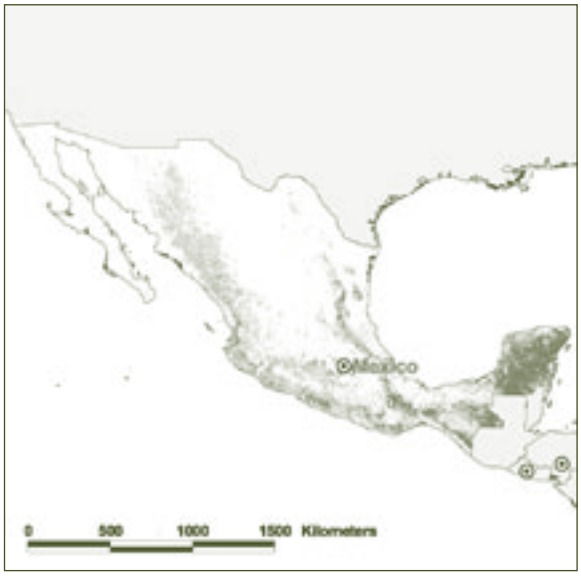
MEXICO



*For legend see page 58

Forest resources

Mexico has a population of 105 million people and a land area of 195 million hectares, making it the third-largest country in Latin America after Brazil and Argentina. It is bordered in the north by the United States; in the west and south by the Pacific Ocean; in the southeast by Guatemala, Belize and the Caribbean Sea; and in the northeast by the Gulf of Mexico. It is mainly mountainous, with less than 35% of its surface area below 500 m and more than half of it above 1,000 m. The northwest of the country contains dry, open forest but rainfall is higher farther south, where tropical moist forests occur. The Southern Highlands, located south of the central plateau, are composed of a number of steep mountain ranges, deep valleys and dry plateaux, including the Chiapas Highlands bordering Guatemala that constitute an important forest zone. The total forest area including bushland (*matorrales*) and non-tropical forest is estimated by Torres Rojo (2004) to be 64 million hectares and by FAO (2005a) to be 55.2 million hectares. The National Commission for Forests (*Comisión Nacional Forestal* – CONAFOR) estimates the forest area to be 56.9 million hectares along with another 58.5 million hectares of 'vegetation' cover in arid zones[b]. There are an estimated 26.4[b] to 33.1 million hectares (FAO 2001) of natural tropical forests.

Forest types. Mexico's ecoclimatic zones can be divided into three approximately equal areas: tropical, subtropical/temperate, and semi-arid/arid. The tropical region includes rainforests, which originally covered 6% of the country but probably about half that now[c]. The major forest type in the temperate and subtropical north is *Quercus* forest, which may be pure or mixed with other temperate-climate broadleaved species such as *Liquidambar styraciflua* (sweet gum) and *Fagus mexicana* (beech). The 'conifer and broadleaved forests' category of the national forestry inventory is characterized by a few dominant species, including conifers such as *Pinus* and *Abies* combined with various species of *Quercus*, *Cupressus* and *Juniperus*. Tropical forests are found on slopes along the Gulf of Mexico and the Pacific Ocean, the Isthmus of Tehuantepec and in southern Yucatán in the states of Campeche, Chiapas, Oaxaca, Quintana Roo and Veracruz. Among typical tree species are *Terminalia amazonia, Dialium* spp, *Brosimum* spp, *Manilkara zapota, Lonchocarpus* spp and *Terminalia oblonga*.

Dynamics of forest resource change. The average annual deforestation rate in 1990–2000 was estimated to be 631,000 hectares, or 1.1% of the forest area (FAO 2005a); it is currently

Table 1 Tropical PFE

Estimated total forest area, range (million hectares)	Total closed tropical natural forest ('000 hectares) Source: derived from FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
55.2–64.0*	33,120	7,880[c]	100	5,600[b]	13,580

* Includes non-tropical forest

an estimated 400,000 hectares and falling[b]. Deforestation is caused mainly by conversion to agricultural land and uncontrolled forest fire. An estimated 550,000 hectares of vegetation are disturbed each year, indicating a rapid degradation process[b]. Forest degradation is often the starting point for deforestation; direct causes of deforestation and forest degradation include incentives for forest land conversion, high levels of rural poverty, illegal logging and the cultivation of illegal crops. Shifting cultivation practices that have been applied successfully for centuries are now a major cause of forest destruction in tropical forests. At the national level, a total of 278,000 hectares of forest are rehabilitated to some extent each year[b].

The Yucatán Peninsula is subject to frequent hurricanes; at the time of report preparation no information was available on the effects of Hurricane Wilma, which hit the Peninsula in October 2005. Forest fires occur mainly in the semi-arid part of the country but also in humid tropical forest areas. Fire is a serious problem and is caused mainly by agricultural and grazing activities; it is exacerbated by the effects of hurricanes, which greatly increase the volume of flammable biomass. The country has made a major effort to combat forest fires[b].

Permanent forest estate. The allocation of PFE *per se* is not done in Mexico. The estimate of the tropical production PFE in Table 1 is based on data supplied by the government of Mexico to ITTO in conjunction with a C&I workshop convened in April 2005 and the estimate of protection PFE is based on data reported by an ITTO diagnostic mission to Mexico.

Planted forests. Estimates vary on the extent of plantations. The ITTO mission reported about 100,000 hectares of planted forest for timber production, mainly in the tropical zone, and about 590,000 hectares for protection and rehabilitation[b]. FAO (2001) estimated a total plantation estate of 256,000 hectares (plus 11,000 hectares of rubber) and an annual planting rate of 35,000 hectares per year.

Institutional arrangements

Forest tenure. Article 5 of the 2003 forest law (see below) states that the forest resources belong to communes (*ejidos*), local communities, indigenous peoples and indigenous communities, private landowners or the government, depending on the location of the forest. An estimated 80% of Mexico's forests are owned by *ejidos* and local communities. These forests are also known as *propiedad social,* or forests under social property. They are owned by about 8,500 communities, or *núcleos agrarios*[b]. Around 15% of the forest area is owned privately and 5% is classified as national land.

SFM policy framework. Mexico has a comprehensive national forest program spanning 2001–2006 and a national Strategic Forestry Plan 2025 (*Programa Estratégico Forestal* – PEF 2025) that sets the framework of SFM. Mexico has developed a C&I framework for temperate forests and is now formulating a proposal to ITTO to develop a set of C&I specifically for its tropical forests, based on the ITTO framework.

Forest policy and legislation. A new forest law (*Ley General de Desarrollo Forestal Sustentable*) for the management of production forests was enacted in 2003 and became effective when the decree (*Reglamento da la Ley General de Desarrollo Sustentable*) was enacted in February 2005. It emphasizes the importance of forest services and their inclusion in forest management. There appears to be some inconsistency in the interpretation of the different laws that affect forest management, including the forest law, the General Law on Ecological Balance and Environment (*Ley General del Equilibrio Ecológico y Protección al Ambiente*) and the General Law on Wildlife (*Ley General de Vida Silvestre*). In addition, many state governments have created their own forestry/environmental laws.

A number of special programs were set up in the 1990s to bring about greater consistency in forest policy. The most important ones are: the National Forest Development Program (*Programa Nacional de Desarrollo Forestal* – PRODEFOR); the national reforestation program (*Programa Nacional de Reforestación*), which is designed to promote the reforestation of deforested areas; the community forest development program (*Programa de Conservación y Manejo Sustentable de Recursos Forestales en México*); and the national reforestation program, PRODEPLAN, for promoting commercial plantations. These programs are geared mainly towards community development and the reduction of poverty through the restoration of natural capital.

In October 2003, CONAFOR launched a pilot program in markets for environmental services to increase funding for forest conservation and management.

Institutions involved in forests. Mexico is a representative, democratic and federal republic comprising 31 states and one federal district. Each state is autonomous in all internal affairs. In many of the states there is a major interest in environmental issues such as forest restoration and conservation. Several states have their own secretariat for environmental and forestry issues. At the federal level, the Secretariat for Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales de México* – SEMARNAT) is the responsible government agency for natural resources, including forests. Various directorates are responsible for technical aspects of forestry, particularly the Directorate for Forest and Soil Management (*Dirección de Gestión Forestal y Suelos*). CONAFOR was created by presidential decree in 2001 as a public organ with a decentralized function and the overall objective of integrating natural resource management into the national sustainable development program. Through its 13 regional offices, CONAFOR is responsible for, among other things, the implementation of PEF 2025. The Federal Office for Environmental Protection (*Procuraduría Federal de Protección al Ambiente* – PROFEPA) is in charge of auditing and monitoring production areas and natural protected areas. In addition, there are technical and capacity-building institutes such as the National Forest and Agriculture Research Institute (*Instituto Nacional de Investigaciones Forestales y Agropecuarias*).

NGOs play a major advocacy role on behalf of communities and are also important for information-sharing and capacity-building in respect to collaborative forest management. Community organizations have a strong influence on the use and management of forest areas.

Status of forest management

Forest for production

Forest management is conducted mainly in the *ejido*-owned forests, most of which are located in the temperate and subtropical forest zone; the forest of each *ejido* can be considered as an FMU.

Harvesting in *ejidos* and privately owned forests is implemented through cutting permits. Three kinds of permits are given out: small-scale harvesting permits in areas of up to 20 hectares, medium-sized harvesting permits for areas of between 20 and 250 hectares, and commercial logging permits for areas above 250 hectares. Logging in tropical forests is carried out mainly by forest owners and communities as well as contractors working for timber traders or the forest industry. Forest owners must employ at least one forestry professional who is in charge of forest management, and they must also present a forest management plan (*programa de manejo forestal*) and a yearly harvesting plan. The minimum cutting diameters tend to vary by state. In the (tropical) state of Quintana Roo, for example, harvesting includes trees of high-value species with a diameter of 55 cm and above and trees of other species with a diameter of 35 cm and above.

About 8,500 *ejidos* and local communities in the country possess forested areas, but in some areas private ownership is also important. The extent of forest within *ejidos* varies, the smallest ones being around 300 hectares and the largest nearly 450,000 hectares. An estimated 7.1 million hectares of closed forests (both temperate and tropical) are covered by management plans (FAO 2001) for timber and/or non-timber forest production. The estimated total tropical forest area harvested annually is 179,000 hectares, distributed in 584 forest management units[c]. Timber harvesting in moist tropical forest involves the selective cutting of high-value tree species, in particular *Cedrela odorata* (cedro rojo) and *Swietenia macrophylla* (caoba). Both were once abundant in the forests of Yucatán, but over-harvesting – including through illegal logging, a widespread problem in Mexico's forests[c] – and a lack of regeneration of these light-demanding species in closed forests have brought the sustainable harvesting level to below 1 m^3 per hectare[b]. Well-established silvicultural systems known as the Silvicultural Development Method (*Método de Desarrollo Silvícola*) and the Mexican Method of Forest Management (*Método Mexicano de Ordenación de Montes*) are applied in the temperate and pine forests. In the Mayan zone in the state of Quintana Roo, several well-functioning FMUs are applying polycyclic forest management; some are also certified. In general, however, *ejidos* find

Table 2 Some commonly harvested tropical timber species for industrial roundwood[c]

Timber species	Remarks
Swietenia macrophylla (caoba, kobchi)	Remains the major logged species in value in all states of Yucatán
Cedrela odorata (cedro rojo)	Both caoba and cedro rojo are being planted due to shortage of supply
Lysiloma latisiliquum (tzalam)	
Lonchocarpus castilloi (machiche)	
Metopium brownei (chechen)	

themselves in a vicious circle: income derived from forest activities is insufficient to justify the investments required to improve their operations[b]. The Mexican government has taken a wide range of actions in the fight against illegal logging. What is still missing is the involvement of public and private buyers through clear purchasing policies that will prevent the access of illegal products to national markets; improved information on the problem is also needed[b].

Silviculture and species selection. Around one-third of hardwood timber production comes from tropical species, among them the species listed in Table 2 as well as *Pseudobombax ellipticum* (amapola), *Dendropanax arboreus* (sac-chaca), *Dalbergia retusa* (guanciban), *Brosimum alicastum* (ramon), *Bucida buceras* (pucte) and *Simarouba glauca* (pasak).

Planted forest and trees outside the forest. Species of *Eucalyptus* are predominant, with a planted area of about 105,000 hectares, followed by pines (85,000 hectares) and *Tectona grandis* (teak, teca – about 3,000 hectares); the latter is becoming increasingly important as a plantation species[c]. A national forest inventory in 1994 estimated that 10.7 million hectares of land were available for the establishment of planted forest (CONAFOR 2001), but only 4–5 million hectares are suitable for that purpose[b].

Forest certification. As of September 2005, there were 41 FSC-certified FMUs covering a total area of 707,829 hectares of natural forest, the great majority community-owned (FSC 2005). Of these, twelve FMUs covering about 163,000 hectares are located in the tropical part of Mexico.

Estimate of the area of forest sustainably managed for production. Mexico has significantly strengthened its system for implementing SFM and many of the necessary elements are operational. However, the process to improve production has been slow due to limited capacity and willingness of the private sector to change forest management and industrial processing systems[b]. An estimated 8.6 million hectares of natural forest are under some form of forest management (Torres Rojo 2004); this figure is more than the total estimated PFE and might include some non-tropical forests in states that are mostly tropical. Of the 8,500 *ejidos*, 2,417 implemented commercial harvesting in 2002[b]. The production potential of 'high and medium' forests in the tropics is an estimated 1.4 million m^3, much more than current (official) production[b]. The area of tropical production PFE being managed sustainably is estimated to be at least 111,000 hectares (Table 3); this includes only certified forests, as no information was available regarding the management of other forests in the production PFE.

Timber production and trade. In 1994, the total growing stock of Mexican forests was an estimated 2.8 billion m^3, of which 1.0 billion m^3 were in tropical regions (CONAFOR 2001); total roundwood production was an estimated 45.5 million m^3 in 2003 (FAO 2005b). Official industrial roundwood production was 6.28 million m^3 in 2003, of which an estimated 781,000 m^3 was non-coniferous and 606,000 m^3 was tropical (ITTO 2006 in prep.); PROFEPA estimates the illegal volume of roundwood from all forests to be in the range of 5–7 million m^3 [b]. Most of the industrial roundwood production is consumed within the country (ITTO 2005). There

Table 3 Management of the tropical production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
7,880	8,600	8,600	163	163	100	34	0

are more than 278 sawmills to process tropical timber, with an average capacity of 5,100 m^3 annual log consumption[b].

Non-wood forest products. More than 1,000 species of NWFPs are used, of which 70 are subject to some form of control (Torres Rojo 2004). National commercial NWFP production was 143,000 tonnes in 2002, of which only 4% was sourced from states in the southeastern region of the country; the total value of this portion was 73 million pesos[b]. NWFPs include ornamental plants, resin, bamboo fibres, wax, tannin and gums, medicine, fruits, nuts, spices and honey. The most important products from tropical regions include copal, products from different palms such as *Chamaedorea* spp (palma camedor), *Sabal* spp (palma de sombrero), *Scheelea liebmannii* (palma real), *Byrsonima crassifolia* (fruits of nanche), *Pimenta dioica* (pimiento gorda) and *Manilkara zapota* (chicozapote gum).

Forest for protection

Soil and water. Large parts of Mexican forests are classified as water protection areas (*cuencas de amortiguamiento*). Data on their extent are not available.

Biological diversity. Mexico is among the top ten most biologically diverse countries in respect to the number of vertebrates and vascular plants. It has the highest diversity of reptiles of any country and is third for bird diversity and fourth for terrestrial mammals. There are more plant species in Mexico than in the US and Canada combined. Seventy-four mammals, 62 birds, 21 reptiles, 191 amphibians and 262 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 13 mammals, 39 birds, three reptiles, 176 amphibians and 113 plants are found in forests (IUCN 2004). Mexico has listed 103 plant species in CITES Appendix I and 2,100 plant species in Appendix II (CITES 2005).

Extent of protected areas. Protected areas (*áreas naturales protegidas* – ANPs) cover about 17.9 million hectares (9.2%) of the national territory. This is an increase of almost 70% in the last decade; they cover about 5.6 million hectares in tropical and sub-tropical areas[b]. The system includes 34 biosphere reserves (10.4 million hectares), 65 national parks (1.39 million hectares), four natural monuments, 27 protection areas of flora and fauna (5.5 million hectares), four natural protected areas for reclassification and one natural-resources protection area. Discrepancies remain in the definition and number of protected areas; for example, it appears that some designated protected areas occur on private land, and their protection status is unclear. According to UNEP-WCMC (2004), 1.04 million hectares of tropical forest are in protected areas classified in IUCN categories I–IV, of which 419,000 hectares are lowland evergreen broadleaved rainforest.

Estimate of the area of forest sustainably managed for protection. No data were available on the status of management of the protection PFE (Table 4).

Socioeconomic aspects

Economic aspects. The direct contribution of the tropical timber sector to employment could be as high as 60,000, but a considerable number of these people work informally and are not counted in official statistics[b]. The contribution of the national forest sector to GDP was about 17 billion pesos, or 1%, in 2003[b].

Livelihood values. It is estimated that about 12 million people live in or adjacent to forest. They are generally considered the poorest segment

Table 4 Management of the tropical protection PFE ('000 hectares)

Total	Attributed to IUCN categories I–IV	Allocated for soil and water	With management plans	Sustainably managed
5,600	1,040	n.d.	n.d.	n.d.

of the rural population, and forests and *matorrales* form an important component of their livelihoods. A substantial number of *ejidos* depend mainly on forest activities for their livelihoods[b].

Social relations. Often, communities lack the organization and funds to manage forests and woodlands effectively. There is also often a divergence between national interests to protect and manage forests and particular local interests. Recent conflicts have arisen due to the extension of protection areas without proper consultations with the people living in these areas[b]. Another area of conflict is excessive utilization and unauthorized land conversion. There is an ongoing conflict in tropical forest areas of the states of Chiapas and Oaxaca over a lack of access to land and insecurity of tenure.

Summary

The management of Mexico's forests differs greatly between the pine and oak forests in the temperate zone, the forests in subtropical regions and the moist tropical forests in the south. The rate of deforestation has apparently slowed but is still high. Overharvesting and illegal harvesting of forest resources is widespread (although less so in the tropics than in the temperate zone); they exceed sustainable levels in many areas. Community management is the major form of forest management but, in many cases, communities are not equipped to manage their forests sustainably. Some of the problems that obstruct progress towards the sustainable management of the closed forest areas in communes (*ejidos*) include a lack of resources and know-how for the economic use of forest resources and discrepancies in the objectives between communities, the private sector and forest authorities. On the other hand, good progress has been achieved in forest certification, although much of this to date has been outside the tropics. Moreover, the government has taken steps to address shortcomings in the sector and is attempting to combat illegal logging and fire.

Key points

- The rate of deforestation has apparently slowed but is still high.
- Mexico has not formally designated a PFE. ITTO estimates that about 13.6 million hectares can be considered to constitute a tropical PFE, comprising 7.88 million hectares of natural-forest production PFE, 5.60 million hectares of protection PFE and 100,000 hectares of industrial timber plantations.
- The area of natural tropical production PFE under SFM is estimated to be at least 111,000 hectares, corresponding to the total area of certified natural tropical forest; insufficient information was available on the forest management outside these areas for an estimate to be made for the wider tropical production PFE.
- No data were made available on the status of management of Mexico's tropical protection PFE.
- About 8,500 *ejidos* and local communities own an estimated 80% of Mexico's forests. About 15% is owned privately and 5% is national land.
- A forest law enacted in 2003 governs the management of production forests, including in *ejidos*. Some states have also enacted their own forestry/environmental laws.
- The low financial viability of natural forest management appears to be inhibiting the uptake of SFM in some *ejidos*.
- The national government has taken steps to combat illegal logging and forest fire, but both these problems are still prevalent.
- The production potential of the natural forests in the tropics is an estimated 1.4 million m^3, much more than current (official) production.
- Continuing conflicts over land-use are apparently inhibiting SFM in some areas.

- Some forests are classified as protected areas but are privately or communally owned, and their protection status is unclear.

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