# BEECH FOREST HEALTH — IMPLICATIONS FOR MANAGEMENT

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## ABSTRACT

Catastrophic tree mortality is a natural process in beech (*Nothofagus* spp.) forest ecology. Managers must accept that periodically large areas of forest will die, accompanied by outbreaks of insects and disease. In accepting the inevitability of these changes, managers also need to recognise an educational responsibility to forest users in offering an explanation of the processes occurring and their probable consequences.

It is well known that small disturbances in beech forest usually initiate change over much greater areas, especially in mature or overmature stands. Forest managers can take action to reduce the impact of new tracks, camp sites, and picnic areas and retain healthy forest cover. Pinhole borers (*Platypus* spp.) are the primary agents in extending damage, and action to reduce populations and prevent their build-up can be very effective. Cleared trees and logs should be cut into short lengths to dry and become unsuitable for attack. Residual trees should not be stressed by root or stem damage or have spoil heaped on their roots. Trees that subsequently do become attacked should be felled and also cut into short lengths before brood emerge, i.e., within 2 years of attack.

Care in planning tracks and camp sites and in the treatment of adjacent trees can go a long way towards preserving the essential character of the area. Conversely, the development of high populations of *Platypus* spp. can lead to prolonged and extensive stand decline.

**Keywords:** forest management; beech forest health; forest ecology; stand decline.

## MANAGEMENT IMPLICATIONS

Ill health in beech forests generally means dead trees. New Zealand *Nothofagus* species seem to have little capacity to linger in any intermediate condition between fully healthy and dead. Tree and stand decline is typically associated with catastrophic events such as snow break, earthquake disturbance, windthrow, and severe drought (Grant 1984; Wardle & Allen 1983; Hosking & Hutcheson 1986, 1988; Hosking & Kershaw 1985). Such events commonly lead to widespread tree death and stand collapse. All evidence suggests that such processes are a natural part of the ecology of beech forests. These disturbances are most often regional rather than national in extent and their magnitude is a function of intensity of the event and maturity of the stands affected. A drought which might cause extensive mortality in old stands might have little effect on young trees. This interaction between disturbance intensity and tree maturity leads to widely dispersed (in both time and space), but often extensive, forest collapse.

Insects and disease invariably accompany such forest disturbance, an association which has naturally led to speculation as to their role in cause and effect. Recent research has shown insects and diseases to be agents of change rather than its cause (Hosking & Hutcheson 1986). These opportunists aggressively exploit natural disturbances, often greatly extending the area of primary damage. This process of change in beech forests is best characterised by Manion's (1981) three-factor theory of stand decline — predisposing factors, inciting factors, and contributing factors. Predisposing factors, such as age or site, mean some stands are initially more at risk than others. Such stands are then placed under varying degrees of stress by periodic inciting factors such as drought or wind. The more trees are stressed, the more vulnerable they are to insect and fungal attack. Insects and disease are thus seen as contributing factors which can ultimately lead to the irreversible decline of the stand.

Recent examples of disturbance-induced changes in beech forests in New Zealand are the death of red beech (*Nothofagus fusca* (Hook.f.) Oerst.) in the Maruia Valley (Hosking & Kershaw 1985), the decline of hard beech (*Nothofagus truncata* (Col.) Ckn.) on the Mamaku Plateau (Hosking & Hutcheson 1986), and the decline of mountain beech (*Nothofagus solandri* var. *cliffortioides* (Hook.f.) Poole) in Tongariro National Park and in the Ruahine Range (Skipworth 1981; Grant 1984). The impact of wind damage, caused by the 1982 Easter storm, to silver beech (*Nothofagus menziesii* (Hook.f.) Oerst.) and red beech in the Kaimanawa Forest Park continues to be apparent in dead and declining trees 7 years after the event (Fig. 1) (Hosking unpubl. data). This lag phase removes peak insect and disease populations from the inciting event and often leads to further confusion as to their role in the changes taking place. It is worth remembering the old adage "Maggots are invariably associated with dead horses but it would be a mistake to assume blowflies are horse killers".

Although the natural process of stand replacement is going to occur in all our forests from time to time, there are two areas in which managers need to be actively involved — education and small-scale stand management. Beech forests form an important component of many of New Zealand's National and Forest parks and periodic senescence of old stands will inevitably result in large areas of dead trees. A sound, ecologically based explanation of what is often seen as a direct threat to the future existence of the forest is in the interests of managers and park users. It allays fear for the future of the forest, builds confidence in managers' understanding of the resource for which they are responsible, and promotes an understanding of beech forests as changing dynamic systems.

Managers need to communicate directly with park users through their interpretive programmes as well as through leaflets and publications in visitor centres. Ensuring staff at the interface with park users are well-informed on local forest changes gives immediate and positive response to the inevitable questions. The use of seminars and field visits by forest ecology specialists can be valuable tools in promoting staff interest and enthusiasm.

Managers can have a more direct influence in restricting artificial disturbance caused by such things as new tracks, hut sites, and picnic areas. Clearing of trees from such sites can act as a nucleus for surrounding forest decline, much as a small natural disturbance; it is therefore important to keep human impacts to a minimum.

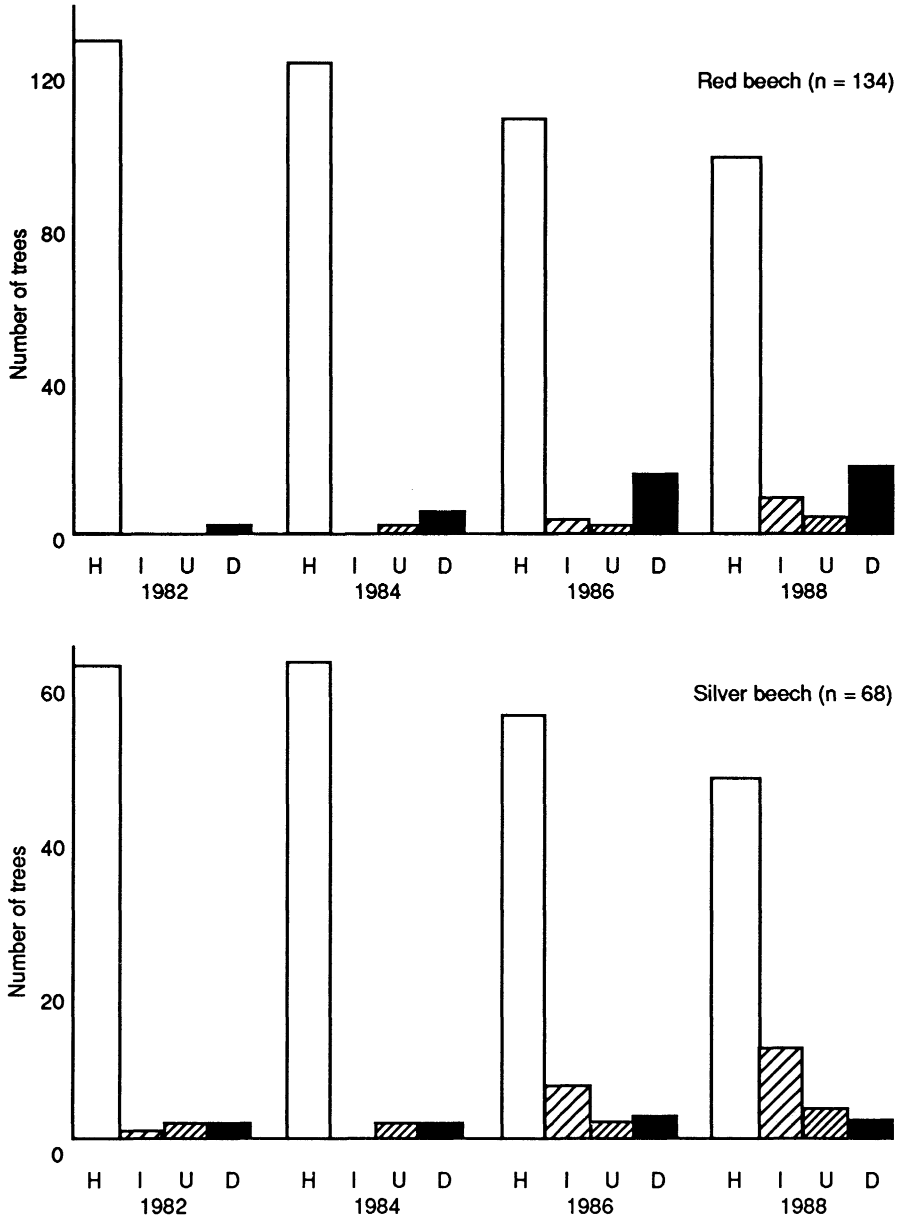


FIG. 1 — Numbers of red and silver beech trees in healthy (H), intermediate (I), unhealthy (U), and dead (D) categories from 1982 to 1988 in the Clements Road area of the Kaimanawa Forest Park.

Pinhole borers (*Platypus* spp.) breed in logs, stumps, and dead beech trees as well as many other tree species. At high population levels they successfully attack healthy trees, introducing a fungus which may kill the tree (Faulds 1977; Milligan 1974).

Where natural disturbances occur, pinhole borers are one of the main organisms responsible for greatly extending tree death from the site of the original damage (Wardle & Allen 1983). By simple attention to limiting breeding material, unnecessary damage can be reduced on high-value sites where forest clearing is unavoidable. Rapid drying of host material makes it unsuitable for pinhole borer breeding and so cutting logs into short lengths effectively controls the insects. If material from which pinhole borers are emerging is heaped near healthy trees, mass attack leading to tree death can occur. Populations build over time such that the effect of a large tree felled into healthy forest may not be evident for several years, until the emergence of brood from the primary infestation.

When operations involving felling trees are necessary in recreation areas where managers wish to preserve aesthetic values, the objective should be to minimise stress and damage to the surrounding stand. Bark damage, branch breakage, root damage, and heaping of spoil on roots may lead to further tree mortality. Population spill-over is typical of bark and ambrosia beetles in general and New Zealand *Platypus* spp. beetles in particular and can lead to protracted periods of tree mortality. Young stands are generally more resistant to damage than older stands (Hosking & Hutcheson 1988). Management activity which might be carried out with impunity in sapling and pole stands may lead to unacceptable mortality in mature or old forest.

It is part of good management to be aware of what is happening in the resource for which you are responsible. Ill health in beech forests should always be investigated, even if only to assure ourselves the processes under way are natural. Changing trade patterns, particularly with the *Nothofagus*-rich countries of South America, bring increased risks of the introduction of pests and diseases of beech forests. The consequences of a serious pest or disease of *Nothofagus* spp. becoming established in New Zealand could be truly devastating.

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