

*Building Consensus on Albertine Rift Climate Change Adaptation for Conservation:  
An outreach Workshop to share Results of New Modeling and Vulnerability Assessments  
La Palisse Hotel, Gashora, Rwanda, 22-25 February 2011*

# **The Implications of Global Climate Change for Mountain Gorilla Conservation in the Albertine Rift**



*Augustin K. Basabose and Eugene Rutagarama  
International Gorilla Conservation Program*



# Introduction

- The Virunga - Bwindi region hosts the world's only remaining population of mountain gorillas (*Gorilla beringei beringei*), one of the most **critically endangered** species on earth. This population of just over **780 mountain gorillas** lives within a restricted habitat and is likely to be particularly **vulnerable to the effects of climate change**.

Thanks to MAF Fund, AWF-IGCP initiated the project  
in close collaboration with EcoAdapt

## Need for

- A gorilla-specific assessment of the vulnerability of the habitat and range of the species to climate change.

## And

- A climate change response plan available to all stakeholders that includes suggested adaptation strategies and means of reducing non-climate stresses.

# Project Overview

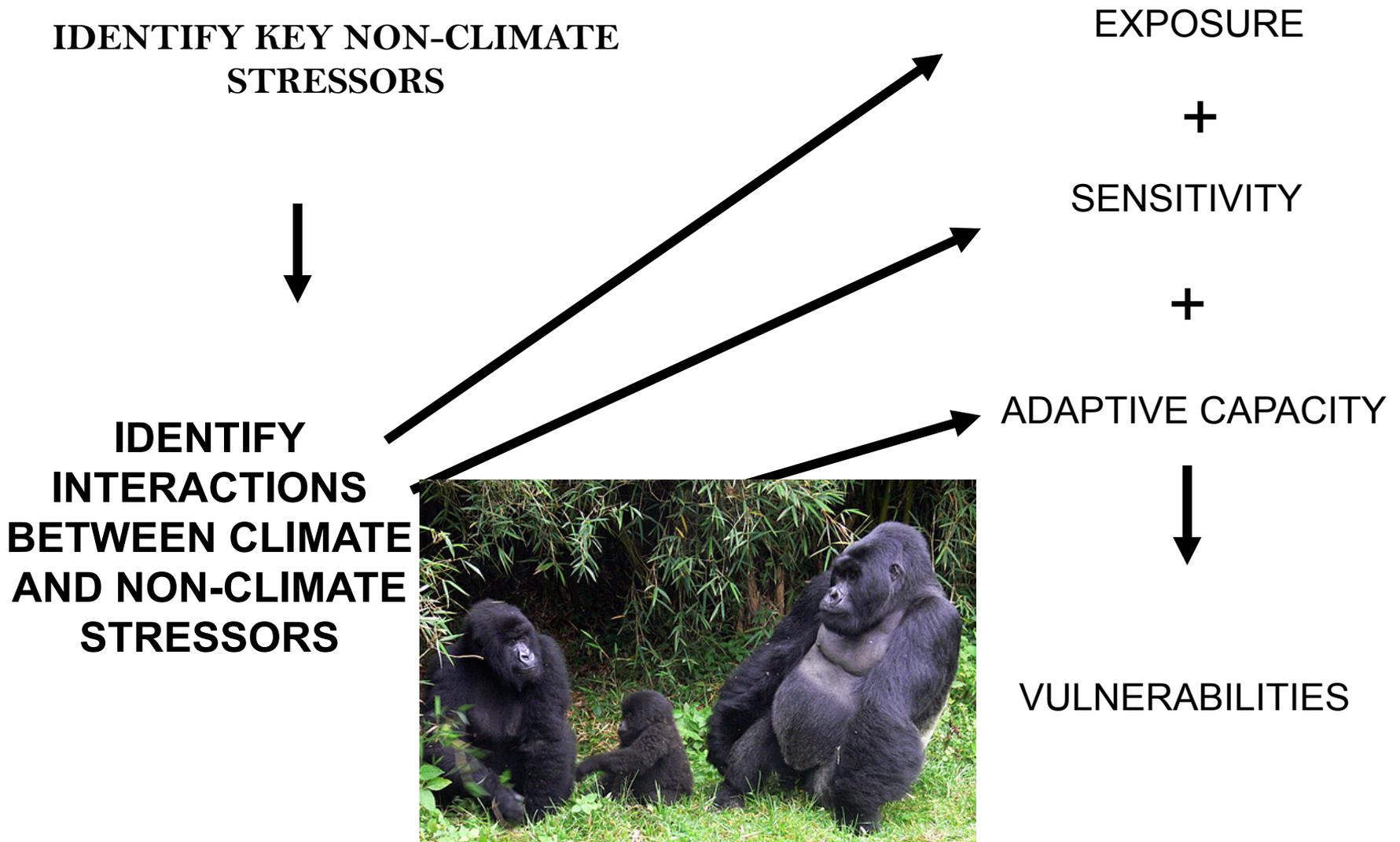
- **18 months MacArthur funded project**
- **Jointly implemented by AWF-IGCP-EcoAdapt**
- **Objective:** To provide a detailed review of the key elements in understanding mountain gorilla vulnerability to climate change. To propose **ideas for adaptation** to climate change specifically to **reduce** mountain gorilla vulnerability.

# **AWF-IGCP-EcoAdapt project Goal**

**To reduce the vulnerability of mountain gorillas to the negative effects of climate change**

- **By understanding its effects on gorillas, their habitat and all necessary resources.**
- **By using this new understanding to inform new conservation guidelines and management plans.**

# VULNERABILITY ANALYSIS, INCLUDING INTERACTIVE EFFECTS



## Example:

Activities	Pressures/Threats	Adaptation Suggestions
<b>Crop Raiding</b> <b>•Gorilla</b>	<ul style="list-style-type: none"><li>•Trend is increasing but current threat is low</li><li>•<b>Likely to increase with climate change</b></li><li>•Community attitudes will become negative with increased pressure</li></ul>	<ul style="list-style-type: none"><li>•Unpalatable buffer crops</li><li>•Encourage compatible landuse practices</li><li>•Feasibility study on options for addressing crop raiding</li><li>•Relocation of people?</li><li>•Feasibility study on electric fencing</li><li>•Communal buffer zones of unpalatable crop (eg tea)</li></ul>

# Climate and species distribution modeling in Gorilla habitat

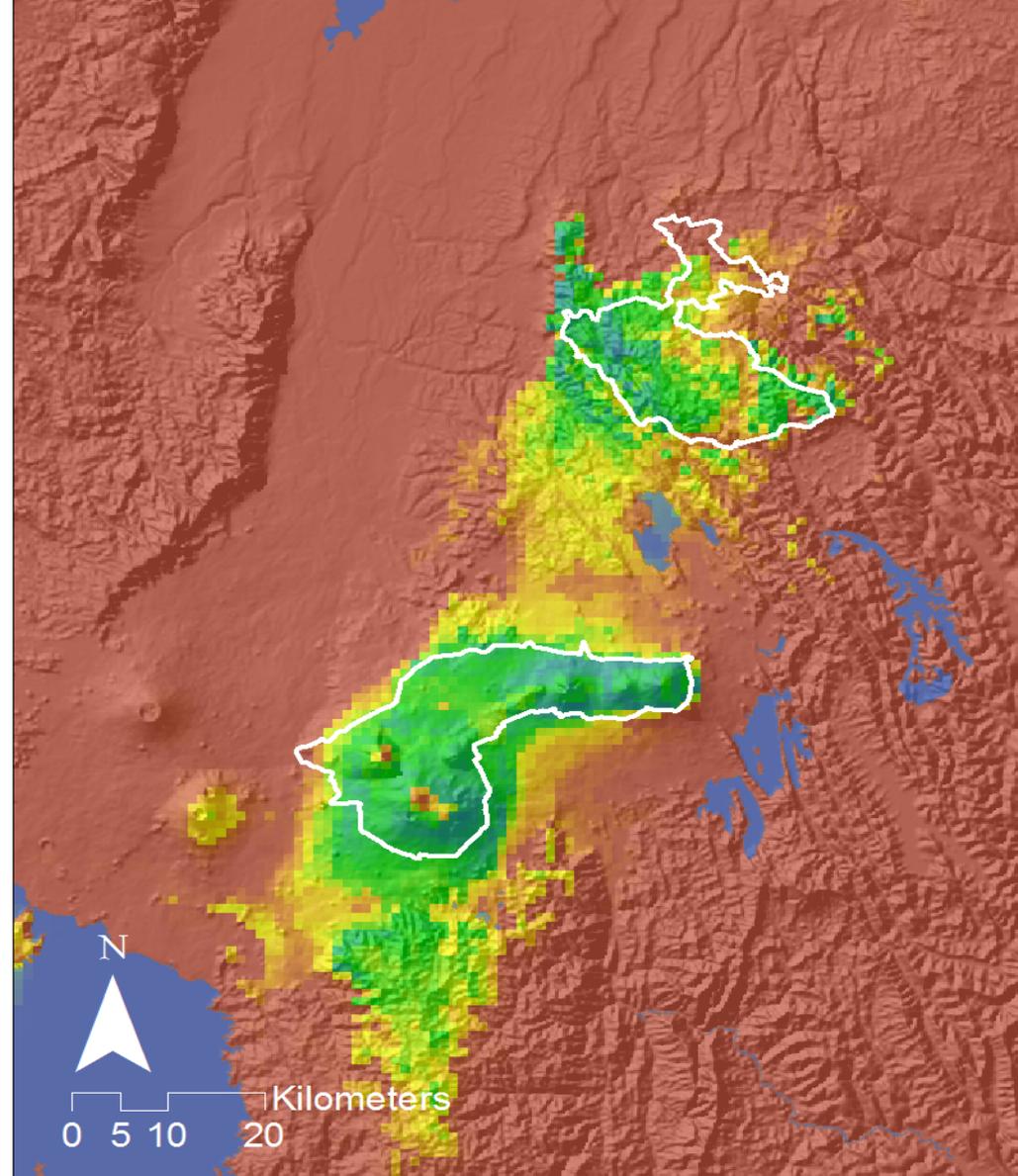
## *Climatology (Dr. A. Seimon)*

- Although climatic trends were identified by the large scale modeling and by observations at several weather stations in the area, it was difficult to state with certainty the timing or intensity of changes in local climate over the next century.
- The limited availability of **long term local weather data** makes finer-scale climatic projections for in this region extremely difficult.

*2 Topographic and  
4 Net Primary Productive current*

Species distribution modeling was performed using advanced GIS modeling methods using the current distribution of mountain gorillas as a baseline and to define suitable mountain gorilla habitat

**The models projected the availability of gorilla habitat at various times in the future.**

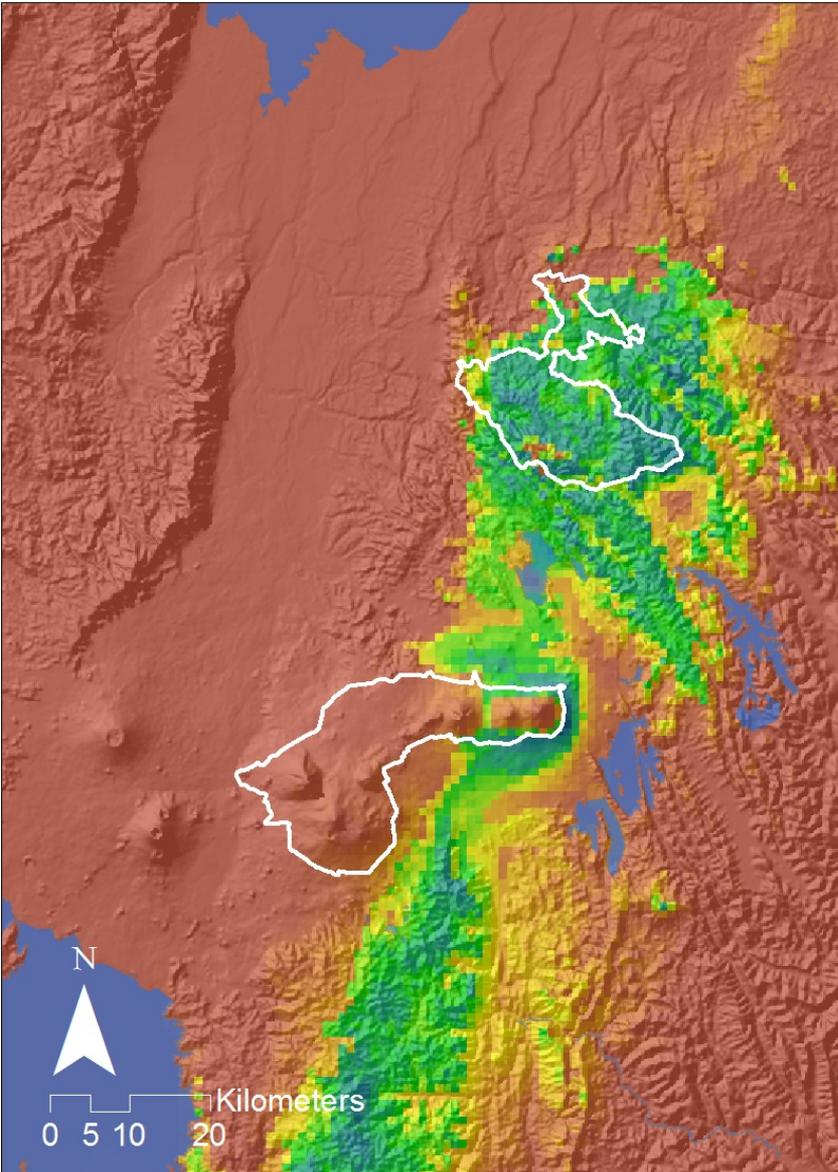


**Current mountain gorilla suitable habitat**

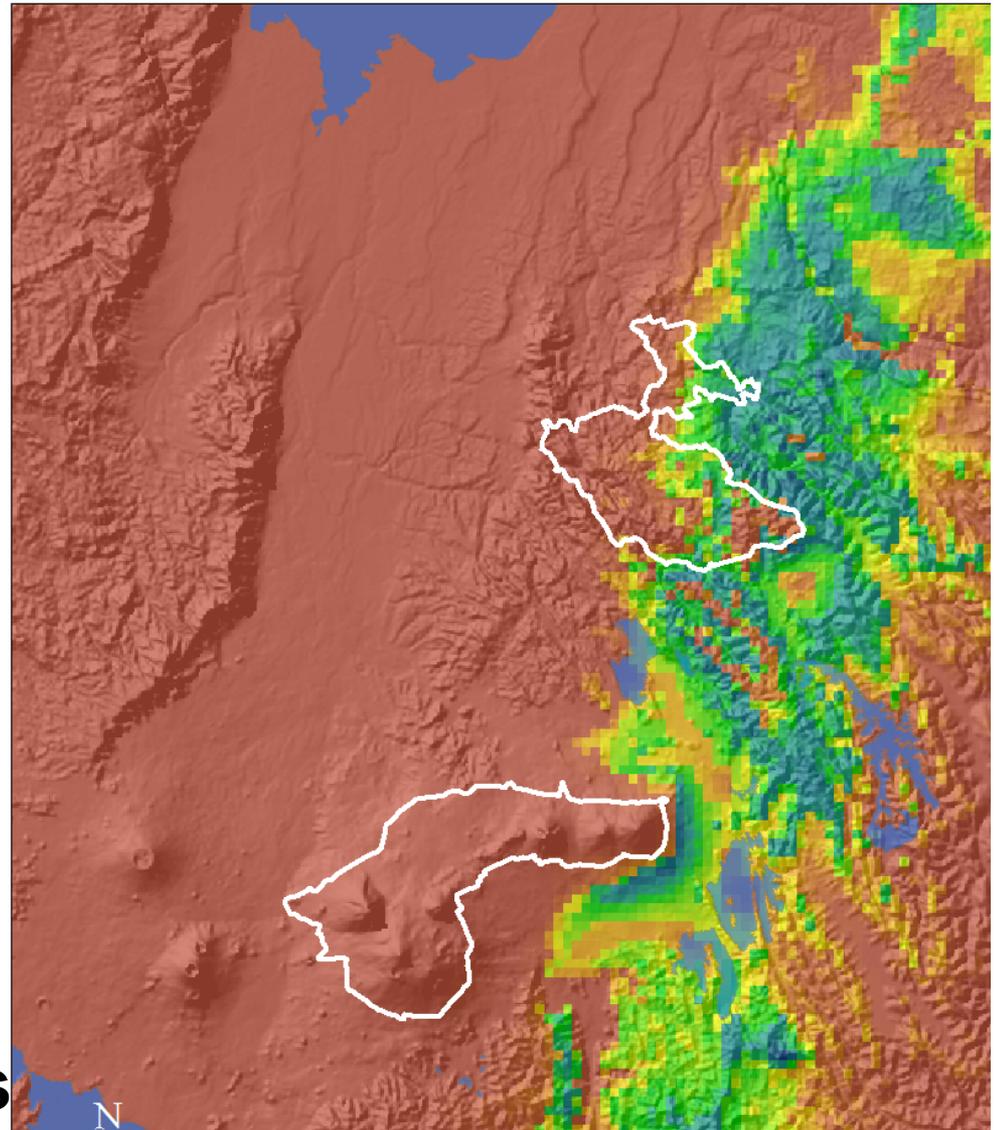
**@ Jim Thorne, University of California**

*A1B Scenario Miroc ; Modeling Group  
50 and 90 year 2 Topo + 4 NPP*

**@ Jim Thorne, University of California**



**In 50 Years**



**In 90 Years**

# ***Mountain Gorilla distribution (Dr. Thorn)***

- **There were extreme disparities among results from different models, ranging from no remaining gorilla habitat in 90 years, to extremely small patches of the current range only, to moderately sized patches overlapping with the current distribution.**

# ***Mountain Gorilla distribution (Dr. Thorn)***

- Using the current distribution of mountain gorillas to indicate the bioclimatic tolerance of gorillas or of vegetation where they live is not representative of the underlying truth.
- Gorillas only occupy a small fraction of their former range; the range reduction is very recent and a result of human activities rather than habitat selection or tolerance by gorillas.
- **The main reason for the extreme results seems to be the limits of the data available for the model runs.**

- **Research and monitoring suggestions were explored and prioritized to address the data gaps, where possible.**

# Project achievements

- Comprehensive vulnerability assessment for mountain gorillas
- Jointly developed **climate change response plan** including suggested adaptation strategies and means of reducing non-climate stresses
- [Copy of CombinedAdaptationAppendixMergedCells.xls](#)
- A knowledge base that will feed into future efforts to strengthen climate change planning within conservation planning and adaptive management.

# Project achievements (cont.)

- Stakeholder buy-in and joint participation in the process and commitment to implement recommendations
- Coalition-building among authorities, NGOs, researchers, and other stakeholders
- Capacity-building among stakeholders about climate change adaptation and the stakeholder approach

# Few preliminary conclusions/ Recommendations

- This effort is great progress, but all participants recognized it is preliminary
- Success will depend on revisiting the questions with more information, data, and modeling results
- Need to do another round of modeling including all the data that came forward at the workshop
- **Need to institute new monitoring and research initiatives immediately to inform ongoing adaptation efforts**

# IGCP Follow up climate change related programs

- (1) Establish a network of weather stations in mountain gorilla habitat.

To record weather data and have a good understanding of climate change impact at micro-habitat level of the mountain gorillas.

- (2) Set up monitoring of plant phenology.

Plant phenology is likely to be greatly affected by climate change, and may have a large effect on gorilla transition ability, or sustainability.

# Why Weather stations in Mt Gorilla Habitat?

1. There is a **lack of climate data** in the protected areas which restricts parks' ability of climate related disaster prevention and reduction.

# Why Weather stations in Mt Gorilla Habitat?

2. Automatic weather stations close to mountain gorilla habitat will help to **better understand the impact** of climate change (variability) at micro-habitat level and interpret the changes in behavioral ecology of mountain gorilla in relation to climate variation: e.g. **Ranging and feeding patterns**

# Why Weather stations in Mt Gorilla Habitat?

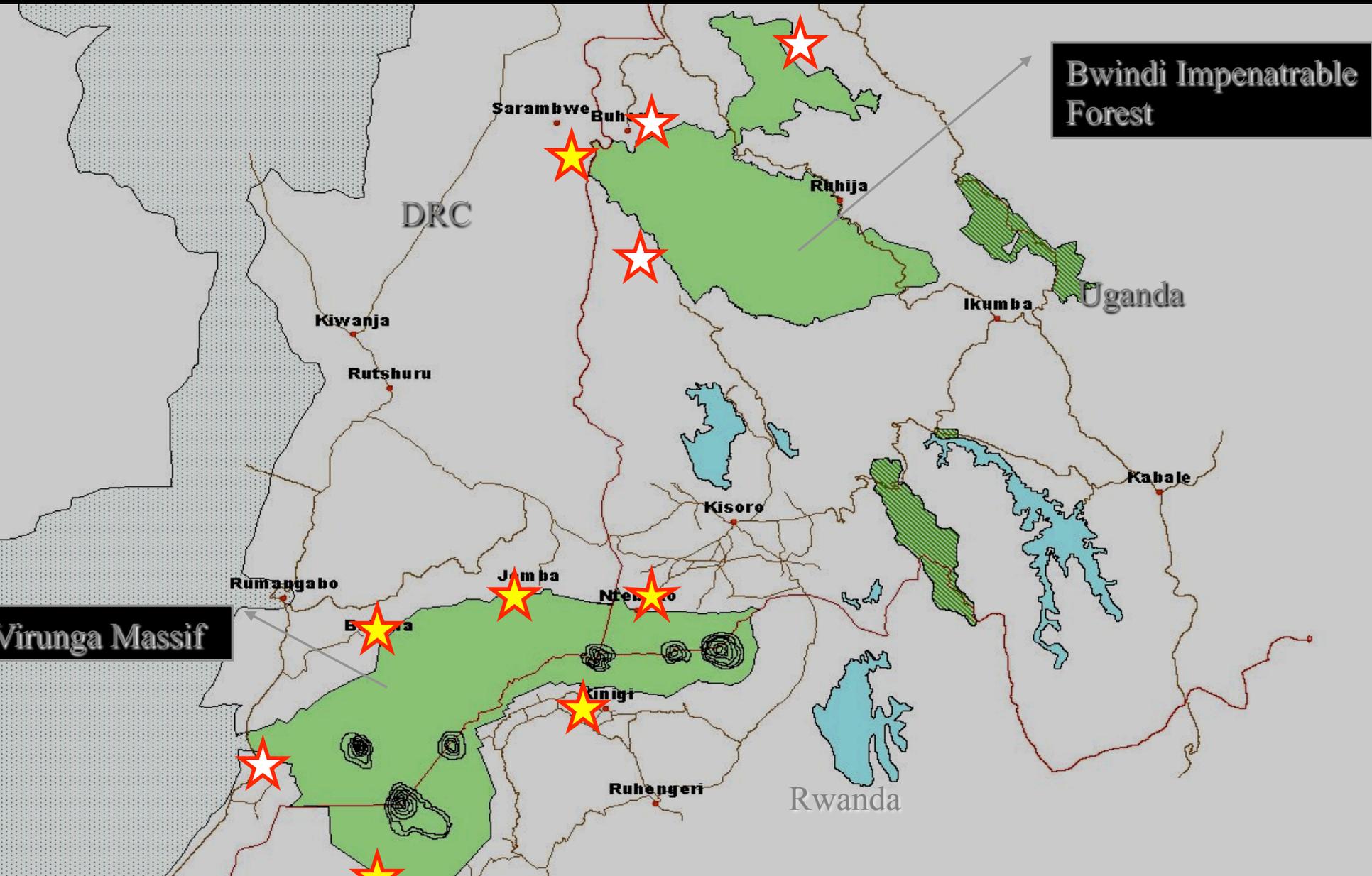
3. With the automatic weather stations in proximity to mountain gorilla habitat, climate change will be **forecasted** and its negative impact on biodiversity, including the endangered mountain gorilla, **mitigated substantially**.

...little is yet known about the likely impacts of climate change on the mountain gorilla...



**Mountain gorillas may (?) shift their range from low-altitudes to higher (cold) altitudes**

# Automatic Micro stations in mountain gorilla habitat in the Virunga-Bwindi Landscape





**Functionality of the automatic weather stations in mountain gorilla habitat is successful**



# Climate data available

The installed automatic weather stations are very **easy to operate**, recording climate data every 30 minute changes in the weather, and data are stored in the station's data logger and kept for several months and can be later downloaded using a computer for analysis.

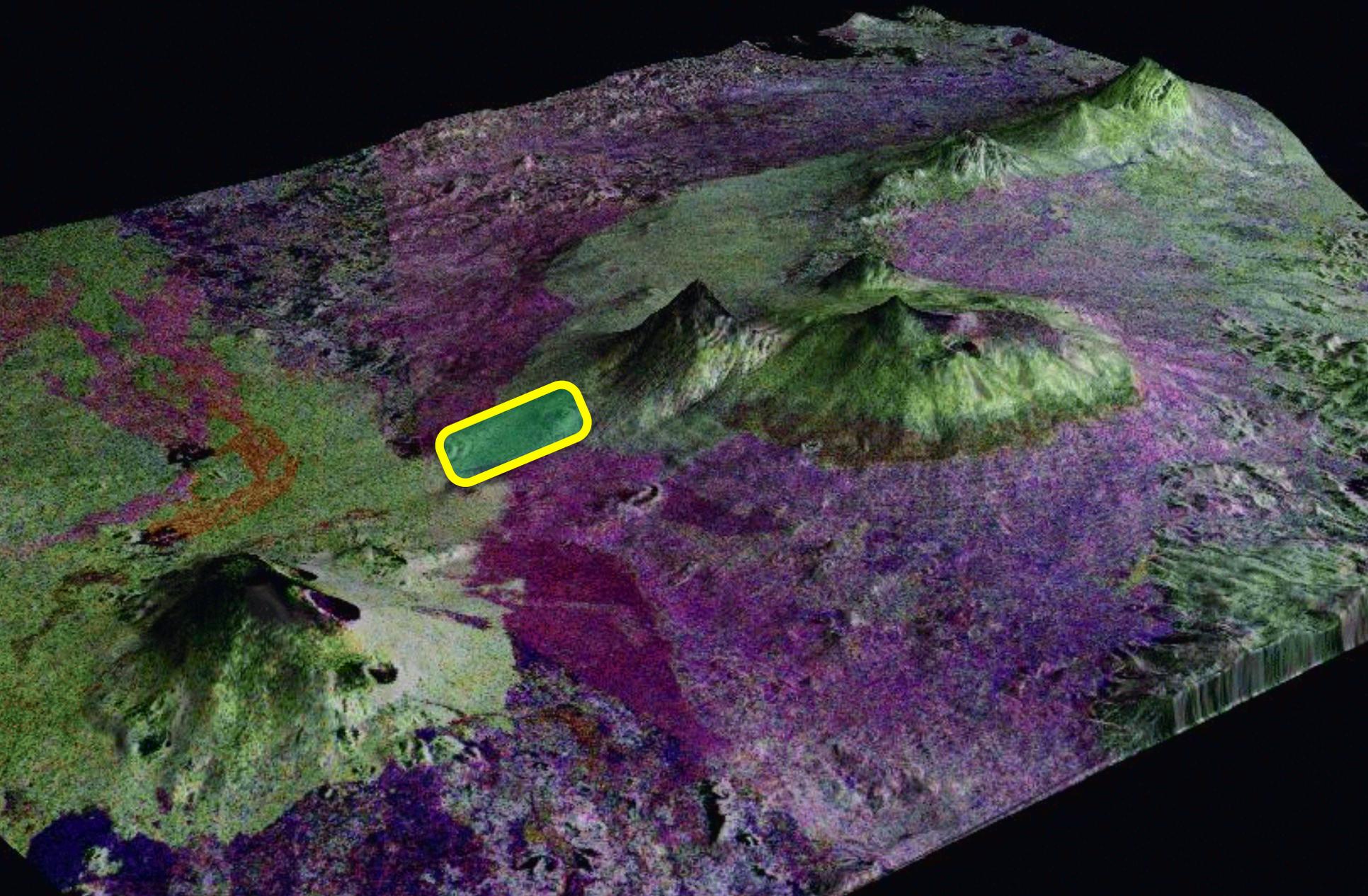


Data

# 2. Monitoring Plant Phenology

- The overall objective of this program is to **investigate** the impact of variability of climatic factors on **spatio-temporal distribution** of mountain gorilla **foods** (**at different altitudinal layers**) and therefore its impact on the Mountain gorilla **behavioral ecology**

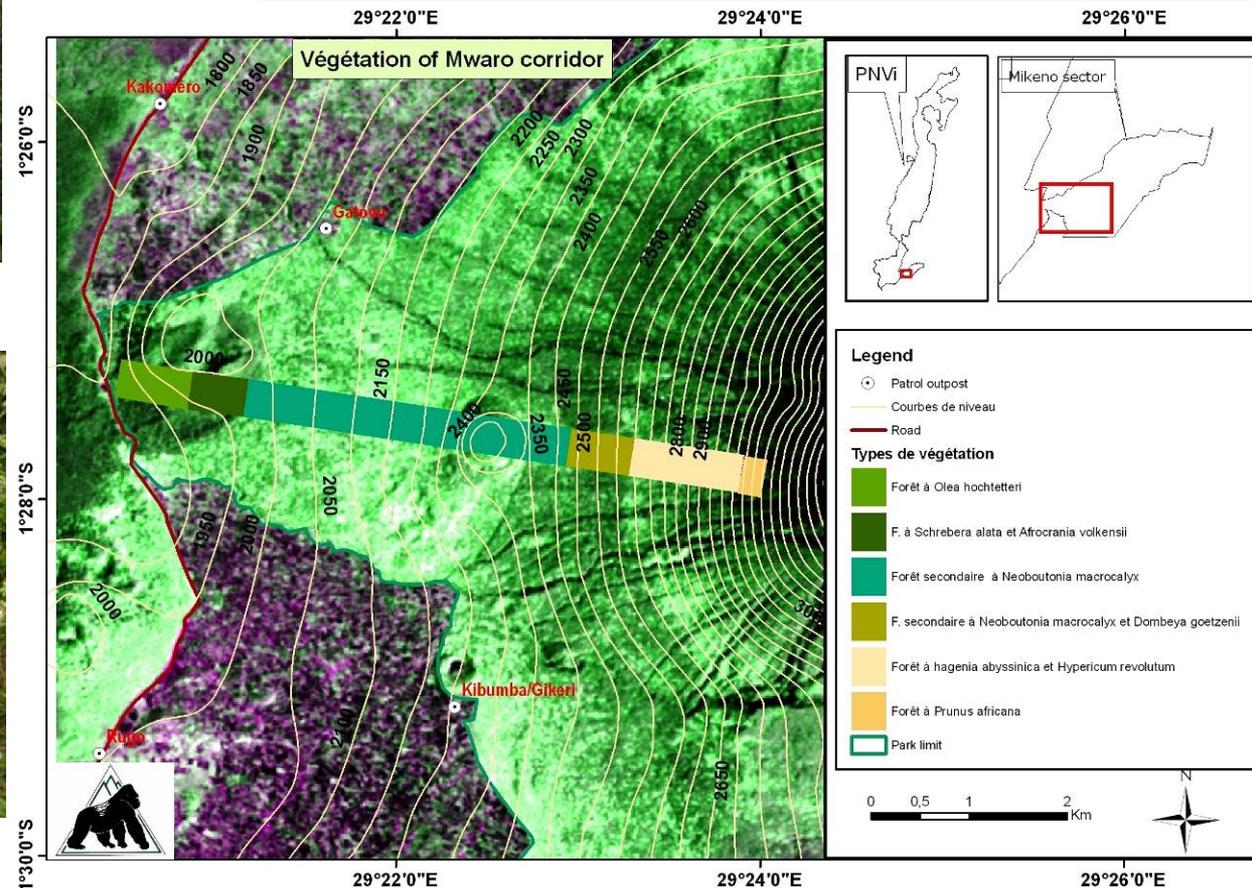
# Mwaro coridor

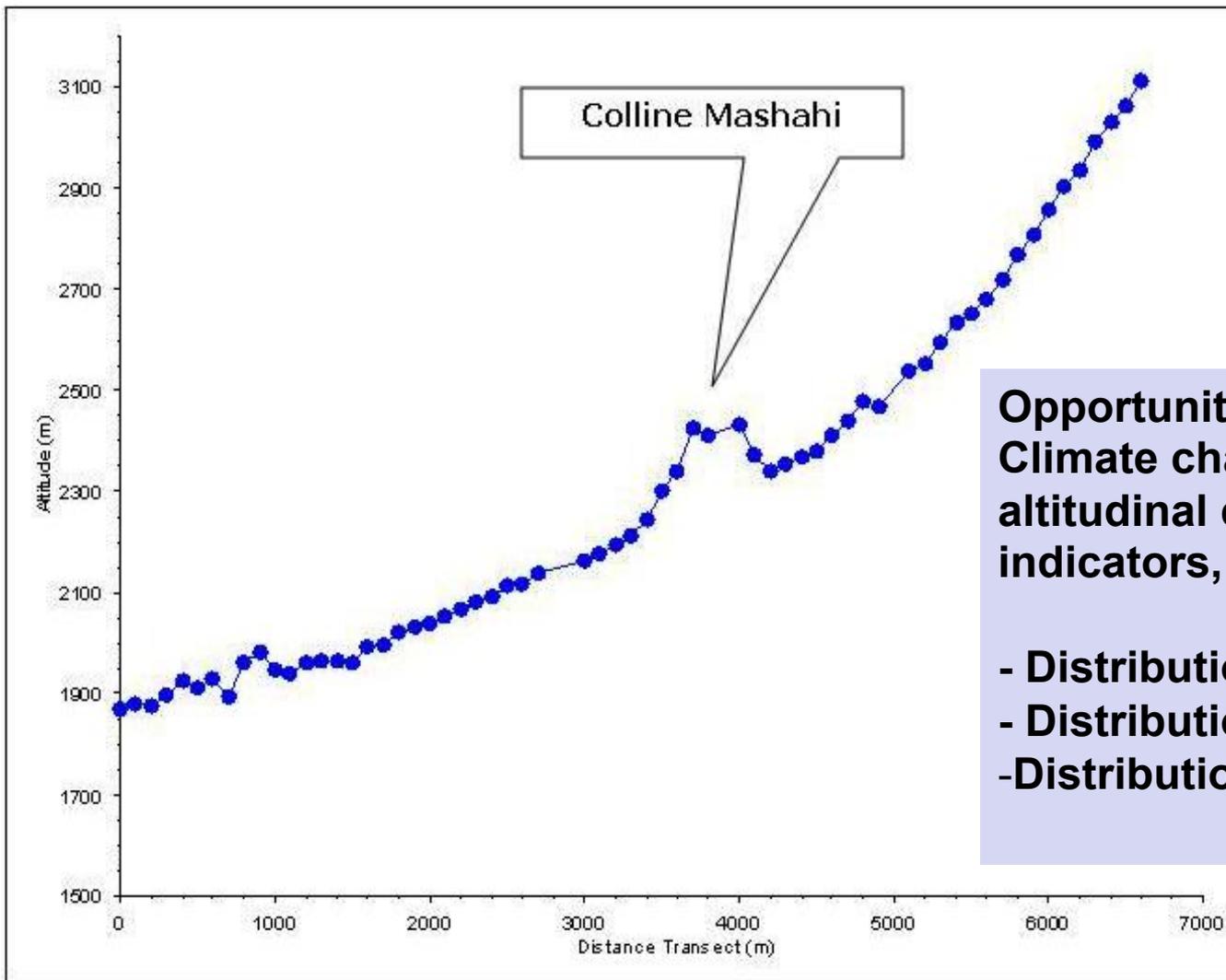


# 1-ha permanent plot and 7 Km line transect



To obtain sufficient and sustainable data on the seasonal change of flora and fauna in Mwaro ecological corridor





Opportunity to assess Impact of Climate change on the altitudinal changes of biological indicators, e.g.:

- Distribution of **lichens**
- Distribution of **small mammals**
- Distribution of **amphibians**

### *Topographic shape of Mwaro ecological corridor*

• **These Taxa** and others are **Highly valued ecological indicators** known for their sensitivity to a wide variety of environmental stressors like air quality and climate change.

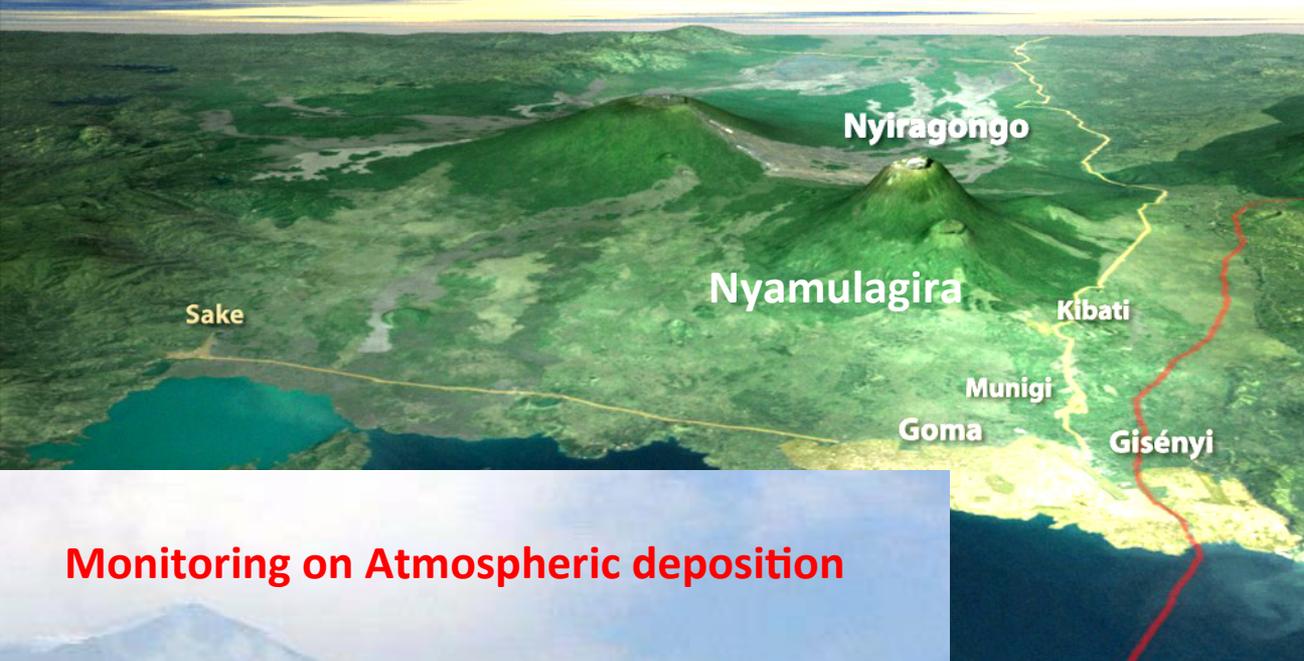
# How to assess impact.....?

To elucidate the impact of climate change, results from both long term monitoring and rapid assessment programs will be compared to those of studies conducted in the same region **three** or **four decades** before.

## Area for future interest:

### Monitoring on Atmospheric deposition

- Atmospheric depositions of chemical elements impacting on plant phenology, and therefore on mountain gorilla food availability and ranging pattern
- Atmospheric CO<sub>2</sub> concentrations to determine potential impact of **biomass burning** and **volcanic emanation** on atmospheric chemistry within mountain gorilla habitat



## Monitoring on Atmospheric deposition



Permanently emanating dangerous smoke may threaten mountain gorilla health as well, though no evidence of such risk has been seen so far.

## Monitoring on the impacts of Atmospheric deposition



**Destruction of plants by volcanic ash in the vicinity of Nyiragongo Volcano**  
*The combination of  $SO_2$  with  $H_2O$  gives **acidic rains** burning plants*

# Conclusion

- Overall, the AWF-IGCP-EcoAdapt joint project has assembled and disseminated what is known about mountain gorilla vulnerability to climate change. Partners and participants contributed their vast, and often subtle, knowledge of the biology and conservation issues surrounding this question, and made great steps in proposing ideas to reduce the gorilla's vulnerability.

# Conclusion

- A **White Paper**, describing the mountain gorilla vulnerability to climate change and proposed adaptation strategies is in its final stage to be printed and will be distributed soon.

**Thank you very much for your attention**



# What is Adaptation?

**Mitigation**: “Anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases”

**Adaptation**: “Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities”

Methodologies to reduce vulnerability, but also.....

A new framework, perspective or philosophy for thinking about things