

# From colonial forestry to 'community-based fire management': the political ecology of fire in Belize's coastal savannas, 1920 to present

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## Abstract

This article examines the past century of fire management of the coastal pine savanna in Belize, drawing on archival evidence, interviews, and ethnographic enquiry into an international development project in Belize. It considers contemporary approaches that seek to use prescribed fire with the participation of local communities in relation to past practices. The Belizean savanna has long been shaped by human fire use. Its flora is ecologically adapted to fire. Yet fire has been repeatedly cast as a problem, from c. 1920, by British colonial and, later, USA foresters, and, most recently, by international and local non-governmental nature conservation organizations. Informed by different schools of thought, each of these organizations has designed programs of fire management aiming to reduce wildfire frequency. Yet little has changed; Belize's diverse and growing rural population has continued to use fire, and the savannas burn, year upon year. While the planned aims and methods differed, each program of fire management has, in practice, been similarly structured and constrained by its genesis within colonial or international development. Funding and leadership for fire management has been inconsistent. Each program has been shaped by a specifically Belizean ecology and politics, in excess of its definition of the fire 'problem' and 'solutions' to it. Powerful political elites and fire users in Belize have not seen clear incentives for the fire management supported by official policy. This analysis highlights that contemporary efforts to build more ecologically and environmentally just forms of fire management must be understood in the context of broader political struggles over land and resources.

**Key Words:** Savanna, fire management, colonial, state forestry, political elites, Belize

## Résumé

Cet article examine la gestion des incendies dans les forêts de pins côtières à Belize depuis un siècle. L'article se base sur les informations puisées dans les archives, des résultats d'interviews et des recherches ethnographiques liées à un projet international de développement dans ce pays. Il compare les méthodes modernes d'incendies contrôlés avec participation des communautés avec les pratiques utilisées dans le passé. L'influence sur la savane des feux d'origine humaine n'est pas un phénomène récent, les espèces végétales s'y étant progressivement adapté. Les incendies de savane sont pourtant considérés comme un problème depuis environ 1920, d'abord par les colons britanniques, puis par les forestiers américains et enfin, plus récemment, par les organismes internationaux de protection de la nature, ainsi que les organismes béliens de protection indépendants de l'Etat. Influencés par des systèmes de pensée différents, ces organismes ont tour à tour proposé des programmes de gestion des incendies afin de réduire les feux de forêt. Et pourtant, en pratique, rien n'a changé; la population rurale de Belize, diverse et en croissance constante, continue la pratique des incendies et la dévastation de la savane se poursuit d'année en année. Bien que leurs objectifs et méthodes varient, tous ces programmes de gestion, qui trouvent leur origine dans le développement colonial ou international, ont en commun la même structure et les mêmes contraintes. Le financement et la direction de ces programmes ont toujours manqué de consistance. Chaque programme tombe sous l'influence d'un système

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écologique ou de politiques propres à Belize et finit par ne plus correspondre aux définitions du réel problème ou de ses solutions. Les puissantes élites politiques ainsi que les pratiquants des incendies ont manqué de voir un intérêt à la politique de gestion de l'heure. L'article met en évidence le fait que, dans un effort de développement de méthodes de gestion des incendies plus écologiques et plus pertinentes, il est impérieux de prendre en compte un contexte politique plus large de problèmes liés aux terres et ressources terrestres.

**Mots clés:** Savane, gestion des incendies, colonial, services forestiers de l'Etat, élites politiques, Belize.

## Resumen

Este artículo aborda el manejo del fuego de la sabana de pino costera de Belice en el siglo más reciente, basándose en datos de archivos, entrevistas, e investigación etnográfica sobre un proyecto internacional de desarrollo que se lleva a cabo en la región. Considera acercamientos contemporáneos que buscan utilizar fuego prescrito con la participación de comunidades locales con relación a las prácticas del pasado. Por mucho tiempo, la sabana de Belice se ha formado por el uso del fuego de la población humana. Su flora se ve adaptada ecológicamente al fuego. Sin embargo, el fuego se ha entendido constantemente como un problema, a partir de c.1920, por colonialistas británicos, guardabosques estadounidenses, y más recientemente, por organizaciones nacionales e internacionales no gubernamentales de conservación natural. Cada organización, influenciada por diversas posturas, ha diseñado programas de manejo del fuego que buscan reducir la frecuencia de incendios. Pero muy poco ha cambiado; la diversa y creciente población rural de Belice sigue usando el fuego y sigue quemando la sabana. Si bien difieren los objetivos y métodos, todos los programas de manejo del fuego, en realidad, se han estructurado de manera parecida, limitados por sus raíces en el desarrollo colonial y poscolonial. El financiamiento y la dirección del manejo del fuego han sido inconscientes. Cada programa se ha formado por una ecología y política específica beliceña, más allá de sus definiciones del 'problema' del fuego y sus 'soluciones'. Las élites políticas poderosas, y los que usan el fuego en Belice, no han tenido incentivos claros para participar en el manejo del fuego apoyado por la política oficial. El análisis que se presenta en este artículo subraya que los esfuerzos contemporáneos para construir modos más justos de manejo del fuego, ecológicamente y respecto al medioambiente, deben comprenderse con relación a las luchas políticas más generales acerca de la tierra y los recursos.

**Palabras clave:** Sabana, manejo del fuego, colonialismo, ingeniería forestal estatal, élites políticas, Belice

## 1. Introduction

Fire is a medium through which human practices and politics have shaped ecologies (Bird and Cali 1998; Bond and Keeley 2005). Knowledge of fire's behavior, and its controlled and sophisticated use, for example to facilitate hunting, agriculture, pastoralism, physical access or protest, have been, and remain, central to many human societies (Bilbao *et al.* 2019; Fowler and Welch 2018; Nigh and Diemont 2013; Pyne 2016a). Yet, where uncontrolled fires or wildfires, are ignited by people or lightning, they can have the potential to negatively impact human wellbeing. People also shape the occurrence of wildfires by modifying fuel environments: by grazing animals, deforesting, introducing new species, building roads and urban areas that break fuel continuity, and via their contribution to climate change. Ecologists understand fire as an important and constructive process in "fire-dependent" ecosystems, such as tropical savannas (Shlisky *et al.* 2006). In many of these ecosystems, human fire use has historically promoted diversity in vegetation structure and species composition (Bird *et al.* 2008; Kepe and Scoones 1999; Laris 2002). Contemporary changes to fire regimes—including increases or decreases in wildfire frequency and intensity—are threatening ecosystems and people (Bowman *et al.* 2011; Doerr and Santin 2016; Flannigan *et al.* 2013; Pechony and Shindell 2010).

Since the mid-nineteenth century, official fire management policies in many countries have been strongly influenced by European and North American attitudes towards fire in the landscape (Pyne 1999).<sup>2</sup> In the nineteenth and early twentieth centuries, the dominant assumption was that total fire suppression was desirable for forestry and nature conservation objectives. Simultaneously, throughout the past century, a growing awareness of the limitations of policies of complete fire suppression was linked to recognition of the ecological role of fire and of the cultural importance of fire use. In many countries, official policies now support prescribed fire use, and some promote public participation in fire management (Kull 2002; Petty *et al.* 2015;

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<sup>2</sup> I use "fire management" for any approach to suppress, prevent, or plan fires in the environment in pursuit of specific goals.

Pyne 2015; Mistry *et al.* 2016; Moura *et al.* 2019). In academia, there are recent commitments to integrate the natural and social sciences to create a more holistic framework for the study of fire (Coughlan and Petty 2012; Scott *et al.* 2016). Yet, since the late twentieth century, fire suppression policies have gained new prominence as a response to 'megafires', and alternative approaches to fire management have failed to take a strong cultural hold (Adams 2013; Donovan and Brown 2007; Eloy *et al.* 2019; Ingalsbee 2017).

Belize is one country which has adopted an official wildfire policy recognizing the role of fire in rural livelihoods and supporting prescribed fire use and community participation in fire management (Sabido and Green 2009). In line with this policy, between 2015 and 2018, Belizean NGO, the Toledo Institute for Development and Environment (TIDE) was supported by consultants from the UK and USA in a UK-government funded project (The Darwin Project) that sought to "conserve pine woodland biodiversity" through "community fire management" in the pine savannas of Belize's Toledo District. The project proposed to increase local capacity for fire management by introducing ecological monitoring for fire effects in the protected areas and training local villagers in prescribed fire use. It also planned to develop "small forest enterprises" with groups of villagers. These activities were intended to be mutually beneficial: local people would gain livelihood benefits, and this would incentivize participation in nature conservation in the form of better fire management. The University of Edinburgh, my research institution, was a partner in the Darwin Project, and I served part-time as the Darwin Project Officer while also conducting research. This role involved drafting bi-annual progress reports to the funder and generally assisting with, but never taking main responsibility for, all project activities. I spent fifteen months living in Belize during the Project (February-April and August-September 2016; January-June 2017; January-April 2018).

This article considers the Darwin Project in light of the previous century of fire management practices in Belize's coastal savannas. It is the first study looking at the history of fire management in Belize, and, more generally, one of very few to have examined the history of state forestry in Belize.<sup>3</sup> It asks what influence Anglo-American attitudes towards fire have had on fire management in Belize's coastal savannas, and with what implications for contemporary efforts to promote public or "community" participation in prescribed fire management. It examines continuities and discontinuities both in the broad *ideas* informing fire management, and in the *processes* by which they were translated into practice within the structures of colonial or international development and the local ecological and political context. I trace how, over the past century, the purpose of fire management in Belize's savannas has changed, in policy, from the conservation of timber for capitalist exploitation and state revenue, to the conservation of nature and the benefit of local communities. In this period, fire management in Belize has been largely designed based on ideologies and policies deriving outside Belize, and has been supported by inconsistent colonial, and later, international development funding. Shaped in practice by Belizean ecology and politics, these externally derived approaches to fire management have often failed to reduce fire frequency in line with their objectives. Belize's political elite long sought to retain control over land and resources, even at the expense of policies (including for fire management) which they have officially endorsed to satisfy colonial and international funders.

The article has eight sections. To contextualize the study, I begin by 1) examining the influence of European and North American approaches to wildfire management in tropical savannas since the nineteenth century and 2) introducing Belize's savannas and broader political economy. Section 3 examines the origins of state forestry and fire management in Belize in the early 1920s. The following sections trace fire management in Belize's coastal savannas through three successive periods: Section 4 examines small-scale efforts by the Belize Forest Department in the 1920s and 1930s; 5) the Department's growth and decline from the 1940s to 1980s; and 6) the re-birth of fire management as 'integrated fire management' from the late 1990s to present. The last sections, 7 and 8, draw conclusions from this history for contemporary efforts to suggest ecologically and environmentally just approaches to fire management.

#### *Methods and sources*

The draws from my ethnographic observations, both as "insider" to the Darwin Project activities and as

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<sup>3</sup> Brief reviews of the history of forestry in Belize are provided only by Benya (1979a, 1979b) and Wainwright and Zempel (2018).

"outsider" in the Project's target villages of Bladen, San Isidro, Trio, Bella Vista, and Medina Bank. It is also informed by archival records in Belize and the UK and 68 semi-structured interviews with Belizean, UK and USA officials, scientists and NGO staff from Belize and villagers from Toledo's coastal savanna (interviews detailed in Appendix 1).<sup>4</sup> My archival research, research interviews, and ethnographic observations in the villages were conducted separately from the Project. I worked to keep my roles as Project Officer and researcher separate, to find the distance from which to critique the Project in my writing. Despite my attempts to explain this, it was perhaps not a distinction that everyone I encountered could understand.

The historical texts I could access give voice strongly to senior government officials, colonial scientists, and international development actors, rather than local fire users or those that labored conducting fire management for the Belize Forest Department. They speak more of ambitious plans than of practice. Through a deconstructive reading of these texts, I looked, in limited ways, for traces of these other voices, and of fire management in practice, by attending to what was hidden, marginalized or conspicuously invoked as pure or ideal (see Stoler 2010). My experiences and interviews in contemporary Belize shaped my ability to read unbalanced historical material in ways that did not attribute undue power to the ideas inscribed in fire management plans.

## **2. The global influence of European and North American approaches to fire management in tropical savannas since the nineteenth century**

Historically, fire was in common use in agricultural and pastoral livelihoods across Europe and North America, but today most people do not use fire in the landscape as part of livelihood activities. Most view it solely as a threat. This mentality is fueled by the contemporary media, but it can also be linked to narratives in agronomy, forestry and ecology that developed from the seventeenth century in Europe, in which fire was not deemed to fit into "rational" land use systems (Pyne 1997, 2016a). Particularly in colonial settings, where Europeans encountered highly flammable environments such as tropical savannas, fire came to represent environmental degradation. State forestry institutions in Europe and many European colonies criminalized fire use and pursued ideals of fire suppression (Bennett 2015; Eriksen 2007; Kull 2004; Pooley 2014). In the early twentieth century, influenced by European models, state-sponsored fire suppression was also instituted in the USA and its colonies (Pyne 2015; Smith and Dressler 2020). By then, the model of fire suppression that originated in Europe had left its mark in the reduction of wildfire activity globally (Pechony and Shindell 2010).

Clements' (1916) concept of ecological succession provided a new way of articulating the rationale for fire suppression: to "recover" forests, which were generally deemed to be the natural vegetation climax in most environments. Within the paradigm of "equilibrium ecology", tropical savannas were viewed as degraded forests rather than a "natural" form of vegetation (Veldman 2016). In 1934, for example, the British forester Edward Stebbing (1937: 7) wrote of west African savannas that they were "fully capable of being reconstituted [into] high forest by the two agencies of closure and strict fire protection."

By the mid-twentieth century there were vocal criticisms of policies of complete fire suppression, although such arguments had already been made much earlier (Pyne 1997). For example, in late nineteenth-century British India, the forester Dietrich Brandis had advocated for controlled burning (Pooley 2014). In practice, it had proven impossible to suppress human fire use practices (Kull 2004). Field staff of some forestry agencies noted that the increasing fuel loads that followed fire suppression made wildfires increasingly difficult to manage. Some ecologists suggested that fire was inherent to certain ecosystems. Gradually, some nation states began to accept controlled or "prescribed" burning. It was practiced in Australia by the 1920s, and in

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<sup>4</sup> In this article I reference records from a number of formal archives: the UK National Archives [TNA], the Belize Archives and Records Service in Belmopan [BARS], the Oxford University Weston Library Special Collections [OWL] and the Kew Garden Archives [KEW]. I also reference two collections of uncatalogued records: at the Mountain Pine Ridge Forest Station in Belize [MPR] and of the Belize Estate and Produce Company, held in Ladyville, Belize [BEC]. These records included official reports and memoranda, newspapers, and correspondences between colonial officials in Belize or between the Governor of Belize and the Colonial Office. In selecting interview participants, I began with people I had developed contact with through the Darwin Project and, in that I asked each respondent to suggest other potential respondents, my list of potential contacts snowballed. When selecting interview participants in the Project's target villages, I aimed to interview fire users, and for a balance of ages and nationalities.

Florida, where there remained a strong culture of fire use, state agencies allowed fire into protected areas from the 1930s (Pooley 2014; Pyne 2016b). By the 1970s, prescribed fire management was mainstreamed into the USA's national policies (Pyne 2015).

By the 1970s, ecologists, too, developed a new paradigm; non-equilibrium ecology (Worster 1989). They began to regard savanna landscapes as a patchwork of habitats, such that the term is now applied at a wide spatial scale to include pockets of forest (Furley 2016; Mistry 2000). Disturbances like fire are now understood to constructively maintain savannas as dynamic mosaics (Jeltsch *et al.* 2000; Sankaran *et al.* 2005; Staver, Archibald and Levin 2011). Contemporary theories to explain the occurrence of savanna relative to broadleaf forest combine climatic or edaphic factors with disturbances like fire or herbivory using the concept of "fire-vegetation feedbacks" (Fill *et al.* 2015; Hoffman *et al.* 2012; Murphy and Bowman 2012; Oliveras and Malhi 2016). Non-equilibrium ecology influenced some prescribed fire management programs aimed at re-creating "ecologically-appropriate" fire regimes; "patch-mosaic burning" emerged in the late 1990s, in reference to attempts to create heterogeneous patterns of fire in the landscape (Parr and Andersen 2006; Parr and Brockett 1999).

Prescribed fire has not taken a strong cultural hold and is less commonly practiced than its support in policy might suggest. Historical patterns of thought are important; official perspectives on fire are often shaped by "received wisdoms" that assume that fire, and particularly fire of human origin, is a cause of environmental degradation (Fairhead and Leach 1996; Kull 2002; Laris and Wardell 2006). On both ideological and practical grounds, the non-equilibrium paradigm in ecology has been slow to influence fire management in savannas (Adams 2003; Driscoll *et al.* 2010; Moore *et al.* 2009; Parr and Andersen 2006). The late twentieth century and early twenty-first century saw new scales of fire suppression in response to 'megafires' (Adams 2013; Donovan and Brown 2007; Eloy *et al.* 2019; Ingalsbee 2017). In the USA the liability surrounding prescribed fire use mounted following incidents of escaped prescribed fire (Pyne 2015).

As Stephen Pyne (2016b) argues, the term "prescribed fire" generally legitimizes only a certain form of human fire use: scientifically directed, pre-designed, and the sole domain of specialist technical agencies. The US Forest Service, for example, developed military-like organization, specialized equipment, and aircraft for prescribed fire management (Pyne 2015). Despite the growing awareness of the historical role of human fire in ecosystems, contemporary fire users have rarely been called upon to participate in the design or implementation of prescribed fire management. Yet, as the concepts of "community-based natural resource management" and "integrated conservation and development projects" emerged in the 1990s within the discourse of "sustainable development" (Adams 2008; Dressler *et al.* 2010), so they were followed, in some places, by "community-based fire management" and "integrated fire management." Both are approaches that aim to recreate ecologically and culturally appropriate fire regimes, though "community-based fire management" more explicitly refers to cases where local people are envisaged as active participants in fire suppression and prescribed burning (Myers 2006; UN-FAO 2011). There were both practical and ethical reasons behind such approaches. In some cases, there was recognition that local, often indigenous, fire users possessed their own expertise in fire management, that had historically been repressed, but that aligned with efforts to recreate "ecologically-appropriate" fire regimes (e.g. Mistry, Bilbao and Berardi 2016; Petty *et al.* 2015). Elsewhere, the rationale for engaging and involving people was changing fire use practices through training (e.g. Devisscher *et al.* 2016; Rodríguez-Trejo *et al.* 2011). Unlike in the Global South, where fire often remains strongly bound to cultures and livelihoods, in the Global North, where fire use practices and fire knowledge have largely been lost, cases of participatory fire management have focused more on integrating local values into fire management strategies, than on local involvement in the execution of these strategies (e.g. Otero *et al.* 2018).

"Participatory" fire management has drawn similar critique to that of "participatory" conservation and development more generally (Cooke and Kothari 2001; Williams 2004). Local "participation" in fire management has not always meant that local knowledge or values have been recognized (Bilbao *et al.* 2019; Mistry *et al.* 2016). Programs have often remained highly technical and so risked treating local people as "workers executing plans developed by others" (Petty *et al.* 2015: 140). The different conceptions and priorities of different stakeholders have not proven easy to integrate (Eloy *et al.* 2019; Eriksen 2007; Devisscher *et al.* 2018; Otero *et al.* 2018). Experience suggests that if local people are truly to participate in fire management

this requires strong local institutions, and political will to support communities more generally, for example, with rights to land and resources (Kull 2002; Moura *et al.* 2019).

I have outlined several approaches to fire management that have appeared in policy in many countries over the past century. Yet, published histories of fire management suggest that these policies have not strongly shaped fire regimes in practice. State agencies or NGOs have never been all-powerful in controlling wildfires or changing local fire use behavior (Pyne 1997). Wildfires are, by their nature, difficult to attribute to individual fire users (Kull 2004). Official policies have been compromised by inconsistencies within the states possessing them (Eriksen 2007; Kepe 2005; Kull 2004; Mathews 2005; Pooley 2014). Historical political ecologies of fire have important implications for those who would seek to influence fire management today.

### 3. Introducing Belize's coastal savannas

Lowland savannas comprise 8.8 percent of Belize's landcover (Meerman and Sabido 2001). They extend along the coast, bordered by mangrove swamps to the sea, and dense broadleaf rainforest inland (Figure 1).<sup>5</sup> These savannas have a mosaic of habitats: grassland with pine, oak or no trees, and pockets of broadleaf forest (Stuart *et al.* 2006; Wright *et al.* 1959). Climatic and edaphic factors broadly control the vegetation distribution in Belize, but at a finer scale, it is feedbacks with the disturbances of fire and hurricanes that control the shifting vegetation boundaries within the savannas (Johnson and Chaffey 1974; Myers and Morrison 2006; Myers and Rodríguez-Trejo 2009; Wright *et al.* 1959).

Wildfires are common in the dry season, from February to May. Today, human agency causes many fires in the coastal savannas (although the presence of grassland, pine and wildfires pre-date human presence in Belize) (Kellman 1975).<sup>6</sup> Numerous plant species of the Belizean coastal savannas, including the dominant pine species *Pinus caribaea*, are adapted to some level of frequent fire. Myers and Morrison (2006) loosely characterize an "ecologically appropriate" fire regime for similar pine savannas in Honduras, as one of low intensity surface fire with a return interval of one to ten years. Recent analysis of satellite imagery suggests that the present fire return interval in the coastal savanna of southern Belize is under three years (Roper 2016). The ecological role of fire in the Belizean coastal savanna has, however, received little empirical research, especially in so far as it may guide management.

What is now Belize was once part of the Mayan civilization. As today, the limitations of the soils for agriculture probably led to little inhabitation of the coastal savannas by the Maya, settlement instead favoring fertile river valleys and broadleaf forest further inland, where fire was integral to swidden agriculture (Ford, Clarke and Raines 2009; Garrison 2020; Kellman and Tackaberry 1997; Nigh and Diemont 2013; Thompson 1973). After their conquest of the Central American mainland, the Spanish did not establish a permanent presence in present-day Belize, although they claimed the area as territory. In the seventeenth century, British logwood cutters established a settlement in "the Bay" (around modern-day Belize City). They imported African slaves and developed an economy reliant on exports of logwood and mahogany harvested from the broadleaf forests and entrepôt trade with the Central American mainland (Bulmer-Thomas and Bulmer-Thomas 2012; Shoman 2012). Belize (known then as British Honduras) eventually became a British colony in 1862.

Surviving travel accounts give some insight into the use of the Belizean savannas after European contact. Most of this activity initially took place near Belize City. The settlers used some savanna areas to graze cattle, but with limited success (Henderson, 1811; Swett 1868). Various resources, most still used today, were harvested from savannas: wild meat, yellow-headed parrots (*Amazona oratrix*) for pets, thatching and walling materials (Henderson 1811; Morris 1883; Swett 1868; Uring 1726). European settlers and African slaves brought their own fire use practices to Central America, which both influenced and were influenced by

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<sup>5</sup> There is also an area of savanna further inland (the Mountain Pine Ridge), which is not my focus here.

<sup>6</sup> Most authors writing on the coastal savannas have stated that most or all fires are human in origin, rather than resulting from lightning strikes (Hunt 1962; Wolffsohn 1967; Johnson & Chaffey 1974; Arnold & Armitage 1989). The only figure I found in this regard is in the Forest Department's annual report for 1963 (Forest Department 1964), which states that of the fires fought that year in the coastal savannas, 19% were due to lightning strikes and 81% were human in origin. This is surprising given that three years later, Wolffsohn (himself associated with the Forest Department) wrote that "in the coastal pine forests lightning fires are unknown" (Wolffsohn 1967: 233).

indigenous practices (Sluyter and Duvall 2015). Early descriptions of fire use in savannas in Belize are few, but nineteenth-century sources suggest that fire was used to bring up fresh grass to attract animals for hunting (Hooper 1887). While laws to control fires within Belize City were passed as early as 1806, the Belizean legislation did not refer to fires outside urban areas until the twentieth century.

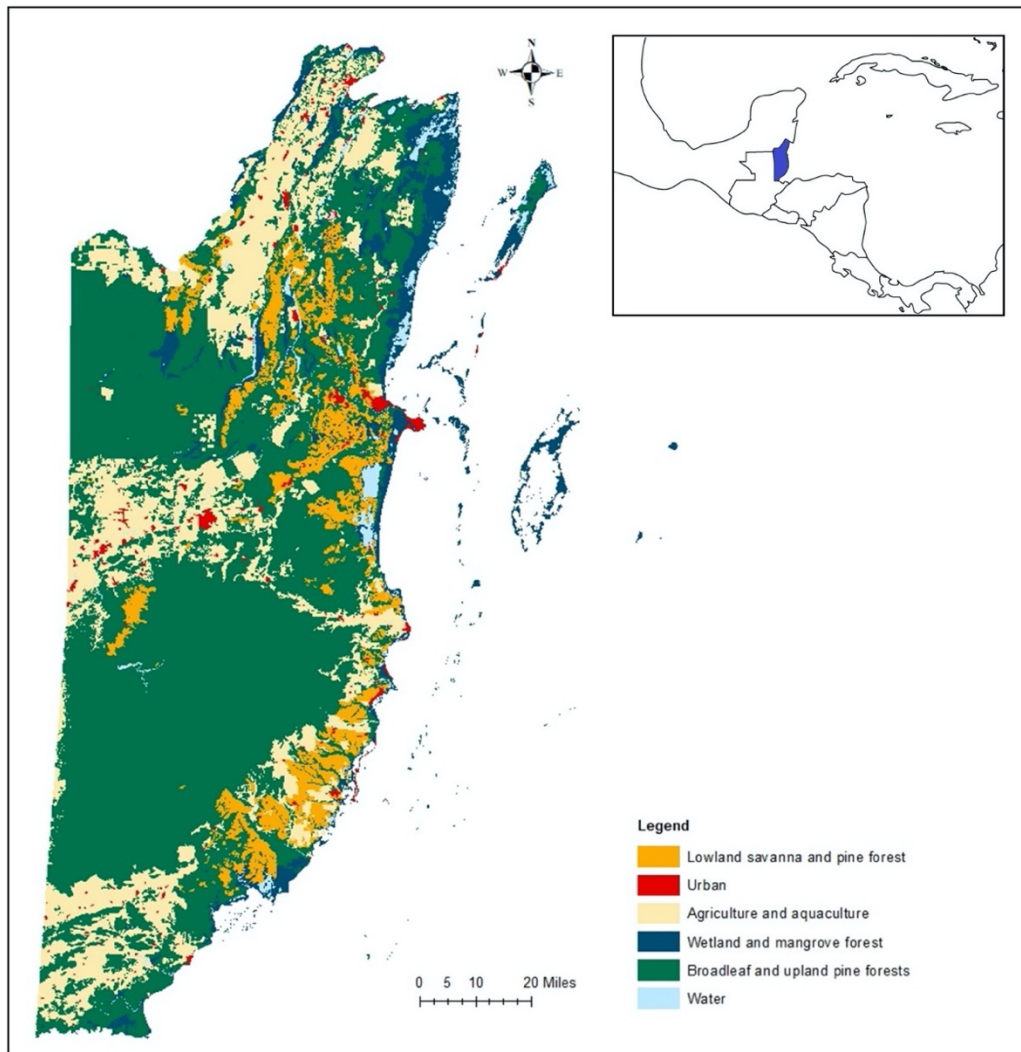


Figure 1: Belize's ecosystems and location within Central America (top right inset). Map produced by the author using Belize Ecosystems shapefile (Meerman 2015), available at <http://www.biodiversity.bz/>.

The Colonial Office, a Department of the British Government located in London, had oversight of all British colonies, appointing a Governor to reside in each Colony and lead both the legislative and administrative branches of the local colonial government. By the time Belize became a colony, the Caribbean colonies were declining in importance within Britain's Empire, and Britain preferred to encourage capitalist investment rather than create a strong local administration (Bolland, 1977). Despite constitutional changes throughout the twentieth century, the influence of the Governor and his colonial officials to direct affairs in Belize remained constrained by the power of a handful of British metropolitan companies, who owned much of the private land

(Bolland and Shoman 1977; Bulmer-Thomas and Bulmer-Thomas 2012). The interests of these companies were protected by local representatives who often held positions in the legislature and doubled as merchants in Belize City. Between 1890 and 1892, this group succeeded in campaigning for an unofficial majority in government (Ashdown 1981).<sup>7</sup> As Governor Swayne lamented in 1910, "no other British Colony has a constitution like that of British Honduras, where we have a nominated unofficial majority practically appointed for life and considering themselves responsible neither to the people of the Colony nor to the Crown."<sup>8</sup> Entering the twentieth century, there was little public spending and private actors were largely unregulated. Outside Belize City there was minimal direct rule by state representatives or institutions (Wainwright 2015).

While the broadleaf forests were largely privatized owing to their valuable timber, the savannas were less prized, and fell to the British Crown (Bolland and Shoman 1977). Officials made few excursions out of Belize City, and the savanna was still un-mapped in 1903.<sup>9</sup> Aware of the commercial potential of Belizean pine for timber, resin and turpentine, by the end of the nineteenth century, the Government began to consider how to encourage capital investment to "make something" of this resource in the savannas.<sup>10</sup> In 1904, the Government, backed by the British Colonial Office, granted a 30-year concession to a USA firm to harvest all pine on Crown Lands.<sup>11</sup> The firm also obtained similar rights to the pine on the private lands of the Belize Estate and Product Company (BEC), which owned the majority of the non-Crown savanna land.<sup>12</sup> At this time, both the Surveyor General and the Director of Belize's Botanic Station cautioned that wildfires may make it difficult to replenish pine stocks after unregulated cutting, but no clauses were added to the concession agreement in response.<sup>13</sup>

#### 4. The birth of forestry's fire management in Belize, 1920-1921

In 1922, the Colonial Office supported the establishment of a state forestry department within Belize's colonial administration, with "fire protection" of the pine savannas within its remit.<sup>14</sup> This followed the recommendations laid out in a report by a German forester, Cornelius Hummel (Hummel 1921). After 1895, the Colonial Office had begun to see itself as responsible for facilitating an empire-wide strategy of colonial development (Constantine 1984). Within the ideology that James Scott terms "high modernism", "sciences" like forestry were viewed as tools by which the state would enable colonial development (Scott 1998: 4; Worboys 1991). Lagging behind countries like France and Germany, Britain had begun to establish state forestry departments and schools, starting in nineteenth-century India (Bennett 2015; Rajan 2006).<sup>15</sup> Forestry promised "progress" by enabling capitalized resource extraction and state revenue collection, sustained by conservation measures such as fire protection (Bryant 1996). By 1920, the ideal of a unified British "Empire forestry" had emerged (Barton 2002). In this context, the Colonial Research Committee was established in 1919 "for the assistance of the poorer colonies and protectorates in conducting necessary researches", and it was this Committee which commissioned and co-financed Hummel's report (Foreign and Commonwealth Office 1971: 8).

Since negotiating the pine concession in 1904, the Government had waited, in vain, for capitalist investment in a pine industry. There was increasing need to reduce Belize's dependence upon mahogany

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<sup>7</sup> The Legislative Council included members appointed by the Governor (official members) and members elected in the Colony (unofficial members). Before 1892, official members had comprised the majority in the Legislative Council.

<sup>8</sup> Governor Swayne to Crewe, 18<sup>th</sup> July 1910, [TNA CO, 123/265].

<sup>9</sup> Memorandum of Surveyor General Usher, 24<sup>th</sup> November 1903 [TNA, CO 123/245].

<sup>10</sup> Speech by Governor Maloney, 1892, [KEW MR/641], f. 12.

<sup>11</sup> Colonial Secretary Cork to Colonial Office in 1903 and 1904, [TNA CO 123/246 and CO 123/247].

<sup>12</sup> Board meeting minutes, 3<sup>rd</sup> May 1905, [BEC].

<sup>13</sup> Memoranda of 26<sup>th</sup> January and 1<sup>st</sup> February 1904 [TNA CO 123/246].

<sup>14</sup> 'Protection' denoted fire prevention and suppression.

<sup>15</sup> The first schools of forestry in Germany and France were established in the eighteenth and nineteenth centuries, while the first forestry school in Britain was in 1909, in Edinburgh. This may explain the appointment of foresters from continental Europe to the British Colonial Service in the nineteenth and early twentieth centuries, including Hummel, who had served in the British Federated Malay States from 1907-1915 prior to his work in Belize. See correspondence between Darnley and Prain, April 1920, [KEW, MR/641], f. 80-2.



exports, an overexploited resource, for which the market had, for decades, been unstable (Bulmer-Thomas and Bulmer-Thomas 2012). In 1920, the concession-holders indicated interest in commencing pine extraction in southern Belize.<sup>16</sup> In correspondence with the Colonial Office, Governor Hutson requested specifically that Hummel report on the Belizean "pine ridges."<sup>17</sup>

Hummel based his report on ten days of field inspection of savannas in the Stann Creek and Toledo Districts, remote from Belize City.<sup>18</sup> Using a handful of tree measurements from a single location he extrapolated estimates of pine stocks on all Crown Land. This impressed the Colonial Office, in showing the "pine forests in British Honduras" to be "of an actual and prospective value" far greater than they "would have anticipated."<sup>19</sup> Hummel (1921: 54, emphasis added) held that treeless savannas were aberrant, and fire an exogenous destructive force:

The stock of the pine forests of this country, with only a few and very small exceptions, is in a sub-normal and unsatisfactory state; they are subject at present to a process of slow, but sure, destruction by fire.... on large areas the destruction is so far advanced that *the former forest can no longer be classed as a 'forest'; it is now poor grass savannah with some pine trees on it and with numerous half-burnt trees lying on the ground, thus showing that there was a forest before.*

Hummel (p. 48-50) attributed the fires to humans, whom he portrayed as irrational and blind to the wider implications of their actions: "It is done practically by everybody and sometimes for very trivial reasons.... for hunting purposes, and even for pleasure." He asserted that if fires were suppressed to raise pine stocks, then "proper" development of the savanna would proceed naturally "at the expense of concessionaires" (p. 49). By speaking to the equilibrium paradigm in ecology, associating fire use with primitive livelihoods, and appealing to elite economic interests, Hummel's arguments for fire suppression were akin to the arguments of foresters in many European colonies in the early twentieth century.

To Hummel (p. 49, emphases added), Belize's fires were materially no different to fires faced by foresters elsewhere and so could be managed by applying universal methods: "A proper system of protection from fire, *as in other countries*, is necessary, with systematically laid out fire lines *under the control of a qualified forester*, and with a special staff for patrolling during the dry season. A Forest Ordinance will also be required for this purpose."<sup>20</sup> His proposed solutions were presented apolitically; the expertise of foresters would legitimize fire suppression in Belize. The Colonial Administration needed guiding and were to be forgiven for past errors as they could not "be expected to have professional knowledge of forestry" (p. 94).

## 5. A slow start, 1920s to 1930s

Following publication of his report, Hummel was appointed to Belize as "Conservator of Forests" to lead the newly established Forest Department. Under his direction, the Department made initial attempts to suppress wildfires and control fire use. The Forest Act of 1926 and Forest Rules of 1927 made it illegal to set fire to grass or undergrowth on Crown Land. Notices in the Government Gazette and signage in some savanna areas warned of the illegality of setting fires.<sup>21</sup> The Belize Pine Reserve, a savanna area near Belize City, was one of several forest reserves established in 1923 (Forest Department 1925). The Department tried different methods of constructing fire breaks in small portion of the reserve, which they patrolled in anticipation of

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<sup>16</sup> Hutson to Colonial Office, 15<sup>th</sup> March 1920, [TNA CO 123/299], f. 440; Kluge to Colonial Secretary, May to June 1920 [BARS MP1697/1920]; Hutson to Colonial Office, June to July 1920, [TNA CO 123/301]; 'Our pine woods and the Chipley contract', *The Clarion*, 17<sup>th</sup> June 1920; 'The Chipley contract', *The Clarion*, 8<sup>th</sup> July 1920; Hutson to Colonial Office, November to December 1920, [TNA CO 123/303].

<sup>17</sup> Hutson to Colonial Office, 5<sup>th</sup> July 1920, [TNA, CO 123/301], f. 452-3. 'Pine ridge' was then the term applied to the savanna areas with pine ('savanna' was reserved for treeless areas).

<sup>18</sup> Report, detailing the savanna reconnaissance, 16<sup>th</sup> December 1920 [TNA, CO 123/303].

<sup>19</sup> Colonial Office minute, 27<sup>th</sup> January 1921, [TNA, CO 123/303], f. 155.

<sup>20</sup> 'Fire lines' denoted fire breaks.

<sup>21</sup> Government Gazette, e.g. 23<sup>rd</sup> June 1928, [TNA CO 127/24].

fires.<sup>22</sup> Although they only attempted to suppress fires in this area, they repeatedly failed to do so. Fires, reportedly originating on nearby agricultural land, entered the protected area in 1924, 1927 and 1933 (Forest Department 1925, 1927, 1933). The Belize Pine Reserve was therefore closed in 1934 (Forest Department 1935).

Hummel's assertion in 1921, that installing a Forest Department to conduct fire management would remove the only barrier to a Belizean pine industry, was undermined, in practice, by an unappreciated Belizean ecology and politics. The Department's attempts to reach fire users had little effect. There was no class or "race" to whom corrective measures could be targeted: fire was used for hunting, land clearance and cattle grazing by diverse sectors of the population, including some government officials.<sup>23</sup> The explosive combustion of palmetto palms threw burning debris over fire breaks.<sup>24</sup> Thick, tufty grass grew as a result of fire suppression, slowing pine regeneration (Forest Department 1937). It became apparent that drainage or soil nutrient levels might also limit pine regeneration (Forest Department 1935, 1939). Most devastatingly, in Belize, hurricanes interacted with fire in the disturbance of the savanna. Following a large hurricane in 1931, the blown-over dead timber fueled widespread wildfires, including those responsible for the closure of the Belize Pine Reserve in 1933 (Forest Department 1933). Swampy conditions early each year made it hard to construct fire breaks before the dry season. In the 1920s the Forest Department thus devoted time to building roads in the Belize Pine Reserve.<sup>25</sup> This had unforeseen consequences. By building roads, the Forest Department facilitated access to the area by local fire users. Roads also made the area more valuable for agricultural leases, which, when granted by government officials despite protests by the Forest Department, was another contributory factor to the 1933 wildfires and closure of the Belize Pine Reserve.<sup>26</sup>

The pine industry did not develop in Belize in the 1920s and 1930s on the scale hoped for by Government. There was no shortage of USA pine on the market (Forest Department, 1928). For capitalists, development of this industry in Belize came with that risk and initially high investment associated with working in a place lacking maps and infrastructure and without information regarding the properties and exchange value of this particular species of pine.<sup>27</sup> Despite the lack of revenue from a pine industry, the Colony might have been able to sustain fire management among other forestry work on a greater scale, had other forest industries generated ample revenue and had there been political support for the Department in Belize. This was not the case. The Belizean economy, which had struggled since 1900, was hit particularly badly by the Great Depression in the 1930s, which coincided with widespread devastation from the 1931 hurricane (Bulmer-Thomas and Bulmer-Thomas 2012). The Forest Department also found itself compromised as it became embroiled in a political conflict of interests in Government.

By the 1920s USA interests were represented by the unofficial members of the Legislative Council. They pushed for a blanket land tax, which would greatly compromise British landed interests, especially the largest landowner, BEC. BEC was well connected in the British Government, and the Colonial Office sought to protect it from such a tax. This placed the Forest Department, with its mandate to encourage forest development and regulate exploitative forest industries, in a predicament. BEC held large tracts of land in speculation and was largely responsible for the Colony's past and current overexploitation of mahogany, yet there was the risk that a USA successor to BEC would be more exploitative (Ashdown 1981). John Oliphant, now Conservator of Forests, was convinced that a land tax was necessary, but did not support the blanket tax proposed by the unofficial members of the Legislative Council. He preferred a discriminatory system, to

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<sup>22</sup> Memorandum of Hummel, 4<sup>th</sup> May 1923, [BARS MP149/1923], f. 12; Hummel to Colonial Secretary, 2<sup>nd</sup> July 1925, [BARS MP1894/1925]; Field diary of Duncan Stevenson, 12<sup>th</sup> February 1924 and 30<sup>th</sup> January 1925, [OWL MSS.W.Ind.s.28(1)].

<sup>23</sup> See accusations by Stevenson against an official of the Survey Department, February 1927, [BARS MP 460/1927].

<sup>24</sup> Hummel to Colonial Secretary, 2<sup>nd</sup> July 1925, [BARS MP1894/1925].

<sup>25</sup> Field diary of Duncan Stevenson, 15<sup>th</sup> February 1924, [OWL MSS.W.Ind.s.28(1)]; Hummel to Colonial Secretary, 2<sup>nd</sup> July 1925, [BARS MP1894/1925].

<sup>26</sup> Comments of Neil Stevenson, enclosed in letter from Burns to Colonial Office, 1<sup>st</sup> October 1936, [TNA, CO 123/360/19].

<sup>27</sup> Reports of Barnett and Hoare on respective visits to Belize in 1935 and 1937 [BEC].

compensate landowners that made efforts to introduce measures of forest conservation, arguing that it would otherwise be "useless to retain the forest organization in any form."<sup>28</sup>

The Forest Department also faced public opposition because of how they were financed and conducted their work. Aware of the financial restraints in Belize and to shield it from political opposition, the Colonial Office had initially set up the Forest Department with a fixed annual budget approved by the Governor rather than the Legislative Council (Forest Department 1924).<sup>29</sup> The unofficial members of the Legislative Council resented that they had no control over the Department's finances and used this as public evidence that the Department was "imposed on the Colony by the British Government in its own interests" (Pim 1934: 105).<sup>30</sup> They also nurtured a growing public resentment of the Department because its staff presented themselves as technical experts superior to other officials in the Colony. To get "staff of the best quality" to serve in Belize, forestry officers were on salaries comparable with those in other British Colonies, and thus far higher than those of the other Government Departments in Belize.<sup>31</sup> Governor Burdon noted that "intellectual pride" was one of the "causes for the public dislike of the Forestry Department."<sup>32</sup>

In 1929, the unofficial members of the Legislative Council raised a petition calling for retrenchment of the Forest Department.<sup>33</sup> Aware of economic difficulties in the Colony and fearing public unrest, the Colonial Office, rather than amending the constitution to strengthen the Department's position, severely reduced the Department's annual budget and arranged for Oliphant's transfer to another Colony.<sup>34</sup> The Colonial Office protected the Department from closure through the economic depression of the 1930s despite repeated calls from the public, Legislative Council and Governors to close it.<sup>35</sup> With the award of colonial development grants to support seven years of forest mapping, the Colonial Office justified the Department's existence, while keeping its work securely in a technical domain.<sup>36</sup> When the Belize Pine Reserve was abandoned in 1934, the fire protection "experiments" were immediately moved away from this populous area and re-located further south, to the Stann Creek district (Forest Department 1935). This was a sufficient base from which to build a larger-scale program of fire management in the 1940s. Yet, importantly for understanding its efficacy and influence, the Department remained reliant on impetus and funding external to Belize.

## 6. Expansion and decline, 1940s to 1980s

In the 1940s two economic factors gave new impetus to the Forest Department's fire management. Firstly, after the Second World War came the long-awaited growth of the pine industry, when the export timber harvest from the colonies rose dramatically in response to demands for reconstruction (Arnold and Armitage 1989).<sup>37</sup> BEC began pine extraction from its private lands and negotiated a string of concessions to harvest on Crown Land, beginning in Stann Creek and moving southwards to the southern extent of the coastal savanna in the Toledo District by the 1960s (Forest Department 1950, 1959).<sup>38</sup> From 1942 to 1952 there was a fifty-fold increase in pine log production in Belize (Arnold and Armitage 1989; Forest Department 1943). Secondly, there was the availability of increased levels of funding after the 1940 Colonial Development and Welfare (CDW) Act. After 1949, the Department successfully attracted CDW grants for five to ten-year plans of work

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<sup>28</sup> Memorandum, 5<sup>th</sup> February 1929 [TNA CO 123/330/8].

<sup>29</sup> Also, Stevenson to Ashdown, 1<sup>st</sup> April 1980, [OWL MSS.W.Ind.s.56].

<sup>30</sup> Also, correspondence between Governor and Colonial Office, August and September 1926, [TNA CO 123/324].

<sup>31</sup> Stevenson to Ashdown, 1<sup>st</sup> April 1980, [OWL MSS.W.Ind.s.56], f. 18.

<sup>32</sup> Governor Burdon to Colonial Office, 11<sup>th</sup> August 1926, [TNA CO 123/324], p. 6.

<sup>33</sup> Petition, 22<sup>nd</sup> January 1929, [CO 123/330/8]; 'An appeal for retrenchment', *The Clarion*, 24<sup>th</sup> January 1929.

<sup>34</sup> Governor Burdon to Colonial Office, August 1929 [CO 123/330/8].

<sup>35</sup> Governor to Colonial Office in 1932 [TNA CO 123/339/9], 1934 [TNA CO 123/349/12], 1936 [TNA CO 123/360/19] and 1938 [TNA CO 123/386/2]; 'Retrenchment', *The Independent*, 16th January 1935; 'The Forest Trust', *The Independent*, 25th September 1935.

<sup>36</sup> Comments from Colonial Office finance committee, [TNA CO 123/339/9, item 21].

<sup>37</sup> Colonial Office to Governor Hunter, 19<sup>th</sup> February 1942, [TNA CO 123/380/7].

<sup>38</sup> Also, Johnson to Woods on subject 'working plan prescriptions', 25<sup>th</sup> November 1976, [MPR].

that included measures to regenerate pine stocks, including fire management (Lamb 1950).<sup>39</sup> Belize was among colonies classed as "small territories which could make little or no contribution from local resources" (Overseas Development Institute 1964: 58). Thus, despite its relatively small size as a country, Belize's Forest Department received 17% of the total money granted for forestry schemes in that period across all British colonies (Foreign and Commonwealth Office 1971). These grants, as well as increased allocation from the territorial budget, enabled a large increase in the Department's spending and a doubling of senior staff from the early 1940s to 1959.<sup>40</sup>

The Forest Department made little attempt to directly regulate the pine industry in order to control or manage the effects of exploitation, despite noting the "serious overcutting" taking place in the 1940s and 1950s (Cree 1957: 5). Instead, the Department developed a parallel and compensatory program of pine plantations and fire management. Reams of paper described the employment of new equipment, infrastructure and organization. The work was concentrated on the coastal savannas of the southern coastal plain (of the Stann Creek and Toledo Districts). This area was compartmentalized into ranges under control from different forest stations and visible from fire lookout towers manned during the dry season. These ranges were divided into "fire management units" separated by fire breaks. Imported mechanical equipment was increasingly deemed a prerequisite, for constructing fire breaks and direct attack on fires. The Department's annual report for 1948, for example, remarked that "proper control of fires awaits improvement of communication and the arrival of a Fordson tractor with rotary cultivator."<sup>41</sup>

In the mid-1950s the Forest Department's policy towards savanna fires changed. In the field, Department staff began to take note of the build-up of fuel that followed fire protection: "Each year that protection is successful, the young pines grow well, but so does the stock of highly inflammable grass and weeds" (Forest Department 1952: 6). In 1955, following a year of severe wildfires, exacerbated by the excess fuel available because of fire suppression, the head of the Department introduced a policy of periodic prescribed burning in the protected areas, explicitly modelling that of the Forest Service in the Southern USA.<sup>42</sup> This change in policy did not represent a full recognition of the ecological role of fire in savannas. Like elsewhere where prescribed burning was being considered at this time, it was viewed as a "necessary evil"; an insurance against uncontrollable fires caused by fuel build-up (Laris and Wardell 2006). Fire was still deemed to slow pine growth and regeneration (which remained the purpose of fire management).

In 1959, an economic advisor to the British Government recommended an immediate cut to the Department's annual budget (Downie 1959). Timber exports, including pine, were decreasing, and the Government sought to diversify the Belizean economy. Forestry ceded its place as the major sector of the Belizean economy to agriculture and then to tourism (Bulmer-Thomas and Bulmer-Thomas 2012). It was also symbolic and politically expedient as the Government neared independence (reached in 1981), to reduce the Department's status, as it had, through its British leadership, retained a public image as a British institution. Simultaneously, the scope of the Department's work was expanding; in keeping with the rising global nature conservation movement, forestry in the sense of conservation to enable sustained timber production was no longer its sole purpose (Young and Horwich 2007). These factors gradually conspired to reduce the Department's perceived need for, and capacity to conduct, a fire management program aimed at pine regeneration. During this phase of decline, sporadic bursts of activity and technical innovations did follow periodic grants of overseas aid. The Canadian International Development Agency (CIDA), USA Forest Service (USFS) and British Overseas Development Agency (ODA) provided new firefighting equipment, fire management training and consultants to write new plans and policies for the Forest Department in the 1960s and 1970s (Forest Department 1963; Johnson 1974).<sup>43</sup> Yet none of these external funders provided consistent funding for fire management as a program, as had the CDW grants. By 1986, the Department lacked the

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<sup>39</sup> Lamb and Stevenson, 1947, unpublished, 'A ten-year forest regeneration plan for British Honduras' [OWL MSS.Brit.Emp.s.366(2)]; Cree 1956, unpublished, 'A pine regeneration scheme for the southern coastal forests of British Honduras', [BARS ASR-1505-114].

<sup>40</sup> C.E. Duff, 1960s, unpublished, 'History of forestry in British Honduras', [OWL MSS.Brit.Emp.s.466].

<sup>41</sup> Forest Department (1949), p. 5.

<sup>42</sup> Cree 1956, unpublished, 'The present forestry programme. A reassessment', [BARS ASR-45-4].

<sup>43</sup> Also, 'The forest resources, forest administration and forest industries in Belize', Fellows 1976 [BARS ASR-955-74].

sustained finances to maintain equipment, fire breaks and dedicated firefighting teams and it ceased to conduct fire management on the southern coastal plain (though fire management continued on a small scale in the upland savannas of the Mountain Pine Ridge) (King *et al.* 1986).

From the 1940s to 1986, the Department's ambitions for fire management far exceeded their realization on the ground. Even in the decade of most consistent funding, from 1949 to 1959, only six of seventeen planned fire lookout towers were built, for example.<sup>44</sup> Besides funding restraints, the Department's fire management efforts were frustrated by lack of continuity of staff. The earliest Conservators of Forests in Belize spent up to fourteen years resident in the country. In 1969, Lewis Lindo became the first Belizean Chief Forest Officer. By then, most senior staff of the Department were Belizean, yet the Department struggled to fill leadership positions with trained foresters: there has never been school of forestry in Belize, and returning Belizeans who had received aid to train abroad often preferred to use the status this afforded them to take better paid positions than were available with the Department.<sup>45</sup> Thus, in the 1970s and 1980s, a string of British ODA staff were seconded to the Belize Forest Department for two to four-year periods (Forest Department 1974, 1985; Johnson 1974). This limited the consistency of the Department's vision for fire management.<sup>46</sup> While prescribed fire use was a Department policy, it did not have support to develop as a program, and the capacity and leadership to carry out prescribed burns gradually eroded. In 1978, an ODA staff member seconded to Belize, wrote that prescribed burning was "in the experimental stage."<sup>47</sup> This parallels the experience elsewhere, such as in South Africa, where prescribed burning never became commonplace, despite support from the Forest Department from the 1940s (Pooley 2014).

The methods the Department deployed were never very effective at reducing the frequency of wildfires. There was a fundamental lack of understanding of the role of fire in the savanna landscape. Sporadically, and driven largely by foreign administrators, pine stocks were surveyed and experimental plots established to test different methods of forestry, but this research was "not used practically" (Forest Department 1939; Johnson and Chaffey 1974).<sup>48</sup> No scientific study examined the causes or behavior of wildfire in the coastal savannas, or its effects on pine growth. In the waterlogged savannas, mechanical equipment did not always perform as hoped or increase firefighting efficiency (Lamb 1950).<sup>49</sup> A former Forest Guard described firefighting in the 1970s: "Water—we never had that too much, because the vehicle that carry [*sic*] the water generally could not get into the place. Once we get pumps and then we spray with that, right. But that was too slow for the kinda fire that we had."<sup>50</sup>

Perhaps most importantly, when the Department conducted fire management, it was with limited ability to reduce the number of savanna wildfires in Belize, because the work did not attempt to engage with fire's socio-political context. The fire "problem" was, of course, still a political one. Wildfires did not necessarily originate within "protection areas." Fires were started by human actors. Fire management was being justified to prop up the pine industry, in which most rural fire users had no stake; it benefitted a few individuals, and, from the 1940s to the 1960s, was monopolized by a single British company. The Department made occasional suggestions that companies should take responsibility for the sustainability of the pine industry, for example by financing fire management, but this was not enforced (Forest Department 1948, 1953, 1958).<sup>51</sup> The Department's engagement with fire users was limited to anti-fire propaganda campaigns. In the 1960s, for example, a mobile cinema toured showing a fire prevention film, and leaflets donated by the USFS were dropped by aircraft over villages that were deemed to be particularly offending in their use of fire (Forest Department 1963).<sup>52</sup> These had limited effect. Several former Department staff remembered that in the 1960s

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<sup>44</sup> Cree 1956, *Pine regeneration scheme*; Duff, 1960s, *History of forestry*.

<sup>45</sup> Interview 65.

<sup>46</sup> Interview 65.

<sup>47</sup> Woods to Chief Forest Officer, 9<sup>th</sup> February 1978, [MPR].

<sup>48</sup> Interview 65.

<sup>49</sup> Also, Fellows 1976, *Forest resources*.

<sup>50</sup> Interview 47.

<sup>51</sup> Also, Forest Department Conference minutes, July 1955, [MPR]; Fellows 1976, *Forest resources*.

<sup>52</sup> Many newspaper articles were also published, e.g. 'Fire is now our only danger', *The Times*, 12<sup>th</sup> December 1961.

and 1970s, local fire users reacted to the Department's fire management work by deliberately starting wildfires: people who had "a little grudge with the Department, you know, because you stop them from hunt [*sic*]" said "You guys are sitting there resting. Ok, we'll give you some work,' and they would be gone, and next you know there is a fire." <sup>53</sup>

## 7. Integrated fire management, 1990s – present

From the 1970s, coincident with humanitarian crises in Guatemala, Honduras and El Salvador, many immigrants were attracted to the coastal plain of the Stann Creek and Toledo districts. They, with many Belizean Maya from southern Toledo were drawn by the prospects of wage labor following infrastructural development and the establishment of banana, citrus and aquaculture industries on the southern coastal plain. Today these settlers make use of resources from the savannas, including from forest reserve areas and national parks. This includes hunting, collecting housebuilding materials, firewood, palmetto berries (which since 2000 have been sold casually by individuals to a single buyer who has a license to export) and capturing yellow-headed parrot chicks for (illegal) sale to the pet trade. With use of fertilizers and drainage improvements, some smallholder farmers grow pineapple, watermelon or vegetables in savanna areas, but most assert that corn, plantain and other staple crops cannot be grown on the poor savanna soils. Those making agricultural use of savanna areas are mostly immigrants from heavily deforested parts of Central America where there are extreme shortages of land for farming. Fire is commonly used to clear land for both swidden "milpa" agriculture (see Nigh and Diemont 2013) and more permanent smallholder agriculture, but as this mostly takes place in the broadleaf rainforest, agricultural fires only occasionally escape to cause savanna wildfires. As villages near the savanna expand, however, and farming increasingly takes place close to and within the savanna, this is likely to be increasingly a cause of savanna wildfires. People still use fires directly within savanna areas for hunting, and to aid access. I was frequently told that people set fires in the savanna "for fun." Even TIDE's protected areas manager, openly admits that as a youth, he "used to like to see fires in the savannas, especially in the palmettos." <sup>54</sup> Despite these casual uses of the savanna and its resources, there is a general perception that the savannas are of low value relative to the broadleaf forests: "a lot of people see it as wasteland ... it's a non-productive area." <sup>55</sup>

The Forest Department's funding and importance declined further after 1990 as the USA's economic policy increasingly directed development in Belize and the International Monetary Fund pushed for reductions in social spending (Shoman 2012; Wainwright and Zempel 2018). The Department maintained an inconsistent fire management program at the Mountain Pine Ridge and continued to receive occasional training or equipment for fire management from overseas aid, but never re-initiated fire management in the coastal savannas. There has been no long-term staff member responsible for fire management, and it is, as discussed below, not a political priority. From the 1970s the Department gradually ceded management responsibility for 75 percent of Belize's protected areas to conservation NGOs, or in some cases to community co-management, but without being able to provide any financial support to these organizations (Brechtin and Salas 2011). In 1997, management of the Payne's Creek National Park, a savanna area in the Toledo District, fell to the recently established local NGO TIDE.

Between 2000 and 2009, TIDE and Forest Department staff were among environmental managers taking fire management training with The Nature Conservancy (TNC) under its Global Fire Initiative (GFI). In the USA, TNC has pioneered prescribed fire management for the integrated purposes of nature conservation and timber-production since the 1960s, when it acquired frequently burning landscapes in the Upper Midwest and in Florida (Pyne 2015). With the GFI, TNC aimed to empower small networks of fire managers worldwide, "to which outsiders might offer guidance but would not administer", with basic training in prescribed fire management to suit their local conditions (Pyne 2016b: 116). TNC's "gospel of fire management" departed radically from previous approaches in Belize. <sup>56</sup> "Integrated fire management" accepted human fire in the

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<sup>53</sup> Quote from interview 51. Similar recollections in interview 47.

<sup>54</sup> Interview 1.

<sup>55</sup> Interview 51.

<sup>56</sup> Interview 60.

landscape, and proposed that fire management could achieve nature conservation and timber regeneration aims while also being integrated with "socio-cultural realities" (Myers 2006: i). TNC staff also suggested that fire was of ecological importance in the Belizean savanna, and at suitable frequencies and intensities, could indeed be beneficial to pine regeneration (Myers and Morrison 2006). TNC's approach and rhetoric formed the basis of a "Wildland Fire Management Policy" published by the Forest Department in 2009 (Sabido and Green 2009). Shortly afterwards, the funding for the GFI was cut, and TNC ceased its support for fire management in Belize.

After the GFI ended, unlike most Belizean agencies that had been trained by TNC, TIDE retained the capacity to conduct prescribed burning, and applied it in the Payne's Creek National Park. TIDE's protected areas manager developed strong working relationships with several TNC staff and continued to seek their assistance (independently of TNC) to train his team further, including on exchange visits to the USA. TIDE has struggled to find a consistent funding source for its fire management. From 2015 to 2018, one of various short-term grants supporting the organization's work was the Darwin Project. The Project sought the outcome that "biodiversity of pine woodlands in southern Belize is conserved by developing community-based wildfire management, with local communities incentivized to participate through a more just and sustainable use of woodland resources."<sup>57</sup>

On paper, Belize's new wildfire policy, and initiatives like the Darwin Project, appear to reflect a radical change in approach to fire management. Where previous policies were directed solely towards maximizing pine production, the 2009 policy suggests that fire management can fulfil multiple objectives including ecosystem or biodiversity conservation, pine regeneration for extractive use, securing property and securing human health, while recognizing cultures and livelihoods dependent upon fire. It calls explicitly for the development of "community governance systems to spearhead local wildland fire management initiatives" (Sabido and Green 2009: 13). Similarly, the Department's 2015 Forest Policy speaks of collaborative forest management and community forestry (Forest Department 2015).

That Belize's policy recognizes each of these dimensions of fire management is laudable (and indeed progressive in global terms), but it fails to acknowledge the trade-offs between them. **First**, there are incompatibilities between fire management to maximize pine extraction, and fire management for conservation of the savanna as a biodiverse patchwork of shifting vegetation types (which calls for more spatially and temporally random fire effects on the landscape). As an ecologist put it, "do we want to set aside certain areas to be managed for parrots or do we want to set areas aside to be managed for pine?"<sup>58</sup> **Second**, there are incompatibilities between institutionalized fire management for forestry or biodiversity conservation, and fire use as practiced in local livelihoods. Some villagers living near the savanna worry about savanna wildfires, with some justification. Some see heavy smoke as a risk to their health. Some palmetto harvesters are conscious that dry season fires destroy palmetto flowers, preventing the formation of berries and reducing their harvest for that year. Those with houses directly bordering the savanna can risk losing their homes, which are largely wooden, to wildfires. This notwithstanding, wildfires in savanna areas removed from their villages are generally not deemed problematic by local people. They have little incentive to care about fires in these areas because they lack clear access rights to the savanna, most do not have crops in the savanna, and most do not directly benefit from the pine industry. Meanwhile, local fire use in savannas, for hunting, access and so on remains incompatible with the forestry and conservation objectives of local land managers, who condone only their own prescribed fires. As one TNC staff member remembered: "The main problem was that the land managers didn't have control of the fire frequency or the fire regime. And so, how do you get that back? How do you get it away from the hunters, and the people who are burning the woods?"<sup>59</sup>

Because these trade-offs remain unacknowledged, in practice, "integrated fire management" naturally resolves itself in line with power relations between different actors. In fire management interventions, local livelihoods are trumped by conservation and pine forestry. The channels for local participation in the Darwin Project were aimed at reducing forms of local fire use deemed inappropriate by the managers of protected areas in the savanna. We sought to enroll and train locals to conduct "proper" prescribed fire use, involving planning,

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<sup>57</sup> Project proposal for Darwin Initiative Project 22-013.

<sup>58</sup> Interview 62.

<sup>59</sup> Interview 60.

teamwork and use of equipment. By the project's logic, support to develop small businesses dependent upon savanna resources would incentivize communities to become "stewards" of the savanna, reducing their inappropriate use of fire and possibly volunteering to participate in future fire management with local land managers. In practice, we struggled to find and support business concepts that were both legal uses of forest reserves, and dependent upon savanna resources. There was really little incentive for individuals to volunteer to participate in fire management: "no-one wants to do things for free."<sup>60</sup> Indeed, aware that it would be difficult to encourage attendance otherwise, we paid stipends to villagers for participation in fire management training. Similarly, attempts to institute community-based fire management in Honduras relied on international funding for community fire brigades, limiting their sustainability in the long-term (Lineal and Laituri 2013).

In turn, conservation and pine forestry themselves lose out to the interests of Belizean political elites. Just as the local political elite undermined the Forest Department's work in the colonial period, after independence, Belize's powerful elites continued to direct land and natural resource use to their advantage (Shoman 2012; Wainwright and Zempel 2018; Zisman 1998). This has undermined the policy objectives of the Forest Department and conservation NGOs. Belize's politicians retain power through a system of patronage. After the 1960s, when the Government introduced new land leasehold and titling processes, "the forest reserves started to be treated as land banks. So, it was a forest reserve until the land situation got desperate—whether in truth, or just politically—then it was ok to go in and chop off a piece and hand it out."<sup>61</sup>

The Darwin Project proposal suggested that staff of the Forest Department would work with TIDE and communities to enable community fire brigades to be established, and work to revise the fire legislation in line with the 2009 Wildland Fire Management Policy. In practice, while Forest Department representatives attended project events, they made no effort towards these goals. There are at least three reasons why implementing fire management policies is not a political priority in Belize. **First**, punishing fire use may threaten votes. As a logging concession-holder told me, he does not expect assistance from the Forest Department to prevent local fire use in his concession: "forestry get info who is taking care of it [*sic*], who is doing these illegal activities.... but they would tell you plain and straight, 'sorry we cannot help you, because the Ministers need the votes'.... And it's the same thing happening with fire."<sup>62</sup> As Christian Kull (2004) has also documented in Madagascar; this results in a stalemate between conservation and forestry actors and local fire users. **Second**, the savanna is viewed as an asset by politicians primarily as land that can be disbursed for political favor. When the savanna is merely considered as *land*, there follows little reason to conduct fire management. **Finally**, politicians are unlikely to relinquish their control over this pool of land by granting tenure over it to entire communities (in such a way as might incentivize community-based fire management of the wider savanna landscape).

James Ferguson (1990) and Tania Li (2007) have both argued that international development actors frame the problems they would solve as technical, which makes their proposed interventions appear desirable and possible. In so doing they avoid reference to the political dimensions of the problems, that they cannot address, but which nonetheless frustrate interventions on the ground. In part, the logic of "integrated fire management" developed in response to the ecological and environmental injustices caused by previous fire policies of fire suppression. Yet Belize's integrated fire management policy was not written as a direct response to (similar) historical approaches *in Belize*, but rather, was imported via international aid projects. As the GFI and Darwin Project both demonstrated, when integrated fire management is *itself* rendered technical in the context of international development, engagement with the socio-political dimensions of fire management remains limited.

## 8. From colonial to post-colonial fire management in Belize

Over the past century, fire management policies in Belize have been more strongly shaped by changing Anglo-American narratives about fire than by local ecological or social analysis. International funding, staffing and consultancies have meant that the Forest Department's policies have predominantly been designed by foreign actors. Yet, in practice, institutionalized fire management has fallen short in practice. Among other

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<sup>60</sup> Interview 9.

<sup>61</sup> Interview 3.

<sup>62</sup> Interview 2.



factors, this has been because of fire management's foreign impetus, short-term funding, and lack of local political support, and because of the broader context of unequal access to benefits from the savanna landscape. In recent decades, scholars of colonial science and environmental management have overthrown the 'diffusionist hypothesis', which imagined that knowledge and practices were directly transferred from colonial centers to colonies (Bennett and Hodge 2011; Grove 1996; Vandergeest and Peluso 2006a, 2006b). Belizean fire management, too, has been strongly shaped by ecological and social conditions *in Belize*.

The fire ecology of Belize's savannas is still poorly understood, as is more generally the case of most ecosystems insofar as it may guide management for biodiversity conservation (Driscoll *et al.* 2010). TIDE does not presently extract pine from the National Park it manages (and is not permitted to do so under the current management agreement), but it is still presumed, perhaps as a vestige from colonial forestry, that a primary outcome of "good" savanna fire management should be "pine regeneration."<sup>63</sup> Based on his involvement with writing Belize's National Protected Areas System Plan, one ecologist surmised that this reflects a lack of understanding of the savanna as an ecosystem: "For savanna, our conservation target always focused on pine production. While for the other areas, there was 'wildlife this', and there was 'this animal that' ... We don't know enough about savanna to value it for its own intrinsic value."<sup>64</sup> In the GFI, without time for detailed ecological study in Belize, TIDE was given generalized rules for prescribed burning which may be insufficiently irregular to mimic a "natural" fire regime for these savannas.<sup>65</sup> TNC staff members also recalled how TIDE's rangers tried to introduce approaches to Belize that they had learned on a training exchange to the USA, that were not suited to the context in Belize (such as attempting to use prescribed fire to eliminate hardwood scrub).<sup>66</sup>

Similar configurations of power continue to be reproduced between foreign funders, environmental managers, local political elites, and local fire users. Throughout the past century, environmental managers in Belize have called upon local people to restrict their fire use in the name of conservation and/ or development of the savanna, posed as a "greater good." Contemporary relations between land managers and local people are in some ways more equal today than they were in the twentieth century. Where prescribed fire was deemed the prerogative of the Forest Department only, today, local NGOs lead prescribed fire management and seek to involve local villagers. The pine industry is no longer monopolized by a single British company, but, rather, owned largely by Belizeans. Yet strong power imbalances are retained in these contemporary relationships, despite calls for "integrated fire management." As logging concessions are held by a handful of individuals, few villagers local to the savanna benefit from the pine industry. The Darwin Project paralleled experiences in other countries, where local recognition is constrained within "participatory" fire management initiatives (Kull 2002; Mistry *et al.* 2016; Petty *et al.* 2015). There was little attempt to create space for local fire use, as it is already practiced within local livelihoods. Environmental managers sought, instead, to involve local people in a separate set of prescribed burning practices. Those writing training materials and reports were predominantly foreign to Belize. Local fire use was still subordinated to technical expertise.

From colonialism to independence, the Belizean state has been internally riven by competing local and external interests. In the Colonial Period there was a struggle for control over the Forest Department and the broader Belizean state apparatus between the British colonial administration and local political elites. As was recognized by John Oliphant in the 1920s, elite control over land strongly limited the work of the Forest Department. Today, the Forest Department is still beholden to international interests (for example via foreign aid or conservation treaties), but local political elites retain control over land and resources. Generally, the potential benefits of fire management for forestry or conservation objectives have been too long-term to be of interest on local political timescales. Local elites have been more interested in the savanna as land for disbursal. Today, in its lack of practical support for community fire management, Belize upholds the case that in many countries, political patronage and corruption create incentives for central actors to maintain control, limiting meaningful shifts of authority associated with participatory natural resource management policies (Moura *et al.* 2019; Nelson and Agrawal 2008; Poteete and Ribot 2011; Ribot *et al.* 2006). Belize's 2009 Wildland Fire

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<sup>63</sup> Interviews 1, 59 and 64.

<sup>64</sup> Interview 62.

<sup>65</sup> Interview 59.

<sup>66</sup> Interviews 59 and 60.

Management Policy is like "soft laws" elsewhere, that see little realization in practice, but nonetheless ensure sustained benefits from donor support (Larson and Ribot 2007; Li 2016).

Two elements of the recent work of TIDE and their USA consultants bear mention. First, in 2017, they established long-term plots to begin to monitor the ecological effects of fire management. Preliminary results from these plots are already informing management. They have been communicated successfully because of strong, long-term friendship between TIDE's staff and their USA consultants. Second, TIDE has begun to collaborate with other land managers in the Toledo District to conduct prescribed burning. Inspired by Florida's 'fire councils', they have formed a "Southern Belize Fire Working Group." As anthropologists of development have emphasized, personal relationships can bring continuity where project funding is sporadic and create dialogue between different knowledges and approaches (Fechter 2012; Heuser 2012; Stern and Baird 2015). Similarly, where the GFI and the Darwin Project catalyzed modest change toward some of the aims of integrated fire management it was because TIDE's staff built lasting friendships and working relationships with external consultants, logging concession-holders, and local villagers.

## 9. Conclusion

Many countries, like Belize, historically adopted policies of complete fire suppression. Such policies were both ecologically inappropriate in fire-dependent ecosystems like tropical savannas and delegitimized the use of fire as an important element of cultures and livelihoods. Belize's present wildfire policy recognizes that a different approach is needed, and it is progressive compared to those found in many other countries, in recognizing the ecological and social importance of savanna fires. Yet, as this article demonstrates, it is not enough to have good policies. We must, after Lippert *et al.* (2015), understand fire management "as situated practice" rather than as the implementation of policy or projects. Fires are born of their specific ecological and political context.

An important conclusion of this research is that those seeking to influence fire regimes in Belize and elsewhere face significant structural constraints. Particularly as foreign actors, we cannot operate independently of those power relations with which international development, like colonial development, is infused. External agencies cannot bring about the participation of local communities in fire management, independently of these power relations. Nevertheless, worldwide, fire is irrevocably bound to the future of landscapes like Belize's savannas, and their people and biodiversity. What, then, can be drawn from the Belizean case, to support local efforts to build more ecologically and environmentally just fire management?

**First**, the research suggests that fire managers should aim to use and develop their own understanding of the ecological and political contexts in which they operate, rather than relying heavily on externally derived policies. The little research that has been carried out on landscape fire in Belize has been conducted by foreign actors (myself included). It is no simple matter to overcome the significant limitations facing research institutions in the Global South: they are intricately intertwined with broader structural inequalities in the international political economy. Yet future funding for fire management might place explicit emphasis on supporting local research informed by local knowledge.

**Second**, the research calls for recognition of the fundamental importance of inter-personal relationships in sustaining fire management programs, despite short-term funding cycles. Funders should aim to support programs based on long-term relationships, rather than technical innovations. Land managers can better influence fire at the landscape scale when they form local alliances.

**Finally**, environmental managers should not ignore the multiple interests with which they compete. Neither should they assume that their work can satisfy all these interests, as in the framing of "integrated fire management" as a "win-win." As has been noted elsewhere, fire management entails trade-offs between different values (Devišcher *et al.* 2018; Otero *et al.* 2018). Wildfire must be understood in the context of broader political struggles over land and resources. If fire managers in Belize wish to support biodiversity conservation and/or local people to benefit from savanna resources, they must be prepared to advocate more comprehensively, more forcefully, and more politically, against the control of land by local political elites. This is not something that international development funding is likely to readily support, nor is it something that external consultants or technical interventions can easily address. But, paradoxically, these will only be effective if they communicate and interact with social movements in Belize. For now, although relationships

for fire management are building between NGOs and civil society in Belize, support from the Government is lacking. This limits the extent to which Belizean people, external funders and actors can build fire management that accounts for the ecology of the savanna and supports the needs of local fire users.

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## Appendix 1: List of research interviews

Number	Date of interview	Gender of interviewee	Nationality of interviewee	Occupation of interviewee	Interview language
1	24/02/2017	Both male	Belizean and USA	Joint interview with TIDE's Protected Areas Manager, and his friend and fire management consultant, formerly Fire Manager with TNC and the US Parks Service.	English
2	28/02/2017	Both male	Belizean	Logging concession-holders in the Toledo District (father and son).	English
3	23/03/2017	Male	Belizean	Forest Department staff member from 1973 to 2004, serving as Chief Forest Officer from 1999 to 2004. Now self-employed consultant.	English
4	14/04/2017	Male	Born in Guatemala	Farmer in San Isidro village in his 40s.	Spanish, with translation
5	15/04/2017	Male	Belizean	34-year old farmer and community health worker in San Isidro village. Participant in the Darwin Project's fire management training, and community business development. Employed as a Ranger with TIDE since 2017.	English

6	26/04/2017	Male	Born in Guatemala	15-year old farmer in Bladen village.	Q'eqchi, with translation
7	26/04/2017	Male	Born in Guatemala	45-year old farmer in Bladen village.	Q'eqchi, with translation
8	26/04/2017	Male	Born in Guatemala	44-year old farmer in Bladen village.	English
9	27/04/2017	Male	Belizean	25-year old resident in Bladen village, participant in Darwin Project's fire management training.	English
10	27/04/2017	Male	Born in Guatemala	48-year old farmer in Bladen village.	Q'eqchi, with translation
11	27/04/2017	Male	Born in Guatemala	45-year old farmer in Bladen village.	Q'eqchi, with translation
12	28/04/2017	Male	Born in Guatemala	40-year old farmer in Bladen village.	Spanish, with translation
13	28/04/2017	Male	Born in Guatemala	37-year old farmer in Bladen village.	Q'eqchi, with translation
14	28/04/2017	Male	Born in Guatemala	35-year old farmer in Bladen village.	Q'eqchi, with translation
15	28/04/2017	Male	Born in Guatemala	57-year old farmer in Bladen village.	English
16	29/04/2017	Male	Born in Guatemala	40-year old farmer in Bladen village.	Q'eqchi, with translation
17	29/04/2017	Male	Belizean	47-year old farmer in Bladen village.	English
18	30/04/2017	Male	Belizean	35-year old resident of Bladen village, employed as a Ranger with TIDE.	English
19	30/04/2017	Male	Belizean	75-year old farmer in Bladen village.	Q'eqchi, with translation
20	01/05/2017	Male	Born in Guatemala	48-year old farmer in San Isidro village.	Q'eqchi, with translation
21	01/05/2017	Male	Born in Guatemala	43-year old farmer in San Isidro village.	Q'eqchi, with translation
22	02/05/2017	Male	Born in El Salvador	63-year old farmer in San Isidro village.	Spanish, with translation
23	02/05/2017	Male	Belizean	67-year old farmer in San Isidro village.	English

24	02/05/2017	Male	Born in Guatemala	41-year old farmer in San Isidro village.	Spanish, with translation
25	02/05/2017	Male	Born in Honduras	65-year old farmer in San Isidro village.	Spanish, with translation
26	05/05/2017	Male	Belizean	24-year old farmer in San Isidro village.	English
27	05/05/2017	Male	Born in Guatemala	61-year old farmer in San Isidro village.	Q'eqchi, with translation
28	05/05/2017	Male	Belizean	28-year old farmer in San Isidro village.	Q'eqchi, with translation
29	05/05/2017	Male	Born in Guatemala	35-year old farmer in San Isidro village.	English
30	08/05/2017	Male	Born in Guatemala	50-year old farmer in Trio village.	Spanish, with translation
31	08/05/2017	Female	Born in Guatemala	58-year old farmer in Trio village.	Spanish, with translation
32	09/05/2017	Female	Born in Guatemala	74-year old farmer in Trio village.	Spanish, with translation
33	09/05/2017	Male	Born in Guatemala	25-year old farmer in Trio village.	Spanish, with translation
34	09/05/2017	Male	Born in Honduras	70-year old farmer in Trio village.	Spanish, with translation
35	09/05/2017	Male	Born in Honduras	62-year old farmer in Trio village.	Spanish, with translation
36	09/05/2017	Male	Belizean	Farmer in his late 20s in Trio village.	English
37	09/05/2017	Male	Belizean	26-year old farmer in Trio village.	Spanish, with translation
38	10/05/2017	Female	Born in Guatemala	59-year old farmer in Trio village.	Spanish, with translation
39	10/05/2017	Male	Born in Honduras	55-year old farmer in Trio village.	Spanish, with translation
40	10/05/2017	Male	Born in Honduras	28-year old farmer in Trio village.	Spanish, with translation
41	10/05/2017	Male	Born in El Salvador	42-year old farmer in Trio village.	Spanish, with translation

42	10/05/2017	Male	Born in Guatemala	71-year old farmer in Trio village.	Q'eqchi, with translation
43	10/05/2017	Male	Born in Guatemala	18-year old farmer in Trio village.	Q'eqchi, with translation
44	11/05/2017	Male	Born in Guatemala	44-year old farmer in Trio village.	Spanish, with translation
45	11/05/2017	Male	Born in Guatemala	Farmer in his 30s in Trio village.	Spanish, with translation
46	15/06/2017	Male	Belizean	Farmer, formerly employed as a Forest Ranger with the Forest Department at Savanna Forest Station in 1962.	English
47	16/06/2017	Both male	Both Belizean	Two former Forest Department staff, one started in 1973 as a Forest Guard, was promoted to Forest Ranger in 1989 and retired in 2006, the other started in 1973 as a Forest Guard, was later an Assistant Carpenter and retired in 2004.	English
48	20/06/2017	Male	Belizean	Forest Officer with the Forest Department from 2003 to present.	English
49	20/06/2017	Male	Belizean	Forest Department staff member from 1980 to present. Currently Deputy Chief Forest Officer.	English
50	21/06/2017	Male	Belizean	United Democratic Party politician and Cabinet Minister from 1988 to 2015. His family owned mahogany cutting operations in Toledo District throughout the twentieth century.	English
51	01/07/2017	Male	Belizean	Forest Department staff member from 1977, recently retired. Led fire management in the Mountain Pine Ridge Forest Reserve during his career.	English
52	04/07/2017	Male	Belizean	Agriculture Department staff member from 1988 to present, acting Chief Agricultural Officer at time of interview.	English
53	05/07/2017	Male	Belizean	Staff member of conservation NGOs the Belize Audobon Society and Programme for Belize in the 1990s. Official in Ministry of Natural Resources from 2003 to 2005. Chief Forest Officer in 2005. Self-employed consultant in natural resources management since 2005.	English
54	19/12/2017	Male	British	Retired Professor of soil science in geography department at University of Edinburgh. Conducted research in Belize, from 1966 to mid-2000s. Particular interest	English

				in tropical savannas, which he also studied elsewhere in Latin America.	
55	31/01/2018	Male	USA	Fire manager with TNC, and the organisation's Director of Fire Management since 2009. Fire management consultant in Belize under the Global Fire Initiative in the 2000s.	English
56	05/02/2018	Male	Belizean	Forest Department staff member from 1976 to 1995. Chief Forest Officer from 1991 to 1995. Ministry of Natural Resources Policy Coordinator from 1998 to 2004. Thereafter employed in Belize's National Climate Change Office.	English
57	15/02/2018	Male	Belizean	Employed as a Ranger with TIDE since 2010.	English
58	15/02/2018	Male	Belizean	Worked with Toledo Maya Cultural Council and as a Ranger with Belize Audobon Society in the 1990s, then as a Ranger with TIDE from 2004 to 2016. Sustainable Agriculture Coordinator for the Ya'axche Conservation Trust since 2016.	English
59	24/02/2018	Male	USA	Fire manager, formerly of the US Parks Service and TNC, now retired. Connection with Belize since his graduate work here in the early 1990s. Consultant fire manager in Belize from early 2000s, first via the GFI, and independently since it ended in 2009, working particularly with TIDE.	English
60	27/02/2018	Male	USA	Land Manager and specialist in prescribed fire management with TNC from 1987 to 2017. Consultant in fire management in Belize during the GFI in the 2000s, continuing independently as a consultant to Belizean NGOs including TIDE, for several years after the close of the GFI in 2009.	English
61	01/03/2018	Male	USA	Ecologist working in Belize since 1984 (largely in North West Belize). Currently Professor at University of Puerto Rico.	English
62	01/03/2018	Male	Dutch	Consultant ecologist resident in Belize since the early 1990s.	English
64	15/03/2018	Female	Belizean	Executive Director of TIDE from 2007 to present.	English
65	23/03/2018	Male	Belizean	Forest Department staff member from 1959 to 1993, Acting Deputy Chief Forest Officer in his late career.	English
66	11/06/2018	Male	British	Forester who led the six-year UK Government funded Forest Planning and Management Project in Belize in the 1990s.	English

67	04/10/2018	Male	British	Former Development Director at TIDE, who wrote the Darwin Project Proposal.	English
68	15/12/2018	Male	British	Employee on the UK Government funded Stann Creek Land Resources Assessment in the late 1980s and the six-year Forest Planning and Management Project in Belize in the 1990s.	English