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	Norma Patricia Arce Peña
Project title	Terrestrial mammals in fragmented tropical landscapes: evidence of defaunation and biotic homogenization and differentiation in a vanishing biodiversity hotspot
RSG reference	22049-1
Reporting period	May 2017 to March 2018
Amount of grant	£ 5000
Your email address	narcepea@gmail.com
Date of this report	May 22nd, 2018

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
Obtain a detailed quantification of the landscape spatial changes in the region from 2011 to 2017.				We obtained data on landscape spatial changes in the region (i.e. percentage of forest loss/gain, increase/decrease of forest fragmentation degree, changes in landscape connectivity and in forest edge density, and changes in matrix composition).
Conduct mammal surveys at the Lacandona rainforest.				We sampled 24 fragmented forest sites and four continuous forest sites during a 6-month period, placing camera traps and conducting surveys looking for mammal tracks, footprints and direct sightings.
Create a data base of the spatial distribution and relative abundance of each mammal species within each forest site.				We created a large database including forest patch occupancy and relative abundance in 24 forest patches and four continuous forest sites.
Assess the landscape metrics that best predict population distribution and abundance, species richness and alpha- and beta-diversity.				We obtained a population and community level assessment of landscape composition and configuration landscape metrics.
Organize workshops and activities with children, land owners and local stakeholders.				We presented the results of the project to the NGO Natura Mexicana y Ecosistemas, and to land owners in two communities (Loma Bonita and Chajul).

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

The main difficulties we had during the project involved the use of camera traps. This was due to two different situations: 1) rainfall in the area was very high and before expected, so some technology was damaged, and 2) some cameras were stolen from the forest fragments, as there were human settlements nearby. However, we

were able to find a method to protect the cameras both from the rain and from the robberies.

The other difficulty he had during the project was that we could not present the results to all of the communities we had planned. This because we did not have enough time. Furthermore, we could not organise workshops with the children because of local problems of the schools.

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

This study was the first in assessing the patterns and potential landscape drivers of mammal populations using a longitudinal approach. The Lacandona rainforest is suffering a rapid process of land use change, spatially variable. We assessed landscape spatial changes in the region: percentage of forest loss/gain, increase/decrease of forest fragmentation degree, changes in landscape connectivity and in forest edge density, and changes in matrix composition (matrix contrast). With this information, we found that landscape structure showed important changes through time in each forest site. While some landscapes lost up to 10 % of forest cover between 2010 and 2016, others actually showed an increase in forest cover of up to 40 %. However, when averaged across all landscapes, we did not find significant differences in landscape metrics between the two years.

Contrary to what we expected, mammal abundance and occupancy in most sites was higher in 2017 than in 2011. Yet, the most endangered mammals and with a bigger size were rarely found, and in some cases completely absent, in fragmented fragments. Such is the case with jaguars, which were only found in three forest fragments, and white-lipped peccaries, which were not found in any of the fragmented fragments, but were found in the continuous forest sites inside Montes Azules Biosphere Reserve. Overall, we cannot confirm or deny an ongoing defaunation in the area, as some species are increasing their relative abundance and distribution, while others are decreasing. It is possible that there is a differential vulnerability of species, depending both on intrinsic (e.g. size, growth rate, home ranges) and extrinsic factors (e.g. preference by hunters and poachers).

Considering the scale of effect of each landscape variable on each response, we found strong associations between temporal changes in landscape structure and changes in mammal abundance, with each species showing different responses to changes in each landscape metric. Based on evidence available for this biodiversity hotspot, preventing the expansion of open areas in the region seems to be crucial for increasing landscape connectivity and resource availability for mammal species. Furthermore, it is important to prevent potential negative edge effects, as well as stopping forest loss and increasing forest cover through restoration.

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

The region we worked at has very high poverty and margination levels. This situation is forcing local people to convert rainforest patches into pasture and agricultural

lands. This project allowed us to approach local communities and continue raising people's awareness on the value of conserving their rainforests and their biodiversity. We obtained a lot of photographs and information on biodiversity at fragmented forest sites, owned by local people, and shared the results with them. We presented the partial results of the project to two communities (Loma Bonita and Chajul), which allowed us to share our findings. We showed them that, even though the fragments are small and surrounded by a matrix of cattle pastures, agricultural lands, roads, and human settlements, they still maintain a high biodiversity. Furthermore, we worked with a local guide, lived with the local family, allowing local people to obtain an income and get involved in conservation actions.

Finally, Natura y Ecosistemas Mexicanos will use some of the information obtained for their work with the communities, including the creation of Voluntary Areas for Conservation and for the Program of Payment for Environmental Services, which benefits the local communities while helping with the conservation of biodiversity and the rainforest.

5. Are there any plans to continue this work?

Yes, we have plans to continue working on the subject. The laboratory has long been conducting research on land use change patterns in the Lacandona rainforest (a diversity hotspot) and on the impact of fragmentation on the biodiversity of the region. Specifically with mammals, we plan to conduct more fieldwork and obtain more data in the future, in order to continue assessing defaunation and human impacts on biodiversity.

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

We have already presented the results to the local NGO Natura y Ecosistemas Mexicanos, who work in the area. We are preparing the final reports for CONANP (Mexico's Natural Commission on Natural Protected Areas) and Natura y Ecosistemas Mexicanos. Natura y Ecosistemas Mexicanos will use some of the information obtained for their work with the communities, including the creation of Voluntary Areas for Conservation and for the Program of Payment for Environmental Services. Furthermore, as planned, we will present the results in all of the ejidos and communities we worked on (Loma Bonita, Chajul, Galacia, Pirú and Flor de Marqués). Finally, we are already writing scientific articles for sharing the results with the scientific community. The first article, where we used the information obtained on landscape spatial changes in the region in order to analyse its impact on the population dynamics of terrestrial rodents, has already been sent to a scientific magazine. We are writing another two articles, regarding the impact of landscape changes on terrestrial mammals, and another one on howler monkeys.

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

We began the project's activities in May, when the Rufford Foundation grant was received. As planned from the beginning, we travelled to the area in May 2017 and

obtained required permits from landowners. From May to October 2017 we conducted field work. From October 2017 to February 2018 we analysed satellite images and started analysing the information. We sent the first scientific article in April 2018.

We had planned to present the project results in February and March 2018. However, the analysis of the data took longer than expected, so we presented results to Natura y Ecosistemas Mexicanos and to the two communities in April 2018. We will present the results to the other communities in the near future.

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.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Two terrestrial transportations to the area (Morelia-Chajul-Morelia)	700	1053	+ 353	We had to make three trips Morelia-Lacandona-Morelia, instead of two.
Fuel for transportation during field work	1200	1578	+ 378	We used more fuel than expected.
Field assistant fees	900	900	0	Fees were payed as planned from the beginning.
Batteries and memories for camera traps	350	769	+ 419	Budget expected for batteries and memories exceeded the amount expected, as we had some problems with the cameras being stolen and damaged by water and humidity.
Materials for workshops	450	177	- 273	We could only present our results in two of the communities, so expenses were lower than expected.
Accommodation and food	1400	1816	+ 416	We spent more in accommodation and food than expected.
TOTAL	5000	6293	+ 1293	Exchange rate (February 2017) 1£ = 24.40 Mexican Pesos.

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

We believe that the most important steps are to continue sharing our results with conservation and management stakeholders in the area. This will allow our information to have a real impact in the protection and conservation of the rainforest and its biodiversity, as well as local community's wellbeing and awareness. One of the greatest impacts is having generated information that allows the communities to have greater opportunities, such as payment for environmental services, as well as the creation of voluntary areas for conservation.

Furthermore, we need to continue gathering information on the status of mammals in the Lacandona rainforest. These animals are involved in key ecological functions (e.g. pollination, seed predation and dispersal, herbivory). Thus, evaluating the consequences that recent land-use changes may have on them is critical to provide important guidelines for land management to minimise local species extinction and favour the maintenance of ecosystem functioning. With the obtained information, we can identify species-specific conservation actions.

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

Yes, we presented part of the results in the 54th Annual Meeting of the Association for Tropical Biology and Conservation, held in Yucatan, Mexico, where we acknowledged The Rufford Foundation for their invaluable help. Furthermore, in the sent article, The Rufford Foundation is mentioned in the acknowledgements.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Ms. Norma Arce Peña – Went to the study area, conducted the mammal surveys, created the database of the spatial distribution and relative abundance of each mammal species within the region, assessed the impact of landscape changes on population distribution and abundance. Presented the results of the project to Natura y Ecosistemas Mexicanos and to the two local communities.

Victor Arroyo Rodríguez PhD – Helped with the planning and implementation of the activities, supervised the project, provided valuable insights, revision and comments to the project.

Ellen Andresen PhD – Provided valuable insights, revision and comments to the project.

Daniel Ábila Cabadilla PhD – Provided valuable insights, revision and comments to the project.

Alfonso Jamangapé – Worked as a field guide during field work, helped during the mammal surveys.

12. Any other comments?

We want to thank The Rufford Foundation for providing the grant that allowed the implementation of this project. Without your help this would not have been possible. We will continue working in the subject in order to help protect the Lacandona rainforest and the conservation of its biodiversity.