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	Sabrina Yasmin Bobadilla
Project title	Socioecological study of the invasive European rabbit (*Oryctolagus cuniculus*) and its implications on nativa fauna and arid ecosystem in Argentina.
RSG reference	21499-1
Reporting period	May 2017- May 2018
Amount of grant	£4,636
Your email address	ybobadilla@mendoza-conicet.gob.ar
Date of this report	May 15, 2018

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
Analyse the impact of wild rabbit warrens on native flora (plant diversity and composition) and soil nutrient cycles.				We found five sites with rabbit warrens where we analysed the impact of this species during December 2017.
Perception of landowners through an interview.				We interviewed 19 households in surrounding area of the Laguna de Llancanelo Provincial Reserve during the January 2018.
Habitat use and trophic ecology.				Fieldwork was carried out between January 2017 and March 2018 twice a year. We had two trips per season to measure ecological traits (habitat use and diet) of species and we collected the necessary samples to achieve the objectives. Up to May 2018 we have analysed the 25% of the faeces for diet while data for habitat use analysis have being assessed all environmental and anthropogenic variables.
Extension activities such as diffusion, education and management.				Up to May 2018 we have organised a training workshop for park rangers, education conservation workshop for teachers, students and educational institutions. Furthermore we were interviewed to promote this project in the web page of CONICET (National Council of Research and Technology).
Publishing in scientific meetings and scientific journals.				Some of the results obtained were published in scientific meetings: "XXX Jornadas Argentinas de Mastozoología (2017)"and we sent an abstract for the IV Congreso Latinoamericano de Mastozoología (2018)".

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

Although we were having a list of all the people that live around of the reserve, we could not interview everyone. The reason for that is that during summer, families travel from the plains to the mountain with their animals ("veranada") from December to April. So despite us visitingited the same house twice we couldn't undertake the interview. Although we have enough number of samples to be representative of the population (n=19).

Landowners helped in finding warrens of European rabbits, but we only found low number of samples (n=5) to be representative of the area. In respect of soil samples, we collected them in the sites that we found but we still do not have lab results. We consider that we need to find more sites to generate more consistent results. So in future we need to find more sites with warrens to analysed impact on native vegetation and soil nutrient cycles.

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

1. Impact on native vegetation

We found significant differences in plant cover between disturbed (dis) and undisturbed (undis) patches. Shrub cover were higher in disturbed patches ($mean_{dis}$= 70.00, $mean_{undis}$= 24.95; Z= -3.05; p= 0.0006), while grasses were lower in disturbed patches ($mean_{dis}$= 7.08, $mean_{undis}$= 18.65; Z= 2.1; p= 0.0026).

Plant species richness were significantly lower in disturbed patches ($mean_{dis}$= 5.69, $mean_{undis}$= 8.4; Z= 2.00; p= 0.03).

2. Use of resources (habitat and diet)

Five habitat types were identified in Laguna de Llancanelo: tamarind woodland, shrubland, wetland, sand dunes and pichanal (it a low height shrubland manly composed by *Baccharis spartoides*). At the habitat-level, the observed frequency of faeces signs was significantly different from expected use of the five habitat types in all seasons and years (wet season 2017: $\chi 2$ = 16.42, df= 4, p = 0.002, n = 14; dry season 2017: $\chi 2$ =11.14, df = 4, p = 0.023, n = 7; wet season 2018: $\chi 2$ =13.27, df = 4, p = 0.009, n = 9). Bonferroni confidence intervals showed that Wetland was used more than expected by chance during the entire study period, indicating that rabbits prefer this habitat inside of the reserve. At the microhabitat-level, the models revealed that there was a positive and significant effect with herb cover and proximity to the source of water (Figure 1). This association is stronger during the dry season.

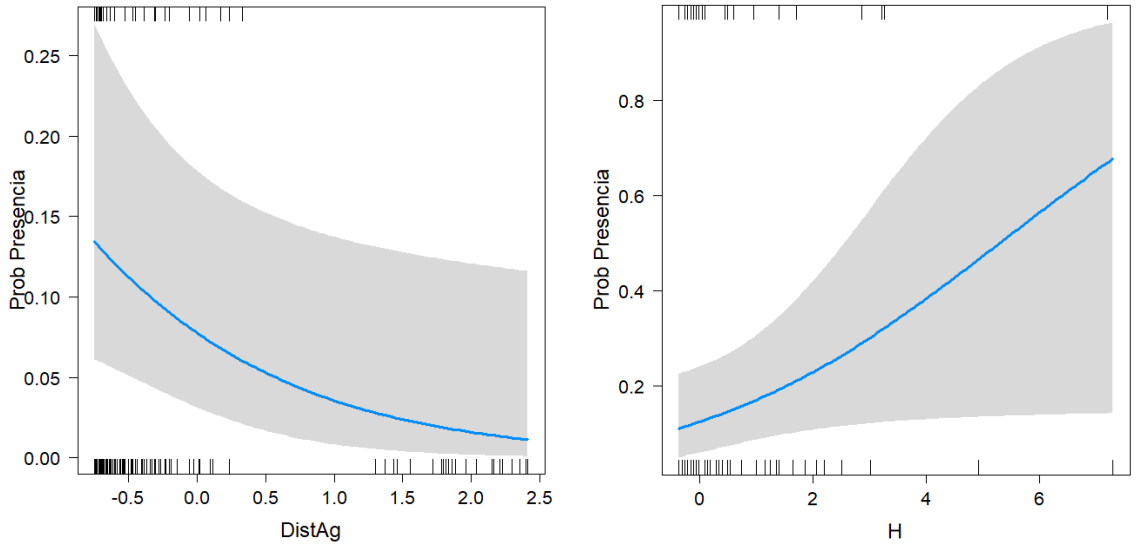

Figure 1.Influence of environmental and anthropogenic variables on rabbit habitat use at the microhabitat-level using all signs and logistic models during the wet and dry seasons in the Laguna de Llancanelo Reserve. DistAg=distance to nearest water source; H=herb cover; ProbPresencia=Probability of presence.

The rabbit diet was composed of different parts (leaves, glumes, fruits, seeds) of 40 plant species. *Poa* sp. was the most consumed (18.39%), followed by *Medicago lupulina* (11.92%) and *Eragrostis* sp. (11.54%). The European rabbit mainly consumed grasses (54.82%) and herbaceous (27.21%) followed by the shrubs (16.80%). The Manly's selectivity index showed positive selection only by herbaceous plants (Figure 2). This result is consistent with habitat use analysis where herbaceous cover is one of the most important elements of the environment that determines the presence of rabbits in the Reserve.

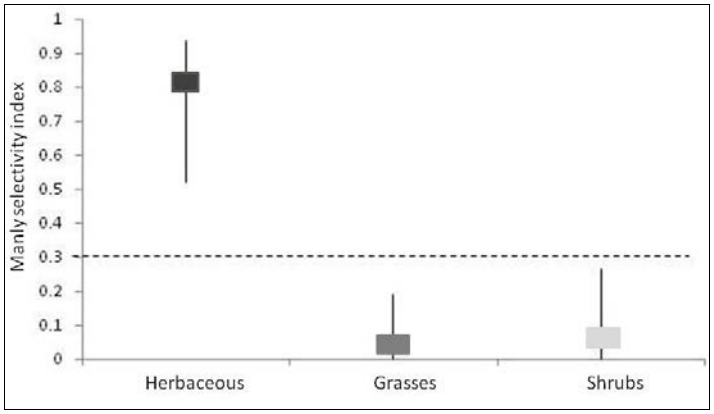

Figure 2.Manly selectivity index (± 95% CI) for the food categories during the wet season 2017. Dotted line indicates 1/K 0.3 for use proportional to availability.

3. Perception of landowners through an interview

Opinion towards the presence of exotic mammals in the reserve (wild boar, European rabbit and European hare) varied according to the species. For example, the wild boar is considered as a problem species (100%) that needs to be controlled. The rabbit and hare have an indifferent perception (73.68% and 68.42% respectively).Some people showed a predominant opinion while the perception of others depended on the place of residence inside the reserve (Figure 3 and 4). The opinion and attitudes of landowners about the presence of exotic mammals depended on the personal experience with the species, its attributes and the time since its introduction, the area of residency, and the knowledge of the impact of this species.

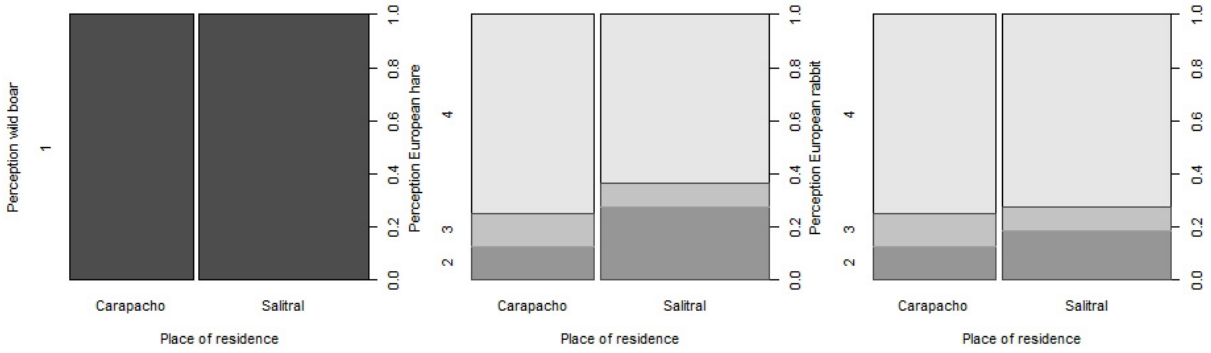

Figure 3.Perception towards the presence of exotic mammals (a=wild boar, b=European rabbit and c=European hare) in two places of residence inside Laguna de Llancanelo Reserve. 1=problem species; 2=attractive species; 3=beneficial species; 4=innocuous species.

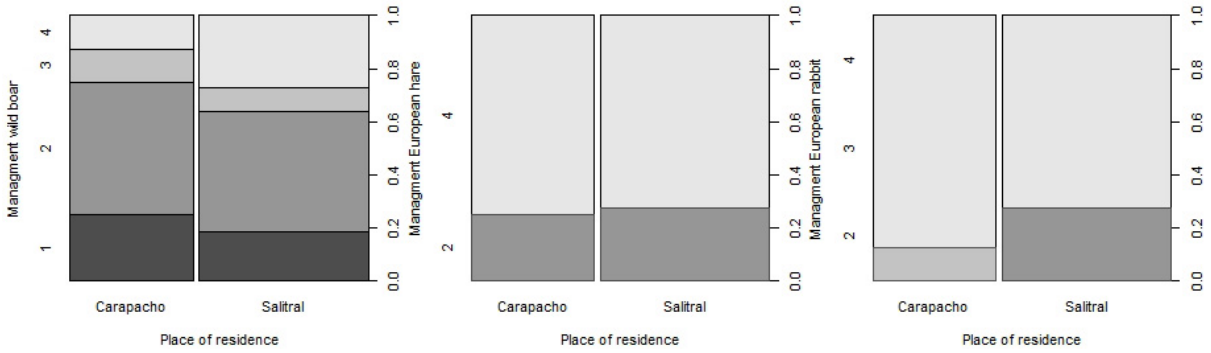

Figure 4.Opinions about what should be done with exotic mammals (a=wild boar, b=European rabbit and c=European hare). 1=hunt and kill; 2=hunt and use them; 3=capture and transfer; 4=nothing.

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

From the interviews, we were able to converse with local people and, on the one hand, to get certain information about their observations of exotic mammals. For example, some landowner told us that more than 30 years ago, one couple of rabbits and its young were intentionally released in the reserve. On the other hand,

we realised awareness of the importance of the conflict with the introduction of exotic mammals in the reserve, especially with the wild boar. Furthermore, we detect the need to generate communication and job networks that let a synergy within the different social actors involved, especially between landowners and park rangers and their institution.

In November 2017 we presented our project in article of scientific diffusion at the national level:
http://www.conicet.gov.ar/el-impacto-del-jabali-y-el-conejo-europeos-especies-invasoras-de-las-zonas-aridas-de-argentina/, whit great impact in local community.

In addition to this, in September 2017 we organised an education conservation workshop in the "XV National Week of Science and Technology" where students and teachers participated and reflecting about of the problems associated with the biological invasions, and seeking to promote the revaluation of the native ecosystems and responsible civic participation in conservation of natural ecosystems.

5. Are there any plans to continue this work?

Invasive mammals are the main topic of our work. To date, we have collected 30 faeces samples of European rabbit, 23 samples of European hare, 22 samples of plains viscacha and 20 samples of Mendoza tuco-tuco. Our plan is to complete analysis of faeces for diet and determine the trophic overlap between these species. In addition, we need finish analysing the impact of wild rabbit warrens on native flora (plant diversity and composition) and soil nutrient cycles. For that, we have to find more sites with warrens of rabbit and take more data for more consistent results.

In future, we also want to assess the ecophisiological mechanisms (stress, parasitism, resource selection) that explain the expansion of European rabbit in arid lands of Argentina. We want to continue working with local community and connect them with park rangers in order to elaborate a program of use of the invasive species in the reserve. For this reason we are going to apply for a Second Rufford Small Grant to continue working in this topic.

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

Results of our research will be published in different manuscripts to be submitted to peer-reviewed journals. In addition, publication of our results in scientific meetings will allow us to discuss with other colleagues working on the same topic about protocols, defiance, and limitations when planning, managing and implementing invasive species control programs. We will translate the manuscripts to Spanish to reach a broader audience and local communities in particular. We also plan to continue to give talks at educative and research institutions, and wildlife agencies to raise awareness of the importance of the ecological problems of exotic mammals in Mendoza.

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

This project includes 2 years of fieldwork (from January 2017 to August 2018). The Rufford Foundation grant was used during the period from May 2017 to May 2018 covering expenses of fieldwork of the dry season 2017 and wet season 2018. Next season we will be measure ecological traits (habitat use and diet) and collect the necessary samples to meet the objectives. We are also going to visit the landowners that we did not interview during summer 2018. Likewise, we will generate didactic material (pamphlet, posters, CDs, web page) for distribute in the education conservation workshop to the students, teachers and local people 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
Handies	796	500	+296	The handles were purchased in Chile. For this reason, cost less than the budgeted amount.
GPS	180	332	-152	The GPS etrex-30x is a more expensive model than previously considered.
Gasoline and Vehicle maintenance	1220	1364	144	Over the period since obtaining the grant, the gasoline increases a 41.8% in Argentina. For this reason is the difference.
Food during field trips	1200	1200	0	
Office supplies	200	200	0	
Field Supplies	1040	1040	0	

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

First, we are going to complete analysis of faeces for diet and determine the trophic overlap between these species.

Second, we are going to build models based on field data that we are currently collecting and preparing the publication of these results for the scientific meeting "IV Congreso Latinoamericano de Mastozoología 2018".

Third, we are going to finish the analysis of the impact of European rabbit's warrens on native flora (plant diversity and composition) and soil nutrient cycles.

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 used the RSGF logo in every talk and seminar I presented:

- Workshop for park rangers, Title: "Rabbit ecology in the Llancanelo reserve". January 2018.
- Education conservation workshop for teachers, students. Title: "The problem of biological invasions: exotic mammals in Mendoza". September 2017.
- Talk in the University Juan Agustín Maza, Faculty of Veterinary and Environmental Sciences. Title: "Biological Invasions". October 2017.
- Scientific meetings "XXX Jornadas Argentinas de Mastozoología". Title: "Use of European rabbit habitat (*Oryctolagus cuniculus*) in two places with different residence times in the Patagonia-Desert of Monte expansion range". November 2017.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Ricardo Ojeda: discussion of the project.

Fernanda Cuevas: help in fieldwork, analysis of impact of European rabbit warrens, and supervision and discussion of the project.

Mariana Dacar: determination of the diet of wild mammals.

Leandro Mastrantonio: analysis of soil samples and subsequent discussion of results.

12. Any other comments?

We want to thank the Rufford Foundation for supporting our project. The data we are gathering has no precedents in Mendoza so far, and is helping us to understand the socioecological impact of European rabbit in a reserve of arid lands of Mendoza province. We want to thank the park rangers for their collaboration and support to this project, and the people of the area for their willingness to collaborate with us.