

**Frost flats occur on low-lying flat areas in the North Island Volcanic Plateau. They are old tephra plains created after large volumes of pumice were deposited during volcanic eruptions.**

Volcanic soils on these plains are well-drained and have very low fertility. Frost flats are located between 400 and 800 metres above sea level and the 'pooling' of cool air in these areas can create a frost at any time of year.

### What grows in a frost flat?

Cold climate, regular frosts, low soil fertility and fires have resulted in a very unique range of plants that survive in frost flats.

Monoao is the most common plant in frost flats and grows to about two metres. Other native plants that are common include; coral lichen, silver tussock, and woolly moss. If you walked through a frost flat plants would only come up to your thighs even though in some areas the monoao can be around 100 years old. Where no fires have burnt for a long period of time you may see bog pine and mountain toatoa coming through.



Monoao (*Dracophyllum subulatum*)



Coral Lichen and moss under monoao

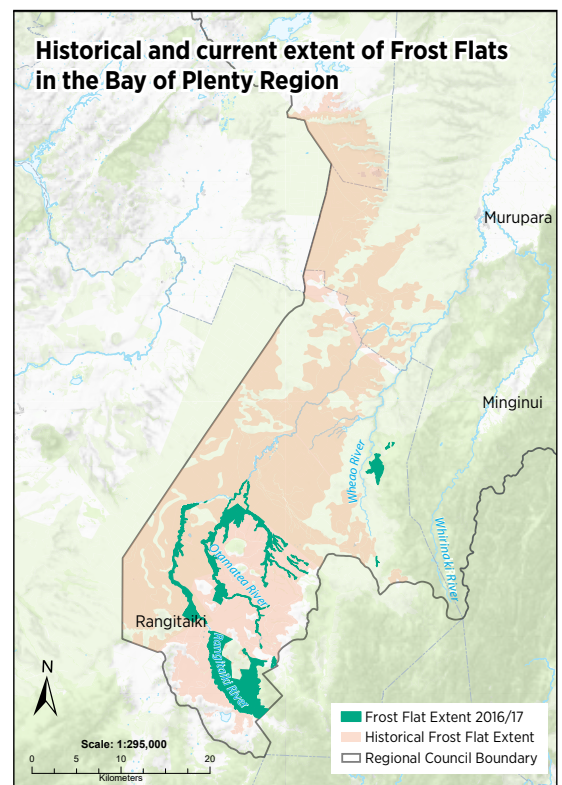


Frost flats in the Rangitāiki Area

### Where can you find frost flats?

Frost flats can be found at the southern end of the Bay of Plenty region, on private, Department of Conservation administered, and multi owned Māori land; within farming or forestry operations. The best remaining examples are in the Rangitāiki and Otangimoana Conservation Areas on the southern Kāingaroa Plateau.

*This map shows the extent of frost flat vegetation (monoao scrub/lichenfield) within the Bay of Plenty region prior to human arrival and the remaining extent in 2017.*



## Why are they important?

Frost flats only occur in the Volcanic Plateau and are a naturally uncommon ecosystem type – meaning they were already rare before humans arrived in New Zealand. They are being lost at a very high rate; since 2003 there has been a loss of 12% of frost flats in the Bay of Plenty region. As frost flats are so rare, they have been classed “critically endangered ecosystem”.

## Threats to frost flats

**Animals** including rabbits, hares, horse, stock, pigs and deer eat and disturb plants. They also increase nutrients in soils with their manure; frost flat plants like low nutrient soils. Pigs can also cause soil disturbance.

**Development** due to farming and forestry expansion reduces areas of frost flats and increase soil nutrient levels due to fertiliser drift.

**Fire** removes all vegetation and due to the length of time it takes for frost flat plants to regrow, areas are likely to become invaded by weeds.

**Humans** damage frost flat communities and soils by the use of off-road vehicles, trampling, riding bikes and lighting fires.

**Wilding pines** are adapted to cold weather, growing easily in frost flat areas. Contorta (lodgepole pine) produce large amounts of seed at a very young age (≈three years) which can be blown long distances. If not controlled early wilding pines will; take over frost flat areas; warm up the soil; add nutrients; and shade out frost flat plants.

**Other weeds** adapted to low soil nutrients (gorse and broom) add nitrogen to the soil (monoao prefer low nutrient levels). Heather, exotic grasses (browntop) and herbs (mouse-ear hawkweed) grow in areas with increased nutrients and completely change frost flats.



Monoao shrubland with wilding pines growing throughout.

## What can you do to help?

- Protect areas of frost flats on your land by fencing to permanently remove stock.
- Control wilding pines.
- Keep off frost flats (do not walk, drive vehicles, bikes or horses in them).
- Do not light any fires near frost flats.
- Control pest animals (rabbits, hares, wild horses, pigs and deer).
- Spread the knowledge of these special places and encourage their protection.

The Bay of Plenty Regional Council may be able to provide advice and support with the protection of this unique and threatened ecosystem on your land. Feel free to contact us.



*Pimelia prostrata*

## Other helpful resources

### Frost flats

#### National Geographic

[www.nzgeo.com/stories/the-frost-flats-of-rangitaiki/](http://www.nzgeo.com/stories/the-frost-flats-of-rangitaiki/)

#### Landcare Research

[www.landcareresearch.co.nz/publications/factsheets/rare-ecosystems/inland-and-alpine/old-tephra-plains-frost-flats](http://www.landcareresearch.co.nz/publications/factsheets/rare-ecosystems/inland-and-alpine/old-tephra-plains-frost-flats)

### Wilding pines

#### Bay of Plenty Regional Council

[cdn.boprc.govt.nz/media/321630/PP21-Lodgepole-pine.pdf](http://cdn.boprc.govt.nz/media/321630/PP21-Lodgepole-pine.pdf)

#### Department of Conservation

[www.doc.govt.nz/nature/pests-and-threats/common-weeds/wilding-conifers/](http://www.doc.govt.nz/nature/pests-and-threats/common-weeds/wilding-conifers/)

#### New Zealand Wilding Conifer Group

[www.wildingconifers.org.nz](http://www.wildingconifers.org.nz)



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