

Wildfire as an ecological factor in the forests of Central Europe

PhD thesis of Martin Adámek deals with interesting and important topic of role of the wildfire in the forests on Central Europe. PhD thesis consists of three main chapters. These three chapters are actually manuscripts of the scientific papers when two of the chapters are already published. Martin Adámek is a first author on all of the manuscripts.

Below I provide the list of comments to presented thesis.

Literature review

This chapter represent a nice review of the published information about the role of the fire in forest ecosystems with special focus on the Central Europe. Special attention is given to the conifer forests and especially pine dominated forests. However I miss a more detailed information about the role of the fire in the oak dominated forest types in the drier site, which are quite common in our region.

Question 1

Can you summarize the recent knowledge about the role of the fire in the oak dominated systems and other thermophilic vegetation in our region? Was fire an important ecological factors in those system in the past or not? In the context of the climate change and future vegetation and climate shifts, can you give brief overview what the future role of the fire in the forests on drier sites in lower altitude?

Chapter 1

Chapter 1 focuses mainly on the factors influencing the spatial distribution of the forest fires in the landscape of the Czech Republic. Another aspect of the study was the role of the environmental and human factors for wildfire occurrence and frequency. This study used a database of the forest fire from the 1994-2004. As a predictor the study used different types of factors.

Question 2

High abundance of the *Pinus sylvestris*, *Picea abies*, and *Betula* spp. was found as an important predictor of the forest fire. Can you comment of the fact that the recent forest composition in highly affected by the forest management and our forests are dominated by conifer species? How this would affect the landscape level results if our landscape would have more natural species composition?

Question 3

You have used the data from the 1994-2004. During this period we have several relatively drought years. How this could affect the results? With the respect of the expecting climate change the drought periods are supposed to increase their occurrence. Can you comment on how the droughts actually affect the process you have been studying?

Question 4

On the page 42, in the last paragraph you say that the most fire-prone were forests dominated by *Betula* spp., *Pinus sylvestris*, and *Fagus sylvatica*. This represents the results on the country level.

How do you explain the differences in the result on the country and region level? Why spruce was only significant on the region level? How do you explain the significance of the *Betula* spp. If you look the at country level statistics, *Betula* spp. has only very minor proportion in our forests.

Can you give a brief description how did you get abundance of the tree species for the study? And how do you explain the relative large significance of the *Fagus sylvatica* on the country level, when this forest types in considered as not vulnerable to the fire?

Chapter 2

Chapter 2 focuses mainly on the long-term fire history of the in Bohemian Switzerland NP. The main question was whether spatial distribution of the recent and ancient fires is driven by the same environmental factors.

This study presents an interesting and important results on the fire ecology in the region and especially on the role of the *Pinus sylvestris* in this process. It is one of the first studies in our country which actually show the importance of the fire for the dynamics of the natural *Pinus sylvestris* dominated stands.

Question 5

Your study was published in *Forest Ecology and Management*. I was wondering if it would be possible using your approach and analysis to actually create a modified map of potential natural vegetation which would respect the role of the fire in the dynamics of the pine forests in the region. And why this was not at least partly incorporated into the recent study? This would have a direct implications for the restoration management in the region? Can you comment on that and show the some example how the concept of the potential natural vegetation would change in the region?

Question 6

Given the results of your thesis, the fire could be used as a restoration tool in the management of the forests in the region. Can you briefly describe what the limiting factors of this approach are and how it could be actually practically used in the field?

Chapter 3

Chapter 3 focuses mainly on the post-fire vegetation development and environmental factors affecting species composition of burnt forests. The study is using a space-for-substitution approach. The plots were located in the stands ranging from 1 to 192 years.

The results of the study gives in interesting results on the rate of recovery and the role of the fire severity on the vegetation dynamics.

Question 7

I have several methodological questions. How did you determine the age of the older burnt stand. Especially the ones which were older than 100 years? How did you determine that there was no planting done or some other management measures in those older stands? All this could have an

important effects on the post-fire vegetation dynamics and result of your analysis?

Question 8

Was the size of the fire included in your analysis as a variable? Could this have an effect on the vegetation dynamics? Size of your area was from the very 0.1 ha up to the 18 ha. The size of the fire could for example affect the seed dispersal of some species and because of that whole vegetation dynamics?

You claim that the large burnt areas had more plots. How did you select the plot position and did you treat the fact you have more plots in some areas in your analysis and why?

Question 9

Are the results giving in the table 1 – page 86 – really relevant for all species? For some species you have a very low number of samples? Based on this table, you could say that the proportion of the oaks surviving the high severity fires is much higher than in case of pine? Do you interpret the results like this and what kind of consequences this could have for the forest dynamics?

Question 10

I did not understand why did you use the unburnt plots as a reference? The species composition there is driven mainly by the forest management and planting. The only conclusion is that the fires and natural development following fire has a different effect compared to forest management? But if the forests would not be managed, how they would develop is difficult to say? Or do you suggest that following the forest logging operation part of the sites should be burned and left to natural dynamics? This could be of course very interesting management tool.

Question 11

Your results are actually nicely showing the vegetation dynamics follow the forest fire. However I have a question which is related to your conclusions. You show that the 150 years old stand are again dominated by shade tolerant species, which are fire sensitive but in which there is a general belief that they do not burn. Without the fire the succession would go most probably towards the stands dominated by Fagus for example, when Pine would gradually lost its presence. But can you say that the fire is actually the factor which would turn back those sites towards the Pine dominance? I do not think your results directly support your conclusion? What about if fire is randomly operating over the landscape and on some sites it burn every 100 – 200 years, but on some sites it burns every 500 or 1000 years? And on those sites the succession could go from the 100 % dominance of shade tolerant species towards the more Pine dominated stands? Do you know what I mean? You cannot actually simply say giving the data you have available “periodic fires occurring every at last once in 200 years maintain forests dominated by Pinus”. What about if the situation is much more complex and you have sites where fire occur regularly relatively often but at the same time you have infrequent unpredictable high severity fires which play also important role?

Conclusions of the thesis

I generally agree with the final conclusions of the thesis. However I have a feeling that some of the statements are too strong, given the data which were presented in the thesis.

What I miss in the conclusion, especially giving the fact that you come from the Department of the Botany and work in the Botanical Institute, is some kind of statement referring to the concept of the potential natural vegetation and its use in the forest management and nature conservation. Can you briefly give your opinion how this concept could or should change giving the results of your thesis?

Conclusions

Phd thesis of Mgr. Martin Adámek fulfills all the requirements and therefore after successful defense I recommend the thesis for acceptance.

Miroslav Svoboda
Česká zemědělská univerzita v Praze
Fakulta lesnická a dřevařská
Kamýcká 129
Praha 6 Suchbátův
16521
svobodam@fld.czu.cz

V Praze 21.9.2016

Miroslav Svoboda