Could biodiversity add value to New Zealand's Kyoto forest credits?

Fiona Carswell and Larry Burrows
Landcare Research, Lincoln

Abstract

New Zealand has included biodiversity measurement in its national system for monitoring carbon in forests and shrublands because of the potential for synergistic management of both carbon and biodiversity. We suggest that these measurements may be used in the future to secure added value for New Zealand's forest sink credits if a carbon market develops that distinguishes "gold standard" credits in forestry from mere "compliant" credits. Existing plantation forests have net biodiversity benefits where they have replaced exotic pasture, as do regenerated indigenous forests. We anticipate a future where linking the production of Kyoto credits to other environmental co-benefits, such as biodiversity, erosion control, improved water quality and reduced flood risk, could leverage a better price for carbon credits, or simply improve access to international forest sink markets.

Introduction

The Kyoto Protocol came into force internationally in February 2005. New Zealand is now beginning to implement policies designed to meet its obligations to reduce total greenhouse gas emissions to 1990 levels over the first commitment period (CP1), 2008-2012. These policies involve a mix of emissions reduction (through reduction of energy use and supporting use of cleaner technologies) and emissions offset through forest carbon sinks. Although some countries have suggested that land-use-change activities - and so forest sinks - should be separated from contributing to national emission reduction targets after 2012 (Schlamadinger 2005), this seems unlikely. The reason is that the world must find a way to reduce the almost 30% of annual global emissions that result from deforestation. Given that reductions in emissions from reduced rates of deforestation are likely to continue to be considered important (Conference of the Parties/Meeting of the Parties (COP/MOP) Montreal 2005), then so too will be reductions achieved by creating new forest sinks.

Forests have many more values than just those of storing carbon and creating a supply of wood products (Coates & Burton 1997; Barnard & Spence 2005). Creation and maintenance of biodiversity is key among these. New Zealand is a signatory to both the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention on Biological Diversity (CBD). Both conventions are legally binding. The Kyoto Protocol requires "stabilisation of greenhouse gas concentrations in the atmosphere…within a timeframe sufficient to allow ecosystems to adapt naturally to climate change" (Article 2; UNFCCC 1992a). Under the CBD, signatories are required to develop national biodiversity strategies, plans, or programmes for the conservation and sustainable use of biodiversity (The New Zealand Biodiversity Strategy: DOC & MfE 2000). Clearly forests offer the opportunity to achieve complementarity in our objectives for both reducing greenhouse gas concentrations and preserving and enhancing biodiversity. Moreover, there may be economic value in bringing these objectives more closely together - as markets for carbon discriminate between the qualities of supplied product.

International perspectives

Negotiations for the second commitment period of the Kyoto Protocol (CP2, beginning 2013) are already in progress, and the conditions for continued inclusion of land use change and forestry are receiving particular attention (Schlamadinger *et al*. 2005). There is a body of opinion among international economists, ecologists and policymakers that the conditions for afforestation and reforestation under the Kyoto Protocol should be stricter in order to preserve global biodiversity (Williams 2000; Caparrós & Jacquemont 2003; Jacquemont & Caparrós 2002; Koziell & Swingland 2002; Niesten *et al*. 2002; Schulze *et al*. 2002; Verheyen 2002; Jones 2003). Whether these opinions will translate into future restrictions on forest eligibility for offsetting of greenhouse gas emissions remains uncertain, but it may be prudent to ensure that New Zealand takes the steps necessary to prove our Kyoto forests maintain or even enhance biodiversity. Such a goal is in step with leading New Zealand forestry companies that have already adopted management policies outlined by the Forest Stewardship Council.

Biodiversity enhancement in New Zealand

The third goal of New Zealand's Biodiversity Strategy is to "maintain and restore a full range of remaining natural habitats…and sustain the more modified ecosystems in production and urban environments…" International researchers agree that, given the large proportion of the world's biodiversity that exists in managed landscapes, success or failure to conserve biodiversity will depend upon how we deal with species in managed ecosystems (Pimentel *et al*. 1992). Given that 70% of New Zealand's landscapes are privately owned and managed, attention must be given to these lands in order to achieve our biodiversity goals (Parliamentary Commissioner for the Environment 2002). Further impetus is given to the protection of biodiversity on "managed" lands through the Resource Management Act 1991 (RMA). In particular, Section 6 of the Act outlines the matters of national importance (including the protection of areas of significant indigenous vegetation and habitats of indigenous fauna) which functionaries of the RMA must provide for (The Royal Forest and Bird Protection Society of New Zealand 2003). The Ministry for the Environment is yet to release its National Policy Statement on Indigenous Biodiversity, which will provide national direction for

the sustainable management of indigenous biodiversity on private land to practitioners of the RMA. However, given that the purpose of the RMA is "to promote the sustainable management of natural and physical resources", responsibility is placed upon each New Zealander "to be a steward to the environment" (Ministry for the Environment 1999). To this end, decision makers are required to consider alternatives to regulation and, in particular, to fund the costs of actions that benefit the wider community through sources other than landowners themselves. New Zealand's decision to use sink credits under the Kyoto Protocol presents an exciting opportunity to progress its objectives under the New Zealand Biodiversity Strategy and the RMA in both exotic plantation forests and in "new" permanent forests created under the Ministry of Agriculture and Forestry's Permanent Forest Sinks Initiative (PFSI). This progress can be funded from income for sink credits from the international carbon market/s. Further, if a "gold standard" in forest credits is developed in the future in order to allay purchaser concerns about the "sustainability" of forest sinks, demonstration of biodiversity benefit could be the key to New Zealand adding value to its sink credits, both in exotic and indigenous forests.

Enhancement in exotic and indigenous forests

In New Zealand we know from site-specific studies that there is potential for commercial plantation forestry to support indigenous biodiversity, when compared with exotic pasture (Henry 1954; Clout & Gaze 1984; Norton 1988; Brockerhoff *et al*. 2005). P. radiata plantations have been shown to foster an understorey of indigenous plant species (McQueen 1961; Allen *et al*. 1995; Brockerhoff *et al*. 2003), provide indigenous bird habitat (Clout & Gaze 1984), and provide a buffer against external (non-forest) influences for indigenous forest fragments (Norton 1988). Further, plantation forests appear to play a critical role in the maintenance of some rare species of indigenous fauna because of a decline in indigenous vegetation or because of the success of predator control in managed forests (Brockerhoff *et al*. 2005; Maunder *et al*. 2005).

Plantation forests can be further managed to preserve and increase indigenous biodiversity (Norton 1988; Spellerberg & Sawyer 1995; Hartley 2002; Maunder *et al*. 2005). Increased demand from forestry stakeholders for clearer guidelines on managing the forest environment, including indigenous biodiversity (Brockerhoff *et al*. 2001; Fairweather & Hock 2004), has prompted the provision of new tools such as the New Zealand Forest Owners' online guide to management of threatened species (New Zealand Forest Owners Association 2005). The recent literature quantifying the biodiversity benefits of existing New Zealand plantation forests will be helpful in proving, internationally, the contribution made by the forest industry to achieving the goals of the New Zealand biodiversity strategy and possibly therefore adding value to credits where a premium can be fetched for a product of greater environmental integrity.

At present we have an important opportunity to move beyond evidence provided by a relatively few, site-specific, studies in exotic forest, by including a biodiversity monitoring component within the inventory methodology proposed for carbon accounting of New Zealand's exotic forests - a component similar to that already in place for our indigenous forests. This would place New Zealand in a strong position to defend the biodiversity benefits of its Kyoto forests, not only in the more usual plantation forestry, but also in forests created through the PFSI. Forests created through the PFSI can be both exotic and indigenous but no harvest is permitted within 35 years of establishment. Management of the succession of exotic pasture through to indigenous forest can be achieved through the removal of impediments to natural regeneration such as fire and browsing by introduced mammals (Wilson 1994). The succession may proceed via an intermediate cover of an exotic species, which could even be an exotic plantation species. This process may be particularly appropriate for remote or steep land with very high harvest costs, capitalising on rapid carbon accumulation in an initial exotic forest crop, with longer-term accumulation through a transition to indigenous forest. The conversion of exotic grasslands marginal for pastoral agriculture to forest, whether indigenous or exotic, should provide multiple long-term environmental benefits under the PFSI, achieving goals for increased indigenous biodiversity, erosion control, improved water quality and reduced flood risk (Marden & Rowan 1993; Trotter *et al*. 2003). While it is outside the remit of MAF's Indigenous Forestry Unit (who administer the PFSI) to quantify benefits additional to carbon storage, we support a previous call for an inter-Ministry system to at least monitor biodiversity (Allen *et al*. 2003) in exotic and indigenous PFSI forests. We propose that this be achieved at the same time as periodic auditing for Kyoto compliance in order to prevent additional costs being levied to landowners. Experience has shown that once a team has to visit a site to quantify the carbon sink, the additional cost of a basic biodiversity audit is 2-5% of the total carbon audit cost (Moore *et al*. 2005). Inclusion of such monitoring would provide consistent and widely based data for promoting the additional value of using forests as carbon sinks.

Acknowledgements

We thank David Norton, Craig Trotter, Richard Gordon Christine Bezar for comments on an earlier versions of the manuscript.

References

Allen, R.B.; Platt, K.H.; Coker, R.E.J. 1995: Understorey species composition patterns in a Pinus radiata plantation on the central North Island volcanic plateau, New Zealand. New Zealand Journal of Forestry Science 25: 301 317.

Allen, R.B.; Bellingham, P.J.; Wiser, S.K. 2003: Developing a forest biodiversity monitoring approach for New Zealand. New Zealand Journal of Ecology 27: 207 220.

Barnard, T.; Spence, H. 2005: Uncovering forest values in New Zealand. XXII IUFRO World Congress. Forests in the balance - linking tradition and technology. Brisbane, August, 2005.

Brockerhoff, E.G.; Eckroyd, C.E.; Langer, E.R. 2001: Biodiversity in New Zealand plantation forests: policy trends, incentives, and the state of our knowledge. New Zealand Journal of Forestry 46: 31 37.

Brockerhoff, E.G.; Eckroyd, C.E.; Leckie, A.C.; Kimberley, M.O. 2003: Diversity and succession of adventive and indigenous vascular understorey plants in Pinus radiata plantation forests in New Zealand. Forest Ecology and Management 185: 307 326.

Brockerhoff, E.G.; Berndt, L.A.; Jactel, H. 2005: Role of exotic pine forests in the conservation of the critically endangered New Zealand ground beetle Holcaspis brevicula (Coleoptera: Carabidae). New Zealand Journal of Ecology 29: 37 43

Caparrós, A.; Jacquemont, F. 2003: Conflicts between biodiversity and carbon sequestration programs: economic and legal implications. Ecological Economics 46: 143-157.

Clout, M.N.; Gaze, P.D. 1984: Effects of plantation forestry on birds in New Zealand. Journal of Applied Ecology 21: 795-815.

Coates, D.K.; Burton, P.J. 1997: A gap-based approach for development of silvicultural systems to address ecosystem management objectives. Forest Ecology and Management 99: 337-354.

Department of Conservation and Ministry for the Environment 2000. The New Zealand Biodiversity Strategy. Wellington.

Fairweather, J.; Hock, B. 2004: Forestry stakeholders' priorities for sustainable management research. New Zealand Journal of Forestry 49(2): 24 27.

Hartley, M.J. 2002: Rationale and methods for conserving biodiversity in plantation forests. Forest Ecology and Management 155: 81-95.

Henry, J.E. 1954: The development of native vegetation on pumice country, and its relationship with exotic pine forests. New Zealand Journal of Forestry 7: 79 82.

Jacquemont, F.; Caparrós, A. 2002: The convention on biological diversity and the climate change convention 10 years after Rio: towards a synergy of the two regimes? Review of European Community and International Environmental Law 11: 169 180.

Jones, D. 2003: Trading for climate without trading off on the environment. An Australian perspective on integration between emissions trading and other environmental objectives and programs. Climate Policy 3S2: S125 S141.

Koziell, I.; Swingland, I.R. 2002: Collateral biodiversity benefits associated with 'free-market' approaches to sustainable land use and forestry activities. Philosophical Transactions of the Royal Society of London Series A 360: 1807 1816.

Marden, M.; Rowan, D. 1993: Protective value of vegetation on tertiary terrain before and during Cyclone Bola, East Coast, North Island, New Zealand. New Zealand Journal of Forestry Science 23: 255 263.

Maunder, C.; Shaw, W.; Pierce, R. 2005: Indigenous biodiversity and land use - what do exotic plantation forests contribute? New Zealand Journal of Forestry 49(4): 20 26.

McQueen, D.R. 1961: Indigenous-induced vegetation and Pinus radiata on volcanic ash soils. Proceedings of the New Zealand Ecological Society 8: 1 14.

Ministry for the Environment 1999: Your Guide to the Resource Management Act 1991. Ministry for the Environment, Wellington.

Moore, J.; Payton, I.; Burrows, L.; Goulding, C.; Dean, M.; Beets, P.; Wilde, H.; Kimberley, M. 2005: Planted forests carbon monitoring system Results from the Nelson/Marlborough pilot study. Planted Forest Kyoto Carbon Accounting System Report No. 2 - February 2005. Report prepared for Ministry of Agriculture and Forestry, P.O. Box 2526, Wellington (Unpubl). 56 p.

New Zealand Forest Owners' Association 2005: http://www.cox.co.nz/test/nzfoa/index.htm

Niesten, E.; Frumhoff, P.C.; Manion, M.; Hardner, J.J. 2002: Designing a carbon market that protects forests in developing countries. Philosophical Transactions of the Royal Society of London Series A 360: 1875 1888.

Norton, D.A. 1988: Indigenous biodiversity conservation and plantation forestry: options for the future. New Zealand Forestry 43: 34 39.

Parliamentary Commissioner for the Environment 2002: Weaving Resilience into our Working Lands: Recommendations for the Future Roles of Native Plants. Parliamentary Commissioner for the Environment, Wellington.

Pimentel, D.; Stachow, U.; Takacs, D.A.; Brubaker, H.W.; Dumas, A.R.; Meaney, J.J.; O'Neil, J.A.S.; Onsi, D.E.; Corzilius, D.B. 1992: Conserving biodiversity in agriculture/forestry systems. BioSience 42: 354 362.

Schlamadinger, B. 2005: Options for including LULUCF activities in a post-2012 international climate agreement. Workshop. Graz Austria, May 5 6, Draft paper: http://www.joanneum.at/Carboinvent/post2012/workshop.html

Schulze, E.-D.; Valentini, R.; Sanz, M.-J. 2002. The long way from Kyoto to Marrakesh: implications of Kyoto Protocol negotiations for global ecology. Global Change Biology 8: 505 518.

Spellerberg, I.F.; Sawyer, J.W.D. 1995: Multiple-use, biological diversity and standards. New Zealand Forestry 39(4): 21 25.

The Royal Forest and Bird Protection Society 2003: Breaking Down the Barriers. A Guide to the Resource Management Act 1991. The Royal Forest and Bird Protection Society, Wellington.

Trotter, C.M.; Tate, K.R.; Scott, N.A.; Saggar, S.; Sutherland, M.A. 2003: A multi-scale analysis of a national terrestrial carbon budget and the effects of land use change. In: Shiyomi, N.; Kawahata, H.; Koizumi, H.; Tsuda, A.; Awaya, Y. (Eds) Global Environmental Change in the Ocean and on Land. Terrapub, Tokyo. Pp. 311 342.

Verheyen, R. 2002: Adaptation to the impacts of anthropogenic climate change - the international legal framework. Review of European Community and International Environmental Law 11: 129 143.

Williams, J.E. 2000: The biodiversity crisis and adaptation to climate change: a case study from Australia's forests. Environmental Monitoring and Assessment 61: 65 74.

Wilson, H.D. 1994: Regeneration of native forest on Hinewai Reserve, Banks Peninsula. New Zealand Journal of Botany 32: 373 383.