



RESEARCH LETTER

# On Biodiversity and Ecosystem Services

conservation – biodiversity – ecosystem service provision – planted forests – forest resilience – forest restoration



## OUR DEPENDENCE ON FOREST BIODIVERSITY

Forests worldwide are important habitats for plants, animals and microorganisms. Forests in tropical and sub-tropical regions harbour most of the world's terrestrial biodiversity, but temperate and boreal forests also contain rich communities and are critical for biodiversity conservation.

Biodiversity is a key determinant of forests' ability to effectively provide ecosystem services. These ecosystem services include supporting services such as nutrient cycling, soil formation and primary productivity; provisioning services such as food, water, timber and medicine; regulating services such as erosion control, climate regulation, flood mitigation, purification of water and air, pollination, and pest and disease control; and cultural services such as recreation, ecotourism, educational and spiritual values.

Everyone on the planet depends on these ecosystem services. However, according to the Global Forest Resources Assessment 2010 report of the Food and Agriculture Organization of the United Nations (FAO), biological diversity is threatened by a high global rate of deforestation and forest degradation as well as a decline in primary forest area.

Deforestation and degradation are the major causes of global biodiversity loss in terrestrial ecosystems. Other threats include climate change, pests and diseases, and biological invaders. These factors represent, or are expected to create, considerable challenges to the sustainability of forests and to their capacity to deliver ecosystem services.

*Scientists have begun to provide guidelines for improving the resilience of forests. In many cases biodiversity considerations are important parts of the likely solutions. These considerations are highly relevant for forest policy and management.*

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## FOREST BIODIVERSITY AND THE UNITED NATIONS (UN) SUSTAINABLE DEVELOPMENT GOALS

The inter-governmental Open Working Group that was tasked by the UN General Assembly to prepare a proposal on the UN Sustainable Development Goals (SDGs) identified ecosystems and biodiversity as a focus area for achieving sustainable development and proposed to ensure the sustainable management of all forests and mountain ecosystems and to halt deforestation and increase reforestation by the year 2030.

### VALUATION AND PAYMENTS FOR ECOSYSTEM SERVICES

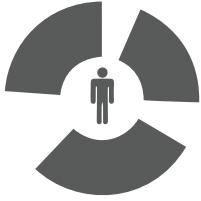
Many ecosystem services are taken for granted, and landowners and managers are rarely compensated for providing these services and for managing their land accordingly. There has been much discussion about how payments for ecosystem services could be implemented to increase incentives for the provision of these services.

To assess the true value of ecosystem services is a goal of “the economics of ecosystems and biodiversity” (TEEB) initiative. Policies that result in greater recognition and payments for ecosystem services and biodiversity are likely to be strong drivers in the future.

### INCREASING RELEVANCE OF PLANTED FORESTS

According to the FAO’s “Global Forest Resources Assessment 2010”, planted forests increased by 5 million ha/yr between 2000 and 2010, and supply an increasing share of the world’s wood. As the area of planted forests and their importance in the supply of forest products is increasing worldwide, considerations about biodiversity and the delivery of ecosystem services also become more important.

While there are elements of biodiversity in planted forests that can be well represented, planted forests tend to be less diverse than natural forests and, as a result, may be less effective in terms of the delivery of a wide range of ecosystem services. Therefore, there is interest in approaches to managing planted forests to enhance the delivery of ecosystem services, ideally with benefits to all concerned parties.



## KNOWLEDGE GAPS

There is a growing awareness of the role of biodiversity in the provision of ecosystem services and in people's dependence on these services. However, it is not always recognized that forests provide ecosystem services to adjacent land uses (outside of forests) and to people who are distant from these forests. Mechanisms and processes that help to clarify and increase the awareness about ecosystem services from forests should be supported, including mechanisms for valuation and payment of ecosystem services and related mechanisms such as REDD+ (reducing emissions from deforestation and forest degradation).

Other knowledge gaps exist, for example, on relationships between plant species richness, functional diversity and biomass accumulation in diverse tropical forest systems, and on relationships between species richness and ecosystem resistance (to disturbance); on long-term effects of forest ecosystem degradation on rates of recovery of forest ecosystems; on the levels of ecosystem service provision from secondary forests, including increasingly widespread 'novel' forest ecosystems.

## IUFRO'S TASK FORCE "BIODIVERSITY AND ECOSYSTEM SERVICES"

This Research Letter summarizes the findings of IUFRO's Task Force "Biodiversity and Ecosystem Services" between 2011 and 2014. The Task Force focused on two key areas: the role of planted forests in the provision of biodiversity and ecosystem services (BES) and opportunities for management, and forest biodiversity and ecosystem services in tropical regions.

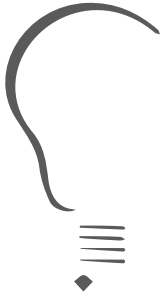
The subject matter is related to the objectives of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) and the UN Convention on Biological Diversity (CBD).



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## LESSONS LEARNED

There is increasing recognition that most forest ecosystem services are related to forest biodiversity - directly or indirectly - and that forest loss and degradation are key drivers that negatively affect the delivery of ecosystem services.

The diversity of tree species in forests has implications for the provision of some ecosystem services such as biomass production and carbon storage, as well as resistance to forest pests. Although these findings are highly relevant for all forests, they are of particular significance to planted forests, which are often composed of a small number of tree species and therefore tend to have lower levels of biodiversity than natural forests. Furthermore, planted forests represent a growing proportion of the world's forests, and it is likely that we will rely increasingly on planted forests for the provision of vital ecosystem services.

In tropical regions, people are often more directly dependent on ecosystem services provided by forests. Hence, future efforts in this area should also give particular consideration to topics relevant for tropical (and sub-tropical) areas.

Finally, recent years have seen the emergence of what could be called the *functional trait paradigm*. Community ecology, including of course forest ecology, is being rebuilt on the basis of measurements of plant functional traits – easily measurable characteristics of organisms that affect their responses to environmental change and their effects on environmental conditions. Functional trait diversity (FTD) may well be more important than species diversity per se in understanding the relationships between forest diversity, ecosystem services, human well-being and global change. The full integration of the FTD approach into forest sciences in the coming years should greatly strengthen the evidence base for forest conservation and management.



## CONCLUSIONS

Even though the exact nature of the relationships between forest biodiversity and the delivery of ecosystem services is not yet known in its entirety and partly based on incomplete evidence, it is already clear that forest biodiversity contributes to the delivery of ecosystem services and that forest loss and degradation have adverse effects on people. The functional trait diversity approach will strengthen understanding of these relationships.

As such it is recommended that, based on the precautionary principle, policy makers should do their utmost to prevent further forest loss and fragmentation, and to support activities that aim at forest restoration, biodiversity conservation and restoration, and diversification of planted forests and degraded forests.

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