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	Rosina Soler Esteban
Project title	Integrating riparian *Nothofagus Antarctica* forests to the study of beaver invasion on Tierra del Fuego Island.
RSG reference	9259-1
Reporting period	01/2011 to 01/2012
Amount of grant	£5800
Your email address	rosinas@cadic-conicet.gob.ar
Date of this report	31/01/2012

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
Identify different levels of impact (flooding, logging) in abandoned sites			X	More levels could be determined at sites where the affected area is very large. For example, flooding gradient (from the front to the end of the pound).
Evaluate the natural regeneration strategies of *N. antarctica* riparian forests, after beaver impacts			X	
Generate the baseline for methods of assessing the impact of beavers on forest vegetation		X		To generate a practical "method" or "tool" to assess beaver impact throughout sub-Antarctic forests, more replicates are essential. This RSG project was the first work that evaluates the impact of beaver and forest recovery considering different areas within the impact. However, greater efforts should be made to agree a systematic methodology (step by step) and tested in different forest types.
Train other students and volunteers, involving them in scientific studies with implications for sub-Antarctic forests restoration.			X	
Involve the private sector in restoration and conservation issues		X		We established a good relationship with the ranch owners (the project was carried out at five private properties). Even they are very interested in further collaborations with future scientific activities within their lands. However, no concrete actions have been still adopted regarding to forest conservation or restoration (for example, restrict the livestock in those sites impacted by beaver).

Finish Doctoral Thesis ("Natural regeneration of *Nothofagus antarctica* in primary forests and silvopastoral systems")			X	Universidad de Córdoba (Argentina) February 2012 Calification: 10 Advisor: Dr Guillermo Martínez Pastur. Co-advisor: Dra. Ma. Vanessa Lencinas
Identify new areas of interest and information gaps for conservation of sub-Antarctic forests			X	New ideas emerged from the results obtained by RSG project.

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

Some selected sites abandoned during 2011 were re-occupied by other beaver colonies during summer 2012. It was therefore necessary to spend more time to looking for new sites effectively abandoned. Re-colonisation by animals depends on the availability of suitable trees as providers of food and building material, and of the geomorphologic conditions of the environment.

The time of site abandonment was another task to resolve on the course of this RSG project. There is no accurate method to determine the date on which the beaver's colonies abandon a site and the causes behind this event. To solve this, we seek woody plants (shrubs, young trees) growing on the dam (preferably) or on the flooded area and measured their age by dendrochronology (rings counting). This age was considered as the time that (at least) the site was unoccupied. However, this is a very conservative estimation because the plant could be installed and grown after abandonment (margin of error).

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

1. *Environmental modifications in abandoned sites*. Beavers produce strong alterations on soil moisture and canopy cover, which are the two more important variables controlling natural regeneration in sub-Antarctic *Nothofagus* forests. Seven micro-environments were distinguished within abandoned sites: 1) pre-dam; 2) dam; 3) frontal section of pond; 4) back section of pond; 5) flood-logging edge; 6) logged forest; 7) no impact forest. Each one of these micro- environments has particular characteristics. The area that was under flood influence (frontal and back section of pond) presents the worse conditions for installation and growth of *N. antarctica* seedling (e.g., high soil moisture content and no canopy cover). Although the dam present low soil moisture content and a little more canopy cover, the higher debris cover (material used for dam building) that impede the installation of *N. antarctica* seedling. Better sites for natural regeneration were flood-logging edge and logged forest.

2. *Nothofagus antarctica natural regeneration*. Seedling density significantly changes according the micro-environments assessed (Figure 2). Higher number of seedlings occurred in logged forest condition (15.0 individuals.m^{-2}) and similar in flood-logging edge (13.6 individuals.m^{-2}). Surprisingly, the back section of pond presented positive levels of

regeneration (5.4 individuals.m^{-2}), such as the pre-dam section (5.1 individuals.m^{-2}). As we expected, natural regeneration was almost zero in the two worst conditions: the dam (0.9 individuals.m^{-2}) and frontal section of pond (0.1 individuals.m^{-2}). On the other hand, more than half were agamic seedlings or resprouting, with annual growth up to 2 cm. year^{-1} (which is positive for *Nothofagus* seedlings). These findings are important contributions to restoration ecology. It could be used to guide future efforts to restore impacted and abandoned sites. Such efforts should focus on certain micro-environments and not the entire area.

3. Graduate Thesis in Restoration Ecology. Angelina Buthet (Biology student at the Universidad Nacional del Litoral, Santa Fe, Argentina) participated as volunteer of RSG project during summer 2012. She will utilise part of our data and results as Graduate Thesis. Her project plan was submitted at the University and is being evaluated by the academic committee.

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

N/A

5. Are there any plans to continue this work?

In addition to finishing the video documentary (during April 2012), the plan for the future is not only to finish extra data analysis and reinforcing the main conclusions but also to publish our outcomes. Understanding the natural regeneration response to environmental changes produced by beavers will be decisive in the near future to guide decisions and efforts for forest restoration.

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

Scientific meetings and conferences; scientific papers in national and international journals; video documentary (distributed in local schools and National Parks Administration); divulgation article in "La Lupa" magazine produced by CADIC towards local people of Tierra del Fuego.

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

RSG funds were used from January 2011 during a 15-month period. The actual length of the project was as expected. Even during April (the last month of our RSG) the project will be focused on the short documentary (video), which is the last outcome we expected to obtain. Data processing and analysis would have been finished during the next two 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.

In the following table all figures are in £ sterling, using an exchange rate of 1£ sterling= 6.0 pesos Argentinos.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Food during fieldwork	800	834	-34	
Fuel (transport to study sites)	1000	1525	-525	
Materials (flagging, batteries, pencils, field notebooks, bags)	340	340	0	
Outdoor clothing (over trousers, gaiters, gloves)	550	550	0	
Food and lodging for volunteer	490	540	-50	
Flight ticket for volunteer (Buenos Aires-Ushuaia)	600	637	-37	
Documentary Development (production, filming, edition)	800	543	257	
Video promotion and DVD copies	450	0	450	
Office supplies, printouts, mail and xerox copies	270	270	0	
Contingency (10%)	500	500	0	
TOTAL	**5800**	**5689**	**61**	

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

The important next steps, after finishing extra data analysis and reinforcing the main conclusions, are to elaborate the base line of a future restoration assay at small level. That is, transplants *N. antarctica* seedlings in those areas detected during this study that are not able to regenerate. Through this study it was possible to identify areas with high level of natural forest regeneration rate, and other areas where active restoration is needed. So, the next step will be to restore a pilot area!

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

Yes, I did it twice. In the project presentation at Austral Centre of Scientific Research (CADIC-CONICET), and in the poster presentation at BIOLIEF International Congress.

Annex 1

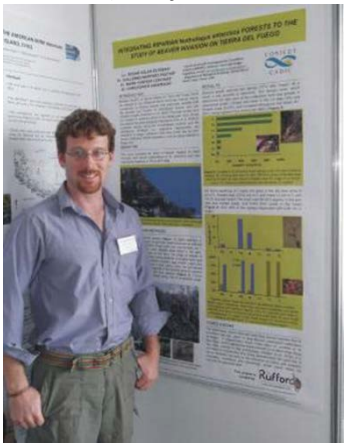
Study area

The study area is located at the centre-north of Tierra del Fuego Island (Argentina) where the landscape is dominated by deciduous Nothofagus forests and grasslands (Figure 1). The climate is characterised by short, cool summers and long, snowy winters. Only 3 months per year are free of mean daily air temperatures under 0°C. Rainfall, including snowfall, reaches up to 600 mm. yr−1. Annual average wind speed outside forests is 8 km.h−1, reaching up to 100 km.h−1 during storms, and the altitude varies between 100 and 250 asl. This is considered one of the most productive area in the province because the occurrence of the major agro-forestry industries.

Ten sites were selected (Below) within four private ranches: 1 site in Tepi, 2 in Rivadavia, 4 in Rubi and 3 sites in Pirinaica. These sites correspond to monospecific N. Antarctica riparian forests, which have been invaded by beavers at different moments.

Study sites location in Tierra del Fuego Island (Argentina).

Formal presentation of the two RSG projects linked to Austral Centre of Scientific Research (CADIC-CONICET): Alejandro Pietrek and me. Researchers, students and governmental



Poster presentation in “BIOLIEF 2011: 2nd World Conference on Biological Invasions and Ecosystem Functioning”. Dr Christopher Anderson.

Angelina Buthet (undergraduate student and volunteer of RSG project) counting *N. antarctica* seedlings and measuring percentage of canopy cover.

Horacio Ivancich and Gastón Kreps (CADIC members) measuring forest structure variables in the studied sites.