POLICY PERSPECTIVE

The dilemma of green business in tropical forests: how to protect what it cannot identify

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Keywords
Borneo; forest; IUCN Red List; logging; mining; oil palm; sustainable forest management; taxonomy.

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Received
7 February 2012
Accepted
2 May 2012

Senior Editor
Phillip Levin

doi: 10.1111/j.1755-263X.2012.00252.x

Abstract

Much tropical biodiversity resides in forests managed by timber, mining, and plantation companies. These companies can determine the local persistence of many species and have considerable implications for global conservation outcomes. Many companies are willing to invest in improved management as long as this does not undermine their business—indeed accessing green markets often makes commercial sense. Compliance with common standards of good commercial practice requires identification of all species of conservation significance which occur within their areas of management responsibility. But, as we demonstrate, it is impossible for companies to do this comprehensively. Such demands are often counterproductive in that they alienate those who might otherwise be willing to improve. Given the finite resources available for achieving conservation outcomes, we need to trade off data collection against other costs. To encourage adoption and implementation of conservation friendly practices requires incentives, not technical and financial obstacles. We challenge conservation biologists to reconsider the realities of good forest management, and provide pragmatic guidance for business compatible conservation. Until we engage more effectively with commercial interests, opportunities for improved conservation outcomes will be wasted.

Introduction

Companies play an important role in the management of tropical forests and wildlife and thus influence the distribution and persistence of many endangered species. Globally close to 1.2 billion hectares (ha) of forest—30% of the world's forests—are managed primarily for the production of wood and other products, 25% of which in the tropics (FAO 2010). This area is almost four times larger than the global area of forest designated for stricter conservation (FAO 2010). Numerous other forest areas are managed as mineral concessions, plantations, or other ventures. Many companies make some commitment to conservation-sensitive management because it makes good business sense (Russo & Fouts 1997; Kollert & Lagan 2007; Chen *et al.* 2010). Much available guidance on what is required is, however, unrealistic. A specific challenge involves the assessment and management of endangered species. This issue is of particular concern in the tropics.

Tropical conservation is strongly associated with the management and preservation of species such as tigers, gorillas, and elephants. A scan of conservation journals and more popular materials such as televised wildlife programs and NGO promotions suggests that most of us, professionals and general public alike, still consider species-focused management the cornerstone of conservation. Cuddly animals also remain a powerful means to raise conservation awareness and access charitable funds (Caro 2010). Endangered species remain a focus for companies aspiring to green business, but as we shall demonstrate the associated requirements present a major

obstacle. We specifically investigate obstacles associated with species surveys, identification, and management in the tropics, and suggest opportunities for progress.

The reality of species identification in tropical forest

Forest management guidance, such as the certification criteria of the Forest Stewardship Council (FSC 2011), the Programme for the Endorsement of Forest Certification (PEFC Council 2010), and the Round Table for Sustainable Palm Oil (RSPO 2007), as well as good practices for mining and biodiversity by the International Council on Mining & Metals (IUCN & ICMM 2006) require the detection, identification, and management of endangered and nationally protected species.

It is instructive to recognize the magnitude of this challenge and the inevitability of falling short. Let us consider the example of plants on the island of Borneo, an area of global conservation importance. Based on a density of some 6,000 trees ha^{-1} (dbh $\geq$1 cm), an average 50,000 ha concession in tropical forest contains around 300 million trees of 3,000–4,000 species (Losos & Leigh 2004). Based on daily identification rates of 55 samples (Ferry Slik, personal communication, 2011), identifying each and every tree would take 500 taxonomists over 30 years (considerably more if we consider regrowth over the same period). A more conservative stem size of dbh $\geq$10 cm might reduce the effort by over 80% but would still leave 30 million stems while allowing many understorey species to be missed entirely. We note that even with such major investments in identification a significant error rate would still be unavoidable, especially given the preponderance of infertile material (reviewed in Sheil & Padmanaba 2012). Herbs, lianas, and epiphytes (etc.) would also take a considerable effort. The situation for fauna would be comparable but brings additional challenges because mobile species may remain undetected or imperfectly identified. Even in a research setting, all-taxa surveys, though advocated, have never been achieved at a single site (Gamez *et al.* 1997; Nichols & Langdon 2011).

A focus only on species formally listed as having conservation significance is simpler but not without challenges either. On Borneo, one could, for example, ignore all ants (Formicidae) because there are no IUCN red-listed or protected ant species, but one would still need to consider a long list of plants and animals including tiny land snails (e.g., various critically endangered species of *Arinia*) or freshwater molluscs such as the endangered *Brotia pageli*, and such a list would require years of work by a team of taxonomists to complete. A company holding a concession in Indonesian Borneo could find itself looking for 714 IUCN-listed of Bornean plant or animal species of near threatened to critically endangered status (IUCN 2011). The number of people who can identify these species with confidence is less than 100, and the list itself grew from 688 to 714 in 2 years, suggesting that the number of species that need to be identified will grow in the years ahead (see later). It is clear that, if rigorously sought, species-level identification for protected and endangered taxa could be tremendously costly. The details will vary from site to site but our conclusion is general: complete species-level surveys, even if focusing only on conservation priority taxa, are commercially unrealistic.

It is not just the companies that need to deal with incomplete and changing knowledge. Many species records, both plants and animals, are based on few observations. In Borneo, 15–35% of the flora may remain uncollected (Beaman & Burley 2003). Estimates suggest that our knowledge of some higher plant families is far from complete (e.g., perhaps only 28% complete for the Fabaceae of Southeast Asia, see Giam *et al.* 2010). We are seldom sure whether a taxon is rare and localized or simply neglected (Abeli *et al.* 2009; Cardoso *et al.* 2011). J.D. Holloway's 18 volumes work describing Borneo's "macro moths" is 70% completed, and hundreds of new species have been identified so far and many more are likely to be added. Similarly, a recent review of Sundaic species of *Edosa* (Perissomasticinae), small moths, described 52 species of which 45 were new to science (Robinson 2008). One consequence of this uncertainty, and ongoing efforts to address it, is that we expect the IUCN Red List and related lists of conservation priorities to be updated repeatedly and at an accelerating pace over the coming decades, likely bringing in increasingly little known taxa and escalating the challenge for anyone who wants or needs to keep up in theory and practice.

Limitations of a sample-based approach

In reality of course companies sidestep the challenge of identifying all red-listed and protected species. Even in tropical forest areas where taxa are relatively understudied and undersampled, they employ short surveys involving a few available experts (Table 1). The assumption is that a sample (or "expert search")-based approach is sufficient to reveal which species of concern occur. This is a compromise which will inevitably allow some vulnerable species to go undetected and thus unconsidered. We do not know how to best judge this compromise. Our earlier examples may appear extreme but it defines one end of a long spectrum of choices and possibilities. Even the problem of identifying all endangered and protected species is real for some companies as this is the only means to

Table 1 A selection of several biodiversity assessments from the FSC website within the context of tropical forestry and plantations

Type of assessment	Area	Number of biodiversity people involved	Length of study	Reference
Preliminary HCV assessment, for natural forest concession	269,660 ha forest in Indonesian Borneo	Three experts and company assistants	Ten days of field study	(Daryatun *et al.* 2002)
HCV assessment for oil palm concession	13,236 ha concession in Indonesian Borneo	Sixteen experts and assistants	Several weeks of field study and several month of desktop study	(Daemeter Consulting 2009)
HCV assessment for timber plantation	33,728 ha concession in Sumatra, Indonesia	Six experts	Twenty-four days of field study	(Rainforest Alliance–SmartWood Program 2005)
HCV assessment for natural forest concession	11,000 ha concession in Vietnam	Three experts	Two days of field study	(Pollard 2005)
RSPO New Planting Procedure for oil palm plantation	51,920 ha concession in Gabon	Thirteen experts and 11 assistants	Sixteen days of field study and quality control	(Proforest 2011)
RSPO New Planting Procedure for oil palm plantation	10,000 ha concession in Liberia	Three experts on ecology, biodiversity, and forestry	Less than 1 month of field study and background research	(Kheong 2011)

protect public image against criticisms which is among the most important market benefits for forest certification (Araujo *et al.* 2009; Chen *et al.* 2010).

Most of us accept that perfection is unobtainable and that compromises and shortcuts are necessary. In the context of public image, it seems that a partial survey matters more for some species than others. Nongovernmental organizations (NGOs) and media would likely pounce on a "green business" if their operations killed even one endangered orangutan (*Pongo pygmaeus*). In contrast the moths and molluscs we discussed earlier are unlikely to be noticed or to raise much interest if they were. Who decides which species require what treatment? Guidelines such as Indonesia's High Conservation Value Tool Kit, which is commonly used by companies to identify areas of biodiversity importance, require population-level management for threatened and endangered plants, but management at the individual level for animals (Consortium to Revise the HCV Toolkit for Indonesia 2008). But while such relative judgements appear necessary, even this generalization remains challenging—which companies on Borneo can manage animals such as the vulnerable dragonfly species *Coeliccia flavostriata* or the Bornean water shrew *Chimarrogale phaeura*? Similar concerns will apply to plants—for example, there are species known only from a single site (e.g., some Asian slipper orchids *Paphiopedilum* spp.) which would therefore be of high conservation significance—but very few people would be able to recognize them in the field, and the species might occur anywhere. Currently, guidelines are insufficient and any decision would be open to dispute—something companies seeking green credentials would like to avoid. With willing companies looking for guidance based on consensus what should we advise?

Overcoming disincentives for forest industries

The difficulty of species detection and identification is not the only obstacle for companies willing to seek and protect species of conservation significance. If a company knows that the discovery of a species will cause delays and other costs this is a powerful disincentive for them to seek, discover, and publicize their survey findings. For example, a company with whom we have worked but cannot identify, appears committed to implementing best practices in biodiversity-friendly forest management. Numerous taxonomic experts have conducted surveys at their site. New species of plants, amphibians, and possibly even one mammal have been identified. What is not clear, however, is whether surveys in other as yet unsurveyed areas, would also reveal these new species or indeed others. The company faces a dilemma: transparency or secrecy. Either it could publish their findings, and try

to engage the possible public outcry due to its operations in an area of apparent diversity and species endemism. Or it could ensure that the information remains confidential. For the sake of conservation science, the former is preferred. For the sake of business, the latter course appears much easier.

In a world where "best practice management" is often voluntary we need companies to feel comfortable to recognize and publicly report the occurrence of rare species. Companies that fail to look should not benefit by comparison. One option would be to ensure all companies are transparent and that information on their environmental track record is available in public from a credible regulatory body. Access to public data in the U.S.A. has contributed to significant reductions in overall industrial pollution (Jobe 1999), although evidence suggests such procedures penalize larger, more "visible" companies in comparison to smaller ones (Lanoie *et al.* 1998). Another option would be for companies or industries to develop their own guidelines and rely on self-policing for effective implementation. Transparency would still be important given that industrial self-policing policies that allow confidentiality generally fail to reduce environmental impacts, for example, pollution by U.S.A.-based industries (Stretesky & Lynch 2009).

We need to acknowledge and understand the costs and risks of achieving good practice and ensure that the incentives are adequate (McCann *et al.* 2005). In much of the world, whatever the legal statutes may say, the actual standards applied are low or easily evaded. Companies that want to be green can find themselves priced out of the market by trying to achieve high environmental standards. Setting the standard too high ensures that the best intentioned companies are uncompetitive with respect to those who do not try. This effect is often increased because of the general scrutiny from NGOs and media that large or international companies receive compared to small or nationally operated ones. Because of their size of operations, such companies potentially have large environmental impacts, and their international exposure makes them good targets for environmental NGOs. But they are often also those with the most pressure from boards and shareholders to adopt and implement best practice standards. This results in a situation where a few of the best companies are regularly criticized for relatively minor transgressions, thus raising their costs of compliance, whereas many bad companies fly under the radar.

A good example is the Indonesian mining industry in which international companies with relatively good practices have been forced out of business by allegations of their negative impacts whereas hundreds of smaller companies with, relatively speaking, much worse environmental performance attract minimal interest and have gained control of numerous operations on the ground (Anonymous 2006).

A challenge for conservation biologists

Poor forest management is a recognized problem (Dennis *et al.* 2008; Zagt *et al.* 2010). Underlying reasons include the costs and skills required to comply with standards for good management. The key to keeping companies engaged and improving is to ensure it makes good business sense. This requires incentives as well as achievable goals (Russo & Fouts 1997). The same reason for being seen to be green—making money from new market opportunities—is also a reason for companies to do as little as they can get away with. Systems need to be simple but effective, useful, and verifiable, and above all realistic and demonstrably achievable.

Conservation biology, including the large body that focuses on species and their management, has strongly influenced ideas about what constitutes good tropical forest management, but practical guidance from applied research remains scarce (Whitten *et al.* 2001; Meijaard & Sheil 2007). As conservation biologists we need to be much more aware of both our own limitations to comprehend the dynamics of complex systems such as tropical forests. Understanding that conservation biology is as much an art as it is a science may put us in a better position to give useful practical direction to the management of poorly defined concepts like sustainability and ecosystem integrity (Soulé 1985; Sheil *et al.* 2004). What general management advice can we give to forest industries that, if implemented, allows them to say that to the best of their knowledge their forests have retained the species abundance and diversity, ecological functioning, and environmental services of the forests prior to disturbance? Whatever that advice is, collecting data is likely to be only a part of it (Sheil 2001).

We need to ensure a well-judged trade-off in which we not only give managers the information needed for good management but also the tools and knowledge to ensure that they can use and respond to it. There are many general procedures in terms of basic good practice that are likely desirable in any conservation setting whatever species are present. This includes practical guidance on reduced impact and biodiversity-friendly logging (Pearce *et al.* 2003; Meijaard *et al.* 2005), or more general principles for conservation-friendly management, such as guidelines for landscape management (Fischer *et al.* 2006; Lindenmayer *et al.* 2008) or management based on ecosystem service indicators (UNEP-WCMC 2011). We need to provide businesses with green guidelines that are straightforward to implement and of which it can be

reasonably expected to maintain species diversity and abundance. Data on species need to be weighed in a process that recognizes all these options that compete for limited resources.

Ways forward

For now our primary point is to emphasize that a problem exists and a search for solutions is required. One way forward would be to establish international standards that require good forest, plantation, and mine management for all companies, not just those that volunteer. European Union Timber Regulation and U.S.A. Lacey Act style prohibition on commerce in illegally sourced wood is a step in the right direction, but legislation should expand to broader aspects of forest management, and include other major importers of timber and minerals, such as Japan, India, and China.

The Extractive Industries Transparency Initiative (EITI) could be another helpful tool if requirements to track and audit revenues from resource extraction were combined with certain environmental standards. Even more important perhaps is the role of national legislation in producer countries. This should include mandatory standard operating procedures and transparent monitoring. In many tropical countries, such legal systems are often undermined by poor standards, and even in cases where standards are present they lack enforcement. The shortfalls derive from a diverse set of challenges that include training, awareness, resources, political expediency, and corruption. The emergence of international standards and regulations, however, provides directions for improvement, while publicly accessible information, such as remotely sensed data on forest cover change, makes transgressions by companies easier to spot. Conservation scientists and NGOs should offer assistance in monitoring the environmental performance of companies, but in this respect it is important that not only "low-hanging fruits" such as large international companies are targeted but also the smaller or national ones that tend to fly under the radar.

These challenges are not new. For example, the data required for the certification of timber from "well-managed" production forests have already spurred considerable investment into selecting practical measures and ways to use them—they have highlighted tension between the practical and the ideal (Sheil *et al.* 2004; Auld *et al.* 2008; Zagt *et al.* 2010). One conclusion is the need to focus on information that can actually lead to better management outcomes and to thus place more emphasis on the management process and not on the data alone (Sheil *et al.* 2004; Meijaard *et al.* 2005). For example, given limited resources we might achieve more by ensuring these are used to control hunting rather than using it to record animals (Bennett & Robinson 2000; Sheil *et al.* 2004). In this case, conservation biologists need to apply their analytical skills to guide companies about the cheapest and most effective ways to reduce hunting, whereas minimizing negative reactions from local hunters, and ensuring compliance with national laws.

What other initiatives would help practitioners and businesses focus their efforts? Perhaps a set of guiding information could be made available online. Experts would map the known and potential distributions of all the species of conservation significance in each region. Inputting any location into the online system would result in a list of all the species that should be searched for in an impact assessment. Each species would be linked to a "how to" set of methods on how to seek and identify them, and the experts that can help. If the species are detected further information would highlight the implications. Different standards could be specified, for example, bronze, silver, and gold depending on the level of pro-green-effort demonstrated.

Areas with potentially lots of endangered species will require more effort. Nonetheless we need to ensure that requirements are practical and helpful rather than bureaucratic and obstructive otherwise they will be avoided. Collaborations between scientists and governments could establish, manage, and encourage minimum standards. Such standards could, for example, wholly ban certain types of practices in some regions (e.g., oil palm on deep peat soils). They could also include specific management guidelines if certain species are present within concessions. Indonesia's national action plan for orangutans, for example, requires that all remaining populations have to be stable by 2017 (Soehartono *et al.* 2007), and minimum standards should prescribe that companies with orangutans in their concessions effectively control threats such as hunting, set aside a given percentage of the forest for conservation, and develop a government-approved forest management plan (Meijaard *et al.* 2012). Implementation would benefit a suit of other forest species. There will be a need for oversight, with an audit body that can check and develop the framework which will be regularly updated.

There will also be value in trying to ensure a favorable context for such conservation-friendly businesses. There are many elements to developing such a context and exploring incentives. For example, governments could ensure that companies do not pay taxes on lands set aside for conservation at the same rates as they do on land used for production. A useful summary of many of these issues

and their relevance to biodiversity conservation in forest areas used for timber production has been provided in the IUCN/ITTO (2009) guidelines.

Progress requires realism. Once an area has been set aside for productive use it is no longer reasonable to expect it to remain pristine and to maintain all the values that pristine forest can provide. Conservation researchers and related professionals have to ensure they keep their demands realistic and constructive. The surveys and decisions regarding which areas are to be strictly protected should be made by national authorities based on the knowledge and information available.

Companies can be asked to behave in a responsible manner and to pay specific attention to reasonable issues—but "reasonable" here means affordable and realistic. Excessive demands can be a distraction and disincentive. Biologists need to help by guiding these priorities and developing tools and approaches that give a bigger benefit from a limited investment of time and resources. This could include easy guides and keys to locating and identifying selected endangered species, simple methods for their monitoring and assessment, and due attention to key threats that are often neglected might be readily managed in such a context (e.g., the recognition and management of alien species).

Pragmatism will be key. Perfection is not achievable and in a world of limited resources and capacity, pushing too hard is counterproductive. The good news is that well-informed management with sensible guidance can still contribute significantly to conservation outcomes.

Acknowledgments

We thank Hugh Possingham and four anonymous reviewers for providing input into an earlier version of this manuscript.

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