Contents

Introduction

The Intact Forest Landscape (IFL) concept was developed by a group of non-governmental environmental organizations (Greenpeace, World Resource Institute and Transparent World) to help create, implement, and monitor policies concerning forest degradation at regional-to-global levels.
According to this group, “An **Intact Forest Landscape (IFL)** is an unbroken expanse of natural ecosystems within the zone of current forest extent, showing no signs of significant human activity, and large enough that all native biodiversity, including viable populations of wide-ranging species, could be maintained.”
A mapping team composed of Greenpeace, Global Forest Watch, Transparent World, University of Maryland, WWF-Russia and Luonto Liitto (Finish Nature League), created a first map of IFL for the year 2000 and made an update for the year 2013.
During the 2014 FSC General Assembly, a motion proposed by Greenpeace International (motion 65) was passed, that stated that FSC will direct Standard Development Groups and Certification Bodies to develop, modify or strengthen indicators that aim to protect the vast majority of IFLs (contained in HCV2) across FSC certified operations.
To prepare the FSC guidelines for HCV of the Congo Basin, a first workshop of the regional workgroup will take placein June 2016 in Brazzaville. The objective of this workshop is a clear and consensual vision of the regional workgroup members on High Conservation Values on:
(i) HCV and IFL concepts;
(ii) Final expected product – FSC guidelines for the HCV of Congo Basin forests;
(iii) A workplan to follow for thedevelopment of the guidelines.

In order to prepare this workshop, a cartographer has been hired to facilitate the mapping of all information already available and relevant to inform possible approaches to IFL and HCV definitions, conservation and forest management in the Congo Basin. This work more precisely presents data on:
(i) Forest management and IFL in the Congo Basin;
(ii) Elephants and Great Apes density and IFL in the Congo Basin;
(ii) Update of the 2013 IFL layer in FSC concessions.

This report presents the atlas of maps produced through this work as well as data and methodology used to create those maps.

1. Methodology

A. Data collection

This work would not have been possible without the collaboration between the FSC Congo Basin Office and the owners of the data.

- Forestry concessionsmanagement level in the Congo Basin

For each country of the Congo Basin, we wanted to know the management status of all forestry concessions: do concessions have a management plan or not, or is it in elaboration? Data from the Forest Atlas created by WRI provided the base layer. It was then updated thanks to different sources of information: WRI, WWF, FSC and FRM. The final result gives an up-to-date state offorestry concessions management level in the Congo Basin except for Gabon, where despite our efforts, we did not find any data after 2013.

- Geographic data on logging activities and infrastructure in certified concessions.

Forestry companies owning FSC-certified concessions in the Congo Basin were asked if they could share the following geographic data:
-Harvest history from 2010 to 2015
-New infrastructure location or delimitation
-Up-to-date trails, roads and ramp network
-Up-to-date series division of the forest management units
-Up-to-date High Conservation Value zones delimitation

We received data from Cafeco, SFID, SCIEB, CEB, CBG, IFO, CIB-Olam and Mokabi. These companies allowed the use of their data for the analysis and maps showed in this report. Without them, no analysis would have been possible.

- Biodiversity data

In addition to forest management data, biodiversity data were also collected directly from researchers. The following geographic data was shared:
-Elephant density in Central Africa, from Fiona Maisels and Samantha Strindberg [Maisels and Strindberg, 2013].
-Great Apes irreplaceability value and priority sites from Dan Segan [Segan and al. 2010].
-Presence of endangered endemic plant species in Gabon from Tariq Stevart

B. Determination of potential impact of harvest on IFL in certified concessions

The aim of the analysis is to update the 2013 IFL layer produced for GFW in the concessions where data is available. The method used to refine the 2013 IFL layer is based on the one developed by Greenpeace to produce de global 2000 and 2013 IFL maps.

- Reminder of the Greenpeace method

The essence of the approach is to establish the boundaries of large undeveloped forest areas, or Intact Forest Landscapes (IFL).
For the global IFL analyses, the following criteria were used:
-minimum area of 50,000 hectares
-minimum IFL patch width of 10 km
-minimum corridor/appendage width of 2 km
The criteria were chosen to insure that IFL patch core areas are large enough to provide refuge for wide-ranging animal species.

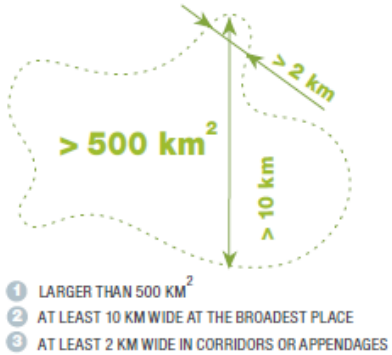


Figure 1 : 3 criteria that define an IFL

The IFL mapping approach is based on 'inverse logic', i.e. on mapping the opposite of intactness: altered and fragmented forest areas. The image analysis was conducted through expert-based visual interpretation, using Geographic Information System (GIS) overlays of medium spatial resolution satellite images with additional thematic and topographic map layers. The purpose is to detect evidence of significant human-caused alteration and fragmentation. To assess fragmentation, all developed areas were excluded and all infrastructure and settlements were buffered by 1 km. Patches without evidence of development, if large enough, are classified as IFL.

Source:
P.Potapof et all, Ecology and Society 13(2): 51
I. Zhuravleva et all, Environmental Research Letters 8: 024034
IFL website

- Greenpeace method applied in this analysis

In this analysis, the Greenpeace method is applied to geographic layers. Instead of looking for signs of activities and IFL degradation on an image, these data are directly pulled from the geographic data shared by forestry companies.
Using the same reverse logic, the aim is to produce a layer of “potential impact of recent harvest on IFL”. To do this, data on harvest and infrastructure for the period 2010 to 2015 were selected to ensure that recent activities, even previous to 2013, were taken into account.

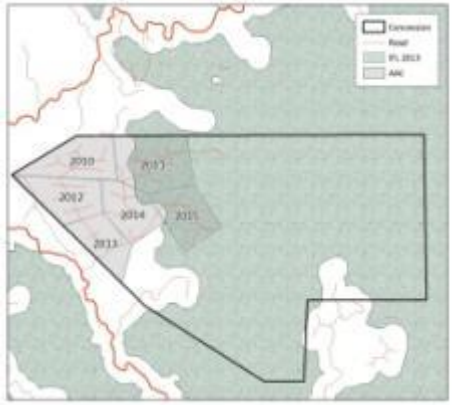


Figure 2 : Example of a fictitious concession. Data available are roads and AAC. Showed here with the 2013 IFL layer.

Protection and conservation series are removed from the AAC layer. Then, a 1km buffer is applied to the AAC and roads resulting in a layer of potential areas impacted by recent harvest. This layer is then used to clip the 2013 IFL layer. The result of the clip gives a first version of the potential impact of recent harvest on IFL in the concession.

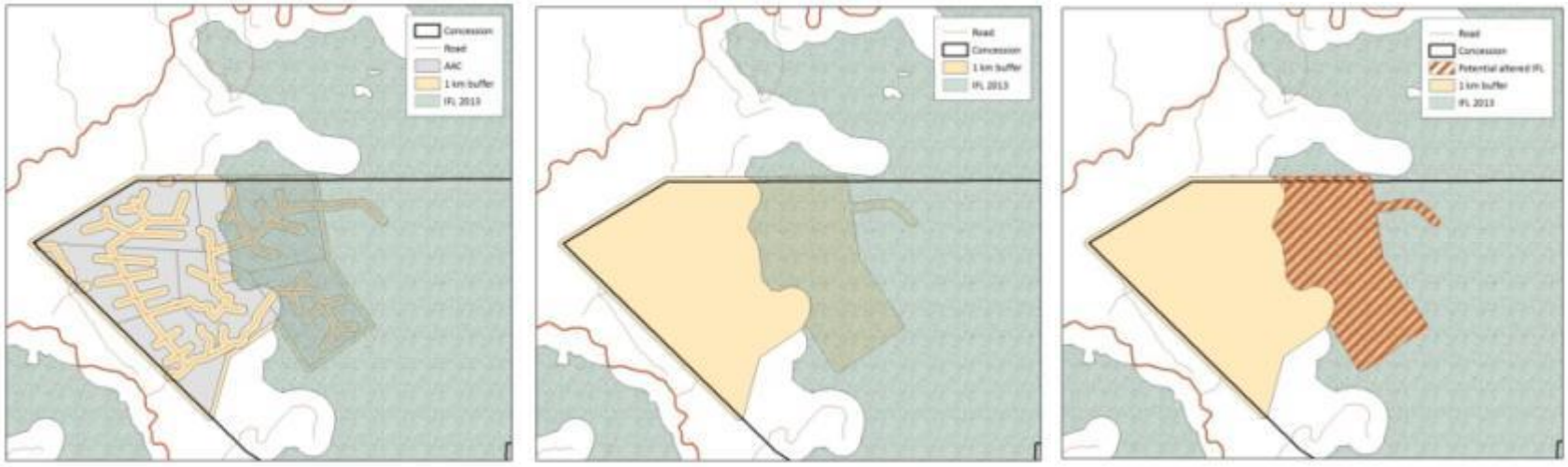


Figure 3 : 1) a 1km buffer is applied to the roads and AAC layers; 2)the 1km buffer layer shows potential altered areas; 3) the superposition of the buffer layer and the 2013 IFL layer gives a first version of the IFL potentially impacted by recent harvest. Showed here with the 2013 IFL layer

The next step refines the IF area potentially impacted by harvest by adding remaining forest areas that do not meet the three IFL criteria.The remaining IFL bloc is analyzed around the concession and parts that do not meet the criteria are considered as impacted IFL.

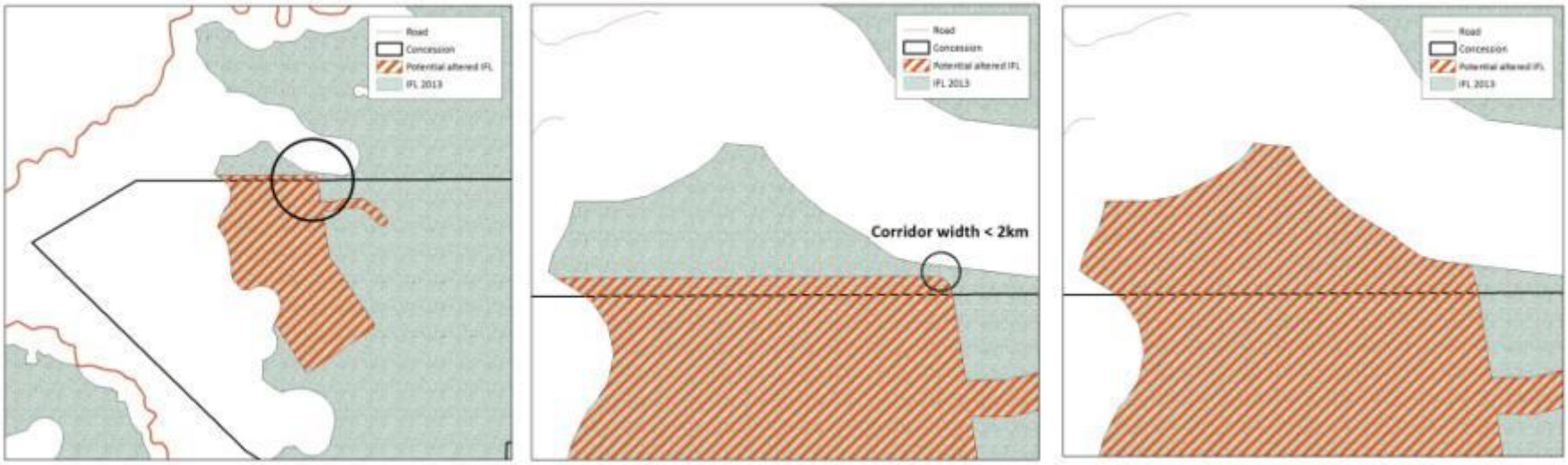


Figure 3: Example of an area that do not meet the IFL criteria and is added to the potentially altered IFL

This process results in a layer for potential impact of harvest on IFL from 2010 to 2015, in each concession. The same approached was used to produce the potential altered IFL layer for the period 2016-2025.

- Notes on the methodology

Here are some remarks to better understand the methodology.

Difference between using satellite imagery and using geographic layers from forestry companies as baseline data to delineate the potential impact of recent harvest on IFL:
Satellite imagery gives data that is independent from the forestry companies. Assuming that the most up to date and best resolution image is used, an analyst could observe an altered area that are possibly not linked to logging activities but are located in the concession (for example, an illegal mining camp), data that is not available to forestry companies.
The analyst could also see with more detail where logging took place. In this analysis the entire AAC is considered as impacted IFL when the disturbance may be restricted to areas closest to the roads. This kind of data could reduce the IFL altered area.

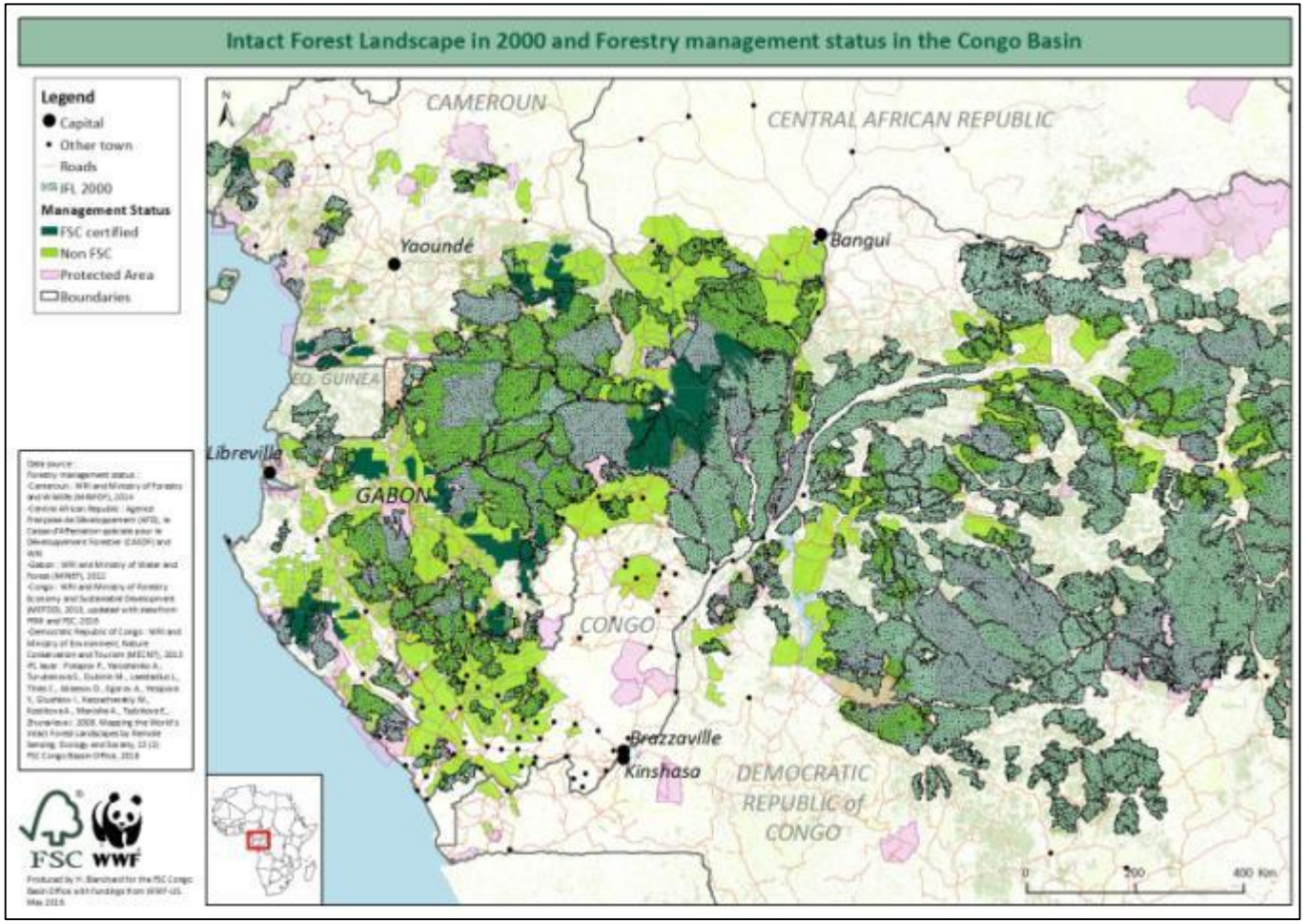
Using data from 2010-2015to update the GFW IFL layer when this layer is from 2013:
The 2013 IFL layer was produced in 2014 and is regularly updated. Not knowing the date of the imagery used to map the IFL layer in the study zone, it was decided to take into account data from three years before 2013 to be sure the update is accurate. And indeed, some IFL area from the 2013 layer was found in AAC from previous years, in zones that were logged.
This raises a question: can a logged area be considered IFL from satellite imagery?

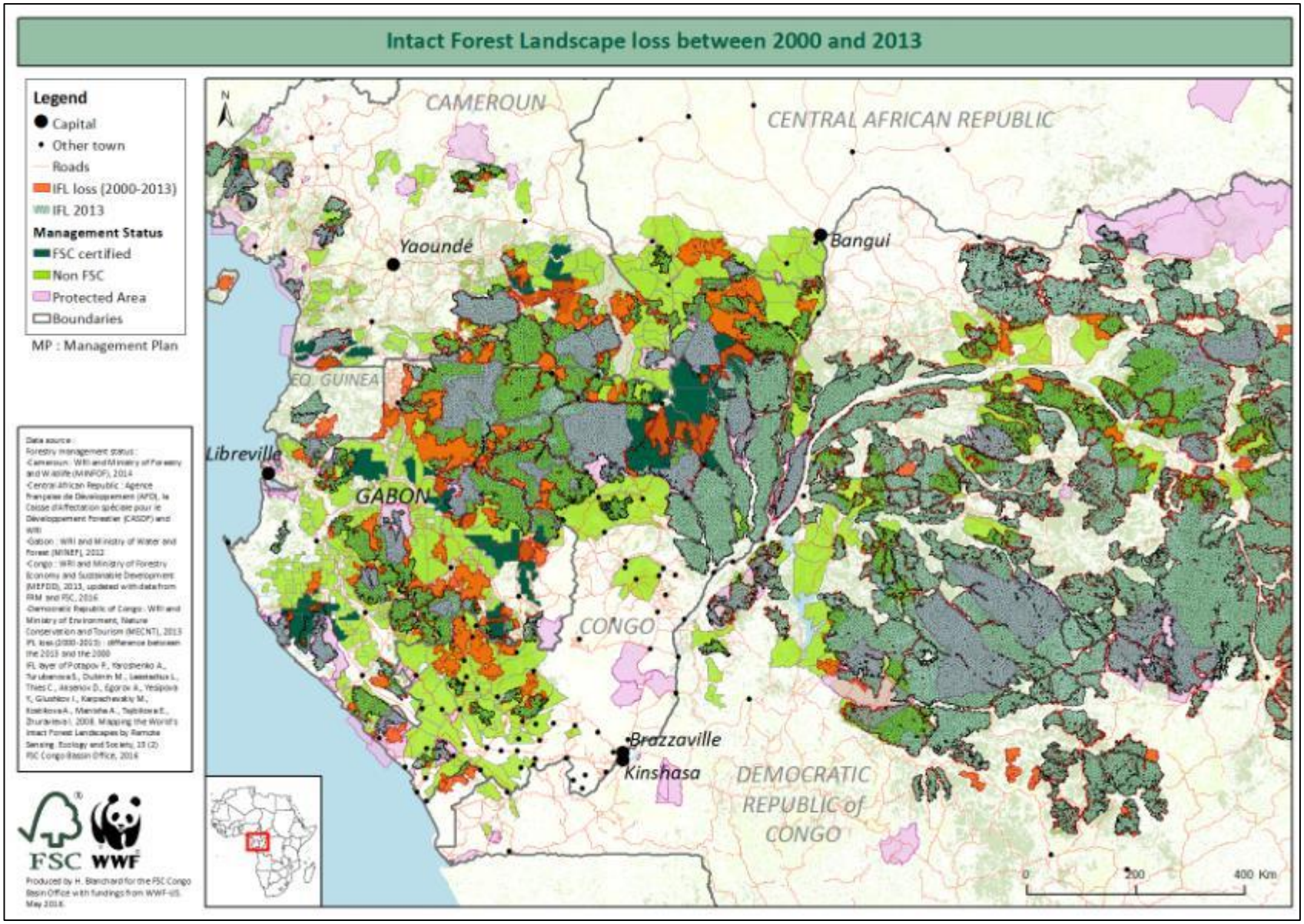
According to this method, impact on IFL caused by logging can be larger than the strict area of logging:
1) The methodology used to define IFL disturbance applies a 1km buffer around “activity areas” (here roads and AAC). If AAC are at the limit of the concession, a 1km wide band of IFL outside the concession will be considered impacted.
2) The technical definition of an IFL states that IFL must be larger than 500km², at least 10km wide at the broadest place and at least 2km wide in corridors or appendages. Even if an area is not directly impacted by logging activities, if the area around it is, then, unless this area fills the 3 criteria above, the intact forest remaining will not be considered IFL and will automatically be included in the IFL impacted layer.

2. Intact Forest Landscape in Central Africa

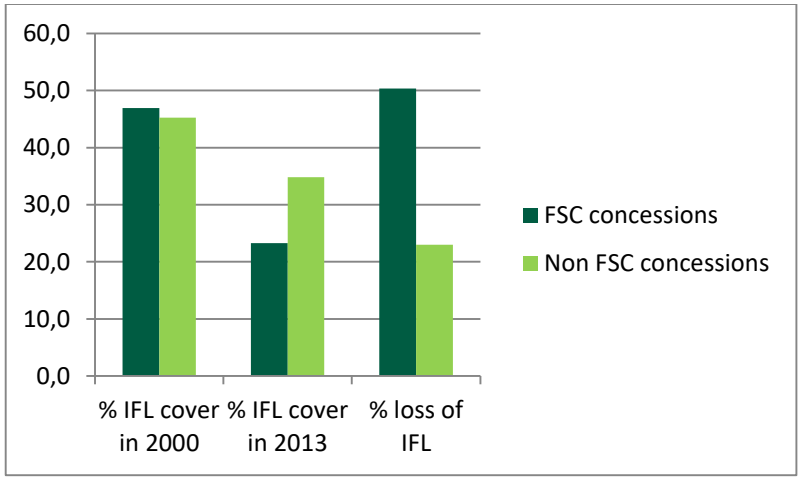
A. Intact Forest Landscape degradation between 2000 and 2013 in forestry concessions

The aim of this analysis is to compare the IFL degradation rate in FSC and non-FSC concessions between 2000 and 2013, based on the 2000 and 2013 IFL layers from Global Forest Watch (GFW). This analysis can only give a rough idea of this rate, as to be more precise, it would have to integrate concession management status change over time. It was not possible to do this here, and the FSC status used is a reflection of today's situation.




Intact Forest Landscape loss between 2000 and 2013
Legend
Capital
Other town
Roads
IFL loss (2000-2013)
IFL 2013
Management Status
FSC certified
Non FSC
Protected Area
Boundaries
MP : Management Plan
CAMEROUN
CENTRAL AFRICAN REPUBLIC
Yaoundé
Bangui
EQ. GUINEA
Libreville
GABON
CONGO
Brazzaville
Kinshasa
DEMOCRATIC REPUBLIC of CONGO
0
200
400 Km
FSC
WWF

To obtain the IFL degradation rate, the difference between the IFL cover in 2000 and 2013 was calculated for FSC certified and non FSC-certified concessions in the Congo Basin. The graphic below shows the percentage of IFL cover for all concessions in each group in 2000 and 2013 and the resulting degradation of IFL.



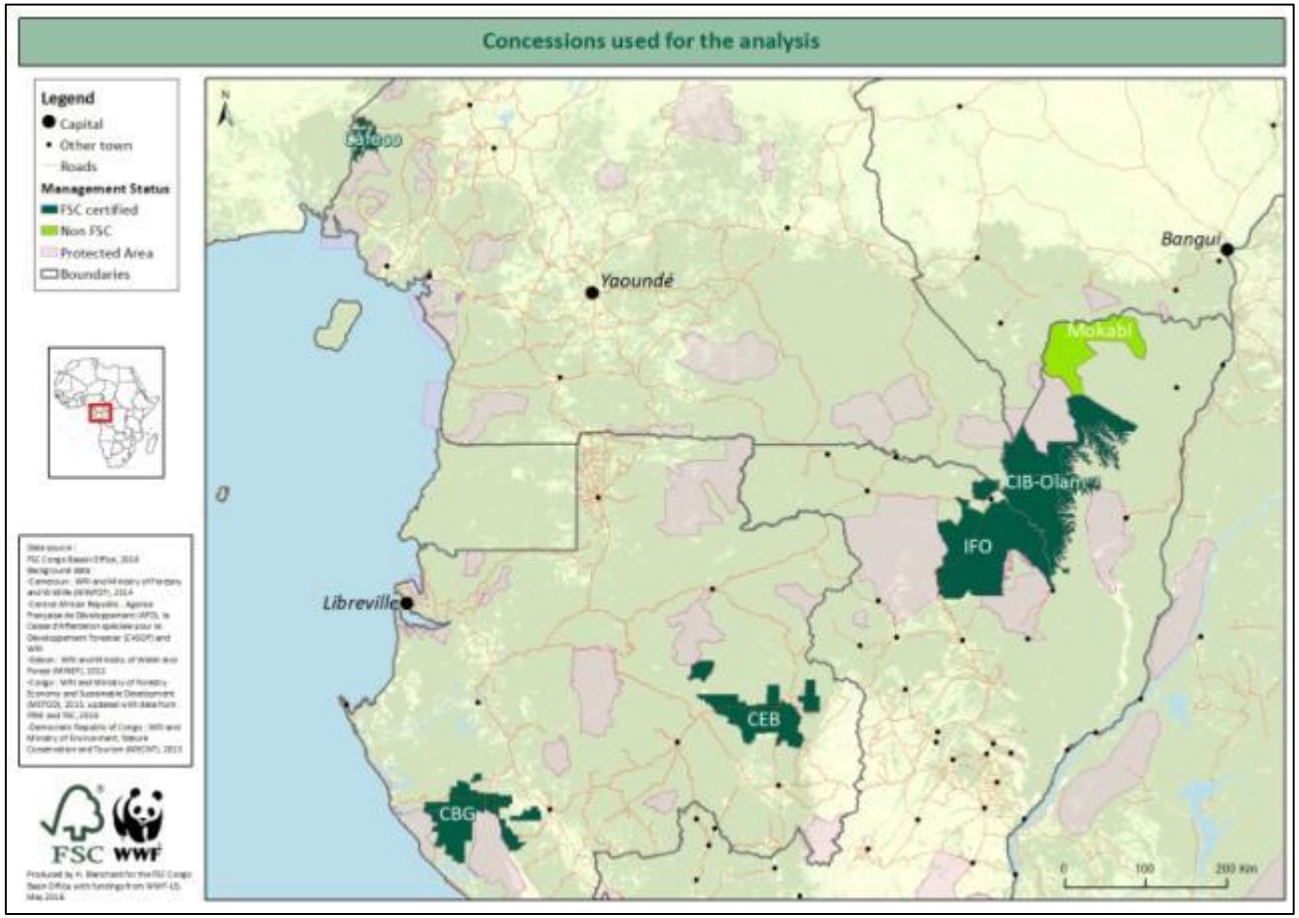
It appears from this analysis that IFL degradation has been occurring at a twice higher rate in FSC certified concessions than non FSC certified concessions between 2000 and 2013. IFL cover reduced to half its size in FSC concessions compared to three quarters in non-FSC concession.

First of all, it has to be reminded that FSC concessions obtained their certification during the period 2000-2013. They were not certified from 2000. It is impossible to know how much IFL degradation occurred before the certification.

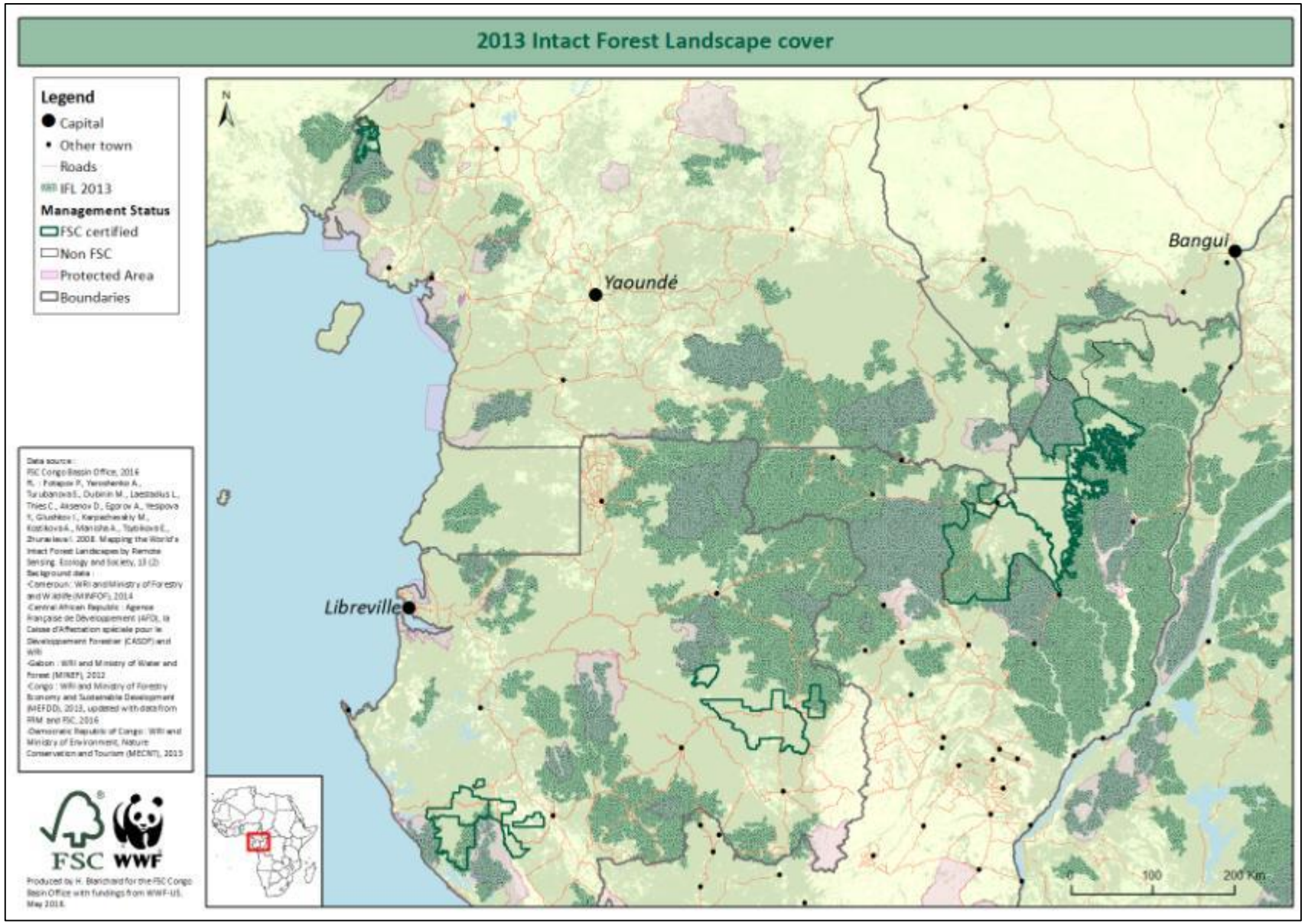
If this argument is set aside, a couple of reason could explain the difference in IFL degradation rate. On one hand, FSC certified concessions are usually better managed than other concessions. The same way that they are doing more effort to protect local population and the environment, they are also more efficient at logging. If the logging rate is higher, the IFL degradation rate is also higher. On the other hand, non-certified concessions include concessions with no management plan and non-attributed concessions, where logging is either absent or poorly organized. Again, with available data, it is not possible to know each concession management history, so it is difficult to draw precise conclusions.

B. IFL disturbance between 2010 and 2015 in nine FSC certified concessions and one VLC certified concession

The aim of this analysis is to take a closer look at IFL disturbance in certified concessions and propose an updated version of the 2013 IFL layer. It was made possible by the collaboration with 10 concessions in Cameroun, Congo and Gabon, which graciously agreed to share production data with the FSC Congo Basin office and allowed its use for mapping analysis and share the results.



The ten concessions are:
-Ngombé of IFO in Congo
-Pokola, Kabo and Loundoungou of CIB-Olam in Congo
-Massif of CEB in Gabon
-Rabi, Mandji and Kivoro of CBG in Gabon
-11-005 of Cafeco in Cameroun
-Mokabi-Dzanga of Mokabi in Congo


2013 Intact Forest Landscape cover
Legend
Capital
Other town
Roads
IFL 2013
Management Status
FSC certified
Non FSC
Protected Area
Boundaries
N
Yaoundé
Bangui
Libreville
0
100
200 Km
FSC WWF

According to the GBF 2013 IFL layer, IFL covered 1,319,060ha (31%) of these concessions combined in 2013. There are many disparities between concessions. Some of them, like Ngombé and 11-005 were more than 50% covered by IFL. CEB's concession on the other hand,was only 10% IFL.

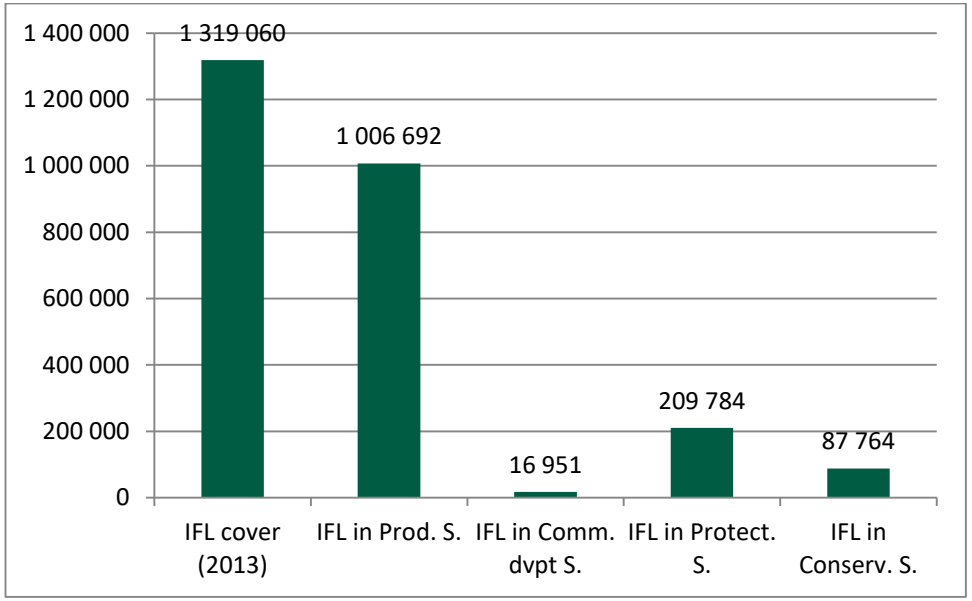
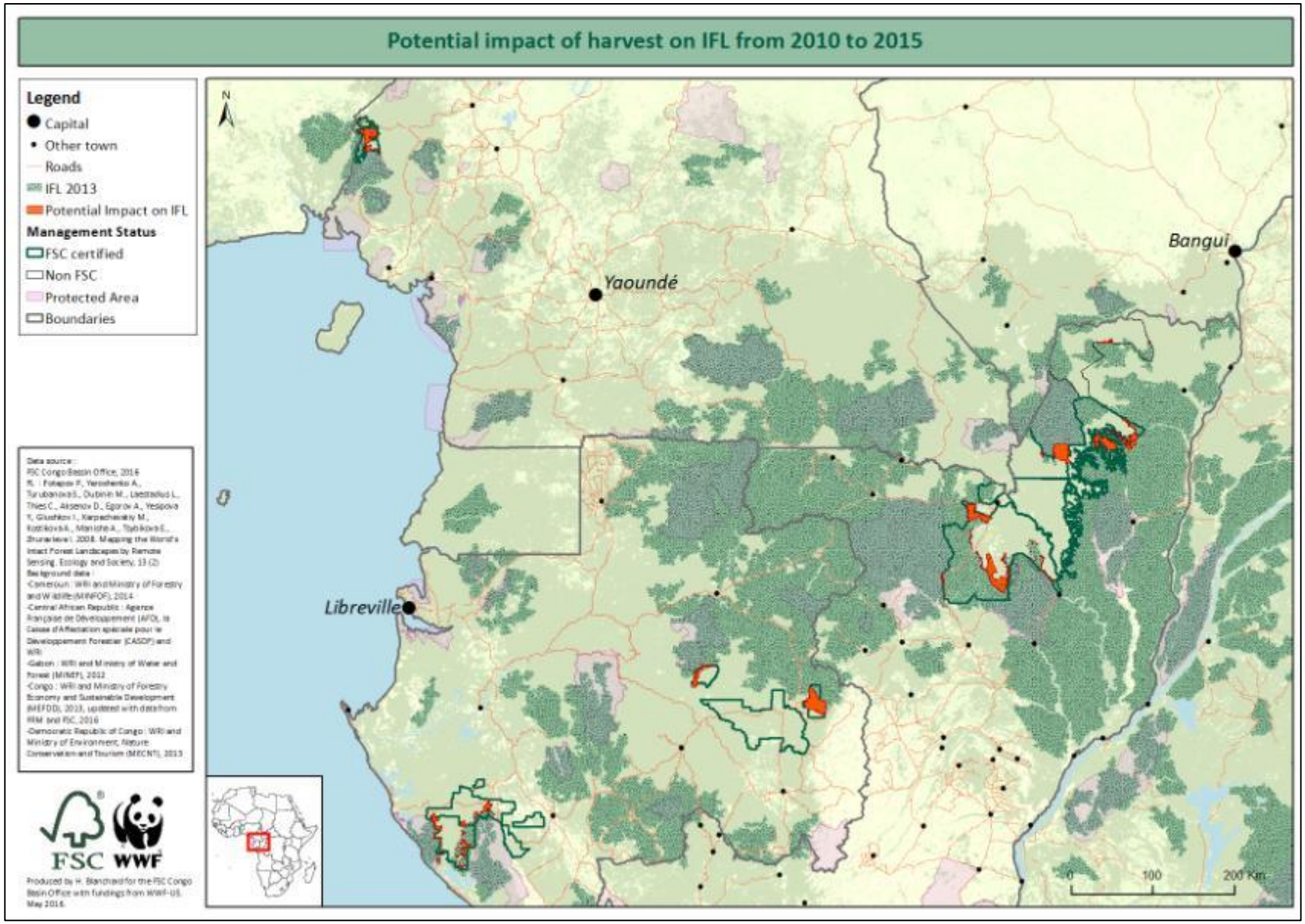


Figure 4 : 2013 IFL cover in certified concessions (in ha)

The graphic above shows the repartition of the IFL in the different management series. It reflects the size of the series themselves: most of a concession is logically in production series. It is then not surprising that most of the IFL (76%) is also located in the production series. Only 1% of the IFL is in Community Development Series, 16% is in Protection series and 7% in Conservation Series.


Potential impact of harvest on IFL from 2010 to 2015
Legend
Capital
Other town
Roads
IFL 2013
Potential Impact on IFL
Management Status
FSC certified
Non FSC
Protected Area
Boundaries
Yaoundé
Bangui
Libreville
0
100
200 Km
FSC WWF

This analysis looked at harvesting data (Annual Allowable Cuts) from 2010 to 2015 and forestry roads to determine “potential impact of harvest on IFL” following the method used by the IFL mapping team.

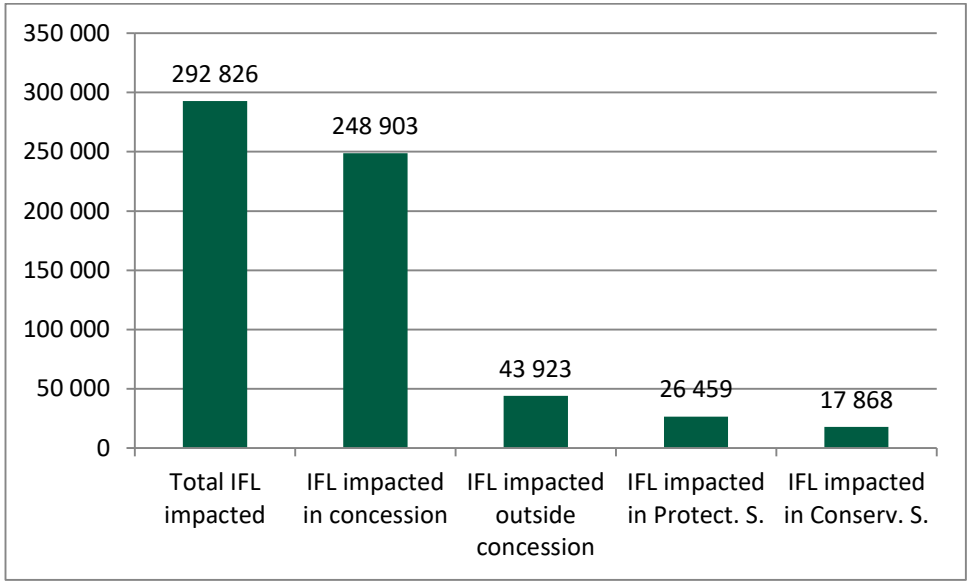


Figure 5: Area of IFL potentially impacted by harvest (in ha) from 2010 to 2015.

Overall, 248,903ha (19%) of the initial (2013) IFL in concessions is found to be potentially impacted. 11% of the IFL impacted is located in protection series and 7% in conservation series. 43,923 ha of IFL are also potentially impacted by harvest outside of the concessions.
This analysis shows here that logging activities impact a greater area than that on which they are strictly conducted. This is due to the method used to define altered IFL areas and to the technical definition of an IFL:
-in the method, a buffer of 1km is applied around all identified areas of activity to determine the area impacted by these activities. This buffer can explain impact outside of concessions or outside of production series.
-the IFL technical definition follows three criteria : size of 50,000ha, at least 2km wide in corridors and appendages, at least 10km wide at the broadest place. The first treatment with the 1km buffer can reveal IFL areas that do not meet these criteria. These areas are considered as impacted by harvest.
A road crossing an IFL can potentially have an indirect impact on IFL much larger than the road by itself.
And protection and conservation series are not very effective at protecting IFL if they are too thin and surrounded by production series.

C. Potential IFL disturbance projection

For eight of the ten concessions, we were able to make a projection of the future potential impact of harvest on IFL from 2016 to 2025, based on the data sent by the companies (see map next page). 83,389 ha of IFL will potentially be impacted by harvest in the next 10 years in these concessions.
The following graphic shows the percentage of IFL cover in the 8 concessions. Data for 2000 And 2013 come from the GFW IFL layers from the same years. Data for 2016 and 2025 come from the current analysis, considering "potential impact of harvest on IFL" as IFL degradation.

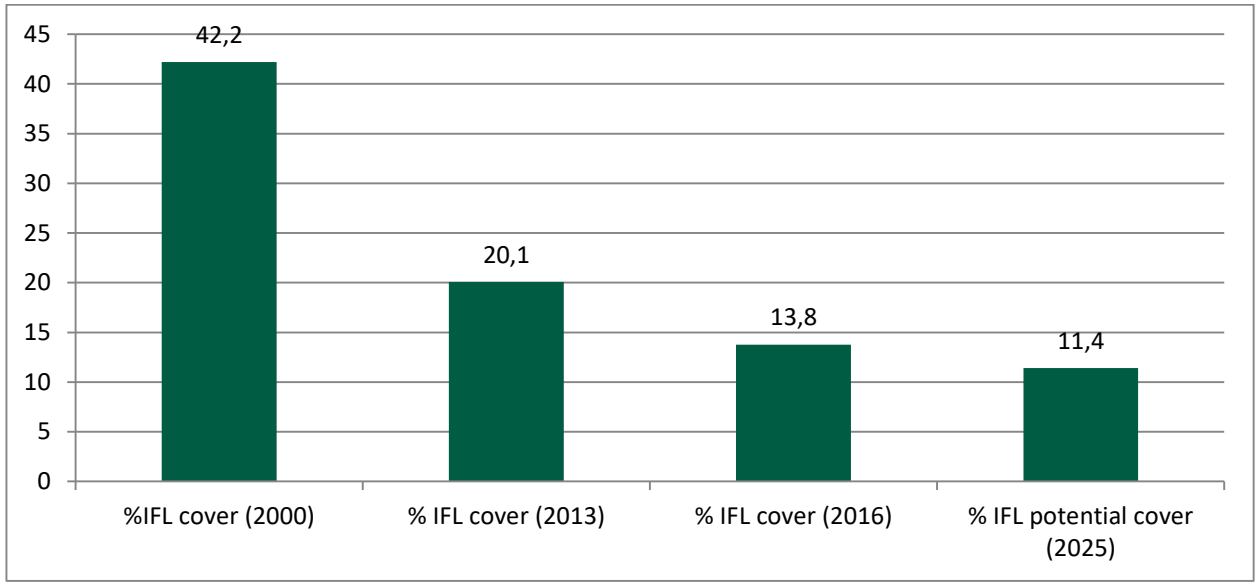
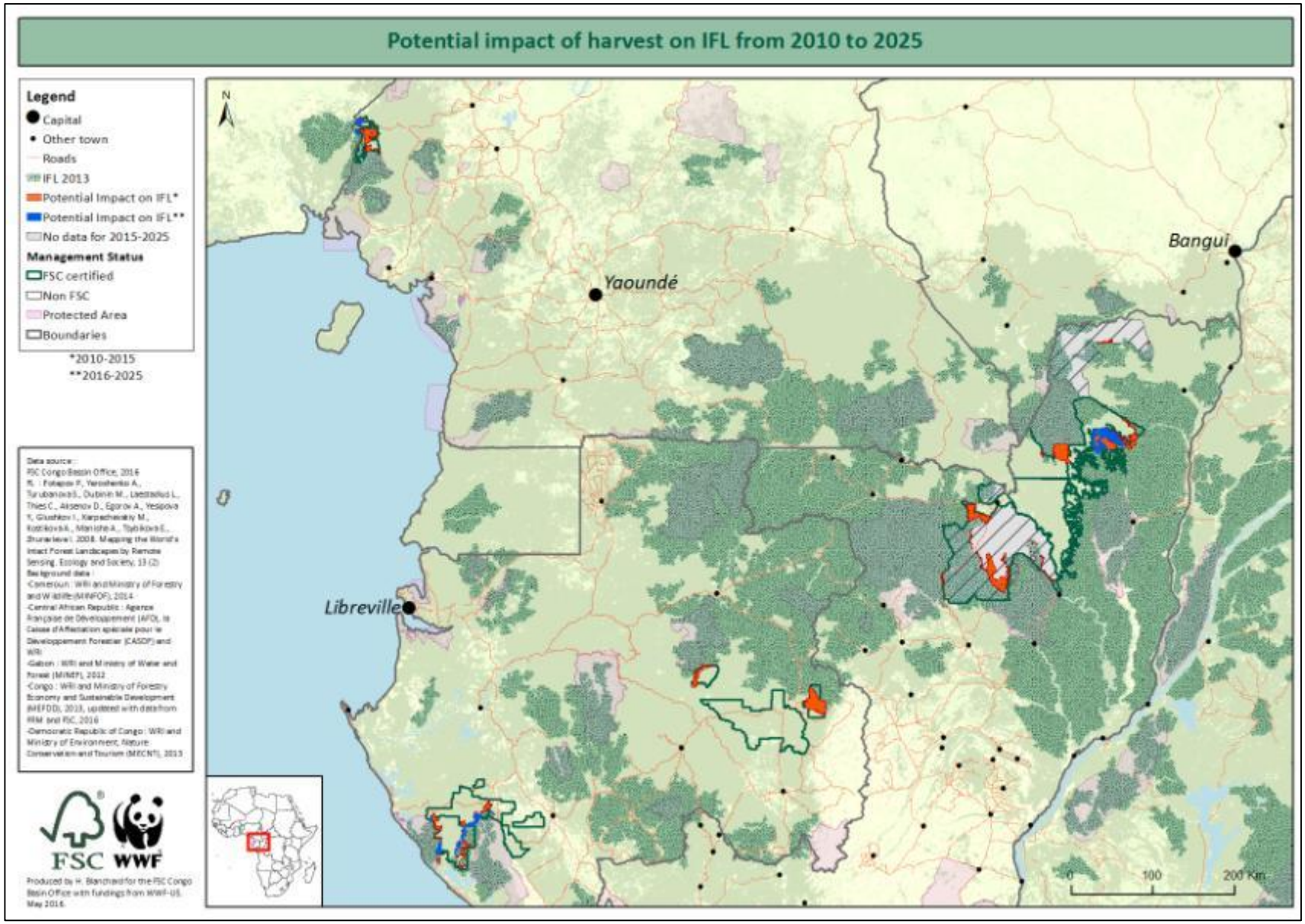


Figure 6 : Percentage of IFL cover in 2000, 2013, 2016 and potential IFL cover in 2025.

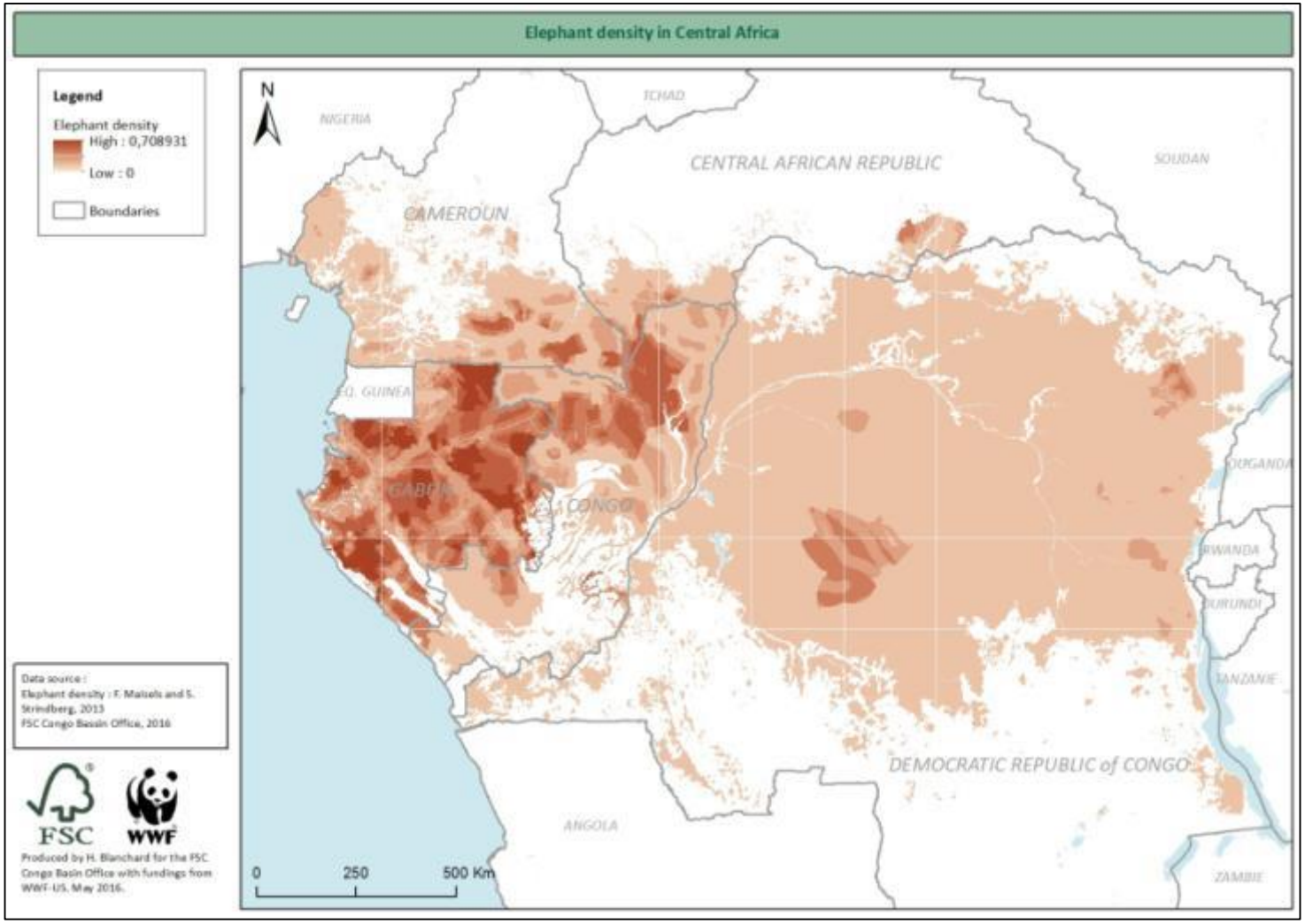
IFL degradation rate seems to be decreasing as the years go by, which is not surprising as IFL covers less and less of the concessions. Two of the concessions already lost all or almost all of their original IFL (from 2000). Concessions with the greatest IFL cover have the biggest impact on IFL disturbance or IFL degradation.

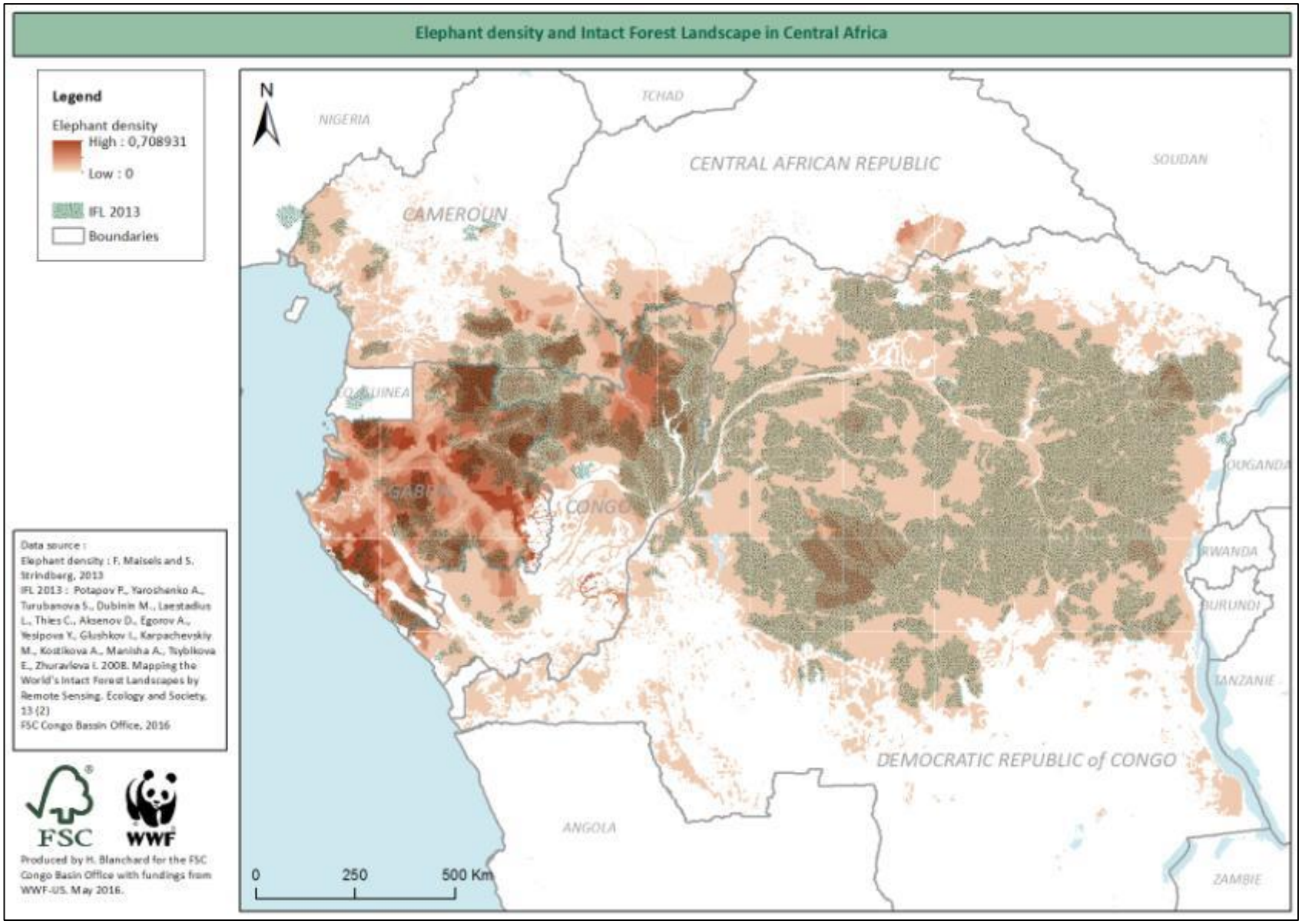

Potential impact of harvest on IFL from 2010 to 2025
Legend
Capital
Other town
Roads
IFL 2013
Potential Impact on IFL*
Potential Impact on IFL**
No data for 2015-2025
Management Status
FSC certified
Non FSC
Protected Area
Boundaries
*2010-2015
**2016-2025
Yaoundé
Bangui
Libreville
0
100
200 Km
FSC WWF
Produced by H. Blanchard for the FSC Congo Basin Office with fundings from WWF-US. May 2016.

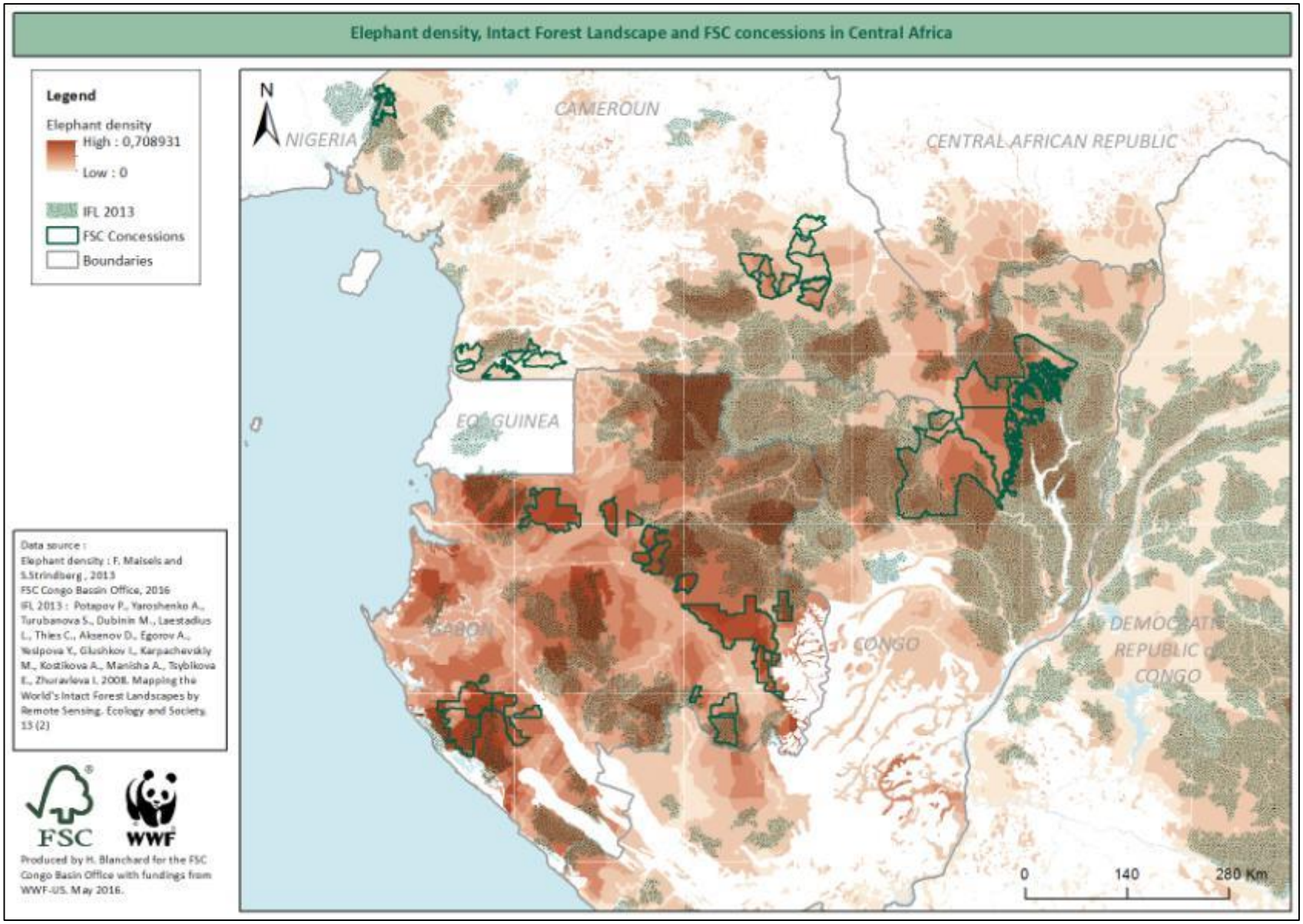
3. Biodiversity and IFL

A. Elephants and IFL

The elephant density layer used in the following maps was created by Fiona Maisels and Samantha Strindberg in 2013. This layer was modeled using data of elephant-dung field-surveys in 80 sites from 2002 and 2011 [Maisels and Strindberg, 2013].

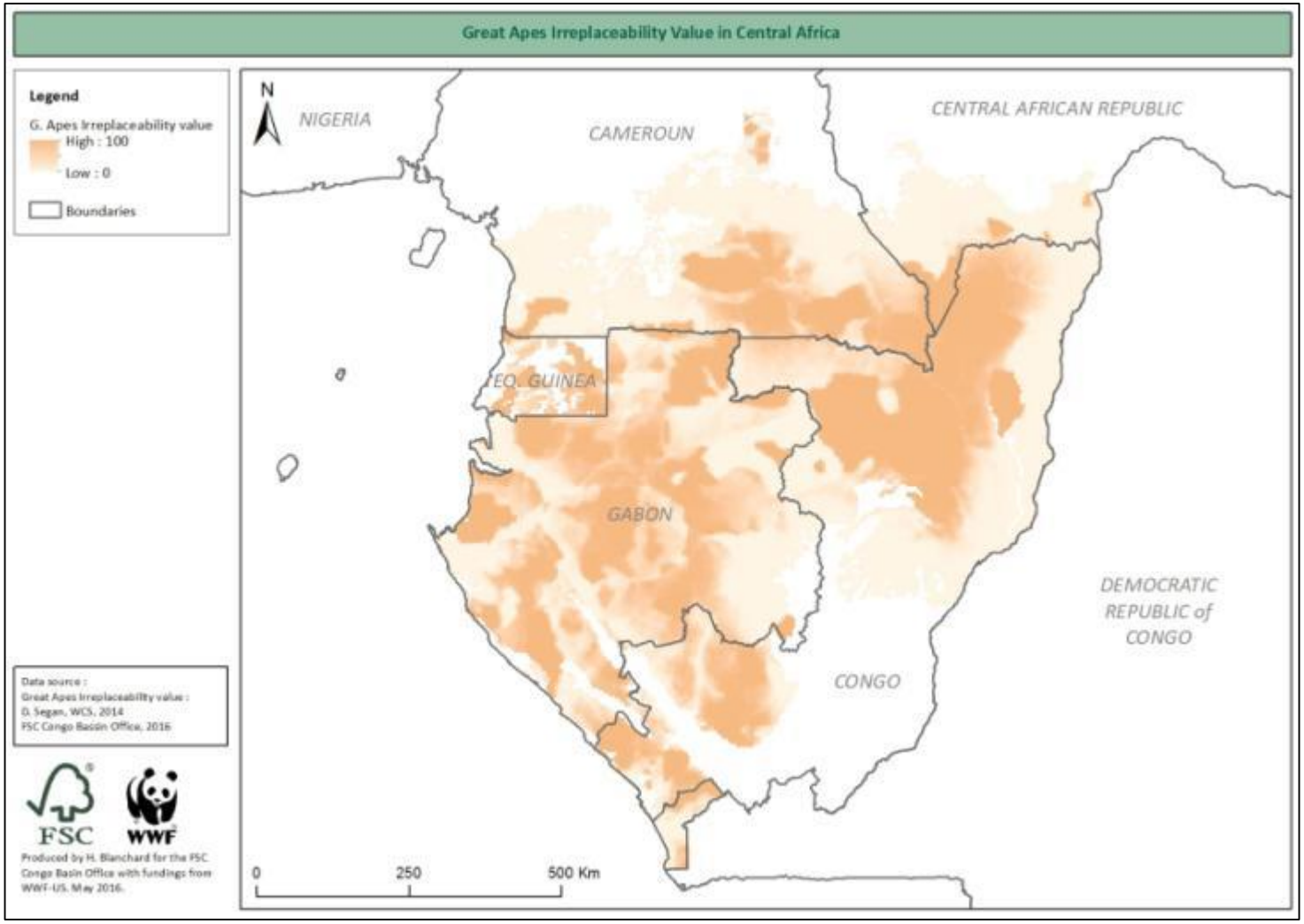



Elephant density and Intact Forest Landscape in Central Africa
Legend
Elephant density
High : 0,708931
Low : 0
IFL 2013
Boundaries
N
NIGERIA
TCHAD
CENTRAL AFRICAN REPUBLIC
SOUDAN
CAMEROUN
GABON
CONGO
OUGANDA
RWANDA
BURUNDI
TANZANIE
DEMOCRATIC REPUBLIC of CONGO
ANGOLA
ZAMBIE
0
250
500 Km
Data source :
Elephant density : F. Maisels and S. Strindberg, 2013
IFL 2013 : Potapov P., Yaroshenko A., Turubanova S., Dubinin M., Laestadius L., Thies C., Aksenov D., Egorov A., Yesipova Y., Glushkov I., Karpachevskiy M., Kostikova A., Manisha A., Tsybikova E., Zhuravleva I. 2008. Mapping the World's Intact Forest Landscapes by Remote Sensing. Ecology and Society. 13 (2)
FSC Congo Bassin Office, 2016
FSC
WWF
Produced by H. Blanchard for the FSC Congo Basin Office with fundings from WWF-US. May 2016.

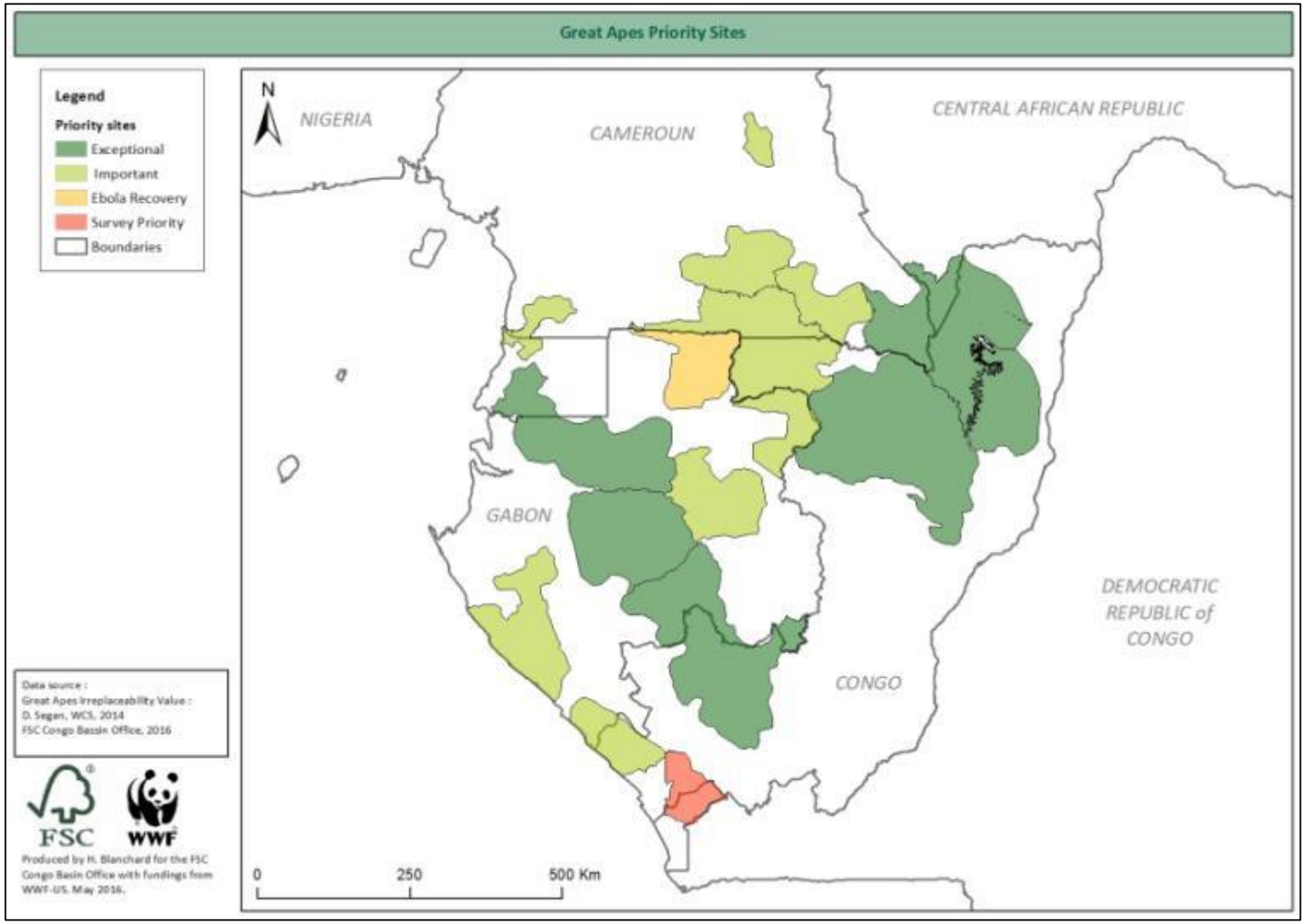

Elephant density, Intact Forest Landscape and FSC concessions in Central Africa
Legend
Elephant density
High : 0,708931
Low : 0
IFL 2013
FSC Concessions
Boundaries
N
NIGERIA
CAMEROUN
CENTRAL AFRICAN REPUBLIC
EQ. GUINEA
GABON
CONGO
DEMOCRATIC REPUBLIC OF CONGO
0
140
280 Km
Data source :
Elephant density : F. Maisels and S.Strindberg , 2013
FSC Congo Basin Office, 2016
IFL 2013 : Potapov P., Yaroshenko A., Turubanova S., Dubinin M., Laestadius L., Thies C., Aksenov D., Egorov A., Yesipova Y., Glushkov I., Karpachevskiy M., Kostikova A., Manisha A., Tsybikova E., Zhuravleva I. 2008. Mapping the World's Intact Forest Landscapes by Remote Sensing. Ecology and Society 13 (2)
FSC
WWF
Produced by H. Blanchard for the FSC Congo Basin Office with fundings from WWF-US. May 2016.

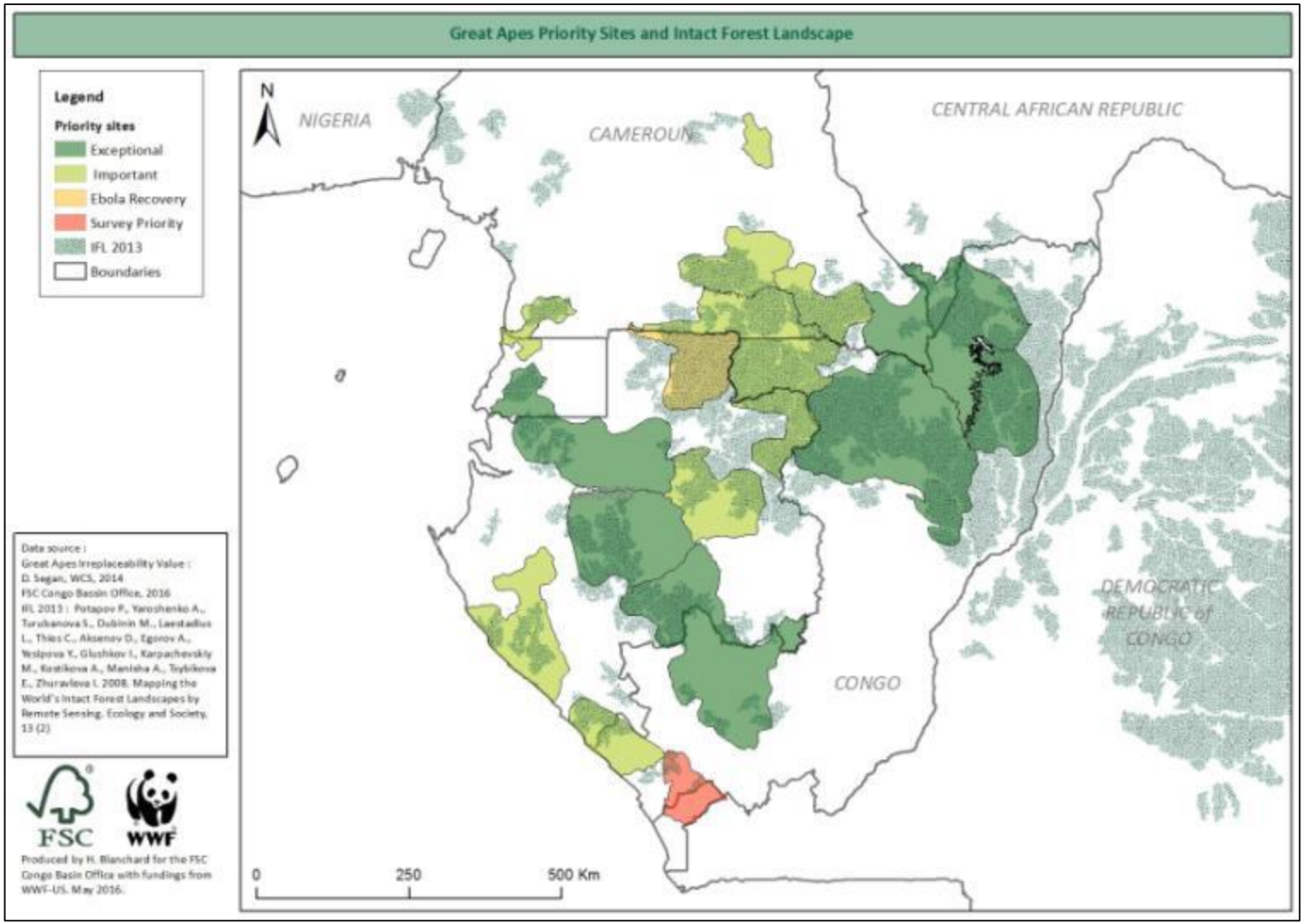
B. Great Apes and IFL

The great apes irreplaceability value layer was created by Dan Segan using Marxan. The irreplaceability characteristic measures the value of a zone for conservation or the probability that it is included in an effective solution [Segan and al. 2010].

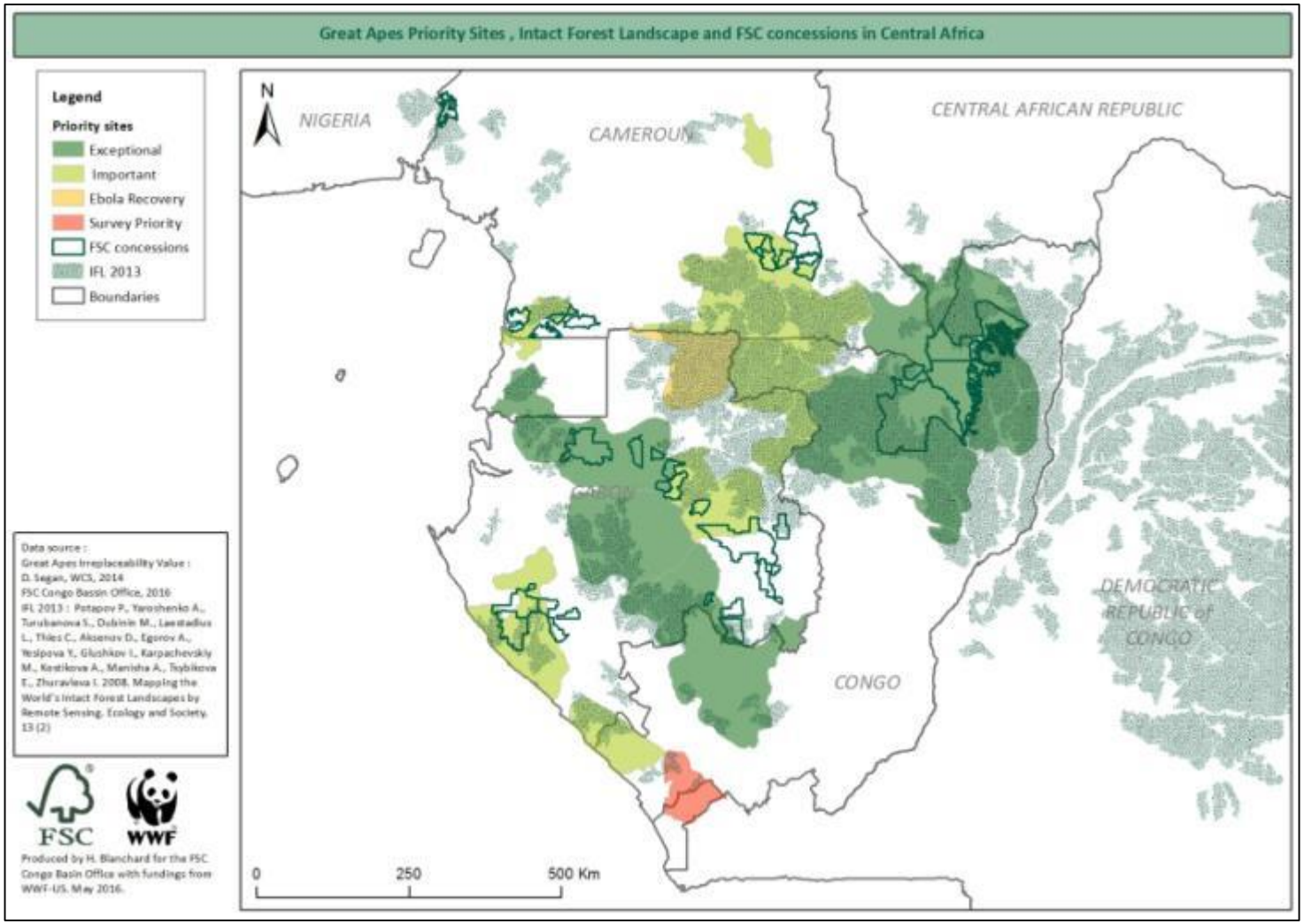


Great Apes priority sites were built using zones with high irreplaceability value as their core. Exceptional sites contain more than 5% of the total number of Great Apes in the region [UICN 2014].





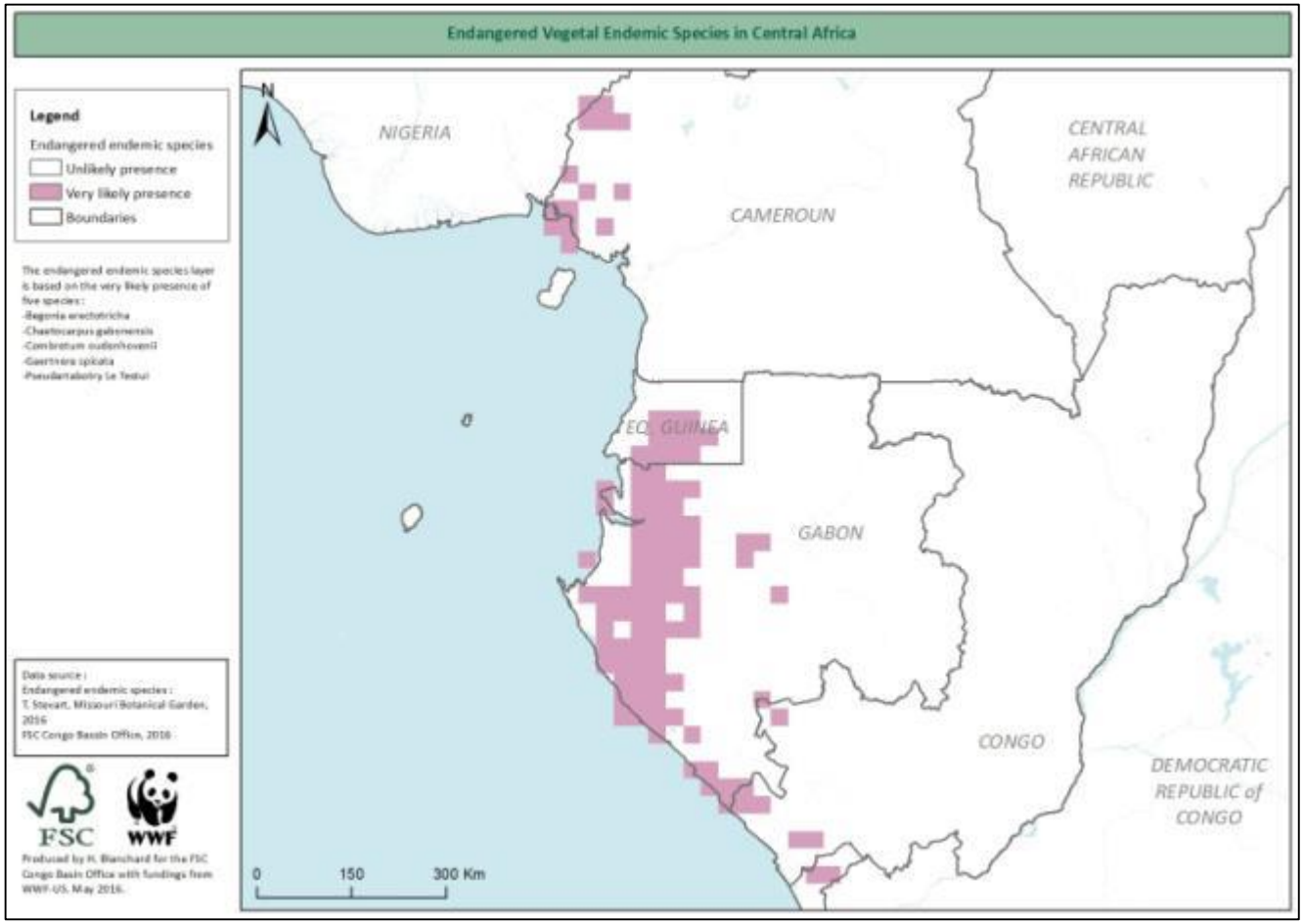
16,444,918ha of IFL are located in the 18 priority sites. This represents 18,8% of the IFL in the Congo Basin. 15,162,048ha (17,3%) of IFL are located in Exceptional and Important priority sites only.

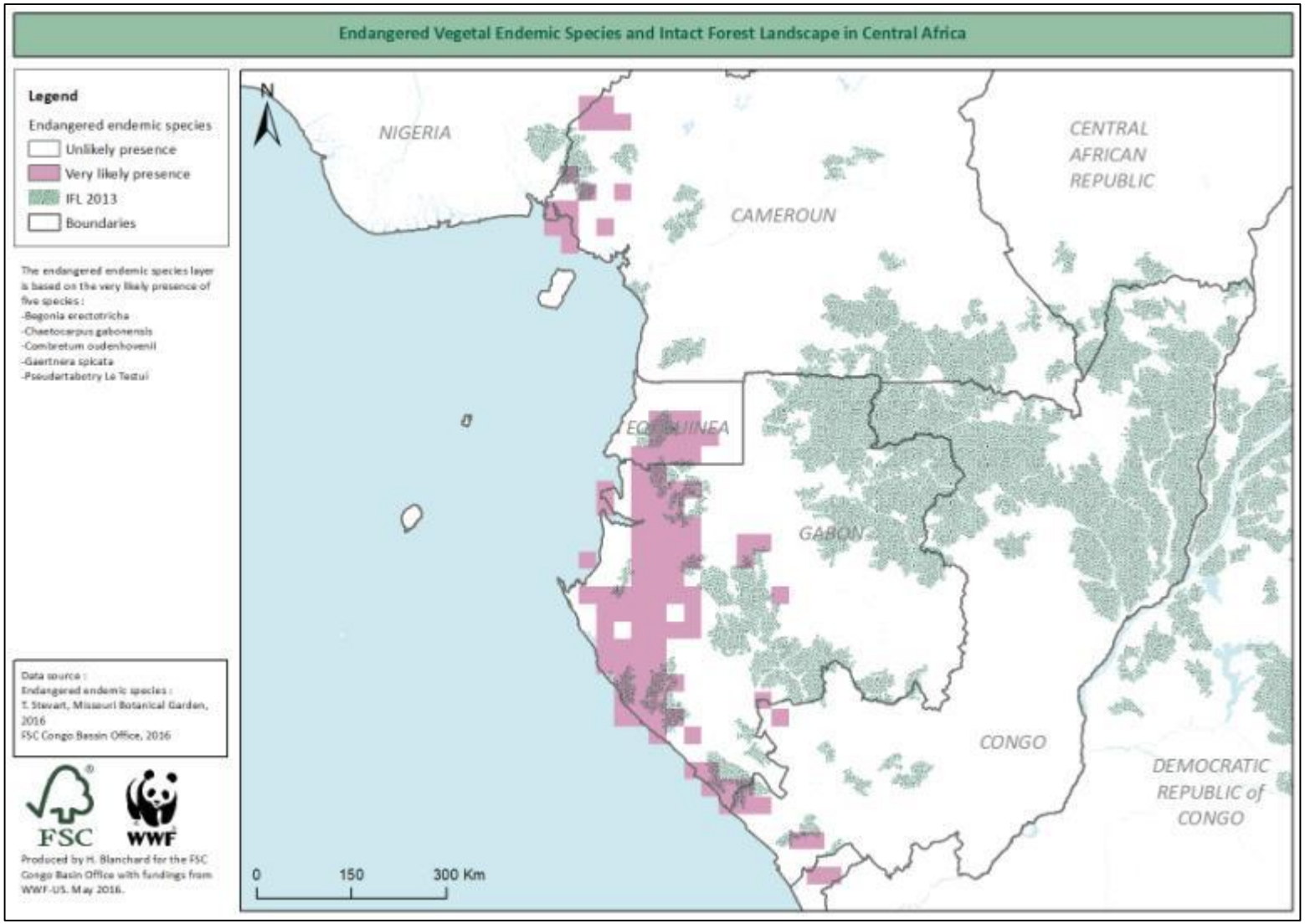


A majority of FSC concessions are located within Exceptional or Important priority sites for Great Apes. CIB and IFO concessions in Northern Congo and Rougier-Gabon concessions in Northern and Eastern Gabon contain IFL in an Exceptional priority site. Rougier-Gabon concessions in Central-East of Gabon also contain IFL in Important priority sites, as well as CBG in Southern Gabon and SFID in South of Cameroun.

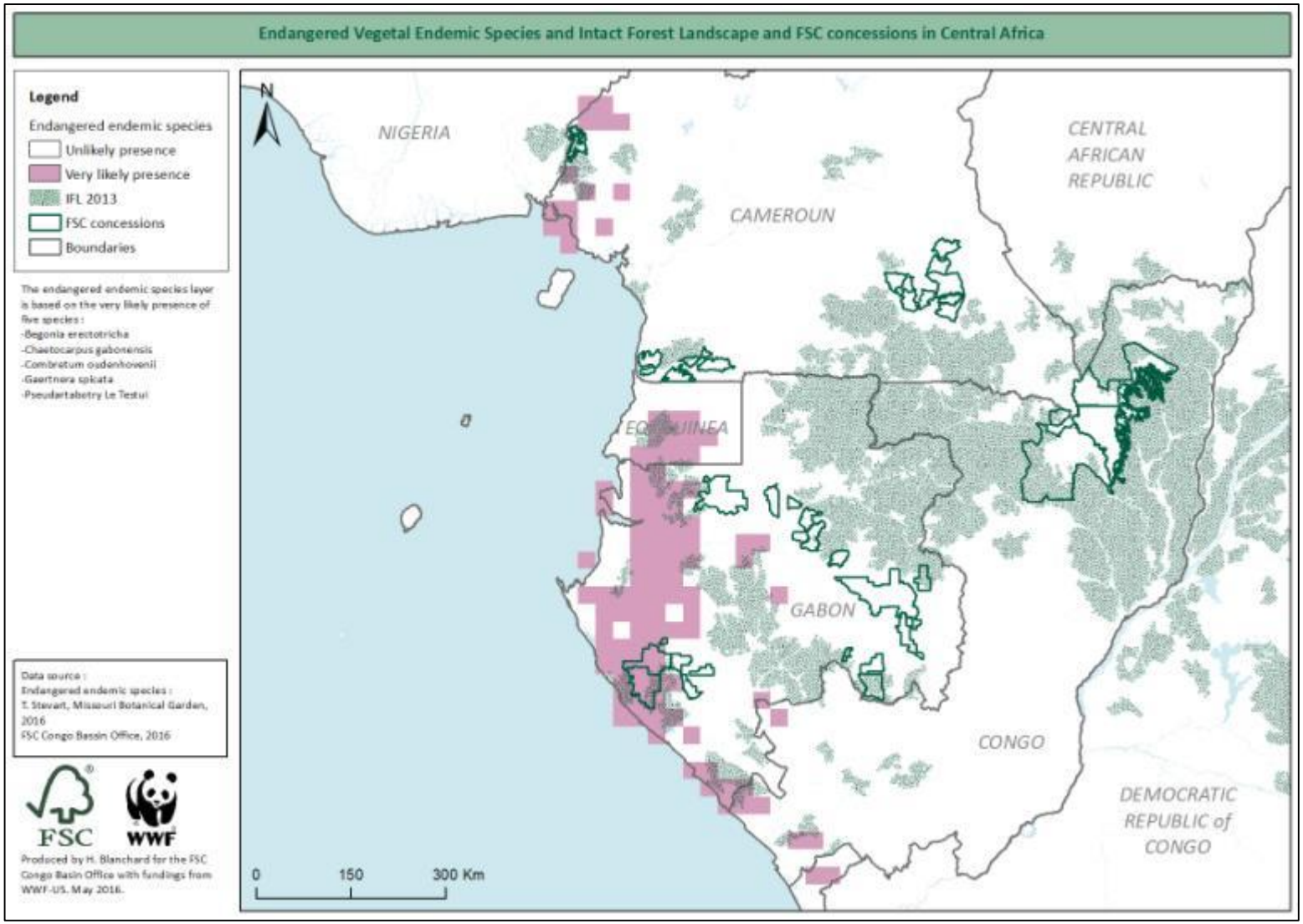
C. **Endemic plant species**

The endangered endemic species layer has been created based on Stevart's work for Missouri Botanical Garden. For the five endangered and endemic species listed on the map, he created a layer of very likely presence in the Congo Basin. Results are more accurate for Gabon where field work was undertaken. These layers have been merged here to create the endangered endemic species layer. For every square of the layer, there is likely to be one or more of the five endangered endemic species.





The species available for the analyses are coastal and central species, which explain why they do not share the same area than most of the IFL.



For the species displayed here, the only concessions concerned are CBG's, in the South of Gabon. It would be interesting to complete the layer when more species are available for this analysis.

Conclusion

The aim of this work was to present the current situation of IFL in the Congo Basin, and more precisely in correlation with FSC-certified concessions. The following information emerges from this analysis.

IFL degradation has been taking place in the Congo Basin since 2000, and the degradation rate in FSC certified concession is as high or higher than in non-certified concessions. This means that the current management system in FSC certified concessions is not effectively protecting IFL.
All FSC concessions are not equally impacted by IFL. Some of them are not or almost not covered by IFL when others have nearly half of their area in IFL.
Management rules to protect IFL, if applied equally to all concessions will not have the same impact on the operations of all concessions. Some very large concessions with a smaller IFL cover can still contain a large patch of IFL, and therefore are maybe more important for IFL protection than a smaller concession with a great proportion of its area covered in IFL.

FSC certified concessions as well as all concessions with a management plan include areas set aside from logging to protect key habitats or species. These areas are called the protection and conservation series. However, these series are not always effective at protecting IFL depending on their shape, size, location in the concession or location regarding IFL blocks location. To be effective, these series should follow the next criteria:
-Be more than 4km wide (to include a 1km buffer on each size and still be larger than 2km).
-Be located at a border of the concession, in a way that it is not surrounded by production series to ensure that the IFL block protected in the concession will be continuous with a larger IFL block (to ensure that the IFL block is more than 50,000ha).
-If possible, this border should be shared with a protected area to be sure that the IFL block on the other side will always be protected.
Roads can also have a big impact on IFL, even if their direct impact is low. When a road cuts an IFL block and therefore detaches a small block of IFL, this block, if under 50,000ha will be considered IFL degradation. This should be kept in mind when designing roads network.

This report brings reveals elements which should help make the best decisions for protecting IFL in a way that does not severely impact the proper functioning of FSC concessions. But it also raises questions that could be addressed during the Regional Working Group workshop on HCV definition in the Congo Basin:

- Do we want to base our IFL definition solely on the Greenpeace method?
- Do we want to apply the same rules to all concessions regardless of their importance for IFL protection? And how do we define their importance?

- Can we propose techniques of logging or road construction that have a reduced impact on IFL and the values these hold?

Acknowledgement

This work and report was produced for the FSC Congo Basin Office with funding from WWF-US.

Many people helped with this work and I would like to thank them all, in particular:
Mathieu Schwartzenberg from the FSC Congo Basin Office
Gisj Breukink from WWF-Netherland
Chris Burchmore from FSC
Brian Milakovsky from WWF-International
CEO, certification and management officers of the following companies : IFO, CIB-Olam, Mokabi, CEB, CBG, SFID, SCIEB and Cafeco.
Fiona Maisels, Samantha Strindberg, Tim Rayden from WCS
Tariq Stevart from the Missouri Botanical Garden
Pascal Douard from WRI
Cedric Sépulcre from WWF-Congo

Many thanks for sharing your data and your expertise with the FSC Congo Basin Office.