

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	Spencer Christian Schubert
Project title	Exploring the potential of endemic colonial-nesting birds as natural agents of forest restoration in degraded lands of the Dominican Republic.
RSG reference	19043-1
Reporting period	March – December 2016
Amount of grant	£4800
Your email address	sschu001@odu.edu
Date of this report	19 December 2016

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. Study of Seed Dispersal at Isolated Trees in Pastures				Modifications to the research design have improved the study and a plan for long-term monitoring of results is in place.
2. Incorporating and Training Local Biologists				Three early-career biologists from the nearby Universidad ISA in Santiago were involved in my project. Two of these served as full-time technicians.
3. Networking and Collaboration with Conservation Partners				Ultimately, I did not attend meetings of the farmer's cooperative in Constanza. However, the partnership that I am currently forming with Plan Yaque has great potential for my project to make meaningful contributions to forest restoration moving forward.
4. Local Elementary School Outreach				In two successive visits to the Rafael Amánzar Ureña primary school in our local community, Grupo Jaragua education specialist Andrea Thomen in conjunction with our team delivered interactive education programmes to 3 rd and 4 th grade students, with great success.
5. Local/Regional University Outreach				The seminar presentation at the biology department of Universidad Autónoma de Santo Domingo was well received. However, some of the visits that I initially planned to make to other institutions did not materialise.

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

Some challenges and unforeseen circumstances during my field season required me and my team to deviate from some of the activities originally proposed; however, I strongly believe that the first year has largely succeeded in its initial objectives.

One such difficulty that we encountered was finding supplies available locally to construct the cattle fences needed for our experimental pasture plots. Despite being told otherwise by a local hardware store that I spoke to over the phone in the months preceding, metal t-posts were not available. Having been aware of my struggles, the cooperating land owner, Señor José Brache, donated the posts we needed from cuttings of the common live fence tree Piñon Cubano (*Gliricidia sepium*). This change ultimately saved a major expense, and I was able to redirect funds to other project purposes. One of these was employing the services of a local handyman and fence specialist named "Mingo". He did a fine job, and his leadership of the effort allowed us to complete all plots by the end of April, very much on schedule.

In the study of seed dispersal around isolated trees in cattle pastures, the biggest difficulty I faced was with the seed addition experiments. First, two tree species (*Inga vera* and *Picramnia pentandra*) of the five originally identified as good candidates for this research appeared to have terminated their fruiting period for the year when we first walked phenology routes in April. Furthermore, the unexpected emergency departure of my collaborator Joshua LaPergola (Cornell University) prevented me from harvesting royal palm (*Roystonea hispaniolana*) seeds. In the context of our original plan, this left us with Cabirma (*Guarea guidonia*) and Guarana (*Cupania americana*). Between April and May 2016, I conducted a pilot effort to add 80 seeds of each species in two separate fields with 16 seeds in each of the different plots. Methods that I had taken from the literature using super glue adhesive attachments to strings is reported as a successful technique on the forest floor. However, rapidly growing pasture grass interfered with strings, often displacing seeds from their point of planting. After due consideration and communication with other members of my research committee advising the project, I determined that the best way to collect data on variable germination and establishment rates of plants in the different pasture plots was to draw conclusions from the densities of seeds into seed traps and compare this to seedling establishment rates in the adjacent seedling quadrats.

Following my initial interactions with several colleagues in the Dominican Republic, I became aware of monthly meetings of a farmers' cooperative gathering in Constanza organised by Fundación José Delio Guzmán. Early conversations with the organization's founder, Señor Delio, indicated there was promising opportunity for

me to communicate with private land owners and seek out future opportunities to apply the findings of my research to ongoing forest recovery efforts. After our first meeting in person, however, I determined that my networking efforts would be better focused elsewhere. As it turns out, the current focus of the organisation and its partners is in farming communities in the vicinity of Valle Nuevo National Park and the town of Constanza. The forest types and much of the fauna in this region – located at higher altitudes – are quite different to the lowland wet forests where I conduct my research. Therefore, my ability to advise forest recovery efforts in this region is limited. Despite this complication, Señor Delio gave me contact information for various other people in the region of Jarabacoa that helped me move closer to achieving my goal of improving forest restoration efforts for local conservation stakeholders.

Upon my arrival to the site in late March 2016, I came prepared with a number of fliers announcing a position opening for a technician to work for several months on the project. I distributed this information as widely as possible to attract interest from the target audience: early career biologists with interest in acquiring further training and career opportunities in science and conservation. Locally, I visited Escuela Nacional de Medio Ambiente and Universidad Agroforestal Fernando Arturo de Meriño to provide the education directors with copies of this information to make available to their current and recently graduated students. I also provided this information to my colleague Jackeline Salazar at Universidad Autónoma de Santo Domingo, an ornithologist at the Natural History Museum in Santo Domingo, the herbarium manager at the national botanical garden, and various members of Birds Caribbean and Grupo Jaragua with professional contacts in the Dominican Republic. Despite these efforts, there were few applicants. Of these, none were able to make the commitment necessary to join the project as a technician. The breakthrough came just after my visit to Fundación José Delio Guzmán in Valle Nuevo. Señor José Delio gave me the contact information for a professor at Universidad ISA in Santiago, one of the larger cities in the country just north of where we work in Jarabacoa. After passing my information to this person, I had applications from several interested candidates with the profile necessary to join my project. From this process, I was able to contract one technician to begin in June, one short-term volunteer during the summer, and an additional technician during the fall.

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

1. *Study of Seed Dispersal at Isolated Trees in Pastures*

The conclusion of this calendar year will mark 8 months of continuous monitoring and data collection for the study initiated last spring on avian seed dispersal around common perching structures in cattle pastures at the primary research site. Several

modifications were made to original study design to improve its effectiveness. Moreover, the adjustments in my budget spending have allowed data collection to continue in my absence until I arrive to the site again in January 2017. This is a remarkable achievement, since few researchers at the graduate level are able to maintain continuous studies at their field sites. In my particular case, it has greatly improved the completeness of my sampling, since the ecological phenomena I study are acting throughout the year.

As for the preliminary results of my study, there are already some interesting findings to report. From the seed traps placed in 20 different plots at the primary research site, we collected more than 19,000 seeds of 64 distinct species. All but two of these species exhibit the diagnostic features of dispersal by frugivorous animals. A comparable number of woody plant seedlings were found during seedling censuses within the lot. Given that few resources are available to accurately identify plant taxa by their seeds and young seedlings, we currently rely heavily on sampling fruits directly from wild plants in order to associate and identify seeds to their plant of origin. We have made and are continually revising a photographic species guide of seeds and seedlings – both known and unknown – to collect and manage data. In one of my visits to the capital, I visited the national botanical garden and herbarium manager at the national botanical garden in Santo Domingo has agreed to receive plant press samples to help us improve species identification.

As expected, seed dispersal and seedling regeneration is greatest and most diverse below royal palm trees that palmchats (*Dulus dominicus*) use as colony nest trees. A similar pattern was seen with snags inhabited by colonially-nesting Hispaniolan woodpeckers (*Melanerpes striatus*); however, the diversity of seeds deposited by birds in these plots was considerably less. Seed dispersal below trees used by nesting woodpeckers was highly variable by season with few seeds arriving after the breeding season concluded in August. Palmchats, on the other hand, actively maintained their nest structures throughout the study period and the quantity of seeds arriving to these plots was more consistent.

2. Incorporating and Training Local Biologists

Though I initially encountered difficulty and frustration trying to attract appropriate candidates for volunteer and technician roles on my project, this aspect of my project has been a resounding success. Though she was only able to volunteer nine days with us, Estefania (Fany) Abreu, provided both me and a collaborator with valuable support during her stay. She was involved in several activities both in the field and at the field station, including assisting my collaborator with ongoing target avian capture. This was an especially important experience for Fany, as she has expressed interest in seeking further opportunities in avian research and conservation.

Two technicians, recently graduated with bachelor's degrees in Ecology and Environmental Management from Universidad ISA in Santiago, were hired to work in for an extended season on my various field investigations. Iram Nsogo Mba, originally from Equatorial Guinea, committed 6 months to the project. And Joaris Samuel Gonzalez, from Santiago, served 5 months. The importance of these two individuals to my project and its various ongoing studies cannot be understated, as they have been instrumental in the maintenance and upkeep of my project during my absence after returning to the United States. During their time with the project, they have worked both independently and as a team to collect data and maintain other project functions at the field site. In addition to their work on the study of seed dispersal in the pasture plots, Joaris and Iram had major roles in two other studies that I am conducting at the site: a radio telemetry study of seasonal changes in woodpecker movement and seed-dispersing behaviour, and a study monitoring phenology and seed dispersal of subannual (multiple annual fruiting periods) tree species. Overall, Iram and Joaris gained numerous skills through learning about the methodologies used in wildlife and plant ecology that will distinguish them as they seek further job opportunities in science and conservation.

3. Networking and Collaboration with Conservation Partners

Despite the initial disappointment that my partnership with Fundación José Delio Guzmán would not be a productive one, my search for local partners soon led me to the non-governmental group Plan Yaque, based in Jarabacoa. The mission of this organisation is to conserve natural water resources in the upper section of the Rio del Yaque Norte watershed near Jarabacoa. They operate numerous programmes including public education, recycling, and litter clean-up in the local area. During 2016, however, Plan Yaque initiated a pilot programme involving reforestation efforts along degraded streams in rural communities in cooperation with approximately 70 owners of small farms that have signed up to participate. In June 2016, the director of Plan Yaque invited me to accompany them for the opening ceremony of this programme on one such property. Since this time, we have continued to discuss the possibility of future collaborations between us. The managers of this project are excited to partner with me, because they have not previously considered how restoration activities may benefit bird populations, and perhaps more interestingly, how birds themselves may play a role in facilitating forest regeneration. This partnership presents great potential for future studies and activities for my project that can contribute meaningfully to actual forest restoration in the future. Currently, the director of Plan Yaque and I have plans to meet in January 2017 when I return to Jarabacoa to discuss future collaborations.

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

On the most basic level, my project continues to maintain positive relations with the cooperating land owner and the community around our primary research site. This includes friendly daily communication with neighbours and farmhands that are learning more about our work and its importance through our casual interactions. More substantially, I offered a local handyman 2 weeks of paid work to lead the construction effort of the cattle fences for the pasture plots in my study. Additionally, I regard the inclusion of locally-trained biologists on my project as technicians to have potentially long-term benefits to local communities. For example, Iram has expressed interest in pursuing a career in the Dominican Ministry of the Environment. Joaris hopes to one day create his own non-profit conservation organisation and to manage a private wildlife sanctuary. It is my sincere hope that I will be able to continue integrating locals on my project in this capacity in the future in order to contribute to the career development of young ecologists that can have an impact on improving their communities through their future work.

One particularly successful aspect of my project's outreach has been the education programme that we delivered to the local elementary school, El Centro Educativo Rafael Amánzar Ureña. With the help of Grupo Jaragua's education specialist, Andrea Thomen, our team made two successive visits to the school to give the 3rd and 4th grade classes our afternoon programme. This programme was designed, in part, for the larger Caribbean-wide initiative, the Festival of Caribbean Endemic Birds, for which conservation groups from nations around the Caribbean engage in youth education programme. Our particular objective with these programmes was to educate school children about the ecosystem services that birds provide and the importance of ending their persecution and protecting their habitat. I was able to directly incorporate my own research into this programme by having the kids play an interactive seed dispersal game, which was so well received, Andrea has continued using it in other programmes throughout the country.

5. Are there any plans to continue this work?

I have firm plans to continue research in this area until at least 2019 for my dissertation. I intend to continue basic monitoring of the pasture seed dispersal study that has been funded by RSG in 2016 to the 12-month mark. After this point, I will likely reduce my monitoring efforts to vegetation surveys and seedling censuses in the pasture plots in order to shift focus to other studies that I will initiate in 2017.

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

I will disseminate the findings of my research in a variety of different forms. Our work over this past year has yielded several interesting data sets. Some of these may soon be ready for publication rather soon. For example, the regular avian point count surveys that we conducted in pasture and forest sites at our primary research site revealed some interesting trends in occupancy at the research site that suggest altitudinal migration of the narrow-billed tody (*Todus angustirostrus*), which has not previously been investigated or documented. This presents an opportunity to publish this work with one of my collaborators that studies this species. While the results from my study on seed dispersal below isolated trees in pastures may not be ready to submit for publication until later in 2017, I plan to present this work at the Birds Caribbean meeting in Cuba in July 2017. As a precursor to this meeting, I will also be writing an article to be included in the Birds Caribbean news blog that will summarise the story of my first field season in the Dominican Republic. In the coming year, I will also seek out opportunities to present my findings to different audiences, such as Dominican academic institutions and events hosted by my local partner Plan Yaque.

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 research and outreach activities for which RSG funds were used took place from late March through December. This is more than a month longer than initially planned. Some basic monitoring work and sample collection will be done by one of the technicians this month leading up to my arrival to the site again in January, when my direct management of the research will resume.

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
Rental Vehicle	383	462.25	-79.25	The daily rate was slightly higher than expected.
Gasoline	74	106.93	-32.93	My initial invited speaking event to the biology department UASD

				was post-pones such that I had to make one more trip than expected to the capital.
Metal T-posts	551	0	551.0 0	This item was not available. I used live cuttings of fence trees as an alternative. These were donated to me by the resident land owner.
Fence Labour	0	192.60	- 192.6 0	Savings on other fence costs allowed me to contract labour from a local handyman, which helped speed plot construction.
Barbed Wire	114	147.85	-33.85	Plots were bigger than initially planned, requiring more barbed wire. Cost for staples and nails also included here.
Cable Cutters	21	20.20	0.80	
PVC tubing	179	116.70	62.30	At the local hardware store where I purchased this item, they gave me a discount for buying in bulk, and a smaller diameter of tubing was used for seedling quadrat posts.
Insect Screen	0	20.00	-20.00	Initially, I had this item at the field house before the project, but it was misplaced by those managing the house before I arrived.
PVC links	199	47.80	151.2 0	We could not find 3-way connector links, but instead used a design involving a combination of "T" and "elbow" connectors. These items were found much cheaper than originally priced online.
Cable Zip-ties	9	9.71	-0.71	
Garmin Etrex20	169	180.96	-11.96	More expensive than originally sourced.
Extendable Pole Saw	21	15.79	5.21	Cheaper than expected.
Flagging Tape	10	1.84	8.16	Less of this material was needed

				as much of the process involving delineating plot boundaries was simplified.
Plastic Binding Combs	5	3.78	1.22	
Callipers (2)	24	23.43	0.57	
Measuring Tape (2)	14	6.40	7.6	Cheaper than expected.
Field Technician Salary	2065	3282	-1217	I diverted funds from savings on other expenses to contract a second technician for the project who spent August-December working on this project as well as another study that I acquired funds/materials for in the summer from a successful grant proposal to conduct radio telemetry work with Hispaniolan Woodpeckers.
Volunteer Food	772	28.12	743.88	Despite considerable interest from local undergraduate students in volunteering with my project in the beginning, many of these did not follow through on their intended commitments. The actual expense was only for one volunteer who stayed for 9 days.
Weekly Taxi	190	231.12	-41.12	Extra cost was due to extending the study period through the month of November and reimbursing taxi expenses for applicants travelling to the site.
Total	4800.00	4897.48	-97.48	I have used my own personal funds to cover the extra expenses.

—exchange rate of \$64.90 (DOP) = £1.00 (GBP) used for these calculations. This was the exchange rate at the time funds were received in March.

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

First and foremost, I believe the study that I have initiated in 2016 will continue to produce valuable data in the coming months of as I aim to bring 12 months of sampling seed dispersal to a close. From this point onward, vegetation surveys in the plots and in the seedling quadrats at 12-month intervals will continue to reveal poorly understood patterns of natural forest succession and the role of avian seed dispersal in this process. The biggest priority for this ongoing study will be to improve species identification of seeds and seedlings. I aim to devote more concerted effort this task by adding another regular activity to our weekly schedule that involves systematic fruit collection along transects to better identify seeds. Furthermore, I plan to germinate seeds from our seed collection in to be able to associate seeds with unknown seedlings photographed from our past censuses of the seedling quadrats.

Since one of the principle objectives of my project from its onset has been to apply ecological research to improve local and regional conservation efforts, I consider future collaborations with Plan Yaque as a top priority. Not only does my involvement in Plan Yaque's reforestation activities stand to enhance their efforts to restore forest cover and natural resources to rural communities, but this will also be a great opportunity to expand my sampling effort in the region to bring further relevance of my studies to conservationists at a larger geographic scale.

In the first year of my project, I have sampled seed dispersal below different isolated trees in cattle pastures in order to draw conclusions indirectly about seed dispersal processes by observing bird perching/nesting activity and seeds arriving below the tree. I have focused mostly on the two colonial-nesting species (palmchat and Hispaniolan woodpecker). However, there are at least 20 other frugivorous bird species in the region that are likely important seed dispersers. The ecological role of these animals in both pastures and maturing secondary forests in degraded landscapes warrants further investigation. In the future, I aim to use my connections with local partners to investigate interactions between birds and the plants they disperse at the community level. One potential avenue for such research would be to examine how avian seed dispersal differs in areas with varying levels of disturbance in order to improve our understanding of the environmental costs associated with land development, and the potential benefits of forest restoration for plants and wildlife.

At the broadest level, seed dispersal research in tropical ecosystems has revealed the importance of the mutualistic interactions between frugivores and the plants they disperse. Interactions between any two species cannot be viewed in isolation, but rather they must be considered in the context of numerous feeding-dispersal relationships in the community that reveal information about a network of

interactions. The structure and composition of these networks are seen as important properties of networks that reveal information about their evolutionary history and potentially predict how species loss (extinction) or addition (invasion) may affect biodiversity and ecosystem functioning. This area of research is still very much in its infancy, and continued research in the unique ecosystems of the Dominican Republic presents a great opportunity to bring further clarity to these knowledge gaps.

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. I used the Rufford logo at the end of all my presentations involving the work I did in the Dominican Republic. These included invited talks to the Universidad Autónoma de Santo Domingo (Dominican Republic), the Cape Henry Audubon Society (Virginia, United States), and various smaller presentations at my home institution. Approximately two months ago, I created my own personal website (<https://student.wp.odu.edu/sschu001/>) that I hope to continue improving going forward. On this page, I have provided links to Rufford's website as well as other funders for those who are interested in learning more about my project.

11. Any other comments?

My project members and I are deeply grateful for the funding provided from the Rufford Foundation in 2016. My doctoral research project represents the culmination years of aspiration that would not have achieved nearly a fraction of its success in the first year without this funding support. Moreover, the RSG funding has allowed me to develop lasting conservation components to my long-term research in the Dominican Republic that I hope will continue to guide my investigations and work toward improving forest restoration efforts in region. The two technicians that have served on the project are also very appreciative for having been able to find compensated positions that have helped them to expand on their past education and gain hands-on experience in different aspects of ecological science in the field that will give them an important foothold in their future careers.