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RESEARCH REPORT

Legal Aspects of Forest Management in Mexico

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LEGAL ASPECTS OF FOREST MANAGEMENT IN MEXICO

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Summary

The object of this study is to determine how laws, policies, and administration can be strengthened to combat deforestation in Mexico and better sustain the productivity and integrity of its forested ecosystems. The emphasis of the study is on protection of internationally recognized forest reserves, though the inquiry is necessarily broader. The study outlines international and domestic law affecting Mexican forests and looks at three case studies. Two of the case studies are reserves with threatened forests: the Monarca Special Biosphere Reserve in the central states of Mexico and Michoacan and the Montes Azules Biosphere Reserve in the southern state of Chiapas. The third case study looks at forests managed for timber production in the state of Durango. Finally, the study discusses some options for improving Mexico's forest laws.

Defining the Problem

Mexico contains about 50 million hectares of forest, half temperate and half tropical. By one estimate, it is losing about one percent of its temperate forests and almost two and a half percent of its tropical forests each year.

The causes of forest loss in Mexico are varied. Fires and conversion of forests to pastures or farms are among the most important. Timber harvest is an important cause in tropical deciduous forests. Locally, oil exploration and urbanization can lead to forest loss.

These causes often work in combination. For example, a logging road into pristine rain forest may facilitate incursion by ranchers or farmers. Secondary factors exacerbate the loses. Government policies until recently have encouraged the spread of roads, farms, and ranches. Social values encourage people to "clean up" wild lands. Population growth has increased the demand for rural land and for forest commodities like firewood and timber.

International Laws

As a sovereign nation, Mexico sets its own forest policy. However, the attitudes of the international community, communicated through declarations, treaties, and grants of aid, have strong influence on the forest laws of most nations.

A recent series of non-binding international declarations have stated that nations should conserve natural resources like forests and manage them for sustainable development. This series includes the 1972 Stockholm Declaration, the 1982 World Charter for Nature, and the 1987 report of World Commission on Environment and

Development, leading up to the various documents from the 1992 United Nations Conference on Environment and Development (UNCED).

Some non-binding efforts have focussed specifically on forest management. The Tropical Forests Action Program, aimed at developing countries, has sparked an allied domestic effort in Mexico. Governments and non-governmental organizations (NGOs) have begun to develop standards for sustainable forest management, which ultimately could influence domestic laws or international trade.

While non-binding declarations help set the tone of forest policy, binding treaties often have more concrete effects. The UNCED Biodiversity Convention has accelerated the work of Mexico's National Commission for Knowledge and Use of Biodiversity (CONABIO). The Migratory Bird Treaty has helped protect forest-dwelling birds. That treaty, the Western Hemisphere Convention, and other treaties aimed at international cooperation have spawned a host of specific projects, many involving U.S. agencies like the National Park Service, the Forest Service, and the Fish and Wildlife Service. Mexico recently acceded to the Convention on International Trade in Endangered Species (CITES), which should lead to better controls on illegal trade in endangered and threatened species, including several forest-dwelling species found in Mexico.

Two general trade treaties, the General Agreement on Tariffs and Trade and the North American Free Trade Agreement (NAFTA), will change economic patterns in North America and the world and so necessarily affect the future of forests. They also place limits on environmental laws that restrict international trade and will bring pressures to bear to stop any subsidies that encourage forest harvest. The NAFTA supplemental agreement on the environment creates a forum in which to challenge failures of environmental regulation. It also creates a North American Commission for Environmental Cooperation, which has begun to promote cooperative environmental projects. Exactly what the net effect of all these will be is difficult to predict.

Domestic Laws

Mexico has a comprehensive set of forestry laws dedicated to protection of the most valuable and sensitive forests and sustainable use of other forests. The laws are difficult to put into practice. To understand why requires an understanding of the legal setting in which the laws operate, a grasp of the laws themselves, and an examination of the difficulties of implementing the laws in specific situations. The chapter of this report on domestic law considers the first two matters, and the case studies illustrate the last.

Some basic values set the foundation of the Mexican legal system as it affects forests. First are a distrust of large landholders coupled with a commitment to distribute land among the rural people. These have led the government to expropriate *latifundios* (large land holdings) and to grant the lands to *ejidos*, rural villages that hold land communally. Nearly three fourths of the forests are on *ejido* land. That means that

most forests are held by poor people dependent on the land for food and income. Restraining their use of the land is politically sensitive and can place a burden on some of the nation's poorest people.

Second is a tradition of strong central government. This means a federal government with a powerful President and almost all important decisionmaking concentrated in the capital. Key decisions on forest use and protection often are made far from the forest, and local communities can be distant from the powers controlling use of their lands.

The root of all natural resource and property law in Mexico is Article 27 of the Mexican Constitution. This sets out the nature of property ownership and empowers the federal government to regulate land uses to encourage development and to protect and restore ecological balance. It also establishes the nature of the social property held by *ejidos* and sets limits on the size of individual land holdings. In 1992, the federal government amended the Constitution and supporting laws to allow *ejido* lands to be used more like private property, to serve as collateral for loans or even to be sold. The object was to bring more market forces to bear on rural development. The outcome for forests remains to be seen.

The two central federal statutes affecting forests are the General Law on Ecological Balance and Environmental Protection and the Forestry Law. The General Ecology Law grants most authority for environmental protection to the federal government. It creates some powerful but under-used tools for setting environmental policy, including creation of comprehensive standards or "orderings" for land use, development, and resource exploitation. It establishes a framework for creating protected natural areas and has provisions for protection of flora and fauna. Effective protection of forest-dwelling species may require protection of forest habitats.

The Forestry Law sets out the basic forest conservation policy of the nation, embracing both preservation and development. It requires government permission for forest harvest. It also gives the government regulatory control over transport of forest products and changes in forest land use.

Would-be harvesters may also need to heed foreign investment, tax, and other commercial laws. Also, the Agrarian Law, which governs ownership of rural lands, places limits on the size of forest ownerships and governs alienation of *ejido* lands.

The Montes Azules Biosphere Reserve

The Montes Azules Biosphere Reserve is a large (331,200 hectare) portion of the Lacandon rainforest in the southern Mexican state of Chiapas. The greater Lacandon rainforest, together with rainforests in the Yucatan Peninsula, Guatemala, and Belize, forms the largest rainforest in the Americas north of the Amazon. Montes Azules is

valuable as a watershed, an influence on climate, a reservoir or sink for greenhouse gases, and a haven for a diverse collection of life, including threatened species. It also holds commercially valuable timber, potential for oil development, and much-sought undeveloped lands.

The area originally was home to the Mayan people; now many indigenous groups live in the area. Three indigenous peoples, the Lacandones, the Choles, and the Tzeltales, make up the Lacandon Community, which owns about 85 percent of the reserve.

Faced with rapid deforestation throughout much of the Lacandon region, the government formally set aside the largely intact forests of Montes Azules in 1978. The reservation did not change ownership of the land. The government has launched several efforts to study and manage the reserve. Because of limited resources, these efforts have had limited success. The government drafted a comprehensive management plan for the reserve in 1992, but it too has not been fully implemented.

Meanwhile, the reserve faces many challenges. Over ten percent of the reserve has been deforested. A large number of people have migrated to the general vicinity. Some of these have been Mexicans encouraged by the government to come create farming communities and some are Guatemalan refugees. Their settlements encroach on the reserve. Some of their land claims overlap with those of the Lacandon Community. Some of their settlements are without any legally supported claim to land. Almost all the new settlers clear the land for crops and cattle. Even some of the older indigenous settlements have engaged in land clearing in recent times. Farming techniques adapted from temperate regions soon exhaust the capabilities of the tropical soils, creating the need to clear even more land. Roads built or improved in recent years have made it easier for people to get to the area of the reserve. Poachers illegally capture protected wildlife.

The laws protecting the reserve and its life are often ignored. Enforcement in this remote forest is difficult. Even some government agencies have apparently ignored the reserve laws in fostering new settlements on reserve lands. Recent changes in the Constitution and the Agrarian and Forestry laws as well as changes in the organization of the government environmental agencies has added to the confusion and difficulty in enforcing laws.

The Zapatista uprising has acutely affected the reserve. Reportedly thousands of displaced people have sought new land there.

Financing for the reserve's protection has been hard hit by the economic difficulties of Mexico. The reserve must compete with other pressing needs in the region for funds.

To solve the reserve's problems will require addressing illegal settlement and encroachment, better orchestrating the efforts of the various agencies and NGOs working on the reserve, helping area farmers find sustainable ways to use the land, securing more financing for the region, improving enforcement, and limiting new roads.

The Monarca Special Biosphere Reserve

The Monarch Special Biosphere Reserve is a series of five small reserved areas, totaling 16,000 hectares, in the high mountains near the border of the states of Michoacan and Mexico, in central Mexico. The forests there are the winter home of millions of Monarch butterflies, which migrate from the United States and Canada. The butterflies can only survive the winter under the narrow range of environmental conditions found in select locations in these forests.

The wintering areas are near the tops of tall mountains. The forests there are the remnants of forests that once extended far down the mountainsides but have now been largely cleared for agriculture. Most of the land is owned by poor farming communities.

Presidential decrees in 1980 and 1986 created the Monarca reserve. With minor exceptions, government actions have not changed property ownership of the area. The reserve lands are still held mostly by *ejidos* and indigenous peoples.

Several government agencies participate in the management of the reserve and the economic development of the affected communities. An NGO, Monarca A.C., initially also played an unusually large role, developing management plans and activities. The prime management strategy has been to close all but a portion of the reserve to tourists and other intruders, and to help the surrounding communities develop in ways consistent with protecting and restoring the forests of the reserve. Local people have been employed in reforestation projects, as tourist guides, and on reserve patrols.

Still, the reserve has serious problems. Parts of the reserve face problems from forest diseases. Parts show significant ongoing human disturbance, including the effects of fires, illegal tree cutting, and grazing. Disturbance can easily ruin the value of the forests to the butterflies in the short term, however some forms of disturbance may play a long-term role in maintaining suitable forests. The exact needs of the butterfly and the dynamics of the forest have been studied but are still imperfectly understood.

Many of the human pressures on the reserve stem from the social situation of the reserve communities. The people depend upon the land for their survival and have few other options. Some communities resent the restrictions of the reserve and the agencies that try to impose them. The communities have benefitted from increased government funding of development due to the reserve. One *ejido* in particular, El Rosario, benefits

from its monopoly on tourist traffic to the reserve, a situation that has created some jealousy among the other communities.

To address future management of the reserve, the government should address several policy and legal issues. What are the management objects for the reserve and surrounding communities? In other words, what should the area be like 100 years from now? Who should own the reserve lands? Is the existing regulatory scheme flexible enough to respond to changing conditions at the reserve? Should more control over the reserve be transferred from Mexico City to local governments and local representative of the federal government? Can the agencies presently managing the reserve better coordinate their efforts? Can the law create better incentives for residents to protect the reserve? How can the legal framework deal with limitations in technology and funding?

The Forests of Durango

The northwestern state of Durango is a major producer of commercial timber products in Mexico. The high mountains of the Sierra Madre Occidental in the western third of the state support a diverse and productive forest dominated by pines and oaks. This forest has supported commercial harvests for many decades. The area was an early target for modern Mexican land reform. Today, ejidos and indigenous communities own much of the forested land. Many earn income from milling the wood and producing value-added products as well as selling timber to private mills, large and small.

The basic concern in Durango is not loss of forest cover. The concern is the long-term loss of some of the many attributes of the forest: its diverse collection of native plants and animals, its ability to sustain productive timber harvest and grazing, its scenery, and its value as a watershed.

The basic Mexican laws as written are broad and flexible enough to protect the many values of the forest. However, good regulation requires more than a broad and flexible statute.

The government in Durango is hampered by a lack of staff and resources. Nine forestry enforcement personnel must cover the entire state, dealing with illegal wood transport, forest fire investigations, and other matters besides illegal cutting of trees. The difficulty of their job is increased by their lack of good vehicles to patrol on Durango's rough backcountry roads. Requests to cut a third of the nation's annual timber production go through SEMARNAP's offices in Durango. There, a single lawyer, three ecological analysts and nine forestry specialists must review them, each within thirty days of receipt.

Science can tell us very little about the flora and fauna of the forests of Durango, except that the forests are diverse and may be home to many endemic species. Without

clear understanding of the biotic resource, the government cannot implement the general directives in the forest regulations to prevent activities that damage the resource.

The roads in the forests of Durango are unpaved and roughly made. For the most part, they were constructed long before we understood how to minimize erosion from roads to protect water quality. They present a threat to the state's aquatic resources.

The basic rules that the forest regulators of Durango apply were written in Mexico City. They do not specifically reflect local concerns, and they do not make it easy for local citizens to become involved in decisions about the forest. Major decisions about forest use are likely to be elevated up the bureaucracy to be made in Mexico City itself, far from the individuals affected in Durango.

Many of the decisions affecting the forest are proceeding piecemeal, on a property-by-property. There does not appear to be much evaluation of the cumulative impacts of these decisions.

Two other generic problems that may be affecting Durango's forestry regulation are corruption and increasing illegal drug activity. The extent of these problems is difficult to gauge.

To address these problems, the government could improve staffing, invest more in research and experiment in new ways to develop forest resources, improve road standards, write regional guidelines on forest development, improve public involvement in forestry decisionmaking, and consider institutional ways to evaluate SEMARNAP's regulatory efforts and their effectiveness. It could also put more emphasis on protection and sustainable use of forest resources other than timber.

Overall Analysis and Options

Most of the problems with Mexican forest laws are not evident from the laws as written. They are apparent from the laws as implemented.

Good forest legal systems need to be built on a base of scientific knowledge of the forest. As is true in all countries, we only dimly grasp the complex workings of the forest and its connections to forest-dependent communities. Some laws, like the General Ecology Law's provisions for ecological "orderings" or land use plans, are only partly implemented because the necessary knowledge base is lacking. Mexico needs the continued help of the international community and its own universities, scientists, and researchers to build up that knowledge base.

Many needs compete for limited resources in Mexico. Some laws are unenforceable because basic implementation investments, such as surveying property lines, have never been made. Mexico needs to take a hard look at its budget for forest protection to consider whether it deserves additional resources and how it can best allocate its resources for implementation and enforcement of laws.

The failure to respect the rule of law and the resulting official corruption is a general problem with which Mexico is bravely beginning to come to terms. In the forest arena, Mexico needs to consider options like increasing the pay of forestry enforcement officials to make them less vulnerable to bribery.

Another way to promote the rule of law is to build support for the law among those it most closely affects. In the case of forests, how can Mexico build support for the law among the many rural communities most closely tied to the forest? Options include generally improving the non-forest and lawful forest economies of these communities to make them less dependent on illegal forest use; ensuring that local communities benefit from tourism and production of non-commodity benefits from their forests; giving local communities a more direct role in shaping government action in their forests; and better educating local communities about the values and uses of their forests.

Like most nations, Mexico has embraced social and economic policies that can put pressure on the forests. In particular, its policies for land reform and rural development have led to forest conversion and unsustainable use of forest lands. Mexico needs to settle on a consistent vision for the future of its forest lands and forest dependent communities, and to work to make all the government's arms act in concert to achieve that vision.

Finally, for natural protected areas, the study offers some general guidelines for improving laws and management. Implementing restrictions on development to protect environmental values will be especially difficult where they conflict with traditions of local control of land development and use. Lawmakers and managers ought to aim for frameworks that are biologically adequate, socially workable, and institutionally practical.

Table of Acronyms

A.C.	civil association (form of incorporation in Mexico)
BID	Inter-American Development Bank (see IDB)
CITES	Convention on Trade in Endangered Species (treaty)
CONABIO	National Commission for Knowledge and Use of Biodiversity
CONAGUA	National Water Commission (within SEMARNAP)
CONAP	National Council on Protected Natural Areas
CONASUPO	Trade name for a chain of government-supported stores serving rural areas
EZLN	Zapatista National Liberation Army (Chiapas rebels)
FAO	Food and Agriculture Organization (UN)
FWS	Fish and Wildlife Service (US)
GATT	General Agreement on Tariffs and Trade (treaty)
GEF	Global Environment Facility (UN-World Bank)
IDB	Inter-American Development Bank (an IGO)
IGO	intergovernmental organization
INE	National Institute of Ecology (within SEMARNAP)
INI	National Institute of Indigenous Peoples
INIFAP	National Institute for Forestry and Agriculture Studies (within SAGDR)
ITTO	International Tropical Timber Organization (an IGO)
IUCN	International Union for the Conservation of Nature (combination NGO & IGO)

MOU	memorandum of understanding
NACEC	North American Commission for Environmental Cooperation (an IGO)
NAFC	North American Forestry Commission (an IGO)
NAFTA	North American Free Trade Agreement (treaty)
NGO	non-governmental organization
NPS	National Park Service (US)
OAS	Organization of American States (an IGO)
OEA	Organization of American States (OAS, an IGO)
PAFT	Tropical Forest Action Plan
PAFT	Tropical Forest Action Program
PEMEX	Mexican Petroleum (state-owned monopoly)
PLANIB	National Biological Inventory Plan
PROAFT	Tropical Forest Action Program
PROFEPA	Office of the Attorney General for Environmental Protection (within SEMARNAP)
PROGRESA	Program for Education, Health, and Food (replacing PRONASOL, within SEDESOL)
PRONASOL	Productive Ecology Program in Solidarity ("Solidarity") (within SEDESOL)
REMIB	Mexican Biodiversity Information Network
SAGDR	Secretariat of Agriculture and Rural Development
SARH	Secretariat of Agriculture and Water Resources (became SAGDR; some functions went to SEMARNAP)

SEDESOL	Secretariat of Social Development (home of environmental agencies before SEMARNAP)
SEDUE	Secretariat of Urban Development and Ecology (home of environmental agencies before SEDESOL)
SEMARNAP	Secretariat of Environment, Natural Resources, and Fish
SINAP	National System of Natural Protected Areas
SNIB	National Biodiversity Information System
TFAP	Tropical Forest Action Plan
TIAS	Treaties and Other International Acts Series (publication)
UICN	International Union for Conservation of Nature (see IUCN)
UK	United Kingdom
UN	United Nations
UNAM	Autonomous University of Mexico
UNCED	United Nations Conference on Environment and Development (Rio de Janeiro, 1992)
UNEP	United Nations Environment Program
US	United States of America
UST	US Treaties and Other International Agreements (publication)
WWF	World Wildlife Fund, also called World-Wide Fund for Nature (an NGO)

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Introduction: Objective, Methods, and Overview

The object of this study is to determine how law, policies, and administration can be strengthened to combat deforestation in Mexico. Mexico's forests are important both for their extent and their diversity, and Mexico is losing forests at an alarming rate. This study examines the laws that deal with forests and problems of forest loss in Mexico, with a particular focus on the protection of nature reserves. It looks at how the laws have worked in two specific reserves of international interest and considers options for improvement.

This study is the product of a team of Mexican and American attorneys working under the coordination of the Inter-American Center for Environmental Policy of the Environmental Law Institute (ELI). The conclusions reflect the professional judgment of that team, but so far as possible, the authors have considered the views of a wide variety of Mexican citizens working with, living in, or concerned about the nation's forests. It is a premise of this study that no single person -- not in government, not in a non-governmental organization (NGO), not on the land -- understands the full range of Mexico's forest issues in all their complexity. Only by listening to a broad spectrum of interested and informed people can anyone hope to understand the problems and improve the law.

The ELI team began by collecting and analyzing statutes, regulations, agency reports, other official documents, and previous studies that bear on Mexico's forests. Talking with government and NGO officials in person, by telephone, post, and electronic mail, they gathered the basic information on Mexican forests and law reported in the chapters I, II, and III of this report. They also selected and framed the three forest case studies described in Chapters IV, V, and VI.

Team members made four trips to speak with federal, state, and local officials, local residents, businesses, and NGOs in Mexico. These included a Fall 1993 trip to Mexico City; a Winter 1994 trip to Mexico City, Angangueo, El Rosario, Morelia, and Toluca to discuss the Monarca Special Biosphere Reserve; a Winter 1995 trip to the state of Chiapas to discuss the Montes Azules Biosphere Reserve; and a Summer 1996 trip to the state of Durango to discuss managed timber harvests. The political situation in Chiapas precluded a visit to Montes Azules itself, but the Monarca and Durango trips included visits to the affected forests. These trips provided much of the information reported in the case studies.

In February 1997, ELI and CEMDA. the Mexican Environmental Law Center, hosted a workshop in Mexico City to review a draft of this report. The government and NGO officials attending the workshop also produced comments on specific reforms of the Forestry Law proposed by the Mexican Government.

Chapter I of this report briefly reviews the complex nature of forests as natural resources. It outlines the world's problems with deforestation and Mexico's problems in particular.

Chapter II examines the framework of international laws that affect forests in Mexico. It considers non-binding laws, like the Forest Principles from the 1992 United Nations Conference on Environment and Development; multinational efforts to set standards for sustainable forest management; binding agreements, like the Biodiversity Convention; and international cooperative efforts.

Chapter III lays out the basic federal laws of Mexico dealing with forests and forest reserves. It explores patterns of land tenure, the structure of government, and the nature of land ownership under the Mexican Constitution. Finally, it takes a detailed look at some key laws aimed at forests and protected natural areas.

Chapters IV and V look at two case studies: the Montes Azules Biosphere Reserve in Chiapas and the Monarca Special Biosphere Reserve in the states of Michoacan and Mexico. Both include forested areas with biological resources of international interest. The Montes Azules reserve has part of the largest remaining tropical rainforest north of the Amazon; the Monarca reserve is the winter home of butterflies migrating from the United States and Canada. Forest harvests, fires, and other illegal activities threaten both reserves. These case studies examine the problems of preventing forest loss from a legal and institutional standpoint.

Chapter VI discusses regulation of forest use in the state of Durango. Durango includes some of Mexico's most productive commercial forests. Its forests also are home to a diverse group of native plants and animals, they shelter the headwaters of local rivers, and they have scenic and recreational potential. The commercial productivity of the forest is relatively well understood and husbanded; the other attributes of the forest are less commercial, less studied, and less protected. The third case study looks at how well the law protects the integrity of forests used for commercial harvest.

Chapter VII presents some options for addressing deforestation and forest protection problems.

Chapter One:

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Forests and The Problems of Deforestation

The Forest Resource

Forests are a complex resource. From a physical and chemical point of view, forests are a key link in the water and nutrient cycling of the planet. They moderate runoff from rainfall, making streams flow more evenly. They hold inorganic nutrients and build soils. They extract carbon dioxide from the atmosphere and turn it into wood. When a forest is cut down and the wood allowed to burn or rot, that carbon returns to the atmosphere and contributes to the greenhouse effect, a likely engine of global climate change.

From a biological point of view, forests are reservoirs of diversity. Humid tropical forests may be the most diverse of terrestrial ecosystems, home to uncounted millions of species.

From a economic point of view, they are a source of goods and income. Forests contribute an estimated 4 trillion U.S. dollars annually to the world's economy.[1] People use 3.4 billion cubic meters of wood a year; about half of that consumption is in developing countries for such basic items as fuel and shelter.[2] Counting subsistence efforts, as much as 80 percent of work hours spent in forests may be in developing countries.[3] Local economies in forested areas often depend heavily on forest products.

Still, economically, forests are usually second-class lands. They may hold potential for development, but if land is covered with forests today it is often because people found other lands less remote, less rugged, more fertile, or otherwise more suitable for farms and cities. Though forests cover more than a quarter of the world's land, less than a tenth of the world's people live in or near them.[4] In general, the

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[1]United Nations Secretary-General, Report to Commission on Sustainable Development, Third session, Review of Sectoral Clusters, Second Phase: Land, Desertification, Forests and Biodiversity ¶ 9 (21 Dec. 1994 draft).

[2]World Bank, The Forest Sector 24 (1991).

[3]U.N. Secretary-General, *supra* note 1, ¶ 10.

[4]World Bank, *supra* note 2, at 24.

average incomes of people in forested areas are lower than in agricultural or urban areas.[5]

Socially, forests are even harder to classify. They may be isolated pockets of traditional life or lands absorbing uprooted people with nowhere else to go. Their communities may be shrinking, stable, or undergoing frontier-style transformations. Forests may be refuges for indigenous cultures or for social renegades. They almost never represent the centers of wealth, power, or culture of the modern nation-state, yet people in those centers of power may see forests as having symbolic or moral values absent in the great cities.

These varying views hint at the problems facing a government concerned about the future of its forests. It must ask itself the question, what are its forests for? Are they sources of wealth for individuals, resources for the nation, or heritage of the world? The likely answer is, forests are all these things.

To some extent, the forest resource can provide many benefits at once. People can manage forests to provide some timber while still providing some types of wildlife habitat and watershed protection. On the other hand, forests cannot be all things to all people. Though multiple uses can sometimes be accommodated, one use almost always affects another. And careless use of one resource can destroy the potential for sustainable production of another -- or even the continued existence of the forest itself.

No single principle has ever been found to adequately guide the regulation of forests. Every principle has a blind spot. Simple market economics may not adequately weigh non-commodity values such as watershed protection or biodiversity preservation. Social and economic development goals may discount biological values. Biocentric and preservationist principles fail to weigh immediate social and economic needs.

In shaping a legal scheme, policy makers will face tremendous gaps in our knowledge about the forest. With all our science, forest management is still very much an art. Even professional forest managers do not agree on what sustainable forest management means.[6] We do know that the decisions we make about forests today will affect the forests for many human generations. We know too that our own views of forest values have changed dramatically over the course of a few decades, and we can only begin to guess at what new values people will find in the forests.

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[5]For example, in Mexico, though more than 20 percent of the land now supports forests, the forests themselves contribute less than half a percent to the Gross Domestic Product. *See* Dr. M. Mondragón y Kalb, PROAFT: Towards a Forest Action Program for the Mexican Tropics (1992-1994), at 3 (Nov. 1991).

[6]*See* Jessica Mathews, *Forestry Word Games: "Sustain."* J. Forestry, May 1991, at 29; Richard P. Gale & Sheila M. Cordray, *What Should Forests Sustain?* J. Forestry, May 1991, at 31.

Whatever legal mechanisms a government devises, the forests pose special problems of implementation. Being remote from centers of population (and usually also centers of government) and covering large areas, surveillance and enforcement of laws on forest lands is often difficult. It may be difficult to determine ownership of a particular parcel of forest and harder still to determine who is responsible for potentially unlawful acts like starting forest fires or stealing wood.

Because of their remoteness and size, forests are often home to clandestine activities. In many eras and many cultures, the forest has been the home of outlaws (political or otherwise), producers of contraband, and groups of isolated and largely self-reliant people. Communities in and near forests may feel themselves distant from the central government, and not always respectful of it.

The Problem of Deforestation

These conflicting pressures on forests and the difficulty of regulating them help explain the phenomenon of deforestation. Around the world, statistics tell stories of forest loss. Given estimates of up to 6.2 billion hectares of open- and closed-canopy forests in pre-agricultural times, people have eliminated approximately one third of the world's forests.[7] In the last 20 years, as much forest land has been cleared as has been cleared in all of prior human history.[8] And increasingly, the loss is concentrated in developing countries.[9]

The tropics are now suffering the greatest transformation pressures. Estimates range from 11 to 20 million hectares of tropical forest cleared annually.[10] Especially in Latin America and Africa, only a tiny fraction of the cleared land is reforested.[11]

Even these figures may give an over-optimistic picture of the state of forest ecosystems. The numbers for deforestation typically reflect only areas that completely

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[7]Sandra Poshel & Lori Heise, Reforesting the Earth 5 (1988) (Worldwatch Paper 83). Another source estimates pre-agricultural forest cover at only 5 billion hectares. World Resources Institute, World Resources 1990-1991, at 107 (1990). The reason for the discrepancy is unclear.

[8]Julia Carabias & Lourdes Arizpe, *El Deterioro Ambiental: Cambios Nacionales y Globales, in* Desarrollo Sustentable: Hacia una Politica Ambiental 49 (Universidad Nacional Autónoma de México, Coordinción de Humanidades) 1993.

[9]World Bank, *supra* note 2, at 28.

[10]*Id.*

[11]*Id.* at 29.

lose forest cover. They do not reflect fragmentation, grazing pressures, conversion of forest type (for example, from diverse native species to an exotic plantation monoculture), or changes in forest age distribution (for example, replacement of large areas of old forests with young trees). None of these changes is universally bad, but each may cause losses of desired forest values. Probably less than half of the remaining forests consist of "intact forest ecosystems".[12]

The Situation in Mexico

Mexico comprises 196 million hectares of land. Of that, about 141 million hectares could support trees. Currently about 25.5 million hectares of temperate forest and 24 million hectares of *selvas* or tropical forest remain.[13]

Though this forest cover puts Mexico in eleventh place in the world in terms of forest acreage, Mexico is twenty-sixth in the world in terms of forest production.[14] Only about 20 million hectares of Mexico's remaining natural forests are considered commercially valuable; most of Mexico's current forest production is from conifer forests in the mountains. Industrial foresters believe that production could rise if more areas in Mexico were dedicated to plantation forestry.

The deforestation rate estimates for Mexico vary, in part because studies have used different definitions of forested land and different methods of estimation. Estimates range from 400,000 to 1.5 million hectares lost annually.[15] The lower estimate includes only closed canopy forests while the higher estimate includes clearing of all types of vegetation. One detailed study concluded 800,000 hectares were lost annually during the 1980s, which means an average annual loss of 1.56 percent.[16] The tropical forests, according to the study, were the most affected, losing 559,000 hectares annually (2.44 percent), while the temperate forests lost 245,000 hectares annually (1.0 percent).[17]

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[12]Alan Thein Durning, Saving the Forests: What Will It Take? 6 (1993) (Worldwatch Paper 117).

[13] Secretaría de Agricultura y Recursos Hidrálicos (SARH), Subsecretaría Forestal, Inventario Forestal de Gran Visión: Mexico 1991- 1992, at 13-15.

[14]The figures in this paragraph are from Secretaría de Medio Ambiente, Recursos Naturales y Pesca (SEMARNAP), Comisión de Desarrollo Sustenible 11 (Apr. 1995).

[15]Carabias & Arizpe, *supra* note 8, at 51.

[16]*Id., citing* O. Massera et al., Carbon Emissions from Deforestation in Mexico: Current Situation and Longterm Scenarios (in press).

[17]*Id.*

According to FAO's 1989 data, Mexico had an annual deforestation rate of 1.3 percent, the 23rd worst rate of loss in the world and eleventh worst in Latin America, behind Paraguay, Costa Rica, Haiti, El Salvador, Jamaica, Nicaragua, Ecuador, Honduras, Guatemala, and Colombia. In terms of number of acres deforested each year, because of its large size, Mexico ranks as high as fourth in the world.[18]

The situation is aggravated by the lack of reforestation -- according to one estimate, only five percent of what is cut is reforested and those plantings often use exotic species unsuited to the site.[19] According to the government, though, reforestation efforts have recently increased. The deforestation ratio "was in 1990, nine deforested to one reforested, in 1993, the average is, from each 2.7 deforested hectares, one is recovered."[20] A more recent government source reported that 110,000 hectares were reforested in 1993 and 1994, which suggests that the country still has far to go.[21]

The reasons for forest loss are many and interconnected. In the temperate forests, the greatest initial cause of forest loss is fire, started either by man or by lightning.[22] After a forest burns, however, farming and grazing may move into the land, preventing it from returning to forest. Deliberate clearing for grazing is the next most important cause in temperate forest, followed by deliberate clearing for crops. Illegal logging is responsible for as little as five percent of the losses.[23]

In tropical areas, clearing of land for cattle ranches is responsible for more than half the forest loss. In tropical evergreen forests, forest fires and agricultural expansion are the next most important causes, with less than ten percent of the losses associated with oil extraction and legal timber harvest.[24]

In tropical deciduous forests, ranching is followed by legal timber harvest and agricultural expansion as causes of forest loss. Together, the three account for over 90

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[18]Cuauhtémoc Ramírez, La Nueva Ley Forestal: Consideraciones Jurídicos y Los Efectos Económicos y Ecológicos 6 (1994). *See also* World Resources Institute, World Resources 1994-95, at 307 & 309.

[19]Carabias & Arizpe, *supra* note 8, at 52.

[20]Carlos Salinas de Gortari, *Discurso Pronunciado con Motivo de los Premios al Mérito Forestal de la Vida Silvestre,* Los Pinos, Salón Avila Camacho, Mexico (November 23, 1993).

[21]SEMARNAP, *Avances en la Conservación y Gestión de los Recursos Naturales* 12 (Apr. 1995).

[22]U.S. Forest Service, Focus Country Plan for Mexico 4 (draft 1994) *citing* SARH, Reforma a la Ley Forestal, 1992.

[23]*Id.*

[24]*Id.*

percent of forest conversion to other land uses. Forest fires are blamed for much of the rest of the loss.[25]

In all these cases, other causes may work in combination with the primary cause. For example, a road for oil exploration or timber harvest may open up the *selva*, allowing people to come in to set fires or clear land deliberately for agriculture. Particularly in the tropics, farms may move in for a few years, growing crops and preventing the *selva* from recapturing the land. For the farmer, though, this is a short-sighted and ultimately inappropriate use of the land. Soon, the crops will deplete the poor tropical soils, the farms will fail, and cattle ranchers will move in to convert the farms to pastures.

The large role of ranching and grazing as direct or indirect causes of forest loss is reflected in the growth of these activities over the years. The area of lands grazed in Mexico increased by more than 131 percent between 1960 and 1980. Though only 10.4 million hectares of Mexico are well suited to grazing, 78 million hectares are grazed today, more than 57 million of those hectares in dry areas including open woodlands. Grazing has degraded many of these lands. The relatively low density of livestock on these lands reflects their marginal value as grazing land.[26]

Another cause of forest loss is locally important: urbanization. For example, around Mexico City, in the central region that makes up about 3.5 percent of the country, almost 95 percent of the original forest is gone. The principal cause is urbanization. Much of this land once supported a productive rural population, but the rural populations remaining now consume more than they produce. As Vicente Sánchez has pointed out,[27] the problem in the region is not simply due to population growth; the land has been put to inappropriate uses. The driving force of development has been short term commercial gain, without consideration of the capacities of the land or the long term basic needs of the growing population.

Though all the factors listed above are immediate causes of deforestation, there are other, less immediate causes that are no less worth considering. Until relatively recently, few people appreciated the non-commodity values of forest land. These include its value for sequestering carbon and fighting global climate change, its role in building and holding soil and fighting erosion, and its value as a reservoir of

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[25] *Id.*

[26] Vicente Sánchez et al., *Población, Recursos y Medio Ambiente en México,* 8 Colección Medio Ambiente 68 (Fundación Universo XXI, ed., 1989).

[27] *Id.* at 73.

biodiversity. Government planners encouraged forest conversion without considering these impacts, and individual farmers, ranchers, and other users of the land had little reason to consider these long-term, public consequences.

Some widely-held cultural values in Mexico have also contributed to deforestation. One is the notion that undeveloped forest land is dirty -- *sucio* -- and ought to be cleaned. Another is the political ideal that every rural community is entitled to some farmable land. This has led the government to grant ever more marginal lands to landless *campesinos.*

The growth of Mexico's population has also contributed to forest loss. More people demand more land for cities, villages, and farms. They also desire resources like firewood, timber, and minerals that come directly or incidentally from forested lands. Removal of these resources does not require destruction of forests, but through urgency, lack of foresight, or carelessness, forests may be lost.

Chapter Two:

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International Laws Affecting Deforestation in Mexico

This chapter considers the influence international law has had on efforts to stop deforestation in Mexico. As a sovereign nation, Mexico sets its own forest policy. However, the attitudes of the international community, communicated through declarations, treaties, and grants of aid, have strong influence on the forest laws of most nations.

The chapter begins with a short discussion of the role of international law generally. It then explains some of the general international law governing forest and other natural resource use and how that has evolved in the last 25 years with the signing of various non-binding agreements. It is difficult to tie these general principles to specific actions domestically in Mexico, but they have inspired at least one domestic program in Mexico, and they are important in setting the tone for domestic law and international development support. Finally, the chapter examines how some binding agreements (treaties) are influencing Mexican actions. These more commonly lead to specific, identifiable actions. In this last group also are the free trade treaties that Mexico has joined. Though these do not usually generate specific forest-related programs, their effect on the economy can have strong effects on forests.

The Role of International Law Generally

International law is much different from domestic law. Domestic law describes the rights and obligations of persons and their relationship to each other and the government. Domestic legal systems almost always include general methods for enforcing laws and adjudicating disputes.

International laws set out the powers and obligations of nations. Usually only nations, not individuals, may seek enforcement of the laws. Though there is an International Court of Justice, unlike a domestic court, it has no authority to force parties to appear before it or to abide by its decisions. Often international law is established through mutual agreements or treaties, and individual treaties may spell out specific means of enforcement or resolution of disputes. These dispute resolution

mechanisms may be open only to nations party to the agreement and not to their citizens in their own right.

Sometimes international accords are not intended to be directly enforceable. Nations will sometimes sign non-binding statements of policy or principle. These may serve as a step towards future treaties, as policy guides for international organizations, or as persuasive references in policy debates involving the signing governments. Violations of the principles, however, have no defined consequences.

Nevertheless, both binding and non-binding international law may make itself felt in domestic situations. A nation may pass domestic laws to implement a treaty or international standard of behavior. For example, in the United States, the Migratory Bird Treaty Act gives domestic force to the various migratory bird treaties the country has signed, including the 1936 treaty with Mexico. Or, a nation may simply conform its actions to the course of international law without specific new domestic laws. For example, a country might render promised technical assistance to another without needing a change of domestic law to comply. Accords may occasionally make themselves felt through non-governmental action. For example, non-governmental organizations (NGOs) around the world have embraced the Forest Principles signed at the 1992 Rio "Earth Summit". Even industry groups have adopted codes of practice reflecting the Forest Principles.[28]

If a nation ignores a treaty or other international accord, even if the accord lacks a distinct enforcement mechanism, other international pressures may force the nation to change its behavior. These pressures may come in the form of incentives and disincentives from other nations, as subtle as diplomatic urging or as direct as the withholding of aid, the levying of a tariff, or the use of force. They may also come from private action supported by public opinion. The possibility of lost prestige, lost tourism, or even a product boycott may influence a nation to follow an accord.

International Law in Mexico

Mexico is a party to the 1969 Vienna Convention on the Law of Treaties.[29] This convention sets out the internationally accepted rules for negotiating, approving,

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[28]Specifically, in the United States the largest forest industry association, the American Forest and Paper Association, has adopted sustainable management standards that its members must respect.

[29]The Mexican Senate ratified the Vienna Convention on September 25, 1974. Under its own terms, the treaty did not come into force until 1980.

modifying, and ending treaties. The Convention recognizes that for each nation, domestic national law governs how the nation ratifies and gives effect to treaties.

In Mexico, the Constitution governs the adoption and implementation of international treaties and conventions. Administrative agencies can only apply international instruments after the Senate has ratified them. Mexico can only integrate international instruments to its legal system if they are not contrary to internal legislation and policies.[30]

Mexico does not have to enact a separate law after the ratification of a treaty to implement it. The appropriate government agencies simply apply the provisions of the treaty to their activities, according to the internal policies of the nation.

General and Non-Binding International Laws and Programs

Antecedents

The traditional starting place for international natural resource law has been that states have sovereign control over natural resources within their borders. Ordinarily other states have no right to complain about how a state conserves or wastes its resources.[31] Most nations in the world, including Mexico, have insisted on this point at one time or another, with varying degrees of vehemence depending on the situation. In fact, versions of this point appear even in some of the most environmental of declarations of international obligations.[32]

The Trail Smelter arbitration between the United States and Canada in the late 1930s established a key international precedent limiting a nation's use of resources: no nation may allow use of its resources in a manner that damages another nation.[33] That case involved industrial pollution, but the principle applies to any use of land that causes harm in another nation, and the principle has found its way into modern declarations.[34] Forest use can affect other nations. Mexico's forests are home to many

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[30]Constitución Política de los Estados Unidos Mexicanos, art. 133 [hereinafter Mexican Constitution].

[31]Cyrille de Klemm & Clare Shine, Biological Diversity Conservation and the Law 1 (1993) (IUCN Environmental Policy and Law Paper No. 29).

[32]*E.g.*, Stockholm Declaration on the Human Environment, June 16, 1972, Principle 21 [hereinafter Stockholm Declaration].

[33]U.N.R.I.A.A. 1905 (1938); 33 Am. J. Int'l L. 182 (1939).

[34]*E.g.*, Stockholm Declaration, *supra* note 32, Principle 21.

migratory species that it shares with other nations, principally the United States. Mexico's forests are also integral to watersheds, some of which feed international rivers and some of which are critical to the health of wetlands and estuaries that in turn support migratory species.

The Stockholm Conference

The 1972 United Nations Conference on the Human Environment in Stockholm was a milestone among international natural resource law efforts. On June 16, 1972, the Conference produced what has become known as the Stockholm Declaration. The Declaration is a set of consensus principles on protection and use of the environment. Though a strong environmental statement, it contains some foreshadowing of economic and social development issues that are still current in the discussions of environmental policy among nations. It acknowledges ties between development and the environment.[35] It declares an obligation among nations to protect the environment and natural resources[36] and an obligation among developed nations to assist developing nations.[37]

The other notable product of the Stockholm Conference was the United Nations Environment Program (UNEP). UNEP has grown into an active participant in and supporter of numerous international projects affecting the environment, biological diversity, and the world's forests.

The Stockholm Conference marked the beginning of twenty years of increasing focus in the international arena on the environment, biological diversity, and natural resources. Among the non-binding but influential products of that time were the 1982 World Charter for Nature adopted by the United Nations General Assembly and the 1987 report of the World Commission on Environment and Development (the Brundtland Commission), which framed succeeding discussions of these issues in terms of sustainable development.

It also saw the environment become a significant influence in the granting of international assistance, including in the lending practices multilateral development

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[35] *See, e.g., id.,* Principles 8, 9, 13, & 14.

[36] *See, e.g., id.,* Principles 2-7.

[37] *Id.* Principles 9-12.

banks.[38] What follows is a discussion of some of the more recent international non-binding actions that have had or will likely have clear impacts on Mexico's forests.

The Tropical Forests Action Program

In 1985, the Food and Agriculture Organization (FAO), working with the World Resources Institute and other organizations, created the Tropical Forests Action Program (TFAP, known in Spanish-speaking countries as PAFT). Its goal was to reverse tropical forest losses by helping developing countries draft and implement national forest policies. In 1989, to guide countries in policy development, TFAP adopted a set of forest management principles. The principles also serve to guide sources of international development aid in choosing projects to support. Ninety-two countries have embraced the TFAP approach.[39]

Mexico has had domestic TFAP-related efforts since 1988. In that year, it began to draft a national *Plan de Acción Forestal Tropical* (PAFT). The initial effort focused on diagnosing deforestation problems in the country's tropical forests and proposing a small number of forestry development projects.[40] In 1990, a panel of experts recommended to the President that he institutionalize this effort as a *Programa de Acción Forestal Tropical* (PROAFT).[41] PROAFT is now organized as PROAFT, A.C., a non-profit civil association formerly attached to the Secretariat of Agriculture and Water Resources (SARH), probably now attached to the new Secretariat of Environment, Natural Resources, and Fisheries (SEMARNAP).

PROAFT's mission is to look at tropical forestry issues in Mexico on a national scale but to encourage sustainable development of forestry on a local scale. It has sponsored several research studies aimed at understanding aspects of sustainable forestry, some on basic natural science issues and some on social issues such as the relation of indigenous people to forests or the role of tourism in conservation. It has brokered alliances involving itself, rural communities, and NGOs for specific sustainable development projects. And it has sponsored regional forums on tropical

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[38]This topic, and its influence on the forests of Mexico, deserves fuller scrutiny. The authors considered it too large a subject to analyze fully to in this study.

[39]U.N. Secretary General, *supra* note 1, ¶ 40.

[40]M. Mondragón y Kalb, *supra* note 5; PROAFT, A.C., *El PROAFT* (23 July 1993) (hereinafter PROAFT fact sheet).

[41]Mondragón y Kalb, *supra* note 5, at 5.

forest issues, bringing together people from many sides of these matters. It is developing a long-term national tropical forestry plan.[42]

Forest Principles and Agenda 21

The 1992 Rio U.N. Conference on Environment and Development (UNCED) produced two non-binding declarations directly relevant to forests. One was a set of non-binding principles on forests, generally called the Forest Principles.[43] The other was Agenda 21, UNCED's outline of future international environmental protection and sustainable development actions.[44]

The Forest Principles call themselves "a first global consensus on forests."[45] They restate some of what has been said before in other instruments about natural resources generally: that states have a sovereign right to control their own resources, including their forests,[46] and that developed countries should support the forest conservation efforts of developing countries.[47]

The Forest Principles also include statements more specifically addressed to modern forest development issues. Principle 5(a) recognizes the need to support the rights of indigenous peoples and other forest dwellers. Several parts of the principles recognize the contribution forests make to rural economies and lifestyles and how their conservation is tied to issues of poverty and development.[48] Other parts recognize the need to preserve the biological diversity and other non-commodity values inherent in many forests.[49]

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[42]PROAFT fact sheet, *supra* note 40.

[43]Non-Legally Binding Authoritative Statement of Principles For a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests, U.N. Doc. A/CONF.151/6, *reprinted in* 4 Agenda 21 & The UNCED Proceeding 666 (Nicholas A. Robinson, ed. 1992) [hereinafter Forest Principles].

[44]Agenda 21 is U.N. Doc. A/CONF.151/4, *reprinted in* Agenda 21 & the UNCED Proceedings (Nicholas A. Robinson, ed. 1992) [hereinafter Agenda 21].

[45]Forest Principles, *supra* note 43, Preamble ¶ (d).

[46]*Id.* Principles 1(a) & 2(a).

[47]*Id.* Principles 1(b), 7(b), 9(a), 10, 11.

[48]*E.g., id.* Principles 6(a) &(d), 7(a), 9(b).

[49]*E.g.,* Principles 4, 6(c), & 7(b).

Agenda 21 contains several chapters that bear on Mexico's forests. Chapters two through eight deal with social and economic dimensions of sustainable development, including issues like fighting poverty. Chapter 10 deals with planning and management of land resources. Chapter 13 deals with fragile mountain systems. Chapter 14 deals with rural agriculture and development. Chapter 15 addresses conservation of biological diversity. Chapter 18 deals with protection of freshwater sources. Chapter 26 deals with the role of indigenous communities. However, the part of Agenda 21 most directly addressing forest issues is Chapter 11, "Combating Deforestation."

Chapter 11 identifies four broad program areas for future national and international efforts. The first is sustaining the multiple roles and functions of all types of forests. This area includes promoting national holistic forest policies created with local-level participation, including that of women and minorities. The second program area is forest rehabilitation and reforestation. The third is full use and valuation of forest goods and services. And the fourth is strengthening capacities for assessment and monitoring of forest activities. For all these activities, the Chapter calls for worldwide expenditures of roughly 31 billion U.S. dollars from 1993 to 2000, about 5.7 billion coming from international grants and other aid.[50]

The impact of the Forest Principles and Chapter 11 on the national policies of the signing member nations, including Mexico, is hard to isolate from the many other factors affecting their forest policies. In Mexico, the tone of balancing conservation with development found in the 1992 revision of the Forestry Law may reflect the influence of the Rio declarations.[51] As a recent U.N. progress report has noted, though, the time since UNCED has been too brief to achieve great changes in forests and forest policies.[52]

Nonetheless, the signing of the Forest Principles and Agenda 21 has resulted in a change of tone in the international discussions of forest policy and resulting changes in national, private, and NGO efforts for forest conservation. People have been talking about a possible binding accord on forest protection.[53] As discussed immediately below, governments and NGOs have accelerated work on criteria for judging whether forests are being managed sustainably.

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[50]Agenda 21, *supra* note 44, ¶¶ 11.6, 11.16, 11.25, 11.34.

[51]*See* U.N. Secretary General, *supra* note 1, ¶ 43.

[52]*Id.* ¶ 18.

[53]*Id.* ¶ 21.

Sustainable Management Criteria

Several efforts are underway in the world to establish criteria for judging whether forests are being managed sustainably. Some are proceeding under the aegis of international organizations and national governments. These may ultimately make their way into domestic laws. Some are proceeding under the sponsorship of environmental NGOs. If embraced by the scientific community or by forest products consumers, these may influence national laws. Finally, some arms of the forest products industry, fearing government-imposed standards, international trade barriers, and consumer rejection, are preparing their own standards, which they may self-police.

The International Tropical Timber Organization (ITTO) is an FAO-affiliated group made up of representatives from producer and consumer nations, with NGO and industry participation. It grew out of the International Tropical Timber Agreement, concluded in 1983 in Geneva, to which Mexico is not a party. Because the ITTO does include a large number of the world's producers and consumers of tropical timber, its actions may ultimately have influence in Mexico.

The ITTO began devising criteria for sustainable management of tropical forests in 1989.[54] In May 1990, the ITTO endorsed a set of Guidelines for the Sustainable Management of Natural Tropical Forests.[55] In 1991 the ITTO produced Criteria for the Measurement of Sustainable Tropical Forest Management.[56] This document offers a more specific delineation of sustainable management that can be more easily applied to individual forestry projects. Following UNCED, in 1993, the ITTO released two new sets of general guidance, the ITTO Guidelines for the Establishment and Sustainable Management of Tropical Plantations and the ITTO Guidelines on Biodiversity Conservation of Production Tropical Forests.[57] All these guidelines and criteria are non-binding.[58] The ITTO has set a goal to have all tropical forests sustainably managed by the year 2000.

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[54]FAO, Report on the FAO/ITTO Expert Consultation on the Harmonization of Criteria and Indicators for Sustainable Forest Management (held in Rome, Italy, 13-16 Feb. 1995), Annex IV, ¶ 18.

[55]*Id.*

[56]*Id.* ¶ 19.

[57]*See Id.*

[58]*Id.* ¶ 20.

Mexico is one of ten nations that have formed a Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests, also called "the Montreal Process". (About half of Mexico's remaining forests are at high enough altitudes to have the characteristics of temperate or boreal forests despite their tropical or near tropical latitude.[59]) The Working Group recently produced a Statement of Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests (the Santiago Statement) and a list of criteria and indicators. The Mexican participants have withheld final acceptance of the documents pending domestic review.[60]

Several environmental NGOs have been involved as observers in the ITTO and Montreal Process efforts. Two well-regarded groups, the Forest Stewardship Council and the World Wide Fund for Nature (known in the United States as the World Wildlife Fund or WWF) have produced their own criteria for sustainable forest management. Though of no legal weight, these are being studied seriously by governmental organizations and are influencing the debate over creation of criteria.[61] At Mexico's invitation, the Forest Stewardship Council has established its headquarters in Oaxaca. This may give its work special weight in Mexico.

Fearing future mandatory requirements for sustainable management or trade restrictions on products from mismanaged forests, private industry groups have begun to adopt their own codes for sustainable management. The American Forest & Paper Association in the United States has adopted such a code.

Binding Documents (Treaties)

1992 United Nations Convention on Biological Diversity

On June 5, 1992, in Rio de Janeiro, the UNCED adopted the Convention on Biological Diversity. Mexico signed this convention on June 13, 1992, and the Mexican Senate ratified it on December 3 of that same year. The Convention entered into force when the thirtieth signatory ratified it, in 1993.

The Convention defines biological diversity as "the variability among living organisms from all sources . . . ; this includes diversity within species, between species,

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[59]See Chapter I of this report.

[60]Copies of the Feb. 3, 1995 documents can be obtained via e-mail from bmankin@igc.apc.org.

[61]U.N. Secretary General, *supra* note 1, ¶ 36.

and of ecosystems."[62] That means biological diversity encompasses the genetic variation to be found within a single kind of plant or animal; the variety of different kinds of plants and animals in a given place and their relative abundance; and the variety of natural aggregations of plants and animals, such as temperate pine forests, temperate oak forests, temperate forests dominated by mixes of particular species, the many distinct kinds of tropical forests, various grasslands, and so forth.

The Convention's objectives are to help conserve biological diversity, to promote sustainable use of its elements, and to ensure fair participation in the benefits that may derive from the utilization of genetic resources.[63] The agreement sets out an international consensus on these issues and thereby creates a legal framework that will contribute to the preservation of biological diversity.[64]

Consistent with basic international law, the Convention reiterates that States have the sovereign right to exploit their natural resources pursuant to their own environmental policies, but with the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction.[65] Article 4 states that the requirements of the Convention apply not just within a State's borders, but also to all actions under the State's control, inside or outside of the State's physical jurisdiction and regardless of where their effects are felt.

The Convention requires each signing State to formulate management plans and national strategies for the conservation and sustainable use of biological diversity or to adapt the existing strategies for this same purpose, and integrate the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programs, and policies.[66] To this general duty, the Convention elaborates more specific obligations concerning monitoring of biological diversity,[67] conservation,[68] sustainable

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[62]Convention on Biological Diversity, art. 2 (1992) [hereinafter Biodiversity Convention].

[63]*Id.* art. 1.

[64]Secretaría de Relaciones Exteriores, Consultoria Jurídica, Relacion de Tratados en Vigor, 1993 [hereinafter Mexican Treaties].

[65]Biodiversity Convention, *supra* note 62, art. 3.

[66]*Id.* art. 6.

[67]*Id.* art. 7.

[68]*Id.* arts. 8 & 9.

use,[69] creation of economic and social incentives to conserve,[70] research, training, and education,[71] impact assessment,[72] access to genetic resources,[73] technical and scientific interchange,[74] mutual development of biotechnology,[75] and financial assistance to developing countries.[76] Though these obligations sound far-reaching, many of them are qualified by phrases like "as appropriate" or "as far as possible and appropriate."

Mexico has taken many steps that help fulfill its obligations under the Biodiversity Convention. A presidential decree created the National Commission for Knowledge and Use of Biodiversity (CONABIO) in March 1992, shortly before UNCED, to coordinate national efforts to protect biodiversity.[77] CONABIO has been especially active in facilitating information exchange about biological diversity, as called for in Convention Article 17. CONABIO has established a computer network for biodiversity information (*el Red Mexicana de Información sobre Biodiversidad* or REMIB) and a national system of biodiversity information (*Sistema Nacional de Información sobre Biodiversidad* or SNIB).[78]

CONABIO has also developed a national plan for biological inventory (*el Plan Nacional de Inventarios Bióticos* or PLANIB).[79] This helps fulfill Mexico's obligation under Article 7 of the Convention to identify components of biological diversity in the country.

Since its creation, CONABIO has funded more than 140 biodiversity research and education projects. In 1993, Mexico created a Fund for Biodiversity attached to

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[69]*Id.* art. 10.

[70]*Id.* art. 11.

[71]*Id.* arts. 12 & 13.

[72]*Id.* art. 14.

[73]*Id.* art. 15.

[74]*Id.* arts. 16-18, 25.

[75]*Id.* art. 19.

[76]*Id.* arts. 20-21.

[77]Instituto Nacional de Ecología, Informe de la Situación General en Materia de Equilibrio Ecológico y Protección al Ambiente 1993-1994, at 103-104 [hereinafter INE 1993-94].

[78]*Id.* at 104-105.

[79]*Id.* at 105-106.

CONABIO to support these kinds of activities.[80] These actions help fulfill Mexico's obligation under Convention Article 20 to give financial support to domestic biodiversity activities.

The Convention directs each country to "Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity."[81] Mexico has a National System of Protected Natural Areas (*Sistema Nacional de Áreas Naturales Protegidas* or SINAP), originally within the Secretariat for Social Development (SEDESOL), now within SEMARNAP.[82] The Convention requires management guidelines for the reserves,[83] which Mexican law directs the National Institute of Ecology (INE) to create.

SEDESOL, first through its National Solidarity Program (PRONASOL) and now through PRONASOL's successor, the Program for Education, Health, and Food (PROGRESA), has created enterprises aimed at developing areas of extreme poverty, many of which are located around protected natural areas, without destroying the ecosystems around them. For example, it created a special program for the Lacandon region to try to provide the inhabitants living near reserves like Montes Azules ways of living that do not require encroachment on the reserves or destructive use of buffer areas. This helped fulfill the requirement of Article 8(e), to "Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas."

Mexico has been an active participant in meetings and conferences growing out of the Convention. In April 1994, it hosted an international meeting of scientific experts on biological diversity in Mexico City, under the auspices of CONABIO.

During the course of this study, the investigators met with many people involved in activities encouraged by the Convention, including tree planting, research, environmental education, and planning. Nevertheless, Mexico lacks the funds to implement all the provisions of this Convention fully. Almost every Mexican government agency could use more resources. Mexico is complying with the Convention as far as possible and appropriate, but with more resources carefully used, it could do more.

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[80] *Id.* at 106-108.

[81] Biodiversity Convention, *supra* note 62, art. 8(a).

[82] The laws enabling creation of protected natural areas are described in Chapter 2 of this report.

[83] Biodiversity Convention, *supra* note 62, art. 8(b): "(b) Develop, where necessary, guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity."

United Nations Convention on Climate Change

The Climate Change Convention[84] was another product of UNCED. Mexico subscribed to this convention at Rio in June 1992. The Mexican Senate ratified it on December 3, 1992.

The main objective of this Convention is to stabilize the level of greenhouse gases in the atmosphere, to avoid triggering rapid climate change. By signing it each party pledged to work for the reduction of greenhouse gas emissions, the protection of greenhouse gas sinks and reservoirs, and the mitigation of any effects of climate change.[85] Each country has to make national inventories of its emissions of those greenhouse gases not regulated under the Montreal Protocol (which governs chlorofluorocarbons and related chemicals affecting the stratospheric ozone layer).[86]

Although the Climate Change Convention is not aimed directly at the protection and conservation of forests, it has implications for forest conservation. Forest plants absorb carbon dioxide, a major industrial emission and greenhouse gas, in the process of photosynthesis. The carbon dioxide is incorporated into the structure of the forest plants, notably into wood, and remains there as long as the plants remain intact. Forests are therefore carbon dioxide reservoirs; growing forests are carbon dioxide sinks. Forest fires and forest clearing are sources of greenhouse gases.

Also, forest ecosystems are potentially sensitive to climate change. For example, if a normally wet, forested area becomes dry because of a decrease in precipitation or increase in temperature, then many of the trees, other plants, and animals in that forest will either die or be unable to reproduce vigorously enough to maintain their populations.[87] In geologic history, forests have been able to adapt to changing climates if the climate change was relatively gradual and the forests stretched in unbroken blocks. For example, the deciduous forests of Eastern North America were able to slowly retreat southward during the ice ages and advance north during the warm interglacial periods. Their counterparts in Northern Europe could not retreat south because the Alps blocked the way. As a result the forests of North America are far richer in species than the forests of Northern Europe. Today, the isolated forests of both the United States and Mexico would have nowhere to retreat to if the climate changed.

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[84]United Nations Framework Convention on Climate Change (1992), 31 I.L.M. 849 [hereinafter Climate Change Convention].

[85]*Id.* art. 1.

[86]*Id.* art. 1 ¶ (a).

[87]Erik Arrhenius & Thomas W. Waltz, The Greenhouse Effect: Implications for Economic Development (1990) (World Bank Discussion Paper).

Their way would be blocked by farms, ranches, and urban development, and many of the species of the forest would die out.

Parties to this Convention must take measures to achieve its objectives guided by principles set forth in Article 3. Article 3 ¶ 3 directs parties to "take precautionary measures to anticipate, prevent or minimize the causes of global climate change and mitigate its adverse effects."[88] Article 4 commits countries to cooperate and promote the implementation of practices to control greenhouse gases and protect sinks and reservoirs in all relevant sectors, including forestry and agriculture.[89]

Mexico began taking actions called for in the Convention well before it was drafted. For example, Mexico established the National Commission for Energy Saving and created a preliminary inventory of greenhouse gases, started in 1988 and concluded in 1992. This study includes data related to the consumption and production of fossil fuels, as well as those related to the forestry, farming, and ranching sectors, provided by the National Institute of Forest, Agricultural and Fish Investigations.[90]

Also before the Rio Conference, on May 13, 1992, Mexico signed the Agreement for the Creation of the Inter-American Institute for the Investigation of Global Climate, in Montevideo, Uruguay. The Mexican Senate ratified this agreement on June 20, 1992. The main purposes of this Institute are to investigate global climate change and to function as a liaison to all the countries in the Americas, promoting investigation and international cooperation.[91]

The Climate Change Convention does not directly require any specific forestry actions in Mexico. However, interest in combating climate change has facilitated many projects in Mexico, including the one that produced this report. Some of the developed nations' interest in supporting Mexican forest projects comes from the possibility that

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[88]Climate Change Convention, *supra* note 84, art. 3 ¶ 3 continues:

> Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost effective so as to ensure global benefits at the lowest possible costs. To achieve this, such policies and measures should take into account different socio-economic contexts, be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation, and comprise all economic sectors. Efforts to address climate change may be carried out cooperatively by interested parties.

[89]*Id.* arts. 4(c) & (d).

[90]INE, Informe de la Situación General en Materia de Equilibrio Ecológico y Protección al Ambiente, 1991-1992, at 178 [hereinafter INE 1991-92].

[91]Organizacion de Estados Americanos (OEA o OAS), Acuerdo para la Creación del Instituto Interamericano para la Investigacion del Cambio Global; *in* Mexican Treaties, *supra* note 64.

recovering these forests may help fulfill obligations under the treaty to mitigate the effects of industrial greenhouse gas emissions.

Environmental Agreements Affecting Border Areas

Mexico shares borders with three nations and has an environmental border treaty with each of them. The Agreement Between the United States of America and the United Mexican States on Cooperation for the Protection and Improvement of the Environment in the Border Area was signed in La Paz on August 14, 1983 and entered into force on February 16, 1984.[92] The agreement focuses on pollution and other environmental problems related to industrial development, urbanization, and population movement in the area within 100 kilometers of the shared border. Since signing the original general agreement, the two countries have added several annexes dealing with specific pollution problems.[93] A subsequent agreement created a Border Environment Cooperation Commission and a North American Development Bank.[94] Because of the pollution control emphasis of the original border area agreement, the United States named its Environmental Protection Agency as its national coordinator.[95] However, the border area contains some significant protected natural areas also, and the treaty has served as the basis for cooperation among United States and Mexican land managers, as described elsewhere in this chapter.[96]

The Agreement Between the United Mexican States and Belize on Protection and Improvement of the Environment and Natural Resource Conservation in the Border Area was signed in Belmopan, Belize, on September 20, 1991. The Mexican Senate has ratified this agreement. Each party agrees to cooperate in protecting and preserving the environment in the border area, 50 kilometers into each country's territory, with reciprocity and according to each country's internal rules, laws, and environmental policies.[97] The parties agree to coordinate efforts between national governments as well

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[92]T.I.A.S. 10827 [hereinafter Main Border Agreement].

[93]T.I.A.S 11269 contains five annexes signed from 1985 through 1989 [hereinafter Annexes].

[94]Agreement Concerning the Establishment of a Border Environment Cooperation Commission and a North American Development Bank, Nov. 16 & 18, 1993 [hereinafter BECC Agreement].

[95]Main Border Agreement, *supra* note 92, art. 9.

[96]*See supra* text accompanying notes 123-153.

[97]Agreement between the United Mexican States and Belize for the Protection and Improvement of the Environment and Preservation of Natural Resources in the Border Area, art. 1.

as with local communities to avoid illegal commerce in endangered species of wild flora and fauna, including forest species coming from protected natural areas.[98]

The countries promise to coordinate actions necessary for environmental education, law, regulation, impact assessment, forest management, training, sustainable development, and care of biological diversity. These will be done through special programs and specific projects.[99] Each party is to designate a National Coordinator, which in the case of Mexico was first the Secretariat for Urban Development and Ecology (SEDUE), then SEDESOL, and is now SEMARNAP.[100] A Binational Mexico-Belize Commission on Border Limits and Cooperation will coordinate specific joint actions implementing the treaty.[101] In November 1993, Belize and Mexico set out a two-year program for environmental cooperation involving specific projects, including exchange of information and ideas about development in the border region.[102]

On April 10, 1987, the governments of Mexico and Guatemala signed the Agreement for the Protection and Preservation of the Environment in the Border Region. The Mexican Senate ratified it on March 22, 1988.

The treaty is said to be a result of the Stockholm Conference on the Human Environment 15 years before. It is aimed at promoting cooperation between both governments for the protection of the environment and natural resources shared by both countries.

It is not a strictly worded treaty. It gives the parties the freedom to act upon it in the most feasible way to adopt the necessary measures to prevent, reduce, and eliminate the pollution sources from within their territory.[103] They are to implement the provisions of the agreement according to their own internal legislation and with all the other international agreements to which they are parties and that have to do directly with the preservation of the environment.

Although it does not deal directly with deforestation per se, it does refer to the preservation of habitats and ecosystems, conservation of protected natural areas along

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[98]*Id.* art. 5(d).

[99]*Id.* art. 5(e).

[100]*Id.* art. 7.

[101]*Id.* art. 7.

[102]INE 1993-94, *supra* note 77, at 310.

[103]Convenio entre los Estados Unidos Mexicanos y la República de Guatemala sobre la Protección y Mejoramiento del Ambiente en la Zona Fronteriza (Apr. 10, 1987), art. 2.

the border, and prevention of illegal trade in endangered species. The treaty calls on the governments to coordinate efforts with the local communities in both countries.[104]

The institution in charge of assuring the application of this agreement, for Mexico, was SEDESOL and now is SEMARNAP. The treaty did not create a specific commission to oversee implementation. On November 29, 1990, Mexico created the Mexican Commission for Cooperation with Central America, which has as its main objective to promote economic and social development in the area without affecting the natural resources in it.[105] Subsequently, on March 16, 1994, Mexico and Guatemala signed a formal letter of intent for direct cooperation between SEDESOL and its Guatemalan counterpart.[106]

Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (Western Hemisphere Convention)

This multilateral convention was signed in Washington, D.C., on November 20, 1940, was ratified by the Mexican Senate on January 27, 1942, and entered into force on April 30, 1942.[107] Currently, 22 nations in the Americas have signed the treaty, 19 of which have ratified it.

Its main objectives are the preservation and protection of flora and fauna, as well as protection of significant natural areas, parks, and cultural and scenic sites.[108] It calls on the signing nations to establish protected areas,[109] adopt laws for the protection of flora and fauna,[110] protect migratory birds,[111] prohibit taking of a list of species of special

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[104]*Id.* art. 4(b) & (d).

[105]*See* INE 1991-92, *supra* note 90, at 305.

[106]INE 1993-94, *supra* note 77, at 311.

[107]56 Stat. 1354; 161 U.N.T.S. 193; 3 Treaties and Other International Agreements of the United States of America 1776-1949 at 630 (C.I. Bevans, ed.) [hereinafter Western Hemisphere Convention].

[108]*Id.* preamble.

[109]*Id.* art. II.

[110]*Id.* art. V.

[111]*Id.* art. VII.

concern,[112] regulate trade in protected species,[113] and cooperate to promote the objectives of the treaty.[114]

Commentators have observed that the treaty is currently of limited influence.[115] Still, it serves as the one of the bases for the cooperative work between U.S. and Mexican natural resource agencies, discussed elsewhere in this chapter.[116]

The treaty has also been an influence behind a series of Organization of American States-sponsored conferences, meetings, and resolutions related to the environment. Mexico has been a regular participant in these activities.[117]

The Migratory Bird Treaty

The Convention Between the United States of America and the United Mexican States for the Protection of Migratory Birds and Game Mammals was signed in Mexico City in February 1936, was ratified by the Mexican Senate on February 12, 1937, and came into effect on March 15, 1937.[118] The treaty includes agreements to protect insect-

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[112]*Id.* art. X.

[113]*Id.* art. IX.

[114]*Id.* art. VI.

[115]*E.g.*, de Klemm & Shine, *supra* note 31, at 7; Kathleen Rogers, Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere: The Need for Inter-American Cooperation to Protect the Environment (presentation to the Standing Commission on the Environment, Organization of American States, Nov. 1, 1993); Susan Bass, Revitalization of the Western Hemisphere Convention (presentation to the Standing Commission on the Environment, Organization of American States, Nov. 1, 1993).

[116]*See supra* text accompanying notes 123-153.

[117]These have included the Inter-American Conference on the conservation of renewable natural resources, Denver, Colorado, September 1948; Inter-American Conference on problems related to renewable natural resources of the continent, Argentina, October 1965; the Sixth Ordinary session of the Assembly General of the OAS, Chile 1976, urging member states to cooperate in scientific matters related to preservation of flora and fauna under the Convention and emphasizing the conservation of natural resources in the region; Terrestrial ecosystems conservation experts meeting, Costa Rica, April 1978; Technical meeting on
education and training for the administration of national parks, wildlife reserves and other protected areas, Venezuela, September 1978; Technical meeting on legal aspects related to the Western Hemisphere Convention, Washington, D.C., December 1979; Technical meeting on legal aspects related to the Western Hemisphere Convention, Washington, D.C. April-May 1980.

[118]50 Stat. 1311; 9 Treaties and Other International Agreements of the United States of America 1776-1949 at 1017 (C.I. Bevans, ed.); 178 League of Nations Treaty Series 309 [hereinafter Migratory Bird Treaty].

eating birds, to regulate hunting, to establish refuges, and to regulate international trade in wild bird and mammal products. The parties amended the treaty with an annex in 1972.[119]

This convention implicitly affects forests. Protection of birds and mammals entails protection of their habitats, which include forests.

A prime motivation behind this treaty was the protection of migratory waterfowl, especially ducks and geese. To that end, it has been relatively successful. These birds' ranges are largely limited to Mexico, the United States, and Canada (also party to a migratory bird treaty with the United States), and their habitats are well-known. As one commentary noted, "The North American system works because of the existence of the two conventions on migratory birds, the close relations that have evolved between the relevant Government departments, . . . and the political will to put a stop to the constant reduction in numbers of certain species of ducks and geese."[120] The cooperative programs in Mexico growing out of the convention are discussed elsewhere in this chapter.[121]

The Convention has not succeeded in preventing the apparent fall in numbers of migratory songbirds observed in the last several decades in North America. Many of these birds have ranges that extend south beyond Mexico, outside the protection of the treaty. Many depend on intact forests to overwinter in or to breed, and the focus of habitat protection efforts under the treaty has been on wetlands. This is clearly an area that could benefit from a strengthened treaty, extended to more countries in the hemisphere, and given greater priority by the subscribing governments. (A "Partners in Flight" initiative, involving governments and NGOs throughout the hemisphere, is working in this area. This initiative is part of the cooperative programs discussed elsewhere in this chapter.[122])

Treaty-Based Cooperative Efforts with the United States

The United States and Mexico have a history of cooperation on science and technical issues. Forestry-related cooperative efforts date back to early part of this

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[119]23 U.S.T. 260 [hereinafter Migratory Bird Treaty Annex].

[120]de Klemm and Shine, *supra* note 31, at 43.

[121]*See supra* text accompanying notes 123-153.

[122]*Id.*

century.[123] The Convention for the Protection of Migratory Birds and Game Mammals, which the two countries signed in 1936,[124] has been the basis of cooperative wildlife protection efforts. The two countries made a general agreement on technical cooperation in 1951[125] and on scientific cooperation in 1972.[126] They signed an environmental cooperation agreement, aimed principally at the border area, in 1983,[127] and have added five annexes to it, focused on pollution-related issues.[128] In 1994 they established a Border Environment Cooperation Commission.[129] A Memorandum of Understanding on Cooperation in Management of National Parks and Other Protected Natural and Cultural Heritage Sites, signed in 1988 and 1989,[130] formalized cooperation in park-related issues.

Three U.S. agencies have active cooperative programs related to forests, wildlife, or protected natural areas with their Mexican counterparts. They are the U.S. Forest Service, the U.S. Fish and Wildlife Service, and the U.S. National Park Service.

The Forest Service is the U.S. agency involved with the broadest range of forest management activities. Its domestic responsibilities include management of the federally-owned national forests for multiple uses including recreation, water, wildlife, grazing, and timber; conducting research on forests and forest products; and assisting state and private forest management efforts.

The Forest Service pursues three avenues of cooperation with Mexican agencies. Under a memorandum of understanding (MOU) between the Forest Service and SARH first signed in 1984 and amended regularly since,[131] the two agencies maintain

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[123]*See* U.S. Forest Service, Focus Country Plan for Mexico 2 (Nov. 1994 draft) [hereinafter Forest Service Plan].

[124]Migratory Bird Treaty, *supra* note 118.

[125]General Agreement for Technical Cooperation, June 27, 1951, 2 U.S.T. 1243, T.I.A.S. 2273, *amended* Jan. 21 & 22, 1952, 3 U.S.T. 4781, T.I.A.S. 2646, *and* Apr. 13, 1954, 5 U.S.T. 13773, T.I.A.S. 3006.

[126]Agreement for Scientific and Technical Cooperation, June 15, 1972, 23 U.S.T. 934 (done by exchange of notes in Washington), *amended* Aug. 10 & Sept. 22, 1994 [hereinafter Scientific Agreement].

[127]Main Border Agreement, *supra* note 92.

[128]Border Annexes, *supra* note 93.

[129]Created by the BECC Agreement, *supra* note 94.

[130]Nov. 30, 1988 and Jan. 24, 1989, T.I.A.S. 11599.

[131]The Forest Service Plan, *supra* note 123, discusses the MOU, at 8, and reprints the most recent supplementary agreement to it, at 19.

cooperative programs in several areas, including wildlife management, natural forest management, land management planning, plantation management, silviculture, agroforestry, and protected natural areas. Current activities include training Mexican foresters and scientists in tree nursery management, migratory bird monitoring, and wetland habitat management. A "sister forest" arrangement has promoted exchanges of expertise and tools between forests that share migratory species, like El Ocote in Chiapas and the Klamath in northern California, or that have other concerns in common. Forests along the border areas cooperate in controlling fires. These activities continue between the Forest Service and those parts of SARH moved into the new environmental secretariat.

The Forest Service also represents the United States on the North American Forestry Commission (NAFC), an arm of the United Nation's Food and Agriculture Organization involving Mexico, the United States, and Canada.[132] Several NAFC working groups bring joint expertise to bear on common problems, such as fire management, migratory bird protection, and the effects of climate change. The level of activity of the working groups varies: some just make general recommendations, while others sponsor research and give concrete guidance to ongoing work of other agencies and NGOs.

Finally, the Forest Service signed a letter of intent in 1992 with the Instituto Nacional de Investigaciones Forestales y Agropecuarias (INIFAP) outlining several areas for cooperative research, including the biology of forest organisms, ecological management, human-forest interactions, trade, and tropical forestry.[133]

The U.S. Fish and Wildlife Service (FWS) focuses on wildlife and biodiversity-related issues. Its domestic duties include management of federally-owned national wildlife refuges, regulation of migratory bird hunting, and protection of threatened or endangered species of plants and animals.

The FWS works cooperatively with Mexican counterparts under several international agreements. Under the 1936 Convention for the Protection of Migratory Birds and Game Mammals,[134] FWS assists in winter surveys of waterfowl and shorebirds. The FWS also relies on two multi-lateral treaties, the 1940 Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere[135] and the

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[132]*See id.* at 8 for a description of the NAFC's activities.

[133]*See id.* at 9 (description of program), 15 (text of letter).

[134]Migratory Bird Treaty, *supra* note 118, and Migratory Bird Treaty Annex, *supra* note 119.

[135]Western Hemisphere Convention, *supra* note 107.

Convention on International Trade in Endangered Species (CITES,)[136] as a basis for its cooperative programs.

In 1974, the FWS and its Mexican counterparts created a Mexico-United States Joint Committee for the Conservation of Wild Flora and Fauna. This committee meets annually to consider joint projects and policies. In 1992 and 1993, the Joint Committee sponsored 30 cooperative projects on endangered wildlife, seven on endangered plants, and 21 on migratory birds.[137] Many of these focused on research,[138] but some involved management and education. Several involved forests or forest-dwelling species, including studies of the Mexican spotted owl, scarlet macaw, and jaguar.

The Committee also works on wildlife trade issues. CITES and the 1936 Convention both have provisions concerning trade, and FWS officials cooperate with Mexican officials on enforcement.[139] Their work together in recent years has led to convictions of smugglers of forest animals like parrots, ocelots, and jaguars. The two countries also cooperate in training enforcement agents.[140]

FWS also helps train reserve managers in Mexico. Some of the training programs are sponsored by the Joint Committee, often with participation from Mexican NGOs or universities. FWS and Mexico also participate in the multilateral Latin American Reserve Manager Training Program (RESERVA) involving the United States and twenty other countries in the Western Hemisphere. The U.S. Forest Service also represents the United States in RESERVA programs.[141]

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[136]27 U.S.T. 1087; 993 U.N.T.S. 243 [hereinafter CITES].

[137]U.S. FWS, U.S. Fish and Wildlife Service Cooperative Programs With Mexico 1992-1993 at 22-27 [hereinafter FWS Report].

[138]The agencies signed an agreement in 1988 describing the scope of the Committee's work on research. Accord Between the Direction General for Ecological Conservation of Natural Resources of the Secretariat for Urban Development and Ecology of the United States of Mexico and the Fish and Wildlife Service of the Department of the Interior of the United States of America on Research, Studies, and Scientific Collection of Terrestrial and Aquatic Species of Wild Flora and Fauna Within the Framework of the Mexico-USA Joint Committee for the Conservation of Wildlife, signed September 9 and 23, 1988.

[139]The two wildlife agencies signed a 1988 accord to govern the Committee's enforcement work. Accord Between the Direction General for Ecological Conservation of Natural Resources of the Secretariat for Urban Development and Ecology of the United States of Mexico and the Fish and Wildlife Service of the Department of the Interior of the United States of America for the Control of Traffic in Wild Species of Flora and Fauna Within the Framework of the Mexico-USA Joint Committee for the Conservation of Wildlife, signed September 24, 1988.

[140]FWS Report, *supra* note 137, at 17-18.

[141]*Id.* at 8-9, 32.

A 1988 memorandum of understanding among Mexico, the United States, and Canada created the Tripartite Committee for the Conservation of Wetlands and their Migratory Birds.[142] This body helps implement the North American Waterfowl Management Plan[143] and promotes wetlands conservation projects. It has helped fund conservation of the Sian Ka'an Biosphere Reserve, an area of tropical forests, mangroves, and marshes in Quintana Roo; coastal wetlands management projects in Chiapas and Yucatan; and at least six other similar projects in Mexico.[144]

The U.S. National Park Service (NPS) is the U.S. agency concerned with management of those public lands set aside as parks and monuments, including many forested areas. Its management emphasis is on preservation, recreation, research, and education. It maintains a US/Mexico Affairs Office at New Mexico State University dedicated to cooperative efforts.

A 1988 memorandum of understanding between NPS and the Mexican Secretariat of Urban Development and Ecology (SEDUE, SEDESOL's predecessor) serves as the basis of NPS's cooperative efforts.[145] The memorandum in turn is based on several treaties: the 1940 Western Hemisphere Convention,[146] the 1972 U.S.-Mexico treaty on general scientific and technical cooperation,[147] the multilateral 1972 World Cultural and Natural Heritage Convention,[148] the multilateral 1983 Cartegena

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[142]The MOU was signed in Mexico City on March 16, 1988. See de Klemm & Shine, *supra* note 31, for a brief discussion of this and the other wildlife-related agency-level cooperative agreements.

[143]A 1985 agency-level agreement among the countries. *See* de Klemm & Shine, *supra* note 31.

[144]FWS Report, *supra* note 137, at 30.

[145]Memorandum of Understanding between the National Park Service of the Department of the Interior of the United States of America and Secretariat of Urban Development and Ecology, United Mexican States on Cooperation in Management and Protection of National Parks and Other Protected Natural and Cultural Heritage Sites, November 30, 1988 and January 24, 1989, T.I.A.S. 11599. The memorandum includes an annex governing administrative procedures. The parties amended the memorandum to substitute SEDESOL and its sub-agencies for SEDUE, and to extend it though 1998.

[146]Western Hemisphere Convention, *supra* note 107.

[147]Scientific Agreement, *supra* note 126.

[148]Nov. 23, 1972, 27 U.S.T. 37.

Convention on protection of the marine environment of the Caribbean region,[149] and the U.S.-Mexico 1983 agreement on environmental protection of the border area.[150]

The majority of work under this memorandum of understanding has focused on the border area. Both countries have parks and protected areas in the border region, and the management agencies have established some sister-park relationships. NPS has supported park management training and conferences on biodiversity and protected areas in the border region.[151]

NPS is the lead agency within the U.S. Department of the Interior for coordinating cooperative Interior Department programs affecting the border region. Other agencies within the Department participating in these cooperative efforts are the FWS (whose non-border projects are described above), the U.S. Geological Survey, the Bureau of Land Management, the Bureau of Indian Affairs, the Bureau of Mines and Reclamation, the Mineral Management Service, and the National Biological Service.[152]

The United States and Mexico have signed two treaties concerning mutual assistance in mapping.[153] Accurate maps help in tracking deforestation, establishing land ownership and reserve boundaries, and designing management programs.

Other International Cooperative Efforts

Mexico has bilateral environmental cooperative efforts ongoing with 16 countries besides the United States.[154] These include Australia, Belize, Bolivia, Canada, Chile, Costa Rica, El Salvador, Finland, Germany, Great Britain, Guatemala, Japan, Nicaragua, Panama, Spain, and Venezuela. The focus of most of these is on pollution control, but some also deal with forests and other natural resources. Canada, for example, has given

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[149]Mar. 24, 1983, T.I.A.S. 11085.

[150]Main Border Agreement, *supra* note 92.

[151]Director, US/Mexico Affairs Office, Memorandum to Files, FY1994 Accomplishments (January 4, 1995); FY1996 Budget Request, NPS Southwest Border Program.

[152]NPS Press release, U.S./Mexico Border Environmental Issues Behind Cooperative Interagency Charter (Nov. 21, 1994) (contact: Howard Ness, (505) 646-7880).

[153]Memorandum Concerning Cooperation and Mutual Assistance in Mapping, Charting and Geodesy, July 25, 1975, 27 U.S.T 1083; Memorandum of Understanding on Scientific and Technical Cooperation in the Mapping and Earth Sciences, with annex, Aug. 12, 1992, T.I.A.S. 11961.

[154]For a list of Mexico's bilateral international cooperative efforts, see INE 1993-94, *supra* note 77, at 310-311 (table 145). The recent agreement with Finland, not on INE's list, is mentioned in SEMARNAP, *Comisión de Desarrollo Sustentable* 15 (April 1995).

3 million Canadian dollars for a model forest program, with projects currently in Chihuahua and Campeche. Canada has also participated in joint work at the Monarca reserve.[155] Spain is supporting studies for ecological *ordenamientos*[156] in four parts of the country, including the forested Sierra de los Tuxtlas, Veracruz.

The Convention on International Trade in Endangered Species (CITES)

CITES[157] was originally signed in March 1973, but Mexico did not become a party to it until 1991. CITES controls trade in endangered and threatened species. The species are listed in three appendices to the Convention. Species in Appendix I are threatened with extinction.[158] CITES permits no commercial trade in these species or products made from them, and requires both export and import permits for non-commercial trade.[159] Appendix II species are threatened with extinction and require trade controls for their protection.[160] Trade in these requires an export permit, which the country may issue only if such trade is consistent with the survival of the species.[161] Appendix III species are listed subject to export controls in specific countries. Import of an Appendix III species or derivative product requires a certificate of origin; if the species or product is from a country limiting exports, the importer must also have a permit from the country of origin.[162] The Appendix I and II lists can be amended by a two-thirds vote of the parties to the Convention.[163]

Several Mexican forest-dwelling species are listed in the CITES appendices. The jaguar, a resident of the Lacandon whose pelt is illegally traded, is listed in Appendix I.

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[155]For a short description of the cooperative work with Canada at the Monarca reserve, see SEMARNAP, *supra* note 154, at 103.

[156]For a discussion of this regulatory and planning tool, see Chapter III of this report.

[157]CITES, *supra* note 136.

[158]*Id.* art. II. ¶ 1.

[159]*Id.* art. III.

[160]*Id.* art. II, ¶ 2.

[161]*Id.* art. IV.

[162]*Id.* art. V.

[163]*Id.* art. XV.

All orchids are either Appendix I or Appendix II species. The Lacandon community has urged the CITES nations to add the local species of mahogany, with its valuable timber, to the CITES lists.

Mexico has taken many steps to implement CITES. It has published internal guidelines on CITES enforcement; sent officers to U.S.-sponsored enforcement training; sent officers to the United States to testify in court in enforcement actions; published internal guidelines on implementation; and sought the return of protected species illegally exported from Mexico.[164] PROFEPA is the agency charged with CITES enforcement, and INE is the agency that issues CITES import and export permits. In 1993 INE issued 753 permits to import animals or animal products, 40 for plant imports, 387 for animal exports, 68 for plant exports, and 186 to import hunting trophies.[165] It is unclear how this legal trade compares in volume with the illegal trade.

Other Treaties Controlling International Trade

International agreements aimed at promoting international trade may affect the environment, although the mechanism of action may be indirect and complex, and the ultimate effect may be difficult to identify or predict. (This discussion does not include agreements like CITES or the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal that restrict trade with the specific intent of protecting the environment.)

Mexico is party to one major multilateral trade agreement -- the General Agreement on Tariffs and Trade (GATT). GATT is actually a series of agreements aimed at reducing tariffs and other barriers to free trade. GATT places several restrictions on domestic laws. Article I requires that a country's laws grant most-favored-nation treatment to GATT members. The laws may not discriminate among GATT nations. Article III requires that the internal domestic laws regarding sale, use, transport, distribution, taxation, and the like be the same for imported and domestic goods. Article XI prohibits most quotas on imports or exports. Article XX lays out some exceptions to the foregoing requirements. A nation may maintain domestic laws necessary to protect human, animal, or plant life or health (Article XX(b)) or to conserve exhaustible natural resources (Article XX(g)). In the latter case, the restrictions must be in conjunction with domestic restrictions on production or consumption.

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[164]INE 1993-94, *supra* note 77, at 315; FWS Report, *supra* note 137, at 17-18.

[165]INE 1993-94, *supra* note 77, at 94 (table 28).

Mexico is also one of the three parties to the North American Free Trade Agreement (NAFTA), which entered into force January 1, 1994. It includes a supplemental agreement on environmental cooperation.

Treaties like GATT and NAFTA may have three kinds of effects on issues like deforestation. First, they may override or force the repeal of domestic laws that protect the forests. If Mexico had a law forbidding exports of certain species of timber, that law might violate GATT Article XI, unless it fell under an Article XX exemption.

Second, they may bring pressure to end domestic subsidies of forest harvest. For example, nations in the European Commission on Economics have proposed international forest practice standards to protect forest ecosystems. Nations ignoring those standards would be considered to be subsidizing timber harvest at the expense of the environment and might be subject to tariffs on their forest-related exports. The proposed standards include strong protections for virgin forests.

As another example, the United States has brought pressure against Canada under the U.S.-Canada free trade agreement to assess an export duty on timber to offset what are claimed to be artificially low stumpage prices (the price paid for the right to cut trees) on federal lands. Canada imposed this duty for a time, in theory lowering the demand in the U.S. for Canadian timber and discouraging harvest.

Third, GATT or NAFTA may affect domestic and international business patterns, and hence indirectly affect land use. For example, if NAFTA makes it easier or more profitable for Mexicans to ship oranges to the United States and Canada, the demand for land suitable for oranges will grow. Depending on local conditions, including local laws, this demand could prompt conversion of forests to orange groves. Lowering of trade barriers could make some sorts of timber harvest so profitable that long-term management will become more attractive and secondary forest acreage will increase. Or, it could make some kinds of timber more available through imports so that harvests diminish. The overall indirect effects of these trade treaties are hard to foresee.

The NAFTA supplemental environmental agreement (the North American Agreement on Environmental Cooperation) may have some influences on natural resource issues only incidentally connected with trade. The agreement creates a North American Commission for Environmental Cooperation.[166] The Commission already has become an instigator and catalyst for cooperative environmental projects.

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[166]North American Agreement on Environmental Cooperation, Sept. 8, 9, 12, & 14, 1993, pt. III.

The supplemental agreement establishes an indirect method for private citizens to press complaints about failures to enforce environmental laws.[167] The private citizens or organizations may bring their complaint before the Secretariat of the North American Commission for Environmental Cooperation. The Secretariat may seek response from the government charged with lax enforcement, after which the Commission Council may direct the Secretariat to develop a full factual record. No sanctions are available through this process, however, unless the citizen complaint results in initiation of government action.

The three nations that negotiated the agreement will be able to request consultations concerning persistent failures to enforce environmental laws.[168] These consultations may eventually lead to arbitration of the claim and imposition of an action plan to resolve the problem. If a nation refuses to implement the action plan, the arbitration panel may impose monetary sanctions and the other parties to the treaty may impose limited tariffs on the offending country's goods.

In summary, trade treaties may have strong impacts on the environmental regulation of forests or the economic incentives to grow timber or to clear land. The effects are multifaceted, though, and in the case of GATT or NAFTA, hard to predict.

Other Treaties

This project report has not attempted to address the following kinds of treaties and programs: (1) those bearing on illicit trade in drugs (forests can be used to conceal drug production or commerce, and law enforcement efforts can affect forests); (2) those concerning immigration or refugees (human migrations can disrupt land use in forested border areas); (3) those concerning debts (debt-for-nature swaps have had some use to create protected areas in Mexico); (4) those involving the United States Environmental Protection Agency and focused on pollution control, not forests. These we leave for future study.

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[167] *Id.* arts. 14 & 15.

[168] *Id.* pt. V & annexes 34 & 36B.

Chapter Three:

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Domestic Forest Laws

This chapter discusses the domestic laws of Mexico concerning the protection of natural resources, with special attention to those protecting forests.

Throughout the world, the environment is a relatively new concern for the lawmaker. That concern has transformed property, land use, and related laws. Every nation has had such laws for years; we have begun to comprehend their impact on the environment only recently.

To understand Mexican natural resource law requires understanding something of Mexican property law generally. Moreover, it requires understanding the larger context of law in Mexico, including patterns of land tenure, organization of the government, the nature of Mexico's civil law system, and the historical basis of all of these.

Patterns of Land Tenure

Scholars have traced the roots of Mexican property law back to the legal systems of the indigenous peoples of Central America.[169] The indigenous people had differing systems of land ownership. For example, the Mayans had communal landholdings, but much of Mexico under Aztec influence had a property system with ownership rights basically originating from the Aztec king. The king originally had claim to all lands, though he would grant rights to lands to nobles and warriors. Common people might own their residences, but most of the land was held in large blocks by a small percentage of the population.

This pattern of large-block ownership continued under Spanish colonization of Mexico, though with different owners. The Spanish Crown originally claimed all the conquered land and made grants of it to nobles, army officers, the church, and others. To correct some of the injustice of depriving indigenous people of their lands, Spain later issued laws recognizing property held in common by indigenous communities. The legal concept of the *ejido* -- land occupied and worked communally by a rural village -- dates to 1573.[170]

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[169]*See, e.g.,* Adriana de Aguinaga, *The New Agrarian Law -- Mexico's Way Out,* 24 St. Mary's L. J. 883 (1993).

[170]*Id.* at 886 n.7.

Nonetheless, in colonial Mexico much land once under indigenous control came to be owned by colonists or the Church. Farming and ranching on these large holdings or *latifundios* was seldom intensive or efficient.

Unjust distribution of land was a fundamental grievance of the Mexican revolutionary movements of the nineteenth and early twentieth centuries. As the recent armed dispute in Chiapas shows, land distribution is still an issue.

When the present Mexican Constitution was drafted in 1917, 96 percent of rural families were without land, and one percent of the population controlled 97 percent of the country.[171] The Constitution sought to remedy this by outlawing *latifundios* and promoting *ejidos* and communal holdings.

The drafters of the Constitution foresaw a process where the government would expropriate large landholdings and turn them over to landless peasants and indigenous peoples. The peasants' lands would be organized as *ejidos. Ejido* lands would fall into a separate legal class of property ownership: social ownership, in contrast to public or private ownership. The lands would be owned by the community, with land use decisions made by democratically elected community leaders. To prevent new large holdings from being formed out of the *ejidos*, the *ejidatarios* were basically not allowed to sell or encumber their lands. (Modern reforms, discussed below, have changed this somewhat.)

Land reform is so fundamental to Mexican government that it has cabinet status in the person of the Minister for Agrarian Reform. Still, the process of land reform has been difficult, its progress gradual. Though *ejidos* are prevalent throughout Mexico, the demand for land has always outstripped supply. In the name of land reform the government has established agricultural communities in many marginal areas, including on forested lands.

General Nature of the Government

The supreme legal authority in Mexico and the blueprint for the national government is a constitution. The Mexican Constitution, formally the *Constitución Política de los Estados Unidos Mexicanos,* has 136 articles setting out the rights of individuals and the powers and structure of government. Compared to the U.S.

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[171] *Id.* at 888 n.8.

Constitution, the Mexican Constitution is more explicit in delineating the government's powers.[172]

In the Mexican system, the President controls far more power within the country than does the President in the United States. In part this is because of the powers the Constitution grants to the President; in part it is because for decades the President's party has also controlled the legislature. This centralization of power is deeply rooted in tradition as well as law. Since the days of the Aztecs, Mexico has had governments with strong central authority. The Spanish King and his viceroy replaced the central Aztec ruler, and the Mexican President has replaced central Spanish control.

The role of the courts, compared with the United States, is limited. Mexican law is civil law, like the legal systems of Spain, France, and Germany, as compared to the common law system of Britain and the United States. In a civil law system, the role of the courts is limited to applying the law as written by the legislature or the executive. The rights of property owners are set out in the Constitution, the civil code, and other derivative documents. The courts have the power to enforce these rights but have no power to elaborate on them.

If a citizen believes that government administrative action is contrary to the limits established in the Constitution, the citizen may bring an *amparo* or shelter action in court. However, the usual initial route for disputing government actions is an administrative challenge. Should a citizen win an *amparo* or other court action, the result does not bind other courts as it would in a common law system following the principle of *stare decisis.* However, if a Mexican court rules five times in the same way on an issue, it does create a binding precedent.

The Administrative Framework

The greatest legal powers are concentrated in the Executive Branch. As with all modern nations, the problems of governance are too complex to handle without recourse to specialization. In Mexico, the powers and duties of the executive are administered through the President and eighteen cabinet-level ministries.

Governments are usually organized along lines of human needs and activities: health, education, social development, defense, justice, agriculture, commerce, and so forth. Natural resources may be of interest under several of these categories. Some governments, including the United States, deal with natural resources more or less independently in each cabinet-level department, with coordination and sharing of

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[172]Anne Rowley, *Mexico's Legal System of Environmental Protection*, 24 Envtl. L. Rep. 10431, 10432 (Aug. 1994).

expertise among departments as required. So, for example, the U.S. national forests are under the U.S. Department of Agriculture, the national parks under the Department of the Interior, endangered wildlife split between the Commerce Department and Interior, and wetland protection under the Defense Department and the Environmental Protection Agency (which is not affiliated with a cabinet department). If an endangered wildlife issue arises on a national forest, the law requires formal consultation between the land managers in Agriculture and the wildlife experts in Interior or Commerce.

With the emergence of the environment as a distinct field, some governments have created environmental ministries and given them jurisdiction over natural resource issues as well. This approach has the advantage of creating a high-level advocate for sustainable resource use, in the person of the environmental minister, and potentially fostering a more coordinated national policy on natural resources. It has the disadvantage of removing mid- and low-level supporters of resource conservation from many agencies and centralizing them in one agency. As a result, it may be more difficult to weave good resource policy into the basic approaches of the non-environmental departments. Also, there is a risk that even in the environmental department, natural resource issues will receive less attention than pollution control issues.[173]

Mexico has experimented with both organizational schemes. Most recently, in December 1994, the national legislature opted for a centralized ministry creating the Ministry of Environment, Natural Resources and Fisheries (SEMARNAP). This ministry has jurisdiction over forest management, federally-protected lands, endangered species protection, and many other government functions affecting forests.

SEMARNAP was assembled from organizational elements that existed under the previous scheme, where several ministries dealt with natural resource issues. Before December 1994, the key government agencies affecting forests were housed in the Ministry of Social Development (SEDESOL) and the Ministry of Agriculture and Water Resources (SARH).

SEDESOL was the central environmental ministry. It had general responsibility for coordinating regional planning in Mexico, for managing biosphere reserves and certain other protected natural areas, for setting policy and standards for environmental

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[173]A recent U.N. report noted:

> A key problem is the low hierarchical profile of forestry institutions in many countries. The absorption of many forestry authorities into larger bureaucracies and other developments which diminish their profile make it more difficult for them to influence policy.

U.N. Secretary-General Report, *supra* note 1, ¶ 46.

and natural resource protection, and for proposing the creation of nature reserves. A presidential declaration, the *Reglamento Interior*, elaborated SEDESOL's authority.

Two key agencies from SEDESOL are now part of the new ministry. They are the National Institute of Ecology (INE), which is in charge of environmental research, planning, and standard-setting, and the Federal Attorney General's Office for Environmental Protection (PROFEPA), which is in charge of enforcing environmental laws.

SEDESOL retains other responsibilities indirectly related to the environment. For example, it implements PROGRESA, a program to fight extreme poverty by improving education, health, and nutrition. This kind of assistance may have strong influences on the environment, one way or the other. For example, a program to raise farm productivity might reduce farmers' needs to harvest trees or graze livestock in a nearby protected area. However, it might also make it practical for the farmers to work larger areas of land and so it might increase clearing of forests outside the protected area or even increase illegal clearing in the protected area.

SARH's forest-related responsibilities included regulation of silviculture, promotion of research (including on nature reserves), soil conservation, reforestation, inventory of forest resources, and management of certain forested public lands. SARH included quasi-governmental entities staffed by foresters and engineers, which provide the technical support for SARH's inventory of timber lands and regulation of timber harvests. All SARH's forest management functions, along with SARH's water-related authorities, have moved to SEMARNAP's sub-ministry of natural resources. SARH, reorganized as the Ministry of Agriculture and Rural Development, retains forest research functions.

SEMARNAP also has four other elements. There are two other sub-ministries, one for fisheries and one for planning, and two other environmental agencies outside the sub-ministries, the National Water Commission and the National Fishery Institute.

Other Ministries

Several other ministries have responsibilities that touch on the forests, directly or indirectly. The Ministry of Agrarian Reform affects rural development; the Ministry of Commerce affects international trade in forest products; the Ministry of Tourism romotes visits to protected areas and parks; the Ministry of Health confers on environmental standards; and so forth.

The work of the various ministries often requires mutual cooperation. For example, in the management of a forested nature reserve, INE (within SEMARNAP) may need to work cooperatively with rural development-oriented programs and

agencies in SAGDR (SARH's successor), SEDESOL, or the Ministry of Agrarian Reform to ensure that activities inside and outside the reserve's borders are consistent with the purpose of the reserve. Sometimes ministries make the relationships formal through coordination and cooperation agreements.

State and Local Governments

Though the federal government in Mexico is strong, the state and municipal governments may also play a role in forest regulations. The federal government licenses timber harvest and regulates conversion of forests to other land uses, but the states have adopted laws that affect forest use. For example, the State of Mexico, whose population is largely urban, for a time had an outright ban on timber harvest. The State of Chiapas has strictly regulated the ownership and use of chainsaws.

The federal General Ecology Law gives states and municipalities authority to establish local parks and reserves. They may also enter into cooperative agreements with the federal government to assume some or all of the responsibility for managing federally-created reserves. These powers and other issues related to reserves are discussed below.

The federal government may also sign a coordination agreement with a state granting abroad powers to regulate forest management. It has signed such an agreement with the State of Mexico. In general, though, any state action must be consistent with federal law and policies.

In the course of this study, the investigators observed that the federal officials were generally inclined to work cooperatively with their counterparts in the states and involve them in planning and decision making affecting forests in each state. There is no question, though, that the federal government has the final say in management of resources of national concern. For example, at one point the State of Mexico refused to sign a cooperative management agreement with the federal government and the State of Michoacan creating a role for the non-governmental organization (NGO) Monarca A.C. in the management of the Monarca Special Biosphere Reserve. This dissent by the state did not stop the federal government from committing to the agreement. With or ithout state participation, the federal government sets the main course of policy affecting the forests.

Forest Law in Mexico

Forest law in Mexico begins with the Constitution, which defines the government's powers and individuals' rights to the use of natural resources. The government exercises the powers outlined in the Constitution through statutes, regulations, and administrative acts. The remainder of this chapter will describe the basic legal structure affecting forest use as set out in the Constitution and key federal statutes.

The Mexican Constitution, Article 27

For land and natural resource issues, the key provision of the Mexican Constitution is Article 27. Article 27 describes, limits, and defines the nature of land ownership and the rights of property owners. At heart, it reflects an abiding ideal of the Mexican Revolution: that natural resources are a common patrimony of the nation and are to be used to fight poverty and to benefit all the people.

The first paragraph of Article 27 sets out the nature of resource ownership and the basic idea of private property:

> Ownership of the lands and waters within the boundaries of the national territory is vested originally in the nation, which has had and has the right to transmit their title to private persons, thereby constituting private property.

The second paragraph of the Article, though phrased as a limitation on government power, actually by implication describes an important government power:

> Expropriations may only be done for public benefit, and through reimbursement.

A subsequent section of Article 27 elaborates on the power of the state and federal governments to expropriate lands.[174] For example, the government must pay the owner the assessed tax value, adjusted to reflect recent improvements or depreciation. More important, the federal and state legislatures have the power to declare that a particular objective is in the public interest or for the public benefit. Though such language in a U.S. statute might have only incidental effect, in a Mexican statute it directly empowers the government to expropriate land to help achieve the objective.

The third paragraph of Article 27 declares the government's power and duty to distribute fairly the wealth from the nation's resources, to preserve those resources to allow their continued production of wealth, to restore ecological balance, and to protect

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[174]Mexican Constitution, *supra* note 30, art. 27, § VI, ¶ 2.

the environment. The language empowering the government to do these things also creates a significant limitation on the rights of private property owners:

> The nation will have, at all times, the right to impose upon private property such conditions for use [*modalidades*] as the public interest dictates, as well as to regulate, for social benefit, the use of natural elements subject to appropriation, with the object of making a fair distribution of public wealth, safeguarding its conservation, achieving balanced development of the country and the improvement of living conditions of the rural and urban population. In consequence, necessary measures will be dictated to ordain human settlements and establish adequate supplies, uses, reserves, and future uses [*destinos*] of lands, waters and forests, so as to execute public works and planning and regulate the foundation, preservation, improvement, and growth of population centers; to preserve and restore ecological balance; to divide up large landholdings [*latifundios*]; to establish, through the terms of regulating law, the organization and collective exploitation of common lands [*ejidos*] and communities; to develop small farm properties; to encourage farming, ranching, forestry, and other economic activities in the rural environment, and to avoid destruction of natural elements and damages property might suffer to the detriment of society.

As an example of the authority created through this language, the government can declare a parcel of private forest land to be part of a nature reserve and forbid all development of the land, including cutting of trees, without expropriating the property. In fact, in one of the reserves examined as a case study in this report, the Monarca Special Biosphere Reserve, the federal government owns almost none of the forests.

The language expressly includes conservation as a justification for regulation of resource use. The language creates a duty for the government to control how lands, waters, and forests are and will be used. This duty extends to taking action to restore balance in the country.

The language also shows that well before the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, Mexican lawmakers had begun to weave the principle of sustainable development into the country's legal base. The language on restoring ecological balance was added by an August 10, 1987 amendment. The adoption of this amendment implicitly acknowledged that some past resource use in the country had been unsustainable.

A major portion of Article 27 deals with what resources the nation may transfer to individuals or groups, who may own land and how large ownerships may be. Some resources, like water and minerals, cannot be privately owned, but the government may

grant concessions for their exploitation.[175] For some resources, including hydropower, petroleum, or radioactive minerals, the government cannot even grant private concessions.[176] The government itself must develop these resources.

No specific restrictions in Article 27 apply to forest ownership, but important general restrictions on land ownership apply to forests. Article 27's land ownership restrictions are designed to prevent historic evils in Mexican land distribution, particularly absentee ownership of large parcels. Foreigners in Mexico have no inherent rights to acquire lands or concessions, however the nation may grant them rights under certain conditions.[177] Charitable institutions may hold property if actually needed for their purpose.[178] All these limits have their roots in the Mexican Revolution's ideals of land reform and equitable allocation of resources.

In the same vein, Article 27 also places limits on the size of landholdings. Large landholdings (*latifundios*) are prohibited.[179] An individual may hold no more than 100 hectares of land for most agricultural purposes. For lists of specified crops, the Article allows holdings of 150 or 300 hectares, and for ranching, enough land to support 500 cattle.[180] A corporation can hold lands up to 25 times the individual limit, so long as no single stockholder's proportional share of the property would exceed the individual limit.[181]

[These limits pose some interesting questions for forestry. The new Agrarian Law, passed after these limits were written into Article 27, sets a limit of 800 hectares for individual holdings devoted to forestry,[182] implying that forests are not subject to the agricultural limits. Where land is used for a variety of crops or livestock, it is unclear what limits apply. For example, in places conducive to agroforestry, with underplantings such as coffee or cacao, both forestry and the much more restrictive

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[175]*Id.* ¶¶ 5 & 6.

[176]*Id.* ¶ 6.

[177]*Id.* § I (in art. 27, roman-numbered sections follow ¶ 9).

[178]*Id.* § III.

[179]*Id.* § XV.

[180]*Id.* § XV.

[181]*Id.* § IV. *See also* Agrarian Law, Diario Oficial de la Federación (Feb. 26, 1992), arts. 125 et seq.

[182]Agrarian Law, *supra* note 181, art. 119. Articles 115-119 of the Agrarian Law set out the size limits for agrarian properties. Articles 125 et seq. set out limits for corporate ownership of agrarian property.

agriculture limits arguably apply. In forests where cattle can be grazed, both forestry and livestock limits might be invoked.]

Article 27 also describes the legal framework for social property. Social property is land held by a rural or indigenous community, rather than by individuals or the government. Article 27 guarantees communal settlements, such as *ejidos,* the legal capacity to hold social property, including to hold communal possession of forests.[183]

In 1992, Mexico amended its Constitution and associated federal laws to change the nature of land reform and social property. Until 1992, landless rural communities had a constitutional right to land; upon petition, the government had to expropriate land for them.[184] Social properties could be apportioned by the community to community members, but were essentially inalienable and unencumberable. Only the government had the power to change social property ownership, through expropriation.

Though land reform gave property to thousands of rural communities, it also inadvertently helped promote deforestation. As the rural population of Mexico grew, so did the demand for arable land. The government looked to marginal areas, including forests and land near forests, to satisfy the demand. That explains why an estimated 73 percent of Mexico's forests are now on *ejido* or communal lands.[185] Growing food is the first priority for most *ejidos,* and communities settling marginal lands have had to clear forests to create new fields and pastures or harvest trees to raise money for fertilizer and other necessities. In some areas in the north of the country, where the population densities are lower and the forests well-suited for commercial timber production, *ejidos* can sustain profitable timber operations on their lands. In the central and southern parts of Mexico, it is less common to find an *ejido* supporting its community through forest harvests.

Since the 1992 amendments to Article 27 and associated laws, *ejidos* can elect to change their social property into individual properties, within restrictions. They can lease property interests to individuals or offer interests as security for loans, for periods of up to thirty years, with possible renewals. This reform also allows corporations to hold agrarian property equivalent to multiple individual properties, as discussed above.

The impact of these changes on deforestation is difficult to gauge. The government intended the changes to encourage outside investment in communal lands,

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[183]Mexican Constitution, *supra* note 30, art. 27, § VII.

[184]*Id.* § X (repealed 1992).

[185]Ramírez, *supra* note 18, at 5.

leading to more productive use. Capital for agriculture should flow to the most productive lands. Often these will not be forest lands. However, in some areas where cash crops, like oranges, can be readily grown on cleared forests, the ability to more easily attract capital could speed deforestation.

Though capital will not flow to marginal areas, investments in more productive areas will have indirect effects. As other farms become more productive, prices for farm commodities could fall, making it harder for farmers in marginal areas to raise money through farming. In this situation, *ejidatarios* will not be likely to abandon their lands. Faced with lowered incomes, they might turn to the forests to sell lumber to raise cash or they might try to put forest land into pasturage or cultivation.

It is unlikely that many individual *ejidatarios* will devote large parts of their lands to silviculture. Forestry's long investment times and uncertain pay-backs make it unattractive as a main investment for small farmers. However, some may be attracted to plant perennial crops like coffee that can be grown while maintaining some forest cover.

Even before Article 27 was amended, forests with clear potential for commercial timber harvest attracted capital. In return for the right to buy timber, private mills have supplied *ejidos* with management assistance and general development help. In some areas, *ejidos* formed forestry cooperatives to pool their own capital to develop the resource. It is unclear whether the amendments to Article 27 will lead to any major change in the patterns of forest investment on *ejido* lands.

Besides Article 27, two other articles of the Constitution have relevance to forest regulation. Article 25, which deals generally with the powers and duties of the nation to promote economic development, directs the government, among other considerations, to protect productive resources and the environment.[186] Article 73, which sets out the powers of the Congress, includes the power to lay fees or duties on forest exploitation[187] and to establish by law the appropriate roles for the federal, state, and municipal governments in environmental protection.[188] Article 73 also grants the Congress the authority to pass all laws necessary to give effect to the other parts of the Constitution.[189]

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[186]Mexican Constitution, *supra* note 30, art. 25, ¶ 6.

[187]*Id.* art. 73 § XXIX-A(5)(f).

[188]*Id.* § XXIX-G.

[189]*Id.* § XXX.

Federal Statutes

Mexican statutory law tends to divide natural resources into sectors, setting out a series of regulatory schemes for particular resources or industrial areas. For example, the Federal Water Law governs water use. The General Law of Human Settlements and the Agrarian Law cover agricultural use of land. Aquatic and marine life fall under the Federal Law of the Sea and the Fishing Law. Wildlife use is subject to the Hunting Law. Non-renewable resources are subject to the Mining Law.

Besides these focused laws, Mexico also has a General Law on Ecological Balance and Environmental Protection. The General Ecology Law deals with pollution control, endangered species protection, environmental planning, and other environmental concerns applicable to a wide variety of industries and natural resource uses. The following discussion explores the General Ecology Law as it may affect forests and then considers the Forestry Law and other more focused statutes.

The General Ecology Law

The central environmental statute of Mexico is the General Law on Ecological Balance and Environmental Protection (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*), enacted in 1988 and substantially amended in the fall of 1996.[190] The General Ecology Law is a broad-ranging statute. It lays out principles of environmental policy, sets out a framework for ecological planning and management, and addresses both pollution and natural resource protection issues. Most of the specific powers and duties outlined in the law apply to SEMARNAP,[191] but many of its general directives for taking environmentally proper action apply to all government agencies. It also deals with the roles of state and municipal governments, and of the public, in environmental protection.[192]

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[190]Ley General del Equilibrio Ecológico y la Protección al Ambiente, Diario Oficial de la Federación (Jan. 28, 1988 & Dec. 13, 1996) [hereinafter General Ecology Law].

[191]The General Ecology Law as originally written assigned most of the federal authority to SEDUE. The authority then fell to SEDUE's successor, SEDESOL. Now it falls to SEDESOL's successor, SEMARNAP.

[192]General Ecology Law, *supra* note 190, art. 1.

Central versus local authority

Consistent with Mexico's highly centralized and powerful federal government structure, the General Ecology Law grants broad authority in environmental matters to the federal government. The reform of the law in 1996 expanded the state and municipal government authority in several specific areas,[193] but the federal government still remains the most dominant force in environmental regulation. Federal powers relevant to forests include setting general environmental policy; setting national standards for resource management or pollution control; dealing with international, interstate, or federal property or jurisdictional issues; dealing with emergency and highly hazardous activities; creating and administering natural areas; protecting wild flora and fauna; and regulating sustainable use of forest resources.[194]

States and municipalities must act consistently with federal law, but they may establish appropriate local policies and other measures to further environmental protection, including the establishment of protected natural areas.[195] The 1996 amendments to the law allow the federal government to make agreements with the states to delegate authorities to manage protected natural areas, natural resources, or forest flora and fauna.[196] The states, in turn, may make agreements with municipalities to carry out these delegated functions.[197]

General environmental policy

Chapter III of the General Ecology Law discusses environmental policy. Article 15 sets out general elements of the nation's ecological policy, including the idea that ecosystems are part of the nation's common heritage and that renewable resources must be used sustainably. The policy set out in Article 15 favors renewable use of forest resources, maintenance of forest cover, and protection of biodiversity. Actions promoting deforestation outside the context of planned and sustainable development are inconsistent with Article 15 policy.

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[193]See, e.g., General Ecology Law, *supra* note 190, Arts. 5, 7, 8, 9, 11.

[194]*Id.* art. 5.

[195]*Id.* arts. 7 & 8.

[196]*Id.* art. 11.

[197]*Id.*

Instruments of policy making

Chapter IV outlines the government's instruments of ecological policy making. Altogether, it creates a set of powerful tools that are currently incompletely used.

The first tool is planning. The chapter requires national development planning to reflect environmental policy. Also, federal agencies must follow the environmental policy guidelines set out in the National Development Plan when carrying out their ongoing economic and social activities.[198]

The second is the ecological *ordenamiento* or ordering.[199] These are statements of policy, norms, and appropriate use, something like land use plans, which guide government agencies when regulating or undertaking a variety of activities that may affect the environment. The General Ecology Law identifies four kinds of orderings. The first is a general territorial ordering, undertaken by SEMARNAP and reflecting national planning. The second is regional, usually undertaken by state governments. Where ecological regions cross governmental boundaries, the federal, state, or municipal governments involved may agree to work together to prepare an appropriate regional ordering. The third kind is local, prepared by municipalities but conforming to state law and federal guidelines. The fourth kind is a marine ordering, prepared by SEMARNAP in coordination with other relevant authorities and covering ocean resources under Mexican jurisdiction.

The third general tool listed in the chapter is the use of economic instruments.[200] The 1996 amendments added this section to the law. The law requires the federal and state governments to develop and implement fiscal, financial, or market-based economic incentives promoting environmental policies. These incentives are to be used with other instruments of environmental policy, particularly to encourage sustainable, beneficial, and equitable resource use and to promote ecological balance and social welfare.[201]

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[198]*Id.* art. 17.

[199]*Id.* arts. 19-20 bis 7. Information on the details and progress of these activities can be found in INE 1993-94, *supra* note 77, ch. 5; SEMARNAP, *Avances en la Conservación y Gestión de los Recursos Naturales* (Apr. 1995).

[200]General Ecology Law, *supra* note 190, arts. 21-22 bis.

[201]*Id.* art. 21.

The fourth tool is the environmental regulation of human settlements. The law sets out a series of principles to guide urban development and related activities.[202]

The fifth is environmental impact assessment, which applies to public or private activities that may cause ecological imbalance or exceed limits set out in government standards or regulations. The law specifies several activities that require impact authorization from SEMARNAP, including logging of forests or *selvas* (tropical forests) or species difficult to regenerate, forest plantations, and conversions of forest or *selva* lands to other uses.[203] In evaluating the environmental impact of a proposed project, the federal government must consider the possible effects on ecosystems.[204] The General Ecology Law provides guidelines for public access to environmental impact documents and public participation in the federal decisionmaking process.[205]

The sixth tool is the issuance of official norms.[206] SEMARNAP may issue environmental or natural-resource-use standards for economic activities. The 1996 amendments make clear that SEMARNAP can write these norms to govern natural resource extraction and can write specific standards for particular regions, zones, basins, or ecosystems. This authority seems broad enough to support norms governing timber extraction and protection of forest resources, though as discussed below, SEMARNAP has additional authorities in these areas under the Forestry Law.

The seventh tool is promotion of self-regulation and environmental audits.[207] The 1996 amendments to the General Ecology Law added these provisions.

Protected Natural Areas

The General Ecology Law outlines the government's power to create parks, monuments, and other special protected areas. The idea of protected areas is very old -- as old as pre-historic sacred groves and hunting taboos. The antecedents of the English word "forest" referred to areas set aside as royal preserves.

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[202] *Id.* art. 23.

[203] *Id.* art. 28.

[204] *Id.* art. 35.

[205] *Id.* art. 34.

[206] *Id.* arts. 36-37 bis.

[207] *Id.* arts. 38-38 bis 2.

Around the world, government-mandated protected areas exist in many forms. They may be on publicly-owned land, privately-owned land, or some combination. They may be largely closed to human use and entry or open to multiple uses, under government control. Depending on their use and management, they may serve as protected centers of biodiversity, key lands for research and education, magnets for tourism, or sustainable providers of renewable resources including wood and water.

In Mexico, not all protected natural areas are forested, and most forests are not in protected natural areas. However, some biologically significant forests, including two of the three areas subject to case studies in this report, are within protected natural areas.

The second title of the General Ecology Law establishes the basic legal framework for protected natural areas (*áreas naturales protegidas*). The General Ecology Law defines protected natural areas as "the areas of the national territory and those over which the nation exercises its sovereignty and jurisdiction, in which the original environments have not been significantly altered by human activity, or which require protection and restoration, and which are subject to the regime envisioned in the present Law."[208] The General Ecology Law empowers the government to protect such areas as ecological reserves, imposing limits on the uses of such land.[209]

Protected natural areas may include lands under private, social, and public ownership. All who own or possess lands, waters, or forests with a protected natural area must comply with any limitations imposed in the declaration creating the area or in the area's management plan.[210]

The General Ecology Law lists eight categories of protected natural areas:

I. Biosphere reserves.
II. National parks.
III. Natural monuments.
IV. Areas for protection of natural resources.
V. Areas for protection of flora and fauna.
VI. Sanctuaries.
VII. State parks and reserves
VIII. Population center ecological preservation zones.

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[208] *Id.* art. 3.II.

[209] *Id.* art. 44.

[210] *Id.*

The federal government creates and controls the first six types, while the last two fall under the jurisdiction of local governments.[211] All of these areas may include forests.

The federal government creates a protected area through a declaration by the federal executive.[212] The President, as opposed to a ministry secretary, must issue the declaration. Generally, proposals to create areas come to the President from SEMARNAP. However, any interested group or person, public or private, may request that SEMARNAP initiate a proposal to create a natural area.[213]

The government may establish protected natural areas for many purposes. These include preservation of sensitive ecosystems or endangered species. However, not all reasons for establishing a protected natural area preclude use of the area's resources. The General Ecology Law allows areas to be set aside to assure sustainable use of the ecosystems and their elements.[214]

The declaration must set out the exact borders of the area, the land and resource use restrictions, and the guidelines for creating a management plan and administering the area. To permit lawful expropriation of land within the protected area, the declaration must set out the public interest in creating the reserve that justifies exercise of the expropriation authority.[215] Any expropriations must comply with provisions of applicable laws, including the Expropriation Law and the Agrarian Law.[216]

The declaration must be based on a study of the area and the protected resource. Affected parties, including local governments, federal agencies, public and private organizations, indigenous communities, and academic institutions, may participate in the this study, and in fact, the government is to solicit their participation.[217]

Within one year after the publication of the declaration, SEMARNAP must prepare a management plan.[218] The 1996 amendments added the one-year time limit. In the past, some areas have gone without a completed plan for years. The 1996 amendments also expanded the list of entities entitled to participate in management

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[211] *Id.* art. 46.

[212] *Id.* art. 57.

[213] *Id.* art. 59.

[214] *Id.* art. 45.

[215] *Id.* art. 60.

[216] *Id.*

[217] *Id.* art. 58.

[218] *Id.* art. 65.

planning. Under the old version of the law only other federal agencies and local authorities had a right to participate in the drafting of the management plan, though the law directed the government to make agreements with inhabitants concerning establishment, administration and development of the areas. The 1996 amendments also call for inclusion of inhabitants, property owners, and interested public or private organizations and persons.[219] The management plan must explain the objective of the reserve, its special characteristics, its short and long term management, and the technical standards governing activities that may affect the reserve.[220]

The 1996 amendments also created expanded opportunities for outside parties to become involved in area administration and management. Before amendment, the law encouraged participation of local inhabitants through collaboration agreements with the government.[221] Also, the declaration creating the reserve could provide for participation of state and local governments and those in the social and private sector.[222] The amended law gives the government general authority to enter into management agreements with a broad range of interested parties, including local governments, land owners, inhabitants, and all kinds of organizations -- social, public or private -- with an interest in the protection of the area or the integral development of the local communities.[223] The amendments also created a process for interested parties to petition the government to release information relevant to environmental issues gathered pursuant to the General Ecology Law.[224]

The 1996 amendments also called for creation of the National Council on Protected Natural Areas (CONAP). CONAP will function as a general consultant and advisory body to SEMARNAP on reserve creation and management. The law allows CONAP to solicit ideas and thoughts from other interested parties, making it another forum for public participation in reserve planning and management.[225]

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[219] *Id.*

[220] *Id.* art 66.

[221] *Id.* arts. 47 & 158.II (before 1996 amendment).

[222] *Id.* art. 66 (before 1996 amendment).

[223] *Id.* art. 47; *see also* art. 158 (current versions).

[224] *Id.* arts. 159 bis 3-159 bis 6.

[225] *Id.* art. 56 bis.

Any governmental permission to exploit resources in protected areas must be consistent with the restrictions in the General Ecology Law, any other underlying laws, the declaration creating the area, and the area's management plan. The party seeking permission to exploit the resource must demonstrate that it can do so without damaging the ecological balance. The government will give technical assistance to *ejidos* and communal land owners and may give assistance to small land owners to comply with this requirement. SEMARNAP may seek to have permission revoked in cases where the ecological balance seems threatened.[226] The government may not give permission to create new settlements in protected areas.[227]

Any contracts or agreements relating to real property in protected natural areas must refer to the declaration creating the area.[228]

Biosphere Reserves. Biosphere reserves are biogeographical areas of national importance that contain species representative of the national biodiversity (including endemic, threatened, or endangered species), and that contain one or more ecosystems not significantly altered by human action or that require preservation and restoration.[229] Biosphere reserves are of particular interest to this study, because two of the case studies discussed below fall into this category. The government established Montes Azules as a biosphere reserve and Monarca as a special biosphere reserve. Before the 1996 amendments, the law called those biosphere reserves smaller than 10,000 hectares or those with limited species diversity "special biosphere reserves." The amended law no longer makes this distinction. The amendments give the Secretary of SEMARNAP the power to reclassify reserves in response to the amendments' changes in the categories and their descriptions.[230] Presumably, the special biosphere reserves will become biosphere reserves.

As of 1994, Mexico had established 29 biosphere reserves. Only 16 were originally called biosphere reserves, ranging in size from the 2.5 million hectare El Vizcaino in northern Baja California Sur to the 13,143 hectare Chamela-Cuixmala in Jalisco. The remaining 13 were originally designated as special biosphere reserves,

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[226] *Id.* art. 64.

[227] *Id.* art. 46.

[228] *Id.* art. 75.

[229] *Id.* art. 48.

[230] *Id.* 7th transitional art. (1996 amendments).

ranging in size from 150,000 hectares in the Islas del Golfo de California reserve to less than 7 in the Isla Rasa reserve, also in the Gulf of California.[231]

These reserves may have core areas or nuclear zones where management focuses on protection and study of and education related to the ecosystem. SEMARNAP **may** limit or prohibit uses in the nuclear zone that alter the reserve's ecosystems.[232] It is unclear whether a court would interpret this language literally as a grant of discretion, or, in light of its context, as the assignment of a duty of protection to the agency. The General Ecology Law specifically prohibits discharge of pollutants or conduct of polluting activities, alteration of water flows, hunting, and exploitation of forest plants in any designated nuclear zone of a biosphere reserve. Any activities that contravene the declaration creating the reserve or dispositions derived from it are prohibited as well.[233]

The law mandates the creation of buffer zones around designated nuclear zones. In these buffer areas, the law permits productive activities only if they are compatible with the goals and criteria for sustainable use set out in the declaration and management plan.[234]

National Parks. The government may create national parks to protect flora or fauna, but also to protect scenery, tourism areas, or places of scientific, educational, recreational, or historic value. As originally conceived, national parks were to be on forested lands and were to be managed by the forestry experts in SARH. Before the 1996 amendments, the law contemplated timber harvest in national parks where such activity was ecologically suitable.[235] The amended law dropped the requirement that national parks be on forest lands and the reference to timber harvest. The amended language permits only activities relating to protection of the area's natural resources, increase in the flora and fauna, preservation of the area's ecosystems, or ecological research, education, or tourism.[236]

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[231]INE 1993-94, *supra* note 77, at 98-99; SEDUE, *Información Basica Sobre las Areas Naturales Protegidas de México* (1989).

[232]*"En ellas podrá ... limitarse o prohibirse aprovechamientos que alteren los ecosystemas."* General Ecology Law, *supra* note 190, art. 48.

[233]*Id.* art. 49.

[234]*Id.* art. 48.

[235]*Id.* art. 50 (before 1996 amendments).

[236]*Id.* art. 50 (current version).

As of 1994, the government had created 44 national parks, ranging in size from less than ten to almost 250,000 hectares, though most are under 10,000 hectares.[237]

Natural Monuments. Natural monuments are areas intended to be managed for absolute protection. They are areas that have national importance, aesthetically, historically, or scientifically, but that do not qualify for other categories of protection. Only activities related to preservation, research, recreation, or education are allowed in these areas.[238] As of 1994, Mexico had created three natural monuments.[239]

Natural Resource Protection Areas. Natural resource protection areas are intended for the preservation and protection of the soil, waters, watersheds, and other natural resources found in forests or lands suitable for forests. The law contemplates that the government will only place lands in this designation if the lands do not fit in any other category of protected natural area. Within this category are (1) forest zones and reserves and (2) protection zones for rivers, lakes, springs, and other national waters (especially those that supply water for human use).[240] Over a quarter of the nation -- 139 areas making up over 51 million hectares -- has been designated for conservation of waters, while about 9 million hectares have been set aside for conservation of forest resources.[241] In these areas, the law only permits activities related to the preservation, protection, and sustainable use of the natural resources, as well as ecological research, education, and tourism. All such activities must conform to requirements of the declaration creating the area and its management plan.[242]

Areas for Wildlife. Areas for the protection of flora and fauna are to be established to encompass key habitat for wild species. The uses of such areas are mainly non-consumptive ones such as species management, research, and education. The declaration creating such an area may allow local communities to use the resources in

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[237]INE 1993-94, *supra* note 77; SEDUE, *supra* note 231.

[238]General Ecology Law, *supra* note 190, art. 52.

[239]INE 1993-94, *supra* note 77, at 98.

[240]Before the 1996 amendments, the law recognized five kinds of natural resource protection areas, including forest reserves, national forest reserves, forest protection zones, forest restoration or propagation zones, and protection zones for water bodies. The 1996 General Ecology Law amendments direct SEMARNAP to determine if there has been a change in conditions that gave rise to areas established under this category prior to the reform and if SEMARNAP needs to modify the declarations establishing the areas. The law sets out a process to make those modifications. General Ecology Law, *supra* note 190, 8th transitional art. (1996 amendments).

[241]INE 1993-94, *supra* note 77, at 99.

[242]General Ecology Law, *supra* note 190, art. 53.

the area, subject to appropriate restrictions.[243] As of 1994, Mexico had designated four such areas covering 909,000 hectares.[244]

Sanctuaries. The 1996 amendments added sanctuaries as a new category of protected area. Sanctuaries are areas that are rich in wildlife or that contain species, subspecies, or habitat of limited distribution. Though the law does not expressly limit the size of sanctuaries, the list of typical geographic features to be protected in this category -- including caves, meadows, and relict habitats -- suggests that this category is intended primarily for small parcels. The only activities that the law permits in sanctuaries are ecological research, recreation, and education, and only if the activities are compatible with conservation of the area.[245]

Local Protected Areas. The 1996 amendments to the General Ecology Law changed the categories of local protected areas. States may create state parks and reserves in areas of importance at the state level. These protected areas should otherwise have the characteristics of biosphere reserves or national parks. Municipal governments may establish population center ecological preservation zones through local legislation.[246]

Restoration zones

The 1996 amendments added a new chapter to the law dealing with restoration zones. This designation is for areas exhibiting degradation, desertification, or serious ecological imbalance. Like protected natural areas, the government can establish these areas through presidential declaration. With the participation of local inhabitants, property owners, governments, and other interested parties, SEMARNAP is to develop and implement programs for restoration of these areas. The declaration establishing an area may set out limitations on land and resource use, and guidelines and terms for the restoration program. Private actions and agreements concerning property and possession or other rights to fixtures must respect the limitations set out in the declaration establishing the zone.[247]

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[243]*Id.* art 54.

[244]INE 1993-94, *supra* note 77, at 98.

[245]General Ecology Law, *supra* note 190, art. 55.

[246]*Id.* art. 46.

[247]*Id.* arts. 78-78 bis 1.

Wild flora and fauna

The General Ecology Law provides for the protection of wild flora and fauna, especially those that are endemic, threatened, or endangered. These sorts of protections can be important to forests in two ways. The protected species may be trees and the law may directly forbid their destruction. Alternatively, the protected species may depend on forests, and the law must protect the habitat to effectively protect the species. Viewed another way, deforestation can cause loss of forest-dependent species, and the increase in the number of threatened or endangered species is partly due to deforestation.

SEMARNAP, as SEDESOL's successor, has the authority to issue technical standards for the conservation and sustainable use of habitat of wild species.[248] It may establish limits on the taking of wild species, in the form of closed seasons.[249] It may also ask the Ministry of Commerce and Industrial Promotion to establish controls on international trade in protected species.[250] This authority is important in implementing the Convention on International Trade in Endangered Species (CITES), discussed in the chapter of this report on international laws.

Specific authorities

Besides the provisions described above, the General Ecology Law has specific chapters addressing use of water; use of land; use of non-renewable resources; air pollution; water pollution; prevention of soil contamination from wastes, pesticides, and other toxic substances; environmentally hazardous activities; hazardous materials and wastes; nuclear energy; and harm from noise, vibrations, heat, light, odors, or visual contamination. It outlines the obligation of the government to encourage and permit public participation in environmental policy making. It grants SEMARNAP power to act against imminent environmental risks. And it deals with enforcement issues such as inspections, sanctions, and public complaints.

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[248] *Id.* art. 84.

[249] *Id.* art. 81.

[250] *Id.* art. 85.

The Forestry Law

The Forestry Law (*Ley Forestal*) and its regulations set out the basic forest conservation policy of Mexico. Like the General Ecology Law, the Forestry Law sets general policies that apply to the whole government, but it grants special powers and duties to the lead environmental arm of the government, SEMARNAP. The part of SEMARNAP responsible for most forestry matters (other than law enforcement) is the Subministry of Natural Resources.

General objectives and authority

The first title of the Forestry Law deals with broad objectives of the law.[251] The law recognizes the need to conserve, protect, and restore the biodiversity of forest ecosystems, but it also notes the need to draw economic benefit from the forests. Notably, the law declares conservation, protection, and restoration of forest ecosystems to be in the public interest,[252] effectively authorizing the government to expropriate private land when necessary to carry out the law.

These objectives can be viewed in two ways. Seen favorably, they conform with the ideal of sustainable development. Seen less favorably, they contain an inherent conflict between preservation and development, with no clear guidance on how to strike a balance between the two. Environmental critics of SARH claimed it tended to favor development too much. Where SEMARNAP will strike the balance remains to be seen.

In forestry matters, the general authority of the federal government includes active management roles, such as inventorying forest resources, fighting fires, and coordinating reforestation efforts; and regulatory actions such as setting standards for forestry activities, authorizing changes in forest land use, and enforcing forest laws.[253] The federal government may delegate some of its governmental functions to the states.[254] It may also enter into agreements with private entities for limited purposes, such as research and training, and also inspection for law enforcement.[255]

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[251] Ley Forestal, Diario Oficial de la Federación (May 20, 1997) [hereinafter Forestry Law], arts. 1-8.

[252] *Id.* art. 2.

[253] *Id.* art. 5.

[254] *Id.* art. 7.

[255] *Id.* art. 8.

Forest harvest under the Forestry Law and related legislation

Before the 1994 reorganization, SARH was the central agency regulating use of wood from the forests, as authorized largely by the Forestry Law. SEDESOL also had a role in establishing ecological standards for protection of resources, in protection of sensitive ecosystems, and in control of non-timber forest resources. Now these authorities lie with SEMARNAP, though with different arms of the ministry. The subministry of natural resources has SARH's old regulatory authorities while INE retains SEDESOL's old regulatory authorities. Enforcement powers within SEMARNAP rest with PROFEPA.

The Forestry Law requires authorization from SEMARNAP before harvesting timber.[256] For non-timber resources, the law requires harvesters to give SEMARNAP notice, and SEMARNAP may further control such activities through regulations and official norms.[257] The law provides for regulations and official norms governing grazing on forest lands and harvest of materials for domestic use, which includes use by indigenous peoples in their rituals.[258]

The law sets out several requirements for applications for permission to harvest timber.[259] The applicant must either hold title to the land, be in possession of it, or hold a legal right to harvest the timber. The applicant must also present a forest management plan that describes the biological and physical characteristics of the forest, the activities planned, the environmental impacts expected, the methods to be used to minimize impacts, and the plan for reforestation. If the land includes tropical forests (*selvas*), species difficult to regenerate, or legally protected areas, the applicant must prepare a more formal environmental impact assessment. The law allows SEMARNAP to write simplified application requirements for harvests involving 20 hectares or less.

To prepare a forest management plan, the applicant must have the technical services of a qualified forester or organization.[260] The government maintains a registry of qualified foresters and provides forestry services to *ejidos* and others who cannot

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[256] *Id.* art. 11.

[257] *Id.* art. 13. In Mexico, "regulations" must be approved by the legislature. "Official norms" are promulgated by administrative authorities without needing legislative approval.

[258] *Id.*

[259] *Id.* art. 12.

[260] *Id.* art. 23.

afford private services.[261] One author has argued that the forestry profession in Mexico is too closely allied with the forest products industry, and that Mexican foresters sometimes encourage harvest at the expense of the environment.[262]

SEMARNAP has 30 days to act on most applications.[263] SEMARNAP has 60 days to act on applications to harvest tropical forests (*selvas*), species difficult to regenerate, or protected natural areas, and may take an additional 60 days in exceptional cases, when necessary to make sure that the plan conforms with applicable law. If the application is missing information or documentation, SEMARNAP may suspend the deadline for review for up to 60 days, beginning on the date when SEMARNAP gives the applicant notice of the deficiency.

SEMARNAP may approve an application as submitted, may add conditions to prevent or mitigate environmental impacts, or may deny the application.[264] SEMARNAP may deny an application only when it violates a specific provision of the law, when it would compromise an area's biodiversity and the regeneration and productive capacity of the land, or when the application includes false information. Once the harvest is approved, SEMARNAP registers the management plan in the National Forestry Registry. Affected parties may seek judicial review of SEMARNAP's actions.[265]

Several articles in the third title of the General Ecology Law may apply to grants of forestry applications. The third title deals with sustainable use of nature. It has chapters on water and aquatic ecosystems, land, and non-renewable resources.

The provisions in the General Ecology Law on water and aquatic systems recognize that forest cover plays a critical role in the quality and quantity of surface and ground waters.[266] So, for example, grants of timber concessions should reflect consideration of potential impacts on water resources.[267] INE may set technical norms

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[261]*Id.* arts. 23 & 24.

[262]Ramírez, *supra* note 18, at 9-10.

[263]Forestry Law, *supra* note 251, art. 13.

[264]*Id.* art. 14.

[265]*Id.* art. 19 bis 7 & art. 57.

[266]General Ecology Law, *supra* note 190, art. 88, § III.

[267]*Id.* art. 89, § II.

for protection of aquatic ecosystems,[268] which logically could include restrictions on deforestation near water bodies.

The provisions in the General Ecology Law on land and its resources emphasize the need to use land in sustainable ways, according to ecological criteria.[269] The law directs the government to apply these criteria to decisions on forest use, including determinations of uses for forested lands, establishment of reserves, regulation of forested watersheds, and issuing permits for forestry activities, among others.[270] Under the law as originally written, SEDESOL had an obligation to ask SARH to revoke, suspend, or modify forestry permits that allowed serious deterioration of the ecological balance.[271] Under the 1996 amendments, SEMARNAP shall revoke, modify, or suspend permits for forest activities that seriously degrade the ecological balance, biodiversity, or regeneration and productive capacity of land.[272] (Within SEMARNAP, PROFEPA is responsible for overseeing permits.) The law also requires the government to apply these criteria to the support of agriculture, foundation of settlements, and mining, which are all activities that could result in conversion of forest lands to non-forest uses.[273] The law spells out special provisions applicable to authorizations affecting land use in tropical forest areas.[274] The government is supposed to consider ecological criteria in the award of any financial incentives for forestry activities.[275]

The Forestry Law continues to impose obligations on an applicant after SEMARNAP has approved the application. A qualified forester or organization must oversee the implementation of the plan.[276] The applicant and forester must report at

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[268]*Id.* art. 96.

[269]*See id.* art. 98.

[270]*Id.* art. 99.

[271]*Id.* art. 100 (before 1996 amendments).

[272]*Id.* art. 100 (current version).

[273]*Id.* art. 99.

[274]*Id.* arts. 101 & 102.

[275]*Id.* art. 107.

[276]Forestry Law, *supra* note 251, art. 23 The technical forest services subject to regulation under the law are listed in *id.* art. 3 bis, § XIII.

least once a year on the plan's implementation.[277] SEMARNAP may revoke or suspend an authorization for any violation of the Forestry Law.[278]

The Forestry Law sets out provisions governing sale of land or rights to cut timber subject to a management plan.[279] Anyone selling rights to the land or timber must notify SEMARNAP. The buyer will become subject to the terms and conditions set out in the management plan and any accompanying environmental impact assessment. In the case of commercial planting and cultivation of trees on unforested areas of 250 hectares or more, SEMARNAP must give specific approval before the rights to operate under the plan pass to the new owner.[280] A new owner may ask SEMARNAP to modify or cancel a plan. In doing so, SEMARNAP may impose new conditions only to prevent or mitigate harm to ecosystems.[281] SEMARNAP must record any modification or cancellation in the National Forestry Register.[282]

Laws aimed at regulating commercial activity may also affect forestry activities. For example, the person with permission to cut may have to register under the foreign investment law, so that the government can track the total foreign investment in the forestry sector and make sure it does not exceed legal limits. Tax considerations may be important motivations to engage in forestry. Individuals pay a 30 percent tax on income from agriculture and forestry, with an initial amount equal to 20 times the minimum wage exempt from taxes. If all the taxpayer's income is from agriculture, forestry, and fisheries, the tax is reduced by half. If the taxpayer's activities also include processing the products from those activities or if the taxpayer gets at least half of all income from those activities, the tax will be reduced by a quarter. *Ejidos* are generally exempt from income taxation.[283]

Besides regulating the cutting of trees, SEMARNAP also has authority to regulate the transport, storage, and processing of primary forest products.[284] This authority increases the government's ability to enforce harvest laws. Illegally cut timber

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[277]*Id.* art. 19 bis 5.

[278]*Id.* arts. 19 bis 6, 48, & 52.

[279]*Id.* art. 19 bis 13.

[280]*See id.* and also arts. 19 & 3 bis, § III.

[281]*Id.* arts. 19 bis 13 and 19 bis 6.

[282]*Id.* art. 10 bis, § I.

[283]*See* de Aguinaga, *supra* note 169.

[284]Forestry Law, *supra* note 251, arts. 20-22.

without proper approvals cannot be lawfully moved, stored, or processed.[285] One commentator, however, has said that this authority is ineffective because of fraud and strong commercial incentives to skirt the law.[286]

Conversion of forests to non-forest use

The Forestry Law requires SEMARNAP's permission to convert forests to non-forest uses.[287] Such conversion goes against the law's preference for maintaining forests on lands capable of supporting forest. Approval of conversion requires an opinion of the Regional Counsel and supporting technical studies. The studies must show that the conversion will not compromise biodiversity, promote soil erosion, or harm water quality or use. The conversion must be consistent with any environmental ordering or other law regarding use of the land.

Other Forestry Law provisions

Title II, Chapters VII and VIII of the Forestry Law set out SEMARNAP's role in fighting forest fires and protecting forest health.[288] Chapter XI allows SEMARNAP to design and implement restoration programs for degraded and desertified lands, forests with serious ecological imbalance, or lands preferred for forest use.[289] Also, after preparing proper technical studies and giving affected property owners opportunity to be heard, SEMARNAP may prohibit particular forest uses to help conserve protected natural areas, ecological restoration zones, or endemic, threatened, or endangered species.[290]

The third title of the Forestry Law concerns promotion of forestry. It directs SEMARNAP and other agencies to promote conservation, protection, and multiple use of forests.[291] It allows SEMARNAP to work with SEDESOL and the Secretariat of Communication and Transportation to promote environmentally safe development of

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[285] *Id.* art 20.

[286] Ramírez, *supra* note 18.

[287] Forestry Law, *supra* note 251, art. 19 bis 11.

[288] *Id.* arts. 27-31.

[289] *Id.* art. 32.

[290] *Id.* art. 32 bis.

[291] *Id.* arts. 33-38.

forest roads.[292] It also directs SEMARNAP to work with the Secretariat of Public Education and other authorities to promote forest education, training, and research.[293]

The final title of the Forestry Law deals with enforcement issues, including inspections, hearings, violations, and crimes.[294]

The Agrarian Law

The Agrarian Law governs ownership of rural lands and the rights of rural land owners. Because much forest land is in the hands of rural communities in Mexico, the law affects forest use.

The Agrarian Law builds upon the foundation for land reform created by Article 27 of the Constitution.[295] In February 1992, the Agrarian Law was broadly revised, reflecting the recent amendments to Article 27. The amended law allows corporations to hold relatively large parcels of land,[296] allows *ejidatarios* to transfer land rights temporarily (for up to 30 years, with a possible 30 year renewal) to third parties,[297] and allows *ejido* land to serve as collateral for loans. It also was intended to allow the collective government of *ejidos* to assign rights to land to individual *ejidatarios* and to give individual *ejidatarios* more autonomy in exploiting their lands. It does not allow assignment of forests or *selvas*, however.[298]

Because the Mexican Congress wrote the new law after the passage of the 1988 version of the General Ecology Law, the new Agrarian Law includes some ecological and environmental references. For example, Article 2 of the Agrarian Law acknowledges that the General Ecology Law has application to agrarian land rights issues.

Unfortunately, some of the Agrarian Law reflects older thinking about agricultural policy. For example, the law sets broadly applicable size limits on small farms, limits that do not always take into consideration the great diversity of the land

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[292] *Id.* arts. 39-40.

[293] *Id.* arts. 41-43.

[294] *Id.* arts. 44-58.

[295] *See* Agrarian Law, *supra* note 181, art. 1.

[296] *Id.* arts. 125-133.

[297] *Id.* art. 45.

[298] *Id.* art. 59.

resource and its varying ecological capacities.[299] The size limits for grazing lands are to be based on the potential of the land to support livestock,[300] but in determining this limit, SARH historically looked at the grazing capacity of the land from an economic, not ecological viewpoint. Whether SEMARNAP will continue this practice remains to be seen.

[299]*See id.* arts. 115-124.

[300]*See id.* art. 120.

Chapter Four:

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The Montes Azules Biosphere Reserve

The Mexican Government created the Montes Azules Biosphere Reserve in 1978[301] to preserve one of the world's most important tropical forests. Covering 331,200 hectares, the reserve's biological and cultural importance and its socioeconomic problems have made it the object of numerous research and conservation efforts. This case study analyzes some of the legal and institutional challenges to achieving sustainable use and management of the great forest resources in the Lacandon region and in particular in the Montes Azules Biosphere Reserve.

The Lacandon Rainforest

The Lacandon Rainforest is one of the last tropical rainforests in Mexico. Located in the southern Mexican state of Chiapas near the Guatemalan border, the Lacandon originally covered approximately 1.5 million hectares. It still has around 450,000 hectares of well-preserved tropical forests.[302]

Together with the Guatemalan Peten and the forests of Belize, Campeche, and Quintana Roo, it constitutes one of the great forests of the Americas. It contains remarkable biological diversity, it is a key influence on the climate, and it shelters unique archeological, cultural, scenic and recreational resources.[303] Its rivers feed one of Mexico's most important estuaries.

Once home to the Mayan people, there are now many different indigenous communities in this region. Each has its own cultural identity and attitudes towards the conservation and use of the region's natural resources.

To protect the resources of the Lacandon Rainforest, Mexico has created one biosphere reserve (Montes Azules), four other natural protected areas (Bonampak, Yaxchilán, Chan Kin, and Lacantúm) and one communal reserve (La Cojolita).[304] The

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[301]Presidential Decree Establishing the Federal Reserve of Montes Azules Biosphere, January 12, 1978.

[302]Comunidad Zona Lacandona, Chiapas, México, Lacandonia, A.C. September 1994, at 6.

[303]INE, Management Program for the Montes Azules Biosphere Reserve, 1994. at 2.

[304]*See* Hugo A. Guillén Trujillo, Conflicts of Land Tenure and Conservation in the Selva Lacandona 1 (Spring 1995).

following is a description of some of the main characteristics of the Lacandon Rainforest and the Montes Azules reserve within it.

Topography. The topography of the Lacandon Rainforest is quite varied, including steep mountains, plateaus, and broad valleys. Most of the true rainforest vegetation grows at elevations below 1000 meters. The Montes Azules Biosphere Reserve is located within a region known as the Range of Chiapas and Guatemala *(Sierras de Chiapas y Guatemala).* Two branches of these mountains, the Sierra San Felipe and the Sierra Jalapa, run in parallel from the northwest portion of the reserve towards the southeast. The highest parts of the mountains, in the northwest, are over 1100 meters. Between the mountains, rivers run to the southeast to join the Rio Lacantún, which forms the southeastern boundary of the reserve. The mountain ranges end before they reach the Lacantún, and the lands in the southeast are alluvial plains.[305]

Hydrology. The Lacandon Rainforest lies in one of the largest hydrologic basins in Mexico, drained by the Grijalva and Usumacinta Rivers.[306] Together, these two rivers carry 30 percent of Mexico's fresh surface water and have 56 percent of Mexico's identified hydropower potential.[307] The Lacandon Rainforest makes a significant contribution to these rivers, covering more than half the Usumacinta's basin.[308] The two rivers empty into the Gulf of Mexico near each other in the states of Tabasco and Campeche, forming one of the most productive estuaries in Mexico.

The main rivers of the Montes Azules Biosphere Reserve, including the Rio Negro, the Rio San Pedro, and the Rio Lacanja, flow into the Rio Lacantún, which is a tributary of the Usumacinta. Permanent lakes, of the sort associated with karst (erodible limestone) geology, are common in the reserve.[309]

Soil. The Lacandon Rainforest offers a variety of soil types because of the variation in temperature, rainfall, and rock types found throughout its regions. In

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[305]INE, *supra* note 303, at 7.

[306]The Usumacinta river runs along the Mexico-Guatemala Border and is the most important in México. Its basin is formed mainly by the Lacantún and Salinas Chixoy rivers. Its drainage is in general semi parallel but in parts it is dendritic. *Id.* at 14.

[307]Marco A. Lazcano-Barrero et al., *Importancia y Situación Actual de la Selva Lacandona: Perspectivas para su Conservación, in* Reserva de la Biósfera Montes Azules, Selva Lacandona: Investigación para su Conservación [hereinafter Montes Azules Studies] 393-436 (Miguel Angel Vásquez Sánchez & Mario A. Ramos Olmos, eds. 1992).

[308]*Id.*

[309]INE, *supra* note 303, at 10-12; José Gerardo García-Gil y José Lugo Hupb, *Las Formas del Relieve y los Tipos de Vegetación en la Selva Lacandona, in* Montes Azules Studies, *supra* note 307, at 39, 46-47.

general, soils in the region are clayey, though some are sandy.[310] Even though the soils support lush forest vegetation, their natural fertility and ability to support cultivated plants are often low.

On the slopes of the mountain ranges thin soils with low natural fertility and little organic matter are predominant. These soils, which are highly susceptible to erosion and runoff, sustain several types of vegetation, mainly evergreen forests. In lower and less steep mountainsides and hills, soils are also shallow, relatively acid and with low fertility, offering a variety of textures and colors and sustaining several types of forests. Soil types in the region's valleys are deeper and clayey, and offer a variety of vegetation ranging from high and medium forests, to palms, depending on fertility and drainage in the area. Alluvial soils can be found along the numerous rivers in the region. Alluvial soils are very deep and fertile, supporting numerous types of vegetation.[311]

Climate. Climate in the Lacandon Rainforest is tropical, characterized by warm and humid conditions with heavy rainfall. Annual rainfall in the region ranges from 60 inches to 120 inches in the northern part of the rainforest. Although the rainy season is well defined (from May until October), some rainfall occurs during the winter months due to cold air fronts coming from the north. Eighty percent of the precipitation in the area is caused by tropical storms and hurricanes from the Caribbean and Gulf coasts.[312]

Temperatures range from hot to warm depending on altitude. The average temperature for the lower regions is around 73 F (22 C) with little variation among average monthly temperatures. In the higher elevations the average yearly temperature is around 65 F (18C).

Vegetation. The Lacandon Rainforest is one of the last regions of tropical forest in Mexico and a rich source of biological diversity. Any given area of the rainforest is likely to have many different species of plants (species diversity), and the variations in topography and soils produces several kinds of associations of species (ecosystem diversity).[313] On the highest, coolest areas grow forests dominated by pines and oaks. As the elevation decreases, these begin to intergrade with more tropical vegetation. At least three distinct associations of tall evergreen rainforest occur, each supporting

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[310]INE, *supra* note 303, at 9-12.

[311]*Id.*

[312]*Id.* at 12.

[313]*Id.*; Gonzolo Castillo-Campos y Héctor Narave Flores, *Contribución al Conocimiento de la Vegetación de la Reserva de la Biósfera Montes Azules, Selva Lacandona, Chiapas, México, in* Montes Azules Studies, *supra* note 307, at 51-60.

dozens of species of trees and other plants. Mahogany (*Swietenia macrophyla*) and ceiba or kapok (*Ceiba pentandra*) are among the typical rainforest trees. Alluvial soils and riparian areas support their own distinct associations. A few areas support savannah vegetation and bamboo thickets. Disturbed areas, cleared for farms or cattle, may initially be covered with grasses and herbs. Where small disturbances have opened the forest canopy, dense "jungle" vegetation soon grows in to take advantage of the light.

Fauna. The topography, climate and vegetation of the Lacandon Rainforest form environments that support a broad variety of species of wild animals. Both neotropical species (species associated with the New World tropics) and nearctic species (associated with the New World north of the tropics) can be found in the region.

Insects are representative of the diversity of invertebrates found in the area. One study of butterflies counted 450 species of Papilionoidea (swallowtails) and 350 of Hesperioidia (skippers). More than 150 species of beetles can also be found in the region, most of which, as with the butterflies, are found in the Montes Azules Biosphere Reserve.[314] Another tally listed 1,135 species of insects from the Lacandon region.[315] Even so, many more insects may be waiting to be found; one report estimated that more that 15,000 kinds of moths may live in the region.[316]

Sixty-five species of fish can be found and 25 species of amphibians. Eighty-four species of reptile have been reported, including such endangered species as the swamp crocodile and white turtle.[317]

Especially impressive are the 341 species of birds found in the region, many of which are migratory. Some of these species are endangered or threatened, for example, the collared toucan, the harpy eagle, and the scarlet macaw.[318]

More than 106 species of mammals exist in the Lacandon Rainforest. It is the natural entrance to Mexico for Central and South American species. Among the

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[314]INE, *supra* note 303, at 19.

[315]Miguel Angel Morón, *Estado Actual Sobre el Conocimiento sobre los Insectos de la Selva Lacandona, in* Montes Azules Studies, *supra* note 307, at 119-134.

[316]INE, *supra* note 303, at 19.

[317]*Id.*; Marco A. Lazcano-Barrero y Richard C. Vogt, *Peces de la Selva Lacandona, un Recurso Potencial, in* Montes Azules Studies, *supra* note 307, at 135; Marco A. Lazcano-Barrero M.A. et al., *Anfibios y Reptiles de la Selva Lacandona, in id.* at 145.

[318]INE, *supra* note 303; Fernando González-García, *Avifauna de la Selva Lacandona, Chiapas México, in* Montes Azules Studies, *supra* note 307, at 173.

mammals found in the region are opossums, deer, howler monkeys, jaguars, and ocelots.[319]

Population. There are conflicting reports on the number of inhabitants of the Lacandon Rainforest. Some reports establish that with a growth rate of 9.5 percent a year since 1975, population now reaches 215,000, distributed in more than 700 population centers that include indigenous people, ejidos, villages, and ranches.[320]

The Lacandon Rainforest can be considered largely indigenous territory. Indigenous communities make up 70 percent of the population of the area. The ethnic groups found in this area are the Lacandones, Choles, Tzeltales, Tojolabales and Zoques. The first three of these together form the "Lacandon Community," established in 1971 by Presidential Decree. This triethnic community owns 614,321 hectares, of which 283,773 are located in the later-created Montes Azules Biosphere Reserve. This overlap causes numerous problems as explained below.

Although these groups by decree are one large united community, they have cultural differences. The Lacandones preserve their land and manage it in a primitive but apparently sustainable manner. The Tzeltales have directly or indirectly allowed their forests to be cleared by ranching or illegal timber harvest operations, leaving them with little forest left. The Choles have adopted an intermediate attitude between the Lacandons and the Tzeltales, using the forest for multiple purposes such as agriculture, animal grazing, and conservation.

These ethnic groups have divided the land of the "Lacandon Community" by tradition and intercommunity agreements. Eight-five percent of the Montes Azules reserve is located in what is considered to belong to the "Lacandon Community", both legally and traditionally. The best-preserved lands in the region belong to the Lacandones, reflecting the attitude of the people of this community towards natural resources.

The Lacandon Community has formed a nongovernmental organization (NGO) called LACANDONIA A.C. to represent the inhabitants of the Lacandon Forest. One of its main objectives is to oversee the commitments of different authorities and groups in the area as well as to administer the funds destined for the region.

Legal and Institutional History

The Lacandon Rainforest which, as mentioned earlier, once had 1.5 million hectares of rainforest, has suffered an accelerated and unsustainable exploitation for

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[319]INE, *supra* note 303, at 18-21.

[320]*See* Guillén Trujillo, *supra* note 304, at 4-6.

more than 35 years. Beginning in 1875 and up until 1969 the average deforestation rate was 851 hectares per year, followed by the largest deforestation rate (53,578 hectares a year) from 1969 to 1975. This average annual rate of deforestation dropped to 18,243 hectares during the period between 1975 and 1982.[321]

This rapid deforestation, caused mainly by logging companies, cattle ranchers, and the high rate of population growth in the past forty years due to immigration, has already destroyed more than 30 percent of the forest resources in the Lacandon region. Because of these problems, numerous decrees, projects, studies, and actions since the 1970s have aimed to preserve the Lacandon Rainforest. Unfortunately, many of these efforts have been carried out without coordination, leading to conflicts and inconsistencies among the numerous governmental and non-governmental institutions in the Lacandon.[322]

Creation of the Reserve. The creation of the Montes Azules Reserve was proposed in 1976 by a team of researchers who later, in 1977, drafted a formal proposal and conducted all necessary studies in coordination with the no longer existing Institute of Ecology (*Instituto de Ecología*), the National Institute for Research on Biotic Resources (*Instituto Nacional de Investigaciones sobre Recursos Bióticos*), the Center for Ecodevelopment (*Centro de Ecodesarrollo*) and the Center for Ecological Research of the Southeast (*Centro de Investigaciones Ecológicas del Sureste,* now *Colegio de la Frontera Sur*).[323]

The President of Mexico created the Montes Azules Biosphere Reserve by decree on January 12, 1978. This has been undoubtedly the most important legal action to preserve the rainforest. The decree creates a reserve of 331,200 hectares of which 283,773 had been granted to the Lacandon Community in 1971, as noted earlier. The decree does not expropriate any land but simply establishes a series of restrictions on the use of natural resources within the reserve. It provides for the determination of the areas for tourism, research and controlled use of resources, strictly forbidding clearing of land within the reserve. Unlike more recent decrees creating biosphere reserves, the Montes Azules decree does not delineate core or buffer zones within the reserve.[324]

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[321]Miguel Angel Vásquez-Sánchez et al., *Características Socioeconómicas de la Selva Lacandona, in* Montes Azules Studies, *supra* note 307, at 287.

[322]*Id.*

[323]Miguel Angel Vásquez-Sánchez, *La Reserva de la Biósfera de Montes Azules: Antecedentes, in* Montes Azules Studies, *supra* note 307, at 19.

[324]Decree establishing the Montes Azules Biosphere Reserve, Diario Oficial de la Federación, January 12, 1978, at 6.

Efforts for Protecting and Administering the Reserve. An Executive Steering Committee for the Ecological Program for the Lacandon Jungle was created several months after the Reserve had been created with the purpose of consolidating all actions aimed at preserving the rainforest. However, because of the lack of financial resources and inter-institutional coordination, the Steering Committee disappeared in the early '80s.[325]

With the creation of the Secretariat of Ecology and Urban Development (SEDUE, SEMARNAP's and SEDESOL's predecessor) in 1982, several regulatory, economic, and political activities were undertaken aimed at studying and conserving the Montes Azules Biosphere Reserve. Numerous studies have been concluded but unfortunately few resulting recommendations have been implemented.[326]

In 1985 the Inter-Secretarial Commission for the Protection of the Lacandon Rainforest was created. This Commission included representatives of the Government of the State of Chiapas (who presided the Commission), the Secretariats of Urban Development, the Interior, Mining, Programs and Budgets, Agrarian Reform, and Agriculture and Water Resources, and the state-owned oil company Petróleos Mexicanos (Pemex). The Commission had a Technical Advisory Committee including representatives of the Center for Ecological Research of the Southeast (CIES), the National Institute for Research on Biotic Resources (INIREB), the Institute of Biology of the National University of Mexico, the Institute of Natural History, and the Institute of Ecology, among others.

The objective of this Commission was to promote the conservation of the rainforest and its resources and the economic development of the population based on sustainable use.[327] Before disappearing in 1988, the Commission did carry out some forest conservation and management activities in coordination with the indigenous communities, especially in the western part of the Lacandon rainforest.

In 1988, the State of Chiapas was given responsibility over the "Integrated Program for the Lacandon Forest." In light of this, the government of Chiapas created a special Subcommittee for the Lacandon Forest which aimed, among other things, to protect the Montes Azules Reserve. In 1989 the state issued a declaration restricting the use of forest and wildlife resources within the Reserve, particularly in the municipalities

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[325]INE, *supra* note 303, at 2-5.

[326]Vásquez-Sánchez, *supra* note 323.

[327]INE, *supra* note 303, at 2-5.

of Ocosingo and Margaritas.[328] Finally, in 1990, in coordination with the World Wildlife Fund (WWF), SEDUE submitted a proposal requesting funds from the World Bank.

Management of the Reserve

A Management Program for the Reserve was drafted in 1992. This Program, which is based on extensive research, provides a complete analysis of the Lacandon Forest and its problems, and most importantly provides a detailed description of activities aimed at administering and preserving the reserve.

Among the objectives of the Management Program are: preserving the genetic diversity in the reserve; regulating what activities can take place in the reserve; promoting public participation; promoting alternatives for managing the sustainable use of natural resources; coordinating activities aimed at restoring deteriorated areas in the reserve; keeping an inventory of flora and fauna in the reserve; writing and coordinating the Annual Operational Program;[329] coordinating the research activities; coordinating management activities of the reserve with the indigenous communities in the area; and developing and implementing programs for environmental education.[330]

Particularly important in the Management Program are the provisions related to the zoning of the region for conservation and land use purposes. According to the Program the reserve is to contain a Core Zone, a Buffer Zone and an Influence Zone.

Core Zone. This area of the reserve has suffered no impacts and therefore preserves its primary vegetation. All extractive and manipulative human activities are prohibited in this area. All use of flora and fauna, any change in land use, tourist activities, and new human settlements are also prohibited. Activities related to scientific research and to the preservation of the resources are permitted.[331]

Buffer Zone: The Buffer Zone is divided into three areas according to the land tenure patterns, land use, productive activities, and economic and social characteristics

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[328] *Id.*

[329] The Annual Operational Program is aimed at implementing the Management Program by establishing specific goals and actions to be taken regarding the reserve. For example, the 1994 Operational Program has two main objectives: Implementing administrative projects, enforcement measures, measures for community development and environmental education in the reserve; and provide information for all sectors on the different options for land use in the reserve. INE, Annual Operational Program for 1994.

[330] INE, *supra* note 303, at 6-7.

[331] *Id.* at 34-37.

of the human settlements. Two types of land use are established for these areas: an area for recovery and an area for agricultural and silviculture.[332]

Areas for recovery are those with human settlements that do not have a well-defined legal status. With these it is necessary to initiate a process of restoration with the local communities redefining the proper agricultural activities for the Buffer Zone. Some of the actions to be taken in this area include: ecological restoration through the vegetation's natural regeneration; basic research and monitoring of the regeneration process; and promoting ecotourism.

Areas for agriculture and silviculture contain settlements that have legally been established. Agriculture and silviculture are the main activities in these areas. Some of the restrictions and actions applicable to these areas include: changes in land use will be restricted to ecologically sound management; agroforestry will be encouraged (e.g., organic coffee, crop rotation); new human settlements are prohibited; cattle grazing will be restricted; the use of chemicals is to be restricted; and the participation of the local communities in the protection of the resources of the region will be encouraged.

Influence Zone. This zone includes several subregions in which agriculture is the predominant activity. Specific programs and norms are to be established in order to determine land use in these subregions according to their characteristics.[333]

In order to manage these three zones, the Management Plan calls for four components: Conservation, Sustainable Social Development, Scientific Research, and a Legal Framework.

The *Conservation* component includes: setting up ecological inspection stations for monitoring illegal activities involving natural resources, particularly flora and fauna; management of natural resources; fire prevention; restoration of degraded areas; and the preservation of archeological monuments.

The *Sustainable Social Development* component includes among other things: the management of natural resources by the local people; environmental education; and creating the necessary infrastructure for the local communities (health services, schools).

The *Scientific Research* component includes: developing agroecosystems and alternative production methods; growing so called "fast growth" plants; creating new biological stations, and conducting socioeconomic research.

The *Legal Framework* component is to develop possible solutions for land tenure problems and to adopt regulations on land use.[334]

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[332]*Id.*

[333]*Id.*

[334]*Id.* at 34-50; *see also* Guillén Trujillo, *supra* note 304, at 9-10.

Despite the extensive research and effort that went into preparing the Management Program for the Montes Azules Biosphere and despite its comprehensiveness, it has not been institutionalized, that is, it has not been formally and fully implemented. Furthermore, there have been several versions of the document, one of which was finally approved in late 1994 as the official version, although few efforts have been undertaken to implement it given the problems the region faces at this time.

Because of the recent restructuring of the Mexican institutional framework for environmental protection, a new Technical Advisory Committee was created, this time within the Secretariat of the Environment, Natural Resources and Fisheries of the State of Chiapas. This Committee includes representatives of federal and state agencies.

During 1991 and 1992, a World Bank program for the sustainable development of the Lacandon Forest was implemented through SEDESOL. Several activities were undertaken with this program including the creation of a system for control and surveillance, a study for ecological land use, and the delimitation of the reserve.

Problems, Issues, and Challenges

There have been a great number of efforts to preserve and administer the reserve in a sustainable manner, none entirely successful. Forest loss in the reserve continues. The complex problems became more so with the January 1994 Zapatista uprising in the region. The following section discusses the main problems that must be addressed in order to achieve a sustainable use of forest resources.

Deforestation. Deforestation rates are difficult to establish, but according to some experts, the greater Lacandon Rainforest has lost 70 percent of its forest cover within the last 30 years.[335] Approximately 585,000 hectares have been destroyed in the last 18 years. Valuable woods (mainly mahogany and cedar) have been extracted from the Lacandon since the mid-1900s.[336] Conversion of land to farms and ranches has played an important role in forest loss. Construction of roads into the area, some to facilitate oil exploration, has facilitated of exploitation of the forest.

The Montes Azules Biosphere Reserve is in better condition than the Lacandon Region generally. As of the late 1980s, about 293,000 hectares of the reserve, out of the

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[335]*Id.* at 2, *citing* F. Paz Arizpe Lourdes and M. Velázquez, Cultura y Cambio Global: Percepciones Sociales sobre la Deforestación en la Selva Lacandona (Centro Regional de Investigaciones Multidisciplinarias, Universidad Nacional Autónoma de México 1993).

[336]Guillén Trujillo, *supra* note 304, at 2.

total of 331,200, still had primary vegetation.[337] The reserve's remoteness and lack of roads have a major factors in keeping deforestation low. Nevertheless, satellite-derived vegetation maps show clear signs of encroachment on the reserve's forests.

From a legal standpoint, it is not enough to outlaw destruction of the forest. It has been illegal to cut trees in the area since the government created the reserve in 1978. We must consider some of the factors leading to encroachment and deforestation and what can be done about them.

Migration and Population Trends. Migration from other regions of the state and of the country to the Lacandon Forest began in the 1950s and intensified during the '60s and '70s. Most of the migrants were indigenous groups who left their villages because of the lack of farmland.[338] More than sixty thousand Tzeltal and Chol Indians had immigrated to the region by 1980, radically altering the ecosystems because of their "slash and burn" agricultural techniques and extensive cattle raising. Adding to the problem are a large number of Guatemalan refugees that have settled in the region. In some areas near the reserve, refugees outnumber Mexican inhabitants ten to one. As a consequence of this strong immigration, numerous new settlements have sprung up in the forest.[339] It is said that by 1990 there were approximately 11,000 people distributed in 18 settlements living within the reserve,[340] however these numbers may have increased drastically in the aftermath of the Zapatista uprising. Other estimates, discussed in the next section, put the number of settlements in or encroaching on the reserve much higher. It is difficult to say how many people have moved into the reserve to flee the conflict.

The new inhabitants put great pressure on the resources of the reserve, usually not for high profits, but rather simply to live. The main activities are the cultivation of basic products for the community, growing crops and raising cattle.

A few of the population centers within the reserve existed in 1978, when the reserve was created. This is the case with some of the settlements of the Lacandon Community.[341]

Land Tenure. Any discussion of land ownership must begin with the Lacandon Community, which owns more than 85 percent of the land within the reserve, at least

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[337]Lazcano-Barrero et al., *supra* note 307.

[338]Jan De Vos, Historia de La Selva, Crónica de una Agresión en Lacandonia: El Ultimo Refugio (UNAM 1991).

[339]Guillén Trujillo, *supra* note 304.

[340]Lazcano-Barrero et al., *supra* note 307, at 405.

[341]INE, *supra* note 303, at 22-31.

"on paper". This Community is lives mainly in three towns formed by each of the three indigenous communities (Tzeltal, Chol, and Lacandon).

As noted in the first part of this chapter, the government formalized the Lacandon Community's land rights in a 1971 decree. The Community's ownership thus predates the creation of the reserve. The creation of the reserve did not change the ownership of the land, but only created legal limits on its use.

In addition to the overlapping of the Lacandon Community land by the Biosphere Reserve, the government has also granted land to 12 ejidos (dotaciones ejidales) well within the limits of the reserve. This is highly irregular given the known patterns of resource use by the ejidos in the past.

The above are the officially recognized claims to the reserve. According to some studies there are 61 settlements totally or partially within the reserve, covering 112,078 hectares of the reserve. Forty-one of these human settlements are located in the Core Zone of the Reserve covering an area of 93,671 hectares. Only 19 of the communities in the reserve have any sort of legal claim to the land; the legal claims cover over 65,000 hectares. That leaves more than 54,000 hectares illegally occupied both by existing communities that have expanded their land, and by irregular settlements.[342] There continues to be a rapid encroachment on the reserve by communities seeking more land for agriculture, particularly affecting the Lacandon Community who still try to protect the areas they own, but who are losing ground to so many other communities that demand more forest land to subsist.

Land Use. Each of these landholding groups has its own approach toward resource conservation and use. The Lacandon Community tend to use the land less intensively than more recent settlers. The Lacandon Indians, who make small, temporary clearings (*milpas*) in the forest for their gardens and who get other food through hunting and gathering, are the closest to achieving the sustainable use of their resources. The Tzeltales and Choles reportedly use their lands for some activities in an unsustainable manner, including potentially unsustainable harvest of valuable woods.

The more recent settlers have opted for more intensive land uses incompatible with maintaining the original forest intact. Their first action is often to cut the trees, occasionally using or selling the wood but sometimes just burning it to add the ash as fertilizer to the poor soils. Because of legal restrictions, the cost of transport, and other market factors, little of the wood makes it to commercial markets outside the region. Clearing leads to falling soil fertility and erosion. For a few years, the land will support farm crops. Eventually the farmers switch to raising cattle or abandon the land to others

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[342] *Id.*

who bring in their cattle.[343] About ten percent of the reserve is now used for agriculture, including basic grains, coffee, and pasture land.

This expansion of the agricultural frontier into the reserve has been caused primarily by the failure of rural development programs. Government policies often encouraged agriculture and the extension of ejido and other farming communities in order to increase crop productions and in turn, the quality of life of the rural population. What these policies did not take into account is the fact that tropical soils cannot generate a sustainable production of food for existing and new settlements.[344]

An important influence on land use is oil exploration and development. The region may have rich oil reserves. PEMEX, the state-owned oil company, has undertaken several exploratory and extractive operations in the past, leaving traces of the harm that this type of activity may cause. The roads PEMEX has constructed to move heavy equipment have inadvertently encouraged migration, illegal settlement, and farming.

Another unfortunate use of the land is the illegal capture of wildlife. There is a market for live tropical birds, such as parrots and macaws, and for the skins of jungle mammals like jaguars.

Legal Issues. The basic legal framework surrounding the reserve calls for protection of the forest. Under the decree creating the reserve and the General Ecology Law, uses that alter the intact forest ecosystems should be limited or prohibited. This basic protection is reinforced by other laws. For example, as described in Chapter III of this report, the Forestry Law requires authorizations for forest harvest or changing forests to other land uses, and the government should not grant these in the reserve. The State of Chiapas has placed its own stringent restrictions on forest harvest.

The current residents of the reserve grant these laws limited respect. As noted above, the newer settlements regularly clear land. Even some of the Lacandon Community engage in forest harvest.

The laws apparently get limited respect even from the government itself. The Agrarian Reform Ministry has issued grants of land within the reserve to farming communities. Recently, despite the current ban on forest exploitation in the state, several permits for exploiting dead wood have been granted to settlements not part of the Lacandon Community, causing strong opposition, especially by the Tzeltales.

Enforcement of the law in such a large area has proved difficult. Observers have alleged that some of the enforcement officials now present can be bribed. The Lacandon

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[343]*Id.*

[344]Carmona Lara María del Carmen, El EZLN en Chiapas. Aproximaciones al Derecho Agrario. (Instituto de Investigaciones Jurídicas de la UNAM, unpublished document).

Indians have taken upon themselves to enforce restrictions on unpermitted transport of timber and forest products and claim to have had more success in stopping the trade than the government.

Complicating the "anarchical" situation in the Lacandon Region are the recent substantial modifications to the Agrarian and Forestry laws. These have generated new management schemes for forests and land in the state. The changes to Article 27 of the Constitution, the new Agrarian Law, and the Forestry Law allow communal lands to be transformed into ejido lands, allow ejido lands to become private lands, and allow private lands to be held by corporations. Individuals may now own up to 800 hectares of forest; corporations up to 20,000. Management programs for the areas being exploited may be created and implemented by individuals or corporations.[345]

These changes in the legal framework for forestry and agrarian issues have contributed to the confusion that already existed in the area and, according to many, have substantially aggravated the problems. However, the laws are not being fully implemented in the reserve mainly because of the lack of human and financial resources and the numerous problems regarding land tenure and land use that already existed in the region.

Another problem is the lack of clarity regarding the distribution of responsibilities for the management of the reserve between federal and state authorities, and the lack of institutional mechanisms for implementing environmental policy. The 1996 amendments to the General Ecology Law include some new provisions on delegation of management authority, management agreements, and other implementation tools. It is too soon to know if the changes will make a difference in the government's approach to managing Montes Azules.

The Zapatista Uprising. Entire books could be written on the January 1, 1994 uprising in the state of Chiapas, on its causes, objectives, and consequences. The uprising was based on the demand for solutions to land tenure, education, health, and human rights problems. Incidentally, it has caused great trouble for environmental authorities, NGOs, and traditional indigenous communities. An already chaotic situation has become worse by displacing large groups of people and making access to the region difficult, among other things. The presence of armed peasants in certain regions surrounding the reserve make it difficult to assess the actual situation within the reserve and to monitor illegal wood extraction. In general, the Zapatista supporters seem to hold the integrity of the reserve as secondary to securing more land and income for rural communities.

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[345]Antonio Castillo, *Los Cinco Pecados Capitales de la Nueva "$" Ley Forestal,* Via Alterna, Vol. I, No. 0, Mayo 1993, UGAM, México.

According to reports by members of the Lacandon Community, there is chaos in the reserve caused by the displacement of thousands of people fleeing the conflict and looking for better farmlands. Furthermore, extraction of valuable woods such as mahogany is taking place given the absence of any means to enforce the ban on logging.

Financial Resources. Adequate financing is a key element to any conservation and protection policy for natural protected areas. Within the government's environmental spending, Natural Protected Areas have been hardest hit by the economic situation in the country, contributing to their management problems.[346]

In the case of Montes Azules, financing has been irregular throughout the past few years. Part of the money destined for the preservation of the forest has been granted by the federal government. The World Bank, through the Global Environment Facility (GEF), has also financially supported the Operational and Management Programs for the Reserve which, as mentioned earlier, have not been fully implemented.

Further financing is much needed in the region, not only for managing the reserve, but also for expropriating land currently held by different groups in and around the reserve, particularly in the buffer zones. It is unlikely however that funding will be a priority for the federal government as long as the conflict with the Zapatistas is not resolved.

Options

The problems surrounding the Montes Azules Biosphere Reserve are indeed complex and will require many measures to resolve. Unlike some other natural protected areas in Mexico, there is enough scientific and practical information on the rainforest and the reserve itself to develop a working management program. Some options for solutions to the problems faced by the reserve are as follows:

Land Ownership, Illegal Settlement, and Encroachment. Sanctioned and unsanctioned settlement of reserve lands by farmers and ranchers before 1994 was distressing; the recent population shifts tied to the Zapatista uprising are especially troubling. People hungry for land have the potential to cause great damage to the ecological integrity of the reserve and are hard to move once settled.

An initial option would be to census the reserve and determine the extent of migration and settlement. This would aid in planning further action. With any study,

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[346]Marc Dourojeanni, Financiamiento del Sistema de Areas Silvestres Protegidas. Parques y Progreso, UICN/BID, Cambridge UK, 1993, at 172.

though, there is always a danger that the completing the study can become an excuse for delay in addressing the problem.

Current land ownership maps show *ejido* land grants overlap not only the reserve but also the land granted by presidential decree to the Lacandon Community. At some point, the government will have to resolve these overlapping grants and determine who are the lawful residents and who are the squatters.

One option would be to go to court to resolve the overlapping claims. Though this would be a legally satisfactory option, it has several practical drawbacks. First, the judicial action would be complex, lengthy, and costly. The communities involved have little free capital to spend on legal battles. The situation is reminiscent of the judicial actions to sort out land and water claims among long-established villages and more recent settlers in the U.S. state of New Mexico early in the 20th Century. The end result there was that much of the land ended up in the possession of the lawyers, in payment of legal fees. Second, no matter what result the court would reach, some parties would find themselves deprived of land without anything received in return to soften the loss. They would be unlikely to leave the land willingly. Third, there would be political costs. Because of the Zapatista uprising, land tenure issues in the region have high political sensitivity, and the government may not wish to appear to be depriving poor *campesinos* of land.

Another option would be to try to negotiate clear land boundaries with the participation of all the claimants. This option would probably require government payments to all sides to get agreement, and there is no guarantee that agreements could be reached.

A third option would be for the government to expropriate all or all but one of the overlapping claims for each piece of land. The cost of this option may be high, and like the first option, it runs the risk of resistance from the people who lose their land.

The above options apply to those settlements with some legal claim to the land. The clearly illegal settlements are at least as great a problem. Eventually the government will have to decide whether to tolerate the encroaching settlers, to negotiate with them to leave, or to remove them with force. Toleration would be popular with some of the local settlements (but not the Lacandon Community, who lawfully claim much of the land, and who might demand compensation or might try to take action against the squatters). On the other hand, toleration will encourage others to invade the reserve. The encroaching settlements themselves will also grow and seek more land. It is clearly the option most harmful to the reserve.

A negotiated settlement might be a way to remove the squatters without the political costs of eviction. It is unlikely the squatters would leave without some land to go to somewhere else, and the government may not have that to offer them. In short,

negotiation may be difficult. And in the end, the government would have to enforce any deal it made, to prevent the squatters from returning to the land.

Unilateral eviction, through expropriation for settlers with possibly legal claims and forceful removal for unlawful settlers, would have its own difficulties. The government hardly has the enforcement strength now to prevent new squatters. It would have to significantly strengthen its presence in the reserve to remove the squatters and keep them out. The cost of buying out the possibly lawful settlers is unknown.

Inter-Institutional Coordination. To make any progress in solving the problems in the reserve, federal and state governments, NGOs and the communities in and around the reserve must coordinate their activities and reach compromises on difficult issues. For example, most of the checkpoints watching for transport of illegal timber products from the reserve are currently empty. Part of the reason for this is a general lack of funds and the difficulty of exerting any government influence in the region, but part is that no one in the government appears to be certain whose responsibility it is to run the program: INE, PROFEPA, or the forestry people formerly with SARH. The Agrarian Reform Ministry is under tremendous pressure to come up with new lands for the farming communities now supporting the Zapatistas. In the past they have ignored the laws establishing the reserve and issued land grants within the reserve. They cannot be allowed to ignore their legal obligations to consult with SEMARNAP on these matters and to respect the boundaries of the reserve.

The new organization of environmental agencies within SEMARNAP may help to resolve some of the failures of the government to coordinate, but it may create others. For example, it is unclear how these agencies will divide responsibilities for promoting and regulating agroforestry. SARH's successor, the Secretariat of Agriculture and Rural Development (SAGDR), if it works to develop agroforestry in the region, will have to coordinate with INE and the SEMARNAP Subsecretariat of Natural Resources to make sure the programs are sustainable. With responsibility unclear, it is possible that no agency will want to take on agroforestry, even though it is a promising alternative for rural development.

Besides the problems with among the federal agencies, there must be effective roles for the state agencies and the local communities. The Lacandon Community now feels particularly isolated from the decision making process, as it is close to neither of the two most influential political forces in the region, the federal government and the Zapatistas. As long as environmental policy in the reserve remains separated from the reality and needs of the inhabitants of the region, no management program will effectively be implemented. In fact, coordination at all levels is the only way to ensure

that the government's policy towards the reserve will reflect the true needs of the people as well as the necessary measures for the conservation of forest resources.

Developing Alternative Productive Activities. Solving the problems in and around the Montes Azules Reserve does not require stopping the use of natural resources completely, but rather it simply requires that alternative and sustainable ways of forest use be found. One way of doing this that has already proven effective is the marketing of certain types of non-timber forest products (e.g., the xate palm, used for floral decoration, and forest mushrooms). However, it is unclear how large the market is for these products. Also, Mexico's farm product marketing system, using state-sanctioned middlemen to buy at controlled prices, has limited the profits earned by farmers and gatherers. According to some, groups that have by-passed the official market and exported commodities directly have made higher profits.

Agroforestry is another possibility that has promise to generate crops sustainably. Again, farmers have had difficulty in getting agroforestry crops like vanilla, coffee, and cacao to competitive and open markets.

It will take more than market reform to change the agricultural base of nearby farmers. A comprehensive reform program will have to include provisions for farm credit, farmer training, and ongoing research to improve farming methods.

Proponents of investment in agricultural productivity argue that it will reduce the demand for new land by existing settlers. The danger is that it will make migration to the region more attractive and increase the demand for new land for immigrants.

Financing. Obviously, no effort will be completed without proper financing. The responsibility for financing activities for the reserve falls mainly upon the federal and state governments and on international organizations. However, the federal government could seek innovative means of raising revenues in the region. The government could levy taxes or fees on companies that are granted permits for forest exploitation (when and if the ban on logging nearby areas is lifted). Other possible sources of financing in the region are the National Commission of Electricity and PEMEX (Mexican Petroleum).

Enforcement. Enforcement in remote forested areas is always difficult. The government may never have enough financial or personal resources to adequately enforce existing laws, regulations, and policies.

One option is to try to craft policies that have broad support of the affected community and therefore require less enforcement effort. This usually requires the participation of the local people. In this particular case, the people of the Lacandon Community would have to be involved, given their rights over the region and their knowledge of it. But the people of the surrounding and encroaching communities also

would have to be involved, and it will be difficult to satisfy their wishes while protecting the integrity of the reserve.

Another option is to conduct a campaign of high-profile enforcement. This would include campaigning against bribery and corruption of enforcement officials, assigning more people to patrol the area and prosecute violators, and seeking strong punishments for those convicted. At the moment, the government's enforcement efforts have little credibility and little deterrent effect, simply because enforcement has been so limited in the past.

Another enforcement issue stems from the difficulty in determining the exact boundaries of the reserve (or property lines within the reserve), except where the boundaries are marked by a river or other clear natural landmark. That uncertainty invites encroachment. This is a difficult problem. Satellite global positioning systems do not have the accuracy of ground surveys. Surveys are costly and difficult to do in remote, heavily vegetated areas. Also, surveyors' boundary monuments are open to vandalism or sabotage. The highest priorities for marking boundaries are probably the areas near existing settlements and the areas now suffering encroachment.

Roads. The worst forest loss in the Mexican tropics is near roads. Roads seem to invite squatters, illegal timber harvest, and other incursions on undeveloped land. Yet roads are a key part of economic development. Roads make it easier to bring animals, seeds, fertilizer, and the like to the farm and to send farm products to market. They allow easier tourist access. They may have military value in this troubled border region. They aid access in case of fire or other emergency. Many of the communities near the reserve would like to see improved roads.

The government could treat roads in a number of ways. There are few roads now leading into or near the reserve, but one option would be to close some existing roads. Alternatively, the government could stop all road construction or repair in the reserve or the zone of influence around the reserve. It could limit construction to improvements on existing roads outside the reserve. It could consider new roads near the reserve on a case-by-case basis. Choosing from among these options will require careful consideration of the many costs and benefits of road construction. The core of the reserve, though, will get few benefits from new roads.

Chapter Five:

The Monarca Biosphere Reserve

In the 1980s the Mexican federal government declared a special biosphere reserve[347] to protect the wintering grounds of the monarch butterfly (*Danaus plexippus*) in the states of Mexico and Michoacán in central Mexico. These wintering grounds are threatened by deforestation. This case study looks at some of the legal and institutional challenges to the suitability of the reserve for the butterflies and the local residents.

The Monarch Butterfly

The monarch butterfly, with its boldly patterned orange and black wings, is a familiar summer sight throughout much of the United States and southern Canada.[348] In

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[347]Executive Federal Decree, March 25, 1980 (Diario Oficial de la Federación, Apr. 9, 1980) & Presidential Decree, Sept. 30, 1986 (Diario Oficial de la Federación Oct. 9, 1986). "Special biosphere reserve" was one of the nine categories of reserves listed in Article 46 of the General Law on Ecological Balance and Environmental Protection. The 1996 amendments created a new set of categories, eliminating the special biosphere reserve and allowing the Secretary of SEMARNAP to reassign existing reserves into the new categories. General Ecology Law, *supra* note 190, art. 46 as amended; 1996 amendments, 7th transitional art.

The Monarca Reserve will probably become a biosphere reserve. Under Article 48 as amended, these are areas of national importance with one or more ecosystems not significantly altered by human activity or which require preservation and restoration and that are home to species representative of the biodiversity of the nation, including those considered endemic, threatened, or in danger of extinction.

Alternatively, the Secretary might give Monarca another designation. The revised definition of national park, in Article 50, no longer includes forest harvest as a valid land use and might be protective enough for Monarca. Under Article 55 as amended, the new category of "sanctuaries" includes areas sheltering species, subspecies, or habitat of restricted area. Ultimately, however, Monarca's international visibility and the suitability of the core and buffer zone arrangement for its management argue for the "biosphere reserve" designation.

[348]The general discussion of the biology of the butterfly and the legal and institutional history of the reserve draws on many sources including the interviews with NGO and government officials during visits to Mexico City, Morelia, Toluca, Angangueo, and El Rosario, and the following general references:

William H. Calvert et al., Recommendations for the Protection and Management of Monarch Butterfly Biological Reserves in Mexico (presented to the National Forestry Commission of Mexico, June 1987) [hereinafter Calvert Recommendations].

William H. Calvert et al., *Conservation Biology of Monarch Butterfly Overwintering Sites in Mexico,* 2 Vida Sylvestre Neotropical 38 (1989).

autumn, the adult butterflies begin to travel south. The migration is unique in the butterfly world, both in the distance the migrants travel and the size and density of the colonial overwintering populations. Monarchs living west of the Rocky Mountains winter in colonies along the California coast. Most monarchs living east of the Rockies travel to the states of Michoacán and Mexico, to a series of isolated sites in the high mountains along the two states' common border.

The butterflies require a highly specific environment to survive the winter. Temperatures much below freezing will kill the butterflies. On the other hand, unless temperatures remain cool, the cold-blooded (poikilothermic) butterflies will burn up their limited supply of fats. Steady cool temperatures will keep the butterflies too torpid to fly, and they need to fly occasionally to seek out water or nectar. Even on cool days, though, if the butterflies can find a spot in the sunshine, they can bask and raise their body temperatures enough to allow flight.

In Mexico, the butterflies gather into dense colonies -- sometimes with millions of individuals -- at specific locations that meet their environmental needs. The colonies form at altitudes of about 10,000 feet (3000 meters), usually in stands of oyamel (*Abies religiousa*), a native fir. The butterflies can cling to the needle-covered fine branches of the oyamel in great numbers, and they seem to prefer it as a roost to other available trees. The colony sites tend to be on southern or eastern slopes, exposed to the warmth of the mid-day or afternoon sun. The sites have low undergrowth, which allows butterflies that fall from the trees at temperatures too cold to allow flight to crawl up and away from the ground where temperatures drop to near-freezing at night and in the early morning.

The oyamel firs where these colonies form, near the mountain tops, used to be part of an unbroken blanket of trees that changed to pines and then to broadleaf trees as one progressed down the mountain. The government has granted much of the land in the region, up to the mountain tops, to *ejidos*[349] and indigenous communities. Though

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Kate Dickson, A Strategy for Conservation with Sustainable Management Pursued by Monarca, Associacion Civil, Mexico. (Master's thesis, the Norman Paterson School of International Affairs, Carleton University, Ottawa, Ontario, Canada, May 1989).

K. Jurgen Hoth von der Meden, Rural Development and Protection of the Monarch Butterfly (*Danaus plexippus*) in Mexico: A Sustainable Development Approach (School of Rural Planning and Development, Guelph Ontario, Canada. May 1993).

Elizabeth Verduzco, *Reserva Especial de la Biósfera Mariposa Monarca: Politicas y Alternativas de Manejo (tesis de licenciatura, Ingeniería Agrónoma, Universidad Michoacana* Feb. 1992).

[349]*Ejidos* are rural communities created as part of the Mexican land reform program. For several decades, the government has expropriated large landholdings (*latifundios*) and allocated the land to landless *campesinos*. Rather than give land to individuals, the government gives the land to communities, which

the altitude is high and the land is steep, these people have cleared much of the land, up to the level of the pine forest and sometimes higher, into the fir, for crops and livestock to support themselves and their families. They turn to the remaining forest for wood, for grazing, and sometimes for additional land.

The wintering sites of the eastern population of monarchs were a mystery to scientists for many years. In the mid 1970s, biologist Fred Urquhart, tracing leads provided by recapture of monarchs marked in the north, discovered the wintering sites.

Though two decades have passed since the first wintering site was reported, we still have much to learn about the area and the butterflies. We are not even sure we have located all the wintering sites; to date, scientists have discovered more than a dozen such sites in and near the reserve. Scientists have tracked fluctuations in the numbers of butterflies and the times of their arrival and departure each year. A significant decline in butterfly numbers in 1992 has been variously attributed to an exceptionally cold winter, the general climatic effects of the Pacific Ocean surface temperature variation known as "el Niño," and degradation of the butterflies' wintering habitat, making it a less effective buffer against extreme weather.[350] No one can state with complete certainty the reasons for the changes, how human activity has affected butterfly numbers, or the best way to manage the reserves. We do know that to survive the butterflies need a winter roost with very special conditions and need to avoid disturbance during their stay.

Legal and Institutional History

At the time of their discovery, none of the wintering sites were on land owned outright by the government. As is true now, most of the land involved belonged to *ejidos*. A significant fraction of the land was communally held by resident indigenous people.[351] A small part was privately owned.

Soon after the wintering sites became known, a Mexican attorney, Rodolfo Ogarrio, visited one of the sites and became interested in protecting them. Initially he acted as a private citizen, but in 1980 he formed a non-profit organization, Monarca

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allocate the land through community government. Recent amendments to Article 27 of the Mexican constitution have permitted individual members of these communities, *ejidatarios*, more potential autonomy. *Ejido* lands can now be temporarily leased or used as collateral for loans.

[350]*See* SARH & SEDESOL, Reunión Sobre la Mortandad de la Mariposa Monarca en México (Avándaro, Méx. 1993).

[351]The indigenous communities are similar to *ejidos* in that the lands are communally held with restrictions on alienation.

A.C., to work for their protection. Since then, Monarca A.C. has been a major advocate for the reserve. It also has sponsored research, worked with the government and other institutions to protect and manage the reserve, and worked with local residents to promote benign economic development.

On April 9, 1980, the Official Diary published a presidential decree declaring the wintering sites, wherever they occurred, and the butterflies themselves to be protected.[352] The decree did not specify where the protected areas were, did not expropriate any lands, and did not demand government ownership of wintering sites. Though the decree had the effect of creating a reserve, it simply imposed conditions on the use of the wintering site lands. Soon after the decree, Monarca A.C. commissioned a study of the area to serve as the basis of future management plans.

To coordinate private and government efforts, Monarca A.C. proposed the creation of a trust to manage the reserve and administer ongoing research and education programs. The Secretariat for Urban Development and Ecology (SEDUE) was to preside over the trust, with the Secretariat for Agriculture and Hydrological Resources (SARH), the states of Mexico and Michoacán (where the wintering grounds lie), and Monarca itself represented as trustees. Assigning management power and responsibility to a combination of government and non-governmental parties was highly unusual and somewhat controversial.[353] In the end, all the parties except the State of Mexico agreed to participate in the trust.

In 1985, responding to concerns about commercial use of the forests destroying butterfly habitat on private lands, the state of Michoacán expropriated 70 hectares of private land. In 1986 SEDUE acquired the remaining 705 hectares of private lands in the area of the wintering grounds. These acquisitions did not create special reserves or change reserve boundaries. They simply changed the ownership of that land and with that change took from private hands any lawful claims to the resources of those 775 hectares.

On October 9, 1986, a new presidential decree was published naming the land around five overwintering areas -- approximately 16,000 hectares -- and expressly set aside a nuclear zone and a buffer zone at each area to be protected.[354] The 1986 decree prohibited the cutting of trees in the nuclear zones and limited uses of the buffer zones.

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[352]Executive Federal Decree, March 25, 1980 (Diario Oficial de la Federación, Apr. 9, 1980).

[353]The General Ecology Law, *supra* note 190, passed a few years later and described in Chapter III of this report, specifically provided for the managing agency to make agreements concerning management with states, municipalities, and community, social, scientific, or academic groups. The 1996 amendments have expanded this authority. *See id.* arts. 47 & 158.

[354]Presidential Decree, Sept. 30, 1986 (Diario Oficial de la Federación Oct. 9, 1986).

As with the previous decree, the 1986 decree did not change land ownership. The decree gave management responsibility to SEDUE. SEDUE continued to work cooperatively with Monarca A.C. in SEDUE's management of the area.

In 1988, the nation enacted the General Ecology Law, which revised and updated the laws governing natural protected areas. It called for development of a management plan for each natural protected area set aside through presidential decree[355] and required any future decrees to set out guidelines for the management program.[356] Despite this, the Monarca reserve still lacks a formal management plan. Monarca A.C., working with the federal government, prepared a management plan and the government has sought World Bank funds to implement it. The World Bank has only partially supported the plan.

The 1988 General Ecology Law also called for restrictions on activities in reserves.[357] The restrictions were to be strongest for the nuclear zone and more flexible for the buffer zone. The law did not give SEDUE as managing agency complete power over activities in the reserves. Instead, other agencies that might have control over activities, as SARH did over forest harvest generally in the country, were to consult with SEDUE and honor the letter and spirit of the decree creating the reserve when granting permission.

When the government reorganized environmental functions in 1992, the newly created Secretariat for Social Development (SEDESOL) got prime responsibility for enforcement as well as regulation of the reserves. Within SEDESOL, the National Institute of Ecology (INE) had responsibility for reserve management and planning. The Office of the Attorney General for Environmental Protection (PROFEPA), also within SEDESOL, had responsibility for enforcement. SARH, however, retained its general authority to regulate timber harvests in the nation.

In December 1994, Mexico reorganized its environmental and natural resource agencies into the Secretariat for Environmental Media, Natural Resources, and Fish (SEMARNAP). INE and PROFEPA moved from SEDESOL into the new ministry. SARH's regulatory authority over forest harvest moved to the new ministry's Subministry for Natural Resources. The result is that the major forces concerned with environmental planning, regulation, and enforcement are all in a single ministry. SARH, reorganized as the Secretariat for Agriculture and Rural Development (SAGDR)

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[355]General Ecology Law, *supra* note 190, art. 65. As discussed below, this article was amended in 1996.

[356]*Id.* art. 60 (also amended in 1996).

[357]*Id.* arts. 48, 49, & 70. Articles 48 & 49 were amended and article 70 repealed in the 1996 amendments to the General Ecology Law.

and SEDESOL will still work closely with the rural communities, influencing their agricultural methods, equipment, and infrastructure.

In recent years, Monarca A.C. has had difficulty raising funds to continue its work. Apparently many of the management efforts and projects begun by Monarca have now fallen to the federal agencies or have been suspended. Local organizations, such as the *Alianza de Ejiods y Communidades de la Mariposa Monarca,* have taken the lead in promoting participation by local residents in reserve management and planning.

In October 1996, the nation passed significant amendments to the General Ecology Law. As noted in an earlier footnote, the law amendments abolished the "special biosphere reserve" designation that Monarca had under the 1988 law and so will require the Secretary of SEMARNAP to place Monarca in a new category of reserves.[358] The new law includes increased opportunities for local inhabitants, property owners, governments, and other interested parties to become involved in the planning, management, and protection of reserves.[359] The new law also sets a time limit of one year after a decree is issued for reserves to have a management plan.[360] How this deadline will apply to existing reserves is unclear.

The reserves are also subject to state and local laws. For example, the State of Mexico, with its largely urban population, had a decree barring all harvest of trees, which was repealed in 1995. Mexico and SEMARNAP now have a coordination agreement giving the state a central role in regulating forestry.

Existing Management

Despite the lack of a comprehensive plan, the government's influence, and Monarca A.C.'s, can clearly be seen in portions of the reserve and the nearby communities.

INE is responsible for reserve planning and management. INE has closed most of the reserve to tourists to avoid disturbance to the butterflies. At the one part of the reserve open to tourists, at El Rosario, INE has built a signed trail with an educational exhibit for tourists at the base. It collects an admission fee from visitors and requires tourist groups to be accompanied by *ejidatario* guides, which it trains. INE has also sponsored training for local teachers in environmental education and environmental

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[358]*See supra* note 347.

[359]*See generally* the discussion of the General Ecology Law in Chapter III of this report.

[360]General Ecology Law, *supra* note 190, art. 65.

workshops for professional guides who might bring tourists to the reserve.[361] At the time of this study's site visit in January 1994, INE was not conducting any formal research itself at the reserve, other than monitoring movement of the butterfly colonies. However, INE grants permits for other scientists to enter and study the reserves.

The Subministry of Natural Resources in SEMARNAP regulates forestry activity in the area. That includes regulating any harvest of trees in the reserve buffer zones and in the surrounding areas outside the reserve, stopping illegal harvest, fighting forest fires, and permitting and monitoring the transport of logs out of the area to local mills. As of the time of our site visit, no permits had ever been granted for forest activities in the buffer zones. Such a permit would require the concurrence of INE. Both the forest managers and INE had doubts about the possible effects of cutting on the reserve and were cautious about issuing permits. However, they were working towards issuing some permits. They had concluded that allowing the *ejidos* to harvest some trees lawfully would help reduce the demand behind the potentially more destructive illegal harvest and would build more support for the reserves among the inhabitants. The lack of permits has not stopped cutting from occurring in the buffer and nuclear zones.

PROFEPA now has responsibility for enforcing the management standards set by both INE and SARH's successors in SEMARNAP. Sources are in conflict about exactly how many enforcement personnel are stationed at the reserve. In one sense, every government employee visiting the area acts as the government's eyes. In January 1994, SARH had seven people assigned to work in the forests of the region, giving priority to the reserve. They had at their disposal two observation towers, built primarily to help spot fires. An outside source estimated that SARH and PROFEPA together had no more than 6 people devoted full time to enforcement at the reserve, augmented by local people hired to patrol the reserve during parts of the year. By choosing the right time and place, it is possible to cut trees without being apprehended. By careful selection of route, it is possible to move logs to mills without surveillance by the forest authorities.

At the time of the case study site visit in 1994, Monarca A.C. was continuing to work on building consensus for their management plan for the reserve and on raising funds for reserve management and the development of the local economy in ways consistent with protecting the reserve. A Monarca A.C. forester was working at the reserve on reforestation, management, and community development projects. According to more recent reports, Monarca no longer has a full-time staff presence at the reserve.

In 1994, both the government and Monarca A.C. were working to strengthening the area economically as well as protecting the reserve. Solidarity, still a part of

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[361]INE 1993-94, *supra* note 77, at 102.

SEDESOL, has established over 250 projects in 41 communities in and around the reserve, including fence construction, patrol of the reserve, and reforestation.[362] The road between the tourist facilities for the reserve and the town of Angangueo has been improved under a Solidarity project. The *ejido* of El Rosario, which has the tourist center, also has a Solidarity-funded nursery raising tree seedlings for reforestation. In 1993-1994 the seedlings were planted out to 650 acres in the reserve.[363] A 1992 Solidarity plan projected spending N$ 4,000,000 on projects in the area.[364]

Several other government agencies have activities or influences affecting the economy of the region. The National Institute for Indigenous Peoples (INI) works to promote development of the local indigenous communities and is second only to Solidarity in its spending for economic development in the area.[365] The *Banco de Crédito Rural* offers loans for rural development; the *Bodegas Rurales CONASUPO*, a government-supported system of stores, subsidizes distribution of animal feed, fertilizers, and other farm goods; the *Secretaría de Comercio y Fomento Industrial* has programs supporting agriculturally-related industry and commerce in the region; and at least a dozen more agencies and NGOs support development in the region in one way or another.[366]

The five portions of the reserve differ in their status and their most pressing problems. For example, the oyamel in the Sierra Chincua unit, in Michoacán north of Angangueo, has some serious disease and insect problems, from mistletoe, bark beetles, and moth larva. The approximately 700 hectares of federally-owned land are in this unit, and they are heavily damaged by unauthorized cutting. Perhaps this is because there is no resident owner there to protest.

The Chivati/Huacal unit in Michoacán also shows the varying influence of ownership. A significant portion of the nuclear zone of the reserve is owned by an indigenous community, and it is badly damaged by fires and illegal use. Adjacent *ejido* land looks well-conserved in contrast. In fact, looking at the unit from a neighboring mountainside, the boundary between indigenous community and *ejido* is quite obvious

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[362] *Id.*

[363] *Id.*

[364] Programa de Ecológia Productiva en Solidaridad, Zona de Reserva de la Biósfera Mariposa Monarca, Michoacán (June 1992).

[365] Gonzalo Chapela y Mendoza & David Barkin, Monarcas y Campesinos: Estrategia de Desarrollo Sustentable en el Oriente Michoacán 65 (1995).

[366] *Id.* at 70-73.

due to the sudden break-up of the forest cover, while the boundaries of the nuclear and buffer zones of the reserve are difficult to locate.

The Pelon unit is the southernmost and largest unit of the reserve and unlike the first two units mentioned, it includes land in the state of Mexico. The Mexican *ejidos* have been resentful of the reserve and of attempts to control the use of their lands. There have been fires set in the unit, perhaps maliciously, and there has been illegal cutting. The Mexican *ejidos* have feuded with their neighbors in Michoacán over land and have even sought legal action to protect what they claim as their property rights.

All five units have some common problems. All show impacts to some degree from illegal harvest of trees. In all five, there are uncertainties about the locations of property lines and reserve boundaries. Some of these common problems are discussed in more detail in the next section of this chapter.

Also, when the 1986 decree set the boundaries of the reserve, the government was aiming to permanently protect all the major butterfly wintering sites. Since then, several butterfly wintering sites have been discovered outside the reserve units, and the existing colonies have been found to shift position from year to year.

More Problems, Issues, and Challenges

The legal and related institutional issues associated with the reserve can only be understood in the context of the biological issues at the reserve and the social issues facing the people whose actions affect the reserve.

Biological issues. The key biological concern is loss of suitable habitat for the wintering butterflies. This essentially means alteration of the forest, though there are many actions that may alter the forest. One obvious one is removal of trees by people. Local people harvest trees for wood or for fuel, or to clear land for agricultural uses. There is a strong market for wood, and people take some from the reserves each year to sell to raise cash for fertilizer and other basic goods. High altitude, steep slopes, and poor soils make the land ill-suited to agriculture, yet the *ejidatarios* are pressed to feed their communities from it. Pressure is strong to put as much land as possible under cultivation. Older residents can remember when forests reached far down from the mountain tops; now the farms press against the edges of the reserves.

The effects of forest harvest and clearing outside the reserves are not completely understood. It is possible that having some open disturbed lands near the reserves may benefit the overwintering colonies by providing nearby areas where butterflies can obtain water and nectar. Nevertheless, the large-scale clearing that has occurred near the reserves is probably not ideal. If nothing else, it has made the trees of the reserve more accessible to harvesters and has reduced harvesters' options for where to find

trees worth cutting. Some scientists believe that the oyamel forests of the overwintering sites may be ecologically linked to the pines below them and even to the deciduous forests below the pines, and that long-term survival of the oyamel forest may require maintenance of forests well outside the current reserves.[367]

Certainly, indiscriminate harvest of trees within the reserves has the potential to do great harm. Studies have shown that even selected thinning of the oyamel forests makes the environment for the butterflies warmer and drier during the day and colder at night, both factors detrimental to the butterflies.[368] It also seems to increase the hunting success of birds that prey on the wintering colonies.[369] Because the oyamel occur in small, isolated patches high in the mountains, heavy harvest could easily extirpate them; they are "more vulnerable to deforestation pressures than any other forest type in Mexico."[370]

Another factor altering the forest is fire. A fire extensive enough to kill the trees destroys the forest as a wintering ground. But even lesser fires, that kill the undergrowth without seriously harming the trees, destroy the butterflies' habitat. The monarchs apparently need a thriving understory to provide a means to escape the freezing nighttime temperatures near the ground if they fall off the trees. When the temperatures are cold enough to threaten frost, it is usually too cold for the butterflies to fly back to their roosts. They must crawl off the ground and wait for warmer weather or sunshine to raise their internal temperature.

People set most of the fires in these forests. Setting fires is not necessarily done as an act of destruction. In many parts of the world people deliberately set fires in temperate forests to clear out the undergrowth and encourage the growth of new grasses and forbs. The result is a forest easier to travel through, one offering more food for livestock and some large game animals, and sometimes one supporting fewer snakes, ticks, biting insects, and other human pests. However, in the case of the reserves' forests, the result is also a forest less suitable for the butterflies.[371]

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[367]Calvert Recommendations, *supra* note 348, at 3.

[368]*Id.* at 19.

[369]*Id.* at 21-22.

[370]*Id.* at 10.

[371]The authors do not know enough about the ecology of the oyamel forest to say if the forest type that the monarchs prefer is stable or the result of regular disturbance. In some forests, occasional ground-level fires are necessary to maintain desirable undergrowth and prevent more serious fires that could result from build up of flammable material on the forest floor.

Grazing may similarly alter the forest without destroying trees. Livestock may selectively eat particular species, changing the composition of the undergrowth in the short run and the whole forest in the long run, particularly if the livestock eat tree seedlings.

Repeated human or animal presence in the midst of the winter colonies can disturb the butterflies, causing them to take flight and tax their limited energy supplies. This is why the government has limited tourism to a single part of the reserve and limited tourists to specific trails. Scientists are not sure how harmful tourist visits are to the butterflies or how much tourism particular parts of the reserve can tolerate.

Some diseases and insects threaten the oyamel. As mentioned above, in one reserve, mistletoe, a parasitic plant, is prevalent. Also, bark beetles attack the trees. Burrowing under the bark, they destroy the cells that transport water and nutrients in the tree. The tops of seriously affected trees die back and the trees' vigor declines. Though only monarch adults stay at the reserve, the caterpillar of another lepidopteran, a moth, feeds on the oyamel needles and can cause damage.

The above disturbances are short-term concerns. There are also longer-term issues. The colonies seem to gather in slightly different places each year. The factors influencing colony location are imperfectly understood. Are the butterflies responding to subtle climatic variation, or are there other factors at work? If these factors, or the forces that seem to be poised to drive global climate change, make the current reserve areas unsuitable, what will become of the winter colonies?

Even absent climate change, more research is needed to understand if the reserves once protected will remain suitable for the butterflies indefinitely, or whether they will require some active human management. Stability of habitats over centuries is relatively rare in temperate terrestrial ecosystems. Wetlands become uplands. Fields become forest. Young forests become old growth. Catastrophe strikes and forests become clearings.

Some sampling suggests that the trees in the reserve are not more than 80 years old, and that butterflies may prefer areas where the trees are of intermediate density, perhaps due to former thinning or disturbance.[372] These less dense stands seem to have thicker undergrowth, which provides thermal protection and perhaps sources of nectar for the butterflies.[373] Though thinning existing wintering spots would make them less valuable to the butterflies, it may be that areas of thinned forest can ultimately become valuable habitat as they age.

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[372]von der Meden, *supra* note 348, at 27.

[373]*Id.* at 28-32.

Is the current stand of oyamel a relatively stable habitat? In fifty years, will it look the same as now? Are periodic fires, diseases, wind storms, land slides, or other disturbances necessary to maintain the habitat? If current management removes these potential disturbances, do we need to replace them with planned and controlled disturbance of the forest? Only better scientific understanding of the forest will give us the answers.

Besides the reserve itself, there are concerns about the habitats that the butterflies need outside of the reserve to complete their annual cycle of migration. The butterflies depend on plants that most people consider weeds: nectar-bearing wildflowers for the adults and various species of milkweed (*Asclepias sp.*) for the larva. Though once forest clearing and road building increased the amount of habitat open to milkweeds, intensive development throughout North America is making weedy meadows, fields, and roadsides less common. Though the loss at present is not as critical as the threats to the unique wintering sites, ultimately it is a concern.

Social concerns. As noted above, many of the most serious threats to the reserve are linked to human activity. The root causes of these problems are social, not biological.

Though income varies among the communities, by most standards the local residents are poor. They have relatively little formal education; most are literate, but about a quarter of the adults are unschooled and less than half have completed their primary education.[374]

The people depend on the land for their survival. The land is not well suited to agriculture. The high altitude, steep slopes, and erodible soils all limit production.

As a practical matter, their poor land, lack of capital, remote location, and lack of education all limit their options for earning a livelihood. The reserve lands hold resources that local residents can turn into food or cash. One study has suggested that poverty and lack of education makes local communities more likely to resort to illegal exploitation of the reserve.[375]

The local residents have varying attitudes towards the butterflies and the reserve. Some are resentful of what they see as a unilateral government take-over of their land. Others fear that the government policy towards the reserves will change with changing administrations. The reserves have lately brought increased government assistance to the economies of the area, and they worry about changing government whims. The government seems to them to be powerful but distant and difficult to influence.

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[374]*Id.* at 19.

[375]*Id.* at 24 & 33.

Some residents, notably many who live in El Rosario, have seen the economic benefits that tourism can bring and see the reserve as a valuable addition to the community. The only portion of the reserve open to ordinary tourists is accessible only through El Rosario, and that community has earned far more money off the reserve than any other in the immediate vicinity.[376] This has caused some jealousy among the other communities. They would like other portions of the reserve open to tourism. It is unclear how much tourism harms the wintering colonies or whether there is enough tourist interest in the reserve to support facilities at multiple sites.

Legal and Institutional Issues and Options

The monarch butterfly wintering colonies are phenomena of nature; the *ejido* and indigenous communities are social phenomena; but the Monarca Special Biosphere Reserve is a legal construct. In many ways, the futures of both the biological and social communities are tied to the laws and related legal institutions, which mediate between nature and society and control how elements within society have access to natural resources.

The following discussion explores several issues connected with the design and implementation of the laws affecting the reserve.

Issue: What are the reserve's management objectives?

As noted in the first chapter of this report, the threshold question of forest management often is, "what values do we want to get from this forest?" In the case of the Monarca reserve, the answer on the surface is relatively simple: we want to preserve viable wintering sites for the butterfly.

There is a second concern, however: the well-being of the local people. We must ask ourselves, what future do we want for the local communities?

Of course, the two concerns are linked. If management of the reserves creates new hardships for the local communities, or if poverty threatens their survival generally, the local people will be inclined to exploit the reserve's resources without regard to the effect on the butterflies. Because of the remoteness of the reserves, the

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[376]Substantial tourist dollars flow into nearby towns like Angangueo that provide hotels, restaurants, and guides for tourists. Many tourists pay to come on day trips to the reserve from larger cities farther away, including Mexico City. Despite the entrance fees, parking fees, and assorted shops, El Rosario probably only gleans a fraction of the money tourists spend to see the butterflies.

The federal government collected 540,000 N$ in revenue from over 57,000 tourists in 1993-1994, which it used for work in the reserve and surrounding communities. INE 1993-94, *supra* note 77, at 102.

government would have a difficult time enforcing restrictions on use without respect and support from the local people. Also the government holds itself morally and ideologically committed to the betterment of the people. Any management plan that hurt the local communities would be both hard to enforce and hard for the government to embrace.

We can perhaps agree that 100 years from now, we would like the reserve still to present suitable habitat for the wintering colonies of monarchs. Their needs and their ecological niche will not have changed much. How about the local people? Do we want or expect to see a community of about the same number of people involved in primary production of crops, livestock, and timber? Human needs may not change greatly over time, but human opportunities do. The human species is constantly changing its own ecological niche.

There are many contemporary models for what might become of this mountainous land: the relatively poor agricultural lands of Nepal, passed on the way by trekking tourists; the relatively prosperous alpine communities of Switzerland, laced with expensive resorts; the depopulating rural communities and ghost towns of the western United States; tourism-dependent communities that have lost their link to primary production activities; and technology-dependent havens where industry or service-oriented businesses have moved away from urban areas and displaced the original farmers.

The question of which of these scenarios is desirable is one for the Mexican people and the residents of the reserve. The notion of land reform is central to the Mexican Revolution. The people of the reserve's communities have strong ties to their land. Yet Mexico's plans for economic development and participation in world markets may bring forces of change to bear on rural communities.

The answer to the initial question of management objectives affects the answer to all of the questions posed below.

Issue: Who should own the reserve lands?

The lands in and around the reserve have a unique capacity to serve as a butterfly reserve, but they are not unique as farm land. Should the government expropriate the reserve lands and move the resident farming communities elsewhere? This option has some superficial attraction. The monarch colonies would probably benefit from reduced interaction with humans. The lands involved might be better suited to forest cover than farming. The lands make up a small fraction of the watershed of the municipal water supply for Mexico City and nearby areas, and restoring forest cover to the area would reduce erosion and make a small improvement to the quality of

the water supply. However, there are reasons to believe that expropriation is not a viable option.

First, the small amount of land that the government has already expropriated is not in particularly good shape. With no resident owners to look after it, it attracts people who wish to cut wood illegally, including people from nearby communities that own land in the reserve. Without strong and effective policing of the land or removal of people from a greatly enlarged buffer zone, expropriation alone is unlikely to protect the forest.

Second, expropriation would be politically unpopular within the local communities. The communities have strong attachments to the land, and taking it from them would stir anger and opposition. With the demand for arable land suitable for new communities so high in Mexico, it seems unlikely that the government could supply the *ejidos* with an exchange of lands, and it seems unlikely that the *ejidos* would be satisfied to take money for the land.

Issue: Is existing law sufficiently flexible to respond to changing conditions at the reserve?

Our science is not certain enough to know whether protection of the existing reserve will succeed in protecting sufficient winter grounds for the monarch. The existing reserve includes five sites. Monarchs are known to winter at over a dozen sites in the region, and colonies have been observed to change their location somewhat during the winter and from year to year. The butterflies' needs for wintering sites appear to be quite specific. Small changes in altitude or forest structure make large differences to the monarchs. Forests change and climate changes, and human influences can encourage both kinds of change. The potential for change is an issue that challenges all habitat reserves, but the small size of the Monarca reserves and the exacting requirements of the monarch make the issue especially important here. When conditions change, can the law adapt readily to accommodate them?

The General Ecology Law requires a presidential decree to create a new reserve or change the boundaries of an existing one. Any newly discovered colonies outside the reserve's boundaries will lack the full legal protection offered to colonies in the current reserves. The original Monarca Reserve decree covered a larger area, but was replaced by a more clearly defined decree when the extent of the wintering areas became better known. Should the government consider other, more flexible ways to protect the wintering grounds?

Flexibility, though, has its own costs. The more clearly defined decree offers more certainty for local inhabitants about what land is protected and what is not. That

sort of certainty encourages the local people to invest their development efforts on land outside the reserve and allows them access to manage and benefit from forested areas that might be protected under a broader reserve.

Also, there is a social and political cost to shifting reserve boundaries. The local people have seen government programs come and go with changing administrations. Frequent major changes in the Monarca boundaries might encourage skepticism among the locals about the constancy of the federal intent to protect the butterflies while ensuring that local communities develop and prosper.

Perhaps we should not talk about shifting boundaries in so narrow a sense. Perhaps what we need to think about shifting boundaries together with changing the rules that accompany the boundaries, creating new categories of protection. Today, the core zones are legally closed to timber harvest, but some illegal tree cutting continues. Perhaps there are areas in the core zones that will never be used by the butterfly colonies, as we understand their biology. Perhaps carefully limited and controlled cutting in the core area could reduce the demand for destructive, uncontrolled illegal cutting.

On the other hand, the butterflies regular fly out to lands beyond the reserve boundaries, and human settlements and activities on lands beyond the boundaries clearly affect the reserve. The current management emphasis on promoting sustainable development in surrounding communities recognizes these facts. Perhaps they could be given formal recognition by declaring a zone or zones of influence affecting the reserve and giving reserve managers some authority to control activities outside the formal boundaries of the reserve that nonetheless affect it.

Issue: Should local governments or local delegates of the federal government be given more control over the reserve's management?

Government in Mexico is highly centralized, and the lines of authority over the reserve reflect this centralization. For example, permission to enter the parts of the reserve normally closed to the public can only be obtained from INE officers in Mexico City.

Centralization has its advantages. The main office of a ministry or agency may feature a collection of highly trained or experienced specialists that could not be duplicated at each field location. The proximity of centralized offices of other agencies and ministries may make coordination easier. Centralized decision making may be easier to police for signs of corruption. Central control is more likely to produce uniform national policies.

On the other hand, central decision makers are unlikely to have the first-hand knowledge of problems that local decision makers might have. They are unlikely to be able to respond as quickly to new problems. They are unlikely to have the personal links to local community leaders that might help encourage acceptance of government management.

To some extent, the federal government can decentralize management of reserves through cooperative agreements with the states, local communities, or other interested parties as provided for in the General Ecology Law.[377] However, the central government might also consider whether it could efficiently delegate some basic authority over the reserves to field offices closer to the actual problems of the reserve.

Issue: Can the managing agencies better coordinate their efforts?

During interviews for this project, government workers did not express problems about inter-agency coordination, but observers outside the government saw the situation differently. One observer commented that the agencies do not always agree on who has authority over a particular area. So, for example, the government has never granted permission for tree harvests in the Monarca buffer areas. In part that is because the government is not exactly sure where the physical boundary of the buffer zone is on the ground (as opposed to in the decree). In part it is because neither INE nor the Subministry for Natural Resources is confident that it has the authority by itself to issue permission.

Some have complained that it is difficult to get permission to do research in the reserve. If you apply to INE for permission, they send you to PROFEPA, and PROFEPA sends you back to INE. Each believes the other has the ultimate authority, and neither will grant permission before the other does.

Mexican federal law calls for and expects coordination among agencies. All ministries are to honor the General Ecology Law and the standards for a reserve's management that SEMARNAP creates. In developing reserves SEMARNAP is to consult with other ministries and state and local governments on matters affecting their jurisdictions. Within SEMARNAP, INE, the Subministry for Natural Resources, and PROFEPA must work in concert to implement and enforce laws.

Cooperation, diffusion of power, and coordination have advantages. Each agency has its own expertise and outlook. Frequently one agency can provide insight into a problem that another agency would lack.

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[377]General Ecology Law, *supra* note 190, arts. 47, 66, & 67. The 1996 amendments to the law expressly permit management agreements with state and municipal governments, *ejidos,* agrarian and indigenous communities, social and business organizations, and other interested parties.

Spreading authority can create problems if the agencies involved can seldom come to agreement or if the law does not clearly state which agency has the ultimate authority to decide.

Closer examination is needed to see how serious the claimed coordination problems are and whether they can be cured by redefining or more clearly defining the powers and duties of various agencies.

Issue: How can the legal system create incentives for residents to protect the areas?

The accepted sociological wisdom on management of natural areas is, the management program must have the support of the local population. If the local people do not support the existence of the reserve, they will not honor the laws that created it, nor will they hold themselves back from acts that might harm the reserve.

Said another way, the local people must see some benefit to themselves from honoring the reserve. The benefit does not have to be strictly economic. It can be a matter of local pride, religious satisfaction, aesthetic gratification, or personal liberty (i.e., not being jailed for harming the reserve). Whatever it is, though, it must outweigh any benefit the residents might get from not honoring the limits imposed by the reserve.

The communities around Monarca are largely short on land and cash. Though the remaining reserve forests are on land with poor potential for farming or grazing, the trees still are valuable as lumber. There are strong incentives for the local people not to honor the reserve, and these incentives have led to the illegal harvest of reserve trees.

What can the government offer the local people as an incentive to honor the reserve? The threat of prosecution of reserve violators is one possibility, though is it clearly not the whole answer. The government lacks the manpower to police the five remote units effectively. The government has enlisted the aid of local residents to police the reserve, but realistically, without strong local commitment to the reserve these resident patrols will not effectively limit illegal uses.

The strongest possibilities seem to be economic incentives. The 1996 amendments to the General Ecology Law added a new section governing the use of economic instruments.[378] The law now directs the federal and state governments to design and implement economic instruments to promote compliance with economic policy objectives. Such instruments must provide incentives for actions protecting ecological balance and promote greater social equity in the distribution of costs and benefits of

[378] *Id.* arts. 21-22 bis.

environmental policy. Creating new economic incentives to protect Monarca would be consistent with the letter and spirit of these new provisions.

Such incentives would have to take into account the current economic effects of the reserve. The *ejido* of El Rosario has the only trail into the reserve open to tourists. INE has constructed some interpretive facilities at the trailhead for the tourists, including a gift shop. INE trains and hires local residents to act as guides on the trail. The *ejido* also charges tourists for parking, sells food and refreshments, and manufactures crafts for sale to the tourists. INE collects an entrance fee from tourists, part of which goes to the *ejido*. And some residents have been employed in reforestation projects and at the tree nursery built at El Rosario.

Other *ejidos* have not reaped equal economic benefits. One has established a toll station on the road to El Rosario. Others have benefitted indirectly from Solidarity-funded improvements to the road between El Rosario and the town of Angangueo. El Rosario, though, has enjoyed the greatest share of benefits.

Other *ejidos* have encouraged INE to open other parts of the reserve to tourism, to allow them the chance to earn tourist income. The impact of tourists on the butterflies is poorly understood, and no one knows if opening more of the reserve to tourists would be compatible with the central purpose of the reserve, which is to protect the butterflies' winter habitat. Also, it is not clear whether opening other areas would increase tourism overall or simply distribute the current tourism income over many communities, making the contribution to each community small.

If the potential for adverse impacts from tourism does prevent opening other parts of the reserve, some communities would like to see the proceeds from El Rosario distributed among all the *ejidos* affected. As just noted, this would make the beneficial impact from tourist dollars much smaller at El Rosario.

Although the government does not by law owe the communities any compensation for restricting land use in the reserve, the government might consider making some sort of annual payment to the communities. This payment could be based on the quality of the reserve land as habitat, as measured by the size of the winter population of butterflies or some other indicator. Perhaps the money could be awarded on a competitive basis among the communities, though such provisions might encourage some communities to sabotage the habitat on other lands.

A non-governmental organization modeled along the lines of a land trust could perform a similar function. It could in effect lease the reserve lands from local communities. With proper capitalization and legal organization, an NGO might actually be a more reliable source of funding than the government, because its funding would not fluctuate with the changing political winds. The problem would be raising the endowment for such an NGO and establishing criteria for lease payments.

Another possibility is for the government to supply substitutes for the goods ordinarily supplied from the reserves. For example, if the community established that no trees were cut on its lands, the government might help supply fuelwood, construction materials, or fertilizer. If the community kept livestock and fire out of the reserve, the government might supply animal feed or animal-based supplies for the *ejidatarios*.

It would be wrong, though, to see the problem only in terms of economic incentives and disincentives. Some local residents and communities simply enjoy the self-determination that comes with land ownership. They resent government efforts to control how they use the land. They are suspicious of government programs, which have changed with changing times and administrations.

One possible solution to this is to increase the power that local communities have in reserve management decisions. This might be accomplished under existing law through cooperative management agreements with the communities that provide them some management authority. Giving authority to the local government can lead to new problems, though, if the local and federal government have strongly differing management objectives.

Another factor affecting whether local people support the reserve involves whether they see it as a source of non-economic values for themselves or the greater community of their state, their nation, North America, or humanity. To a certain extent, people's feelings in these matters can be changed through education. The government has tried to educate the people of the reserve about the unique treasure they hold. The government may want to consider stronger efforts to build support for the reserve, though education pushed to extremes can become indoctrination.

Issue: Is the current legal framework for reserve management workable, given practical questions of available technology, funding, and other factors?

There are many practical hurdles to the implementation of the current legal framework for the reserve. Some involve existing technology. For example, no one knows exactly where the boundaries of the reserve are on the ground. The costs and limits to surveying in remote areas mean that no one has precisely plotted the boundaries of the nuclear zones or buffer areas. This uncertainty makes regulators reluctant to approve too many activities in the buffer zones, for fear that they might accidently involve the nuclear zones. It also makes enforcement more difficult.

The current framework presupposes a certain amount of funding for reserve management and social development in the associated communities. Much money has been forthcoming, but, like most reserves around the world, more money could always

be put to good uses. The World Bank has identified Monarca as a potential recipient of Global Environment Facility (GEF) money, but has expressed concerns about the proposed management plans drawn up by the government and Monarca A.C.

Boundary and funding issues aside, are the strictures of the reserve decree enforceable in any practical way? How do you monitor compliance effectively over such a large, remote, little-developed area? As is obvious from the degree of degradation from clandestine cutting that has occurred in some parts of the reserve, the government has not succeeded in getting all people to honor the reserve decree.

Perhaps these questions are only artifacts of a normative view of the reserve laws. Laws can be aspirational as well as normative. The United States' federal Clean Air and Clean Water laws passed in the 1970s set environmental goals for the 1980s that still have not been met. These laws have other extremely strict normative aspects that have been enforced and that have brought about real improvements in environmental quality. Meanwhile, the ambitious goals of the acts set the tone for pollution control efforts and gave notice to polluters that their practices ultimately must change. Perhaps the laws and institutions creating the Monarca reserve should be seen as aspirational first and normative second. As the years pass and the people affected by the reserve accept it and adapt to its presence, the normative aspects will become more enforceable.

The danger in this view is, the reserve may not have the luxury of waiting. The threats to the reserve hang over it today; the response must come today as well.

Chapter Six:

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Regulation of Commercial Forestry in the State of Durango

The state of Durango is a major producer of commercial timber in Mexico. Most of the commercial harvest there is from non-federal (private and social) properties, subject to federal approval and oversight under the Forestry Law. In most cases, harvest proceeds without change of the basic land use. The land returns to forest, either from natural regeneration encouraged by good forestry practices or with the assistance of planting.

The threat from this economic activity is not loss of forest cover. The threat is the ultimate loss of forest resources such as timber, grazing, biodiversity, watershed quality, recreation, and scenery. Economic forces, cultural forces, and political forces all press upon the forest, seeking different mixes of uses. The Forest Law implicitly attempts to reconcile the many demands on the forest and provide for overall sustainability. Because the various uses of the forest are often in conflict, reconciling them is not an easy task. This case study looks at the ability of the law as written and implemented to assure sustainability of all of Durango's forest resources.

The Geography of Durango

Durango is a large, relatively lightly populated state in the interior of northwest Mexico. To its north is the border state of Chihuahua, and to its west is the coastal state of Sinaloa. The state spans roughly the same latitude as the southern third of the peninsula of Baja California. Covering 46,196 square miles (6.2% of Mexico's territory) Durango is the fourth largest state in the country. With about 1.3 million people, it is the eleventh least populated.

Most of the state lies 5,000 feet or more above sea level, with the highest parts reaching over 10,000 feet. Durango geographically falls into three main regions running east to west. Semi-arid plains with sparse vegetation cover the eastern part of the state; the central region is characterized by a series of valleys, while the western part of the state sits within the Sierra Madre Occidental, one of Mexico's principal mountain ranges. The forests of the state are in the western mountains.

Though Durango straddles the Tropic of Cancer, topography gives it a range of climates. The mountainous west gets up to 52 inches of rain a year, mostly in the summer. That moisture sustains the mountains' forests and feeds rivers that water the lands below. The temperatures can be quite cool in the higher elevations, with an annual average as low as 52 degrees Fahrenheit (11 Celsius). The central valleys are more temperate, with annual average temperatures around 68 (20 Celsius) and far less rain. The eastern plateau is arid and dry.[379]

Three Views of Durango's Forests

Biodiversity

Durango has a variety of forests. The lowest slopes and canyons of the Sierra Madre Occidental in the western parts of the state support pockets of tropical forests. As one climbs the mountains, the climate turns cooler and often wetter. The vegetation comes to be dominated by oaks, then by a mix of pines and oaks, and finally by a coniferous forest. About three percent of Durango is covered by tropical forests; about 28 percent supports coniferous forests.[380]

These mountain forests of oak, pine-oak mixtures, and pines are typical of the Sierra Madre Occidental, which runs from the state of Jalisco north through Durango Chihuahua and Sonora. A recent study by Birdlife International shows that although the Sierra Madre Occidental is still largely forested, less than one percent of forest remains old growth, and some of these remaining areas are in Durango.[381] The Sierra Madre Occidental's forests are home to a remarkably diverse collection of life. One can find the southernmost occurrence of many temperate species, the northernmost occurrence of tropical species, and the westernmost occurrence of species found in eastern North America. The area has many endemic species. It boasts 18 species of pine

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[379]SEMARNAP, *Información General del Estado de Durango* (August, 1995).

[380]Oscar Flores Villela & Patricia Gerez, Biodiversidad y Conservación en México: Vertebrados, Vegetación, y Uso del Suelo 141 (1994).

[381]J.M. Lammertink et al., Status and conservation of old-growth forests and endemic birds in the pine-oak zone of the Sierra Madre Occidental, Mexico (1996) (Report No. 69 from the Institute for Systematics and Population Biology (Zoological Museum), University of Amsterdam).

and 41 species of oak. In total, it may have as many as 4000 different species of plants, though its flora have not been well studied.[382]

It is also is the meeting ground of two great provinces of fauna, the New World tropical (neotropical) animals of the south and the New World temperate and boreal (nearctic) animals of the north. For the forests of Durango and of Chihuahua to the north, one search of the scientific literature found records of 327 species of birds, 79 species of mammals, 44 species of reptiles, and 11 species of amphibians.[383]

The birds of the Sierra Madre Occidental are particularly diverse and are perhaps the best studied element of Durango's biodiversity. Approximately half the migratory species nesting in the western United States and Canada use the forests of the Sierra Madre as their primary wintering habitat. Home ranges of these birds in winter are much smaller than in summer, making a loss of winter habitat many times more significant that a similar loss of breeding habitat. Fortunately, migrant species tend to be highly adaptive and can survive in almost any forest type. Sustainability of timber operations and the continued presence of large forest expanses appear key to the health of these migrant bird populations.

The Sierra Madre is also home to a more than a dozen endemic bird species, including the Aztec thrush, tufted jay, eared trogon, and imperial woodpecker. The latter three are considered endangered by Birdlife International with the imperial woodpecker -- the largest woodpecker in the world -- presumed extinct.[384] Each of these latter species has been put in danger by loss of older forest habitats due to harvest along with other contributing factors, such as hunting in the case of the imperial woodpecker. The thick-billed parrot is critically endangered, primarily because of removal by loggers of dead snags, which the bird needs for nesting sites. The eared trogon is less endangered because it prefers canyons, which are often passed over by loggers as inaccessible.

The biological diversity of the region has a rich economic potential. A study of the Sierra Madre to the north of Durango found 253 wild relatives of domesticated plants, which might some day be used to contribute useful genetic traits to their

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[382]Robert Bye, *Prominence of the Sierra Madre Occidental in the Biological Diversity of Mexico, in* USDA Forest Service General Technical Report RM-GTR-264, Biodiversity and Management of the Madrean Archipelago 19 (Leonard F. DeBano et al., technical coordinators 1995).

[383]Luis A. Bojórquez-Tapia et al., *Conservation of Madrean Archipelago and Regional Forest Development Projects in Mexico, in* Biodiversity and Management of the Madrean Archipelago, *supra* note 382, at 206.

[384]Lammertink et al., *supra* note 381, at 30-51.

commercial relatives. That same study found 18 plants used as crops by pre-Columbian peoples. The authors estimated between 700 and 1000 plants in the area might have use as food, fiber, or medicine.[385] Local markets sell several native plants from the forests as medicines; the prices for these plants have climbed sharply in recent years, perhaps reflecting over-collection or destruction of habitat.[386] One analysis has concluded that some of these plants have a market value so high that growing them on forested land could produce as much or more money than managing the land exclusively for timber.[387] The government keeps actual statistics on only a few non-wood forest products, though, and the recorded commercial value of their harvests is a fraction of one percent of the cash value of the state's overall timber harvest.[388]

Commercial timber production

The pines of Durango are one of Mexico's major domestic sources of timber. Durango leads Mexico in roundwood production, producing about a third of the country's pine harvest and about 30 percent of the country's total timber harvest.[389] As much as eight percent of the nation's production comes from a single union of ejidos round the town of El Salto.[390] The total value of wood harvested in the state in 1994 was almost 350 million new pesos.[391]

Timber harvest and wood processing are an important part of the state's economy. In 1991, almost 20,000 people in the state were directly employed in industrial

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[385]Richard S. Felger & Michael F. Wilson, *Northern Sierra Madre Occidental and Its Apachian Outliers: A Neglected Center of Biodiversity, in* Biodiversity and Management of the Madrean Archipelago, *supra* note 382, at 36.

[386]Bye, *supra* note 382.

[387]*Id.*

[388]Secretaría de Agricultura, Ganadería y Desarrollo Rural, Anuario Estadístico de la Producción Forestal 25 (1994) (Cuardo 9) [hereinafter 1994 Statistics].

[389]James T. Fisher et al., *Temperate Pines of Northern Mexico: Their Use, Abuse, and Regeneration, in* Biodiversity and Management of the Madrean Archipelago, *supra* note 382, at 165; 1994 Statistics, *supra* note 388, at 10-11 (Cuardo 2).

[390]Personal communication with the Union Secretary. A fact sheet from the Instituto Nacional de Investigaciones Forestales y Agropecuarias (INIFAP) confirms that in 1990, about 22 percent of the state's production came from the lands around El Salto. INIFAP, La Actividad Forestal de Durango en Cifras (Desplegable Informativa Núm. 1) (1994).

[391]1994 Statistics, *supra* note 388, at 25 (Cuardo 9).

forestry.[392] By another estimate, forestry activity generates 110,000 jobs overall in the state, benefitting indirectly over half a million people and accounting for about half the state's gross domestic product.[393]

Forestry is especially important to the economies of the ejidos and indigenous communities in the Sierra Madre. Though the original developers of the timber resource were corporations and large landowners, ejidos and indigenous communities now hold most of the timber lands and account for about 80 percent of the timber harvest permits granted annually.[394] Durango played an important role during the Mexican revolution and the government began to implement the revolution's principles of land reform there shortly after the 1920s. As in the rest of Mexico, the transition to newly adopted forms of ownership was slow and not always equitable. The first ejido lands were granted during the 1930s with the last ejido being created in the 1960s. In part because they were created early on in a relatively lightly populated state, ejidos in Durango tend to be larger than ejidos in many other Mexican states, including those in the areas of the two other case studies of this report, in Michoacán and Chiapas.

In 1991, about 6000 of the 20,000 direct industrial forestry jobs in the state were on ejidos or in indigenous communities.[395] Besides work in harvest or replanting, individual settlements may have small mills or even factories to produce wooden boxes and other value-added products. Cooperatives, like the Union of Ejidos at El Salto, run extensive milling operations. The harvest and processing of wood is essential to the livelihood and living standards of many rural communities. Based on limited and subjective observation during this case study, the rural communities of Durango appear more prosperous than similar communities in the other case study areas of this report.

The existence of more than 13,000 forest-related jobs off the ejidos, including 9500 jobs in the city of Durango itself, suggests that rural land owners also draw significant income selling their raw timber to private industry. Private operations range from small, portable, one-saw mills to highly sophisticated industrial operations making value-added products for export. The state has over 400 mills and forest-dependent

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[392]INIFAP, *supra* note 390, table 9.

[393]Statistics supplied by Ing. Juan José Rojas Soto, Subdelegado de Recursos Naturales, PROFEPA Delegación Durango (1997).

[394]*Id.*

[395]*Id.*

factories. About half are small operations devoted to making packing crates, but the total includes nine plywood mills and two cellulose and paper mills.[396]

Water

Although forestry appears to be the most important commercial activity of the mountains, the most valuable output of the mountains may be water. The Sierra Madre gives rise to several rivers, including the Rio Nazas, the largest river in the state and the state's main source of water for agriculture. Durango's commercial crops include cotton, wheat, corn, beans, chilies, vegetables, and fruits. These are mostly raised in the central region of the state and often depend on irrigation. The city of Durango lives on water that fell first as rain or snow in the mountains.

Removal of the forests would not mean the end of Durango's rivers. But the presence of forests and the activities of people in the forests do affect the quantity and quality of water. Forest vegetation and soils tend to moderate the flow of water, holding it back during storms and releasing it slowly during drier times, helping prevent both floods and droughts. Vegetation helps slow soil erosion; poorly constructed or maintained forest roads and careless harvest operations can promote erosion. The silt carried down the mountains fills in the reservoirs and plugs the irrigation works in the valleys below.

Identified Threats to Durango's Forests

Observers see different threats to the forest depending on the values they see in the forest. Those interested in timber production are concerned with fire, insects, and disease destroying the trees. The concern about fire is obvious even to the casual observer in Durango. SEMARNAP and local foresters have spelled out fire warnings on the hillsides in signs made up of white stones, visible from the major highways. Fire is a genuine cause of forest loss. From 1983 to 1993 almost 240,000 hectares of forests and range lands burned in the state, including over 50,000 hectares of adult trees; only 2,256

[396]Mill statistics supplied by Ing. Juan José Rojas Soto, Subdelegado de Recursos Naturales, PROFEPA Delegación Durango (1997).

hectares of burned areas were reported reforested.[397] Forests can also be lost when land is converted for farming or ranching.[398]

Progressive timber managers are also concerned about unsustainable management practices. In every part of the world where trees have value as timber, short-sighted land owners and mill owners have encouraged harvests that "high-grade" the forest, taking the most valuable trees but not taking steps to ensure the sustained productivity of the site. Mexico has embarked on a Forestry Development Project in Chihuahua and Durango to help improve the quality of forest practices.

Those concerned about biodiversity have a different point of view. They worry about fire leading to forest loss, but they also worry about exclusion of fire leading to forest changes. Though the true role of fire in these forests is not yet understood, in many similar coniferous forests, frequent low intensity fires serve to thin out competing vegetation without killing fire-tolerant species. Many commercially valuable pine species tolerate low, frequent fires well. Suppression of fires leads to a different mix of species on the site. It also leads to a greater build-up of burnable materials and a higher likelihood that when fire does come, it will be intense enough to kill everything on the site.[399]

Those concerned with biodiversity also worry about the effects of commercial use of the forest. One author listed the following threats, in no special order: overcollection (of wild medicinal plants, wild birds, etc.), clear-cutting, overgrazing, and inappropriate land use, such as planting trees on high wet meadows ("llanos") that do not ordinarily support tall trees.[400] The exact impact of commercial forestry on biodiversity is difficult to gauge, because we know so little about the area's diversity to begin with. On the one hand, most of the forests of the Sierra Madre have been disturbed in some way in the last hundred years -- either by cutting or fire. Very rarely these days will commercial harvest affect an "untouched" piece of land. On the other hand, widespread commercial forestry tends to change the distribution of disturbance, increasing the prevalence of disturbed lands and reducing the prevalence of forests with the large trees, fallen logs, complex vegetational layering, and other "old growth"

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[397]*Id.* table 13.

[398]*See* the general discussion of causes of deforestation in Mexico in Chapter I of this report; *see also* Fisher et al., *supra* note 388, at 167-69.

[399]*See* Peter Z. Fulé & W. Wallace Covington, *Changing Fire Regimes in Mexican Pine Forests,* J. Forestry, Oct. 1996, at 33.

[400]Bye, *supra* note 382, at 24.

features. Some species in the region are becoming rarer or have been extirpated -- for example, the Mexican wolf and the imperial woodpecker -- and changes in the forest habitat are often cited as factors in these kinds of declines.

These concerns were serious enough to have led the World Bank to drop support for the Chihuahua and Durango Forestry Development Project, mentioned above. The aim of the project was to bring better commercial forest management to the region, particularly to the ejidos and small landowners. Though the World Bank at first hoped the project would lead to a more sustainable use of the timber resource, it ultimately agreed with NGO objections that the project would encourage forest harvest to the potential detriment of biodiversity.[401]

Those concerned with water must worry about catastrophic fires leading to erosion and other water quality problems; grazing, farming, and forestry activities in riparian areas; careless forest harvest promoting erosion; and poorly constructed and maintained roads. Use of pesticides and fertilizers, more common in farming than in forestry in Mexico, can also be a concern, as can pollution from human settlements.

Regulation of Forest Use

How does the law address these threats? Chapter III of this report gives an overview of the federal laws that apply to forest areas. This discussion will review a few of those points, especially as they apply to commercial activities, and discuss some of the norms written under those laws that apply to timber harvest and other commercial uses.

Under Title I, Chapter IV of the General Ecology Law, the government has a set of broad tools to help limit the environmental impacts of human activities. At least four tools are potentially important to commercial use of the forest:

1. The government may write broad statements of policy, standards, and appropriate uses of land called ecological *ordenamientos* or orderings.[402] Though the prime use of these has been to govern industrial and commercial development, they can also be used to govern forestry activities.

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[401] *See* Bojórquez-Tapia et al., *supra* note 383, at 207.

[402] General Ecology Law, *supra* note 190, arts. 19-20 bis 7.

2. The government prepares environmental impact assessments of proposed public or private actions that may cause ecological imbalance. These may include forestry activities that result in changes in land use.[403]

3. The government may issue technical norms governing industrial activities that affect the environment.[404] This general authority is strengthened in the Forestry Law, which gives the government specific authority to write norms governing forest use.[405]

4. The government is to develop economic instruments to create incentives for achieving environmental policy objectives.[406]

The government has not used all these tools fully in Durango. Currently, no ecological ordering addresses forestry activities. Environmental impact assessments are not usually required for forest activities unless tropical forests, areas difficult to regenerate, or protected natural areas are involved, as specified in the Forestry Law.[407] And the authors are not aware of any economic incentives of consequence aimed at improving forest protection.

The Forestry Law has a more direct and specific application to activities in the forests. The most important provision of the law in this context is Article 11, which requires authorization from SEMARNAP for harvest or development of timber resources from forested lands or lands suitable for forestry. Article 13 also gives SEMARNAP regulatory authority over harvest of non-wood resources and domestic firewood and also over grazing in forest areas.

The Forestry Law requires landowners seeking authorization for forestry operations to submit a management plan prepared by a qualified forester.[408] SEMARNAP reviews the plan and considers its effects on the timber resource and on

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[403]*Id.* art. 28.

[404]*Id.* arts. 36 & 37.

[405]Forestry Law, *supra* note ?, art. 5, § III.

[406]General Ecology Law, *supra* note 190, arts. 21-22 bis.

[407]Forestry Law, *supra* note ?, art. 14, § IV.

[408]Forestry Law, *supra* note ?, arts. 12, 23-24.

water, land, non-renewable resources, and ecological balance generally.[409] It also considers whether the applicant has a lawful right to harvest the trees.[410] The Forestry Law also requires authorization from SEMARNAP for conversion of forests to non-forest uses.[411]

The Forestry Law also makes SEMARNAP responsible for fighting forest fires, promoting conservation of forests, encouraging environmentally sound construction of forest roads, and promoting forestry education and research.[412]

SEMARNAP and the agencies that came before it have filled in some of the details of forestry regulation in norms published in the Official Diary of the Federation. These norms cover harvest of non-wood forest products[413] as well as the harvest and transport of timber. Among those relevant to timber harvest operations are norms concerning mitigation of impacts on soil and water,[414]mitigation of effects on forest flora and fauna,[415]and mitigation of biodiversity impacts from changes of forest and agricultural land use.[416]

These norms for the most part are national standards, though some sections single out particularly sensitive forest types for special treatment. Some of the prescriptions are quite specific. For example, the norm on protection of soil and water bodies directs that roads constructed for forest harvest not cross bodies of water.[417] Many are quite general. For example, forest roads are to control erosion and soil loss through use of efficient drainage and are to be constructed with the minimum amount

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[409]See the discussion of the interplay of the General Ecology Law and the Forestry Law on these points in Chapter III of this report.

[410]Forestry Law, *supra* note ?, art. 12.

[411]*Id.* art. 19 bis 11.

[412]*See id.* arts. 27-43.

[413]*See, e.g.*, Diario Oficial de la Federación, October 23, 1995, at 357-68 (government responds to comments on norms for collection of pine resin, forest soil, roots and rhizomes, palm leaves, mushrooms, and other non-wood forest products).

[414]PROFEPA, NOM-060, Diario Oficial de la Federación, May 13, 1994 [hereinafter Soil & Water Norm].

[415]PROFEPA, NOM-061, Diario Oficial de la Federación, May 13, 1994.

[416]PROFEPA, NOM-062, Diario Oficial de la Federación, May 13, 1994.

[417]Soil & Water Norm, *supra* note 414, § 4.8.3.

of disturbance to vegetation as is necessary.[418] These kinds of broad standards allow the regulator to exercise considerable professional judgment in their implementation. It would be difficult, though, to write more specific standards in a national norm that must apply to roads built through many different terrains and soil types.

Besides federal regulation, state efforts also influence conservation and development of the forests. A 1989 state law created a Forestry Council to promote protection of forests, to disseminate technical information, and to take complaints about improper activities.[419] The Council invites participation from all interests in the state.

A State Development Plan attempts to balance industrial and urban development with ecological preservation, improvement of environmental conditions, and social welfare.[420] It addresses state actions to promote forestry, agriculture and fishing as well as communications, transportation, education, and other parts of the economy indirectly linked to forests. Also, the state's Secretariat of Rural Development includes a subdivision devoted to forestry.

According to state officials, state policy puts special emphasis on promoting development of indigenous communities. The state encourages restoration of degraded communal lands and has offered technical assistance and training to the communities on land management techniques.

In general, though, federal actions strongly influence the state's forest-related programs. Federal laws and agencies determine the basic strategy for regulating and promoting forest use. The state coordinates its efforts to fit with the federal strategy and actions.

Implementation of the Law in Durango

The law as written is only a beginning. This case study included a site visit to Durango to interview officials and land owners and observe conditions in the field. From that visit, the following list of issues emerged concerning how the law is implemented.

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[418] *Id.* §§ 4.8.7, 4.8.9.

[419] Legislative Decree of the State of Durango No. 55, Dec. 29, 1989.

[420] Plan Estatal de Desarrollo del Estado de Durango (1992-1998).

Lack of administrative resources

Every forest regulatory system requires a capable and well-equipped staff to implement it. Every forest regulatory body faces the problem of regulating a vast area of land with limited resources.

In Durango, both PROFEPA (the enforcement arm of SEMARNAP) and SEMARNAP's subdelegation of natural resources (which reviews applications for forestry activities) must deal with staff and equipment limits. PROFEPA has nine forestry enforcement personnel in the state. Their duties include inspection of legal site operations, patrolling for unlawful cutting, inspection of road and right-of-way construction through forests, investigation of human-caused forest fires, and inspection of wood transport. PROFEPA has an additional three inspectors devoted to enforcement of wildlife and hunting laws (including laws regarding capture and sale of parrots, which are sold on the streets of Durango), fishing laws, and plant protection.

Based on impressions gathered during the site visit, the PROFEPA staff seems younger, less experienced, and lower paid than the professionals in the private sector that they regulate and police. The staff expertise is skewed towards technical knowledge of tree harvest. For example, the PROFEPA inspectors include foresters, but no wildlife biologists.

PROFEPA does not have the budget or equipment to maintain a strong presence by itself in the forests. The size of the state and nature of the roads means that some forest locations take as long as 19 hours to reach by car from the state capital. PROFEPA's state delegation has seven vehicles. Five are listed in bad condition.

Interested citizens do help extend PROFEPA's oversight. PROFEPA's natural resources branch in Durango received 19 citizen complaints of illegal activity in the last half of 1995 and 33 complaints in the first half of 1996. Land owners and occupants have an incentive to report timber theft and trespass on their own lands. However, social pressures probably discourage people from complaining to authorities about activities on neighbors' lands.

There is no ready answer to the basic questions, how effective are PROFEPA's efforts in stopping illegal cutting and how much illegal forest harvest is going on? Some factors argue that illegal harvest is probably a minor percentage of the total harvest. The system of marking legally harvested logs makes it possible to trace logs back to their place of harvest, absent fraudulent marking. The larger mills are easy to police and are concerned about their reputations. These factors give them incentive to deal with reputable foresters and legally harvested logs, to avoid the possible penalties for buying illegal timber.

Some factors suggest illegal cutting could be prevalent. Small milling operations, consisting of a single saw and a small number of workers, are easily moved, established, and moved again. The quality of such mills produce is not high, but there is a market for low quality lumber. It is quite possible to move into a remote area, cut trees, mill them, and move on, though such operations are unlikely to process large volumes of wood. Also, stories of fraudulent marking are common, and there are rumors of larger mills working with foresters to illegally cut, mark, and process timber.

One rough gauge of illegal cutting would be to compare the production volumes from the mills of the state against the volumes authorized to be cut in approved management plans. That comparison does not suggest a significant amount of illegal cutting. The authors were not able to get firm statistics of the number of approved management plans and the surface area of the state that they covered, but one source during the site visit estimated that a little more than 10 percent of the state's commercial forest area was covered by current, SEMARNAP-approved plans for cutting or regeneration. Given that during much of the time between regeneration of a stand of trees and harvest, no active management takes place, that estimate is not alarming. Actually, the current volume reported annually harvested in the state represents about two percent of the standing volume on the state's commercial forests.[421] That means that a relatively small amount of the state's forest land could account for the volume.[422] One government source reported that in 1990, almost twice as much timber harvest volume was authorized as was actually commercially cut.[423] If the government statistics on the total amount of wood cut and processed are accurate, the sites with lawful harvest permission could easily produce those volumes.

However, illegal harvest could be occurring on sites with permission for harvest if the harvest activity differed from the approved management plan. It is difficult to judge, independent of PROFEPA's own enforcement effort, how well holders of lawful permits are following their management plans. Perhaps compliance is high, but perhaps many small and large violations of the management plans occur and go unreported.

Another issue related to the availability of administrative resources is how well SEMARNAP reviews management plans prior to approval. The size of SEMARNAP's staff in the Durango subdelegation of natural resources is limited. The authors spoke

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[421]*See* INIFAP, *supra* note 390, tables 1 (standing volumes) & 2 (volume cut for profitable use).

[422]Clear-cutting, leaving only a limited number of trees behind to provide seed for regeneration or shelter for wildlife, was the dominant harvest prescription we observed in our limited view of field sites.

[423]INIFAP, *supra* note 390, table 12.

with three SEMARNAP employees involved in reviewing applications for commercial forestry operations in Durango. They variously estimated that between 250 and 500 applications each year come from Durango. (PROFEPA concurs with the 500 application estimate.) An application will include maps and descriptions of the site, information on the flora and fauna there, the kinds and volumes of trees, the streams and other environmentally sensitive features of the site, and so forth. It will describe a program of forest management, explaining how the program will harvest trees while protecting ecological values and ensuring reforestation. An application may be dozens of pages long and may cost more than $10,000 in professional time and expenses to prepare. Durango has over 50 foresters licensed to prepare such applications.

The SEMARNAP subdelegation office must first review these applications for compliance with legal requirements, including determining that the applicant is the owner of record of the forested land or has other sufficient property rights to it. There is only one attorney in the office to review these applications. The attorney also must serve as general counsel to the office, rendering opinions on the meaning of norms and the application of the law to situations as they arise.

The office has three analysts who review the applications for ecological concerns such as the anticipated impact on water quality and wildlife, and the adequacy of any proposed mitigation for environmental harm. These analysts ordinarily do not have the time to visit the site of proposed operations to verify the contents of the applications.

The office has nine analysts who review the technical forestry aspects of the applications. These aspects include the methods used to inventory the timber volumes, the sustainability of the harvest levels and techniques, the steps taken to protect against wildfires, and the impacts of road construction and use.

The subdelegation by law has only 20 days to determine if any information is missing from an application and only 30 days from the date of submission of a complete application to approve or deny it.[424] The ruling on an application requires a coordinated response from the three analysts (legal, ecological, and technical) who review it. Often approvals are conditioned on making some improvements to the plan. But of necessity, the people reviewing applications must often place faith in the honesty, skill, and reputation of the professional forester preparing the application.

Every state has a SEMARNAP subdelegation reviewing forestry applications. One source told us that the staffing levels for the subdelegations in all the states are roughly similar. It seems odd, though, that a subdelegation handling approvals for a

[424]For the law concerning deadlines for application review, see Forestry Law, *supra* note ?, art.14.

third of the nation's timber harvest would not be significantly larger than similar delegations in states less well endowed with commercial forests.

Lack of knowledge about the forest

A group of issues stem from a lack of basic information about the forests. The basic forest inventory data in Durango -- how much area is covered with trees and how much volume of timber does that represent -- is improving greatly with the use of modern forest measurement techniques, including use of remote sensing data from satellites. Each new forest plan submitted to SEMARNAP also adds information. But there are still gaps in knowledge of the timber resources.

There is even less of a quantitative handle on the non-timber assets of the forests -- fish, wildlife, rare plants, water quality, etc. In some cases, we lack even a qualitative grasp of the issues. We were repeatedly told by foresters and government employees that there were no endangered animals in Durango's forests -- a biologically incorrect statement. We were also told that because animals can move around, forest harvest did not have a big impact on them. This reasoning reflects a basic misunderstanding of the value of habitat in species conservation.

Plants clearly cannot move out of the way of forestry operations and their populations could be threatened by forest use. At least one scientist has reported extinction of a native plant species due to inappropriate forestry practices.[425] Forest professionals we spoke with in government and the private sector did not seem particularly attuned to these sorts of biodiversity concerns.

The forest norms protecting flora and fauna are, like the other national norms, quite general in their terms. For the norms to be applied effectively, local officials must have a good working knowledge of the flora and fauna of the forest, their biology, and how forest operations can affect them. They must be aware of what needs to be protected. Such knowledge seems rare or non-existent.

Lack of good roads

The backcountry roads that we observed in the forested mountains of Durango were unpaved. They generally have few improvements to restrict erosion beyond a roadside ditch to divert surface runoff. They generally crossed streams via fords rather

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[425]Bye, *supra* note 382, at 24, reports extinction of the endemic *Taushia allioides* due to destruction of its wetland habitat for forest plantings.

than bridges. We did not find culverts diverting streams under the roads to avoid erosion. The few streambeds we saw near the roads were full of silt. Streams ran brown during the rains. Such conditions are probably harmful to most of the fish and the supporting food webs that would be found in unsilted mountain streams.

The description above applies not to roads built for timber harvest, but to the main transportation links between rural communities and the state's major highways. Traffic from forest activities no doubt contributes to erosion, but erosion would still be a problem from non-timber traffic.

The state of the roads makes it difficult to get commercial products out and difficult to get inspectors in. Some forest sites, we were told, are a 19 hour drive from PROFEPA's Durango offices.

Construction of new roads would probably have a double-edged effect on illegal activity in the forest. On the one hand, new roads probably would make it easier to move equipment into areas and timber out of areas illegally. On the other hand, new and more easily passable roads would greatly facilitate PROFEPA's patrol and inspection of the forests.

National versus regional regulation and review

The forest norms for all of Mexico are written in Mexico City. One set of norms covers forest practices in the whole country. Forest practice rules need to be crafted to the local conditions. A single set of norms cannot possibly serve the entire nation well.

Instead of clear directives on issues like the size of clear-cuts, the standards for road construction, the norms give general guidance applicable to the nation as a whole. Much stronger, more specific, and more easily enforceable standards could be written if they focused on individual regions of the country or specific forest types.

Issues of centralization also affect public involvement in government regulation of forest activities. There doesn't seem to be a formal process for public involvement in review of proposed harvest activities. Informally, SEMARNAP seems willing to share applications with you, if you know enough to ask. The 1996 amendments to the General Ecology Law include provisions requiring government release of environmental information on request.[426] SEMARNAP staff have been reluctant to call for formal environmental impact assessment (EIA) under the General Ecology Law for harvest authorizations, even though the law directs it in some cases, because they do not believe that formal EIA produces a better review than their own in-house analysis. Also,

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[426]General Ecology Law, *supra* note 190, arts. 159 bis-159 bis 6.

anything serious enough to require an EIA is more than likely to be elevated to Mexico City.

The bottom line is, if you are a local resident concerned about a proposed timber operation, you may not hear about it until it already has authorization from SEMARNAP, at which point you have few if any options to fight it. If you do hear about it and succeed in convincing the local delegation that the harvest may have serious environmental implications, the decision may be passed on to Mexico City, potentially making it even more difficult for you to influence.

Land tenure problems

Though we were told by the ejidatarios and foresters that northern Mexico does not have the same incidence of land boundary disputes that one can find in the rest of the country, others told us that land ownership disputes frequently surface during timber harvest operations. Based on carelessness in awarding land to ejidos and others, there are often multiple claims to particular forest tracts and boundaries are in dispute.

These disputes aside, an issue of biological concern arises out of the patterns of land tenure. Much of the forest land in Durango is held by ejidos, indigenous communities, or small private property owners. The permits for forest activities on these lands are awarded on a piecemeal basis, as the owners decide to cut. Except at the El Salto Union of Ejidos, we saw no effort to look at the cumulative effect of many harvests on adjoining properties. This kind of analysis of cumulative impacts is essential to management of populations of wide-ranging species, such as birds and large mammals. Again, protection of these species seems to more or less fall into a blind spot in the government regulatory scheme.

By the way, the El Tecuan National Park, a federally-owned, forested natural protected area in the mountains of Durango, has no management plan. In that, it is in the same boat as the other two protected areas we have studied. No legal harvests are going on there, but there is no coordinated effort to manage for wildlife, scenery, or recreation either.

Corruption

Corruption is a difficult issue to get a grasp on in a study like this. People are understandably reluctant to talk to strangers about something that is almost always considered a personal embarrassment.

In Durango, some people told us that they thought PROFEPA was less corrupt than SARH had been, and that enforcement was now better. (Others told us that PROFEPA has earned less trust from local communities and so has less influence on them, and that persuasion and getting along sometimes worked better than enforcement in the long run.) One sense we got was that how SEMARNAP or PROFEPA felt about you, however that feeling came to be, could influence how efficiently you did business with the government.

There was corruption alleged too within the governments of the ejidos, with timber profits going to individual pockets rather than to community development.

Some sources alleged dishonesty and participation in illegal harvest by a portion of the government-registered private foresters. Though this is not governmental corruption, the registered foresters do play an important role ensuring that harvests are carried out lawfully.

Of course, the potential for corruption stems from the profits to be made in the processing and sale of forest products. Responsibility for corruption lies both with those who accept bribes and those that offer them with expectation of even greater rewards.

Drug activity

This is another problem seldom openly discussed. We heard rumors and stories of drug-related activity in Durango forests, especially those near the borders of the states of Sinaloa or Chihuahua.

Drug-related activity increases the danger of travel in the backcountry. This makes detection of other illegal forest activities more difficult.

Drug-related activity may also have direct impacts on the forest. In the United States, we have experienced illegal clearing of forest land for growing cannabis and establishment of drug manufacturing laboratories. Drug production has involved illegal use of pesticides to clear land or control weeds and insects. Drug laboratories have released hazardous wastes into the environment.

Options

The study authors offer the following options for improvement of the regulation of forest use in Durango:

SEMARNAP could examine its levels of staffing in management plan review and enforcement. Is it really sufficient to have a single attorney and three ecological analysts reviewing what amounts to a third of the nation's timber harvests? Also, higher salaries

for staff would make it easier to recruit and keep highly qualified people and would help discourage corruption.

SEMARNAP, in cooperation with the nation's universities and other research bodies in North America, could invest more in basic research on the region's biodiversity and the effect of forestry operations on flora, fauna, and other non-commodity resources. These investigations could also study the role of fire in the ecology of the forests, the consequences of strict fire suppression, and the potential use of fire as a management tool. Also, SEMARNAP could establish some means of measuring the impact of current forest practices on biodiversity and similar resources and could monitor the forests for signs of unintended harm.

SEMARNAP, working with other ministries and the state, could start a program to experiment with innovative uses of the forest. These might include intensive management for non-wood forest products; genetic prospecting; ecotourism; and development of new value-added manufacturing projects with low environmental impacts for rural communities.

Roads have a significant potential to harm the state's aquatic resources. SEMARNAP, in cooperation with the appropriate federal and state ministries, could begin a campaign to improving existing roads and set higher standards for building and maintaining new roads. SEMARNAP could consider conditioning approval of major forest projects on the applicant agreeing to help upgrade the roads that will be used to transport forest products.

SEMARNAP could consider how to improve public participation in forestry matters. SEMARNAP could reach out to advocates for the non-commodity values of the forest, as well as those with economic interests in forest development, to encourage them to comment on specific management plans and general forest policies. More efficient and open responses to public requests for information on forestry matters would improve SEMARNAP's transparency and promote useful public participation.

Currently, one of the most important avenues for public participation is through SEMARNAP's National Forest Technical Consultative Council and its regional councils. SEMARNAP could review whether the membership of these councils fairly reflects the various interests of the public in the forests. Also, at present, these councils seem to focus on the Secretary's decisions. SEMARNAP could use them as arenas for independent public review of more specific policies and actions.

SEMARNAP could write an ecological ordering for development of forest resources in the Sierra Madre Occidental. Such an ordering could take local conditions into account better than a national norm could. It could also consider the cumulative impacts on biodiversity and other resources from many separate timber management operations.

Chapter Seven:

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Observations and Options

During the course of this study, some general themes emerged about Mexican forest laws, their implementation, and their application to natural protected areas. This chapter offers some final observations about the state of the law and its future, and some suggested options for management programs for natural protected areas.

Implementing Forest-Related Laws

Most of the problems with Mexican forest laws are not evident from the laws as written. They are apparent from the laws as implemented. This project did not study in detail how the law is actually implemented across the country, however it did examine implementation in the case study areas. From those observations and from analysis of the broader sweep of the laws, here are some reflections on issues facing Mexico in the implementation of its laws.

Scientific Foundations for Action

Forest policy issues almost always raise forest science issues. The truth is, we do not understand forests all that well. How many tourist visits can the Monarca reserves take before the butterfly habitat suffers? How long does it take the rain forest to return to its original state after it is disturbed by slash and burn farmers? How are commercial forestry operations in Durango affecting the region's biodiversity? For some of the key questions about Mexican forests, such as these, we simply have no answers yet. In fact, we know so little about some forest ecosystems, we probably do not even know what the important questions are.

To make matters more complicated, some of the things we assume we know are probably wrong. Assumptions, estimates, and outright myths, repeated often enough without challenge, become taken as fact.

Mexican forest law needs knowledge to function well. An example of a powerful law that is hobbled by the lack of knowledge is the provision of the General Ecology Law allowing the government to plan land uses through ecological orderings. To write an ordering requires a deep understanding of the land, its resources, and its people, and

the information is often lacking. No national ordering is in place.[427] The federal government has produced some foundation documents for the national ordering, which give some sense of the complexity of the task. They tentatively divide the country into four regions (arid, temperate, dry tropic, and humid tropic), 88 ecological provinces, and over 1800 natural planning units. About 40 lesser orderings are in place, though these cover only a fraction of the nation's territory. Only two states, Colima and Sonora, have state-wide orderings. Studies are underway to prepare the foundation for further orderings, including one for the Lacandon region.

A nation seldom has the luxury to wait for all the answers. Postponing choices usually means losing opportunities. As a practical matter, Mexico must make some decisions about forest use now, without orderings, without comprehensive plans, without complete understanding of its problems.

However, investment in basic research about the forests today will mean better informed decisions tomorrow. One political, institutional, and legal commitment Mexico and its supporters in the world community could make to the future is a commitment to more research in basic forest sciences, and continued effort to develop the practical understanding needed to implement existing laws.

Budgets

Many needs compete for limited resources in Mexico. The result is a long list of laws unimplemented and tasks undone. For example, few of the property lines and reserve boundaries in remote areas are clearly marked or surveyed. The government cannot effectively regulate forest harvest or control activities in buffer zones around reserves if no one knows what land is actually owned by a permit applicant or located in the buffer zone. Some of the basic questions that arise in forest law are "who owns this tree?" and "what restrictions has the law placed on its use?" These questions can only be answered if we can relate the property boundary descriptions in laws and other documents to the physical reality of the forest. As Mexico writes its budgets, it must weigh basic management needs like these against all its other priorities.

Another budget issue is whether the government has enough qualified people to design the plans, write the regulations, review the permit applications, and carry out the enforcement envisioned in the laws. Empirically, the answer is no. Management plans required by law for reserves do not exist, and the government has sought help from international funding sources to produce some of these. Having sufficient

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[427]The information on the current status of the ecological ordering effort is from INE 1993-94, *supra* note 77, ch. 5.

enforcement personnel is a difficult problem in forested countries, even in the most developed ones. Mexico has begun to take steps to improve its enforcement. It has trained local residents to police reserves. It has increased the training of its reserve managers. It is using satellite images and other modern technology to monitor forests for incursions and other illegal activity. It has stepped up its efforts to halt illegal trade in protected forest plants and animals. All these are good steps, but all face limits in budgets and available resources. Mexico will have to continue exploring options to secure additional resources for forest management and will have to make sure that existing resources are being used wisely.

Corruption

It is difficult to write about so sensitive an issue as corruption when the authors have heard only anecdotal evidence of it and its effects. However, even President Zedillo has pointed to the lack of respect for the rule of law as a problem that Mexico must resolve as it moves into the ranks of developed countries. On one level, corruption may be linked to poverty and lack of resources, as where an enforcement officer must take bribes to feed his family or must allow illegal cutting so that his community has enough fuel and other necessities to survive. The motive could also be fear, if the officer believed that lawbreakers would retaliate against him or his family if he enforced the law. At higher levels it may be linked to greed, favoritism, or other motivations. At some point, corruption becomes expected and accepted by officials. Then it truly becomes difficult to eliminate. Options for addressing this problem include policing the government and prosecuting corrupt officials; encouraging leadership by senior officials to speak and act against corruption; increasing the compensation to the lowest officials to make them less in need of money and to give them more to lose if they are caught taking a bribe; and creating non-enforcement-related incentives leading communities to support enforcement of forest laws. This last option goes beyond enforcement and gets more discussion below.

Incentives

Clearly, poverty and need are driving people to ignore the forest laws. People set fires to the woods to clear land for farming or improve grazing conditions for their cattle. They harvest trees from reserves to use the wood themselves or to sell it so that they can afford other goods. These pressures on the forest need to be addressed.

Some have suggested that improving the economic position of farmers will help. If farmers could be more productive or get more for their crops, or could develop new

profitable uses of the land, such as aquaculture, perhaps they would not turn to forests for wood and new lands. On the other hand, perhaps economic success for farmers will draw more people to rural areas, increasing the demand for land.

Many have observed that for reserves to work, they must have the support of local residents.[428] This may be equally true of commercial forestry laws. Sometimes that support can come through economic benefits from the regulated lands, but figuring out how the reserve can benefit locals is not always easy. For example, at the Monarca reserve, the El Rosario *ejido* is benefiting from tourist spending, and support for protecting the reserve there is relatively strong. The other *ejidos* affected by the reserve want tourist traffic as well, but whether the reserve can tolerate more tourism or whether more tourists would come if more of the reserve were open to tourists is unknown.

The 1996 amendments to the General Ecology Law include new provisions directing the federal, state, and local governments to design, develop, and apply economic instruments to promote environmental policies.[429] The new language offers powerful tools to the governments, but little concrete guidance on how to construct these tools properly. Implementing these provisions will take a great deal of creativity and skill.

Local involvement and control

Going hand-in-hand with the idea of creating incentives for proper management is the idea of giving more influence and control over management of reserves and other common resources to local people. If the people already have an incentive to see the management program succeed, giving them more influence over the program can give them a sense of ownership and stewardship of the resource. With community support, enforcement is easier.

Cooperative action is highly valued in Mexican society, and Mexican federal laws often provide for cooperation with state and municipal governments. Particular programs, like PROGRESA (described in Chapter II) or PROAFT (described in Chapter III) have sought to involve local communities directly in forest-related projects.

On the other hand, the highly centralized nature of Mexican government naturally works against local control. The official with the authority to alter a

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[428]*See, e.g.*, Michael Wells et al., People and Parks: Linking Protected Area Management with Local Communities (1992).

[429]General Ecology Law, *supra* note 190, art. 21.

management plan or approve a project may be in Mexico City. Local communities often feel distant from the true centers of power.

Options for decentralization include experimenting in appropriate areas with giving local people and local officials more direct authority over reserves. Another option is to create more public hearings, more public involvement in environmental impact assessment, and other opportunities for local people to participate in the management of reserves and use of forest resources.

The 1996 amendments to the General Ecology Law allow the federal government to make agreements to share authorities for managing reserves with local people and officials.[430] The amended law also requires SEMARNAP, the states, and municipalities to share environmental information with the public.[431] How the government will implement these provisions remains to be seen.

Policy conflicts

Forests present political issues. As discussed in the first chapter of this report, a nation must decide what it wants from its forests. Few nations confront this issue directly. Instead, they make many separate policy decisions that have implications for the forests, such as commitments to ameliorate rural poverty, to protect endangered species, or to control wildfire.

Mexico has embraced many policies that affect its forests, and they often work at cross-purposes. For example, as discussed in the Montes Azules case study, the Mexican commitment to allotting *ejido* lands for landless *campesinos* has led it to establish and expand settlements within declared forest reserves, apparently in violation of its own laws. At Monarca, the *ejidos* also extend into the reserves, but the *ejidos* are older than the reserves; in other words, Mexico reserved lands already entrusted to *ejidos*. This action was lawful, but obviously conflicts with the policies behind establishing the *ejidos* in the first place. Mexico's decision to encourage forest harvest to promote the economy of rural Chiapas has, according to Lacandonia A.C., run counter to the commitments Mexico made to protect endangered species under CITES. Its decision to limit timber harvests around reserves no doubt runs counter to its goals of rural development.

No nation has completely sorted out its many policies that affect forests. The United States, for example, gives technical aid to landowners to manage private lands for forest products while federal income tax policy tends to discourage some private

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[430] *Id.* arts. 47, 158.

[431] *Id.* arts. 159 bis 3-159 bis 6.

investments in sustainable forest management. However, every nation must give some thought to the policies it embraces for forestry and how they fit with the larger scope of government policies and commitments.

Another way to look at these policy choices is in terms of the nation's vision for its forests and rural communities living in forested areas. Looking around the world, there are many modes of rural life in areas with forests or former forests. There are the prosperous alpine communities of Switzerland; the poor rural farming towns of Northern New Mexico or Nepal; the small towns of the U.S. Cascade Mountains, dependent on the forest industry and dying for lack of unreserved trees; the gentrified tourist towns like Aspen, Colorado. Mexico had a vision of cooperative rural farming communities, but this vision is being challenged by recent demands for more efficient agriculture, protection of natural resources, and global markets. All these demands have made themselves felt as changes in the law, yet much of the law reflects older views. What is Mexico's new vision for its rural communities?

Inter-agency coordination

One symptom of a lack of unified policy is a lack of inter-agency cooperation. Non-environmental agencies sometimes overlook their environmental obligations. An official involved in rural development might not be aware of all the requirements imposed by the General Ecology Law or related decrees. This could explain why the government has made some new land grants to *ejidos* even though the lands were within declared reserves. Perhaps, though, officials ignore environmental safeguards if the safeguards are in the way of achieving what they believe are more important goals, such as fighting rural poverty.

People outside the government often reported to the authors problems with inter-agency coordination. These were never confirmed by sources inside the government. The first step to resolving this apparent difference in views could be an open examination of the problem by government and interested citizens.

Environmental education

One facet of environmental protection that touches on all of the issues above is environmental education. It grows from knowledge, shapes policy and budgets, and motivates government action. As one African environmental leader has observed, we only protect what we love, we only love what we understand, and we only understand what we are taught. The government has tried to educate both local residents and forest visitors about the value, care, and sustainable use of natural resources. These efforts

deserve praise and expansion to all formal and informal levels of education at all levels of society.

Legal Frameworks for Protected Natural Areas

Considering the issues discussed above, here are some general guidelines for improving the laws and management of protected natural area or reserves. The guidelines are intended to be general and to serve as a starting point for developing a consensus on reserve management policies.

The laws and management should be biologically adequate.

They should provide for the continued integrity of the forest ecosystem. That means they must address past harms as well as ongoing degradation. They must look beyond the reserve boundaries (the nuclear and buffer zone) and address the "influence zone" affecting the reserve.

As a corollary to the requirement to protect the integrity of the ecosystem, forest laws and management should provide for the continued existence of component species. That means they may have to look well off the reserve to consider the impacts on migratory species happening in other parts of their range, or to consider the impact on a species of a shrinking range as it loses habitat outside the reserve. Even if these factors are not strictly speaking part of reserve management, in the long run to ignore them means to frustrate the purposes of the reserve.

They should be structured to be respond to foreseeable change. They should be able to respond to the occasional catastrophic change, such as a major fire or destructive storm. They should take into account gradual but ordinary changes such as successional changes in forests. And if possible, they should take into account extraordinary gradual changes, such as global warming. The law may be able to address these long, slow, unpredictable changes through its own ability to change.

They should support continued research into the biology of the reserve. Knowledge is a critical part of good management.

They should reflect a long-term, permanent commitment to conservation. Somehow, they should transcend the limited time frames of economists and politicians and look to the far future.

The laws and management should be socially adequate.

They should have the support and cooperation of local people in protecting the reserve. Without a basic local social acceptance, even a policeman for every tree could not protect a reserve. To get local support and cooperation, the legal structure must provide benefits and incentives to local people, it must educate them about the reserve, and it must involve them in key decisions affecting the reserve that will also affect their communities.

The laws and management should be consistent with Mexican national legal and political institutions. So, for example, they should respect the Mexican commitment to land reform and support for rural communities.

They should have the long-term support of the Mexican people and government.

The laws and management should be institutionally practical.

They should be achievable using the foreseeable levels of resources available to the managers. They should provide for practical enforcement.

They should involve all the institutional parties who have power to affect the reserve and provide for their cooperation and coordinated effort.

Whether they centralize or decentralize control, they should put control of the reserve in the hands of people who have the information, time, resources, and motivation to manage the reserve wisely.

They should provide for a degree of clarity and certainty, about who owns what land and what restrictions apply, and who has responsibility to act to protect the reserve. This certainty should go beyond paper descriptions. It should make it possible to quickly resolve practical questions about ownership and authority.

They should be self-evaluating, and they should be able to initiate changes in management or management institutions if the existing practices fail.

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