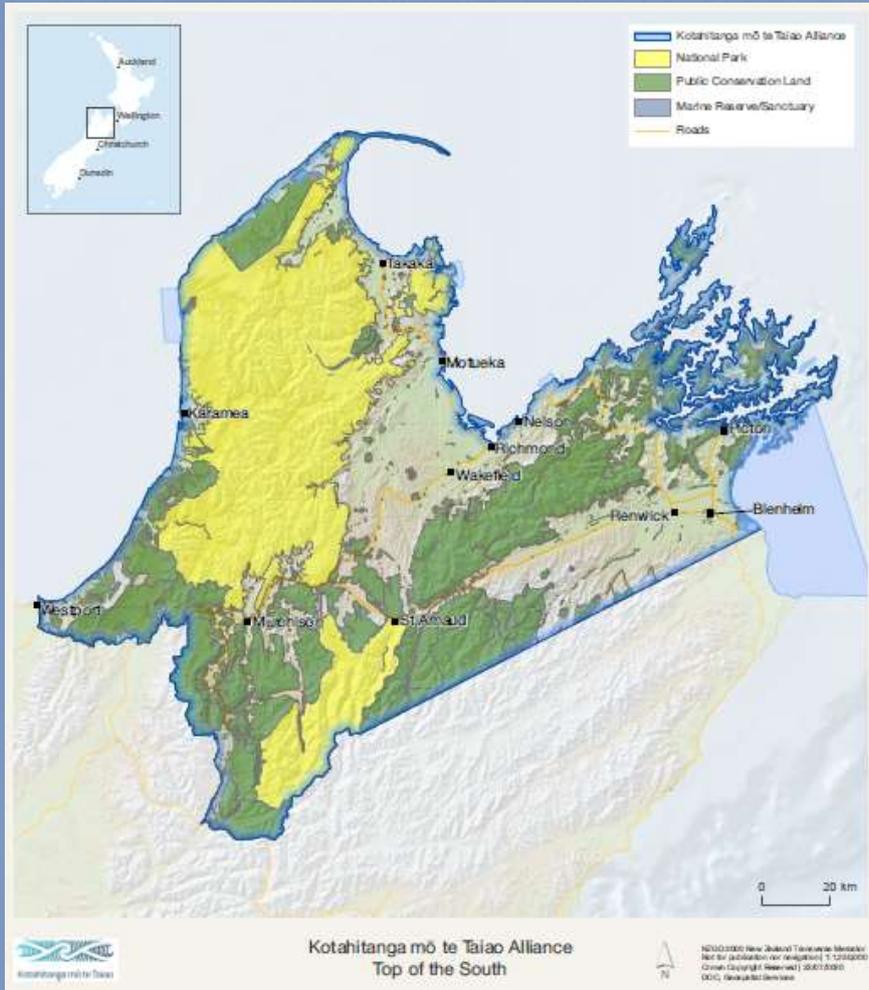




Kotahitanga mō te Taiao



# Ecosystem Health

## *Top of the South Scorecards Freshwater & Terrestrial Ecosystems*

*October 2020*

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Kotahitanga mō te Taiao

# Ecosystem Health Scorecard



## Rivers & Streams

<b>Good</b>	<b>Good / Fair</b>	<b>Good / Fair</b>	<b>Poor</b>
Upland Rivers & Streams	Steep Lowland Rivers & Streams	Valley Floor Rivers	Lowland Streams



## Forests

<b>Fair</b>	<b>Poor</b>	<b>Very Poor</b>
Upland Forests	Steep Lowland Forests	Valley Floor Forests



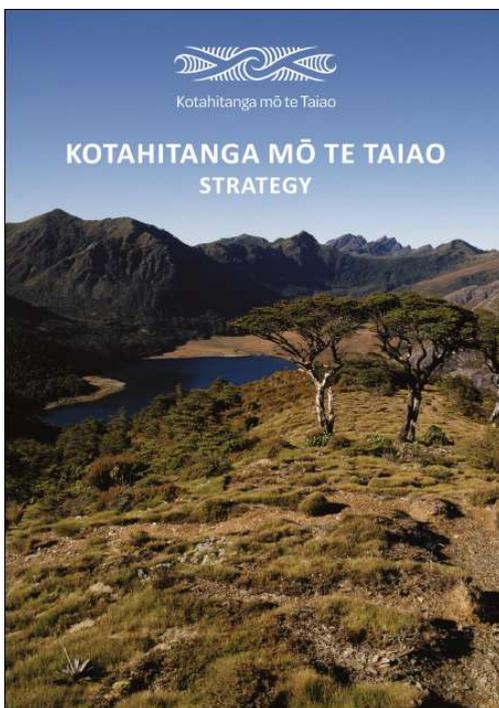
## Other Terrestrial Ecosystems

<b>Good</b>	<b>Good / Fair</b>	<b>Fair</b>	<b>Poor</b>	<b>Very Poor</b>
Alpine, Downs, Caves	Marble, Mineral Belt, Coastal Turf, Frost Flats* Cliffs* (*NW Nelson)	Coal Measure, Barrier Banks, Seabird Soils* (*NW Nelson)	Coastal Cliffs* Seabird Soils* (*Nelson Motueka)	Dunes, Frost Flats* (*Nelson Lakes)



## Lakes & Wetlands

<b>Excellent</b>	<b>Excellent</b>	<b>Good</b>	<b>Poor</b>
Upland Lakes	Upland Wetlands	Lowland Lakes	Lowland Wetlands



## Top of the South

The Top of the South Island is the most environmentally diverse and ancient part of New Zealand. It is home to hundreds of species found nowhere else in the world and which form unique natural communities. The region hosts some of the nation’s largest beech forests, rivers and streams flowing undammed from mountains to sea, lakes and freshwater wetlands, and dozens of unique terrestrial ecosystems. A large majority of the region is in managed conservation land. However, many ecosystems are degraded or imperilled due to past clearing, non-native predators, browsers, invasive weeds, adjoining land uses and other issues.

*Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data and expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.*

## Executive Summary

The Top of the South Island is the most environmentally diverse area of New Zealand.

*Kotahitanga mō te Taiao* is an alliance formed by the majority of iwi in the top of the South Island, all six Councils and the Department of Conservation. The Alliance's focus is landscape-scale conservation projects that have environmental, economic, social and cultural benefits. In 2018-19 the Alliance developed and launched a Strategy to achieve high-level outcomes that no participating entity could achieve alone.

To help inform and support its conservation and restoration strategies, the Kotahitanga mō te Taiao Alliance is developing measures of ecosystem health, as well as for iwi cultural values, social wellbeing and economic wellbeing – all developed in relation to the Alliance strategies.

Measures, or **ecosystem health scorecards**, have been completed for all terrestrial and freshwater ecosystems. A framework has also been developed for measuring social and economic wellbeing. A pilot project has been completed for assessing iwi cultural health, as well as measures for marine and estuarine ecosystems. The Alliance is continuing all of these efforts.

The measures by their nature are high level and integrated over large landscape units. Although conditions for a given ecosystem may vary within a landscape, the measures are intended to provide an overall picture of health. The key purposes of the Alliance's ecosystem measures are to:

- show the health of the region's varied ecosystems
- provide information to decision-makers and stakeholders
- define "what is success" for the Alliance Strategies
- help prioritise and focus Strategies on key factors
- engage communities and stakeholders in monitoring health

The Measures were developed by a 10-person Measures Working Group, using a proven, long-standing approach. Eight facilitated workshops were held in person or virtually to develop the measures. The measures are designed to be understandable and relevant to local communities, as well as to capture the best available science knowledge and perspective.

Ecosystems were defined and assessed across the large inland landscapes at the Top of the South. Four broad groups were identified for capturing terrestrial and freshwater ecosystems:

- Rivers and streams
- Forests
- Other terrestrial ecosystems (e.g. alpine, dunes, mineral belt, frost flats)
- Lakes and wetlands

Three of these four broad groups were stratified for the purpose of developing landscape-level metrics. Stratification for rivers and streams, forests, and lakes & wetlands was based on elevation (upland, lowland) and/or topography (steep, gentle, valley floor). Twelve (12) specific other terrestrial ecosystems were identified.

Four *Places* identified in the Alliance strategy also provided important stratification; these are large areas with their boundaries defined by topographical, ecological, land use and governance factors. The four inland *Places* are: Mt Richmond, Nelson Lakes, Nelson Motueka and Northwest Nelson.

For each ecosystem, a set of key ecological attributes was determined. Current ecosystem health grades were assigned for each of the key attributes along a six-grade scoring scale ranging from

“Excellent” to “Very Poor.” Narrative standards were used for describing health (e.g., what is “good”), using measurable words that are understandable to local citizens, community leaders and stakeholders. The measures and health scores are based on the best professional judgement of the Measures Working Group, drawing upon relevant data where available and other experts.

The results of the measures are reported in detailed scorecards for each ecosystem type, including the standards for defining “what is good,” detailed health scores for each attribute, key findings, and the relevant Alliance strategies designed to enhance or restore ecosystem health.

Overall, the health of the Top of the South’s ecosystems varies widely, ranging from Excellent to Very Poor. The detailed findings for each ecosystem provide more complete insights; however, some overall landscape-level findings stand out.

- Overall. As a general pattern, ecosystem health tends to be good in higher elevation, steep upland areas and poor in lowlands and valley floors. The extent of landcover modification and associated surrounding land use in these areas are key factors.
- Forests. Forest ecosystems across the landscape are highly impaired. Forest birds and snails are struggling due to non-native predators. Native forest plants are impacted by browsers, wilding conifers and weeds. Wasps in beech forests deplete honeydew, a key food source for many forest birds. Most valley floor forests are small, unconnected remnants.
- Lowland Streams and Wetlands. Small lowland streams and lowland wetlands overall are in poor health. They tend to have poor in-stream and riparian habitat for aquatic life and varied other issues. Upland streams and wetlands, however, tend to be in very good condition.
- Terrestrial Ecosystems. Many of the twelve other terrestrial ecosystem types have very special plant communities and species. Their health scores varied widely. Alpine ecosystems overall were in good health, whereas dune ecosystems and Nelson Lake frost flats were very poor. Other ecosystem occurrences ranged from good to poor health.
- Places. Among the four Places outlined in the Alliance strategy document, Northwest Nelson, which has the highest percentage of public land and some landscape scale management of predators, tended to have the highest health scores. Nelson Motueka, which is the most densely settled, has lost most of its original landcover, and with mostly remnant ecosystems remaining had the lowest scores.

The ecosystem health measures highly reinforce the strategies developed by the Alliance for all of the major ecosystems. Strategies should be directed towards improving the condition of those attributes for those ecosystems which are most impaired. For example, the Alliance strategies, either across the Top of the South or at specific Places, include:

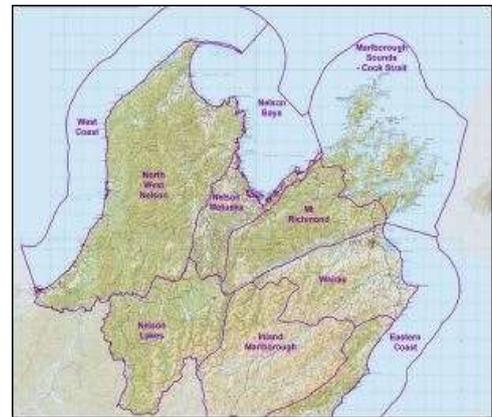
- Landscape-scale predator, herbivore, wasp, wilding conifer and invasive weed control
- Fence and protect remaining lowland forest remnants; restore and connect gaps
- Work collectively to improve riparian margins, alluvial forests and water quality
- Eradicate pest fish and aquatic weeds and maintain native species dominance in priority wetland areas
- Intensify management of ecosystem pressures in areas of high endemism, including predator, herbivore, pest and weed controls

The Alliance seeks to “change the colours on the scorecards” – from red to yellow and from yellow to green. Strategies for the conservation and restoration of all impaired ecosystems need to be scaled-up and deployed at a landscape-level, over many years, to achieve the desired future health of the region’s ecological taonga.

# Introduction

*Kotahitanga mō te Taiao* is an alliance formed by all six Councils and the majority of iwi in the top of the South Island, and the Department of Conservation. The Alliance’s focus is landscape-scale conservation projects that have environmental, economic, social and cultural benefits. In 2018-19 the Alliance developed and launched a Strategy to achieve high-level outcomes that no participating entity could achieve alone.

The Alliance Strategy describes high-level outcomes for the Top of the South (TOS) as a whole, and more detailed outcomes for distinct *Places*. The *Places* (see map Appendix E) are large geographies, each of which has a distinctive character and faces certain large-scale challenges. The original 2018 Alliance Strategy encompassed eleven *Places*. Mapped boundaries are provided for each *Place* to create the basis for strategic analysis, but the connections among the *Places* are equally important, as many ecosystems, challenges and leadership entities are shared across multiple *Places*.



Top of the South - Initial Places DOC

In 2019 the Alliance launched an effort to develop measures of success for its Strategies. An initial pilot effort was expanded to develop a comprehensive set of measures, or **ecosystem health scorecards**, for all terrestrial and freshwater ecosystems at four inland *Places* that collectively encompass a vast area across the Top of the South. The four inland *Places* are: *Mt Richmond*, *Nelson Lakes*, *Nelson Motueka* and *Northwest Nelson*. Due to an organisational re-alignment, the Alliance now focuses its strategy efforts on seven *Places*, four of which are the inland *Places* that encompass the geography of this report, and three of which are marine/ estuarine *Places* (West Coast, Nelson Bays and Marlborough Sounds-Cook Strait), whose health will be assessed at a later date.

The key purposes of the Alliance’s measures are to:

- show the health of the region’s varied ecosystems
- provide information to decision-makers and stakeholders
- define “what is success” for the Alliance Strategies
- help prioritise and focus Strategies on key factors
- engage communities and stakeholders in monitoring health

The Measures were developed by a 10-person Measures Working Group (see Appendix A), using a proven, longstanding approach deployed in Conservation Action Planning, the Open Standards for the Practice of Conservation, and Healthy Country Planning. The methodology is consistent with the National Objectives Framework, Cultural Health Indicators developed at several areas with iwi guidance and leadership, and other measures efforts deployed in New Zealand. A total of eight facilitated workshops were held in person or virtually to develop the measures. The measures are designed to be understandable and relevant to local communities, as well as to capture the best available science knowledge.

The ecosystem measures apply the following overall approach (see Appendix B for detailed methodology):

1. Ecosystem Groupings at Places. The measures are directed to the varied ecological communities described in the Top of the South Strategy outcomes or in the character, shared future and strategy outcomes for each of the four inland Places in the Top of the South. Four very broadly defined ecosystem groups were identified for terrestrial and freshwater ecosystems: rivers and streams; forests; lakes and wetlands; and other terrestrial ecosystems. Each of these broad groups was then more narrowly defined for the purpose of developing meaningful landscape-level measures (e.g. upland forests, steep lowland forests, valley floor forests). Stratification was also provided by the Places, each of which has boundaries defined by topographical, ecological, land use and governance factors:

Twelve other specific terrestrial ecological communities were identified. These included: alpine, frost flats, mineral belt, downs & plateau, caves, marble, coal measure, coastal turf, coastal cliffs, barrier bank/tombolos/islets, dunes, and seabird burrowed soils.

*For purposes of this report, all of the subsets of ecosystem groups or ecological communities are called “ecosystems.”*

2. Key Attributes. For each ecosystem, a small number of key ecological attributes was specified. Key attributes are factors which are vital to an ecosystem’s long-term health and/or reflect key stresses (e.g., water quality in freshwater ecosystems; native vs. invasive species).
3. Narrative Ranking Standards. Narrative standards were used for describing health (e.g., what is “good”), using words that are measurable as well understandable to community leaders and stakeholders. Standards were described along a health grading scale from Excellent to Very Poor. The “Excellent” standard reflects conditions approximating as they were believed to be prior to the introduction of human-caused stresses to the ecosystem (e.g. predators, browsers, clearing and development pressures). “Good” reflects a viable condition for the ecosystem, often with some human intervention required. On the other end of the spectrum, “Very Poor” means a key attribute of ecosystem health or a focal species is imperiled.
4. Health Grades. Current health was graded for each key attribute for each ecosystem at each Place. A six-grade scale was deployed by the Measures Working Group, with grades as follows: Excellent, Good, Good/Fair, Fair, Poor and Very Poor. An overall health grade was then calculated for each ecosystem at each Place. The metrics are based on a landscape scale perspective; conditions may well be better or worse for an ecosystem occurrence at any one site.
5. Best Professional Judgement. The Alliance’s measures and health scores are based on best professional judgement of the Measures Working Group, drawing upon data where available, as well as the advice of other experts. A great deal of important science research has been done at the Top of the South and is drawn upon, but often science data relevant to the measures are not available, are inconclusive, or don’t lend themselves to the Places’ landscape scale.

Along with the ecosystem health measures, a set of key attributes was also developed for assessing *social and economic wellbeing* in relation to the Alliance’s strategies, but not to generate a scorecard. In addition, a pilot

Measures Matter
“I have been struck by how important measurement is to improving the human condition. You can achieve incredible progress if you set a clear goal and find a measure that will drive progress toward that goal.” Bill Gates

project was completed for assessing *iwi cultural health*, as well as measures for marine and estuarine ecosystems. The Alliance is continuing these efforts.

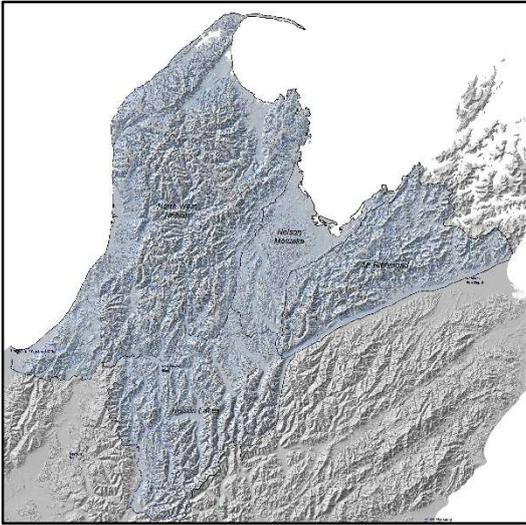
This report represents a first iteration assessment of the health of terrestrial and freshwater ecosystems across the Top of the South. The health measures are based on the best information, knowledge and judgement available to the Alliance's Measures Working Group as of October, 2020. Most current health scores are likely not to change significantly over at least 3 to 5 years. On-going research, additional information, new insights and changing conditions will no doubt lead to the need to modify and improve the health assessment in a future iteration, and measures should be revisited when Alliance Strategies are revisited. These ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.



Kotahitanga mō te Taiao

# Rivers & Streams Overview

- 
**Upland Rivers & Streams**
**Good**
- 
**Steep Lowland Rivers & Streams**
**Good / Fair**
- 
**Valley Floor Rivers**
**Good / Fair**
- 
**Lowland Streams**
**Poor**



Rivers & streams (draft) DOC

## Top of South Rivers & Streams

Rivers and streams in the Top of the South have many values. They provide vital habitat for biodiversity, as well as ecological and hydrological functions. The mauri of rivers is fundamental to Māori culture and they are an important source of mahinga kai. They also provide scenic, amenity, educational and recreational values. Rivers have economic value as a resource for electricity generation, commercial fisheries, drinking water storage, water supply for stock and irrigation, and as a focus for tourism.

What we want to achieve	This is what success looks like
TOS 11.0 Our rivers and streams flow clean, plentiful, and unimpeded from the mountains to the sea. (Outcomes 1, 2 and 5)	Native freshwater migratory fish are abundant and estuarine and braided river bird numbers are restored.
	Freshwater flows and water quality are maintained and restored.
	Barriers to fish passage are removed or mitigated.
	People treasure their freshwater resource and its contribution to their health and wellbeing.

From Kotahitanga mō te Taiao Strategy



Te Hoiere River, Pelorus Bridge Scenic Reserve Dept. of Conservation (DOC)

# Rivers & Streams Health Scorecard

	 Upland Rivers & Streams	 Steep Lowland Rivers	 Valley Floor Rivers	 Lowland Streams
 <b>Water Quality (Humans)</b>	Excellent	Good	Good	Fair
 <b>Water Quality (Aquatic)</b>	Excellent	Good	Good	Fair
 <b>River Flows</b>	Excellent	Good	Good	Good / Fair
 <b>Native Fish Passage</b>	Excellent	Good	Good	Poor
 <b>Native Fish Diversity</b>	Good	Good	Good	Fair
 <b>Native River Birds</b>	Poor	Poor	Poor	Poor
 <b>Natural Channels</b>	Excellent	Good	Good / Fair	Fair
 <b>Margins</b>	Excellent	Good / Fair	Good / Fair	Poor

Scores are average scores across 4 Places; site-specific scores may vary

What is Good? For most rivers and streams...

-  **Water Quality – Human Interactions:** suitable for swimming, boating and fishing
-  **Water Quality – Aquatic Life:** water quality conditions that cause no or little stress to aquatic life
-  **River Flows:** flows & flooding support expected native aquatic species and riparian habitat
-  **Native Fish Passage:** no artificial barriers that significantly impair native fish passage
-  **Native Fish Diversity & Abundance:** healthy native fish populations across their expected range
-  **Native River Birds:** healthy native river bird populations across their historic range
-  **Natural Channels:** natural channel form, substrates and function
-  **Margins:** continuous intact native vegetation along the margin which is sufficient to sustain instream water/habitat quality and provide connectivity

*Note: The above descriptors are shorthand excerpts; see Appendix F for full rating standards*

## Key Findings: Rivers and Streams

- Location, location, location. The Rivers and Streams ecosystems on the Top of the South range from nearly excellent health at higher elevations to poor health in the lowlands. Topography, the associated surrounding land use, degree of in-stream and riparian modification, and the stream size/sources are key factors.
- Steep upland rivers and streams in good health. Rivers and their tributary streams in steep mountainous or hilly areas, which have largely intact forest cover, are in good health.
- Lowland streams at greatest risk. Small lowland streams ecosystems, which feed into the larger rivers on the valley floor are located in areas that have been largely cleared; these streams are overall rated *Fair* to *Poor*, with urban streams in the poorest condition of all. The larger valley floor (mainstem) rivers, into which these streams feed, are in better condition, largely due to abundant and high-quality flows from their mountain upstream sources.
- Major lowland stream issues. Issues include poor water quality, degraded habitat including stream straightening, fine sediment accumulation, prolific weed and algae growth, insufficient riparian margins, and impaired native fish passage.
- Good flows overall. The amount and timing of flows that are vital to instream and habitat health are generally good across the region.
- Native river birds struggling. A notable regional issue with River and Stream health is absence of healthy native river bird populations, which is rated *Poor* across the entire Top of the South. This issue is a function of predators (see Forests Ecosystem Health) as well as habitat disturbance by stock and loss of wetlands. The poor scores for this factor contributed to lower overall health ratings for Rivers and Streams at some Places.
- Other key attributes – good to poor gradient. All other key attributes of river and stream health reflect the elevational gradient, with ratings generally ranging from *Excellent* to *Good* health in steep upland rivers to *Fair* to *Poor* health in lowland streams. These attributes include:
  - Water quality
  - Native fish
  - Natural channels and substrates
  - Riparian margins

## Health at Top of the South Places

There is more commonality than variance in river and stream health across the four Places on the Top of the South, with all Places mostly showing the same basic pattern described above (e.g. good health for upland rivers and streams; poor health for lowland streams), with a few variations. Overall, river and stream health is better in Northwest Nelson, which has a greater proportion of native vegetation cover and more precipitation, and worse in the drier Nelson Motueka area, where native cover has been largely cleared.

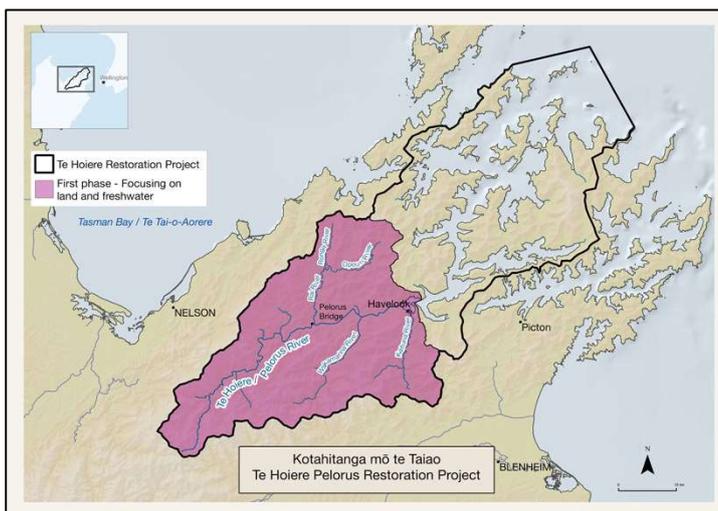
Summary of Health by Place				
River & Stream Ecosystems	Steep Upland Rivers & Streams	Steep Lowland Rivers & Streams	Valley Floor Rivers	Lowland Streams
Mt Richmond	Good	Good / Fair	Good / Fair	Poor
Nelson Lakes	Good	N/A	Good	Fair
Northwest Nelson	Good	Good	Good / Fair	Fair
Nelson Motueka	N/A	Fair	Fair	Poor
<b>Overall Health</b>	<b>Good</b>	<b>Good / Fair</b>	<b>Good / Fair</b>	<b>Poor</b>

## Top of the South Strategies

The following Kotahitanga mō te Taiao Strategies are intended to achieve healthy rivers and streams.

Various strategies are cited within specific Places. Many strategies also need to be scaled-up and applied across the region, especially for the Lowland Streams. Improving margins on the all Rivers and the Lowland Streams will also provide substantial benefits to estuaries and marine ecosystems.

- Support and encourage landowners to plant and restore riparian margins
- Work collectively with DOC, iwi, community, forestry to improve riparian margins, alluvial forests and water quality and reduce sediment loss
- Remove or mitigate barriers to fish passage
- Incentivize more sustainable land use practices on erodible soils near waterways
- Incentivize and encourage wider use of farm nutrient/management plans
- Eradicate pest fish
- Also see forest predator management strategies (to help restore native river birds)



DOC



Te Hoiere/Pelorus River

P. Hamill

### Te Hoiere /Pelorus Restoration – Mt Richmond

Te Hoiere/Pelorus is one of 14 priority catchments around the country identified for funding through the Department of Conservation's Te Awa programme to restore the catchments to a healthy, functioning state. In addition, the catchment has been named as one of the Ministry for the Environment's Freshwater Exemplar catchments, providing further funding for this restoration project.

"Te Hoiere/Pelorus catchment is set for a new phase of community-led landscape-scale restoration that could provide a leading example for restoration projects around the country," said Eugenie Sage.

Te Hoiere/Pelorus is home to at least 14 native freshwater fish species, nine of which are either threatened or at risk of extinction. It's also home to kākahi (freshwater mussels), kōura (freshwater crayfish) and freshwater shrimp.

The catchment supports recreation, agriculture, forestry and marine farming.



# Upland Rivers and Streams

## Health Scorecard

Rivers and tributaries above 700 metres. Includes larger rivers as well as small-sized, low-volume creeks and streams with steep gradients. Mountain or hill source of flow. Adjoining land is mostly covered in extensive and continuous tracts of native forest, often with a protected land status.



**Mt Richmond**

Good



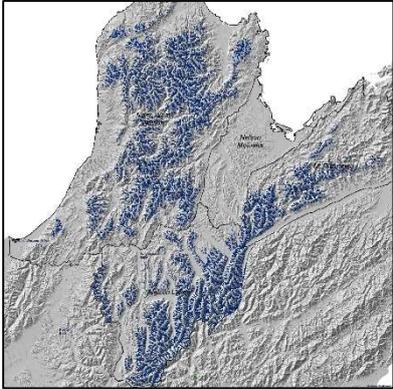
**Nelson Lakes**

Good



**Northwest Nelson**

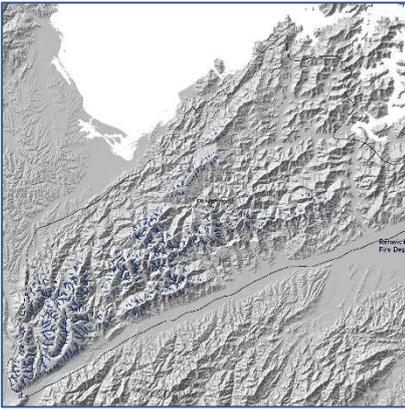
Good



Upland rivers & streams (draft) DOC

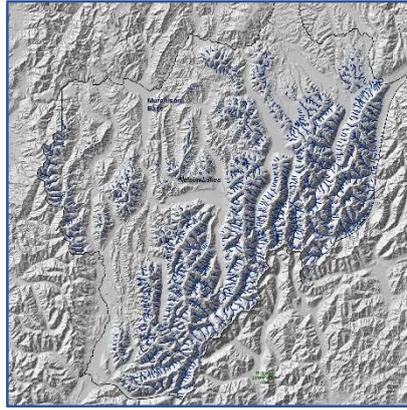
		Upland Rivers & Streams		
River & Stream Ecosystems	What is Good...	Upland Rivers & Streams - Mt Richmond	Upland Rivers & Streams - Nelson Lakes	Upland Rivers & Streams - NW Nelson
Water quality- human interactions	Most river/stream reaches are suitable for "contact recreation" (e.g. swimming and fishing)	Excellent	Excellent	Excellent
Water quality – aquatic ecosystem health	Most river and stream reaches have good water quality conditions that cause no or little stress to aquatic life	Excellent	Excellent	Excellent
River flows	Amount and timing of flows are sufficient to support expected native aquatic species and riparian habitat along most rivers/streams	Excellent	Excellent	Good
Native fish passage	Most rivers and streams have no artificial barriers that significantly impair native fish passage	Excellent	Excellent	Good
Native fish diversity, abundance and age structure	Most rivers and streams have healthy native fish populations across their expected range	Excellent	Good	Good
Native river birds diversity and abundance	Most rivers and streams have healthy native river bird populations across their historic range	Very Poor	Very Poor	Good / Fair
Natural channels and substrate	Most river/stream reaches have natural channel form, substrates and function	Excellent	Excellent	Excellent
Riparian margins	Most river/streams have continuous intact native vegetation along the margin sufficient to sustain instream	Excellent	Good	Excellent
<b>Overall Health</b>		<b>Good</b>	<b>Good</b>	<b>Good</b>

Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data and expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.



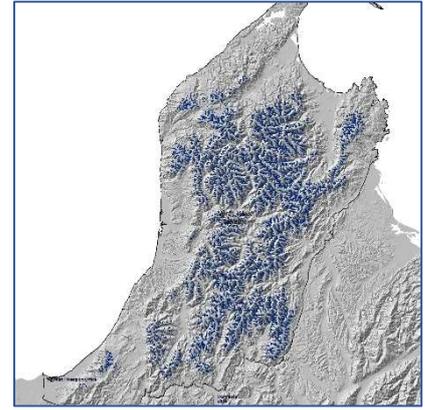
### Mt Richmond

Mt Richmond's nearly pristine upland streams include the many small tributaries of the Te Hoiere/Pelorus River and the Wakamarina River, with their headwaters in the Richmond Range. The upland rivers and streams are entirely within Mt Richmond Forest Park.



### Nelson Lakes

Over 60% of the Nelson Lakes area is above 700 metres elevation and often part of conservation lands. The Buller River has the highest peak flow in New Zealand.

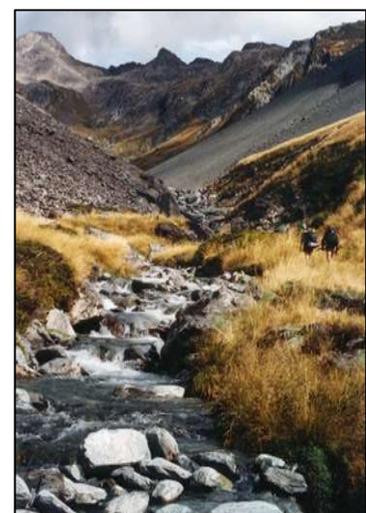


### Northwest Nelson

As with Nelson Lakes, the majority of the area is above 700 metres elevation. With a large amount of precipitation, Northwest Nelson gives rise to large rivers, including the Karamea River and the Heaphy in the west, the Aorere in the north and the Wangapeka, a large tributary of the Motueka River in the east.

## Key Findings: Upland Rivers and Streams

- Good health overall across the Top of the South. The upland rivers and their tributary streams are located in steep mountainous areas, often within National Parks or other conservation areas which have largely intact forest cover. Upland rivers in Mt Richmond overall are nearly pristine, with mostly excellent attributes at Nelson Lakes, slightly less so at Northwest Nelson.
- Water quality is in *Excellent* condition.
- Native river birds generally struggling. Even within the largely pristine upland rivers of Mt Richmond and Nelson Lakes, native river birds are impacted, due largely to predation arising from adjoining forest lands. Effects are less so in Northwest Nelson, where intensive management is underway to secure several Whio populations, supplemented by an ongoing landscape scale predator control programme.
- River flows, riparian margins and other attributes are in *Excellent* or *Good* condition. The Cobb Reservoir impacts the overall scores for Northwest Nelson, as it affects native fish passage; all other upper rivers except Onekaka, Waikoropupu and Brooklynare free flowing.



Upland Stream, Nelson Lakes DOC



# Steep Lowland Rivers and Streams

## Health Scorecard

Medium-sized/volume rivers and tributaries in a mountain or hilly landscape below 700 metres elevation, typically without adjoining river terraces. Mountain or hill source of flow. Adjoining land is typically forested (either native or planted). These rivers and streams are often headwater streams, frequently having steep channels with high water velocities.

	<b>Mt Richmond</b>	Good / Fair
	<b>Northwest Nelson</b>	Good
	<b>Nelson Motueka</b>	Fair



Steep lowland stream, NW Nelson T. James

Note: Steep Lowland Rivers and Streams was not initially considered as a focal ecosystem at Nelson Lakes, but during GIS mapping it was identified as an important contributing feature. Its health will be considered in future assessments.

		Steep Lowland Rivers & Streams		
River & Stream Ecosystems	What is Good...	Steep Lowland Rivers & Streams - Mt Richmond	Steep Lowland Rivers & Streams - NW Nelson	Steep Lowland Rivers & Streams - Nelson Mot
Water quality- human interactions	Most river/stream reaches are suitable for "contact recreation" (e.g. swimming and fishing)	Good / Fair	Excellent	Good
Water quality – aquatic ecosystem health	Most river and stream reaches have good water quality conditions that cause no or little stress to aquatic life	Good	Excellent	Good / Fair
River flows	Amount and timing of flows are sufficient to support expected native aquatic species and riparian habitat along most rivers/streams	Good / Fair	Excellent	Good / Fair
Native fish passage	Most rivers and streams have no artificial barriers that significantly impair native fish passage	Good	Good	Good
Native fish diversity, abundance and age structure	Most rivers and streams have healthy native fish populations across their expected range	Good	Excellent	Good
Native river birds diversity and abundance	Most rivers and streams have healthy native river bird populations across their historic range	Very Poor	Fair	Very Poor
Natural channels and substrate	Most river/stream reaches have natural channel form, substrates and function	Excellent	Excellent	Good / Fair
Riparian margins	Most river/streams have continuous intact native vegetation along the margin sufficient to sustain instream	Good	Good	Fair
<b>Overall Health</b>		<b>Good / Fair</b>	<b>Good</b>	<b>Fair</b>

*Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data and expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.*

## Mt Richmond

The Te Hoiere/Pelorus and its tributaries are the primary rivers and streams found in mountain or hilly areas below 700 metres elevation.

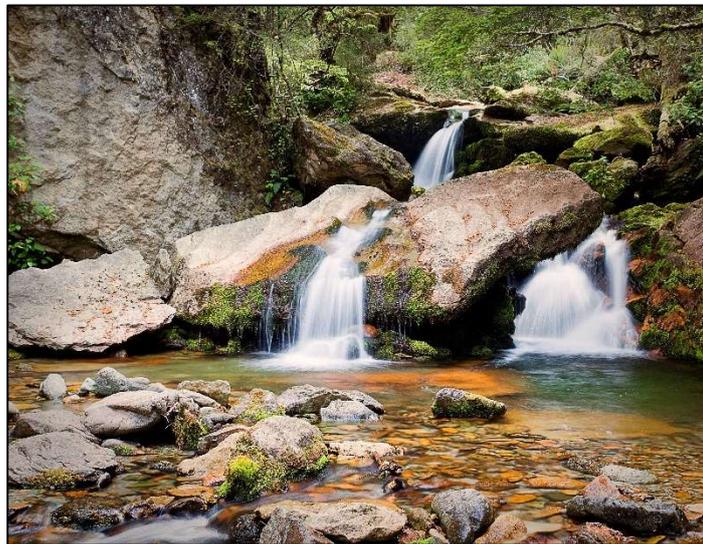


Steep lowland stream, Mt Richmond

P. Hamill

## Northwest Nelson

The Heaphy, Buller, Aoere, Takaka, Wangapeka and Riuwaka Rivers are found in mountain or hilly areas below 700 metres elevation.



Steep lowland stream, Northwest Nelson

DOC

## Nelson Motueka

The tributaries of the upper Motueka in the west and the Waimea in the east are found in hilly areas above the valley floors.

### Key Findings: Steep Lowland Rivers and Streams

- Overall condition ranges from Good to Fair across the region.
  - Northwest Nelson rates *Good* overall, with four attributes rated excellent.
  - Mt Richmond rates overall as *Good/Fair*.
  - Nelson Motueka's overall health rating is lowest; while most attributes are *Good* or *Good/Fair*, its *Fair* overall health score is adversely affected by a *Very Poor* rating for native river birds.
  - Nelson Lakes: Although not formally assessed, overall condition is expected to be somewhat similar to Mt Richmond.
- Native fish diversity and fish passage are in Good overall condition at all Places.
- Water quality and river flows health varies. *Excellent* at Northwest Nelson, but ranges from *Good* to *Good/Fair* at Mt Richmond and Nelson Motueka.
- Native river birds rate Very Poor at Mt Richmond and Nelson Motueka, largely due to impact of predation and habitat loss.
- Natural channels and substrate are Excellent at Mt Richmond and Northwest Nelson.



# Valley Floor Rivers and Streams

## Health Scorecard

Large volume, gentle or low-gradient mainstem rivers which are associated with adjoining river terraces. Mountain, hill or low elevation source of flow. Adjoining land is often cleared of native forest for farming or other intensive land use.

	<b>Mt Richmond</b>	Good / Fair
	<b>Nelson Lakes</b>	Good
	<b>Northwest Nelson</b>	Good / Fair
	<b>Nelson Motueka</b>	Fair

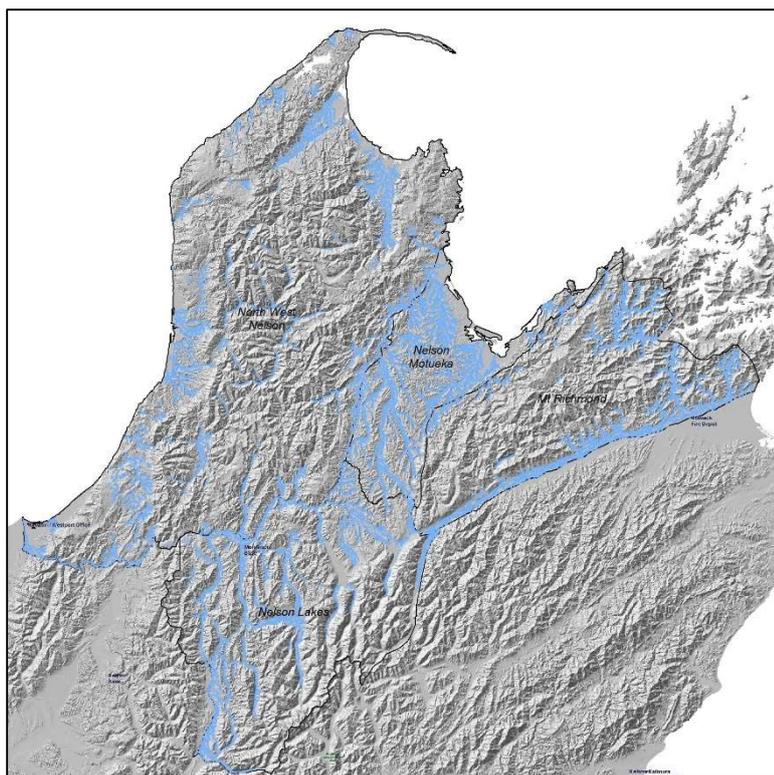


Buller River, Northwest Nelson

DOC

Valley Floor Rivers					
River & Stream Ecosystems	What is Good...	Valley Floor Rivers - Mt Richmond	Valley Floor Rivers - Nelson Lakes	Valley Floor Rivers - NW Nelson	Valley Floor Rivers - Nelson Mot
Water quality- human interactions	Most river/stream reaches are suitable for "contact recreation" (e.g. swimming and fishing)	Fair	Good	Good	Good
Water quality – aquatic ecosystem health	Most river and stream reaches have good water quality conditions that cause no or little stress to aquatic life	Good	Excellent	Good	Good / Fair
River flows	Amount and timing of flows are sufficient to support expected native aquatic species and riparian habitat along most rivers/streams	Good	Good	Good	Good / Fair
Native fish passage	Most rivers and streams have no artificial barriers that significantly impair native fish passage	Excellent	Good	Fair	Excellent
Native fish diversity, abundance and age structure	Most rivers and streams have healthy native fish populations across their expected range	Good	Good	Good	Good
Native river birds diversity and abundance	Most rivers and streams have healthy native river bird populations across their historic range	Very Poor	Fair	Poor	Very Poor
Natural channels and substrate	Most river/stream reaches have natural channel form, substrates and function	Good	Good	Good / Fair	Fair
Riparian margins	Most river/streams have continuous intact native vegetation along the margin sufficient to sustain instream	Good	Good	Good / Fair	Very Poor
<b>Overall Health</b>		<b>Good / Fair</b>	<b>Good</b>	<b>Good / Fair</b>	<b>Fair</b>

*Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data and expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.*



Valley floor rivers (draft)

DOC

## Nelson Lakes

Te Kauparenuī / Gowan River is fed by Lake Rotoroa and the upper Buller is fed by Lake Rotoiti. The Matakītaki and Maruia are main rivers to the west.

## Northwest Nelson

The Aorere, Tākaka, Motueka, Wangapeka, Owen, Mātiri, Orikākā, Little Wanganui, Karamea and Heaphy Rivers are the primary valley floor rivers.

### Mt Richmond

The Te Hoiere/Pelorus is the primary valley floor river.

### Nelson Motueka

The Waimea, Moutere and Motueka are the primary valley floor rivers.



Heaphy River, Northwest Nelson

DOC

## Key Findings: Valley Floor Rivers and Streams

- The majority of key attributes are rated as *Good* for the valley floor rivers.
- Water quality and flows are *Good* overall. Due to the excellent flows arising upstream, the amount and timing of flows that are vital to water quality are generally good across the valley floor rivers, slightly less so in Nelson Motueka.
- Native fish passage is *Good* overall, with medium-large dams in the upper Maitai and Lee Rivers.
- Native fish diversity also rated *Good* overall (but with less certainty).
- Native river birds rate *Very Poor* at Mt Richmond and Nelson Motueka.
- Riparian margins vary. Rated *Good* at two places; however, rated *Very Poor* in Nelson Motueka, due to lack of native riparian vegetation and dominance of willow vegetation.



Whio, Kahurangi National Park

DOC

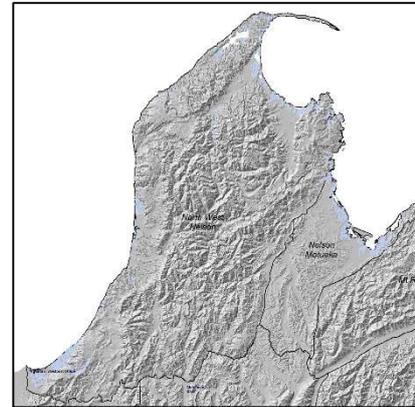


# Lowland Streams

## Health Scorecard

Smaller, slow-moving waterways with more side-streams, terrace backwaters, spring-fed streams and ephemeral streams. Low elevation or spring source of flow, often meandering and with deeper channels. Adjoining land is mostly cleared of native forest for farming or other intensive land use, but with some remaining narrow riparian strips in places.

	<b>Mt Richmond</b>	<b>Poor</b>
	<b>Nelson Lakes</b>	<b>Fair</b>
	<b>Northwest Nelson</b>	<b>Fair</b>
	<b>Nelson Motueka</b>	<b>Poor</b>



Lowland streams (draft) DOC

Lowland Streams					
River & Stream Ecosystems	What is Good...	Lowland Streams - Mt Richmond	Lowland Streams - Nelson Lakes	Lowland Streams - NW Nelson	Lowland Streams - Nelson Mot
Water quality- human interactions	Most river/stream reaches are suitable for "contact recreation" (e.g. swimming and fishing)	Poor	Poor	Good / Fair	Good / Fair
Water quality – aquatic ecosystem health	Most river and stream reaches have good water quality conditions that cause no or little stress to aquatic life	Fair	Fair	Fair	Poor
River flows	Amount and timing of flows are sufficient to support expected native aquatic species and riparian habitat along most rivers/streams	Good	Good	Good / Fair	Poor
Native fish passage	Most rivers and streams have no artificial barriers that significantly impair native fish passage	Poor	Fair	Poor	Poor
Native fish diversity, abundance and age structure	Most rivers and streams have healthy native fish populations across their expected range	Fair	Good / Fair	Fair	Poor
Native river birds diversity and abundance	Most rivers and streams have healthy native river bird populations across their historic range	Very Poor	N/A	Poor	Poor
Natural channels and substrate	Most river/stream reaches have natural channel form, substrates and function	Poor	Good / Fair	Fair	Poor
Riparian margins	Most river/streams have continuous intact native vegetation along the margin sufficient to sustain instream	Very Poor	Poor	Fair	Very Poor
<b>Overall Health</b>		<b>Poor</b>	<b>Fair</b>	<b>Fair</b>	<b>Poor</b>

*Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data and expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.*

## Key Findings: Lowland Streams

- Major lowland stream issues. Small lowland stream ecosystems, which feed into the larger rivers on the valley floor, face many stresses across the region. Issues for lowland stream health are fine sediment accumulation in the beds, poor stream habitat including channel modification, excessive algal growth, insufficient riparian margins, low abundance of habitat-sensitive native fish, and impaired native fish passage, as well as absence of native river birds.
- Water quality is variable. Water quality rated as *Poor* for human interactions at two Places, but better at two others (with less certainty about the two *Good/Fair* ratings); it rated as mostly *Fair* for aquatic life, due to low dissolved oxygen and high water temperatures in summer, as well as low water clarity, high sediment and high nutrients.
- River flows are the attribute in best condition for lowland streams at three Places across the region, rated *Good* at Mt Richmond and Nelson Lakes, *Good/Fair* at Northwest Nelson, but *Poor* at Nelson Motueka.
- Overall lowland stream health ranges from *Fair* to *Poor* across the region. Nelson Lakes and Northwest Nelson rate as *Fair* overall. Mt Richmond and Nelson Motueka rate as *Poor* overall.



Impaired lowland stream, Northwest Nelson

T. James



Victory Primary School students have learned about the York Stream that flows through their school and have been talking to Nelson City Council about how to improve both the look and the health of the stream.

Nelson City Council

### Project Mahitahi / Maitai - Nelson Motueka

Restoration of the Mahitahi/Maitai catchment in the Nelson area is set to receive another \$2 million from the Jobs for Nature programme, on top of the \$1.7 million it received earlier in 2020 from the Ministry for the Environment. This funding will go towards 30 full-time equivalent jobs spread over two years restoring river ecology through riparian planting, controlling pest plants and wetlands restoration. The funding was secured through the Kotahitanga mō te Taiao Alliance. It comes from a DOC funding stream of \$200 million for “nature-based jobs” around the country, called Kaimahi for Nature.



Kotahitanga mō te Taiao

# Forests Overview



**Upland Forests**

Fair



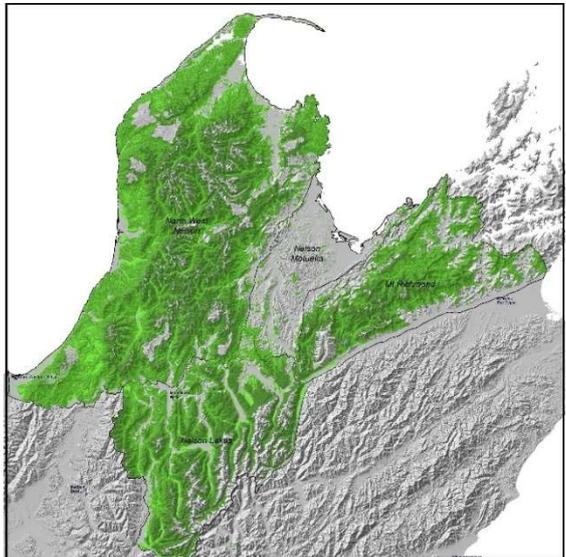
**Steep Lowland Forests**

Poor



**Valley Floor & Gentle Lowland Forests**

Very Poor



Forests (draft)

DOC

## Top of South Forests

Prior to human arrival, the Top of the South Island was largely a forested land mass, with native forest occurring almost continuously below the timber line. Native forests, predominantly beech forests, are now generally found within public conservation areas in more mountainous and steep areas. Remnant forest types are generally found in valleys and other gentle topography. The forests of the Top of the South Island have been stratified into three categories to reflect their differing conditions in the landscape, varying historic and current pressures, and differences across Places.

This is what success looks like	How to get there
Future beech masts are a cause for celebration because the forest floors abound with seedlings awaiting their opportunity to be part of the forest canopy. Native birds, reptiles, bats and invertebrates thrive within the forests.	Ensure herbivores and predators are eradicated or kept at low numbers.
	Effective beech mast responses throughout the Top of the South.
Beech forests drip with honeydew and are scarlet with mistletoe.	Undertake landscape-scale wasp and possum control.
Large areas are predator free.	Utilise technological and operational advances in pest control operations.
Increased control over more pests over greater areas.	Efficient and cost effective control of pests.
	Gain social support for new and effective technologies and new increased funding.

From TOS Outcome 3.0, Kotahitanga mō te Taiao Strategy



Upland forest, Nelson Lakes

P. Hamill

# Forests Health Scorecard



Upland Forests



Steep Lowland Forests



Valley Floor Forests

	Upland Forests	Steep Lowland Forests	Valley Floor Forests
<b>Extent</b>	Excellent	Fair	Very Poor
<b>Regeneration</b>	Fair	Fair	Poor
<b>Honeydew</b>	Fair	Poor	Poor
<b>Snails</b>	Poor	Very Poor	Very Poor
<b>Kaka</b>	Poor	Very Poor	Very Poor
<b>Native Forest Birds</b>	Fair	Poor	Poor
<b>Plant Diversity</b>	Good / Fair	Fair	Poor
<b>Connectivity</b>	Excellent	Fair	Very Poor

*Scores are average scores across 4 Places; site-specific scores may vary*

## What is Good? For most forests...

- Extent:** native forest occurs over most of its historic range
- Natural Regeneration:** native plant species are naturally regenerating
- Abundance of Honeydew:** honeydew is abundant most years & available to native species
- Abundance of Snails:** stable populations are commonly found & abundant across their range
- Abundance of Kaka:** healthy populations are abundant across their range
- Abundance/Diversity of Native Birds:** existing forest is noisy with diverse native bird sounds
- Plant Species Diversity:** native plant species are present & non-native species largely absent
- Connectivity:** most native forest tracts provide largely unimpeded access for native species

*Note: The above descriptors are shorthand excerpts; see Appendix F for full rating standards*

## Key Findings: Forests

- Valley floor remnant forests are imperilled. Almost all key attributes at all Places are rated *Very Poor* or *Poor*.
- Predators and pests are causing serious impacts to native forest animals across all types of forests.
- Upland forests have two *Excellent* attributes: they are still very extensive across their historic range and they are well-connected to adjoining ecosystems across the region.
- Browsers are adversely affecting native forest regeneration.
- Invasive plant species are seriously degrading valley floor and hilly lowland forests.

## Health at Top of the South Places

There is more commonality than variance in forest health across the four Places on the Top of the South, with all Places mostly showing the same basic pattern described above (e.g. *Fair* health for upland forests; *Poor* health for steep lowland forests and *Very Poor* for valley floor), with some variations. Overall, forest health is better in Northwest Nelson, which has a greater proportion of native vegetation cover and more precipitation, and worse in the drier Nelson Motueka area, where native cover has been largely cleared.

Summary of Health by Place			
Forest Ecosystems	Upland Forests	Steep & Hilly Lowland Forests	Valley Floor & Gentle Lowland Forests
Mt Richmond	Fair	Poor	Very Poor
Nelson Lakes	Fair	Poor	Very Poor
Northwest Nelson	Fair	Fair	Very Poor
Nelson Motueka	N/A	Very Poor	Very Poor
<b>Overall Health</b>	Fair	Poor	Very Poor

## Top of the South Strategies

The following Kotahitanga mō te Taiao Strategies are intended to achieve healthy forest ecosystems. Various strategies are cited within specific Places, but also need to be scaled-up and applied across the region, especially for predator and pest control and for restoring and reconnecting the valley floor remnant forests.

- Ensure herbivores and predators are eradicated or kept at low numbers
- Undertake landscape-scale wasp and possum control
- Landscape-scale wilding conifer and invasive weed control
- Carry out restoration plantings and reintroductions of lost native fauna and flora where predator and browse control permit
- Rotoiti Nature Recovery Project: ten-fold increase in the area under intensive management

### Rotoiti Nature Recovery Project - Nelson Lakes



Rotoiti Nature Recovery Project comprises approximately 5000 ha of predominantly red, silver and mountain beech forest, situated alongside Lake Rotoiti in Nelson Lakes National Park. The project aims to restore this area of through an extensive predator trapping programme, and the area is managed as a "mainland island." The success of the project's work is evident when walking through the beech forest. There is a resounding chorus of bellbirds, mistletoe is becoming more visible and small groups of kaka can be spotted.



# Upland Forests

## Health Scorecard

Forest areas above 700 meters. Steep to very steep topography. Land is mostly covered in extensive and continuous tracts of native forest. Includes predominantly mountain beech, silver beech and mixed hardwood forests.



**Mt Richmond**

Fair



**Nelson Lakes**

Fair



**Northwest Nelson**

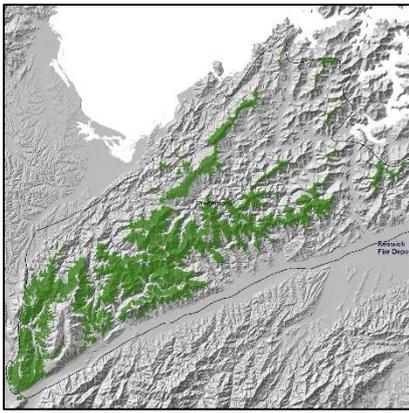
Good / Fair



Mt Richmond Forest Park S. Courtney

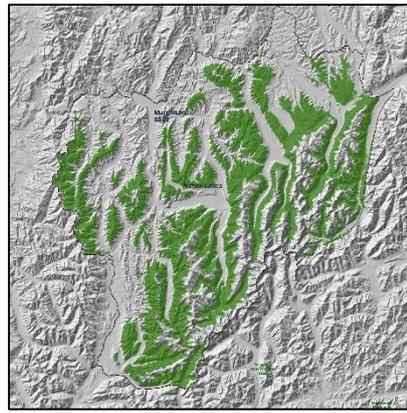
Forest Ecosystems	What is Good...	Upland Forests - Mt Richmond	Upland Forests - Nelson Lakes	Upland Forests - NW Nelson
Extent of native forest	Native forest occurs over most of its historic range, in blocks large enough to withstand severe natural disturbances	Excellent	Good	Excellent
Natural regeneration of native forest plant species	Native plant species are naturally regenerating over most of the forest	Fair	Fair	Fair
Abundance of honeydew	Honeydew is abundant over most years and available to native species over most of the beech forest where the associated species naturally occur.	Fair	Fair	Fair
Abundance of snails	Healthy populations of snails are commonly found and abundant across most of their historic range	Very Poor	Poor	Poor
Abundance of kaka	Healthy populations of kaka are abundant, including survival through beech mast events and are present throughout most of their historic range	Very Poor	Poor	Fair
Abundance and diversity of native birds	Most of the existing forest is noisy with diverse native bird sounds at dawn	Fair	Poor	Fair
Plant species composition / diversity	Native plant species are present in most existing forest and generally represent the original composition, proportions, and	Good / Fair	Good / Fair	Good
Connectivity	Most native forest tracts provide largely unimpeded access for native species within the landscape	Excellent	Excellent	Excellent
<b>Overall Health</b>		<b>Fair</b>	<b>Fair</b>	<b>Good / Fair</b>

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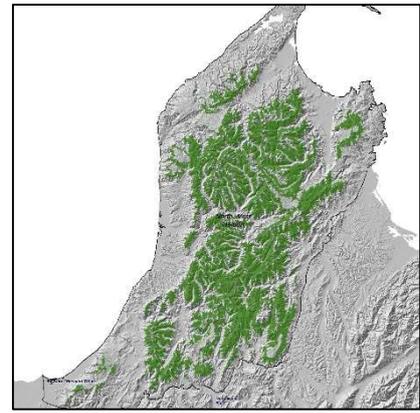
Upland forests (draft)

DOC



Upland forests (draft)

DOC



Upland forests (draft)

DOC

## Mt Richmond

Upland forests are mostly covered in extensive, continuous tracts of forest dominated by red, silver and mountain beeches, ranging from above 700 metres elevation to the natural bushline at around 1350 metres. Notable rare species are pitpat (a small tree) and the locally endemic carnivorous snail. Mt. Richmond Forest Park comprises most of this ecosystem.

## Nelson Lakes

Over 60% of the Nelson Lakes area is above 700 metres elevation. Most of these upland forests are largely original in composition and extent, lying within Nelson Lakes National Park and other public conservation lands. Rare species include great spotted kiwi, kākā, pitpat and beech mistletoes.

## Northwest Nelson

Vast areas remain covered in native upland forests lying within Kahurangi National Park and other public conservation lands. Notable and threatened species are great-spotted kiwi, kākā, giant land snails, magenta rātā, kahurangi tarata, pitpat and beech mistletoes and a suite of species solely confined to limestones, dolomites and ultramafics.

## Key Findings: Upland Forests

- The extent of upland forests is *Excellent or Good* across the region where they are found (Nelson Motueka Place lies below 700 metres elevation).
- Generally well connected to adjoining ecosystems. These native upland forests are the dominant ecosystems in the Top of the South's protected public conservation land, which collectively comprises over half of the total landscape.
- The composition and diversity of native upland forest plant species ranges from *Good* in Northwest Nelson to *Good/Fair* in Mt Richmond and Nelson Lakes.
- However, regeneration of native upland forest plant species is *only Fair*, due to pressure from browsers (possums, goats, deer).
- Key attributes for the native forest birds and snails overall range from *Fair to Poor*, due to pressures from predators (stoats, rats and possums) and pests (wasps). Conditions are generally similar across the three Places with some minor variations in ratings across a given attribute. The abundance of kaka ranges from *Fair* at NW Nelson to *Very Poor* at Mt Richmond.



Kaka, Nelson Lakes S. Courtney



# Steep Lowland Forests

## Health Scorecard

Originally forested areas in a mountain or steep hilly landscape below 700 metres. May have a high component of secondary native forest, planted commercial forest or have been cleared.

	<b>Mt Richmond</b>	Poor
	<b>Nelson Lakes</b>	Poor
	<b>Northwest Nelson</b>	Fair
	<b>Nelson Motueka</b>	Very Poor



Steep lowland forest, Kahurangi National Park DOC

Forest Ecosystems	What is Good...	Steep Lowland Forests - Mt Richmond	Steep Lowland Forests - Nelson Lakes	Steep Lowland Forests - NW Nelson	Steep & Hilly Lowland Forests - Nelson Mot
Extent of native forest	Native forest occurs over most of its historic range, in blocks large enough to withstand severe natural disturbances	Good / Fair	Fair	Good	Very Poor
Natural regeneration of native forest plant species	Native plant species are naturally regenerating over most of the forest	Fair	Fair	Fair	Poor
Abundance of honeydew	Honeydew is abundant over most years and available to native species over most of the beech forest where the associated species naturally occur.	Poor	Poor	Poor	Poor
Abundance of snails	Healthy populations of snails are commonly found and abundant across most of their historic range	Very Poor	N/A	Poor	N/A
Abundance of kaka	Healthy populations of kaka are abundant, including survival through beech mast events and are present throughout most of their historic range	Very Poor	Very Poor	Fair	Very Poor
Abundance and diversity of native birds	Most of the existing forest is noisy with diverse native bird sounds at dawn	Poor	Poor	Fair	Poor
Plant species composition / diversity	Native plant species are present in most existing forest and generally represent the original composition, proportions, and	Poor	Fair	Good / Fair	Poor
Connectivity	Most native forest tracts provide largely unimpeded access for native species within the landscape	Good / Fair	Good / Fair	Good / Fair	Very Poor
<b>Overall Health</b>		<b>Poor</b>	<b>Poor</b>	<b>Fair</b>	<b>Very Poor</b>

*Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data and expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.*

## Mt Richmond

Mt. Richmond Forest Park comprises around 40% of this ecosystem, which is mostly native forest. The main forest trees are hard beech, black beech, red beech, rimu, miro, thin-barked tōtara, mataī, tōtara and kamahi. There are also large areas of pine plantations.

## Nelson Lakes

Much of the steep lowland forests have been cleared or have a high component of secondary native forest. While some of the remaining forest occurs within conservation stewardship land and Nelson Lakes National Park, most of it is privately owned. Extensive agriculture and exotic pine plantation forestry are the main land uses.

## Northwest Nelson

Most of the remaining forests occur within Kahurangi and Abel Tasman National Parks and conservation stewardship land, with the lowest altitude forests generally in private ownership. Hill country agriculture and exotic pine plantation forestry are the main land uses.



Forest undergrowth destroyed by pigs

P. Hamill

## Nelson Motueka

Today less than 20% of this forest remains and most of this is in the higher, colder areas. Forest has been cleared for agriculture, horticulture and exotic forestry. Most remnants are privately owned. They are fragmented, isolated, small, and have been heavily modified and degraded.

### Key Findings: Steep Lowland Forests

- Steep and hilly native lowland forests are in poorer condition than the upland forests. These forests are found on private lands as well as within public conservation areas.
- Mt Richmond, Nelson Lakes and Nelson Motueka steep/hilly forests are in Poor or Very Poor health overall.
  - Key attributes for the native forest birds and animals are *Very Poor* or *Poor*, reflecting predator impacts at all Places as well as habitat loss in Nelson Motueka. Predators include stoats, rats and possums.
  - Regeneration of native species is impaired by varied browsers.
- Northwest Nelson steep lowland forests are in better condition at *Fair* health overall.
- The extent of the steep lowland forests ranges from *Good* in Northwest Nelson to *Very Poor* in Nelson Motueka, where the most extensive clearing has occurred.
- Connectivity to adjoining ecosystems ranges from *Good/Fair* in three Places to *Very Poor* in Nelson Motueka.



Powelliphanta snail, Northwest Nelson S. Courtney



# Valley Floor & Gentle Lowland Forests

## Health Scorecard

Lowland alluvial forests on the valley floors and forests on the gentle low hill country landforms. Nearly all the native forests have been cleared; a few important forest remnants and riparian strips remain. Some larger intact examples are present within Kahurangi National Park. Includes coastal hardwood forests, podocarp forests, mixed podocarp/beech forests and mixed hardwood forests. These forests support several nationally endangered species.



**Mt Richmond**

Very Poor



**Nelson Lakes**

Very Poor



**Northwest Nelson**

Very Poor



**Nelson Motueka**

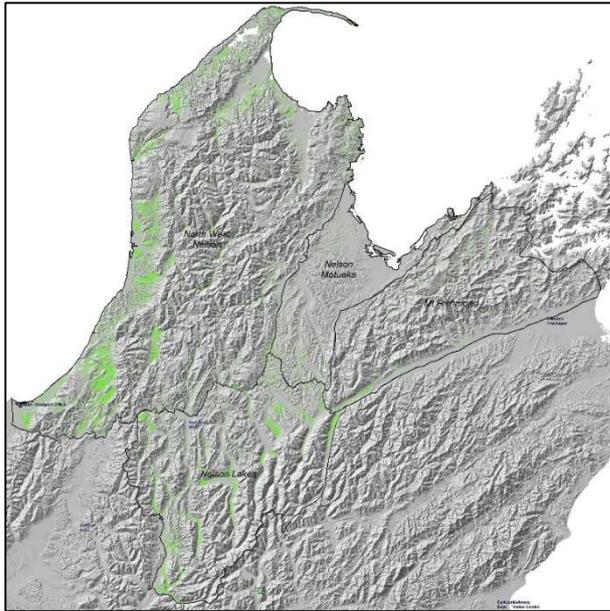
Very Poor



Valley forest, Nelson Lakes DOC

Forest Ecosystems	What is Good...	Valley Floor Forests - Mt Richmond	Valley Floor Forests - Nelson Lakes	Valley Floor & Gentle Lowland Forests - NW Nelson	Valley Floor & Gentle Lowland Forests - Nelson Motueka
Extent of native forest	Native forest occurs over most of its historic range, in blocks large enough to withstand severe natural disturbances	Very Poor	Very Poor	Very Poor	Very Poor
Natural regeneration of native forest plant species	Native plant species are naturally regenerating over most of the forest	Poor	Poor	Poor	Poor
Abundance of honeydew	Honeydew is abundant over most years and available to native species over most of the beech forest where the associated species naturally occur.	Poor	Poor	Poor	Poor
Abundance of snails	Healthy populations of snails are commonly found and abundant across most of their historic range	Very Poor	N/A	Poor	N/A
Abundance of kaka	Healthy populations of kaka are abundant, including survival through beech mast events and are present throughout most of their historic range	Very Poor	Very Poor	Very Poor	Very Poor
Abundance and diversity of native birds	Most of the existing forest is noisy with diverse native bird sounds at dawn	Poor	Very Poor	Poor	Poor
Plant species composition / diversity	Native plant species are present in most existing forest and generally represent the original composition, proportions, and	Fair	Fair	Poor	Poor
Connectivity	Most native forest tracts provide largely unimpeded access for native species within the landscape	Very Poor	Poor	Very Poor	Very Poor
<b>Overall Health</b>		<b>Very Poor</b>	<b>Very Poor</b>	<b>Very Poor</b>	<b>Very Poor</b>

*Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data and expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.*



Valley floor and coastal forests (draft)

DOC

## Northwest Nelson

With few exceptions, remaining forests have been logged of their tall forest trees and do not represent the original structure and composition. The largest areas of remaining forests are at the higher elevation range -- much of this is in public conservation land. Most of the fertile, lower altitude flats have lost most of their forest for mainly agriculture. A few important remnants remain in various states of protection and health.

### Mt Richmond

Ranges from near sea level to ~200 metres elevation, found mostly on private land. Nearly all the native forests have been cleared for mainly agriculture. A few important forest remnants and riparian strips remain. Most of these are degraded. Supports several nationally threatened species.

### Nelson Motueka

Today almost all of the forest has been cleared for horticulture, agriculture and urban development. The valuable handful of remnants surviving in various states of health and viability are small, fragmented and isolated, mostly privately-owned and often with some legal protection. Most have been heavily modified and degraded.

### Nelson Lakes

Ranges from ~ 100 to 800 metres elevation. Found mostly on private land, mostly cleared for agriculture. A few important forest remnants and riparian strips remain. Most of these are degraded. Supports several nationally threatened species.

## Key Findings: Valley Floor & Gentle Native Lowland Forests

- Valley floor remnant forests are imperilled. Almost all key attributes at all four Places are rated *Very Poor* or *Poor*.
- These forests are virtually all remnants, found in less than 10% of their historic range.
- Where they are found they typically are not connected to adjoining ecosystems, thus not providing unimpeded access for native species across the landscape.
- Where they are found, regeneration is poor. Browsers include livestock.
- Predators and pests are causing serious stresses: stoats, rats, possums, cats and wasps.
- Invasive plant species are also affecting native plant species composition and diversity.



Male rifleman (NZ's smallest bird)

DOC



Kotahitanga mō te Taiao

## Other Terrestrial Ecosystems Overview

### Alpine & Subalpine Ecosystems

Alpine - Mt Richmond	Good / Fair
Alpine - Nelson Lakes	Good
Alpine - Northwest Nelson	Good

### Dune Ecosystems

Dune Ecosystems - Northwest Nelson	Very Poor
Dune Ecosystems - Nelson Motueka	Very Poor

### Coastal Cliffs

Coastal Cliffs - Northwest Nelson	Good / Fair
Coastal Cliffs & Seastacks - Nelson Motueka	Poor

### Seabird Burrowed Soils

Seabird Burrowed Soils - Northwest Nelson	Fair
Seabird Burrowed Soils - Nelson Motueka	Poor

### Frost Flats

Frost Flats - Nelson Lakes	Very Poor
Frost Flats - Northwest Nelson	Good / Fair

### Other Special Ecosystems

Mineral Belt - Mt Richmond	Good / Fair
Downs & Plateaux - Northwest Nelson	Good
Caves - Northwest Nelson	Good
Marble - Northwest Nelson	Good / Fair
Coal Measure - NW Nelson	Fair
Coastal Turf - Northwest Nelson	Good / Fair
Barrier Bank, Tombolos, Islets, Bars - Nelson Motueka	Fair

*Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data & expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback & contributions.*

### Top of South Other Terrestrial Ecosystems

The Top of the South Island is the most environmentally diverse part of New Zealand. Much of its diversity stems from its great variety of terrestrial ecosystems, which range across a wide environmental gradient – from high alpine to coast and from extremely wet to relatively dry. Several are rare or uncommon ecosystems that are found nowhere else. Many of these ecosystems are geographically unique and located in only one area (Place) in the Top of the South, mostly in Northwest Nelson.

#### What we want to achieve

**TOS 9.0** The full range of native terrestrial ecosystems is sustained. (Outcomes 2 and 5)

**TOS 10.0** Internationally important features secured and celebrated. (Outcomes 1, 3 and 4)

Pressure from browsers, predators, wasps and invasive weeds is reduced to sustainable levels.

The following internationally important features are secure and celebrated: Farewell Spit (Onetahua), glaciated marble landscapes, cave and karst ecosystems, coal plateaux ecosystems, Kaikōura canyon, migratory shorebirds and seabirds and their habitats,

*TOS Outcomes 9.0 and 10.0, Kotahitanga mō te Taiao Strategy*

## Key Findings: Other Terrestrial Ecosystems

- Twelve distinct types of other terrestrial ecosystems were identified across the region, ranging from alpine in the high ranges to dunes and cliffs along the coast.
- Northwest Nelson had the greatest diversity of terrestrial ecosystems, with nine of the twelve types represented.
- Many of these ecosystems are rare and contain elements which are endemic to the Places where they are found, such as the mineral belt communities in Mt Richmond, the frost flats in Nelson Lakes and Northwest Nelson, and the marble and coal measure ecosystems in Northwest Nelson.
- Dune ecosystems have very poor health in the two Places where they are found.
- Alpine ecosystems generally have good health in the three Places they are found.
- The health of the other diverse terrestrial ecosystems is highly variable, ranging from *Good* to *Very Poor* overall health.
- For the 18 occurrences of the 12 ecosystems the health grades were distributed as follows:

<b>Good</b>	4	Alpine (Nelson Lakes & NW Nelson); Downs & Plateau and Caves (both in NW Nelson)
<b>Good/Fair</b>	6	Alpine (Mt Richmond); Mineral Belt (Mt Richmond); Frost Flats, Marble, Coastal Turf and Coastal Cliffs (all four in NW Nelson)
<b>Fair</b>	3	Coal Measure (NW Nelson); Barrier Banks/Tombolos/Islets/Bars (Nelson Motueka); Seabird Burrowed Soils (NW Nelson)
<b>Poor</b>	2	Seabird Burrowed Soils and Coastal Cliffs (Nelson Motueka)
<b>Very Poor</b>	3	Frost Flats (Nelson Lakes); Dunes (NW Nelson & Nelson Motueka)

### What is Good? For other terrestrial ecosystems...



**Extent:** ecosystems occur over most of their historic range



**Native Animals Abundance/Diversity:** healthy populations are commonly found and abundant across most existing areas



**Native Plants Diversity/Composition:** present in most existing areas & generally represent the original composition; non-native species largely absent



**Natural Regeneration:** Native plant species are naturally regenerating



**Special Plant & Animal Species:** species that are special to the ecosystem are present and in large enough numbers to sustain their populations



**Connectivity:** largely unimpeded access to adjoining native ecosystems for native species



**Landform Integrity:** natural landforms intact

*Note: The above descriptors are shorthand excerpts; see Appendix F for full rating standards*

## Health at Top of the South Places



**Mt Richmond:** *Good/Fair* scores for its two ecosystems - Alpine and Mineral Belt.



**Nelson Lakes:** *Very Poor* for its one unique ecosystem, Frost Flats.



**Northwest Nelson:** *Good* or *Good/Fair* scores for six of its nine ecosystems, *Fair* for two, but *Very Poor* for one (Dunes).

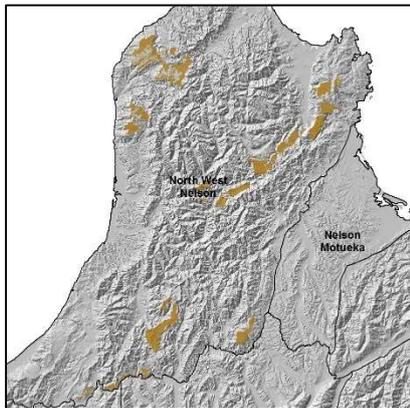


**Nelson Motueka:** *Very Poor* for one (Dunes), *Poor* for two (Coastal Cliffs & Seabird Burrowed Soils) and *Fair* for one (Barrier Banks/Tombolos/Islets/Bars).

## Top of the South Strategies

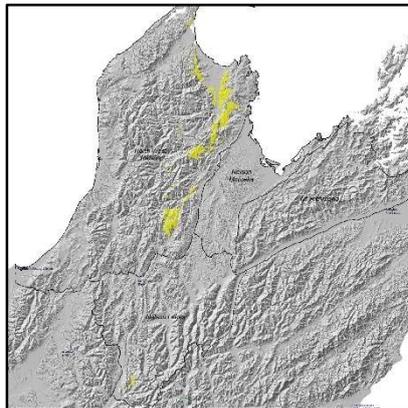
The following Kotahitanga mō te Taiao strategies are intended to achieve healthy terrestrial ecosystems.

- Intensify management of ecosystem pressures in areas of high endemism, including predator, herbivore, pest and weed controls.
- Reduce development pressures which are impacting ecosystem integrity and resilience within ecologically significant sites.
- Establish propagation, seed banking, translocation, fencing and enhancement planting of threatened plant species.
- Cultivate a stronger understanding of the geological and biodiversity values of under-appreciated ecosystems by providing appropriate interpretation and sustainable visitor opportunities. Promote recognition and protection of places and species of international importance and tell their stories to enrich people's experience.



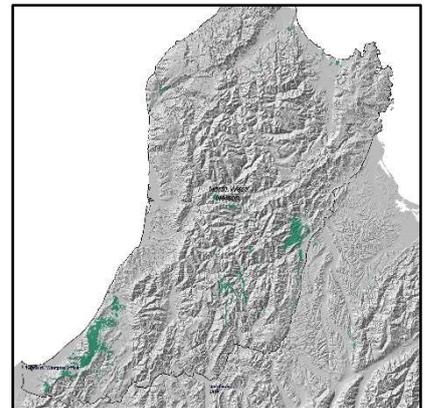
Downs & Plateaux (draft)

DOC



Marble ecosystems (draft)

DOC

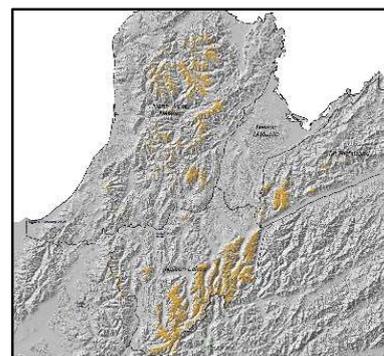


Coal Measures ecosystems (draft)

DOC

## Alpine & Subalpine

Includes all of the lands above the natural bushline. Landforms include steep to very steep mountain slopes, bluffs, gentle cirque basins and flat-topped summits. Subalpine shrublands, tussocklands and alpine herbfields, fellfields, scree and rockland are the main communities. Some of the rarer species are confined to this ecosystem. Most is largely original in extent with only a few areas having been burnt.



Alpine ecosystems (draft) DOC

Other Terrestrial Ecosystems	What is Good...	Alpine - Mt Richmond	Alpine - Nelson Lakes	Alpine - Northwest Nelson
Extent of native communities	Native communities occur over much of their historic range, in blocks large enough to withstand severe natural disturbances	Excellent	Excellent	Excellent
Abundance & diversity of native animals	Healthy populations of native animals are commonly found and abundant across most of their historic range	Poor	Fair	Fair
Composition and diversity of native plant communities	Native plant species are present in most existing areas and generally represent the original composition, proportions and structure; non-native species are largely	Good / Fair	Good	Good
Natural regeneration of native plant species	Native plant species are naturally regenerating over most of the existing areas	Good / Fair	Good	Good
Presence of special plant and animal species	Most special native species are present in most areas and are in large enough numbers to sustain their populations	Poor	Poor	Good / Fair
Connectivity	Most areas provide largely unimpeded access to adjoining native ecosystems for native species	Excellent	Excellent	Excellent
Geological / landform integrity	Most areas have their natural landforms intact	Excellent	Excellent	Excellent
<b>Overall Health</b>		<b>Good / Fair</b>	<b>Good</b>	<b>Good</b>

## Key Findings

- Extent, connectivity and physical integrity are all *Excellent* at all three Places: Mt Richmond, Nelson Lakes and Northwest Nelson.
- Diversity/abundance of animal species is *Poor* at Mt Richmond and *Fair* at Nelson Lakes & Northwest Nelson. Stoats are the main predators of native wildlife.
- Presence of special species is *Poor* at Mt Richmond. Deer, goats pigs and hares are having significant impacts on vegetation and habitats. Chamois are increasing in numbers and wilding conifers are the main weed threat.



Alpine, Mt Richmond

P. Hamill

## Dune Ecosystems

Specifically including Farewell Spit, estuary barrier bars and accreting sandy coastline. Along the west coast, dunes are mostly associated with river inlet mouths and are sometimes extensive. The ecosystem also includes the wetlands and small lakes associated with Farewell Spit, which is internationally recognised under the Ramsar Convention as important wetlands and habitat for migratory shorebirds.



Dune ecosystem, Farewell Spit DOC

## Key Findings

- Extent of the dune ecosystems is less than 10% of its historic range and regeneration of native plant species is also *Very Poor* where the dune systems occur.

- Native animals are threatened by mammalian predators (cats, rats, weasels, stoats, possums, hedgehogs and pigs).

- Deer, pigs, rabbits, hares and possums are the main browsers of native plants.

- Competition from invasive plants is a key factor inhibiting regeneration and presence of special species.
- Integrity of dunes is *Good/Fair* at Nelson Motueka but *Poor* at Northwest Nelson. Many dunes in Nelson/Motueka have retained their natural form (even though largely supporting introduced plants), but in Northwest Nelson plant pests are impacting dune-forming processes (most significant of these is Farewell Spit).
- The dune lakes and wetlands on Farewell Spit are naturally small and dynamic, and appear to have good water quality.

Other Terrestrial Ecosystems	What is Good...	Dune Ecosystems - Northwest Nelson	Dune Ecosystems - Nelson Motueka
Extent of native communities	Native communities occur over much of their historic range, in blocks large enough to withstand severe natural disturbances	Very Poor	Very Poor
Abundance & diversity of native animals	Healthy populations of native animals are commonly found and abundant across most of their historic range	Fair	Fair
Composition and diversity of native plant communities	Native plant species are present in most existing areas and generally represent the original composition, proportions and structure; non-native species are largely	Very Poor	Poor
Natural regeneration of native plant species	Native plant species are naturally regenerating over most of the existing areas	Very Poor	Very Poor
Presence of special plant and animal species	Most special native species are present in most areas and are in large enough numbers to sustain their populations	Very Poor	Very Poor
Connectivity	Most areas provide largely unimpeded access to adjoining native ecosystems for native species	Fair	Poor
Geological / landform integrity	Most areas have their natural landforms intact	Poor	Good / Fair
<b>Overall Health</b>		<b>Very Poor</b>	<b>Very Poor</b>

## Coastal Cliff & Sea Stack Communities - Northwest Nelson & Nelson Motueka

This ecosystem is confined to cliffs scattered along the coast, including islet stacks. Slopes are so steep that forest is unable to establish. Instead, large areas of bare bedrock are sparsely colonised by shrubs, tussocks and herbs. Stacks are important roosting sites for red-billed gulls and white-fronted terns. Much of the ecosystem is physically protected due to its steepness, but still accessible to predators.

## Seabird Burrowed-Soils - Northwest Nelson & Nelson Motueka

This coastal ecosystem supports populations of burrowing seabirds. Exposed maritime conditions, guano deposits and frequent soil disturbance by seabirds profoundly influence ecosystem productivity. Little blue penguins, fluttering shearwaters and sooty shearwaters currently persist. This system was once frequent on mainland sites and also at suitable sites inland; mainland sites are now decimated by introduced mammals. The only remaining suitable sites are a few inshore islands that are either far enough off-shore or impregnable due to their sheer perimeters.

### Key Findings

- Overall ratings for both systems vary between the two Places: Good/Fair or Fair at NW Nelson, but Poor at Nelson Motueka
- Coastal Cliffs at NW Nelson: mostly rated *Excellent, Good, or Good/Fair*. Many headlands and bluffs retain indigenous cover, although invasive weeds are impacting some.

Other Terrestrial Ecosystems	What is Good...	Coastal Cliffs		Seabird Burrowed Soils	
		Coastal Cliffs - NW Nelson	Coastal Cliffs & Seastacks - Nelson Motueka	Seabird Burrowed Soils - NW Nelson	Seabird Burrowed Soils - Nelson Motueka
Extent of native communities	Native communities occur over much of their historic range, in blocks large enough to withstand severe natural disturbances	Good	Fair	Very Poor	Very Poor
Abundance & diversity of native animals	Healthy populations of native animals are commonly found and abundant across most of their historic range	Good / Fair	Poor	Good	Very Poor
Composition and diversity of native plant communities	Native plant species are present in most existing areas and generally represent the original composition, proportions and structure; non-native species are largely	Good / Fair	Fair	Good	Fair
Natural regeneration of native plant species	Native plant species are naturally regenerating over most of the existing areas	Good / Fair	Poor	Good	Good
Presence of special plant and animal species	Most special native species are present in most areas and are in large enough numbers to sustain their populations	N/A	Poor	Good	Poor
Connectivity	Most areas provide largely unimpeded access to adjoining native ecosystems for native species	Fair	Fair	Poor	Good / Fair
Geological / landform integrity	Most areas have their natural landforms intact	Excellent	Fair	Good	Excellent
Overall Health		Good / Fair	Poor	Fair	Poor

- Coastal Cliffs in Nelson/Motueka: vegetation is often cleared and exotic species can dominate composition. Stoats, possums and rats are predators.
- Seabird Burrowing Habitat
  - Extent is less than 10% of its historic range – *Very Poor*.
  - Physical integrity is either *Excellent* or *Good* where the habitat occurs, usually on small offshore stacks and islets.
  - At Northwest Nelson, all other key attributes are rated *Good*, except connectivity which is *Poor* where connection with mainland habitats has been disrupted by predators.
  - At Nelson Motueka, other key attributes have a spectrum of ratings

## Frost Flats – Nelson Lakes & Northwest Nelson

Frost Flats are confined to valley floors between 300-800 metres elevation where intense cold air ponding, and sometimes poor drainage, have created conditions that prevent the establishment of forest. Instead shrublands dominate. Frost flats and several species of plants within them are now threatened due to extensive loss nationally. Most of this ecological community is on private land in Nelson Lakes, where almost all have been cleared for mainly agriculture. A few important remnants remain. In Northwest Nelson, most of this system is within Kahurangi National Park, the largest of which is in the Cobb Valley (a third of which has been inundated by a dammed lake).

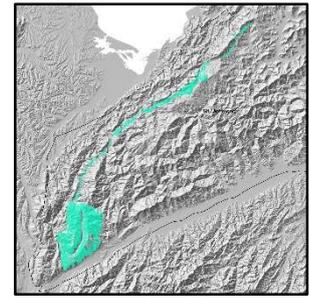
Other Terrestrial Ecosystems	What is Good...	Frost Flats - Nelson Lakes	Frost Flats - Northwest Nelson
Extent of native communities	Native communities occur over much of their historic range, in blocks large enough to withstand severe natural disturbances	Very Poor	Good / Fair
Abundance & diversity of native animals	Healthy populations of native animals are commonly found and abundant across most of their historic range	Poor	Fair
Composition and diversity of native plant communities	Native plant species are present in most existing areas and generally represent the original composition, proportions and structure; non-native species are largely	Very Poor	Good / Fair
Natural regeneration of native plant species	Native plant species are naturally regenerating over most of the existing areas	Very Poor	Fair
Presence of special plant and animal species	Most special native species are present in most areas and are in large enough numbers to sustain their populations	Poor	Fair
Connectivity	Most areas provide largely unimpeded access to adjoining native ecosystems for native species	Very Poor	Excellent
Geological / landform integrity	Most areas have their natural landforms intact	Good / Fair	Good / Fair
<b>Overall Health</b>		<b>Very Poor</b>	<b>Good / Fair</b>

### Key Findings

- Overall health ratings vary greatly between the two Places they are found: *Good/Fair* at Northwest Nelson and *Poor* at Nelson Lakes
- Nelson Lakes:
  - Four key attributes are rated *Very Poor*: extent, connectivity, plant composition and regeneration.
  - Most of these sites are very small, degraded, and continue to be reduced in extent by land development, browsers (especially stock), woody weeds, vines and swarding grasses. Fragmentation has made many sites non-functional.
- Northwest Nelson:
  - Threats to native plant communities are browsers (stock, fallow and red deer, hares, possums) and exotic swarding pasture grasses.

## Mineral Belt – Mt Richmond

This ecosystem includes the stunted forest, shrublands, tussocklands and openlands which largely occur in the Red Hills and Dun Mountain areas. Most of the ecosystem occurs above bushline. The Mineral Belt is unique and characterised by erodible soils which have high concentrations of metals that are toxic to most plants, so that unique shrubland and tussockland communities have evolved. Species diversity is naturally low. Many special species are confined solely to this ecosystem.



Mineral Belt (draft) DOC

## Downs and Plateaux – Northwest Nelson

These peneplains are unusual, being largely devoid of forests below the natural timber line. Leached rocks of the peneplain surface, coupled with high rainfall have resulted in skeletal soils supporting unusual vegetative cover of tussocks and stunted woody plants at a relatively low altitude. Some of the best examples include: Matiri Plateau, Gunner Downs, Mackay Downs, Goulard Downs, Garibaldi Plateau, Hope Range, and Mt Arthur Tableland.



Plateaux, Northwest Nelson

DOC

## Key Findings

- Extent is *Excellent* for both ecosystems.
- Connectivity and physical integrity are either *Excellent* or *Good* for both ecosystems.
- Mineral Belt: Woody weeds, especially confers, gorse and Spanish heath, are the biggest current threats, followed by introduced browsers (deer, goats, pigs) and predators (stoats, rats).

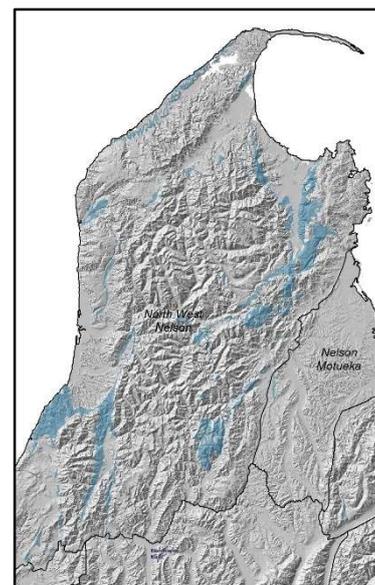
Large areas have been extensively burnt in the past and fire still poses a significant potential threat.

Other Terrestrial Ecosystems	What is Good...	Mineral Belt - Mt Richmond	Downs & Plateaux - NW Nelson
Extent of native communities	Native communities occur over much of their historic range, in blocks large enough to withstand severe natural disturbances	Excellent	Excellent
Abundance & diversity of native animals	Healthy populations of native animals are commonly found and abundant across most of their historic range	Fair	Fair
Composition and diversity of native plant communities	Native plant species are present in most existing areas and generally represent the original composition, proportions and structure; non-native species are largely	Fair	Good / Fair
Natural regeneration of native plant species	Native plant species are naturally regenerating over most of the existing areas	Fair	Good / Fair
Presence of special plant and animal species	Most special native species are present in most areas and are in large enough numbers to sustain their populations	Good / Fair	Fair
Connectivity	Most areas provide largely unimpeded access to adjoining native ecosystems for native species	Good	Excellent
Geological / landform integrity	Most areas have their natural landforms intact	Good	Excellent
<b>Overall Health</b>		<b>Good / Fair</b>	<b>Good</b>

- Downs & Plateaux: All other key attributes are either *Good/Fair* or *Fair*. Areas have been modified, mainly due to attempts at pastoral grazing (burning, weed invasion).

## Cave Ecosystems – Northwest Nelson

Caves are a component of landscapes known as 'karst' – formed from the dissolution of rocks such as limestone, dolomite and gypsum. A karst is characterized by underground drainage systems with sinkholes and caves. Some of the oldest, deepest and longest karst cave systems known in New Zealand are represented on the Top of the South Island, and are noteworthy for their extent and diversity. Some caves have formations that are internationally significant and contain important fossil records of now extinct fauna such as moa bones. This ecosystem is intended to capture all the subterranean biodiversity of karst caves in the region.



Cave/karst ecosystems (draft) DOC

Other Terrestrial Ecosystems	What is Good...	Caves - Northwest Nelson
Extent of native communities	Native communities occur over much of their historic range, in blocks large enough to withstand severe natural disturbances	Excellent
Abundance & diversity of native animals	Healthy populations of native animals are commonly found and abundant across most of their historic range	N/A
Composition and diversity of native plant communities	Native plant species are present in most existing areas and generally represent the original composition, proportions and structure; non-native species are largely	N/A
Natural regeneration of native plant species	Native plant species are naturally regenerating over most of the existing areas	N/A
Presence of special plant and animal species	Most special native species are present in most areas and are in large enough numbers to sustain their populations	Excellent
Connectivity	Most areas provide largely unimpeded access to adjoining native ecosystems for native species	Good
Geological / landform integrity	Most areas have their natural landforms intact	Good
Air & water conditions in caves	Temperature, humidity & other environmental variables inside most caves are suitable for native cave fauna	Good / Fair
<b>Overall Health</b>		<b>Good</b>



Cave, Northwest Nelson DOC

## Key Findings

- Extent, connectivity and physical integrity are all *Excellent* or *Good*.
- To the degree known, special species known to these caves are still present.
- Air and water conditions in caves are important: CO2 composition, humidity, ambient temperature and acidity are key factors. Main threats to these ecosystems are from direct human impacts such as disturbance, discharges of fine sediment from earthworks and changes to atmospheric conditions.

## Marble Ecosystems – Northwest Nelson

This includes all of the marble geology that is not associated with plateaux and downlands, including the Arthur and Owen massifs, Mounts Burnett, Hoary Head, Crusader, Olive, Baldy, Sodom, Patriarch, Turk’s Cap and The Gendarme. Most occur above the natural bushline (c. 1350m to 1875m) although shrublands occur in some areas as low as 400 metres elevation. Includes some of the world’s best examples of glacially sculpted alpine marble. Nearly all of this system lies within Kahurangi National Park.



Marble, Northwest Nelson DOC

## Coal Measure Ecosystems – Northwest Nelson

Large upland plateaux in the far southwest of Northwest Nelson Place, between 200-1100 metres, are characterised by very impoverished coal measure geology and soils, which combined with high rainfall and exposure, have created harsh and unique conditions. Coal measure ecosystems contain naturally rare sandstone erosion pavements, nationally significant wetlands, and numerous threatened or at-risk native plant species, some of which are only found here. These ecosystems are only found in Northwest Nelson with most representation at Stockton and Denniston Plateaux.



Denniston coal measure, NW Nelson DOC

## Key Findings

### Marble Ecosystems:

- Extent, connectivity and physical integrity are all *Good*
- All other key attributes are either *Good/Fair* or *Fair*.
- Stoats and possums are the main predators of native wildlife. Red deer, goats, chamois, pigs, hares and possums are having impacts on vegetation and habitats.

### Coal Measure Ecosystems:

- Five key attributes are rated only *Fair* and the presence of special species is *Poor*.
- Indigenous cover, special species and habitat for fauna have been impacted by burning to clear vegetation, opencast mining, and weed invasion.
- Predators of native animals include stoats, rats and cats.

Other Terrestrial Ecosystems	What is Good...	Marble - NW Nelson	Coal Measure - NW Nelson
Extent of native communities	Native communities occur over much of their historic range, in blocks large enough to withstand severe natural disturbances	Good	Fair
Abundance & diversity of native animals	Healthy populations of native animals are commonly found and abundant across most of their historic range	Fair	Fair
Composition and diversity of native plant communities	Native plant species are present in most existing areas and generally represent the original composition, proportions and structure; non-native species are largely	Good / Fair	Fair
Natural regeneration of native plant species	Native plant species are naturally regenerating over most of the existing areas	Good / Fair	Fair
Presence of special plant and animal species	Most special native species are present in most areas and are in large enough numbers to sustain their populations	Fair	Poor
Connectivity	Most areas provide largely unimpeded access to adjoining native ecosystems for native species	Good	Good
Geological / landform integrity	Most areas have their natural landforms intact	Good	Fair
<b>Overall Health</b>		<b>Good / Fair</b>	<b>Fair</b>

## Coastal Turf Communities – Northwest Nelson

This ecosystem is confined to small stable landforms along the western coast which are subject to extreme, windy maritime conditions. These conditions prevent the establishment of forest and promote shrubs, vines and turf herb vegetation. Crests of promontories and headlands support the most well-developed coastal turfs. They occur infrequently between the Heaphy and Kahurangi Rivers, and more frequently northwards to Cape Farewell. These turfs' species diversity is nationally significant; several threatened species are present. Much of this ecosystem has no legal protection.

## Islets, Barrier Beaches, Tombolos, Spits & Bars – Nelson Motueka

This ecosystem includes coast landforms that have resulted from the deposition of sand, cobbles, boulders and shells by the action of coastal process such as longshore drift. They include iconic features such as the Nelson Boulder Bank (Te Taero a Kereopa) and are often associated with tidal lagoons/estuaries and river/stream mouths. Cable Bay tombolo connects the mainland with Pepin Island. Some of the landforms, such as bars, are mobile or transient. Many are vital nesting and high tide roosting sites for shorebirds. The larger landforms support a diverse lizard fauna. Vegetation is usually sparse and low with limited diversity due to the tough environmental conditions. Most landforms support important archaeological sites.

### Key Findings

#### Coastal Turf:

- *Good/Fair* overall health
- There has been a net loss of habitat.
- Slugs and snails selectively target some species to local extinction.

#### Barrier Banks, Tombolos,

#### Islets and Bars:

- Connectivity and integrity are rated *Good*, but all other key attributes are rated *Poor*.
- Most of the original native forest on these landforms has been lost.
- Significant weed threats affect native plant communities.
- Predators and browsers include rats, weasels, stoats, cats, mice, hedgehogs, possums and rabbits.

Other Terrestrial Ecosystems	What is Good...	Coastal Turf - NW Nelson	Barrier Bank, Tombolos, Islets, Bars - Nelson
Extent of native communities	Native communities occur over much of their historic range, in blocks large enough to withstand severe natural disturbances	Fair	Poor
Abundance & diversity of native animals	Healthy populations of native animals are commonly found and abundant across most of their historic range	Fair	Poor
Composition and diversity of native plant communities	Native plant species are present in most existing areas and generally represent the original composition, proportions and structure; non-native species are largely	Good	Poor
Natural regeneration of native plant species	Native plant species are naturally regenerating over most of the existing areas	Good / Fair	Poor
Presence of special plant and animal species	Most special native species are present in most areas and are in large enough numbers to sustain their populations	Good	Poor
Connectivity	Most areas provide largely unimpeded access to adjoining native ecosystems for native species	Fair	Good
Geological / landform integrity	Most areas have their natural landforms intact	Good	Good
<b>Overall Health</b>		Good / Fair	Fair



Kotahitanga mō te Taiao

# Lakes & Wetlands Overview

	<b>Upland Lakes</b>	<b>Excellent</b>
	<b>Lowland Lakes</b>	<b>Good</b>
	<b>Upland Wetlands</b>	<b>Excellent</b>
	<b>Valley Floor &amp; Coastal Wetlands</b>	<b>Poor</b>



Upland lake, Northwest Nelson

DOC

## Top of South Lakes & Wetlands

Clean lakes provide recreational values for swimming, fishing and boating. Wetlands support high levels of biodiversity. They provide habitat for indigenous invertebrates, plants, fish, and bird species, many of which live only in wetlands. Wetlands also act as giant sponges and kidneys – they clean the water of excess nutrients and sediment, control flood water and pollutants. Wetlands and lakes have strong cultural and spiritual importance for Māori.

What we want to achieve	This is what success looks like
TOS 12.0 Secure, sustain and enhance natural freshwater systems and increase their resilience. (Outcomes 2 and 5)	<p>The Top of the South is free of harmful freshwater pests.</p> <p>Riparian margins are dominated by indigenous species.</p>

From Kotahitanga mō te Taiao Strategy

# Lakes & Wetlands Health Scorecard



Upland Lakes



Lowland Lakes



Upland Wetlands



Valley Floor & Coastal Wetlands



**Extent**

Excellent

Excellent

Excellent

Poor



**Aquatic Animals**

Excellent

Good / Fair

Good

Poor



**Aquatic Vegetation**

Excellent

Good

Good

Poor



**Margins**

Excellent

Good

Excellent

Poor



**Water Levels**

Excellent

Good

Excellent

Fair



**Water Quality**

Excellent

Good

Excellent

Fair

*Scores are average scores across Places; site-specific scores may vary*

## What is Good? For most lakes and wetlands...



**Extent:** occur over their historic range



**Aquatic Animals Diversity/Abundance:** healthy native aquatic animal populations



**Aquatic Vegetation:** Native aquatic plant species generally represent the original composition & proportions; invasive non-native species are manageable or in small numbers



**Margins:** intact native vegetation around margin, sufficient to sustain water/habitat quality



**Water Levels:** sustain expected native aquatic species and habitats



**Water Quality – Aquatic Systems:** good water quality conditions that cause no or little stress to aquatic life

*Note: The above descriptors are shorthand excerpts; see Appendix F for full rating standards*

## Key Findings: Lakes and Wetlands

- Upland Lakes are in excellent health across the region. They rate *Excellent* for every attribute at the three Places they are found. (There are no natural lakes in Nelson Motueka or in lowland areas of Mt Richmond.)
- Upland Wetlands are also in excellent health across the region. They rate either *Excellent* or *Good* for every attribute at the three Places they are found.
- Lowland Lakes are also in good condition in the two Places they are found. Overall they rated as *Excellent* at Nelson Lakes and *Good* at Northwest Nelson. However, conditions at some sink-hole lakes and at Kaihoka Lakes are on the brink of becoming adversely affected by nutrients.
- Conversely, Valley Floor & Coastal Wetlands range from fair to very poor condition. Lowland wetlands in Mt Richmond and Nelson Motueka are especially imperilled. Overall conditions are better at Nelson Lakes and at Northwest Nelson but still only *Fair*.
- Lowland wetlands face many serious stresses.
  - They are greatly reduced in their extent
  - Water levels are lowered due to extraction and diversions
  - Margins are insufficiently protected and/or maintained to provide good buffer capacity
  - Native aquatic animal populations are unhealthy
  - Invasive plant species such as willow, blackberry and Spanish Heath are encroaching or completely dominating
  - Water quality is impaired

## Health at Top of the South Places

There is substantial commonality across the four Places on the Top of the South, with all Places mostly showing the same basic pattern described above (e.g. excellent health for upland lakes and wetlands; much poorer health for lowland wetlands). The largest variation among Places is the health of Lowland Wetlands.

Summary of Health by Place				
Lake & Wetland Ecosystems	Upland Lakes	Lowland Lakes	Upland Wetlands	Lowland Wetlands
Mt Richmond	Excellent	N/A	Excellent	Very Poor
Nelson Lakes	Excellent	Excellent	Excellent	Fair
Northwest Nelson	Excellent	Good	Excellent	Fair
Nelson Motueka	N/A	N/A	N/A	Very Poor
<b>Overall Health</b>	<b>Excellent</b>	<b>Good</b>	<b>Excellent</b>	<b>Poor</b>

## Top of the South Strategies

The following Kotahitanga mō te Taiao strategies are intended to achieve healthy lowland wetland ecosystems.

- Eradicate pest fish and aquatic weeds and maintain native species dominance in priority areas
- Support and encourage landowners to plant riparian margins and to manage weeds and pests
- Sustained engagement by people in restoring depleted ecosystems, and an increased understanding how these ecosystems benefit the local communities



# Upland Lakes

## Health Scorecard

Lakes and tarns above ~700 meters. Adjoining land cover varies depending on lake altitude and location -- mostly large tracts of native alpine or sub-alpine grasses, forbs, shrubs, tussock or mountain beech forest; other forest types may adjoin lakes in western regions.



**Mt Richmond**

**Excellent**



**Nelson Lakes**

**Excellent**



**Northwest Nelson**

**Excellent**

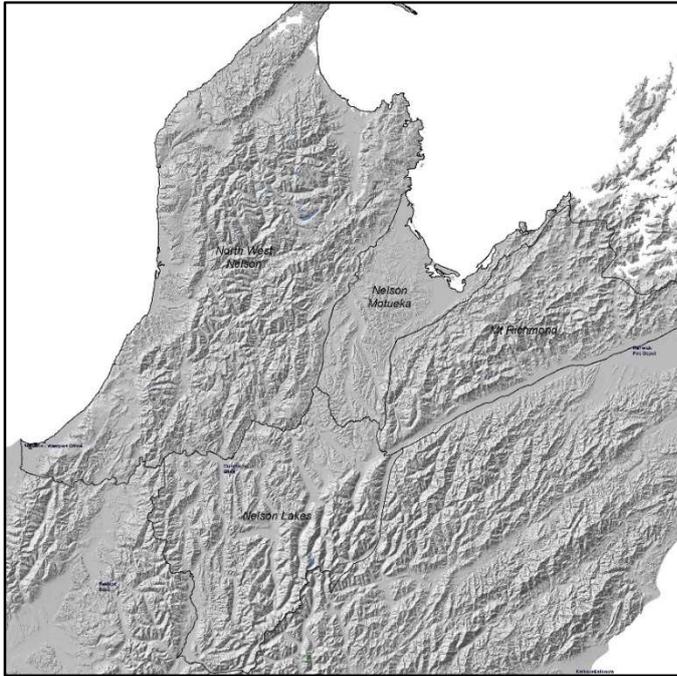


Tarn, Nelson Lakes

P. Hamill

Lake and Wetland Ecosystems	What is Good...	Upland Lakes - Mt Richmond	Upland Lakes - Nelson Lakes	Upland Lakes - NW Nelson
Extent	Most of the lakes/wetlands occur over their historic range	Excellent	Excellent	Excellent
Native aquatic animal species diversity and abundance	Most lakes/wetlands have healthy native aquatic animal populations (including waterbirds, fernbirds and marsh birds) across their expected range; lakes thought to be mostly free of non-native fish (e.g. trout)	Excellent	Excellent	Excellent
Aquatic vegetation composition and structure	Native aquatic plant species are present in most existing lakes/wetlands and generally represent the original composition, proportions, and invasive non-native species are manageable and/or in small numbers	Excellent	Excellent	Excellent
Margins	Most lakes/wetlands have intact native vegetation along/around the margin which is sufficient to sustain water/habitat quality	Excellent	Excellent	Excellent
Water levels	Water levels sustain expected native aquatic species and habitats in most lakes/wetlands	Excellent	Excellent	Excellent
Water quality - aquatic systems	Most lakes/wetlands have good water quality conditions that cause no or little stress to aquatic life	Excellent	Excellent	Excellent
<b>Overall Health</b>		<b>Excellent</b>	<b>Excellent</b>	<b>Excellent</b>

*Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data and expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.*



Upland lakes (draft)

DOC

## Northwest Nelson

Most of the Top of the South upland lakes and tarns are found in Northwest Nelson. These include many lakes in Kahurangi National Park such as Sylvester, Lockett, Cobb, Peel, Boulder and Stanley.

## Nelson Lakes

Includes small lakes and tarns at higher elevations in Nelson Lakes National Park. This includes Blue Lake which is famed for having the clearest water in the world.



Upland lake, Nelson Lakes

DOC

## Mt Richmond

The Mt Richmond Place, which is generally lower elevation than Northwest Nelson, has relatively few alpine lakes and tarns.

## Key Findings: Upland Lakes

- Upland Lakes are in excellent health at the three Places they are found across the region (none in lower elevation Nelson Motueka). They rate *Excellent* for every attribute at every Place:
  - Extent across their historic range
  - Native aquatic animal species diversity and abundance
  - Native aquatic vegetation composition and structure
  - Margins
  - Water levels
  - Water quality



## Lowland Lakes

## Health Scorecard

Lakes below ~700 metres. Includes two large lakes at Nelson Lakes National Park, but mostly valley floor or low elevation lakes. These include sinkhole lakes, mostly in Takaka Valley, and some coastal lakes. (Small dune lakes, such as those on Farewell Spit and Turamwiwi, are included within Dune ecosystems.) Adjoining land cover is variable, depending on the elevation. Most lowland lakes are within public conservation lands with adjoining native vegetation cover.



**Nelson Lakes**

**Excellent**



**Northwest Nelson**

**Good**

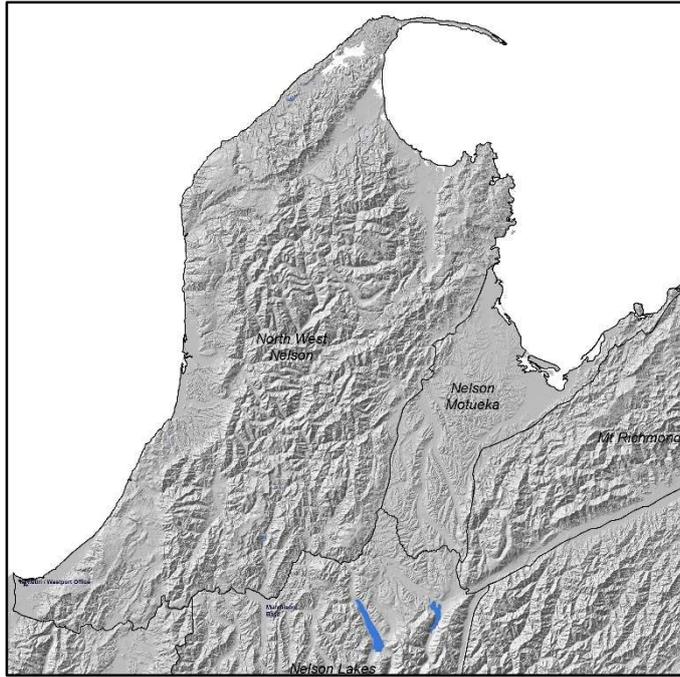


Lake Rotoiti, Nelson Lakes

G. Low

Lake and Wetland Ecosystems	What is Good...	Lowland Lakes – Nelson Lakes	Lowland Lakes – NW Nelson
Extent	Most of the lakes/wetlands occur over their historic range	Excellent	Excellent
Native aquatic animal species diversity and abundance	Most lakes/wetlands have healthy native aquatic animal populations (including waterbirds, fernbirds and marsh birds) across their expected range; lakes thought to be mostly free of non-native fish (e.g. trout)	Good / Fair	Good / Fair
Aquatic vegetation composition and structure	Native aquatic plant species are present in most existing lakes/wetlands and generally represent the original composition, proportions, and invasive non-native species are manageable and/or in small numbers	Good	Good
Margins	Most lakes/wetlands have intact native vegetation along/around the margin which is sufficient to sustain water/habitat quality	Excellent	Good / Fair
Water levels	Water levels sustain expected native aquatic species and habitats in most lakes/wetlands	Excellent	Good
Water quality – aquatic systems	Most lakes/wetlands have good water quality conditions that cause no or little stress to aquatic life	Excellent	Good / Fair
<b>Overall Health</b>		<b>Excellent</b>	<b>Good</b>

*Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data and expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.*



Lowland lakes (draft)

DOC



Kaihoka Lakes, Northwest Nelson

DOC

## Northwest Nelson

Many small lakes including sinkhole lakes in the Takaka valley, coastal lakes such as Hanlon, Otuhie, Kaihoka, Wharariki, and inland lakes within beech forest such as Matiri and Caslani.

## Nelson Lakes

Most notably includes Lake Rotoiti and Lake Rotoroa in Nelson Lakes National Park, both of which are below 600 metres elevation.

### Key Findings: Lowland Lakes

- Lowland Lakes are in excellent or good overall health at the two Places they are found. They are rated *Excellent* overall at Nelson Lakes; they are rated *Good* overall at Northwest Nelson, due to land use activities in catchments for some lakes in this place.
  - Nelson Lakes rates as *Excellent* in four of the six key attributes.
  - Native aquatic animal species diversity and abundance is the lowest-rated attribute, *Good/Fair* at both Places, due largely to the influence of predators on native waterbirds and other native aquatic animals.
  - Margins are *Good/Fair* in Northwest Nelson due to several small lakes, particularly in the Takaka Valley, with very narrow margins and some with stock grazing right to the edge.
  - Water quality is also *Good/Fair* at Northwest Nelson. Conditions at some sinkhole lakes and at Kaihoka Lakes are on the brink of becoming adversely affected by nutrients.
  - Water levels are only likely to be a significant adverse effect for Lake Matiri and Cobb Hydro-electric Power Schemes in Northwest Nelson, hence the slightly lower score for this attribute.



# Upland Wetlands

## Health Scorecard

Includes peatlands and other wetlands such as bogs, fens, pakihi wetlands, seeps and flushes above 700 metres elevation, also includes Tophouse wetlands as an exception slightly below 700 metres. Many of these higher-elevation wetlands are within public conservation lands.



**Mt Richmond**

**Excellent**



**Nelson Lakes**

**Excellent**



**Northwest Nelson**

**Excellent**

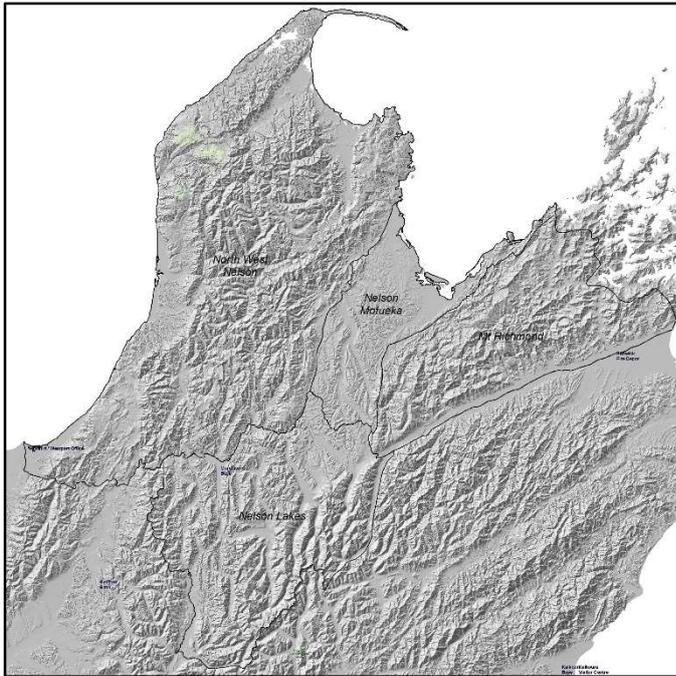


Fen wetland, Northwest Nelson

DOC

Lake and Wetland Ecosystems	What is Good...	Upland Wetlands - Mt Richmond	Upland Wetlands - Nelson Lakes	Upland Wetlands - NW Nelson
Extent	Most of the lakes/wetlands occur over their historic range	Excellent	Good	Excellent
Native aquatic animal species diversity and abundance	Most lakes/wetlands have healthy native aquatic animal populations (including waterbirds, fernbirds and marsh birds) across their expected range; lakes thought to be mostly free of non-native fish (e.g. trout)	Good	Good	Good
Aquatic vegetation composition and structure	Native aquatic plant species are present in most existing lakes/wetlands and generally represent the original composition, proportions, and invasive non-native species are manageable and/or in small numbers	Good	Good	Excellent
Margins	Most lakes/wetlands have intact native vegetation along/around the margin which is sufficient to sustain water/habitat quality	Excellent	Excellent	Excellent
Water levels	Water levels sustain expected native aquatic species and habitats in most lakes/wetlands	Excellent	Excellent	Excellent
Water quality – aquatic systems	Most lakes/wetlands have good water quality conditions that cause no or little stress to aquatic life	Excellent	Excellent	Excellent
<b>Overall Health</b>		<b>Excellent</b>	<b>Excellent</b>	<b>Excellent</b>

*Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data and expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.*



Upland wetlands (draft)

DOC

## Northwest Nelson

There is a rich diversity of alpine and subalpine bogs in Northwest Nelson. Wetlands in the mountains are generally bogs, fens and seepages. Heaphy and Wangapeka have extensive bog and fen complexes – Goulard Downs, Mackay Downs, Cobb Valley and Matiri Plateaus – most of which remain intact.

## Mt Richmond

Patches of upland wetlands in Mt Richmond's higher elevations occur over their historic range.

## Nelson Lakes

A reasonable proportion of the original extent of sub-alpine bogs exist in Nelson Lakes, even in developed areas such as at Tophouse and Upper Tutaki.

## Key Findings: Upland Wetlands

- Upland Wetlands are largely undisturbed and in excellent health at the three Places they are found across the region. They rate either *Excellent* or *Good* for every attribute.



# Valley Floor & Coastal Wetlands

## Health Scorecard

Includes pakihi wetlands, swamps, fens, freshwater marshes, and low elevation springs (salt marshes are included in estuaries). Swamps and marshes can be associated with rivers, streams or lakes. Some are near the coast but are not influenced by coastal processes. A diverse mix of ecosystems, they are mostly scattered remnants and suffer from either being degraded and/or vulnerable to future degradation. Adjoining land use may be public conservation land or private land, including farms.



**Mt Richmond**

**Very Poor**



**Nelson Lakes**

**Fair**



**Northwest Nelson**

**Fair**



**Nelson Motueka**

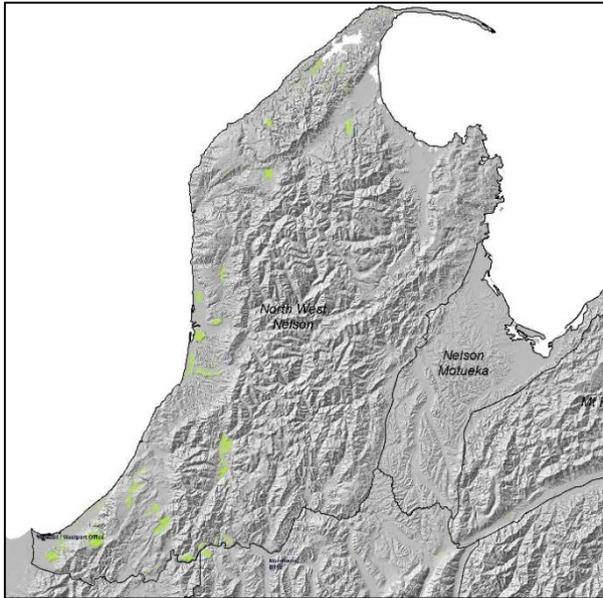
**Very Poor**



Lowland wetland, Tutaki Heights Nelson Lakes  
T. James

Lake and Wetland Ecosystems	What is Good...	Lowland Wetlands - Mt Richmond	Lowland Wetlands - Nelson Lakes	Lowland Wetlands - NW Nelson	Lowland Wetlands - Nelson Motueka
Extent	Most of the lakes/wetlands occur over their historic range	Poor	Poor	Fair	Very Poor
Native aquatic animal species diversity and abundance	Most lakes/wetlands have healthy native aquatic animal populations (including waterbirds, fernbirds and marsh birds) across their expected range; lakes thought to be mostly free of non-native fish (e.g. trout)	Poor	Poor	Fair	Very Poor
Aquatic vegetation composition and structure	Native aquatic plant species are present in most existing lakes/wetlands and generally represent the original composition, proportions, and invasive non-native species are manageable and/or in small numbers	Very Poor	Good / Fair	Fair	Very Poor
Margins	Most lakes/wetlands have intact native vegetation along/around the margin which is sufficient to sustain water/habitat quality	Very Poor	Fair	Poor	Very Poor
Water levels	Water levels sustain expected native aquatic species and habitats in most lakes/wetlands	Fair	Fair	Fair	Fair
Water quality – aquatic systems	Most lakes/wetlands have good water quality conditions that cause no or little stress to aquatic life	Fair	Fair	Fair	Poor
<b>Overall Health</b>		<b>Very Poor</b>	<b>Fair</b>	<b>Fair</b>	<b>Very Poor</b>

*Ecosystem health measures are based on a landscape scale perspective, using best professional judgement, available data and expert opinion. Conditions may be better or worse at any one site. The ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.*



Valley floor & coastal wetlands (draft)

DOC

## Northwest Nelson

Lowland wetlands examples of good quality include Mangarakau Swamp and Waikoropupū Springs (below).



Te Waikoropupū Springs, Northwest Nelson DOC

## Mt Richmond

Few remaining natural wetlands remain in the Mt Richmond valley floors.

## Nelson Lakes

Few valley floor wetlands including kahikatea swamp forest remain, and few are within public conservation lands.

## Nelson Motueka

Almost all freshwater wetlands have been drained. Irrigation ponds feature in the Moutere Hill landscape.

## Key Findings: Valley Floor & Coastal Wetlands

- Valley Floor & Coastal Wetlands are the Top of the South's most threatened non-river freshwater ecosystem.
  - Lowland wetlands in Mt Richmond and Nelson Motueka are especially imperilled. Overall health is better at Nelson Lakes and at Northwest Nelson but still only *Fair*.
- They are greatly reduced in their extent.
  - The lowland Ecological Districts historically had extensive valley floor swamps and marshes, which have suffered the greatest losses in area (e.g. 75% for Nelson Lakes).
  - Northwest Nelson's West Whanganui has had the lowest losses of valley floor wetlands (45%), and still retains extensive intact lowland swamps such as Mangarakau Swamp.
- Lowland wetlands have also suffered the greatest declines in condition.
  - Water levels are lowered due to extraction and diversions
  - Native wetland vegetation in wetlands and their margins outside of protected areas is often absent and if present, usually less intact than in upland wetlands
  - Invasive plant species are encroaching
  - Water quality is impaired

## Cultural, Social and Economic Wellbeing

In addition to maintaining and restoring ecosystem health, *Kotahitanga mō te Taiao* is strongly committed to enhancing cultural, social and economic wellbeing as it develops and implements its strategies. In its Strategy document, the Alliance has referenced some important outcomes in this regard, across the Top of the South and at Places.

In developing potential indicators for cultural, social and economic wellbeing, the Measures participants recognised the following principles:

1. Alliance measures are *not intended to be a comprehensive set* of wellbeing indicators -- a scope and task that exceeds the focused mission, goals and strategies of the Alliance.
2. Measures should relate to the Alliance's Strategies at Places, and wellbeing scores should potentially be improved via Alliance and partner strategies, either directly or indirectly.
3. The framework used for developing ecosystem health measures (e.g. key attributes and ranking standards) may be potentially useful for cultural, social and economic measures as well, but this approach is not yet fully definitive.

An iwi-led pilot project was completed for assessing **iwi cultural health**, using a similar framework to the ecosystem health measures. Iwi leaders are now keen on developing and completing an iwi-led, full-scale cultural health assessment across the Top of the South.

A framework was also developed by an Alliance measures sub-group for assessing **social and economic wellbeing** in relation to the Alliance's strategies. This framework will not be applied as scorecard, but rather be used to help assess and evaluate potential Alliance strategies and projects.

Although the above efforts are preliminary, a sense of their potential future direction can be gained by looking at the Alliance's desired outcomes and the initial draft attributes for assessing wellbeing.

### Iwi Cultural Wellbeing

*Iwi customs, spiritual values and traditions are maintained through access to healthy, clean, safe and abundant environments.*

What we want to achieve	This is what success looks like	How to get there
<b>TOS 2.0</b> Iwi customs, spiritual values, and traditions have been maintained through access to healthy, clean, safe and abundant environments. (Outcomes 2 and 4)	Mahinga kai and mataitai have been protected and maintained. Traditional foods, including uncultivated foods, are available for harvest and planting. Indigenous plants, birds, animals and forests are healthy, abundant and managed sustainably.	Document iwi aspirations for the management of the te Taiao and develop programmes and projects that align with these.

*Kotahitanga mō te Taiao Strategy*

### Initial Draft Indicators – Iwi Cultural Health

- Seeing culturally significant species over the seasons
- Mahinga kai
  - Species abundance to harvest and considered healthy to eat
  - Physical and legal access for iwi
  - Would the next generation of iwi return?
- Traditional places
  - Integrity and security
  - Physical and legal access
  - Iwi place names and stories

### Social Wellbeing

*The majority of citizens, industries and visitors know what makes the region special and are actively involved in sustaining/restoring nature.*

What we want to achieve	This is what success looks like	How to get there
<b>TOS 1.0</b> People understand and care for their natural heritage, moving to ecologically sustainable use of their environment and restoring past damage. (Outcome 4)	The majority of citizens, industries, and visitors know what makes the region special and are actively involved in sustaining and restoring nature.	Inspire curiosity about natural heritage and support people to care for it.
		Socialise active support for landscape scale nature restoration.
		Grow understanding of how thriving ecosystems contribute to thriving communities.

*Kotahitanga mō te Taiao Strategy*

### Initial Draft Indicators – Social Wellbeing

- Organizational collaboration
- Citizen connection to Place
- Broad and diverse citizen participation

## **Sustainable Economic Wellbeing**

*Communities and industries flourish while using ecologically sustainable practices.*

<b>This is what success looks like</b>	<b>How to get there</b>
Communities prosper as they transition to more ecologically sustainable creation of wealth	Support communities to develop opportunities that encourage the use of ecologically sustainable practices.

*Kotahitanga mō te Taiao Strategy, Northwest Nelson*

### **Initial Draft Indicators – Sustainable Economic Wellbeing**

- Enabling sustainable practices and sector vitality
- Achieving sustainable practices and sector vitality
- Businesses and economic development activity advancing Kotahitanga strategy goals
- Achieving / advancing Kotahitanga strategy goals provides new business opportunities

The draft cultural, social and economic wellbeing indicators, together with draft ranking standards for “what is good,” can all help inform the Alliance – as it further develops these measures – to prioritise strategies, assess project opportunities and evaluate project success.

## Conclusion and Next Steps

The Top of the South ecosystem health measures provide a high-level perspective of the status of the region's extraordinary natural diversity. The high-level measures by their nature are integrated over large landscape units. Although conditions for a given ecosystem type will vary within a landscape, the measures are intended to provide an informative overall picture of health.

At a landscape-level, they show at a glance – via scorecards for all major ecosystems – which ecosystems in which Places are in good condition, which ones most need management and restoration attention, and why.

The landscape-level measures are based upon narrative, not numerical standards. They are not represented to be exact metrics. They are informed by science, by data where relevant and available, and by the best professional judgement of knowledgeable local scientists and practitioners.

The measures will provide a helpful framework for gathering, prioritising and assessing more detailed science data for designing project activities, as well as for monitoring and evaluation of project results.

The Alliance plans to expand the measures to include marine and coastal ecosystems at three additional Places – Nelson Bays, West Coast Marine and Marlborough Sounds/Cook Straight. The Marlborough Sounds islands also have important terrestrial and freshwater ecosystems.

Alliance leaders are committed to undertaking a full, iwi-led development of iwi cultural health measures, which will provide a vital additional set of values to help set strategy priorities, evaluate opportunities and assess project activities. The Alliance's pilot effort for iwi cultural health measures, and iwi cultural health measures undertaken elsewhere in New Zealand, indicate that these values will be very complementary to the ecosystem health measures, enhancing the qualities of each other.

The ecosystem health scorecards are meant to be a "credible first iteration." As soon as they are published there undoubtedly will be new information that becomes available, new or different science hypotheses, and differing interpretations and opinions on some health scores. Over time, circumstances will change on the ground – both for better and for worse in terms of ecosystem health. The Alliance expects to revisit the measures when it revisits its strategies, which it intends to do every five years.

A major purpose of these measures is to help inform selection of strategies and priority project-level actions. Ideally, project-level strategies should be designed to help "change the colours on the scorecards" – from red to yellow and from yellow to green. Strategies for the conservation and restoration of all impaired ecosystems need to be scaled-up and deployed at a landscape-level, over many years, to achieve the desired future health of the region's ecological taonga.

## Appendix A – Measures Working Group

The ecosystem measures were developed with the assistance of many participants. A core group of ten persons, including five representatives from the Top of the South Councils and five from the Department of Conservation, were involved throughout most of the work for most ecosystems (terrestrial and/or freshwater) at most Places. The tasks of the Measure Working Group included:

- Determine ecosystem classes for each Place
- Determine key attributes for each ecosystem
- Develop narrative standards of health for each attribute, focusing on “what is good”
- Assign current health ratings for each attribute

Members were selected with knowledge of the ecosystems and Places in the Alliance Strategy. The group and other participants met in a series of four in-person and four virtual workshops during 2020, following the development of pilot measures in late 2019. The group reached out for additional scientific and local expertise as needed. The group worked together as a whole, as well as within freshwater and terrestrial ecosystem-oriented teams. The group’s decisions were based upon consensus.

### Core Working Group

The following persons were involved in developing and reviewing the ecosystem classifications, descriptions, key attributes, ranking standards and current health scores for multiple ecosystems at multiple Places.

- Anne Brow, Department of Conservation
- Shannel Courtney, Department of Conservation
- Jasmine Foxlee, Department of Conservation
- Philippe Gerbeaux, Department of Conservation
- Peter Hamill, Marlborough District Council
- Trevor James, Tasman District Council
- Leigh Marshall, Nelson City Council
- Jo Martin, Nelson City Council
- Paul Sheldon, Tasman District Council
- Kate Steffens, Department of Conservation

### Support

- Greg Low, Applied Conservation – facilitator & lead author (pro bono)
- Kelly Stevens, Department of Conservation – Alliance partnership coordinator
- Chris Woolmore, Department of Conservation – measures science support
- Jo Kearns, Department of Conservation – measures support

Additional assistance or review of specific ecosystem descriptions, attributes or health scores at one or more Places was provided by:

- Randall Beal, West Coast Regional Council
- Maria Deutsch, Department of Conservation
- Paul Fisher, Nelson City Council

- Scott Freeman, Department of Conservation
- Melissa Griffen, Department of Conservation
- Mike Hawes, Department of Conservation
- Darrell Haworth, Department of Conservation
- Jeroen Lurling, Tasman District Council
- Jane Marshall, Department of Conservation
- Hans Stroffregen, Department of Conservation
- Rachel Townrow, Buller District Council
- Kath Walker, Department of Conservation

Andrew Evans, Shannel Courtney and Chris Woolmore – all with the Department of Conservation (DOC) -- provided assistance with maps.

Maria Deutsch – DOC, Shelley Sidley – DOC, and Jo Martin – Nelson City Council helped lead the development of the social and economic indicators, with helpful participation by Jasmine Foxlee - DOC, Carl McGuinness – The Nature Conservancy, Peter Hamill – Marlborough District Council, Paul Sheldon – Tasman District Council and others.

Andrew Baxter – DOC, Damian Cloeter – MPI, Peter Lawless – Nelson Biodiversity Strategy and Kura Stafford – Ngāti Tama ki Te Waipounamu Trust helped develop the pilot measures for marine and estuarine ecosystems, which will be more fully developed at a later date.

Special thanks to Daren Horne of Te Atiawa o Te Waka-a-Māui Trust and Raymond Smith of Te Rūnanga o Ngāti Kuia Trust for their work on the pilot measures for iwi cultural health. While this work is now under development with wider iwi participation, their initial korero and work on the iwi cultural health measures was invaluable.

Alliance co-chairs Martin Rodd and David Johnston provided support and encouragement for the project.

## Appendix B – Methodology

### Overview

The Alliance measures deployed the following overall approach:

- **Established Methodology.** The measures are based-upon a proven, longstanding, worldwide approach used in Conservation Action Planning, the Open Standards for the Practice of Conservation, and Healthy Country Planning. This methodology is consistent with the New Zealand National Objectives Framework, Cultural Health Indicators developed at several areas with iwi guidance and leadership, and several other previous measures efforts deployed in New Zealand.
- **Ecosystem Groupings at Places.** The measures are directed to the varied ecological communities described in the Top of the South Strategy outcomes or in the character, shared future and strategy outcomes for each of the four inland *Places* in the Top of the South. A set of broadly defined ecosystem groups were then more narrowly defined and geographically stratified at each Place for the purpose of developing landscape-level measures. For purposes of this report, all of the subsets of ecosystem groups or ecological communities are broadly called “ecosystems.”
- **Key Attributes.** A parsimonious set of attributes is defined for each ecosystem that collectively capture key elements of long-term health.
- **Narrative Standards.** Narrative standards are used for describing each attribute’s health (e.g., what is “good”), using words that are measurable as well understandable to local stakeholders.
- **Health Grades.** The health is graded for each ecosystem’s key attributes – e.g., Excellent, Good, Fair and Very Poor. An overall ecosystem health score is then calculated. A six-score grading scale is used in order to capture the variability of ecosystem health across the large size of the landscapes.
- **Best Judgement.** The Alliance’s measures and health scores are based on best professional judgement, drawing upon relevant data and outside expertise. A great deal of important science research and monitoring has been done at the Top of the South, but often science data relevant to landscape-level measures is not available, is inconclusive, or doesn’t lend itself to the Alliance’s Place scale or outcomes.
- **Complementary Iwi and Science Measures.** While the ecosystem health measures are bio-diversity focused and deploy a western science-based approach, they are believed to be very complementary with iwi cultural health measures. Iwi cultural health incorporates healthy ecosystems as well as additional culturally-significant attributes.

### Methodology

1. **Measures Working Group.** The Measures were developed by a 10-person Measures Working Group with assistance from many others (see Appendix A).
2. **Determination of Ecosystems**
  - Ecosystem groupings and ecological communities are the focus of the measures. Ecosystems act as “coarse-filters” for biodiversity conservation that typically capture most native

species. The measures are directed to the ecological communities described in the Top of the South Strategy outcomes and/or referenced in the character, shared future and strategy outcomes for the four inland Places in the Top of the South. Four broad classes were identified for terrestrial and freshwater ecosystems:

- Rivers and streams
  - Forests
  - Other terrestrial ecosystems
  - Lakes and wetlands
- Stratification. These broadly defined classes were then more narrowly defined and geographically stratified at each Place for the purpose of developing meaningful landscape-level measures. Typically, the more narrowly defined ecosystems occur in similar settings across the landscape, have similar ecological processes and face similar stresses. Stratification was variously based on elevation (e.g., upland, lowland) and/or topography (e.g., steep, gentle, valley floor). Twelve (12) specific other terrestrial ecosystems were identified. Important stratification for measures was also provided by the Places, each of which has boundaries defined by topographical, ecological, land use and governance factors.

### 3. Key Attributes

- An Attribute is *what's really important* for an ecosystem's long-term health (e.g., water quality in freshwater ecosystems; native vs. invasive species).
- Attributes are briefly worded but sufficiently descriptive (e.g., extent of native forest, river flows, riparian margins). Detailed descriptions of all attributes are provided in Appendix F.
- A parsimonious number. A small number of really key attributes are selected, versus listing many desirable or descriptive characteristics. Having more than eight attributes typically yields diminishing returns and becomes difficult for stakeholders to digest.
- Avoid redundancy. At times two potential key attributes were considered that may be closely related; in these cases one is selected that is clearer to measure or provides the best early warning of future stress.
- Focal native species. Native species or assemblages of species are represented as key attributes of ecosystem health, either because they are fundamental to an ecosystem's health or because their condition reflects critical stresses to an ecosystem's health.
- Capture key stresses. The key attributes should capture the most critical stresses. For example, "composition of native plant communities" as a key attribute reflects the potential stress of invasive plant species.
- Uncertainty. At times a key attribute was identified, but current or historical information to assign assess health had a higher degree of uncertainty. In these cases the attribute was retained if the Measures Working Group felt it had access to "best professional judgement" for a credible first iteration health rating.

### 4. Narrative Ratings Standards

- Clear, measurable words are used rather than aspirational language. The ratings standards are intended to be consistently applied by various graders over time, and clearly understood by varied users.

- Use of numbers/quantitative measures. For landscape-level metrics, the ratings standards do not explicitly use numbers or quantitative metrics; however, numbers are used to help establish the rating bands, and are described more fully in Appendix F. For example, “almost all” is defined, approximately, as being greater than 90% and “very few” as less than 10%.
  - Rating Standards. The *Good* rating was the focal, benchmark rating used for the purpose of developing the rating standards. The *Very Poor* rating was the second benchmark. Building upon these two ratings, standards were also assigned for *Excellent* and *Fair*.
    - *Excellent*. Conditions approximating as they were believed to be prior to the introduction of human-caused stresses to the ecosystem.
    - *Good*. A viable condition or minimal integrity for the ecosystem, often with some human intervention required.
    - *Fair*. The factor lies outside of its range of acceptable variation, representing conditions between Good and Very Poor.
    - *Very Poor*. A condition, if allowed to remain for an extended period, reflects imperilment of an ecosystem or focal species.
  - Capturing spatial variation and condition. The ratings definition for a given Attribute take into account the spatial distribution of an ecosystem as well as its condition across the landscape. Invariably an ecosystem’s condition will differ across the large landscape being measured. Hence the rating standards explicitly reflect spatial consideration of a described condition (e.g., “over most of the occurrences...”).
5. Grading Current Health. A six-grade band was utilized to assess current health for each Attribute for each ecosystem. Because of the high level of variability for some Attributes across the very large Place landscapes, two additional intermediate ratings were deployed for current health scoring: *Good/Fair* and *Poor*. *Good/Fair* represents conditions or spatial distribution that falls somewhere between *Good* and *Fair*. *Poor* represents conditions or spatial distribution that falls somewhere between *Fair* and *Very Poor*. Detailed written standards were not felt to be necessary for these two intermediate ratings; however, descriptive language was provided (e.g., *Poor* = little or few, approximately 10% - 25%).
6. Future Iterations and Revisions. Most current health scores are likely not to change over the near-term time horizon (e.g., at least 3 to 5 years). On-going research, additional information and changing conditions will no doubt lead to the need to modify and improve the health assessment in a future iteration, and the measures should be revisited when Alliance Strategies are revisited. The initial ecosystem health scores are intended to represent a credible first iteration; the Alliance welcomes any feedback and contributions.

## Scoring Methodology

Scoring of ecosystem health was based upon long-time methods used in the *Conservation Action Planning (CAP) Excel Workbook* developed by The Nature Conservancy and subsequently used in the Conservation Standards *Miradi* software. Cosmetic language changes for some of the scores were made by the Measures Working Group – *Excellent* replaced *Very Good*, *Very Poor* replaced *Poor*, and *Poor* replaced *Fair/Poor*. Minor modifications to the CAP scoring algorithm, incorporating the six-band grading scale, are found in Excel-based *turboCAP* software developed by Greg Low, which was used for the Alliance ecosystem health scorecards. Overall health scoring is determined by formulas and thresholds in the *turboCAP* Excel workbook, with settings seeking to mimic the traditional CAP scoring algorithm. For example, to determine overall health scores for a given

ecosystem at a Place, rather than a simple average of scores across all attributes, a higher weight is assigned to any *Very Poor* scores, as these reflect an imperiled condition.

## Mapping

Mapping of most ecosystems was completed by the Department of Conservation using varied available geographic information data layers (GIS). GIS location data were not available or were incomplete for some systems. As the mapping was completed near the end of the project, a few anomalies occur in terms of final Place boundaries and some ecosystem locations. These do not change any substantive elements of the report, and will be adjusted in future iterations. The selected map excerpts shown in the report are draft versions intended to be illustrative and to serve as a reasonable first iteration.

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## Appendix C – Kotahitanga mō te Taiao Membership



## Appendix D – Alliance Vision, Mission and Values

Our extraordinary natural heritage is flourishing, having been restored over large areas, including where people live. People live, care for, and benefit from the environment in ways that bolster natural ecology and the communities that live within them.

### OUR VISION

To create a connected and aligned region that understands, protects, enhances, and future proofs the values of nature critical to the Top of the South and that this flourishing nature in turn enriches its communities.

### OUR MISSION

### OUR VALUES

<b>Manaakitanga</b>	<b>Kaitiakitanga</b>	<b>Matauranga Māori</b>	<b>Kotahitanga</b>	<b>Rangatiratanga</b>	<b>Mauri</b>
To care for each other, to be respectful, and an act of reciprocity of natural resources to be shared with others	Provision of active utilisation, preservation, conservation, maintenance, and management of the environs (including flora, fauna, aquatic and marine)	Acceptance and acknowledgement of Māori epistemologies within the construction of key concepts and projects	Unity of purpose and collective agreement for achievement of outcomes and goals	The chiefly right to determine use and management of the natural environment.	The principle life force of our environs is protected including their tapu and wairua
					<b>Arohatia</b> Duty of care and responsibility to this kaupapa, each other, and iwi

### OUTCOMES OF IMPLEMENTING THIS STRATEGY

1. **Native species**, including those found nowhere else, are thriving
2. **Naturally functioning ecosystems** are protected, restored and enhanced
3. **Wilderness** is sustained
4. **People** flourish in harmony with nature
5. **Ecological connections and resilience** are protected, restored and enhanced

## Appendix E – Top of the South Places



## Appendix F – Descriptions, Key Attributes & Ranking Standards

### Rivers and Stream Ecosystems – Descriptions

Rivers and streams in the Top of the South have many values. Life-supporting values include providing habitat for biodiversity, as well as ecological and hydrological functions (e.g. corridors, flood regulation, water retention in the landscape, processing of nutrients and absorption of other contaminants). Socio-cultural values recognise that the mauri of rivers is fundamental to Māori culture and they are an important source of mahinga kai. They also include scenic, amenity, educational and recreational values (e.g. recreational fisheries and contact recreation). Rivers also have value as an economic resource for electricity generation, commercial fisheries, drinking water storage, water supply for stock and/or irrigation, or as a focus for domestic and international tourism.

The Top of the South rivers and streams have been stratified into four broad categories to reflect their differing conditions in the landscape, varying historic and current pressures, and differences across places. The proposed classification is partly derived from the NZ River Environment Classification, but adapted, to be consistent with how the terrestrial ecosystems are classified.

#### 1. Upland Rivers & Streams

Rivers and tributaries above 700 metres. Includes larger rivers as well as small-sized, low-volume creeks and streams with steep gradients. Mountain or hill source of flow. Adjoining land is mostly covered in extensive and continuous tracts of native forest, often with a protected land status.

#### 2. Steep Lowland Rivers & Streams

Medium-sized/volume rivers and tributaries in a mountain or hilly landscape below 700 metres, typically without adjoining river terraces. Mountain or hill source of flow. Adjoining land is typically forested (either native or planted).

These rivers and streams are typically headwater streams (stream order 1, 2 and 3) with little upstream storage. Fluxes of water and water borne constituents (e.g. sediment) move rapidly through with little attenuation. They often have steep channels with high water velocities. Substrates tend to be coarse relative to those of the lower gradient valley-floor rivers.

#### 3. Valley-floor Rivers

Characterised by large volume, gentle or low-gradient main stem rivers where they are associated with adjoining river terraces. Mountain, hill or low elevation source of flow. Adjoining land is mostly cleared of native forest for farming or other intensive land use, but with some remaining narrow riparian strips in places.

Valley-floor rivers (stream order greater than 4) have large upstream catchments with appreciable storage. The response of the river to rainfall is “damped,” and variation in concentrations or fluxes of inputs such as sediment or other contaminants are smoothed by the homogenising effect of catchment storage and upstream mixing. Medium-gradient channels are typically broad and shallow with some meandering pattern resulting in varied morphology, typically a pool-riffle-run sequence.

#### 4. Lowland Streams

Smaller, slow-moving waterways with more side-streams, terrace backwaters, spring-fed streams and ephemeral streams. Low elevation or spring source of flow, often meandering and with deeper channels.

## River and Streams at Places

### 1. Mt Richmond

Some of the area occupied by the Mt Richmond place is above 700m but not to the same extent as Northwest Nelson and Nelson Lakes. The largest river, Te Hoiere/Pelorus River traverses the north-eastern part of the area towards the Marlborough Sounds, with some rivers and streams flowing south into the Wairau River.

### 2. Nelson Lakes

This place, although receiving less rainfall than Northwest Nelson still holds important and large river and lake ecosystems, feeding the Buller River which flows for 170km from Lake Rotoiti to Westport on the West Coast. Like for Northwest Nelson, over 60% of the area is above 700m and often part of conservation land.

### 3. Northwest Nelson

All freshwater ecosystems in the Top of the South are logically influenced by the rainfall gradient, from the wetter upland Northwestern areas (Northwest Nelson) to the lowland drier Southeastern areas (Nelson Motueka).

It is therefore not surprising to see this place holding important and abundant freshwater resources, with in particular large rivers (e.g. the Karamea River in the West, the Aorere in the North and the Whangapeka, a large tributary of the Motueka River in the East). The presence of karst systems gives to this place some unique New Zealand riverscapes.

### 4. Nelson Motueka

Nelson Motueka is the driest of the four places described in this report. It lies east of the Motueka River. No land in this unit is above 700m. Most rivers and streams are therefore hill-fed. It is the place where most development has taken place, namely plantation forestry, farming and agriculture or horticulture, as well as vineyards. Most waterways in this place are therefore lowland steep and low gradient rivers and streams, some ephemeral.

## Rivers and Streams – Key Attributes

Key Attribute	Description
Water quality-human interactions	Rivers and streams are highly desired for their recreational uses, including “contact” recreation -- e.g. swimming and fishing -- as well as boating/kayaking. Water quality should be supportive of swimming and fishing, and can be degraded by the presence of excessive <i>E. coli</i> bacteria. Sources of <i>E. coli</i> can include untreated human sewage, livestock and wildlife. Swimmers usually prefer sites without green filamentous algae (that are often indicators of water quality degradation)
Water quality – aquatic ecosystem health	Good water quality is essential for freshwater fish, mussels, invertebrates, aquatic plants, waterbirds and other species found in rivers and streams. It is also essential for maintaining key bio-geochemical processes. Many aspects of water quality health are measured by local governments in the Top of the South. Key water quality indicators include dissolved oxygen, nutrients, suspended sediment, and contaminants. Those indicators are mostly measured by specific parameters which include: minimum dissolved oxygen, dissolved reactive phosphorus and dissolved inorganic nitrogen, turbidity and ammonia toxicity, nitrate toxicity and heavy metals. Acidity (pH), and temperature are also measured. If any one of these parameters is

	measured to be in a Poor condition (“D” grade in NZ standards), then stress is caused to one or more groups of aquatic species.
River flows	The hydrological characteristics of rivers and streams vary over the course of a year and between river/stream categories. They include mean flow, seasonal low flow, and flood frequency, timing, magnitude and duration. They are considered to be good descriptors of the natural hydrological regime of each river/stream category. Hydrological connectivity (with floodplain or groundwater) along with hydrological variability, is also needed to maintain healthy aquatic life. Together, they ensure a dynamic dispersal of aquatic plants and animals both longitudinally and laterally through to riparian and floodplain habitats. They also support a diversity of aquatic species through their full life cycle, in water and on land (particularly important for invertebrates and some plants). Natural river flows can be impacted by dams, diversions and abstractions.
Native fish passage	Many native fish species move upstream and downstream between different habitats in rivers and streams. Others need to migrate between freshwater and the sea as part of their life cycle. Movement up and downstream can be impaired or blocked by dams, culverts, fords, weirs, etc. If so, fish may not be able to get to the upstream habitats they need to complete their life cycle, and their numbers can be reduced or completely lost from a stream.
Native fish - diversity, abundance and age structure	Fish are key indicators. Most of the native fish species are found only in New Zealand. Many species are hard to find, as they are small and/or nocturnal. A healthy fish population includes the full range of expected native fish (some reaches naturally don’t have some species) that represent pre-threat abundance, composition and proportions (to the degree known), with sustained recruitment and a diverse age structure.
Native river birds - diversity and abundance	There is a diversity of birdlife associated with rivers and streams which includes instream waterfowl (e.g. whio, paradise shelduck), braided river wading birds (e.g. banded dotterel, wrybill, black fronted tern) and sometimes other bird types associated with wetland or floodplain and river margins (e.g. herons, creakes, shags). This indicator is included to better reflect their biodiversity status. A healthy bird population includes the full range of expected species in their suitable habitat (some reaches naturally don’t have some species) that represent pre-threat abundance, composition and proportions (to the degree known).
Natural channels and substrate	The form of the channel and the substrate composition of the bed varies with each river/stream category (see descriptions above). A natural form can be represented by the presence of stable banks and the presence and diversity of substrate expected in each category. The percentage of fine sediment present can be a measure of degradation. Unstable and/or artificial banks, loss of riparian cover (see below), or loss of connection with the floodplain can also be used as indicators of how healthy the physical habitat is.
Riparian margins	Native riparian vegetation along the edges of rivers and streams brings many benefits to the health of the waterway (shading, stabilising banks, reducing erosion, pollution control and wildlife habitat). The desirable width of the riparian margin depends upon the waterway, topography, soils, vegetation and adjoining land uses.

## Rivers and Streams – Ranking Standards

Key Attribute	Very Poor	Fair	Good	Excellent
Water quality-human interactions	<i>Very few...</i>	<i>Some...</i>	<i>Most river and stream reaches are suitable for “contact recreation” (e.g. swimming and fishing) or boating/ kayaking</i>	<i>Almost all...</i>
Water quality – aquatic ecosystem health	<i>Most rivers and streams have very poor water quality condition that cause significant adverse effects to aquatic life</i>	<i>Some rivers and streams have good water quality conditions that cause no or little stress to aquatic life</i>	<i>Most rivers and streams have good water quality condition that cause no or little stress to aquatic life</i>	<i>Almost all ... that cause no stress...</i>
River flows	<i>Natural variability in flows and flooding is not sufficiently maintained and does not support expected native aquatic species and riparian habitat along most rivers and streams</i>	<i>Natural variability in flows and flooding is sufficiently maintained and supports expected native aquatic species and riparian habitat along some rivers and streams</i>	<i>Natural variability in flows and flooding is sufficiently maintained and supports expected native aquatic species and riparian habitat along most rivers and streams</i>	<i>.... along almost all...</i>
Native fish passage	<i>Artificial barriers are significantly impeding native fish passage in most rivers and streams</i>	<i>Some rivers and streams have no artificial barriers that significantly impair native fish passage - except for barriers intended to protect non-migratory fish</i>	<i>Most rivers and streams have no artificial barriers that significantly impair native fish passage - except for barriers intended to protect non-migratory fish</i>	<i>Almost all...</i>
Native fish - diversity, abundance and age structure	<i>Very few ...</i>	<i>Some...</i>	<i>Most rivers and streams have healthy native fish populations across their expected range</i>	<i>Almost all...</i>
Native river birds - diversity and abundance	<i>Very few ...</i>	<i>Some...</i>	<i>Most rivers and streams have healthy native river bird populations across their historic range</i>	<i>Almost all...</i>

Natural channels and substrate	<i>Very few ...</i>	<i>Some...</i>	<i>Most rivers and streams have natural channel form, substrates and function</i>	<i>Almost all...</i>
Riparian margins	<i>Very few ...</i>	<i>Some ...</i>	<i>Most rivers and streams have continuous intact native vegetation along the margin which is sufficient to sustain instream water/habitat quality and provide connectivity for native species and natural floodplain processes</i>	<i>Almost all...</i>

Note: *Good/Fair* ratings reflect conditions and/or spatial extent that fall between the *Good* and *Fair* narrative ratings; *Poor* ratings fall between *Fair* and *Very Poor*

### Spatial Rating Narrative Standards: Illustrative/Approximate Ranges

Rating	Descriptive Language	EG %
Excellent	Almost All	> 90%
Good	Most	75 – 90%
Good/Fair	Much/Many	50 – 75%
Fair	Some	25 – 50%
Poor	Little/Few	10 – 25%
Very Poor	Very Little/Very Few	< 10%

Note: For greater clarity, *Very Poor* ratings sometimes use “Most” or “Almost All” to describe the extent of a poor condition

### Resources

Varied resources were drawn upon to help inform the Measures Working Group’s best professional judgement for current health ratings, including monitoring data and modelling outputs collected over many decades. Examples include:

- "Water quality for human interaction" was informed by Tasman Council's long-running bathing water quality monitoring data and a model of base-flow
- "Water quality for aquatic ecosystem health" was informed by Tasman Council's long-running river water quality monitoring data including: monthly data for water clarity, nutrients, turbidity and periphyton cover; 3-7 day 15-minute interval dissolved oxygen and water temperature; and annual data for macro-invertebrates and fine sediment composition of stream beds. Models of reasonable accuracy were used for extrapolating these discrete data across the region, allowing for scoring of the water quality attribute with a reasonably high degree of confidence.
- "River flows" was informed by a large quantity of hydrological information (both continuous gaugings at core sites and regular discrete gaugings over dry weather periods) as well as a

number of detailed studies of ecological effects on fish and invertebrates from specific resource investigations and consent applications.

- "Native Fish Passage" was informed by a large number of assessments of in-stream structures (over 2500 assessments in Tasman District alone) stored in Council databases.
- "Native Fish diversity, abundance and age structure" was informed by fish surveys undertaken by Tasman Council over the past two decades, as well as maps from a reasonably accurate native fish prediction model (Leathwick et al 2009).
- "Native river birds" was informed by data from surveys of braided river birds and whio by Department of Conservation.
- "Natural channels and Substrate" and "Riparian Margins" were informed by data collected as part of fish surveys and in Tasman District for where LiDAR is available, a full GIS analysis of riparian tree cover and channel sinuosity.

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## Forest Ecosystems – Descriptions

Prior to human arrival, the Top of the South Island was largely a forested land mass, with native forest occurring almost continuously below the timber line. Native forests, predominantly beech forests, are now generally found within public conservation areas in more mountainous and steep areas. Remnant forest types are generally found in valleys and other gentle topography. The forests of the Top of the South Island have been stratified into three broad categories to reflect their differing conditions in the landscape, varying historic and current pressures, and differences across Places.

### 1. Upland Forests

Forests above 700 metres. Steep to very steep topography. Land is mostly covered in extensive and continuous tracts of native forest. Includes predominantly mountain beech, silver beech and mixed hardwood forests.

### 2. Steep Lowland Forests

Forests in a mountain or steep hilly landscape below 700 metres. May have a high component of secondary native forest, planted commercial forest or have been cleared.

### 3. Valley Floor and Gentle Lowland Forests

In addition to lowland alluvial forests, these also includes forest of the lowland gentle hill country landforms. Often remnants, including riparian margins along valley floor streams; larger intact examples are present within Kahurangi National Park. Includes coastal hardwood forests, podocarp forests, mixed podocarp/beech forests and mixed hardwood forests.

## Forests at Places

### 1. Mt Richmond

#### Upland Forests

This ecosystem includes all of the mountain lands that are or would have been originally forested above 700 metres elevation to the natural bushline at around 1350 metres. It is characterised by its steep to very steep topography, relatively high relief and dendritic drainage patterns. The geology is predominantly schist in the east and greywacke in the west encompassing narrow splinters of limestone. It is mostly covered in extensive, continuous tracts of forest dominated by red, silver and mountain beeches with frequent kamahi and thin-barked tōtara. Notable rare species are pitpat and the locally endemic carnivorous snail. Some species such as kiwi are now locally extinct. Upland forests are largely original in contrast to the lowland forests which have a high component of secondary native forest or have been cleared. Mount Richmond Forest Park (166,000 ha) comprises most of this ecosystem. These forests are degraded by introduced predators (stoats, rats and possums), browsers (possums, goats, deer) and wasps. Forests on limestone are particularly vulnerable to these threats as well as invasion by weeds.

#### Steep Lowland Forests

This ecosystem includes all of the steep lands below 700 metres elevation that are, or would originally have been forested. It is characterised by steep to very steep topography of moderate relief. The geology is predominantly schist in the east and greywacke in the west encompassing narrow splinters of limestone. In contrast to the steep upland forests that are largely original, extensive, contiguous tracts of beech forest, the steep lowland forests have a high component of secondary native forest, or have been cleared. Mt.

Richmond Forest Park comprises around 40% of this ecosystem which is mostly native forest. The main forest trees are hard beech, black beech, red beech, rimu, miro, thin-barked tōtara, mataī, tōtara and kamahi. At lowest altitudes, tawa and hinau are common throughout. Notable tree occurrences are white maire, and in the west tānekaha and black maire. Secondary vegetation is often a varying mixture of native broadleaved species and kānuka with introduced species including gorse, broom, barberry, hawthorn and Spanish heath. There are also large areas of commercially forested pine plantations. The native forests are degraded by introduced predators (stoats, rats and possums), browsers (possums, goats, deer), wasps, woody weeds and vines. Forests on limestone are particularly vulnerable to these threats.

### Valley Floor Lowland Forests

This ecosystem includes all of the fertile valley floors and riparian margins of all the main catchments. It is characterised by the flat to gentle topography of fans, terrace & riser systems and flood plains associated with all the main rivers and alluvial streams. It ranges from near level to mostly 200 metres elevation. Originally, it comprised tall lowland and semi-coastal mixed podocarp-beech-broadleaf forest. Dominant trees are silver beech, black beech, tōtara, mataī and kahikatea. Rimu, pōkākā, tānekaha, southern rātā, black and white maire, tawa, and tītoki are locally common. On the most fertile flood plains kōwhai, ribbonwood and lacebark are important species. Supports several nationally threatened species and a stronghold for shovel mint and pygmy button daisy. Some species within this ecosystem are now regionally extinct such as deciduous tree-daisy. Most of this ecosystem is on private land. Nearly all the native forests have been cleared for mainly agriculture. A few important forest remnants and riparian strips remain. Most of these are degraded and being reduced in extent by a diverse range of woody weeds, vines and ground covers, introduced predators (stoats, rats, possums, cats), browsers including stock, wasps and fragmentation.

## **2. Nelson Lakes**

### Upland Forests

This ecosystem includes all of the hill slopes and mountain slopes above 700 metres elevation up to the natural bushline (~ 1400m) that are or would have been originally forested. The landforms include the steep, high relief greywacke and schist mountain lands east of the Alpine Fault and the very diverse geologies of the generally lower relief hill and mountain lands to the west which range from very steep to gentle topography. It includes limestone bluffs, and subdued landforms that have been glacially and tectonically derived. Steeper terrain is mostly covered in extensive, continuous tracts of forest dominated by red, silver and mountain beeches with frequent kamahi and thin-barked tōtara. The more gentle terrain with impeded drainage also supports southern cedar, mountain toatoa, pink pine and silver pine. Southern rātā, pōkākā, broadleaf, tree fuchsia, mountain ribbonwood and neinei are variously present. Notable rare species are great spotted kiwi, kākā, pitpat and beech mistletoes. Most of these upland forests are largely original in composition and extent with ~ 90% lying within Nelson Lakes National Park and other public conservation lands. These forests are degraded by introduced predators (mainly stoats, rats and possums), browsers (possums, goats, deer, chamois and pigs) and wasps. Limestone communities are particularly vulnerable to these browsers as well as invasion by weeds.

### Steep Lowland Forests

This ecosystem includes all of the steep lands below 700 metres elevation that are, or would originally have been forested. It is characterised by steep to very steep topography of moderate relief. It covers the hill country below 700 metres in the Murchison/Maruia areas.

Threats include: Himalayan honeysuckle, barberry, hawthorn, Spanish heath, wilding conifers. Goats, pigs, deer, rats, stoats, cats, wasps.

### Valley Floor Forests

This ecosystem includes all of the fertile valley floors and riparian margins of all the main catchments. It is characterised by the flat to gentle topography of fans, terrace & riser systems, flood plains, deltas and eyots (river islands) associated with all the main rivers and alluvial streams. It ranges from ~100m – 800 metres elevation. Originally, it comprised tall lowland mixed podocarp-beech-broadleaf forest. Dominant trees are silver beech, red beech and black beech. On the recent soils of the fertile floodplains at lower elevations are matai, kahikatea, tōtara, kōwhai, ribbonwood and lacebark. Inland kānuka and matagouri are dominant on regenerating sites and new alluvial surfaces, eyots and deltas. Supports several nationally threatened species such as beech mistletoes, long-tailed bat and is a stronghold for shy foxglove. Some species within this ecosystem are now regionally extinct such as deciduous tree-daisy. Most of this ecosystem is on private land. Most native forest has been cleared for mainly agriculture. A few important forest remnants and riparian strips remain. Most of these are degraded and being reduced in extent by a diverse range of woody weeds, vines and ground covers - especially riparian, introduced predators (stoats, rats, possums, cats), browsers including stock, wasps and fragmentation.

## **3. Northwest Nelson**

### Upland Forests

Includes all of the mountain slopes and hill slopes above 700 metres elevation up to the natural bushline (ave. 1350 metres) that are or would have been originally forested. It is the most extensive ecosystem in Northwest Nelson and most of it occurs in Kahurangi National Park. Slopes are mostly steep, high relief comprise very diverse geologies from infertile ultramafics and granites to fertile volcanics, marble, dolomite and limestone. Much of this ecosystem has been influenced by glaciation. Other landforms include bluffs, wide U-shaped valley headwaters, forested cirque basins and earthquake-induced landslides. The forests are extensive and continuous and dominated by red, silver and mountain beeches, thin-barked tōtara, kamahi, pōkākā and broadleaf. They are joined by southern rātā, toro, quintinia, and neinei at western, wetter sites. On infertile sites are frequent southern cedar, mountain toatoa, pink pine and yellow-silver pine. Valley heads, slips and landslides frequently support forests of mountain ribbonwood, tree fuchsia and tree daisies. Regenerating sites support īnaka and various shrub species. Notable and threatened species are great-spotted kiwi, kākā, giant land snails, magenta rātā, kahurangi tarata, pitpat and beech mistletoes and a suite of species solely confined to limestones, dolomites and ultramafics.

Most of these upland forests are largely original in composition and extent with less than 10% having been burnt in the past. Most also occur within Kahurangi National Park, Abel Tasman National Park and other Public Conservation Lands. These forests are degraded by introduced predators (mainly stoats, rats and possums), browsers (possums, goats, red and fallow deer, and pigs) and wasps. Limestone communities and ribbonwood/fuchsia forests are particularly vulnerable to these browsers as well as invasion by weeds. Broom, gorse, and wilding pines are localised threats.

### Steep Lowland Forests

Includes all of the steep lands below 700 metres elevation that are, or would originally have been forested, including coastal forest. It is characterised by steep to very steep topography of moderate relief. The geology is very diverse ranging from highly infertile quartzite, granite

and sandstones though to fertile mudstones, limestones and volcanics. In contrast to the largely original, extensive, contiguous tracts of steep upland forests, large areas of the steep lowland forests have been cleared or have a high component of secondary native forest often mixed with exotics. The main native forest trees are distributed by landform with hard beech, black beech, rimu, miro, northern rātā, hīnau, and kamahi dominating ridges. Gullies and the western coastal forests are variously dominated by red beech and a diverse mixed broadleaved species, climbers, lianes and perching plants. Conspicuous are pukatea, nīkau, northern rātā, supplejack, kiekie, puka and emergent kahikatea. Wetter, infertile forests also include northern cedar, tānekaha, quintinia, toro, lowland neinei and hutu. Where this is recovering from fire, induced heathlands of mānuka, kānuka, īnaka, native daphnes and various sedges dominate. Forests on the most fertile substrates comprise mataī, tōtara, kahikatea and a diverse range of mixed broadleaf species including māhoe, kaikōmako, kōhūhū and kawakawa. Threatened species include large-leaved milk tree, fierce lancewood, several species of limestone plants, giant land snails, green gecko, and orchids. Several bird species are thriving such as kekerū, weka and bellbird, while others are now regionally extinct (mōhua, bats) or very rare such as kākā, kākāriki and robin.

Most of the remaining forests occur within Kahurangi and Abel Tasman National Parks and conservation stewardship land with the lowest elevation forests generally in private ownership. Hill country agriculture and exotic pine plantation forestry are the main land uses. Threats to wildlife include wasps, possums, stoats, rats, pigs and cats. Woody weeds are manifold and worst in forests on limestone or have been modified and disturbed. They include gorse, broom, yellow jasmine, Himalayan honeysuckle, barberry, hawthorn, cotoneasters, various vines, wilding pines, various hakea species, grevillea and Spanish heath. Forests are generally degraded and their wildlife reduced by introduced predators (pigs, rats, stoats, cats, possums), browsers (possums, goats, deer, pigs, hares) and wasps.

### Valley Floor and Gentle Lowland Forests

This ecosystem includes all of the lowland and coastal fertile floodplains, valley floors, low and high terraces, and riparian margins of all the main catchments. It also includes gently undulating hill country and basins. Flat lands of largest extent are in the lower reaches of the Aorere, Tākaka, Motueka, Wangapeka, Owen, Mātiri, Orikākā, Little Wanganui, Karamea and Heaphy Rivers, as well as the Westport and Karamea coastal plains. Major inland basins include the Orikākā, Mōkihinui and Ōpārara. The ecosystem is characterised by the flat to gentle topography of fans, terrace & riser systems, flood plains and deltas associated with all the main rivers and alluvial streams. It ranges from sea level to mostly 200 metres elevation. Originally, it comprised tall lowland and coastal mixed podocarp-beech-broadleaf forest. Dominant trees on the recently formed floodplains and low terraces with good drainage would have been tōtara, mataī, black beech and tītoki, with kōwhai, lowland ribbonwood and lacebarks on the youngest surfaces. Well-watered fertile flats supported kahikatea, pukatea, northern rātā, nīkau, kiekie, supplejack and various broadleaved species. The furthest inland flats and basins support silver beech, red beech and pōkākā. Their secondary forests are variously kānuka and broadleaved species including kaikōmako, pigeonwood, māhoe and kawakawa. High terraces and basins in high rainfall areas are generally poorly drained and infertile. They were originally dominated by rimu, silver pine, yellow-silver pine, lowland toatoa or tānekaha, northern or southern cedars, kamahi, toro and quintinia. Their secondary vegetation is mānuka heathland and pākihi. The fertile flats support several nationally threatened species including shovel mint, fierce lancewood, native germander and various orchids. Some species, such as bats are regionally extinct. With few exceptions, remaining forests have been logged of their tall forest trees and do not represent the original structure and composition.

The largest areas of remaining forests and secondary vegetation are mostly inland terraces and infertile high terraces and gentle downlands at the upper altitudinal limits of this ecosystem. Much of this is in public conservation land. By contrast, most of the fertile, lower altitude flats are privately owned and have lost most of their forest for mainly agriculture. A few important remnants remain in various states of protection and health. They are typically small and isolated. Many are being degraded and reduced in extent by a wide diversity of woody weeds, vines and ground covers, stock browsing, wildlife predation (by stoats, rats, possums and cats) and fragmentation.

#### **4. Nelson Motueka**

##### Steep and Hilly Lowland Forests

This ecosystem includes the forest remnants of extensive, low-relief hill country and rolling downs of the Moutere Depression which are made from consolidated greywacke gravels of glacial origin. Also included are the forests on coastal and lowland hills in the north-east. Drainage patterns are very regular resulting in uniform arrays of ridges, spurs and gullies. Generally, hills are younger and higher in the south, with more deeply incised streams, while in the north towards the coast, the older landforms are more subdued and rolling with gentle toeslopes. Steep hill country dominates the eastern side of Tasman Bay. Elevation ranges from the coast to ~700 metres inland and in the north-east. All soils are acidic and so have relatively low fertility. Originally, most of the forest cover would have been a complex mosaic of beeches, podocarps and broadleaved hardwoods comprising silver, black, hard and red beeches, rimu, miro, thin-bark tōtara, kamahi and hīnau. Towards the coast and in the north-east, additional trees of tītoki, ngaio, kohekohe, nīkau and tawa dominated. Forest would have been almost continuous throughout.

Today less than 20% of this forest remains and most of this is in the higher, colder south and warmer, steeper north-east. Induced vegetation is comprised of mainly bracken, kānuka, mānuka, māhoe and other mixed broadleaved species. Forest has been cleared for agriculture, horticulture and exotic forestry. Most remnants are privately owned. They are fragmented, isolated, small, and have been heavily modified and degraded, having lost their original trees and understoreys, are now invaded by exotic tree, shrub, vine and ground cover species, and are depleted by a range of browsers (possums, cattle, sheep, goats, pigs, deer, rabbits, hares) and mammalian predators (possums, pigs, rats, stoats, weasels, cats, hedgehogs). Threatened species of beech mistletoe still persist in a few forest stands. Several plant and bird species are now locally extinct.

##### Valley Floor and Gentle Lowland Forests

In addition to lowland alluvial forests, this ecosystem also includes the lowland gentle hill country landforms; i.e. the ecosystem is topographically-defined to cover all areas of low-gradient topography, as these landforms correlate well with where most forest clearance has occurred for other land uses, and also generally with forest type. Most of this ecosystem is on private land. Most native forest has been cleared for mainly agriculture. Most of these are degraded and being reduced in extent by a diverse range of woody weeds, vines and ground covers - especially riparian, introduced predators (stoats, rats, possums, cats), browsers including stock, wasps and fragmentation.

## Forests – Key Attributes

Key Attribute	Description
Extent of native forest	Large continuous tracts of unmodified forest are important for maintaining ecosystem function and resilience to natural disturbance events. The indigenous ecosystems, habitats and communities of many of New Zealand’s ecosystems have been substantially reduced in area. Ecosystems with less than 10% of their original extent remaining are considered to be the most acutely threatened. Despite their high degree of modification, these remaining areas of habitat are important for maintaining the full range of biodiversity in New Zealand.
Natural regeneration of native forest plant species	Forest regeneration is the process by which native understory plants and canopy tree become re-established after forest trees and shrubs die naturally or have been removed through natural disturbances. Without regeneration of the right plants, a forest or some of its components can become unhealthy or no longer suitable for fauna which depend on it. A range of introduced browsers including deer, goats, rats and possums can selectively browse preferred plant species (and seeds) disrupting the sequence of regeneration from seedling through to mature tree or shrub.
Abundance of honeydew	The beech forests of New Zealand are home to a unique resource – honeydew – a delicious food source for native forest birds and bats. Honeydew is produced by small native insects that live within the bark of beech trees. These native insects are highly threatened by invasive wasps which can also have wide ranging impacts on other invertebrates and fauna. There is less wasp pressure on higher elevation forests.
Abundance of snails	Hidden away in New Zealand's forests is a very diverse array of native land snails, which range from microscopic to large in size. Large native snails face many pressures from introduced predators and habitat modifiers, including pigs, rats, possums, deer and goats, in conjunction with climate change which is drying out the snails’ forest floor habitat. Healthy snail populations display a diverse age structure and are found commonly in suitable habitat.
Abundance of kaka	Flocks of this large parrot were once common in New Zealand forests but are now considered to be endangered. Kākā require large tracts of forest to survive and are particularly vulnerable to predators while nesting in holes and crevices of old forest trees. Their numbers have greatly declined as a result of habitat loss, predation by rats, possums and stoats, and competition from wasps and bees for nectar or honeydew. A healthy kaka population has a balanced sex ratio, reliable juvenile recruitment, and a diverse age structure.
Abundance and diversity of native birds	New Zealand forest ecosystems have traditionally supported an abundant array of distinctive native birds which evolved in the complete absence of non-avian predators. The introduction of rodents, mustelids and possums has greatly reduced the numbers of many species. Some birds are now extinct and many species continue to decline over time. Ground dwelling and hole nesting birds are particularly vulnerable to predators but most species have been adversely impacted. A healthy bird fauna has reliable juvenile recruitment, and a diverse age structure with species occupying suitable habitat in abundance. Expect slightly less bird sounds at higher elevations -- more hear individuals than a cacophony.

Plant species composition / diversity	New Zealand has a relatively small but highly distinctive forest flora which evolved in isolation and has retained elements of its ancient origins. Plants have evolved in the absence of mammalian browsers to fill ecological niches which reflect the diverse range of geological and climatic influences present. Some species are under pressure from a range of impacts including clearance for land use, selective browsing by introduced mammals, and seed consumption by rodents.
Connectivity	Landscape connectivity reflects the ability of animal and plant species to move between different elements of a landscape that they require for food, habitat or dispersal. Connectivity can be impaired or fragmented by loss of habitat, highly altered habitat or development. For forest ecosystems, connectivity is desired between upland and valley floor, along rivers and streams, and with adjoining ecosystems.

## Forests – Ranking Standards

Key Attribute	Very Poor	Fair	Good	Excellent
Extent of native forest	... over <i>very little</i> of its historic range and/or most blocks are too small to withstand natural disturbance	... over <i>some...</i> and/or many blocks are too small	Native forest occurs over <i>most</i> of its historic range, in blocks large enough to withstand severe natural disturbances	... <i>almost all</i> ...
Natural regeneration of native forest plant species	<i>Very little</i> regeneration of native species over most of the forest	A less diverse subset of native plant species are regenerating over most of the forest	Native plant species are naturally regenerating over most of the forest	Almost all native plant species - including beech mistletoes, pitpat, and others that are vulnerable to browse - are naturally regenerating over most of the forest
Abundance of honeydew	Very little or no honeydew is found and/or not readily available to native species over most years	Some honeydew is found over most years or availability to native species is limited over most years	Honeydew is abundant over most years and available to native species over most of the beech forest where the associated species naturally occur	Honeydew is abundant over almost all years and readily available to native species over almost all of the beech forest where the associated species naturally occur

Abundance of snails	Snail populations are rarely found ...	<i>Sparse populations</i> of snails are found across their historic range	<i>Stable populations</i> of snails are <i>commonly found</i> and abundant across most of their historic range	<i>Large and increasing populations...</i>
Abundance of kaka	Kaka are rarely found ...	Some kaka are found across their historic range, but with unbalanced sex ratios	Healthy populations of kaka are abundant, including survival through beech mast events and are present throughout <i>most</i> of their historic range	<i>... almost all ...</i>
Abundance and diversity of native birds	The forest is quiet, with very few native bird sounds at dawn	<i>Some</i> of the forest is noisy with diverse native bird sounds and/or there is less diversity of native bird sounds at dawn than expected over much of the forest	<i>Most</i> of the existing forest is noisy with diverse native bird sounds at dawn	<i>Almost all...</i>
Plant species composition / diversity	Very limited range of native plant species are present in existing forest and do not represent the original composition, proportions and structure; non-native species are dominant	Some native plant species are present in existing forest, but do not represent the original composition, proportions and/or structure; non-native species are present	Native plant species are present in most existing forest and generally represent the original composition, proportions, and structure; non-native species are largely absent	A full range of native plant species are present in most existing forest, and represent the original composition, proportions and structure; invasive non-native species are absent
Connectivity	Forests remnants are mostly in very small or isolated fragments and provide poor connectivity for native species within the landscape	Some native forest tracts provide access for native species within the landscape	Most native forest tracts provide largely unimpeded access for native species within the landscape	<i>Almost all ...</i>

Note: *Good/Fair* ratings reflect spatial extent or conditions that fall between the *Good* and *Fair* narrative ratings; *Poor* ratings fall between *Fair* and *Very Poor*

### Spatial Rating Narrative Standards: Illustrative/Approximate Ranges

Rating	Descriptive Language	EG %
Excellent	Almost All	> 90%
Good	Most	75 – 90%
Good/Fair	Much/Many	50 – 75%
Fair	Some	25 – 50%
Poor	Little/Few	10 – 25%
Very Poor	Very Little/Very Few	< 10%

Note: *Very Poor* ratings sometimes use “Most” or “Almost All” for greater clarity to describe the extent of a poor condition

## Other Terrestrial Ecosystems – Descriptions

The Top of the South is the most environmentally diverse part of New Zealand, including several rare or uncommon terrestrial ecosystems that are found nowhere else. Eight of the twelve other terrestrial ecosystems are geographically unique and located in only one Place in the Top of the South -- one in Mt Richmond, one in Nelson Motueka, and six in Northwest Nelson. The dune, coastal cliff and seabird-burrowed soils ecosystems are each found in only two Places. The alpine/subalpine ecosystem is more widespread.

### 1. Alpine and Subalpine [Mt Richmond, Nelson Lakes, Northwest Nelson]

The alpine/subalpine ecosystem includes all lands above the natural bushline, including sub-alpine shrublands. Landforms include steep to very steep mountain slopes, bluffs, gentle cirque basins and flat-top summits. Subalpine shrublands, tussocklands and alpine herbfields, fellfields, scree and rockland are the main communities, dominated by several species of snow tussock, various species of coprosma, hebe, īnaka, celmisia, gentian and speargrass. Some of the rarer species are confined to this ecosystem. Several species of threatened plant and animal are present including giant land snails and kea. Stoats are the main predators of native wildlife. Deer, goats, chamois, pigs and hares are having significant impacts on vegetation and habitats.

In Mt Richmond it lies above the natural bushline (~ 1350 metres) along the Richmond, Bryant and Gordon Ranges outside of the mineral belt. It comprises geologies of greywacke in the west and summits of schist in the east. Chamois are increasing in numbers and wilding pines are the main weed threat. Some species, including rockwren are now locally extinct.

In Nelson Lakes this ecosystem lies above the natural bushline at ~ 1400 metres. It comprises the greywackes and schists of the northern Southern Alps (Ngā Tiritiri o te Moana) and small areas of mineral belt, granite and diorite west of the Alpine Fault. Weed threats are currently minimal.

In Northwest Nelson, this system lies above the natural bushline (~ 1350 metres), comprising numerous discrete ranges with largely concordant summit heights. The marble mountains and alpine plateaux are excluded. It comprises some of the most diverse geology in New Zealand ranging from fertile volcanics and conglomerates to infertile sedimentaries and granite. Most landforms are glacially derived and range from steep to very steep mountain slopes and cliffs to gentle cirque basins to broad gentle ridges. Scree is limited in extent. Several species of threatened species are present including rock wren, kea, numerous species of giant land snail, NW Nelson giant wētā and special alpine plants confined to NW Nelson. Kākāpō disappeared from this area probably in the 1950s. Most of this ecosystem is within Kahurangi National Park and is largely original in extent with only a few areas having been burnt and grazed. Weed threats are minimal and largely limited to wilding pines.

### 2. Dune Ecosystems [Northwest Nelson, Nelson Motueka]

Specifically including Farewell Spit, but also estuary barrier bars and accreting sandy coastline. The ecosystem also includes all the wetland elements associated with dune formations – slacks, lakes, ephemeral wetlands – they are considered here as an integral part of the Dune ecosystem rather than putting them into freshwater ecosystems. Dunes are vulnerable to invasion by weeds which displace native plants and change their geomorphology, modifying habitats for native plants and animals. Farewell Spit is recognised as internationally important habitat for migratory shorebirds and as a dune complex in its own right.

Northwest Nelson: The system is scattered along parts of the coastline where sand is accumulating. Along the west coast, dunes are mostly associated with river in inlet mouths and are

sometimes extensive, such as the Buller, Karamea and Turimawivi mouths. Otherwise they occur along discrete stretches of coastline between Heaphy River and Wekakura Point, and from Kahurangi River to Cape Farewell. The most extensive and well-developed dune system by far is Farewell Spit (Onetahua), with mobile dunes, sand plains and a complex of rear dunes and swales. Within Golden Bay and the Abel Tasman coast dunes are sparse, not well-developed and often transient. They are confined to river mouths or shallow bays. Originally the most seaward mobile dunes would have been variously covered in native dune binders: pingāo, spinifex and sand tussock with various other dune specialist species, while more stable rear dunes supported knobby clubbrush, cyperus, sand coprosma, scrambling pōhuehue, bracken, tauhinu, akeake scrub and vinelands. The most stable back dunes supported exposed, stunted coastal forest of sand kānuka, and various broad-leaved species or rarely, sheltered tall mixed podocarp- northern rātā forest. Today, apart from some important exceptions, most of the native dunes are covered in exotic marram grass, which has significantly altered dune dynamics and dune profiles. Others have been burnt or stabilised for agriculture with pasture grasses. Most native dune species are now rare such as pingāo, sand iris, sand daphne, coastal milk spurge and sand tussock. Farewell Spit is a national stronghold for sand kānuka, sand coprosma, sand gunnera, and sand spike-rush. Other notable dune species include katipō spider, sand scarab, shore earwig, sand truffles and coastal peppergrass.

Farewell Spit and river mouth dunes especially, are important breeding sites for shorebirds such as gannets, oystercatchers and dotterels. They are threatened by mammalian predators (cats, rats, weasels, stoats, possums, hedgehogs and pigs). Deer, pigs, hares and possums are the main browsers of native plants. Other invasive weeds include gorse, tree lupin, climbing asparagus, climbing dock, pampas and European sea spurge. Many of the dunes are either privately owned or have uncertain tenure.

Nelson Motueka: The ecosystem includes the extensive coastal dunes of Rabbit Island (Moturoa) barrier island and the smaller isolated stretches of sandy coast to the east: Tahunanui, Delaware Bay Spit, Whangamoa Spit, Ōnāhau and Ōananga. Dunes are absent or transient in the west. Originally the most seaward mobile dunes would have been variously covered in native dune binders: pingāo, spinifex and sand tussock, while more stable rear dunes supported knobby clubbrush and sand coprosma shrublands with various other dune specialist species. The most stable back dunes were covered in stunted forest of ngaio, akeake, kānuka, akiraho and tauhinu. Today, apart from a few restoration areas, most dunes are covered in exotic marram grass, or exotic pine forests. Most native dune species are now rare and several are locally extinct such as sand iris, sand daphne, coastal milk spurge and sand tussock.

Where habitat is still suitable for native wildlife they are threatened by mammalian predators (cats, rats, weasels, stoats, possums, hedgehogs). Rabbits, hares and possums are the main browsers of native plants. The largest dunes are publicly owned and small areas of these are being restored. None are legally protected for nature conservation.

### **3. Coastal Cliff & Sea Stack Communities [Northwest Nelson, Nelson Motueka]**

Northwest Nelson: This ecosystem is largely confined to the granite, sedimentary and conglomerate cliffs along the north-western coast between Mokihinui River and Farewell Spit, including islet stacks. Outliers include the eastern Golden Bay limestone cliffs and stacks, and a few granite cliffs and stacks along the Abel Tasman coast. The ecosystem is defined by slopes being so steep that forest is unable to establish. Instead, large areas of bare bedrock are sparsely colonised by shrubs, tussocks, vines and herbs. Typical cliff species include wharariki, harakeke, koromiko, tutu, ngaio, taupapa, karamū, climbing rātā, horokaka iceplant, knobby clubbrush and native spinach. The most exposed cliffs along the west coast are strongholds for

maritime species such as native puha, maritime spleenworts, maritime hardfern and rauhuia. On limestone cliffs rengarenga lily is also dominant. Tata Island limestone cliffs are a regionally important breeding site for spotted shag. Stacks are important roosting sites for red-billed gulls and white-fronted terns. Stoats, possums and rats are mainland predators although much of the ecosystem is physically protected due to its steepness. Weeds are the main threat and include gorse, boxthorn, cotoneaster, yellow jasmine, barberry, buddleia and Mexican daisy.

Nelson Motueka: This ecosystem is confined to the sea-truncated conglomerate cliffs between Moutere and Waimea Inlets, and the greywacke, granodiorite and gneiss cliffs scattered along the eastern coast north of The Glen, including islet stacks. The ecosystem is defined by slopes being so steep that forest is unable to establish. Instead, large areas of bare bedrock, often actively eroding, are sparsely colonised by shrubs, tussocks and herbs. Typical cliff species include wharariki, koromiko, tutu, ngaio, taupata, karamū, akiraho, puka, horokaka iceplant, knobby clubbrush, silver tussock and native spinach. Notable and rare species include Cook Strait bristle tussock, bluff wheatgrass, rauhuia and leafless pōhuehue. Islets and stacks are important breeding/roosting sites for white-fronted terns, spotted shags and red-billed gulls. Stoats, possums and rats are mainland predators although much of the ecosystem is physically protected due to its steepness. Weeds are the main threat and include wilding pines, broom, gorse, and nasella tussock. Maritime threats of seabird by-catch and reduced food supply may also be the causes of declining seabird populations.

#### **4. Seabird Burrowed Soils [Northwest Nelson, Nelson Motueka]**

This coastal ecosystem supports populations of burrowing seabirds. Exposed maritime conditions, guano deposits and frequent soil disturbance by seabirds profoundly influence soil fertility, vegetation composition and ecosystem productivity. Little blue penguins, fluttering shearwaters and sooty shearwaters can be found, along with red-billed gulls, white-fronted-terns and shags. This ecosystem was once frequent on mainland sites and also at suitable sites inland. Mainland sites are now almost extinct due to decimation of seabird populations by introduced mammals including rats, stoats and cats.

Northwest Nelson: Vegetation is characterised by stunted or prostrate taupata and ngaio along with special seabird associates including Cook's scurvy grass, muttonbird groundsel and matangoa. Invertebrates and lizards are also dense and diverse due to high ecosystem productivity. The only remaining sites are a few inshore islands along the north-western coast and in western Tasman Bay (Tonga Island) that are either far enough off-shore or impregnable due to their sheer perimeters to prevent predator invasion.

Nelson Motueka: Associated vegetation is characterised by stunted taupata and ngaio along with special seabird associates including coastal peppergrass, muttonbird groundsel and coastal wheatgrass. Little-blue penguins and shearwaters currently persist in low numbers. Predation by introduced mammals includes rats, stoats, weasels and cats. The only remaining sites are a few inshore islands along the north-eastern coast, that because of their sheer perimeters are impregnable to predator visitation. Maritime threats of seabird by-catch and reduced food supply may also be the causes of declining populations.

#### **5. Frost Flat Communities [Nelson Lakes, Northwest Nelson]**

In Nelson Lakes this ecosystem is confined to valley floors between 400-800 metres elevation where intense cold air ponding, and sometimes poor drainage, have created conditions that prevent the establishment of forest. Instead shrublands dominate which on fertile sites with good drainage comprise a distinctive and diverse range of divaricating shrubs, sometimes with

inland kānuka and matagouri. On wetter, more infertile sites, bog pine and īnaka are the dominant shrubs. Both frost flats and several species of plants within them are now threatened due to extensive loss nationally. Most of this ecosystem is on private land. Almost all frost flat shrublands have been cleared for mainly agriculture. A few important remnants remain. Most of these are very small, degraded and continue to be reduced in extent by land development, browsers - especially stock, woody weeds, vines and swarding grasses. Fragmentation has made many sites non-functional.

In Northwest Nelson this system is confined to valley floors between 300-800 metres. Fertile sites with good drainage comprise a distinctive and diverse range of divaricating shrubs, including shrub daisies and coprosmas. On wetter, more infertile sites, bog pine and red tussock dominate. Frost flat communities and several species of plants within them are now nationally threatened due to extensive loss nationally, including leafless māhoe, bloodwood, heart-leaved kōhūhū and five-tooth shrub daisy. Some are only found in Northwest Nelson frost flats such as the Cobb mat daphne. Most of this ecosystem is within Kahurangi National Park, the largest of which is in the Cobb Valley; a third of this has been inundated by a dam lake. The rest in the Park are small and isolated but with a largely native cover. Most frost flats on private land (e.g. Owen basin, Canaan Downs) have been cleared or modified for agriculture although a few important and unique remnants still survive. Threats are browsers (stock, fallow and red deer, hares, possums) and exotic swarding pasture grasses.

## **6. Mineral Belt Communities [Mt Richmond]**

The Nelson Mineral Belt is unique and characterised by erodible soils which have high concentrations of metals that are toxic to most plants so that unique shrubland and tussockland communities have evolved. Vegetation is sparse, stunted and floristically poor but a number of species are only found in these mineral belt communities. They are vulnerable to clearance for mineral extraction but due to the sparseness of plant cover, are more resilient to other pressures. This ecosystem includes the stunted forest, shrublands, tussocklands and open lands which occur on the ultramafic geology associated with the Bryant Range, including the Red Hills and Dun Mountain areas. Altitudes range greatly from 100-1790 metres but with most of the ecosystem occurring above bushline (~1350 metres). Topography is highly variable from very steep to gentle landforms, due to erosion-resistant outcrops, debris flows associated with slope failures and glaciation which is evident in the Red Hills. Pakohe is a culturally important form of argillite that only occurs within the mineral belt. Species diversity is naturally low, the main tree species being mountain beech, thin-barked tōtara, southern cedar, southern rātā, pink pine and mountain toatoa. Tussocklands are dominated by the endemic mineral belt snow tussock, and shrublands by mānuka, īnaka and other heath species, and divaricating shrubs. Many special species are confined solely to this ecosystem. Large areas have been extensively burnt in the past and fire still poses a significant potential threat. Woody weeds, especially confers, gorse and Spanish heath, are the biggest current threats, followed by introduced browsers (deer, goats, pigs) and predators (stoats, rats).

## **7. Downs and Plateaux [Northwest Nelson]**

Erosion peneplains which have been uplifted during tectonic plate movement. These peneplains are unusual, being largely forest free below the natural timber line. Leached rocks of the peneplain surface, coupled with high rainfall have resulted in development of skeletal soils supporting unusual vegetative cover of tussocks, and stunted woody plants at a relatively low altitude. Some of the best examples include: Matiri Plateau, Gunner Downs, Mackay Downs, Gouland Downs, Garibaldi Plateau, Hope Range, Mt Arthur Tableland. Within the uplands, these areas have generally been modified the most – mainly due to attempts at pastoral grazing

(burning, weed invasion). Also, these downlands are where most of our red tussocklands occur, which are a semi-wetland ecosystem.

## **8. Cave Ecosystems [Northwest Nelson]**

Some of the oldest, deepest and longest karst cave systems known in New Zealand are represented here, and cave systems associated with limestone and marble formations of North West Nelson are noteworthy for their extent and diversity. Some caves have formations that are internationally significant and contain important fossil records of now extinct fauna such as moa bones. This ecosystem classification is intended to capture all the subterranean biodiversity of karst caves in the region. Air and water conditions in caves are important: CO<sub>2</sub> composition, humidity, ambient temperature and pH are key factors. Main threats to these ecosystems are from direct human impacts such as disturbance and changes to atmospheric conditions.

## **9. Marble Ecosystems [Northwest Nelson]**

This ecosystem includes all of the marble geology that is not associated with plateaux and downlands, including the Arthur and Owen massifs, Mounts Burnett, Hoary Head, Crusader, Olive, Baldy, Sodom, Patriarch, Turk's Cap and The Gendarme. Most occur above the natural bushline (~ 1350 metres) to 1875 metres although shrublands occur in some areas as low as 400 metres elevation. All sites are relatively fertile due to the presence of calcium and magnesium in marble and dolomite respectively. Landforms are most extreme on the alpine karst massifs and range from bedrock pavements, gentle basins, blind depressions and dolines, to deeply fissured karrenfield, towering cliffs and overhangs. Includes some of the world's best examples of glacially sculpted alpine marble. Subalpine shrublands, tussocklands, fellfields, scree, alpine and cliff herbfields and rocklands are the main communities. Depending on the landform they are variously dominated by several species of snow tussock, shrub daisies, coprosma, hebe, īnaka, celmisia, gentian and speargrass. Herb diversity is exceptional and many species are confined to these marbles and dolomites. Threatened species include, kea, marble gecko, black-eyed gecko, moonwort, marble māhoe, dolomite aniseed and various other marble plant endemics.

Nearly all of this ecosystem lies within Kahurangi National Park and is partly original in extent. The massifs which are largest and most accessible have been partially burnt and grazed in the past. Threats include dolomite mining. Stoats and possums are the main predators of native wildlife. Red deer, goats, chamois, pigs, hares and possums are having significant impacts on vegetation and habitats. Alpine weed threats include hieracium, wilding pines, swarding grasses and clovers. Due to high fertility, weeds of lower warmer altitudes are manifold and include Mexican daisy, cotoneasters and buddleia.

## **10. Coal Measure Ecosystems [Northwest Nelson]**

Large upland plateaux in the far south-west, between 200-1100 metres are characterised by very impoverished coal measure geology and soils, which combined with high rainfall and exposure, have created harsh and unique conditions. The landforms are a series of gently-sloping plateaux and pavements with steeply incised watercourses and ringed with scarps. Vegetation is a mosaic of stunted forest, shrubland, tussockland and pavement openlands. Forest comprises mountain beech, southern cedar, southern rātā, pink pine, yellow pine, rimu, mountain toatoa, quintinia, kāmahi and neinei. Shrublands are dominated by bog pine, mānuka, īnaka and numerous other heath species, while the endemic plateau snow tussock, red tussock, tangle ferns, and various herb daisies make up the tussocklands and openlands. Some systems on this landform are included in the Upland Wetlands. Notable and threatened species include giant land snails, great-spotted kiwi, forest ringlet butterfly, and several species that are confined to this ecosystem. One of these, the august snail, is now extinct in the wild.

Around 30% of this system is still in original condition. Over 30% has been completely lost to mining, and around 40% is still largely indigenous but has been variously modified by fire, roading and other land disturbance. While around 50% of this ecosystem is within Public Conservation Land, large areas of still unmodified plateau are not. Loss of vegetation and habitat by ongoing mining is the most pressing threat, followed by associated ingress by weeds and fragmentation. Predators include stoats, rats and cats.

### **11. Coastal Turf Communities [Northwest Nelson]**

This ecosystem is confined to small stable landforms along the western coast which are subject to extreme maritime conditions of frequent, strong, salt- and sand-laden winds. The sheering, abrasion and salt-burn effects of these conditions prevents the establishment of forest and promotes low-statured shrubs, vines and turf herb vegetation. Crests of promontories and headlands support the most well-developed coastal turfs. They occur infrequently between the Heaphy and Kahurangi Rivers, and more frequently northwards to Cape Farewell. The species diversity of these turfs are nationally significant and include a complex mosaic of succulents, mat-formers and rosettes. The main species are remuremu, coastal button, shore primrose, shore plantains and fleshy daphne. Several threatened species include springy peppergrass, turf buttercup, pygmy forget-me-not, sea holly, mazus, turf carrot, as well as species largely confined to Northwest Nelson turfs: tai tapu button, daphne moth, turf wollyhead and pupū daisy.

Threats include invasive weeds such as catsear, lotus and clovers, and swarding pasture grasses. Stock trampling breaks up the turf allowing weed ingress. Slugs and snails selectively target species to local extinction. While clearance for farming of landward woody vegetation has in places increased the extent inland of this ecosystem, there has been a net loss of habitat and remaining habitat quality due to pastoral exotic vegetation encroachment. Much of this ecosystem has no legal protection.

### **12. Islets, Barrier Beaches, Tombolos, Spits and Bars [Nelson Motueka]**

This broad ecosystem group includes coast landforms that have resulted from the deposition of sand, cobbles, boulders and shells by the action of coastal process such as longshore drift. They include iconic features such as the Nelson Boulder Bank (Te Taero a Kereopa) and are often associated with estuaries and river mouths. Cable Bay tombolo connects the mainland with Pepin Island. Some of the landforms such as bars, are mobile or transient. Many are vital nesting and high tide roosting sites for shorebirds. Vegetation is usually sparse and low with limited diversity due to the tough environmental conditions: excessive drainage, infrequent seawater inundation, high exposure to wind and sun, and limited soil. Most of the original low-statured native forest has been lost but significant areas of sparse shrubland, herbfield, tussockland, vineland and lichenfields remain. Main surviving species include scrambling pōhuehue, matagouri, porcupine shrubs, tauhinu, various coprosmas, knobby clubrush, silver tussock and horokaka iceplant. Forest occurred on the oldest and most stable landforms which would most likely have included tōtara, mataī, akeake, ngaio, akiraho, taupata and mānuka/kānuka. The larger landforms support a diverse lizard fauna. Notable species include Caspian terns, spotted skink, annual forget-me-not, leafless pōhuehue and Boulder Bank peacock mite. Known local extinctions include coastal peppergrass and grey salt bush. Most landforms support important archaeological sites. Weed threats include especially Burmuda buttercup but also South African iceplant, other succulents, smilax, gorse, tamarisk, tree lucerne and exotic grasses. Predators and browsers include rats, weasels, stoats, cats, mice, hedgehogs, possums and rabbits.

## Other Terrestrial Ecosystems – Key Attributes

Key Attribute	Description
Extent of native communities	The indigenous ecosystems, habitats and communities of many of New Zealand’s ecosystems have been substantially reduced in area. Ecosystems with less than 10% of their original extent remaining are considered to be the most acutely threatened. Despite their high degree of modification, these remaining areas of habitat are important for maintaining the full range of biodiversity in New Zealand.
Abundance & diversity of native animals	New Zealand ecosystems have traditionally supported an abundant array of distinctive birds, reptiles and invertebrates which evolved in the complete absence of mammalian predators. The introduction of rodents, mustelids and possums has greatly reduced the numbers of many species. Some animals are now extinct and many species continue to decline over time. Ground dwelling animals and those using habitats easily accessible to introduced predators are particularly vulnerable, as are species with very limited distributions or small populations which can be depleted quickly. A healthy fauna has reliable juvenile recruitment, and a diverse population age structure with species occupying suitable habitats in abundance.
Composition and diversity of native plant species	New Zealand has a relatively small but highly distinctive native flora which evolved in isolation and has retained elements of its ancient origins. Plants have evolved in the absence of mammalian browsers to fill ecological niches which reflect the diverse range of geological and climatic influences present. Some species are under pressure from a range of impacts including clearance for land use, selective browsing by introduced mammals, and seed consumption by rodents.
Natural regeneration of native plant species	Regeneration is the process by which native plants become re-established after removal or through natural disturbances. Without regeneration of the right plants, an ecosystem can become unhealthy or no longer suitable for fauna which depend on it. A range of introduced browsers including deer, goats, rats and possums can selectively browse preferred plant species (and seeds) disrupting the sequence of regeneration from seedling through to mature tree or shrub.
Presence of plant and animal species that are special to the ecosystem	Some ecosystems are associated with unusual geology and soils, climatic conditions or ecological processes which have created very specialised conditions for plants and animals to live and grow in. Over time, a number of plants and animals have evolved to take advantage of these conditions and may only be found in one or a few ecosystem types. The introduction of mammalian predators and browsers has greatly reduced the numbers of many specialised plants and animals and in other cases their habitats have been modified or removed for other land uses. Some species are now extinct and many others continue to decline over time. Ground dwelling animals and those using habitats easily accessible to introduced predators are particularly vulnerable, as are plants with foliage or fruits / seeds preferred by browsers. In addition,

	both plant and animal species with very limited distributions or small populations can be depleted quickly or selectively impacted by habitat loss. Healthy plant and animal populations have reliable juvenile recruitment, and a diverse population age structure with populations large enough to be resilient to natural disturbance.
Connectivity	Landscape connectivity reflects the ability of animal and plant species to move between different elements of a landscape that they require for food, habitat or dispersal. Connectivity can be impaired or fragmented by loss of habitat, highly altered habitat or development. For small or unique ecosystems, connectivity is desired with adjoining native ecosystems.
Geological / landform integrity	All ecosystems include their abiotic (non-living) components as well as their living plant and animal communities. Basic landforms, including their underlying geology, support and influence the natural communities found on the surface, and may take millennia to develop. All development in one way or another has impacts on geology, landforms, and associated soil and water resources.

### Other Terrestrial Ecosystems – Ranking Standards

Key Attribute	Very Poor	Fair	Good	Excellent
Extent of native communities	... over <i>very little</i> of their historic range and/or most blocks are too small to withstand natural disturbance	<i>Some...</i> and/or many blocks are too small	Native communities occur over <i>most</i> of their historic range, in blocks large enough to withstand severe natural disturbances	... <i>almost all...</i>
Abundance & diversity of native animals	<i>Very few</i> native animal species are found in most existing areas	<i>Some</i> native animal species are found in existing areas, but do not represent the original diversity and proportions of species	<i>Healthy populations</i> of native animals are commonly found and abundant across <i>most</i> existing areas	A full range of ... in <i>almost all</i> existing areas...
Composition and diversity of native plant species	Very limited range of native plant species are present in existing areas and do not represent the original composition, proportions and structure; non-	Some native plant species are present in existing areas, but do not represent the original composition, proportions and/or structure; non-native	Native plant species are present in most existing areas and generally represent the original composition, proportions and structure; non-native species are largely absent	A full range of native plant species are present in most existing areas, and represent the original composition, proportions and structure; invasive non-

	native species are dominant	species are present		native species are absent
Natural regeneration of native plant species	Very little regeneration of native species over most of the existing areas	A less diverse subset of native plant species are regenerating over most of the existing areas	Native plant species are naturally regenerating over <i>most</i> of the existing areas	<i>... almost all...</i>
Presence of plant and animal species that are special to the ecosystem	Special native species are present in <i>very few</i> areas; and numbers are not large enough to sustain their populations	<i>Some ... in some</i> areas...	<i>Most</i> special native species are present in <i>most</i> existing areas and are in large enough numbers to sustain their populations	<i>Almost all... in almost all...</i>
Connectivity	Most areas provide poor connectivity to adjoining native ecosystems for native species	<i>Some</i> areas provide <i>some</i> access...	<i>Most</i> areas provide largely unimpeded access to adjoining native ecosystems for native species	<i>Almost all ...</i>
Geological / landform integrity	<i>Very few ...</i>	<i>Some...</i>	Most areas have their natural landforms intact	<i>Almost all...</i>
FOR CAVES: Air and water conditions in caves	<i>... most</i> caves are <i>unsuitable ...</i>	<i>... many</i> caves are <i>substandard ...</i>	Temperature, humidity and other environmental variables inside <i>most</i> caves are <i>desirable</i> for characteristic cave fauna	<i>... almost all</i> caves are <i>optimal ...</i>

Note: *Good/Fair* ratings reflect spatial extent or conditions that fall between the *Good* and *Fair* narrative ratings; *Poor* ratings fall between *Fair* and *Very Poor*

### Spatial Rating Narrative Standards: Illustrative/Approximate Ranges

Rating	Descriptive Language	EG %
Excellent	Almost All	> 90%
Good	Most	75 – 90%
Good/Fair	Much/Many	50 – 75%
Fair	Some	25 – 50%
Poor	Little/Few	10 – 25%
Very Poor	Very Little/Very Few	< 10%

Note: *Very Poor* ratings sometimes use “Most” or “Almost All” for greater clarity to describe the extent of a poor condition

## Lakes and Wetlands – Descriptions

For the purpose of the work undertaken under Kotahitanga mō te Taiao, lakes are defined as natural closed bodies of fresh water, larger than 1 hectare. Their depth can vary from shallow, to moderate or deep. Smaller waterbodies such as tarns are located on mountain tops and some baseline biodiversity surveys of the most important ones is being carried out by the Department of Conservation. Those tarns are usually all part of protected land. Most lakes drain catchments that have a land area at least as large as the lake, and usually many times larger. The morphology and climate of a lake and its catchment and the activities taking place in its catchment affect the ecological conditions of each lake and the functions and values it provides, which are overall similar to those of rivers and streams (see River and Stream ecosystems).

Besides rivers and streams, that distribute water throughout the landscape, lakes, and also wetlands, store water the way that Papatūānuku intended them to be. Wetlands are among the most diverse, productive and valuable ecosystems, providing a disproportionately high 40% of global ecosystem services. They support high levels of biodiversity. They provide habitat for indigenous invertebrates, plants, fish, and bird species, many of which live only in wetlands. Wetlands act as ‘kidneys’ and giant sponges – they clean the water of excess nutrients and sediment, control flood water and pollutants, and act as carbon sinks (removing carbon dioxide from the atmosphere). Wetlands have strong cultural and spiritual importance for Māori. They are a food source (e.g. eel, whitebait) and provide material for weaving. Draining wetlands for agricultural and urban development over the past 150 years has led to significant wetland loss and deterioration, more especially so in the North Island. In the Tasman region, it has been estimated that less than 20% of the original wetland cover remains, while in Marlborough only 11.5% remains.

### 1. Upland Lakes and Tarns

Lakes and tarns above ~700 metres. Adjoining land is mostly large tracts of native alpine or sub-alpine grasses, forbs, shrubs, tussock or mountain beech forest. Land cover varies depending on lake altitude and location; for example, other forest types may adjoin lakes in western regions. Most upland lakes and tarns are located in Northwest Nelson.

### 2. Lowland Lakes

Lakes below ~700 metres, to include large subalpine lakes at Nelson Lakes National Park, the lowland lakes are mostly valley floor or low elevation. Includes sinkhole lakes and some coastal lakes. Dune lakes are included in dune ecosystems. Adjoining land cover is variable, but most lowland lakes are in the Northwest Nelson or the Nelson Lakes Places and within public conservation lands with native vegetation cover adjoining. Adjoining vegetation cover also varies depending on the altitude.

### 3. Upland Wetlands

Includes peatlands and other wetlands such as bogs, fens, pakihis, seeps and flushes above the valley floors, including Tophouse wetlands as an exception slightly below 700 metres. Threats (and management) typically are similar for all the diverse elements and may include weeds, grazing by wild animals, fire. Many of those wetlands are within Public Conservation Lands.

### 4. Valley Floor & Coastal Wetlands

Includes pakihi, swamps, fens, freshwater marshes, and low elevation springs (salt marshes are included in estuaries). Some of those wetlands (swamps and marshes) can be associated

with rivers and streams (riverine wetlands), and lakes (lacustrine wetlands). Some can be near the coast but are not influenced by any coastal process. A diverse mix of ecosystems, but typically they are mostly scattered remnants and all suffer from either being degraded and/or vulnerable to future degradation. Adjoining land use varies from place to place but can either be public conservation lands or private land, including farms. Indigenous wetland vegetation in valley floor wetlands and their margins outside protected areas is often absent and if present, usually less intact than in upland wetlands.

## Lakes and Wetlands at Places

### 1. Mt Richmond

Some of the area occupied by the Mt Richmond place is above 700 metres but not to the same extent as Northwest Nelson and Nelson Lakes. Lakes are rare, and the remaining wetlands few.

### 2. Nelson Lakes

This place, although receiving less rainfall than Northwest Nelson still holds important and large river and lake ecosystems, feeding the Buller River which flows for 170km from Lake Rotoiti to Westport on the West Coast. Like for Northwest Nelson, over 60% of the area is above 700 metres and often part of conservation land. Lowland wetlands occur in the upper reaches of the Buller River around Lake Rotoroa and the Matakita and Tukaki valleys. This place is the main locality for bogs in the Tasman District. More fertile wetlands, swamps, are common in the lowland areas and few are within public conservation lands.

### 3. Northwest Nelson

All freshwater ecosystems in the Top of the South are logically influenced by the rainfall gradient, from the wetter upland North-Western areas (Northwest Nelson) to the lowland drier South-Eastern areas (Nelson Motueka).

It is therefore not surprising to see this place holding important and abundant freshwater wetlands (e.g. Mangarakau Swamp, MacKay Downs and Goulard Downs, Waikoropupū Springs), and lakes and tarns (e.g. Lake Sylvester, Lake Lockett and Lake Peel).

### 4. Nelson Motueka

Nelson Motueka is the driest of the four places described in this report. It lies east of the Motueka River. No land in this unit is above 700 metres. Most freshwater wetlands have been drained, and only irrigation ponds may feature in the overall landscape.

## Lakes and Wetlands – Key Attributes

Key Attribute	Description
Extent	New Zealand's wetland ecosystems have been substantially reduced in area; an estimated 90% have been lost across the nation. Despite their high degree of modification, remaining areas of habitat are important for maintaining the full range of biodiversity in New Zealand. Extent is usually obtained from remote sensing. It is anticipated that methodology will improve over time, with in particular MfE proposing to map wetlands down to 500m <sup>2</sup> under the National Policy Statement for Freshwater Management.

Native aquatic animal species diversity and abundance	Animals species in lakes and wetlands include fish, mussels, invertebrates, and water-dependent birds. Healthy populations of animals include the full range of expected species (some places naturally don't have some species) that represent pre-threat abundance, diverse age structure, and composition and proportions - to the degree known.
Vegetation composition and structure	Wetland and aquatic plants include those growing submerged and those emergent. In contrast to fish and invertebrates, the species richness of native submerged plants is greater in lakes than in flowing waters.
Margins	Native vegetation along the edges of lakes and wetlands brings many benefits to the health of the ecosystems (stabilising banks, reducing erosion, pollution control, wildlife habitat and connectivity). Margins also serve as an "ecotone" – a transition area between the lake/wetland and adjoining terrestrial ecosystems. The desirable width of the margin depends upon the waterbody, topography, soils, vegetation and adjoining land uses.
Water levels	Freshwater lakes and wetlands need water to survive. Water levels can be influenced by rain, groundwater and surface water flows. The amount, frequency, timing and duration of flows/water levels naturally vary over seasons and years. Water levels can also be modified by human activities, such as drainage to create pasture, or flooding to create bigger pond or lake areas.
Water quality – aquatic systems	Good water quality is essential for freshwater fish, mussels, invertebrates, aquatic plants, waterbirds and other species found in lakes and wetlands. Some key water quality parameters include dissolved oxygen, nutrients, sediment/ turbidity, acidity (pH), temperature, and contaminants. Parameters of water quality health are measured less frequently and systematically in lakes and wetlands, as compared to rivers and streams.

## Lakes and Wetlands – Ranking Standards

Key Attribute	Very Poor	Fair	Good	Excellent
Extent	Very few ...	Some...	Most of the lakes/wetlands occur over their historic range	Almost all...
Native aquatic animal species diversity and abundance	Very few ...	Some...	Most lakes/wetlands have healthy native aquatic animal populations (including waterbirds, fernbirds and marsh birds) across their expected range; lakes thought to be mostly free of non-native fish (e.g. trout)	Almost all...
Aquatic vegetation	Very limited range of native plant species are	Some native plant species are present in	Native aquatic plant species are present in most existing	A full range of native plant species are

composition and structure	present in existing lakes/wetlands and do not represent the original composition, proportions and structure; invasive non-native species are dominant	existing lakes/wetlands, but do not represent the original composition, proportions and/or structure; invasive non-native species are present	lakes/wetlands and generally represent the original composition, proportions, and invasive non-native species are manageable and/or in small numbers	present in almost all existing lakes/wetlands, and represent the original composition, proportions and structure, and non-native species are largely absent
Margins	Very few ...	Some...	Most lakes/wetlands have intact native vegetation along/around the margin which is sufficient to sustain water/habitat quality	Almost all...
Water levels	Water levels do not support expected native aquatic species and habitats along most lakes/wetlands	Water levels sustain expected native aquatic species and habitats in some lakes/wetlands	Water levels sustain expected native aquatic species and habitats in most lakes/wetlands	... almost all...
Water quality – aquatic systems	Most lakes/wetlands have very poor water quality conditions that cause significant adverse effects to aquatic life	Some lakes/wetlands have good water quality conditions that cause no or little stress to aquatic life	Most lakes/wetlands have good water quality conditions that cause no or little stress to aquatic life	Almost all lakes/wetlands have good water quality conditions that cause no stress to aquatic life

Note: *Good/Fair* ratings reflect conditions and/or spatial extent that fall between the *Good* and *Fair* narrative ratings; *Poor* ratings fall between *Fair* and *Very Poor*

**Spatial Rating Narrative Standards: Illustrative/Approximate Ranges**

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Good/Fair	Much/Many	50 – 75%
Fair	Some	25 – 50%
Poor	Little/Few	10 – 25%
Very Poor	Very Little/Very Few	< 10%

Note: For greater clarity, *Very Poor* ratings sometimes use “Most” or “Almost All” to describe the extent of a poor condition

## Resources

Varied resources were drawn upon to help inform the Measures Working Group's best professional judgement for current health ratings.

For Wetlands:

- "Extent" and "Aquatic vegetation composition and structure" were informed by thorough mapping of wetlands in Tasman and Marlborough districts (mostly on private land) and background knowledge of wetlands on the northern West Coast region. An estimate of wetland loss was obtained by comparing present day wetland extent from detailed desktop and ground mapping to estimates of historic extent inferred largely from ditches on aerial imagery.
- Extents were estimated for valley floors, terraces and low hill country only. They exclude mountains, generally above 800 metres. Wetlands in the mountains have not yet been mapped,
- "Native animal species diversity and abundance" was informed by a more limited data set of wetland birds, mostly from Department of Conservation.
- "Margins". Aerial photos of a reasonable proportion of wetlands were scanned to make a rapid assessment.
- "Water levels" and "Water quality" was assessed from one-off observations. Artificial drainage or water diversion was assessed during field surveys, but not able to be analysed at a regional scale. Assessing water levels and water quality is very expensive and needs to be monitored over long periods.

For Lakes:

- "Extent". There is no known infilling of lakes to reduce extents.
- "Native animal species diversity and abundance" was informed by limited data set of fish and birds of wetlands, mostly from Department of Conservation.
- "Aquatic vegetation composition and structure". Very limited data is available for this attribute, other than Lake Matiri, Kaihoka Lakes and Lake Otuhie).
- "Margins". While aerial photos are available for analysis of this attribute, systematic and detailed analysis was not carried out. To score this attribute most lowland lakes were viewed by aerial photos any many have been visited.
- "Water levels". The measures group was not aware of many water takes that would cause any adverse effect on water levels.
- "Water quality". Limited data is available for this attribute, other than Lake Matiri, Kaihoka Lakes and Lake Otuhie.

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