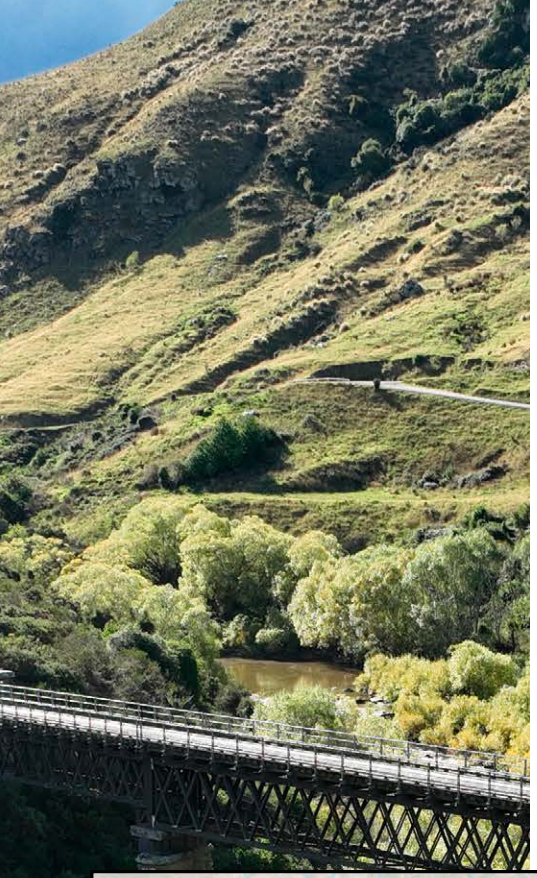


Department of Conservation
Te Papa Atawhai

Mid Taiari

Climate change impacts on freshwater ecosystems & values, and management options

The Taiari is one of 14 rivers in DOC's Ngā Awa river restoration programme. DOC commissioned an assessment of the impacts of climate change on freshwater values and ecosystems of the Taiari catchment. This summary focuses on the Mid Taiari and highlights management opportunities to protect freshwater species and ecosystems likely to be impacted. For more in-depth analysis, please refer to the full report linked at the end of the document.

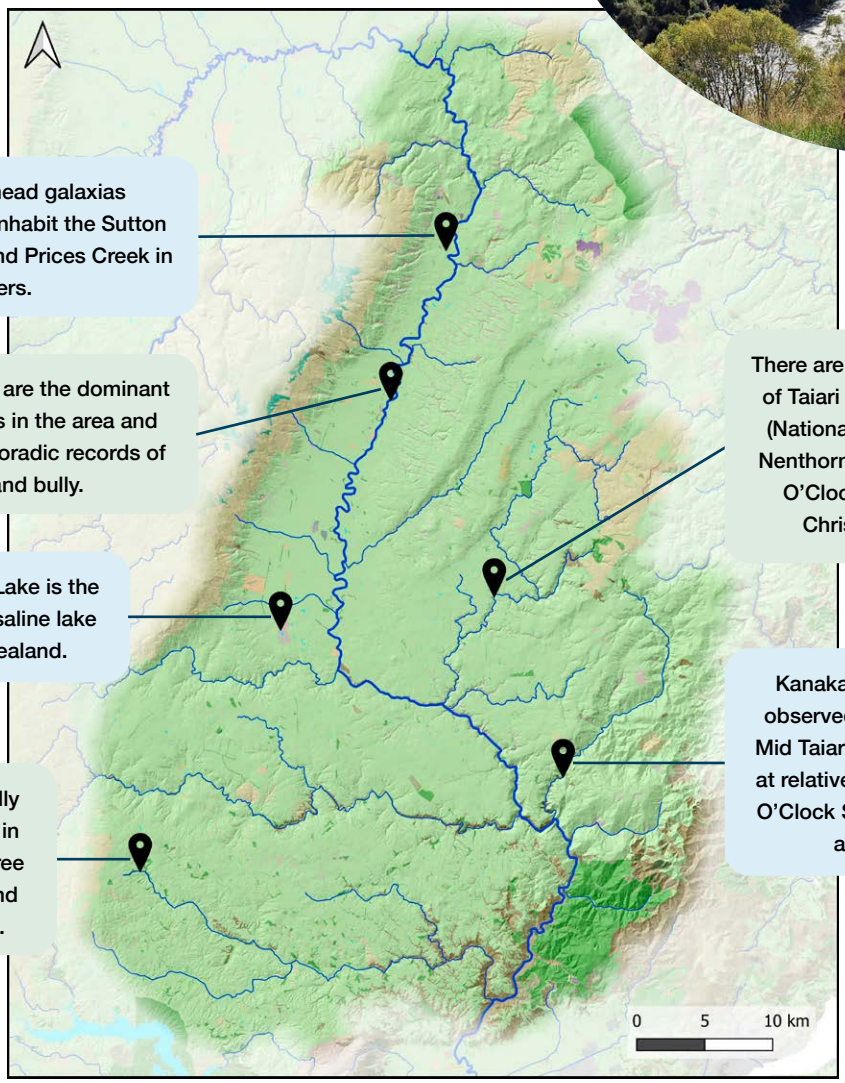
The Mid Taiari

We defined the Mid Taiari as the Taiari and tributaries from Outram Glen upstream to Tiroiti just downstream of the confluence with the Kye Burn. Many of the watercourses in this region, especially in the Strath Taiari are contained within steep gorges, although near Middlemarch the Taiari flows through a more open valley. Significant tributaries include Lee Stream, Big Stream, Three O'Clock Stream, Deep Stream, Sutton Stream and Nenthorn. Numerous smaller streams drain from the eastern slopes of the Rock and Pillar Range and western slopes of Taiari Ridge into the Taiari River.

< Map of the Mid Taiari basin

Key freshwater values

Several species of fish inhabit the Mid Taiari including three species of non-migratory galaxiids that are only found in Otago and Southland. In general fish data in this part of the Taiari is lacking, due to the difficulty of river access through this area.



Central Otago roundhead galaxias (Nationally Endangered) inhabit the Sutton Lakes area, Scrub Burn and Prices Creek in small numbers.

Longfin tuna are the dominant fish species in the area and there are sporadic records of upland bully.

Sutton Salt Lake is the only inland saline lake in New Zealand.

Eldon's galaxias (Nationally Endangered) are present in Traquair Burn and the Three O'Clock, Sutton, Deep and Lee Stream headwaters.

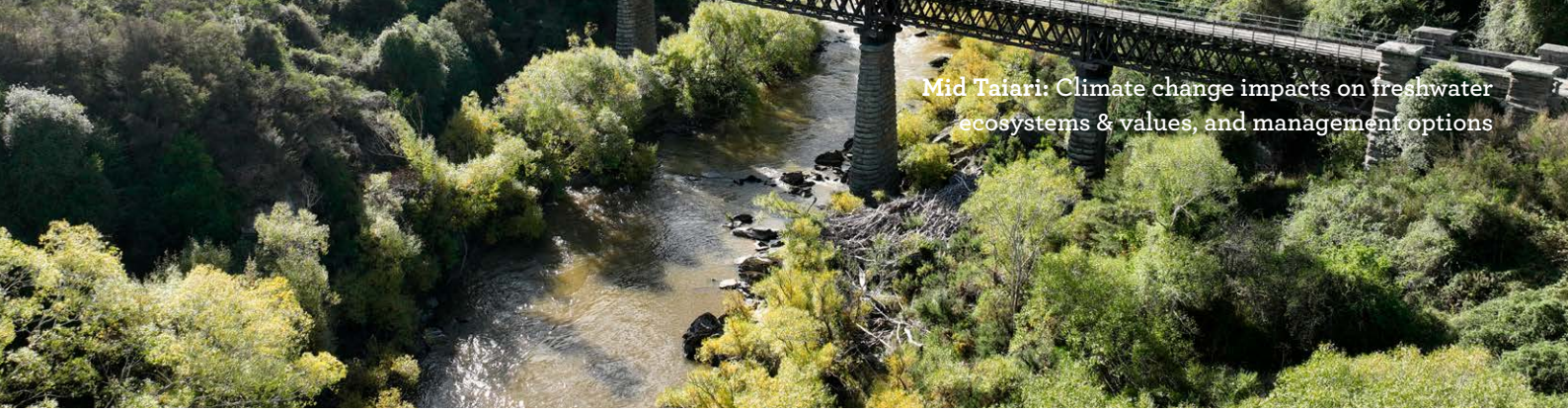
There are large populations of Taiari flathead galaxias (Nationally Vulnerable) in Nenthorn, Ross and Three O'Clock Streams and Christmas Creek.

Kanakana/Lamprey have been observed in the main stem in the Mid Taiari and have been detected at relatively high numbers in Three O'Clock Stream, Christmas Creek, and Traquair Burn.

Tadpole shrimp © Natasha Drury

An ecosystem of interest – Sutton Salt Lake

Sutton Salt Lake is the only shallow, inland, saline lake in New Zealand. The lake is situated at an elevation of 250 m, near Middlemarch, and has no surface outflow and loses no water to groundwater. Sutton Salt Lake is fed by rainwater, and during the dry summer months, the shallow lake completely evaporates. The lake is part of the regionally significant Sutton Salt Lake Wetland Management Area. The lake and surrounding wetland areas are home to several nationally threatened plants and invertebrates, including the enigmatic tadpole shrimp (*Lepidurus apis veridis*) and the critically endangered clam shrimp (*Eulimnadia marplesi*).



Climate model predictions

The predicted effects of climate change on the Mid Taiari summarised below are projections*. The main threat from climate change in this region is from more intense floods and droughts.

PRECIPITATION

Increases in projected annual rainfall, and both number and magnitude of heavy rain days.

Increase in annual dry days in the north and decrease downstream.

TEMPERATURE

Increases in projected annual temperature and projected +30˚C days.

Decrease in annual frost days.

WIND

Historical decreases in annual wind speed.

Decreases in projected extreme wind initially, changing to an increase in the north and west.

FLOWS

No change in projected mean flows in the north, but increases downstream.

Increases in flood flows.

Decrease in annual low flows.

*The 'projections' use the mid to high range RCP and a 2090-time frame. Projections vary depending on the scenario and timeframe modelled and thus impacts could differ depending on emissions. There is also likely to be seasonal and inter-annual variability (e.g. El Niño / La Niña years). See the Taiari Climate Change Risks & Impacts report and its source material for further detail (link at end).

Key climate change related risks: Sutton Salt Lake

The Sutton Salt Lake Wetland Area's salinity is dependent on the balance between annual evaporation and rainfall. Any change to that ratio will affect the hydrology and salinity of the system significantly. The lake is therefore one of the ecosystems in the Mid Taiari that is most sensitive to climate factors. Increased rain could flush salt out of the system, while less rain and/or greater evaporation could result in longer drying periods of the lake and wetland. Due to the complexity of the climate models, it is not clear what the net effect of these changes will be on the lake; however, the current conditions and current biotic communities of the Sutton Salt Lake Wetland Area are almost certain to alter with a changing climate. Any changes to the hydrology have the potential to affect the unique species that inhabit the area with population decline as a worst-case outcome.

Key climate change related risks: **Fish**

The Taiari has always been prone to floods and droughts, and these have had no obvious impacts on its current fish communities, so assuming current minimum flows and water quality is maintained, fish in the mainstem of the Taiari are likely to be fairly resilient to climate change impacts. However, there is generally a lack of fish data within the Mid Taiari, so this may not be the case and caution should be taken.

Increased risk appears for the smaller streams throughout the catchment which are more vulnerable to the impacts of climate change. This is because more frequent floods, drought, drying and wildfire are likely. Low flows will impact in-stream and riparian habitat and limit the downstream and upstream migrations of galaxiids that are necessary at different life stages and seasons. Pressure on instream values from water takes (including stock drinking water and domestic water supply) will be exacerbated during increased drought periods.

Management options

Sutton Salt Lake

- Identify wetland and pond habitats on or near the Sutton Salt Lake Wetland Area.
- Examine the hydrology of the lake and explore options for maintaining saline water chemistry.
- Search elsewhere for suitable habitat and populations of the rare species found at the Sutton Salt Lake complex. Consider establishing new populations of rare species from Sutton Salt Lake at additional locations.

Landscape wide interventions

- Carry out fish surveys (e.g. using eDNA) to understand current state and issues.
- Manage the minimum flow regime on the Taiari to preserve refuge habitats for fish (i.e. deep, sheltered pools) during extreme drought.
- Look for opportunities for small-scale interventions across the landscape, especially in steep headwaters to slow flood flows e.g., sediment traps, leaky barriers.

Management options

Protection for rare non-migratory fish and kanakana

- Monitor fish communities, particularly the rare non-migratory galaxias and kanakana. Evaluate habitat (including at a sub-catchment scale) to establish management priorities.
- Monitor to detect and manage trout incursions to rare non-migratory galaxias habitat (e.g. Sheepwash Creek).
- Where increased drought is projected, maintain / increase environmental flows allocated to small streams where there are consented water takes – with the goal of maintaining instream habitat even as climate change progresses.
- Consider changing land use to reduce/remove irrigation needs.
- Headwater and riparian margin restoration to increase shading, flow mitigation and to intercept sediments.
- Restore small wetlands to support flow mitigation in response to floods and drought.
- Assess and mitigate fish passage barriers – balancing galaxiid and trout management (i.e. restricting trout access).
- Plant with wildfire resistance in mind (consider landscape-scale planning for this).

Download full reports:

Closs et al. (2024) Climate change vulnerability assessment of freshwater ecosystems and values of the Taiari River catchment, and management options.

Goldsmith (2023) Climate change impacts and risks – Taiari River catchment. A compilation of current research to support local decision-making.

Kanakana/lamprey © NIWA