

Identifying High Conservation Values: a case study from Gabon

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INTRODUCTION

The **High Conservation Value** (HCV) concept provides a framework for identifying conservation values in the landscape, so that they can be managed in a way that ensures their continued persistence.

Historically, it has been used by the forestry and agriculture sectors as part of voluntary certification schemes that require HCV management (Ref 1, 2), however it can be applied at a number of scales and other uses, e.g. management in National Park buffer zones. While general HCV guidance and best practices exist for management unit scale assessment (Ref 3), HCV management should account for national conservation priorities and broader scale properties (e.g. connectivity) that cannot be defined based solely on locally identified values. This is challenging in countries whose ecosystems are largely intact but where data is poor, and where large scale planning is at an early stage of development such as Gabon, in central Africa.

An **HCV National Interpretation** (NI) was drafted in 2008 following a workshop organised by Proforest and WWF (Ref 4). Although the draft is a useful reference, Gabon's NI was not fully elaborated and was never approved by the HCV network. With support from ABCG, WCS, WWF and MBG have been collaborating on a project to trial methods and provide guidance to improve decision making about the definition and management of HCV areas in Gabon (Ref 5), addressing some of the limitations identified during this first national interpretation workshop. By identifying national priorities, the HCV-NI process provides a tool to designate and manage conservation features, and can better account or attributes that are under-represented in the National Park network. We have compiled and improved national biodiversity data sets for Gabon, and demonstrated analytical approaches to identifying national priorities, addressing HCV types 1 to 4.

The data and approaches provide promising solutions to setting guidelines for the use of the HCV framework in different contexts, and improving a national interpretation. The process also provides a transparent framework through which stakeholders can articulate individual conservation and social objectives for the region, and visualise the consequences of those decisions in a participatory approach.

	HCV categories
1	**Species diversity;** concentration of diversity including endemic, rare threatened and endangered species, significant at global, regional and national levels
2	**Landscape-level ecosystems;** large land-scape level ecosystems and mosaics significant at global, regional or national levels, and that contain viable populations of the majority of naturally occurring species in natural patterns of distribution and abundance
3	**Ecosystems & habitats;** rare, threatened or endangered ecosystems, habitats or refugia
4	**Ecosystem services;** basic ecosystem services in critical situations, including protection of watersheds and control of erosion of vulnerable soils and slopes
5	**Community needs;** Sites and resources fundamental for satisfying the basic necessities of local communities or indigenous peoples, , identified through engagement with these communities or indigenous peoples
6	**Cultural values;** Sites, resources, habitats and landscapes of global or national cultural, archaeological or historical significance, and/or of critical cultural, ecological, economic or religious/sacred importance for the traditional cultures of local communities or indigenous peoples, identified through engagement with these local communities or indigenous peoples

CONTENTS

This document introduces some of the techniques that we have developed, the resulting maps, and their application in the HCV process. We provide lists of relevant reference material and online resources, and outline next steps. This is intended to assist working groups, technicians and institutions involved in defining national HCV criteria in Gabon, or indeed elsewhere in the region, in particular in the context of a National Interpretation. It can also be a useful reference for those conducting HCV and Environmental and Social Impact assessments.

The modules presented here are:

1	Approaches to identifying national priority areas for forest elephants and great apes	HCV 1 & 2
2	Mapping endemic plant distributions	HCV 1
3	Forest type classification	HCV 2 & 3
4	Identifying HCVs at the landscape scale that include national priorities	Combined HCV 1-6

This work has been presented and discussed at a workshop with government, private sector and civil society actors in Gabon, in March 2015. Additional documentation associated with this project are available on the ABCG website (Ref 5).

1. Large mammal priority areas

HCV 1 & 2

SUMMARY

Conservation Importance

Forest elephant (*Loxodonta africana cyclotis*) populations have declined by >65% in a 10 year period. With 52% of the remaining individuals, Gabon is now the last stronghold for this sub-species (Ref 6). Gabon is also a stronghold for western lowland gorilla (*Gorilla gorilla gorilla*), and central chimpanzee (*Pan troglodytes troglodytes*), and according to the most recent regional great ape action plan. Gabon contains three exceptional and four important great ape priority sites (Ref 7). The single best strategy for maintaining viable populations of these species is to protect large blocks of forest (Refs 7 & 8).

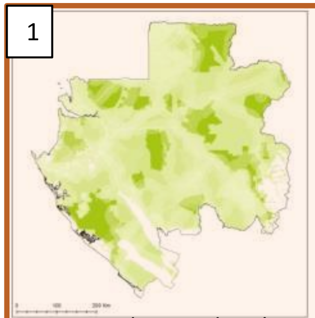
Challenges for HCV

With teh exception of very large forestry concessions, viable population would typically extend beyond the scale of a single concession. Elephants in particular are highly mobile and travel large distances. This poses limitations on defining concentrations of these species simply based on a density threshold e.g. >1 ind./km^2., at the scale of a concession. We need to identify *a priori* the priority areas for these species at the national scale, and a means for deciding when a population becomes “nationally significant”.

Our approach

1. *Set criteria*: Develop a method to define the areas of habitat that should be maintained to ensure the long term survival of these species. Criteria can be set to identify ‘priority areas’ needed to achieve proposed national objectives e.g. forest area that contain 70% of Gabon’s elephants in population blocks of > 1000 individuals.
2. *Collate data*: National population data was acquired from recently published regional distribution models for elephants and apes (Ref 6 & 7) (Map 1). The national model was divided into population blocks based on probable barriers to population movement (Map 2) for elephants and for apes (step 1).
3. *Conservation zoning analyses:* The Zonation (Ref 9) decision support tool was used to identify the priority areas (Map 4) that achieved the population targets we set, (steps 2 & 3) while avoiding areas that have particular socio-economic values (Map 3) e.g. human habitation and agricultural potential and therefore may conflict with conservation objectives.

1



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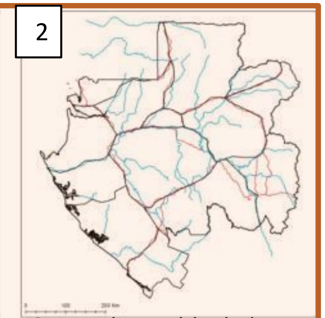
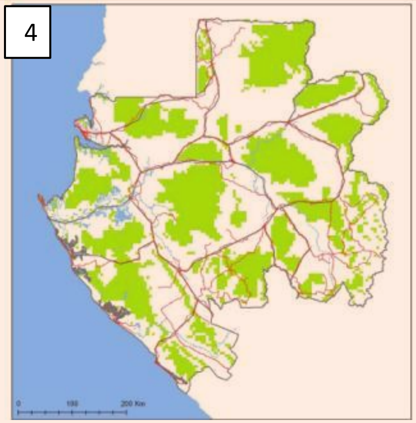


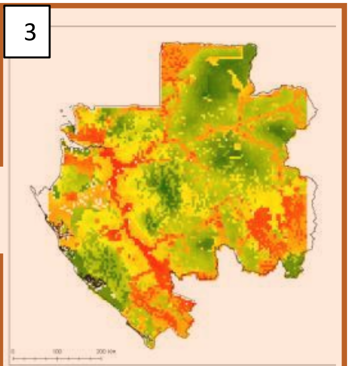
Species density distribution & population block data layers

4



Example ZONATION output.
Forest that contain 70% elephants in each population block that also avoids areas costly to conservation
Source WCS &PLoS 2013.
Produced by WCS March 2015

3



Socio-economic value layer

1. Large mammal priority areas

Application to HCV

- HCV Species concentrations. The case-study demonstrates how available population data and methods based in the principles of systematic conservation planning can create a platform for discussion to define nationally important populations and priority areas for these species.
- Large mammal priority areas can be applied to HCV 1 (species concentrations) and as umbrella species for HCV 2 (landscape level forested ecosystem)
- Land management within priority areas should not threaten the continued existence of this species, including connectivity within the population unit.

Important next steps

- Broad stakeholder consultation to define final national objectives for each of these sub-species, and appropriate management in *and* adjacent to large mammal HCVs,
- Consider defining national large mammal priority areas, that combines ape and elephant data in ZONATION analyses.
- Propose best practices for collecting local data on critical micro-habitats for each species e.g. forest clearings for elephants, core areas for chimpanzee groups, where additional HCV management may be necessary, to compliment national priority areas.
- HCVs for these species should also consider opportunities for connectivity between populations.

Caveats

These results are presented to demonstrate the application of an analytical method, providing an example for how detailed datasets and spatial prioritization tools can be used to inform decision making. The results could be discussed with a wider stakeholder group and the prioritization outputs revised based on their input.

1. Large mammal priority areas

HCV 1 & 2

Step 1: Species distribution models and population blocks

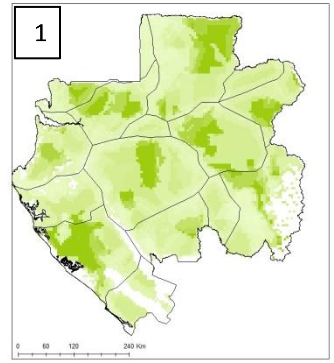
Regional models on the distribution and density (individuals/km^2) of these sub-species have recently been published. Elephant data is available at the 5 km^2 resolution (Map 1), and apes at the 1 km^2 resolution (Map 2).

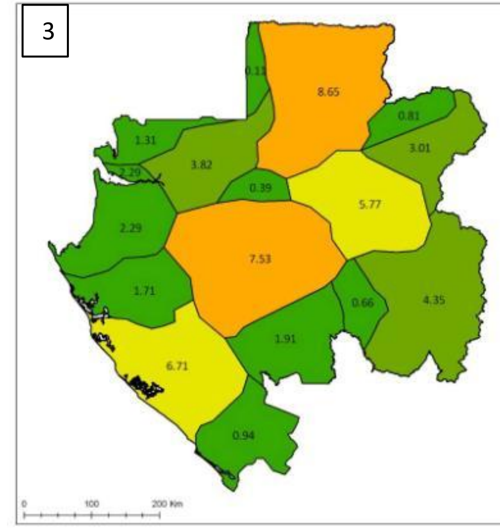
These models result from survey work that has been conducted over a ten year period in and around protected areas, using standardized survey techniques. They provide the most accurate continuous data currently available on the distribution and abundance of these species.

Population blocks (PB) were produced separately for apes and elephants, based on known barriers to movement, e.g. large rivers, major areas of human habitations.

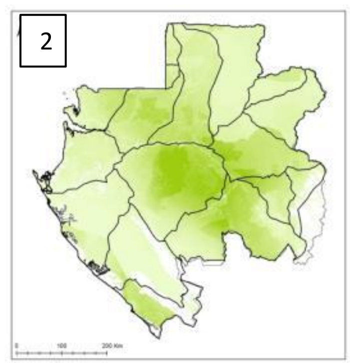
With these data, one can already visualize the relative importance of each PB, with the proportion of global population per PB shown for elephants (Map 3), and absolute numbers for apes (Map 4).

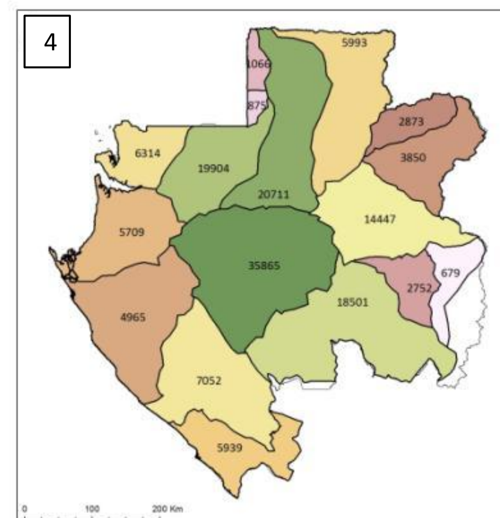
PBs with relatively low densities can still be important in the national context (e.g. for reasons of genetic diversity), which could be considered nationally or regionally important populations. We begin with a national level conservation objectives and then define targets within each PB to ensure that collectively they achieve the national population objective. Information on socio-economic values was included as a proxy for the likely opportunity cost of managing areas for conservation. We attempted to minimize the opportunity cost of achieving these objectives wherever possible, subject to the constraint that the conservation targets had to be achieved.





Elephant model. Importance of each PB (right); estimated proportion of global population in each PB
Source WCS & Maisels *et al* 2013.
Produced by WCS March 2015





Combined great ape model. Importance of each PB (right); estimated number of individuals in each PB
Source WCS & IUCN 2014.
Produced by WCS March 2015

1. Large mammal priority areas

Step 2: Creating a cost of conservation layer

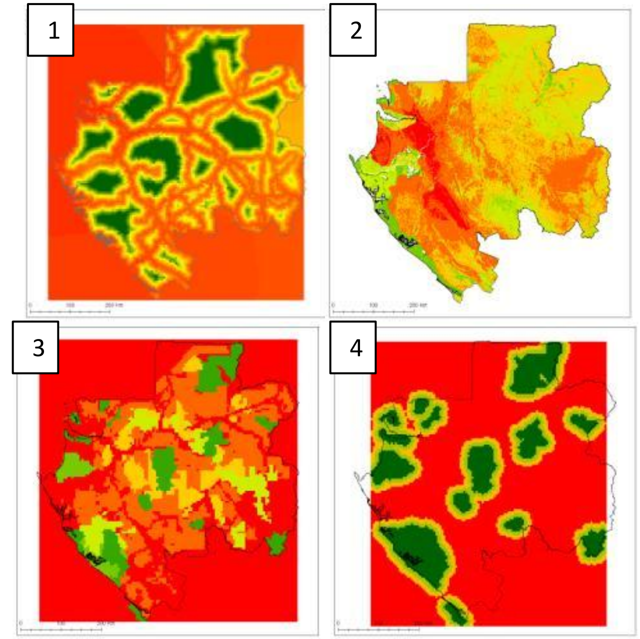
Areas of higher socio-economic value can conflict with conservation objectives, or make conservation interventions more 'costly' (politically, monetarily etc.).

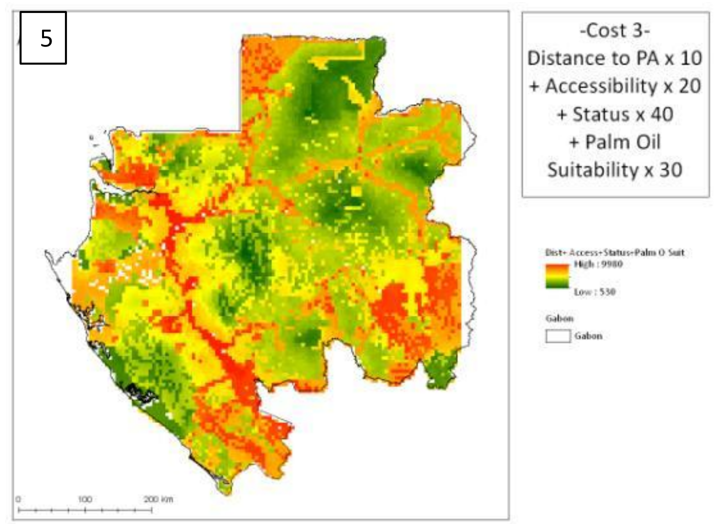
We generated several data layers that represent socio-economic factors with categories of 'cost to conservation' (red is high cost, green low cost) :

1. Accessible areas with higher human density are more costly (Map 1)
2. Areas suitable for agriculture are more costly (Map 2)
3. Land-use status; protected areas (PA) and forestry under certification schemes are more favourable for conservation (Map 3)
4. We assume conservation is more favourable closer to PAs (Map 4)

A combined conservation cost layer was created by adding the cost values for each category from the four cost factors. Separate cost factors considered to have a greater impact on conservation potential, i.e. agriculture potential and land-use can be multiplied to contribute more cost to the combined layer. In the combined 'conservation cost' layer (Map 5), red areas are those that should be avoided if possible, because they have greater socio-economic value and are therefore more likely to complicate conservation.

All maps except agriculture suitability. Source WCS, WRI. Produced by WCS Sept 2012
Agriculture suitability map. Source and produced by WWF 2011





1. Large mammal priority areas

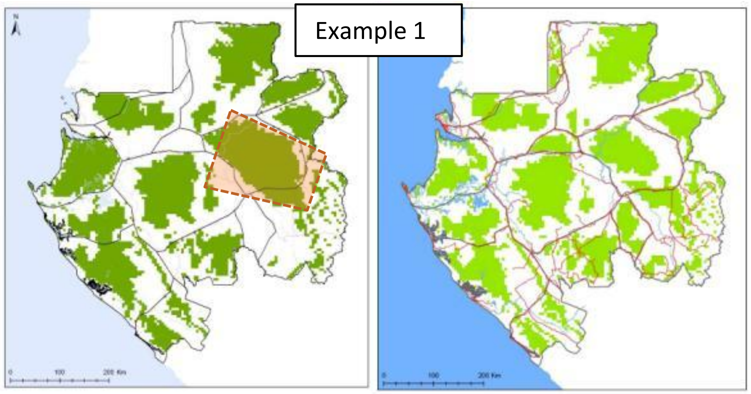
Step 3: Setting population targets and Zonation analysiS

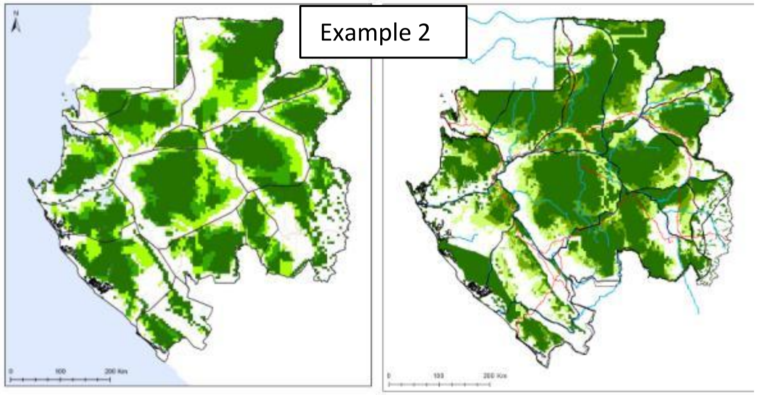
Population targets can be defined at the national or population block (PB) scale. ZONATION selects areas to achieve a given population target while avoiding where-ever possible the areas identified as more costly to conservation (step 2). Targets, should be defined based on ensuring the long term survival of the species and precautionary principles.

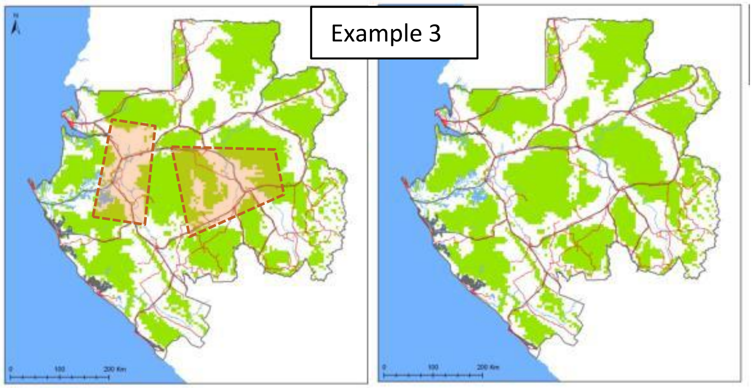
Example 1: Two approaches to meeting a national target to maintain 70% of Gabon's elephant population. (a) Variable targets per PB based on existing population size (target ∝ population size) (left) *versus* (b) a uniform target of 70% per PB (right). The flexible approach (a) allows higher targets to be set for certain landscapes based on their perceived importance. The fixed target approach (b) ensures some space is conserved in every block.

Example 2: Uniform targets per PB of 70, 80 and 90%, for elephants (left) and apes (right) to visualise the additional area required as targets are increased (dark to lighter green areas).

Example 3: Effect of cost layer on elephant priority areas. Uniform population targets for each PB of 80%, where oil palm suitability is included in the cost layer (left), and excluded from the cost layer (right) with resulting differences in the selected priority areas indicated.







Source WCS. Produced by WCS 2012-2015

2. Mapping national endemic plant distributions

SUMMARY

Conservation Importance

650 of Gabon's ~7000 plant species are endemic or sub-endemic to Gabon*[1]. Many are known only from a hand-full of collections, are extremely rare and/or sensitive to disturbance, and would be challenging to managed *ex-situ*

Challenges for HCV

Botanical field work has focused in a few key sites, and therefore current zones of endemism may be artefacts of biased sampling. As a result we also lack reliable distribution data for endemic plants. Endemic or rare species may be cryptic and difficult to identify in the field without highly skilled specialist botanists or sample collection, and therefore can be easily missed in inventory field surveys. In addition the conservation status (IUCN Red List) has only been evaluated for a few endemic species, and therefore many species would be missed from an HCV assessment unless a rapid Red List assessment was conducted. We estimate that 200 of Gabon's endemic species would be evaluated as threatened.

The most recent national '*phytogeographic*'*[2] map dates to 1978 (Ref 10) and is based on habitat rather than species data.

These constraints limit being able to identify national priorities, such as thresholds of species concentrations.

Our approach

1. Data on known localities and ecological preference of species was used to produce predicted distribution models for 193 species endemic or sub-endemic to Gabon
2. Endemic plant hotspots were identified, by overlaying the predicted distribution models
3. Distinct areas of plant endemism were identified, using the predicted species distributions

*[1] Species with a distribution range >80% in Gabon are considered sub-endemic to Gabon

*[2] Phytogeographic regions are defined on the distribution of specific taxonomic groups e.g. plants or animals

Important next steps

- Conduct additional field work to fill identified information gaps.
- Add more species in the national analysis of endemic zones.
- Improve in-country capacity to conduct IUCN Red List evaluations of species rare and endemic to Gabon.
- Improve access to information on HCV criteria, and identifying, managing and monitoring HCVs specific to Gabon.

Caveats

The national maps are based on incomplete data, and should therefore be considered preliminary outputs, that demonstrate the utility of the methods used. In their current state they can provide an indicator of potential HCV areas.

2. Mapping national endemic plant distributions

HCV 1

Modelling distribution of endemic species

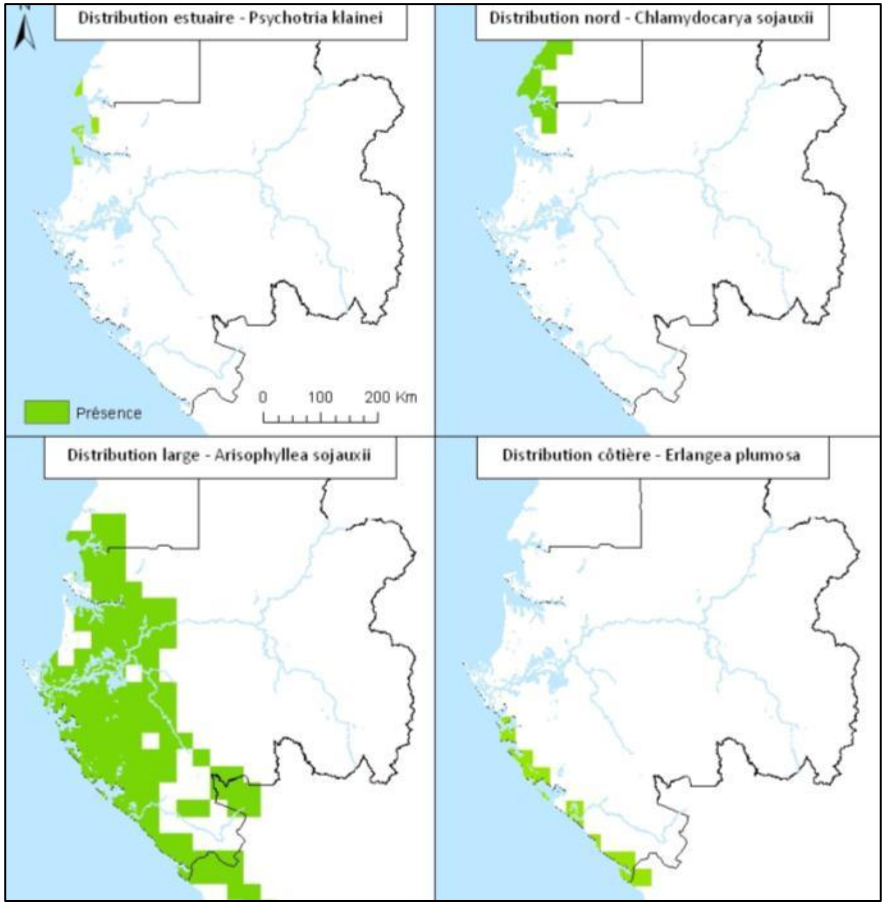
Plant species herbarium records from Gabon are managed and are accessible from an online data-base administered by NCB Naturalis-Wageningen (Ref 11).

In total 193 endemic or sub-endemic species were retained for distribution modelling, after screening for accuracy of the distribution data and taxonomic identification of historical records extracted from the data-base, and records for additional species from recent field surveying. Preference was made on selecting coastal species.

Maximum entropy statistical analysis (MaxEnt) (Ref 12) was used to produce the most uniform predicted distribution maps for each species. This uses the environmental variables associated with the known locality points for a species, to predict occurrence at points within the study area that have similar environmental characteristics.

Application to HCV

- A definition of 'restricted range' can be developed on the basis of these results
- Species with very restricted ranges can be regarded as HCV species, that should be protected *in situ*.
- For species with very restricted ranges, their presence or potential presence should define an area as HCV for that species. Management actions in the area should not threaten the continued existence and reproduction of the species



Example predicted distribution maps produced by the analysis, with pixel resolution of 50 km^2
Source MBG/WCS. Produced by MBG/WCS/IRD November 2012.

2. Mapping national endemic plant distributions

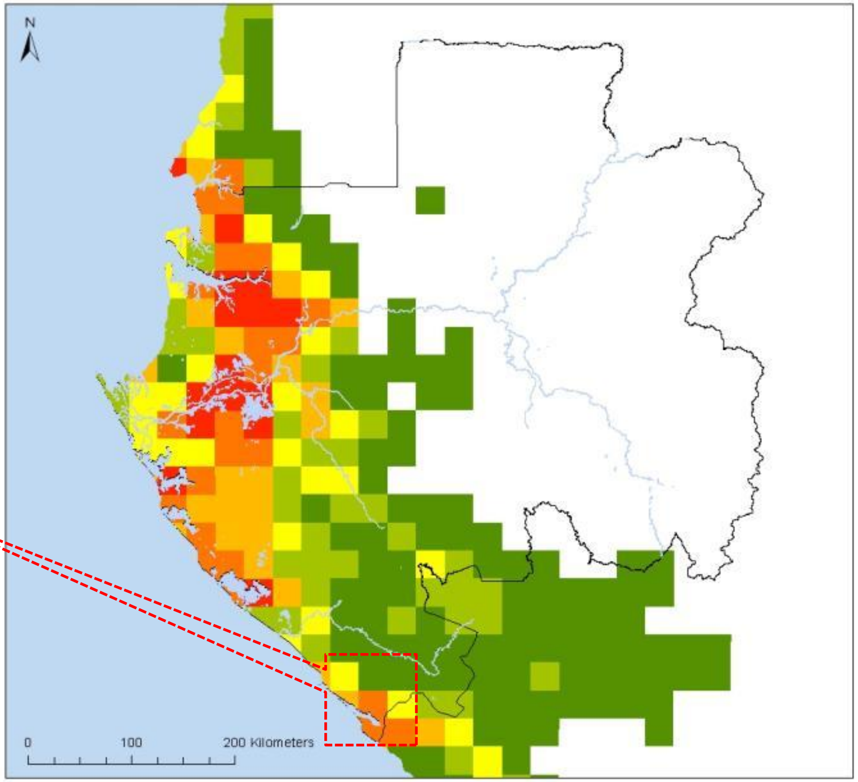
HCV 1

Identifying endemic plant hotspots

The predicted species distribution maps were overlaid, to present areas of high endemic plant species richness, i.e. endemic hotspots, at the coarse scale. These hotspots could be considered HCV areas for the conservation of endemic plants.

Application to HCV

- A threshold value for concentrations can be developed based on this approach
- Areas supporting the presence, or potential presence of several endemics should be regarded as HCV
- To maintain the important biological diversity of these areas, the likely management recommendation would be maintenance of forest cover with restrictions on activities such as selective logging. For instance, the landscape study in the Grande Mayumba would be considered to be located in an isolated endemic "hotspot".



Coastal endemic plant species richness for a sub-set of 53 species. Red areas have highest richness (>25 spp.), and green areas lowest richness (<11 spp.). As only 53 species are used this is not a final map of endemic plant hotspots for Gabon.
Source MBG/WCS. Produced by MBG/WCS/IRD November 2012.

2. Mapping national endemic plant distributions

HCV 1 & 2

Distinct areas of plant endemism

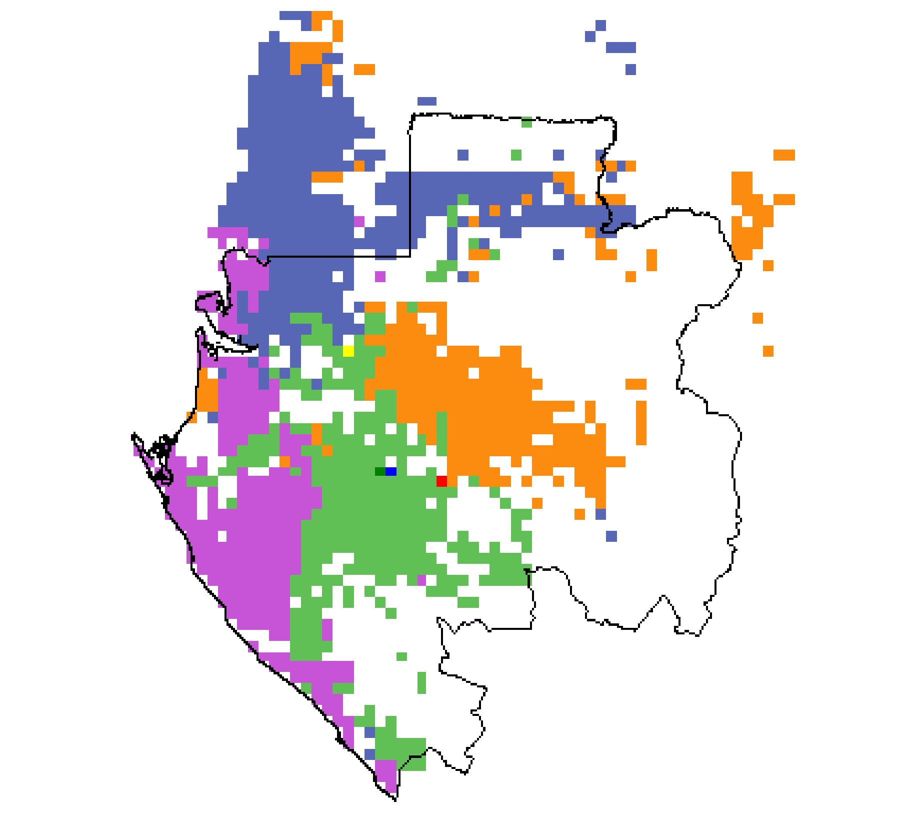
193 species from Gabon’s coastal and central region were used in a preliminary analysis to identify distinct zones of endemism, i.e. phytogeographic areas based on plant endemism.

Cluster analysis was used on the predicted species distribution maps, that finds statistically defined spatial associations between species and identifying the major compositional groups that can then be represented on a map (right-hand Map).

The clusters represent preliminary distinct phytogeographic regions for endemic plants, based on the available data.

Application to HCV

- National objectives can be set to ensure that each area of endemism is represented in protected area planning
- HCV Species concentrations. Set asides should be identified at the scale of a concessions to contribute to these national objectives



Distribution of the major compositional groups of plants endemic in the coastal and central regions of Gabon, based on cluster analysis of 193 endemic species. This results here are preliminary, and the addition of more species would improve resolution in the areas of endemism.
Source MBG. Produced by MBG.

3. Forest type classification

SUMMARY

Conservation Importance

85% of Gabon is forested, and large blocks of forest remain intact. These forests support high species richness and endemism, and intact forests are critically important to the survival of endemic and endangered species.

Challenges for HCV

The very fact that much of Gabon is forested has hindered efforts to reach a consensus on the definition of large landscape level forest ecosystems (HCV 2; see Ref 4). As there is no recognised vegetation type classification for Gabon, or national vegetation map, it is difficult to objectively identify rare and threatened vegetation types (HCV 3).

At the scale of an operator, it has been considered technically complex and expensive to produce high quality habitat type maps, essential for identifying HCV 3s.

Our approach

1. Demonstrate analytical approaches to identifying forest vegetation types using forestry inventory data collected by forestry companies, generating a preliminary forest type map at the national level.
2. At the scale of the concession, forest types were identified using the same analytical approached, combined with additional field and remote sensing data, demonstrating how high resolution vegetation maps can be produced to ascertain the presence of rare forest types.

Important next steps

- Complete field data gaps and develop classification systems of major habitat types, including a savannas and non *terra firma* forest.
- Evaluate potential to combine forestry inventory data from multiple sources to produce a more complete national forest type map
- Improve access to information on HCV criteria, and identifying, managing and monitoring HCVs

Caveats

The national map is based on incomplete data, and should therefore be considered a preliminary output, that demonstrates the utility of the methods used. In their current state they can provide an indicator of potential HCV areas.

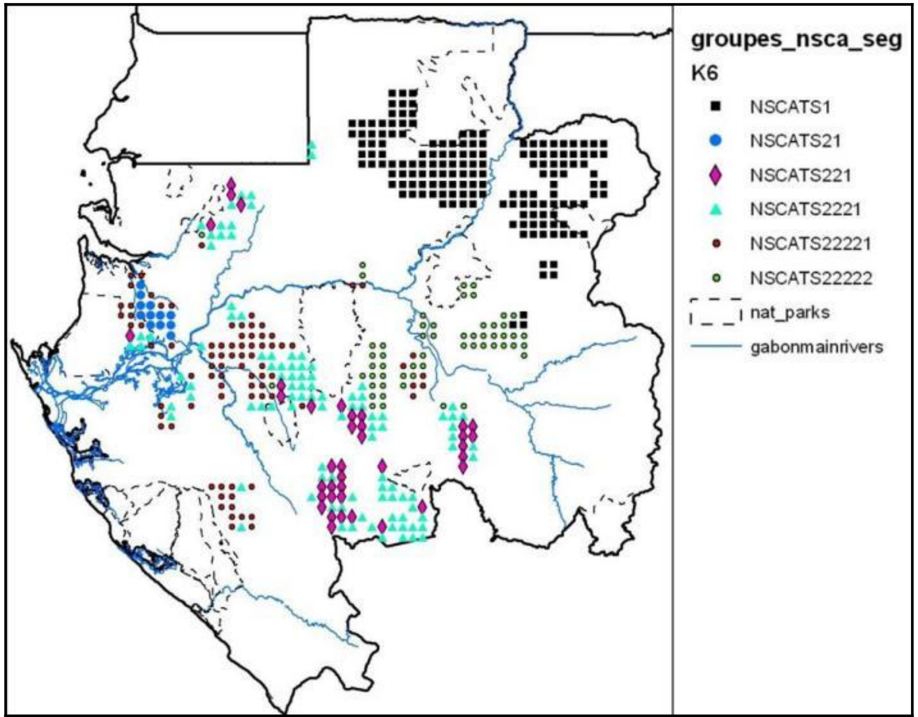
3. Forest type classification

Distinct National Forest vegetation types

Forestry concessions are obliged to conduct forest inventories and present the data in their forestry management plan. MBG obtained data collected by one environmental consultancy company, Sylvafrica, from 20 forestry concessions spread across Gabon, and collectively covering >15% of Gabon's forest. Statistical ordination and cluster analyses were applied to these data sets, identifying six distinct forest types defined by species associations (see Map).

Application to HCV

- National vegetation maps provide an objective means to identify nationally rare and threatened habitats, and large ecosystems significant at the national level, which would be considered HCV 2 or 3, and subject to appropriate management.
- The large intact forests (Ref 13), type HCV 2, should be complimented with data on the vegetation types.



Designation	Description
NSCATS1	Continental forest without okoumé
NSCATS21	Estuary forest
NSCATS221	Mature central forest rich in okoumé
NSCATS2221	Mature central forest
NSCATS22221	Coastal forest
NSCATS22222	Ivindo forest

Six distinct forest vegetation types identified from analysis of forest inventory data provided by Sylvafrica.
Source MBG. Produced by MBG.

3. Forest type classification

Vegetation types at the landscape scale

A test landscape HCV study was conducted in the Grande Mayumba area, integrating proposed national HCV priorities (see Chapter 4). Here we describe the techniques we used to produce a habitat map and its application to HCVs. The outputs of the three data sets and analyses were combined:

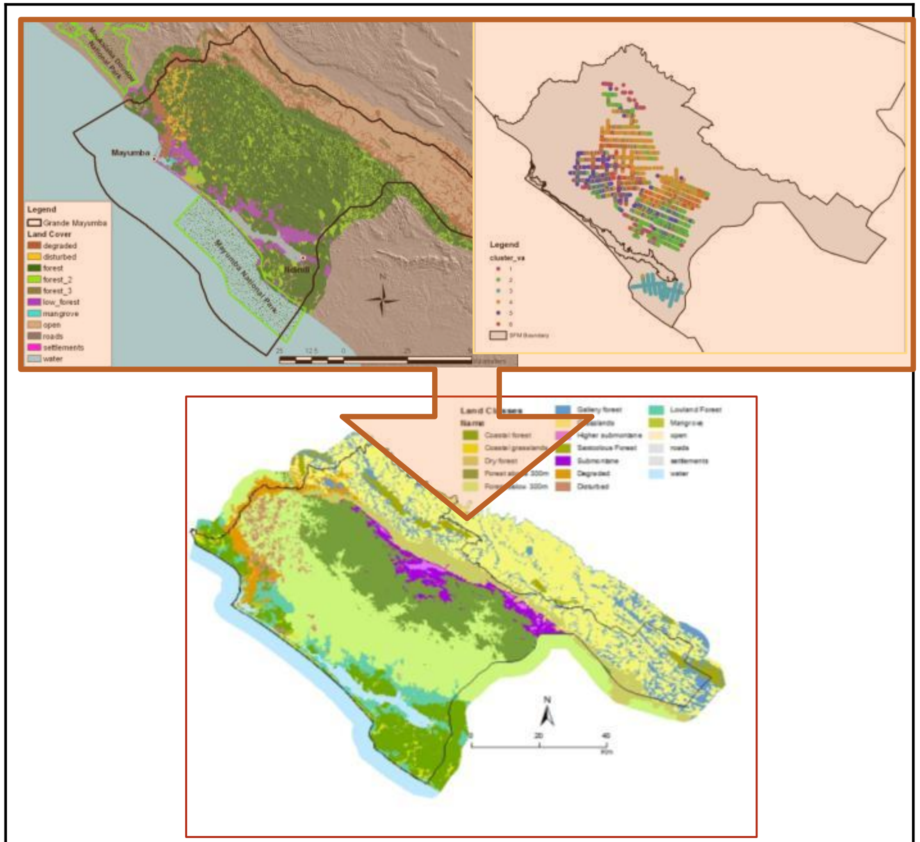
1. An initial vegetation map was produced by GMDC*[1] through remote sensing analysis of satellite imagery and an intensive flyover survey
2. Statistical ordination and cluster analyses of the available forestry inventory data were used to identify distinct forest types based on species composition.
3. Field plots on both sides of the mountain range were analysed using multivariate techniques (PRIMER) to identify vegetation types based on floristic composition.

By combining this data and through detailed consultation, a high resolution vegetation map was produced for the Grande Mayumba. The habitat map combines physical geography, species composition and disturbance history. Rare habitat types could be then identified, while the map also served to generate predicted distribution maps for animals and plants (see chapter 4).

Application to HCV

- Vegetation types identified by floristic composition, i.e. from field survey data, are essential for identification of HCV 1-3. In the example of Grande Mayumba a semi-deciduous forest was identified that is unique to Gabon, with a highly restricted range on the eastern side of the Mayombe mountain range.
- Conservation set-aside at the scale of the concession can ensure the major habitat types are represented, while consideration can be made of nation or international objectives, and landscape features such as connectivity (HCV 3) (see Chapter 4).

*[1] GMDC = Greater Mayumba Development Company



Vegetation types map for the Grande Mayumba area (bottom), developed from combining data from remote sensing analysis of imagery (top left), analysis of forestry inventory data (top right), vegetation plots and consultation.
Source MBG/SFM. Produced by MBG/SFM/WCS 2014.

4. Landscape scale case study

Combing HCVs 1-6

SUMMARY

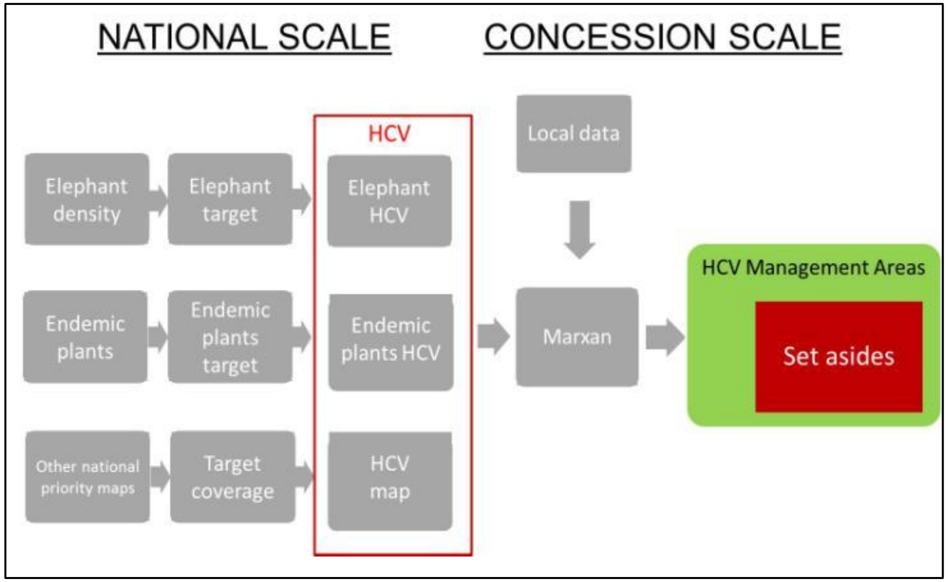
Challenges for HCV

In the absence of national objectives, HCV assessments are considered subjective and open to interpretation, and landscape features may be missed. By incorporating national scale conservation priorities into concession scale decisions, it is possible to ensure greater consistency in conservation between national parks and private lands. However, private lands are generally allocated for economic use, so, it is necessary to optimise HCV management areas and set-aside, that minimises loss of revenue or conflict with development objectives.

Analytical methods exist that make it possible to quantify the contribution of locally identified HCVs to national or international conservation priorities. They also provide a more robust and transparent platform for discussion and decision-making with stakeholders.

Our approach

- Conduct a test case for HCV mapping at a land management scale, combining ‘*national level priorities*’*[1] with local level data.
- The conservation planning software, Marxan*[2], was used to find optimal management areas and visualise the outcomes of decisions. Three types of management units were defined (see approach schematic):
  1. Conservation areas where no extractive activities are permitted (“set asides”)
  2. HCV zones where timber extraction is possible but under certain management conditions to ensure the values are maintained (‘HCV-managed extractive zone”)
  3. Areas where use is not restricted by additional regulations.



*[1] refers to approaches to prioritisation proposed in this project, with the caveat that some national data is still incomplete, and that national priorities have not yet been identified or validated in a national process.

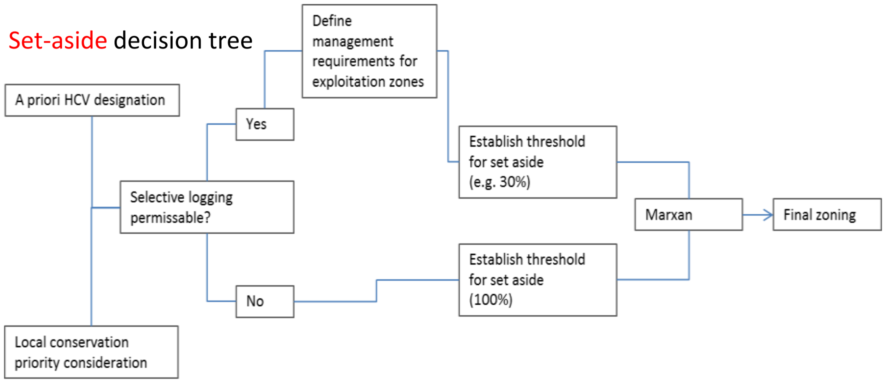
*[2] Marxan is a spatially explicit optimization tool designed to identify areas where conservation objectives can be achieved most efficiently. It integrates individual data layers for a study area, producing land-use options e.g. conservation set-aside, that achieve the conservation targets defined for each data layer. Marxan provides a systematic and transparent approach to identify HCV areas and set-aside that include national scale priorities, allowing the concession holder to make and justify management decisions that will contribute to national conservation objectives.

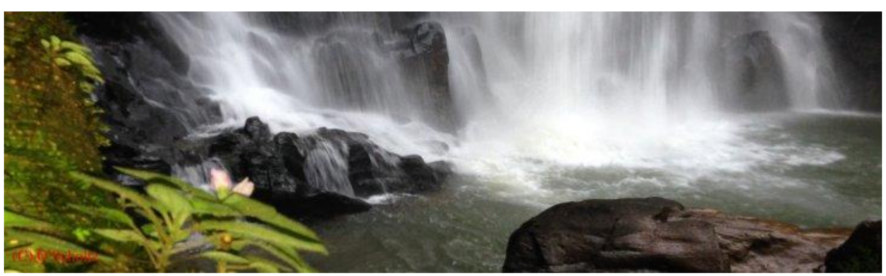
SUMMARY cont.

Our approach continued

- HCVs identified through national prioritisation, were automatically treated as HCV at the concession-level. Additional HCVs were locally identified. Clearly some extractive activities (e.g. low intensity timber harvesting) are compatible with the maintenance of certain HCVs, as long as appropriate best practices are applied. These HCVs were therefore assigned to the HCV-managed extractive zone. To ensure that these conservation values were still represented in conservation areas, a certain target was defined for their inclusion in the set-aside zone. HCVs were entirely assigned to set-aside if extractive activities were not considered compatible with maintaining their value e.g. ecological sensitive endemic plants, local community sacred sites.

Set-aside decision tree





SUMMARY cont.

Application to HCV

- HCV assessments require broad stakeholder consultation, and therefore proposed HCV areas may be adapted through the consultation process. Using the Marxan tool to identify HCV management units and set aside, helps provide a transparent, robust and dynamic HCV planning framework.

Important next steps

- Outline the specific best practices and monitoring techniques that should be adopted for the HCV types addressed in this project.
- This case-study demonstrates the strong possibility that large areas of a concession will be identified as a HCV when national priorities are adopted. Clearly this has financial implications (cost of additional best practices or lost revenue in set-aside). Quantifying this cost and effectiveness would be valuable as at some scales, set-aside may be cheaper than adapted exploitation.
- This study has demonstrated how local data can contribute to improving national data sets and priority setting. For instance the semi-deciduous forest type that has not been described elsewhere in Gabon, and therefore can be integrated into a national vegetation type map.

Caveats

GMDC are not currently engaged in a certification scheme, but envision doing so as part of their Sustainable Land Use Plan. This HCV landscape study is not a complete HCV assessment; verification of modelled distributions, important data sets (e.g. mapping of endangered species and adapted field surveys), broad stakeholder consultation has not been conducted. The HCV management areas and set-aside presented here demonstrate novel approaches to the HCV process at the scale of a landscape, and are not final HCV maps.

Case study site - the Grande Mayumba Area in southern Gabon

The Grande Mayumba Development Project (GMDP) occupies a large area in southern coastal Gabon. Positioned between three national parks it has a remarkable diversity of ecosystems; including coastal and montane forests, savannas, lagoons and beaches. The area is located within an isolated endemic plant hotspot identified in preliminary national analyses. The area is largely forested, much of which is still intact (Ref 13), and is likely an important wildlife corridor between the national parks.

Land-uses ear-marked for the sustainable development concession, include timber extraction, agro-forestry, agriculture, infrastructure development, tourism and conservation. The trial HCV assessment was conducted in collaboration and consultation with experts from SFM (the private entity of GMDP), using ecological and social data already collected in the region.

The following HCV types were treated:

HCV 1	Threatened animals and endemic plants
HCV 3	Rare and threatened forest types
HCV 4	Ecosystem services; erosion control
HCV 5	Local community basic forest needs
HCV 6	Local community cultural values

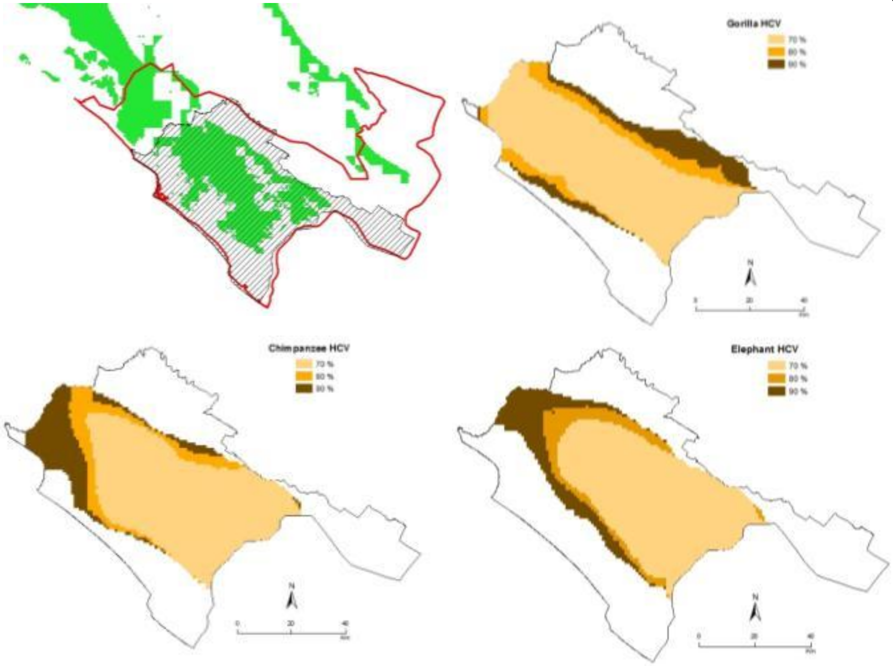
Combing HCVs 1-6

HCV 1 Elephants and great apes

The concession has high densities of elephants and great apes, and therefore much of the zone is always identified in the national priority analyses presented in Chapter 1 (example output from ape Zonation analysis top left). We used the regional distribution model data to create concession-scale HCV maps for each species (see three maps), using independent Marxan analyses. The same “national priority” population targets where applied, while we included criteria adapted to the local context (connectivity with the protected areas, single large block), to generate maps containing 70, 80, & 90% of the concession’s populations for each species.

Management zones

Exploitation is possible even within the areas identified as HCV so long as certain measures are adopted. The 70% population extents were retained in the HCV-managed extractive zone, within which a reduced percentage were assigned to the set-aside in the final Marxan analysis.

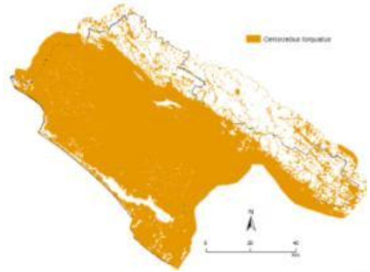


HCV 1 Concentrations of species: other animals

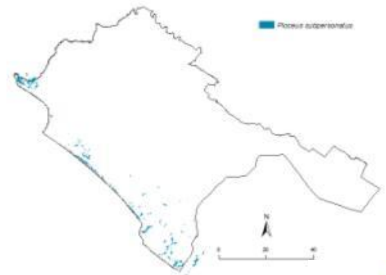
By referring to the IUCN Red List data-base, a number of NT and VU animal species (birds and mammals) are considered to occur in the study area. Predicted distribution maps in the study area were generated by matching their known habitat preference with the study area’s vegetation types (see distribution maps for three species).

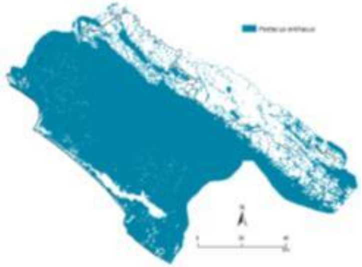
Management zones

These individual species distributions were not considered HCV, however where several species co-exist can be considered HCV. Variable population targets were defined per species (between 10 and 50%) for inclusion in the set-aside in the Marxan analysis, depending on their local threat and spatial extent.



Left to right
Red capped mangabey (VU)
Loango weaver (VU)
African grey parrot (VU)



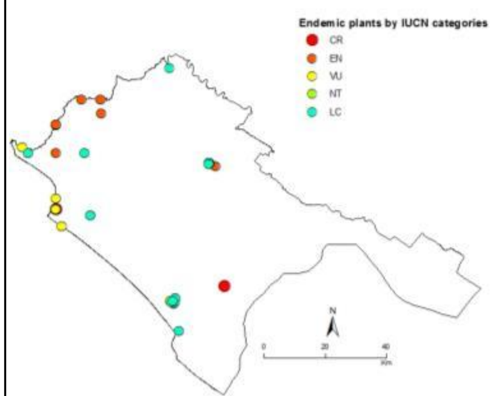


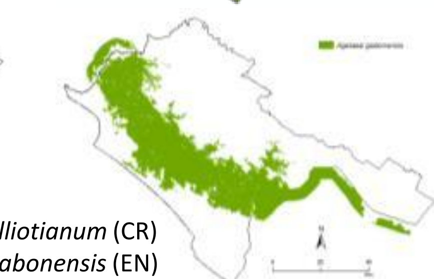
HCV 1 Concentrations of species: endemic plants

Location data on endemic plant species recorded in the study area were extracted from the online herbarium data-base for Gabon (Ref 11). As only a few plant species from Gabon have had their conservation status assessed through the IUCN Red List, a rapid assessment was conducted, which classified 14 species as VU, EN or CR. The know locations of these 14 species could be considered HCV 1, however this represents isolated points in a forested landscape (see locality data coloured coded by IUCN Red List status). Predicted distribution maps were created for each species, by matching their ecological preferences (where this was known), with the vegetation types identified in the study area (see vegetation type mapping in chapter 3).

Management zones

Low impact logging is considered possible and therefore their predicted distributions were assigned to HCV-managed extractive zone (see example distributions for two species below). The exception were two exceptionally rare plant species, for which it was not possible to generate distribution maps, and their point location were assigned to set-aside. For all other species classified as VU and above, variable population targets (10-30%) were applied on their distribution maps for inclusion in the set-aside.



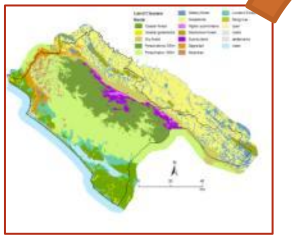


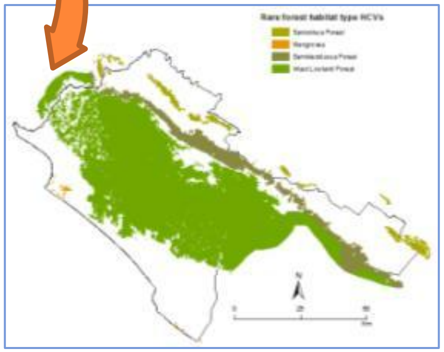
Top *Mischogyne elliotianum* (CR)
Bottom *Agelaea gabonensis* (EN)

HCV 3 Rare forest types

In the absence of a national level habitat prioritisation (see Chapter 3), we evaluated each vegetation class in the concession for its national-level threat and spatial extent (rarity). Vegetation types classified as both threatened and rare were considered HCV 3.

Vegetation Class	Threat and rarity	% retained in set aside
Semi-deciduous Forest	Extremely rare (unique to Gabon), potentially threatened	100%
Intact lowland Forest	Threatened, less rare	20%
« Saxicolous » Forest	Less threatened but highly localised	100%
Mangrove	Rare and highly threatened	100%





Management zones

For highly-restricted range HCV 3 types, their entire distribution were assigned to set-aside. Low impact forestry is considered compatible with maintaining HCV 3 type intact lowland forest HCV3 type. This was assigned to HCV-managed extractive zone, while a certain percentage of its distribution was retained for set-aside.

4. Landscape scale case study

HCV 4 Erosion vulnerability

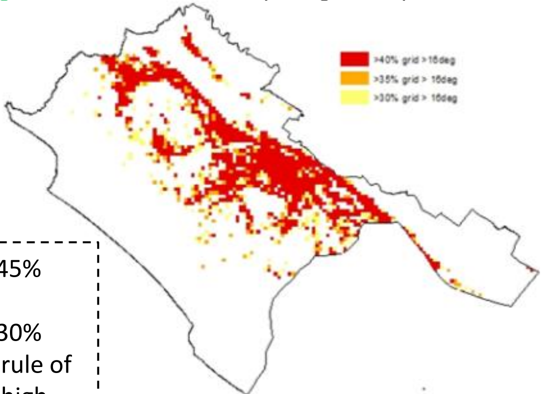
Steep slopes are more vulnerable to soil erosion, and forest and soil disturbance should be avoided in the steepest areas. GIS analysis of digital elevation model data (Ref 15), allowed us to assign a steepness category to each 1km^2 grid cell. We considered steep slopes to be >16deg.

When >30% of the grid had steep slopes, these were considered "*steep*" grid cells (yellow and orange zones). When >40% of the grid had steep slopes these were considered "*very steep*" (red zones) (FAO*[1]).

Management zones

The *very steep* grids were fully assigned to set-aside, and the *steep* grids were considered to be HCV-managed extractive zone requiring best practices to prevent erosion.

Source: WCS, MapMart
Produced WCS June 2014



*[1] FAO (2004) (Ref 16) cites 45% (25 degrees) slopes as being completely un-harvestable. 30% slope (16 degrees) is a good rule of thumb for areas that will be high risk.

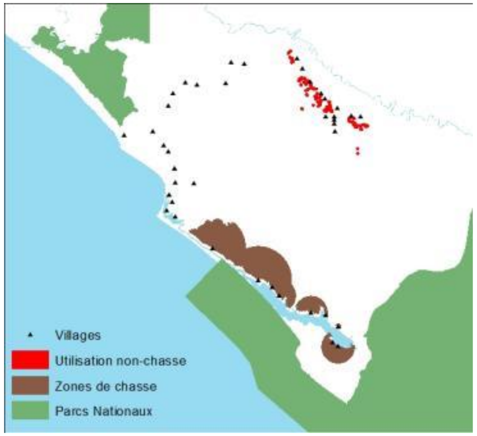
HCV 5 & 6 Local community forest use and cultural values

Data on local community forest use was available from two independent socio-economic studies conducted in the area, that included participatory mapping to various degrees (Ref 17 & 18). The primary purpose of the studies was not the identification of HCV areas, and therefore the data should be treated as preliminary and are included for illustration purposes. Forest uses identified included hunting and fishing zones, agriculture, non-timber forest products, ancient village and scared sites.

Management zones

Each community forest use were fully assigned to either HCV-managed extractive zone or set-aside (see Table pg 22).

Source: WCS, ASF, WRI
Produced WCS February 2015

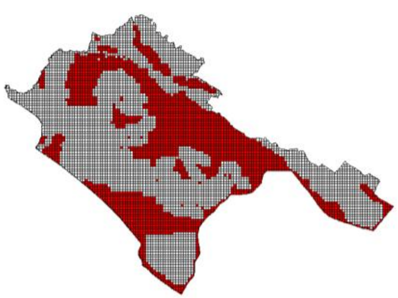


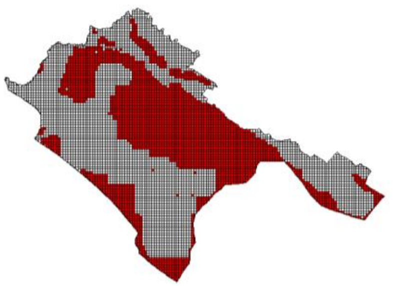
Combing HCVs 1-6

Conservation set-aside & HCV management zones

Marxan spatial planning software combines the set-aside targets defined for each data layer, to find the optimal set-aside areas that achieves these targets. Socio-economic factors that may conflict with conservation objectives, can be included as cost layers. ‘Costly’ areas are then avoided for selection in set-aside areas. Outputs are presented for the best-solution set-aside (red areas) generated by two Marxan analysis. The set-aside targets for each data layer are the same in the two analyses, but in the left hand output, the cost layer representing timber value was given a stronger weight in the analysis, creating differences in the selected optimal set-aside (see ABCG report for more explanation).

The targets and cost layers to be used in a Marxan analysis are determined by the anticipated conservation management approach (e.g. strict conservation, community area etc.). Based on the conservation targets specified in this analysis, the set-aside would not exclude community use (on the *proviso* it is sustainable and legal), but would require poaching control measures, while any habitat disturbance would be prohibited.



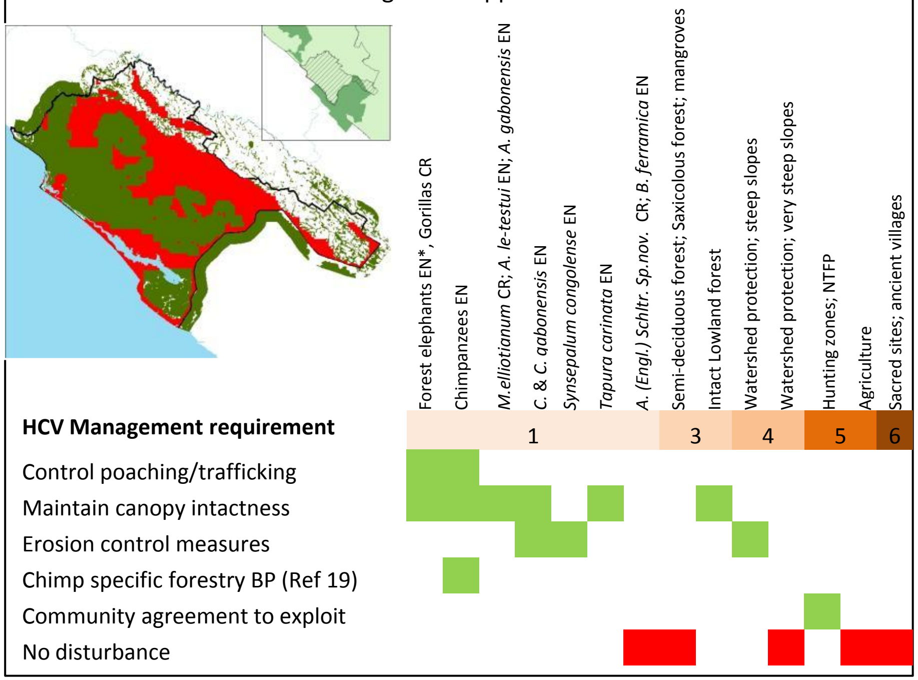


The three management zones are represented in a combined map (right)

The table presents how individual HCVs can be regrouped according to similar management requirements, from which individual maps would be produced for each HCV management type.

Maps produced WCS March 2015
See ABCG report for more details on the set aside targets

1. **Set aside** : The area selected for this category (equivalent to left hand Marxan output map) collectively represents the user-defined conservation targets, and is where several conservation priorities overlap. The set aside of these areas ensures the most sensitive areas in the concession are protected, and ensures that *a proportion* of all the HCV attributes are included in strict protection zones while optimising all other parameters
2. **HCV-managed extractive area** : This area represents a combination of several HCV features, but where extractive activities that respect best practices are permitted. Each HCV type can be presented separately to guide the implementation of appropriate management activities.
3. **Lower conservation priority** : Areas not designated as HCVs, where a greater variety of extractive uses could be permitted with the normal environmental management applied.



REFERENCES & RESOURCES

Cited Resources & References

1. **Forestry Stewardship Council & HCV**. Principle 9 of the FSC Principles and Criteria outlines identification and management of HCV https://ic.fsc.org/the-10-principles.103.htm
2. **Roundtable Sustainable Palm Oil & HCV**. RSPO Principles and Criteria 5.2 and 7.3 refer to the management of HCVs http://www.rspo.org/about/who-we-are/working-groups/biodiversity-high-conservation-values
3. **HCV network and resources website**. https://www.hcvnetwork.org/resources/resources/folder.2006-09-29.6584228415
4. Une Interprétation Nationale des Forets à Haute Valeur de Conservation pour le Gabon (First Draft, 2008) https://www.hcvnetwork.org/resources/global-hcv-toolkits
5. **African Biodiversity Collaborative Group** HCV grant page http://www.abcg.org/high_conservation_value_forest_assessments
6. Maisels, Fiona, Samantha Strindberg, Stephen Blake, George Wittemyer, John Hart, E. A. Williamson, Rostand Aba'a, et al. "Devastating Decline of Forest Elephants in Central Africa." *PloS One* 8 (2013): e59469. doi:10.1371/journal.pone.0059469.
7. IUCN. "Plan d'action régional pour la conservation des gorilles de plaine de l'Ouest et des chimpanzés d'Afrique centrale 2015–2025." Gland, Suisse: Groupe de spécialistes des primates de la CSE/UICN, 2014.
8. Blake, Stephen, Sharon L. Deem, Samantha Strindberg, Fiona Maisels, Ludovic Momont, Inogwabini-Bila Isia, Iain Douglas-Hamilton, William B. Karesh, and Michael D. Kock. "Roadless Wilderness Area Determines Forest Elephant Movements in the Congo Basin." Edited by Craig R. McClain. *PloS One* 3 (2008). doi:10.1371/journal.pone.0003546.
9. **ZONATION** conservation planning software http://www.helsinki.fi/bioscience/consplan/software/Zonation/References.html
10. **Définit des types floristiques au Gabon** dans G. Caballé, 1978. Essai sur la géographie forestière du Gabon. Adansonia, sér. 2, 17 (4): 425–440.
11. **Online herbarium data-base for Gabon** http://herbaria.plants.ox.ac.uk/bol/Gabon/Home/Index
12. **MaxEnt** for species habitat mapping e.g. https://www.cs.princeton.edu/~schapire/maxent/
13. **Intact Forest Landscapes** (IFL) http://www.intactforests.org/
14. Marxan Conservation Planning Tool http://www.uq.edu.au/marxan
15. Digital Elevation Model (DEM) data and maps are available on the internet e.g. http://www.mapmart.com/Products/Digital-Elevation-Models/DEM/Digital-Elevation-Model-Gabon.htm
16. FAO (2004) Regional code of practice for reduced-impact forest harvesting in tropical moist forests of west and central Africa.
17. Loundou, Paul, Malcolm Starkey, Wilfrid Mbombe Tsongue, and Prisca Roseline Mapangou. *Projet d'Appui Au Renforcement Des Capacités de Gestion Des Parcs Nationaux et de La Biodiversité (PARC): Evaluation Socioéconomique Du Massif Du Mayombe*. Libreville, Gabon: WCS Gabon, 2013
18. Sounguet, Guy-Philippe, Andréa Minkwe, Carmen Oliwina Kouerey, and Marie Céline Garnier. *Diagnostic Des Dynamiques Socioéconomiques Des Village Périphériques Au Parc National de Mayumba*. Libreville, Gabon: ASF, 2011.
19. Morgan, D., and C. Sanz. "Best Practice Guidelines for Reducing the Impact of Commercial Logging on Great Apes in Western Equatorial Africa." *IUCN Species Survival Commission Primate Specialist Group*, 2007, 32.

Other useful resources

WWF-DACEFI Community development alternatives to illegal forest exploitation

Critical habitats in the IFC PS6 explained by TBC

Cameroon HCV case-study PPECF Rougier Group, Nature+ http://pfbc-cbfp.org/news_en/items/PPECF-SFID-en.html

WCS Gabon http://wcs.gabon.org

ANPN www.parcsgabon.org

World Resources Institute www.wri.org/

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