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Chapter 9

Forest Management and Conservation in Belize: A Brief Background

Elizabeth Platt

As part of the Maya Forest, Belize shares many species and communities with its neighbors, Mexico and Guatemala. However, Belize has a unique perspective on the ways in which these species should be managed and conserved—an outgrowth of its special history, which is unlike that of any other nation in Central America. As a result of this history, particularly the establishment of policies that favored utilization of a small, select range of timber resources rather than promoting agriculture, the country has been left with extensive, relatively diverse forests that include healthy populations of species that are threatened or extinct elsewhere in the region. A commonwealth country with a parliamentary government modeled on the British system, Belize also has been spared many of the internal conflicts that have adversely affected both the citizens and the natural resources of neighboring Mexico and Guatemala (see Ponciano, this volume; Galletti, this volume). However, though the land under forest is still fairly extensive, external and internal pressures to convert it to other uses are growing. Moreover, the forests have been high-graded—that is, stripped of all marketable individuals of preferred species, leaving behind the less-valuable species—to the point that valuable species, such as mahogany and cedar, are fairly rare. Like its northern and western neighbors, Belize has reached a point at which direct intervention is necessary if these species are to recover and if remaining forests are to remain productive.

Historical Background

The area of Belize was originally claimed by the Spanish as part of the territory comprising Guatemala. Like the Petén, Belize was not formally settled by the Spanish in the seventeenth and eighteenth centuries. The Spanish concentrated most of the military and economic activities of colonization in centers such as Merida and Antigua, none of which were sufficiently close to the Belizean coast by standard means of transportation of the time to allow expansion into this region. The Spanish ignored the lowland areas, primarily because this land was considered marginal at best for agriculture, but perhaps also because military dominance over the indigenous Maya residents of the lowland forests remained tenuous until the end of the seventeenth century. Although the Spanish logged significant quantities of mahogany during the sixteenth century, most of it was extracted from Cuba, the West Indies, and Mexico (Lamb 1966).

In the late seventeenth and eighteenth centuries, small British logging settlements were established along the Belize River (Finamore 1994). The British loggers, some of whom were former buccaneers, originally extracted logwood (*Haematoxylum campechianum*), a tree with a dark purple heartwood valued for making red dye (Craig 1969; Hartshorn et al. 1984). Because this species grows in low-lying swamps (*bajos*) and logging technology of the day relied upon the presence of rivers to transport the logs, the first British settlements were concentrated along the watersheds and stayed relatively small and ephemeral (Finamore 1994). However, as demand for logwood declined, British efforts shifted to logging mahogany (*Swietenia macrophylla*), a wood highly prized in shipbuilding for both its durability and the ease with which it could be worked (Lamb 1966). British logging settlements encountered some opposition by the Spanish colonial government, but treaties between Britain and Spain forbade permanent agricultural settlements, and conflicts were limited to occasional raids and skirmishes (Hartshorn et al. 1984). As Spanish influence in the Caribbean waned during the eighteenth century, permanent logging operations, owned by British-born timber barons and manned primarily by slaves imported from Africa and the Caribbean, became common. Mahogany resources eventually became the justification for formal annexation of Belize in 1862 (Lamb 1966; Hartshorn et al. 1984), at which point a de facto British colony had been in existence for some time. Although the Spanish disputed the British claim—a dispute that continued in spirit until formal recognition of Belize by Guatemala in 1991—the area eventually became British Honduras, a legal colony of Great Britain, which it remained until independence was granted in 1981.

Evolution of Colonial Forest Policy

During the initial, informal stage of the colony, mahogany extraction was somewhat arbitrary. Cutting rights for specific areas called "works" were often allocated on the basis of wealth and political influence (Nicolait and Franklin 1995). Many of the strongest logging barons were also merchants who controlled the importation of goods on which the colony depended. Most of the reasonably accessible tracts of land containing mahogany stands were bought or claimed by such individuals early in the colony's history; by the time a formal governing forest department was created in 1922, nearly all of northern Belize and the richest mahogany stands of southern Belize were in private hands. As a result, most of the government-owned forests found in Belize today are located in the south, and much of that is restricted to the less accessible lowland areas, the highland regions where mahogany is less common, and parts of the southern coast and swamplands (Arnold et al. 1989).

Formalization of the British claim to Belize led to a more structured forest management policy. Much of this policy was based on experience that had been gained by colonial administrations in other tropical colonies, particularly India, during the eighteenth and nineteenth centuries (Primack 1993). Timber exploitation had been the preeminent resource in these colonies, leading the British colonial governments to develop strong forestry departments and encourage scientific investigation of forest and ecosystem dynamics. Belize ultimately benefited greatly from the experience and scientific knowledge obtained in other tropical colonies. These experiences taught the Belizean colonial government the value of practices such as leaving stands of forest intact to maintain rainfall levels and prevent erosion (Hartshorn et al. 1984; Primack 1993).

Some of these practices were codified in colonial law well in advance of independence. The Forest Department was founded in 1922, shortly before a permanent forest estate was formally established to protect remaining public lands (Johnson and Chaffey 1973; Nicolait and Franklin 1995). Control of timber extraction was instituted by the Forest Department almost from its inception; department records from as early as 1925 indicate the establishment of a formal concession system to regulate and collect royalties from timber operations (Johnson and Chaffey 1973). As the timber industry grew, other methods of forest management were explored. For instance, natural forest silviculture was investigated in the 1920s (Stevenson 1927; Johnson and Chaffey 1973), while a few plantations of pine (*Pinus caribaea*), cedar (*Cedrela odorata*), and other valuable timber species were established in the 1940s and 1950s to prevent overexploitation of commercial species in natural forests (Johnson and Chaffey 1973; Arnold et al. 1989). Various pieces of legislation were specifically aimed at promoting sustainable timber harvest: the 1954 Forest Policy of British Honduras included recommendations that land be set aside to conserve forest both for "sustained yield management" and for protection of watersheds and climate (Arnold et al. 1989). Other laws were explicitly conservation-oriented, emphasizing ecological concerns rather than economic ones. The Forest Ordinance of 1927, for example, established a legal basis for the creation of protected areas, legitimizing the Silkgrass Forest

Reserve established five years earlier, and furthermore called for conservation to coincide with development of the forestry industry (Nicolait and Franklin 1995)—although it is important to note that "conservation" probably was used in the sense of maintaining viable habitat for timber species, rather than in the currently popular sense of preserving communities or maintaining biological diversity. Timber development and conservation were simultaneous objectives; one goal mentioned in the 1954 Forest Policy decree was to "bring about an increased appreciation of the need for and aims of forest conservation amongst the general public . . . and [in] the schools" (Arnold et al. 1989).

Despite policies aimed at protecting timber resources, the main species of interest to loggers, mahogany (characteristically located in subtropical moist forests of northern and western Belize) and pine (primarily found in the western portion of Mountain Pine Ridge and in an extensive pine savanna north of the Western Highway), declined in the 1950s (Hartshorn et al. 1984); 300 years of continuous logging had virtually exhausted these species. In the face of this decline, in the late 1950s the colonial government made a decision that would strongly affect the way in which forests contributed to the national economy: it cut back dramatically on its investment in forestry, reducing the overall importance of the Forestry Department in the colonial budget, despite recommendations for continued management (Hartshorn et al. 1984; Arnold et al. 1989). This action had repercussions that modern Belize still feels: programs aimed at replenishing depleted stocks of timber species were ended, scientific studies were continued only on a sporadic basis, fire prevention programs were halted, and efforts to oversee use of public lands decreased. In these circumstances, replenishment of the depleted forests became difficult, if not impossible, under the colonial administration. More importantly, however, the gutted Forestry Department was too small to perform many of the management and conservation functions for which it was originally created. As a result, many activities and restrictions mandated by law, such as enforcement of cutting limits, could not be pursued for lack of manpower—a problem that continues today (Hartshorn et al. 1984; Nicolait and Franklin 1995).

Culture and Economy in Modern Belize: Where Do Forests Fit In?

In the brief overview of Belizean colonial history above, several factors stand out: first, throughout all stages of the colony's development, no policy of agricultural expansion and large-scale settlement of the countryside was ever promoted by colonial administrators. This factor stands in sharp contrast to both Guatemala and Mexico, where agrarian policies were aggressively pursued, first by the Spanish, and later by the independent governments. Second, although a certain amount of uncontrolled forest exploitation occurred before the formal British claim to Belize was established, the colonial government recognized the value of intact forests and began a concerted effort to manage forest resources fairly early in the country's history—well in advance of such efforts elsewhere in Central America. Finally, Belize has not encountered the same scale of forest conversion seen in Mexico and highland Guatemala for the simple reason that Belize's colonial and modern population has never been as dense as its neighbors', although recent decades have seen a rapid growth of population, primarily a result of immigration from other areas of Central America (Hartshorn et al. 1984). Lower population means that subsistence farming using milpa techniques does little damage to forests (Whitacre, this volume), and that large-scale agricultural holdings are less likely to be at maximum production, as has indeed been the case in Belize throughout much of its history (Hartshorn et al. 1984).

These factors meant that by 1981 a newly independent Belize had largely escaped the deforestation seen in Mexico and in highland Guatemala. Though certain species had suffered from overexploitation, the Belizean forests were still basically intact. The one significant government action that adversely affected the condition of Belize's forests—namely, the decision to drastically cut back funding for the Forest Department, leaving only a skeleton staff insufficient to fulfill the department's intended functions of regulatory enforcement and scientific study—occurred relatively recently, a response to declines in productivity of the primary timber species. In spirit, the policies of the colonial government were conscientious efforts to manage forest resources in a sustainable manner; in practice, however, implementation of these policies suffered from insufficient staffing and funding for enforcement.

Unfortunately, the decline of the timber industry in the 1950s meant that the economy and culture of modern Belize has become increasingly oriented toward industries that are not conducive to forest management. As timber extraction declined in productivity, it was replaced primarily by agriculture. The most serious trend was the establishment of large-scale, permanent fields of cash crops such as sugarcane in the north and citrus and bananas in the south. A significant number of Belizean men and teenage boys earn at least part of their yearly income working either as cane cutters or as truck drivers transporting loads of cane to the Belize Sugar Industry's single processing plant near Orange Walk. Both jobs are seasonal, and income levels may vary depending on the year-to-year changes in planting and harvesting, so cane harvesting and hauling may not provide a secure or steady source of income for many workers. Moreover, Mennonite communities that traditionally farm permanent fields of vegetables for their own use and for market have expanded into cash crops such as sorghum, and other local inhabitants have plantations of citrus and cacao. Some of these agricultural developments are of questionable sustainability; for example, citrus groves planted on poor-

quality soils in southern Belize are unlikely to thrive there (Arnold et al. 1989). More recently, efforts to promote tourism based upon ecological and archaeological attractions have developed (see Matola and Platt, this volume; Horwich and Lyon, this volume). These efforts hold promise, as sites such as Lamanai, Caracol, and Lubaantun are both attractive and reasonably accessible, but at present the most advanced tourist outfits focus upon the coastal cays, which has helped raise popular consciousness regarding the fragility of the reef but does not advance forest conservation.

Transition to Independence: Changes in Forestry in Modern Belize

The last important piece of colonial forestry legislation was the Forests Act (Chapter 176, Laws of Belize, 1980), which conferred authority upon government ministries to regulate the use of forests on both public and private lands and to create forest reserves by decree upon "Crown Lands" (now called "National Lands") (Nicolait and Franklin 1995). Following its independence in 1981, Belize built upon this legacy of the colonial government by creating the National Park System Act of 1981 to provide the legal basis for establishing national parks, natural monuments, wildlife sanctuaries, and nature reserves. A series of acts protecting threatened wildlife and specialized ecosystems such as mangroves followed during the 1980s, as the new Belizean government took stock of its resources and sought to protect them (Hartshorn et al. 1984; Arnold et al. 1989).

Yet the major problem, enforcement of forestry policies, was never addressed. Though timber extraction on public land is only done under concession licenses administered by the Forest Department, it is common knowledge that government officials are spread too thin to effectively monitor logging operations. The Forest Department makes as efficient use of its limited personnel as possible; the number of trees to be felled in a given concession is determined by Forest Department officials prior to the actual cutting, and only trees that meet the minimum diameter requirements can be extracted. Diameter limits are designed to make certain that loggers leave some reproductive individuals as seed sources for regeneration, and concessionaires are permitted to extract only those trees marked by the Forest Department during the site assessment (Hartshorn et al. 1984). Despite these precautions, there are too few foresters to ensure that loggers adhere to the cutting limits for particular species; where valuable species such as mahogany and cedar are concerned, loggers may take a short-term, profit-oriented perspective, knowing that chances are good that they will not get caught—and, as Forest Department officers cannot be on site for all logging operations, the loggers may be correct. At best, the officers can spot-check the timber during transport; if the loggers have exceeded cutting limits, any harm done is a fait accompli, and there is little the Forest Department officials can do about it. Forest Department regulations alone cannot prevent poor logging practices without adequate enforcement, and unscrupulous timber companies may attempt fraud and bribery on the occasions that they are inspected (Nicolait and Franklin 1995).

The enforcement problem is complicated by lack of a clear-cut division of responsibilities among ministries and departments designated to oversee natural resources. Assignment of departments to individual ministries occurs at the discretion of the prime minister, which in theory means that oversight of natural resources can vary among ministries from one administration to the next. Currently, creation and oversight of protected areas is divided among three departments—Forestry, Fisheries, and Archaeology—while responsibility for protection and "rational use" of natural resources lies with the Department of the Environment (Nicolait and Franklin 1995). Compounding matters, these four departments report to different ministries: the Forestry Department works within the Ministry of Natural Resources, while Fisheries, Archaeology, and Environment all report to the Ministry of Tourism and the Environment. Such division of labor must at least occasionally create situations where two departments either are working at cross-purposes or are duplicating each others' efforts. There is also a certain amount of inherent conflict in these divisions: for example, mangrove forests often act as hatching grounds for many species of fish; so should they be administered by Forestry or by Fisheries? And if a government-owned tract of forest contains valuable timber, but logging would damage a unique archaeological site, which department—Forestry or Archaeology—has the authority to make a decision on whether or not to cut timber? Such questions are made more urgent by the fact that the "minister in charge" of National Lands (a definition that changes according to the wishes of the current administration) has the power to reverse the protected status of reserve lands.

Tropical Forestry Action Plan

In 1989 Belize commissioned a Tropical Forestry Action Plan (TFAP) to be carried out by a team composed of experts from Britain, Canada, the United States, and the United Nations Food and Agriculture Organization (Arnold et al. 1989). This report observed that a sound legal structure for conservation and sustainable forestry had existed in Belize for decades, but that the poorly funded and understaffed Forest Department was incapable of implementing the existing laws. One notable problem cited by the TFAP was the de-reservation of protected lands. Ministers in charge of national protected lands have the ability to remove the restrictions for resource exploitation when "overriding public interest" dictated that such action was appropriate—but *only* after Forest Department personnel had collected adequate data on the current condition of the land, assessed the potential impacts of new land uses upon species there, and determined whether proposed uses of that land were

appropriate for the region. In practice, these precautions were virtually ignored; protected lands often were released for private use in a haphazard, arbitrary fashion irrespective of their ecological value, in large part because there were too few Forest Department officials to keep track of, much less slow down, the pace of development (Arnold et al. 1989). In short, forest management became a matter of policy but not practice, leading to ill-considered land conversion and waste of potentially valuable timber.

The TFAP recommended a number of changes to halt the trend toward forest degradation. First, the "high-grading" method by which most logging was done does not encourage regeneration of the preferred species. Because mahogany and other valuable species depend on high light levels, they do not regenerate well in the small gaps created by this system of timber extraction (Flachsenberg and Galletti, this volume; Snook, this volume). A more viable practice proposed by the TFAP would be to exploit a wider range of species so that forest gaps from logging are larger, allowing greater regeneration of high-quality timber. Monocyclic logging, rather than the polycyclic management system that had been in place, was deemed more appropriate to maintaining stocks of commercial species. In support of this point, the TFAP investigators observed that Belize's forests were adapted to catastrophic disturbance caused by occasional hurricanes and therefore regenerated best under conditions of high disturbance (Arnold et al. 1989). In conjunction with such intensive logging activity, however, the TFAP proposed increasing silvicultural research to determine the best methods of restocking the valuable species, as the available information was anecdotal at best (Brokaw et al., this volume).

A second proposal was to create the industrial capacity to process timber into high-value end products. It has been pointed out in other chapters (Galletti, this volume; Ponciano, this volume; Chayax Huex et al., this volume) that sale of raw timber brings the least revenue to the owners of forested land and therefore is not an effective or efficient way to transform timber resources into capital. Unfortunately, creation of processing plants requires capital, which most Belizeans—like the Peteneros and Mexican *ejidatarios*—simply do not have in sufficient quantity to support the cost of a brand new mill. The TFAP solution to this problem was to make gradual improvements by investing in small changes, purchasing used equipment from North American or European mills, and most importantly, investing in education and training for mill operators (Arnold et al. 1989). As mills gradually upgrade to the ability to produce high-value end products, they will require less timber to produce higher profits.

A final priority for the TFAP was increased efforts at data collection and scientific analyses. Of the three countries that comprise the Maya Forest, Belize is perhaps the best studied as a result of efforts by the colonial government (e.g., Lamb 1946; Wright et al. 1959), yet there is still too little information for effective resource management. Information on forest composition, growth rates and seedling requirements of important timber species, and the effects on regeneration of different land-use regimes are all topics of vital importance to the future sustainability of Belize's forests that require further investigation. In recognizing this fact, the TFAP sounded a precautionary note against the all-too-common practice of simply granting permission for resource extraction without taking into account its potential effects on the environment.

Beyond TFAP: Priorities for Belize in the Twenty-First Century

The Tropical Forestry Action Plan is now nearly a decade old. In the intervening years, a number of significant changes have taken place. Most important of these is the fact that the country has gradually gained a reputation as a superior tourist destination, a process accelerated by the publicity surrounding the Ruta Maya concept (Garrett 1989), which became widely known shortly after the TFAP was completed. Much of the tourism generated by this publicity focuses upon so-called archaeo-ecotourism or adventure tourism based upon Maya ruins and tropical forest species. This industry holds a strong potential to generate income—*if* the forests themselves remain intact to draw the tourists. This potential, however, can only be realized if TFAP's proposals to maximize production of timber by making more intensive use of forest species are carried out with an eye to maintaining a good environment for tourism. Moreover, timber production, no matter how carefully managed, has additional environmental repercussions that may be problematic. Even when programs to reseed or reforest logged areas are present and functional, there is still a possibility of topsoil erosion, which can lead to siltation of rivers and coastal waters (Primack 1993)—a potentially serious situation in light of the fact that Belize's coastal waters contain a major portion of the second-largest coral reef ecosystem in the world. Aside from its role as a major tourist attraction, the reef is home to many species of fish and coral, some of which are endangered or even extinct in other parts of the Caribbean (Primack 1993). Thus, logging that is not undertaken with considerable care could have far-reaching implications for both the economic and ecological future of Belize.

The TFAP's assertion that information collection is a priority is still valid; even if the Belizean government had the resources to embark on large-scale ecological and managerial research projects, it would still take decades to acquire comprehensive and detailed information given the sheer number of species that exist in these forests. Some of the missing information has been filled in through the efforts of nongovernmental organizations such as the Belize Audubon Society and the Programme for Belize. To its credit, the Belizean government has actively encouraged such efforts. For this reason, in spite of its budgetary constraints, Belize has never suffered from a lack of personnel conducting research; a small army of forest researchers, botanists, ornithologists, archaeologists, and other specialists descend upon Belize each

year, drawn by the wealth of information still hidden in the forests, funded by universities, private foundations, and government scientific and cultural organizations such as the U.S. National Science Foundation. This situation benefits Belize because the data generated from such foreign-funded projects are automatically made available to Belize's government agencies—interim and final reports are mandated in government-issued research permits, although most data are offered to appropriate departments as a professional courtesy anyway. However, the hidden drawback to this setup is that data analysis generally takes place in the researchers' institute of origin; although the information is returned to Belize, one valuable aspect—the learning process that occurs when the data are analyzed—departs the country when the researchers leave. This problem may be addressed through sponsorship of promising young Belizean students to university programs abroad, and through advanced degree programs for experienced departmental personnel, both of which have been undertaken to a limited extent as opportunities and funds present themselves. However, the urgent need for trained local researchers, both for Belize and for the Maya Forest as a whole, cannot be overstated.

The TFAP focuses on increasing the productivity of its forests in terms of timber extraction. However, several additional economic uses of the forest should be considered, as mentioned in the TFAP. While it is unrealistic to imagine that timber production will be excised from the Belizean economy, it is perfectly reasonable to suggest that perhaps timber, historically large in this small country's livelihood, should become in the modern era one piece of the total economic pie. Forests do have a role to play in the Belizean economy, but the challenge is to create a system involving national parks, watershed management, nature reserves, ecotourism, and nontimber forest products in which the presence of healthy, well-managed forests is the source of local income.

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