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KAMAHI DECLINE IN TONGARIRO NATIONAL PARK

A thesis presented

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Doctor of Philosophy

in Ecology

at Massey University

Kim Suzanne M°Breen

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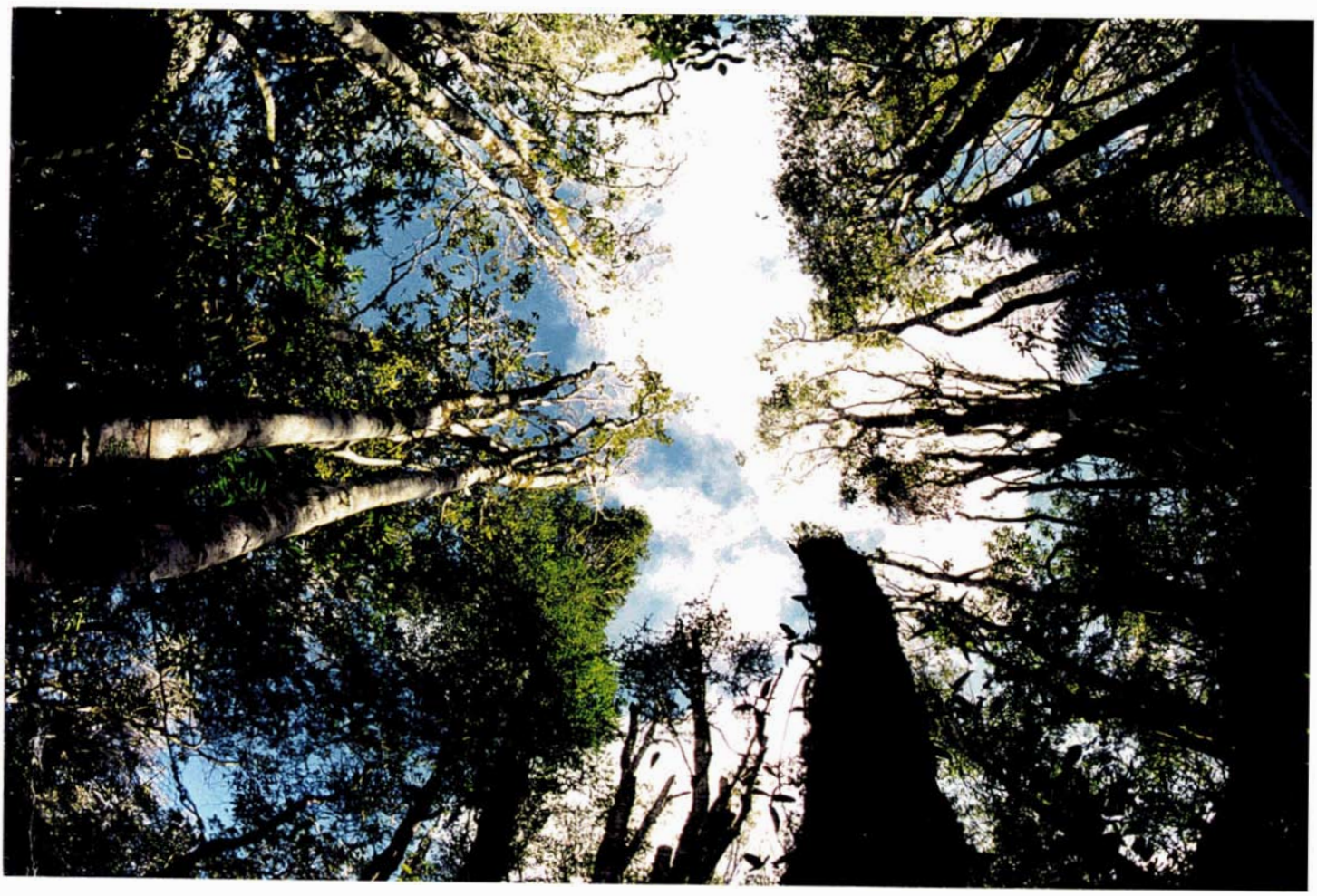
"And I forget just what it takes
and , yeah, I guess it makes me smile,
I found it hard,
it was hard to find,
oh well, whatever, nevermind."

Cobain, 1990.



"I greet him the days I meet him,
and bless when I understand."

Hopkins, 1875.

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Pretty much every morning I get dressed. I don't have many clothes to choose from, but I pick out what I feel like wearing and ask either Megan or my flatmates how I look. Scruffy, usually. Sweet as, I say - because I'm a student. A student. And with that in mind...

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ABSTRACT

Forest dieback is a complex area of study that has led to the development of a number of theories or models which purport to explain it. These models are examined using the example of kamahi dieback in Tongariro National Park. There has long been concern over the health of kamahi in the Park and it is thought kamahi could be in a state of decline. A survey on three transects in the area of the Park where dieback is most apparent compared kamahi health to possible predisposing, triggering and hastening factors (the decline-disease theory of forest dieback) to determine their role in any dieback. Possums, pinhole borer, and *Sporothrix* fungus were highlighted in literature as likely triggering factors in kamahi dieback; an experiment examined their role: possums were excluded from trees, pinhole borer attack simulated, and healthy trees infected with *Sporothrix*, while unhealthy trees were treated with fungicide. To assess the effect of canopy health and vertebrate browsers on regeneration (regeneration is important in both the cohort senescence theory and the model of stand succession), another experiment was conducted using open and exclosure plots under healthy and thinning canopies. A second survey assessed the overall health of kamahi in the area, and compared site and tree factors to levels of dieback.

The survey of an area with high apparent dieback found 14 % of kamahi stems were dead. There was some evidence that age predisposed stems to dieback, and *Sporothrix* was identified as accelerating stem death; no causal factor was determined. The experiment found no evidence that possums, pinhole borer, or *Sporothrix* were affecting the health of kamahi at this site. Sites under a thinning canopy in the regeneration study were much more variable in composition than sites under the healthy canopy; while sites in exclosure plots had higher densities of seedlings than sites that browsers had access to. Sites covered by the broad-scale survey contained very few unhealthy or dead kamahi trees, and none of the factors studied seemed to be impacting on the health of kamahi. There were more small (between 50 cm and 2 m) saplings present at sites with more dead kamahi trees.

It was concluded that kamahi in Tongariro National Park is generally in a healthy state, and not undergoing decline; although localised dieback may be very high. Possums, pinhole borer and *Sporothrix* are not having a large effect on kamahi health in this area. Vertebrate browsers may be maintaining regeneration at a level below natural. Comparison between the theories of dieback, succession and the kamahi data indicate that the successional model may best explain the pattern of kamahi dieback.

The models of dieback and succession can be inserted into an overriding model of dieback management, which will indicate the best path for investigating forest dieback.