

## **Project Update: March 2015**

### **Objectives**

Estimating seeding tree survivorship in relation to fire severity at different fires – fully achieved. Data about tree survivorship were obtained at six areas burnt 2-28 years ago and within 16 patches. More than 700 *Araucaria* trees were surveyed.

Estimating cone production recovery on trees with different fire severity at places 1-27 years after fire occurred – fully achieved. More than 200 seeding trees were marked and surveyed for cone production recovery at six burnt areas and compare it with more than 300 seeding trees sampled at unburnt control areas.

Estimating non-native granivores relative abundance at burned and unburned sites – partially achieved. Non-native relative abundance was estimated counting signs at six burnt areas, more than 5 km of transects were established in burnt and unburnt sites. Complementary, fauna activity was surveyed using six camera-traps for 21 days at each site. Between April and May 2015 we will go to finish the survey during autumn when *Araucaria* seeds are available and fully achieved this objective.

Field training to government agents, students and local inhabitants – fully achieved. In 10 months we trained 60 people in the field, including national and provincial park rangers, technicians from different government agencies, NGO members, students and mapuche indigenous settlers that lives on *Araucaria* forest.

Preparing education material – fully achieved. A poster was developed to disseminate the conservation issues related to fires and non-native invasions in *Araucaria* forest. The project also helped with the development of educational games related with the conservation of *araucaria*. We will develop material for teachers in the next months.

Preparing a Guidelines for the conservation of *Araucaria* forest – partially achieved. We are developing a handbook with guidelines for the conservation and management of *Araucaria* forest based on scientific information obtained during the last 15 years from several researches. In July 2015 this will be ready.

Seed predation by non-native mammals estimations at burnt sites – not achieved. This objective will be carrying out during April-May 2015 as was indicated in the schedule of the project (See “Activities and Methodology”). We will fully achieve at the end of the project.

Manual for protection and conservation with guidelines for *Araucaria* conservation – partially achieved. This objective will be carried out from March-August 2015 as was indicated in the schedule of the project (See “Activities and Methodology”). We started with writing Educational activities for Teachers – not achieved. This objective will be carried out during July-August 2015 as was indicated in the schedule of the project (See “Activities and Methodology”).

### **Unforeseen difficulties**

Initially was planned to have access to an official vehicle and fuel largely funded by the park. This was not possible and for that reason I had to use my personal truck which caused an increase in fuel costs supported by the grant. Moreover, accidentally loaded dirty fuel caused the rupture of the vehicle which must be repaired.

## Outcomes

After 12 of the 18 months of the project the three most important outcomes are:

1. We determine the *Araucaria* tree survivorship and the cone production recovery in relation to fire severity in six sites burnt 2-29 years ago with a total area sampled greater than 500 km<sup>2</sup>. This is new key scientific information that helps us to understand the degree of forest recovery in the context of climate change. Fire killed on average 50 (11.3 SE) % of the *Araucaria* trees but varied between 14 to 89 % according to fire severity. Within patches tree mortality varied between 7 to 96 %, reflecting the spatial variability of tree survivorship. After 2-29 years, cone production recovery in survived seeding trees varied between 0 to 35 % but trees that suffered higher fire severity only recovered 4 to 5 % of the reproduction capacity compared to unburnt trees. Therefore, if wildfires increase in extension and intensity promoted by climate change, we expect that *Araucaria* will seriously diminish their survivorship rates and reproduction recovery despite having adaptations against fire.
2. We start to understand the relationship between non-native granivores mammals and *Araucaria* fires. Apparently this fauna increases in *Araucaria* burned sites, especially after 2-7 years after the fire. We detected increases up to six times in the abundance of introduced mammals in burnt sites compared with unburnt forests. However this depends on the regional context of the distribution of this introduced fauna. Also, apparently the increase in abundance is stronger in the valleys and lower parts of the mountain compared to the high mountain areas. This information is important if we want to predict where the non-native granivores species (livestock, wild boar, red deer, European hare, European rabbits) will produce more impact against *Araucaria* regeneration. Besides, will be useful to develop maps showing the more vulnerable areas against this threat. More information about this relationship will be obtained during April-May 2015 when seed consumption experiments will be carry out on burnt and unburnt forests.
3. We trained technicians and professionals from government institutions, students, NGO members and mapuche settlers. Now these different stakeholders know how to estimate cone production, evaluate fire severity and survey non-native wildlife. We are finishing the first manual (handbook) that describes the main conservation practices for the protection and conservation of the *Araucaria* forest and its biodiversity relate it with their seeds. This handbook will summarise the information gathered during the last 15 years by our research group and other scientist from Argentina and Chile.

Different stakeholders from the local communities from national and province institutions relate it with forest and fire management, students from universities and some mapuche indigenous settlers actively participated during the field work. The project was widely disseminated among state institutions and this caused that the Province and the Federal Governments are planning to prepare proposals to estimate *Araucaria* cone production outside the national park to establish quote to seed gathering by people and to increase the funds to protect burnt areas against livestock grazing. As a result of the project there is now better communication between professionals from several governmental institutions and there is a way of exchange of information and consultation. One of the results of this better communication is the idea proposed by functionaries from the National Environment & Sustainable Development Secretary to financially support the printing of the handbook (manual) with guidelines for conservation, management and protection of *Araucaria* forest generated by the project. However, much more work is needed to increase and improve the inter-institutional communication and the organisation of community work with stakeholders.

We plan to continue monitoring cone production, seedling establishment and seed predation on sites affected by fire. It will be very important to get a long term record of cone production from individual trees to compare it with the data gathered between 2000 to 2015 years from individuals at unburnt forests. We also consider important to monitoring *Araucaria* seedling establishment during the next years and evaluate seed predation by non-native mammals on burnt sites during high productive years when satiation effects are expected.

I will publish the work at regional scientific journals and at scientific meetings, in fact I sent the work to the Rufford Foundation Conference Sudamérica 2015. Besides, I will continue with notes in newspapers to divulgate the information within the general public. Finally, I will send technical reports and papers to government institutions with management proposals and conservation guidelines. In fact, I sent two reports the last year to the Provincial and Federal authorities in order to exemplify what is need, in terms of management, outside Lanín National Park.

Considering the conservation, management and socioeconomic implications that the results of this project has, it is important to consolidate and confirm the actual results with more research, extending the sampling period for at least 3 more years. In this way, the scientific information will be more solid in order to use it for management, conservation, mitigation and protection actions.

Another important step will be the transfer of the information to the decision makers and stakeholders that depends on *Araucaria* forests. During 2015 we had huge wildfires in Patagonia, outside araucaria range, some of them with more than 300 km<sup>2</sup> in size. In this context, the fire issue is installed in public opinion, not only in Patagonia but throughout the country. This scenario represents an opportunity for conservation biologist to influence on politicians and decision makers.

The last week we published note about the Project at the regional newspaper and within the blog of Lanin National Park. See links below.

<http://www.rionegro.com.ar/diario/los-incendios-han-diezmado-las-araucarias-6684575-9574-nota.aspx>.

[http://www.lmneuquen.com.ar/noticias/2015/3/21/controlan-la-recoleccion-de-pinones-en-zonas-afectadas-por-incendios\\_250248](http://www.lmneuquen.com.ar/noticias/2015/3/21/controlan-la-recoleccion-de-pinones-en-zonas-afectadas-por-incendios_250248)

<https://plus.google.com/u/0/115073864074619120601>

The grants was used from March 2014 and as indicated in schedule presented in the proposal (see "Activities and Methodology"), the project has an 18 month length and will finish in August 2015. Therefore, there are some activities, results and outcomes that will be finish during the next 6 months. For example, the seed predation experiment during autumn, the manual (handbook) development with guidelines for *Araucaria* forest conservation or teacher education activities will be carry out during the next six months.

I included on a poster (is attached) and in oral presentations during the training activities to stakeholders. I will use it soon at scientific meetings and in note at newspapers. Finally, the logo will be including it in the handbook (manual) with guidelines for conservation and protection of *Araucaria* forests.

Several photos, a poster and note in newspapers generated by the project, and a pdf file with preliminary scientific results are attached to this report.

Preliminary scientific data obtained by the project.

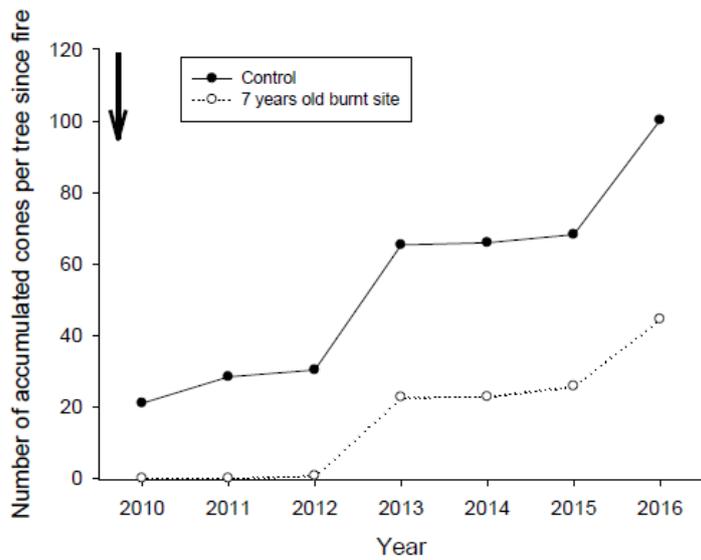


Figure 1. Accumulation of the amount of cones per tree counted since the fire occurred in 2009 (arrow)

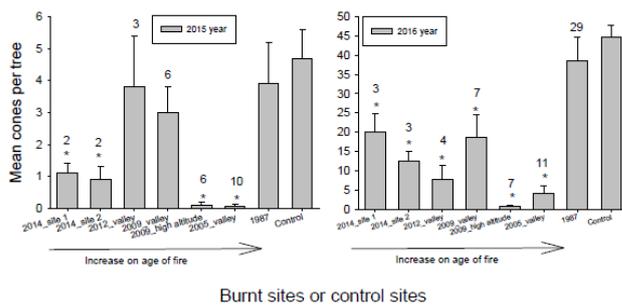


Figure 2. Mean cone per tree during 2015 and 2016 at the six burnt sites with 3-29 years old. Ages of fires are shown. With \* are shown significant difference with control sites

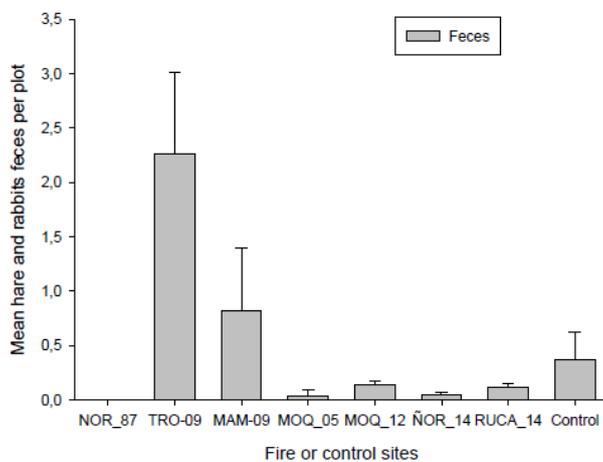


Figure 3. Abundance of faeces per plot at different burnt sites and compared with control. Number on X axe represent de year of the fire (eg. 87 = 1987 or 14 = 2014).

Pictures



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