

Final Evaluation Report

Your Details	
Full Name	Matthew Joseph Ruggirello
Project Title	Wildfire at the End of the World Sub-Antarctic Beech Trees and their Response to Anthropogenic Fire: Implications for Forest Conservation and Restoration
Application ID	35530-1
Date of this Report	5/17/2022

1. 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) Evaluate the impacts of old (1930-1980) and recent (2005-2020) forest fires on the regeneration and spatial distribution of ñire and lenga.				All of the data has been collected to achieve this objective. I have begun analysing this data and will continue to analyse and summarise it over the winter, thus completing this goal.
2) Understand how topography, post-fire remnant forest structures, and new biophysical conditions influence the health and vigour of ñire and lenga.				All of the data has been collected to achieve this objective. I have begun analysing this data and will continue to analyse and summarise it over the winter, thus completing this goal.
3) Experimentally analyse possible limitations on natural regeneration from seeds and evaluate the response of seedlings of both species to burned soils by monitoring morphological and physiological traits.				I have collected part of the data to achieve this objective. I will continue to collect these data over two or more years, dependent on funding, and I will progressively analyse and summarise it to eventually complete this goal.
4) Compare the response and survival of the two species and identify through field experiments the exact conditions that favour the recovery and protection of ñire and lenga.				I have collected part of the data to achieve this objective. I will continue to collect these data over two or more years, dependent on funding, and I will progressively analyse and summarise it to eventually complete this goal.
5) Propose practical techniques and tools to protect and restore ñire and lenga forests.				I do not feel comfortable yet sharing my initial results formally with forest managers and private companies to help guide their restoration plans. A second Rufford grant would help immensely with finalising my data collection and processing with the

			ends of completing restoration guidelines (tools and techniques) to share with local forest managers.
6)	Disseminate information to the broader community on how fire threatens these fragile ecosystems and the role local volunteers can play in forest conservation and restoration. Accompany and guide local volunteers planting trees in burned areas.		I have conducted significant community outreach already for this project (see item 7), but one of the most important still remains to be completed. Ultimately, I hope to create a set of written, post-fire restoration guidelines that I can share with the Ministry of Environment, local state foresters, and private forestry companies. I hope to conduct a field workshop in which I demonstrate and explain these restoration practices to these forest management groups.

2. Describe the three most important outcomes of your project.

a). Data collection: With a team of helpers, I was able to establish 192 field plots in which I quantified approximately 90 different variables, including tree regeneration in different stages (initial, advanced, and juvenile). We observed tree seedling/sapling densities in the context of a plot's exposure to the sun, remnant woody material, trees that survived the fire, elevation, evidence of grazing, and microsite conditions, among many other variables. I ended the field season with a tremendous amount of data. With this robust data set complete, I will analyse patterns over the winter and begin to form recommendations for forest restoration to share with the broader community. Given the amount and quality of data collected, I will feel extremely confident in the conclusions and recommendations I will derive from my work.

b). Initial outreach: Given that this was the first year of my project and PhD, I am very happy with the connections I was able to make with local business owners, ranchers, foresters, students, educators and others and the initial community outreach I achieved (see item 7 for more details). A large portion of the broader community interested in the forest health of the island is now aware of my project. This has given me a strong base, which moving forward I can capitalise on to organise community and industry restoration planting events.

c). Establishment of long-term experiments: As part of the initial phase of this project, I was able to establish a seedling growth and survival experiment at my home research station. Monitoring this experiment moving forward, I will be able to quantify the impacts of burned soil properties on tree survival and growth. I also established a restoration field establishment that involved sowing over 4,000 seeds in burned and unburned areas across the island. I plan to monitor this experiment for years to come and to link critical variables to the germination, survival, and growth of seeds planted in different conditions.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

The field work portion of the project went relatively smoothly. Unfortunately, many plants I transplanted to the experimental garden died due to extreme wind and sun exposure. We replaced those individuals in autumn, giving seedlings the chance to acclimatise to environmental conditions over winter when they are more strongly buffered against adverse climate. Also, the rampant inflation in Argentina made it so that Rufford funds did not accomplish as much as I had hoped. The £6,000 grant was converted to pesos at a very unfavourable exchange rate. Argentina has several exchange rates and, unfortunately, the grant was converted to pesos at approximately 134:1, when the best exchange rate available at the time was over 250:1. This poor exchange rate, combined with rampant inflation, reduced the purchasing power of the grant relative to what I had expected when I applied. Still, I was able to accomplish much of what I hoped with the funds I did receive and remain extremely grateful for the assistance the Rufford foundation provided.

4. Describe the involvement of local communities and how they have benefited from the project.

I employed several local assistants over the first year of my project to help with field data collection. Several university students have also gained valuable experience and exposure to environmental research, as they have helped me with different parts of the project as well. I co-hosted a field tour of burned areas with a group of high school students and their teachers. Students that attended the field tour will bring valuable lessons back to their classrooms and I hope to organise planting events with them and their teachers in the months and years to come.

I have also engaged the local business, Neurona, to help with my field work. For additional help in the field, I reached out to local business owner, Mr. Francisco Mattenet, who is a renewable natural resource engineer. He is the owner of a small, local business that uses the extracts from the leaves of ñire trees to produce teas, creams, and liquors. His company is actively involved in preserving the health and vigour of the island's native forests, as the quality of his products depends on the conservation of old growth, ñire forests. Through Neurona's social media page and an appearance on local television, we have been promoting the importance of my research and of forest conservation and restoration.

I also had the chance to participate in a post-fire restoration planting day in an area of forest that burned in 2008 as well. Through this event organised by the provincial forestry department, I was able to experience first-hand the current reforestation techniques being employed by local forestry professionals and NGOs. The working group was honest in admitting that more science-based planting techniques and a more systematic determination of the best microsites in which to plant seeds and seedlings could improve their planting success. I have formed close contacts in the provincial forestry department and different local environmental NGOs over the last year and I hope to provide guidance to these groups as I return results from my field data analyses. I have also been in close contact with private foresters and ranchers,

as I have conducted field research on their lands. I plan to help them restore their burned forests in the future.

5. Are there any plans to continue this work?

Yes. This was the initial phase of this project, the first year of my PhD. I used this year to conduct much of my initial field work. Still, as part of this work, I set up two experiments that I hope to monitor over the next several years. These experiments involve monitoring seedling growth and survival in different conditions. One of the experiments is located in burned areas 2 – 3 hours from my home base in Ushuaia and continuing to monitor this experiment will involve significant field work. A subsequent Rufford grant would help immensely with continuing the monitoring of the field experiment in particular. I also hope to return to plots I established this summer to conduct a more detailed inventory of understory conditions and soils: while the first part of this project focused exclusively on forest regeneration, it would be beneficial to return to monitoring plots to quantify which non-tree species (grasses, forbs, herbs, etc.) are present, to determine whether these species further indicate a shift from forest to grassland. We were also not able to collect soil samples from our field plots this summer as we did not have the proper equipment available to us. I would plan to use a subsequent Rufford grant to purchase a soil extractor and conduct this remaining field work. Ultimately, I am only now beginning to process the data collected this summer. I do not feel comfortable yet sharing these results formally with forest managers and private companies to help guide their restoration plans. I plan to apply for a subsequent Rufford grant that will allow me to finish my field research for this project and to focus more intensely on outreach.

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

I have already begun sharing my initial results with others: I presented initial results at the Patagonian forestry conference in Bariloche, Argentina in April 2022; I appeared on local public television last year to speak about my project; I accompanied local foresters on a restoration planting last spring; I participated in a field tour with local school teachers and students where I shared with them the devastating impacts of forest fires and my early results and I will be presenting my initial findings virtually at the International Association for Vegetation Science's annual symposium at the end of June 2022 and the International Association for Ecology's annual conference in August 2022. I plan to host a local school group at my research institute next spring to show them my seedling experiment and talk about this project. Ultimately, I hope to create a set of written, post-fire restoration guidelines that I can share with the Ministry of Environment, local state foresters, volunteers, local NGOs, and private forestry companies. I hope to conduct a field workshop in which I demonstrate and explain these restoration practices to these groups. A second Rufford grant would help immensely with finalising my data collection and processing with the ends of completing my restoration guidelines to share with local forest managers. As in-person conferences begin again, I also hope to travel domestically and abroad over the next several years to share my results with the international science and forest management/conservation community and to network with international experts on wildfire and forest restoration.

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

As previously mentioned, I feel it would be beneficial to bolster the data set collected this field season by collecting understory and soils data in the plots I established over the summer. I also plan to maintain and remeasure my field and research station experiments. The amount of time I can dedicate to remeasuring and maintaining my field restoration experiment will depend on future funding; it would be beneficial to monitor indefinitely the two experiments I set up this field season. After analysing and summarising my data this winter, I hope to focus intensely on outreach and active restoration. When I have summarised my results into restoration recommendations, not only can I share and workshop those recommendations with local land managers, but I can also use them to conduct plantings with volunteers. Contacts I have made in local schools, government and businesses should give me the volunteer workforce I need to implement large scale restoration plantings in burned areas across the island that are not recovering forest cover on their own. Ultimately, the aim of my project is not only to produce information and increase knowledge about post-fire restoration and forest regeneration, but to actively restore burned forests as well. I feel this first grant has given me the start I need to accomplish this active restoration. I plan to apply for a second grant to help conduct this post-fire restoration with local volunteers.

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

I used the logo in a presentation I gave at the Patagonian forestry conference in Bariloche and on hand-outs distributed on a field tour with local educators and students. I also thanked the organisation on local public television. My research group and the larger forestry community in Tierra del Fuego is also aware that my research is being supported by a Rufford grant. I will also use the Rufford logo when presenting at IAVS and INTECOL conferences this winter.

9. Provide a full list of all the members of your team and their role in the project.

Rosina Soler: thesis director, project design, field assistance, general assistance, diffusion of information

Ana Tibaudin: field assistance

Ale Tibaudin: field assistance

Fran Mattenet: field assistance, publicity/diffusion

Augustin Ceravolo: field and lab assistance

Pauli Rodriguez: field assistance

Gimena Bustamante: field and lab assistance

Vanessa Lencinas: project design

Santiago Favoretti: field contact, research site host, private forestry rep

Jorge Sevillano: private rancher, research site host, field support

Martin Parodi: provincial forester, research site contact, field and technical support

10. Any other comments?

I am grateful for the support of The Rufford Foundation and look forward to carrying my work into the future.