Effective biosecurity is built on strong partnerships

Brian Richardson

A recent trip to the United States provided plenty of reason to pause and reflect on the potentially devastating effects of introduced pests on forest ecosystems. Examples of the dramatic impacts of pests include: chestnut blight, which virtually eliminated American chestnut; Dutch elm disease, which has had a similar effect on elms; gypsy moth, a major defoliator of eastern forests; the balsam and hemlock woolly adelgids; the emerald ash borer that is currently more or less eliminating ash from large areas of its natural habitat; and *Phytophthora ramorum*, the cause of 'sudden oak death'.

Government and the forest industry acknowledge the importance of forest biosecurity in New Zealand. It is critical for safeguarding the health of our forests, meeting the phytosanitary requirements of trading partners, and providing investor confidence in forestry. The need for continuous improvement in our biosecurity has been reinforced by events such as the emergence of Red Needle Cast, the ongoing battle against kauri dieback, and the recent incursion of the eucalyptus leaf beetle.

Management of biosecurity threats at regional, national and international levels is complex and relies on sound policy and regulatory frameworks, and effective and flexible management systems, all underpinned by high-quality science. In Rotorua five years ago, an OECD-sponsored forest biosecurity workshop hosted by Scion brought together scientists, policy-makers, forest managers and other stakeholders. Their recommendations identified priorities for the improvement of forest biosecurity in New Zealand and worldwide. It is worth reflecting on progress since then (the recommendations have been paraphrased).

Recommendations

1. To be most effective, forest biosecurity research programmes, policy frameworks, and operational responses should be an active collaboration between policy-makers, scientists and forest managers.

Progress

The links in New Zealand between forest managers, Ministry for Primary Industries staff, and researchers involved in forest biosecurity are now much closer with partnerships strengthened in a number of ways:

- Development by the forest industry of a clear research strategy highlighting the importance of forest biosecurity and associated priorities was a huge step forward, and gave Scion the impetus to re-organise research programmes to more effectively align funding with industry priorities. With significant industry co-funding, Scion secured two large Ministry of Business, Innovation and Employment-funded research programmes. One addresses the risk to forests and trees from Phytophthora diseases ($1.7 million per year from government over six years) and the other seeks to find a replacement for methyl bromide as a phytosanitary treatment for logs and timber exports ($1.3 million per year from government over four years).
- Formation of the Forest Biosecurity Committee, which involves forest managers, policy-makers and scientists.
- Eventual signing of a Government Industry Agreement on joint decision-making and cost-sharing for biosecurity preparedness and response activities that will strengthen the relationship between government and the forest industry.

2. Biosecurity science should move towards pathway risk analysis – how high-risk organisms move around the world – and mitigation options rather than focus on single organism risk analysis, i.e. there should be less emphasis on the individual pests and more on their movement and associated mitigation options.

Progress

New Zealand's approach continues to balance the need for generic research on pathways and targeted research on particular high-risk organisms. At an international level, the International Standards for Phytosanitary Measures for live plants has been finalised, which should result in improvements overseas. This remains one of the highest-risk pathways internationally, although it has been well managed domestically for some time.

3. Seek improved communication and public awareness around the risks posed by biosecurity threats to carbon sequestering forests in a changing climate.

Progress

Scion has been very active, with support from the Ministry for Primary Industries, in using a range of modelling approaches to identify changes in biosecurity risks associated with climate change. Examples include pitch canker, Swiss needle cast, Dothistroma needle blight, cyclaneusma needle cast, buddleja, broom and pine processionary moth.

4. Biosecurity research funding models need to enable effective succession planning, promote a balance between fundamental and applied research, and reward collaboration between research organisations.

Progress

Effective biosecurity policy and efficient operational responses often rely heavily on input from experienced science specialists from a range of organisations. Sustaining specialist capability and institutional knowledge is important to ensure lessons from the past are not forgotten. The examples below demonstrate this:

- The successful novel approach taken in the recent eucalypt leaf beetle response in Wellington demonstrated the benefits from blending fundamental and applied science, maintaining institutional knowledge, and innovation that comes from science and policy-makers and operational managers working together.
- Substantial collaboration from other Crown Research Institutes and universities in the two most recent Ministry of Business, Innovation and Employment-funded programmes mentioned above shows the trend for research to involve multidisciplinary research capabilities drawn from within and between research organisations here and internationally.
- The 10-year long Better Border Biosecurity collaboration is another highly effective collaborative programme involving four Crown Research Institutes, a university, and stakeholders from a number of government agencies.

5. Establish specific educational programmes that focus on applied biosecurity issues to equip agencies with well-qualified people, and support new science to improve decision-making where the levels of uncertainty are high.

Progress

The Lincoln University-based BioProtection Research Centre focuses on improving New Zealand biosecurity outcomes and developing new capability in biosecurity sciences. It has helped enhance our biosecurity curriculum and published a book on plant biosecurity, which has appeared this year – *The Handbook of Plant Biosecurity* – see www.springer.com/life+sciences/entomology/book/978-94-007-7364-6. The BioProtection Research Centre loss of funding as a Centre of Research Excellence is extremely disappointing. I believe this outcome reflects a failure of aligning science funding policy and strategic science needs.

In conclusion

The recommendations from the 2009 OECD workshop are certainly not the definitive measure of progress in forest biosecurity research. Nevertheless, it is pleasing that the recommendations have largely been adopted. There is no doubt in my mind that the clarity provided by an industry strategy articulating research priorities has been a critical factor in building a more effective research partnership and in aligning research to address these priorities.

Of equal importance are the forums that keep the partnership active. The Forest Biosecurity Committee, the technical sub-committees that support specific research streams, and the annual Forest Owners Association/Ministry for Primary Industries workshop at Scion all play a part in maintaining the policy/industry/science relationship.

To further the effectiveness of forest biosecurity research, future opportunities must be taken and challenges overcome. New technologies are advancing at a rapid pace and opening up many new research and development opportunities to improve outcomes. Examples include: remote sensing technologies and delivery platforms, such as unmanned aerial vehicles; new molecular technologies, e.g. genomics, metabolomics, transcriptomics, that will underpin many aspects of forest biosecurity such as identifying disease resistant genotypes; and a range of genetic engineering technologies. Challenges for science organisations include:

- Evolving more effective approaches for developing collaborative science programmes that take advantage of specialist skills in different organisations and opportunities provided by new technologies.
- Upgrading science infrastructure to remain at the cutting edge in specialist or high-priority areas and accessing science infrastructure in other areas.
- Legislation's inability to keep pace with rapidly evolving technology, especially given the accelerating pace of change. For example, genetic engineering – both transgenic and also new breeding technologies – remains one of the strongest opportunities for overcoming problems associated with established pests. As Scion CEO, Warren Parker, stated recently in Scion Connections, legislation that is technology neutral and able to accommodate new science innovation fairly and effectively as it develops may be the solution.

The forest industry has long recognised the significance of forest biosecurity by investing in both surveillance to detect new pest introductions and in research. As the lead Crown Research Institute for forest biosecurity, Scion will tackle these challenges with gusto.

Brian Richardson is the general manager for forest science at Scion, the Crown Research Institute responsible for research to support the forestry industry.

Back cover (top): A young radiata pine stand affected by dothistroma needle blight. Disease is worse at the base of the tree because foliage there stays wetter for longer and is exposed to more infective spores; (bottom): Kauri dieback caused by *Phytophthora* taxon Agathis

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