

Monitoring of clearings in Odzala Park (Congo Republic)

Sentinel-2 MSI acquired on **24 September 2015** at 09:07:26 UTC

Sentinel-2 MSI acquired on **02 January 2016** at 09:32:47 UTC

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Sentinel-1 CSAR IW acquired on **25 December 2017** from 04:41:37 to 04:42:02 UTC

Sentinel-2 MSI acquired on **27 December 2017** at 09:13:59 UTC

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[2D Layerstack](#)

Fig. 1 - S1 (13.12.2017) - vv,vh,vv colour composite - The relief of Odzala Kakoua National Park brought to light by radar imagery.

[2D view](#)

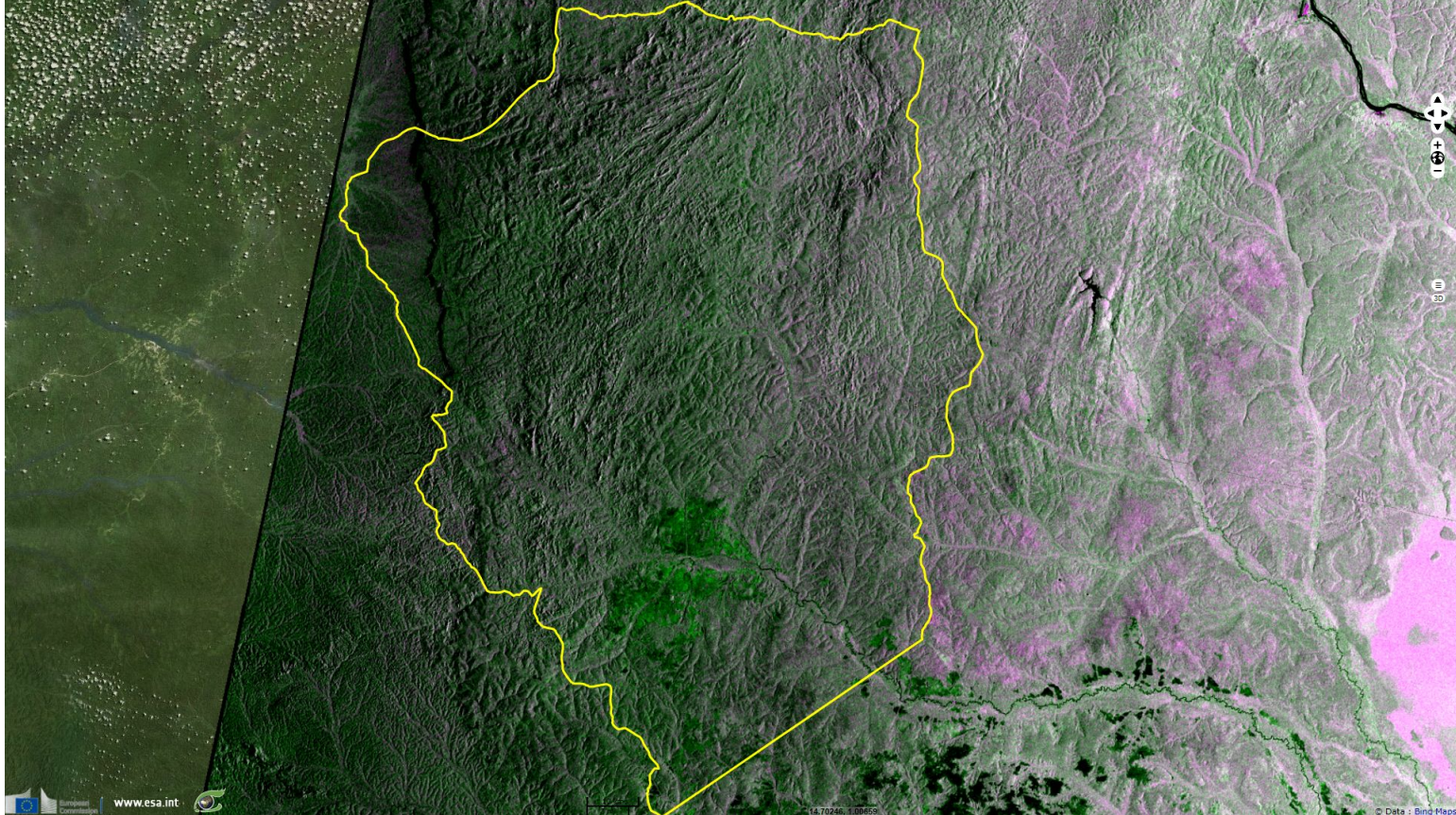
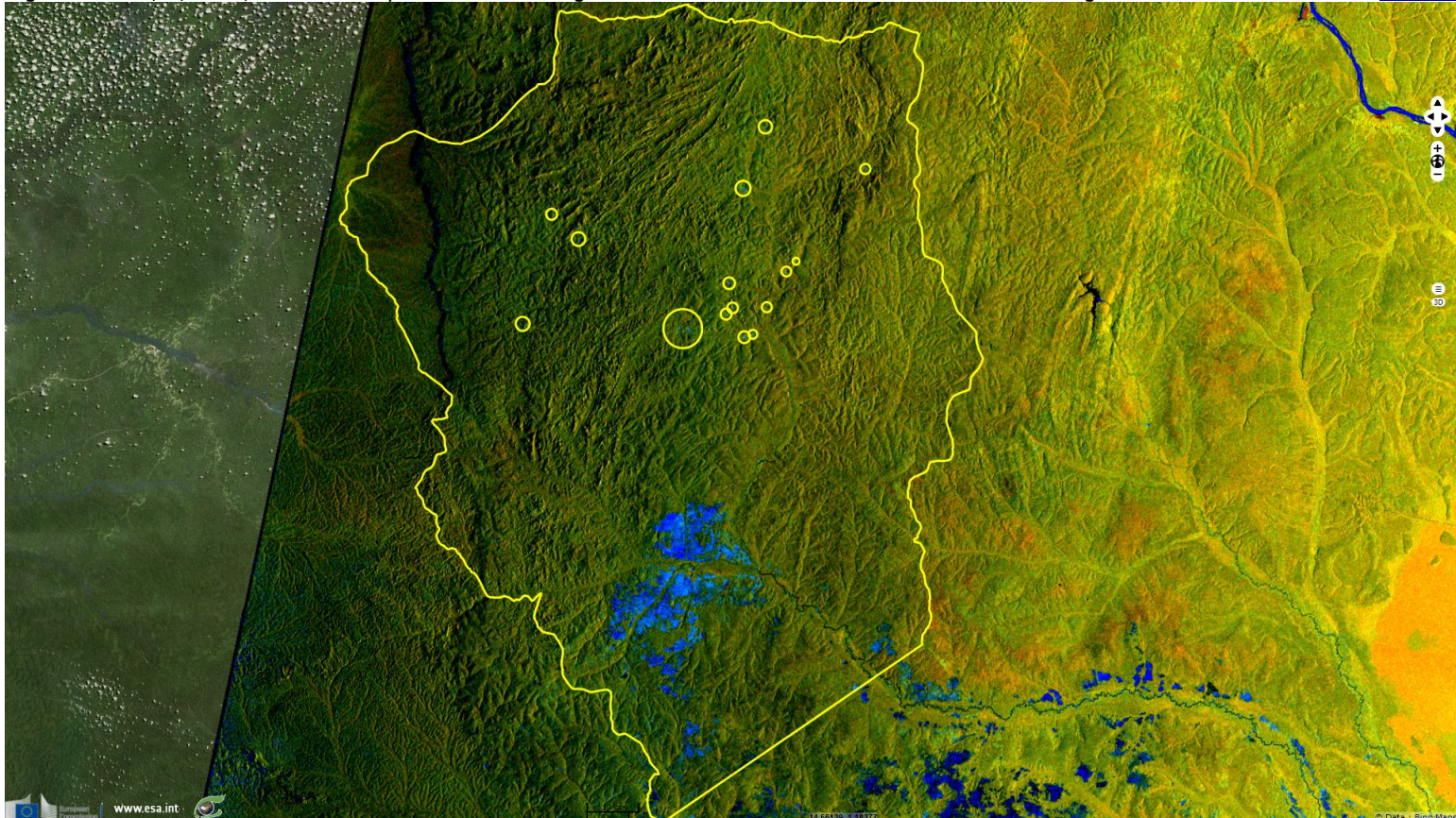


Fig. 2 - S1 - vv,vh,ndi[vh,vv] colour composite - The clearings (circled) of Odzala Kakoua National Park show in light blue.

[2D view](#)

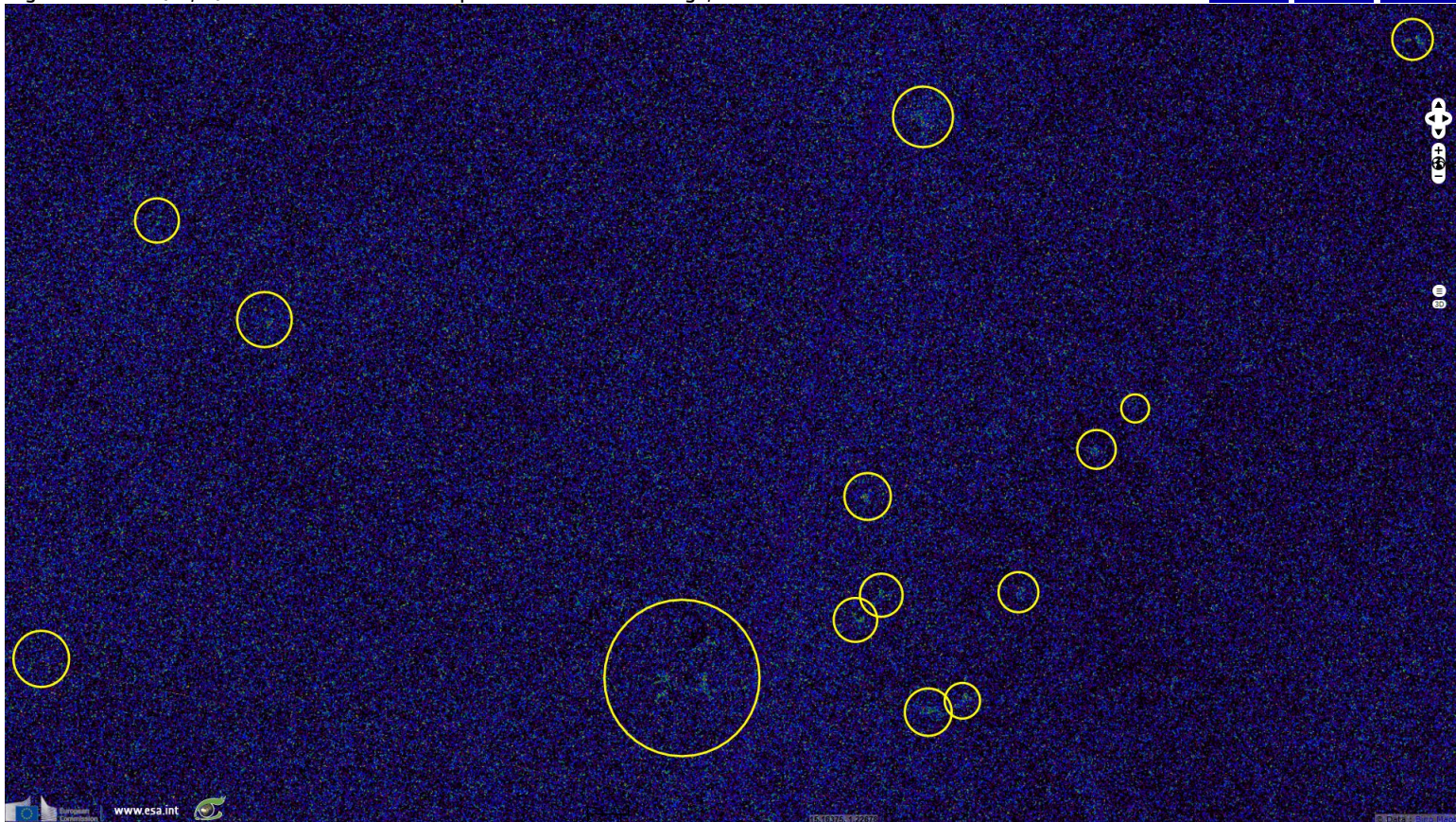


The website of [Odzala Kakoua National Park](#) reminds the importance of rainforests: "Rainforests are a crucial feature of life on Earth. They function as the "lungs of the Earth", as by absorbing vast quantities of carbon dioxide they help to regulate global climate by acting as a major carbon sink. Rainforests have been described as treasure chests of biodiversity. The Congo Basin spreads across six countries. It contains 25% of the world's surviving tropical forests and 10 000 plant species of which some 3 000 are endemic. It also hosts 1 000 bird species (more than all of southern Africa), 700 fish species and 125 000+ western lowland gorillas."

"In modern times rainforests have come under immense pressure from logging, mining, and the impacts of global climate change, but historically they have also sheltered many diverse ethnic groups of forest dwelling people in relative harmony. Many of our modern medicines, including important cancer and AIDS drugs, are based on synthesized rainforest plant compounds."

Fig. 3 - S1 - ndi(vh,vv) with rainbow colour map - Zoom on the clearings, visible in more vivid colours.

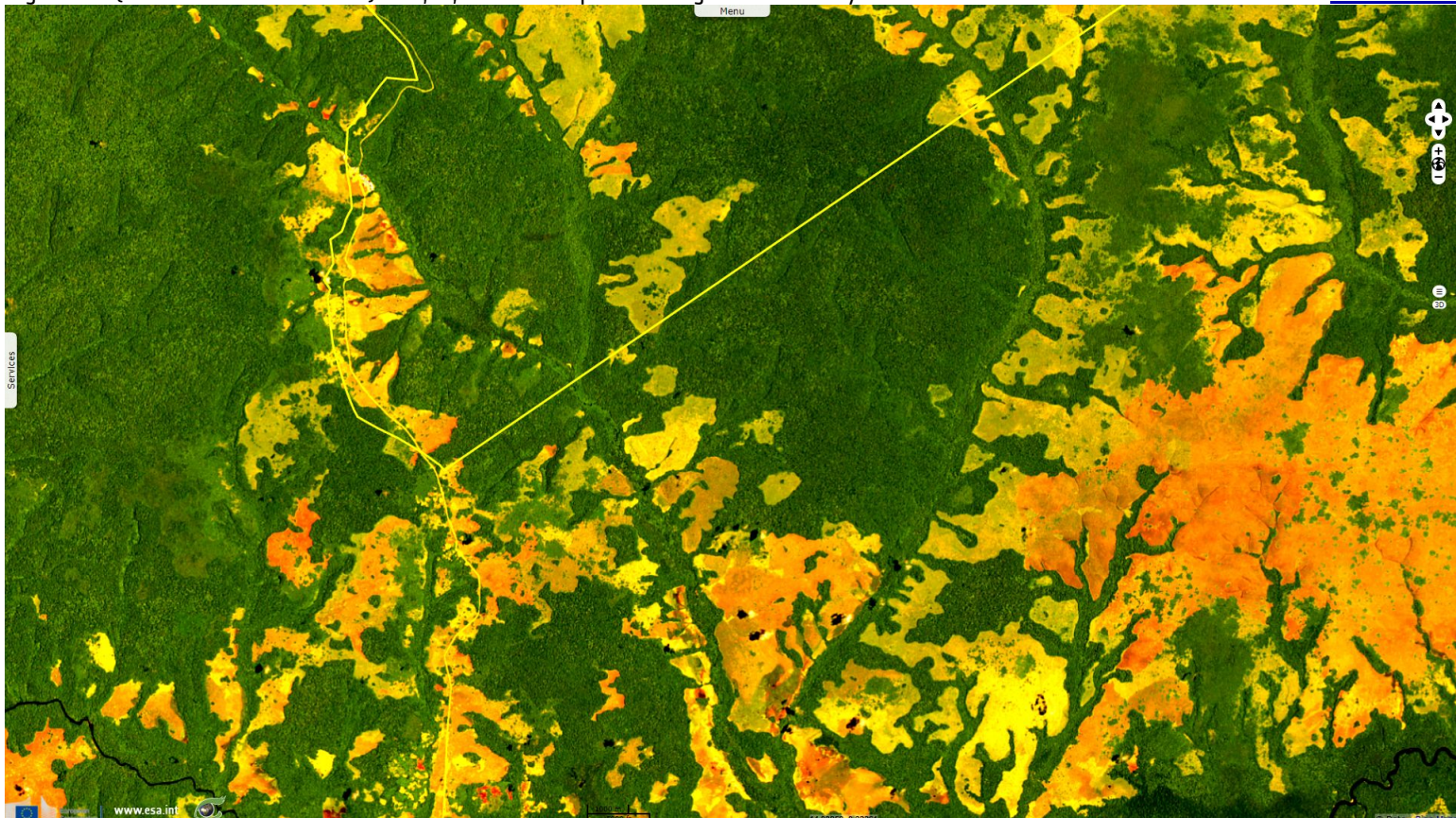
[2D view](#) [2D view](#) [2D view](#)



One can notice the radar signal is more depolarised on the clearings than it is over the close forest.

Fig. 4 - S2 (24.09.2015 & 02.01.2016) - 12,11,2 colour composite - Progressive recovery of burnt savanna areas

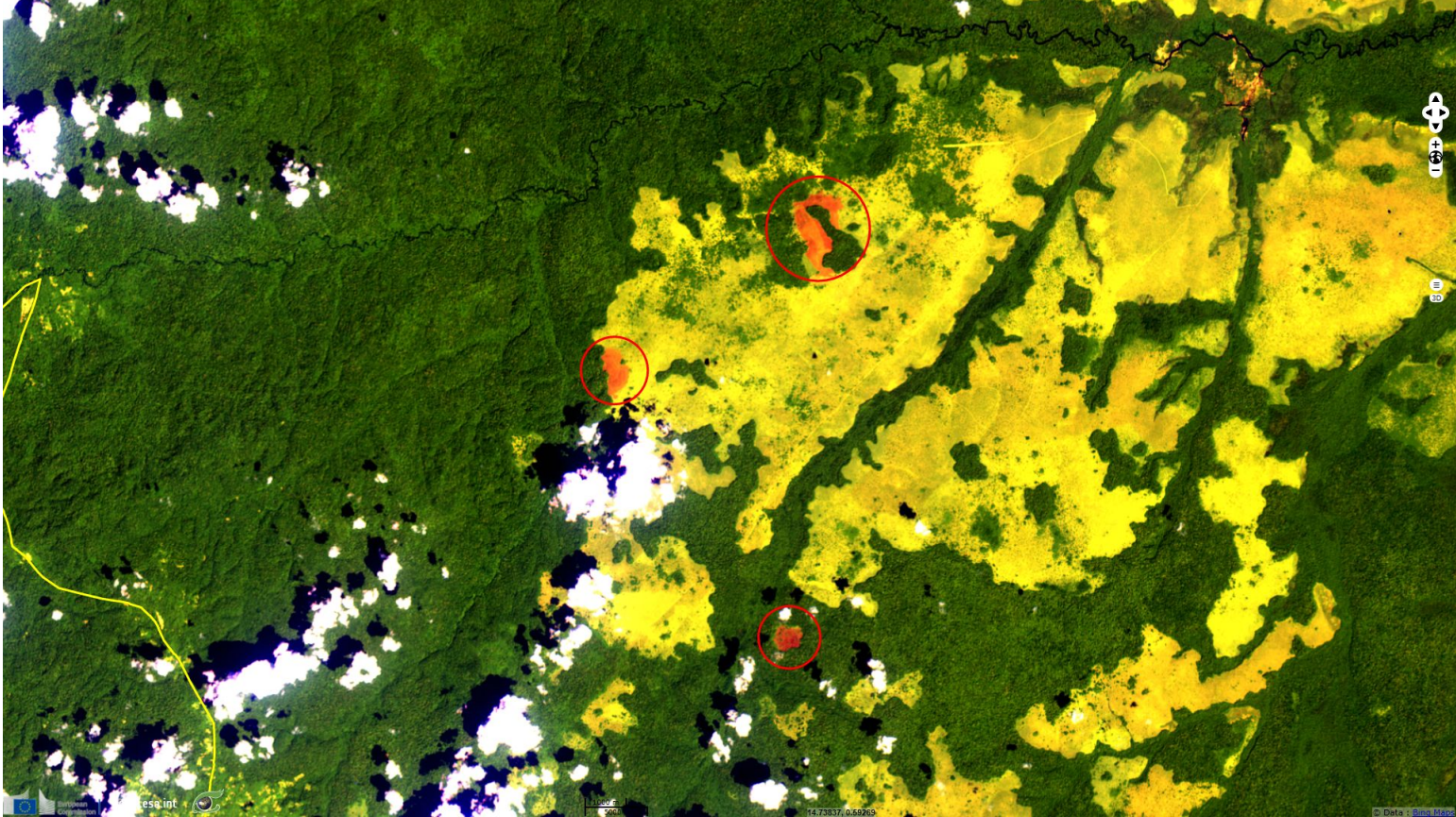
[2D animation](#)



[Odzala's website](#) recalls: "In Congo, large areas of the forest" "have been set aside as protected areas to safeguard these globally significant forests". The 13600 km² Odzala-Kokoua National Park is a prime exemple. [UNESCO](#) details it contains a mosaic of pristine landscapes (forest, savanna and saltpans) unaltered by antropic actions, unlike similar protected areas in Gulf of Congo. "With permanent freshwater rivers surrounded by very dense seasonally flooded freshwater swamp forests and ponds, the site is characterised by semi-evergreen forests, swamp forests, saline marshes, shrubs and a rich savannah forest" [Ramsar](#) continues.

Fig. 5 - S2 (02.01.2016) & S1 (29.01.2016) - Correlations between optical (red) and radar (dark) images on recently burnt areas.

[2D animation](#)



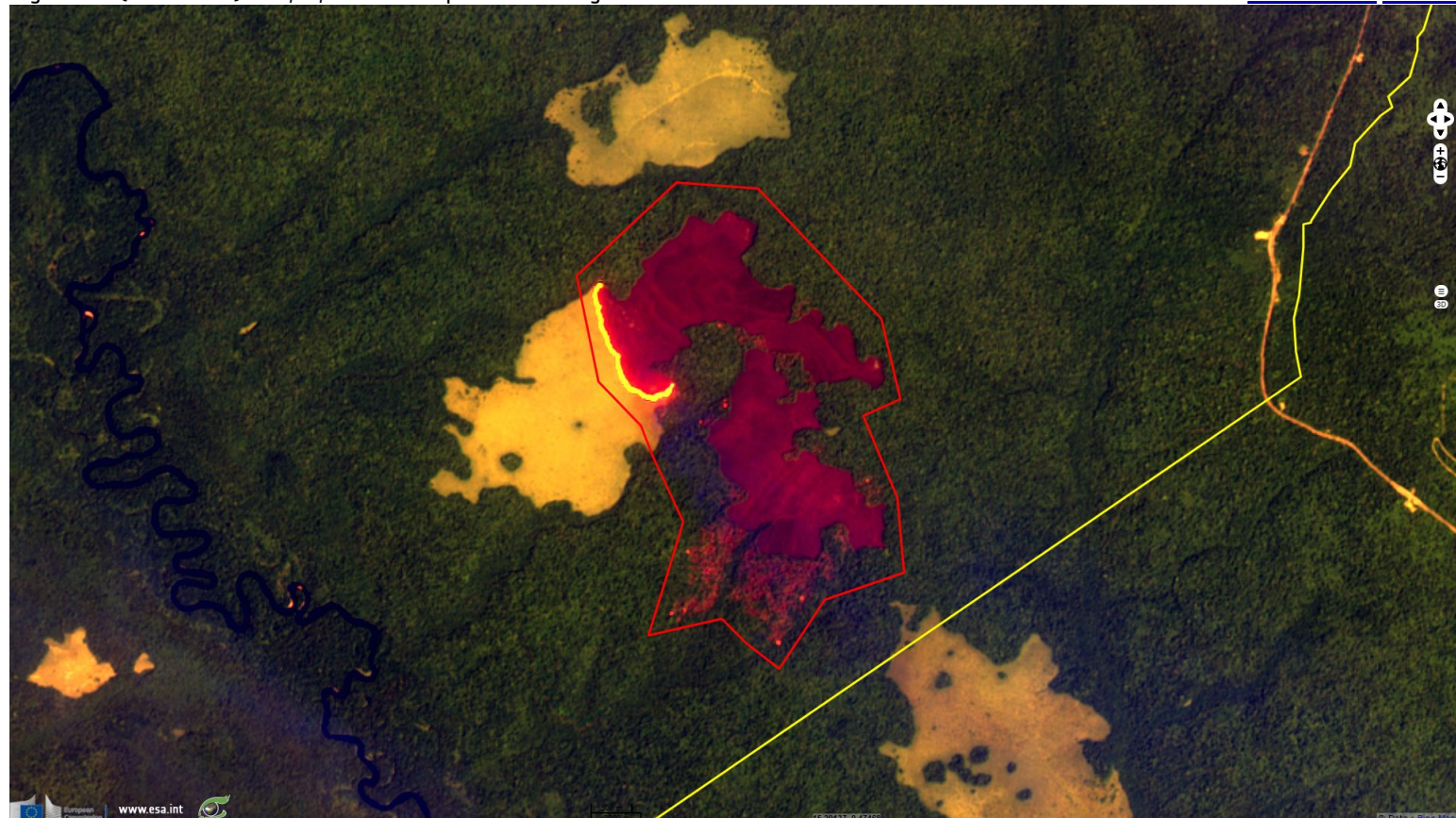
The website of [Odzala Kakoua National Park](#) adds: "The Odzala area receives an average of some 1 500 mm (60 inches) of rain annually, which falls mainly during the two wet seasons (March to May and September to November)." "The southern part of the Park, where two of our three Camps are located, is a rich tapestry of savannah punctuated with forest islands, and divided up by ribbons of gallery forest following the river channels. These unique ecosystems represent the struggle for supremacy between the ancient savannahs and the currently expanding forest biomes of the Congo basin. Swampy clearings known as bais provide some of the best places to view wildlife that is drawn to these open areas by the availability of mineral salts, water, and lush grazing." This makes the evolution of these clearings a very important factor of biodiversity.



Birds over a bai bordered by dense forest - [source](#)

Fig. 6 - S2 (02.01.2016) - 12,11,2 colour composite - Burning savanna in Odzala Kakoua National Park.

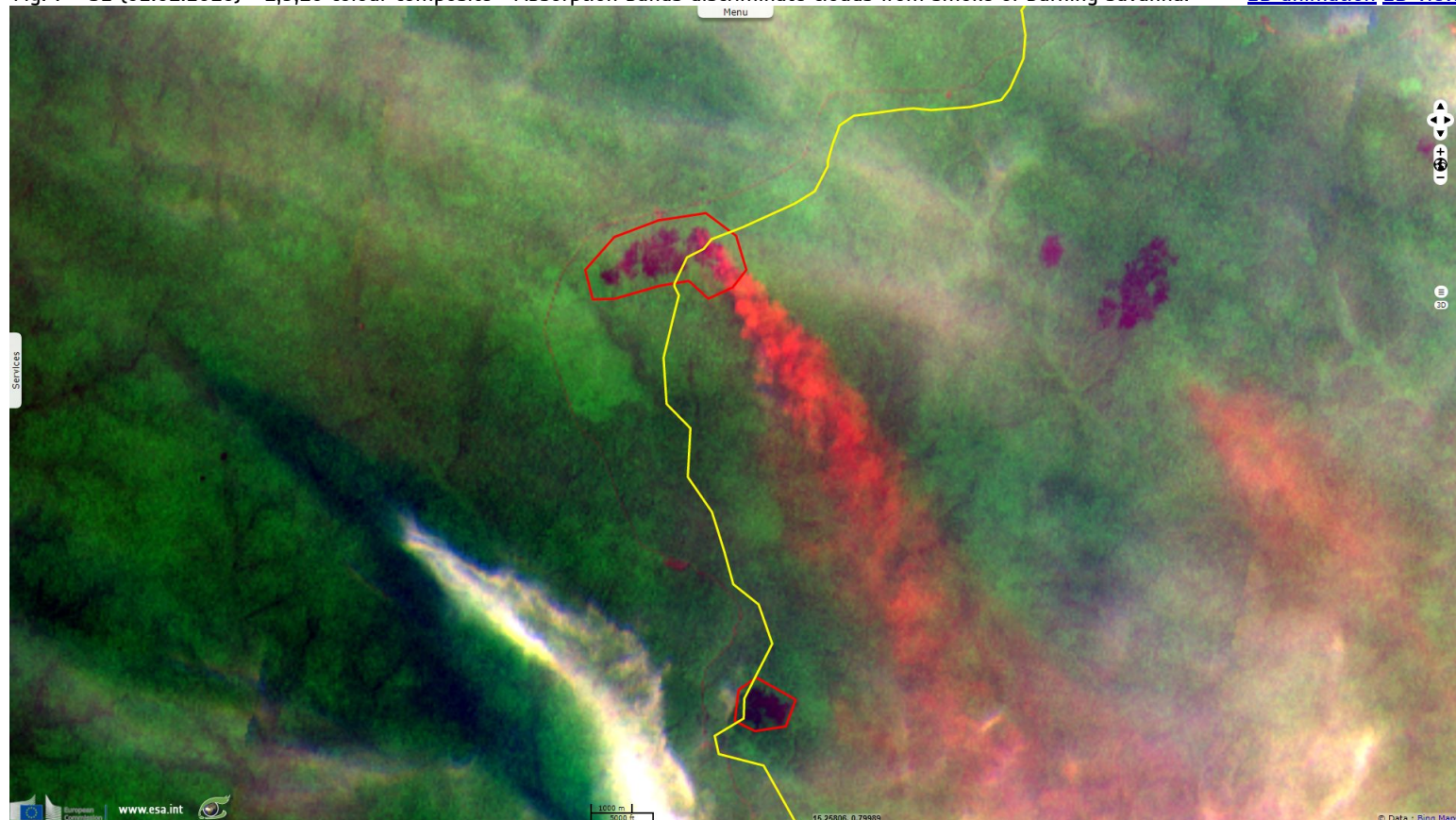
[2D animation](#) [2D view](#)



[Ramsar](#) specifies the Odzala Kakoua National Park supports "1062 plant species, including several endemic species, usually harvested by the local population for food and trading in nearby towns."

Fig. 7 - S2 (02.01.2016) - 1,9,10 colour composite - Absorption bands discriminate clouds from smoke of burning savanna.

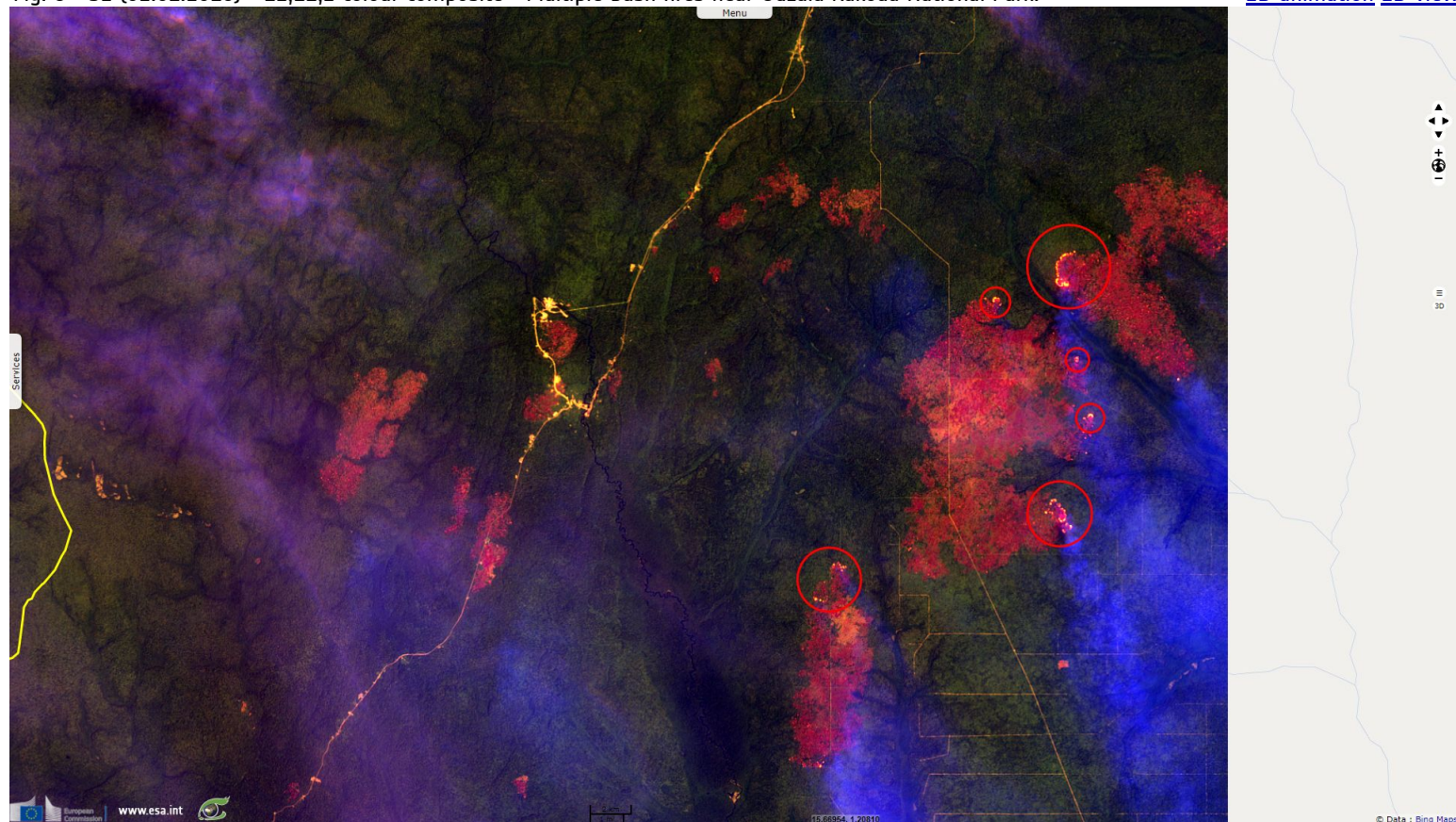
[2D animation](#) [2D view](#)



[UNESCO](#) underlines Odzala Kakoua National Park includes large natural saline marshes which are important concentration spots used for feeding. [Odzala National Park](#) emphasizes "over 100 different mammal species are found here", many listed as Vulnerable or Threatened by the IUCN according to [Ramsar](#), such as the last population of forest lions writes [UNESCO](#). The park also hosts "the critically endangered western lowland gorilla: a very significant population of these great apes survives in unspoiled natural habitat, alongside ten other diurnal primate species" which of "chimpanzees and red-tailed monkeys." "More terrestrial species include sitatunga and species of duiker some not much larger than rabbits. Herds of shy forest elephant move along ancient pathways." "Odzala also boasts iconic West Central African fauna such as spotted hyenas, forest buffalo and bongo as well as dozens of little-known mammal species, from water chevrotain to palm civets." "Overhead, more than 400 bird species also call Odzala home." Finally, [Ramsar](#) counts "it supports 25 families and over 150 species of indigenous fishes and 108 migratory fish species."

Fig. 8 - S2 (02.01.2016) - 12,11,2 colour composite - Multiple bush fires near Odzala Kakoua National Park.

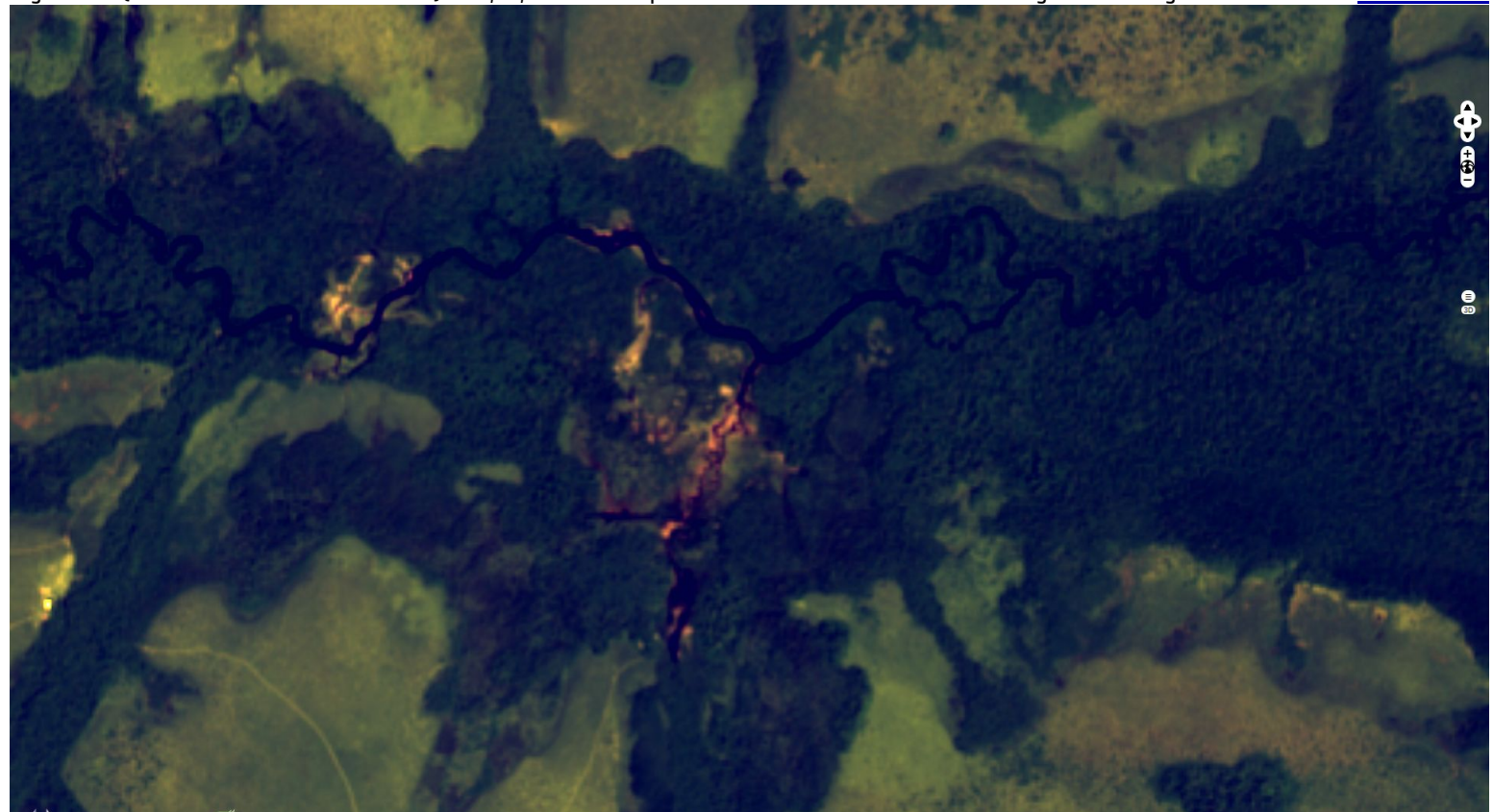
[2D animation](#) [2D view](#)



"Forest elephants are threatened by poaching for ivory, and by habitat loss due to deforestation. Elephant poaching was historically a significant issue in Odzala, but since African Parks (APN) took over management of the Park in 2010, a more effective approach to law enforcement has seen a number of poachers arrested. Forest elephants are now moving back into the Park – a sure sign that it is offering them sanctuary. The TRIDOM Trans-Frontier Conservation Area (TFCA) of which Odzala is part, now supports the largest forest elephant population in Central Africa." writes [Odzala Park](#) website















Forest elephants in the savanna - [source](#)



[Ramsar](#) indicates "the main activities carried out in the site are agriculture, aquaculture, hunting, and harvesting of non-timber forest products. It is also an ecological research ground and an eco-touristic site", "helping local people see the benefits of eco-tourism, and allowing them to share in those benefits", complements [the park's website](#).

Regarding logging, [Odzala's website](#) reminds "forest dwelling peoples have traditionally practiced sustainable lifestyles, utilising the forest as a larder, hardware store, and pharmacy, as well as finding inspiration for their animistic religions and rich cultures. This spirit of sustainability can be seen in the enlightened approach the Congolese government is taking towards the logging industry and the long-term protection of its forests and wildlife. Rather than the destructive short-term free-for-all which has been seen in other countries, the Congo has regulated extractive practices to ensure that the country will be able to benefit from its natural resources for many generations to come." "Additionally, one of Africa's largest Forest Stewardship Council (FSC) certified logging concessions is adjacent to Odzala." "Low-intensity logging conditions effectively function as "green belts", extending the reach of Congo's national parks and reserves and forming a vital buffer zone between the forest and areas of more concentrated human development", "effectively doubling the protected area for wildlife."

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