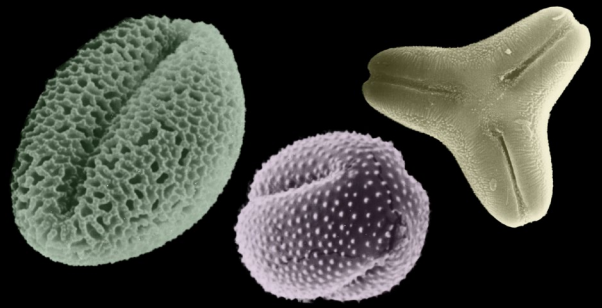
Manaaki Whenua
Landcare Research

MANAAKI WHENUA – LANDCARE RESEARCH

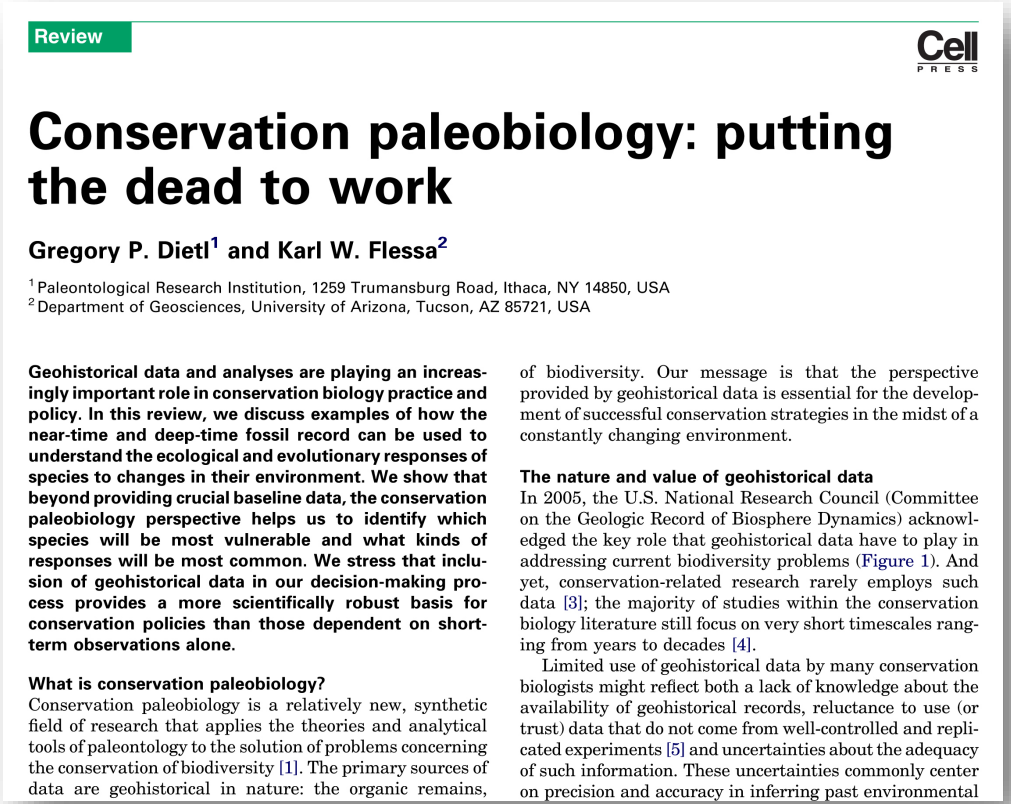
# Looking to the past with a view to the future

## Applying conservation palaeobiology in New Zealand

Dr Jamie R Wood




http://ltel.landcareresearch.co.nz/ Twitter: @LCR_LTEL



Review

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# Conservation paleobiology: putting the dead to work

Gregory P. Dietl[1] and Karl W. Flessa[2]

[1] Paleontological Research Institution, 1259 Trumansburg Road, Ithaca, NY 14850, USA
[2] Department of Geosciences, University of Arizona, Tucson, AZ 85721, USA

**Geohistorical data and analyses are playing an increasingly important role in conservation biology practice and policy. In this review, we discuss examples of how the near-time and deep-time fossil record can be used to understand the ecological and evolutionary responses of species to changes in their environment. We show that beyond providing crucial baseline data, the conservation paleobiology perspective helps us to identify which species will be most vulnerable and what kinds of responses will be most common. We stress that inclusion of geohistorical data in our decision-making process provides a more scientifically robust basis for conservation policies than those dependent on short-term observations alone.**

### What is conservation paleobiology?

Conservation paleobiology is a relatively new, synthetic field of research that applies the theories and analytical tools of paleontology to the solution of problems concerning the conservation of biodiversity [1]. The primary sources of data are geohistorical in nature: the organic remains, of biodiversity. Our message is that the perspective provided by geohistorical data is essential for the development of successful conservation strategies in the midst of a constantly changing environment.

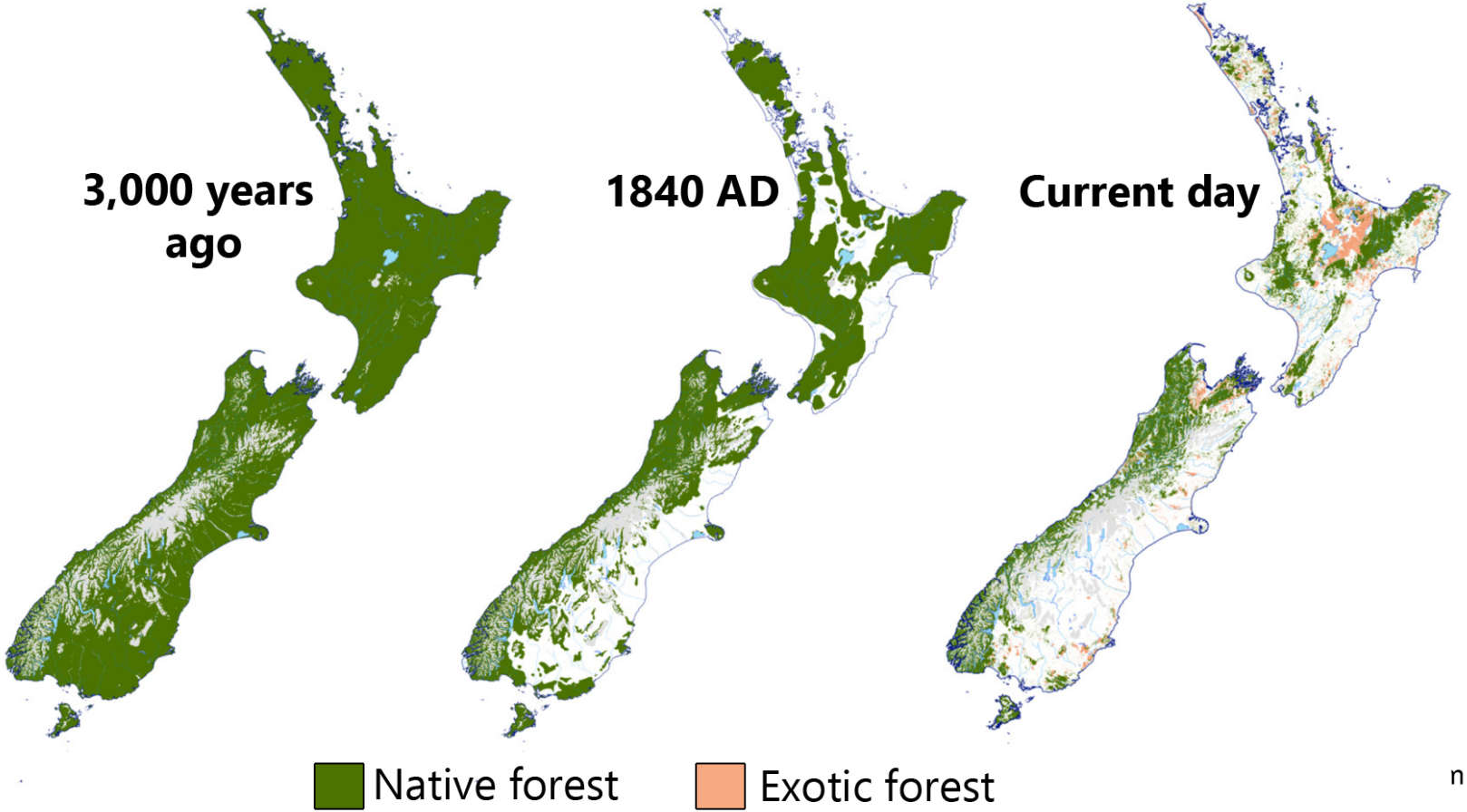
### The nature and value of geohistorical data

In 2005, the U.S. National Research Council (Committee on the Geologic Record of Biosphere Dynamics) acknowledged the key role that geohistorical data have to play in addressing current biodiversity problems (Figure 1). And yet, conservation-related research rarely employs such data [3]; the majority of studies within the conservation biology literature still focus on very short timescales ranging from years to decades [4].

Limited use of geohistorical data by many conservation biologists might reflect both a lack of knowledge about the availability of geohistorical records, reluctance to use (or trust) data that do not come from well-controlled and replicated experiments [5] and uncertainties about the adequacy of such information. These uncertainties commonly center on precision and accuracy in inferring past environmental

- Natural range of variability
- Geographic range shifts
- Adaptive phenotypic responses
- Extinction selectivity
- Ecological surrogacy
- Ecological interactions
- Baseline states
- Long-term demographic patterns
- Phylogeographic patterns
- Natural genetic diversity
- De-extinction candidates

Dietl & Flessa (2011) *Trends Ecol. Evol.* 26: 30-37.



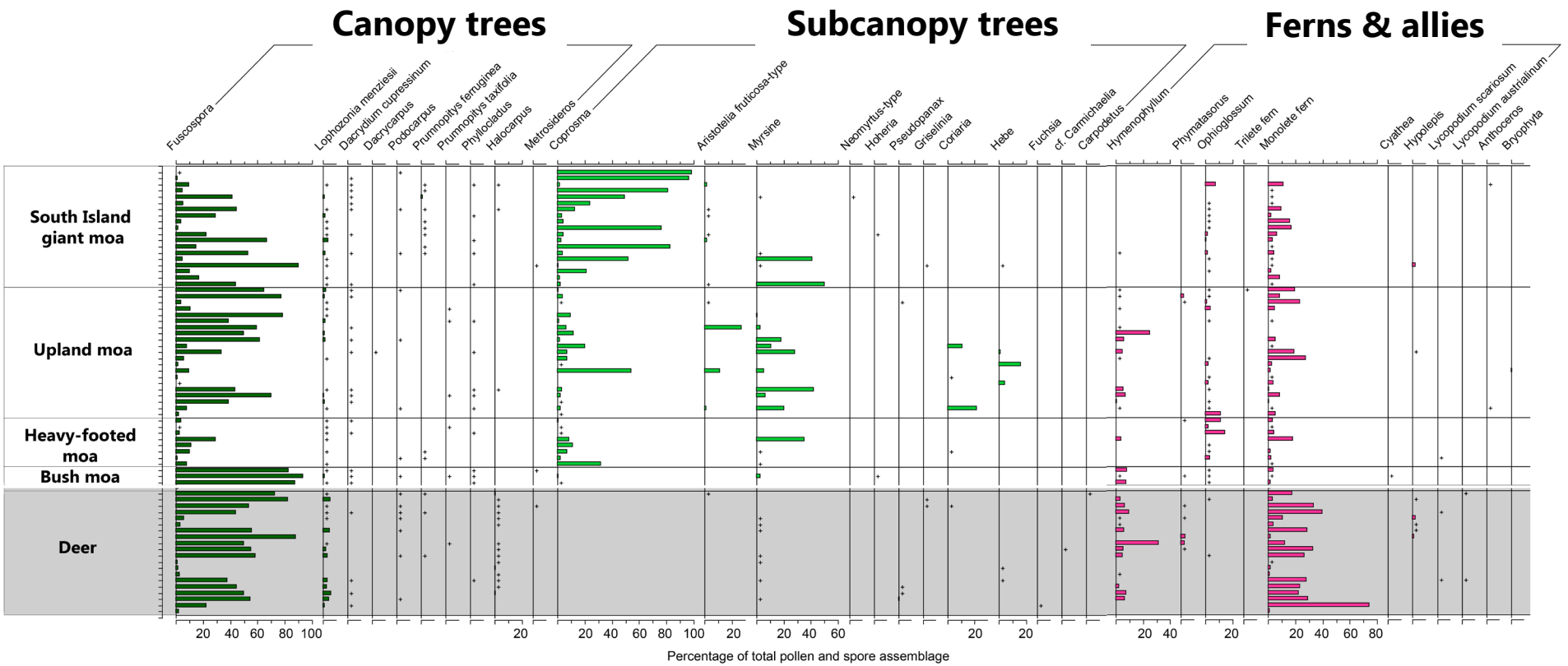

Adapted from Perry et al. (2014) *NZ J Ecol.* 38:157-176.

*Malcolm Rutherford*

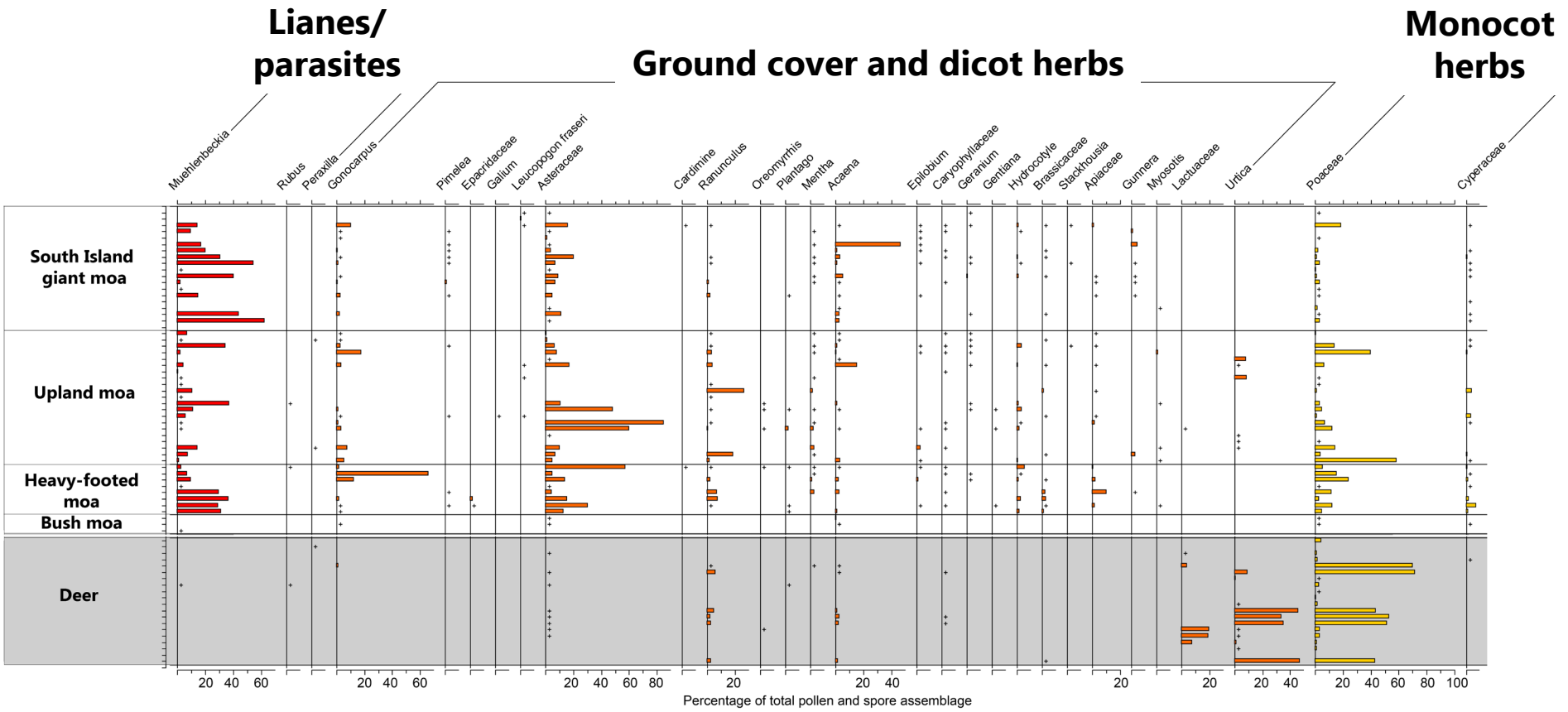
*Paul Martinson*
*Extinct Birds of New Zealand*

# 1. Establishing ecological surrogacy


Dart River
Valley

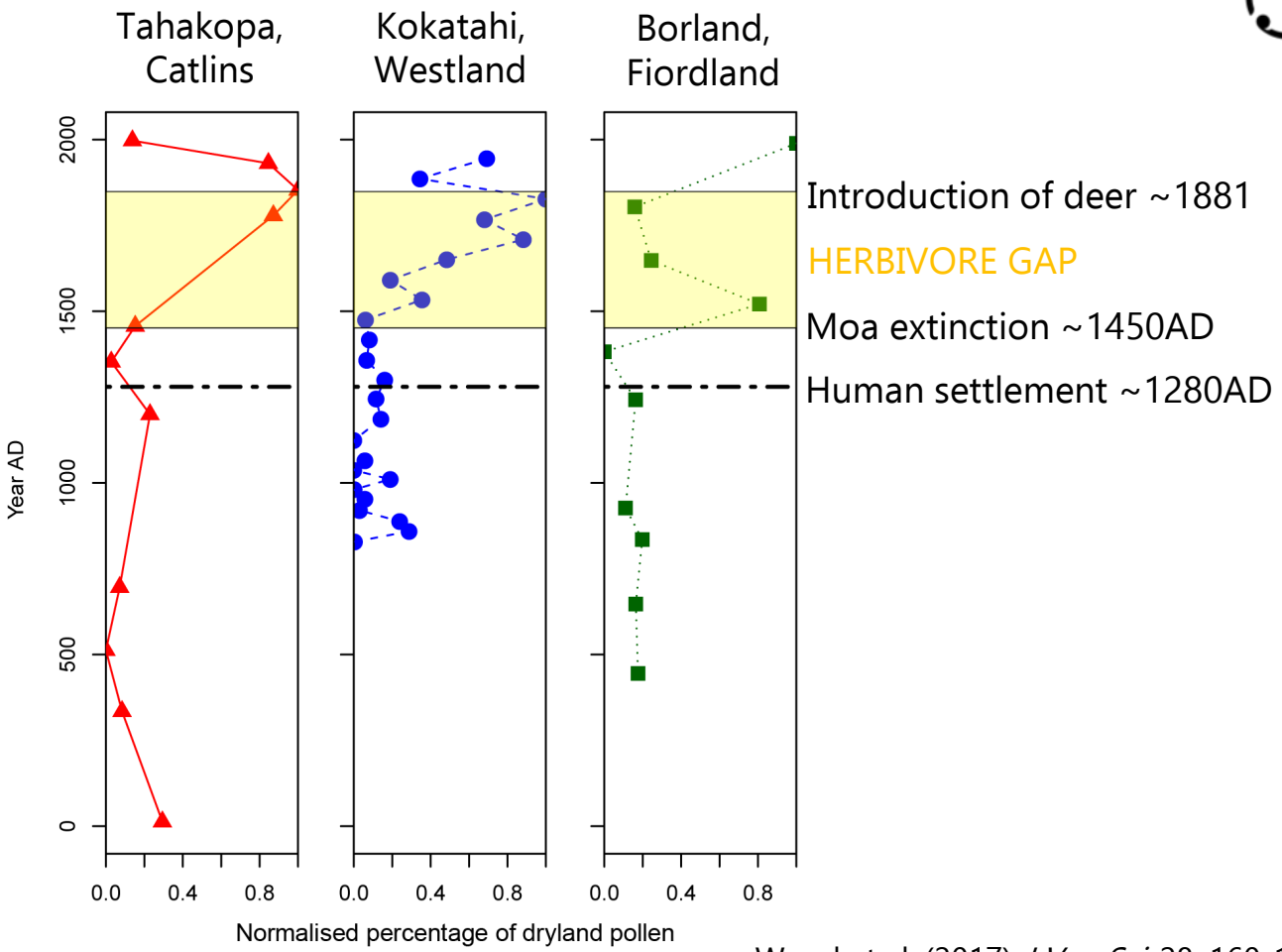



Wood et al. (2019) *PLoS ONE*. 14:e0214959.



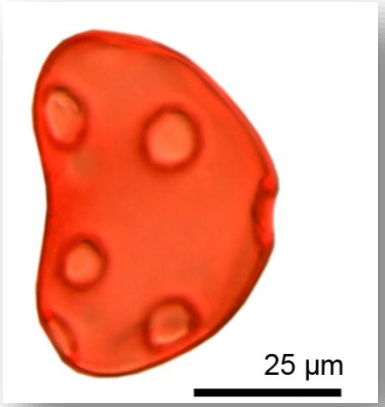

Wood et al. (2019) *PLoS ONE*. 14:e0214959.

*Coprosma*




Wood et al. (2017) *J Veg Sci*. 28: 160-171.


# 2. Detecting lost ecological interactions


25 µm


Dactylanthus Taylori H.F
3
2
1
5
6
7
8


Ngā Manu Nature Images


Ngā Manu Nature Images

Wood et al. (2012) *Cons Biol.* 26:1091-1099.

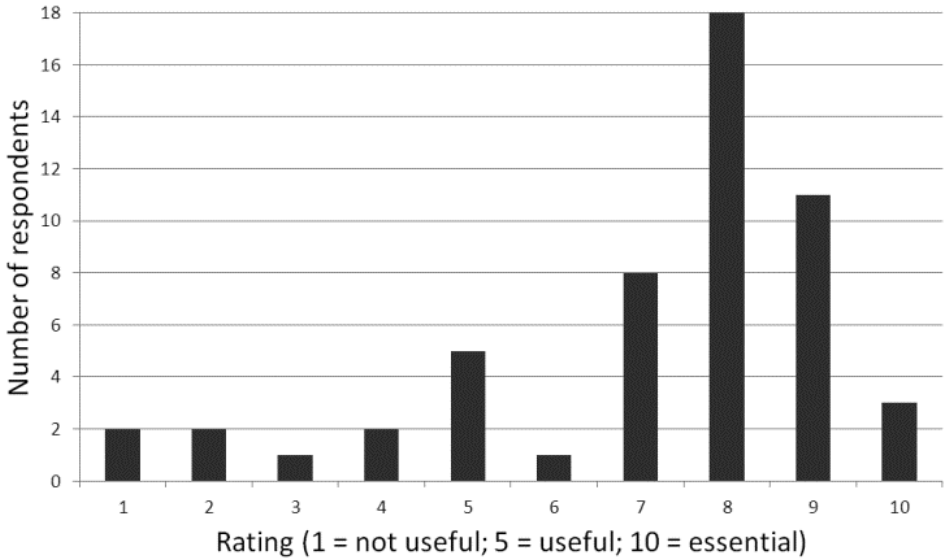
# 3. Establishing vegetation baselines

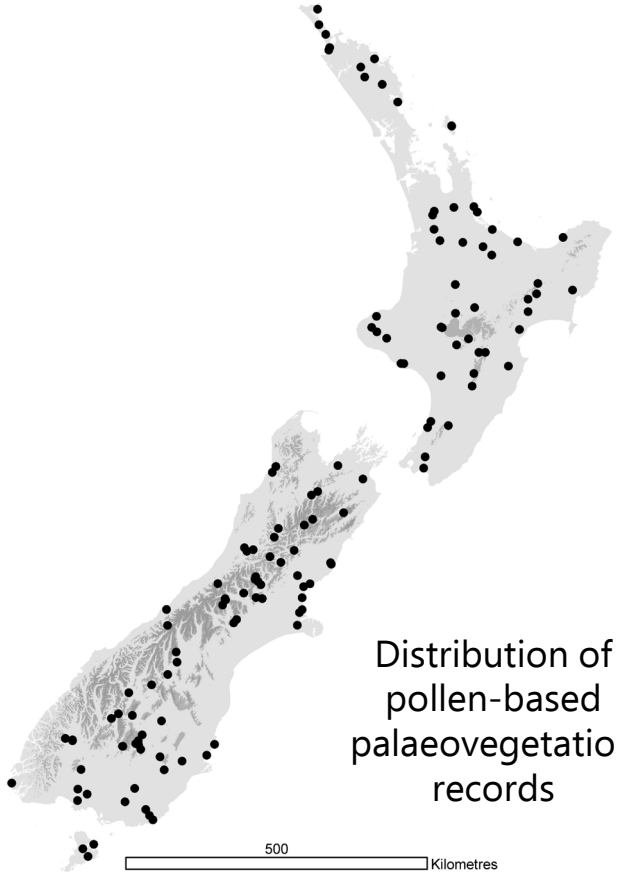

Tawhiti Rahi

Wilmshurst et al. (2014) *Cons Biol.* 28:202-212. Lyver et al. (2015) *Human Ecology* 43:681-695.

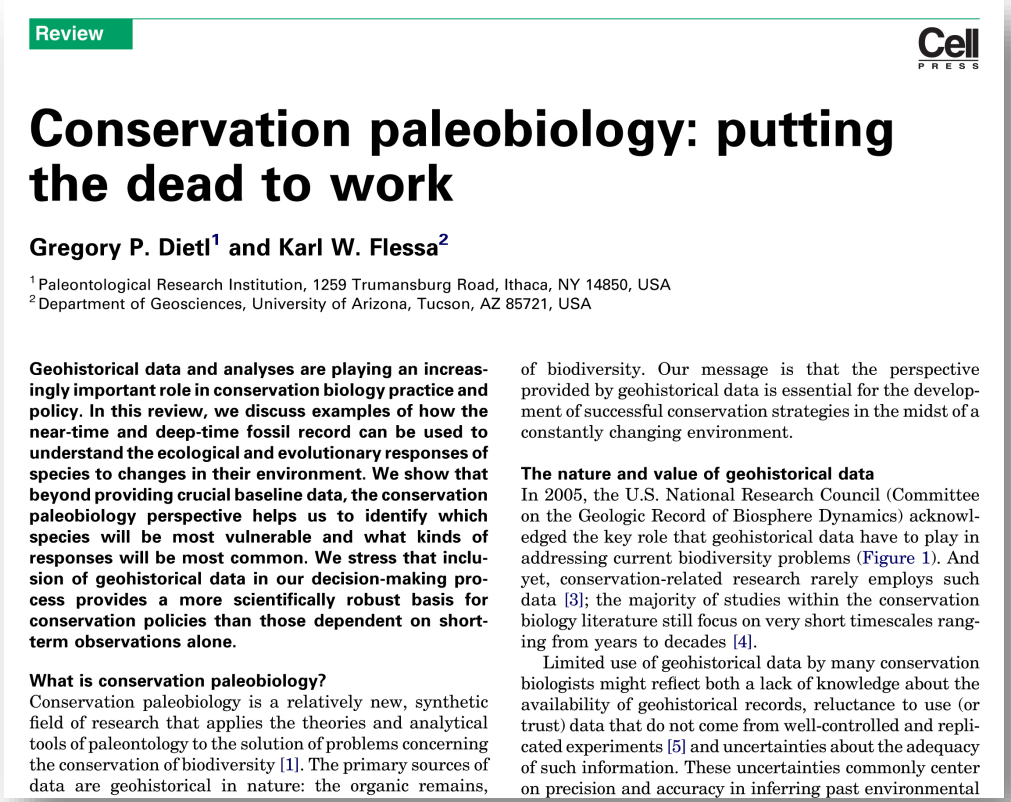
# QUAVONZ

## QUATERNARY VEGETATION OF NEW ZEALAND




Distribution of pollen-based palaeovegetation records



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**“A crucial challenge for the immediate future is making conservation paleobiology results policy-relevant**. As the approaches of conservation paleobiology move from their academic development to their application by agencies and non-governmental organizations, this new discipline will be putting the dead to work to benefit the future”