USAID
FROM THE AMERICAN PEOPLE

Foreign Assistance Act 118/119
Tropical Forest and Biodiversity Analysis

LIBERIA TROPICAL FOREST AND BIODIVERSITY ANALYSIS

This publication was produced for review by the United States Agency for International Development. It was prepared by Integra Government Services International.

April 2018

FOREIGN ASSISTANCE ACT 118/119 TROPICAL FOREST AND BIODIVERSITY ANALYSIS

Liberia Tropical Forest and Biodiversity Analysis

CONTRACT INFORMATION This work is made possible by the generous support of the American people through the United States Agency for International Development through the contract number AID-OAA-I-I4-00017 / 72066918F00001. It was implemented by Integra Government Services International.

AUTHORS
Patricia Foster-Turley PhD, Richard Sambolah, Garvoie Kardoh, Nora Nelson, John Waugh, Benjamin White

SUBMITTED BY
John Waugh, Integra Government Services International

SUBMITTED TO
Lisa Korte, Contracting Officer's Representative, USAID/Liberia

DISCLAIMER

April 5, 2018

Front Cover: Photo of Guinean pit sawyer in Nimba County by John Waugh, used by permission

ACKNOWLEDGEMENTS

This work was conducted by Integra Government Services International LLC ("Integra"), under a task order through the Restoring the Environment through Prosperity, Livelihoods and Conserving Ecosystems (REPLACE) Federal Contracting Vehicle (IDIQ). The contract number is AID-OAA-I-I4-00017 / 72066918F00001.

Team members include Patricia Foster-Turley PhD, (team leader), and Richard Sambolah, Garvoie Kardoh, and Nora Nelson. John Waugh, Vice President for Climate and Environment at Integra, was the program manager and editor. Benjamin White was the geographer.

Lisa Korte, Natural Resources Officer at USAID/Liberia, was the Contracting Officer's Representative. Yoel Kirschner, Natural Resources Officer at USAID/Liberia, was the alternate Contracting Officer's Representative.

TABLE OF CONTENTS

TABLES

ACRONYMS AND ABBREVIATIONS

BI	Birdlife International
BNF	Bureau of National Fisheries
CARI	Central Agricultural Research Institute
CBD	Convention on Biological Diversity
CDCS	Country Development Cooperation Strategy
CEPF	Critical Ecosystems Partnership Fund
CFWG	Community Forest Working Group
CI	Conservation International
CITES	Convention on International Trade in Endangered Species
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
DO	Development Objective
EBA	Endemic Bird Area
EEZ	Exclusive Economic Zone
ENNR	East Nimba Nature Reserve
EPA	Environmental Protection Agency
ESU	European Space Agency
ETOA	Environmental Threats and Opportunities Assessment
EU	European Union
FAA	U.S. Foreign Assistance Act
FAO	Food and Agriculture Organization of the United Nations
FDA	Forestry Development Authority
FIFES	Forest Incomes for Environmental Sustainability (USAID project)
FFI	Fauna and Flora International
FLEGT	Forest Law Enforcement, Governance and Trade
FRA	Forest Resource Assessment (FAO)
FTI	Forestry Training Institute
GEF	Global Environment Facility
GIS	Geographic Information System
GIZ	German Agency for International Cooperation
GOL	Government of Liberia
GPS	Global Positioning System
IBA	Important Bird Area
IR	Intermediate Result
IUCN	International Union for Conservation of Nature
IUU	Illegal, Unreported and Unregulated
KBA	Key Biodiversity Area
LACE	Liberia Agency for Community Empowerment
LAVI	Liberia Accountability and Voice Initiative
LCDF	Liberia Community Development Foundation
LEC	Liberia Electricity Corporation
LEITI	Liberia Extractive Industries Transparency
LFI	Liberia Forest Initiative
LFSP	Liberia Forestry Support Program
LISGIS	Liberia Institute for Statistics and Geo-Information Services
LMA	Liberia Maritime Authority
LPIS	Liberia Land Policy and Institutional Support

LRCFP	Land Rights and Community Forestry Program
LUP	Land Use Planning
MDA	Mineral Development Agreement
MIA	Ministry of Internal Affairs
MLME	Ministry of Lands, Mines and Energy
MOA	Ministry of Agriculture
MOU	Memorandum of Understanding
MPW	Ministry of Public Works
NACUL	National Charcoal Union of Liberia
NaFAA	Aquaculture Authority
NASA	National Aeronautics and Space Administration (US agency)
NBC	National Bureau of Concessions
NBSAP	National Biodiversity Strategy and Action Plan
NF	National Forest
NGO	Non-Governmental Organization
NOCAL	National Oil Company of Liberia
NORAD	Norwegian Agency for Development Cooperation
NP	National Park
NRM	Natural Resource Management
NTFP	Non-Timber Forest Product
PACS	Partnership for Advancing Community Based Services
PROSPER	People, Rules and Organizations Supporting the Protection of Ecosystem Resources (USAID project)
PUP	Private Use Permit
REDD	Reduced Emissions from Degradation and Deforestation
RSPB	Royal Society for the Protection of Birds
SCNL	Society for the Conservation of Nature in Liberia
SDI	Spatial Data Infrastructure
SWG	Species Working Group
UL	University of Liberia
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USG	United Sates Government
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey (US agency)
VPA	Voluntary Partnership Agreement
WA-BiCC	West Africa Biodiversity and Climate Change (USAID project)
WDF	Wild Chimp Foundation

EXECUTIVE SUMMARY

The purpose of this analysis is to determine the actions necessary to conserve and sustainably manage tropical forests and to conserve biodiversity, as well as to determine the extent to which the actions proposed for support by the Agency meet the needs identified, in compliance with Sections 118 and 119 of the Foreign Assistance Act (FAA) of 1961, as amended, and USAID directives, as documented in the Automated Directives System Section 201The analysis will inform USAID/Liberia in the development of its Country Development Cooperation Strategy (CDCS).

USAID's approach to development requires that the Agency examine cross-sector linkages and opportunities to ensure a robust development hypothesis. Biodiversity conservation is critical for achieving sustainable development and should be considered across mission strategic approaches to improve development outcomes. This analysis is therefore an opportunity for USAID/Liberia to better understand the strategic linkages between the conservation of a country's tropical forest and biodiversity and development, so that it can structure a sound results framework to support future programming. This analysis will identify strategic linkages at the results framework level, highlighting opportunities to integrate tropical forest and biodiversity conservation into priority development sectors identified in the CDCS.

Specific FAA Requirements

FAA Sec 118 Tropical Forests

"Country Analysis Requirements. --Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of-- (1) the actions necessary in that country to achieve conservation and sustainable management of tropical forests, and (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified."

FAA Sec 119 Endangered Species

"Country Analysis Requirements. --Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of-- (1) the actions necessary in that country to achieve conservation and sustainable management of tropical forests, and (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified."

Liberia is an important reservoir of biodiversity as part of the Guinean Forests and the West Africa Biodiversity Hotspot; it contains most of the remaining tropical forest in this region. These forests shelter populations of endangered pygmy hippopotamuses, western chimpanzees, red colobus monkeys, and a number of other threatened or endangered species. Coastal areas contain small but important tracts of mangrove forest, which protect the coast from erosion and provide spawning grounds for marine species. Wetlands throughout the country include habitats for many bird species, both resident and migratory. The forests themselves contain a number of valuable timber species, many of which are harvested commercially, as well as many non-timber forest products providing value through customary use and trade.

Liberia struggles to conserve its resources for the future. Its natural resources are central to economic growth now and sustaining these resources for the future is also necessary

for long-term prosperity. The institutional, social and economic factors that drive the direct threats to biodiversity and forest resources reflect this tension between present and future needs. The drivers of unsustainable resource use identified in this analysis include:

- Persistent poverty and the lack of sustainable sources of income
- The lack of adequate capacity to enforce rules governing resource use
- The lack of technical capacity to manage resources
- The lack of information and data necessary to sustainably manage resources
- The lack of widespread appreciation of the long-term value of natural resources
- The lack of leadership to provide clear, unified policies among branches of government, abetted by rent-seeking behavior by government officials
- Perverse economic incentives, flowing from the lack of leadership
- Ineffective land use policies and insecure land tenure and property rights, and
- Unmet demands for energy

Key Threats

These factors produce direct threats to biodiversity and forests:

- Unsustainable hunting, both for subsistence and for trade in wildlife products
- Poorly coordinated and managed timber and mining concessions, especially in ecologically sensitive areas, and overlapping with protected areas
- Increasingly unsustainable shifting cultivation
- Cutting of forests for fuelwood and charcoal
- Unregulated cutting of forests to supply local timber needs (“pit sawing”)
- Illegal, unreported and/or unregulated fishing;
- Illegal and/or unregulated artisanal mining;
- The spread of industrial plantations of oil palm and rubber into forested areas
- Water pollution, including risks to freshwater resources and as land-based sources of marine pollution
- Invasive and problematic species, introduced accidentally or intentionally (e.g., fast-growing tree species for re-afforestation)
- Climate change

No USAID/Liberia programs at present directly threaten biodiversity or forests. However, with the exception of the Forest Incomes for Environmental Sustainability (FIFES) activity, programs typically do not explicitly address these issues and seek synergies, either. This analysis identifies possible synergies between the recommended conservation actions and USAID programs in health, democracy, economic growth and trade, education, energy, and food security. To further illustrate the point, it also highlights examples of a missed and a current opportunity.

Several actions are necessary to address the key threats to tropical forests and biodiversity in Liberia. First, it is important to support Liberia’s fledgling Protected Area System. This includes building the capacity of the Forestry Development Authority’s Conservation branch and securing sustainable financing for the operation of the protected area system. Much of what remains of the Upper Guinean Forest, a biodiversity hotspot, is in Liberia. The country has laid out an ambitious protected area expansion plan, but it is not clear how it can be effectively implemented with existing resources.

To the extent that it can be made viable, it provides the best hope for conserving much of the remaining biodiversity in Liberia. At the same time, it is not possible to capture all biodiversity in protected areas. There is evidence that as much two-thirds of areas important for biodiversity will not be included in even the expanded protected area network.

An inter-sectoral landscape-based approach that links protected areas with surrounding landscapes and provides integrity to the tropical forest ecosystems should be the next phase in the evolution of conservation in Liberia. In order to accomplish this, community co-management of resources in the interstitial spaces between protected areas will be necessary and will require:

- Inclusive governance and effective institutions for biodiversity conservation and natural resource management at all levels, including the continuation of on-going activities that promote land tenure, land reform, natural-resource governance, and land tenure and property rights for women.

- Land tenure and property rights will be critical not only in forest areas, but in marine and coastal areas, and wherever human needs and biodiversity overlap.
- Sustainable livelihoods need to be developed in the context of community managed natural resources, building on previous experiences with non-timber forest products under prior USAID programs. Agricultural programs will need to be made more climate-resilient. New and innovative approaches for energy for household and light industrial use will be needed.

- Holistic, demand-driven programming that addresses community health, nutrition, food security, and natural resource use that will generate more resilient communities and more sustainable outcomes.

The threshold of a green economy is crossed when a society transitions from sharing benefits from resource decisions made at the top to sharing the actual decision-making. Co-management with central authorities and direct local management, based upon a practice of self-government afforded by benefit-sharing arrangements, secure resource rights, and increased capacity, will provide the critical ingredients for the development of sustainable livelihoods in the forest sector.

1. INTRODUCTION

1.1. PURPOSE

The primary purpose of this Tropical Forest and Biodiversity Analysis is to determine the necessary actions to conserve and sustainably manage tropical forests and biodiversity in Liberia and the extent to which current and planned USAID programming addresses these needs, as required by Sections 118 (tropical forests) and 119 (biodiversity) of the Foreign Assistance Act (FAA):

> "Each country development strategy, statement or other country plan prepared by the Agency for International Development shall include an analysis of:
>
> The actions necessary in that country to achieve conservation and sustainable management of tropical forests (Section 118) and biodiversity (Section 119), and
>
> The extent to which the actions proposed for support by the Agency meet the needs thus identified."

USAID/Liberia will use this analysis to help inform its new five-year Country Development Cooperation Strategy (CDCS) and strengthen the mission's role in biodiversity and tropical forest conservation across sectors of its programming. The analysis therefore is an opportunity for the mission to better understand the strategic linkages between the conservation of a country's tropical forest and biodiversity and development.

This analysis is among the first group to apply the USAID Foreign Assistance Act 118/119 Tropical Forest and Biodiversity Analysis Best Practices Guide published in February 2017 (USAID, 2017). It takes into account the Ebola crisis and other relevant factors occurring since the previous report. The Scope of Work is in Annex B.

The previous 118/119 analysis--completed in December 2014 (USAID/Liberia, 2014) as part of a larger Environmental Threats and Opportunities Assessment (ETOA)—did not include recommendations specifically for biodiversity or tropical forest conservation.

The present USAID/Liberia CDCS was originally planned to cover the period from 2013 to 2017 (USAID/Liberia, 2013) but has been extended through 2018.

1.2 THE USAID PROGRAM

The current USAID/Liberia CDCS was developed to balance two approaches: 1) strengthen Liberia's capacity to sustain development progress over the longer term; and 2) improve access to critical goods and services needed to meet basic human needs in the short term. The work of the Mission is structured under four Development Objectives (DOs) and four associated offices:

DO-1: More effective, accountable, and inclusive governance (Democracy, Human Rights and Governance)

DO-2: Sustained, market-driven economic growth to reduce poverty (Economic Growth and Trade)

DO-3: Improved health status of Liberians (Health), and

DO-4: Better educated Liberians (Education).

This analysis considers programming across all sectors to determine multi-disciplinary ways that the Mission might incorporate tropical forest and biodiversity conservation efforts throughout its portfolio. The Mission is in Phase 1 of its new CDCS development,

1.3 METHODOLOGY

This 118/119 Analysis was conducted by a team of biodiversity and forestry experts (Annex B).

The team undertook a comprehensive desk study and produced a first draft of the analysis prior to traveling to Liberia for fieldwork. The Team Leader also held informational meetings in Washington, D.C. The draft provided a solid background for strategic interviews and field site visits. Once in the country, the team held individual and group meetings with key government, non-government, academic, community, and private-sector representatives in both Monrovia and outlying counties to refine the findings and develop recommendations. An interview template (Annex D) was used in relevant meetings to focus the interviews and acquire information for comparison. (See Annex E for lists of interviewees).

After consultations with the Mission and national experts, the team conducted field trips in two groups of two, to ground-truth the threats and determine actions necessary to address them. After visits to coastal areas, the teams regrouped in Monrovia, and then traveled inland, covering 12 of Liberia's 15 counties (Map 1.0, Annex H). Visited sited are shown in the illustration in Figure 1, and itineraries are provided in Annex F.

Annex G organizes the targets, threats, and drivers of tropical forest and biodiversity loss in Liberia as a visual guide.

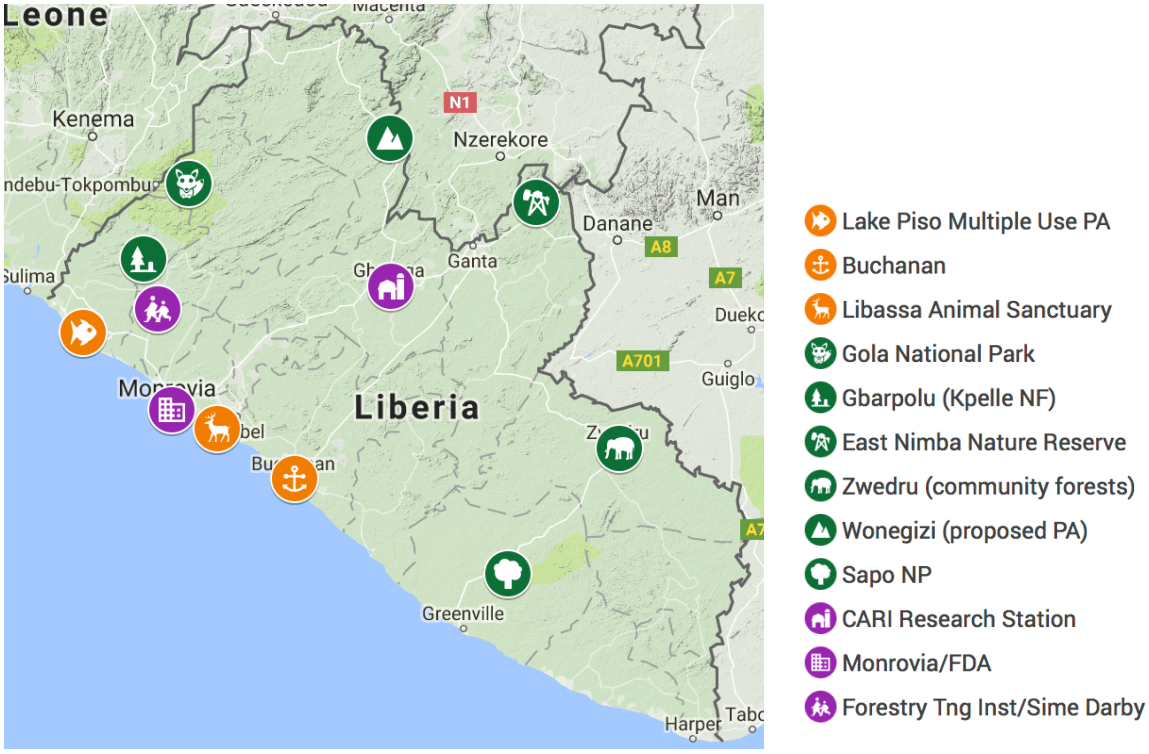


Figure 1: Sites visited – coastal sites in orange, terrestrial sites in green, and institutions in purple

2. COUNTRY CONTEXT

2.1 COUNTRY CONTEXT

In order to understand the threats and drivers for tropical forest and biodiversity conservation, it is instructive to recall some watershed moments in Liberian history. Since its founding by settlers comprised mostly of freed slaves from the United States, Liberia has been a country divided between coastal, primarily urban, elites, originally descendants of the colonists, and inhabitants of the interior of the country. The concentration of wealth and power by these elites produced sharp social divisions. A military coup led by Master Sergeant Samuel K. Doe in 1980 ended the political domination of "Libero-Americans", but the concentration of wealth and power remained under the control of a (now expanded) urban elite, at the expense of the rural populations (Sawyer 2005). This concentration of power remained a source of conflict, culminating in two civil wars (1989-1996 and 1999–2003), that produced general economic collapse.

Natural resource extraction has remained the backbone of Liberia's economy. During Liberia's civil wars (1989-1996 and 1999–2003), armed factions took control of these resources and exploited them in order to buy arms. In Resolution 1521 of 2003, the United Nations Security Council (UNSC) imposed sanctions intended to choke the money supply to armed groups, included a ban on the export of logs and timber products. This was renewed in 2004 and again in 2005. With the assumption of rule by a democratically elected government helmed by Dr. Ellen Johnson Sirleaf in 2005, the sanctions became an economic bottleneck. Lifting them became a top priority of the government. This

created an opening for a forest policy reform process to satisfy the Security Council's concerns.

The US-led Liberia Forest Initiative (LFI) was launched in 2004 and supported by USAID and the US Forest Service (USFS). This process resulted in the 2006 National Forestry Reform Law (NFRL) and the 2009 Community Rights Law (CRL), with support from USAID and the USFS. The NFRL included measures to combat illegal logging, promote sustainability in the forest sector, protect biological diversity, and share the benefits of logging with forest communities. The Security Council lifted the ban on the in 2006. The government is now designating community forest lands where rights to manage and use forests are devolved to the communities directly.

Liberia was traumatized following the outbreak of the Ebola virus epidemic of 2014, which set back economic development, and left an indelible stamp on its people. While the epidemic sensitized government agencies and the general population to the potential linkages between Ebola vectors and reservoirs, and the forest environment, the actual linkages are elusive. A major evaluation of the Ebola response is still underway at the time of writing (March 2018), examining the response and the structures that emerged as a result. The initial top-down response to the epidemic is widely acknowledged to have been problematic because of cultural clashes between medical authorities and communities. Only later in the response effort did the international health community begin to adopt culturally sensitive, participatory approaches to containment. The lessons from this experience correspond to lessons learned by USAID and others in the conservation of biological diversity, which in turn led to the partnership of USAID and Government of Liberia on community forests. The lesson is that demand-driven, bottom-up approaches, wherever possible, are more likely to be effective than top down and supply-driven approaches.

2.2 LOCATION AND BIOPHYSICAL SETTING

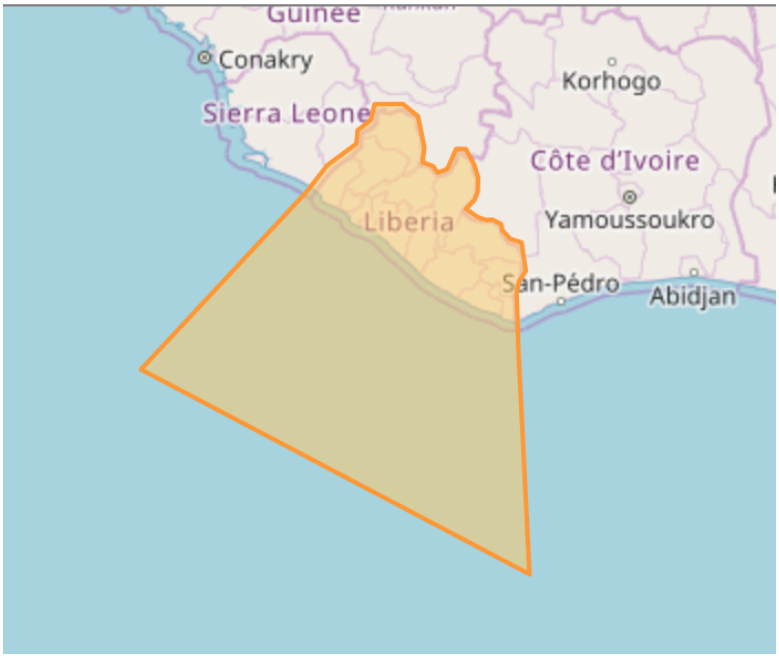


Figure 2: Location of Liberia showing the Exclusive Economic Zone. Boundaries are indicative and are not intended to be used for legal interpretations. (OSM, Geofabrik)

Liberia is situated on the Atlantic coast of West Africa, Between Sierra Leone and Côte d'Ivoire. Most of the country lies in the Upper Guinean forest belt, in the heaviest rainfall zone of West Africa. Liberia is generally described as comprising three physiographic regions – coastal plains, rolling hills, and highlands – generally defined by their elevation. The coastal plains extend up to 40 km inland and rise to no more than around 20 m in elevation. The rolling hills rise from these plains in a band topping out at 150 m elevation. The terrain then rises to rolling plateaus and hills reaching 300 m in elevation. (Hadden, 2006) This highland area constitutes approximately one half of Liberia's land area. In the far northwest and north central frontiers, portions of Liberia cover outliers of the Guinea Highlands, including the Nimba Massif in the northeastern part of the country (Nimba County), and Mount Wologizi (also known as Mount Wuteve) in Loma County in the north. This is the highest point entirely within Liberia, at 1,400 m elevation. Wologizi is the site of a proposed protected area and is an important bird area. The Guinea Highlands are known as the "water-tower" of West Africa, and Liberia is well watered. Six major rivers--the St. Paul, St. John, Cestos, Cavalla (Cavally), Lofa and Mano, flow through Liberia, in addition to numerous streams and tributaries. Coastal and freshwater wetlands are also abundant. Two major lakes--Lake Piso and Lake Shepherd on the Atlantic Coast, are actually brackish lagoons.

3. STATUS OF LIBERIA'S BIODIVERSITY AND TROPICAL FORESTS

3.1 MAJOR ECOSYSTEM TYPES AND STATUS

Aside from the coastal zone and a small area of savannah in the extreme northwest, Liberia is within the Upper Guinean Forest Ecoregion. The recent description by the US Geological Survey (USGS) and the *Comité Permanent Inter-états de Lutte contre la Sécheresse dans le Sahel* (Permanent Interstate Committee for Drought Control in the Sahel, or CILSS, a regional intergovernmental body based in Niamey) (CILSS 2016), describes discrete ecological units, consisting of a) montane forest, b) evergreen or mixed

evergreen-deciduous forests of the wooded interior plateaus and plains (e.g., Bong, Kono, Koinadugu), and c) tropical forests. These are shown in Map 2.0 (Annex H).

Aquatic Ecosystems

Liberia has four types of wetland: inland riverine, inland swamp, coastal, and coastal lacustrine. The country has approximately 600,000 hectares of freshwater wetlands, of which 20,000 ha, or 3 percent, is cultivated (DAI, 2008). Five Liberian wetlands are officially Wetlands of International Importance, or Ramsar sites, (see Table 4 in Annex I), but these receive limited or no protection. Data on brackish and saltwater wetlands is limited, and their relationship with fisheries poorly understood.

Liberia's 580 km Atlantic coastline features brackish wetlands, bays and estuaries, and lagoons. The coastal zone is a mosaic landscape of shoreline, grass savannahs, and coastal forests, and comprises a network of permanent and seasonal wetlands and mangroves that extend up to 40 kilometers inland from the coast. Mangroves, freshwater, and coastal habitats are shown in Maps 5.0-5.3, Annex H.

Six species of mangroves are found in Liberia, which cover about 0.5 percent of the country's total area (FCPF, 2016). Wetlands and mangroves provide valuable ecosystem services such as flood protection and erosion control (see Part 4). Liberia's beaches also provide important habitat and nesting grounds for sea turtles and other species.

Freshwater resources cover approximately 14 percent of Liberia's total area, or just over 15,000 km^2. Six major river basins provide drainage for two-thirds of the country. The near-shore marine environment shelters numerous fish species, many of which spawn in mangrove areas. The continental shelf area up to 200 m is about 18 400 km^2; Liberia claims an exclusive economic zone (EEZ) of 249,542 km^2 (see Figure 2). Both freshwater and near-shore marine resources in Liberia are prone to degradation as a result of upstream and/or terrestrial activities (land-based sources of marine pollution). Both are also poorly studied and there is insufficient data to determine their status.

Forests

Liberia is the most heavily forested country in West Africa; it is the only country within the Upper Guinean Rainforest zone that was originally entirely forested. Today Liberia accounts for roughly half of the remaining forest in the Upper Guinean region. In 2013, forests (including degraded and intact forests) comprised two-thirds of Liberia's total land area (EROS/USGS). The three types, discernable from the ecoregion map (Map 2.0 in Annex H) are:

1. Evergreen or mixed evergreen/semi-deciduous moist forests in western Liberia, characterized by a distinct dry season, with less than 100mm of rainfall a month (wooded plateaus)
2. Wet evergreen forests in eastern Liberia, with a very short or absent dry season (tropical forest)
3. Sub-montane or montane forests, typically above elevations of 800-1,000 meters.

Swamp and riparian forests are found within semi-deciduous and evergreen forests. These can be seen in Map 5.0, Annex H.

3.2 STATUS OF TROPICAL FORESTS

The two areas of dense forest in the country are concentrated in the northwest and southeast (see Annex H, Map 3.4); the southeast is primarily wet evergreen forests, the northwest is a combination of mixed evergreen and semi-deciduous forests and montane forests. there are nine forest reserves (National Forests) in these areas, which contain 225 tree species. These forest reserves are managed for production and are not protected forests by international standards.[1] Map data on these forests, including from FDA, is inconsistent or incomplete.

USGS data show that primary tropical forests declined from 43.5% of the land area in 1975 to 36.82% in 2013, and that the annual average rate of deforestation more than doubled from the 1975-2000 period to the 2000-2013 period. In Annex H, data is in table 11 and is visualized in figures 5 and 6.

Except for privately developed forests, forests on deeded land, and communal forests, forests in Liberia are held in trust as mandated by the 2006 National Forestry Reform Law, with the Republic of Liberia as the trustee. All forest concessions in the country were cancelled in 2005, resulting in a decline in industrial forestry production, but deforestation and degradation of forested land continued due to uncontrolled use, both within and outside of the National Forests. Enforcement of legal and regulatory protections for forest ecosystems and biodiversity ranges from limited to non-existent. Government agencies generally lack the capacity to undertake comprehensive land-use planning.

Land-use and land-cover classifications for Liberia (Annex H, Maps 3.0 and 3.1) are provided by the West Africa Land Use Land Cover Dynamics Project of the USGS and by the European Space Agency (ESA). Data for Map 3.0 was most recently updated in 2013 using regional time series data, Landsat images, and aerial photographs (Cotillon, 2017). This is the most detailed of several recent regional classifications. It relies heavily on expert interpretation, whereas most land cover maps depend heavily on unsupervised machine classification. The European Space Agency's high quality 2014 land use map (Map 3.1) provides better mixed crop/grassland data.

Conservation International (CI) (2017) estimates that one third of Liberia's forests (1.2 million ha) is currently slated for harvest in existing or proposed timber concessions, producing 212 million cubic meters of timber. This would account for most remaining unprotected forest. It is not clear if forest exploitation at this level is economically viable, however[2].

[1] Several National Forests are however designated as proposed protected areas, as discussed below). Internationally recognized standards for protected areas are the IUCN World Commission on Protected Areas protected area categories. For information see:
https://www.iucn.org/theme/protected-areas/about/protected-area-categories

[2] With a value of $180/cubic meter without factoring shipping, Liberia's *commercially viable* timber stock (50% of the stock slated for harvest) is estimated to be worth USD 18 billion at the 2017 market price. CI further estimates that 20-30 cubic meters of timber per hectare have to be removed for logging companies to break even. This is far above not only the natural regeneration rate, but also of the 7 cubic meters per

While most of Liberia's interior lies below 500m above sea level, it has two prominent mountain areas; the Wologizi range in the north and the Nimba range in the northeast, which contains a small area of montane forest. The East Nimba Nature Reserve protects part of the Nimba area. There are at present no protected areas in the Wologizi range, although several are proposed (see Table 7 in Annex I and Map 4.0 in Annex H).

The Guinean Montane Forests of Liberia, Sierra Leone, and Guinea constitute a regional center of endemism in the form of an archipelago of highlands across the region. Thirty-five endemic plants and eleven paleo-endemic species have been recorded in the ecoregion. Four mammals found in the ecoregion are either strict endemics or narrowly shared with the surrounding habitats. Mount Nimba's elevation, isolation, and presence of rapids and waterfalls has led to high endemism of aquatic species, despite its moderate species richness. These endemic species include frogs, fish, a freshwater crab, the endangered Mount Nimba otter shrew, and the near-threatened Cape clawless otter. Mount Nimba is also especially rich in terms of plants (CEPF, 2015).

3.3 SPECIES DIVERSITY AND STATUS

Liberia is part of the West Africa Biodiversity Hotspot, which extends from Guinea to Cameroon (CEPF, 2015). Within this region live a reported 9,000 species of vascular plants (1,800 of which are endemic); 320 species of mammals (67 endemic); 785 species of birds (75 endemic); 210 species of reptiles (52 endemic); and 221 species of amphibians (52 endemic). This hotspot contains 25 percent of all mammal species found in the continent of Africa, including 30 species of primates.

In addition, Liberia is one of 14 centers of plant endemism globally. (GoL, 2017). Estimates of species diversity are likely conservative, as data and in-depth studies of biodiversity and taxonomy in Liberia are few, particularly with regard to plants. Lack of data is a significant barrier to the assessment and management of biodiversity. Aside from chimpanzees, there have been no systematic surveys in Liberia (World Bank, 2015). Historically, this is linked to inaccessibility of the Liberian interior, especially in the rainy season; more recently, during the civil wars, the security situation precluded fieldwork, and the country's only biological research facility, at Mount Nimba, was destroyed. The record is therefore incomplete. Large mammals and birds are the best-known wildlife in Liberia; little is known about many lesser-known and smaller species that may be at risk.

Overall, the status of biodiversity is poorly known due to inadequate surveys and data loss during the civil wars. Simpson's Biodiversity Index (Map 2.4, Annex H) provides a probabilistic map of biodiversity, a useful proxy in the absence of detailed surveys.

Of the identified species, the IUCN Red List (online) describes 49 plants and 102 animals as vulnerable, endangered, or critically endangered. The Critical Ecosystems Partnership Fund identifies globally threatened species in Liberia to include 18 mammals, 13 birds, 5 reptiles, 4 amphibians, 31 bony fishes, 21 sharks and rays, 2 odonates (dragon- and

hectare recommended harvest intensity. At this price, either the commercial viability or the sustainability of forest management will suffer.

damsel-flies), 5 freshwater crabs and shrimps, 1 mollusk and 51 plant species, or 151 species altogether (CEPF, 2015).

Birds have also received attention primarily through the efforts of FFI, the national program of Birdlife International, the Royal Society for the Protection of Birds, and the Society for the Conservation of Nature in Liberia. Liberia is a major thoroughfare for migratory birds and also home to many resident bird populations. Twelve bird species are listed as endangered or vulnerable and one, the Liberian greenbul (*Phyllastrephus leucolepis*) is classified as critically endangered by the IUCN Red List. BirdLife International has designated seven Important Bird Areas in Liberia, though in reality these have few protections (see Table 5, Annex I). Eighteen resident bird species are now of global conservation concern.

The IUCN Red List of Threatened Species classifies six mammals as endangered: the pygmy hippo (*Choeropsis liberiensis*), red colobus (*Procolobus badius*), Jentink's duiker (*Cephalophus jentiki*), Nimba otter shrew (*Micropotamogale lamottei*), Ziama horseshoe bat (*Rhinolophus ziama*), and the western chimpanzee (*Pan troglodytes verus*). The chimpanzee status has recently been revised to Critically Endangered.

Western chimpanzees generate special international conservation attention because of the precipitous decline in their populations in recent decades. Some 7,000 chimps still exist in the wild in Liberia, according to a survey by the Wild Chimpanzee Foundation (WCF) (WCF, 2014). Chimps are the subject of a Species Action Plan led by Fauna and Flora International (FFI). The WCF and the FDA found 341 chimps during a survey in the Grebo forests in 2013 (GoL, 2017). A more recent survey by WCF estimates that there are 531 chimps in the proposed protected area at Krahn-Bassa (A. Hillers, *pers. com.*). Work has recently begun on a regional action plan for chimps.

The pygmy hippopotamus is one of the least studied large mammals in the world. Hunted for meat, pygmy hippos have also seen their habitat in Liberia reduced due to deforestation. With a declining population, pygmy hippos are now the subject of a Species Action Plan prepared by FFI and other partners.

Forest elephants[3] in Liberia are also scarce. A lack of systematic study makes it difficult to accurately estimate numbers, but one conservation NGO active in Liberia estimates the population to as low as 300 individuals (FFI 2017). A third National Species Action Plan has been prepared for elephants, stimulating more survey and conservation efforts in the country.

Little is known of the extent or population of most other mammals in the country.

Threatened reptiles include the African dwarf crocodile (*Osteolaemus tetraspis*), Western gecko (*Cnemaspis occidentalis*), four species of sea turtles and four species of frogs.

[3] The IUCN Red List (http://www.iucnredlist.org/details/12392/0, accessed March 29, 2018) indicates there may be at least two species of African elephants, the Savanna Elephant (*Loxodonta africana*) and the Forest Elephant (*Loxodonta cyclotis*). A third species, the West African Elephant, has also been postulated. The African Elephant Specialist Group believes that more extensive research is required to support the proposed re-classification.

The on-line database Fishbase documents 467 species of marine fish and 151 species of freshwater fish in Liberia, including 7 endemic freshwater species (Fishbase, 2017). One of these, *Paramphilius firestonei* in the loach/catfish family, is exported for the pet trade. Fifty-one fish species are listed as threatened--primarily marine species including sharks, sawfish, groupers, and smaller species like West African sea horses. The presence, distribution, and population of lower animal taxa in Liberia is poorly studied.

Because of its varied ecosystems and large remaining tracts of forests, Liberia has a great diversity of plants, but data is incomplete, and new plants are still being found. Fauna and Flora International maintains an online Plant Atlas of tree, brush, shrub and liana species, providing information on hundreds of plants including their scientific name, local name and, in many cases, their human use.

Several high-value timber species in the wild are endangered and under increasing pressure from exporters and threat from shifting cultivation. These include the African mahogany (*Khaya anthoteca*); African/Liberian Pine, also known locally as Tet (*Tetraberlina tubmaniana*); African walnut (*Lovoa. tricilioides*); Sipo (*Entandropragma utile*); and Tiama (*E. angolense*). No detailed studies were found of the status and extent of these species, however.

The implications of poor data are twofold. On the one hand, without knowing the status and distribution of species, it is more difficult to identify priority sites for protection. On the other hand, it is difficult to design and monitor measures to mitigate habitat loss due to resource extraction, such as biodiversity offsets. That is because it is difficult to know what is lost due to mining that must be offset. Without adequate data it is difficult to know where to site mitigating offset projects to achieve the desired biodiversity results, and to measure their success when implemented. The bottom line is that biodiversity will be lost before it can even be described, and this loss will accelerate over time. There is a very small window in which to protect the remaining, globally significant, biodiversity in Liberia.

3.4 GENETIC DIVERSITY

As part of national goals established in its second National Biodiversity Strategy and Action Plan, Liberia is working to improve the status of biodiversity by safeguarding genetic diversity. Activities to date focus on agro-biodiversity, which, in Liberia, include domesticated plant and animal species, and wild relatives of domesticated crops and animals. The Plan establishes a broad goal of maintaining and enhancing the genetic diversity of both cultivated plants and farm animals by 2020. This includes the development of a national germplasm collection, the establishment of gene banks, the strengthening the Biosafety Risk Assessment procedures for the evaluation of genetically-modified organisms that may be introduced, and through surveys to document traditional knowledge regarding agro-biodiversity.

No information was found on the genetic diversity of wild species of economic importance.

3.5 STATUS AND MANAGEMENT OF PROTECTED AREAS

Protected areas in Liberia may be comprised of land for which the tenure is customary, held by government, and/or privately held, but which must be conserved for the benefit of all Liberians. Map 4.0 in Annex L shows current and proposed protected areas. Map 3.3 shows protected areas and community forests juxtaposed with forest loss.

As of 2016, Liberia has five designated protected areas (see Table 6 in Annex K for details):

1) Sapo National Park, designated in 1983 and primarily comprised of lowland rainforest, including swampy areas, dry land, and riparian forests;
2) East Nimba Reserve, designated in 2003 and featuring high, closed tropical forest;
3) Lake Piso, designated in 1999, a coastal mixed-use reserve and Ramsar site
4) Gola Forest National Park, designated in 2016, and
5) Grebo-Krahn National Park, designated in 2017.

The Protected Forest Area Network Law (2003) expanded Sapo National Park and identified additional sites for classification as protected areas (map 6.0, Annex H and table 8, Annex I), including a range of options that offer varying degrees of restriction on activities. If all the proposed protected areas were created, the proportion of protected land would grow from less than 3 percent to more than 12 percent (CI, 2017). Currently, 22 percent of Liberia's mangroves grow within protected areas, but the proposed areas would collectively increase that proportion to approximately 46 percent.

Management plans for the proposed protected areas are to be developed from the process stipulated in this law, which may include co-management with communities in pilots focused on community management zones. Communities near protected areas will be mapped, and community natural-resource management committees established and supported based on this mapping. Management plans will supplement the participatory approaches. However, the status of such plans and hence the development of the proposed protected areas remains unclear. For existing protected areas, Sapo National Park has an out of date management plan. World Bank support for the Grebo-Krahn National Park through a project now under way is expected to produce a management plan. A management plan outline was produced for East Nimba Nature Reserve in 2012 but no information was available on progress in completing this plan.

At the present, protected areas contribute a negligible amount to Liberia's economy. Due to poor infrastructure, these sites are not yet viable for commercial tourism. Section 4 below discussed what is known of ecosystem goods and services in Liberia.

It must be stressed that because Liberia's economy is based upon natural resource extraction, any measure takes forest and mineral resources out of production puts the FDA and EPA on a collision course with powerful economic interests and their corresponding (and generally more powerful) ministries. For this reason, in the future, the benefits (both tangible and intangible) of protected areas must be identified and expressed in clear, unambiguous terms with data that does not exist today. And this alone will be insufficient. The use and conservation of land must be part of a broader conversation about equity, socially, geographically and generationally. In short, the case for protected areas as a fundamental component of resilience and self-reliance must be made.

3.6 STATUS AND MANAGEMENT OF KEY NATURAL RESOURCES OUTSIDE PROTECTED AREAS

More than 97 percent of Liberia's total area falls outside of the country's existing protected areas. The status of biodiversity is poorly known.

A Critical Ecosystem Partnership Fund (CEPF) 2015 analysis of the Guinean Forest hotspot used the Key Biodiversity Area (KBA) methodology to identify conservation priorities based upon the species at greatest risk of extinction. The CEPF analysis identified eighteen terrestrial KBAs and four freshwater KBAs. These include some protected areas, such as the Gola Forest in the northwest, and the Cestos-Sapo-Grebo-Taï-Cavally complex in the southeast. Table 9 in Annex I shows KBA sites.

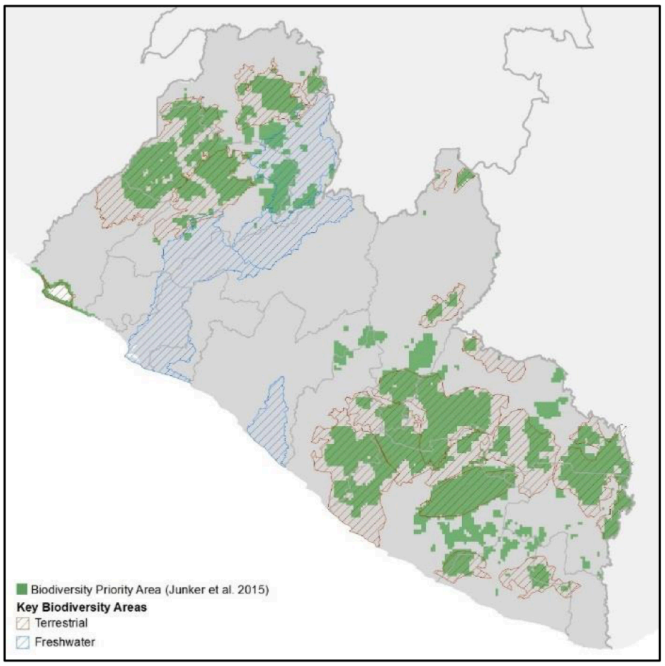


Figure 3: Biodiversity Priority Areas compared with KBAs (Junker et al 2015)

A 2015 modeling analysis (Junker et al) using MARXAN software compared overall conservation targets against the 30% protected forest target previously mentioned (Figure 3). Inputs included chimpanzee abundance, IUCN threat-weighted large mammal species richness, forest cover, elevation, known elephant occurrence, and known threatened large mammal occurrence. Identified conservation priority areas were compared with current and proposed protected areas. 92 discrete conservation priority areas were found, of which 9% were contained within existing protected areas, and 24% within proposed protected areas. They align well with terrestrial, but not with freshwater and coastal KBAs. The study found little overlap with *existing* mining, oil palm, or rubber concessions, but substantial overlap with timber concessions.

Management authority for lands outside of protected areas lacks clarity. County government has primary responsibility, but several ministries have the responsibility for the establishment of concessions (e.g. the Ministry of Agriculture, the Ministry of Mines and Energy). The capacity for coordination with local authorities is very low, and typically, local authorities will not have access to basic map information.

The Environmental Protection and Management Law and National Environmental Policy of Liberia provide the legal framework for the sustainable development, management and protection of the environment outside of forests. The Environmental Protection Agency (EPA) has the overall responsibility to coordinate natural resources management. It is responsible for Ramsar sites (which have no formal legal protection as Ramsar sites *per se*), and wetland areas including the Lake Piso Multiple Use Area.

Conservation efforts outside of protected areas are primarily focused on community forests, surveys, and the identification of boundaries for proposed protected areas.

Proposed expansion of the protected area system will significantly increase the amount of land under protection. The 2006 National Forestry Reform Law (q.v., section 5) mandates the establishment of a Protected Forest Area Network to cover at least 30 percent of the existing *forested area* of Liberia. The Wildlife Law of 2012 (ratified 2016) affirms this, and indicates this would amount to 1.5 million ha, consistent with CI figures cited above. This conservation goal directly competes with Liberia's extractive economic activities, such as mining and logging, which are large parts of its export income (See Map 4.1, Annex H).

Though many areas including forests have been proposed for protection, as described in Section 3.5, the fact of the *proposed* designation does not necessarily confer any additional benefits, special status, or protection. The 2016 Wildlife Act does authorize management plans for areas in addition to designated protected areas, but there are no known examples.

Farm fields and forests are important features of Liberia, but the landscape also includes large tracts of disturbed or secondary forest, primarily cyclically farmed areas under shifting cultivation. Although considered to be degraded, this secondary forest is part of a mosaic of habitat types and may be important for species such as large ungulates.

CILSS and the USGS conducted a land-use mapping exercise in Liberia for the period 1975-2013 with USAID support; Map 3.0 in Annex H and accompanying Table 8 present some of the resulting data (USGS, 2013).

4. VALUE AND ECONOMIC POTENTIAL

4.1 VALUE OF BIODIVERSITY

Many Liberians took shelter in the forests when conflict came to their communities. At a fundamental level, Liberians identify as "forest people". But great care must be taken not to romanticize these forest connections; that Liberians are forest people does not mean that they identify forests as embraceable. Their relationship with nature is complex and often deeply ambivalent. This is a social and cultural issue, the understanding of which is important, and which may require specialized social science expertise. A very sophisticated approach to "value" in forests and biodiversity is required for conservation to have understanding and support.

As in other countries, Liberia's ecosystems and natural areas provide essential benefits for urban and rural communities, helping to meet basic needs for most of the country's population. Consider food security, for instance; a substantial amount of total protein consumed in Liberia comes from wild fisheries[4]. In addition, as many as 96 percent of people consume bushmeat (wildlife), albeit for the most part in low quantities (Hoyt and Groff 2002). Up to 75 percent of the country's meat consumption may come from bushmeat - with a replacement value estimated more than a decade ago at US $100 million (Hoyt, 2004).

Forests generate significant amounts of both food and income, with 70 percent of Liberia's rural population earning a living from forest-related products. Rural drinking-water

[4] Estimates vary from between 15 and 65 percent.

supplies rely on natural water bodies and consistent flows, and the entire country benefits from hydrological services provided by wetlands, catchments, and other areas. Such services include management of erosion and sediment, water quality protection, and flood regulation. These hydrologic functions also drive the country's hydropower resources, which are a potential cornerstone of Liberia's energy future (CI, 2017). In the meantime, more than 80 percent of Liberian households cook and heat with firewood and charcoal directly from the forest.

As the largest intact forests in West Africa, Liberia's forests play an important role in regulating the global climate. They contain some of the highest above-ground biomass stocks per hectare of any forest in the world, including the Amazon, and some areas contain over 300 tons CO_2/ha. Liberia's coastal ecosystems, including mangroves, also mitigate climate change through services like flood management and erosion control. And they are critical to fisheries, both for direct consumption, and livelihoods, through market participation.

Liberia's ecosystems also play a role in cultural identity, local recreation, and tourism. Sites of cultural importance include sacred groves, ancestral burial grounds, culturally protected forests, shrines, and natural features associated with deities, including mountains, rivers, and waterfalls. Plants and animals are also used as totems, and traditional non-timber forest products and materials are used in religious rituals.

4.2 ECOSYSTEM GOODS AND SERVICES

Our understanding of the economic value of natural resources and ecosystem services remains limited due to a shortage of data, but a new effort is attempting to fill in gaps. The most comprehensive study designed to assign valuation to Liberia's biodiversity was just completed by CI in collaboration with Liberia's Environmental Protection Agency (EPA) (CI, 2017). This pilot effort to map and account for Liberia's natural capital includes biodiversity plus ecosystems. Maps were developed for the following essential natural-capital values: biodiversity; forest carbon; non-timber forest products (NTFPs), including bushmeat; freshwater ecosystem services (including flood control and erosion and sediment regulation); and coastal protection by mangroves. The pilot also built on ecosystem accounting for the forest sector to show the importance of natural capital (forests, in this case) to the national economy.

Although the economic contributions of the forest sector itself are disputed, CI (2017) attributes 11% of GDP (USD 212 million) to the logging industry for 2015, and as much as 50% of export revenues. The Observatory of Economic Complexity (OEC) analysis for 2015 (OEC 2015) indicate that rough wood experts (USD 39 million in export value), or approximately 4.7% of exports. Some estimates indicate that local demand for timber may be three to four times that of Liberia's export market (USAID/Liberia, 2017). An analysis was conducted as part of the CI ecosystems services pilot that found, at current market prices, the value of Liberia's timber stock in terms of commercially viable biomass is USD 18 billion.

5. LEGAL FRAMEWORK AFFECTING CONSERVATION

5.1 NATIONAL LAWS, POLICIES AND STRATEGIES

The US-led Liberia Forest Initiative (LFI) was launched in 2004 to restructure and reinvigorate the forestry sector and the FDA in the aftermath of the civil wars. This process produced the 2006 National Forestry Reform Law and the 2009 Community Rights Law, both with USAID support. The reform process also introduced regulations governing commercial forestry practices, non-timber forest products, artisanal logging for local use, community forestry, protected areas, and wildlife conservation.

The National Wildlife Law of 2012 was approved through an Act Adopting the National Wildlife and Conservation Protected Area Management Law of Liberia was approved on October 5, 2016, amplifying conservation measures in the 2006 National Forestry Reform Law. Significant provisions include provisions for cooperative governance in the establishment of protected areas and management of wildlife, and for a national system of conservation areas. It declares as Liberia's policy that wildlife management enhance the social and economic benefits of the country. It permitted the establishment of a protected area management advisory council for each protected area, to include representatives of county, district, and community government, as well as NGOs and community-based organizations. Table 10 in Annex I provides a list of the types of protected areas permitted under this law. The law also sets forward standards for managing wildlife according to international best practices, extends protection to all species, and sets out penalties for infractions of rules governing wildlife and conservation areas[5].

The Environmental Protection and Management Law and National Environmental Policy of Liberia provide the legal framework for the protection of the environment outside of forests. The EPA has the overall responsibility to coordinate natural resources management.

The Bureau of National Fisheries, now the National Fisheries and Aquaculture Authority, developed the Fisheries and Aquaculture Policy and Strategy (2014) setting out objectives for strengthening community stewardship of fishery resources and supporting the development of upstream and downstream commercial activities, However, under Executive Order 84 signed by the President Sirleaf in 2017, the government halved its Inshore Exclusion Zone, previously reserved for artisanal fishermen, from six nautical miles to just three, thus allowing industrial vessels, including from distant-water fishing fleets, to directly compete with fishing communities.

The effectiveness of the natural resource laws of Liberia is extremely limited due poor capacity, competing mandates of different government agencies, and inconsistent policies. From a conservation perspective, the critical legislation includes the National Wildlife Law, resources for implementation of which are extremely limited, and non-existent for proposed protected areas. Donor support and partnerships with international

[5] The CITES Secretariat has determined that the National Wildlife Law set out in the Wildlife Conservation and Protected Areas Act of 2016 does not meet the minimum requirements for implementation of the convention.

conservation organizations provides limited near-term support, but a long-term solution will remain elusive unless and until a long-term sustainable financing plan for biodiversity is implemented that is governed through an independent and appropriately accountable mechanism.

The major gaps in legislation are in the contrary and unreconciled mandates of different government agencies, and lack of clarity regarding precedence of mandates, e.g., for forestry, mining, and agricultural concessions, conservation areas and community forests. The need for harmonization of mandates is acute. Liberia also lacks some key policies, including a policy regarding ownership of forest carbon and an overall policy on forest carbon mitigation, including REDD+. The legal framework for natural resource management in Liberia has loopholes that have been exploited by rent-seeking officials for personal gain. This legal framework requires review and amendment, but the Government of Liberia (GoL) lacks official bodies that have both the capacity and the standing with which to undertake this needed shift. NGO "watchdog" organizations like the Sustainable Development Institute have played a crucial role in keeping shortcomings in legislation and policy in the public eye.

5.2 INTERNATIONAL AGREEMENTS

Liberia ratified the **Convention on Biological Diversity** (CBD) in 2000. The newly updated National Biodiversity Strategy and Action Plan (NBSAP) covering 2017-2025 outlines national priorities. EPA is the focal point for the NBSAP in Liberia. An inter-agency team including the FDA and universities work with EPA on CBD programs and implementation. The NBSAP, which is highly descriptive, includes 20 aspirational targets. The strategy for achieving these targets is broadly consistent with this analysis. Its implementation will require additional in-depth analysis of the constraints to capacity development, policy harmonization, monitoring and enforcement. Notably it recognizes the need for a National Conservation Fund.

The NBSAP expresses the position of the EPA and doesn't address the broader political economy of natural resource access and use, which has kept the EPA poorly resourced and with little influence over land use decisions made by other ministries. Overall, the capacity to implement this convention is weak, and the convention has little or no apparent influence on economic policy.

As party to the **Wetlands of International Importance (Ramsar) Convention** since 2003, Liberia has nominated five wetland sites for protection (Table 4 in Annex I). Liberia also ratified the **Convention on the Conservation of Migratory Species of Wild Animals** in 2002. Seven Important Bird Areas have been identified with Birdlife International. The EPA has not achieved conservation status for Ramsar sites aside from Lake Piso.

The EPA houses the National Coordinator for the **UN Framework Convention on Climate Change** and recently produced a National Climate Change Policy. The EPA is also responsible for the **United Nations Convention to Combat Desertification**.

Liberia is active in the **Convention on the International Trade in Endangered Species (CITES)**. The University of Liberia is the CITES Scientific Authority responsible for the status of species, and the FDA is the Management Authority, responsible for reporting.

The capacity for monitoring and reporting is very limited. Monitoring of the issuance of CITES expert certificates is weak, leaving the system exposed to risk from fraud. In March 2016, the CITES Secretariat recommended that parties suspend commercial trade with Liberia in listed specimens, due to lack of compliance with minimum requirements for legislation for convention implementation.

The FDA oversees the implementation of the **Forest Law Enforcement, Governance and Trade** Voluntary Partnership Agreement with the European Union, signed in 2011, establishing a chain of custody for legally harvested timber destined for Europe.

Liberia is collaborating with the Mano River Union countries in the implementation of the **African Convention on the Conservation of Natural Resources.**

Liberia is party to many other agreements including the International Tropical Timber Agreement, and the Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region.

5.3 GOVERNMENT AGENCIES

Lead agencies with responsibilities for tropical forests and biodiversity include FDA, established in 1976, and EPA, established in 2003. The Ministry of Agriculture, the Liberia Land Authority and other agencies have remits to forests and biodiversity with competing mandates. (See Annex L for details on institutional remits).

The EPA has the overall responsibility to coordinate natural resources management and is also responsible for most of the multilateral environmental agreements to which Liberia is a party. The EPA's mandate is weak, with limited enforcement capacity.

In the FDA, concerns have been raised over an imbalance between the commercial forestry, conservation, and community components, in favor of commercial interests. This is unsurprising given the economic pressures, but it undermines the balanced path created through the LFI.

At the 2013 summit of the Mano River Union's heads of state, Liberia took the regional lead on forestry and natural resources, setting the stage for a potential reemergence of the Forest Training Institute (FTI) as a regional training facility. However, like its parent organization, the FDA, and the EPA, FTI is chronically underfunded.

These government agencies lack the capacity to monitor resources, and to maintain and share data. Although some individual agencies maintain data, there is no national spatial data infrastructure. Data are not shared among government agencies, creating substantial constraints on management of natural resources. There is a need for common standards for open data. An inter-ministerial concession committee reviews all concessions but is ineffectual due to the lack of a national spatial data infrastructure.

5.4 CONSERVATION INITIATIVES

Since the end of the last civil war, Liberia has received sizeable investments for biodiversity and forest conservation initiatives from bilateral, multi-lateral and non-government organizations. Through the LFI donors have attempted to coordinate action. This is now eroding. World Bank support for community forests is not well coordinated with USAID efforts, for example.

International NGOs have been active in Liberia. Substantial progress has been made in the articulation and prioritization of conservation efforts through the CEPF, which has promoted an ecosystem-based approach to conservation, based upon land units rather than individual taxa. Conservation interests remain to some extent driven by charismatic species, but NGOs are playing an increasingly important role in surveying (Wild Chimp Foundation in Krahn-Bassa proposed protected area, the Rainforest Trust and Birdlife International, through management support for the Society for Conservation of Nature in Liberia (SCNL), and in partnership with the FDA.

International Conservation NGOs are also brokering public/private partnerships. Of particular interest is the ongoing work of Conservation International in promoting biodiversity offsets for mining concessions, and its work with ArcellorMittal. Given the mineral wealth and economic development prerogatives, biodiversity offset programs may provide the best alternative for supporting the protection of critical biodiversity areas. This initiative will generate important lessons on the efficacy of the approach over the long term.

Conservation, like other activities, produces a political economy. In Liberia, the continued dependency of the key natural resource management agencies on private support from NGOs has the potential to undermine self-reliance. A collateral risk is that the agendas of international conservation groups engaging industry and national advocacy groups may not align, creating tension and potentially politicizing conservation initiatives.

Annex F summarizes the major conservation initiatives now underway.

6. THREATS TO BIODIVERSITY (INCLUDING TROPICAL FORESTS)

Threats to biodiversity and forests are generally classified into two types: direct threats and indirect threats (or drivers). Major threats are categorized by the Conservation Measures Partnership http://cmp-openstandards.org/tools/threats-and-actions-taxonomies). Many direct threats are visible from major roads and thoroughfares; others may be hidden out of sight, but still play important roles in the status of biodiversity in a country. The drivers behind them are the institutional, political and economic factors that fuel these direct threats. Drivers are the most likely access points for donor and government interventions.

The Analysis team referred to two primary sources in categorizing the threats to biodiversity and forests in Liberia: 2017 NBSAP (GoL, 2017) and the 2014 FAA118/119 (USAID/Liberia, 2014). Through fieldwork and in-country consultations, the Analysis team has consolidated and refined the present direct and indirect threats into the information below.

6.1 DIRECT THREATS TO BIODIVERSITY AND FORESTS

Direct threats to biodiversity include, in broad terms, unsustainable use, habitat modification and other human action that immediately degrades biodiversity. The assessment team produced the following list of the major direct threats to biodiversity through review of the available literature and through interviews with land use managers,

biodiversity experts, and civil society organizations. This is not intended to be an exhaustive list. A scientifically rigorous prioritization of threats within such a complex system is a major undertaking and is not feasible to do within the constraints of this assessment. Accordingly, the assessment draws upon existing prioritization of the threats (pulling heavily on the NBSAP and the work of the CEPF (CEPF, 2015). However, the team took pains not to simply repeat the assessments made in the latest Liberia FAA 118/119 assessment component of the Environmental Threats and Opportunities Assessment (USAID, 2014). The team made the ranking of threats based upon available evidence and direct knowledge of the team members.

Efforts have been made to develop a balanced view, e.g., of marine and terrestrial, and floral and faunal, interests through our selection of review materials and informants. Annex J shows a threat assessment matrix.

Agriculture

Unsustainable Shifting Cultivation (i.e. swidden, or slash and burn agriculture) is the primary type of farming practiced in Liberia. It involves rotating plots, generally of less than five hectares. Shifting cultivation becomes a problem due to a growing demand for land for food production, as is the case in Liberia. At historic levels, this practice would have produced a mosaic of habitat types that might favor larger mammals. As demand for land increases, farmland is not being left fallow long enough to restore productive capacity, resulting in lower outputs per unit of land. Thus, the demand for land is reinforced, while simultaneously, habitat destruction and human proximity, e.g., increasing hunting pressure, are eroding biodiversity.

Expansion of Agro-industrial Crop Plantations into Forested Areas: Worldwide, agro-industrial plantations**,** such as rubber and oil palm plantations, turn once-forested land into monocultures. In Liberia, this process began in 1926, with Firestone Rubber Plantation Company in Harbel, Margibi County; other large-scale rubber plantations were subsequently developed around the country.

Palm-oil plantations also cover about 629,000 hectares of land, managed by three large foreign companies: Sime Darby (Malaysia), Equatorial Oil Palm (United Kingdom) and Golden Agri-resources (Singapore) (GoL, 2017). Palm-oil plantations are becoming a ubiquitous part of the landscape; the team observed both mature and newly planted plantations during site visits in Bomi and Grand Cape Mount counties. New plantations are still being allowed in some forested areas, despite the absence of available unencumbered land, due to overlapping agency mandates and limited spatial data.

Biological Resource Use

Timber Concessions in Sensitive Areas: The Forestry Development Authority (FDA) issues five types of licenses for use of forest lands, including: 1) Forest Management Contracts for areas 50,000 hectares and larger for 25 year periods; 2) Timber Sale Contracts for areas 5,000 hectares or smaller for three years; 3) Forest Use Permits for small-scale research, logging or non-timber forest products; 4) Community Forestry Management Agreements for community-based forest management areas less than

50,000 hectares; and 5) Private Use Permits for private property owners[6]. However, these regulations are not effectively enforced.

Wildlife Trafficking: Illegal trade in protected species for pets is reported, although data is not available. At the Libassa Wildlife Sanctuary, a joint project of the Libassa Ecolodge, the FDA, and the SCNL, the team noted efforts to rehabilitate animals obtained from the pet trade, including Timneh parrots (*Psittacus timneh*), various duikers, and monkeys. Until recently, most statistics gathered on Liberian wildlife trade conflated wildlife trafficking with market hunting for the domestic consumption of wild meat ("bushmeat"). The global demand for wildlife parts that fueled the decimation of elephants and rhinos in southern and eastern Africa has reached West Africa. Liberia is a range state for pangolin species, thought to be the most trafficked animals in the world due to demand for its scales. The International Union for the Conservation of Nature (IUCN) reported on the emergence of the illegal trafficking since 2008 of pangolin scales to the Convention on the International Trade in Endangered Species (CITES) in a 2017 report (Challender and Waterman, 2017). Recent seizures have been linked to origins in West Africa, including Liberia and its neighbors Guinea and Côte d'Ivoire. These were being trafficked via Europe largely to China and Vietnam. Although not a major source at present, pressure on pangolins will certainly increase as populations are reduced elsewhere.

While the Analysis team conducted field work in Liberia, 600 kg of elephant tusks and 600 kg of pangolin scales were seized in Côte d'Ivoire, a country with limited remaining forest and wildlife resources. Given the porosity of Liberia's border with Côte d'Ivoire, it is reasonable to suspect that Liberia was the point of origin. Liberia reported the seizure of 50 kg of scales in 2015 destined for China (CITES 2017). Belgium reported a large seizure of scales from multiple countries, including Liberia.

Subsistence and Local Market Hunting: Bushmeat is important to Liberians as a source of protein and is also culturally preferred over meat from livestock. It has long been an economically important industry in Liberia – as far back as the 1980s Liberian bushmeat hunters were notorious for clearing areas of the Gola Forest in Sierra Leone of wildlife, because domestic forests were largely depleted. However, bushmeat hunting is unregulated and has been so prevalent that Liberian forests are sometimes called "empty forests," meaning largely defaunated (Redford, 1992). In the 2017 household study (USAID/Liberia, 2017), bushmeat was found to be an important protein source, consumed by 61 percent of the households surveyed.

Households reported three main types of bushmeat: hog (36 percent), duiker (25 percent), and primates (15 percent). Only five percent of the hunters surveyed hold permits. In general, current hunting practices are unmanaged and thought to be unsustainable, leading to diminished numbers of endangered forest species (GoL, 2017).

Illegal or Unregulated Pit Sawing: Small-scale chainsaw operators fell trees all over Liberia, with no proper legal framework, A recent study (USAID/Liberia, 2017) of households in five Liberian counties (Grand Cape Mount, Bong, Grand Gedeh, Lofa, and Margibi) found that 11 percent of households surveyed harvest timber, largely year-round;

[6] There is a moratorium on Private Use Permits enacted January 4, 2013, by Executive Order number 44 of President Ellen Johnson Sirleaf.

68 percent of these loggers hired others to help. The total amount of sawn wood from informal chainsaw milling operations ranges, in 2016, from 691,944 m^3 to 922,591 m^3 (in Roundwood Equivalents), which is roughly four times the amount of exported timber (200,263 m^3) for the same year (USAID/Liberia, Jan 2017). Planks from illegal pit sawing operations were seen piled along the roadside--including just outside protected areas like Sapo National Park and the East Nimba Nature Reserve. This problem is widespread and uncontrolled.

Illegal, Unreported and Unregulated (IUU) Fishing: IUU fishing by distant-water fleets is a widespread and growing problem in Liberia, and the government does not have the capacity to regulate it. USAID has supported recent studies of fisheries in Liberia and the role of fish in food security (USAID/DC, 2016; USAID/Liberia, 2017). Although fish is a significant component the national diet, the Liberian National Fisheries and Aquaculture Authority[7] (NFaACA), has limited enforcement capacity and lacks resources to properly survey fisheries and document fish landings.

Large commercial trawlers from distant water fleets pass within the six-nautical mile coastal zone, without permission and at night. They capture large quantities of fish and incidental take and destroy the set nets of Liberian fishermen in the process. While visiting Robertsport, the Assessment Team observed this issue being addressed by the international NGO Sea Shepherd in partnership with the Liberian Coast Guard and the military. Regulation is complicated by Executive Order 84, signed by President Sirleaf in 2017, which instructed the government to cut by half its Inshore Exclusion Zone reserved for artisanal fishermen from six nautical miles to three, allowing industrial vessels to more directly compete with fishing communities (See Map 5.3 in Annex H).

A landmark study (D. Belhabib et al, 2013) analyzed Liberian commercial fisheries from 1950 to 2010. The study determined that FAO data provided by Liberia showed that harvested biomass – which was estimated to be just one-fifth of the actual catch - was worth almost US $75 US million annually. The remainder consisted of illegal and unreported catches. There is no data available on artisanal fishing efforts. Many nets used in artisanal fisheries are small sieve size nets (known locally as two-finger), which harvest juveniles.

The impact on aquatic biodiversity due to IUU fishing is likely to be high but is under-studied, and the data available is insufficient to provide a basis for further recommendations.

Energy Production and Mining

The GoL encourages large-scale mining as part of its Poverty Reduction Strategy. Overlapping mandates and jurisdictions of agencies responsible for various aspects of land and natural resource management (e.g., mining, forestry, agriculture, conservation) and the absence of co-ordination will continue to threaten the integrity of Liberia's protected areas and forest estate in the absence of clear policies and leadership. Map 6 in Annex L illustrates the overlapping boundaries of different kinds of concessions and conservation areas.

[7] Formerly known as the Bureau of National Fisheries

Mining operations are destroying and fragmenting forests as well as leaving tailings and open cast pits unmanaged--polluting waterways and impacting the lives of both humans and other species. Siltation from mining sites threatens fish populations and freshwater systems. The common practice of hunting to feed workers in the logging and mining camps adversely affects animal populations. During this assessment, the team saw first-hand the degradation of land in Bomi Country, from one of the country's original iron-ore mines. The mine closed in the mid- 1970s, but a lack of restoration work coupled with shifting cultivation from nearby communities has produced land that has not been rehabilitated and is now unproductive.

Artisanal Mining: In addition to large commercial mining operations like ArcelorMittal, China Union Company Ltd., and Western Cluster, many artisanal miners prospect for diamonds and gold. They tend to work in remote areas and are not easily policed, especially in understaffed protected areas. In Sapo National Park, conflicts between FDA rangers and miners led to the murder of two rangers and injury to four others, in April 2017 (The Guardian, 2017). When the team visited the Sapo National Park headquarters in February 2018, it learned that one large mining camp was still operating in the park.

Cutting Forests for Fuelwood and Charcoal Production: Charcoal and firewood provide cooking and heating fuel for most households, due to limited electricity and renewable fuel sources. Charcoal production also provides supplemental income for many families and is sold to markets in Monrovia and other towns. A study in five Liberian counties (USAID/Liberia, 2017) found charcoal to be the primary cooking fuel in 70 percent of households surveyed; most of the rest used firewood.

The study also found that 41 percent of household heads produced carcoal--yet only four percent had permits to do so. Wood used for charcoal production comes from many sources, including forests cleared for agriculture, community forests and privately-owned forests, with resultant threats to remaining secondary and primary forests. Fuelwood is also used to smoke fish for commercial sale, as the analysis team observed at the Robertsport commercial fish landing area. Until recently, mangrove wood was commonly used to smoke fish.

Invasive and Problematic Species

A number of plants inadvertently introduced to Liberia have become problematic (GOL, 2017). *Chromoleana odorata* (known locally as Doe leaf), a pyrophytic New World perennial shrub, is a pioneer species. It replaces native species following disturbance due to shifting cultivation and presents a fire hazard during dry season. *C. odorata* is associated with progressive drying of forest edges and gradual conversion from forest to fire-adapted savannah. *Acacia spp.* are fast-growing trees that thrive on degraded land, prohibiting the regeneration of native plants. Many are fire-adapted as well. In freshwater systems, invasive water hyacinths (*Eichhornia crassipes*) clog waterways and shade out other aquatic plants.

Along the coast, ballast water from ships from other parts of the world contain plankton—as well as the young of many exotic marine species. If ballast water is not treated prior to discharge, these species can become established and displace native biodiversity. For

example, the Indian Ocean seaweed *Caulerpa taxifolia* has spread around the world, producing claims of severe biodiversity loss.[8]

Climate Change

The effects of climate change are most apparent in coastal regions and agricultural areas. Ecosystem encroachment through sea level rise and coastal erosion—in large part from a loss of ecosystem services — directly threaten coastal communities and livelihoods. Many communities abut tidal zones and are battered by storm surge during the wettest months of the year. In fishing villages around Buchanan, for instance, encroachment of the sea is readily apparent.

Changes in temperature and hydrological regimes are also contributing to shifting planting seasons, affecting food security. Since farmers rely on rain-fed agriculture, they typically use water inefficiently. As compared with the past, many farmers express uncertainty about when to plant or harvest, and many are reporting reduced yields. USAID's 2013 Climate Change Assessment notes that forests in eastern Liberia are the most likely to be impacted by a drier climate by 2050. Notwithstanding direct impacts from the potential for increased aridity, forests will be at risk from the combined effects of human disturbance, invasive species, habitat fragmentation, and climate change.

Pollution

Outflows from rubber plantations, mines, municipalities, and agricultural areas degrade water quality throughout the country. Access to clean drinking water is a problem nationwide, even for many in Monrovia. While difficult to document due to lack of data, aquatic flora and fauna undoubtedly also suffer from water pollution. In addition, the country lacks adequate sanitation facilities and interventions at all levels; open defecation contaminates waterways and coastal areas, spreading human disease and impacting biodiversity.

Natural Systems Modifications

The Mount Coffee Hydropower Dam on the Saint Paul River outside Monrovia was built to World Bank Environmental Impact Assessment standards and is just coming back into operation following the Liberian Civil Wars. Although this is a 'run of the river' dam with no reservoir, other hydroelectric projects planned for Liberia may have even greater impacts due to large-scale flooding of forests to create reservoirs. Conversely, siltation and sedimentation from deforestation may limit Liberia's hydroelectric potential. The impact of the Mount Coffee dam on aquatic biodiversity is now being studied. It will be essential that studies such as this become part of the knowledge base of the GoL as it considers future infrastructure projects.

Roads and railroads may also impact adversely impact biodiversity and forests, especially when planned in or near protected or sensitive ecosystems.

[8] Aquariums are implicated as *C. taxifolia's* initial introduction pathway. It is a commonly used aquarium plant; and as it becomes established in coastal areas worldwide, it will become easier to spread through ballast water.

6.2 DRIVERS OF THREATS

Drivers (or indirect threats) are factors that negatively affect the conservation of biodiversity and natural resources like forests. These factors act “behind the scenes” but shape the direct threats happening on the ground. Like many countries, Liberia has numerous drivers in various categories, including institutional arrangements, economic factors, technical and management capacity, and socio-political issues. See table 1 (below) for a matrix of underlying drivers, direct threats, and required actions.

Poverty and Lack of Sustainable Sources of Income: Liberia is a country richly endowed with mineral and biological resources as well as a favorable climate for agriculture. Unfortunately, abject poverty exists in every county; 83.8% of the population live below an income of USD 1.25/day (World Food Program 2015). Liberia ranks 177 out 188 countries in the current (2016) Human Development Report; inequality is a strong weighting factor (UNDP, 2016). The analysis team visited the northwest, north and southeast of the country, and everywhere found signs of severe poverty, such as malnutrition of children, poor educational facilities, poor road conditions, pronounced illiteracy, etc. Sixteen percent of households are food-insecure, according to an Emergency Food Security Assessment conducted in 2015 (World Food Program 2015). Food insecurity produces chronic malnutrition and reduces health and productivity, creating a vicious circle that militates against natural resource conservation. The World Food Program cites limited access to education as a major underlying cause of poverty.

When a modern economy falters, rural people become even more dependent on forests for subsistence; immediate extraction of resources takes precedence over more time consuming sustainable and regenerative strategies. This translates into the direct threats of hunting pressure, the increased demand upon land for shifting cultivation, resulting in shorter fallow periods, and the conversion of forests for fuelwood and charcoal production and for local timber production. Climate change and poverty are mutually reinforcing; poverty will reduce social and economic resilience to climate impacts, including the capacity to adapt, e.g., through climate smart agricultural practices. Climate impacts such as extreme weather events and changing hydrological cycles have strong potential to undermine productivity and food security, thus exacerbating poverty.

Lack of Adequate Capacity to Enforce Laws: Despite many laws and policies, Liberia sees very little enforcement or support from regulatory frameworks. Staff assigned to points of illegal activities are either limited in their capacity or poorly equipped to carry out law enforcement duties. At Lake Piso Multiple Use Area, for instance, only one FDA official covers the 97,159 ha unit. A limited command structure at field stations and lack of collaboration with agency headquarters in Monrovia also hamper enforcement efforts.

In some cases, the enforcers find themselves with conflicts of interest: in communities engaged in poaching, for example, many park rangers could be torn between loyalty to the community and their professional obligations. A lack of coordination within and between agencies further weakens surveillance and enforcement. Finally, a weak justice system causes delays or dismissals in adjudication of cases on the rare occasions when they are brought to court, diminishing confidence in the justice system to manage environmental crimes.

As a result, the enforcement of wildlife laws is severely constrained, resulting in defaunation of large areas, including through increased illegal international trafficking of wildlife parts such as ivory and pangolin scales. Enforcement against encroachment within protected areas is also constrained, as seen from the ongoing problem of illegal artisanal mining in Sapo NP. In addition, the ability to ensure compliance with laws concerning natural resource extraction, including commercial fisheries, logging, and mining, is diminished.

Lack of Technical Capacity to Manage Resources: All direct threats are amplified by the lack of technical capacity to respond on the part of responsible agencies.

Agencies lack trained staff for many key positions, and educational institutions need much upgrading to be more effective in turning out qualified students to fill these roles. Relevant institutions do exist—e.g. the Colleges of Agriculture and Forestry and Science and Technology at the University of Liberia, the Agriculture and Integrated Rural Development Departments at Cuttington University, the Forestry Training Institute, the Maritime Training Institute, and the Central Agricultural Research Institute, among others. But they lack equipment, facilities and financial resources. The Analysis team found little evidence of broad support for key capacity-building and training institutions.

Sustaining outcomes from training projects with communities is also challenge. In many cases, as soon as donor-driven activities end, so too do the outcomes. This suggests that programs are insufficiently demand-driven.

As a result, the ability to monitoring natural resources and to plan for sustainable use is constrained, making it difficult to manage any direct threats such as unsustainable hunting and fishing, climate change, invasive species, and pollution.

Lack of Awareness or Appreciation of the Long-Term Value of Natural Resources: Many Liberians possess no knowledge about the sustainability of natural resources and may feel that these resources are infinite. Laws and policies protecting wildlife, forests, and other ecosystems are ineffectively communicated. Too often, awareness messages are conveyed through mediums and methods that are inaccessible or otherwise difficult for most Liberians to understand. There is a dearth of billboards, radio programs or other awareness-building efforts—let alone well-structured social and behavior change communication—relating to biodiversity conservation. This confounds efforts to promote compliance in natural resource use, and to build the political will for stronger policies and budget allocations, thus creating and amplifying all direct threats.

Lack of Information and Data Necessary for Effective Natural Resource Management: Data on biodiversity and forests are important sources of evidence for planning purposes. A lot of data have been collected on Liberia's biodiversity and forests by partner organizations operating in the forest sector, but no system exists for storage or management to promote easy access. An integrated, national-level data management system based upon agreed standards and protocols does not exist in Liberia. Individual institutions are reluctant to share the data in their possession.

Liberia is not taking advantage of a wide range of techniques and technologies available to collect the required data, including citizen-science approaches involving community natural resource monitoring, and the use of ground based and satellite-based remote

sensing. Nor is it conducting surveys adequate to document and measure change in forests and wildlife or supporting soil science essential for climate adaptation.

The team found limited or no access to data on climate variables and modeling, hydrology, endangered plant species, soil characteristics, growth performance of forest trees and agricultural crops, and many other areas. Remote sensing and spatial data on land-use cover and land-use change are limited to absent.

The FDA, in collaboration with the USAID-funded West African Biodiversity Climate Change (WA-BiCC) project, is strategizing the development of a data storage and management system for the forest sector. Similarly, other sectors (e.g. fisheries) may set up a data storage and tracking system in the country, but these have not yet come to fruition.

Uncertainty about the implications of the Ebola epidemic is a complicating factor. Forest faunal species have been implicated as reservoirs of the disease, but the science is not yet conclusive. Models do show a strong correlation between outbreak sites and the rainforest boundary, suggesting increased probability of and outbreak linked to recent deforestation events (Olivero et al 2017). Caution is required because of the risk of unintended consequences, such as aggravated defaunation to rid the forest of reservoir species before the etiology of the disease is well understood.

Lack of Leadership in Economic and Environmental Policy, Including Resource Allocation and Agency Coordination: Institutional roles and responsibilities among key agencies are ill defined. For instance, two agencies, the FDA and the EPA, manage mangroves under different regulatory regimes. A similar lack of coordination among land-use agencies creates conflict in landscape management. Currently there are land-use conflicts between FDA and the Ministry of Mines and Energy, and between the FDA and the Ministry of Agriculture, as well as other agencies.

Leadership should promote data exchange through open data policies in order to empower managers and facilitate evidence-based decisions concerning resource allocation and management.

This links to direct threats including uncontrolled hunting and animal trade and overlapping extractive industry concessions in conservation areas. The awarding of large-scale, extractive concessions like mines and land for rubber or oil-palm plantations without coordination among agencies and ministries also works against conservation: areas recognized as protected by one agency may be viewed by another as suitable for concessions. Our team observed establishment of new oil palm plantations in areas near Sapo Park in the southeast. Persons interviewed across agencies in Monrovia could not confirm coordination on land use. There is a need for policy harmonization among land-use sectors to reduce threats to biodiversity and forests in Liberia.

Perverse Economic Incentives: Huge opportunities exist in Liberia for extrinsic and intrinsic economic incentives. For extrinsic opportunities, increased international demand for timber, palm oil, rubber, and minerals (iron ore, diamonds, gold) is attracting investors to the country. As intrinsic incentives, companies in extractive industries and commercial monoculture plantations employ hundreds of Liberians (both skilled and unskilled). Although important for economic growth, the plantations are not implementing best

practices at scale to prevent significant damage to biodiversity and forests. Incentives such as tax reductions or exemptions for agro-industrial development have the tendency to promote unintended and undesirable results, contrary to the aims of the incentive-maker. They may also undermine corporate social responsibility as reflected in initiatives such as biodiversity offsets. It will affect direct threats such as uncontrolled hunting and the animal trade, timber and mineral extraction in sensitive areas, illegal pit sawing, artisanal mining, and the expansion of agro-industrial crops leading to deforestation.

Ineffective Land Use Policies and Insecure Land Tenure and Property Rights: Land-use planning has been a source of contentious debate in Liberia. The major land uses are agriculture, forestry, mineral mining, fisheries, and settlements. The 2013 Land Policy aims to address existing and potential conflicts among these and other land uses. Unfortunately, the 2014 Land Rights Act – a critical part of land tenure reform – does not yet have enough support to pass into law. In the absence of an integrated land-use policy, land-use conflicts may be expected to escalate.

As an example, there are overlaps in mapping efforts in communities under the Land Agency's self-identification activities and FDA community forest mapping. There is not yet any clear and unambiguous land-rights provision assigning forest custodianship to communities.

Culturally, gender parity in forested land rights is not recognized in many communities, and women lack inheritance rights to land. Since women work the land more than men, promoting gender equality in this area could greatly contribute to sustainable land management.

Individual national policies govern the development of each sector; these may overlap or conflict. The contentious national policies include the Mineral Policy of Liberia (GoL, 2001), the Forest Reform Policy of Liberia (FDA, 2006), the National Forest Policy and Implementation Strategy (FDA, 2006), and the National Policy for Agricultural Extension and Advisory Services (MoA, July 2012). This results in heightened risk of expansion of agro-industrial crops into forested areas, and timber and mineral extraction in biologically sensitive areas.

Unmet Demands for Energy: As the NBSAP points out, without a strategy that considers infrastructure upgrades, household fuel substitution, and renewable energy at scale, there is little incentive to stop the use of forest-based charcoal and wood energy. A lack of quantifiable, evidence-based data on energy demand and consumption at the household level is an impediment to management of the sector. Current emphasis is placed on the large-scale power grid rather than simple, decentralized, affordable, and environmentally friendly sources. Reducing biomass consumption at the household level has yet to be discussed at the national level in Liberia. As the population becomes increasingly urbanized, formal markets for forest-based energy products will grow. This may create perverse incentives for widespread deforestation, from which protected areas will not be immune.

7. ACTIONS NECESSARY TO CONSERVE BIODIVERSITY (INCLUDING TROPICAL FORESTS)

The NBSAP for Liberia concludes with five overall goals: 1) Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society; 2) reduce direct pressures on biodiversity and promote sustainable use; 3) improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity; 4) enhance the benefits to all from biodiversity and ecosystem services; and 5) enhance implementation through participatory planning, knowledge planning and capacity building, and includes six pages of recommendations (GoL, 2017).

At the conclusion of the fieldwork the analysis team reviewed and organized findings, based upon key informant interviews, focus group discussions, published scientific and technical literature and available gray literature from the ministries. They then organized and ranked the information to produce a list of necessary actions. Table 1 shows actions to address each driver.

Table 1: Actions Necessary Linked to Drivers and Direct Threats

Drivers	Links to Direct Threats	Actions Necessary
Poverty and lack of sustainable sources of income	Uncontrolled hunting and animal trade Cutting for firewood or charcoal Climate change Habitat loss due to unsustainable shifting cultivation Wildlife trafficking Subsistence and local market hunting Illegal pit sawing IUU fishing Artisanal mining	Improve food security through: • climate-smart agriculture • agricultural intensification for smallholders • Improved animal husbandry • Develop research on crop productivity and location suitability • Aquaculture (develop climate smart aquaculture) Support sustainable livelihoods in sensitive areas • support income-generating community forestry • Support value chain enhancement for non-timber forest products (NTFP) • Regulate pit sawing for local timber production and develop a sustainable supply chain • Support jobs training for youth • Promote access to/distribution of fish nets with legal mesh size

Drivers	Links to Direct Threats	Actions Necessary
Lack of adequate capacity to enforce laws	Pollution of waterways Uncontrolled hunting and animal trade Cutting for firewood or charcoal IUU fishing Artisanal mining	Support sustainable livelihoods in sensitive areas • support income-generating community forestry • Support value chain enhancement for non-timber forest products (NTFP) • Regulate pit sawing for local timber production and develop a sustainable supply chain • Support jobs training for youth • Promote access to/distribution of fish nets with legal mesh size Improve marine resource management • Create and enforce regulations governing wastewater and ballast water discharge from vessels • Strengthen relationship between Coast Guard and National Fisheries Authority • Monitor the fish catch quantity, species and size caught, incidental takes, etc.
Lack of technical capacity to manage resources	IUU fishing Climate change Invasive species Pollution of waterways Uncontrolled hunting and animal trade	Strengthen wildlife regulations • Strengthen CITES enforcement • Strengthen ability to combat wildlife trafficking, including interagency and interregional coordination Strengthen technical capacity of FDA and EPA
Lack of awareness or appreciation of the long-term value of natural resources	Pollution Overhunting Logging and mining of sensitive sites Unsustainable shifting cultivation Fuelwood and charcoal production	Identify and promote culturally appropriate best practices for conservation Train journalists on forest and biodiversity issues Build on Liberian Forest Forum as a mechanism for collaborative learning and citizen forum
Lack of information and data necessary for resource management	IUU fishing Uncontrolled hunting and animal trade Invasive species Climate change Ecologically unsound dams and infrastructure Pollution of waterways	Develop a national natural resources information infrastructure • Develop community monitoring of natural resources • Improve access to remote sensing data • Establish weather stations and support data collection, analysis and data sharing • Generate, analyze, and share data between Liberia and development partners • Integrate with LISGIS and Lands data
Lack of leadership in economic and environmental policy, including resource allocation and agency coordination	Uncontrolled hunting and animal trade Overlapping extractive industry concessions in conservation areas Lack of data exchange and open data policies	Coordinate government agencies • Conduct biodiversity surveys and data collection, particularly for plant species • Enforce existing Executive Order on inter-agency cooperation Produce a national open data policy

Drivers	Links to Direct Threats	Actions Necessary
		• Create a knowledge management system that supports sharing information with agencies and the public
Perverse economic incentives	Uncontrolled hunting and animal trade Timber or mining concessions in sensitive areas Illegal pit sawing Artisanal mining Agro-industrial crop plantations in forested areas	Stop incentivizing industrial expansion into environmentally sensitive areas • Conduct political economy analysis of extractive industries • Develop transparent participatory guidelines ahead of introducing economic incentives • Close tax loopholes • Conduct adequate pilot testing and monitoring and evaluation of economic programs before scaling up
Ineffective land use policies and insecure land tenure and property rights	Expansion of agro-industrial crop plantations into forested areas Mining Timber or mining concessions in sensitive areas	Improve national land tenure systems • Improve documentation capacity, including for common-pool resources • Advocate for the passage and adoption of the 2014 Land Rights Act (or follow-on legislation) • Remove barriers to achieving gender equality in forestry and land rights, including women's right to inherit land
Unmet demand for energy	Cutting for firewood and charcoal Ecologically unsound dams and infrastructure	Reduce dependence on forest-based fuels, especially in urban areas • Conduct national-level survey on household energy demand and consumption • Promote adoption of improved cook stoves that consume less fuel • Find alternatives to forest-based fuels

8. EXTENT TO WHICH THE MISSION MEETS THE IDENTIFIED ACTIONS NEEDED

Part 7 of this report outlines a number of actions necessary for Liberia to better address the direct and indirect threats to biodiversity and forests. This section examines current USAID programs to determine the extent to which they currently address the necessary actions.

USAID/Liberia is working under the 2013-2018 CDCS for Liberia. This CDCS was developed to balance two approaches:

- To strengthen Liberia's capacity to sustain development progress over the longer term; and
- To improve access to critical goods and services needed to meet basic human needs in the short term.

The mission's work is structured under four Development Objectives (DOs) and four associated offices:

DO-1: More effective, accountable, and inclusive governance (Democracy, Human Rights and Governance)
DO-2: Sustained, market-driven economic growth to reduce poverty (Economic Growth and Trade)
DO-3: Improved health status of Liberians (Health)
DO-4: Better educated Liberians (Global Education).

The mission also manages some projects initiated under the USAID/Bureau for Food Security, e.g., an initiative supporting the Liberia Agribusiness Development Activity (LADA) and implemented by Cultivating New Frontiers in Agriculture.

USAID/Liberia presently addresses a limited of the recommended actions, Table 2, below, provides a summary of the activities that directly address these needs through existing programs.

In addition, USAID/West Africa Regional Office's West Africa Biodiversity and Climate Change (WA-BiCC) Project has provided grants totaling nearly $10 million to NGOs for biodiversity conservation activities in Liberia for the period 2017-2020. Table 11 in Annex K lists the grants, grantees, activities and areas, and dollar amounts.

Specific issues of interest or concern include:

DO1: Democracy, Human Rights and Governance

Land programs fall under this DO. The absence of legislation - most notably the failure to pass the 2014 Land Rights Act – have hindered the ability some land activities to advance their objectives; several programs are now moving forward under the assumption that the bill will not pass. In particular, this failure will directly impact the development of a land-law curriculum requested by the University of Liberia law school, the Liberia National Bar Association, and the Judicial Institute. Though development is proceeding, the final curriculum will look very different than it would if land-reform legislation had passed. Even without the Act in place, the curriculum may have value by helping to conceptualize the incorporation of biodiversity and forests issues into land tenure and legal frameworks.

DO2: Economic Growth and Trade

A key to sustainable economic growth is effective management of concessions for Liberia's extractive industries. There is a lack of accurate, accessible documentation of Liberia's natural resources, including for concessions granted for resource extraction. This leads to duplication and overlap (as shown in Map 6.1, Annex H). Moreover, failure to accurately document concessions means that there is no easy way of assessing the potential impact of land use decisions on land cover, including priority conservation areas.

Possible conflicts with biodiversity: Although efforts were made to minimize the impact on natural habitats, roadwork does contribute to some deforestation and cutting of vegetation; new roads are pathways for invasive species introductions and afford access to hunters.

Near-term Opportunity to Link Agricultural Production and Sustainable Livelihoods in Forest Communities

Community forests presently being supported by USAID are in a race against time. As communities gain legal control over forestlands, they are being courted by logging companies offering to produce required management plans and to produce income through the sale of timber (undoubtedly at unfair prices). Because of limited options, in terms of alternatives for income generation, there is a temptation to "cash in" forest assets for short-term gains. USAID/Liberia's Office of Economic Growth is striving to identify business strategies that can cover the costs of forest management for long-term benefits to the communities and to the nation.

This analysis has identified the expansion of agro-industrial crops to forested areas as a threat to tropical forests and biodiversity. Oil palm plantations present an important example of agro-industrial crops in Liberia. While in some cases, there has been clearance of natural forest for plantations, in others, plantations have been established through the conversion of already developed lands. Malaysia-based Sime Darby Plantations has acquired existing rubber concessions and converted them to oil palm. Their milling operation however requires twice the oil palm kernels that they can provide from their concession lands to be profitable, so they have turned to an out-grower model, purchasing from small-scale producers. Sime Darby is committed to having no deforestation result from their operations, so they have a challenge in quality control. If sustainably produced oil palm could be sourced from the buffers of community forests in such a way that the proceeds could support both farmers and the management of the community forest, then a sustainable livelihoods strategy and a sustainable sourcing strategy could both be realized, for the benefit of biodiversity and human well-being. While there are challenges to the approach, the potential benefits militate in favor of investigating the opportunity.

DO3: Health

Biodiversity and Forest Connections*:* Health programming in Liberia currently focuses on three main themes: 1) infectious diseases (primarily malaria) / GHSA - Global Health Security Agenda (emerging disease threats, prevention, surveillance and response nationwide including support for the multi-sectoral One Health Platform; 2) service delivery; and 3) health systems strengthening. There are clear opportunities to link health with forests and biodiversity that should be explored.

DO4: Education

Biodiversity and Forests Connections: Current activities under this SO have little to do with biodiversity and forest issues, but these could be worked into programming.

Table 2: Extent to which USAID addresses identified actions

	Actions necessary to achieve conservation of tropical forests and biodiversity	**Extent to which** the current DO or IR contributes towards sustainable management and conservation of tropical forests and biodiversity.
Poverty and Lack of Sustainable Incomes	Improve food security through: • climate-smart agriculture • agricultural intensification for smallholders • Improved animal husbandry • Develop research on crop productivity and location suitability • Aquaculture	The mission manages projects initiated under the USAID/Bureau for Food Security, e.g., an initiative supporting the Liberia Agribusiness Development Activity (LADA). Resilience is reinforced in the USAID reorganization now underway, and may create future opportunities to align food security, biodiversity, and tropical forests.
	Support sustainable livelihoods in sensitive areas • support income-generating community forestry • Support value chain enhancement for non-timber forest products (NTFP) • Regulate pit sawing for local timber production and develop a sustainable supply chain • Support jobs training for youth • Promote access to/distribution of fish nets with legal mesh size	Under DO 2, the Forest Incomes for Environmental Sustainability (FIFES) project is supporting sustainable livelihoods in communities in sensitive areas, value chain enhancement for non-timber forest products, and community forestry in selected sites. DO3's Global Health Security Agenda supports the multi-sectoral One Health Platform, and provides for surveillance of emerging infectious disease threats, which can be linked in some cases to land use change and climate change. High-level priorities for future programming include sustainability of interventions, country ownership, strengthening of national laboratory capacity for integrated diseases detection and surveillance via GHSA, and a focus on local solutions in order to directly fund local partners. Integration of programming to promote more cross-cutting approaches to health is also a priority.
Enforcement	Build capacity in law enforcement • Support situational law enforcement to engage communities in wildlife protection • Better equip enforcement officials • Train customs agents, commercial staff at transportation hubs and borders to recognize products of wildlife crimes • Support a rigorous, transparent Environment and Social Impact Assessment process for future infrastructure projects	No USAID/Liberia activities cover this, but it is addressed to a limited extent through the USAID/West Africa regional West Africa Biodiversity and Climate Change Activity.
	Strengthen wildlife regulations • Strengthen CITES enforcement • Strengthen ability to combat wildlife trafficking Strengthen capacities of FDA and EPA	Limited work is done in wildlife regulation under the regional WA-BiCC project, and the community forestry branch of FDA receives support from USAID through FIFES.
	Improve marine resource management • Create and enforce regulations governing wastewater and ballast water discharge from vessels • Strengthen relationship between Coast Guard and National Fisheries Authority	

	• Monitor the fish catch quantity, species and size caught, incidental takes, etc.	
Resource Management	Build financial, institutional and human capacity within EPA, FDA, including for sustainable management of the protected area system	No USAID activities address this.
	Build human and institutional capacity in biodiversity, tropical forests, and resilience • Support training on and use of climate models in policy development, planning, and technical implementation processes • Support training and research in climate adaptation, especially in agriculture • Strengthen university programs to produce graduates with strong research and analytical capabilities • Incorporate more environmental education in school curricula at all levels • Build capacity and deploy ground-based remote sensing to improve natural resource management, including, e.g., camera traps • Conduct biodiversity surveys and data collection, particularly for plant species • Build capacity to implement multilateral environmental agreements	No USAID/Liberia activities address these issues directly in the context of biodiversity conservation.
Awareness	Develop informal learning and youth nature/conservation programming	Under DO 1, the Liberia Accountability and Voice Initiative (LAVI) has worked to build capacity of community-based organizations, including for community forestry, which serve to raise awareness, including through community radio. Under DO4 The Read Liberia activity trains teachers to teach reading and provides reading materials in 640 primary schools. Biodiversity and forests themes could be incorporated in the program. Similarly, the Accelerated Quality Education (AQE) Activity enables older students who have been out of the education system to catch up and get to the primary-grade level that they belong in. The program focuses on family planning and peace and conflict education, which can be linked to resilience and sustainability issues. In DO3, a key community health initiative is the Partnership for Advancing Community Based Services (PACS). PACS includes a significant communications component and provides funds for community surveillance and training on disease identification. It provides potential to promote awareness through its training on vector identification and infection prevention, the role of healthy ecosystems, and awareness of wildlife-disease risk.
	Identify and promote culturally appropriate best practices for conservation	
	Train journalists on forest and biodiversity issues	
	Build on Liberian Forest Forum as a mechanism for collaborative learning and citizen forum	

Lack of Data	Develop a national natural resources information infrastructure • Develop community monitoring of natural resources • Improve access to remote sensing data • Establish weather stations and support data collection, analysis and data sharing • Generate, analyze, and share data between Liberia and development partners • Integrate with LISGIS and Lands data	No USAID activities address this.
Leadership	Coordinate government agencies • Conduct biodiversity surveys and data collection, particularly for plant species • Enforce existing Executive Order on inter-agency cooperation	No USAID activities address this.
	Require a national open data policy • Create a knowledge management system that supports sharing information with agencies and the public	
Incentives	Stop incentivizing industrial expansion into environmentally sensitive areas • Conduct political economy analysis of extractive industries • Develop transparent participatory guidelines ahead of introducing economic incentives • Close tax loopholes	No USAID activities address this.
	Conduct adequate pilot testing and monitoring and evaluation of economic programs before scaling up	
Insecure Land Tenure	Improve national land tenure systems • Improve documentation capacity, including for common-pool resources • Advocate for the passage and adoption of the 2014 Land Rights Act (or follow-on legislation) • Remove barriers to achieving gender equality in forestry and land rights, including women's right to inherit land	Under DO1, land programming falls under the umbrella of rule of law and is focused on human capacity and institutional strengthening. Partnerships with the Judicial Institute, Anti-Corruption Commission, the Louis Arthur Grimes School of Law, the Carter Center, and others advance conflict-resolution methods for land-use disputes. The Liberia Governance Support Activity is working on community self-identification of land, though no mapping is occurring at this time.
Energy	Reduce dependence on forest-based fuels, especially in urban areas • Conduct national-level survey on household energy demand and consumption • Promote adoption of improved cook stoves that consume less fuel • Develop alternatives to fuelwood and charcoal • Develop a national energy policy and strategy	DO 2 encompasses a number of energy and infrastructure projects. Energy pilot projects include biomass and solar power production, and the mini-hydro power production on the Mein River/Kpatawee Falls, which has been put on hold in favor of connection to the cross-border extension of the West African Power Pool.

9. RECOMMENDATIONS

9.1 OVERVIEW

The recommendation presented here were developed from the analyses presented in previous sections building on the “actions necessary,” the “extent to which” the Mission is currently addressing these and the possible overlaps with biodiversity and forest concerns already present in their programs.

USAID/Liberia continues to have a strong presence in community forestry efforts in Liberia stretching over a number of programs beginning with the Liberia Forest Initiative-- a government/NGO/private sector partnership—and its first workshop in December. 2005. This work was followed by the Land Rights and Community Forest Project (LRCFP), followed by the People, Rules and Organizations Supporting the Protection of Ecosystem Resources (PROSPER), and is being continued in the current USAID/Liberia Forest Incomes for Environmental Sustainability (FIFES) activity. The collective knowledge gained through these years of USAID’s involvement in forest conservation and community forestry gives the agency a comparative advantage in this area of conservation work and should continue to be built upon to ensure that the work has a strong foothold in the country.

The Mission also has a strong democracy and governance program, which could, through cross-sectoral programming, more directly link natural resource governance and land tenure and property rights issues to forest and biodiversity conservation in Liberia. In addition, both the health and education sectors of USAID’s portfolio involve long term community-scale efforts that give USAID/Liberia a comparative advantage in grassroots development in areas that are biologically rich and ecologically important.

In addition to the conservation issues involving terrestrial forests, however, there are some areas of concern that have not received significant attention from many donors, and where gaps in coverage exist. Although the data is weak, fishing pressure does not appear to be close to the levels of adjacent Sierra Leone and Côte d’Ivoire (see Map 5, Annex H). Recently donors have begun to strengthen support for issues related to mangroves and coastal areas, for example, the European Union is supporting the fisheries sector (see Annex L). Nevertheless, actions related to marine species diversity and abundance are still lagging.

Another area not being fully addressed are issues related to wetlands, waterways and freshwater biodiversity, and there is an acute lack of data available on the status and threats to various species and ecosystems. Although USAID does not now have a comparative advantage here, any future water, sanitation and health programming could dovetail with biodiversity conservation (for example, benthic invertebrates are a common indicator of the health of streams; sampling would contribute to both environmental and health management) and forest protection (for watersheds).

9.2 RECOMMENDATIONS BASED ON ACTIONS NECESSARY TO CONSERVE BIODIVERSITY (INCLUDING TROPICAL FORESTRY)

The recommendations in this section are directed to USAID/Liberia based on the results of this analysis. Some of these may fit into current mission programing and others into

the CDCS 2018. These overall recommendations to USAID/Liberia are seen as the most important contributions that the agency could support in the efforts to conserve biodiversity and forests in Liberia.

The highest priority is building the capacity of the Forestry Development Authority's Conservation branch and securing sustainable financing for the operation of the protected area system. Much of what remains of the Upper Guinean Forest, a biodiversity hotspot, is in Liberia. The country has laid out an ambitious protected area expansion plan, but it is not clear how it can be effectively implemented with existing resources. To the extent that it can be made viable, it provides the best hope for conserving much of the remaining biodiversity in Liberia.

At the same time, it is not possible to capture all biodiversity in protected areas. There is evidence that as much two-thirds of areas important for biodiversity will not be included in even the expanded protected area network. An inter-sectoral landscape-based approach to link protected areas with the surrounding landscapes and provide integrity to the tropical forest ecosystems should be the next phase in the evolution of conservation in Liberia. In order to do this, community co-management of resources in the interstitial spaces between protected areas will be necessary. This will require:

- inclusive governance and effective institutions for biodiversity conservation and natural resource management at all levels, including the continuation of on-going activities that promote land tenure, land reform, natural-resource governance, and land tenure and property rights for women.
- Land tenure and property rights will be critical not only in forest areas, but in marine and coastal areas, and anywhere that human needs and biodiversity overlap. S
- Sustainable livelihoods need to be developed in the context of community managed natural resources, building on previous experiences with non-timber forest products under prior USAID programs. Agricultural programs will need to be made more climate-resilient. New and innovative approaches for energy for household and light industrial use will be needed. All of this must take into account the implications of a changing climate. Projects must be designed to be resilient to projected changes.
- Holistic, demand-driven, and evidence-based programming that address multiple development outcomes, including health, nutrition, food security, and sustainable natural resource use will generate resilient communities and better outcomes.

USAID has acquired substantial experience in landscape level approaches to tropical forest and biodiversity management, particularly in USAID/Indonesia's LESTARI program and in the activities under the USAID Central Africa Regional Program for the Environment (CARPE). Important lessons can be learned from these initiatives that can be applied to future program design.

Depending upon the evolution of the CDCS, other opportunities may emerge to enhance biodiversity and tropical forests. These include

- The development of alternatives to charcoal and fuelwood as a primary energy source as part of a low emissions development strategy

- The development of agriculture, timber and NTFP value added processing and marketing
- The promotion of resilient, climate smart, evidence-based agriculture
- Support and promotion of the value of nature and ecosystem services for human well-being through education, and through incentives.

The recommendations in this section are directed to USAID/Liberia based on the results of this analysis. Some of these may fit into current mission programing and others into the CDCS 2018. These overall recommendations to USAID/Liberia are seen as the most important contributions that the agency could support in the efforts to conserve biodiversity and forests in Liberia.

Table 3: Recommendations

	Recommendations		
Sector	**Opportunistic:** Working within the boundaries of programs to improve the extent to which the mission is meeting the actions necessary to reduce threats.	**Proactive:** Adapting programs to improve the extent to which the mission is meeting the actions necessary to reduce threats.	**Direct Threat Reduction:** Designing with an explicit objective of reducing threats or otherwise contributing to biodiversity conservation.
USAID/Liberia, cross sectoral	Improve opportunities to engage women in decision-making processes Build capacity in data and knowledge management within existing programming	Better understand the cultural significance of nature, biodiversity, and forests. On this basis, implement demand-driven and responsive programming, and Factor responsiveness into the sustainability components in evaluations. Promote the development of common standards for data and an open data culture, to make data from different projects both interoperable and accessible.	Employ a whole-of-mission approach to landscape approaches, to curtail wildlife trafficking and over-hunting, build capacity for natural resource governance, promote economic growth, and prevent disease Develop a national bioinformatics and spatial data infrastructure
Democracy and Governance	Apply the lessons of the Ebola crisis in terms of demand-driven and bottom up, culturally appropriate solutions to governance. Conduct political econ-omy analysis of extrac-tive industries and	Promote land tenure, land reform and grassroots natural-resource governance Improve land tenure rights and resource access rights for women	Develop local government mechanisms for wildlife and forest management, through community-based techniques. In local governance, facilitate links between land tenure and property rights and anti-poaching strategies.

	biodiversity, including fisheries, mining, and forestry		
Economic Growth and Trade	In supporting economic opportunity, target sustainable livelihoods for community forests and around sensitive natural areas; Link efforts to combat corruption with biodiversity and especially with combating wildlife poaching and trafficking	Support and promote the value of nature and ecosystem services for human well-being; Promote effective institutions that support biodiversity and tropical forests at all levels; Build human capacity in the natural resources sector by supporting the Forestry Training Institute, Central Agricultural Research Institute, and other relevant institutes of advanced training and research Support for agriculture, timber and NTFP value added processing and marketing	Support Liberia's Protected Area System—the best hope for conserving much of the remaining important biodiversity in Liberia, through improved capacity and the sustainable finance Find sustainable alternatives to existing fuelwood and charcoal practices for household and light industrial energy production. In payment for ecosystem services schemes, incorporate financial literacy and access to financial services to underserved populations Harness the growth in information and communications technologies to improve environmental monitoring
Health	Make Ebola and other infectious disease data spatially explicit and analyze in the context of environmental change Link water quality and waterborne disease analysis with environmental change parameters	Maintain surveillance of potential reservoirs and vectors for Ebola, and understand better the observed correlations between deforestation and outbreaks	Link epidemiology of emerging infectious diseases, waterborne diseases, and environmental parameters related to land use and climate to develop integrated biodiversity and health programing
Education	Link literacy programs with environmental awareness through subject matter	Promote literacy and numeracy for women to improve participation in livelihood development and governance	

Food Security	Support climate smart, resilient agriculture, including a system of rice Intensification Add environmental parameters, e.g., wild meat consumption, to household surveys	Improve the management of fisheries at both artisanal and commercial levels	Develop an alternative protein supply strategy for a growing population, diminishing wildlife and fish resources, and a changing environment, to take the pressure off natural resources

9.3 OTHER OPPORTUNITIES:

FTI, originally conceived as a regional training center under the Mano River Union, has untapped potential. At the 2013 summit of the Mano River Union heads of state in Monrovia, the four Mano River Union (MRU) states agreed to take a lead on key development concerns on behalf of the member states. Liberia took responsibility for forestry and natural resources. This sets the stage for a potential reemergence of the FTI as a regional facility. This may present a significant opportunity to advance badly needed capacity building in the nation and in the region. Given the preeminence of Liberia as a forest nation in West Africa, the establishment of a regional center of excellence for forests and biodiversity deserves serious consideration. This would presumably require the support of multiple donors and regional institutions. USAID could play a catalytic role in building regional capacity.

Annex A: References

Altman, S. L., S. S. Nichols, and J. T. Woods. 2012. Leveraging high-value natural resources to restore the rule of law: The role of the Liberia Forest Initiative in Liberia's transition to stability. In *High-value natural resources and post-conflict peacebuilding,* ed. P. Lujala and S. A. Rustad. London: Earthscan.

Belhabib, Dyhia et al, 2013, When 'reality leaves a lot to the imagination': Liberian fisheries from 1950 to 2010, Fisheries Center, Univ. of British Columbia, http://researcherdiaries.com/download/reality-leaves-lot-imagination-liberian-fisheries-pdf/?wpdmdl=382.

Birdlife International, Important Bird Areas Liberia, accessed on January 18, 2018 at ,http://datazone.birdlife.org/site/results?thrlev1=&thrlev2=&kw=&reg=0&cty=120&snm=&fam=0&gen=0&spc=&cmn=

Brown, David, 2007, Sustainable Development Institute (SDI), Prospects for Community Forestry in Liberia: Implementing the National Forest Policy

Challender, D. and Waterman, C., 2017. Implementation of CITES Decisions 17.239 b) and 17.240 on Pangolins (*Manis* spp.) prepared by IUCN for the CITES Secretariat.

CIA Factbook, accessed 03/02/18 at https://www.cia.gov/library/publications/the-world-factbook/geos/li.html,

CILSS (2016). *Landscapes of West Africa – A Window on a Changing World*. U.S. Geological Survey EROS, 47914 252nd St, Garretson, SD 57030, UNITED STATES.

Critical Ecosystem Partnership (CEPF), online, Hotspot Forests of West Africa, accessed Jan 11, 2018 at http://www.cepf.net/resources/hotspots/africa/Pages/Guinean-Forests-of-West-Africa.aspx

Critical Ecosystem Partnership Fund (CEPF) 2015. Ecosystem Profile, Guinean Forests of West Africa Biodiversity Hotspot. Retrieved online January 11, 2018 at https://www.cepf.net/sites/default/files/en_guinean_forests_ecosystem_profile.pdf

Conservation International, no date, Responsible Mining in Nimba Mountains, accessed on February 3, 2018 at https://www.conservation.org/projects/Pages/Responsible-Mining-in-Liberia-Nimba-Mountains.aspx

Conservation International. May 2017. National Capital Mapping and Accounting in Liberia: Understanding the contribution of biodiversity and ecosystem services to Liberia's sustainable development. http://bit.ly/2BGFrEg

Cotillon, S.E. 2017. West Africa land use and land cover time series: U.S. Geological Survey Fact Sheet 2017–3004, 4 p. https://doi.org/10.3133/fs20173004.

Dowd, Dervla, et al, 2014 Report on the Chimpanzee and Large Mammal survey in the Kpayan Gross Concession Area of investigation of Golden Veroleum, Liberia, Prepared by Wild Chimpanzee Foundation(WCF) http://goldenveroleumliberia.com/upload/20140403_gvl_report__wcf_survey.pdf

EROS/USGS, online, accessed January 23, 2018 Liberia country study and land use cover trends https://eros.usgs.gov/westafrica/land-cover/land-use-land-cover-and-trends-liberia

FAO, 2015, Food and Agriculture Organization (FAO), Liberia programs, accessed online on January 22, 2018 at http://www.fao.org/countryprofiles/index/en/?iso3=LBR

Forest Carbon Partnership Facility, 2016, Liberia, accessed on January 28, 2018 at https://www.forestcarbonpartnership.org/liberia

FDA, 2015. National Forests Classification, Acreages, Location and Utilization Index, Division Of Scientific Research, Forestry Research and Development, Forestry Development Authority.

Retrieved online at https://www.documents.clientearth.org/wp-content/uploads/library/2017-03-21-fda-document-–-2015-national-forests-classification-acreages-location-and-utilization-ext-en.pdf on Feb 18, 2018.

Fishbase, online: Fish in Liberia accessed on January 23, 2018 at http://www.fishbase.org/country/CountryChecklist.php?what=list&trpp=50&c_code=430&csub_code=&cpresence=present&sortby=alpha2&vhabitat=saltwater

Flora and Fauna International (FFI) 2017. *Liberia takes a major step forward in protecting its elephants.* https://www.fauna-flora.org/news/liberia-takes-a-major-step-forward-in-protecting-its-elephants accessed March 30, 2018.

Flora and Fauna International, Plant Atlas online: http://www.liberianfaunaflora.org/plant-atlas-of-liberia accessed March 30, 2018

Flora and Fauna International, online: Action Plans for Liberia https://www.fauna-flora.org/projects/development-implementation-key-species-action-plans-liberia

Flora and Fauna International, online, Pygmy Hippo Action Plan http://www.saveourspecies.org/projects/ungulates/implementing-first-liberian-national-action-plan-endangered-pygmy-hippopotamus

Forest Carbon Partnership Facility. 2016. *Liberia Land Cover and Forest Mapping* Final Report. Accessed January 21, 2018 at http://forestcarbonpartnership.org/sites/fcp/files/2017/Aug/Liberia%20Land%20Cover%20and%20Forest%20Mapping%20report.pdf

Guardian, 2017a accessed on January 18, 2018 at https://www.theguardian.com/environment/2017/may/08/forest-rangers-tortured-and-killed-by-illegal-settlers-in-liberia-rainforest).

Guardian, 2017b, Killer Bees in Liberia, accessed on January 18, 2018 at *https://www.theguardian.com/global-development/2017/dec/04/african-killer-bees-providing-living-liberia*

Global Forest Watch. Liberia country profile. http://www.globalforestwatch.org/country/LBR

Gov. of Liberia, Forest Development Authority, Regulation on the Commercial and Sustainable Extraction of NTFPs *https://rmportal.net/library/content/liberias-land-rights-and-community-forestry-program/liberian-laws-and-regulations/regulation-on-the-commercial-and-sustainable-extraction-of-ntfps/view*

Gov. of Liberia, 2017, Liberia National Biodiversity Strategy and Action Plan ii, https://www.cbd.int/doc/world/lr/lr-nbsap-v2-en.pdf

Gov. of Liberia, 2006, Liberia's National State of the Environment Report (NSOER), https://www.thegef.org/sites/default/files/ncsa-documents/State_of_the_environment_report_final.pdf

Hadden, Robert Lee, 2006. The Geology of Liberia: a Selected Bibliography of Liberian Geology, Geography and Earth Science, USGS. Retrieved on line at https://www.scribd.com/document/261427/Geography-of-Liberia

Hoyt RA, Groff A, 2002. Liberia, West Africa: Bushmeat and Public Opinion Survey. Forest Partners International, Conservation Endowment Fund of the American Zoo and Aquarium Association, and Forestry Development Authority, Liberia, Flourtown, PA.

Hoyt R. 2004, Wild Meat Harvest and Trade in Liberia: managing biodiversity, economic and social impacts. 6, Wildlife Policy Briefing. ODI.

Human Development Index, 2014, accessed January 22, 2018 at .http://hdr.undp.org/en/countries/profiles/LBR).

IUCN, 2017 The IUCN Red List of Threatened Species. Version 2017-3. Accessed March 28, 2018 at www.iucnredlist.org.

Junker J, Boesch C, Freeman T, Mundry R, Stephens C, Kuehl HS. 2015. Integrating wildlife conservation with conflicting economic land-use goals in a West African biodiversity hotspot. Basic and Applied Ecology 16:690–702.

Liberia Extractive Industry Transparency Initiative database, online, http://www.leiti.org.lr/companies.html, LEITI database of forestry concessions

Liberia Fauna and Flora, website accessed on January 18, 2018 at: http://www.liberianfaunaflora.org/

Olivero, Jesús, Fa, John E., Real, Raimundo, Márquez, Ana L., Farfán, Miguel A., Vargas, J. Mario, Gaveau, David, Salim, Mohammad A., Park, Douglas, Suter, Jamison, King, Shona, Leendertz, Siv Aina, Sheil, Douglas, and Nasi, Robert (2017). Recent loss of closed forests is associated with Ebola virus disease outbreaks. *Scientific Reports 7,* Article number 14291, doi:10.103a/s415898-017-14727-9, Published online 10/30/2017, retrieved from https://www.nature.com/articles/s41598-017-14727-9

PhysOrg, 2017, release of Liberia Elephant Action Plan, accessed on March 17, 2018 at: https://phys.org/news/2017-07-liberia-major-elephants.html#jCp

Ramsar, 2017, Liberia, accessed January 17, 2018 at https://www.ramsar.org/wetland/liberia

Redford, K, 1992, The Empty Forest, Bioscience: Vol 42, No. 6,pp 412-422. http://www.jstor.org/stable/1311860

ReefBase, http://www.reefbase.org/global_database/dbr1,11,CPV,79.aspx

Republic of Liberia Country page (includes high resolution maps). https://eros.usgs.gov/westafrica/country/republic-liberia

Robbins, J, 2016, Yale Environment 360, How Forest Loss is Leading to a Rise in Human Disease, https://e360.yale.edu/features/how_forest_loss_is_leading_to_a_rise_in_human_disease_malaria_zika_climate_change

Sawyer, A. (2005). *Beyond Plunder: Towards Democratic Governance in Liberia*. Boulder, Colorado: Lynne Rienner.

Tappan, G. G., Cushing, W.M., Cotillon, S.E., Mathis, M.L., Hutchinson, J.A., and Dalsted, K.J. 2016. West Africa Land Use Land Cover Time Series: U.S. Geological Survey data release. http://dx.doi.org/10.5066/F73N21JF

The Economics of Ecosystems and Biodiversity (TEEB). Liberia: Mainstreaming the value of ecosystems and biodiversity into coastal and marine management policy. Accessed on January 13, 2018 at http://www.teebweb.org/areas-of-work/teeb-country-studies/liberia/

UNDP, 2016. Human Development Report. Available online at http://hdr.undp.org/sites/default/files/HDR2016_EN_Overview_Web.pdf

USAID/Liberia, 2017a, Liberia: Domestic Timber Value Chain Analysis Domestic Timber Value Chain Sustainable Markets accessed online January 23, 2018 at http://buildingmarkets.org/sites/default/files/pdm_reports/liberia_domestic_timber_vca.pdf

USAID/Liberia, 2017b, Natural Resource Survey of Bushmeat, Charcoal, Non-Timber Forest Products and Domestic Timber in Liberia.

USAID/Liberia, 2017c, The Importance of Wild Fisheries for Local Food Security: Liberia

USAID/Liberia, 2017d Deliverables produced by People, Rules, and Organizations Supporting the Protection of Ecosystem Resources (PROSPER) May 2012-April 2017

USAID, 2017e, PREDICT in Ebola-affected West African countries (Sierra Leone, Guinea, and Liberia)

USAID, 2015, Fishing for Food Security (with Liberia example)

USAID/Liberia, 2014, Environmental Threats and Opportunities Assessment http://pdf.usaid.gov/pdf_docs/PA00KBNP.pdf),

USAID/Liberia, 2013 Climate Change Assessment, https://www.researchgate.net/publication/237102310_LIBERIA_CLIMATE_CHANGE_ASSESSMENT

USAID/Liberia 2013 Country Development and Cooperation Strategy Liberia 2013-2017

U.S. Geological Survey, 2013, Liberia Land Use and Cover, https://eros.usgs.gov/westafrica/land-cover/land-use-land-cover-and-trends-liberia

World Resources Institute (WRI), online, http://www.wri.org/geography/liberia

World Bank, 2017, Updates for the Liberia Forest Sector Project, http://projects.worldbank.org/P154114?lang=en

World Bank, 2016, Biodiversity Offsets: A User's Guide (includes annex on ArcelorMittal), Washington, World Bank.

World Food Program, 2015. Standard Project Report: Liberia. Accessed online at http://documents.wfp.org/stellent/groups/public/documents/eb/wfp283191.pdf on March 17 2018.

World Wildlife Fund, 2017 online, Ecoregion: Western Africa: Coastal areas of Guinea, Côte d'Ivoire, Liberia, and Sierra Leone https://www.worldwildlife.org/ecoregions/at0130

Annex B: Scope of Work

SECTION C – SCOPE OF WORK

Scope of work for foreign assistance sections 118/119 tropical forest and biodiversity analysis for USAID/Liberia

C.1 Background

As part of the documentation for the FY2019-FY2023 CDCS, USAID/Liberia is required by Sections 118 and 119 of the Foreign Assistance Act, as amended, to prepare an analysis of tropical forests and biodiversity in Liberia.

By mandating an FAA 118/119 analysis (hereafter referred to as "the analysis"), the U.S. Congress is recognizing the fundamental role that tropical forest and biodiversity play in sustainable development. Based on this analysis, USAID/Liberia will define to what extent the CDCS will contribute to biodiversity conservation needs in Liberia. The analysis will assist in strengthening the mission's role in biodiversity conservation by integrating biodiversity and tropical forest conservation in the CDCS.

1.1 Relevant parts of FAA Sections 118 and 119

FAA Sections 118 and 119, as amended, require that USAID missions address the following:

1) FAA Sec 118 Tropical Forests

(e) COUNTRY ANALYSIS REQUIREMENTS. Each country development strategy, statement or other country plan prepared by the Agency for International Development shall include an analysis of:

The actions necessary in that country to achieve conservation and sustainable management of tropical forests, and

The extent to which the actions proposed for support by the Agency meet the needs thus identified.

2) FAA Sec 119 Endangered Species

(d) COUNTRY ANALYSIS REQUIREMENTS. Each country development strategy, statement, or other country plan prepared by the Agency for International Development shall include an analysis of:

The actions necessary in that country to conserve biological diversity, and

The extent to which the actions proposed for support by the Agency meet the needs thus identified.

The FAA 118/119 analysis for USAID/Liberia must adequately respond to the two questions for country strategies, also known as "actions necessary" and "extent to which."

C.2 Purpose

The primary purpose of this task order, given Liberia's development context, is to determine the actions necessary to conserve and sustainably manage tropical forests and to conserve biodiversity in compliance with Sections 118 and 119 of the FAA of 1961, as amended, and ADS guidelines. The analysis will inform USAID/Liberia in the development of its CDCS. USAID's approach to development requires that the Agency examine cross-sector linkages and opportunities to ensure a robust development hypothesis. Biodiversity conservation is a critical approach for achieving sustainable development and should be considered in mission strategic approaches to improve development outcomes. The analysis therefore is an opportunity for the mission to better understand the strategic linkages between the conservation of a country's tropical forest and biodiversity and development, so that it can structure a sound results framework to support future programming. Notably, the analysis will identify strategic linkages at the results framework level, highlighting opportunities to integrate tropical forest and biodiversity conservation into priority development sectors identified in the CDCS.

This analysis will advance the previous analysis produced in 2013 and published in 2014 (http://pdf.usaid.gov/pdf_docs/PA00KBNP.pdf), taking an in-depth, comprehensive approach and engage all sectors at the mission. The investigation is important with regard to post-Ebola Liberia, USAID forest community activities (biodiversity funded), and future funding scenarios. With respect to Ebola, it will be important to understand the connection between ecosystem health and human heath, including governance of natural resources.

In April 2017, the USAID-funded, "People, Rules, and Organizations Supporting the Protection of Ecosystem Resources (PROSPER)" activity completed the establishment of eight new Community Forest Management Bodies, who are responsible for managing their Community Forest Management Agreements with the Government of Liberia's Forestry Development Authority. These communities serve as a model for establishing new community forests, increasing the extent of forest management by local communities. They have the potential to play a significant role in the management of tropical forests and biodiversity in Liberia as well as the region. In the current budget scenarios, cross-cutting sector engagement at USAID/Liberia will be essential to maintain tropical forests and biodiversity in Liberia. This includes collaboration with regional projects such as the USAID-funded West African Biodiversity and Climate Change (WA-BiCC). As a forward-looking document, this analysis will inform the mission's next generation CDCS with an emphasis on how USAID Liberia's other sector programs could consider forests and biodiversity across the portfolio.

Climate change is a concern in Liberia. As such, the analysis will evaluate the threat to the country's tropical forest and biodiversity from climate change. In addition to evaluating the climate change threat to biodiversity and tropical forests, the analysis team should consider climate change as a cross-cutting theme and should analyze and incorporate climate change, as appropriate, throughout the report. Climate change vulnerabilities should also be considered when developing the report's recommendations. The analysis team should identify innovative, integrated strategic approaches that link tropical forest and biodiversity conservation to all USAID programming sectors, and to climate change.

The analysis team should use mission reports on climate change in the analysis, including the March 2013 Liberia Climate Change Assessment completed for USAID.

C.3 Mission Program

The current USAID/Liberia CDCS focuses on sustainable long-term development with the overall strategic goal to strengthened Liberian institutions positioned to drive inclusive economic growth and poverty reduction by the end of the CDCS period, September 2018. The core institutional foundations required for sustainable growth and poverty reduction include: inclusive political institutions that ensure the accountability, responsiveness and legitimacy of the state; inclusive economic institutions that encourage creative individual initiative, efficiently mobilize labor and other public and private resources, and allocate those resources to their most productive uses; and inclusive education and health services institutions that expand all Liberians' abilities and opportunities to contribute to and benefit from development progress. Therefore, the Results Framework for this CDCS is built around four Development Objectives (DOs):

DO-1: More effective, accountable, and inclusive governance

DO-2: Sustained, market-driven economic growth to reduce poverty

DO-3: Improved health status of Liberians

DO-4: Better educated Liberians

The accomplishment of each of these objectives is necessary, but not individually sufficient, to achieve the strategic goal of the current CDCS. A central development hypothesis of this CDCS is that, taken together, the successful accomplishment of these four, mutually-reinforcing objectives will achieve those goals. A key assumption is that Liberia will be able to maintain and continue to improve civil peace and security throughout its territory, an objective that is not included in the results framework of this CDCS.

C.4 Statement of Work

This analysis will involve synthesis and analysis of existing information, coupled with key stakeholder consultations and site visits to ground-truth information.

Under the direction of the team leader, the analysis team will evaluate the status and identify the actions necessary to conserve and sustainably manage tropical forests and biodiversity in Liberia. The purpose of the analysis is to:

A) Determine actions needed to conserve tropical forests and biodiversity, and

B) Describe the extent to which the development outcomes, projects and activities proposed under the new CDCS are likely to conserve tropical forests and biodiversity

To accomplish this task, the analysis team will perform the activities in Sections 2.1 and 2.2:

C.4.1 Data Collection and Analysis

Prior to in-country fieldwork, the analysis team will:

Gather and begin to analyze existing information to identify tropical forest and biodiversity status, key tropical forest and biodiversity issues, including projected impacts and risks of climate change, stakeholders, policy and institutional frameworks and gaps in the available information. Reports and other documentation to be reviewed include previous

118/119 analyses and similar analyses of other development partners, current USAID/Liberia CDCS, Project Appraisal Documents (PAD) and activity reports, information available online (websites and archives of conservation organizations – Food and Agriculture Organization (FAO), World Resources Institute (WRI), Conservation International (CI), Flora and Fauna International (FFI) etc. and government ministries) on tropical forest and biodiversity conservation activity evaluations, reports on wildlife crime and trafficking, reforms in land and natural resource tenure and access, Liberia's National Biodiversity Strategy and Action Plan (NBSAP), National State of the Environment Report (NSOER), Liberia's National Policy and Response Strategy on Climate Change, and Nationally Determined Contributions in terms of adaptation and mitigation as they apply to tropical forests and biodiversity as presented at the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (CoP) 22.

This is an opportunity to dive deeply into Liberia's natural and environmental history as a basis for understanding the country's ecological systems and the paths the nation took to arrive at the current status of tropical forests and biodiversity. This will include a literature review of sources, including flora/fauna, ecological classifications/forest inventories, coastal/marine resources, and freshwater resources. This should include environmental assessments of current extractive industries activities, including mining and logging especially in regard to threats to tropical forests and biodiversity. This initial deep dive must be a comprehensive desk study, which will inform the in-country visit.

Please see Annex 'A' of this SOW for an illustrative list of documents to be reviewed; however, the team should expand this list as needed.

In coordination with the mission, begin planning site visits based on the mission's recommendations and on the team's preliminary review of key topics and information gaps. For site visits, the team should consider the locations that still harbor rainforest with high biodiversity as well as sites where the rainforest has been lost. USAID/Liberia recommends a site visit to the Putu Community Forest in Grand Gedeh County, where large tracts of tropical rainforest remain. Although large tracts of forest remain, both commercial and artisanal mining and logging are penetrating this area and must be assessed. A site visit to the northern portion of Nimba County, would allow an opportunity to visit USAID community forest sites. Travel to the area would bring the team through some of the most developed areas and largest cities of Liberia (i.e., Gbarnga, Ganta, Kakata), where rainforests and biodiversity have been lost.

Within ten business Working Days after signing the contract, develop a draft work plan (Deliverable 1). The draft work plan will include a schedule of tasks and milestones, proposed assessment tools and a discussion of information gaps and how to fill them. In the work plan, identify the type of information to be obtained and the key people to engage throughout the analysis process, i.e., Washington; mission staff, including the program office, technical staff and the deputy and mission director; implementing partners; and biodiversity stakeholders, including host country government, international, national, local non-governmental organizations and private sector. The final work plan will be based on mission comments/suggestions and submitted after the in-briefing of the analysis team.

Begin preparation of interview guides and a draft report outline based on the outline in Annex B: (Analysis Report Annotated Outline) in the FAA 118/119 Best Practices Guide

(https://rmportal.net/biodiversityconservation-gateway/foreign-assistance-act-sections-118-119-tropical-forest-and-biodiversity-analysis-best-practices-guide). Note that Annex B is found on page 38 of the Best Practices Guide.

Coordinate with the designated Washington technical expert on the proposed list of Washington technical staff and other Washington-based organizations. Recommended meetings with the US Forest Service, Conservation International, World Resources Institute, and World Bank to meet and gather relevant information about their programs and input into the status of tropical forests and biodiversity in Liberia.

After arrival in-country, in coordination with the activity manager, the analysis team will:

Meet with the USAID technical teams, including Economic Growth, Democracy & Governance, Education, and Health, the Program Office, and the CDCS Core Working Group to get mission perspectives on the assignment and an understanding of specific mission interests, organizations to be contacted and site visits, including advice and protocol on approaching USAID partners and host country organizations with respect to the assignment. The mission will brief the analysis team on any sensitivity related to the exercise (i.e., the potential for raising expectations and the need to be clear about the purpose of the analysis) and relevant mission guidance.

Meet with the program office at USAID to gain an understanding of the status of the CDCS and its program goals and objectives.

Meet with organizations, government bodies, the private sector and individuals who are knowledgeable about and/or implementing projects on environment, biodiversity and tropical forest conservation and other sectors relevant to tropical forest and biodiversity conservation, such as agriculture, economic growth, health and governance.

Key stakeholders are listed in Annex B of this SOW; however, team should expand list as needed.

Continue to obtain, review and analyze existing reports, online information and other data. Use time in country to track down information that is not available remotely.

Conduct site visits to supplement information gathered from consultations, literature review and other second-hand sources. Site visit locations will be finalized in consultation with the mission.

Prior to departure, host an exit briefing with the mission, including mission management, program office and technical teams, to provide them with an overview of the analysis and preliminary report findings (Deliverable 4).

C.4.2 Preparation of the FAA 118/119 Analysis

The analysis team will analyze the information gathered and prepare the analysis in accordance with Annex B of the FAA 118/119 Best Practices Guide

(https://rmportal.net/biodiversityconservation-gateway/foreign-assistance-act-sections-118-119-tropical-forest-and-biodiversity-analysis-best-practices-guide).

Information required in each section of the report starts on page 38 of the Best Practice Guide.

The analysis team shall prepare two draft reports, of between 30-35 pages (excluding annexes), for review by USAID (Deliverables 3 and 6).

The analysis report will respond to the legislative requirements listed above and include recommendations on the extent to which the mission can contribute to the actions necessary to conserve tropical forest and biodiversity.

The mission review period for draft reports will be ten business Working Days. Following receipt of mission comments on the draft report, the analysis team will prepare and submit a final analysis (Deliverable 6) that incorporates mission comments, in accordance with the schedule of deliverables below. The analysis report should be sent to the relevant bureau in Washington for review and concurrence. The mission may review and provide comments on Deliverable 6 until the analysis is considered final and sufficient.

The FAA 118/119 analysis draft and final reports will follow the outline in Annex A of the FAA 118/119 Best Practices Guide (https://rmportal.net/biodiversityconservation-gateway/foreign-assistance-act-sections-118-119-tropical-forest-and-biodiversity-analysis-best-practices-guide; starting on page 36 of the guide), and should include the following maps and tables:

a) Map of main ecosystems in the country;
b) Map of the forested areas and land uses;
c) Map of protected areas, including forest reserves;
d) Map of aquatic and marine resources;
e) Protected area status table with:

A list of all declared and proposed protected areas (national parks, wildlife reserves and refuges, forest reserves, sanctuaries, hunting preserves, etc.);

Institution(s) responsible for the protection and management of each protected area;

Area of coverage;

Ecosystems contained in each protected area; and

Protected area management plan status.

f) Table of natural resources outside protected areas (Note: covered in text Chapter II)

- Land cover and land-use type (e.g., wetlands/freshwater sources, major catchment areas, agricultural ecosystems, etc.);
- Institution(s) responsible for management;
- An overview of the major threats and challenges to conserving biodiversity outside protected areas; and
- Economic potential.

g) Table of conservation initiatives including:

- A list of the main conservation initiatives implemented by government, donors, non- governmental organizations, private sector and universities;
- Brief evaluation of effectiveness;
- Implementation dates; and
- Funding levels.

C.5 Schedule and Logistics

The assignment is expected to be completed no later than150 Working Days after the award. This includes approximately 3 weeks of work in-country, 2 weeks to produce the draft report following in-country work, 2 weeks for USAID review of the draft report, and 2 weeks to produce the final report.

The estimated level of effort (LOE) requirements for this task are:

A total of 10 Working Days for expatriate staff in-country;
A total of 38 Working Days for expatriate staff working from home base; and
A total of 20 Working Days for local staff

Week	Activity/Milestone	Comments
Week 2	Work plan	(LOE 7 Working Days)
Week 4	First bi-weekly report	
	First draft of FAA 118/119 submitted	at least 15 Working Days before in-country work; (LOE 14 Working Days to prepare)
	In-country work	10 Working Days in-country, including site visits and interviews; note that travel in country is difficult between July and September due to rain and resulting road conditions (LOE 10 Working Days)
	Second draft of FAA 118/119 submitted	Within 10 business Working Days of in-country work; (LOE 10 Working Days)
	Final FAA 118/119 submitted	No later than 150 Calendar Days after the award (LOE 7 Working Days). Include the annex on Key Changes and Updates from the Previous FAA 118/119 as well as annex on Lessons Learned from the Previous FAA 118/119.

C.6 Deliverables

The following are the deliverables for this task:

Deliverable 1. Work plan and schedule submitted within 10 Working Days of award date. The work plan should include all tasks and a timetable, milestones and deliverables and explain the following information:

- Plan for coordination and consultations with the mission;
- The analysis team's expectations of the mission (activity manager and others);
- A brief agenda for development objective (DO) and program office meetings and for the in-briefing and exit briefing;
- Proposed coordination with implementing partners and donors;
- Coordination with the mission to ensure the analysis team can respond to "extent to which"; and
- Plan for communicating the recommendations to all DO teams.

Deliverable 2. Progress reports to the activity manager starting on 30 calendar Working Days after award and bi-weekly thereafter.

Deliverable 3. Draft FAA 118/119 submitted at least 15 business Working Days before in-country work. This draft should highlight gaps that will help to priorities activities and data gathering on the site visit. In country work may not proceed without approval of Deliverable 3.

Deliverable 4. Exit briefing presentation prior to the analysis team's departure from the country.

Deliverable 5. Draft FAA 118/119 submitted 10 business Working Days after the conclusion of in-country work. This final draft will fill gaps identified prior to the in-country work.

Deliverable 6. Following 10 business Working Days for USAID review and comment, a revised final report incorporating all comments, formatted and branded in accordance with USAID requirements, will be submitted within 10 business Working Days of the receipt of comments on the draft. In no event will this be more than 150 calendar Working Days from date of award.

C.7 Role of USAID Mission

The USAID mission will provide the analysis team with:

A list of key documents to review;

A list of key stakeholders to be contacted and will assist the team in making initial contact to arrange interviews;

Criteria to identify potential site visits;

A list of donor projects;

Logistics support for site visits; and

Review and feedback on the draft analysis report.

To ensure continued coordination with the mission over the course of the in-country work, the analysis team will submit bi-weekly progress reports to the activity manager, which discuss progress, challenges and issues and key findings to-date. (See list of deliverables in Section 4.)

C.8 Qualifications of the Consultants

The team leader will lead the analysis and should be a senior-level natural resource management specialist with the following qualifications:

- Post-graduate qualifications (master's level degree or higher) in biology, ecology, zoology, forestry, ecosystem conservation or a closely related field;
- Knowledge of USAID's strategic planning process related to tropical forests and biodiversity;
- Expertise in assessing environmental threats;
- Experience in the West Africa, preferably Liberia;
- Experience coordinating analyses and leading teams;
- Exceptional organizational, analytical, writing and presentation skills; and
- Fluent in English.

Natural resources and environmental management specialist or environmental policy specialist should have the following qualifications:

- Expertise in the Liberia's environmental policy and institutional framework;
- Expertise in the Liberia's biodiversity (including forests) and natural resources management status;
- Good contacts within the country's government agencies, non-governmental organizations,
- international donors and private sector; and
- Fluent in English.

Other possible team members:

- Agricultural, governance, health or other non-environment sector specialist who will focus on linkages between tropical forests, biodiversity and other key technical sectors; and
- Aquatic resources specialist with expertise in fresh water and marine environments.
- Climate specialist – expertise in long-term analyses of key drivers of climate change (El Nino/Southern Oscillation, Sea Surface Temperature); effects of climate change (acidification of marine environments, shifts in natural populations, impacts on major ecosystems), shifts in prevalence of major disease vectors (malaria mosquitoes, neglected tropical diseases).

LIST OF DOCUMENTS TO BE REVIEWED

Liberia Environmental Threats and Opportunities 118/119 Assessment December 2014
Country Development and Cooperation Strategy Liberia 2013-2017
Deliverables produced by People, Rules, and Organizations Supporting the Protection of Ecosystem Resources (PROSPER) May 2012-April 2017

Congressional Budget Justification (CBJ). 2017. FY2017, Foreign Operations, Biodiversity.
Liberia Forest Sector Project. World Bank.
Domestic Timber Value Chain Sustainable Markets.

KEY STAKEHOLDERS

Forestry Development Authority
World Bank
ACDI/VOCA
US Forest Service
USAID Liberia staff
Civil Affairs Officer, UNMIL
Traditional Council
Technical Advisor, EPA
Chair of Forestry, University of Liberia
Head of Marine Division, Bureau of National Fisheries
Coordinator, Bureau of National Fisheries
Director General, LISGIS
Asst. Director, Environmental Statistics, LISGIS
Executive Director, Society for the Conservation of Nature in Liberia

Annex C: Bio-sketches of team

Dr. Patricia Foster-Turley is the **Team Leader** and **Biodiversity Specialist**. Dr. Foster-Turley is a conservation biologist and independent consultant. She has more than 25 years of professional experience providing technical assistance to USAID, NGOs, and the private sector, carrying out assessments, analyses, evaluations, and applied research that lead to the design of effective strategies and programs in complex ecological and social contexts. She has served on steering committees for IUCN's Species Survival Commission and AAAS Science and Diplomacy Fellow with USAID bureaus, and regional and bilateral missions in Africa. Pat has extensive experience in advising USAID on environment and natural programming. She has led teams on ten FAA 117 and 118/119 analyses in Asia, Africa and Eastern Europe, most recently leading Integra's team on the Bangladesh FAA 118/119 Analysis in 2016.

Mr. Garvoie Kardoh is the Policy Specialist. Mr. Kardoh has extensive experience in Liberian forest policy, having served as Liberia's focal point for the International Tropical Timber Organization and Executive Director of the Forestry Training Institute of the Forestry Development Authority. He has also served as the Manager for Forestry Extension Services at FDA, participated in the World Bank funded Strategic Environmental Assessment for Liberia and was involved in drafting of the Community Rights Law. He represented the government of Liberia to the International Tropical Timber Organization in 2012.

Ms. Nora V. Nelson is the **Landscapes and Aquatic Resources Specialist.** Nora is a water resource and natural resource management professional with expertise working on watershed and integrated water management and livelihood issues across Asia, Africa, and Latin America. Nora has experience working with women and indigenous groups on water and forest management and provides gender and minority expertise for the team. She has extensive USAID program management, analysis, and evaluation experience serving as a subject matter expert and/or team leader in five performance evaluations.

Richard S. Sambolah is the **Community Forestry and Institutional Specialist**. Sambolah is a Liberian forester with 20 years of experience in community forestry, agroforestry, and forest landscape restoration. He worked for the Forestry Development Authority of Liberia for 25 years, coordinating forestry research activities of the German Forestry Mission to Liber (GFM) from 1984 t0 1990 and managing FDA reforestation program between 1996 and 2002. He has worked with international NGOs and founded community-level conservation and livelihood NGOs and is widely respected as an expert on community forestry and conservation activities.

Mr. John Waugh is the **Project Manager** and **Editor**. He is the Vice-President for Climate and Environment at Integra. He has more than 35 years of experience in conservation and development, including project management, policy analysis, and planning, 20 years of which was with IUCN.

Mr. Benjamin White is the **Geographer**. A Fellow of the Royal Geographical Society, He is an expert in spatial analysis using geographic information systems and satellite remote sensing. He has worked with Integra on several mapping projects.

Annex D: Interview Template

Who: Contact details

Date and Time of meeting and people in attendance:

1. What are the primary threats to forests and biodiversity (terrestrial, freshwater, and/or marine) that your program/office addresses?

2. What are your main approaches to addressing these threats?

3. What are notable successes of your approach and how are these measured?

4. What difficulties do you face (i.e., approaches that haven't worked out as planned, overlapping institutional mandates, lack of funding, etc.)?

5. Are there other organizations you believe have innovative approaches to biodiversity conservation? Can you give us contacts at these organizations that we can follow up with?

6. In your expert opinion, above and beyond your own program, what do you think are the major issues regarding conservation of biodiversity/forests/ecosystems in your region or sector?

7. Other questions, to be determined by context

Annex E: Individuals consulted

Persons Met	Title or Unit	Institution	Location
Washington			
Alicia Grimes	FAB Office	USAID/E3	Wash DC
Diane Russell	FAB Office	USAID/E3	Wash DC
Sarah Paige	Africa Office	USAID/AFR	Wash DC
Robin Martino	Consultant	BRIDGE project	Wash DC
George Ledec	Africa Office	World Bank/DC	Wash DC
Neeta Hooda	Africa Office	World Bank/DC	Wash DC
Sachiko Kondo	NRM Specialist	World Bank/DC	Wash DC
Adam Welti	Africa Middle East Manager	USFS International Programs	Wash DC
Ken Cameron	Great Apes	USFWS International Programs	Wash DC
Earl Possardt	Sea Turtles	USFWS International Programs	Wash DC
Scott Bode	Sr. Climate Change Adviser	ACDI/VOCA	Wash DC
Monrovia			
Tony Chen, et al.	USAID Mission team	USAID/Liberia	Monrovia
Ara Voker Chea	Education Specialist	USAID/Liberia	Monrovia
Murdeau Nyumah	Education Specialist	USAID/Liberia	Monrovia
Sonjai Reynolds-Cooper	Deputy Director Education	USAID/Liberia	Monrovia
Laurel Rushton	Health	USAID/Liberia	Monrovia
April O'Neill	Democracy	USAID/Liberia	Monrovia
Jusu W. Holmes	Democracy	USAID/Liberia	Monrovia
Richard Nyarsuk	Roads/infrastructure Specialist	USAID/Liberia	Monrovia
Maxime N. Bainduah	Energy Specialist	USAID/Liberia	Monrovia
Francis F. Wreh	Executive Director	LISGIS	Monrovia
Thomas L. Davis	Director GIS	LISGIS	Monrovia
Johnson Q. Kei	DPG/Info	LISGIS	Monrovia
Kayloe R. Frank	Assistant to Executive Director	LISGIS	Monrovia
Bannel S. Dennis	GIS Technician	LISGIS	Monrovia
Robert W. Wilson, III	Fisheries Dashboard Operator	National Fisheries Authority	Monrovia

Ernest Kiazolu	Senior Research Statistician	National Fisheries Authority	Monrovia
Preston Anderson	Animal Nutrition Officer	Ministry of Agriculture	Monrovia
Alaric N. Mienwipia	Agronomist	Ministry of Agriculture	Monrovia
Musu B. Flomo-Bendah	Director/ Planning & Policy	Ministry of Agriculture	Monrovia
Oliver Boye Tekpeh	Plant Pathologist	Ministry of Agriculture	Monrovia
Gregory Taplah	Director Crop Dip.	Ministry of Agriculture	Monrovia
Gertie K. Sulunteh	Program	Ministry of Agriculture	Monrovia
Michael Garbo	Director	Society for the Conservation of Nature in Liberia (SCNL)	Monrovia
Dr Mary Molokwu-Odozi	Prog./Oper. Mgr.	Fauna and Flora International Liberia	Monrovia
Jessica Donovan	Country Director	Conservation International	Monrovia
Peter Gayflor Mulbah	Asst. Director	Conservation International	Monrovia
Moses Massa	Ener./Env. Mgr.	UNDP	Monrovia
Anyaa Vohiri	Director	Environmental Protection Agency (EPA) of Liberia	Monrovia
J.S. Datuama Cammue	CBD/Focal Pt.	EPA	Monrovia
Levi Piah	Ramsar/Focal Pt.	EPA	Monrovia
Blamah Goll	TM/Conserv.	FDA	Monrovia
Edward S. Kamara	Mgr. Fore./Prod. Mkt.	FDA	Monrovia
Glenn Lines	Chief of Party	USAID FIFES Project	Monrovia
John Woods	Prof./CAF/UL	University of Liberia	Monrovia
David Palacios Garcia de la Rosa	Programme Manager Forestry, Climate Change & Natural Resources	Delegation of the EU-Liberia	Monrovia
Annika Hillers	Country Director	Wild Chimpanzee Foundation – Liberia	Monrovia
Silvana Site	Program Manager	Wild Chimpanzee Foundation – Liberia	Monrovia
Andrew Egan	Response Peace Corps Volunteer	Forestry Training Institute	Monrovia
Dr. C. Otello Brandy	Chairman	Liberia Land Authority	Monrovia
Daniel Tarr	Director, Environment	Liberia Maritime Authority	Monrovia
Field Trips			
Emmanuel S. Nmah, Sr.	Regional Forester		Buchanan, Grand Bassa County
Gayflor Kemah	Forest Management Officer	Region #3 / FDA	Buchanan, Grand Bassa County

Evans M. Kiatamba		Region #3 / FDA	Buchanan, Grand Bassa County
Juergui Schedeman	Buchanan Manager	LTTC	Buchanan, Grand Bassa County
Alphonso Gee	Community Leader	Barccolin	Barccolin, Grand Bassa County
Augustine Sunday	Town Chief	Blawein	Blawein, Grand Bassa County
George Free	Supervisor	Sea Turtle Watch Project	Little Bassa
Luke Brannon	Managing Director	Libassa	Libassa
Advertus Roberts	Asst. Dir. For Admin	Forestry Training Institute	Forestry Training Institute, Tubmanburg
George Yenay	Procurement Instructor	Forestry Training Institute	Forestry Training Institute, Tubmanburg .
Richard Moseray	Accountant	Forestry Training Institute	Forestry Training Institute, Tubmanburg
Teta Bonar	Instructor	Forestry Training Institute	Forestry Training Institute, Tubmanburg
Stephen Bedell	Instructor	Forestry Training Institute	Forestry Training Institute, Tubmanburg
Patrick Garteh	Instructor	Forestry Training Institute	Forestry Training Institute, Tubmanburg
William Parker	Mechanic Instructor	Forestry Training Institute	Forestry Training Institute, Tubmanburg
Etta Cummeh	Warehouse Manager	Forestry Training Institute	Forestry Training Institute, Tubmanburg
Jimmy Gray	Special Assistant	Forestry Training Institute	Forestry Training Institute, Tubmanburg
Andrew Egan	Peace Corp volunteer	Forestry Training Institute	Forestry Training Institute, Tubmanburg
Laurenzo Karteh	County Information Officer	Grand Cape Mount County	Robertsport
Eric Pinney	Country Inspector	Grand Cape Mount County	Robertsport
Milton Davids, Jr.	field Liason Officer	Grand Cape Mount County	Robertsport
Romeo Varney	Reserve Directo/FDA	Lake Piso Multiple Reserve	Robertsport, Grand Cape Mount County
Charles Simpson	Chairman	Collaborative Management Association (CMA)	Robertsport, Grand Cape Mount County
john Adams	General Secretary	Collaborative Management Association (CMA)	Robertsport, Grand Cape Mount County
Anne Gardner	Project Manager	GolaMa Project	Gola Forest, northwest Liberia
Emmanuel Smith	Chief Park Warden	Gola Forest NP	Gola Forest, northwest Liberia
Samuel K. Freeman	Zone Warden	Wonegisi PPA	Zorzor District, Lofa County
Mooh E. Lamah	Ranger	Wonegisi PPA	Zorzor District, Lofa County
Joseph K. Flomo	Chief Park Warden	Wonegisi PPA	Zorzor District, Lofa County
Daniel Livingstone	Community Engagement Ranger	Wonegisi PPA	Zorzor District, Lofa County

Eric S. Torkpah	Research Officer	Central Agriculture Research Institute (CARI)	Suacoco, Bong County
David S. Kolleh	Research Officer	CARI	Suacoco, Bong County
Christopher Geterminah	Administrative Officer	CARI	Suacoco, Bong County
Randolph R. Kolleh	M&E Officer	CARI	Suacoco, Bong County
David C. Koffa	Research Assistant	CARI	Suacoco, Bong County
ArcelorMittal: Hendrix Kuit.	Environmental Advisor	ArcelorMittal	Yekepa, Nimba County
Forkpayea Gbelee	Biodiversity Superintendent	ArcelorMittal	Yekepa, Nimba County
David Parker	Head, Plantation Upstream Liberia	Sime Darby Plantations	Bomi County, Liberia
Korvah K. Vanyanbah	Chief Park Warden	East Nimba Nature Reserve (ENNR)	Zortapa, Nimba County
Tarley A. Dweh	Acting County Inspector	Ministry of Internal Affairs, Grand Gedeh County	Zwedru, Grand Gedeh County
James Duofayce	Chairman	County Forest Forum	Zwedru, Grand Gedeh County
J. Edward Gbeway	CF Chairman	Community Forest	Juluzon Town, Grand Gedeh County
Matthew Varney	Technical Assistant	Fauna & Flora Int'l	SNP, Sinoe County

Annex F: Field Trip Itineraries for Forest and Biodiversity Assessment

Date	Team	Team members	Trip	Sites	No. of days	Expected to see
	Costal Trips					
Feb. 3-4	One	Sambolah and Nelson	Coastal	**Buchanan area** **Little Bassa** (Visit sea turtles program) **Bacconin/Bacculin)** (Visit to Superintendent's office while in route to site and visit community forest site. If time permits, visit LAC and CF communities in Compound 3)	2	**Little Bassa:** Fisheries, wetlands, mangrove, savannah woodland, bio-fuel uses, sea turtle research, landscape degradation, deforestation and sea erosion. **Bacconin/Bacculin:** Fisheries, wetlands, mangrove, terrestrial forest, bio-fuel uses, community forest initiatives (FIFES), landscape degradation/ deforestation.
Feb. 3-4	Two	Foster-Turley and Kardoh	Coastal	**Lake Piso** (Visit Superintendent's office and fishing communities) **Marshall** (Visit Libassa Animal Sanctuary etc.) **Old LMC mines**	2	**Lake Piso**: Fisheries, wetlands, mangrove, terrestrial forest, savannah woodland, park management facility, bio-fuel uses, community forest initiatives (FACE), landscape degradation, deforestation. Impact of large-scale oil palm plantation (Sime Darby). **Marshall**: Fisheries, wetlands, mangrove, savannah woodland, bio-fuel uses, landscape degradation, deforestation, learn about chimpanzee sanctuary. Old LMC mines (Blue Lake) Observe degraded mining sites, impact of mining and status of environmental compliance or non-compliance
Feb. 4-5	All	Foster-Turley, Sambolah, Kardoh, Nelson		**Monrovia**	2	Teams returned to Monrovia, compared notes and consolidated report of coastal field trips and prepare for in-land field trip

	Inland Trips					
Feb.8 -12	Three	Kardoh and Nelson Gola Forest – 2 days and Wonegisi PPA & CARI - 5 days)	Inland Gola Cross Border program	**Gola Forest** (Visit the Gola Cross-Border program). **Wonegisi Forest** (Visit FFI project COMMUNITIES Central Agricultural Research Institute (CARI) hold discussions and interviews	5	**Gola Forest:** learn of mining threats, Cross-Border conservation program, effect of bushmeat hunting deforestation, land degradation, local land uses, population issues, health issues road infrastructure. **Wonegisi Forest:** learn about conservation and community engagement initiatives, forest status, land degradation, local land uses, population issues, road infrastructure. **CARI:** hold discussions and conduct interviews with staff and members of administrative and technical teams
Feb. 8-12	Four	Foster-Turley and Sambolah	Inland (Nimba-2 days and Grand Gedeh/ Sinoe-5 days	**Zor Community Forest / East Nimba Nature Reserve:** (While in Sanniquellie, visit Superintendent's office before departing to Zor Community Forests site) ArcelorMittal Steel Company (N. Nimba) (Visit the management and conduct an interview briefly) Neezonee CF in Gbaezon Statutory District (G. Gedeh) **(**Visit a community forest and conduct a brief interview) Sapo National Park interview staff at park HQ.	5	**Zor Community Forest / East Nimba Nature Reserve:** Community forests, forest status, degraded forest, land degradation, conservation program, local land uses, health issues, population issues, road infrastructure. **Mittal Steel:** see the impact of iron ore mining to forest and biodiversity. Blouquia clan Community forests, forest status, land degradation, conservation program, local land uses, health issues, population issues, road infrastructure. SNP: see park HQ and learn of activities ongoing
Feb. 13-16	All	Foster-Turley, Sambolah, Kardoh, Nelson		**Monrovia**	4	Teams returned to Monrovia compared notes and produce completed draft report with final recommendation and USAID debriefing materials.

Purpose of the planned field trips and relevance to FAA 118/119	
Coastal field trips:	To assess: Natural resource/biodiversity situation; Physical landscapes conditions and status; Impact of land uses; Local economic situation; Health situation; Local/national perceptions and programs on forest and biodiversity conservation; and General environmental conditions.
Inland field trips	To assess: Natural resource/biodiversity situation; Terrestrial forest landscape conditions and status; Land uses, local economic situation Health situation; Impact of mining on forests and biodiversity; Local/national perceptions and programs on forest and biodiversity conservation; and general environmental conditions.

Annex G: Visual Guide to Threats, Drivers, and Recommendations

The following chart illustrates the objective (in green) threats (direct in red, and indirect in orange), recommendations (in yellow), and the human well-being outcomes (in brown, expressed as Development Objectives). Using Miradi software, users can add links between and modify recommendations, the indirect and direct threats, goals, and human well-being outcomes and isolate threats to create individual results chains for programming purposes.

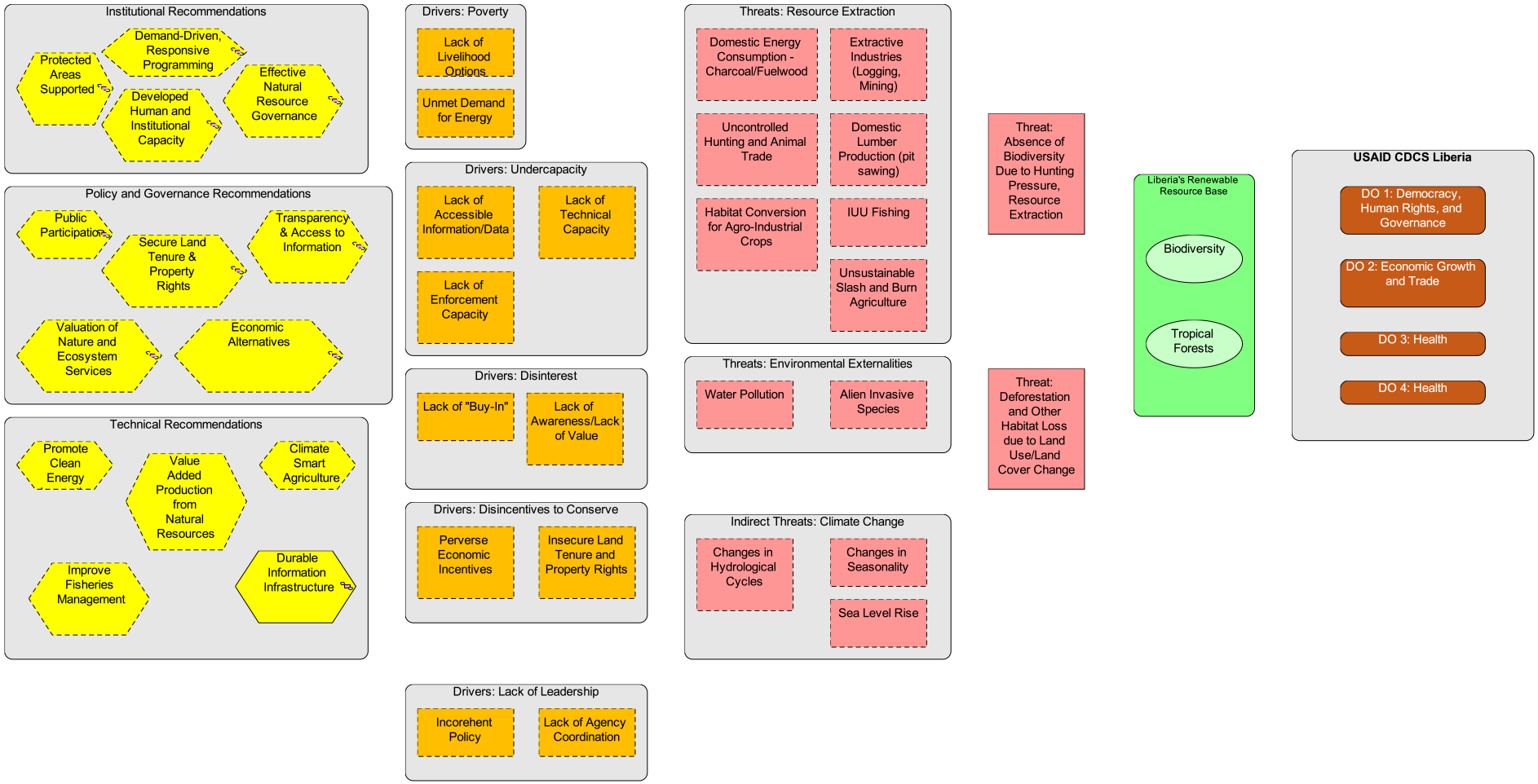
For more information about the Open Standards for the Practice of Conservation and the Miradi software, visit www.cmp-openstandards.org.

Open Standards brings together common concepts, approaches, and terminology in conservation project design, management, and monitoring in order to help practitioners improve the practice of conservation. These standards are meant to provide the principles, tasks, and guidance necessary for the successful implementation of conservation projects.

The original Miradi file is accessible through John Waugh at Integra (jwaugh@integrallc.com).

Visual Guide to Drivers and Threats to Liberia's Tropical Forests and Biodiversity

This chart shows clusters of threats and drivers and recommendations. These polygons are building blocks for constructing results chains and a theory of change. Users can add and subtract, arrange and connect boxes to construct a narrative of the program logic of a given response, using Miradi software.



Annex H: Maps

The following maps are presented as references for the main text. All data used in maps was obtained either directly from credited public domain sources or was the result of analysis of data sets. Explanatory text and citations are given with each map.

The maps are provided using:

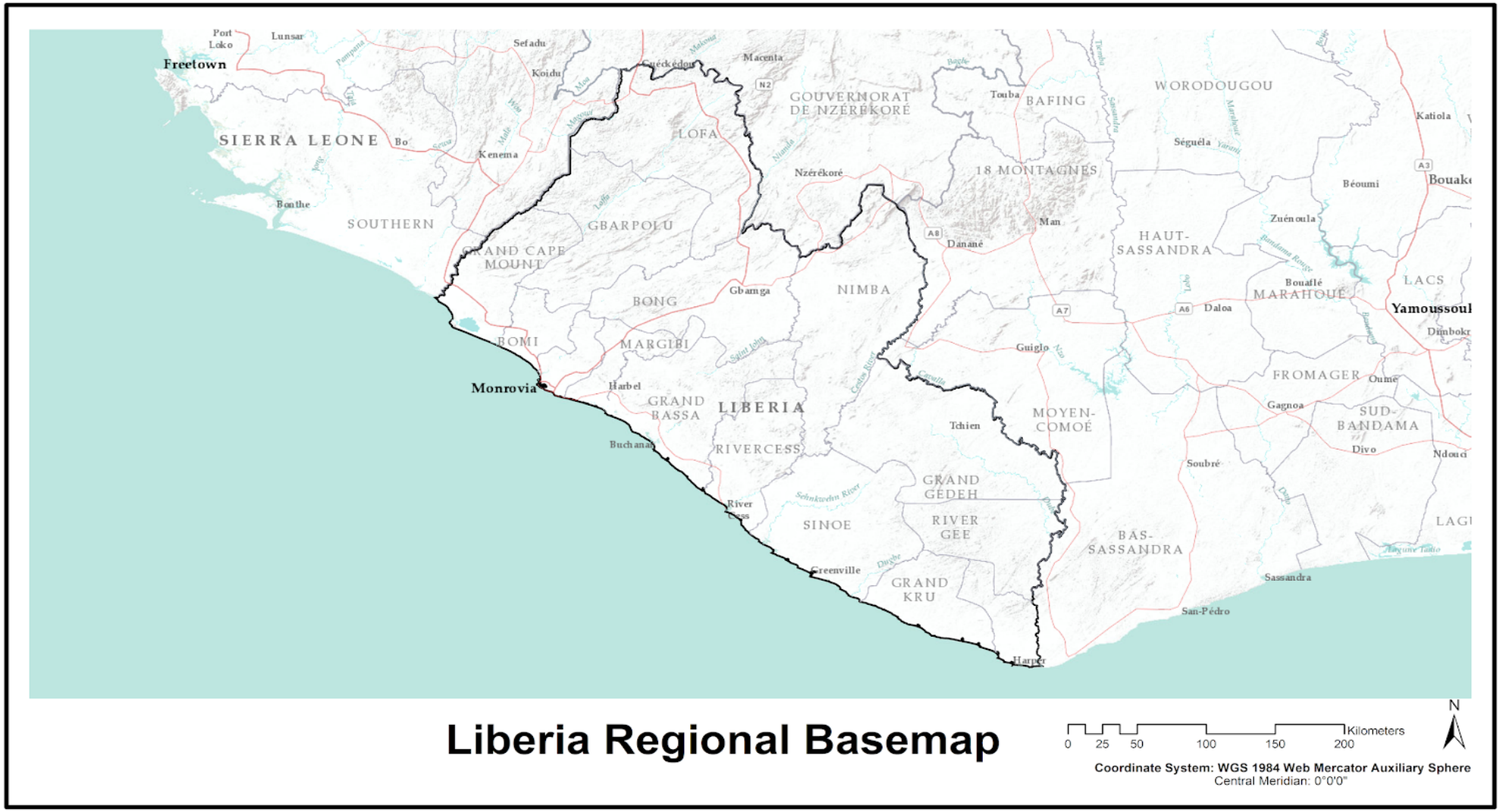
- A WGS 1984 Geographic Coordinate System
- A Mercator Auxiliary Spherical Projection

Required maps for the FAA 118/119 Analysis are:

- Map of main ecosystems in the country (Map 2.0, with supplemental maps and charts)
- Map of the forested areas and land uses (Map 3.0 with supplemental maps and charts)
- Map of protected areas, including forest reserves (Map 4.0 with supplemental maps)
- Map of aquatic and marine resources (Map 4.0 with supplemental maps)

Map 1.0: Liberia basemap

This base map is a composite of standardized data from ESRI, NGA, NIMA, USGS and other mapping sources, US and international. Its main purpose is to provide overall context for the report and to detail important boundaries and geophysical features. Infrastructure and major developed places are also included. Significant health details such as border crossings, refugee camps, sources of drinkable water and health clinics are beyond the scope of this map.


Port Loko
Lunsar
Freetown
Sefadu
Koidu
Macenta
N2
GOUVERNORAT DE NZÉRÉKORÉ
Touba
BAFING
WORODOUGOU
Katiola
SIERRA LEONE
Bo
Kenema
LOFA
Séguéla
A3
Bouaké
Nzérékoré
18 MONTAGNES
Béoumi
Bonthe
SOUTHERN
GBARPOLU
Man
Zuénoula
A8
Danané
HAUT-SASSANDRA
GRAND CAPE MOUNT
Bouaflé
LACS
MARAHOUÉ
Yamoussoukro
BONG
Gbarnga
NIMBA
A7
A6
Daloa
BOMI
MARGIBI
Guiglo
Monrovia
Harbel
FROMAGER
Oumé
GRAND BASSA
LIBERIA
Gagnoa
SUD-BANDAMA
MOYEN-COMOÉ
Tchien
Buchanan
RIVERCESS
Divo
Ndouci
Soubré
GRAND GEDEH
River Cess
SINOE
RIVER GEE
BAS-SASSANDRA
Greenville
GRAND KRU
Sassandra
San-Pédro
Harper
Liberia Regional Basemap
0 25 50 100 150 200
Kilometers
N
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Map 2.0: Liberia Ecoregions

The ecoregions map is a subset of a regional map generated by CILSS and the USGS. They utilized a series of country teams to delineate ecoregions based on visual interpretation of a Landsat image mosaic, drawing on their extensive knowledge of the physical and human geography of their respective countries. Their interpretation of the Landsat imagery was also supported by thematic maps of individual environmental properties (e.g., soils, geology, climate, vegetation) where available.

When comparing the results found in the CILSS/USGS Atlas (CILSS, 2016), to other ecoregional analyses (Olson, 2002), it was evident that the USGS had generated a superior product. This is likely due to: a) high resolution remotely sensed input data, b) validation and classification by experts with in-situ knowledge. It is also worth noting that, in comparison, most of the other ecoregional products we reviewed determined that Liberia's ecoregions were confined to three to four ecoregions (see also Map 2.1 below).

Liberia is often characterized as an ecologically homogeneous land area. This is reflected in most of the ecoregional data sets. The below map is typical of this perspective (Figure 4). To that end, the use of ELUs in the previous map provide important advances over traditional ecoregional maps.

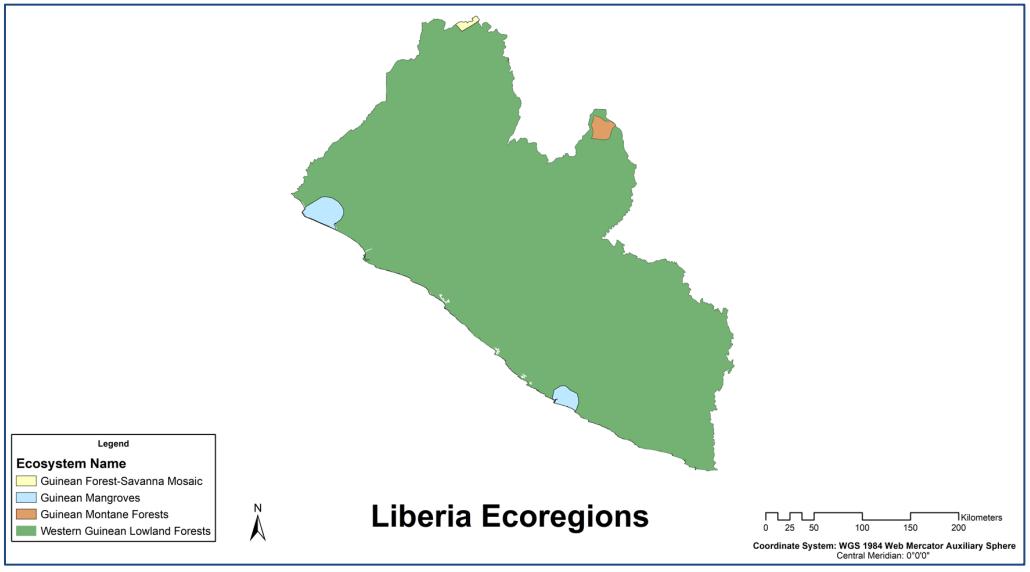
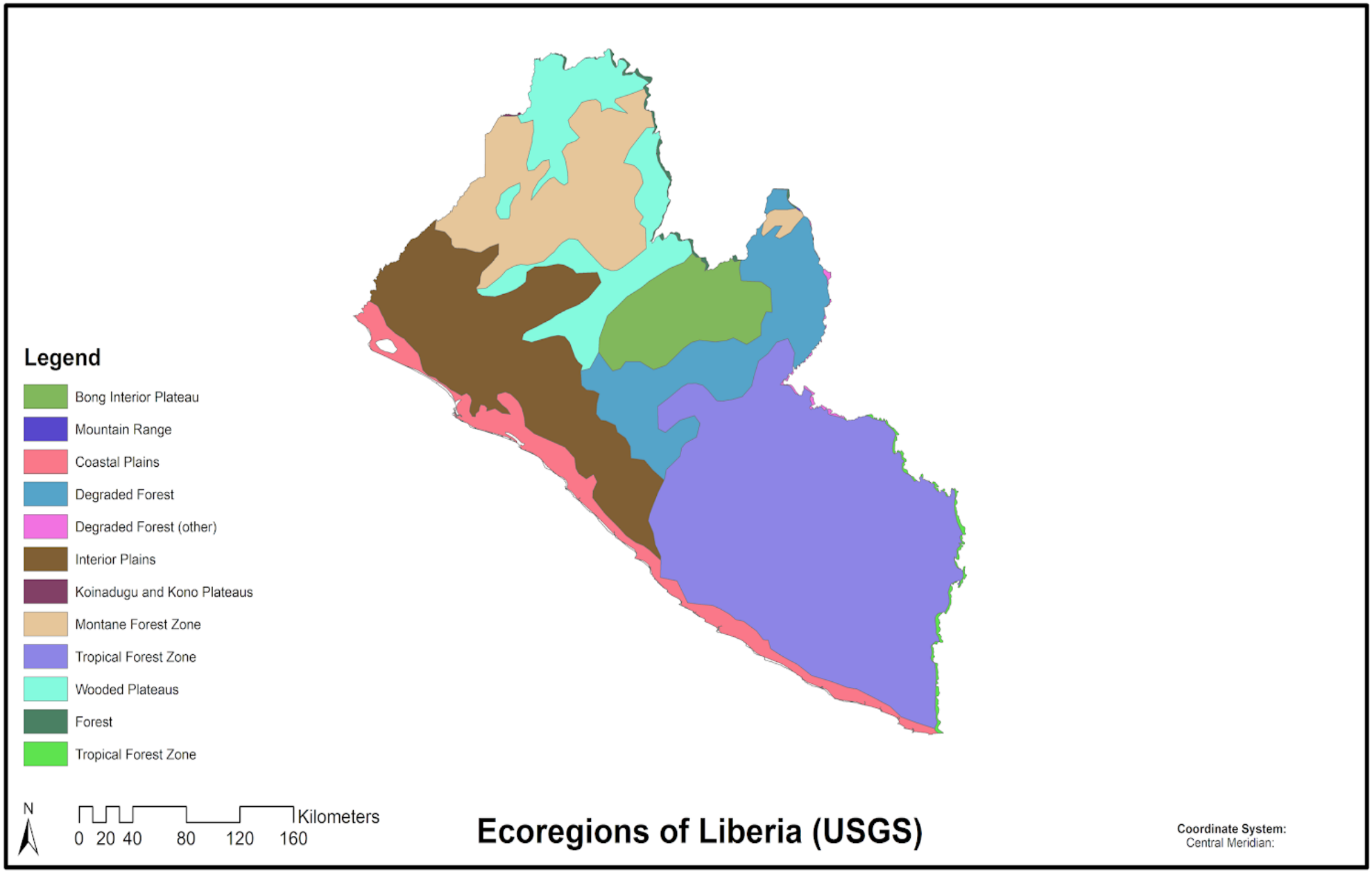


Figure 4: Homogenous Ecoregions of Liberia (Olson, 2002)

Citations

Comité Permanent Inter-états de Lutte contre la Sécheresse dans le Sahel [CILSS], 2016, Landscapes of West Africa—A window on a changing world: Ouagadougou, Burkina Faso, CILSS, 219 p. [Also available at *https://eros.usgs.gov/ westafrica*].

Olson, D. M. and E. Dinerstein. 2002. The Global 200: Priority ecoregions for global conservation. (PDF file) Annals of the Missouri Botanical Garden 89:125-126. The Nature Conservancy, USDA Forest Service and U.S. Geological Survey, based on Bailey, Robert G. 1995. Description of the ecoregions of the United States (2nd ed.). Misc. Pub. No. 1391, Map scale 1:7,500,000. USDA Forest Service. 108pp. The Nature Conservancy (2003), based on Wiken, E.B. (compiler). 1986. Terrestrial ecozones of Canada. Ecological Land Classification Series No. 19. Environment Canada, Hull, Que. 26 pp. + map.


Legend
Bong Interior Plateau
Mountain Range
Coastal Plains
Degraded Forest
Degraded Forest (other)
Interior Plains
Koinadugu and Kono Plateaus
Montane Forest Zone
Tropical Forest Zone
Wooded Plateaus
Forest
Tropical Forest Zone
N
0 20 40 80 120 160
Kilometers
Ecoregions of Liberia (USGS)
Coordinate System:
Central Meridian:

Map 2.1: Liberia Ecological Land Units

This map is based on Sayre, 2017. It is the most up-to-date and high resolution (250m) characterization of global Ecological Land Units (ELUs). At the foundation of the data set are raster inputs on bioclimate, landform, lithology, and land cover. The ELUs are an important decision support tool, particularly alongside ecoregional analysis.

Related Content and Findings

In reference to the application of ELUs and their importance for decision support, Sayre, remarks that, "The ELUs and other potential ecological facet aggregations provide an accounting framework to assess ecosystem services, such as carbon storage and soil formation, as well as risks such as environmental degradation. The ELUs also lend themselves to the study of ecological diversity, rarity, and evolutionary isolation. For example, we can identify whether the most diverse landscapes in terms of proximity to the most unique ELUs are protected. Understanding diversity can point the way to conservation and preservation planning."

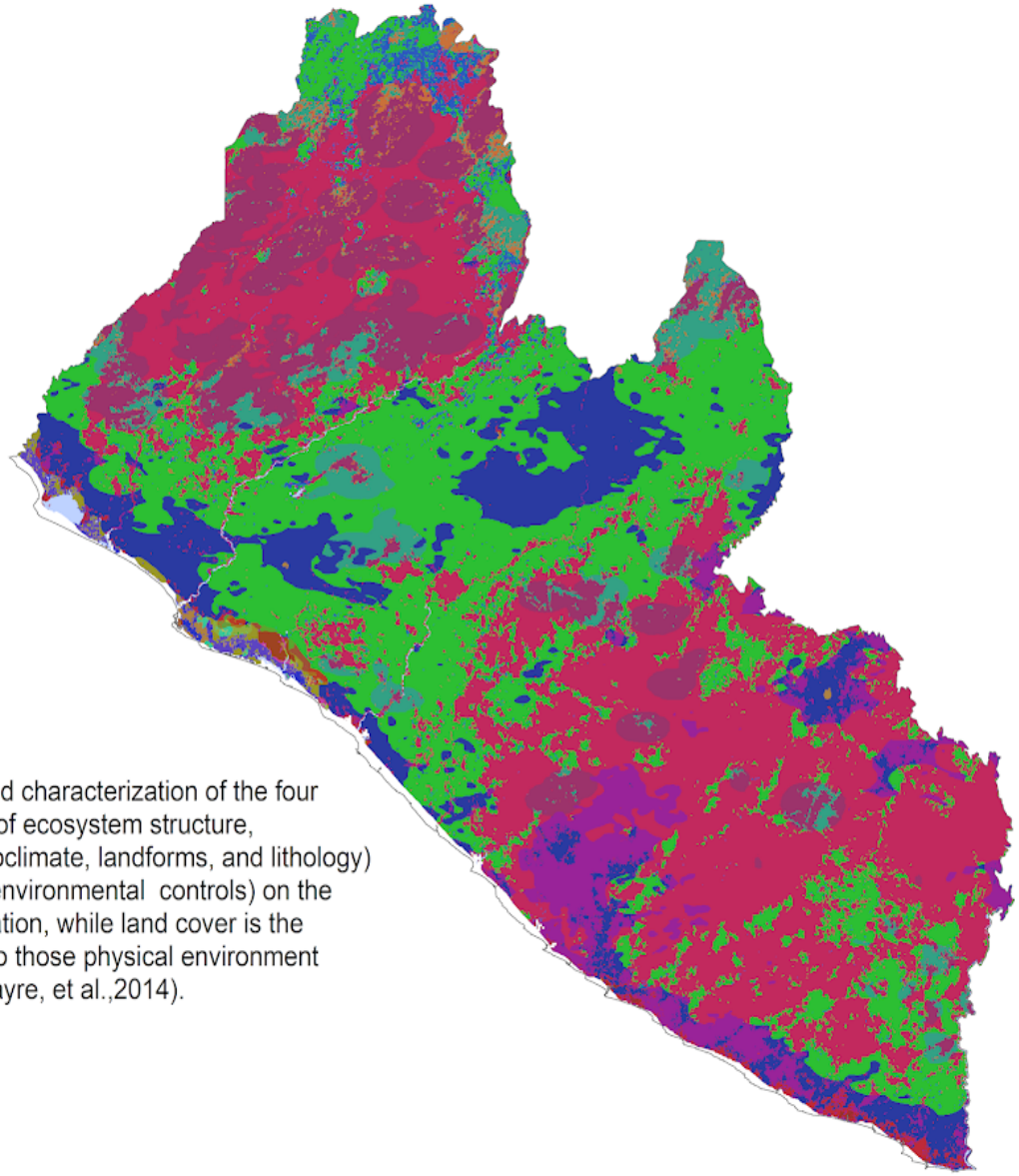
It is worth noting that the ELUs correctly portray the moist, Upper Guinean forests as well as croplands (see map and accompanying graph, below). In addition, they detail the great diversity of the region, providing a basis for further research into biodiversity and habitat, should it be required.

This is a 250m product, with a high degree of granularity, designed to be used alongside MODIS and other global products, particularly for agro-ecological and climate change analysis.

Citations

Sayre, R., J. Dangermond, C. Frye, R. Vaughan, P. Aniello, S. Breyer, D. Cribbs, D. Hopkins, R. Nauman, W. Derrenbacher, D.Wright, C. Brown, C. Convis, J. Smith, L. Benson, D. Paco VanSistine, H. Warner, J. Cress, J. Danielson, S. Hamann, T. Cecere, A. Reddy, D. Burton, A. Grosse, D. True, M. Metzger, J. Hartmann, N. Moosdorf, H. Dürr, M. Paganini, P. DeFourny, O. Arino, S. Maynard, M. Anderson, and P. Comer, 2014, A New Map of Global Ecological Land Units – An Ecophysiographic Stratification Approach. Washington, DC: Association of American Geographers. 46 pages.

Olson, D. M. and E. Dinerstein. 2002. The Global 200: Priority ecoregions for global conservation. (PDF file) Annals of the Missouri Botanical Garden 89:125-126. -The Nature Conservancy, USDA Forest Service and U.S. Geological Survey, based on Bailey, Robert G. 1995. Description of the ecoregions of the United States (2nd ed.). Misc. Pub. No. 1391, Map scale 1:7,500,000. USDA Forest Service. 108pp. -The Nature Conservancy (2003), based on Wiken, E.B. (compiler). 1986. Terrestrial ecozones of Canada. Ecological Land Classification Series No. 19. Environment Canada, Hull, Que. 26 pp. + ma



ELUs are an integrated characterization of the four basic elements of ecosystem structure, the first three of which (bioclimate, landforms, and lithology) are physical drivers (environmental controls) on the distribution of vegetation, while land cover is the vegetative response to those physical environment drivers (Sayre, et al.,2014).

N

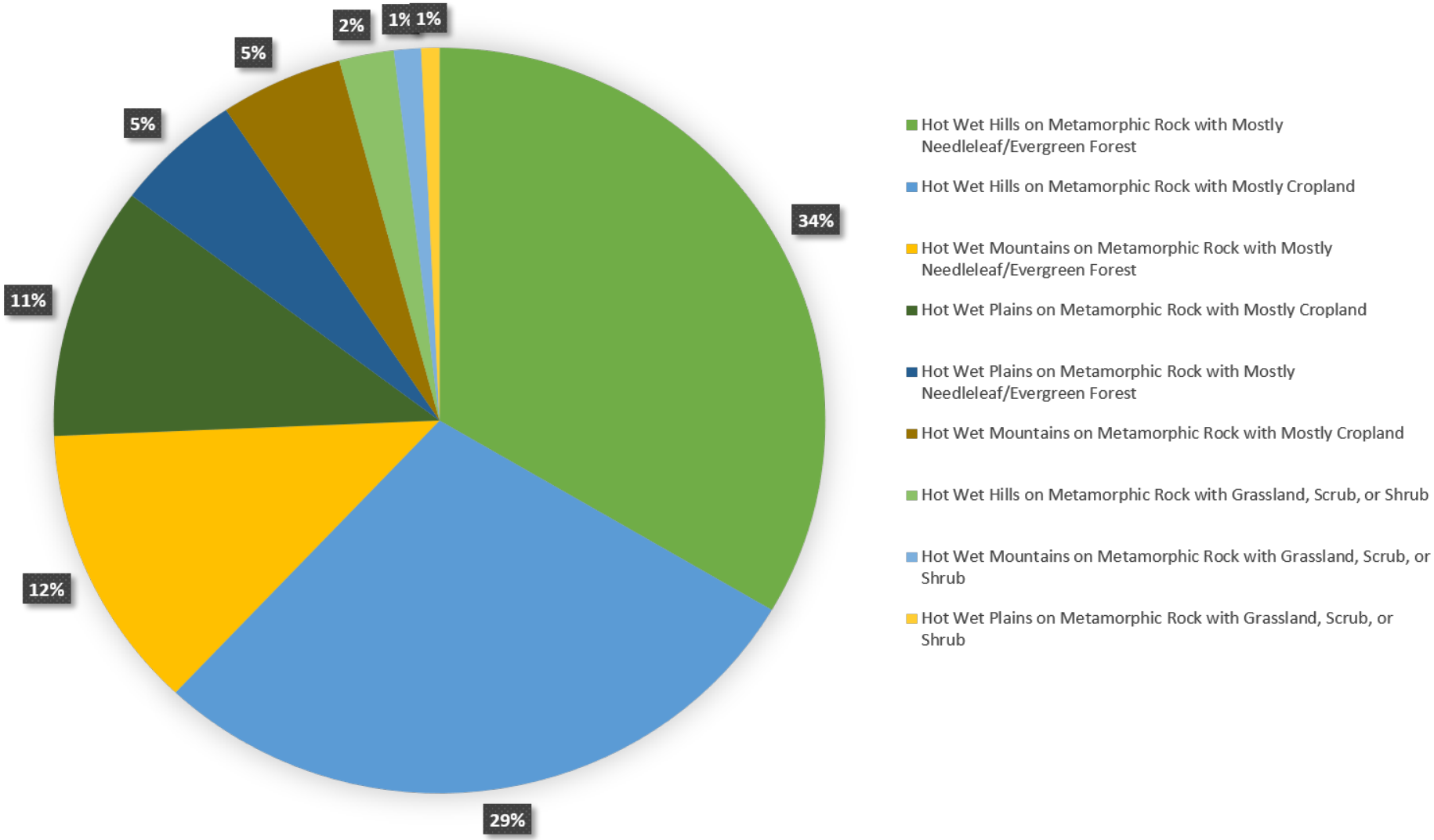
0 15 30 60 90 120 Kilometers

Ecological Land Units of Liberia (250m)

Coordinate System:
Central Meridian:


Legend
ClassName
Artificial or Urban Area
Hot Wet Hills on Metamorphic Rock with Grassland, Scrub, or Shrub
Hot Wet Hills on Metamorphic Rock with Mostly Cropland
Hot Wet Hills on Metamorphic Rock with Mostly Deciduous Forest
Hot Wet Hills on Metamorphic Rock with Mostly Needleleaf/Evergreen Forest
Hot Wet Hills on Metamorphic Rock with Swampy or Often Flooded Vegetation
Hot Wet Hills on Mixed Sedimentary Rock with Grassland, Scrub, or Shrub
Hot Wet Hills on Mixed Sedimentary Rock with Mostly Cropland
Hot Wet Hills on Mixed Sedimentary Rock with Mostly Needleleaf/Evergreen Forest
Hot Wet Hills on Non-Acidic Volcanics with Grassland, Scrub, or Shrub
Hot Wet Hills on Non-Acidic Volcanics with Mostly Cropland
Hot Wet Hills on Non-Acidic Volcanics with Mostly Needleleaf/Evergreen Forest
Hot Wet Hills on Non-Carbonate Sedimentary Rock with Grassland, Scrub, or Shrub
Hot Wet Hills on Non-Carbonate Sedimentary Rock with Mostly Cropland
Hot Wet Hills on Unconsolidated Sediment with Grassland, Scrub, or Shrub
Hot Wet Hills on Unconsolidated Sediment with Mostly Cropland
Hot Wet Hills on Unconsolidated Sediment with Mostly Needleleaf/Evergreen Forest
Hot Wet Mountains on Metamorphic Rock with Grassland, Scrub, or Shrub
Hot Wet Mountains on Metamorphic Rock with Mostly Cropland
Hot Wet Mountains on Metamorphic Rock with Mostly Deciduous Forest
Hot Wet Mountains on Metamorphic Rock with Mostly Needleleaf/Evergreen Forest
Hot Wet Mountains on Metamorphic Rock with Swampy or Often Flooded Vegetation
Hot Wet Mountains on Non-Acidic Volcanics with Grassland, Scrub, or Shrub
Hot Wet Mountains on Non-Acidic Volcanics with Mostly Cropland
Hot Wet Mountains on Non-Acidic Volcanics with Mostly Needleleaf/Evergreen Forest
Hot Wet Plains on Metamorphic Rock with Grassland, Scrub, or Shrub
Hot Wet Plains on Metamorphic Rock with Mostly Cropland
Hot Wet Plains on Metamorphic Rock with Mostly Deciduous Forest
Hot Wet Plains on Metamorphic Rock with Mostly Needleleaf/Evergreen Forest
Hot Wet Plains on Metamorphic Rock with Swampy or Often Flooded Vegetation
Hot Wet Plains on Mixed Sedimentary Rock with Grassland, Scrub, or Shrub
Hot Wet Plains on Mixed Sedimentary Rock with Mostly Cropland
Hot Wet Plains on Mixed Sedimentary Rock with Mostly Needleleaf/Evergreen Forest
Hot Wet Plains on Non-Acidic Volcanics with Grassland, Scrub, or Shrub
Hot Wet Plains on Non-Acidic Volcanics with Mostly Cropland
Hot Wet Plains on Non-Acidic Volcanics with Mostly Deciduous Forest
Hot Wet Plains on Non-Acidic Volcanics with Mostly Needleleaf/Evergreen Forest
Hot Wet Plains on Non-Acidic Volcanics with Swampy or Often Flooded Vegetation
Hot Wet Plains on Non-Carbonate Sedimentary Rock with Grassland, Scrub, or Shrub
Hot Wet Plains on Non-Carbonate Sedimentary Rock with Mostly Cropland
Hot Wet Plains on Non-Carbonate Sedimentary Rock with Mostly Deciduous Forest
Hot Wet Plains on Non-Carbonate Sedimentary Rock with Mostly Needleleaf/Evergreen Forest
Hot Wet Plains on Unconsolidated Sediment with Grassland, Scrub, or Shrub
Hot Wet Plains on Unconsolidated Sediment with Mostly Cropland
Hot Wet Plains on Unconsolidated Sediment with Mostly Deciduous Forest
Hot Wet Plains on Unconsolidated Sediment with Mostly Needleleaf/Evergreen Forest
Hot Wet Plains on Unconsolidated Sediment with Swampy or Often Flooded Vegetation
Surface Water

Ecological Land Units in Liberia With at Least One Percent Areal Coverage



Map 2.2 Simpson's Biodiversity Index for Liberia

The following map is based off of the MODIS EVI product (Didan, 2015; Tuanmu, 2015). The Simpson's Index is calculated as:

$$SIDI = 1 - \sum_{i=1}^{m} P_i^2$$

.

The Simpson's index represents the probability that any 2 pixels selected at random would be different patch types. Applied to landscape geography maps such as the following, the Simpsons Index provides a useful predictor of areas of high and low biodiversity.

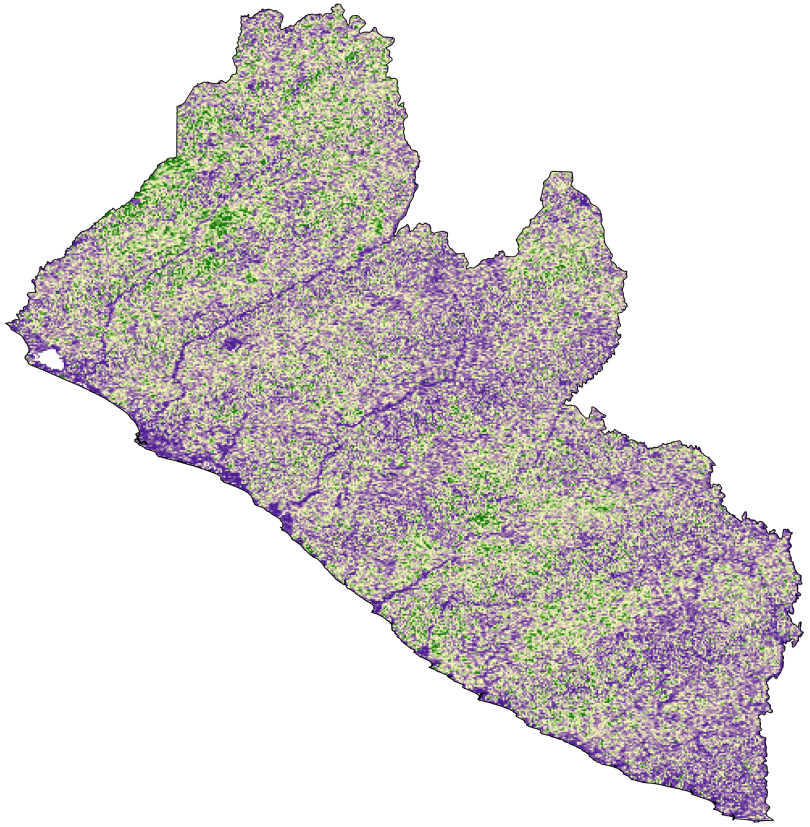
Findings: Initial spatial statistics show a correlation between areas of predicted high biodiversity and other maps depicting dense forests (see Map 3.4). The likelihood is higher that protected areas will be less fragmented and have more biodiverse habitat. It is anticipated that additional research will yield further insights into the relationship between the Simpson's Index and other indices and biodiversity in Liberia.

Citations:

Didan, K. (2015). *MOD13Q1 MODIS/Terra Vegetation Indices 16-Day L3 Global 250m SIN Grid V006* [Data set]. NASA EOSDIS LP DAAC. doi: 10.5067/MODIS/MOD13Q1.006.

Simpson, E. H. (1949). Measurement of diversity. Nature,163 688.

Tuanmu, M.-N. and W. Jetz. (2015) A global, remote sensing-based characterization of terrestrial habitat heterogeneity for biodiversity and ecosystem modeling. Global Ecology and Biogeography. DOI: 10.1111/geb.12365.



Legend

FRAG

Value

Low Biodiversity

High Biodiversity

Liberia Biodiversity (Simpson's Index)

0 25 50 100 150 200 Kilometers

N

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Map 3.0: Liberia Land Use/Land Cover – West African Regional Subset

The USGS, in combination with partners in Africa, has developed a land cover change analysis of West Africa. The time series uses ~30m Landsat satellite data from 1975, 2000, 2013. At each stage, the satellite image is classified using an image interpretation technique then further validated using aerial imagery, google maps and other resources.

Related Content and Findings

The product was reviewed by local experts and is a useful reference for the regional land cover. The attention to regional detail is important as global land cover classifications may well conflate classes such as “Gallery Forest” with typical forest cover.

Important findings include:

- While the land cover classification differs substantially from that in the ESA product, above, the USGS product similarly captures the central agricultural corridor.
- As detailed in Table 11 it is evident that Liberia was characterized by significant growth of agricultural extent accompanied by forest degradation and forest loss.

Citations

Comité Permanent Inter-états de Lutte contre la Sécheresse dans le Sahel [CILSS], 2016, Landscapes of West Africa—A window on a changing world: Ouagadougou, Burkina Faso, CILSS, 219 p. [Also available at *https://eros.usgs.gov/ westafrica*].

Tappan, G. G., Cushing, W.M., Cotillon, S.E., Mathis, M.L., Hutchinson, J.A., and Dalsted, K.J., 2016, West Africa Land Use Land Cover Time Series: U.S. Geological Survey data release, http://dx.doi.org/10.5066/F73N21JF.

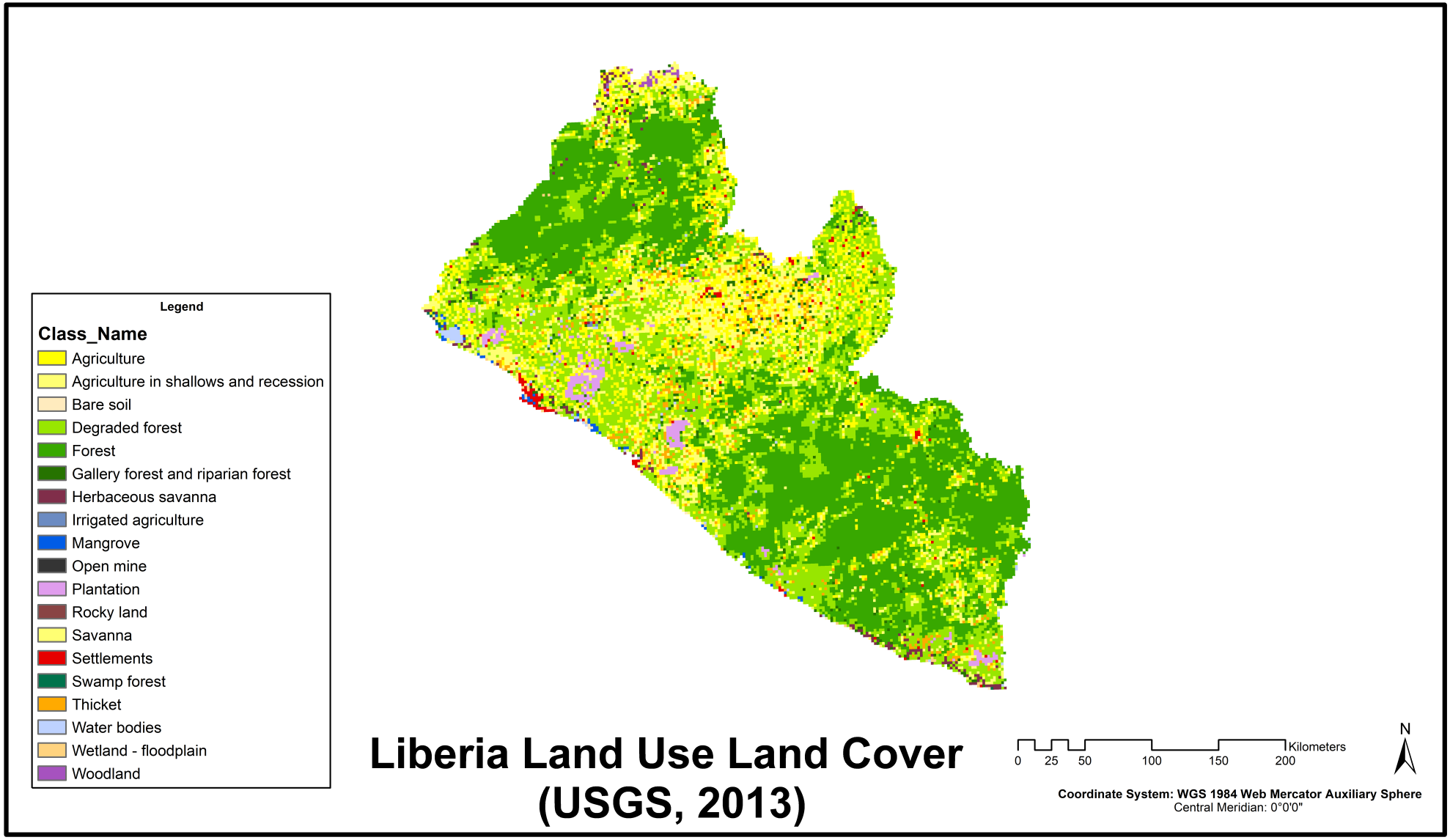

Legend
Class_Name
Agriculture
Agriculture in shallows and recession
Bare soil
Degraded forest
Forest
Gallery forest and riparian forest
Herbaceous savanna
Irrigated agriculture
Mangrove
Open mine
Plantation
Rocky land
Savanna
Settlements
Swamp forest
Thicket
Water bodies
Wetland - floodplain
Woodland
Liberia Land Use Land Cover
(USGS, 2013)
0 25 50 100 150 200
Kilometers
N
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Table 11: Land Cover time series change 1975-2013

Land cover classes	1975		2000		2013	
	Area (km^2)	Percent of total area	Area (km^2)	Percent of total area	Area (km^2)	Percent of total area
Agriculture	7,428	7.75	8,868	9.25	12,744	13.29
Agriculture in shallows and recession	16	0.02	16	0.02	12	0.01
Bare soil	60	0.06	48	0.05	52	0.05
Degraded forest	25,232	26.31	26,296	27.42	28,192	29.40
Forest	41,716	43.50	38,808	40.47	35,308	36.82
Gallery forest and riparian forest	1,976	2.06	1,976	2.06	1,800	1.88
Herbaceous savanna	816	0.85	828	0.86	832	0.87
Irrigated agriculture	12	0.01	12	0.01	28	0.03
Mangrove	196	0.20	196	0.20	204	0.21
Open mine	36	0.04	44	0.05	60	0.06
Plantation	1,096	1.14	1,336	1.39	1,424	1.48
Rocky land	16	0.02	16	0.02	16	0.02
Savanna	10,464	10.91	11,456	11.95	10,960	11.43
Settlements	504	0.53	572	0.60	628	0.65
Swamp forest	28	0.03	28	0.03	28	0.03
Thicket	248	0.26	1,204	1.26	2,816	2.94
Water bodies	396	0.41	432	0.45	544	0.57
Wetland - floodplain	228	0.24	224	0.23	124	0.13

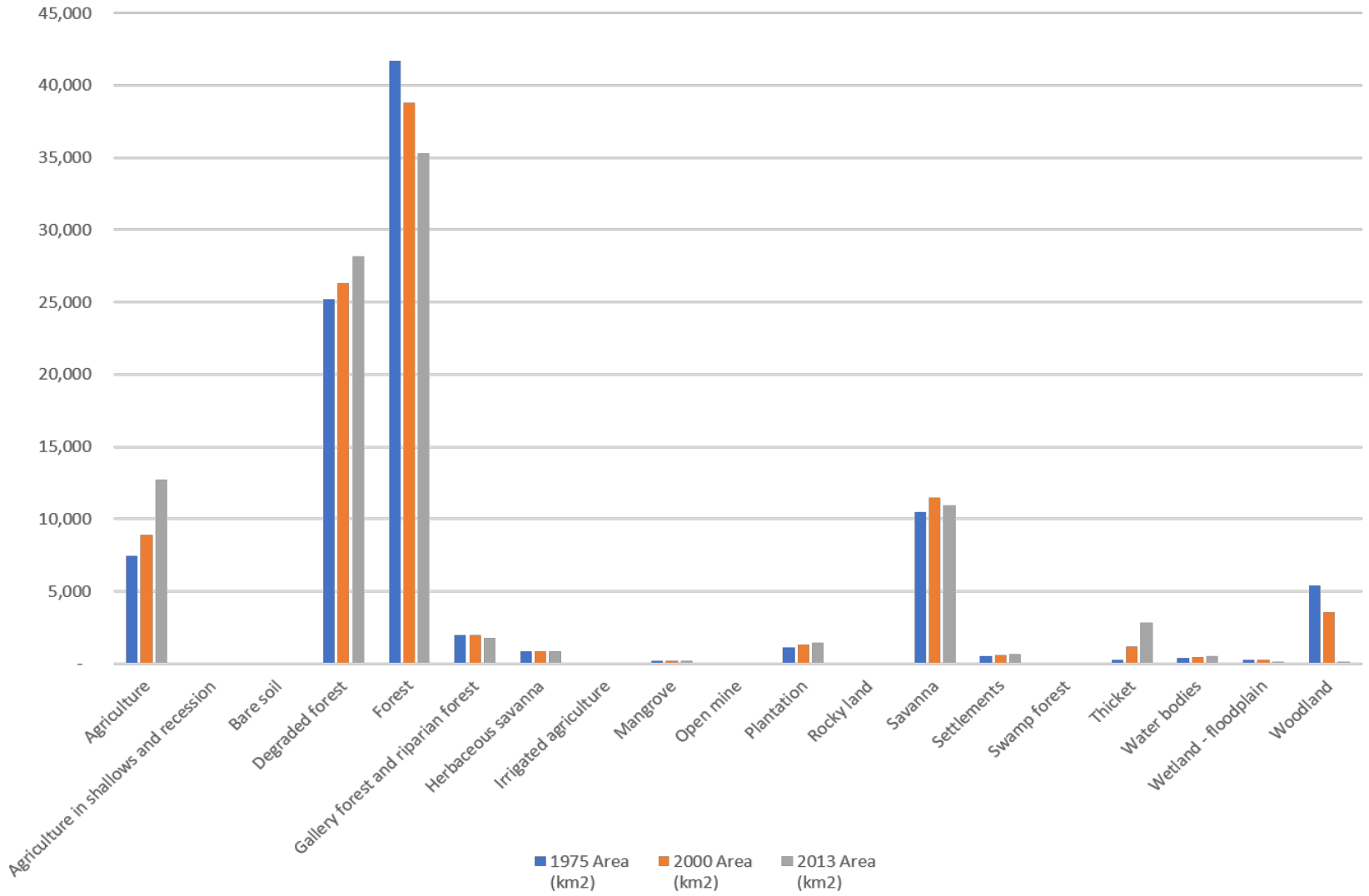


Figure 5: Areal change by land cover type

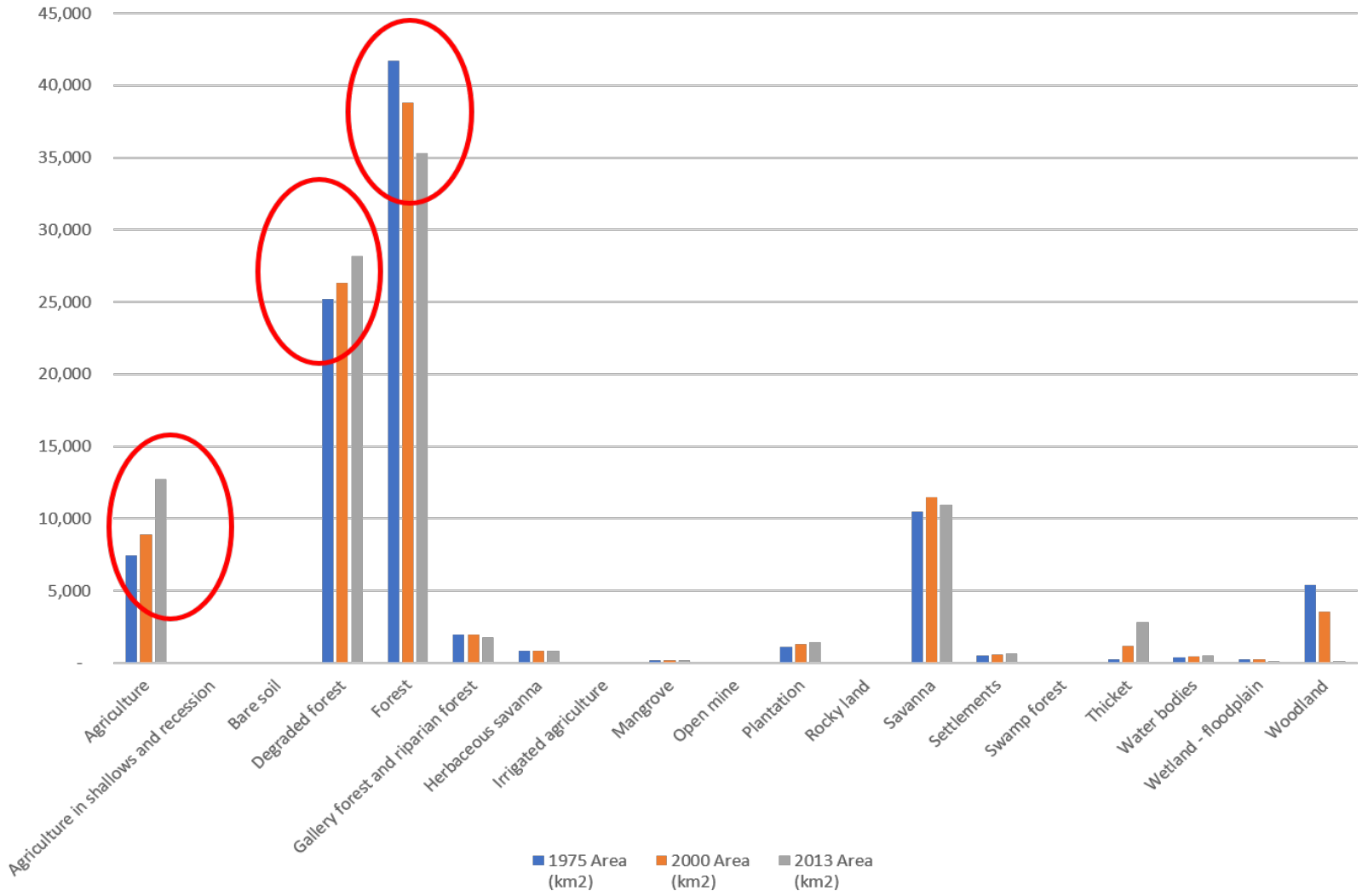


Figure 6: Salience changes in areal extent

Map 3.1: Liberia Landcover (Percent Cover Class)

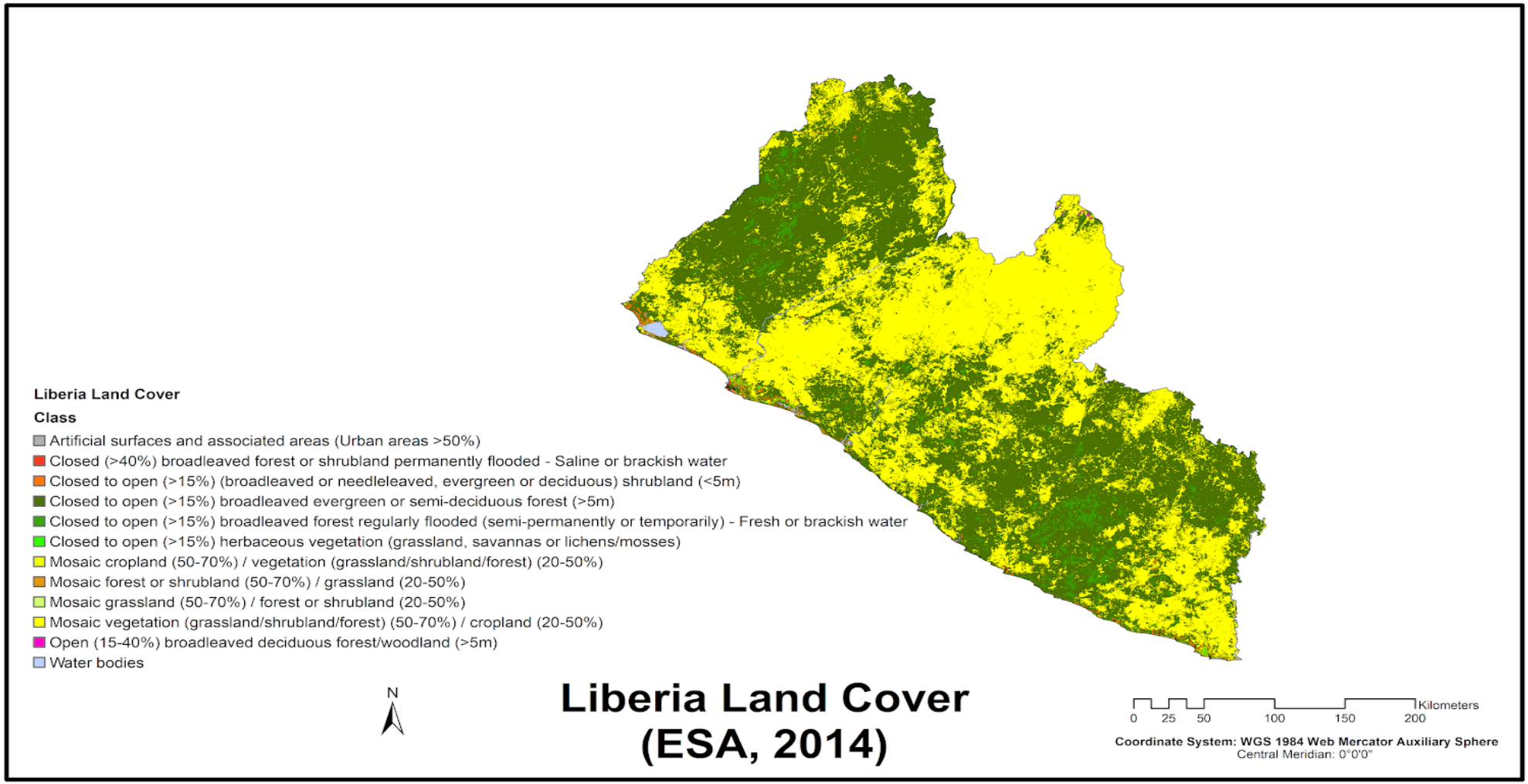
The following map portrays the land cover of Liberia at 300m resolution, by percent cover class. This provides significant insight into mixed land cover, e.g. cropland/grassland. The other land cover classifications provided here are not able to do this. This map resource provides an excellent introduction to the land cover of Liberia and useful compared against more distinct or regional classifications such as the USGS classification.

Related Content and Findings

This map resource is intended as an introduction to the land cover of Liberia and is a useful tool in tandem with discrete or regional classifications such as the USGS classification (following).

Citation

Arino, Olivier; Ramos Perez, Jose Julio; Kalogirou, Vasileios; Bontemps, Sophie; Defourny, Pierre; Van Bogaert, Eric (2012): Global Land Cover Map for 2009 (GlobCover 2009). © European Space Agency (ESA) & Université catholique de Louvain (UCL), PANGAEA, https://doi.org/10.1594/PANGAEA.787668. [updated as ESA, 2014]


Liberia Land Cover
Class
Artificial surfaces and associated areas (Urban areas >50%)
Closed (>40%) broadleaved forest or shrubland permanently flooded - Saline or brackish water
Closed to open (>15%) (broadleaved or needleleaved, evergreen or deciduous) shrubland (<5m)
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)
Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water
Closed to open (>15%) herbaceous vegetation (grassland, savannas or lichens/mosses)
Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)
Mosaic forest or shrubland (50-70%) / grassland (20-50%)
Mosaic grassland (50-70%) / forest or shrubland (20-50%)
Mosaic vegetation (grassland/shrubland/forest) (50-70%) / cropland (20-50%)
Open (15-40%) broadleaved deciduous forest/woodland (>5m)
Water bodies
N
Liberia Land Cover
(ESA, 2014)
0 25 50 100 150 200 Kilometers
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Map 3.2: Liberia Forest Cover Change 2000-2016

Derived from 30m Landsat data, the 2000-2016 time series of annual forest loss is a useful tool for visualizing and accounting forest loss in Liberia. Areas exhibiting net forest loss over this period are delineated in red. Areas with opposite trend (very few) are blue.

Related Content and Findings

The` areas that experienced the greatest areal extent of forest loss are in the coastal area and in the agricultural corridor. Note that this data set is not designed to specifically identify the type of forest loss or its diversity, but such change could be modeled as an additional activity.

Citation

Hansen, M. C`., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. “High-Resolution Global Maps of 21st-Century Forest Cover Change.” Science 342 (15 November): 850–53. Data available on-line from: http://earthenginepartners.appspot.com/science-2013-global-forest. [updated]


Legend
Major Cities
Forest Cover Gain
Value
Gain
Forest Cover Loss
Value
Loss
Percent Forest Cover
Range
1 - 10
10-20
20-30
30-40
40-50
50-60
60-70
70-80
80-90
90-100
Voinjama
Sanniquellie
Bopolu
Gbarnga
Tubmanburg
Robertsport
Kakata
Bensonville
Monrovia
Zwedru
Buchanan
Cestos City
Fish Town
Greenville
Barclayville
Harper
N
Liberia Forest Cover Change
2000-2016
Forest area lost in Liberia: 722942 km2
Forest area lost in concessions (fiber, oil, plantations): 98361 km2
0 25 50 100 150 200 Kilometers
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Map 3.3: Liberia Forest Cover Change 2000-2016 with Overlay of Community Forests and Protected Areas

The following map is a modification of the above map with an overlay of polygons representing community forests and protected areas.

Related Content and Findings

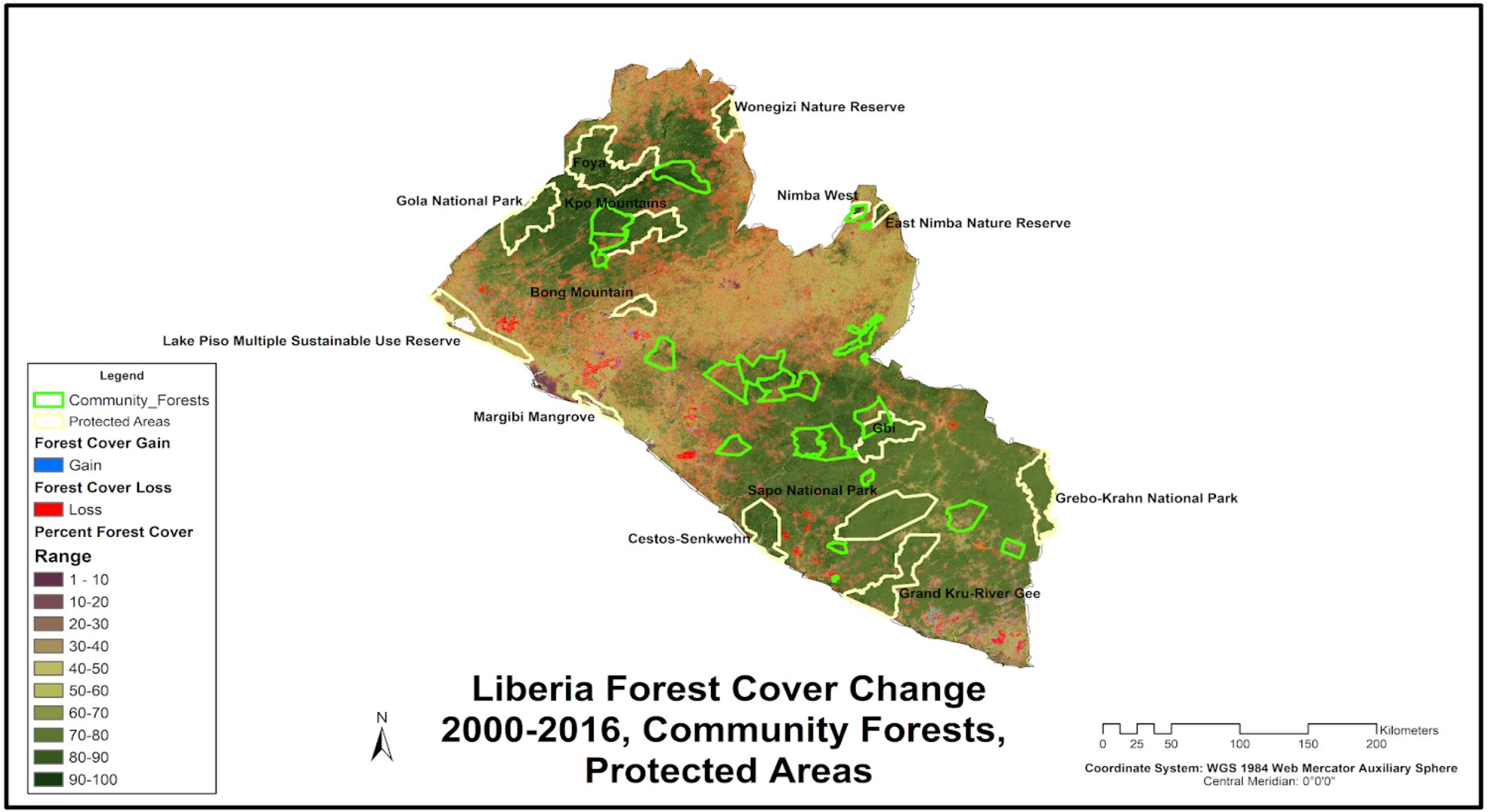
Note that in the North and South, the community forests are play an important role as a border between the agricultural corridor and the intact forests.

Citations

Global Forest Watch, Liberia Community Forests. Accessed 2018. http://data.globalforestwatch.org/datasets/28f8f523aa594da2914d1b3392843634_11

Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." Science 342 (15 November): 850–53. Data available on-line from: http://earthenginepartners.appspot.com/science-2013-global-forest. [updated]

UNEP-WCMC (2017). Protected areas map of the world, July 2017.


Wonegizi Nature Reserve
Foya
Gola National Park
Kpo Mountains
Nimba West
East Nimba Nature Reserve
Bong Mountain
Lake Piso Multiple Sustainable Use Reserve
Margibi Mangrove
Gbi
Sapo National Park
Grebo-Krahn National Park
Cestos-Senkwehn
Grand Kru-River Gee
Legend
Community_Forests
Protected Areas
Forest Cover Gain
Gain
Forest Cover Loss
Loss
Percent Forest Cover
Range
1 - 10
10-20
20-30
30-40
40-50
50-60
60-70
70-80
80-90
90-100
N
Liberia Forest Cover Change 2000-2016, Community Forests, Protected Areas
0 25 50 100 150 200
Kilometers
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Map 3.4: Liberia Dense Forests

In West Africa, the "forest" land cover class is associated with dense tropical evergreen rain forest and moist deciduous forest, and a closed canopy cover (White, 1983). The forest class occurs mainly along the coast where rainfall is higher. Of all the Upper Guinean countries, only Liberia (Map 4.2) lies entirely within the moist forest zone. About 50 percent of the remaining Upper Guinean dense forest is contained within Liberia. This characterizes the dense forest visualized in the following map. Areas of degraded forest are omitted. (CILSS, 2016)

Related Content and Findings

There are two key findings associated with map 4.2:

1) The map details not ecoregions or land cover classes per se but ***patches of forest with dense condition***. This is a notable conservation characteristic and coincident or connected patches have important implications for forest landscapes, habitats and corridors.

2) Figure 7 demonstrates that almost all of the dense forest in Liberia is Upper Guinean moist dense forest. The map of ELUs yields greater insight into the densely forested areas.

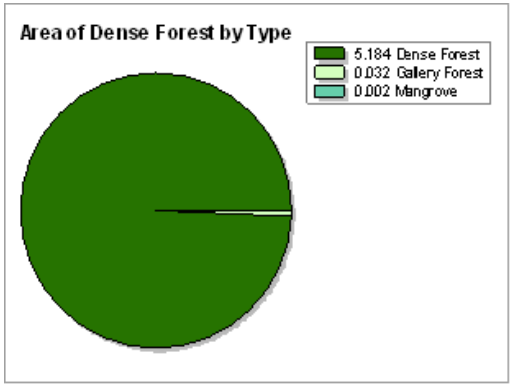
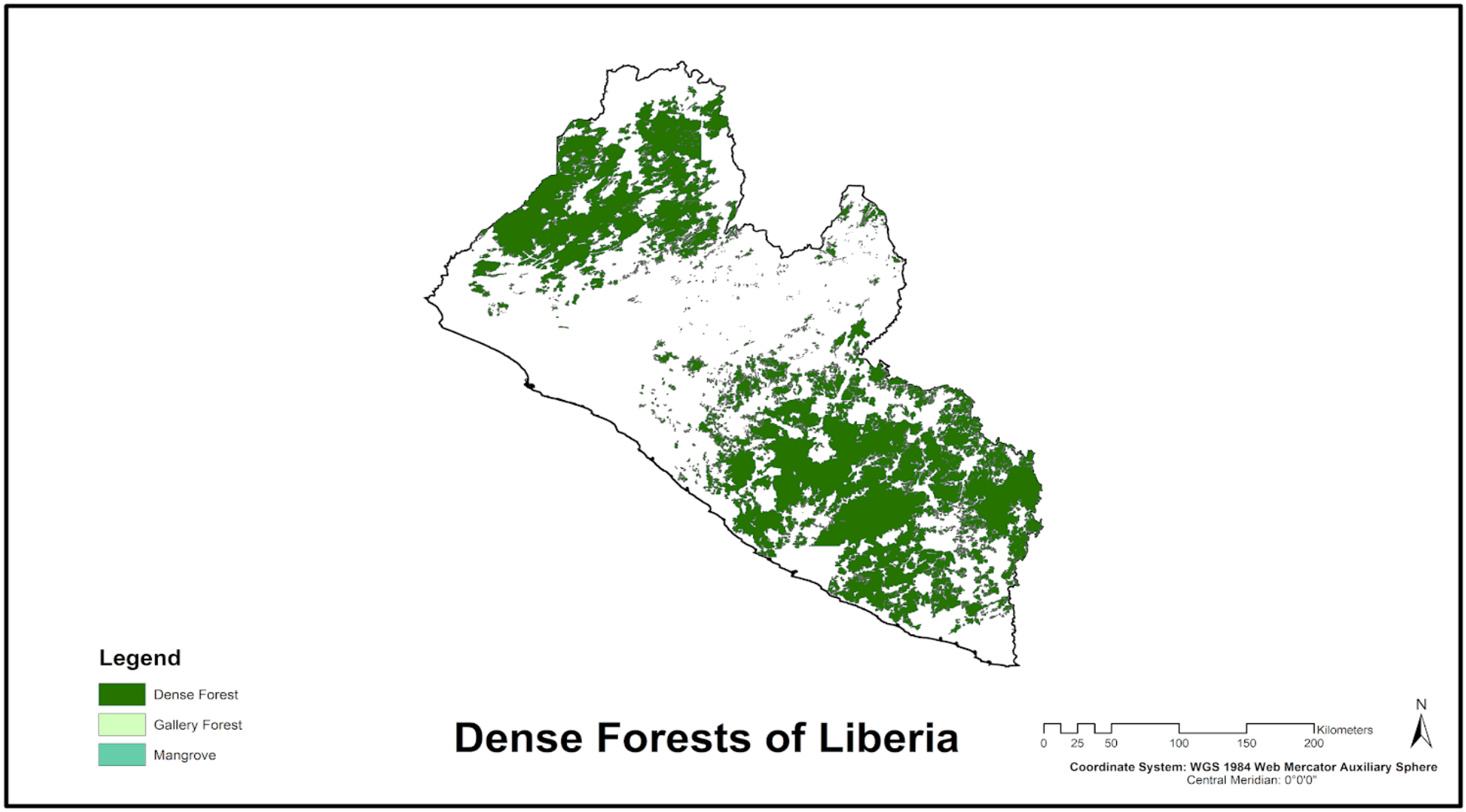


Figure 7: Areal Ratio of Dense Forests by Type

Citations

Comité Permanent Inter-états de Lutte contre la Sécheresse dans le Sahel [CILSS], 2016, Landscapes of West Africa—A window on a changing world: Ouagadougou, Burkina Faso, CILSS, 219 p. [Also available at https://eros.usgs.gov/ *westafrica*].

White, F., 1983, The Vegetation of Africa: A Descriptive Memoir to Accompany the UNESCO/ AETFAT/UNSO Vegetation Map of Africa: The Geographical Journal, v. 151, no. 1, p. 132, at http://dx.doi.org/10.2307/633318.


Legend
Dense Forest
Gallery Forest
Mangrove
Dense Forests of Liberia
0 25 50 100 150 200
Kilometers
N
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Map 4.0: Protected Areas and National Forests of Liberia

The following map serves as a reference map for the current and proposed protected areas of Liberia.

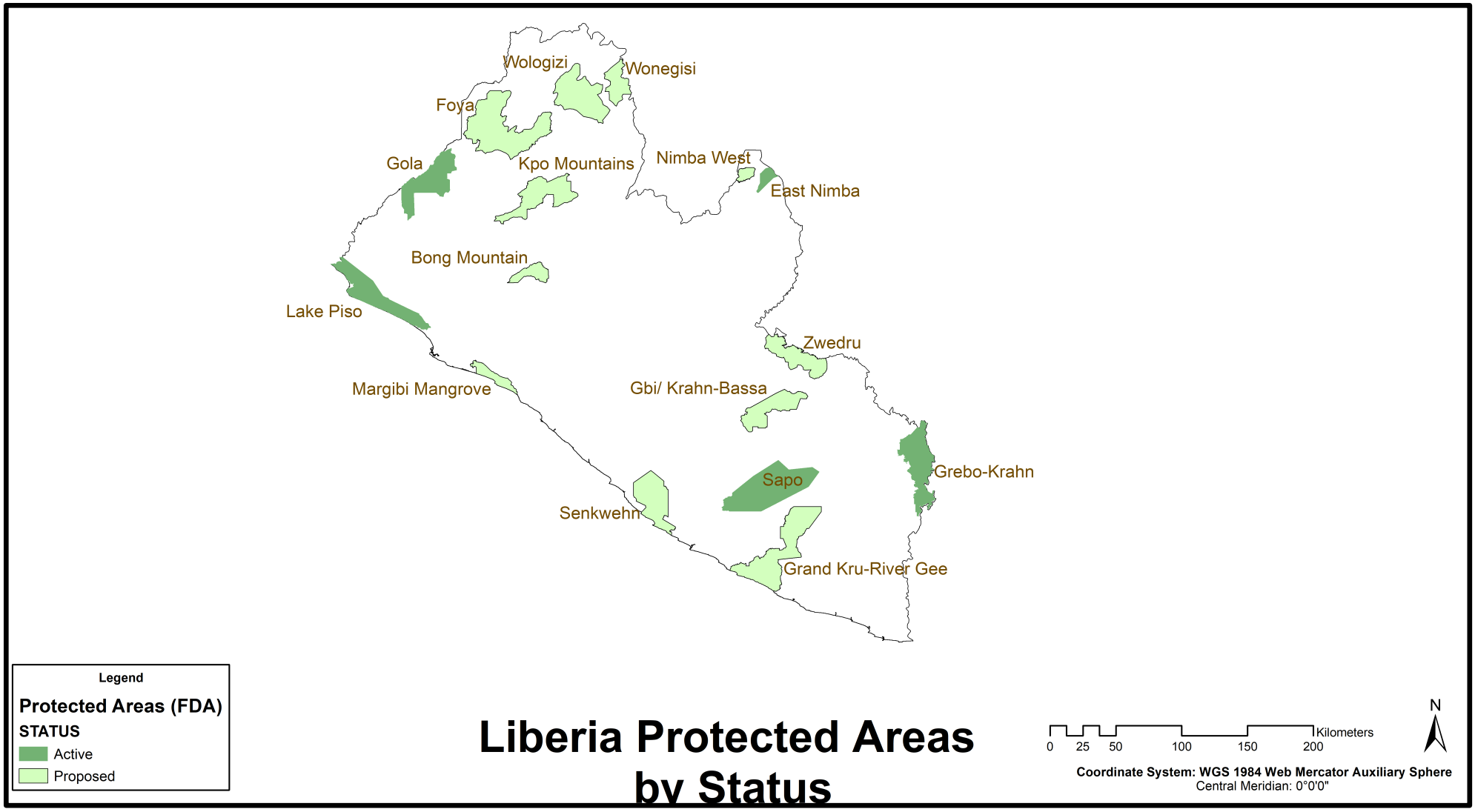
Citations

UNEP-WCMC (2017). Protected areas map of the world, July 2017.

Liberia, 2018. Forestry Development Authority (FDA). Accessed, 2018: http://www.fda.gov.lr/ and online at ESRI.com.

NB: Liberian map data is incomplete and inconsistent. In this map, site of proposed Krahn-Bassa National Park is based upon the Krahn-Bassa National Forest. The map data for the Krahn-Bassa National Forest is inaccurate in size and placement, according to key informants. Moreover, the fieldwork to identify the boundaries of the proposed protected area is not complete, so the location of the proposed protected area is not known precisely at the time of this writing (April 2018).

Kpo Mountains and Kpelle are used interchangeably in FDA materials. On some maps, the site here labeled Kpo Mountains is labeled Kpelle National Forest.


Wologizi
Wonegisi
Foya
Gola
Kpo Mountains
Nimba West
East Nimba
Bong Mountain
Lake Piso
Zwedru
Margibi Mangrove
Gbi/ Krahn-Bassa
Grebo-Krahn
Sapo
Senkwehn
Grand Kru-River Gee
Legend
Protected Areas (FDA)
STATUS
Active
Proposed
Liberia Protected Areas by Status
0 25 50 100 150 200
Kilometers
N
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Map 4.1: Protected Areas and Community Forests Conflicting with Concessions

The concessions in Liberia represent a complex and often conflicting patchwork landscape. The comprehensive GoL-USAID data layer in the below map highlights this fact.

Related Content and Findings

Key findings from the map analysis include:

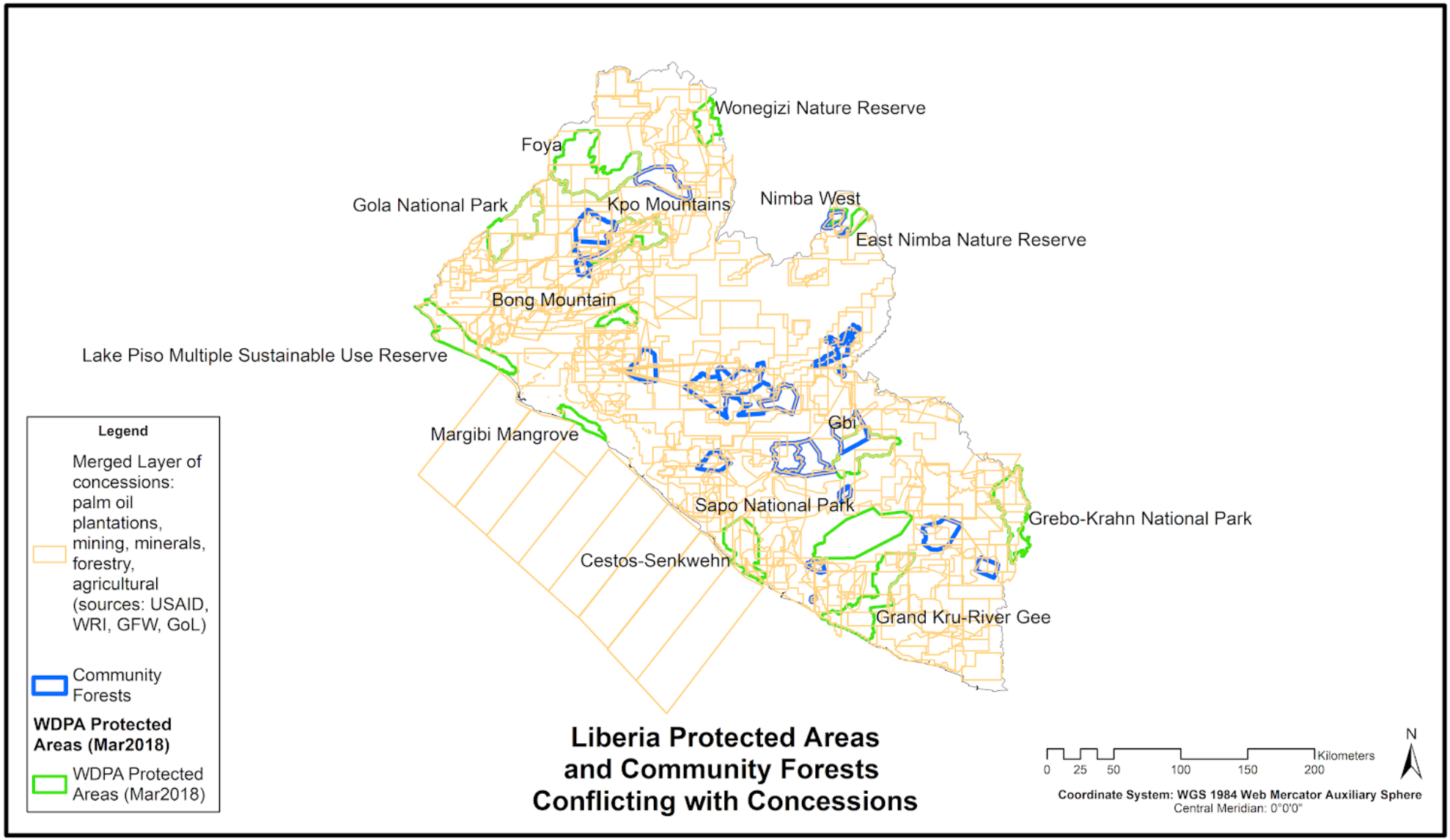
- Due to their overlapping nature, it is "clear that it is unclear" where the boundaries of the concessions begin and end.
- There are potentially important environmental implications as many of the concession impinge on the dense forests.
- Many of the concessions overlap protected areas and it is unclear how they relate to community forestry projects.
- It is anticipated that concessions will continue to develop in Liberia. Bunte (2017), noted specifically that a series of corridors (including the central agricultural corridor and a northwesterly coastal corridor) are used as a rollout mechanism for concessions. Bunte also stated that, "natural resource concessions improve local economic growth outcomes. However, there is important variation across different types of concessions and concessionaires. Mining concessions outperform agricultural concessions, and concessions granted to Chinese investors outperform concessions granted to U.S. investors." Finally, the report found that US commercial responsibility projects had no discernable effect on economic wellbeing in Liberia.

Citation

UNEP-WCMC (2017). Protected areas map of the world, July 2017.

Bunte, Jonas B., Harsh Desai, Kanio Gbala, Bradley C. Parks, Daniel Miller Runfola. 2017. Natural Resource Sector FDI and Growth in Post-Conflict Settings: Subnational Evidence from Liberia. AidData Working Paper #34. Williamsburg, VA: AidData. Accessed at http://aiddata.org/working-papers.

Global Forest Watch, Liberia Community Forests. Accessed 2018.


Wonegizi Nature Reserve
Foya
Gola National Park
Kpo Mountains
Nimba West
East Nimba Nature Reserve
Bong Mountain
Lake Piso Multiple Sustainable Use Reserve
Margibi Mangrove
Gbi
Sapo National Park
Grebo-Krahn National Park
Cestos-Senkwehn
Grand Kru-River Gee
Legend
Merged Layer of concessions: palm oil plantations, mining, minerals, forestry, agricultural (sources: USAID, WRI, GFW, GoL)
Community Forests
WDPA Protected Areas (Mar2018)
WDPA Protected Areas (Mar2018)
Liberia Protected Areas and Community Forests Conflicting with Concessions
0 25 50 100 150 200 Kilometers
N
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Map 5.0 Mangroves and Freshwater Resources (CIFOR)

Overview: The below map depicts key freshwater and mangrove resources in Liberia. The data set was derived based on: 1. Long-term water supply exceeding atmospheric water demand; 2. Annually or seasonally water-logged soils; 3. A geomorphological position where water is supplied and retained (Gumbrichi, 2017). The wetlands are mapped at 231 meters resolution.

Key Findings: When compared to other mappings of freshwater marine resources, the CIFOR data set is more comprehensive in its assessment. However, when mapping mangroves, it remains to determine which of the mangrove mappings is most accurate. Note that Sierra Leone has significantly greater area devoted to the mangrove class than does Liberia.

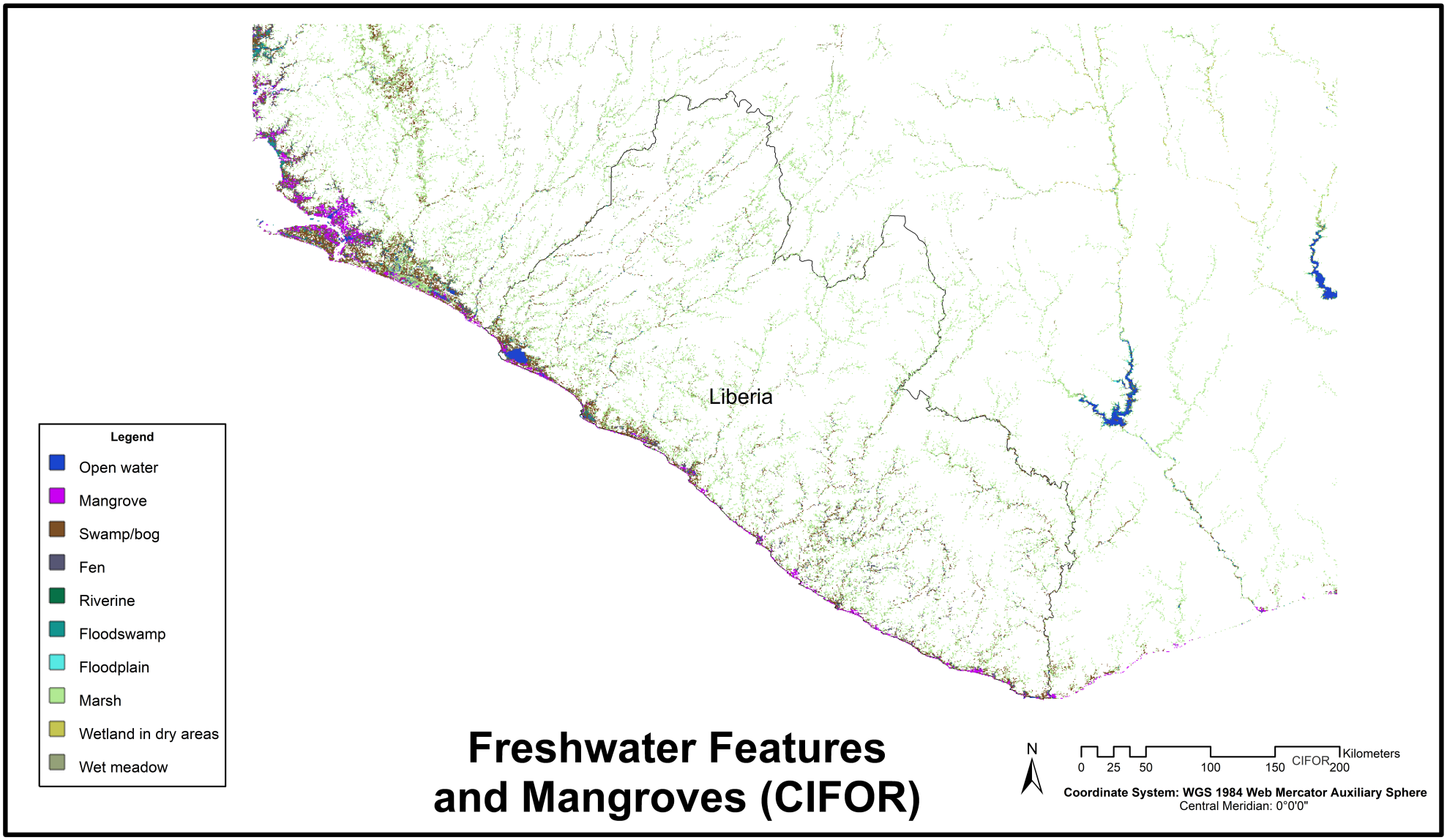
The findings of the mangrove mapping projects differ greatly but the one most grounded in empirical evidence seems to be the remotely sensed analysis conducted by NASA. The data set draws of observations from the Landsat satellite at 30m. However, the findings are dated, require field validation and it remains to determine, with certainty, their accuracy relative to alternate data sets. The following map utilizes the NASA dataset along with freshwater bodies from the digital chart of the world.

Related Content and Findings

A cursory view of the mangrove map reveals that almost none of Liberia terrain is occupied by mangroves. This, however, is not necessarily the case: in the map inset (Figure 8), it is evident that the high-resolution NASA dataset does not lend itself to regional visualizations; in other datasets, mangroves are often combined with or confused with other land cover classes; mangroves, as a distinct class, can be inherently difficult to classify using remotely sensed imagery.

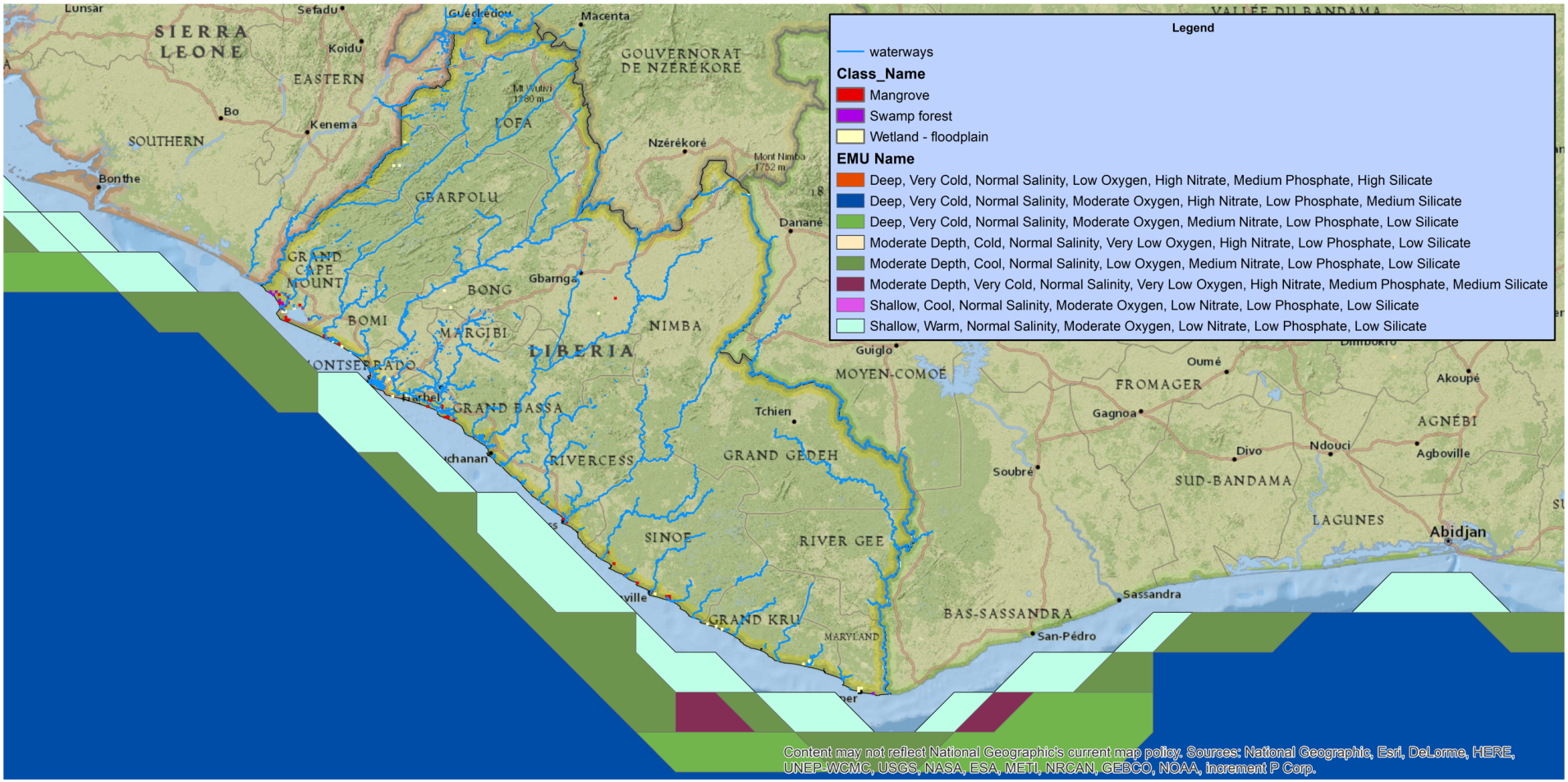
Citation:

Gumbricht, T.; Román-Cuesta, R.M.; Verchot, L.V; Herold, M; Wittmann, F; Householder, E.; Herold, N.; Murdiyarso, D., 2017, "Tropical and Subtropical Wetlands Distribution version 2", doi:10.17528/CIFOR/DATA.00058, Center for International Forestry Research (CIFOR), V2.


Liberia
Legend
Open water
Mangrove
Swamp/bog
Fen
Riverine
Floodswamp
Floodplain
Marsh
Wetland in dry areas
Wet meadow
Freshwater Features
and Mangroves (CIFOR)
N
0 25 50 100 150 200
CIFOR
Kilometers
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Map 5.1 Ecological Marine Units

The attached map is a draft composite of ecological land units associated with aquatic biodiversity, ecological marine units, mangroves, and freshwater bodies. Much of the detail is hard to see at this scale. The final citation is not available, as elements of this map are still under development. Map analysis shows the very limited distribution of mangroves in Liberia, additional detail about which is provided in Map 5.2.



Liberia Regional Ecological Marine Units

0 25 50 100 150 200 Kilometers

N

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Map 5.2: Uncertainty and Conflict in Liberia Mangrove Forest Data

In assessing the extent of Liberia's mangroves, two salient issues become immediately evident:

Current mapping products differ greatly in their findings. The following map serves as an illustration of how the data sets differ. The NASA data set (red) reports the smallest mangrove area and the TNC report (green) returns the largest.

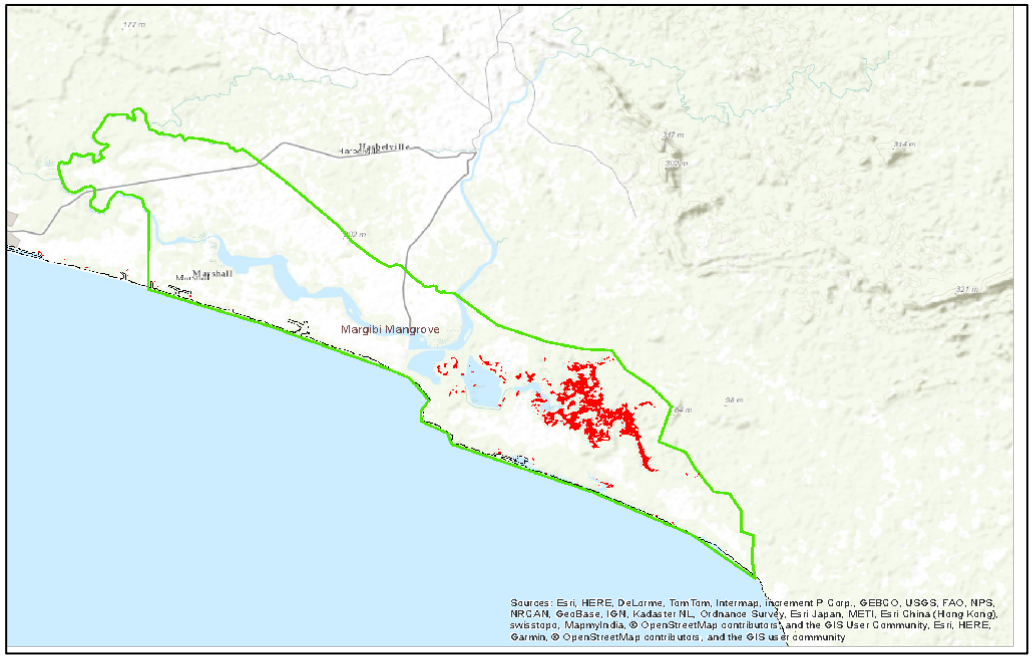


Figure 8: Detail of the NASA mangrove map

There is a discrepancy between Liberia's reported mangroves, per the FAO Global Forest Resource Assessment (FRA), 2014, and the figures evidenced in the map products (see map inset, below). These types of discrepancies have long plagued the FRA, and FAO has begun to incorporate the use of remote sensing to supplement their country-based reporting mechanisms. The analysis of this difference in reporting is significant but beyond the scope of this report.

Related Content and Recommendations

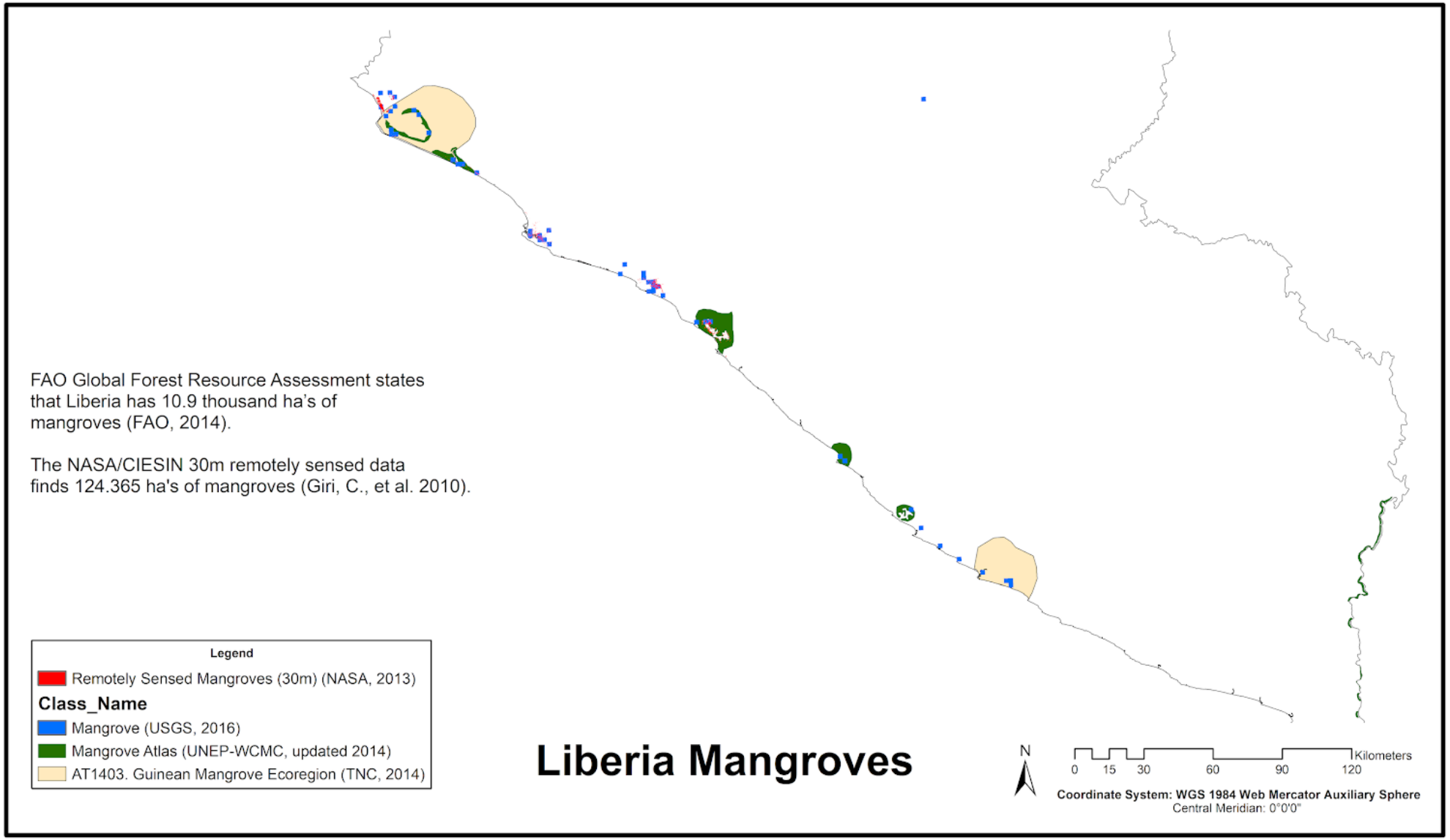
Additional geographic analysis of the extent of Liberia's mangroves needs to take place. Current data make it difficult to ascertain correct figures for Liberia.

Citations

Giri, C., E. Ochieng, L.L.Tieszen, Z. Zhu, A. Singh, T. Loveland, J. Masek, and N. Duke. 2013. Global Mangrove Forests Distribution, 2000. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). http://dx.doi.org/10.7927/H4J67DW8. Accessed DAY MONTH YEAR.

Spalding MD, Blasco F, Field CD (Eds.) (1997). World Mangrove Atlas. Okinawa (Japan): International Society for Mangrove Ecosystems. 178 pp. Compiled by UNEP-WCMC, in collaboration with the International Society for Mangrove Ecosystems (ISME). (version 3). URL: http://data.unep-wcmc.org/datasets/6

Olson, D. M. and E. Dinerstein. 2002. The Global 200: Priority ecoregions for global conservation. (PDF file) Annals of the Missouri Botanical Garden 89:125-126. -The Nature Conservancy, USDA Forest Service and U.S. Geological Survey, based on Bailey, Robert G. 1995. Description of the ecoregions of the United States (2nd ed.). Misc. Pub. No. 1391, Map scale 1:7,500,000. USDA Forest Service. 108pp. -The Nature Conservancy (2003), based on Wiken, E.B. (compiler). 1986. Terrestrial ecozones of Canada. Ecological Land Classification Series No. 19. Environment Canada, Hull, Que. 26 pp. + map.


FAO Global Forest Resource Assessment states that Liberia has 10.9 thousand ha's of mangroves (FAO, 2014).
The NASA/CIESIN 30m remotely sensed data finds 124.365 ha's of mangroves (Giri, C., et al. 2010).
Legend
Remotely Sensed Mangroves (30m) (NASA, 2013)
Class_Name
Mangrove (USGS, 2016)
Mangrove Atlas (UNEP-WCMC, updated 2014)
AT1403. Guinean Mangrove Ecoregion (TNC, 2014)
Liberia Mangroves
N
0 15 30 60 90 120
Kilometers
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Central Meridian: 0°0'0"

Map 5.3: Fishing Activity Off the Coast of Liberia

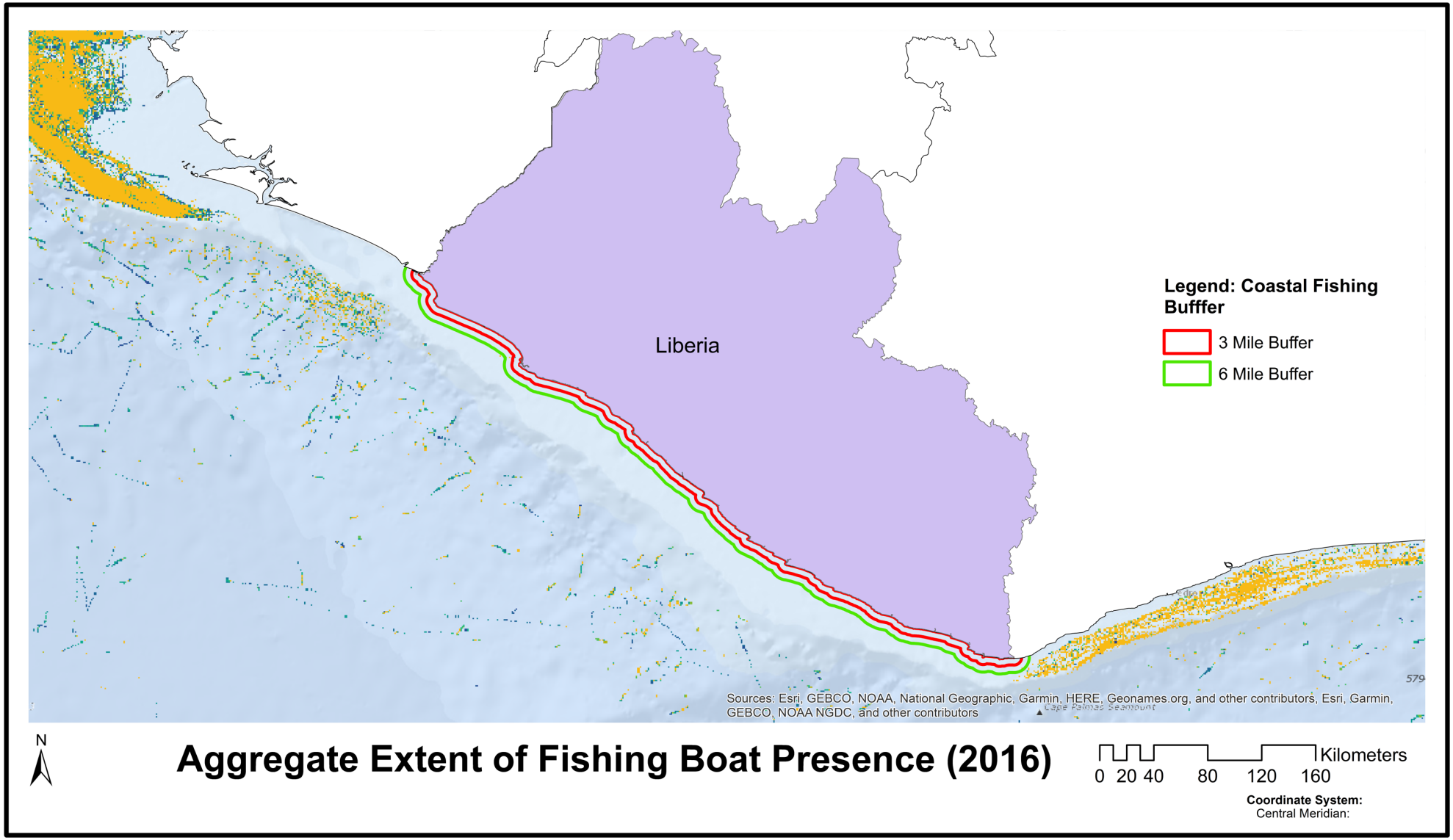
The following map shows 1) Aggregate fishing activity data off the coast of Liberia (artisanal and otherwise) as a heat map with yellow being the highest intensity; 2) the three and six nautical mile lines, relevant to Executive Order 44 of 2013.

Related Content and Findings

A key finding is that the majority of regional coastal fishing is conducted around the coasts of Liberia's neighbors. The reasons are probably complex and may include the coastal shelf (accessibility), fish abundance (further research is required), ocean currents, and regulation (the causal relationship here to fishing activity requires further investigation, but is not expected to be significant).

Citation

Kroodsma, DA, J Mayorga, T Hochberg, NA Miller, K Boerder, F Ferretti, A Wilson, B Bergman,TD White, BA Block, P Woods, B Sullivan, C Costello, B Worm. Tracking the Global Footprint of Fisheries. 2018. *Science*. February 22, 2018.

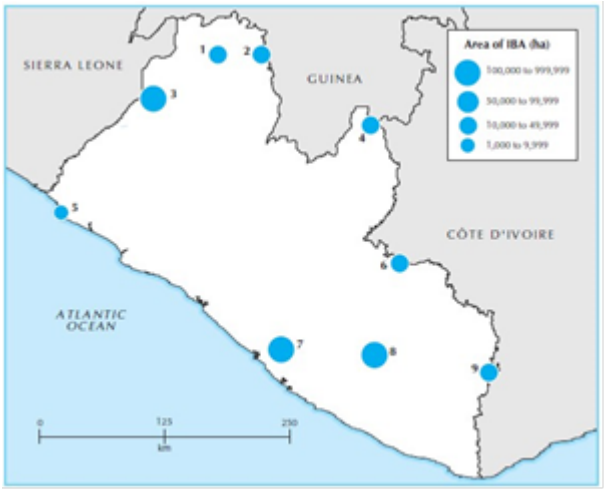

Liberia
Legend: Coastal Fishing Bufffer
3 Mile Buffer
6 Mile Buffer
Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors
N
Aggregate Extent of Fishing Boat Presence (2016)
0 20 40 80 120 160
Kilometers
Coordinate System:
Central Meridian:

Annex I: Explanatory Tables

Table 4: Ramsar Sites

Site	County	Area (ha)	Date added	Management
Lake Piso	Grand Cape Mount	48,953	2003	FDA/EPA
Gbedin Wetlands	Nimba	25	2006	EPA
Kpatawee Wetlands	Bong	835	2006	EPA
Marshall Wetlands	Margibi	12,168	2006	EPA
Mesurado Wetlands	Montserrado	6,760	2006	EPA

Table 5: Important Bird Areas



Map	Name	Area (ha)
1	Wologizi mountains	20,200
2	Wonegizi mountains	20,235
4	Nimba mountains	20,240
5	Cape Mount	4,560
6	Zwedru	15,000
7	Cestos: Senkwen	146,800
8	Sapo National Park	180,432
9	Grebo	12,150

Table 6: The Protected Area Network

Site	Status	Area(Ha)	Year Designated	Oversight	Notes
Sapo	Designated National Park	180, 363	1983	FDA	Terrestrial forest and inland wetland (swamps and rivers)
East Nimba	Designated Nature Reserve	13, 500	2003	FDA	Terrestrial forest and inland wetland (swamps and rivers)
Lake Piso	Designated Multi-Use Reserve, Ramsar site	97, 159	2003	FDA/ EPA	Terrestrial forest, inland wetland (swamps and rivers), mountain, marine & coastal, mangrove and savanna
Gola	Designated Gola National Forest Park	88, 000	2017	FDA	Terrestrial forest and inland wetland (swamps and rivers), Supported by Birdlife International, Society for Nature Conservation of Liberia
Grebo-Krahn	Designated Trans-boundary Park	97, 000	2017	FDA	Terrestrial forest and inland wetland (swamps and rivers); supported by World Bank

Table 7: Proposed Protected Areas (FDA 2015)

Site	Area (Ha)	Oversight	Notes
Bong Mountain	24,822	FDA	Bong County
Cestos-Senkwehn	80,348	FDA	Sinoe County
Foya	164,628	FDA	Lofa County, EU is supporting a corridor connecting this proposed protected area with Gola NP
Grand Kru-River Gee	135,100	FDA	Straddling Grand Kru and River Gee counties
Krahn-Bassa	Un-known	FDA	Proposed by Wild Chimps Foundation, in Sinoe County
Kpo Mountains	83,709	FDA	Partially within Kpelle NF, Gbarpolu County
Margibi Mangrove	23,818	FDA/EPA	Margibi County
Nimba West	10,482	FDA	Largely within W. Nimba NF, Nimba County, adjacent to ArcelorMittal iron ore mining operations

Table 8: Direct Threats by Land Cover Class

Land Cover Class	Total Land Area (%)	Major direct threats	Economic Potential
Intact Forest	37.00%	Unsustainable hunting and the animal trade, unsustainable shifting cultivation, cutting trees for fuelwood (firewood and charcoal), illegal pit sawing, artisanal mining, spread of industrial plantations of oil palm and rubber into forested areas, timber and mining concessions in sensitive areas	Ecosystem services, carbon sequestration, timber, NTFPs, flora and fauna
Degraded Forest	30.00%	Unsustainable hunting and the animal trade, cutting of forest for fuelwood/ (firewood and charcoal), artisanal mining, invasive species	Ecosystem services, carbon sequestration, timber, NTFPs regeneration of under story flora and fauna
Agriculture	13.70%	Unsustainable subsistence shifting cultivation cutting trees for fuelwood/ (firewood and charcoal) invasive species	Development of farmed/domesticated animals, carbon sequestration, timber, NTFPs
Savanna	11.00%	Unsustainable hunting and the animal trade, cutting trees for fuelwood/ (firewood and charcoal), invasive species and forest fire	Develop industrial forest plantation and woodlots to support wood energy demand, NTFPs
Thicket	3.00%	Unsustainable hunting and the animal trade, cutting of trees for fuelwood/ (firewood and charcoal), invasive species	Develop industrial forest plantation and woodlots to support wood energy demand, NTFPs
Gallery Forest	2.00%	Unsustainable hunting and the animal trade, cutting of forest for fuelwood/ (firewood and charcoal), illegal pit sawing, invasive species	NTFPs, flora and fauna, wildlife habitat, carbon sequestration
Plantations	1.50%	Unsustainable hunting and the animal trade, cutting of forest for fuelwood/ (firewood and charcoal), illegal pit sawing, invasive species, forest fire	Expansion of reforestation plantations and woodlots to support wood energy demand, develop alternative timber source
Other (i.e. lakes and rivers)	1.20%	IUU fishing, water pollution, invasive species	Commercial fishery & ecotourism development, support to national revenue pool

Table 9: Key Biodiversity Areas (after CEPF 2015)

Code	Key Biodiversity Area	Terrestrial or freshwater	Area (hectares)
LBR1	Cestos-Senkwen	Terrestrial	350,405
LBR2	Cestos-Gbi Area	Terrestrial	316,490
LBR3	Cestos-Sapo North Corridor forest blocks	Terrestrial	81,401
LBR4	Gio National Forest	Terrestrial	48,826
LBR5	Grand Kru Southeast Forest blocks	Terrestrial	90,191
LBR6	Grand Kru Southwest blocks	Terrestrial	55,111
LBR7	Grebo	Terrestrial	282,195
LBR8	Kpelle Forest	Terrestrial	216,898
LBR9	Krahn Bassa South	Terrestrial	203,020
LBR10	Lake Piso	Terrestrial	24,859
LBR11	Lofa-Mano Complex	Terrestrial	437,854
LBR12	Nimba mountains	Terrestrial	13,254
LBR13	Sapo-Grebo Corridor	Terrestrial	197,421
LBR14	Sapo National Park	Terrestrial	155,084
LBR15	West Nimba	Terrestrial	11,625
LBR16	Wologizi mountains	Terrestrial	167,985
LBR17	Wonegizi mountains	Terrestrial	28,868
LBR18	Zwedru	Terrestrial	64,458
fw4	Lower reaches of St Paul River	Freshwater	350,405
fw7	Middle reaches of St Paul River	Freshwater	316,490
fw11	Upper reaches of St Paul River	Freshwater	81,401
fw12	Weeni creek - Grand Bassa County	Freshwater	48,826

Table 10: Liberia Protected Area Classification, from Wildlife Conservation and Protected Area Management Act of 2016

Protected Area Established by Legislation	**IUCN Category[9]**
Multiple Sustainable Use Reserve	No formal determination
National Forest Reserve	No formal determination
National Park	No formal determination, aligns with Cat II
Nature Reserve	No formal determination, aligns with Cat VI
Strict Nature Reserve	No formal determination, aligns with Cat I
Natural Monument	No formal determination, aligns with Cat IV
Habitat/Species Management Area	No formal determination, aligns with Cat IV
Protected Landscape/Seascape	No formal determination, aligns with Cat V
Protected Area Established by Regulation	**IUCN Category**
Buffer Zones	No formal determination
Communal Forests (as defined by Act)	No formal determination
Community Resource Management Area	No formal determination
Community Wildlife Management (area)	No formal determination
Conservation Corridor	No formal determination
Controlled Hunting Area	No formal determination
Game Reserve	No formal determination
Marine Reserve or Park	No formal determination
Multiple Sustainable Use Management Area	No formal determination
Wildlife Sanctuary	No formal determination
International Designation	
Ramsar Site	n/a

[9] Countries self-report categories of protected areas to the International Union for Conservation of Nature (IUCN), which maintains the international classification system and global record (the World Database on Protected Areas). The system was devised for comparability in monitoring conservation progress, because of confusion stemming from differential interpretation of titles by different governments.

Table 11: Biodiversity Grants from USAID/West Africa WA-BiCC project

Grantee's Name	Sub Grantee	Project Name	Total Grant Value (US$)	Period of Performance
Fauna & Flora International (FFI)	Partners in Development (PADEV)	Strengthening Multi-Stakeholder Management of the Taï-Grebo-Krahn-Sapo Transboundary Forest Landscape between Liberia and Côte d'Ivoire"	**2,571,521**	Jan 22, 2018 – Jan 31, 2020
Fauna & Flora International (FFI)	NONE	Conserving and connecting the Ziama-Wonegizi-Wologizi-Foya Transboundary Forest Landscape between Guinea and Liberia	**2,100,000**	TBD
Royal Society for the Protection of Birds	Gola Rainforest Company Limited by Guarantee (GRC LG) Society for Conservation of Nature of Liberia (SCNL) Conservation Society of Sierra Leone (CSSL)	Community Landscape Management to Reduce Deforestation and Biodiversity Loss in the Gola Transboundary Forest Landscape	**1,883,731** (plus 164,578 in matching funds)	September 19, 2017 –January 31, 2020
Wild Chimpanzee Foundation (WCF)	Alma Production Liberia Edie Theatre Universal Outreach Foundation IDEF	Strengthening Multi-Stakeholder Management of the Taï-Grebo-Krahn-Sapo Transboundary Forest Landscape between Liberia and Côte d'Ivoire"	**2,680,092**	September 28, 2017 – January 31, 2020
total			**9,235,344**	

Annex J: Threat Assessment Matrix

Threats	Biodiversity	Tropical Forests	Summary Threat Rating
Uncontrolled hunting and animal trafficking	**Very High**	**Very High**	**Very High**
Extractive industries (logging, mining)	**High**	**High**	**High**
Habitat loss due to unsustainable shifting cultivation	**High**	**High**	**High**
Cutting of forests for fuelwood and charcoal	**High**	**High**	**High**
Cutting of forests through illegal pit sawing for local timber consumption	**Low**	**Medium**	**Low**
Risk of industrial plantation spread	**Medium**	**Medium**	**Medium**
IUU fishing	**High**	**N/A**	**Medium**
Artisanal mining	**Medium**	**Low**	**Low**
Water pollution	**Medium**	**N/A**	**Low**
Alien invasive species	**Very High**	**High**	**High**

Annex K: Liberian Agencies Involved in Biodiversity and Forestry

Agency	Responsibilities	Analysis
Forest Development Authority (FDA)	The 2006 Forest Policy that is the background for the RDA is based on three management pillars: Conservation, Commercial and Community forestry and three distinct departments are each responsible for one of the "Cs." in addition to cross-cutting units of law enforcement, planning, research and development.	The FDA along with partners in the Liberia Forest Initiative have successfully accomplished forest sector legal reforms, established the Liberian Extractive Industries Transparency Initiative (LEITI) which includes forestry; made progress in introducing forest certification standards and a Chain of Custody (CoC) System; and overseen Protected Area expansion and management. The FDA serves as the focal point, for REDD+ related processes and manages the Voluntary Partnership Agreement (VPA) with the European Union which established a system for traceability and verification of legality of timber as part of the Forest Law Enforcement, Governance and Trade (FLEGT) program.
Environmental Protection Agency (EPA)	The EPA coordinates environmental protection and sustainable use of natural resources, works on environmental awareness and oversees the implementation of some international conventions related to the environment.	The institution has put in place adequate and strong environmental policies and regulations and continues to build national and institutional capacities in various aspects of environment facets to ensure a vibrant environment in Liberia. The institution has good plans on paper but, like the FDA, is confronted with financial limitations to implement the plans. For example, the EPA cannot implement its wetlands management activities due to lack of financial resources and technical support.

Liberia Institute of Statistics and Geo-Information Services (LISGIS)	LISGIS is responsible for compilation, analysis, publication and dissemination of all data (including geos- spatial information) from GoL Agencies, NGOs, and universities	Since the early 1960s, the Government of Liberia has been increasingly conscious of the need to incorporate socio-demographic indicators into its economic and social development planning and programs. The Government of Liberia, after the 1984 National Population and Housing Census, decided to conduct a population and housing census every ten (10) years but this was interrupted by civil war. LISGIS successfully conducted the first post war census in 2008.
Liberia Land Authority	This new Agency has a comprehensive mandate for land policy, land administration, and oversight of land management regulations and use functions. The general mandate and purpose of the Commission is to propose, advocate and coordinate reforms of land policy, laws and programs in Liberia.	The Land Commission was established by an ACT of National Legislature in 2008. The Commission successful produced the Land Rights Law. The Commission was replaced by the Liberia Land Authority in 2016 by an Act of National Legislature. These were great achievements. There may be overlaps in mapping efforts in communities under this agency's self- identification activities and the FDA community forest mapping.
Ministry of Agriculture (MOA)	The mandate of the Ministry of Agriculture is the planning, coordinating, implementing, monitoring and evaluating of agricultural development programs. In addition, MOA ensures that agricultural challenges that impede production are investigated and lasting solutions found, and the farmers are provided with training, supportive services and an enabling environment.	The core general areas of responsibility of MOA will likely continue to consist of: agriculture, both smallholder and commercial; plantation crops; fisheries; and livestock. A Food and Agriculture Policy and Strategy are formulated. The major constraints in the agriculture sector are poor road conditions obstructing the movement of farm produce to markets and aggressive climatic conditions (high soil temperature during the dry season and heavy rainfall during the rainy/wet season).
Bureau of National Fisheries (BNF)/National Fishery and Aquaculture Authority (NaFAA)	Formerly the Bureau of National Fisheries (BNF) a division of MOA created by an Act of National Legislature in 1957 to regulate fishing activities in Liberian waters.	The BNF finalized the new Fisheries Regulations in 2010 to ensure that the sector is well managed and regulated. Through the West Africa Regional Fisheries Project Liberia, the NaFAA is also undertaking various activities to improve the

		management and regulation of fisheries in Liberia, in line with the Poverty Reduction Strategy.
Central Agricultural Research Institute (CARI)	A division of MOA, mandated to organize and undertake Agricultural Research with results to be use by the public.	CARI is being revitalized by the GoL with international donor support. Core activities remains: agricultural research, development of new/improved varieties as well as extension techniques and training tools. Needs to upgrade capacity of Liberian scientists and equipment for enhanced domestication of international best practices.
University of Liberia (UL)	Established in 1951 Includes Colleges of Agriculture and Forestry, Science & Technology; that are degree granting.	Produced hundreds of graduates every year with GoL and donor support. The UL is challenged with information management and has a Biological Information Database Project running in collaboration with Kansas State University, Currently collaborating with other relevant national agencies in forest and biodiversity protocols.
University of Liberia-Pacific Institute for Research and Evaluation	established in 2005	The Liberia Ministry of Health and the University of Liberia - Pacific Institute of Research & Evaluation have partnered to address issues relating to the Ebola response, the general health system and s among others.
William V. S. Tubman University	College of Agriculture and Food Sciences College of Arts and Sciences established 1978	The University is the country's second public university; it held its 4th graduation ceremonies in June 2017 and granted degrees in various fields to 170 graduates.
Forestry Training Institute (FTI)	FTI serves to train middle-level foresters (Forest Rangers) and other related professionals.	The FTI has graduated its 14th class of Forest Rangers and Industrial Workers in 2017. The USFS and the Peace Corp are working with FTI to build the institutional capacity, develop curriculum and enhance training efforts at the Institute.
Liberia Maritime Authority (LMA)	This agency works in collaboration with other public agencies and institutions to prevent marine source pollution,	LMA is working with WARFP, Sea Shepard/USDOD, AFL, EPA, FDA and NaFAA to implement activities

	protect the marine environment and to coordinate response to marine environment incidents.	relative to Environment conservation, implements the ongoing Coastal defense project and the EU vessel tracking programs
Ministry of Land Mines and Energy	Administration and regulatory powers of the mineral sector, including granting mining licenses, and it has statutory oversight of the energy, land, minerals, and water sectors. i.e the Mining and Minerals Law of 2000.	Granted Mineral Development Licenses around the country. Has successfully rehabilitated and has upgraded the national power grid from the Mt. Coffee Hydroelectric dam to 120 MW. Has plans to undertake other smaller schemes of hydro and renewable sources aimed at making access to affordable electric power to every strata of the population.
Liberia Agency for Community Empowerment (LACE)	Public enterprise mandated to develop and implement small-scale infrastructure projects in Liberia	LACE has ongoing several community public infrastructure projects and has completed many others.
Ministry of Public Works (MPW)	Ministry mandated by the national Legislature to administer and regulate public infrastructure including policy, strategy and procedure for achieving them	The Ministry is currently supervising several road rehabilitation and or construction projects throughout the country involving approximately 500 km of feeder roads in Lofa, Bong, Grand Bassa counties (including USAID funded activities).
Forest Management Advisory Committee	Platform established in 2007 as offshoot of forestry reform process to monitor and advice the FDA application of policies/strategies.	Served advisory functions to FDA in aspects of forest management, including strategic planning.
National Benefit Sharing Trust	Platform established in 2009 as part of forestry reform process to monitor revenue sharing from logging fees accrued to communities.	The Trust represents the communities sharing revenue accrued from logging operations.
Community Forestry Working Group (CFWG)	Platform established as part of forestry reform process to monitor and discuss trends in community forestry activities and suggest improvements.	With donor support has implemented several projects including the World Bank Strategic Environmental Assessment (SEA) 2009
Liberia Timber Association (LTA)	Platform where forest concessionaires meet to discuss issues of common interests and find solutions.	Currently composed of at least 27 member companies supported with VPA-SU/EU funding and doing advocating for and advancing interests of logging companies.

Union of Community Forestry Development Committees (CFDC)	Platform where community members and their representatives meet to discuss issues of common interests and find solutions.	Community Based Organization (CBO) established by communities to represent their interest in collecting revenues from logging. Due to low logging activities fewer CFDCs have achieved their mandates
Community Forestry Management Bodies (CFMB)	The structure established by communities to advocate for, advice and management their community forest resources.	Community Forestry Management Bodies have successfully executed their mandates within communities around Liberia some are facing challenges implementing the 9 steps in the CFMA
National Charcoal Union of Liberia (NaCUL)	Was established in 2004 and is a CBO of charcoal producers and traders that provides advocacy and find common solutions to address their common problems.	The NACUL with USAID/Liberia funds has undertaken gap analysis as well as other studies/advocacy activities in Monrovia/production sites and successfully implemented community social services (sanitation) work in Cape Mount etc.
National Chainsaw Union of Liberia	Established in 2008 as a platform where chainsaw producers and local timber dealers/traders meet to discuss issues and find common solutions to address their common problems.	LIBERIA CHAINSAW AND TIMBER DEALERS UNION has successfully implemented various projects with support from FAO, European Union VPA, there is an estimated 15,000 members.
Liberian Extractive Industries Transparency Initiative	Established July 2009 with responsibilities to track and monitor performance of various extractive sectors in the country.	Annually provides up-to-date the database of the reporting entities. Summary reports and newsletters are distributed throughout the country and contribute to an informed starting point for a wider dialogue
Species Working Group (SWG)	Platform established in 2016 for discussion and investigation issues surrounding the status and conservation of species and their ecology.	Established four sub-committees Plant, Animal, Biomonitoring and Law Enforcement and their leadership and developed logo and drafted communication and promotional strategies through the West Africa Biodiversity and Climate Change (WA-BiCC) project.

Annex L: Major Projects, Implementers and Funding in Liberia

Implementer	Funder	Project title	Duration	Funding	Purpose
Forest Development Authority (FDA)	World Bank	Liberia Forest Sector Project builds on PROSPER	2016-2020	$ 37.5 million	Improved management of and increased benefit-sharing in targeted forest landscapes
ACDI/VOCA	USAID	Forest Incomes for Environmental Sustainability (FIFES)	2017-	$22 million	Develop key rural forest-based enterprises that benefit communities and forests
Conservation International/ EPA	GEF	Improve Sustainability of Mangrove Forests and Coastal Mangrove Areas in Liberia through Protection, Planning and Livelihood Creation	2016-?	$ 4.77 million	To strengthen the conservation and sustainable use of globally important mangrove forests through effective participatory land-use planning and establishment of coastal protected areas in at least 35% of Liberia's mangroves
Conservation International/ EPA	GEF	Conservation and Sustainable use of Liberia's Coastal Natural Capital	Not yet fully approved and initiated	$14 million	To improve conservation and sustainable use of Liberia's coastal natural capital by mainstreaming the value of nature into Liberia's development trajectory
Flora and Fauna International	NORAD	Driving REDD+ Consensus through National Policy Implementation	2016-2020	$4.2 million	To develop a REDD+ policy framework and community conservation enterprises in Wonegizi Proposed PA
Flora and Fauna International	USAID WA-BiCC	Sapo NP	Feb 2018 to April 2020	$2.7 million	PA management
Royal Society for the Protection of Birds	EU	Gola Forest	Ongoing	$3.7 million	Gola Forest and transboundary
GIZ	EU/GTZ	Grebo-Krahn NP	2017--?	$7.4	Transboundary PA
IUCN	EU	Mangroves	ongoing	$6.2 million	Mangrove conservation
Private Sector Partners	EU	FLEGT	ongoing	$24.7 million	Combat illegal logging and strengthen forest management

Wild Chimpanzee Foundation	USAID WA-BiCC	Grebo-Krahn NP/Sapo corridor	Feb 2018 to April 2020	$2.7million	Support a conservation corridor between Ivory Coast and Liberia
Liberia Conservation Trust Project	CI/ World Bank	Conservation endowment	Ongoing	Limited $$ to start	Conservation endowment
International Tropical Timber Organization (ITTO)	Japan/ USA/ Switzerland	Reviving Forestry Education in Liberia and Development PD#506 Reforestation Policy and Afforestation Strategy for Liberia	2017-2020	Approx. $800,000	Provide soft training components and prepare a draft Reforestation Policy, Afforestation Strategy, silvicultural guidelines

U.S. Agency for International Development
1300 Pennsylvania Avenue, NW
Washington DC 20523
Tel: (202) 712-0000
Fax: (202) 216-3524

www.usaid.gov