

## The Rufford Small Grants Foundation

### Final Report

Congratulations on the completion of your project that was supported by The Rufford Small Grants Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to [jane@rufford.org](mailto:jane@rufford.org).

Thank you for your help.

**Josh Cole, Grants Director**

Grant Recipient Details	
<b>Your name</b>	Lía Montti
<b>Project title</b>	Distribution and invasion risk by <i>Ligustrum lucidum</i> (Oleaceae) in the Argentinean Yungas as consequences of climate and land use changes
<b>RSG reference</b>	8204-2
<b>Reporting period</b>	2010-2011
<b>Amount of grant</b>	6000
<b>Your email address</b>	<a href="mailto:liamontti@gmail.com">liamontti@gmail.com</a>
<b>Date of this report</b>	

**1. Please 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
Develop a map of the current <i>Ligustrum</i> distribution in the Yungas			X	We did extensive field work along Yungas (3 million ha) and collected samples where the species is present. We developed maps of the most important areas of Yungas where we detected big monospecific <i>Ligustrum</i> forest, but we need a bigger effort to improve the correct methodology. The data obtained was very important but the methodology should develop in the future in order to establish the real magnitude of this invasion in terms of time, space and the ecological meaning.
Elaborate statistical habitat models with Maxent			X	We identified which climate variables determine <i>Ligustrum</i> distribution in native and novel areas and witch areas along Yungas are more susceptible to be invaded.
Elaborate future distribution models to predict <i>Ligustrum</i> distribution changes			X	Due to a delay in field work and recollection of record of <i>Ligustrum</i> in its original distribution range, actually we are analysing this data. When we complete it, we will prepare a manuscript with these results to transfer the information to institutions and people involved in policy development and implementation (e.g. NGO, environmental government office) to develop protocols and recommendation to control the invasion of this tree.
Evaluation of impact of <i>Ligustrum</i> in ecosystem service of the Yungas			X	We were able to identify the invasion effect in Yungas forest. We are preparing a manuscript with these results to transfer the information

**2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).**

We had been problem with previous methodology selected for analysis the image. We tried to map the distribution of forest dominated by *L. lucidum* using Landsat 5 TM along very big area. The mosaic had four images and we conducted a supervised classification. The technologies and

methodology previous selected, not endured the amount of information, so we must work in small areas. Also, to differentiate structure between native and invaded forest was difficult. There were no significant differences between forests that can be detected easily with Landsat image in this ecosystem. In addition, the complex topography of mountain forest and differences in *Ligustrum* forest ages affected the previous results.

Another problem was that Landsat have 30 x 30 m pixel resolution, but the incipient small forests, that cover 2-3 pixels, so these forest and also mixed forest (native + *Ligustrum*) were not detected. The citric and eucalyptus plantations present similar spectral reflectance and were worse classified on some occasions. For this we must increment field sample effort and check in the field continuously the results. In consequence, the maps that we made underestimate the *Ligustrum* forest but there are good models of *Ligustrum* cover. Now we started working with another methodology, especially for determining *Ligustrum* past distribution but we need to calibrate the methodology and buy more images that are expensive.

We found that species information about this species in herbaria collections and research institute is not completed and accessible easily, especially from Argentina and neighbouring countries. However now we have completed records observation along native area thanks to invaluable help of Chinese collaborators.

In addition, we had a significant delay in the allocation of another two grants, which caused the delay in the purchase of equipment. However, we were able to complete all planned activities.

### **3. Briefly describe the three most important outcomes of your project.**

1. *L. lucidum* forests could promote carbon sequestration because they present faster growth rate and accumulate more biomass than native forest of the same age. But invaded forests reduce richness of trees and animals, and increase the water consumption. Contrary to our prediction monospecific forest of *Ligustrum* does not affect soil nutrient status. Also, other changes in ecosystem function are detected (e.g. litter decomposition, productivity). In consequence the cover forest recovery by *L. lucidum* may not ensure the same environmental service than native forest.
2. Our preliminary results shown that invasive areas were associated with agricultural abandoned land use (specially in the foothills) and that the most affected areas are the peri-urban zone in Sierra de San Javier (Tucumán province), San Lorenzo (Salta province) and Yala (Jujuy province). Catamarca province (in the most southern Yungas range) not presented important *Ligustrum*'s cover yet. Currently, *Ligustrum* covers more than 1% of the total area analysed but in general the exotic forests started to expanding in the Yungas.
3. *Ligustrum* is distributed along most biodiversity zone in the world. The countries with more information about this species and their invasive status are EEUU, Australia and New Zealand. In Argentina *Ligustrum* are present in Yungas northwest, in dry forest (central) and along riparian forest in the east of the country and have hard correlation with anthropogenic activities and semi-urban areas.
4. This species present potential large expansion area and appear to tolerate a wide range of climatic condition in native (China) and novel area in Argentina. We can detect important

site of invasion risk and some site where *Ligustrum* are present but not where the model predicted the invasion. In addition the models reveal an apparent shift in climatic variable importance between native and invasive distribution. These results lead to think in hypotheses concerning and adaptative shift in the fundamental niche of *Ligustrum*.

**4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).**

During our research we contacted different persons and institution that have interest in our future results (especially organisation that coordinates management project). Also, some graduate and undergraduate students and professionals from different universities and local people participated in this project as field assistants and collaborators, so the result was the constitution of informal network of peoples that have interest in invasive species (especially plants and, of course, *Ligustrum*). So it is a first step to share the information and it was a direct consequence of the project. As soon as possible the results provided in this project will be transferred in a manuscript to local NGO: Fundación ProYungas that collaborate with this project.

**5. Are there any plans to continue this work?**

Yes, our project is planned to be a long term research programme and we will apply for Rufford again. We wanted to make a project involving different ecosystem levels. The next step is to explore by different models and future sceneries the *Ligustrum* invasive behaviour in the mountain ecosystem and the ecosystem consequences in the C-sequestration, watershed conservation and biodiversity for future. Also we wanted to explore another effect in ecosystem function and compared this novel ecosystem with native.

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

Contribution information is an important aspect of the project since one of the key issues we have identified is the necessity to know the real effects (positive and negative) of biological invasion. We have presented our results in the IUFRO Landscape Ecology Working Group International Conference in Portugal and in the 2nd World Conference on Biological Invasions and Ecosystem Functioning in Argentina. The past month we submitted two scientific papers with the results of our first year's survey. Once we publish the papers its will be distributed to all person that have interest in work with invasive species and conservation of Yungas forest. The next step is to prepare easy share printed material and share them with local authorities in the area we are working in order to give them information about our work.

**7. Timescale: Over what period was the RSG used? How does this compare to the anticipated or actual length of the project?**

The RSG was used mostly during 2010 and 2011, but at beginning of the year we had a delay in the onset of field activities us consequences of delay in other grants. So some activities were made on during 2012.

**8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.**

Item	Budgeted Amount	Actual Amount	Difference	Comments
Rent and maintenance of field vehicle and gasoline	1,500	1,500	0	
Electronic equipment	1,357.14	1,500	-142.86	We underestimate the real cost of equipment
GPS	141.73	153	-11.27	Underestimated
Other small equipment (batteries, lamps)	57.143	100	-42.857	
Software analysis/satellite image/aerial photograph/technical assistant	742.82	600	142.82	
Per diem expenses for field assistants	514.28	514.28	0	
Meals during field work	114.29	300	-185.71	We underestimate the real cost
Travel for field assistants	1,172	1,000	172	
Supplies (Cds, bibliography, etc.) and Field expenses	173	240	-67	
Dissemination of results	228	100	128	
<b>TOTAL</b>	<b>6,000</b>	<b>6,007</b>	<b>0,007</b>	

The positive credit balances in some items were used in the negative credit balance of other items.

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

I think that the more important steps will be finished the objective and results in the next few months and evaluate the real expansion of *Ligustrum* in Yungas in the last decade. Evaluate other ecosystem service impacted by this species and the behaviours of this novel ecosystem in the future days.

Also, an important step will be to elaborate an interdisciplinary document about the knowledge of this invasive species and start to make prevention management in priority risk site.

**10. Did you use the RSGF logo in any materials produced in relation to this project? Did the RSGF receive any publicity during the course of your work?**

Of course, I made some talks about the project in the university of Tucumán and Misiones and we present previous result in two international meeting. We hope finished the next steps of our project and publish our results in international journal where we acknowledge the RSG grant.

### 11. Any other comments?

Special thank for RSGF for trust and patience in my proposal. The grant allowed significant progress in my research. When we finished to write the scientific paper and its will be accepted we will send it to RSG office.

### Appendix



Study area and record of invaded sites in the Yungas forest of Argentina collected during this project.



Fig 1. Invasion in suburban area. The dark-green trees are individuals of *Ligustrum lucidum* inside native forest. Fig2. A park ranger collaborator taking point of native forest during the first field travel.



Fig. 3. During field travel for collect some record of *Ligustrum* presence along Yungas forest. Fig 4. Incipient invasion of *Ligustrum* trees (individuals with white flowers) in San Lorenzo (Salta).



Fig 5. Taking soil samples under invaded forest Fig 6. Under invaded forest near Villa Nougues (Tucumán), 1400msl.