

The Rufford Foundation Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh	Cole,	Grants	Director

Grant Recipient Details	
Your name	Cara Steger
Project title	Participatory Mapping of Ecosystem Services in the Ethiopian Highlands
RSG reference	19601-1
Reporting period	
Amount of grant	£5,000
Your email address	Cara.steger@gmail.com
Date of this report	March 27, 2017



1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Community meetings to discuss proposed research and solicit community input				During our trip in July/August 2016, we met with the entire Guassa Committee and Tourism Board (55 members), woreda administration, and conservation office. This project was approved during that meeting. We also met with key members of these groups individually to confirm there wasn't any sensitive information that had not come up during the large group meeting. We were assured the mapping project was appropriate and would be useful to them.
Mapping workshops to translate local ecological knowledge into geospatial maps				It wasn't until we actually attempted the mapping workshops that it became apparent that most community members had never seen a map before, and were extremely hesitant to participate in such an activity. We successfully facilitated the production of current maps of resource distribution for men and women in each kebele, but due to time constraints were unable to produce maps of past or future distributions. Instead, we convened group discussions using remote sensing maps to guide us in the discussion of changing resources in the area. Policy makers did not have time to produce maps of their own, but we also conducted group interviews with them about changes and ideal future conditions.
GPS mapping of MGCCA boundary, GPS points of critical habitat and ecosystem services for				The MGCCA boundary shapefile was provided to the research team, along with the boundaries of the kebeles, early on in the project.



each kebele		During our mapping workshops we realised that these files differed from the borders on the ground as perceived by the communities. Unfortunately, we realised this too late to re-map the boundaries with community members, and would like to continue this work in the future. We successfully collected GPS points of critical ecosystems and ecosystem services from inside the conservation area and from the surrounding kebeles.
Supervised land cover classification		Due to civil unrest throughout Amhara and Oromia, our December 2016-January 2017 trip was cancelled and rescheduled for March 2017. Therefore, we only just collected the ground truth data needed to conduct the supervised classification in our most recent visit. We are currently in the process of using these data to produce the supervised maps.
Capstone workshop to discuss similarities and differences across men and women, across kebeles.		The cancelled trip in December- January caused some financial difficulties for the team, as we used up our outside funding to bring Cara to Ethiopia. As a result, we ended up using Rufford funds to pay for Cara's plane ticket in March 2017. Similarly, we found that it was impossible to access all nine kebeles using public transport, and we were forced to hire a private vehicle. Therefore, we did not have the resources left to conduct a final capstone workshop. We have several ideas for how to integrate this capstone workshop into future work in this area.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

Due to escalating civil unrest that resulted in hundreds of deaths, including that of a University of California researcher, the Ethiopian government issued a State of Emergency beginning in October 2016. Just days after the American researcher was killed, Cara arrived in Addis ready to conduct the participatory mapping workshops



and collect GPS ground truth data. However, the Risk Management team at Colorado State University strongly advised us to postpone the trip, which we did. We covered the costs of this cancelled trip from another grant, but that left us without the means to pay for Cara's next plane ticket to Ethiopia. We decided to use Rufford funds to pay for her ticket in March.

Another unexpected difficulty that arose was the absence of Abebe Sinteyu, who left his position as Tourism Manager of the Guassa area in December 2016 for another job in Addis Ababa. He was still able to facilitate some connections to the communities, but he was not able to join us for the field work sessions, which left us as a group of mostly outsiders. This wasn't a major barrier to our research, but we did have to spend extra time getting to know people better to that we could build trust and understanding of our research goals, which slowed down the research process more than we anticipated.

Finally, we were surprised to discover that most people in our mapping workshops were completely unfamiliar with maps. This made them very hesitant to participate in actually drawing the distribution of habitats and ecosystem services. Therefore, we adjusted our workshop by having the research assistants control the writing and drawing, and asking the community groups to point out and describe the relevant resources and features of the landscape. This method was successful, and in the end it was even enjoyable for the communities. However, it did take quite a lot of time (1-1.5 hours), and we were unable to produce hand-drawn maps of the past or ideal future distributions of these resources. Instead, we ended the workshops by bringing out the unsupervised classification maps produced for the workshop, and used them to guide our discussion of how the land and its ecosystem services have been changing over time, and which land covers/services are most desired for the future.

3. Briefly describe the three most important outcomes of your project.

- Using group discussions, we recorded local perceptions of ecosystem services within each of the land use/land cover types described by the communities. We also asked them to rank those ES in order of importance to them. This places our understanding of land use/land cover and ecosystem services within an emic perspective, so we are now able to use words and concepts that are most relevant to the communities in future conversations and workshops about these issues. This improves the salience and credibility of our work for our community partners.
- 2. We conducted semi-structured interviews with key informants, group discussions, and structured pre- and post- workshop interviews with individual participants in order to understand how locals conceive of the land changes in the region over time, and their causes. These multiple methods of eliciting detailed local knowledge have allowed us to triangulate across individual and group perspectives. Therefore, we are now better prepared to understand how individuals and groups may agree/disagree on certain drivers and outcomes of land change in this area. Again, this makes our work more relevant to our community partners, and also fills in gaps in our



understanding of changes because remote sensing can only tell us about some aspects of change.

3. Within the group discussions and follow-up interviews, we were able to assess individual and community-level desires for future changes in the kebeles and within the Guassa area. Almost unanimously, participants responded that their main objective is to increase the amount of guassa grass (Festuca spp.) available to them and to remove the invasive shrubs they call nachillo (Helichrysum spp.). This is incredibly helpful for guiding future research in the area; the strong agreement within and across the communities indicates that we will get strong support and community buy-in for future work that addresses these critical issues in local land change.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

We held workshops in each of the nine kebeles involved in the management of MGCCA, totalling 106 participants, and conducted 100 semi-structured interviews within the four kebeles closest to the Guassa area. The workshops were aimed at generating group discussion regarding the ecosystem services provided by the landscape as a whole, including both the agro-pastoral matrix and the protected Guassa area itself. We then asked them to sketch those land use/cover types on a blank map of their kebele and the Guassa area (see amendments to this method, above). This work supported the Master's thesis of a student at Addis Ababa University, Girma Nigussie, and it also supported numerous community members through their paid work as our field assistants.

The workshops were also a chance for us to introduce the communities to some methods of mapping and land change analysis that are commonly used by researchers. At these workshops, we compared the hand drawn maps with the preliminary maps of land cover created from Landsat images, which improved community member understanding and learning, and which enabled the research team to better understand how they conceived of change spatially. We also conducted a MODIS hypertemporal analysis of change, but the results of this analysis did not show significant areas of change, probably because the coarse spatial resolution is inappropriate for the fine-scale heterogeneity of the landscape. Therefore, we did not discuss this analysis in our workshops and limited our discussions to the unsupervised Landsat maps.

We asked participants in the exit interview what they learned from each aspect of the workshop in order to assess which types of communication were most impactful for the communities involved. By and large, participants enjoyed the group discussions of ecosystem services and the associated ranking very much, saying that individual peoples' preferences differed but they were always able to come to an agreement. They said it was a useful process for them to understand each other's perspectives. Participants struggled quite drastically with the hand drawn mapping exercises. Only two kebeles attempted it themselves, and one of those gave up halfway through and asked the field assistants to draw the features they described to them. Even when they were presented with an aerial photo of the kebele to



reference, they were either not comfortable or not able to translate what they saw into a sketched map. Most participants reported that they were happy with the final product (the hand drawn maps facilitated by research assistants), but they would not have been able to do it on their own.

Participants were most enthusiastic about the discussion surrounding the unsupervised classification performed on four Landsat images from 1974, 1985, 2000, and 2015. These four images span a range of government regimes and local conservation management strategies. Despite the drawbacks of unsupervised classification, which were well explained to the participants, they still interpreted the images as supporting their local knowledge of the changing system. This was obviously gratifying to them, as they have sacrificed quite a lot in recent years in order to promote tourism and endemic animal conservation within the Guassa area. Almost all participants indicated they would be excited about having copies of the final supervised classification maps for their kebele, saying that it would help them with land use planning and promoting tourism to the area. Therefore, we are working quickly to use the data gathered during our most recent trip to make these supervised classifications, which we plan to deliver to the communities via email until Cara is able to return to the area with hard copies.

5. Are there any plans to continue this work?

It was quite surprising to find such a strong and cohesive future research objective in all nine kebeles – to study the ecological impacts of the invasive shrub nachillo. The communities reported to us that have wanted to remove the shrub for years, but the woreda administration and the conservation office recommended that they wait until an ecological study could be conducted to be sure its removal would not have negative impacts on the ecosystem. However, none of the researchers they contacted in nearby universities have been able to afford a research programme to study the shrub species and its impact on the *Festuca* grasslands that both the communities and wildlife rely on. Therefore, a new component of our future research will involve sponsoring a Master's or PhD student from the Plant Biology department of Addis Ababa University to study the interaction of these species of social and ecological interest.

The kebele leaders, woreda administration, and conservation office also showed great interest in better maps of the area to support land management decisions and promote the conservation area, and so that will be a continued objective of this research. We will continue to refine the maps produced during the first round of funding according to the preferences of the communities. For example, we learned from our workshops the locally relevant terms used to discuss and describe land cover, and so we will be able to use these words and habitat types in our supervised map making, thus making our maps highly relevant and comprehensible by the communities. Once the maps are completed, we will convene a kebele-wide workshop with the objectives of: (1) explaining and evaluating the maps to ensure the communities understand them and agree they are accurate (a remaining objective from our first proposal), and (2) developing a set of future scenarios that we can use to model land change and ecosystem services into the future. This



gradual introduction to modelling is designed to ensure that the communities understand and appreciate the modelling process, so that they are comfortable contributing to the model development in the future. We will use the scenarios described during this workshop to guide the development of models that help the communities anticipate and plan for future changes to the natural resources of the area. In particular, we will focus on the locally-important and globally-relevant issue of shrub encroachment in Afro-alpine grasslands.

6. How do you plan to share the results of your work with others?

We plan to translate our final maps and reports into Amharic so that the communities are able to read them without need of translation. We will give these maps/reports to the local kebele offices, to the local woreda administration and conservation offices, and the Amhara Regional offices in charge of conservation in Bahir Dar.

We are currently preparing three manuscripts for publication in peer-reviewed journals: one discussing the integration of local and scientific knowledge for mapmaking, one that integrates local and scientific knowledge to describe changes in land use/cover, and one that discusses the vegetation cover found inside the Guassa area. Girma Nigussie, the Master's student who worked on this project with me, will collaborate on the second and third manuscripts along with his advisor, Dr Bikila Workineh Dullo.

7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?

Our research was conducted between July 2016 and March 2017.

exchange rate used.					
ltem	Budgeted Amount	Actual Amount	Difference	Comments	
Transportation to Ethiopia for Cara Steger	0	1,272	1,272	Our cancelled trip in Dec-Jan used up external funds to support Cara's travel	
Transportation within Ethiopia for the research	282	1392	1110	We were surprised to find that	

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.

tor Cara Steger					used up external tunds to support
Transportation Ethiopia for the team	within research	282	1392	1110	We were surprised to find that there was no public transportation to all the kebeles involved in our project, partially because the roads are inaccessible except by 4x4. We were forced to hire a private vehicle.



Lodging for research team	1695	980	-715	The community lodge gave us a reduced price due to our focus on relevant research that furthers their conservation goals
Food for research team, translator, and field assistants	1695	565	-1130	We ate at cheap local eateries instead of hotels in order to save some funds
GPS units	255	71	-184	We decided to start with one GPS unit and assess whether there was community interest in buying more.
Materials for mapping workshops	635	444	191	We were able to use printing credits from another project to print many of the materials we used.
Translator for Cara Steger	282	270	-12	
Printing final maps for communities	156	0	-156	We have not yet completed the maps
				We used an exchange rate of 28.7 birr to the pound
Total		4994		

9. Looking ahead, what do you feel are the important next steps?

While there have been many researchers studying ecological processes in the Guassa area over the last 20 years, very few have had the time and inclination to engage meaningfully with the community management system. Therefore, our work is highly relevant for understanding and addressing local management needs, and for building capacity in their management system.

The next step should be to convene a workshop that brings the kebele management system (the Guassa Committee) together with the woreda administration, conservation office, and our research team in order to identify future scenarios of concern or interest for this social-ecological system. For example, during our recent workshops it became very clear that people are worried about the spread of nachillo, a shrub species, as it threatens the future guassa grass growth. Therefore, we work with these diverse groups of stakeholders in order to clarify the potential changes in climate, policy, and management that may influence future nachillo and guassa growth. These scenarios will be used to build models of the system that will allow the communities to explore management actions virtually, which will help them prepare for unexpected consequences of future management actions.

This workshop will facilitate social learning among the diverse stakeholders, which can improve their ability to work together towards a common goal. This workshop will also introduce them to the concept of computer modelling, which is something



we should have done in advance of our last mapping workshop (we would have been better informed of participants' knowledge base). Overall, this workshop should build trust and understanding between stakeholders and the research team by framing research as a collaborative process.

We also need to build trust with the communities by showing them that we are listening to and responding to the needs they expressed to us in this first phase of funding. Therefore, we are working with faculty at Addis Ababa University to find a Master's or PhD student who is interesting in studying the interactions of nachillo (Helichrysum spp.) and guassa grass (Festuca spp.). The results of this research will be directly relevant to the management of the conservation area as it has been something they have wanted to know about for years. Furthermore, we will be able to use the data to parameterize the models we develop following the scenario development workshop described above.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the RSGF receive any publicity during the course of your work?

Rufford Foundation Cara uses the logo on her personal website (carasteger.weebly.com), under the participatory mapping research project header. We are using the RF logo in a presentation that Cara Steger gave at the annual meeting of the American Association of Geographers on April 7, 2017. Cara acknowledged Rufford funding during a workshop at Portland State University in September 2016, and received two follow up emails from fellow workshop attendees asking for more details on the foundation. Cara is currently writing two blog posts about the participatory mapping project, which cover different aspects of the mapping process (both posts will use the Rufford logo, and will be published on http://www.nrel.colostate.edu/projects/csu-ethiopia/ and https://nrelscience.org/) by the end of April. We will be sure to forward those blog posts to Jane Raymond when they are published. Girma Nigussie acknowledged Rufford funding in his thesis, and we both plan to reference the foundation in the Acknowledgements section of future publications. Finally, we will use the RF logo on all the maps and reports that we send to stakeholders involved in Guassa management once we complete the final supervised classification.

11. Any other comments?

This experience has been incredibly rewarding for all our team members, and we have done everything in our power to ensure it has been rewarding for our community partners as well. We are very grateful to have had this experience to work towards the Rufford Foundation's mission of action-oriented research that promoted ecological and cultural sustainability.