

# forest quality

ASSESSING FORESTS AT A LANDSCAPE SCALE

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NIGEL DUDLEY, RODOLPHE SCHLAEPFER,  
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# Forest Quality

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# Preface

The following manual is a practitioners' guide assessing forest quality at a landscape scale.

The book describes a *framework for forest quality assessment* that can be tailored to individual needs and to a range of outputs. It summarizes work by the World Wide Fund for Nature (WWF), The World Conservation Union (IUCN) and the École Polytechnique Fédérale de Lausanne, in association with the German development organization, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), including field-testing in Europe, Central America and the Congo Basin in Africa. The framework aims to provide information for a number of distinct purposes:

- identifying the current and future potential of forested landscapes from environmental and social perspectives;
- distinguishing between different levels of ecological forest quality at a landscape scale to aid in prioritizing conservation interventions;
- planning conservation interventions within priority landscapes identified in ecoregional planning processes or similar;
- providing a basis for negotiation about trade-offs between different forest uses and development of a vision for a forest landscape;
- developing a monitoring and evaluation framework for a variety of conservation actions – protection-management-restoration – within a landscape;
- assessing specific elements of forest quality as part of wider research;
- undertaking long-term monitoring of conditions within a forested landscape.

Application of the framework can vary from being a first, coarse and approximate assessment of conditions to a detailed research programme. It can also be used to provide a single 'snapshot' in time, an indication of trends or long-term monitoring of progress over time. Examples of different uses are included in the book.

Although developed for use in the forest sector, the thinking behind the approach could equally be applied to the assessment of other natural and cultural resources such as marine ecosystems, freshwater and more generally to assessment of landscape or seascape values.

# List of Acronyms and Abbreviations

C&I	criteria and indicators
CBD	Convention on Biological Diversity
CEC	Commission for the European Communities
CIFOR	Center for International Forestry Research
DEVP	Dyfi Eco Valley Partnership
FAO	Food and Agriculture Organization
FSC	Forest Stewardship Council
GIS	geographical information systems
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German technical development organization)
HCVF	High Conservation Value Forests
HEP	hydroelectric power
ISO	International Organization for Standardization
ITTO	International Tropical Timber Organisation
IUCN	The World Conservation Union
MAB	Man and the Biosphere
MCPFE	Ministerial Conference for the Protection of Forests in Europe
MINEF	Ministère des forêts et de la faune
NGO	non-governmental organization
NTPF	non-timber forest product
NWGS	non-wood goods and services
PEFC	Programme for the Endorsement of Forest Certification
PES	payment for environmental services
PRA	participatory rural appraisal
P&C	principles and criteria
RAPPAM	Rapid Assessment and Prioritization of Protected Area Management
SWOT	strengths, weaknesses, opportunities and threats
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization
WDPA	World Database on Protected Areas
WRI	World Resources Institute
WWF	World Wide Fund for Nature

# **Part 1**

## **Measuring Forest Quality**



## 1

# What is Forest Quality?

*The Tree that moves some to tears of joy is in the Eyes of others only a Green thing that stands in the way*

*The poet and artist William Blake, circa 1800 in a letter to Reverend John Trusler*

*In the foothills of the Snowdonia National Park, in Wales, we're looking for an abandoned village; a scatter of houses left behind when a slate quarry closed. It is marked on the map and clearly visible from the road, but is nowadays surrounded by a dense sward of conifers in one of the state-owned forests. We are probably trespassing, forcing our way up a steep slope – often literally on our hands and knees – through dense stands of Sitka spruce. No-one can have been in here for years. The ground is covered with a thick mat of needles, empty of any plants except for the odd place where a windfall has created a little pool of light and life; and here the burst of green forms a sudden contrast with the featureless surroundings. The dense foliage muffles sounds as well, so that we are in virtual silence. It's peaceful, but rather unreal.*

*The few ruins, when we finally reach them, seem as remote as a village hidden away in a tropical jungle and it is hard to imagine this place as it must have been 50 years ago, stuck out on the edge of a bare hillside, with quarrymen patiently cutting slates for roofing. Most of the men died young, their lungs clogged with decades' worth of thick dust. This operation was obviously abandoned in a hurry. There are still hundreds of slates stacked neatly as if ready for sale, although they are now frost-shattered and covered in a thick growth of lichen, and all the cottages have lost their roofs.*

*We take a different route out, slithering uncomfortably down a slope where tree branches pull at our faces and hair, but then suddenly burst out into a scrap of remnant oak woodland left around the banks of a stream. The change is immediate, like switching on a light in a darkened room, a burst of new colours and sounds. There is a range of trees: sessile oaks interspersed with birch,*



*Note: In the Snowdonia National Park, Wales, ancient native woodlands and exotic conifer plantations are both labelled 'forests' but their qualities are very different.*

Source: Nigel Dudley

**FIGURE 1.1 Two views of Snowdonia**

*hazel and yew. Twisted tree branches are dripping with lichens and mosses, and we have to clamber over fallen logs, while underfoot there is a rich profusion of flowers and ferns. The trees are full of birdsong and overhead the mewing call of a buzzard sounds above the canopy.*

The two worlds, pressed up against each other physically, remain in other ways a universe apart. Yet both the conifer plantation and the oak wood are 'forests'. And they both have their uses and their champions. At the heart of this book lies an attempt to understand the differences between the quality of different forests – many far more subtle than the deliberately stark example from Wales – and what 'forest quality' means in practice.

## Quantity and quality

Everybody knows that the world is losing forests – images of deforestation fill our magazines and television screens. But it is not just the number of trees that matters; the quality of the forest is also important. Even where the forest area is stable or increasing, there are often rapid changes in its character. Natural forests are being replaced by plantations or by intensively managed forests. Forests around the world are generally becoming younger and less diverse, in both species and structure; this has important impacts for biodiversity and also affects many human values.

A tree plantation is as different from a natural forest as a football pitch is from a wildflower meadow: both may have their place in the forested landscape but it is important that we distinguish between them and understand their different qualities.

Throughout the 1980s and early 1990s, global concerns about forest conservation focused on the rapid rate of deforestation in tropical countries. While this is a real and continuing issue, it is only one half of a more complex problem of global forest management. Growing interest in the status of temperate and boreal forests resulted in recognition of the importance of social or ecological values. Forest *quality* was recognized to be as important an issue as the *quantity* of forest remaining (Dudley, 1992).

There is a growing perception that global forest quality is declining as a result of human activities. Ecologists have become concerned about the replacement of biologically rich old-growth forest with species-poor young forests, intensively managed forests or plantations and the decline in the health of trees and other forest species as a result of anthropogenic changes, especially air pollution and climate change, but also as a result of introduced pests and diseases and invasive species. This in turn has led to a breakdown in the ecological support systems associated with forests including hydrological systems, soil structure and fire ecology. People interested in social welfare and development complain about threats to social rights in forests including issues related to tenure, access and changes of management that have resulted in a decline in non-wood goods and services (NWGS). Lastly and more generally, the changes are resulting in more intangible and hard-to-measure losses to the aesthetic, cultural and spiritual values that many people demand from forests.

Each of these aspects of 'forest quality' has its own champions and detractors. The public debate about the role of both plantations (Carrere and Lohmann, 1996) and air pollution (Dudley et al, 1985), for instance, has frequently been bitter. In those countries where forest cover has stabilized – particularly in the richer temperate and boreal countries of Europe, the Commonwealth of Independent States, the US, Japan, Australia and New Zealand – the debate about forests has shifted from how *much* forest we need to what *kind* of forests remain or could be recreated.

Although the discussion about forest quality initially centred on temperate and boreal forests, as it gained attention, concern about quality has spread to tropical areas as well. The focus of conservationists working in the tropics has been on conserving remaining areas of primary forest. A sharp distinction has been made – at least in theory – between 'natural forest' and 'disturbed forest', although these categories are often poorly defined. Forest that has been disturbed or selectively logged is frequently relegated to a low status in terms of its conservation value. Indeed, it is sometimes not referred to as 'forest' at all; it is for example not uncommon to hear conservationists

say that a country like Cameroon has 'barely any forest left at all', even though around 20 million hectares of the country is covered by predominantly natural forest vegetation (Global Forest Watch, 2000). However, this distinction is becoming increasingly hard to maintain as more and more areas of apparently remote tropical forests are also disturbed – sometimes dramatically. A research study published by the German technical development organization Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) estimated that 32 per cent of forests in the tropics are 'secondary' even using a fairly coarse definition of secondary as *open forest, long fallow and fragmented forest* (Emrich et al, 2000). A more precise definition, including all forests where disturbance has taken place in the recent past, would include a much larger proportion of the total.

## But what exactly is forest quality?

Quality means different things to different people. Commercial timber producers will probably not look at a forest in the same way as local villagers, holidaymakers or indigenous people. Yet their views are all valid. The needs of wild plants and animals may not always be the same as our own. Forests give us an astonishing range of goods and services, and reconciling these within a policy of sustainable forest management presents a major challenge to planners and managers. Some countries, such as Germany, have attempted to achieve this by managing forests so that each particular forest stand supplies a wide range of economic, social and environmental benefits, while countries like New Zealand have made a sharp distinction between commercial timber and fibre plantations and 'natural' forests managed for biodiversity and social values.

In practice, some qualities are hard to reconcile: for example timber production and wilderness values. Many forests that are supposedly managed for multiple purposes ('multipurpose forests') have tended to exclude or underplay certain values. However, although a single forest stand cannot easily supply all the potential forest goods and services, this should be possible in a well-designed and managed forest *landscape*, containing a mosaic of different land uses. For example, some forests might be set aside particularly for specialized needs like biodiversity conservation, watershed protection or wood production, while others will serve a range of different functions. We are interested here principally in forest quality on a landscape level; that is, in the overall values of many different areas of forest within one landscape mosaic.

To create forest landscapes that serve many requirements, we need to understand what makes up forest quality, both for wildlife and for people: to understand that, we need first to understand and to cater for different perceptions of forest quality. This is at the core of the forest quality project and the framework for assessment described in this book.

## A brief overview of changes in global forest quality

This book is principally about assessment, but a brief discussion of how forests changed during the last century might help set the scene for what follows.

Generally, forests have declined in naturalness over the last 100 years. In some areas, such as western Europe, Japan and much of eastern North America, natural forests were largely cleared hundreds or thousands of years ago, and here the change was more in an increasing 'standardization' of secondary forests. Research undertaken by the United Nations Economic Commission for Europe (UNECE) found that most European countries have less than 1 per cent of their forests in anything approaching a natural state (FAO and UNECE, 2000). National correspondents were asked to estimate the area of 'forest undisturbed by man' as an approximation of 'naturalness', which was defined as forests that had no human disturbance or had been disturbed so long ago that natural processes were completely re-established. According to replies received, 55 per cent of forest studied by the

Temperate and Boreal Forest Resource Assessment can be classified as 'natural'. However, this global figure is distorted by the forest rich areas of Canada and the Russian Federation, and outside these countries the figure for forest drops to just 7 per cent of the total, with most of this in the US and Australia. Sweden records 16 per cent of its forest as natural, Finland 5 per cent and Norway 2 per cent. In the rest of Europe the proportion is usually from zero to less than 1 per cent (Dudley and Stolton, 2004).

Similar changes are now taking place in tropical forests. Although most tropical forests have also long been affected by human activity (Posey and Balee, 1989), until recently this has often been relatively subtle and tropical forests have in general retained a far more natural ecology and structure. This is now changing. Forest degradation affects many of the tropical wet and dry forests that remain, most commonly through logging out the largest individuals or changing forests as a result of overgrazing, unsustainable harvest of non-timber forest products (NTFP), changes to fire regimes and fuelwood collection.

These changes have had a marked impact on biodiversity. Consistent analyses over the last 20 years have found the highest levels of threat to terrestrial species being amongst those found in forests: this is true both for species in developing countries and in highly developed countries. Analysis of the *2000 IUCN Red List of Threatened Species*, found that 74 per cent of threatened bird species are almost entirely confined to a single habitat and of these, 75 per cent are dependent on forests (though in each case figures refer to that proportion of threatened species where analysis was possible). Tropical forests contain a high proportion of the threatened species, including 900 bird species. In addition 33 per cent of threatened mammals use lowland tropical rainforest and 22 per cent use montane tropical rainforest. Habitat loss is the over-riding threat to wildlife including for example 89 per cent of threatened birds, 83 per cent of threatened mammals and 91 per cent of threatened plants (analysis focused mainly on trees), and selective logging alone threatens 31 per cent of threatened bird species (Dudley and Mansourian, 2003 drawing on the IUCN Red Data List). In Finland, one of the countries with the highest proportion of forest cover in the world, 44 per cent of the almost 1700 species listed in the Finnish Red Data Book are associated with forests.

At the same time, there has been increased recognition of the value of forests in terms of their environmental benefits, principally through their value in protecting watersheds to supply high quality drinking water, their role in soil control and prevention of avalanches and their potential to sequester carbon. For instance, roughly a third of the world's 100 largest cities draw a significant proportion of their drinking water from forests within protected areas, and protection has often been spurred by recognition of their value in maintaining high quality water (Dudley and Stolton, 2003a). Forests are also proven barriers to erosion. Many of the earliest successful attempts at reforestation, in Austria, Japan and Switzerland, were spurred by concern about rapid soil erosion and catastrophic avalanche damage (Küchli et al, 1998). A number of countries have identified various types of 'conserved forests' to classify these areas, and the concept that states set aside areas of land specifically for their environmental services is now widely accepted. International initiatives, such as the Convention to Combat Desertification and the Convention on Biological Diversity, explicitly recognize the importance of forests from the perspective of environmental management.

Forest quality has also changed from social and economic perspectives. Most commercial attempts to manage forests have focused primarily on timber and fibre, and indeed the increased efficiency of forests as producers of valuable raw materials has been a major driver behind the changes in the quality of the forests that remain. Increasing use of monocultures, including of genetically similar stock, and of intensive management within secondary forests has dramatic impacts on the structure and the ecosystem functioning of forests and also changes their appearance. Fears that the world would run out of timber have proved premature and most recent analyses conclude that supply is likely to meet or exceed demand (Nilsson, 1996; Solberg et al, 1996; Sedjo, 1999; Victor and Ausubel, 2000) although the impacts of climate change are unpredictable.