

The Nyungwe Forest as a test case on integrating climate change adaptation into conservation planning

Gashora, February 23, 2011



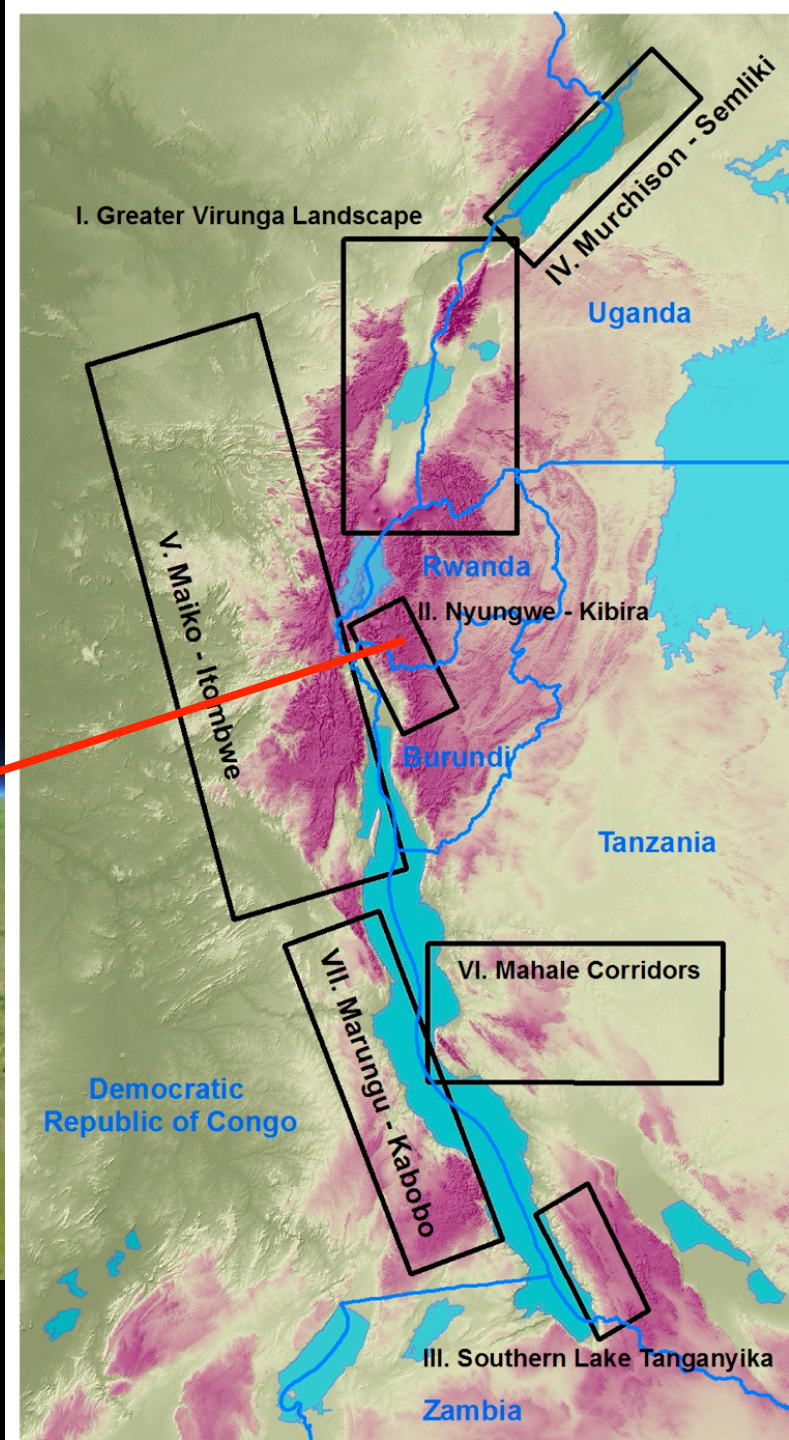
Outline of the presentation

- Nyungwe National Park: Characteristics and biological importance
- Conservation history of Nyungwe National Park
- Integration of climate change adaptation into conservation planning

Nyungwe National Park: Characteristics



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General characteristics

- Area: 1.019 km²
- Altitude: 1600 – 2950m a.b.s.l.
- Rainfall: 1600 – 2950mm
- Features: Very mountainous terrain; one of the largest and most biologically diverse in the Albertine Rift Highlands of East-central Africa



Table 2. Rankings (1=best) of Albertine forest sites by key taxa, total AR endemics, IUCN listed species, and conservation importance (ARE+IUCN rankings). Virunga volcanoes include VNP, MGNP, and montane sectors of ViNP (adapted from Plumptre et al, 2003).

PA/Site	ARE Plants	ARE Mammals	ARE Birds	ARE Reptiles	ARE Amphibians	ARE Butterflies	ARE Species	IUCN Listed	Conservation Priority
Kahuzi-Biega	1	4	2	3	4	4	2	2	1
Nyungwe	2	5	3	2	3	2	1	4	2
Bwindi	4	1	5	5	5	1	4	3	3
Itombwe	NA	7	1	6	1	-	6	1	3
Ruwenzori	5	2	6	1	7	5	5	5	5
Virunga volcanoes	3	2	8	3	1	3	3	7	5
Kibale	-	7	-	7	9	10	7	5	7
Kibira	NA	6	6	9	NA	NA	8	8	8
Kabobo	NA	NA	NA	9	6	NA	10	10	9
Echuya	9	10	-	NA	-	5	9	-	-

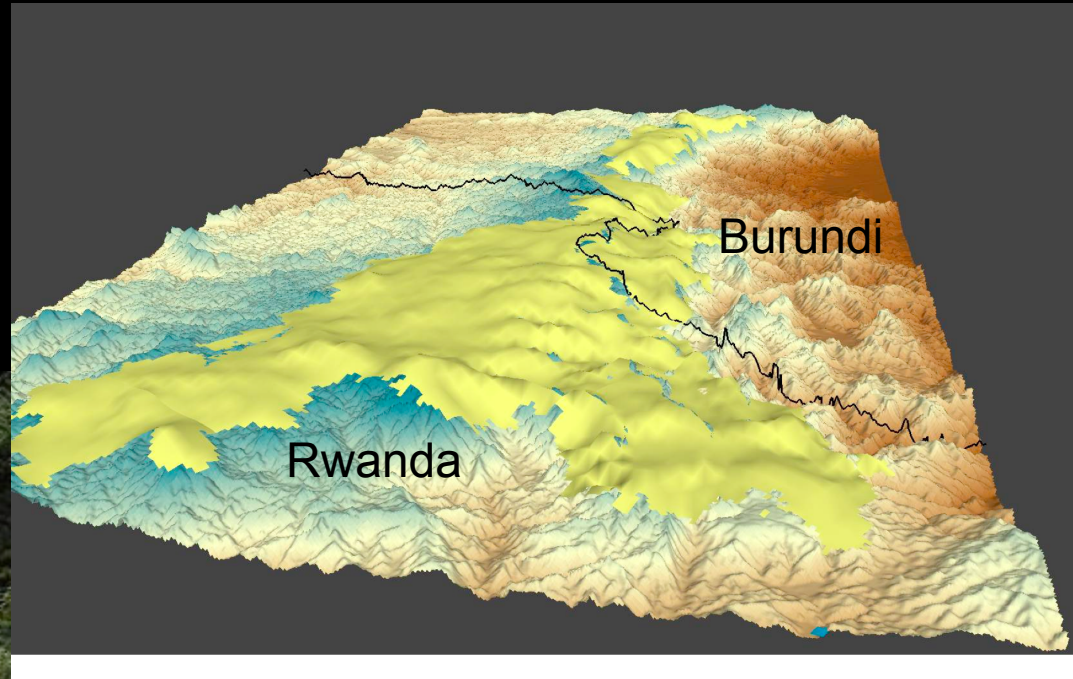
Biodiversity value

- Plants: 1068 species
 - trees: >240 spp;
 - orchids >140
- Birds: 275 species
 - 26 Albertin Rift endemic
- Mammals: 85 species
 - 13 primates spp (2 Albertin Rift endemic)
- Amphibians: 32 species
- Reptiles: 38 species



Hydrological services

- Important watershed area for
 - Rwanda
 - DR Congo and
 - Burundi



History of conservation of Nyungwe N.P.

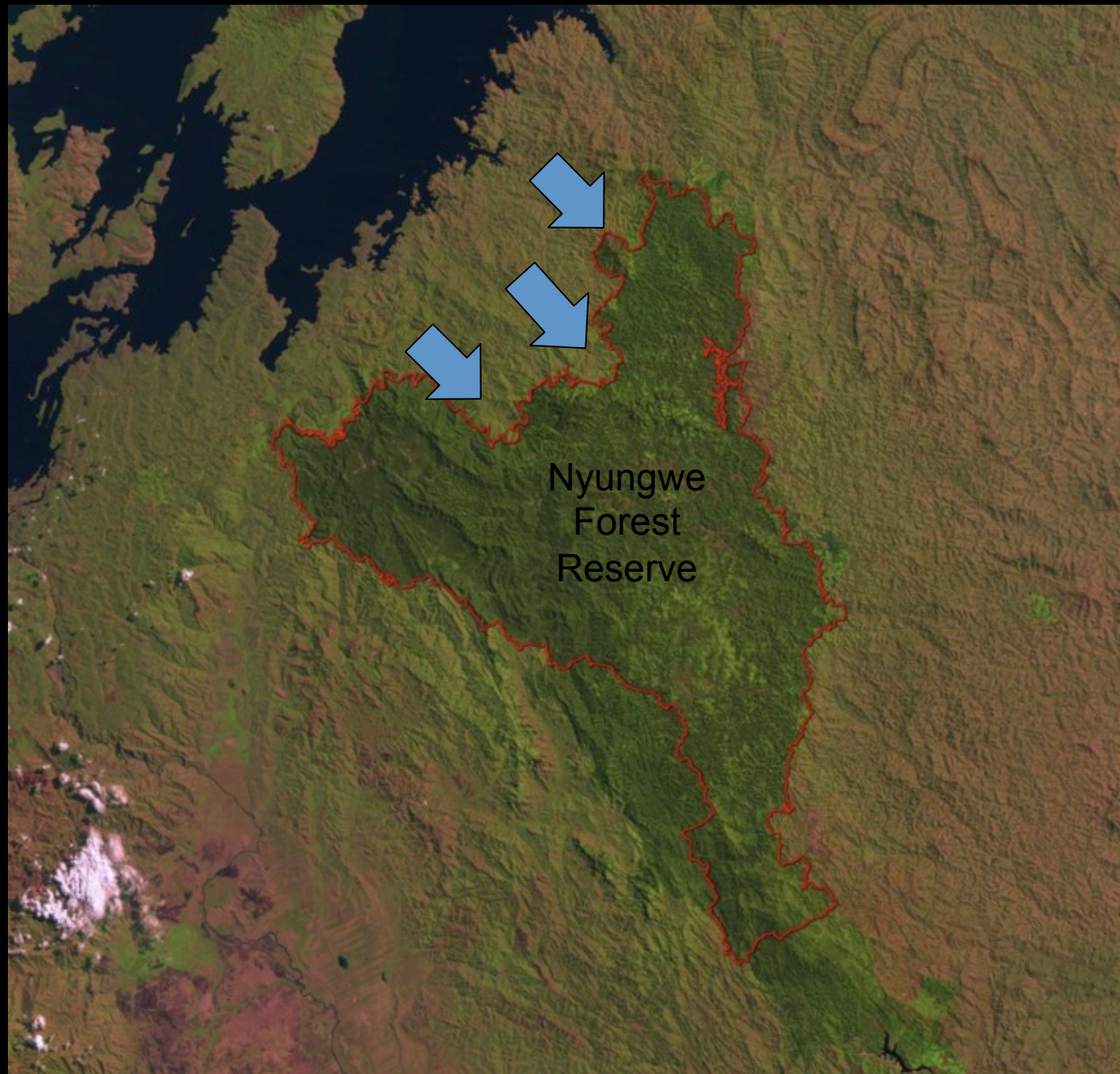
1920s – 1932

~ 300 km² of
forest
cleared in
eastern
Nyungwe

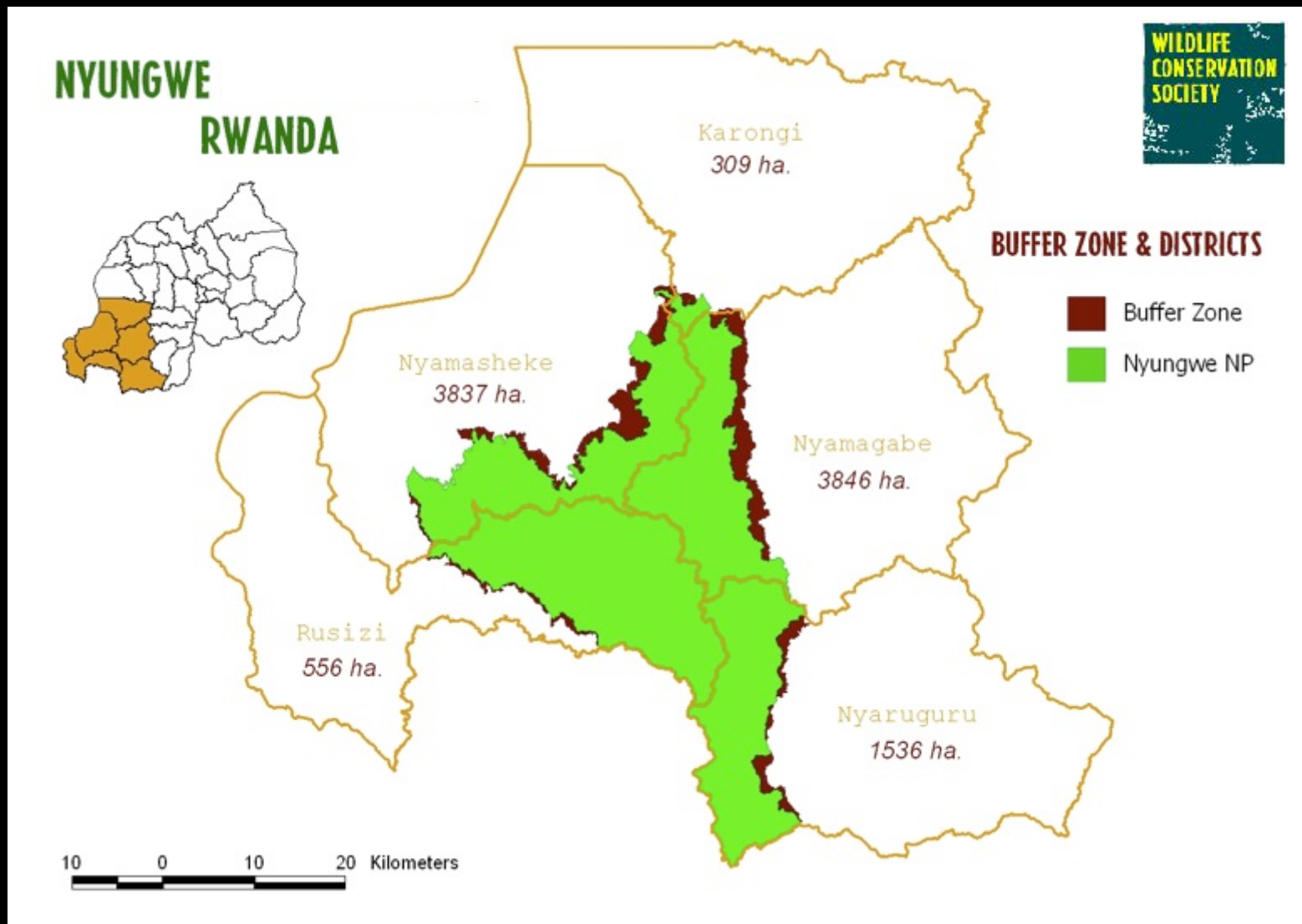


1962 – 1974

~ 180 km² of
forest cleared
in northwest
Nyungwe

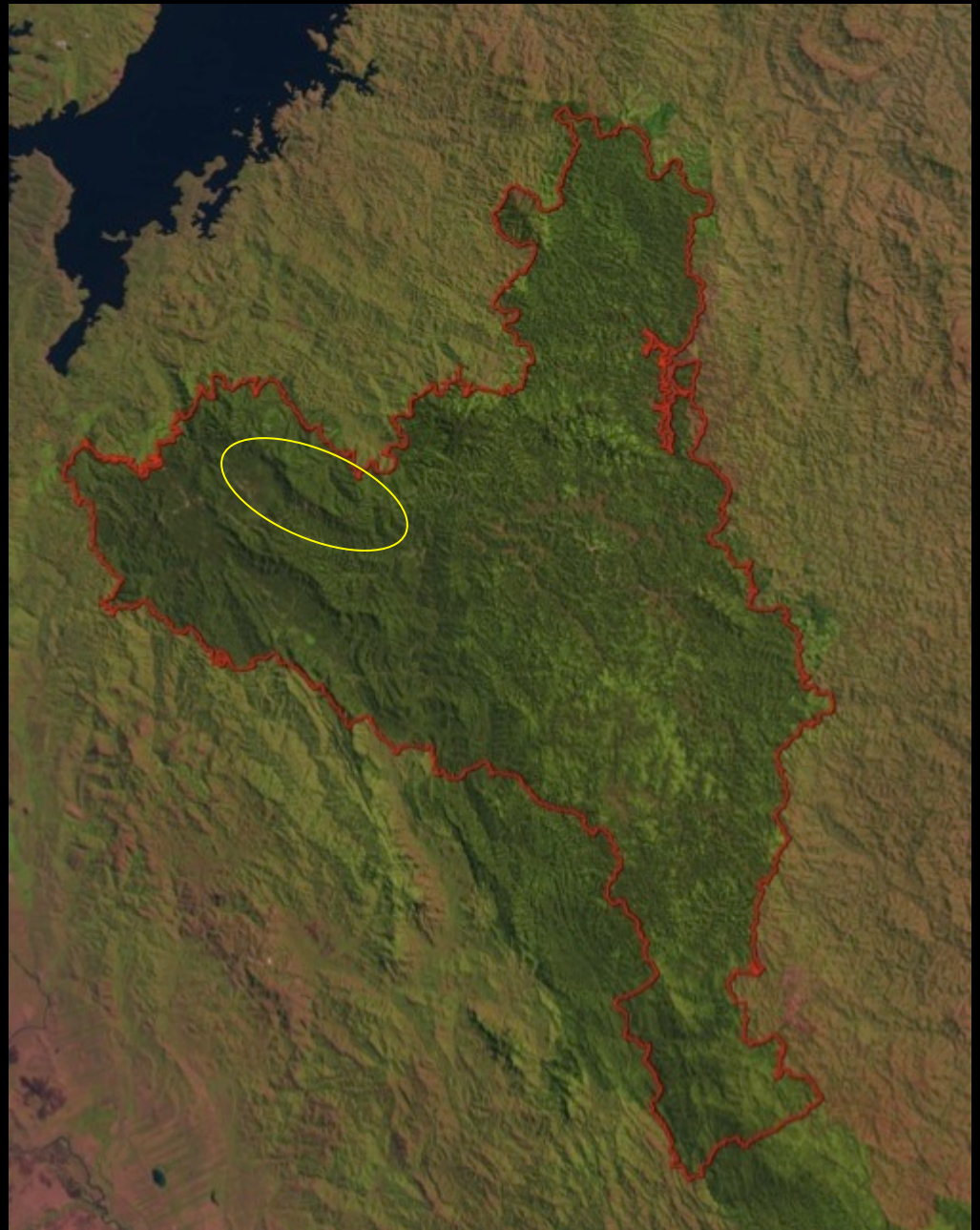


1975 – 1993: Nyungwe Buffer Zone Creation



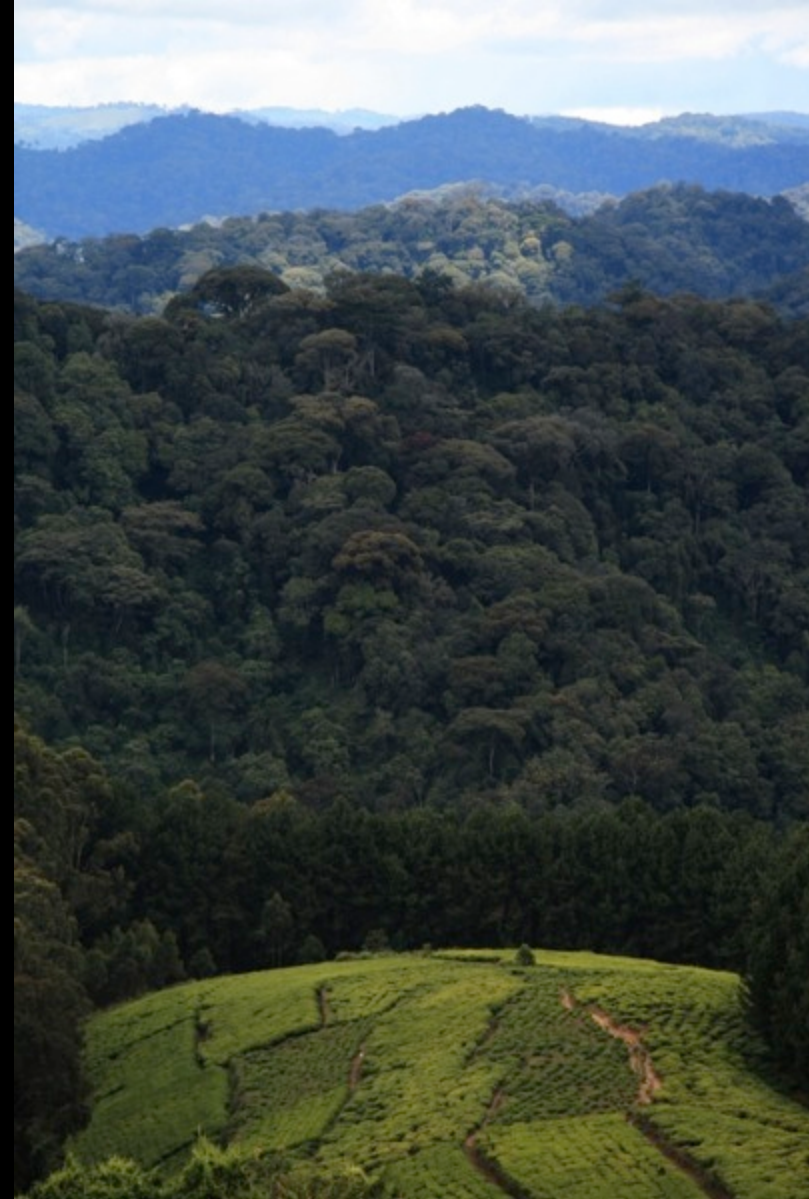
1985-87

Research & Surveys
by WCS to identify
“Nature Zone”
Within Multi-Use
Forest Reserve under DGF

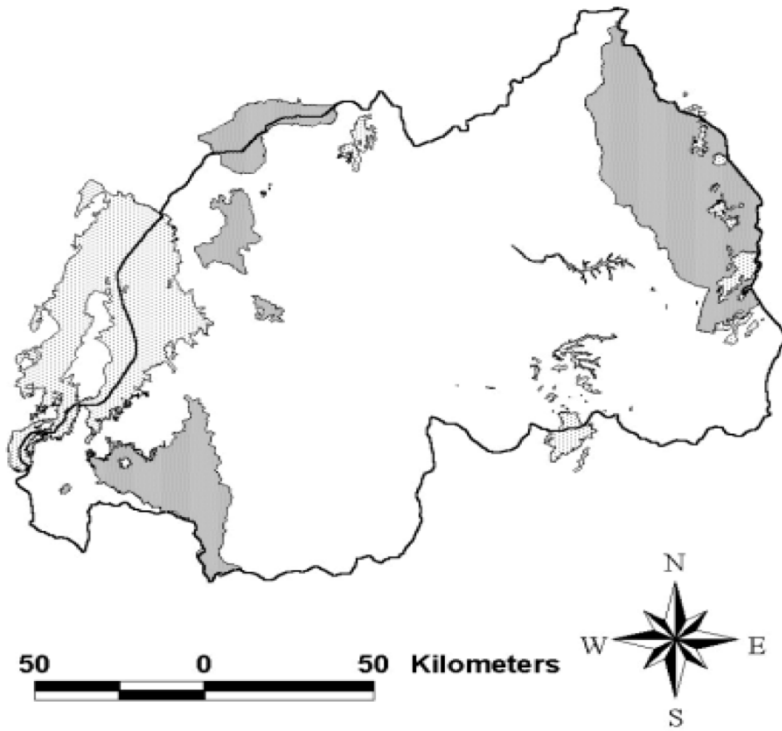


Conservation History of NNP

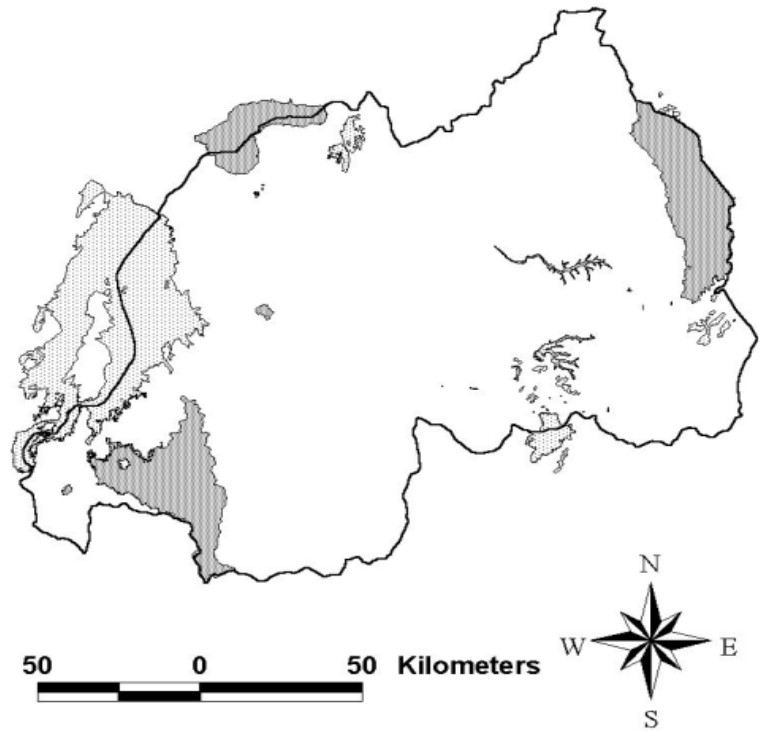
- 1987: WCS Nyungwe Forest Conservation Project starts to support Rwandan government to conserve the forest reserve
- 2000: proposed National Park
 - increasing investment by the Government
- 2005: Gazettment Nyungwe as National Park.



Rwanda in 1990

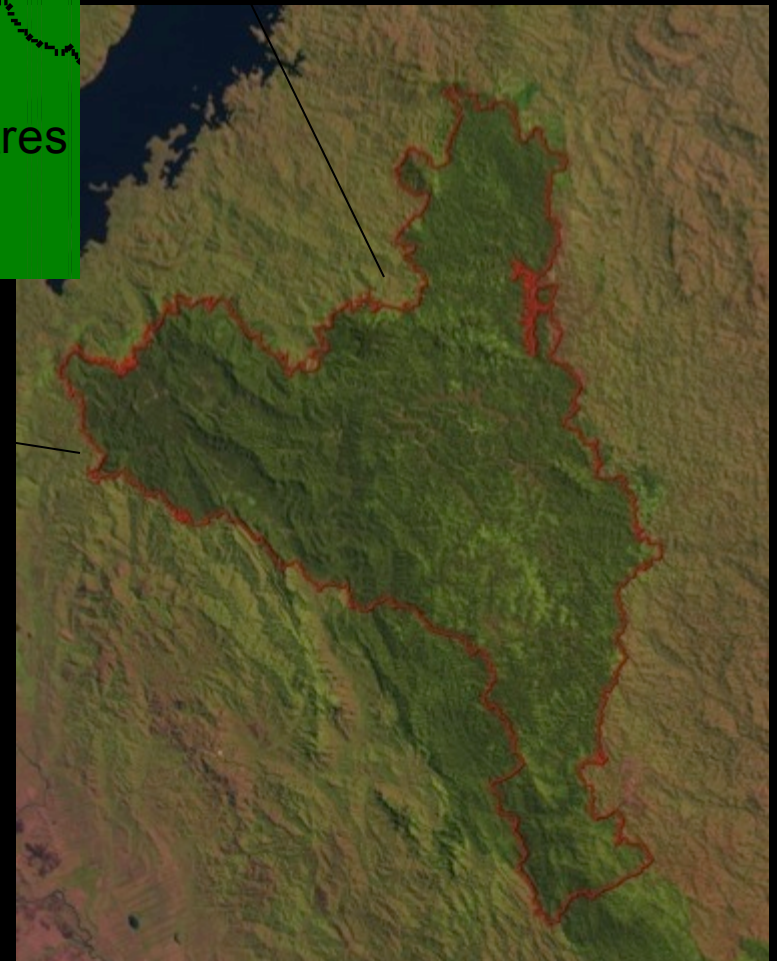
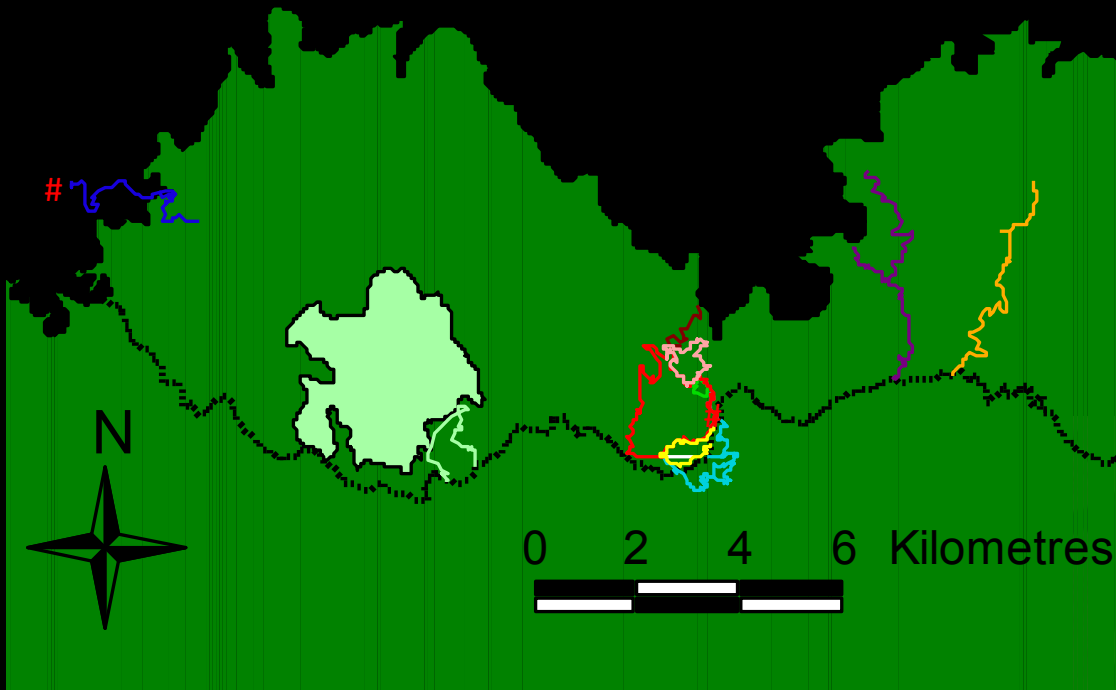


Rwanda in 2000



WCS interventions

- **Tourism Development**
 - Infrastructure development and products diversification
- **Biodiversity Research and Monitoring**
 - Biodiversity surveys
 - Monitoring
 - Species
 - Threats
 - Forest Regeneration
- **Community Development and Outreach**
 - Education
 - Ex-poachers
 - Beekeeping
 - Handicrafts
 - Energy Efficient Stoves
- **Transboundary collaboration**
 - Nyungwe-Kibira Landscape



1987: Formal Tourism
Begins in Nyungwe



Gisakura Uwinka



Kitabi

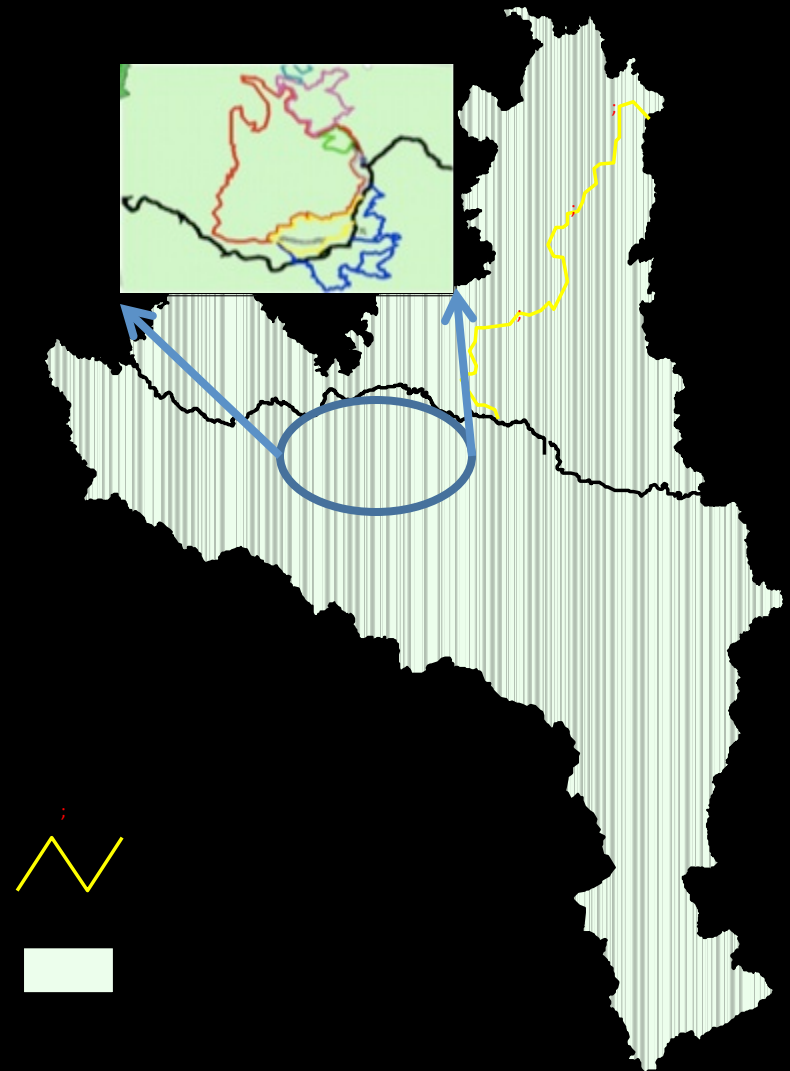


Infrastructure Development



Products diversification and infrastructure development

- Mapping and developing new trails (e.g. Congo-Nile Divide trail)



Canopy Walk



Uwinka Interpretation Center



Biodiversity Research and Monitoring:

- Monitor trends in animal & bird populations, especially Albertine endemic and rare species
- Small mammal surveys



Tree Phenology

- Ongoing data collection every month (± 1000 indiv.) since 1996
- Monitor changes in forest tree fruiting
- Important for primate tourism and climate



Threat Monitoring

RBM to monitor threats to biodiversity:

- Bush fire
- Tree & bamboo harvesting
- Mining
- Poaching





Community Development and Outreach

Integration of climate change adaptation into conservation planning

- Some of the expected consequences of climate change include changes in amphibian and reptile assemblages, changes in the presence, prevalence and significance of disease, and decline
- Monitoring the impacts of climate change on amphibians and reptiles NNP
- This study provides critical baseline data for disease distribution and species abundance that will be used to monitor amphibians for the impacts of climate change over time.



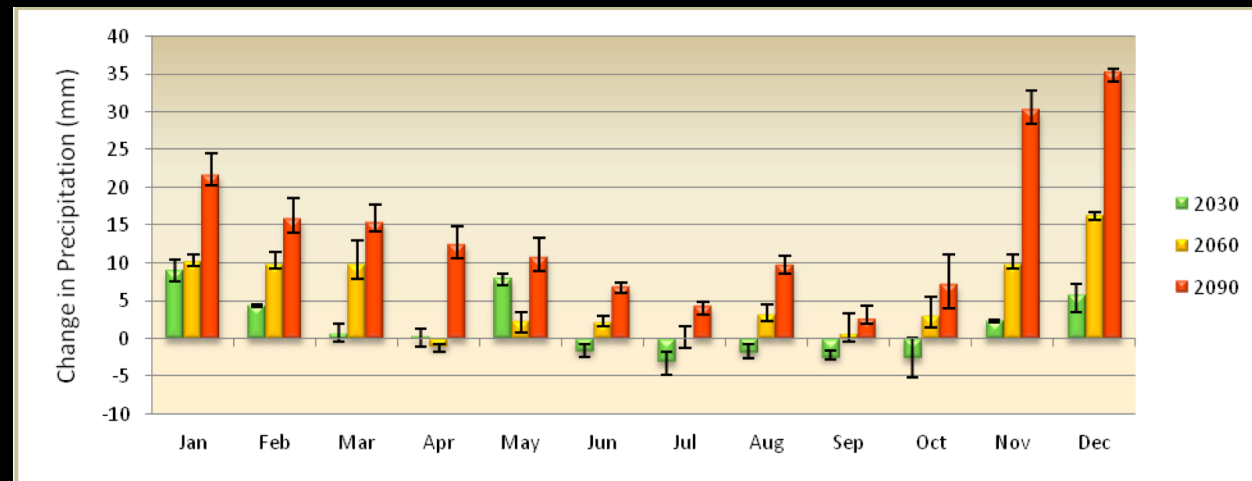
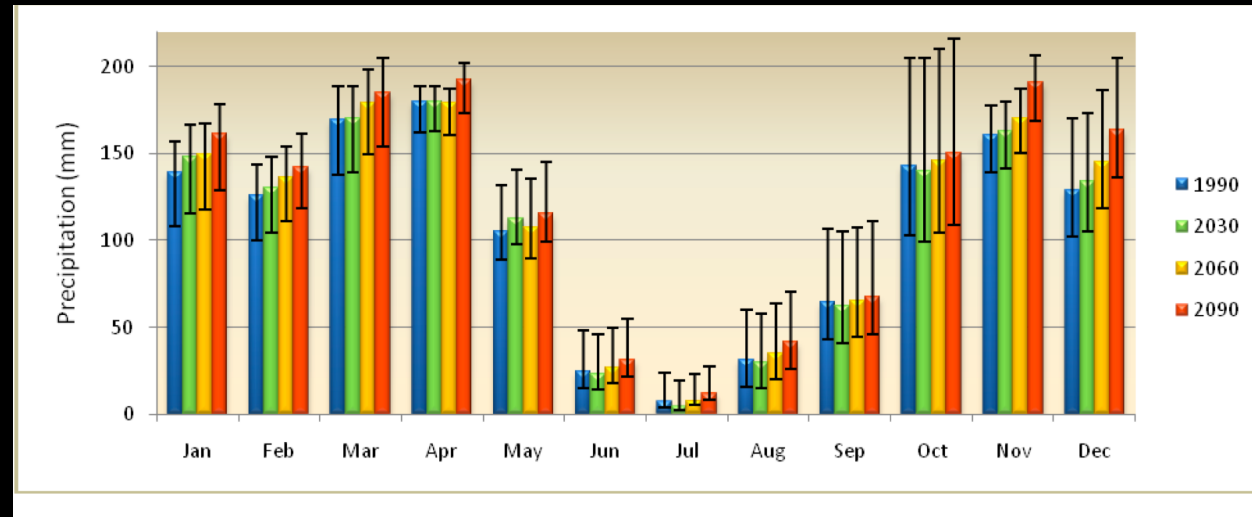
Nyungwe-Kibira: summary statistics of model output

- Summary of modeled climate, ecosystem and crop yield parameters under the A2 emissions scenario for the Nyungwe-Kibira sub-region of the Albertine Rift

		1990	2030	2060	2090	
Mean Monthly Temperature	<i>Min</i>	17.3	18.1	19.3	20.9	°C
	<i>Mean</i>	19.7	20.6	21.7	23.3	
	<i>Max</i>	22.4	23.3	24.5	26.1	
Annual Precipitation	<i>Min</i>	1019	1041	1089	1201	mm
	<i>Mean</i>	1281	1299	1347	1454	
	<i>Max</i>	1603	1617	1674	1792	
Runoff	<i>Min</i>	172	200	251	383	mm
	<i>Mean</i>	317	352	408	536	
	<i>Max</i>	618	605	638	826	
Net Primary Production	<i>Min</i>	1062	1110	1109	1246	gC m ⁻²
	<i>Mean</i>	1100	1230	1315	1455	
	<i>Max</i>	1172	1290	1398	1515	
Heterotrophic Respiration	<i>Min</i>	853	947	988	1098	gC m ⁻²
	<i>Mean</i>	913	1006	1092	1257	
	<i>Max</i>	973	1047	1185	1324	
Bean Yield	<i>Min</i>	559	557	467	280	kg ha ⁻²
	<i>Mean</i>	1057	1063	1070	1046	
	<i>Max</i>	1462	1386	1366	1332	
Maize Yield	<i>Min</i>	856	873	964	1008	kg ha ⁻²
	<i>Mean</i>	1826	1872	1944	1990	
	<i>Max</i>	2949	2866	2856	2956	
Brachiaria Yield	<i>Min</i>	416	568	902	1203	kg ha ⁻²
	<i>Mean</i>	1669	1933	2262	2703	
	<i>Max</i>	4056	4298	4577	4880	

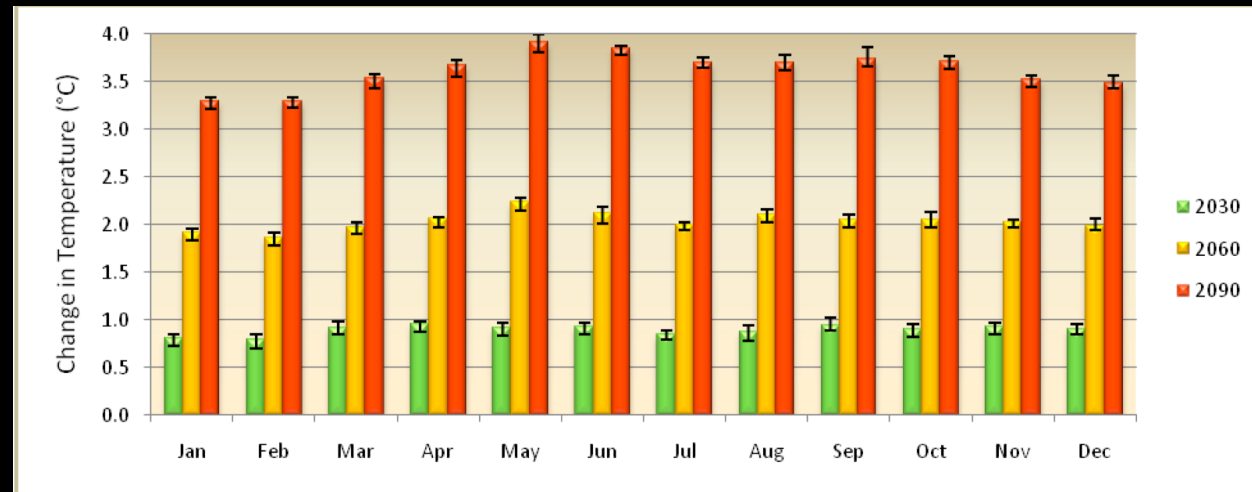
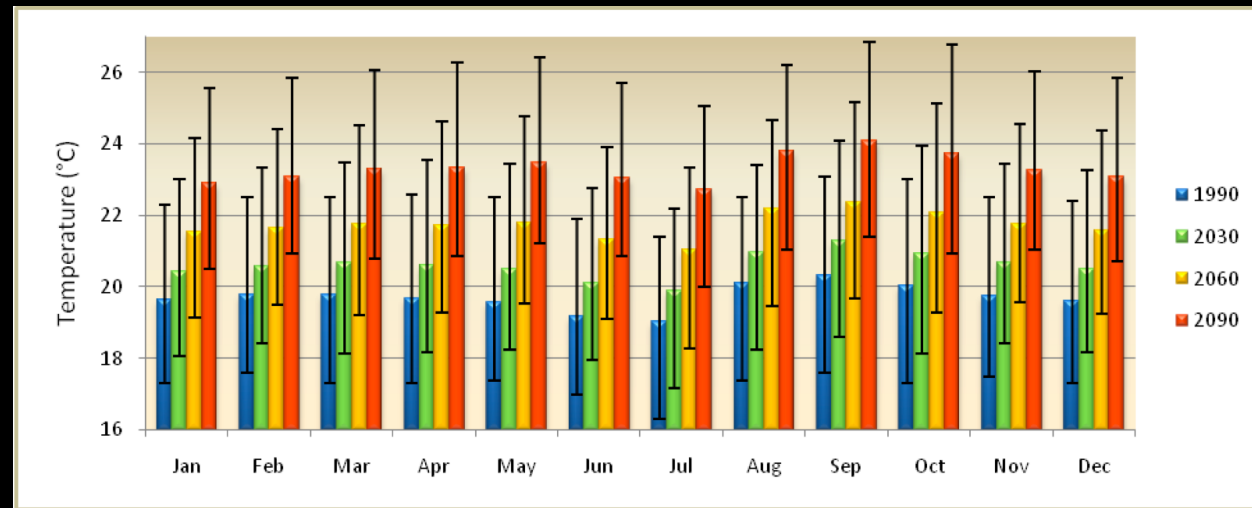
Nyungwe-Kibira: monthly precipitation and change relative to present

- Seasonal pattern remains the same
- Significant rainfall increases Nov-Jan by 2090



Nyungwe-Kibira: mean monthly temperature and change relative to present

- Very little monthly variation at present and in the future
- Temperature increases will be experienced almost equally in all months



Human pressure along park margins

- Will continue to intensify with increasing populations
- Like to become much more intense around NNP as “climate refugees” migrate to highlands to sustain food sources and livelihoods



The Boundary of Volcanoes National Park, Rwanda

Fire at Nyungwe

- Most fires are anthropogenic.
- Fires that originate during the dry season from June through September can become very intense crown fires.
- A substantial amount of the forest (nearly 13,000 ha, or 12% of the national park) was lost to wildfires in 1997, which completely removed above-ground vegetation.
- Fire likely to be severe as temperature increases

Fire prevention and management

- 1) Strategy for Fire Prevention
- 2) Develop an Early Fire Warning System
- 3) Refine a Firefighting Plan
- 4) Create a Fire Revegetation Plan
- 5) Develop a capacity Building Plan for fire prevention and management
- 6) Create associations of illegal forest resource users (beekeepers, ex-poachers)



Nyungwe buffer zone concern



Tea accounts for 34 % of national export in Rwanda

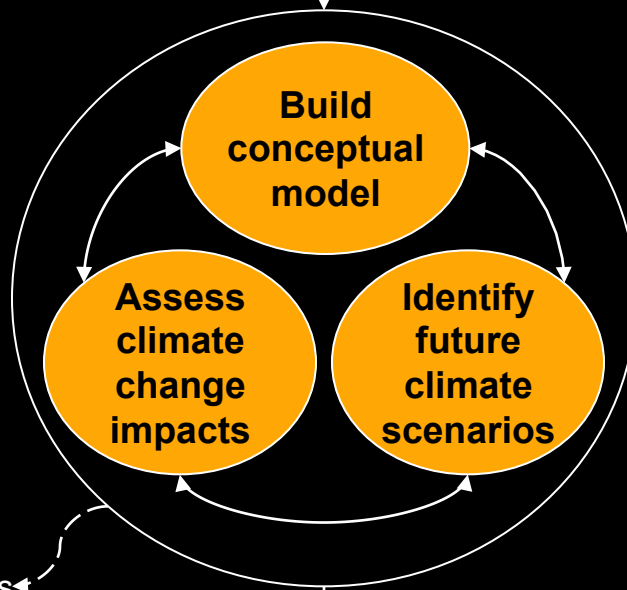
Water resources management

- Water is the primary medium through which climate change influences people's livelihoods and well-being.
- What are likely to be the impacts of climate change on Nyungwe hydrology?



Adaptation planning phase

Select conservation target and
Define management objective



Identify intervention points
and management actions

Evaluate actions

Repeat for:

- more information
- more targets
- more objectives

Implementation and efficacy evaluation phase

Monitor and
evaluate action
plan efficacy

Implement
action plan

Develop
action plan

Cross et al, *in review*