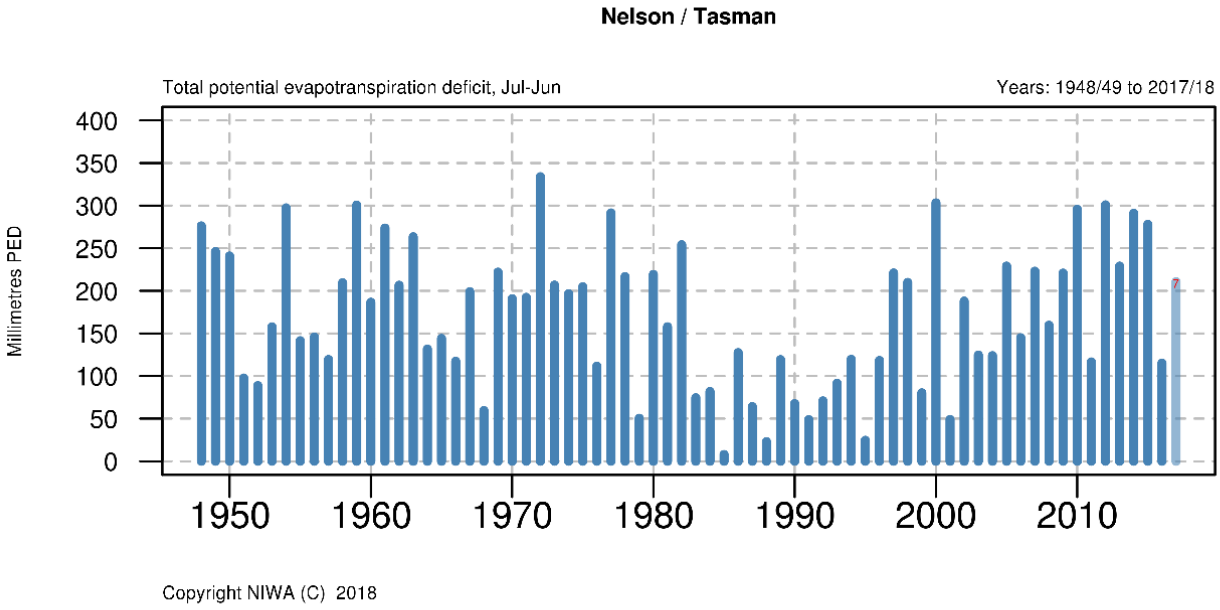
Drought in the Abel Tasman National Park
Dr Philip Simpson

The Abel Tasman National Park experienced a substantial drought in the summer of 2018/19, with virtually no rain for nearly three months. The impact is possibly less than that of the 2000-2001 drought because 2018 was one of the wettest years in recent decades, meaning the soil and underlying rock water reserves were fully charged.

Nevertheless, many plants wilted or died back, and seedlings died, and so it is a good opportunity to study the effects of drought on the ecosystem, and to reflect on what it means in terms of ecological restoration such as planting and species reintroduction. Drought is a regular feature of the park and the frequency seems to be increasing as you will see from this graph.



Potential evaporation deficit is the amount of rain needed to restore soil moisture to a level that supports normal plant growth. The histograms since 2010 show recurring drought conditions, and 2019 will no doubt add another high figure.

In many other countries coppicing growth, where species of trees and shrubs put out new shoots from the base of the trunk, is related to recovery after fire. Some of the species that suffer canopy dieback as a result of drought, for instance whiteywood (mahoe, *Melicytus ramiflorus*) are capable of coppice growth – new branches from the base of the trunk, which may be an adaptation to survive drought. New Zealand ecologists (like Matt McGlone of Manaaki Whenua - Landcare Research) do not think fire was sufficiently

common in New Zealand to have influenced plant evolution. Recovery from drought is much more likely to explain this.

Why is the incidence of drought increasing?

Increased temperature owing to heating of the sea and atmosphere because of greenhouse gases (CO_2 and methane), combined with the depletion of ozone are causing reduced rainfall in most parts of New Zealand, and the higher summer temperatures are increasing evaporation and transpiration.

How did trees in the Abel Tasman National Park fare?

A walk in the park during the drought revealed many of the large-leaved shrubs and trees wilting: kawakawa, rangiora, kanono, pigeonwood, horopito, mahoe. Seedlings are unlikely to recover. Beech seedlings are particularly vulnerable. Often thousands of seedlings establish in spring but are nearly all dead by the end of summer. One can often see distinct size classes in the regeneration, these representing phases of seedling survival in good wet years.

Wilting kanono – Philip Simpson

Kanono (*Coprosma grandifolia*) is a common large-leaved shrub along streams and gullies. It carries ripe fruit for much of the year and is an important food source for bellbirds. This seedling (above) is likely to die from drought. In this way the distribution of the species becomes confined to wet places.

Many of the large-leaved ferns like hen and chicken fern have collapsed their leaves onto the ground. The ferns are likely to recover because the hairy crown at the base protects the growing tissue. Filmy ferns, the most delicate leaves in the bush, regularly dry up and then recover.

Hinau – Philip Simpson

These hinau (*Elaeocarpus dentatus*) seedlings (above) are being thinned out by the drought, only the most vigorous surviving.

Some species are more resistant to drought

One group that does not seem to suffer from drought includes miro, rimu and matai seedlings. These conifers (podocarps) have tough leaves and may have evolved during warmer drier conditions than now. Another group that shows little impact of drought includes the small–leaved shrubs like *Coprosma rhamnoides* and *C. taylorae*, *Pittosporum divaricatum* and *Raukaua anomalus*. These 'divaricating' plants (which are a distinctive feature of the New Zealand flora) survive drought by having small leaves often concentrated inside the mass of branches. Some species like putaputaweta (marble-leaf) have small leaved juveniles and typical large-leaved adults, which are more capable of surviving drought. The purpose of small leaves has been related to reducing the impact of browsing, by moa for instance, but avoidance of drought is probably a much more important reason.

Some species coat the undersides of their leaves with hairs or wax. This traps moist air, reduces evaporation from the breathing pores, and reflects light and heat away from the leaves. Rangiora and heketara (both tree daisies) have furry white undersides. Our national emblem, the silver fern, has silver wax. Of all the tree ferns silver fern is the most drought tolerant and can be seen regenerating *en mass* underneath typically dry kanuka forest.

Some plants have extremely tough leaves, for instance young lancewood, the leaves of which not only hang down and avoid direct sunlight, but mimic dead leaves by looking as if lichens are growing on them and hence reduce the chance of animal damage and subsequent water loss.

Rangiora - Philip Simpson

Rangiora is a large-leaved shrub in wetter places throughout lowland parts of the park. Despite the hairy undersides of the leaves it wilts very badly in really dry conditions. In fact, while widespread, it is not especially common in the Abel Tasman, and one of the likely reasons for this is drought, which prevents seedlings from establishing except in favourable places and years.

Drought influences species distribution

Pukatea – Philip Simpson

Droughts are likely to rigidly enforce the contrast between gullies and ridges. For instance pukatea (*Laurelia novae-zelandiae*) is an important large tree in the swamps and gullies of the coastal areas. Pukatea grows only in the wettest places but the wind-blown seeds are carried far and wide and millions of

seedlings establish. However they seldom get beyond the seedling phase because drought restricts successful seedlings to gullies and swamps.

By restricting large-leaved species to gullies, droughts probably enhance the ability of drought tolerant podocarps to regenerate.

Limestone mahoe - Philip Simpson

Melicytus obovatus (the limestone mahoe) grows only on limestone outcrops, and this individual (above) is the only known plant in lowland parts of the park. Its habitat is naturally dry and this plant is at risk in times of drought. Drought is one of the reasons why many species in the park are rare.

Mapou – Philip Simpson

Mapou (*Myrsine australis*) is a widespread but thinly scattered small tree in the park. Note the dead branches from former years as well as the current drought impact. This tree has died back repeatedly from successive droughts over the years. Drought is probably one reason why mapou is uncommon.

About the writer

Dr Philip Simpson is a botanist and award winning author of a number of books on New Zealand trees including cabbage trees, pohutukawa, rata and totara. His most recent book – Down the Bay, A natural and cultural history of Abel Tasman National Park was released in 2018. He is also a Project Janszoon director.