Project Update: July 2018

Since September 2017 we carried out this study in northwest Patagonia and have made significant progress on our objectives. During the course of our study we have interacted with different stakeholders including pine plantation owners, forestry extensionists, park rangers, local citizens, national and international researchers and students. We made progress in many aspects:

Pine seed predation by native rodents

A preliminary study before setting up the pine establishment experiments revealed that pine seed predation by native small mammals was very high in the steppe sites. Such high seed predation would have important consequences on pine establishment. Therefore we included rodent enclosures for the establishment experiment and we also designed two short term experiments to evaluate pine seed predation as a barrier to pine establishment. On one experiment we compared seed predation levels between different pine species to evaluate which species would be favored (by lower levels of seed predation). By offering seeds of different pine species (Figure 1: Below - ©Jaime Moyano) and assessing the preference of native rodents we were be able to determine which pine species represent a lower threat of invasion (since most of their seeds are consumed by native seed predators). On the other experiment we evaluated seed dispersal and seed predation at different distances from a pine plantation. By evaluating the distance to which pine seeds survive predation we were be able to determine the distance range with higher risk of invasion. This information can be useful to focus pine control efforts on a particular distance range from the pine plantation.

Evaluation of establishment success for different Pine species

We set up the 1-year experiment to compare establishment between different pine species in the Patagonian steppe (Figure 2: Below - ©Jaime Moyano). We decided to include a native forest site because non-native pine invasions in the Patagonian forests are increasing. It is possible that the species that threaten with invasion in the steppe ecosystem are not the same that threaten the forests. We have monitored pine seedlings emergence and survival through summer, autumn and winter. For this experiment we

counted with the help of two field assistants, a local student from the National University of Comahue and a Syrian student from Damascus University. Researchers from South Africa, New Zealand and United States visited our experiments and made very useful suggestions for making the best use of the data. In the coming months we will continue monitoring the experiment and by the end of August we will harvest the plants to measure biomass and other growth variables.

Sharing the results with the community

In November 2017 we presented some results of the seed predation experiments on a Congress in Puerto Varas, Chile (http://www.biologiachile.cl/wp-content/uploads/2017/04/Afiche-Congreso-2017.pdf). Many of the pine invasion problems we have in Argentinean Patagonia are the same in Chilean Patagonia, so many researchers and students were interested in our project and made many helpful comments and suggestions. In May 2018 we were invited to a regional radio for an interview on our research project. This was particularly useful because we were able to describe our work and make some recommendations for the locals regarding invasive plants and especially non-native pines. Also in May 2018 we presented a seminar in the National University of Comahue showing our research project to predict pine invasions. The public of this meeting was mainly students, professors and researchers from the University. Again we received very valuable feedback on our research. We also visited a local primary school to organise a workshop with children, where we used games to describe our work and the importance of nature conservation.

Furthermore, we participated on another workshop where many primary schools from Bariloche city were gathered. On this event our research group, together with many others, interacted with children of different ages to show them what we are working on and why it is important to fight invasive species and take care of native species and ecosystems (Figure 3: Below - ©Mariano A. Rodriguez-Cabal). Finally, we participated in a workshop on management of invasive species, with multiple stakeholders: pine plantation owners, forestry extensionists, park rangers, national park technicians, researchers, students and government authorities. On this workshop we discussed the most important problems regarding regional invasive species. Preventing non-native pine

invasions was one of the priorities for many of the participants. This was a very good opportunity to share our research with the decision makers in the forestry industry and discuss ways of preventing Pine invasions.

Next steps

Most of the field work of our research project has been fulfilled. Once we harvest the establishment experiment and process all the samples we will analyse the data. We have already prepared two manuscripts with the results from the seed predation experiments and will submit one to an international journal (Biological Invasions) and one to a local journal (Producción Forestal) in the following months. We are also organizing a workshop with local pine plantation owners to discuss with them some of the results from our research and try to think about possible ways to prevent invasions in the future.