Do Burning Practices Contribute to Caring for Country? Contemporary Uses of Fire for Conservation Purposes in Indigenous Australia

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DO BURNING PRACTICES CONTRIBUTE TO CARING FOR COUNTRY? CONTEMPORARY USES OF FIRE FOR CONSERVATION PURPOSES IN INDIGENOUS AUSTRALIA

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Since the mid-1990s, natural resource management or ''ranger'' jobs have been established in many Indigenous communities of northern Australia. These jobs are based on the formalization and professionalization of ''traditional'' responsibilities for the land and the sea referred to as ''caring for country.'' They are predominantly funded by the Australian government through policies and programs that combine environmental conservation and Indigenous economic development objectives. Fire management is usually one of the Indigenous rangers' main activities. This paper endeavors to analyze the power relations and ambivalences inherent in these rangers' burning practices, described in the scientific literature as ''community-based.'' The joint or integrated use of ''traditional ecological knowledge'' and Western science is widely advocated for programs using anthropogenic fires for conservation purposes. We argue that in northern Australia, attempts to integrate these two systems of knowledge have resulted in a de facto transfer of the social and ritual responsibility of burning the country from specific Indigenous custodians (traditional owners and managers) to Indigenous rangers, non-Indigenous fire ecologists, and other non-Indigenous actors. While traditional owners and local people are supposed to define and control their rangers' fire management activities, local involvement is impeded by the role of external experts. Furthermore, attempts to combine Indigenous and non-Indigenous fire knowledge entangle different understandings of what a ''traditional'' fire regime was and should be, and often prioritize Western views supported by funding bodies. Consequently, the burning practices implemented by Indigenous rangers can be a source of controversy within local communities and among rangers themselves.

Keywords: *indigenous Australia, conservation, community-based natural resource management, fire management regimes, burning practices*

Introduction

The Indigenous Australians' uses of fire have been the focus of many scientific studies and debates.[1] Outside the academic realm, they have also given rise to conflicting interpretations and views. While such uses of fire continue to be disapproved of by part of the Australian mainstream population, they are increasingly viewed as a solution to ''Australia's bushfire problem'' associated with global climate change phenomena. The uses of fire by minorities to manage pastoral territories, clear forest areas, or regenerate arable land are viewed with a similar mixture of disapproval and acclaim elsewhere in the world (e.g., Evrard 2006; McKinnon and Bhruksasri 1983; McKinnon and Vienne 1989; Moizo 2000). Indigenous Australians are now perceived as being the group best positioned to manage and conserve the environment and landscapes of the country, although their expertise in this domain was completely denied in the past. In the northern Australian savanna region, where Indigenous Australians collectively own about

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half the land and represent half the total population (Vigilante et al. 2009:146), programs based on Indigenous burning practices are being developed and increasingly funded through payments for environmental services and greenhouse gas offset agreements.

In the framework of such funding arrangements, much attention is paid to the potential of Indigenous burning practices in terms of environmental conservation, which is intrinsically linked with local economic development and empowerment objectives (see Fache 2014). However, from the point of view of Indigenous Australians, the rationale for maintaining or reestablishing burning practices involves the translation of their past(s) into the terms of their present(s) and the definition of the multifaceted heritage they will transmit to the next generation. Efforts to maintain or reestablish burning practices raise questions regarding their relationships with the Australian state, their participation in transnational movements, and their recognition on national and global scales. In other words, Indigenous Australians' contemporary uses of fire reflect their diverse, and sometimes contradictory, aspirations with regard to their ways of life, livelihoods, identities, and futures. As a result, analyzing Indigenous burning practices throws light on the multidimensional processes by which Indigenous people define their existence in an ever-changing world.

When considered at the community scale, these processes also involve many non-local actors and interests. Since the 1970s, the so-called Aboriginal self-determination policy implemented by the Australian government has brought into Indigenous communities more non-Indigenous people and organizations than ever in the past (Cowlishaw 1999:234; see also Batty 2005). Non-Indigenous fire ecologists, nongovernmental organizations, the Australian government and its agencies, private industries, and other actors and institutions have likewise become increasingly involved in burning practices in Indigenous Australia. Under the guise of supporting Indigenous uses of fire, mainly for conservation purposes, these stakeholders are actively participating in the professionalization, the formalization and, to some extent, the reshaping of local burning practices and their rationale. In this paper, we argue that the resulting fire regimes reveal, reproduce, or create power relationships at the expense of Indigenous people. Rather than reflecting a consensus, they may also be a source of social tensions within the Indigenous communities concerned.

We explore these issues through the presentation and analysis of an ethnographic case study. Since the mid-1990s, ''ranger'' job opportunities have developed in many Indigenous communities in northern Australia that are not necessarily (or not yet) included in the national network of protected areas (National Reserve System), which comprises national parks as well as Indigenous Protected Areas. The role of Indigenous rangers is to ''care for country,'' meaning to carry out day-to-day duties of land and sea management on behalf of the wider group(s) having rights and responsibilities for the country (cf. Fache 2013; Kerins 2012:33). ''Fire management'' is usually one of their main activities, reflecting the underlying assumption that only Indigenous Australians are entitled and able to ''repair'' the colonial and postcolonial damage that non-Indigenous people have inflicted on the environments of the northern savanna and other regions in Australia.
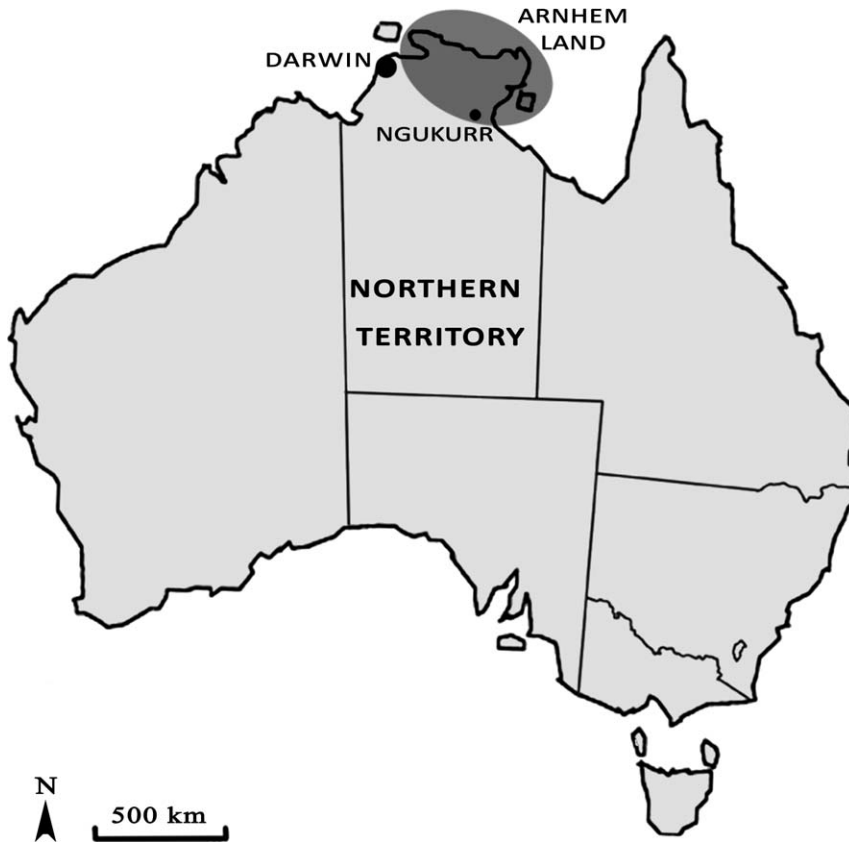
Figure 1. Ngukurr, a remote Indigenous community of Arnhem Land (E. Fache).

A ranger group emerged in 2001–2002 within the Indigenous community of Ngukurr in southeastern Arnhem Land, Northern Territory (Figure 1). This community of over one thousand inhabitants is not yet located within the national network of protected areas, but may become part of the ''South East Arnhem Land'' Indigenous Protected Area if the latter is declared at the end of the consultation process currently in progress. Its small satellite settlements, known as ''outstations,'' were established in the 1970s and 1980s. They are no longer inhabited on a regular basis, but some people living in Ngukurr come out to fish, hunt, and collect bush foods when four-wheel drive vehicles and fuel are available, particularly on weekends and school holidays. Indeed, in this context most Indigenous people fish, hunt, and gather only occasionally, purchasing most of their daily food from the local store or ''in town'' (in Mataranka, Katherine, or Darwin). At the time of our study in 2009–2010, the core ranger group based in Ngukurr consisted of eight community members, four women and four men, aged between 30 and 65 years old, with up to four additional local persons intermittently joining the team. A major focus of the work of this group was ''fire management,'' especially early in the dry season.

As we will demonstrate through our study of the Ngukurr ranger group, burning practices are progressively being organized around multi-actor and multi-rationale mechanisms in Indigenous-owned lands of northern Australia. These burning practices, which differ from the ones dedicated solely to Indigenous goals, are also a locus of entanglement between local fire use knowledge and western fire ecology, and thereby a context of opposition between different views of what "traditional" fire regimes were and should be.

To better understand these issues, we shall first succinctly outline the various Indigenous uses of fire reported in the scientific literature. We also will examine how the concept of "fire-stick farming," introduced by the archaeologist Rhys Jones in the late 1960s, acknowledges the association (rather than the opposition) of anthropogenic fires with natural resource management in the Australian context.

"Parasites on Nature" or Land and Sea Managers?

As semi-nomadic hunter-gatherers, the first inhabitants of Australia did not cultivate plants or domesticate animals for subsistence purposes. A.P. Elkin, who has contributed significantly to the development of Australianist anthropology, described their existence and economy in terms of complete dependence upon what "nature" could provide them without any labor of the land. He even referred to them as "parasites on nature" (e.g., Elkin et al. 1950:1). Since the end of the 1960s, scientists of different backgrounds have explicitly challenged the conclusion that Indigenous Australians have a passive or "parasitic" attitude towards their environment. In particular, the concept of "fire-stick farming" introduced by Jones (1969) has marked a turning point in the scientific description of the livelihoods of Indigenous Australians. This concept suggests that several millennia ago, Indigenous Australians developed a particular type of agriculture (called "igniculture" by Bowman 2003:2) based on the productive use of fire on extensive territories, which is distinct from better-known slash and burn practices: "at the time of ethnographic contact with the Aborigines, and probably for tens of thousands of years before,[2] fires were systematically lit by Aborigines and were an integral part of their economy" (Jones 1969:228). Jones points out that through their fire regimes, Australian hunter-gatherers did (and, in some contexts, still do) increase the quantity of game and edible wild plants available in the bush, both on the short- and long-term. In other words, Indigenous Australians were and are investing in the productivity of their land (Rose 1996:63) and in the construction of their own ecosystem (Bliege Bird et al. 2008:14799) through their burning practices, which were and may remain essential for their subsistence. The historian Bill Gammage (2011:281, 304) even describes them as exploiting "farms without fences," and "making farm and wilderness one." Langton (1998:41) argues that the Indigenous uses of fire in Australia have always had land management purposes as well as economic aims. The practice of "fire-stick farming" indeed argues that Indigenous Australians have been continuously and actively managing their land since time immemorial, and have thus contributed greatly to shaping Australian landscapes, especially in the northern savanna.

Jones' analysis has received some criticism (e.g., Horton 1982). However, the "fire-stick farming" hypothesis has been widely accepted in the academic realm

and popularized by various organizations promoting Indigenous rights and interests, including land councils, which have been playing a significant role in the creation of ranger job opportunities and programs in northern Australia since the 1990s. On the basis of ''fire-stick farming,'' the idea that Indigenous Australians have always been land (and sea) managers has been increasingly accepted.

Australianist literature highlights that fire was, and in some places still is, central to the daily life of Indigenous Australians. It can, among other things, be used to cook, produce heat and light, heal through warmth and steam, clean up well-defined areas in order to facilitate travel or arrange campgrounds, signal one's presence in an area, facilitate hunting (e.g., by flushing or driving game, improving the visibility and tracking of animals, attracting them to specific areas, or influencing their distribution), stimulate the regrowth of edible plant resources, control insects and snakes, and drive away dangerous supernatural figures (see Bliege Bird et al. 2013; Langton 1998:40; Rose 1996:64–65; Testart 1978, 1987; Vigilante et al. 2009:148–153). Furthermore, fire is used to ''clean up the country,'' to ensure that ''wild'' or ''dirty'' country is transformed into ''quiet'' or ''clean'' country (Head and Hughes 1996:279–280; Lewis 1989:940). This allows ''the country [to be brought] back to life'' (Yibarbuk 1998:1) while inscribing in the land a signal of its use and thus expressing associated co-ownership and obligation systems (Bliege Bird et al. 2008:14797). Fire is also involved in the spiritual cleansing of sites and objects intrinsically associated with deceased persons (mortuary rituals) and in ceremonies that connect people to the ancestral domain and allow them to pass on their sacred knowledge and customary law. For instance, as observed during male initiation ceremonies in the West Kimberley in Western Australia (Moizo 1991, 2007), classificatory brothers-in-law grant to young initiates the right to use fire for cooking and other purposes by giving them a burning stick to be kept during the seclusion period that follows circumcision (see also Morrison and Cooke 2003:5). Dean Yibarbuk also explains that fires are central physical parts of ceremonies as they ''sit between the ceremony grounds where children and women stay and the more spiritually dangerous ceremony grounds where only senior initiated men go'' (Yibarbuk 1998:2). Additionally, burning and creating fire-breaks ensure the protection of sacred sites created by mythical beings.

In sum, the motives for Indigenous burning practices ''are complex and include the fulfillment of social and religious needs, a factor that remains important to Indigenous people despite the rapid and ongoing transformation of their traditional lifestyles'' (Yibarbuk et al. 2001:325). Even Indigenous people who have been forced to leave their land and live elsewhere generally continue to view anthropogenic fires as a socio-religious responsibility which they feel obliged to fulfill by returning to their country from time to time. During fieldwork conducted between 1985 and 1987 in the West Kimberley, one of the authors (Moizo) on several occasions accompanied groups of initiated men who visited their ''countries,'' which they had left a long time before, in order to ''clean'' secret objects and the ''country'' by using fire in specific places of significance. Nowadays, Indigenous Australians generally crystallize this sense of responsibility in the phrase ''caring for country'':

> Caring for country encompasses being spiritually bound to country through intimate connections with ancestral beings still present in the land and waters. For Aboriginal people, caring for country is first and foremost about looking after these powerful and sacred places; protecting their values, ceremonies, songs and stories, as well as associated processes of spiritual renewal, connecting with ancestors, food provision and maintaining language, law, knowledge systems and, importantly, kin relations (Kerins 2012:29).

In the eyes of Indigenous people, burning constitutes something far greater than the physical and ecological management of a geographic area as it ensures the maintenance of the ancestral domain and thereby the continuation of the socio-cultural domain. However, Gammage (2011:132–133) suggests that such motives for Indigenous burning practices can also be described as inherently ecological because ''theology and ecology are fused'' for Indigenous Australians.

Although there are numerous rationales for Indigenous uses of fire, one dimension is particularly emphasized today: ''It is the most ancient and most powerful of Indigenous Australian land management tools'' (Northern Land Council 2004:18). The handling of fire as a ''land management tool'' involves the selective and controlled burning of a variety of ecosystems, with varying frequencies and intensities, and at different times of the year and even of the day—or, in other words, ''a lot of spatial and temporal heterogeneity'' (Vigilante et al. 2009:148). These ''traditional Aboriginal burning practices'' (Lewis 1989:950) are based on detailed knowledge of the natural environment (soils, land forms, surface and underground water, habitats and behaviors of plant and animal species, etc.) and of the various effects of fire according to ecosystem types and weather conditions (cf. Lewis 1989; Rose 1996:67). They produce a mosaic of burned and unburned areas at broad landscape scales (e.g., Armstrong et al. 2012:5; Bird et al. 2005; Bliege Bird et al. 2008; Whitehead et al. 2003; Yibarbuk et al. 2001). This fine-grained mosaic reflects ''a type of ecosystem engineering'' (Bliege Bird et al. 2013:2) that reduces the risk of devastating wildfires and the extent of lightning-caused fires, and thus the surface burnt over the long-term. Concomitantly, it influences the population structure and the spatial distribution of a broad range of plant and animal species, as acknowledged in the domain of ethnoscience. In Australia, many plant species (some edible) require fire to flower or for their seeds to germinate; many animal species depend on, or respond positively to, the effects of controlled fires (cf. Rose 1996:65) such as the regrowth of fresh and nutrient-rich plant shoots that attract kangaroos. Based on a study of fire ecology in north-central Arnhem Land (Northern Territory), Yibarbuk et al. (2001) state the key role of Indigenous fine-scale patterns of burning for the maintenance of biodiversity on the Arnhem Land plateau and beyond (see also Bird et al. 2005; Bliege Bird et al. 2008; Vigilante et al. 2009:156–158; Whitehead et al. 2003).

Fire Management as Implemented by Indigenous Rangers

The colonization of Australia, which has been very progressive, has induced a decline or cessation of Indigenous burning practices, particularly over much of

the northern savanna region (cf. Petty et al. in this issue). This has resulted in the multiplication of extensive and intense wildfires with negative impacts on endemic flora (especially fire-sensitive plant communities) and fauna (e.g., Bowman 2003; Russell-Smith et al. 1997:180; Vigilante et al. 2009:154–155; Whitehead et al. 2003:417–418). To counter these phenomena, fire management has become a significant activity for most Indigenous ranger groups in northern Australia since the 1990s. Non-Indigenous experts, knowledge, and technologies have supported this process. The result has been hybrid fire regimes in which Indigenous burning practices are combined with non-Indigenous expertise, and both Indigenous rangers and non-Indigenous actors play an essential role. The rangers themselves, as well as other Indigenous Australians, nongovernmental and governmental bodies, and transnational movements, associate such hybrid fire regimes with conservation purposes and with related processes of ''on country'' job creation, sustainable economic development, safeguarding ''traditional'' knowledge and ensuring its intergenerational transmission, and Indigenous empowerment. These related processes are all deeply lacking in Australia and are claimed by many Indigenous Australians.

''Fire management''—also locally called ''burning off'' or ''grass burning''—is a major focus of the Indigenous ranger group based in Ngukurr. These Indigenous rangers consider that their burning practices implemented early in the dry season (between April–May and July–August) produce ''low and cold fires'' with ''small flames'' that die out in the morning dew. They argue that such controlled fires reduce the risk of devastating ''wildfires,'' or ''hot fires'' with ''big flames,'' later in the year. They also believe that controlled fires release into the atmosphere less carbon and other greenhouse gases than wildfires. During the early dry season, the rangers therefore organize most of their working days around fire management. While travelling through the bush in four-wheel drive vehicles in their area of action, the rangers stop frequently to burn-off the dry grass that covers the ground on both sides of unsealed roads and tracks. To do so, they use lighters, matches, or a torch containing a mixture of petrol and diesel that they call a ''fire-box'' or ''drip-torch.'' They sometimes also use incendiary capsules. Stretches of bush which are not accessible by four-wheel drive vehicles are burned from a helicopter using a ''Raindance machine'' which propels capsules that ignite when they hit the ground. The rangers respectively describe these methods as ''on-ground burning'' and ''aerial burning.'' They can follow the progress of the fires that they start (and which can last several days) on a website showing satellite images of the areas burned in recent days and even during the last few hours.[3]

Such fire management activities are part of the Central Arnhem Land Fire Abatement (CALFA) project. The Central Arnhem Land Fire Abatement project builds on the Western Arnhem Land Fire Abatement (WALFA) Project (see Petty et al. in this issue) and extends its ongoing fire management program in a neighboring area. The Western Arnhem Land Fire Abatement Project ''has been developing since 1996 to address chronic fire management problems in Aboriginal-owned, high-biodiversity savanna landscapes of western Arnhem Land'' (Fitzsimons et al. 2012:52). This greenhouse gas abatement project reduces greenhouse gas emissions in the atmosphere while creating employment

opportunities for Indigenous people in remote regions (see, among others, Altman et al. 2007:42–43, 2009:23; Concu 2012:300; Fitzsimons et al. 2012; Vigilante et al. 2009:159–160; Whitehead et al. 2008). As such, it is supported by private investments through a payment for environmental services scheme. The scheme is mainly funded by a subsidiary of the multinational ConocoPhillips, which aims to partially offset its emissions of greenhouse gases from a liquefied natural gas plant in Darwin (100,000 tons of CO_2 equivalent annually) against AU \$1 million a year for 17 years. These investments fund several Indigenous ranger groups located in western Arnhem Land, which work in collaboration with traditional owners of the region[4] as well as fire ecologists. The multinational is thus seeking to reduce its carbon footprint and abate its greenhouse gas emissions, not by limiting its own production and release of such gases, but by funding fire management programs that are led by and benefit Indigenous people. The Central Arnhem Land Fire Abatement project is organized along the same lines as WALFA, and involves several Indigenous ranger groups working in central and southeastern Arnhem Land. Although it initially was funded through public subsidies, private funding is expected over the longer term. The key objective of the project is to reestablish ''customary Indigenous fire management regimes'' (Fitzsimons et al. 2012:52) and thereby limit the extent of late season wildfires and reduce emissions of carbon and other greenhouse gases.

Under CALFA, the Indigenous rangers based in Ngukurr participate in the collection of data about the amount of greenhouse gas emissions that their burning practices produce and prevent. This study is coordinated by, and implemented in collaboration with, non-Indigenous ecologists from the Commonwealth Scientific and Industrial Research Organisation[5] (CSIRO) and Bushfires NT (Department of Land Resource Management, Northern Territory Government[6]). These ecologists have defined the protocol for data collection, which consists of a series of measures that aim to determine the amount of ''fuel'' (trees, shrubs, grass, and ground cover) existing before and after the burning of well-defined transects (100 m long $\times$ 1 m wide paths located in different ecosystems that have not been burned during recent years). In Darwin, and without the involvement of the rangers, these measures then are used to estimate, using modeling, the reduction of greenhouse gas emissions resulting from fire management during the early dry season. The outputs are expected to facilitate the inclusion of CALFA in a ''carbon market,'' a concept defined for instance by Douglass et al. (2011:1). The intention is thus to acquire revenue generated by managing fire within the CALFA region and thereby ensure the maintenance of adapted fire regimes within this region.

Contemporary Uses of Fire: From Conservation Purposes to Internal Tensions

In Ngukurr, fire management was a source of tension within the ranger group as well as between the group and some other community members at the time of the study (2009–2010). The oldest member of the group felt the rangers burned ''too much'' each year, and that the fruits, berries, and tubers produced by endemic flora were consequently becoming increasingly scarce around

Ngukurr. She argued that the Indigenous Australians who lived in the region in the past did not burn as great a surface area or as systematically as the rangers do now. Through this statement, she outlined the differences between a fire regime conducted within a social, ceremonial, and symbolic framework and a fire regime implemented for conservation purposes following guidelines that were mainly defined outside the community. During a ''fire meeting'' in September 2009 attended by the rangers and several non-Indigenous scientists involved in CALFA, she supported her view by evoking childhood memories. She began by saying: ''When I was younger I used to travel around a lot in the bush with my grandfather … I was carrying the fire.'' She then explained that at the time, she was enthusiastic and excited about the idea of burning the landscape, but her grandfather used to prevent her from burning ''too much,'' which would have endangered some plants and animals that they used to collect and hunt: ''We used to burn when they wanted us to burn, not all the time…That's why sometimes I don't go with them [the rangers] when they go burning,'' she finished.

A younger woman ranger, in her thirties, shared her ambivalence with regard to the group's burning practices. Some community members also shared the opinion that the rangers burned ''too much'' as well as ''too late'' in the year, and that this could negatively impact the production of endemic plant resources in the region. Such resources are not a staple food, but are nevertheless very popular. Certain male community members also called into question the control exercised by the rangers over the trajectory of the fires that they started. For instance, in personal conversations with one of the authors (Fache), a community leader expressed his feeling that the rangers (above all the female rangers) may be responsible for the destruction of some secret/sacred trees and sites, whose cleansing using fire should be carefully conducted by their fully initiated male owners and managers, not the rangers. When secret/sacred trees and sites were involved, controversy over the trajectory of anthropogenic fires thus appeared to be rooted in the status and rights of the person who started the fire rather than the fire's physical/geographic progress (see also, for the Western Desert, Bliege Bird et al. 2008:14797).

Local discourses tended to distinguish the burning practices conducted by the rangers for conservation purposes from burning practices implemented by other community members for other purposes, such as cleaning up a path in long grasses (and thereby avoiding poisonous snakes) or hunting. Within the Indigenous community, and even within the minds of individual members, there appeared to be conflicting views regarding these two sets of burning practices. One view held that the rangers are inexperienced in the domain of burning practices and thus should learn from community elders who have deeper knowledge of the way fire should be used to care for country. The other held that the rangers are fire management specialists while the other community members are ''firebugs'' likely to start fires anywhere and at any time of the year without anticipating the consequences of their actions: ''They see heaps of grass, they get itchy fingers, then Bang! They light it [a fire]'' (Ngukurr, September 2010).

Some of the Indigenous rangers appeared to hold this second perspective, which paradoxically reflects the negative view held by some non-Indigenous

Australians regarding Indigenous uses of fire. In particular, the rangers deemed that the local population was prone to burn the landscape around Ngukurr and its outstations ''at the wrong time'' of the year (in the late dry season), while they themselves always burned ''at the right time'' (in the early dry season, between April–May and July–August). They added that their own fire management activities aimed to prevent the devastating wildfires ''deliberately'' started by some community members in the late dry season, or at least to limit their intensity and extent. The rangers' point of view is illustrated in their statements below:

> We did our burning, like I'm repeating myself, from May to July. That's the only time we've burned. But sometimes it's not us, the ranger group, which are burning elsewhere. It's usually the locals that go out camping-out, or go fishing, hunting. That's the time you see extra fires during the year, even in October–November…We [the rangers] have finished our burning then, and then we know that somebody else was out there with their families, you know, hunting and gathering and all that, and burning at the same time (Ngukurr, September 2009).
>
> Every time they [community members] see a fire they blame us [the rangers], but sometimes it's not us that light the fire, it's somebody else travelling or somebody else camping-out. And we get the blame for it. And then again I told them: ''it's some people in the village, in the community that light those fires, and some hot fires.'' They just want to burn because they see a lot of grass, [even if it] is the wrong time too when they go out (Ngukurr, September 2010).

For their part, however, most community members systematically associated smoke coming from a distance but visible from the village late in the dry season with fire management activities implemented by the rangers, even when the latter had no involvement in starting the corresponding fires. Indeed, during the fieldwork conducted in 2009 and 2010, although the rangers were sometimes observed burning in September and October, fire management generally was not a major activity from August onwards (see also Fache 2013).

In this context of conflicting opinions and fire regimes, the rangers asserted that they were, in their burning practices, endeavoring to fulfill their official purpose of assisting the traditional owners of the region to care for their country. They also stressed that all of the rangers were well aware of the importance of not burning some specific areas to preserve edible plants and sacred sites. One of the women rangers explicitly assigned the responsibility for the increasing scarcity of endemic fruits and berries in the surroundings of Ngukurr to the phenomena of ''climate change'' and ''global warming.'' She regretted that the CALFA project had not yet included a community awareness-raising component so that the other community members could better understand the specificities and benefits of the rangers' fire regime.

Community members generally associated local past and contemporary burning practices, including those implemented by the rangers, with specific objectives such as the access to food resources (see above) and the production of smoke signals. Smoke used to be, and sometimes remains, a communication tool

allowing people to announce their visits from a certain distance or a gathering for
ceremonies, and to inform others of one's position and progression in the bush.
According to the Indigenous rangers, however, the primary rationale for their
own burning practices in the early dry season is the reduction of emissions of
greenhouse gases in the atmosphere to mitigate ''global warming.'' In 2009 and
2010, they tended to consider this phenomenon in terms of its global, rather than
local, causes and impacts: air pollution, greenhouse gas emissions, rising
temperatures, melting of polar ice, rising sea levels. For example, one ranger
observed: ''Pollution from everyone, everything, the vehicles, the electricity, the
fire, the smoke, the mining. We make that happen. Men made it.'' (Ngukurr,
September 2009).

The following questions thus arise: to what extent are the Indigenous rangers
echoing and reproducing discourses on ''global warming'' and ''climate change''
passed on to them by governmental and nongovernmental agents, and to what
extent are they aware of the scientific background and relevance of such
discourses? Will rangers be able, with other community members, to develop
their own definition of ''global warming'' and ''climate change'' and use the
concepts within the framework of local strategies? If so, what forms will such a
process take and what interests will it aim to serve? These matters still need to be
explored through future fieldwork research, but we can already introduce here
some elements of a response.

The Indigenous rangers based in Ngukurr suggested during discussions with
one of the authors (Fache) that they had been introduced to the concept of ''global
warming'' and its association with Indigenous burning practices by the
''scientists'' (their words) involved in CALFA. For instance, one of the documents
developed and used by Bushfires NT to explain this project and corresponding
research activities to ranger groups states:

> Scientists believe the climate is changing and slowly getting warmer. If
> the world gets warmer there will be bigger floods and droughts, more
> cyclones and the sea level will rise. Global Warming is caused by too
> much ''greenhouse'' gas being released into the sky by cars, industry,
> and land cleaning. Bushfire smoke also has lots of ''greenhouse gas.''
> Strategic burning at the right time of the year can hopefully reduce the
> area burnt and reduce the number of intense hot weather fires. Fire
> management in central Arnhem Land will mean less smoke going up
> and help stop global warming (Bushfires NT, undated, viewed in 2009).

Echoes of this formal presentation were found in statements made by the
non-Indigenous agents from Bushfires NT who gave this document to the
Indigenous rangers of Ngukurr, and, therefore, in the statements of these
rangers. The rangers also assimilated and often used a technocratic term, ''fuel,''
which is central to the discourse of the scientists involved in the CALFA project.
This term refers to the dry grass, leaves, dead branches, plants, trees, and any
other vegetal combustible material that can be ignited and thereby spread
bushfires. Other community members were not familiar with this understanding
of the word ''fuel,'' nor were they familiar with the concept of ''global warming.''
This situation may be the source of mutual misunderstanding, and reveals the

gap that too often exists, in both the domain of natural resource management and more widely, between members and elders of Indigenous communities and the people (who may, like the rangers, come from and live in the same communities) now in charge of duties and responsibilities directly connected with local life and affairs.

Fire Regimes and Power Asymmetries

The varying understandings and local tensions which have emerged around the burning practices implemented by Indigenous rangers are intrinsically linked with asymmetries of power between these rangers and their non-Indigenous collaborators. Over the last few years, some community members have repeatedly requested that the rangers modify their fire regime to correspond to local aspirations, as described by one of the women rangers:

> People [have been] talking about: ''Can yumob [second person plural in Kriol language], ranger mob [group] stop burning too much? We don't want you guys to burn our bush medicines or bush tucker [food resources existing in the bush]. We don't want to go that far, [in] rocky-mountains or sandy areas, to get that bush tucker or thing. We want to get it closer. Can yumob please stop burning too much?'' (Ngukurr, July 2010).

The ranger expressed a feeling of guilt, but placed the blame for the contested practices on the non-Indigenous actors involved in the rangers' fire management activities. In her view, the rangers acted as expected by the latter, and had limited room to maneuver:

> But it's our job, what we…what those people out there in Darwin told us to do, it's part of our job. …They told us to do this job (Ngukurr, July 2010).
> But they [community members] should know we're just being told what to do. …By the fire mob [the people involved in fire management] up in Darwin (Ngukurr, July 2010).

During a meeting in May 2009, the oldest woman in the ranger group suggested: ''We have to talk to the Bushfire Council [and] maybe not burn next year,'' referring here to Bushfires NT (see also Sithole and Hunter-Xenie 2007:20). Her recommendation provoked the following reaction from one of the male rangers: ''If we don't burn, we won't get money for this fire project.'' She replied: ''You're worried about money; I'm worried for the country.''

This anecdote illustrates that the influence of outside bodies on the local rangers' fire regime is both significant and contested by some of the rangers themselves. Outside bodies are involved in multiple aspects of the rangers' fire regime: planning, implementation, monitoring, and securing of funding (in particular through the collection of data as part of the CALFA project). This is in contrast with, and may help explain, the limited involvement of other community members including the traditional owners of the region in the rangers' fire management activities (see also Fache 2014). The role played by

these outside bodies deters local capacity building and empowerment, and helps produce social distinctions and tensions within the local community (particularly between rangers and other community members).

Annual and monthly plans for Indigenous rangers' burning activities are established through regularly scheduled ranger meetings attended by one or more non-Indigenous actors. These non-Indigenous actors actively participate in the definition of the rangers' fire management agenda. They often use maps to show rangers what areas they should burn in the coming months (usually areas that have not been burned for several years according to satellite images) and suggest a monthly burning program. For instance, in 2009, one of the woman rangers described how the annual planning process regarding fire management in the CALFA region involved a major meeting between the rangers based in Ngukurr and neighboring land managers (''some of the rangers came from Numbulwar and Bulman, and one man from the outstation Wongalara came out'') as well as a non-Indigenous collaborator (''one person from the Bushfire mob''). The organization of such meetings, and the contents of the actual calendar of fire management activities produced during them, therefore depends on the availability and schedules of outside bodies. This is despite the fact that the importance of planning fire management in the Ngukurr region on the basis of local seasonal calendars was highlighted as early as 1999. This recommendation emerged in the first fire management strategy defined for the area (Urapunga, Costello, Nalawan, Baddawarka, Washaway Creek, Wuyagiba; cf. Figure 2).[7]

With regard to the implementation of on-ground burning activities, the Indigenous rangers based in Ngukurr mainly worked autonomously in 2009 and 2010, meaning without any intervention *in situ* of the non-Indigenous actors involved in the CALFA project. The situation was different with regard to aerial burning activities. The rangers were generally not in charge of reserving a helicopter and hiring a pilot, whose costs were covered by CALFA. Therefore, they did not feel fully involved in the organization of aerial burning sessions—typically lasting one or two days—and sometimes realized that such a session was going to happen only a few days beforehand. When the pilot and a non-Indigenous collaborator arrived in Ngukurr, only the rangers who had the highest hierarchical positions within the group (coordinator, senior ranger), and occasionally the other male rangers, actively participated in the discussion about the program and the itinerary of the upcoming session. In the helicopter, only one ranger at a time could be present with the pilot and the non-Indigenous collaborator to operate the ''Raindance machine,'' a device designed for aerial ignition. The use of this device requires a license called a ''bombardier (aerial burning) ticket.'' Indigenous rangers did not often operate the device; some did not have the required license, others had the license but no desire to use it. Indeed, many community members did not consider aerial burning to be an appropriate way of caring for their country. Indigenous rangers therefore transferred the responsibility for aerial burning to a person who was neither involved in their local social and kinship relationships nor subject to associated duties and modes of accountability.

The participation of the Indigenous rangers in CALFA collaborative research also was limited. They did not contribute to the definition of the protocol for data
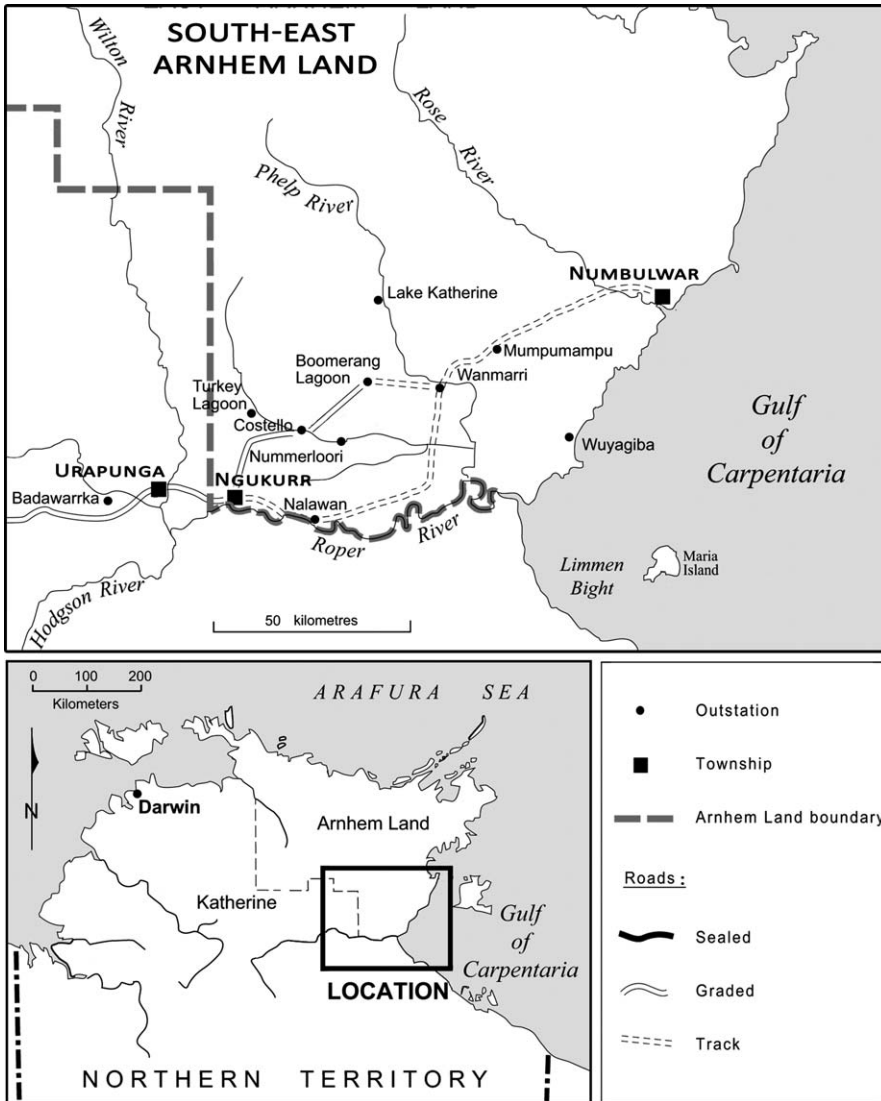
Figure 2. Area of action of the Indigenous rangers based in Ngukurr (map from E. Fache after Taylor et al. 2000:20).

collection on the amount of greenhouse gas emissions produced and prevented by Indigenous burning practices, including their own fire management activities. They also were not involved in the analysis of the data collected, and their understanding of the process was fragmentary. The rangers' role in this research mainly involved the on-site collection of data along well-defined transects on Indigenous-owned lands with their non-Indigenous collaborators. However, the rangers tended to lose interest in the task after a few hours, leaving their non-Indigenous collaborators to complete the measures.

Discussion and Conclusions

Burning for Conservation Purposes and Redistribution of Authority

In northern Australia, Indigenous rangers are increasingly responsible for the seasonal and controlled burning of the land. Public and private funds designated for conservation (and the economic development expected from conservation) in Indigenous communities are concentrated on the ranger programs. The rangers also benefit from the assistance of non-Indigenous fire ecologists and agents from several outside governmental and nongovernmental bodies. While these actors and bodies currently play a central role in the burning of the northern savanna, Indigenous leaders are no longer systematically included in the process. These outside actors also participate actively in the different dimensions of the Indigenous rangers' fire management activities, and therefore influence Indigenous rangers' knowledge, rationale, and practices regarding anthropogenic fires.

This state of affairs reveals a redistribution of authority in the domain of burning. On the one hand, burning is no longer a responsibility reflecting reciprocal relationships between specific persons, sites, and mythical figures. As professional land and sea managers, the Indigenous rangers undertake most of the fire management activities on behalf of, rather than in association with, their community and the traditional owners and managers of their working areas. On the other hand, the rangers' fire management activities involve both actors representing multiple levels and cross-cultural interactions. Several non-local bodies, including agencies of the Australian state and their non-Indigenous agents, have received a share of the responsibility for prescribed burning of the northern savanna. Their role is ambiguous and adds complexity to the already intricate decision-making process over contemporary uses of fire.

Such a redistribution of authority is supposed to contribute to the ecological, economic, and political recognition of Indigenous knowledge and skills relating to fire and the environment. The process itself aims to support a positive redefinition of the relationships between the Indigenous people living in remote areas, the Australian mainstream, the state that provides the rangers with most of their funding, and private enterprises. However, it does not challenge, but rather reproduces, what Cowlishaw (2010:57) calls the "systematic relationship between the nation and Indigenous people." The Indigenous people's control over their country is partly transferred to exogenous actors and is therefore weakened under the guise of better fire management meant to benefit the whole nation. In addition, the involvement of exogenous actors in the Indigenous rangers' fire management activities, as well as the rangers' role of mediation between these actors and local community members, produces social tensions at the community level. Some community members, including rangers, express their concern about the influence of outside bodies and non-Indigenous actors on local burning practices. Such an influence may indeed weaken local knowledge related to uses of fire and threaten its transmission to younger generations. It also results in the definition of fire regimes that community members do not necessarily recognize as positive or "traditional."

Fire Regimes and Traditions

''Tradition'' is primarily a contemporary interpretation of the past (Bouju 1995). The issues associated with contemporary burning practices in northern Australia and outlined in this paper reflect the coexistence of diverse (if not antagonistic) interpretations of the Indigenous Australians' past, especially of their former relationships with their natural environment. Exogenous understanding of what is, and what should be, part of local Indigenous ''traditions'' is not necessarily consistent with Indigenous views and aspirations. Furthermore, it is critical to note that Indigenous views and aspirations are not homogeneous at even the most local scale, and can be opposed and conflicting.

The multifaceted involvement of outside bodies in Indigenous fire management is based on the concept of ''fire-stick farming'' developed by Jones (1969). These bodies accept and convey that Indigenous burning practices create mosaics of burned and unburned patches and that a decrease in these practices, by failing to maintain these mosaics, threatens endemic fauna and flora. These bodies tend to consider that all Indigenous communities in the northern savanna implement relatively similar practices which are unanimously supported by their members. In particular, they focus considerable attention ''on the timing of fire, with strong emphasis on an early/late dry-season dichotomy,'' thus suggesting that Indigenous Australians ''traditionally favored early dry-season fires,'' even though such a generalization at a vast regional level may be misconstrued (Vigilante et al. 2009:147). Sithole and Hunter-Xenie (2007:20), among others, argue that traditional fire regimes were and are variable in the Top End of the Northern Territory (as they are across the whole northern savanna region, where the lifestyles of Indigenous Australians are not homogeneous). Furthermore, traditional owners and managers have varying attitudes towards the way fire is currently being used by Indigenous people who are not rangers, Indigenous rangers, and the non-Indigenous actors involved in the fire management activites of rangers: ''There is no agreement about which fire regimes are traditional'' (Sithole and Hunter-Xenie 2007:20) amongst the Indigenous Australians living in northern Australia. However, the outside bodies involved in Indigenous fire management suggest that the rangers' burning practices, because they are supposedly community-based and occur mostly in the early dry season, are unanimously recognized as ''traditional.''

As we have seen, local rangers themselves do not always agree on how fire should be managed. Several questions emerge from the findings of this case study regarding the kind of fire regime that should be implemented: should the pursued fire regime be like that practiced by the rangers' own parents or grandparents, even if these practices aimed to maintain grasslands for cattle stations, and even if they may not be labeled ''traditional'' insofar as they were used during colonial times? Should one recreate a precolonial fire regime that once prevailed in the region, even if it is no longer efficient with regard to the contemporary ecological and socioeconomic context? Should one promote a fire regime that allows job opportunities and funding sources dedicated to fire management?

Reestablishing or strengthening customary fire regimes is a very complex process that is rendered even more complex when various Indigenous and non-Indigenous actors and community-level and outside bodies are involved and are

competing for funds and resources such as jobs. Such a process necessitates, in the Australian context at least, continuous adjustments between local knowledge and Western ecology, and between intergenerational transmission of practices described as "traditional" and compliance with concepts that are not defined by, nor yet widely understood within, Indigenous communities such as "global warming," "climate change," or "carbon market." If such adjustments are not made, the process risks producing fire regimes that respond to Western expectations but do not conform to Indigenous people's own dynamic relationships with the environment.

Notes

[1] See references cited throughout the paper: Bird et al. 2005; Bliege Bird et al. 2008, 2013; Bowman 2003; Gammage 2011; Horton 1982; Jones 1969; Langton 1998; Lewis 1989; Russell-Smith et al. 1997; Vigilante et al. 2009; Yibarbuk 1998; Yibarbuk et al. 2001; etc. The relevant literature on Indigenous Australians' uses of fire, in particular on the fine-grained mosaics of burned and unburned areas which they produce, and on their ecological implications, is large and constantly growing. The authors of the present paper do not aim to make an exhaustive overview of this literature, but rather to analyze some of the ambivalences and social impacts of the fire regimes currently implemented by Indigenous rangers. We thus invite our readers to acknowledge and explore other key publications on the topic, and we especially call attention to the article coauthored by Petty, deKoninck, and Orlove in this same issue.

[2] See Caldararo (2002) for a discussion of the first evidence of forest fires in Australia and its association with human arrival in this part of the world. More generally, Caldararo argues that "the intense forest fires we experience today are an artifact of human intervention in forest ecology" (2002:141).

[3] North Australian Fire Information website. Available at: http://www.firenorth.org.au/nafi2/. Accessed on February 28, 2014.

[4] In Australia, "traditional owners" is a statutory category applied to "a local descent group of Aboriginals who: (a) have common spiritual affiliations to a site on the land, being affiliations that place the group under a primary spiritual responsibility for that site and for the land; and (b) are entitled by Aboriginal tradition to forage as of right over that land" (Holcombe 2004:65).

[5] Available at: http://www.csiro.au/. Accessed on February 28, 2014.

[6] Available at: http://www.lrm.nt.gov.au/. Accessed on February 28, 2014.

[7] Cf. *Looking after the Yugal Mangi Homelands: Report to the Traditional Owners on the 'Sustainable Management of Yugal Mangi Homelands' Project*, Indigenous Land Management Facilitator–on behalf of the Yugal Mangi Council, 2000.

Acknowledgments

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