# 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. 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** | Alejandro Pietrek |
| **Project title** | Building Realistic Models to Predict the Spread of Invasive Beavers in Patagonia |
| **RSG reference** | 10947-2 |
| **Reporting period** | May 2012- May 2013 |
| **Amount of grant** | £6,000 |
| **Your email address** | alejandro.pietrek@duke.edu |
| **Date of this report** | May 31st, 2013 |

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 |
|---|---|---|---|---|
| Incorporate induced habitat heterogeneity in the invasion models | | | X | We estimated the change in vegetation cover from one year to the next but we did not find significant differences on a yearly basis. Probably, beaver damage is detectable at larger temporal scales. |
| Use coloured ear-tags to complement high-cost radiotransmitters | | | X | |
| Estimate dispersal distances of beavers in different habitats | | X | | Until May 2013 we recorded three large scale movement events in the forest and three in the steppe. |
| Estimate rates of survival and reproduction in different habitats | | X | | Until May 2013 we have marked and captured 84 beavers. As in most long term demographic studies we will have definite results by the end of 2014 (our study started in early 2011). |
| Build an individual based model parameterised with data we obtained in the field | | X | | We built an individual based model for beavers that will be parameterised with data collected during this study. |

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

Although we expected to see changes in vegetation cover as a consequence of beaver foraging and flooding, our analysis indicate these were not important on a yearly basis. We believe these changes may be noticeable at larger temporal scales. Therefore, we will conduct vegetation surveys in our third and last field season (2013-14) and we will compare these surveys with the surveys we started in 2011.

Use of coloured ear-tags is helping us to obtain additional information on beaver survival and dispersal. However, in the beginning of the field season many of our marked beavers lost their tags. In a typical learning process we contacted other wildlife specialists and tried alternative placement of the tags to improve their persistence on beavers. We found placement and positioning of the tags was key to successfully mark the beavers we captured. By May 2013 we did not record lost ear-tags.

We found really hard to follow individual movement of beavers at a fine temporal scale. For instance, one of our radio-tagged beavers moved more than 7 km in less than a week. This means the dispersal process can be very fast, making relocation and detailed tracking more difficult than

previously expected. Thus, we allocated part of the budget for transmitters to our transportation costs, in order to relocate missing beavers. This also changed our initial formulation of the model from fine scale movement to a more broad scale movement formulation (that relies only upon the starting and finishing locations of dispersal).

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

1) To date, I have recorded six dispersal events (three in the steppe and three in the forest). More importantly, I have documented movement between basins separated by high mountain passes in Tierra del Fuego, which suggests beavers can spread more easily than previously expected.

2) Compared to our previous study also funded by the Rufford Foundation we were able to obtain estimates of colony size and fecundity in both habitats (forest and steppe). We found that colony sizes and productivity of the colonies (measured as the proportion of colonies producing kits and the number of kits per colony) was higher in the steppe than in the forest. This is important for at least two reasons: a) Confirms that habitat heterogeneity affects demographic parameters; and b) Sheds light on what is happening in the front of the invasion (steppe habitats). Although the steppe was traditionally considered a marginal habitat, our study consistently shows that populations are stable and highly productive, thus emphasizing the importance of steppe in accelerating the speed of the invasion.

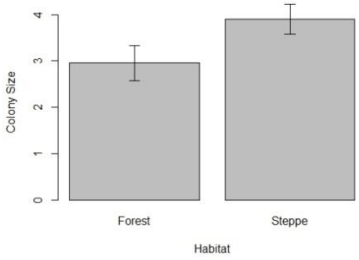
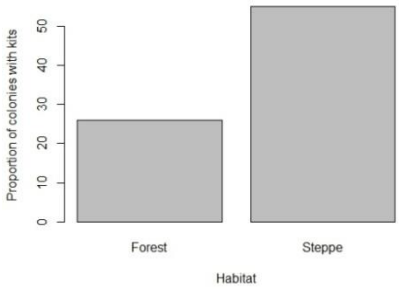



**Figure 1.** Differences in colony size, proportion of colonies with kits and litter size between forest and steppe.




3) After trial and error we are successfully using ear-tags to obtain additional estimates of survival and dispersal of beavers using mark-resight techniques.

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

We raised awareness of the importance of controlling the beaver invasion on the local media, schools and museums in Tierra del Fuego. More specifically on January 21st 2013 we presented our project in the local TV (Canal 11, Ushuaia) and in a local newspaper:

http://www.momentostdf.com.ar/2013/01/cientifico-busca-voluntarios-para.html.

In addition to this, I gave a talk to the interns and students of the Acatushun Natural Sciences Museum located in the proximities one of my study sites, and one to high school biology

Professors of the city of Rio Grande in Tierra del Fuego. We also presented some of our preliminary results in the meeting of the national committee for the control of invasive species dependent upon the Secretary of Environment in Buenos Aires.

During 2012-13 we also trained four undergraduates and a high school professor in beaver handling and trapping techniques, radio-telemetry and vegetation measurements.

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

Next will be our last field season. To date we have 91 captures of 84 individuals (seven beavers were recaptured). Of these 84 individuals we have radio-tagged 40 (25 in the steppe and 15 in the forest). Our plan is to radio-tag a minimum of 30 beavers in each habitat to obtain accurate population parameters and estimates of dispersal distances. Once we have estimated population parameters of beavers in forest and steppe (by the end of next year) we will parameterise our individual-based models. We had previously attempted to study the spread of the invasion with population models tied to data of beavers in North America, but the use of more detailed models parameterised with our field data will represent a significant improvement with respect to our previous efforts.

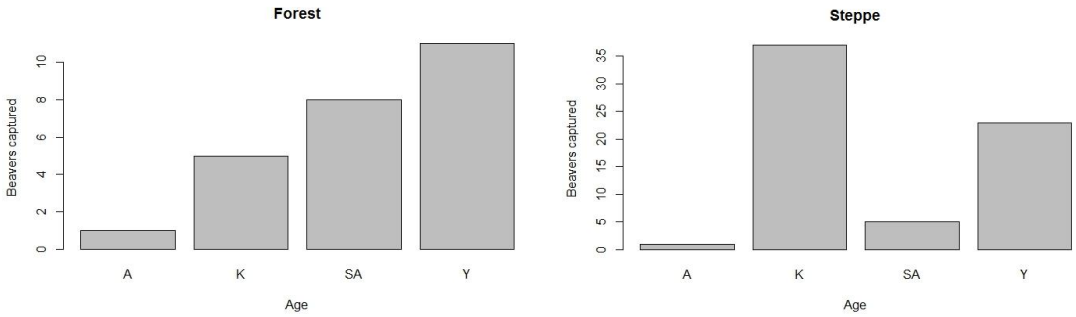



**Figure 2.** Age distribution of the beavers captured in forest and steppe (A=adults, SA= subadults, Y=yearlings, K=kits). Notice the high number of kits captured in the steppe, which agrees with the high productivity observed in these colonies.

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

Results of our research will be published in three different manuscripts to be submitted to peer reviewed journals. I will translate the manuscripts to Spanish to reach a broader audience and local communities in particular. I also plan to give talks at high Schools, research institutions and wildlife agencies to raise awareness of the importance of the ecological problems beaver pose on Patagonia.

One of our most important goals is to provide useful guidelines to managers to slow the spread of the beaver invasion in Patagonia. As we highlighted before, we discussed some of our preliminary results in meetings at the national level where managers are taking decisions on how to control the invasion. We are also submitting annual reports of our results to the province of Tierra del Fuego where we carry out our research. Definite results by the end of next year will provide more insight to understand how to stop the beaver invasion.

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

Next season we will be still placing transmitters we purchased with funding from the Rufford Foundation. Usually we allocate transmitters on subadults, which provide more useful information

on movement (subadults disperse when they are around 2 years old). Last season we radio-tagged 20 individuals, and in the next season we expect to place the remaining 20 transmitters. Likewise, we will continue our repeated observations and vegetation surveys in our next and last field season (2013-14) as originally planned.

**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 |
|---|---|---|---|---|
| Transmitters X 39 units | 6000 | 5070 | +930 | Transmitters were purchased in the US. Exchange rate 1 £= I.58 US$. Price per unit ~ £130. |
| Transportation in and between study sites | 0 | 1 | -930 | As I mentioned under "unforeseen difficulties" beavers moved faster and at longer distances than we previously assumed. This increased costs of transportation in and between study sites to relocate missing beavers. Exchange rate: 1£= 8 Argentine Pesos. |
| **Total** | 6000 | **6000** | 0 | |

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

First, obtain good, reliable estimates of survival, reproduction and movement of beavers in different habitats, based on field data we are currently collecting.

Second, use these estimates to parameterise the invasion models we built.

Third, use the results to formulate guidelines to slow the spread of the beaver invasion.

**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?**

Yes, I used the RSGF logo in every talk and seminar I presented.

**11. Any other comments?**

I want to thank the Rufford Foundation for supporting our project for a second year. As in any demographic study many of the main results will be obtained by the end of the lab work (next year), but the information we are gathering has no precedents in Patagonia so far, and is helping us to understand the further spread of Beaver in continental Patagonia where beavers have become a real threat.