

Figure 3: Homesteads of individuals who own land in the Gap are located away from it, and from other forest edges.

## Land Use Patterns Findings

Smallholder land use patterns are complex in East Africa given the sheer number of actors making decisions in a given land area. The Gap, though measuring only 3 km<sup>2</sup>, has nearly 300 land owners in it, whose landholdings average 0.2 Ha in size. These plot owners don't live at their Gap plots, since each has at least one other plot that has their homestead (see image on the left.) The plots located in the Gap tend to be planted with trees if the farmer has enough land to grow food elsewhere. Farmers plant trees as a response to market demand but also as means to address wildlife damage to crops.

## Ecological Findings

We surveyed the Gap for tree seedlings, and recorded highest diversity and abundance of native tree seedlings in the human-use section of the Gap. The northern, protected side has aggressive grass (average height: 2m) and sparse trees. The grass may be playing a role in preventing native seedlings from taking hold. In the southern, human use section, the farmers actively suppress the grass in order to help their tree woodlots. That practice could partially explain the higher success of seedlings in the southern gap.



Figure 4: Surveying for tree seedlings in tall grass (note the two field researchers for scale grass identified as *Hyparrhenia rufa*)

## History of Forest Cover Findings

The archival research for aerial photographs enabled by this grant provided crucial insights on historical forest cover that were a revelation to the Southern Highlands Conservation Program partners. The assumption that the Gap was a contiguous forest especially in the Northern section, deforested in the past four to five decades was unsupported. The northern Gap has been without cultivation and without forest cover for more than six decades (Figure 5a) whereas the southern Gap had connected forests that were cleared for agriculture. Interviewees recalled the clearing taking place in the 1950s. The kipunji has therefore faced decades of habitat fragmentation, making connectivity a more urgently needed solution.



Figure 5a: Bujingijila Gap: 1949

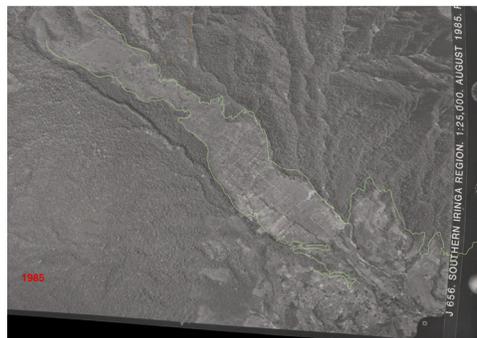


Figure 5b: Bujingijila Gap: 1985



Figure 5c: Bujingijila Gap 2014



Figure 6: Fields of maize against Rungwe forest, with a scarecrow holding an umbrella in the foreground.

Our work highlighted that farmers would prefer to place their crops away from forest edges, if they have the option. Observing food plantings right next to the forest edge (as pictured on Figure 6) indicates lack of alternative options: the individuals placing their crops at a zone with such high crop raiding pressure may not have other land further away from the forest edge on which to plant food. They also might not have the resources to invest in alternative crops such as trees or tea.

## Native Trees in Exotic Woodlots

A major surprise finding in this study was the presence of native tree seedlings in more abundance and diversity amidst the exotic tree woodlots. A possible challenge for ensuring survival of native seedlings amidst plantation trees is the management style (ie, whether the underbrush are continually cleared) and the damage to the native seedlings during tree harvesting. This finding, however, presents an unusual opportunity for connectivity, where the native tree regenerants could be tended with the woodlots as part of a restoration effort. Its incorporation should be considered.

## Wildlife Habitat Use Observations

During our field work, we set 3 camera traps for a period of 24 days. Originally, we intended to capture whether any non-human primate, specifically the kipunji walks amidst the tall grass, crossing the gap. We did not manage to document such evidence, apart from personal sightings of Moloney's monkeys and black and white colobus monkeys in trees at the edges of the gap. We did, however, obtain several cameratrap images of bushpigs (Figure 7). These images were a fascination in the community especially among younger individuals. Farmers experience crop damage from bushpigs but many had no idea what they look like.



Figure 7: Bushpig image from a camera trap set over the course of our field work



Figure 8: A eucalyptus woodlot that served as our base camp. Moloney's monkeys and black-and-white colobus were frequently observed in the woodlot

To conservationists, the prospect of conserving an endangered species with an exotic one is an uncomfortable premise. Yet the landscape around Rungwe and Livingstone mountains is a complex mosaic of people use, and the prospect of removing people land use from the Gap is equally uncomfortable. The woodlots should be considered a transitional solution: since local land use seems to be creating preferable outcomes for connectivity in the short term, it is worth exploring further the long-term behavioral implications of unusual habitats (see Figure 8) and considering the place of human land use in conservation planning.

## Woodlots and Primates

# Training, Future Actions and Publications

Kimambo | kipunji | CBOT



Figure 9: Field Work with rising conservationists (Pictured: Mbugi, Huruma, WCS volunteer)

## Enduring Collaborations

This work included on-site collaborations from senior and rising conservationists at the Southern Highlands Conservation Program. The work provided an opportunity for both senior and rising conservationists to learn about new tools for field data collection and management, particularly using the Open Data Kit, GPS and modern camera traps. The work proved particularly pertinent for Ms. Mbugi (Pictured in Figure 9) as she was a recent university graduate with limited field experience.

## Future Actions

Protecting endangered Kipunji is a triage task. Conservationists need to consider all available options; particularly incorporation of smallholder land use. Tree planting is a land use trend that can be compatible with connectivity improvement and habitat creation. Careful planning that ensures that the native seedlings found in the exotic woodlots are safe during harvesting, can assist in transitioning the gap into a successful mixed-use corridor that serves both wildlife and people. Further research is necessary on the effects of woodlots and other human landscapes on the Kipunji and other arboreal primates in the region. Our opportunistic observations suggest that the primates have some tolerance to these landscapes and at least use them for travel. Woodlots, however, can never substitute for native habitat, therefore it is still important to consider long-term plans where core habitat is carefully protected.



Figure 10: Setting camera traps that enabled observations of wildlife that use the Gap. (Pictured: Kimiti, Sylvanus, WCS Field researcher & Mbugi, Huruma, WCS volunteer)



Figure 11: Bujingijila field research team

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## Upcoming Publications

IN PREPARATION: Kimambo, N. E., & Naughton-Treves, L., Connecting Forests in Densely Settled African Highlands via Native Tree Regeneration, Tree Planting or Woodlot Development.