Project Update: May 2022

Completion of Forest Recovery Measurements

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 exposition to the sun, remnant woody material, trees that survived fire, elevation, evidence of grazing, and microsite conditions, among many other variables. With this data set complete, I have begun to analyse patterns and formulate recommendations for forest restoration to share with the wider community. Rufford funds were instrumental in conducting this portion of my project: funds were used to pay for accommodations while working in the field, per diem for field assistants, fuel for travel to and from research sites, and crew meals.

Trees were girdled (the live layer of woody material below their bark was cut with an axe) in the 1940's, killing them and making them easier to burn. This allowed ranchers to convert old-growth forests to pastureland in Estancia Pirinaica, central Tierra del Fuego.

A non-native gray fox patrols the burned areas of Estancia Pirinaica (top). These exotic invaders have thrived, hunting insects and rodents in burned areas much to the detriment of the native red foxes. A field assistant looks for tree regeneration in the burned landscape (bottom).

Seedling Growth and Survival Re-measurement

In the initial phase of this project, my team and I transplanted some 400+ seedlings from the forest to our research station in Ushuaia. We then planted these seedlings in pots filled with burned and unburned soils. These seedlings were divided between a shade tunnel and experimental garden. Over several days, I retook measurements of heights, diameters, and other variables on each plant.

Unfortunately, many plants in the experimental garden died due to extreme wind and sun exposure. We returned to the field in autumn to replace these individuals. Transplanting in autumn gives seedlings the chance to acclimatise to environmental conditions over winter when they are more strongly buffered against adverse climate. In the shade tunnel, survival rates were high, and we are already seeing that plants in burned soils are growing more slowly than plants in unburned soils. Rufford funds were instrumental in conducting the field work portion of this experiment (collection of soils and seedlings) and helped purchase supplies for transplantation (shovels). I will continue to monitor this experiment over the next two years.

Ñire (left) and lenga (right) seedlings being remeasured.

We collected 100 lenga seedlings and transplanted them into burned and unburned soils to replace plants that had died in our experimental garden in Ushuaia. We are hoping that transplanting in autumn will result in lower mortality due to transplant stress.

Restoration Field Experiment

In March 2022, we placed "seed traps" (3 x 4 m mesh tarps) in forests adjacent to burned areas. In April 2022, we collected these seed traps and brought them back to our lab in Ushuaia. We were then able to sort through fallen leaves, branches, and mosses to collect 55,376 seeds, 19,238 from lenga (*Nothofagus pumilio*) and 36,138 from ñire (*Nothofagus antarctica*) trees. We then chose 14,400 of these seeds for planting, selecting robust and full seeds that sank to the bottom of buckets filled with water, indicating they were filled and more likely to be viable for germination next spring. The selected seeds were then placed in previously established plots located across the burned areas studied in this project: they were dropped in different microsites (under bushes and downed logs, in bare mineral soil, on leaf litter, and in grasses and herbs). I will monitor their germination next spring and I hope to monitor their survival and growth over additional years as well. Rufford funds were again used to conduct the field work portion of this work and to pay for materials to make seed traps. A subsequent Rufford grant would be instrumental in continuing to monitor this restoration experiment over time.

Seed "traps" dot the unburned forest like hammocks awaiting leaf fall in the autumn.

Collecting leaf litter and seeds in late April.

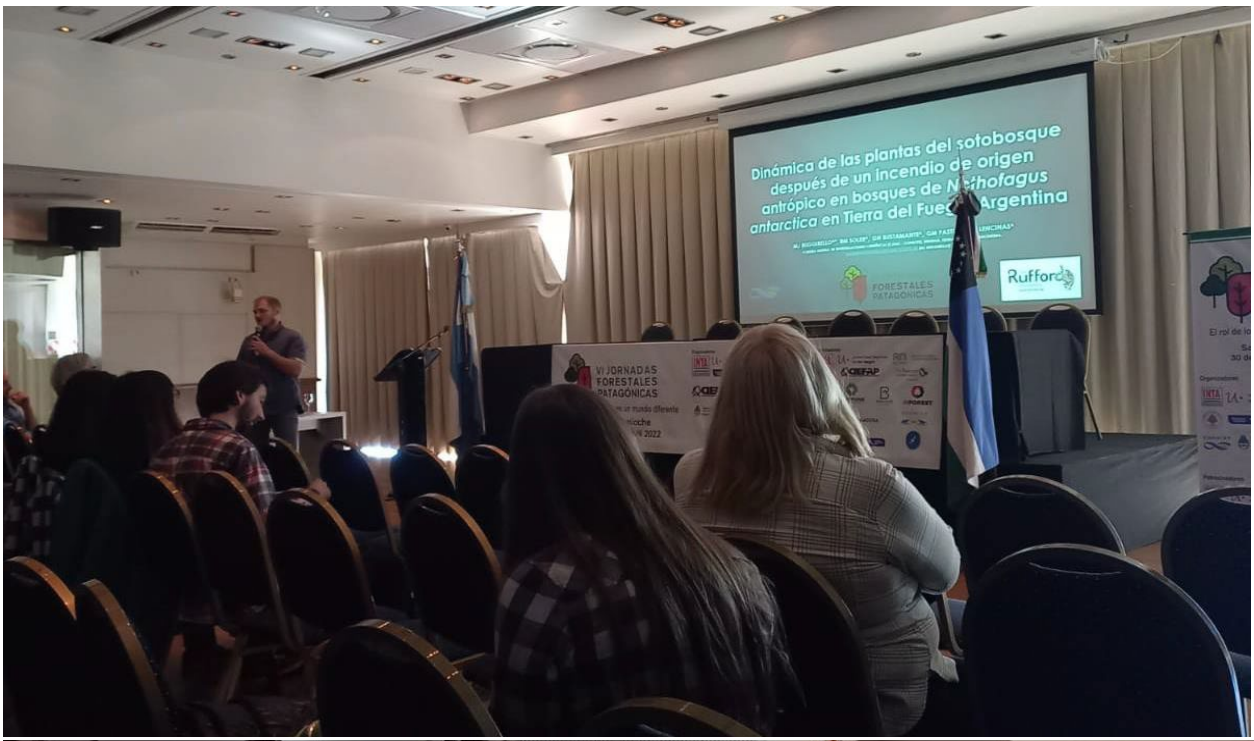
Separating seeds from leaf litter in the lab.

Confirming which seeds are filled (filled seeds sink; empty seeds float) and letting them dry.

Planting seeds in different microsite conditions across the burned and unburned landscape.

Patagonian Forestry Conference

After a hiatus of 2 years because of the COVID-19 outbreak, the Argentine Government's agriculture department (INTA) was able to organise and host the Patagonian forestry conference in San Carlos de Bariloche in northern Patagonia. This conference provided me with an opportunity to share the initial results of my work with a wider academic and non-academic audience and acknowledge Rufford support for the project. Interest in forest fires and post-fire recovery is very high in Argentina as wildfires again devastated large swaths of the country this summer.



Field Trip with Local High School Students

I had the opportunity to present my work to students from a local high school who were on a field trip to see a sawmill in the town of Tolhuin. Together with my thesis director, we were able to describe the preliminary results of my study to a group of approximately 30 students and three teachers, as well as give them an overview of what it means to be a PhD student and researcher in Argentina and Tierra del Fuego. The students were very interested in the post-fire recuperation of their local forests and were excited to see the lenga and ñire tree seeds we had collected earlier that day.

Rufford funding has been instrumental to the success of the 1st year of my project. Funding has allowed me to conduct a tremendous amount of field work, to set up two long-term ecological experiments, and to purchase essential field and office equipment. It has also allowed me to begin the outreach portion of my project. I plan to apply for a subsequent Rufford grant that will allow me to finish the field research for this project and to focus more intensely on outreach to local forest management groups.