

## DEFORESTATION TECHNICAL SUPPORT PACKAGE

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- o Mining (Metallic ores and Minerals),
- o Petroleum Refining and Petrochemicals,
- o Residential and Industrial (Solid) Waste Disposal
- o Tourism, and
- o Deforestation.

The documents provide an overview of the environmental impacts, pollution prevention and control opportunities, range of institutional mechanisms to control adverse impacts, and an annotated bibliography of selected reference materials. They do not address institutional and program development issues surrounding regulatory and enforcement programs. These topics, as well as country specific program examples are developed in the Proceedings of the International Conferences on environmental compliance and enforcement, UNEP institution-building workshop materials and new capacity building documents under development for the Fourth International Conference scheduled to be held in April, 1996 in Thailand.

International workshops on the Principles of Environmental Enforcement provide an opportunity for governmental and non-governmental officials to discover and apply the definitions, frameworks and principles to develop a successful management approach, compliance strategy and enforcement program for any environmental problem in any cultural or legal setting and to explore negotiated resolution of enforcement problems. The Principles of Environmental Enforcement text and training was developed by the U.S. Environmental Protection Agency in collaboration with the government of Poland and in cooperation with the government of the Netherlands. It was adopted as a basis for international exchange after having been success-

fully presented with this purpose in mind at the Second International Conference on Environmental Enforcement held in Budapest, Hungary, September 1992.

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## **DEFORESTATION\FOREST RESOURCES SUPPORT PACKAGE**

### **1 INTRODUCTION**

Forests cover almost a third of the earth's land surface<sup>1</sup>, providing many environmental benefits including a major role in the hydrologic cycle, soil conservation, prevention of climate change, and preservation of biodiversity. Forest resources can provide long-term national economic benefits. For example, at least 145 countries of the world are currently involved in wood production. However, deforestation, particularly in the tropical moist forests, is proceeding at a very rapid rate. Reasons for deforestation include clearing of land for agriculture and ranching, fuelwood gathering, unsustainable and inefficient logging practices, timber theft, and the adverse effect of air pollution on forests. The negative economic impacts of deforestation are substantial, and include losses due to pollution and siltation of water used for drinking, agricultural, commercial and industrial purposes; destruction of fisheries and aquatic habitat; flooding; siltation of waterways and dams; loss of top soil and soil fertility; climate change; reduction or loss of non-timber harvests; and loss of recreational resources that attract tourists. Many of these impacts can be avoided or controlled through the use of prevention and control options, and through planning, monitoring, enforcement and compliance.

#### **1.1 Purpose and Overview of the Deforestation Support Package**

The purpose of this support package is to provide a general resource for governments and others concerned about the environmental impacts of deforestation and to present alternatives for preventing, controlling or minimizing these impacts. It provides a brief overview of global deforestation, forest types and characteristics, and summarizes causes of deforestation. The document reviews some major prevention and control options, along with enforcement and compliance approaches that can be used to reduce or eliminate negative effects of deforestation.

For purposes of this document, deforestation is defined as the full-scale clearing of forest lands. Forest degradation refers to forest damage or significant alteration (for example, from air pollution or partial clearing of forest trees and/or vegetation). Sustainable use is defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

This document is intended as an initial reference, providing summary-level information on deforestation prevention and minimization of adverse environmental effects. More detailed sources of information are provided in the Appendices, including information on organizations and ministries concerned with forestry and deforestation, an annotated bibliography, and sample documents.

## **1.2 Deforestation and the Environment**

Major environmental problems associated with deforestation include:

- Loss of water quality, including water used for drinking, commercial, agricultural and recreational purposes;
- Damage to fisheries and aquatic habitats from erosion and turbidity (dissolved and undissolved particles in water);
- Increased flooding during wet periods, and loss of water normally stored and released during dry periods;
- Erosion of top soil and nutrient loss;
- Climate change, such as decreased local rainfall and desertification; and
- Decreased biodiversity, and loss of habitat for wildlife and endangered species.

## **2 PROFILE OF THE FOREST SECTOR**

### **2.1 Overview: International Deforestation**

An overview of global deforestation between 1965-1989 is provided in Figure 1. A more detailed summary of forestry problems is provided in the *Nations of the Earth Report* of 1992 which summarizes reports prepared by 47 of the countries on environmental problem areas and programs for dealing them. Many of the country reports discuss deforestation problems. Countries with average annual deforestation rates over 2% during the 1980s include (in Africa) Algeria, Burundi, Cote d'Ivoire, Guinea-Bissau, Liberia, Malawi, Mauritania, Niger, Nigeria, and Rwanda; (in Asia) Nepal, Sri Lanka and Thailand; and (in Central & South America) Costa Rica, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, and Nicaragua.<sup>2</sup> A 1992 Food and Agriculture Organization of the United Nations (FAO) study reported that since the early 1980s, the rate of tropical deforestation had increased by 50%.<sup>3</sup>

Generally, the area of temperate forests is increasing as second growth forests replace the primary forest (original, intact or virgin forest) cut earlier. Many remaining tropical forests are primary forest which still retain their biodiversity. Differences between tropical and temperate forests are discussed in the following section.

## 2.2 Forest Types

Around the world, there are three main forest types and related ecosystems: boreal, deciduous, and tropical. Variation in the longevity and growth capabilities of trees and vegetation, soil characteristics, and biodiversity between and within these different forest types all affect the environmental impacts of deforestation, and selection of the most effective management options.

### Boreal

The boreal forest is found in northern latitudes and composed almost completely by coniferous trees - those bearing pine cones - such as firs, spruce, pines, and hemlock.

### Temperate

Temperate forests include both coniferous and deciduous trees. About 39% of the land area of temperate regions is covered by forests.<sup>4</sup> About half of the world's total forest and other wooded land is in the temperate-zone regions, with about 25% in the former USSR and almost 20% in North America. The World Conservation Monitoring Centre in England reports that for temperate forests overall, forest area is increasing.<sup>5</sup>

The temperate rainforest is a special category of forest, such as the alerce forests of Chile and the redwood forests of California. These coastal forests are noted for heavy fog and rain, and are home to some of the oldest trees on earth such as coast redwoods which have a life expectancy of up to 2,000 years, and the giant sequoia which reaches full growth at 3,000 years.<sup>6</sup>

Deciduous forests lose their leaves every year during winter, and include trees such as oak, beech and maple. These forests have been heavily impacted by man. However, some scientists think that some of these temperate forests have natural destruction/regeneration cycles of about 250-450 years, with destruction caused by storms, fires caused by lightning, old age, insects and disease.

### Tropical Forests

Tropical dry and moist forests are characterized by warm temperatures all year and moist tropical forests by abundant rainfall. Generally, nutrients in tropical forests are stored in the vegetation, unlike temperate forests where many nutrients are stored in the ground. Often when moist tropical forests are cleared, the rains quickly wash away nutrients in the soil and agriculture cannot be sustained very long. Tropical forests also contain tremendous biodiversity, partly because of the favorable growing conditions, and also because unlike the boreal and deciduous forests, the tropical forests were not periodically destroyed by glaciers. Moist tropical forests, at an estimated 7% of the world's land area, may contain over 50% of all named species in the world biota.<sup>7</sup> Tropical dry forests are concentrated in Africa, and are utilized heavily for fuelwood gathering. Deforestation of some tropical dry forests, such as those in the Sahel, may contribute to desertification.

Environmentally important mangrove forests, found in tropical coastal areas such as bays, lagoons, and river estuaries, are a special category of tropical forest. Mangroves grow in shallow water and protect coastal areas during storms. The bark and leaves of some species are used for medicinal purposes. The mangrove forests also serve as nurseries for fish and shell-fish. In India, for instance, the

mangroves shelter 105 species of fish, 229 crustacean species, and 20 shellfish species, but during the last 25 years, almost 30% of the Indian mangrove forests have been destroyed.<sup>8</sup>

## **2.3 Causes of Deforestation**

Major causes of deforestation include cutting for fuel, clearing of land for agriculture and ranching, and logging. Causes of forest degradation include air pollution (such as acid rain and ozone), slash and burn agriculture, and non-sustainable partial clearing. Timber theft accounts for some deforestation and degradation. Unnecessary deforestation also takes place in many areas because lower than market prices are charged for government logging concessions, residual timber is unnecessarily damaged during the logging operations, and inefficient processing wastes lumber.

### 2.3.1 Fragmentation

A precursor of deforestation is fragmentation of forests, because fragmented forest units are more accessible for clearing, timber theft, and fuelwood cutting, and subject to decreased biological diversity. A study found 2/3 of the tropical rainforests were fragmented (under 400,000 hectares and had road or water access). South America had the least fragmented rainforests, with 41% of the rainforest remaining in large tracts, Central America has about 33% remaining, Africa has about 20%, and forests in Southeast Asia and Oceania are the most fragmented with only 12% in large tracts.<sup>9</sup>

### 2.3.2 Fuelwood

About 80% of wood used in developing countries is for fuelwood.<sup>10</sup> (Even an industrially developed country like Hungary reports that in 1989, 44% of the wood production was for fuelwood<sup>11</sup>). Fuelwood gathering is often concentrated in tropical dry forests and degraded forest areas.

### 2.3.3 Clearing without Timber Utilization

About 60% of the clearing of tropical moist forests is for agricultural settlement<sup>12</sup>, with logging and other reasons (roads, urbanization and fuelwood) accounting for the rest. As an example of the scope of the clearing without timber utilization, 6000 separate fires were burning on a single day in 1988 in the Amazon forest as a result of slash and burn deforestation.<sup>13</sup> Other examples include Ghana and the Ivory Coast, where in Ghana, with 80% deforestation, the forest department estimates only 15% of the timber was harvested before land clearance. In the Ivory Coast, estimated loss from unutilized timber was perhaps \$5 billion.<sup>14</sup>

### 2.3.4 Air Pollution

Air pollution is associated with degradation of some European and North American forests. The syndrome is called “Waldsterben” or forest death. For example, in 1982, 8% of all West German trees exhibited damage, rising to about 52% by 1987.<sup>15</sup> One report indicates that half the trees in the Alps are dying of Waldsterben.<sup>16</sup> High elevation forests show the earliest damage, including forests in the north-east and central US. Scientist E.Schulze of West Germany concluded that nitrogen compounds and sulfates (acid rain components from fossil fuel burning) acidify the forest soil, freeing toxic aluminum to enter the tree roots instead of calcium and magnesium which are crucial to tree nutrition. The calcium/magnesium deficiency stunts growth. Increased nitrogen depositing on tree foliage and into roots acts at the same time as a fertilizer, stressing the trees. Thus weakened, the trees succumb to pests and adverse

weather, conditions which would not otherwise kill the trees.<sup>17</sup>

### 2.3.5 Timber Harvesting

Timber harvesting is another leading cause of deforestation. Of the approximately 185 - 190 countries currently recognized as independent, at least 145 are wood producers (the former USSR, now 12 entities, is counted as 1). The lead United Nations agency for forestry issues is the Food and Agriculture Organization (FAO), which defines wood production (roundwood) as “the quantities removed from forests and from trees outside the forest, including wood recovered from natural, felling and logging losses... Commodities included are sawlogs and veneer logs, pulpwood, other industrial roundwood ... and fuelwood.” As of 1992, using this definition, wood production by region was: Africa - 15%, North and Central America - 22%, South America - 10%, Asia - 32%, Europe - 10%, Oceania - 1%, and the former USSR (CIS) - 10%.<sup>18</sup>

### 2.3.6 Inefficient Timber Processing and Revenue Practices

Inefficient timber processing and revenue practices cause unnecessary deforestation. A World Bank study indicated that these problems are common to many countries. For example, a World Bank study cited a situation in Cameroon where in 1987 the total of all forest revenues collected from forest fees was only between 2-4% of the FOB (price of timber including transportation to the ship) price of export logs, and in Ghana where 1988 forest revenues collected from all forest fees was only about 1/6 the amount that should have been realized.<sup>19</sup>

## 3 **PRINCIPAL DEFORESTATION-RELATED ENVIRONMENTAL PROBLEMS**

Loss of water resources, erosion of top soil, climate change, and decreased biodiversity are major environmental problems associated with deforestation, as summarized in Table 1, and described, with examples, in the following section.

Table 1  
**Major Environmental Problems Caused by Deforestation  
and Inappropriate Forestry Practices**

**Loss of Water Resources** Uncontrolled runoff carries soil and debris into surface water, reducing water quality for drinking, fisheries and aquatic habitat, and flood prevention. Navigable waterways and dams are silted up

Drinking Water Increased turbidity reduces effectiveness of chlorination, increases adsorption of toxic materials, provides food for microbes which can then multiply in the water distribution system, interferes with ion exchange and carbon adsorption processes and with lab analysis of water quality

Destruction of Fisheries and Aquatic Habitat Siltation kills fish, spawning areas and vegetation needed by fish to reproduce and survive

Flooding Uncontrolled runoff increases flooding

Siltation of Waterways, Dams Turbidity & suspended solids deposit in navigable waterways (requiring dredging) and dam impoundments



(shortening the useful life of the dam)

**Decreased Recreation** Turbid waters are dangerous for swimming and diving because the depth and submerged hazards cannot be seen. Also, users prefer clear water and clean beaches for aesthetic reasons.

**Crop Damage** Turbidity damages irrigation systems and equipment, films form on plant leaves, reducing growth and market value, crusts form on soil surfaces inhibiting water absorption, soil aeration, young plant growth and

**Erosion of Top Soil & Nutrient Loss** Removal of the trees, ground cover, and leaf litter allows uncontrolled runoff and nutrient leaching during rains, making reforestation and farming difficult

**Climate Change** Large deforested areas can cause undesirable climate change, such as decreased rainfall, or can contribute to global warming

**Decreased Biodiversity** Loss of sustainable forest is accompanied by loss of habitat, species and genetic diversity, and loss of non- timber harvests

### 3.1 Loss of Water Resources

Water resources affected by deforestation include drinking water, fisheries and aquatic habitats, flood/drought controls, waterways and dams affected by siltation, less appealing water-related recreation, and damage to crops and irrigation systems from erosion and turbidity.

Turbidity (dissolved and undissolved particles in water) is one of the problems caused by deforestation. As indicated in Table 1, turbidity can impair the use of water for a variety of purposes. For example, turbidity interferes with treatment of drinking water, as illustrated in Washington, DC recently when high turbidity levels in the municipal drinking water supplies resulted in a recommendation that residents boil their water during a ten day period. One of the ways turbidity can contribute to water pollution is that many chemical constituents, such as pesticides, are sorbed onto fine particles in the water. Turbidity can damage or even eliminate fish and aquatic habitat.<sup>20</sup> High turbidity levels from deforestation in the Pacific Northwest of the U.S. are reported to be one of the causes of reduced salmon harvests.

Examples of the extent of damage to waterways and dams include a reduction by half in the useful life of the dams on Himalayan rivers and a rate of erosion in the watershed area of the Himalayan rivers five times greater than the rate over the past 40 million years. The estimated 50 year life of the Tarbela dam in Pakistan was reduced to under 20 years by sedimentation from deforestation, cultivation of steep slopes, and overgrazing. Another example of the costs includes flood damage in India from deforestation in the Himalayas costing about \$210 million annually in emergency assistance.<sup>21</sup>

### 3.2 Erosion of Top Soil and Loss of Nutrients

Erosion of top soil from deforestation affects many countries. Examples include Ethiopia, Nepal, and Haiti; half of Ethiopia's land area was affected by erosion in the 1980s. In the United States, billions of dollars have been spent by the US Soil Conservation Service to prevent loss of top soil in areas which were converted to agricultural use from forests. Tropical forest soils are particularly vulnerable to nutrient loss. Because forests converted to pastures quickly lose fertility and productivity, and therefore can carry few cattle, the per hectare revenue from Brazil nuts and wild rubber from the

same land is estimated to be four times greater than the revenue from cattle ranching in the Brazilian state of Acre. Similarly, in a 1987 evaluation of a one hectare forest area near Iquitos, Peru, total net revenues from sustainable harvesting of non-wood forest products (using market prices in Iquitos) were 66% greater than those from forest conversion.<sup>22</sup>

### **3.3 Climate Change**

Climate change (also known as global warming or global change) includes anthropogenically produced climatic and ecological problems such as recent apparent climatic temperature shifts and precipitation regimes in some areas, sea level rise, stratospheric ozone depletion, atmospheric pollution and forest decline. “Greenhouse gasses”, including carbon dioxide, trap heat in the earth’s atmosphere, creating a warming, or greenhouse effect. Forested areas serve as “sinks” or reservoirs of carbon because carbon is part of tree and plant tissue. Thus, deforestation increases the greenhouse effect, and reforestation reduces it. Over 90% of the carbon lost from deforestation is released to the atmosphere as carbon dioxide, and carbon dioxide is a long-lasting gas, with an average residence time in the atmosphere of 100 years. Release of the carbon dioxide from deforestation accounts for an estimated 25% of emissions from combustion of fossil fuels.<sup>23</sup>

Estimates of the global warming effect of the six greenhouse gasses released by deforestation in the Brazilian Amazon in 1990 indicated that the emissions represent 7-8 times the annual carbon release from Brazil’s use of fossil fuels. A study by the Lawrence Berkeley Lab indicated that ending deforestation in Brazil would cut greenhouse emissions as much as making all the cars in the world three times more fuel efficient.<sup>24</sup>

### **3.4 Decreased Biodiversity and Habitat Loss**

When forest is destroyed, fragmented or degraded, biodiversity and habitat for migratory birds and for many types of endangered species is lost. Retaining the biodiversity of the forested areas is retaining a form of capital, until more research can establish the relative importance of various plant and animal species. The value of biodiversity in the medical area alone is illustrated by several examples. According to the World Health Organization, as much as 80% of the world’s population relies for primary health care at least partially on traditional medicine. Much traditional medicine relies on forest plants. The local economic value of medicinal forest products was studied in Belize. Two scientists evaluated the sustainable harvest from two forest plots of all the medicinal plants that could be sold to local herb healers and pharmacists. On a sustainable basis (30 year harvesting rotation), the herb harvest was worth \$294 and \$1,346 per acre on the two plots. In comparison, clearing rain forests for agriculture was worth \$117 per acre in Guatemala, and \$137 in Brazil.<sup>25</sup> Pharmaceutical use of forest-based drugs includes the rosy periwinkle from tropical forests in Madagascar, used to treat childhood leukemia and Hodgkin’s disease, and the yew bark from temperate forests used to treat ovarian cancer. It is estimated that less than 1% of tropical plants have been screened for medical uses.<sup>26</sup>

## **4 PREVENTION/CONTROL OPTIONS**

Around the world, governments have used a variety of prevention/control options to prevent environmental damage from deforestation as well as to retain existing forests and forest resources, to prevent unnecessary deforestation, and encourage reforestation where appropriate. Many

of these control options are technological (e.g., use of best management practices to control erosion). However, many control options, such as bans on logging, limits on forest destruction or subsidies, can also be viewed as management options. We discuss each of these different types of options in this section. A summary of some major options is included in Table 2, with examples provided in the following section.

## **TABLE 2: SELECTED PREVENTION/CONTROL OPTIONS**

### **TECHNOLOGICAL/BEST MANAGEMENT PRACTICES**

Establish Best Management Practices (BMP) for forestry operations, institute a full or partial logging ban, limit access to forests, control major air pollution affecting trees

### **PERFORMANCE-BASED**

Set a Performance Goal (e.g. no net forest destruction, x% increase in forested area, limit turbidity levels from forestry runoff into surface waters)

### **ECONOMIC**

Maximize the market for non-wood products, improve forest pricing and concessions policies, change laws providing inadvertent economic incentives for deforestation, develop social forestry programs

### **VOLUNTARY**

Provide technical assistance, set up a timber certification program, use awards programs

## **4.1 Technological/Best Management Practices**

Best Management Practices (BMP) include water pollution control measures in widespread use in forestry operations throughout the world. These management practices involve a variety of locally appropriate erosion control measures which help prevent pollution in surface waters resulting from forestry activities and deforestation. In the United States, recent surveys indicate forestry activities contribute approximately 3-9% of all non-point source pollution of water bodies.<sup>27</sup> Best Management Practices are important because they prevent or minimize environmental problems associated with forestry activity such as turbidity, nutrient transport, and runoff of herbicides, insecticides and fungicides into surface waters affecting drinking water, fisheries and aquatic habitats, flooding, siltation of dams and irrigation systems, and crop damage from siltation on leaves from irrigation water.

Many different specific control technologies, or Best Management Practices, are available, including preharvest planning to minimize runoff and erosion from roads and harvest areas into streams, use of streamside buffer or management areas (areas along surface waters where the vegetative cover is left) to reduce runoff from upslope activities and trap sediments, use of road construction, maintenance, and post-harvest revegetation techniques that minimize erosion, and use of effective erosion control devices, as locally appropriate, such as sediment control devices like silt fences, riprap, and sediment traps or check dams. Other control technologies include timber harvesting techniques that minimize erosion like cable yarding and aerial harvesting, particularly for dispersed high value timber. Fire management is important in preventing erosion, particularly on steep slopes near streams. Careful management of chemicals used in forestry is important in reducing environmental damage. Aerial applications of pesticides may

pose the greatest risk to water quality, but streamside buffer zones have been found to minimize the effects of pesticide application. Studies have shown prompt revegetation of disturbed areas effectively reduces erosion. Detailed information on effectiveness, applicability, and costs of different Best Management Practices is contained in many of the references in Appendix 2, the Water Resources and Forestry section of the Bibliography.

An indication of the extent to which different Best Management Practices are used in the U.S. is provided in a 1993 U.S. Environmental Protection Agency study. The study reported that over 80% of the states had state BMP regulations or manuals. Most state BMPs addressed preharvest planning (over a third), road construction and maintenance (all), timber harvesting, streamside buffer or management zones (almost 60%), site preparation, chemical management (over 40%), revegetation (almost 70%), prescribed burning, and drainage structures in some.<sup>28</sup> A recent summary by USEPA of the effectiveness of various forestry management measures indicates revegetation, roads, and streamside buffer or management zones offer some of the greatest opportunities for pollution reduction.

Logging Bans/Protected Areas: The establishment of various categories of protected forest areas has been used effectively by many countries to retain important benefits of forests and prevent environmental damage from deforestation. In some countries, the only remaining forests are those with protected status. Protected forest areas have existed since the 4th century BC in India, and hunting reserves existed in Europe for hundreds of years. Most protected areas were established in the late 19th century. The International Union for the Conservation of Nature has developed a standard classification system of ten types of protected areas. Using this criteria, 169 countries have protected sites covering over 5% of the world's land area. Of this amount, about 9% is in subtropical/temperate rainforests/woodlands, about 5% in tropical humid forests, 4.7% in tropical dry forests/woodlands, 4.7% in evergreen sclerophyllous forests, about 3% in temperate broad-leaf forests, and about 2.9% in temperate needle-leaf forests/woodlands.<sup>29</sup> Because of the range of different forest types protected, preservation of biodiversity is a major benefit.

A different type of ban/protected area was established by the government of Thailand. A full commercial logging ban on government forests was imposed after uncontrolled runoff from rains caused landslides, and destroyed the homes of 40,000 people. However, between 1985 and 1988, forest cover fell from 29% to 19%.<sup>30</sup> A logging ban was also imposed in Ecuador to reduce deforestation.

Another example of a national timber ban is one imposed by the Kingdom of Bhutan in the Himalayas. In 1974, the government stipulated that 60% of the country would remain under permanent forest cover. A tree planting program was initiated to increase the forest area, and the government has started giving villages their own forest plots to manage.<sup>31</sup>

Other types of logging bans which have been used include bans on steep slopes (e.g. over 30% grade), bans on logging near surface waters (streamside buffer areas), and logging bans in government reserves (extractive reserves). Examples of such bans include Brazil's new system of nine extractive reserves where logging is prohibited, but activities such as rubber harvesting, shellfish gathering and fishing, and coconut harvesting are permitted.<sup>32</sup> A critical component of such programs balancing the extraction of non-wood products with the maintenance of

biodiversity, and to avoid over-harvesting.

## **4.2 Performance-Based Options**

Performance-based options leave the choice of management options up to the regulated group or individual but require measurement and monitoring methods to determine whether the performance standard has been met. An example of a performance-based goal or standard is the surface water turbidity standard used by the United States and Canada. A copy of the standard for the province of British Columbia, Canada is included in Appendix 3.

## **4.3 Economic Options**

Economic options use market forces to encourage activities reducing deforestation and/or forestry activities causing environmental problems. Such options include tax policies that reduce assessments for “conservation land”, government assistance for reforestation, tax incentives and government subsidies for turbidity control and other Best Management Practices, and extending the life of timber concessions to provide an incentive for protection and maintenance of the reforested area until the new growth is well established. Other economic options include changing laws inadvertently causing deforestation, provision of secure land tenure for forest residents protecting the forest, the development of community forestry programs, and programs for timber theft prevention.

An example of an economic option is the use establishment of “conservation land” areas in Lincoln, Massachusetts, USA. Tax rates are set at a lower level for forest lands of conservation interest to the town. Another example of an economic option is the timber theft program established by the State of Louisiana, USA which helps private landowners protect their forest lands against timber theft (see Appendix 3 for more information on this program).

Brazil changed a policy which provided economic incentives for conversion of forests to ranches in Amazonia. The changes involved suspending the economic incentives for new livestock ranches in Amazonian forests.<sup>33</sup>

Another example of an economic option is changing the forest pricing methods. Options include raising forest sale fees to market levels, simplifying overly complex procedures, adjusting for inflation, increasing collection rates, using market mechanisms (e.g. competitive bids) for concession allocation, and reducing wasteful logging through payment per tree or volume of trees felled (rather than removed). The Grut, Gray and Egli report by the World Bank on Forest Pricing contains detailed recommendations in each one of these areas.

Community forestry programs and land titling programs work with local populations and their economic interests to increase forest protection. For example, the Awa reserve was created in 1982 in Ecuador to protect 1700 hectares of forest from deforestation by developing a multi-faceted program including land titling for local residents, inventorying forest resources and developing a program for effective forest use.<sup>34</sup> In Nepal, an effort to combat deforestation involved establishment of community nurseries and distribution of tree seedlings free or at minimal cost, and promotion of agroforestry.<sup>35</sup>

## **4.4 Voluntary Options**

Voluntary approaches are widely used in the forestry area to encourage compliance with environmental goals. Voluntary options include education and technical assistance, timber certification programs, and awards programs. Examples include many of the Best Management Practice programs in the US which are voluntary, and depend heavily on education and technical assistance efforts by forestry staff. For instance, a study of the effectiveness of U.S. State programs directed at private landowners indicated technical assistance programs were judged most effective<sup>36</sup>.

## **5. PLANNING, MONITORING, ENFORCEMENT AND COMPLIANCE APPROACHES**

### **5.1 Planning**

Planning is used in many countries, from the national to local levels, to maximize the benefit from forest resources, and minimize the environmental damage resulting from deforestation and forestry activities. Typical plans relating to deforestation include land use planning, natural resource planning, park and recreational planning, and harvest planning, with special attention focused on sensitive areas. For example, Madagascar is currently undertaking a major national planning effort to preserve the remaining 20% of its forested areas and is studying the potential of nature tourism in these areas.<sup>37</sup> At a local level, the State of California precludes any person from conducting timber operations unless a timber harvesting plan, prepared by a registered professional forester, has been approved by the Director of Forestry. The plan must be based on site-specific characteristics including vegetation type, topography, and stream characteristics.<sup>38</sup>

### **5.2 Policy, Legislative and Regulatory Measures**

A wide variety of policy statements, and legislative and regulatory measures have been established to protect forests and prevent pollution. Two reference volumes allow country-by-country analysis, IUCN's Protected Areas of the World: A Review of National Systems, and FAO's Forest Legislation in Selected African Countries. A review of legislation specifically pertaining to Biodiversity is contained in the World Conservation Monitoring Centre's Global Diversity. Legislation on water quality and climate change is often available through the offices responsible for those programs. Costa Rica's recent forest policy, referenced in Appendix 3, is an example of a coordinated national effort, developed through a cooperative process by the government and private forestry sector representatives. The State of Virginia's recent Forest Water Quality Law is included in the same Appendix as an example of a legislative measure designed to prevent water resource damage from forestry activities.

### **5.3 Monitoring and Inspection**

Monitoring compliance is essential to a effective enforcement program. Forestry monitoring may include evaluation of the overall extent of deforestation or forest degradation, and/or examination of specific environmental problems caused by deforestation such as erosion, and effects on surface water. Major monitoring tools in forestry include on-site inspections by staff, citizen monitoring and complaints, aircraft overflights, and use of satellite data.

### **5.4 Training and Education**

Training and education of stakeholders helps people understand how to prevent and reduce adverse environmental effects associated with deforestation and forestry activities, and take appropriate action when possible.

An example in the enforcement area in the U.S. is the Federal Law Enforcement Training Center (FLETC). U.S. government studies indicated a need for standardized national enforcement training. In 1975, an interagency law enforcement training facility was established in Georgia for over 70 Federal organizations, including the U.S. National Forest Service, the National Park Service, and the U.S. Fish and Wildlife Service. The U.S. Environmental Protection Agency (USEPA) also trains staff from their Criminal Investigation Division at this facility. Basic training is given in enforcement operations, behavioral science, legal aspects such as evidence and Federal Court procedures, and security. A special course lasting 48 days has been developed for land management (including forestry) agencies. USEPA gives a specialized 7 week course in environmental basics as a follow-on to the FLETC basic training. (See the Bibliography for more information on the Syllabus for this course). In addition, over 40 specialized programs are given for State and local law enforcement personnel, enhancing networking, a more consistent approach, and cooperation in the government law enforcement community.

## **5.5 Local Participation**

Where local populations live in or near forests, local participation has been found to be essential to the successful prevention of deforestation. Many case studies of local participation are included in Saving the Tropical Forests, and in People and Parks: Linking Protected Area Management with Local Communities. The first study includes a number of positive approaches to tropical forest conservation, and the second is an analytical look at the results of a number of projects. Another report, Developing a Partnership of Indigenous Peoples, Conservationists, and Land Use Planners in Latin America, includes case studies of some successful forest preservation projects developed with indigenous peoples.

An example of a different type of community participation is the local volunteer monitoring of water quality by organizations like the Izaak Walton League of America in their Save Our Streams program. Started in 1969, the program has grown to several thousand active projects across the United States.<sup>39</sup> Local groups “adopt” a stream of their choice and monitor it for a year or more. Timber operations are one of the non-point sources whose effects on surface waters the local groups are trained to monitor. Local citizens are trained in conducting biological and/or chemical testing, and reporting stream abuses, and are given information on improving water quality through measures such as Best Management Practices for forestry activities. A Stream Quality Survey form, used for monitoring of macroinvertebrates sensitive to turbidity and other forms of pollution, is included in Appendix 3.

## **5.6 Enforcement and Compliance**

Many formal and informal enforcement/compliance mechanisms are used to prevent deforestation and environmental problems from forestry activities. These approaches include negotiation, warnings, Stop Work Orders, Notices of Violation, fines, arrests, and court action. An example of a successful enforcement program is on the Bururi and Rumonge forest preservation and reforestation projects in Burundi, where increased enforcement was reported to be critical in reducing illegal fuelwood gathering and logging.<sup>40</sup> Samples of legislation and other documents supporting enforcement actions are included in Appendix 3. levels to citizen actions.

## **APPENDIX 1: MINISTRIES AND ORGANIZATIONS CONCERNED WITH FORESTRY AND DEFORESTATION**

Directory of Principal Governmental Bodies Dealing with the Environment, United Nations Environment Program, Nairobi, 1990.

Compiled by the Environmental Law and Institutions Unit of UNEP, the Directory provides the name of the Ministry or Department dealing with environmental issues, along with address, phone number and fax.

Worldwide Government Directory, Belmont Publications, Bethesda, MD. 1993.

Country by country listing of the structure and personnel of 193 governments, including the heads of state, ministries, departments, and legislative and judicial entities.

Natural Resources Directory: Latin America and the Caribbean, Partners of the Americas with the Tinker Foundation, 1988.

Country by country listing of non-government organizations with contacts and description, and listing of government ministries concerned with natural resources.

Directory of Non-Governmental Environment and Development Organizations in OECD Member Countries, OECD, Paris, France, 1992.

Listing of NGOs by country including contacts and activities in the areas of development, environment, and environmental education.

World Directory of Environmental Organizations: A Handbook of National and International Organizations and Programs-Governmental and Non-Governmental-Concerned with Protecting the Earth's Resources, T. Trzyna and R. Childers, ed., California Institute of Public Affairs, Sacramento, CA 1992.

National agencies and forestry associations are listed by country in Part 7. International forestry organizations are listed on pages 25-26.

## **APPENDIX 2: ANNOTATED BIBLIOGRAPHY**



## A2.1 BOOKS, REPORTS, AND ARTICLES

### GENERAL

Andrasko, K., "Global warming and forests: an overview of current knowledge", Unasylva, Vol. 41, FAO, Rome, Italy, 1990/4.

Summary of current knowledge about global warming, its potential effects on forests, and possible measures within the forestry sector to mitigate global warming.

Andrasko, Kenneth and the FAO (Food and Agriculture Organization of the United Nations), Climate Change and Global Forests: Current Knowledge of Potential Effects, Adaptation and Mitigation Options, Draft, FAO, Rome, Italy, October 1990.

A comprehensive review of the scientific literature on climate change due to the greenhouse effect and the potential effect on forests. Also discusses the role of forests and forestry in reducing and contributing to greenhouse gasses.

Commonwealth Secretariat, Sustainable Development: An Imperative for Environmental Protection, Economic Affairs Division, Commonwealth Secretariat, London, England, August 1991.

Conclusions of an appointed Commonwealth group of experts regarding sustainable development for the Commonwealth countries. Chapter 3 covers forests; Chapter 4 climate change.

Dixon, Robert and Kenneth Andrasko, "Integrated Systems: Assessment of Promising Alternative Land-Use Practices to Enhance Carbon Conservation and Sequestration", IPCC (Intergovernmental Panel on Climate Change) Workshop, Canberra, Australia, Jan. 1992.

Analysis of technical options from 94 nations to sequester and conserve carbon on marginal lands, including revegetation practices.

Dixon, et al, "Carbon Pools and Flux of Global Forest Ecosystems", Science, vol. 263, January 14, 1994.

Summary and analysis of the role of forest systems in carbon sequestration. Indicates over two-thirds of the carbon in forest ecosystems is contained in soils and associated peat deposits.

Dold, Catherine, "Tropical Forests Found More Valuable for Medicine than Other Uses", New York Times, April 28, 1992.

A study of two secondary growth hardwood forest plots in Belize

showing the value of all the medicinal plants that could be sustainably harvested and sold to local herb pharmacists and healers exceeded the estimated value of other land uses, including timber harvesting.

Federal Law Enforcement Training Center, Basic Law Enforcement for Land Management Agencies, Syllabus, FLETC, April 1991.

200+ page volume describing each segment of the course, including performance objectives and method of evaluation.

FAO (Food and Agricultural Organization of the United Nations), Forest products: Yearbook 1991, FAO, Rome, Italy, 1992.

Annual statistical yearbook of global and country-specific forest products.

FAO (Food and Agriculture Organization of the United Nations), Some medicinal Forest Plants of Africa and Latin America, FAO Forestry Dept., Rome, Italy, 1986.

Information on 40 species of trees and shrubs with a variety of traditional and pharmaceutical uses, compiled in collaboration with nine institutions in Africa and Latin America.

FAO and the UN Economic Commission for Europe, The Forest Resources of the Temperate Zones, Main findings of the UN-ECE/FAO 1990 Forest Resource Assessment, and Vol. II, Benefits and Functions of the Forest.

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Gradwohl, Judith and Russell Greenberg, Saving the Tropical Forests, Earthscan Publications Ltd., London, England, 1988.

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Gillis, M. Forest Incentive Policies, Duke University, N.C., 1991.

Grut, Mikael, John Gray and Nicolas Egli, Forest Pricing and Concession Policies, World Bank, Washington, D.C., 1991.

*Issues, options, and recommendations on forest pricing and concession policies in West and Central Africa*

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IUCN (International Union for the Conservation of Nature), Caring for the Earth: A Strategy for Sustainable Living, IUCN, UNEP, WWF, Gland, Switzerland, October 1991.

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A study to determine whether member countries of the International Tropical Timber Organization (ITTO) have a legal and administrative basis for managing their production forests to contribute to biological diversity conservation.

IUCN, El Extractivismo en America Latina, IUCN, Gland, Switzerland, 1993.

General summary and country-specific description of non-timber harvesting in Latin America.

IUCN, Parks and Progress: Protected Areas and Economic Development in Latin America and the Caribbean, V. Barzetti, Ed., IUCN and the Inter-American Development Bank, Gland, Switzerland, 1993.

Synopsis of workshops and reports from the Feb. 1992 World Congress on National Parks and Protected Areas.

Lawrence Berkeley Lab, Carbon emissions and sequestration in forests: Case studies from seven developing Countries, U.S. Department of Energy, DC, August 1992.

The study assesses the major effect forest preservation can have on global warming relative to other control measures.

Leblanc, Joyce Y., "A Perfect Scene for a Perfect Crime": Forests and People, Louisiana Forestry Association, Forth Quarter 1992, p. 5-11.

Description of timber theft and investigations of an estimated \$15 million/year of timber theft in Louisiana.

Lean, Geoffrey, ed., World Wildlife Fund Atlas of the Environment, Prentice Hall Press, New York, NY, 1990.

Environmental Atlas including narrative and maps on tropical forest destruction, the tropical timber trade, the fuelwood crisis, damaged watersheds, temperate forests under threat, acid rain, biological diversity and genetic resources, and protected areas and national parks.

Mahar, Dennis, Government Policies and Deforestation in Brazil's Amazon Region, The World Bank, WWF, and the Conservation Foundation, Washington, DC, 1989.

Analysis of policies contributing to deforestation and recommendations.

McCloskey, Michael, "Note on the Fragmentation of Primary Rainforest", Ambia, June 1993, p. 249-250.

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Miller, Kenton and Laura Tangley, Trees of Life: Saving Tropical Forests and Their Biological Wealth, Beacon Press, Boston, MA, 1991.

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Raloff, Janet, "Where Acids Reign", Science News, July 22, 1989, p. 56-58.

Review of the effect of air pollution on forests .

Repetto, Robert, "Deforestation in the Tropics", Scientific American, April 1990, p. 36-42.

Overview of deforestation causes and effects .

Seager, Joni, Ed., The State of the Earth Atlas, Simon & Schuster, Inc., NY, NY, 1990.

Global maps showing areas vulnerable to sea level rise as a result of global warming, rainforest destruction, proportion of population with access to safe drinking water, desertification risks and soil erosion, proportion of energy supplied by fuelwood and charcoal, acid rain, and timber trade.

Serageldin, Ismail, Saving Africa's Rainforests, The World Bank, Washington, DC, 1993.

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Sharma, Narendra, ed., Managing the World's Forests: Looking for Balance Between Conservation and Development, Kendall/Hunt Publishing Co., Dubuque, Iowa, 1992.

Assessment of the world forestry situation from many perspectives, including watershed management, climate change, biological diversity, fuelwood, concessions, and forest valuation.

Trahan, Tom, "How to Reduce Chances for Timber Theft Losses", Forests and People, Louisiana Forestry Association, Forth Quarter, 1992, p. 5.

Summary of successful program in Louisiana to reduce timber theft on both public and private forests .

UNCED (United Nations Conference on Environment and Development: National Reports Summaries), Nations of the Earth Report, UNCED, Geneva, 1992.

Summary of environmental problems, including deforestation, and initiatives for dealing with them for 47 country reports .

Wells, Michael and Katrina Brandon, People and Parks: Linking Protected Area Management with

Local Communities, The World Bank, WWF, and USAID, Washington, DC., 1992.

Includes case studies of problems and successes with community involvement in protected area conservation.

Whelan, Tensie, Nature Tourism: Managing for the Environment, Island Press, Washington, DC, 1991. Discussion of economic aspects and case studies including forested parks in Kenya and Costa Rica.

World Conservation Monitoring Centre, Global Biodiversity, World Conservation Monitoring Centre with IUCN, UNEP, WWF and WRI, Chapman & Hall, London, England, 1992.

Detailed summary of information on biodiversity, including a section on national policies and instruments in Part 3.

World Bank with IUCN, Conservation of West and Central African Rainforests, K. Cleaver, M. Munasinghe, M. Dyson, N. Egli, A. Peuker, F. Wencelius, eds., The World Bank, Washington, DC, 1992.

Selected papers from the Conference on Conservation of West and Central African Rainforests, held in Abidjan, November 5-9, 1990. Subjects include country strategies, agricultural nexus, natural forestry management, biodiversity and conservation, forest peoples and products, economic and fiscal issues, and institutional and private participation issues.

World Bank, The Forest Sector: A World Bank Policy Paper, The World Bank, Washington, DC. 1991.

Outlines the World Bank policy on forests, including promotion of the conservation of natural forests and the sustainable development of managed forestry resources. Objectives include support for international efforts and legal instruments to promote forest conservation, assistance to government in policy reform and institutional strengthening, creation of additional forest resources, and support for initiatives that preserve intact forest areas.

World Bank, People and Trees: The Role of Social Forestry in Sustainable Development, Hans Gregersen, Sydney Draper, Dieter Elz, eds., The World Bank, Washington, DC, 1989.

A reference for training those involved in integrating trees into farming and ecological systems. Indicates the two most important conditions for success are a high level of local participation and substantial political commitment to long term solutions.

World Resources Institute, The 1994 Information Please Environmental Almanac, Houghton Mifflin Co., Boston, NY 1993 and 1994.

Annual almanac with country-by-country descriptions of environmental problems and issues, including deforestation. The 1993 edition contains a special section on wetlands and forests.

## **WATER RESOURCES AND FORESTRY**

Brooks, Kenneth et al, "Watershed Management: A Key to Sustainability", Managing the World's Forests, N. Sharma, ed., Kendall/Hunt Publishing Co., Dubuque, Iowa, 1992, p. 455-487.

Description of a practical framework to identify and assess priorities for watershed management in forestry projects, with examples of successes and problems.

Cheng, Antony and Paul Ellefson, State Programs Directed at the Forestry Practices of Private Forest Landowners: Program Administrators' Assessment of Effectiveness, Minnesota Agricultural Experiment Station, University of Minnesota, S. Paul, MN, 1993.

Technical assistance and educational programs were most commonly used, particularly for protecting water quality. Technical assistance programs were judged most effective, although regional differences were evident in the use of programs such as financial incentive, tax, and regulatory programs.

U.S. Environmental Protection Agency, Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, (840-B-92-002), Chapter 3, "Management Measures for Forestry", USEPA, Office of Water, Washington, DC 20460, January 1993.

Detailed description of runoff control measures for forestry operations, including some costs and effectiveness data. Sections include preharvest planning, streamside management areas, road construction/reconstruction, road management, timber harvesting, site preparation and forest regeneration, fire management, revegetation of disturbed areas, forest chemical management, and wetlands forest management. (Although the title refers to "coastal", the measures apply to forestry operations and water resources in general (e.g. surface and ground waters).

U.S. Environmental Protection Agency, Economic Analysis of Coastal Nonpoint Source Pollution Controls: Forestry, December 15, 1992.

Analysis of the economic feasibility of implementing the management measures for forestry discussed in the preceding document.

U.S. Environmental Protection Agency and Jones & Stokes Associates, Effectiveness of Agricultural and Silvicultural Nonpoint Source Controls, Jones & Stokes Associates, Inc., Bellevue, WA, 1988.

Many case studies of silvicultural-related monitoring in Alaska and the western U.S. Report includes recommendations for silviculture monitoring.

U.S. Environmental Protection Agency and Tetra Tech, Inc., Summary of Current State Nonpoint Source Control Practices for Forestry, (EPA-841/S-93-001), USEPA Office of Wetlands, Oceans and Watersheds, August 1993.

A state-by-state synopsis of the currently used Best Management Practices to address nonpoint pollution impacts on water quality caused by forestry activities.

U.S. Environmental Protection Agency, Region 10, and University of Washington, Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska, (EPA/910/9-91-001), USEPA Water Division, Region 10, May 1991.

Information on how to develop water quality monitoring for forested areas, including baseline and compliance monitoring.

U.S. Environmental Protection Agency and Tetra Tech, Inc., Water Quality Effects and Nonpoint Source Control for Forestry: An Annotated Bibliography, EPA-841/B-93-005, Office of Water, USEPA, Washington, DC, August 1993.

More than 240 pages of annotated technical documents covering areas of Best Management Practice such as road construction and timber harvest, plus sections on instream studies, modeling, and water quality monitoring.

U.S. Forest Service, Stream Habitat Improvement Handbook, Tech. Pub. R8-TP, U.S. Dept. of Agriculture, Forest Service Southern Region, Atlanta, Ga., June 1992.

Includes instructions and photos for improving fish habitat, including removal of sediment. Cost estimates are also provided.

## **A2.2 JOURNALS AND NEWSLETTERS**

Forestry Support Program, US Forest Service International Forestry, Directory of Selected Tropical Forestry Journals and Newsletters., US National Forest Service, Washington, DC, 1993.

A directory of almost 500 periodicals focusing on tropical forestry including contacts, a summary of the focus of the publishing organization, frequency of publication, and target audience.



## **A2.3 OBTAINING SELECTED PUBLICATIONS**

### HOW TO OBTAIN SELECTED PUBLICATIONS

UNITED NATIONS (FAO) PUBLICATIONS: Check your local bookstore, or write:

UNIPUB  
4611/F, Assembly Drive  
Lanham, MD 20706-4391, USA

US ENVIRONMENTAL PROTECTION AGENCY PUBLICATIONS:

U.S. Environmental Protection Agency  
401 M Street, SW  
Washington, DC 20460, USA

WORLD BANK PUBLICATIONS:

World Bank  
Publications Office  
1818 H St., N.W.]  
Washington, DC 20433, USA

FEDERAL LAW ENFORCEMENT TRAINING CENTER PUBLICATIONS:

Federal Law Enforcement Training Center  
Glynco, GA 31524, USA

US FOREST SERVICE PUBLICATIONS:

Forestry Support Program  
USDA Forest Service  
PO Box 96090  
Washington, DC 20090-6090

## **APPENDIX 3: SAMPLE LAWS, CRITERIA, PERMITS, SURVEY FORMS, GUIDELINES, CONTRACTS AND POLICIES**

A3.1 Forest Water Quality Law and Description:  
Commonwealth of Virginia, USA, 1993

A3.2 Provincial Turbidity Criteria: British

Columbia, Canada  
Feb. 1985

A3.3 Forest Operation Permit: State of Oregon,  
USA, 1991

A3.4 NGO (Non-Government Agency) Stream Quality  
Survey

A3.5 Timber Theft Legislation, Prevention  
Guidelines, and Sample  
Timber Sales Contract: State of Louisiana,  
USA

A3.6 National Forestry Policy: Costa Rica, 1993  
**APPENDIX A3.1: Forest Water Quality Law and  
Description  
Commonwealth of Virginia, 1993.**

**APPENDIX A3.2: Provincial Turbidity Criteria  
British Columbia, Canada, Feb. 1985.**

**APPENDIX A3.3: Forest Operation Permit  
State of Oregon, USA, 1992**

**APPENDIX A3.4: NGO (Non-Government Agency) Stream  
Quality Survey**

**APPENDIX 3.5: Timber Theft Legislation, Prevention  
Guidelines,  
and Sample Sales Contract: State of Louisiana, USA**

## **TIMBER THEFT**

### I. The Problem

- A. Statewide timber standing inventory according to 1985 Federal Study is approximately 53 billion board feet of sawtimber and 87 million cords of pulpwood. Using today's market stumpage prices, that's over 8 billion dollars of standing timber which could be subject to theft.
- B. Average retail outlet loses anywhere from 2-4 percent of volume sales through theft. Timber theft could very well surpass that percentage. the volume of timber stumpage sales is approximately \$3000 million annually.

C. Most cases fall under this State's theft statutes.

1. Theft - Title 14. Section 67, definitions and penalties:

Theft is the misappropriation or taking of anything of value which belongs to another, either without the consent of the other to the misappropriation or taking, or by means of fraudulent conduct, practices, or representations. An intent to deprive the other permanently of whatever may be the subject of the misappropriation or taking is essential.

Whoever commits the crime of theft when the misappropriation or taking amounts of a value of five hundred dollars or more shall be imprisoned, with or without hard labor, for not more than ten years, or may be fined not more than three thousand dollars, or both.

When the misappropriation or taking amounts to a value of one hundred dollars or more, but less than a value of five hundred dollars, the offender shall be imprisoned, with or without hard labor, for not more than two years, or may be fined not more than two thousand dollars, or both.

When the misappropriation or taking amounts to less than a value of one hundred dollars, the offender shall be imprisoned for not more than six months, or may be fined not more than five hundred dollars, or both. If the offender in such cases has been convicted of theft two or more times previously, upon any subsequent conviction he shall be imprisoned, with or without hard labor, for not more than two years, or may be fined not more than one thousand dollars, or both.

When there has been a misappropriation or taking by a number of distinct acts of the offender, the aggregate of the amount of the misappropriations or takings shall determine the grade of the offense.

2. The majority of people in the industry are honest, hard-working individuals who work in one of the nation's most dangerous professions.

D. Trees are vulnerable to theft

1. Isolated

2. Infrequently monitored

3. Difficult to trace

- L.F.A. Committee to recommend Legislation

4. Many landowners don't recognize the value of their timber resources.

II. Methods of Theft

A. Diversion

1. Diverting a load of sawtimber or pulpwood from a legitimate harvest to another mill or woodyard and registering for payment in a name other than the rightful owner.

B. Cut and Leave

1. An individual simply picks someone's land, cuts a load or loads, sells it for himself and then moves to someone else's property and repeats the process.

C. Fraud or misrepresentation

1. laying false claim to the timber through acts of fraud.

2. When facts regarding the land and resources are criminally misrepresented to the

- landowner.
- D. Firewood Theft
  - 1. The cutting of firewood for personal use or commercial sales without the direct permission of the landowner.
    - a. Large number of individuals participating
    - b. Not viewed as criminal
    - c. Increasing prices of hardwood will require closer monitoring of firewood thefts
- E. Cutting across boundary lines
  - 1. Criminal
    - a. Can be charged with theft if cutter willfully and intentionally cut across boundary lines
  - 2. Civil - Previous court decisions allow for mainly three types of recovery
    - a. Moral bad faith
      - Willful and intentional - in some cases, the owner can collect up to three times fair market value plus, reasonable attorney fees, clean and replant land general damages for aesthetic value, expert witness fees, and at time mental anguish and emotional trauma.
    - b. Legal bad faith
      - Cutter should have been aware that timber did not belong to him. usually liable for damages three times fair market value of timber cut, can be held responsible for reasonable attorney fees if not paid within 30 days after being informed of demand.
    - c. Good faith
      - No evidence to show that cutter should have been aware - is liable for only fair market value of timber at the time it was cut.
- F. Bribery
  - 1. When someone gives or offers to give, directly or indirectly, anything of apparent present or prospective value to a private agent, employee or fiduciary without the knowledge and consent of the principal or employer in an attempt to influence the agent, employee or fiduciary into actions which betrays the best interest of the principal's or employer's affairs.

### III. SelfProtection

- A. Boundary Lines
  - 1. Make sure boundary lines are correct and well marked (check description at courthouse).
    - a. Will prevent honest mistakes
    - b. Add to the chain of evidence should theft occur
- B. Frequent visits to property
  - 1. Make sure no unauthorized logging activities are taking place
  - 2. Daily visits to site when you have a logging job, including firewood activities, in operation or when one is occurring on adjacent property.
- C. Absentee owners
  - 1. They are especially vulnerable
  - 2. Should arrange for an overseer
    - a. Paid employee

- b. Professional consultant
    - c. Hunting Club
    - d. Friend or neighboring landowners
    - e. Combination of all
  - 3. Make local authorities aware that you are an absentee landowner.
- D. Selling of timber
  - 1. Check with the Office of Forestry on service offered
  - 2. Hire professional consultant
  - 3. Draw written contract
    - a. Spell out limitations and conditions of sale and method of logging
    - b. Estimate volume to be cut (cruise or tree count)
    - c. Identify trees to be harvested
    - d. Lump-sum sale - excellent method
    - e. Bid timber to as many buyers as possible
    - f. Police terms of contract
- E. Firewood cutting
  - 1. Make sure permission is directly authorized by you
    - a. Written
    - b. Verbal
  - 2. Specify area and trees to be cut
  - 3. Do not allow transfer of authorization
  - 4. Police cutting activities
- F. If theft occurs
  - 1. Report theft as soon as possible
    - a. Office of Forestry
    - b. Local Sheriffs Office
    - c. Both
  - 2. Provide as much and as detailed information on alleged theft as possible
    - a. Make yourself written notes
  - 3. Cooperate to the fullest with authorities
  - 4. If arrest is made - PRESS CHARGES
  - 5. Positive reinforcement for participating public officials (all landowners)
- G. Rewards
  - 1. Louisiana Forestry Association offers rewards of up to \$1000 for information leading to the arrest and conviction of individuals responsible for committing woods arson, forestry equipment theft or vandalism and TIMBER THEFT
  - 2. The identify of individuals providing information or receiving rewards will be kept in strictest confidence.

FOR MORE INFORMATION  
CONTACT:

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Louisiana Department of Agriculture  
& Forestry  
Baton Rouge, LA, USA 70821-0631  
(Telephone) 504 925 4500

## **APPENDIX A3.6: National Forestry Policy Costa Rica, 1993**

### **Costa Rica's Forestry Policy contained in a September 1993 publication of Costa Rica's Ministry of Natural Resources, Energy, and Mines**

#### **I. General Forestry Policy** (pp. 9-11):

a) achieve an equilibrium between conservation of forest-related natural resources (biodiversity, water, soil, and oxygen) with the productive development of the forestry sector, within the paradigm of sustainable development.

b) apply within the process of state reform, a process of administrative deregulation, accompanied by liberalization of the forestry sector, and a gradual reduction of incentives for cutting down trees.

c) adapt forestry administration to focus on promotion and support, making the technical and administrative procedures efficient, in order to enhance the productive process.

d) conserve and support the increase of natural forest products and establish and regulate protected forests. At the same time, increase the national forest inventory through the recuperation of areas with good forest potential, based upon technical criteria.

e) reorient the utilization of money authorized by the Government of Costa Rica for forest development.

f) look for a more efficient and competitive forestry industry through modernization of the industrial process, adequate methods of commercialization, forest pricing, the elimination of restrictive barriers, and the gradual elimination of industry protectionism.

g) increase the capacity of forest management through investigation, training, and forestry extension; accomplished in coordination with the public and private sectors and with universities through mechanisms of technological transfer.

h) [not translated since not relevant to the project.]

i) adapt Costa Rica's forestry legislation to its forestry policy.

#### **II. Specific Forestry Policy** (pp. 11-15):

a) adapt customs and non-customs restrictions as an indispensable requirement of fulfilling the objective of giving value or worth to the forests and of assuring sustainability of forest resources.

b) establish clear and precise procedures through the creation of procedure manuals, with the goal of facilitating administration and of promoting the saving of administrative costs for the Costa Rican Government, but principally with the purpose of making the system convenient for the user.

c) provide security for forestry investment and ownership, without restrictions for sustainable use in accordance with the owner's interest, provided that the owner complies with the rules for sustaining this resource.

d) development of a plan of action or management plan (hereinafter "Management Plan"), is an indispensable requirement in order to establish and make use of forest plantations that receive incentives, and in order to enable use of natural forests.

e) concentrate forest protection and control functions in areas of forestry interest, while in other areas permit local organisms such as municipalities and associations to assist in forestry protection.

f) promote the formation and operation of consultative forestry groups, with the goal of establishing adequate mechanisms of agreement that will benefit forestry development at the national level, but with regional protection.

g) fortify the infrastructure of the Costa Rican Forestry Department<sup>41</sup> in areas of forestry interest, in order to facilitate operating conditions, to stimulate regional staff, and thus to improve the Department's efficiency.

h) support actions that help consolidate the organization of the forestry private sector. There is special interest in helping the formation of consortiums and associations of small businesses in order to achieve better business capacity within the concept of democratization of the economy through small business.

i) authorize a preponderant role to the State forestry operation, requiring it to take responsibility to conduct, control, and promote the development of private forestry projects.

j) reorient the use of incentives authorized by the Government. Use of these incentives will be exclusively in lands with forestry potential, and for the administration of degraded, natural and secondary forests, for natural regeneration, and for reforestation by small land owners.

k) create a mechanism for waiving payment of territorial taxes in areas voluntarily submitted to the State Forestry Operation, and making it attractive to the owners of such areas.

l) eliminate all time periods for submission of documents. The service provided to users will be continuous and expedited.

m) eliminate all transactions or forestry permits required for the profitable use of trees on an owner's land.

n) adapt the granting of authorizations to cut trees to the stages, or steps, established in the Management Plan.

o) accept the right of possession for those that receive incentives for reforestation, cutting, profitable use of trees, and forest management, regardless of whether such persons are formally registered as the owner.

p) promote and facilitate the importation and exportation of forestry products.

q) eliminate all taxes based on the value of standing timber. Solely establish a tax applicable to the final product, such tax to be paid by the consumer.

r) offer technical assistance to small forest owners, preferably to those who are organized and who conduct projects of social interest.

s) produce statistics and data bases as a basic and elemental function in order to achieve the full development of

the forestry resource, in order to determine policy and to support and foster the private sector.

t) complete, in the shortest time possible, an inventory of the forests in Costa Rica. This inventory will constitute the basis for a “National Forestry Development Plan”, which will become the basic model for planning, use of, and benefiting from, forestry resources.

u) adapt the organizational structure of Costa Rica’s Forestry Department to guaranty the sustainable management of forest resources and to complement the actions taken by the private sector.

v) adequately prepare the personnel of the Department of Forestry so that they can respond to the required necessities for the development of the forestry sector.

u) decentralize administration and responsibilities in order to provide expedited service. The regions will offer service of a quality level necessary to resolve all matters or administrative problems. The regions will administer the budgets assigned to them, based on their basic needs.

### **III. Areas of Natural Forest (pp. 15-17):**

a) value the producing forest through industrialization and commercialization, with a large number of permanent and sustained forest products. Consideration will be given to other benefits such as social and environmental, which cannot be quantified by the mechanisms of established markets.

b) base the administration of the forest on the concept of sustainability. The benefits from this approach will be achieved through a combination of protection and production, guaranteed through the incorporation of the technical rules or norms established in the Management Plan.

c) guarantee through the forestry Management Plan, as a technical tool to achieve sustainable



use of the forest, recovery and replacement of the forest in accordance with the requirements of national policies and of international rules of sustainability. This will permit full backing for commercialization of the wood.

d) eliminate existing barriers or restrictions to forestry development. This activity will be integrated into the national economy, so that the market will fix the prices, and so that these prices can cover the cost of administration and also provide a clear reference point of forest activity.

e) support the sustainable management of natural forests on lands with good forest potential through the use of adequate credits directed to that end, providing incentive for the administration of secondary forests and of degraded or damaged forests in order to support their growth and production.

f) create an incentive for forestry protection, in order to promote the natural regeneration and permanency of natural, protected forests located in biological corridors, in high valleys, and in water discharge areas which are of communal and national interest.

g) prevent changing the use of lands with tree coverage which are located in areas of forest potential, for example, in areas with agricultural potential located in buffer zones to protected areas or to biological corridors. Forestry business will be promoted in these areas as a permitted use of the land.

#### **IV. Areas of Reforestation (pp. 17 - 19):**

a) become a driving force for the development of large blocks of reforested areas that permit the administration, profitable use of, and industrialization in an efficient manner. A definition and priority list of the areas marked for inclusion will be prepared.

b) authorize incentives for reforestation of lands with good forest potential, until the National Forestry Financing Fund (hereinafter "FONAFIFO") is funded. In addition, use will be made of fiscal incentives such as waiving territorial taxes, waiving taxes on uncultivated land, and protection of land owners against land squatters.

c) without the use of incentives, promote the establishment of compact plantations or agro-forestry systems in areas with agricultural potential. These plantations will be promoted under the concept of a income-producing product.

d) promote foreign investment for the financing of reforestation projects which guarantee a socio-economic benefit to the areas that are developed.

e) promote the use of native species previously identified and prioritized by region, and in so doing thereby foment research and publication.

f) establish a "Certificate of Free Harvest" for those plantations established with one's own resources.

g) modify conditions for incentives, while those are still in effect, financing the management of the plantations until the species on them are mature. The purpose is to guarantee the success of the forestry-cultivation program, whose goal is to improve the quality and quantity of the final products.

h) to promote forestry-cultivation in rural communities in order to incorporate them in the process of reforestation for commercial purposes.

i) give support to fixing the conditions under which FONAFIFO will provide credit, such conditions to be based upon research concerning costs and income. With this information, establish the value of species by region for use with the establishment and administration of plantations.

## **V. The Forestry Industry (pp. 19 - 20):**

a. adapt the industry to a market that manages typical amounts of natural tropical forest, but primarily of small dimension and young or “juvenile” product from plantations and secondary forests.

b. eliminate restrictions to the installation, enlargement, and transfer of new industry, permitting competition based on efficiency and technological transfer.

c. promote industrial conversion based upon an appropriate financing system that permits industry to make technological changes, transferring part of the benefits to the owner of the forest, but always working under the concept of efficiency.

d. establish systems of normalization and of standardization of forest products, so that the consumer can have better quality products, while at the same time benefiting the producer.

e. promote the commercialization of forest products through stock exchanges and auction houses, etc., that afford the forest owner direct access to the market and to price information.

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