

visited by international tourists carrying tents and other camping equipment. MAF surveillance is focussed around ports of first entry (i.e. air and sea ports) and small-planted forests. The forest industry operates surveillance in planted forests. In addition, a specific trapping programme for gypsy moth is ongoing at ports and risk sites.

Although there are clear synergies between these programmes, a review of all biosecurity surveillance programmes is currently underway. All agencies with an interest in protecting New Zealand forests from invasive pests should ensure that the money being spent is achieving the highest level of protection possible.

Responses to new forest pests are the responsibility of MAF in accordance with its incursion policy. This was developed in consultation with the other biosecurity departments. MAF recognises that in order to develop effective and efficient programmes for eradication, surveillance and control, it is necessary to have a strong and constructive relationship with industry. There may be an opportunity in the future to run forest pest incursion simulation exercises (like the ones that have been run for pests of horticulture and agriculture in the past) to encourage preparedness and reveal areas of weakness in the current system.

### So, do we have a Strategy?

A biosecurity strategy is being developed to comprehensively review New Zealand's biosecurity. There has been wide ranging public consultation and the use of sector-based focus groups to flush out key issues. These have been consolidated and commented on by the public and interest groups. Expert issues groups have grappled with specific matters such as decision making processes, governance and funding.

A draft strategy is currently being prepared for public comment. The strategy has the potential to improve the direction, organisation and coordination of New Zealand's forest biosecurity.

Coordination between MAF and the forestry industry can certainly be improved and this improvement should be an ongoing process. The biosecurity strategy should be a good opportunity for us all to take stock and check that we're all heading in the same direction, and that the goals of MAF and the Government are the same as (or substantially similar to) those of foresters.

A strategy may set the blueprint for enhancing biosecurity but it is only a start. Broad-based support and commitment will be required to transform the strategy into tangible improvements in the protection of our forests and other important sectors and assets.

## Pest or pathway? The focus of risk reduction strategies

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### Square pegs in round holes

Despite the obvious differences between trees and carrots, there has been a worldwide tendency to try and fit them into the same biosecurity box. Historically, biosecurity risk reduction strategies have been driven from the horticultural, agricultural, and animal health sectors, where the crop and animal pest associations are usually well known. As a result biosecurity has focused on individual pests and diseases, most often by treating and controlling the movement of host material. For example, if you are trying to exclude bee diseases you focus on bees and honey, armed with a short list of specific exotic organisms. Likewise to exclude fruitfly you treat, inspect, or exclude their fruit hosts. This over-riding strategy has led to the concept of pest lists, where individual named pests are categorised according

to risk, for quarantine purposes.

The pest list approach works reasonably well for crops, animals, and produce, where pest and disease associations are well known. Unfortunately many forest trees do not meet this requirement, and what is worse, many of their pests and diseases travel as unaccompanied baggage completely separate from their host. Rarely has a pest or disease of a forest tree become established in New Zealand through the importation of seedlings, cuttings, or other live plant material, almost certainly because such material is either prohibited or strictly controlled. And yet, in an average year between five and six new forest insects and diseases are found in this country.

Few of the important exotic pests and diseases of forest trees, which have become established in New Zealand, would have appeared on anyone's list of most likely arrivals. A list of lymantriid moths posing risks to New Zealand forests would not have included white-spotted tussock moth or painted apple moth, in its top five. *Dothistroma pini* would never have ranked high as a risk worth focusing on for radiata pine. Even past interception data is a poor predictor of establishments at a species level. Why have we got *Arhopalus tristis* (burnt pine longhorn) and not the much more frequently intercepted *Arhopalus rusticus*, why *Sirex noctilio* (sirex) rather than *Sirex juvencus* or *Urococcus gigas*, why did white-spotted tussock moth establish in Auckland and not the more frequently intercepted gypsy moth?

It may be difficult to pick the individual species that



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establish, but the pathways down which these pests and diseases travel are much more easily identified. Lymantriid moths arrive on used cars, sea containers, and machinery; wood-boring cerambycids and siricids arrive in packaging and dunnage. The strategy seems obvious, stop trying to pick winners and focus on closing pathways.

### A hitch hiker's guide

Until recently forestry had the luxury of running its own strategy in the biosecurity risk reduction stakes, first under the New Zealand Forest Service and later under the Ministry of Forestry. Research, quarantine, and surveillance, were uniquely focused on forests and forest produce, and an independent Forest Biosecurity Advisory Committee worked closely with Government to ensure sector input. The incorporation of forest biosecurity into the Ministry of Agriculture and Forestry has brought two rather different philosophies into sharper focus.

Historically forestry has eschewed the pest list approach for the reasons discussed above, and because forest and timber produce, such as sawn timber, wood panels, finished timber products etc., have a low incidence of pest and disease contamination. Fifty years of quarantine interception data shows risks to forestry arrive on such diverse commodities as pallets and sea containers, dunnage and used vehicles, personal effects and used machinery. Infested wood is typically low-grade packaging, dunnage and pallets, all secondary to the products they protect and of little or no value. Vehicles and machinery are almost always second hand, often carrying the contaminants of daily use.

The existence of risk pathways is not news to forestry protection folk, who have pursued pathway-focused strategies for the past 40 years. These strategies accepted that the risks were incompletely known at a species level, and instead sought to treat and limit the pathways along which risk organisms travelled. Wood packaging in all its forms was targeted, machinery was subjected to cleaning and inspection, tree seed was strictly controlled and treated, and vehicles were subjected to inspection. This pathway strategy extended to risk analysis, with evaluations being undertaken of the exterior contamination of sea containers, the risks from the contents of both sea and air containers, and the risks posed by travellers carrying recreational equipment. A focus on pathways, rather than lists of known insects, addresses both the known and the unknown risks, and not only benefits forests, but also reduces risks to other sectors.

### Pest lists versus priority pathways

The two strategies ask fundamentally different questions in allocating resources to risk reduction. Pest lists ask what are the most serious pests we can expect, and what would be their likely impact on New Zealand? A pathway strategy on the other hand asks what are the most likely pathways for pest and disease entry into New Zealand, and how can we treat these pathways to minimise risk? The key to more effective biosecurity is the pragmatic application of both strategies across the wider biosecurity continuum, avoiding any ideologically driven commitment to one or the other. Forestry will



*Fig. 1. Preparing a vehicle for a heat disinfection "proof of concept" trial, in a timber drying kiln.*

always have a need to address the risks from certain particularly threatening organisms, such as pine wilt nematode, pine pitch canker, and western gall rust, but its primary strategy should remain pathway focused. In contrast to the forestry strategy, crop and animal biosecurity is likely to remain focused on individual pests and pest lists. However, by supporting pathway initiatives, such as those aimed at sea containers, non-forestry sectors will inevitably benefit.

### Where to from here?

The national Biosecurity Strategy, currently under development, has the potential to make the single largest contribution to New Zealand's future biosecurity. Its success will depend on the collaboration of sectors and agencies in an integrated approach to the allocation of resources across the biosecurity continuum. The forestry sector will need to engage in this process, and provide strong advocacy for the pathway approach if it is to be retained within an over-arching strategy. Such advocacy will need to be supported by robust risk assessment provided by researchers knowledgeable in forest pest and disease impacts world wide, and their likely consequences for New Zealand's exotic and indigenous forests.

The forestry sector must not only identify risks, but must support innovative solutions. For example, used vehicles are the most likely pathway for Asian gypsy moth entering New Zealand. Treatment involves a visual inspection that is known to have failed, with hatching eggs found beyond the border. Heat treatment has been shown to be fully effective against a wide range of insects, including gypsy moth, but progress has been slow in getting it approved as an alternative treatment for used cars (Fig. 1). The sector can play an important role in encouraging new and innovative quarantine treatments, which not only reduce risk but also reduce the use of methyl bromide. The sector must move from its observer role of recent years to become an active participant in biosecurity decision-making and initiatives.

Trees are definitely not carrots. A failure of the sector to engage with the wider biosecurity community, and vigorously represent its interests, may see carrot solutions applied to forestry risks.