on dunes • Restrict the construction of seawalls, outfalls and other hard structures with potential to impact on natural coastal processes • Provide for generous setbacks from coastal and riparian margins for coastal development • Promote the restoration of ecologically-important areas, such as coastal margins, and linkages between coastal forest, dune systems and estuaries • Provide financial incentives for landowners to covenant ecologically significant coastal areas
Resource consent conditions	<ul style="list-style-type: none"> • Control the extent of earthworks and vegetation clearance • Require site rehabilitation through planting • Require fencing of estuaries and riparian margins • Require building setbacks adjacent to the coast • Require for esplanade reserves, esplanade strips and/or reserve contributions • Control the location and design of any structures
Strategic coastal plans	<ul style="list-style-type: none"> • Include an overall vision of how a community wishes to see their coast develop and be managed in the future • Include coastal biodiversity issues • Incorporate key provisions in statutory planning documents (regional, district and annual planning processes)

Figure 19.21 Summary of the management approaches and best practice recommendations specific to coastal environments

Useful websites

Auckland Council environment funds – <http://www.aucklandcouncil.govt.nz/EN/Services/CommunityFacilitiesSupport/grantsfunding/environmentheritage/Pages/home.aspx>

Dune Restoration Trust of New Zealand – <http://www.dunestrust.org.nz/>

Care for our Coast – <http://www.sirpeterblaketrust.org/get-involved/care-for-our-coast/>

Northland's Coast and Us – <http://www.nrc.govt.nz/For-Schools/Northlands-Coast-and-Us/>

Quality Planning Coastal Land Development Guidance Note – http://www.qp.org.nz/plan-topics/coastal-land-development.php#_Introduction

World Wildlife Fund Habitat Protection Fund – http://www.wwf.org.nz/what_we_do/community_funding/habitat_protection_fund/

References and further reading

Buchan D, 2007, *Not just trees in the ground: The social and economic benefits of community-led conservation projects*, WWF-New Zealand, Wellington

Department of Conservation and Ministry for the Environment, 2000, *The New Zealand Biodiversity Strategy: Our chance to turn the tide, Whakakōhukihukitia Te Tai Roroku Ki Te Tai Oranga*, Department of Conservation and Ministry for the Environment, Wellington

Gibb J, 1983, 'The geography of the New Zealand coast', in G Matthews, *The edge of the land: The coastline of New Zealand*, Penguin Books, Auckland

Hauraki Gulf Forum, 2004, *The Hauraki Gulf State of the Environment Report*, Hauraki Gulf Forum, Auckland

Heather B and H Robertson, 1996, *The field guide to the birds of New Zealand*, Penguin Books, Auckland

Hilton M J, U Macauley and R Henderson, 2000, 'Inventory of New Zealand's active dunelands' *Science for Conservation*, 157, Department of Conservation, Wellington

Hilton M J, 2006, 'The loss of New Zealand's active dunes and the spread of Marram grass', *New Zealand Geographer*, 62, 105–120

McGlone M and Walker S, 2011, 'Potential effects of climate change on New Zealand's terrestrial biodiversity and policy recommendations for mitigation, adaption and research', *Science for Conservation*, 312

Jamieson S L, 2010, '*Sand dune restoration in New Zealand: Methods, motives and monitoring*', A thesis submitted for the partial fulfillment for the degree of Master of Science in Ecological restoration, Victoria University, Wellington

Milne R and J Sawyer, 2002, *Coastal foredune vegetation in the Wellington Conservancy: Current status and future management*, Department of Conservation, Wellington

Ministry for the Environment, 1997, *The state of New Zealand's environment 1997*, GP Publications, Wellington

Patrick B, 1994, '*Lepidoptera of Kaitorete Spit, Canterbury*', *New Zealand Entomologist*, 17, 52-63

Patrick B H and J S Dugdale, 2000, 'Conservation status of New Zealand *Lepidoptera*', *Science for Conservation*, 136

Peart R, 2005, '*The community guide to coastal development under the Resource Management Act 1991*', Environmental Defence Society, Auckland

Peart R, 2009, *Castles in the sand: What's happening to New Zealand's coast?*, Craig Potton Publishing Limited, Nelson

Endnotes

- 1 <http://www.niwa.co.nz/sites/default/files/import/attachments/estuaries.pdf>
- 2 <http://www.doc.govt.nz/upload/documents/about-doc/concessions-and-permits/conservation-revealed/mason-bay-dune-restoration-lowres.pdf>
- 3 <http://www.doc.govt.nz/publications/conservation/native-plants/pikao-or-pingao-the-golden-sand-sedge/introduction/>
- 4 Patrick B H and J S Dugdale 2000, 32
- 5 Patrick B, 1994
- 6 Department of Conservation and Ministry for the Environment, 2000
- 7 <http://www.teara.govt.nz/en/estuaries/5>
- 8 <http://www.teara.govt.nz/en/estuaries/5>
- 9 http://www.landcareresearch.co.nz/research/ecosystems/rare/ecosystem_details.asp?Rare_Ecosystem_ID=58
- 10 Hilton M J, 2006
- 11 Hilton M J, et al., 2000, 35
- 12 Hauraki Gulf Forum, 2004, 47
- 13 Peart R, 2009
- 14 <http://maxa.maf.govt.nz/sff/about-projects/search/LC09-008/scoping-study.pdf>
- 15 <http://www.doc.govt.nz/publications/conservation/nz-threat-classification-system/nz-threat-classification-system-lists-2012-2014/>
- 16 Peart R, 2005
- 17 Peart R, 2005
- 18 Peart R, 2005
- 19 <http://www.horizons.govt.nz/about-us/one-plan/provisional-determinations/biodiversity-and-historic-heritage-provisional-determinations/>
- 20 <http://www.wellington.govt.nz/plans/policies/biodiversity/pdfs/biodiversity.pdf>
- 21 <http://www.nrc.govt.nz/For-Schools/Northlands-Coast-and-Us/Our-rocky-shores/>
- 22 Jamieson S L, 2010
- 23 http://www.wwf.org.nz/what_we_do/community_funding/habitat_protection_fund/
- 24 Buchan D, 2007
- 25 <http://yellow-eyedpenguin.org.nz/about-us/>
- 26 Buchan D, 2007
- 27 <http://www.mfe.govt.nz/withyou/awards/green-ribbon-winners-2007.html>
- 28 <http://www.niwa.co.nz/news/help-hand-new-water-restoration-toolkit>



The marine environment supports a diverse array of fish species (*Raewyn Peart*)

twenty

Marine

The ocean, font of life and ultimate refuge for many, has become a threatened oasis.

Jacques-Yves Cousteau

As with the coast, the ocean, and all it embraces, is deeply ingrained in New Zealand's culture and environmental consciousness. It defines the country and the voyaging nature of its people. Due to its location and geographical isolation, New Zealand enjoys a unique and diverse marine environment, with high levels of endemism. As a home to so many different plants, invertebrate, fish, marine mammal and seabird species, the marine environment plays an integral role in the biodiversity values of this country.

New Zealand's land mass is positioned within the Pacific Ocean, but on the northern extent of the Southern Ocean. The convergence zone, where these two oceans meet, influences weather patterns and the marine environment more generally.¹ The marine environment has been subjected to intense geological processes, which have led to the formation of diverse marine habitats, including chains of underwater volcanoes, deep oceanic trenches and seamounts. It is a highly interconnected system, with ocean currents transporting species over large distances, and life cycles extending over wide geographic areas.

Marine habitats vary considerably with geology, ocean currents and climate and these affect the distribution of species.² New Zealand's marine environment jurisdiction extends out to the 200 nautical mile EEZ.³ The area covers 4.1 million square kilometres, which is more than 15 times the land area of the country, making it the fifth largest marine jurisdiction in the world.⁴ New Zealand also has more limited rights over the seabed in areas of the continental shelf which extend out further than the limits of the EEZ.



Figure 20.1 White Island, off the Eastern Bay of Plenty, is part of New Zealand's unique marine environment (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2009)

Life in the ocean

It has been estimated by marine scientists that 80 per cent of New Zealand's biological diversity is found in the sea.⁵ New Zealand has a wide variety of marine species, some of which reside permanently in local habitats, whilst others are migratory.⁶ Many of our marine species also spend a significant period of time in international waters; extending New Zealand's interests well into the Southern and Pacific Oceans and to Antarctica.

There are more than 16,970 known living species within New Zealand's marine environment, including approximately 4,320 undescribed species in collections.⁷ A recent paper by biodiversity scientist Dr Dennis Gordon noted that the taxonomic kingdom Animalia (the largest of all kingdoms which includes all animals) is by far the richest in species numbers in New Zealand with 13,415 marine species, followed by Chromista (a kingdom of plant-like organisms that possess chlorophyll) with 2644 species, Plantae (mostly red and green seaweeds) with 702 species, Fungi with 89 and Protozoa (unicellular organisms with membranes) with 43 species.⁸

Marine habitats

New Zealand's marine environment supports a wide range of habitats, some of which have only just been discovered by scientists. These include:

- *Estuaries* – are one of the most ecologically productive marine habitats. New Zealand has around 300 estuarine systems, covering over 100,000 hectares.
- *Rocky reefs* – are common in near-shore areas around New Zealand's coast. They provide important habitats for a diverse range of sea creatures.
- *Soft sediments* – are particularly common in harbours, estuaries, and along the open coast. These sediments are often rich in organic matter.
- *Calcareous gravels* – are one of the most biodiverse marine habitats in New Zealand and very rare.
- *Fiords* – support diverse marine communities.
- *Seamounts* – are located within deep parts of New Zealand's marine area. They provide a food-rich environment and support a diverse range of life forms.
- *Hydrothermal vents* – provide very high temperatures and support a range of unique species.

More information on these environments, and the species found living within them, can be found in 'Managing the Marine Environment', an EDS Community Guide available at www.eds.org.nz.



Figure 20.2 New Zealand fur seal habitat, Red Rocks near Wellington (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2000)

Marine mammals

New Zealand's seas are a marine mammal 'hotspot'. It is estimated that just under half of the world's total number of dolphin and whale species are found in New Zealand. At least nine species of dolphin can be sighted in New Zealand's coastal waters, including common, dusky, bottlenose, Hector's and Maui's dolphin, and orca.

Species of whale, including the humpback and blue whale, migrate seasonally through New Zealand waters. Other species such as the Bryde's whale and southern right whale breed here. A small population of around 40 to 50 Bryde's whales reside in the Hauraki Gulf year round. The species is classified as nationally critical in New Zealand, although there are secure populations overseas.



Figure 20.3 New Zealand's seas are a marine mammal 'hot spot' for species such as this common dolphin (*Raewyn Peart*)

Pinnipeds, including New Zealand sea lions and fur seals are also found in New Zealand's waters.

More information on marine mammals can be found in 'Wonders of the Sea: the protection of New Zealand's marine mammals' at www.eds.org.nz.

Seabirds

As 'seabird capital of the world' New Zealand not only provides breeding grounds for more species of seabirds than any other country, it is also thought to have a greater number of seabird species than land bird species. Thirty-five species of seabird are endemic to New Zealand and breed nowhere else. Seven species of penguin can be found in New Zealand, with four of these breeding on the mainland. The blue penguin is the smallest penguin species in the world and can be found along the coasts of the North and South Islands.



Figure 20.4 Seabirds are commonly seen in New Zealand's marine areas (*Raewyn Peart*)

Fish

Whilst many of New Zealand's marine fish found in New Zealand waters are also seen elsewhere, a large number of this country's benthic species are endemic. There are a number of fish species that are very rare, such as the morse-code leatherjacket which is generally only spotted in the Kermadec Islands.⁹ Fish are an important food source for marine mammals and birds, as well as for the larger predatory migratory fish species, such as tuna. New Zealand waters are regularly visited by migratory fish and provide a critical habitat for many of them.

Invertebrates

This is a highly diverse group of species, including corals, sea anemones and jellyfishes. There are around 58 black coral species known to be present in New Zealand, extending over a wide range of depths and geographic areas, including the shallow reefs at the Kermadec Islands.¹⁰ New Zealand's hydrocoral fauna (very small predatory animals mostly found in saltwater) is one of the most diverse in the world, and 80 per cent of the more than 50 species that live in this country are endemic.¹¹

Threats

Impact on targeted fish populations

Fishing activity can significantly reduce the size of the target fish population. It also preferentially removes larger and older fish, including those in a reproductive stage. This in turn changes the size and age structure of exploited populations, reduces their genetic diversity, and affects their capacity to recover from fishing activity. The quota management system, which creates transferable quota for specific fish stocks, and the maximum sustainable yield, are important management tools used to set fishing limits. ‘Maximum sustainable yield’ is defined in the Fisheries Act as being ‘the greatest yield that can be achieved over time while maintaining the stock’s productive capacity ...’.



Figure 20.5 Fishing net being released from a boat (Crown Copyright: Department of Conservation: Te Papa Atawhai, n.d.)

Disruption of marine ecosystems

Fish are located within complex marine food webs. Species interacting with harvested fish, as either predators or prey, are affected by a reduction in fish stocks. They may either increase or decrease in population levels. This flow on effect is known as a 'trophic cascade' and in northern New Zealand has given rise to the phenomenon of 'kina barrens'.¹² They occur because the diminished population of snapper and crayfish (through fishing activity) causes a large increase in the numbers of their prey, kina (sea eggs). As kina feed on seaweed their increased numbers significantly reduce the extent of the kelp forests, causing a loss of habitat for sponges, seasquirts, bryozoans and many more species which shelter in the kelp. The result is that rocky reefs become colonised by kina to the exclusion of most other species.¹³

Damage to seabed habitats

Bottom trawling and dredging can crush benthic organisms including sponges, bryozoans, seaweeds and soft corals. Such activities can also flatten outcrops which provide an important refuge for juvenile species of fish, and suspend sediment in the water column, which can disrupt filter feeders.

Dredging is more destructive to the seabed in the localised areas where it occurs. But trawling is cumulatively more damaging within New Zealand's marine environment as it is undertaken over much larger areas. Other fishing methods which involve equipment interacting with the seabed can also damage benthic habitats, including seining, long lining and potting, although the effects are usually much less significant.

Impacts on marine mammals, turtles and birds

Fishing activity can result in the capture of protected and threatened species such as marine mammals, seabirds and turtles. Dolphins, fur seals and sea lions can become entrapped in fishing nets, with some being released successfully and others asphyxiating or drowning. Seabirds are attracted to baited hooks in long line fisheries and can get hooked or tangled in the line and drown. Others can become entangled in trawling equipment. Species such as protected corals can also be damaged by fishing activity.



Figure 20.6 New Zealand fur seal with plastic netting around its neck, Gisborne (Crown Copyright: Department of Conservation: Te Papa Atawhai, 2006)

Invasive species

New marine species arriving into New Zealand are a major threat to marine biodiversity. Many marine invasive species have already become established, entering the country through the discharge of ballast water or through being attached to the hulls of ships. By 1998 around 150 marine species had been introduced into New Zealand waters, of which 127 have become established.¹⁴ These include seaweeds, algae (both large and microscopic), barnacles, crabs, bryozoans, sea squirts, mussels and other molluscs.

Marine invasive species can cause major disruptions to ecosystems and habitats. They compete with native species for space and food, and many of the introduced species are more aggressive than the native ones. By smothering vast areas of seafloor, some pests fundamentally change habitats.¹⁵ The Ministry for Primary Industries has identified six unwanted marine organisms which are highly invasive, being the Chinese mitten crab (*Eriocheir sinensis*), Mediterranean fanworm (*Sabella spallanzanii*), Northern Pacific seastar (*Asterias*

amurensis), Asian clam (*Potamocorbula amurensis*) and *Caulerpa taxifolia* (a marine aquarium weed).

Impacts from other marine activities

Contemporary society uses the oceans in many ways, including for growing fish and seafood, for accessing oil and gas resources, for gathering minerals and for transporting resources across the globe. These activities can have significant impacts on marine biodiversity, particularly when they are not properly managed.

Pollution

Many pollutants find their way into the marine area from industrial and agricultural activity, and from domestic households. In particular, metals, chemicals, hormones, dioxins, organochlorines and PCBs can cause problems through disrupting the natural growth and reproduction of marine organisms. The pollutants can accumulate higher up the food chain, as shellfish and other organisms are eaten by fish, marine mammals and birds.

Summary of threats

Cause		Potential effects
Fishing	Reduces fish stocks	<ul style="list-style-type: none"> • Reduces resilience, including the capacity of species to recover from sustained fishing activity
	Disrupts species population composition	<ul style="list-style-type: none"> • Preferentially removes age cohorts • Removes older and more highly reproductive fish • Reduces genetic diversity
	Disrupts marine ecosystems	<ul style="list-style-type: none"> • Impacts on predator and prey species • Can result in a trophic cascade
	Damages seabed habitats	<ul style="list-style-type: none"> • Destroys benthic habitats and species • Increases sediment suspended in the water column
	Impacts on threatened marine mammal and bird species	<ul style="list-style-type: none"> • Kills animals caught in fishing equipment • Reduces food supply
Invasive species		<ul style="list-style-type: none"> • Compete with native marine species • Can block waterways • Can alter habitat features • Impact on ecosystem processes

Impacts from other marine activities	Aquaculture	<ul style="list-style-type: none"> • Changes benthic habitats • Increases nitrogen and decreases dissolved oxygen • Increases accumulation of heavy metals • Increases biosecurity threats • Leads to genetic changes in wild populations • Increases risk of entanglement for marine mammals • Changes local biodiversity
	Oil and gas exploration	<ul style="list-style-type: none"> • Directly impacts on benthic communities • Modifies the seafloor • Increases suspension of sediment • Changes nutrient values • Increases the risk of contamination from oil spills • Negatively impacts on marine mammals
	Mineral exploitation	<ul style="list-style-type: none"> • Damages shellfish beds • Permanently modifies seabed habitats and communities • Increases suspension of sediment • Disrupts marine mammals • Disrupts fish populations
	Marine transportation	<ul style="list-style-type: none"> • Increases toxins in water and being ingested by species • Increases contamination of benthic and inshore communities • Increases biosecurity risks • Disrupts marine mammals • Causes death of marine mammals through ship strike

Figure 20.7 Summary of the main causes and effects of biodiversity loss in marine environments

Description of regulatory management approaches

International agreements

A number of key agreements and regulations are part of the international regime aimed at protecting the marine environment and biodiversity. These include the United Nations Convention on the Law of the Sea, the United Nations Straddling Fish Stocks Agreement and the Convention on Biological Diversity. They are discussed in Chapter 2.

Legislative framework

New Zealand's marine environment is managed within a somewhat complex and overlapping legislative framework which has developed over the past fifty or so years. This legislation is discussed in Chapter 7.



Figure 20.8 Banks Peninsula Marine Mammal Sanctuary (*Raewyn Peart*)

The key tool for marine biodiversity protection is the creation of marine reserves which generally exclude all fishing activity. A range of other spatial and activity-based management measures, can be used to exclude damaging activities from ecologically sensitive areas, or to mitigate their effects on the marine environment. A number of marine species are protected under the Wildlife Act 1953 (including seabirds, fish and invertebrates) and marine mammals are protected under the Marine Mammals Protection Act 1978 as described in Chapter 8.

Some key elements of the legislative framework applying to marine biodiversity are described below. A more comprehensive description of the legislation applying to the marine area can be found in the EDS Guide 'Managing the Marine Environment'.

Marine Protected Areas

Marine reserves, which are designed to preserve marine areas in their natural state for the purpose of scientific study, can be established under the Marine Reserves Act 1971 and are administered by the Department of Conservation. They can only be established in the territorial sea. Currently they protect only a very small proportion of the coastal area around the New Zealand mainland and much larger areas around offshore islands. A list of current and proposed marine reserves, and information about them, can be found at <http://www.doc.govt.nz/conservation/marine-and-coastal/marine-protected-areas/marine-reserve-information/>.

A coastal and marine classification system applied by the Department of Conservation identifies different types of marine habitat, to help ensure that the network of marine protected areas is comprehensive and representative. Fourteen biogeographic regions have been identified which collectively cover the entire New Zealand marine area out to the 200 metre depth contour. They are intended to reflect major different coastal biological patterns.

The MPA Policy takes a regional approach to the planning and establishment of a network of protected areas around New Zealand, although it is aligned with biogeographic regions and not regional council boundaries. The 'Marine protected areas: classification, protection standard and implementation guidelines', prepared by the former Ministry of Fisheries and the Department of Conservation provide design guidelines to assist with identifying and selecting potential protected areas.

For a fuller discussion of New Zealand's current system for marine protected areas and prospects for future reform see 'Safeguarding Our Oceans: Strengthening Marine Protection in New Zealand' which is available at www.eds.org.nz.

Fisheries Act 1996

All fishing activity is managed under this legislation. Areas can be closed to specified types of fishing activity to protect biodiversity. For example, restrictions under the Fisheries Act have closed a number of areas within the EEZ, including seamounts and benthic protection areas, to dredging and trawling activity as a result of biodiversity concerns. There is a suite of customary management tools available under the Fisheries Act and associated regulations. These are discussed in Chapter 11.

Resource Management Act 1991

Most activities that have an impact on biodiversity in the territorial sea, with the exception of fishing activity, are managed under the RMA. The management

of land-based activities which impact on the marine area, such as farming, forestry and urban development; and major marine works, such as reclamation, dredging and the construction of wharves, jetties, sea walls and outfalls are discussed in Chapter 19.

Regional coastal plans are the main tool for managing the impacts of marine activities, such as dredging, dumping, mining, oil and gas exploitation, aquaculture, moorings and vessels on marine biodiversity. The plans regulate these activities and provide the framework for resource consenting. The plans can spatially identify important marine habitats and species in the region and provide rules to protect them from the adverse effects of such activities.

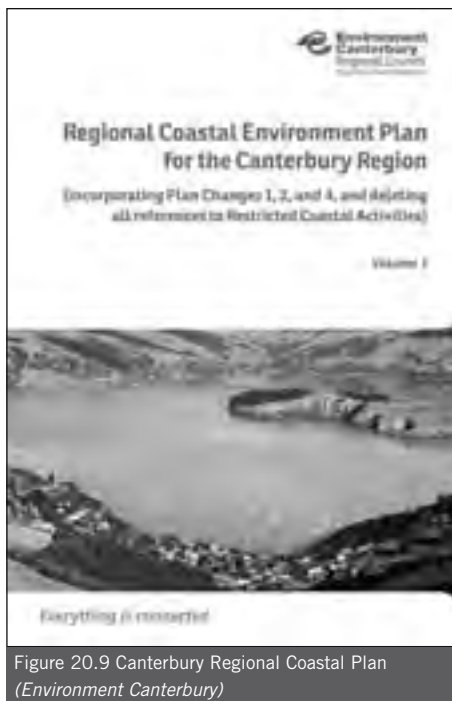


Figure 20.9 Canterbury Regional Coastal Plan
(Environment Canterbury)

Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012

Most activities within the EEZ, other than fishing and shipping, will be managed under this legislation. Its purpose is 'to promote the sustainable management of the natural resources of the exclusive economic zone and the continental shelf'. It provides a regulatory framework for classifying activities as permitted, discretionary or prohibited. Marine consent applications are determined by the Environmental Protection Authority. When considering such applications, the Authority must take into account, amongst other things (section 59):

- The importance of protecting the biological diversity and integrity of marine species, ecosystems, and processes.
- The importance of protecting rare and vulnerable ecosystems and the habitats of threatened species.

Detailed rules about what classification particular activities will be given will be contained in regulations. Regulations can also identify areas that are ‘important or especially vulnerable because of their biophysical characteristics’ and can close areas to all or any activities (section 28).

Biosecurity Act 1993

This legislation gives the Ministry for Primary Industries the tools to control activities that have a high risk of introducing marine pest species, such as discharging ballast water or carrying invasive species on ship hulls. An import health standard has been established which requires all ships to exchange their ballast with mid-ocean water. In addition, draft Antifouling and In-water Cleaning Guidelines and a draft Import Health Standard for Vessel Biofouling, have been prepared.



Figure 20.10 Ships can cause pollution through discharging ballast water or carrying invasive species on their hull (*Raewyn Peart*)

Description of non-regulatory approaches

Regional partnerships

The Ministry for Primary Industries has set up a partnership programme which is aimed at fostering a collaborative environment to help protect New Zealand’s

marine environment. There are currently one national and four regional marine biosecurity partnerships. These programmes involve government agencies working closely with iwi, industry groups, community agencies and research institutes to address regional marine biosecurity issues.¹⁶ The partnerships come under the umbrella of the national marine partnership framework called STOMP (Stop the Spread of Marine Pests).

Ocean mapping

Ocean Survey 20/20 is a seabed mapping and research project designed to improve the country's knowledge about the marine environment. It has contributed significantly to our understanding of aspects such as the biodiversity, hazards, and resources in the coastal and marine environment. It has included extensive and comprehensive surveys of areas such as the Chatham Rise and Challenger Plateau, the Ross Sea and Bay of Islands.

In 2010, a two year ocean and coastal survey was completed in the Bay of Islands, involving seafloor mapping and biodiversity sampling.

A seafloor survey has also been conducted in the Kaikōura Canyon, off the coast of the South Island, to identify the location of submarine canyons and to learn more about these habitats. Whilst not much is known about submarine canyons, they are thought to be biodiversity hotspots and potentially areas of concentrated nutrients, organic debris and animals. The Kaikōura Canyon was discovered to be highly productive and diverse, possibly due to its gentle slopes to the canyon floor that trap organic matter and sediment.¹⁷ These projects aim to increase knowledge and public awareness of the ocean floor, as well as to support policy changes.

Marine spatial planning

Marine spatial planning is an approach designed to provide greater direction on how defined areas of marine space, including coastal and offshore areas, are to be managed in order to meet desired societal outcomes. The theory of marine spatial planning is that a strategic and forward-looking approach is taken, which focuses on protecting the ecological underpinning of the marine system, as well on managing conflicts between human activities and the marine environment, and those between competing marine uses.¹⁸ Marine protected areas may be identified as part of a marine spatial planning process as well as areas suitable for defined marine activities. Marine spatial planning is a concept that has been widely used in Australia, the USA and Europe, but has yet to be implemented in New Zealand. However, it is under development as a planning tool for the Hauraki Gulf.

Case studies

Fiordland Marine Guardians

Fiordland boasts a unique marine environment, with diverse habitats and species. Whilst this area attracts a significant number of tourists each year, this biodiversity is under increasing risk from a number of threats, including invasive species and overfishing. Driven by concerns about the impacts on the unique environment in Fiordland, local citizens set up the Guardians of Fiordland's Fisheries and Marine Environment Incorporated in 1995. The group represented the many stakeholder industries in the area, including commercial and recreational fishers, charter boat operators, Ngāi Tahu and community interests.¹⁹



Figure 20.11 Fiordland (*Raewyn Peart*)

Funding was awarded to the group in 2000 from the Ministry for the Environment's Sustainable Management Fund, where it contributed towards the preparation of the Fiordland Marine Conservation Strategy. In 2005, legislation was created to provide an implementation tool for the strategy, called the Fiordland (Te Moana o Atawhenua) Marine Management Act 2005. This Act gave the Guardians statutory recognition (and a new name 'Fiordland Marine Guardians') and established eight new marine reserves (in addition to two pre-existing reserves). In addition, commercial fishers withdrew completely from the inner fiords, recreational fishers reduced bag limit, and a two-year closure of the blue cod fishery in Doubtful and Milford Sounds was put in place. Areas of special significance were protected with a range of restrictions, including anchoring prohibitions, fishing closures and a code of practice for divers.²⁰

The Fiordland Marine Guardians has created a number of resources that are important for increasing public awareness of the issues and threats, and they provide practical advice for people using Fiordland's marine environment. This includes advice on responsible fishing and diving and how to avoid bringing marine pests into the fiords.²¹ The work of the Fiordland Marine Guardians is an excellent example of a 'bottom-up, community management model' which integrates both management of the marine environment and protection of biodiversity.

This case study highlights how a community can drive protection of its marine biodiversity through vision and collaboration and using the suite of practical management approaches available.

Top of the South Marine Biosecurity Partnership

One of the most biodiversity-rich marine environments within New Zealand is found at the top of the South Island. This area also hosts two regional ports and has the largest concentration of marine farming in the country. The area includes the coastline administered by three territorial authorities as well as the associated marine area within the territorial sea. The Top of the South Marine Biodiversity Partnership is coordinated by the Ministry for Primary Industries and includes a wide representation of industry, councils, iwi and the community.



Figure 20.12 Nelson marine environment (*Raewyn Peart*)

Funding was awarded to the group in. The partnership has been set up with the goal of preventing the introduction, and minimising the spread of, marine pest species. In 2009 the partnership prepared a strategic plan to help direct how this was going to be achieved. This plan identifies priority actions and provides a framework for determining who is best to undertake them.

Funding for the programme has been provided by the three local councils and the Ministry for Primary Industries. This is the first time a joint-funding approach has been agreed for marine biodiversity management in New Zealand.²²

This case study highlights the value of partnerships between government and non-governmental organisations, iwi, industry groups, community agencies and research institutes.

Recommendations for best practice

Recommendation	Tools
A network of representative and fully protected marine areas	<ul style="list-style-type: none"> • Marine Reserves Act
A complimentary network of marine protected areas which restrict damaging activities such as trawling and dredging	<ul style="list-style-type: none"> • Fisheries Act
A complimentary network of areas which restrict other potentially damaging activities such as mining, dumping and marine farming	<ul style="list-style-type: none"> • RMA regional coastal plans • EEZ regulations
Safe places for marine mammals which include their key habitat	<ul style="list-style-type: none"> • Marine mammal sanctuaries
A regulatory framework which avoids, remedies and mitigates adverse effects of marine activities on marine biodiversity	<ul style="list-style-type: none"> • RMA regional coastal plans • Conditions on coastal permits • EEZ regulations • Conditions on marine consents
Ecosystem-based marine management	<ul style="list-style-type: none"> • Marine spatial planning

Figure 20.13 Summary of the recommendations to protect marine biodiversity and the tools to achieve this

Useful websites

Department of Conservation – <http://www.doc.govt.nz/conservation/marine-and-coastal/marine-protected-areas/marine-reserve-information/>

Ministry for the Environment – <http://www.mfe.govt.nz/issues/oceans/eez-regulations-consultation.html>

Ministry for Primary Industries – <http://www.biosecurity.govt.nz/pests/salt-freshwater/saltwater/marine-pest-map>

National Fisheries Plan for Highly Migratory Species – <http://www.fish.govt.nz/NR/rdonlyres/C2A22B9D-2C84-4A33-A1C8-F8E35F22FE70/0/HMSNationalPlan.pdf>

Safeguarding Our Oceans: Strengthening Marine Protection in New Zealand' available at www.eds.org.nz

References and further reading

Auckland Council, n.d., *Hauraki Gulf Forum*, available at, <http://www.arc.govt.nz/environment/coastal-and-marine/hauraki-gulf-forum/>

Banks S, 2009, New Zealand's Marine Biodiversity, *Coastnet Magazine*, available at <http://www.scribd.com/doc/19789120/Aug-2009-New-Zealands-marine-biodiversity>

Department of Conservation, n.d., *Hauraki Gulf Marine Park*, available at <http://www.doc.govt.nz/conservation/marine-and-coastal/marine-protected-areas/marine-parks/hauraki-gulf-marine-park/>

Department of Conservation, n.d., *Hector's dolphin*, available at <http://www.doc.govt.nz/conservation/native-animals/marine-mammals/dolphins/hectors-dolphin/>

Department of Conservation, n.d., *Banks Peninsula marine area*, available at <http://www.doc.govt.nz/conservation/marine-and-coastal/marine-protected-areas/marine-mammal-sanctuaries/banks-peninsula/>

Department of Conservation and Ministry for the Environment, 2000, *The New Zealand Biodiversity Strategy: Our chance to turn the tide, Whakakōhukihukitia Te Tai Roroku Ki Te Tai Oranga*, Department of Conservation and Ministry for the Environment, Wellington

Department of Conservation, 2002, *Marine Reserves Bill: Policy background and key features*, available at <http://www.doc.govt.nz/publications/conservation/marine-and-coastal/marine-protected-areas/review-of-the-marine-reserves-act-1971/>

Environment Canterbury, 2008, *A Biodiversity Strategy for the Canterbury Region*, Environment Canterbury, Christchurch, available at <http://ecan.govt.nz/publications/Pages/biodiversity-strategy.aspx>.

Gordon D, 2012, '*New Zealand's marine biodiversity – extreme, or just normal for a temperate region of the world?*', abstract from keynote address at the joint Australian Marine Sciences Association and New Zealand Marine Sciences Society Conference, 1-5 July 2012, Hobart, Tasmania

Grace R, 2010, *Fish for the Future*, available at http://www.marinenz.org.nz/index.php/the_undersea_world/roger_grace_archive/fish_for_the_future

Hauraki Gulf Forum, 2004, *The Hauraki Gulf State of the Environment Report*, Auckland Regional Council and Environment Waikato, Auckland

Hauraki Gulf Forum, 2010, *Fishing the Gulf: Implementing the Hauraki Gulf Marine Park Act through fisheries management*, Hauraki Gulf Forum, Auckland

Hauraki Gulf Forum, 2011a, *Hauraki Gulf Forum Annual Report 2010-2011*, Hauraki Gulf Forum, Auckland

Hauraki Gulf Forum, 2011b, *Spatial planning for the Gulf: An international review of marine spatial planning initiatives and application to the Hauraki Gulf*, Hauraki Gulf Forum, Auckland

Hersoug B, 2002, *Unfinished business: New Zealand's experience with rights-based fisheries management*, Delft, Uitgeverij Eburon Publishers

Lee M, 2010, *The making of the Hauraki Gulf Marine Park*, address delivered to the Hauraki Gulf Marine Park 10th Anniversary Symposium, available at <http://www.arc.govt.nz/albany/fms/main/Documents/Environment/Coastal%20and%20marine/Mike%20Lee%20speech%20notes%2030%20Mar%202010.pdf>

Ministry for the Environment, 1997, *The state of New Zealand's environment 1997*, Ministry for the Environment, GP Publications, Wellington

Mulcahy K and R Peart, 2012, *Wonders of the Sea: The protection of New Zealand's marine mammals*, Environmental Defence Society, Auckland

Mulcahy K, R Peart and A Bull, 2012, *Safeguarding our oceans, Strengthening marine protection in New Zealand*, Environmental Defence Society, Auckland

NIWA, n.d., *Oceans – Research Projects*, available at <http://www.niwa.co.nz/our-science/aquatic-biodiversity-and-biosecurity/research-projects/>

New Zealand Parliament, n.d., *Legislation, Bills: Marine Reserves Bill*, available at http://www.parliament.nz/en-NZ/PB/Legislation/Bills/9/e/d/00DBHOH_BILL4754_1-Marine-Reserves-Bill.htm

Peart R and K Mulcahy, 2010, *Managing the Marine Environment – An EDS Community Guide*, Environmental Defence Society, Auckland

Peart R, K Serjeant and K Mulcahy, 2011, *Governing our oceans – Environmental reform for the exclusive economic zone*, An EDS Policy Paper, Environmental Defence Society, Auckland

United Nations, 1998, *The United Nations Convention on the Law of the Sea* (A historical perspective), Division for Ocean Affairs and the Law of the Sea, originally prepared for the International Year of the Ocean 1998

United Nations, n.d., *Oceans and Law of the Sea*, available at http://www.un.org/depts/los/convention_agreements/texts/unclos/UNCLOS-TOC.htm

United Nations Environment Programme, n.d., *Introduction to the Convention on Migratory Species*, available at <http://www.cms.int/about/intro.htm>

Endnotes

- 1 <http://www.scribd.com/doc/19789120/Aug-2009-New-Zealands-marine-biodiversity>
- 2 Department of Conservation and Ministry for the Environment, 2000, 55
- 3 Department of Conservation and Ministry for the Environment, 2000, 55
- 4 Hersoug B, 2002, 21
- 5 Department of Conservation and Ministry for the Environment, 2000, 55
- 6 Department of Conservation and Ministry for the Environment, 2000,55
- 7 Gordon D, 2012
- 8 Gordon D, 2012
- 9 <http://www.TeAra.govt.nz/en/coastal-fish/6>
- 10 <http://www.doc.govt.nz/conservation/native-animals/invertebrates/protected-coral/facts/>
- 11 <http://www.doc.govt.nz/conservation/native-animals/invertebrates/protected-coral/facts/>
- 12 Grace R, 2010

- 13 Grace R, 2010
- 14 <http://www.teara.govt.nz/en/marine-invaders/2>
- 15 <http://www.teara.govt.nz/en/marine-invaders/2>
- 16 <http://www.biosecurity.govt.nz/pests/surv-mgmt/mgmt-partnerships>
- 17 <http://www.niwa.co.nz/our-science/aquatic-biodiversity-and-biosecurity/research-projects/>
- 18 <http://www.arc.govt.nz/albany/fms/main/Documents/Environment/Coastal%20and%20marine/Spatialplanforthegulf.pdf>
- 19 <http://www.mfe.govt.nz/issues/biodiversity/fjordland/index.html>
- 20 <http://www.mfe.govt.nz/issues/biodiversity/fjordland/index.html>
- 21 <http://www.fmg.org.nz/>
- 22 <http://www.biosecurity.govt.nz/pests/surv-mgmt/mgmt-partnerships/top-of-the-south>



Estuary (*Raewyn Peart*)

twenty one

Conclusions

New Zealand is in the very fortunate position of possessing indigenous biodiversity that is different to that found anywhere else in the world. This privilege brings with it a responsibility to treasure, care for and protect our unique plants and animals. With the increasing pressures and threats that New Zealand's indigenous biodiversity is facing, in particular from habitat destruction and the damage caused by invasive species, we are at risk of losing many significant natural heritage values which are of much environmental, social, cultural and economic importance.

Indigenous biodiversity management is about more than just threatened species and habitats; it requires the protection of populations, subspecies and ecosystems which include both threatened and non-threatened species and habitats. These span terrestrial, freshwater and marine environments. Effective biodiversity management therefore requires integrated planning and management incorporating catchments and the sea. There are a range management approaches that can be used to conserve and protect indigenous biodiversity, but these need to be tailored for the specific challenges being faced. For example, achieving protection of biodiversity on land will require protection of key habitats as well as proactive and on-going land management through weed and pest control. In contrast, safeguarding biodiversity in the marine area demands controls on both catchment and marine activities.. For less vulnerable areas there is scope for using less prescriptive methods, such as voluntary instruments, to retain some flexibility as well as community and landowner involvement at the local level.

Responsibilities for managing indigenous biodiversity lie with different organisations and the legislation is complex. There are, however, many opportunities for members of the community, landowners and government agencies to jointly work towards the protection of biodiversity in their local area. This EDS publication has identified how this can be achieved so that New Zealand's indigenous biodiversity can be enhanced and treasured.

Index

A

- afforestation of sand dune ecosystems 324–5
- Agreement for the Implementation of the Provisions of UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks 24, 357
- Agreement on the Conservation of Albatrosses and Petrels 22
- agriculture facilitation programmes 252
- agro-chemical use, effects 247–8, 249
- albatross 323
- Antifouling and In-water Cleaning Guidelines 361
- aquaculture 356, 357
- Arawai Kakāriki wetland restoration programme 234–5
- Archey's frog (*Leiopelma archeyi*) 184
- Asian clam (*Potamocorbula amurensis*) 356
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality 71

B

- ballast water discharges 361
- bamboo orchid (*Earina mucronata*) 182
- Banks Peninsular Conservation Trust 194
- Bay of Plenty Coast Care Partnership 133
- Bay of Plenty Environmental Enhancement Fund 131
- Bay of Plenty wild kiwifruit control 135
- beech forests 180–1
- Biodiversity Advice Fund 130, 193
- Biodiversity Condition Fund 130, 193, 231, 246
- biodiversity defined 4
- biodiversity grants 35
- biodiversity offsets 54–6, 105
- Biodiversity Offsets Research Programme 54
- Biosecurity Act 1993 35, 118–21
 - marine ecosystems 361
 - pest management strategies 120–1
 - small-scale management programme 121
- Biosecurity (National Bovine Tuberculosis Pest Management Strategy) Order 1998 120
- Biosecurity New Zealand 35

bird species

- albatross 323
- bellbird 183
- black swan 293
- blackbird 267
- blue duck (whio whio) 292
- blue penguin (kororā) 323, 351
- brown teal (pāteke) 321
- Canadian geese 293
- coots 293
- dotterel (tuturiwhatu) 318
- ducks 268
- estuary ecosystems 321
- fairy tern (tara-iti) 318
- fantail 267
- freshwater ecosystems 292–3
- game birds 245
- Garden Bird Survey 267
- godwit (kūaka) 321,
- grebe 292
- Haast Tokoeka kiwi 203
- herons 292
- house sparrow 267
- indigenous forests 183
- indigenous grasslands 203
- kākā 323
- kereru 183
- kōkako 183
- kororā (blue penguin) 323
- mallard duck 293
- marine ecosystems 351
- mohua 183
- myna 267
- native bird corridors 270, 272
- nectar-feeding birds 323
- oystercatcher (tōrea) 292, 319, 321
- pigeon 268
- pipit (pihoihoi) 203, 319
- productive land 245
- pukeko 268, 292
- rock wren 203
- rocky coast ecosystems 323
- royal albatross 323
- sand dune ecosystems 318–19
- seagulls 268, 292
- shags 292
- silveryeye 183, 267

- stilts 292
- terns 292
- tūi 183, 267, 323
- urban ecosystems 267–8
- waterfowl 292
- wrybill 292
- yellow-eyed penguin (hoiho) 323
- black coral 352
- blue duck (whio whio) 292
- blue penguin (kororā) 323, 351
- bogs 221
- Bonn Convention 21–2
- border control and surveillance 35, 118–21
- brown teal (pāteke) 321
- burn-offs, effect
 - indigenous grasslands 205–6, 209
- Business and Biodiversity Offsets Programme 55

C

- CITES Management Authority 21
- cabbage trees (tī kōuka) (*Cordyline*) 321
- Cauleroa taxifolia* (marine aquarium weed) 356
- Canterbury Region, Biodiversity Strategy 126–7
- carbon credits
 - carbon forestry schemes 193
 - New Zealand Emissions Trading Scheme 193
 - sequestration of tussock ecosystem 212
- Care for our Coast programme 339
- caves and underground streams 223
- Chinese mitten crab (*Eriocheir sinensis*) 355
- climate change 8–9, 189
 - coastal ecosystems 249
- coast care groups 133
- coastal ecosystems 315–46, 372
 - see also* estuary ecosystems; sand dune ecosystems
 - best practice recommendations 343
 - biodiversity strategies 337–8
 - case studies 341–2
 - climate change 332
 - community care groups 339–40
 - district plans 335, 343
 - education and awareness 338–9
 - flora and fauna 316–24
 - funding initiatives 340
 - Habitat Protection Fund 340

- Horizons One Plan 337
- integrated coastal management 338
- management plans 34, 39, 336–7
- marine activities 331
- marine mammals 323
- New Zealand Coastal Policy Statement 2010 (NZCPS 2010) 34, 45, 48, 61–76, 334
- non-regulatory management approaches 336–42
- oil spills 331
- overharvesting fish and shellfish 331
- recreational activities 331, 333
- regional plans 50–1, 335, 343
- regulatory management approaches 334–6
- threats 11, 324–34, 333
- urban development 330, 333
- Uretara Estuary Managers 342
- Yellow-Eyed Penguin Trust 341
- commercial marine mammal tourism 114
- Community Environment Fund 35, 130
- community environmental monitoring programmes 135–6
- Community Organisation Grant Scheme 130
- community restoration projects
 - coastal ecosystems 339–40
 - urban ecosystems 280–1, 284
- conditional resource consents 53–4
- conifer-broadleaved forest 180–1
- Conservation Act 1987 90, 91, 92–4
 - concessions 93–4, 172, 173
- Conservation innovation Fund 130
- conservation lots 53, 250
- conservation management strategies 34, 93
- public involvement opportunities 164–5, 167
- contaminated run-off
 - urban ecosystems 273, 274
 - wetlands 224
- Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) 19–21
- Convention for the Conservation of Antarctic Marine Living Resources 25
- Convention on Biological Diversity 1992 4, 16, 22, 25, 357, 372
- Conference of the Parties 23
- valuation of diversity 7

- Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) 21, 114
- Convention on Migratory Species of Wild Animals (Bonn Convention) 21–2
- Convention on Wetlands of International Importance (Ramsar Convention) 18–19
 - review 19
- covenants
 - habitats on private land 102–3
 - land or conservation covenants 101, 102, 129
 - open space covenants 38, 102–3
- Crown-owned conservation land 33, 92–4, 96
- Crown-owned pastoral land 36, 96–8
 - Crown leasehold approach 97–8
 - public involvement opportunities, 172, 173
 - tenure review proposals 172, 173
- Crown Pastoral Land Act 1998 90, 96–8

D

- declarations and enforcement orders 175
- Department of Conservation, 32, 33–4
 - NZ specific threat classification system 27–8
- discharge permits 39
- district plans 40, 51–2, 85
 - coastal ecosystems 335, 343
 - conditional resource consents 53–4
 - conservation lots 53
 - freshwater ecosystem management 303–4
 - green infrastructure 278–9
 - identifying significant indigenous vegetation and habitats 45–6, 52–3
 - indigenous forest management 191
 - indigenous grasslands management 210
 - public involvement opportunities 174
 - tree protection rules 276–7
 - urban ecosystems 275–6
 - wetland management 228–9
- dolphins 350, 354
- domestic predators 269
- dotterel (tuturiwhatu) 318
- dredging and trawling activities 359
- Dune Restoration Trust of New Zealand 339

E

- Earth Summit 1992 4, 22
- Earth Summit 2012 5, 23
- ecosystem services 6
 - estuary ecosystems 320
 - freshwater ecosystems 294
 - indigenous forests 184
 - indigenous grasslands 202
 - productive land 244, 253–4
 - wetlands 220, 223
- ecosystems, key components 4
- eco-tourism or sports activities 93–4, 95
 - conservation concessions 93–4, 172, 173
- education and awareness programmes 127
 - “Backyard buffers” initiative 338
 - Care for our Coast programme 339
 - coastal ecosystems 338–9
 - Dune Restoration Trust of New Zealand 339
 - Environmental Education Action Fund 130
 - freshwater ecosystems 305–6, 309
 - native forest restoration 192
 - native grasslands restoration 213
 - Northlands Coast and Us” 338–9
 - “Rivers and Us” school programme 305
 - Sir Peter Blake Trust 339
 - “Stream Sense” school programme 305
 - urban ecosystems 280, 284
 - weed management education 127
 - wetland restoration 230
- elephant seal 324
- emissions trading scheme management 36
- endemic species protection 5
- enforcement orders 175
- Environment Canterbury Annual Plan 87
- Environmental Education Action Fund 130
- environmental management reforms 5
- Environmental Protection Authority 33, 36, 122
 - Māori Advisory Committee 122
- Environmental Protection Authority Act 2011 122
- environmental standards 48–9
- ephemeral (temporary) wetlands 223
- epiphytic plants 182
 - bamboo orchid (*Earina mucronata*) 182
 - perching lily (*Collospermum hastatum*) 182
- esplanade reserves or strips 94, 104–5

estuary ecosystems 320–2, 327–9, 332–46, 372
see also coastal ecosystems
 agricultural, industrial or urban runoff 329–40
 bird species 321
 coastal development and reclamation 327–8, 333
 essential ecosystem services 320
 fish and invertebrates 322
 invasive species 328, 333
 mangroves 320
 plant species 320–1
 sedimentation 329, 333
 threats 327–30, 333

Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 360–1

exclusive economic zone management 36, 360, 365
 shipping and marine pollution 37

exports of endangered species 21, 114

F

fairy tern (*tara-iti*) 318

farm forestry plantations 244

fens 221

feral animals 207

Fiordland Marine Guardians 363

Fiordland Marine Biosecurity Programme 122–3

fire and burn-offs *see* burn-offs, effect

fish and shellfish species
 bullies 292
 crayfish, freshwater 292
 eels 224, 268, 353–4, 356
 estuary ecosystems 322
 freshwater ecosystems 292
 galaxiids 292, 294
 grayling 294
 kina 354
 lamphrey 292
 marine ecosystems 352
 salmon 292, 297
 smelt 292
 trout 292, 297
 urban ecosystems 268
 wetlands 224
 whitebait 224, 268, 353–4, 356

Fisheries Act 1996 91, 99, 113, 359, 365

Māori perspectives and values 149–50

Fisheries (Kaimoana Customary Fishing) Regulations 1998 150

fisheries management 35, 99
 bottom trawling and dredging 354, 359
 customary fishing 150
 establishment of taiāpure and temporary closures 149
 fish migration, barriers 224, 327
 kina barrens 354
 Māori perspectives and values 149–50
 marine mammals protection 112–14, 169, 170
 mātaihai reserves 150
 maximum sustainable yield, defined 353
 population management plans 112, 113
 public involvement opportunities 165–6, 167, 169, 170
 quota management system 353
 seabed habitat destruction 354
 sustainability measures 169, 170
 “trophic cascade” effect 354
 utilisation defined 99

Fisheries (South Island Customary Fishing) Regulations 1999 150

flax (*Phormium tenax*) 321

flora and fauna
see also plant species
 coastal ecosystems 316–24
 estuary ecosystems 320–2
 freshwater ecosystems 291–4
 indigenous forests 180–4
 indigenous grasslands 201–4
 productive land 243–5
 rocky coast ecosystems 322–4
 sand dune ecosystems 316–19
 urban ecosystems 267–9
 wetlands 221–2

Forest Heritage Fund *see* Nature Heritage Fund

forestry management 35, 179–97

Forests Act 1949 91, 106

forums 128

fragmentation *see* habitat loss and fragmentation

freshwater ecosystems 289–313, 372
 agricultural, industrial or urban runoff 296
 anoxic (dead) bodies of water 295
 best practice recommendations 309

- bird species 292–3
- Canterbury Water Management Strategy 306–7
- case studies 306–8
- clearance of riparian habitat 295, 300
- crayfish 292
- damming of habitats 297–8, 300
- deteriorating water quality 295, 300
- didymo 297
- discharge permits 304, 303
- district plans 303–4
- diversion of braided rivers 298, 300
- education and awareness 305–6, 309
- essential ecosystem services 294
- excessive plant growth (eutrophication) 295
- fish species 292
- freshwater bodies, types 291
- gravel extraction 298, 300
- groundwater biota 294
- integrated catchment management plans 305
- introduced species 297, 300
- invasive species 297, 300
- invertebrates and insects 291–2
- National Policy Statement for Freshwater Management 19, 48, 60–1, 228, 301, 302
- New Zealand grayling 294, 295
- non-regulatory management approaches 305–8
- outstanding freshwater bodies defined 60
- overallocation defined 60
- piping, culverts and bridges 299, 300
- plant species 293–4
- predatory invertebrates 291
- Project River Recovery 308
- recovery plans 305
- regional plans 302–3
- regulatory management approaches 301–4
- resource consents 304, 309
- “Rivers and Us” school programme 305
- RMA plans 302–3, 309
- role of iwi and hapū 60
- sedimentation 296, 300
- “Stream Sense” school programme 305
- threats 10, 294–300
- water conservation orders 302

frogs 184

- Archeys’ frog (*Leiopelma archeyi*) 184
- Hochstetter’s frog 290
- funding programmes *see* grants
- fur seals 323, 351, 354

G

- game birds 245
- Garden Bird Survey 267
- gas exploration *see* oil and gas exploration
- geckos 184, 323
- genetic engineering 36, 118, 122
- geothermal wetlands 221–2
- grants, 35, 130
 - Biodiversity Advice Fund 130, 193
 - Biodiversity Condition Fund 130, 193, 231, 246
 - central government funding 130, 252
 - Community Environment Fund 35, 130
 - Community Organisation Grant Scheme 130
 - Conservation innovation Fund 130
 - Environmental Education Action Fund 130
 - Habitat Protection Fund 340
 - indigenous forest protection funding 193
 - indigenous grasslands protection funding 211
 - local government funding 130, 231, 252
 - Lottery Environment and Heritage Fund 130
 - Māori contestable funds 153
 - Mātauranga Kura Taiao Fund 130, 153
 - Nature Heritage Fund 130, 193
 - New Zealand Emissions Trading Scheme 193
 - New Zealand Habitat Protection Fund 130
 - Ngāi Whenua Rahui Fund 130, 146, 153, 193
 - open space grants 38
 - Permanent Forest Sink Initiative 193
 - productive land management 252
 - QE II National Trust 102–3, 193
 - Sustainable Farming Fund 130, 212
 - wetland restoration projects 231
 - wilding pines management 210–11
 - World Wildlife Fund 340
- grazing *see* pastoral farming, effects
- green infrastructure 278–9, 284
- green roof tops 278–9

rain gardens, tree pits and planter boxes 279
Greening Waipara Project 257–8
groundsell (*Senecio lautus*) 323
groundwater biota 294

H

habitat loss and fragmentation 8
 estuary ecosystems 327–8
 indigenous forest habitats 187–8, 189
 marine ecosystems 354
 sand dune ecosystems 324–5
 urban ecosystems 269–70, 274
habitat mapping 28
 ocean seabed mapping 362
habitats in marine area
 legislative framework 91, 98–100
habitats on Crown-owned land
 legislative framework 90, 92–8
habitats on private land
 covenants 102–3
 legislative framework 91, 101–3
 logging activities 106, 190
 rates relief 103
 voluntary protection 101
harbour care groups 133
Hazardous Substances and New Organisms Act 1996 36, 122
 Treaty of Waitangi principles 122
hazardous substances and new organisms management 36, 122
 public involvement opportunities 172, 173
 voluntary partnerships and initiatives 122–3
hebe (*Leonohebe cupressoides*) 202
Hector's tree daisy (*Olearia hectori*) 202
high country land management 36, 96–8
hoiho (yellow-eyed penguin) 323
Horizons "One Plan" 276, 337

I

impervious urban surfaces 272, 274
Import Health Standard for Vessel Biofouling 361
imports
 endangered species 21, 114
 hazardous substances and new organisms 122, 172, 173

national surveillance programmes 119, 120
public involvement opportunities 169, 170, 172, 173
unwanted organisms or risk goods 119–20
indigenous biodiversity 4–12, 372
 contribution to global diversity 6
 current threats 7–12
 environmental management reforms 5
 evolution in isolation 4–5
 legacy of loss 5
 valuation 6–7
indigenous forests 179–97, 372
 activity rules and consent conditions 191, 195
 Banks Peninsular Conservation Trust 194
 beech (*Nothofagus*) forest 180–1
 best practice recommendations 195
 bird species 183
 carbon forestry schemes 193
 case studies 193–4
 climate change 189
 community organisations 191–2
 conifer-broadleaved forest 180–1
 education and awareness 192, 195
 epiphytic plants 182
 essential ecosystem services 184
 financial incentives 193
 forest clearance, effects 185
 forest processes 180
 fragmentation of forest habitats 187–8, 189
 invasive animal and weed pests 185–7, 189
 invertebrates 183
 kauri dieback (*Phytophthora* taxon Agathis) 187
 livestock browsing and trampling 186
 logging on private land 190
 mammalian pests 185–6
 non-regulatory management approaches 191–4
 plant pathogens 187, 189
 pollination and seed dispersal 183
 regulatory management approaches 190–1
 replanting guides 192
 RMA plans 190, 195
 significant areas protection 190

- threats 9, 184–9
- trees and other flora types 180–2
- voluntary land covenants 193, 195
- Wairere Farm bush protection 193
- weed pests 186–7
- indigenous grasslands 199–218, 372
 - best practice recommendations 215
 - bird species 203
 - carbon sequestration 212
 - case studies 213–14
 - coverage changes 205
 - burn offs and regeneration 205–6, 209
 - exotic pasture grasses 208
 - feral animals 207
 - Grand and Otago skinks 203
 - Haast Tokoeka kiwi 203
 - incorporation into public conservation land 211–12, 215
 - invasive mammals 207, 209
 - invasive plants 208, 209
 - invertebrates 204
 - lizards 203
 - native plants and grasses 202
 - New Zealand Wilding Conifer Management Group 214
 - non-regulatory management approaches 210–14
 - pastoral farming effects 206–6, 209
 - pollination and seed dispersal 203
 - regulatory management approaches 209–10
 - reptiles 203
 - resource consents 209–10, 215
 - RMA plans 209–10, 215
 - short tussock grasslands 201
 - tall tussock grasslands 201
 - Tekapo Scientific Reserve 213
 - threats 9, 205–9
 - tussock grassland types 201
 - voluntary land covenants 211, 215
 - wilding pine management 208, 210–11, 215
- integrated catchment management plans 305
- international policy framework 17–25
 - Agreement for the Implementation of the Provisions of UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks 24, 357
 - Agreement on the Conservation of Albatrosses and Petrels 22
 - Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) 19–21
 - Convention for the Conservation of Antarctic Marine Living Resources 25
 - Convention on Biological Diversity 4, 16, 22–3, 25, 357, 372
 - Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) 21, 114
 - Convention on Migratory Species of Wild Animals (Bonn Convention) 21–2
 - Convention on the Law of the Sea (UNCLOS) 23–4, 357
 - Convention on Wetlands of International Importance (Ramsar Convention) 18–19
- International Union for Conservation of Nature (IUCN)
 - Red Data List threat classification system 27–8
- invasive species, colonisation 8–12
 - Asian clam (*Potamocorbula amurensis*) 356
 - Caulerpa taxifolia* (marine aquarium weed) 356
 - Chinese mitten crab (*Eriocheir sinensis*) 355
 - estuary ecosystems 328, 333
 - freshwater ecosystems 297
 - indigenous forests 185–7, 189
 - indigenous grasslands 207–8, 209
 - marine ecosystems 355, 356
 - Mediterranean fanworm (*Sabella spallanzanii*) 355
 - Northern Pacific seastar (*Asterias amurensis*) 355
 - productive land 246–7, 249
 - sand dune ecosystems 325–6, 333
 - wetlands 225–6, 227
- invertebrates and insects
 - bees and other pollinators 245
 - black coral 352
 - bugs 204, 291–2
 - centipedes 204
 - chitins 322
 - coral 352
 - earthworms 204

estuary ecosystems 322
 flies 204, 291–2
 freshwater ecosystems 291–2
 freshwater macroinvertebrates 269
 freshwater snails 292
 freshwater worms 292
 grasshoppers 204
 indigenous forests 183
 indigenous grasslands 204
 jellyfish 352
 katipō 319, 326
Kiwaia jeanae (native moth) 319
Kupea electilis (native moth) 319
 limpets 322
 marine ecosystems 352
 midges 204, 291–2
 molluscs 322
 mosquitoes 292
Notoreas moths 319
 pond skaters 292
 productive land 244–5
 sand dune ecosystems 319
 sand scarab (*Pericoptus frontalis*) 319
 sea anemones 352
 seashore earwig (*Anisobasis littorea*) 319
 shredders, browsers and filterers 291
 slugs and snails 204
 tussock weevils 204
 iwi and hapū management plans 33, 40, 151

J

judicial review of decisions 175

K

kahikatea (*Dacrycarpus dacrydioides*) 321
 Kaipara Harbour seagrass meadows 66
 karaka (*Corynocarpus laevigatus*) 323
 katipō 319, 326
 kauri dieback (*Phytophthora* taxon *Agathis*) 187
 kina barrens 354
 kiwi, Haast Tokoeka kiwi 203
 kiwifruit industry and biodiversity 326
 kohekohe (*Dysoxylum spectabile*) 323
 kōkako 183
 kororā (blue penguin) 323
 Kowhai Farm biodiversity outcome reporting 254, 255, 257
 kowhai (*Sophora tetraptera*) 323

Kōwhangatarā (*Spinifex sericeus*) 317
 Key Native Ecosystems Programme 132

L

lacustrine wetlands 222
 Lakeland Farm wetland restoration 232–3
 land care groups 35, 127, 252–3
 land covenants *see* voluntary land covenants
 Land Information New Zealand 32, 36
 land subdivision use and development 40, 51–2
 changes in sediment regimes 72–4
 coastal development and reclamation 327–8
 coastal ecosystems 330
 conservation lots 53
 estuary ecosystems 327–8
 land or conservation covenants 101, 102, 129
 sand dune ecosystems 326–7
 legislative framework, habitat protection 89–108
 Biosecurity Act 1993 35, 118–21
 Conservation Act 1987 90, 91, 92–4, 101
 Crown Pastoral Land Act 1998 90, 96–8
 Fisheries Act 1996 91, 99
 Forests Act 1949 91, 106
 habitats in marine area 91, 98–100
 habitats on Crown-owned land 90, 92–8
 habitats on private land 91, 101–3
 Hazardous Substances and New Organisms Act 1996 36, 122
 Local Government (Rating) Act 2002 91, 103
 Marine Reserves Act 1971 91, 98–9
 National Parks Act 1980 90, 94–5
 Overseas Investment Act 2005 91, 106
 Queen Elizabeth II National Trust Act 1977 91, 102–3
 Reserves Act 1977 90, 91, 95–6, 101, 102
 Resource Management Act 41–57, 91, 103–5
 legislative framework, species protection 109–15
 Biosecurity Act 1993 35, 118–21
 Fisheries Act 1996 113–14
 Hazardous Substances and New Organisms Act 1996 36, 122

- Marine Mammals Protection Act 1978 109, 112–14
 - Marine Mammals Protection Regulations 114
 - Native Plants Protection Act 1934 109, 115
 - Trade in Endangered Species Act 1989 109, 114
 - Wildlife Act 1953 109, 110–12
 - List of World Heritage in Danger 21
 - livestock grazing practices
 - indigenous forests 186
 - indigenous grasslands 207
 - productive land 248, 249
 - sand dune ecosystems 326
 - wetlands 224
 - lizards
 - see also* skinks
 - indigenous forests 184
 - indigenous grasslands 203
 - sand dune ecosystems 319
 - tuatara (*Sphenodontia*) 184
 - local government plans *see also* district plans; regional plans
 - annual plans 86–7
 - criteria 80–1
 - long-term council community plans 86–7
 - public involvement opportunities 164, 167
 - regional coastal plans 83–4
 - regional policy statements 81–2
 - Local Government (Rating) Act 2002 91, 103
 - logging activities 106, 190
 - Long Term Council Community Plans (LTCCPs) 86–7
 - Lottery Environment and Heritage Fund 130
- M**
- mainland islands 281
 - management agencies and ministers 31–40, 372
 - Department of Conservation 33–4
 - Environmental Protection Authority 36
 - iwi and hapū 40
 - Land Information New Zealand 36
 - Maritime New Zealand 37
 - Ministry for Primary Industries 35–6
 - Ministry for the Environment 34–5
 - Queen Elizabeth II National Trust 38
 - regional councils 39
 - territorial authorities 40
 - mangroves (*Avicennia marina*) 320, 327
 - Māori Advisory Committee
 - hazardous substances and new organisms advice 122
 - Māori perspectives and values 40, 139–59
 - and Fisheries Act 1996 149–50
 - and New Zealand Biodiversity Strategy 147–8
 - and NZCPS 2010 148–9
 - and Resource Management Act 1991 148–9
 - best practice recommendations 155–6
 - case studies 154–5
 - collaborative research projects 153–5
 - co-management arrangements 151–2
 - contestable funds 153
 - customary fishing 150
 - funding 153
 - iwi and hapū management plans 151
 - kaitiakitanga and biodiversity 143
 - kaitiakitanga defined 47
 - key issues 144–6
 - Mana and biodiversity 142
 - management approaches and responses 147–53
 - management-partnership conflicts 146
 - Manawhenua and biodiversity 143
 - Mangaroa/Ototo Trust 154
 - Māori story of creation 140
 - Māori-owned land and biodiversity decline 144
 - marine biodiversity and Kaimoana 144–5
 - mātaihai reserves 150
 - Mātauranga Kura Taiao Fund 130, 153
 - Mauri and biodiversity 142
 - natural environment and Māori identity 140
 - Ngāi Tahu natural resource management 154
 - Ngāi Whenua Rāhui Fund 146, 153
 - Polynesian settlement 141
 - Rāhui, tapu and biodiversity 143
 - taiapure and temporary closing of fishing grounds 149
 - traditional biodiversity knowledge 145
 - WAI 262 claim 145
 - women, whenua and biodiversity 142
 - marginal strips 94, 104–5
 - marine ecosystems 347–69, 372

- agriculture and industrial runoff 356
- Antifouling and In-water Cleaning Guidelines 361
- aquaculture 356, 357
- ballast water discharges 361
- best practice recommendations 365
- bird species 351
- bottom trawling and dredging 354, 359
- coastal and marine classification system 359
- effect of fishing activities on marine life 354
- Fiordland Marine Guardians 363
- fish species 352
- fishing activities 356
- Import Health Standard for Vessel Biofouling 361
- international agreements 357
- invasive species 355–6, 356
- invertebrates 352
- kina barrens 354
- legislative framework 358–61
- marine habitats 349–50, 354
- marine mammal species 350–1
- marine spatial planning 362, 365
- marine transportation 356, 357
- maximum sustainable yield, defined 353
- mineral exploitation 356, 357
- non-regulatory management approaches 361–4
- ocean seabed mapping 362
- oil and gas exploration 356, 357
- pollution 356
- quota management system 353
- regional coastal plans 360
- regional partnerships 361–2
- regulatory management approaches 357–61
- seabed habitat destruction 354
- shipping and marine pollution 37
- STOMP (Stop the Spread of Marine Pests) 362
- submarine canyons 362
- threats 11, 353–7
- Top of the South Marine Biosecurity Partnership 364
- “trophic cascade” effect 354
- Marine Mammals Protection Act 1978 110, 112–14, 358
 - defences for offending 112
- Marine Mammals Protection Regulations 114
 - public involvement opportunities 172, 173
- marine mammals sanctuaries 113–14, 365
 - public involvement opportunities 169, 170
- marine mammals species 350–1
 - dolphin 350, 354
 - elephant seal 324
 - fur seals 323, 351, 354
 - pinnipeds 323–4, 351, 354
 - sea lion 324, 354
 - whales 350
- marine oil spill response strategy 37
- Marine protected areas: classification, protection standard and implementation guidelines 359
- Marine Protected Areas Policy and Implementation Plan (MPA Policy) 91, 100, 359
- Marine Protection Planning Forums 100
- marine protection rules
 - public involvement opportunities 169, 170
- marine reserves 35, 98–9
 - legislative framework 358, 359
 - marine spatial planning 362, 365
 - public involvement opportunities 168, 170
- Marine Reserves Act 1971 91, 98–9, 365
- marine transportation 356, 357
- Maritime New Zealand 33, 37
- marram grass (*Ammophila arenaria*) 325
- Mātauranga Kura Taiao Fund 130, 153
- Mediterranean fanworm (*Sabella spallanzanii*) 355
- mineral exploitation 356, 357
- Ministry for Primary Industries 32, 35–6
- Ministry for the Environment 32, 34–5
 - biodiversity grants 35
- mistletoes
 - native mistletoes (*Peraxilla*) 202
 - parasitic mistletoe (*Tupeia antarctica*) 202
- morse-code leatherjacket 352
- mosses 181, 293–4
 - Epipterygium opararensense* 181
- Muddy Feet Project 136

N

- National Environmental Standard on Ecological Flows and Water Levels 19, 48–9
- national environmental standards 48–9
 - public involvement opportunities 168, 170
- national implementation tools 27–8
 - habitat mapping 28
 - threat classification systems 27–8
- National Parks Act 1980 90, 94–5
- national pest management strategy 120–1
 - implementation of strategies 121
 - reporting requirements 121
- national policy documents 25–7, 59–77
- National Policy Statement for Freshwater Management 19, 48, 60–1, 228, 301, 302
- National Policy Statement on Indigenous Biodiversity 8, 47, 54–5
 - management of native forest remnants 190
- National Wetland Trust of New Zealand 230
- native bird corridors 270, 272
- native forest restoration planning 192
- Native Plants Protection Act 1934 115
- natural resources defined 33
- Nature Heritage Fund 130, 193
- nectar-feeding birds 323
- new organisms management 36
 - public involvement opportunities 172, 173
- New Zealand Biodiversity Strategy 2000 6, 8, 25–6
 - Māori perspective and values 147–8
 - review 26, 146, 247, 250, 294
- New Zealand Coastal Policy Statement 2010 (NZCPS 2010) 34, 45, 48, 61–76, 334
 - coastal environment defined 63
 - effect defined 70
 - extent of the coastal environment 62–3
 - improving coastal water quality 70–2
 - key concepts and terms 64–5
 - maintaining or enhancing natural biological processes 65–6
 - maintaining or enhancing natural physical processes 67
 - management of native forest remnants 190
 - Māori perspective and values 148–9
 - objectives 64
 - practicable defined 75
 - protecting indigenous biological diversity 69–70
 - protecting representative or significant natural ecosystems and sites of biological importance 68–9
 - protection defined 68
 - reducing sedimentation effects 72–4
 - restoring natural character 74–6
 - Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land 26–7
- New Zealand Conservation Authority 34
- New Zealand Emissions Trading Scheme 193, 212
- New Zealand grayling 294, 295
- New Zealand Habitat Protection Fund 130
- New Zealand Landcare Trust 35, 127, 133, 191–2, 253, 305
- New Zealand Large Galaxiid Recovery Plan 305
- New Zealand Native Forests Restoration Trust 192
- New Zealand Plant Conservation Network 192
- New Zealand Wilding Conifer Management Group 210–11, 214
- Ngāi Tahu natural resource management 154
- Ngāi Tahu Murihiku Natural Resource and Environmental Iwi Management Plan 2008 151
- Ngāi Whenua Rahui Fund 130, 146, 153, 193
- nival (snow-derived) wetlands 223
- non-regulatory tools *see* voluntary tools
- Northern Pacific seastar (*Asterias amurensis*) 355–6
- Northland Regional Council Environment Fund 132

O

- ocean seabed mapping 362
- Ocean Survey 20/20 362
- oceans *see* marine ecosystems
- offshore dumping permits
 - public involvement opportunities 171–2, 173
- oil and gas exploration 356, 357
- oil spills 331

- marine oil spill response strategy 37
- open space protection
 - covenants 38, 102–3
 - grants 38
 - open space defined 38
- organic produce 256
- overharvesting fish and shellfish 331
- Overseas Investment Act 2005 91
 - overseas investment in sensitive land 106

P

- pastoral farming, effects 206–7, 209
- penguins 323, 351
- perching lily (*Collospermum hastatum*) 182
- Permanent Forest Sink Initiative 193
- pest management 39, 134–5
 - implementation of strategies 121
 - joint partnerships and initiatives 122–3
 - national pest management strategy 120–1
 - productive land 251
 - public involvement opportunities 166, 167
 - regional pest management strategy 121
 - small-scale management programme 121
- pinnipeds 323–4, 351, 354
- plant species
 - see also flora and fauna
 - algae 293–4
 - Apodasmia similis* 317–18
 - bamboo orchid (*Earina mucronata*) 182
 - beech forests 180–1
 - cabbage trees (tī kōuka) (*Cordyline*) 321
 - conifer-broadleaved forest 180–1
 - Cook's scurvy grass (*Lepidium oleraceum*) 323
 - coprosma (*Coprosma acerosa*) 317
 - cottonwood (*Ozothamnus leptophyllus*) 317
 - epiphytic plants 182
 - Epipterygium opararensis* 181
 - ferns 182, 293–4
 - flax (*Phormium tenax*) 321
 - fungi 181–2, 293–4
 - groundsell (*Senecio lautus*) 323
 - Gunnera arenaria* 317
 - hawkweeds (*Hieracium spp*) 208
 - hebe (*Leonohebe cupressoides*) 202
 - Hector's tree daisy (*Olearia hectori*) 202
 - hornwort 181–2, 293–4
 - horokaka (*Disphyma australe*) 323

- ice plant (*Disphyma australe*) 323
- kahikatea (*Dacrycarpus dacrydioides*) 321
- karaka (*Corynocarpus laevigatus*) 323
- karo (*Pittosporum crassifolium*) 323
- kauri dieback (*Phytophthora* taxon Agathis) 187
- kohekohe (*Dysoxylum spectabile*) 323
- kowhai (*Sophora tetraptera*) 323
- Kōwhangatare (*Spinifex sericeus*) 317
- lianes (climbing plants) 182
- lichens 182, 322
- liverworts 181–2, 293–4
- mākaka (*Plagianthus divaricatus*) 320
- mangroves (*Avicennia marina*) 320, 327
- marram grass (*Ammophila arenaria*) 325
- mosses 181293–4
- native mistletoes (*Peraxilla*) 202
- oioi (*Apodasmia similis*) 320
- parasitic mistletoe (*Tupeia antarctica*) 202
- peppergrass (*Lepidium banksii*) 323
- perching lily (*Collospermum hastatum*) 182
- pōhuetue (*Muehlenbeckia complexa*) 317
- pohutukawa (*Metrosideros excelsa*) 321
- ponga (silver fern) 182
- pūriri (*Vitex lucens*) 323
- rauhini (*Ozothamnus leptophyllus*) 317
- raupō (*Typha orientalis*) 321
- saltmarsh ribbonwood (*Plagianthus divaricatus*) 320
- sand coprosma (*Coprosma acerosa*) 317
- sand tussock (*Austrofestuca littoralis*) 317
- sea rush wīwī (*Juncus kraussii*) 320
- sedge pīngao (*Desmoschoenus spiralis*) 317
- southern rātā (*Metersideros umbellata*) 323
- tree Lucerne 271
- water cress (*Rorippa divaricate*) 323
- plutonic wetlands 223
- pohutukawa (*Metrosideros excelsa*) 321
- policy framework 15–30
 - international conventions 17–25
 - national implementation tools 27–8
 - national policy documents 25–7
- pollination and seed dispersal
 - bees and other pollinators 245
 - indigenous forests 183
 - indigenous grasslands 203
 - urban ecosystems 267, 269, 272
- ponga, silver fern (*Cyathea dealbata*) 182

- population management plans
 - public involvement opportunities 166, 167
 - possums 271
 - private land *see* habitats on private land
 - productive land ecosystems 241–63, 372
 - agriculture facilitation programmes 252
 - agro-chemical use, effects 247–8, 249
 - bees and other pollinators 245
 - beneficial insects 245
 - best practice recommendations 259
 - biological control of insect pests 253, 258
 - bird species 245
 - case studies 257–8
 - climate changes 249
 - conservation lots 250
 - demands for organic produce 256
 - developing indicators for farmland biodiversity 255–6
 - diversity of life on productive land 243–5
 - essential ecosystem services 244, 253–4
 - expansion and intensification of agriculture 245–6, 249
 - farm forestry plantations 244
 - financial incentive programmes 252
 - game birds 245
 - Greening Waipara Project 257–8
 - incorporating biodiversity into land management 253–5, 259
 - insect pests 245
 - invasive species 246–7, 249
 - invertebrates 244–5
 - Kowhai Farm biodiversity outcome reporting 254, 255, 257
 - land care groups 252–3
 - livestock grazing practices 248, 249
 - non-regulatory management approaches 251–8
 - pest management strategies 251
 - plant species 244
 - planting shelterbelts 254, 255
 - rates relief 251
 - regulatory management approaches 249–51
 - resource consents 250
 - RMA plans 250, 259
 - threats 9–10, 245–9
 - tree species 244
 - unsustainable logging practices 246
 - value of biodiversity 243
 - voluntary land covenants 251
 - protection procedures 42–3
 - voluntary methods 43, 53
 - public conservation land
 - incorporation of grasslands 211
 - public involvement opportunities 161–76
 - conservation concessions 172, 173
 - conservation strategies and plans 164–5, 167
 - declarations and enforcement orders 175
 - fisheries management plans 165–6, 167
 - fisheries sustainability measures 169
 - import health standards 169
 - individual proposals 171–3
 - judicial review 175
 - Local Government Act plans 164, 167
 - marine mammals permits 172, 173
 - marine mammals sanctuaries 169
 - marine protection rules 169
 - marine reserves 168
 - national environmental standards 168
 - new organisms permits 172, 173
 - offshore dumping permits 171–2, 173
 - pest management strategies 166, 167
 - policies and plans 163–7
 - population management plans 166, 167
 - preliminary tenure review proposals 172, 173
 - private plan changes 174
 - publicly-initiated processes 174–5
 - reporting offences 174–5
 - reserve management plans 165, 167
 - resource consents 171, 173
 - Resource Management Act plans 163–4, 166
 - rules and regulations 168–70
 - pūriri (*Vitex lucens*) 323
- Q**
- Queen Elizabeth II National Trust 33, 38
 - habitats on private land 102–3, 193
 - open space grants 38, 102–3
 - voluntary land covenants 211
 - Queen Elizabeth II National Trust Act 1977 91, 102–3
- R**
- rain gardens 279
 - Ramsar Convention 18–19

- rātā (*Meterosideros umbellata*) 323
- rates relief
 - habitats on private land 103, 251
- rauhini (*Ozothamnus leptophyllus*) 317
- raupō (*Typha orientalis*) 321
- reclamation and coastal development 327–8
- recovery plans 305
- recreational and sporting activities
 - conservation concessions 93–4, 172, 173
 - estuary ecosystems, threats to 327–8, 333
 - rocky coast ecosystems 331, 333
 - sand dune ecosystems 326–7, 333
 - wetlands, threats to 224
- Red Data List threat classification system
- regional coastal plans 83–4
 - coastal ecosystems 335, 343
 - marine ecosystems 359–60, 365
- regional councils 33, 39
 - annual plans 86–7
 - green infrastructure 278–9
 - long-term council community plans (LTCCPs) 86–7
 - national environmental standards 48–9
 - regional parks management 39
 - regional policy statements 50, 81
 - strategies and action plans 126
- regional pest management strategy 121
 - implementation of strategies 121
 - reporting requirements 121
 - small-scale management programme 121
- regional plans 50–1, 82–3, 126
 - conditional resource consents 53–4
 - freshwater ecosystems 302–3
 - identifying significant indigenous vegetation and habitats 45–6, 52–3
 - indigenous forest management 191
 - public involvement opportunities 174
 - urban ecosystems 275–6
 - wetland management 228
- reporting offences 174–5
 - declarations and enforcement orders 175
- reptiles 184
 - see also* frogs; geckos; lizards; skinks
- research programmes
 - Māori collaborative research projects 153–5
- reserve management plans
 - public involvement opportunities 165, 167
- Reserves Act 1977 90, 91, 95–6
 - conservation covenants 101, 102, 129
 - classification of reserves 96
 - residual adverse biodiversity impacts 54–6
- resource consents 53–4, 105
 - coastal ecosystems 335–6, 343
 - development contributions 105
 - discharge permits 304
 - environmental compensation 105
 - financial contributions 105, 276
 - freshwater ecosystems 304, 309
 - indigenous forest management 191
 - indigenous grasslands management 210
 - productive land management 250
 - public involvement opportunities 171, 173
 - urban ecosystem management 276, 283
 - wetland management 229, 236
- Resource Management Act 1991 41–57, 91
 - biodiversity offsetting 54–6, 105
 - biological diversity defined 42
 - conservation lots 53
 - district plans 51–2, 85–6, 210, 303–4
 - esplanade reserves and strips 104–5
 - identifying significant indigenous vegetation and habitats 45–6, 52–3, 190
 - intrinsic values defined 47
 - kaitiakitanga defined 47
 - management of native forest remnants 190
 - Māori perspective and values 148–9
 - matters for consideration 46–7
 - matters of national importance 44–6
 - national environmental standards 48–9
 - national policy statements 47–8
 - natural and physical resources defined 43
 - natural character defined 44–5
 - protection procedures 42–3
 - public involvement opportunities, 163–4, 166
 - purpose of the Act 42, 43
 - regional coastal plans 83–4, 359–60, 365
 - regional plans 50, 82–3, 104, 250, 259, 302–3
 - regional policy statements 50
 - resource consents 53–4, 105, 190, 210
 - Treaty of Waitangi principles 47
 - water conservation orders 49–50
- Resource Management (Simplifying and Streamlining) Amendment Act 2009 276–7

Rio+20 Conference *see* Earth Summit 2012
riverine wetlands 222–3
rivers management 36
rocky coasts *see* coastal ecosystems
royal albatross 323
rules and regulations
 public involvement opportunities 168–70
runoff, contaminated
 estuary ecosystems 329–30, 333
 freshwater ecosystems 296
 urban ecosystems 273, 274

S

STOMP (Stop the Spread of Marine Pests)
 362
sand dune ecosystems 316–9, 324–6,
 332–46, 372
 see also coastal ecosystems
 “Backyard buffers” initiative 338
bird species 318–19
Care for our Coast programme 339
Dune Restoration Trust of New Zealand
 339
education and awareness 338–9
fragmentation 325
livestock grazing 326, 333
habitat degradation 324
invasive plant species 325–6, 333
invertebrates and lizards 319
Northland’s Coast and Us 338
plant species 317–18
Sir Peter Blake Trust 339
stabilisation afforestation 324
threats 324–7, 333
urban development 326–7, 333
sea lions 324, 354
sea rush wīwī (*Juncus kraussii*) 320
seabirds 268, 292, 323, 351, 354
seals and seal “haul outs” 323–4, 354
seawalls and other structures
 estuary ecosystems 327–8
 sand dune ecosystems 326–7
sedimentation
 estuary ecosystems 327, 333
 freshwater ecosystems 296, 300
 reducing sedimentation effects 72–4
sewage discharge 273, 274, 295, 329–30, 333
shellfish monitoring in Hauraki Gulf 136
shelterbelts 254, 255

shipping and marine pollution management
 37
Sinbad Sanctuary Project 134
Sir Peter Blake Trust 339
skinks 184
 see also lizards
 Grand and Otago skinks 203
 shore skink (*Oligosoma smithi*) 319
 striped skink (*Oligosoma striatum*) 184
South Pacific Regional Fisheries Management
 Organisation 25
Statement of National Priorities for Protecting
 Rare and Threatened Biodiversity on
 Private Land 26–7
Stop the Spread of Marine Pests (STOMP)
 362
stormwater drainage 272, 273, 274
 contaminated runoff 273, 274
subdivisions *see* land subdivision use and
 development
submarine canyons 362
submissions *see* public involvement
 opportunities
Sustainable Farming Fund 130, 212
swamps 221

T

Tekapo Scientific Reserve 213
territorial authorities 33, 40
 district plans 40, 51–2
 identifying significant indigenous
 vegetation and habitats 45–6, 52–3
 national environmental standards 48–9
territorial sea and exclusive economic zone
 23–4, 36, 365
 shipping and marine pollution 37
threats 7–12
 climate change 8–9, 189, 332
 estuary ecosystems 327–30, 332, 333
 freshwater ecosystems 294–300
 habitat destruction 8
 indigenous forests 9, 184–9
 indigenous grasslands 9, 205–9
 invasive species *see* invasive species,
 colonisation
 marine ecosystems 353–7
 productive land 245–9
 rocky coast ecosystems 330–1, 332, 333
 sand dune ecosystems 324–7, 332, 333
 wetlands 9, 224–7

threats, solutions
 classification systems 27–8
 habitat mapping 28
 toetoe (*Cortaderia splendens*) 318
 Top of the South Marine Biosecurity
 Partnership 364
 tourism
 conservation concessions 93–4, 172, 173
 marine mammals tourism permits 114,
 172, 173
 national parks 95
 public involvement opportunities 172,
 173
 Trade in Endangered Species Act 1989 21,
 114
 Treaty of Waitangi principles
 and Hazardous Substances and New
 Organisms Act 122
 and Resource Management Act 47
 tree pits and planter boxes 279
 tree protection rules 276–7
 tree defined 276–7
 urban environment defined 276
 “trophic cascade” effect 354
 tuatara (*Sphenodontia*) 184

U

UN Conference on Sustainable Development
 Rio+20 *see* Earth Summit 2012
 UN Convention on the Law of the Sea
 (UNCLOS) 23–4, 357
 unalienated Crown land management 36
 unsustainable logging practices 246
 urban development
 estuary ecosystems 327–8, 333
 sand dune ecosystems 326–7, 333
 urban ecosystems 265–88, 372
 best practices recommendations 283–4
 bird species 267–8
 case studies 281–3
 community restoration projects 280–1,
 284
 contaminated runoff 273, 274
 district plans 275–6
 domestic and wild predators 269, 271–2
 education and awareness 280, 284
 freshwater macroinvertebrates 269
 green infrastructure 278–9, 284
 green roof tops 278–9

habitat loss and fragmentation 269–70,
 274
 impervious surfaces 272, 274
 invertebrates 269
 Karori Sanctuary Trust 282–3
 mainland islands 281
 native bird corridors 270, 272
 non-regulatory management approaches
 277–83
 pest species 271–2, 274
 plant species 268
 pollination and seed dispersal 267, 269,
 272
 Project Twin Streams 281–2
 rain gardens, tree pits and planter boxes
 279
 regional pest management strategies 284
 regional plans 275–6
 regulatory management approaches
 274–7
 reptiles 269
 resource consents 276, 283
 RMA plans 283
 sewage discharge 273, 274
 stormwater drainage 272, 273, 274
 threats 10, 269–74
 tree defined 276–7
 tree protection rules 276–7
 urban environment defined 276
 weed and garden waste control 279–80,
 284
 wildlife species in the city 267–9
 Uretara Estuary Managers 342

V

valuation of indigenous biodiversity 6–7
 cultural benefits 7
 economic benefits 6
 monetary value 6
 social benefits 7
 Vessels Intention Register 123
 voluntary land covenants
 indigenous forests 193, 195
 indigenous grasslands 211, 215
 productive land 251
 voluntary tools 125–38
 best practice examples 136–8
 central government funding programmes
 130
 coast care groups 133

- community care groups 132–4
- community environmental monitoring programmes 135–6
- education and advocacy 127–8
- harbour care groups 133
- land or conservation covenants, 101, 102, 129, 211
- Landcare groups 35, 127
- local government funding incentives 131–2
- pest management partnerships and initiatives 134–5
- regional biodiversity forums 128
- regional strategic planning and action plans 126

W

- Waiatarua Reserve wetland restoration 235
- Waikato Environmental Initiatives Fund 131
- Waikato Regional Biodiversity Forum 128
- Waikato Regional Pest Management Strategy plan 191
- Waikato River Authority 152
- Waikato Tainui Raupatu Claims (Waikato River) Settlement Act 2010 152
- Wairere Farm bush protection 193
- Waitangi Tribunal settlements
 - Te Arawa Lakes settlement 152
 - WAI 262 claim 145
 - Waikato River settlement 148, 152
- water allocation standard 19, 48–9
- water conservation orders 49–50, 302
- water permits 39
- water quality standard 71
- weed management education 127
- wetlands 219–39, 372
 - Arawai Kākāriki wetland restoration programme 234–5
 - best practice recommendations 236
 - biodiversity on Zespri kiwifruit orchards 236
 - bogs 221
 - case studies 232–6
 - contaminated run-off 224
 - defined 228
 - education and awareness 230, 236
 - ephemeral (temporary) wetlands 223
 - essential ecosystem services 220, 223
 - extraction processes 224
 - fens 221

- fish migration, barriers 224
- fishing, whitebaiting and eeling 224
- funds and grants 231
- geothermal wetlands 221
- importance 223
- international convention on wetlands 18–19
- invasive plants and animals 225–6, 227
- lacustrine wetlands 222
- Lakeland Farm restoration 232–3
- land conversion and catchment activities 224, 226
- livestock grazing 224
- nival (snow-derived) wetlands 223
- non-regulatory management approaches 229–36
- plutonic wetlands 223
- recreational and sporting activities 224
- regulatory management approaches 227–9
- resource consents 229, 236
- restoration initiatives 232, 236
- riverine wetlands 222–3
- RMA plans 228–9, 236
- swamps 221
- threats 9, 224–7
- types of wetland 220–3
 - Waiatarua Reserve restoration 235
- Whakatipu Wilding Conifer Control Group 211
- Whakaupoko Landcare Group 134
- whales 350
- whio whio (blue duck) 292
- whitebait 224, 322
- wild kiwifruit control in BOP 135
- wilding pines management 208, 209, 210–11
- Wildlife Act 1953 109, 110–12, 358
 - animal defined 111
 - defences for offending 111–12
 - species that can be hunted 111
 - wildlife defined 111
- wildlife sanctuaries, refuges and management plans 112
- World Heritage Convention 19–21
- World Heritage List 19–21

Y

- yellow-eyed penguin (hoiho) 323
- Yellow-Eyed Penguin Trust 341

New Zealand has particularly high levels of biodiversity but a very poor record of conserving it. This Guide is designed to assist people who want to achieve better biodiversity outcomes as well as those whose activities impact on New Zealand's indigenous habitats and species.

The Guide describes the legal and voluntary tools which are available to protect biodiversity and opportunities for public involvement in their deployment. It identifies elements of 'good practice' and how they can be implemented on the ground. It also has specific chapters addressing biodiversity in indigenous grasslands, forests, productive land, freshwater, urban environments, wetlands, coastal areas and the sea.

This book is an invaluable resource for anyone concerned with managing and protecting biodiversity, including landowners, community groups, local authorities, developers and planners.

This Guide is well tailored to the lay audience and to the requirements of landowners, farmers and community groups. The way the Guide is structured is an easy way for landowners to engage with the document. They can cut to the chase and get the basic information for each chapter quickly and simply.

NICK EDGAR, CEO, LANDCARE TRUST

LUCY BRAKE is an environmental writer with a post graduate qualification in environmental science. She has an extensive background in resource management consultancy and has supported community groups to protect and conserve biodiversity.

RAEWYN PEART is the Environment Defence Society's Policy Director. She holds degrees in psychology, law and commerce and has over 20 years' professional experience in environmental law and policy. Raewyn has published widely on environmental management issues.

ISBN 978-0-9876660-0-0



9 780987 666000 >

eds 
ENVIRONMENTAL DEFENCE SOCIETY