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Abstract

This research is motivated by the compelling finding that the illicit cocaine trade is responsible for extensive new patterns of deforestation in Central America. This pattern is most pronounced in largest protected areas constituting the Mesoamerican Biological Corridor. This paper examines whether observed forest loss could be linked to a shift in conservation governance. We wanted to know how cocaine trafficking affects forest conservation governance in Central America's protected areas. To answer this question, we interviewed conservation stakeholders from key institutions at various levels in three drug-trafficking hotspots: Peten, Guatemala, Northeastern Honduras, and the Osa Peninsula in Costa Rica. We found that, in order to establish and maintain drug transit operations, drug-trafficking organizations directly and indirectly compete with and undermine conservation governance actors and institutions. Drug trafficking impacts conservation governance in three ways: 1) it fuels booms in extractive activities inside protected lands; 2) it undermines long standing conservation coalitions; and 3) it exploits differences in governance models and geography. Narco-related activities undermine traditional forest uses and resource governance, which produce significant social and ecological costs. Nevertheless, some types of conservation models appear more resistant than others. Particularly, participatory governance models can better maintain conservation goals compared to state-managed parks oriented toward strict conservation policies that exclude park residents and neighbors in land and resource management.

Keywords	Conservation; environmental governance; protected areas; deforestation; drug trafficking
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Dear Editors,

The illicit cocaine trade has recently been identified as a new and significant driver of forest loss in Central America (McSweeney et al. 2014; Sesnie et al. 2017). Since the early 2000s, drug-trafficking organizations (DTOs) have been establishing drug transit hubs and money laundering operations in remote, forested areas under the guise of land-intensive ventures including cattle ranching and industrial agriculture. This trend is disproportionately concentrated within the region's largest remaining protected areas. This paper examines the strategies that drug-trafficking organizations (DTOs) use to access and transform landscapes in protected areas: by exploiting and undermining the actors and institutions involved in conservation governance.

The environment ministries and park agencies charged with implementing conservation law have become the new front-line for drug enforcement, even at a time when they are understaffed, underfunded, ill-equipped, and oriented toward priorities set by international donors and NGOs. As observers of this phenomenon, we submit this manuscript for consideration, ***The impacts of cocaine-trafficking on conservation governance in Central America***, which identifies conservation governance coalitions as collateral damage from the War on Drugs. The irony is that over the past two decades, US-led drug enforcement policies have contributed to the conservation crisis we describe. Militarized counter-drug policies have ultimately pushed drug trafficking and the laundering of spectacular profits into remote, biodiverse spaces, where they threaten both ecosystems and people, and undermine conservation goals and local livelihoods. In this way, the War on Drugs is working directly at odds against the billions of dollars invested in conservation by donor countries, international conservation NGOs, advocacy groups, and local communities.

We hope that you find this manuscript timely, relevant and contributory to debates on the complex and pressing policy concerns in Central America related to the rise of violent criminal organizations there, including institutional corruption, environmental change, and migration.

Sincerely,

David J. Wrathall

Corresponding author on behalf of all

References:

- McSweeney, K., Nielsen, E. A., Taylor, M. J., Wrathall, D. J., Pearson, Z., Wang, O., & Plumb, S. T. (2014). Drug policy as conservation policy: narco-deforestation. *Science*, 343(6170), 489-490.
- Sesnie, S. E., Tellman, B., Wrathall, D., McSweeney, K., Nielsen, E., Benessaiah, K., ... & Rey, L. (2017). A spatio-temporal analysis of forest loss related to cocaine trafficking in Central America. *Environmental Research Letters*, 12(5), 054015.

Highlights:

- Cocaine trafficking is linked to multiple forms of environmental degradation inside Central American protected areas, which occurs through drug-traffickers' impact on the actors and institutions involved in conservation governance.
- Drug trafficking impacts conservation governance in three primary ways: 1) it fuels booms in extractive activities inside protected lands; 2) it undermines long standing conservation coalitions; and 3) it exploits differences in governance models and geography.
- The US-led War on Drugs policy undermines investments in conservation governance in Central America's PAs.
- The participatory governance of PAs may be a viable conservation strategy in trafficking hotspots in Central America.

Title:

The impacts of cocaine-trafficking on conservation governance in Central America

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D.J.W., J.D., K.B., and B.A.G. designed research; and D.J.W., J.D., B.A.G., A.R.S., E.T., and S.E.S. performed research; D.J.W., J.D., B.A.G. and S.E.S. analyzed data; all authors contributed to the framing, drafting, writing, and editing of the paper.

The impacts of cocaine-trafficking on conservation governance in Central America

Abstract:

This research is motivated by the compelling finding that the illicit cocaine trade is responsible for extensive new patterns of deforestation in Central America. This pattern is most pronounced in largest protected areas constituting the Mesoamerican Biological Corridor. This paper examines whether observed forest loss could be linked to a shift in conservation governance. We wanted to know how cocaine trafficking affects forest conservation governance in Central America's protected areas. To answer this question, we interviewed conservation stakeholders from key institutions at various levels in three drug-trafficking hotspots: Peten, Guatemala, Northeastern Honduras, and the Osa Peninsula in Costa Rica. We found that, in order to establish and maintain drug transit operations, drug-trafficking organizations directly and indirectly compete with and undermine conservation governance actors and institutions. Drug trafficking impacts conservation governance in three ways: 1) it fuels booms in extractive activities inside protected lands; 2) it undermines long standing conservation coalitions; and 3) it exploits differences in governance models and geography. Narco-related activities undermine traditional forest uses and resource governance, which produce significant social and ecological costs. Nevertheless, some types of conservation models appear more resistant than others. Particularly, participatory governance models can better maintain conservation goals compared to state-managed parks oriented toward strict conservation policies that exclude park residents and neighbors in land and resource management.

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1. Introduction

The MesoAmerican Biological Corridor (MBC) consists of a culturally and biologically diverse set of landscapes historically dominated by broad-leaved lowland forests and low-impact smallholder agriculture (Geist and Lambin 2002; Rudel *et al* 2009). For the last two decades the territory comprising the MBC has received official recognition and partial protection under a patchwork of conservation regimes, and has been cited as a model for integrating smallholder activities into landscapes of conservation (Holland 2012). Even after hundreds of millions of dollars in investments in conservation programming, the MBC registers some of the highest deforestation rates in the world (Clark *et al* 2012; Redo *et al* 2012; Kim *et al* 2015; Hansen *et al* 2013) – it does not seem, then, to be a framework for conservation that *works*. Why?

An important new consideration is that Central America has become the principal transportation pathway for moving drugs from South to North America (McSweeney *et al* 2014; Sesnie *et al.* 2017; Magliocca *et al.* 2019). The drug trade disproportionately affects Guatemala, Honduras, and El Salvador, Central America’s “Northern Triangle,” which globally register among the highest rates of violence, and corruption (UNODC 2014). From a \$100 billion-a-year global cocaine economy, an estimated \$6 billion are captured and laundered in Central American countries, which adds between 1% and 14% of the national GDPs in the region (UNOCD 2012). Strategies for laundering illicit profits involve environmentally destructive land use practices, such as clearing forest for cattle ranching and oil palm production (McSweeney *et al* 2014; McSweeney *et. al* 2017; Devine *et al* 2018a). These activities are increasingly concentrated in and around Central America’s largest remaining forest areas that are often within nationally and

internationally designated protected areas (e.g. National Parks and Biosphere Reserves). In this paper, we contend that drug trafficking organizations' (DTOs) physical impacts on Central American forests are enabled by their institutional impacts to the actors and agencies tasked with the governance of these biologically and culturally diverse spaces.

1.1. Environmental Impacts of Drug Trafficking

Forested areas now designated for conservation in many Latin American contexts have historical origins that are unrelated to current conservation goals (Rodriguez Solorzano and Fleischman 2018; Muñoz Brenes et. al 2018), but rather are the product of development strategies that supported, in parallel, the privatization of public lands, and their use and accumulation in private enterprise (Ceddia 2019; Oliveira 2013; Zoomers 2010). As such, it is not surprising to find deforestation in protected areas resulting from urbanization, expanding small holder and industrial agricultural frontiers, logging, and penetration of road networks. Recent work identifies a new set of drivers, which includes industrial agriculture (Ceddia et al. 2014), extractive industries and related infrastructure (Bebbington et. al 2018; Grandia 2013), large-scale land acquisition or “land grabbing” (Clements & Fernandes 2013), as well as money laundering and illicit drug economies (Devine et. al 2018, McSweeney et. al 2014, Sesnie et. al 2017).

In the mid-2000s, as cocaine surged into Central America, a new pattern of deforestation began to appear, dubbed “narco-deforestation” by McSweeney et. al (2014), representing a previously unrecognized driver of landscape transformation. Sesnie et. al (2017) spatiotemporally located and quantified this new pattern – large clearings appearing suddenly amid remote forested landscapes— and associated it with the

establishment of cocaine transit routes across Central America, which brought new actors and capital into the region. Significant forest loss signaled the entry of DTOs into landscapes, coordinating labor, investing significant capital due to the need to launder money, and reordering access to land and resources (McSweeney et al. 2018). In doing so, narco-trafficking directly and indirectly interacted with other more traditional drivers of forest loss pre-existing in the region. This pattern appeared first in northern Guatemala's Petén region in the mid-2000s, then moved to Northeastern Honduras in the late 2000s, and radiated across Nicaragua's *Region Autónoma Atlántico Norte* and *Sur*, accounting for between 15% and 30% of annual national forest loss in Nicaragua, Guatemala, and Honduras between 2000 and 2014 (Sesnie et al. 2017).

Surprisingly anomalous patterns identified in Sesnie et al. (2017) were most pronounced in the protected areas constituting the MBC. However, looking closer, forest loss is not even across all park types. The case of the Maya Biosphere Reserve in Peten, Guatemala is illustrative (figs. 1, 2). Forest loss in Peten's dense configuration of PAs drive the national trend through the mid-2000s (fig. 1a). While wilderness refuges, biosphere reserves and the UNESCO-designated core of the MBR suffer heavy forest losses during this period, overall, national parks are the biggest forest losers (fig. 1b, c). Nevertheless, during the same period, communally-managed forest concessions register very low forest losses (see rectangular polygons just northeast of the center, fig. 2a, b). Why?

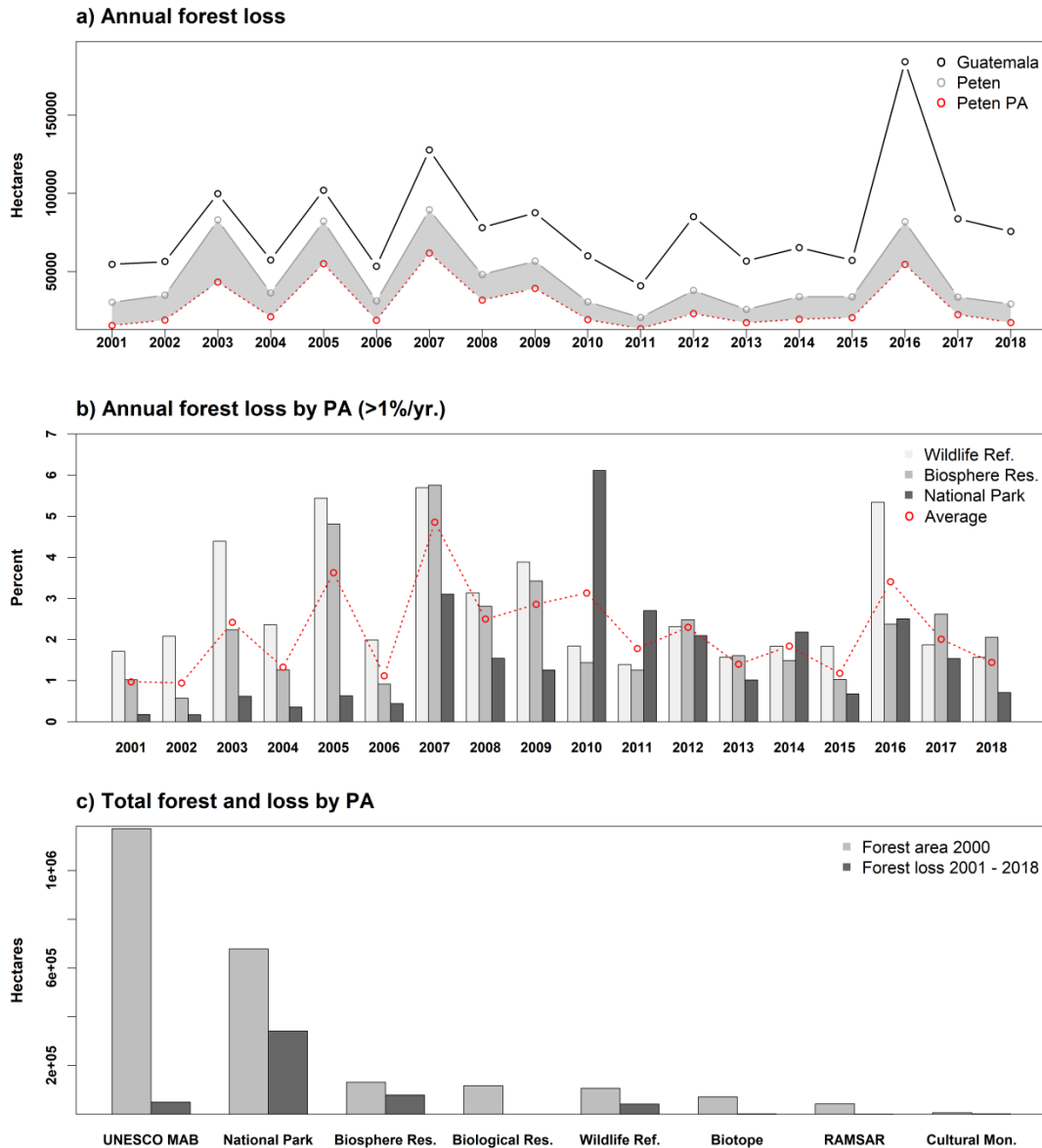


Fig. 1 | Summary of forest loss in the Maya Biosphere Reserve between 2000 and 2018, depicting: a) forest loss in Guatemala, Peten and Peten PAs; b) the annual percentage of forest loss in each protected area compared to baseline forest area in 2000; and c) total hectares of forest by PA type in 2000 and the total amount lost between 2001 and 2018. The UNESCO multiple use designation represents the core zone of the MBR.

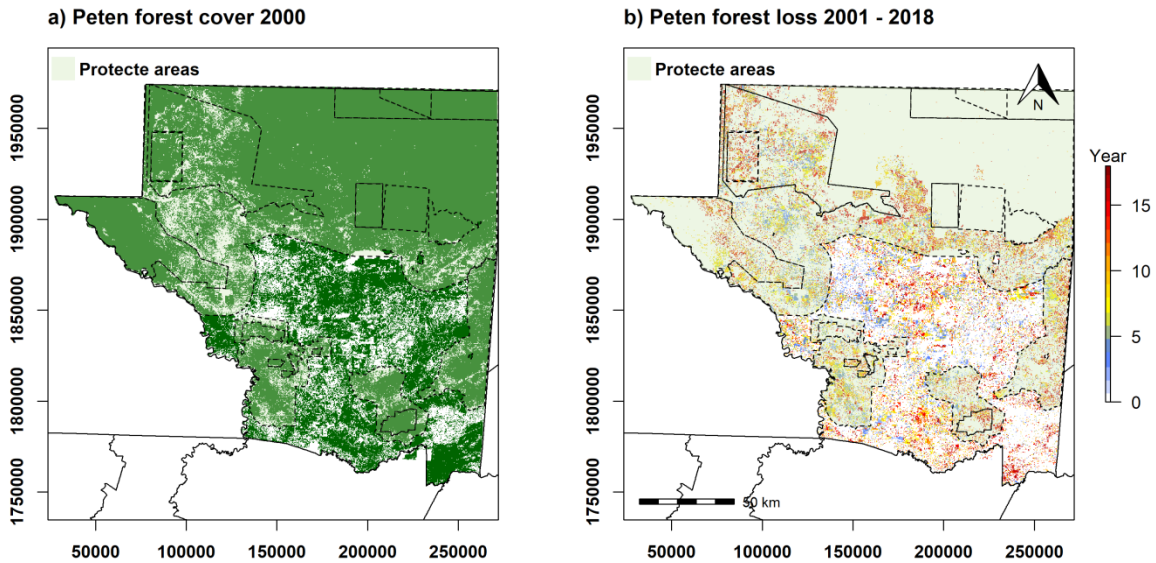


Fig. 2 | A spatial representation of forest loss by year in Peten, Guatemala. The maps show 2000 forest cover and 2001 to 2018 forest loss areas inside areas non-overlapping protected areas, larger than 10 square kilometers.

The answer is complex. DTOs' needs to operate clandestinely, acquire safe territory, and launder illicit money accelerates changes in land and resource use (Devine et al. 2018, McSweeney et al. 2018; Magliocca et al. 2019). Where DTOs embed transit activities among forest communities, their imperatives to control risks and accumulate profits drive intense local transformations in social relations and landscapes (Magliocca et al. 2019; McSweeney et al. 2018). As DTOs arrive seeking land for transit and money laundering activities rural people experience land dispossession, impoverishment, food insecurity and physical harm (McSweeney et al. 2017; Ballvé 2012). New patterns of forest loss become observable (Sesnie et al. 2017). In this paper, we will make the case that DTOs are able to locally embed in PAs where they can undermine conservation governance.

119

120 **2. Conservation governance and Drug Trafficking in Central America**

121 This paper examines the impact of drug trafficking on conservation governance in
122 Guatemala, Honduras and Costa Rica, which we define as the “regulatory processes,
123 mechanisms and organizations through which political actors influence environmental
124 actions and outcomes” (Lemos and Agarwal 2006 p. 298),. The concept of polycentric
125 governance is useful in describing “conservation” as a governance goal, aimed at
126 achieving an idiosyncratic set of desired social and environmental outcomes for specific
127 land and resources. This goal, in turn, is negotiated by a diverse set of actors—the state,
128 civil society and private actors– which collaborate and compete to obtain their interests
129 (Brockington *et al* 2012). The work of conservation is then accomplished through formal
130 and informal frameworks set up to regulate access (Zimmerer *et al* 2004; Finley-Brook
131 2007). The polycentric array of local actors constantly renegotiates rules about resource
132 access, and the institutional relations that prescribe practices of conservation (Fairhead,
133 *et. al* 2012; Runk 2012). Key to understanding this renegotiation is that every local space
134 designated for conservation there are grounded, power-laden relationships between local
135 actors, resources and territories (Vandergeest and Peluso 1995). We assert here that
136 DTOs are among the actors and institutions with competing visions for land and
137 resources, with a high degree of power in leveraging their interests, alongside the local
138 forest communities.

139 As a descriptive and analytical concept, polycentricity describes the architecture
140 of governance, the “form and geographical scale of socio-political institutions ... key
141 actors and organisations, and ... relations among these components” (Bridge and

Perreault, 2009 p.476), which, we contend, must consider DTOs, who also operate in these landscapes. Polycentricity enables an evaluation of local level institutions that manage the use of common pool resources, scale up their efforts through co-management arrangements with national and global conservation agencies (Ostrom 2010, Paavola et. al 2009), and how they negotiate the presence of DTOs. As a policy proscription, polycentricity holds that local actors who manage resources also tend to monitor them effectively (Ostrom 1998), and this translates into outcomes, such as better prevention of wildfires and forest loss in communally managed forests in Central America (Davis and Sauls 2017). It also begs questions about how DTOs alter the monitoring and management of resources in places where they operate.

What are the polycentric governance settings in Honduras, Guatemala and Costa Rica, where drug trafficking occurs? Conservation governance models vary from country to country, as well as at sub-national levels (fig. 3, table 1), but each country has different centrally planned protected area systems with Costa Rica being the most engaged in participatory governance and Honduras most engaged in formal co-management. Throughout the 1990s and 2000s, a push toward decentralization in Central America promoted polycentric governance arrangements in which Indigenous groups, cooperatives, campesino associations, and community resource management organizations became part of co-management agreements that linked them into policy-making circles. In Honduras and Guatemala, conservation has tended to be institutionally supported via multilateral treaties and donor relationships, which designate priority territories for conservation, including UNESCO World Heritage Sites in both countries, and designation of areas for the MBC. Following a broader global tendency, conservation

programming in Central America generally operates under specific donor-sponsored projects that define rules that delimit access to land and resources (Duffy 2005). Donor countries, in partnership with the state, typically support competitive bidders (usually international NGOs) to implement conservation programs, using a variety of models for enrolling the forest communities that live in protected areas (Igoe and Brockington 2016). While governance goals and structures in protected areas across Central America are by no means uniform, they can be assigned to various management categories (Dudley et al. 2008, table 1), and comparatively evaluated (see Muñoz et al. 2018).

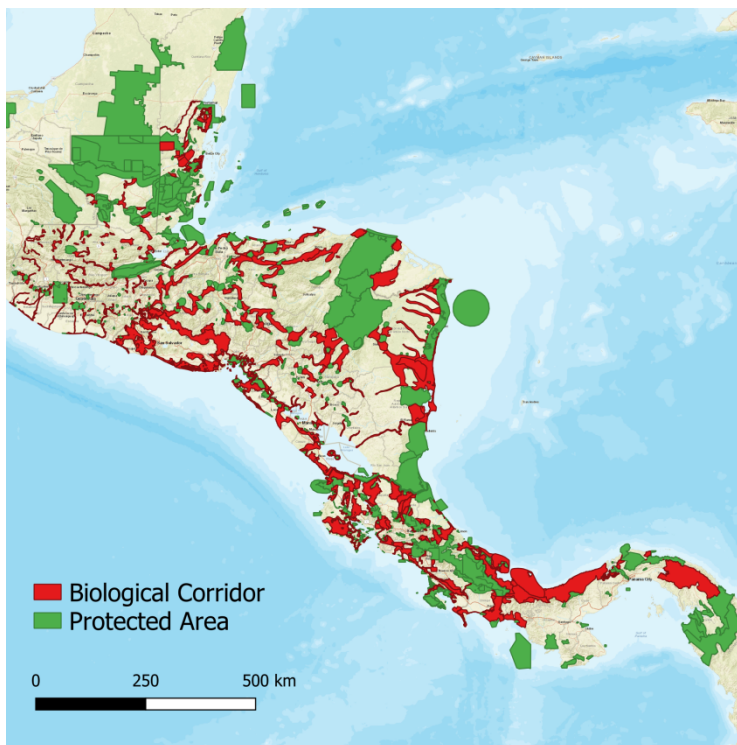


Fig. 3 | Protected Areas and the Meso-American Biological Corridor of Central America.

Table 1 | Diversity of Protected Area Governance in the Osa Peninsula, Costa Rica; Peten, Guatemala and Northeastern Honduras.

PA Type	Osa Peninsula, Costa Rica	Peten, Guatemala	Northeastern Honduras
National Parks	Corcovado National Park* Ballena National Marine Park* Piedras Blancas National Park*	Tikal NP* Laguna Del Tigre NP* Sierra del Lancadon NP (CM) Mirador-Rio Azul NP*	Capiro Calentura NP (CM) Janat Kawas NP (CM) Pico Bonito NP (CM) Punto Izopo (CM) Zona Nucleo Rio Platano*
Wildlife Refuge/Biological Reserves/Biotopo	Caño Island Biological Reserve* Carate Refuge(M) Golfito Refuge (M) Osa Refuge (M) Preciosa Platanares (M) Wildlife Refuge (M) Punta Rio Claro Refuge (M) Quillotro Refuge (M) RHR Blancas Refuge Rio Oro Wildlife Refuge Rancho La Merced Refuge (M) Pejeperro Refuge (M) Saimiri Refuge (M)	El-Zotz-San Miguel La Palotada Biotopo Laguna del Tigre*	Iguana Conservation Area Rio Platano Cuero y Salado CM
Wetland Reserves-Ramsar sites	Lacustrino Pejeperrito Wetlands Térraba-Sierpe National Wetland*	PN Laguna del Tigre PN Yaxhá-Nakum-Naranjo	Laguna de Bacalar Laguna de Guaimoreto
Private protected areas	Cerro Dantas National Wildlife Refuge (P) Agua Buena Refuge (P) Hacienda Copano Refuge (P) Lagunazul Refuge (P) Rio Piro Wildlife Refuge (P)		
National Forests	Golfo Dulce National Forest (Forest Reserve)*		Siera del Rio Tinto
Indigenous Territories	Osa Ngöbe-Bugle Territory Conte Burica Ngöbe-Bugle Territory Altos de San Antonio Ngöbe-Bugle Territory Abrojo-Montezuma Ngöbe-Bugle Territory		RAYAKA BAMIATA BAKINATA PECH DIUNAT Garifuna Community holdings
Community Concessions		MBR Multiple use zones	Zona de Amortiguamiento Rio Plátano

Note: *centrally administered PA, P=private PA, CM=co-managed protected area, M=mixed management (Costa Rican form of co-management)

The problems with polycentric models in Central America are that conservation priorities are in frequent cases set abroad (Ybarra 2017), such as the protection of specific charismatic megafauna (e.g. jaguars, scarlet macaws); development of ecotourism; establishment of indigenous reserves; and maintenance of specific ecosystem services such as carbon sequestration (e.g. REDD+) (Finley-Brook 2007; Zimmerer *et al* 2006; Plumb *et al* 2012). With such narrow conservation goals, projects often receive insufficient funding and rely on weak local institutional support (Bennett et al. 2017). Because implementing organizations have low capacity to enforce environmental rules, their focus is frequently regulating the activities of poor forest communities to the detriment of local livelihoods (Oldekop et al. 2016), rather than addressing the more pernicious land use and land acquisition strategies of politically and economically powerful actors (Kelly 2013), which we assert include DTOs. Compounding this problem, in each of our three case study countries, resource monitoring and rule enforcement is undertaken by park rangers, police, military and the judicial system. The problem arises in Guatemala and Honduras, where weak judicial systems and systematic corruption occur at the levels necessary for multi-scale governance coalitions.

2.1. Drug-trafficking and Conservation Governance

What has not been examined previously is the impact of drug-traffickers, among the polycentric actors and institutions that determine resource use and land tenure in protected areas, on conservation governance. Following Ballvé (2019) we examine how DTOs' embedding in conservation contributes to their "regimes of rule" through everyday practices of territorialization, dispossession, and commodification. Analysis relies on

evidence from interviews and focus group discussions conducted during six weeks of field-based research in three drug-trafficking hotspots with dense configurations of PAs: Peten, Guatemala, Northeastern Honduras, and the Osa Peninsula in Costa Rica. We examined aspects of conservation governance that drug traffickers are most likely to influence: practices of boundary and territory making; the exercise of authority; definition of norms, and application of law; access, use and monitoring of resources; and the provisioning of basic services to forest communities (such as food, healthcare and education).

The paper outlines how DTOs establish and maintain drug transit operations by directly competing with and undermining formal conservation governance actors and institutions. We present evidence that drug trafficking impacts conservation governance in the MBC by 1) fueling booms in extractive activities that increasingly encroach upon national protected areas; 2) undermining conservation coalitions; and 3) exploiting the weaknesses of strict conservation models. We follow with a discussion of conservation models that best maintain conservation goals in the face of DTOs, and those that are most vulnerable, e.g. community-based land and resource management models versus state-managed parks that are oriented toward strict, fortress-like, conservation. The paper adds nuance to earlier observations about the inseparability of drug policy and conservation policy in Central American cocaine transit zones (McSweeney et. al 2014; Sesnie et al. 2017). It concludes that the War on Drugs directly and indirectly drives environmental degradation in Central America's protected areas, imperiling decades of investments in participatory, polycentric governance institutions and programs (Magliocca et al. 2019). The differences in impacts across conservation models have implications for conservation policy and management.

3. Methods

We present case studies of three drug-trafficking hotspots with dense configurations of PAs: Peten, Guatemala, Northeastern Honduras, and the Osa Peninsula in Costa Rica. These case studies were chosen for their importance as recognized transit nodes in regional drug trafficking networks, and in order to capture various stages of integration by DTOs. Peten's proximity to Mexico makes it ideal for overland and air transport; Northeastern Honduras has longstanding marine, air, and overland transport routes; and OSA is primarily marine with some air transport. We compare older trafficking sites (Peten, NE Honduras) with emerging ones (Osa). The selection of these sites allowed us to leverage the professional networks necessary to safely conduct the research.

To examine the effect of DTOs on the polycentric architecture of conservation governance, we employ Elinor Ostrom's (2009, 2015) design principles of effective communal resource governance. A focus on practices allows an examination of DTOs' effect on: 1) boundary making and territorialization; 2) norms and rules that govern behavior, and the authority to enforce rules; 3) dispute resolution and the enforcement of rules with sanctions; 4) participation and exclusion in resource use and control; 5) access, use and monitoring of resources within territories; and 6) service provisioning, including infrastructure, market access and basic needs. This approach provides heuristics for examining how DTOs compete with state actors, local communities and conservation organizations to define territories, resource governance rules and sanctions, and practices of commodification and service provision.

3.1. Data Collection

We undertook semi-structured interviews with protected areas stakeholders in our three case study sites aimed at understanding impacts of drug-trafficking on governance. We conducted scoping trips in four countries during 2015 and 2016, culminating in a pilot study in July of 2017 in Guatemala. We then undertook two weeks of field work in each of the three case studies during 2018. We interviewed 12 Costa Rican protected areas administrators and other stakeholders, 18 from Guatemala, and 15 from Honduras for a total of 45 interviewees. In each case, we interviewed conservation stakeholders across sectors (i.e. government, INGOs, private initiatives), and at different levels (national, regional, local), including park residents, managers and community leaders. Interviewees were selected for their knowledge of parks impacted by DTO activity over time.

Interviews consisted of two parts. First, interviewees participated in a mapping exercise allowing them to identify areas of drug trafficking activity and their environmental impacts on hard copy high-resolution maps detailing forest loss from 2000 – 2015. Second, semi-structured interviews allowed participants to reflect on how these activities impact conservation governance and their work as PA managers and leaders of forest communities. With participants' permission, interviews were audiotaped, and transcribed, and verbatim notes were taken to correspond directly with the mapping exercise. The resulting method produced rich, spatialized information on illicit activities inside the focal areas. Field work also included nine workshops with 70 PA stakeholders

that touched on drug trafficking’s role in land use change and position among formal conservation governance institutions.

3.2 Data Analysis

We digitized the mapped data collected via hard copy in the mapping exercise in Arc GIS, converted them into points or polygons and assigning each entry an identifying number corresponding to a database, where each activity was categorized. Across the three country case studies, the mapping exercise produced a catalog of ~500 environmental impacts of drug trafficking, which provide rich insight on activities associated with the transit of drugs, and their negative environmental impacts, what we call “narco-degradation.” We manually coded the 45 semi-structured interviews and the workshops field notes for a) Ostrom’s design principles of conservation governance (outlined above), and b) themes emerging from our preliminary research between 2015 and 2017.

4. Results

The analysis revealed four principal insights about cocaine trafficking’s impacts on conservation governance in the MBC, summarized in Table 1.

Drug Trafficking’s Impacts on Conservation Governance	
1.	Drug trafficking fuels multiple extractivist booms (e.g. cattle ranching, oil palm, logging, and fishing) that cause multiple forms of environmental degradation
2.	Drug trafficking organizations undermine conservation coalitions through tactics of intimidation, violence and corruption
3.	Drug Trafficking’s impacts are uneven and

4. Synthesis:

Drug trafficking alters conservation governance in ways that permits new practices and patterns of environmental degradation.

	reflect differences in governance structures and physical geography
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Table 1: A summary of four impacts of drug trafficking on conservation governance.

4.1 Narco-degradation: Fueling Extractivism in Protected Areas

“La gran lavadora de dinero es la industria (industry is the great launderer of money).”

--NGO administrator, Guatemala

The illicit cocaine trade fuels boom economies that promote short-term over-extraction and environmental degradation over long-term conservation goals. DTOs are claiming drug smuggling territory and laundering drug money in protected areas through diverse industries such as cattle ranching, oil palm production, gold mining, fishing, and illegal poaching of flora and fauna. These activities have historically threatened protected areas throughout the MBC and have been intensified by narco-capitalization.

Cattle ranching has been Central America’s most opportune industry for drug trafficking organizations to launder cocaine profits (Devine et al 2018). The region has long supplied beef to growing internal and northern markets, and the drug trade opens up access to new forms of capital that accelerate the process. Cattle ranching is uniquely suited to launder cocaine profits as one of the few unregulated agro-industries within the Central American common market (*ibid*). The international cattle trade between Central American and Mexico has been subject to little monitoring or taxation, and transactions can be remitted electronically across borders with minimal formal reporting requirements (*ibid*). This lack of oversight allows the international cattle trade to become a means for laundering drug proceeds. A Guatemalan conservation manager explained, “There has never been anything to control cattle imports and exports: taxes, management plans,

business regulations, market constraints... no type of control. Not to begin raising cattle, nor to sell the full-grown ones. You don't need any of that: just fire and a forest.”

This phenomenon is so ubiquitous in and around some protected areas in Central American that is commonly known as *narco-ganadería*, or “narco-ranching,” (treated in detail in Devine et. al 2018; WCS 2017). To provide a sense of case-by-case impact of narco-cattle ranches, in the MBR, interviewees provided information on four *narco-ganaderos* currently being tried for land usurpation in protected areas totaling 1,010 hectares. In a large area with forest loss, he continued “unbelievable forest clearings. Three thousand hectares at a time! Too much! We’re in crisis.” In the MBR’s Laguna del Tigre National Park and Sierra del Lacandón National Park, illegal cattle ranching took place on 67% and 87% of sampled deforested lands (Devine et al, 2018)

This explosive increase in ranching can be explained in part by capital scarcity and land speculation practices (see Devine et. al 2018). DTOs often acquire land through land speculators and *testaferros* (front men) who facilitate land acquisitions on behalf of absentee and anonymous DTO actors (also described in McSweeney *et al* 2017). A Guatemalan conservation manager explained: “They layer landownership and transactions...*testaferros* will flip it [land] several times and launder money as the land changes and increases in value.”

A dominant theme in Central America’s ascendancy in the North American drug trade involves the transition from forest to ranches to industrial agriculture, including oil palm plantations, as noted in Grandia (2012). This transition has been recognized regionally and globally (Furumo and Aide 2017). Following prices in oil palm commodity markets, however, the shift in Central America first requires cattle ranching.

While this paper does not recount the role of oil palm plantations in drug money laundering, a few details are key. As prime transit territories have emerged and land values increased, the “land speculation engine began. People learned how to convert land and sell it directly to palm plantations, and they keep moving.” A Honduran conservationist explained further that flipping land to palm producers is a way for peasants and small ranchers to access capital that the state or banks will not provide, and for narco-traffickers to further launder their profits.

Interviewees provided various accounts of narco-capital investment in cattle and oil palm that alienate and displace Indigenous people and forest communities (see also McSweeney *et al* 2018), including various examples of long-standing communities selling, abandoning and being forced from their traditional lands (McSweeney *et al* 2013, Shipley 2016). While oil palm’s role in land dispossession and links to DTOs is clear in each of the contexts (CICIG 2016), it is clearest in and around Northeastern Honduras. A Honduran interviewee described one case in which an Indigenous community had been dispossessed by narco-capitalized oil palm plantations. In the middle of ancestral lands there is an area of narco-linked oil palm. With a small legalized piece of land, they [DTO] illegally occupied the protected area.” Versions of this account dotted the region.

Money laundering is just one motivation for DTOs to cattle ranch and produce palm in protected areas, “the real purpose is territorial control,” several PA managers and residents explained. “Cattle is not the end, it is the means,” explained an interviewee, “the end is territory”. Our interviewees explained that narco-cattle ranchers and oil palm producers use territory to secure landing sites and connect land routes across countries as well, securing passage from Northeastern Honduras to Peten, Guatemala. As we detail

370 ahead, territorial acquisition or “narco-land grabbing” (Ballvé 2012) inside PAs often
371 occurs through corruption, violence and economic coercion (McSweeney 2017 et. al,
372 McSweeney 2018 et. al).

373 Interviewees describe how drug trafficking fuels a proliferation of interwoven
374 illicit markets. Rosewood is at the center of illegal lumber across Central American
375 forests. Illicit logging is a direct conservation problem, but even while countries and
376 conservation agencies are focusing on the problem of rosewood, and preventing
377 rosewood from entering Chinese lumber markets, the amount of rosewood circulating in
378 illicit markets increases. Why? “Because lumber traffickers are moving drugs at the same
379 time. It’s easier to pay off a park official for rosewood than for cocaine,” however
380 loggers can pay these bribes with cocaine proceeds. According to various respondents,
381 there are different taxes for different illegal products (e.g. drugs, migrants, wood), and
382 lumber is among the cheaper commodities. “If you say there are drugs in your shipment,
383 they’ll make you pay more.” But if a shipment includes drugs, then it will easily make
384 enough in profits to cover the “taxes” on lumber.

385 Narco-trafficking is not only linked to deforestation but to broader patterns of
386 environmental degradation. In Costa Rica’s Osa Peninsula home to Corcovado National
387 Park, for example, trafficking results in mangrove destruction, illicit gold mining, as well
388 as fish and timber poaching. A Honduran interviewee brought up the connection between
389 various forms of trafficking, “We haven’t yet talked about the relationship between
390 poaching and drugs, but it’s there.” In all three case studies, interviewees described in
391 detail the networks that support ranching, the harvest of illicit lumber, and poaching of
392 flora and/or fauna, but who will also engage opportunistically in “eeeeeeeverything:

every kind of illicit activity under the sun.” Many forest resources in conservation spaces, e.g. lumber, fibers, gold and wildlife, are prized as commodities in global markets. In addition to illicit resource extraction and poaching, in all three cases human trafficking was reported as well. In Guatemala, DTOs control most of the “blind passes” and tax coyotes or even entice them to traffic drugs and people, for example, offering coyotes to pay their territorial “tax” in the form of women and girls, who were sold into prostitution. In Costa Rica, DTOs trafficked girls and women with cocaine, and constructed a make-shift bar inside Corcovado National Park where traffickers “partied” with human trafficking victims.

The more recent emergence of Osa Peninsula’s cocaine-fueled boom economy shows how horizontal linkages to diverse forms of environmental degradation follow. The Osa is an attractive landing, refueling and warehousing site for DTOs because, as our interviewees collectively summarized, it is near the Panamanian border, it is isolated, there are ample wetlands and mangroves, and there is little police presence. In the last five years the Osa Peninsula transitioned from a way station for refueling boats on maritime routes to a warehousing location for cocaine on its way north. Drug trafficking is negatively impacting Osa’s fishing and mussel industries and maritime ecologies: “The narcos did incredible destruction to mangroves to make canals so they could unload boats,” a park official explained. Others explained how traffickers drain wetlands to construct airstrips or store the drugs in underground warehouses inside the wetlands “because the earth is soft and sandy, and really easy to dig. You can hide things well.” In the Osa Peninsula, narco-land grabbing is incipient, and conservationists worry: “Years ago there were a few planes that landed, but now the phenomenon is structural. I

fear that narcos will take control of the territory of Corcovado so that we can't even go in. If that happens, we lose the protected areas and with them, park governance."

In both Honduras's north coast and Costa Rica's Osa Peninsula, narco-degradation occurs in coastal and marine protected areas. Just as cattle are a mechanism for both transit and money laundering in terrestrial protected areas, fisheries accomplish the same goals on the sea (Benessaiah and Sayles 2014). In Honduras, interviewees provided lengthy narratives on the oldest and most powerful traffickers, and their long-standing reliance on the fishing industry in marine and terrestrial protected areas. Our interviewees describe encounters with fishermen in marine protected areas from neighboring countries without fishing licenses, with state-of-the-art GPS equipment, unused fishing gear, and multiple high-powered outboard motors. To ground shipments on the mainland, drug traffickers often recruit and coerce small-scale and artisanal fisherman who live and work in protected areas to lend their boats and docks, coordinate fuel transfers, or store drugs temporarily. An Osa park guard explained, "Narcos threaten fisherman to participate. They are asked to work as mules, to pick up packages." It is beyond the scope of this paper to fully articulate dynamics of drug trafficking in marine protected areas, but interviewees outlined impacts of drug trafficking on marine conservation governance.

4.2 Narco-violence and Corruption: Undermining Conservation Coalitions

"You ask how drugs trafficking affects conservation governance? It ends lives." –

Guatemalan Grassroots Conservation Leader

The illicit cocaine trade tears at the social relations of trust, reciprocity and collaboration that comprise polycentric conservation governance. The violence and

441 *corruption defining drug trafficking undermine participation and trust across scales and*
442 *sectors.*

443 Protected areas managers, rangers and residents have been placed on the front line
444 in the war on drugs (WCS 2017). In addition to their forest management responsibilities
445 addressing a multiplicity of illegal threats, PA workers are now confronted with violent
446 criminal organizations. There are numerous documented cases of conservation workers
447 being killed or forced into exile for speaking publicly, implicating, or even drawing
448 attention to the culprits of environmental destruction.

449 Nearly every interviewee in Guatemala, Honduras and Costa Rica recounted cases
450 in which DTOs are directly implicated in the murder of PA leaders, residents and public
451 officials. In one of our interviews, an official reviewing our maps put his finger on a
452 patch of forest loss and said: “This farm here is guarded by armed men. How are we
453 supposed to do conservation? When we say, ‘don’t cut down trees,’ and they respond
454 with bullets!” Operating in a high-value trade outside the law, DTOs use violence to
455 enforce contracts and resolve disputes (Beittel 2011). This violence makes denouncing
456 narco-activities life threatening in PAs and undermines the formal legal systems of
457 governance, incentives and sanctions: “There are lots of cases where agreements are
458 settled on the condition of death.” DTOs use targeted violence on specific actors as a
459 strategy for undermining formal regulation of land tenure, enforcement of environmental
460 law, infrastructural development, agricultural planning, sustainable development
461 financing, among other sectors of governance. An MBR resident explained: “People
462 die...take the case of our friend. Narcos killed the leader of the local conservation
463 association for speaking against them, and then the whole board resigned.”

464 Violence and the threat of violence have a disciplinary effect on witnesses; none
465 of the respondents who shared their experiences with us were immune to the threat of
466 DTO violence. Interviewees recounted the various colleagues who had been killed for
467 their work in conservation. A Guatemalan activist told the story of a 24-year-old park
468 ranger who worked for a well-known international NGO, who was killed in the entrance
469 of the local office in the middle of town. When asked if the illicit cocaine trade affected
470 the day-to-day work of conservation monitoring and enforcement, a Honduran park
471 ranger replied, “Yes, of course, it affects my work. All of the program coordinators are
472 scared. It’s hard to do this work when you’re scared of losing your life all the time.” To
473 the manager of one Indigenous reserve, the threats were very personal, “They’ve killed a
474 lot of our community leaders. I myself had to flee to the capital, and they followed me.
475 I’m still in danger, even now!” In one park, rangers set camera traps to monitor pumas,
476 which instead recorded images of narco-traffickers transiting drugs through the PA; they
477 found the ranger and told him, “you should stop watching those cameras so much, we
478 know where your kids go to school.”

479 Through corruption and violence DTOs can often act with total impunity in PAs,
480 thereby overturning not just management, regulatory and enforcement institutions, but
481 also the goals of conservation governance. Violence as a system of rule enforcement is
482 sometimes enacted against an entire community, such as was an infamous case of a
483 community of 500 people, where competing DTOs each expected settlers to cooperate.
484 One of the DTOs decided the community had broken its contract and murdered 27
485 villagers as a penalty. This system of rules and enforcement stands above the formal
486 justice system, as one interviewee explained: “The government knows who did it, and

they issued a warrant for the three leaders who perpetrated it. The judges are afraid to dispatch the order. The police won't enforce it. How can we possibly work on community conservation in this desperate situation?" Various interviewees reported that threats of violence strongly dampened agencies' willingness to enforce rules, officially sanction those who had violated rules, and to press claims forward. In multiple interviews, we heard statements about impacts of DTOs at all levels of governance, such as "very few official complaints are actually registered," "there is no legal mandate to stop these people," "there isn't interest or funds to bring these people to trial," and "they killed the judge that attempted to bring this suit against them."

The impacts of violence and threats of violence on institutions cannot be overstated. In a particularly poignant example, a leader from an Indigenous community explained that the primary existential threat to his remaining people is the threat of violence levied at leaders denouncing land usurpations by narco-ranchers are: "In ten years, we will no longer have anything. Our ancestors. Plants and animals. Traditional medicines from the forest. It will all be gone. This gives us great sadness. Many leaders of the [our Indigenous community] have been killed. I left and they keep pursuing me. I am still in danger."

Corruption is another key method that DTOs use to make rules and establish authority in PAs. Corruption is a way to evade formal rules and rule enforcement and is backed with violence. Across the MBC interviewees described the "*pago o plomo*" (bribe or bullet) strategy used by DTOs to exercise authority within PAs: "when a narco-*ganadero* illegally attempts to settle in a protected area he might offer a community leader the 'pago' – a large sum of money— and when he resists the narco-rancher will

say, ‘Ok. I will return in two months and offer your widow half the price I offered you today.’” (Devine et. al 2018). The *pago* or *plomo* strategy enables DTOs to infiltrate formal governance structures, even local level cooperatives and community organizations. An interviewee in the MBR explained: “In these places, they buy leaders. But if your honor is stronger than your price, then you’re dead.”

Corruption undermines state authority, and state-society relations in PA governance because forest residents feel that powerful, politically-connected, narco-enriched elites are the ones violating conservation rules inside PAs. One interviewee explained how elites operate under a different set of rules, “If the brother of the president (an indicted drug kingpin) is involved [in *narco-ganaderia*], then the army isn’t going to do their job. Everyone knows the reason! So I don’t trust anyone.” Uneven application of rules is deleterious to governance, as one park ranger explained: “it undermines the rule of law, the public confidence of doing things in the right way. In practice, it is primary poor, marginalized settler communities that are subject to rule enforcement. As a Guatemalan community leader explained, “justice is like a serpent: it only bites the poor.”

Drug trafficking activities have also threatened donor relationships and funding, an essential element of chronically underfunded conservation agencies. The “Northern Triangle’s” reputation for high homicide rates and dangers for environmental activists has threatened funding for conservation efforts as donors pull funding to invest elsewhere. A Honduran participant explained that when the human rights organization Global Witness named Honduras “the most dangerous country in world for environmental activism” many organizations felt financial ramifications. The fear of

violence deters international investment in conservation efforts and chokes off critical funding streams as donors redirect funds to safer, more secure programs. While homicide rates remain low in the Osa at present, a Costa Rican official explained: “This area is controlled by a single Mexican cartel. One single cartel for the past five years. If another cartel arrives, there will be a lot more casualties.” Interviewees suggested that if a turf war opens in Costa Rica, eco-tourism will immediately suffer, and in the long-term so may funding for conservation programming.

In Guatemala and Honduras, drug trafficking has also resulted in the militarization of conservation funding, part of a broader securitization or militarization of conservation (Duffy 2014; MacKenzie 1988). These shifting investments take the form of initiatives such as the specialized military brigades charged with conservation in the MBR (Prensa Libre 2010) and increased imbedding of international border police with park rangers in Costa Rica’s Corcovado National Park. The work of park ranger is taking on more security functions, including liaising with security and police forces, while security-related skills and experience are preferred in hiring procedures. This pushes the actors and agencies that implement conservation goals into the governance apparatus of national security and drug enforcement. As interviewees explained, the militarization of conservation professions further contributes to conservation professionals leaving the field.

4.3 Drug Trafficking’s Uneven Impacts: Governance Structures and Geography

Not all PAs, forest dwelling communities and conservation governance types are equally susceptible to the influence of DTOs. Areas of vertical conservation policies like national parks where absentee states or private sector actors monopolize governance are most

vulnerable. Community-based and participatory resource governance can be more effective than strict conservation in deterring narco-land grabs. Geographic features make certain PAs more susceptible than others.

Governance models predispose certain PAs for narco trafficking. Interviewees explained that top-down, state-managed parks based on a strict model of conservation are most vulnerable in Guatemalan and Honduras (See also PRISMA 2014), but also in Costa Rica. This is partly because national parks, biological reserves and biotopes that prohibit residency offer DTOs landscapes that are remote, isolated, absent of state presence. In these places, there are few human settlements, which makes it easier to ensconce illegal activities, such as landing drug planes.

Even when present, state institutions tasked with monitoring protected areas are often underfunded, understaffed, and ill equipped to address most illegal activity- narcotrafficking related or not. Resource monitoring and rule enforcement are often patchwork, undertaken by a relative handful of rangers, or not at all. Even in the comparatively resource-rich context of Costa Rica's Corcovado National Park, nine rangers are responsible for 42,400 hectares of territory, and an additional 27,100 hectares of mangroves and waterways, which they patrol with antiquated boats and low-horsepower motors. DTOs can influence state presence with acts of vandalism and violence against state infrastructure. Interviewees provided accounts of DTOs disabling vehicles, closing roads, and in one instance, burning a ranger station to the ground, including infrastructure funded and co-operated by the state and an INGO, with monitoring equipment and records inside (fig. 4).



Fig. 4 | Remains of a ranger station co-managed by an international conservation non-profit in a protected area. A DTO burned the station to the ground to prevent monitoring.

Interviewees provided multiple examples of strict conservation failing in the face of trafficking. An interviewee in Guatemala explained generally why conservation efforts failed to stop deforestation in the Laguna del Tigre National Park in the MBR: strict conservation “is a model that was imported. It was never our model, that we originated here. From the moment we started following that model, we see deforestation rise and environmental conflicts begin.” In support of general findings on PAs, interviewees explained that the vision of strict conservation almost always fails because it does not consider the needs of communities surrounding PA. Strict conservation law in national parks pits state agencies against communities living in those areas because their residency is defined as illegal. A Guatemalan researcher explained: “The problem is the communities view [the conservation authority] and the government as the enemy.” People occupy these lands for a variety of reasons, but for many, poverty, landlessness and civil war violence motivate, if not compel, their unauthorized farming and

homesteading practices in PAs. Rather than co-managing lands, settlers occupying PAs without authorization are subject to eviction, putting them between the threat of state on one hand, and drug traffickers on the other (CIDH 2017). Interviewees cited multiple cases of PA residents whose traditional economic activities had been criminalized – specifically artisanal mining, hunting, and trade in archeological artifacts (see also Duffy 2016). The risk, we were told, is that criminalizing locals may push them to cooperate with DTOs.

The case of Costa Rica is instructive for showing the role of conservation models in resisting DTO influence. Despite numerous illustrations of DTOs' incipient attempts to infiltrate and corrupt state institutions, traffickers do not undermine conservation law and enforcement in Costa Rica in national parks with the same level of impunity that they do in Honduras and Guatemala. Why? Interviewees in Costa Rica rationalized this in terms of the contrasting model of governance. While the state plays a larger relative role in forest and PA management, the structure of state agencies is decentralized, allowing polycentric and participatory engagement with locals. In Costa Rica's PAs, the result has been deeper state support for private and communal eco-tourism initiatives, which has broadly driven national economic development as well as the creation of robust institutions, making PAs there less attractive to traffickers. Nonetheless, Costa Rica's importance as a transit node has elevated within the last five years. Interviewees at various levels suggested that the entry point for DTOs has been communities, whose access to resources has been excluded or restricted due to heavy-handed state regulation, such as fishermen, foresters and artisanal miners.

619 The multiple use zones of the MBR and Northeastern Honduras provide evidence
620 that co-management models of land and resources can resist DTO influence, under
621 specific conditions. Interviewees reported that the MBR’s community forest concessions,
622 for example, have been more successful than strict conservation models in Laguna del
623 Tigre and Sierra del Lacandón National Parks in terms of retaining forest cover (Devine
624 et. al. 2018), preventing forest fires (see also Davis and Sauls 2017), protecting
625 biodiversity (see also Hodgdon et. al 2015), reducing poverty and building institutional
626 capacity in neighboring communities (see also PRISMA 2014). In the MBR, interviewees
627 cited the local benefits of forestry: \$25 million in annual revenue, providing 30,000
628 people with living-wage jobs, schools, health care clinics, and community infrastructure,
629 as well as professional training in forestry, carpentry, eco-tourism, and project
630 management.

631 The key to co-management models is secure land tenure, which takes many forms
632 across the region, including communal titling. In the MBR, for example, land tenure is
633 guaranteed through 25-year forest concessions, which contrasts with communal titling
634 conventions in Indigenous communities elsewhere. Regardless of the mechanism, land
635 tenure security may create preconditions against land grabbing by narco-traffickers and
636 land speculators (see also Mollet 2011; Shipley 2016). Community leaders from the
637 Northeastern Honduras and Guatemala’s MBR suggest land titling is not enough; titles
638 must be accompanied by long-term planning and financing for community organizations.
639 As one leader explained: “If we don’t organize, we don’t develop. ... And if we don’t
640 develop, the drugs will keep moving.”

642 **5. Discussion:**
643

644 *“Yo soy quien manda aquí”* (I am the one in charge here.)

645 ---- Cattle rancher in Laguna del Tigre National Park, Guatemala

646
647 *In contrast to popular and political discourses that describe protected areas*
648 *where DTOs operate as lawless or ungovernable, we suggest that drug trafficking*
649 *organizations alter relations and practices of governance that undermine conservation*
650 *goals. DTOs do so by engaging in everyday practices of governance that circumvent pre-*
651 *existing formal and informal institutions. Thus, traffickers produce new governance*
652 *regimes and relations with alternative forms of control over territories, which influence*
653 *land use change and natural resource use.*

654 Drug-trafficking in protected areas alters institutions and practices of conservation
655 governance. In each case, DTOs embedded themselves within the polycentric set of
656 conservation governance actors and institutions and competed with formal institutions to
657 reorder the relationships between resources, people, and space. In PAs where DTOs exert
658 significant influence, they redefine boundaries and territories; articulate norms and rules
659 that govern behavior; enforce rules with violence; determine participation and exclusion
660 in resource use and control; commodify land and resources in ways that act
661 synergistically with the drug trade; and they even provide basic services. While they
662 rarely exercise complete territorial control, they compete over territory and resources in
663 ways that challenge protected areas state agencies and personnel, and the communities
664 whose lands they occupy, in ways that physically alter the landscape.

665 In parts of the Honduran North Coast and the western national parks of the MBR,
666 DTOs exercise control over large tracts of land, determining who can enter and occupy
667 the spaces they claim. The economic activities undertaken by DTOs, such as narco-cattle
668 ranching, mining, and industrial agriculture, serve as money laundering practices, but
669 they are also practices of territorial control. Territorial control is exerted in a range of
670 activities, such as building fences, setting up checkpoints, and implementing
671 sophisticated surveillance operations. In Laguna del Tigre in the MBR, one narco-cattle
672 rancher built a fence between land he illegally occupied and deforested, and the military
673 checkpoint marking the park's entrance. In effect, he enclosed the park entrance. This
674 rancher explained to the park guards when he built the fence: "I am in the one in charge
675 here." Where narco-ranchers claim to be "in charge," organized crime undermines and
676 can supersede the state's authority at the level of everyday practices of governing
677 territory and resources.

678 While DTOs use violence to assert territorial control and reconfigure access to
679 resources, they also use their capital to purchase social legitimacy. This is particularly
680 salient in areas with little government support. At times they do so by providing
681 desperately needed basic services to national park residents denied by the state (see
682 Richani 2013). DTOs commonly provide services to settler communities, such as the
683 provision of food and medicine, and financing for school buildings and school supplies.
684 Interviewees reported that DTOs provide locals with a buffer against financial shocks,
685 covering costs of emergency medical bills and funerals. In addition to these legitimizing
686 services, DTOs finance social infrastructure in public spaces, such as school buildings,
687 soccer fields and churches. On a more basic level, one interviewee succinctly captured a

688 sentiment, shared by many: “Traffickers introduce a system of [incentives and
689 deterrents], and meanwhile the government hasn’t done shit for you in the last 500
690 years!”

691 In agreement with Ballvé’s (2012) observations in Colombia, DTOs in Central
692 America advance their own goals by engaging in a range of pro-development state-
693 making activities. DTOs’ social and economic investments follow a neoliberal
694 development logic already present in the region and historically evident in illegal cattle
695 ranching, mining and logging, which centers on limited government, entrepreneurial
696 freedom, strong private property rights, unregulated markets, and free trade. Pursuing a
697 model of development in direct opposition to conservation governance agencies, faulty
698 and unsustainable as it may be, lends social legitimacy, as one Honduran interviewee
699 explained that many “people respect the narcos’ authority because they provide
700 employment.” DTOs know that they can accomplish something that conservation
701 agencies have not, according to one Guatemalan interviewee: “The state isn’t responding
702 to the needs of the people. The people in the park are not getting what they need: access
703 to land, access to labor.” Narratives of “ungovernability” and “lawlessness” defining the
704 Guatemalan MBR and the north coast fail to capture how DTOs actually engage in many
705 basic governance practices the state is unable or unwilling to fulfill for people living
706 inside and adjacent to PAs.

707 Interviewees explained one key reason that community forest concessions have
708 been more successful in resisting narco-land grabs in MBR PAs: Grassroots Indigenous
709 and community organizations engage in practices of governance typically assigned to the
710 state. Rather than framing forest residents as threats to conservation, concessions rely on

participants to perform core governance activities, including establishing rules and norms for resource use, monitoring resources, enforcing sanctions, and performing services. The multiple-use zone in Guatemala's MBR provides the clearest example, where forests under community management led by the Association of Petén's Forest Communities have strong monitoring programs, which support wildfire prevention and reforestation activities, with clear economic benefits to stakeholders. In co-managed land in Guatemala neighboring hotspots of narco-activity, scientific evidence and interviewees relate rates of deforestation near zero, high biodiversity, and well-functioning eco-system services (as supported in other work, see Davis and Sauls 2017).

6. Conclusion

"The root causes of narco-deforestation are these: if you cut off the trunk, you'll see campesinos, and then into the roots you'll see poverty, and then deeper into the roots you'll find the narcos, but at the bottom you'll find the global economy."

----- Guatemalan Conservation Leader

Since the creation Meso-American Biological Corridor and hundreds protected areas in the 1990s, Central America has experienced some of the world's highest deforestation rates (Hansen et. al 2013, Hodgdon et. al 2015). One explanation for the recent increase is the concentration of drug trafficking and money laundering in and around protected areas (Devine et al 2018; McSweeney et al. 2014, 2017, 2018; Sesnie et. al 2017). In Guatemala's Maya Biosphere Reserve, Northeastern Honduras, and Costa Rica's Osa Peninsula, drug trafficking activities undermine the ability of forest residents, protected area managers, and state agencies to govern forests and protected areas.

736 We identify three pathways by which drug trafficking undermines conservation
737 governance. First, drug trafficking fuels extractive economies in and around protected
738 areas, such as cattle ranching, industrial agriculture and fishing. In addition to driving
739 forest loss, trafficking produces other forms of environmental degradation, including
740 wetland and mangrove destruction, illegal logging, illegal fishing, poaching of flora and
741 fauna, and illicit mining activities, among other impacts. Second, it undermines
742 conservation coalitions, notably by introducing violence and corruption. Traffickers
743 employ various tools (including corruption, land-laundering, intimidation and violence)
744 to enroll the land and resources inside protected areas, long coveted for economic
745 purposes, into speculative markets. The corresponding economic booms and violence
746 imperil conservation strategies that rely on market-based mechanisms, such as eco-
747 tourism or payments for ecosystem services. At the same time, traffickers distort
748 conservation rules and practices (i.e. environmental law) by directly undermining and
749 dismantling the alliances painstakingly built over time to support and enforce them.
750 Third, the unevenness of drug trafficking's impacts on PAs reflect differences in physical
751 geography and governance structures. Across the diversity of PAs in the three cases,
752 evidence suggests traffickers were more able to target and exploit remote state-managed
753 national parks situated along international and marine borders, where formal conservation
754 institutions have a limited presence. National parks with flat terrain, savannahs, and
755 water sources make ideal locations for narco-cattle ranching, as exemplified in Laguna
756 del Tigre National Park in Guatemala's Maya Biosphere Reserve. Likewise, in
757 Northeastern Honduras and Costa Rica's Osa Peninsula, mangroves and wetlands make
758 these protected areas attractive for supplying maritime routes and warehousing cocaine.

759 DTOs ability to control territory, behaviors and resource use may depend on local
760 conservation models. Strict conservation models where the state monopolizes land uses
761 excluding locals are vulnerable simply because there are fewer stakeholders in
762 monitoring resources, enforcing rules, and denouncing illicit activities. In Central
763 America, environment ministries and park agencies charged with implementing
764 conservation law, even at a time when they have become the new front-line for drug
765 enforcement, are understaffed, underfunded, ill equipped, and unable to ward off and
766 resist land grabs by powerful actors including narco-traffickers. More importantly, at
767 least where a robust ecotourism infrastructure does not exist, strict conservation models
768 fail to provide local communities with livelihood opportunities (Moreno et al. 2011), let
769 alone sustainable economic development pathways, thus rendering them more vulnerable
770 to the entry of highly profitable illicit economies. In contrast, where institutions support
771 participatory management of protected areas, where Indigenous and peasant cooperatives
772 co-manage land and resources, there are fewer opportunities for DTOs to embed.

773 Ultimately, the solutions to the complex transformations introduced by narco-
774 trafficking also lie outside the boundaries of the region's parks. Continued cocaine
775 demand in the global north, the US led War on Drugs and its militarized interdiction
776 policies, ultimately push drug trafficking and the laundering of spectacular profits into
777 remote, biodiverse spaces, where they threaten both ecosystems and people, and
778 undermine conservation goals and local livelihoods. The irony is that over the past two
779 decades, US-led drug enforcement policy has contributed indirectly to the conservation
780 crisis we describe, working directly at odds against the billions of dollars invested in
781 conservation by donor countries, international conservation NGOs, advocacy groups, and

local communities (Aguilar *et al* 2017). Rather than spending billions of dollars on a War on Drugs that has proved to be not only ineffective, but destructive to ecosystems and rural people in Central America (Magliocca et al. 2019), further investments should be made in conservation and sustainable development models that empower locals to manage land and resources.

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