Flora & Fauna

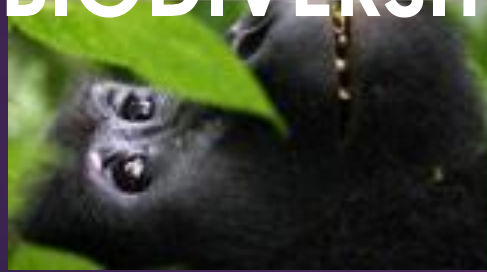## BIODIVERSITY

Link

Understanding the complexity of biodiversity

New Zealand = a hugely diverse environment, including many different types of habitat which all influence native biodiversity, e.g:
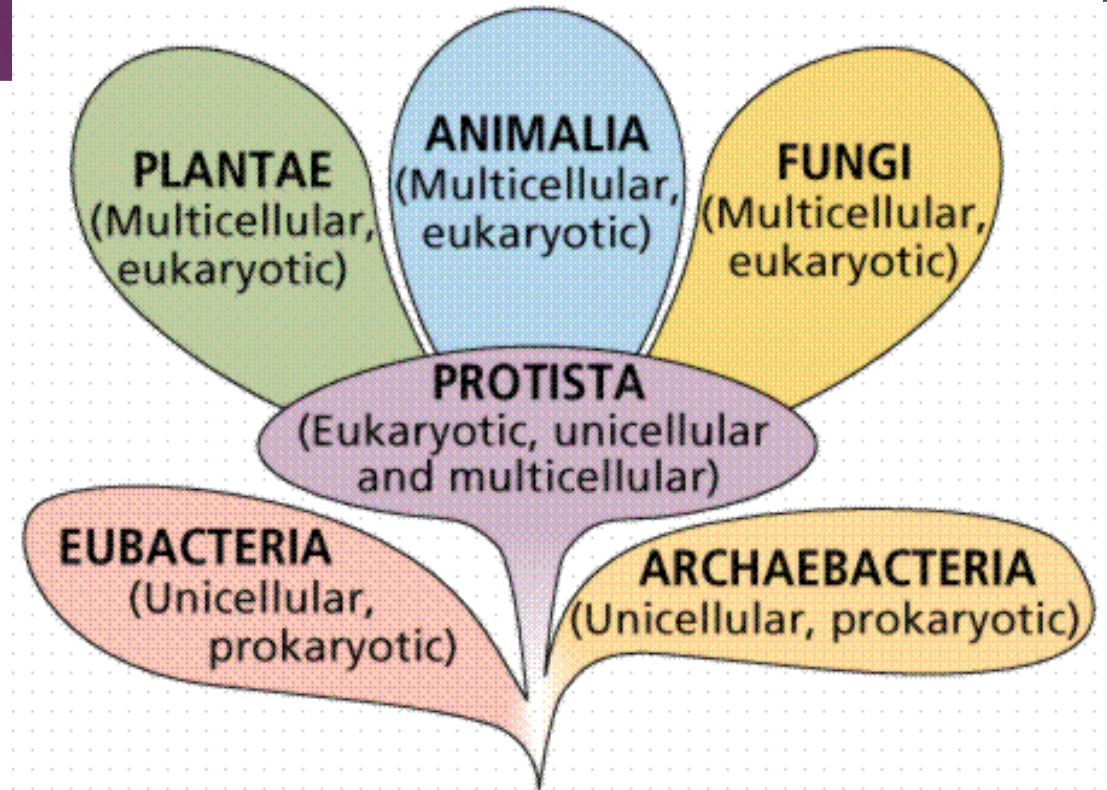
▶ Dunes

▶ Lakes

▶ Forests

▶ Marine / Freshwater

▶ Riverine

▶ Subterranean

▶ Alpine

Classifying living things

- Can you name each of the biological kingdoms?
- Which one is missing from the diagram?
- What characteristics do each of the kingdoms have?
- What is the level above Kingdom?
- What is the level below Kingdom?

Ecology

The scientific study of the interactions between organisms and the environment

Factors Affecting Distribution

Interactions between organisms and the environment limit the distribution of species.

Factors affecting where and why species occur in certain places are divided into two groups:

▶ Biotic (or living factors)

▶ Abiotic (non-living factors)

Living things affecting living things
Author's own (2019)

Biotic Factors

The inability to survive and reproduce may be due to predation, parasitism or competition with other species.

Introduction of exotic predators or pathogens can wipe out species.
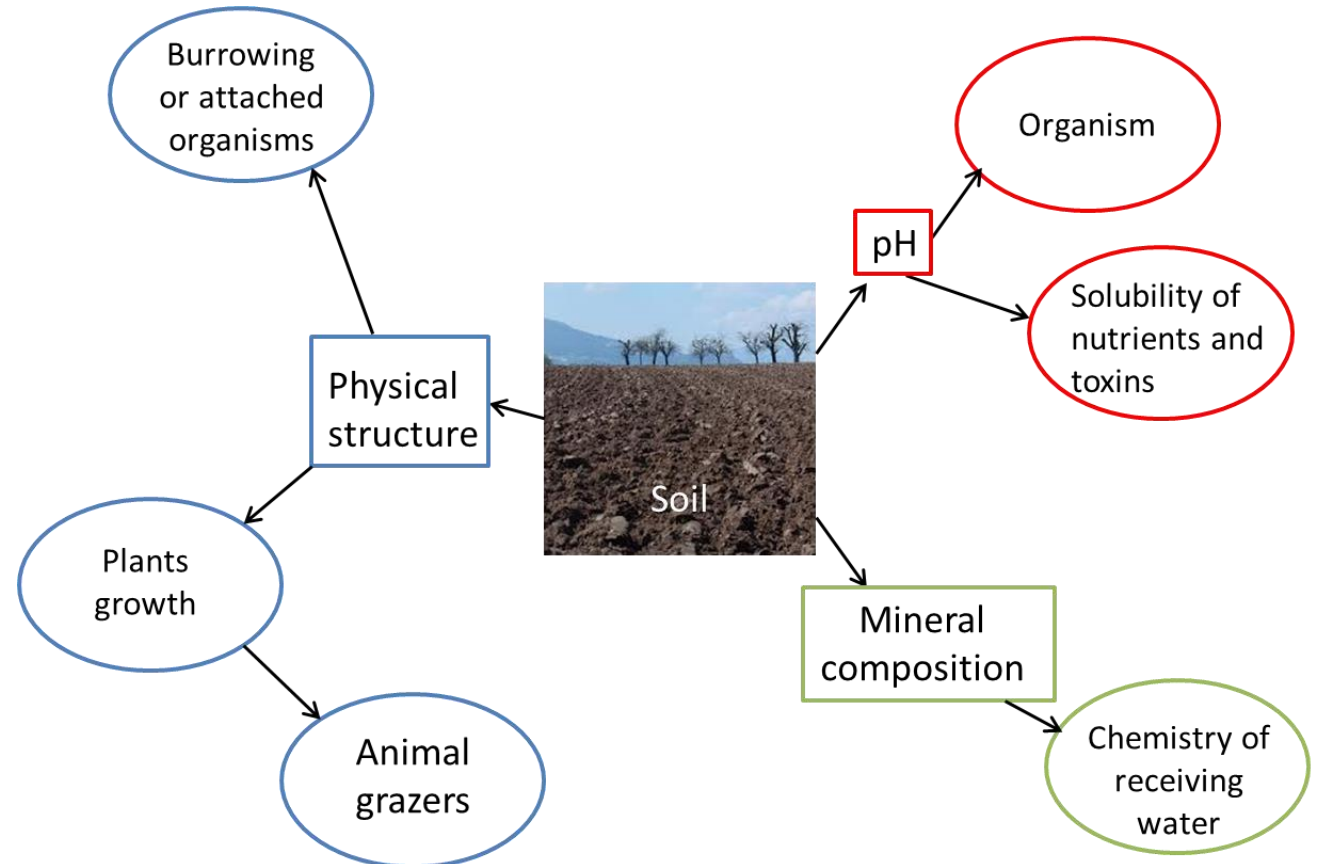
Caulerpa taxifolia

Irukandji

Walking Catfish

Abiotic Factors

These non-living factors include:

▶ Temperature

▶ Water

▶ Salinity

▶ Rocks and soil

Endemic Species

Our country contains a high level of **endemic** species, one of the most varied and unique on earth due to its long isolation from other continental landmasses.

Walking worms (*Peripatus*), who still resemble their ancestors who lived hundreds of millions of years ago, are still found here.

Extinctions

These unique species include many plants, skinks, lizards and birds, all of which have been impacted by our activities.

For example, the Huia bird is now extinct as the last 50 individuals were taken to form collections.

The Black robin was reduced down to the last 11 individuals before conservation efforts boosted numbers back to 200 - which is still very low.

Maui's dolphin extinction scenario
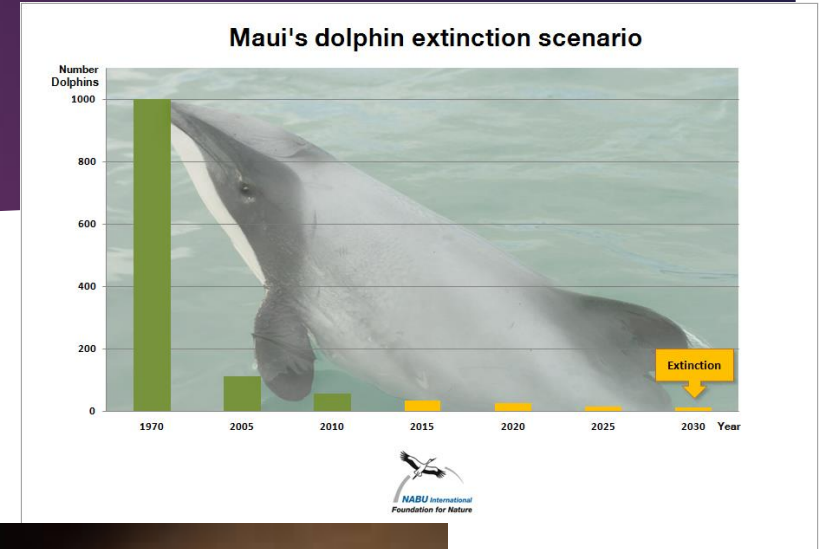
21 Species

- Kiwi Bird
- Lesser short-tailed bat
- Hector's dolphin
- Kea
- Hamilton's frog
- Yellow-eyed penguins
- Chevron skint
- Little blue penguins
- NZ fur seal
- Tuatara
- Maui Dolphin
- Tui
- Bellbird
- Wood pigeon
- Morepork
- NZ falcon
- Hooker's sealion
- NZ fantail
- Tomtit
- NZ robin
- Stitchbird (Hihi)

Vulnerable species

Birds and Mammal species struggling to cope in New Zealand's water, forests and rivers include:

- New Zealand Fairy Tern (35)
- Kakapo (124)
- Chatham Island Taiko (135)
- White Heron (120)
- Black Stilt (150)

- Greater short-tailed bat (??)
- Maui's Dolphin (55)
- Bryde's Whale (160)
- Southern Elephant Seal (250)
- New Zealand Sea Lion (12000)

Examples of activities affecting Flora & Fauna

▶ Roads / Transport (Fragmentation / Safety)

▶ Developments (invasive species)

▶ Coastal infrastructure (marine impacts)

▶ Water infrastructure (habitat disturbance/ Discharges)

▶ Agriculture / Farming (biodiversity)

▶ Power infrastructure (Bird strike)

▶ Discharges (from all sources e.g. spills)
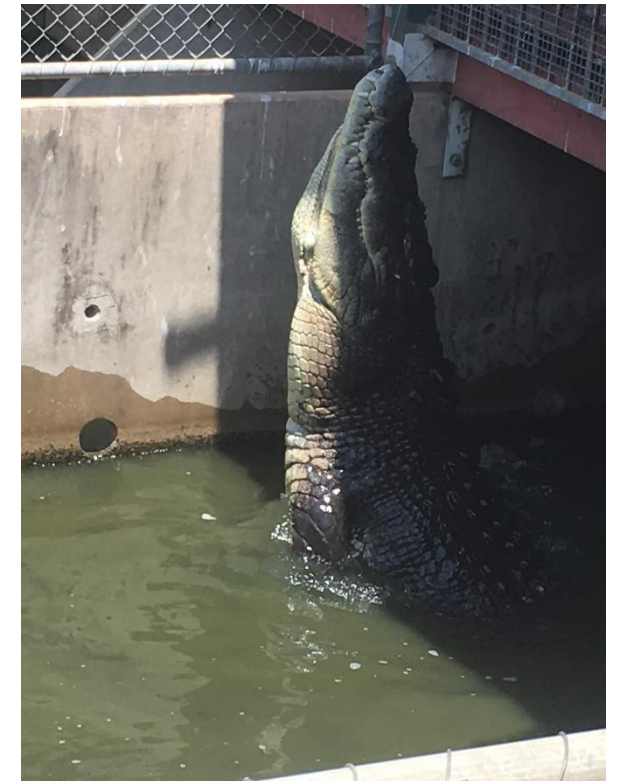
Dare to enter?
Author's own (2018)

Fragmentation

Fragmentation may present problems when building transportation routes, including:

▶ Separation of ecological communities from new roads through the physical barrier they represent

▶ Change of nature of the physical environment – habitat impacts

▶ Increases in pedestrian or road traffic resulting in dispersal of weeds and pest species.

Trains – a better environmental option ?

Smith's Bush – North Shore

- Fragmentation case study
- Studies since then have observed the gradual decline of the biodiversity on the right of the road.

Other factors affecting Habitat

▶ Discharging of nutrients upstream can adversely affect the ecology of an aquatic environment.

▶ An extreme example of this is observed in concrete channels which lack riperian zones.

▶ These channels types are now no longer an option in Auckland but may be elsewhere in NZ.

No more concrete channels in Auckland

Species Loss

The installation of windmills as an alternative energy source at Te Uku require monitoring of the potential for the loss of bird life (in particular falcons).

Bird Strikes

Approximately, 1.3 million dollars were spent determining the statistical chance of bird strikes.

This assessment ran over a long time scale - approx. 6 months. Other species observed were:

▶ Migratory Seabirds

▶ Freshwater Fish

▶ Weeds and their dispersal

▶ Freshwater insects

International Standards

There are no national standards for assessing flora and fauna with the exception of the MCI (Macroinvertebrate Community Index).

The ANZECC guidelines (Australian and New Zealand guidelines for freshwater and marine water quality - click here for link) are a useful tool for comparing results.

Keeping the marine system safe

Current Methodologies

Methodologies for assessing ecology include:

- ▶ MCI
- ▶ Pit Trapping
- ▶ 5 Min Bird Counts
- ▶ Environmental Response Criteria (ERC)
- ▶ Vegetation Survey (significant trees or biodiversity may be listed in the district or regional plans).

Herpetofauna trap

5 minute bird counts

- The five-minute bird count (5MBC) method was developed in New Zealand in the early 1970s by the DSIR for monitoring forest birds.

- Nearly 40 years of research has led to a large resource of counts (over 200 000).

- Sole historical baseline measure of multi-species bird populations in New Zealand forests
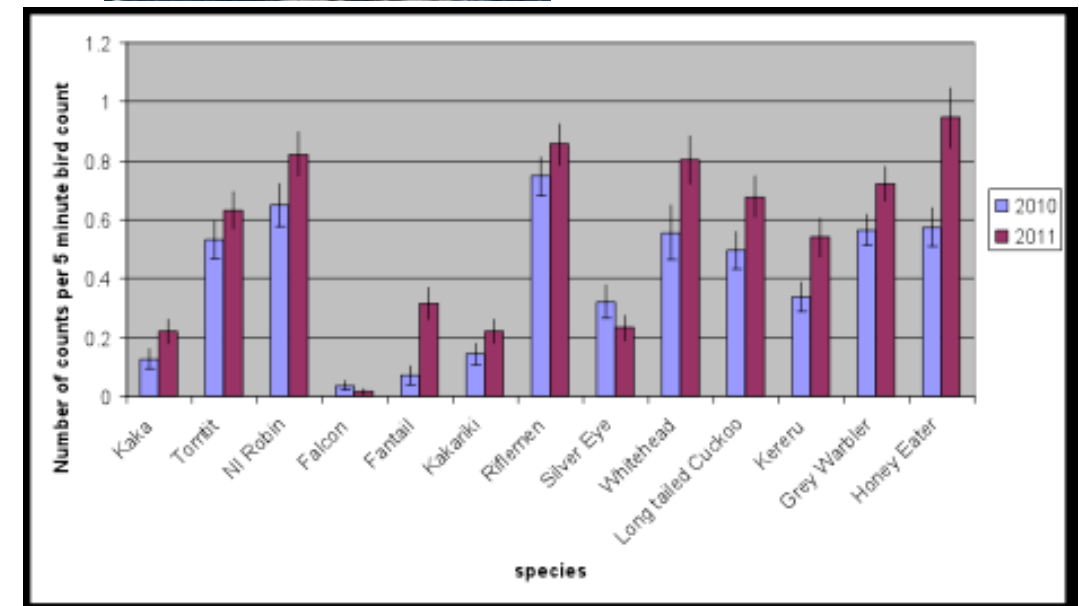
Environmental Response Criteria (ERC)

Developed for sediment quality and water quality (ARC - Coastal Plan)

Substance	ERC (ARC 2004a)		
	Green	Amber	Red
Copper	<19	19-34	>34
Lead	<30	30-50	>50
Zinc	<124	124-150	>150
HWPAH	<0.66	0.66-1.7	>1.7

Units = mg kg dry weight for metals and mg/kg at 1% Total Organic Carbon (TOC) for high molecular weight polycyclic aromatic hydrocarbons (HWPAH)

- Green - low level of impact
- Amber – showing signs of contamination
- Red – higher impact, significant degradation observed.

Very conservative e.g ANZECC guidelines for low copper conc. = 65 mg kg^{-1}

Marine Sediments Contamination

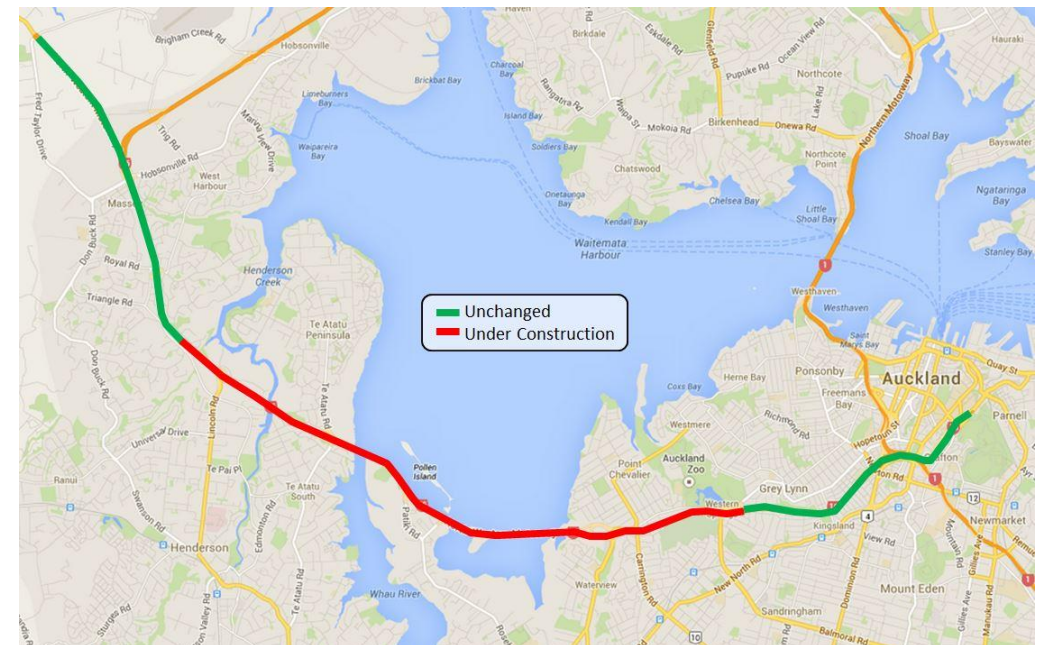Current Status (ARC TR20, Marine Sediment Contaminants, 1998-2010)
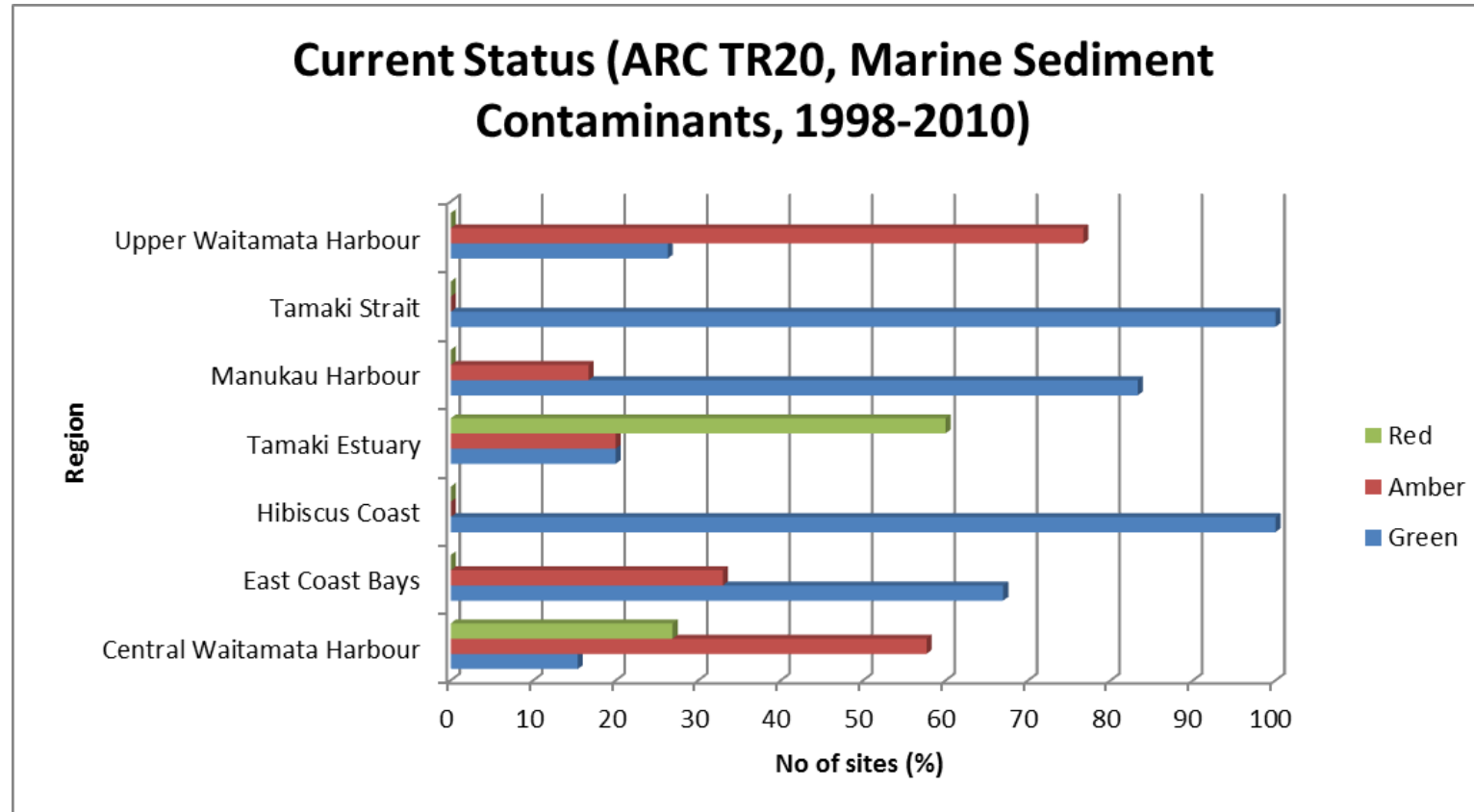
AEE – Waterview Tunnel

Based on ANZECC (2000) Interim Sediment Quality Guidelines (ISQG) and other international sediment quality guidelines.

Monitoring including analysing for lead, zinc and polyaromatic hydrocarbons (PAHs).

Assessment of current ecological value was established

Case Study 1 – Waterview Tunnel

Assessment of effects for marine environment included consideration of the significance of impacts based upon the following:

▶ Type of impact (adverse/beneficial);

▶ Extent and magnitude of the impact;

▶ Duration of the impact (permanent, long-term, short-term);

▶ Sensitivity of the receptor / receiving environment;

▶ Comparison with legal requirements, policies and standards and guidelines.
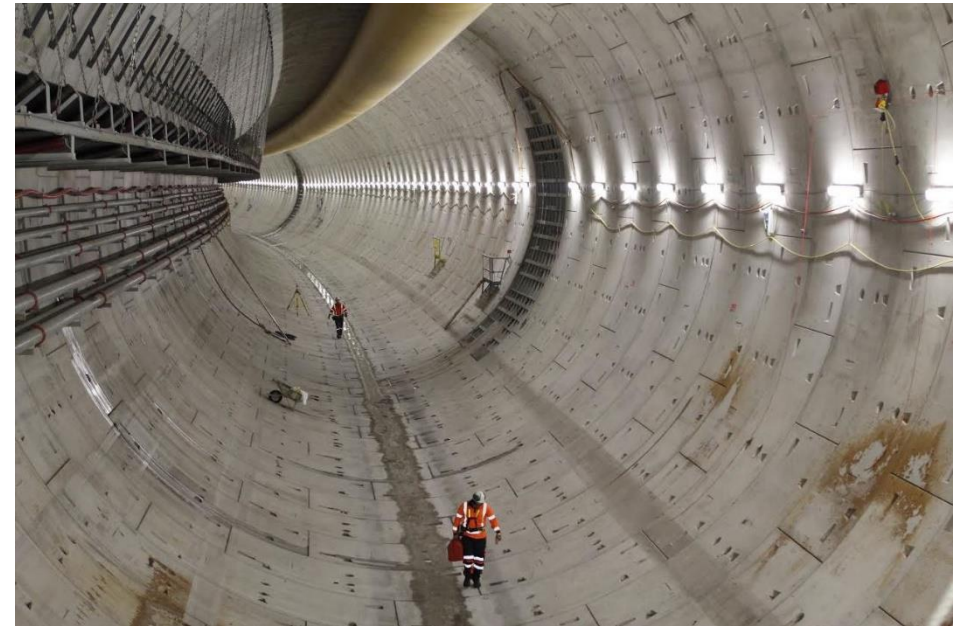
Case Study 2 – Pūhoi to Warkworth

River and Mahurangi River catchments have low ecological values with poor quality habitat and in-stream conditions.

Permanent streams in the few areas of native bush within the catchments, or with native riparian corridors, are of higher ecological value.

Actual/Potential Effects (FW Ecology)

- Sedimentation of watercourses during the construction phase
- Loss of habitat through culverting of streams and watercourses and disposal of fill during construction
- Disruption to fish passage during both construction and operational phases
- Effects of contaminated discharges from construction and operational stormwater discharges.

Avoid, remedy, mitigate

Temporary effects, mainly fish (unaffected)

Incorporation of fish passage in culverts

Implementation of best practice stormwater treatment measures (water quality parameters significantly less than ANZECC guidelines)

Effects on Marine Ecology

Adverse effects on marine ecological values may occur from:

► Discharge of construction sediment into the marine environment

► Construction of piers

► Discharge of stormwater from the motorway surfaces to the marine environment.

Long-term sedimentation is a cumulative effects assessed as minor

Outline plan of works and construction water management – preserve natural character of coastal environment

Routine and triggered monitoring of benthic vertebrates and sediment quality

Potential Effects on Terrestrial Ecology

- Direct loss, edge effects

- Changes in soil moisture related to surface hydrological changes may affect some wetland site

- Shading and rain shadow effects of bridges and viaduct

- Excess dust deposition

- Reduction in the height of vegetation under bridges and viaducts

land snails, reptiles, birds and long-tailed bats

Potentially significant effects on At Risk native land snails & lizards; fernbirds and Nationally Vulnerable long-tailed bats.

Minimise/mitigate?
monitoring, programming clearance to avoid roosting periods and relocation protocols.

Overall

High/long-term/regional effects due to:

- Habitat loss (due to culverting of streams and the disposal of spoil
- Habitat loss and direct mortality of bats (vegetation clearance)
- Direct loss of native forest vegetation

Nationally vulnerable Long Tailed bats