Are our indigenous forests trying to tell us something?

The health of plantation and indigenous forests has largely been viewed as two separate issues by both managers and researchers. Plantations, representing investment and income, have received considerable attention while indigenous forests have been largely ignored, the exception being the impact of introduced animals. While at an individual problem level, plantations and indigenous forests appear to have little in common, at an ecosystem level, understanding present health issues in indigenous forests may provide valuable insights into plantation forest health and deliver major dividends in the future.

The reality of global environmental changes, including CO_2 elevation, global warming and ozone depletion, are brought to our attention through an endless succession of conferences, meetings and international initiatives. However, any relevance of present and predicted changes to the condition of our immediate environment escapes most of us, and other than a bit of slip, slop, slap, is relegated for the consideration of some future generation.

Let us assume these changes are already influencing our forests and ask the questions: where should we look and what should we look for as evidence of such influence? We can assume earliest effects will be subtle, so it does not make sense to look closely at a robust exotic species tolerant of a wide range of sites and climates. Early signs of poor performance will most likely appear on the most marginal sites where it will be easy to assume we pushed radiata pine tolerance too far, and write it off as human error. The recent origins of the species in New Zealand, and the human factor in its siting and management, preclude any realistic baseline against which to measure subtle changes in health and performance. Our native forests by contrast have been here for millions of years, and although in many areas much modified by human intervention, the complexes of species and their associated fauna have largely sorted out where they belong, based on the pushing and shoving which is an inherent part of the dynamics of these natural communities. It follows therefore that environmental changes, which may be long on a human time scale but short on an evolutionary one, may generate unusually high levels of change in our indigenous forests. Environmental changes which make life less than enjoyable for a particular species generate stress, the symptoms of which are ill health. It seems obvious that the first signs of environmental change will be seen not in our plantation forests but in our finely-tuned, diverse indigenous ecosystems.

There are already signs that all is not well in our indigenous forests. Putting aside problems such as possum devastation where the cause of ill health is in most cases clear, there are increasing reports of unexplained decline in a range of species commonly seen as robust and resiliant even to human interference. The decline of cabbage trees since the early 1980s, the unexplained dieback of kanuka which has become particularly noticeable since the early 1990s, recent reports of rewarewa decline, black maire dieback in the Aorangi range and mangeo decline in both young and old trees. In addition, a surge in reports of insect activity such as a native diaspid scale on northern and southern rata, *Proteodes* defoliation of mountain beech in the Lewis Pass. Individually plausable explanations can be advanced for some of these events which must certainly have happened in the past. However, cumulatively there might be an important message; there is most certainly a strong signal.

So why is the signal not being heeded? Our lack of knowledge of indigenous ecosystems makes it easy to invoke ignorance as a barrier to explanation and to put the problem to one side. Perhaps more importantly, where we have attempted to tackle a problem, we have tended to focus on the symptoms rather than the causes. Just like in human society dysfunctional systems generate plenty of symptoms, and while in many cases they can be treated, getting at the cause at worst generates understanding and at best may generate a solution. The late Bob Milligan, an original thinker and outstanding entomologist, liked to draw callow young entomologists' attention to the fact that blowflies were invariably associated with dead horses but that it would be a grave mistake to assume they were a primary cause of equine decline.

Our focus on the symptoms has drawn our attention away from the bigger picture, partly because the symptoms are so obviously associated with ill health, like the blowflies on the carcass, and partly because the big picture is just too hard. However, it is only with the wider view that the common threads can be established and any underlying cause identified. Robert Persig's book 'Zen and the Art of Motorcycle Maintenance' has some interesting lessons for those that would take the reductionist trail: you can waste a lot of time fiddling with the spark plug if the problem is in the fuel system. Start with a holistic view, systematically and on good evidence narrow the focus by eliminating those parts which are demonstrably irrelevant to the problem.

There is an urgent need to understand forest health changes which are occurring in our indigenous forest but it will require a big picture approach and much greater

resources to make real progress. If the changes we are seeing reflect global environmental change then they must surely send early warning signals to the plantation forestry sector. Similar changes in health and vigour can be expected to affect our exotic forest species. It may just take longer to become apparent.

Back in 1989 Geoff Sweet asked the challenging question: "Are our plantation forests less healthy than they were 20 years ago?" It was a big picture question, and we have yet to rise to the challenge.

Gordon Hosking

Juvenile wood, compression wood and the customer

I have been concerned for many years that combination of fast growth rate and short rotation age for radiata pine would have a detrimental effect on the overall quality of wood delivered to customers. Projects related to the promotion of New Zealand pine have over the past few years brought me into contact with individuals and groups of end users. Discussions with these people on the problems associated with wood quality in New Zealand pine have confirmed my concerns.

Most of the problems arise from an increasing proportion of juvenile wood in the harvest. Juvenile wood can be classed as all wood with immature tracheids in terms of cell wall thickness and cell length. For practical purposes in the solid wood product business, juvenile wood is all wood up to 13 years of age. This would include a column up the centre of the tree, up to and including the 12th latewood band.

The higher proportion of juvenile wood comes from a number of factors. One factor is fast growth arising both from genetic "improvement" and from much higher fertility sites than have hitherto been the norm. Utilisation practices also contribute as pruned and other butt logs are separated out for particular uses, leaving in many cases only the physiologically younger sawlogs available for domestic solid-wood processing and added-value export markets. Younger clearfell ages also have an effect on the proportion of juvenile wood.

The problems with juvenile wood are now being exacerbated by an increasing incidence of compression wood. Among a number of undesirable attributes, compression wood has very high longitudinal shrinkage properties. Compression wood is normally only found in leaning trees and in young trees subject to regular and severe wind "thrashing". On fertile sites though, many young, perfectly straight trees will have compression wood completely around the stem. The causes of this have not been thoroughly researched. One could probably attribute the compression wood formation in these cases to an inability of the thin walls and high microfibril angle of juvenile wood cells to support the heavy weight of the stem and crown of a very fast-growing tree. The microscopic structure of compression wood differs from normal juvenile wood. It is the basic cause of excessive longitudinal shrinkage and other distortions during processing, and produces very low strength.

The effects of juvenile and compression wood can be seen in both primary processing and end uses. Without any doubt, it is hampering the acceptance of radiata pine in export markets and is reducing its hard-won acceptance in domestic markets. Sawmillers complain, and justifiably I believe, about an inability to source a continuing supply of stable, mature wood suitable for framing production, particularly as there is a need to supply kiln-dried and often stress-graded framing timber. The percentage of degrade after high-quality kiln drying, particularly for appearance grades containing juvenile wood, seems to be more than double that of 10-15 years ago. Builders complain that they are increasingly unable to source an adequate volume of stable wood from sawmillers, and there is in-service distortion of components. Offshore, there are reports in the Japanese housing industry of the incidence of surface checking, grain lifting and variable moisture content in furniture and joinery components. There are also reports of severe distortion of internal lining attachment studs fixed to aluminium house frames.

Past experience as part of the industry's technology transfer "system", combined with semi-retirement, has led me to a role as a "non-aligned sounding board" for end users, architects and specifiers, both in New Zealand and overseas. I must say that I have been surprised at the depth of feeling about what is in effect a reduction in the quality of much of the radiata pine on the open market. It must also be said though, that the product quality from the relatively few large processors is generally very high. There are, however, many smaller processors whose only available raw material supply seems to be getting younger and it is consequently very difficult for those processors to compete in the quality stakes.

Suggestions

One can assume that the problem will be with us for a long time and will in fact increase as more and more raw material comes from small and farm woodlots whose owners want cash flow as soon as possible. The following suggestions are in the hope that both the decline in acceptability of radiata pine from an end-user point of view, and a likely reduction in financial optimisation from a grower point of view can be halted.

- Marketing mature wood and juvenile wood separately with a premium for mature wood. Technically this is very valid as juvenile wood really is a different "animal". It is more difficult to dry satisfactorily than mature wood, and it has many different properties.
- Funding an intensive and limited-time collaborative project with FRI to develop kiln-drying schedules for juvenile wood. The best end-result schedules may take considerably longer than current more or less mixed-quality radiata pine schedules but may well be cost effective.
- Funding a project to fully investigate the juvenile wood/compression wood association. There may be a "trigger point" beyond which unacceptable wood is produced. For example, this may be equivalent to a GF rating above 16 or 18 on a fertile site.
- Determining whether or not the current range of genetic "improvement" programmes actually increases the proportion of juvenile wood in mature trees. At the very least it is logical to request a very much higher emphasis on density as a most desirable attribute in all programmes.
- Exploring the potential for breeding from individual trees that may exhibit early maturity characteristics.
- Changing stand valuation criteria to