2019 report

FIGHTING PEATLAND FIRES IN CENTRAL KALIMANTAN

Emergency Response, Prevention & Recovery

Borneo Nature Foundation

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Executive Summary

Huge peatland fires once again ravaged the island of Borneo in 2019. In scenes that are becoming all too familiar, a thick, poisonous smoke-haze blanketed Central Kalimantan for several months, as fires took hold in drained and degraded peatlands after a long period of drought. For months these fires threatened protected forests, and the orangutans and other biodiversity found within. The Borneo Nature Foundation put all our effort into fighting these fires and supporting communities affected, working with communities and government partners in the critical Sebangau region, and we were supported by donors from around the world who helped us keep fire-fighting teams in the field for months. These community teams succeeded in preventing fires entering the forest along the Sebangau River and are true heroes of conservation.

Having witnessed first-hand the destruction caused by the last major fires in 2015, the Borneo Nature Foundation responded by tackling the causes of fires and by making sure we would be prepared for the next fire crisis. We embarked upon a major canal-blocking programme to re-wet the peat and established community seedling nurseries as the first stage in our new campaign to reforest and restore burnt land. We created two new independent fire-fighting teams, known locally as *Masyarakat Peduli Api (MPA's :* Communities Concerned about Fire), providing equipment, vehicles, training and emergency funding; and supported two existing teams in the same way, integrating the teams together and with local agencies to ensure a coordinated and effective approach.

When the time came to mobilise these teams, everyone was ready and attacked the fire hotspots early and intensively. Over 100 people joined the efforts, including trained fire-fighters supported by our research staff, patrolling over 50 km of waterway and fighting 24 major fires. The whole effort took four months to complete, before rains came and controlled the fires. Meanwhile, we distributed 1,615 masks to local schools, children's groups and community members. Overcoming the peatland fire crisis in Kalimantan will not be easy and will take many years of hard work together with all stakeholders, but the Borneo Nature Foundation is committed to finding a solution that will help protect the forest, people and wildlife in Central Kalimantan from fire and smoke.

Background: The 2019 Fire Crisis

Extensive, severe fires ravaged the forests and peatlands of Indonesian Borneo between July - October 2019, posing a grave threat to the Sebangau Forest and its wildlife, including its globally important population of orangutans.

This crisis demanded an emergency response, and BNF, working with local communities and government partners, put all our efforts into fire-fighting, advocacy and education outreach throughout the fire season.

Across Indonesia, the 2019 fires exacted a devastating toll: The Indonesian Ministry of Environment and Forestry report that fires burned 8,578 km² of land and forest (an area the size of Puerto Rico), including 2,273 km² of peatland; the toxic smoke pollution placed 10 million children at health risk; and in the city of Palangka Raya alone, 11,758 people were treated for upper respiratory tract infections in 5 months.

In Central Kalimantan province, MODIS satellites detected 16,465 hotspots, of which 70% were in peatland. A total of 298 hotspots were recorded within the boundary of the Sebangau National Park. This vast peatland is home to the largest protected population of the Critically Endangered Bornean orangutan (ca. 6,500 individuals), and over 1,100 plant and animal species, including 46 that are globally threatened and 59 that are protected by Indonesian law. Although an accurate estimate of the area burned across the Sebangau Landscape in 2019 is not yet available, it is clear that the potential conservation impacts of fire in Sebangau are immense and that fire prevention in this area must be a top conservation priority.

Why do these fires occur?

Tropical peatlands form in regions of high rainfall and are permanently waterlogged. In their natural condition they are fire resistant, but a combination of human activities and climate change have changed this. Loggers dug canals in the peat to float out timber, and these remain long after the logging has finished, draining the peat. Elsewhere major canals have been dug in attempt to control water levels to support agriculture and plantations. Meanwhile, the annual dry season is becoming longer and more severe, a combination of climate change and frequent El Niño climate events. The result of this is low water-levels and dried-out peat, which is highly flammable. Fires started on nearby land spreads into peatland, burning both above and below the ground, at very high temperatures, making peatland fires notoriously difficult to extinguish.

To reverse this situation requires much better management of peatlands, including restoration and changes in fire use behaviour by people. The underlying reasons behind this are incredibly complex, however, and vary between locations and over time, meaning there is no silver-bullet solution. BNF is therefore developing a holistic, multi-pronged approach to reduce fire prevalence in Sebangau and the devastating impacts these have on its wildlife populations.

BNF's Integrated Fire Management Strategy

Through our Integrated Fire Management Strategy (Figure 1), we aim to address the problems and issues caused by man-made fires within the context of the natural environment and socio-economic systems. This involves implementing a suite of interventions focusing on reducing both short-term fire impacts and long-term fire risk, both of which are essential for protecting the region's threatened apes.

This follows the annual seasonal cycles, with four main work areas included within our integrated approach: fire prevention, preparedness, response and recovery.

Figure 1: Integrated Fire Management Strategy adopted by BNF

- Peat rewetting through canal-blocking
- Conservation and fire research
- Livelihood research and development
- Education and awareness

- Fire-fighting team development and training
- Local fire-fighting network coordination (government, land managers)
- Sourcing fire-fighting equipment and securing operational funds
- Bore construction
- Use of technology (SMART, drones)

- Intense patrols
- Fire fighting
- Fire research
- Minimising health impact (face mask distribution to affected communities)
- Intensive education and outreach

- Assessing impacts
- Community seedling nurseries
- Reforestation to replant burned areas
- Monitoring and evaluation
- Peat re-wetting

Fire Prevention

Our goal is to prevent fire from occurring, via two main activities: (i) reducing dry season fires through community socialisation and outreach efforts (almost all fires are started by people); and (ii) reduce the susceptibility of the peat and vegetation in vulnerable areas to fire.

Changing Fire-starting Behaviour

During 2019, the BNF Conservation Team worked together with the community fire-fighting teams and site management authorities on a series of fire awareness and socialisation activities, with the aim to increase awareness of the impacts of fire and potential alternatives to land-burning practices. We led 10 specific community workshops which aimed to empower fire-fighting teams, land holders/managers and community members to better manage and understand fire risks and impacts. These sessions were attended by 300 people, including fire-fighting team members, NGOs and government officials from the Disaster Management Agency, Sebangau National Park and other departments. This is the start of a long-term effort to change local behaviour and attitudes to clearing land by burning.

Reducing Fire Susceptibility in Forest Areas

Reducing fire susceptibility in (previously) disturbed peat-swamp forest areas involves restoring natural flooded swamp conditions, to keep the peat wet and fire resistant. Our Conservation Team together with the CIMTROP Patrol Team is building dams on the ex-illegal logging canals that criss-cross the forest. Our monitoring research has demonstrated that this work has had a positive impact on peat hydrology, with a substantial slowing of water discharge in dammed canals and consequent increase in ground water tables and slowing the rate of dry season drawdown. To date we have constructed 685 dams on 15 canals, blocking 32 kilometres of canal and this work continues with another 25 canals needing to be blocked.

Finally, our research is also investigating the underlying socio-ecological context within which fires occur, including assessing the various ecological, socio-economic and political challenges facing peat-swamp forest conservation (published here), plus developing studies to understand local fishing and farming practices and identify opportunities to reduce their contribution to the fire crisis.

Fire Preparedness

Strong preparation of fire-fighting teams is essential for mounting an effective fire-fighting response during critical periods. After the 2015 fires we stepped up preparations for each subsequent dry season by implementing fire-fighting team training, establishment of a local coordination system/network for fire-fighting activities, sourcing fire-fighting equipment and developing effective team management structures. The most important thing we did was form two new independent community fire-fighting teams, known locally as *Masyarakat Peduli Api (MPA)* or Communities Concerned about Fire. Each of these teams received set-up costs, training and equipment from BNF, emergency funding during fire seasons, and working with us for coordination during critical periods (see Tables 1 and 2).

During 2019, BNF supported four fire-fighting and patrol teams operating in the northern Sebangau area. These teams are self-managed, but worked in 2019 under a coordinated system via BNF. These teams have participated in a series of fire-fighting training and capacity building sessions during the preparedness phase.

Most of these team members received direct benefits from the eight training and capacity building events/workshops held in 2019, led by BNF and other local stakeholders, including UPT CIMTROP at the University of Palangka Raya, the Disaster Information Management Centre and Central Kalimantan Disaster Management Agency. A total of 247 people attended these training and capacity building sessions, with 108 fire-fighting team members involved. Some of the key training and capacity building topics included:

- √ Forest navigation, GPS training and fire-fighting activities coordination (BNF)
- √ Fire-fighting collaborative strategies and internal coordination (Focus Discussion Groups)

- √ Integrated Fire-fighting Strategies - International Workshop (ACIAR - Australian Centre for International Agricultural Research)
- √ Developing automated detection of peat fires with thermal infrared sensors (BNF, UPT CIMTROP and Liverpool John Moores University)
- √ SMART training: Patrol techniques and reporting using SMART Software (BNF, UPT CIMTROP, IAR and YABI)
- √ Fire fighting - field techniques training (Disaster Information Management Centre)

The establishment of a coordinated fire-fighting network including fire-fighting teams, government agencies and other relevant stakeholders is a vital part of the preparedness phase. This includes establishment of agreed operational protocols, communication channels and coordination systems. Between July and September, just before the peak of the dry season, BNF led seven coordination meetings, involving 100 people, 60 of them members of fire-fighting teams.

The preparedness phase also included the sourcing of fire-fighting equipment and providing operational funds to fire teams to ensure they are fully equipped, including provision of water pumps, hoses, nozzles, plus health and safety equipment.

From July 2019, the fire-fighting teams intensified their patrolling activities to minimise the risks of fire hotspots appearing in fire-prone areas. Key efforts included:

- Established a **daily combined patrol routine of high-risk areas**, along a 51 km route following the northern side of Sebangau River and Forest canals.
- Installed **25 deep bore wells** along the northern boundary of the Sebangau Forest, to ensure immediate access to underground water supplies in the event of a fire emergency.
- Direct **re-wetting of fire-prone areas** in order to reduce the risk of fires taking hold.
- **Drone flights** to support the patrols and search for smoke columns to pinpoint fire locations.

Table 1. Fire-fighting teams supported by BNF during the 2019 fire season

FIRE-FIGHTING TEAMS	MANAGED BY	ACTIVE TEAM MEMBERS
Community Fire-fighting MPA team - Kereng village	Community members	15
Community Fire-fighting MPA team - Sabaru village	Community members	12
CIMTROP Patrol & Fire-fighting Team	UPT CIMTROP - UPR	7
Sebangau Fire-fighting Team	Sebangau National Park	46

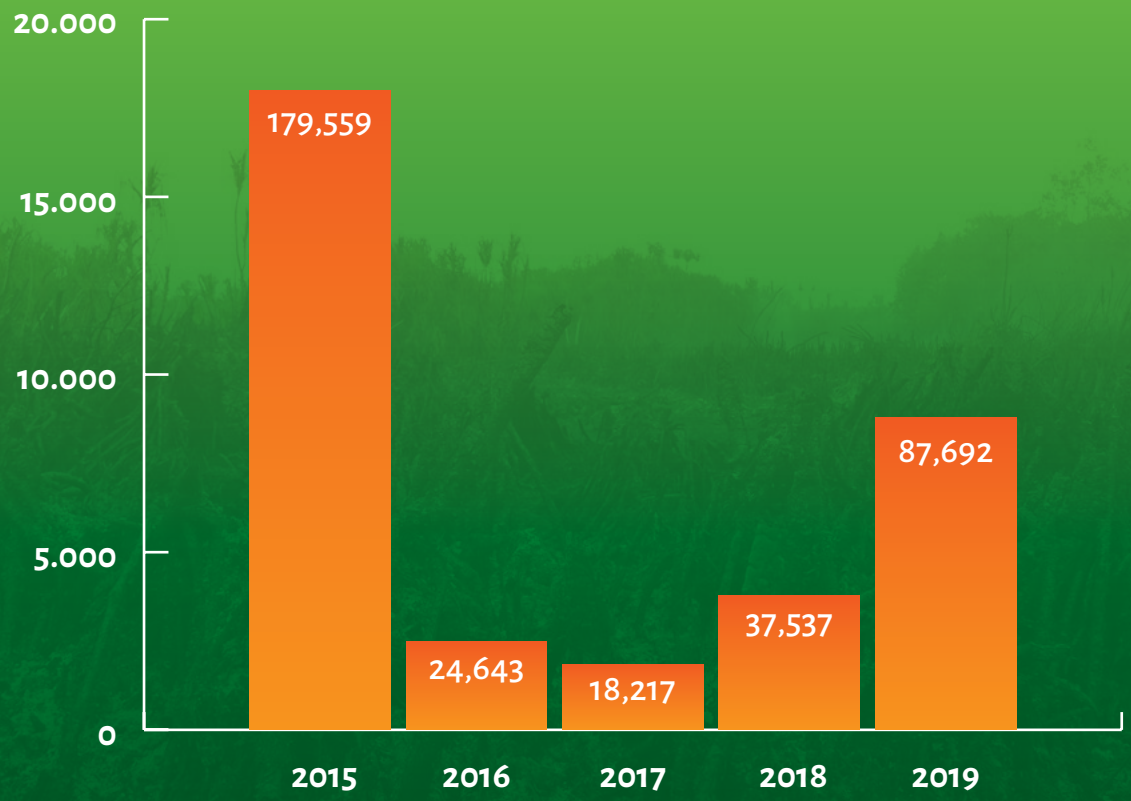
Table 2. Fire-fighting equipment donated by BNF in 2019

EQUIPMENT	DETAILS	No. ITEMS
Water pump	Motoyama	9
	Ninja 6,5 HP	4
	Lounchin 3"	3
	Radin 1,5"	1
Generator	Yamamax	1
Nozzle	1,5"	18
Fire hose	Kuningan 1,5 "x20 m Ryota	25
	Kuningan 1,5 "x30 m Ryota	5
	Gosave 1,5 "x20 m	35
	Moswel 1,5 "x20 m	2
Hose Connector Y	1,5x1,5x1,5	5
Safety/field work boots		37
Head-torch		40
Walkie talkie + antenna		10
Equipment bag		11
DJI Mavic 2-pro Drone		1

Fire Fighting Response

From July to November 2019 Indonesia experienced a severe dry season with 16,465 hotspots detected by MODIS satellites in Central Kalimantan. Although the dry season and ENSO (El Niño Southern Oscillation) event was not as long and severe as in 2015, this was the worst fire season since then for Indonesia (Figure 2) and particularly in Kalimantan. A total of 298 hotspots were detected within the boundary of the Sebangau National Park, with 85% of those during August and September 2019, when the fire-fighting teams worked tirelessly to prevent fires spreading from grasslands into the rainforest.

Figure 2. Historical (2015-2019) number of hotspots identified by MODIS satellite in Indonesia (Data source: Global Forest Watch)



The fire-fighting response activities in the northern Sebangau area were conducted by four fire-fighting teams and more than 126 people, including fire-fighters, community members and BNF field assistants were involved. Fire-fighting took place daily, involving patrolling, re-wetting, installing bores and fighting. A total of 395 patrolling and fire-fighting activities were recorded between July and October 2019 by the fire-fighting teams, with a total of 182 team days spent fighting fires.

182

FIRE-FIGHTING TEAM DAYS

4

FIRE-FIGHTING TEAMS INVOLVED

126

FIRE-FIGHTERS ON-THE-GROUND

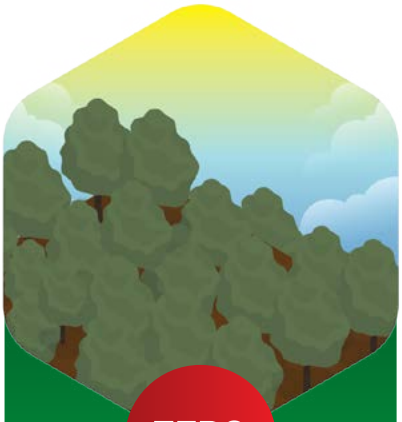
24

MAJOR FIRES SUPRESSED

17 WATER-PUMPS

67 FIRE-HOSE

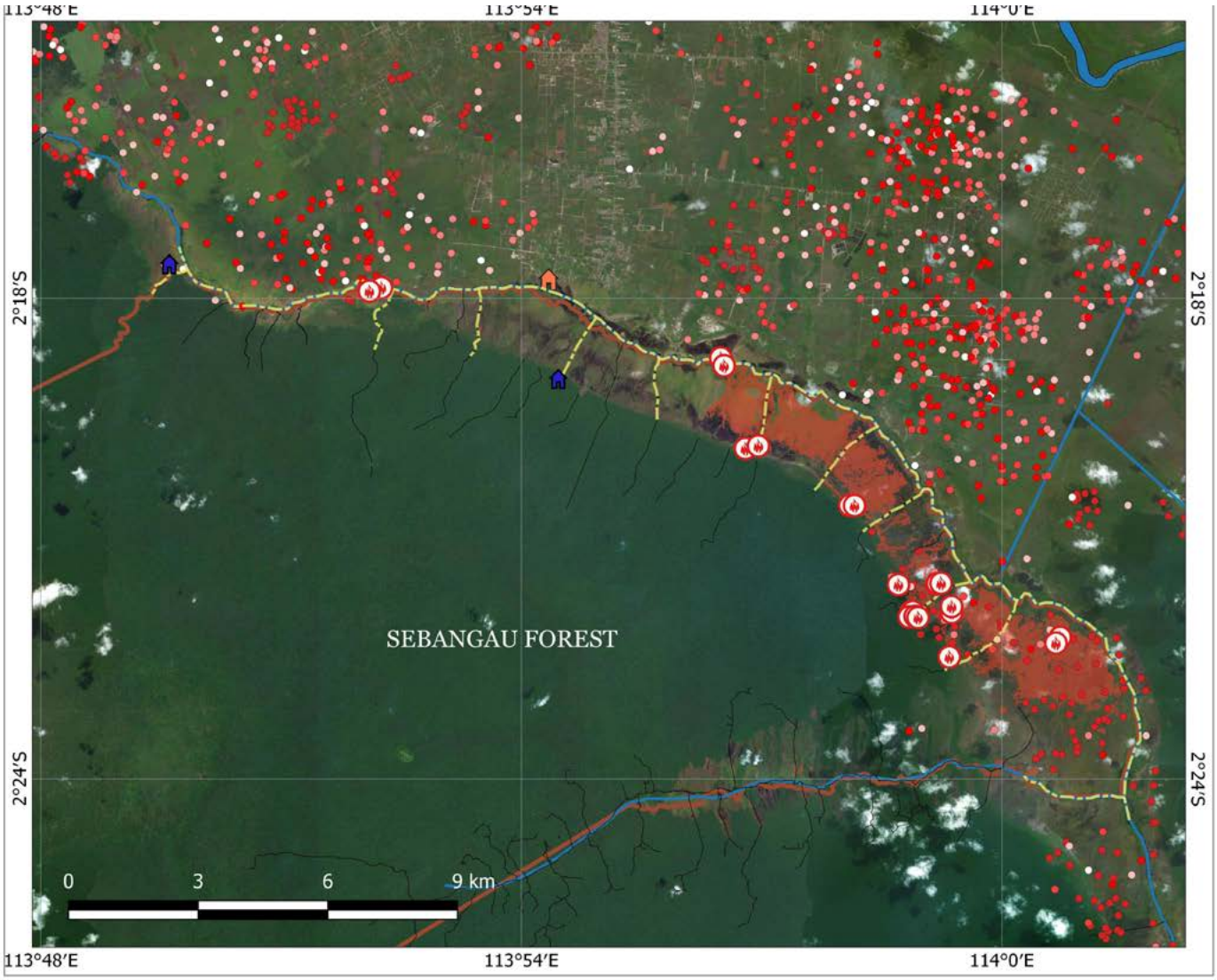
1,615 MASKS DISTRIBUTED



ZERO

FOREST LOSS IN THE RESEARCH AREA

Figure 3. 2019 hotspots, burned areas, patrol routes and major fire interventions in the northern Sebangau Forest



LEGEND

- Sebangau forest cover
- 2019 burned areas
- Fire fighting intervention
- Primary patrolling routes
- Research site - boundary
- Fire fighting office
- Camp/Research station
- City
- River
- Large canal

2019 Hotspots - MODIS

- 20 - 40 % confidence
- 40 - 60 % confidence
- 60 - 80 % confidence
- 80 - 100 % confidence

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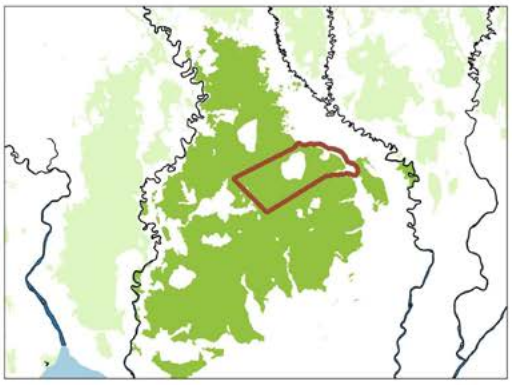
SITUATION MAP KALIMANTAN
Scale 1 : 970,000



Habitat type	Burned area (ha)	% of Research area
River sedge	1,197	2.2
Forested areas	0	0

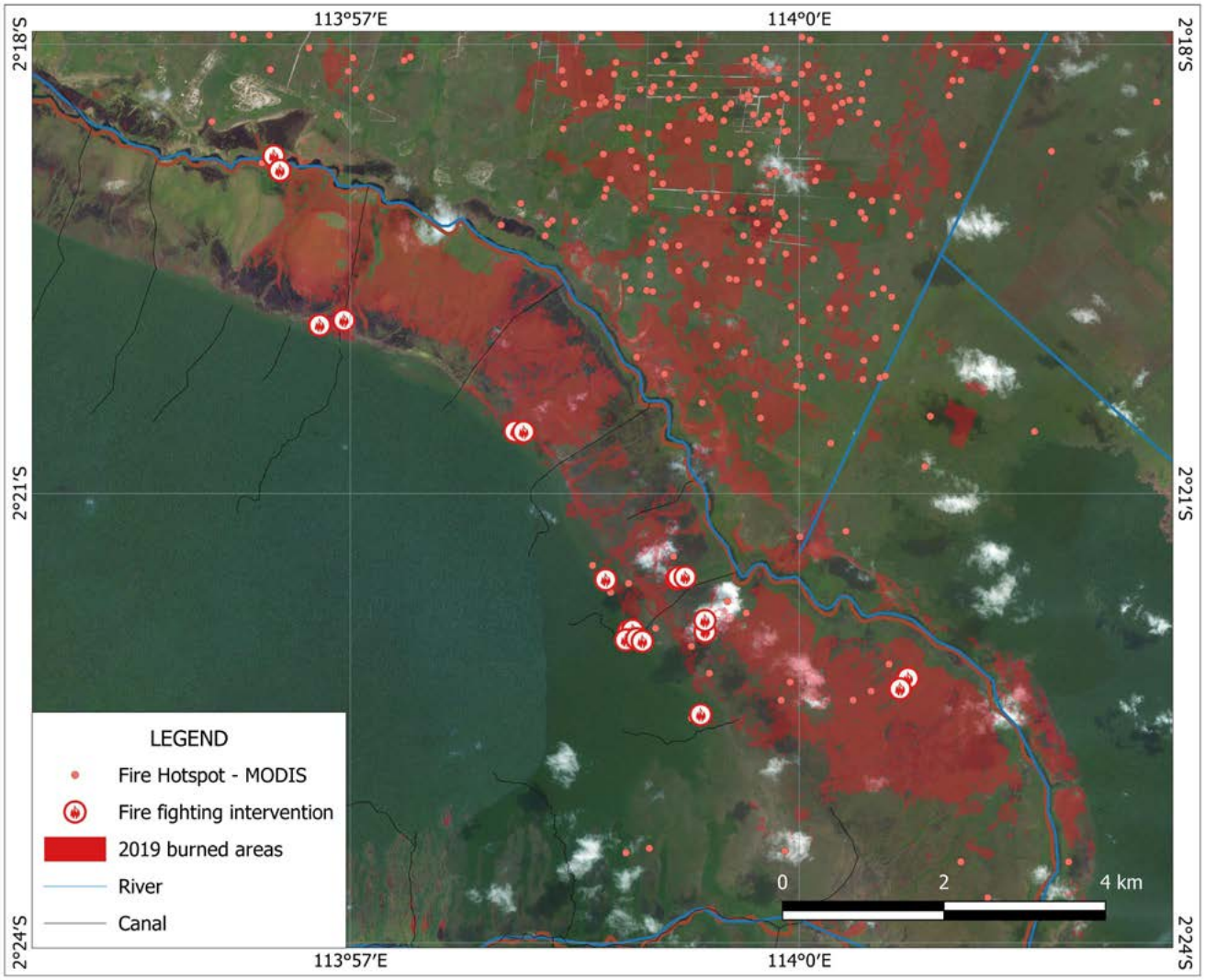
Data source:
Satellite data: Sentinel 2A (23rd November 2019)
Fire fighting teams waypoints
BNF Historical data
Data analysis:
Burned area: difference Normalise Burn Ratio (dNBR)

Table 3. Total number of fire response activities implemented by the 3 main fire-fighting teams (CIMTROP Patrol and Fire-fighting team, Kereng Community fire-fighting team and Sabaru Community fire-fighting team) supported by BNF

ACTIVITY	NUMBER OF ACTIVITIES				
	June	July	August	September	October
Patrolling	20	28	37	59	48
Fire-fighting	-	35	18	101	28
Bore (deep well) drilling / re-wetting	-	2	5	8	6
TOTAL	20	65	60	168	82

A total of 395 fire-related interventions were implemented during 2019, with 24 major fires identified and tackled by the fire-fighting teams in the northern Sebangau Forest. All the major fires occurred in the forest sedge and thanks to the effective and quick response all were extinguished before reaching the forested areas,. We are delighted to report that no forest was lost in our target area (Figures 3 and 4).

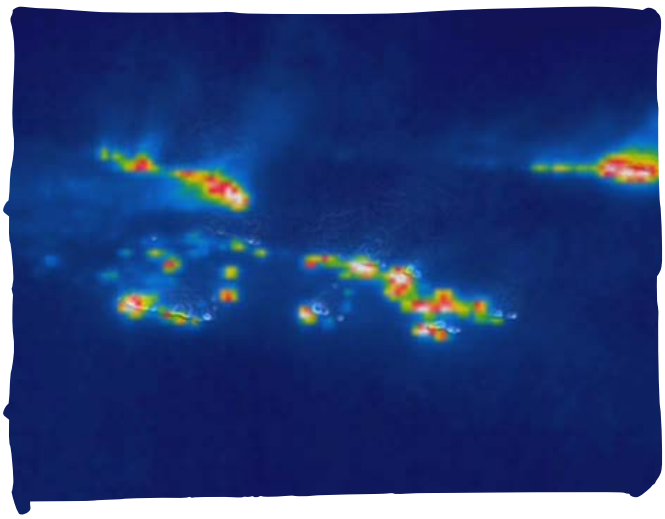
Figure 4. Location of large fires and interventions on the edge of Sebangau Forest, none of the fires reached the forested areas thanks to the fire-blocking efforts



Between August and October, the haze situation worsened due the huge amount of active hotspots burning and the air quality reached hazardous levels, increasing the risk of respiratory health problems and even premature death. BNF distributed 1,615 N95 face masks to vulnerable groups (children, fire-fighters and other people living in villages near the fires), with instructions explaining appropriate use, to protect them from exposure to toxic pollution from the burning peat. Many of these masks were directly donated from supporters within Indonesia.

This emergency response was aided by using innovative drone technology, being developed by BNF and partners, specifically to enhance the effectiveness of fire-fighting efforts and safety of fire teams. Together with Liverpool John Moores University and UPT CIMTROP at the University of Palangka Raya, we are developing the use of thermal imaging cameras on drones to quickly and accurately detect fire hotspots, without needing to send ground teams to explore potentially dangerous fire situations on foot (Figure 5). Although still in its infancy, this system proved extremely useful to the fire-fighting teams, helping them to identify fire locations and track their movements, and therefore to plan the most effective fire attack strategy.

Figure 5. Active fire in Sebangau, RGB (left) and thermal image (right) comparison captured by one of our drones. It shows fire hotspots of increasing temperature in green-yellow-red-white, and "cool" areas in blue.



Fire Recovery Strategy - moving forward in 2020 and beyond

The 2019 fire season has now ended with the arrival of the wet season rains, but that does not mean that our fire prevention work is taking a break. In addition to preparing for the next fire season and coordinating with partners to improve responses and expand our effective area, we are also implementing a variety of recovery activities to rehabilitate fire damaged areas and restore burned forest. This is important both for restoring orangutan habitat in the long-term and also for reducing the immediate risk of fire in burned areas, which may spread into neighbouring forest (fire risk is substantially lower in forest than non-forest areas).

Firstly, it is important to assess the immediate post-fire situation to ensure efficient targeting of future efforts. We are assessing the location and size of burned areas, and the level of damage these have suffered through satellite mapping, drone imagery and ground surveys. This will enable us to better plan recovery efforts.

We are also conducting post-fire evaluations with the fire-fighting teams, including assessing activities conducted, coordination efforts, SOPs, equipment stock, and identifying where improvements can be made and further preparations are needed for the 2020 fire season.

At the time of writing this report, the BNF Conservation Team is implementing new habitat restoration activities by blocking six more logging canals in the Bakong area with 120 new dams built in order to re-wet the area and embarking upon our ambitious restoration programme with the first 24,000 trees planted in previously burned areas during December 2019. These trees were grown in seven community nurseries run by families, in the nearby villages, to provide seedlings for burned areas in Sebangau.

The Community Seedling Nursery initiative aims to :

i. increase the seedling stock for reforestation by growing on underutilised community land;

ii. engage and increase community awareness by promoting self-responsibility for reforestation and peat restoration programmes;

iii. promote small-scale green economy to provide financial benefits;

iv. maximise efforts to reduce carbon emissions from peatland degradation by implementing community development and poverty mitigation initiatives.

BNF 2020 HABITAT PROTECTION AND RESTORATION GOALS

2

NEW FIRE-FIGHTING TEAMS ESTABLISHED

6 NEW CANALS BLOCKED

120 DAMS BUILT

166

COMMUNITY MEMBERS BENEFICIARIES OF GREEN JOBS

50,000

TREES PLANTED iN BURNT FOREST AREAS

In 2020, we aim to implement two new fire-fighting teams in two more villages and enlarge the scale of the community seedling nursery programme, thus developing income streams for more community members, encouraging participation and leadership by women.

These reforestation activities are the start of our one million trees project, leading the recovery of burnt forest areas post-fire with a major tree-replanting initiative.

Fire Fighting Outreach

Although BNF works year-round to address the peatland fire crisis, public attention can wane, and so it is important to take advantage of the media and public attention generated through major fire events to raise awareness about the impacts of fire, solutions to the fire problem and BNF's work in relation to this. We therefore conducted intensive education and outreach activities during this fire season, including highlights listed below.

News & Blogs on the BNF website

21 August 2019	Peat fires affecting local communities and closing in on Sebangau Forest [news]
22 August 2019	I See Fire [blog]
29 August 2019	Gibbon Youth Campaign: Introducing gibbons and the threat of forest fires [blog]
6 September 2019	Borneo is burning again and again, but why? [blog]
12 September 2019	The toxic smoke is smothering towns and villages once again [blog]
13 September 2019	Peat fires spread and haze thickens by the day in Central Kalimantan [news]
30 September 2019	Thermal Drone: New technology to detect fires [news]
4 October 2019	The fires still burn, I can feel the heat even in my dreams [blog]
11 October 2019	Talking about the smoke and forest fires in Sebangau Ranger-style [blog]
15 October 2019	Indonesian fires and toxic smoke devastate wildlife as well as people [news]
19 November 2019	Emerging through the haze: Moving forward to tackle Indonesia's fire crisis [news]

Borneo is burning again!
Released: 23 August 2019
Number of views (at time of reporting):
YouTube: 3,465 views
Instagram: 144,009 views
Facebook: 7,290 views
Twitter: views 37,100 views

Borneo is burning - when will it end?
Released: 7 October 2019
Number of views (at time of reporting):
YouTube: 652 views
Instagram: 878 views
Facebook: 2,209 views
Twitter: 1,700 views

Media Coverage

Articles	16 September 2019, drone thermal imaging publicity: Fire-fighting prevention, UPT CIMTROP and BNF working on thermal cameras solution BNF and UPT CIMTROP working on thermal drone solutions for hotspots monitoring Spirit Kalteng newspaper, "*Kerja Sama Proyek Thermal Drone*" Kalteng Pos newspaper, "*Perkenalan Kamera Drone Pantau Titik Panas*"

Television

4 October 2019	Fire-fighting and law reinforcement	kompas.tv
26-27 October 2019	Gibbon Youth Camp publicity: Video 1 Video 2 Video 3	 antaranews.com metro.tempo.co teras.id
6 November 2019	Fire-fighting and drone technology Video 1 Video 2 Video 3	Metro TV Part I Part II Part III
15 November 2019	Insight – Fighting Fires	channelnewsasia.com
3 December 2019	Borneo is Burning	edition.cnn.com

Thank you

This fire season has been an incredibly emotional period for BNF: great sadness at seeing fires emerge again, threatening and burning forests in Kalimantan; utter determination to prevent fire from destroying forest in our Sebangau work area; physical and mental exhaustion from maintaining maximum-level emergency response efforts for over three months, while ourselves experiencing the health impacts of the haze; together with immense pride in observing the heroic efforts of the fire-fighters; followed by relief when the rains arrived and we knew they had prevented damaging forest loss in Sebangau.

All of this work and all of these results would not have been possible without the extreme generosity of our local and international partners, supporters and donors at this critical time.

We would like to express our immense gratitude to our main local partners that makes all this conservation work possible: UPT CIMTROP – University of Palangkaraya, Sebangau National Park, the Central Kalimantan Disaster Management Agency, Kereng Bangkerai village community fire-fighting team, Sabaru village community fire-fighting team, UPT CIMTROP Patrol and fire-fighting team, Palangka Raya City and the Central Kalimantan Forestry and Environmental agencies.

We cannot understate the importance of being able to tell fire-fighters, who work for long periods under intense conditions, that the outside world knows and cares about their efforts, and through that we can commit to provide them with the resources they need.

As we now enter the wet season and transition to focusing on future fire prevention and preparedness, the ongoing support of our incredible friend's network will remain just as important.

Thank you.

BNF PARTNERS AND SUPPORTERS

Borneo Nature Foundation

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