CONSERVATION
TE PAPA ATAWHAI

CONSERVATION ADVISORY SCIENCE NOTES

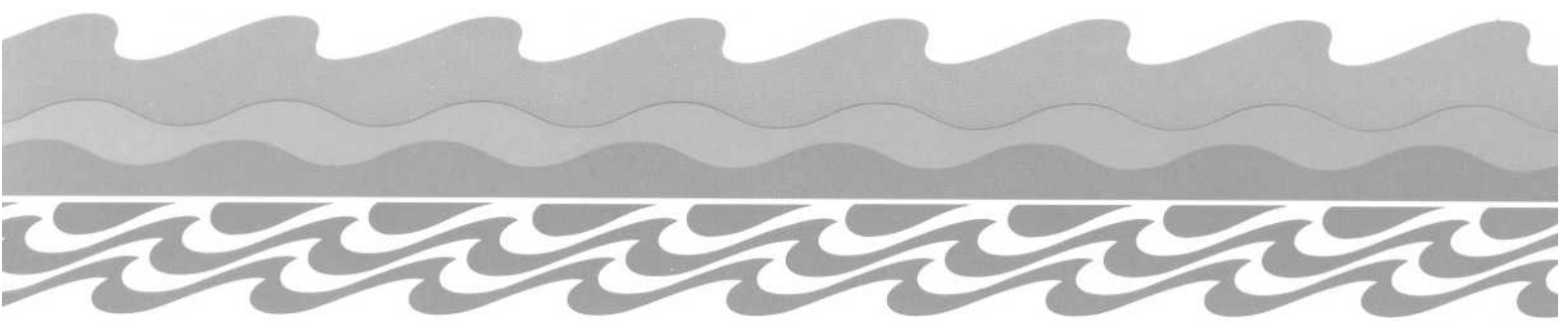
No. 51

FIRE FOR CONSERVATION MANAGEMENT OF PAKIHI

(Short Answers in Conservation Science)

This report is published by Head Office, Department of Conservation, and presents the results of scientific services or advice purchased from a consultant outside the Department or provided by Departmental scientific staff. All enquiries should be addressed to the CAS Coordinator, S&R Division.

Department of Conservation, P O Box 10-420, Wellington, New Zealand



ISSN 1171-9834

Reference to material in this report should be cited thus:

Miller, C., 1993.
Fire for conservation management of Pakihi.
Conservation Advisory Science Notes No. 51, Department of Conservation, Wellington. 5p.

Commissioned by: West Coast Conservancy.
Location: NZMS

FIRE FOR CONSERVATION MANAGEMENT OF PAKIHI.

Craig Miller
Conservancy Advisory Scientist
Private Bag 701
Hokitika

Summary

Whether or not fire is used as a "conservation" measure depends on the types of habitats conservation managers want to maintain. Although fire can be considered a natural process, its use as a management tool is directed by human values and interests. If it is to be used, conservation managers should decide which areas are to be "kept" as pakihi swamp, and which areas should be left to regenerate in a more "natural" way. There are very few situations in the management of New Zealand's ecosystems where fire is necessary or even desirable, so the greater part of any management strategy should involve fire containment.

Fire for conservation

The use of fire in conservation management is a controversial issue (Good, 1981; Wakimoto, 1990), although prescribed burning is used internationally, eg Australia (Good, 1981), United States (Biswell, 1989; Kilgore, 1976) and South Africa (Edwards, 1984). Carefully timed and controlled burns can reduce the fuel load, hence reducing the hazard risk of accidental fires, and to modify and "improve" vegetation composition (Biswell, 1989; Edwards, 1984; Wright and Bailey, 1982).

In many places there is evidence of natural fires occurring before human colonisation and some plants actually require seasonal fires as part of their regenerative life cycle. In Australia deliberate fires are advocated and used to retain those fire-requiring species, to preserve the communities typical of pre-European and maybe pre-Aboriginal, time (Stocker, 1966; Good, 1981; Preece, 1990).

The situation in New Zealand is different. McGlone (1989) says that pre-human fires were probably rare in New Zealand, and to date there have been no species confirmed as being dependant on or specifically adapted to fire. However, many of the contemporary New Zealand landscapes have been shaped by fire, including prized pasture, and at the other end of the scale, pakihi swamp.

Pakihi

Pakihi is a Maori word denoting a clearing free from forest. It is now used to define areas of flat or gently sloping wetland on the South Island's west coast which support a low, stunted vegetation community on wet infertile soils (Mew and Johnston, 1988).

Some areas of pakihi swamp are thought to have occurred naturally, and have been in existence long enough for at least one plant species, *Bulbinella modesta,* to become endemic (Burke, 1981). Others have been induced by humans through deliberate burning and forest clearance. The pre-Pakeha Maori probably contributed to the formation of some open pakihi landscapes by burning forest to allow for settlement and small-scale agriculture. Further large areas of semi-pakihi forest have been converted to open pakihi swamp as a result of burning following the logging of podocarp/beech *Nothofagus* sp. forests and clearance for farmland in more recent times (Williams *et al.,* 1987, 1990).

Conservation value

Pakihi vegetation typically comprises sedges *Baumea* sp., ferns (chiefly *Gleichenia dicarpa),* rushes e.g. *Juncus* sp., moss e.g. *Sphagnum* sp. and varying amounts of manuka *Leptospermum scoparium* (Washbourn, 1972; Jackson, 1987), although the flora and species composition varies due to soil drainage, fire frequency, and soil nutrient status (Williams *et al.,* 1990). Several lowland (within 10 km of the sea) open pakihi have rare species of fern and orchid, whereas the more structurally complex areas, characterised by manuka, support large populations of the South Island fernbird *Bowdleria punctata* (Best, 1979; Williams *et al.,* 1987, 1990). Many other bird species, such as Australasian bittern *Botaurus poiciloptilus,* pukeko *Porphyrio p. melanotus,* black shag *Phalacrocorax carbo,* crakes *Porzana* sp., tui *Prosthemadera novaeseelandiae* and bellbird *Anthornis melanura* either reside in these areas or use them as a food source.

There appears to have been very little scientific reporting of the invertebrate or aquatic fauna of pakihi. I suggest that this is an area that needs investigating into. Several species of native fish may possibly be found in the wetter parts of pakihi swamps if those swamps are connected to a river system; the species may include the Brown mudfish *Neochanna apoda,* shortfinned eels *Anguilla australis* and giant kokopu *Galaxias argenteus* (McDowall, 1990).

The main economical value of unmodified pakihi is *Sphagnum* harvesting.

Because of the dynamic nature of pakihi vegetation, it is thought that most areas, except perhaps the most impoverished, would eventually revert back to forests of podocarps and beech in the absence of fire (Williams *et al.,* 1987, 1990). This is natural succession and in some areas should probably be allowed to happen for its own intrinsic conservation and scientific values. However there will be other cases where the existing ecological values are considered to have priority and should possibly be maintained.

Ecological effects of fire

As I have mentioned above, no New Zealand species is specifically adapted to fire, which would suggest that fire is not an integral part in the functioning of the greater New Zealand ecosystem. Nevertheless it could be used to maintain certain early stages in the ecological succession of pakihi. The state which vegetation regrowth would reach depends on the frequency of fire. Given that the fire is extensive enough to burn off the shrubs and trees, the period after the fire would see a growth of herbs, grasses and small shrubs. Deer hunters will often set pakihi alight for this early regrowth so as to entice deer to the fresh grass (F. Overmars and J. Lyall, pers. comm.). It is also likely that exotic weeds such as gorse will establish.

Severson and Rinne (1990) suggest that most animals will escape from a fire and that deaths are rare. They also indicate that there will be rapid reinvasion or an increase in the reproductive rate of animal species. However they are talking about mammals and birds. The extent to which this holds true for New Zealand species, including the herpetofauna and invertebrates, is uncertain.

Ecological systems will recover after a fire (or any other perturbation), however the initial states may or may not be considered desirable.

Implications for a fire strategy

Under the Conservation Act 1987, the Department of Conservation is required to maintain representative ecosystems. Obviously pakihi falls under this category. Whether or not fire is used as a management tool to maintain pakihi swamp will continue to be a contentious issue, and will depend on the values ascribed to those areas.

A management plan should be drawn up for pakihi swamp, potentially incorporating the use of fire. I would suggest that there be a range or spectrum of areas, from those where fire is used to maintain certain values to those which are being allowed to revert to native bush.

There are several areas of research that would need to be carried out:

1) Is fire necessary to maintain the conservation values.

2) When should prescribed burning be carried out so as to cause the least detrimental impacts on the plants and animals.

3) How often should burning occur to maintain conservation values.

4) Assess population density, species survivorship, reproductive success and species diversity on burnt and unburnt areas. This should include aquatic species.

The objectives of any prescribed burning will need to be clearly stated, and provision should be made for monitoring to see whether or not the objectives were met. Monitoring should be started before the burning is carried out, and continued for several years after.

Conclusion

The use of fire to maintain pakihi swamps is going to be a value judgement on the part of conservation managers. There are no ecological imperatives and few historical guidelines, such as can be found in overseas situations. There are very few situations in the conservation management of New Zealand's ecosystems where fire is necessary or even desirable, so the greater part of any fire management strategy should look at containment rather than use. It comes down to a philosophical point of view as to whether we try to maintain an ecosystem in a static state (in which we will eventually fail), or to allow natural processes to occur with occasional management initiatives to control undesirable elements.

References

Best, H. A. (1979). Observations on habitat selection by South Island fernbirds *(Bowdleria punctata). Notornis* 26: 279-287.

Biswell, H.H. (1989). *Prescribed burning in California Wildlands Vegetation Management.* University of California Press, California. 255pp.

Burke, W.D. (1981). A botanical survey of the pakihi and scrub vegetation of the Golden Bay region, Nelson. Unpubl. report, Dept. Lands and Survey.

Edwards, P.J. (1984). The use of fire as a management tool. pp 349-362 In *Ecological effects of fire in South African Ecosystems Ecol. Studies* No 48. Booysen, P. de V. and Tainton, N.M. (Eds.). Springer-Verlag, Berlin.

Good, R.B. (1981). The role of fire in conservation reserves. pp 529-549 In *Fire and the Australian biota.* Gill, A.M., Groves, R.H. and Noble I.R. (Eds.). Australian Academy of Sciences, Canberra.

Jackson, R.J. (1987). Hydrology of an acid wetland before and after draining for afforestation, western New Zealand. pp 465-574 In *Forest hydrology and watershed management (Proc. Vancouver Symposium, August, 1987). I.H.A. S. publ.* No. 167.

Kilgore, B.M. (1976). Fire management in the national parks: an overview. *Proc. Tall Timbers Fire Ecol. Conf.* 14: 45-57.

McDowall, R.M. (1990). New Zealand freshwater fishes. A natural history and guide. Heinemann Reed, Auckland, MAF Publishing Group, Wellington. 553p.

McGlone, M.S. (1989). The Polynesian settlement of New Zealand in relation to environmental and biotic changes. N.Z.J. Ecol. 12(suppl.): 115-129.

Mew, G. and Johnston, M. (1988). The use of the word "pakihi" on the South Island west coast in the nineteenth century. *New Zealand Geographer* April 1988: 22-24.

Preece, N. (1990). Application of fire ecology to fire management: a managers perspective. *Proc. Ecol. Soc. Aust.* 16: 221-233.

Severson, K.E. and Rinne, J.N. (1990). Increasing habitat diversity in Southwestern forests and woodlands via prescribed fire. pp 94-104 In *Effects of fire management of Southwestern natural resources. Proceedings of the Symposium.* Krammes, J.S. (Coord.). USDA Forest Service. Tucson, Arizona.

Stocker, G.C. (1966). Effects of fires on the vegetation in the Northern Territory. *Aust. For.* 30:23-30.

Wakimoto, R.H. (1990). The Yellowstone fires of 1988, natural process and national policy. *Northwest Science* 64: 239-242.

Washbourn, R. W. (1972). The rehabilitation of induced pakihi sites in Westland. *N. Z. J. For.* 17:232-248.

Williams, P.A., Courtney, S., Glenny, D. and Hall, G. (1987). The diversity and conservation status of pakihi and associated vegetation in North Westland. Unpubl. report. Botany Division, DSIR.

Williams, P.A., Courtney, S., Glenny, D. Hall, G. and Mew, G. (1990). Pakihi and surrounding vegetation in North Westland, South Island *J Roy Soc N Z* 20(2): 179-203.

Wright, H.A. and Bailey, A.W. (1982). *Fire ecology. United States and Southern Canada.* John Wiley, New York.