



Universitat de Lleida

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Vegetal i Ciència Forestal

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2.- Questions to candidate:

A) In the view of the results found in this thesis, i.e. need and effectiveness of forestry (or technical) vs. spontaneous revegetation and considering that mining activities have effects worldwide, what could be the application area (i.e. geographical) and the ecosystems types that will be benefited from the restoration recommendations and knowledge gained with this thesis?

B) Dispersal filters are important elements to guarantee a natural seed inputs in mined sites. However, as it is described in the text, sometimes the colonization of invasive species is produced. My question is related with invasive species colonization, because they can arrest the successional process. Considering restoration perspective, what can we do over sites that were colonized by invasive species? Do you think it would be necessary to apply any technical actuation over these invasive species or sites?

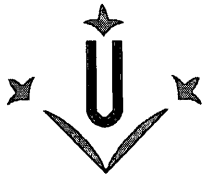
C) You have observed a decrease of colonization rates and successional rates in restored sites and slightly divergences in composition between sites. Do you think that can be possible to have different alternative states, formed naturally, over these reclaimed areas? if happens, can you describe one case?

D) Based on you results, and considering technical (or forestry) reclamation methods are still going to be applied, what improvements in technical reclamation would you suggest or recommend?

E) After all the nice and interesting thesis done by the candidate, I like to ask: looking with perspective, would you change or improve any research aim that you carried out during your PhD? Also, you have improved your knowledge in restoration ecology, thus, what new hypothesis need to be targeted within this new research field?

Signed:

Dr. Josu González Alday



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Review Report for: Šebelíková, L. 2018: Spontaneous revegetation vs. forestry reclamation of mining sites on different spatial scales. Ph.D. Thesis Series, No. 12. University of South Bohemia, Faculty of Science, School of Doctoral Studies in Biological Sciences, České Budějovice, Czech Republic, 158 pp.

1.- Brief evaluation:

The thesis is a substantial essay and clearly shows that a considerable amount of work has been done. The thesis is well planned, employs adequate methodology, and it has sound results, being an original contribution to restoration ecology of mined sites in Czech Republic (Central Europe). It is organized in four chapters, some of them already published, that are well organized and clearly written, with interesting conclusions. The thesis is focused on a hot topic from restoration ecology field, the medium- long-term effectiveness of natural versus technical reclamation techniques. The study of highly disturbed mine areas is a current topic in restoration literature. However, the approach used here comparing natural restoration versus technical methods is not common. This gives to this thesis a relevant scientific importance, since the effectiveness of both restoration methods has never been properly compared. At the same time, it is always interesting and informative to analyze the restoration process in different case-studies, such as here in Central Europe. Hence, the results are very interesting and relevant to improve restoration techniques in mined sites. Together, the thesis used information from local to regional levels, which is not usual in this kind of works, because in some regions there are a limited number of mines with similar characteristics. Thus, this gives an extra strength to the results presented and to the conclusions drawn.

It is my true belief that this thesis should be accepted for defense.

Mgr. Lenka Šebelíková – Spontaneous revegetation vs. forestry reclamation of mining sites on different spatial scales

PhD Thesis – Review

PhD thesis consists of four papers, from which three of them have been already published in high-quality scientific journals, and one is in the form of the manuscript. The general structure of the thesis is nicely organised starting from local to regional, country and finishing at Central European study scale. First three studies are focused on sand pits. Only the last one studied natural succession and artificial afforestation of spoil heaps after brown coal mining. Lenka Šebelíková is the main author of three papers.

Comments and questions:

In the beginning, I have a provocative question related to Table 1, page 13. **Is spontaneous succession better in the whole time of its duration than forestry reclamation? Alternatively, is this conclusion presented in the table focused on the first few decades after land abandonment? How temporary are the characteristics of spontaneous succession during the time?** In later stages, the species richness of spontaneous succession may decrease, alien species prevail, and the landscape without 'additive artificial energy' remain similarly species poor (e.g. *Prunus spinosa* monoculture) as possible forestry reclamation. As you also mentioned at the different part of the thesis, the solution could be a disturbed succession. However, we can see on it by a different optic. **What about something like a disturbed afforestation?** I would also prefer to divide the reclamation to technical and biological part. Even though they are usually realised together, they may be completely independent. Technical part can consider various microhabitats with different soil depth and fractions of soil, sand, gravel and stones, slopes and orientations. Biological part or the reclamation needn't be focused only on afforestation. Excellent current examples can be found in a large limestone quarry Mokrá. The main aim of the mining company is to store soil and clay deposits as a useless material. They do not care what will be the future land productivity. Therefore, the resulting technical and biological reclamation can respect species diversity potential, microhabitat structure and various tree species plantations, which may result to the lower threats (aliens, habitat loss), different habitat conditions, and higher species richness and tend to the improvement of ecosystem conditions.

Even though the topic of the thesis is rather general, three studies analysed data from sand pits, which represent unique bedrock for reclamation. From this point of view, it is somehow inconsistent that the last study is not also focused on re-forestation of sand pits on a subcontinental level. **Was it difficult to find proper mining sites across Europe? Are spoil heaps comparable with sand pits?**

No paper presented in this thesis used species indicator values as some explanatory variables. **Why?** In my opinion, it is a pity, because they offer another dimension of the data explanation. They have some problems, but pitfalls may also appear considering, e.g. the use of any plot characteristics related to the species (e.g. table 3, page 142). **Is it due to the authors' general animosity to these values?**

The question appeared from Table 2, page 115, but it is much more general. If we consider absolute numbers of species, we can almost every time conclude, that spontaneous succession surpasses

reclamation in species richness, number of Red List species, number of native species and others. However, where is a problem? If we consider not the absolute numbers, but the ratio of dry grassland, woodland, Red List and other species related to the total number of species determined at proper restoration status, we would obtain probably no or few significant results. The problem of artificial reclamation is in the grain and number of possible habitats, which are created at the beginning. It seems that the problem is not in the artificial reclamation at all, but in the technical reclamation plan, which does not offer a sufficient number of different biotopes. **What do you mean about it?** The third study also showed that 90% of observed species grew in spontaneously revegetated plots. It is evident that forestry reclaimed plots host some part of species diversity, which does not occur in spontaneous succession. **What is an ecological structure of these species? Is the reclamation partly complementary to natural succession?**

Brown coal and lignite mining sites of the Czech Republic also consider marginal areas as Žitava basin, Vienna Basin or České Budějovice basin. Those areas had rather small deposits, and most of the coal has been usually exploited there. However, **have you ever been there to see if there are some old spoil heaps and their current stage?**

Fig. 3, page 117 – 2nd axis has a range [0, 3.5] for Log values of the cover. The relative vegetation cover (if the axis is described correctly) of a set of species at one place cannot exceed 100%. The similar figure (Fig. 4, page 91) has a range [0, 2]. **What do the numbers mean?**

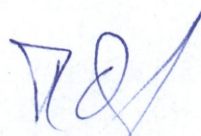
Fig. 2, page 139: *Acer campestre* and *Betula pendula* were considered once as a woodland species, once as planted species. I am not sure if it is correct to consider the same species two times to the ordination. I prefer to use the only passive projection of these species at localities, where they were planted. **Where *Robinia pseudacacia* and *Populus xcanadensis* were planted and how did you recognize it?**

Presented conclusion 'Unlike our assumption, the cover of planted trees played a role in species composition only at the regional scale' is misleading, because the result partly depends on the number of analysed plots. Probably better-formulated result would be: Even though we expect the role of planted trees in species composition, we were able to evaluate it only at the regional scale.

General conclusion:

This PhD thesis brings a scientific material of high quality. Generally, I can conclude that the whole manuscript can be accepted as a PhD thesis of the School of Doctoral Studies in Biological Sciences at the University of South Bohemia.

Brno, 28th December 2018



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