MEETING REPORT
Using Marxan as a tool to make scientifically sound decisions considering trade-offs involving conservation actions and development under climate change

A Case Study from the Greater Mahale Ecosystem, Tanzania

23-24th May, 2013, JGI Education Center, Kigoma, Tanzania

Project overview

Facing limited conservation resources, conservation managers and planners often need to make trade-offs in decisions regarding what they want to conserve and where. Such decisions may involve multiple stakeholders with dramatically different priorities, further complicating the decision making process. These decisions are also being made against a backdrop of all prior land-use decisions, which have often proved be short-sighted, leading to sub-optimal outcomes for all stakeholders. Climate change impacts such as shifting species ranges complicate the picture further To address these often difficult resource allocation problems a suite of decision support tools have been developed to assist managers. One such tool, MARXAN, has been used around the globe to identify critical areas for species and ecosystem conservation that minimize the impact of conservation decisions on other stakeholders. MARXAN can also be used to assess trade-offs between competing objectives, or to identify where offsets for development impacts (e.g. forestry, farming etc) would be best cited.

The Jane Goodall Institute (JGI) with technical support from the Wildlife Conservation Society (WCS) held a two day workshop at the JGI's Education Center in Kigoma on 23-24th of May 2013 to expose conservation managers, planners, members of the development community and government to these relatively new tools and how they can be used to make better decisions for all concerned. We aimed to do this through analyzing a case study of the trade-offs between biodiversity conservation, carbon sequestration and development in the Greater Mahale Ecosystem in western Tanzania.

Forests and miombo woodlands are important ecosystems in Tanzania with important plant and animal biodiversity. Currently, these woodlands are being cleared or degraded at an unprecedented rate. This loss will have a serious impact on biodiversity and greatly contribute to ongoing carbon emissions, but also impact our ability to mitigate climate change in the region. It is therefore important to identify and

prioritize forest and woodland areas that will achieve large conservation and mitigation gains, so as to achieve the greatest return on limited conservation and REDD+ investment. Such interventions should also attempt to minimize social cost, and increase forest and woodland connectivity to enhance resilience to climate change and human pressures. This USAID funded project aims to provide case studies of how to integrate the objectives of climate change mitigation, climate change adaptation, and biodiversity for REDD+ into one overall goal that maximizes the three objectives. The planning framework and scenario planning approach is designed to allow stakeholders to identify clear trade-offs and prioritize robust investments at the landscape scale. This workshop was designed as the first in a series of two workshops to support the process of developing an integrated general management plan for the Greater Mahale Ecosystem. The second workshop will be build upon the data collected and information solicited during this workshop and support a second round of analysis and presentation of final results at a second workshop in early 2014.

The aim of this report is to provide a summary of the two-day meeting. The agenda for this workshop can be found in Appendix 1. The meeting was well attended with the Tanzania National Parks (TANAPA) including Chief Wardens of all three National Parks in the region (Gombe, Mahale Mountains and Katavi National Parks) , Tanzania Wildlife Research Institute (TAWIRI), local and regional governments from Kigoma and Mpanda regions and other stakeholders. The full list of attendees is included in Appendix 2.

Workshop Goals

1) Introduce conservation planning using Marxan to explore trade-offs in landscape prioritization
2) Review and refine modeling input data; identify gaps, and shortcomings in the methods
3) Begin development of planning scenarios

Welcome

Emmanuel Mtiti welcomed workshop attendees and provided an overview of how the series of workshops planned under this project fits within JGI's wider efforts in the landscape. He stressed that the results presented in the workshop were preliminary in nature, and that the primary objective of the workshop was to introduce attendees to the methodology and solicit advice on additional information to support the analysis. He stressed JGI's hope that the process would be a collaborative effort between all partners, and that through that collaboration the results of the analysis would be much improved. Lilian Pintea then gave an overview of the USAID BATS program through which ABCG and the workshop

were funded. Lilian explained that the workplan is part of a collaborative effort between three NGOs (AWF, JGI, WCS) and that a similar series of workshops were being held in two other African landscapes.

Greater Mahale landscape overview

Lilian Pintea & Sood Ndimuligo then provided an overview of the biodiversity values and conservation challenges the landscape is currently facing, setting the stage for the rest of the workshop. Sood discussed JGI's work to date in the communities of the Greater Mahale landscape. Then Lilian discussed the Greater Mahale and Masito-Ugalla conservation action planning (CAP) processes that JGI and FZS led that identified the conservation targets that will be used for the rest of the workshop. Many of the workshop attendees also participated in these CAP processes and were pleased to hear that the current work would be in building upon, rather than replacing the work already completed in the landscape.

Introduction to systematic conservation planning and the Marxan optimization tool

Dan Segan then explained the theoretical underpinnings and origins of systematic conservation planning. The talk covered the fundamental principles of systematic conservation planning, including stating of quantifiable objectives, complementarily, efficiency and an emphasis on an engaged and participatory planning process. Then Dan introduced the Marxan decision support tool, and provided and overview of the 'lingo' used in Marxan analysis and explained the cost minimization approach of the tool and emphasis of importance of setting targets. After the audience had been introduced to the basics, case study were provided that detailed how Marxan has been used to explore trade-offs in other landscapes.

Review of the data

Lilian then gave a presentation on the data that had been gathered to support the planning processes to date. He covered both the biodiversity data used in the analysis as well as the socio economic layers that could be included. The talk walked participants through how datasets were identified and collected, and how they would be used within the Marxan planning framework. The talk also outlined data sets currently under development and gaps in the knowledge base to filled before the next workshop.

Fig 1. Photos from the first day of the workshop. On the left a general session, and on the right a working group reviews the data collected on day one of the workshop.

Data review: Biodiversity data

After Lillian's talk, workshop attendees were divided into working groups and tasked with reviewing the data in their subject area and asked to identify gaps in the current data and provide recommendations for addressing those gaps before the second workshop. Each group was asked to focus on the identification of pre-compiled datasets that could be leveraged to support the analysis, rather than the design of new lines of scientific inquiry. After the session each group provided a review of what they had discussed to the full workshop.

Investment strategies and scenario planning

Dan then introduced the concepts of strategy design and scenario development in a Marxan trade-offs analysis. Conservation strategies with Marxan he explained were a mix of three parts, 1) Conservation targets, 2) Cost layer to minimize, 3) Analysis constraints. And the objective of any strategy was always to achieve the specified objectives, while minimizing the overall cost, subject to any spatial constraints imposed. Scenario's were alternative versions of the how the future of the landscape may look, including alternative development futures of the landscape or how species distribution and abundance may shift in response to climate change. The two can be combined to explored trade-offs between different conservation investment strategies and how those individual strategies perform under different scenarios for the landscape. The talk prompted further discussion for how socio-economic interests were incorporated into Marxan style trade-offs analysis.

Data review: Socio-economic data

After participants had a better understanding of interests other than conservation objectives were incorporated into a Marxan analysis, the participants were asked to once again break-up into four working groups. Each group was first tasked with reviewing the spatial information gathered to date on the costs of conservation within the region. Participants were asked to review information like roads and communities and ensure that those features identified on the maps were still in existence and that no additional ones were missing from the map. After reviewing the existing data, participants were asked to discuss and delineate what they thought the future of the landscape might look like, based on development projects they knew were currently planned and where agricultural or timber extraction

were likely to grow in the region. Each group was then given the opportunity to share what they had mapped with all workshop participants.

Marxan Demonstration

Dan then demonstrated the Marxan decision tool for the workshop and walked users through how the data compiled for the preliminary analysis had been integrated into the decision support tool. The session afforded participants the opportunity to iteratively explore the impact of decisions through an interactive target setting exercise during which targets were removed/added or adjusted at the suggestion of participants. Lilian and Dan then demonstrated for participants how the information collected during the interactive mapping and data review session in the first day of the workshop could be integrated into the analysis. The regions identified by participants as areas likely to be converted to agriculture were digitized in ArcGIS and then used as a cost surface within Marxan. Using areas where future development was likely to occur as a cost in Marxan meant that they were avoided when selecting priority areas for conservation action (Fig 2).
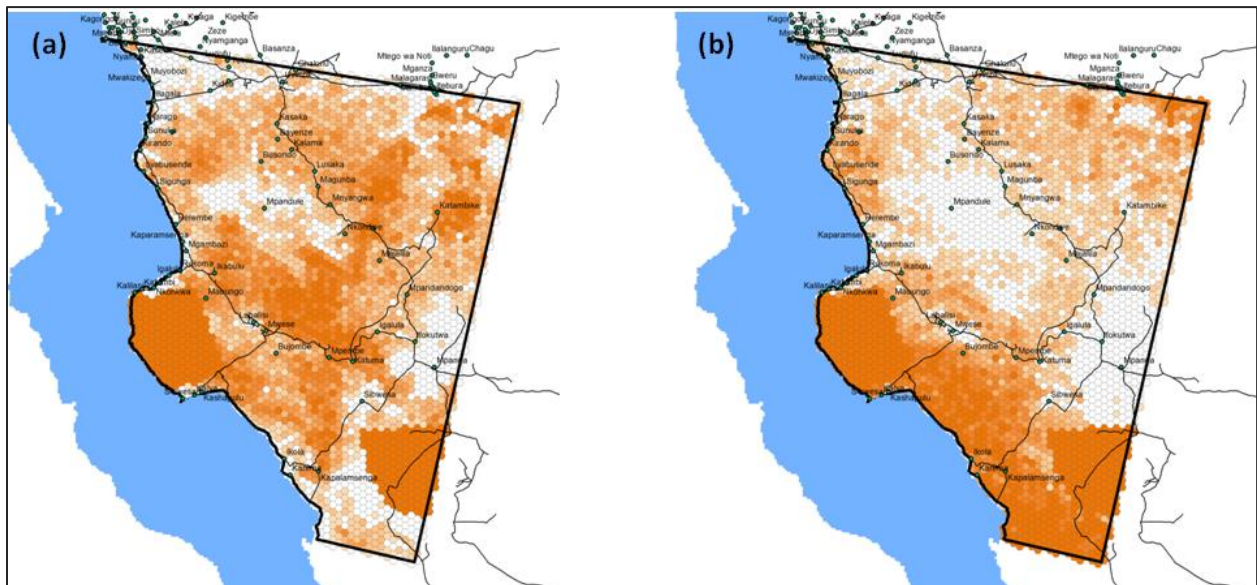

Figure 2. Change in priority conservation areas when integrating areas digitized by workshop participants. (a) Priority conservation areas when trying to minimize total area required to achieve the base level conservation objectives. (b) Priority areas when trying to minimize selection of areas where agriculture is likely to expand into. In both figures darker orange colors indicate higher levels of conservation importance, while lighter colors indicate the area is less important to the efficient achievement of the conservation objectives.

Workshop conclusion and next steps

The workshop concluded with a discussion of what would happen next in the analysis. Participants were advised that the next workshop would likely take place in early 2014, and participants should be prepared to comment on data and scenarios as they continued to be developed in the months leading up to the next workshop. Specific action items outlined below:

1) Follow up with workshop participants as data layers are developed. Two layers in particular were flagged by participants as needing review
   a. Standing biomass (carbon) estimate inside Katavi National Park. Several participants expressed concern that the current mapping underestimated carbon within the park
   b. Riparian areas - Riparian areas are an important conservation target within the region, but their inclusion in Marxan led to fragmented solutions.
2) Explore expanding the scope of the analysis to the entire Mpanda district which is currently in the process of developing a land use plan.
3) Present findings of the final analysis to TANAPA in Arusha. Many attendees felt that the methods used in the analysis should be presented to the TANAPA and could be applied more broadly within their work.

Appendix 1. Workshop agenda

Day 1 – Thursday, May 23rd			
Time	**Topic**	**Description**	**Speaker**
8:30 – 9:00	Arrival	Registration	
9:00 - 9:15	Welcome	Why are we here?	Emmanuel Mtiti
9:15-9:30		What is BATS/ABCG	Lilian Pintea
9:30 – 9:45	Introductions		All
9:45 – 10:30	Conservation planning	Overview of Conservation Action Planning process in the region	Lilian Pintea & Sood Ndimuligo
10:30 – 11:00	Coffee/Tea break		
11:00 – 12:30	Introduction to Marxan	What is Marxan? How does it support systematic conservation planning? Example applications: case studies of how people went through the process.	Dan Segan
12:30-1:30	Data	Review of data used to inform decision making in this workshop	Lilian Pintea
1:30 – 2:30	Lunch		
2:30 – 3: 30	Participatory mapping and data review	Break into small groups to map expert knowledge: 1) Chimps 2) Elephants 3) Watersheds, riparian, wetlands 4) Carbon 5) Woodlands, mountain ecosystem, evergreen forest	Working groups (all groups comment on data used, comment on targets and alternative sources of information)
3:30 –4:00	Marxan Scenario	Scenario planning and overview of cost in Marxan	Dan Segan
4:00-5:00	Mapping the cost of conservation	Mapping what affects the cost of conservation 1) Distance to roads 2) Population (house) density 3) Potential for agricultural expansion 4) Other items	Whole group
5:00 – 5:15	Day 1 wrap up Break	What's been covered, what to expect from day 2	Emmanuel Mtiti

Day 2 – Friday, May 24th			
Time	**Topic**	**Description**	**Speaker**
8:30 – 9:00	Arrival		
9:00 – 9:15	Welcome		Emmanuel Mtiti
9:15 – 10:15	Group report	Reconvene - review of conservation and	1 representative

	back	cost mapping in working groups	from each group
10:15 – 11:15	Marxan demo	Discussion and feedback on how the information refined in day 1 can be used to inform decision making	Dan Segan
11:15-11:45	Coffee/Tea		
11:45- 12:45	Marxan demo continued	Discussion and feedback on of how the information refined in day 1 can be used to inform decision making	Dan Segan
12:45 – 1:15	REDD	Overview of REDD and REDD project work to-date in the Masito-Ugalla Ecosystem	Lilian Pintea
1:15-2:00	Day 2 wrap-up	What have we covered? How will this information be used? What happens next?	Emmanuel Mtiti
2:00-3:00	Lunch		
END OF WORKSHOP			

Appendix 2. Workshop attendee list

#	NAME	TITLE	ORGANIZATION
1	Hamis Chinduli	District Land, Natural Resource and Environment Officer	Kigoma District Council
2	Masumbuko Kechegwa	District Game Officer	Kigoma District Council
3	Kishela Siulapwa	District Forestry Officer	Kigoma District Council
4	Shija	District Agr. & Livestock Dev. Officer	Kigoma District Council
5	Petronila Gwakila	District Environmental Officer	Kigoma District Council
6	Josephine Rupia	District Land Natural Resource and Environment Officer	Mpanda District Council
7	Lucas Nyambala	District Forestry Officer	Mpanda District Council
8		District Game Officer	Mpanda District Council
9	Kashindye	District Agr & Livestock Dev. Officer	Mpanda District Council
10	Saka Mocko	District Environmental Officer	Mpanda District Council
11	Magnus Mosha	Program Officer	FZS
12	Regina Domoko	Community Development Officer	FZS
13	Petro Masolwa	Project Coordinator	Tuungane Project
14	Dr. Ernest Athuman	Health Coordinator	Tuungane Project
15	Seleboni Mushi	Project Forester	Lake Tanganyika Proj
16	Mwamsojo	Project Forester	Lake Tanganyika Proj
17	Edwin Nssoko	Project Director	REDD project
18	Thomas Moshi	Conservation Biologist	REDD project
19	Richard Ngate	M&E officer	REDD project
20	Emmanuel Mtiti	Program Director	GMU Program
21	Aristides Kashula	Program Forester	GMU Program
22	Sood Ndimuligo	Conservation Biologist	GMU Program
23	Fadhili Abdallah	Land use Planning Coordinator	GMU Program
24	Jovin Lwehabura	GIS Manager	GMU Program
25	Rehema Dulla	M&E	GMU Program
26	Mayuma Cheyo	Regional NR Adviser	Kigoma Region
27	Violet Mrope	Regional Game Officer	Kigoma Region
28		Regional Agriculture Adviser	Kigoma Region
29	Lilian Pintea	Vice President, Conservation Science	JGI
30	Dan Segan	Conservation Planner	WCS