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	Paulina Stowhas
Project title	Biodiversity Monitoring Plan for restoration of the Biological Corridors in Manabí Province, Ecuador
RSG reference	17542-1
Reporting period	2015-2016
Amount of grant	3193
Your email address	stowhas@gmail.com / paulina.stowhas@islandconservation.org
Date of this report	January 30th, 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
1.Habitat characterization			▓	Habitat characterisation was completed based on mammals' presence in the different patches, understory and canopy data.
2.Wildlife present and their association with different habitat characteristics		▓		A complete analysis of the wildlife presence in the site and their association with different habitat characteristics was not possible due to the effects of the 2016 earthquake in coastal Ecuador. Valuable time was lost due to the efforts spend helping people affected and waiting for road reconstruction. Amphibian and bird surveys were cancelled in order to use all efforts to fully achieved mammals' presence and habitat characterisation. Available data was not enough to create prediction models.
3.Determine the site to be reforested		▓		The recommendations of sites to be reforested were based on the data obtained for mammals' presence and habitat characterization. Available data was not enough to create prediction models.

*More explanations of these results located in question three response.

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

During the estimated time for the development of our project we faced two main unforeseen difficulties.

- The first difficulty was a disagreement or misunderstanding with two farm owners who had previously committed to participate in the project. Prior to the application of the present grant, an informal survey was carried out with the owners to see their willingness to participate in case this project was carried out. During the informal survey, we obtained 100% support and willingness to participate. However, when the project started gathering information and installing the camera traps on the farms, one owner did not agree to let us carry out fieldwork on his property. He did not give further explanations about it. The team explained the objectives and intentions of the study to help the landowner better understand the purpose, but because of the refusal we did not press the issue. The second owner decided not to participate because he had troubles with relatives regarding the ownership of the land where the fieldwork would have been developed. The land in question was in dispute with his son. With this owner, we also provided him with an in-depth explanation of the objectives and intentions of our project to increase his understanding. After this conversation, the owner agreed to the installation of camera traps but only in what corresponded to his area of the property.

- The second difficulty, which was more complex and difficult to overcome, was the earthquake that occurred in April of 2016; the epicenter of this event was approximately 30 miles from the center of our study area. This difficulty cost us a delay of approximately 3-4 months while we worked to provide aid to the victims, waited for the reconstruction of roads and other infrastructure, searched for materials, reorganised of the equipment, and reorganised the logistics of the project. Despite the above, almost all our materials, and 100% of our team were in good condition! The reorganisation of the team and scheduling as well as the much appreciated understanding of the Rufford team, allowed us a few more months of time for the field work and the development of this report gave us the strength to move our project forward despite the difficulties.

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

1. Wildlife present and association with different habitats
28 camera traps were installed (392 nights of effort) in four different habitat types: forest (native forest = 14), sustainable (native forest with agroforestry = five), enrichment (degraded forest with restoration = six), and reforestation (land without forest with incipient restoration = two).

We found 12 different mammal species (excluding domestic species such as cattle, cats and dogs) in the three different areas where the camera traps were located,

including the critically endangered *Cebus albifrons aequatorialis* (Ecuadorian white-fronted capuchin), *Leopardus pardalis* (ocelot) and *Tamandua Mexicana* (tamandua). All 12 species were found in forest habitat, while none were found in reforestation habitat. In addition, four species (*Cebus aequatorialis, Cuniculus paca, Mazama americana* and *Dasypus novemcinctus)* were found only in forest sites (table 1).

Forest sites contained an average of 3.23 species while sustainable and enrichment sites had an average of 2 and 2.17, respectively. Furthermore, forest type habitat showed the highest number of different species (12), while both sustainable and enrichment habitats showed only six different mammal species. The different sampling points for all habitats ranged from 6 different mammals to none at all (Table 2).

Table 1: Mammal presence in the area of study. *Rodents are different species grouped into one category due to difficulties with their identification.

English name	Nombre en Español	Scientific name	IUCN Status	Habitat; F: Forest, E: Enrichment, S: Sustainable
Ocelot	Tigrillo	*Leopardus pardalis*	LC	F, E, S
Tayra	Cabeza de mate	*Eira barbara*	LC	F, E, S
Crab-eating raccoon	Oso lavador cangrejero	*Procyon cancrivorus*	LC	F, E, S
Northern tamandua	Oso hormiguero de Occidente	*Tamandua mexicana*	LC	F, S
White-nosed Coati	Cuchucho, Andasolo	*Nasua narica*	LC	F, S
Central American agouti	Guatusa de Occidente	*Dasyprocta punctata*	LC	F, E
Common opossum	Zarigüeya común	*Didelphis marsupialis*	LC	F, E
White-faced capuchin	Mico, Capuchino	*Cebus aequatorialis*	CR	F
Spotted paca	Guanta	*Cuniculus paca*	LC	F
Red brocket deer	Venado colorado	*Mazama americana*	DD	F
Nine-banded	Armadillo de nueve	*Dasypus*	LC	F

armadillo	bandas	*novemcinctus*		
Rodents*	Roedores*	-		F, E, S

Table 2: Number of different species found and average number of species per habitat. Maximum and minimum number of species found in a sample point of that type.

Habitat	# Mammals Species	Average	Max SP	Min SP
Forest	12	3.23	6	0
Reforestation	0	0	0	0
Sustainable	6	2	4	1
Enrichment	6	2.17	4	1

2. Domestic species and habitat implications

When considering domestic species, forest type habitat had only one event, compared with 16 and seven events in sustainable and enrichment habitats respectively. The domestic dog (*Canis lupus familiaris*) was the species with a highest number of events overall with 21 events in all three sites, 13 of them occurring in sustainable land. Sustainable lands where the only ones that presented all three domestic species (Table 3).

It is important to consider how these domestic species could affect wildlife in the different habitats. Sustainable habitat type is the habitat type most affected by the presence of domestic animals, and also the habitat type with the lowest average number of different species found, although the average is only slightly lower than the one for enrichment habitat type. More studies are required to understand the way wildlife and domestic species interact in the area of study and how this could affect a possible wildlife corridor.

Table 3: Events of domestic animals per habitat.

Habitat	Domestic Species		
	Canis lupus familiaris	*Felis catus*	*Equus caballus*
Forest	1	0	0
Reforestation	0	0	0
Sustainable	13	1	2
Enrichment	7	0	0

3. Habitat characterisation

The percentage of understory and canopy cover was also measured for every sample point in the four different habitats. On average, enrichment habitats presented the higher values for understory cover while reforestation sites the lowest. When considering average canopy cover the forest habitats had the highest values, and enrichment sites had the lowest. For understory cover, the percentages ranged from 44 to 92% in forest, 40 to 91.5% in sustainable habitats and 28.5 to 99% for enrichment. The percentages for canopy cover ranged from 84.5 to 93.5% in forest, 80 to 94% in sustainable and 38.75 to 91.5% in enrichment (Table 4). The details per sampling point are described in Appendix 1.

Table 4: Understory and canopy cover average and range for each habitat type.

Habitat	Average Understory (%)	Average Canopy (%)	Understory range (%)	Canopy range (%)
Forest	72.61	88.89	44 - 92	84.5 - 93.5
Reforestation	34*	82.75*	-	-
Sustainable	66.3	86.5	40 - 91.5	80 – 94
Enrichment	80.25	70.88	28.5 - 99	38.75 – 91.5

Based on this data, forest habitat is the most suitable in terms of mammal diversity. All 12 species were found in this type of habitat, it has the highest average number of species and also the highest number of species found in one sample point. In addition, only one event of domestic species was captured in forest habitat during the study. Considering that the sampling points for forest habitat are dominated by native forest, and that most of them are within of the Lalo Loor Dry Forest Reserve, these results are expected. Sustainable and enrichment habitat types presented similar results in terms of mammal diversity, with sustainable habitats having a higher presence of domestic animals. When comparing canopy coverage, enrichment habitats have less coverage than sustainable habitats. The opposite occurs for understory coverage, where enrichment habitats have the highest values of all four types of habitats.

When thinking about restoration possibilities, one strategy would be to use more resources in restoration efforts for enrichment and sustainable habitats, while protecting forest type habitats. Both sustainable and enrichment habitats are still used by mammals, despite not being protected and the high presence of domestic species. By restoring and protecting these habitats it would be possible to create a wildlife corridor in the area of study.

Another possibility would be to use more resources in forest type habitats, including restoration, protection and acquisition of forest lands that are not currently protected. Forest type habitat showed the highest diversity and is also the only type of habitat where the critically endangered Ecuadorian White-fronted Capuchin was found.

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

The involvement of communities was accomplished primarily through the data collection in their forests and private plantations. People with private farms who participated (n = 3) in the study were involved from the beginning of the study, both in the pre-survey and during data collection and the subsequent delivery of information.

By installing the camera traps, we were able to identify the types of carnivores that could potentially pre-date domestic animals and the areas through which these carnivores usually travel. Many of the private owners, besides having their plantations (coffee, fruit trees, forest, others), also have domestic animals, mainly for their own consumption (poultry, pigs and a few cattle), and have suffered losses due to predation by wildlife.

The information provided by the project was very useful to the farmers, since it allowed them to improve their installations for their domestic animals or to change them according to the carnivores present. Without this knowledge people only suspected the reasons for some of their losses of domestic animals, but they did not take preventative or retaliatory action. This data and newly available information increases the understanding of the actual presence of wildlife and allows the search of solutions for the decrease of the conflict and the increase of coexistence between humans and wildlife.

While the photos were shown to the participants who were interested or requested them, during the second stage of financing, people asked us to hold a workshop to find solutions together, and to mitigate and prevent conflicts with them and wildlife.

5. Are there any plans to continue this work?

Yes. We have two edges where we would like to continue our work and one was proposed by the participants themselves. Although the photos were shown to the participants who were interested, in a second stage of financing, people asked us to hold a workshop to find solutions to mitigate and prevent conflicts with these species.

The second issue is to continue collecting data, and with the information collected select two representative species to create models of occupation and abundance along the corridor and with them make recommendations to government and other local actors of the priority sites to be Reforested and protected

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

We plan to share it in the following ways:

1. Infographics in blogs and web pages: With the information we obtained, we are working on developing an infographic, with the goal of presenting the obtained information in an easily understandable and aesthetically pleasing manner. Ceiba, the organisation that provided support for the development of the project, has an institutional website, and they have provided us with a space to share the infographic, as well as pictures, text, and other related information.
2. The VII World Conference on Ecological Restoration (Society for Ecological Restoration, August 27th to September 1st, 2017), will be hosted in Iguazú, Brazil (http://ser2017.org/index.php): Despite our limitations in the amount of data collected, it is still important to share our preliminary results with others. We will send a summary to the VII International Congress of Ecological Restoration to present the information in Poster format, so that it is also able to be shared in PDF format to other audiences.
3. *Presentation - Workshops in the local communities:* At the request of the community, we will develop workshops to share the information collected on their farms. The workshops aim to identify potentially predatory carnivores, and to propose measures of protection and improvement of the facilities in which animals are contained, as well as other preventative measures.

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

The grant was obtained in September 2015, and material purchases were made in November and December 2015. The materials were sent to the study area in mid-January 2016. Field work was planned to sample during the dry and wet seasons (March-May and August-October 2016), but because of the earthquake in April 2016, whose epicenter was located close to the center of our study area, we were not able to take data during the wet season, and were only able to take data during part of the dry season (July-November 2016).

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. (1 US dollar – 0, 75)

Within the budget there were expenditures that were not made, or whose values changed slightly. Finally, and as a result of our backlog, some of the money available was used to pay stipends to local people who could help us with the fieldwork. Some comments are detailed in the table.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Battery Charger (**2 units** + 8 battery units / each)	34	15	+19	Chargers only, batteries not included
Camera trap (15 units) **16**	1457	1280	+177	Amazon sale
Memory cards (15 units) **20**	90	121	-31	We purchased some more to make the checking faster
USB memory card adapter (2 units)	15	0	+15	-
HardDrive + Carrying case **(1 unit)**	50	47	+3	-
Security lock for camera trap (15 units) **16**	178	124	+54	-
Binocular (2 units)	48	0	+48	Not made. The NGO provided binoculars
Rain coat (2 units)	68	76	-9	-
GPS (2 units)	213	0	+213	Not made. The NGO provided GPS units
Rent a car (+ gas)	603	0	+603	Not made. Was not useful and the roads were destroyed after the earthquake
Stipends (not for the researcher)	400	0	+400	Amount added to local person stipend
Added: Security boxes(16 u)	-	346	-346	We added sectary boxes for our camera traps to ensure they were not stolen from the field
Added: Book - Monitoring	-	42	-42	-

Forest Biodiversity				
Added: Payment (stipend) to a local person		984	-984	Payment to the local person for helping us with the fieldwork
Total	3193	3193	0	

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

We think that the next steps are: 1) to re-apply to this and other grants that will allow us to obtain enough data to model the biological corridor in the study area, 2) inform the community and maintain their interest through providing information on the studies being carried out in the area, listening to their needs and concerns, and (3) enhancing coexistence of wildlife and people through the search for joint solutions in case the formation of a biological corridor significantly increase losses of domestic animals due to the wildlife passing through it.

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?

We used The Rufford Foundation logo at the National Congress of Wildlife Management and the 3rd Ecuadorian Congress of Mastozoology, held from June 8th - 10th 2016 at the Santa Elena Peninsula State University under the Conservation and Management and Ecology and Ethology categories. We presented work from a previous study which provided baseline data for wildlife in the area. In this presentation we also commented that we had been awarded a small Rufford grant from Rufford Foundation, and that this new research (Rufford Project) would include follow up for the wildlife baseline data. The Rufford logo was on the slide when the comment was made.

11. Any other comments?

In addition to the results obtained and presented in questions 1 and 3, we provide additional comments on the following Outcomes:

1. **Community interest in conservation and ecological restoration projects**: One of the main desired outcomes was to generate interest in conservation and restoration projects in the local community. People who participated are interested in knowing more about the results obtained during the process and the options to continue with similar projects that allow these initiatives to develop into long-term projects, and not only remain in obtaining information.
2. **Partial knowledge of the local community about carnivores**: The landowners are interested to know about the carnivores present on their farms: Although

people have casual sightings of wildlife in the area, information about the carnivores in particular that surround their farms was informative for both the research team as well as landowners. The people who participated in the study began to propose preventive measures for the predation of their domestic animals and to improve the coexistence with the wildlife of the place.

3. **Definition of two model species**: Two species will be used to make models of occupation and abundance to propose reforestation in areas that allow the creation of a biological corridor for the native fauna of project area. This information will be presented to the authorities to help them make informed decisions for the achievement of ecological restoration in one of the most threatened ecosystems in the country.

4. For the past 2 years (2015-2016), I have been participating in a group of Latina women who voluntarily allocated time and energy to the implementation of three workshops called; **"Professional Women in Environmental Sciences and Sustainability: Opportunities and Challenges in Latin America"**, in the United States (Gainsville, Florida), Ecuador (Quito) and Argentina (Puerto Iguazú). The purpose of these workshops is to provide unique opportunities to bring together professional women, examine specific gender issues that impact their work, share experiences, and create a network to support women researchers and professionals in Latin America.

These workshops were held in association with conservation, ecology, and environmental congresses, in order to take advantage of the resources and participation of women who were already attending the congress. For the third workshop in Argentina (September 2016) we received an email from a group of women named "Tigresas" (in reference to the Tiger of the Rufford Foundation logo), which was formed during the Rufford meeting held in Lima, Peru on January 18th and 19th 2016, with interest to participate in the Workshop of Women! As part of my commitment to the Rufford Foundation, and my gender, this group of four women was awarded a Rufford grant and were provided with a four-room reservation for their participation. One of them was also asked participate as speaker during the workshop describing her experiences and personal history. The participants were: Viviana Zeidemann, Flavia Mazzini (Speaker), Elena Castañeira, and Elizabeth Chang.

Appendix

Appendix 1: Percentage of understory and canopy cover for each sampling point.

CT ID	Habitat Description	Understory Cover (%)	Canopy Cover (%)
Forest CAM1	Forest	77.5	84.75
Forest CAM2	Forest	88	87.25
Forest CAM3	Forest	65.5	92
Forest CAM4	Forest	76	87.75
Forest CAM5	Forest	74	86.75
Forest CAM6	Forest	60	89.5
Forest CAM7	Forest	78	85
Forest CAM8	Forest	82	89
Forest CAM9	Forest	63.5	92.25
Forest CAM10	Forest	-	-
Forest CAM11	Forest	75.5	90
Forest CAM12	Forest	44	84.5
Forest CAM13	Forest	-	-
Forest CAM14	Forest	58.5	93.5
Forest CAM15	Forest	92	92
Re-Forest CAM1	Reforestation	-	-
Re-Forest CAM2	Reforestation	34	82.75
Sustainable CAM1	Sustainable	40	85.75
Sustainable CAM2	Sustainable	44	80
Sustainable CAM3	Sustainable	91.5	89.5
Sustainable CAM4	Sustainable	80	83.25
Sustainable CAM5	Sustainable	76	94
Enrichment CAM1	Enrichment	99	85.75
Enrichment CAM2	Enrichment	96	91.5
Enrichment CAM3	Enrichment	74.5	38.75
Enrichment CAM4	Enrichment	95	68.75
Enrichment CAM5	Enrichment	88.5	91.5
Enrichment CAM6	Enrichment	28.5	49