Illegal Logging In The Chiquibul Forest

An Economic and Ecological Valuation Assessment

2015

Reducing Illegal Trafficking of Timber in the Chiquibul Forest through a Consolidated Bi-national Effort

From: Friends for Conservation and Development (FCD)
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BACKGROUND

In the Chiquibul Forest, illegal logging was first detected in 2006. At the time, however, this appeared to be a single and isolated case found in the area of Rio Blanco, southern Chiquibul. By March 2008, a joint forces patrol documented that illegal logging was escalating and a logging trail network was evident. In late 2009, aerial flights conducted by FCD observed numerous illegal logging clusters. By 2010, joint patrols reported frequent and persistent illegal logging activities.

With financial assistance from the FAO/FLEGT Programme, an assessment conducted by FCD in 2012 demonstrated that an estimated 5,803,538 board feet of lumber with an aggregated value of US$9,448,144.00 had been extracted illegally within a perimeter of 34,188.74 hectares. The study proved that illegal logging, together with the advancement of the agricultural frontier, was one of two primary sources of deforestation in Belize's largest protected area. Based on the data obtained it was clear that all extraction of illegal timber was of a trans-boundary nature, namely from Guatemala. Illegal logging occurring up to 17 kilometers inside Belize, was severely destroying the mahogany and cedar populations within that zone of influence, where a high percentage of logged trees, fell below the minimum cutting diameter resulting in the loss of potential seed trees and leading to genetic erosion.

After two years of this first assessment, FCD with the support of the **EU FAO/FLEGT Programme**, has completed a second assessment with the aim of documenting and establishing the ecological and economic impacts of illegal logging in the Chiquibul Forest during this period.

INTRODUCTION

Rosander (2008), states that illegal logging is linked to corruption and organized crime; it fuels poverty and restricts access to natural resources. In addition, it has economical, social and ecological impacts (Lawson & MacFaul 2010; Li *et al.* 2008; Rosander 2008; Sheikh 2008; World Bank 2008). The World Bank (2006) estimates that in developing countries illegal logging causes an annual loss of more than US$ 15 billion and is responsible for lowering wood products prices (up to 16% on certain products) globally (Lawson 2007) and constitutes 10% of the global timber trade (RIIA 2003). Some argue that weak law enforcement benefits the poor as they can make use of the forestry resources without paying due taxes (World Bank 2006). On the other hand many rich and powerful individuals are involved in illegal logging activities and usually employ the rural poor who gain marginal benefits (World Bank 2006) and are usually the ones caught and jailed.

Illegal logging has become an issue of global concern. It is estimated that 80% of timber harvested in Bolivia is illegal, while in Brazil 80% and in Columbia 42% of all timber has an illegal origin (Guertin 2003). For Central American countries such as Honduras and Nicaragua, the Forest Integrity Network (2003) reports an annual net loss of US$12-18 and US$8-12 million respectively, as a consequence of illegal logging. While the LMB Daily (2003) states that Indonesia is losing an estimated US$600 million annually to illegal logging. In the US, illegal logging in national forests represents a loss of at least US$1 billion (FIN 2003).

Illegal logging has ecological impacts (Lawson & MacFaul 2010; Sheikh 2008). Some direct impacts include the loss of biodiversity (in many cases depletion of wild animal populations that depend on ecosystems being logged) and if this occurs within protected areas, such as the case of the Chiquibul Forest, important biological and ecological functions are altered (Lawson & MacFaul 2010). Since illegal logging is carried out with no regard of protecting the ecological integrity of the system, it leads to many collateral damages including damage to other tree species, decrease in the amount of standing seed trees (reducing seed banks, which is directly linked to reduction of targeted species natural regeneration ability), deforestation (Rosander 2008), increase in the risk of forest fires and lowers the potential for sustainable harvesting of timber species (Lawson & MacFaul 2010), which may also lead to soil erosion and sedimentation, leading to effects of water pollution.

METHODOLOGY

The study was conducted in the Chiquibul Forest (for detailed site description refer to Arevalo & Chan, 2012). A total of 10 transects were established running on a general east to west direction (Figure 1). Transects ranged from 2.5 to 6 km in length. A total of 353 ha. were surveyed within the Chiquibul National Park, Caracol Archaeological Reserve and Chiquibul Forest Reserve. All illegally logged trees within a distance of 50 meter on both sides of the transects were recorded. The recorded variables included: species, perpendicular distance to trail (m), diameter at cut height (cm), diameter at cut end (cm) and commercial bole length (m). In addition, to the above variables, the geographic coordinates were taken for each tree. The diameter of logged trees was measured, excluding the trees" bark, using a carpenters tape where possible or a diametric tape.

The commercial bole length (referred to the length of the tree from which lumber can be obtained) of the trees was regarded as the bole length of the same to the first major fork, but if above branches were of suitable diameter and more than or equal to 3 m in length these were also measured both for diameter and length. The commercial bole length was estimated based on field evidence left behind by loggers. This was achieved by estimating a distance between the logged tree stump and the cut end (usually at the first major tree branching). Great care was taken to avoid over estimating the length due to log displacement during the felling process. This was achieved by carefully analyzing the area where the tree was sawn.
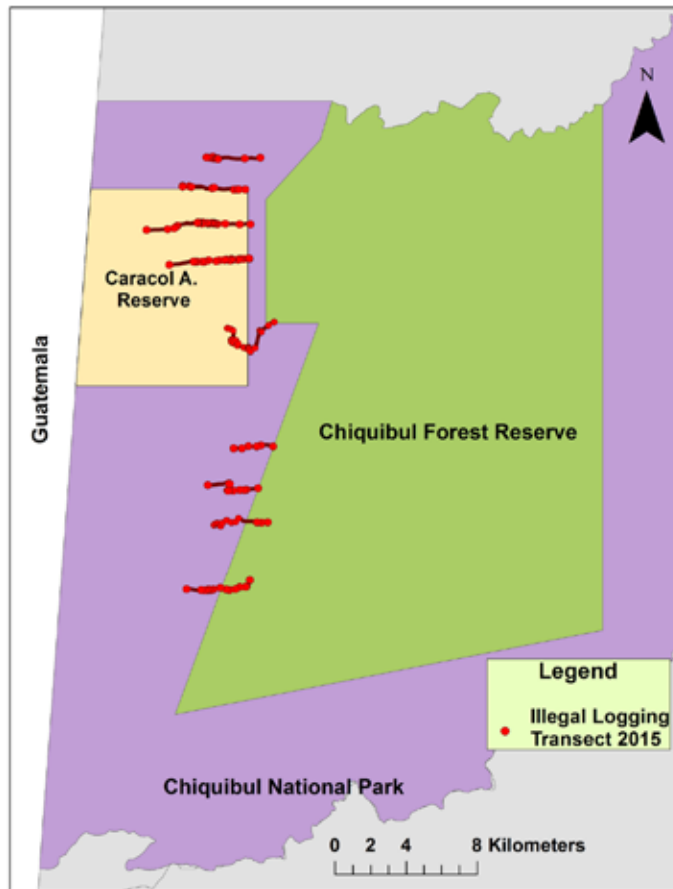
Figure 1: *Spatial distribution of transects used for the 2015 illegal logging assessment*

In order to calculate the commercial volume of logged trees the following variables were recorded: diameter at cut height, diameter at cut end and commercial bole length. The commercial volume of the trees was estimated using the Smalian's Formula (See Formula 1). This formula is based on calculating the volume for the frustum of a paraboloid. Although this formula tends to slightly over estimate the real volume of a tree it was the most accurate in this case as it was only possible to measure the above mentioned diameter as most to all of the commercial length of the trees had been sawn, preventing the measurement of intermediate log diameters. Once the volume of the tree was calculated, then the quantity of board feet was obtained. This calculation was conducted following the conversion factor of CONADEH (2009), where it states that 1 m3 of timber in logs will yield 262 board feet if it was to be sawn in a saw mill. The economic value of the timber was calculated based on the current national prices for a board foot of mahogany and cedar, which on average a board foot of mahogany is valued at US $2.25, and cedar at US $2.00 (US $ 1= Bz $ 2).

Formula 1: Smalian's Formula: $V = \dfrac{h}{2}(A_b + A_u)$
Where:

      V = volume
      h = commercial bole length of tree
      A_b = cross sectional area of tree at cut height
 A_u = cross sectional area of tree at cut end

An Illegal Logging Zone of Influence (ILZF) was then identified. The zone of influence refers to the territory within the Chiquibul Forest that has been impacted by illegal logging. The identification of this zone was made possible by projecting the geographic coordinates of catalogued logged trees within the Chiquibul Forest. This data was mainly collected during routine ranger patrols over the last five years (2010 to mid 2015). Once the coordinates were projected using ArcGIS, a polygon was drawn by connecting the far extreme points (logged trees with greatest distance into Belizean territory). The "Zone of Influence" was used as a proxy to estimate the severity of illegal logging occurring within the Chiquibul Forest.

RESEARCH RESULTS

The Illegal Logging Zone of Influence (area impacted by illegal logging) has shown an increase of 2.5 times from 2010 to 2015 (Figure 2 and Figure 3) and appears to have reached a saturation point in 2014. From May 2014 to the time of the end of the study has shown a 3.3% increase, however, it is important to note that no new illegal logging activity has been reported in the Chiquibul Forest since September of 2014. Thus it can be presumed that illegal activity increase would have occurred within May 2014 to October 2014. The present illegal logging zone of influence is 4.4 times bigger than the Caracol Archaeological Reserve or equivalent to 75% of the Chiquibul Forest Reserve.
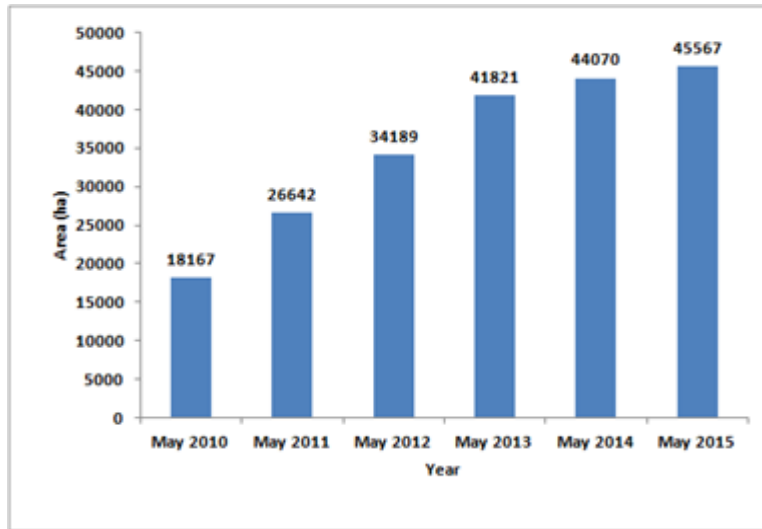
Figure 2: *Growth in area of the illegal logging zone of influence in the Chiquibul Forest from May 2010 to May 2015*
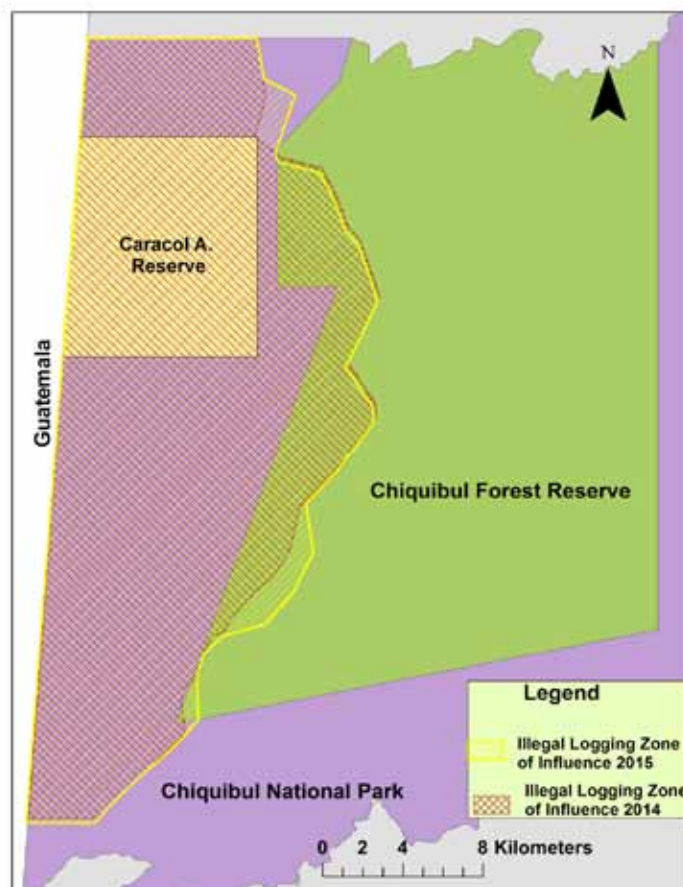
Figure 3: *Spatial representation of the area affected by illegal logging activities in the Chiquibul Forest*

Targeted tree species were Mahogany (*Swietenia macrophylla* King) and Cedar (*Cedrela odorata* L). Illegally logged mahogany trees were smaller in diameter and bole length compared to cedar trees (Table 1) but with higher densities. Density of illegally logged mahogany was 0.21 trees per hectare, while 0.1 cedar trees per ha. have been illegally logged.

Table 1: Mean diameter at cut height and bole length of illegal logged mahogany and cedar trees in the Chiquibul Forest

Species	Variable	Mean	Minimum	Maximum
Mahogany	Diameter at cut height (m)	0.548	0.32	0.80
	bole length (m)	10.99	3.4	18.5
Cedar	Diameter at cut height (m)	0.592	0.32	1.15
	bole length (m)	11.30	3	18.3

A total of 8,725,833 board feet of lumber have been illegally extracted from the Chiquibul Forest, having an estimated monetary value of US $18,830,387.00 (Table 2). Illegal harvesting intensity was 121 board feet of mahogany and 70.46 board feet of cedar per hectare.

Table 2: Volume and economic value of illegally harvested timber in the Chiquibul Forest, 2015

		Volume (m3)	Board feet	Value (US$)
Mahogany	Mean per tree	2.23	585.24	12,408,500.00
	mean per hectare	0.46	121	
	Projected total ILZF	21,049	5,514,889	
Cedar	Mean per tree	2.79	731.6	6,421,887.60
	mean per hectare	0.28	70.46	
	Projected total ILZF	21,049	3,210,944	
Total				18,830,387.60

DISCUSSION AND CONCLUSION

Until late 2014, illegal logging remained one of the most important threats to biodiversity conservation in the Chiquibul Forest. Loggers have been targeting mahogany and cedar, since the two species have a high local and regional market value and demand. This illegal activity has led to the depletion of targeted species population within an area 4.4 times greater than the Caracol Archaeological Reserve. However, since September of 2014, no new illegal logging activity has been recorded. One assumption is that the illegal logging zone of influence has not increased as drastically compared to previous years because the further an illegal logger venture into the Chiquibul Forest, the more difficult it becomes for them since travelling time increases and the probability of being intersected by law enforcement agencies increases. Also transportation of lumber becomes a more arduous, intense and dangerous endeavor. Nonetheless, illegal loggers are able to evade law enforcement units by conducting their illicit activities in a random fashion and operating at night. Another factor that may be helping in the decrease of illegal logging is the increased presence of mobile law enforcement units in Southern Peten, Guatemala that target the illegal

extraction of forest products. An improved number of park rangers and security forces in the Chiquibul Forest, has meant likewise more law enforcement patrols within the illegal logging hotspots in the Chiquibul, helping reduce the illicit activity. However, we cannot assume that the area is now free of illegal logging or that illegal logging will not occur in the Chiquibul Forest in the near future, given that illegal activities have a dynamic trend.

From 2012 to 2015 the density of illegally logged mahogany and cedar trees has increased from 0.14 trees per hectare to 0.206 for mahogany, and from 0.091 cedar trees per hectare to 0.96 trees per hectare. But the mean volume for both mahogany and cedar has decreased from 2012 to 2015. Mean volume for illegally harvested cedars in 2012 was 3.47 m3 while in 2015 it was 2.79 m3. For mahogany it decreased from 2.39 m3 in 2012 to 2.23 m3 in 2015. Compared to the 2012 illegal logging assessment (Arevalo & Chan 2012), the volume of timber illegally extracted for mahogany was 0.33 meter cubic per hectare in 2012 to 0.46 meters cubic per hectare in 2015, but for cedar it has decreased from 0.33 meters cubic to 0.28 meters cubic in 2015. This data clearly indicates that illegal loggers have severely impacted the mahogany and cedar populations in the Chiquibul Forest, coupled with the fact that 69% of logged trees fall below the minimum cutting diameter (62 cm) established by law. This occurrence has ecological implications on the targeted populations, such as loss of potential seed trees, necessary for the continued process of natural regeneration, reduction in the seed banks essential for regeneration after severe destructions such as hurricanes and fires, alteration of population age structure (great variability in age structure is required by a population assures population viability over time) and ultimately leading to genetic erosion as the few remaining standing trees will (if possible) produce the following generation.

Since illegal loggers are interested mainly on high grade timber, the activity is very wasteful. During the 2012 assessment it was estimated that on average 30% of felled trees are left to rot in the forest. This pattern is likewise documented in the 2015 assessment. The practice is also ecologically destructive as lack of best logging practices are not employed leading to deforestation at an average of 0.05 ha. per tree (Arevalo & Chan 2012).

Although illegal logging is presently not occurring in the Chiquibul Forest the impacts are evident. It has caused an economical loss of over US $18.8 million and has resulted in the depletion of targeted species population in a 45,567 hectares within the Caracol Archaeological Reserve, Chiquibul National Park and Chiquibul Forest Reserve. Factors that may be leading to the decline in illegal logging is the increasing distance from the Guatemalan border to the timber stocks; an increase in law enforcement patrols within the Chiquibul Forest and the mobilization of mobile patrols in Guatemala targeting illegal extraction of forest products in Southern Peten.

RECOMMENDATIONS

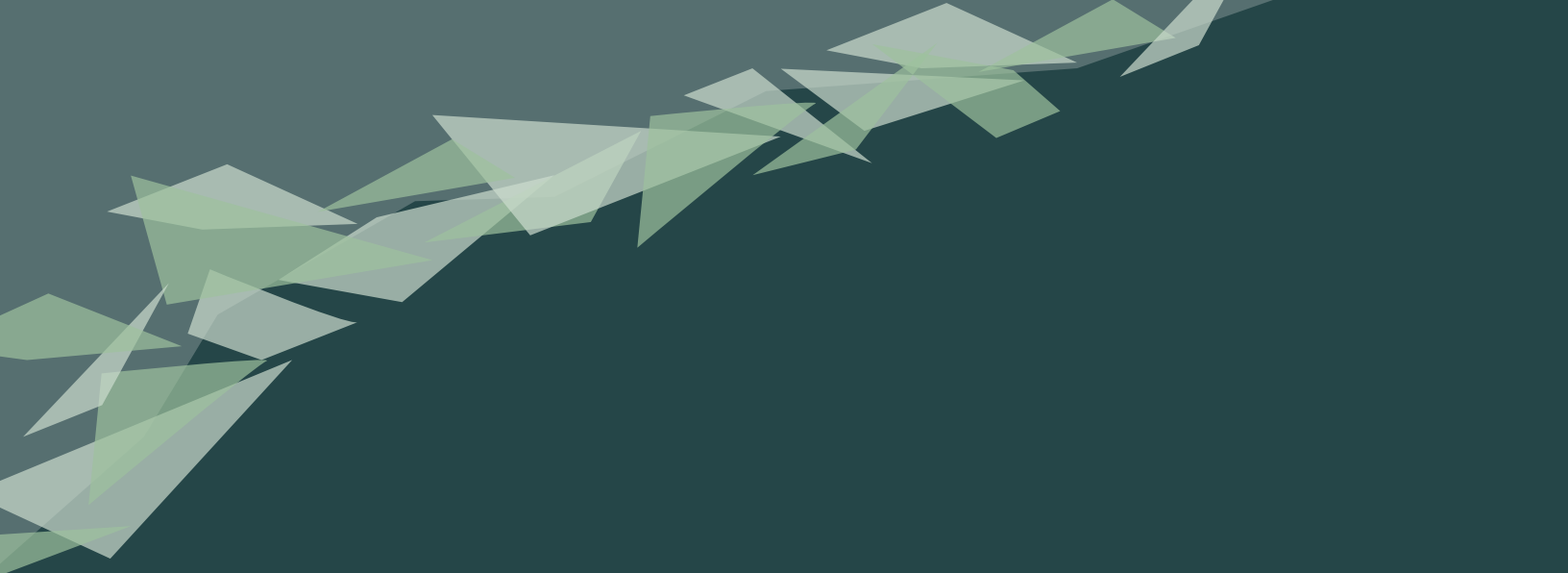Based on the result the following is recommended:

- Conduct an inventory survey of remaining timber trees in the affected zone, to understand population demographics of target species.

- Continue lobbying for an increased fine on illegal logging activities so as to serve as a viable deterrence.

- Institute a cross sectorial working group or commission to address illegal logging in the Chiquibul Forest.

- Obtain support from regulatory agencies and implement focalized patrols at night in order to have a more intense success rate at intercepting illegal loggers.

- Further consolidate the bi-national efforts to combat illegal logging activities across borders.

- Identify and solidify three years of finances with EC FAO/FLEGT and/or other institutions in order to have an enforcement and monitoring presence to control and reduce the effects and impacts of illegal logging in the Chiquibul Forest for the long term.

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