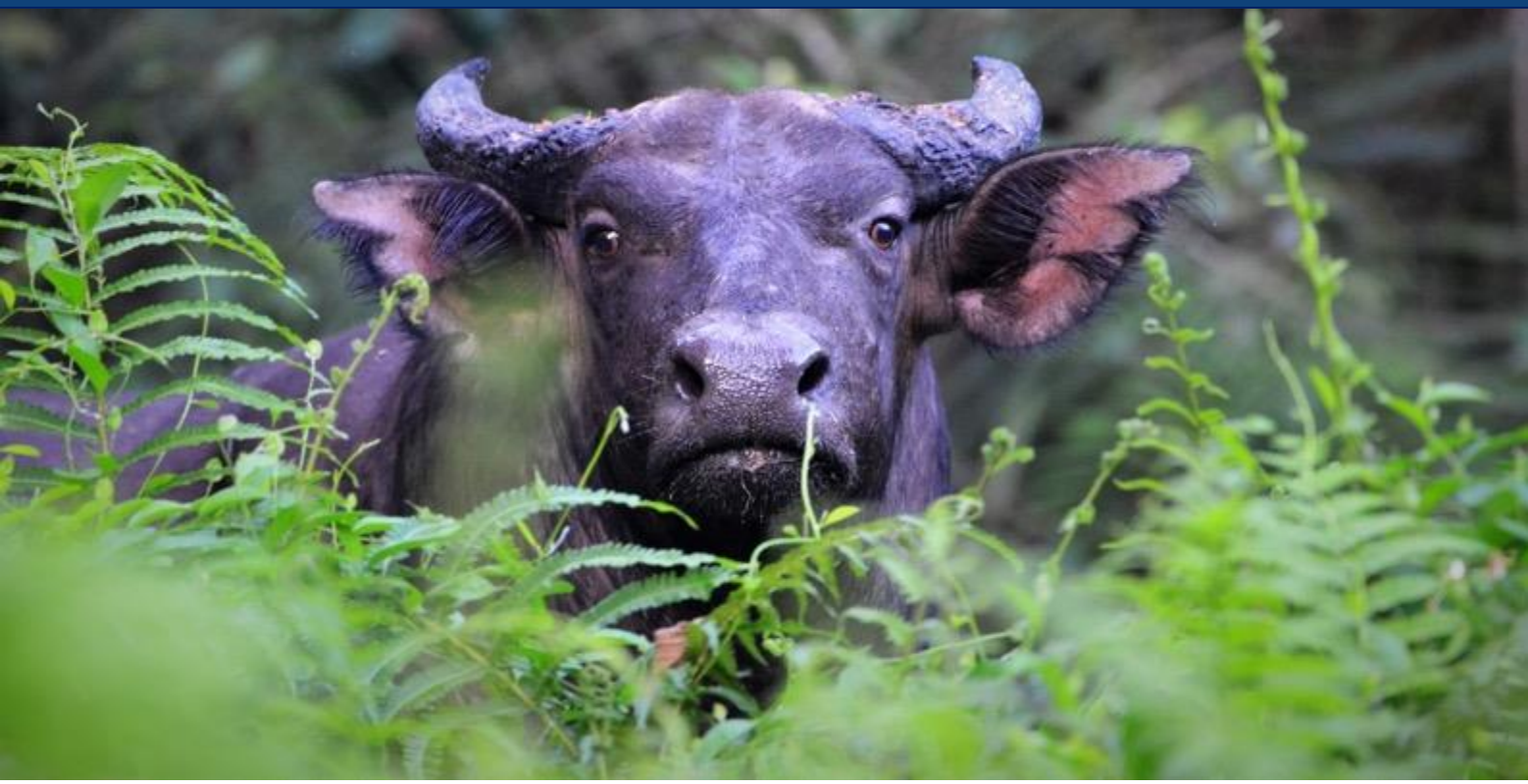
HCVAfrica
HIGH CONSERVATION VALUE



La Société des Caoutchoucs de Grand Béréby (SOGB) – San Pedro, Côte d'Ivoire

High Conservation Value Assessment

February 2020

Executive Summary

SOGB S.A. is a legally registered company in Côte d'Ivoire that specializes in the production of palm oil and rubber products. La Société Financière des Caoutchoucs (Socfin), together with a national investor, acquired a majority stake in SOGB in 1994 as part of the privatisation of the rubber and oil palm sectors in Côte d'Ivoire. SOGB is Côte d'Ivoire's second largest rubber producer and third largest palm oil producer[1].

Socfin commissioned a High Conservation Value (HCV) assessment as part of its endeavours to achieve Round Table for Sustainable Oil (RSPO) certification. This report presents the studies and findings of the HCV assessment for SOCFIN's SOGB Plantation (Côte d'Ivoire). The project involves a large scale project of approximately 23,923 ha rubber and oil palm plantations on a 34,712 ha concession.

HCV 1-3 have been identified as follows:

HCV 1:

- Mainstem Dodo River and Gnebouagbo River. Low order source/plateau swamps, headwater streams and upper foothill rivers;
- Forested rivers and streams within the Concession, remaining patches of intact forest within the Concession & rocky streams associated with forested inselbergs;
- Remnant dense forest patches within the hillslope forest, lowland forest, riparian forest and swamp forest habitats; and
- Upper and lower foothill river systems harbour range limited taxa.

HCV 2:

- Network of large rivers and streams connecting remaining intact forest patches (especially those protected within the Concession);
- Remaining large patches of intact forest and undisturbed riparian forests;
- Confined to protected areas on the SOGB Concession;
- Dodo and Gnebouagbo River. Absent Tiépé River;

HCV 3:

- All watercourses excluding drainage lines[2]; and
- Forested inselbergs large enough to have semi-permanent rocky streams are very rare in the landscape.

Major threats include:

- Alien and/or invasive plants
- The lack of riparian reserve in certain areas is both an erosion hazard and a barrier to species movement through the loss of habitat connectivity; and
- Loss of forest habitat due to shifting agriculture, charcoal production, logging, erosion and sedimentation, channelization, construction of impoundments resulting in:
    - Loss of rare, threatened and endangered (RTE) plant species; and
    - Loss of migratory routes for RTE fauna, avifauna and aquatic species due to shifting agriculture, charcoal production, logging.

HCV 4:

The neighbouring communities are reliant on ecosystem services for drinking water and soil for agricultural practices as they are predominantly cash crop and subsistence farmers. Plantation villagers also practice some agriculture within the concession to supplement the income they receive from SOGB.

[1] https://www.socfin.com/en/investors/sogb

[2] Drainage line in this context refers to all artificially constructed channels to drain swamps and lowlands

HCV 5:

Both plantation villagers and neighbouring villagers are making use of ecosystem services and the natural environment to meet their basic needs, particularly drinking water. This is less so for the plantation villagers as they earn salaries or are dependents of salaried people, but they are still making use of the environment for fishing, and growing crops. There is some gathering of non-timber products due to the small amount of secondary and primary forests remaining.

HCV 6:

There are sites of cultural and historical importance which occur in the plantation concession. HCV Africa recommends that these sites be identified and where possible preserved.

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LIST OF ACRONYMS

Acronym	Meaning
AIS	Alien/Invasive Species
ALS	Assessor Licensing Scheme
AVD	Association des Villages Déplacés or Association of Displaced Villages
CR	Critically Endangered
DD	Data Deficient
DEG	German Investment Corporation or Deutsche Investitions- und Entwicklungsgesellschaft
DEM	Digital Elevation Model
EFB	Empty Fruit Bunches
EIA	Environmental Impact Assessment
EN	Endangered
ESA	European Space Agency
ESIA	Environmental and Social Impact Assessment
FFB	Fresh Fruit Bunches
FPIC	Free Prior and Informed Consent
GBIF	Global Biodiversity Information Facility
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectare(s)
HCR	Habitat Cover Rating
HCV	High Conservation Value
HCVRN	High Conservation Value Resource Network

HL	Habitat Linkage
HR	Habitat Requirements
HS	Habitat Status
IBA	Important Bird Areas
IHIA	Intermediate Habitat Integrity Assessment
IUCN	International Union for the Conservation of Nature
LC	Least Concern
MOU	Memorandum of Understanding
MUS	Management Units
NASA	National Aeronautics and Space Administration
NE	Not Evaluated
NGO	Non-governmental Organization
NPP	New Planting Procedure
NSP	Nonsource Point Pollution
NT	Near Threatened
PM	Participatory Mapping
POO	Probability of Occurrence
PROTA	Plant Resources of Tropical Africa
PV	Planteurs Villageois
RSPO	Roundtable on Sustainable Palm Oil
RTE	Rare, Threatened or Endangered
SCC	Species of Conservation Concern
Socfin	La Société Financière des Caoutchoucs
SOGB	La Société des Caoutchoucs de Grand Béréby
SRTM	Shuttle Radar Topography Mission
TFT	The Forest Trust
VU	Vulnerable
WWF	World Wide Fund for Nature

Date of Report	December 2019
Name of Lead Assessor:	Mr. Llwelyn Coertzen
Contact Information of Lead Assessor	Llwelyn@hcvafrica.com
Senior review	Marion Thomas / Phil Patton
Organisation commissioning HCV assessment	Socfin
Location of HCV Assessment	SOGB Plantation, Côte d'Ivoire
Current Land Use Concession	Oil Palm and Rubber
Dates of assessment	November 2019
Size of assessment area	Total: 34,712 hectare (ha)
Total number of hectares allocated as HCV management areas (ha) Current or planned land use(s) for assessment area (e.g. forestry, oil palm plantation, soy, sugar)	Planted: 23,923 hectare (ha) Currently Protected forests: 2212 hectare (ha) HCV management areas: 6735,20 hectare (ha)
Current or planned land use(s) for assessment area	Oil Palm and Rubber
Certification scheme (specify certification scheme or N/A if taking place outside of a widely recognised scheme, if outside scheme, what is motivation for assessment?)	RSPO

1 Introduction & Background

1.1 Purpose of Assessment

This report has been compiled as part of the High Conservation Value (HCV) assessment for La Société des Caoutchoucs de Grand Béréby (SOGB) Plantation, Côte d'Ivoire. La Société Financière des Caoutchoucs (Socfin) commissioned this HCV assessment as part of its endeavours to achieve Round Table for Sustainable Oil (RSPO) certification.

The SOGB concession (34,712 ha) includes rubber plantation (16,434 ha), oil palm plantation (7,471 ha) and processing facilities producing rubber and palm oil. It has been operating in the rubber sector since 1970 and oil palm since 1998.

The area has patches of rich ecosystem but is affected by direct and indirect impacts of agriculture, further heightening the importance of sustainable development.

In order to obtain RSPO certification and adhere to the RSPO principles and criteria (RSPO, November 2018, SOGB is committed to:

- Not developing areas that have HCV or HCS forests;
- Engaging with local communities so they are fully aware of the Project and phases of development;
- Complying with relevant laws of Côte d'Ivoire and regulations; and
- Conforming with applicable, internationally accepted certification principles and criteria (RSPO).

Key reference documents used to inform the HCV assessment included:

- National Interpretation of the Principles and Criteria of the RSPO Standard For Sustainable Production Of Palm Oil in Côte D'ivoire;
- The HCV Approach Toolkit: No Deforestation in Practice; and
- 2017 HCV Assessment Manual Factsheet.

1.2 Location of the SOGB HCV assessment

The SOGB concession is in the southwest Côte d'Ivoire, 25 kilometers (km) from the coast of Grand Béréby, and west of San Pedro (Figure 1-1). To the north of the concession is the town Grabo; to the east is Grand Béréby and San Pedro; to the south is coastline and the Atlantic Ocean; and to the west is the classified forest of 'High Dodo' and the town Tabou.

The SOGB concession is in southwest Côte d'Ivoire, approximately 15 km from the crossroads "Grand Béréby towards Tabou", 25 km from the coast of Grand Béréby, west of San Pedro (Figure 1–1). The Project Site is located in the sub- Prefecture of Grand-Béréby, in the Bas-Sassandra Region of Côte d'Ivoire. There are 23 plantation villages and 13 neighbouring villages of area of interest (AOI (Figure 6–11)); the definition of types of villages is given in Section 6...

The criteria for selecting the AOI for this assessment, was based on HCV specifications (HCV Manual ALS_02_D, 18 March 2019), and comprises the Management Unit (MU) (i.e., the concession) and the extents of the main watershed boundaries that intersect the MU (Section 6).

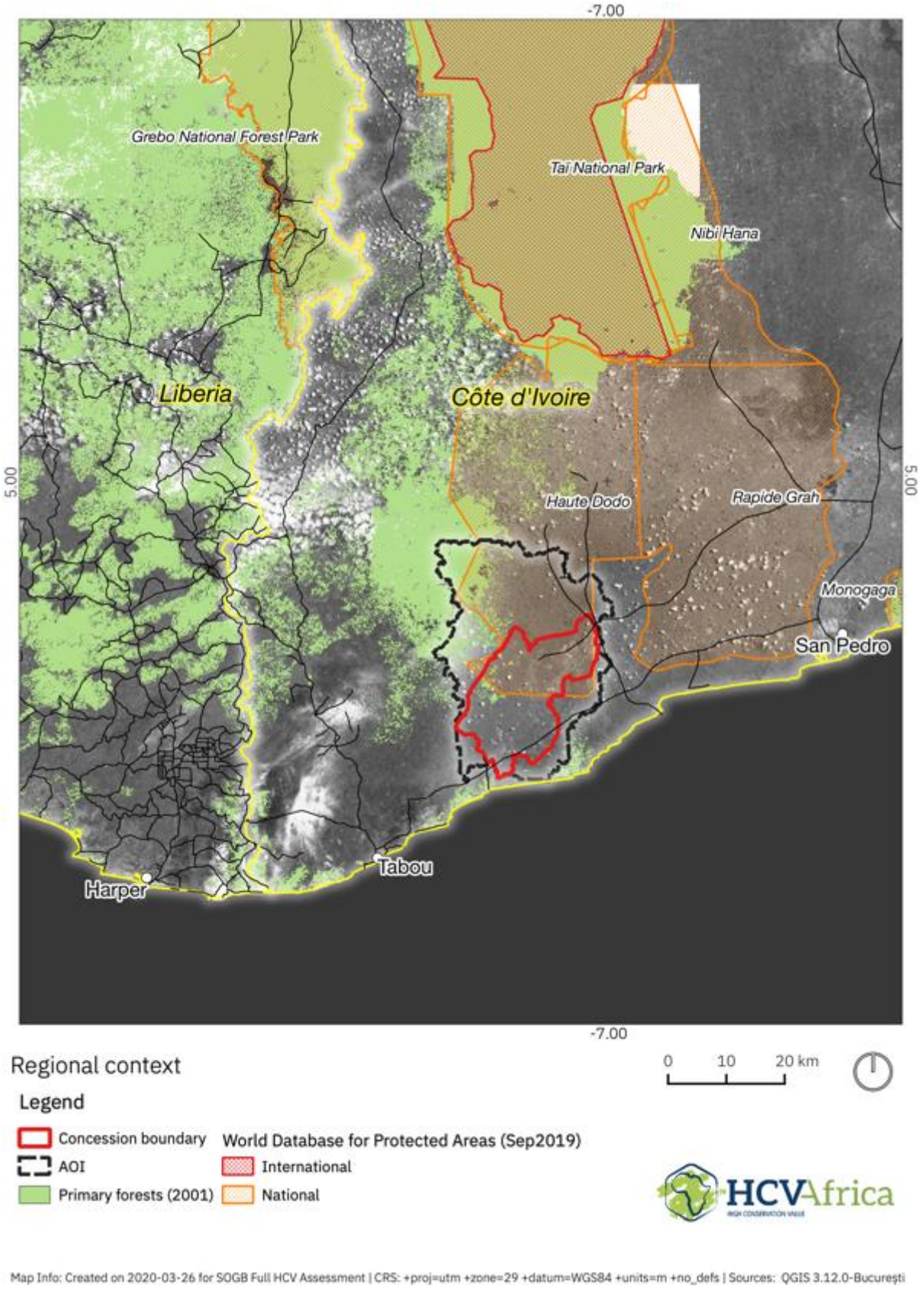


Figure 1–1: Location of the SOGB plantation

1.3 Company Overview

Socfin is a Luxembourg based company that owns and operates commercial oil palm and rubber concessions and production facilities in Africa and Asia. The history of the SOGB plantation is provided in Table 1–1. The concession was originally owned by the State of Côte d'Ivoire: state company SATAC created in 1970 and managed by the Compagnie Générale des Etablissements Michelin (CGEM) until 1994 when the state privatised the company and SOCFIN subsequently acquired the management.

SOGB is a major employer in the region. In 2018, SOGB had a total of 8,551 employees (5,820 permanent workers and approximatively 2,660 temporary/daily workers) (Socfin Sustainability Report, 2018).

A number of smallholders, representing around 23,000 private planters, benefit from SOGB's technical assistance in villages surrounding the concession.

SOGB purchases their production for processing at SOGB's rubber factory and oil palm mill. These purchases concern up to 70% of SOGB's rubber production and 5% of the palm production, and give a direct income to a neighboring population of more than 100,000 people.

Table 1–1: Summary of the history of SOGB

Date	Detail
1970	Creation of SATAC, a state company, with aim to develop rubber smallholders cultivation in the Sout West Region of Côte d'Ivoire, and explore an industrial rubber plantation on a concession of 35,000 ha, managed by CGEM
1972	First rubber tree planting on the concession is initiated
1972 - 1981	13,500 ha of rubber trees were planted
1979	The company was officially designated SOGB
1982	Rubber processing commenced
1983	First outgrower/smallholder plots
1994	Privatisation of SOGB and acquisition by Socfin
1998	First oil palms planting on the concession is initiated
2004	Palm oil processing commenced
2010	San Pedro palm oil storage site constructed – from where it crude palm oil (CPO) was locally shipped via Port Autonome de San Pedro harbour to Abidjan

1.4 Social Context, Land Acquisition Process and Resettlement Framework

The company is legally authorized to operate 34,712 ha of plantations since the privatization under a 99 years lease (bail emphytéotique) from the State of Côte d'Ivoire. The lease was formalized during the development of SOGB's plantations by the State of Côte d'Ivoire (i.e. in the 1970s, well before its privatization in 1995).

There was no additional land acquisition outside of the concession since the 70's and no further extensions are planned inside the concession either, only replanting.

Before the State of Côte d'Ivoire started developments on this land in 1970, the land was occupied by villages which were subsequently relocated outside the defined concession in line with Côte d'Ivoire regulations. These villages either used to live or have land within the concession:

- The villages that used to be within the concession are: Tiépé, Hinklo, Dérablé, Djihimbo, Trahé, Ibo, Petit-Boua, Hamene 1 and 2, Soklobleke, Klo and Héké. These villages were relocated or absorbed in 13 villages surrounding the plantation on the basis of their belonging to a tribe. The main tribes are: Wlepo, Wapo, Henan, Nenin. The numbers of people relocated is unknown.
    - Tiépé and Hinklo were absorbed by Oueoulo, which was not inside the concession
    - Débablé and Djihimbo were relocated to the current site of Djihimbo and kept the name Djihimbo

    - Ibo, Petit Boua, Hamené 1 and Hamené 2 were absorbed by Kako on the current site of Kako
    - Soklèblébé was absorbed by Klotou
    - Klo and Héké were merged and moved to the current site at Héké 19.
- The villages that used to have land within the concession are: Kako, Batcha, Ouéoulo, Oulibio, Djoro, Teklebo, Klotou, and Oulidie Patake.
- Irépoué, a village just outside the concession, used to have land rights within concession.

These villages, named “villages déplacés”, do not hold statutory property rights under the Côte d’Ivoire legislation, but they hold customary rights. The figure below shows the resulting changes after the development of the plantation in 1970.

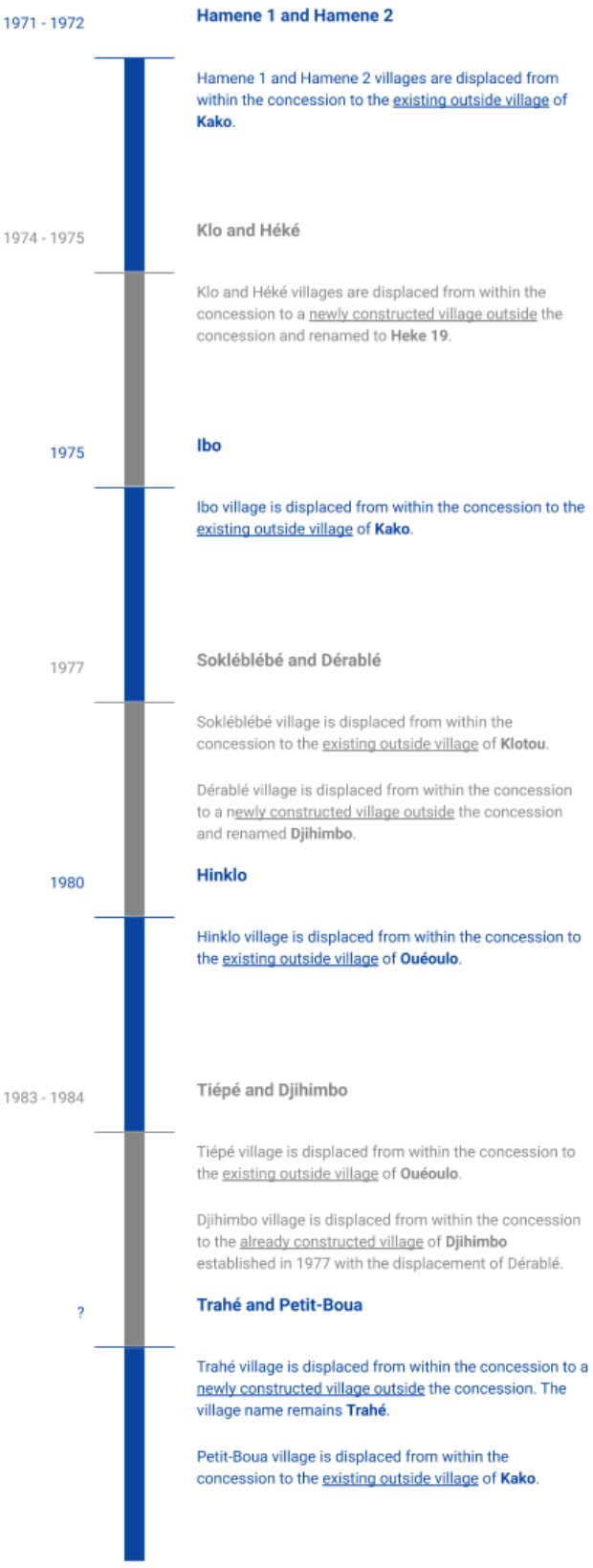


Figure 1–2: Location of the SOGB plantation Displacement of villages in 1970 following development by the State of Côte d'Ivoire

The 10 villages that used to have land rights within the concession but now are located outside that area, and the 3 newly formed villages, make up the 13 villages covered by the "AVD" or "Association des Villages Déplacés".

At that time of the displacements a process was undertaken by the State of Côte d'Ivoire to compensate the villages that used to live or had land rights within the concession. As it was the State that carried out this process, SOGB does not possess these documents.

Since then, some local communities have denounced the State's compensation to local communities. The dissatisfaction occasionally led to demonstrations, disrupting the work on the plantation. These demonstrations were directed at the Government, but as the company had already been privatised, their grievances were not taken into account by the Government.

Faced with this tense situation, several meetings were organized in 2001 with the communities, the authorities and SOGB. Following these meetings, a list of grievances was established. These grievances were not addressed by the government and regular manifestations continued. Following these manifestations, a Protocol for compensation (Protocole d'accord entre la société de Caoutchoucs de Grand Béréby et les villages déguerpis) was signed in September 2009 by 10 villages (Batcha, Oulibio and Djoro are attached to the budget of Kako and Oueoulo), gathered in association and named the "Association des Villages Déplacés" (AVD), the SOGB and the local authority ("Sous Préfet").

The role of AVD is to centralise the 13 villages' expectations, projects and grievance. The AVD has an Executive Board and the 13 villages representing the "villages déplacés" are part of this Board. The protocol is updated in agreement with the Executive Board every 5 years and a budget is established for a 5 years period. The AVD community development plans are financed by SOGB and the budget is established on the basis of each village territory. From 2009 to 2013, the budget amounted for 70,000,000 FCFA per year and since 2013 it has been 80,000,000 FCFA per year.

Programs developed as part of the AVD vary between the 13 villages but all focus primarily on improving living conditions in theses villages. The programs seek to improve access to basic social services including health, drinking water and infrastructure capacity. Examples of actions delivered under the programs include the development of new water, the rehabilitation of classrooms, and the development of local electrification schemes.

1.5 Brief Environmental Context

Several faunal species are protected by Côte d'Ivoire legislation (Law 94-442 of 1994, modifying Law 65-255 of 1965 which relates to faunal protection and the regulation of hunting). There are three classes of protection (Annex I, II and III) as follows:

- Annex I – Fully protected wild animals (including capture and hunting);
- Annex II – Partially protected wild animals (limited hunting and capture allowed within bounds of appropriate permits); and
- Annex III – Authorised hunting only, within the limits of hunting laws.

The national protection status of these species is not considered to be informative for the evaluation of HCV values.

2 Assessment Team

The assessment team who undertook specialist studies and other components of the assessment report, is presented in Table 2–1 and their CVs are presented in annex 1.

Table 2–1: Specialists comprising the assessment team

Name	Institution	Role	Expertise	HCV Experience by country
Llwelyn Coertzen	HCV Africa	Lead Assessor, vegetation expert and HCS component	Vegetation and Spatial Ecologist	Angola, Liberia, Côte d'Ivoire, Sierra Leone, South Africa, Cameroon, Mozambique
Carlo Fourie	HCV Africa	GIS / HCV, scoping study	GIS	Cameroon, Côte d'Ivoire, South Africa
Frank Bie	Independent consultant	Social support	Social specialist	Côte d'Ivoire, Liberia
Luke Verburgt	HCV Africa	Herpetofauna specialist	Herpetologist	Cameroon, Côte d'Ivoire
Marion Thomas	HCV Africa	Quality assurance and senior review	Environmental impact assessment (ESIA), Social and consultation specialist	Democratic Republic of Congo (DRC), Cameroon, Sierra Leone, Myanmar
Nelius Scheepers	HCV Africa	Review, Scoping Study	Ecology, ESIA	Angola, South Africa, Uganda, Cameroon, Myanmar
Phil Patton	HCV Africa	Avifauna and mammals, general support	Senior Ecologist and Ornithologist	Angola, Cameroon, Sierra Leone, Côte d'Ivoire, South Africa, DRC, Uganda, Botswana, Swaziland, Mozambique, Myanmar
Russell Tate	HCV Africa	Aquatic ecologist	Water resource scientist, freshwater biologist	Angola, Cameroon, DRC, Senegal, Mali, Sierra Leone, Liberia, Ghana, Côte d'Ivoire, DRC, Republic of Congo, South AFrica, Swaziland, Mozambique, Myanmar, Namibia, Zambia
Stephen Horak	HCV Africa	Social Scientist	Social Specialist	Sierra Leone, Nigeria, Côte d'Ivoire, Mali, DRC, Mozambique, Botswana, Cameroon
Travis Dugmore	HCV Africa	Report Collation, Support & Mycology	Microbiologist	South Africa, Cameroon, Côte d'Ivoire
Tyron Clark	HCV Africa	Mammal studies	Senior Ecologist	Cameroon, Côte d'Ivoire

3 Assessment Timeline

The assessment timeline comprised:

- Pre-assessment phase - February to June 2019;
- Scoping assessment – April 2019
  - scoping survey - 15th and 21st of April of 2019; and

- Specialist studies – November - December 2019 (social, herpetofauna, mammalian/avifauna, botanical and riverine ecology)

4 Pre-assessment

4.1 Due Diligence

During the pre-assessment phase, the assessor undertook desktop studies to gather information from Socfin, publicly available information about the company was reviewed and a series of conference calls took place with SOGB plantation management. During conference calls with SOGB management, company policies and objectives were discussed; environmental and social policies are presented in Annex 9. SOGB Plantation management is committed to the Socfin Group policy for responsible management. Additionally, the SOGB plantation is ISO14001:2015 certified.

Preconditions to be met by the Organisation
1: Commitment to Environmental and Social Safeguards
Socfin is currently committed to operating in conformance with relevant sustainability certification schemes' requirements and good international industry practice (GIIP) particularly the RSPO, the Forest Stewardship Council (FSC), the International Finance Corporation Performance Standards (IFC PS). Socfin collaborated with the IFC and Earthworm Foundation (EF), formally known as TFT (The Forest Trust), to commission environmental and social performance studies of all Socfin operations.
2: Moratorium on land clearing or land preparation until the proposed Integrated Conservation and Land Use Plan (ICLUP) has been completed
SOGB, as all other Socfin companies, will not clear any land for rubber or oil palms without doing a HCV/HCS study for the proposed area of expansion. In the case of oil palms, NPP will be followed, as this is according to the RSPO P&C 2018 requirements. This includes converting rubber to oil palms, but does not include replanting's. For rubber, there is no NPP guideline, so here, any expansion for rubber, will be preceded at least by a HCV/HCS study, including FPIC. However, as mentioned before, SOGB has no intention of expanding its operation in the near future.
3: Demonstrated legal right over or permission to explore Area of Influence: emphyteutic land lease agreement with the State of Côte d'Ivoire. SOGB has secured a 99 year land lease agreement.
4: FPIC process has been initiated with full disclosure of the project with all potentially affected communities and stakeholders, and the process for negotiation and consent going forward has been agreed, with representatives appointed through a fair process. In this case, there is no plantation extension project. FPIC was merely done as part of the HCV study for the existing project.
The FPIC process has been described in Section 5.2 & 5.3 of (social studies and consultation) and in Section 4.2 for the pre-assessment phase.

4.2 FPIC and Pre-assessment

SOGB and HCV Africa informed villagers in the AOI during the scoping phase that a full HCV assessment would be undertaken; a brief introduction to HCV assessments was given during scoping meetings. For this assessment, communities are classified as plantation villages (i.e., those within the concession) and neighbouring villages (i.e., those outside the concession but in the Project AOI). Leaders of all the plantation and neighbouring villages were informed of the impending HCV full assessment and a week's notification was given to the leaders before meetings in the villages took place.

It must be noted that the concession has existed since 1971 and predates the FPIC process but Socfin adopts the process for operational changes that could impact communities throughout all of its operations. Currently, there

are no projects proposed for the SOGB plantation. Should any extension be planned in the future, SOGB commits itself to following the FPIC processes as set out by the RSPO.

SOGB maintains good relations with the neighbouring villages[3] by:

- Dedicating a budget of 80,000,000 FCFA per annum for development projects infavor of these villages, as per the protocol of agreement signed between SOGB and AVD;
- Maintaining a list of leaders and notables with their contact details;
- Maintaining maps showing the neighbouring villages;
- Having a programme for regular consultation meetings (every four months);
- Sending out invitations with an agenda before each meeting and filing a signed report recording proceedings of meetings; and
- Consulting and getting villagers' agreement before any projects or initiatives are undertaken.

SOGB maintains a grievance mechanism for registering complaints and issues which includes a procedure for escalating issues should any villager feel that an issue is not being addressed adequately. The plantation has a Social Affairs Manager who is responsible for communication and liaison with the 13 neighbouring villages.

5 Scoping Study

5.1 Summary of the Scoping Study Activities

The approach for the scoping study included:

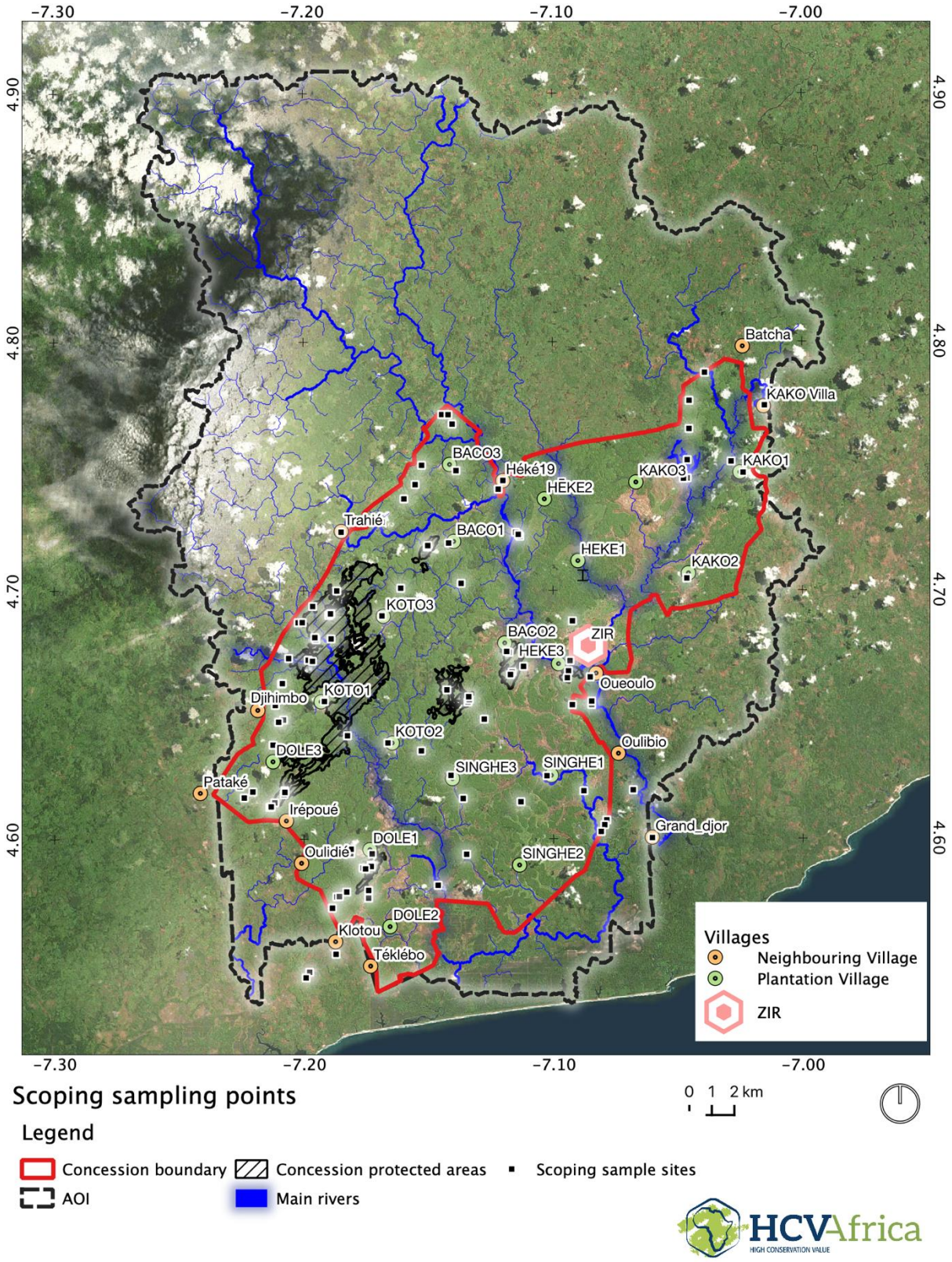
- Desktop study and literature review to obtain high-level data/information – using publicly available information, Socfin reports, data and information; and HCV literature;
- Preliminary identification of HCV based on desktop studies prior to going to site using imagery and Google maps: and
- Field studies including consultation with stakeholders.

The key activities and objectives of the scoping field included:

- Visiting areas in the AOI of the plantation and ground-truthing the potential HCV areas identified during desktop studies;
- Understanding the current conditions of the receiving environment notably, the extent of remnant natural vegetation areas and biodiversity in general; the extent of small-scale agriculture being practiced within the Concession; the ecosystem services and use of natural resources by local communities; and identifying villages/settlements in the AOI;
- Having discussions with the SOGB management team about current and historic operations. Meetings took place with the:
    - General Manager
    - Agricultural Operations Manager and Head of Palm agricultural Operations
- Using the high-level information based on desktop studies and field visits to inform the way forward and make recommendations regarding the HCV assessment to meet RSPO certification requirements;
- Taking photographs to document current conditions in the AOI;
- Conducting rapid biodiversity surveys on an opportunistic basis (due to the short duration of scoping visit). Species that were encountered (flora and fauna) were identified, recorded and listed; most were bird species, as they are most common in the forest and could be identified based on sight and call;
- Developing initial species lists to prepare specialists for the assessment phase;

[3] Note that Plantation/Company villages are under supervision of the Management of SOGB.

- Noting evidence of RTE species (seen or heard), and developing an initial list of potential Red Data species that may occur;
- Visiting swamp and wetland areas in the AOI;
- Holding preliminary meetings with communities (or community members), to elicit information on current land use, ecosystem services, resource use, sites where resources are gathered, and areas of cultural values; and
- Compiling an HCV Scoping Study Report which documents the key findings and recommendations from the scoping study and determines the way forward for the full HCV assessment.



Map Info: Created on 2020-06-03 for SOGB Full HCV Assessment | CRS: +proj=utm +zone=29 +datum=WGS84 +units=m +no_defs | Sources: QGIS 3.12.3-București

Figure 5–1: Summary map of scoping activities

Key factors and habitat/landscape features that were used in the preliminary identification of potential HCV areas included:

- Habitat quality (terrestrial and aquatic);
- Stream, wetlands and rivers within the catchment;
- Rocky outcrops;
- Forest patch size;
- Habitat connectivity; and
- Accessibility of the forest patch.

5.2 List of Consultations

The HCV Africa and SOGB teams met with community representatives during the scoping site visit as per the HCV approach, and in line with Socfin's ongoing and transparent stakeholder engagement policy/procedures.

Stakeholder engagement had the following aims:

- To introduce the scoping team (i.e., HCV Africa and SOGB team members);
- To obtain consent from the local people to enter their farms and the natural areas within the riverine areas and agricultural lands;
- To enable communities to understand and support the fieldwork;
- To obtain initial information from local people (local knowledge), notably regarding their farming practices, livelihoods, the presence of wildlife in the greater area and their use of natural resources/ecosystem services.

Key issues discussed with local communities included:

- The scope of fieldwork in terms of accessing natural areas, riverine systems and agricultural fields within the concession area;
- Natural vegetation protection and forest use/ecosystem services;
- The importance of biodiversity conservation at a broad level;
- Areas where logging or new clearing takes place;
- Fauna species seen by locals in their greater region,
- Attitudes towards, and perceptions of, SOGB.
- Permission to proceed with the studies.

Interviews were conducted with a range of stakeholders (e.g., plantation and neighbouring village Chiefs, leaders, villagers, the Sub Prefect of the Grand-Béréby Sub Prefecture, representatives of Department of Environment (Grand-Béréby) and the environmental regulator based in San-Pedro, SOGB managers, SOGB human resources manager, small grower's manager and the RSPO coordinator).

A summary of the consultations that took place during the scoping phase is presented in Table 5–1

Table 5–1: Stakeholders consulted during the scoping study

Meeting date	Location	Individual / group	Key concerns / comments	Response
20/11/2019	Dole 3 (plantation village)	Leader Tro Tiemoko + three notabilities	Wanted to know the purpose of the interview and why questions were not asked relating to the workers' wages and accommodation.	The purpose of the HCV assessment was explained. It was also explained that the focus of the study was about specific environmental and social issues; it is not about employment conditions (wages and accommodation).
20/11/2019	Koto 1 (plantation village)	Leader Akpangni Richard Amon + three notabilities	Questioned that Stephen (social specialist) is a South African and asked if he considers himself European or African.	Stephen responded that his family had lived in Africa since 1866 and that he himself had never been to Europe and considers himself to be African.
20/11/2019	Oueoulo (neighbouring village)	Chief GAE Tout-Saint Deny + three notabilities	They said that: displaced people need support from investors. It was promised to be accommodated but nothing has been forthcoming. More land is needed to extend the village and create farmland for subsistence and livelihoods. They said that to support communities could be an option. They stated that precedence is not given to affected communities and that the new GM (JC Dienst) is not doing a good job.	It was explained that the RSPO certification will allow the plantation to get external investors. It was indicated to them that HCV Africa cannot address these issues but will make the plantation aware of all comments raised during meetings.
20/11/2019	Oulidié (neighbouring village)	Chief Hinohié Patrice	They wanted to know why we ask all these questions.	The RSPO certification purpose and process was explained to the meeting attendees such as the importance of understanding communities' livelihoods and lives in order to identify HCVs 4,5&6.
20/11/2019	Héké 1 (plantation village)	Leader Nean Tah Ernest Leader Yao Jacques + three notabilities	Wanted to know what does RSPO stand for and could we provide them with a training certificate.	It was explained that RSPO stands for the Roundtable for Sustainable Palm Oil. The RSPO promotes sustainable development of palm oil which means that the environment is protected for our children's children.
20/11/2019	Klotou (neighbouring village)	Nean Tah Ernest	The relationship between SOGB and communities is good thanks to the former GM Olivier Martin but the current GM (JC Dienst) does not listen to communities, does not respect chiefdom. He promised to continue the work Olivier started	This is an issue that should be raised with SOGB through the grievance procedure. SOGB will receive the HCV report and will see this comment.

Meeting date	Location	Individual / group	Key concerns / comments	Response
20/11/2019	Grand Djoro (neighbouring village)	Kpassahi Sare Benoit	A request was made that SOGB should properly manage drainage to avoid flooding in communities' farms, lands, and forests.	We are glad this has been raised and is an itme that will be considered in the HCV assessment. The road between Ouéoulo and Grand Djoro goes through a swamp and is yearly maintained by SOGB to make traffic possible.
21/11/2019	SOGB offices	Human Resources Manager	At present there are approximately 6,000 permanent workers and 2,500 temporary workers employed on the plantation; 25,0000 people live in the plantation villages. 90% of workers have housing, and the plantation is in the process of building more house to cover the shortfall. Should a worker be dismissed or reaches retirement they need to leave the plantation and vacate their house. Children are given the opportunity to finish the school year. Should a worker die, the plantation will pay for the body to be transported to the worker's village of origin. If a worker is caught in the protected areas in the Concession, they are immediately dismissed. During the workers' induction they are instructed as to the rules regarding the protected areas and that they will be dismissed if they are caught in these areas. The company should not pay less than the minimum wage for agricultural sector as stated by the Government. Its wage is actually much higher than this minimum wage. There are seven workers unions on the plantation but only one is State-registered because it has enough members to qualify for registration. Unions are met with every 2 months. There is a hospital for workers and their families; more serious cases are referred to San-Pedro. Workers must pay 11% of the costs. In the neighbouring villages SOGB has built dispensaries. Neighbouring villagers can also come to the hospital on the plantation for free but for specialised services they need to pay. Workers can have fields, but they need to ask permission. The village leader will delineate the field. A rule of 0.25 ha is applied. Only certain crops are permitted; no cash crops are permitted; buffer areas may not be planted; no slash and burn farming methods are permitted.	The information is well received and will be included in the HCV report.

Meeting date	Location	Individual / group	Key concerns / comments	Response
21/11/2019	SOGB Offices	Taky Jean-Louis Chief- Department of Smallholders Management	From the 1970s only rubber was planted. In 2002 palm oil was introduced. In 2019 the smallholders started training. Now there is only one cooperative registered and they will be trained in the RSPO requirements. Smallholders will be registered and then trained in the requirements. There are approximately 150 palm oil smallholders and approximately 1,500 ha of palm. 65,000ha is under rubber and approximately 23,000 smallholders (approximately 3ha per smallholder).	The information is well received and will be included in the HCV report.
25/11/2019	Grand-Béréby	Koome Kouare Charles Ministry of Environment and Forestry	The department looks after rural forests which fall outside of national parks. Most forests have been lost to communities overusing them and illegal clearance for agriculture. If people kill animals in the remaining forests they are arrested. The Ministry has very few rangers to police these forests. The Ministry is also responsible for the reestablishment of these forests. NGOs like GIZ come to them for their assistance in protecting the remaining rural forests. GIZ has done good work in Trahé and Héké in conserving these sacred forests. The challenge is in explaining to communities that the forests have value as they do not see this; they want to establish agriculture in the remaining forests as this is a way for them to make a living. They cannot make a living from conserving the forests. They have worked with SOGB in the conservation of the forests in the concession. The re-establishment of forests is difficult. People do not get money when they protect or re-establish a forest. There is no meta fauna left in the remaining rural forests, this fauna only exists in the national parks.	The information is well received and will be included where relevant in the report.
25/11/2019	Grand-Béréby	Dao Yssouf Sub-Prefect	The authorities are still working on a development plan for Grand-Béréby; they hope to have this completed in the first half of 2020. The plan includes a conservation plan for the areas that fall within the Sub Prefecture. There is tourism potential in the area particularly related to the beaches in and around Grand-Béréby. Cocoa and palm oil are cash crops which should be further developed in addition to rubber.	The information is well received and will be included in the HCV report. It was explained that these had to do with the conservation of the environment including people's cultural sites; establishing buffers and rehabilitation of other areas; undertaking participatory mapping to identify HCV 4,5 and 6.

Meeting date	Location	Individual / group	Key concerns / comments	Response
			The challenge is that there is not enough land for the number of people. The Government has a good relationship with SOGB. SOGB provides employment and if there are activities where the authorities need the assistance of SOGB, SOGB are willing to help where they can. There are disputes around the limits of the plantations concession and the Government will assist where it can resolve these disputes. On occasion, the department will also mediate between NGOs and the company such as with AVD. He wanted to understand a bit more about what the HCVs mean.	
25/11/2019	San-Pedro	Tisse Tokpa Bernard Department of Environment San-Pedro	The Department represents the Minister at the local level and is responsible for implementing the Environmental Management Codes. The Department works with companies like SOGB to implement the Regulations to ensure sustainable development. It ensures that the companies have EIA's in place and that they implement the management plans and the requirements are met. He advised the team that we should take special care of the social aspects as these are very important particularly for the neighbouring villages. Local development is important, and he hopes that SOGB will get their certification as this will help further development.	The information is well received.
28/12/2019	Kako (neighbouring village)	Community Meeting	Lack of land for livelihood since 1993; no land rights respected during displacement; They need projects to support their livelihoods, they requested a land use plan from SOGB Construct decent housing for displaced peoples, Boundaries reopening is ongoing but SOGB is trying to grab new land from communities;	This issue is addressed by the Protocol of Agreement signed between SOGB and AVD. Boundaries reopening strictly follows the geographical coordinates of the land lease agreement.

Meeting date	Location	Individual / group	Key concerns / comments	Response
			SOGB ceded a portion of land (37 Ha) to Kako but the location of this land is unknown; Precedence is not given to affected communities in terms of employment, and the youth are unemployed; SOGB does not buy all the production from rubber outgrowers. The relationship between SOGB and communities is not good. They said that all the projects they suggest are rejected for unknown reasons.	There is a signed agreement (1997), with maps and clear location of these 37 ha. Precedence is well given to natives. Rubber outgrowers are all independent smallholders. Some agreements exist, but no one is contractually bound to sell to SOGB. SOGB accepts only community development projects, excluding individual projects as it is stated in the AVD-SOGB Protocol of Agreement.

5.3 FPIC gate – Scoping Phase

As part of the HCV approach, and in line with SOGBs on-going and transparent engagement with stakeholders living in the AOI, the HCV Africa and SOGB scoping study team met with community representatives during the scoping study field visits, informed them of the assessment's objectives and obtained their consent.

6 Description of the AOI

6.1 Boundaries of the Area of Influence

The area of influence (AOI) was delineated to meet the HCV specification (i.e., the management unit (MU) and the broader landscape) (HCV Manual ALS_02_D, 18 March 2019). The final delineation was determined using watershed boundaries directly connected to the Concession. River catchments are illustrated in Figure 6–5.

Refer to Figure 1–1: Location of the SOGB plantation for the wider landscape boundaries reflecting the AOI delineation

6.2 Physical and Environmental Variables

6.2.1 Climate and Precipitation

The southern part of Côte d'Ivoire falls in the humid tropics, and the original primary vegetation type is Upper Guinean forest.

The AOI has a typical climate of the tropical equatorial climate which is warm and humid. There are four seasons, two dry (August-September and December-March) and two wet seasons (October-November and April-July). Temperatures average between 25°C and 32 °C. San Pedro, approximately 60km east of the SOGB Concession, has annual precipitation ranging from1,900 to 2,000 mm (Figure 6–1).

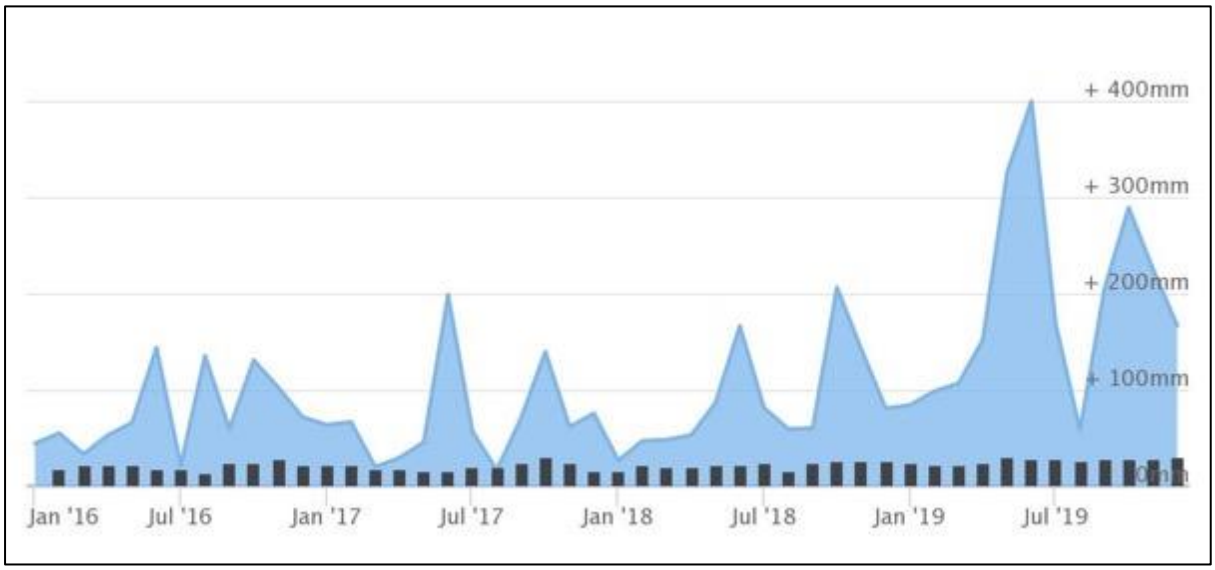


Figure 6–1: Historical (2016-2019) weather data for the Concession (World Weather Online, 2020)

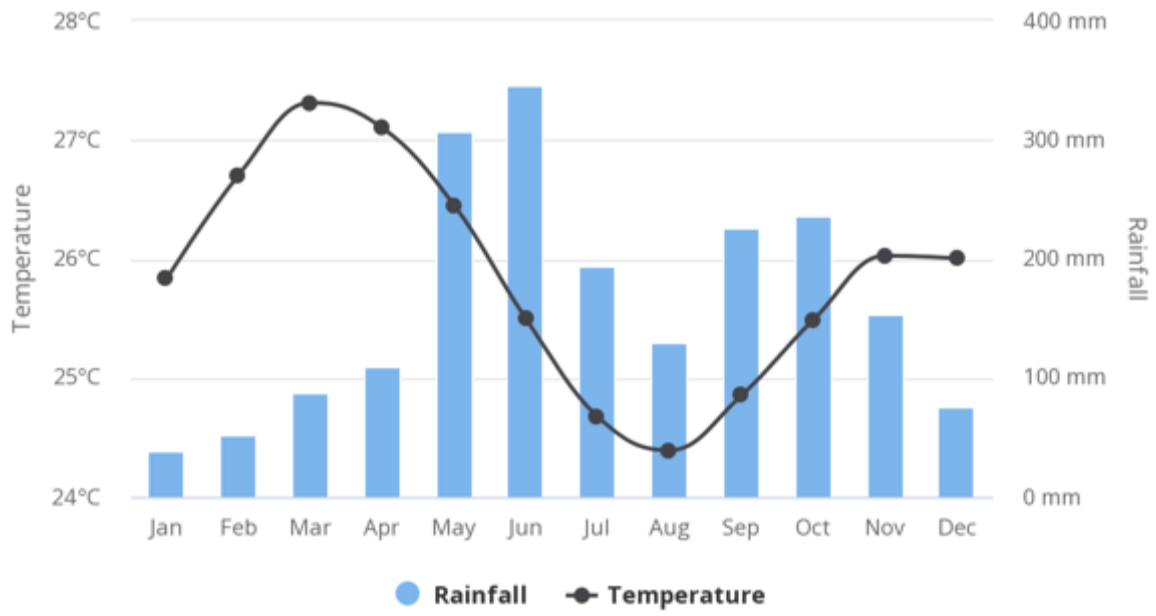


Figure 6–2: Historical (1991-2016) climate data for the Concession (World Weather Online, 2020)

6.2.2 General Terrain and Landscape Features

Côte d'Ivoire's terrain can be described as a plateau rising gradually from sea level in the south to 500 m above sea level in the north. The south-eastern region of Côte d'Ivoire is characterised by coastal inland lagoons that extend from the Ghanaian border 300 km along the coast. The southern region, especially the south-west, is covered with dense tropical moist forest. The Eastern Guinean forests extend from the Sassandra River across south-central and south-east Côte d'Ivoire and east into Ghana. The Western Guinean lowland forests extend west from the Sassandra River into Liberia and southeast Guinea. The mountains of Dix-Huit Montagnes Region, near the border with Guinea and Liberia, are home to the Guinean montane forests. Elevation and slope classes are illustrated in Figure 6–3 & Figure 6–4, respectively.

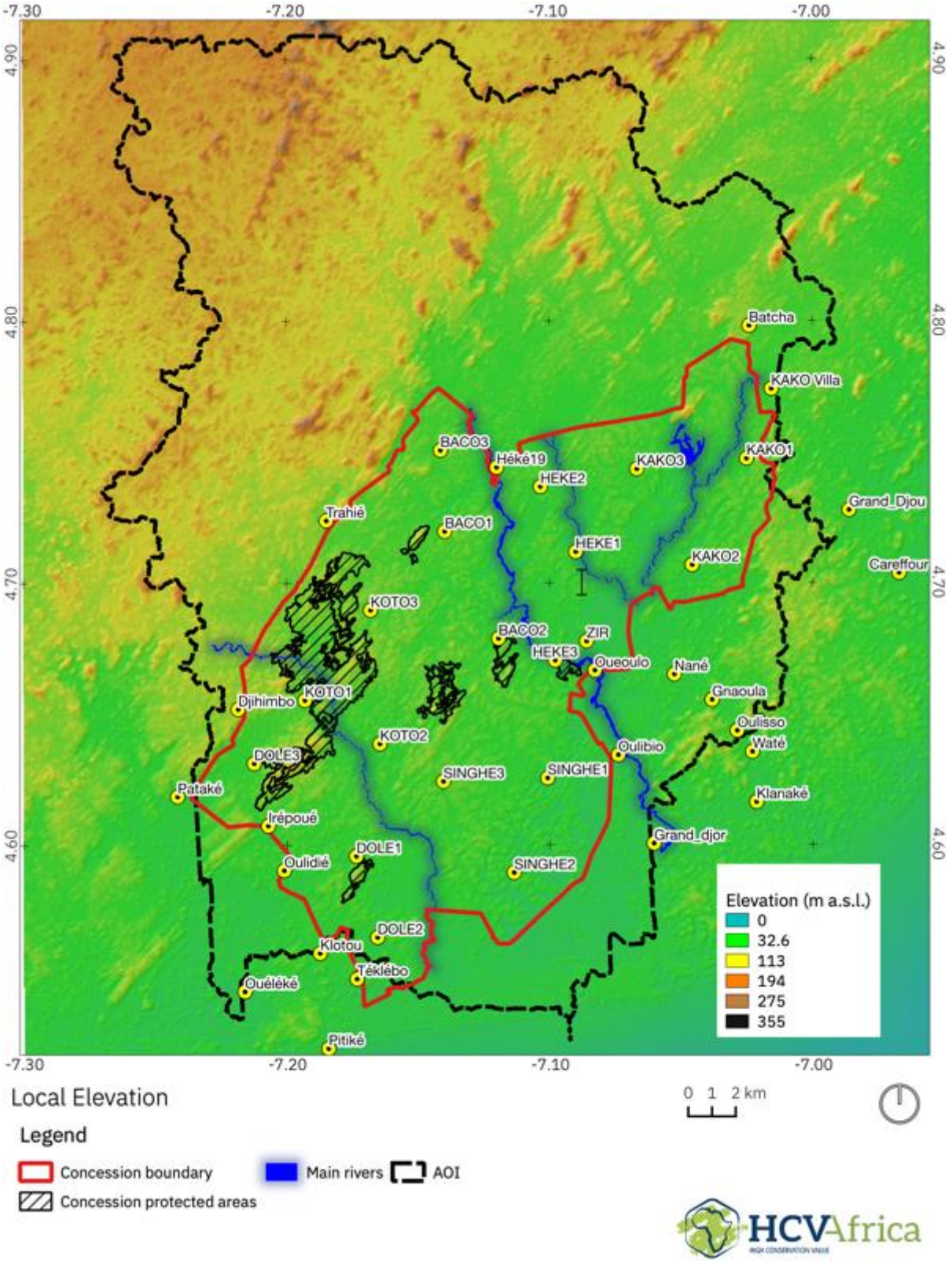


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Figure 6–3: Elevation map

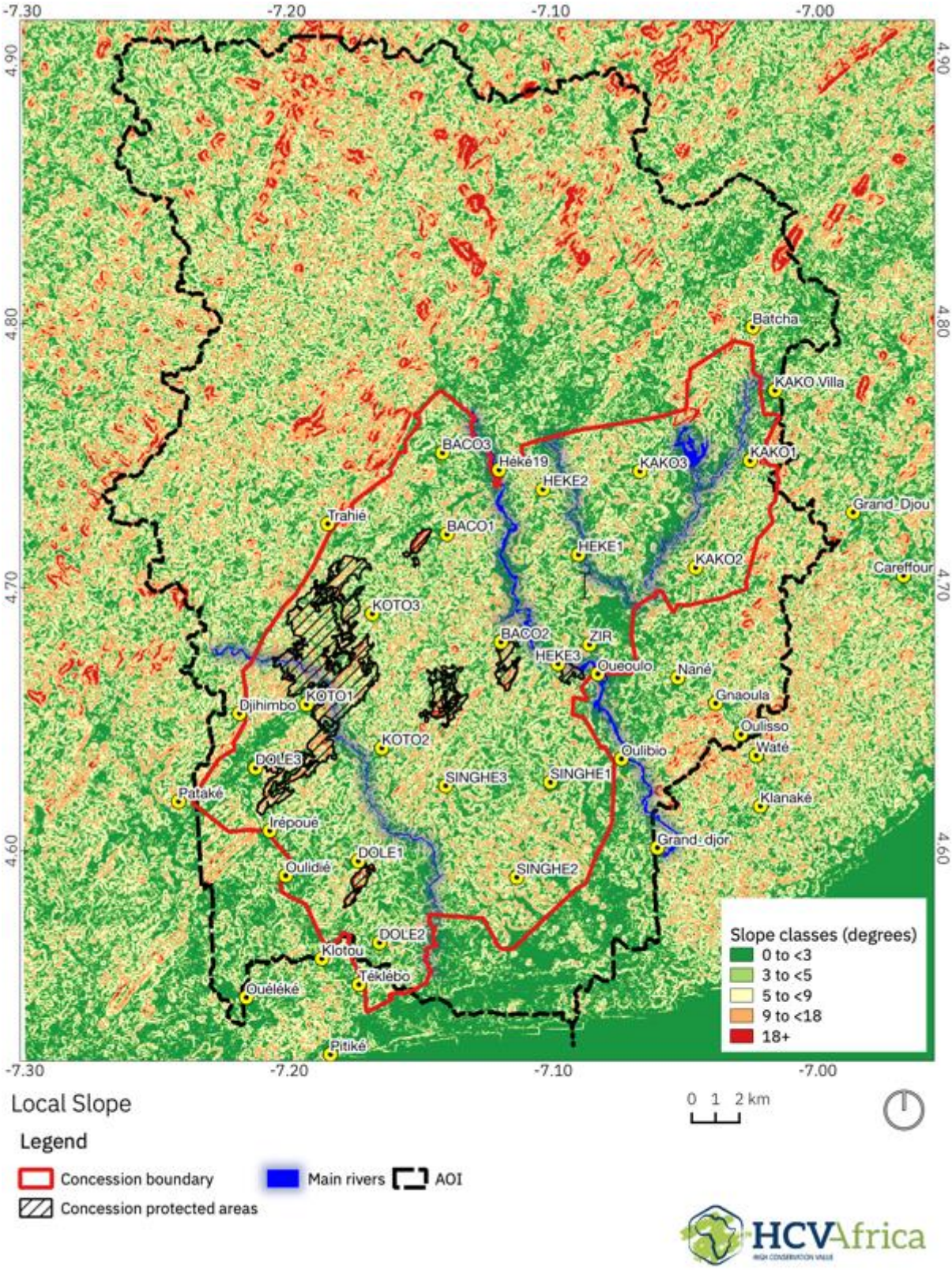


Figure 6–4: Map of slope intensity

6.2.3 Catchment Based Management Approach

The need for assessing, monitoring and managing freshwater ecosystems on a landscape-level is evolving rapidly. This holds true especially for the rapidly expanding rural areas of West Africa wherein impacts on rivers and streams are added across vast spatial and temporal scales on a daily basis. Many impacts are diffuse and the increasing contribution of nonpoint source pollution (NSP). This makes the management for single variables and site-specific approaches on water quality very difficult, if not impossible in most cases.

It is therefore proposed that a catchment-based management approach be followed, where management efforts are focused first around land use within higher priority catchments.

The Dodo and Gnebouagbo sub-basins are regarded as having a high priority and management actions should focus on land use interventions within these first.

6.2.3.1 Hydrological Setting

Characteristics of river catchments in the AOI are summarised in Table 6–1 and illustrated in Figure 6–5.

All watercourses are coastal systems that flow into the Atlantic Ocean to the south of the SOGB Concession. Watercourses predominantly drain into the lower Dodo River system. Watercourses on the SOGB Concession, in order of size (discharge), include the Dodo River (Figure 6–6), Gnebouagbo River (Figure 6–7), Tiépé River and Blé River (Figure 6–8).

Tributaries of a separate western drainage system not connected to the Dodo River were also noted to occur in the SOGB concession, these were separated into two individual watercourses which were typical of headwater swamps at most locations with undefined channels. The layout of the watercourses and the respective management units are presented in Figure 6–5.

Table 6–1: Catchment Descriptions

River name	Catchment area (km²)	Elevation at source (metres above mean sea level)
Dodo River	846.73	220
Gnebouagbo River	141.878	160
Blé River	83.51	210
Tiépé River	148.52	210
Western Drainages	67.2	110

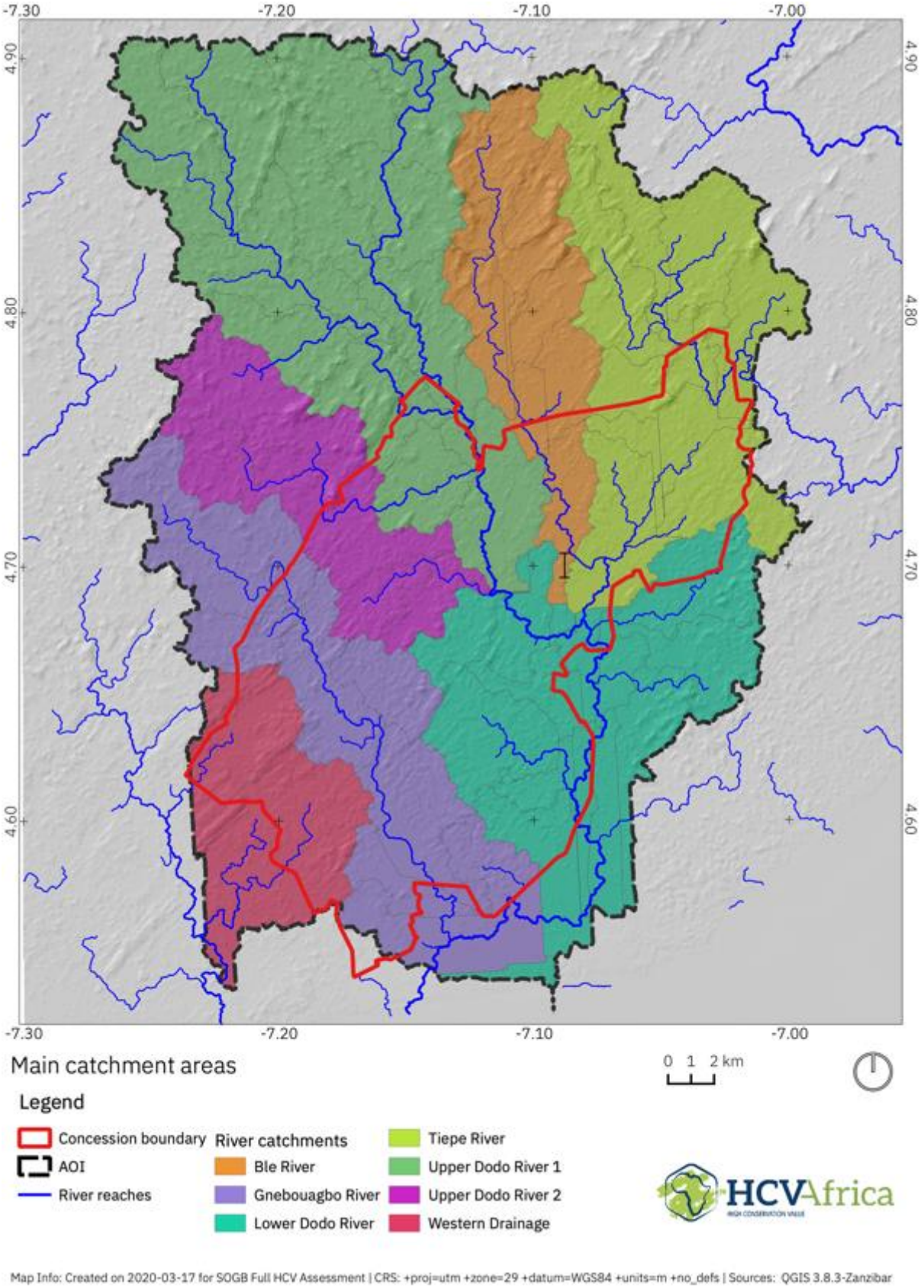


Figure 6–5: Sub basin catchment areas for the respective management units/river catchment

The primary waterbodies originate upstream of the SOGB Concession at an elevation of 220m AMSL. However, the Gnebouagbo River and the western drainage tributaries originate at elevations between 160m and 110m

AMSL. The analysis of the elevation profile of the Dodo River within the concession indicates a mean gradient of 0.004 m/m indicating that the watercourse is conforming to the geomorphology of a lowland coastal system. Watercourses were defined based on their classified Strahler order, gradient, substrate and macro-flow characteristics. Zones of rivers and their characteristics are summarised in Table 6–2 and refer to five freshwater classifications.

The only physical barriers identified are a single impoundment on a secondary tributary of the Tiépé River, a series of cascades in the Dodo and Gnebouagbo Rivers (Figure 6–9) and a significant cascade in the Gnebouagbo River (Figure 6–10). The barriers are likely to affect the distribution of local fish species, this will be presented in the results of this study.

Table 6–2: Watercourse descriptions

Zone	Physical Characteristics	Flow Characteristics	Substrate
Source/plateau swamp	Variable width dependent on plateau/floodplain structure/geology; typically, associated with swamp/floodplain vegetation such as *Raphia sp.*	Slow flow	Mud with detritus
Headwater stream	Gradient moderate but clearly identified by eye ; narrow channel (<1m width); slope forest riparian cover is typical	Slow flow	Sand or gravels
Upper foothill river	Gradient moderate; Small Channel (1-2m width), typically gallery forest riparian cover	Moderate to Slow flow	Variable; stones, sand, mud and gravel
Lower foothill river	Gradient moderate/gentle but noticeable, Small channel (3-5m width), typically with marginal gallery riparian cover	Fast to moderate flow but slow flowing in pools and runs	Bedrock, stones, gravels and sand
Lowland river	Gradient reduced, wide channel (6-15m), typical gallery forest in the riparian zone, floodplains with associated vegetation	Moderate to slow flow	Bedrock, sand and mud
Coastal wetland	Gradient slope gentle, extensive channel with undefined fluctuating extent, typical swamp forest and Raphia vegetation.	Slow flow	Sand and mud

Figure 6–6: The lower Dodo River, the largest watercourse downstream of the SOGB Concession (November 2019)

Figure 6–7: The headwaters of the Gnebouagbo River on the SOGB Concession (November 2019)

Figure 6–8: A fisherman on the Tiépé River on the SOGB Concession (April 2019)

Figure 6–9: An impoundment in the Tiépé River system (April 2019)

Figure 6–10: A natural barrier in the form of a cascade on the Gnebouagbo River (November 2019)

The freshwater ecoregion and freshwater habitats are described in the SOGB Riverine Ecology Specialist Report (HCV Africa 2020).

6.3 Biological and Ecological Characteristics

The Upper Guinean forest is a tropical seasonal forest that extends from Senegal to Togo and is regarded as one of the biodiversity hotspots of the world. Woodland savanna stretching from the Sahel to the Gulf of Guinea, known as the Dahomey Gap, separates the Upper Guinean forests from the rest of the African forests. Thus, the Upper Guinean forests have a high degree of plant and animal endemism (Poorter, et al., 2004; Table 6–3). Compared to neotropical and Asian rainforests, African forests are characterised by much lower species richness, and contain fewer palm, epiphyte and under-storey species.

Table 6–3: Upper Guinean Forest diversity (Poorter et al, 2004)

Group	Number of species	Number of endemic species
Plant	2,800	650
Bird	514	90
Mammal	551	45
Reptile	139	46
Amphibian	116	89

These Upper Guinean forests are much affected by winds from the hot dry area to the north and the cool Atlantic currents. This gives the region a very seasonal climate with over 2,000 mm of rain falling in some areas in the wet season. The northern parts of Côte d'Ivoire are characterised by a single wet season stretching from May to October followed by the dry season from November to April.

The WWF divides the Upper Guinean forests into three ecoregions:

- The Western Guinean lowland forests extend from Guinea and Sierra Leone through Liberia and southeastern Côte d'Ivoire as far as the Sassandra River;
- The Eastern Guinean forests extend east from the Sassandra River through Côte d'Ivoire and Ghana to western Togo, with a few isolated enclaves further inland in the highlands of central Togo and Benin; and
- The Guinean montane forests are found at higher elevations in the Guinea Highlands, which extend through central and southeastern Guinea, northern Sierra Leone, and eastern Côte d'Ivoire.

The SOGB concession is in the Western Guinean lowland forest ecoregion, close to two Key Biodiversity Areas (KBAs) that play a critical role in the maintenance of the Upper Guinea Biodiversity hotspot which is characterised by high species diversity and endemism. Key threats to biodiversity include population growth, agriculture, logging and fisheries.

Details on the botanical composition of the study area are provided in the botanical specialist report (HCVA, 2019). The proximity of the Concession to nearby conservation areas are shown in Figure 1–1.

6.4 Social, Cultural and Economic Characteristics

For the purposes of this report, a plantation village is one that was established by SOGB to accommodate plantation workers and is within the SOGB concession. Neighbouring communities are villages with custodianship over land and are communities that are influenced by the plantation. Refer to 1.4 for more details.

There are 23 plantation villages, and 13 neighbouring villages (Figure 6–11). The neighbouring villages were relocated from the concession when it was established in the 1970s. The oldest plantation villages date back to the 1970s and the newest was established in 1983.

Plantation villages are ethnically diverse as a result of in-migration of people from elsewhere in Côte d'Ivoire and from West Africa, looking for work or working on the plantation. Neighbouring villages are less ethnically diverse and the Kroumen, Mossi and Baoulé people are dominant. Table 7–1 presents the estimated populations for the villages.

The economy of the AOI is driven by agriculture, principally the commercial rubber and oil palm plantation of SOGB. In the neighbouring villages the economy is cash crop agriculture, predominantly rubber growing. Small scale trading takes place in informal shops and at markets in the bigger villages. The plantation worker camp villages economy is driven by salaried workers who provide local buying power but also send a portion of their wages to the villages where they came from.

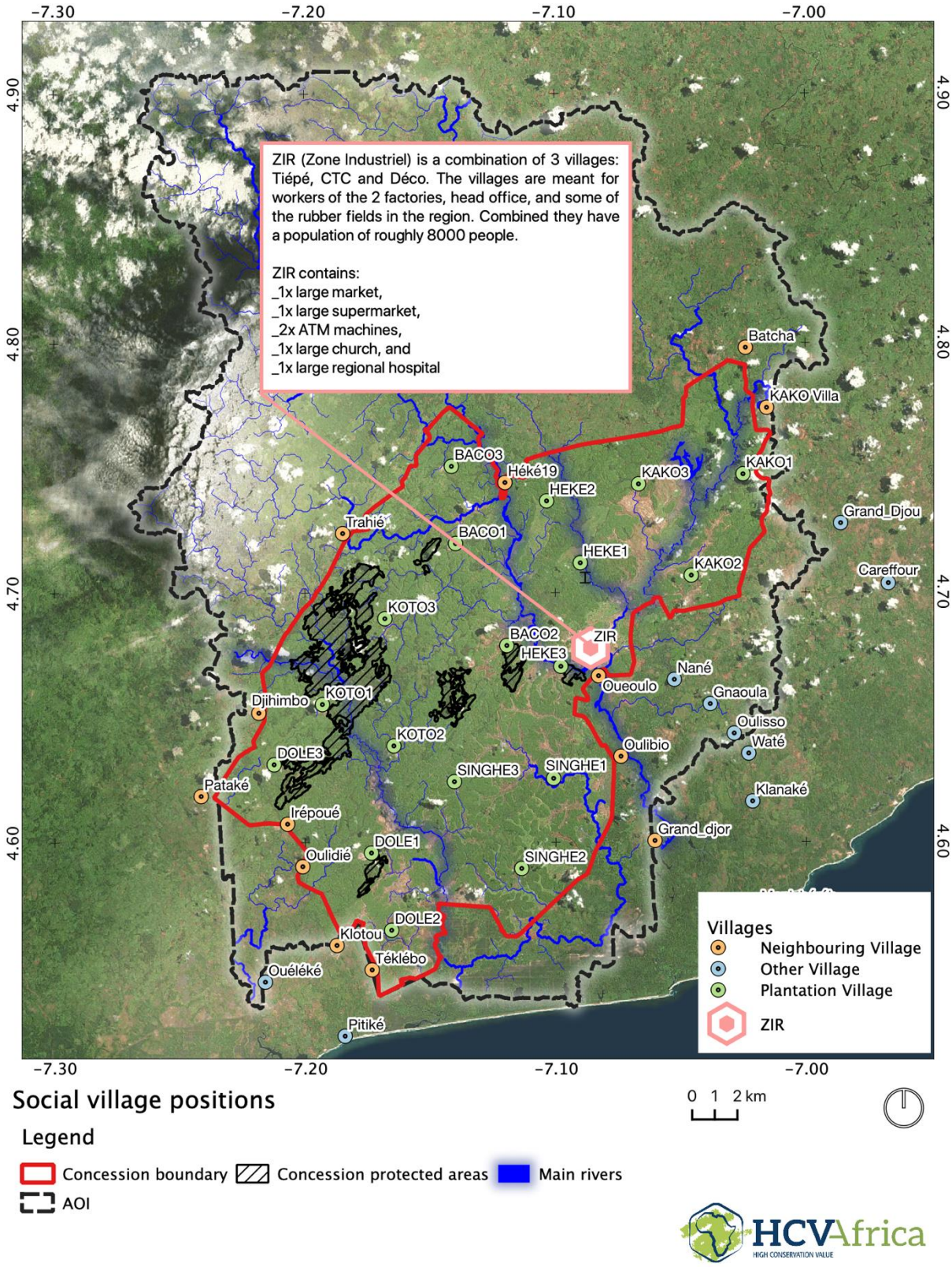


Figure 6–11: Villages in the SOGB AOI

6.5 Smallholders

A large proportion of the rubber processed at SOGB's rubber factory comes from smallholders. In 2019, up to 70% of the rubber production was sourced from smallholders. For the oil palm production, only 5% of the processed Fresh Fruit Bunches (FFB) came from smallholders. In total, roughly 23,000 private planters provide either dry rubber or FFB to SOGB.

For the most part, they are individual smallholders. Some are grouped in cooperatives that provide a service for collecting and transporting the products to the factory. For rubber, these cooperatives sometimes play the role of intermediary between the growers and SOGB, but without an exclusive agreement. For FFB, cooperatives are less well developed in the area and only one cooperative receives support from SOGB. Further, as FFB needs to be processed quickly after harvesting, it usually comes from smallholders located close to SOGB and cooperatives are less required. The small growers who SOGB works with are identified as SOGB approved suppliers by means of a supplier code but there is no obligation of exclusivity. Only cooperatives have annual delivery contracts with SOGB. Most have benefited from loans from international banks, such as the German Investment Corporation (Deutsche Investitions- und Entwicklungsgesellschaft or DEG), with SOGB's support. SOGB is working on its traceability of both products, and currently has the GPS location of all its FFB suppliers. It is working on doing the same for rubber.

To ensure the quality of the products delivered to the oil palm mill and rubber factory, SOGB provides training to the smallholders on good agricultural practices, which is provided by SOGB's Planteurs Villageois (PV) department. Besides training on good agricultural practices, such as the safe use of plant protection products, SOGB also sensitizes the smallholders on their policies (eg. child labour policy) and on the identification and protection of HCVs.

SOGB also offers different agricultural products which they can use on their farm (rubber and oil palms, fertilizers, plant protection products, harvesting materials, ...), which are usually provided to stallholder by means of micro loans and technical assistance.

6.6 Land Use and Development Trends

The mainland uses in southern Côte d'Ivoire include:

- Agriculture – practiced by local communities;
- Plantations – cocoa, oil palm and rubber plantations owned by local people and companies such as SOGB, PALMCI, SAPH
- Natural forest - provide ecosystems services for local communities (e.g., for timber, medicinal plants, and hunting).

Local communities generally use slash-and-burn agricultural methods, whereby trees and larger plants are cut down/slashed. The brush is then burnt and cleared, paving the way for planting crops. The main crop/fruit species include cassava, oil palm, rubber trees, rice, banana, cocoa, coffee, plantain, yam, groundnuts, maize and sorghum. Small-scale agriculture is the dominant land-use in the AOI, outside the SOGB Concession.

The SOGB concession is made up of a mosaic of plantations, crops, thicket areas and indigenous forest patches.

6.7 Image Analysis and land Cover Classification

The land cover classification sets a foundation upon which HCV analyses follow. During the scoping study, a preliminary land cover classification was produced. Subsequent studies, field results and sampling plots from the botanical fieldwork were used to produce the final habitats map.

For the full assessment, the land cover classes were used as habitat proxies (i.e., to estimate habitat quality for the HCV component). The habitat proxies took into consideration the spatial extent and scale of the assessment

and the lack of detailed spatial data collection. This was primarily based on structural variables and vegetation indices derived by integrating field data and remote sensing information.

Image quality was deemed adequate and the team in the field was able to carry out a ground-truthing exercise; the images are within the 12-month period described in the HCV specification (HCV Manual ALS_02_D, 18 March 2019).

The land cover classes used by HCV Africa for SOGB include dense forest, secondary forest, open land/scrub (this class currently represents both fallow land and subsistence agriculture areas; no differentiation between these were made during the scoping phase), open water, Hevea (i.e. rubber)/Elaeis (i.e. oil palm) cover and open water.

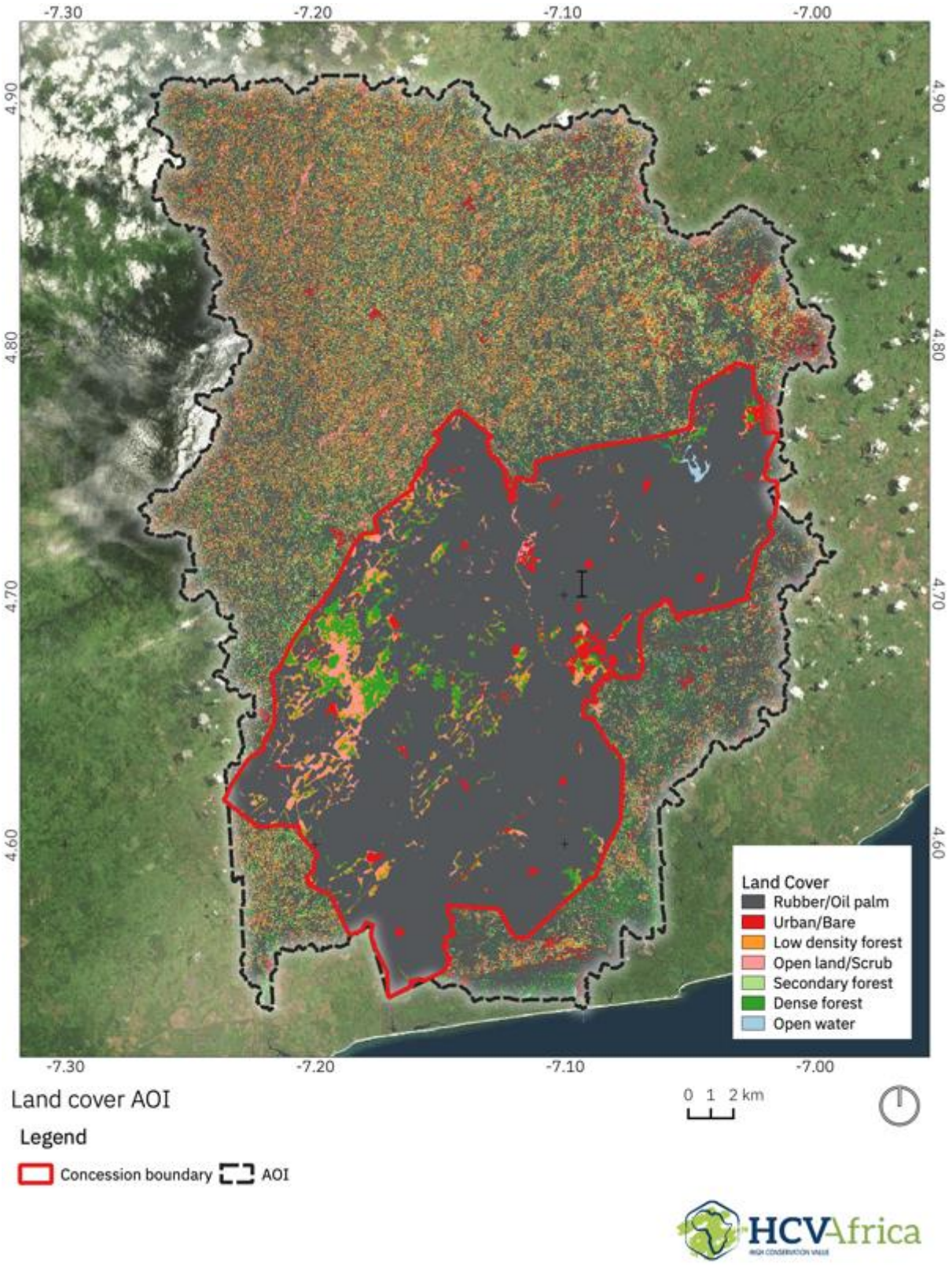


Figure 6–12: Land cover map with land cover classes

7 Social Section: Methods and Results

For reference, the Social Specialist Report (HCV Africa, 2020) is presented in Annex 7.

7.1 Social Methods

The methods used for the socio-economic study and ecosystem services study comprised meetings with villagers (plantation and neighbouring villages); interviews with village Chiefs, villagers and community leaders; and discussions with community members using participatory mapping exercises and recording seasonal calendars. Ecosystem information was verified by biologists.

7.1.1 Literature Review and use of Secondary Data

Desktop studies included reviews of:

- The HCV-HCSA assessment manual, March 2019;
- Guidance for using the HCV assessment report template;
- The scoping study report for the SOGB plantation Montrose, May 2019;
- Sociéte des Caoutchoucs de Grand Bérébу (SOGB), Côte d'Ivoire Environmental and Social Due Diligence Assessment Draft Report, ERM, June 2015
- Secondary data on the plantation villages and FPIC consultation supplied by SOGB; and
- Internet searches for additional secondary data.

7.1.2 Social Fieldwork

Due to the number of villages that had to be visited, two site visits took place for the social studies; the first from the 19th to 25th November 2019 and a second visit from the 27th to 29th December 2019.

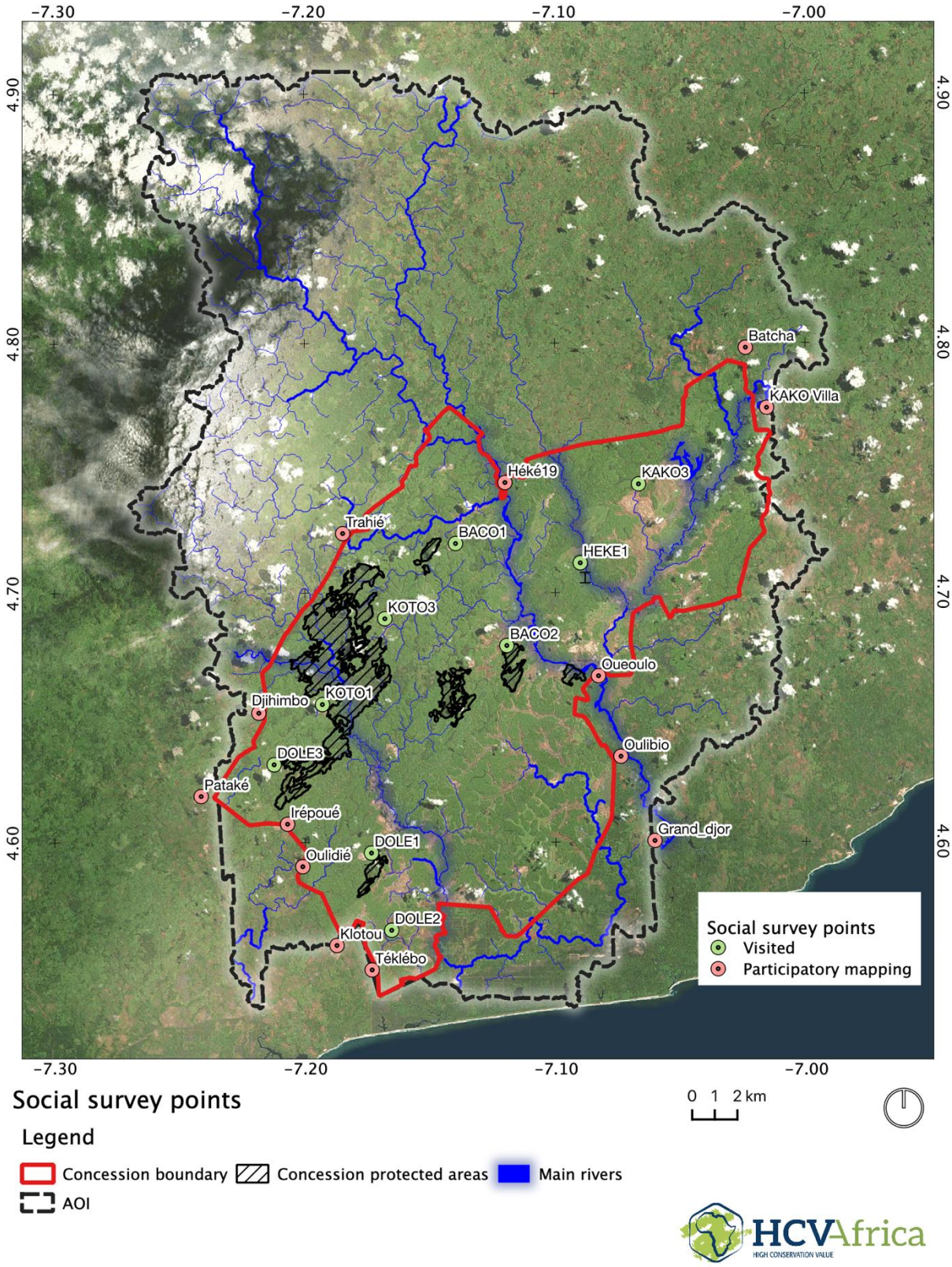
Nine plantation workers camp villages and all 13 of the neighbouring villages were subject to consultation and social surveys (Figure 7–1). Village Chiefs were the points of contact for all activities in the villages as they are the gatekeepers for these communities. Meetings included those with village notables, women, youth, and vulnerable groups.

The plantation villages were selected to be representative. Baco 1, Baco 2, Dole, Dole2, Dole3, Koto 1, Koto 3, Héké 1, and Kako 3 were selected due to their proximity to forested areas and the likelihood of these communities make use of ecosystems services.

All 13 neighbouring villages were included in the social study (i.e., Oulibio, Kako Village, Batcha, Irépoué, Pataké, Tèklèbo, Djihimbo, Oulidié, Klotou, Trahé, Héké, Oueoulo and Grand Djoro).

NOTE regarding the Zone Industriel (ZIR):

The ZIR (Zone Industriel et Residentiel) is a combination of 3 villages: Tiépé, CTC and Déco. The villages are meant for workers of the 2 factories, head office, and some of the rubber fields in the region. Combined they have a population of roughly 8000 people. Because these 3 villages have grown next to each other, they seem like 1 big area. The ZIR contains 1 large market; 1 supermarket; 2 banks with ATM machines; 1 large church; 1 large (regional) hospital.



Social survey points

Legend

Concession boundary | Concession protected areas | Main rivers | AOI

0 1 2 km

HCVAfrica
HIGH CONSERVATION VALUE

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Figure 7–1: Map indicating social survey points where meetings were held and participatory mapping took place

7.2 Results: Social HCVs

7.2.1 Status of FPIC

SOGB and HCV Africa teams informed villagers during the scoping study that a full assessment would be undertaken. Plantation village leaders were informed of the full assessment prior to engaging with them. Neighbouring Chiefs were given notice of meetings a week before they took place.

SOGB plantation cannot strictly adhere to FPIC as the plantation was created in 1970s, before the concept of FPIC was in place.

Should an extension of the plantation be planned in the future, SOGB commits itself to following the FPIC processes as set out by the RSPO. SOGB maintains good relations with its neighbouring communities as follows:

- The plantation management maintains a list of neighbouring communities, their leaders and notables, including their contact details;
- The plantation has a Head of Social Affairs who is responsible for communication and liaison with the 13 neighbouring villages;
- SOGB has a grievance mechanism for registering complaints; the grievance procedure includes a mechanism to escalate issues;
- SOGB has a map showing the neighbouring villages in relation to the plantation;
- There is a consultation program for regular, four-monthly meetings with the neighbouring communities;
- Before each consultation an invitation with an agenda is sent to communities. A report of the meeting is compiled which is signed by leaders showing they agree the record of the meeting is accurate; and
- SOGB informs, consults and requests the agreement of the neighbouring communities which would be potentially impacted by possible projects/initiatives, before any projects or initiatives are undertaken.

7.2.1.1 Participatory Mapping

The framework for carrying out participatory mapping (PM) and maps produced during village meetings are presented in Appendix A (Figure 7-2). Community members found it difficult to indicate the boundaries of their villages due to difficulties with scale and making a 2-dimensional representation of a 3D reality, in the form of a map; this is a limitation of participatory mapping. However, the maps still provide a very good indication of the layout of the areas which are important to communities and where HCVs may be found. One of the most positive aspects of PM is that it encourages everyone to participate and share information; almost inevitably, participants will have lengthy discussions if they disagree with information offered.

The results of the PM indicate that neighbouring villages are making use of ecosystem services such as drinking water; there are almost no remaining secondary and primary forests; and they collect firewood from their own rubber plantations. The only primary forest indicated is the sacred forest associated with the villages of Héké and Trahé, but people do not collect products or animals from these forests because access is restricted by the community itself. Fishing for subsistence and as a source of protein, takes place in streams and rivers. There is great pressure for land for subsistence agricultural development. Some medicinal plants are collected by villagers in the bush around villages and in the periphery of their plantations.

Plantation villages that took part in the PM are Baco 2, Koto 3 Koto 1 Dole 3 and Dole 1. The villages were chosen due to their proximity to the SOGB protected areas and it was a good way to discover whether they are making use of these protected areas. A young boy said that they do hunt at Koto 3, but he was quickly silenced by the elders. This does indicate that there is some hunting in the protected areas and the villagers know this is not permitted. In the other villages where PM took place, villagers all said that they do not hunt or collect forest products from these protected areas. They use the rubber plantations for collecting firewood. They practice fishing where they can, but this is for subsistence to supplement protein in diets. They have some fields close to the villages and these are for growing crops such as cassava and plantain.

Figure 7–2: Participatory mapping in Trahé village

7.2.1.2 Seasonal Calendar

A seasonal calendar was developed with the villagers which is also a method to stimulate discussions; the same calendar applies to all neighbouring and plantation villages. The calendar illustrates the following :

- December to March is the dry season;
- May to October is the wet season - water in rivers and water bodies has increased sediment loads and is “muddier”;
- Year-round activity - fishing but it is more productive in the dry season;
- Fires occur in the dry season – in small areas where fields are being prepared:
- January to March field are prepared:
- April to June is the planting season depending on the crops;
- April - crops are mostly harvested.
- May to July – shortage of produce and this is when it is most difficult to find food;
- May to October – villagers leave to find seasonal work; and
- April, Easter, June – September and December are school holidays.

People indicated that they do not collect medicines, fruit, food, nor construction materials from the forests because they are protected and very little is left. Firewood is collected from their or SOGB’s rubber plantations. Religious traditional ceremonies used to be practiced in January but now they take place when there is a celebration or a need. Initiation rites do not take place now as villagers are mostly either Christian or Muslim. Appendix B for the seasonal calendar which was developed.

7.2.1.3 Subsistence Farming

Workers purchase between 90-100% of their food and only grow 10% of their food. Neighbouring villages indicated the same percentages. They are dependent on cash crops (i.e., rubber, oil palm and some cocoa). Grand Djoro village was the exception that indicated that they produce 40% of their food requirements.

Figure 7–3: Palm fruit being processed to produce oil

The food crops are cassava, plantain and aubergine. Villagers mostly use slash and gather techniques with no burning (burning is forbidden). Permission has to be obtained from SOGB to farm within the SOGB concession.

The neighbouring communities do not burn their fields as they do not want to damage their cash crops.

Figure 7–4: Typical cassava field and plantain orchard

Very little animal husbandry is practiced and is restricted to small numbers of animals such as pigs, sheep, goats and chickens.

Figure 7–5: Pigs and chickens in villages

7.2.1.4 Hunting

Plantation villagers do not hunt as they are forbidden to go into the protected areas within the concession. The exception was Koto 3, where a boy during the participatory mapping said that they hunt but the elders quickly silenced him. During one of the night surveys the HCV herpetologist reported hearing a gunshot but no traps or footpaths were seen by any of the teams in protected areas.

Neighbouring villages do not hunt, the reason being that there are no longer any forests left for them to hunt in. This was supported by the Chiefs of Klotou and Grand Djoro who said that in the past they were 100% reliant on bushmeat, but that now they never eat it.

7.2.1.5 Fishing

Nine of the 13 neighbouring villages do some fishing. Grand Djoro and Oulibio rely on fishing for supporting their livelihoods. Two villages claimed that fishing was no longer good due to chemicals applied by SOGB and drainage structures that had been dug in the plantation. Four plantation village Chiefs indicated that there were one or two people going fishing, but the practice was not widespread.

Figure 7–6: Dugout canoe

7.2.1.6 Timber and Non-Timber Forest Products

Héké, Trahé, Klotou and Grand Djoro still have some closed canopy forests. Héké villagers still collect building materials from the forests (bamboo and raffia). Klotou has a sacred forest but one of their sacred trees has been removed by an illegal logger without their permission. Firewood is gathered from their own rubber plantations

and the SOGB plantation. The Irépoué and Tèklèbo village Chiefs indicated that they collect building materials from the SOGB protected forests which is not permitted and is a threat to the forests. Most neighbouring villagers collect non-timber forest products (NTFP) such as snails, mushrooms and nuts from their plantations and SOGB plantations not from forests.

Figure 7–7: Dried mushroom

All the plantation villagers that were interviewed say there are closed canopy forests near the village but they do not collect building materials from them as these are protected and it is prohibited to do so.

7.2.1.7 Traditional Medicine

Héké, Trahé, Djihimbo, Klotou, Irépoué, Téklèbo, Kako and Batcha villages have resident traditional healers. The traditional healers in Irépoué collect traditional medicines from the sacred forest whilst other villages said they need to buy or travel far to get them.

Figure 7–8: Bark from a tree used as an aphrodisiac

7.2.1.8 Land Tenure

Prior to the establishment of the plantation by the state in 1970, 13 neighbouring villages were displaced (1969). The land in the plantation villages is owned by Government and is held by SOGB as a lease as a concession agreement. In the neighbouring villages land is owned by the State, but the Chiefs and their subjects have informal and formal user rights. One chief of the Grand Djoro village said that they held the title deed of one part of the village, and they were in the process of getting a deed for the remaining part. In neighbouring villages land can be inherited and women can inherit land in certain circumstances if there is no male relative. There is no inheritance of land in plantation villages because heads of household are employees of SOGB who, with their families, vacate their houses when no longer employed.

7.2.1.9 Development Plans

Development initiatives are driven by SOGB in the plantation villages and include improved housing, water and sanitation, schools and health centres.

Since the compensation that was provided after the displacement of the neighbouring villages by the state in 1969 was later disputed, the villages have put pressure on the company to, in some way, compensate for the displacement. In order to accommodate these grievances, an agreement was made between the villages and SOGB to set up a development association to help guide new developments within the 13 neighbouring villages. The association is known as the Association of Displaced Villages (AVD) and was formed in 2008. Development plans are submitted by the AVD to SOGB for deliberation and funds are allocated for the successful plans in proportion to the amount of land which the village gave up for the Concession. Under this development scheme schools, clinics, boreholes, roads and the electrification of villages has taken place. From 2008 to date FCFA 682,309,483 has been invested by SOGB for the benefit of the displaced villages.

Government is actively working on a development plan for the Grand-Béréby Sub-prefecture focusing on agricultural development and tourism potential.

7.2.1.10 Population

Table 7–1 displays population figures for plantation villages (November 2018 SOGB data) and neighbouring villages (approximate numbers given by village Chiefs).

Table 7–1: Plantation and neighbouring village populations

Plantation Villages	Number of people
Total for all plantation villages	**25,101**
Number of employees	5,054
Number of dependants	19,813
Neighbouring Villages	**Number,of people (as reported by chiefs)**
Oulibio	77
Kako	14,000
Batcha	Unknown
Irépoué	500
Pataké	Unknown
Tèklèbo	Unknown
Djihimbo	1,277
Oulidié	250
Klotou	500
Trahé	2,700
Héké village	5,000
Oueoulo	6,000

Grand Djoro	392
Total for all neighbouring villages	**31,000**

Neighbouring village Chiefs reported natural population growth. In Oueoulo and Grand Djoro there is an influx of SOGB workers. All Chiefs said that there was immigration from Burkina Faso and the Economic Community of West African States (ECOWAS), mostly people looking for work. Plantation villagers said their populations fluctuated due to seasonal workers coming and leaving the villages. They also said that migrants come from within the country and from neighbouring countries.

7.2.1.11 Cultural Practice and Ethnicity

In the SOGB plantation villages the workers camp village leader is elected. In the neighbouring communities, chieftaincy is inherited. Plantation villages are ethnically diverse as people come from all over Côte d'Ivoire and ECOWAS and include the following ethnic groups Yacoubo, Guré, Bété, Agni, Gouro, and people from Burkina Faso, Togo, Liberia, Ghana, Benin. In the neighbouring communities the Kroumen, Mossi and Baoulé people are recognised as the original inhabitants, but these villages have also become more ethnically diverse due to in-migration of people looking for work on the plantation.

The plantation camps were created after the establishment of the plantation in 1969, Oueoulo was reported as the oldest village having been created in the 1600s and the youngest village was Djihimbo, it was created in 1950.

7.2.1.12 Religion

Although now mostly Muslim and Christian, the fact that some people still practice animism indicates that they have a syncretic belief system.

People are buried in cemeteries which are visited with permission from the village chief or village leaders. Eight of the 13 villages indicated that there were traditional doctors in their village. They indicated that they collect medicines from around the village in the plantations and in the sacred forests they also said that some traditional doctors purchase their medicines or must travel far to collect these.

7.2.1.13 Sacred Sites and Traditional Ceremonies

Most villages indicated that they had sacred sites, the exception being Oulibio and Batcha. Djihimbo, Kako, Héké, Oulidié Trahé and Oueoulo villages have sites that are now in the concession.

Access to all sites are restricted to secret societies and the initiated only; women and outsiders of the community may not visit the sites.

Figure 7–9: Sacred stone found in Grand Djoro Village (left) & the sacred tree at Oulidie (right)

Héké and Trahé villagers said that a committee of 10 peoples and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) German development corporation staff are responsible for looking after the sacred forest. Djihimbo villagers said that SOGB is responsible for looking after their sites.

The villagers of Héké, Trahé, Djihimbo, Klotou, Grand Djoro, Oueoulo, Irépoué, Téklèbo still practice traditional ceremonies (e.g., burials, weddings and celebrations). Traditional ceremonies are not held in the plantation villages, but some may take place in workers home villages.

7.2.1.14 Historic Sites

No historic sites were reported by plantation villagers. Yorobodoha Mountain at Dole 3 (within the concession) was reported to have historical significance by Batcha villagers. Héké villagers mentioned a waterfall within the concession, which was of historic value. Grand Djoro said that the old villages which were within the concession were historical sites (e.g., Para village where an old soldier named Klé was buried, where this strong warrior used to bath and get prepared to fight his enemies). Villagers reported that historic sites in the concession have been destroyed. None of these sites have Government recognition. Refer to Section 10 for details on next steps.

7.2.1.15 Education

Within the plantation there are 11 primary schools and one kindergarten. There is also a secondary school at Oueoulo. There is one college or high school at Oueoulo, but this is a private school.

7.2.1.16 Transport

Modes of transport include (in order of prevalence): motorbikes, cars and pickup trucks. SOGB provides transport for its workers.

7.2.1.17 Housing

Houses in all plantation villages are brick-and-mortar. Houses in neighbouring villages are a mixture of brick and mortar and wooden structures.

Figure 7–10: Brick structures at Kako (left) and typical mud, wood and raffia houses from a neighbouring village (right)

7.2.1.18 Drinking Water

SOGB supplies borehole water to plantation villages; villagers indicated that there is enough water, the supply is regular and it is safe to drink.

Neighbouring villages are supplied with borehole water. Oulidié villagers collect water from swampy areas where the water is muddy due to SOGBs activities (refer to 8.2.1.7.1). All the neighbouring villages indicated that the water is not good to drink as it makes them ill and they often get diarrhoea. The boreholes were installed as an AVD project, so financed by SOGB. The contractor must have been the same as for the SOGB boreholes. Testing for quality was not part of the arrangement, but the company is assessing if these boreholes can be tested when those of SOGB are tested.

Plantations boreholes are tested annually. Reports can be provided. If any results are off, corrective actions are taken.

Trahé and Héké villages claimed that SOGB uses chemicals and this makes them sick. This needs to be confirmed or refuted by SOGB with water quality testing. Some villagers also claimed that SOGB is polluting the rivers, this is unlikely due to the volumes of water flowing down these rivers providing enough dilution, but this should also be confirmed through water quality testing.

Trahé and Héké are both upstream from SOGB. Any issues in the water would come from somewhere else. People need to be made aware that drinking river water, that other people and animals use upstream, can be dangerous if not treated before use.

Water is being tested in all major rivers where the river enters and exits the concession. An analysis of the water quality is presented in the riverine section of this report (refer to 8.2.1.7.1)..

Figure 7–11: Water collection at Héké village

The villager in Figure 7-11 was interviewed; she reported that when the borehole in Héké is not working, water is collected from the river where animals drink, people bath and wash their clothes.

7.2.1.19 Health

Each plantation village has a health post to treat minor ailments. There is a hospital at SOGB (ZIR), next to the head office, which is open to all villages. Together with the clinics in the plantations villages it had 100,000 consultations last year, and delivered 500 babies. It is also a HIV reference hospital, supported by the Elisabeth Glazer foundation. Tabou and Grand Béréby have State hospitals but people will go as far as San Pedro for medical care.

Figure 7–12: Health centre at Kako

7.2.1.20 Energy

All plantation villages have electricity for lighting and firewood is used for cooking. Kloto, Héké, and Oueoulo have electricity, the other villages use solar panels installed by SOGB under AVD Protocol of Agreement and torches for lighting and firewood for cooking.

Figure 7–13: Rubber wood pile for cooking purposes

7.2.1.21 Sanitation

In the plantation villages pit latrines are provided, some are older wooden structures and others are improved brick structures. The neighbouring communities all have basic timber pit latrines, but there are too few for the number of houses.

7.2.1.22 Waste Disposal

In the plantation villages waste is disposed of at collection points and SOGB removes the waste for final disposal at a disposal site. Neighbouring villages do not have a formal waste disposal system and waste is generally disposed of at the back of the houses or on the streets.

7.2.1.23 Services

The closest police stations and libraries are at Tabou and San Pedro. The closest market and supermarket are in Tiépé (part of the ZIR), SOGB where there is also a bank with an ATM.

7.2.1.24 Vulnerable Groups and Village Organisations

Villagers referred to widows and orphans as being vulnerable, but the Chiefs indicated that there were only one or two individuals. Woman's groups include savings groups and agriculture groups. NGOs are not active in the villages.

7.2.2 HCV 4: Ecosystem Services in Critical Situations

The neighbouring communities are reliant on ecosystem services for drinking water and soil for agricultural practices as they are predominantly cash crop and subsistence farmers. Plantation villagers also practice some agriculture within the concession to supplement the income they receive from SOGB.

Table 7–2: HCV 4 Matrix

HCV 4	Presence in AOI	Reason
Protection of water catchments	Present	The catchment is providing critical ecosystem services such as drinking water and providing fish habitat which are utilsied as a protein source.
Control of erosion of	Present	There are some areas of exposed soil in the AOI and erosion can be seen

HCV 4	Presence in AOI	Reason
vulnerable soils and slopes.		from satellite images. SOGB has a programme in place to address soil erosion where it occurs within the concession.
Floodplains and wetlands	Present: Lowland watercourses such as the Dodo River, and Gnebouagbo River. Swamp habitats were also delineted in the AoI.	Floodplains and flooding dependent systems present. Wetlands were also located in the AOI in the form of headwater/lowland swamp systems.
Riparian forests	Present: Not widely distributed but associated with the Dodo and Gnebouagbo Rivers, streams in the protected areas, wetlands and steep slopes with associated streams/swamps.	Observed and delineated on site.
Un-leveed floodplains	Present: Larlgey located to the downstream region of the AOI.	Observed and documented in the AOI.
Areas with a critical recharging effect on aquafers used for potable water	Present: The AOI forms the central region of the Dodo River catchment, a key water resource in the coastal region.	Observed and documented in the AOI.
High surface water yield areas	Present: The Dodo River can be considered a major water resource.	The region is located in a tropical climate and therefore high water yield areas are common throughout the region. No continuous mountainous regions were observed in the AOI. Despite this, considering that the Dodo River is a primary watercourse in the region it is considered of importance.
Vegetated areas upstream of critical water supplies	Absent.	Not unique/uncommon. The upstream region of the Dodo River has largely been altered by small scale agricultural activities compounded by general land cover alteration.
Areas in a savannah-forest transition landscape preventing the spread of fires	Present	Observed
Existing vegetation barriers against wind erosion and extreme weather events	Present	Observed

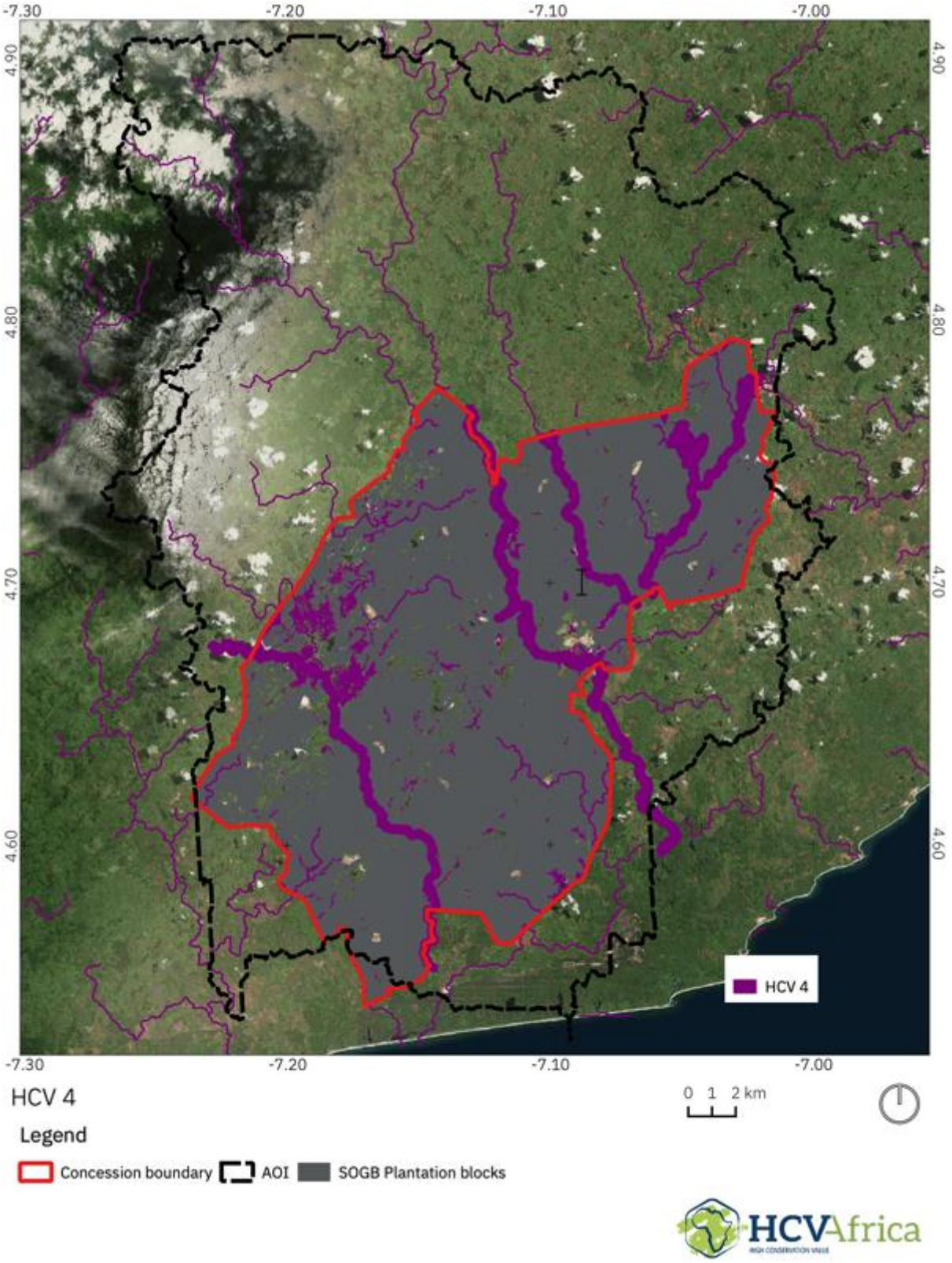


Figure 7–14: HCV 4 areas

7.2.3 HCV 5: Local People's Basic Needs

HCV 5 relates to the sites and resources that are fundamental to satisfying the basic needs of local communities (e.g., food, freshwater, wood, fibre and fuel).

Findings of the HCV 5 assessment is summarised in Table 7-3. Based on the findings of the social surveys, community engagement and field surveys, HCV Africa determined that HCV 5 is absent except for drinking, based on the following:

- Very few food crops are grown in clearings and buffer areas people are reliant on purchasing most of their food from money earned from cash crops and wages;
- Houses and other structures are not constructed using materials gathered from the forest and bush, this is limited use of raffia for roofing and bamboo;
- Wood is gathered from rubber plantations, not from forested or bushy areas;
- Surface water is used for domestic purposes (drinking and cooking) and some is used for washing (laundry and personal hygiene), domestic animals use the same sources;
- Some use is made of plants for medicinal purposes (for minor injuries and sickness) this is gathered from the forested areas and some is collected elsewhere or is bought, conventional medicine is more prevalent;
- Almost no hunting is practiced as very little forest remains and those that do remain are protected; and
- Fishing is practiced, but this is by a few individuals and only the villages of Grand Djoro and Oulibio mentioned fishing as part of the villager's livelihood. However, rivers and water bodies have been delineated as HCV 4 anyway as these areas need to be protected.

Table 7–3: HCV 5 Matrix

HCV 5	Presence in AOI	Finding
Water sources necessary for access to basic drinking water and sanitation	Present	Neighbouring villages use surface water when boreholes break down.
Freshwater animal populations relied upon by local communities	Absent: All watercourses	Fishing was only mentioned by Grand Djoro villagers as part of their livelihood strategy this is outside the concession. It is important to note that the watercourse in AOI supports downstream fishing communities. Furthermore, estuarine fish were observed in the concession which indicates that fisheries in the coastal region is supported by the watercourses in the concession. The freshwater ecology studies confirms this, whereby limited netting was noted in the plantation. However, artisanal fishing methods were observed whereby hook-line angling and basket trapping were noted to occur (Figure 8–49).
Clothing	Absent	Neighbouring and plantation villagers are not making use of the environment to produce clothing.
Material for building and tools	Absent	Héké villagers indicated that they still collect building materials.
Firewood	Absent	Both neighbouring and plantation villagers collect firewood from rubber plantations for cooking

		food.
NTFP	Absent	NTFP are collected but the communities are not dependant on them.
Bushmeat	Absent	None of the villagers said that they practice hunting.
Medicine	Present	Some collection of medicinal plants does occur, but communities are not dependant on this as conventional medicine exists as an available alternative.
Fodder for livestock	Absent	Very little livestock is kept and grazing is restricted to around villages

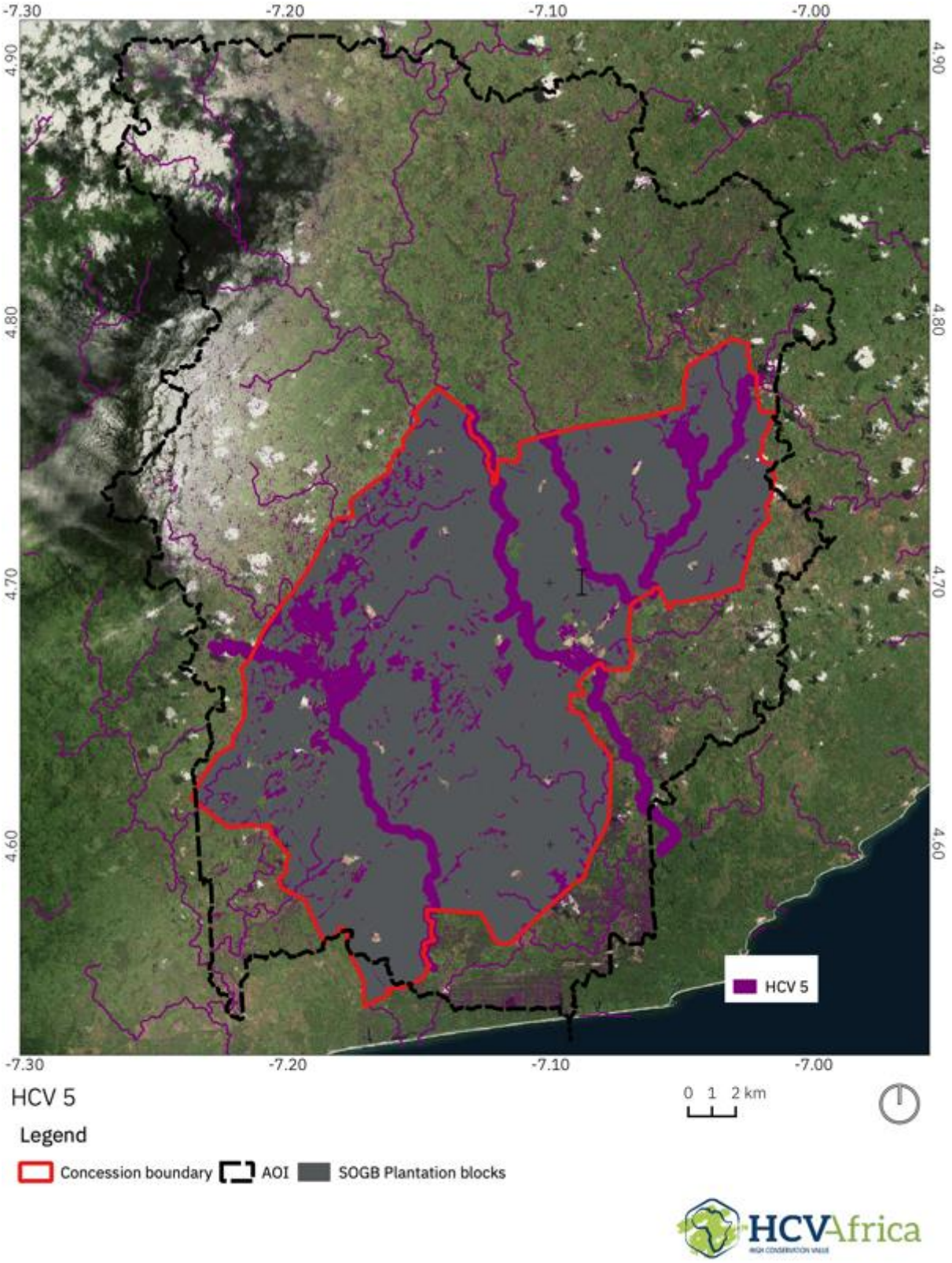


Figure 7–15: HCV 5 areas

7.2.4 HCV 6: Cultural Values

HCV 6 incorporates sites, resources, habitats and landscapes of global/national cultural, archaeological, economic or religious significance; and /or critical cultural, ecological, economic or religious/sacred importance for traditional cultures.

Based on the findings of the community engagement and field surveys, HCV Africa determined that HCV 6 is present in the concession, based on the following (Table 7-4):

- The general landscape, forests and natural resources give the communities a sense of place;
- Community livelihoods and their very existence is inextricably linked to the natural environment;
- Graveyards are present in villages;
- The communities are mostly Christians and Muslim and hold Christian and Muslim values and traditions which are not associated with the land/forests;
- However, most villagers also said that they also practice animism indicating that they have a syncretic belief system which allows them to principally be Christian or Muslim but still hold on to traditional beliefs; and
- All neighbouring villages indicated that they have sacred sites some of which are within the concession.

Please note that the sacred sites as mentioned by neighbouring villages were mapped as accurately as possible according to the understanding of the social specialist. Many of these sites can't be accessed without permission from chiefs and sacred site keepers. Access to all sites are restricted to secret societies and the initiated only; women and outsiders of the community may not visit the sites. It is therefore recommended that a heritage impact assessment be conducted with the required permission to ensure the location of all historic and sacred sites.

Table 7–4: HCV 6 Matrix

HCV 6	Presence in AOI	Finding
UNESCO cultural heritage sites	Absent	There are no areas of high conservation value of global significance in the AOI
Sites with a national status	Absent	
Sites with religious/sacred/traditional/ cultural significance for rituals,	Present	Most neighbouring villages indicated that they have sacred sites, Oulibi and Batcha being the exceptions.
Historical significance	Present	The historical sites mentioned by neighbouring villagers need to be confirmed if these are of historical significance and will require a separate cultural heritage assessment.
Collection of ingredients necessary for rituals and festivals, important for traditional identity.	Absent	Villagers, when asked, did not mention any specific ingredients for festivals or rituals. These were not mentioned in any of the engagements.

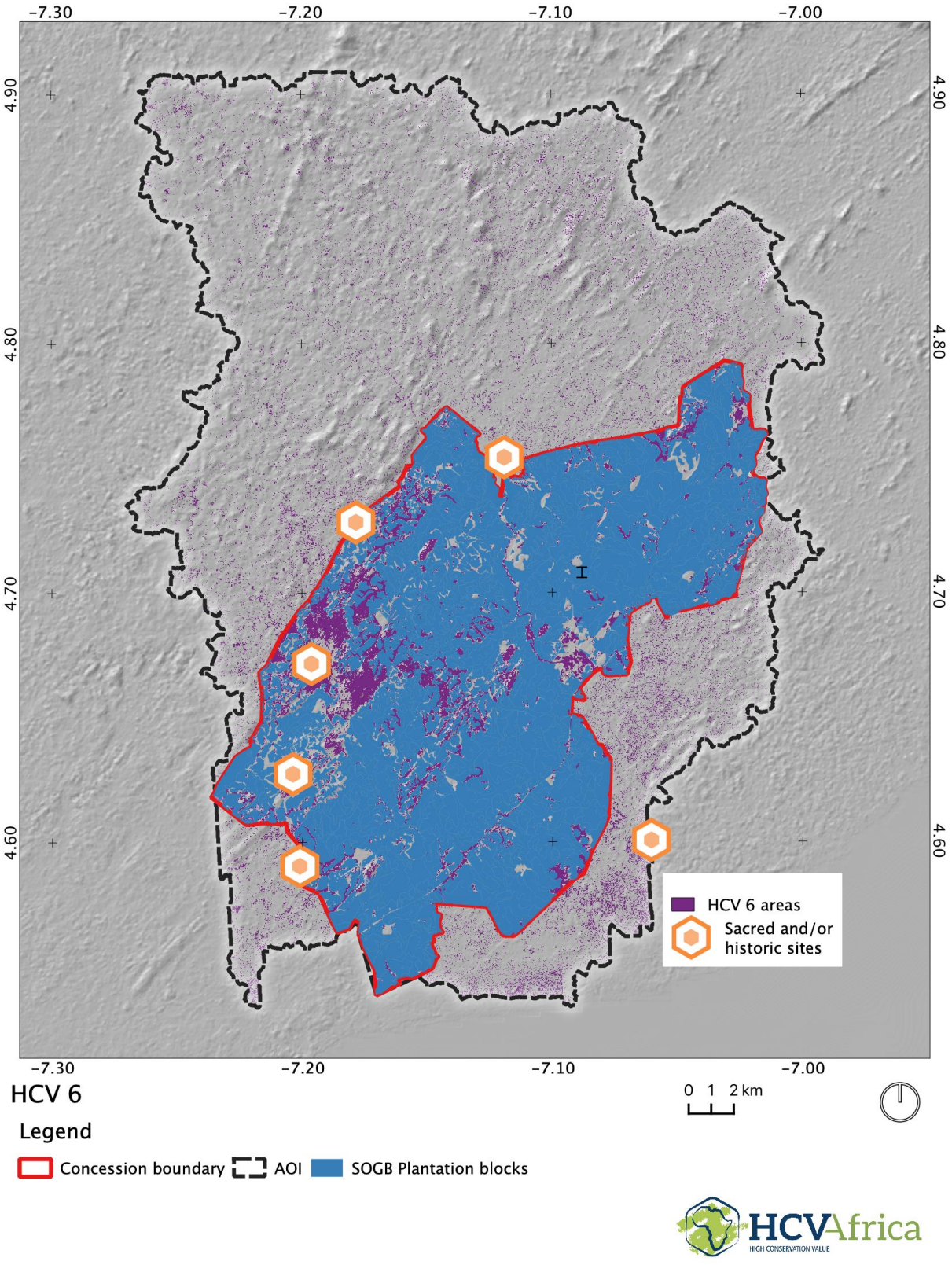


Figure 7–16: HCV 6 areas

8 Environmental Section: Methods and Results

8.1 Environmental Methods

8.1.1 Literature Review and Use of Secondary Data

8.1.1.1 Botany

Existing spatial datasets representing important terrestrial ecological entities that intersect the AOI were analysed in a Geographic Information System (GIS) and included:

- A new land cover map of Africa for the year 2000 (Mayaux et al., 2004);
- GlobCover 2009 land cover map (Arino et al., 2012);
- A New Map of Standardized Terrestrial Ecosystems of Africa (Sayre et al., 2013);
- Terrestrial ecoregions of the world: a new map of life on Earth (Olson et al., 2001); and
- Spatial datasets for distribution of plant species according to the International Union for the Conservation of Nature (IUCN) (IUCN, 2019).

A literature review (including the information retrieved through GIS) was conducted to identify habitats and ecosystems associated with the AOI. Potential plant species of conservation concern (SCC) were identified by cross-referencing records retrieved from the Global Biodiversity Information Facility (GBIF) database with IUCN threatened[4] and near-threatened[5] species with known distributions in Côte d'Ivoire. The GBIF database provides point-based distribution data. However, many areas in Côte d'Ivoire are poorly sampled for flora so limiting the database query to the AOI could result in plant species diversity being underestimated. For this reason, the expected species list was drawn from a larger area. The GBIF was set to query all plant records for Côte d'Ivoire.

Using larger areas (beyond the AOI) to search databases increases the likelihood of obtaining a comprehensive species list in places where sampling has been poor, but it also inflates the expected number of species and include habitats that may not be present in the AOI. To counteract this limitation, the expected species list was refined by the botanist once fieldwork had been completed (i.e., when the botanist had a good understanding of the habitat types and quality; species-specific habitat requirements; and had the knowledge to refine the list that was realistic).

The following reports and databases were also consulted:

- KEW plant database[6]
- West African Plants- A photo Guide[7];
- Plant Resources of Tropical Africa (PROTA) database[8]; and
- International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN, 2019).

8.1.1.2 Fungi

The main data sources for identification of fungi was as follows:

[4] Species categorised as Critically Endangered, Endangered or Vulnerable on the IUCN Red List

[5] Species either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme

[6] http://www.kew.org/

[7] http://www.westafricanplants.senckenberg.de/root/index.php

[8] http://www.prota.org/

- Ainsworth & Bisby's dictionary of the fungi (Kirk et al, 2008);
- Field Guide to Mushrooms and other Fungi of South Africa (Goldman & Gryzenhout, 2019);
- MushroomExpert (Kuo, 2020); and
- The MycoBank engine and related databases (Robert et al, 2005)

8.1.1.3 Mammals & Avifauna

Prior to fieldwork a desktop research was conducted on the available literature for the region and its potentially occurring species. Key literary sources included:

- Sinclair and Ryan (2010), primarily for distribution and taxonomic ordering but also habitat preferences and migratory status.
- Fishpool (2001), for information on biome-restricted species and general information on the country's birdlife.
- Avibase[9] for the national inventory upon which the taxonomy and nomenclature were based.
- The IUCN Red List of threatened species (IUCN, 2019, v.3), for the conservation status and nomenclature of the various species.
- National Interpretation of the Principles and Criteria of the RSPO Standard for Sustainable Production of Palm Oil in Côte d'Ivoire (RSPO, 2019).

8.1.1.4 Herpetofauna

Côte d'Ivoire has a relatively good information base for herpetofauna when compared to other African countries. Sources of information used for the herpetofauna study comprised:

- The recent publication on the amphibians of Africa provides crucial information for non-Hylidae amphibians and includes updated taxonomy (Channing & Rödel, 2019);
- Electronic databases for reptiles (The Reptile Database; Uetz et al., 2019) and amphibians (AmphibiaWeb, 2019);
- The International Union for Conservation of Nature (IUCN) Red List (IUCN, 2019); and
- Specific reports/sources such as for frogs (Schiøtz, 1999); for tortoises and terrapins (Branch, 2012; Rhodin et al., 2017); for snakes (Chippaux, 2006 and Trape & Mane, 2006) and for lizards (Trape et al., 2012).

8.1.1.5 Freshwater Ecology

The study area has been surveyed for fish fauna by Kamelan et al. (2013), this data was utilised to conduct a literature review of the expected species. Furthermore, the comprehensive field guides by Paugy et al. (2003a;b) were utilised to assess the expected species. IUCN (IUCN, 2020) data were utilised to obtain spatial distribution of Odonata and Fish for the AOI.

8.1.2 Environmental Fieldwork

8.1.2.1 Botany

The AOI was traversed by vehicle and on foot between the 18th and the 21st of November 2019. Based on preliminary interpretation of satellite imagery during the scoping phase, sample sites were randomly stratified in the remaining natural areas of the Concession (i.e., areas that the botanist perceived as being ecologically sensitive based on the scoping phase findings, which mainly included dense forest in the SOGB protected areas). Navigation to each of the sample sites was done with the support of the eco-rangers employed by SOGB. The focus of the field survey was to obtain coverage and navigate to as many target areas as time and access permitted.

[9] https://avibase.bsc-eoc.org/avibase.jsp?lang=EN

Systematic and/or random sampling techniques often fail to provide sufficient information and lack reliable means of determining or detecting the presence of rare and/or SCC (Goff et al., 1982; Kershaw et al., 2016). To mitigate the potential for under-sampling SCC, due to limitations associated with plot sampling methods, random meanders in habitats leading to the target sample sites were carried out in order to search for plant SCC and analyse floristic diversity.

The random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. The method is time- and cost-effective, highly suited to compiling flora species lists and gives a rapid indication of flora diversity (Goff et al., 1982; Kershaw et al., 2016). The following were recorded during field surveys:

- Canopy cover assessment at each of the target sites;
- Information about current impacts (e.g., logging, slash and burn agriculture, charcoal);
- Lists of dominant vegetation species; and
- Types of sensitive features (e.g., streams, restricted habitat types).

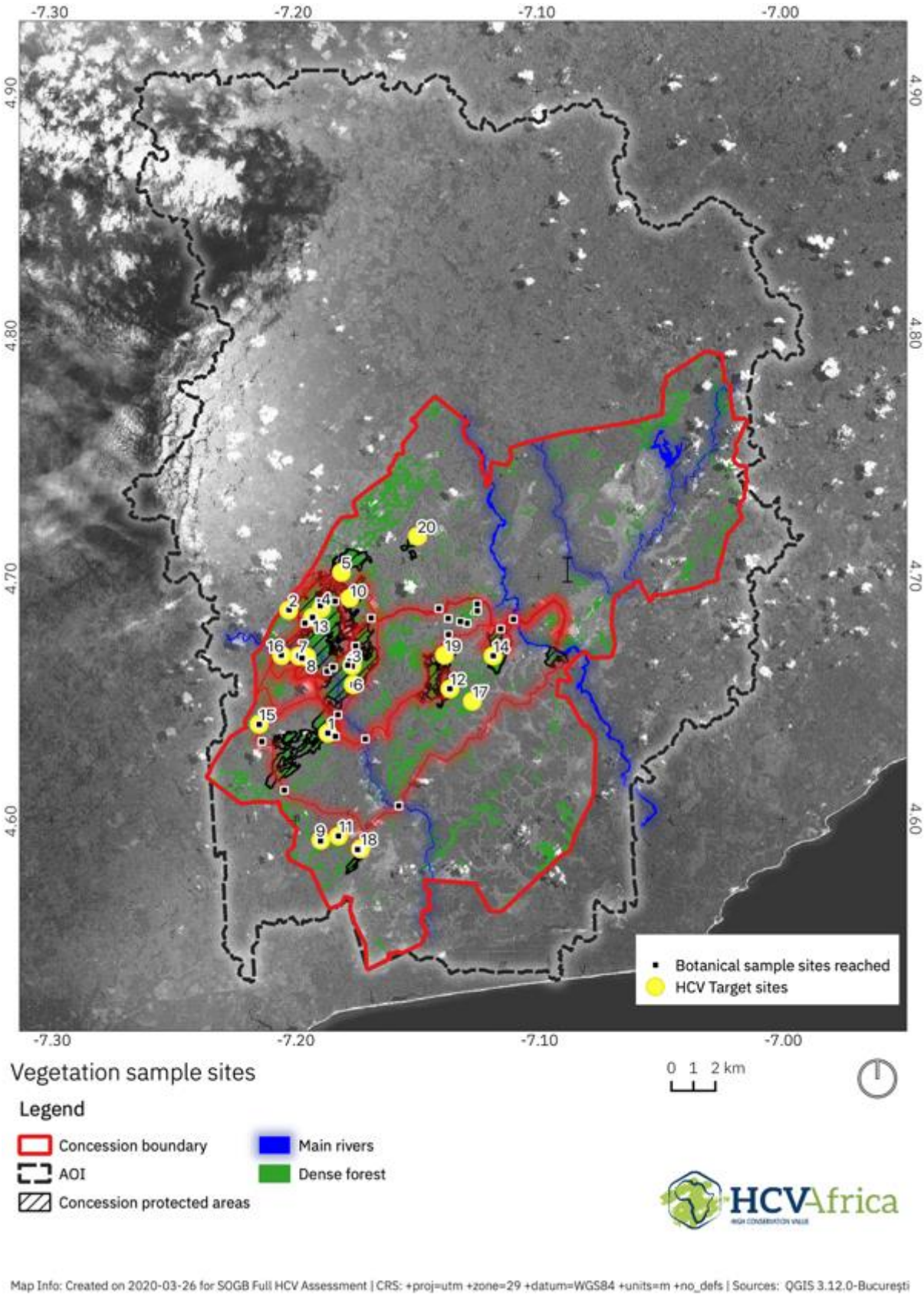


Figure 8–1: Botanical sampling sites

8.1.2.1.1.1 *GIS Analysis and Habitat Mapping*

A combination of methods was used to map habitats in the AOI including:

- Use of recent multispectral satellite imagery to differentiate between vegetation cover differences;
- Use of the Shuttle Radar Topography Mission (SRTM) digital elevation model (DEM) for terrain analysis;
- Use of existing spatial datasets of the region;
- Field observations and in situ data collection; and
- Literature review.

HCV requires a fine-scale classification to delineate different habitats, so a tiered approach is followed whereby land cover is combined with terrain modelling to derive habitats. The tier 1 land cover mapping is done through the Earth Engine portal. Sentinel satellite imagery (from the European Space Agency [ESA]) and a Digital Elevation Model (DEM) (from the National Aeronautics and Space Administration [NASA] [SRTM, v3.0, 1 arcsec resolution]) is used to perform the initial modelling via Earth Engine. A basic terrain analysis is performed on the DEM that encompasses slope and channel network analyses to detect hillslopes, lowlands and potential drainage lines. Drainage channels produced from the DEM are classified according to their branching complexity or Strahler Order (Strahler, 1957) and average slope in order to differentiate streams from rivers and slow from fast flowing channels.

Supervised classification is performed by defining regions of interest (ROI) and performing a random forest classification to derive a tier 1 land cover delineation. The resulting land cover is interpreted in conjunction with the results from the terrain analysis in order to derive a tier 2 habitat delineation. Additional tiers of habitat classification are performed where necessary to reflect potential micro-habitats.

8.1.2.1.1.2 *Habitat quality*

Habitats for this assessment are assessed and classified into two parent categories namely “Natural” and “Modified” habitats and follows the definitions used by the IFC (IFC GN6 (2019)[10]):

- Natural habitats as “areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area’s primary ecological functions and species composition”; and
- Modified habitats are “areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area’s primary ecological functions and species composition”.

In line with the IFC definitions, all areas in the AOI comprise obvious secondary regrowth (e.g., pioneer bush that has grown after forest clearance) and were assigned to modified habitats. In addition, natural habitats are assigned a qualitative disturbance level ranging from Very Low to Very High (Table 8–1: Qualitative disturbance categories with associated forest conditions (adapted from Tchouto (2004))). The rationale behind this is to identify natural habitats that may be vulnerable to conversion into modified habitat.

Table 8–1: Qualitative disturbance categories with associated forest conditions (adapted from Tchouto (2004))

Disturbance class	Forest/Stream condition	Summary description
Very low	Excellent	Virtually undisturbed
Low	Good	Less than 25% disturbed
Moderate	Slightly degraded	25-50% disturbed
High	Mostly degraded	More than 50% disturbed
Very high	Very poor	Farmland and/or areas close to being modified

[10] Guidance Note 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2019)

Disturbance levels, where applicable for these habitats were indicated on a five-point scale from 1-5 and assigned taking into account the dominant land cover for that habitat.

8.1.2.2 Fungi

Sampling was done by documenting fungal morphology and taking spore prints.

8.1.2.3 Mammals and Avifauna Survey

Fieldwork was conducted during the end of the short rainy season wet season (19-23 November 2019). Surveys involved a combination of both active (point counts, opportunistic sampling and live trapping) and passive (motion cameras and acoustic surveys) sampling techniques. The conservation status of present and potentially occurring species was based on the IUCN Red List of threatened species (IUCN, 2019).

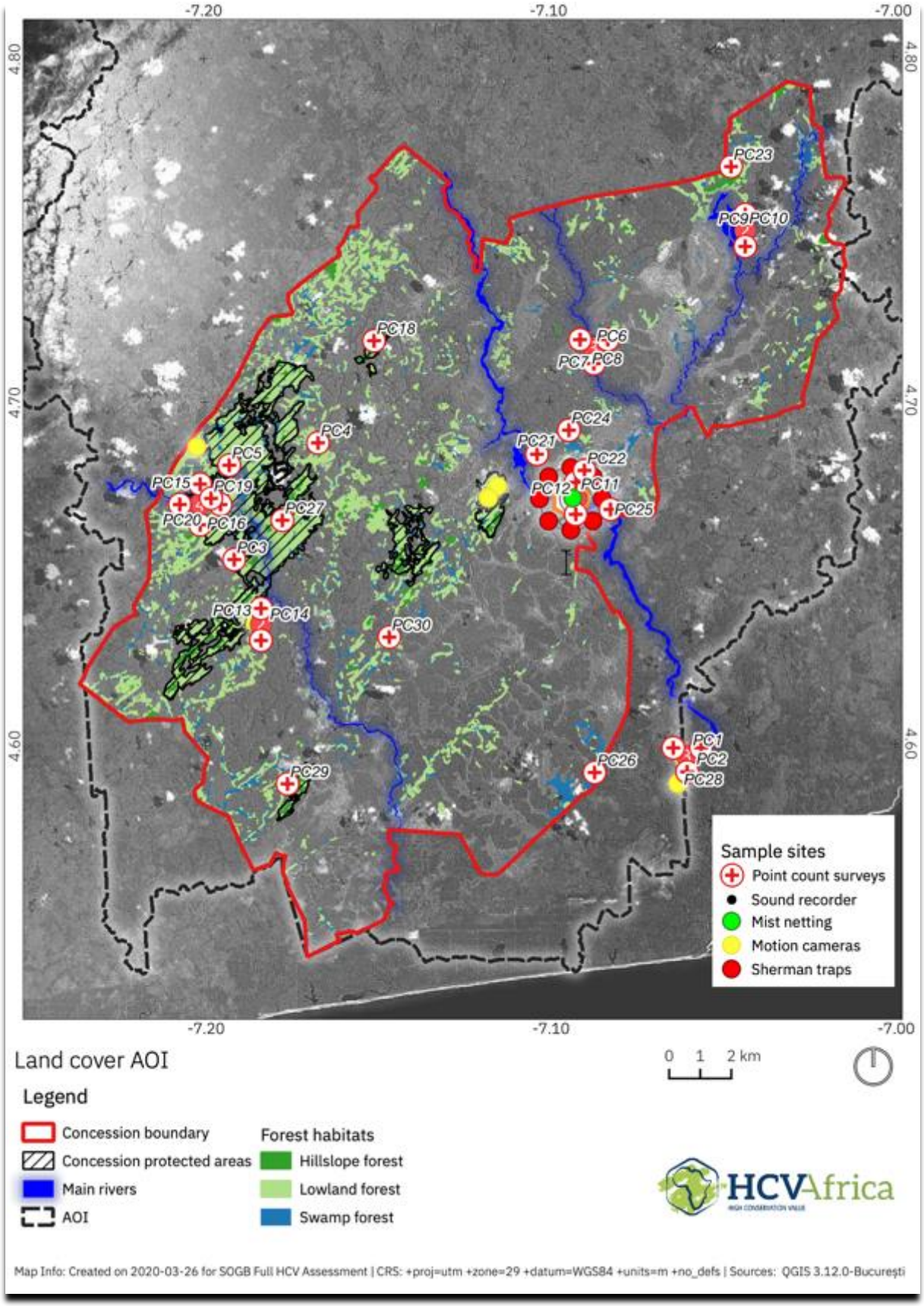


Figure 8–2: Mammal and Avifauna field survey points

Figure 8–3: Examples of some of the active and passive sampling techniques employed during the field survey; A) mist netting for bats; B) canoe based river surveys, C) sherman traps D, E, F, G) motion-sensitive camera traps, H) searching for signs such as discarded fruit and I) tracking.

8.1.2.3.1 Mammal Survey

8.1.2.3.1.1 *Opportunistic Sampling*

Between checking traps most of the mammal survey time was spent actively searching for species, particularly SCC, by looking in key habitats (otherwise known as target species searches). Incidental observations were made while traversing the site. Mammals were detected through visual observations (e.g., tracks, droppings, and burrows). Spotlighting during slow night drives was used to detect crepuscular and nocturnal species.

8.1.2.3.1.2 *Live Trapping*

Live trapping was conducted for small mammals using Sherman traps. Trapping of small mammals was conducted at three sites within the project area. Traps were installed at locations considered to be representative of the dominant habitat types in the concession area and where trapping success was expected to be highest. The small mammal trapping sites consisted of a series of 10 collapsible stainless-steel Sherman traps, spaced at approximately 10 m intervals. Each Sherman trap was baited (daily, if necessary) with a mixture of peanut butter, oats, canola oil and syrup and covered by plant material to provide shade.

8.1.2.3.1.3 *Passive Sampling*

Passive sampling involved the use of motion sensitive cameras and acoustic recordings at various locations within the project area. Motion-sensitive cameras were deployed along paths, streams and road junctions deemed likely to channel local wildlife to detect shy, cryptic and / or elusive species. Cameras were baited.

Acoustic sampling for bats was conducted at three locations within the project area. Echolocation calls were recorded using an Echo Meter Touch 2 Pro ultra-sonic bat detector (Wildlife Acoustics, Inc., USA). The Kaleidoscope software package (Wildlife Acoustics Inc., USA) was used to convert WAV files to the Zero Crossing

(ZC) file format required for further analysis. Calls were analysed using ANALOOK software (for specific frequency parameters) and Avisoft Lab Lite (for visual analysis of call structure and the production of spectrograms).

8.1.2.3.2 Avifauna Survey

8.1.2.3.2.1 *Fieldwork*

Sampling consisted of standardized point counts and random diurnal and nocturnal incidental surveys. Standardised point counts were conducted to gather data on the species composition and relative abundance of species within the three broad habitat types identified within the concession (Buckland et al. 1993).

Each point count ran over a 5 min period. The horizontal detection limit was set a 50 m. At each point the observer documented the date, start time and end time, habitat, numbers of each species, detection method (seen or heard), behaviour (perched or flying) and flight direction and general notes on habitat and nesting suitability for conservation important species. To supplement the species inventory with cryptic and elusive species that may not have been detected during the rigid point count protocol, diurnal and nocturnal incidental searches were conducted. This involved the opportunistic sampling of species between point count periods, river scanning, spotlighting and road cruising.

8.1.2.3.2.2 *Data Analysis*

Point count data was arranged into a matrix with point count samples in rows and species in columns. The table formed the basis of the subsequent statistical analyses. The data was used as follows:

1. To generate a species accumulation curve to assess sampling adequacy. Random accumulation was assumed over 100 permutations;
2. To distinguish similarities / differences in the species composition between the four identified avifaunal habitats, the matrix was converted into a Bray-Curtis dissimilarity matrix; the matrix was used to generate a two-axis non-metric multidimensional scaling (NMDS) ordination; and
3. Count data were used to establish dominant species and calculate the diversity of each habitat. Shannon's Diversity Index H was the metric used to estimate diversity. All statistical analyses were performed in the R statistical environment.

8.1.2.4 Herpetofauna

The majority of the Concession was accessible during the day and each of the different habitat types observed was also sampled at night. A total of 16 diurnal and 12 nocturnal point samples were completed for the habitat types within the Concession (Figure 8–4). The specialist considers the coverage to be sufficient to interpret the habitat types in terms of herpetofauna and classify these habitats according to the HCV criteria.

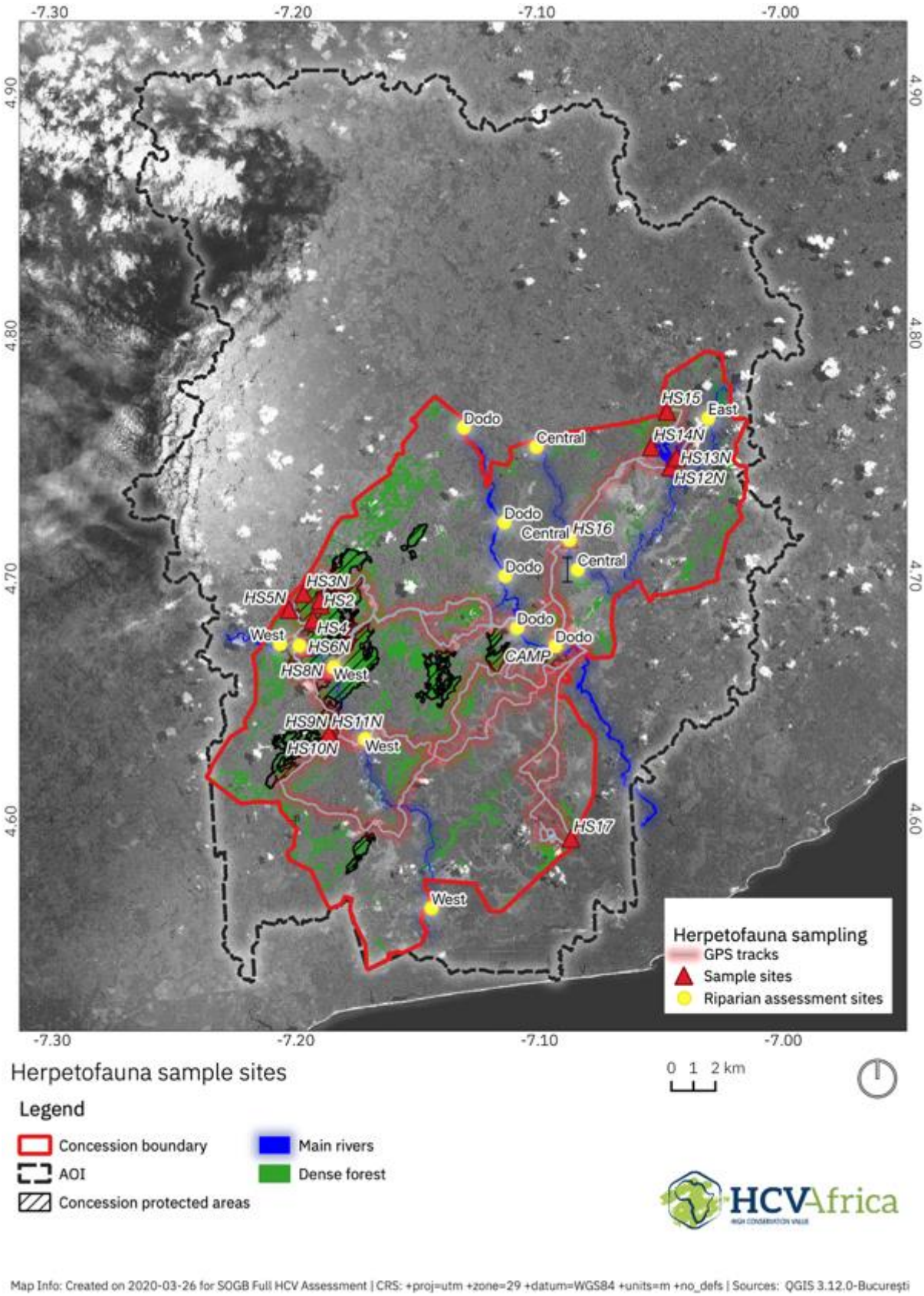


Figure 8–4: Herpetofauna sampling sites

8.1.2.4.1.1 *Active Searching*

Foot surveys were carried out on site to search for reptiles and amphibians, both during the day and at night. Specific sample sites were targeted based on habitat differences and point sample data were collected. For each sample site photographs were taken and the habitat was documented.

Active searching for herpetofauna at each sample site involved:

- Photographing active reptiles from a distance with a telephoto lens;
- Lifting up and searching under debris, rocks or logs (rocks and logs were always returned to their original positions);
- Raking through leaf litter to disturb and detect both active and resting herpetofauna;
- Scanning for any signs of reptiles such as shed skins, the positive identification of which was taken as an observation of that species;
- Netting in aquatic habitats to capture amphibians (including tadpoles);
- Searching at night with torchlight for active and sleeping herpetofauna;
- Acoustic detection of frogs (for most species, males call to attract females and these species-specific calls can be used to identify frogs without the need to capture them); and
- Catching selected herpetofauna by hand (necessary in many cases for accurate identification).

8.1.2.4.1.2 *Opportunistic Sampling*

Reptiles, especially snakes, are very elusive and difficult to observe, so every possible opportunity to observe reptiles was taken in order to augment the standard sampling procedures described in 8.1.2.4.1.1 above. Opportunistic sampling included:

- During driving between sampling sites, the road and road verges were scanned for active and dead reptiles (road collisions). Driving speeds were slow to increase the likelihood of a successful observation; when herpetofauna were observed the driver stopped to enable the specialist to capture and/or photograph the species;
- The aquatic specialist was given the task of opportunistically collecting any adult amphibians or tadpoles during the fish and invertebrate sampling procedures (the aquatic specialist used methods such as electro-shocking and netting);
- All staff members on site and biodiversity specialists opportunistically took photographs of reptiles and amphibians that were seen in the Concession. These images were copied by the specialist so that species could be identified and added to the list of random observations. Where necessary, a geographic coordinate of the observation was obtained; and
- All previous herpetofauna studies performed within or adjacent to the Concession were carefully reviewed and any point locality data provided was georeferenced and included in the final dataset.

8.1.2.4.1.3 *Weather Monitoring*

All herpetofauna are ectothermic and their behaviour is heavily influenced by temperature and rainfall, so it is prescient to present herpetofauna survey data in the context of the prevailing weather conditions at the time of the field surveys. Two Hygrochron iButtons were deployed in the garden of the guesthouse (which is approximately in the centre of the Concession) to record the temperature and relative humidity at 30-minute intervals (Figure 8–5). The iButtons were placed inside inverted ventilated paper cups in the shade of dense trees to protect them against the effects of rain and direct solar radiation.

Figure 8–5: The two Hygrochron iButtons deployed to monitor the weather for the Concession during the herpetofauna survey

8.1.2.5 Aquatic Ecology

Waterbodies which are more likely to be directly affected by the plantation activities were prioritised over those that may be indirectly affected. Watershed delineations were completed using the SRTM DEM rasters and standard ARCGIS (v10.5) hydrology toolbox applications. The directly affected watersheds were selected for the assessment and delineation of the aquatic ecology AOI. The rationale of this was that larger order waterbodies are more resilient to change and have largely homogenous biological compositions. Timeframes for this study would not allow for the detailed assessment of larger watercourses, which typically require the use of set gill nets. Thus, the larger (>6th order) watercourses downstream of the concession were selected as the spatial endpoints for the assessment. The site selection criteria were further supported by the availability of data (Kamelan et al., 2013) with regards to the fish community distributions of the larger watercourses.

The ecological conditions of the rivers were established through the use of various fauna sampling and habitat observation points (one point can serve both purposes).

Sampling points were established in line with the watercourse descriptors presented in Table 6–2. The outcomes of such methods allow for the extrapolation of results to areas of similar habitat structure which is important for the HCV delineations. 29 sampling points and 32 observation points were surveyed during the two survey periods (Figure 8–6).

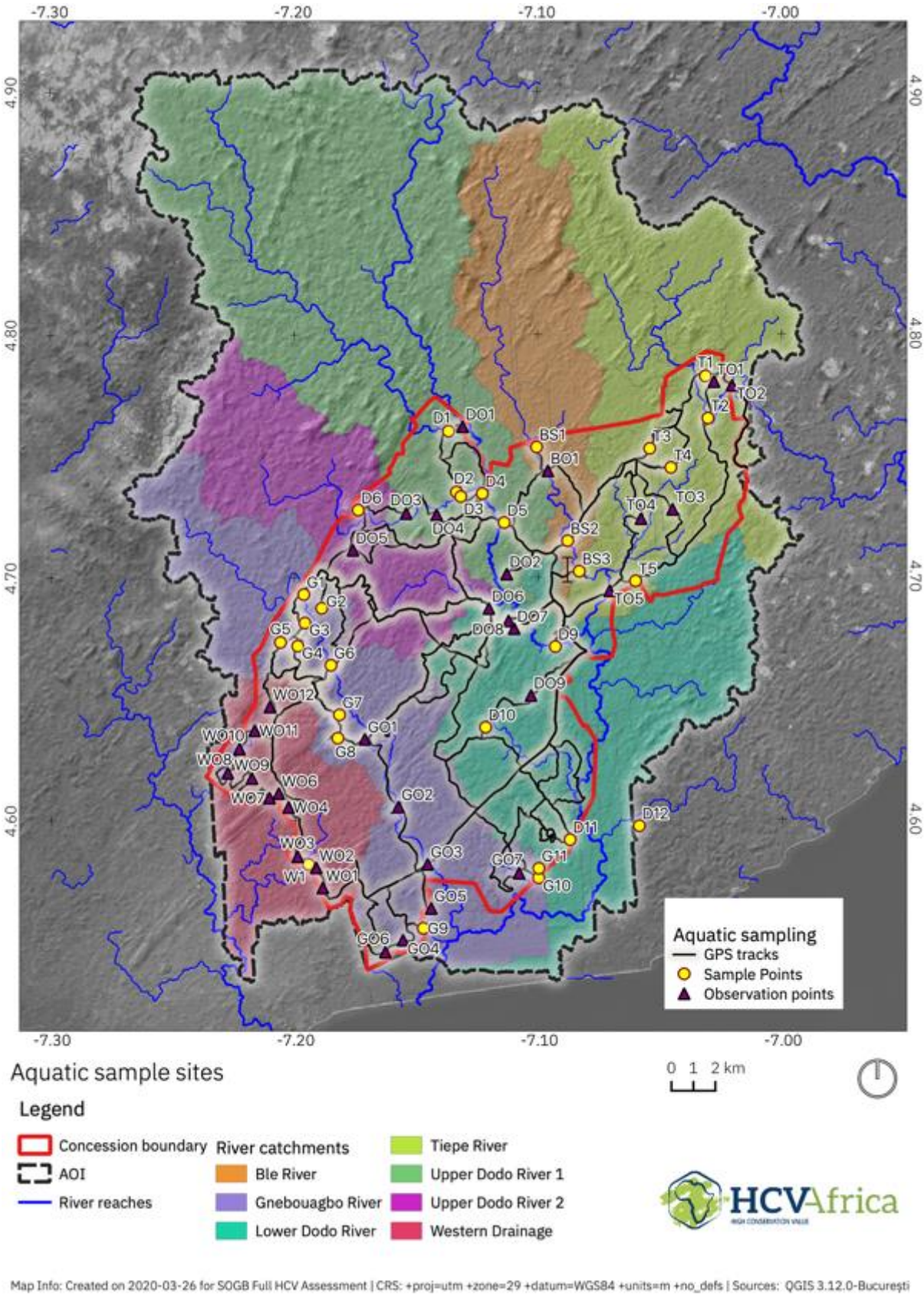


Figure 8–6: Aquatic ecology sampling sites

8.1.2.5.1.1 *Habitat Quality*

To define the general aquatic habitat and delineate the specifically HCV2 areas, the instream and riparian habitat was assessed and characterised according to Intermediate Habitat Integrity Assessment (IHIA) (Kleynhans, 1996). The spatial framework for the IHIA was the mainstem reaches (primary flow-paths) of the watercourses in the AOI.

The IHIA model was applied to assess the integrity of the habitats from a riparian and instream perspective. The habitat integrity of a river refers to the maintenance of a balanced composition of physico-chemical and habitat characteristics on a temporal and spatial scale that are comparable to the characteristics of natural habitats of the region (Kleynhans, 1996).

This model compares current conditions with reference conditions that are expected to have been present in the past. Specification of the reference condition follows an impact-based approach where the intensity and extent of anthropogenic changes are used to interpret the impact on the habitat integrity of the system. To accomplish this, information on abiotic changes that can potentially influence river habitat integrity are obtained from surveys or available data sources. These changes are all related and interpreted in terms of modification of the drivers of the system, namely hydrology, geomorphology and physico-chemical conditions and how these changes would impact on the natural riverine habitats. The criteria and ratings utilised in the assessment of habitat integrity in the current study are presented in Table 8–2 and Table 8–3 respectively.

Table 8–2: Criteria included in the habitat assessment (Kleynhans, 1996)

Criterion	Relevance
Water abstraction	Direct impact on habitat type, abundance and size. Also implicated in flow, bed, channel and water quality characteristics. Riparian vegetation may be influenced by a decrease in the supply of water.
Flow modification	Consequence of abstraction or regulation by impoundments. Changes in temporal and spatial characteristics of flow can have an impact on habitat attributes such as an increase in duration of low flow season, resulting in low availability of certain habitat types or water at the start of the breeding, flowering or growing season.
Bed modification	Regarded as the result of increased input of sediment from the catchment or a decrease in the ability of the river to transport sediment. Indirect indications of sedimentation are stream bank and catchment erosion. Purposeful alteration of the stream bed, e.g. the removal of rapids for navigation is also included.
Channel modification	May be the result of a change in flow, which may alter channel characteristics causing a change in marginal instream and riparian habitat. Purposeful channel modification to improve drainage is also included.
Water quality modification	Originates from point and diffuse point sources. Measured directly or alternatively agricultural activities, human settlements and industrial activities may indicate the likelihood of modification. Aggravated by a decrease in the volume of water during low or no flow conditions.
Inundation	Destruction of riffle, rapid and riparian zone habitat. Obstruction to the movement of aquatic fauna and

Criterion	Relevance
	influences water quality and the movement of sediments (Gordon *et al*., 1992).
Exotic macrophytes	Alteration of habitat by obstruction of flow and may influence water quality. Dependent upon the species involved and scale of infestation.
Exotic aquatic fauna	The disturbance of the stream bottom during feeding may influence the water quality and increase turbidity. Dependent upon the species involved and their abundance.
Solid waste disposal	A direct anthropogenic impact which may alter habitat structurally. Also a general indication of the misuse and mismanagement of the river.
Indigenous vegetation removal	Impairment of the buffer the vegetation forms to the movement of sediment and other catchment runoff products into the river (Gordon *et al*., 1992). Refers to physical removal for farming, firewood and overgrazing.
Exotic vegetation encroachment	Excludes natural vegetation due to vigorous growth, causing bank instability and decreasing the buffering function of the riparian zone. Allochtonous organic matter input will also be changed. Riparian zone habitat diversity is also reduced.
Bank erosion	Decrease in bank stability will cause sedimentation and possible collapse of the riverbank resulting in a loss or modification of both instream and riparian habitats. Increased erosion can be the result of natural vegetation removal, overgrazing or exotic vegetation encroachment.

Table 8–3: Ratings of the various criteria (Kleynhans, 1996)

Impact Category	Description	Score
None	No discernible impact or the modification is located in such a way that it has no impact on habitat quality, diversity, size and variability.	0
Small	The modification is limited to very few localities and the impact on habitat quality, diversity, size and variability are also very small.	1-5
Moderate	The modifications are present at a small number of localities and the impact on habitat quality, diversity, size and variability are also limited.	6-10
Large	The modification is generally present with a clearly detrimental impact on habitat quality, diversity, size and variability. Large areas are, however, not influenced.	11-15
Serious	The modification is frequently present and the habitat quality, diversity, size and variability in	16-20

	almost the whole of the defined area are affected. Only small areas are not influenced.	
Critical	The modification is present overall with a high intensity. The habitat quality, diversity, size and variability in almost the whole of the defined section are influenced detrimentally.	21-25

8.1.2.5.1.2 *Odonata Assessment*

Odonata are effective indicators of the stability of aquatic environments. Their adaptations and preferences to utilise both freshwater and terrestrial habitats allow for interpretations on surrounding landuse to be made based on qualitative observations. A list of expected Odonata for the study area was obtained from IUCN (2020) spatial data. The theoretical distributions were then studied infield at each sampling point. A total of 20 minutes per sampling period were set aside for the identification and photographing of Odonata. Photographs were then assessed to determine the species present on the SOGB concession. No collections of Odonata specimens were made for this study. Individual odonatan taxa were identified through consultation with dragonfly specialists and the African Dragonflies and Damselflies Online (ADDO) database. Where identification was not possible, the closest genus level identification was made.

8.1.2.5.1.3 *Fish Assessment*

The expected fish species data for the country were obtained from Fishbase (Fishbase, 2019). Using the country wide species list, species were added or removed according to the zoogeographical regions (Abell et al., 2008). Thereafter, the International Union for the Conservation of Nature (IUCN, 2020) spatial distribution data were extracted (clipped) using ArcGIS 10.5 for the project area. This data was then compared to relevant scientific papers such as Kamelan et al. (2013).

To confirm the theoretical distributions of the fish community in the study area and define the HCV areas, the timed exhaustive depletion sampling of the various selected sampling sites was completed. A qualitative fish species assessment was completed for this study. Several sampling methods were employed to complete the fish sampling. Methods applied at each sampling point varied according to the habitat structures at the sampling point. Timed exhaustive electroshock sampling using the Haltech electro-fisher was completed for each site (Figure 8–7). Where applicable, timed angling, dip nets, cast nets and underwater cameras were used to observe fish species.

Figure 8–7: Sampling techniques applied during this study. Left: Electrofishing; Right: Minnow Trapping.

Fish species were captured, photographed and identified using Fishbase (Fishbase, 2020) and et al., Paugy (2003a; 2003b). Specific fish species were placed in a 40% buffered formalin solution and detailed photographs of each specimen were taken.

An adaptation of the Habitat Cover Rating (HCR) method of Kleynhans (1999) was used to characterise habitats at each sample site. The HCR was calculated according to the rating of the relative contribution of various depth-flow classes (df) (1=Rare/poor (<5%); 2=Sparse/poor (5-25%); 3= Moderate (25-75%); 4=Extensive (>75%). Cover features (cf) are then rated within each depth-flow class using the same scale. For each depth-flow class, the cover features were summed (∑cf). The HCR at each site was then calculated based on the contribution of each depth-flow class (df/∑df) multiplied by the summed cover feature ratings for each depth-flow class (∑cf). The results of the HCR method will not be presented in this report. However, the method was completed with the aim of publishing the results of the study in a scientific journal.

8.2 Results: Environmental HCVs

Field surveys were carried out for six days in November 2020 by a team of specialist ecologists at the onset of the dry season.

8.2.1 Environmental Fieldwork Results

8.2.1.1 Peat soils

Although detailed soil surveys and analysis was not part of the scope of this assessment, the field results from the biophysical surveys **did not indicate the presence of peat within the AOI**. Soil in swamp forests was investigated and although the swamp forest soils contain a higher than average organic content, these do not meet the RSPO definition for peat with regards to composition. However, because these areas were classified as swamp forest they are required to be protected and managed as HCV 2 areas.

8.2.1.2 Botany

8.2.1.2.1.1 *Landscape Context*

The AOI forms part of the WWF Critical/Endangered Western Guinean Lowland Forest ecoregion (Olson, 2001) and forms part of four macro ecosystems, namely the Guineo-Congolian Evergreen Rainforest, Guineo-Congolian Littoral Rainforest, Antostema – Alstonia Swamp Forest and Atlantic Ocean Mangrove (Sayre et al., 2013).

8.2.1.2.1.2 *Forest Typology and Terminology*

“Primary forest” or “virgin forest” are terms often used to describe forests that have not been disturbed through anthropogenic activity (Voorhoeve, 1965; Hall & Swaine, 1981). Hall & Swaine presented two arguments against this usage, namely that such forests are unlikely to exist in Africa and that natural disturbance (e.g., tree fall) is often hard to distinguish from forest changes due to anthropogenic disturbances. They therefore use the term “primary” to differentiate forests with a high and more or less closed canopy from “secondary” forests consisting of a more broken canopy with a well-defined lower and tangled undergrowth layer. They further imply that secondary forest species are mostly absent from primary forest, but that primary forest species may be present in secondary forest. Estimates suggest that the successional period from pioneer to mature high forest can last between 300 and 400 years (Voorhoeve, 1965).

HCV (and HCS) terminology refer to primary forest as undisturbed forest. Within the strict definition of primary forest, no such forest patches were recorded or are expected to occur in the AOI. Although areas of closed (i.e., dense) evergreen forest were observed by the biophysical team, these have been impacted to some degree by anthropogenic activities (e.g., logging and charcoal production) and are, for the most part, moderately disturbed forest patches that lack continuous upper stratum. The dense forest patches in the AOI are therefore mostly embedded within degraded secondary forest patches.

8.2.1.2.1.3 *Local Context*

Three ecosystems systems occur within the AOI namely, terrestrial, aquatic and the transitional aquatic-terrestrial interface. These ecosystems were subdivided as part of the GIS analysis into nine habitat types ranging from degraded natural forest habitats through to modified and transformed built-up areas (Figure 8–8). Five natural habitat types (irrespective of their disturbance levels) and four modified/transformed habitat types are present within the AOI (Figure 8–12). Summaries of the natural habitats are given in Table 8–4 and representative photographs (A-F) are presented in Figure 8–10. Only natural habitat types are discussed, including scrub, which although regarded as a somewhat modified habitat type plays a significant role in the natural succession of the riparian buffer zones and grazing habitat for the forest buffalo. Selected photographs of conspicuous plant species associated with the natural habitats are shown in Figure 8–11.

Ecosystems

The remnant forests patches within the AOI can be classified as evergreen hillslope and lowland forests with elements of coastal forests (along the southern coastal forest patches). These habitats represent the terrestrial ecosystems. Edaphic habitat types in the AOI include open swamp (non-forested) and swamp forest (seasonally flooded), riparian forest and stream channel community (azonal and therefore not mapped), which are embedded in the evergreen hillslope and lowland forests. These forest habitats represent the aquatic-terrestrial and aquatic ecosystems and play significant roles in the local fauna biodiversity.

Habitat groups and types

Natural habitat types (irrespective of disturbance) include:

- Hillslope forest
- Lowland forest
- Swamp/Riparian forest
- Open swamp
- River/stream channel community (azonal and not mapped, but includes the aquatic habitats)

Modified habitat types include:

- Scrub
- Open water

Transformed habitat types include:

- Urban/bare
- Plantations (commercial hevea and oil palm)

Habitat disturbance

Disturbance levels for these habitats (Figure 8–12) were indicated on a five-point scale from 1-5 taking the dominant land cover for that habitat into account as follow:

1 Very low was assigned to all areas perceived as remnant dense forest;
2 Low was assigned to all areas perceived as secondary forest e.g. where obvious signs of broken canopy cover were observed;
3 Moderate was assigned to all areas perceived as low density forest (although some of these could be rated as highly disturbed) and also to all open swamp areas on the precautionary notion that these areas may be naturally open swamp/wetland areas and or maintained in an open state by forest buffalo;
4 High was assigned to all areas of open land embedded within Lowland and Hillslope forest under the assumption that these were likely cleared anthropogenically (mostly Scrub habitat fall within this); and
5 Very high (including transitional) - urban/bare and plantation areas.

All disturbances listed in Table 8–4 are the result of illegal logging and land clearance for agriculture.

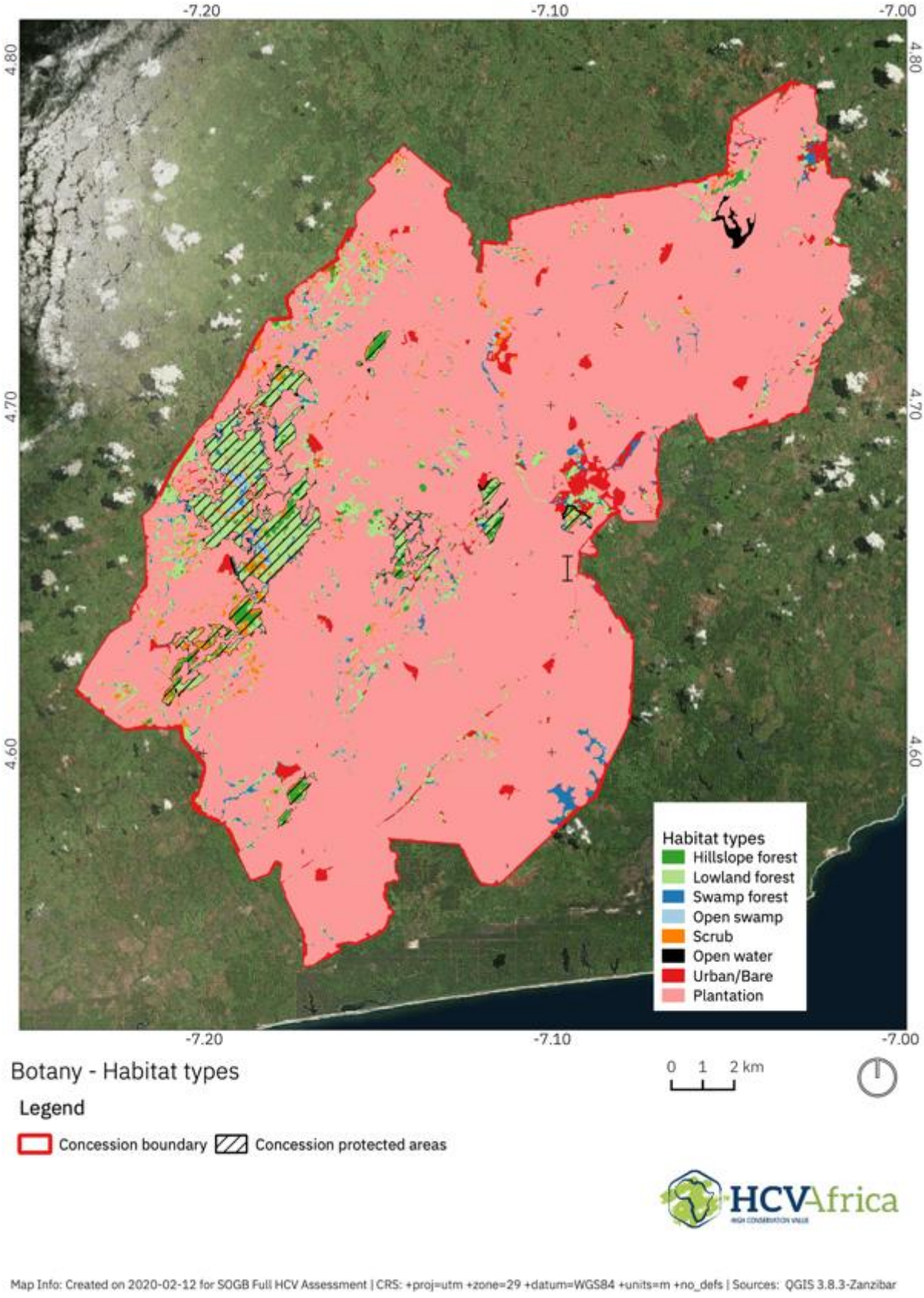


Figure 8–8: Habitat types in the AOI

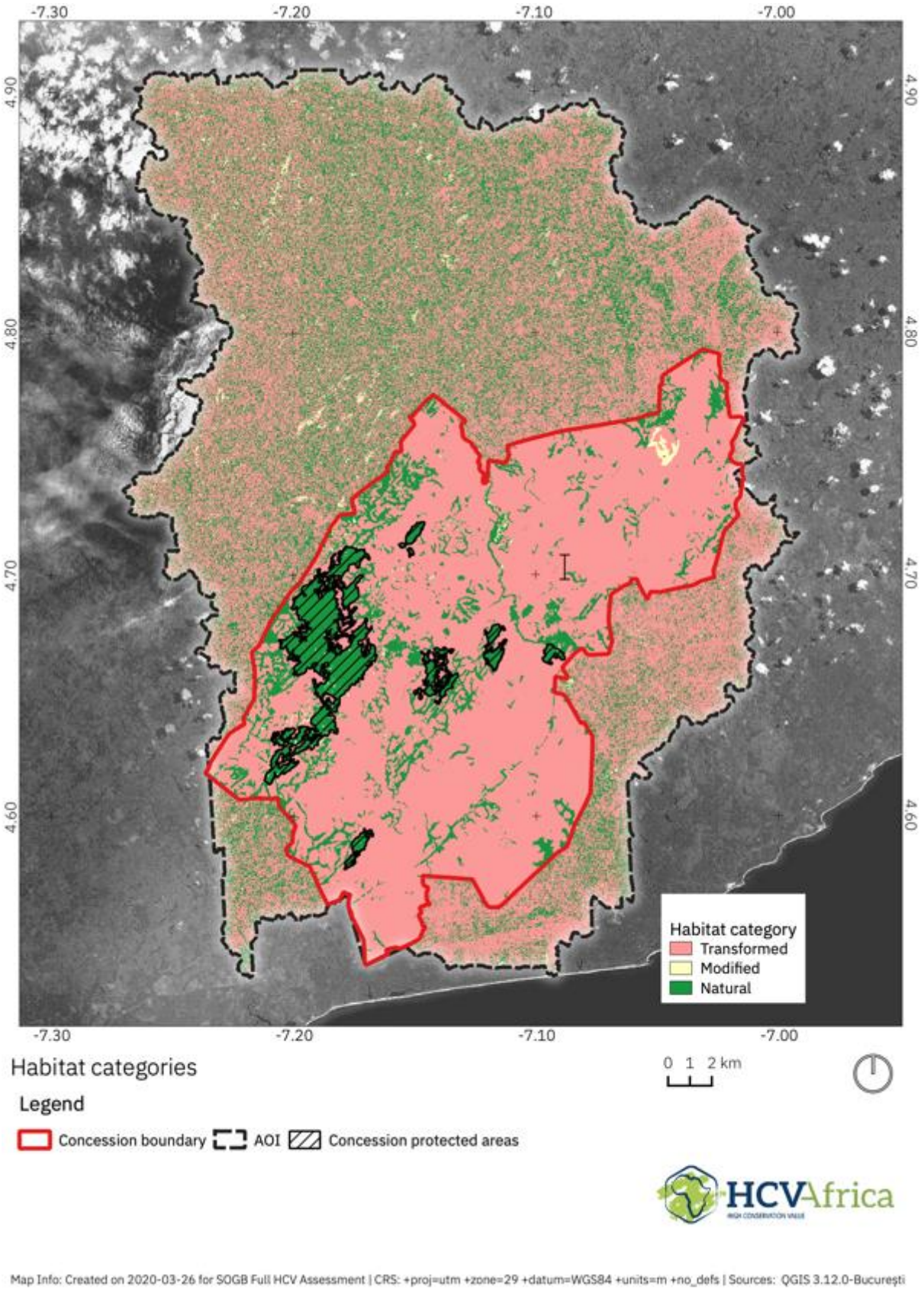


Figure 8–9: Habitat groups found within the AOI

Table 8–4: Summary of natural habitat types in the AOI

Vegetation type	Summary description	Disturbance level	Forest/stream condition
Hillslope forest	Forest with signs of recent disturbance, but these are very patchy and small. The canopy cover is mostly well developed, with a well layered sub-stratum in the denser patches	Moderate to very low	Slightly degraded to Excellent
Lowland forest	Forests with clear signs of recent disturbance, but mostly consisting of predominantly good forest with a broken upper canopy	Moderate to very low	Slightly degraded to Excellent
Riparian / Swamp forest	Forests with considerable areas of recent and past disturbance, ranging from areas with predominantly patchy forest with a heavily disrupted canopy to areas that have been converted on large scales for plantations or subsistence farming, with limited ecologically viable forest patches remaining.	Moderate to very low	Slightly degraded to Excellent
Open swamp	Non-forested swampland characterised by open areas, either as a result of anthropogenic disturbance or naturally open and likely maintained in such a state by forest buffalo.	Moderate	Slightly degraded
River/stream channel community (azonal and not mapped)	Rivers and streams with clear signs of recent disturbance. Disturbance levels range from low in areas with good riparian buffers and canopy cover and limited sedimentation to areas with riparian zones cleared of forest with clear signs of sedimentation.	Low to very high	Good to very poor

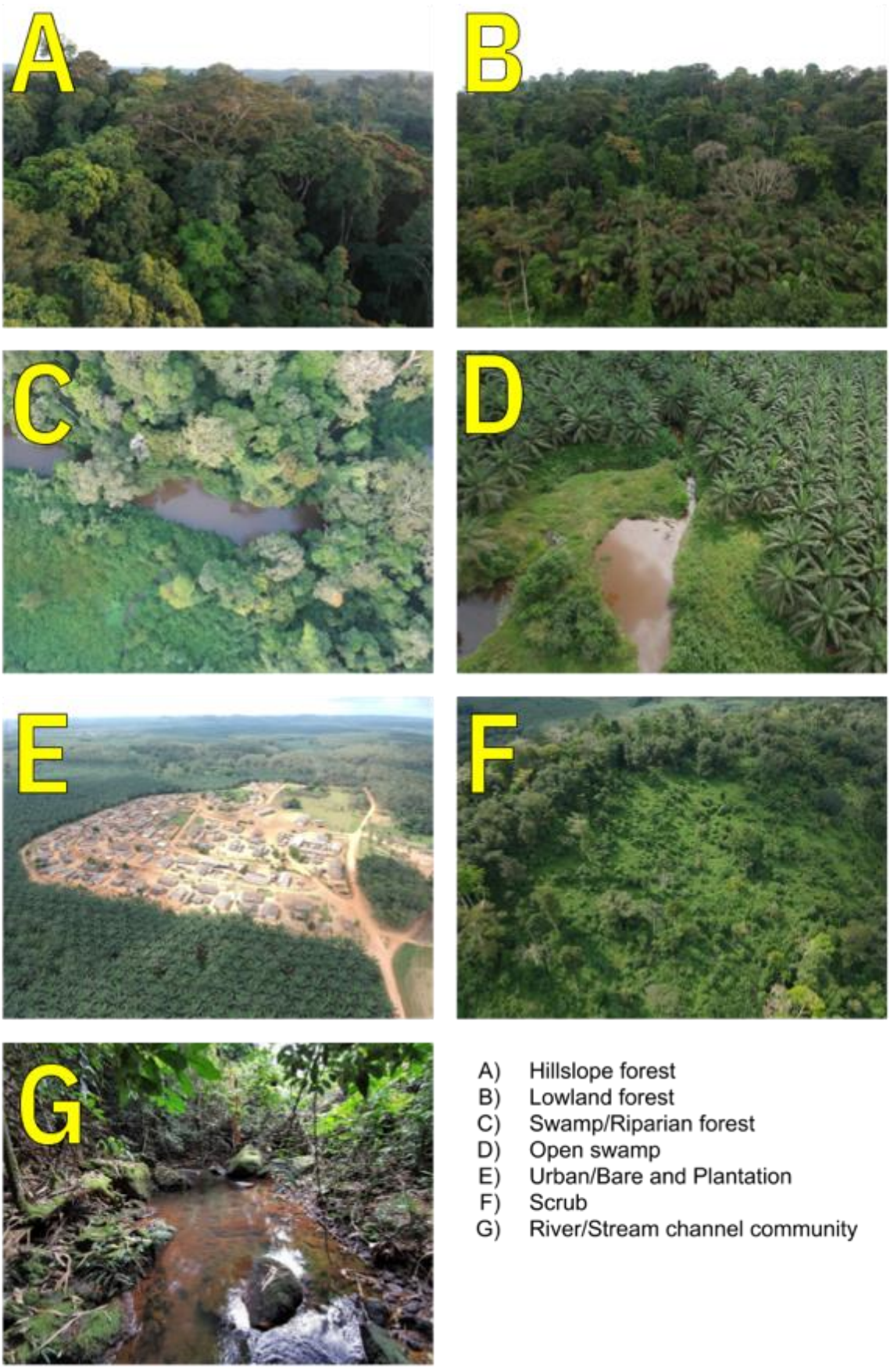


Figure 8–10: Photographs showing representative natural habitats in the AOI

Figure 8–11: Selected photographs of conspicuous plant species observed in the natural habitats

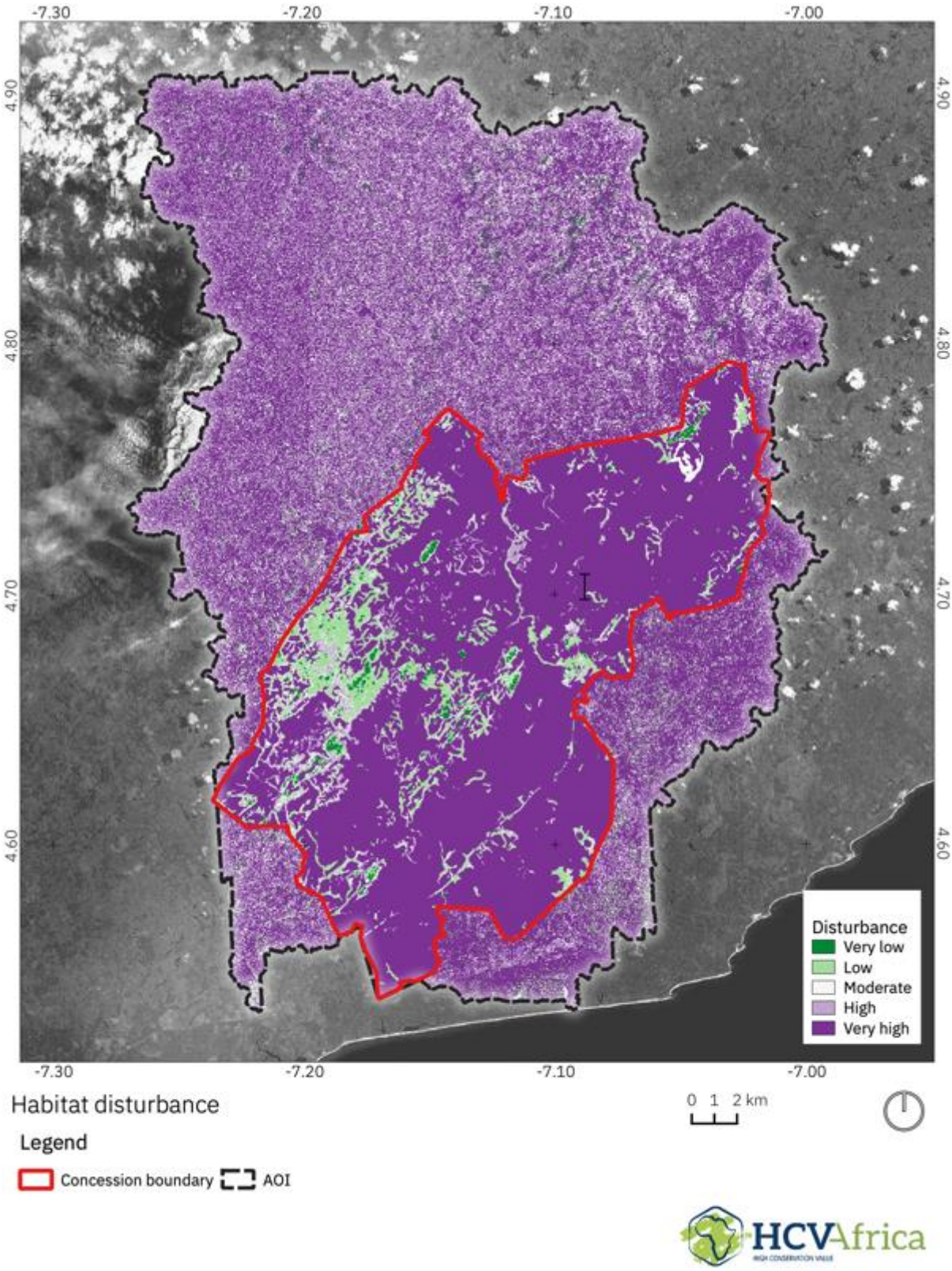


Figure 8–12: Level of disturbance

Hillslope forest

Hillslope forest habitat type represents the forest patches on elevated terrain, away from lowlands and streams. Areas along the lower slopes of these patches have been selectively logged/cleared but become more intact towards their cores. The canopy is relatively intact and continuous, with many emergent and canopy trees between 35 and 55 m tall.

The mid-storey tree and shrub species present are typical of forests rich in Caesalpinioideae and include tall emergent species of *Entandrophragma angolensis*, *Erythrophleum ivorense*, *Anthonotha fragrans*, *Lophira alata*, *Aphanocalyx spp., Pycnanthus angolensis, Heritiera utilis and Piptadeniastrum africanum*. Understorey smaller tree species include *Cola* spp., *Diospyros spp., Asystasia macrophylla* and *Drypetes* spp. Common liana species include *Aganope leucobotrya, Pararistolochia goldieana* and species of the genera *Combretum*, *Millettia* and *Strychnos.*

Lowland forest

Lowland forest patches are mostly found in the gentle undulating landscape of the AOI. This forest habitat is mostly limited to sections along the fringes of riparian and swamp forests and it represents the remnant lowland forest patches (these patches were excluded from oil palm development). The canopy is relatively intact and continuous, with some remaining emergent canopy trees that are between 30 and 45 m high.

The mid-storey tree and shrub species are typical of selectively logged forest and include tall species of *Erythrophleum ivorense*, *Alstonia boonei*, *Lophira alata*, *Nauclea diderrichii*, *Guibourtia spp.*, *Terminalia spp.*, *Pterocarpus mildbraedii*, *Pentaclethra macrophylla, Pycnanthus angolensis* and scattered emergents of *Klainedoxa gabonensis*, *Piptadeniastrum africanum* and *Irvingia gabonensis*. Understorey species include *Heisteria parvifolia, Dracaena phrynioides, Sarcophrynium brachystachys,* and *Geophila obvallata*.

Riparian forest

This habitat type is found throughout the AOI along embankments of rivers and streams that are seasonally flooded. Although represented by mostly common lowland forest species, a few specialist species adapted to intermittent flooding include *Aphanocalyx hedinii*, *Anthonotha macrophylla*, *Pellegriniodendron diphyllum*, *Monodora brevipes*, *Pterocarpus santalinoides*, *Ficus vogelliana, Uapaca* spp., and scattered emergents of *Ceiba pentandra*. Understorey (often in stream) species include *Landolphia owariensis*, *Halopegia azurea*, *Palisota hirsuta*,.

Understorey species include *Leea guineensis*, *Whitfieldia lateritia*, *Megaphrynium macrostachyum*, and *Chassalia corallifera.*

Swamp forest

This habitat type is found throughout the AOI in the lower lying areas adjacent to rivers, streams and local depressions within the landscape. This habitat type ranges from being permanently to seasonally inundated. A common physiognomic characteristic of this habitat is the presence of species with stilt roots and/or *Raphia* species. This habitat usually consists of a well-developed herbaceuous layer and single tree layer consisting of large leaved species. However, areas that are subjected to longer periods of inundation or that are permanently waterlogged are almost always represented by dominant stands of *Raphia* palms. Typical swamp forest specialist species are associated with this habitat type include *Anthostema aubryanum, Sterculia tragacantha, Raphia* sp, *Symphonia globulifera*, *Carapa procera*, and *Xylopia spp.* and *Uapaca* spp. Understorey species include *Begonia* spp., *Lasimorpha senegalensis* and *Anchomanes difformis.*

River/stream channel community

This habitat type represents the rocky, gravel, sandy and muddy substrates within river and streams. Plant species associated with this habitat typically root within the channel and are therefore almost permanently submerged and/or inundated. Plants include mostly herbaceous species, with some woody species. Typical plant species observed include *Bolbitis heudelotii*, Halopegia *azurea*, *Lasimorpha senegalensis* and *Anchomanes difformis*.

Note on Scrub

This habitat type is represented by a mosaic of secondary vegetation that has regrown following clearance of vegetation (i.e. slash and burn agriculture or areas where riparian/swamp forests were cleared as a result of plantation development) and along old logging roads and paths. It consists mainly of various pioneer woody and herbaceous species. Limited remnant forest trees are left, and the canopy cover is mostly less than 5 m in height. Secondary bush within the riparian buffers that have since clearing been left to recover mostly consist of pioneer tree and shrub species with almost monodominant stands of species from the genera *Alchornea*, *Harungana* and *Musanga cecropioides*.

Along old paths flanked by forest, the secondary bush mainly consist of large herbaceous species including *Dicranopteris linearis*, *Maranthochloa spp.*, *Afromomum* spp., *Costus* spp., *Thaumatococcus danielli*, *Megaphrynium macrostachyum* and *Sarcophrynium spp.*

More recently disturbed areas are dominated by alien invasive plants species including *Ageratum conyzoides, Chromolaena odorata*, *Lantana camara*, *Mimosa pudica*, *Mimosa pigra, Passiflora foetida, Pueraria spp.* and *Tithonia diversifolia.*

8.2.1.2.1.4 *Species of Conservation Concern*

Ten plant SCC were recorded during the botanical survey (Table 8–5) and selected photographs are given in Figure 8–13. Please refer to the botanical specialist report for additional plant species with a high probability of occurrence, based on habitat-type.

Table 8–5: Plant SCC observed by the botanists in the AOI

Species name	IUCN Status	Ivorian Status	Habitat
Albizia ferruginea	VU		Lowland rainforest
Anthonotha vignei	VU		A species which is confined to riversides or swampy areas within lowland wet evergreen forest.
Entandrophragma angolense	VU		Lowland and mid-altitude rainforest
Mitragyna stipulosa	VU		This important timber tree occurs in lowland evergreen forest, often in swamps where it may be dominant.
Heritiera utilis	VU		Especially common in evergreen forests.
Lophira alata	VU		Azobé is a pioneer species and occurs abundantly in wet evergreen forest.
Nauclea diderrichii	VU		Occurs in lowland evergreen forest, up to 800 m altitude
Aristolochia goldieana	VU	Rare/Endangered	Found in lowland evergreen forest, often seen in disturbed areas. This climber almost certainly has the largest flowers (c. 30 × 30 × 30 cm) of any African species of flowering plant. It is the African equivalent of the S.E. Asian Rafflesia, matching it in habitat, colour, size and scent of the flowers. The life cycle of this species is unknown, but it appears to be a perennial, producing annual shoots. It is estimated that a generation might last for 10 years.
Pellegriniodendron diphyllum	NT		Small understorey tree confined to areas of wet evergreen forest.
Terminalia ivorensis	VU		Large forest tree in secondary forest

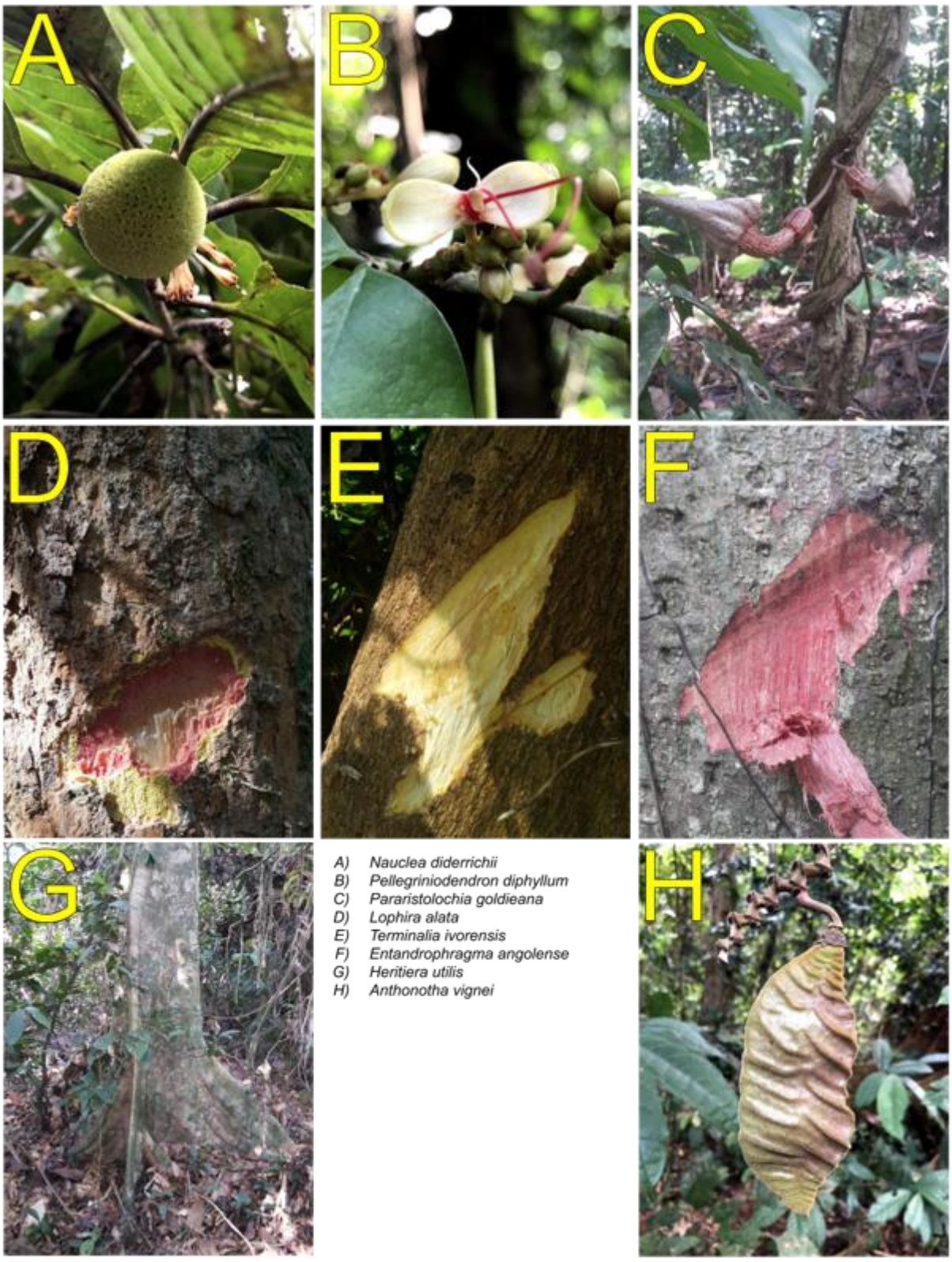


Figure 8–13: Selected photographs of plant SCC observed within the AOI during the field surveys

8.2.1.3 Fungi

Observations for fungi across the intact forest patches that have not been heavily impacted by past anthropogenic activity all showed a diverse fungal composition dominated by members of the Marasmiaceae

family. The family has seen extensive study in tropical Africa as it comprises well over one thousand species and counting (de Oliveira et al, 2014). Forest patches that have been extensively logged in the past and since recovered to a secondary state, as well as rubber and palm plantation, both presented minimal Marasmeriaceae. The change in dominant species after forest regeneration from diverse and largely endemic species compositions, both saprophytic and mycorhzial, to a less endemic distribution with increased cosmopolitan saprophytes is well documented both from removal of ectomycorhizial host trees and adverse changes in local environment (Arnolds, 1990). African macrofungi are poorly documented and show a high degree of endemism. This highlights the importance conserving indigenous intact forest patches for conservation of fungal diversity.

The absence of microscopy and genetic analysis has limited the ability to narrow down the individuals observed as cap and stipe morphologies are very similar across genera and the fruiting bodies are small. Despite this the intact forest patches showed high population counts of at least 7 distinct species. Members of the genus *Gymnopus* (Specifically *Gymnopus androsaceus*), *Marasmius* and *Marasmiellus* were identified with *Micromphale* also likely. A sample of the Marasmiaceae are presented in *Figure 8-14*.

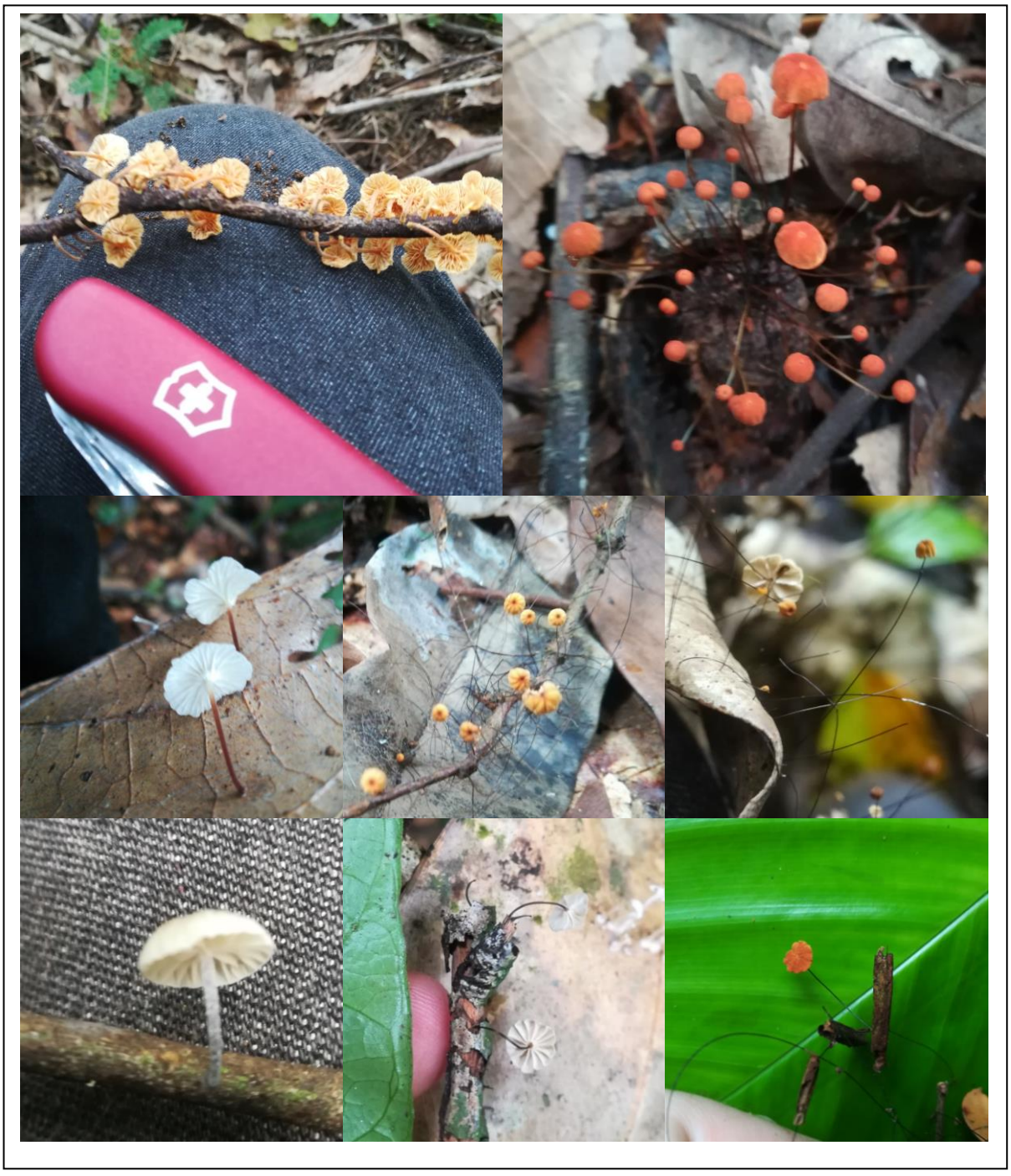


Figure 8-14: Members of the Family Marasmiaceae observed in the SOGB concession

Species that have been identified under the limitations of this fungal assessment are indicated in *Table 8-6* below and a section of them displayed in *Figure 8-16*. At present no IUCN Red List data is available for fungi however, at the time of this assessment there is a two-year initiative to categorise species globally.

The reduction of diversity and species population was visible both in fruiting bodies as well as visible mycelia when disturbing leaf litter and soil. All *Pluteus*, *Agaricus, Volvariella*, *Fomes* and *Hygrocybe* species were within palm and rubber blocks. Other species here were hardwood brackets of the genera *Trametes* and *Sterium* as well as the cosmopolitan *Coprinellus domesticus* (which was also seen in forests that had previously been heavily degraded). *Ganoderma* is known to occur here but was not directly observed due to the plantations effective control methods.

Table 8-6: Species identified within the SOGB concession

List of macrofungi identified to Genus or species level		
Cyptotrama asperata	*Mycena chlorophos*	*Clavatia acuta*
Leucocoprinis birnbaumii	*Chondosterium purpureum*	*Coprinellus domesticus*
Daldinia concentrica	*Panellus mitis*	*Trametes versicolor*
Xylaria cubensis	*Auricularia polytricha*	*Marasmius rotula*
Cookeina speciosa	*Ophiocordyceps dipterigena*	*Russula sp.*
Hygrocybe sp.	*Panus sp.*	*Creptidotus sp.*
Xylaria sp.	*Coltricia sp.*	*Mycena sp.*
Volvariella sp.	*Ganoderma sp.*	*Crepidotus sp.*
Rimbachia sp.	*Fomes sp.*	*Phellinus sp.*
Sterium sp.	*Gymnopus androsaceus*	*Marasmiellus sp.*
Marasmius sp.		

Fruiting body formation is triggered by a combination of humidity, temperature and light. Given the absence of rain over the course of the assessment period the likelihood of encountering species with longer lived fruiting bodies and species that leave behind structures after sporulation is increased. Additionally even with optimal conditions many fruiting bodies only present for several days, some even only for hours. It is likely that there are many more species of gilled caps present (Stamets, 1993).

While surveying hillslope forest a sample of *Ophiocordyceps dipterigena* was obtained. *O. dipterigena* infects live fly species, possibly one or many local species, and leads to certain behaviors in the host while it is being killed. On death of the host the body is consumed by the mycelium and stromata are created to disperse more spores. Members of Hypocreales (Order) have valuable application in bio-control measures putting further value on conservation of potentially novel genetic makeups within the order, of which there are many due to their narrow host range favouring rapid speciation (Divers & Stahl, 2019).

Figure 8-15: Ophiocordyceps dipterigena fruiting bodies extending out from a dead fly.

Figure 8-16: Selection of species observed within the SOGB concession. 1a) Cyptotrama asperata. 1b) Cookenia speciosa. 1c) Leucocoprinis birnbaumii. 2a)Xylaria cubensis (Xylocoremium flabelliforme anamorph). 2b) protists resembling fungi. 2c) Clavatia acuta. 3a) Sterium sp.. 3b) Phellinus sp.. 3c) Hygrocybe sp.. 4a) Mycelium of Coprinellus domesticus (left) and Auricularia polytricha (right). 4b) Mycena sp..

To protect fungal biodiversity Intact forest patches that have not previously been heavily degraded should be conserved. The HCV areas for fungi align with those delineated on grounds of RTE plant species.

8.2.1.4 Avifauna

Timneh Parrot (*Psittacus timneh*)

For its size, Côte d'Ivoire supports one of the richest avifaunal assemblages in Africa (Thiollay, 1985). Currently some 746 species are known to occur within the country, however many parts of the country remain poorly studied and this inventory is likely to grow. Indeed Fishpool (2001) remarks that as many as 47 species were added to the national inventory since Thiollay's (1985) account. This high diversity is attributable to the countries varied topography and climate which divides the country into the wetter tropical Guinea–Congo Forests biome to the south from the drier Sudan– Guinea Savanna biome further inland and to the north. Although no bird species are strictly endemic to Côte d'Ivoire, the country does support several small ranging and biome restricted species including nine Sudan– Guinea Savanna biome endemics and 185 Guinea–Congo Forests biome endemics.

However, timber and charcoal production which were once the mainstay of the country's economy during the 1980s have all-but decimated its natural forest habitat[11]. At the time the country recorded the highest rates of deforestation in the world. Today less than 10% of the original forest cover persists. As such all remaining natural forests in Côte d'Ivoire are extremely important for the continued survival of the country's rich birdlife. Of particular significance are the forests in the southwest of the country, west of the Sassandra river (Fishpool, 2001); the area in which the concession is located. This dense swathe of lowland Evergreen forest, which extends into eastern Liberia has a uniquely humid, tropical and stable climatic regime that is known as the Sassandra Pleistocene Refuge supporting a unique complement of "relictual" forest species.

Côte d'Ivoire supports eight official reserves, all of which are Important Bird Areas (IBAs) (Birdlife, 2019). The two largest being Taï and Comoé National Parks both of which are UNESCO World Heritage Sites. The former is closest to the concession (40 km north) and of most relevance to the avifaunal community within the concession. This 518,000 ha reserve, supports over 250 bird species and represents the largest remaining, contiguous patch of Upper Guinean forest and is the main stronghold of White-breasted Guineafowl (*Agelastes meleagrides*) and White-necked Picathartes (*Picathartes gymnocephalus*). Other rare species include Rufous Fishing-owl (*Scotopelia ussheri*), Western Wattled Cuckoo-Shrike (Lobotos lobatus), Nimba Flycatcher (*Melaenornis annamarulae*), Green-Taïled Bristlebill (*Bleda eximius*), Yellow-bearded Greenbul (Criniger olivaceus), Black-headed Rufous Warbler (*Bathmocercus cerviniventris*) and Lagden's Bush-Shrike (*Malaconotus lagdeni*).

8.2.1.4.1.1 *Local Context*

Noteworthy bird observations from forests within the AOI include:

[11] https://www.africanbirdclub.org/

1. Three threatened species namely the Endangered Timneh Parrot (*Psittacus timneh*) and Vulnerable Yellow-casqued Hornbill (*Ceratogymna elata*) and Yellow-bearded Greenbul (*Criniger olivaceus*).
2. 44 Guinea-Congo Forests biome-restricted species.
3. Two observations of the secretive African Finfoot (*Podica senegalensis*)

The south-western forests of Côte d'Ivoire support some 280 species (Appendix 1). However, this inventory includes species from some of the larger more intact forest patches such as Tai National park which also hosts large mountains (>1,000 masl), a habitat which is lacking in the concession (mostly small hills). This together with higher levels of forest disturbance suggests a lower a lower number of expected species for the concession. Based on distribution data and the availability of suitable habitat, some 250 species are considered highly likely to occur within the AOI. Of these, 113 species were detected through point counts and incidental records during this survey conducted during the shorter wet season. The unavoidable limitation associated with rapid surveys is that they provide only a glimpse of the full spectrum of species likely to occur. Nevertheless, this inventory is considered largely representative of the species richness during the short wet season based on the species accumulation curve for all point counts across the project area which reached an asymptote at 29 point samples (tangent to a straight line with a gradient of one, the point where less than one species was added for each new point count). Photographs of some of the birdlife observed during the field survey are shown in Figure 8–18.

Overall, field observations suggest that most of the non-forested (transformed) areas within the concession (plantation and built environments) are occupied by a mix of resilient Guinea-Congolian forest species and other widespread, adaptable sub-Saharan and Palearctic species. However, many of the regions more elusive forest specialists still persist in some of the remaining forest patches within (the six protected forest areas) and surrounding the concession. Here, both species richness and abundance were considerably higher as opposed to transformed (including plantation) habitat. Diversity was particularly high within the largest of the protected forests (Block A) and especially within the remote riparian and coastal swamp forests along the Dodo River immediately west of the concession. With the exception of the commensal Black Kite (*Milvus migrans*) and Palm-nut Vulture (*Gypohierax angolensis*) which were particularly common, other raptors were scarce and comprised occasional observations of five species namely Congo Serpent-eagle (*Dryotriorchis spectabilis*), Red-chested Goshawk (*Accipiter toussenelii*), Osprey (*Pandion haliaetus*), African Harrier-hawk (*Polyboroides typus*) and Lizard Buzzard (*Kaupifalco monogrammicus*).

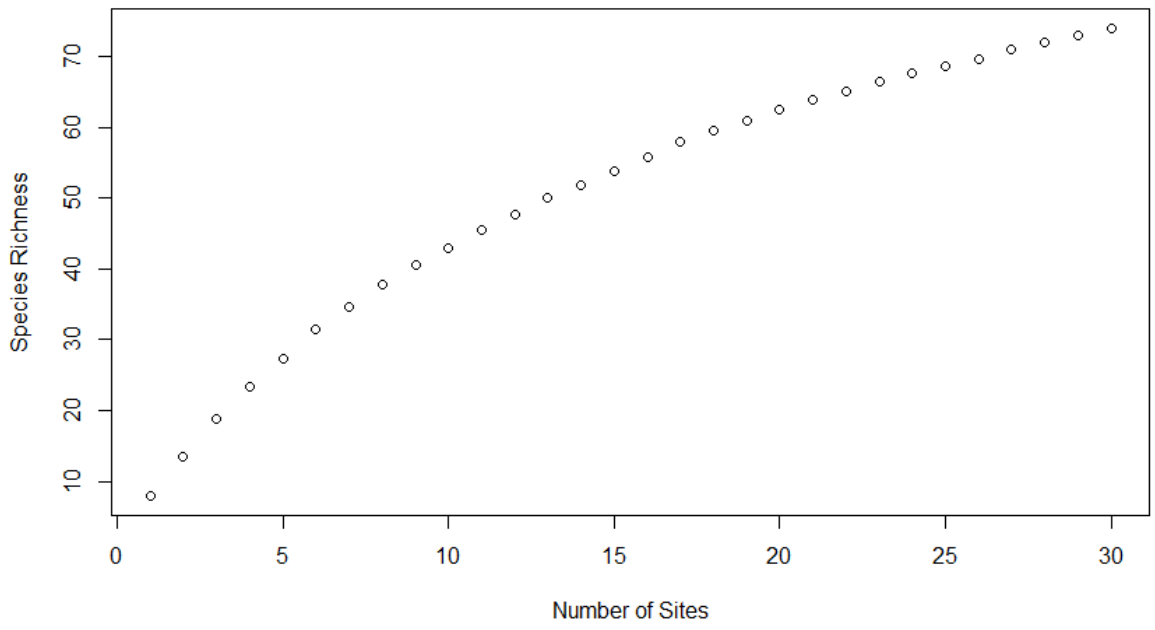


Figure 8–17: Species accumulation curve for the 30 avifaunal point counts

Table 8–7 provides a list of the top 10 most abundant species of the AOI along with the frequency with which each species appeared in the point count samples. Together these species account for 50% of the 461 observed individuals and represents 24% of the 195 species observations. In contrast the 10 least abundant species are provided in Table 8–8. Other less common species observed but not included in point count data (incidentals) included African pygmy goose (*Nettapus auritus*), Black-throated Coucal (*Centropus leucogaster*), Dwarf Hornbill (*Lophoceros camurus*), Fire-bellied Woodpecker (*Dendropicos pyrrhogaster*), Rufous-sided Broadbill (*Smithornis rufolateralis*), Honeyguide Greenbul (*Baeopogon indicator*), White-browed Forest-flycatcher (*Fraseria cinerascens*), Superb Sunbird (*Cinnyris superbus*), Carmelite Sunbird (*Chalcomitra fuliginosa*) and Chestnut-breasted Nigrita (*Nigrita bicolor*). In contrast Table 8–8 represents the least frequently observed species during point counts.

Table 8–7 Top 10 most abundant bird species encountered in the AOI during the wet season point counts shown alongside their frequency of detection. Species are sorted from highest to lowest relative abundance

Common Name	Species	Relative Abundance	Frequency (%)
Barn Swallow	*Hirundo rustica*	13.23	2.56
White-rumped Swift	*Apus caffer*	8.68	1.03
Vieillot's Weaver	*Ploceus nigerrimus*	6.94	2.05
Great Blue Turaco	*Corythaeola cristata*	4.34	2.56
Village Weaver	*Ploceus cucullatus*	3.69	2.56
Common Bulbul	*Pycnonotus barbatus*	3.04	1.54
Black Kite	*Milvus migrans*	2.82	3.08
West African Pied Hornbill	*Lophoceros semifasciatus*	2.60	4.62
Orange weaver	*Ploceus aurantius*	2.60	1.03
African Green Pigeon	*Treron calvus*	2.39	3.08

Table 8–8 Top 10 least abundant bird species encountered in the AOI during the wet season point counts shown alongside their frequency of detection. Species are sorted from highest to lowest relative abundance

Common Name	Species	Relative Abundance	Frequency (%)
Chocolate-backed Kingfisher	*Halcyon badia*	0.22	0.51
Yellow-spotted Barbet	*Buccanodon duchaillui*	0.22	0.51
Western Black-headed Oriole	*Oriolus brachyrynchus*	0.22	0.51
Rufous-bellied Wattle-eye	*Dyaphorophyia concreta*	0.22	0.51
Fork-tailed Drongo	*Dicrurus adsimilis*	0.22	0.51
African Paradise-flycatcher	*Terpsiphone viridis*	0.22	0.51
Northern Fiscal	*Lanius humeralis*	0.22	0.51
Bleating Camaroptera	*Camaroptera brachyura*	0.22	0.51
Preuss's Swallow	*Petrochelidon preussi*	0.22	0.51
Slender-billed Greenbul	*Stelgidillas gracilirostris*	0.22	0.51

Figure 8–18: Examples of some of the bird species detected during the field survey; A) Woodland Kingfisher (Halcyon senegalensis), B) Blue-breasted Kingfisher (Halcyon malimbica), C) Malachite Kingfisher (Corythornis cristatus), D) Black-throated Coucal (Centropus leucogaster), E) Senegal Coucal (Centropus senegalensis), F) Olive Sunbird (Cyanomitra olivacea), G) Great Blue Turaco (Corythaeola cristata), H) Fork-tailed Drongo (Dicrurus adsimilis), I) African Green Pigeon (Treron calvus), J) Orange-cheaked Waxbill (Estrilda melpoda), K) Golden Greenbul (Calyptocichla serina), L) Cattle Egret (Bubulcus ibis), M) Plain-backed Pipit (Anthus leucophrys), N) Osprey (Pandion haliaetus) and O) White-throated Bee-eater (Merops albicollis)

8.2.1.4.1.2 *Habitat Assemblages*

Three broad avifaunal habitat types were identified in the AOI Evergreen Lowland Forest, Riparian and Swamp Forest and Transformed Areas (Figure 8–20).

Avifauna and mammal habitats

A summary of the point count data for each of these habitats is given in Table 8–9 together with a measure of their respective diversities (which takes into account both species richness and species evenness). Overall 461 individuals representing 73 species were recorded from the 30 point count samples. Species diversity was highest within the Evergreen Lowland Forest habitat followed closely by the Riparian Forest and was lowest in the Transformed habitat.

Table 8–9: Summary of count data for the various habitats

Habitat	Samples (n)	Species Richness	Number of Individuals	Shannon Diversity Index (H)
Evergreen Lowland Forest	13	48	144	3.4
Riparian and Swamp Forest	10	42	166	3.1
Transformed	7	26	151	2.6
Overall Total	**30**	**73**	**461**	-

The non-metric multidimensional scaling (NMDS) ordination shown in Figure 8–19 provides a visual representation of the difference / similarity in the species composition among the three broad habitat types. From the ordination plot it can be observed that although the Evergreen Lowland Forest and Riparian and Swamp Forests support a similar avifaunal assemblage, they do however support an assemblage that is different from the transformed habitat and unique to these forested habitats. This result reflects the gradient in structural complexity, microhabitat availability and overall intactness associated with them and highlights the importance of the forest habitats as refugia for the Upper Guinean forest specialist species that inhabit the region.

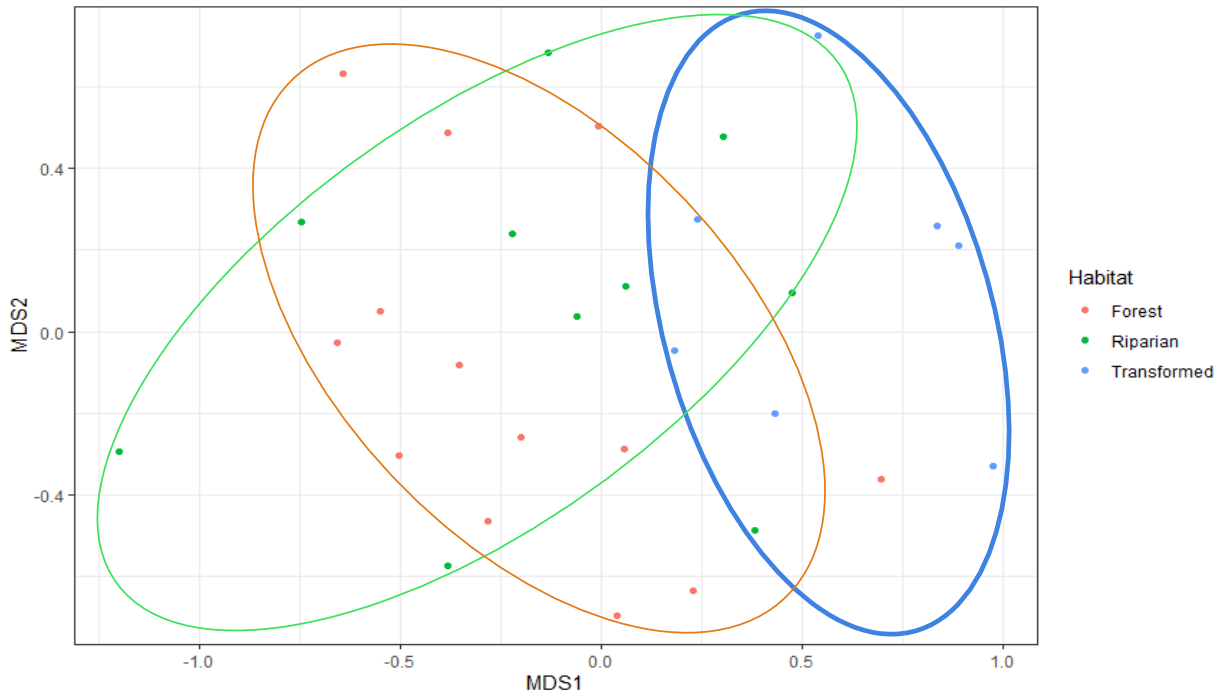


Figure 8–19: A non-metric multidimensional scaling ordination of the relative abundances of bird species based on Bray-Curtis similarities obtained from 30 point counts, the further the habitat groupings in ordinal space the more distinct their bird assemblages are from one another

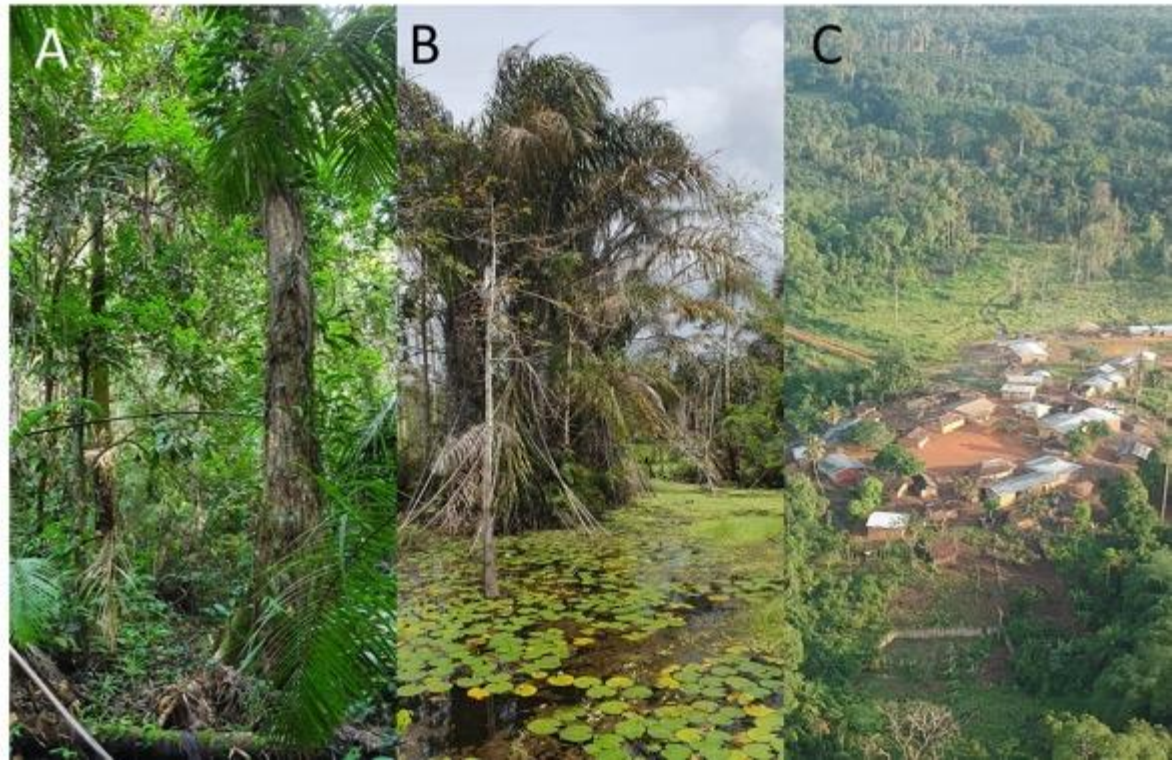


Figure 8–20: Examples of the three broad avifaunal habitats identified in the project area A)Evergreen Lowland Forest, B) Riparian and Swamp Forest and C) Transformed.

8.2.1.4.1.3 *Lowland Evergreen Forest*

This habitat consists of selectively logged yet largely intact and functional patches of upper Guinea-Congolian evergreen lowland forest that were once widespread throughout the region. These forests are scattered throughout the concession, the largest of which are conserved by SOGB within six protected forest areas (Aire Protégée Blocks A-F). Of these Block A is by far the largest land most significant from an avifaunal perspective. This habitat type supported the highest avian diversity within the project area which is likely attributable to its largely intact state and heightened structural complexity. The bird community associated with this habitat comprised mainly of Guinea-Congolian forest species. Species that were largely characteristic of this habitat included Afep Pigeon (*Columba unicincta*), Blue-headed Wood-dove (*Turtur brehmeri*), White-spotted Flufftail (*Sarothrura pulchra*), Yellow-casqued Hornbill (*Ceratogymna elata*), Black-casqued Hornbill (*Ceratogymna atrata*), Red-rumped Tinkerbird (*Pogoniulus atroflavus*), Fire-bellied Woodpecker (*Dendropicos pyrrhogaster*), Timneh Parrot (*Psittacus timneh*), Rufous-sided Broadbill (*Smithornis rufolateralis*), Western Black-headed Oriole (*Oriolus brachyrynchus*), Slender-billed Greenbul (*Stelgidillas gracilirostris*), Orange-breasted Forest-robin (*Stiphrornis erythrothorax*) and Red-headed Malimbe (*Malimbus rubricollis*).

8.2.1.4.1.4 *Riparian and Swamp*

This habitat comprised riparian (gallery) forest fringing significant streams and rivers together with the swamp palm and coastal swamp forest found in the lower-lying areas. Although the overall diversity was slightly lower than the Lowland Evergreen Forest habitat one reach of riparian habitat along the Dodo river (just west of the concession yet within the area of interest) was particularly diverse supporting an exceptional abundance and richness of species. Species typically associated with this habitat type included African Finfoot (*Podica senegalensis*), White-thighed Hornbill (*Bycanistes albotibialis*), Black Bee-eater (*Merops gularis*), Malachite Kingfisher (*Corythornis cristatus*), African Dwarf-kingfisher (*Ispidina lecontei*), Shining-blue Kingfisher (*Alcedo quadribrachys*), Giant Kingfisher (*Megaceryle maxima*), Chocolate-backed Kingfisher (*Halcyon badia*), White-bibbed Swallow (*Hirundo nigrita*), Swamp Palm Bulbul (*Thescelocichla leucopleura*) and Little Grey Flycatcher (*Muscicapa epulata*).

8.2.1.4.1.5 *Transformed*

All areas under plantation or otherwise transformed from natural to anthropogenic habitat, by for example infrastructure, were classified as transformed. The bird community associated with this habitat comprised mostly widespread, common and commensal species such as White-rumped Swift (*Apus caffer*), Red-eyed Dove (*Streptopelia semitorquata*), Cattle Egret (*Bubulcus ibis*), Black Kite (*Milvus migrans*), White-throated Bee-eater (*Merops albicollis*), Western Yellow Wagtail (*Motacilla flava*), Pied Crow (*Corvus albus*), Orange-cheaked Waxbill (*Estrilda melpoda*), Bronze Mannikin (*Spermestes cucullatus*), Northern Grey-headed Sparrow (*Passer griseus*) and Vieillot's Weaver (*Ploceus nigerrimus*).

8.2.1.4.1.6 *Species of Conservation Concern*

This section provides an overview of the project area's potential to support species of conservation concern (SCC), a term which is extended to include red-listed species (Globally or locally Threatened or Near-threatened species), endemic and biome-restricted species and other species deemed to be of conservation importance.

8.2.1.4.1.7 *Red-listed Species*

A total of 20 IUCN Red-listed species have the potential to occur in the region (50 km radius around the project area). Based on the distribution and the availability of suitable habitat the concession has the potential to support 17 Red-listed species representing 81% of the regional Red-listed diversity (Table 8–10). Field surveys revealed the presence of three Threatened species within the project area namely the Endangered Timneh Parrot (*Psittacus timneh)* and Vulnerable Yellow-casqued Hornbill (*Ceratogymna elata*) and Yellow-bearded Greenbul (*Criniger olivaceus*). Common amongst these species was the fact that they were only observed in some of the largest and most contiguous remaining forest patches (Protected Forest Block A and west of the concession along the Dodo River), highlighting the importance of these large unfragmented habitats.

Timneh Parrot was observed on three occasions from Lowland Evergreen Forest habitat. Although this species has a night roost near the plantation camp, Timneh's are typically reliant on sizeable patches of dense contiguous forest to forage and breed and the only other place where these birds were seen was in Protected forest Block A. Although Côte d'Ivoire supports one of the largest populations of Timneh Parrot (54,000-130,000 individuals) there have been major declines in Tai National Park and the complete disappearance of the species from some of the more populated areas (Martin et al. 2014). Aside from the rapid rates of habitat loss in the country, these declines are thought to be driven primarily by collection for the pet trade following Gatter's (1997) publication which revealed that some 1,400 birds were smuggled from Côte d'Ivoire on an annual basis between 1981-1984.

A flock of three Yellow-casqued Hornbill were observed flying and calling over Protected Forest Block A during a dawn survey, sound recordings were taken, and the species was not observed again. This large, long-lived and locally nomadic species is under threat from hunting and increased loss and fragmentation of its preferred primary forest habitat.

Yellow-bearded Greenbul (*Criniger olivaceus*) was first detected tentatively by call during a canoe-based dawn survey along the Dodo River approximately 2 km south of the Village Djoro on the first day of the site visit. A follow trip two days later confirmed the presence of the species at the same locality through the observation of a small party of calling individuals. This range restricted species is threatened by deforestation and even selective logging of its preferred intact upper Guinea-Congolean forest habitat.

Table 8–10: Present and potentially occurring conservation important avifauna

Species	Common Name	Status	LO	Previous Study	Current Study
Endangered					
Psittacus timneh	Timneh Parrot	EN (D)	1		x

Vulnerable					
Ceratogymna elata	Yellow-casqued Hornbill	VU (D)	1		x
Criniger olivaceus	Yellow-bearded Greenbul	VU (D)	1	x	x
Bycanistes cylindricus	Brown-cheeked Hornbill	VU (D)	1	x	
Lobotos lobatus	Western Wattled Cuckooshrike	VU (D)	1	x	
Bubo shelleyi	Shelley's Eagle-owl	VU (D)	3		
Scotopelia ussheri	Rufous Fishing-owl	VU (D)	3		
Agelastes meleagrides	White-breasted Guineafowl	VU (D)	4		
Picathartes gymnocephalus	White-necked Rockfowl	VU (D)	4		
Melaenornis annamarulae	Nimba Flycatcher	VU (D)	1	x	
Near-Threatened					
Stephanoaetus coronatus	Crowned Eagle	NT (D)	1	x	
Merops mentalis	Blue-moustached Bee-eater	NT (D)	2		
Malaconotus lagdeni	Lagden's Bush-shrike	NT (D)	2		
Bleda eximius	Green-tailed Bristlebill	NT (D)	1	x	
Illadopsis rufescens	Rufous-winged Illadopsis	NT (D)	2		
Hylopsar cupreocauda	Copper-tailed Starling	NT (D)	1	x	
Rynchops flavirostris	African Skimmer	NT (D)	4		
Parmoptila rubrifrons	Red-fronted Antpecker	NT (D)	1	x	
Data Deficient					
Bathmocercus cerviniventris	Black-headed Rufous-warbler	DD (D)	3		
Jubula lettii	Maned Owl	DD (S)	3		

8.2.1.4.1.8 *Biome Restricted Species*

The region supports 151 (68%) of the country's 224 biome restricted species. Of these, 133 species are considered highly likely to occur within the project area based on habitat suitability, all of which are Guinea–Congo Forests biome restricted species. A total of 44 biome restricted species were detected within the concession during the survey. These species are listed in Table 8–11. Photographs taken on site of some of these species is shown in Table 8–11. The stable least concern species are listed in the Avifauna & mammal Specialist Report (HCV Africa, 2019).

Table 8–11: Present and potentially occurring biome restricted avifauna of conservation concern

Common Name	Scientific Name	Status	LO	Biome Res
Afep Pigeon	*Columba unicincta*	LC (D)	1	GCFB
Blue-headed Wood-dove	*Turtur brehmeri*	LC (D)	1	GCFB
White-spotted Flufftail	*Sarothrura pulchra*	LC (D)	1	GCFB
Yellow-billed Turaco	*Tauraco macrorhynchus*	LC (D)	1	GCFB
Congo Serpent-eagle	*Dryotriorchis spectabilis*	LC (D)	1	GCFB
Dwarf Hornbill	*Lophoceros camurus*	LC (D)	1	GCFB
Black-casqued Hornbill	*Ceratogymna atrata*	LC (D)	1	GCFB
Chocolate-backed Kingfisher	*Halcyon badia*	LC (D)	1	GCFB
Yellow-spotted Barbet	*Buccanodon duchaillui*	LC (D)	1	GCFB
Speckled Tinkerbird	*Pogoniulus scolopaceus*	LC (D)	1	GCFB
Rufous-sided Broadbill	*Smithornis rufolateralis*	LC (D)	1	GCFB
Shining Drongo	*Dicrurus atripennis*	LC (D)	1	GCFB
Red-bellied Paradise-flycatcher	*Terpsiphone rufiventer*	LC (D)	1	GCFB
Chestnut-winged Starling	*Onychognathus fulgidus*	LC (D)	1	GCFB
Orange-breasted Forest-robin	*Stiphrornis erythrothorax*	LC (D)	1	GCFB
Superb Sunbird	*Cinnyris superbus*	LC (D)	1	GCFB
White-bibbed Swallow	*Hirundo nigrita*	LC (U)	1	GCFB

Yellow-casqued Hornbill	*Ceratogymna elata*	VU (D)	1	GCFB
Yellow-bearded Greenbul	*Criniger olivaceus*	VU (D)	1	GCFB

Key: IUCN (2019) global status, letters in parentheses indicate population trend, D= Decreasing, S = Stable, U = Uncertain..

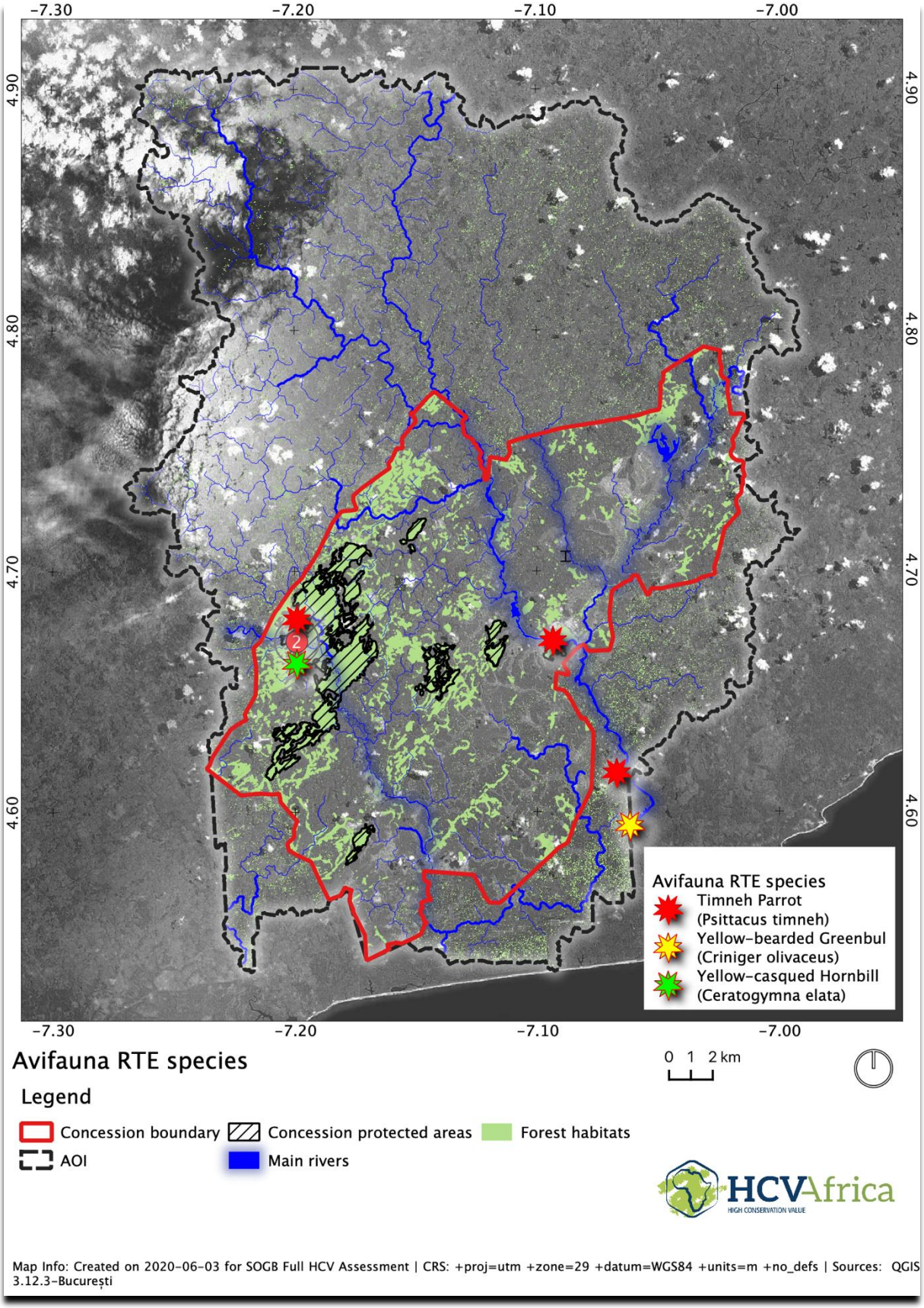


Figure 8–21: Localities of conservation important avifauna observed during the field survey.

8.2.1.5 Mammals

Forest Buffalo (*Syncerus caffer nanus*)

Collection and documentation of mammals from the upper Guinean forests of West Africa began during the mid-nineteenth century following a flurry of European expeditions to the "fever coast" (Liberia and western Côte d'Ivoire). Much of our knowledge on the region's mammal diversity is attributable to the efforts of the swiss taxidermist Johann Büttikofer who catalogued his survey findings at the Museum of Natural History in Leiden, Holland.

Since then a number of studies have brought to light the exceptional mammalian diversity within this centre of endemism, attributing its heightened diversity to the stable warm-wet climatic regime these forests have provided since the Pleistocene. The largest and most contiguous example of this habitat persists in Tai National Park which provides a glimpse into the reference state mammalian fauna of the region. Supporting over 90% of the 150 species known to occur in the Upper Guinean forests this area is widely regarded as one of the most important forest reserves in West Africa and has been proclaimed as a Unesco World Heritage Site. As with other vertebrates, however, the rich mammalian diversity in Côte d'Ivoire is threatened by the persecution of the country's rampant rates of deforestation which have reduced the natural forest cover to a mere 10% of its original extent.

8.2.1.5.1.1 *Local Context*

The nearby Tai National Park supports some 140 species of mammals including 11 species of primates, 14 species of insectivores, 43 species of bats, 3 species of pangolins, 43 species of rodents and 15 ungulates as well as elephants and hyraxes. This assemblage can be considered largely representative of the mammalian diversity likely to occur in some of the larger remaining patches of natural habitat within the concession, albeit at a somewhat lower diversity due to the higher levels of fragmentation and disturbance as well as the lack of distinctly montane (> 1000 masl) habitat.

Based on distribution data and the availability of suitable habitat some 75 species are considered highly likely to occur within the concession. During the current survey (conducted in the short-wet season) a total of 18 species were detected. These records combined with the 25 species detected during the preceding study by (Assi et al. 2013) brings the total number of confirmed mammal species for the concession to 33 species. Interviews with local villagers at Grand Djoro adds an additional two anecdotal species were not detected during either study bringing the current inventory to 34 species. These included Black-bellied pangolin (*Phataginus tetradactyla*) and Chimpanzee (*Pan troglodytes*). The latter were heard shouting and chest beating in the forests beyond the Dodo river near the village. SOGB rangers also report hearing Chimpanzee vocalizations coming from Protected Forest Block A. The list of all confirmed and potentially occurring species is provided in Appendix 2. Some examples of mammals encountered on site are shown in Figure 8–22.

Live trapping of small mammals using baited (mixture of peanut butter, oats and honey) sherman traps yielded low capture rates during the short-wet season survey. Although no bats were captured in mist nets active nocturnal searches yielded observations of Hammer headed fruit bat (detected through distinct audible social calls).

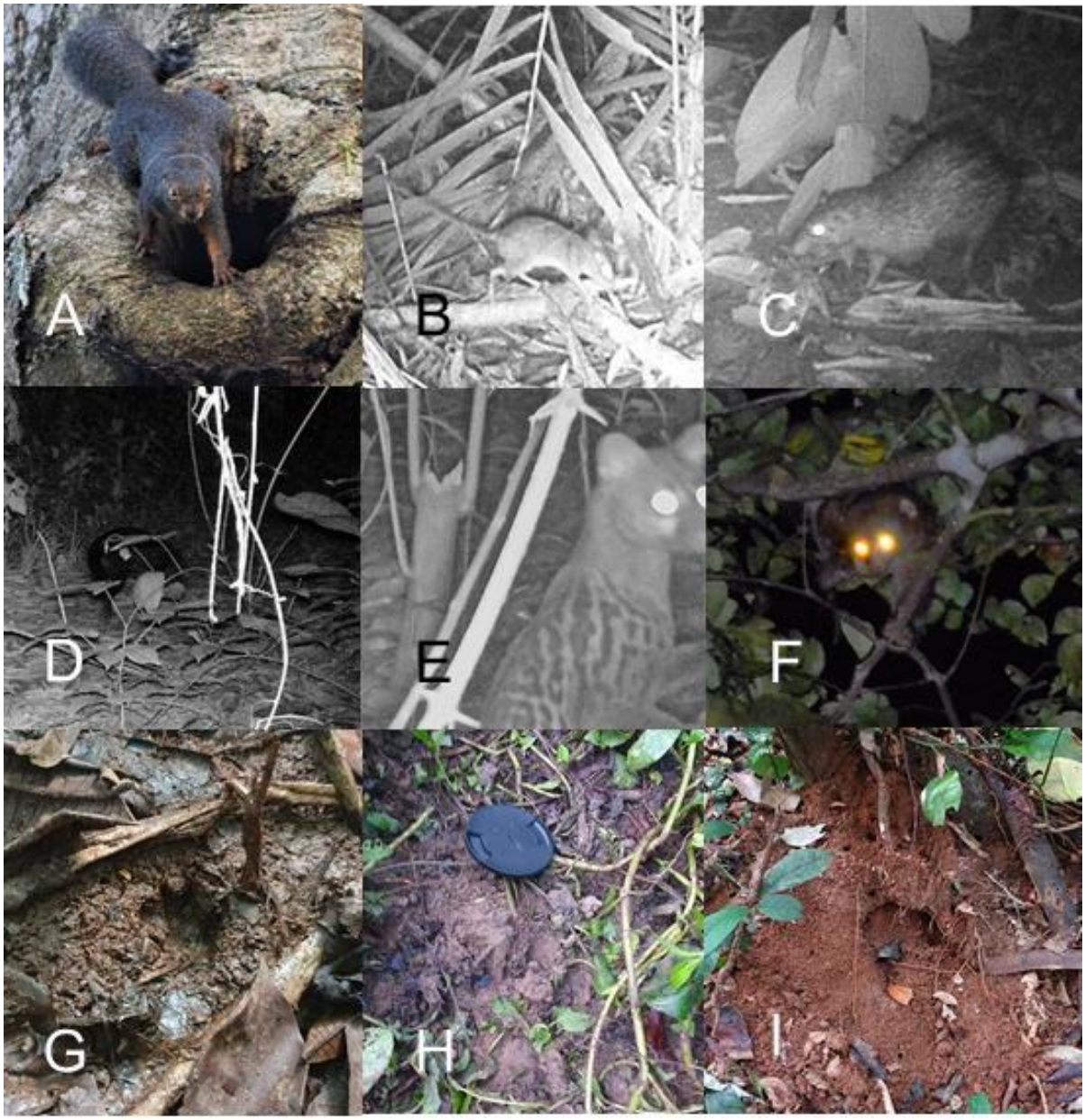


Figure 8–22: Examples of mammal species detected within the project area; A) African Giant Squirrel (Protoxerus stangeri), B) c.f. Liberian Forest Mouse (Hybomys planifrons), C) African Brush-tailed Porcupine (Atherurus africanus), D) Giant Forest Hog (Hylochoerus meinertzhageni), E) West African Large-spotted Genet (Genetta pardina), F) Western Potto (Perodicticus potto), G) Water Mongoose (Atilax paludinosus), H) Pygmy Hippopotamus (Choeropsis liberiensis) and scratchings in a termite nest most likely from I) African White-bellied Pangolin (Phataginus tricuspis)

Acoustic sampling at four locations around the concession revealed the presence of three bat species namely Cape Serotine Bat (*Neoromicia capensis*), Egyptian Free-tailed Bat (*Tadarida aegyptiaca*) and Lesser Free-tailed Bat (*Chaerephon pumilus*). None of which are of conservation importance. The highest densities of these species were observed around the concession camp. Echolocation call data for the identified species is given in Table 8–12 while examples of their respective spectrograms are shown in Figure 8–23.

Table 8–12: Representative echolocation call data for bats Identified during the acoustic surveys

Species	Fmax	Fmin	Fmean	Fk	Fc	Tk	Tc	Duration
Tadarida aegyptiaca	22.82	19.89	21.09	21.98	20.10	1.05	7.91	8.64
Chaerephon pumilus	32.77	24.28	26.45	26.78	24.50	3.60	8.75	9.97

Neoromicia capensis	40.43	36.60	38.19	38.86	37.12	1.07	5.54	6.30

Values represent the eight time most important diagnostic vocalisation parameters. Frequency parameters are measured in kilohertz (kHz) and time parameters in milliseconds (ms). Fmax, maximum frequency of the call; Fmin, minimum frequency of the call; Fmean, mean frequency of the call; FK; frequency at the knee, FC; characteristic frequency, Dur; duration of the call, TK; time into the call when FK is reached; and TC time into the call when FC is reached.

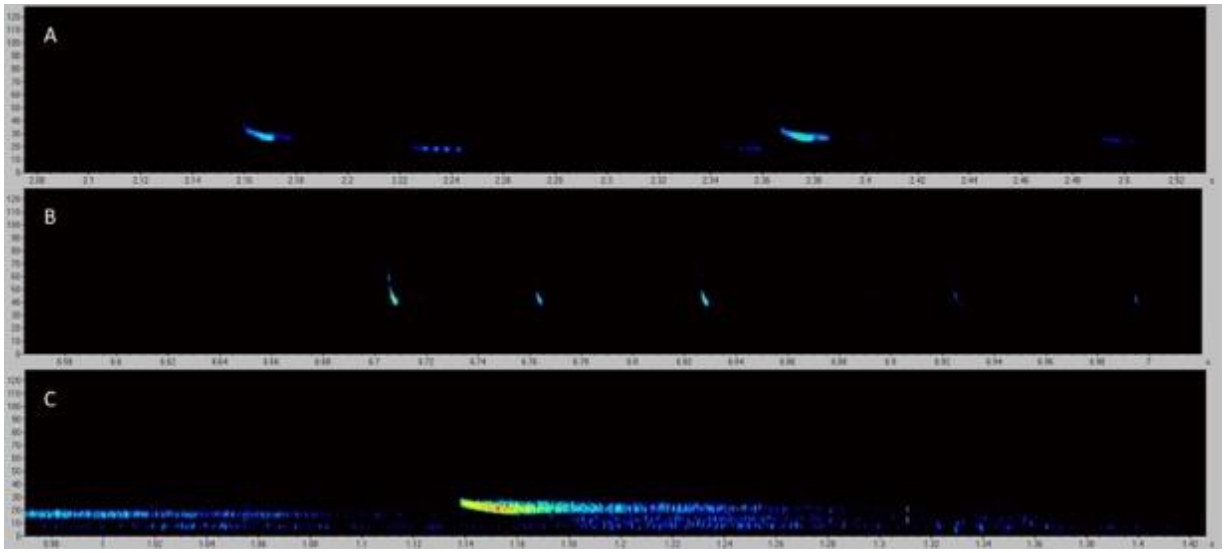


Figure 8–23: Examples of sonagrams of the cals of three bat species recorded on site namely A) Chaerephon pumilus, B) Neoromicia capensis and C) Tadarida aegyptiaca

8.2.1.5.1.2 *Species of Conservation Concern*

A total of 25 IUCN Red-listed species are considered highly likely to occur within the project area based on the availability of suitable habitat. This includes 15 threatened mammal species which are considered likely to occur, an exceptional concentration of threatened species by any African standard. This is due to the concession's location within the Sassandra Pleistocene Refugia and the connectivity of some of the remaining forest patches to the Haute Dodo Reserve to the North and the extensive coastal swamps to the south. Present and potentially occurring species of conservation concern (SCC) for the concession are listed in Table 8–13 together with their likelihood of occurrence and the localities of observed species shown in Figure 8–25. Findings of the preceding and current studies within the concession confirmed the presence of six red-listed species within the AOI. An additional two species of conservation importance are reported to occur by the local community bringing the total number of present SCC to nine including three Endangered, one Vulnerable, four Near-Threatened and one Data Deficient species.

Figure 8–24: Examples of specific habitat utilised by large conservation important mammals; A) fern-dominated forest clearing surrounded by tall trees frequented by Forest Buffalo (Syncerus caffer nanus) and B and C) game path utilised by this species as well as Pygmy Hippopotamus (Choeropsis liberiensis), note the lack of incised banks.

Pygmy Hippopotamus (*Choeropsis liberiensis*) - Endangered

This species was detected by means of fresh tracks and paths at several locations along the Dodo River south of the village of Djoro (2.5 km west of the concession boundary. Conditions appear suitable northwards as far as the plantation camp. Thereafter the riparian zone becomes increasingly more impacted until it completely disappears further north into the concession. Here the banks are considerably more incised (compared to the shallow sloped flooded setting south of Grand Djoro). Increased human disturbance, a lack of forest cover and difficult access to and from the river likely preclude the presence of the species north of the plantation camp. All other rivers within the concession are likely too impacted by a loss of riparian forest, and human disturbance to sustain the species, although rivers within protected Forest Block A may still sustain transitory individuals. The species is rarely seen due to its secretive nocturnal habits. A six-month study by Bülow (1988) in Azagny National Park, Côte d'Ivoire, found that female home ranges covered 40-60 ha, while those of males covered 150 ha. The species is, however, highly associated with intact relatively contiguous forest and is largely absent from developed areas with highly degraded forest. The remaining population of Pygmy Hippopotamus is estimated at <3000 individuals (IUCN, 2019). Camera trap-based field studies reveal extremely low capture rates suggesting low densities even areas known to be hotspots for the species. A study by Collen et al. (2011) 1,247 trap days we obtained seven camera-trap photographs This dwindling population is threatened by forest loss and persecution for the bushmeat trade.

African White-bellied Pangolin (*Phataginus tricuspis*) - Endangered

This species was detected visually in Protected Area Block A during the preceding study but was not detected during the current study. Interviews with locals suggest the species is locally common in forests within the concession. This species is typically associated with moist lowland forest but does appear somewhat adaptable as it is often encountered in secondary forests and even abandoned oil palm plantations (IUCN, 2019). Like all

other pangolins this species is threatened by persecution for the bushmeat market and for trafficking. It is the most commonly available pangolin in the African bushmeat markets (IUCN, 2019).

Chimpanzee (*Pan troglodytes*) - Endangered

This presence of this species within the concession is anecdotal, with neither the current or preceding studies finding any signs of the species presence (e.g. nests, vocalizations, tracks). Nevertheless, the accounts appear accurate and certainly the presence of this species within larger forests within the concession seems highly plausible. A group of Chimpanzees were heard vocalizing by the SOGB forest rangers from Forest Block A a few months prior to the current site visit. However, occurrence within most of the forests within the concession is likely to be transitory within the exception of Forest Block A which may support more sustained presence. These large charismatic primates are threatened mainly by poaching, habitat loss and disease.

Black-bellied pangolin (*Phataginus tetradactyla*) - Vulnerable

This species is reported to occur by locals. Suitable forest habitat remains within the concession to support this species. Like the African White-bellied Pangolin this species is also threatened by hunting and trade.

Bay Duiker (*Cephalophus dorsalis*) - Near-Threatened

This large unmistakable duiker was observed by L. Verburgt (herpetofauna specialist) during a night survey within rubber plantations in the western regions of the concession. It is likely that the species inhabits most of the larger remaining forested patches within the concession. Bay Duiker are subject to intense persecution for the bushmeat trade.

Forest Buffalo (*Syncerus caffer nanus*)

This species was observed on two occasions during the current survey, both on the first fieldwork day and then not observed again for the remainder of the fieldwork, suggesting skittishness likely due to persecution. The first observation was made while installing motion cameras at a remote location along the Dodo River only accessible by canoe. The herd comprised of approximately 10 individuals was grazing in a forest clearing near the river filled with ferns tended by one large bull. Based on the size and number of freshly trodden tracks it is apparent that the area supports a relatively large population of resident buffalo. The second observation was made in Forest Block A where the specialist team startled a heard which could be heard crashing through the forest. Drone-based aerial surveys during the study revealed that this open, fern dominated swamp habitat (Figure 8–24) extends southwards towards the coast and occurs again in the large patch of unprotected swamp forest in the north-western regions of the concession, north of Protected Forest Block A and west of Protected Forest Block E. These large, secretive animals are one of the least studied large mammals in Africa. The species typically inhabits large stands of dense forest. A study on the habitat preferences of this species by Melletti et al. (2007) reveals that open canopy forest clearings surrounded by large trees appear to be an important prerequisite for the occurrence of the species with the authors suggesting that they play a role in facilitating social interactions between the members of the herd and allowing the herd to rest and ruminate together. Although the conservation status of this species is poorly known it is clear that their numbers have declined substantially due to poaching and deforestation (Melletti et al. 2007).

Spectacled Mangabey (*Cercocebus atys*)

This species was detected during the preceding survey and involved detection by means of vocalizations that were heard coming from Protected Forest Block A. This species is presumed to have declined by 20-25% over the past 27 years due to deforestation and hunting justifying its Near-Threatened Status.

Pel's Scaly-tailed Squirrel (*Anomalurus pelii*)

This species was observed visually within Protected Forest Block A during the preceding study. Very little is known about this flying squirrel, hence its designation as Data Deficient.

Table 8–13: Confirmed and potentially occurring mammal SCC[12]

Species	Common Name	LO	Previous Study	Current Study	Anecdotal
Endangered					
Cephalophus jentinki	Jentink's Duiker	3			
Choeropsis liberiensis	Pygmy Hippopotamus	1		x	
Phataginus tricuspis	African White-bellied Pangolin	1	x		x
Smutsia gigantea	Giant Pangolin	2			
Cercopithecus diana	Diana Guenon	2			
Pan troglodytes	Chimpanzee	1			x
Piliocolobus badius	Upper Guinea Red Colobus	2			
Vulnerable					
Caracal aurata	Golden Cat	2			
Liberiictis kuhni	Liberian Mongoose	2			
Panthera pardus	Leopard	2			
Poiana leightoni	West African Oyan	2			
Cephalophus zebra	Zebra Duiker	3			
Phataginus tetradactyla	Black-bellied pangolin	1			x
Colobus polykomos	Ursine Black-and-White Colobus	2			
Procolobus verus	Van Beneden's Colobus	2			
Trichechus senegalensis	African manatee	4			
Near-Threatened					
Aonyx capensis	Cape Clawless Otter	2			
Genetta johnstoni	Johnston's Genet	2			
Hydrictis maculicollis	Speckle-throated Otter	2			
Cephalophus dorsalis	Bay Duiker	1		x	
Cephalophus silvicultor	Yellow-backed Duiker	2			
Syncerus caffer nanus	Forest Buffalo	1	x	x	
Tragelaphus eurycerus	Bongo	1			x
Eidolon helvum	African Straw-coloured Fruit Bat	2			
Neoromicia brunnea	Brown Pipistrelle	2			
Scotonycteris ophiodon	Pohle's Fruit Bat	2			
Crocidura grandiceps	Large-headed Forest Shrew	3			
Crocidura nimbae	Nimba Shrew	4			
Cercocebus atys	Spectacled mangabey	1	x		
Cercopithecus nictitans	Greater Spot-nosed Guenon	4			
Data Deficient					
Genetta poensis	Genette Royale	2			
Anomalurus pelii	Pel's Scaly-tailed Squirrel	1	x		
Grammomys buntingi	Bunting's Grammomys	3			
Graphiurus crassicaudatus	Jentink's Dormouse	3			

[12] LO, likelihood of occurrence; 1, present; 2, high; 3, moderate; 4, unlikely (a = anecdotal). IUCN status; EN, Endangered; CR, Critically Endangered; LC, Least Concern; NT, Near Threatened; VU, Vulnerable. Lettering in parentheses denotes population trend; D, decreasing; I, increasing.

Species	Common Name	LO	Previous Study	Current Study	Anecdotal
Heliosciurus punctatus	Small Sun Squirrel	3			
Oenomys ornatus	Ghana Rufous-nosed Rat	3			

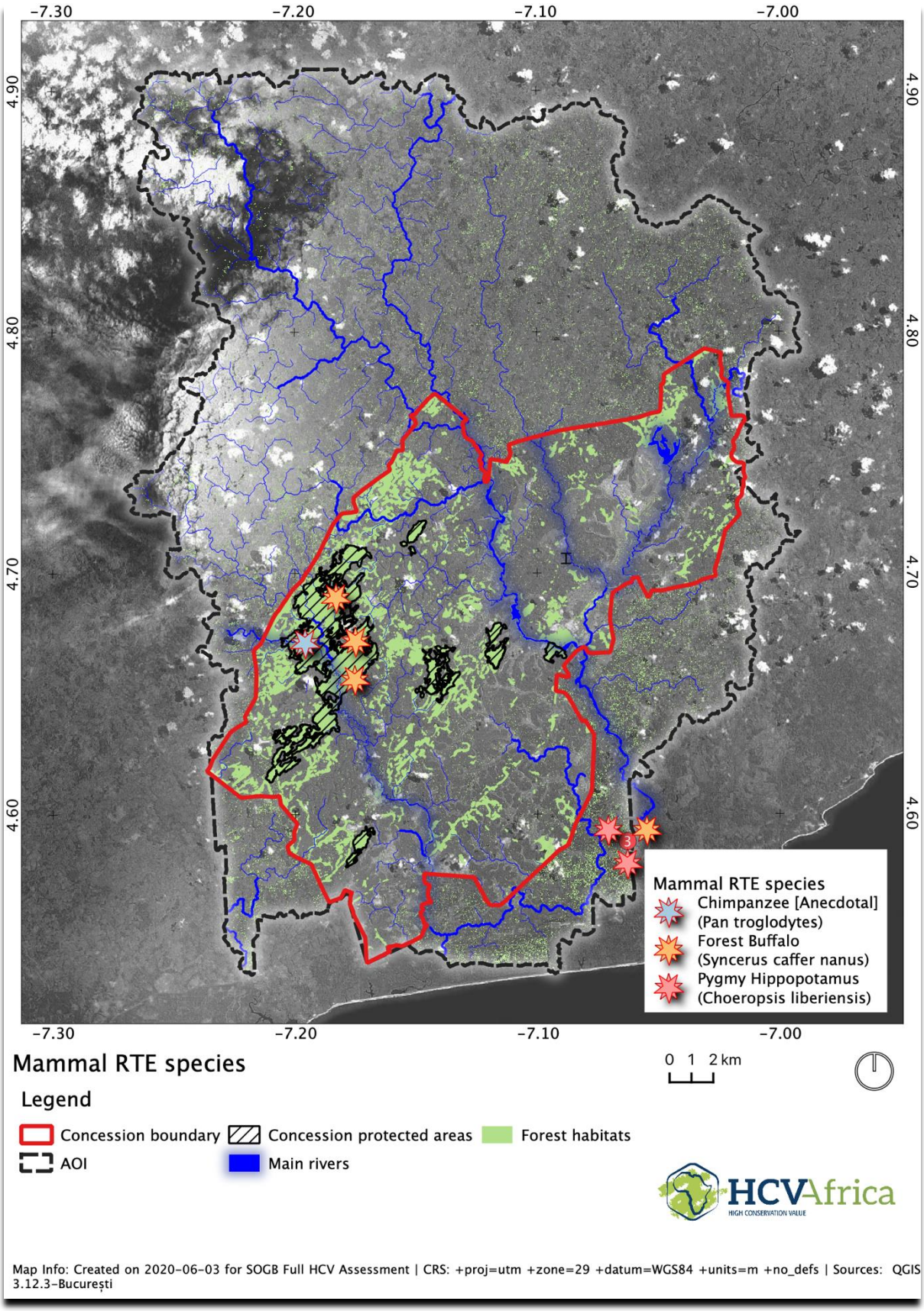


Figure 8–25: Localities of conservation important mammal species

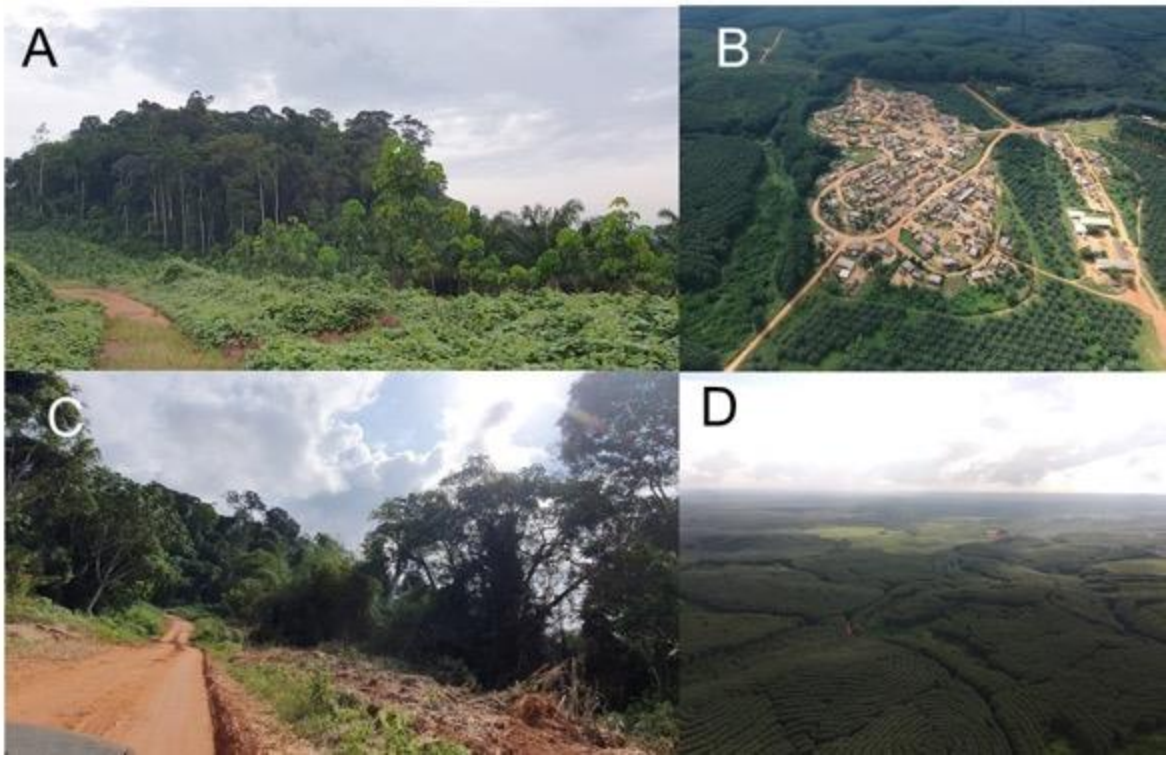


Figure 8–26: Examples of existing impacts observed on site namely A) deforestation due to palm oil cultivation, B) settlement, C) forest clearing along roads and D) rubber plantation

8.2.1.6 Herpetofauna

8.2.1.6.1.1 *Landscape Context*

Côte d'Ivoire has a diverse herpetofauna comprising approximately 162 reptiles and 85 frog species (Uetz et al., 2019; AmphibiaWeb, 2019). This species richness is due to the diversity associated with the Upper Guinea Forest.

The Concession is large, covering about 34 712 ha, with small villages and towns connected by gravel roads. The majority of the land use is for plantations, mostly oil palm and rubber. There are no formally proclaimed Forest Reserves within or adjacent to the Concession, although some small Protected Areas, managed by SOGB, are encompassed by the Concession.

At least 19 (8 %) of the herpetofauna species occurring in Côte d'Ivoire are considered to be at risk of extinction (Threatened [CR, EN & VU]; IUCN 2019), predominantly due to habitat transformation associated with deforestation due to agriculture and/or consumption of bushmeat (large-bodied species).

8.2.1.6.1.2 *Local context*

Generally speaking, the habitat types of relevance to herpetofauna within the Concession can be classified as follows:

- Lowland Forest;
- Riparian Forest;
- Hillslope Forest (includes inselbergs);
- Swamp Forest;
- Secondary or degraded Forest;
- Streams and rivers; and
- Transformed habitats (includes infrastructure, roads and agricultural plantations).

A desktop evaluation of all herpetofauna known to occur in Côte d'Ivoire was performed to determine the probability of occurrence for each species within the Concession, taking into account the available habitat types.

The evaluation was based on the known geographic distribution, the species-specific habitat preferences, and the availability of suitable habitat within the Concession.

Based on the evaluation, a total of 102 reptile and 59 amphibian species are expected to occur with a medium to high probability within the Concession, representing the relatively high herpetofauna diversity, characteristic of the Guinean Forests.

8.2.1.6.1.3 *Species Richness*

During the herpetofauna survey 22 amphibian (Figure 8–27) and 15 reptile (Figure 8–28) species were observed, three of which are SCC that trigger HCV1 (Figure 8–29). A relatively high number of herpetofauna species capable of adapting to disturbed conditions were observed within the oil palm and rubber plantations. While these species are generalists and not of conservation concern, they are nevertheless considered to be important in maintaining ecological function and providing a source of food for forest-dependent species migrating/dispersing through the landscape.

Only two species of tadpole were observed (but not collected) during the survey, both well-developed and close to metamorphosis, which is indicative of the end of the breeding season for amphibians (that breed during the wet season).

Figure 8–27: A selection of amphibian species observed during the herpetofauna survey. A] Aubria subsigillata B] Phlyctimantis boulengeri C] Geotrypetes seraphini D] Hyperolius chlorosteus E] Afrixalus dorsalis F] Phrynobatrachus villiersi G] Hyperolius guttulatus H] Hyperolius soror I] Hyperolius fusciventris J] Hyperolius cf picturatus K] Hyperolius concolor L] Astylosternus occidentalis M] Amnirana albolabris N] Ptychadena bibroni O] Leptopelis viridis P] Phrynobatrachus liberiensis Q] Arthroleptis poecilonotus R] Sclerophrys maculata S] Phrynobatrachus latifrons T] Phrynobatrachus alleni U] Phrynobatrachus plicatus - note that the identities of species with "cf" in the name must still be confirmed

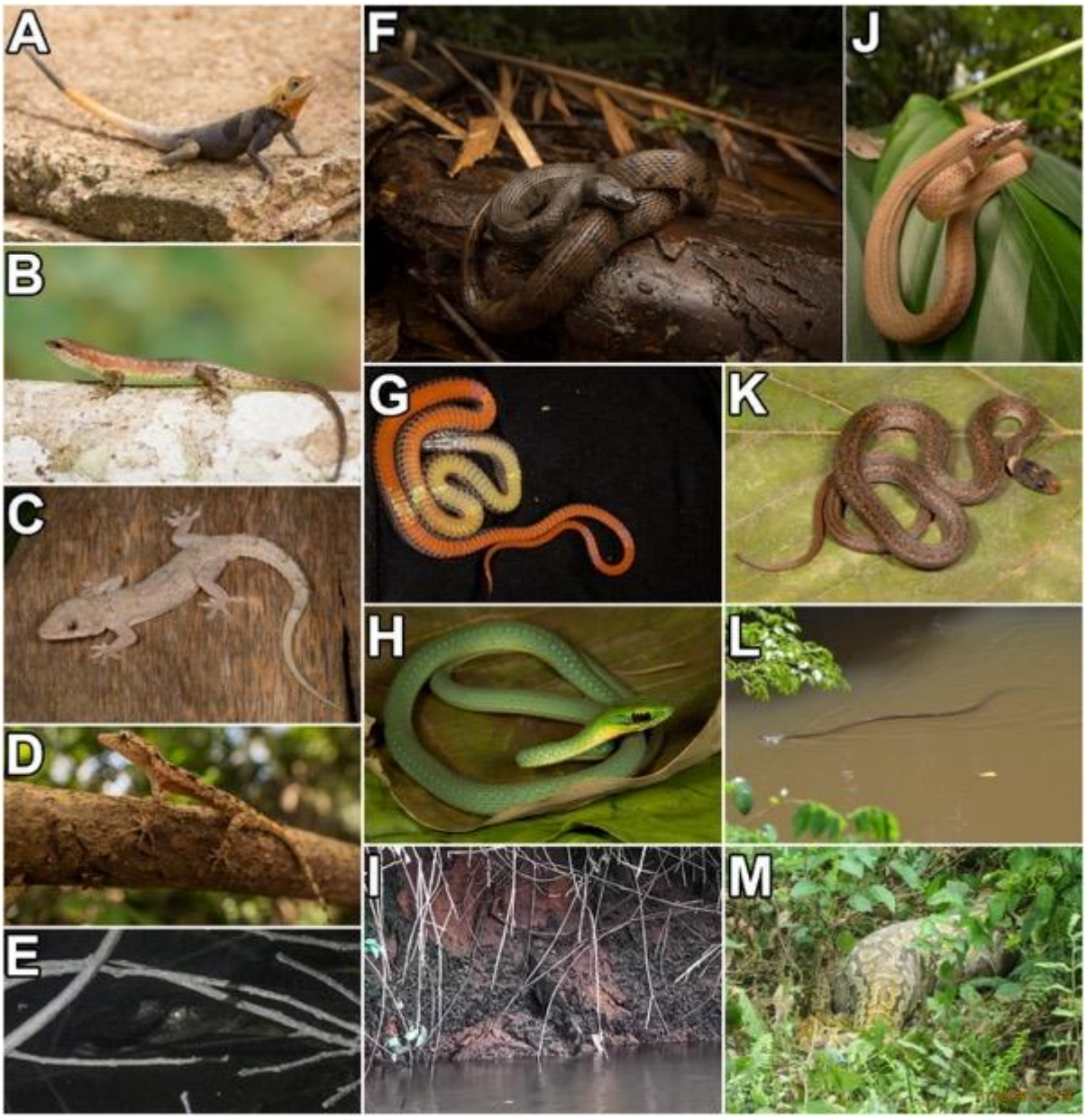


Figure 8–28: A selection of reptile species observed during the herpetofauna survey. A] Agama agama B] Trachylepis paucisquamis C] Hemidactylus mabouia D] Hemidactylus ansorgii E] Crocodylus suchus F] Afronatrix anoscopus G] Natriciteres variegata (ventral) H] Hapsidophrys smaragdinus I] Varanus niloticus J] Hormonotus modestus K] Natriciteres variegata (dorsal) L] Grayia smithii M] Python sebae

8.2.1.6.1.4 *Species of Conservation Concern*

A total of 8 herpetofauna SCC were either confirmed or have a high probability of occurrence in the Concession (Table 8–14). Photographs of the observed SCC are provided in Figure 8–29 and a map of the localities of the confirmed observations of SCC is provided in Figure 8–30. Evaluation of the habitat requirements for these species indicate a strong requirement for rivers and streams in forested habitats (Table 8–14). Each of the IUCN threatened species either confirmed or having a high probability of occurrence in the Concession are briefly discussed in this section following the order of presentation in Table 8–14.

Mecistops cataphractus (West African slender-snouted crocodile) is a mound-nesting crocodile that constructs nests within 10 m of the high-water level (Shirley *et al.,* 2018). The nesting behaviour of this species is therefore reliant on healthy river and stream habitats with suitable riparian forest cover. This species has been previously observed in the Dodo River in the Concession (Ahizi *et al.,* 2017) and is known from the river systems of Tai National Park and the coastal swamps near San Pedro (Shirley *et al.,* 2018).

Kinixys homeana (Home's hinge-back tortoise, CR[13]) requires lowland evergreen forest and is usually associated with streams and swampy areas (Branch, 2012). It is particularly sensitive to over-heating through exposure to sun, which is why it cannot tolerate significant habitat degradation (Luiselli, 2005). It is sought after by local people throughout its range as a food protein source (bushmeat). This species was observed in the forested habitats of the Concession.

Phrynobatrachus annulatus (Ringed river frog, EN) inhabits primary lowland rainforest, most often in drier forest parts, such as rocky slopes of inselbergs (Channing & Rödel, 2019). It is associated with shallow rocky streams on inselbergs in primary forest and therefore has very limited suitable habitat in the landscapes, since such habitats are generally rare and disjunct. This species was observed in the rocky streams in forested habitats of the Concession.

Kinixys erosa (Eroded hinge-back tortoise, EN[14]) has similar habitat requirements to that of *K. homeana* and is threatened by the same pressures such as loss of habitat and over-exploitation (Branch, 2012). This species has a high likelihood of occurring in the forested habitats and their ecotones in the Concession.

Osteolaemus tetraspis (African dwarf crocodile, VU) has a similar ecology to that of *M. cataphractus* as it is a dwarf, nest-building crocodile that requires forested rivers and streams to survive. It is, however, slightly more tolerant to disturbances than *M. cataphractus* and has a wider geographic range, which is why it has a less threatened conservation status (Vulnerable). This species is known from the rivers in the region (Trape *et al.,* 2012) and suitable habitats exist within and surrounding the Concession.

*Trionyx triungui*s (African softshell turtle, VU) prefers slow-moving rivers and streams but also inhabits flooded pans and is fond of estuaries. It is hunted by local people for food and can become entangled in fishing nets and drown (Branch, 2012). This species is known from the rivers in the region (Trape *et al.,* 2012, Rhodin *et al.,* 2017) and suitable habitats exist within and surrounding the Concession.

Kassina arboricola (Côte d'Ivoire running frog, VU) selects edges of primary rainforest, and secondary growth. It breeds in vegetated temporary waterbodies (Channing & Rödel, 2019). It has a high probability of occurring within the Concession but was not found during the survey due to the breeding season already having been completed.

Cyclanorbis senegalensis (Senegal flapshell turtle, VU) occurs in nearly any freshwater body, but prefers small, seasonal ponds, puddles and marshes (IUCN 2019). It has a high probability of occurring within the Concession (Rhodin et al., 2017).

[13] The IUCN Red List evaluation of this species is outdated (2006) and therefore the TFTSG Draft Red List (2013) is used (see Rhodin et al. 2017)

[14] The IUCN Red List evaluation of this species is outdated (2006) and therefore the TFTSG Draft Red List (2013) is used (see Rhodin et al. 2017)

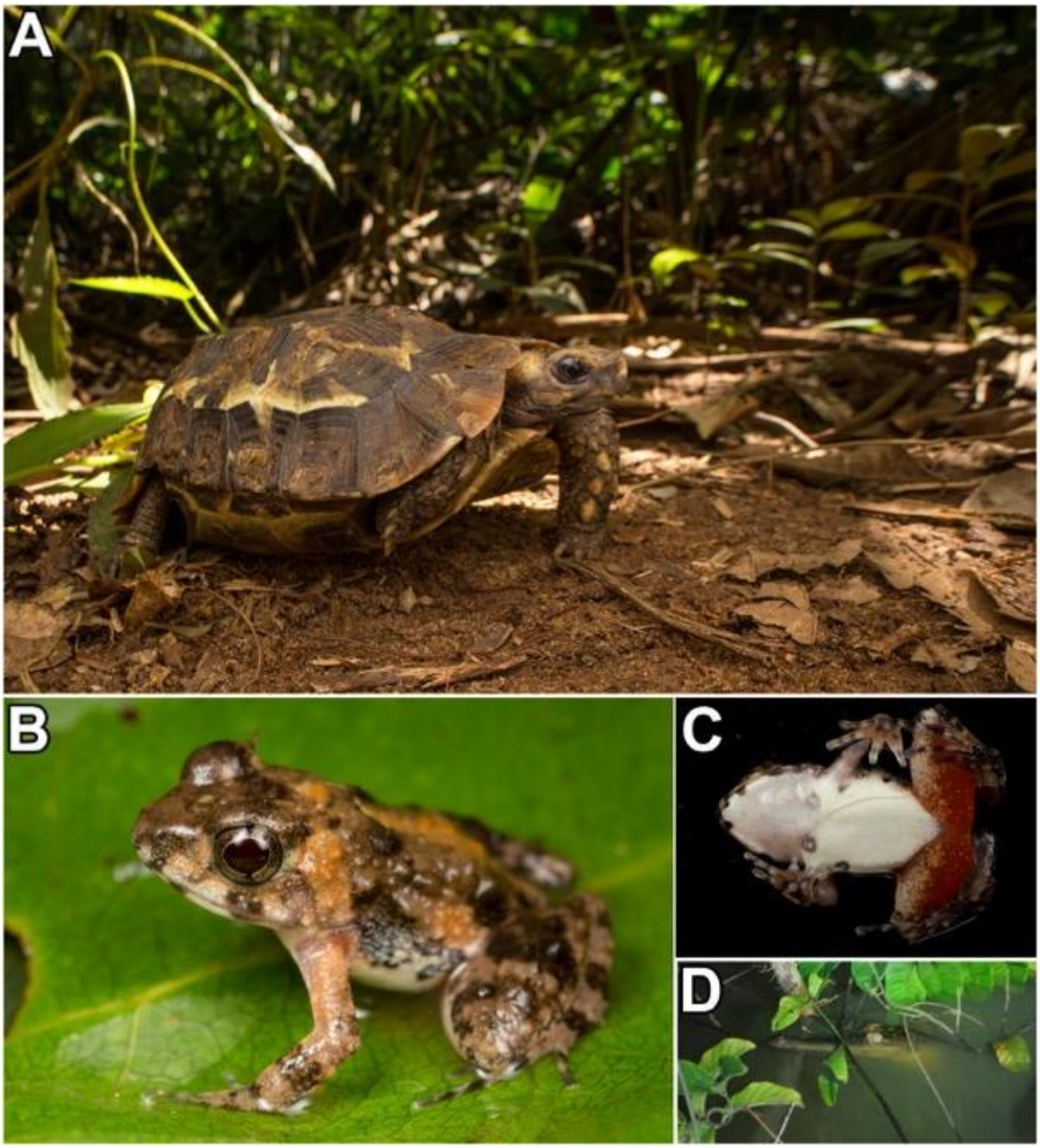


Figure 8–29: A selection of herpetofauna species of conservation concern observed within the Concession. A] Kinixys homeana B] Phrynobatrachus annulatus C] Phrynobatrachus annulatus (ventral) D] Mecistops cataphractus

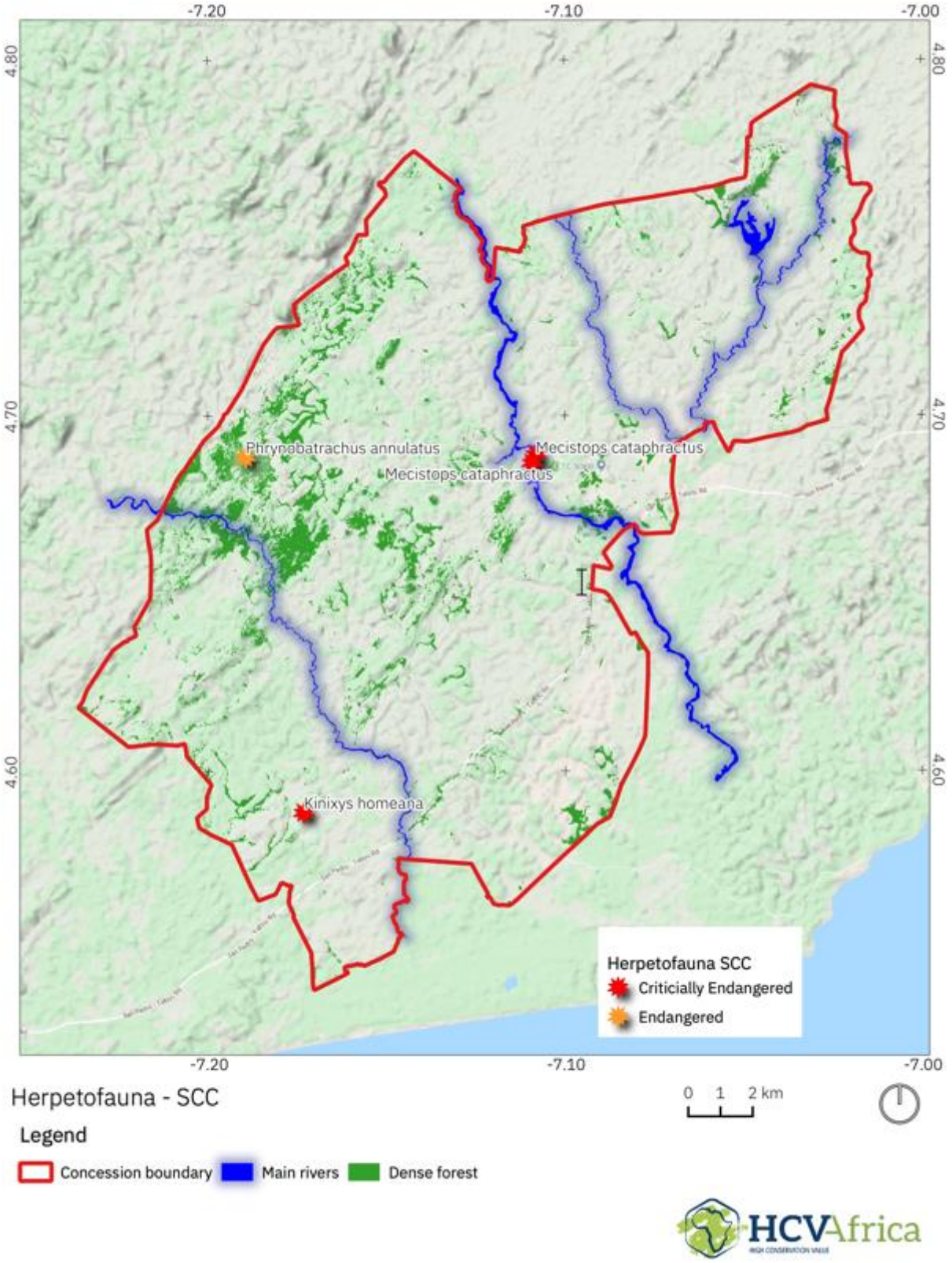


Figure 8–30: Location of species of conservation concern in relation to the Concession.

Table 8–14: Expected herpetofauna SCC (considered to be threatened by the IUCN) for the Concession.

Class	Species	IUCN Status	National Protection Annex	Habitat Requirements	Probability of Occurrence
Reptillia	*Mecistops cataphractus*	Critically Endangered	I	Forested rivers, streams and lakes.	Confirmed
Reptillia	*Kinixys homeana*	Critically Endangered	III	Forested areas, prefers ecotones of secondary and mangrove/swamp forest.	Confirmed
Amphibia	*Phrynobatrachus annulatus*	Endangered		Small rocky streams and ponds in primary forest, usually associated with rocky inselbergs	Confirmed
Amphibia	*Sclerophrys taiensis*	Endangered		Pristine lowland forest. Breeds in leaf litter adjacent to small forest streams and swamps.	Low
Amphibia	*Hyperolius nienokouensis*	Endangered		Primary rainforest, males call from up to 4 m above ponds	Low
Reptillia	*Kinixys erosa*	Endangered	III	Forested areas, prefers ecotones of secondary and mangrove/swamp forest.	High
Amphibia	*Kassina arboricola*	Vulnerable		Edges of primary rainforest, and secondary growth. Breeds in vegetated temporary waterbodies.	High
Amphibia	*Kassina lamottei*	Vulnerable		Primary lowland rainforest, calls from burrows and leaf litter and at breeding sites in large temporary water-bodies.	Low
Reptillia	*Osteolaemus tetraspis*	Vulnerable	I	Forested streams, small rivers, swamps, pools and mangroves.	High
Reptillia	*Trionyx triunguis*	Vulnerable	III	Deep permanent lakes, rivers, estuaries, coastal lagoons and coastal waters.	High
Reptillia	*Cyclanorbis senegalensis*	Vulnerable		Nearly any freshwater bodies, but prefers small, seasonal ponds, puddles and marshes.	High

8.2.1.7 Aquatic Ecology

8.2.1.7.1 Water Quality

Water samples were obtained directly from SOGB. The water quality results were largely interpreted from sampling sites located at the entry point into the plantation and an exit point of the same watercourse downstream of the plantation. The assessment therefore allows for the assessment of water quality as it enters the plantation and exits, thereby providing an effective upstream and downstream monitoring plan.It is noted that borehole monitoring was not considered in this assessment.

The results provided in Rapport d'essai no. 645.19 for an assessment completed on the 19th of May 2019 (ENVAL, 2019). It is noted that water was obtained from the sampling points at 10/05/2019. The results are provided below.

Table 8–15: Water Quality Results Entry Concession (ENVAL, 2019)

Parameter/Site	Entrée Tiepé	Entrée Blé	Entrée Dodo	Entrée Gnebougabo
Temperature	27.8	28.1	28	27.7
pH	6.9	6.9	6.9	6.9
Total Suspended Solids (mg/l)	19	499	12.4	8.7
Turbidite	38.8	23.9	16.9	4.5
Conductivity (uS/cm)	96	57	58	66
Dissolved Oxygen	2.7	5.1	5.3	6.5
Nitrites	0.014	0.05	0.06	0.01
TDS (mg/l)	95	53	50	55

Table 8–16: Water Quality Results Exit Concession (ENVAL, 2019)

Parameter/Site	Sortie Tiepé	Sortie Blé	Sortie Dodo	Sortie Gnebougabo
Temperature	28.8	29.3	28.6	28.6
pH	6.8	6.9	6.8	7.2
Total Suspended Solids (mg/l)	10.6	121	664	334
Turbidite	14.3	38.9	20.5	7.7
Conductivity (uS/cm)	91	227	58	59
Dissolved Oxygen	3.6	0.8	5.1	5.3
Nitrites	0.2	0.002	0.009	0.012
TDS (mg/l)	81	230	53	55

The results of the assessment indicate neutral pH levels at both upstream and downstream locations. Concentrations of Total Suspended Solids (TSS;mg/l) were found to decrease in the Tiepé and Blé Rivers but increase in the Dodo and Gnebougabou. The concentrations fo TSS were found to be inconsistent with the turbidity trends observed in the water samples, an un-common occurrence which may indicate poor quality analysis. This was evident in the Blé River, where TSS concentrations and turbidity of 499 mg/l and 23.9 (NTU) were observed at the entry point which decreased to 121 mg/l TSS and increased turbidity of 38.9 (NTU). Similar inconsistencies were observed in the Gneboagbo River.

The measurement of conductivity provides an indication of the nature of dissolved solid content in drainage. Aside for the Blé River, the conductivity results indicated no increase in dissolved solid content of the watercourse, indicating runoff from the SOGB plantation was not negatively effecting the concentration of dissolved solids.

The concentration of dissolved nitrogen forms an integral component of the trophic status of a watercourse. In combination with total phosphorous the trophic status of a watercourse can be derived. In the case of the available results for this assessment, the dissolved total concentration of nitrogen was not possible to calculate as only nitrite was considered. Nitrite is typically only present for a short time concentration and is typically present in concentrations which are irrelevant biologically as observed in this assessment. The consideration of nitrate and ammonium must be considered in all future analysis.

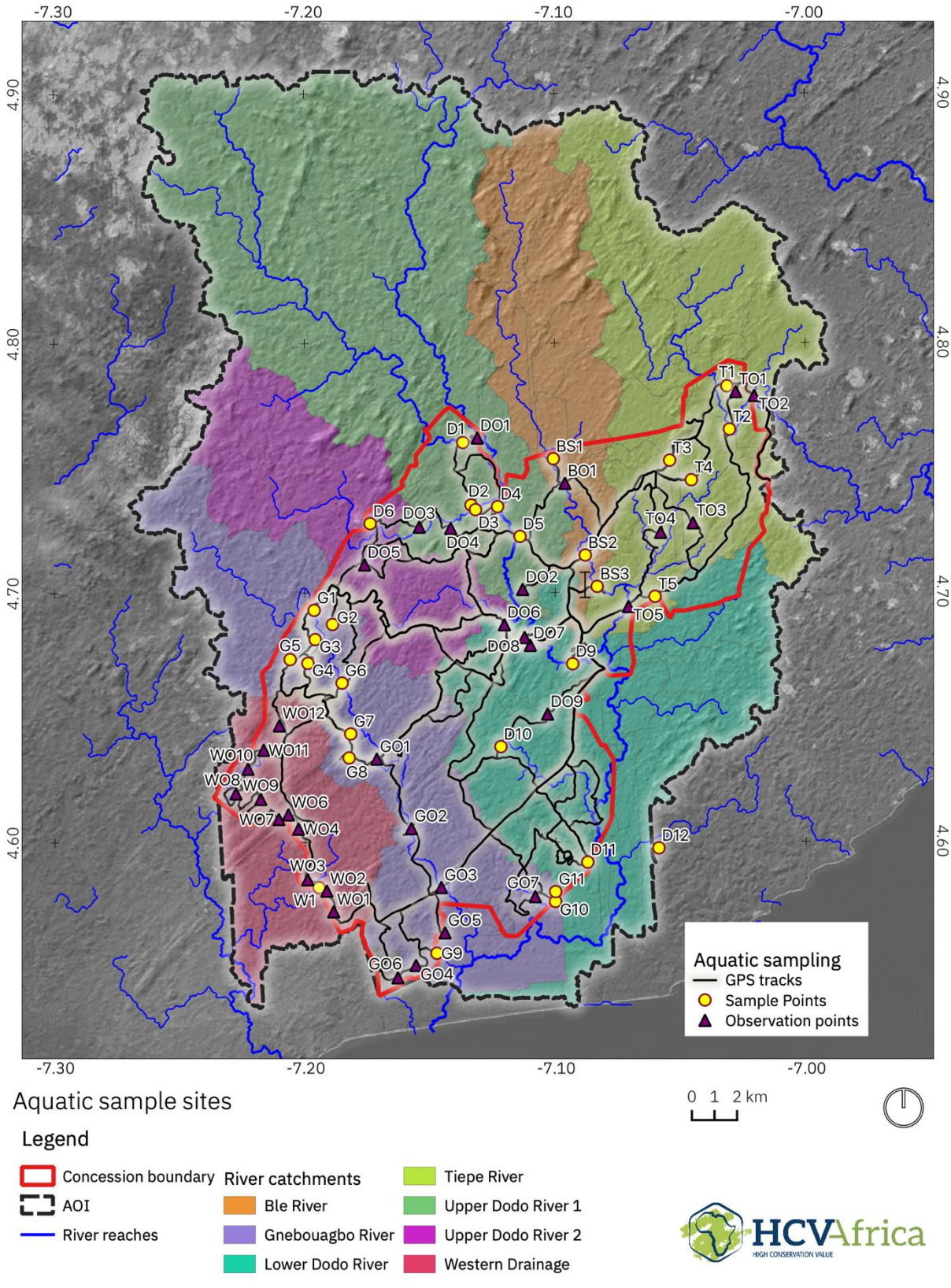
The dissolved concentration of oxygen was derived to range from 0.8 mg/l at the downstream sampling point of the Blé River to 6.5 mg/l at the entry site of the Gnebouagbo River. Typically, at values below 5.0 mg/l negative effects on sensitive aquatic biota would be observed. However, it is unlikely that the Blé River would contain such low concentrations of dissolved oxygen, particularly considering that there is limited chemical or biological oxygen demand in the watercourse.

In conclusion, the available data for water quality in the local river systems is temporally poor and is not comprehensive. The impact of the SOGB activities on water quality is therefore inconclusive. Recommendations on how to improve the water quality monitoring is provided in the recommendations component of this report.

8.2.1.7.2 Habitat Quality

8.2.1.7.2.1 *Habitat Quality – The Dodo River*

The IHIA was performed on the Dodo River at eight sampling points on the mainstem of the Dodo watercourse. In addition, 12 observation and sampling points were utilised to assess the general state of the various unclassified tributaries which were not located on the primary flow-path of the Dodo River. The sampling locations of the IHIA is shown in Figure 8–31. The results of the IHIA is presented in Table 8–17.



Map Info: Created on 2020-03-26 for SOGB Full HCV Assessment | CRS: +proj=utm +zone=29 +datum=WGS84 +units=m +no_defs | Sources: QGIS 3.12.0-București

Figure 8–31: Aquatic sampling locations

Table 8–17: Habitat Integrity Assessment of the Dodo River (April & November 2019)

Criterion	Average Score	Score
Instream		
Water abstraction	3.0	1.7
Flow modification	10	5.2
Bed modification	10	5.2
Channel modification	15	7.8
Water quality	2.0	1.1
Inundation	0.0	0.0
Exotic macrophytes	0.0	0.0
Exotic fauna	0.0	0.0
Solid waste disposal	5.0	1.2
Total Instream Score	**77.8**	
Instream Category	**Class C**	
Riparian		
Indigenous vegetation removal	10	10.4
Exotic vegetation encroachment	10	7.2
Bank erosion	5.0	5.6
Channel modification	15	7.2
Water abstraction	3.0	1.56
Inundation	0.0	0.0
Flow modification	10	4.8
Water quality	2	1.0
Total Riparian Score	**62**	
Riparian Category	**Class D**	

The results of the IHIA in the Dodo River indicated moderately modified instream conditions (class C). The dominant factors negatively affecting the instream condition of the watercourse could be attributed to channel, bed and flow modification. Landcover in the central catchments of the Dodo River have been extensively modified from natural to agricultural cover. Although the headwaters of the Dodo River were not directly surveyed in this study, aerial imagery of the catchments indicate a large degree of modification as a result of smallholder agricultural activity.

In the northern region of the SOGB Concession, where the Dodo River enters the plantation, modification of the watercourse was observed to be occurring upstream of the SOGB activities (Figure 8–32). The Dodo River at DO1 was characterised by an incised modified channel, an indication of high energy water movements. It was noted that the incised nature of the watercourse could be attributed to the alteration of landuse, and the increase in discharge rates and volumes of surface stormwater runoff. This impact was observed throughout the middle reaches of the Dodo River (DO7, Figure 8–33). In the lower reaches of the watercourse the incised nature of the waterbody was no longer evident and wetland floodplains were observed in an unmodified channel (Figure 8–34). Bed modification present in the Dodo River was attributed to increased sedimentation as a result of the catchment wide landuse modification.

Riparian habitat forms an integral component of the watercourse and provides effective cover for aquatic biota via overhanging foliage to the input of allochthonous materials. The IHIA for the riparian habitat of the Dodo River indicated largely modified (class D) conditions. Indigenous vegetation removal and the establishment of exotic vegetation in the riparian zone of the Dodo River was noted to occur throughout the middle reaches (Figure 8–35), with an extensive natural riparian zone in the lower reaches (Figure 8–34). Similarly, to the instream habitat, flow and channel modification also negatively impact the condition of the riparian habitats.

Figure 8–32: The Dodo River as it enters the SOGB Concession (DO1, April 2019)

Figure 8–33: The Dodo River in the southern portion of the SOGB Concession (DO7, April 2019)

Figure 8–34: The lower Dodo River with an intact riparian zone and natural channel (D12, November 2019)

Figure 8–35: Alien vegetation (Bamboo) in the Dodo River riparian zone (D5; April 2019)

The survey of the various tributaries of the Dodo River on the SOGB Concession revealed the presence of a headwater tributary system at observation point D6 (Figure 8–36). The composition of the system was regarded as largely natural with an intact riparian habitat. Upland systems form an important component of watercourses in that downstream conditions are characterised by the condition of the headwaters.

Figure 8–36: A natural headwater (Upper Foothill) in the Dodo River system (D6, November 2019)

The further assessment of unclassified tributaries of the Dodo River indicated the presence of modified habitats. Typical impacts observed were that to the instream and riparian habitat which was noted to be extensively modified as a resultant effect of agricultural activities. Despite the modified nature of these watercourses, these habitats are still considered to be important to local fauna.

Figure 8–37: A modified reach tributary of the Dodo River (D3; April 2019)

8.2.1.7.2.2 *Habitat Quality – The Gnebouagbo River*

The IHIA was performed on the Gnebouagbo River at 11 sampling and 7 observation points throughout its catchment. This included 8 points on the mainstem of the river system. The results of the IHIA is presented in Table 8–18.

Table 8–18: Habitat Integrity Assessment for the Gnebouagbo River (April and November 2019)

Criterion	Average Score	Score
Instream		
Water abstraction	1.0	0.5
Flow modification	12	6.2
Bed modification	13	6.7
Channel modification	15.5	8.06
Water quality	2.0	1.12
Inundation	0.0	0.0
Exotic macrophytes	0.0	0.0
Exotic fauna	0.0	0.0
Solid waste disposal	2.0	0.4
Total Instream Score	**76**	
Instream Category	**Class C**	
Riparian		
Indigenous vegetation removal	14	7.3
Exotic vegetation encroachment	14	6.7
Bank erosion	5.0	2.8
Channel modification	15	7.2
Water abstraction	1.0	0.5
Inundation	0.0	0.0
Flow modification	11	5.3
Water quality	2.0	1.1
Total Riparian Score	**69**	
Riparian Category	**Class C**	

The results of the IHIA for the Gnebouagbo River indicated moderately modified (class C) instream and riparian habitats. Similarly to the Dodo River, the headwater zone of the Gnebouagbo River catchment was derived via aerial imagery to be developed into a landscape dominated smallholder agricultural plantations. Where the Gnebouagbo River enters into the SOGB concession, natural landcover associated with a protected area was noted to occur (Figure 8–38). Throughout an approximate reach length of 6 km the watercourse flows through a protected area with natural morphology (Figure 8–39). Despite the natural landcover, activities in the upper catchment would impact on discharge rates, volumes and sedimentation in the watercourse as was noted to have occurred at the survey points.

Downstream of the protected areas, agricultural encroachment and direct channel manipulation was noted to occur (Figure 8–40). These activities resulted in the alteration of local hydraulic functions and properties of the Gnebouagbo River.

Figure 8–38: Natural landcover in the middle reaches of the Gnebouagbo River where it enters the SOGB Concession (G5, April 2019)

Figure 8–39: A natural channel in the Gnebouagbo River in the protected area of the SOGB Concession (G5, April 2019)

Figure 8–40: A modified reach of the Gnebouagbo River (GO1, April 2019)

The survey of unclassified perennial tributaries in the Gnebouagbo River catchment indicated the presence of natural source zone swamps and streams (Figure 8–41). Similarly to the Dodo River system discussed above, throughout the middle reaches of the Gnebouagbo River, the tributaries of the Gnebouagbo River flow through the SOGB plantation where agricultural encroachment was noted to be extensive.

Figure 8–41: A headwater stream tributary in the Gnebouagbo River system (G2, November 2019)

8.2.1.7.2.3 *Habitat Quality – The TiépéTiépé River*

The Tiépé River was assessed at 5 sampling and 5 observation points during the April and November 2019 surveys. The results of the IHIA are presented in Table 8–19.

Table 8–19: Habitat Integrity Assessment for the TiépéTiépé River (April and November 2019)

Criterion	Average Score	Score
Instream		
Water abstraction	5.0	2.8
Flow modification	20	10
Bed modification	20	10
Channel modification	25	13
Water quality	8.0	4.4
Inundation	5.0	2.0
Exotic macrophytes	0.0	0.0
Exotic fauna	0.0	0.0
Solid waste disposal	5.0	1.2
Total Instream Score	**55**	
Instream Category	**Class D**	
Riparian		
Indigenous vegetation removal	20	10
Exotic vegetation encroachment	20	9.6
Bank erosion	5.0	2.8
Channel modification	20	9.6
Water abstraction	5.0	2.6
Inundation	0.0	0.0
Flow modification	15	7.2
Water quality	5.0	2.6
Total Riparian Score	**55**	
Riparian Category	**Class D**	

The results of the IHIA for the Tiépé River indicated largely modified (class D) instream and riparian habitat. Kako village is located outside of the concession adjacent the banks of the Tiépé River. The roadway and channels left from its construction characterise the watercourse as it enters into the SOGB Concession. Local water users in Kako village had a notable impact on the waterbody as a result of various domestic uses. Within the SOGB Concession the Tiépé River has been canalised and the riparian zone encroached upon. In addition, an impoundment is located on a tributary of the Tiépé resulting in a degree of flow modification and direct inundation impacts. Flow, channel structure and streambed within the concession until the confluence with the Dodo River was noted to be impacted as indicated above.

Figure 8–42: Agricultural encroachment in the Tiépé River (T2, April 2019)

Figure 8–43: A canalised and impounded tributary of the Tiépé River (T4; April 2019)

8.2.1.7.2.4 *Habitat Quality – The Blé River*

The Blé River was assessed at four sampling and observation points during the survey periods. The results of the IHIA in the Blé River is presented in Table 8–20.

Table 8–20: Habitat Integrity Assessment for the Blé River (April and November 2019)

Criterion	Average Score	Score
Instream		
Water abstraction	0.0	0.0
Flow modification	18	9.3
Bed modification	18	9.3
Channel modification	20	10

Water quality	5.0	2.8
Inundation	2.0	0.8
Exotic macrophytes	0.0	0.0
Exotic fauna	0.0	0.0
Solid waste disposal	2.0	0.4
Total Instream Score	**66**	
Instream Category	**Class D**	
Riparian		
Indigenous vegetation removal	20	10
Exotic vegetation encroachment	20	9.6
Bank erosion	5.0	2.8
Channel modification	15	7.2
Water abstraction	5.0	2.6
Inundation	0.0	0.0
Flow modification	15	7.2
Water quality	2.0	1.
Total Riparian Score	**59**	
Riparian Category	**Class D**	

The results of the IHIA in the Blé River indicated largely modified instream and riparian habitat. Smallholder agricultural activities affect the Blé River in the headwaters of the river system whereby a significant component of the catchment area natural cover has been modified. Within the SOGB Concession agricultural encroachment and canalisation were evident throughout the watercourses reach until the confluence with the Dodo River. No natural areas were noted to occur within the Blé River catchment during the April and November 2019 survey.

8.2.1.7.2.5 *Odonata*

A total of 160 species, representing 8 families of Odonata are expected to occur within the AOI. The expected Odonata species list is presented in Appendix A. Photographs of the various species obtained in the AOI are presented in the SOGB Riverine Ecology Specialist Report, HCV Africa 2020. It is noted that all expected Odonata taxa are considered to be Least Concern (IUCN, 2020). Odonate diversity is closely related to habitat diversity. Freshwater habitats associated with modified land cover, particularly monoculture developments, is uniform with little variation. In tropical areas these uniform habitat types can support a wide diversity of Odonata. However, intact freshwater habitat types allow the proliferation of niche taxa with highly specific habitat preferences. Within the SOGB Concession, both modified uniform habitats and intact freshwater systems were observed though-out the concession.

Habitat types for Odonata is largely depicted in the morphological setting of this study which illustrates the range of watercourse types in the AOI. A total of 60 species of Odonata were photographed during the April and November 2019, a further 15 species were visually observed. The observed Odonata confirm the quality of the intact habitats with numerous sensitive taxa observed. Three *Allocnemis* taxa were observed during the study, these species occur in intact source/plateau swamps and headwater streams with 100% forest cover. Five species of *Chlorocypha* were recorded in the AOI, the species is adapted to flowing waters, with certain species only found in watercourses with cobbled stone substrates. Numerous taxa adapted to open but vegetated waters, such as *Pseudagrion camerunense* and *Ictinogomphus ferox* were also observed. Vegetated margins in the lowland swamp habitats also provided effective habitats for specialist species such as *Aethriamanta rezia*, *Rhyothemis fenestrina* and numerous *Agriocnemis* wisps. Furthermore, three species were recorded for the first time in Côte d'Ivoire during the surveys undertaken for this study. These species include *Chlorocypha luminosa*, *Brachythemis lacustris* and *Pseudagrion cyathoforme.*

Figure 8–44: Odonata observed on the SOGB Concession. Top Left: Allocnemis elongata*; Top Right:* Chlorocypha luminosa; *Bottom Left:* Cyanothemis simpsoni; *Bottom Right: Sapho ciliata.*

8.2.1.7.2.6 *Ichthyofauna*

The fish fauna of the AOI is typical of the coastal regions of Côte d'Ivoire within the Upper Guinea ichthyological province (Figure 8–45). This ichthyological province includes Atlantic draining basins originating on the Guinean ridge to the border of western Côte d'Ivoire (Snoeks et al. 2011). However, the exact boundaries of the province have not been well defined and based on the current literature coastal regions of Côte d'Ivoire are included in the Upper Guinea Province. Furthermore, not all ichthyological provinces begin and end abruptly with some species occurring across two neighbouring provinces. This was determined to be the case for this study where the AOI was located between two freshwater ecoregions and on the borders between two ichthyological provinces.

Aside from the watercourses in the western drainage, the majority of the rivers in the AOI enter into the coastal floodplain of the Dodo River. The ichthyological composition of the Dodo River has been assessed in several previous studies (Teugels et al., 1988, Paugy et al 1994 and Kamelan et al., 2013). A total of 49 fish species have been recorded as a result of these studies (Table 8–21).

The results of the surveys yielded 27 species representing 14 families. The most common fish species encountered was *Hemichromis fasciatus* (86%) and *Brycinus longipinus (75%).*

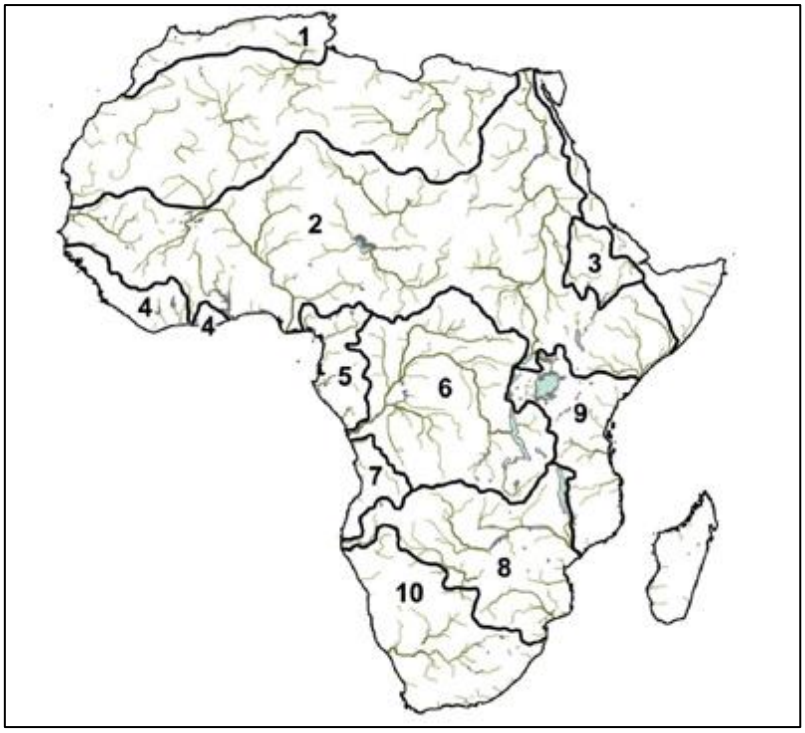


Figure 8–45: The Ichthyological provinces of Africa. 1: Maghreb, 2: Nilo-Sudan, 3= Abyssinian Highlands, 4: Upper Guinea, 5: Lower Guinea, 6: Congo, 7: Quanza, 8: Zambezi, 9: East Coast, 10 Southern (Snoeks et al. 2011)

Table 8–21: Expected fish species of special concern in the Concession (IUCN, 2019)

Species	IUCN Status	IUCN Status
Labeobarbus parawaldroni	*NT*	*Likely*
Brycinus derhami	*VU*	*Highly Likely*
Fundulopanchax walkeri	*NT*	*Likely*
Parasicydium bandama	*EN*	*Likely*
Enteromius traori	*EN*	*Observed*
Lepidarchus adonis	*VU*	*Observed*

The full list of expected species as well as captured species can be found inclusive of less threatened species in Table 9 and 10 respectively of the Riverine Ecology Specialist report, HCV Africa 2020.

Hemichromis fasciatus is a tolerant species adapted to a wide range of habitat types. This species was found in all morphological settings from upland swamps to the coastal wetlands. This result was in agreement with the extensive surveys in the mainstem of the Dodo River which indicated the presence of this species in 66% of the sample points (Kamelan et al., 2013). *Brycinus longipinnus* was found to occupy flowing waters across the SOGB Concession. Its presence was noted to be included the highly modified tributaries, the primary waterbodies, and natural areas in the AOI. Similarly, *Chromotilapia guntheri* was noted to occur at more than 50% of the sampling points where it occurred in a wide variety of habitat types. The remaining Cichlids were represented by sparsely present taxa such as *Coptodon zillii* and *Pelmatolapia mariae. Oreochromis niloticus* was observed in the impoundment within the Tiépé River system with locals reporting that the taxa was introduced into this waterbody. This study represents the first record of *Oreochromis niloticus* in the Dodo River system.

Several fish taxa were only observed at a single site, including *Pelmatolapia mariae*, *Papyrocranus afer, Eleotris daganensis, Hepsetus odoe, Micralestes cf. occidentalis,* and *Petrocephalus pellegrini.* The rarity of these taxa was attributed to the sampling methods applied during the survey which favoured shallow wade-able habitats, as some were regarded as being common in previous studies.

Although the species is not considered to be an annual killifish, *Epiplatys olbrechtsi* were only observed in habitat with sufficient riparian cover in the upper reaches of the Dodo and Gnebouagbo Rivers. This finding therefore suggests these taxa have complex habitat preferences where they occupy the margins of slow flowing watercourses and isolated pools on floodplains. The species is therefore considered to be an indicator species

for HCV habitats. It is noted that the *Epiplatys olbrechtsi* observed in this study represents an undescribed variant of the taxa. Within the historically sampled fish species list, *Fundulopanchax walkeri (NT;*Figure 8–46*)* is noted. However, despite extensively sampling suitable habitats for this taxa, no individuals could be observed. It is likely that this species is restricted to the more coastal tributaries as opposed to the watercourses on the SOGB Concession, the same can be said for *Epiplatys chaperi* (Figure 8–47). It is however possible that both taxa may occupy habitats on the SOGB Concession. *Epiplats dageti* was found to be present at 50% of the sample points and therefore represented a common taxa on the concession.

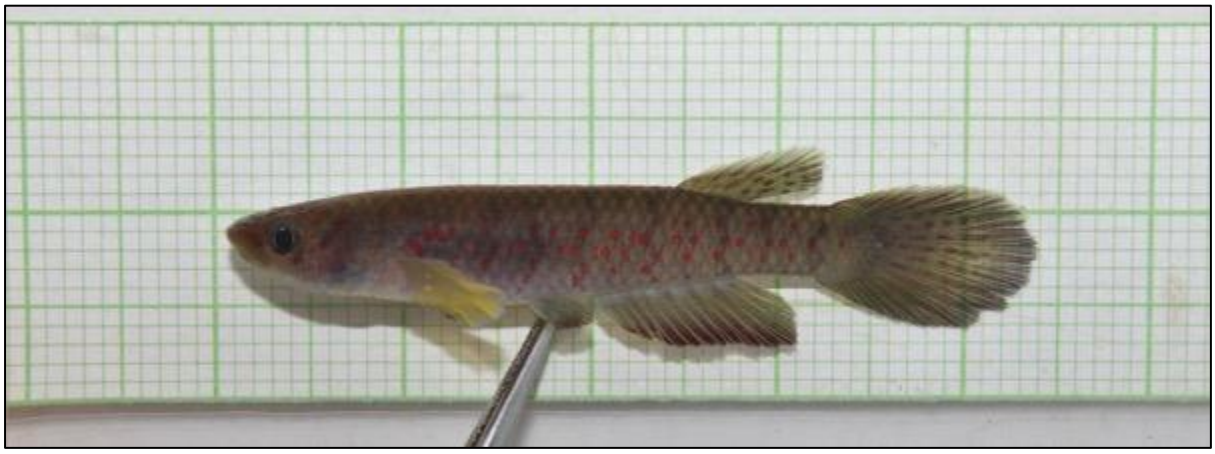


Figure 8–46: Fundulopanchax walkeri (NT) *from the Bia River system*

Figure 8–47: Enteromius chaperi *(LC) from the Bia River system*

Within the expected species list Cyprinid taxa are represented by four species including the listed *Labeobarbus parawaldroni* (NT) which is expected to be present in the Dodo River system but was not sampled in 2019. Three *Enteromius* taxa were determined to be present in the AOI, with the listed *Enteromius traori* (EN) being recorded for the first time in the Dodo River system. According to IUCN (2020), *E. traori* is meant to be restricted to the Cavally River system, its presence in the Dodo River therefore represents a significant range extension. This species was found to be present in the upper and lower foothill watercourses where bedrock and cobbled substrates were present. When present the species was found to be abundant as can be observed in the underwater footage (https://youtu.be/SX8tPrrtF8k). The SOGB Concession therefore support an important population of this species and continued conservation actions are recommended.

The remaining two *Enteromius* species were both frequently observed in the study area, in larger lowland rivers as well as throughout the foothill sampling points. Flow and water quality sensitive taxa such as *Amphilius atesuensis* were noted to occur only within the upland watercourses where sufficient flow and cobbled substrates were observed. Similarly, *Poropanchax rancureli* were also noted to only occur in the undisturbed areas and therefore served as effective indicators for stream condition. The family Mormyridae were represented by two species, with the observation of *Petrocephalus pellegrini* being the first time the species has been recorded in the Dodo River system.

Amphidromous aquatic species were observed in the upper reaches of the Dodo and Gnebouagbo River systems. These included *Awaous laterstriga* and *Macrobrachium* crayfish and were noted to occur in the upper reaches of the watercourses which confirmed a clear migratory passage for the biota. *Parasicydium bandama* (EN) has been recorded in the Dodo River system in previous studies. In addition, habitat for the species, which includes rocky substrates in flowing water, was observed in the study area, the species is therefore likely to be present on the SOGB Concession. Despite the intensive sampling in these habitat types the species was not captured in the 2019 surveys.

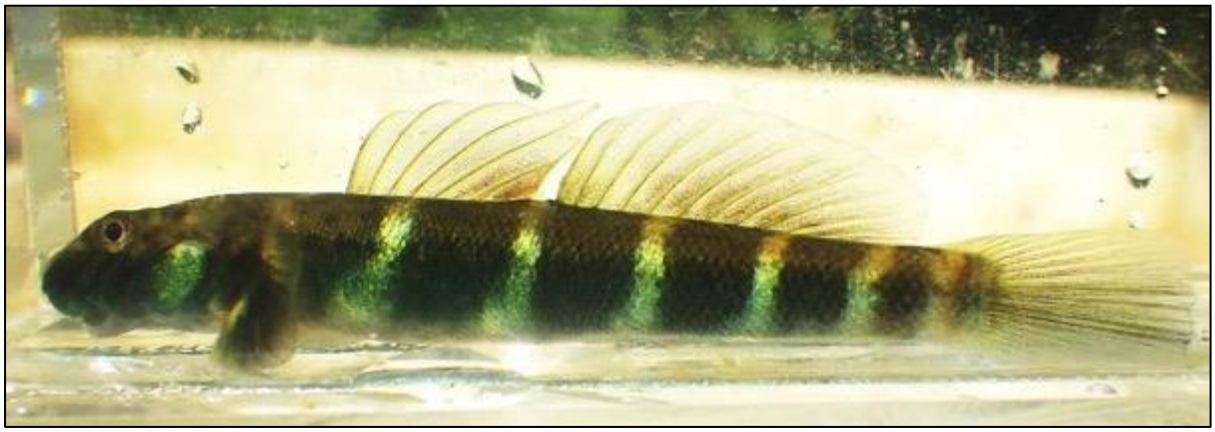


Figure 8–48: Parasicydium bandama *from Cameroon*

A break-down of the conservation status of the fish community is presented below:

- Endangered: 4%
- Near Threatened: 4%
- Data Deficient: 2%
- Vulnerable: 2%
- Least Concern: 88%

Existing impacts on local fish communities have largely been addressed in the IHIA component of this report. However, fishing activities are anticipated to have a limited effect but were noted to be taking place on the SOGB concession (Figure 8–49). The fish species observed in this study AOI therefore represent an important protein source for local communities.

Figure 8–49: Fishing activity on the SOGB Concession (November 2019)

8.2.2 HCV 1: Concentrations of Biodiversity

Concentrations of biological diversity including endemic species, and rare, threatened or endangered species (RTE), that are significant at global, regional or national levels;

Table 8–22: HCV 1 Matrix

HCV 1	Presence	Reasoning
Presence of Rare, Threatened and Endangered species	Present: Mainstem Dodo River and Gnebouagbo River. Low order source/plateau swamps, headwater streams and upper foothill rivers.	Endangered taxa were recorded in abundance and are expected to occur in the mainstem river systems. The watercourses considered in this report support a significant population of *Enteromius traori (EN)* described in this report.
	Present – forested rivers and streams within the Concession, remaining patches of intact forest within the Concession & rocky streams associated with forested inselbergs	- Confirmed presence of Mecistops cataphractus in the Dodo River; given its Critically Endangered status, any location where this species occurs with potential breeding habitat is significant for the species. - Confirmed presence of Kinixys homeana in the intact forest fragments; given its Critically Endangered status, any location where this species has suitable habitat and is protected from excessive hunting should be considered as significant for the species. - Confirmed presence of Phrynobatrachus annulatus in the rocky streams in forested inselbergs; this species is Endangered due to its reliance on these limited habitats and therefore, its presence is significant. - Kinixys erosa (EN) and Kassina arboricola (VU) are reliant on forests and have a high probability of occurrence within the Concession. - Osteolaemus tetraspis (VU), Trionyx triunguis (VU) and Cyclanorbis senegalensis (VU) are reliant on forested aquatic habitats and have a high probability of occurrence within the Concession.
	Present – remnant dense forest patches within the hillslope forest, lowland forest, riparian forest and swamp forest habitats	Confirmed presence of the following IUCN VU/NT species within these habitats: *Albizia ferruginea, Anthonotha vignei, Entandrophragma angolense, Mitragyna stipulosa, Heritiera utilis, Lophira alata, Nauclea diderrichii, Aristolochia goldieana, Pellegriniodendron diphyllum, and Terminalia ivorensis*
Presence of protected areas for Rare, Threatened and Endangered (RTE) taxa	Absent.	No protected areas for aquatic fauna directly associated with the SOGB Concession. However, plans to develop the lower Dodo River into a protected area are proposed. The nearest protected area (Taï National Park) is situated approximately 44 km to the north from the Concession.
	Absent with regards to botany	

Presence of endemic, highly range limited species	Present: Upper and lower foothill river systems harbour range limited taxa.	Thriving populations of the endangered species *Enteromius traori* was noted to occur in the AOI. This population represents the first observation of the taxa outside of the Cavally River system. The population therefore is considered to be of significant importance nationally and internationally.
	Absent with regards herpetofauna	No herpetofauna expected within the Concession are restricted exclusively to that area. Range-restricted and endemic species, specifically, *Sclerophrys taiensis* (EN) and *Hyperolius nienokouensis* (EN), are restricted to the Taï National Park area.
	Absent with regards to botany	
Critical dispersal routes for fish	Present: The Dodo River system and major tributaries such as the Gnebouagbo River	Migratory fish species were observed in the headwater systems of the Dodo and Gnebouagbo River systems. The watercourses within the SOGB Concession, within the middle reaches, play a critical dispersal route for fish in the associated watercourses.

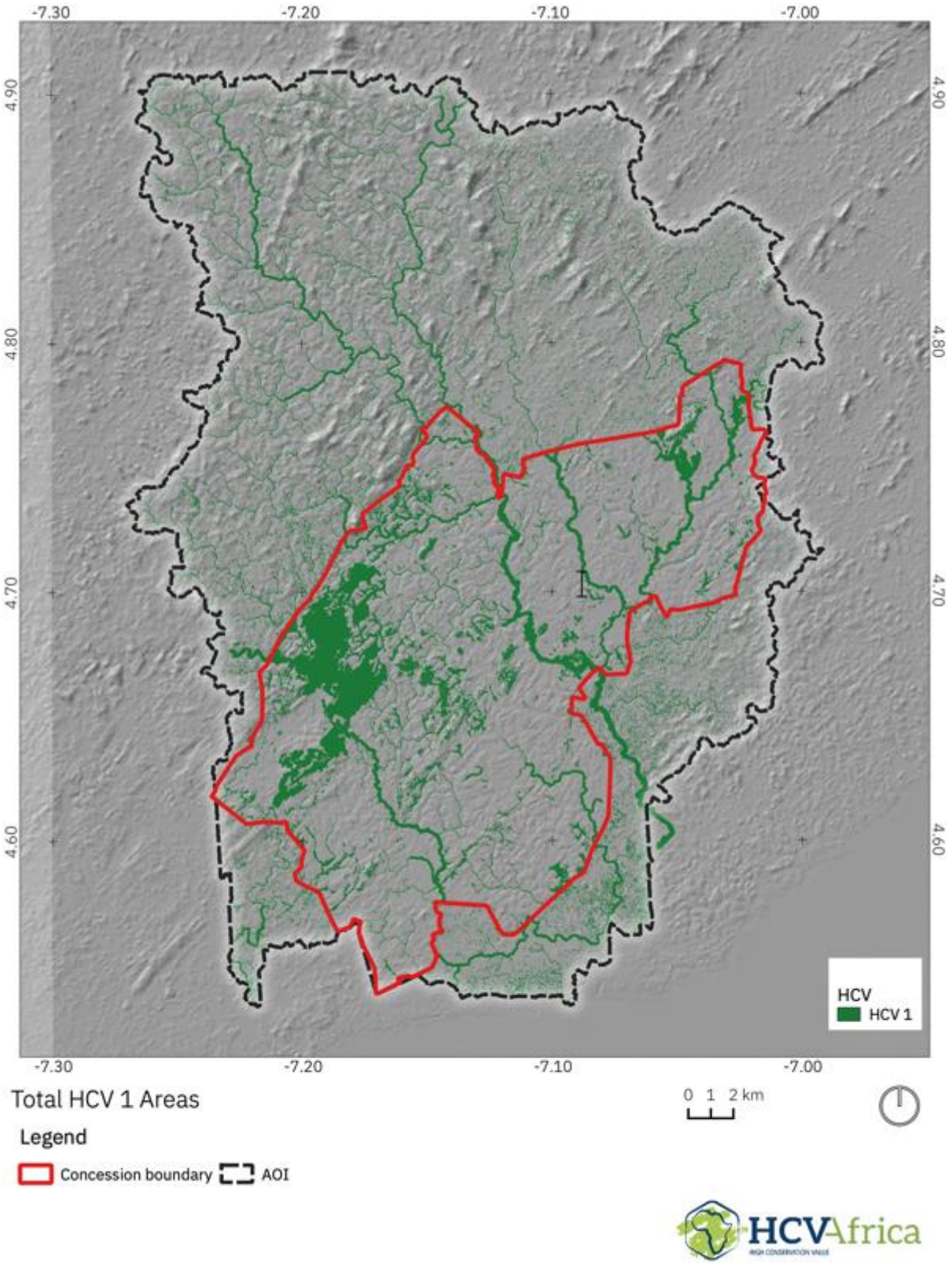


Figure 8–50: Total HCV 1 Area

8.2.3 HCV 2: Large landscapes

Large landscape-level ecosystems and ecosystem mosaics and intact forest landscapes (IFL) that are significant at global, regional or national levels, and that contain viable populations of the great majority of the naturally occurring species in natural patterns of distribution and abundance;

Table 8–23: HCV 2 Matrix

HCV 2	Presence	Reasoning
Large, landscape level ecosystems and ecosystem mosaics	Present - network of large rivers and streams connecting remaining intact forest patches (especially those protected within the Concession)	**To be finalized following final habitat map production**
Viable populations of the great majority of species and natural patterns of distribution and abundance	Present - remaining large patches of intact forest and undisturbed riparian forests.	For herpetofauna, which are mostly small-bodied and not actively hunted, the overall majority of species in functional populations can be expected to occur in the forested habitats which have low levels of disturbance. The presence within the Concession of large-bodied herpetofauna usually targeted for bushmeat consumption (e.g. crocodiles [see Ahizi *et al*., 2017] and tortoises) indicates some protection from excessive hunting and therefore the persistence of viable populations
Conservation Landscapes	Present – protected areas within the Concession	The nearest protected area (Taï National Park) is situated approximately 44 km to the north from the Concession. However, SOGB has various protected areas within the Concession that are formally protected
Intact forest landscapes (IFL)	Absent.	A large patch of IFL is located in the Taï National Park, situated approximately 44 km to the north from the Concession.
Rivers with natural flow regimes	Present: Dodo and Gnebouagbo River. Absent Tiépé River.	Unmodified hydrological inputs into the various river systems were observed in the variously considered river reaches. This was however not the case for the Tiépé River.
Rivers without downstream and upstream barriers	Present: All watercourses except for the Tiépé River.	No impoundments were observed in all waterbodies aside for the impoundment in the Tiépé River.
Unmodified river channels	Present: Confined to protected areas on the SOGB Concession.	River channels throughout the considered catchments have largely been modified on the concession. However, unmodified channels were observed in protected areas.
Unmodified thermal, sediment and nutrient regimes	Present: All waterbodies aside for the Tiépé River.	River substrates throughout the considered catchments have been modified predominantly by sedimentation, however this was determined to be minor in intensity.
Rivers without invasive taxa	Present: All waterbodies	The presence of *Oreochromis niloticus* as a non-native taxon needs further assessment, as this species is naturally widespread in Côte d'Ivoire.

Rivers with natural flow regimes	Present: Dodo and Gnebouagbo River. Absent Tiépé River.	Unmodified hydrological inputs into the various river systems were observed in the various considered river reaches. This was however not the case for the Tiépé River.

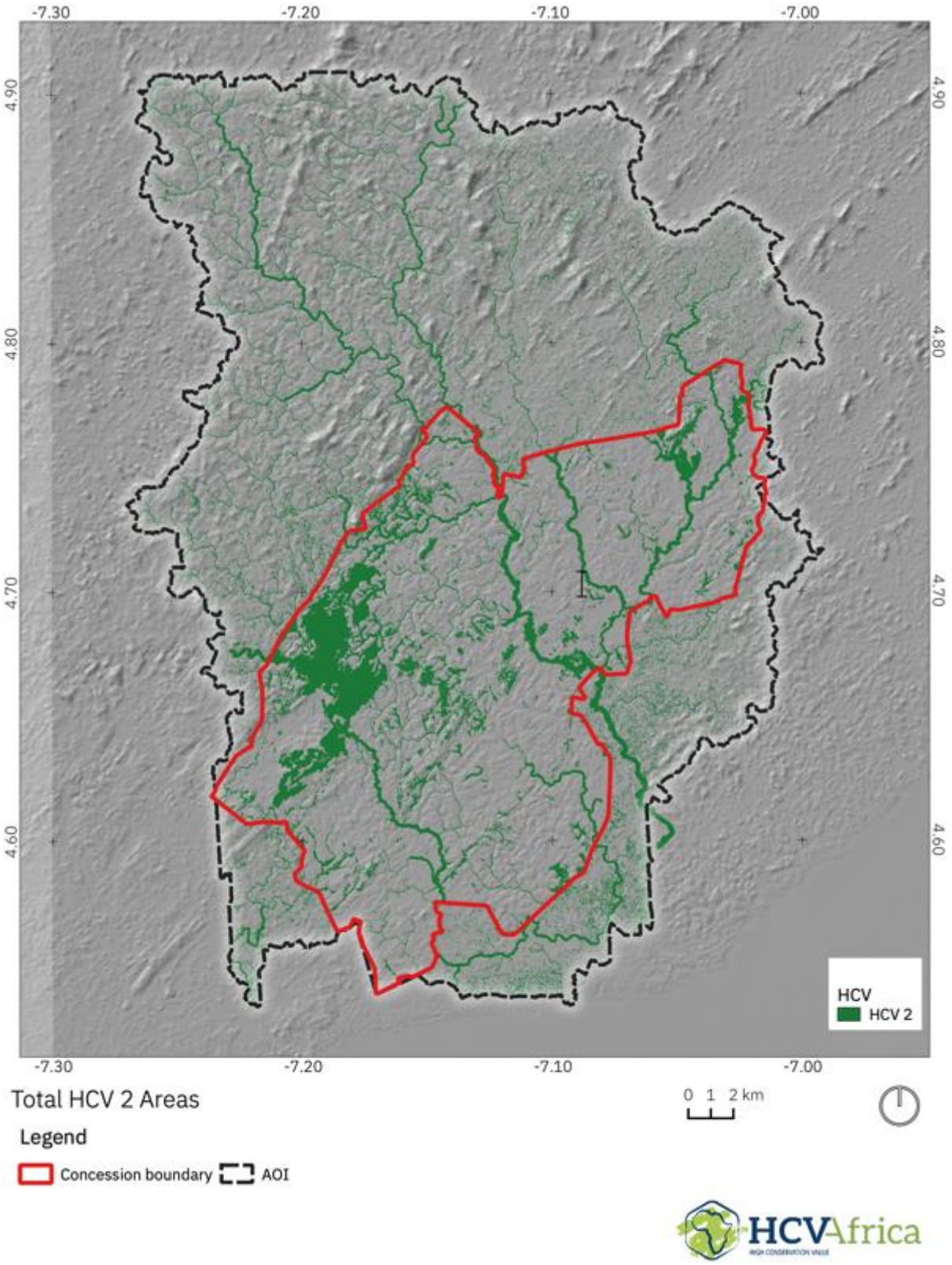


Figure 8–51: Total HCV 2 Area

8.2.4 HCV 3: Rare ecosystems

Rare, threatened, or endangered ecosystems (RTE), habitats or refugia;

Table 8–24: HCV 3 Matrix

HCV 3	Presence	Reasoning
Rare, threatened or endangered freshwater ecosystems	Present: All watercourses excluding drainage lines	The watercourses considered in this assessment lie on the border of two ichthyological provinces. As a result, Upper Guinean taxa as well as Nilo-Sudanese species occur in the same area. This therefore presents a unique and rare environment. Furthermore, Upper Guinean ecosystems, particularly watercourses are increasingly under threat by both hydropower developments and the side effects of deforestation.
	Present – Forested inselbergs large enough to have semi-permanent rocky streams are very rare in the landscape.	Large forested inselbergs are very rare in the landscape and several species are reliant on these habitats, specifically the streams generated from the water flowing off of the elevated areas. These habitats or ecosystems can be considered to have a high level of threat specifically from logging and deforestation (for agriculture).

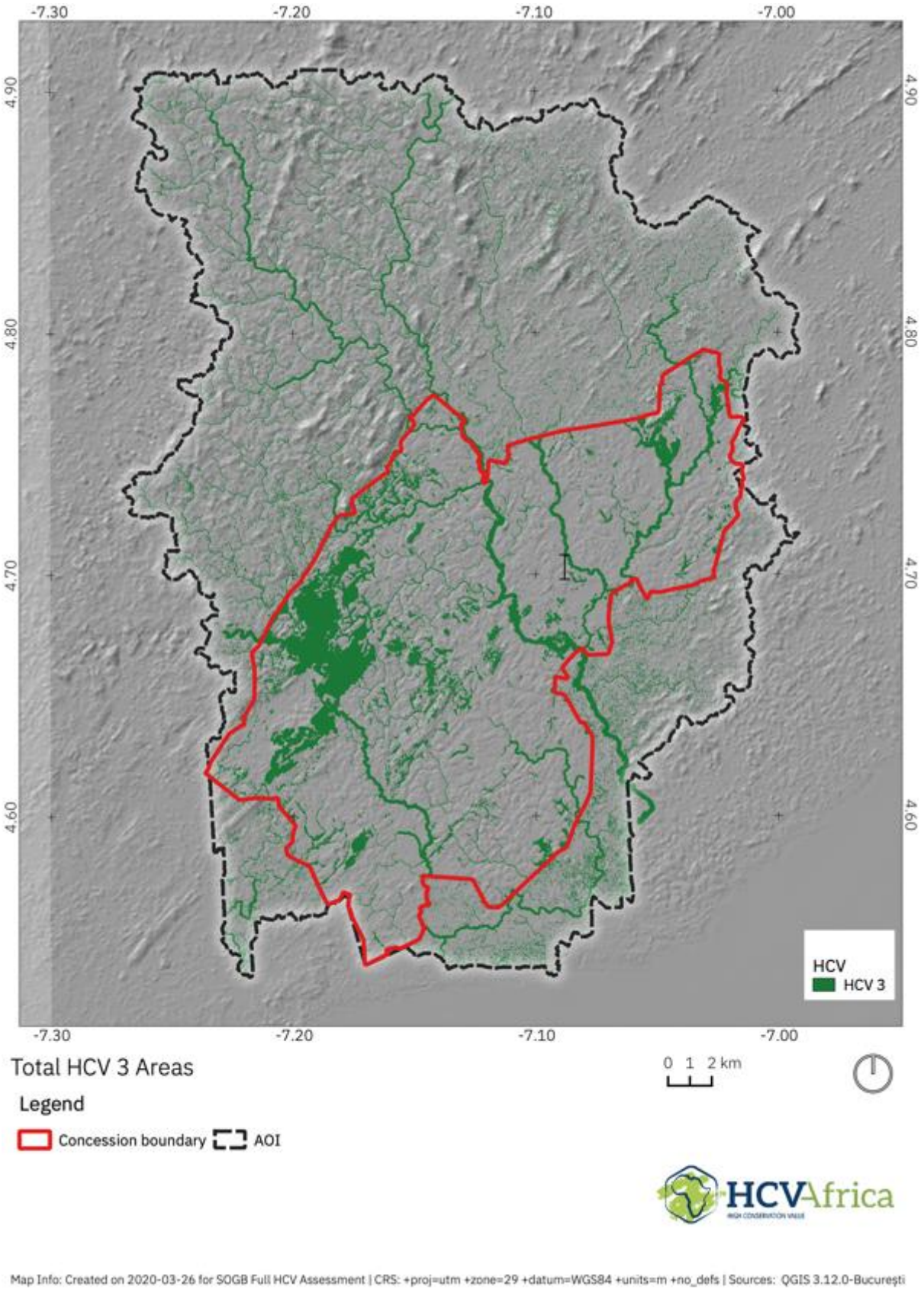


Figure 8–52: Total HCV 3 Area

9 Management and Monitoring Recommendations

9.1 Threat Assessment

A threat assessment was conducted for each of the HCVs occurring in the SOGB concession and area of influence. For each threat identified, management measures have then been recommended. These measures are for the Management Units (MUs) present within the SOGB concession boundaries. General management measures are required for the country specific HCV interpretations (Proforest, 2012).

Many of the HCV areas overlap so the management units are based on the outermost boundaries of each HCV area (i.e., the MUs capture the full extent of the HCV areas). SOCFIN has no control beyond the borders of the Concession, so HCV Africa recommends management measures for the MUs within the Concession.

The specialists identified several negative impacts which affect biodiversity and ecosystem services

9.1.1 Alien and/or Invasive Plants

Alien and/or invasive species (AIS) were recorded by the botanist throughout the AOI (e.g., *Acacia manguim*, *Ageratum conyzoides, Bambusa vulgaris*, *Canna spp., Chromolaena odorata*, *Lantana camara*, *Mimosa pudica*, *Mimosa pigra, Passiflora foetida, Pueraria spp.* and *Tithonia diversifolia*). These plants negatively impact on the local flora through competitive exclusion and/or exploitation.

9.1.2 Drainage of Swamps

Historically wetter swampy areas have been drained within the Concession as a result of commercial plantations. Large channels were constructed to increase the areas suitable for planting. Although these channels are mostly unlined and therefore still vegetated, the construction of these channels has resulted in a significant alteration in the terrain and hydrology needed to support the establishment of swamp vegetation. Unique swamp forest habitats have therefore decreased significantly throughout the SOGB plantation.

9.1.3 Erosion and Sedimentation

Access roads, commercial and subsistence agricultural activities have led to erosion and sedimentation of watercourses. Soil from areas stripped of vegetation is transported to streams and carried in rivers as suspended solids that affect downstream lakes and aquatic environments. Negative impacts from the suspended solids impacts aquatic fauna and flora, through decreased visibility and oxygen depletion (e.g. due to increased eutrophication).

9.1.4 Shifting/Slash and Burn Agriculture

Slash and burn agriculture refer to the common practice of felling tracts of vegetation which is left for a period of time to dry before being burned. The process of burning creates a carbon- and phosphorous-rich layer in otherwise nutrient-poor topsoil which improves agricultural productivity. However, the soils are depleted within two to three growing seasons, so other land has to be cleared and the cycle is repeated.

When the farmers abandon the land, a pioneer succession stage begins which is characterised by high disturbance levels and greater susceptibility to colonisation from alien/invasive plant species.

This impact was observed within the AOI and was localized to specific areas adjacent to human settlements, roads and riparian zones.

9.1.5 Unregulated Charcoal Production

Local communities throughout Africa rely on the production of charcoal as a fuel source for cooking and as a means to generate income. Felled trees are cut into sizable chunks which are set alight and left to smoulder in deep charcoal pits or heaps covered with earth. Once the charcoal is ready it is may be used by the producers or sold to raise cash (either in markets or to other villagers).

Charcoal production in the AOI, has, and continues to, cause severe loss and degradation of natural forests.

9.1.6 Unregulated Logging

Numerous valuable large forest timber species are selectively targeted and felled for use in local construction, for making furniture, and for commercial or illegal export.

Inevitably, improved access, through roads constructed for the plantation, facilitates illegal logging, especially along the poorly monitored peripheral forests. Species targeted for logging include *Alstonia boonei*; *Dialium* spp.; *Lophira alata (IUCN VU)*; *Nauclea diderrichii (IUCN VU)*; *Mitragyna stipulosa* (IUCN VU). *Terminalia ivorensis (IUCN VU)*; and *Entandrophragma angolense (IUCN VU)*.

9.1.7 Bushmeat and Trapping

Hunting fauna for bushmeat (both for consumption and trade) can have severe negative implications for the persistence of large-bodied fauna

9.1.8 Fish and Crustacean traps

Direct fishing places some strain on local species. Traps and gill nets also impact species not targeted for fishing through entanglement as they, typically herpetofauna, scavenge the traps or traverse netted areas.

9.1.9 Monoculture Plantations

A large proportion of the Concession is covered in either palm or rubber tree monoculture plantations. While not currently being expanded upon, monocultures result in impacts on the biological environment and significantly reduce ecosystem functionality in the broader landscape context.

9.1.10 Livestock

Intensive grazing by livestock can have detrimental impacts on forest recovery as well as herpetofauna populations but it is unlikely to be significant in this case, given the low densities of livestock and the fact that the livestock populations typically roam the open areas in village peripheries.

9.1.11 Lack of Riparian Reserve

In many places in the Concession, palm and rubber tree plantations extend to the banks of watercourses so that virtually no riparian reserve exists. Riparian reserves are crucial for the continued ecological function of aquatic systems, the persistence of herpetofauna SCC and for reducing sediment input into the watercourse.

The riparian forest habitat is the most important habitat type in the Concession for herpetofauna SCC as it satisfies the requirements for species reliant on riverine and/or forest habitats.

9.2 Recommendations for Each Value

Threats, recommendations and monitoring is detailed in Table 9–1. Furthermore, a bullet point summary and additional riverine monitoring information is provided in section 9.3.

Table 9–1: Threats and recommendations affecting each HCV value

Value identified	Threats	Management areas and prescriptions	Monitoring Recommendations Note: The monitoring recommendations in this table are in many respects summarised versions of monitoring recommendations indicated in each specialist report. Please refer to these reports for detail protocols
HCV 1-3	Alien plants	Developing and Implementing an integrated AIS management plan that clearly identifies target species (e.g., those listed in Section 9.1.1). The SOGB management team, in cooperation with a botanist, should assess the options for controlling AIS before deciding which method(s) is/are most suitable (e.g., physical, chemical, biological and cultural control methods, or combination of any, depending on the location, access, prevailing environment, and skills available). Opportunities for using local communities / labour for weed control should be assessed when reviewing options.	Visual inspection on foot and by vehicle (for road verges) of all new construction (e.g. plantation roads) and operational areas, particularly where vegetation clearing has occurred, and establishment of alien plant species is possible/evident. Evaluation of the effectiveness of AIS control measures that have been implemented.
	The lack of riparian reserve in certain areas is both an erosion hazard as well as a barrier to species movement through decrease of habitat connectivity	Appropriate riparian reserves must be established for all naturally occurring streams and rivers. This excludes canalised swamps although alternative means should be implemented to limit sedimentation where it is problematic in order to reduce sediment from these canalised swamps entering the main rivers. Riparian reserve areas should be determined according to the size of the river or stream itself as per the RSPO recommendations (Barclay et al., 2017) (Figure xxx). No new planting will be considered within the reserves as per the RSPO certification requirements. Existing plantations within these riparian reserves should not be replanted once their productive life is over.	Riparian reserves should be managed and monitored (e.g., through maintenance such as weed clearing and re-planting of indigenous tree species; Barclay et al., 2017). Connectivity of riparian reserves should be maintained to promote ecological function in the greater landscape. Engagement with- and an education programme for local people within the Concession should precede riparian reserve rehabilitation so that they understand the aims of the rehabilitation programme and understand the importance of maintaining reserves.
	Loss of forest habitat due to shifting agriculture, charcoal production, logging,	Access by local people must be controlled and access by third parties should potentially be permitted in designated areas e.g. some of the un-protected small	Web-based monitoring of medium resolution (10-20 m) satellite imagery using a change detection algorithm. This can easily be set-up using free open source GIS tools that automatically acquire and

	erosion and sedimentation, channelization, construction of impoundments resulting in: • Loss of RTE plant species • Migratory routes for RTE fauna, avifauna and aquatic species due to shifting agriculture, charcoal production, logging	remnant and isolated forest patches within the Eastern sections of the Concession (this should be in line with the social impact assessment and management plan – if there are tenure / access rights, these will have to be established and subject to negotiations). Management of sedimentation, riparian habitat, and water quality deterioration is of significant importance. Inline with Criterion 4.3 and 7.2 of RSPO (2019), topographic information must be used to plan for adequate drainage. It is recommended that an Erosion Risk Assessment and Management Plan is completed and implemented to derive the areas at highest risk for erosion. In line with the Water Code Law 98-755 of 23 December 1998 (Article 51), any activity which alters the hydraulic functioning of the watercourse must implement protection measures for hydrologic and water quality systems. Erosion control measures are therefore recommended, this is particularly applicable at water crossings (hydraulic structures). Furthermore, as per the conditions stipulated in Article 12, the use of water from public waterbodies and the construction of hydraulic structures of facilities shall be subject, as the case may be, to prior authorization or declaration. General mitigation actions required to reduce sedimentation within the local water resources include erosion control mechanisms and are of specific importance within oil palm plantations, particularly along the roadways. Current measures in place include diversions. However, additional measures are recommended. Mitigation actions listed in Zuraidah et al. (2017) should be consulted for further details.	analyse free Sentinel imagery from the European Space Agency (ESA). Images are captured every 5 days and should therefore allow for periodically available cloud free sections over the Concession throughout the year. Annual in-field forest monitoring to assess forest morphology. It is recommended that an annual audit of the crossings is completed to determine whether erosion control measures are effective. The monitoring of aquatic ecology should be completed with routine water quality monitoring to effectively monitor water resources. Aquatic biomonitoring studies should be conducted prior to clearing indigenous land or when replanting has occurred/is proposed. Water sampling must be conducted as a minimum on a quarterly basis. Sampling points must include the discharge itself as well as on a waterbody approximately 1 km downstream of the discharge point. The constituents to be considered in the monitoring have been provided in ORDER 01164/MINEF/MINEF/CIAPOL/SDIIC of 04 November 2008 regulating the Releases and Emissions from Facilities Classified for Environmental Protection. These criterions include aspects such as flow volume, pH, temperature, suspended solids, biological oxygen demand, chemical oxygen demand, nitrogen, phosphorous, oils and fats and a list of other substances.

		No further construction of impoundments of any nature in the permanent watercourses on the SOGB Concession should be allowed without ecological assessment. Should further impoundments be required for operational purposes, an aquatic and surface water assessment is recommended in order to conduct a risk assessment. In order to support the delineated HCV habitats, the implementation of riparian reserves is advocated. This advocation is further supported by Article 6 of the Ivorian Water-code. The methods to be applied for the delineation riparian reserve are indicated in the RSPO Manual on Best Management Practices for the Management and Rehabilitation of Riparian Reserves (RSPO, 2017). Flow modification as a result of landcover change to small and seasonal streams can result in the increase of flow velocities, which may result in water and habitat quality deterioration in downstream waterbodies. Therefore, in order to effectively manage established riparian habitats, the management of all drainage in a waterbody is required. Fish of the family Nothobranchiidae have complex life cycles, taxa such as the expected *Fundulopanchax* genera require periods of inundation followed by desiccation. Thus, ephemeral streams make up a significant component of their natural habitats. Considering that the ephemeral streams form an important habitat type as well as the supporting function of downstream HCV habitats, it is recommended that small ephemeral systems (<1m) are protected via the implementation of a 1m riparian reserve zone within these systems. The strict implementation of riverine reserve zones in the SOGB plantation should be established. This was largely in place in the protected areas, however, in several reaches of the larger Dodo River system riparian encroachment and canalisation was observed. The April and November 2019 surveys	

		indicated oil palm plantation within approximately 1m from watercourses. Riparian reserve zone width should range from 5m to 100m depending on the gradient of the area, with larger buffer zones for steeper gradients as provided in RSPO (2017). It is recommended that rehabilitation actions for the riparian areas of the permanent waterbodies are investigated further and implemented in areas where no buffer zones have been applied. The areas located within the zones should allow for the re-vegetation process to occur with no clearing of these areas or further canalisation to occur. Should it be feasible the implementation of active planting of riparian woody species must be completed in the riparian zones.	
HCV 4	There is heavy population pressure on ecosystems services particularly drinking water and arable land availability, this will only increase as populations increase due to in-migration and natural population growth. In plantation villages, people are practicing agriculture in the plantation peripheries and peripheries of secondary forest areas.	Drinking water needs to be tested. Assurance of supply also needs to be maintained to prevent people from drinking from unsafe surface water sources.	Monitoring of water qualities will need to be undertaken by SOGB and a monitoring programme developed and maintained.
		A management strategy would be to continue to allocate land to worker camp villagers in a structured and regulated manner and actively manage these lands to ensure that villagers do not plant outside of these allocations and that the fields are productive. Access to the remaining buffers and peripheries will need to be prohibited.	Monitoring of water qualities will need to be undertaken by SOGB and a monitoring programme developed and maintained. The strategy of having conservation rangers to police the remaining protected areas is working well and access to these areas is restricted. However, there was one mention of hunting in these areas and one-gun shot was heard during the assessment. It is therefore recommended that additional guards be appointed as at present the 4 guards need to protect 1614 ha of forests within the concession.
HCV 5	People are dependent on the natural environment to meet their basic needs, particularly subsistence farmers in the neighbouring communities. The threat is that this will increase as populations increase.	SOGB is not planning expansions within the existing concession. However, should the plantation decide to do so this will need to be carefully planned to ensure that neighbouring communities' livelihoods and food security is not adversely affected.	Monitoring of the restrictions and exclusions will need to take place to ensure that these are enforced.

		To preserve the little remaining forests, only areas already transformed by agricultural and deforestation practices should be considered for further plantations.	
	SOGB employees are not as dependent on the natural environment as they receive salaries to meet their basic needs, however, there are many worker dependents who are supplementing the workers incomes by making use of the natural environment to meet their needs, this will increase as populations increase.	Worker and worker's dependents' access to buffers and forest peripheries will need to be restricted to ensure that these areas continue to be preserved. Hunting and fishing in these areas by employees and their dependents and by people from outside the plantation will need to be stopped if these limited resources are to be preserved.	Monitoring of the restrictions and exclusions will need to take place to ensure that these are enforced.
		Alternative livelihoods will need to be sought such as agriculture in allocated areas and high yield programmes will need to be implemented. Supplementing workers and dependents diets with protein from outside the AOI will need to be encouraged.	It is recommended that SOGB continue to set aside areas where plantation villagers can grow crops in a controlled manner, this is happening regardless of whether this is permitted or not and continuing to formalise this will result in the practice being better managed and should reduce the pressure on buffer zones within the plantation.
		Logging of the remaining closed canopy forests and secondary forests which occur outside the plantation concession will need to be stopped with assistance from the Ivorian government, local and international pressure groups in order to preserve these limited remaining areas.	Logging in the remaining forests will need to be monitored by the government to ensure that this does not happen, this will be the only way to preserve these areas and to ensure that these remaining areas continue to provide eco-system services
HCV 6	This HCV is present in the AOI as there are several sites which have been claimed by the neighbouring communities as falling within the concession.		These sites will need to be monitored to ensure that the integrity of the sites is maintained. It is also likely that some sites will need to be rehabilitated.

9.3 Cross-Cutting Recommendations

Summary of monitoring recommendations:

- SOGB should be recommended in terms of preserving their remaining forests as by providing rangers and having procedures and consequences for breaking the rules in place, they are effectively conserving the remaining forests within the concession;
- Access by local people must be controlled and access by third parties should be permitted in designated areas (this should be in line with the social impact assessment and management plan) – if there are tenure/access rights, these will have to be established and subject to negotiations (e.g., through resettlement planning albeit that no physical resettlement will be required);
- An Erosion Risk Assessment and Management Plan is completed and implemented to derive the areas at highest risk for erosion. Mitigation actions listed in Zuraidah et al. (2017) should be consulted for further details on the following recommended mitigation actions:
    - If available, Empty Fruit Bunches (EFB) should be used to cover vulnerable areas and minimise erosion within the concession;
    - Leguminous Cover Crops (LCC) should be established immediately after land clearing;
    - In areas where soil erosion may be severe despite soil conservation techniques, construction of silt ponds is recommended, these should be subject to ongoing maintenance; and
    - Drainage lines and small streams should only be crossed where structures such as culverts have been installed;
    - The establishment of an adequate buffer (riparian reserve) can reduce the extent of sedimentation in rivers and provide allochthonous vegetation material; and
    - Drains alongside roads should convey runoff to energy dissipating areas before discharging into local streams.
- Appropriate riparian reserves must be established for all naturally occurring streams and rivers, as well as canalised swamps. Riparian reserve width should be proportional to river width as per the RSPO recommendations;
- Annual aquatic biomonitoring of watercourses must be completed with routine water quality assessments;
- Biennial monitoring of the herpetofauna communities should take place in the low flow season, in the restored riparian reserves and the original riparian forested areas. This will enable breeding amphibian SCC to be identified and for adaptive monitoring recommendations be made. Time should be allowed during monitoring to include trapping which would increase confidence in results;
- Developing and implementing an integrated Alien/Invasive Species (AIS) management plan that clearly identifies target species (e.g., those listed in 9.1.1). The SOGB management team, in cooperation with a botanist, should assess the options for controlling AIS before deciding which method(s) is/are most suitable (e.g., physical, chemical, biological and cultural control methods, or combination of any, depending on the location, access, prevailing environment, and skills available). Opportunities for using local communities/labour for weed control should be assessed when reviewing options;
- Establishing vegetation outside the operational footprints (i.e. areas not planted and still within the concession limits) through both natural succession and active reforestation efforts to re-establish habitats similar to those found in the natural forest habitats. However, it should be noted that studies suggest that forest patches less than 25 ha in size (assuming it is a well-rounded patch with a core size of 10 ha) are prone to degrade over time and are not viable to support keystone canopy tree species to regenerate naturally or support multiple species (Rosoman et al., 2017);
- Existing plantation need not be cut but as trees reach the end of their productive lifespan those riparian reserve areas must be restored;

- HCV Africa recommends ortho-rectified aerial imagery (can be achieved cheaply using drones) to identify and delineate streams and rivers where remedial action is required to restore riparian reserves. The imagery and the delineated spatial data would serve as a baseline against which restorative actions can be monitored;
- Identifying and propagating fast growing pioneer tree and shrub species in the on-site nursery: planting such species will encourage in rapid ecological succession at the outset of rehabilitation projects;
- It is an RSPO requirement that a Memorandum of Understanding (MoU) be drafted and agreed upon between SOGB and the local communities with regards to land and natural resource use rights in the area, to establish cooperative land use;
- It is important that all HCV areas identified within the concessions are clearly marked in the field (using loaded spatial data) and safeguarded against future clearing and cultivation. Marking should be done with bright paint to mark trees that form the edge of HCVs and signposted at regular intervals as environmentally sensitive areas. To avoid social misunderstandings, communities must be consulted about the locations of HCVs and informed about why the boundaries and signs exist. Safeguarding these areas includes ensuring that these areas are regularly patrolled to detect signs of deforestation and to ensure that measures are put in place to prohibit illegal logging and slash and burn practices as far as is safe and practical (as is the case within the current protected areas of SOGB);
- Logging in the remaining forests outside the concession will need to be monitored and prevented by government, this will be the only way to preserve these areas and enable these remaining areas to continue to provide ecosystem services. If a commitment to preserving these areas is not made by the government, these areas will be lost;
- Monitoring of drinking water qualities in the plantation villages provided by SOGB will need to be undertaken to ensure that the water is of good quality;
- Monitoring of the restrictions and exclusion zones of where people can and cannot go will need to continue to take place to ensure that these are enforced. The use of signboards may assist but security in the form of rangers will continue to be most effective;
- Monitoring of the water qualities in the major river systems will need to be undertaken and a monitoring programme developed;
- With the implementation and restoration of the riparian reserve/buffer, an aquatic biomonitoring study should be conducted on an annual basis throughout the life of the operation, as an essential component to holistic water management. This should consider current fish and aquatic invertebrate species as a baseline and monitor for improvement or deterioration. It is proposed that this monitoring plan also focuses on the discharge areas downstream of the mills/processing plant. It is proposed that standard aquatic macroinvertebrate assemblage monitoring take place downstream of the discharge points;
- Monitoring will need to be undertaken of buffer zones and peripheries to prevent people are not making fields in these areas or are hunting and fishing;
- Monitoring will need to be undertaken of protected areas, HCV 1-6, to ensure that these are conserved;
- More rangers will need to be appointed to ensure that the protected areas remain conserved;
- Perform community education programmes to highlight the importance of contiguous riparian reserve;
- Slash and burn should not be used when clearing land for plantation.
- SOGB must appoint (or otherwise adequately train) a suitably qualified person/s as a dedicated environmental control officer (ECO) responsible for overseeing and coordinating all environmental-related aspects and monitoring to ensuring compliance with all legislation, RSPO requirements and other local/international best practice guidelines;
- The appointed ECO in association with the HCV specialist team should develop and implement an environmental and social management plan for the plantation. The plan must aim to incorporate the findings and recommendations of the various baseline studies (such as this) to demonstrate the commitment to the applicable principles and requirements of RSPO;

- The delineation of the HCV areas was largely based on desktop data and ground-truthed during the survey. It is however, recommended that additional ground truthing to define the precise extent of the delineated areas is conducted;
- The dismissal of workers who are found in the protected areas should be continued, although it may seem harsh, as this has an effect in conserving these areas; and
- This management plan should include a monitoring plan to gauge the efficacy of management practices in maintaining and/or enhance the HCVs over time. The monitoring plan needs to translate the strategic objectives of the management plan into operational objectives. Appropriate indicators for these operational objectives must be chosen to assess the status of the HCVs, and thresholds for action to ensure that the HCVs are maintained or enhanced.

9.4 Summary map

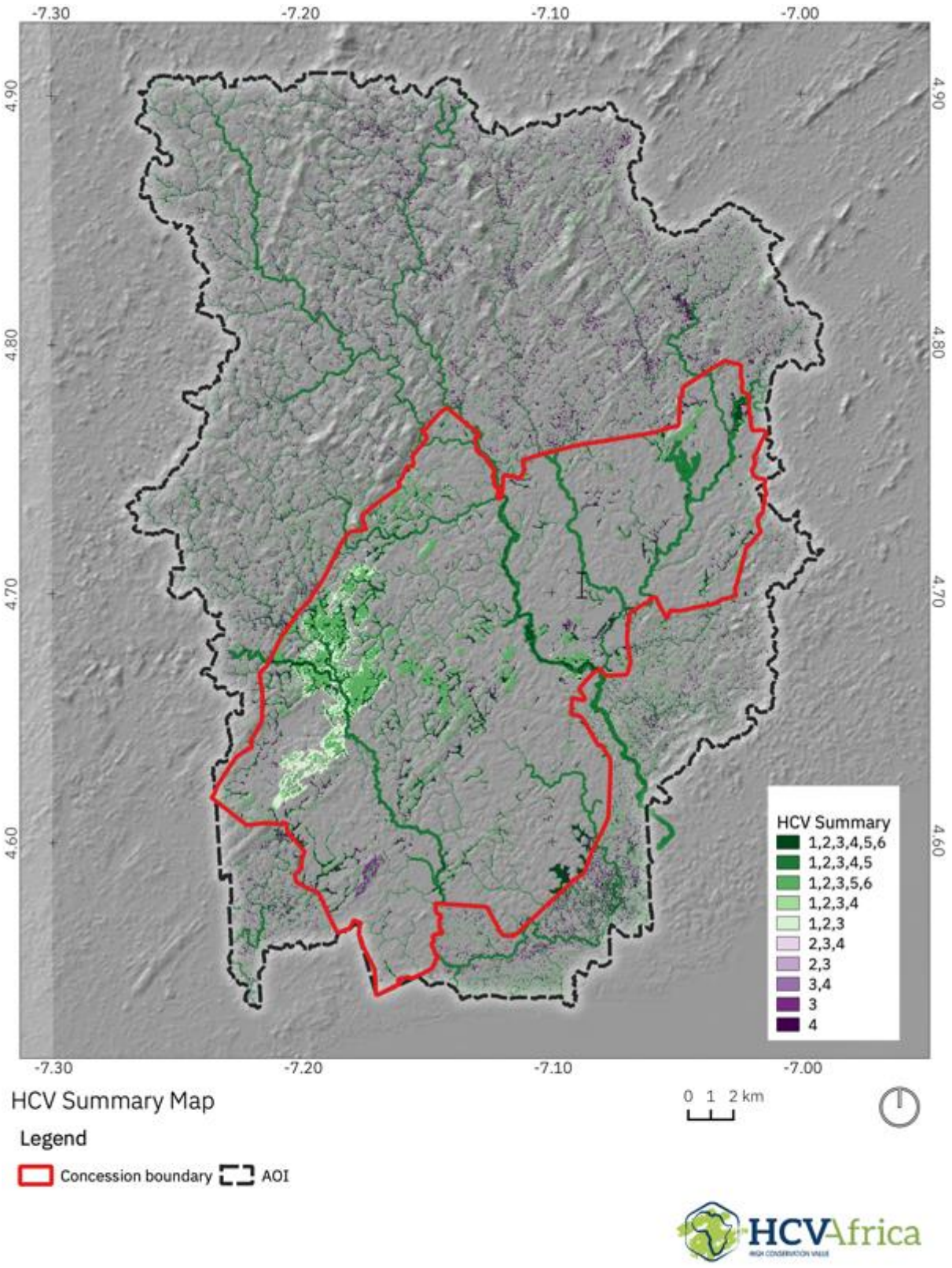


Figure 9–1: HCV Summary Map

Table 9–2:Land Use Summary

Environmental and social values to be conserved	Management areas (ha) (inside MU only)
HCV 1	6247,57
HCV 2	6293,29
HCV 3	6348,19
HCV 4	3584,77
HCV 5	5522,20
HCV 6	3675,56

10 Next steps

The SOGB plantation is a long-standing entity and a large land/concession comprised of 16 530 ha rubber and 7 471 ha oil palm. Consultation is ongoing and the HCV team has received email responses from individual stakeholders who have provided input to the HCV assessment. The local communities will be updated and a presentation about the impacts and results of the assessment that relate to their respective village, will be provided by SOGB. It is recommended that a meeting will be held between the company and the stakeholders to ensure they are appropriately kept up to date with the HCV assessment process; these stakeholders will receive a soft copy of the specialist reports. Hard copies should be available to read at plantation offices.

Within the AOI 14524,66 ha (15.84%) of potential HCV 1-6 areas exist. Of this 6735,20 ha is situated within the SOGB concession. This equates to almost 20% of the concession. At the time of writing, 2212 ha of forested habitats are already under protection and actively managed by SOGB. As more HCV monitoring and management is required the HCV maps are subject to change as the data in this report will evolve as this is a living process.

The illegal hunting of bushmeat, illegal logging, slash and burn activities and channel modifications are an ongoing threat to SOGB and its associated forest patches. From an ecological and conservation perspective, these above-mentioned threats, along with the absence of riparian reserve along some watercourses, are the most critical concerns. The buffer zones relating to all aquatic systems must be adhered to in accordance with RSPO guidelines.

Social concerns can be summarised in the conservation of sacred and historical sites, management of water quality and controlling access to forest patches. The latter as it stands, is occurring regardless and managing it affords more control over actions thus preventing it from occurring in valuable forest patches and watercourse buffer areas.

In order to investigate the claims from villagers reporting that historic sites in the concession have been destroyed, a heritage assessment is recommended (e.g. where is the location of Para village as mentioned). There's no proof that historic sites were destroyed by Socfin, but this could have been done under previous concession management preceding that of Socfin.

It will be crucial to monitor compliance by smallholders and out-growers to the principles of RSPO and the above-mentioned recommendations. In order for this to happen, a larger regional HCV screening exercise is recommended that focus specifically on smallholders and out-growers. The following key questions are relevant to such an exercise:

- Exact location and size of smallholder and out-grower plantations;

- Current sustainability practices and/or understanding of RSPO requirements; and
- How much is produced by each and how much of this is sold to SOGB

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12 Annexes

ANNEX 1 – CV'S

ANNEX 2 – COMMUNITY ENGAGEMENT THROUGHOUT ASSESSMENT

ANNEX 3 – LAND COVER CLASSIFICATION: ACCURACY ASSESSMENT

ANNEX 4 – INDICATIVE PHOTOS OF EACH VEGETATION CLASS

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ANNEX 9 - LAND TITLES, ENVIRONMENTAL AUTHORIZATION AND AGREEMENTS WITH APPROPRIATE VILLAGES