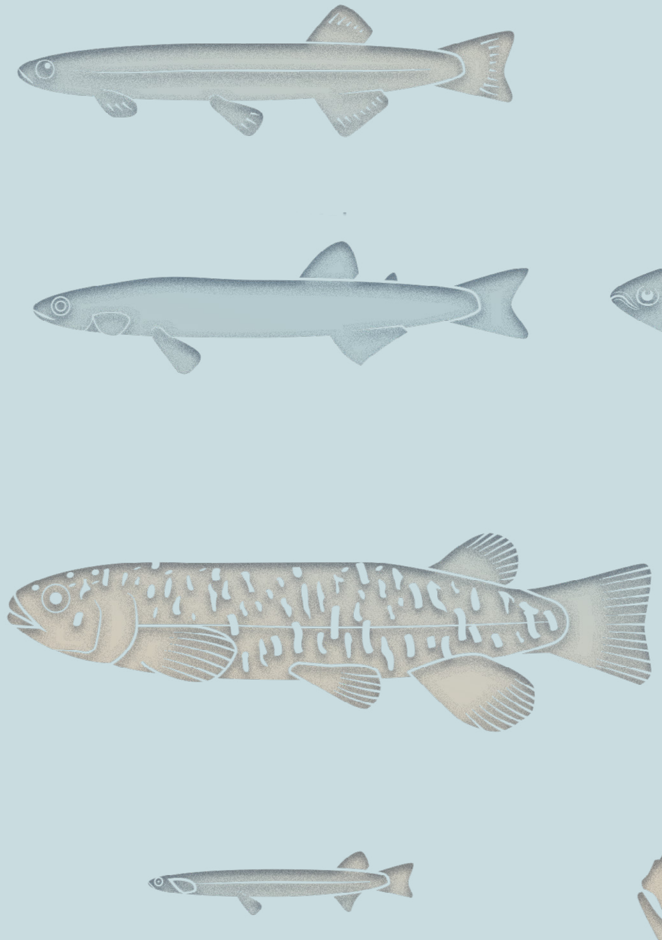
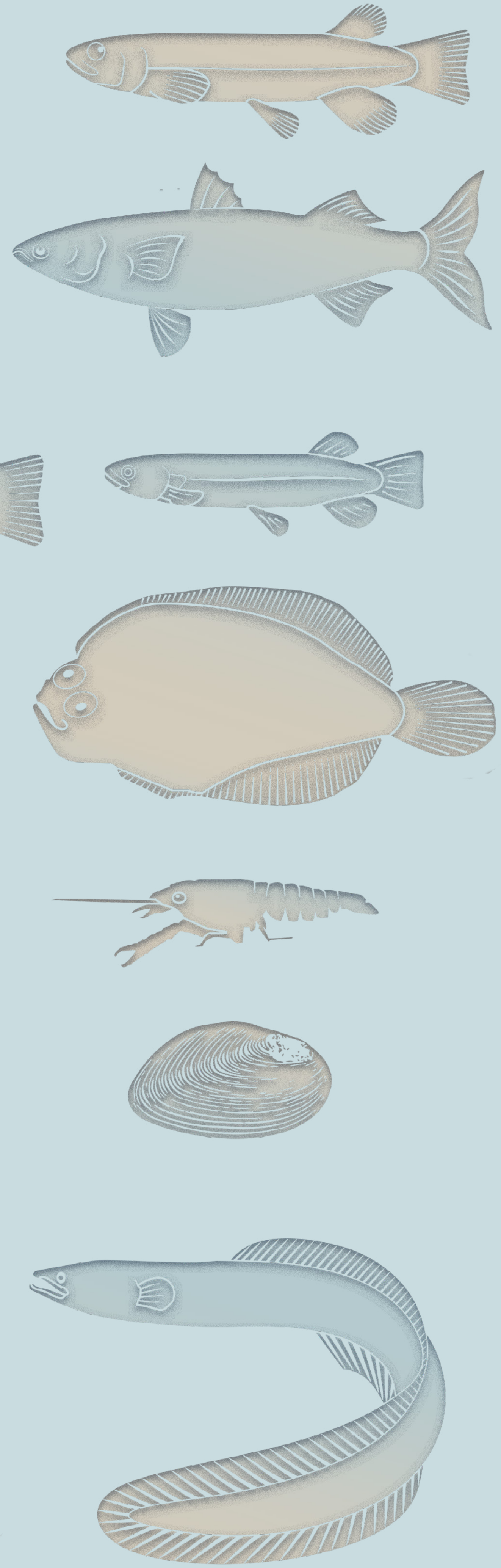
DRAINS ARE WATERWAYS

Modified waterways, commonly known as drains, are typically streams and small rivers that have historically been straightened and/or deepened to enhance land drainage and reduce the risk of flooding. Smaller drains often result from the conversion of wetlands to 'productive' land uses, such as intensive agriculture.

Te Wai Māori





Ecological Importance

Although often viewed solely as infrastructure for flood control or land drainage, modified waterways—or drains—play a crucial role in supporting aquatic habitats and migration pathways for native freshwater species. These waterways are home to many taonga and nationally threatened species, with fish communities that often mirror those found in nearby streams. Remarkably, some drains have even been found to host more diverse animal communities than neighbouring natural waterways.

Over 20 native fish species have been documented in drains. Among these are:

+ culturally treasured species like tuna (shortfin and longfin eels) and īnanga,
+ some of our most threatened species, such as the roundhead galaxias, Canterbury mudfish, and Gollum galaxias, and
+ species that are highly vulnerable to climate change, such as the kanakana/piharau (lamprey) and banded kōkopu.

Drain Maintenance

To maintain the drainage function of these modified waterways, regular clearance is often necessary to address sediment buildup and aquatic plant growth. Nutrients entering the waterways fuel this growth, which reduces water flow and impedes effective drainage of the surrounding land. As a result, these vital waterways are often perceived and managed as infrastructure.

There are various methods used to clear drains of aquatic weeds, including:

HAND WEEDING
This labour-intensive method is suitable for small areas only.

CHEMICAL CONTROL
Herbicides are applied within the waterway to gradually break down plants, this can result in downstream sediment mobilisation as decaying plants often trap fine sediment.

MECHANICAL CLEARANCE
The most common method, involving machinery to remove weeds and sediment efficiently.

Impact of Drain Clearance on Taonga Species and Their Habitats

Mechanical clearance is a common practice across the country, undertaken by landowners and regional and territorial authorities. Its impact on freshwater species can include:

+ Stranding, injury, and mortality.
+ Increased suspended sediments and reduced water clarity.
+ Downstream movement and deposition of fine sediments.
+ Disruption of fish spawning areas.
+ Damage to bank vegetation and structural integrity.
+ Removal or crushing of eggs and larvae.
+ Loss and degradation of physical habitats.

The destruction and removal of habitats pose significant risks to freshwater taonga species, contributing to the ongoing decline of these species and degradation of their environments. This can result in local species extinctions, reduced mahinga kai, and the loss of ecological functions, community structure, and biodiversity.

Species in drains

The below shows native and introduced species that have be found in drains and provides their threat status and climate change vulnerability ranking.

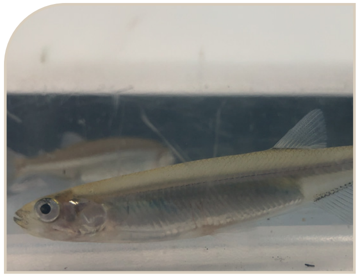
Native Species

Banded kōkopu (kōkopu)
NOT THREATENED HIGH

Brown mudfish (hauhau, waikaka)
AT RISK DECLINING

Canterbury mudfish (hauhau, waikaka, kōwaro)
THREATENED: NATIONALLY CRITICAL

Common bully (toitoi)
NOT THREATENED



Common smelt (pōrohe, paraki)
NOT THREATENED

Giant bully (tīpokopoko, tītarakura)
AT RISK NATURALLY UNCOMMON

Giant kōkopu (kōkopu)
AT RISK DECLINING MODERATE

Black mudfish (hauhau waikaka, kōwaro)
AT RISK DECLINING

Īnanga
AT RISK DECLINING HIGH

Lamprey (kanakana/piharau[3])
THREATENED: NATIONALLY VULNERABLE VERY HIGH

Longfin eel (tuna kuwharuwharu)
AT RISK DECLINING VERY HIGH

Redfin bully[4]
NOT THREATENED

Roundhead galaxias
THREATENED: NATIONALLY ENDANGERED

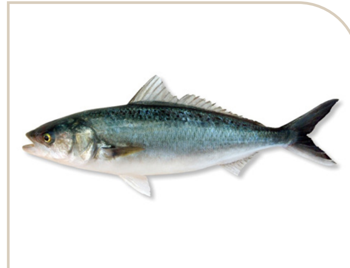
Shortfin eel (tuna hinahina)
NOT THREATENED HIGH

Upland bully
NOT THREATENED

Gollum galaxias[5]
THREATENED: NATIONALLY VULNERABLE

Kōura (kēwai)
PARANEPHROPS ZEALANDICUS DECLINING

Kākahi (kāeo)
ECHYRIDELLA AUCKLANDICA NATIONALLY VULNERABLE



Kahawai
NOT THREATENED

Yellow Belly flounder (pātiki tōtara)
NOT THREATENED

Introduced Species

Brown trout
INTRODUCED AND NATURALISED

Catfish
INTRODUCED AND NATURALISED

Grass carp
NOT ASSESSED

Koi carp
INTRODUCED AND NATURALISED

Gambusia/Mosquitofish
INTRODUCED AND NATURALISED

Perch
INTRODUCED AND NATURALISED

Rudd
INTRODUCED AND NATURALISED

Tench
INTRODUCED AND NATURALISED

Unpictured species also found in drains:

NATIVE

Yellow eyed mullet (makawhiti, aua, kātaha, kātaka, mokohiti)
NOT THREATENED LOW

Grey mullet (kanae, kanae raukura)
NOT THREATENED

INTRODUCED

Goldfish
INTRODUCED AND NATURALISED

All information is sourced from the summary provided by Hudson and Harding (2004)[1] unless noted otherwise.

CLIMATE CHANGE VULNERABILITY RANKING[2]
https://waimaori.maori.nz/vulnerability-assessment-reports-for-freshwater-taonga-species-to-climate-change/

GOOD MANAGEMENT PRACTICES FOR DRAIN MAINTENANCE

This guidance focuses on the mechanical clearance of weeds and sediment in highly modified waterways or drains, as this is the most common method. Some Regional Councils have created management guidelines to support practices that minimise harm to freshwater taonga. Below is a summary of practices aimed at reducing impacts on freshwater species and their habitats, along with related implementation challenges.

IMPACT

Strandings, damage, and mortality of freshwater taonga species

Mitigation
+ Conduct fish recovery efforts.
+ Use a weed rake in hard-bottomed drains.
+ Leave the bucket submerged at the end of each scoop.
+ Distribute spoil so that eels can return to water.

Implementation
+ Highly beneficial and recommended, although challenging. Particularly for small fish, and on hot days when species can quickly die.
+ Multiple passes with a dedicated team are necessary, focus on low-mobility species.
+ Effectiveness of recovery in New Zealand is not well understood.

IMPACT

Increased suspended sediment

Mitigation
+ Place spoil away from waterway but enable fish recovery.
+ Minimise downstream sediment transport.
+ Use a conventional bucket in heavily silted drains.
+ Recover distressed fish in the waterway.
+ Do not remove vegetation from dry banks and re-stabilise exposed soil.

Implementation
+ Important to mitigate sediment release, as it affects all aquatic species.
+ Fish recovery requires specialised equipment and trained personnel.

IMPACT

Habitat loss

Mitigation
+ Leave some riparian and/or instream vegetation as cover.
+ Install artificial fish refuges.
+ Avoid clearing entire waterways simultaneously.
+ Preserve channel width and depth.
+ Retain specific habitats.
+ Avoid removing stony substrates.
+ Maintain variability in streambed profile.

Implementation
+ While helpful, these methods have limitations for fully preserving habitat and minimising disturbance.
+ Reducing the frequency of clearing activities is generally the best method.
+ Artificial fish refuges are a last resort and remain largely untested; other habitat-preserving techniques are preferred.

IMPACT:

Disturbance to spawning habitat of freshwater taonga species

Mitigation
+ Avoid scheduling aquatic plant removal during fish spawning and migration periods.
+ Year-round protection of īnanga spawning habitats.

Implementation
+ Spawning habitat disturbance can occur year-round.
+ Timing can be challenging given the varied lifecycles of species, though priority could be given to the most at-risk species.
+ Identifying spawning habitats requires specialised knowledge and may not apply to all species.

Additional measures can include working upstream to downstream, allowing downstream macrophytes to trap mobilised sediment, and alternating cleaning sections to maintain habitat refugia and sediment trapping between maintenance cycles.

Sustainable Drain Management: A Long-Term View

A sustainable approach to drain management involves reducing the need for frequent clearance by enhancing ecosystem resilience and natural processes.

Key strategies include:
+ Addressing land-based sources of sediment and nutrients,
+ Increasing riparian vegetation to provide shade and limit nuisance plant growth, and
+ Restoring natural channel forms.

Research in Aotearoa has explored sustainable alternatives, such as implementing “two-stage channels” and promoting on-farm practices to limit nutrient and sediment runoff. Catchment-wide transformation plans, like those for the Ararira/LII tributary of Te Waihora in Canterbury, have been developed to support holistic drainage network management.

Drains are waterways references

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1. All information relating to species threat classifications are summarised in Hudson & Harding (2004), including the following sources: McDowall & Lambert 1996, Ryder 1997, Goldsmith 2000, Young et al 2000 and R. R. Strickland pers. comm.

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Image references

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