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	Lina Maria Valencia
Project title	Effects of habitat fragmentation on movement patterns and dispersal of the endangered silvery-brown tamarin (*Saguinus leucopus)* in Caldas, Colombia.
RSG reference	14806-1
Reporting period	June 2014 – May 2015
Amount of grant	£5800.
Your email address	linavalencia85@gmail.com
Date of this report	June 2nd, 2015

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
Evaluate how heterogeneous, human modified landscapes affect gene flow and the spatial distribution of genetic variation of the silvery-brown tamarins in Caldas, Colombia.		X		As we started collecting data and analysing land use change over time, we realised that the degree of habitat fragmentation in Caldas was too recent, and that the scale at which we were going to sample was too small to have a significant representation of the genetic diversity of the species. Consequently, in order to evaluate the effect of habitat fragmentation on tamarin dispersal, we expanded our sampling scheme to a bigger landscape that represents the most human modified range of the species, and that has fragments of forest that have been isolated for more than five decades. Therefore, for this project we are now exploring the effect of habitat fragmentation on silvery-brown tamarin dispersal in the southernmost distribution of the species, encompassing the states of Caldas, Antioquia and Tolima.
Examine the spatial distribution of genetic variation of silvery-brown tamarins in Norcasia, Caldas		X		After successfully trapping various tamarin groups, we realised that for certain groups the baiting process can take more than 3 months without success (see below) and thus our timetable has been delayed. To date we continue our sampling effort and on the next few months we plan to trap individuals from two different populations and six social groups. Furthermore, we have started collaborating with WCS Colombia, and they have provided us with samples from four different populations. Thus, our sampling effort has been significantly improved.
Collect fine scale landscape data to assess the spatial configuration and quality of silvery brown tamarin habitat in the Municipality of Norcasia, as well as identify the different			X	Different landscape classification schemes have been developed for the state of Caldas, based on the collected GPS points. Since the area of study has changed and thus the effort needed to conduct an accurate landscape classification has significantly increased, we will also use the land use cover map developed by the Colombian government for 2010. We have already verified and ground-truth this classification and it is quite accurate and represents the current land cover

habitats in the study area.				classes in our landscape of study. By using this already developed classification we will save fieldwork effort that can be solely devoted to sample collection.
Examine the spatial distribution of genetic variation of tamarin populations		X		Since fieldwork activities have not finished yet and we have not finishing collecting samples, the neutral genetic variability of tamarin populations has not been quantified. Nonetheless, to date we have begun standardising laboratory procedures and so far we have been able to successfully amplified 11 variable microsatellites markers specific for silvery-brown tamarins. Furthermore, we have also explored the feasibility of using next generation sequencing techniques in order to obtain genetic markers throughout the genome. So far we have explored the protocol developed be Peterson *et al.* (2012) called double-digest Restriction Site Associated-DNA (ddRAD) method in which two different restriction enzymes used to gather a reduced representation of the genome. To date, we have successfully tested the pair of enzymes and have built genomic libraries for two tamarin samples in order to identify thousands of diagnostic single nucleotide polymorphism (SNPs). Evaluating thousands of SNPs will allow a much more representative view of the genetic variation, both adaptive and neutral, within individuals and populations which will further allow higher resolution inferences on population demography, gene flow and population history. Furthermore, being able to have more genetic markers per individual will allow us to have a smaller sample size and still detect even very low levels of differentiation among populations.
Identify what environmental factors favour or restrict silvery-brown tamarin dispersal and in turn the connectivity between populations of this species, information that can help identify habitat corridors for the species.	X			As stated above, since fieldwork activities have not finished yet, we have not quantified the neutral genetic variability or estimated any possible gene flow among tamarin populations. Thus, we have not been able to model potential habitat corridors for the silvery brown tamarin. However, while collecting data in the field we have come to realise that tamarins move over substrates that we have previously not considered as suitable habitat (i.e., fences, electric poles, shurblands and pastures). This information can help us better identify those habitat types that potentially favour tamarin

				dispersal and thus could work as potential habitat corridors.
Provide opportunities for Colombian undergraduate students to develop short-term research projects.			X	The project has provided three female Colombian undergraduate students the opportunity to conduct their undergraduate thesis. These students have not only had the opportunity to assist the project by baiting the tamarins and assisting in the trapping events, but we have had the possibility to articulate other research projects within the proposed one. Cristhina Florez already defended her thesis entitled "Influence of landscape characteristics on Silvery-brown tamarin (*Saguinus leucopus*) presence in forest fragments at Norcasia and La Dorada, Caldas". While she collected GPS data to classify the landscape, Cristhina was able to record the presence and absence of tamarins and analyse the relationship between landscape characteristics and tamarin presence. We supervised the data collection and advised Cristhina in data analysis and manuscript writing. Additionally, Julieth Florez and Jessica Otalvaro are currently developing their undergraduate thesis estimating silvery brown tamarin densities, and habitat use and home range of silvery brown tamarins in highly degraded habitats. Additionally, three veterinarians have had the chance to participate in the research and assisted us during the trapping procedure in order to gain more experience in wildlife research.
Involve the community by developing conservation workshops in the local schools to familiarise the community and general public with these primates and the risk of extinction they face			X	See below.
Disseminate the project results to the local community, general public, and the scientific community as well		X		Preliminary results of this project have been presented in the IV Colombian Zoology Meeting and the III Colombian Symposium of Primatology. Trimestral reports have been sent to the Environmental State Corporation, CORPOCALDAS, and a Facebook page has been created to inform

as the State Environmental Corporation and the Conservation Program for *S. leucopus*.				the general public of the project activities and results (see below).
Provide recommendations to conservation managers about how to maintain population dynamics in human modified landscapes, as well as to understand and predict the results of human induced land use change.	X			Since we have not finished collecting our data, and don't have all the analysis done, we have not been able to provide recommendation to conservation managers.
Provide baseline information for the implementation of an active conservation action plan that seeks to preserve this endangered species and integrates the local community.	X			Since we have not finished collecting our data, and don't have all the analysis done, we have not been able to provide baseline information that can contribute to the implementation of the current conservation plans.

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

One of the main difficulties we encountered while developing this project was the long periods of time required for trapping tamarins. Although we had anticipated that this would be time consuming for some groups, and thus we have prepared accordingly (i.e., use playbacks and caller animals), in some localities none of these solutions were available or effective. To date we have sampled 60 individuals from 12 social groups and five populations in the state of Caldas and Antioquia. Of all the groups sampled we have been able to capture on average, ~70% of all the individuals of each group. Although we have successfully trapped various tamarin groups, we realised that for certain groups the baiting process can take more than 3 months without success, especially for groups inhabiting conserved forest. Due to the fact that many studies have documented that tamarin aversion to bait can be reduced by employing a decoy or caller individual next to the trapping site in a similar compartment, we employed a caller individual lent by CORPOCALDAS who manages the tamarin rescue centre in Caldas. During our various attempts in using a caller animal, we observed that while adult individuals attracted the wild tamarins to the baiting platform, they represented a threat and consequently they vocalise and display aggressively towards the caller and never ate the bananas. On the contrary, using a juvenile or infant as a caller gave the most success and after a couple of weeks of exposure wild tamarins

were being trapped. However, since CORPOCALDAS' mission is to reintroduce captive tamarins into the wild, it was not very easy to have access to young tamarins as they are less imprinted to humans and therefore the target for release programmes. When we used a caller animal no physical interaction between the caller and the wild tamarins was observed, and the caller did not shown any health problems.

As trapping in some sites can be quite challenging, we have decided to target our sampling in sites where tamarins raid banana plantations or are used to eat bananas. Additionally, we have hired members from the local community to help us baiting since they know the area better and can help us identify those areas in the forest that tamarins usually use. Since we are aware that hiring members of the local community in this process can potentially encourage illegal pet trade, we have been very careful in only those people that have worked with CORPOCALDAS before or that we know personally.

Another unforeseen difficulty we encountered at the beginning of the project was the lack of support by some of the community members. Although we conducted an informal meeting with the community to familiarise them with the project objectives, methods and team members, after a couple of months of being in the field collecting data some members of the community thought our trapping methods were causing the death of the tamarins (which did not occur), and thus had a negative perception of our project. After realising this, we did another meeting that was attended by the above mention people, and we were able to clarify any misunderstandings and thanks to the support given by some of the community leaders, our project had a 100% approval. Although we managed to meet a couple of times with the community, the number of people that participated in some of these meetings was quite low. Community members of our study site have no steady jobs and as such they plan their lives on a daily basis. Consequently, it was sometimes hard to plan ahead of time the meetings and have high attendance rates. Even the community leaders, which were very interested in the project, did not assist some of our meetings if that same day someone offered them a job. One solution we found to deal with this problem was to convene our meetings the same day as the meetings developed by the company that manages the hydroelectric in the area, which informally employs 80% of the community and requires a mandatory attendance to the meetings. We expect that as the project continues developing, we are able to bring together all of the people who are interested in the project and that are fully committed without relying in the hydroelectric meetings.

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

To date the three most important outcomes of this project are:

- We successfully trapped and sampled 60 individuals from 12 social groups and five different populations in Caldas and Antioquia; and collected GPS data of the different habitats in the landscape of study in Caldas, which we have used to partially classify the landscape. So far, different landscape classification schemes have been developed. This data have allowed us to evidence that tamarin's mover over substrates that we have previously not considered as suitable habitat (i.e. fences, electric poles, shrublands and pastures). This information can help us better identify those habitat types that potentially favour tamarin movement, and thus identify potential habitat corridors. This data will be taken into account to test whether there is an observable relationship between how populations are being structured and the landscape characteristics.

- We have built a strong relationship with the local community and cattle ranching farm owners, which have showed their interest in participating in the project. Throughout the project development we have developed conservation workshops in the local school and conducted informal meetings and interviews with the community, thanks to which we have been able to raise awareness of the threats and degree of endemicity of the silvery-brown tamarin, its role in the ecosystem and in the community's livelihoods. Moreover, we have been able to develop a close relationship with the owners of two of the cattle ranching farms were we worked, which we believed is one of our most important outcomes. Through our casual conversations, we have talked about alternative cattle ranching strategies that benefit both the beef production and the silvery-brown tamarin habitat, and have explored the feasibility of implementing silvopastoral systems, that involve live fences, in their farms. Cattle ranchers have shown their willingness to implement these systems and build live fences, but have emphasised the lack of funds and time to do so. Thus, during July 2015 we plan to have a meeting with both owners and evaluate whether they are interesting in testing in their farm an approach that uses economically important tree species, that provide ecosystem services and that can establish connectivity among fragments, for which we as a project are thinking of applying for funds. Moreover, we plan to develop farm specific conservation plans.

- We have contributed to the revision of the current action plans that seek to preserve silvery-brown tamarins and integrate the local community. Although our project has not been completed and we still don't have the accurate information to identify what environmental factors favour or restrict silvery-brown tamarin dispersal and thus habitat corridors for the species, we have established a strong relationship with the Environmental State Corporation, CORPOCALDAS. We have met with them on various occasions, have send trimestral reports of our project activities and are currently working on a new project to estimate genetic diversity of silvery brown tamarins in the state of Caldas. They have continually shown great interest in the project results, as they are currently planning a project on habitat corridor implementation. We believe, that once we have finished collecting and analysing the samples, these results will contribute significantly to the implementation and design of these corridors in the area.

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

Throughout the project development we have involved the three main stakeholders (cattle ranchers, local community and local school) of our study area in Norcasia, Caldas. Although we have expanded our sampling scheme outside of Norcasia, we continued our work with the community there.

- We developed a class curriculum focused on silvery-brown tamarin conservation, which was approved and is currently being implemented by the local school. We have conducted three environmental workshops in the local community school "Institución Educativa Buenavista Posprimaria La Habana" in the Municipality of Norcasia. In the workshops 20 kids ranging from age 6 to age 12 have participated

  With these workshops we have accomplished three main objectives:

- Evaluate the different views the kids have about the tamarins, their habitat and its conservation status.
- Raise awareness and understanding of the risks of extinction tamarins have.
- Generate pride, ownership, belonging and identity regarding the tamarin, emphasising the fact that the silvery-brown tamarin is only found in Colombia and more specifically where these kids live. The message of these workshop was “Let’s protect OUR tamarin that is UNIQUE in the world”.

Over the next 2 months we will develop two more conservation workshops in which we will hand out a colouring activity book to the kids and will (if possible) take the kids to one of our field sites in Norcasia. We are still waiting on the school authorization.

- We have conducted two informal meetings with the local community, where we have presented the scope of our project in order to familiarise them with their objectives and methods. Additionally, we have conducted informal interviews to understand their perception about tamarins and their habitats and evaluate any change in perception and behaviour after project completion. We have identified and increase the knowledge of their influence-role in silvery-brown tamarin’s survival and habitat conservation, as well as the threats and degree of endemicity of the silvery-brown tamarin, its role in the ecosystem and in the community’s livelihoods. In this meetings we have emphasised the benefits tamarin conservation bring for tourism, as they are an endemic species that are primarily found in Norcasia. Some members of the local community have expressed their desire to build baiting platforms in strategic areas so that tourists can observe the tamarins, as well as their wish to develop and implement reforestation projects. Finally we provided two community members the chance to actively participate in the project by helping team member’s complete hands-on task such as daily rain measurements and collecting GPS points.

5. Are there any plans to continue this work?

Over the last year we applied and successfully were awarded the future conservationist award from the Conservation Leadership Program, to build new scientific knowledge about the viability of silvery-brown tamarin populations in highly degraded habitats, to raise stakeholder’s awareness and understanding of the species importance and revise conservation actions plans. For this project, we are currently collecting data regarding differences between habitat use, population densities and home range of silvery-brown tamarins in highly degraded and conserved habitats. This information coupled with the results from this project will provide ecological, behavioural and genetic data to the design and implementation of habitat corridors for this species. We plan to continue our work, exploring more in depth how agroecosystems, specifically silvopastures, can contribute to the connectivity of isolated patches of forest in cattle ranches and thus on tamarin dispersal, while benefiting the cattle production. Furthermore, we want to explore with CORPOCALDAS the feasibility of receiving government funds and technical advice to the development and implementation of silvopastures and design of habitat corridors to maintain connectivity between isolated populations of tamarins.

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

We plan to disseminate the results of this project to different audiences. To date, we have created a Facebook page (https://www.facebook.com/pages/Conservaci%C3%B3n-Titi-Gris-Conservation-Silvery-brown-tamarin-Colombia/1541738879443465?ref=aymt_homepage_panel) with a total of 530 likes, were we inform the general public about the results and activities of the project. Thanks to this, one graduate student from Oxford Brookes has joined the project and is conducting her master thesis with us. Furthermore, we have been able to generate collaborations with other people interested in this work and other NGOS have used this page to share experiences.

Additionally, we have shared our preliminary results with CORPOCALDAS through trimestral reports as well as meetings, and have presented some of these results to the scientific community in the IV Colombian Zoology Meeting and the III Colombian Symposium of Primatology.

Once our project is completed, we plan to disseminate the results of the project to the local community with educational outreach materials such as educational booklets, presentations and posters. We will also meet with cattle ranchers to show the main findings of the project. Moreover, we will meet with CORPOCALDAS, who will get a detailed report of our findings and if desired will get a copy of all the raw data. Finally we will write and publish scientific papers analysing and presenting the results of the data collected, and present them in national and international meetings

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

To date we have used 70% of the Rufford Foundation grant, and we have spent this funds from June 2014 to May 2015. We plan to finish our fieldwork by August 2015 and thus 100% of the grant. Due to some issues in trapping, our project has been delayed 2 months.

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
Land Transportation	£200	£200	£0	
Food and lodging	£4200	£3500	£700	Fieldwork has not finished yet and the remaining funds will be used during the next months
Field equipment	£400	£300	£100	We were able to get some of the equipment for free from other researchers.
Field supplies	£700	£300	£400	CORPOCALDAS gave us some old traps that they were not currently using and the Primate Molecular Ecology and Evolution Laboratory from the University of Texas at Austin kindly provided the sampling tubes and DNA

				preservation buffer.
Laboratory procedures (DNA extraction, sequencing and genotyping)	**£**300	**£**500	**£20**0	Funds requested for laboratory procedures were going to be spent on DNA extraction of some of the samples. After conducting the first preliminary analysis, we realised that we needed to quantify the DNA concentration for each sample after each extraction and thus we end up spending more money than what we anticipated.
Outreach materials for Conservation workshops	0	**£**300	**£**300	Since some of the funds requested for field equipment and field supplies were not used, as we were fortunate to get the materials through donations, we used **£**300 for some of the outreach materials we used during the conservation workshops. These included t-shirts and ponchos for the local community, as well as for the development of a colouring book for the kids of the local school.
Total	**£**5800	**£4800**		

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

We need to finish collecting samples in the remaining sites as well as building genomic libraries and calling of genetic markers. With this information we will be able to examine the spatial distribution of genetic variation of tamarin populations, and thus evaluate if the landscape affects how tamarin populations are being structured and identify if tamarin dispersal occurs preferentially through certain features of the landscape. Once we have this information, we will be able to test different biological corridor configurations for their ability to augment gene flow between isolated tamarin populations and explore whether several potential biological corridor configurations across the landscape might achieve connectivity among populations in a preliminary, qualitative analysis. These results then will be provided to CORPOCALDAS, in order to inform science-based management recommendations for the conservation of silvery-brown tamarins and intend to inform CORPOCALDAS' biological corridor construction program and management of matrix habitats.

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?

Yes, we used The Rufford Foundation logo in the t-shirts and ponchos we gave to the local community. As stated above we are currently designing a colouring book about tamarin conservation that we will give to the local school, in which the RF logo is also printed. So far, RSGF have not received any publicity during the course of our work. Nonetheless, CORPOCALDAS and the NGOs we are currently working with are aware that you are one of our main funders.