



OSFAC NASA / UMD CARPE

Building capacity in
geospatial applications and
use of remote sensing data



CBFP Meeting, Kigali, 21-26 November 2016



USAID
FROM THE AMERICAN PEOPLE

OSFAC : Satellite Observatory for Central African Forests

Founded in 2000, OSFAC is a representative of GOFC GOLD Network in Central Africa

- 1. Free dissemination of satellite imagery in the countries of the Congo Basin**
- 2. Capacity Building in Remote Sensing (RS) and Geographic Information Systems (GIS)**
- 3. Monitoring and Evaluation of forest cover loss and changes**

OSFAC Support

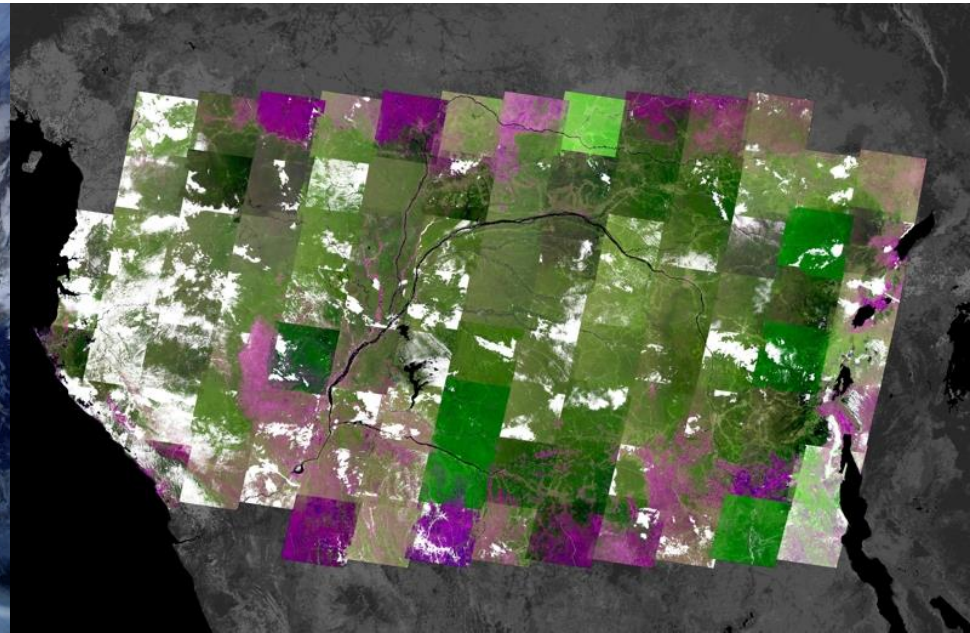
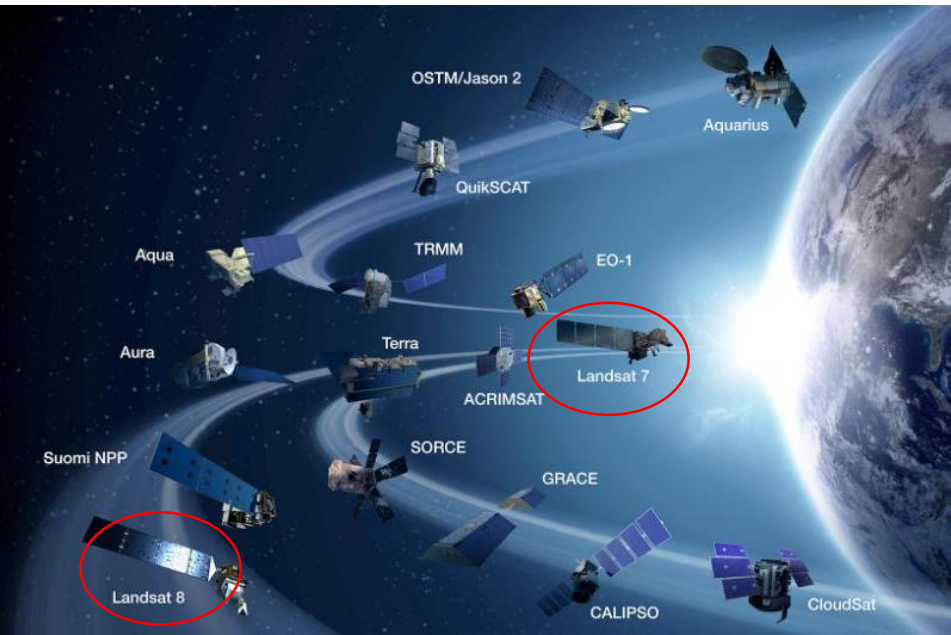
Financial Support : USAID/CARPE, EU

Technical Support : UMD, SDSU, NASA, GOFC-GOLD, START

Use of remote sensing data

1. Derivation of useful thematic information from satellite reflectance data
2. Operational, systematic satellite based forest monitoring and production of consistent time series data on forest cover.
3. Dissemination of data sets through data portals, on line interactive maps and through hard copy atlases.
4. Establishing capacity in remote sensing data applications

Uncorrected Landsat imagery



Composite of multiple observations

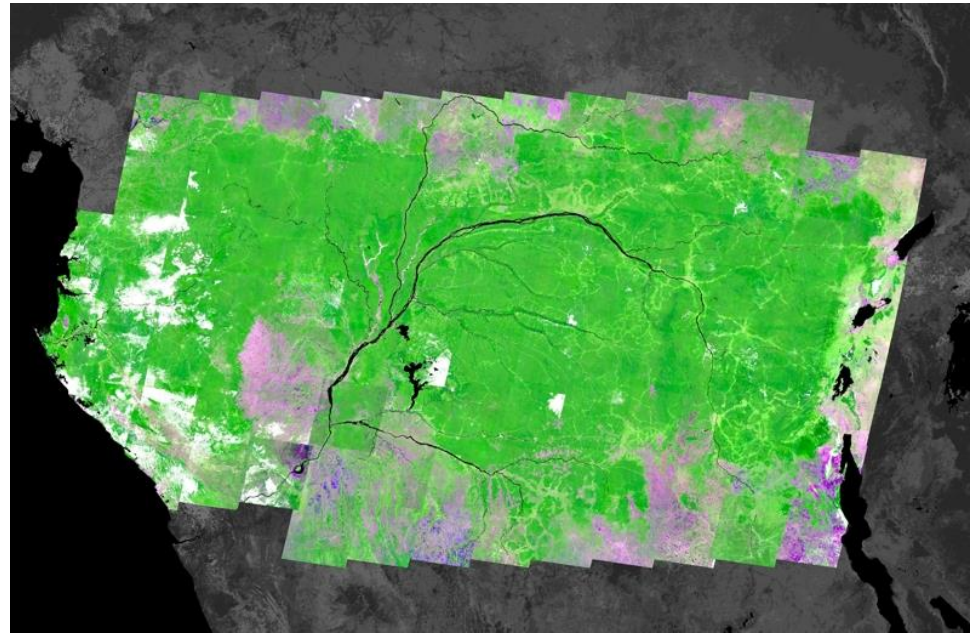
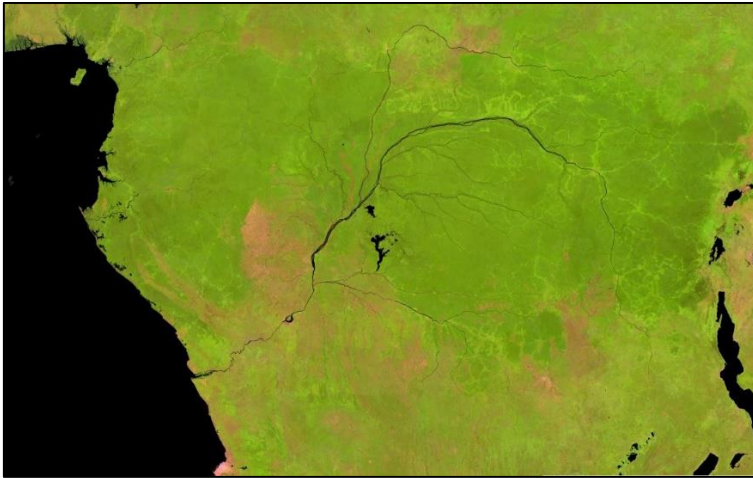


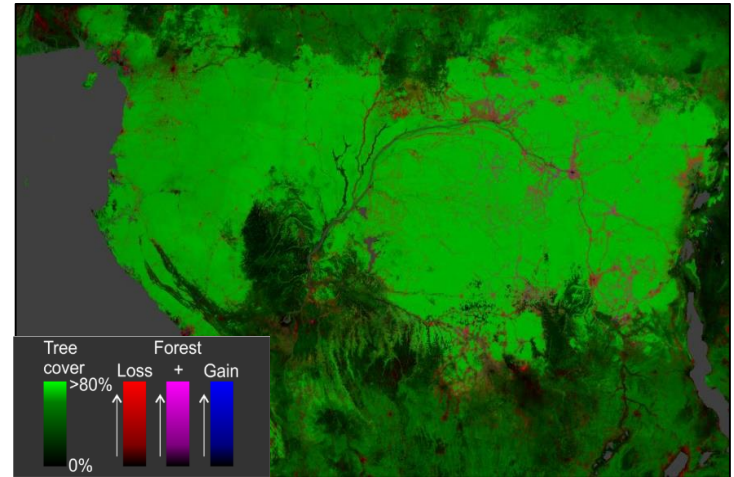
Image credit: NASA

Data is normalized (bias adjusted) to consistent top of atmosphere reflectance, corrected for anisotropy (varying angle between target, sun and sensor); cloudy pixels replaced with highest quality pixels

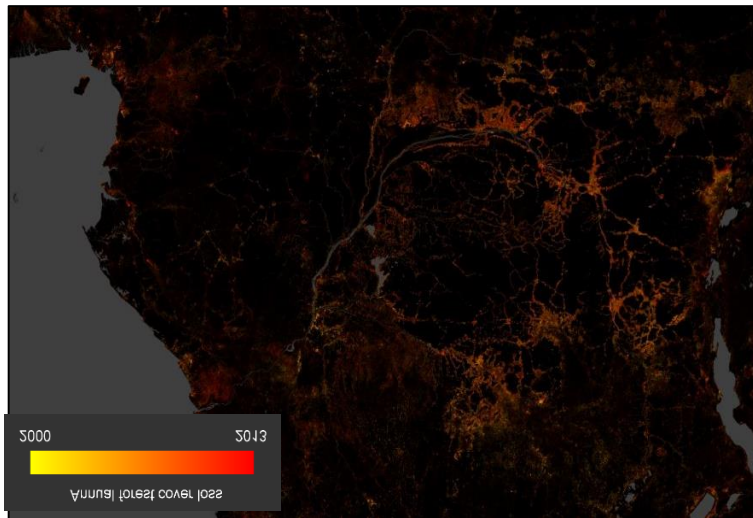
Operational Monitoring of Forest Extent and Change



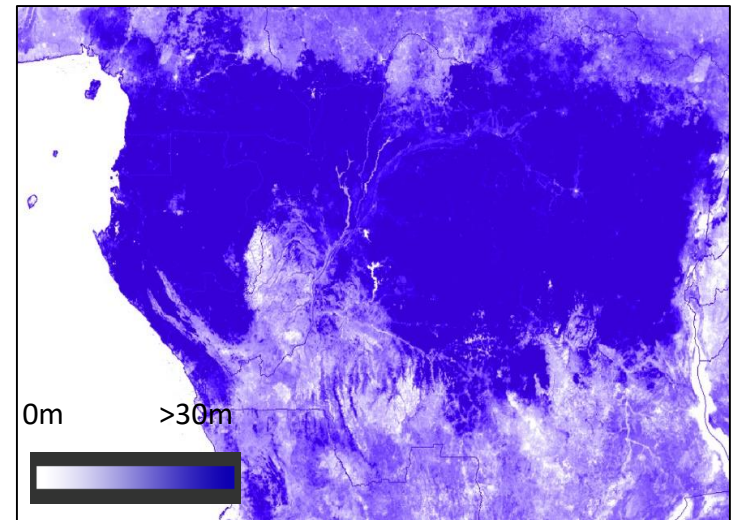
Cloud-free Landsat time-series data sets



Tree cover extent and change



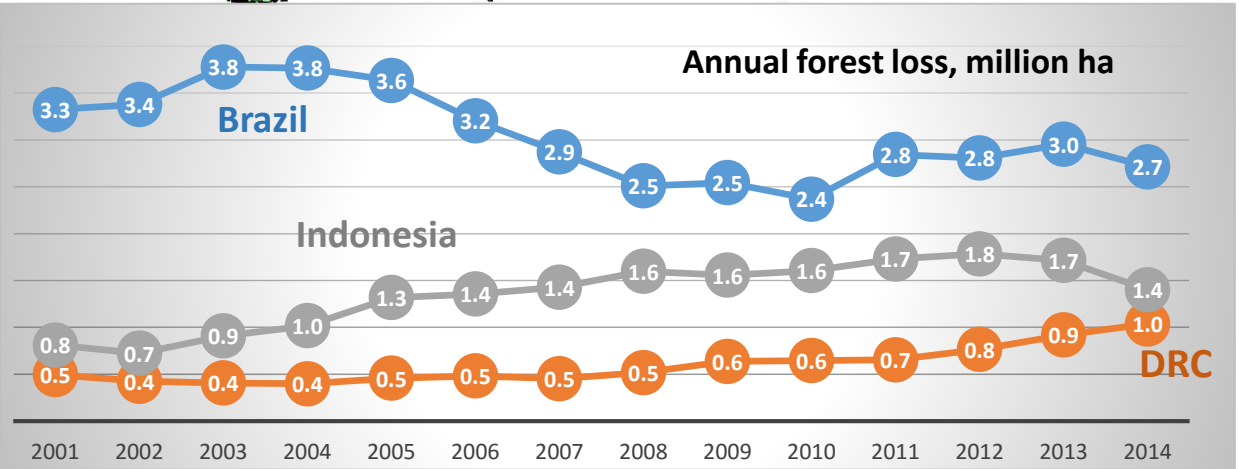
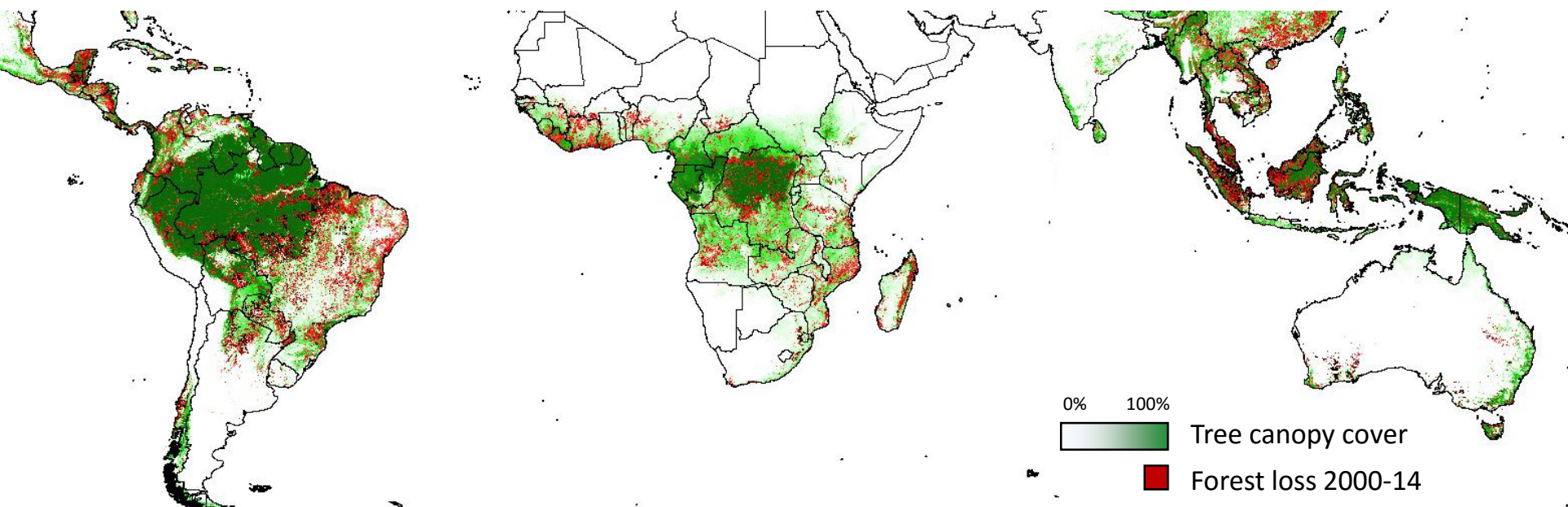
Annual forest loss



Tree canopy height

Global forest cover change 2000-2014

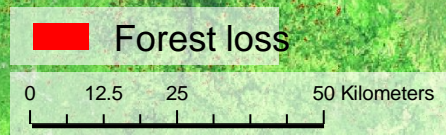
Gross forest cover loss 2000-2014 within tropical countries



Annual loss shown using 3-years mean filter

2001

Virunga NP,
Dem. Rep. Congo



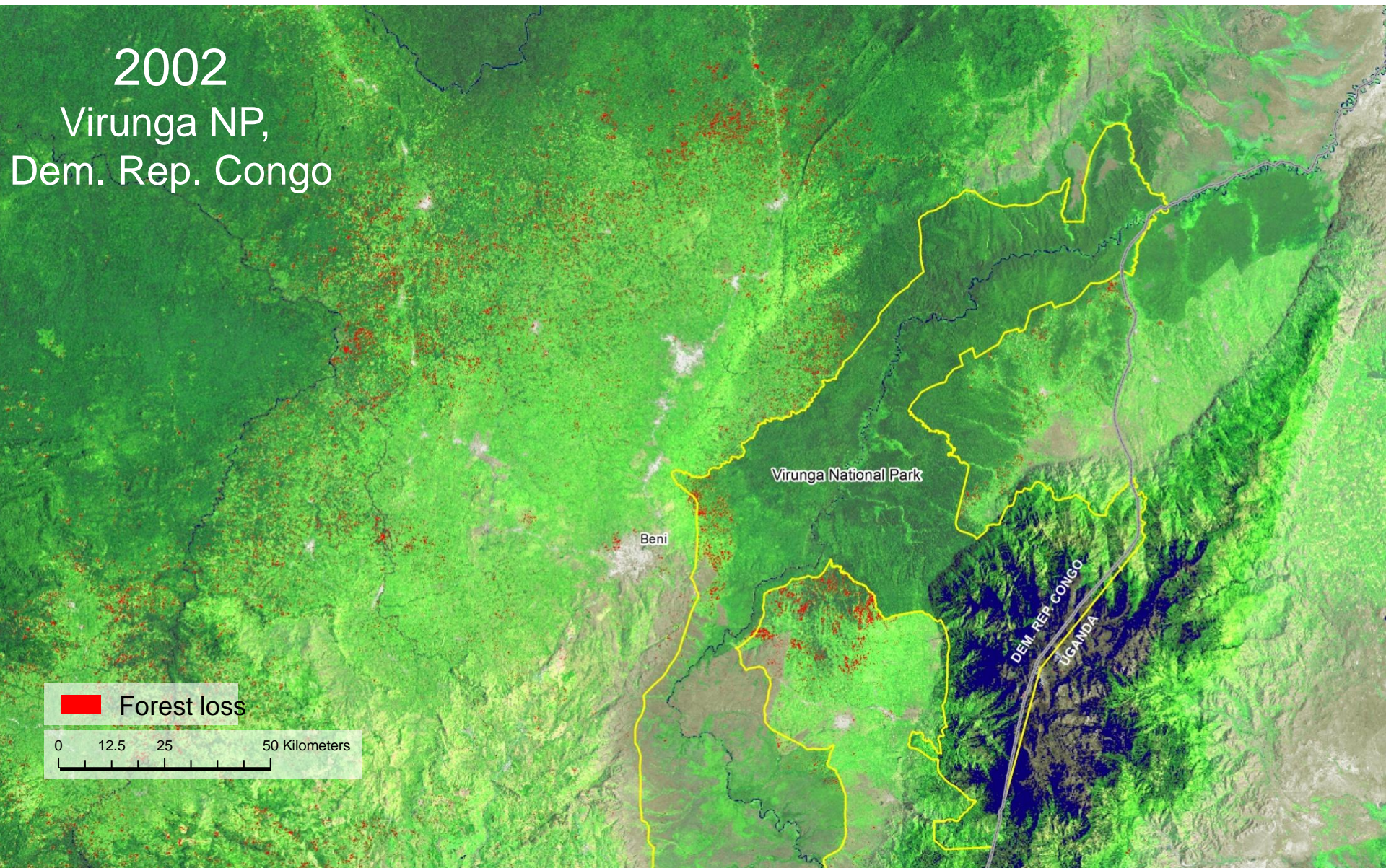
Virunga National Park

Beni

DEM. REP. CONGO
UGANDA

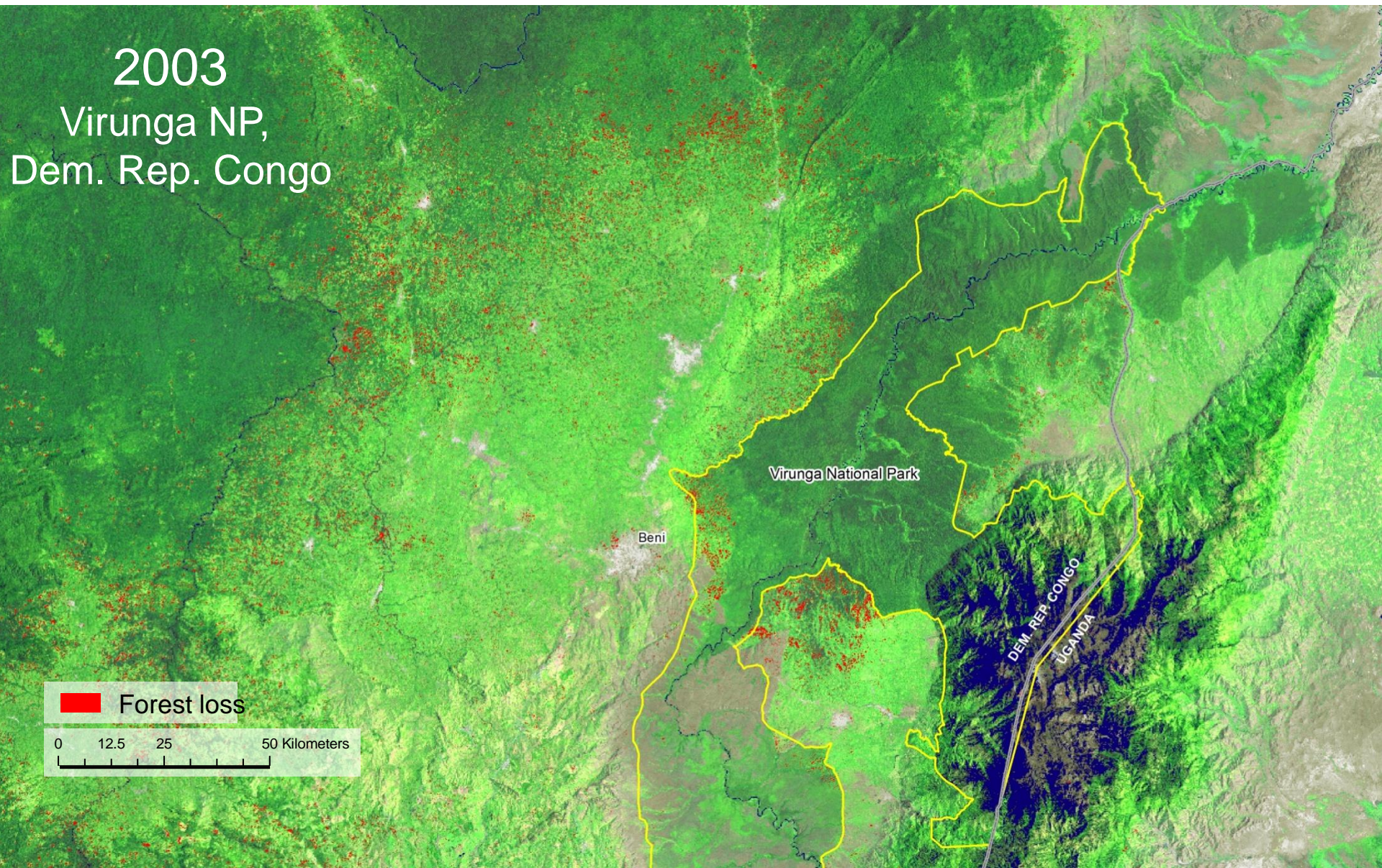
2002

Virunga NP,
Dem. Rep. Congo



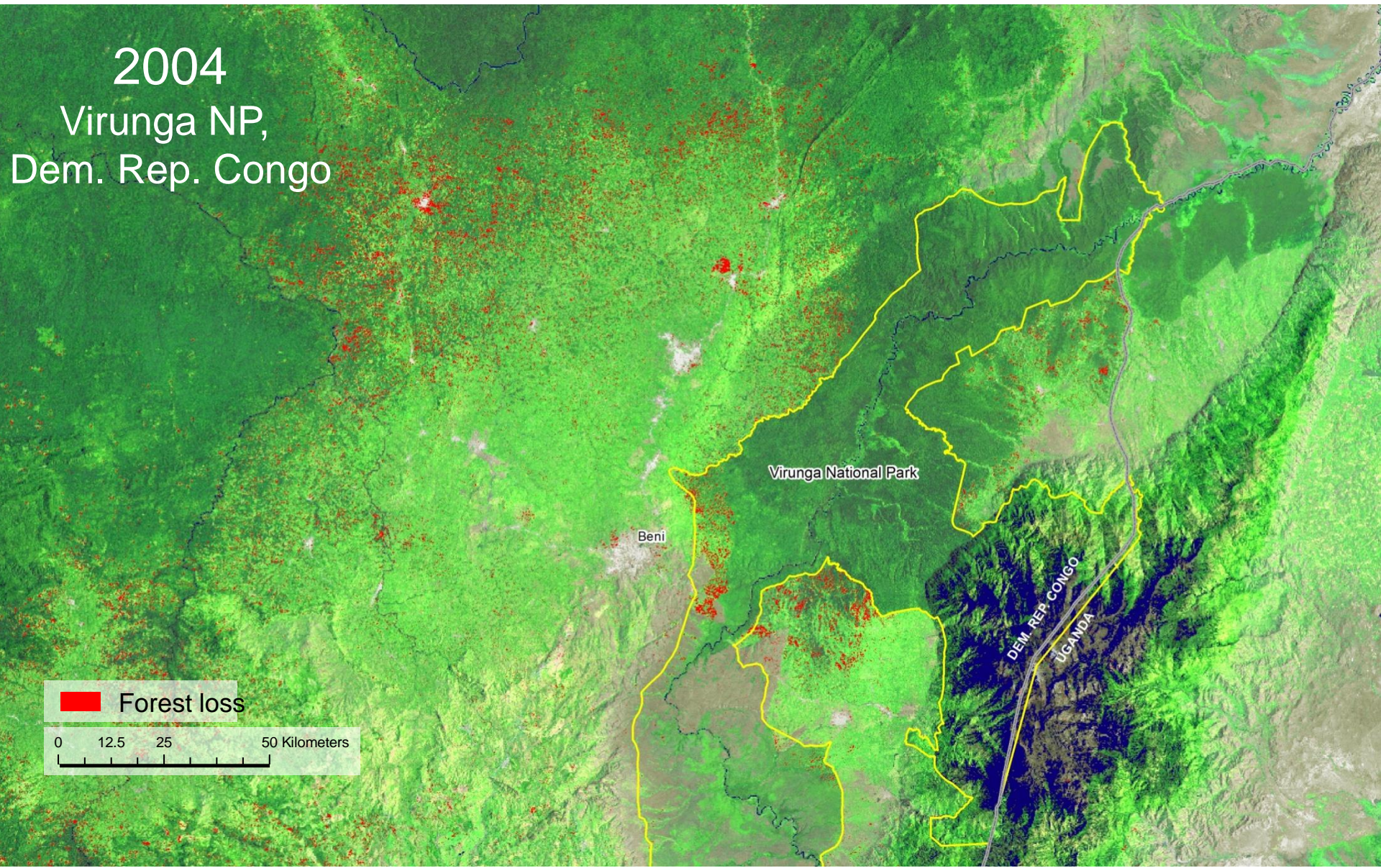
2003

Virunga NP,
Dem. Rep. Congo



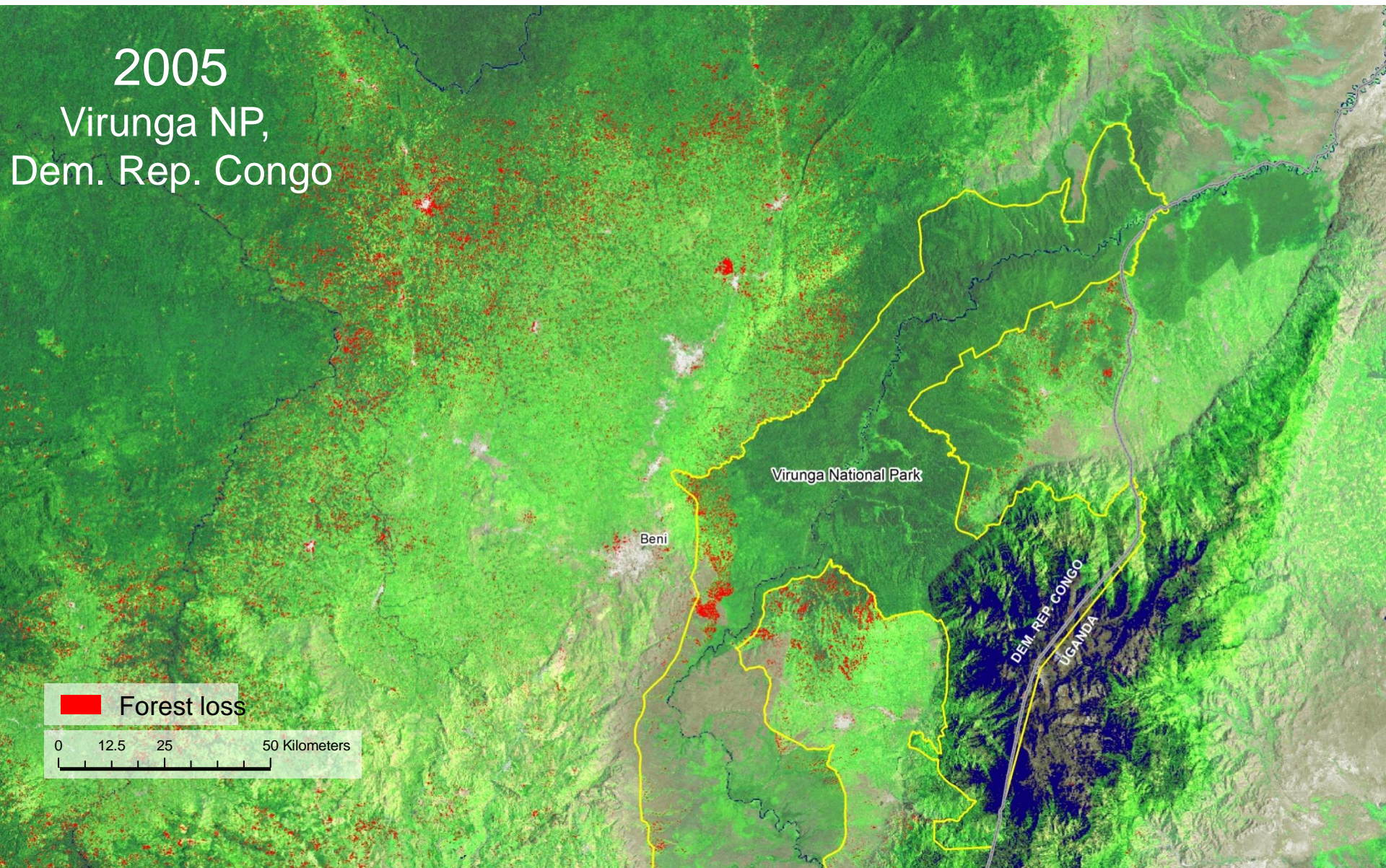
2004

Virunga NP,
Dem. Rep. Congo



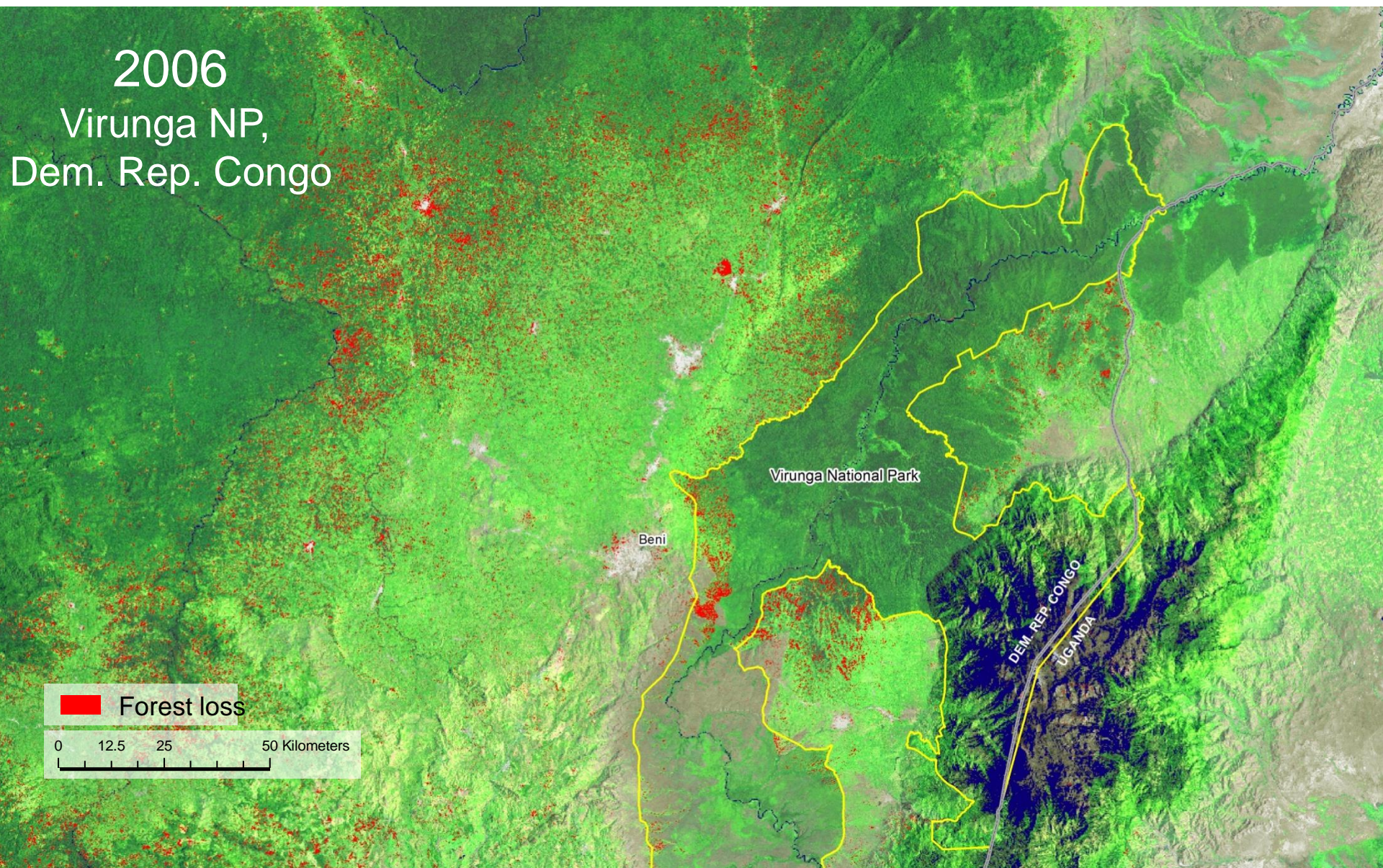
2005

Virunga NP,
Dem. Rep. Congo



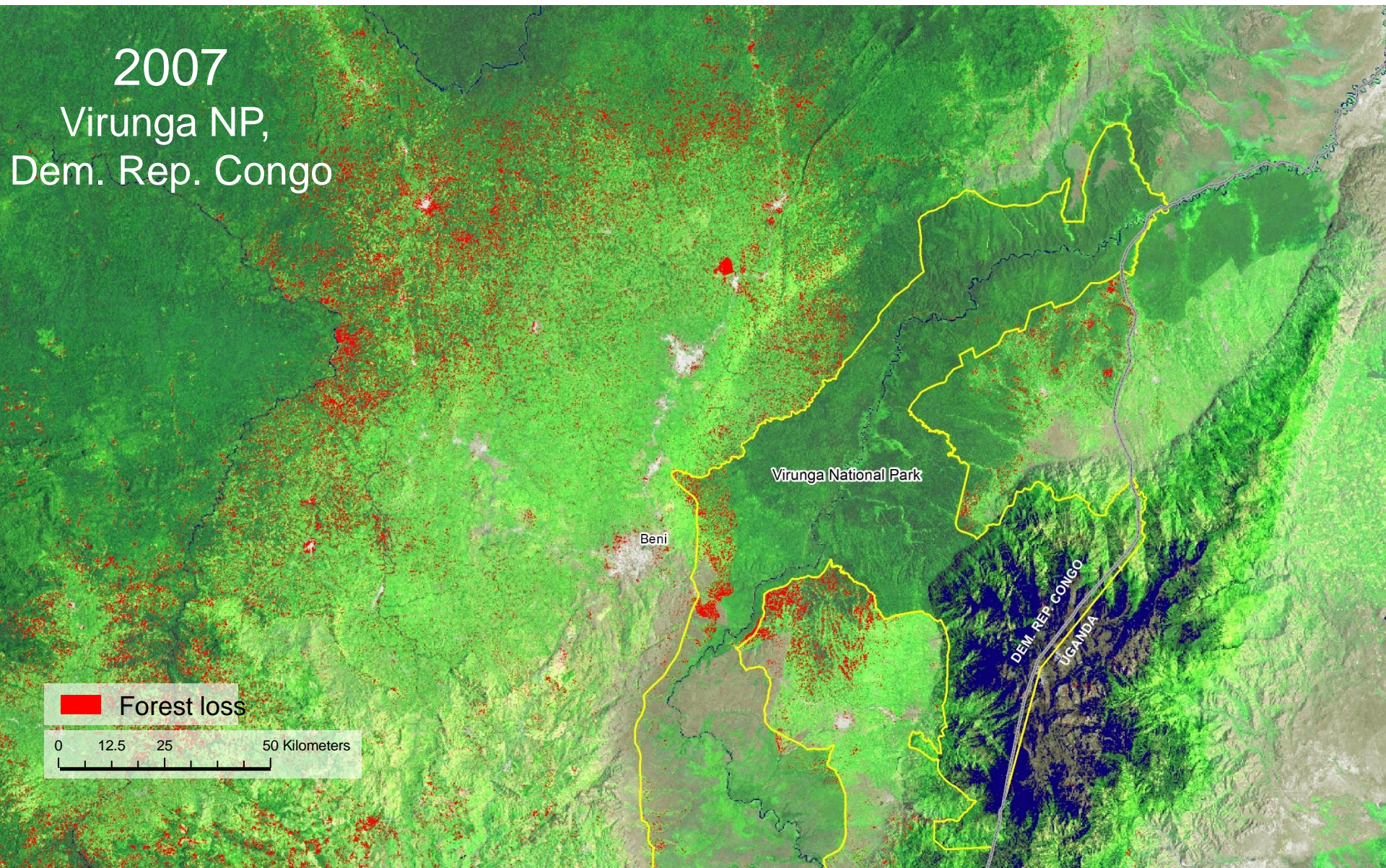
2006

Virunga NP,
Dem. Rep. Congo



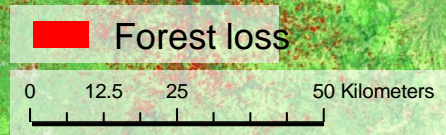
2007

Virunga NP,
Dem. Rep. Congo



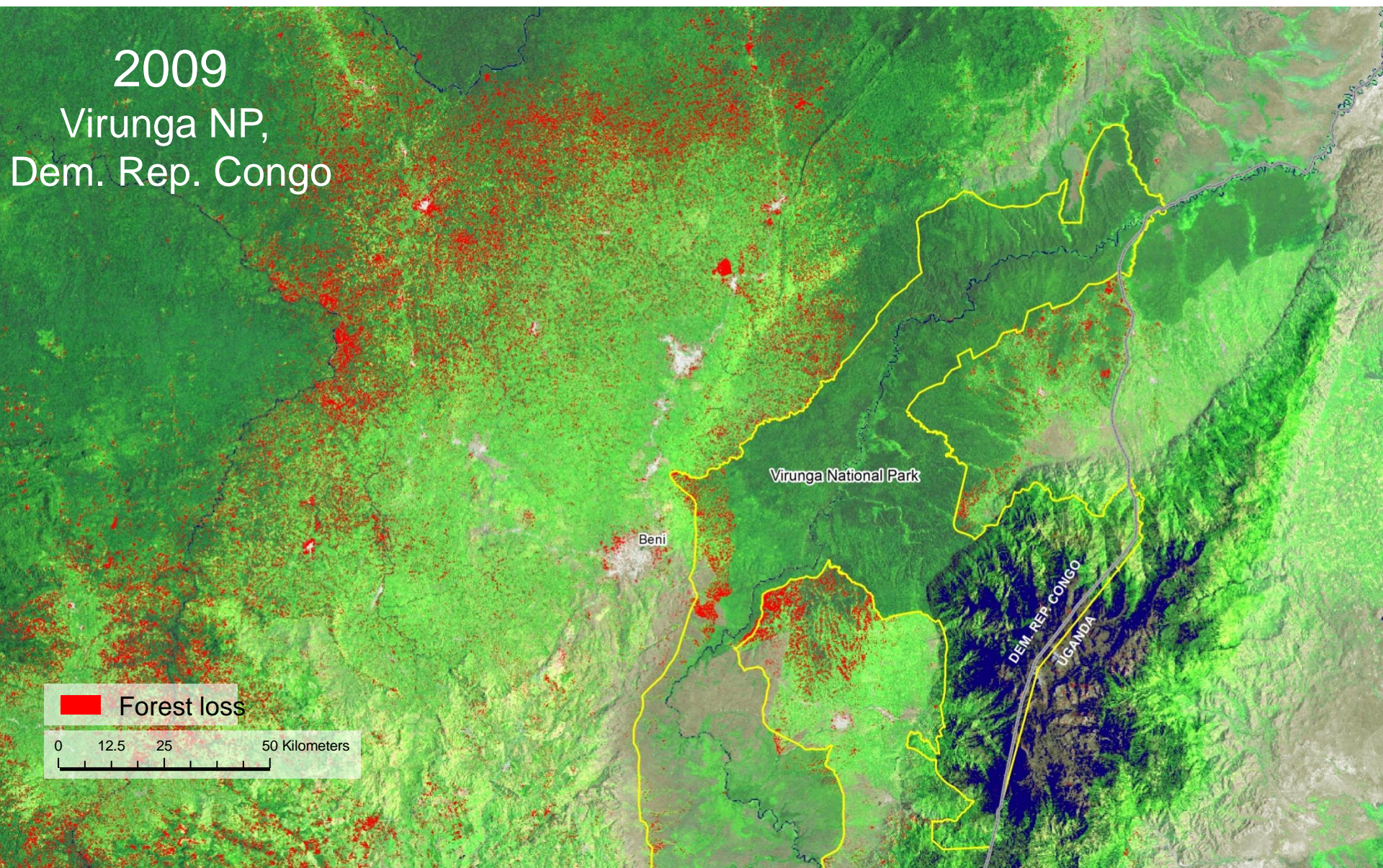
2008

Virunga NP,
Dem. Rep. Congo

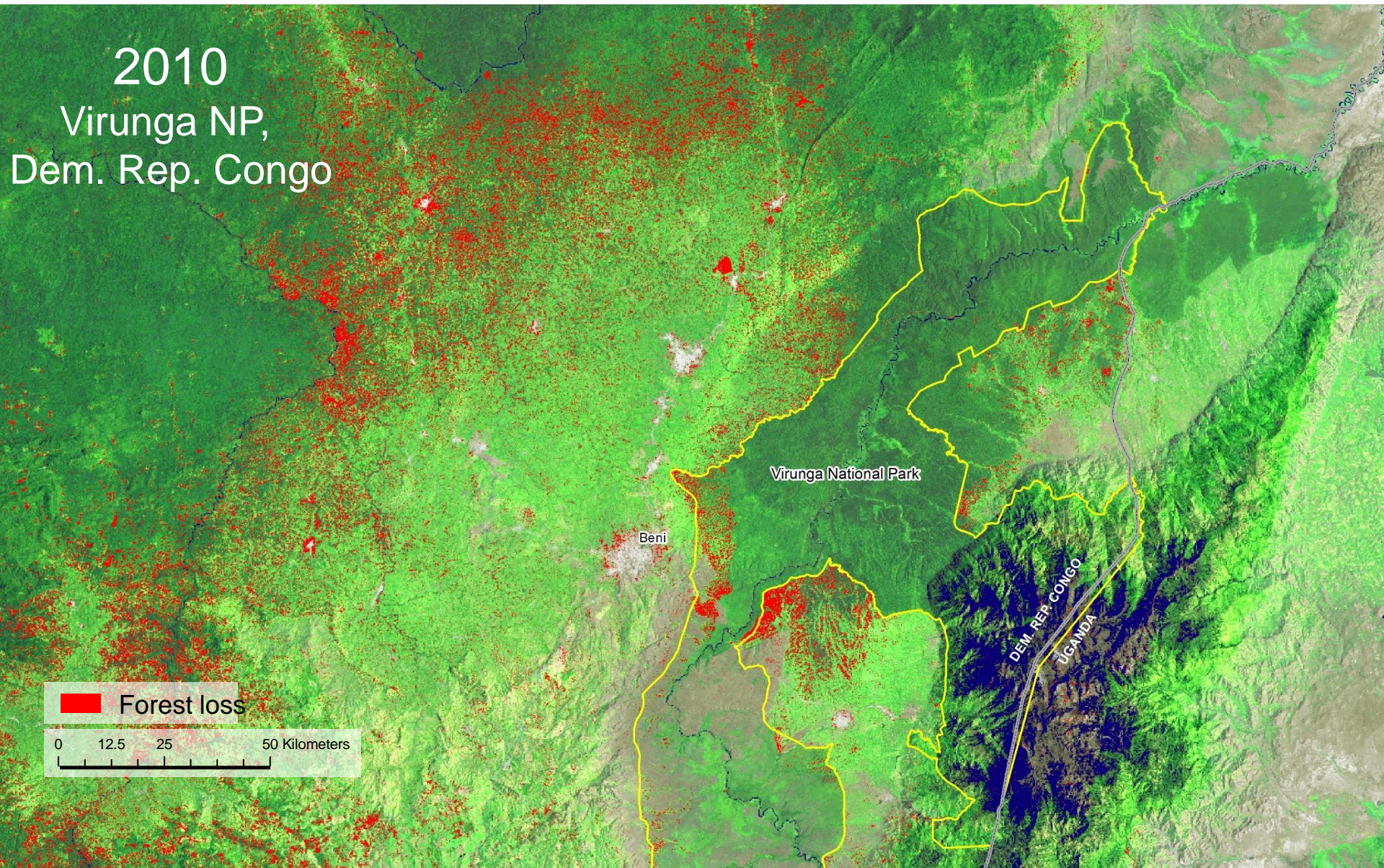


2009

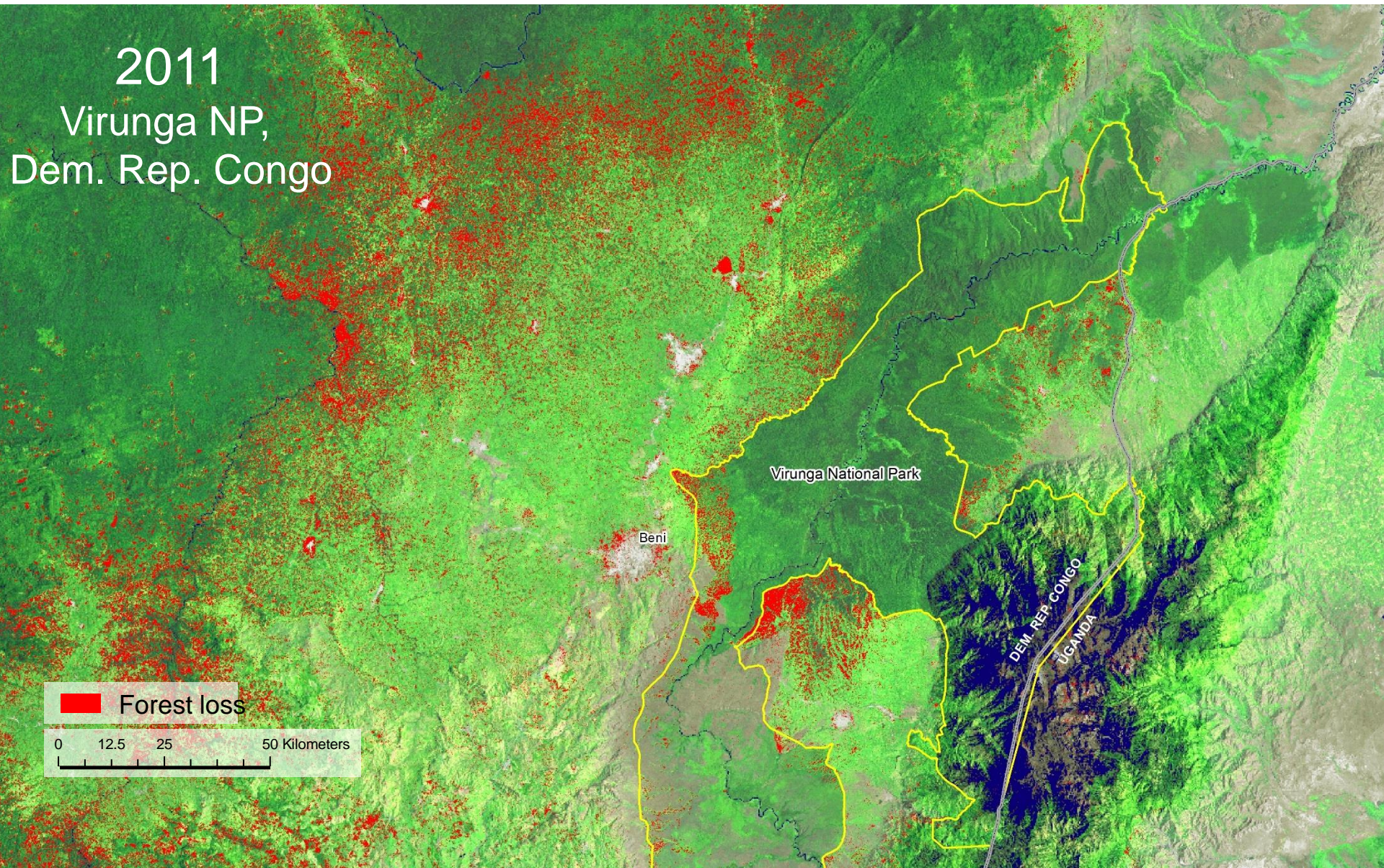
Virunga NP,
Dem. Rep. Congo



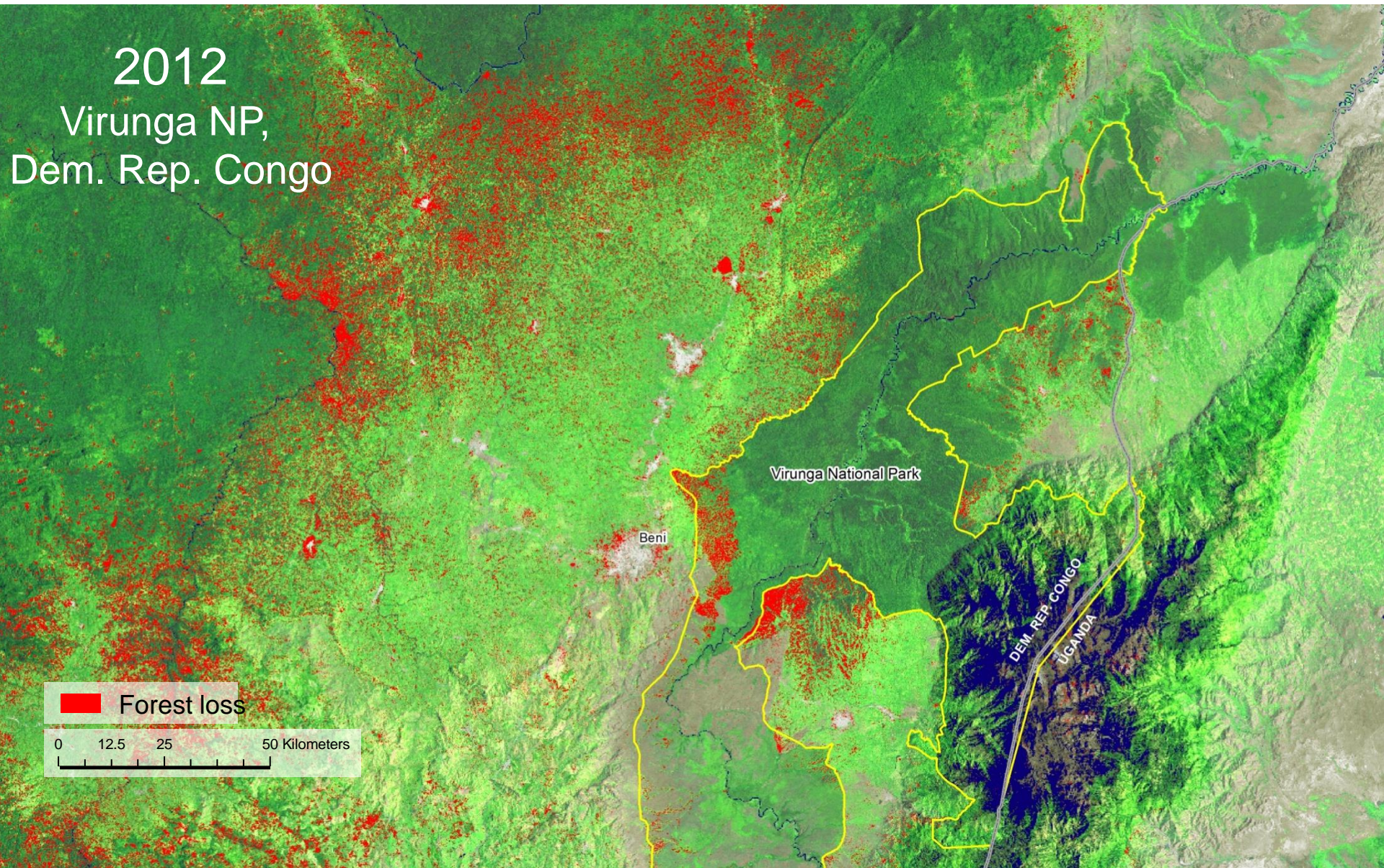
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Virunga NP,
Dem. Rep. Congo



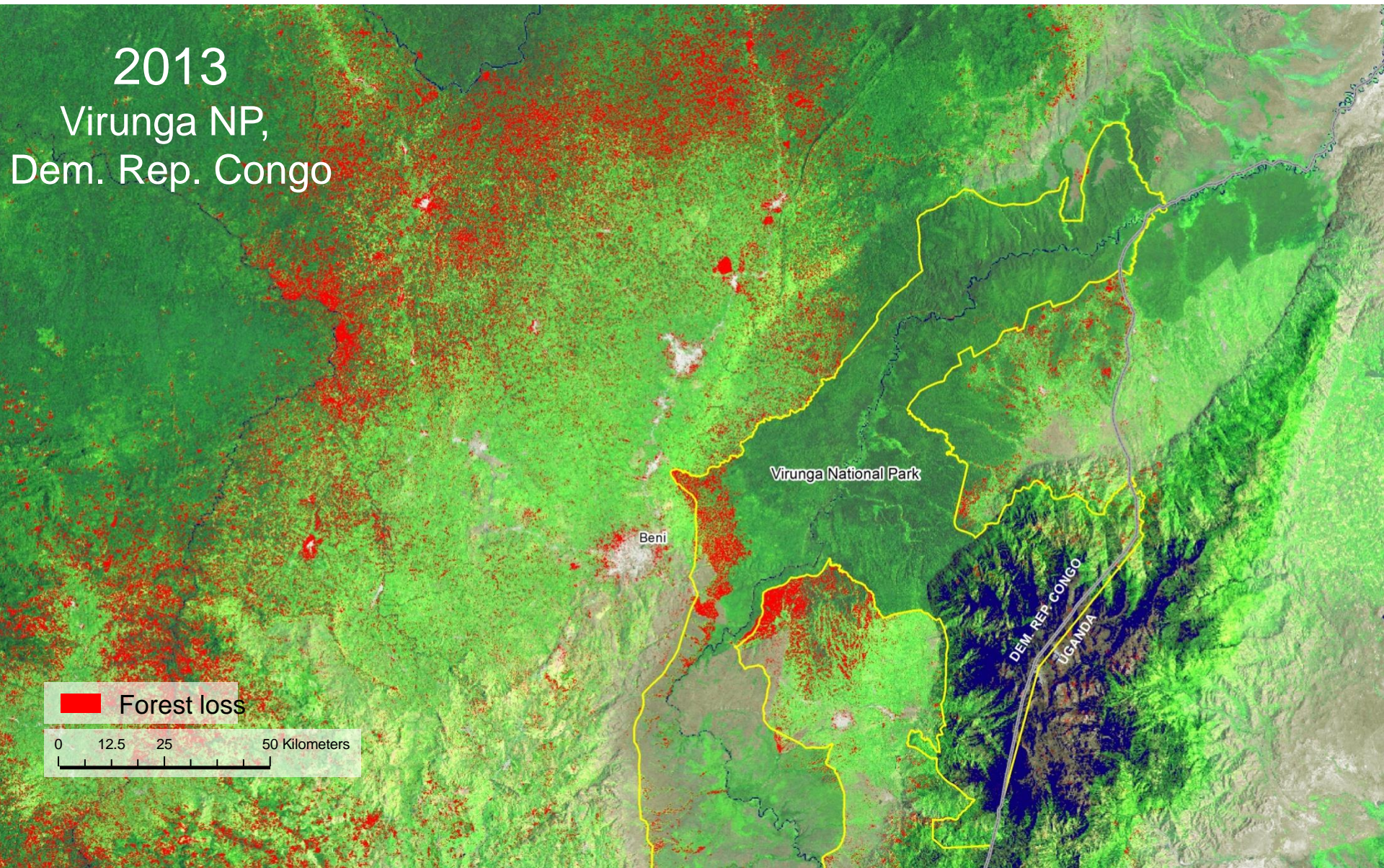
2011
Virunga NP,
Dem. Rep. Congo



2012
Virunga NP,
Dem. Rep. Congo



2013
Virunga NP,
Dem. Rep. Congo



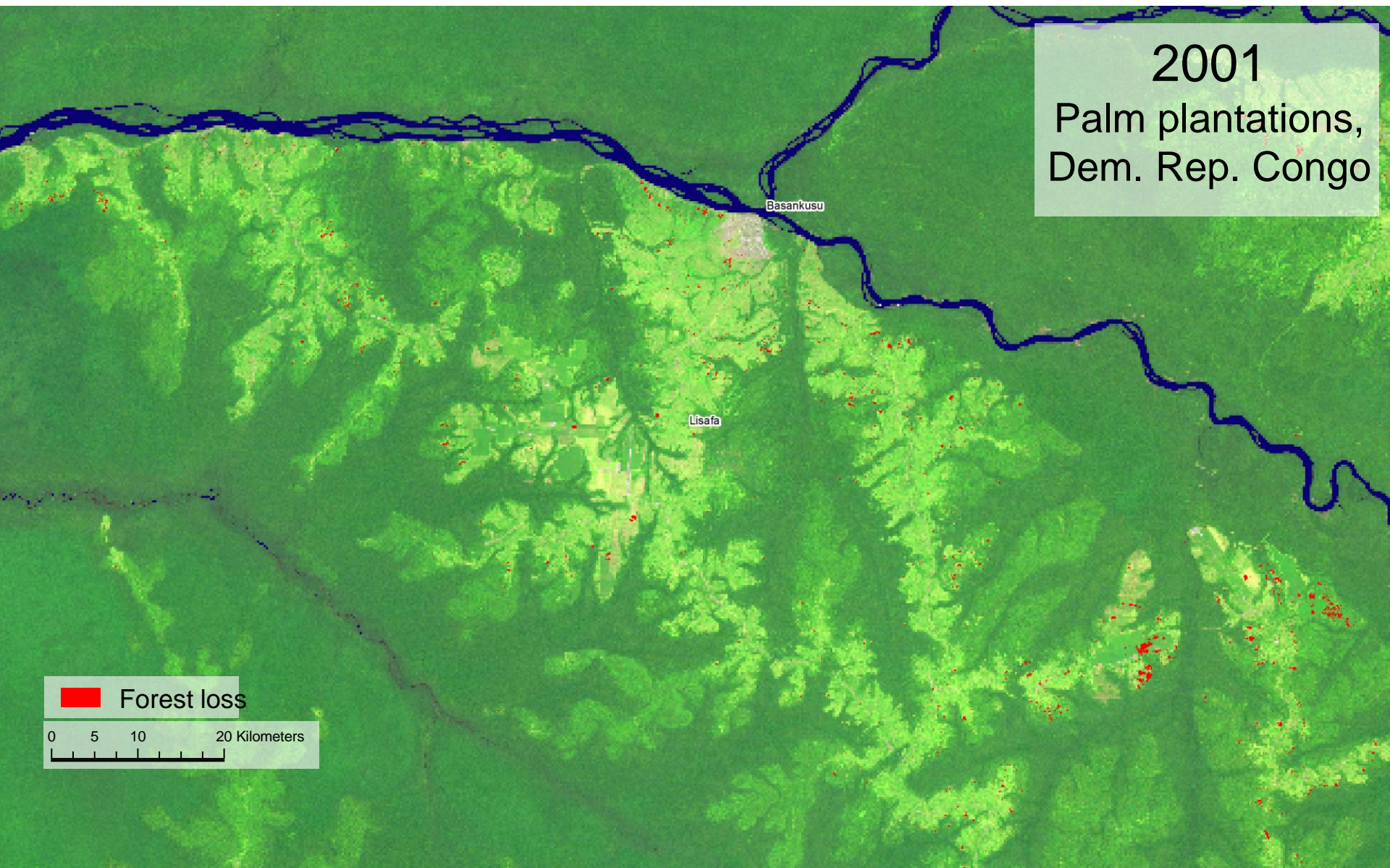
Forest loss in palm plantations south of Basankusu, Democratic Republic of Congo

2000 - 2013



2001

Palm plantations, Dem. Rep. Congo




2002

Palm plantations,
Dem. Rep. Congo

Basankusu

Lisafa

 Forest loss

0 5 10 20 Kilometers



2003

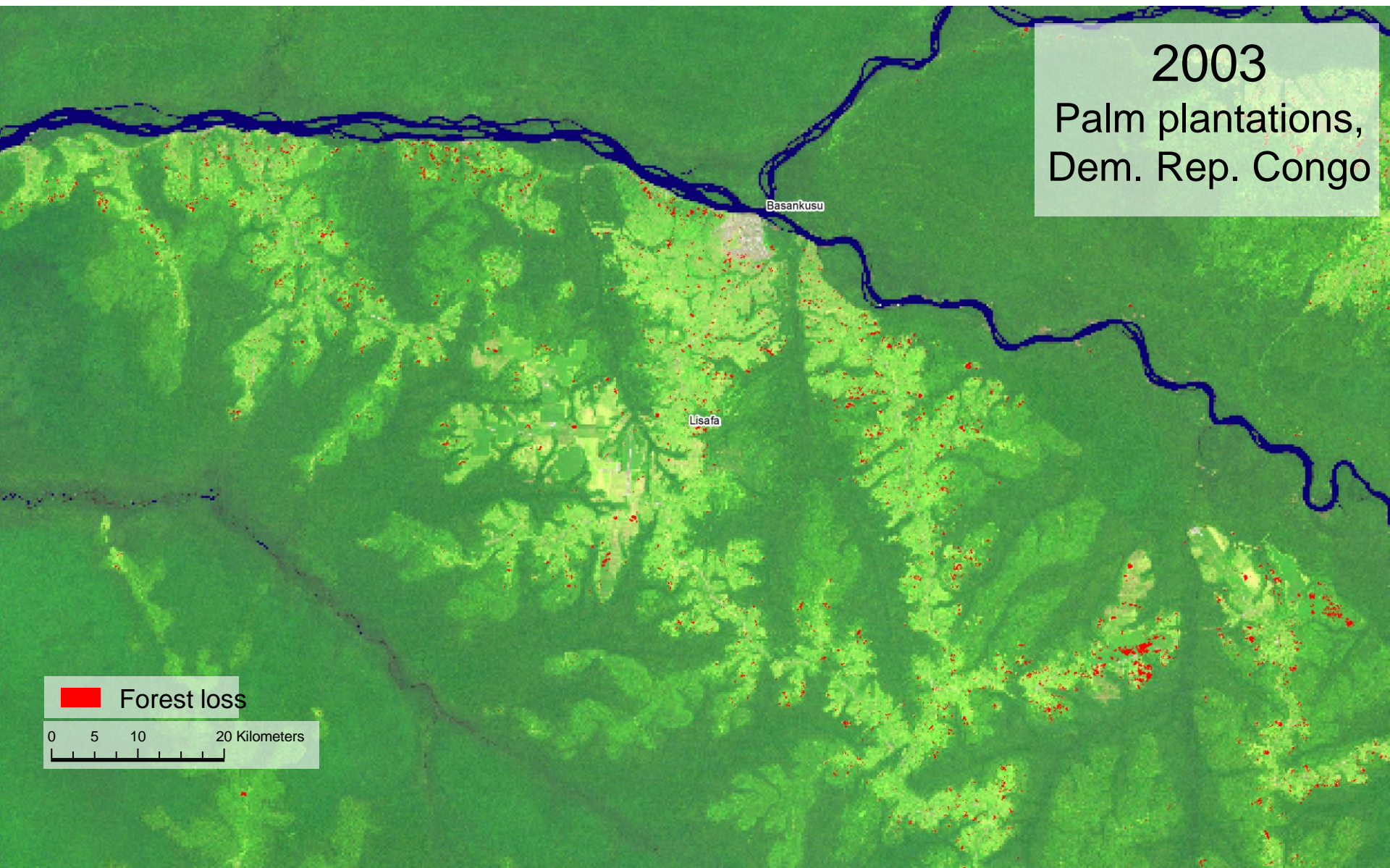
Palm plantations,
Dem. Rep. Congo

Basankusu

Lisafa

Forest loss

0 5 10 20 Kilometers




2004

Palm plantations,
Dem. Rep. Congo

Basankusu

Lisafa

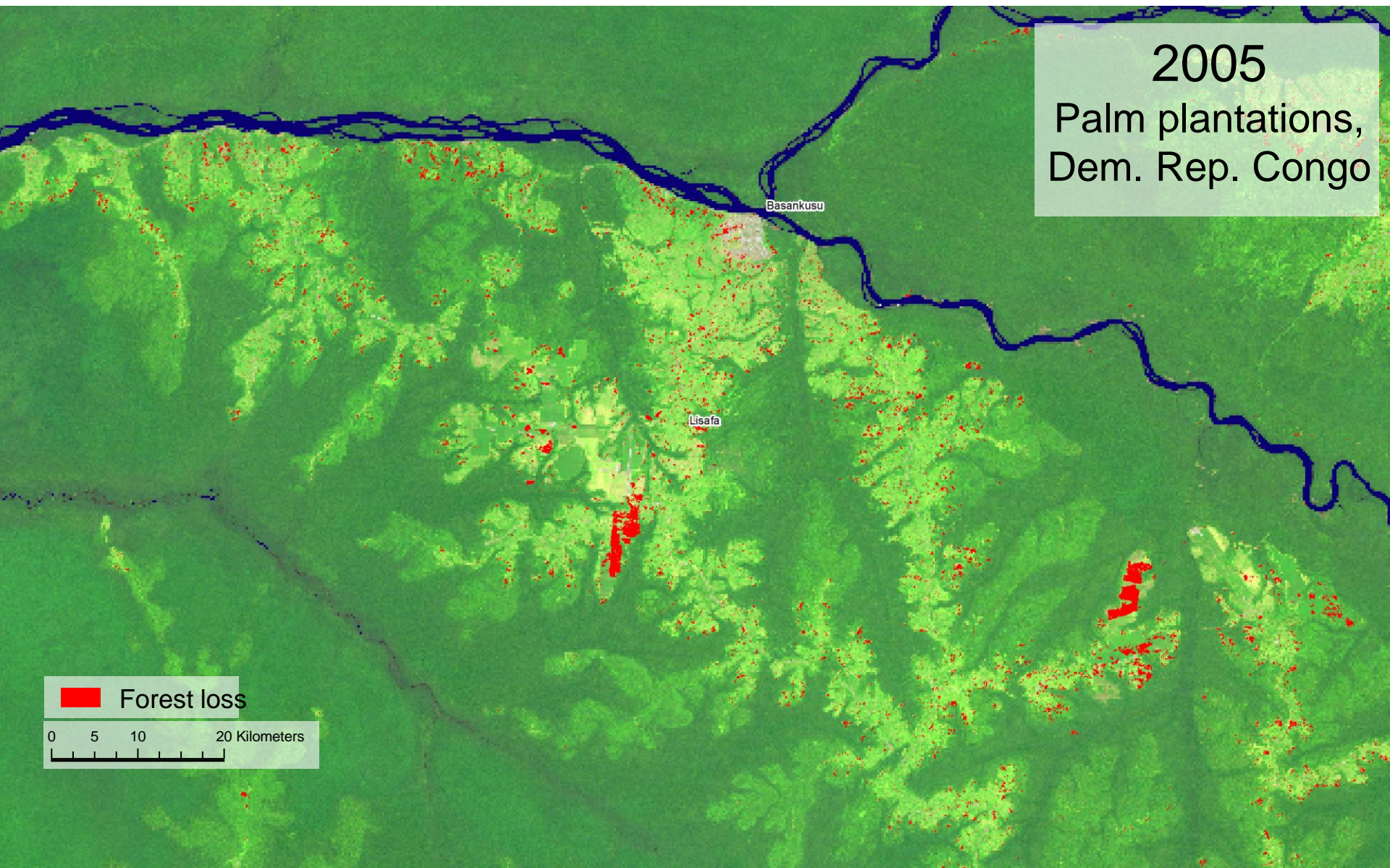
 Forest loss

0 5 10 20 Kilometers

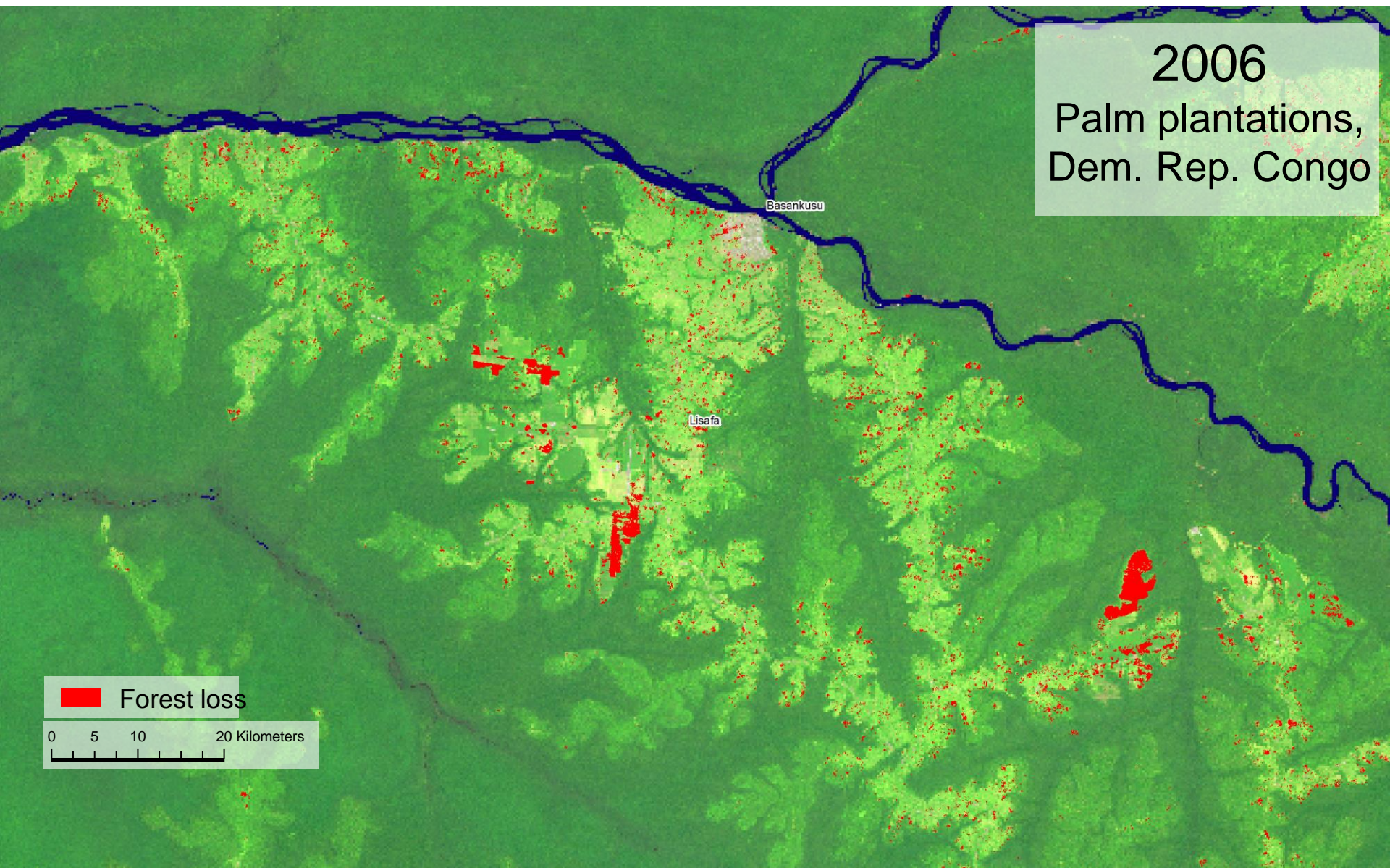


2005

Palm plantations, Dem. Rep. Congo

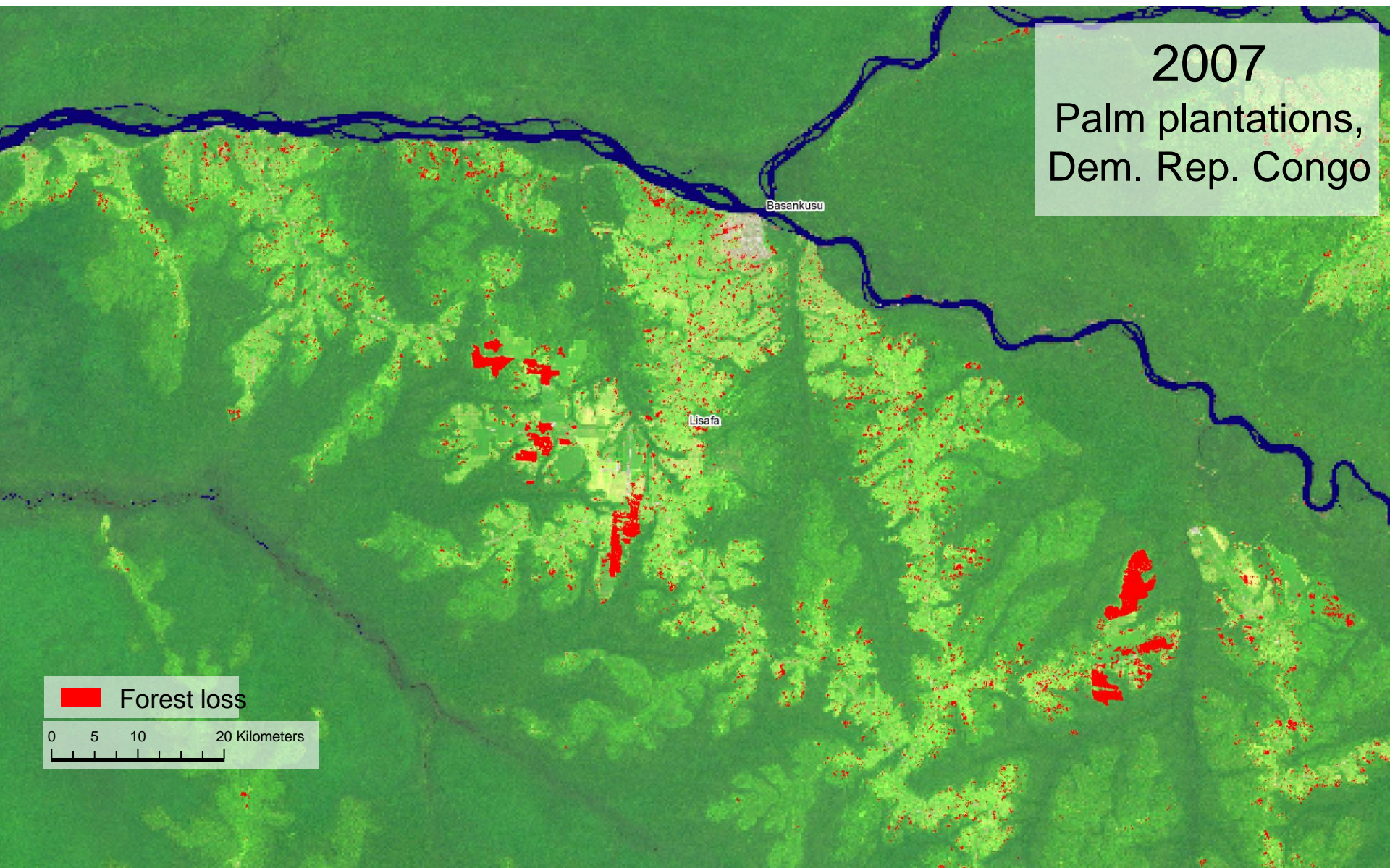


2006 Palm plantations, Dem. Rep. Congo

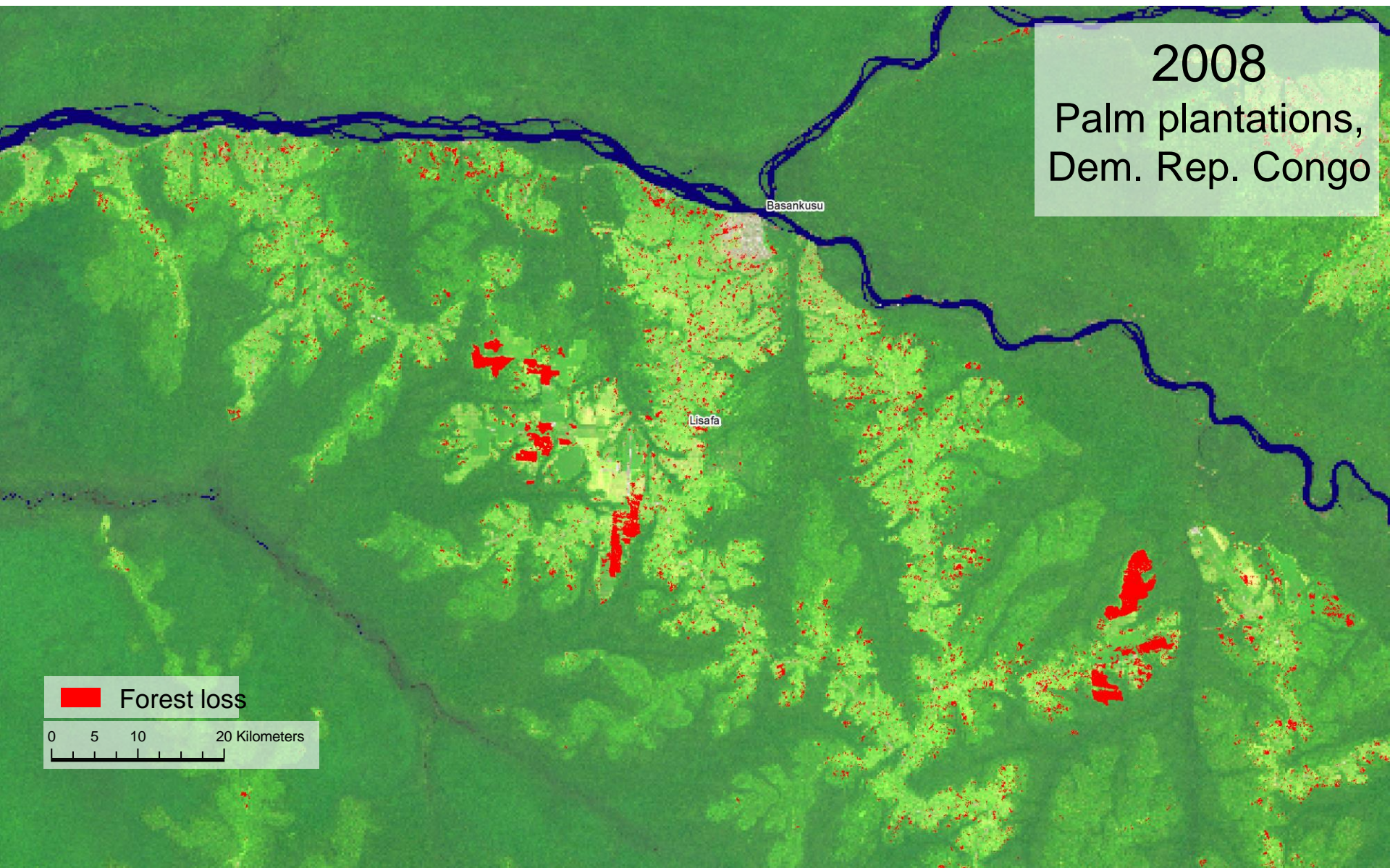


2007

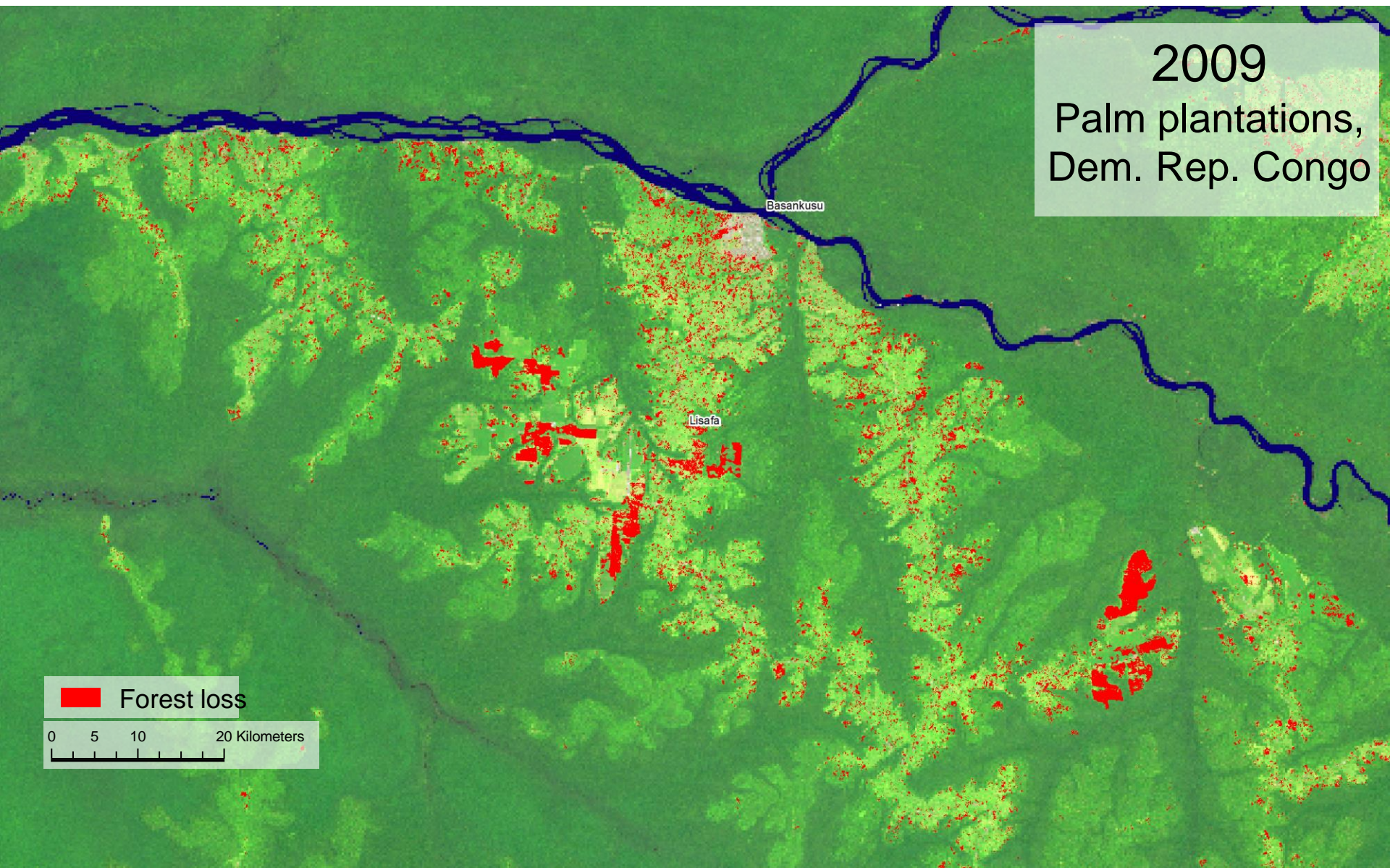
Palm plantations, Dem. Rep. Congo



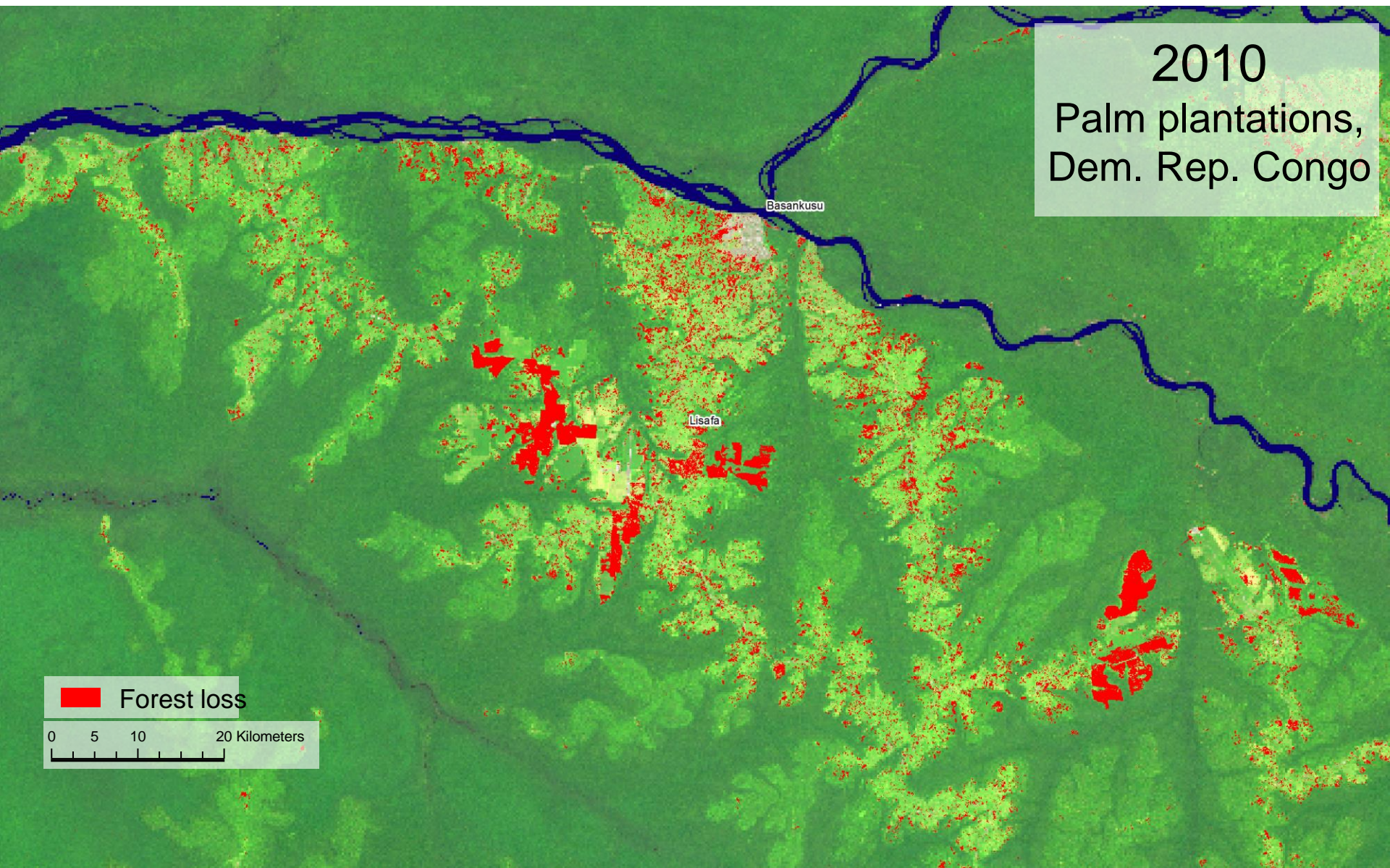
2008 Palm plantations, Dem. Rep. Congo



2009 Palm plantations, Dem. Rep. Congo

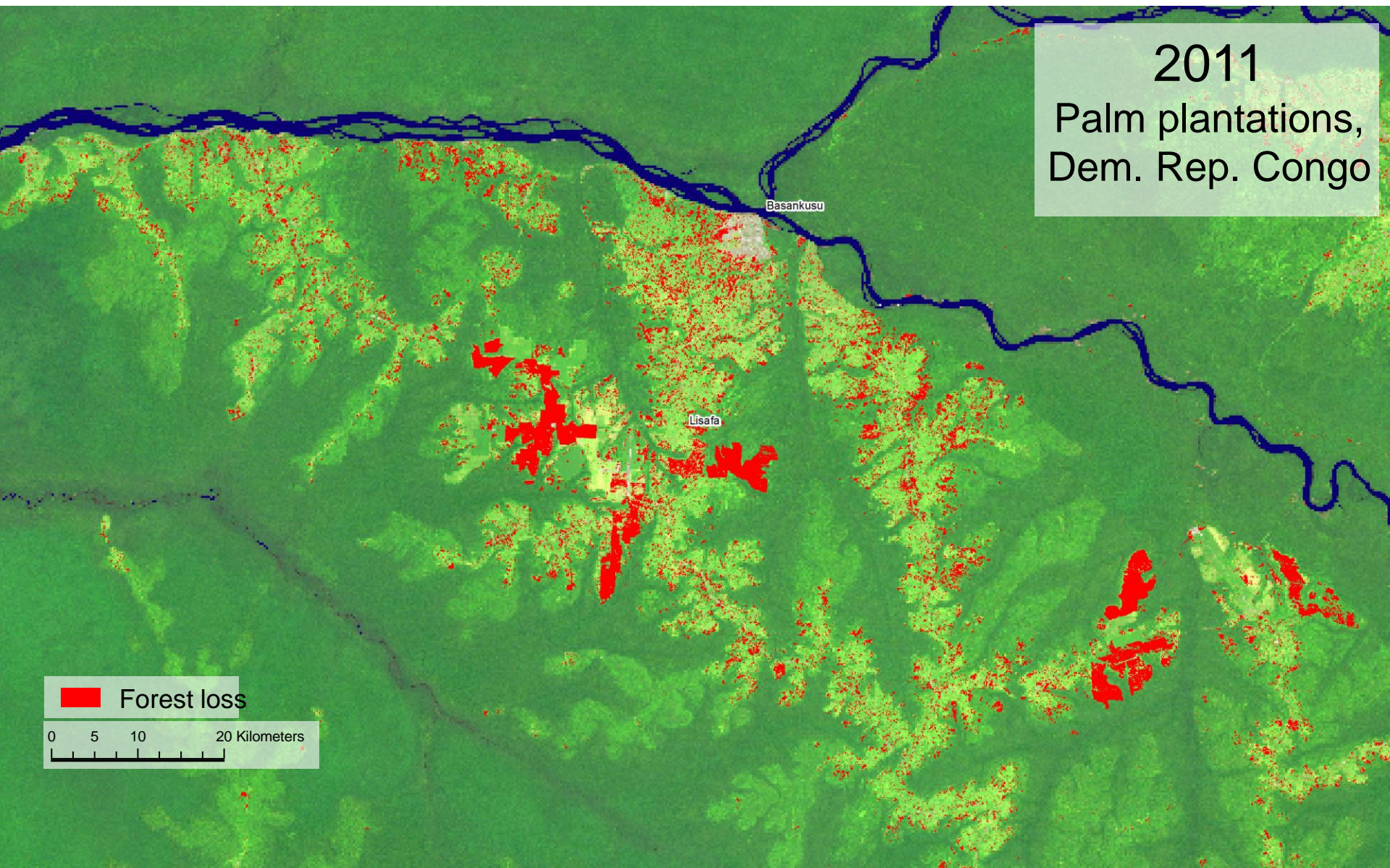


2010 Palm plantations, Dem. Rep. Congo



2011

Palm plantations, Dem. Rep. Congo



2012

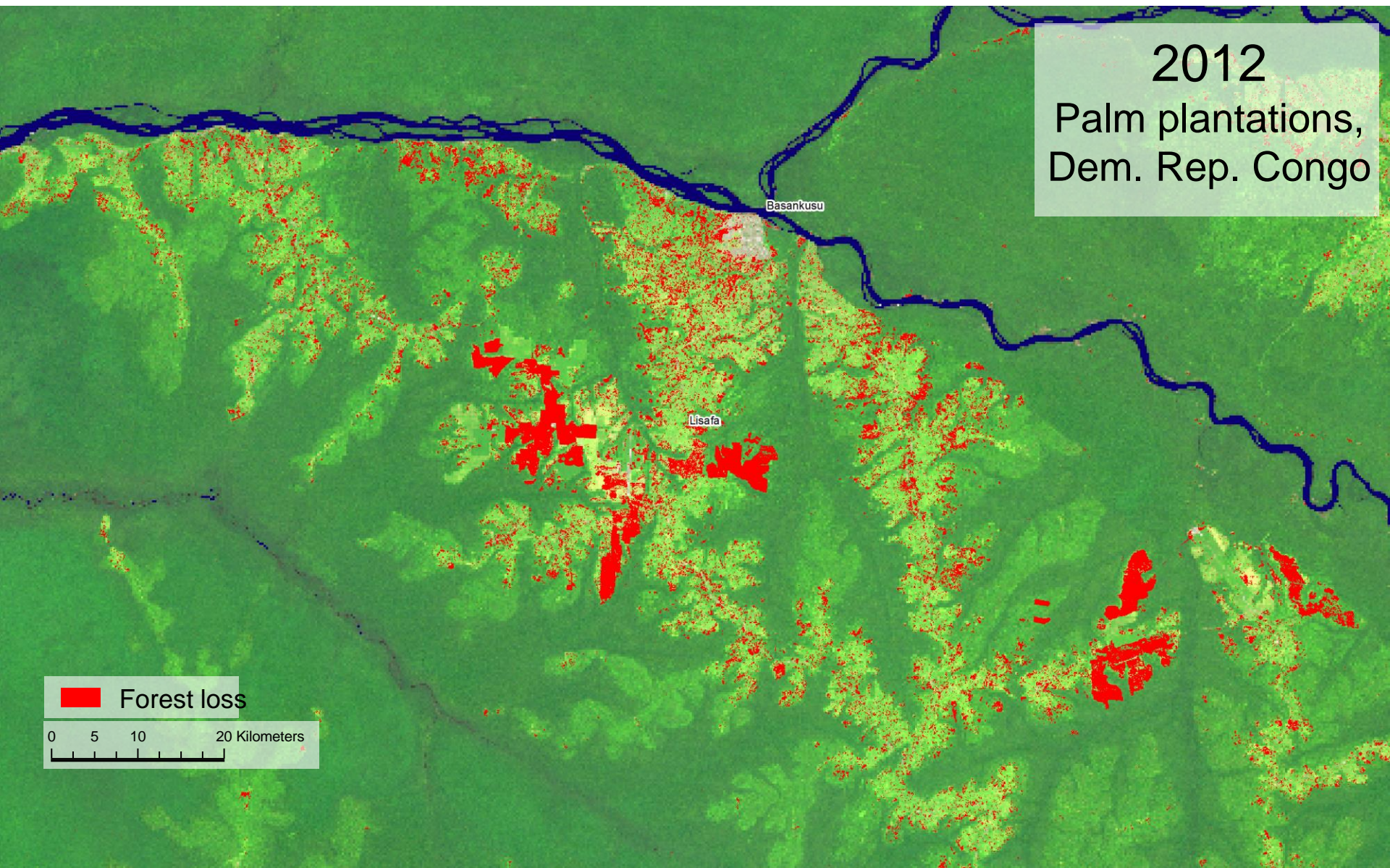
Palm plantations,
Dem. Rep. Congo

Basankusu

Lisafa

Forest loss

0 5 10 20 Kilometers



2013

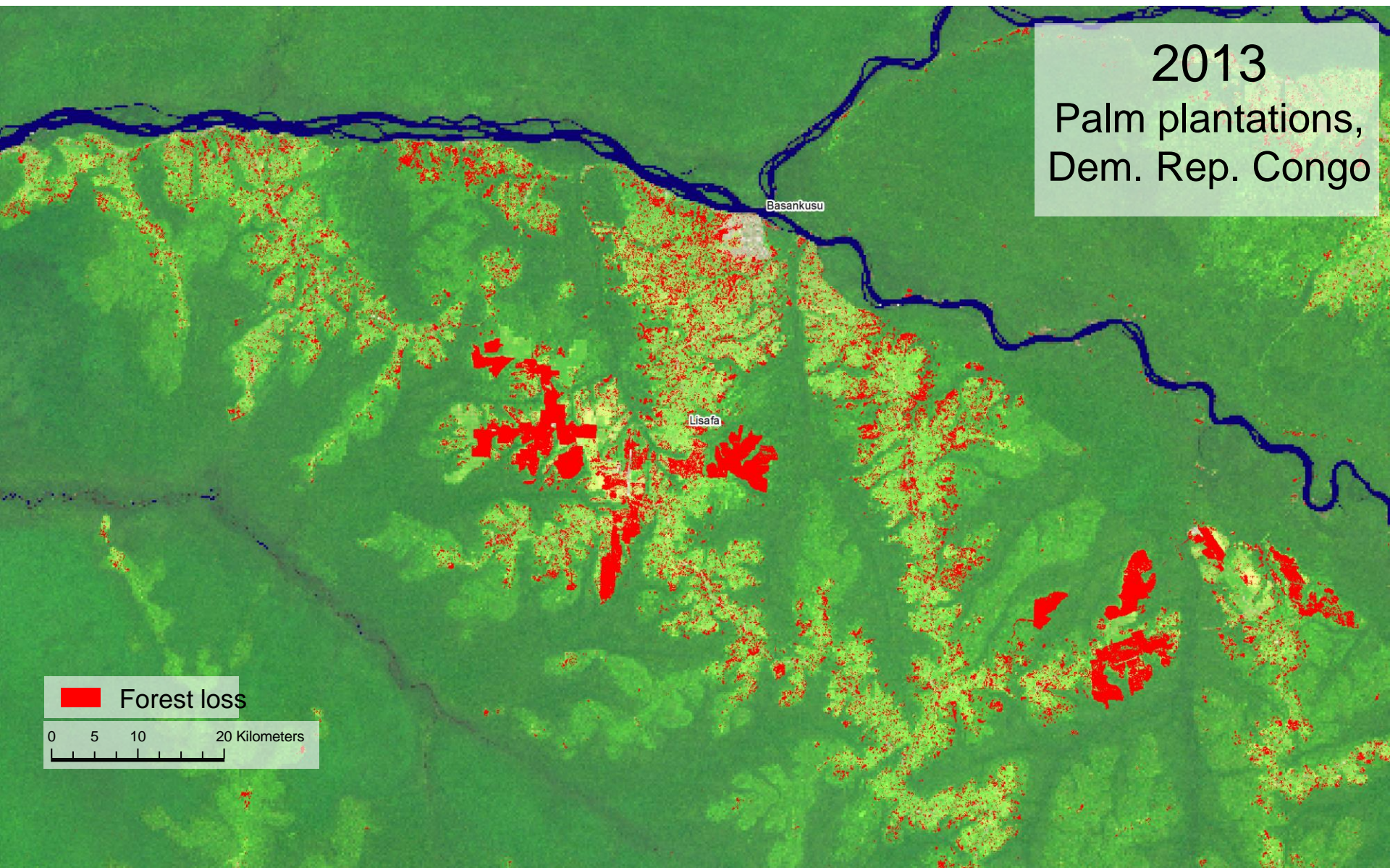
Palm plantations,
Dem. Rep. Congo

Basankusu

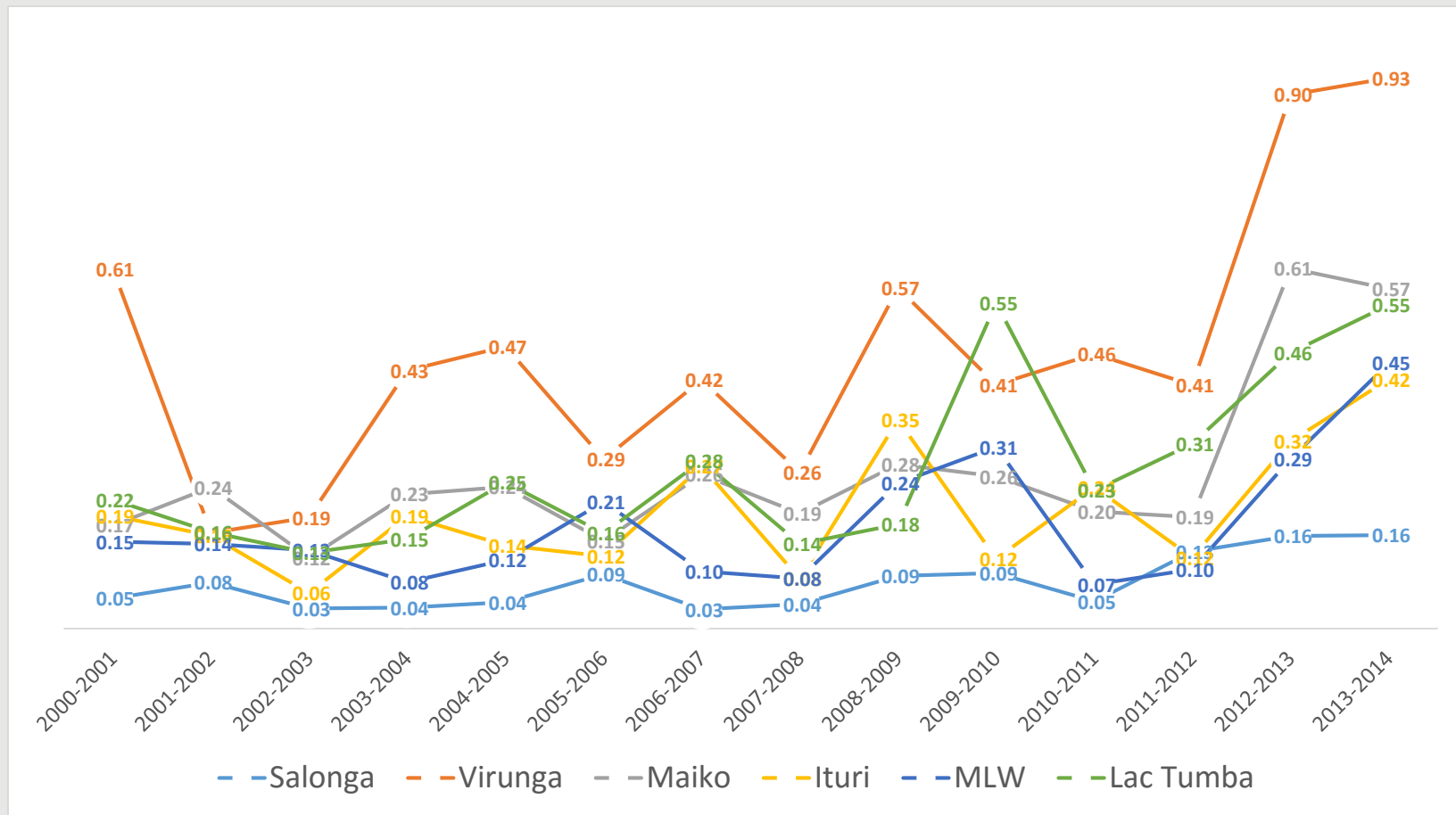
Lisafa

Forest loss

0 5 10 20 Kilometers



Annual Forest loss (2000-2014) in CARPE Landscapes



Nom	Forest Cover 2000 (Ha)	Forest Loss 2000-2014 (Ha)	Annual average rate Forest Loss 2000-2014 (%)
RD Congo	199 060 058	8197104	0,29
Landscapes	40 494 783	1128762	0,20

Data source: Global Forest Change (GFC 2014)



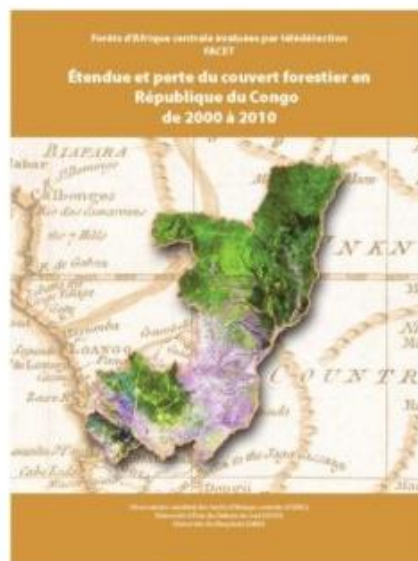
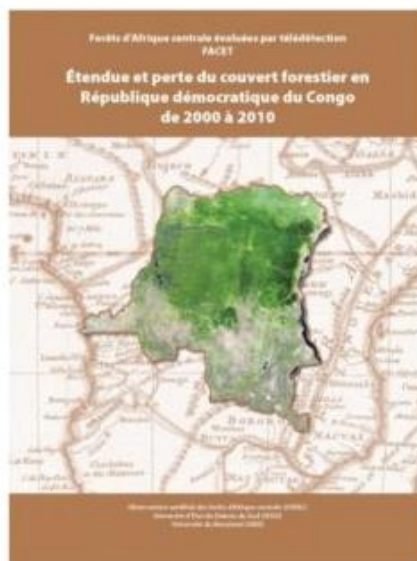
Observatoire Satellital des Forêts d'Afrique Centrale

Center of excellence for sustainable management of natural resources

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Forest cover and loss in the Central Africa countries from 2000 to 2010



These atlas were produced as a part of the OSFAC (Observatoire Satellital des Forêts d'Afrique Centrale) initiative "Monitoring the forests of Central Africa using remotely sensed data sets" (FACET in French). FACET is led by OSFAC in collaboration with South Dakota State University and the University of Maryland, and supported by USAID CARPE. Additional support was provided by World Resources Institute.

FACET (Central African Forests Remotely Assessed) is a OSFAC project whose goal is to quantify the spatiotemporal dynamics of the forest change in Central Africa through the use of multi-temporal satellite data. The series of multi-temporal data of the FACET project will also be a useful addition to many projects, including: monitoring of biodiversity, climate modeling and biogeochemical data, the natural resource management and planning of the use of soils. The results of the FACET project will describe as the loss of forest cover through deforestation or degradation that its expansion by reforestation or afforestation. All results will be made available to the public.

FACET publications are the result of an analysis by OSFAC which was used to map the extent of forest cover and changes in Central Africa.

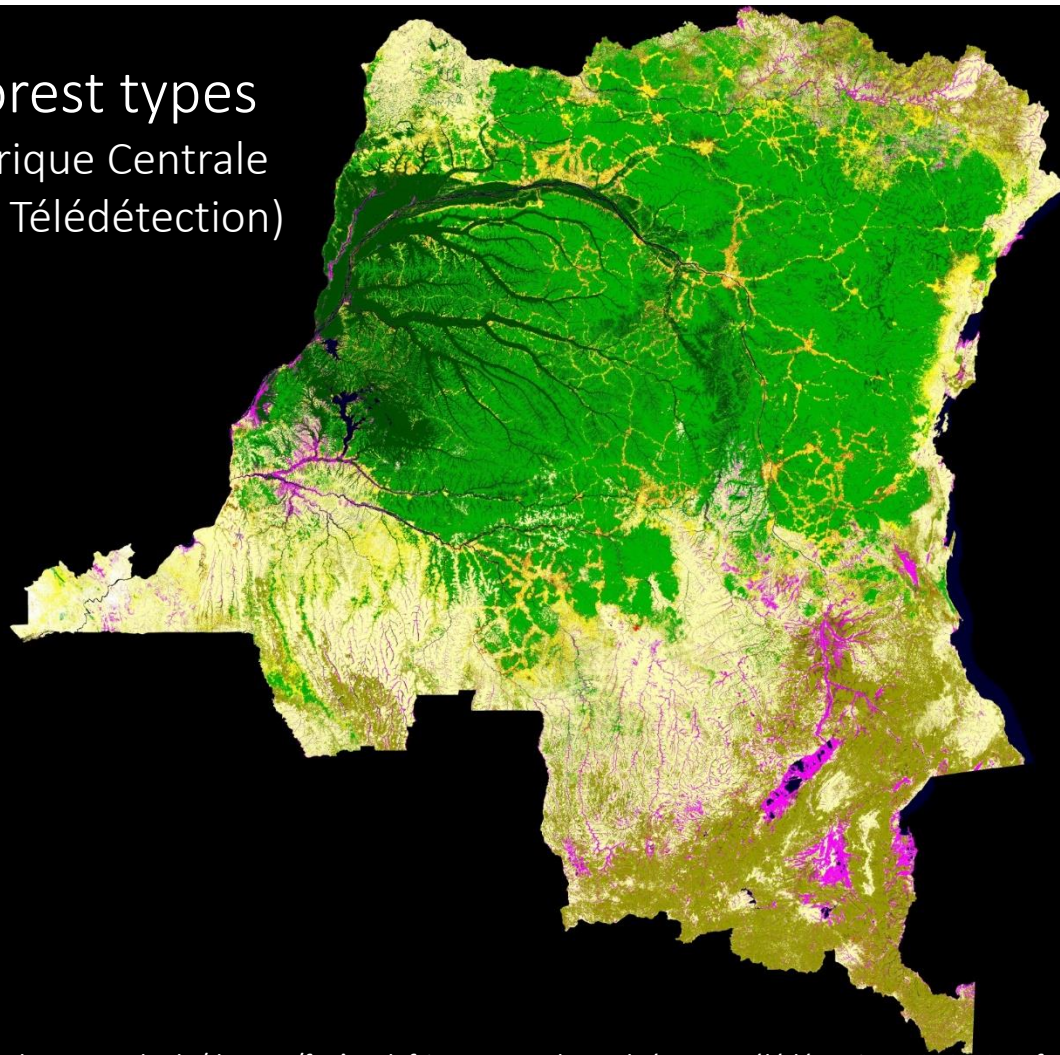
The method used is the "wall-to-wall", a method developed jointly by the universities of South Dakota and Maryland. It is an adaptation of the approach of Hansen et al. (2008). MODIS Satellite data (Moderate Resolution Imaging Spectroradiometer) were used to pretreat the Landsat series, themselves used to characterize the extension and the loss of the forest cover. Landsat ETM+ data were sampled at a spatial resolution of 60 meters.

Mapping the extent and loss of forest cover by Landsat is severely limited to areas permanently covered by clouds. MODIS data were used to overcome this problem. The forest was defined as a space occupied by trees over 5 meters in height and having a canopy density of above 30%.

Primary forest is defined as a mature forest with a canopy density of above 60%. Secondary forest is a forest that has delayed and whose canopy covers more than 60% of the soil surface. A wood (woodland) is characterized by a density of forest cover between 30% and 60%. The swamp forest is defined as a primary forest located on a wetland. Wetlands are

FACET forest types (Forêts d'Afrique Centrale Évaluées par Télédétection)

- Humid tropical forest
- Secondary forest
- Dry tropical woodland
- Non-forest
- Inundated grassland
- Water
- Swamp forest

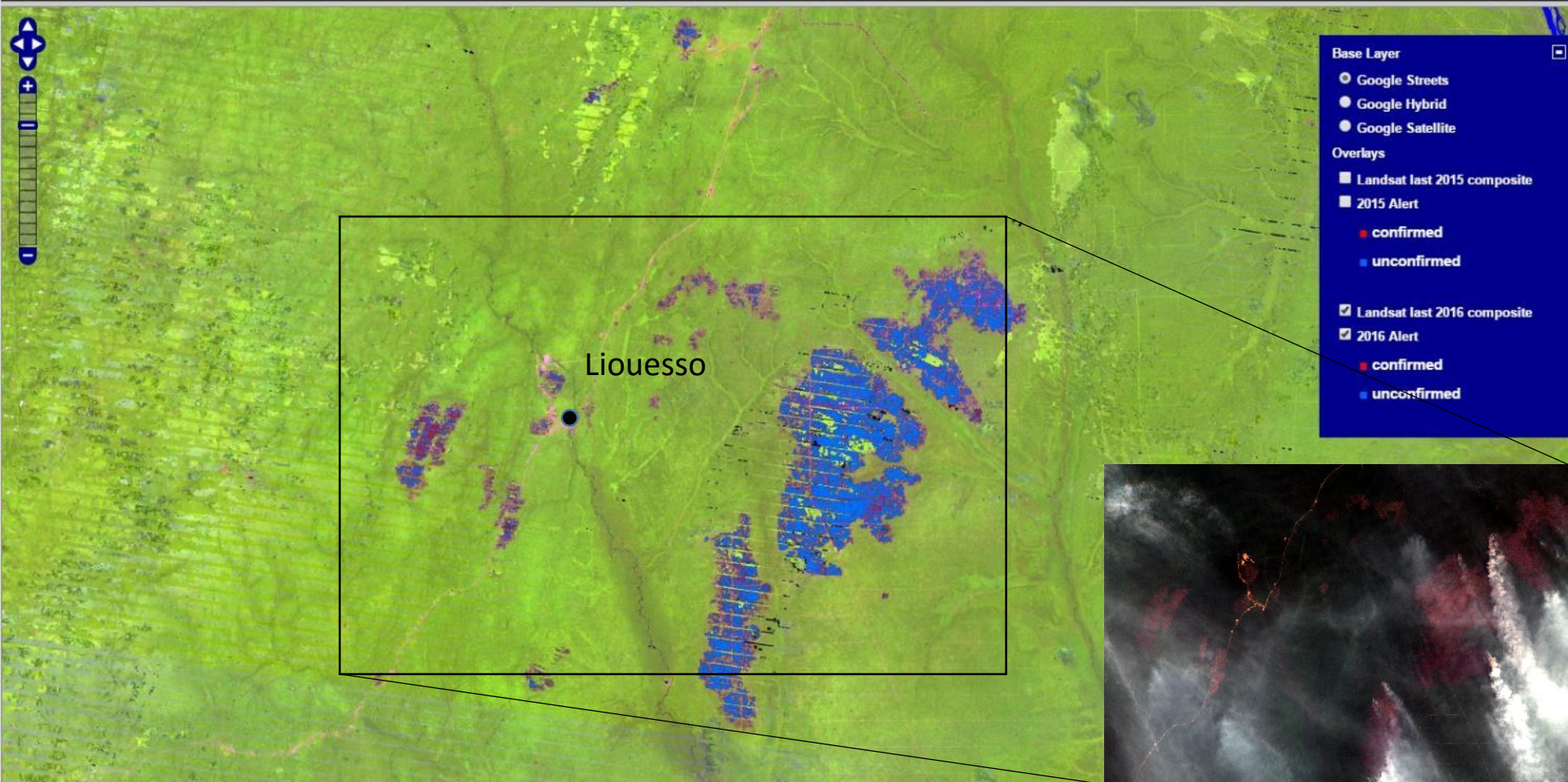


<http://glad.geog.umd.edu/dataset/forêts-dafrique-centrale-evaluées-par-télédétection-2000-2010-facet>



Home

Forest Alert



Landsat composite of most recent land observations

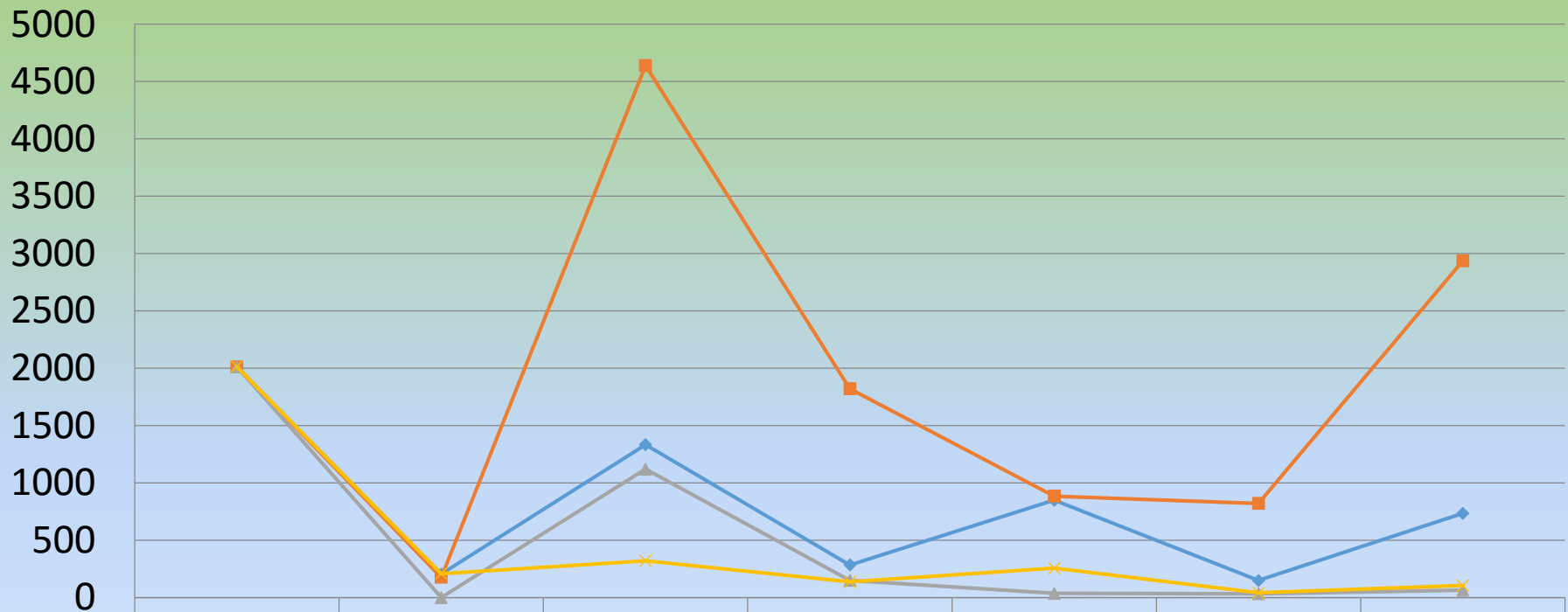
Sentinel 2 image for 2/2/2016

MC Hansen, A Krylov, A Tyukavina, PV Potapov, S Turubanova, B Zutta, S Ifo, B Margono, F Stolle and R Moore.

Humid tropical forest disturbance alerts using Landsat data

Environ. Res. Lett. 11 (2016) doi:10.1088/1748-9326/11/3/034008

Active fire points distribution in DRC Landscapes (2011-2014)



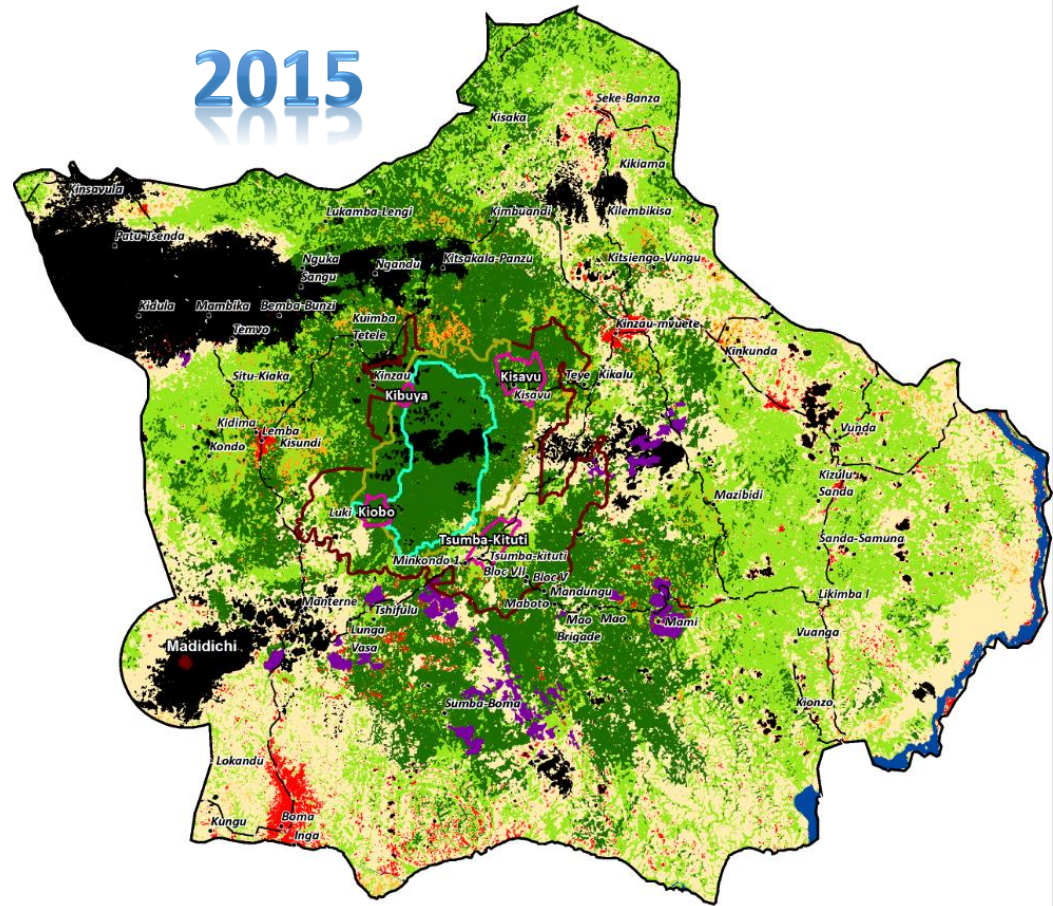
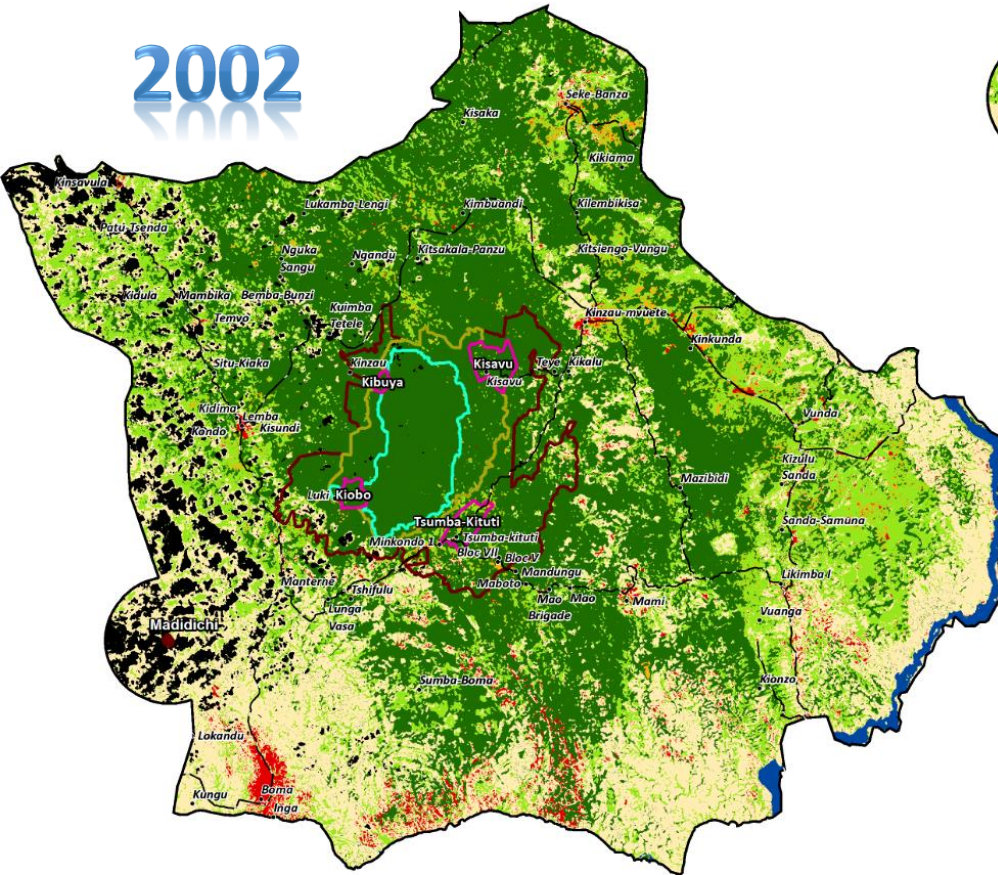
Data source: Satellite MODIS Actifs Fires/FIRMS

Land Occupation and Land use mapping

PROJET PILOTE CBFF LUKI

2015

2002



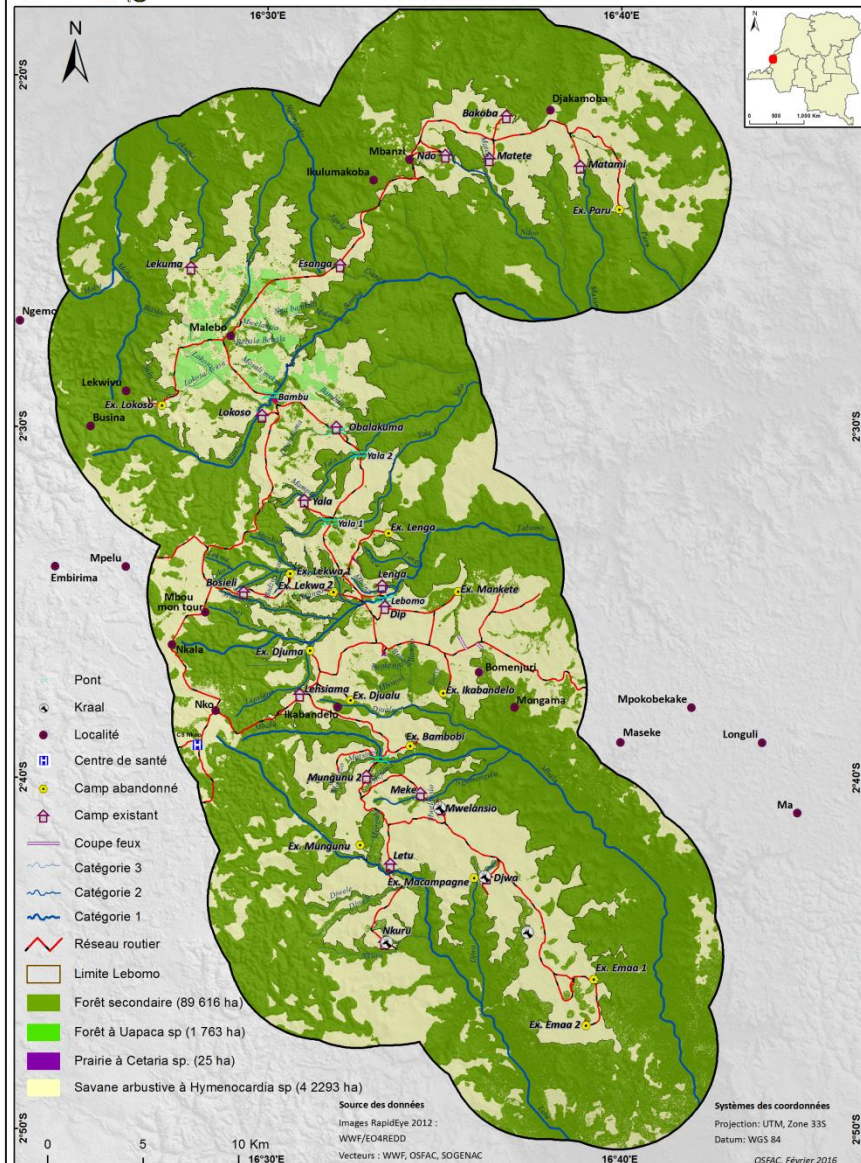
CLASSIF_LUKI_2015

-  Eau
-  Forêt
-  Nuages et Ombres
-  Savane arbustive
-  Savane herbeuse
-  Savanes mises en d
-  Zone agricole
-  Zone anthropique

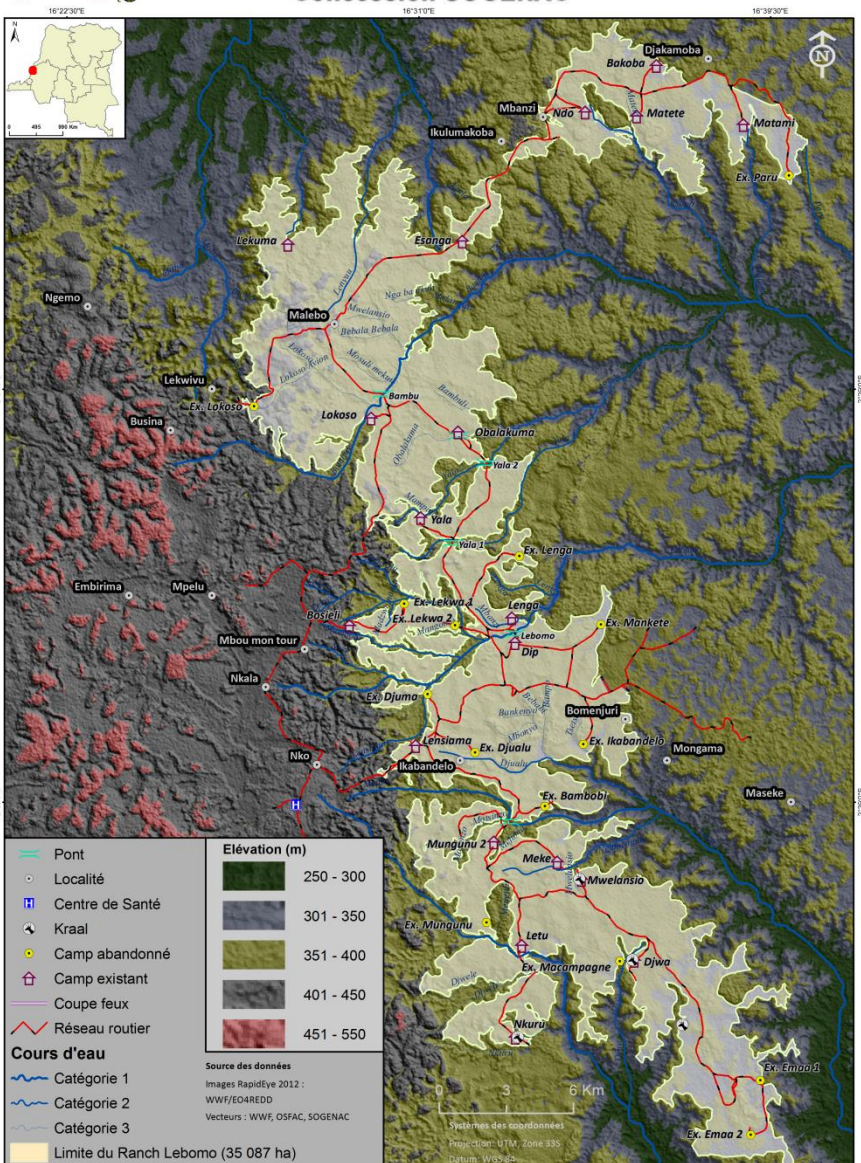
CLASSIF_LUKI_2002

-  Eau
-  Forêt
-  Nuages et Ombres
-  Savane arbustive
-  Savane herbeuse
-  Zone agricole
-  Zone anthropique

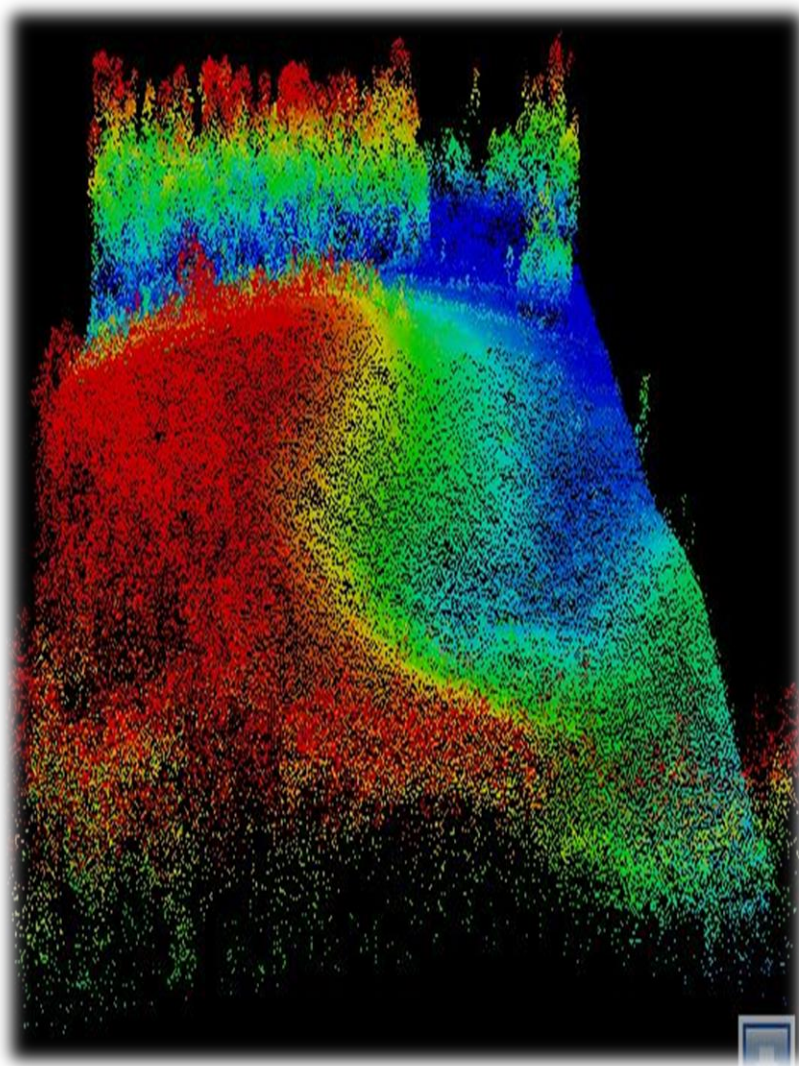
Occupation du sol de la Zone Pilote LEBOMO en 2012 Concession SOGENAC



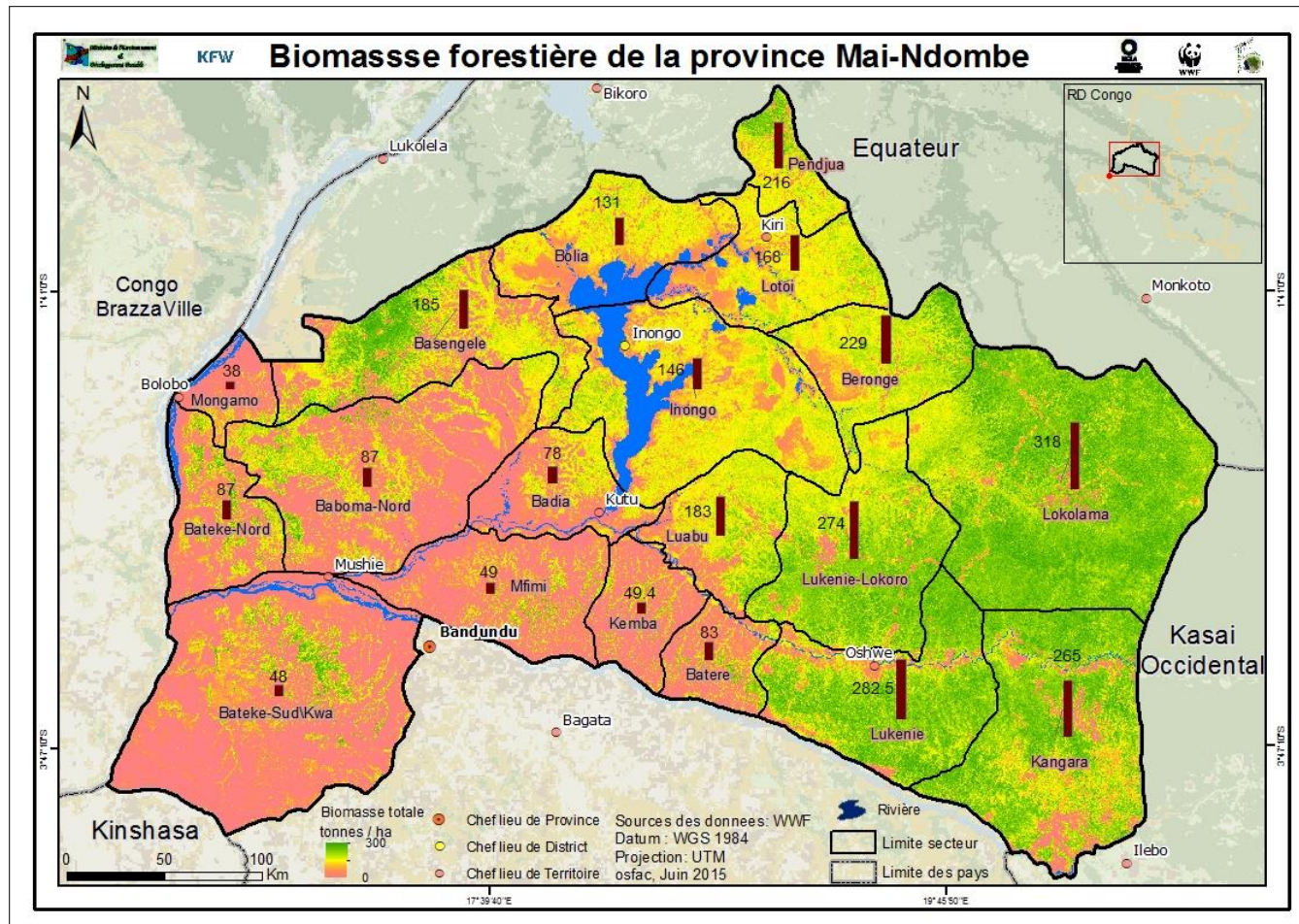
Topographie de la Section LEBOMO Concession SOGENAC



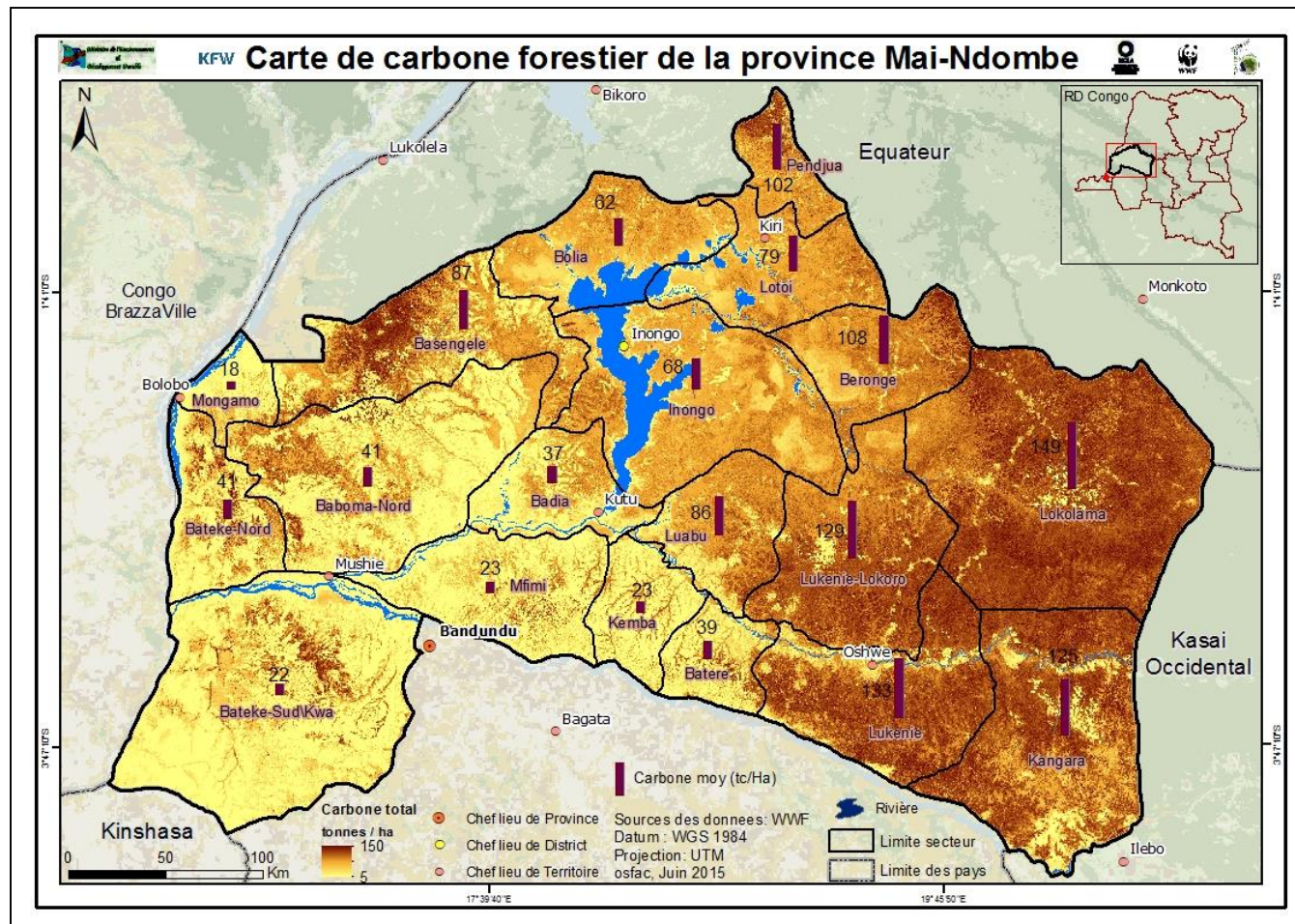
Climate Change and REDD+



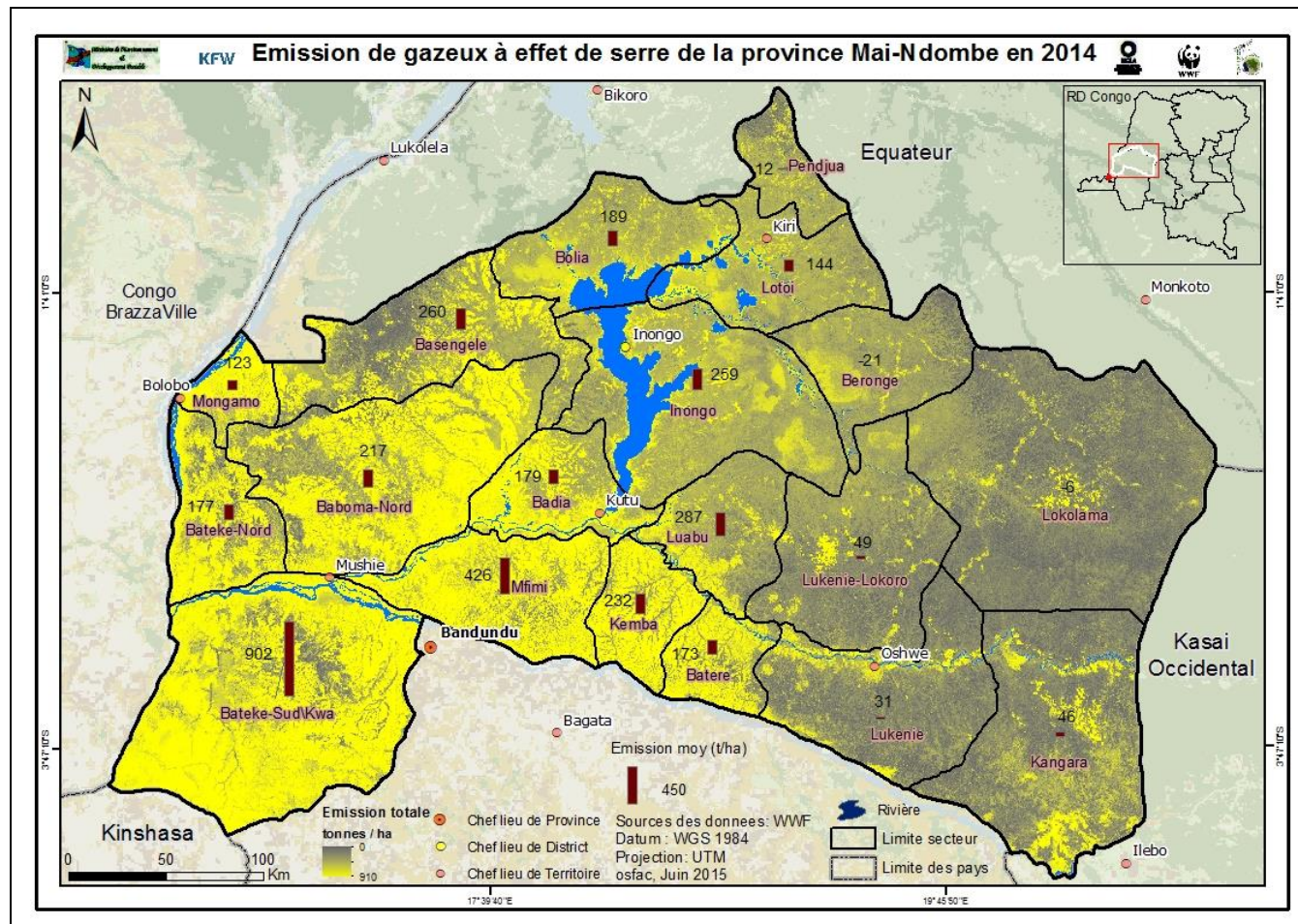
Biomass mapping Mai Ndombe Province (DRC)

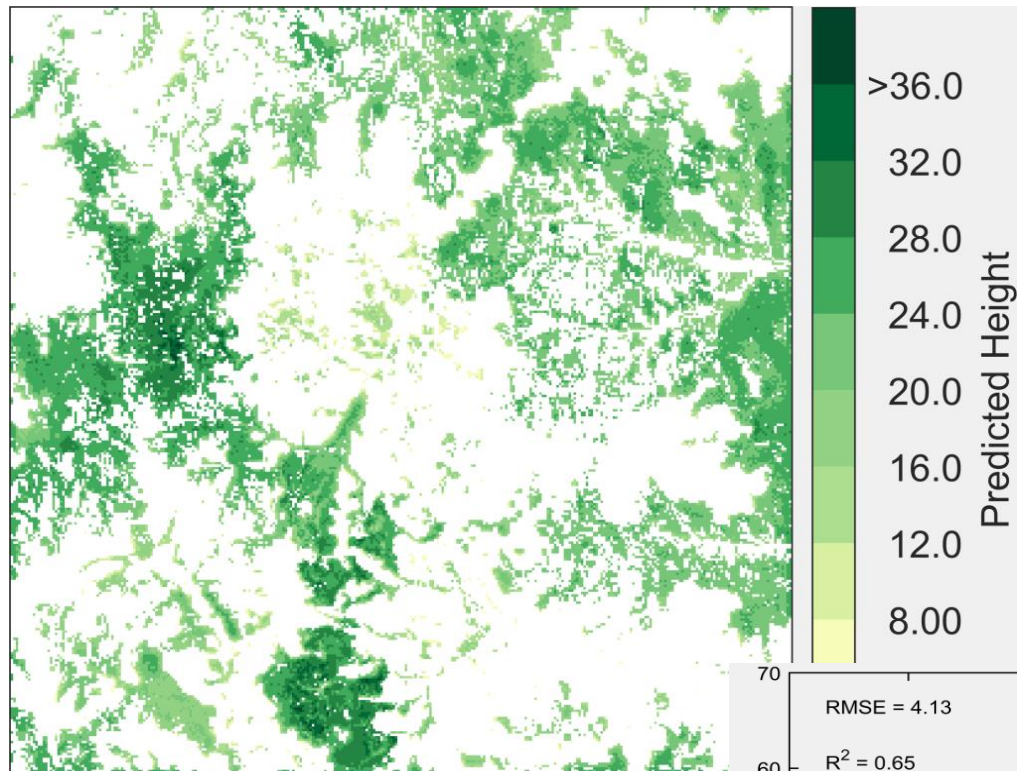


Carbon mapping in Mai Ndombe Province (DRC)



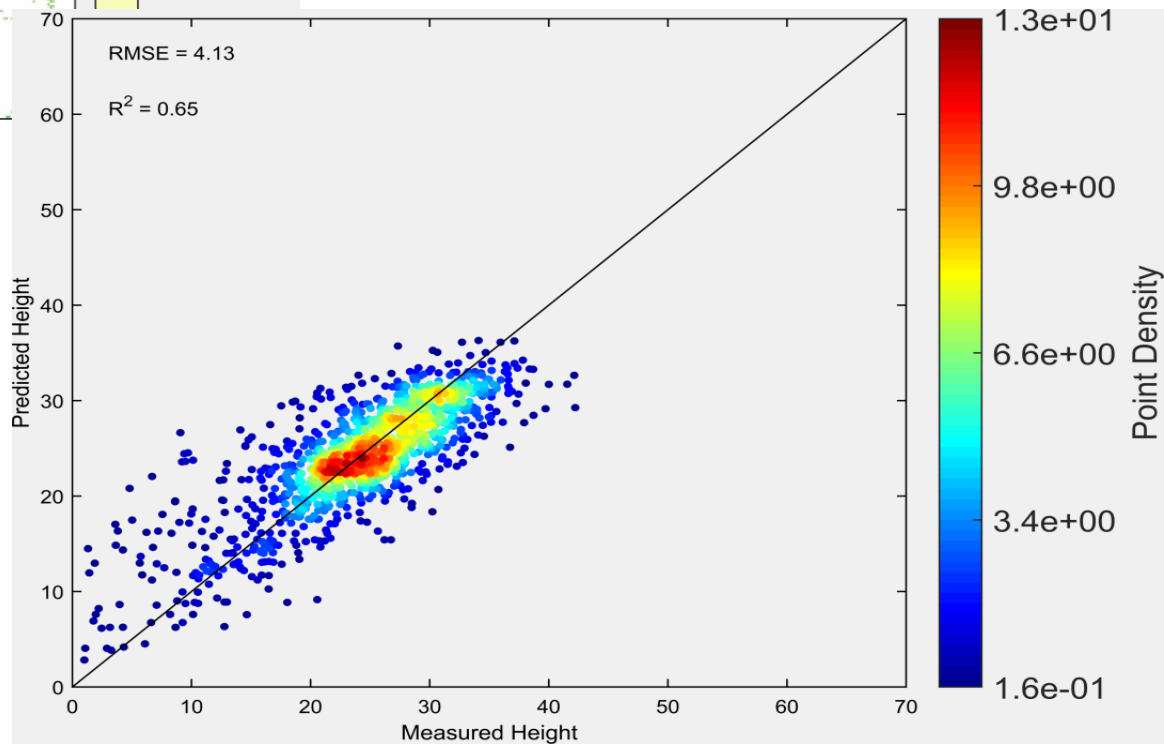
Emission mapping in Mai Ndombe Province (DRC)





(1)Lidar Tree height
prediction using machine
learning algorithm Random
Forest

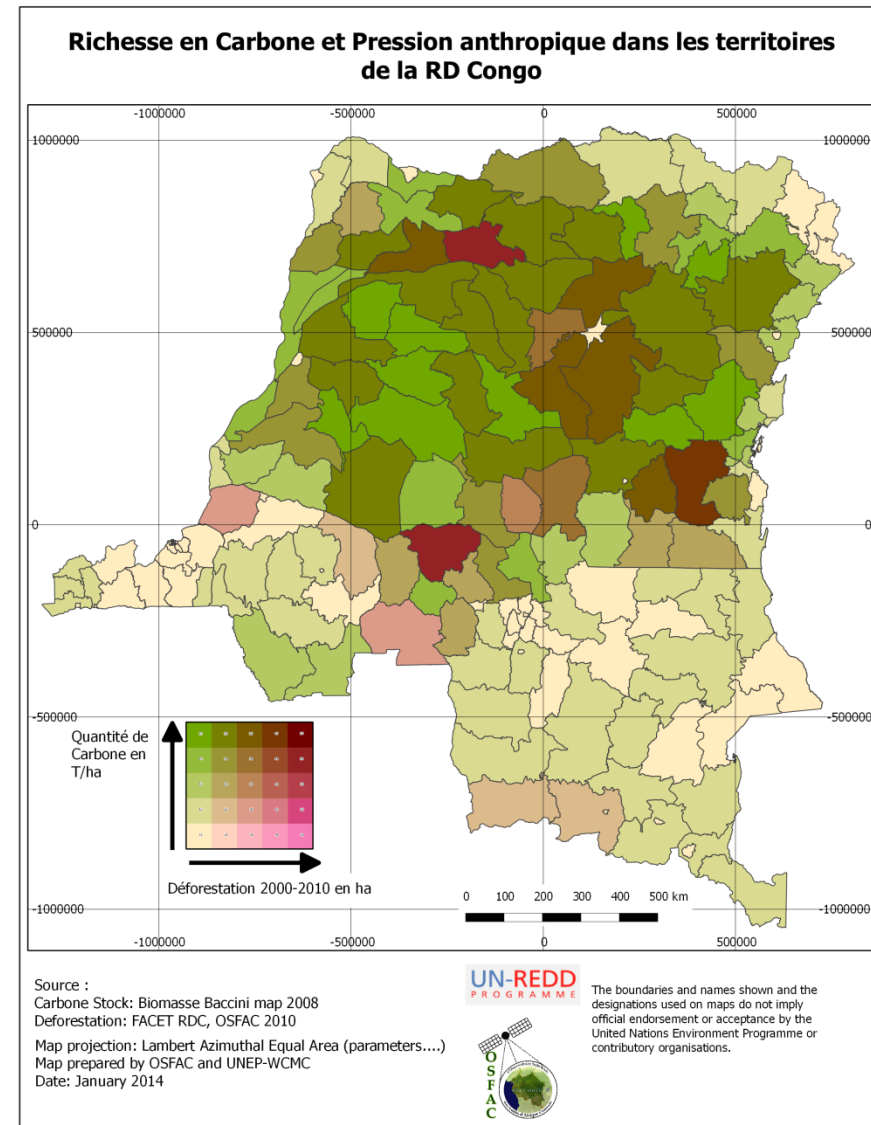
(2)Validation



Carbon & Deforestation

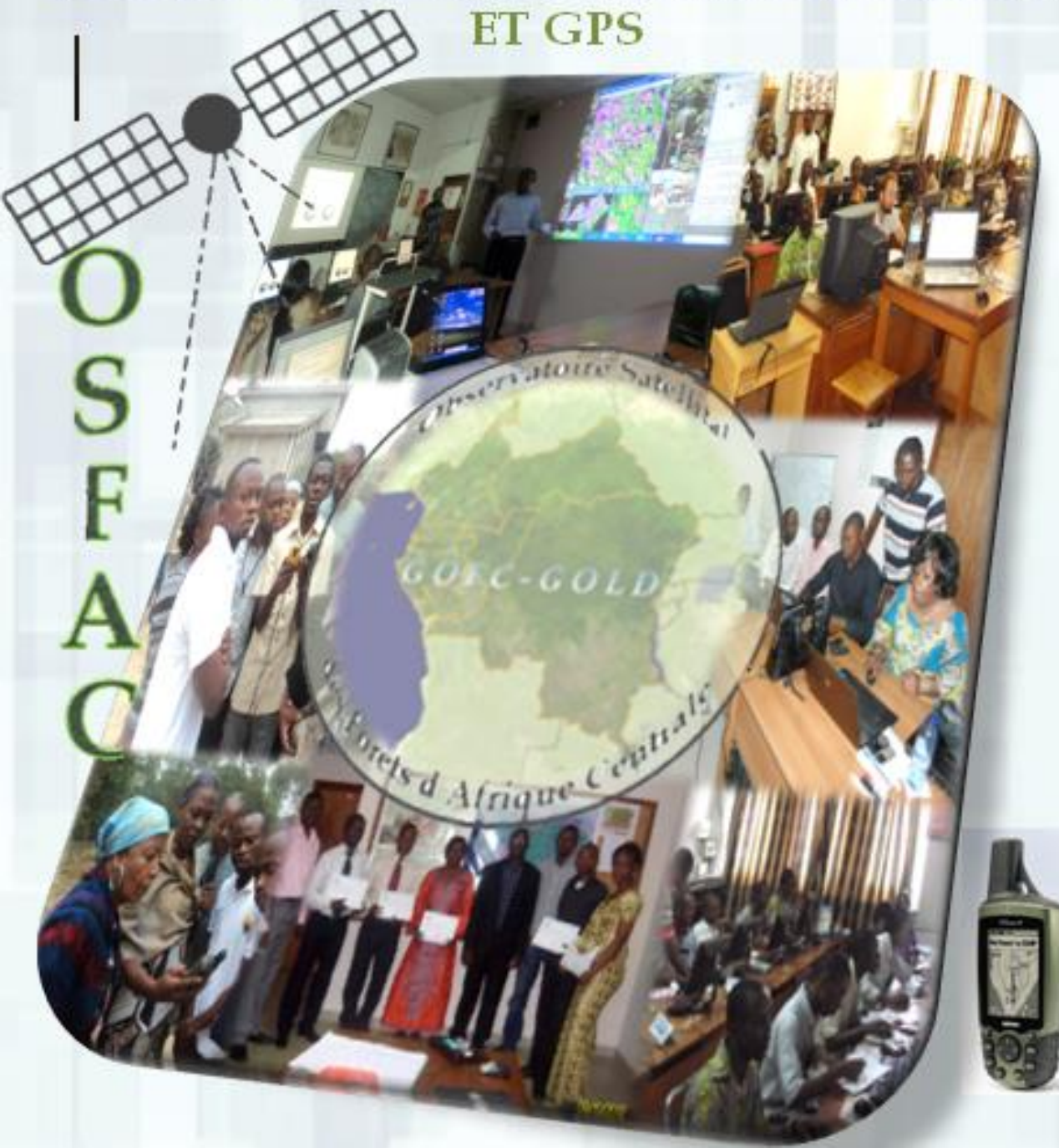
- This analysis shows irregularity in the spatial distribution of relevant variables in the choice of REDD+ actions :*

Carbon High	REDD Activities: <ul style="list-style-type: none"> - Conservation - Ecotourisme 	Activities : <ul style="list-style-type: none"> - Conservation - Ecotourisme - Reforestation
	Activities: <ul style="list-style-type: none"> - Reforestation 	Type d'action : <ul style="list-style-type: none"> - Reforestation
Carbon Low		
Deforestation -		Deforestation +



Capacity building in geospatial applications

FORMATIONS EN SIG, TELEDETECTION ET GPS



OSFAC trainings are offered to :

- *Academic institutions;*
- *Professional institutions;*
- *CARPE partners;*
- *researchers;*
- *NGOs;*

NB: *Operating primarily in the environmental field*

partners :



USAID
FROM THE AMERICAN PEOPLE



Training Inscription



Dernières nouvelles:

Mission OSFAC à Brazzaville : 16 au 18 décembre ...

Galerie photos

EN FR

Q

+

+



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Cours de SIG

Cours de GPS

Calendrier des cours

< > today

February 2016

month week day

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	
8	9	10	11			

Training day Selection

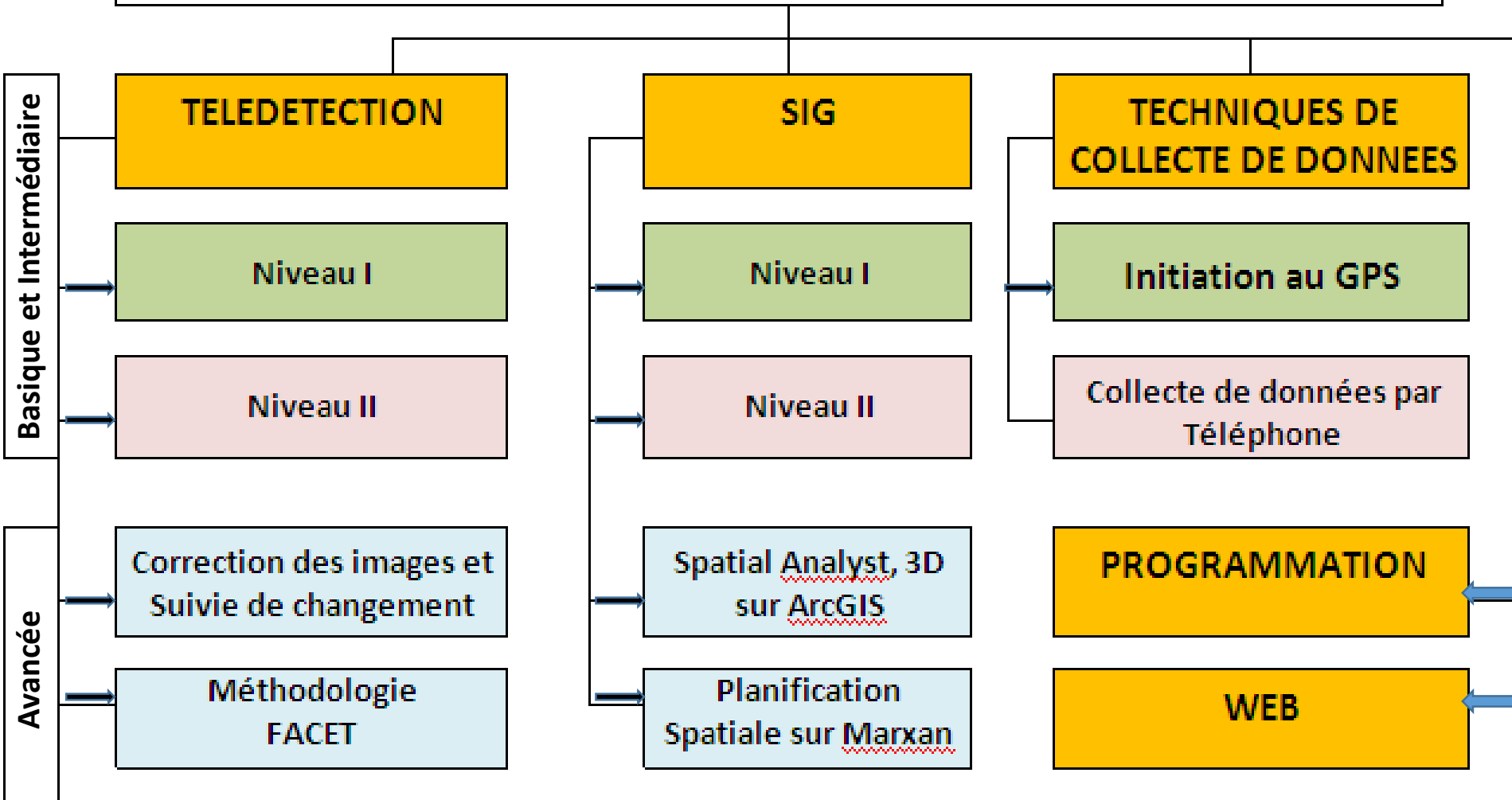
Training Software Selection

Training location Selection



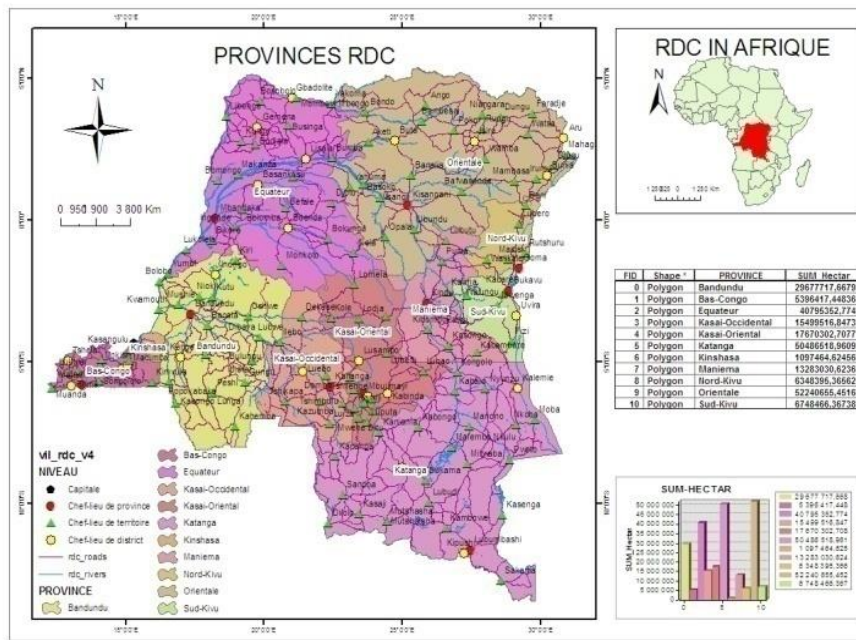
Training Courses selection

FORMATIONS ORGANISEES PAR OSFAC	
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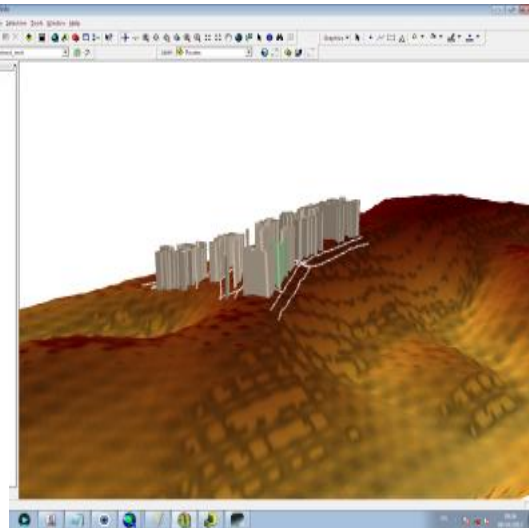
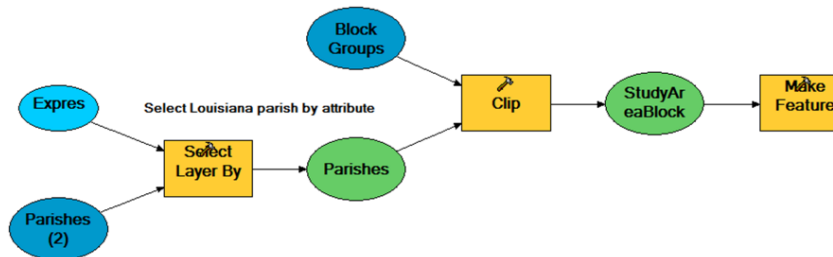
GIS Training

GIS Level I

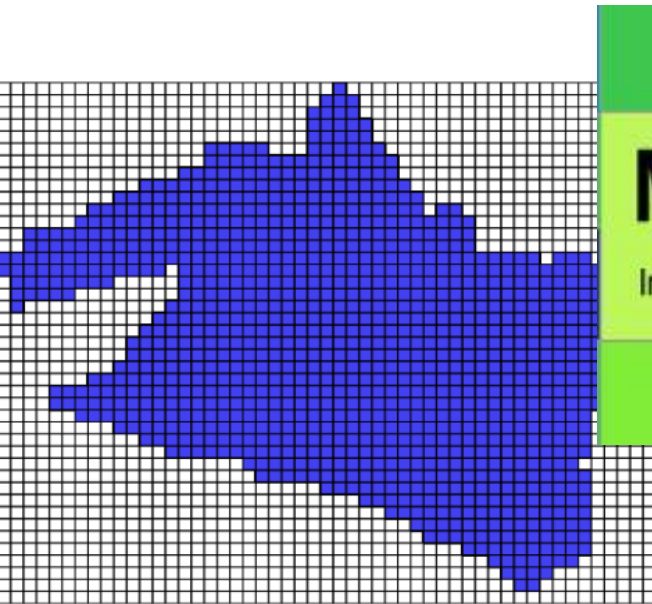


GIS Advanced Level : Spatial Analyst

GIS Level II

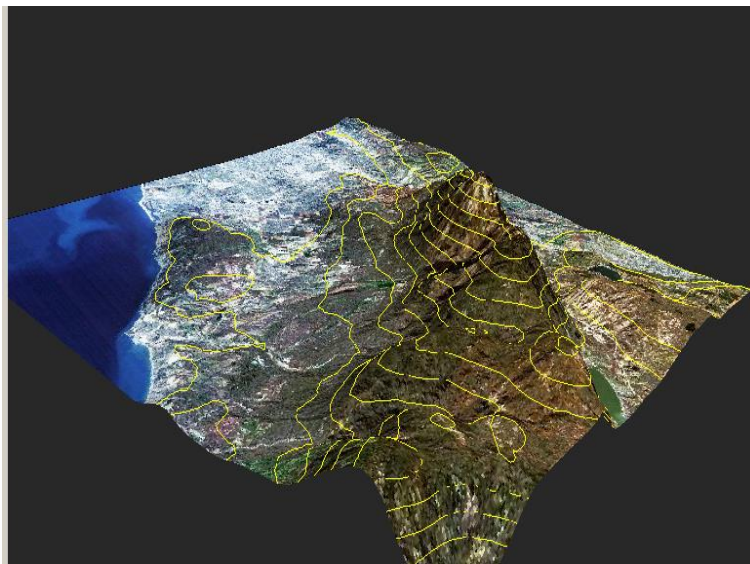


GIS Advanced: Spatial Planning



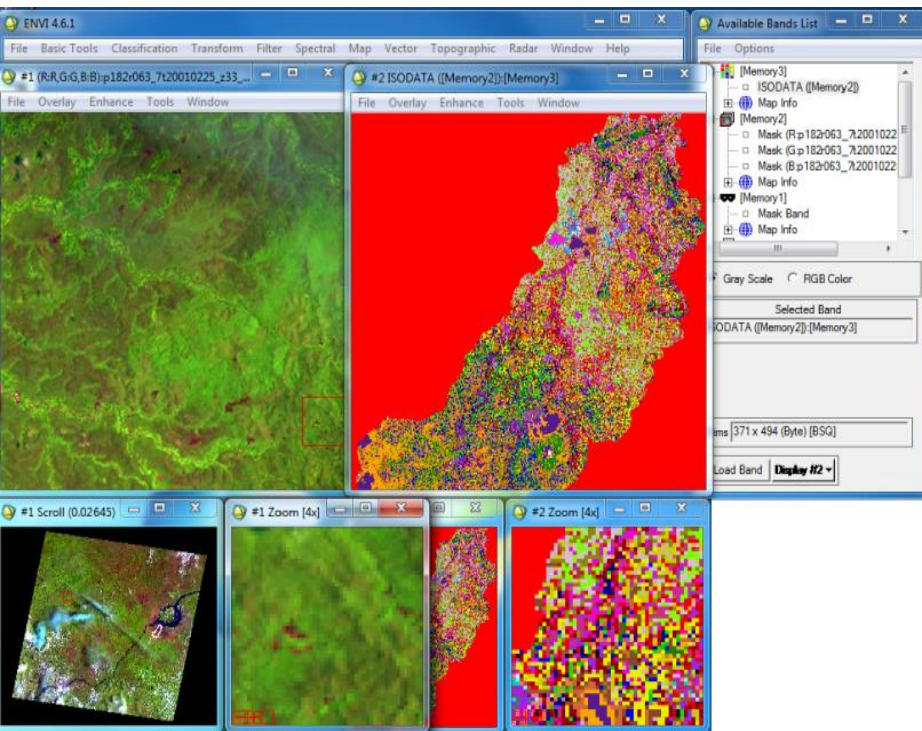
```
File Edit Search Options Help
RDC_test2_log.dat

Iterative Improvement:Value 745109844164.1 Cost 439400000000.0 PUs 4394 Connection 3
Time passed so far is 36 secs
Run 98 Using Calculated Tinit = 499999999.9600 Tcool = 0.99960887
Creating the initial reserve
Init:Value 3476299999786.9 Cost 1347500000000.0 PUs 13475 Connection 212880000.0 Mis
ThermalAnnealing:Value 751450207119.2 Cost 435000000000.0 PUs 4350 Connection 316200
Iterative Improvement:Value 751450207119.2 Cost 435000000000.0 PUs 4350 Connection 3
Time passed so far is 37 secs
Run 99 Using Calculated Tinit = 499999999.9600 Tcool = 0.99960887
Creating the initial reserve
Init:Value 3458699999789.1 Cost 1351300000000.0 PUs 13513 Connection 210740000.0 Mis
ThermalAnnealing:Value 742856748094.0 Cost 438400000000.0 PUs 4384 Connection 304400
Iterative Improvement:Value 742856748094.0 Cost 438400000000.0 PUs 4384 Connection 3
Time passed so far is 37 secs
Run 100 Using Calculated Tinit = 499999999.9600 Tcool = 0.99960887
Creating the initial reserve
Init:Value 3455099999788.9 Cost 1345900000000.0 PUs 13459 Connection 210920000.0 Mis
ThermalAnnealing:Value 746834391295.0 Cost 439200000000.0 PUs 4392 Connection 307600
Iterative Improvement:Value 746834391295.0 Cost 439200000000.0 PUs 4392 Connection 3
Time passed so far is 37 secs
Best solution is run 64
Time passed so far is 37 secs
The End
```



07.26.2009 11:17

Remote Sensing Level I



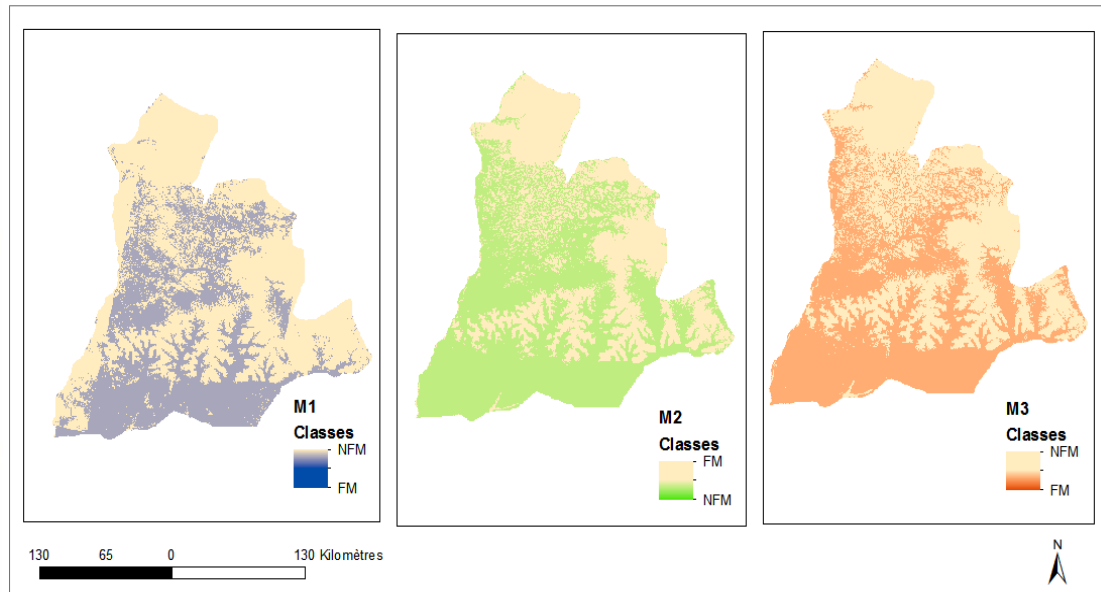
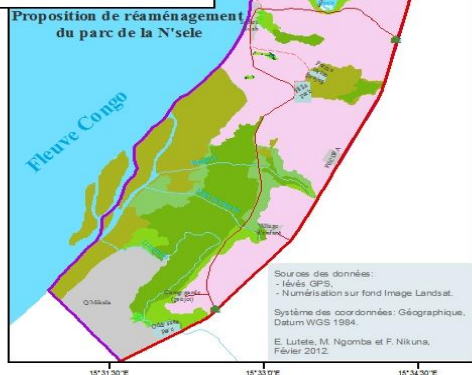
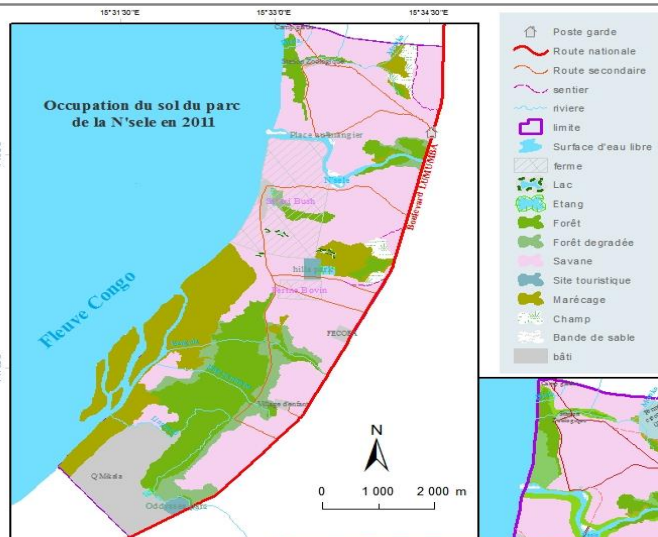
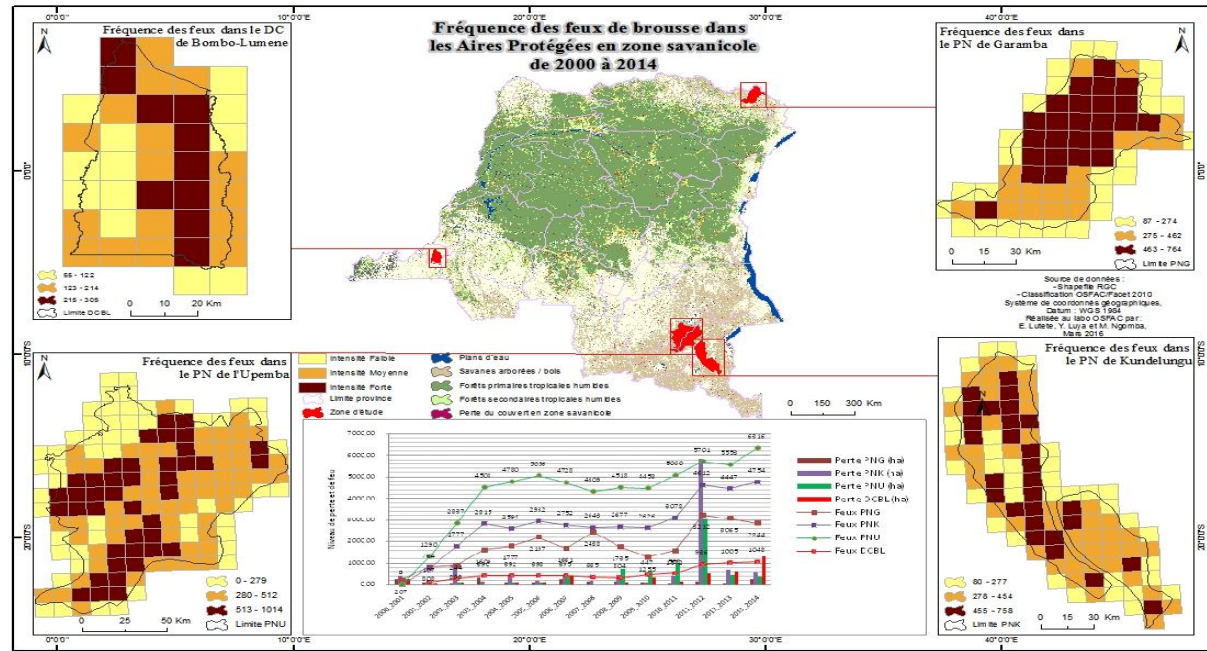
Remote Sensing Advanced Level : FACET Methodology



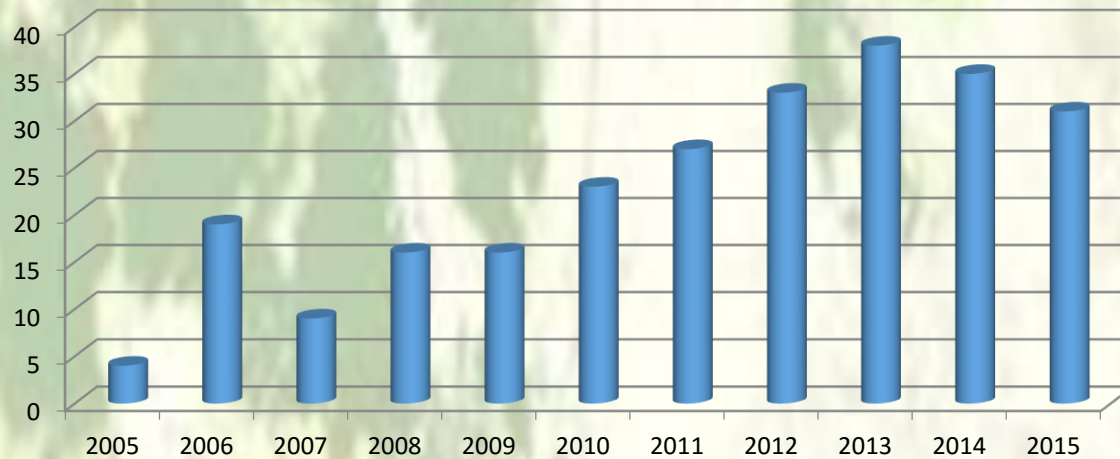
GPS Training



Academic Training Results

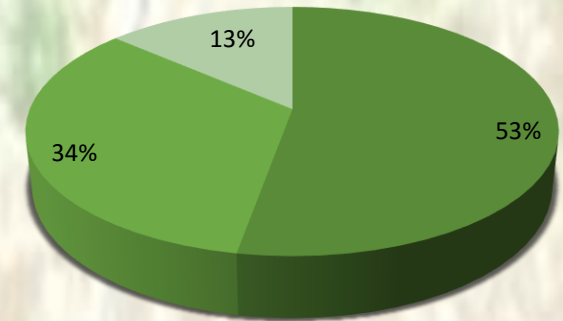


NUMBER OF TRAININGS (2005-2015)



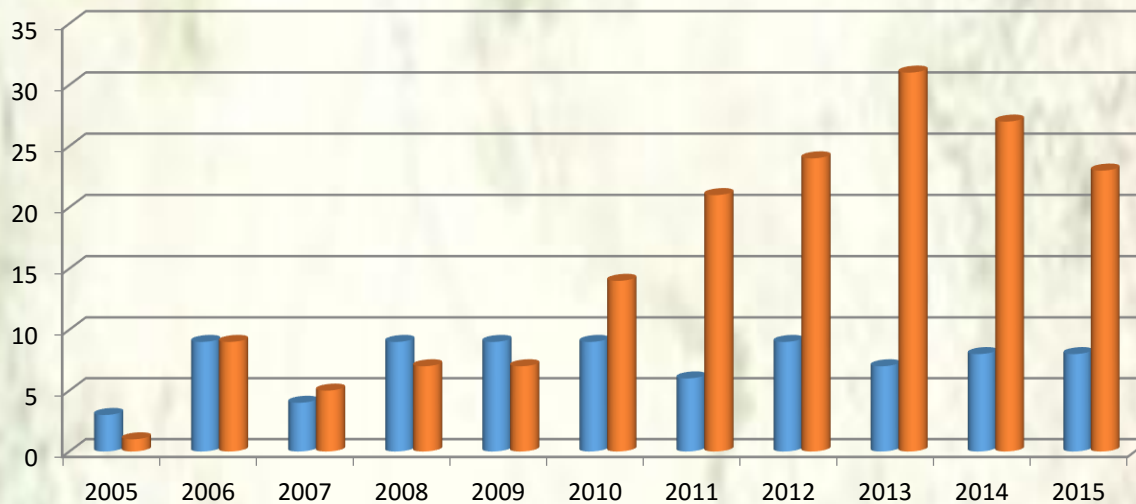
Number of training by year from 2005 to 2015

Nbre Formation



SIG Télédétection GPS

Percentage of tranings by theme

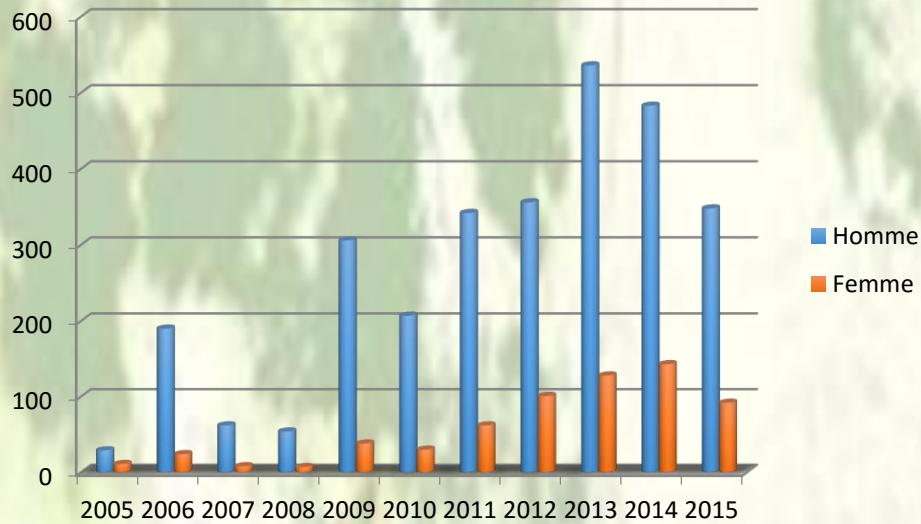


Payante

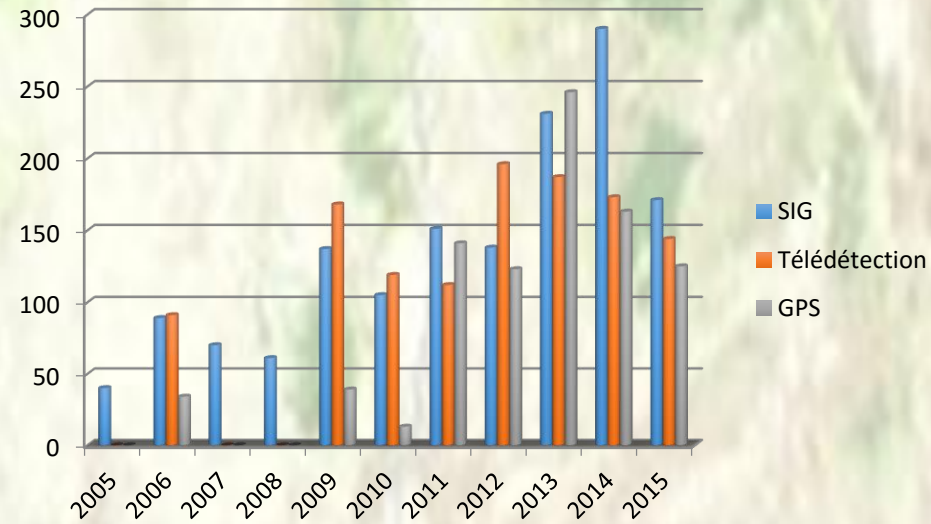
Non Payante

Number of training by year and by category pay and not pay

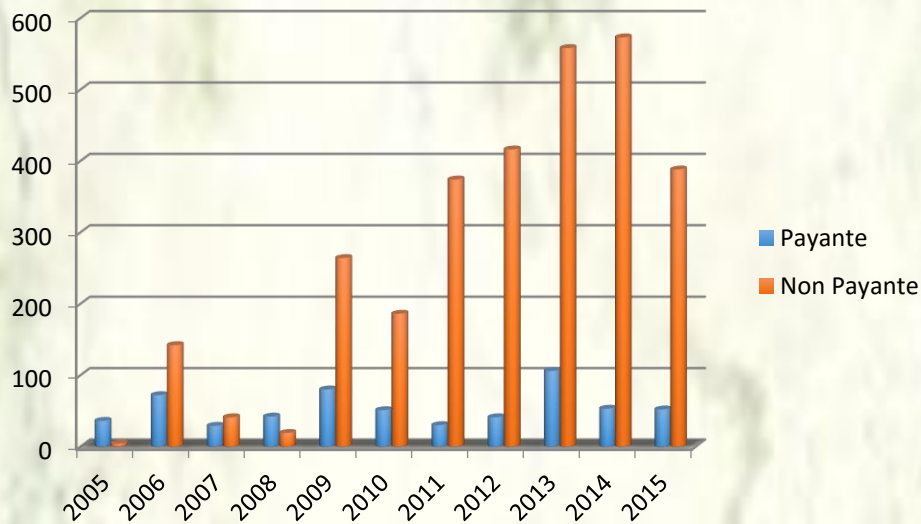
NUMBERS OF TRAINED PERSONS (2005-2015)



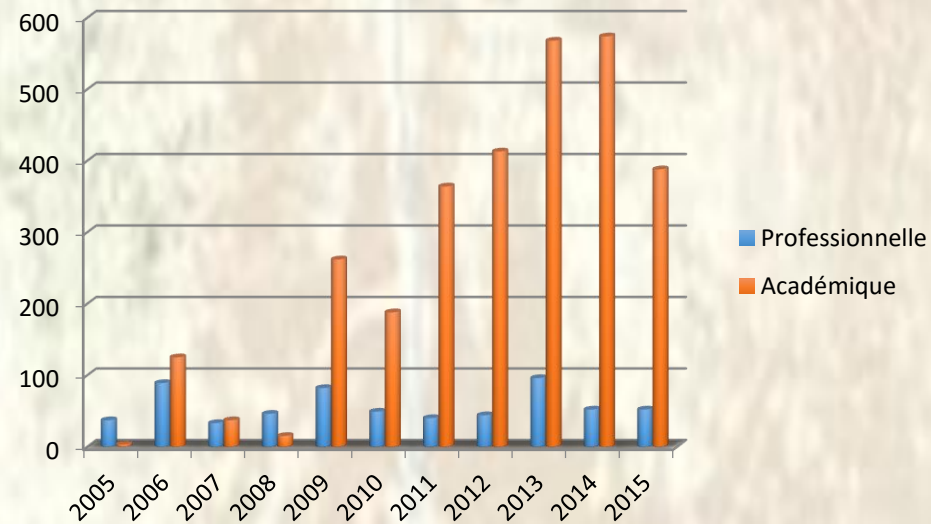
Number of trained persons by sex from 2005 to 2015



Number of trained persons by theme



Number of trained persons by category pay and not pay



Number of trained persons by Institutions category

Summary: training from 2005 to 2015

- Analysis of training organized by OSFAC from 2005 to 2015 shows that:
 - **250 training (81 pay et 169 not pay) was organized**
 - **131 on GIS ;**
 - **85 on Remote Sensing ; et**
 - **34 on GPS**
 - **3557 persons (2913 men et 644 women) was trained**
 - **1483 on GIS ;**
 - **1190 on Remote Sensing ; and**
 - **884 on GPS**
 - **130 institutions was trained**
 - **110 professional ; and**
 - **20 académic ;**

La République du Congo, qui s'est engagée dans le processus REDD+ depuis 2008, est en train de mettre en place les outils stratégiques et techniques utiles pour la consolidation dudit processus. Il s'agit principalement du système MRV et du Niveau des Émissions de Référence pour les Forêts (NERF). Elle se propose d'intégrer la déforestation et la dégradation des forêts dans les calculs des niveaux de référence.

La détection de la déforestation et la dégradation des forêts passe par l'identification du couvert forestier et son évolution dans le temps conformément à la définition de la « forêt » dans le contexte de la REDD+.

La République du Congo, nantis de sa définition de la « forêt » qui se fonde sur les trois critères de base suivants :

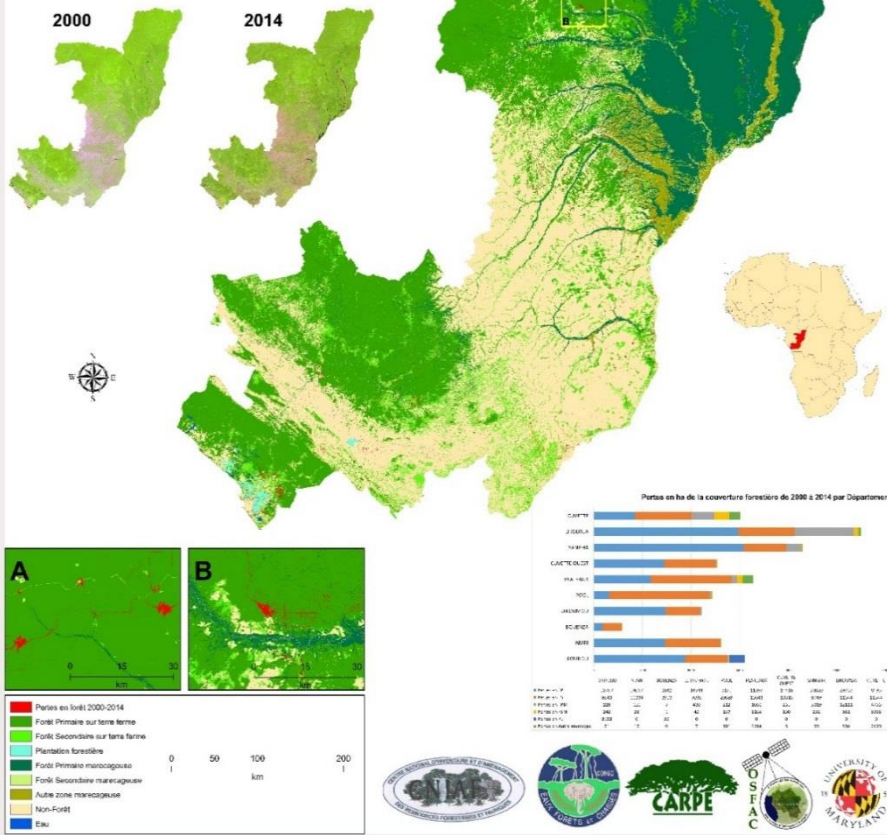
- superficie minimale de la forêt : 0,50 ha ;
- hauteur minimale des arbres : 3 mètres ;
- taux minimal de couverture des houppiers : 30 % ;

se lance dans une étude relative à l'état des lieux du son couvert forestier et à la production des données historiques, en partenariat avec USFS américains.

La méthodologie utilisée est celle du « Wali to Wali » développée par l'Université du Maryland. Cette méthodologie automatisée utilise la Classification Hiérarchique de « l'Arbre à décision » (Decision Tree). Le programme est écrit dans le Langage informatique « PERL » et tourne avec le logiciel PCI Geomatica.

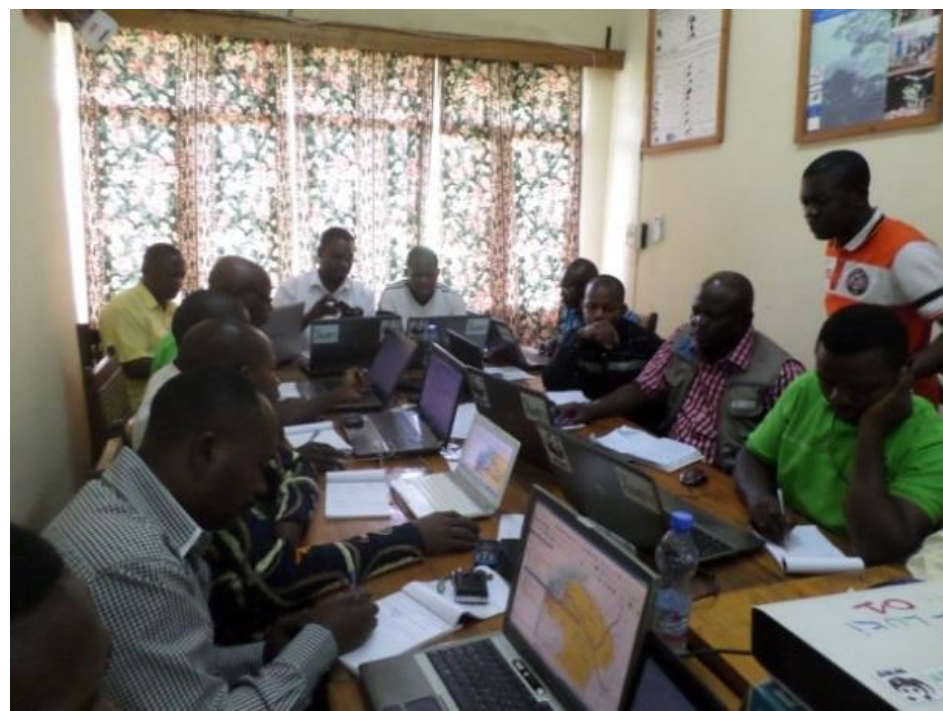
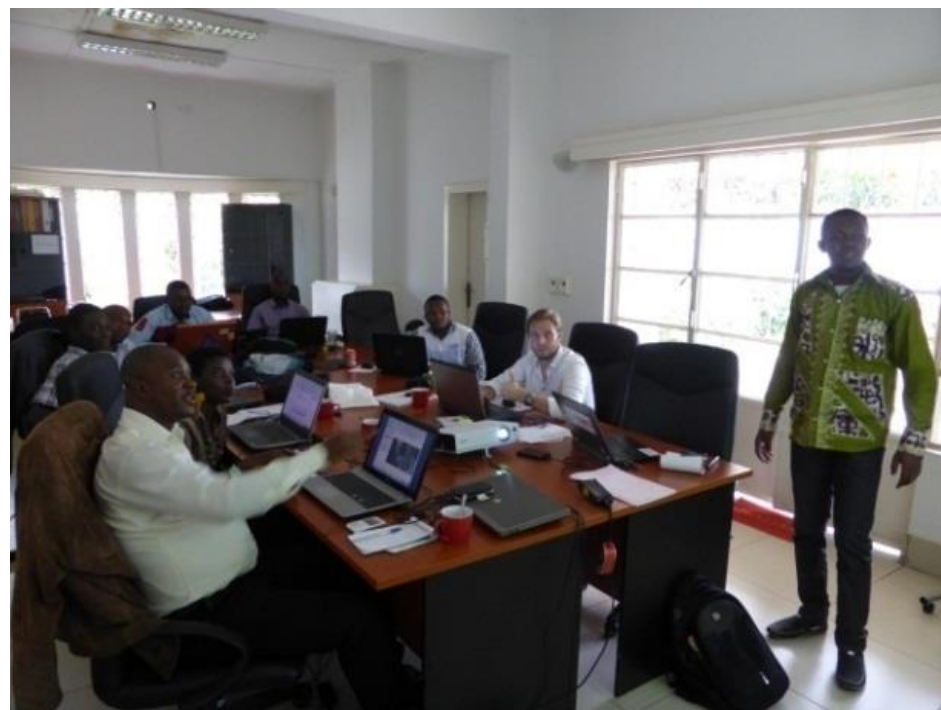
L'utilisation de cette méthode de traitement des données satellitaires a permis une discrimination des types de forêts, leur cartographie et la réalisation des statistiques (étendues, pertes, etc.)

Les résultats présentés dans ce travail prennent en compte la nouvelle définition de la forêt.



CNIAF training in support of REDD+ monitoring – how to estimate activity data using our global method implemented by CNIAF staff at the national scale. We also validated the map themes of forest extent and loss using our standard method. We plan for a field-based validation to assess map accuracy, degradation versus clearing dynamics, and drivers of disturbance.

August 31 – October 4 2015. Clockwise from left: Matt Hansen (*UMD*) , Andre Mazinga (*OSFAC*), Patrick Lola Amani, (*UMD*) Cedric Singa (*OSFAC*), Lill Teddy (*CNIAF*), Cherubins- Brice Ouissika (*not shown, CNIAF*) *Sponsored by USFS-IP, USAID-CARPE & SilvaCarbon*



GIS & Remote-Sensing Training *Sponsored by USFS-IP, USAID-CARPE & SilvaCarbon* :
QGIS Software use , Atmospheric correction and Classification Applications
Trainers OSFAC (Brazzaville, Republic of Congo 2015)



Remote-Sensing Training Sponsored by FAO: Ecognition Software use , Classification Applications Trainers UCL/OSFAC (DRC, 2016)



Communication / Data sharing most used in Congo Basin (in Red colour)

1. Formats ?

Scientific publication, Newsletter paper, Electronic newsletter, magazines, Press release, Social media (Tweeter, Facebook...), Workshops...

1. 2. Tools ?

Radio, TV, Internet (Website, DropBox, Google drive, Ftp...), hard drive, ...

1. 3.Target audience ?

Universities, research Institutions, Government agencies, Private sector, Civil society, Decision makers

Conclusions

Remote Sensing for Knowledge Based Decisions

- 1. Creation of useful information from satellite data**
- 2. Effective dissemination of this information in useful forms**
- 3. Capacity building in data applications and creation of new knowledge**



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Forêts d'Afrique centrale étudiées par télédétection
FACET

Étendue et perte du couvert forestier en République du Congo de 2000 à 2010

Étendue et perte du couvert forestier en République démocratique du Congo de 2000 à 2010

Forest cover and loss in the Central Africa countries from 2000 to 2010

These atlas were produced as a part of the OSFAC (Observatoire Satellital des Forêts d'Afrique Centrale) initiative "Monitoring the forests..."

Forest cover and loss in the Central Africa countries from 2000 to 2010 FACET

Satellite Images

LANDSAT, ASTER, SRTM, SPOT, ...

Training

GIS, Remote Sensing, GPS, ...

Quantifying carbon stocks and emissions in the forests of the Republic of Congo

Mapping Services

Featured News

- ⇒ **OSFAC at 14th Francophonie ceremony**, Kinshasa [October 11, 2012]
- ⇒ **United Nations conference on sustainable development, RIO+20** [October 9, 2012]
- ⇒ **Do you need Satellite images? Try OSFAC-DMT** [April 22, 2012]
- ⇒ **Launch Ceremony of the FACET DRC Atlas** [April 05, 2011]

Satellite Images available

- ⇒ **ASTER** 2000 - 2008
- ⇒ **ASTER GDEM** 2009
- ⇒ **LANDSAT** 1972 - 2012
- ⇒ **LANDSAT MOSAICS** 2004 - 2005
- ⇒ **RADARSAT MOSAICS**
- ⇒ **SPOT** 2008 - 2011
- ⇒ **SRTM** 2000

[Learn more...](#)

OSFAC conducts beginner to advanced trainings in **Geographic Information System (GIS)** and basic **Remote Sensing**, using the following software:

- ⇒ ArcView 3.3;
- ⇒ ArcGIS 10.x;
- ⇒ ENVI 4.x;
- ⇒ ERDAS 9.x;

Trainings are adapted to different levels of experience as well as different areas of application, such as natural resource management, participatory mapping, urban infrastructure, etc. [Learn more...](#)

