



Amazonia revealed: a perspective from the Amazon

As Foley *et al.* indicated (*Front Ecol Environ* 2007; **5**[1]: 25–32), we are now at “a critical point in the history of the Amazon Basin”. The examples provided by the authors clearly show that several of the ecosystem goods and services provided by Amazonian forests are being lost due to deforestation. Given that, at the moment, there is a great need to find viable alternatives to forest destruction, we as researchers and conservationists cannot afford to be unclear about the definitions and concepts we provide to policy makers, funding agencies, and governments. Unfortunately, Foley and his co-authors do not make a clear distinction between forest management and unplanned logging, and seem to argue that selective logging is equivalent to deforestation. Such an image is easily absorbed by a public that associates logging with the large clear-cuts common in northern temperate forests, but this does not coincide with the reality in the tropics, where hyper-diverse forests allow for the selective extraction of a few (1–20) trees per hectare. Foley’s definition therefore does not conform to reality, does not acknowledge the role of forest management as a conservation tool, and completely denies all the advances made in reducing the deleterious impacts of logging. It also assumes that selective logging and outright deforestation have the same negative impacts on ecological services. Although the authors mention four examples of services that are being deteriorated by deforestation and logging, they only present evidence of the effect of logging on carbon storage. They present no evidence for the effect of logging on water flow regulation, regional and global climate regulation, or vector-borne diseases, probably because it is currently unavailable.

Advocates of forest management as a tool for conservation will not deny that timber production results in

forest damage, but will point out that the amount of damage varies with logging intensity, application of reduced-impact logging techniques, and commitment of the logger to long-term sustainability. While logging damage certainly has impacts on the ecological goods and services provided by forests, these impacts are much smaller than that of deforestation. For example, studies in Guyana have shown that the effect of selective logging on water and nutrient cycling is negligible (ter Steege *et al.* 1995). The difference in the impact caused by forest management and deforestation lies basically in the fact that forest management allows for the long-term maintenance of vegetation cover, and therefore of many ecological services. It also allows for rapid recovery of vegetative cover, even in areas heavily damaged during logging operations, such as large logging gaps (eg Broadbent *et al.* 2006). Even in the case where single dominant species have been logged at high intensities, no long-term effects (>75 yr) on forest structure, species composition, or diversity could be detected (ter Steege *et al.* 2002).

There is certainly an urgent need for alternatives to deforestation to guarantee that ecosystem goods and services provided by the Amazon Basin are not lost. Forest management is one of them, if we can manage to put our prejudices aside and if all people committed to forest conservation accept that it is better to have a managed forest than a soybean field or cattle ranch.

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Forest management versus forest degradation and destruction

Efforts at improving natural forest management as an approach to conservation and development in the tropics are impaired when exploitative logging is confounded with forest management for timber, and when both are thrown in together with deforestation. In the otherwise informative article by Foley *et al.* (*Front Ecol Environ* 2007; **5**[1]: 25–32), selective logging seems to be equated with forest degradation and destruction, with nary a mention of forest management. That some of the logging detected from satellites is being carried out according to government-approved management plans is not even mentioned. The cover image is especially ironic because, although most readers of *Frontiers* will share our anguish over the destruction of such a beautiful tree, the felling technique displayed is remarkably good. Most fellers would simply cut such a tree above the buttresses, thereby wasting a great deal of wood. Notice the small step cut in the stump; that innovation, attributed to Johan Zweede of the Fundação Floresta Tropical, decreases the likelihood that the trunk will split when the tree falls. Clearly, what is depicted is a phase of forest management and not, as readers are likely to infer, forest destruction.

With Brazil leading the world in natural tropical forests certified as well-managed by the Forest Steward-

ship Council, and with an area about the size of New England officially designated for forest management in the Brazilian Amazon (Veríssimo *et al.* 2002), it is high time for such confusion to cease. Unfortunately, with fewer people working in the woods, confusion is likely to reign unless researchers and the policy makers they inform are very careful to differentiate between forest management and forest destruction.

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Veríssimo A, Cochrane MA, and Souza Jr C. 2002. National forests in the Amazon. *Science* **297**: 1478.

The authors reply

Peña-Claros *et al.* and Putz *et al.* rightly point out the critical role of forest management as a determinant of the long-term efficacy of timber resource use in the Amazon region. They are correct to note that good forest management practices are the way forward, but this hasn't yet happened at the large, nearly continental scale that we aimed to address in our paper. They failed, as we did, to fully describe what has occurred in the recent past in the Brazilian Amazon. About half of the selective logging in the region is illegal and, hence, unregulated (Barreto *et al.* 2006). Moreover, up through 2002, selective logging was regionally dominated by high-damage extraction operations that left the forest susceptible to drought and fire (Nepstad *et al.* 1999; Gerwing 2002; Souza *et al.* 2003; Asner *et al.* 2006). Logging was often a precursor to deforestation (Asner *et al.* 2006), facilitated by the increased access to the forest that unofficial logging roads provide to people on the landscape (Souza *et al.* 2005). Furthermore, as of 2005, the total land under Forest Stewardship Council (FSC) green certifica-

tion was 12 619 km² (FSC 2005), which is only ~3% of the land supplying timber to markets (Barreto *et al.* 2006). Thus, in recent years, the evidence suggests that selective logging was not dominated by the kind of well-managed, low-impact, green certification operations intended to preserve forest cover, structure, diversity, and function, and serving an alternative to deforestation.

Meanwhile, organizations like the Fundação Floresta Tropical are beacons of hope for change. They are teaching reduced-impact logging (RIL) methods to loggers, and are spreading knowledge of ways to make forest use more sustainable. RIL methods decrease forest damage per cubic meter of wood extracted (Pereira *et al.* 2002), and RIL is reported to be cost-effective (Holmes *et al.* 2001). With an even more rapid expansion of RIL methods throughout the entire Amazon, along with the planned control of timber extraction via concessions in Brazil (Veríssimo *et al.* 2002), the link between selective logging and forest degradation might be broken.

We certainly agree that good management is the path to creating a forest use scenario that will supply goods and services to society for the long term and serve as an alternative to deforestation. We also agree that the term degradation is abused in the literature, and that we did not correct this situation. In the future, from an ecological science standpoint, we might consider using the term *disturbance* in place of *degradation* (Asner *et al.* 2006).

As for the cover photo, that image was chosen by *Frontiers* staff, not by the authors, and yes, it does show exceptionally good felling practices at work.

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The best papers are the boldest

John Grace's comments on what constitutes a good paper and the problems of citation counting were timely (Pathways to Effective Communication; *Front Ecol Environ* **5**[1]: 49–50). However, as someone who is both a "Roger" and a "Rebecca", I would suggest that papers addressing the interdisciplinary challenge of sustainability are more important (Cloud 2005). It