



# **THREATENED HABITATS & TROPICAL IMPORTANT PLANT AREAS (TIPAs) OF GUINEA, WEST AFRICA**

Charlotte Couch, Martin Cheek, Pépé Haba,  
Denise Molmou, Jenny Williams, Sékou Magassouba,  
Saïdou Doumbouya, and Muhammad Yaya Diallo.

Royal Botanic Gardens  
**Kew**



**Plantlife**

**Cover image:** Kounounkan, showing the sandstone cliffs of the table mountain, with intact submontane forest grading into lowland forest below. High altitude sandstone bowal dominates the top of the plateau, with gallery submontane forest. In the foreground on the cliff edge is a pink-flowered shrub, *Cailliella praerupticola* (CR). This genus, unique to Guinea, has a single species, which is restricted to Kounounkan.

Photo ©Xander van der Burgt.



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Working Group in Action at HNG-UGAN. Aoubacar Sylla (representing Saïdou Doumbouya), Denise Molmou (HNG), Falaye Kone (MEEF), Mamadou Cellou Diallo (PEG), Fatoumata Stell Conté (Guinée Écologie), Dr Sékou Magassouba, Sékou Kourouma (OGuiPar), and Charlotte Couch (RBG Kew).

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This book is dedicated to the Groupe de Travail pour les Zone Tropicales Importantes pour les Plantes (ZTIP) and the Plan d'Action de Conservation (PAC) for threatened plant species.

Dr Sékou Magassouba (HNG), Charlotte Couch (RBG Kew), Saïdou Doumbouya (COSIE), Bella Diallo (MEEF), Mamadou Diawara (Guinée Écologie), Muhammad Yaya Diallo (Guinée Écologie), Denise Molmou (HNG), Col. Sayba (OGuiPar), Moussa Diabaté (SERG), Falaye Kone (MEEF), Fatoumata Stell Conté (Guinée Écologie), Sékou Kourouma (OGuiPar), Pr. Sékou Moussa Keita (CERE), and Mamadou Cellou Diallo (PEG).

## Foreword

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It gives me great pleasure to introduce this ground-breaking publication, the first book on the Tropical Important Plant Areas (TIPAs) of an African country.

Plantlife International conceived and designed the concept of Important Plant Areas (IPAs) in 2001. The following year, they were included as Target 5 in the UN's Convention on Biological Diversity Global Strategy for Plant Conservation (GSPC), in recognition of the need to focus attention and effort on conserving botanical heritage *in situ*. Today, the concept of IPAs has been taken up in over 70 countries around the world. To have Guinea join this group is an important step in ensuring the country's important and rich botanical diversity is recognised, celebrated and, most importantly, conserved.

Royal Botanic Gardens Kew's support of the IPA initiative has been hugely helpful, not least in progressing this work in the tropics and especially Africa. Their passion and expertise has been vital in supporting national partners to develop the necessary evidence that underpins IPAs and we are delighted to have supported them.

Implementation of the IPA protocol is important and urgent. "All life depends on plants" is a well-known and well-founded statement. Whilst collecting data for this project, it appears 25 plant species have likely become globally extinct. This irrevocable loss risks becoming all too common unless we ensure that plant conservation becomes more prominent in our thinking and reflected in our actions.

**Ben McCarthy,**  
**Director of Strategy, Plantlife International**



Mt Gbalan Classified Forest, Guinea March 2019 showing ongoing conversion of lowland forest remnants in Guinée Maritime to planks, charcoal (log pile in centre), and farmland. This forest patch has been reduced in size by 70% in two years.

Photo: © Charlotte Couch

## Authors' preface

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Guinea has more than 250 documented unique and threatened plant species, more than is known for any other country in West Africa. To protect them should be not only a national priority but a global one.

Among these species – these natural resources – are the potential for new medicines, materials, and foods that could improve the livelihoods of Guineans through research and development.

However, time is running out. Already 35 of Guinea's rarest plant species are possibly extinct, and 25 of these species are, or were, globally unique to Guinea. These species have not been found in more than 50 years, despite our surveys to seek them, and appear to have been destroyed unknowingly as a result of human activities.

Guinea will continue to develop, with increased mining, improved agriculture, new roads, new industry, larger towns and cities, and more infrastructure to support them. This future development will impact on the natural environment.

In this book, we document Guinea's most threatened habitats for plants, the 22 most important areas for the conservation of these habitats, and the threatened plant species that they contain. If the 22 Tropical Important Plant Areas (TIPAs) that are mapped in this book can be protected, much of Guinea's national patrimony in terms of wild plant resources will be safeguarded. Altogether, these 22 areas occupy 8,702km<sup>2</sup>, 3.5% of the surface area of Guinea. Several of these areas are already protected, such as Nimba and Ziama. Others are not protected, such as Kounounkan, which has more globally unique species than any other location in Guinea, yet where forest destruction continues. The 22 TIPAs that are mapped in this book include:

- Over 60% of Guinea's threatened plant species
- Guinea's most species-rich documented sites
- Important indigenous socio-economic species
- The highest quality areas of each of the nine threatened habitats.

We hope that this book, a joint product of Guinean and UK-based scientists, government officials, and NGO staff, will result in increased protection and better management of Guinea's plant diversity.

# Acknowledgements

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This book could not have been started or completed without the support of the Darwin Initiative programme of the UK Government, which funded 'The Republic of Guinea IPA' programme (Darwin Project 23-002) from 2016-2019, for which this book on Threatened Habitats and TIPAs is the primary output. We especially thank Eilidh Young, representing the Darwin Initiative, for constructive advice over the life of the project.

We thank the Ellis Goodman Family Foundation for supporting the continuation of this project (2018-2020) and especially for supporting the salary of the Technical Adviser to the project and principal author of Part 2 of this book, Charlotte Couch, as well as much of the final phase of the Red List work in 2018-2019 at the Plant Assessment Unit of the Royal Botanic Gardens, Kew (RBG, Kew). This work was done by Catia Canteiro and Emma Williams, supervised by Serene Hargreaves. It was Emma Williams who secured the Bentham-Moxon Trust grant to fund the visit of Fatima Diop (University of Cheikh Anta Diop, Dakar) to review these assessments.

Aiah Lebbie (University of Sierra Leone) reviewed many of the assessments of Guinea species that also occurred in his country and Liberia, where he also has experience. The Mohammed Bin Zayed Foundation supported work to conserve the Critically Endangered point endemic *Vernonia djalonensis*.

We also thank GBIF (2016-2018) for the BID award that enabled data cleaning and georeferencing of Guinean herbarium specimens housed predominantly in MNHN Paris, so that they could be available to this project for mapping and assessing the extinction risk of Guinean plant species, and to Guinean researchers.

Colin Harris and John Merry are thanked because in 2004 they first approached RBG Kew to seek botanical expertise and advice for the Rio Tinto-Simfer Simandou project, then in its prospection phase. This initiated 15 years of botanical research by RBG Kew in Guinea, which led to numerous other projects, mainly with Herbar National de Guinée, which led to the current project. Salim Kouyaté, Seydou Cissé, Thomas Williams, Pierre Haba, and Alphonse Traoré are among the key Simfer environment staff that supported our botanical research.

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In London, Janis Shillito typed most of the text for Part 1 of this book. George Gosline maintained the WTA Access database, which holds the specimen and species records data that underpins this book. Iain Darbyshire, as leader of Kew's Science Strategy Output for TIPAs, provided guidance throughout, wrote most of the successful Darwin Initiative project funding application, and drafted most of the successful BID funding application. His expertise on Acanthaceae fed into all the Red List assessments for the species of that family.

Xander van der Burgt, leading numerous fieldwork missions with Guinean colleagues to remote areas, rediscovered lost species, discovered new ones, and collected essential data to contribute to the recognition of future TIPAs. Isabel Larridon reviewed our project and led on assessments and research on Cyperaceae species. Saba Rokni began the Red List work on Guinean species for this project as a volunteer in 2015 and was then employed to continue this important task in 2016-2017, before moving to a similar role for our Mozambique TIPAs project. This role was continued by Emma Williams and Catia Canteiro in 2018-2019. This Red List work would not have been possible without the help in data gathering and making preliminary assessments of volunteers and summer interns at Kew and the project partners. Our thanks go principally to Margaret Joachim, Rosemary Lomer, but also to Olly Hooper, Tom Smith, Emily Marshall, Charlie Gore, and Amy Guest. Justin Moat and Tim Wilkinson supported Jenny Williams' work on map development. Eimear M. Nic Lughadha reviewed a draft of this book and gave valuable advice.

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# List of abbreviations

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## Acronyms

**BID** = Biodiversity Information for Development

**CBD** = Convention on Biological Diversity

**CEGENS** = Centre de Gestion de l'Environnement des Monts Nimba- Simandou (Centre for the Management of the Environment of Mount Nimba-Simandou)

**CERE** = Centre for Environmental Research & Education

**CITES** = Convention on International Trade in Endangered Species of Wild Fauna and Flora

**COSIE** = Centre d'Observation de Surveillance et d'Information Environnementales (Centre for the Observation and Monitoring of Environmental Information)

**DNEF** = Direction Nationale des Eaux et Forêts (National Office of Water and Forests, Guinea)

**GBIF** = Global Biodiversity Information Facility

**GSPC** = Global Strategy for Plant Conservation

**HNG** = Herbarium National de Guinée

**IBA** = Important Bird Area

**IPA** = Important Plant Area

**IUCN** = International Union for Conservation of Nature

**MEEF** = Ministère de l'Environnement des Eaux et Forêts (Ministry of Environment, Water and Forests)

**MESRS** = Ministère de l'Enseignement Supérieur et de la Recherche Scientifique (Ministry for Higher Education and Scientific Research)

**MNHN Paris** = Museum National d'Histoire Naturelle, Paris (National Museum of Natural History, Paris)

**MBNP** = Moyen-Bafing National Park

**NGO** = Non-Governmental Organization

**OGUIDAP** = Office Guinéen de la Diversité Biologique et des Aires Protégées (Guinean Office of Biological Diversity and Protected Areas)

**OGuiPar** = Office Guinéen des Parcs et Réserves (Guinean Office for Parks and Reserves)

**PAC** = Plan d'Action de Conservation (Conservation Action Plan)

**PEG** = Protection et Gestion de l'Environnement (ONG) (Protection and Management of the Environment (NGO))

**pers. obs.** = Personal Observation

**RBG, Kew** = Royal Botanical Gardens, Kew

**SEIA** = Social and Environmental Impact Assessment

**SERG** = Herbarium de l'Institut de Recherche Agronomique de Guinée, Sérédou (Herbarium of the Guinean Institute of Agricultural Research, Sérédou).

**SMFG** = Société des Mines de Fer de Guinée (The Nimba Iron Ore Company)

**TIPA** = Tropical Important Plant Area

**UGANC** = Université Gamal Abdel Nasser de Conakry (Gamal Abdel Nasser University of Conakry)

**UN** = United Nations

**UNCCD** = United Nations Convention to Combat Desertification

**USAID** = United States Agency for International Development

**WCF** = Wild Chimpanzee Foundation

**ZD** = Zone de Développement (Development Area)

**ZGR** = Zone de Gestion des Ressources (Managed Resources Area)

**ZIP** = Zone Intégralement Protégée (Core Protected Area)

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### **IUCN Red List categories**

**EX** = Extinct

**EW** = Extinct in the Wild

**CR** = Critically Endangered

**CR(PE)** = Critically Endangered (Possibly Extinct)

**EN** = Endangered

**VU** = Vulnerable

**NT** = Near Threatened

**LC** = Least Concern

**DD** = Data Deficient

**NE** = Not Evaluated

### **Botanical abbreviations**

**ined.** = ineditus = unpublished

**sp.** = species

**sp. nov.** = species novum (new species)

**sp. nov. aff.** = species novum affinis (new species similar to)

**spp.** = plural version of sp.

**var.** = variety

**subsp.** = subspecies

### **Substrates**

**Fe** = lateritic/ferralitic

**SS** = sandstone

**G** = granite

## General Introduction

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This is the first book on Threatened Habitats and Tropical Important Plant Areas (TIPAs) for any African country. Its purpose is:

- To bring together all nationally available plant and habitat data on these subjects in an accessible format.
- To identify priority plant sites (TIPAs), providing accessible maps and data to allow local, national, and international stakeholders to target conservation actions and resources.
- To highlight globally and nationally important gaps in the existing Protected Area framework for Guinea.
- To help Guinea fulfil international reporting obligations on biodiversity including the Global Strategy for Plant Conservation (GSPC), the Convention on Biological Diversity (CBD), Aichi targets, and the UN Sustainable Development Goals. Also, to contribute to the IUCN Red List of threatened species and the IUCN Red List of threatened ecosystems.
- To highlight Guinea's high plant value, giving easily accessible data on its Threatened Habitats and plants to national and international scientists, policy makers, funders, and tourists.
- To encourage pride in the natural patrimony of Guinea, especially its globally important plant species and habitats, and to support their conservation for future generations.
- To improve livelihoods and community benefits in the buffer zones of TIPAs in Guinea, through better awareness and management of key plant resources for materials, food and medicine, ecosystem services, their spiritual and religious values, and/or sustainable ecotourism.

The need is urgent, since Guinea's plant species are becoming globally extinct and the habitats in which they grow are disappearing fast. In 2018, it was verified that at least one species of plant globally unique to Guinea had become extinct: a waterfall plant, *Inversodicraea pygmaea*.



*Inversodicraea pygmaea*, a Guinean species now considered globally extinct

In early 2019, when assembling and analysing the records accumulated in the last several years for our Guinea TIPAs project, we found that many rare, threatened plant species have not been rediscovered, despite many surveys throughout Guinea by ourselves and others (see table below). Of these 35 species, 25 are unique to Guinea. We conclude that these species are possibly extinct either nationally, or in the case of Guinean endemic species, globally. Most of these possibly extinct species – the vast majority – occur in Guinea’s Fouta Djallon, a densely populated area where agriculture is advanced and intensive. We expect and hope that with further targeted surveys in forgotten corners of the Fouta, some of these lost species will be rediscovered, giving the possibility that they might be protected. But we expect that the majority are already extinct.

**Table organisation: 1: Substrate/Habitat. 2: Altitude. 3: Species.**

<b>Genus &amp; species</b>	<b>Family</b>	<b>Substrate/Habitat</b>	<b>Altitude</b>	<b>Endemic to Guinea?</b>	<b>Year last seen in Guinea</b>	<b>Location/Prefecture</b>	<b>IUCN category</b>
<i>Anadelphia funerea</i>	Gram.	Fe	Low	✓	1937	Kouria-Trebeleya & Linsan	EN
<i>Cyanotis scaberula</i>	Comm.	Fe	Low	✓	1937	Linsan-Kouroussa	EN
<i>Indigofera pobeguini</i>	Leg.	Fe	Low	✓	1904	Kouroussa	CR
<i>Sporobolus pauciflorus</i>	Gram.	Fe	Low	✓	1947	Mt Nimba, base of	CR
<i>Bidens occidentalis</i>	Comp.	Fe	High	✓	1954	Timbo, Mali, Trebeleya	EN
<i>Ctenium sesquiflorum</i>	Gram.	Fe	High	✓	1945	Ditinn-Diaguissa	EN
<i>Drimia sudanica</i>	Hyac.	Fe	High	Also S. Leone, S. Sudan	1905	Labé	EN
<i>Emilia djalonensis</i>	Comp.	Fe	High	✓	1913	Haut Dalaba	CR (PE)
<i>Eriosema latericola</i>	Leg.	Fe	High	✓	1937	Kolenté, Mamou & Timbo	EN
<i>Microglossa caudata</i>	Comp.	Fe	High	✓	1905	Bowali Kouria	CR (PE)
<i>Tephrosia djalonica</i>	Leg.	Fe	High	✓	1907	Timbo to Ditinn	CR (PE)
<i>Bulbostylis bodardii</i>	Cyp.	Fe	Both	✓	1948	Diaguissa, Dalaba	EN
<i>Echinops guineensis</i>	Comp.	Fe SS	Both	Also, Iv. Coast.	1954	Beyla, Mt Loura	EN
<i>Andropogon incomptus</i>	Gram.	SS	High	✓	1956	Madina Tossékéré	CR
<i>Cyanotis lourensis</i>	Comm.	SS	High	✓	1962	Misside Banga, E of Pita; Mt Loura	EN
<i>Eriocaulon irregulare</i>	Erioc.	SS	High	✓	1962	Kala près de Dalaba; entre Timbo et Ditinn; plaine de la Fétoré, près de Koubi	EN
<i>Eriosema adamii</i>	Leg.	SS	High	✓	1958	Madina Tossékéré (Pita)	CR
<i>Heterosamara bennae</i>	Poly.	SS	High	✓	1937	Benna	CR
<i>Isachne guineensis</i>	Gram.	SS	High	✓	1956	Madina Tossékéré, Timbi; pont avant, Popodara; Mt Loura	EN
<i>Rhynchosia chevalieri</i>	Leg.	SS	High	Also Mali	1930	Mt Loura, Mali	EN

<b>Genus &amp; species</b>	<b>Family</b>	<b>Substrate/Habitat</b>	<b>Altitude</b>	<b>Endemic to Guinea?</b>	<b>Year last seen in Guinea</b>	<b>Location/Prefecture</b>	<b>IUCN category</b>
<i>Habenaria jacobii</i>	Orch.	SS Fe G	Both	Also S. Leone	1962	Passo, near Pita; surroundings of Kindia	EN
<i>Schizachyrium djalonicum</i>	Gram.	SS Fe	High	✓	1956	Pita; Benna	EN
<i>Bothriocline (Erlangea) fruticosa</i>	Comp.	SS G	High	Also S. Leone	1956	Madina Tossékéré; Benna	EN
<i>Schizachyrium penicillatum</i>	Gram.	SS G	Both	Also S. Leone	1956	Madina Tossékéré; Kindia	EN
<i>Loudetiopsis baldwini</i>	Gram.	G	Low	✓	1947	Macenta	CR(PE)
<i>Osbeckia praviantha</i>	Mela.	G	Low	Also, Liberia	1949	Macenta	EN
<i>Inversodicraea pygmaea</i>	Podo.	Waterfall	Low	✓	1951	Grandes Chutes, Kindia	CR(PE)
<i>Stonesia gracilis</i>	Podo.	Waterfall	Low	Also, S. Leone	1951	Grandes Chutes, Kindia	EN
<i>Impatiens bennae</i>	Bals.	Waterfall	High	✓	1956	Benna	CR
<i>Heterodelphia paulojaegeria</i>	Acan.	Lowl. forest	Low	Also, Iv. Coast, S. Leone	1949	Beyla	EN
<i>Ritchiea afzeli</i>	Capp.	Lowl. forest	Low	✓	1899	Beyla	CR
<i>Agelanthus guineensis</i>	Loran.	Subm. forest	High	✓	1956	Mali: Mt Loura	CR(PE)
<i>Clematis kakoulimensis</i>	Ran.	Subm. forest	High	✓	1945	Kakoulima	CR
<i>Rinorea djalonensis</i>	Viol.	Subm. forest	High	Also, Liberia, S. Leone	1949	Ditinn et Diaguissa; Macenta; Nimba	EN
<i>Sabicea bracteolata</i>	Rub.	Subm. forest	High	✓	1956	Pita; Timbi Madina. River Fétoré; banks of the Mafin in Dalaba; Labé; Bomboli	CR

**Table A: Possibly extinct plant threatened species of Guinea: where and when last recorded in Guinea.**

**Key:** ✓ = yes. Substrate: Fe = lateritic; SS = sandstone; G = granite. Altitude: Low =<500m; High =>500m. IUCN category: see page 9.

To avoid further global and national extinctions of Guinean plant species, for this project we sought:

- **To know which plant species are at most risk of extinction (threatened).**  
Since, to date, globally only 7.2% of plant species have been assessed for their extinction risk (Red List) status, it was necessary to formally evaluate the conservation status of most Guinean plant species using the IUCN (2012) system of categories and criteria (see separate *Red Data Book of Guinea Flowering Plant Species*).
- **To know where the threatened species survive in the wild, and in which habitats.**  
This was achieved through georeferencing all available records of species found to be threatened so they could be mapped, and supporting fieldwork on the ground to verify that they survived. We also worked to characterise the Threatened Habitats of Guinea.
- **To help ensure the continued existence of surviving threatened species by including them in demarcated areas known as Tropical Important Plant Areas (TIPAs).**  
Since development is set to continue in Guinea, it is crucial to know which parts of Guinea have irreplaceable plant biodiversity, and indeed which are the most important areas for conservation, so that the Threatened Habitats and species in these areas can be protected from extinction.

The key results of our programme are presented in this book in two parts:

## **Part 1. Threatened Habitats of Guinea**

In Part 1 we detail nine globally Threatened Habitats that occur in Guinea. Their conservation and protection are urgent because so much has already been lost. The surviving fragments are the last hope for the continued existence of the unique and irreplaceable biodiversity that they contain. Two of Guinea's Threatened Habitats are West African lowland evergreen forest, and Guinean Highland submontane forest (Threatened Habitats 8 and 9). 96% of Guinea's original forest has already been destroyed (Sayer et al. 1992) and that which survives is still being cleared for agriculture. Both forest habitats are not unique to Guinea. Fragments survive, sometimes better protected, in neighbouring Sierra Leone (submontane forest at Mts Loma) where 95% of the original forest has been lost (UNCCD 2004), and in Liberia, where 40% of lowland forest still survives (Robertson 2001).

Of equal or greater concern are those Threatened Habitats which are globally unique to Guinea: Fouta Djallon sandstone habitats (Threatened Habitats 1-3), and Guinea Highland high-altitude lateritic bowal grassland (Threatened Habitat 4). These habitats have the greatest number of globally unique species and the highest number of recorded possible species extinctions.

## **Part 2. Tropical Important Plant Areas of Guinea**

In Part 2 we detail 22 Tropical Important Plant Areas (TIPAs) which have been evidenced and workshopped in Guinea, using specimen data collected from around the world including from Paris (France), and Poznan (Poland), where key sources of data on Guinea's plants reside. If these can all be protected, over 60% of Guinea's threatened plant species and 100% of Guinea's Threatened Habitats will have the possibility of surviving to benefit future generations of Guineans with medicines, materials, and foods, including for applications and products to be researched and developed in future.

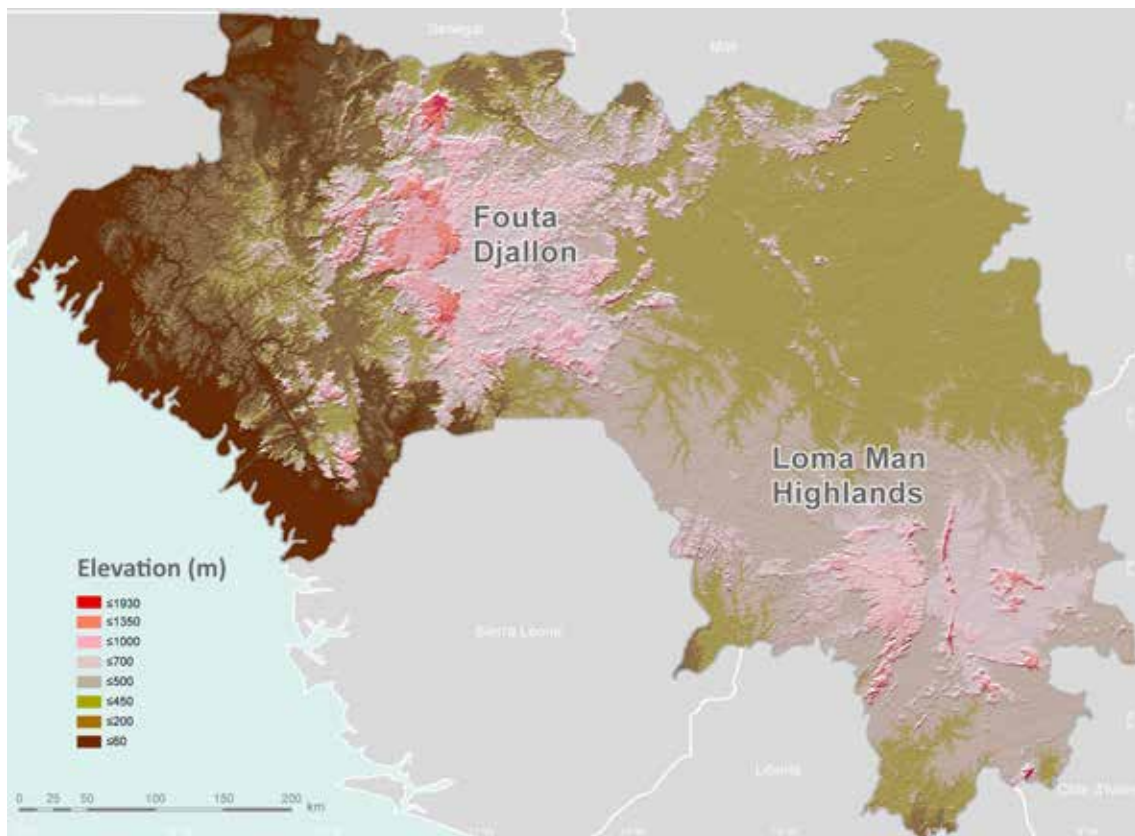
# Threatened Habitats of Guinea

Little detailed information has been available until now on the Threatened Habitats of Guinea. Except for notes in earlier literature from the French colonial period (e.g. Adam 1958, Jaeger 1959, Schnell 1952a, 1952b, 1968), published works are misleading. Porembski et al. (1994) survey the plant communities and species occurring on granite inselbergs, sandstone outcrops, and ferricretes (lateritic bowal) in Guinea, but conclude that granite inselbergs and ferricretes have no local endemics when, in fact, they have many endemics, as we show below in Threatened Habitats 4-6. Likewise, on the subject of the upland forests of the Guinea Highlands, White (1983) stated that they had 'very few endemics' when in fact we document 24 species endemic to the Guinea Highlands' submontane forests (Threatened Habitat 9). In short, until now, the full importance of the habitats of Guinea for endemic and threatened plant species has not been appreciated. Even now, our knowledge is incomplete and new discoveries are being made, especially when new fragments of original habitat are discovered and surveyed.

In characterising the species composition of Threatened Habitats, we drew on our knowledge of habitats that we had surveyed in Guinée Forestière in 2006-2016 and in Guinée Maritime and Haute Guinée in 2011-2018 (Map 1). In assigning threatened species to Threatened Habitats, we further drew upon the excellent Lisowski (2009), itself founded on Keay & Hepper (1954-1972). However, in the case of species known only from specimens collected 50-100 years ago, there is the possibility of misattribution to habitat because the metadata for such specimens was often poor insofar as specifying habitat. In such cases, we have relied heavily on the locality name. For example, Boulivel is a well-known ferralitic bowal area at high altitude, while Madina Tossékéré is sandstone.



**Map 1.** The four provinces of Guinea.



**Map 2.** The Guinea Highlands of Guinea: Fouta Djallon and Loma-Man.

Each of the nine Threatened Habitats we recognise has 20 or more threatened species and at least four threatened species which are globally unique to that habitat.

We do not include habitats which are globally widespread, not or little threatened, or which have few range-restricted/threatened species. Therefore, we do not include as Threatened Habitats:

- **Guinean woodland/wooded grassland/grassland (also known as savannah or prairie boisée/forêt claire).** This habitat is distributed in a band south of the Sahara from Senegal to Sudan, contains few threatened species and is largely intact over great parts of its range.
- **Atlantic mangrove.** Even though this habitat is under pressure in Guinea, it includes only seven species of tree, none of which are threatened, and which occur on both sides of the Atlantic between the tropics.

## Threatened Habitat Classification for TIPA Assessments

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Threatened Habitat is one of the three TIPA criteria, namely criterion C. Three sub-criteria are recognised within criterion C as follows (Plantlife 2018):

- **C(i): Globally threatened** or restricted habitat
- **C(ii): Regionally threatened** or restricted habitat
- **C(iii): Nationally threatened** or restricted habitat and which has severely declined

All Guinean habitats have been assessed using criterion C(iii) as there is no global or regional list of Threatened Habitats currently available.

The nine Threatened Habitats that we include are:

- **Threatened Habitat 1:** Sandstone Cliffs and Walls
- **Threatened Habitat 2:** High-altitude Sandstone Bowal Grasslands
- **Threatened Habitat 3:** Low-altitude Sandstone Bowal Grasslands
- **Threatened Habitat 4:** High-altitude Lateritic Bowal Grasslands
- **Threatened Habitat 5:** Low-altitude Lateritic Bowal Grasslands
- **Threatened Habitat 6:** Granite Inselbergs
- **Threatened Habitat 7:** Waterfalls and Rapids
- **Threatened Habitat 8:** West African Lowland Evergreen Forest
- **Threatened Habitat 9:** Guinean Highland Submontane Forest

Each of these nine Threatened Habitats is mapped and characterised as follows:

- **Conservation importance:** how many threatened species does the habitat contain, and how many species are endemic?
- **Distribution, quantification, and geology:** what is their global range, range within Guinea, geology (Threatened Habitats 1-6 are substrate based), and what area do they occupy (if they can be calculated)?
- **Recognition:** how can the habitat be recognised on the ground, are there indicator species?
- **Microhabitats:** which microhabitats can be recognised and what species do they hold?
- **Exploration levels:** how well studied is the habitat and which areas remain to be surveyed, if any?
- **Occurrence in Protected Areas:** which areas of this habitat are included in existing Protected Areas (if any) and which TIPAs include them?
- **Threats:** which threats does the habitat face and how severe are they?

It was not possible to attach all of Guinea's threatened species to one of the nine Threatened Habitats above. Species such as *Habenaria lelyi*, *Rytigynia leonensis*, *Satanocrater fellatensis*, *Ceropegia porphyrotricha*, *C. rhynchantha*, *Combretum fulvum*, and *Aspilia chevalieri*, which are all Vulnerable (VU) or Endangered (EN), either lack records of their habitat or the available data is imprecise. More field research is needed to rediscover these species and to assign them to a habitat and microhabitat.

Additional Threatened Habitats existed and fragments may survive which we have not succeeded in rediscovering. *Omphalocarpum ahia* and *Tristemma involucreatum* occur in coastal swamp forest in Sierra Leone and Liberia, and these species are recorded from Guinea, although we have not refound them. Similarly, in neighbouring countries, coastal grasslands on white sand support species such as *Anadelphia polychaeta*, *Eugenia liberiana*, *Eriosema arenicola*, and *Terminalia scutifera*, all of which are threatened or near threatened and recorded from Guinea, but we have not yet found any surviving areas of this habitat, if indeed it survives in Guinea.

## Mapping Methodologies

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All the maps that accompany this book were generated by Jenny Williams of the RBG Kew Spatial Analysis team with assistance from Tim Wilkinson. Jenny supervised students, staff, and interns for much of the digitisation work on a series of habitat-dedicated projects: Natalie König (bawal habitats), Olly Hooper (submontane forest), Vanessa Stevens and Hayley Mardle (waterfalls and rapids), Xander van der Burgt (sandstone cliffs), and Charlotte Couch (lowland forest and inselbergs). Notes on the methodologies involved are presented here:

### Sandstone (Threatened Habitats 1-3)

Cliffs were identified and manually digitised from Google Earth imagery and ArcGIS Pro using ground-truthed locations, opportunistic mapping, and the use of contour data and elevation models. This extensive dataset may not be complete as gaps are suspected in some provinces, where field teams have been unable to survey and where associated satellite imagery is not clear.

Sandstone bawal was mapped in outline due to its extensive nature and the difficulty of differentiating it from lateritic bawal through automated extraction techniques. Therefore, the sandstone bawal was approximately fitted to the Palaeozoic sedimentary rocks coverage published in <http://mines.gov.gn/carte-mineralogique/> It was then separated into high and low altitude sandstone bawal mapping units using the 500m contour.

### Lateritic Bawal Areas (Threatened Habitats 4-5)

Bawal areas were mapped at two levels. At a coarse, national scale, the USAID land-cover bawal mapping unit was employed after masking out Palaeozoic sedimentary rock areas equating to sandstone in the broad sense (see sandstone habitats). <https://eros.usgs.gov/westafrica/land-cover/land-use-land-cover-and-trends-guinea>

At a finer scale, after a survey of Guinea at a coarse resolution to identify bawal clusters occurring both in the lowland (below 500m altitude) and submontane (above 500m altitude) areas. High-density areas of bawal have been manually digitised from dry season Google Earth Imagery. Three large grids were intensely surveyed and all bawal patches collected. This very fine detail mapping may not be available throughout all provinces.

### Granite Inselbergs (Threatened Habitat 6)

Inselbergs were identified in Google Earth and ArcGIS Pro from ground-truthed locations, and from general image surveillance in Google Earth. Inselbergs were manually identified by experts and then fully digitised to form polygons.

A more intensive search for inselbergs was undertaken in areas immediately surrounding known inselberg complexes. Whilst this extensive dataset is based on expert knowledge, it may not be fully complete, as gaps are suspected in some provinces where field teams have been unable to survey.

## **Waterfalls and Rapids (Threatened Habitat 7)**

Whitewater, waterfalls, ripples, and rapids were identified in ArcGIS using a combination of contour breaks, river database layers, and manually digitised river and stream layers. Where stream lines were present and large breaks in elevation were calculated, it is probable that waterfalls may be present. This data was overlaid on Bing Maps to verify the presence of waterfalls, to determine whether water flow was evident in the satellite image or dry (due to seasonal waterfalls). A similar process was undertaken to extract possible locations for rapids and ripples, but with less extreme contour breaks.

Whitewater was extracted as line and point data for waterfalls, ripples, and rapids. This dataset is not fully complete as many smaller rivers have not been collected for Guinea. Our collection of river channels was restricted to rivers and streams that are immediately visible on high-resolution satellite imagery, available through Google Earth and ArcGIS Pro, and only in areas known to the field teams. The resolution of the available country-wide rivers dataset is very coarse, and no small rivers are mapped. The full Guinea map of whitewater also shows locations of Podostemaceae which have been collected in the field at whitewater locations. These areas of whitewater are not always visually identifiable from satellite imagery, as the river channels, when viewed from above, are often hidden by dense vegetation and trees in these areas.

## **West African Lowland Evergreen Forest (Threatened Habitat 8)**

Lowland forest was identified and extracted from 10 years of dry season Landsat satellite imagery. The time-series imagery was combined to a single 'green' layer and classified to discriminate forests from non-forest cover types and senescent grasses. Both forest and gallery forest less than 500m elevation were classified as lowland forest. Areas of identified forest loss in the years up to 2017 (Hansen 2013: updated 2017 dataset 'Year of gross forest cover loss event') were removed. Small forest patches of trees were also removed so that only larger contiguous forest areas were retained.

Within lowland forests, gallery forest along rivers also exists and often contains different species assemblages, and therefore needed to be extracted separately. The same base satellite imagery was used, but an independent classification and extraction process was undertaken to identify forest cover within 100m of river channels. Landsat data (ground resolution of 30m) may overestimate the coverage of lowland gallery forest as the many small and narrow gallery forest areas may cover less area than full 30x30m pixels. Palm cultivation has also occurred in the region and may be confused with natural forests during the classification process.

It was determined that village forests, rather than natural forests, predominantly occur in Guéckédou Prefecture. These forests largely consist of useful tree species which are managed and cultivated for local communities. Fieldwork has determined that these forests do not contain natural assemblages of forest species, and as a result, will not be included as lowland forests despite appearing very similar to natural forests in satellite imagery. Village forests are uniquely identifiable as small areas of forest directly surrounding, or in the vicinity of, a settlement which is otherwise surrounded by a matrix of non-forest vegetation.

## **Guinean Highland Submontane Forest (Threatened Habitat 9)**

This was identified and extracted from 10 years of dry season Landsat satellite imagery. The time-series imagery was combined to a single 'green' layer and classified to discriminate forests from non-forest cover types and senescent grasses. Areas of identified forest loss in the years up to 2017 (Hansen 2013: updated 2017 dataset 'Year of gross forest cover loss event') were removed. Small forest patches of trees were also removed so that only larger contiguous forest areas were retained. Submontane forest cover was extracted at elevations greater than 500m. This submontane forest layer may overestimate the coverage of submontane forest as extensive deforestation and degradation of forests continue to occur within the region.

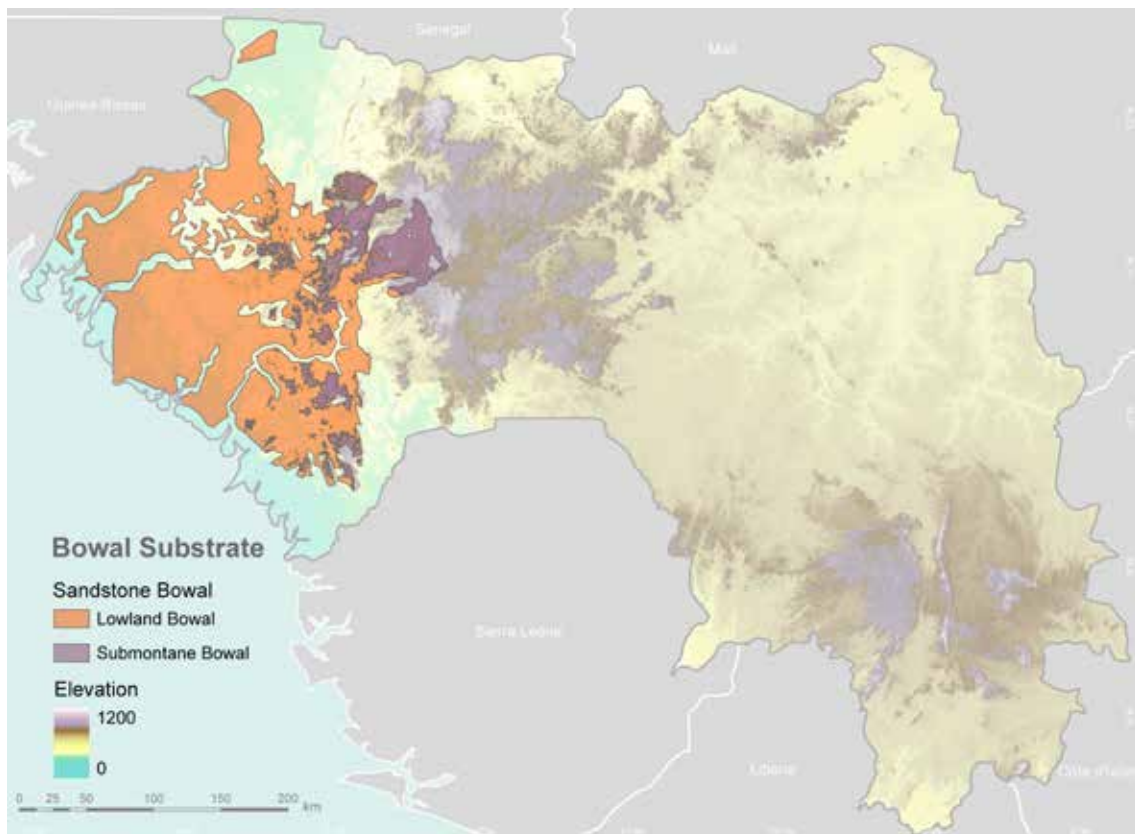
Fieldwork has indicated that the forest in the Fouta Djallon is severely degraded and, despite appearing very similar to natural forests from satellite imagery, it does not contain natural assemblages of intact forest. This degraded forest area is included on the Guinea submontane map to denote known forest areas that are no longer intact and as such contain little conservation value.

## Threatened Habitats 1-3: Sandstone Habitats

The underlying geology of most of Guinea derives from the Palaeoproterozoic era (2,500 to 1,600 million years ago). Most of these rocks are now overlain by deep soils or laterite layers. However, much of Moyenne Guinée and Guinée Maritime (Map 1) is dominated by sedimentary rocks which form flat-topped plateaus, varying from sea level to 1,000m altitude, where the solid rock is mostly bare at the surface, forming bowal (Map 3). This rock derives from the younger, but still ancient Palaeozoic era (541-252 million years ago). It comprises Devonian and Silurian siltstones and argillites, and the older Ordovician quartzitic sandstones.

The Devonian siltstones and sandstones form a plateau 100-300m high in the Boké region, and their upper surfaces, weathered and leached, supply most of Guinea's bauxite. The Silurian siltstones and argillites also yield bauxite, as at Fria, but at the same time outcrop on the highest of the sandstone table mountains, reaching above 1,000m altitude. In particular, the bare rocks of the Ordovician sandstones host the greatest number of Guinea's endemic (unique) species, all of which are threatened. These Ordovician sandstones, so important for plants, outcrop in the 'core' of the Fouta Djallon (Map 2), at Pita, extending south to Dalaba and north to near Labé at 1,000m altitude. They also form the 400m high plateau that extends from Mambiya to Kindia, and its southern extension, the table mountains that lead southwards to Kounounkan. These three sandstone areas each have seven or eight unique, threatened species that occur nowhere else. Due to faulting and tilting, all three Palaeozoic sedimentary rock types also outcrop near sea-level close to the coast, for example the Ordovician sandstone at Îles Tristao and at Cap Verga. These Palaeozoic rocks, although mostly confined to western parts of Guinea, extend just across the border into Guinea-Bissau, Senegal, southern Mali, Ivory Coast, Burkina Faso, and even into Sierra Leone. Usually, these extensions are comparatively small areas. Nevertheless, as a result, some predominantly Guinean sandstone specialist species have also been recorded in neighbouring countries.

In total, we have documented 59 threatened species on sandstone in Guinea, of which 40 are globally unique to Guinea. Twenty-seven of these species also occur on other bare rock habitats (Tables 1-7), either lateritic (mainly ferralitic) bowal (10 species), granite inselbergs (9 species), or on both of the latter two (9 species).



**Map 3.** Sandstone bowal habitats in Guinea.

Here, we recognise three different sandstone habitats, accepting that there are some species that overlap between habitats:

- Cliffs and walls
- High-altitude bowal grasslands (above 500m altitude)
- Low-altitude bowal grasslands (below 500m altitude)

An excellent indicator species for sandstone is the distinctive shrub or small tree, *Fegimanra afzelii* (family Anacardiaceae), a relative of the mango. This species roots in fissures in the sandstone in all three sandstone habitats.

Genus & species	Family	IUCN category	Altitude	Endemic to Guinea	Sandstone	Laterite	Granite
<i>Anadelphia macrochaeta</i>	Gram.	VU	Both	Also, Mali	✓	✓	
<i>Anadelphia trichaeta</i>	Gram.	VU	Low	Also, Mali & S. Leone	✓	✓	✓
<i>Barleria maclaudii</i>	Acan.	EN	Both	Also, Mali & Senegal	✓	✓	
<i>Bothriocline (Erlangea) fruticosa</i>	Comp.	EN	High	Also, S. Leone	✓		✓
<i>Bulbostylis bodardii</i>	Cyp.	EN	Both	Also, Senegal	✓	✓	
<i>Bulbostylis guineensis</i>	Cyp.	EN	Both	✓	✓	✓	
<i>Cyathula pobeguinii</i>	Amar.	VU	Both	Also, Mali, Senegal & G. Biss.	✓	✓	
<i>Dilophotriche occidentalis</i>	Gram.	VU	Low	✓	✓	✓	✓
<i>Dissotis (Anaheterotis) pobeguinii</i>	Mela.	VU	High	Also, S. Leone	✓	✓	✓
<i>Dissotis leonensis</i>	Mela.	EN	High	Also, S. Leone	✓	✓	✓
<i>Echinops guineensis</i>	Comp.	EN	Both	Also, Iv. Coast	✓	✓	
<i>Emilia guineensis</i>	Comp.	NT	High	✓	✓	✓	
<i>Eriocaulon cryptocephalum</i>	Erioc.	VU	Both	Also, S. Leone & Iv. Coast	✓		✓
<i>Eriocaulon sessile</i>	Erioc.	VU	Both	Also, Iv. Coast	✓	✓	
<i>Eriocaulon tingilomum</i>	Erioc.	EN	High	Also, S. Leone	✓	?	✓
<i>Eriosema spicatum</i> subsp. <i>collinum</i>	Leg.	VU	High	Also, S. Leone	✓	✓	✓
<i>Genlisea barthlottii</i>	Lent.	VU	High	✓	✓	?	✓
<i>Habenaria jacobii</i>	Orch.	EN	Both	Also, S. Leone	✓	✓	✓
<i>Indigofera megacephala</i>	Leg.	VU	Both	No	✓	✓	
<i>Leocus pobeguinii</i>	Labi.	VU	High	Also, S. Leone	✓		✓
<i>Mesanthemum albidum</i>	Erioc.	VU	Low	Also, S. Leone & Senegal	✓		✓
<i>Monocymbium lanceolatum</i>	Gram.	VU	High	Also, S. Leone	✓	✓	✓
<i>Plectranthus linearifolius</i>	Labi.	EN	Low	✓	✓		✓
<i>Raphionacme caerulea</i>	Apoc.	EN	Both	Also, S. Leone	✓		✓
<i>Schizachyrium delicatum</i>	Gram.	VU	High	No	✓	✓	✓
<i>Schizachyrium djalonicum</i>	Gram.	EN	High	✓	✓	✓	
<i>Schizachyrium penicillatum</i>	Gram.	EN	Both	Also, S. Leone	✓		✓
<i>Vernonia nimbaensis</i>	Comp.	EN	High	Also, S. Leone	✓	✓	✓

**Table 1:** Threatened species of Guinean sandstone bowal which also occur on lateritic bowal and/or granite inselbergs.

**Key:** ✓ = yes. IUCN category: see page 9.

## Threatened Habitat 1: Sandstone Cliffs and Walls

### Conservation importance

Vertical sandstone cliffs and walls have lower species richness than habitats such as bowal and forest. Yet, three of the four vascular plant genera unique to Guinea are entirely or largely restricted to this habitat: *Cailliella* (rarely also on cliff-tops), *Fleurydora*, and *Kindia*, each with one species. Furthermore, the only species of Bromeliaceae native outside the Americas, *Pitcairnia feliciana* is also unique to Guinea's sandstone cliffs. Eight other species also are globally unique to Guinea's vertical sandstone cliffs and walls (Table 2). Several of these species, such as the *Coleus* and *Cyanotis*, can also occur on low 'steps' that occur between different levels on flat sandstone bowal.

### Distribution, quantification, and geology

Sandstone cliffs and walls are almost entirely restricted to the Fouta Djallon of Guinea (Map 4), where they form the vertical boundary of the high-altitude sandstone plateaus that bear sandstone bowal. Tiny outcrops also occur in Guinée Forestière, and just across the border into neighbouring Guinea-Bissau, Senegal, Mali, and Sierra Leone, but these are more poorly studied for such habitat even than in Guinea. We have mapped a linear length of 1,751km of sandstone cliff. Map 5, a detailed part of Map 4, shows the sandstone cliffs in the Kounounkan area, at the southern extreme of Fouta Djallon, which is extremely rich in specialised sandstone cliff species.

### Recognition

The vertical sandstone walls that comprise this habitat glow in shades of pink to orange in the wet season (May-Oct.), when they are most conspicuous from Conakry and along the coast from Kamsar to Forécariah, but they also stretch far inland to the core of the Fouta Djallon. In the dry season, the sandstone appears dull and pale yellow, and it may be blackened with algae. Due to the horizontal strata, sandstone cannot be confused with any other rock type in Guinea. *Fegimanra afzelii* is an indicator shrub for sandstone, occurring on cliffs and in fissures and low walls in sandstone bowal.

None of the endemic species of sandstone cliffs are known to be widespread throughout the range of this habitat type. Most are localised to small areas, e.g. *Kindia* is only known from the northeast part of the Mt Gangan complex, while *Cailliella* is restricted to the cliffs of Kounounkan and nearby Tassing.

Genus & species	Family	IUCN category	Unique to habitat	In Protected Area	In TIPA
<i>Anisotes guineensis</i>	Acan.	EN	✓		✓
<i>Cailliella praeurpticola</i>	Mela.	EN	±		✓
<i>Cinnobotrys felcis</i>	Mela.	EN	✓		✓
<i>Clerodendrum sylvae</i>	Labi.	EN	✓		✓
<i>Coleus</i> sp. nov.	Labi.	Likely EN	✓		✓
<i>Dissotis splendens</i>	Mela.	EN	±		✓
<i>Fleurydora felcis</i>	Ochn.	EN	✓		✓
<i>Heterosamara bennae</i>	Polyg.	CR	✓		
<i>Heterotis pygmaea</i>	Mela.	EN	✓		✓
<i>Kindia gangan</i>	Rubi.	EN	✓		✓
<i>Mesanthemum bennae</i>	Erio.	EN	±		✓
<i>Pitcairnia feliciana</i>	Brom.	EN	✓		✓
<i>Rhytachne perfecta</i>	Gram.	EN	±		✓

**Table 2:** Threatened species of sandstone cliff and wall habitat. All but one species is unique to Guinea. No species occurs in a Protected Area at present.

**Key:** ✓ = yes. IUCN category: see page 9. Unique to habitat: '±' also occur on sandstone bowal.



**Map 4.** Sandstone cliff habitat in Guinea.



**Map 5.** Detail of sandstone cliffs of southernmost Fouta Djallon.

## Microhabitats

Large expanses of sandstone cliff can lack plants completely. Even the most densely vegetated cliffs may have only 5-10% vegetation cover. Species often require different microhabitats:

- **Horizontal, shallow ledges**  
Ledges 1-2cm deep in the cliff-face, with partial-shade (*Pitcairnia feliciana*).
- **Horizontal ledges**  
Ledges 15-30cm wide, with water seepage and shade (*Anisotes guineensis* and *Heterotis pygmaea*).
- **Vertical or diagonal hairline fissures**  
Found in sheer cliffs in full sun (*Kinda gangan*).

The most biodiverse sandstone cliffs have a mixture of these microhabitats in close juxtaposition, with a variety of numerous ledges, fissures, ravines, and seepages.

## Exploration levels

Sandstone cliff habitat has not been explored, or only incompletely so, in the Labé, Téliimélé to Pita, and Dubréka areas. Additional sandstone cliff species are likely to be discovered if these are researched.

## Protection

The proposed Mt Gangan and Kounoukan TIPAs include the sites documented to date with greatest concentrations of threatened endemic sandstone cliff and wall species. Otherwise, none occur in the existing Guinea Protected Area network at present (2019).

## Threats

Plant communities on high sandstone cliffs can be threatened by natural erosion events that cause falls of cliff faces, as at Kounoukan. Low-level quarrying for building material can also pose a threat, as seen at Mt Gangan. Sandstone walls on stepped hills in bauxite areas such as at Grandes Chutes (Mambiya) and in the Boké region are threatened by mining.

## Threatened Habitat 2: High-Altitude Sandstone Bowal Grasslands

Areas above 500m altitude (known as 'kapété' in Pular)

### Conservation importance

The flat tops of the sandstone table mountains of Guinea occur in no other part of Africa – they are habitats unique to the Fouta Djallon (Adam 1958, Jaeger 1959). Due to the numerous threatened and rare species unique to this habitat, they have very high conservation value, as do sandstone cliffs and bowal habitats at lower altitude (see adjoining entries) and some species are shared with these.

In total, we have documented 35 threatened species in high-altitude sandstone bowal. Eight are unique to Kounoukan, of which several also occur at the tops of cliffs (Table 3). Eight are unique to the 'core' Fouta Djallon (Dalaba-Pita-Labé-Mali) (Table 4). Three occur in both areas (Table 5). Twenty-three occur in both high-altitude sandstone bowal and on lateritic bowal and/or granitic inselbergs (Table 1).

### Distribution, quantification, and geology

High-altitude sandstone bowal occurs mainly in Gaoual, Lelouma, Pita, and Dalaba Prefectures of Moyenne Guinée, and in Téliimélé, Kindia, and Dubréka Prefectures of Guinée Maritime (Map 3). Ordovician quartzitic sandstone is the predominant substrate.

### Recognition

This habitat is easily recognised in satellite imagery by the flat, sparsely vegetated, mainly bare-rock terrain, with cross-cutting straight-line, slender faults, which act as drainage lines and can have submontane gallery forest. On the ground, the rock is distinctive due to the inclusion of quartzite pebbles and a curved and sculptured surface. In some cases, ripples can be clearly seen (fossilised

wave action on sediment), remaining from the time the rock was formed. In the wet season, this habitat is dominated by short-statured (60-90cm tall) grassland. Dry season fires turn these into blackened, burnt bare areas.

### Fire-free Kounoukan bowal-shrubland

This extremely rare habitat may once have been more widespread in the Fouta Djallon before humans began modifying sandstone habitats, principally by the increased frequency of fires and by the grazing of domestic animals, which can damage sensitive plant species by trampling. Today it survives only on one small, 15km<sup>2</sup>, 860-900m tall table-top mountain that is the southernmost extension of the high sandstone plateau in Guinea. It was described by P  p   Haba and Xander van der Burgt in late November 2017:

'...wooded grassland on flat sandstone bedrock, surrounded by extensive areas of submontane forest which protect this vegetation from fire. *Cailliella praerupticola* cover 25%, *Microdracoides squamosus* cover 25%, other shrubs including *Dissotis leonensis*, *Sakersia (Dichaetanthera) echinulata*, *Fegimanra afzelii* 25%. This vegetation was seen in 3 places; here, on a ridge 1900m ESE. *Kotschya uniflora* may survive in very rocky parts of grasslands...'

At the same location numerous other threatened species and seven additional species occur which are globally unique to its bare sandstone substrate: *Mesanthemum bennae* (CR), *Andropogon incomptus* (CR), *Rhytachne perfecta* (EN), and newly discovered and awaiting publication, *Melastomastrum* sp. nov., *Virectaria pepehabai* sp. nov., *Gladiolus mariae* sp. nov., and *Panicum* sp. nov. This is the highest concentration of threatened, unique species known to survive today in Guinea, and perhaps West Africa.

No evidence of fire has been found at this location, despite searching, during visits in 2016, 2017, and 2019 by Xander van der Burgt and P  p   Haba. Excavation has revealed no charcoal, and fire-blackened tree and shrub stems were absent.

Finding that several of the species thought to be unique to cliffs grow on the horizontal surface of the plateau at this location (e.g. *Cailliella praerupticola* and *Mesanthemum benna*), Xander van der Burgt and P  p   Haba concluded that this was due to the absence, or low frequency and low intensity, of dry-season fires. They further postulated that cliffs act as refuges for fire-sensitive species that used to be more widespread on (horizontal) sandstone bowal habitats, but which have now been eliminated from those habitats by human-managed fires for agriculture.

Since the exceptionally high conservation value of this location depends, it appears, on its remaining fire-free, it is a concern that livestock might be introduced, resulting in fires being set that can be expected to result in the extinction of rare and irreplaceable plant species. Protection of this location is a global priority, not just for this vegetative type but for the species-rich, pristine submontane forest that adjoins it.

Genus & species	Family	IUCN category	Unique to habitat
<i>Cailliella praerupticola</i>	Mela.	EN	±
<i>Gladiolus mariae</i> ined.	Irid.	EN	✓
<i>Melastomastrum</i> sp. nov.	Mela.	EN	✓
<i>Mesanthemum bennae</i>	Erioc.	CR	±
<i>Panicum</i> sp. nov.	Gram.	EN	✓
<i>Rhytachne perfecta</i>	Gram.	EN	±
<i>Virectaria pepehabai</i> ined.	Rub.	EN	✓

**Table 3:** Threatened species of high altitude sandstone bowal; point endemics of the pristine habitat at Kounoukan (fire free).

**Key:** ✓ = yes. IUCN category: see page 9. Unique to habitat: '±' also occur on sandstone bowal.

Genus & species	Family	IUCN category	Unique to habitat & to Guinea	Date last seen
<i>Andropogon incomptus</i>	Gram.	CR	✓	1956
<i>Cyanotis lourensis</i>	Comm.	EN	✓	1962
<i>Cyperus felicis</i>	Cyp.	EN	✓	
<i>Eriocaulon irregulare</i>	Erioc.	EN	✓	1962
<i>Eriosema adamii</i>	Leg.	CR	✓	1958
<i>Isachne guineensis</i>	Gram.	EN	✓	1956
<i>Mesanthemum tuberosum</i>	Erio.	VU	✓	
<i>Rhynchosia chevalieri</i>	Leg.	EN	Also Mali	1930

**Table 4:** 'Core' Fouta-Djallon (Mamou-Labé-Mali) endemics.

**Key:** ✓ = yes. IUCN category: see page 9.

Genus & species	Family	IUCN category	Core	Kindia	Kounounkan
<i>Cyanotis ganganensis</i>	Comm.	EN	✓	✓	
<i>Dichaetanthera echinulata</i>	Mela.	EN	✓		✓
<i>Dissotis splendens</i>	Mela.	EN	✓	✓	✓
<i>Droogmansia montana</i>	Leg.	EN	✓		✓
<i>Kotschya uniflora</i>	Leg.	EN	✓	✓	✓

**Table 5:** Threatened species of sandstone bowal found in 2 or more units of Fouta Djallon: 1) core; 2) Mambiya-Kindia; 3) Kounounkan

**Key:** ✓ = yes. IUCN category: see page 9.

## Microhabitats

- The horizontal bedding of the sandstone results in large flat areas with only a few centimetres of sand over the impervious solid rock below. In the wet season, these areas can be permanently wet, producing short statured grassland with specialist Cyperaceae and grasses, such as *Eragrostis gangetica* and *Fimbristylis striolata* mixed with threatened herbs such as *Mesanthemum tuberosum* (VU) and an unusual, hairy variant of *Raphionacme caerulea* (EN). These areas dry out completely after the rainy season, but small, lower areas can remain wetter for longer, having black, peaty soils with *Platycoryne paludosa*, *Fimbristylis schweinfurthiana*, and *Cyperus capillifolius*.
- On sloping ground, short vertical steps between the layers of bedrock are exposed, where the fissures between allow the rooting of trees such as *Dichaetanthera (Sakersia) echinulata*, *Ficus ellipticum*, and *Hymenodictyon floribundum*. The sessile form of *Afrotrilepis pilosa*, with its epiphytic *Polystachya microbambusa*, also grows on rock faces, together with *Cyanotis ganganensis* (EN).
- Near sills and surface blocks of sandstone, where there are deeper soils, lines of scattered shrubs and trees such as *Erythrocca chevalieri* can occur. Faults give rise to drainage lines supporting gallery submontane forest. The transition between this and sandstone bowal is thought to have supported threatened herbs, possibly *Bothriocline fruticosa* (EN) and *Echinops guineensis* (EN).

## Exploration levels

High-altitude sandstone bowal remains largely unsurveyed for plants in the Dubréka and Téliélé areas, and in the extensive area between Kindia and Kounounkan.

## Protection

No areas of this habitat are currently included in Protected Areas. The proposed Kounounka TIPA will include the 'Fire-free Kounounkan bowal-shrubland' habitat type, which contains the greatest concentration of globally unique species of high-altitude open sandstone habitats.

The proposed TIPA at Koba, near Dalaba, will include four threatened species, but only one (*Mesanthemum tuberosum*) of the eight threatened species only known in Guinea from the 'core' Fouta Djallon area (Mamou-Dalaba-Labé-Mali). The remaining seven do not occur in any of the proposed TIPAs, mostly because we have not yet succeeded in rediscovering them. Indeed, six of these species have not been recorded for 57-89 years and, therefore, given the decline in pristine habitats in this time, may be extinct. More efforts are needed to attempt to rediscover these species and then to protect them.

## Threats

Threats to species at high-altitude sandstone bowal are at first unexpected. Such bare, rocky substrates, with thin or no soils, seem to have little value for humanity and might therefore be expected to be passed by and remain undegraded. However, the skilful way in which these areas are deliberately burned in the dry season, in order to provide fresh grazing for livestock, appears to have had a devastating effect on the survival of the rarer unique species. This deduction is supported by two observations: 1. The area of this habitat currently known to be richest in rare endemic species, Kounounkan, is fire-free; 2. The areas most densely populated by humans, which are burnt every year, are where endemic species appear to have become extinct, not being found despite repeated searches in the last three years.

## Threatened Habitat 3: Low-Altitude Sandstone Bowal Grasslands

Areas below 500m altitude

### Conservation importance

At least 20 threatened plant species are found in low-altitude sandstone bowal. Most of these also occur on lateritic bowal and/or granite inselberg habitats (Table 1). Two other species are restricted to sandstone, but also occur at high-altitudes (Table 6), while others are restricted entirely to low-altitude sandstone bowal, of which seven are restricted to Mambiya-Kindia plateau (Table 7) (Cheek et al. 2016b).

### Distribution, quantification, and geology

Although Palaeozoic rocks at low altitude cover a large area of Guinée Maritime, most of these are Devonian siltstones rather than the Ordovician quartzitic sandstone known to host threatened and rare species (Map 3). Surveys are needed to verify that the Devonian rocks of the Boké region, which are so heavily exploited for bauxite, are indeed poor in threatened species. It is possible that threatened species do occur on such rocks – certainly bowal is present in large quantities – but that plant surveys have been insufficient to detect them.

### Recognition

Same as for high-altitude sandstone bowal (above).

## Microhabitats

Same as for high-altitude sandstone bowl (above), but with different species composition.

- Large flat areas with only a few centimetres of white sand are dominated by swards of the distinctive yellow grass, *Anadelphia chevalieri*, which is globally unique to the Mambiya-Kindia plateau. Intermixed with this and other grasses are a great diversity of herb species in the Leguminosae, Rubiaceae, and Scrophulariaceae. Additional threatened species are the grass *Anadelphia macrochaeta* (Gram.), and, epiphytic on *Afrotrilepis pilosa* (Cyp.) is *Plectranthus linearifolius* (Labiatae).
- Seepages and seasonal shallow pools host Lentibulariaceae, Xyridaceae, Droseraceae, Eriocaulaceae, and Cyperaceae. Among these are several small, very local, highly threatened species such as *Utricularia pobeguinii*, *Anadelphia pumila*, and *Scleria guineensis*, all of which are also unique to Mambiya-Kindia (Table 7). Additional more widespread threatened species are *Eriocaulon cryptocephalum*, *Eriocaulon sessile*, and *Mesanthemum albidum*, (all Eriocaulaceae), and *Raphionacme caerulea* (Apoc.)
- Rock sills and bare rocks host *Coleus* sp. nov. and *Cyanotis ganganensis*.
- At the base of cliffs, shrubs of *Keetia susu* (VU) and *Clerodendrum sylvae* (EN) occur.

Genus & species	Family	IUCN category	Occurs outside Guinea
<i>Digitaria patagiata</i>	Gram.	EN	Also, Senegal
<i>Schizachyrium radicosum</i>	Gram.	EN	Also, Senegal

**Table 6:** Threatened species of sandstone bowl – both high and low altitude.

**Key:** IUCN category: see page 9.

Genus & species	Family	IUCN category
<i>Anadelphia chevalieri</i>	Gram.	EN
<i>Anadelphia pumila</i>	Gram.	CR
<i>Clerodendrum sylvae</i>	Labi.	EN
<i>Coleus</i> sp. nov.	Labi.	EN
<i>Phyllanthus felicis</i>	Phyll.	CR(PE)
<i>Scleria guineensis</i>	Cyp.	CR
<i>Utricularia pobeguunii</i>	Lent.	EN

**Table 7:** Threatened species restricted to low-altitude sandstone bowl at Mambiya-Kindia (Grandes Chutes and Mt Gangan TIPAs).

**Key:** IUCN category: see page 9.

## **Exploration levels**

The Mambiya-Kindia plateau, at 400m alt., is unquestionably the richest documented area so far for threatened species of low-altitude sandstone bowal (Table 7). This may reflect easy access, since it is on the transnational highway that connects Conakry with both Mali and Ivory Coast. However, surveys of the whole plateau, which extends many tens of kilometres to the north and south, have been almost non-existent.

## **Protection**

The proposed Mt Gangan and Grandes Chutes TIPAs include the sites documented with greatest concentrations of threatened species of this habitat. Otherwise, none occur in the existing Guinea Protected Area network at present (2019).

## **Threats**

Ongoing and expanding bauxite mining in the Grandes Chutes area is a major threat to this habitat and its species. Fires to promote dry season grazing for livestock and resultant trampling are also a threat. Market gardening of crops, such as aubergines and tomatoes, is established on skilfully constructed mounds made of composted bowal vegetation scraped from the rock.

## Threatened Habitats 4–5: Lateritic Bowal Habitats

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Lateritic bowal habitats are also known as (and comprise of) ferralitic and bauxitic bowal, ferricretes, lateritic duricrusts, cuirasse, carapace, and ironstones.

### Conservation importance

Lateritic (mainly ferralitic) bowal habitat in Guinea hosts at least 57 threatened species, of which 27 are restricted to such habitats and 21 are endemic (unique) to Guinea (Tables 1, 8-11). These habitat types interface with other habitats, particularly woodland, wooded grassland, and submontane forest. Table 10 lists the 13 possibly globally extinct species of Guinean lateritic bowal.

### Distribution, quantification, and geology

Bowal is not unique to Guinea. It is widespread throughout West Africa and is known under many different names, such as 'cuirasse ferralitique', 'carapace ferralitique', 'iron hardpan', 'lateritic crust', 'cuirasse lateritique', and 'laterite hardpans', in addition to the terms given under the above title.

Within Guinea, we divide lateritic bowal into two classes based on altitude, using the 500m contour, as we have also for sandstone and forest habitats.

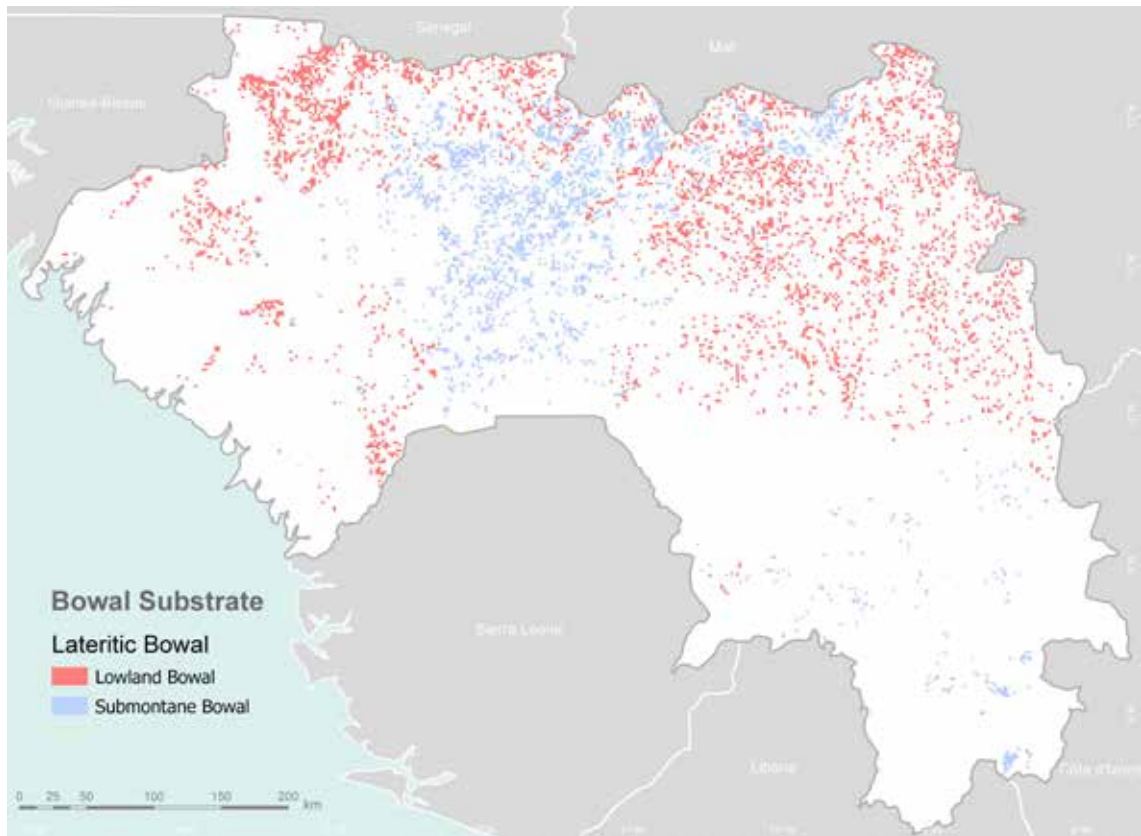
Lateritic (mainly ferralitic) bowal habitat is widely distributed in Guinea from west to east, north to south, and from the top of Mt Nimba to sea-level (Maps 6 & 7). Unlike sandstone bowal, lateritic (mainly ferralitic) bowal is not itself a bedrock but is formed from the degradation and reformation of several subsurface rock types, as a concretised surface layer that may be only two metres thick. The original sedimentary rocks from which lateritic bowal has been formed are predominantly of the Palaeoproterozoic era and were laid down 2,500-1,600 million years ago. They have since been weathered, leaving predominantly or almost purely iron oxide, with the other minerals having been leached away. Bauxitic bowal, in contrast, has higher levels of aluminium oxides and hydroxides in addition to iron oxides. Some colonial French biologists believed that ferralitic bowal in the Fouta Djallon of Guinea resulted from recent poor agricultural practices. This does not agree with the fact that many plant species are unique to this type of bowal in the Fouta Djallon, suggesting that it has existed for many thousands if not millions of years.

### Recognition

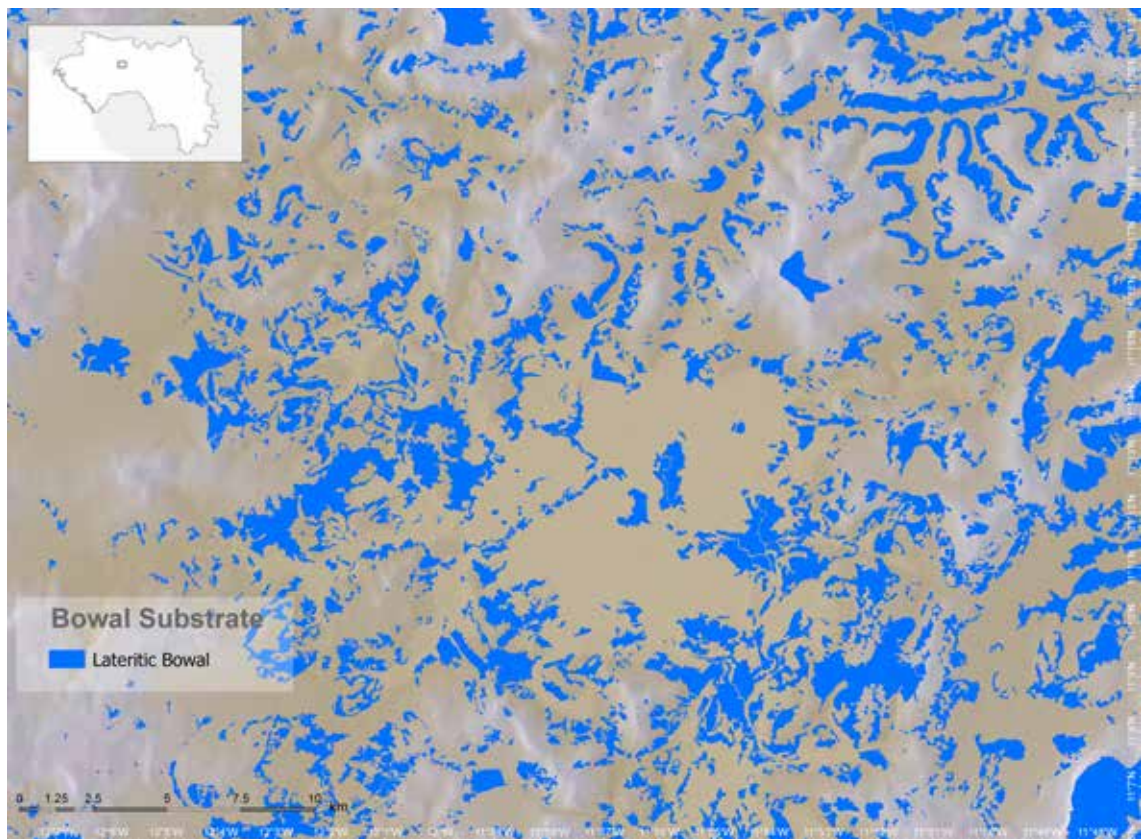
Due to its high iron content, lateritic (mainly ferralitic) bowal is bright orange-red at the surface, or immediately under the surface. It forms flat or gently sloping surfaces. The stones lack the layers that characterise sedimentary rock and the crystals that help characterise granite. Irregular blocks, resembling orange-red concrete, result when a hole is dug with a pick-axe. The lumps are pock-marked, rounded (not jagged), and often evidently formed of smaller stones cemented together. The surface can be covered in loose blocks of bowal, making walking or driving a car over difficult or impossible (e.g. Tougué Prefecture). However, in the Simbaraya-Madina Oula area, the surface of the bowal is so smooth that cars can be driven over it easily. Some bowal have a surface layer of rounded pebbles (pisoliths), others have none.

The fundamental definition of bowal habitat is the absence of trees. The roots of trees cannot penetrate through the surface hardpan, so they cannot establish. Commonly, in lateritic bowal during the wet season, if the iron layer is concretised the surface is covered with a thin layer of water. If a depth of soil builds up over the iron layer, or if the iron layer has fractures and fissures, tree roots can be supported, allowing woodland or forest to develop adjacent to the bowal, or as islands in the bowal. Lateritic bowal therefore often occurs mixed with woodland, forming a mosaic (Map 7). Schnell (1952a) gives some notes on Guinean ferricrete vegetation.

A unique indicator species of the ferralitic bowal of the Fouta Djallon, from high to low-altitude, is the strange labiate herb, *Aeollanthus paradoxus*. This species is almost universal to this habitat and it has numerous sites, so is not threatened. It cannot be confused with any other member of the labiate (mint) family in Guinea, because of its alternate, not opposite leaves.



**Map 6.** Lateritic bowal (including ferralitic) habitats in Guinea.



**Map 7.** Detail of lateritic bowal in northern Fouta Djallon.

Genus & species	Family	IUCN category	Altitude	Endemic to Guinea	Sandstone	Granite	Iron	Fouta Djallon	Loma-Man	If possibly extinct, year last collected
<i>Anadelphia trepidaria</i>	Gram.	VU	Both?	✓		✓	✓	✓		
<i>Ceropegia bracteolata</i>	Apoc.	EN	Both	Also, Nigeria		✓	✓	✓		
<i>Droogmansia chevalieri</i>	Leg.	EN	High	Also, S. Leone		✓	✓	✓	✓	
<i>Gladiolus praecostatus</i>	Irid.	VU	High	Also, S. Leone		✓	✓		✓	
<i>Habenaria jaegeri</i>	Orch.	EN	High	Also, S. Leone		✓	✓	✓	✓	
<i>Hypolytrum cacuminum</i>	Cyp.	EN	High	Also, S. Leone & Liberia		✓	✓		✓	
<i>Kotschyia lutea</i>	Leg.	VU	High	Also, S. Leone		✓	✓	✓	✓	
<i>Marsdenia exellii</i>	Apoc.	EN	Both			✓	✓		✓	
<i>Nemum bulbostyloides</i>	Cyp.	VU	High	Also, S. Leone		✓	✓		✓	
<i>Rhytachne glabra</i>	Gram.	VU	High	Also, S. Leone		✓	✓		✓	
<i>Xysmalobium samoritourei</i>	Apoc.	EN	High	Also, S. Leone		✓	✓		✓	

**Table 8:** Threatened species of lateritic bowal which also occur on granite inselbergs.

**Key:** ✓ = yes. IUCN category: see page 9. Altitude: Low =<500m; High =>500m.

## Threatened Habitat 4: High-Altitude Lateritic Bowal

Above 500m altitude

### Conservation importance

Forty-three threatened species occur in high-altitude lateritic (mainly ferralitic) bowal, of which 17 are endemic to Guinea (Tables 1, 8, & 10). Sixteen of these 43 occur in both parts of the Guinea Highlands, while most threatened species occur either in one or the other. In the Fouta Djallon, 26 species occur on ferralitic bowal at high-altitude, of which 12 are endemic, but at least 5 of these have not been found for seventy or more years (Tables 8-11).

High-altitude ferralitic bowal is only known in West Africa in the Guinea Highlands. In the Loma-Man Highlands, 23 threatened species occur in highland ferralitic bowal habitat. None of these occur in the Fouta Djallon, and 11 appear to be endemic to the Loma-Man mountains, the vast majority being unique to the Nimba range, world-famous for both its ferralitic habitats and its high level of plant diversity and endemism. Many of the endemic species are not widespread across bowal but restricted to small areas.

### Distribution, quantification, and geology

The high-altitude lateritic bowal of the Fouta Djallon (Maps 2, 6, & 7) is often locally referred to simply as 'bowal' or 'bowé', since sandstone bowal is distinguished as '*kapété*'. It is generally flat or gently sloping, sometimes with surface rocks. It covers large areas of the 'core' Fouta Djallon area and is particularly common around Dalaba and Boulivel, reaching 1200m alt. In contrast, sandstone bowal is restricted to the Pita area and the western part of the Fouta Djallon.

The high-altitude bowal of the Loma-Man Highlands is much smaller in total area (Map 6). It is mainly confined to the steeply sloping free-draining ridges, above the submontane forest of the Nimba and Simandou ranges (reaching 1,752m and 1,658m respectively). It appears to be absent from the Loma Mts and Tingi Hills, and from Mt Ziama. A small outcrop occurs on Mt Bero. It is often referred to as 'submontane grassland' or 'ferralitic mountain grassland'. The bowal of the ridge tops of Nimba and Simandou, unlike those of other locations, are formed over deep iron-rich rocks of sedimentary origin, making these attractive for iron-ore mining, depending on the purity of the iron.

## Recognition

See details for lateritic bowal in general, above.

## Microhabitats

For many threatened species of this habitat the microhabitat is unknown. These species are now possibly extinct, since they have not been found in the last 70 years, despite searching. Older records, which are all that are available for such species, generally have little metadata. Often just 'bowé' is indicated.

- Flat, well-drained surfaces, dominated by sparse grasses, such as *Schizachyrium djalonicum*, interspersed with rare, fire-resistant or pyrophytic, usually tuberous perennial herbs, such as *Vernonia djalonenis*, *Rhytachne glabra*, and *Eriosema triformum*.
- Shallow basins with shallow water in the wet season (*Kotschya micrantha*, *Nemum bulbostyloides*).
- Transition zones with woodland (*Barleria asterotricha*) or submontane forest (*Kotschya lutea*, *Lipotriche tithonioides*).
- Shaded rock overhangs or crevices (*Begonia quadrialata* subsp. *nimbaensis*).

Genus & species	Family	IUCN category	Altitude	Endemic to Guinea	Sandstone	Granite	Iron	Fouta Djallon	Loma-Man	If possibly extinct, year last collected
<i>Barleria asterotricha</i>	Acan.	CR	High	✓			✓	✓		
<i>Begonia quadrialata</i> subsp. <i>nimbaensis</i>	Beg.	EN	High	Also, Liberia			✓		✓	
<i>Bidens occidentalis</i>	Comp.	EN	High	✓			✓	✓		1954
<i>Ctenium sesquiflorum</i>	Gram.	EN	High	✓			✓	✓		1949
<i>Drimia sudanica</i>	Hyac.	EN	High	Also, S. Leone & S. Sudan			✓	✓	✓	1905
<i>Emilia djalonenis</i>	Comp.	CR(PE)	High	✓			✓	✓		1913
<i>Eriosema latencola</i>	Leg.	EN	High	✓			✓	✓		1937
<i>Eriosema triformum</i>	Leg.	CR	High	✓			✓		✓	
<i>Kotschya micrantha</i>	Leg.	VU	High	✓			✓	✓	✓	
<i>Microglossa caudata</i>	Comp.	CR(PE)	High	✓			✓	✓		1905
<i>Osbeckia porteresii</i>	Mela.	EN	High	Also, Iv. Coast & Liberia			✓		✓	
<i>Tephrosia djalonica</i>	Leg.	CR(PE)	High	✓			✓	✓		1907
<i>Vernonia djalonenis</i>	Comp.	CR	High	✓			✓	✓		

**Table 9:** Threatened species unique to Guinean high-altitude lateritic bowal (>500m alt.), occurring either in Fouta Djallon or Loma-Man.

**Key:** ✓ = yes. IUCN category: see page 9. Altitude: Low =<500m; High =>500m.

Genus & species	Family	IUCN category	Altitude	Last seen in Guinea	Location/Prefecture
<i>Anadelphia funerea</i>	Gram.	EN	Low	1937	Kouria-Trebeleya & Linsan
<i>Bidens occidentalis</i>	Comp.	EN	High	1954	Timbo, Mali, Trebeleya
<i>Bulbostylis bodardii</i>	Cyp.	EN	Both	1948	Diaguissa, Dalaba
<i>Ctenium sesquiflorum</i>	Gram.	EN	High	1945	Ditinn-Diaguissa
<i>Cyanotis scaberula</i>	Comm.	EN	Low	1937	Linsan-Kouroussa
<i>Drimia sudanica</i>	Hyac.	EN	High	1905	Labé
<i>Echinops guineensis</i>	Comp.	EN	Both	1954	Beyla, Mt Loura
<i>Emilia djalonenis</i>	Comp.	CR(PE)	High	1913	Haut Dalaba
<i>Eriosema latericola</i>	Leg.	EN	High	1937	Kolenté, Mamou & Timbo
<i>Indigofera pobeguinii</i>	Leg.	CR	Low	1904	Kouroussa
<i>Sporobolus pauciflorus</i>	Gram.	CR	Low	1947	Mt Nimba, base of
<i>Tephrosia djalonica</i>	Leg.	CR(PE)	High	1907	Timbo to Ditinn

**Table 10:** Possibly extinct plant species of Guinean lateritic bowal: where and when last recorded.

**Key:** IUCN category: see page 9. Altitude: Low =<500m; High =>500m.

## Exploration levels

High-altitude lateritic bowal was relatively well explored in the colonial period. However, further botanical survey is likely to find additional species new to science, such as the recent discovery of *Eriosema triformum* at Simandou.

## Threats

In Loma-Man, the main threat to the ferralitic submontane grassland is open-cast iron ore mining at Nimba and Simandou. Although surfaces with less pure ore will not be mined, undoubtedly many rare species will be very negatively impacted. For example, *Eriosema triformum* (CR) is predicted to lose 50% of its population at its single location as a result of iron ore mining.

In the Fouta Djallon, artificial fires and associated grazing may account for the disappearance over the last 70 years, perhaps for eternity, of 12 species (Table 10). Additionally, some rare species, such as *Vernonia djalonenis* (CR) which has reduced from three locations to one, face additional threats, such as habitat conversion for house building.

## Protection

Part of Nimba is contained in a Biosphere Reserve, but otherwise no high-altitude bowal habitat is protected. Additional TIPAs are proposed at Nimba and Simandou. Meanwhile, in the Fouta Djallon part of the Bowal Tankon has been evidenced as a TIPA, mainly due to the presence of *Vernonia djalonenis*.

## Threatened Habitat 5: Low-Altitude Lateritic Bowal

Below 500m altitude

### Conservation importance

Twenty-eight threatened plant species are documented from lowland lateritic bowal, of which 16 are unique to it, while 12 species also occur on either sandstone and/or granite and/or at high-altitude (Tables 1, 8, & 11). These numbers are lower than for the less extensive high-altitude lateritic bowal. This probably reflects that low-altitude lateritic bowal is widespread in West Africa. In fact, all but five of the 12 uniquely low-altitude bowal species also occur in neighbouring countries, especially Senegal, Guinea-Bissau, Sierra Leone, and Ivory Coast where there are also significant areas of this habitat.

Nonetheless, five species unique to lowland bowal are endemic to Guinea. These are a special concern for conservation since four have not been refound for over 70 years. These are, with dates last recorded: *Indigofera pobeguinii* (1904), *Cyanotis scaberula* (1937), *Sporobolus pauciflorus* (1947), and *Anadelphia funerea* (1937).

### Distribution, quantification, and geology

Low-altitude lateritic bowal is widespread throughout Guinea, particularly surrounding the Fouta Djallon highlands, but also through Haute Guinée near the border with Mali, on the plains between Linsan and Sierra Leone, and on the lower slopes of Nimba (Map 6). Its geological origin, reformed from decomposed Palaeoproterozoic rocks, forming a mostly ferralitic, concrete-like layer over the surface, is as seen in high-altitude bowal in the Fouta Djallon. Although neighbouring countries in West Africa, eastwards to Nigeria and the Central African Republic, also have some low-altitude lateritic bowal, Guinea has the largest area of this habitat.

### Recognition

Low-altitude lateritic bowal is recognised by flat, treeless areas usually with hard, orange-red substrate. In the wet season, it supports grassland with grasses only 30-120cm tall due to the very shallow soil. Grasslands developing in areas where woodland has been cleared are denser and taller, well over 1.5m, due to the deeper soils. Species composition also differs.

Bowal usually is bordered by woodland. Where bowal is cracked, tree roots can penetrate, supporting woodland trees. In the wet season, a thin film of water is often present on the surface due to the impermeable substrate. In the dry season the dead grass is burnt leaving a bare scorched surface.

### Microhabitats

The grasslands include Gramineae that are specialised and rare. In one 25mx25m plot at Santiguiya, the following were recorded: *Anadelphia macrochaeta* (VU), *Anadelphia trispiculata*, *Andropogon chinensis*, *Andropogon perligulatus*, *Dilophotriche occidentalis* (VU), and *Rhytachne gracilis*.

- Shallow drainage channels characterised by conspicuous *Dopatrium senegalense*.
- Shallow ponds or lakes, usually seasonal. *Nymphoides guineensis* (EN), *Cyperus lateriticus* (EN), *Lepidagathis epacridea* (EN), *Bacopa lisowskiana* (EN), and *Chlorophytum immaculatum* (VU) are among the threatened species recorded from seasonal swamps or lakes on lateritic bowal. These species do not extend over the whole range of lowland bowal but are confined to parts of it and are usually rare within these small ranges.
- Transition zones with adjacent habitats. *Rungia (Justicia) eriostachya* (NT) is a spectacular herb that is confined to the interface of open lowland bowal and woodland.

## Exploration levels

Lowland bowal has not been comprehensively botanically surveyed and new species gradually continue to be discovered, such as *Bacopa lisowskiana* (EN) in 1994.

## Protection

This threatened habitat is not known to be in any current Guinean Protected Area (2019). However, it may occur in Haut Niger National Park. It is included in one proposed TIPA at Simbaraya, East of Kindia.

## Threats

Since this habitat is so widespread and common, there appears little risk that it will be lost. Areas are exploited for supplying the construction industry with road-building and house-building materials. Other areas are at risk of removal of the bowal carapace to access minerals below for mining. The priority is not to protect all lowland bowal, just those small scattered areas with threatened species, such as in Mandiana Prefecture, a site for *Lepidagathis epacridea* (EN).

Genus & species	Family	IUCN category	Altitude	Endemic to Guinea	Sandstone	Granite	Iron	If possibly extinct, date last collected
<i>Anadelphia funerea</i>	Gram.	EN	Low	✓			✓	1937
<i>Bacopa lisowskiana</i>	Plant.	EN	Low	Also, Mali			✓	
<i>Chlorophytum immaculatum</i>	Anth.	VU	Low	Also, Senegal, Mali & S. Leone			✓	
<i>Cyanotis scaberula</i>	Comm.	EN	Low	✓			✓	1937
<i>Cyperus lateriticus</i>	Cyp.	EN	Low	Also, Senegal			✓	
<i>Dissotis linearis (Argyrella)</i>	Mela.	EN	Both	✓	?		✓	
<i>Indigofera pobeguinii</i>	Leg.	CR	Low	✓			✓	1904
<i>Indigofera scarcesii</i>	Leg.	VU	Low	Also, Mali & G. Bissau	?		✓	
<i>Lepidagathis chevalieri</i>	Acan.	VU	Low	Also, G. Bissau & Senegal			✓	
<i>Lepidagathis epacridea</i>	Acan.	EN	Low	Also. Mali & Iv. Coast			✓	
<i>Lipotriche felicis</i>	Comp.	EN	Low	Also, Mali			✓	
<i>Nymphoides guineensis</i>	Meny.	EN	Low	Also, S. Leone			✓	
<i>Polycarpha pobeguinii</i>	Cary.	EN	Low	Also, Burkina & Senegal	✓		✓	
<i>Sporobolus pauciflorus</i>	Gram.	CR	Low	✓			✓	1947

**Table 11:** Threatened species of low-altitude (<500m) lateritic bowal in Guinea.

**Key:** ✓ = yes. IUCN category: see page 9. Altitude: Low =<500m; High =>500m.

## Threatened Habitat 6: Granite Inselbergs

Known as 'Fanyi' by the Susu people

### Conservation importance

Inselbergs are outcrops of granite rock, usually isolated from other mountain or hill formations. They can be domed or flat. In the dry season, inselbergs are dry and appear lifeless. Yet, in the wet season, they host diverse plant species, including several that are threatened (Couch et al. 2014). *Feliciadamia*, one of only four genera globally unique to Guinea, is only found on one inselberg, Mt Konoussou, near Guéckédou. Similarly, *Loudetiopsis baldwinii* is unique to the Macenta inselberg; however, despite searches it has not been seen since 1947 and may be extinct. In total, 33 threatened species are known from granitic inselbergs, of which four are unique to granite alone (Table 12). The remainder also occur on sandstone and/or lateritic bowal (Tables 1 & 8).

Genus & species	Family	IUCN category	Unique to habitat	Also on sandstone	In Protected Area	TIPA
<i>Bryaspis humulariodes</i>	Leg.	EN	✓			✓
<i>Feliciadamia stenocarpa</i>	Mela.	CR	✓			✓
<i>Loudetiopsis baldwinii</i>	Gram.	CR(PE)	✓			✓
<i>Osbeckia praviantha</i>	Mela.	EN	✓			✓

**Table 12:** Threatened Guinean species unique to granite inselbergs (see also Tables 1 & 8). None of these species currently occurs in a Protected Area in Guinea.

**Key:** ✓ = yes. IUCN category: see page 9.

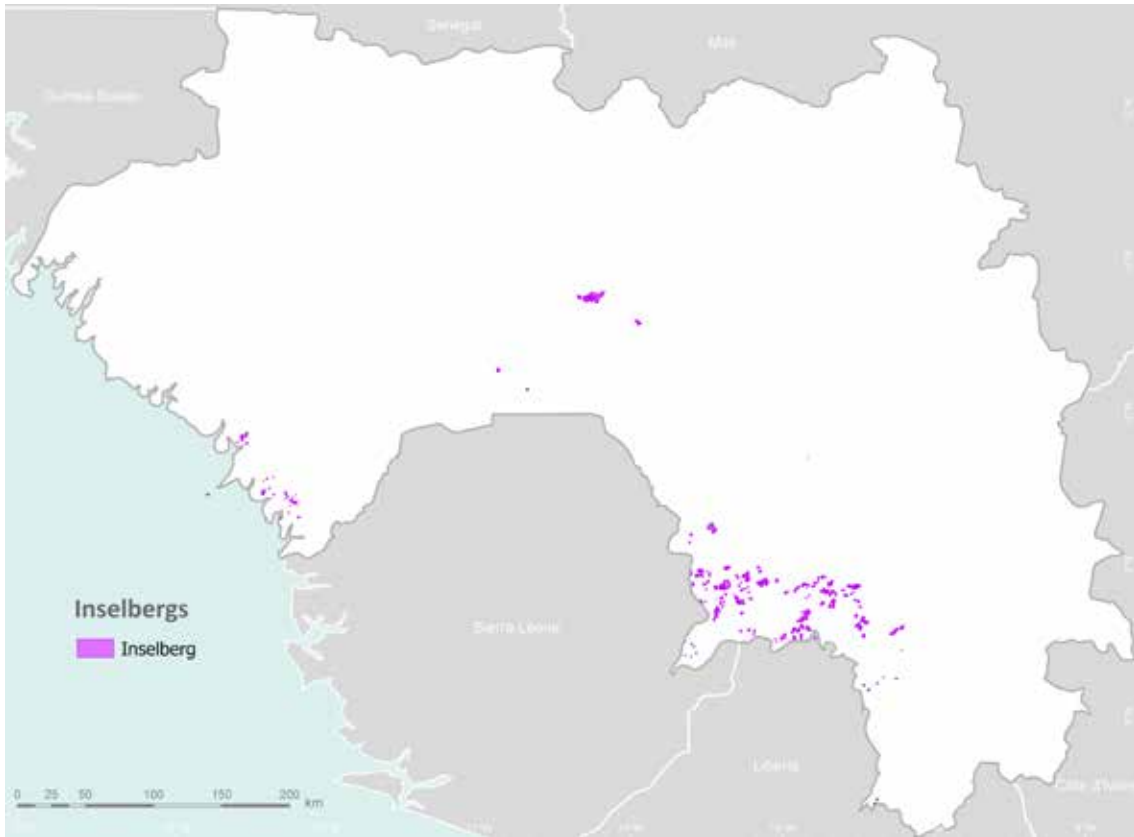
### Distribution, quantification, and geology

In Guinea, inselbergs are predominantly found in two zones (Map 8): the coastal zone stretching from Forécariah to Dubréka, where there is a mix between flat and small dome inselbergs (Couch et al. 2014); and in Guinée Forestière, around the Guéckédou and Macenta areas, where the inselbergs are the largest, most numerous, and dense in Guinea (Map 9). This is also where there are much higher dome inselbergs, such as Mt Konoussou at over 1300m altitude. Further inselbergs appear near Mamou and Dabola (Map 8).

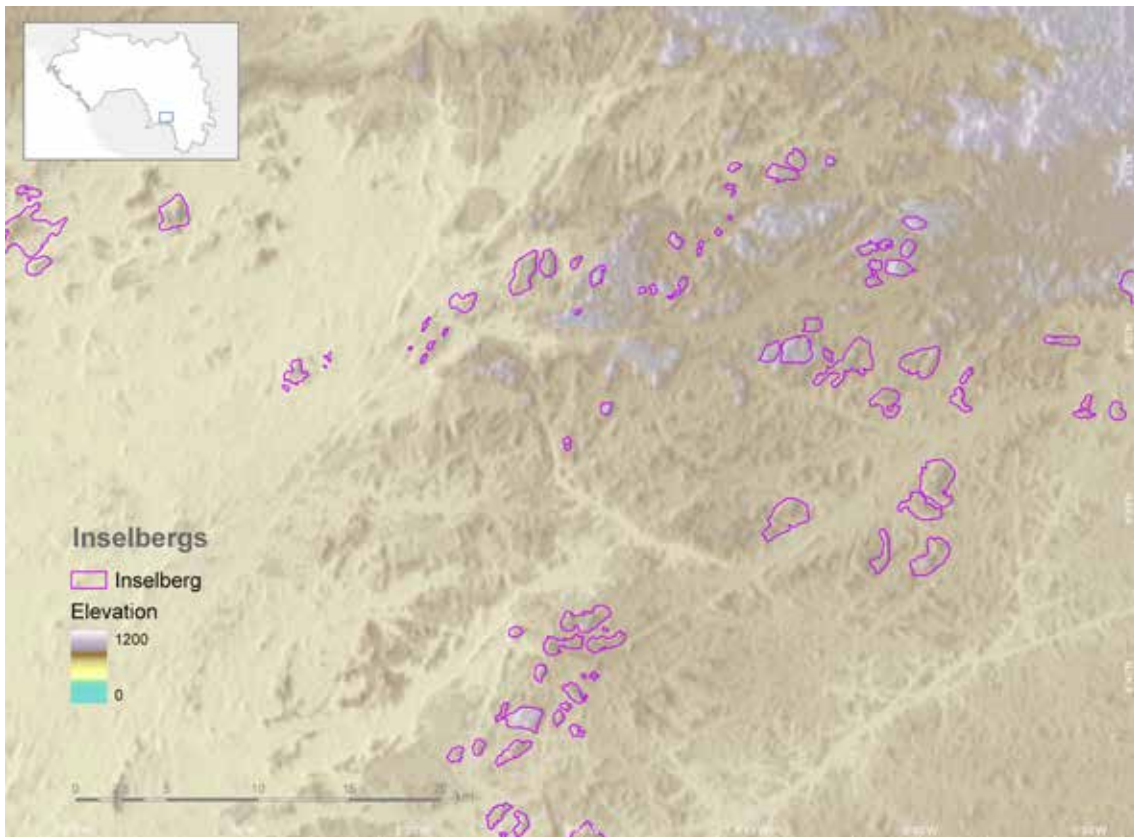
The total area of inselbergs documented in Guinea is 317.15 km<sup>2</sup>. Inselbergs also occur in Sierra Leone, where they are just as numerous, if not more so. Formed underground from molten igneous rock rising from the depths, granitic inselbergs are only exposed over time by the erosion of softer rocks above. In Sierra Leone, Mt Loma, the highest point of the Guinea Highlands geographic area, is made of granite. Granite outcrops occur in the Ziama ridge; however, most individual inselbergs in Guinea occur at low altitude, below 500m. Some also occur at sea-level, in the sea itself. They usually occur in clusters.

### Recognition

Inselbergs are usually smoothly rounded in shape with slopes that, although steep, can be walked or scrambled up. In Forécariah, they can be flat and at the same level as the surrounding habitat, while in Dubréka, they can be steep-sided domes. The granite is crystalline, usually pale grey with black flecks. Two indicator species are: 1. *Afrotrilepis pilosa* (aerial stemmed variant), growing on slopes in colonies; 2. *Dilophotriche tristachyoides*, a grass that is dominant on flat areas.



**Map 8.** Granitic inselbergs in Guinea.



**Map 9.** Detail of granitic inselbergs in Guékédou-Macenta area.

## Microhabitats

According to Porembski et al. (1994), there are up to nine microhabitats present on inselbergs in West Africa. The following species characterisations are taken mainly from the coastal inselbergs of Forécariah.

### – Cryptogamic crust

Exposed rock surfaces, covered in a range of slippery red-black algae in the wet season. In the dry season the algae curls up. *Afrotrilepis* seedlings may establish in this organic matrix.

### – Drainage channels

Found in steeply sloping areas with fast-moving current in shallowly to deeply-eroded channels in rock. Plant species infrequent (e.g. *Utricularia rigida*, a fast-flowing water specialist).

### – Rock crevices

Linear cracks, extending vertically down into the inselberg, offer deeper rooting for numerous species of larger (1m tall) perennial herbs or small trees. In most other open inselberg microhabitats, the herbs are only 5-30cm tall and annual. Species present include some inselberg specialists (e.g. *Hibiscus scotellii* (NT)), but also many widespread, non-specialist and weedy species (e.g. *Melochia melissifolia* var. *bracteosa*). A few shrubs of woodland (e.g. *Annona senegalensis*, *Lannea* sp.) and forest edge (e.g. *Hymenocardia lyrata*) can also establish in these cracks. Boulder fall areas also accumulate deeper soils and so can have the same species.

#### Species present:

*Annona senegalensis*  
*Aspilia helianthoides* subsp. *ciliata*  
*Brachiaria villosa*  
*Calopogonium mucunoides*  
*Ceropegia deightonii*  
*Chamaecrista absus*  
*Chamaecrista mimosoides*  
*Desmodium linearifolium* (NT)  
*Hildegardia barteri* (tree)  
*Hibiscus scotellii* (NT)  
*Hymenocardia lyrata* (shrub)  
*Indigofera deightonii* subsp. *deightonii*  
*Kinghamia angustifolia*  
*Melochia melissifolia* var. *bracteosa*  
*Merremia pinnata*  
*Plectranthus monostachyus*  
*Polygala rarifolia*  
*Spermacoce bambusicola*  
*Tephrosia nana*  
*Vigna luteola*  
*Vigna venulosa*  
*Virectaria multiflora*

#### Rare species:

*Feliciadama stenocarpa* (CR) (Mt Konossou)  
*Raphionacme caerulea* (EN) (coast)

### – Rock pools and gnammas

Permanently wet, eroded depressions in inselberg. Some are shallow pan gnammas (10cm deep), with generalised wetland species (e.g. *Dopatrium senegalense*, *Xyris anceps*, and *Nymphaea* sp.). Others are deeper (60-150cm) steep-sided armchair gnammas in slopes, from which plant species are absent (but amphibians present).

#### Species present:

*Desmodium* cf. *salicifolium*  
*Dopatrium senegalense*  
*Nymphaea lotus*  
*Nymphaea micrantha*  
*Xyris anceps*

– **Flat depressions**

Flat areas at top of inselberg, with 90-100% cover of the specialist grass, *Loudetiopsis tristachyoides* (30-60cm tall). Other species are rare and occasional (e.g. *Polygala sparsiflora* (NT), *Scleria robinsoniana* (NT), and (rarely) *Raphionacme caerulea* (EN)). Often borders with *Afrotrilepis* mats on raised, better-drained areas (see below).

**Species present:**

*Loudetiopsis pobeguinii*  
*Loudetiopsis tristachyoides*  
*Oldenlandia corymbosa*  
*Polygala sparsiflora* (NT)  
*Scleria robinsoniana* (NT)  
*Sporobolus infirmus*

**Rare species:**

*Loudetiopsis baldwinii* (CR) (Macenta)  
*Mesanthemum albidum* (VU)  
*Raphionacme caerulea* (EN)

– **Afrotrilepis mats**

Dominating well-drained, raised or sloping areas with 90-100% cover of *Afrotrilepis* tussocks, with stems 15-20cm tall, forming black root mats on rock, which may support herbs. After burning, regenerating or dead *Afrotrilepis* areas may be densely colonised by *Cyanotis* or other herbaceous species. *Afrotrilepis* trunks can support specialised epiphytes (e.g. *Polystachya microbambusa*) and species such as *Plectranthus linearifolius*, which root into the *Afrotrilepis* vegetation mats, or are also epiphytic.

**Species often present:**

*Afrotrilepis pilosa*  
*Cyanotis lanata*  
*Polystachya microbambusa*  
*Scleria* cf. *tricholepis*  
*Sporobolus infirmus*

**Rare species:**

*Plectranthus linearifolius* (EN)

– **Flushes**

Sloping gradually, with a film of slow-moving water in the wet season. Outer margins often bordered by *Loudetiopsis tristachyoides*. Species-diverse. Scattered annual herbs 5-15cm tall.

**Species present:**

*Brachiaria villosa*  
*Bryaspis lupulina*  
*Bulbostylis* sp.  
*Cyanotis lanata*  
*Cyperus capillifolius*  
*Desmodium linearifolium*  
*Drosera indica*  
*Eragrostis unioloides*  
*Eriocaulon pulchellum*  
*Lindernia schweinfurthii*  
*Mesanthemum albidum* (VU)  
*Nemum spadiceum*  
*Neurotheca loeselioides*  
*Oldenlandia herbacea*  
*Panicum (lindleyana) tenellus*  
*Panicum griffonii*  
*Scleria* cf. *tricholepis*  
*Sporobolus infirmus*  
*Utricularia micropetala*  
*Utricularia subulata*  
*Utricularia tortilis*  
*Xyris filiformis*

- **Belt forest**

Forest encircling the base of the inselberg (like a belt). Species composition can vary, depending on where the inselbergs are found. Near the coast this can include mangrove species: *Elaeis guineensis*, *Allophylus africanus*, *Cassipourea congoensis*, *Dialium guineense*, *Azelia africana* (VU), *Margaritaria discoidea*, *Sterculia tragacantha*, *Trichilia prieureana*, *Uvaria chamae*, and *Warneckea fascicularis* var. *fascicularis*.

- **Inselberg forest**

Deep basins within the inselberg can support lowland evergreen or semi-deciduous forest (see Guinée Maritime lowland forest habitat), with several conservation priority species. At one inselberg in coastal Guinée with such forest, the canopy of *Guibourtia copallifera* is dense and intact. The shrub layer is dominated by *Uvariopsis tripetala*, a specialised inselberg species. The ground layer is dominated (above ground only in the wet season) by *Stylochaeton pilosus* (EN).

## Exploration levels

Inselbergs in the mangrove areas of Forécariah are the most intensively surveyed in Guinea. Those in Dubréka are less well studied. Except for Mt Wokou, Macenta, and Mt Konoussou near Guéckédou, the Guéckédou-Macenta cluster are almost unstudied apart from brief and incomplete studies by us and by Porembski et al. (1994), as are those at Dabola-Mamou.

## Protection

Currently no inselbergs are included in Protected Areas in Guinea (2019). The following inselbergs are proposed as TIPAs (Part 2):

- Mt Konoussou, Guéckédou (*Feliciadamia stenocarpa*)
- Moofanyi Inselbergs, Forécariah
- Mt Wokou, Macenta (*Loudetiopsis baldwinii*)
- Tonkoyah Inselberg Complex, Forécariah

## Threats

Inselbergs are highly threatened by infrastructure and construction projects. This is because they are formed of granite. When crushed, this is an important component of concrete used for large buildings, for dam walls, and for road construction. Inselbergs near port or rail construction sites, mining projects, major roads, and near to cities are at high risk. Quarrying has already started at several inselbergs; we observed one that totally disappeared within 24 months for construction of a port.

## Threatened Habitat 7: Waterfalls and Rapids

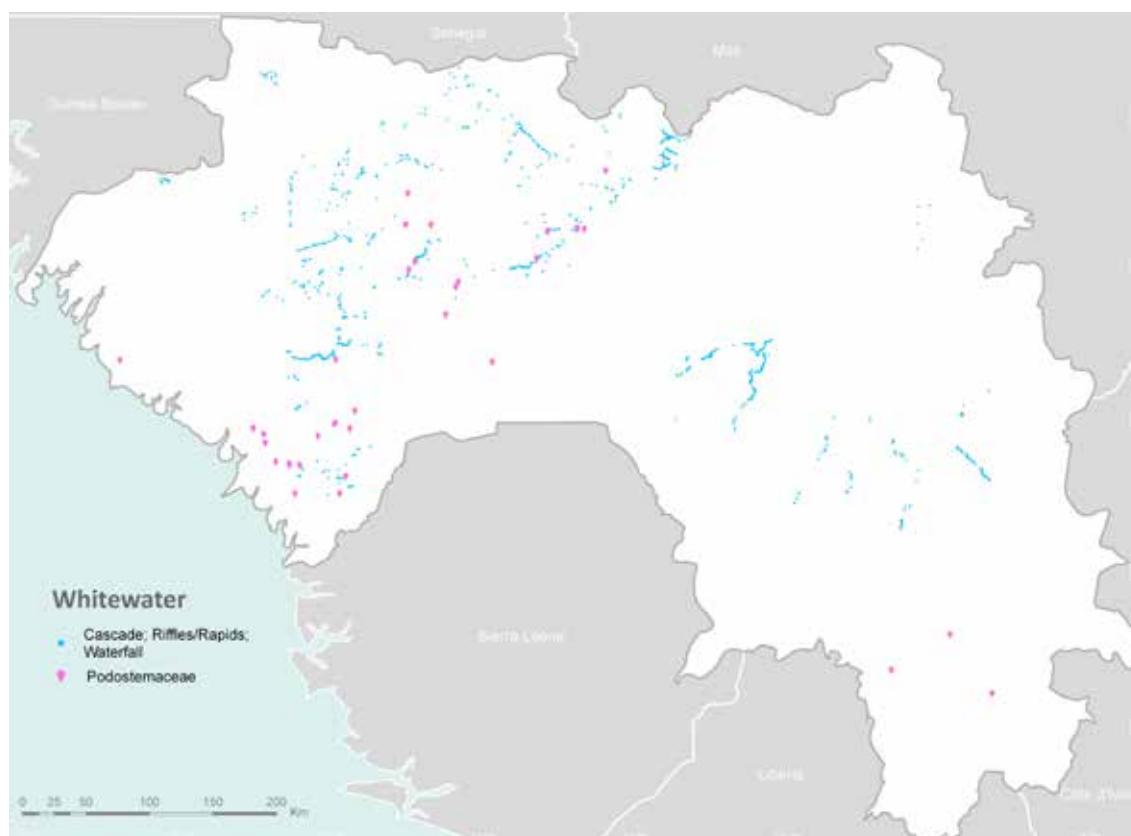
### Conservation importance

Waterfalls and rapids (white water) contain highly developed, if often sparse and inconspicuous, plant species that grow in no other habitat. These plants are adapted to both fast-flowing water and to large seasonal changes in flow. Many species are confined to short sections of river systems or even individual waterfalls. It appears that a higher proportion of waterfall species are threatened with higher levels of extinction than species in any other habitat in Guinea. Sixteen of the 20 threatened species of this habitat have an extinction risk category of Endangered (EN) or Critically Endangered (CR). Three of the CR species are also classed as Possibly Extinct (PE). These are single-site endemics now apparently extinct at their sole former sites.

Podostemaceae are the most species-diverse family in this habitat. Sixteen threatened species are documented in Guinea so far (Table 13), together with four species in other families.

### Distribution, quantification, and geology

We have documented 33 points where waterfall plants have been recorded in Guinea (Map 10). This habitat is distributed almost throughout Guinea, wherever clear water streams or rivers (not turbid or brown rivers such as the Niger) descend over rock from higher altitudes, causing the water to become aerated. The Fouta Djallon, also known as the 'water tower of West Africa', gives rise to the rivers with the greatest number of threatened waterfall plants. The rivers Bafing, Konkouré, Kolenté, and their tributaries all contain threatened species. The Loma-Man highlands also contains threatened waterfall species, such as *Inversodicraea pepehabai* at Ziama, Sérédou. Waterfall plants are most diverse on sandstone and granitic rock, less so on ferralitic rocks.



**Map 10.** Waterfalls and rapids in Guinea, showing known Podostemaceae records.

## Recognition

Waterfalls and rapids are easily recognised most of the year, but less so in the late dry season when river flows can greatly reduce or cease completely. In this period, most waterfall species dry out and die, surviving as seed until the next wet season when they re-establish and grow underwater, flowering and fruiting later when exposed by falling water levels from November to March. The following perennial shrubs indicate rapids and falls: *Rotula aquatica* (Lythraceae) and, less frequently, *Gnidia kraussiana* (Thymeleaceae), and *Karima scarciesii* (Euphorbiaceae). *Tristicha trifaria* is also a good indicator of this habitat, specifically for Podostemaceae; unusually for a Podostemaceae, this species is universal in both rapids and waterfalls and is not threatened.

## Microhabitats

Within a waterfall or set of rapids, different species often occupy different niches. Among the Podostemaceae at one waterfall, small stemless species such as *Saxicolella futa* grow high up the river banks and are exposed and flower in November. Larger species, such as *Macropodiella macrothyrsa* and *Ledermanniella guineensis*, grow deep in the river, have stem and leaves 1m long, and may not flower until they are exposed in February or March. Shrubby rheophytes, such as *Rotula*, grow in the river bed at the base of rocks, not on the tops of solid rocks like Podostemaceae.

## Exploration levels

Our knowledge of waterfall species is growing rapidly. In 2018, six species of Podostemaceae were discovered in Guinea for the first time, five of which were new to science. Many waterfalls and rapids in Guinea remain to be visited by botanists. West of the line from Mamou to Pita is a large area with waterfalls that have never been studied. Similarly, the Loma-Man Highlands of Guinea are very poorly studied for such plants. The Tinkisso, Moa-Makona, Niandan, Gambie, Kogon, and Tinguilinta are all examples of substantial river catchments which appear never to have been studied for their waterfall plants.

## Protection

Apart from *Inversodicraea pepehabai* (Ziama Biosphere Reserve), *Impatiens nzoana* (Nimba World Heritage Site) and *Macropodiella garrettii* (proposed Moyen-Bafing National Park), all other 17 threatened waterfall species are not currently in a Protected Area (2019). However, all but three species (including *Inversodicraea pygmaea* (CR(PE))) are encompassed by proposed TIPAs (Table 13).

<b>Genus &amp; species</b>	<b>Family</b>	<b>IUCN category</b>	<b>Unique to Guinea?</b>	<b>Protected Area</b>	<b>TIPA</b>
<i>Eriocaulon sulanum</i>	Eriocaul.	EN	Also, S. Leone		✓
<i>Impatiens bennae</i>	Balsam.	CR	✓		✓
<i>Impatiens nzoana</i>	Balsam.	EN	✓	✓	✓
<i>Inversodicraea harrisii</i>	Podost.	VU	Also, S. Leone		✓
<i>Inversodicraea abbayesii</i>	Podost.	CR(PE)	✓		✓
<i>Inversodicraea koukoutamba</i>	Podost.	CR	✓		✓
<i>Inversodicraea pepehabai</i>	Podost.	EN	✓	✓	✓
<i>Inversodicraea pygmaea</i>	Podost.	CR(PE)	✓		
<i>Inversodicraea tassing</i>	Podost.	EN	✓		✓
<i>Lebbiea grandiflora</i>	Podost.	CR	Also, S. Leone		✓
<i>Ledermanniella guineensis</i>	Podost.	EN	✓		
<i>Macropodiella garrettii</i>	Podost.	VU	Also, S. Leone	✓	✓
<i>Macropodiella macrothyrsa</i>	Podost.	CR	✓		
<i>Saxicolella denisiae</i>	Podost.	CR	✓		
<i>Saxicolella futa</i>	Podost.	EN	✓		✓
<i>Stonesia fascicularis</i>	Podost.	CR(PE)	✓		✓
<i>Stonesia gracilis</i>	Podost.	EN	Also, S. Leone		
<i>Stonesia heterospathella</i>	Podost.	VU	Also, S. Leone		✓
<i>Stonesia taylorii</i>	Podost.	EN	✓		✓
<i>Utricularia tetraloba</i>	Lentib.	VU	Also, S. Leone		✓

**Table 13:** Threatened species of waterfalls and rapids in Guinea. Thirteen of the 20 species are unique to Guinea. Hydroelectric projects are the principal threat. In 2019, only three species are in Protected Areas.

**Key:** ✓ = yes. IUCN category: see page 9.

## Threats

Hydroelectric projects are a major threat to waterfall species in Guinea because they are sited at waterfalls and environmental impact assessments usually ignore waterfall plants. *Inversodicraea pygmaea* is considered likely to be globally extinct due to the construction of the hydroelectric dam at Grandes Chutes, Kindia. Local extinctions have occurred of three other species, and more can be expected in the future.

## Threatened Habitat 8: Lowland Evergreen Forest

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Below 500m altitude

### Conservation importance

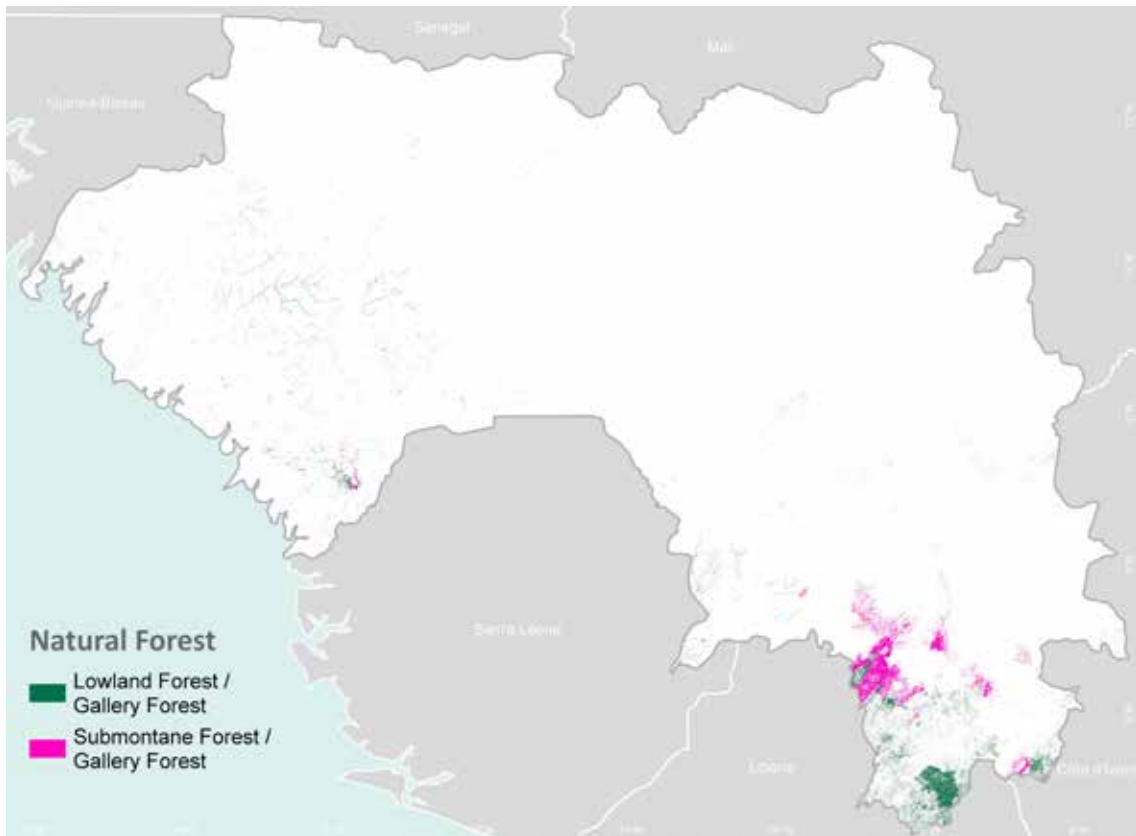
The tiny surviving fragments of original and intact lowland evergreen forest in Guinea are of high conservation importance. Thirty-six species of threatened plants have been recorded (excluding widespread West African timber species), of which three are endemic to Guinea (Tables 14 & 15). Over the centuries, most of Guinea's original forests have been cleared for agriculture. Sayer et al. (1992) calculate that 96% of the original forest has been lost. This is probably an underestimate. The interfaces of forest that formerly existed with other habitats, such as woodland and submontane forest, have now almost entirely been lost. Instead, small islands of forest, severely fragmented, are all that remain. It is especially important to protect these and the threatened species that they contain.

### Distribution

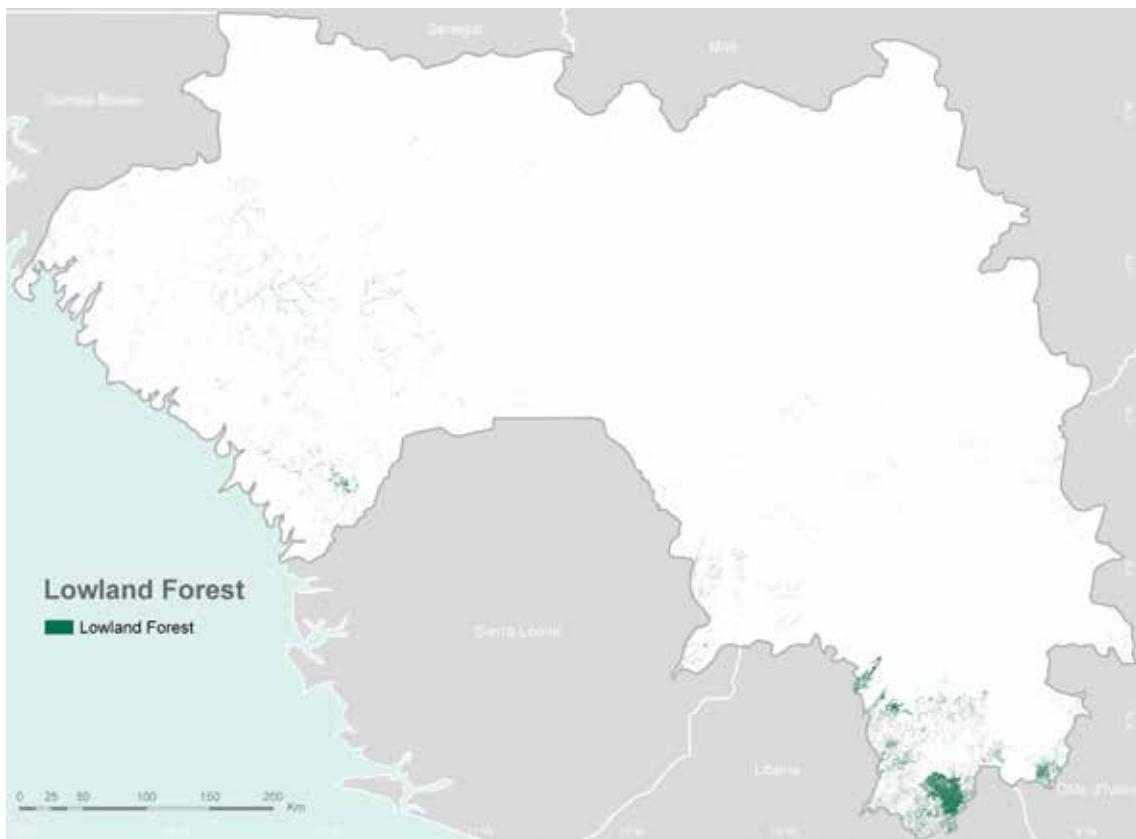
The main areas in which lowland evergreen forest formerly occurred, and where some remnants remain, are Guinée Maritime and Guinée Forestière (Maps 11 & 12).

Guinée Maritime has a high annual rainfall of 3.8m per annum (at Conakry). The minimum rainfall required to support rainforest (evergreen lowland forest) is approximately 2m per annum. Guinée Maritime does have a dry season of six months, so much of the long-lost original forest may have been semi-deciduous rather than evergreen. Losses of forest have been so extensive along the coast of Guinea, and over such a long period, that some widespread coastal forest species that occur from west (Senegal) to east (Sierra Leone, Liberia), such as *Guibourtia leonensis*, have never been recorded in Guinée Maritime, even by the earliest collectors of Guinean plants in the 19<sup>th</sup> century (Heudelot). The largest patch of surviving lowland evergreen forest in Guinée Maritime is undoubtedly that at Kounoukan, but this is unprotected and is being cleared.

In Guinée Forestière rainfall levels are lower than on the coast (c. 2m per annum), but the dry season is much shorter (only 2-3 months at Nzérékoré), which favours evergreen forest. The largest block of lowland evergreen forest remaining in Guinea is that of Diécké, just west of Nzérékoré. The other important patches are those of Ziama and Simandou. Fragments also remain at Béro.



**Map 11.** Surviving original forest in Guinea.



**Map 12.** Lowland forest of Guinée Maritime and Guinée Forestière, including gallery forest.

Genus & species	Family	IUCN category	G. Maritime	G. Forestière	Endemic to Guinée	Also submontane	Possibly extinct (year last collected in Guinea)
<b>G. Maritime &amp; G. Forestière</b>							
<i>Cola angustifolia</i>	Sterc.	EN	✓	✓	Also, S. Leone & Liberia	✓	
<i>Copaifera salikounda</i>	Leg.	VU	✓	✓	Also, east to Ghana	✓	
<i>Homalium smythei</i>	Flac.	VU	✓	✓	Also, Liberia, S. Leone & Iv. Coast	✓	
<i>Neolemonniera clitandrifolia</i>	Sapo.	VU	✓	✓	Also, Senegal to Nigeria	✓	
<i>Tarenna brachysiphon</i>	Rub.	EN	✓	✓	Also, S. Leone & Liberia	✓	
<i>Tarenna hutchinsonii</i>	Rub.	CR	✓	✓	Also, S. Leone & Liberia		
<i>Tessmannia baikieaoides</i>	Leg.	VU	✓	✓	Also, S. Leone to Iv. Coast		
<i>Vepris felicis</i>	Rut.	CR	✓	✓	Also, S. Leone & Liberia		
<b>G. Maritime</b>							
<i>Apodiscus chevalieri</i>	Euph.	EN	✓		Also, Liberia & Ghana		
<i>Baphia heudelotiana</i>	Leg.	VU	✓		Also, S. Leone		
<i>Cola lorougnonis</i>	Sterc.	EN	✓		Also, Iv. Coast		1954
<i>Dactyladenia smeathmannii</i>	Chry.	EN	✓		Also, S. Leone & Liberia		
<i>Diospyros feliciana</i>	Eben.	EN	✓		✓	✓	
<i>Gilbertiodendron tonkolili</i>	Leg.	EN	✓		Also, S. Leone		
<i>Keetia susu</i>	Rub.	EN	✓		✓		
<i>Landolphia macrantha</i>	Apoc.	VU	✓		Also, S. Leone		
<i>Mostuea adamii</i>	Log.	EN	✓		Also, S. Leone & Iv. Coast		
<i>Phyllanthus profusus</i>	Phyll.	VU	✓		Also, east to Ghana		1907
<i>Strychnos melastomatoides</i>	Log.	VU	✓		Also, S. Leone & Gabon		
<i>Stylochaeton pilosus</i>	Arac.	EN	✓		Also, S. Leone		
<i>Talbotiella cheekii</i>	Leg.	EN	✓		✓		
<b>G. Forestière</b>							
<i>Allophylus samoritourei</i>	Sapi.	EN		✓	Also, Liberia	✓	
<i>Cassia aubrevillei</i>	Leg.	VU		✓	Also, Liberia & Iv. Coast		
<i>Cassia fikifiki</i>	Leg.	EN		✓	Also, Liberia & Iv. Coast		
<i>Gilbertiodendron bilineatum</i>	Leg.	VU		✓	Also, east to Ghana		
<i>Heteradelphia paulojaegeria</i>	Acan.	EN		✓	Also, Iv. Coast & S. Leone		1949
<i>Heterotis sylvestris</i>	Mela.	EN		✓	Also, Liberia	✓	
<i>Ritchiea afzelii</i>	Capp.	CR		✓	Also, S. Leone		1899
<i>Tricalysia faranahensis</i>	Rub.	VU		✓	Also, S. Leone, Iv. Coast & Liberia	✓	

**Table 14:** Lowland evergreen forest threatened species of Guinée Maritime and Guinée Forestière (excluding widespread timber species).

**Key:** ✓ = yes. IUCN category: see page 9.

## Recognition

Forest is characterised by a continuous tree canopy that is closed by 80% or more. Trees are generally not less than 8m tall, and mostly 20-30m tall. In lowland forest most of the trees keep their leaves throughout the year, while in drier forest types some of the evergreen trees are leafless in the dry season (semi-deciduous forest). Evergreen forest is characterised by high diversity of forest trees, with no single species dominating or characterising. The exceptions are the Caesalpinoid legume trees, now known as Detarioids, which can form monodominant patches or stands, and which are conspicuous in the forest remnants of Guinée Maritime (e.g. *Guibourtia copaillifera*, *Talbotiella cheekii*), but which are less usual in Guinée Forestière.

Forest can be confused with 'Forêt-Claire' (dense woodland), which appears similar due to the dense, tall trees, sometimes with a canopy cover approaching 80%. However, these habitats are two completely different vegetation types. Tree species of 'Forêt-Claire' are those that occur also in wooded grassland. They are fire-resistant and able to resprout when cut back to the ground, either for timber or by fire. Tree species of forest cannot do this, with few exceptions.

### Forest-derived fallow thicket

Large areas in Forécariah Prefecture are blanketed in a dense impenetrable thicket 2-4m tall. Emerging from this at scattered intervals may be 15-25m tall oil palms. Sometimes these areas are interpreted as forest, especially by those using aerial or satellite images. In fact, they are farm fallows. Formerly, perhaps centuries ago, they were forest which was cut. Following clearing and planting with crops, a small subset of forest species regrows, over as much as ten years, acquiring nutrients which will later be released for a crop by slashing and burning. As this cycle is repeated, woodland species are favoured and have colonised from the drier hinterland, since they are fire adapted, unlike most forest species. These dense thickets have only a small fraction of the conservation value of the original forest habitat that they replace. If left uncleared for centuries, they might regain more of the characteristics of the original forest but would lack the threatened species they formerly contained.

### Village forest

In Guéckédou, Macenta, and Nzérékoré Prefectures of Guinée Forestière, many villages appear to be surrounded by their own belts of forest in a landscape that is otherwise deforested and farmed. Although they resemble forest, these areas comprise useful species, including non-native tree species that provide fruit, such as mangos, timber for house construction, and other products. The number of tree species is far lower than in original forest, and threatened species (unless timber species known to be useful), are absent. Similar village forests (but arranged in straight lines) are found in Guinée Maritime (e.g. Ile de Kabak), along the crests of low ridges. These areas appear not to have direct importance for conservation of threatened species and for this reason have not been included in our map of lowland forest.

### Guinée Maritime lowland forest

Given the differences in rainfall quantity and pattern, it is to be expected that the remaining forest patches of Guinée Maritime have a different species composition to those of Guinée Forestière. Those forests that survive in Guinée Maritime are probably not representative of what formerly existed because forests on deeper soils, better for agriculture, were likely preferentially cleared compared with those on shallow, bouldery soils, less immediately useful for agriculture.

In all, thirteen threatened species occur in the forest habitat of Guinée Maritime which are unknown in Guinée Forestière. As is to be expected, many of these species occur in the maritime forests of adjoining Sierra Leone, and eastwards to Liberia (e.g. *Apodiscus chevalieri* (EN), *Dactyladenia smeathmannii* (VU), and *Gilbertiodendron tonkolili* (EN)). However, a surprising number are not only unique to the forests of Guinée Maritime, but also, within them, frequent or even common, and so uniquely characteristic. These are *Baphia heudelotiana* (VU – one record in Sierra Leone), *Keetia susu* (VU), and *Talbotiella cheekii* (EN).

### Guinée Forestière lowland forest

In addition to the ten threatened species shared with the Guinée Maritime forest fragments, Guinée Forestière forest contains a further eight species which are not shared with the maritime area. All these eight threatened species also occur in closely adjoining parts of Liberia, Ivory Coast, and/or Sierra Leone. This number is expected to rise with further botanical prospection and identification. Monodominant detaroid legume forests are almost absent here, despite being so common in the maritime forest fragments.

### Microhabitats

So little forest remains, and that which does is so incompletely studied, that it is difficult to recognise and characterise different subtypes and microhabitats of lowland forest today in Guinea, apart from gallery forest (see below).

#### – Swamp forest

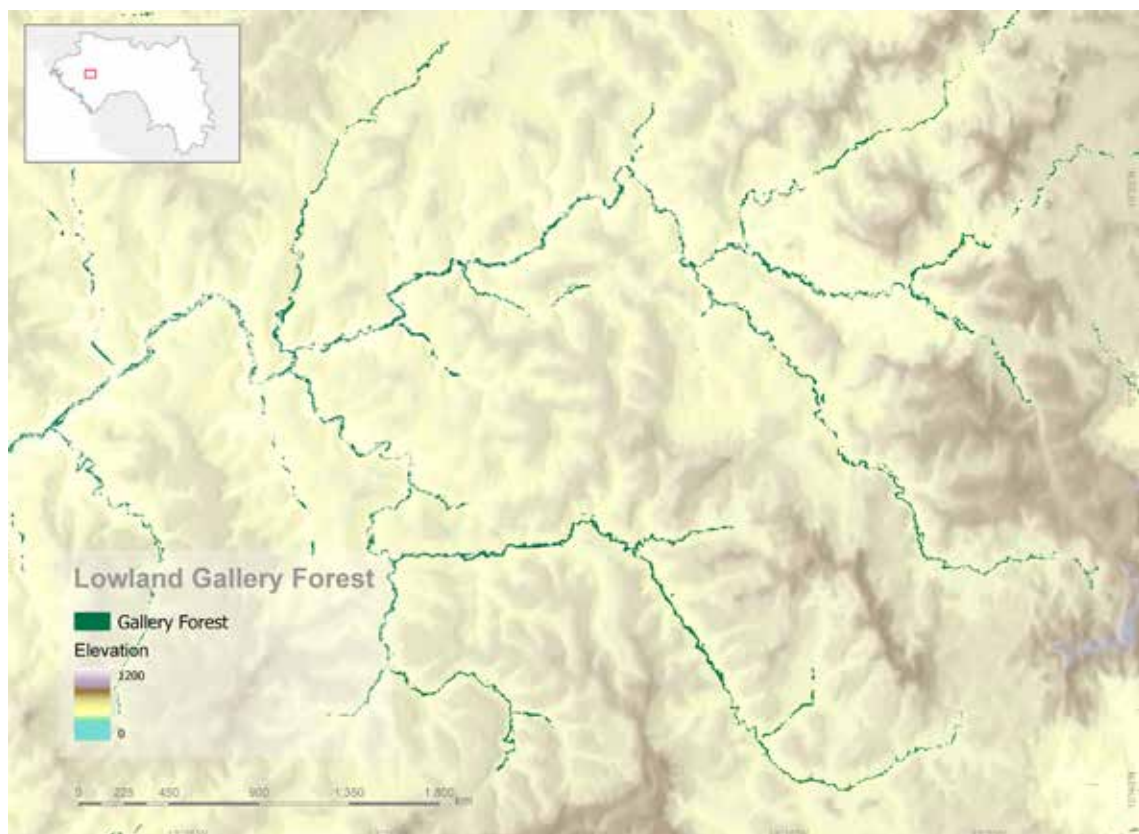
Dominated by trees of *Mitragyna stipulosa* and *Uapaca* spp., swamp forests have been converted into rice fields, with the loss (and possible Guinean extinction) of threatened species that appear to have been restricted to them, such as *Heteradelphina paulojaegeri* (EN). This species was last recorded in Guinea in 1949. It may yet survive in Sierra Leone or Ivory Coast, where it has also been recorded historically, although not in recent years.

#### – Semi-deciduous forest

*Triplochiton scleroxylon*, an indicator of semi-deciduous forest throughout West Africa, occurs in the lowland Banko forest in the western fringes of the Pic de Fon Forêt Classée (Classified Forest). However, that part of the forest has been heavily impacted by farms.

#### – Gallery forest

Flanking rivers along their banks and sustained by this water at their roots, gallery forest composed of evergreen forest species penetrates far into woodland, wooded grassland, and bowal areas, such as in Haute Guinée, where lowland forest is otherwise completely absent or rare (Map 12).



Map 13. Detail of lowland gallery forest in Guinée Maritime.

In areas of forest in Guinée Maritime and Guinée Forestière, that were cleared long ago, historically trees were left along the river banks creating artificial gallery forest (Map 13). Some species which are unique to gallery forest occur in Guinea, are apparently specialised to riverside habitats. Those which are threatened are detailed below (Table 15). These species have not been found in forest away from rivers. Sadly, the practice of preserving forest trees along river banks is not now maintained as before. Such is the demand for charcoal and land for cultivation that it is not unusual for trees to be cut to the water's edge.

Genus & species	Family	IUCN category	G. Maritime	G. Forestière	Endemic	Also submontane
<i>Anubias gracilis</i>	Arac.	VU	✓	✓	Also, S. Leone	✓
<i>Dialium pobeguinii</i>	Leg.	VU	✓		Also, S. Leone	
<i>Napoleonaea alata</i>	Lecy.	VU	✓	✓	Also, S. Leone & Liberia	
<i>Placodiscus riparius</i>	Sapi.	VU	✓	✓	Also, G. Bissau to Liberia	
<i>Pseudoprosopis bampsiana</i>	Leg.	VU	✓		Also, S. Leone & Liberia	

**Table 15.** Threatened Guinean species of lowland gallery forest.

**Key:** ✓ = yes. IUCN category: see page 9.

## Exploration levels

Despite their proximity to the coast, the forest fragments of Guinée Maritime remained largely unexplored until 2012. This is evidenced by the significant number of discoveries made in this habitat since that time. New records of rare species previously unknown to Guinée (e.g. *Tarenna hutchinsonii* and *Stylochaeton pilosus*) and new species to science unique to Guinée (e.g. *Keetia susu* and *Talbotiella cheekii*) have resulted. More are set to follow if botanical surveys of these fragments continue before they disappear.

Surveys of lowland forest in Guinée Forestière, initiated earlier (mainly in connection with environmental impact assessments for the mining industry), have also discovered the first records in Guinée for many West African forest species that previously had their north-western limit in Sierra Leone. The number of new species to science discovered in this habitat has been low (e.g. *Allophylus samoritourei*). However, more exploration, especially at Zياما near the border with Sierra Leone, is likely to result in further discoveries. There is also the hope of rediscovering the long-lost species from Beyla area (*Ritchiea afzelii* (CR) and *Heteradelphina paulojaegeria* (EN)) that have not been seen since the early 20<sup>th</sup> century.

## Threats

The surviving forest of Guinée, which is less than 4% of its original extent, is hugely threatened by ongoing clearance for agriculture, timber extraction, and to a lesser extent by open-cast mining. The need for protection and local community engagement is great and urgent.

## Protection

Currently, none of the maritime forest fragments are included in a Protected Area, but Kounounkan, Kakiwondi, Tassing, and Gbélén are proposed TIPAs which include this habitat.

In Guinée Forestière, lowland forest areas are protected by inclusion in the Nimba and Zياما Biosphere Reserves, which are also proposed as TIPAs. The forests of Mts Béro, Pic de Fon, and Diécké are additionally also proposed as TIPAs. Of these, the most crucial for protection is the forest of Diécké, in view of its high number of threatened species, and since it is by far the largest single block of surviving lowland forest in Guinea.

## Threatened Habitat 9: Submontane Forest

Above 500m altitude

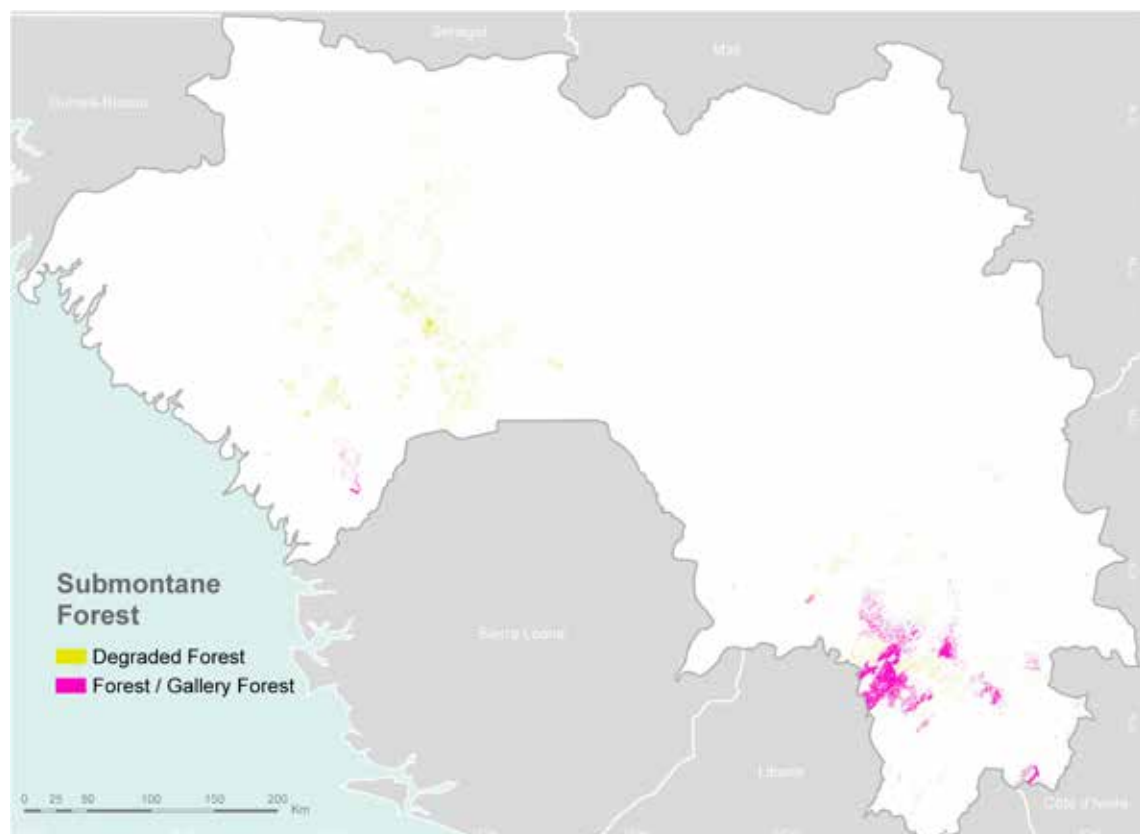
### Conservation importance

Also known as 'cloud forest', 'elfin forest', or 'moss forest', submontane forest in Guinea contains (or contained) at least 20 globally threatened plant species, all but five of which are restricted to the Guinea Highlands. Four of these species may now be extinct, since they have not been refound in the last 50 years or more, and because their natural habitat, submontane forest, has been removed or heavily degraded at the only sites where they were recorded (Table 16).

### Distribution

The Guinea Highlands or 'Guinée Dorsale' are aligned northwest-southeast and are arranged like a figure of eight (Map 2). The northwest portion falls entirely in Guinée and is known as the Fouta Djallon. It is found in Guinée Maritime and Moyenne Guinée. The geological basis of these mountains is discussed in the earlier sections covering sandstone and lateritic bowal habitats (Threatened Habitats 1-5).

Most of the former submontane forest of the Fouta Djallon has either been cleared or so heavily modified that it has little conservation value, apart from that at Kounounkan. The southeast portion of the Guinea Highlands mostly occurs in Guinée Forestière, including Mts Simandou, Béro, Tetini, Kourandou, Ziama, Nimba, and Yonon. The highest point is Mts Loma, in northern Sierra Leone, and the easternmost part of the mountains, including Mt Tonkui, is in the western part of Ivory Coast, near Man. This portion is known as the Loma-Man Highlands (Map 2). Most of the surviving submontane forest of Guinea is found here (Maps 11 & 14)



**Map 14.** Surviving pristine and degraded submontane forest in Guinea

## Recognition

Submontane forest is distinguished from lowland forest by its shorter stature, which usually diminishes with increased altitude, reduced soil depth, and increased exposure to winds. It has high abundance of epiphytic bryophytes, which can be pendulous, festooning tree branches and capturing moisture from clouds (horizontal precipitation).

Submontane forest has also much higher biomass and diversity of vascular epiphytes, particularly orchids, compared with lowland forest. There is no abrupt transition from lowland to submontane forest; it is a gradual transition, so the decision as to which contour divides these two vegetation types is somewhat subjective. In central Africa, the 800m altitude contour is often used, yet we have found that characteristic species of submontane forest in Guinea descend below this altitude, so we have used the 500m contour.

In terms of species composition, numerous (but not all) lowland species extend into submontane forest and form much (if not most) of its biomass. First amongst these is *Parinari excelsa*, a lowland forest species widespread in tropical Africa, which can become characteristic and subdominant in submontane forest. For this reason, White (1983) characterised this habitat as 'Upland *Parinari excelsa* forest in West Africa ... not high enough to support distinct Afromontane communities, although a number of Afromontane species occur, mixed with lowland elements ...'. White additionally suggested that the Guinea Highlands had 'very few endemic species'. In fact, there are 34 species that fit the description of either Afromontane or Afro-submontane and/or endemic (Tables 16-19). Ten of these 34 species (Table 17) also occur in the Cameroon Highlands, far to the east, and several continue to the mountains of East Africa.

A further four species (Table 18) are restricted to the Guinea Highlands and are uniquely characteristic of its submontane forest. In Loma-Man most (sometimes all) of these four species can be found in intact submontane forest patches of any size. In Fouta Djallon where intact submontane forest has been almost eliminated, occasional individuals of these species can still be found. They are useful indicators since they are distinctive and not likely to be confused with other species. Because they are known from more than ten locations each, none of these four has been assessed as threatened.

A further four species are also recorded in both Fouta Djallon and Loma-Man Highlands, but these are assessed as threatened, being much rarer and possibly locally extinct in the 'core' Fouta Djallon (they have not been refound in recent years). Sixteen further threatened submontane forest species have been documented (Table 16). These are more restricted in their ranges and occur either in Fouta Djallon (4 species) or the Loma-Man Highlands (12 species).

Genus & species	Family	IUCN category	Fouta Djallon	Loma-Man	If possibly extinct, year last collected	Endemic to Guinea?
<b>Guinea Highlands wide threatened submontane forest species</b>						
<i>Keetia futa</i>	Rub.	CR	✓	✓		✓
<i>Pavetta leonensis</i>	Rub.	EN	✓	✓		Also, S. Leone
<i>Psychotria samoritourei</i>	Rub.	VU	✓	✓		Also, Liberia & S. Leone
<i>Rinorea djalonensis</i>	Viol.	EN	?	✓	1949	Also, Liberia & S. Leone
<b>Fouta Djallon threatened submontane forest species</b>						
			<b>Locations recorded in Guinea</b>			
<i>Agelanthus guineensis</i>	Loran.	CR(PE)	Mali: Mt Loura		1956	✓
<i>Clematis kakoulimensis</i>	Ranun.	CR	Kakoulima		1945	✓
<i>Sabicea bracteolata</i>	Rub.	CR(PE)	'core' Fouta		1956	✓
<i>Ternstroemia guineensis</i>	Ternst.	EN	Kounounkan			✓
<b>Loma-Man threatened submontane forest species</b>						
<i>Begonia quadrialata</i> subsp. <i>nimbaensis</i>	Beg.	EN	Nimba			Also, Liberia
<i>Brachystephanus jaundensis</i> subsp. <i>nimbanae</i>	Acan.	VU	Ziama, Nimba, Macenta			Also, Iv. Coast
<i>Brachystephanus oreacanthus</i>	Acan.	VU	Bero, Simandou			Also, Cameroon
<i>Cassipourea adamii</i>	Rhizoph	EN	Ziama, Nimba			✓
<i>Cola reticulata</i>	Sterc.	VU	Nimba			Also, Ghana & Iv. Coast
<i>Dorstenia astyanactis</i>	Mor.	VU	Ziama, Nimba, Simandou			Also, Iv. Coast & Cameroon
<i>Glenniea adamii</i>	Sapind.	VU	Nimba			Also, Liberia
<i>Gymnosiphon bekensis</i>	Burm.	VU	Simandou			Also, Cameroon to Congo
<i>Gymnosiphon samoritoureanus</i>	Burm.	EN	Simandou, Ziama, Nimba			Also, Liberia
<i>Isoglossa dispersa</i>	Acan.	VU	Bero, Simandou			Also, S. Leone
<i>Justicia jamisonii</i>	Acan.	EN	Nimba			Also, Iv. Coast & Kenya
<i>Mikaniopsis camarae</i>	Comp.	CR	Ziama			✓

**Table 16.** Threatened plant species of Guinean submontane forest.

**Key:** ✓ = yes. IUCN category: see page 9.

Genus & species	Family	Fouta Djallon	Loma-Man	Cameroon Highlands	E. Africa
<i>Brucea antidysenterica</i>	Sim.	✓	✓	✓	✓
<i>Cassine (Mystroxyylon) aethiopica</i>	Cela.	✓		✓	✓
<i>Croton macrostachyus</i>	Euph.		✓	✓	✓
<i>Ensete (gilletii) livingstonianum</i>	Musa.	✓	✓	✓	✓
<i>Ilex mitis</i>	Aquif.		✓	✓	✓
<i>Maesa lanceolata</i>	Myr.	✓	✓	✓	✓
<i>Nuxia congesta</i>	Stilb.	✓	✓	✓	✓
<i>Olea capensis</i> subsp. <i>macrocarpa</i>	Oleac.		✓	✓	✓
<i>Peddiea fischeri</i>	Thym.	✓	✓	✓	✓
<i>Syzygium staudtii</i>	Mela.		✓	✓	

**Table 17.** Indicator species of Guinea Highlands submontane forest. Africa-wide submontane and montane species in the Guinea Highlands.

**Key:** ✓ = yes.

Genus & species	Family	Likely IUCN category	Fouta Djallon	Loma-Man
<i>Eugenia leonensis</i>	Myrt.	NT	✓	✓
<i>Monanthes nimbana</i>	Annon.	NT	✓	✓
<i>Trichilia djaloni</i>	Meliac.	NT	✓	✓
<i>Uapaca chevalieri</i>	Phyll.	NT	✓	✓

**Table 18.** Indicator species of Guinea Highlands submontane forest. Guinea Highlands wide endemic submontane forest species.

**Key:** ✓ = yes. IUCN category: see page 9.

### Fouta Djallon submontane forest

Submontane forest with threatened species has all but been eliminated from the 'core' Fouta Djallon area that extends from Mamou, north to Dalaba, Pita, Labé, and Mali. Those forest reserves that survive, such as the Tinka Forêt Classée (Classified Forest) near Dalaba, have been heavily managed for forest products and appear to have lost the higher-level threatened species that they probably once possessed. Efforts to rediscover such species as *Sabicea bracteolata* (CR(PE)) and *Agelanthus guineensis* (CR(PE)), both globally unique to the core Fouta Djallon, and *Keetia futa* (EN), have so far failed (Table 16).

The few submontane forest species that have been re-found in recent years were in small gallery forests or rare marginal areas. The 'core' Fouta Djallon has been so highly managed for agricultural productivity, for so long, that several rare species may have become extinct. Mont Kakoulima near Conakry, home to *Clematis kakoulimensis* (CR), is also heavily degraded. Searches to rediscover this species at its only known location in 2018 also failed. Kounoukan is the only location in the Fouta Djallon where intact submontane forest with threatened species has been found.

## Loma-Man submontane forest

In contrast with the Fouta Djallon, the Loma-Man Highlands hold several intact submontane forests and has 12 threatened species found nowhere else in Guinea (Table 16). About half of these were first discovered since 2006, when botanical studies linked with prospective iron ore mines at Nimba and Simandou began. Ziama, Nimba, Pic de Fon (Simandou), and Mts Béro are the principal locations of submontane forest in Guinean Loma-Man, but Tetini and Kourandou also have gallery submontane forest. In all cases these forests are on steep slopes which are uninhabited by humans. Consequently, unlike the submontane forests of Fouta Djallon, they are pristine for the most part.

## Microhabitats

Microhabitats are not conspicuous within submontane forest in Guinea, but communities can be distinctive. Two remarkable ones are:

### Community A: Mass-flowering Acanthaceae

At Mts Béro and Pic de Fon (Simandou) two (sometimes three) species of threatened Acanthaceae flower en-masse in the understorey during November to March, dominating large areas. The two key species are *Brachystephanus oreacanthus* (VU) and *Isoglossa dispersa* (VU).

### Community B: Achlorophyllous mycotrophic communities

In small areas of Pic de Fon and Ziama forests, several species with this lifestyle occur together: *Gymnosiphon samouritoureanus* (EN), *G. bekensis* (VU), *G. longistylus*, *Burmannia congesta*, and *Sebaea oligantha*.

Altitudinal zonation is expected and detectable. *Nuxia congesta* and other tropical African-wide montane species are not found below 1,000m altitude and appear to be more frequently encountered towards the summits of mountains (e.g. c. 1,600m at Pic de Fon). The lower limit of the montane vegetational band recognised in the Cameroon Highlands is 2,000m alt. No point in the Guinea Highlands attains that height, although Nimba and the Loma Mts (in Sierra Leone) come close. The presence of Afromontane species, such as *Nuxia congesta*, at much lower altitudes in the Guinea Highlands than in other parts of Africa, may be partly due to the Massenerhebung effect.

### Submontane forest-bowal grassland transition zone

The most distinctive microhabitat present is the transition of submontane forest with grassland. Table 19 details five conservation priority species restricted to this zone.

Genus & species	Family	IUCN category	Fouta Djallon	Loma-Man	Year last collected in Fouta Djallon, if present
<i>Acalypha guineensis</i>	Euph.	VU	✓	✓	1907
<i>Hibiscus fabiana</i> sp. nov.	Malv.	VU		✓	
<i>Kotschya lutea</i>	Leg.	VU	✓	✓	1944
<i>Lipotriche tithonioides</i>	Comp.	EN		✓	
<i>Phyllanthus bancilhonae</i>	Phyll.	NT	✓	✓	1907

**Table 19.** Threatened submontane forest – grassland transition species, unique to this microhabitat.

**Key:** ✓ = yes. IUCN category: see page 9.

More details of this microhabitat are given in RBG Kew's (2006) Pic de Fon vegetation map and botanical survey. The five species listed all occur in Loma-Man, possibly now uniquely. Although three were recorded from Fouta Djallon historically, they have not been refound despite searches in recent years. It is interesting to speculate that some of the possibly extinct Fouta Djallon bowal grassland species might also have been transition species (Table 10). We suspect that *Bidens occidentalis*, *Tephrosia djalonica*, and *Emila djalonensis* may have been restricted to this niche in the Fouta Djallon.

### Exploration levels

Although submontane forest now seems to be lost from the Fouta Djallon, from which endemic species were discovered in the French colonial period, it is possible that further exploration might discover new fragments, such as in the Téliimélé area.

### Threats

If any original submontane forest patches survive in Fouta Djallon, which is uncertain, it will be under great pressure from clearance and degradation for agriculture. In the unpopulated high-altitude areas of Loma-Man, where most submontane forest of Guinea survives, threats have been minimal until now (apart from at Ziama, where areas were cleared for quinine and tea plantations in the colonial period). However, open-cast iron ore mining is now set to begin at both Nimba and Pic de Fon (Simandou), after many years of preparations. This will remove some of the submontane forest on those mountain ranges.

### Protection

In Loma-Man, submontane forest is included in the Ziama and Nimba Biosphere Reserves, which are both TIPAs. Additionally, Pic de Fon (Simandou) and Mts Béro are proposed TIPAs. Since no intact submontane forest has been found in Fouta Djallon, none is known or proposed to be protected.



# Tropical Important Plant Areas (TIPAs)

Here we detail the 22 Tropical Important Plant Areas (TIPAs) which have been evidenced and workshopped in Guinea, using specimen data collected from around the world including from Paris (France) and Poznan (Poland), where key sources of data on Guinean plant species reside. If these 22 TIPAs can be protected, then over 60% of Guinea's threatened plant species, Guinea's most species-diverse areas, and representative areas all of Guinea's nine threatened habitats, will have the possibility of surviving to benefit future generations of Guineans. These benefits comprise medicines, materials and foods, including applications and products that may be researched and developed in future.

Among the 22 TIPAs (Map 15) are areas which were already well-known to be important for conservation and which are already protected. Chief among these is Mts Nimba. This range, shared with Ivory Coast and Liberia, is a World Heritage Site and famous botanically for being the most diverse centre for plants in all West Africa. J.G. Adam recorded nearly 2,000 species in his *Flore descriptive des monts Nimba* (Paris. 1971-1983). At least five plants are globally unique to Nimba and, according to J. Suter of SMFG (pers. comm. to Couch, 2018), the total number of plant species at Nimba has now risen to 2,400 as a result of environmental impact studies executed before open-cast iron ore mining begins in the Guinean part of the mountains. Less species-rich but still enormously diverse are Monts Ziama, part of a Biosphere Reserve, but with at least two species which are globally unique to it.

However, Nimba and Ziama are exceeded in the number of endemic species by a sandstone area, Kounounkan, with nine globally endemic species including an endemic genus. This site is clearly Guinea's highest priority for conservation in terms of globally irreplaceable unique plant species, yet it is unprotected, as are most of the other proposed TIPAs detailed below.

While sites such as Nimba, Ziama, and especially Simandou (more than 1,000 species, with a single globally endemic species) were well-known to us at the beginning of our Guinea TIPA project in 2016, other sites, now documented and evidenced as TIPAs below, were not. These were either uncovered by the study of herbarium specimens or nominated during the project inception workshop in 2016, and later visited by us in the field for verification and data collection.

Once data had been collected for an area and there was an indication that it might qualify as a TIPA, a TIPA data sheet was completed. Some areas surveyed were found not to merit nomination as a TIPA. The data sheets were then reviewed by Groupe de travail pour des Zone Tropicales Importantes pour les Plantes (ZTIP) et Plan d'Action de Conservation (PAC) pour les espèces végétales menacées. The members of this group are: Dr Sékou Magassouba (HNG); Charlotte Couch (RBG Kew); Saïdou Doumbouya (COSIE); Bella Diallo (MEEF); Mamadou Diawara (Guinée Écologie); Yaya Diallo (Guinée Écologie); Denise Molmou (HNG); Col. Sayba (OGuiPar); Moussa Diabaté (SERG); Falaye Kone (MEEF); Fatoumata Stell Conté (Guinée Écologie); Sékou Kourouma (OGuiPar); Pr. Sékou Moussa Keita (CERE); and Mamadou Cellou Diallo (PEG).

## Summary of the Criteria for Tropical Important Plant Areas (TIPAs)

Candidate TIPA sites were evaluated against the three TIPA criteria (Darbyshire et al. 2017; Plantlife International. 2018), as set out below in summary form. Most TIPA sites did not fulfil all three criteria (A, B, and C), but this is not necessary as part of the Important Plant Area (IPA) protocol. To qualify as a TIPA, a site only needs to satisfy one or more of the following criteria:

### Criterion A: Threatened Species

<b>A(i)</b>	<b>Site contains</b> one or more globally threatened species.	Site known, thought, or inferred to contain $\geq 1\%$ of the global population; AND/OR $\geq 5\%$ of the national population; OR the 5 'best sites' for that species nationally – whichever is most appropriate.
<b>A(ii)</b>	<b>Site contains</b> one or more regionally threatened species.	Site known, thought, or inferred to contain $\geq 5\%$ of the national population; OR the 5 'best sites' for that species nationally – whichever is most appropriate.
<b>A(iii)</b>	<b>Site contains</b> one or more highly restricted endemic species that are potentially threatened.	Site known, thought, or inferred to contain $\geq 1\%$ of the global population; AND/OR $\geq 5\%$ of the national population; OR the 5 'best sites' for that species nationally – whichever is most appropriate.
<b>A(iv)</b>	<b>Site contains</b> one or more range restricted endemic species that are potentially threatened.	Site known, thought, or inferred to contain $\geq 1\%$ of the global population; AND/OR $\geq 5\%$ of the national population; OR the 5 'best sites' for that species nationally – whichever is most appropriate.

## Criterion B: Botanical Richness

<b>B(i)</b>	<b>Site contains</b> a high number of species within defined habitat or vegetation types.	For each habitat or vegetation type: Up to 10% of the national resource can be selected within the whole national TIPA network; OR the 5 'best sites' nationally – whichever is the most appropriate.
<b>B(ii)</b>	<b>Site contains</b> an exceptional number of species of high conservation importance.	Site known to contain $\geq 3\%$ of the selected national list of species of conservation importance; OR the 15 richest sites nationally – whichever is most appropriate.
<b>B(iii)</b>	<b>Site contains</b> an exceptional number of socially, economically, or culturally valuable species.	Site known to contain $\geq 3\%$ of the selected national list of socially, economically or culturally valuable species; OR the 15 richest sites nationally – whichever is most appropriate.

## Criterion C: Threatened Habitats

<b>C(i)</b>	<b>Site contains</b> globally threatened or restricted habitat / vegetation type.	Site known, thought, or inferred to contain $\geq 5\%$ of the national resource (area) of the Threatened Habitat type; OR, site is among the best quality examples required to collectively prioritise 20-60% of the national resource; OR the 5 'best sites' for that habitat nationally – whichever is the most appropriate.
<b>C(ii)</b>	<b>Site contains</b> regionally threatened or restricted habitat / vegetation type	Site known, thought, or inferred to contain $\geq 5\%$ of the national resource (area) of the Threatened Habitat type; OR site is among the best quality examples required to collectively prioritise 20-60% of the national resource; OR the 5 'best sites' nationally – whichever is the most appropriate.
<b>C(iii)</b>	<b>Site contains</b> nationally threatened or restricted habitat / vegetation type, AND/ OR habitats that have severely declined in extent nationally.	Site known, thought, or inferred to contain $\geq 10\%$ of the national resource (area) of the Threatened Habitat type; OR site is among the best quality examples required to collectively prioritise up to 20% of the national resource; OR the 5 'best sites' nationally – whichever is the most appropriate.

## Use of Data

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Before sites could be evaluated, the data available had to be interpreted.

### Criterion A (Threatened Species)

The numbers of globally threatened species and their status according to the IUCN system had to be tallied for each TIPA site. At the beginning of the project, very few of Guinea's rarest species had been assessed for the IUCN Red List, especially the range-restricted species, which are the rarest and most likely to be threatened. Understandably, the *Monographie nationale sur la diversité biologique de Guinée* (1997) lacks up-to-date conservation assessments. Therefore, a candidate list of 482 potentially threatened species was drawn up (Couch et al. 2018), by reviewing data in Lisowski (2009) and in Aké Assi (2001). This was later reduced to 255 species which were then formally evaluated. Extinction risk assessments of these species were the priority at the beginning of the project, following the IUCN 2012 protocol (Red List of Threatened Species), generally using Geocat first for provisional assessments (Bachman et al. 2011). Over 200 Guinean species were assessed as threatened for the first time in the years that followed. This work is ongoing as new species to science are discovered, or previously overlooked species are found to need assessment. Initially, provisional assessments from the candidate list (Couch et al. 2018) were used to populate the draft TIPA data sheets that were compiled. The provisional assessments were replaced with comprehensive, reviewed assessments when available, towards the end of the programme.

To accompany this book, a *Red Data Book for Guinea Plants*, IUCN global assessments – the first for any West African country – will be published shortly (Cheek et al. 2019a). This will detail the over 270 IUCN level threatened species of plant of Guinea. The distribution of these threatened species, by TIPA, is given in Appendix A.

Twenty new and resurrected species to science, including two new genera to science, were published, or are being published, as a result of the Guinea TIPA survey programme and preliminary work. Each of these had also to be assessed, but this is only possible once publication is complete, due to IUCN rules. The references for these new and resurrected species are:

Cheek & van der Burgt (2010); Cheek et al. (2015, 2016a, 2016b, 2018a, 2018b, 2019a, 2019b); Cheek & P.M. Haba (2016a, 2016b); Cheek & Lebbie (2018); Cheek & Williams (2016); Jongkind & Vollesen (2012); Phillips et al. (2018); Phillipson et al. (2019); van der Burgt et al. (2012, 2018).

At least eight other species are in the course of publication. Taxonomic adjustments were needed for several of the threatened Guinean species, especially Compositae (Hind 2014, 2019).

The TIPA network that we have evidenced will protect 60% of the Guinean threatened species that we have assessed and documented. These 22 TIPA sites occupy 8,702km<sup>2</sup> or about 3.5% of the surface area of Guinea. Over 50% of the species will be protected if 21 of the (smaller) TIPAs are protected, which occupy an even smaller proportion, only 0.9%, of Guinea.

### Criterion B (Botanical Richness)

Comprehensive species checklists, required to assess this criterion, were only available for a few proposed TIPAs: Nimba, Simandou, Inselbergs de Moofanyi, Inselbergs de Tonkoyah, and Ziama. The remaining TIPAs lack species checklists, making it difficult to apply this criterion, apart from by using a subjective estimate. However, during the programme, we were able to begin species checklists for several TIPAs, such as Moyen Bafing, Kakiwoundi, Gangan, and Kounounkan. We hope to publish this information in the second phase of the project, funded by the Ellis Goodman Family Foundation.

Ideally, each TIPA will have a comprehensive species checklist and mapping of its threatened species and threatened habitat. This will support a management plan so that the TIPA can be effectively monitored to ensure that its plant patrimony is maintained, or increased, and supported by interventions if needed.

## Criterion C (Threatened Habitat)

It was necessary to define and characterise Guinea's Threatened Habitats. A preliminary classification, based on years of experience of botanical surveys in Guinea, was devised prior to the inception workshop of our Darwin Initiative programme in June 2016. This was thoroughly reviewed and debated during the workshop by all partners. The task was then to survey these habitats, especially those which were less well known to us, such as in the Fouta Djallon, in detail over the three years 2016-2019. Further studies are still needed. The results, together with the conclusions of our fieldwork and data gathering are presented in Part 1 of this book, Threatened Habitats of Guinea, and feed into the 22 TIPA assessments below. A summary of Threatened Habitats by TIPA is given in Appendix B.

## Variation in TIPAs

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There is great variation in the TIPAs proposed below. While all fit the protocol of Darbyshire et al. (2017), simplified in Plantlife (2018), they vary enormously in size. The smallest, Koba, near Pita, is only 1km<sup>2</sup> with four threatened species. By comparison, at 8,702km<sup>2</sup>, Moyon Bafing is enormous. A proposed National Park divided between Tougé and Dinguiraye, it has many more threatened species, including those known nowhere else, and three new species to science, which based on current evidence are globally unique to this TIPA.

Three TIPAs have the most irreplaceable biodiversity at the higher evolutionary rank, genus: TIPA 3, Mt Gangan (*Kindia*, *Fleurydora*); TIPA 9, Mt Konossou (*Felicadamia*); and TIPA 11, Kounoukan (*Cailliella*, *Fleurydora*).

The TIPAs with the highest number of threatened species are TIPA 16, Nimba (58 threatened species); and TIPA 18, Simandou (40 threatened species).

The TIPAs with the highest number of globally unique (narrowly endemic species) is TIPA 11, Kounoukan (9 species); followed by TIPA 16, Nimba (4 species).

Further work is needed with local authorities and local communities to raise awareness of the importance of their TIPAs, and to seek their protection. Without this, there is little hope for the survival of these natural areas. This is the case also for those larger areas, such as Kounoukan and Moyon Bafing, for which the clear ambition and logic is that they should become National Parks.

The TIPA network characterised below is not a final work and may be modified with new knowledge. For example, new sites may be found with additional threatened species and under-represented Threatened Habitat that may be viable for inclusion in a new TIPA.

Since not all threatened species of Guinea are included in a TIPA, further effort, beyond these 22 TIPAs, is needed to protect these remaining species from extinction. If it is not viable to include them in further TIPAs, as may well be the case, then alternative solutions should be found to protect them, perhaps, after an awareness campaign, by local community adoption. Such species should also be seed-banked to help insure against the possibility of their extinction in the wild.

Equally, if some TIPAs are irrevocably destroyed, such as by an unfortunate development project, it will be necessary to de-list those as TIPAs.

## List of TIPAs

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The 22 TIPA sites that were accepted following review by the working group are listed above. A detailed, standalone assessment and map, is included with each TIPA in this book.

## **Bowal Tankon and Bowal Touppé Mama, Dalaba**



### **IPA criteria under which the site qualifies: A(i), C(iii)**

**Assessed by:** Charlotte Couch (RBG Kew), Muhammad Yaya Diallo (Guinée Écologie), and Martin Cheek (RBG Kew).

### **TIPA assessment rationale**

Bowal Tankon and Bowal Touppé Mama are home to the last known global populations of *Vernonia djalensis* and *Emilia djalensis* (to be verified), endemic species to the Fouta Djallon area of the Guinea Highlands. Other historic sites have been searched at Mali and between Timbo and Ditinn, but neither species has been rediscovered in these places. Bowal Tankon is under immediate threat from construction and urbanisation. Based on historical records, three other Vulnerable (VU) species are also thought to be present: *Kotschyia lutea*, *Eriocaulon sessile*, and *Indigofera megacephala*.

### **Site overview**

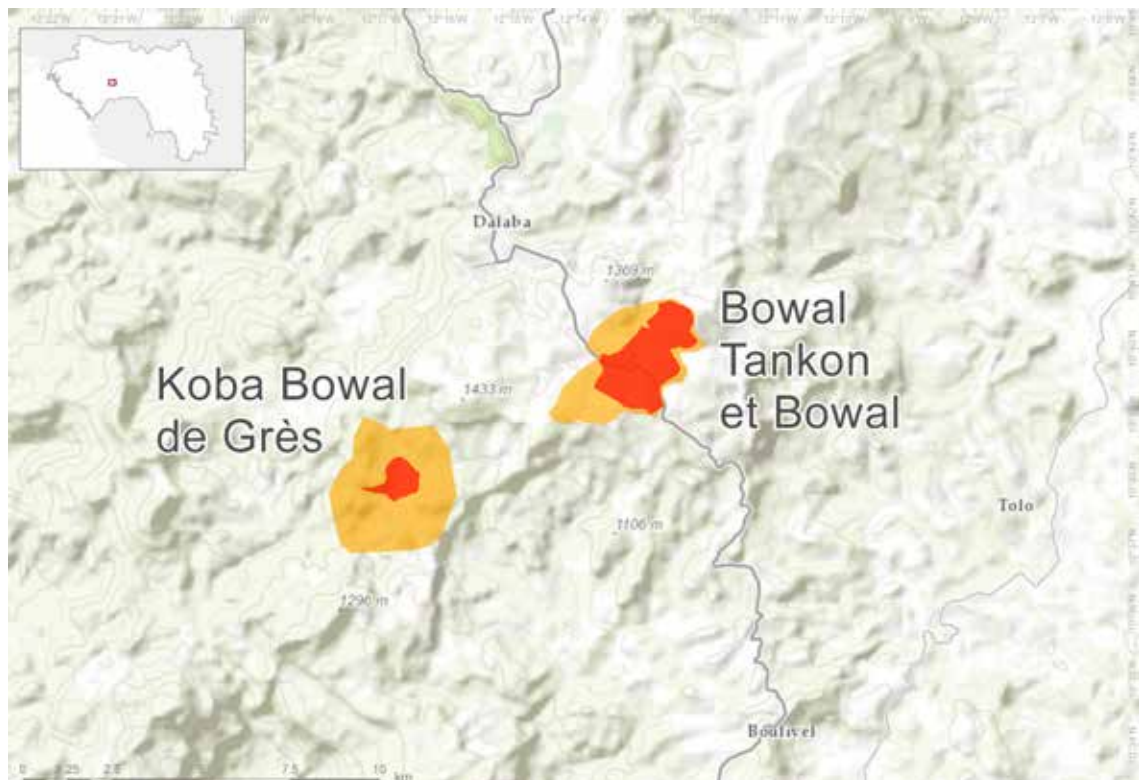
Site name: Bowal Tankon and Bowal Touppé Mama  
Country: Republic of Guinea  
Administrative region: Dalaba Prefecture  
Central co-ordinates: 10°39'31.8"N, 12°12'52.9"W  
Area: 5km<sup>2</sup>  
Altitude minimum: 1,290m  
Altitude maximum: 1,350m

### **Site description**

Bowal Tankon is the southern part of the Diaguissa plateau which runs from the north-east to the south-west across National Route 5. The plateau is made up of a solid outcrop of iron-rich laterite covered by thin soils, with some gravel and deeper soils upslope. In the wet season, there is a marsh area on the upper part of the plateau area. The north-west side of the plateau, Bowal Touppé Mama, has a less intact outcrop and areas with deeper soils, compared to Bowal Tankon.

The vegetation is typical of high-altitude bowal and shares affinities with the iron-rich bowal found in the mountains of Guinée Forestière. Areas further north in the Fouta Djallon, towards Labé and Pita, are not iron rich and therefore have a different composition.

Bowal Tankon and Bowal Touppé Mama both have some human influence either from construction, pastoralism, or agriculture. Due to these areas being alongside the road, housing has already sprung up and a new estate area has been marked out with lots assigned.



**Map 16.** The proposed areas for protection as TIPAs. Core area in red, buffer zone in yellow.

### Botanical significance

The Diaguissa plateau is the only known surviving site globally for *Vernonia djalonensis* (CR) and *Emilia djalonensis* (CR(PE)). There have been recent field campaigns to verify other populations known from old collections, and to search areas that resemble the Diaguissa plateau on satellite imagery. However, these searches have unfortunately not yielded any extant populations.

The largest part of the population of *Vernonia djalonensis* is found on the lower slopes of Bowal Tankon with a smaller number found on Bowal Touppé Mama. *Emilia djalonensis* is known from one Chevalier collection on the Diaguissa plateau of which this is a part. There have been no recent collections of this species. The lower slope of Bowal Tankon is populated with other bowal species. Upslope, where there is a temporary marsh in the wet season, there is a large population of *Kotschyia micrantha*, one of only five sites known in the Fouta Djallon. On Bowal Touppé Mama, a small sparse population of *Mesanthemum tuberosum* (VU) has been recorded. Three other Vulnerable species, *Kotschyia lutea*, *Eriocaulon sessile*, and *Indigofera megacephala* have also been recorded from this area. It is conceivable that they are still present; however, it is unlikely that *Kotschyia lutea* is still extant here as this species is very distinct and has not been found, despite active searching during surveys. It could, therefore, be locally extinct.

### General habitat and geology description

Ferrallitic hard pan (impervious). Bowal grassland on a continuous outcrop of concretised iron pan with very thin soils. Different from other bowal in the area as there is very little gravel present.

### Conservation issues

This area has already been marked out for building plots and most have been sold (pers. comm. Mayor of Dalaba, July 2017).

A Chinese gravel crushing plant, installed after November 2016, means that much of the upper slope of Bowal Tankon has been cleared (for installation). There was also evidence of rubbish burning outside the plant in July 2017 (pers. obs. C. Couch).

## Protected area status and management

This area is currently unprotected. It shares governance between the local Mayors Office and the State.

### Threats

- Urbanisation: A housing estate is likely to cover up to 90% of the population of *Vernonia djalonensis*.
- Infrastructure: A gravel crushing plant covers a small part of the area.

**Threat level: High**

## Criteria Assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Vernonia djalonensis</i> A.Chev.	A(i)	CR	✓	✓	✓	✓	✓	Frequent
<i>Kotschy micrantha</i> (Harms) Hepper	A(i)	VU	✓	✓	✓			Infrequent
<i>Mesanthemum tuberosum</i> Lecomte	A(i)	VU	✓	✓	✓			Scarce
<i>Emilia djalonensis</i> Lisowski	A(i)	CR(PE)	✓	✓	✓	✓		Unknown
<i>Indigofera megacephala</i> J.B.Gillett	A(i)	VU	✓					Unknown
<i>Eriocaulon sessile</i> Meikle	A(i)	VU	✓					Unknown

**Table 20.** Criterion A for Bowal Tankon and Bowal Touppé Mama.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

Insufficient data available.

### Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
High altitude lateritic bowal	C(iii)			✓	5km <sup>2</sup>

**Table 21.** Criterion C for Bowal Tankon and Bowal Touppé Mama.

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Couch, C. (July 2017). TIPAs Guinea Darwin Project report: Field expedition to Fouta Djallon.

## Site in pictures



Upper section of Bowal Tankon, in October 2016, with *Vernonia djalonensis*. (Photo: ©C. Couch, RBG Kew)



Lower part of Bowal Tankon, in October 2016, with *Vernonia djalonensis*. (Photo: ©C. Couch, RBG Kew)



Marsh area on upper plateau of Bowal Tankon. (Photo: ©C. Couch, RBG Kew)



Bowal Touppé Mama, October 2016. (Photo: ©C. Couch, RBG Kew)



Bowal Tankon dry season, January 2018. (Photo: ©M. Cheek, RBG Kew)



Evidence of construction at Bowal Tankon. (Photo: ©C. Couch, RBG Kew).



*Vernonia djalonensis* in flower, October 2016.  
(Photo: ©C. Couch, RBG Kew)



*Vernonia djalonensis* in fruit, January 2018.  
(Photo: ©M. Cheek, RBG Kew)

## TIPA Assessment 2:

### Diécké Classified Forest, Yomou



**IPA criteria under which the site qualifies:** A(i), B(i), C(iii)

**Assessed by:** Charlotte Couch (RBG Kew) and Pépé Haba (Guinée Biodiversité).

#### **TIPA assessment rationale**

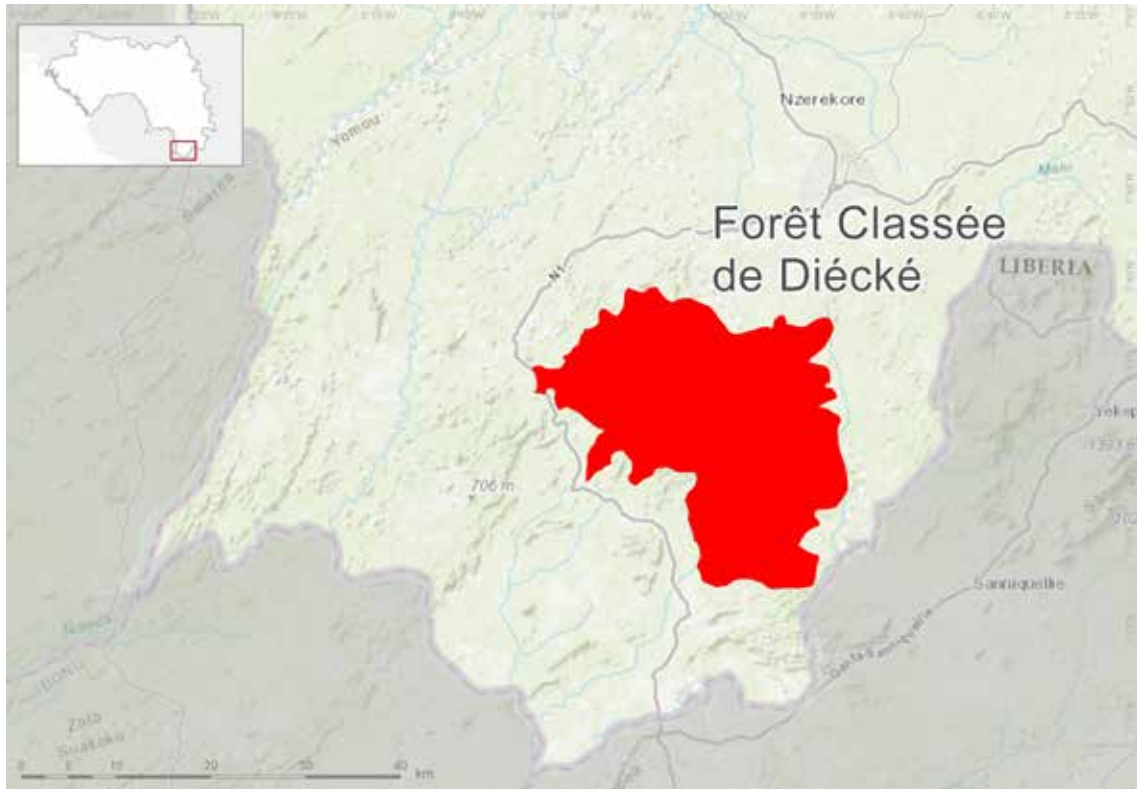
Diécké Classified Forest is the largest intact area of lowland forest remaining in Guinée Forestière. It has a high diversity of species including 29 threatened species, especially timber trees. Many West African trees have their only Guinean location in this forest. Diécké remains to be comprehensively surveyed for its plant species.

#### **Site overview**

Site name: Diécké Classified Forest  
Country: Republic of Guinea  
Administrative region: Yomou Prefecture  
Central co-ordinates: 07°12'36"N, 08°56'43"W  
Area: 640km<sup>2</sup>  
Altitude minimum: 300m  
Altitude maximum: 550m

#### **Site description**

Lowland evergreen forest situated in the southeast of Guinée Forestière in Yomou prefecture, close to the border of Liberia. This has been a Classified Forest since 1945. It was previously logged in certain areas, leaving an open canopy, but most of the site is still relatively intact forest with an open understory. The forest is bordered by villages and cultivation has encroached on some of the boundaries.



**Map 17.** The proposed area for protection as a TIPA.

### **Botanical significance**

Diécké is the largest surviving near pristine lowland evergreen forest area in Guinée Forestière. It has many rivers running through it and has a high diversity of plant species, including some threatened species, e.g. *Allophylus samouritouri* (Haba, 2018). Large girth trees of timber species are still present forming a dense canopy (Haba, 2016 and 2018).

### **General habitat and geology description**

The area is gently undulating with hills reaching 550m, with forested slopes and riverine forest in the valleys. It sits on the late Archean period Mani series of biotite gneiss with localized magnetite. It is part of the Leonean-Liberian crystalline massif.

### **Conservation issues**

Part of the Classified Forest of Diécké was exploited by the Forêt Forte company between 2003-2004, but fortunately, they did not do much damage in this brief period. However, their activities are thought to have caused the presence of invasive species in the forest.

Areas in the river valleys (Bas-fonds) have been authorized for rice cultivation in recent years, which has led to the encroachment of fields from the surrounding area. The areas closest to Kéréma, Ouéta, Kilikpala, Nonah, and Gboimou are especially threatened by the encroachment of fields and from illegal hunting by the neighbouring population. Towards the east, in the zone of Yonsono, Guêpa, and Diécké, hunting dominates and so the forest has remained intact. Eco-guards are present, but they do not regularly patrol the forest.

### **Protected area status and management**

The forest of Diécké was classified in 1945. The TIPA corresponds with the classified forest boundary. Classified forests are not protected in Guinea.

## Threats

- Agriculture: Encroachment of fields on the edge of the classified forest and rice cultivation in the floodplains.
- Forestry: There has been historic activity in the forest, but there is none at present (2019).

**Threat level: Medium**

## Criteria assessments

### Criterion A: Threatened Species

	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<b>Criterion A taxon present</b>								
<i>Allophylus samouritouri</i> Cheek	A(i)	EN	✓	✓	✓		✓	Infrequent
<i>Cassia fikifikiki</i> Aubrev. & Pellegr.	A(i)	EN	✓				✓	Infrequent
<i>Cola attiensis</i> Aubrév. & Pellegr.	A(i)	EN	✓	✓	✓			Unknown
<i>Neolemonniera clitandrifolia</i> (A. Chev.)	A(i)	EN	✓	✓	✓			Infrequent
<i>Pericopsis elata</i> (Harms) Meeuwen	A(i)	EN	✓	✓	✓		✓	Unknown
<i>Tieghemella heckelii</i> (A. Chev.) Pierre ex Dubard	A(i)	EN	✓	✓	✓		✓	Infrequent
<i>Albizia ferruginea</i> (Guill. & Perr.) Benth.	A(i)	VU	✓	✓	✓		✓	Infrequent
<i>Amanoa bracteosa</i> Planch.	A(i)	VU	✓	✓	✓		✓	Unknown
<i>Anopyxis klaineana</i> (Pierre) Engl.	A(i)	VU	✓				✓	Infrequent
<i>Copaifera salikounda</i> Heckel	A(i)	VU	✓				✓	Infrequent
<i>Cryptosepalum tetraphyllum</i> (Hook.f.) Benth.	A(i)	VU	✓	✓	✓			Abundant
<i>Drypetes afzelii</i> (Pax) Hutch.	A(i)	VU	✓	✓	✓			Infrequent
<i>Entandrophragma candollei</i> Harms	A(i)	VU	✓	✓	✓		✓	Infrequent
<i>Entandrophragma cylindricum</i> (Sprague) Sprague	A(i)	VU	✓	✓	✓		✓	Infrequent
<i>Entandrophragma utile</i> (Dawe & Sprague) Sprague	A(i)	VU	✓	✓	✓		✓	Infrequent
<i>Garcinia afzelii</i> Engl.	A(i)	VU	✓	✓	✓		✓	Infrequent
<i>Garcinia epunctata</i> Stapf	A(i)	VU	✓	✓	✓		✓	Unknown
<i>Garcinia kola</i> Heckel	A(i)	VU	✓					Infrequent
<i>Guarea cedrata</i> (A.Chev.) Pellegr.	A(i)	VU	✓	✓	✓		✓	Infrequent
<i>Guibourtia ehie</i> (A.Chev.) J.Léonard	A(i)	VU	✓	✓	✓		✓	Infrequent
<i>Heritiera (Tarrietia) utilis</i> (Sprague) Sprague	A(i)	VU	✓				✓	Unknown
<i>Khaya anthotheca</i> C.DC.	A(i)	VU	✓	✓	✓		✓	Infrequent
<i>Khaya grandifoliola</i> C.DC.	A(i)	VU	✓	✓	✓		✓	Infrequent
<i>Khaya ivorensis</i> A.Chev.	A(i)	VU	✓	✓	✓		✓	Infrequent
<i>Lophira alata</i> Banks ex Gaertn.f.	A(i)	VU	✓	✓	✓		✓	Abundant
<i>Lovoa trichilioides</i> Harms	A(i)	VU	✓	✓	✓		✓	Scarce
<i>Nauclea diderrichii</i> (De Wild. & T.Durand) Merrill	A(i)	VU	✓	✓	✓		✓	Abundant
<i>Terminalia ivorensis</i> A.Chev.	A(i)	VU	✓	✓	✓		✓	Infrequent
<i>Tessmannia baikieaoides</i> Hutch. & Dalz	A(i)	VU	✓				✓	Infrequent

**Table 22.** Criterion A for Diécké Classified Forest, Yomou.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion B: Botanical Richness

<b>B(i):</b> exceptional botanical richness within a defined habitat		
<b>Habitat code and name</b>	<b>Site is part of the top 10% of the national resource</b>	<b>Site is one of the 5 best sites nationally for that habitat</b>
Lowland evergreen forest	✓	✓

**Table 23.** Criterion B for Diécké Classified Forest, Yomou.

**Key:** ✓ = yes.

	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<b>Criterion B taxon present</b>			
<i>Azelia parviflora</i> (Vahl) Hepper	B(i)	Lowland evergreen forest	Infrequent
<i>Albizia ferruginea</i> (Guill. & Perr.) Benth.	B(i)	Lowland evergreen forest	Scarce
<i>Anopyxis klaineana</i> (Pierre) Engl.	B(i)	Lowland evergreen forest	Abundant
<i>Cassia fikifiki</i> Aubrév. & Pellegr.	B(i)	Lowland evergreen forest	Scarce
<i>Chidlowia sanguinea</i> Hoyle	B(i)	Lowland evergreen forest	Abundant
<i>Coffea humilis</i> A.Chev.	B(i)	Lowland evergreen forest	Abundant
<i>Copaifera salikounda</i> Heckel	B(i)	Lowland evergreen forest	Infrequent
<i>Cryptosepalum tetraphyllum</i> (Hook.f.) Benth.	B(i)	Lowland evergreen forest	Abundant
<i>Daniellia thurifera</i> Bennett	B(i)	Lowland evergreen forest	Infrequent
<i>Drypetes afzelii</i> (Pax) Hutch.	B(i)	Lowland evergreen forest	Infrequent
<i>Drypetes inaequalis</i> Hutch.	B(i)	Lowland evergreen forest	Abundant
<i>Garcinia afzelii</i> Engl.	B(i)	Lowland evergreen forest	Infrequent
<i>Garcinia epunctata</i> Stapf	B(i)	Lowland evergreen forest	Unknown
<i>Garcinia kola</i> Heckel	B(i)	Lowland evergreen forest	Infrequent
<i>Guibourtia ehie</i> (A.Chev.) J.Léonard	B(i)	Lowland evergreen forest	Infrequent
<i>Guibourtia leonensis</i> J Léonard	B(i)	Lowland evergreen forest	Infrequent
<i>Heritiera (Tarrietia)</i> (Sprague) Sprague	B(i)	Lowland evergreen forest	Abundant
<i>Landolphia membranacea</i> (Stapf) Pichon	B(i)	Lowland evergreen forest	Scarce
<i>Landolphia micrantha</i> (A.Chev.) Pichon	B(i)	Lowland evergreen forest	Scarce
<i>Newtonia aubrevillei</i> (Pellegr.) Keay	B(i)	Lowland evergreen forest	Abundant
<i>Newtonia duparquetiana</i> (Baill.) Keay	B(i)	Lowland evergreen forest	Infrequent
<i>Omphalocarpum pachysteloides</i> Mildbr. ex Hutch. & Dalziel	B(i)	Lowland evergreen forest	Unknown
<i>Pericopsis elata</i> (Harms) Meeuwen	B(i)	Lowland evergreen forest	Unknown
<i>Sclerochiton vogelii</i> (Nees) T. Anders.	B(i)	Lowland evergreen forest	Scarce
<i>Tessmannia baikiaeooides</i> Hutch. & Dalziel	B(i)	Lowland evergreen forest	Infrequent
<i>Tetrapleura chevalieri</i> (Harms) Baker.f	B(i)	Lowland evergreen forest	Infrequent
<i>Xylia evansii</i> Hutch.	B(i)	Lowland evergreen forest	Abundant

**Table 24.** Criterion B for Diécké Classified Forest, Yomou.

**Key:** ✓ = yes. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion C: Threatened Habitat

Habitat type	IPA subcritterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Lowland evergreen forest	C(iii)			✓	600km <sup>2</sup>

**Table 25.** Criterion C for Diécké Classified Forest, Yomou.

## Bibliography

Couch, C., Magassouba, S., Rokni, S., and Cheek, M. (2017) Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>

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Haba, P.M. (2018). Rapport de terrain du projet Darwin Initiative en Guinée: Forêt Classée de Diécké: Villages-Guêpa-Yonso.

## Site in pictures



Interior of the Diécké Classified Forest. (Photo: © Pépé Haba)



Illegal tree cutting for agriculture. (Photo: ©Pépé Haba)



*Tetrapleura chevalieri* (Harms) Baker.f.  
(Photo: ©Pépé Haba)

## TIPA Assessment 3:

### Mt Gangan Sandstone Mountain Chain, Kindia



**IPA criteria under which the site qualifies: A(i,iii), B(i), C(iii)**

**Assessed by:** Charlotte Couch, Martin Cheek (RBG Kew), Denise Molmou, Sékou Magassouba (HNG), and Saïdou Doumbouya (COSIE, Govt. of Guinea).

#### TIPA assessment rationale

The Mt Gangan sandstone table mountains form a unique environment within the local area of Kindia Prefecture. The sandstone cliffs, low-altitude sandstone bowl, and submontane forest are all recognised as threatened vegetation types of Guinea. Species globally endemic to Mt Gangan are *Kindia gangan* (newly described in 2018), *Clerodendrum sylvae*, *Phyllanthus felicis*, plus several near endemics to Mt Gangan, such as *Pitcairnia feliciana*, the only bromeliad in Africa. There are numerous other rare and threatened species found on the sandstone bowl, including *Plectranthus linearifolius* and *Raphionacme caerulea*. The area also includes some disturbed lowland forest on Mt Gangan itself.

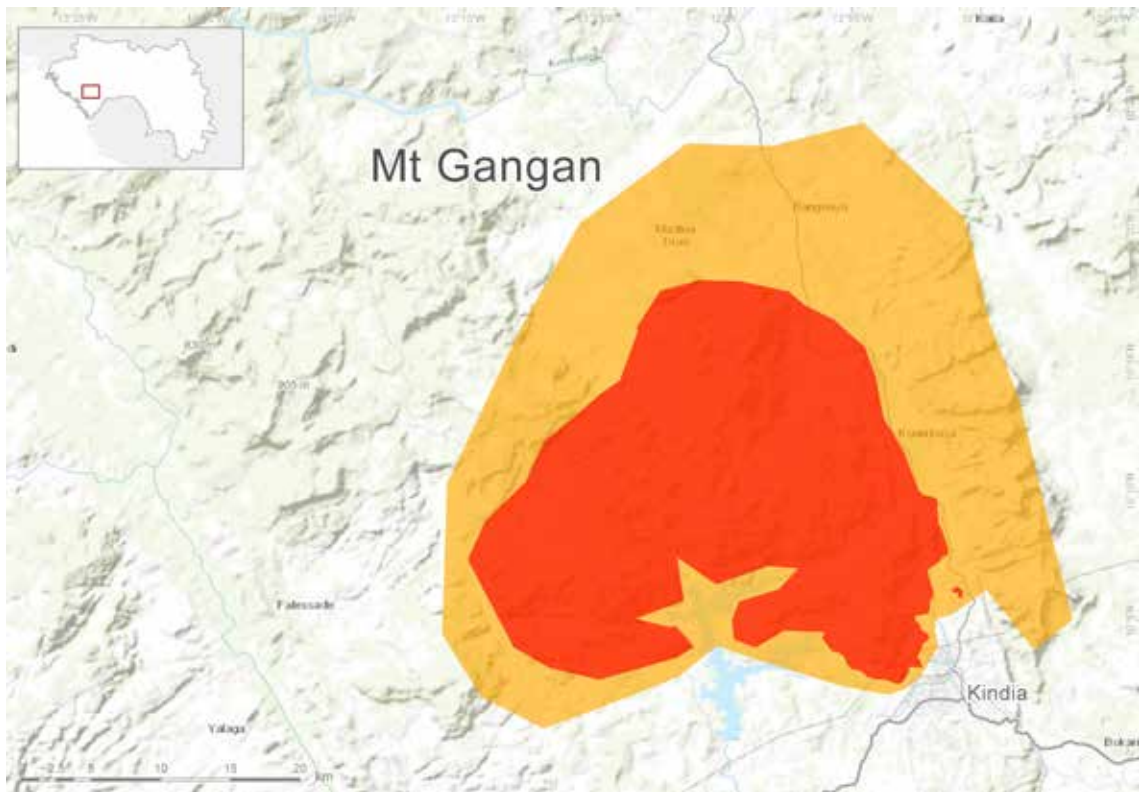
#### Site overview

Site name: Mt Gangan Sandstone Mountains  
Country: Republic of Guinea  
Administrative region: Kindia Prefecture  
Central co-ordinates: 10°09'55"N, 12°57'03"W  
Area: 633km<sup>2</sup>  
Altitude minimum: 663m  
Altitude maximum: 1,111m

## Site description

The Mt Gangan sandstone mountains are located northwest of the town of Kindia. The core area is 33.4km wide and 26.5km long. It comprises a series of sandstone step hills intersected with valleys and surrounded by sandstone bowl. The proposed TIPA surrounds the top half of the reservoir at Samaya. Sandstone steps on the bowl have *Plectranthus* sp. nov. and *Cyanotis ganganensis*, both nearly endemic to Mt Gangan. The sandstone bowl is often used for small-scale cultivation of vegetables and herbs. The crevices and cracks in the cliffs are home to numerous endemic species, and new species have been recently discovered here.

Mt Gangan itself has patches of remnant submontane forest near the summit. However, much was lost due to a now disused banana plantation and part of the summit area is cleared and littered by tourists from Kindia, who use it as a picnic spot. Part of this area was previously designated as a Classified Forest, but there has been little practical protection in recent years. The low altitude sandstone bowl, submontane forest, and sandstone cliffs are recognised as threatened vegetation types in Guinea.



**Map 18.** The proposed area for protection as a TIPA. Core area in red, buffer zone in yellow.

## Botanical significance

The topographic features of the Mt Gangan Sandstone Mountains give rise to some unique habitats.

Numerous species endemic to Guinea are found on the cliffs, for example *Pitcairnia feliciana* (EN), the only native African member of the Bromeliaceae (pineapple family), *Fleurydora felcis* (VU) (Ochnaceae), and *Clerodendrum sylvae* (EN) (Lamiaceae). In 2018, a new genus to science was described from these cliff areas, *Kindia gangan* (Rubiaceae), also monospecific and endemic to Mt Gangan. In addition, *Anisotes guineensis* (Acanthaceae), *Cyanotis ganganensis* (Commelinaceae), *Apodiscus chevalieri* (Phyllanthaceae) are also present. All these species are threatened and have a very restricted distribution.

The sandstone bowl dominant grass, *Anadelphia chevalieri*, is globally endemic to the Kindia area. Globally threatened species include *Utricularia pobeguinii* (Lentibulariaceae), also unique to the environs of Kindia, *Plectranthus linearifolius* (Lamiaceae), and an unusual variant of *Raphionacme caerulea* (Apocynaceae). Small trees found in the deeper cracks of the bowl are *Baphia heudelotiana* (VU) (Leguminosae-Papilionoideae) and *Fegimanra afzelii* (NT) (Anacardiaceae).

## General habitat and geology description

Sandstone table mountains, cliffs, and valleys with crevices and cracks. The valley vegetation can be quite high and dense. Sandstone bowl with seepage areas and temporary waterways. Mt Gangan itself has patches of remnant submontane forest near the summit, but much was lost due to a banana plantation (now disused). In the local language, Susu, gangan means 'Sisa!'. The mountain therefore takes its name from this plant species. Ordovician sandstone layered with younger Silurian and Devonian argillite and siltstone; differential weathering gives rise to steps in the mountains (Source: Carte des Minéraux de la Guinée, Ministry of Mines, Government of Guinea, 2006).

## Conservation issues

There are several threats to this area. Fires from the cattle herders are an issue in the lowland bowl area, and they can potentially move up valleys and onto the cliffs. Cattle herds of large numbers have been observed in this area and this can cause damage through trampling and overgrazing. Cultivation of market garden produce is a threat to the bowl. This is currently quite localised and small-scale but threatens some areas where *Raphionacme caerulea* has been observed. There is also a threat from lowland forest being cleared for charcoal production. *Fleurydora felicis* is used by the local people as a medicine, but the level of collection and utilisation is not known.

## Protected area status and management

Mt Gangan Classified Forest was designated in 1942 and will be encompassed by the proposed TIPAs. Not all Classified Forests are given protected area status in Guinea. There is no known management plan for this area.

## Threats

- Settlement: Settlement expansion inside the area.
- Market gardening: Production of vegetables for Kindia.
- Charcoal production: Excessive wood cutting.
- Subsistence agriculture: Slash and burn techniques.
- Cattle grazing: By nomadic herders and local people.
- Fire: Fire used to clear for grazing, hunting, and agriculture.

**Threat level: High**

## Criteria assessment

### Criterion A: Threatened Species

Criterion A taxon present	IPA sub-criterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Pitcairnia feliciana</i> (A.Chev.) Harms & Mildbr.	A(i,iii)	EN	✓	✓	✓			Frequent
<i>Fleurydora felicis</i> A.Chev.	A(i,iii)	EN	✓	✓	✓		✓	Infrequent
<i>Kindia gangan</i> Cheek	A(i,iii)	EN	✓	✓	✓	✓		Infrequent
<i>Anisotes guineensis</i> Lindau	A(i,iii)	EN	✓	✓	✓			Infrequent
<i>Apodiscus chevalieri</i> Hutch.	A(iii)	EN	✓	✓	✓			Infrequent
<i>Baphia heudelotiana</i> Baill.	A(i)	VU	✓	✓	✓			Infrequent
<i>Cyanotis ganganensis</i> Schnell	A(iii)	EN	✓	✓	✓			Infrequent
<i>Anadelphia pumila</i> Jacq.-Fél.	A(i)	CR	✓	✓	✓	✓		Unknown
<i>Dilophotriche occidentalis</i> Jacq.-Fél.	A(i)	VU	✓	✓	✓			Infrequent
<i>Digitaria patagiata</i> Henrard	A(i)	EN?	✓	✓	✓			Unknown
<i>Dissotis humilis</i> A.Chev. & Jacq.-Fél.	A(iii)	VU?	✓	✓	✓			Infrequent
<i>Heterotis pygmea</i> (A.Chev. & Jacq.-Fél.) Jacq.-Fél.	A(iii)	EN	✓	✓	✓			Infrequent
<i>Dissotis leonensis</i> Hutch. & Dalz	A(i,iii)	EN	✓	✓	✓			Infrequent
<i>Keetia susu</i> Cheek	A(iii)	EN	✓	✓	✓			Infrequent
<i>Bulbostylis guineensis</i> (A. Rich.) C.B. Clarke	A(i)	EN	✓	✓	✓			Infrequent
<i>Utricularia pobeguini</i> Pellegr.	A(i)	EN	✓	✓	✓			Infrequent
<i>Utricularia macrocheilos</i> (P.Taylor) P.Taylor	A(i,iii)	VU	✓	✓				Infrequent
<i>Utricularia tetraloba</i> P.Taylor	A(i,iii)	VU	✓	✓	✓			Infrequent
<i>Clerodendron sylvae</i> J.-G.Adam	A(iii)	EN	✓	✓	✓	✓		Scarce
<i>Anadelphia chevalieri</i> Reznik	A(i)	EN?	✓	✓	✓			Frequent
<i>Phyllanthus felicis</i> J.F.Brunel	A(i)	CR(PE)	✓	✓	✓	✓		Scarce
<i>Schizachyrium penicillatum</i> Jacq.-Fél	A(i)	EN	✓	✓	✓			Unknown
<i>Schizachyrium radicosum</i> Jacq.-Fél.	A(i,iii)	EN	✓	✓	✓			Unknown
<i>Anadelphia macrochaeta</i> (Stapf) Clayton	A(i,iii)	VU	✓	✓				Infrequent
<i>Anadelphia trichaeta</i> (Reznik) Clayton	A(i)	VU	✓	✓				Infrequent
<i>Napoleonaea alata</i> Jongkind	A(i)	EN	✓	✓	✓			Infrequent

**Table 26.** Criterion A for Mt Gangan Sandstone Mountain Chain, Kindia.

**Key:** ✓ = yes. IUCN category: see page 9. **Abundance:** Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion B: Botanical Richness

<b>B(i):</b> exceptional botanical richness within a defined habitat		
Habitat code and name	Site is part of the top 10% of the national resource	Site is one of the 5 best sites nationally for that habitat
Sandstone cliffs	✓	✓
Low altitude sandstone bowl	✓	✓

**Table 27.** Criterion B for Mt Gangan Sandstone Mountain Chain, Kindia.

Key: ✓ = yes.

Criterion B taxon present	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<i>Pitcairnia feliciana</i> (A.Chev.) Harms & Mildbr.	B(i)	Sandstone cliffs	Frequent
<i>Fleurydora felicis</i> A.Chev.	B(i)	Sandstone cliffs	Infrequent
<i>Kindia gangan</i> Cheek	B(i)	Sandstone cliffs	Infrequent
<i>Anisotes guineensis</i> Lindau	B(i)	Sandstone cliffs	Infrequent
<i>Apodiscus chevalieri</i> Hutch.	B(i)	Sandstone cliffs	Infrequent
<i>Cyanotis ganganensis</i> Schnell	B(i)	Sandstone cliffs and Sandstone Bowl (low-altitude)	Infrequent
<i>Keetia susu</i> Cheek	B(i)	Sandstone cliffs and Sandstone Bowl (low-altitude)	Infrequent
<i>Dissotis humilis</i> A.Chev. & Jacq.-Fél.	B(i)	Sandstone cliffs and Sandstone Bowl (low-altitude)	Infrequent
<i>Heterotis pygmea</i> (A.Chev. & Jacq.-Fél.) Jacq.-Fél.	B(i)	Sandstone cliffs and Sandstone Bowl (low-altitude)	Infrequent
<i>Fegimanra afzelii</i> Engl.	B(i)	Sandstone cliffs and Sandstone Bowl (low-altitude)	Infrequent
<i>Raphionacme caerulea</i> E.A.Bruce	B(i)	Sandstone Bowl (low-altitude)	Infrequent
<i>Plectranthus linearifolius</i> (J.K.Morton) B.J.Pollard & A.J.Paton	B(i)	Sandstone Bowl (low-altitude)	Scarce
<i>Utricularia pobeguinii</i> Pellegr. unital.	B(i)	Sandstone Bowl (low-altitude)	Scarce

**Table 28.** Criterion B for Mt Gangan Sandstone Mountain Chain, Kindia.

Key: Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Sandstone bowl	C (iii)			✓	451km <sup>2</sup>
Sandstone cliffs	C (iii)			✓	58.2km <sup>2</sup>

**Table 29.** Criterion C for Mt Gangan Sandstone Mountain Chain, Kindia.

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Molmou, D., and Seny Dore, T. (Oct 2017). Rapport Darwin de la mission à Kébé Friguia et environs, Kindia.

## Site in pictures



Sandstone Step Mountains, Mt Gangan, Kindia, June 2016. (Photo: © C. Couch, RBG Kew)



Low altitude sandstone bowl with *Anadelphia chevalieri*, October 2017. (Photo: © C. Couch, RBG Kew)



Market gardening on edge of sandstone bowl, Mt Gangan, Kindia. (Photo: © C. Couch, RBG Kew)



*Kindia gangan*  
(Photo: ©M. Cheek, RBG Kew)



*Utricularia pobeguinii*  
(Photo: ©C. Couch, RBG Kew)



*Fleurydora felicis*  
(Photo: ©M. Cheek, RBG Kew)



*Pitcairnia feliciana*  
(Photo: © M. Cheek, RBG Kew)

## TIPA Assessment 4:

### Gbélén Forest, Dubréka



#### IPA criteria under which the site qualifies: A(i), C(iii)

**Assessed by:** Pépé Haba (Guinée Biodiversité), Charlotte Couch (RBG Kew), and Gbamon Konomou (HNG).

#### TIPA assessment rationale

The Gbélén forest is a lowland evergreen forest of high biodiversity value comprising significant populations of threatened species, such as *Talbotiella cheekii* (EN) and *Diospyros felicis* (EN), and rare herbs that grow on moist rocks (e.g. *Heterotis pygmaea* (EN) and *Cinnobotrys felicis* (EN)).

#### Site overview

Site name: Gbélén Forest  
Country: Republic of Guinea  
Administrative region: Dubréka Prefecture  
Central co-ordinates: 09°57'02"N, 13°31'19.5"W  
Area: 14.5km<sup>2</sup>  
Altitude minimum: 150m  
Altitude maximum: 500m

#### Site description

Gallery forest and lowland evergreen forest situated in the north of Dubréka Prefecture. The forest is surrounded by village communities that illegally enter the area for excessive timber cutting. Bush fires and cattle grazing were observed on the plateau. The southern part of the forest suffers from illegal wood cutting by the local populations of Bawa and Balayah (Khorira Sous Prefecture). However, most of the forest in the northern and western valleys is intact due to the flow of water and vertical rocks on both sides making access very difficult. Here there is a closed canopy with open understorey throughout.

Gbélén means 'valley' in the local Susu language. This valley belongs to the old village of Bétayah that has now moved to the new village called Bawa, on the Dubréka-Tanènè road because of the easier access. The river Gbélén took its name from the valley it flows through.



**Map 19.** The proposed area for protection as a TIPA.

### Botanical significance

This is one of the most beautiful intact lowland evergreen forests that survives in the valleys of Dubréka Prefecture. Fed by several rivers which support the high biological diversity, notably populations of threatened species such as *Talbotiella cheekii*, *Heterotis pygmaea*, *Diospyros feliciana*, and *Cinnobotrys felicitis*. Forest trees of large circumference are still present and form a closed canopy over the area.

### General habitat and geology description

The valley and surrounding area consist of Ordovician quartzitic sandstone and oligomictic conglomerates. This is the same outcrop that continues towards Pita and the southern extent of the Fouta Djallon. The plateau has grasslands with forested valleys.

### Conservation issues

A part of the forest has been illegally exploited by the local population since 2013. The excessive cutting of wood from the forest has reduced the quality and number of threatened species present. The areas of grassland on the sandstone plateau above are subject to the effects of bushfires, set for field clearance and pasture for cattle. The forest found in the valleys in the north, east, and west on both sides of the Gbélén valley are protected by the steep vertical rock faces.

### Protected area status and management

The area is not currently protected.

### Threats

- Deforestation: Excessive wood cutting by the local population.
- Agriculture: Clearance of areas for fields.
- Pastoralism: Unseasonal fires across grassland for cattle grazing.

**Threat level: Medium-High**

## Criteria assessment

### Criterion A: Threatened Species

	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<b>Criterion A taxon present</b>								
<i>Talbotiella cheekii</i> Burt	A(i)	EN	✓	✓	✓			Abundant
<i>Heterotis pygmaea</i> (A.Chev. & Jacq.-Fél.) Jacq.-Fél.	A(iv)	EN	✓	✓	✓			Abundant
<i>Cinnobotrys felicis</i> (A.Chev.) Jacq.-Fél.	A(i)	EN	✓	✓	✓			Abundant
<i>Diospyros feliciana</i> Letouzey & F. White	A(i)	EN	✓	✓	✓			Abundant
<i>Tessmannia baikiaoides</i> Hutch. & Dalziel	A(i)	VU	✓	✓	✓			Abundant
<i>Baphia heudelotiana</i> Baill.	A(i)	VU	✓	✓	✓			Abundant
<i>Apodiscus chevalieri</i> Hutch.	A(i)	EN	✓	✓	✓			Scarce

**Table 30.** Criterion A for Gbélén Forest, Dubréka.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

Insufficient information available to apply this criterion.

### Criterion C: Threatened Habitat

	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
<b>Habitat type</b>					
Lowland evergreen forest (Guinée Maritime)	C(iii)			✓	

**Table 31.** Criterion C for Gbélén Forest, Dubréka.

## Bibliography

Couch, C., Magassouba, S., Rokni, S., and Cheek, M. (2017). Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>

IUCN Red List of Threatened Species. <https://www.iucnredlist.org/>

## Field Reports

Haba, P.M., and Konomou, G. (October 2018). Rapport de terrain de la forêt de Gbélén à Dubréka.

## Site in pictures



Gbélén forest. (Photo: ©Pépé Haba)



Waterfall in Gbélén forest. (Photo: ©Pépé Haba)



*Heterotis pygmaea* (A.Chev. & Jacq.-Fél.) Jacq.-Fél.  
(Photo: ©Xander van der Burgt)



*Talbotiella cheekii* Burgt.  
(Photo: ©Xander van der Burgt)



*Diospyros felicianae* Letouzey & F.White.  
(Photo: ©Xander van der Burgt)



*Cincinnobotrys felicis* (A.Chev.) Jacq.-Fél.  
(Photo: ©Pépé Haba)

## Grandes Chutes Classified Forest, Kindia



### **IPA criteria under which the site qualifies: A(i), B(i), C(iii)**

**Assessed by:** Charlotte Couch, Martin Cheek (RBG Kew), and Denise Molmou (HNG).

### **TIPA assessment rationale**

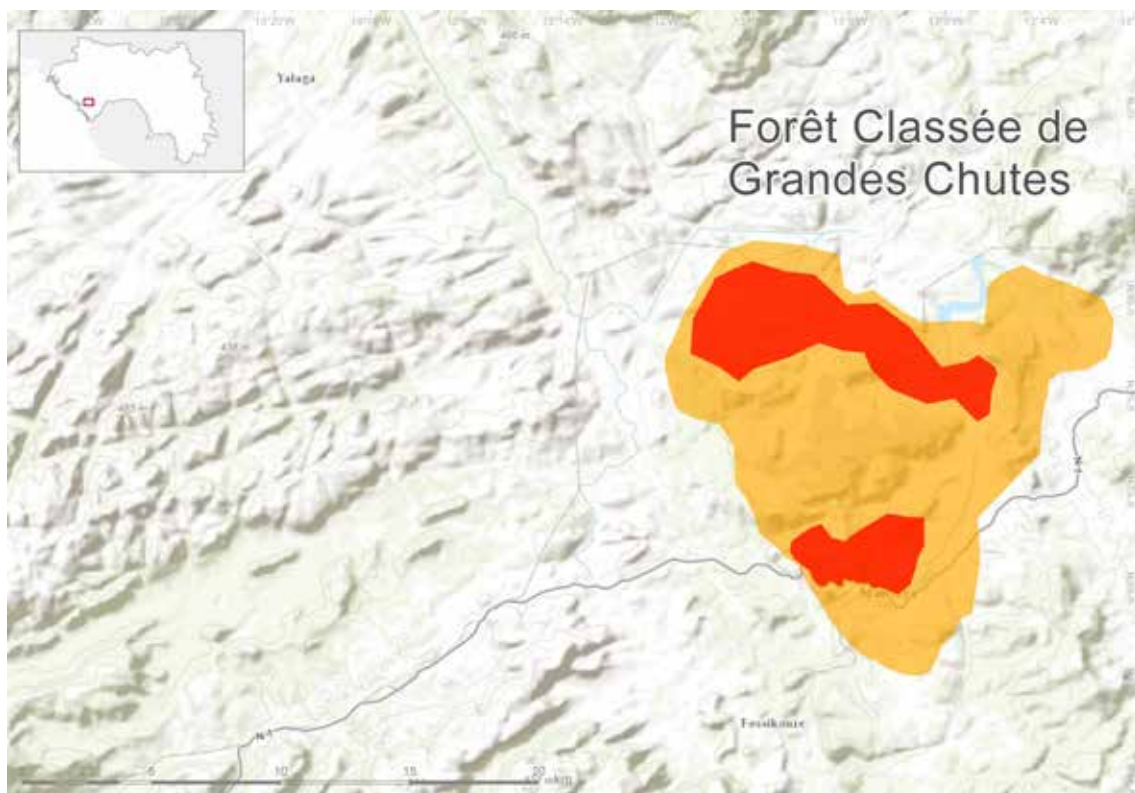
This is the only known global site for four species of plant, such as *Scleria guineensis*, a critically endangered endemic species to Guinea, and a new species to science of *Coleus*. Grandes Chutes falls is the only known global site for the Podostemaceae species, *Inversodicraea pygmaea*, and several other species of Podostemaceae that may now be extinct due to the construction of a dam for hydro-electric power. It also has a population of *Raphionacme caerulea* (EN). The seepage areas are rich in carnivorous plant species including the threatened species *Utricularia pobeguini* (EN) and *Utricularia macrocheilos* (VU). The area is under threat from increased mining activities, housing, and cattle grazing.

### **Site overview**

Site name: Grandes Chutes Classified Forest  
Country: Republic of Guinea  
Administrative region: Kindia  
Central co-ordinates: 09°54'26"N, 13°07'10"W  
Area: 160km<sup>2</sup>  
Altitude minimum: 80m  
Altitude maximum: 560m

### **Site description**

Grandes Chutes Classified Forest is located between the towns of Coyah and Kindia on the N1 national highway, in Kindia Prefecture. The area is part of the southern extent of the Fouta Djallon, with low elevation sandstone outcrops with shallow valleys and bowal. The sandstone bowal has several microhabitats, including seasonal seepage areas which support threatened herb species such as *Utricularia pobeguini*, *Raphionacme caerulea*, and *Scleria guineensis*. Part of the classified forest has an active bauxite mining concession owned by RUSAL. The Grandes Chutes falls, after which the area is named, was dammed in the 1960s to provide power to the nearby town and open-cast bauxite mine. This may have resulted in the global extinctions of *Inversodicraea pygmaea* and *Stonesia gracilis*, as this was their sole global site. They have not been discovered elsewhere, despite searches.



**Map 20.** The proposed area for protection as a TIPA. Core area in red, buffer zone in yellow.

### Botanical significance

The classified forest is the only known site for *Scleria guineensis*, a critically endangered (CR) endemic species to Guinea. It also has a population of *Raphionacme caerulea* (EN). The seepage areas are rich in carnivorous plant species, including five species of Lentibulariaceae, two of which are threatened (*Utricularia pobeguinii* (EN) and *Utricularia macrocheilos* (VU)). Grandes Chutes falls is the only known global site for the Podostemaceae species *Inversodicraea pygmaea* and *Stonesia gracilis*. Several other species of Podostemaceae are also recorded from the site, but due to the change in hydrology caused by the dam, they are likely extinct. Targeted searches in January 2018 failed to find them.

### General habitat and geology description

Low sandstone hills with sandstone bowal, rich in bauxite in some parts, with crevices and cracks, seepage areas, and temporary waterways. Ordovician sandstone of the Pita suite with patches of aleurolites (Source: Carte des Minéraux de la Guinée, Ministry of Mines, Government of Guinea, 2006).

### Conservation issues

There are numerous threats to the Grandes Chutes Classified Forest, most notable from the RUSAL mine and its potential expansion. There is a lot of dust across the area from the access roads and the mine itself, coating the vegetation. The hydroelectric dam has already caused damage to the Podostemaceae populations. There is also an area that has been marked out for housing (seen from Google Earth). From recent visits to the area, cattle grazing and trampling in the seepage areas close to the road have been observed, which has also led to fires across the bowal areas.

Since the mine and hydroelectric dam are already established, the TIPA area will have two core areas of protection within the larger boundary of the Classified Forest, to protect specific populations of threatened species.

### Protected area status and management

The Grandes Chutes Classified Forest was designated in 1944. The TIPA encompassed by the Classified Forest boundary.

## Threats

- Pastoral farming: Cattle grazing and trampling of threatened species.
- Mineral extraction: Bauxite mine (RUSAL) active in the area and has expanded over time.
- Housing: Part of area has housing lot designated.
- Fire: Fire set by cattle herders, reducing seed dispersal of species.

**Threat level: High**

## Criteria Assessments

### Criterion A: Threatened Species

	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<b>Criterion A: taxon present</b>								
<i>Raphionacme caerulea</i> E.A.Bruce	A(i)	EN	✓	✓				Infrequent
<i>Scleria guineensis</i> J.Raynal	A(i)	CR	✓	✓	✓	✓		Infrequent
<i>Utricularia macrocheilos</i> (P.Taylor) P.Taylor	A(i)	VU	✓	✓	✓			Frequent
<i>Utricularia pobeguinii</i> Pellegr.	A(i)	EN	✓	✓	✓			Infrequent
<i>Stonesia gracilis</i> G.Taylor	A(i)	CR(PE)	✓ <i>If extant</i>	✓	✓	✓		Unknown
<i>Inversodicraea pygmaea</i> G.Taylor	A(i)	CR(PE)	✓ <i>If extant</i>	✓	✓	✓		Unknown
<i>Sericanthe trilocularis</i> subsp. <i>paroissei</i> (Scott-Elliot) Robbr.	A(i)	EN	✓	✓	✓			Unknown
<i>Keetia susu</i> Cheek	A(i)	EN	✓					Infrequent
<i>Coleus (Plectranthus) sp. nov.</i>	A(i,iii)	CR	✓	✓	✓	✓		Infrequent
<i>Dilophotriche occidentalis</i> Jacq.-Fél.	A(i)	VU	✓					Frequent

**Table 32.** Criterion A for Grandes Chutes Classified Forest, Kindia.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

<b>B(i):</b> exceptional botanical richness within a defined habitat		
Habitat code and name	Site is part of the top 10% of the national resource	Site is one of the 5 best sites nationally for that habitat
Sandstone bowal (low altitude)	✓	✓

**Table 33.** Criterion B for Grandes Chutes Classified Forest, Kindia.

	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<b>Criterion B taxon present</b>			
<i>Lepidagathis fimbriata</i> C.B.Clarke	B(i)	Sandstone bowal	
<i>Hygrophila barbata</i> (Nees) T.Anderson	B(i)	Sandstone bowal	
<i>Fegimanra afzelii</i> Engl.	B(i)	Sandstone bowal	
<i>Raphionacme caerulea</i> E.A.Bruce	B(i)	Sandstone bowal	
<i>Cyanotis arachnoidea</i> var. <i>arachnoidea</i> C.B.Clarke	B(i)	Sandstone bowal	
<i>Fimbristylis dichotoma</i> (L.) Vahl	B(i)	Sandstone bowal	
<i>Scleria guineensis</i> J.Raynal	B(i)	Sandstone bowal	
<i>Nemum spadiceum</i> subsp. <i>spadiceum</i> (Lam.) Desv. ex Ham.	B(i)	Sandstone bowal	
<i>Scleria tricholepis</i> Nelmès	B(i)	Sandstone bowal	
<i>Afrotrilepis pilosa</i> (Boeck.) J.Raynal	B(i)	Sandstone bowal	
<i>Scleria naumanniana</i> Boeck.	B(i)	Sandstone bowal	
<i>Eriocaulon rufum</i> Lecomte	B(i)	Sandstone bowal	
<i>Sebaea teuszii</i> (Schinz) P.Taylor	B(i)	Sandstone bowal	
<i>Rhytachne gracilis</i> Stapf	B(i)	Sandstone bowal	
<i>Dilophotriche occidentalis</i> Jacq.-Fél.	B(i)	Sandstone bowal	
<i>Anadelphia liebigiana</i> H.Scholz	B(i)	Sandstone bowal	
<i>Plectranthus</i> sp. nov. Gangan	B(i)	Sandstone bowal	
<i>Aeschynomene tambacoundensis</i> Berhaut	B(i)	Sandstone bowal	
<i>Dalbergia albiflora</i> subsp. <i>albiflora</i> A.Chev. ex Hutch. & Dalziel	B(i)	Sandstone bowal	
<i>Dolichos dinklagei</i> Harms	B(i)	Sandstone bowal	
<i>Vigna venulosa</i> Baker	B(i)	Sandstone bowal	
<i>Utricularia foveolata</i> Edgew.	B(i)	Sandstone bowal	
<i>Utricularia macrocheilos</i> (P.Taylor) P.Taylor	B(i)	Sandstone bowal	
<i>Utricularia scandens</i> Benj.	B(i)	Sandstone bowal	
<i>Utricularia firmula</i> Welw. ex Oliv.	B(i)	Sandstone bowal	
<i>Utricularia pobeguini</i> Pellegr.	B(i)	Sandstone bowal	
<i>Polygala sparsiflora</i> var. <i>sparsiflora</i> Oliv.	B(i)	Sandstone bowal	
<i>Sericanthe trilocularis</i> subsp. <i>paroissei</i> (Scott-Elliot) Robbr.	B(i)	Sandstone bowal	
<i>Tricliceras pilosum</i> (Willd.) R.Fern.	B(i)	Sandstone bowal	

**Table 34.** Criterion B for Grandes Chutes Classified Forest, Kindia.

**Key:** ✓ = yes. **Abundance:** Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion C: Threatened Habitat

Habitat type	IPA subcritterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Sandstone bowal (low altitude)	C(iii)			✓	41km <sup>2</sup>

**Table 35.** Criterion C for Grandes Chutes Classified Forest, Kindia.

## Bibliography

Couch, C., Magassouba, S., Rokni, S., and Cheek, M. (2017). Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>

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## Site in pictures



Grandes Chutes Classified Forest, October 2016. (Photo: ©I. Larridon, RBG Kew)



Grandes Chutes Classified Forest, October 2016. (Photo: © C. Couch, RBG Kew)



Grandes Chutes Classified Forest, June 2016. (Photo: © C. Couch, RBG Kew)



Grandes Chutes Classified Forest, October 2016. (Photo: © C. Couch, RBG Kew)



Species assemblage in wet flush vegetation, Grandes Chutes, October 2016. (Photo: ©I. Larridon, RBG Kew)



*Utricularia pobeguinii*.  
(Photo: ©M. Cheek, RBG Kew)



*Raphionacme caerulea*.  
(Photo: ©C. Couch, RBG Kew)

## TIPA Assessment 6:

### Kakiwondi Forest Patch, Coyah



#### IPA criteria under which the site qualifies: A(i), B(i), C(iii)

**Assessed by:** Charlotte Couch, Martin Cheek, Xander van der Burgt (RBG Kew), and Denise Molmou (HNG).

#### TIPA assessment rationale

This remnant of lowland forest is a significant habitat for many threatened species. It is possibly the best representative of the forest patches of the Coyah hills, with likely the second highest species diversity so far recorded for this forest type after the Kounounkan Forest in Forécariah Prefecture.

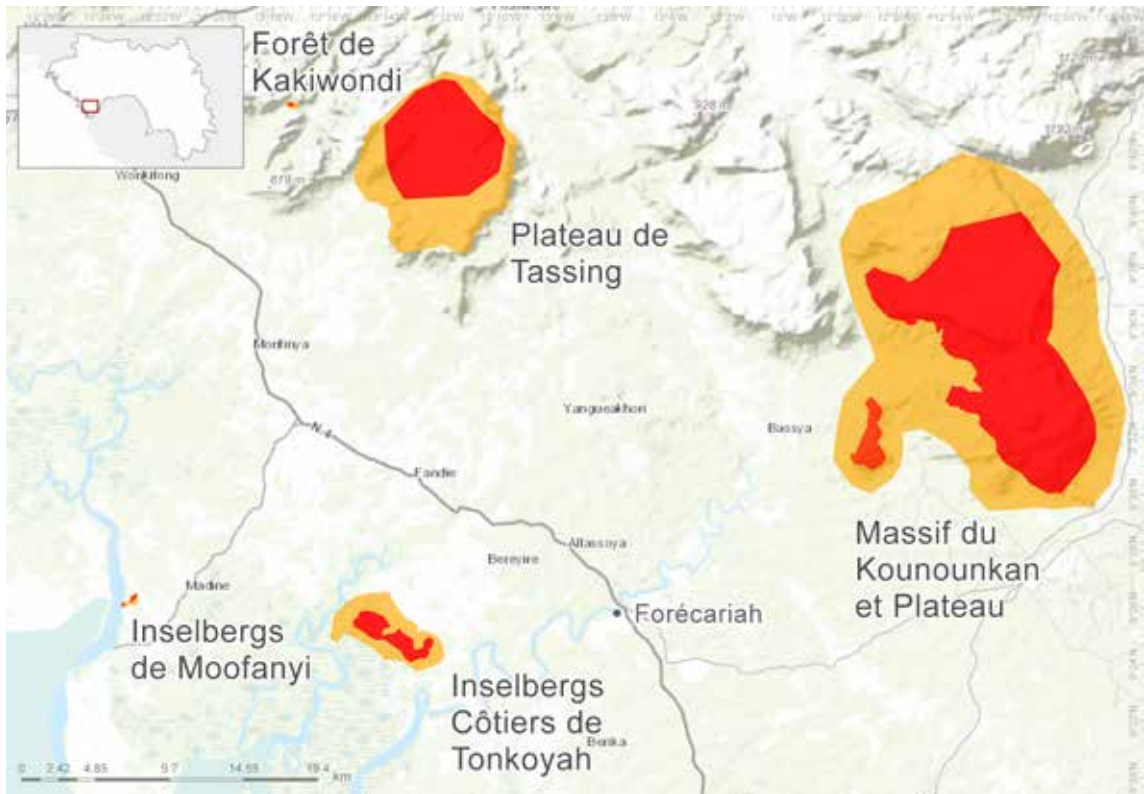
The population of *Tarenna hutchinsonii* is the second largest in Guinée Maritime. There are also significant populations of *Diospyros feliciana*, *Baphia heudelotiana* (largest population known globally), *Stylochaeton pilosus*, and the newly described *Talbotiella cheekii*. The forest patches of Coyah are under threat from cultivation and Kakiwondi is a good representation. Although it is a sacred forest, it has been impacted by slash and burn agriculture practice.

#### Site overview

Site name: Kakiwondi Forest Patch  
Country: Republic of Guinea  
Administrative region: Coyah Prefecture  
Central co-ordinates: 09°43'47"N, 13°17'24"W  
Area: 0.1km<sup>2</sup>  
Altitude minimum: 170m  
Altitude maximum: 240m

#### Site description

Kakiwondi, near the village of Tomboya in the central hills of Coyah Prefecture, is a small sacred forest patch protected by the village. This forest is a remnant of the lowland forest that would have covered this area in the past, and is recognised as one of the national threatened vegetation types. The area is on the side of the Wélé Wélé river valley and quite rocky. The dominant tree, *Guibourtia copallifera*, gives its name to forest – *Kaki* – from the Susu language. The area is small, only 100m<sup>2</sup>, but significant given the pressures of cultivation in surrounding area.



**Map 21.** The proposed TIPAs in relation to the wider Guinea Maritime area



**Map 22.** The proposed areas for protection as TIPAs. Core area in red, buffer zone in yellow.

## Botanical significance

Kakiwondi is one of the last refuges for some of the rare lowland forest species in the Guinée Maritime region. The region's second largest population of *Tarenna hutchinsonii*, significant populations of *Diospyros felicianae*, *Baphia heudelotiana*, and *Stylochaeton pilosus*, and the newly described *Talbotiella cheekii*, are all found in this small forest patch. Of several small remnants of lowland forest in the Coyah hills, it is one of the richest in threatened species. It is likely that additional species will be found in future surveys.

## General habitat and geology description

Small lowland forest patch on the side of a sandstone hill with exposed rocks and boulders of dolerite. It is part of the same Ordovician sandstone ridge that goes northeast through Kindia, up to Pita in the Fouta Djallon. The forest patch is partly sloped and partly plateau, with the Wélé Wélé river adjacent.

## Conservation issues

Nearby cultivation of land on the slopes, using slash and burn clearance methods, has led to fire invading the forest patch. Some plants of *Tarenna hutchinsonii* were lost in 2016. The path through the forest is used to reach neighbouring villages of Kaporo, Yataraya, and Saliya by foot; currently this does not seem to have a detrimental effect.

## Protected area status and management

The forest is protected by the village as a sacred forest, but it is not officially protected.

## Threats

- Agriculture: Shifting agriculture and slash and burn agriculture.

**Threat level: High**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subcritterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Diospyros felicianae</i> Letouzey & F.White	A(i)	EN	✓	✓	✓			Infrequent
<i>Cryptosepalum tetraphyllum</i> (Hook.f.) Benth.	A(i)	VU	✓	✓	✓			Infrequent
<i>Tessmannia baikiaeoides</i> Hutch. & Dalziel	A(i)	VU	✓	✓	✓			Infrequent
<i>Baphia heudelotiana</i> Baill.	A(i)	VU	✓	✓	✓		✓	Frequent
<i>Keetia susu</i> Cheek	A(i)	VU	✓	✓	✓			Infrequent
<i>Tarenna hutchinsonii</i> Bremek.	A(i)	CR	✓	✓	✓			Infrequent
<i>Talbotiella cheekii</i> Burgt	A(i)	EN	✓	✓	✓			Abundant
<i>Apodiscus chevalieri</i> Hutch.	A(i)	EN	✓	✓	✓			Infrequent

**Table 36.** Criterion A for Kakiwondi Forest Patch, Coyah.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion B: Botanical Richness

<b>B(i):</b> exceptional botanical richness within a defined habitat		
<b>Habitat code and name</b>	<b>Site is part of the top 10% of the national resource</b>	<b>Site is one of the 5 best sites nationally for that habitat</b>
Maritime Evergreen Forest	✓	✓

**Table 37.** Criterion B for Kakiwondi Forest Patch, Coyah.

**Key:** ✓ = yes.

<b>Criterion B taxon present</b>	<b>Sub-criterion under which species qualifies</b>	<b>For B(i) – indicator of habitat</b>	<b>Abundance at site</b>
<i>Stylochaeton pilosus</i> Bogner	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Diospyros feliciana</i> Letouzey & F.White	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Cryptosepalum tetraphyllum</i> (Hook.f.) Benth.	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Tessmannia baikieoides</i> Hutch. & Dalziel	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Baphia heudelotiana</i> Baill.	B(i)	Lowland evergreen forest (Guinée Maritime)	Frequent
<i>Keetia susu</i> Cheek	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Tarenna hutchinsonii</i> Bremek.	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Talbotiella cheekii</i> Burgt	B(i)	Lowland evergreen forest (Guinée Maritime)	Abundant
<i>Aulacocalyx divergens</i> (Hutch. & Dalziel) Keay	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Mostuea hirsuta</i> (T.Anderson ex Benth.) Baill. ex Baker	B(i)	Lowland evergreen forest (Guinée Maritime)	Frequent
<i>Leptactina senegambica</i> Hook.f.	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Polygala multiflora</i> Poir.	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Dorstenia cuspidata</i> var. <i>preussii</i> Hochst.	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Olax gambecola</i> Baill.	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Oxyanthus racemosus</i> (Schum. & Thonn.) Keay	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Batesanthus purpureus</i> N.E.Br.	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Guibourtia copallifera</i> Benn.	B(i)	Lowland evergreen forest (Guinée Maritime)	Frequent
<i>Ceropegia peulhorum</i> A.Chev.	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Cryptolepis sanguinolenta</i> (Lindl.) Schltr.	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Apodiscus chevalieri</i> Hutch.	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Ancistrorhynchus akeassiae</i> (Aubl.) Harley & J.F.B.Pastore	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Atroxima afzeliana</i> (Oliv.) Stapf	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Brillantaisia lamium</i> (Nees) Benth.	B(i)	Lowland evergreen forest (Guinée Maritime)	Frequent
<i>Coffea ebracteolata</i> (Hiern) Brenan	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Croton nigritanus</i> Scott-Elliot	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Daniellia thurifera</i> Bennett	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Elaeophorbium drupifera</i> (Thonn.) Stapf	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Homalium smythei</i> Hutch. & Dalziel	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Hunteria simii</i> (Stapf) H.Huber	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown

	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<b>Criterion B taxon present</b>			
<i>Lasiodiscus chevalieri</i> Hutch.	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Myrianthus serratus</i> (Trécul) Benth. & Hook.	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Plectranthus bojeri</i> (Benth.) Hedge.	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Rinorea breviremosa</i> Chipp	B(i)	Lowland evergreen forest (Guinée Maritime)	Common
<i>Rourea coccinea</i> (Thonn. ex Schum.) Benth.	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Rytigynia umbellulata</i> (Hiern) Robyns	B(i)	Lowland evergreen forest (Guinée Maritime)	Infrequent
<i>Sansevieria senegambica</i> Baker	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Streblus usambarensis</i> (Engl.) C.C.Berg	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Uvaria ovata</i> subsp. <i>afzeliana</i> (DC.) A.DC.	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Uvaria thomasi</i> Sprague & Hutch.	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Vitex ferruginea</i> Schum. & Thonn.	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown
<i>Warneckea fascicularis</i> var. <i>fascicularis</i> (Planch. ex Benth.) Jacq-Fél.	B(i)	Lowland evergreen forest (Guinée Maritime)	Unknown

**Table 38.** Criterion B for Kakiwondi Forest Patch, Coyah.

**Key:** ✓ = yes. **Abundance:** Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Lowland evergreen forest (Guinée Maritime)	C(iii)			✓	0.1km <sup>2</sup>

**Table 39.** Criterion C for Kakiwondi Forest Patch, Coyah.

### Bibliography

- Couch, C., Magassouba, S., Rokni, S., Cheek, M. (2017). Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>
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### Field Reports

- Molmou, D. (2016-2017). TIPA Field reports.

## Site in pictures



Entering Kakiwondi forest from the Kaporo side.  
(Photo: ©C. Couch, RBG Kew)



*Talbotiella cheekii* Burgt (EN), new species published in 2018. (Photo: ©X. van der Burgt, RBG Kew)



Wélé Wélé river in the dry season, Kakiwondi forest patch. (Photo: ©X. van der Burgt, RBG Kew)



Fire damage on the slope below Kakiwondi Forest Patch, 2016. (Photo: © C. Couch, RBG Kew)



*Talbotiella cheekii* Burgt (EN).  
(Photo: © X. van der Burgt, RBG Kew)



*Baphia heudelotiana* Baill (VU).  
(Photo: © M. Cheek, RBG Kew)



**IPA criteria under which the site qualifies:** A(i), B(i), C(iii)

**Assessed by:** Charlotte Couch and Martin Cheek (RBG Kew).

### **TIPA assessment rationale**

Kambadga Falls is the only existing site known globally for *Inversodicraea abbayesii* (CR (PE)), and for *Stonesia fascicularis* (CR(PE)). It also has a population of *Saxicolella futa* Cheek ined. (likely EN), a new species discovered in 2018, and *Eriocaulon sulanum* (EN), only the second population known in Guinea. It is under threat from the proposed building of a hydroelectric dam.

### **Site overview**

Site name: Kambadga Falls  
Country: Republic of Guinea  
Administrative region: Pita Prefecture  
Central co-ordinates: 10°59'52"N, 12°29'31"W  
Area: 2km<sup>2</sup>  
Altitude minimum: 520m  
Altitude maximum: 730m

### **Site description**

The Kambadga Falls are located around 21km from Pita town and are on the Kokoulo River, a tributary of the Konkouré. The Kinkon Falls and hydroelectric dam are 15km upstream. The falls are made up of a series of four cascades, the first two being the highest. The river is flanked by thin strips of gallery forest. It is a popular tourist site with an ecovillage nearby.



**Map 23.** The proposed area for protection as a TIPA. Core area in red, buffer zone in yellow.

### Botanical significance

The succession of fast flowing rapids and waterfalls at Kambadga is particularly rich in rheophyte species. It has four species of Podostemaceae, two of which are Critically Endangered (CR) and were made locally extinct due to the Kinkon dam. They had been thought possibly globally extinct before they were found at Kambadga, together with *Eriocaulon sulanum* (EN), for which this is only one of two known sites in Guinea.

Associated rheophytes are: *Tristicha trifaria*, *Eriocaulon latifolium*, *Gnidia kraussiana*, *Hygrophila*, and *Culcasia*. The submontane gallery forest is intact and includes: *Uapaca chevalieri*, *Gardenia imperialis*, *Hypolytrum senegalensis*, *Ficus saussureana*, *Usteria*, *Harungana*, *Bertiera*, *Anthocleista*, *Alchornea*, *Kotschyia*, *Syzygium*, *Pavetta*, *Garcinia*, *Warneckea*, and *Anthostemma*.

### General habitat and geology description

The river valley has carved its way through the surrounding Ordovician quartzite rich sandstone to older argillites and aleurolites interlayered with quartzitic sandstone. The river is flanked by thin strips of gallery forest though much of the surrounding area has been cleared for farming over the years.

### Conservation issues

The site has been earmarked for a hydroelectric dam, financed by the Chinese (sign found close to the falls). The site is popular with tourists who have a low-level impact by trampling.

### Protected area status and management

No protection is currently in place.

### Threats

- Tourism: Impacts from tourists (trampling).
- Hydroelectric dam: Proposed site for a new dam.

**Threat level: Medium-High**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Inversodicraea abbayesii</i> G.Taylor	A(i)	CR(PE)	✓	✓	✓	✓		Frequent
<i>Stonesia fascicularis</i> G.Taylor	A(i)	CR(PE)	✓	✓	✓	✓		Frequent
<i>Saxicolella futa</i> Cheek ined.	A(i)	EN?	✓	✓	✓			Scarce
<i>Eriocaulon sulanum</i> S.M.Phillips & Burgt	A(i)	EN	✓	✓	✓			Scarce

**Table 40.** Criterion A for Kambadga Falls, Pita.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

B(i): exceptional botanical richness within a defined habitat		
Habitat code and name	Site is part of the top 10% of the national resource	Site is one of the 5 best sites nationally for that habitat
Waterfalls and rapids with Podostemaceae		✓

**Table 41.** Criterion B for Kambadga Falls, Pita.

Criterion B taxon present	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<i>Inversodicraea abbayesii</i> G.Taylor	B(i)	Waterfalls and rapids with Podostemaceae	Locally common
<i>Stonesia fascicularis</i> G.Taylor	B(i)	Waterfalls and rapids with Podostemaceae	Locally common
<i>Saxicolella futa</i> Cheek ined.	B(i)	Waterfalls and rapids with Podostemaceae	Infrequent
<i>Eriocaulon sulanum</i> S.M.Phillips & Burgt	B(i)	Waterfalls and rapids with Podostemaceae	Infrequent

**Table 42.** Criterion B for Kambadga Falls, Pita.

**Key:** ✓ = yes. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Waterfalls and rapids with Podostemaceae	C(iii)			✓	1km <sup>2</sup>

**Table 43.** Criterion C for Kambadga Falls, Pita.

## Bibliography

Couch, C., Magassouba, S., Rokni, S., Cheek, M. (2018). Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>

IUCN Red List of Threatened Species. <https://www.iucnredlist.org/>

## Site in pictures



Kambadga falls, January 2018. (Photo: ©M. Cheek, RBG Kew)



Kambadga Falls, January 2018.  
(Photo: ©M. Cheek, RBG Kew)



*Inversodicraea abbayesii* (CR(PE)). January 2018.  
(Photo: ©M. Cheek, RBG Kew)



*Stonesia fascicularis* (CR(PE)). January 2018.  
(Photo: ©M. Cheek, RBG Kew)



*Eriocaulon sulanum* and *Culcasia* sp. January 2018. (Photo: ©M. Cheek, RBG Kew)

## TIPA Assessment 8:

### Koba Sandstone Bowal (Kapété), Dalaba



**IPA criteria under which the site qualifies:** A(i,iii), C(iii)

**Assessed by:** Charlotte Couch and Martin Cheek (RBG Kew).

#### TIPA assessment rationale

The site at Koba represents the largest populations of *Mesanthemum tuberosum* and *Raphionacme caerulea* in the Fouta Djallon and is a good example of high-altitude sandstone bowal. This is a pure sandstone outcrop and is unlike some other bowal areas in the Fouta Djallon, which are iron-based bowal. *Mesanthemum tuberosum* is endemic to the Fouta Djallon, and although present in many areas in small numbers, there is no other known site at present with such a concentration.

#### Site overview

Site name: Koba Sandstone Bowal (Kapété)  
Country: Republic of Guinea  
Administrative region: Dalaba Prefecture  
Central co-ordinates: 10°37'59"N, 12°16'43"W  
Area: 1km<sup>2</sup>  
Altitude minimum: 1,050m  
Altitude maximum: 1,130m

#### Site description

Sandstone outcrop and bowal, known locally as 'kapété', with shallow and medium-depth soils, close to the village of Koba, c. 7km southwest of the town of Dalaba. Grassland with trees in the deeper soils or growing through cracks in the rocky outcrop. The outcrop is part of the high-altitude plateau of the Fouta Djallon and is between 1,050m and 1,350m altitude, and c. 1km<sup>2</sup> in area.



**Map 24.** The proposed areas for protection as TIPAs. Core area in red, buffer zone in yellow.

### Botanical significance

The flat, plain area has the largest population of *Mesanthemum tuberosum* (rediscovered in 2017) found in the Fouta Djallon area. It also has a population of *Raphionacme caerulea*. This is a good example of high-altitude sandstone bowal in the Moyenne Guinée region. It is considered likely that revisiting the site at different seasons (e.g. Oct) will result in additional threatened species being identified.

### General habitat and geology description

High-altitude sandstone bowal grassland, dominated by *Elymandra subulata* with many herbs present including *Mesanthemum tuberosum*, *Buchnera bowalensis*, *Cyanotis arachnoidea*, *Cyanotis lanata*, *Tephrosia platycarpa*, *Crotalaria lathyroides*, *Fimbristylis schweinfurthiana*, *Nemum spadiceum*, *Raphionacme caerulea*, and *Platycoryne paludosa*. In the deeper soil pockets, trees and shrubs of *Dichaetanthera echinulata*, *Vismia guineensis*, *Psorospermum febrifugum*, and *Ficus* sp. can be found. There is a river to the southwest of the site with riverine species present.

This area is part of the Oundou series of interbedded quartzitic sandstone and dolomitic clays with Mesozoic intrusions of dolerite or gabbro-dolerites (Source: Carte des Minéraux Utiles de la République de Guinée, 2006).

### Conservation issues

The area is used for grazing cattle and goats, which could cause problems for some species from grazing and trampling. Also, increased nitrification of the soil may lead to enrichment and a decrease in species diversity. It has been observed that the *Raphionacme caerulea* plants do not seem to make it to seed dispersal stages – plants viewed in flower and GPS marked could not be refound in the fruiting season (pers. obs. Couch, 2017).

### Protected area status and management

This area is not included in any Protected Area or managed at present.

## Threats

- Pastoralism: the area is used for grazing cattle and goats, which could cause problems for some species from grazing and trampling.

**Threat level: Medium**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Raphionacme caerulea</i> E.A. Bruce	A(i)	EN	✓	✓	✓			Infrequent
<i>Mesanthemum tuberosum</i> Lecomte	A(i,iii)	VU	✓	✓	✓			Frequent
<i>Cyanotis ganganensis</i> Schnell	A(i,iii)	EN	✓	✓	✓			Infrequent
<i>Dichaetanthera echinulata</i> Hook. f.	A(i)	EN	✓	✓	✓			Infrequent

**Table 44.** Criterion A for Koba Sandstone Bowal (Kapété), Dalaba.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

Insufficient information for this criterion

### Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
High altitude sandstone bowal	C(iii)		✓		1km <sup>2</sup>

**Table 45.** Criterion C for Koba Sandstone Bowal (Kapété), Dalaba.

## Bibliography

- Couch, C., Magassouba, S., Rokni, S., Cheek, M. (2018). Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>
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## Field Reports

- Couch, C. (Oct 2016). TIPAs Guinea Darwin Project report: Field expedition to Fouta Djallon.
- Couch, C. (July 2017). TIPAs Guinea Darwin Project report: Field expedition to Fouta Djallon.

## Site in pictures



Koba sandstone 'Kapété', in June 2016. (Photo: © C. Couch, RBG Kew)



Koba sandstone 'Kapété', in June 2016. (Photo: © C. Couch, RBG Kew)



Grazers on Koba sandstone 'Kapété'. (Photo: ©C. Couch, RBG Kew)



*Mesanthemum tuberosum* Lecomte.  
(Photo: ©M. Cheek, RBG Kew)



*Raphionacme caerulea* E.A.Bruce.  
(Photo: ©C. Couch, RBG Kew)



**IPA criteria under which the site qualifies: A(i), C(iii)**

**Assessed by:** Charlotte Couch, Martin Cheek (RBG Kew), and Pépé Haba (Guinée Biodiversité).

**TIPA assessment rationale**

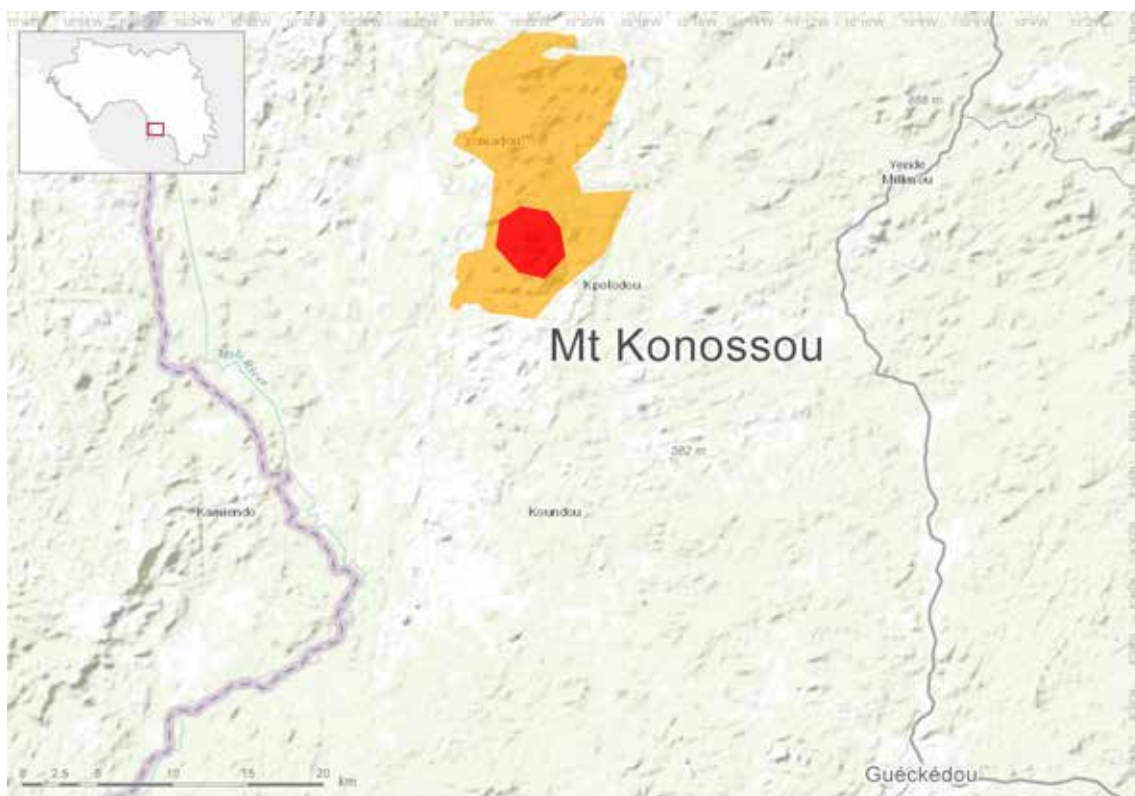
Mt Konossou is the only known global location for the endemic monospecific genus *Feliciadamia stenocarpa*. Its habitat is threatened by uncontrolled burning for agriculture and hunting, and needs to be better protected, otherwise this species will become extinct. Granite inselbergs are a threatened habitat in Guinea, as they are often quarried for building materials.

**Site overview**

Site name: Mt Konossou  
Country: Republic of Guinea  
Administrative region: Guéckédou Prefecture  
Central co-ordinates: 08°52'49"N, 10°22'06"W  
Area: 16km<sup>2</sup>  
Altitude minimum: 500m  
Altitude maximum: 1,350m

**Site description**

Mt Konossou is a small chain of granitic mountains in the Guéckédou prefecture, situated between the sub-prefectures of Kassadou and Gbolodou in Guinée Forestière. It is locally called *Konsou* in the local Lélé dialect, which means 'mountain of rock'. The main peak is 1,350m altitude, with several smaller peaks between 900m and 1,300m, over a core area of 16km<sup>2</sup>, with a buffer zone of 136km<sup>2</sup>.



**Map 25.** The proposed area for protection as a TIPA. Core area in red, buffer zone in yellow.

### Botanical significance

This is only known site for the Guinean endemic *Feliciadamia stenocarpa*, rediscovered in 2017. This species of Melastomataceae is a monospecific genus and is only known to grow in moist, shaded overhangs in the granite between 900m and 1,350m altitude.

### General habitat and geology description

Granitic outcrop belonging to the Leonean-Liberian massif, from the late Archean period. It forms part of the chain of inselbergs and granite outcrops extending northeast-southwest from Kissidougou Prefecture into Sierra Leone, and east in Guinea to Macenta Prefecture. The vegetation ranges from grassland, with small marsh areas, to shaded cliffs, and wooded grassland at the base of the mountain, with gallery forest along the base and small pockets of forest at the summit.

### Conservation issues

The main threats to this area are from the neighbouring populations at Yogboma, Gbodou, and Songbo. Hunters and farmers set fires for field clearance and hunting. This uncontrolled burning may be a real threat to the population of *Feliciadamia stenocarpa*, if seed heads are burnt in the dry season. There are also some rice fields that have been made on the plateaus at 600-700m altitude.

There are forest guards present in the area, but due to the size of their area for patrol, little protection is provided. Granite inselbergs are a threatened habitat in Guinea, as they are often quarried for building materials. However, this site's remote location is currently protecting it from quarrying.

### Protected area status and management

Mt Konossou Forêt Classée (Classified Forest) was designated in 1945 and is shown on maps, but not all Classified Forests are treated as protected areas by the Guinean Government.

The TIPA will encompass the present boundary of the Classified Forest.

## Threats

- Agriculture: Clearing by fire for farming and hunting.
- Quarrying: Potential threat from granite extraction.

**Threat level: Medium-high**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Feliciadamia stenocarpa</i> (Jacq.-Fél.) Bullock	A(i)	CR	✓	✓	✓	✓		Infrequent

**Table 46.** Criterion A for Mt Konossou, Guéckédou.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

This criterion does not apply.

### Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Inselberg	C(iii)			✓	149km <sup>2</sup>

**Table 47.** Criterion A for Mt Konossou, Guéckédou.

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Couch, C., Magassouba, S., Rokni, S., Cheek, M. (2018). Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>

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Lisowski, S. (2009). Flore (Angiospermes) de la République de Guinée. *Scripta Botanica Belgica*. Meise: Jardin Botanique National de Belgique.

## Field Reports

Haba, P. (October 2017).

## Site in pictures



Mt Konossou. (Photo: ©Pépé Haba, Guinée Biodiversité)



Mt Konossou's peak. (Photo: ©Pépé Haba, Guinée Biodiversité)



*Feliciadamia stenocarpa*.  
(Photo: ©Pépé Haba, Guinée Biodiversité)



*Feliciadamia stenocarpa* on humid granite rocks, Mt  
Konossou. (Photo: ©Pépé Haba, Guinée Biodiversité)

## **Koukoutamba Waterfalls, Tougué**



**IPA criteria under which the site qualifies: A(i), B(i), C(iii)**

**Assessed by:** Charlotte Couch and Martin Cheek (RBG Kew).

### **TIPA assessment rationale**

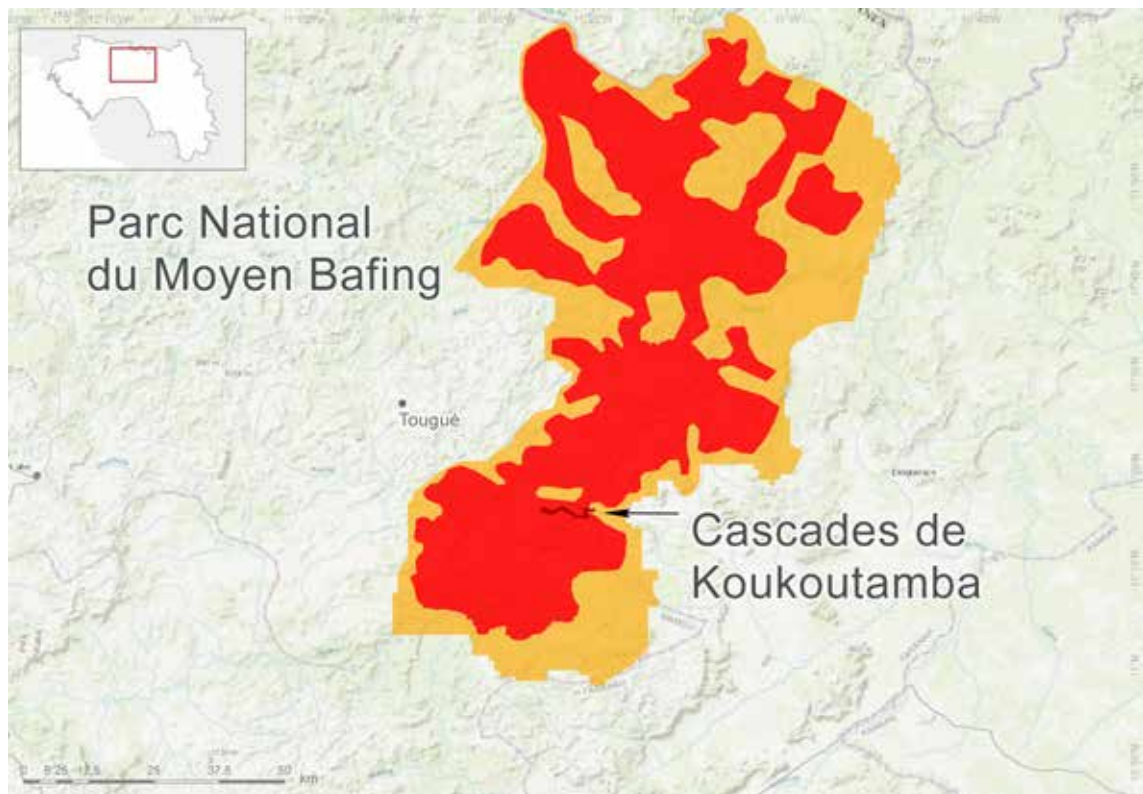
The rapids and waterfalls at Koukoutamba are the most species-rich for Podostemaceae known in Guinea, with five species. It is the only known location in Guinea for the Critically Endangered (CR) Podostemaceae species, *Lebbiea grandiflora*, and the only global location for the spectacular new species *Inversodicraea koukoutamba* ined. These species are directly and imminently threatened with extinction from the planned hydroelectric dam. In addition, the globally Endangered (EN) *Stonesia taylorii* and the Critically Endangered (CR) *Barleria asterotricha* are also present and threatened by the project.

### **Site overview**

Site name: Koukoutamba Waterfalls  
Country: Republic of Guinea  
Administrative region: Tougué Prefecture  
Central co-ordinates: 13°16'11"N, 11°22'47"W  
Area: 27.5km<sup>2</sup>  
Altitude minimum: 450m  
Altitude maximum: 470m

### **Site description**

The Koukoutamba Falls are on the Bafing River, upriver from the N27 road in Tougué Prefecture. It is a fast-flowing area of rapids and waterfalls. For around 12km below the main falls, the river is flanked by a thin strip of gallery forest dominated by *Syzygium guineense* var. *guineense*.



**Map 26.** The proposed area for protection as a TIPA. Core area in red, buffer zone in yellow.

### Botanical significance

The succession of fast flowing rapids and waterfalls at Koukoutamba on this stretch of the Bafing river is particularly rich in rheophyte species. It is the only known location in Guinea for the Critically Endangered Podostemaceae species, *Lebbiea grandiflora* (newly described in 2018), and two other highly-threatened species of Podostemaceae.

### General habitat and geology description

The Bafing river flows through a valley of sandstone, argillite interlayered with limestone and silica over conglomerate base rock. The unequal erosion is likely to be the cause of the rapids and waterfalls on the river. Narrow strips of gallery forest dominated by *Syzygium guineense* var. *guineense* are found either side of the river with bowal areas behind and seasonal gullies draining into the river.

### Conservation issues

The Koukoutamba falls are threatened by the creation of a hydroelectric dam. Despite the falls being encompassed within the Moyen Bafing National Park, if construction is allowed upstream (outside of the park area) it will significantly alter the hydrology of the river and very likely cause silt deposits, exterminating the threatened (and in one case globally unique) Podostemaceae species.

### Protected area status and management

The area is within proposed Moyen Bafing National Park, designated in 2018. The Protected Area encompasses part of the TIPA (c. 16km<sup>2</sup>). A management plan is currently being put in place by the Wild Chimpanzee Foundation.

### Threats

- Infrastructure: Construction of a hydroelectric dam is planned upstream of the area.

**Threat level: High**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Lebbiea grandiflora</i> Cheek	A(i)	CR	✓	✓	✓			Frequent
<i>Inversodicraea harrisii</i> (C.Cusset) Cheek	A(i)	VU	✓	✓	✓			Frequent
<i>Stonesia taylorii</i> C.Cusset	A(i)	EN	✓	✓	✓			Frequent
<i>Inversodicraea koukoutamba</i> ined.	A(i)	CR	✓	✓	✓	✓		Abundant
<i>Barleria asterotricha</i> Benoist	A(i)	CR	✓	✓	✓			Scarce

**Table 48.** Criterion A for Koukoutamba Waterfalls, Tougué.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

<b>B(i):</b> exceptional botanical richness within a defined habitat		
Habitat code and name	Site is part of the top 10% of the national resource	Site is one of the 5 best sites nationally for that habitat
Waterfalls and rapids with Podostemaceae	✓	✓

**Table 49.** Criterion B for Koukoutamba Waterfalls, Tougué.

**Key:** ✓ = yes.

Criterion B taxon present	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<i>Lebbiea grandiflora</i> Cheek	B(i)	Waterfalls and rapids with Podostemaceae	Frequent
<i>Inversodicraea harrisii</i> (C.Cusset) Cheek	B(i)	Waterfalls and rapids with Podostemaceae	Frequent
<i>Stonesia taylorii</i> C.Cusset	B(i)	Waterfalls and rapids with Podostemaceae	Frequent
<i>Inversodicraea koukoutamba</i> ined.	B(i)	Waterfalls and rapids with Podostemaceae	Abundant

**Table 50.** Criterion B for Koukoutamba Waterfalls, Tougué.

**Key:** Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Waterfall and Rapids with Podostemaceae	C (iii)			✓	c.12km <sup>2</sup>

**Table 51.** Criterion C for Koukoutamba Waterfalls, Tougué.

## Bibliography

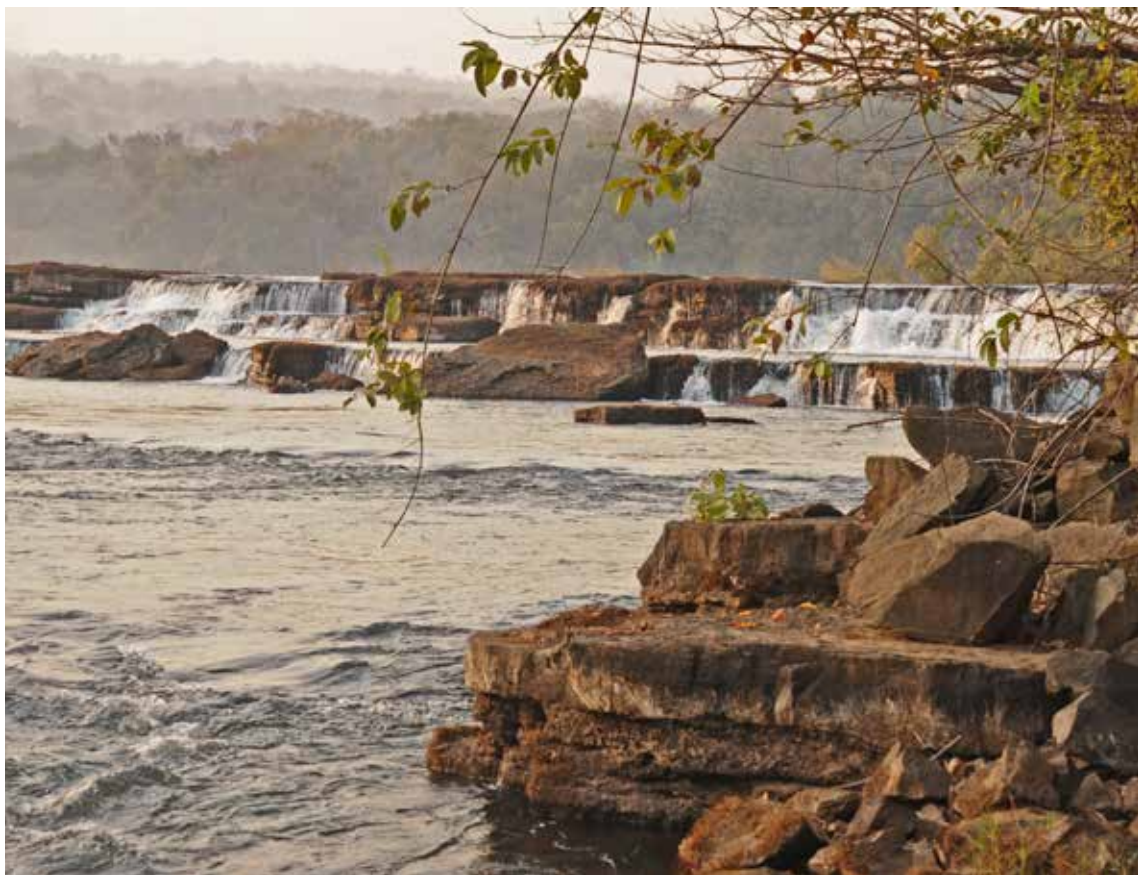
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Ministère de l’Energie et de l’Hydraulique, République de Guinée. Report on the Proposed Hydroelectric Dam Project. <http://www.invest.gov.gn/document/projet-hydroelectrique-de-koukoutamba>

## Site in pictures



Koukoutamba Waterfalls in January 2018. (Photo: © M. Cheek, RBG Kew)



Koukoutamba waterfall with 'carpets' of Podostemaceae in January 2018. (Photo: © M. Cheek, RBG Kew)



Koukoutamba waterfalls in June 2018. (Photo: © Charlotte Couch, RBG Kew)

Examples of Podostemaceae



*Lebbiea grandiflora* Cheek. (Photo: ©M. Cheek, RBG Kew)



*Stonesia taylorii* C.Cusset. (Photo: ©M. Cheek, RBG Kew)



*Inversodicraea koukoutamba* ined. (Photo: ©M. Cheek, RBG Kew)

**Kounounkan Massif and Plateau, Forécariah****IPA criteria under which the site qualifies: A(i,iii), B(ii), C(iii)**

**Assessed by:** Martin Cheek, Charlotte Couch, Xander van der Burgt (RBG Kew), and Pépé Haba (Guinée Biodiversité).

**TIPA assessment rationale**

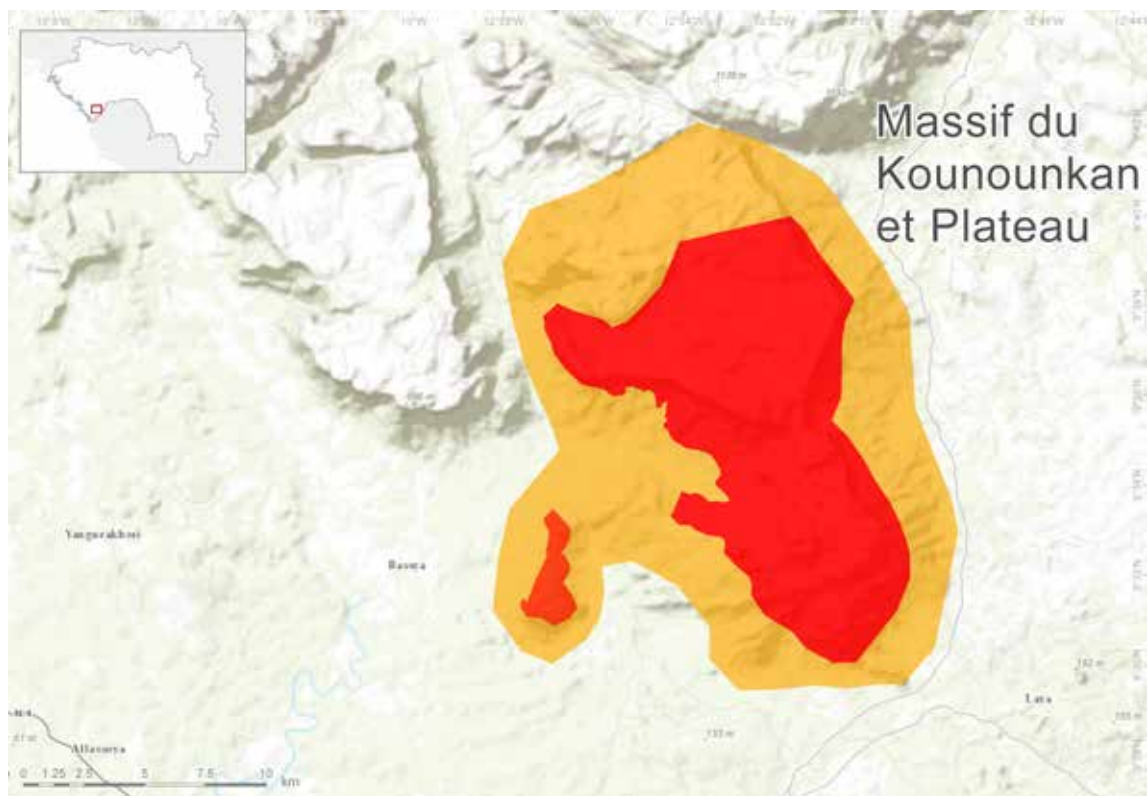
The Kounounkan Massif is home to more than 30 threatened plant species, including nine point-endemic species that are globally unique to Kounounkan. There are significant threats to the species and landscape from increased population pressure, resulting in areas being cleared for subsistence farming. The Kounounkan forest is the largest remaining intact lowland forest in Guinée Maritime. It is a significant habitat for many mammal and bird species, in addition to its globally important plant diversity.

**Site overview**

Site name: Kounounkan Massif and Plateau  
Country: Republic of Guinea  
Administrative region: Forécariah Prefecture  
Central co-ordinates: 09°33'59"N, 12°52'09"W  
Area: 39.55km<sup>2</sup>  
Altitude minimum: 100m  
Altitude maximum: 1,180m

**Site description**

The Kounounkan Massif consists of the southernmost extension of the Fouta Djallon highland area. It comprises a series of several barely connected sandstone table mountains with sheer cliffs falling hundreds of metres, with few and difficult access routes to reach the summit plateaus. In colonial times, this part of Kounounkan was known as Mt Benna. The southernmost tip is uninhabited but elsewhere pastoralists occupy the seasonal summit grasslands. Further east, outside the TIPA, the talus slopes and lowlands are intensively cultivated for *Riz de Pays* (*Oryza glaberrima*), *Cajanus*, and *Capsicum*. To the west, the talus slopes are forested and descend intact into large areas of lowland evergreen forest, both pristine and secondary, due to intermittent collapse of the cliffs above. Much of the surface is boulder strewn, but despite this it is being cleared for smallholder agriculture.



**Map 27.** The proposed area for protection as a TIPA. Core area in red, buffer zone in yellow.

### Botanical significance

The Kounounkan Massif is the location for 31 globally threatened species. It is the sole global location for *Caillella praeerupticola* (EN) (Melastomataceae), *Mesanthemum bennae* (EN) (Eriocaulaceae), *Ternstroemia guineensis* (EN) (Theaceae), a newly described species in 2019, and five other species. The sandstone plateau has the greatest concentration of high-altitude sandstone bowl endemic species in Guinea and is the most ecologically intact area. The species-rich submontane sandstone bowl grassland in the southern part is pristine, compared to the northern part. The sandstone cliffs below the plateau are also home to several endemic threatened species, some of which occur nowhere else. Kounounkan is only 65km inland from the coast and has the largest surviving lowland ‘maritime’ forest in Guinea. This contains the largest global populations of several threatened species, such as *Diospyros feliciana* (EN) (Ebenaceae) and *Vepris felcicis* (CR) (Rutaceae). It also possibly contains the largest area of intact submontane forest in this zone (c. 10km<sup>2</sup>). This transition of lowland evergreen to submontane forest also occurs at Simandou and Ziam in Guinée Forestière, but those have different species compositions. In the faulted valleys on the plateau, good quality undisturbed submontane gallery forest can be found in the southern part, though this is not the case in the northern part where it is disturbed by cattle farmers. Further investigation is required in this area. Lowland forest, submontane forest, sandstone cliffs, and high-altitude sandstone bowl are all recognised threatened habitats in Guinea.

### General habitat and geology description

Ordovician quarzitic sandstone overlying metamorphic rock, this is the part of the outcrop that extends north to Pita. Thin soils on the plateau with some rock outcrops. On the lower slopes, the soils are deeper and humus rich. In areas of the south and west the soils can be thinner and rockier, as indicated by the presence of *Guibourtia copallifera*.

### Conservation issues

The lower slopes of the forest are under threat from clearance for agriculture with large farms of hill rice mixed with other crops. This is largely for smallholder farming or village cooperatives. On the eastern and western flanks there has been some large-scale, village-led forest clearance, though this has currently been stopped by the government. However, due to the lack of protection of this

area, it could commence again. The plateau sandstone bowal grasslands are threatened in the northern part from the increased burning regime brought about by cattle herders. It has already been seen that the increase in fire has pushed several threatened species to the brink of existence at the edge of the plateau.

Kounounkan has high potential for village-based eco-tourism that would benefit local communities, giving an incentive for conservation. Kounounkan is a Classified Forest (designated in 1994), but not a formally Protected Area. Eco-guards are present in the area but are unable to patrol all of it. Designation as a National Park is strongly recommended.

### **Protected area status and management**

Kounounkan (also known as Kamalayah) Forêt Classée (Classified Forest) was created in 1994. It is also recognised as an Important Bird Area (IBA) by Birdlife International. There have been several scientific surveys in the area, but no formal management plan has been written.

### **Threats**

- Agriculture: Clearance of large areas for fields.
- Pastoralism: Cattle grazing, increased unseasonal fires across grassland.
- Wood cutting and harvesting: Wood cutting on a subsistence level.
- Non timber forest products: The fruits of *Beilschmiedia mannii* are harvested every year, for sale by the local population.

**Threat level: Medium**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Anisotes guineensis</i> Lindau	A(i)	EN	✓	✓	✓			Frequent
<i>Apodiscus chevalieri</i> Hutch.	A(iii)	EN?	✓	✓	✓			Frequent
<i>Caillella praerupticola</i> Jacq.-Fél.	A(i)	EN	✓	✓	✓	✓		Frequent
<i>Cinnobotrys felicis</i> (A.Chev.) Jacq.-Fél.	A(iii)	EN?	✓	✓	✓			Infrequent
<i>Diospyros feliciana</i> Letouzey & F.White	A(i)	EN	✓	✓	✓		✓	Frequent
<i>Dissotis leonensis</i> Hutch. & Dalziel	A(i)	EN?	✓	✓	✓			Common
<i>Dissotis splendens</i> A.Chev. & Jacq.-Fél.	A(i)	EN?	✓	✓	✓			Common
<i>Droogmansia montana</i> Jacq.-Fél.	A(i)	EN?	✓	✓	✓			Unknown
<i>Fleurydora felicis</i> A.Chev.	A(i)	EN	✓	✓	✓		✓	Frequent
<i>Genlisea barthlottii</i> S.Porembski, Eb.Fisch. & Gemmel	A(i)	VU	✓	✓	✓			Abundant
<i>Gladiolus chevalieranus</i> (A.Chev.) Marais	A(i)	EN?	✓	✓	✓			Unknown
<i>Gladiolus sp nov</i>	A(i)	CR?	✓	✓		✓		Scarce
<i>Heterotis pygmaea</i> (A.Chev. & Jacq.-Fél.) Jacq.-Fél.	A(i)	EN?	✓	✓	✓			Infrequent
<i>Impatiens. bennae</i> Jacq.-Fél.	A(i)	EN	✓	✓	✓	✓		Unknown
<i>Keetia susu</i> Cheek	A(i)	EN	✓					Scarce
<i>Kotschya micrantha</i> Harms	A(i)	VU	✓	✓	✓			Infrequent
<i>Kotschya uniflora</i> (A.Chev.) Hepper	A(i)	EN	✓	✓	✓			Frequent
<i>Dilophotriche occidentalis</i> Jacq.-Fél.	A(i)	VU	✓					Frequent
<i>Mesanthemum bennae</i> Jacq.-Fél.	A(i)	EN?	✓	✓	✓	✓		Infrequent
<i>Neolemmoniera clitandrifolia</i> A.Chev.	A(i)	EN	✓	✓	✓			Frequent
<i>Rhytachne perfecta</i> Jacq.-Fél.	A(i)	EN?	✓	✓	✓	✓		Infrequent
<i>Dichaetanthera echinulata</i> (Hook.f.) Jacq.-Fél.	A(i)	EN?	✓	✓	✓			Common
<i>Schizachyrium radicosum</i> Jacq.-Fél.	A(i)	EN?	✓	✓	✓			Scarce
<i>Stylochaeton pilosus</i> Bogner	A(i)	EN	✓					Infrequent
<i>Ternstroemia guineensis</i> Cheek ined.	A(i)	EN?	✓	✓	✓	✓		Infrequent
<i>Tessmannia baikieaoides</i> Hutch. & Dalziel	A(i)	VU	✓	✓				Infrequent
<i>Vepris felicis</i> Breteler	A(i)	CR	✓	✓				Unknown
<i>Virectaria pepehabai</i> Cheek ined.	A(i)	EN	✓	✓	✓	✓		Scarce
<i>Cola lorougnonis</i> Aké Assi	A(i)	CR	✓	✓	✓			Scarce

**Table 52.** Criterion A for Kounounkan Massif and Plateau, Forécariah.

**Key:** ✓ = yes. IUCN category: see page 9. **Abundance:** Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion B: Botanical Richness

<b>B(ii):</b> exceptional number of species of conservation importance – site recording table (from nationally agreed list)		
<b>Habitat code and name</b>	<b>Site contains ≥ 3% of the species on the national list</b>	<b>Site is one of the 15 richest locations nationally</b>
	✓	✓

**Table 53.** Criterion B for Kounounkan Massif and Plateau, Forécariah.

	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<b>Criterion B taxon present</b>			
<i>Anisotes guineensis</i> Lindau	B(ii)		Frequent
<i>Apodiscus chevalieri</i> Hutch.	B(ii)		Frequent
<i>Baphia heudelotiana</i> Baill.	B(ii)		Infrequent
<i>Caillella praerupticola</i> Jacq.-Fél.	B(ii)		Frequent
<i>Cinnobotrys felcis</i> (A.Chev.) Jacq.-Fél.	B(ii)		Infrequent
<i>Diospyros felciana</i> Letouzey & F.White	B(ii)		Frequent
<i>Dissotis leonensis</i> Hutch. & Dalziel	B(ii)		Common
<i>Dissotis splendens</i> A.Chev. & Jacq.-Fél.	B(ii)		Common
<i>Droogmansia montana</i> Jacq.-Fél.	B(ii)		Unknown
<i>Fleurydora felcis</i> A.Chev.	B(ii)		Frequent
<i>Genlisea barthlottii</i> S.Porembski, Eb.Fisch. & Gemmel	B(ii)		Abundant
<i>Gladiolus chevalieranus</i> (A.Chev.) Marais	B(ii)		Unknown
<i>Gladiolus sp nov</i>	B(ii)		Scarce
<i>Heterotis pygmaea</i> (A.Chev. & Jacq.-Fél.) Jacq.-Fél.	B(ii)		Infrequent
<i>Impatiens bennae</i> (Jacq.-Fél.) Grey-Wilson	B(ii)		Unknown
<i>Keetia susu</i> Cheek	B(ii)		Scarce
<i>Kotschya micrantha</i> Harms	B(ii)		Infrequent
<i>Kotschya uniflora</i> (A.Chev.) Hepper	B(ii)		Frequent
<i>Dilophotriche occidentalis</i> Jacq.-Fél.	B(ii)		Frequent
<i>Mesanthemum bennae</i> Jacq.-Fél.	B(ii)		Infrequent
<i>Marsdenia exellii</i> C.Norman	B(ii)		Infrequent
<i>Monocymbium deightonii</i> C.E.Hubb.	B(ii)		Unknown
<i>Neolemmoniera clitandrifolia</i> A.Chev.	B(ii)		Frequent
<i>Rhytachne perfecta</i> Jacq.-Fél.	B(ii)		Infrequent
<i>Dichaetanthera echinulata</i> (Hook.f.) Jacq.-Fél.	B(ii)		Common
<i>Schizachyrium radicosum</i> Jacq.-Fél.	B(ii)		Scarce
<i>Stylochaeton pilosus</i> Bogner	B(ii)		Infrequent
<i>Ternstroemia guineensis</i> Cheek ined.	B(ii)		Infrequent
<i>Tessmannia baikieaoides</i> Hutch. & Dalziel	B(ii)		Infrequent
<i>Vepris felcis</i> Breteler	B(ii)		Unknown
<i>Virectaria pepehabai</i> Cheek ined.	B(ii)		Scarce

**Table 54.** Criterion B for Kounounkan Massif and Plateau, Forécariah.

**Key:** Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion C: Threatened Habitat

Habitat type	IPA subcritterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Lowland evergreen forest (Guinee Maritime)	C(iii)			✓	Unknown
Submontane forest	C(iii)			✓	c.10km <sup>2</sup>
Sandstone cliffs	C(iii)			✓	Unknown
High altitude sandstone bowal	C(iii)			✓	Unknown

**Table 55.** Criterion C for Kounounkan Massif and Plateau, Forécariah.

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 IUCN Red List of Threatened Species. <https://www.iucnredlist.org/>

## Field Report

van der Burgt, X. (2016-2018). RBG Kew.

## Site in pictures



Kounounkan forest near Gbara village. (Photo: ©Xander van der Burgt, RBG Kew)



Kounounkan forest near Samayah. (Photo: ©Xander van der Burgt, RBG Kew)



Kounounkan submontane forest near Gbara. (Photo: ©Xander van der Burgt, RBG Kew)



Kounounkan Massif Plateau. (Photo: ©Xander van der Burgt, RBG Kew)



Kounounkan Massif Plateau in the distance, showing cultivation on lower slopes.  
(Photo: ©Xander van der Burgt, RBG Kew)



Rock slide seen in October 2016. (Photo: ©Xander van der Burgt, RBG Kew)



*Cailliella praerupticola* (EN) (Melastomataceae).  
Endemic to the Kounounkan Massif A(i).  
(Photo: ©Xander van der Burgt, RBG Kew)



*Tessmannia baikieoides* (VU) (Leguminosae), A(i).  
(Photo: ©Xander van der Burgt, RBG Kew)



Fruits of *Diospyros feliciana* (EN) (Ebenaceae). Endemic to Guinea A(i). (Photo: ©Xander van der Burgt, RBG Kew)



*Dactyladenia* sp. nov. (Chrysobalanaceae). New species to science A(i). (Photo: ©Xander van der Burgt, RBG Kew)



*Dissotis leonensis* (EN) (Melastomataceae) A(i). (Photo: ©Xander van der Burgt, RBG Kew)



*Fleurydora felicis* (VU) (Ochnaceae). Endemic to Guinea A(i). (Photo: ©Xander van der Burgt, RBG Kew)

## TIPA Assessment 12:

### Moofanyi Inselbergs, Forécariah



#### IPA criteria under which the site qualifies: A(i), B(i), C(iii)

**Assessed by:** Charlotte Couch, Martin Cheek (RBG Kew), Denise Molmou (HNG/Simfer), and Salim Kouyaté (Simfer).

#### TIPA assessment rationale

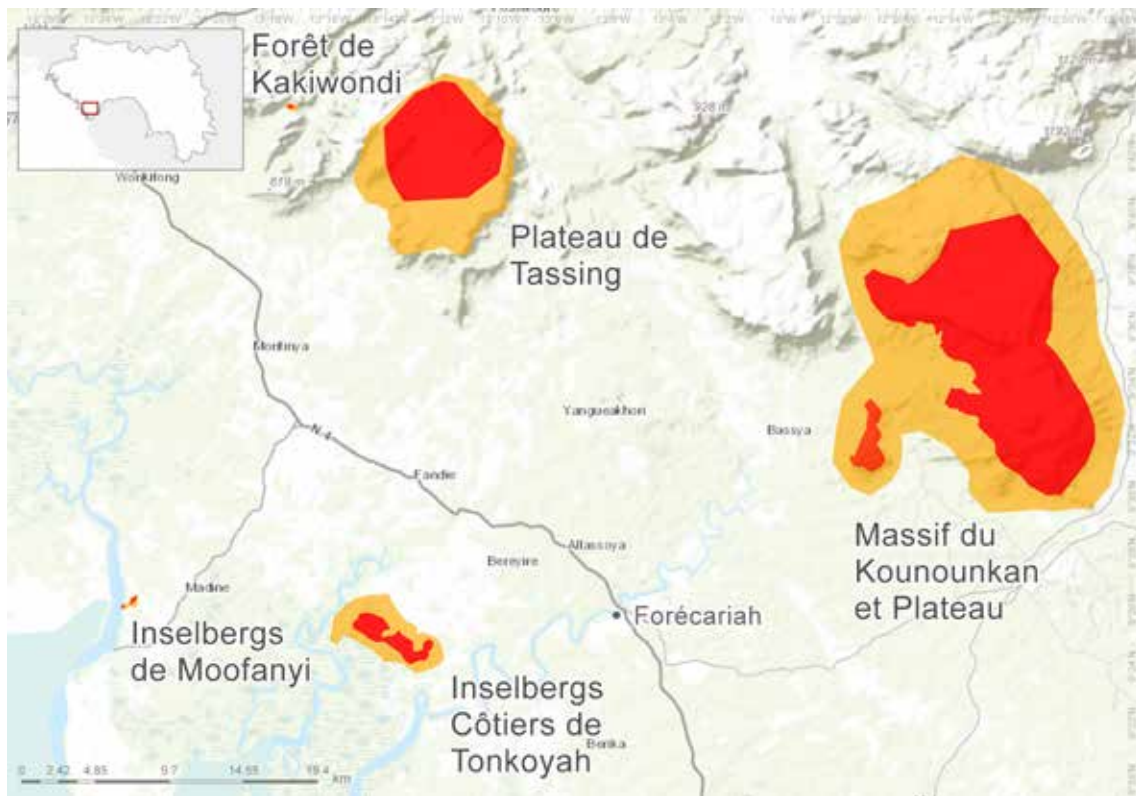
The Moofanyi inselbergs are one of the best representatives of coastal inselbergs in Guinée Maritime, depicting nine of the ten microhabitats for West African inselbergs identified by Porembski et al. (1997, 2000). The lowland forest patch on the inselberg has three globally important highly threatened species, the first two of which demonstrate high genetic diversity: *Tarenna hutchinsonii* (CR), *Marsdenia exellii* (EN), and *Stylochaeton pilosus* (EN). The inselberg has populations of *Raphionacme caerulea* (EN), *Dilophotriche occidentalis* (VU), *Mesanthemum albidum* (VU), and numerous near threatened species. It is threatened by past and future quarrying activities.

#### Site overview

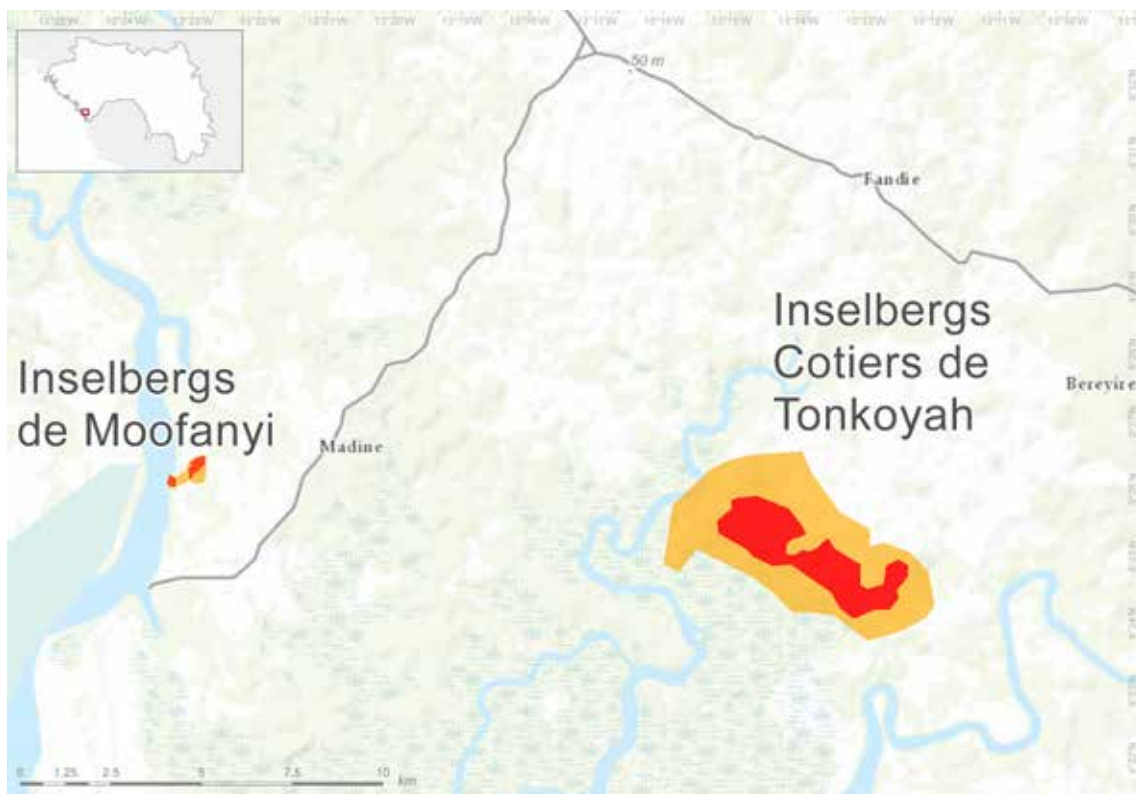
Site name: Moofanyi Inselbergs  
Country: Republic of Guinea  
Administrative region: Forécariah Prefecture  
Central co-ordinates: 07°37'20"N, 08°24'36"W  
Area: 0.5km<sup>2</sup>  
Altitude minimum: 0m  
Altitude maximum: 35m

#### Site description

Two granite dome inselbergs partly surrounded by mangrove. The larger inselberg (Moofanyi masculine) has a lowland forest patch on part of it, dominated by trees of *Guibourtia copallifera*. The larger inselberg has many microhabitats present which are best distinguished during the wet season.



**Map 28.** The proposed TIPAs in relation to the wider Guinea Maritime area.



**Map 29.** The proposed areas for protection as TIPAs. Core area in red, buffer zone in yellow.

## Botanical significance

These are coastal inselbergs with a patch of lowland forest. The large inselberg is one of the tallest in Guinée Maritime. Both the large and small inselbergs have a population of *Raphionacme caerulea* (EN). The smaller inselberg, inhabited by the local community until recently, is degraded and less diverse in species and microhabitats. The inselberg lowland forest patch has large populations of *Tarenna hutchinsonii* (CR), *Stylochaeton pilosus* (EN), and *Marsdenia exellii* (EN). The *Tarenna hutchinsonii* population has the highest genetic diversity known in this species. The *Marsdenia exellii* population is also genetically diverse. Nine out of the ten known African inselberg microhabitats are present, including seepage areas rich in *Utricularia* spp, *Xyris* spp. and *Eriocaulaceae* spp., wet flush vegetation, and *Afrotrilepis pilosa* mats.

## General habitat and geology description

Coastal granite-dolerite outcrop amongst recent alluvial deposits. Both inselbergs interface with mangroves. There are several microhabitats present on the inselbergs, giving rise to different species assemblages. Flat areas and shallow depressions are dominated by grasses (e.g. *Loudetiopsis tristachyoides*) and sedges in the wet season, with globally threatened small herbs such as *Mesanthemum albidum* and *Raphionacme caerulea*.

## Conservation issues

The inselberg was quarried in the past for building materials. More recently, about half the inselberg was destroyed to facilitate port building activities by the infrastructure consortium, Simfer. However, in 2013 the most important part of the large inselberg for plant conservation was conserved, yet there are concerns that this may be degraded or lost if Simfer passes management control to another company.

Deliberate burning of the inselberg vegetation by the local community occurred in 2018. Previously, local people would not have entered the forest patch as it was sacred, but when they acquired the site Simfer arranged to deconsecrate it. Since Simfer is not currently active at the site, there is no presence to act as a deterrent to local people accessing the forest. The current status of the inselbergs and forest patch is not clear. Simfer does not have the right to prevent community access to the area (e.g. people traversing the area to get to fields) and the local authorities are not able to provide adequate policing of the area. As a result, burning of the vegetation and illegal wood cutting have taken place. Grazing and trampling of Conservation Priority Species by cattle has also been observed.

In 2018, the community became more sensitised to the protection of inselbergs. Technical services bodies (Water and Forests, Environment, OGUIDAP) and NGOs have begun to implement sustainable conservation measures.

## Protected area status and management

The site is not currently protected and only managed under the concession rights of Simfer.

## Threats

- Quarrying: Extraction of granite for building materials.
- Fire: Setting of fires by local community.
- Pastoralism: Repeated passage of the cattle on inselbergs.

**Threat level: High**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Raphionacme caerulea</i> E.A.Bruce	A(i)	EN	✓					Infrequent
<i>Tarenna hutchinsonii</i> Bremek.	A(i)	CR	✓	✓	✓			Frequent
<i>Marsdenia exellii</i> C.E.Norman	A(i)	EN	✓	✓	✓			Frequent
<i>Stylochaeton pilosus</i> Bogner	A(i)	EN	✓	✓	✓			Frequent
<i>Mesanthemum albidum</i> Lecomte	A(i)	VU	✓	✓				Infrequent
<i>Dilophotriche occidentalis</i> Jacq.-Fél	A(i)	VU	✓					Frequent

**Table 56.** Criterion A for Moofanyi Inselbergs, Forécariah.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

<b>B(i):</b> exceptional botanical richness within a defined habitat		
Habitat code and name	Site is part of the top 10% of the national resource	Site is one of the 5 best sites nationally for that habitat
Inselbergs	✓	✓

**Table 57.** Criterion B for Moofanyi Inselbergs, Forécariah.

**Key:** ✓ = yes.

	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<b>Criterion B taxon present</b>			
<i>Afrotrilepis pilosa</i> (Boeck.) J.Raynal	B(i)	Granite inselbergs	Abundant
<i>Brachiaria villosa</i> (Lam.) A.Camus	B(i)	Granite inselbergs	Frequent
<i>Ceropegia deightonii</i> Hutch. & Dalziel	B(i)	Granite inselbergs	Infrequent
<i>Chamaecrista absus</i> (L.) H.S. Irwin & Barneby	B(i)	Granite inselbergs	Infrequent
<i>Cyanotis lanata</i> Benth.	B(i)	Granite inselbergs	Common
<i>Desmodium linearifolium</i> G.Don	B(i)	Granite inselbergs	Common
<i>Dopatrium senegalense</i> Benth.	B(i)	Granite inselbergs	Infrequent
<i>Drosera indica</i> L.	B(i)	Granite inselbergs	Common
<i>Echinochloa colona</i> (L.) Link	B(i)	Granite inselbergs	Frequent
<i>Eragrostis unioloides</i> (Retz.) Nees	B(i)	Granite inselbergs	Frequent
<i>Eriocaulon pulchellum</i> Koern.	B(i)	Granite inselbergs	Frequent
<i>Fimbristylis ferruginea</i> (L.) Vahl	B(i)	Granite inselbergs	Common
<i>Lindernia schweinfurthii</i> (Engl.) Dandy	B(i)	Granite inselbergs	Common
<i>Loudetiopsis pobeguinii</i> (Jacq.-Fél.) Clayton	B(i)	Granite inselbergs	Frequent
<i>Loudetiopsis tristachyoides</i> (Trin.) Conert	B(i)	Granite inselbergs	Common
<i>Mesanthemum albidum</i> Lecomte	B(i)	Granite inselbergs	Frequent
<i>Nemum spadiceum</i> (Lam.) Desv.	B(i)	Granite inselbergs	Common
<i>Neurotheca loeselioides</i> (Spruce ex Prog.) Baill.	B(i)	Granite inselbergs	Common
<i>Nymphaea lotus</i> L.	B(i)	Granite inselbergs	Infrequent
<i>Nymphaea micrantha</i> Guill. & Perr.	B(i)	Granite inselbergs	Infrequent
<i>Panicum dinklagei</i> Mez	B(i)	Granite inselbergs	Frequent
<i>Panicum griffonii</i> Franch.	B(i)	Granite inselbergs	Frequent
<i>Panicum subalbidum</i> Kunth	B(i)	Granite inselbergs	Frequent
<i>Panicum tenellum</i> Lam.	B(i)	Granite inselbergs	Frequent
<i>Pennisetum purpureum</i> Schumach.	B(i)	Granite inselbergs	Infrequent
<i>Plectranthus monostachyus</i> (P.Beauv.) B.J.Pollard	B(i)	Granite inselbergs	Infrequent
<i>Polystachya microbambusa</i> Kraenzl.	B(i)	Granite inselbergs	Infrequent
<i>Pycreus capillifolius</i> (A.Rich.) C.B.Clarke	B(i)	Granite inselbergs	Frequent
<i>Scleria cf. tricholepis</i> .	B(i)	Granite inselbergs	Frequent
<i>Scleria robinsoniana</i> J.Raynal	B(i)	Granite inselbergs	Frequent
<i>Spermacoce bambusicola</i> (Berhaut) Lebrun & Stork	B(i)	Granite inselbergs	Common
<i>Sporobolus infirmus</i> Mez	B(i)	Granite inselbergs	Frequent
<i>Tephrosia nana</i> Schweinf.	B(i)	Granite inselbergs	Infrequent
<i>Utricularia micropetala</i> Sm.	B(i)	Granite inselbergs	Infrequent
<i>Utricularia subulata</i> L.	B(i)	Granite inselbergs	infrequent
<i>Utricularia tortilis</i> Welw. ex Oliv.	B(i)	Granite inselbergs	Infrequent
<i>Vigna luteola</i> (Jacq.) Benth.	B(i)	Granite inselbergs	Frequent
<i>Vigna venulosa</i> Baker	B(i)	Granite inselbergs	Frequent
<i>Xyris anceps</i> Lam.	B(i)	Granite inselbergs	Frequent
<i>Xyris filiformis</i> Lam.	B(i)	Granite inselbergs	Frequent

**Table 58.** Criterion B for Moofanyi Inselbergs, Forécariah.

**Key:** Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion C: Threatened Habitat

Habitat type	IPA subcritterion (automatically populated from habitat look-up table)	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Inselbergs	C(iii)			✓	0.5km <sup>2</sup>

**Table 59.** Criterion C for Moofanyi Inselbergs, Forécariah.

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## Site in pictures



*Afrotrilepis* mats on Moofanyi masculine. (Photo: ©Martin Cheek, RBG Kew)



View of Moofanyi Masculin from approach road, October 2013. (Photo: ©Martin Cheek, RBG Kew)



Seepage areas with *Loudetiopsis tristachyoides*. (Photo: ©Martin Cheek, RBG Kew)



Temporary pool with *Dopatrium senegalense*.  
(Photo: ©Martin Cheek, RBG Kew)

Some of the rare species found on the Moofanyi inselbergs:



*Raphionacme caerulea* E.A.Bruce (EN).  
(Photo: ©Martin Cheek, RBG Kew)



*Tarenna hutchinsonii* Bremek. (CR).  
(Photo: ©Martin Cheek, RBG Kew)



*Hibiscus scotellii* Baker f. (NT).  
(Photo: ©Martin Cheek, RBG Kew)



*Stylochaeton pilosus* Bogner (EN).  
(Photo: ©Martin Cheek, RBG Kew)

**IPA criteria under which the site qualifies: A(i), B(ii), C(iii)**

**Assessed by:** Charlotte Couch, Martin Cheek (RBG Kew), Denise Molmou (HNG), Arnaud Gotanegre, Mélanie Sottocasa, and Pacifique Kizila (Wild Chimpanzee Foundation).

**TIPA assessment rationale**

The proposed Moyen-Bafing National Park (MBNP) has 19 threatened species present across different vegetation types. It is the only known location where two global endemic species are known to survive (*Barleria asterotricha* and *Dissotis linearis*) and has important populations of the globally threatened species, *Lipotriche felicitis*, *Cyathula pobeguinii*, *Macropodiella garrettii*, *Danthoniopsis chevalieri*, and *Leocus pobeguinii*, for which Moyen-Bafing contains the only known records (or the only known recent records). Four potential new species have been identified in 2018, all of which are likely to prove critically endangered and potentially globally endemic to Moyen-Bafing. In addition, three new records for Guinea were discovered. The landscape is under severe pressure from the large local population within the park and sizeable herds of cattle.

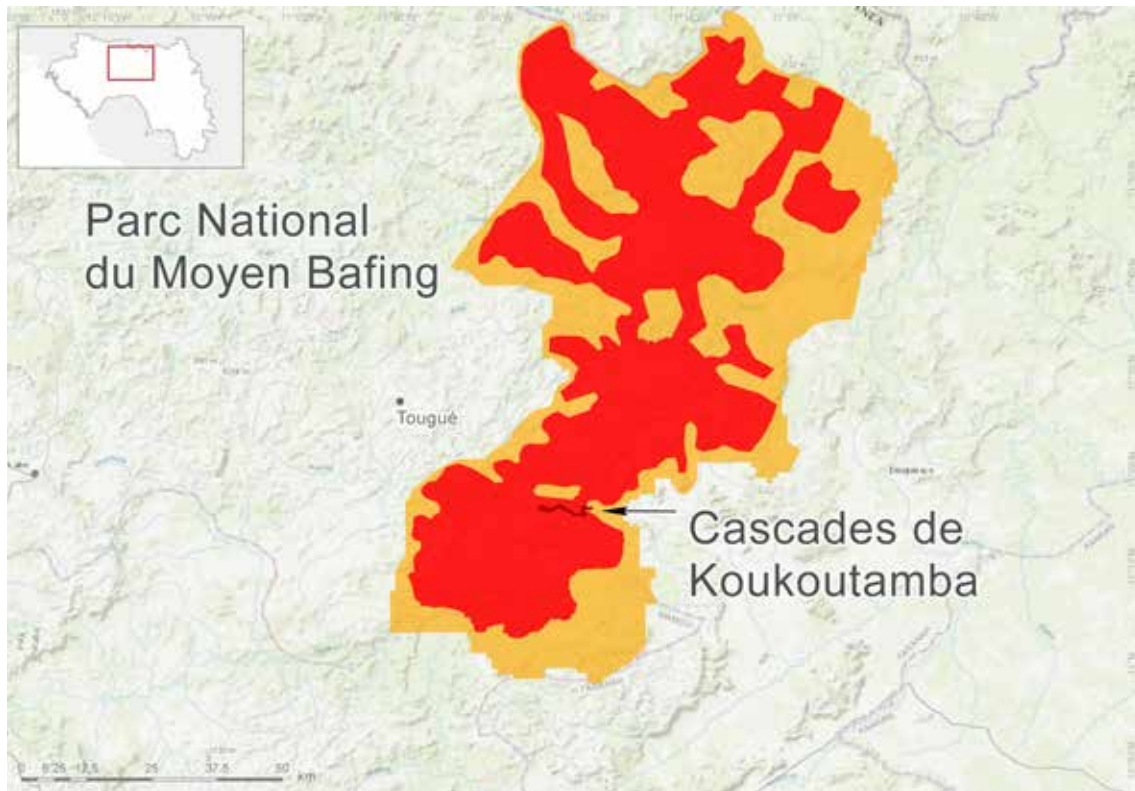
**Site overview**

Site name: Proposed Moyen-Bafing National Park  
Country: Republic of Guinea  
Administrative region: Tougué, Dinguiraye, Dabola, Koubia, and Mamou Prefectures  
Central co-ordinates: 11°32'26"N, 11°14'03"W  
Area: 6,426.17km<sup>2</sup>  
Altitude minimum: 420m  
Altitude maximum: 935m

**Site description**

The proposed MBNP is in the north-east of the Fouta Djallon, straddling the prefectures of Tougué and Dinguiraye. The area extends southwards from the Mali border and encompasses six Classified Forests. It covers a large section of the Bafing river catchment, tributaries of the Falémé river, as well as the Koukoutamba and Téné rivers in the southern part of the park. It is a matrix of vegetation types, including lateritic bowal (bauxite based), wooded grassland, and woodland. It has an altitudinal range of 500m and the highest point (935m) is in the south of the

park, at Kourousansan. The rivers have a number of cascades and rapid sections which are home to rare Podostemaceae. It has been designated largely for the large population of Chimpanzees (a population of 3,715 mature individuals) present, as well as other large mammals found predominantly in gallery forest and woodland within the park (listed as priority vegetation types for management in the park). There are 233 villages, 7 hamlets, and 15 camps within the provisional park boundary. This area is made up of three protected zones (ZIP, ZGR, and ZD).



**Map 30.** The proposed area for protection as a TIPA. Core area in red, buffer zone in yellow.

### Botanical significance

Three botanical expeditions to the MBNP in 2018 have shown that, despite the fragmented and highly disturbed nature of the vegetation, there are 19 threatened species present, found across a range of habitat types. In the rapids and cascades, five species of Podostemaceae have been found. In addition, the park has the largest global populations of *Barleria asterotricha* (EN) and *Dissotis linearis* (EN), both endemic to Guinea. A recent collection of *Lipotriche felicis* (EN) was the first collection in Guinea since 1937, and only the third collection globally. There were four potential new species and three new records for Guinea identified in November 2018. The whole park has not been surveyed, so it is possible that more threatened species could be discovered with further surveys.

### General habitat and geology description

The geology is mostly sandstone, argillite interlayered with limestone, and silica with igneous intrusions. It has a matrix of grassland including lateritic bowal (mostly bauxite based), wooded grassland, and woodland, with small areas of gallery forest. Several large rivers run through the park (Bafing, Koukoutamba, Téné – tributaries of the Falémé in the north and the Bakoun and Kokoun in the centre), with many tributaries and temporary rivers feeding into them. The length of the hydrological network within the park is 4,214km, including 148km of the Bafing River.

### Conservation issues

Due to the large human population (c. 67,000 people) within the park, there are significant threats from clearance for fields and cattle grazing. In addition, there are small-scale mining activities and the setting of uncontrolled fires. There are large herds of Ndama cattle across the park and this leads to burning of the grassland for pasture. The increased frequency of burning has almost

certainly influenced the species diversity. Some of the bowal areas are also threatened from gravel extraction on a local scale and are also potential sites of mining activities (bauxite). The alluvial areas are also potential sites for gold panning.

The potential construction of an hydroelectric dam at the Koukoutamba Falls on the Bafing river (a tributary of the Senegal river) will cause considerable damage to both the populations of threatened Podostemaceae species and threatened habitats. It is predicted that the reservoir for the dam will cover 3.5% of the southern part of the park. The park itself will protect 24% of the hydrological network that will feed the hydroelectric dam.

### **Protected area status and management**

The Guinean government authorised the creation process for the proposed MBNP in 2017, by ministerial decree. The TIPA is encompassed by the Protected Area. A 2018-2020 action plan is available and will lead to a development and management plan by the end of 2020.

### **Threats**

- Agriculture: Clearance of areas for fields.
- Pastoralism: Cattle grazing.
- Fires: Unseasonal fires across grassland, fires set for hunting and honey production.
- Hydroelectric dams: Planned hydroelectric dam at the Koukoutamba Falls on the Bafing river and potentially on other rivers in the park.
- Mining activities: Gravel extraction, potential bauxite mining, and gold panning.

**Threat level: High**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Barleria asterotricha</i> Benoist	A(i)	CR	✓	✓	✓			Frequent
<i>Cyathula pobeguinii</i> Jacq.-Fél.	A(i)	VU	✓	✓	✓			Scarce
<i>Lipotriche felicis</i> (C.D.Adams) D.J.N.Hind	A(i)	EN	✓	✓	✓			Scarce
<i>Mesanthemum tuberosum</i> Lecomte	A(i)	VU	✓	✓	✓			Scarce
<i>Leocus pobeguinii</i> (Hutch. & Dalziel) J.K.Morton	A(i)	VU	✓	✓	✓			Infrequent
<i>Afzelia africana</i> Sm.	A(i)	VU					✓	Frequent
<i>Pterocarpus erinaceus</i> Poir.	A(i)	EN					✓	Common
<i>Acridocarpus spectabilis</i> (Nied.) Doorn-Hoekm.	A(i)	VU?	✓	✓	✓			Frequent
<i>Dissotis (Argyrella) linearis</i> (Jacq.-Fél.) Veranso-Libalah & G.Kadereit	A(i)	EN	✓	✓	✓			Infrequent
<i>Khaya senegalensis</i> A.Juss.	A(i)	VU					✓	Common
<i>Danthoniopsis chevalieri</i> A.Camus & C.E.Hubb.	A(i)	VU	✓	✓				Scarce
<i>Embelia djalensis</i> A.Chev. ex Hutch. & Dalziel	A(i)	VU?	✓	✓	✓			Scarce
<i>Inversodicraea koukoutamba</i> Cheek ined.	A(i)	CR?	✓	✓	✓			Abundant
<i>Stonesia taylorii</i> C.Cusset	A(i)	EN	✓	✓	✓			Frequent
<i>Inversodicraea harrisii</i> (C.Cusset) Cheek	A(i)	VU	✓	✓	✓			Frequent
<i>Lebbiea grandiflora</i> Cheek	A(i)	EN	✓	✓	✓			Frequent
<i>Macropodiella garrettii</i> (C. H. Wright) C. Cusset	A(i)	EN?	✓	✓	✓			Frequent
<i>Pavetta lasioclada</i> (K.Krause) Mildbr. Ex. Bremek	A(i)	VU	✓					Frequent
<i>Vitellaria paradoxa</i> C.F. Gaertner	A(i)	VU					✓	Common

**Table 60.** Criterion A for Proposed Moyen-Bafing National Park, Tougué and Dinguiraye.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

B(ii): exceptional number of species of conservation importance – site recording table (from nationally agreed list)		
Habitat code and name	Site contains ≥ 3% of the species on the national list	Site is one of the 15 richest locations nationally
	✓	✓

**Table 61.** Criterion B for Proposed Moyen-Bafing National Park, Tougué and Dinguiraye.

**Key:** ✓ = yes.

	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<b>Criterion B taxon present</b>			
<i>Barleria asterotricha</i> Benoist	B(ii)		Frequent
<i>Cyathula pobeguinii</i> Jacq.-Fél.	B(ii)		Scarce
<i>Lipotriche felicis</i> (C.D.Adams) D.J.N.Hind	B(ii)		Scarce
<i>Mesanthemum tuberosum</i> Lecomte	B(ii)		Scarce
<i>Leocus pobeguinii</i> (Hutch. & Dalziel) J.K.Morton	B(ii)		Infrequent
<i>Azelia africana</i> Sm.	B(ii)		Frequent
<i>Pterocarpus erinaceus</i> Poir.	B(ii)		Common
<i>Acridocarpus spectabilis</i> (Nied.) Doorn-Hoekm.	B(ii)		Frequent
<i>Dissotis (Argyrella) linearis</i> (Jacq.-Fél.) Veranso-Libalah & G.Kadereit	B(ii)		Infrequent
<i>Khaya senegalensis</i> A.Juss.	B(ii)		Common
<i>Lophira lanceolata</i> Tiegh. ex Keay	B(ii)		Frequent
<i>Danthoniopsis chevalieri</i> A.Camus & C.E.Hubb.	B(ii)		Scarce
<i>Embelia djalonensis</i> A.Chev. ex Hutch. & Dalziel	B(ii)		Scarce
<i>Inversodicraea koukoutamba</i> Cheek ined.	B(ii)		Abundant
<i>Stonesia taylorii</i> C.Cusset	B(ii)		Frequent
<i>Inversodicraea harrisii</i> (C.Cusset) Cheek	B(ii)		Frequent
<i>Lebbiea grandiflora</i> Cheek	B(ii)		Frequent
<i>Macropodiella garrettii</i> (C. H. Wright) C. Cusset	B(ii)		Frequent
<i>Pavetta lasioclada</i> (K.Krause) Mildbr. Ex. Bremek	B(ii)		Frequent
<i>Vitellaria paradoxa</i> C.F. Gaertner	B(ii)		Common

**Table 62.** Criterion B for Proposed Moyen-Bafing National Park, Tougué and Dinguiraye.

**Key:** Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Sandstone bowal grassland high altitude	C(iii)			✓	877km <sup>2</sup>
Waterfalls and Rapids with Podostemaceae	C(iii)			✓	

**Table 63.** Criterion C for Proposed Moyen-Bafing National Park, Tougué and Dinguiraye.

## Bibliography

Couch, C., Magassouba, S., Rokni, S., and Cheek, M. (2017) Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>

IUCN Red List of Threatened Species. <https://www.iucnredlist.org/>

Wild Chimpanzee Foundation. (2018). *Plan d'action du projet de création du Parc national du Moyen-Bafing*. Version 4.

## Field Reports

Cheek, M. (Jan. 2018).

Couch, C., and Molmou, D. (Aug. 2018).

Couch, C., and Molmou, D. (Jan. 2019).

Three field reports prepared for the Wild Chimpanzee Foundation.

## Site in pictures



Bawal grassland at the end of the rainy season, November 2018. (Photo: ©C. Couch, RBG Kew)



Woodland in the dry season, May 2018. (Photo: ©C. Couch, RBG Kew)



Moist areas in bowal grassland with *Bryaspis lupulina*, November 2018. (Photo: © C. Couch, RBG Kew)



Waterfalls on the Bafing river, November 2018. (Photo: © C. Couch, RBG Kew)



*Lepidagathis pobeguinii* (NT).  
(Photo: ©C. Couch, RBG Kew)



*Barleria asterotricha* (CR).  
(Photo: ©C. Couch, RBG Kew)



*Cyathula pobeguinii* (VU).  
(Photo: ©C. Couch, RBG Kew)



*Macropodiella garrettii* (EN).  
(Photo: ©C. Couch, RBG Kew)

## Mt Béro Classified Forest, Nzérékoré and Beyla



### **IPA criteria under which the site qualifies: A(i), C(iii)**

**Assessed by:** Charlotte Couch, Martin Cheek, Xander van der Burgt (RBG Kew), and Pépé Haba (Guinée Biodiversité).

### **TIPA assessment rationale**

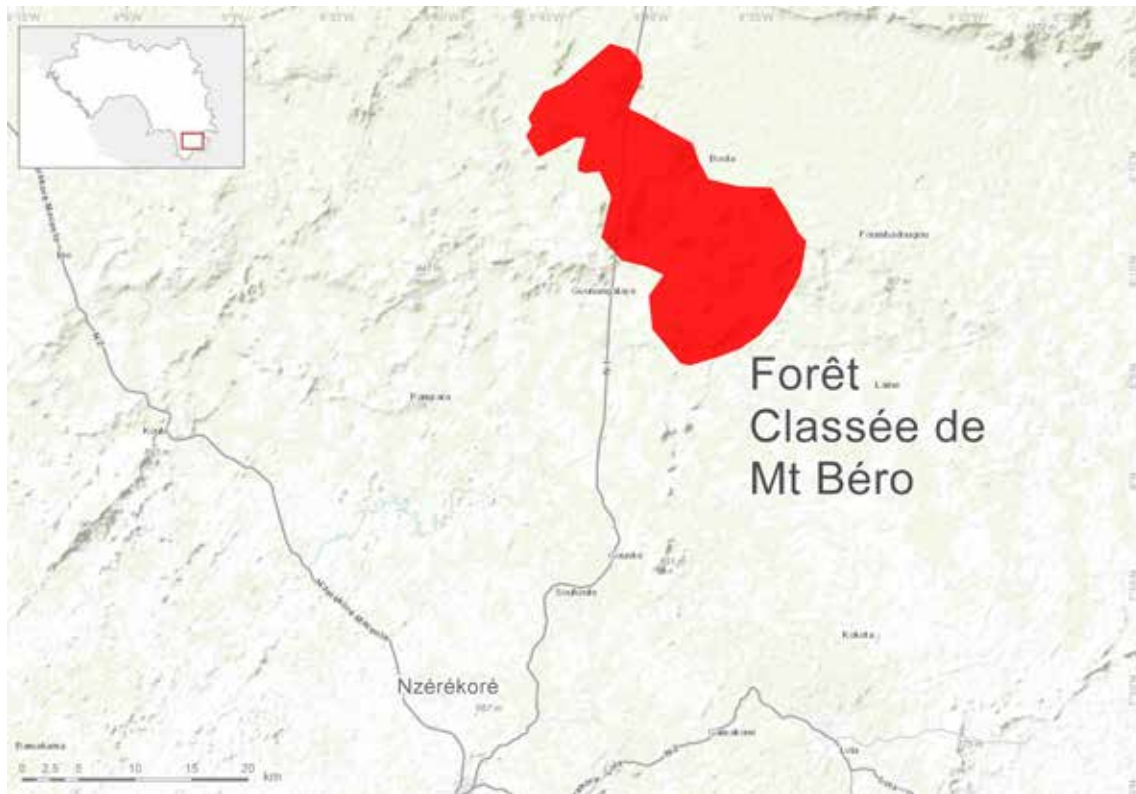
Mt Béro Classified Forest has the largest global population for two threatened species of mass-flowering Acanthaceae. It also has significant populations of several other threatened species. These are restricted to submontane forest and submontane forest-grassland boundary habitats. Cattle trampling and illegal forest clearance for agriculture are significant threats.

### **Site overview**

Site name: Mt Béro Classified Forest  
Country: Republic of Guinea  
Administrative region: Nzérékoré and Beyla Prefectures  
Central co-ordinates: 08°12'N, 08°38'W  
Area: 80km<sup>2</sup>  
Altitude minimum: 500m  
Altitude maximum: 1,182m

### **Site description**

Located south-east of the Simandou range, mostly in Nzérékoré prefecture, Mt Béro is a Classified Forest of c. 80km<sup>2</sup> (Source: Protected Planet). At 1,182m, the main peak is lower than the Simandou range. Submontane forest is present on the flanks and grassland is present on the summit areas. Lowland forest remnants occur on the western slopes. Recently, there have been reports of significant damage to the forest from illegal logging and clearance for subsistence crops, and of the grassland areas by introduction of a large herd of Zebu cattle.



**Map 31.** The proposed area for protection as a TIPA. Core area in red.

### Botanical significance

The Béro mountains share similarities in floristic composition with the other mountain ranges in Guinée Forestière. There are populations of several threatened species found here, such as *Allophylus samoritourei*, in lowland forest remnants, plus *Acalypha guineensis* and *Lipotriche tithonioides*, on the border between grassland and submontane forest. The submontane forest, characterised by *Uapaca chevalieri* and *Trichilia djalonis*, has the world's largest population of the threatened mass-flowering *Brachystephanus oreacanthus*, and *Isoglossa dispersa*. There is also a population of the range-restricted species *Dorstenia astyanactis* and *Brachystephanus jaundensis* subsp. *nimbae*. The grassland area on the flat tops includes small areas of high-altitude lateritic (ferralitic) bowal. This is much smaller than that at Simandou, and not as species-rich, but there are some threatened species present in the seasonally wet areas, such as *Rhytachne glabra*, *Nemum bulbostyloides*, and *Kotschy micrantha*. Comprehensive botanical exploration has not yet been completed and several threatened potential new species to science are present, such as *Psychotria* sp. nov. aff. *humilis* and *Hibiscus* sp. nov. aff. *rostellatus* (*Hibiscus fabiana*).

### General habitat and geology description

The area is part of the Leonean-Liberian crystalline massif with dolerites and metagabbros. It is not part of the banded iron Simandou rift, which could account for the differences in vegetation between it and the other mountain formations of Simandou and Nimba.

### Conservation issues

The area has been a Classified Forest since 1952 but has not always had protection on the ground. In recent years, a large herd of Zebu cattle from north of Guinea were introduced, causing trampling of the grassland. The increased nitrification could also have caused changes to the species composition. During a period when patrols ceased, large areas of submontane and lowland forest were cleared for agricultural land. There has also been illegal logging where the road is close to the forest and areas have been cleared for agriculture by the local villagers. This should have been prevented by the authorities, but the site has not been sufficiently policed.

## Protected area status and management

The forest of Mt Béro was classified in 1952. The TIPA corresponds with the Protected Area.

### Threats

- Agriculture: Encroachment of fields on the edge of the Protected Area and cattle trampling.
- Forestry: Illegal woodcutting.

**Threat level: Medium-High**

## Criteria assessments

### Criterion A: Threatened Species

	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<b>Criterion A taxon present</b>								
<i>Acalypha guineensis</i> J.K. Morton & G.A.Lavin	A(i)	VU	✓	✓				Infrequent
<i>Allophylus samoritourei</i> Cheek	A(i)	EN	✓	✓				Infrequent
<i>Amorphophallus abyssinicus</i> subsp. <i>akeassii</i> N.E. Br.	A(i)	VU	✓					Infrequent
<i>Brachystephanus jaundensis</i> subsp. <i>nimbae</i> Lindau	A(i)	VU	✓	✓	✓			Infrequent
<i>Brachystephanus oreacanthus</i> Champ.	A(i)	VU	✓	✓	✓			Frequent
<i>Dorstenia astyanactis</i> Aké Assi	A(i)	VU	✓	✓	✓			Infrequent
<i>Garcinia afzelii</i> Engl.	A(i)	VU	✓	✓				Infrequent
<i>Isoglossa dispersa</i> I.Darbysh. & L.J.Pearce	A(i)	VU	✓	✓	✓			Unknown
<i>Kotschyia micrantha</i> Harms	A(i)	VU	✓	✓	✓			Infrequent
<i>Lipotriche tithonioides</i> (Aké Assi) D.J.N.Hind	A(i)	EN	✓	✓	✓			Frequent
<i>Nemum bulbostyloides</i> (Hooper) J. Raynal	A(i)	VU	✓	✓	✓			Frequent
<i>Pavetta platycalyx</i> Bremek.	A(i)	VU	✓	✓				Unknown
<i>Rhytachne glabra</i> (Gledhill) Clayton	A(i)	VU	✓	✓				Infrequent
<i>Hibiscus fabiana</i> Cheek	A(i)	VU	✓	✓	✓			Infrequent

**Table 64.** Criterion A for Mt Béro Classified Forest, Nzérékoré and Beyla.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

Insufficient data available.

## Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Submontane forest	C(iii)			✓	

**Table 65.** Criterion C for Mt Béro Classified Forest, Nzérékoré and Beyla.

## Bibliography

Couch, C., Magassouba, S., Rokni, S., Cheek, M. (2018). Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>

IUCN Red List of Threatened Species. <https://www.iucnredlist.org/>

## Site in pictures



Mt Béro Classified Forest showing submontane forest and grassland. (Photo: ©Xander van der Burgt, RBG Kew)



Interior of submontane forest in 2007. (Photo: ©Xander van der Burgt, RBG Kew)



Edge of the Mt Béro Classified Forest in 2017. (Photo: ©Pépé Haba)



View of Mt Béro from Boola village. (Photo: ©Xander van der Burgt, RBG Kew)



*Brachystephanus oreacanthus* Champ.  
(Photo: ©Xander van der Burgt, RBG Kew)



*Lipotriche tithonioides* (Aké Assi) D.J.N.Hind.  
(Photo: ©Xander van der Burgt, RBG Kew)



*Acalypha guineensis* J.K. Morton & G.A.Lavin.  
(Photo: ©Xander van der Burgt, RBG Kew)



*Allophylus samoritourei* Cheek.  
(Photo: ©Xander van der Burgt, RBG Kew)

## TIPA Assessment 15:

### Mt Wokou, Macenta



**IPA criteria under which the site qualifies:** A(i), C(iii)

**Assessed by:** Charlotte Couch and Martin Cheek (RBG Kew).

#### **TIPA assessment rationale**

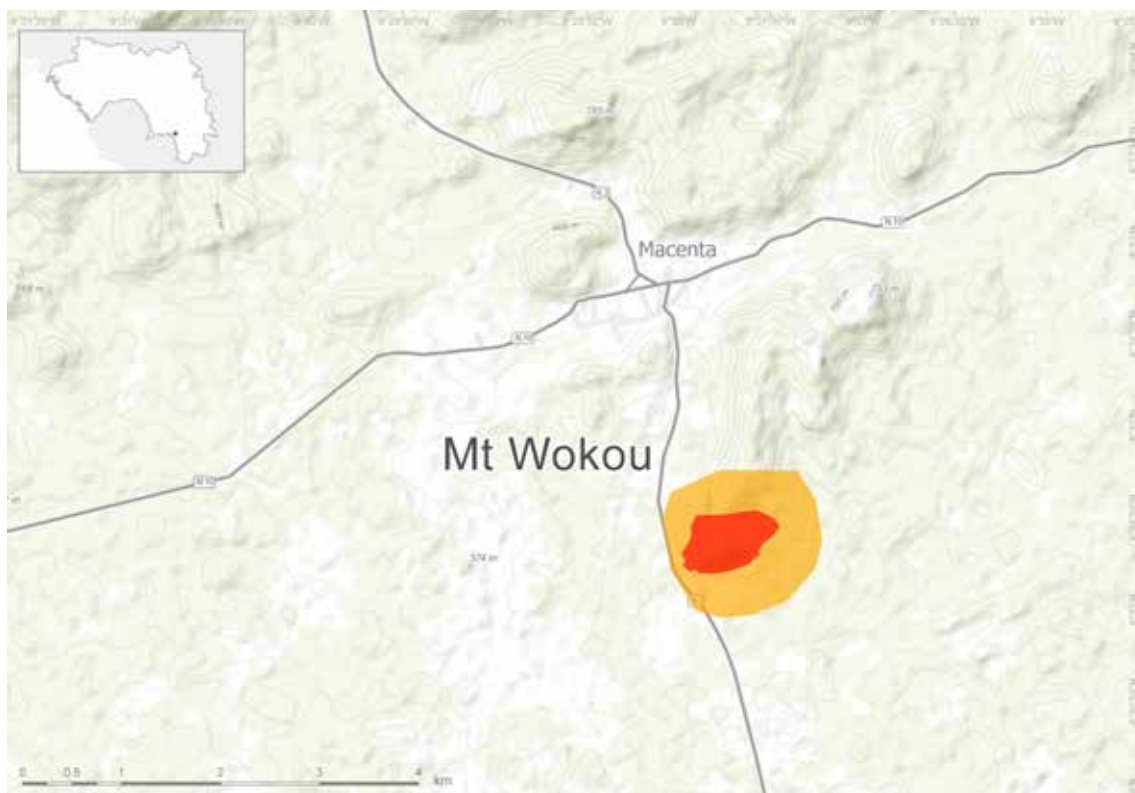
Mt Wokou is the only known global location for the Critically Endangered species *Loudetiopsis baldwinii* (CR) and is under threat from quarrying.

#### **Site overview**

Site name: Mt Wokou  
Country: Republic of Guinea  
Administrative region: Macenta Prefecture  
Central co-ordinates: 08°31'18"N, 09°27'47"W  
Area: 2km<sup>2</sup>  
Altitude minimum: 540m  
Altitude maximum: 690m

#### **Site description**

Mt Wokou is a large granite inselberg located on the southern side of Macenta town, near the N2 road in Macenta Prefecture, Guinée Forestière. It is the largest inselberg in the area.



**Map 32.** The proposed area for protection as a TIPA. Core area in red, buffer zone in yellow.

### Botanical significance

The inselberg has one point-endemic species, *Loudetiopsis baldwinii*, which is Critically Endangered, and there are several other threatened species. The inselberg has not been surveyed comprehensively and it is likely that other interesting species will be found with more investigation.

### General habitat and geology description

The inselberg is a result of a Mesozoic igneous intrusion into the surrounding older Archean metamorphic base rocks. It is part of a band on igneous intrusions, perhaps a sill or dyke which runs northeast-southwest into Sierra Leone.

### Conservation issues

There are granite quarries established on the southwestern and southeastern edges of the inselberg, which poses a significant threat to the habitat.

### Protected area status and management

No protection is currently in place.

### Threats

- Mineral extraction: Granite quarrying is occurring on the south western and south eastern edges of the inselberg, destroying habitat.

**Threat level: High**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Loudetiopsis baldwinii</i> C.E.Hubb.	A(i)	CR	✓	✓	✓	✓		Unknown
<i>Genlisea barthlottii</i> S.Porembski, Eb.Fisch. & Gemmel	A(i)	VU	✓					Unknown
<i>Osbeckia praviantha</i> Jacq.-Fél.	A(i)	VU	✓	✓	✓			Unknown
<i>Utricularia macrocheilos</i> (P.Taylor) P.Taylor	A(i)	VU	✓					Unknown

**Table 66.** Criterion A for Mt Wokou, Macenta.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

Insufficient information available to apply this criterion.

### Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Inselberg	C(iii)			✓	2km <sup>2</sup>

**Table 67.** Criterion C for Mt Wokou, Macenta.

## Bibliography

Couch, C., Magassouba, S., Rokni, S., Cheek, M. (2018). Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>  
 IUCN Red List of Threatened Species. <https://www.iucnredlist.org/>

## Site in pictures



Mt Wokou, Macenta, 2008. (Photo: ©L. Pearce, RBG Kew)



Seepage area with *Utricularia subulata*. Mt Wokou, Macenta, 2008. Photo: (Photo: ©L. Pearce, RBG Kew)

## Nimba Mountains, Lola



### **IPA criteria under which the site qualifies: A(i,iii), B(i), C(iii)**

**Assessed by:** Charlotte Couch, Martin Cheek (RBG Kew), Jamison Suter (SMFG), and Carel Jongkind (Consultant Botanist).

### **TIPA assessment rationale**

The Nimba Mountain range is an area of exceptional biodiversity globally. It has over 2,400 plant species, making it the richest documented botanical site in West Africa. It has plants globally endemic to the Nimba Mountains, such as *Osbeckia porteresii*, *Sporobolus pauciflorus*, *Impatiens nzoana*, and *Begonia quadrialata* subsp. *nimbaensis*. At least 40 threatened species, and species with restricted disjunct distributions (e.g. *Justicia jamisonii*) also occur. Although it is recognised as a Biosphere Reserve and World Heritage Site, the rare plant species and habitats of the range are still threatened.

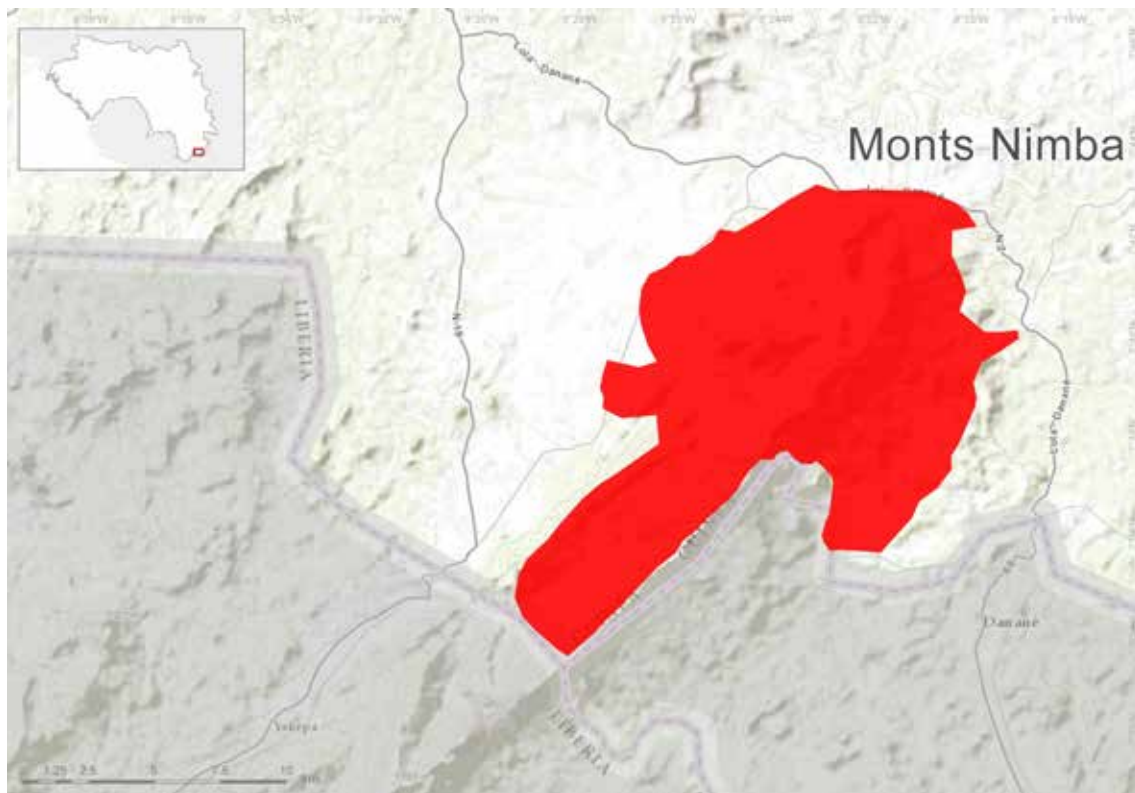
### **Site overview**

Site name: Nimba Mountains  
Country: Republic of Guinea  
Administrative region: Lola Prefecture  
Central co-ordinates: 07°37'20"N, 08°24'36"W  
Area: 149.2km<sup>2</sup>  
Altitude minimum: 450m  
Altitude maximum: 1,752m

### **Site description**

The Nimba Mountains are situated in the south-east of Guinea, in Lola Prefecture. The range extends into Liberia and Ivory Coast. The highest peak in Guinea is part of Nimba and reaches 1,752m above sea-level. The area of Nimba in Guinea covers 149.2km<sup>2</sup> and was protected in 1944. The majority (134.1km<sup>2</sup>) is recognised as a World Heritage Site and has been a core area of the Nimba Mountains Biosphere Reserve since 1980. Due to their height, age, and isolation, the Nimba Mountains are exceptionally rich in flora and fauna, with many rare and range-restricted species, including a few species endemic to the Nimba Mountains. The slopes of the mountains are forested and there is submontane grassland above this, on mainly ferralitic itabirites that have undergone various degrees of leaching of its alumina-silicate components. The high-altitude lateritic (ferralitic) bowal grasslands, and submontane forest are both recognised Threatened Habitats of Guinea.

The area is locally managed by the Centre for the Management of the Environment of the Nimba and Simandou Mountains (CEGENS).



**Map 33.** The proposed area for protection as a TIPA. Core area in red.

### Botanical significance

Due to the height and isolation of the Nimba Mountains, they are home to many rare and range-restricted species, including a few endemic to the mountain and others endemic to Guinea. Recent studies have resulted in over 2,400 plant species being recorded in the Guinean portion (pers. obs. Suter, 2018), making it the richest site in Guinea for plant species.

At least 40 globally threatened species are known, though this is likely to increase as more IUCN assessments are made. The submontane forests have plants globally endemic to the Nimba Mountains, such as *Osbeckia porteresii*, *Sporobolus pauciflorus*, *Impatiens nzoana*, and *Begonia quadrialata* subsp. *nimbaensis*. The submontane grassland has threatened species found both at Nimba and in the Simandou mountains (e.g. *Kotchya lutea*, *Rhytachne glabra*, *Bulbostylis guineensis*, and *Nemum bulbostyloides*). There are also species found here that have disjunct distributions across Africa (e.g. *Justicia jamisonii* and *Marsdenia exellii*). Some species named 'nimba', while first collected at Nimba, have subsequently been found on other parts of the Guinean highlands (e.g. *Ixora nimbana*, *Brachystephanus jaundensis* subsp. *nimbae*, *Dolichos nimbaensis*, and *Monanthataxis nimbana*).

### General habitat and geology description

The Nimba Mountains represent a rift area of the early Proterozoic era, similar in age and structure to the Simandou range intrusion. The range comprises itabirite, quartzite, and other schists emplaced onto a terrain of tonalitic granite-gneiss, migmatite, and sedimentary gneisses. There is a significant iron ore deposit which is in the forms of haematites and goethites enriched from long-term leaching and weathering processes, including thrusting, faulting, folding, and thermal processes.

## Conservation issues

The mountains are threatened by:

- Intense poaching, suffering from the ‘empty-forest’ syndrome.
- Agricultural encroachment, which has disturbed far more habitat, generally at low altitudes in forest, than any other form of disturbance.
- Regular, anthropogenic, and intense bushfires are a problem at the height of the dry season, when they do not occur naturally.
- Invasive species. In particular, *Chromolaena odorata*, which has invaded mid-altitude savannahs and forest-edges.
- Grazing of cattle at low elevations at the edge of forest.
- Isolation from neighbouring intact ecosystems due to agriculture, forestry, and roads in the surrounding lowlands.
- Mineral exploration in the mining enclave.

An area of 15.16km<sup>2</sup> was excised from the colonial Strict Nature Reserve of 1944 for mineral exploration, covering 10% of the Guinean Nimba Mountains, and 4.8% of the entire Nimba range. Within this enclave, an iron-ore mining concession of 6.25km<sup>2</sup> is currently in late-phase exploration. Mineral exploration has resulted in the construction of access roads and drill pads, affecting up to 0.5km<sup>2</sup>. If a mine were developed, it would result in the disturbance of a several square kilometres of the enclave. For this reason, a detailed environmental impact assessment is underway to avoid and minimise negative impacts, particularly to the adjacent World Heritage Site, and to seek how best to close a future mine and rehabilitate the site for its long-term, subsequent conservation. Since the same habitat types are found within the mining enclave and the World Heritage site, this TIPA area will acknowledge the mining zone as an area of development, with the objective of minimising disturbance to the area as a whole.

Concerns have also been raised by the World Heritage Committee about a road upgrade running between Lola (Guinea) and Danané (Ivory Coast), in the Biosphere Reserve’s Buffer Zone. The World Heritage Committee has retained Nimba on the list of World Heritage Sites in Danger (2018).

Despite controls in place to manage these threats, continuing damage to the World Heritage Site is possible and will inevitably reduce the global populations of some species, and the extent of Threatened Habitats.

## Protected area status and management

The site is protected as a Strict Nature Reserve (1944, updated in 2010), Managed Nature Reserve (2010), Biosphere Reserve (1980, updated in 1993), and World Heritage Site (1980, updated in 1993). The TIPA surrounds the Strict Nature Reserve and the Managed Nature Reserve, which are part of the Biosphere Reserve and the World Heritage Site.

## Threats

- Agriculture: Villagers in the foothills of the Nimba area have encroached with their fields, burning the mountains and isolating it from surrounding natural habitats.
- Wildfires: Anthropogenic bushfires regularly burn the mountain most years, at a time when they do not occur naturally.
- Invasive species: Invasive exotic species like *Chromolaena odorata* are rapidly colonising certain ecosystems, in particular savannah and forest-edge between 450-1200m altitude.
- Mining: An iron ore concession in the northern portion of the mountain range, outside of the current Strict Nature Reserve, may be developed.
- Habitat isolation: Nimba Mountains are increasingly isolated from neighbouring natural habitats.

- Hunting: Illegal hunting, leading to wildfires (see above) and consequent reduced regeneration of certain species and habitats.
- Grazing: Cattle are grazed in the lowland savannah, disturbing lowland savannah types and forest edges. Forest is also burnt to create more savannah.

**Threat level: High**

## Criteria assessments

### Criterion A: Threatened Species

	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<b>Criterion A taxon present</b>								
<i>Begonia quadrialata</i> subsp. <i>nimbaensis</i> Sosef	A(i)	EN	✓	✓	✓	✓		Common
<i>Tarenna hutchinsonii</i> Bremek.	A(i)	CR	✓	✓				Scarce
<i>Justicia jamisonii</i> Jongkind & Vollesen	A(i)	EN	✓	✓				Infrequent
<i>Marsdenia exellii</i> C. Norman	A(i)	EN	✓	✓	✓			Scarce
<i>Bulbostylis guineensis</i> Cherm. ex Bodard	A(i)	EN	✓	✓	✓			Unknown
<i>Hypolytrum cacuminum</i> Nelmes	A(i)	EN	✓	✓	✓			Common
<i>Okoubaka aubrevillei</i> Pellegr. & Normand	A(i)	EN	✓	✓	✓			Frequent
<i>Allophylus samoritourei</i> Cheek	A(i)	EN	✓	✓	✓			Infrequent
<i>Brachystephanus jaundensis</i> subsp. <i>nimbae</i> Lindau	A(i)	VU	✓	✓	✓			Infrequent
<i>Terminalia ivorensis</i> A. Chev.	A(i)	VU	✓				✓	Frequent
<i>Nemum bulbostyloides</i> (Hooper) J. Raynal	A(i)	VU	✓	✓				Common
<i>Albizia ferruginea</i> (Guill. & Perr.) Benth.	A(i)	VU	✓	✓			✓	Frequent
<i>Kotschya lutea</i> (Portères) Hepper	A(i)	VU	✓	✓				Common
<i>Gladiolus praecostatus</i> Marais	A(i)	VU	✓	✓				Common
<i>Genlisea barthlottii</i> Porembski, Eb. Fisch. & Gemmel	A(i)	VU	✓	✓				Common
<i>Dorstenia astyanactis</i> Aké Assi	A(i)	VU	✓	✓	✓			Scarce
<i>Panicum glaucocladum</i> C.E. Hubb.	A(i)	VU	✓	✓				Common
<i>Rhytachne glabra</i> (Gledhill) Clayton	A(i)	VU	✓	✓	✓			Common
<i>Homalium smythei</i> Hutch. & Dalziel	A(i)	VU	✓	✓	✓			Frequent
<i>Pavetta platycalyx</i> Bremek.	A(i)	VU?	✓	✓	✓			Frequent
<i>Copaifera salikounda</i> Heckel	A(i)	VU	✓	✓	✓			Frequent
<i>Cryptosepalum tetraphyllum</i> (Hook. f.) Benth.	A(i)	VU	✓	✓	✓			Common
<i>Cola reticulata</i> A. Chev.	A(i)	VU	✓	✓	✓			Frequent
<i>Entandrophragma angolense</i> (Welw. ex C. DC.) C. DC.	A(i)	VU	✓		✓		✓	Frequent
<i>Entandrophragma candollei</i> Harms	A(i)	VU	✓		✓		✓	Frequent
<i>Khaya grandifoliola</i> C. DC.	A(i)	VU	✓		✓		✓	Frequent
<i>Milicia regia</i> (A. Chev.) C.C. Berg	A(i)	VU	✓		✓		✓	Frequent
<i>Polystachya orophila</i> Stévant & E. Bidault	A(i)	EN	✓	✓	✓			Common

<b>Criterion A taxon present</b>	<b>IPA subcritterion</b>	<b>IUCN category</b>	<b>≥ 1% of global population</b>	<b>≥ 5% of national population</b>	<b>Is 1 of 5 best sites nationally</b>	<b>Entire global population (single-site endemic)</b>	<b>Species is of socio-economic importance</b>	<b>Abundance at site</b>
<i>Vernonia nimbaensis</i> C.D.Adams	A(i)	EN	✓	✓	✓			Unknown
<i>Glenniea adami</i> (Fouilloy) Leenh.	A(i)	VU	✓	✓	✓			Unknown
<i>Rinorea djalensis</i> A.Chev.	A(i)	VU	✓	✓	✓			Unknown
<i>Pavetta leonensis</i> Keay	A(i)	EN	✓	✓	✓			Unknown
<i>Tarenna brachysiphon</i> (Hiern) Keay	A(i)	EN	✓	✓				Unknown
<i>Cola angustifolia</i> K. Schum.	A(i)	EN	✓	✓	✓			Unknown
<i>Osbeckia porteresii</i> (Jacq.-Fél.) Jacq.-Fél.	A(i)	EN	✓	✓	✓	✓		Unknown
<i>Heterotis sylvestris</i> (Jacq.-Fél.) Jacq.-Fél.	A(i)	EN	✓	✓	✓			Unknown
<i>Droogmansia chevalieri</i> (Harms) Hutch. & Dalziel	A(i)	EN	✓	✓	✓			Unknown
<i>Dracaena calocephala</i> Bos	A(i)	VU	✓					Unknown
<i>Sporobolus pauciflorus</i> A.Chev.	A(i)	CR(PE)	✓	✓	✓	✓		Unknown
<i>Impatiens nzoana</i> A.Chev.	A(i,iii)	EN	✓	✓	✓	✓		Unknown

**Table 68.** Criterion A for Nimba Mountains, Lola.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

<b>B(i):</b> exceptional botanical richness within a defined habitat		
<b>Habitat code and name</b>	<b>Site is part of the top 10% of the national resource</b>	<b>Site is one of the 5 best sites nationally for that habitat</b>
High-altitude lateritic bowal	✓	✓
Submontane Forest	✓	✓

**Table 69.** Criterion B for Nimba Mountains, Lola.

**Key:** ✓ = yes.

	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<b>Criterion B taxon present</b>			
<i>Justicia guineensis</i> (Heine) W. D. Hawth. & Jongkind	B(i)	Submontane Forest	Frequent
<i>Brachystephanus jaundensis</i> subsp. <i>nimbae</i> Lindau	B(i)	Submontane Forest	Infrequent
<i>Bulbophyllum scariosum</i> Summerh.	B(i)	Submontane forest	Scarce
<i>Cassipourea adamii</i> Jacq.-Fél.	B(i)	Submontane forest	Infrequent
<i>Croton aubrevillei</i> J.Léonard	B(i)	Submontane forest	Scarce
<i>Helichrysum globosum</i> Sch. Bip. ex A. Rich.	B(i)	Submontane Forest	Unknown
<i>Impatiens nzoana</i> A.Chev.	B(i)	Submontane Forest	Scarce
<i>Monanthes nimbana</i> (Schnell) Verdc.	B(i)	Submontane Forest	Unknown
<i>Brachycorythis paucifolia</i> Summerh.	B(i)	High-altitude lateritic bowl	Infrequent
<i>Bulbostylis guineensis</i> Cherm. ex Bodard	B(i)	High-altitude lateritic bowl	Infrequent
<i>Coleus lateriticola</i> (A. Chev.) Phillipson, O. Hooper & A.J. Paton	B(i)	High-altitude lateritic bowl	Infrequent
<i>Dolichos nimbaensis</i> Schnell	B(i)	High-altitude lateritic bowl	Frequent
<i>Dolichos tonkouiensis</i> Portères	B(i)	High-altitude lateritic bowl	Frequent
<i>Droogmansia scaettaiana</i> A. Chev. & Sillans	B(i)	High-altitude lateritic bowl	Common
<i>Eriosema laurentii</i> De Wild.	B(i)	High-altitude lateritic bowl	Frequent
<i>Eriosema parviflorum</i> subsp. <i>collinum</i> Hepper	B(i)	High-altitude lateritic bowl	Unknown
<i>Eriosema spicatum</i> subsp. <i>collinum</i> Hook. f.	B(i)	High-altitude lateritic bowl	Unknown
<i>Genlisea barthlottii</i> Porembski, Eb. Fisch. & Gemmel	B(i)	High-altitude lateritic bowl	Frequent
<i>Gladiolus praecostatus</i> Marais	B(i)	High-altitude lateritic bowl	Frequent
<i>Gynura micheliana</i> J. G. Adam	B(i)	High-altitude lateritic bowl	Scarce
<i>Kotschya lutea</i> (Portères) Hepper	B(i)	High-altitude lateritic bowl	Frequent
<i>Nemum bulbostyloides</i> (Hooper) J. Raynal	B(i)	High-altitude lateritic bowl	Abundant
<i>Panicum glaucocladum</i> C.E. Hubb.	B(i)	High-altitude lateritic bowl	Frequent
<i>Polygala cristata</i> P.Taylor	B(i)	High-altitude lateritic bowl	Infrequent
<i>Rhytachne glabra</i> (Gledhill) Clayton	B(i)	High-altitude lateritic bowl	Infrequent
<i>Rhytachne megastachya</i> Jacq.-Fél.	B(i)	High-altitude lateritic bowl	Unknown
<i>Scleria robinsoniana</i> J. Raynal	B(i)	High-altitude lateritic bowl	Infrequent
<i>Vernonia nimbaensis</i> C.D. Adams	B(i)	High-altitude lateritic bowl	Frequent
<i>Virectaria multiflora</i> (Sm.) Bremek.	B(i)	High-altitude lateritic bowl	Frequent
<i>Osbeckia porteresii</i> Jacq.-Fél.	B(i)	High-altitude lateritic bowl (on rocks)	Unknown
<i>Phyllanthus jaegeri</i> Jean F.Brunel & J.P.Roux	B(i)	High-altitude lateritic bowl (on rocks)	Unknown
<i>Polystachya dalzielii</i> Summerh.	B(i)	High-altitude lateritic bowl (on rocks)	Scarce
<i>Polystachya orophila</i> Stévart & E. Bidault	B(i)	High-altitude lateritic bowl (on rocks)	Infrequent

**Table 70.** Criterion B for Nimba Mountains, Lola.

**Key:** Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion C: Threatened Habitat

Habitat type	IPA subcritterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
High-altitude lateritic bowal	C(iii)			✓	
Submontane forest	C(iii)			✓	
Lowland evergreen forest	C(iii)			✓	

**Table 71.** Criterion C for Nimba Mountains, Lola.

### Orchids (postscript)

As this book went to press, the authors were presented by Dr Tariq Stévant with assessments of 19 threatened species of orchid that are not yet on the IUCN Red List website, 18 of which they had been unaware of. These all transpired to be from Mt Nimba where Tariq, a noted orchid specialist, has been studying orchids for several years. These species will all feature in the forthcoming *Red Data Book of Guinea flowering plants* (Cheek et al. 2019). Since the species do not appear in the Nimba data sheet, we present them here in alphabetical order, with their preliminary conservation category: *Angraecopsis elliptica* Summerh. (VU), *Brachycorythis paucifolia* Summerh. (EN), *Bulbophyllum bifarium* Hook.f. (VU), *Bulbophyllum lucifugum* Summerh. (VU), *Bulbophyllum nigericum* Summerh. (VU), *Chamaeangis letouzeyi* Szlach. & Olszewski (*Diaphananthe letouzeyi*) (VU), *Eulophia barteri* Summerh. (VU), *Habenaria buettneriana* Kraenzl. (VU), *Kylicanthe arcuata* Descourvières, Stévant & Droissart (VU), *Kylicanthe perezverae* Descourvières, Stévant & Farminhão (EN), *Liparis platyglossa* Schltr. (VU), *Nervilia fuerstenbergiana* Schltr. (VU), *Polystachya leonensis* Rchb.f. (VU), *Polystachya parva* Summerh. (VU), *Polystachya rydingii* Baranow & Mytnik (EN), *Rangaeris longicaudata* (Rolfe) Summerh. (EN), *Rhipidoglossum paucifolium* D.Johanss. (VU), and *Tridactyle fusifera* Mansf. (VU). These additions lift the number of threatened species at Nimba from 40 to 58, the highest number by far of all Guinea TIPAs thus far documented.

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UNESCO: <https://whc.unesco.org/en/list/155>

## Site in pictures



View of the Nimba Mountains. (Photo: © Denise Molmou)



**IPA criteria under which the site qualifies: A(i,iv), C(iii)**

**Assessed by:** Charlotte Couch, Martin Cheek (RBG Kew), Muhammad Yaya Diallo (Guinée Écologie), and Catherine André (Biotope).

**TIPA assessment rationale**

The Saala Waterfalls (Chutes de Saala) and rapids are one of the most important national sites for Podostemaceae, including three threatened species. Other threatened rheophytic species include *Eriocaulon sulanum*.

**Site overview**

Site name: Saala Waterfalls  
Country: Republic of Guinea  
Administrative region: Labé Prefecture  
Central co-ordinates: 11°17'45"N, 12°31'23"W  
Area: 7km<sup>2</sup>  
Altitude minimum: 560m  
Altitude maximum: 930m

**Site description**

Touristic waterfall site near the town of Labé, in the Fouta Djallon. There are numerous rocky rapids leading up to the main waterfall that have Podostemaceae present. The area around the waterfall has a mixture of riverine forest and woodland species. The area at the base of the waterfall has denser riverine forest. There is a tourist camp present near the waterfall that is seldom used, but day tourists regularly visit.



**Map 34.** The proposed area for protection as a TIPA. Core area in red.

### Botanical significance

The rocks in the river are rich in Podostemaceae species endemic to Guinea. This family of plants is known to have species which are endemic to particular rivers or to specific points in a river. They require fast-flowing, clean water and do not tolerate pollution or silt in the water. All rapids and waterfalls in Guinea are threatened due to the expanding hydroelectric sector.

### General habitat and geology description

The underlying geology of the area is Ordovician quartzite rich sandstone. Around the edge of the upper part of the river Saala, near the tourist village, there is some riverine vegetation with *Raphia* sp., *Pandanus candelabrum*, *Carapa procera*, *Heisteria parviflora*, and *Gnidia foliosa*. The rapids and waterfalls of the Saala River are the second richest in Guinea for Podostemaceae.

### Conservation issues

There is a hydroelectric dam planned for this river. If this goes ahead, it is likely to alter the flow of the river and negatively affect the populations of Podostemaceae. This has been seen at other hydroelectric dam sites (e.g. Grandes Chutes, near Kindia).

Litter from tourists is polluting the area both in and out of the water. As one of the major tourist attractions for the Fouta Djallon, it should be given more protection.

### Protected area status and management

The Saala Waterfalls site was designated as a Classified Forest in 1945, although not all Classified Forests have Protected Area status in Guinea. It was also listed as an Important Bird Area (IBA) by Birdlife International in 2001.

## Threats

- Infrastructure: A planned hydroelectric dam for the Saala river will alter flow levels and the works could add silt to the river and litter from workers.
- Human impact: Currently there is a tourist village next to the falls and litter has been found in the river and surrounding area. Washing of clothes and motorcycles also pollutes the water.
- Agriculture: There are local communities upstream of the Saala Waterfalls using chemicals (e.g. fertilizers) in their activities. These could potentially leach into the watercourse.
- Poaching: Poaching is common. Plant species are indirectly impacted.

**Threat level: High**

## Criteria assessments

### Criterion A: Threatened Species

	IPA subcriteria	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<b>Criterion A taxon present</b>								
<i>Eriocaulon sulanum</i> S.M.Phillips & Burgt	A (i)	CR	✓	✓	✓			Infrequent
<i>Saxicolella futa</i> ined.	A (i,iv)	EN	✓	✓	✓			Infrequent
<i>Macropodiella macrothyrsa</i> (G.Taylor) C.Cusset	A(i,iv)	CR	✓	✓	✓			Frequent
<i>Stonesia heterospathella</i> G.Taylor	A (i)	VU	✓	✓	✓			Frequent
<i>Apodiscus chevalieri</i> Hutch.	A (i)	EN	✓	✓				Infrequent
<i>Dissotis splendens</i> A.Chev. & Jacq.-Fél.	A(iv)	VU	✓	✓				Common

**Table 72.** Criterion A for Saala Waterfalls, Labé.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

This criterion does not apply in this case.

### Criterion C: Threatened Habitat

	IPA subcriteria	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
<b>Habitat type</b>					
Waterfalls and Rapids with Podostemaceae	C(iii)			✓	7km <sup>2</sup>

**Table 73.** Criterion C for Saala Waterfalls, Labé.

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## Site in pictures



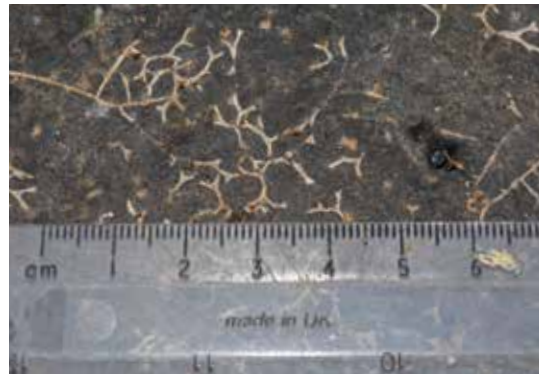
Rocks with Podostemaceae at the Saala Waterfalls, June 2016. (Photo: ©M. Cheek, RBG Kew)



View of the Saala river valley. (Photo: ©C. Couch, RBG Kew)



Saala waterfall. (Photo: © C. Couch, RBG Kew)



*Saxicolella futa* dried on rocks. January 2018.  
(Photo: © M. Cheek, RBG Kew)



Rocks with Podostemaceae at the Saala Waterfalls, June.  
(Photo: © M. Cheek, RBG Kew)



*Eriocaulon sulanum* S.M. Phillips & Burgt in flower,  
January 2018. (Photo: © M. Cheek, RBG Kew)



*Dissotis splendens* A. Chev. & Jacq.-Fél.  
(Photo: © M. Cheek, RBG Kew)



*Apodiscus chevalieri* Hutch.  
(Photo: © M. Cheek, RBG Kew)

**Southern Simandou Mountains, Beyla and Macenta****IPA criteria under which the site qualifies: A(i), B(i), C(ii)**

**Assessed by:** Charlotte Couch, Martin Cheek, and Xander van der Burgt (RBG Kew).

**TIPA assessment rationale**

The southern Simandou Mountains have the second highest diversity of plant species in Guinea after the Nimba Mountains, with over 1,400 documented plant species and c. 40 threatened species, including one species globally endemic to Pic de Fon. Although the Pic de Fon Classified Forest has a management plan, there have been some oversights in the plan impacting on the plant species. A lack of on-the-ground protection and management has led to increased artisanal diamond mining in the submontane and lowland forest at Banko, the largest area of previously intact forest in the area. Mining and the associated infrastructure will have a significant impact on the vegetation of the area when it goes ahead.

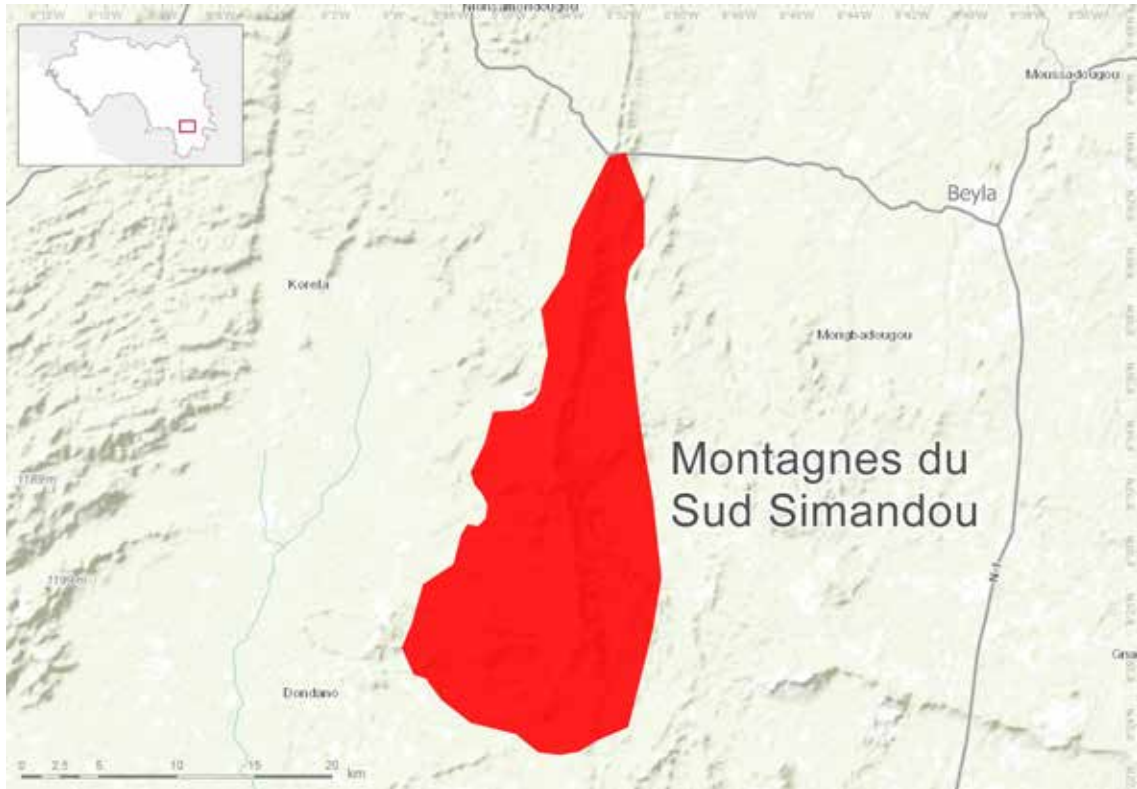
**Site overview**

Site name: Southern Simandou Mountains  
Country: Republic of Guinea  
Administrative region: Beyla and Macenta Prefectures  
Central co-ordinates: 08°32'N, 08°55'W  
Area: 368km<sup>2</sup>  
Altitude minimum: 550m  
Altitude maximum: 1,658m

**Site description**

The southern Simandou range of mountains is situated in the south-east of Guinea. It straddles the prefectures of Macenta and Beyla and is part of the Loma-Man range that extends into Sierra Leone. The highest peak, Pic de Fon, reaches 1,658m. It has species associations with the Guinea Highlands (Fouta Djallon) and with the Nimba Mountains. The ridges and flanks have a mosaic of submontane forest and submontane lateritic (ferralitic) bowal (grassland) with high species diversity, both of which are recognised as Threatened Habitats of Guinea.

The area has extensive iron ore deposits and a mining concession has been granted by the government to Rio Tinto. A Social and Environmental Impact Assessment (SEIA) was carried out between 2005 and 2011 and was submitted to government in 2012. A management plan was agreed by the government in 2010, and the area is locally managed by the Centre for the Management of the Environment of the Nimba and Simandou Mountains (CEGENS).



**Map 35.** The proposed area for protection as a TIPA. Core area in red.

### Botanical significance

The Simandou range is of a similar age to the Nimba Mountains and has many shared species in both the submontane forest and submontane ferrallitic bowal. Recent studies in the southern Simandou Mountains have documented more than 1,400 plant species including c. 40 threatened species, ranging from Critically Endangered (CR) to Vulnerable (VU), many of which will be impacted by the mining concession. The transition zone between the submontane forest and ferrallitic bowal grassland has many rare and endangered plant species, such as *Lipotriche tithonioides* and *Acalypha guineensis*. The submontane grassland has a high species diversity with many endangered species (e.g. *Xysmalobium samoritourei*, *Dissotis (Anaheterotis) pobeguinii*, *Rhytachne glabra*, and *Kotschya lutea*). It also hosts the one and only globally endemic species to Pic de Fon, *Eriosema triformum*. There is also some high-altitude bowal with temporary seepage or swamp areas with *Kotschya micrantha*, *Nemum bulbostyloides*, and *Utricularia* spp. Some species historically also found in the Fouta Djallon and Simandou (e.g. *Keetia futa* and *Habenaria jaegeri*) are no longer present in the Fouta Djallon and therefore the Simandou mountains are the last refuge for these species in Guinea.

### General habitat and geology description

The Simandou Mountains represent a rift area of the early Proterozoic era, similar in age and structure to the Nimba range intrusion. The range comprises itabirite, quartzite, and other schists emplaced onto a terrain of tonalitic granite-gneiss, migmatite, and sedimentary gneisses. There is a significant iron ore deposit along the ridge top which is in the forms of haematites and goethites enriched from long-term leaching and weathering processes.

## Conservation issues

There are several current threats to the southern Simandou Mountains. See below for further details.

The mine will occupy a total area of approximately 6,400 hectares (ha), including safety and security zones around the works. Within this area, a total of approximately 3,750ha will be occupied by the mine pits, waste emplacements, other developed areas, roads, and conveyors. The remaining area will not be cleared of vegetation but will be under the management of the Mine Operations team and will not be available for social or commercial use by the public (Simandou SEIA. Volume I. Mine. 2012).

A detailed SEIA was carried out between 2005 and 2011 to support a plan to minimise the impact of mining on all aspects of the environment. In the report, vegetation types are given a value based on specific criteria relating to distribution and diversity. Submontane lateritic (ferralitic) bowal (grassland), submontane forest, submontane forest-grassland (ferralitic bowal), transition areas, and high-altitude bowal with swamps are all labelled as high-value habitats. It has been previously proposed by Simfer/Rio Tinto that the forest on the western side and the area at Dabatini peak would be left as conservation areas. However, the current mine footprint will remove half of the known population of the Critically Endangered and globally unique *Eriosema triformum*. The status of the mine is currently unknown, but there has been reduction in activity since 2015.

There is a management plan in place which implicates community-led conservation organisations, Centre Forestière de Nzérékoré, and CEGENS, with support from Simfer/Rio Tinto. The total area under management is 16,887ha (66.9% of the total forested area). There is a core Protected Area with restricted access of 8,839ha (35% of the total area of the Classified Forest). There is also a 'production zone' of 8,048ha (31.9 % of the total area of the Classified Forest). (Pic de Fon Management Plan. 2010).

Lack of on-the-ground protection from the managing authorities has led to increased forest destruction within the Classified Forest from artisanal diamond mining, visible via Google Earth imagery.

The TIPA will take into account that there is a mining concession within the proposed area, but that the mining company should work to minimise damage to the identified high-value vegetation types.

## Protected area status and management

Pic de Fon Classified Forest was designated in 1953. The current management plan (Plan d'Aménagement et Plan de Gestion de la Forêt Classée du Pic de Fon) runs from 2010 to 2030, with reviews every 5 years.

## Threats

- Agricultural expansion: Increase in size of villages due to the presence of the mining project.
- Artisanal diamond mining: This is affecting the lowland/submontane forest to the west of the range, near Banko.
- Prevention of fires: Lack of fires in the mining concession hinders the reproduction of certain threatened pyrophytic species.
- Animal disturbance: Cattle grazing and trampling in previously undisturbed areas due to a change in the management plan.
- Mineral exploitation and infrastructure placement: Roads and drill pads have disturbed the submontane grassland and areas have been cleared, destroying some threatened species.
- Invasive species: There has also been an increase in invasive species in the area as a result of increased traffic because of mining preparations.
- Annual anthropogenic grassland fires: Fires invade forest edges and decrease the area of submontane forest.

**Threat level: High**

## Criteria assessments

### Criterion A: Threatened Species

	IPA subcritterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<b>Criterion A taxon present</b>								
<i>Lipotriche tithonioides</i> (Aké Assi) D.J.N.Hind	A(i)	EN	✓	✓	✓			Locally common
<i>Habenaria jaegeri</i> Summerh.	A(i)	EN	✓	✓	✓			Locally common
<i>Acalypha guineensis</i> J.K. Morton & G.A.Lavin	A(i)	VU	✓	✓	✓			Scarce
<i>Eriosema triformum</i> Burgt	A(i)	EN	✓	✓	✓	✓		Locally common
<i>Kotschya lutea</i> (Portères) Hepper	A(i)	VU	✓	✓	✓			Frequent
<i>Garcinia afzelii</i> Engl.	A(i)	VU					✓	Infrequent
<i>Xysmalobium samoritourei</i> Goyder	A(i)	EN	✓	✓	✓			Infrequent
<i>Psychotria samoritourei</i> Cheek	A(i)	VU	✓	✓	✓			Infrequent
<i>Pavetta lasioclada</i> (K.Krause) Mildbr. ex. Bremek	A(i)	VU	✓					Infrequent
<i>Polystachya orophila</i> Stévant & E.Bidault	A(i)	EN	✓	✓	✓			Scarce
<i>Rhytachne glabra</i> (Gledhill) Clayton	A(i)	VU	✓	✓	✓			Frequent
<i>Eriosema spicatum</i> subsp. <i>collinum</i> Hook.f.	A(i)	VU	✓	✓	✓			Frequent
<i>Fleroya stipulosa</i> (DC.) Y.F.Deng	A(i)	VU					✓	Unknown
<i>Dorstenia astyanactis</i> Aké Assi	A(i)	VU	✓	✓	✓			Infrequent
<i>Anubias gracilis</i> A.Chev. ex Hutch.	A(i)	VU	✓	✓	✓			Scarce
<i>Amorphophallus abyssinicus</i> subsp. <i>akeassii</i> N.E. Br.	A(i)	VU?	✓	✓	✓			Scarce
<i>Kotschya micrantha</i> Harms	A(i)	VU	✓	✓	✓			Locally common
<i>Nemum bulbostyloides</i> (Hooper) J. Raynal	A(i)	VU	✓	✓	✓			Frequent
<i>Milicia regia</i> A.Chev.	A(i)	VU					✓	Infrequent
<i>Cryptosepalum tetraphyllum</i> (Hook.f.) Benth.	A(i)	VU	✓		✓			Frequent
<i>Anaheterotis (Dissotis) pobeguini</i> (Hutch. & Dalziel) Ver.-Lib. & G.Kadereit	A(i)	VU	✓	✓	✓			Infrequent
<i>Mikaniopsis tedliei</i> (Oliv. & Hiern) C.D.Adams	A(i)	VU?	✓	✓	✓			Scarce
<i>Guarea cedrata</i> (A.Chev.) Pellegr.	A(i)	VU					✓	Infrequent
<i>Isoglossa dispersa</i> I.Darbysh. & L.J.Pearce	A(i)	VU	✓	✓	✓			Very locally common
<i>Brachystephanus oreacanthus</i> Champ.	A(i)	VU	✓	✓	✓			Very locally common
<i>Utricularia macrocheilos</i> (P.Taylor) P.Taylor	A(i)	VU	✓	✓				Infrequent
<i>Entandrophragma angolense</i> (Welw.) C.DC.	A(i)	VU					✓	Infrequent
<i>Keetia futa</i> Cheek	A(i)	EN	✓	✓	✓			Scarce
<i>Entandrophragma candollei</i> Harms	A(i)	VU					✓	Infrequent
<i>Cola angustifolia</i> K.Schum.	A(i)	EN	✓	✓				Infrequent
<i>Drypetes afzelii</i> (Pax) Hutch.	A(i)	VU	✓					Frequent
<i>Garcinia kola</i> Heckel	A(i)	VU					✓	Infrequent

Criterion A taxon present	IPA subcritterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Copaifera salikounda</i> Heckel	A(i)	VU					✓	Infrequent
<i>Afzelia africana</i> Sm.	A(i)	VU					✓	Frequent
<i>Khaya grandifoliola</i> C. DC.	A(i)	VU					✓	Infrequent
<i>Pavetta platycalyx</i> Bremek.	A(i)	VU ?	✓					Infrequent
<i>Nauclea diderrichii</i> (De Wild. & T.Durand) Merrill	A(i)	VU					✓	Frequent
<i>Lophira alata</i> Banks ex Gaertn.f.	A(i)	VU					✓	Infrequent
<i>Anopyxis klaineana</i> (Pierre) Engl.	A(i)	VU					✓	Infrequent
<i>Gladiolus praecostatus</i> Marais	A(i)	VU	✓	✓	✓			Locally common

**Table 74.** Criterion A for Southern Simandou Mountains, Beyla and Macenta.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

<b>B(i):</b> exceptional botanical richness within a defined habitat		
Habitat code and name	Site is part of the top 10% of the national resource	Site is one of the 5 best sites nationally for that habitat
High-altitude lateritic (ferralitic) bowal	✓	✓
Submontane forest	✓	✓

**Table 75.** Criterion B for Southern Simandou Mountains, Beyla and Macenta.

**Key:** ✓ = yes.

<b>Criterion B taxon present</b>	<b>Sub-criterion under which species qualifies</b>	<b>For B(i) – indicator of</b>	<b>Abundance at site</b>
<i>Habenaria jaegeri</i> Summerh.	B(i)	High-altitude lateritic bowal	Locally common in two places
<i>Xysmalobium samoritourei</i> Goyder	B(i)	High-altitude lateritic bowal	Infrequent
<i>Eriosema triformum</i> Burgt	B(i)	High-altitude lateritic bowal	Locally common
<i>Polystachya orophila</i> Stévant & E.Bidault	B(i)	High-altitude lateritic bowal	Scarce
<i>Panicum ecklonii</i> Nees	B(i)	High-altitude lateritic bowal	Scarce
<i>Elionurus muticus</i> (Sprengel) Kuntze	B(i)	High-altitude lateritic bowal	Frequent
<i>Rhytachne glabra</i> (Gledhill) Clayton	B(i)	High-altitude lateritic bowal	Frequent
<i>Eriosema spicatum</i> subsp. <i>collinum</i> Hook. f.	B(i)	High-altitude lateritic bowal	Frequent
<i>Lactuca praevia</i> C.D.Adams	B(i)	High-altitude lateritic bowal	Frequent
<i>Stomatanthes africanus</i> (Oliv. & Hiern) H.Rob. & R.M.King	B(i)	High-altitude lateritic bowal	Frequent
<i>Vernonia acrocephala</i> Klatt	B(i)	High-altitude lateritic bowal	Frequent
<i>Aeschynomene pulchella</i> Planch. ex Benth.	B(i)	High-altitude lateritic bowal	Infrequent
<i>Protea madiensis</i> Oliv.	B(i)	High-altitude lateritic bowal	Frequent
<i>Amorphophallus abyssinicus</i> subsp. <i>akeassii</i> N.E. Br.	B(i)	High-altitude lateritic bowal	Infrequent
<i>Crotalaria glauca</i> Willd.	B(i)	High-altitude lateritic bowal	Unknown
<i>Aloe buettneri</i> A.Berger	B(i)	High-altitude lateritic bowal	Scarce
<i>Vernonia purpurea</i> Sch.Bip.	B(i)	High-altitude lateritic bowal	Infrequent
<i>Pseudarthria hookeri</i> var. <i>hookeri</i> Wight & Arn.	B(i)	High-altitude lateritic bowal	Infrequent
<i>Raphionacme brownii</i> Scott-Elliot	B(i)	High-altitude lateritic bowal	Scarce
<i>Dissotis pobeguinii</i> Hutch & Dalz.	B(i)	High-altitude lateritic bowal	Scarce
<i>Habenaria zambesina</i> Rchb.f.	B(i)	High-altitude lateritic bowal	Locally common
<i>Kotschya lutea</i> (Portères) Hepper	B(i)	High-altitude lateritic bowal	Frequent
<i>Nemum bulbostyloides</i> (Hooper) J. Raynal	B(i)	High-altitude lateritic bowal	Frequent
<i>Bulbostylis pusilla</i> subsp. <i>congolensis</i> (A.Rich.) C.B.Cl.	B(i)	High-altitude lateritic bowal	Unknown
<i>Cyperus tenuiculmis</i> Boeck.	B(i)	High-altitude lateritic bowal	Frequent
<i>Fimbristylis dichotoma</i> (L.) Vahl	B(i)	High-altitude lateritic bowal	Frequent
<i>Loudetia kagerensis</i> (K.Schum.) C. E. Hubb. ex Hutch.	B(i)	High-altitude lateritic bowal	Frequent
<i>Teramnus buettneri</i> (Harms) Baker.f	B(i)	High-altitude lateritic bowal	Unknown
<i>Cyperus cyperoides</i> (L.) Kuntze	B(i)	High-altitude lateritic bowal	Frequent
<i>Lipocarpha chinensis</i> (Osbeck) J.Kern	B(i)	High-altitude lateritic bowal	Frequent
<i>Ascolepis brasiliensis</i> (Kunth) Benth. ex C.B.Clarke	B(i)	High-altitude lateritic bowal	Infrequent
<i>Xyris decipiens</i> N.E.Br.	B(i)	High-altitude lateritic bowal	Unknown
<i>Kotschya micrantha</i> Harms	B(i)	High-altitude lateritic bowal	Locally common
<i>Liparis nervosa</i> (Thunb.) Lindl.	B(i)	High-altitude lateritic bowal	Unknown
<i>Platycoryne paludosa</i> Rolfe	B(i)	High-altitude lateritic bowal	Frequent
<i>Habenaria papyracea</i> Schltr.	B(i)	High-altitude lateritic bowal	Unknown
<i>Gladiolus praecostatus</i> Marais	B(i)	High altitude lateritic bowal	Locally common
<i>Belonophora coffeoides</i> subsp. <i>hypoglauca</i> Hook.f.	B(i)	Submontane forest	Frequent

	Sub-criterion under which species qualifies	For B(i) – indicator of	Abundance at site
<b>Criterion B taxon present</b>			
<i>Brillantaisia owariensis</i> P.Beauv.	B(i)	Submontane forest	Frequent
<i>Chassalia kolly</i> (Schumach.) Hepper	B(i)	Submontane forest	Frequent
<i>Cryptosepalum tetraphyllum</i> (Hook.f.) Benth.	B(i)	Submontane forest	Common
<i>Cyathea manniana</i> Hook.	B(i)	Submontane forest	Infrequent
<i>Dracaena arborea</i> Link	B(i)	Submontane forest	Infrequent
<i>Drypetes principum</i> (Müll.Arg.) Hutch.	B(i)	Submontane forest	Infrequent
<i>Eugenia leonensis</i> Engl. & Brehmer	B(i)	Submontane forest	Infrequent
<i>Garcinia smeathmannii</i> (Planch. & Triana) Oliv.	B(i)	Submontane forest	Infrequent
<i>Hypoestes triflora</i> (Forssk.) Roem. & Schult.	B(i)	Submontane forest	Frequent
<i>Morus mesozygia</i> Stapf	B(i)	Submontane forest	Frequent
<i>Nuxia congesta</i> R.Br. ex Fresen.	B(i)	Submontane forest	Infrequent
<i>Parinari excelsa</i> Sabine	B(i)	Submontane forest	Common
<i>Peperomia fernandopoiana</i> C.DC.	B(i)	Submontane forest	Frequent
<i>Pouteria altissima</i> (A.Chev.) Baehni	B(i)	Submontane forest	Infrequent
<i>Samanea leptophylla</i> (Harms) Brenan & Brummitt	B(i)	Submontane forest	Infrequent
<i>Santiria trimera</i> (Oliv.) Aubrév.	B(i)	Submontane forest	Frequent
<i>Synsepalum cerasiferum</i> (Welw.) T.D.Penn.	B(i)	Submontane forest	Infrequent
<i>Syzygium staudtii</i> (Engl.) Mildbr.	B(i)	Submontane forest	Infrequent
<i>Trichilia djaloni</i> A.Chev.	B(i)	Submontane forest	Infrequent
<i>Uapaca chevalieri</i> Beille	B(i)	Submontane forest	Infrequent
<i>Zanthoxylum rubescens</i> Hook.f.	B(i)	Submontane forest	Infrequent

**Table 76.** Criterion B for Southern Simandou Mountains, Beyla and Macenta.

**Key:** Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Submontane forest	C(iii)			✓	
Lowland forest	C(iii)			✓	
High-altitude lateritic (ferralitic) bowal grassland	C(iii)			✓	

**Table 77.** Criterion C for Southern Simandou Mountains, Beyla and Macenta.

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## Site in pictures



View towards Dabatini Peak. 2008. (Photo: ©Xander van der Burgt, RBG Kew)



Submontane grassland on high-altitude ferrallitic bowal. (Photo: ©Xander van der Burgt, RBG Kew)



Submontane forest, eastern side, 2008. (Photo: ©Xander van der Burgt, RBG Kew)



Effects of mining activities on the Southern Simandou Mountains. (Photo: ©Xander van der Burgt, RBG Kew)



*Acalypha guineensis* J.K. Morton & G.A.Lavin.  
(Photo: ©Xander van der Burgt, RBG Kew)



*Eriosema triformum* Burgt.  
(Photo: ©Xander van der Burgt, RBG Kew)



*Anaheterotis (Dissotis) pobeguinii* (Hutch. & Dalziel)  
Ver.-Lib. & G.Kadereit. (Photo: ©Xander van der Burgt,  
RBG Kew)



*Nemum bulbostyloides* (Hooper) J. Raynal.  
(Photo: ©Xander van der Burgt, RBG Kew)

## TIPA Assessment 19:

### Simbaraya Ferralitic Bowé, Kindia



**IPA criteria under which the site qualifies:** A(i), B(i), C(iii)

**Assessed by:** Charlotte Couch and Martin Cheek (RBG Kew).

#### TIPA assessment rationale

Low-altitude lateritic (ferralitic) bowal is a threatened habitat type in Guinea. It can support a high diversity of herbaceous species as well as threatened, rare species, such as *Nymphoides guineensis* in temporary pools. The Simbaraya bowé are a good example of this habitat type, which is under threat in Guinea from mining, gravel extraction, overgrazing, and housing.

#### Site overview

Site name: Simbaraya Ferralitic Bowé  
Country: Republic of Guinea  
Administrative region: Kindia Prefecture  
Central co-ordinates: 09°53'46"N, 12°36'05"W  
Area: c. 7km<sup>2</sup>  
Altitude minimum: 140m  
Altitude maximum: 220m

#### Site description

Ferralitic ironstone bowal area, south of the village of Simbaraya in Kindia Prefecture. It is located along the road leading south to Madina Oula (and Sierra Leone). The bowé are surrounded by wooded grassland and there are small wooded islands, temporary ponds, and marshes within them.



**Map 36.** The proposed area for protection as a TIPA. Core area in red.

### Botanical significance

Iron-rich bowal has a different species composition to bauxite or pure sandstone bowal, though similar microhabitats are present. The bowal at Simbaraya has small ponds with *Nymphoides guineensis*, grassland with depressions, and wooded islands. There is a high species diversity at this locality. Low-altitude lateritic (ferralitic) bowal is a recognised Threatened Habitat type in Guinea, specifically at risk from mining activities, as the iron is close to the surface.

### General habitat and geology description

The concretised iron pan is impermeable causing flooding in the rainy season and the formation of temporary marshes. The thin soils support grasses and herbs, either annual species or with tubers to survive the dry season.

### Conservation issues

Currently no low-altitude lateritic (ferralitic) bowal is protected in Guinea. This habitat is threatened by mining, gravel extraction, and housing. There is also cattle grazing in the area and fires are set by pastoralist farmers for new grass shoots in the dry season.

### Protected area status and management

There is currently no protection for this area.

### Threats

- Gravel extraction: Gravel is extracted for building materials.
- Mineral extraction: Iron ore extraction.
- Fires: Set by cattle herders for their livestock.
- Housing expansion: Bowal is used for building houses upon as it is a solid base.
- Overgrazing: Cattle and other domestic animals.

**Threat level: Medium**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subcriterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Nymphoides guineensis</i> A. Raynal	A(i)	EN	✓	✓	✓			Scarce
<i>Dilophotriche occidentalis</i> Jacq.-Fél.	A(i)	VU	✓	✓				Frequent

**Table 78.** Criterion A for Simbaraya Ferralitic Bowé, Kindia.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

B(i) exceptional botanical richness within a defined habitat		
Habitat code and name	Site is part of the top 10% of the national resource	Site is one of the 5 best sites nationally for that habitat
Low-altitude lateritic bowal		✓

**Table 79.** Criterion B for Simbaraya Ferralitic Bowé, Kindia.

**Key:** ✓ = yes.

Criterion B taxon present	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<i>Acroceras amplexans</i> Stapf	B(i)	Low-altitude lateritic bowal	
<i>Adelostigma senegalense</i> Benth.	B(i)	Low-altitude lateritic bowal	
<i>Aeollanthus pubescens</i> Benth.	B(i)	Low-altitude lateritic bowal	
<i>Aeschynomene americana</i> L.	B(i)	Low-altitude lateritic bowal	
<i>Afrotrilepis pilosus</i> (Boeck.) J.Raynal	B(i)	Low-altitude lateritic bowal	
<i>Alysicarpus rugosus</i> (Willd.) DC.	B(i)	Low-altitude lateritic bowal	
<i>Anadelphia leptocoma</i> (Trin.) Pilg.	B(i)	Low-altitude lateritic bowal	
<i>Anadelphia trispiculata</i> Stapf	B(i)	Low-altitude lateritic bowal	
<i>Andropogon chinensis</i> (Nees) Merr.	B(i)	Low-altitude lateritic bowal	
<i>Bryaspis lupulina</i> (Planch.) Duvign.	B(i)	Low-altitude lateritic bowal	
<i>Bulbostylis coleotricha</i> (A. Rich.) C.B.Clarke	B(i)	Low-altitude lateritic bowal	
<i>Caperonia serrata</i> (Turcz.) Presl	B(i)	Low-altitude lateritic bowal	
<i>Celosia argentea</i> Voss	B(i)	Low-altitude lateritic bowal	
<i>Celosia trigyna</i> L.	B(i)	Low-altitude lateritic bowal	
<i>Ceropegia deightonii</i> Hutch. & Dalziel	B(i)	Low-altitude lateritic bowal	

Criterion B taxon present	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<i>Chamaecrista mimosoides</i> (L.) Greene	B(i)	Low-altitude lateritic bowal	
<i>Commelina nigritana</i> Benth.	B(i)	Low-altitude lateritic bowal	
<i>Crepidorhopalon gracilis</i> (Pilg.) Eb.Fisch.	B(i)	Low-altitude lateritic bowal	
<i>Crotalaria goreensis</i> Guill. & Perr.	B(i)	Low-altitude lateritic bowal	
<i>Cyanotis lanata</i> Benth.	B(i)	Low-altitude lateritic bowal	
<i>Cyclocarpa stellaris</i> Afzel. ex Baker	B(i)	Low-altitude lateritic bowal	
<i>Cyperus denudatus</i> var. <i>denudatus</i> L.f.	B(i)	Low-altitude lateritic bowal	
<i>Cyperus distans</i> L.f.	B(i)	Low-altitude lateritic bowal	
<i>Desmodium delicatulum</i> A.Rich.	B(i)	Low-altitude lateritic bowal	
<i>Desmodium velutinum</i> (Willd.) DC.	B(i)	Low-altitude lateritic bowal	
<i>Dilophotriche occidentalis</i> Jacq.-Fél.	B(i)	Low-altitude lateritic bowal	
<i>Dioscoreophyllum cumminsii</i> var. <i>cumminsii</i> (Stapf) Diels	B(i)	Low-altitude lateritic bowal	
<i>Dipcadi viride</i> (L.) Moench	B(i)	Low-altitude lateritic bowal	
<i>Diplacrum africanum</i> (Benth.) C.B.Clarke	B(i)	Low-altitude lateritic bowal	
<i>Dopatrium senegalense</i> Benth.	B(i)	Low-altitude lateritic bowal	
<i>Drosera indica</i> L.	B(i)	Low-altitude lateritic bowal	
<i>Elymandra subulata</i> Jacq.-Fél.	B(i)	Low-altitude lateritic bowal	
<i>Eriocaulon afzelianum</i> Wikstr. ex Körn	B(i)	Low-altitude lateritic bowal	
<i>Eriocaulon plumale</i> subsp. <i>plumale</i> N.E.Br.	B(i)	Low-altitude lateritic bowal	
<i>Eriosema glomeratum</i> (Guill. & Perr.) Hook.f.	B(i)	Low-altitude lateritic bowal	
<i>Euphorbia hyssopifolia</i> L.	B(i)	Low-altitude lateritic bowal	
<i>Floscopa axillaris</i> (Poir.) C.B.Clarke	B(i)	Low-altitude lateritic bowal	
<i>Fuirena umbellata</i> Rottb.	B(i)	Low-altitude lateritic bowal	
<i>Hibiscus squamosus</i> Hochr.	B(i)	Low-altitude lateritic bowal	
<i>Hydrolea macrosepala</i> A. W. Benn.	B(i)	Low-altitude lateritic bowal	
<i>Hyptis spicigera</i> Lam.	B(i)	Low-altitude lateritic bowal	
<i>Hyptis suaveolens</i> (L.) Poit.	B(i)	Low-altitude lateritic bowal	
<i>Indigofera capitata</i> Kotschy	B(i)	Low-altitude lateritic bowal	
<i>Indigofera simplicifolia</i> Dennst.	B(i)	Low-altitude lateritic bowal	
<i>Ipomoea eriocarpa</i> R.Br.	B(i)	Low-altitude lateritic bowal	
<i>Ischaemum rugosum</i> Salisb.	B(i)	Low-altitude lateritic bowal	
<i>Justicia ladanoides</i> Lam.	B(i)	Low-altitude lateritic bowal	
<i>Leersia drepanothrix</i> Stapf	B(i)	Low-altitude lateritic bowal	
<i>Limnophila barteri</i> Skan	B(i)	Low-altitude lateritic bowal	
<i>Limnophila dasyantha</i> (Engl. & Gilg) Skan	B(i)	Low-altitude lateritic bowal	
<i>Lindernia crustacea</i> (L.) F.Muell.	B(i)	Low-altitude lateritic bowal	
<i>Ludwigia hyssopifolia</i> (G.Don) Exell	B(i)	Low-altitude lateritic bowal	
<i>Mesanthemum radicans</i> (Benth.) Koern.	B(i)	Low-altitude lateritic bowal	

Criterion B taxon present	Sub-criterion under which species qualifies	For B(i) – indicator of habitat	Abundance at site
<i>Mollugo nudicaulis</i> Lam.	B(i)	Low-altitude lateritic bowal	
<i>Mukia maderaspatana</i> (L.) M.J.Roem.	B(i)	Low-altitude lateritic bowal	
<i>Nemum spadiceum</i> (Lam.) Desv.	B(i)	Low-altitude lateritic bowal	
<i>Nymphoides guineensis</i> A.Raynal	B(i)	Low-altitude lateritic bowal	
<i>Ocimum basilicum</i> L.	B(i)	Low-altitude lateritic bowal	
<i>Ocimum gratissimum</i> L.	B(i)	Low-altitude lateritic bowal	
<i>Oldenlandia herbacea</i> (L.) Roxb.	B(i)	Low-altitude lateritic bowal	
<i>Oryza longistaminata</i> A.Chev. & Roehr.	B(i)	Low-altitude lateritic bowal	
<i>Pandiaka angustifolia</i> (Vahl) Hepper	B(i)	Low-altitude lateritic bowal	
<i>Panicum</i> cf. <i>gracilicaule</i> Rendle	B(i)	Low-altitude lateritic bowal	
<i>Panicum pilgeri</i> Mez	B(i)	Low-altitude lateritic bowal	
<i>Parahyparrhenia annua</i> (Hack.) Clayton	B(i)	Low-altitude lateritic bowal	
<i>Parkia biglobosa</i> (Jacq.) R.Br. ex G. Don	B(i)	Low-altitude lateritic bowal	
<i>Pennisetum polystachion</i> (L.) Schult.	B(i)	Low-altitude lateritic bowal	
<i>Pycreus capillifolius</i> (A.Rich.) C.B.Clarke	B(i)	Low-altitude lateritic bowal	
<i>Raphionacme brownii</i> Scott-Elliot	B(i)	Low-altitude lateritic bowal	
<i>Rhynchospora triflora</i> Vahl	B(i)	Low-altitude lateritic bowal	
<i>Sacciolepis cymbiandra</i> Stapf	B(i)	Low-altitude lateritic bowal	
<i>Scleria sphaerocarpa</i> (E.A. Rob.) Napper	B(i)	Low-altitude lateritic bowal	
<i>Sesamum radiatum</i> Schum. & Thonn.	B(i)	Low-altitude lateritic bowal	
<i>Spermacoce filifolia</i> (Schum. & Thonn.) J.-P.Lebrun & Stork	B(i)	Low-altitude lateritic bowal	
<i>Spermacoce hepperiana</i> Verdc.	B(i)	Low-altitude lateritic bowal	
<i>Spermacoce ruelliae</i> DC.	B(i)	Low-altitude lateritic bowal	
<i>Spermacoce verticillata</i> L.	B(i)	Low-altitude lateritic bowal	
<i>Striga asiatica</i> (L.) Kuntze	B(i)	Low-altitude lateritic bowal	
<i>Tephrosia bracteolata</i> Guill. & Perr.	B(i)	Low-altitude lateritic bowal	
<i>Torenia thouarsii</i> (Cham. & Schltdl.) Kuntze	B(i)	Low-altitude lateritic bowal	
<i>Urena lobata</i> L.	B(i)	Low-altitude lateritic bowal	
<i>Utricularia tortilis</i> Welw. ex Oliv.	B(i)	Low-altitude lateritic bowal	
<i>Vernonia cinerea</i> (L.) Less.	B(i)	Low-altitude lateritic bowal	
<i>Vigna filicaulis</i> Hepper	B(i)	Low-altitude lateritic bowal	
<i>Waltheria indica</i> L.	B(i)	Low-altitude lateritic bowal	
<i>Wissadula amplissima</i> var. <i>rostrata</i> (L.) R.E.Fr.	B(i)	Low-altitude lateritic bowal	

**Table 80.** Criterion B for Simbaraya Ferralitic Bowé, Kindia.

## Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Low-altitude lateritic bowal	C(iii)			✓	c.7km <sup>2</sup>

**Table 81.** Criterion C for Simbaraya Ferralitic Bowé, Kindia.

## Bibliography

Couch, C., Magassouba, S., Rokni, S., Cheek, M. (2018). Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>

IUCN Red List of Threatened Species. <https://www.iucnredlist.org/>

## Site in pictures



Simbaraya ferralitic bowal, November 2012. (Photo: ©M. Cheek, RBG Kew)



Cattle herders on the Simbaraya bowal, November 2012. (Photo: © M. Cheek, RBG Kew)



Ephemeral flush vegetation, November 2012. (Photo: © M.-H. Weech, RBG Kew)



Ephemeral flush vegetation, November 2012. (Photo: © M.-H. Weech, RBG Kew)

## **Tassing Plateau, Coyah and Kindia**



**IPA criteria under which the site qualifies: A(i), C(iii)**

**Assessed by:** Charlotte Couch and Xander van der Burgt (RBG Kew).

### **TIPA assessment rationale**

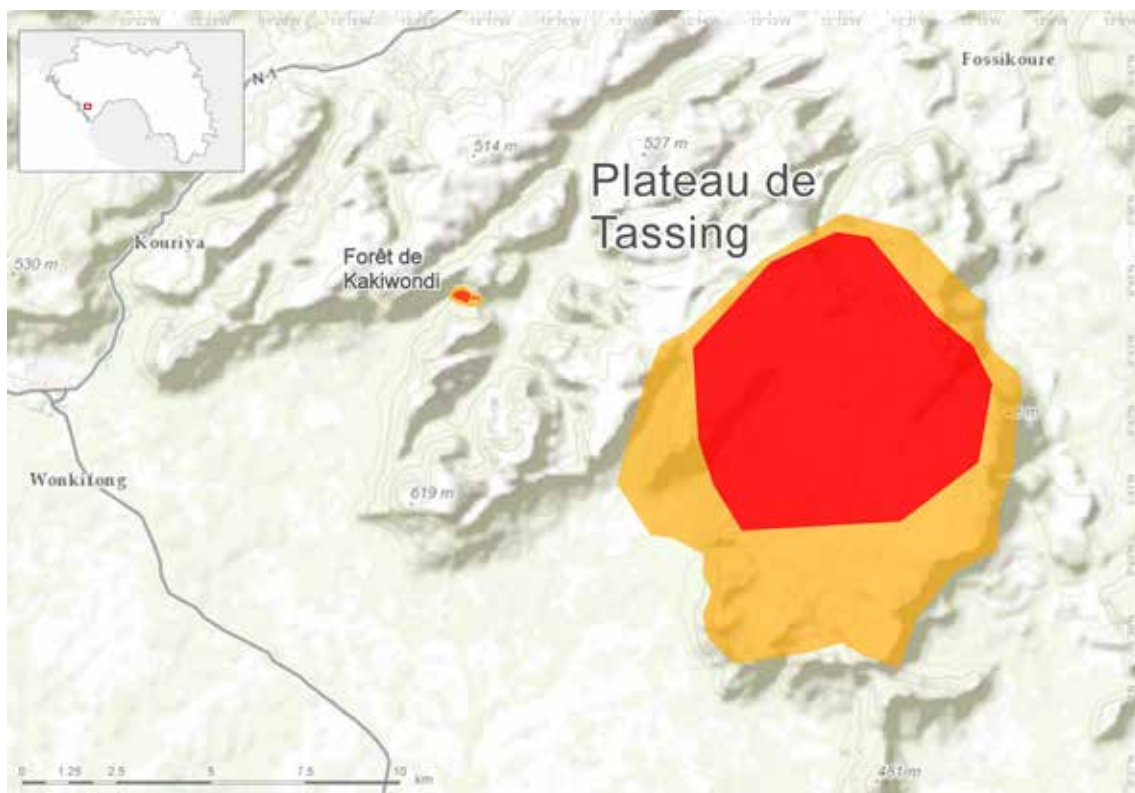
The Tassing Plateau is an important site for sandstone cliff species and was only recently surveyed for the first time. It is only the second known global site for *Mesanthemum bennae* and *Cailliella praerupticola*. The waterfall is the only known global site for a new species of Podostemaceae, currently being described (*Inversodicraea* sp. nov. tassing). In addition, it is home to several threatened Guinean endemic species and other globally threatened species.

### **Site overview**

Site name: Tassing Plateau  
Country: Republic of Guinea  
Administrative region: Coyah and Kindia Prefectures  
Central co-ordinates: 09°43'0"N, 13°12'0"W  
Area: 0.5km<sup>2</sup>  
Altitude minimum: 100m  
Altitude maximum: 740m

### **Site description**

Sandstone plateau with high cliffs in parts and forested steep valleys which are rocky and with limited access. The plateau straddles the prefectures of Coyah and Kindia. The nearest villages are Malassi to the south-west and Fossikouré to the north-east. On the lower slopes of the valley and on the plateau there has been clearance for farming. The plateau is also used for cattle ranging. The grasslands are burned in the dry season. There are several seasonal waterfalls that run off the plateau; the largest near Malassi provides habitat to a unique species of Podostemaceae.



**Map 37.** The proposed areas for protection as TIPAs. Core area in red, buffer zone in yellow.

### Botanical significance

The Tassing Plateau has a number of threatened Guinean endemic species present, some of which are specific to the sandstone cliffs of the lower Fouta Djallon: *Cailliella praerupticola*, *Pitcairnia felicianae*, *Mesanthemum bennae* (outside of Kounounkan), *Heterotis pygmaea*, and *Anisotes guineensis*. Due to the fragmentation of the lowland forest in coastal Guinea, this area is an important refuge. The forested valleys have *Talbotiella cheekii* (EN) and *Diospyros felicianae* (EN), in addition to several vulnerable species of Legume trees. The waterfall is home to a new species of Podostemaceae, currently being described. Sandstone cliffs, waterfalls with Podostemaceae, and lowland forest are all recognised as Threatened Habitats in Guinea.

### General habitat and geology description

Sandstone overlying plutonic/metamorphic rock. Sandstone cliffs with crevices and cracks. Thin soils on the plateau with some rock outcrops. On the lower slopes the soils are deeper and humus rich.

### Conservation issues

The main threats to this TIPA come from farming. Forest has been cleared on lower slopes and on parts of the plateau for fields. The high plateau area has been burnt repeatedly due to the presence of cattle herders. Species that would usually have occurred here have been pushed to the edges of the plateau and to the cliff area (e.g. *Mesanthemum bennae* and *Cailliella praerupticola*). There is also localised tree cutting for construction materials and hunting.

### Protected area status and management

Not currently protected.

## Threats

- Agriculture: Clearance of forest on lower slopes and plateau for agriculture.
- Forestry: Localised tree cutting by villagers.
- Fire: Unseasonal fires for hunting and cattle pasture.

**Threat level: High**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA subcritterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Talbotiella cheekii</i> Burgt	A(i)	EN	✓	✓	✓			Abundant
<i>Cailliella praerupticola</i> Jacq.-Fél.	A(i)	EN	✓	✓	✓			Frequent
<i>Mesanthemum bennae</i> Jacq.-Fél.	A(i)	EN	✓	✓	✓			Scarce
<i>Heterotis pygmaea</i> (A.Chev. & Jacq.-Fél.) Jacq.-Fél.	A(i)	EN	✓	✓	✓			Scarce
<i>Cryptosepalum tetraphyllum</i> (Hook.f.) Benth.	A(i)	VU	✓					Abundant
<i>Gilbertiodendron aylmeri</i> (Hutch. & Dalziel) J.Léonard	A(i)	VU	✓	✓	✓			Frequent
<i>Tessmannia baikieaoides</i> Hutch. & Dalziel	A(i)	VU	✓	✓	✓			Frequent
<i>Copaifera salikounda</i> Heckel	A(i)	VU	✓	✓	✓			Scarce
<i>Diospyros feliciana</i> Letouzey & F.White	A(i)	EN	✓	✓	✓			Frequent
<i>Pitcairnia feliciana</i> (A.Chev.) Harms & Mildbr.	A(i)	EN	✓	✓	✓			Frequent
<i>Anisotes guineensis</i> Lindau	A(i)	EN	✓	✓				Infrequent
<i>Inversodicraea</i> sp. nov. <i>tassing</i>	A(i)	EN	✓	✓	✓	✓		Scarce

**Table 82.** Criterion A for Tassing Plateau, Coyah and Kindia.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

### Criterion B: Botanical Richness

Insufficient information available for this criterion.

### Criterion C: Threatened Habitat

Habitat type	IPA subcritterion	IUCN category	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Sandstone cliffs	C(iii)			✓	
Lowland forest (Guinée Maritime)	C(iii)			✓	

**Table 83.** Criterion C for Tassing Plateau, Coyah and Kindia.

## Bibliography

Couch, C., Magassouba, S., Rokni, S., Cheek, M. (2018). Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>

IUCN Red List of Threatened Species. <https://www.iucnredlist.org/>

## Site in pictures



Forest in the Malassi valley. (Photo: ©X. van der Burgt, RBG Kew)



Effect of agriculture on the lower slopes. (Photo: ©X. van der Burgt, RBG Kew)



Sandstone cliffs from Malassi. (Photo: ©X. van der Burgt, RBG Kew)



*Heterotis pygmaea*.  
(Photo: ©X. van der Burgt, RBG Kew)



*Anisotes guineensis*.  
(Photo: ©X. van der Burgt, RBG Kew)



*Cailliella praerupticola* and *Mesanthemum bennae*. (Photo: ©X. van der Burgt, RBG Kew)

**Tonkoyah Inselberg Complex, Forécariah****IPA criteria under which the site qualifies: A(i), C(iii)**

**Assessed by:** Charlotte Couch (RBG Kew) and Denise Molmou (HNG).

**TIPA assessment rationale**

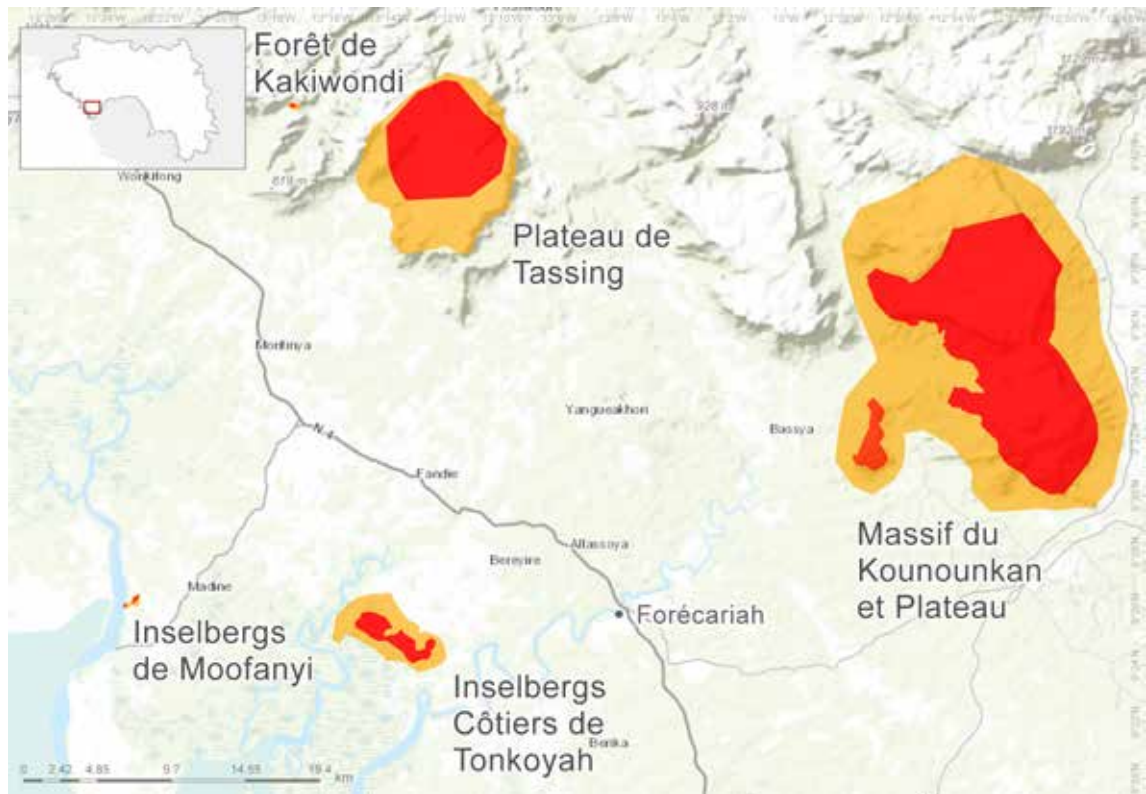
This inselberg complex is one of the best examples of coastal inselbergs in Guinea and West Africa in general. The inselbergs have significant populations of four endangered species, including the largest known population of *Raphionacme caerulea* (EN). They are under threat from quarrying, nomadic cattle grazing, and invasive species.

**Site overview**

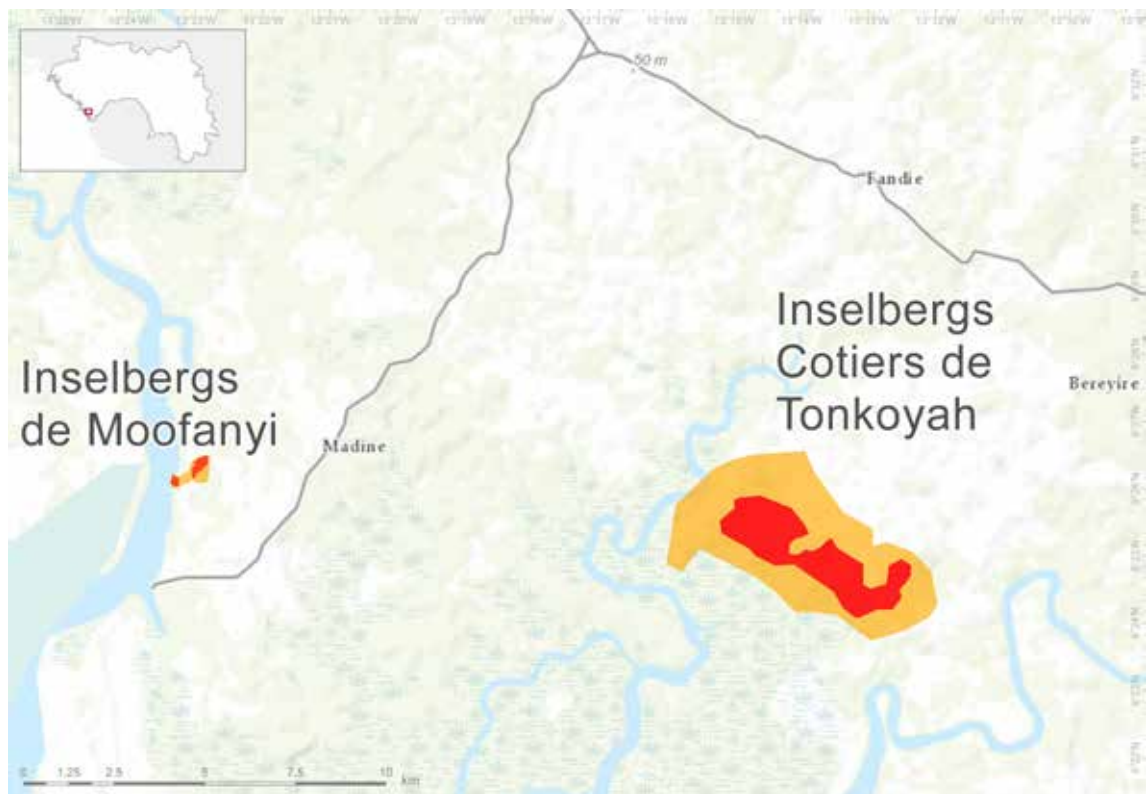
Site name: Tonkoyah Inselberg Complex  
Country: Republic of Guinea  
Administrative region: Forécariah Prefecture  
Central co-ordinates: 09°25'6"N, 13°14'16"W  
Area: 6.12km<sup>2</sup>  
Altitude minimum: 7m  
Altitude maximum: 20m

**Site description**

The Tonkoyah inselberg complex is located in the coastal zone of Forécariah. It is a series of low-lying granite shield inselbergs varying in size from c. 100m to 1km long. Many of the inselbergs are bordered by mangrove and some have small patches of forest associated with them. In the dry season, the only vegetation is the dehydrated plants of *Afrotrilepis pilosa*, often forming candelabra structures, and most of the inselbergs are covered with an algal crust. In the wet season, these inselbergs are covered with a variety of species and habitats which can be classified into microhabitats (Porembski, 1999), such as temporary pools and wet depressions, the latter dominated by the grass, *Dilophotiche occidentalis*. Some of the inselbergs in this complex also have endangered species present, such as *Raphionacme caerulea* (EN) and *Plectranthus linearifolius* (EN). In the forest patches associated with some of these inselbergs, *Stylochaeton pilosus* (EN) can be found. Inselbergs in this area are under threat from quarrying for building material. One quarry was started in the area in 2013.



**Map 38.** The proposed TIPA in relation to the wider Guinea Maritime area.



**Map 39.** The proposed areas for protection as TIPAs. Core area in red, buffer zone in yellow.

## Botanical significance

The microhabitats found on these inselbergs have several threatened species present. The largest inselberg has one of the most significant populations of *Raphionacme caerulea* and *Plectranthus linearifolius*. The forest adjacent also has a small population of *Stylochaeton pilosus*. Other inselbergs in the complex have small populations of *Raphionacme* and the forest patches adjoining them have populations of *Stylochaeton pilosus*, varying in size. One also has a small population of *Marsdenia exellii*, a rare Apocynaceae liana associated with the vegetation at the interface of inselbergs and forest.

## General habitat and geology description

Granite shield inselbergs with several different microhabitats present. Areas of seepage and depressions with thin soils, *Afrotrilepis pilosus* forming clumps, temporary ponds, cracks and crevices, and associated forest patches.

## Conservation issues

The main threat to inselbergs in Guinea is from quarrying. There has already been one quarry opened up in the area, which may increase the likelihood of more. The invasive species *Breynia disticha* was also recorded here in 2012, in small numbers. We have been working with the villagers at Tonkoyah for a number of years and they are aware of the importance of the rare species of plants. They also have issues with nomadic herders coming through and burning the inselberg vegetation and nearby areas for new pasture. This can influence the amount of seed produced and distributed by *Raphionacme*, as the fires are often set in January when the fruits are ripening.

## Protected area status and management

Not currently protected.

## Threats

- Pastoralism: Nomadic cattle grazing.
- Wood cutting: Mangrove trees.
- Quarrying: Extraction of granite.
- Infrastructure: Transport road from the mangrove area to the village.
- Invasive species: Presence of *Breynia disticha*.

**Threat level: Medium-High**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA sub criterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Raphionacme caerulea</i> E.A.Bruce	A(i)	EN	✓	✓	✓			Frequent
<i>Plectranthus linearifolius</i> (J.K.Morton) B.J.Pollard & A.J.Paton	A(i)	EN	✓	✓	✓			Infrequent
<i>Marsdenia exellii</i> C.Norman	A(i)	EN	✓	✓	✓			Scarce
<i>Stylochaeton pilosus</i> Bogner	A(i)	EN	✓	✓	✓			Infrequent

**Table 84.** Criterion A for Tonkoyah Inselberg Complex, Forécariah.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion B: Botanical Richness

There is insufficient information to apply this criteria.

## Criterion C: Threatened Habitat

Habitat type	IPA subcriterion	IUCN redlist assessment	≥ 5% of national resource (for C(i) and C(ii))	≥ 10% of national resource (for C(iii))	Estimated area at site (if known)
Coastal Inselbergs	C(iii)			✓	

**Table 85.** Criterion C for Tonkoyah Inselberg Complex, Forécariah.

## Bibliography

Couch, C., Magassouba, S., Rokni, S., Cheek, M. (2018). Threatened plants species of Guinea-Conakry: A preliminary checklist. *PeerJ Preprints*. <https://doi.org/10.7287/peerj.preprints.3451v1>

IUCN Red List of Threatened Species. <https://www.iucnredlist.org/>

Lisowski, S. (2009). Flore (Angiospermes) de la République de Guinée. *Scripta Botanica Belgica*. Meise: Jardin Botanique National de Belgique.

## Site in pictures



*Plectranthus linearifolius* (J.K.Morton) B.J.Pollard & A.J.Paton (EN). (Photo: ©M. Cheek, RBG Kew)



*Raphionacme caerulea* E.A.Bruce (EN). (Photo: ©M. Cheek, RBG Kew)



*Stylochaeton pilosus* Bogner (EN), in the forest patch bordering Inselberg 7C. (Photo: © C. Couch, RBG Kew)



Inselberg 7, the largest of the shield inselbergs in the complex, July 2013. (Photo: © C. Couch, RBG Kew)



**IPA criteria under which the site qualifies:** A(i), B(ii), C(iii)

**Assessed by:** Charlotte Couch, Martin Cheek (RBG Kew), and P  p   Haba (Guin  e Biodiversit  ).

### **TIPA assessment rationale**

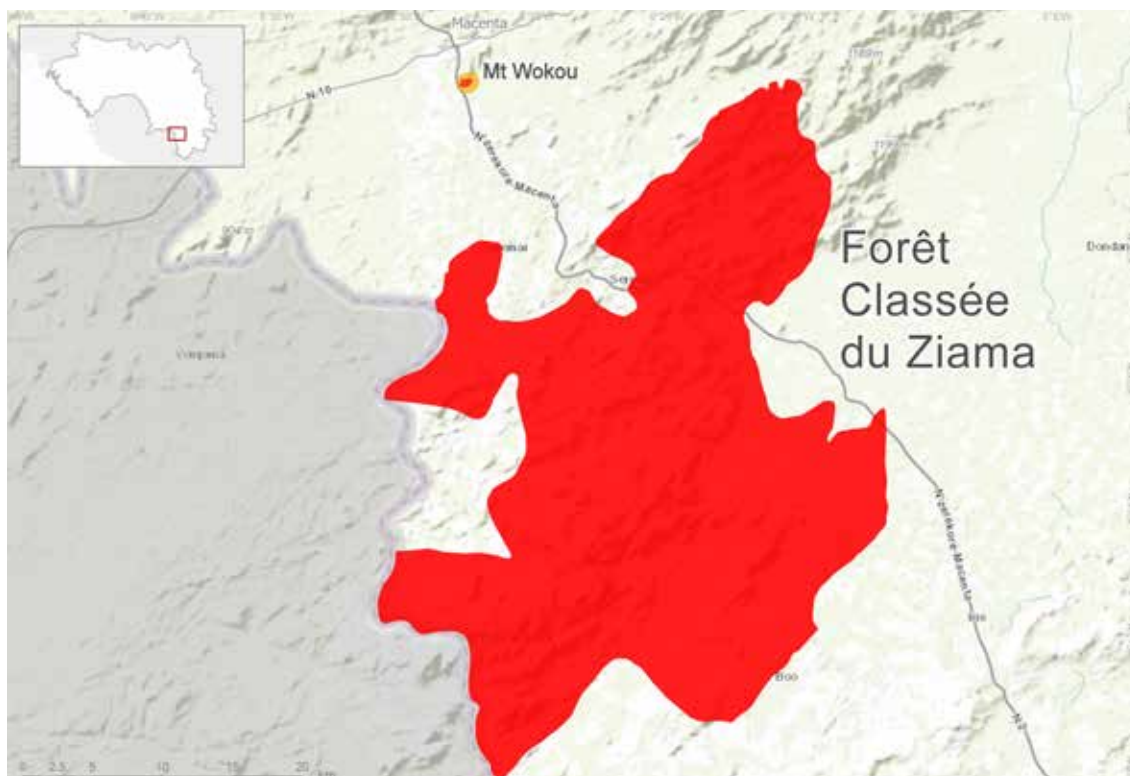
The Ziama mountain range comprises a rich matrix of submontane forest, punctuated by granite inselbergs and grading into lowland evergreen forest. This supports a wide range of plant species, including two global endemic species (*Mikaniopsis camarae* and *Inversodicraea pepehabei*) and 33 range-restricted species. It has one of the largest areas of intact submontane forest in the country and a significant area of lowland rainforest, albeit disturbed. There are significant populations of many threatened plant species found here. The Ziama Classified Forest has several villages within the southern, lowland forest portion, and there are concerns over forest clearance, both recent and during past periods of instability. Although Ziama is already a Biosphere Reserve, there are no specific management actions for plant species.

### **Site overview**

Site name: Ziama Classified Forest  
Country: Republic of Guinea  
Administrative region: Macenta Prefecture  
Central co-ordinates: 08°15'57''N, 09°20'43''W  
Area: 1,161.7 km<sup>2</sup>  
Altitude minimum: 450m  
Altitude maximum: 1,250m

### **Site description**

The Ziama Classified Forest, located in the prefecture of Macenta in Guin  e Foresti  re, consists of a mountain range aligned approximately southwest to northeast, with submontane forest and granite inselbergs with grassland. On both sides of the mountain range there are areas of lowland evergreen forest. The area is crossed by rivers with white-water, habitat for Podostemaceae species.



**Map 40.** The proposed areas for protection as TIPAs. Core area in red, buffer zone in yellow.

### Botanical significance

Due to the variation and intactness of the vegetation types in this area, there is an exceptional botanical richness in Ziamá Classified Forest. Thirty-three rare, threatened and/or endemic plant species have been documented, including *Cassipourea adamii* (EN) in submontane forest, *Tarenna hutchinsonii* (CR) and *Gymnosiphon samoritourenus* (EN) in the lowland forest, and *Inversodicraea pepehabai* (EN), an endemic species to the fast flowing rivers.

### General habitat and geology description

Ziamá consists of a dolerite/orthogneiss mountain range, mostly covered in lowland and submontane forest. The inselbergs have open vegetation with woodland, wooded grassland, grassland, and open rocky areas. The lowland forest areas surrounding the mountain range are mostly on Archean era base rock.

### Conservation issues

In the lowland forest area, there are villages enclaved and there have been concerns about forest clearance. Large areas of lowland forest have been converted into monospecific tree plantations, usually of *Terminalia* sp. In the submontane forest there are plantations of tea and *Cinchona*, and there are concerns that these may restart production. Ziamá is presumably frequently visited by local hunters, which will have reduced the density of many animal species, and this in turn could negatively affect some plant species. Collection of *Piper guineensis* by poachers involves cutting trees down to get to the liana.

### Protected area status and management

The forest was originally classified in 1942 and is a *Réserve intégrale*. In addition, it was designated a Man and Biosphere Reserve (Massif du Ziamá) in 1980. A management plan exists for this area, but the extent is unknown. According to a Birdlife International Assessment in 2007, it is out of date and not well implemented.

### Threats

- Agriculture: Clearing for farming and plantations has occurred in the Protected Area.
- Wood cutting and harvesting: Wood cutting on a subsistence level. Cutting trees for collection of *Piper guineensis*.

**Threat level: Medium**

## Criteria assessments

### Criterion A: Threatened Species

Criterion A taxon present	IPA sub-criterion	IUCN category	≥ 1% of global population	≥ 5% of national population	Is 1 of 5 best sites nationally	Entire global population (single-site endemic)	Species is of socio-economic importance	Abundance at site
<i>Brachystephanus jaundensis</i> Lindau subsp. <i>nimbae</i> (Heine) I. Darbysh.	A(i)	VU	✓	✓	✓			Infrequent
<i>Bryaspis humularioides</i> Gledhill	A(i)	EN?	✓	✓	✓			Infrequent
<i>Cassia aubrevillei</i> Pellegr.	A(i)	VU	✓	✓	✓			Infrequent
<i>Cassipourea adamii</i> Jacq.-Fél.	A(i)	EN	✓	✓	✓			Infrequent
<i>Cryptosepalum tetraphyllum</i> (Hook. f.) Benth.	A(i)	VU	✓					Infrequent
<i>Dalbergia adamii</i> Berhaut	A(i)	VU	✓	✓	✓			Infrequent
<i>Dorstenia astyanactis</i> Aké Assi	A(i)	VU	✓	✓	✓			Infrequent
<i>Drypetes afzelii</i> (Pax) Hutch.	A(i)	VU	✓	✓	✓			Unknown
<i>Entandrophragma candollei</i> Harms	A(i)	VU	✓	✓	✓		✓	Unknown
<i>Entandrophragma cylindricum</i> (Sprague) Sprague	A(i)	VU	✓	✓	✓		✓	Unknown
<i>Entandrophragma utile</i> (Dawe & Sprague) Sprague	A(i)	VU	✓	✓	✓		✓	Unknown
<i>Garcinia kola</i> Heckel	A(i)	VU	✓	✓	✓		✓	Unknown
<i>Genlisea barthlottii</i> Porembski, Eb. Fisch. & Gemmel	A(i)	VU	✓	✓	✓			Infrequent
<i>Gladiolus praecostatus</i> Marais	A(i)	VU	✓	✓	✓			Scarce
<i>Gymnosiphon samoritourenus</i> Cheek	A(i)	EN	✓	✓	✓			Infrequent
<i>Heterotis sylvestris</i> (Jacq.-Fél.) Jacq.-Fél.	A(i)	EN	✓	✓	✓			Infrequent
<i>Hymenocoleus multinervis</i> Robbr.	A(i)	VU	✓	✓	✓			Unknown
<i>Inversodicraea pepehabei</i> Cheek	A(i)	EN	✓	✓	✓	✓		Infrequent
<i>Mikaniopsis camarae</i> Lisowski	A(i)	CR	✓	✓	✓	✓		Infrequent
<i>Milicia regia</i> (A. Chev.) C. C. Berg	A(i)	VU	✓	✓	✓		✓	Unknown
<i>Monocymbium lanceolatum</i> C. E. Hubb.	A(i)	VU	✓	✓				Unknown
<i>Mostuea adamii</i> Sillans	A(i)	EN	✓	✓	✓			Unknown
<i>Nemum bulbostyloides</i> (S. S. Hooper) J. Raynal	A(i)	VU	✓					Unknown
<i>Neolemonniera clitandrifolia</i> (A. Chev.) Heine	A(i)	EN	✓	✓	✓			Infrequent
<i>Osbeckia praviantha</i> Jacq.-Fél.	A(i)	EN	✓	✓	✓			Unknown
<i>Pauridiantha schnellii</i> N. Hallé	A(i)	VU?	✓	✓	✓			Unknown
<i>Psychotria samoritourei</i> Cheek	A(i)	VU	✓	✓	✓			Unknown
<i>Rinorea djalonensis</i> A. Chev. ex Hutch. & Dalziel	A(i)	EN	✓	✓	✓			Unknown
<i>Salacighia linderi</i> (Loes. ex Harms) Blakelock	A(i)	VU?	✓	✓	✓			Unknown
<i>Tarenna hutchinsonii</i> Bremek.	A(i)	CR	✓	✓	✓			Infrequent
<i>Vepris felicis</i> Breteler	A(i)	CR	✓	✓	✓			Infrequent

**Table 86.** Criterion A for Ziama Classified Forest, Macenta.

**Key:** ✓ = yes. IUCN category: see page 9. Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion B: Botanical Richness

<b>B(ii):</b> exceptional number of species of conservation importance – site recording table (from nationally agreed list)		
<b>Habitat code and name</b>	<b>Site contains ≥ 3% of the species on the national list</b>	<b>Site is one of the 15 richest locations nationally</b>
	✓	✓

**Table 87.** Criterion B for Ziama Classified Forest, Macenta.

**Key:** ✓ = yes.

	<b>Sub-criterion under which species qualifies</b>	<b>For B(i) – indicator of habitat</b>	<b>Abundance at site</b>
<b>Criterion B taxon present</b>			
<i>Brachystephanus jaundensis</i> Lindau subsp. <i>nimbae</i> (Heine) I.Darbysh.	B(ii)		Infrequent
<i>Bryaspis humularioides</i> Gledhill	B(ii)		Infrequent
<i>Cassia aubrevillei</i> Pellegr.	B(ii)		Infrequent
<i>Cassipourea adamii</i> Jacq.-Fél.	B(ii)		Infrequent
<i>Cryptosepalum tetraphyllum</i> (Hook. f.) Benth.	B(ii)		Infrequent
<i>Dalbergia adamii</i> Berhaut	B(ii)		Infrequent
<i>Dorstenia astyanactis</i> Aké Assi	B(ii)		Infrequent
<i>Drypetes afzelii</i> (Pax) Hutch.	B(ii)		Unknown
<i>Entandrophragma candollei</i> Harms	B(ii)		Unknown
<i>Entandrophragma cylindricum</i> (Sprague) Sprague	B(ii)		Unknown
<i>Entandrophragma utile</i> (Dawe & Sprague) Sprague	B(ii)		Unknown
<i>Garcinia kola</i> Heckel	B(ii)		Unknown
<i>Genlisea barthlottii</i> Porembski, Eb. Fisch. & Gemmel	B(ii)		Infrequent
<i>Gladiolus praecostatus</i> Marais	B(ii)		Scarce
<i>Gymnosiphon samoritourenus</i> Cheek	B(ii)		Infrequent
<i>Heterotis sylvestris</i> (Jacq.-Fél.) Jacq.-Fél.	B(ii)		Infrequent
<i>Inversodicraea pepehabai</i> Cheek	B(ii)		Infrequent
<i>Mikaniopsis camarae</i> Lisowski	B(ii)		Infrequent
<i>Milicia regia</i> (A. Chev.) C. C. Berg	B(ii)		Unknown
<i>Monocymbium lanceolatum</i> C. E. Hubb.	B(ii)		Unknown
<i>Mostuea adamii</i> Sillans	B(ii)		Unknown
<i>Nemum bulbostyloides</i> (S. S. Hooper) J. Raynal	B(ii)		Unknown
<i>Neolemonniera clitandrifolia</i> (A. Chev.) Heine	B(ii)		Infrequent
<i>Osbeckia praviantha</i> Jacq.-Fél.	B(ii)		Unknown
<i>Psychotria samoritourei</i> Cheek	B(ii)		Unknown
<i>Rinorea djalonensis</i> A. Chev. ex Hutch. & Dalziel	B(ii)		Unknown
<i>Tarenna hutchinsonii</i> Bremek.	B(ii)		Infrequent
<i>Vepris felcis</i> Breteler	B(ii)		Infrequent

**Table 88.** Criterion B for Ziama Classified Forest, Macenta.

**Key:** Abundance: Abundant, Common, Frequent, Infrequent, Scarce, Unknown.

## Criterion C: Threatened Habitat

Habitat type	IPA subcritterion	IUCN category	≈ 5% of national resource (for C(i) and C(ii))	≈ 10% of national resource (for C(iii))	Estimated area at site (if known)
Lowland Forest	C(iii)			✓	
Submontane Forest	C(iii)			✓	
Inselbergs	C(iii)			✓	

**Table 89.** Criterion C for Ziama Classified Forest, Macenta.

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## Field Reports

Haba, P. (Guinée Biodiversité). (Dec 2016 and Feb 2017). TIPA Field reports.

## Site in pictures



Mt Ziama during the wet season, September. (Photo: ©Xander van der Burgt, RBG Kew)



Mt Ziama showing the side of a granite outcrop, September. (Photo: ©Xander van der Burgt, RBG Kew)



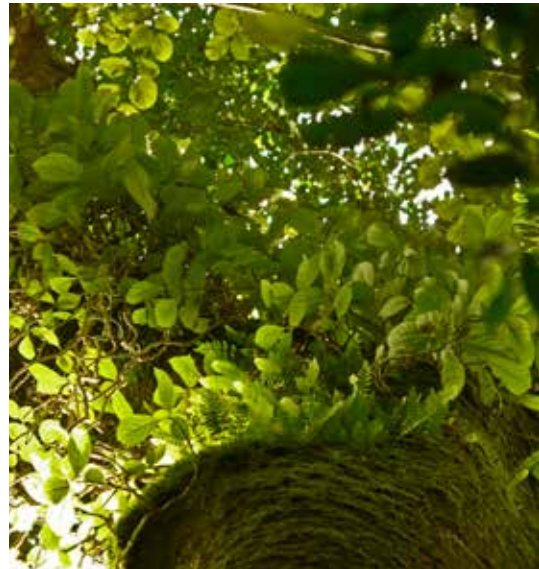
Mt Ziama showing the transition between inselberg, grassland, and forest. (Photo: ©Xander van der Burgt, RBG Kew)



Palm plantation with workers hut, Mt Ziama. (Photo: ©Xander van der Burgt, RBG Kew)



*Gymnosiphon samoritoueanus* (Burmanniaceae) (EN), saprophyte of forest floor. (Photo: ©Xander van der Burgt, RBG Kew)



*Dorstenia astyanactis* (Moraceae) (VU), epiphyte. (Photo: ©Xander van der Burgt, RBG Kew)

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## Appendix A: Threatened Species per TIPA

Species	IUCN category	Bawal Tankon	Forêt de Diéké	Mt Gangan	Forêt de Gblén	Grandes Chutes	Kakiwondi	Chutes de Kambadga	Koba	Mt Konossou	Koukoutamba	Kounoukan	Inselbergs Moofanyi	Moyen Bafing	Mt Béro	Mt Wokou	Mt Nimba	Chute de la Saala	Mts Simandou	Simbaraya	Plateau de Tassing	Inselbergs Tonkoyah	Forêt de Ziam
<i>Acalypha guineensis</i>	VU														✓				✓				
<i>Acridocarpus spectabilis</i>	VU ?													✓									
<i>Afzelia africana</i>	VU													✓									
<i>Albizia ferruginea</i>	VU		✓											✓									
<i>Allophylus samoritourei</i>	EN		✓												✓								
<i>Amanoa bracteosa</i>	VU		✓												✓								
<i>Amorphophallus abyssinicus</i> subsp. <i>akeassii</i>	VU?														✓								
<i>Anadelphia macrochaeta</i>	VU			✓																			
<i>Anadelphia pumila</i>	CR			✓																			
<i>Anadelphia trichaeta</i>	VU			✓																			
<i>Anaheterotis (Dissotis) pobeguinii</i>	VU																						
<i>Anisotes guineensis</i>	EN			✓																			
<i>Anopyxis klaineana</i>	VU		✓																				
<i>Anubias gracilis</i>	VU																						
<i>Apodiscus chevalieri</i>	EN																						
<i>Baphia heudelotiana</i>	VU			✓	✓																		
<i>Barleria asterotricha</i>	CR							✓															
<i>Begonia quadrialata</i> subsp. <i>nimbaensis</i>	EN																						
<i>Brachystephanus jaundensis</i> subsp. <i>nimbae</i>	VU																						
<i>Brachystephanus oreacanthus</i>	VU																						
<i>Bryaspis humularioides</i>	EN?																						
<i>Bulbostylis guineensis</i>	EN																						
<i>Cailliea praerupticola</i>	EN																						
<i>Cassia aubrevillei</i>	VU																						

## Appendix A: Threatened Species per TIPA

Species	IUCN category	Bawal Tankon	Forêt de Diéké	Mt Gangan	Forêt de Gblén	Grandes Chutes	Kakivondi	Chutes de Kambadga	Koba	Mt Konosso	Koukoutamba	Kounoukan	Inselbergs Moofanyi	Moyen Bafing	Mt Béro	Mt Wokou	Mt Nimba	Chute de la Saala	Mts Simandou	Simbaraya	Plateau de Tassing	Inselbergs Tonkoyah	Forêt de Zlama	
<i>Cassia fikiifiki</i>	EN	✓																					✓	
<i>Cassipourea adami</i>	EN											✓												
<i>Cinnobotrys felicis</i>	EN?				✓																			
<i>Clerodendron sylviae</i>	EN			✓																				
<i>Cola angustifolia</i>	EN																✓							
<i>Cola attiensis</i>	EN		✓														✓							
<i>Cola reticulata</i>	VU																✓							
<i>Coleus (Plectranthus) sp. nov.</i>	CR					✓																		
<i>Copaifera salikounda</i>	VU																✓							
<i>Cryptosepalum tetraphyllum</i>	VU																✓							✓
<i>Cyanotis ganganensis</i>	EN			✓																				
<i>Cyathula pobeginii</i>	VU																							
<i>Dalbergia adami</i>	VU																							
<i>Danthoniopsis chevalieri</i>	VU																							
<i>Dichaetanthera echinulata</i>	EN											✓												
<i>Digitaria patagiata</i>	EN?			✓																				
<i>Dilophotriche occidentalis</i>	VU			✓								✓	✓											
<i>Diospyros feliciana</i>	EN				✓							✓												
<i>Dissotis (Argyrella) linearis</i>	EN																							
<i>Dissotis humilis</i>	VU?			✓																				
<i>Dissotis leonensis</i>	EN			✓								✓												
<i>Dissotis splendens</i>	VU											✓												
<i>Dorstenia astyanactis</i>	VU																							
<i>Dracaena calocephala</i>	VU																							

## Appendix A: Threatened Species per TIPA

Species	IUCN category	Bawal Tankon	Forêt de Diecké	Mt Gangan	Forêt de Gblèn	Grandes Chutes	Kakiwondi	Chutes de Kambadga	Koba	Mt Konossou	Koukoutamba	Kounoukan	Inselbergs Moofanyi	Moyen Bafing	Mt Béro	Mt Wokou	Mt Nimba	Chute de la Saala	Mts Simandou	Simbaraya	Plateau de Tassing	Inselbergs Tonkoyah	Forêt de Ziam
<i>Droogmansia chevalieri</i>	EN																						
<i>Droogmansia montana</i>	EN?																						
<i>Drypetes afzelii</i>	VU		✓									✓							✓				✓
<i>Embelia djalonensis</i>	VU?													✓									
<i>Emilia djalonensis</i>	CR(PE)	✓																					
<i>Entandrophragma angolense</i>	VU																✓						
<i>Entandrophragma candollei</i>	VU		✓														✓						✓
<i>Entandrophragma cylindricum</i>	VU		✓														✓						✓
<i>Entandrophragma utile</i>	VU		✓														✓						✓
<i>Eriocaulon sessile</i>	VU																						
<i>Eriocaulon sulanum</i>	CR																	✓					
<i>Eriosema spicatum</i>	VU																		✓				
<i>Eriosema triflorum</i>	EN																		✓				
<i>Felciadama stenocarpa</i>	CR									✓													
<i>Fleroya stipulosa</i>	VU																						
<i>Fleurydora felcis</i>	VU																		✓				
<i>Garcinia afzelii</i>	EN		✓																✓				
<i>Garcinia epunctata</i>	VU		✓																✓				
<i>Garcinia kola</i>	VU		✓																✓				
<i>Genlisea barthlottii</i>	VU																						
<i>Gilbertiodendron aylmeri</i>	VU																						
<i>Gladiolus chevalieranus</i>	EN?																						
<i>Gladiolus praecostatus</i>	VU																						
<i>Gladiolus sp nov</i>	CR?																						

## Appendix A: Threatened Species per TIPA

Species	IUCN category	Bawal Tankon	Forêt de Diéké	Mt Gangan	Forêt de Gblén	Grandes Chutes	Kakiwondi	Chutes de Kambadga	Koba	Mt Konossou	Koukoutamba	Kounoukan	Inselbergs Moofany!	Moyen Bafing	Mt Béro	Mt Wokou	Mt Nimba	Chute de la Saala	Mts Simandou	Simbaraya	Plateau de Tassing	Inselbergs Tonkoyah	Forêt de Ziama
<i>Glennia adami</i>	VU																✓						
<i>Guarea cedrata</i>	VU		✓														✓						
<i>Guibourtia ehie</i>	VU		✓																				
<i>Gymnosiphon samoritoureanus</i>	EN																						✓
<i>Habenaria jaegeri</i>	EN																						
<i>Heritiera (Tarrictia) utilis</i>	VU		✓																				
<i>Heterotis pygmaea</i>	EN?			✓	✓							✓											
<i>Heterotis sylvestris</i>	EN																✓						✓
<i>Hibiscus fabiana in ed.</i>	VU																✓						
<i>Homalium smythei</i>	VU																						
<i>Hymenocoleus multinervis</i>	VU																						
<i>Hypolytrum cacuminum</i>	EN																✓						
<i>Impatiens nzoana</i>	EN																✓						
<i>Impatiens. bennae</i>	EN																						
<i>Indigofera megacephala</i>	VU																						
<i>Inversodicraea abbayesii</i>	CR(PE)							✓															
<i>Inversodicraea harrisii</i>	VU																						
<i>Inversodicraea koukoutamba</i> Cheek ined.	CR?																						
<i>Inversodicraea pepehabai</i>	EN																						
<i>Inversodicraea pygmaea</i>	CR (PE)																						
<i>Inversodicraea sp. nov. Tassing</i>	EN																						
<i>Isoglossa dispersa</i>	VU																						
<i>Justicia jamisonii</i>	EN																						
<i>Keetia futa</i>	EN																						

## Appendix A: Threatened Species per TIPA

Species	IUCN category	Bawal Tankon	Forêt de Diécké	Mt Gangan	Forêt de Gbelèn	Grandes Chutes	Kakiwondi	Chutes de Kambadga	Koba	Mt Konossou	Koukoutamba	Kounoukan	Inselbergs Moofanyi	Moyen Bafing	Mt Béro	Mt Wokou	Mt Nimba	Chute de la Saala	Mts Simandou	Simaraya	Plateau de Tassing	Inselbergs Tonkoyah	Forêt de Ziam
<i>Keetia susu</i>	EN			✓		✓	✓																
<i>Khaya anthotheca</i>	VU		✓														✓						
<i>Khaya grandifoliola</i>	VU		✓														✓						
<i>Khaya ivorensis</i>	VU		✓																				
<i>Khaya senegalensis</i>	VU													✓									
<i>Kindia gangan</i>	EN			✓																			
<i>Kotschya lutea</i>	VU																✓						
<i>Kotschya micrantha</i>	VU											✓					✓						
<i>Kotschya uniflora</i>	EN											✓											
<i>Lebbiea grandiflora</i>	CR										✓												
<i>Leocus pobeguinii</i>	VU																						
<i>Lipotriche felicis</i>	EN													✓									
<i>Lipotriche tithoniooides</i>	EN																						
<i>Lophira alata</i>	VU																						
<i>Loudetiopsis baldwinii</i>	CR																						
<i>Lovoa trichilioides</i>	VU																						
<i>Macropodiella garrettii</i>	EN?																						
<i>Macropodiella macrothyrsa</i>	CR																						
<i>Marsdenia exellii</i>	EN																						
<i>Mesanthemum albidum</i>	VU																						
<i>Mesanthemum bennae</i>	EN?																						
<i>Mesanthemum tuberosum</i>	VU																						
<i>Mikaniopsis camarae</i>	CR																						
<i>Mikaniopsis tedliei</i>	VU?																						

## Appendix A: Threatened Species per TIPA

Species	IUCN category	Bawal Tankon	Forêt de Diéké	Mt Gangan	Forêt de Gblén	Grandes Chutes	Kakiwondi	Chutes de Kambadga	Koba	Mt Konosso	Koukoutamba	Kounoukan	Inselbergs Moofany!	Moyen Bafing	Mt Béro	Mt Wokou	Mt Nimba	Chute de la Saala	Mts Simandou	Simbaraya	Plateau de Tassing	Inselbergs Tonkoyah	Forêt de Zlama	
<i>Milicia regia</i>	VU																✓		✓				✓	
<i>Monocymbium lanceolatum</i>	VU																							✓
<i>Mostuea adamii</i>	EN																							✓
<i>Napoleonaea alata</i>	EN			✓																				
<i>Nauclea diderrichii</i>	VU		✓																✓					
<i>Nemum bulbostyoides</i>	VU														✓				✓					✓
<i>Neolemmmoniera cilitandrifolia</i>	EN		✓																					✓
<i>Nymphoides guineensis</i>	EN																							
<i>Okoubaka aubrevillei</i>	EN																✓							
<i>Osbeckia porteresii</i>	EN																✓							
<i>Osbeckia praviantha</i>	VU																✓							
<i>Panicum glaucocladum</i>	VU															✓								✓
<i>Pauridiantha schnellii</i>	EN/VU																							
<i>Pavetta lasiodada</i>	VU																		✓					
<i>Pavetta leonensis</i>	EN																✓							
<i>Pavetta platycalyx</i>	VU?																✓							
<i>Pericopsis elata</i>	EN		✓																					
<i>Phyllanthus felicis</i>	CR(PE)			✓																				
<i>Pitcairnia feliciana</i>	EN			✓																				
<i>Plectranthus linearifolius</i>	EN																				✓			
<i>Pleioceras afzelii</i>	VU																							✓
<i>Polystachya orophila</i>	EN																							✓
<i>Psychotria samoritourei</i>	VU																							✓
<i>Pterocarpus erinaceus</i>	EN																							

## Appendix A: Threatened Species per TIPA

Species	IUCN category	Bawal Tankon	Forêt de Dièké	Mt Gangan	Forêt de Gbelèn	Grandes Chutes	Kakiwondi	Chutes de Kambadga	Koba	Mt Konosso	Koukoutamba	Kounoukan	Inselbergs Moofanyi	Moyen Bafing	Mt Béro	Mt Wokou	Mt Nimba	Chute de la Saala	Mts Simandou	Simbaraya	Plateau de Tassing	Inselbergs Tonkoyah	Forêt de Ziam	
<i>Raphionacme caerulea</i>	EN					✓			✓				✓											
<i>Rhytachne glabra</i>	VU														✓				✓					
<i>Rhytachne perfecta</i>	EN?											✓												
<i>Rinorea djalonensis</i>	VU																✓							✓
<i>Salacighia linderi</i>	VU?																							✓
<i>Saxicolella futa</i> Cheek in ed.	EN?							✓										✓						
<i>Schizachyrium penicillatum</i>	EN			✓																				
<i>Schizachyrium radicosum</i>	EN?											✓												
<i>Scleria guineensis</i>	CR					✓																		
<i>Sericanthe trilocularis</i> subsp. paroisei	EN					✓																		
<i>Sporobolus pauciflorus</i>	CR(PE)																							
<i>Stonesia fascicularis</i>	CR							✓																
<i>Stonesia gracilis</i>	CR(PE)																							
<i>Stonesia heterospathella</i>	VU																	✓						
<i>Stonesia taylorii</i>	EN													✓										
<i>Stylochaeton pilosus</i>	EN																							
<i>Talbotiella cheekii</i>	EN																							
<i>Tarennia brachysiphon</i>	EN																							
<i>Tarennia hutchinsonii</i>	CR																							✓
<i>Terminalia ivorensis</i>	VU																							
<i>Ternstroemia guineensis</i> Cheek ined.	EN?																							
<i>Tessmannia baikieoides</i>	VU																							
<i>Tieghemella heckelii</i>	EN																							
<i>Utricularia macrocheilos</i>	VU																							

## Appendix A: Threatened Species per TIPA

Species	IUCN category	Bawal Tankon	Forêt de Dièké	Mt Gangan	Forêt de Gblèn	Grandes Chutes	Kakivondi	Chutes de Kambadga	Koba	Mt Konossou	Koukoutamba	Kounounkan	Inselbergs Moofany!	Moyen Bafing	Mt Béro	Mt Wokou	Mt Nimba	Chute de la Saala	Mts Simandou	Simbaraya	Plateau de Tassing	Inselbergs Tonkoyah	Forêt de Ziama
<i>Utricularia pobeguinii</i>	EN			✓		✓																	
<i>Utricularia tetraloba</i>	VU			✓																			
<i>Vepris felicitis</i>	CR											✓											✓
<i>Vernonia djalonensis</i>	CR																						
<i>Vernonia nimbaensis</i>	EN																✓						
<i>Virectaria pepehabai</i> Cheek ined.	EN											✓											
<i>Vitellaria paradoxa</i>	VU													✓									
<i>Xysmalobium samoritourei</i>	EN																						✓

## Appendix B: Habitat per TIPA

Threatened Habitat Type	Forêt de Diècké	Mt Gangan	Forêt de Gblèn	Grandes Chutes	Kakiwondi	Kambagda	Koba Bowal	Mt Konossou	Koukoutamba	Kounoukan	Inselbergs Moofanyi	Moyen Bafing	Mt Bérou	Mt Wokou	Mt Nimba	Chute de la Saala	Mt Simandou	Simbaraya	Plateau de Tassing	Inselbergs Tonkoyah	Forêt de Ziam
Sandstone cliffs		✓								✓									✓		✓
high altitude Sandstone bowal (above 500m)							✓			✓		✓									
low altitude Sandstone bowal (below 500m),				✓																	
high altitude Lateritic bowal (above 500m)		✓															✓				
low altitude Lateritic bowal (below 500m),																		✓			
Inselbergs (granite)								✓			✓			✓					✓		
Waterfalls and rapids with endemic Podostemaceae									✓			✓				✓					
Lowland evergreen forest (up to 500m altitude) including gallery forest.																			✓		✓
Sub montane forest (500m+ altitude) including gallery forest																					✓



