

PATTERNS AND ENVIRONMENTAL IMPACTS
OF DRUG TRAFFICKING IN GUATEMALA

by

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A directed research report submitted to the Geography Department of

Texas State University in partial fulfillment

of the requirements for the degree of

Master of Applied Geography

with a specialization in Environmental Resource Management

August 2020

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Acknowledgements

I would first like to thank Dr. Jennifer Devine, my graduate advisor, for inspiring me to get my master's degree in the first place and for helping me through this project at every stage. I would also like to thank my committee member Dr. Nathan Currit for his invaluable contributions both to this project and my master's degree.

I want to express extreme gratitude to my amazing professors, both during my undergraduate and graduate education, at Texas State University: Dr. Brian Cooper, whose enlivening lectures inspired me to change my undergraduate major to geography, Dr. Andrew Sansom for his classes in conservation that helped put a lot of this research into context, and I would like to thank Dr. Hagelman for being patient with me and helping me develop this project into a viable directed research as well as giving me real-world experience in environmental consulting.

I next want to thank my mother and father, Charles and Barbara Brooks, for supporting me throughout my education and my entire life, and for giving me the tools I needed to be successful.

Next I would like to thank the entire Texas State Quidditch organization for giving me a lifelong passion and lifelong friends to go along with it. My deepest appreciation goes to Tess Acosta, Melissa Kite, and Clayton Carlisle for their unwavering support and friendship- especially Tess, who has been there since literally day one of college.

Lastly, I would like to thank my boyfriend, Bradley Himes, who has been a steady beacon of love and support for my entire adult life, and I cannot thank him enough for that.

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List of Abbreviations

Abbreviation	Description
MBR	Maya Biosphere Reserve
DTO	Drug Trafficking Organization
UNESCO	United Nations Educational, Scientific and Cultural Organization
PAN	Partido Acción Nacional (National Action Party)
CCDB	Consolidated Counterdrug Database
JIATF-S	Joint Interagency Task Force-South

ABSTRACT

Narco-trafficking and the illicit industry's associated money laundering operations are becoming clearer contributors of land use change and land degradation in Guatemala. In the past, public officials and opinion often blamed small-scale, Indigenous and non -Indigenous farming communities for large scale land use change, but this research project demonstrates that the large numbers of cattle ranches and palm plantations driving deforestation are funded by narco-capital. The analysis draws on two separate databases: the first is a collection of *Prensa Libre* newspaper articles detailing cocaine seizures and interdiction efforts, and the second is called the narco-degradation database, which was compiled from 20 different interviews with community leaders which were conducted in 2017 and were transcribed and coded in 2018.

The first database provides a clear picture of interdiction seizures for three transportation methods, air, maritime, and land. The second provides context as well as a link to the money laundering activities of the drug trafficking organizations. Mapping the drug smuggling data reveals that drug traffickers rely more heavily on maritime and air travel, while analysis of the narco-degradation data demonstrates that drug trafficking organizations are laundering money in mass in palm oil plantations and cattle ranching. These agro-industrial land uses have

severe implications for their surrounding environment. Further complicating the issue is the drug traffickers' exploitation of protected areas of the Maya Biosphere Reserve, use of land grabbing tactics that dispossess Indigenous and non-Indigenous peasants, and large-scale impunity for these crimes.

I. Introduction

Central America is utilized today as the transit zone between South American cocaine production and consumers in North America. This transit zone is made up of different nodes (countries) that may activate and deactivate with the changing political climate and in response to interdiction efforts in any of the Central American nations (McSweeney et al., 2018). Guatemala is an important node in this transit zone. The government is weak in the aftermath of the 30-year civil war, which ended in 1996, and has left a power vacuum in which drug trafficking organizations (DTOs) operate with relative impunity (Devine et al., 2018).

Environmental impacts of drug trafficking operations take many forms, but the most common is cattle ranching and oil palm plantations for money laundering and territorial acquisition for drug smuggling (McSweeney et al., 2014). Narco-capitalized agro-industries have serious implications for the environment and surrounding ecosystem. However, drug trafficking data is both difficult and dangerous to acquire, and thus, research is limited on the topic.

This project contributes to this research gap by detailing the spatial and temporal patterns of drug trafficking and their environmental impacts. Following Devine et. al (n.d.) use the term “narco-degradation” to capture these wide-ranging environmental impacts that are associated drug trafficking or funded with narco-capital. Narco-degradation is a phenomenon that has been relatively understudied in literature, as the focus of narco environmental impacts has been narco-deforestation thus far (for exceptions see Devine et al., 2018; McSweeney et. al, 2014; Sesnie et. al, 2017). However, environmental impacts have more wide-ranging effects than just the loss of

tree cover. These activities and their impacts vary significantly; however, I will be focusing primarily on cattle ranching and oil palm plantations' contribution to narco-degradation.

To contribute to the gap in the knowledge of this topic, I ask the following questions: first, what are the spatial and temporal patterns of drug trafficking in Guatemala from 2000-2018? And second, what are the environmental impacts of this drug trafficking? To answer these questions, I utilize two databases that were produced by the PEGASUS Project Research Team, co-led by my advisor and funded by a Future Earth grant. The first database is a media database, a collection of extracted data from the main Guatemalan national newspaper, the *Prensa Libre*. This data details interdiction efforts and cocaine seizures reported in the *Prensa Libre*, from 1995-2018. The second database is what we call a “narco-degradation” database, which was compiled from 20 different interviews with community leaders in the protected areas in Guatemala that are being affected most. These interviews took place in 2017 and were transcribed and coded in 2018, creating the database.

This research reveals that narco-degradation is directly related to DTOs drug smuggling and money laundering activities. Cattle ranching and oil palm are the most prevalent forms of money laundering for DTOs, and these two activities have devastating effects on the land. To launder money, DTOs invest in cattle ranches and oil palm plantations, often within protected areas, which also serve as a remote trafficking territory.

My research into the effects of drug trafficking on the environment through money laundering in Guatemala seeks to broaden the scope of land use change driven by narco-trafficking activity. I draw on existing research into narco-deforestation and incorporate

Geographic Information System (GIS) techniques to identify spatial and temporal patterns of interdiction efforts, money laundering operations, and transportation methods in Guatemala.

II. Background

Until very recently, the blame for deforestation in Guatemala was often placed on small scale, subsistence farmers (Devine, 2018; Ybarra, 2018). Research by both McSweeney (2014) and Sesnie (2017) has proved this to be false. The real driver of this deforestation has been found to be cocaine trafficking networks and the money laundering activities they engage in as part of the trafficking operation. In Guatemala, the primary source of money laundering for DTOs is cattle ranches, and the majority of these enterprises are located deep into the forests, on protected land (Devine et. al, n.d., McSweeney et. al, 2017). Cattle ranches are especially effective in deforestation, as the land cannot recover as it would from a normal forest fire. The cattle graze the land to the dirt, and also trample the grasses and shrubs that remain in place of the trees. This makes it difficult for primary and secondary successors to reestablish themselves on the land. All of this makes the land unable to recover, and unusable for agricultural activity (Butler, 2019).

Guatemala has 14 different distinct ecoregions (Figure 1): Central American Atlantic moist forests, Central American montane forests, Chiapas montane forests, Petén-Veracruz moist forests, Sierra Madre de Chiapas moist forest, Yucatán moist forests, Central American dry forests, Chiapas Depression dry forests, Central American pine-oak forests, Motagua Valley thornscrub, Belizean Coast mangroves, Northern Honduras mangroves, Tehuantepec-El Manchón mangroves, and Northern Dry Pacific Coast mangrove- which leaves room for a

multitude of different land use changes and environmental effects to be possible (Carr, 2008, DeClerk et. al, 2010).

Ecoregions Guatemala

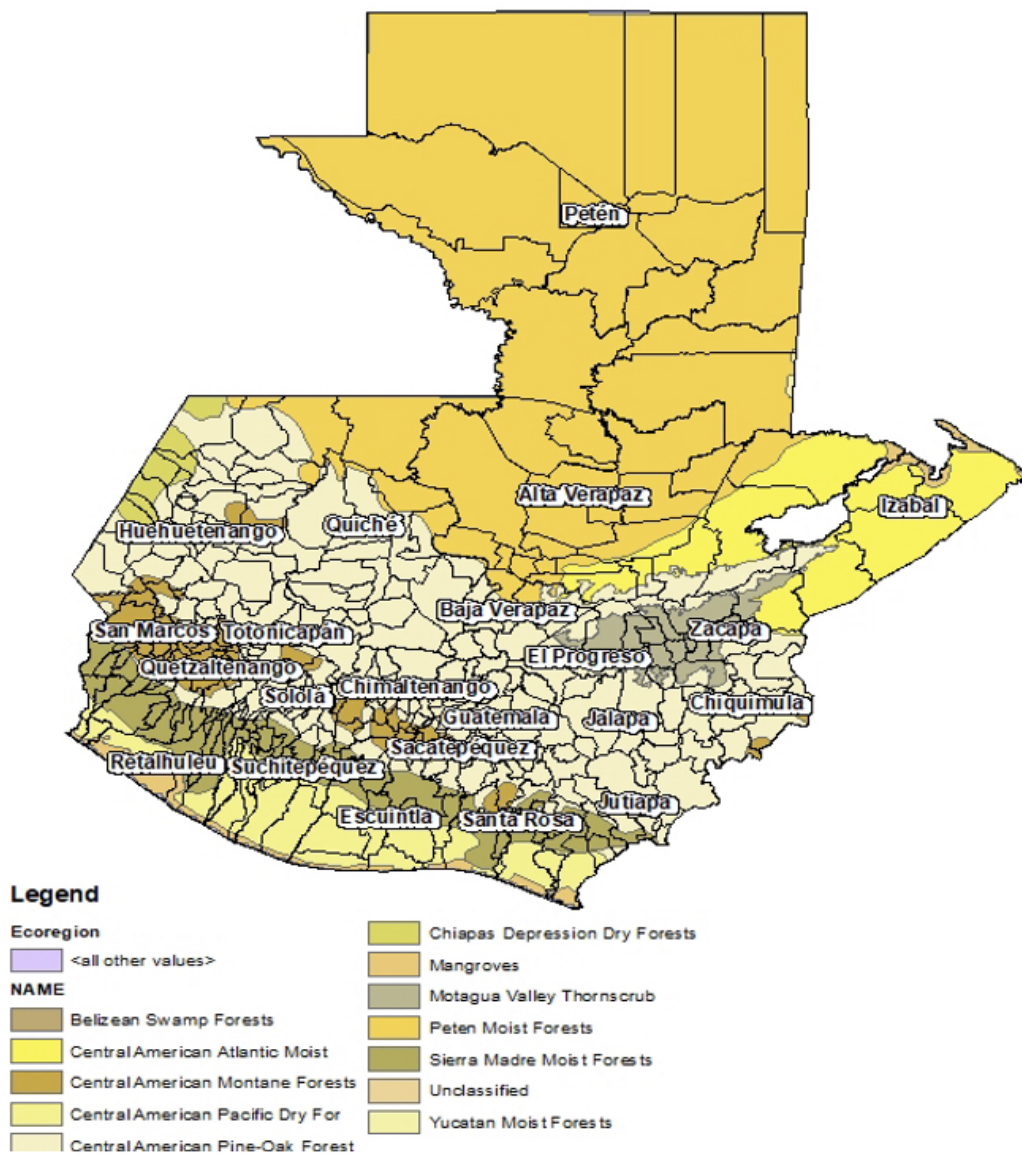


Figure 1: Ecoregions of Guatemala
Source: Sarah Brooks

The Maya Biosphere Reserve is located in the Petén department in the north of Guatemala (see Figure 2). It is one of the three UNESCO biosphere reserves within the larger collective of the tri-national Maya Forest. The multiple use zone in the eastern portion of the reserve allows for Indigenous Maya and non-Indigenous communities to practice subsistence farming, while also protecting the land as much as possible (Carr, 2008; Devine et. al, 2020). The western part of the Maya Biosphere is home to two large national parks, Laguna del Tigre and Sierra del Lacandón. The southern border of the Maya Biosphere is a buffer zone between the areas of the Maya Biosphere with land use restrictions and rest of the department of the Petén.

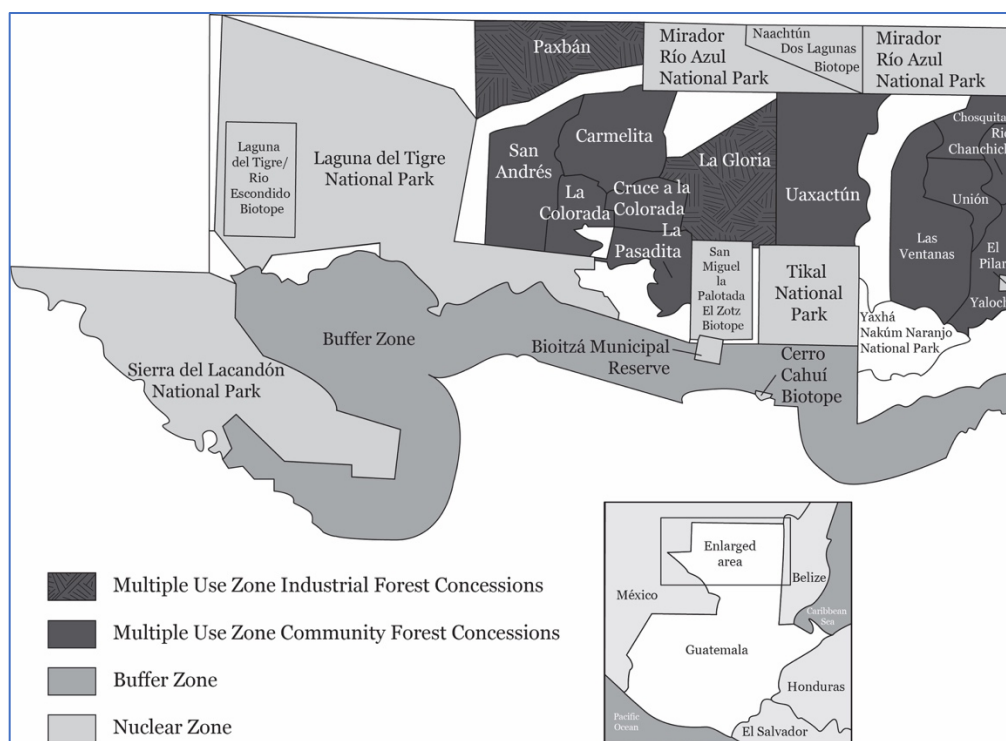


Figure 2: Maya Biosphere Reserve Land-Use Zones
Source: Jennifer Devine

The MBR was created in 1990 in order to preserve part of the largest remaining forest in Central America, the Maya forest. Eco-tourism, one particular method of preservation has brought in a new revenue stream for the region. Tourists come to Guatemala to see the beautiful forests of the reserve, and their impacts are minimal compared to extractive industries. What is not minimal, however, is the effect that narco-capitalized land use change is having on the Maya Biosphere. DTOs are exploiting the protected status of the forests of northern Guatemala to lend them cover to transport illicit goods and prop up money laundering operations. The result is an impasse between DTOs, the Guatemalan government, and those involved in international interdiction efforts that allows the narcos to operate with relative impunity, to the detriment of both the land and the people that call the reserve home.

III. Literature Review

Money laundering and other illicit narco activities in Guatemala are key drivers of land use change and degradation in the region. While there is a body of research on this topic, much of it is focused on “narco-deforestation” (Sesnie et. al, 2017) rather than multiple environmental impacts, what I refer to as “narco-degradation” when perpetrated by narco groups. This research seeks to answer the question, what impacts do cocaine trafficking and their associated money laundering activities have on the Guatemalan environment from 2000 - 2018?

Cocaine Trafficking Trends in Central America

There is a lack of data of cocaine trafficking in Central America, therefore for this research a more complete database for Guatemala had to be created (McSweeney, 2020). The incompleteness of this data has made it difficult for proper analysis of cocaine trafficking trends in the region. To understand the effect of cocaine trafficking in Guatemala today, it is important to understand the history of the effect of the US War on Drugs on Central America (United Nations Office on Drugs and Crime, 2012). Prior to the 1990s, around 90% of cocaine was primarily trafficked to the United States through Caribbean. Interdiction efforts in the islands, however, led the Columbian cartels to switch routes to Central America, particularly Mexico. The PAN party in Mexico won the presidential election in 2000 and began to implement military interdiction policies, which created a new “balloon effect” of pushing drug trafficking activities into Central American countries and Guatemala’s Maya Biosphere Reserve in particular (United Nations Office on Drugs and Crime, 2012, McSweeney et al., 2015, Devine et al. 2018).

The Consolidated Counterdrug Database (CCDB) has been evaluated by researchers as being high quality in nature, but inadequate in its actual content (McSweeney, 2020). The database is now managed out by the Joint Interagency Task Force-South (JIATF-S), meaning much of the data available to them had to be requested, as it is classified and not publicly searchable. It was created to support interdiction efforts in Central America, but in reality, its numbers show that current interdiction efforts are actually ineffective at intercepting cocaine and even add to the problem (McSweeney et al. 2018). Today, 90% of cocaine is trafficked through Central America.

Land Use Change, Land-grabs, and Environmental Impacts

Land in Guatemala is quickly being bought and consolidated by corporations looking to expand their enterprise, mostly sugarcane and oil palm plantations. The land-grab frenzy by corporations is lending legitimacy to the narco land-grabs taking place simultaneously (Alonso-Fradejas, 2012, McSweeney et. al, 2017). The DTOs are taking advantage of the remote and isolated national parks of the Maya Biosphere Reserve to smuggle drugs and launder money (Carr, 2008, Alonso-Fradejas, 2012, Devine et. al, 2018). These areas are meant to conserve and protect the Petén department from the exact activities the protected status seeks to mitigate (McSweeney et. al, 2017, Devine et al, 2018).

Cattle ranching in particular is expanding and pushing subsistence farmers off the land and crowding them into smaller and smaller plots of nutrient-poor land, and further into the protected zone of the Maya Biosphere Reserve, exacerbating the degradation of the land (Carr,

2008). In the MBR, DTOs routinely force subsistence farmers and indigenous peoples off of their land, and bribe government officials to legitimize their purchases (Elbein, 2016).

It is important to note the distinction between Central America and Latin America in this study. Latin America includes South America, which is referred to as the production zone of the cocaine corridor, while Central America is the transit zone. DTO land grabbing tactics are a key driver of environmental degradation in the region. A study of narco land-grab activities in the Honduran Moskitia region outlines the manner in which cocaine trafficking organizations acquire land to use for money laundering operations. McSweeney et al. (2018) provide an interpretation of the importance of transit zones in global commodity chains, particularly in the cocaine trade. This analysis, however, needs to be expanded upon and put into Guatemalan context. My own analysis of the media database in ArcMap provides a small insight into the spatial patterns of cocaine trafficking organizations' money laundering techniques.

Narco land grab tactics are also being studied in the production zone of the cocaine corridor (Ballvé, 2012). Ballvé 2012 provides an analysis of narco land grab methods, focusing on Colombia, particularly the subregion of Urabá. Ballvé's study outlines an alliance between the narcos and the elites in the region. While paramilitary groups provide protection DTOs are employing vicious land appropriation tactics in order to expand their money laundering operations (Ballvé, 2012). This study gives excellent insight into the relationships between narcos and the communities they reside in, but again, is not focused on Guatemala or narco-degradation, which is where my research steps in. Ballvé's analysis of narco alliances in Colombia provides a framework for understanding those same alliance relationships in Guatemala, while understanding the differences between the two as part of the production zone and transit zone, respectively (McSweeney et al. 2014).

Cattle ranching is one of the biggest money laundering operations in the Central American transit zone (McSweeney et al. 2014). McSweeney et al. 2014 find a direct correlation between interdiction efforts and deforestation. Seizures of cocaine led to movement by the cartels, which spreads their money laundering operations, including and specifically cattle ranching. Cattle ranching in the region requires massive amounts of land, which leads to narcos having immense territorial control and large-scale money laundering operations (McSweeney et al. 2015).

I also seek to expand upon my advisor, Dr. Devine's, research into narco-deforestation and narco-degradation and provide further analysis into the effects of narco money laundering, particularly narco-capitalized cattle ranching, on land use and degradation in Guatemala (Devine et al. 2018). Dr. Devine's research also posits that the wide-reaching effects of narco-cattle ranching are a direct effect of the demand for cocaine in the United States and the failure of the War on Drugs to make a profound impact on the illicit cocaine trade, as well as the post-civil war issues that Guatemala is facing. My research corroborates, builds on, and expands this work.

IV. Methods

The question that my research seeks to answer is as follows: what are the spatial and temporal patterns of drug trafficking in Guatemala between 2000 - 2018? And, what are the environmental impacts of drug trafficking? To answer this question, I am utilizing two databases that were produced by the PEGASUS Project Research Team. The first is a collection of newspaper articles from Guatemala's preeminent newspaper, *La Prensa Libre*, detailing cocaine seizures and interdiction efforts. The other database is what the team calls the narco-degradation database, which was compiled from 20 different interviews with community leaders in the protected areas in Guatemala that are being affected most. These interviews took place in 2017 and were transcribed and coded in 2018, creating the database.

Data collection:

The media database is a collection of extracted data from the *Prensa Libre* newspaper. To fill in the gaps of the data, a currently unpublished database was compiled by Dr. Jennifer Devine and her collaborators on the PEGASUS project. 793 articles were collected and input into the database which analyzes newspaper reports on interdiction efforts from 1999-2018. The database provides a more in-depth look at the actual number of cocaine interdiction operations in Guatemala, as well as money laundering operation information, including the method: cattle ranching and oil palm farms being the most prevalent operations (Devine et al. 2018). Data detailing cocaine seizures and interdiction methods was then analyzed to determine the location, amount seized, and transportation method. The database also notes if any evidence of money laundering is detected, and, if so, what kind of operation it is. The articles date back to 1995, and

continue until early 2018, when the research was completed. Any narco-related event that featured a kilo or more of cocaine was entered into the database, or any event that mentioned seizure of cocaine. These events also mention the transport used to get the cocaine to the place where the event took place: air, maritime, or land.

The narco-degradation dataset was collected by the PEGASUS research team in Guatemala from 2017 - 2018. The PEGASUS team interviewed twenty protected area managers and residents to find first-hand accounts of the instances of narco-capitalized land use change in the reserve using participatory mapping methods. They also asked respondents to detail how those operations impact both the environment and conservation governance in the Maya Biosphere Reserve. There are 41 recorded mentions of money laundering in the region, 9 of which have confirmed narco-driven land degradation at that location. The largest sub-group is cattle ranching with 34 of the 41 entries, and all of the 9 confirmed narco-degradation entries are related to cattle ranching.

Data Analysis:

In my analysis, I created graphs, tables, and maps based on the content of both databases. For the media database, I isolated variables relevant to this research which are listed in Table 2. Analysis of the media database reveals that not all of the 793 articles mentioned a type of money laundering operation, so the articles had to be combed through to extract the ones with relevant data. This was done by searching for any entry under the money_laundering variable. Then, once those were isolated, it was left to determine which type of money laundering was taking place; cattle ranching, oil palm plantations, fishing, mining, exports, or “other”, which was not clearly defined in the database or the articles themselves.

After creating these tables, I plugged the datasets into ArcMap, creating the three transportation method maps, as well as the aggregate and pattern of flows maps detailed in the following section. The reliance on *Prensa Libre* articles presents a unique problem; reporting on drug trafficking activities is not a safe venture, so many incidents

Table 1: Prensa Libre Events

	A	B	C
1	Department	ID_1	Events
2	Chimaltenango	2	1
3	Chiquimla	3	2
4	Escuintla	5	4
5	Guatemala	6	61
6	Izabal	8	5
7	Jutiapa	10	1
8	Petén	11	8
9	Quezaltenango	12	4
10	Retalhuleu	14	1
11	San Marcos	16	3
12	Suchitepequez	19	2
13	Zacapa	21	4

may have gone unreported, which would suggest that the actual numbers are much higher in reality.

For the narco degradation database, I once again isolated the variables. The database was compiled from 20 different interviews and participatory mapping exercises with community leaders in the areas most affected. The interviews were coded to create the narco-degradation database for the Petén. The database also has 107 entries of narco-driven environmental degradation, and notes if any evidence of money laundering is detected, and, if so, what kind of operation it is. As the following section explains, I found that cattle ranching and palm plantations are the most commonly utilized form of money laundering for the narcos, and that the preferred location for these operations is usually forested and has some form of protected status.

Table 2: Prensa Libre Money Laundering Events

1	Guatemala, Media Database_1 1.1.19 Level0	Level1 (Department)	GADMCode_Level1	Department	GADMCode_Level0	Country	Moneylaundering	enrolledsectorc	enrolledsectoro	enrolledsectorfi	enrolledsectoric	enrolledsectorm	enrolledsectorm
3	GT	GT05	Escuintla	Escuintla	Guatemala	Guatemala	1						
4	GT	GT05	Escuintla	Escuintla	Guatemala	Guatemala					1		
5	GT	GT05	Escuintla	Escuintla	Guatemala	Guatemala				1			
6	GT	GT05	Escuintla	Escuintla	Guatemala	Guatemala							1
7	GT	GT18	Izabal	Izabal	Guatemala	Guatemala	1						
8	GT	GT05	Escuintla	Escuintla	Guatemala	Guatemala							1
9	GT	GT05	Escuintla	Escuintla	Guatemala	Guatemala				1			
10	GT	GT05	Escuintla	Escuintla	Guatemala	Guatemala				1			
11	GT	GT18	Izabal	Izabal	Guatemala	Guatemala							1
12	GT	GT18	Izabal	Izabal	Guatemala	Guatemala				1			
13	GT	GT17	Petén	Petén	Guatemala	Guatemala	1						
14	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
15	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1	1					
16	GT	GT19	Zacapa	Zacapa	Guatemala	Guatemala	1						
17	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
18	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
19	GT	GT11	Retalhuleu	Retalhuleu	Guatemala	Guatemala	1						
20	GT	GT05	Escuintla	Escuintla	Guatemala	Guatemala	1						
21	GT	GT18	Izabal	Izabal	Guatemala	Guatemala	1						
22	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
23	GT	GT01	Guatemala	Amatitlán	Guatemala	Guatemala	1						
24	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
25	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
26	GT	GT19	Zacapa	Zacapa	Guatemala	Guatemala	1						
27	GT	GT19	Zacapa	Zacapa	Guatemala	Guatemala	1						
28	GT	GT12	San Marcos	San Marcos	Guatemala	Guatemala				1			
29	GT	GT09	Quezaltenango	Quezaltenango	Guatemala	Guatemala	1						
30	GT	GT12	San Marcos	San Marcos	Guatemala	Guatemala	1						
31	GT	GT09	Quezaltenango	Quezaltenango	Guatemala	Guatemala	1						
32	GT	GT17	Petén	Petén	Guatemala	Guatemala	1						
33	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
34	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
35	GT	GT01	Guatemala	Mixco	Guatemala	Guatemala	1						
36	GT	GT05	Escuintla	Escuintla	Guatemala	Guatemala	1						
37	GT	GT17	Petén	Petén	Guatemala	Guatemala	1						
38	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
39	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
40	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
41	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
42	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
43	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
44	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
45	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
46	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
47	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
48	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
49	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
50	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
51	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
52	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
53	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
54	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
55	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
56	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
57	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
58	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
59	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
60	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
61	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
62	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
63	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
64	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
65	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
66	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
67	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
68	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
69	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
70	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
71	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
72	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
73	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
74	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
75	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
76	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
77	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
78	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
79	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
80	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
81	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
82	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
83	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
84	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
85	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
86	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
87	GT	GT01	Guatemala	Guatemala	Guatemala	Guatemala	1						
88	GT	GT04	Chimaltenango	Chimaltenango	Guatemala	Guatemala	1						
89	GT	GT05	Escuintla	Escuintla	Guatemala	Guatemala	1						
90	GT	GT09	Quezaltenango	Quezaltenango	Guatemala	Guatemala	1						
91	GT	GT09	Quezaltenango	Quezaltenango	Guatemala	Guatemala	1						
92	GT	GT10	Suchitepéquez	Suchitepéquez	Guatemala	Guatemala	1						
93	GT	GT10	Suchitepéquez	Suchitepéquez	Guatemala	Guatemala	1						
94	GT	GT12	San Marcos	San Marcos	Guatemala	Guatemala	1						
95	GT	GT12	San Marcos	San Marcos	Guatemala	Guatemala	1						
96	GT	GT17	Petén	Petén	Guatemala	Guatemala	1	1					
97	GT	GT17	Petén	Petén	Guatemala	Guatemala	1						
98	GT	GT17	Petén	Petén	Guatemala	Guatemala	1						
99	GT	GT17	Petén	Petén	Guatemala	Guatemala	1						
100	GT	GT18	Izabal	Izabal	Guatemala	Guatemala	1						
101	GT	GT18	Izabal	Izabal	Guatemala	Guatemala	1	1					
102	GT	GT18	Izabal	Izabal	Guatemala	Guatemala	1	1					
103	GT	GT18	Izabal	Izabal	Guatemala	Guatemala	1	1					
104	GT	GT18	Izabal	Izabal	Guatemala	Guatemala					1		
105	GT	GT19	Zacapa	Zacapa	Guatemala	Guatemala	1						
106	GT	GT20	Chiquimula	Chiquimula	Guatemala	Guatemala	1						
107	GT	GT20	Chiquimula	Chiquimula	Guatemala	Guatemala	1						
108	GT	GT22	Jutiapa	Jutiapa	Guatemala	Guatemala	1						

V. Discussion and Analysis

This research focused on three main methods of transportation: air, maritime, and land. Interdiction efforts involving air transportation appear to occur most frequently in the Escuintla, Izabal, and Petén departments. This is especially interesting when comparing the Air Seizure map with the Maritime Seizure map (Figures 3 and 4). Again, we see that Escuintla and Izabal are leading in the number of events, however, the Petén has none. This spatial pattern potentially suggests drug trafficking path going through Izabal and into the rest of the country. The land seizure map (Figure 7) would appear to support this idea, as the leading department in this category is the capital department of Guatemala. What this suggests is perhaps the presence of a smuggling route connecting Izabal to Escuintla via land transportation. Izabal and Escuintla both have higher rates of maritime seizures because those two areas are uniquely suited to those types of transport with the country's two largest maritime ports. Through the aggregate map combining all three types of smuggling activities (Figure 6), I can visualize a large smuggling corridor "through which DTOs operate (Figure 7) and is corroborated by the media analysis and existing interdiction analysis (UNODC 2012). Illicit goods may enter the country through Puerto Barrios (Port Barrios) in Izabal, and continue along land routes in the highway network north. Escuintla's is home to Puerto Quetzal (Port Quetzal) and the Pacific Ocean. The Petén's air trafficking patterns illustrate the role that the Maya Biosphere plays as landing site for aircraft coming from the Andes.

V. 1. Cocaine Trafficking Patterns by Air Transport

A closer analysis of the air map produced a pattern: the largest flows were all located in departments which border an ocean, like Escuintla and Izabal, which might indicate a strong

connection between air and maritime transport. The large flow located in the Petén department would suggest a supplemental route with the maritime routes, landing strips for small planes are not as easily spotted due to the heavy tree cover and savannahs characteristic of the region.

La Aurora International Airport is Guatemala's largest international airport located in Guatemala City and the second largest, Mundo Maya International Airport, is located in Flores in the northern Petén department. La Aurora has a cargo division, which can provide an element of legitimacy to narcos operating in the area. While Mundo Maya has limited cargo traffic, its location poses an advantage to narcos bringing personnel to the Petén, where the cattle ranches and palm plantations are located. DTOs take advantage of the portions of protected forest and remote savannahs in the Maya Biosphere that are meant to be preserved, as there is little law enforcement as well as infrastructure to support interdiction efforts. The MBR is home to over a hundred clandestine airstrips, given cover both by the forest and its protected status.

Despite La Aurora being the largest airport in Guatemala, the Petén has the largest number of air seizures. This is because of the presence of so many clandestine airstrips, and it can be seen that most of the interdiction involving air traffic occurred on clandestine airstrips, rather than Mundo Maya or La Aurora, the official airports of entry. Both airlines and airports have made advancement in interdiction efforts, so it would seem that commercial travel has become less popular as a viable option for the narcos' operation.

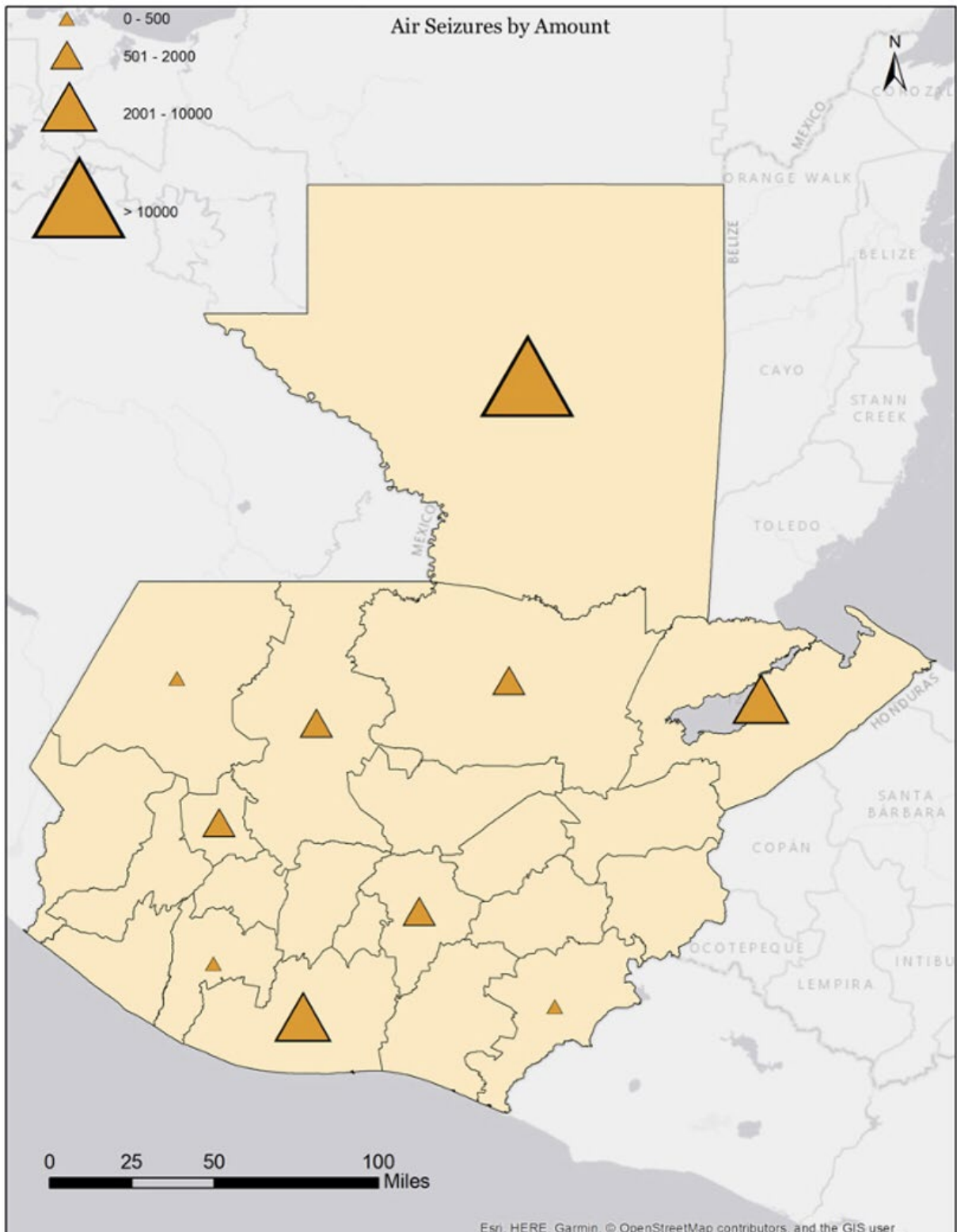


Figure 3: Air Transportation Flows
Source: Jennifer Devine and Sarah Brooks

V. 2. Cocaine Trafficking Patterns by Maritime Transport

The maritime flows in Escuintla and Izabal are larger in size from their corresponding Air and Land flows. These shapes represent the prevalence and distribution of narco-related activities, as reported by *La Prensa Libre*. Upon analysis I believe this indicates two things: the bulk of the cocaine is trafficked in this manner and that indictment operations are focused here for this reason. A maritime flow is notably absent from the Petén department, as the rivers and lakes there are not used commercially at the same scale. I have also observed that every department bordering an ocean has a maritime flow, though Izabal is the only one located on the Caribbean side. Izabal sits right at the mouth of the Gulf of Honduras, is home to Puerto Barrios, Guatemala's largest seaport, and has a massive interior network of navigable lakes and rivers. Escuintla has a coast along the Pacific Ocean, and is home to Puerto Quetzal, the largest Pacific port in the country. The entire western coast of Guatemala sees an increased flow of maritime activity, to the point that the country's second largest port, Puerto Quetzal, has more trafficking activity than Puerto Barrios. The department also has seven rivers that drain through it to the Pacific Ocean, all of them navigable; Rio Maria Linda, Rio Madre Vieja, Rio Coyolate, Rio Acome, Rio Aceituno, Rio Achuguate, and Rio Nahualate.

These factors make these departments prime locations for maritime transportation, as well as an easy location to get to and from, as the roads and infrastructure in these two regions is much further reaching than that of the Petén department. The real advantage of the Izabal and Escuintla departments is the navigable waterways and coastlines, the Petén department has limited navigable waterways by comparison, with the Usumacinta River being a large exception.

This is likely why there is no data for instances for Maritime transport in the department, but the cover of forest and protected forest allows for easy access to rudimentary roads and airstrips.

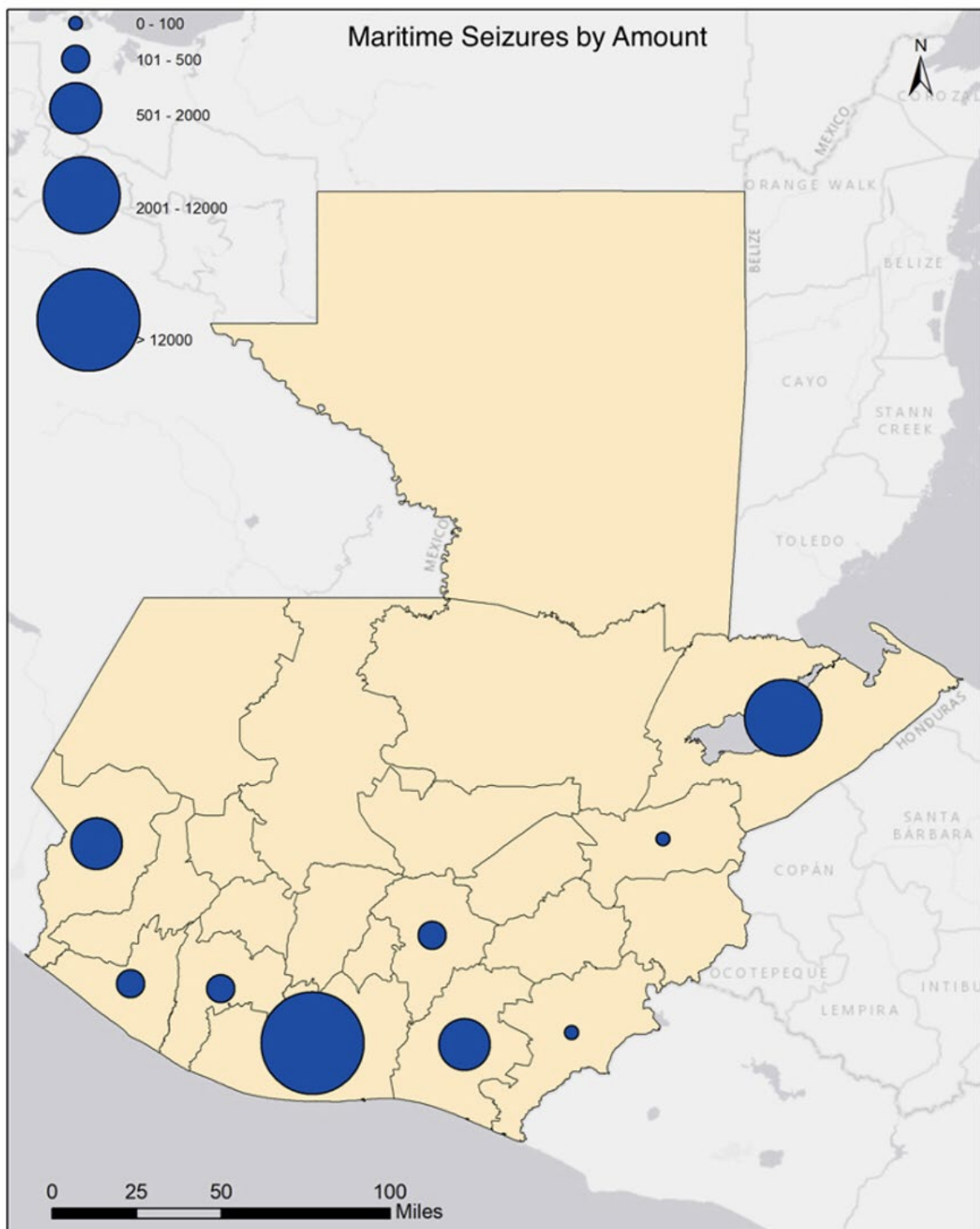


Figure 4: Maritime Transportation Flows
Source: Jennifer Devine and Sarah Brooks

V. 3. Cocaine Trafficking Patterns by Land Transport

The Land transportation map shows a large amount of trafficking activity and interdiction taking place in the capital department, Guatemala, with significant presence in Escuintla and Izabal, again showing the importance of maritime transport in this illicit trafficking operation. It is also notable that there is a small land flow in the Petén department, despite much of the region being dominated by forest, including varying degrees of protected forest. This is where likely money laundering is taking place. The cover of the trees is meant to hide such operations but cattle ranching and palm plantations can be spotted from the air. The sparse population and the focus in the region leaning toward air transport lend a small advantage to drug traffickers, one that they do seem to utilize. The department of Guatemala has the most instances of land transportation, and this is likely due to the capital city being located here. However, another advantage this area for DTOs is the Pan-American Highway. Once this multi-national highway reaches Guatemala City, it's only a 170 km drive to the border with El Salvador and right out of the country. Land transportation is the smallest of the three flows, owing to older road infrastructure and increased border security for land ports of entry.

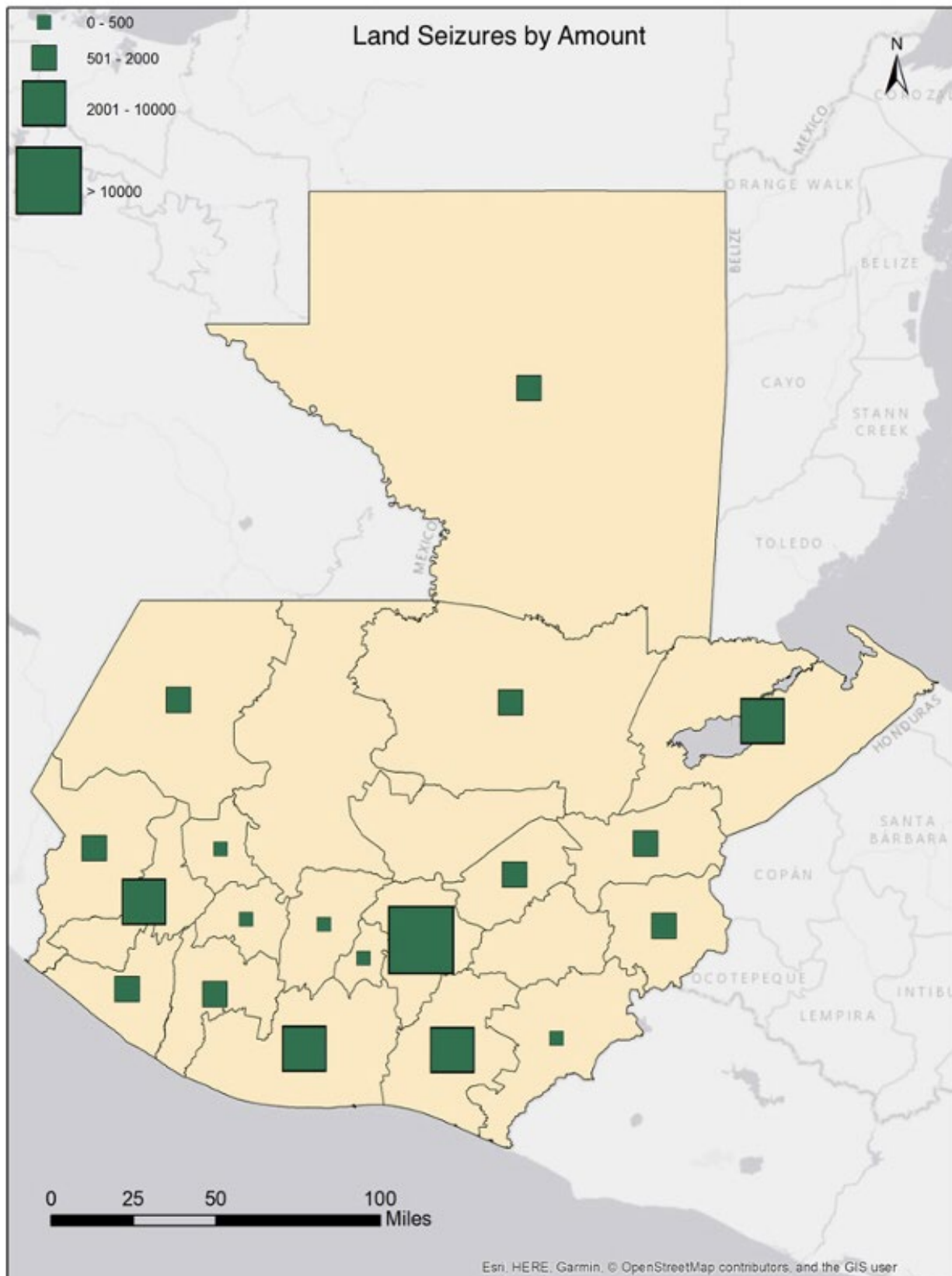


Figure 5: Land Transportation Flows
 Source: Jennifer Devine and Sarah Brooks)

V. Drug Trafficking Patterns in Guatemala - Air, Maritime, and Land transport

Looking at the aggregate map of all three (Figure 6), trends start to become apparent; the largest maritime flows are located in Escuintla and Izabal, there is no Maritime flow represented in the Petén, the largest land flow is in the capital department of Guatemala, and the largest air flow is in the Petén. These trends suggest a potential transportation network, where all three of the transportation methods work together to allow drug traffickers to integrate their transportation networks. One such “mixed” route could be a shipment of illicit goods which arrives in Puerto Barrios, Izabal, it is then loaded onto a ferry and shipped down-river and through Lake Izabal where it is unloaded and reloaded into the back of a truck, this truck then drives through the capital, Guatemala City, and then north to destination markets in the United States and Canada. This is one possible route given the data visualized using the maps.

The most important observation to make is that land transport typically has a much smaller presence than air or maritime. Maritime transport flows account for the largest portion of the seizure data, and the reason for this is that maritime imports and exports are a very big portion of Guatemala’s economy and maritime transport allows for large scale movement of drugs. The air transport flows are not only flows captured in commercial and cargo airports, but the presence of clandestine airstrips in the Petén characteristic of narco trafficking operations. Land is the transportation method with the smallest seizure amounts. The Pan-American highway provides a simple way in and out, but travel within the country and between the departments can be slow.

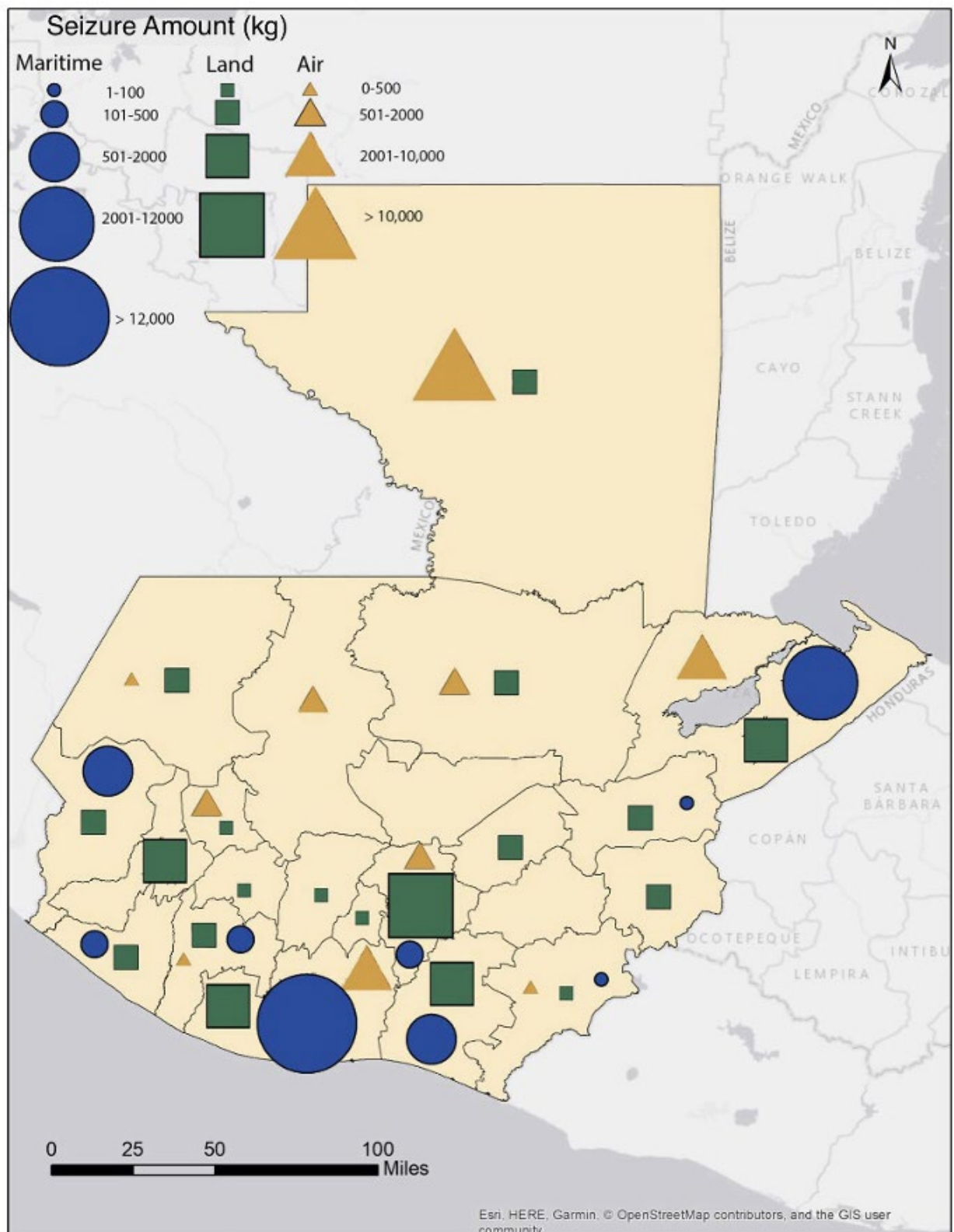


Figure 6: Aggregate Transportation Flows
Source: Jennifer Devine and Sarah Brooks

V. 5. Money Laundering Activities

Both the *Prensa Libre* and narco degradation databases were analyzed to identify key variables, with graphs and tables being created to represent those variables. The *Prensa Libre* data is a collection of newspaper articles detailing narco activities in Guatemala, while the narco-degradation database was built by coding interviews with community members and leaders throughout the country, namely, those most affected by narco-driven land use change. The difference between the two datasets is that the media database details the mode of transportation used in DTOs' operations.

The narco degradation database details the money laundering activities of DTOs, but the media database has some data on money laundering, as some interviewed for *Prensa Libre*

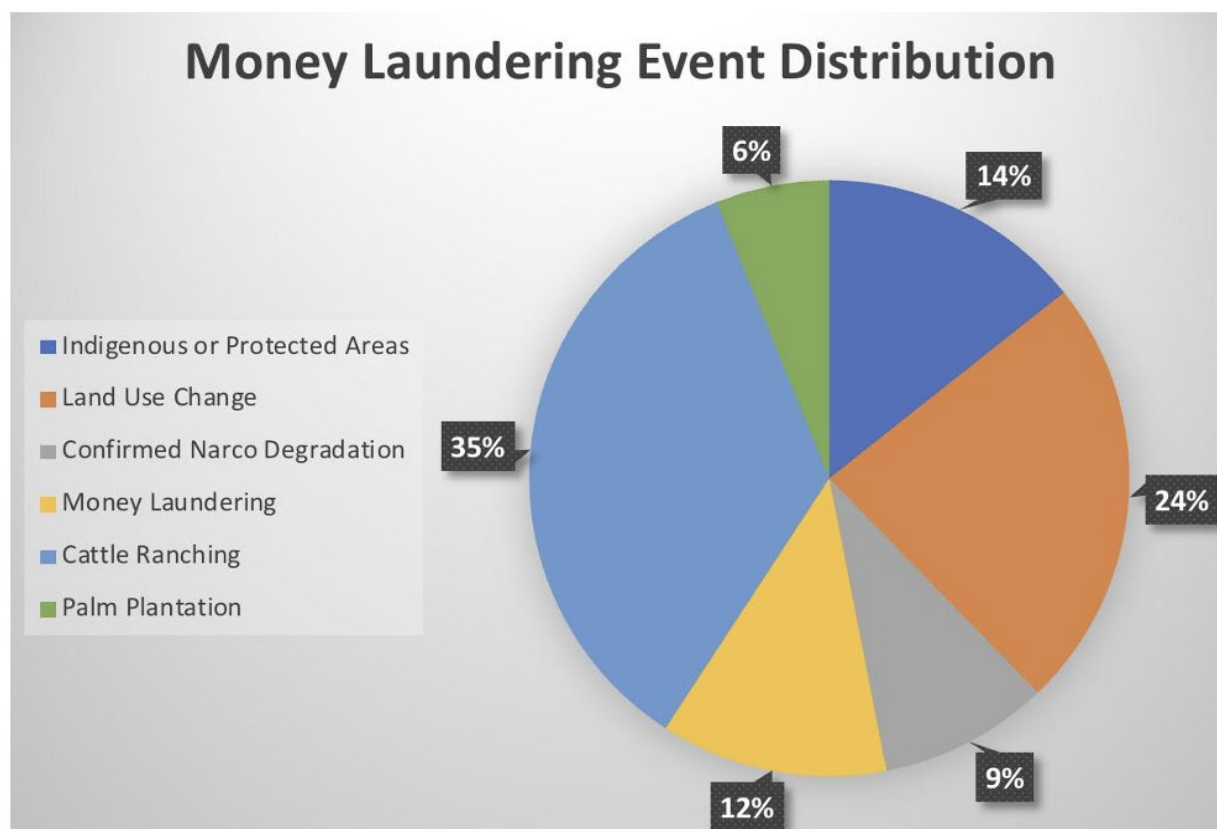


Figure 7: Money Laundering Distribution by Type

mentioned a form of money laundering; cattle ranching, palm plantations, logging, etc. For this research, however, cattle ranching and palm plantations are the main focus, as these two operations do the most damage to the environment in which they take place.

The graphs and tables have similar variables, but the media database is events that made it into the Prensa Libre newspaper (Table 2), while the narco-degradation database (Figure 8) is based on interviews conducted with community leaders. They show very similar results. While it is true that the media database may have less entries as people may be less inclined to talk to reporters or people associated with the newspaper given the danger of reprisal, the result that it produces is very similar to the results of the narco degradation database. What this shows is that the databases serve to lend credibility to each other. The similarity of the resulting graphs and tables shows the amalgamation of first and second person accounts of drug trafficking events, and gives a more accurate look into money laundering activities associated with drug trafficking in Guatemala.

This is a crucial time for this sort of research, especially for the forests of Central America, as climate change mitigation efforts are connected with these oxygen-producing regions and biodiversity hotspots. As this is being written, the Amazon Rainforest is being burned for agricultural use in both illicit and government-sanctioned practices. These practices are particularly harmful, as once the land has been converted to pasture, it is difficult to recover. This is because the soil in rainforests and tropical moist forests is actually very nutrient poor due to its inability to “fix” nutrients into itself, because there is no longer any organic matter to fuel the nutrient cycle (Butler, 2019). Drug trafficking organizations are not concerned with their impact on the land or ecosystems they trample through. They take no care in their movements,

save for covering their tracks from law enforcement. For them, all they see is a means to an end; locations and routes to increase their capital.

Money Laundering Events by Department

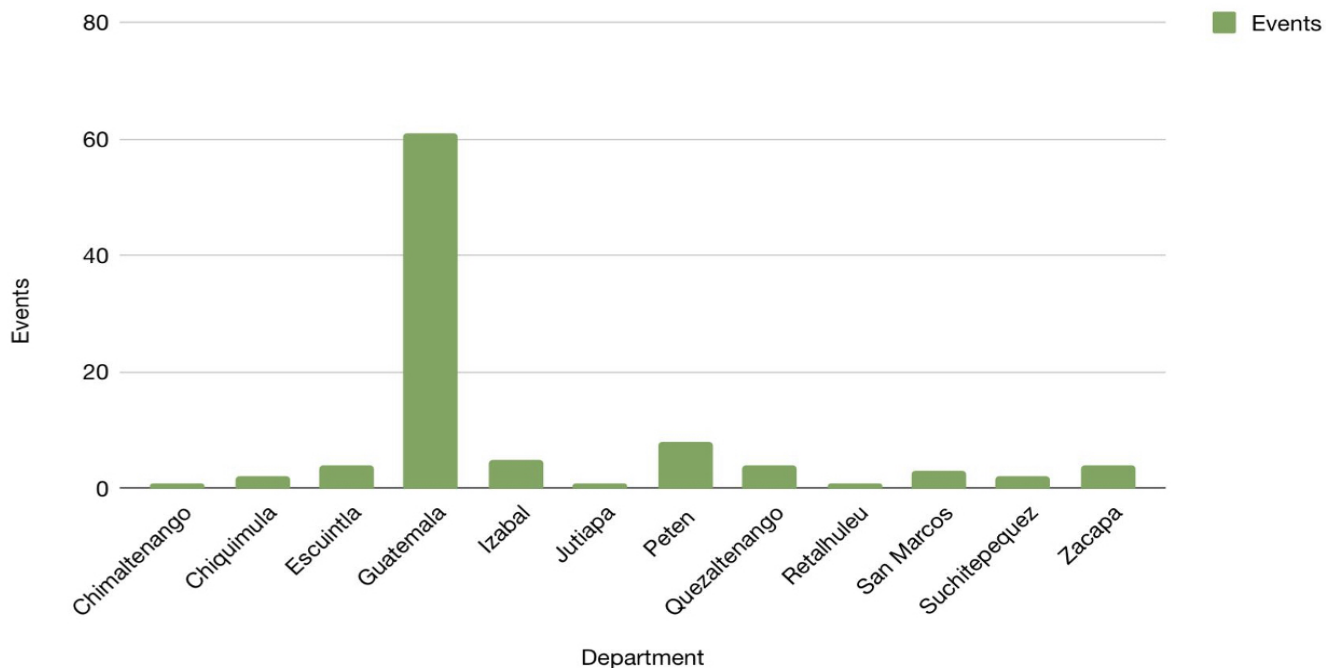


Figure 8: Money Laundering Events by Department

Figure 8 is a graph created with the *Prensa Libre* dataset and represents the captured instances of money laundering in each department. The first thing to notice is the capital department, Guatemala, is towering above the others. One thing to note is the media database contains sections on money laundering through real estate and other “legitimate” businesses. Guatemala City is the political and economic hub of the country, there is simply more traffic in general through this department, so the numbers for narco-trafficking are up as well. It may also be that Guatemala City is a distribution hub, where everything comes and goes to be shipped out to its destination.

VI. Conclusions

Deforestation and degradation is occurring at an alarming rate in Guatemala, and a main source of this degradation is the money laundering operations of drug trafficking organizations (DTOs) (McSweeney et al. 2017). Institutions of the Guatemalan government remain weak in the face of narco-capital and violence and the aftermath of their 30-year civil war, which has left a power vacuum in which drug trafficking organizations can operate with relative impunity (Devine et al., 2018).

In Guatemala, DTOs are laundering money through cattle ranching and oil palm production with large scale impacts for land use change and the environment. To minimize interdiction efforts, DTOs operate within Guatemala's national parks and protected areas; remote places with little state presence. The many narco-capitalized cattle ranches in protected areas are located in the Maya Biosphere Reserve (Devine et. al 2018). Establishing cattle ranches not only involves deforestation, but these money laundering methods leave the land much worse off than when DTOs found it. This "narco-degradation" is destroying not only a protected area of forest, but the lands many indigenous Maya call home.

The extent of narco-degradation and its links to drug trafficking efforts are difficult to study due to the clandestine nature of the activity. This research addresses this lack of information by answering the following questions: what are the spatial and temporal patterns of drug trafficking in Guatemala between 2000 - 2018? And, what are the environmental impacts of drug trafficking? To answer these questions, I analyzed two databases and mapped their data, which provided a basis for further analysis of the patterns it shows.

DTO's have adapted and respond to interdiction efforts for decades, and those patterns spatial and temporal can be found, quantified, and mapped. This research reveals an extensive network of multiple transportation methods along multiple different routes, which not only helps visualize drug trafficking patterns, but also illuminates the money laundering activities necessary to sustain this kind of large-scale operation. Having mapped air, maritime, and land transportation data, comparing it to the money laundering information reveals yet another pattern.

Examining all three modes of transport allows for patterns emerge: Maritime transportation accounts for the majority of the seizure data, with air second, and land transportation last. La Aurora airport in Guatemala City is the largest airport in Guatemala, however, the Petén has the largest number of air seizures. I suspect this is due to the presence of many clandestine airstrips in the Maya Biosphere and interdiction activities concentrating in the reserve. The Petén does not have a maritime flow recorded, which is the result of limited navigable rivers and no ocean access. However, many people report cocaine being smuggled into Mexico along the Usumacinta River. Of the departments which border an ocean, all have a maritime flow. The largest of these flows is located in Escuintla, on the Pacific Coast, home to the second largest port in the country, Puerto Quetzal. Notably the largest flow is not located near the primary port of Guatemala, Puerto Barrios, which connects to the Caribbean Sea. Puerto Barrios is in Izabal, the only eastern department with ocean access. Guatemala's whole west coast sees the most flow of maritime activity resulting in Puerto Quetzal seeing higher trafficking rates than Puerto Barrios.

Land transportations flows are concentrated around the capital department, Guatemala, Escuintla, and Izabal. The latter two have land flows attached to their maritime flows, as illicit

materials are transported to and from the ports on either coast. The department of Guatemala is located along the Pan-American Highway, allowing for swift movement around and out of the country. The Petén department has a very small land flow presence recorded. Road infrastructure is limited in the Petén compared to other departments, but DTOs are known to utilize these roads to transport illicit materials to and from their remote clandestine airstrips.

Money laundering is spatially concentrated in two hubs in Guatemala, Guatemala City and the Petén. These spatial concentrations represent different money laundering operations. In Guatemala City, real estate investments and commercial enterprises provide ample money laundering opportunities. The Petén, however, is more rural, and money laundering is concentrated in agro-industries such as cattle ranches and palm plantations. This is where the most severe effects of narco-degradation can be seen. Cattle ranching requires the burning of several acres of land and forest at a time, and the animals' grazing prevents substantial regrowth of the vegetation. Palm plantations leech the soil of its' nutrients, destroying the surrounding flora and again preventing regrowth. These two activities are increasingly effective in cleaning DTO's money, but they are wildly destructive to the biodiversity of eco-systems.

With the continued increase of narco-trafficking activities in Central America, the narco-driven degradation of these ecosystems will only become aggravated and more detrimental to the flora, fauna, and humans that call them home. The Maya Biosphere Reserve is a "biodiversity hotspot", and narco-degradation presents a direct threat to this abundance of life. The carbon-capture potential of the region should put an international spotlight on the forces threatening these forests, as the entire world should have a vested interest in the forests' benefit to them.

Narco-degradation highlights the problems of the United States of America's foreign-policy stance on drugs and interdiction. The United States' war on drugs has been effective in one measure: driving the DTO's further into remote areas (Magliocca et al.2019). It has also created the need for more money laundering operations as U.S. dollars need to be laundered extensively to be usable. The problem of drug trafficking and its environmental impacts in Mesoamerica will not be solved overnight, however research like this, and that of the PEGASUS project, will serve to uncover and display the shortcomings of the current War on Drugs strategy.

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