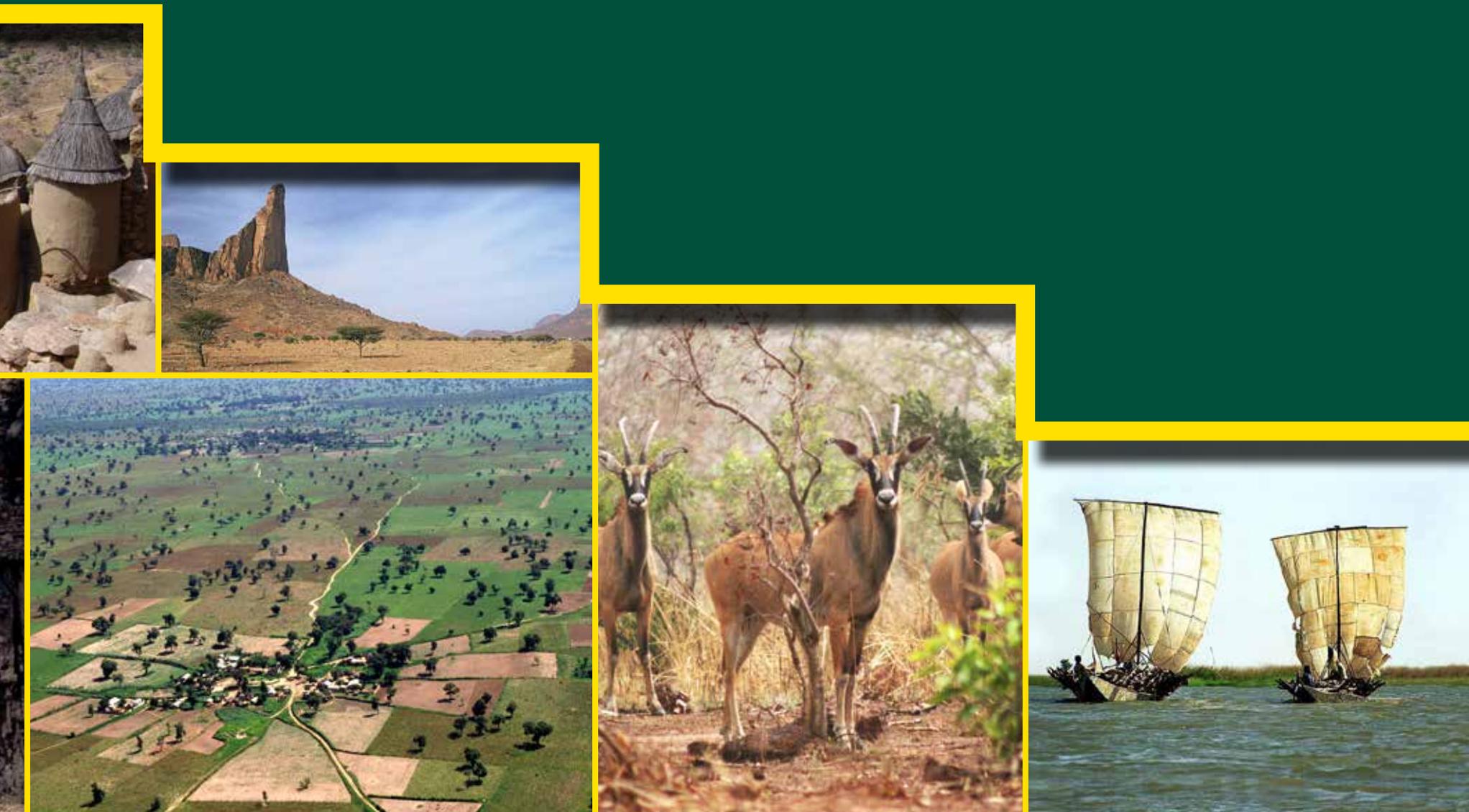


Landscapes of West Africa

A WINDOW ON A CHANGING WORLD



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Editorial and Production Team

Comité Inter-états de Lutte contre la Sécheresse dans le Sahel (CILSS)

Issifou Alfari, GIS and Remote Sensing Specialist

Edwige Botoni, Natural Resources Management Specialist

Amadou Soulé, Monitoring and Evaluation Specialist

U.S. Geological Survey Earth Resources Observation and Science (USGS EROS) Center

Suzanne Cotillon, Geographer*

W. Matthew Cushing, GIS Specialist

Kim Giese, Graphic Designer*

John Hutchinson, Cartographer

Bruce Pengra, Geographer*

Gray Tappan, Geographer

University of Arizona

Stefanie Herrmann, Geographer

U.S. Agency for International Development/West Africa (USAID/WA)

Nicodeme Tchamou, Regional Natural Resource Management and Climate Change Adviser

Funding and Program Support

Regional Office of Environment and Climate Change Response

U.S. Agency for International Development/West Africa

Accra, Ghana

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Apart from its beauty, this image of the Earth from the Moon shows the African continent quite prominently. A great amount of cloud cover characterizes the blue planet. Several large areas are, however, clear: the deserts of North Africa and the Middle East, and in the Southern Hemisphere, the drylands of southern Africa. The tropical regions of Africa's mid-section are partially covered by belts of clouds that mark the intertropical convergence zone, where the northern and southern circulation patterns merge.





Dr. Djimé Adoum

Since the 1970s, West Africa has experienced many forms of climate stress — heavy rains, floods, and periods of drought. Drought has had a particularly devastating impact on agricultural production, pastoral livelihoods, and natural ecosystems. Economic losses alone are estimated in billions of dollars.

The concerns raised by these climate stressors have translated into initiatives to combat desertification and to adapt to climate change. The Comité Inter-états de Lutte contre la Sécheresse dans le Sahel (CILSS – The Permanent Interstate Committee for Drought Control in the Sahel) and the U.S. Agency for International Development (USAID) have put in place activities to benefit the population of the Sahel and all of West Africa.

The West Africa Land Use Dynamics (LULC) Project is emblematic of this cooperation. Initiated in 1999, the LULC project has had several phases including training national experts to extract pertinent information from satellite images to characterize vegetation cover and producing tools and supporting information on land cover dynamics.

This atlas — *Landscapes of West Africa: Window on a Changing World* — is part of the current phase of the LULC project and provides insights into the changes occurring at national and regional levels through mapping time series data from 1975 to 2013. This work highlights landscapes that have undergone major transformations, and examines the drivers of change and their environmental and socioeconomic impacts.

The atlas showcases the accomplishments of the LULC project, and makes a case for further investment in natural resource management. Aimed at both decision-makers and the general public, the Atlas has a goal of making people aware of the changes taking place in the landscapes of the region.

Beyond raising awareness, the atlas also aims to incite action to protect the environment of West Africa and the Sahelian region. We therefore invite everyone — scientists, students, researchers, teachers, planners, managers of development or research projects, local, national and regional decision-makers, donors, members of civil society organizations, and visitors to the region — to make the most of this work.

Congratulations to the experts at CILSS, U.S. Geological Survey, USAID and the country-level teams of the LULC project for this fruitful partnership. We truly hope that this cooperation will continue and deepen, with the view of regaining the equilibrium of ecosystems. Doing so will constitute a decisive step towards realizing a green economy in West Africa, thereby enhancing the well-being of all West African people.

A handwritten signature in blue ink, appearing to read 'Djimé Adoum'.

Djimé Adoum, Ph.D,

Executive Secretary

CILSS

Ouagadougou, Burkina Faso



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FROM THE AMERICAN PEOPLE

At the core of the U.S. Agency for International Development's (USAID's) mission is a deep commitment to work as partners in fostering sustainable development. Environments that are vulnerable to changing climate patterns are often the most reliant on agriculture for food and income, and the least able to financially protect themselves or respond to disasters. As effects of climate change are felt more severely, advanced mitigation and adaptation measures are key to resilience.

Rapid changes are occurring across West Africa's natural and human landscapes and balancing the need to preserve natural ecosystems with the need to grow more food, together with ensuring resilience in the same ecosystems, is a challenge. USAID West Africa's (USAID/WA) Environmental Threats and Opportunity Assessment and its Climate Change Vulnerability Assessment revealed that timely and accurate information, indispensable for good governance in the environmental sector, is scant and barely accessible. Mitigating climate change impacts and conserving biodiversity can support sustainable development, and prevent countries from sliding further into poverty.

USAID/WA worked in partnership with the U.S. Geological Survey (USGS) and the Comité Inter-états de Lutte contre la Sécheresse dans le Sahel (CILSS – The Permanent Interstate Committee for Drought Control in the Sahel), to analyze changes in land use and land cover in West Africa and to better understand trends over the past 40 years with the goal of improving decision-making in land management. Products derived from these analyses include maps that provide a clear record of changes and trends in three periods — 1975, 2000 and 2013 — in 17 West African countries and aggregated to the regional level.

These maps and analyses form the foundation for future landscape scenarios and contribute to a body of best practices for the re-greening of landscapes in West Africa. Application of the atlas and associated data goes beyond informing decision-making on land

use planning. The time series maps provide credible information to help countries account for their carbon emissions to the United Nations Framework Convention on Climate Change and can also be used to quantify carbon emission trends in West Africa for the past 40 years.

This achievement would not have been possible without the U.S. Landsat Program. Landsat satellites have provided the longest-ever continuous global record of the Earth's surface. A partnership of the National Aeronautics and Space Administration and the USGS, the Landsat program provides image data that show the impact of human society on the planet — a crucial measure as the world's population has already surpassed seven billion people. The first Landsat satellite was launched in 1972 and now, 44 years later, Landsats 7 and 8 are continuing to provide an unbroken record of the Earth, providing critical information for monitoring, understanding and managing our resources of food, water, and forests. No other satellite program in the world comes close to providing such a long, unbroken record of geospatial information of the planet.

Knowing that these analyses will be put to use for decision making in natural resource management, I would like to thank all of the teams that worked tirelessly to produce this Landscapes of West Africa atlas. And my sincere gratitude goes to CILSS, the USGS, and the multitude of government institutions in West Africa for their commitment to completing this influential work.

Alex Depez
Regional Mission Director
USAID/West Africa
Accra, Ghana



Alex Depez



On behalf of the governments and the people of West Africa who have benefitted from the West Africa Land Use Dynamics Project, the Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS – Permanent Interstate Committee for Drought Control in the Sahel) expresses its profound gratitude to all those who have contributed to the publication of this atlas. In particular, we would like to thank:

The U.S. Agency for International Development/West Africa (USAID/WA) which financed, encouraged and contributed actively to the review of this atlas;

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Members of the National Teams

Benin

Cocou Pascal Akpassonou, Chef Division Coopération Technique au Centre National de Télédétection du Bénin (CENATEL) ;

O. Félix Houeto, Chef Division Télédétection et SIG au Centre National de Télédétection (CENATEL) du Bénin.

Burkina Faso

Rainatou Kabré, Chargé de production et de diffusion de l'information environnementale au Secrétariat Permanent du Conseil National pour l'Environnement et le Développement Durable (CONEDD) ;

Louis Blanc Traoré, Directeur Monitoring de l'Environnement au Secrétariat Permanent du Conseil National pour l'Environnement et le Développement Durable (CONEDD).

Cabo Verde

Maria Da Cruz Gomes Soares, Directrice, Direction des Services de Sylviculture (DGASP);

Sanchez Vaz Moreno Conceição, Responsable Inventaires Forestiers et Cartographie, Direction des Services de Sylviculture (DGASP).

The Gambia

Peter Gibba, Senior Meteorologist, Department Of Water Resources (DWR);

Awa Kaira Agi, Program Officer CGIS UNIT, National Environment Agency (NEA).

Ghana

Emmanuel Tachie-Obeng, Environmental Protection Agency (EPA);

Emmanuel Attua Morgan, Lecturer, Department of Geography and Resource Development, University of Ghana.

Guinea

Aïssatou Taran Diallo, Agro-environnementaliste, Ministère de l'Agriculture, Service National des Sols (SENASOL) ;

Seny Soumah, Ingénieur Agrométéorologiste et Chef de Section, Direction Nationale de la Météorologie (CMN).

Guinea-Bissau

Antonio Pansau N'Dafa, Responsable Bases de Données Changements Climatiques, Secrétariat de l'Environnement Durable;

Luis Mendes Chernó, Chargé de Bases de Données Climatiques, Institut National de Météorologie.

Liberia

D. Anthony Kpadeh, Head of Agro-meteorology, Climatology and Climate Change Adaptation, Liberia Hydrological Services;

Torwon Tony Yantay, GIS Manager, Forestry Development Authority (FDA).

Mali

Abdou Ballo, Enseignant Chercheur, Faculté d'Histoire-Géographie, Université de Bamako;

Zeinab Sidibe Keita, Ingénieur des Eaux Forêts, Système d'Information Forestier (SIFOR).

Niger

Nouhou Abdou, Chef Division Inventaires forestiers et Cartographie, Direction des Aménagements Forestiers et Restauration des terres, Ministère de l'Environnement, de la Salubrité Urbaine, et du Développement Durable;

Abdou Roro, Chef du Département Cartographie, Institut Géographique National du Niger (IGNN).

Nigeria

Kayode Adewale Adepoju, Lecturer and Scientist, Obafemi Awolowo University, Ile Ife;

Esther Oluwafunmilayo Omodanisi, Lecturer, Obafemi Awolowo University, Ile Ife;

Sule Isaiah, Lecturer, Federal University of Technology, Minna;
Mary Oluwatobi Odekunle, Federal University of Technology,
Minna.

Senegal

Samba Laobé Ndao, Cartographe et Ingénieur en
Aménagement du Territoire, Direction des Eaux, Forêts,
Chasse, et de la Conservation des Sols (DEFCCS), Programme
PROGEDE;

Ousmane Bocoum, Cartographe, Centre de Suivi Écologique
(CSE).

Sierra Leone

Samuel Dominic Johnson, System Administrator, Ministry of
Agriculture, Forestry and Food Security (MAFFS).

Chad

Angeline Noubagombé Kemsol, Agronome, Assistante de
Recherche, Centre National d'Appui à la Recherche (CNAR);

Ouya Bondoro, Chercheur, Centre National d'Appui à la
Recherche (CNAR).

Togo

Issa Abdou-Kérim Bindaoudou, Géographe et Cartographe,
Direction Générale de la Statistique et de la Comptabilité
Nationale;

Yendouhame John Kombaté, Responsable Suivi Evaluation
et Communication, Agence Nationale de Gestion de
l'Environnement, Ministère de l'Environnement.

Contributors from the AGRHYMET Regional Center

Bako Mamane, Expert en télédétection et Système
d'Information Géographique (SIG);

Djibo Soumana, Expert Agrométéorologue;

Alio Agoumo, Technicien en traitement d'images;

Dan Karami, Technicien en Système d'Information
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In Memory

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Introduction

Our global ecosystem is and has always been complex, dynamic, and in constant flux. Science tells us how natural forces of enormous power have shaped and reshaped Earth's surface, atmosphere, climate, and biota again and again since the planet's beginnings about 4.5 billion years ago. For most of the planet's history those environmental changes were the result of the interaction of natural processes such as geology and climate, and were described on the geological time scale in epochs spanning millions of years.

When humankind appeared on Earth around 200,000 years ago the influence of human activity on the environment must have been small and localized. The influence of scattered small groups of people on the global ecosystem would have been overwhelmed by the forces of natural systems (Steffen and others, 2007). Human population would not grow to 50 million (about 0.7 percent of the Earth's current population) for another 197,000 years. Population growth accelerated over the centuries that followed until the planet was adding more than that 50 million people every year. Our planet is now home to roughly 7.3 billion people and we are adding 1 million more people roughly every 4.8 days (US Census Bureau, 2011). Before 1950, no one on Earth had lived through a doubling of the human

population, but now some people have experienced a tripling in their lifetime (Cohen, 2003).

With hunting and the use of fire, later agriculture and urbanization, and eventually the industrial revolution and modern technology, the ability of humans to shape their environment also grew exponentially.

Earth scientists use the geologic time scale to describe time periods where different processes and forces shaped events in the Earth's history, such as ice ages and mass extinction events. They use periods of time they call epochs, which range from 11,700 years (the Holocene) to millions of years (the Pleistocene and Neogene). In about 2000, Earth scientists coined a new word — Anthropocene — to describe

a new epoch where “the human imprint on the global environment has become so large and active that it rivals some of the great forces of nature in its impact on the functioning of the Earth system” (Steffen and others, 2011). Many in the Earth sciences believe that epoch has begun and that humankind with its vast numbers and its power to change the face of the Earth is at risk of putting the Earth system out of balance and causing

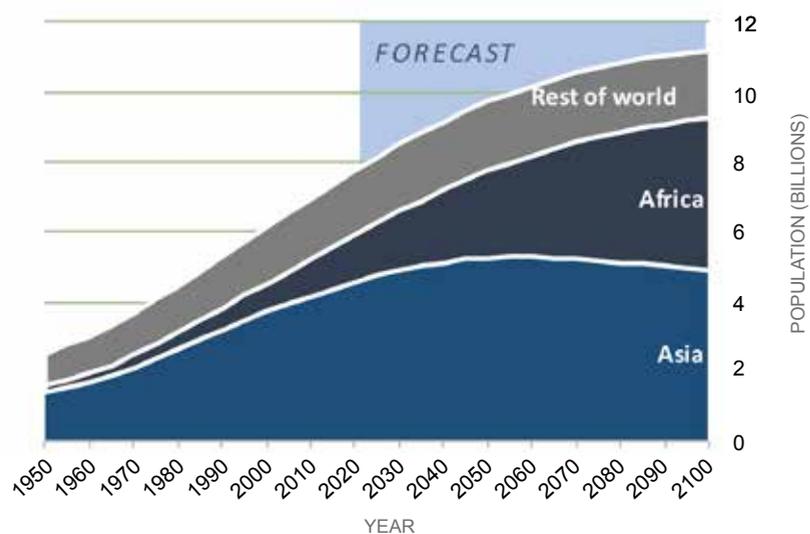
the collapse of natural systems that are essential for humans to thrive, perhaps even threatening the future of all humankind.

In 2015, the 17 countries included in this atlas are estimated to have a total population of over 369 million, representing a nearly 5-fold increase since 1950 — outstripping global population growth, which grew by 2.9 fold during the same time (UN, 2015). The young age structure of the West African population assures continued rapid population growth until 2050 and beyond. If United Nations estimates are correct the 17 countries in this atlas will grow to 835 million people by 2050; that would equate to 11.1 times as many people as lived on the same land in 1950 (UN, 2015)!

“Mai lura da ice bashin jin yunwa” — He who takes care of trees will not suffer from hunger.

— Hausa proverb

Population growth in Africa and the rest of the world from 1950 to 2100



Wooded landscape fragmented by agriculture expansion in western Burkina Faso



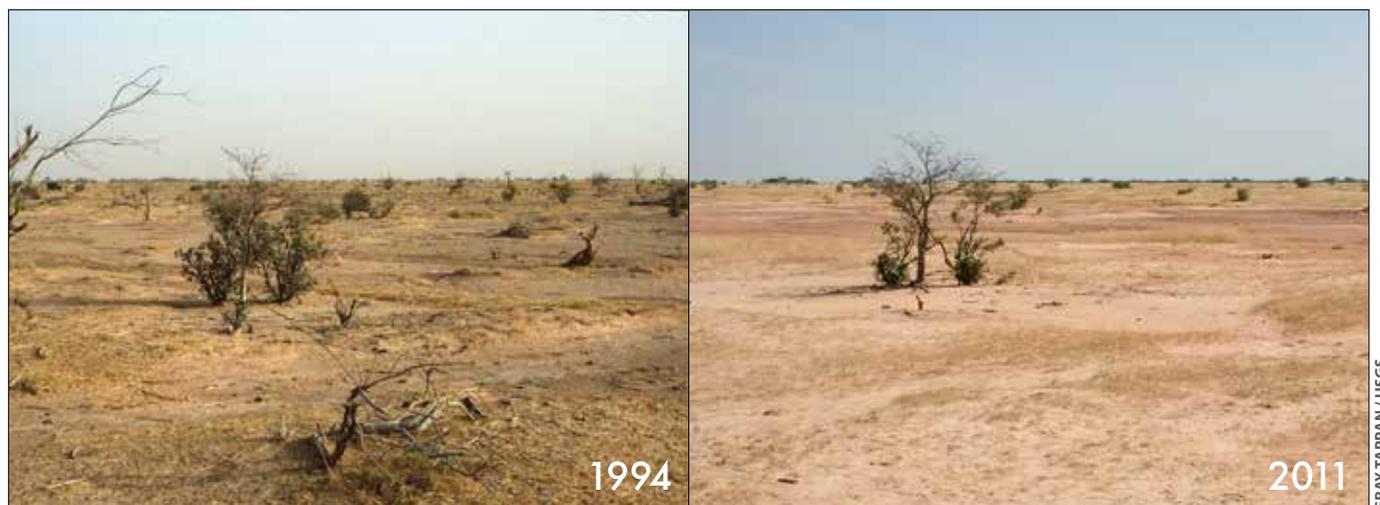
JAMES ROWLAND / USGS

Parallel trends can be seen in the land cover changes of West Africa. With so many new families to feed, West Africa doubled the area covered by farms between 1975 and 2013. Vast areas of savanna, woodland, and forest landscape have been replaced or fragmented by cropland. At the same time villages, towns, and cities have grown in area — taking up 140 percent as much land as they had in 1975. In part to make way for those farms and settlements more than a third of the forest cover present in 1975 has been lost. In savanna and steppe landscapes of West Africa, drought, in some cases made worse by unsustainable land use practices, has degraded the vegetation cover contributing to a 47 percent increase in sandy areas (see top images

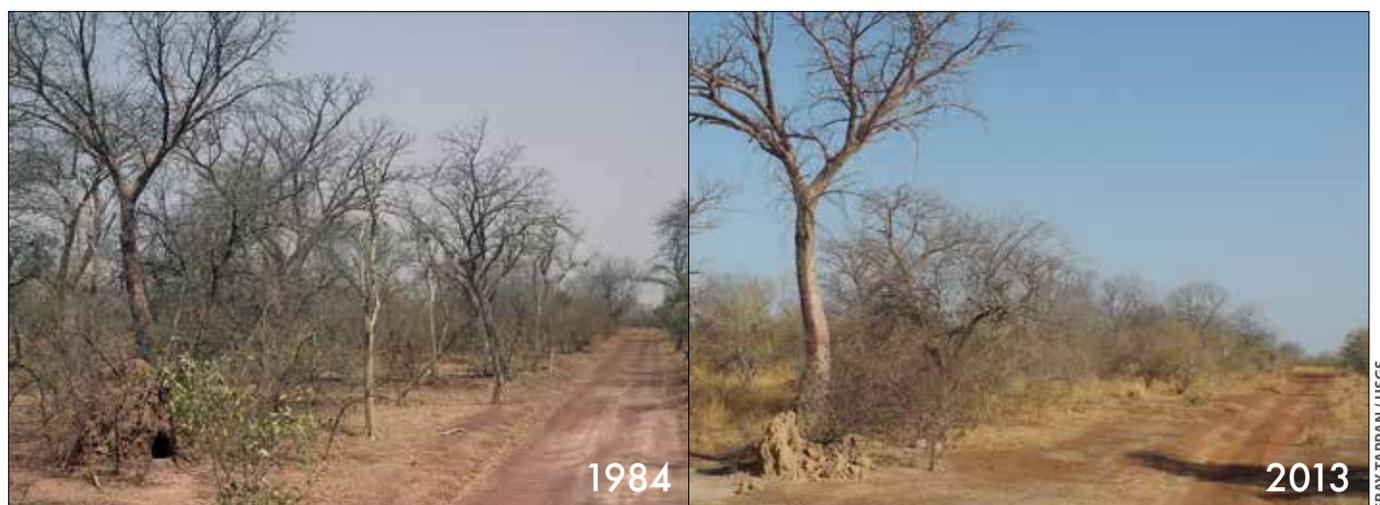
pair, opposite page). The future is unpredictable, but the trends of the past four decades projected into the future would be unsustainable.

Conversion of the natural landscapes of West Africa to agriculture greatly reduces the natural biodiversity, and exposes the soil to wind and water erosion. The savanna, woodland, forest, and wetland ecosystems that are lost have some relatively tangible impacts such as the loss of natural ecosystem goods and services like wood for fuel and construction, honey, nuts, medicines, game animals, berries, and forage. There are also many important goods and services lost that are less visible such as biodiversity, carbon storage, water quality, water runoff versus infiltration, and regional climate functions.

Expansion of degraded land in the Ferlo region of Senegal



Decline in vegetation cover and biodiversity in east-central Senegal



It is in the hands of today's decision makers to formulate wise, well informed choices about how to manage West Africa's land, to ensure that vital ecosystem services and agricultural productivity are able to support tomorrow's people. To make good choices the governments of West Africa need good information about the rapid changes now occurring, the causes of those changes, and the interactions occurring between climate, land use, other human activity, and the environment.

Experts from institutions in 17 countries in West Africa have partnered with the Comité Inter-états de Lutte contre la Sécheresse dans le Sahel (CILSS – The Permanent Interstate Committee for Drought Control in the Sahel), the U.S. Agency for International Development (USAID) West Africa and the U.S Geological Survey (USGS) to map changing land use and land cover and associated factors across much of West Africa through the West Africa

Land Use Dynamics Project. This publication presents the results of that work. The following chapters present maps, graphs, tables, and images detailing the natural environment of these 17 countries and changes that have taken place over the past four decades.

This atlas tells a story of rapid environmental change with both hopeful and worrisome chapters. The story is told with maps and numbers detailing the rate, magnitude, and location of land cover change but also with words and images that seek to make the story more real for the people living in West Africa and around the globe. The hope is that this information helps to build a clearer picture of past and current land use and land cover in order to guide us all in making informed choices that will support the livelihoods and well-being of ours and future generations.





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Suzanne Cotillon, Geographer*

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Ouagadougou, Burkina Faso

Tel: (226) 30 67 58

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Dr. Djimé Adoum

Since the 1970s, West Africa has experienced many forms of climate stress — heavy rains, floods, and periods of drought. Drought has had a particularly devastating impact on agricultural production, pastoral livelihoods, and natural ecosystems. Economic losses alone are estimated in billions of dollars.

The concerns raised by these climate stressors have translated into initiatives to combat desertification and to adapt to climate change. The Comité Inter-états de Lutte contre la Sécheresse dans le Sahel (CILSS – The Permanent Interstate Committee for Drought Control in the Sahel) and the U.S. Agency for International Development (USAID) have put in place activities to benefit the population of the Sahel and all of West Africa.

The West Africa Land Use Dynamics (LULC) Project is emblematic of this cooperation. Initiated in 1999, the LULC project has had several phases including training national experts to extract pertinent information from satellite images to characterize vegetation cover and producing tools and supporting information on land cover dynamics.

This atlas — *Landscapes of West Africa: Window on a Changing World* — is part of the current phase of the LULC project and provides insights into the changes occurring at national and regional levels through mapping time series data from 1975 to 2013. This work highlights landscapes that have undergone major transformations, and examines the drivers of change and their environmental and socioeconomic impacts.

The atlas showcases the accomplishments of the LULC project, and makes a case for further investment in natural resource management. Aimed at both decision-makers and the general public, the Atlas has a goal of making people aware of the changes taking place in the landscapes of the region.

Beyond raising awareness, the atlas also aims to incite action to protect the environment of West Africa and the Sahelian region. We therefore invite everyone — scientists, students, researchers, teachers, planners, managers of development or research projects, local, national and regional decision-makers, donors, members of civil society organizations, and visitors to the region — to make the most of this work.

Congratulations to the experts at CILSS, U.S. Geological Survey, USAID and the country-level teams of the LULC project for this fruitful partnership. We truly hope that this cooperation will continue and deepen, with the view of regaining the equilibrium of ecosystems. Doing so will constitute a decisive step towards realizing a green economy in West Africa, thereby enhancing the well-being of all West African people.

A handwritten signature in blue ink, appearing to read 'Djimé Adoum'.

Djimé Adoum, Ph.D,

Executive Secretary

CILSS

Ouagadougou, Burkina Faso



USAID | WEST AFRICA

FROM THE AMERICAN PEOPLE

At the core of the U.S. Agency for International Development's (USAID's) mission is a deep commitment to work as partners in fostering sustainable development. Environments that are vulnerable to changing climate patterns are often the most reliant on agriculture for food and income, and the least able to financially protect themselves or respond to disasters. As effects of climate change are felt more severely, advanced mitigation and adaptation measures are key to resilience.

Rapid changes are occurring across West Africa's natural and human landscapes and balancing the need to preserve natural ecosystems with the need to grow more food, together with ensuring resilience in the same ecosystems, is a challenge. USAID West Africa's (USAID/WA) Environmental Threats and Opportunity Assessment and its Climate Change Vulnerability Assessment revealed that timely and accurate information, indispensable for good governance in the environmental sector, is scant and barely accessible. Mitigating climate change impacts and conserving biodiversity can support sustainable development, and prevent countries from sliding further into poverty.

USAID/WA worked in partnership with the U.S. Geological Survey (USGS) and the Comité Inter-états de Lutte contre la Sécheresse dans le Sahel (CILSS – The Permanent Interstate Committee for Drought Control in the Sahel), to analyze changes in land use and land cover in West Africa and to better understand trends over the past 40 years with the goal of improving decision-making in land management. Products derived from these analyses include maps that provide a clear record of changes and trends in three periods — 1975, 2000 and 2013 — in 17 West African countries and aggregated to the regional level.

These maps and analyses form the foundation for future landscape scenarios and contribute to a body of best practices for the re-greening of landscapes in West Africa. Application of the atlas and associated data goes beyond informing decision-making on land

use planning. The time series maps provide credible information to help countries account for their carbon emissions to the United Nations Framework Convention on Climate Change and can also be used to quantify carbon emission trends in West Africa for the past 40 years.

This achievement would not have been possible without the U.S. Landsat Program. Landsat satellites have provided the longest-ever continuous global record of the Earth's surface. A partnership of the National Aeronautics and Space Administration and the USGS, the Landsat program provides image data that show the impact of human society on the planet — a crucial measure as the world's population has already surpassed seven billion people. The first Landsat satellite was launched in 1972 and now, 44 years later, Landsats 7 and 8 are continuing to provide an unbroken record of the Earth, providing critical information for monitoring, understanding and managing our resources of food, water, and forests. No other satellite program in the world comes close to providing such a long, unbroken record of geospatial information of the planet.

Knowing that these analyses will be put to use for decision making in natural resource management, I would like to thank all of the teams that worked tirelessly to produce this Landscapes of West Africa atlas. And my sincere gratitude goes to CILSS, the USGS, and the multitude of government institutions in West Africa for their commitment to completing this influential work.

Alex Deprez
Regional Mission Director
USAID/West Africa
Accra, Ghana



Alex Deprez



On behalf of the governments and the people of West Africa who have benefitted from the West Africa Land Use Dynamics Project, the Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS – Permanent Interstate Committee for Drought Control in the Sahel) expresses its profound gratitude to all those who have contributed to the publication of this atlas. In particular, we would like to thank:

The U.S. Agency for International Development/West Africa (USAID/WA) which financed, encouraged and contributed actively to the review of this atlas;

The Resilience in the Sahel Enhanced (RISE) Program managed from USAID/Senegal's Sahel Regional Office, which supports the work of mapping best practices and re-greening, and promotes soil and water conservation in the Sahel;

The U.S. Geological Survey Earth Resources and Observation Science (USGS EROS) Center for the scientific and technical guidance, provision of satellite imagery, maps, field data and photographs, statistics and analyses;

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The national teams from across West Africa who provided valuable content for the maps and case studies.

Members of the National Teams

Benin

Cocou Pascal Akpassonou, Chef Division Coopération Technique au Centre National de Télédétection du Bénin (CENATEL) ;

O. Félix Houeto, Chef Division Télédétection et SIG au Centre National de Télédétection (CENATEL) du Bénin.

Burkina Faso

Rainatou Kabré, Chargé de production et de diffusion de l'information environnementale au Secrétariat Permanent du Conseil National pour l'Environnement et le Développement Durable (CONEDD) ;

Louis Blanc Traoré, Directeur Monitoring de l'Environnement au Secrétariat Permanent du Conseil National pour l'Environnement et le Développement Durable (CONEDD).

Cabo Verde

Maria Da Cruz Gomes Soares, Directrice, Direction des Services de Sylviculture (DGASP);

Sanchez Vaz Moreno Conceição, Responsable Inventaires Forestiers et Cartographie, Direction des Services de Sylviculture (DGASP).

The Gambia

Peter Gibba, Senior Meteorologist, Department Of Water Resources (DWR);

Awa Kaira Agi, Program Officer CGIS UNIT, National Environment Agency (NEA).

Ghana

Emmanuel Tachie-Obeng, Environmental Protection Agency (EPA);

Emmanuel Attua Morgan, Lecturer, Department of Geography and Resource Development, University of Ghana.

Guinea

Aïssatou Taran Diallo, Agro-environnementaliste, Ministère de l'Agriculture, Service National des Sols (SENASOL) ;

Seny Soumah, Ingénieur Agrométéorologiste et Chef de Section, Direction Nationale de la Météorologie (CMN).

Guinea-Bissau

Antonio Pansau N'Dafa, Responsable Bases de Données Changements Climatiques, Secrétariat de l'Environnement Durable;

Luis Mendes Chernó, Chargé de Bases de Données Climatiques, Institut National de Météorologie.

Liberia

D. Anthony Kpadeh, Head of Agro-meteorology, Climatology and Climate Change Adaptation, Liberia Hydrological Services;

Torwon Tony Yantay, GIS Manager, Forestry Development Authority (FDA).

Mali

Abdou Ballo, Enseignant Chercheur, Faculté d'Histoire-Géographie, Université de Bamako;

Zeinab Sidibe Keita, Ingénieur des Eaux Forêts, Système d'Information Forestier (SIFOR).

Niger

Nouhou Abdou, Chef Division Inventaires forestiers et Cartographie, Direction des Aménagements Forestiers et Restauration des terres, Ministère de l'Environnement, de la Salubrité Urbaine, et du Développement Durable;

Abdou Roro, Chef du Département Cartographie, Institut Géographique National du Niger (IGNN).

Nigeria

Kayode Adewale Adepoju, Lecturer and Scientist, Obafemi Awolowo University, Ile Ife;

Esther Oluwafunmilayo Omodanisi, Lecturer, Obafemi Awolowo University, Ile Ife;

Sule Isaiah, Lecturer, Federal University of Technology, Minna;
Mary Oluwatobi Odekunle, Federal University of Technology,
Minna.

Senegal

Samba Laobé Ndao, Cartographe et Ingénieur en
Aménagement du Territoire, Direction des Eaux, Forêts,
Chasse, et de la Conservation des Sols (DEFCCS), Programme
PROGEDE;

Ousmane Bocoum, Cartographe, Centre de Suivi Écologique
(CSE).

Sierra Leone

Samuel Dominic Johnson, System Administrator, Ministry of
Agriculture, Forestry and Food Security (MAFFS).

Chad

Angeline Noubagombé Kemsol, Agronome, Assistante de
Recherche, Centre National d'Appui à la Recherche (CNAR);

Ouya Bondoro, Chercheur, Centre National d'Appui à la
Recherche (CNAR).

Togo

Issa Abdou-Kérim Bindaoudou, Géographe et Cartographe,
Direction Générale de la Statistique et de la Comptabilité
Nationale;

Yendouhame John Kombaté, Responsable Suivi Evaluation
et Communication, Agence Nationale de Gestion de
l'Environnement, Ministère de l'Environnement.

Contributors from the AGRHYMET Regional Center

Bako Mamane, Expert en télédétection et Système
d'Information Géographique (SIG);

Djibo Soumana, Expert Agrométéorologue;

Alio Agoumo, Technicien en traitement d'images;

Dan Karami, Technicien en Système d'Information
Géographique.

Other Contributors

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In Memory

Our thoughts are with three colleagues and friends who
are no longer with us. All three contributed significantly
to the success of the West Africa Land Use Dynamics
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atlas:

Yendouhame John Kombaté, Responsable Suivi
Evaluation et Communication, Agence Nationale
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Introduction

Our global ecosystem is and has always been complex, dynamic, and in constant flux. Science tells us how natural forces of enormous power have shaped and reshaped Earth's surface, atmosphere, climate, and biota again and again since the planet's beginnings about 4.5 billion years ago. For most of the planet's history those environmental changes were the result of the interaction of natural processes such as geology and climate, and were described on the geological time scale in epochs spanning millions of years.

When humankind appeared on Earth around 200,000 years ago the influence of human activity on the environment must have been small and localized. The influence of scattered small groups of people on the global ecosystem would have been overwhelmed by the forces of natural systems (Steffen and others, 2007). Human population would not grow to 50 million (about 0.7 percent of the Earth's current population) for another 197,000 years. Population growth accelerated over the centuries that followed until the planet was adding more than that 50 million people every year. Our planet is now home to roughly 7.3 billion people and we are adding 1 million more people roughly every 4.8 days (US Census Bureau, 2011). Before 1950, no one on Earth had lived through a doubling of the human

population, but now some people have experienced a tripling in their lifetime (Cohen, 2003).

With hunting and the use of fire, later agriculture and urbanization, and eventually the industrial revolution and modern technology, the ability of humans to shape their environment also grew exponentially.

Earth scientists use the geologic time scale to describe time periods where different processes and forces shaped events in the Earth's history, such as ice ages and mass extinction events. They use periods of time they call epochs, which range from 11,700 years (the Holocene) to millions of years (the Pleistocene and Neogene). In about 2000, Earth scientists coined a new word — Anthropocene — to describe

a new epoch where “the human imprint on the global environment has become so large and active that it rivals some of the great forces of nature in its impact on the functioning of the Earth system” (Steffen and others, 2011). Many in the Earth sciences believe that epoch has begun and that humankind with its vast numbers and its power to change the face of the Earth is at risk of putting the Earth system out of balance and causing

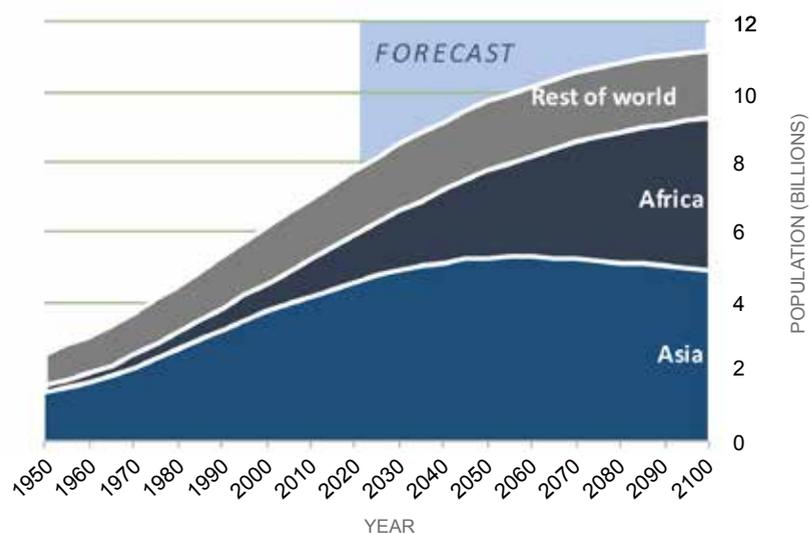
the collapse of natural systems that are essential for humans to thrive, perhaps even threatening the future of all humankind.

In 2015, the 17 countries included in this atlas are estimated to have a total population of over 369 million, representing a nearly 5-fold increase since 1950 — outstripping global population growth, which grew by 2.9 fold during the same time (UN, 2015). The young age structure of the West African population assures continued rapid population growth until 2050 and beyond. If United Nations estimates are correct the 17 countries in this atlas will grow to 835 million people by 2050; that would equate to 11.1 times as many people as lived on the same land in 1950 (UN, 2015)!

“Mai lura da ice bashin jin yunwa” — He who takes care of trees will not suffer from hunger.

— Hausa proverb

Population growth in Africa and the rest of the world from 1950 to 2100



Wooded landscape fragmented by agriculture expansion in western Burkina Faso



JAMES ROWLAND / USGS

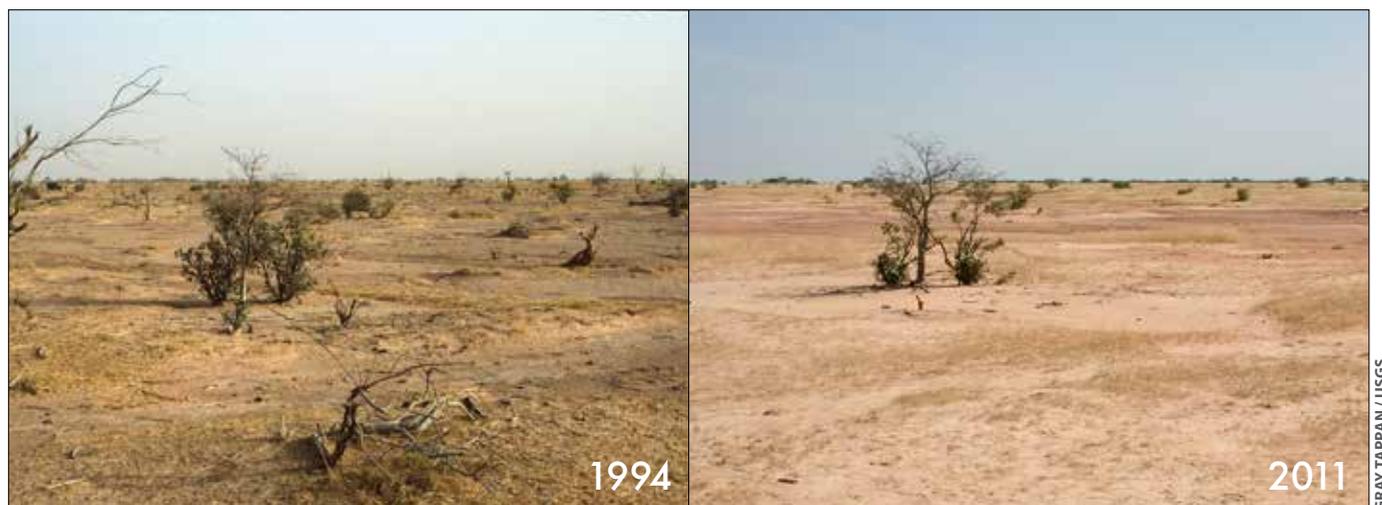
Parallel trends can be seen in the land cover changes of West Africa. With so many new families to feed, West Africa doubled the area covered by farms between 1975 and 2013. Vast areas of savanna, woodland, and forest landscape have been replaced or fragmented by cropland. At the same time villages, towns, and cities have grown in area — taking up 140 percent as much land as they had in 1975. In part to make way for those farms and settlements more than a third of the forest cover present in 1975 has been lost. In savanna and steppe landscapes of West Africa, drought, in some cases made worse by unsustainable land use practices, has degraded the vegetation cover contributing to a 47 percent increase in sandy areas (see top images

pair, opposite page). The future is unpredictable, but the trends of the past four decades projected into the future would be unsustainable.

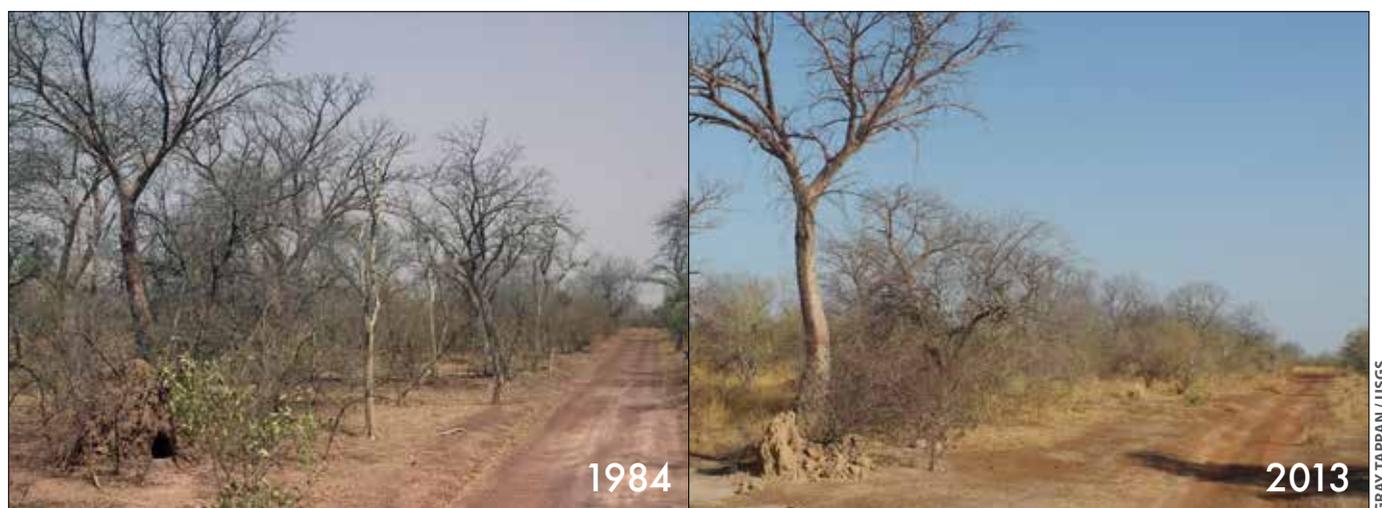
Conversion of the natural landscapes of West Africa to agriculture greatly reduces the natural biodiversity, and exposes the soil to wind and water erosion. The savanna, woodland, forest, and wetland ecosystems that are lost have some relatively tangible impacts such as the loss of natural ecosystem goods and services like wood for fuel and construction, honey, nuts, medicines, game animals, berries, and forage. There are also many important goods and services lost that are less visible such as biodiversity, carbon storage, water quality, water runoff versus infiltration, and regional climate functions.



Expansion of degraded land in the Ferlo region of Senegal



Decline in vegetation cover and biodiversity in east-central Senegal



It is in the hands of today's decision makers to formulate wise, well informed choices about how to manage West Africa's land, to ensure that vital ecosystem services and agricultural productivity are able to support tomorrow's people. To make good choices the governments of West Africa need good information about the rapid changes now occurring, the causes of those changes, and the interactions occurring between climate, land use, other human activity, and the environment.

Experts from institutions in 17 countries in West Africa have partnered with the Comité Inter-états de Lutte contre la Sécheresse dans le Sahel (CILSS – The Permanent Interstate Committee for Drought Control in the Sahel), the U.S. Agency for International Development (USAID) West Africa and the U.S Geological Survey (USGS) to map changing land use and land cover and associated factors across much of West Africa through the West Africa

Land Use Dynamics Project. This publication presents the results of that work. The following chapters present maps, graphs, tables, and images detailing the natural environment of these 17 countries and changes that have taken place over the past four decades.

This atlas tells a story of rapid environmental change with both hopeful and worrisome chapters. The story is told with maps and numbers detailing the rate, magnitude, and location of land cover change but also with words and images that seek to make the story more real for the people living in West Africa and around the globe. The hope is that this information helps to build a clearer picture of past and current land use and land cover in order to guide us all in making informed choices that will support the livelihoods and well-being of ours and future generations.





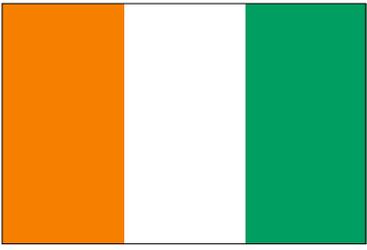


Chapter

III

Country Profiles, Land Use and Land Cover, and Trends





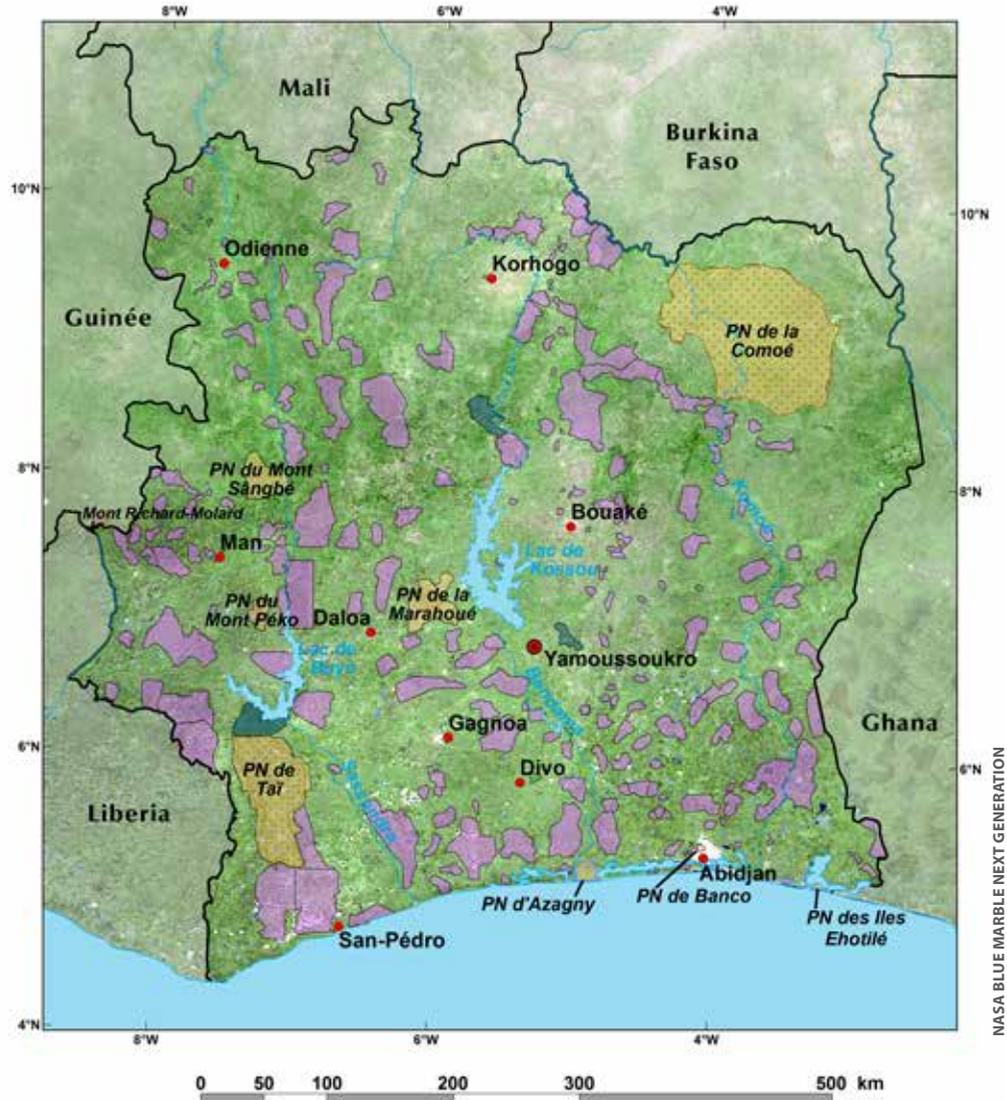
Republic of

Côte d'Ivoire

Total Surface Area: 322,463 sq km
Estimated Population in 2013: 21,622,000

Côte d'Ivoire borders the Gulf of Guinea with 515 km of coastline fringed by a network of large lagoons. The northern and southern halves of Côte d'Ivoire present two distinct landscapes: a seasonally wet-and-dry savanna landscape typical of the Sudanian zone in the north, and in the south, humid tropical Guinean and Guineo-Congolian landscapes with a variety of evergreen vegetation types. The southern part of the country was once entirely covered by dense tropical forest, but is now dominated by a mosaic of plantations, degraded forest, and cropland, along with patches of remaining dense forest. Until recent decades, there were greater stands of useful timber in Côte d'Ivoire than in any other West African country. The area covered by rain forest was halved between 1900 and 1960, and that trend has continued — most of the forest has now disappeared. The Taï National Park, in southwestern Côte d'Ivoire, constitutes the largest intact relic of old tropical forest in West Africa and was listed as a World Heritage Site in 1982.

Côte d'Ivoire has a climate system that is common to all the Gulf of Guinea countries, with two clear rainfall seasons on the coast, transitioning to one rainy season in the north. Soils are particularly fertile and agriculturally productive, even in the northern semiarid savanna. Côte d'Ivoire is one of the world's largest producers of cocoa and coffee. The richness of this country is not only based on the land but also on the people — Côte d'Ivoire is home to 68 ethnic groups, contributing to a wide diversity of customs and art.



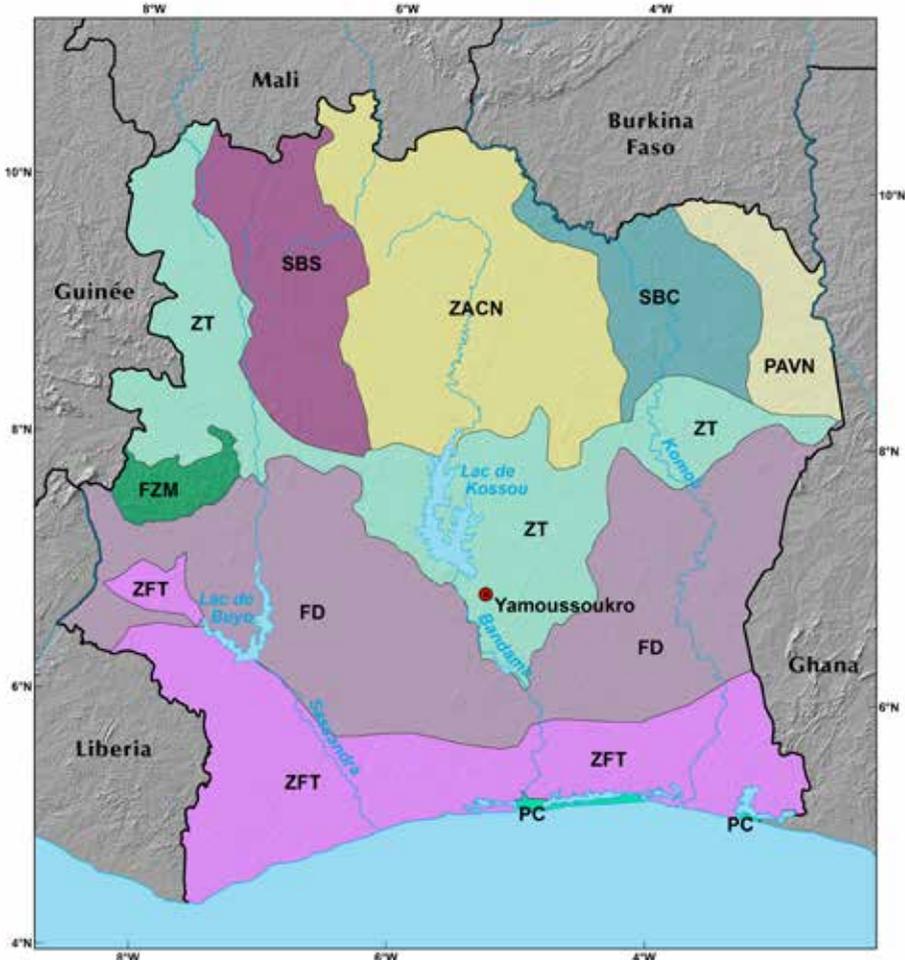
- Réserve de Biosphère / Biosphere Reserve
- Site Ramsar / Ramsar Site
- Parc National / National Park
- Réserve Naturelle / Nature Reserve
- Réserve de Faune / Faunal Reserve
- Forêt Classée / Forest Reserve
- Capitale Nationale / National Capital
- Autre Ville / Other City

Environmental Highlights:

- Deforestation
- Land degradation
- Largest intact tract of primary forest
- Second highest number of chimpanzees among West African countries

Cropland at the bottom of a forested hills in southern Côte d'Ivoire

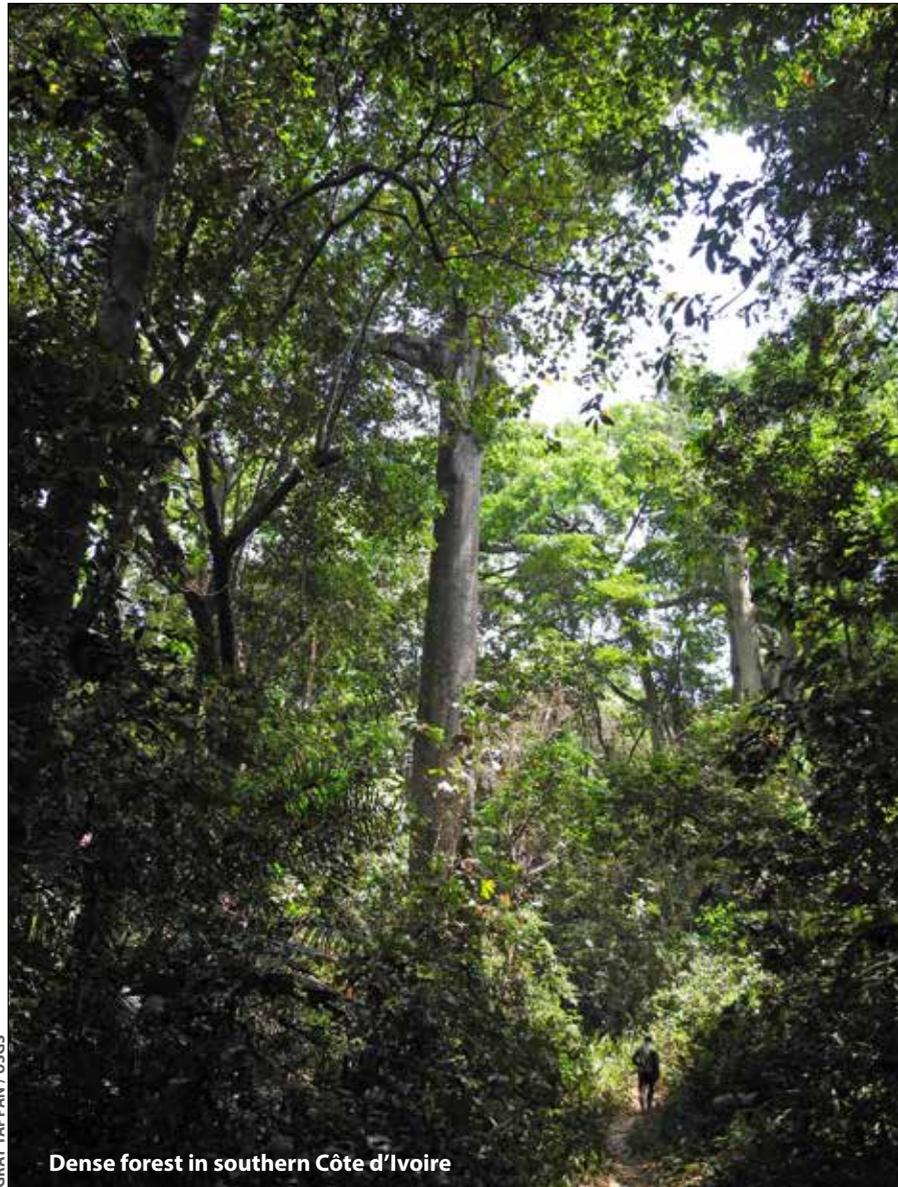
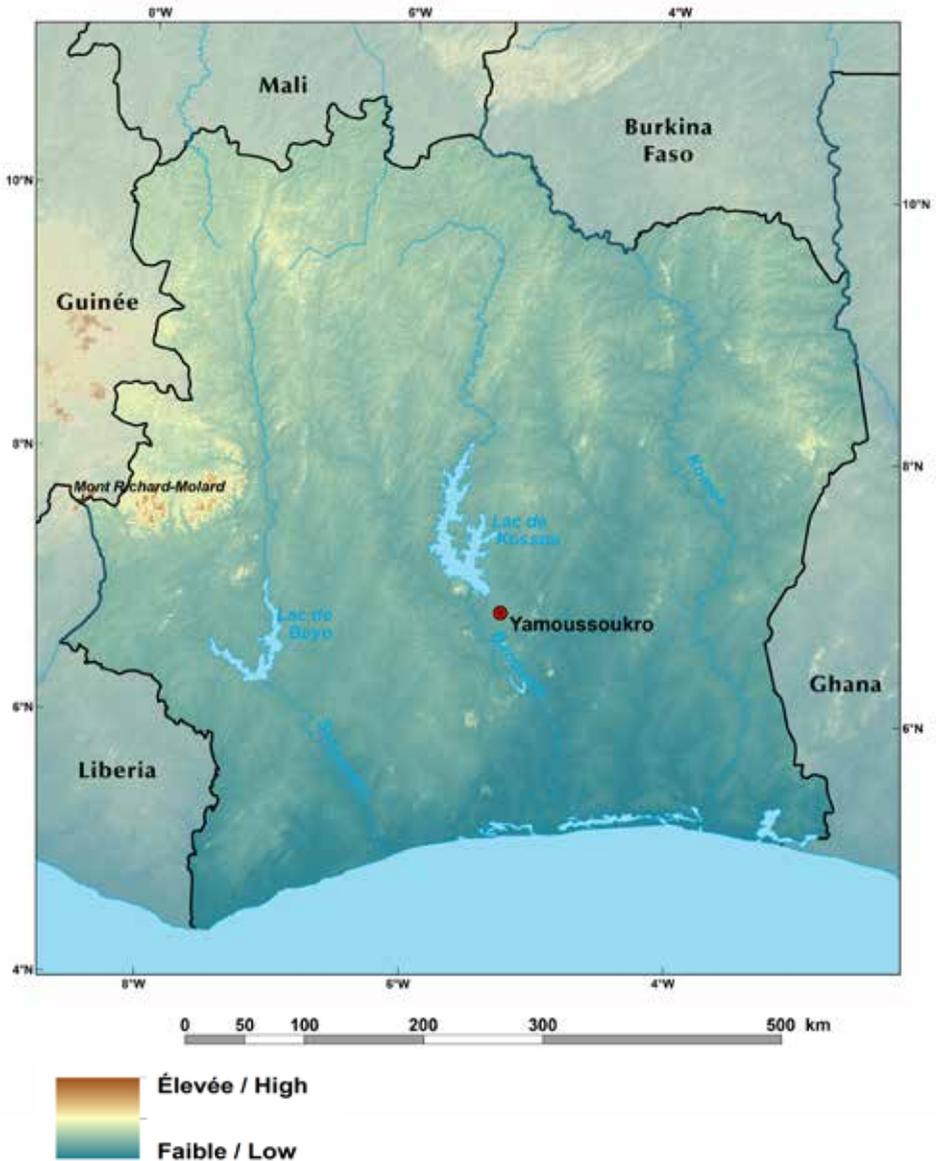
Ecoregions



- FD Forêt Dégradée
- FZM Forêt Montagnarde
- PAVN Plateau Agricole de la Volta Noire
- PC Plaines Côtières
- SBC Savanes du Bassin de la Comoé
- SBS Savanes du Bassin de la Sassandra
- ZACN Zone Agricole du Centre-Nord
- ZFT Zone Forestière Tropicale
- ZT Zone de Transition

The southern part of Côte d'Ivoire is characterized by broad plains, dissected by three main rivers, the Sassandra, the Bandama, and the Komoé (also spelled Comoé). These plains and their productive soils were once forested, but are now heavily used for agriculture and plantations. The center of the country is a transition zone between forest and savanna. Most of the savannas are being encroached upon by rainfed agriculture, especially in the north, along the borders with Mali and Burkina Faso. In northwestern Côte d'Ivoire, several highlands rise from the surrounding plateau. This mountainous region is part of the Guinean Highlands that extend from the southern Fouta Djallon through southeastern Guinea, northern Sierra Leone and Liberia, and adjacent areas of Côte d'Ivoire.

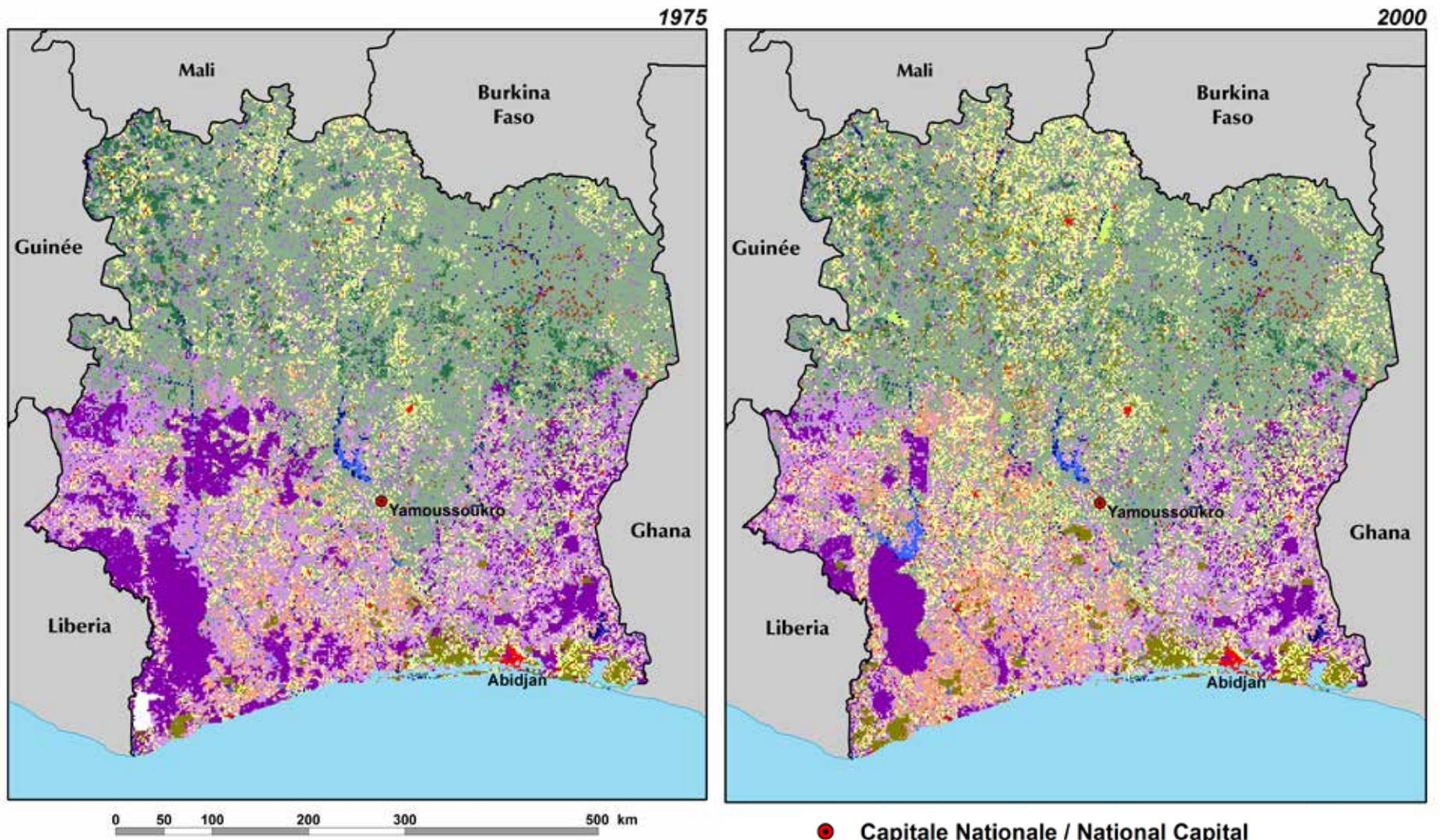
Shaded Relief



Dense forest in southern Côte d'Ivoire

PHOTO (OPPOSITE PAGE): GRAY TAPPAN / USGS

Land Use, Land Cover and Trends



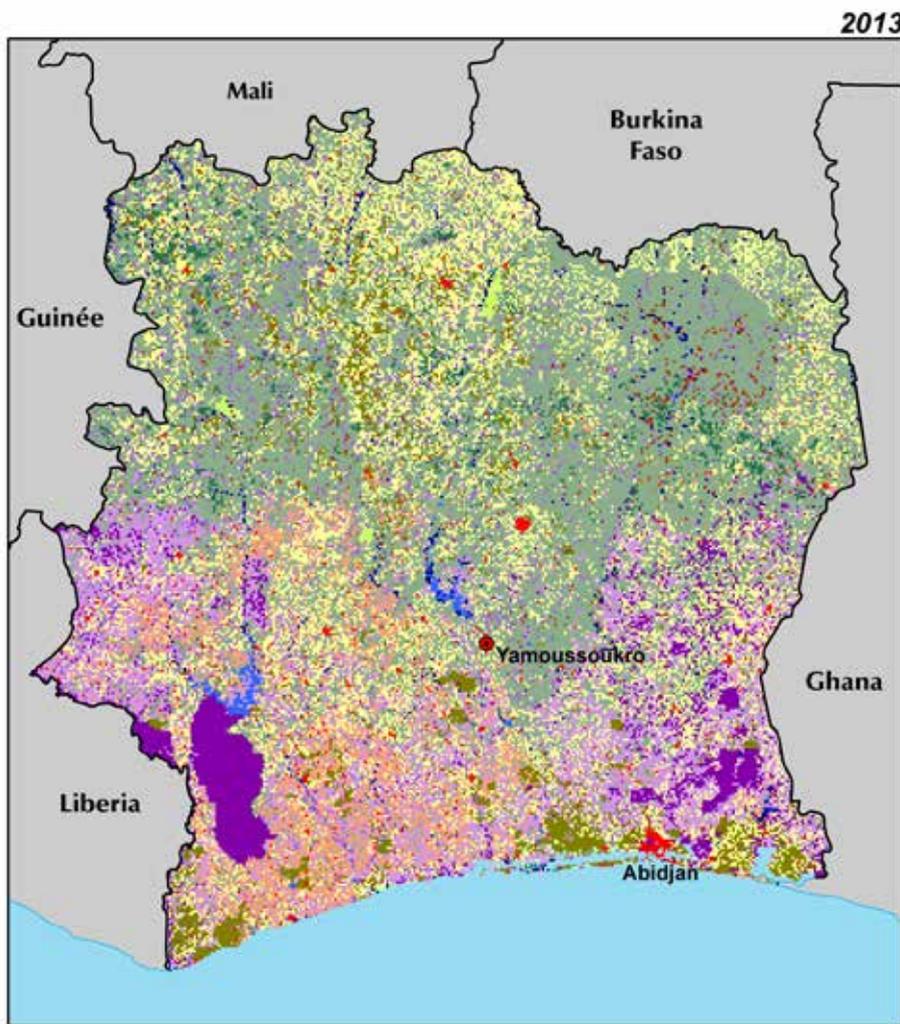
Pineapple crop in Côte d'Ivoire

Land use and land cover in Côte d'Ivoire have changed dramatically over the 38-year period between 1975 and 2013. Most striking has been the expansion of agriculture, with a net increase of 84 percent (31,600 sq km). Agriculture spread almost everywhere in Côte d'Ivoire, with the exception of the northeast, where the boundary of Comoé National Park is well respected and the savanna protected.

In the southern half of the country, rainfall is higher and the soils more productive, making it the center of production for most of the export crops, such as coffee and cocoa. Palm, coconut trees, and rubber tree plantations increased by 160 percent (10,420 sq km), mostly in the southern and central parts of the country. In the northern half of Côte d'Ivoire, subsistence and cash crops such as cotton, sugar, starches, and rice greatly increased, fragmenting the large expanses of woodland and savannas.

Because a large part of the population in Côte d'Ivoire obtains its subsistence from farming, agricultural expansion was mostly driven by population growth. Population increased steadily from 6.6 million in 1975 to 21.6 million in 2013, a rise of 227 percent. On the land cover maps, the area occupied by settlements — towns and cities — doubled from 1975 to 2013. This national average, however, masks an uneven distribution, with much of the population concentrated in the farm-and-forest patchwork region in the south.

Expansion of agricultural lands was not without consequences on the forested landscape. Indeed, the continuous deforestation to clear for cultivation is one of the most dramatic and possibly irreversible events in Côte d'Ivoire. In the past, most of the timber harvest occurred



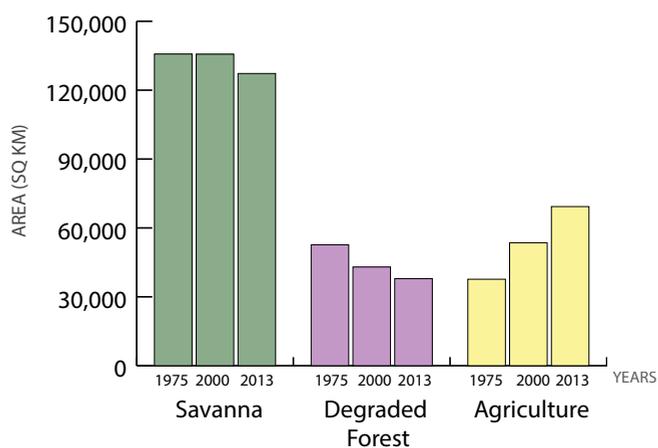
Occupation des Terres / Land Cover

- Forêt / Forest
- Forêt galerie & formation ripicole / Gallery forest & riparian forest
- Forêt dégradée / Degraded forest
- Forêt claire / Woodland
- Forêt marécageuse / Swamp forest
- Mangrove
- Savane / Savanna
- Fourré / Thicket
- Zone de culture / Agriculture
- Cultures irriguées / Irrigated agriculture
- Cultures des bas-fonds et de décrue / Agriculture in shallows and recession
- Plantation
- Habitation / Settlements
- Sols dénudés / Bare soil
- Terrains rocheux / Rocky land
- Surfaces sableuses / Sandy area
- Carrière / Open mine
- Plans d'eau / Water bodies
- Prairie marécageuse - vallée inondable / Wetland - floodplain

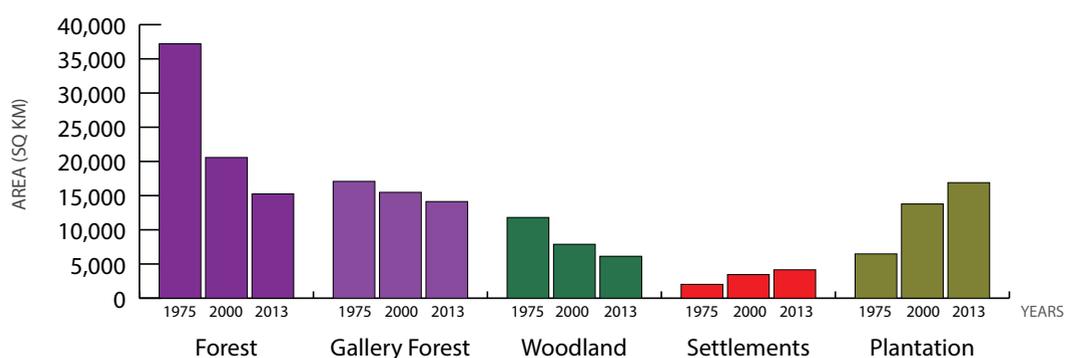
within the reserved forests that counted for 40 percent of the total forest of the country (14,500 sq km). However, excessive extraction over the past 38 years has led to their depletion, and reserved forests lost almost 70 percent of their forest coverage. In addition, timber theft and illegal logging are widespread and are the primary reasons for the degradation of natural forests. Forests and gallery forests, as well as woodland outside protected areas, are all heavily degraded. By 2013, Côte d'Ivoire had lost nearly 60 percent of the 37,300 sq km of dense tropical forests that existed in 1975. Similarly, degraded forest decreased by 28 percent and woodland area declined by 48 percent. Another important forest class is the gallery forest — dense ribbons of biologically rich forest that follow watercourses and river systems up into the Sudanian zone savannas in the north. While they are limited to narrow strips of dense forest, their total area covers almost 5 percent of the country. In 1975, the gallery forests represented 17,100 sq km. This figure decreased to 14,130 sq km in 2013.

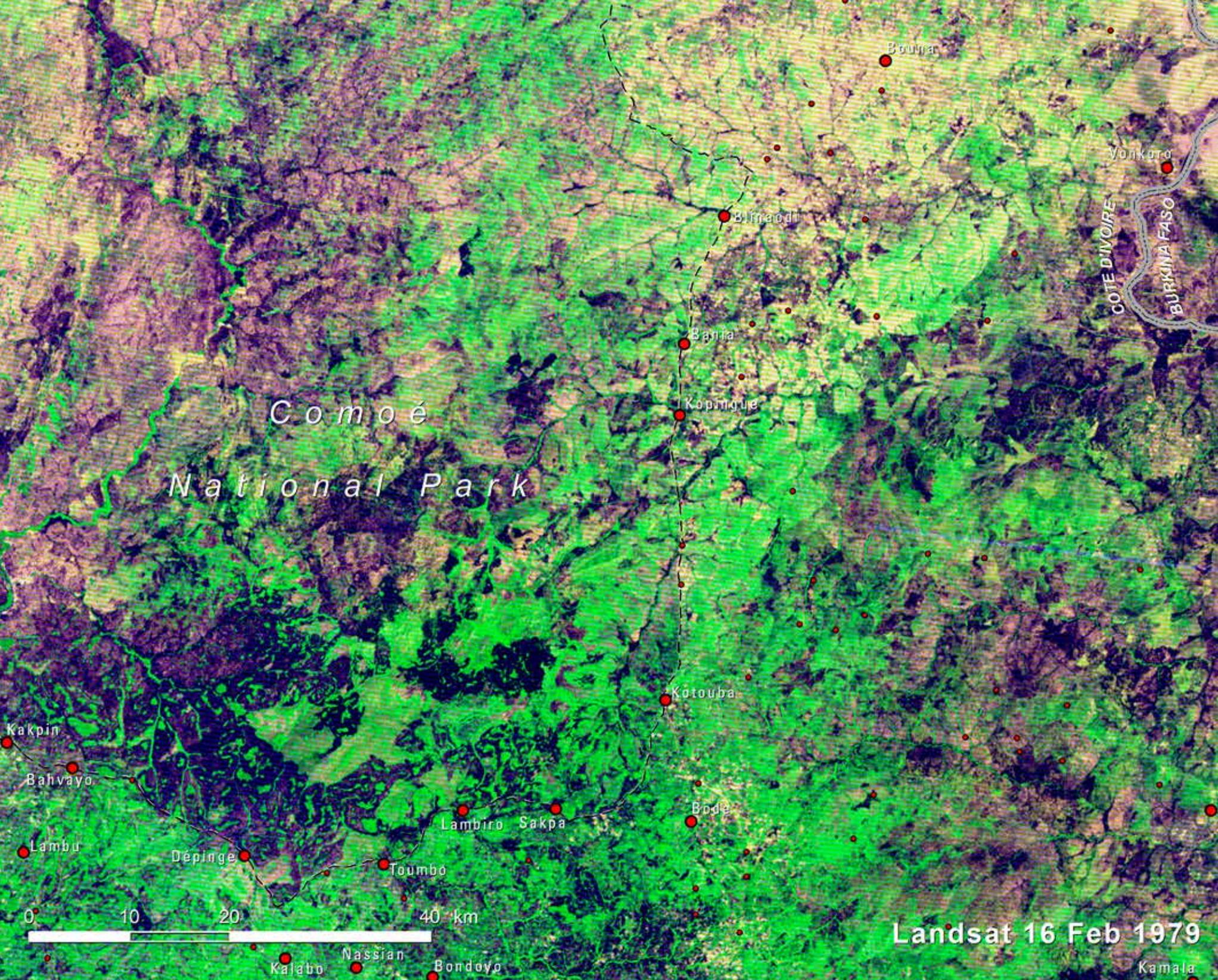
Despite recent forest management efforts taken by the government, such as halting illicit harvesting, promoting reforestation, reformation of logging activities, increasing the protected areas, and encouraging private investments in forestry, expansion of agricultural lands driven by an increasing population remains the key driver to deforestation in Côte d'Ivoire (Ehuitché, 2015).

Large area classes



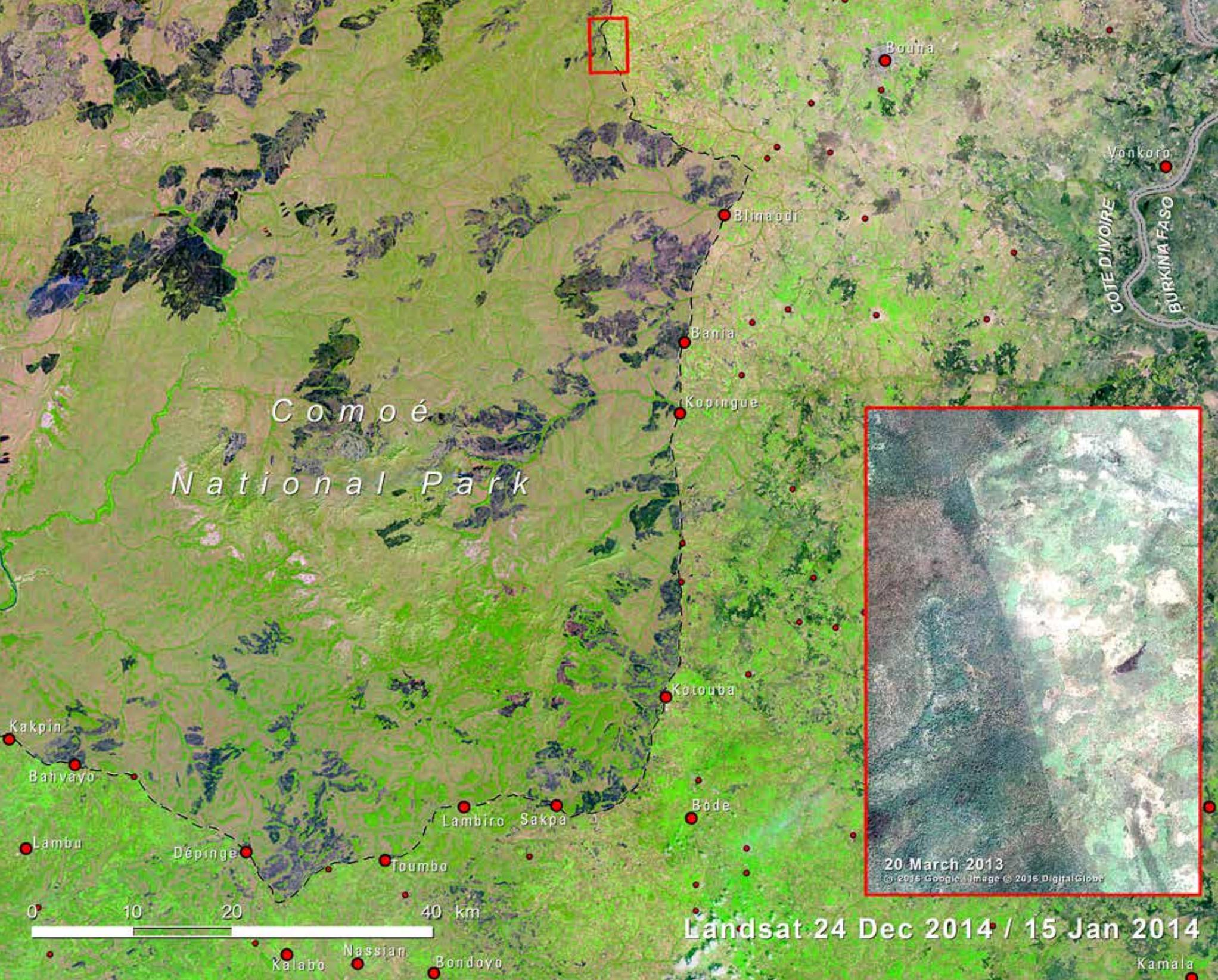
Small area classes



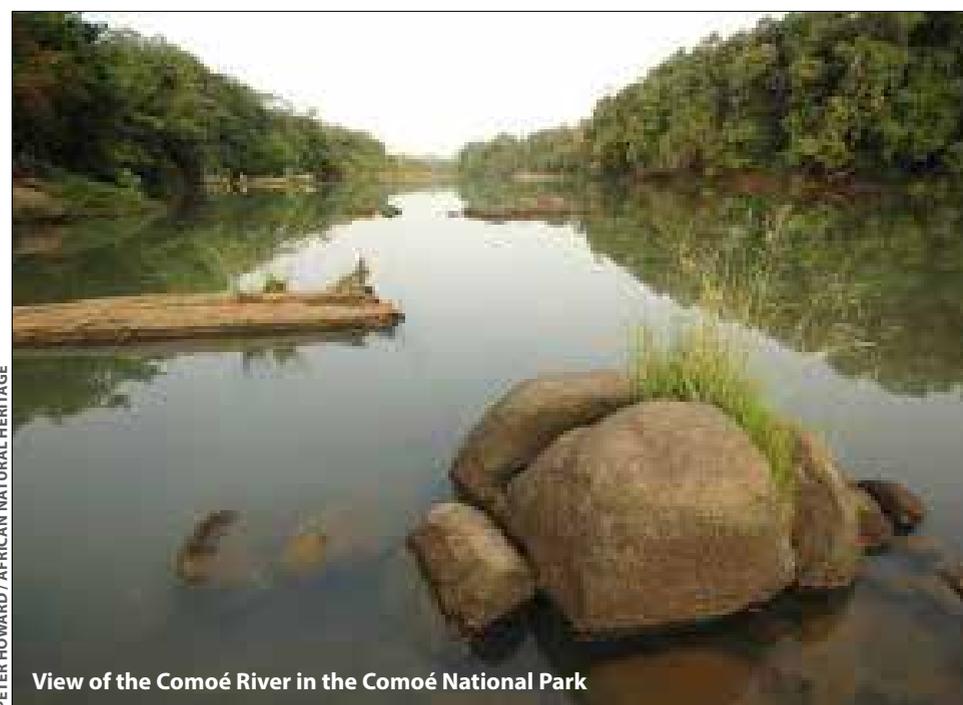


Protecting the ecological integrity of Comoé National Park

Located in northeastern Côte d'Ivoire, 30 km south of the Burkina Faso border, Comoé National Park covers about 11,500 sq km. Comoé National Park was established in 1968 and designated a UNESCO World Heritage Site in 1983. Due to its location and vast area dedicated to the conservation of natural resources, this park is an ecological unit of particular importance. Comoé National Park contains a remarkable variety of habitats, ranging from open savannas and woodland to wetland and gallery forests, normally only found much farther south (UNESCO, 2015). In the 1970s, the Park's natural landscapes could hardly be distinguished from the surrounding savannas and woodlands, with the exception of the northeast boundary where agriculture had already started to expand between the park and the Burkina Faso border (UNEP-WCMC, 2014). By 2014, the park boundary clearly stands out from the growing agricultural landscapes around it. Despite increasing pressure from agriculture expansion and urbanization, the park's natural habitats have remained relatively intact. However, in 2003, Comoé National Park was added to the list of World Heritage Sites in Danger due to poaching, overgrazing by cattle, and breakdown of management owing to civil conflict (UNEP-WCMC, 2014). To reduce these problems, checkpoints and patrol posts were implemented

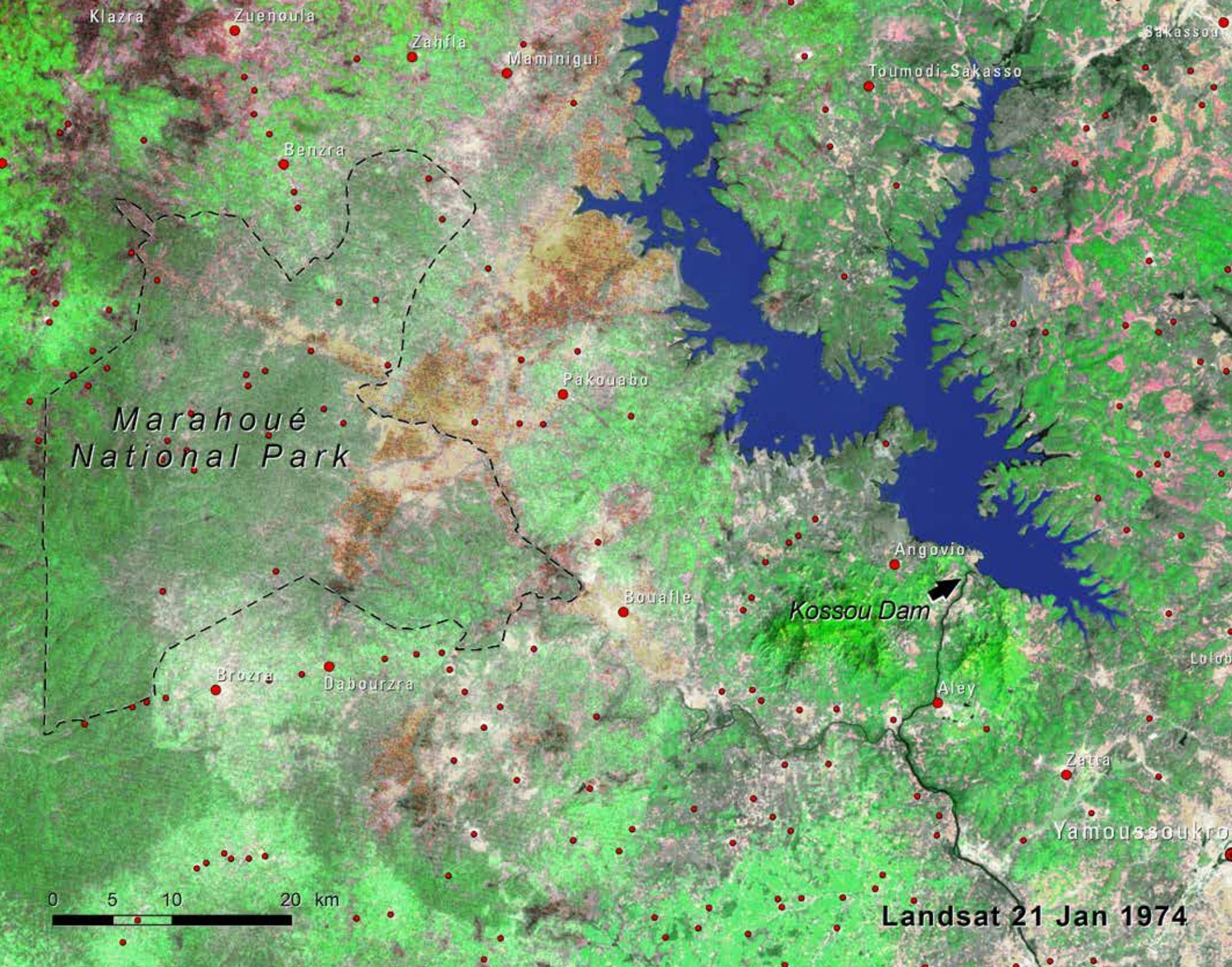


around the park boundary, and only two zones are open for tourism. An evaluation by UNESCO recommended an efficient surveillance system throughout the park and the establishment of participatory management with local communities to diminish the pressures and impacts associated with the management of areas located on the periphery (UNESCO, 2015). Currently, Comoé National Park is a rare sanctuary for a variety of West African species, including the western chimpanzee, the African wild dog, and the African elephant. It is also one of the few remaining natural areas in the region that is large enough to ensure the ecological integrity of the species that live there. Despite the clearly established and defined boundaries, additional management measures will be needed to protect the unique park ecosystems in their entirety in the long term.



PETER HOWARD / AFRICAN NATURAL HERITAGE

View of the Comoé River in the Comoé National Park

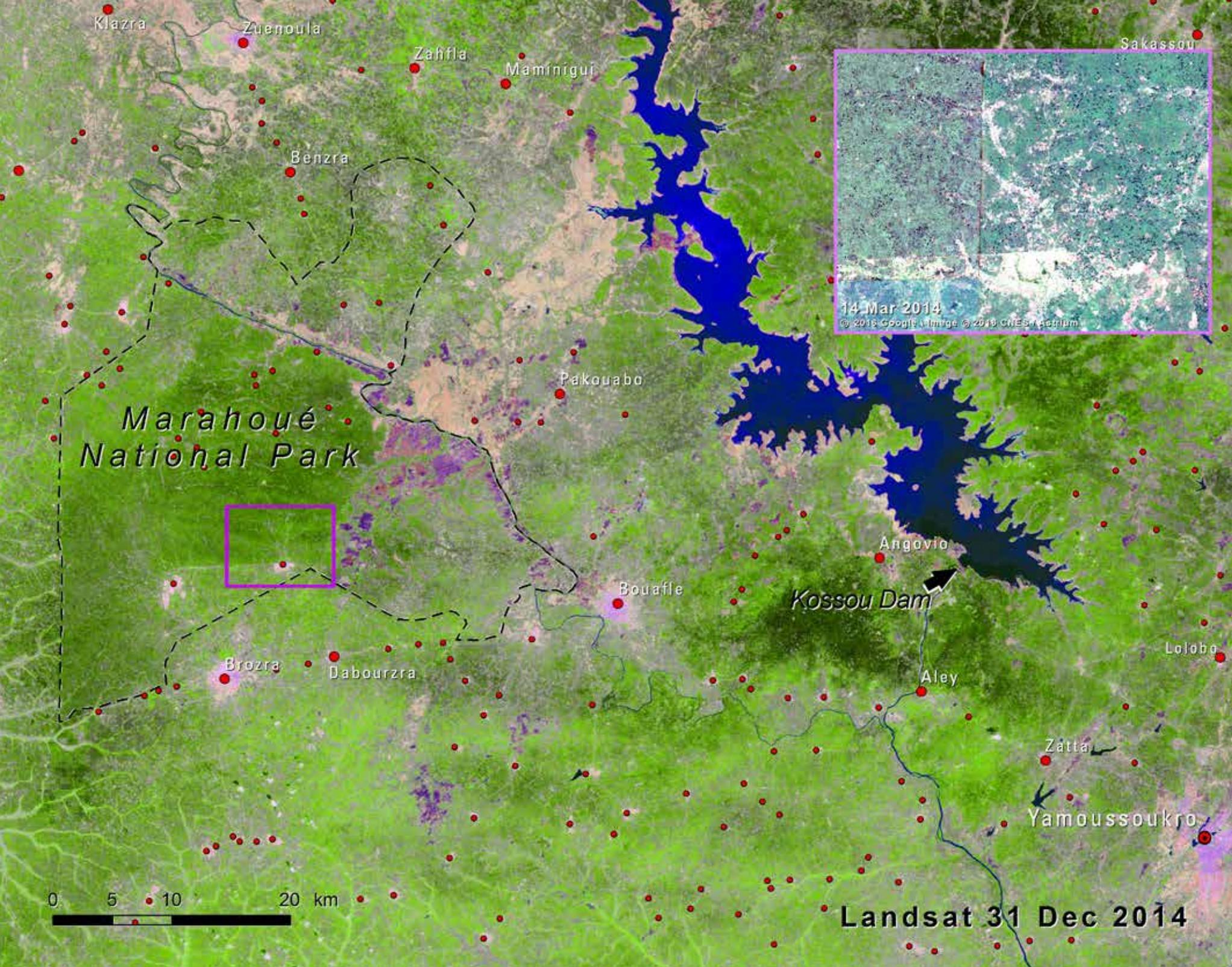


Marahoué National Park: a protected area on the edge of existence

Marahoué was designated as a national park in 1968, after being previously established as a wildlife reserve in 1956. The park covers 1,010 sq km in central Côte d'Ivoire. Marahoué lies on the northern edge of West Africa's Upper Guinean forest and was especially unique for its range of habitat types and great diversity of fauna (Schulenberg and others, 1999).

As a transition zone between the savannas and the tropical rain forest, the park was an important center of biodiversity due to the presence of species from both savanna and forest-type habitats. The variety of environments in Marahoué also provided refuge for several rare and endangered species, including forest elephants, primates, and a wide variety of birds (Schulenberg and others, 1999). Prior to its establishment as a national park, several cacao plantations and cropland had already encroached within its boundary, covering about 3 percent of the park area by 1975. The remaining vegetation of Marahoué National Park was composed of approximately 60 percent forest, 15 percent degraded forest, 5 percent gallery forest, and 17 percent mosaic of savannas and thickets.

In recent decades, Côte d'Ivoire has experienced some of the highest rates of deforestation seen anywhere in Africa. The non-eviction of farmers within the national park exacerbated human pressure on its resources, especially near the eastern and northern boundary. This human pressure is also related to the proximity of the city of Yamoussoukro and the Kossou dam (Denis, 2015). Wildlife and other park resources were subject to exploitation by human populations from adjacent villages and towns, mainly for game meat, wood and land for agriculture. Many people continue to cultivate and extend large cocoa plantations within the park boundaries,



even though it is illegal (Schulenberg and others, 1999). By 2014, the forest had totally disappeared and only few vestiges of degraded forest and gallery forest remained (12 percent and 4 percent of the park area, respectively). Agriculture and plantations had replaced natural habitats and covered about 15 percent of the park area. Although the land cover appears green and lush in the 2014 Landsat image, intensive deforestation had converted most of the forested habitats to savanna and thicket that now represent 67 percent of the Marahoué National Park area (see inset above).

Human pressure has left wide swaths of land inhospitable to most park wildlife, and today Marahoué National Park is characterized by a sharp deterioration in its natural resources. Human pressures, years of continuous poaching and the development of plantations have significantly reduced the number of animals within the park boundary (Denis, 2015). As habitat shrinks, species such as the chimpanzee (*Pan troglodytes verus*) were almost totally eradicated, and others, such as the elephants, had to be relocated to avoid conflicts with farmers (AFP, 2014).



ROBERT WATREL/SDSU