# The Rufford Small Grants Foundation

# Final Report

Congratulations on the completion of your project that was supported   by The Rufford Small Grants Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. 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. 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](mailto:jane@rufford.org).

Thank you for   your help.

**Josh Cole Grants Director**

## Grant Recipient Details

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|---|---|
| **Your name** | Jorge Luis Rentería |
| **Project title** | Integrated Weed Management In Galapagos – Combining Methods To Improve Control of the Invasive *Rubus niveus* and *Leucaena Leucochephala.* |
| **RSG reference** | 52.04.08 |
| **Reporting period** | August 2008 -  January 2010 |
| **Amount of grant** | £4,200 |
| **Your email address** | [jorge.renteria@fcdarwin.org.ec](mailto:jorge.renteria@fcdarwin.org.ec) / [j.renteria07@imperial.ac.uk](mailto:j.renteria07@imperial.ac.uk) |
| **Date of this report** | 23 January 2010 |

**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 |
|---|---|---|---|---|
| To assess the potential of the degraded areas to be restored based on the seedbank | | | X | An average of 1,200 seedlings/m² of *R. niveus* were found in the soil. The number of seedlings of the native species was very low compared to the invasive *R. niveus*. Considering the most common native plants of the forest, the number of seedlings available in the soil did not reach 20 seedlings/m²/species. These low numbers figures were also found in soil samples taken from areas where *R. nives* was not present. So the conclusion is that seedling populations are generally very low and even more so where the *R. niveus* is found. The invasive species is clearly outcompeting native species. |
| Experimental trails to reduce the soil seed banks of the invasive *Rubus niveus* and *Leucaena leucochephala*. | | | X | Five different pre-emergent herbicides (seed herbicides) were tested at experimental level to assess the effectiveness to reduce seed germination. One seed herbicide was 99% effective, inhibiting the germination of almost all the seeds of *R. niveus*. However, seeds of *L. leuchocephala* showed more resistance to the herbicide at the concentration used. Control of seed germination was approximately 20% effective. It may be necessary to repeat trials using higher herbicide concentrations in order to achieve better results in the control of *L. leucocephala* seed germination. |
| Competition between the invasive *R. niveus* and five of the most common native plant species of the Scalesia forest. | | X | | Native species showed equal or greater tolerance than *R. niveus* to stress conditions. There was no significant or obvious difference in the effect of the different light and water treatments on the native vs. the invasive species. However when plants were growth under favourable water and light conditions, *R. niveus* seems to perform better than the |

| | | | | native plants. These results are not conclusive at this stage. Complementary data we are still awaiting may shed further light on the competitiveness of R. niveus in comparison to that of native species. |
|---|---|---|---|---|
| Academic training. | | | X | The information derived from this project will used as part of a PhD thesis at Imperial College in London The project has assisted in the training and skilling of an Ecuadorian volunteer/student from an Ecuadorian University in the field of conservation, invasive species management and habitat restoration. An oral presentation was given at the International Galapagos Science Symposium 2009. |
| Assisting the managers and local community. | | | X | Through our interaction with the Charles Darwin Foundation, formal and informal technical advice has been provided to The Galapagos National Park Service on the control of the invasive plant species. |

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

Unexpectedly slow growth and high mortality of seedlings used in the competition trials were a tremendous hurdle.  Soil mixture used on pots seemed to be the factor affecting seedlings development and survivorship. Where possible, experiments were repeated using different type of soil.

Site availability for the proposed experiments was an additional barrier to progress. We didn't find adequate sites to carry out all the proposed experiments with the invasive *L. leucocephala,* therefore most of the resources were put on the study of *R. niveus* which is the most pernicious plant invasive species in the Galapagos Islands.

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

> **a. Understanding the invasion process.** The soil seedbank of *R.  niveus* has been confirmed as the main source of reinvasion after control of adult plants.
> **b. Management of the invasive.** A pre-emergent herbicide that may reduce considerably the germination of seeds of *R. niveus* has been identified. This finding could be used as the basis for an alternative control method within an integrated management strategy.
> **c. Habitat restoration.** Control of *R. niveus* in natural areas has to be complemented with the facilitation of native vegetation regeneration. The amount available seeds in the soil and the growth rate of native species are considerably low compared with that of the invasive species.  This links in the experiments on competition mentioned above.

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

We have worked closely with local farmers, providing them with technical assistance on the control of invasive plant species and the restoration of farms. We have used local people as field assistants and provided some temporal work opportunities.

**5. Are there any plans to continue this work?**

Yes, this is a 3-year project.  We are about to start the second field work season. We expect to carry out a study to assess the impact of *R. niveus* on the composition and structure of the forest. Although the effects of *R. niveus* on the natural communities are evident, there has not been any formal study to identify and quantify such effects.

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

We have shared our preliminary results, ideas and knowledge through formal and informal communications with National Park Service. Some results of this project will be published in internationally recognized peer-reviewed scientific journals. A short paper was published as part Galapagos Science Symposium 2009: "Towards an optimal management of the invasive *Rubus niveus* for habitat restoration in the Galapagos".  Information about this project will be found on the Charles Darwin Foundation web site: http://www.darwinfoundation.org

**7. Timescale:  Over what period was the RSG used?  How does this compare to the anticipated or actual length of the project?**

The RSG grant (received 12 August 2008) was used throughout 2008 and 2009. Funding was used to cover flights to the UK from Galapagos, nursery infrastructure development, stipends and accommodation to support an Ecuadorian volunteer, field assistant, transport, and tools/equipment. The grant was for 1 year and we are seeking support from RSG for another year to assess the impact of the invasive *R. niveus* on the natural ecosystem.

**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 |
|------|-----------------|---------------|------------|----------|
| International flight UK. Galapagos | 1500 | 1,286 | 214 | Under-spent funds were reallocated to pay for equipment and greenhouses |
| Transportation | 800 | 393 | 407 | Cost of hiring a taxi to go to the field.  Under-spent funds were reallocated to pay for equipment and greenhouses |
| Student/volunteer | 700 | 3 | -1,443 | Subsistence and accommodation for volunteer during a period of 6 months. |
| Temporary field assistant | 300 | 7,14 | -414 | Cost of labour; it involved hiring a local assistant to help in the field |

| | | | | |
|---|---|---|---|---|
| Tools, equipment and infrastructure | 900 | 1071 | -171 | Cost of equipment, instruments and material to carry out experiment. An important investment was the building of greenhouses which was not budgeted. |
| **TOTAL £** | **4,200 (Rufford)** | **5,607** | **-1,407** | Difference was covered with the financial support of the Charles Darwin Foundation |

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

Future fieldwork is necessary to document the invasion process and the environmental impacts of *R. niveus* on the natural ecosystems of Galapagos. This information will be very useful to develop methodologies to reduce the cost and duration of control projects and perhaps meet the restoration goals.

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

I used RSGF logo in my oral presentation during International Galapagos Science Symposium 2009. The RSGF logo was used in a poster which has been displayed at the Charles Darwin Research Station. It is not possible to use logos in the scientific papers, however the RSGF funding will be acknowledged in any published materials.

**11. Any other comments?**

Thanks to the financial support from the RSGF, It has been possible to me to carry out my PhD research project in the Galapagos Island. I feel so proud to be able to help with the conservation of this natural paradise.