Project Update: February 2023

A *Nothofagus antarctica* (ñire) tree growing in the form of an arc (top); traversing the burned landscape with soil samples in hand (middle); the end of a long day of field work at Estancia Pirinaica (bottom)

Soil collection and processing

In phase one of this project, we measured tree regeneration in 384 subplots that were tied to 192 macroplots. In our larger plots, we measured a series of variables which included plot elevation, slope, aspect, distance to mature live trees and regeneration site abundance. As the final step in this part of data collection, we collected soil samples from each of our 192 macroplots across our eight research sites in four fires. Collecting soil using a special cylinder, we weighed soil samples upon arrival to our lab in Ushuaia and after drying we reweighed these samples to determine their moisture content. After passing the samples through various sieves, we are now moving forward with pH, available nitrogen, organic matter, carbon, cation, and other nutrient measurements. A smaller round of initial sampling from last year's field work revealed that severely burned soils tend to have more nitrogen and less organic material and tend to be more acidic than lightly burned or unburned soils. Analyses of soil samples collected this summer will bolster these results and will also allow us to link fire severity to soil properties and tree regeneration, therefore allowing land managers to prioritise areas of greatest need for forest restoration.

Collecting soil samples with a hammer and soil cylinder from underneath a log in Estancia Pirinaica (left), drying and weighing soils at our lab in Ushuaia (right).

Seedling germination measurements

In phase one of this project, we established a restoration experiment in which we placed tens of thousands of seeds of *Nothofagus pumilio* (lenga) and *N. antarctica* in macroplots we previously established in burned and unburned areas. We visited all planting sites over the course of a month to record seedling germination and height in different regeneration sites (leaflitter, grasses/forbs, underneath logs, bare-mineral soil, underneath a bush). Unfortunately, not a single ñire seed had germinated. We are optimistic that when we visit these planting sites again in March 2023 to record additional germination, survival, and height growth, some ñire seedlings will have emerged, as the species is known to break bud later than lenga. A total of 105 lenga seedlings had germinated, 93 in unburned control plots and only 12 in burned plots. Of these 12 seedlings, not a single one had germinated in grass/forb microsites that are common post-fire, especially when the area is grazed by livestock. Nearly half of seedlings that germinated in our control plots germinated in leaflitter, the natural condition for these trees to regenerate in. Early results indicate just how harsh conditions are post-fire for seedling germination and survival. Restoration via sowing seeds also would seem to be a poor strategy given the low germination results observed up to this point of the study, and

continuing research would be best directed at improving planting techniques of greenhouse stock or for seedling transplantation.

Checking for seedlings in an unburned, control plot (top left); camp set-up at our remote

research site (top right); a lenga seedling that germinated in bare-mineral soil ("s" for *suelo desnudo* in Spanish) in a burned area (bottom left); a lenga seedling that germinated in unburned leaflitter (bottom right).