

Collaborative Models for Adaptive Conservation in the Ethiopian Highlands

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Collaboration Can Help Solve 'Wicked Problems'

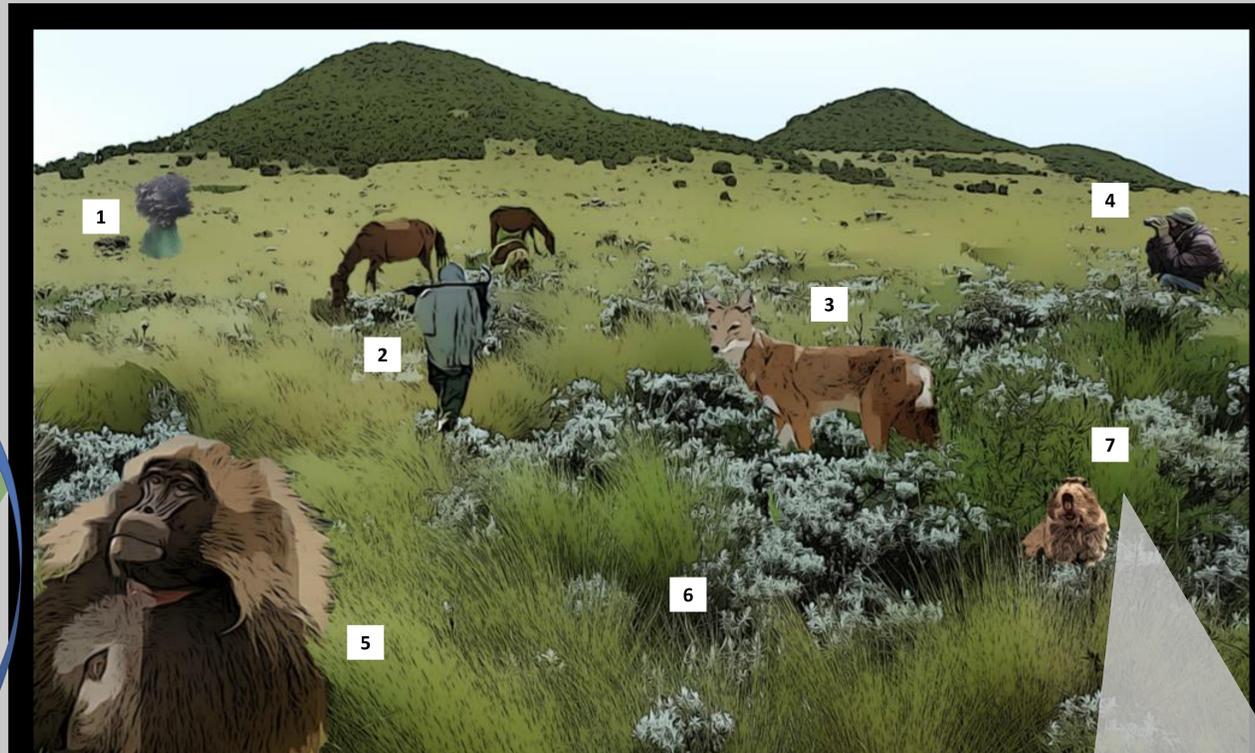
In a rapidly changing world, human communities struggle to address complex environmental 'wicked problems'¹ that are multidimensional, without clear definitions or solutions, and which require collaboration between actors with potentially conflicting objectives.

Collaborative governance – where diverse stakeholders work together to make decisions – can improve the management of increasingly uncertain social-ecological systems by fostering trust, learning, and structured dialogue between resource users, researchers, and various public and private entities².

Modeling is used to encourage collaborative governance³, yet little research has been done to measure the impacts of this process on local ecological knowledge and related cultural models (i.e., the beliefs, norms, and values surrounding human-environment relationships)⁴.

A Changing Social-Ecological System

The Guassa area has undergone considerable social and ecological change over the past 40 years⁷, resulting in an on-going process of shrub encroachment that locals identify as the primary threat to sustainability. The area is named after the guassa grass (*Festuca* spp.) that is highly valued by local communities for its use as thatch, rope, construction material, and forage. Shrubby *Helichrysum* species populations are increasing in Guassa, though the mechanisms of competition with *Festuca* are not yet well known.

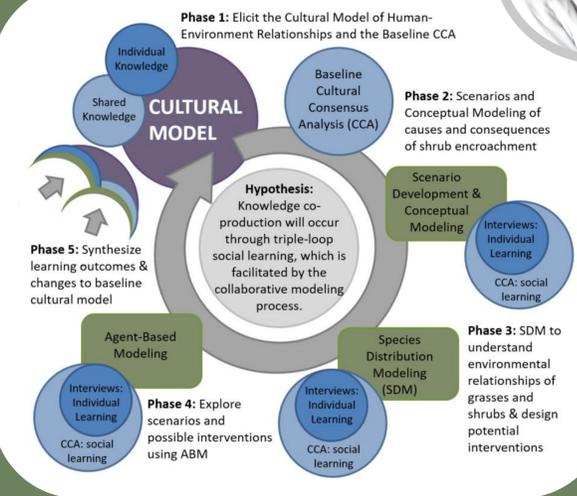


- 1 Women historically collected firewood in the Guassa area, but that practice has been banned since 2010. They now harvest at night to avoid fines.
- 2 Before 1974, wet season grazing was allowed every 3-5 years according to a traditional management system. The area was then heavily grazed from about 1980 – 2000. Now grazing is banned entirely since 2010.
- 3 Ethiopian wolves (*Canis simensis*) is endangered, and the Guassa population has attracted national and international attention. They primarily feed on rodents, some of which are sensitive to firewood harvesting⁸.
- 4 Tourism promoted as an alternative source of income that promotes conservation goals. FZS established the tourism office in 2012. All proceeds from the tourism program go directly to local communities.
- 5 Gelada monkey (*Theropithecus gelada*) diets consist of 90% grass, notably *Festuca*⁹. Dr. Peter Fashing and students have been studying Guassa geladas for over a decade from a long term base camp inside the area
- 6 *Festuca macrophylla* is an endemic grass with unique strength and size, and *Helichrysum splendidum* is considered its primary competitor – a shrubby forb with no utility to humans or wildlife.
- 7 Activity from the common molerat (*Tachyoryctes splendens*) and other rodent species, soil erosion and deposition, and resource heterogeneity from vegetation spatial patterning are thought to produce *Euryops*-dominated mima mounds¹⁰, which may also threaten the *Festuca* grasslands.

"15-30 years ago there was no nachillo. Maybe you encountered it every 500 meters or so. We don't know why it is spreading now, so quickly. Our parents used to pull it out by hand...But they stopped during the Derg."



Research Design



Broader Impacts

International
The project will advance the transdisciplinary methods and procedures of the Mountain Sentinels Collaborative Network (NSF award #1414106). They are a global team of mountain researchers and practitioners studying mountains as critical sentinels of climate change.

U.S.
The project has enabled PhD student Cara Steger to develop critical skills in proposal writing and project management. The project also prioritizes involvement from underrepresented groups in STEM, and strengthens international partnerships for future research and education.

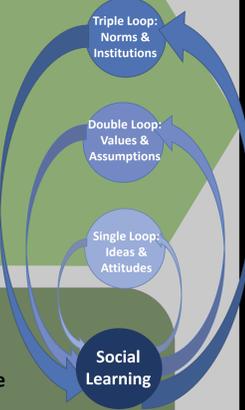
Ethiopia
Models developed during this project will be turned into case study tutorials for the Evangelista Lab's website "Geospatial Lessons and Applications in Natural Resources: Online resources for Ethiopian practitioners" (NSF award #1313728)

Guassa
This project was co-designed with key members of the Guassa management team to ensure it met the needs of local resource users. The modeling exercises are designed to improve understanding of shrub encroachment while expanding participants' ability to visualize, anticipate, and adapt to changing environmental conditions.

"Guassa is our clothes, our food, our everything, and we want it to be well-protected."

How does modeling impact social learning in a cultural landscape?

My research investigates the cultural and cognitive changes that occur when participants engage with a scientific modeling process. This study is designed to clarify and measure the three loops of social learning⁵.



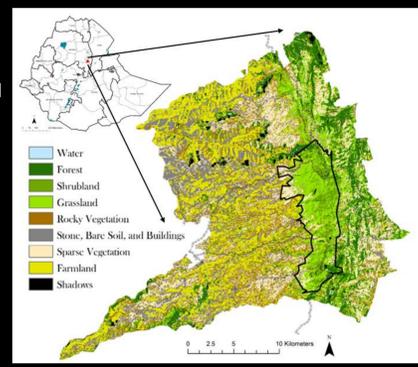
Intellectual Merit

By repurposing theory and methods from cognitive anthropology⁶, this case study has potential to:

- advance our conceptualization of knowledge co-production and the measurement of multiple-loop social learning
- contribute to the development of more empirically-informed theories of collaborative environmental governance, and
- inform the study and management of adaptive and resilient social-ecological grassland systems worldwide.

Guassa Community Conservation Area

Guassa straddles the catchment basins of two major rivers in East Africa – the Blue Nile and the Awash – and its conservation is critical to the health and functioning of those headwaters. Guassa itself (outlined in black) is only about 100 km², but the nine communities that manage and utilize the system occupy an area roughly five times that size in the surrounding landscape. It supports a population of about 45,000 people, nearly all of whom are of the same ethnic and religious group.



A Collaborative Research Team

Collaborative research produces a nuanced understanding of the problem, allowing for solutions that are culturally appropriate and thus more sustainable. However, it is also a very time- and labor-intensive process, requiring long-term collaborations between diverse groups of people.

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References: (1) Chapin et al. 2008 *BioScience* (2) Innes and Booher, 2010 (3) Voinov and Bousquet 2010 *Environmental Modeling & Software* (4) Jones et al. 2009 *Environmental Management* (5) Keen et al. 2005 Routledge (6) Romney et al. 1986 *American Anthropologist* (7) Ashenafi and Leader-Williams 2005 *Human Ecology* (8) Ashenafi et al., 2012 *Conservation & Society* (9) Fashing et al., 2014 *American Journal of Physical Anthropology* (10) Ashenafi et al., 2005 *Animal Conservation*

