Does forest certification conserve biodiversity?

R. E. Gullison

Abstract Forest certification provides a means by which producers who meet stringent sustainable forestry standards can identify their products in the marketplace, allowing them to potentially receive greater market access and higher prices for their products. An examination of the ways in which certification may contribute to biodiversity conservation leads to the following conclusions: 1) the process of Forest Stewardship Council (FSC)-certification generates improvements to management with respect to the value of managed forests for biodiversity. 2) Current incentives are not sufficient to attract the majority of producers to seek certification, particularly in tropical countries where the costs of improving management to meet FSC guidelines are significantly greater than any market benefits they may receive; available incentives are even less capable of convincing forest owners to retain forest cover and produce certified timber on a sustainable basis, rather than deforesting their lands for timber and agriculture. 3) At present, current volumes of certified forest products are insufficient to reduce demand to log high conservation value forests. If FSC certification is to make greater inroads, particularly in tropical countries, significant investments will be needed both to increase the benefits and reduce the costs of certification. Conservation investors will need to carefully consider the biodiversity benefits that will be generated from such investments, versus the benefits generated from investing in more traditional approaches to biodiversity conservation.

Keywords Biodiversity, certification, tropical forests, forestry, Forest Stewardship Council, FSC.

Introduction

The ongoing loss and degradation of the world's forests is one of the greatest challenges that the international environmental community faces. Recent attempts to measure the rate of forest decline suggest that the world lost almost 10 million ha of net forest cover per year during the 1990s (FAO, 2001). Even this alarming figure is an underestimate of the plight of the world's natural forests, as it does not reflect forest degradation, or the fact that in some cases forests have been replaced with plantations.

Although the causes of deforestation vary regionally (Rudel & Roper, 1996; Roper, 1999), industrial logging has maintained the attention of the international environmental community as a major causal agent (Dudley *et al*., 1995). At very high harvest intensities, industrial logging is synonymous with deforestation, while at lower harvest intensities, logging can severely degrade the environmental value of forests, even though forest cover remains (van Soest, 1998). Furthermore, industrial logging can catalyze deforestation by opening up vast tracts of forest to colonization (Verissimo *et al*., 1995), and it can change the microclimate of forests and make them more susceptible to forest fires and windthrow (Cochrane, 2001).

Although the destructive impacts of industrial logging mean that it is a major threat to biodiversity in some contexts, it is also apparent that in other contexts the promotion of industrial logging may make a positive contribution to biodiversity conservation. For example, in order for efforts to stop logging in high conservation value forests (HCVF) to be successful, logging pressure needs to be directed towards forests and plantations of lower conservation value, where logging is compatible with biodiversity conservation objectives (Frumhoff & Losos, 1998). In addition, in some cases industrial forestry may provide higher biodiversity benefits than default land uses, such as agriculture, and as such, forestry may be a significant conservation strategy in its own right.

A comprehensive strategy for conserving the world's forests and their biodiversity therefore needs to address industrial logging as a threat to be mitigated in some contexts, and as a land use to be promoted in others. Gullison *et al*. (2001) recently reviewed mechanisms to stop or prevent industrial logging in HCVF. They identified five categories of mechanisms, organized by

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where they were applied along the flow of forest products from forest to market. The mechanisms included creating new protected areas from unallocated public lands, purchasing and retiring timber rights on public and private lands, and reducing the international flow of timber products from HCVF with the use of CITES and import/export bans. The diverse nature of the mechanisms means that there are approaches appropriate for most contexts in which industrial logging in HCVF occurs. Despite chronic underfunding, protected areas have been surprisingly effective at countering threats such as logging (Bruner *et al*., 2001), and various efforts are underway to further improve their performance (IUCN, 2000).

The second component of a comprehensive strategy for conserving the world's forests is to maximize the contribution that industrial logging makes to biodiversity conservation in well-managed plantations and natural forests of lesser conservation value (Frumhoff & Losos, 1998). One such approach is 'log and protect' (Rice *et al*., 1997) – the forest equivalent to 'dehorning the rhino' – where logging of low density and high value timber species precedes the creation of protected areas. This approach avoids the foregoing of revenue that would otherwise occur if logging was sacrificed, and can also maintain most of the environmental values of the forest, providing that logging is of low intensity.

Another approach to maximizing the contribution of industrial logging to biodiversity conservation is the promotion of sustainable forestry through certification (FSC, 2002a; WWF, 2002a). The goal of certification is to provide an independent evaluation of the environmental and social impacts of the production process of a product, which allows consumers to make an informed choice at the time of purchase. The recent appearance of forest certification is part of a larger trend, which has also seen the emergence of certification of the sustainable management of fisheries (MSC, 2003), certification that products have avoided the use of sweatshop labour in their construction (SAI, 2003), and certification that produce meets organic production standards (OCIA, 2003). Certification provides a means by which consumers can reward producers who provide the greatest environmental and social benefits from their production process, either by paying a price premium, or by preferential purchasing.

The emergence of certification as a conservation strategy has triggered a vigorous debate concerning the role of certification and sustainable forestry versus more traditional approaches to forest conservation (Rice *et al*., 1997; Pearce *et al*., 1999; Rice *et al*., 2001). The purpose of this paper is to examine the role and contribution of forest certification as a biodiversity conservation tool, focussing in particular on the only global certification system, the Forest Stewardship Council (FSC). The FSC has been in operation for almost 10 years, and hence this is an opportune time to review its progress. The paper begins with a general explanation of how forest certification works, and then describes the FSC's standards, before examining various ways in which FSC-certification may contribute to biodiversity conservation. The paper concludes by raising some questions that need to be addressed before the role of certification can be more clearly defined in an overall conservation strategy for the world's forests.

Forest certification

The goal of forest certification is to improve forest management by providing a means by which producers that operate to higher standards can identify their products in the marketplace, thereby enabling consumers to recognize and preferentially purchase forest products that originate from forests whose production generates greater environmental and social benefits than products arising from forests with conventional management (FSC, 2002a; WWF, 2002a). An environmentally sensitive consumer base should create incentives that reward certified producers, and encourage other non-certified producers to seek certification and its market benefits. In this way, certification directs demand away from uncertified forests and towards products from forests that meet rigorous management criteria, including implementing management practices to promote biodiversity conservation.

The implementation of a forest certification system normally proceeds in the following way (Upton & Bass, 1995; Bass, 2001). Firstly, standards, criteria, and indicators for sustainable forestry are developed. 'Sustainable' in this sense means that the standards consider the environmental and social impacts of forest management, not just the economic objective of producing a sustained yield of timber. The goal of sustainable forestry standards is to define management practices that are economically viable, that retain a company's social licence to operate, and that maintain the natural capital upon which the business is based. The range and balance of stakeholder groups represented during the standard setting process varies considerably among different certification systems. As a result, there are differences, sometimes large, in the social and environmental standards that are considered to be sustainable.

The next step in implementing a forest certification system is to allow for voluntary certification of those producers who wish to demonstrate that they meet the standards. Some standards allow first-party auditing (i.e. self-assessment), but the trend is towards independent third-party certification by a certifying organization that

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is accredited by the standard setting body. If a forestry company passes the audit, it is said to be 'certified', and is allowed to state that it meets the relevant standards. After the initial certification, some systems require minor annual audits to ensure that there have been no major changes in management that would contradict the forestry standards, and to ensure that any required corrections to management have been implemented. After a specific period, another comprehensive audit is required.

Such certification is useful to a forestry company in that it demonstrates to its local stakeholders that it meets high standards of forest management. However, it does not provide a mechanism by which consumers can recognize and preferentially purchase its products. Increasingly, certification systems are developing product labels or 'eco-seals' so that certified companies can identify their products in the marketplace. The use of eco-seals requires procedures for chain-of-custody that enable businesses to demonstrate that they can effectively track certified forest products from the forest to the market. Distributors and vendors of certified forest products must seek chain-of-custody certification if they wish to display an eco-seal on a certified forest product.

The final requirement for an effective certification system is to have an environmentally aware consumer base that preferentially seeks out and purchases certified forest products or, ideally, who are willing to pay a price premium. In order to develop a 'green' market, environmental organizations have focused on changing the purchasing patterns of large buyers and retailers of forest products, rather than changing the purchasing patterns at the level of the individual consumer (Rametsteiner, 2002). Under pressure from a strong environmental lobby, many major wood retailers and municipalities in Europe and North America have formulated purchasing policies that give preference to certified forest products, usually those of the FSC.

Forest certification has grown explosively in the last decade. More than 50 forest certification systems around the world have appeared (CWC, 2003) and the area of certified forests has increased rapidly. The Pan European Forest Certification (PEFC) has certified the largest forest area. The PEFC is a private sector initiative that provides a mutual recognition framework for national standards (primarily European), and to date has certified *c.* 46.6 million ha (PEFC, 2003). The American Forest and Paper Association's Sustainable Forestry Initiative has certified the second largest forest area, *c.* 30 million ha of primarily privately-owned industrial forests in the United States (SFB, 2002). The FSC, the only global forest certification system, has certified *c.* 29 million ha in 56 countries around the world (FSC, 2002b).

The Forest Stewardship Council

Although many sustainable forestry standards have been developed, this paper will focus on the contribution of the FSC to biodiversity conservation, for the following reasons. Firstly, the FSC is the only international certification system with wide geographical coverage. In particular, FSC-accredited certifying organizations have certified more forests in tropical countries, where biodiversity conservation needs are greatest. Secondly, the FSC standards have the greatest support from the environmental and social non-governmental organization (NGO) communities (Joint NGO Statement, 2001). If any forest certification system is generating biodiversity benefits, it is reasonable to expect that this should be most evident in the scheme with the greatest participation and endorsement by the NGO community. The focus on FSC is not meant to imply that other standards are not potentially contributing to biodiversity conservation, only that the benefits should be easiest to detect within the FSC system. Thirdly, the FSC has the greatest commitment to transparency, and is therefore easiest to analyze. For example, public summaries of all audits of FSC-certified companies are available on the websites of FSC-accredited certifiers.

The FSCs 10 Principles and Criteria of Sustainable Forest Management form the core of its certification efforts across the globe (FSC, 2000). FSC's standards are generally performance-based. In other words, they specify minimum standards of forest management that must be met before a producer can be certified. (Alternatively, standards may be process-based, which describe aspects of a management system that must be in place, but do not specify quantitative targets). In some cases forestry companies are certified directly against third-party standards that meet FSC's Principles and Criteria. In other cases, regional FSC standards have been developed using the FSC Principles and Criteria as a starting point. The FSC has also developed standards for chain-of-custody procedures, and companies that buy and sell forest products may seek chain-of-custody certification in order to demonstrate that they can successfully track certified products within their operations. If companies that buy and sell products are chain-of-custody-certified, then they may display the FSC eco-seal on products at the final point of sale.

The standards of the FSC are the most rigorous of all the certification systems with respect to biodiversity conservation. Principle 6 deals with mitigating the environmental impacts of timber production, and broadly requires companies to maintain the species and functioning of production forests. Specific requirements for FSC certification include:

- An Environmental Impact Assessment must be conducted.

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- Rare, threatened or endangered species and their habitats must be managed for and maintained.
- Representative samples of ecosystems must be protected.
- The use of genetically modified organisms is prohibited.
- The use of exotic species should be carefully controlled.
- With very few exceptions, the conversion of natural forests is prohibited.

FSC's standards have had input from a great variety of stakeholders. Some 561 individual, institutional and corporate members compose the economic, social and environmental chambers (FSC, 2002c). Each chamber has equal voting strength with regard to passing motions that determine the content of the standards. Because of the broad stakeholder participation in developing FSC standards, and because they are performance-based, the FSC standards have by far the greatest support from the NGO community (Joint NGO Statement, 2001; Ozinga, 2001; NRDC, 2002). The World Wildlife Fund (WWF), Greenpeace, Friends of the Earth, Environmental Defense Fund, Sierra Club, The Nature Conservancy, and The Wilderness Society are all active FSC members (FSC, 2002c). In addition, WWF has entered into a strategic alliance with the World Bank whose goals include certifying 200 million ha of production forests by 2005 (World Bank/WWF Alliance, 2002). Although this initiative does not specify the FSC, it appears that the FSC standards are the only ones that are currently acceptable to WWF and the Alliance. WWF also helps market FSC-certified products through the Global Forest and Trade Network (WWF, 2002b).

Conversely, the FSC standards have little support in some segments of the private sector, particularly in the tropics, where it is felt that the standards do not recognize the political and legal difficulties of operating in certain regions, nor do they recognize and promote continuous improvement, a disadvantage to producers where current management practices are rudimentary (Atyi & Simula, 2002).

As of August 2002, FSC-accredited certifying agencies have certified more than 500 forestry operations in 56 countries, for a total of *c*. 29 million hectares (Fig. 1). Information on countries where the FSC has made the greatest inroads is shown in Table 1. Together these 14 countries contain 24.6 million ha of FSC-certified forests, or *c*. 85% of the total (FSC, 2002b). FSC has made the greatest inroads in temperate developed countries, certifying nearly seven times more forest in Europe and North America than it has in Asia, Latin America and Africa combined. In temperate countries, the majority of certified forests are mixed forests (a combination of plantation and natural) or natural forests, with very few pure plantations having been certified. In the tropics, FSC has certified an approximately equal amount of plantations and natural forests.

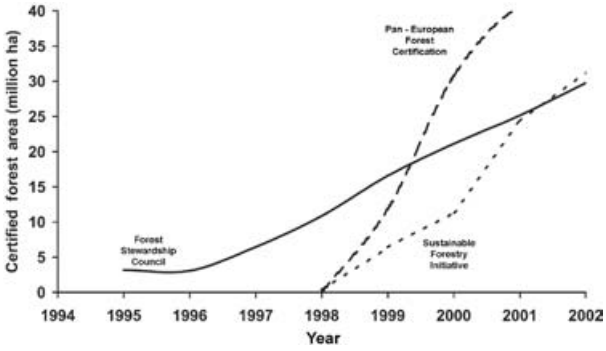

Fig. 1 Changes in forest area certified over time by the three main forest certification initiatives (Data from PEFC, 2003; FSC, 2002b; SFB, 2002).

Does FSC certification conserve biodiversity?

The remainder of this paper examines the contribution of FSC-certification to biodiversity conservation. As a market-based conservation mechanism, forest certification has the potential to deliver biodiversity conservation benefits in at least three ways (Fig. 2). Firstly, the process of certification may improve the value of certified forests for biodiversity. The biodiversity benefits delivered in this way would be measured by the difference in the value for biodiversity between a forest managed for timber production under conventional management, and the value of an operation meeting the FSC standards. Secondly, certification may be sufficiently profitable that landowners choose to manage their forests for the production of certified timber, rather than clearing their forests for agricultural uses. The biodiversity benefits produced by certification in this way would be the difference in the value of a certified forest for biodiversity compared to the value of agricultural fields. Thirdly, certification may reduce logging pressure on HCVF if it offers consumers the option of purchasing forest products that come from well-managed forests of lower conservation value. The biodiversity benefits delivered in this manner would depend on the market share of certified products, and what happens to the HCVF if they are not logged (i.e. do they remain under threat from other land uses?). These possibilities are now examined in turn.

1. Does certification improve forest management?

Although the FSC Principles and Criteria contain management prescriptions that are of clear value to biodiversity, it does not necessarily follow that the process of certification improves the value of certified forests for biodiversity. Certification could simply be recognizing

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Table 1 Regional descriptive statistics for the area of natural, plantation and mixed forests certified by the Forest Stewardship Council, and the total forested area and percentage of total forest cover certified by the FSC (data from FSC, 2002b; FAO, 2001).

		FSC-certified forests					
Region	Country	Natural forests (ha)	Plantations (ha)	Mixed forests (ha)	Total FSC-certified (ha)	Total forests (ha)	% forest cover FSC-certified
North America	Canada	971,441	0	29,479	1,000,920	244,571,000	0.4
	USA	3,125,997	7,001	1,063,987	4,196,985	225,993,000	1.9
Europe	Estonia	–	0	1,063,517	1,063,517	2,060,000	51.6
	Poland	2,742,786	0	849,374	3,592,160	9,047,000	39.7
	Sweden	1,598,309	0	8,534,931	10,133,240	27,134,000	37.3
	Sub-total	*8,438,533*	*7,001*	*11,541,288*	*19,986,822*	*508,805,000*	
	Overall						*3.9*
Asia	Indonesia	90,240	51,349	10,000	151,589	104,986,000	0.1
	Malaysia	64,808	12,434	0	77,242	19,292,000	0.4
	New Zealand	25,498	584,760	0	610,258	7,946,000	7.7
Latin America	Bolivia	965,263	0	0	965,263	53,068,000	1.8
	Brazil	357,913	826,599	13,206	1,197,718	543,905,000	0.2
	Mexico	439,103	0	85,118	524,221	55,205,000	0.9
Africa	Namibia	61,130	0	0	61,130	8,040,000	0.8
	South Africa	–	898,225	0	898,225	8,917,000	10.1
	Zimbabwe	24,850	85,711	0	110,561	19,040,000	0.6
	Sub-total	*2,028,805*	*2,459,078*	*108,324*	*4,596,207*	*820,399,000*	
	Overall						*0.6*

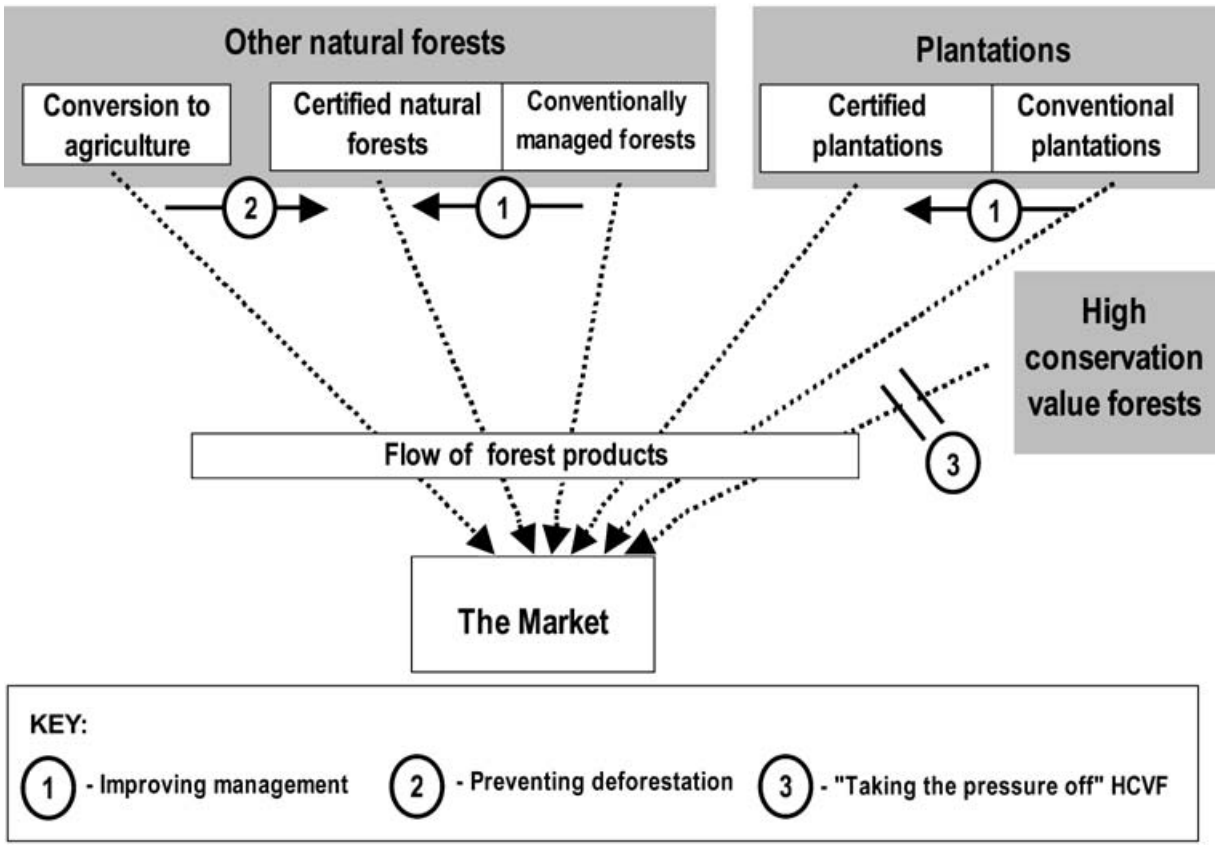

Fig. 2 Schematic of three possible means by which forest certification can contribute to biodiversity conservation.

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exemplary companies with good environmental management practices already in place, rather than requiring relatively poorly managed companies to improve their management as a condition of achieving certification.

An analysis of global trends in FSC certificates by Thornber (1999) tests these alternatives. Thornber reviewed 156 active FSC certificates to quantify the type of corrective actions that were required of companies as they underwent audits prior to certification. She found clear evidence that companies were required to make corrections to management during the certification process that would benefit biodiversity. For example, 38% of companies were required to improve the protection of representative ecosystems within their borders, 37% of companies had to improve their management of rare, threatened or endangered species, and 24% were required to conduct an Environmental Impact Assessment (Fig. 3).

A more detailed and recent summary of corrective actions required by companies undergoing FSC certification is shown in Table 2. These results were obtained by randomly selecting 30 FSC-certified companies (10 each from natural, plantation and mixed forest categories), and then reviewing their publicly available audit summaries to identify specific corrective actions that were required during the certification process (note that the final sample size was 27, due to the unavailability of three summaries). The results reinforce those of Thornber in that they clearly demonstrate that the process of FSC certification requires companies to make a wide variety of significant changes to management that would benefit biodiversity. They also show that most FSC-certified companies have established significant protected set-asides within their borders.

Given that the process of FSC certification improves the value of certified forests for biodiversity, it is of interest to speculate whether the area of FSC-certified forests is likely to increase rapidly, and in particular, to ask whether timber producers in the subtropics and tropics, regions where biodiversity conservation needs are greatest, are likely to seek FSC certification. Although such speculation is highly uncertain, it is possible to use the magnitude of the incentive offered by FSC-certification as an indicator of future rates of uptake.

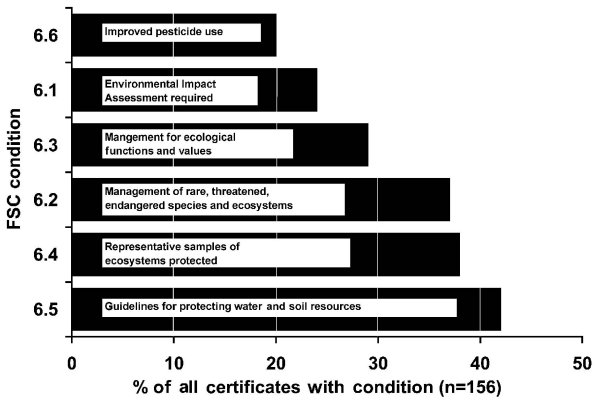

Fig. 3 Corrections to management required of companies seeking FSC-certification (adapted from Thornber, 1999).

Benefits of certification

One possible benefit of certification is that certified producers receive a higher price for their products. Available evidence is somewhat contradictory, but generally suggests that buyers are unwilling to pay a price premium for certified products (Bass *et al*., 2001; Teisl *et al*., 2001a), or only a very small premium (Stevens *et al*., 1997). Where a price premium has been achieved, it appears that this has been driven more by a shortage of supply of certified forest products, rather than a conscious willingness on the part of consumers to pay for the 'sustainability' of the production system, and this premium can be expected to disappear as the supply of certified forest products increases (Rametsteiner, 2002).

Another possible benefit of FSC certification is that it allows certified producers to access or retain environmentally sensitive market share (Raunetsalo *et al*., 2002). However, environmentally sensitive markets for forest products exist to any significant degree only in North America and Western Europe (Bass *et al*., 2001; Rametsteiner, 2002), and the number of producers that are able or choose to access these markets is relatively small. Only 6–8% of global timber production enters international trade, and the majority of this is between countries in the same region. Tropical and subtropical producers therefore have disproportionately less access to environmentally sensitive markets. Asia accounts for more than 80% of tropical wood exports and 70% of imports by value, yet has virtually no demand for certified timber. Only 14% of Amazonian timber production is exported, the remainder serving domestic markets, primarily in southern Brazil, which at present demonstrates little or no concern about the origin of its timber (Smeraldi & Verrisimo, 1999). These patterns suggest that the incentive of market access that FSC offers may only be of benefit to a relatively small proportion of global producers, primarily located in temperate countries.

Costs of certification

The costs of certification are of two types. The direct cost of certification is the cost of the certification process itself, while the indirect cost is the cost required to change management to meet the sustainable forestry standards (Bass *et al*., 2001). Direct costs vary with size of the enterprise and distance that certifiers have to travel. The direct costs of certification are relatively low

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Table 2 Examples of the types of changes to management that were required of companies during the FSC certification process (data from publicly available audits).

		Forest Type					
Company	Country	Native	Plantation	Mixed	Area (ha)	Set-aside (%)	Examples of improvements required
Allen Hopwood Enterprises Ltd	Canada	x			132	?	Ban cutting of trees in riparian zones; develop specific management guidelines for sensitive habitats; ban felling on steep slopes; increase retention of trees until final harvest.
Auropel	Brazil		x		4,143		
Bevan Forestry	U.S.A.	x			319	0	Identify special management areas; develop prescriptions for snag retention.
Border Timbers Ltd	Zimbabwe		x		47,654	27	Improve planning and management of unplanted areas.
Bratt Woodland Farm	USA			x	59	12	Establish conservation zone of 7.2 ha.
Chase Mountain Management Corporation	USA	x			374	?	
Chris W. Olson Forestry	USA	x			1,823		Establish special management zones.
CIMAL	Bolivia	x			181,750	12	Stop hunting; develop management plans for Red Listed species.
City Forests Ltd	New Zealand		x		15,845	10	Develop management plans for rare species and natural areas.
Ejido Noh Bec	Mexico	x			18,000	?	Identify CITES-listed species; regulate hunting; map protected areas.
Ejido San Diego	Mexico	x			16,800	>10	Prohibit extraction of timber from riparian corridors; map and manage ecologically sensitive areas; prohibit extraction of rare species.
Forest, Soil & Water	USA	x			205		Develop management plans for late seral stages and endangered/threatened species; increase to 30% high quality and old growth leave trees; establish buffers for old growth.
Forestry Branch, Fort Lewis Military Installation, Department of Defense	USA	x			35,005	44	Develop legacy management strategy; increase coarse woody debris.
Holmen Skog AB	Sweden			x	1,030,000	?	Improve planning and management of conservation areas; establish improved leave tree guidelines, reduce clear cut areas.
Juliana	Brazil		x		4,143	37	Better management plans for conservation areas.

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Table 2 (Continued)

Company	Country	Forest Type			Area (ha)	Set-aside (%)	Examples of improvements required
		Native	Plantation	Mixed			
Klabin	Brazil		x		218,545	38	Control exotic regeneration in natural areas; implement management plans; reduce felling in areas of natural vegetation.
Komatiland Forest (Pty) Ltd	South Africa		x		64,378	21	Implement better riparian management.
Kristianstad Kommun	Sweden			x	1,319	10	Leave more high stumps.
New York State Dept. of Environmental Conservation	USA			x	717,285	?	
Pennsylvania State Forest – Districts 9, 10, 12, 13, 15, & 16	USA	x			898,385	10–20	Control deer populations and damage; promote uneven-aged silviculture; develop landscape conservation plan; implement ecological reserve programme
PF Olsen & Company Ltd	New Zealand		x		4,526	12	Identify and manage any endangered species; establish conservation sites; protect bat roosting sites.
Pictou Landing First Nation	Canada			x	384	3–7	Formally protect old growth forest within concession; manage for wildlife values.
Pisa Florestal S.A.	Brazil		x		103,036	?	Get rid of invasive exotic species; management of special sites.
Regional Directorate of State ForestsTorun	Poland			x	421,000		
SCA Forest and Timber AB	Sweden			x	1,800,000	5	Improve ability to identify key habitats; require strategy to reach 5%.
Scaninge Timber AB	Sweden			x	NA		
Sierra del Nayar	Mexico			x	13,748	16	Better protection of riparian areas.
Stockholm Vatten	Sweden			x	NA		
The Wattle Company	Zimbabwe		x			30	Improve mapping of sensitive sites and rare species; establish better riparian management.
Timberlands West Coast Ltd	New Zealand		x		51,205	43	Reduce 'over-cutting' of indigenous forest; increase protection and management of special sites and endangered species; conduct better screening for high conservation value sites.

for large industrial intensively managed operations, and relatively high for small-scale extensive producers. For example, certification of large companies in Poland and the USA adds about 2–3 cents per cubic meter to production costs. Certification of plantations in South Africa costs about 19 cents per cubic meter. Other tropical producers' costs have ranged from $0.26–$1.10 per cubic meter, with small producers paying up to $4.00 cubic meter in Latin America.

Indirect costs of certification include investments in securing timber supply, investments in infrastructure and machinery in order to be able to harvest more efficiently with lower impacts, higher wage costs incurred by paying legally specified wages and providing social benefits, and the opportunity cost of reducing timber harvests to sustainable levels. As such, the magnitude of the indirect costs depends on existing quality of forest management, and on the context in which forestry is taking place. The indirect costs of certification can be significant even in developed countries, where the quality of management is already relatively high. For example, Murray & Apt (1998) estimated that in order to cover the indirect costs of certification, non-industrial private forest owners in the southern USA would need to receive a median price premium of 1.6%, and industrial forest owners would need a median price premium of 9.6%. Tropical producers are faced with even higher indirect costs of certification because the general state of management is poorer than in temperate countries. For example, a Brazilian forestry company that previously bought illegally felled trees has had to purchase its own timberland in order to demonstrate that it will be able to sustainably produce future rotations of trees (Bass *et al*., 2001; Pro-Natura/IIED/GTZ, 2000). Another Brazilian Amazonian logging company claims that its logging costs under certification are 30% more than traditional practices. In addition, higher discount rates in the tropics mean that tropical timber producers have a greater opportunity cost to reducing harvest (Rice *et al*., 1997). There is a general sentiment that improvements to management required by the FSC raise the bar beyond what is financially viable for the average tropical concession manager (Wibowo, 2002).

Future increases in FSC-certified forests

Taken together, it appears that the benefits of FSC certification are slightly greater than the costs (i.e. there is an incentive to seek certification) for only a relatively small proportion of producers, and those are likely to be producers who already implement relatively good management practices, and who are able to sell the majority of their products to environmentally sensitive markets in Western Europe and North America. Indeed, even for temperate producers with access to these markets, the high costs of certification are one of the top reasons that producers have chosen not to seek certification (Raunetsalo *et al*., 2002; Teisl *et al*., 2001b). If FSC is unable to increase the magnitude of the incentive it offers producers, it seems reasonable to conclude that a rapid growth in the area of FSC-certified forests is unlikely.

2. Does certification prevent deforestation?

The second means by which certification may contribute to biodiversity conservation is if landowners choose to retain their forests and to manage them for certified timber production, instead of deforesting them. However, liquidation logging (with or without subsequent conversion to agriculture) is often many times more profitable than sustainable forestry (Rice *et al*., 1997; Pearce *et al*., 1999). The difference in profitability has been documented to be as high as eight-fold (Howard *et al*. 1996). What this means in practice is that benefits offered by certification would have to be many times greater than they are at present in order to entice landowners to seek FSC certification instead of deforesting their lands. The comparative disadvantage of certified forestry relative to non-forest land uses is highest in biodiversity-rich tropical countries. Tropical countries are often characterized by high discount rates, insecure land tenure, and political and economic uncertainty, i.e. factors that greatly favor forest conversion over long-term management for sustainable timber production (Kishor & Constantino, 1993; Rice *et al*., 1997; Pearce *et al*., 1999, Rice *et al*., 2001). In other words, there is a larger opportunity cost to managing tropical forests for sustainable timber production, instead of logging them at unsustainable rates and subsequently converting them to other uses. The relatively poor market penetration of FSC-certification in countries with high rates of forest loss is demonstrated in Fig. 4. In balance, it seems fair to conclude that forest certification is not a viable conservation strategy to counter deforestation.

3. Does certification take the pressure off of high conservation value forests?

The third means by which certification may contribute to biodiversity conservation is if the availability of certified timber products helped to reduce pressure to log HCVF. There are at least three requirements for certification to provide biodiversity benefits in this way. Firstly, the volume of certified forest products must be large enough to influence overall demand for forest products. Secondly, there must be substantial overlap between certified products and products originating from HCVF. Finally, certified forest products should be

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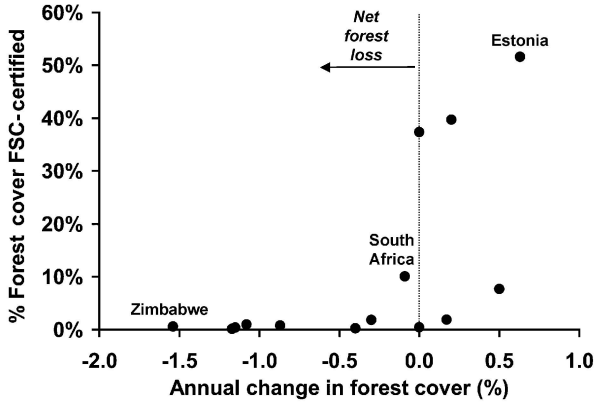

Fig. 4 The relative success of the Forest Stewardship Council among countries is positively correlated with annual change in forest cover (Spearman Rank Correlation, $n = 14$, $r = 0.79$, $0.001 < P < 0.002$) (Countries as per Table 1: FSC data from FSC, 2002b; forest cover data from FAO, 2001; deforestation data from FAO, 2001).

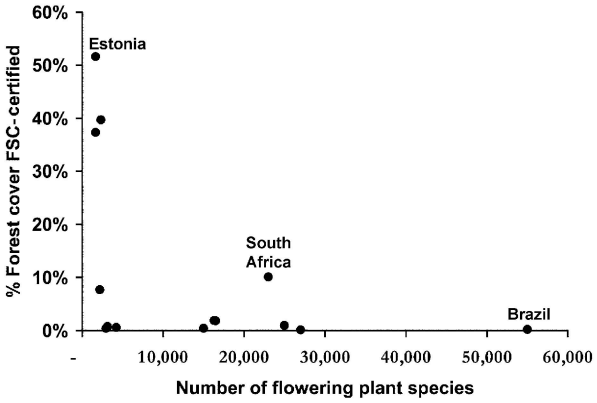

Fig. 5 The relative success of the Forest Stewardship Council among countries is inversely correlated with vascular plant diversity (Spearman Rank Correlation, $n = 14$, $r = -0.63$, $0.01 < P < 0.02$) (Countries as per Table 1: FSC data from FSC, 2002b; forest cover data from FAO, 2001; vascular plant diversity data from WCMC, 1994).

priced low enough that they make the logging of HCVF uneconomical.

At present it appears that the first condition is not met, as the supply of FSC-certified products is small. FSC has certified only about 6% of the world's timber production forests, mostly outside the tropics (Mok, 2002). Even in the most environmentally sensitive markets, FSC production accounts for only a small proportion of timber on the market. Certified products have attained their greatest market share in Europe, where they are 10% by volume in the UK, 7% in the Netherlands, and 1% in Germany.

Overall in Europe the market share of certified products is about 5% (Rametsteiner, 2002). In contrast, certified production makes up only 0.2% of total volume in Japan, which is one of the largest importers of tropical woods. As mentioned in the preceding sections, market share of certified forest products is even less in tropical countries.

It also appears that the remaining two conditions are not met. There does not appear to be much product overlap between certified forest products and products from HCVF. This is because the majority of HCVF are tropical (CI, 2002), and the FSC has made relatively poor progress in certifying tropical natural forests. It also seems improbable that the presence of inexpensive certified forest products is making the logging of HCVF using conventional means unprofitable, as certified products are more expensive rather than cheaper to produce than forest products using conventional logging techniques (Leslie *et al.*, 2002). Instead, the opposite appears to be the case – the abundance of cheap illegally produced forest products from natural forests is preventing sustainable forestry from being implemented on a significant scale in many parts of the world.

Finally, even if the three conditions were met, it should be noted that conservation strategies that address demand are necessary but not sufficient in themselves to conserve HCVF. Eliminating the demand for industrial forest products from high conservation value forests would not necessarily remove pressure to clear the same forests for agriculture, although it could eliminate the catalytic role that logging plays. Demand side conservation measures must also be matched with efforts to effectively manage and protect HCVF from remaining threats.

Conclusions

This review has shown that although the certification of timber production forests can potentially contribute to biodiversity conservation in at least three ways, there is only clear evidence that certification produces biodiversity benefits by improving management of existing timber production forests during the auditing process. In contrast, the incentives offered by certification are insufficient to prevent deforestation, and the volume of certified forest products currently on the market is too small to significantly reduce logging pressure on HCVF. FSC has made modest inroads in temperate countries, but very little progress in certifying tropical natural forests. The extent to which additional forest managers will seek FSC-certification based on the current cost/benefit structure offered by FSC is uncertain but, at least for tropical countries, it seems unlikely that there will be rapid large increases in the area of FSC-certified forests in the near future.

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If the area of certified producers is to increase drastically, then greater benefits need to accrue to certified producers in the form of increased market access, price premiums, or both. At a minimum, this will require significant investments in consumer education to generate greater awareness and willingness to pay, and it may also be necessary to subsidize both the direct and indirect costs of certification, particularly in the tropics.

Given that the available evidence suggests that the area of FSC-certified forests is not likely to increase spontaneously, but rather will require significant investments to create greater incentives for producers to seek certification, conservation donors (foundations, governments, and aid agencies) must decide how they will allocate their funds. Financing for forest conservation is limited, and promoting forest certification is only one of many possible ways that donors may seek to achieve their goals. Donors must ask themselves if the biodiversity benefits generated by investing in forest certification are greater than investing in measures to stop industrial logging altogether. This question is beyond the scope of this paper, and probably unanswerable at present, but in closing, some issues that will help define the role of certification in an overall forest conservation strategy will be briefly touched upon.

Are there time constraints? Because it is possible to build a sustainable forest industry from secondary forests, or from establishing plantations on degraded lands, the establishment of a certified forest products industry is likely to have a much more forgiving timeline than are efforts to protect remaining HCVF. Where HCVF are disappearing rapidly, it probably makes sense to give priority to financing protection over financing certification.

What are the limits to protection? A logical approach to allocating funds between protection and certification may be a sequential one. Donors could simply invest in protection until it is no longer possible to do so, and then focus on promoting sustainable forestry by financing certification. However, it is far from clear what the limits to protection are. In the last decade, the rate of creation of National Parks in tropical countries such as Peru, Bolivia and Brazil is many times greater than the rate in growth of FSC-certified forests (Frumhoff *et al*., 2002). In addition, new and alternative market-based mechanisms that provide compensation for the opportunity cost of conservation may be able to overcome obstacles that have traditionally limited the creation of protected areas. For example, conservation concessions, conservation easements, and payments for environmental services may greatly increase the willingness of countries to bring additional forests under protection (Gullison *et al*., 2001).

Is certified forestry more likely to produce direct or indirect conservation benefits? Industrial logging has the potential to produce both direct benefits (e.g. preventing deforestation, or improving the value of managed forests for biodiversity), and indirect benefits (e.g. providing alternative timber supplies to those from HCVF). If the role of certification in an overall conservation strategy is to generate direct biodiversity benefits, then the fact that the FSC has only certified a little over 2 million ha of natural tropical forests in almost 10 years is worrying, and a frank assessment is needed concerning the ability of FSC to overcome barriers to certification in tropical countries. If, however, the role of certification in an overall forest conservation strategy is to provide indirect benefits, then the volume of wood that can be produced on a sustainable basis by the 2.5 million hectares of certified tropical plantations is a major achievement, and FSC may do well to focus on further increasing the benefits that plantations generate. In particular, it would be worthwhile to focus on increasing product overlap between certified forests and plantations and forest products from HCVF, and also, to promote the establishment of plantations for other types of forest products such as fuelwood for which HCVF are also under pressure. Finally, it would be useful to develop a better understanding of the market impacts of removing HCVF timber supply from the market, in order to refine strategies to address 'leakage' or displacement of market demand that may occur as a consequence of protecting significant areas of HCVF.

How to trade off quantity versus quality of certified forests? Closely related to whether certified forests are meant to produce indirect or direct biodiversity benefits is the issue of how to trade off decreases in the environmental rigor of standards with increases in the area of certified forests. If the goal of certification is to produce indirect conservation benefits (i.e. to achieve the sustained production of timber that can help address displaced demand created by protecting forests), then it may be desirable to weaken standards, and the corresponding direct benefits of certification, in order to increase the supply of certified products. Even if the role of certification is to produce direct conservation benefits in certified forests, the weakening of standards may still be beneficial, if some improvements can still be generated but over much larger areas.

Will it become more or less expensive to expand the FSC-certified forest area over time? There are two possibilities as to how the costs of promoting certification will change over time. One possibility is that it will always be the forest managers with the relatively best management practices, and lowest indirect costs, that will be next in line to seek certification. As these producers are certified, expanding the certified forest base becomes relatively more and more expensive, as greater and greater incentives are needed to entice producers with higher indirect costs to seek certification.

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An alternative, but not mutually exclusive, view is that there is some critical threshold of market share for certified products beyond which the entire market will demand certified products, and the remaining uncertified producers will have to bear the costs of certification themselves, or go out of business. These two scenarios have greatly different cost implications for promoting the continued growth of certification.

In conclusion, there is no doubt that FSC certification has generated biodiversity benefits for those forests that have been certified, and all other things being equal, it is better from a conservation perspective to have existing forestry operations FSC-certified rather than not. The issue is not whether certification is a good thing when considered in isolation, but rather, in deciding to what extent limited conservation dollars should be invested in promoting certification and sustainable forestry, particularly if this funding comes at the expense of funding other approaches to conservation. The answers to the questions raised here, in addition to many others, are needed before certification matures as a conservation mechanism, and its role in an overall conservation strategy for the world's forest can be fully realized.

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