

# THE SUCCESSION DYNAMICS IN *SPHAGNOSA* FOREST SITE TYPE ECOSYSTEM AFTER THE FOREST FIRE

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*ERAF Project “The support system of planning and  
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## **Actuality of theme**

**The outstanding and character of forest fires are predicted by the interaction of the meteorological conditions, topography as well the site and forest stand peculiarities.**

**The fire appearance depends particularly on the quality, moisture, amount and placing of burning material.**

**In Latvia since 1990 there have been at an average 850 forest fires every year.**

## *Actuality of theme*

The forest site type *Sphagnosa* is characterising by at least 30 cm thick peat layer and with unfortunate soil moisture and aeration regime.

The *Sphagnosa* forests take 1.4% from the total forest area of Latvia. The forest stand is formed by unproductive pine (*Pinus sylvestris* L.) with site index V and some birch admixture.

Because of strong suffering during the forest fires, already two or three years after the burning the trees dry up and fall down.

**There is a natural regeneration with pubescent birch (*Betula pubescens* Ehrh.) permissible in *Sphagnosa* forest site type, because after the fire there begins the paludification process in the burned area and the birch increases the water transpiration thus improving the growth conditions for the natural regeneration of pine.**

**The Regulations of forest regeneration (No. 1453) of the Cabinet of Ministers of Republic of Latvia determines that in the *Sphagnosa* forest site type there is the regeneration with the pine and birch permissible and the maximal permissible number of trees is not limited.**

**The time-limit of the forest regeneration in *Sphagnosa* is 10 years after the forest cut or impact of other factors.**

## **The aim of the study:**

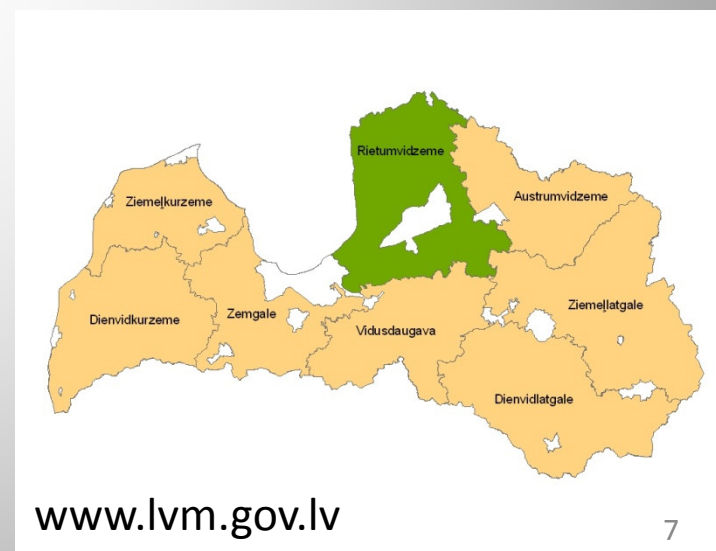
**The aim of the study was to evaluate the process of natural regeneration after the subsurface fire in the *Sphagnosa* forest ecosystem 2, 6, 10 and 16 years after the fire by comparing of different areas burned in the past.**

## **Research tasks:**

- 1) to analyse the changes of number of trees and growing conditions in time after the fire;**
- 2) to evaluate the chances of natural regeneration in the areas after the forest fire.**

## *Materials and Methods (1)*

***The research is carried out in 2010 in the districts of Rūjiena and Piejūra of the Forestry Rietumvidzeme of the Joint stock company “Latvian state forests”.***



## **Materials and Methods (2)**

**The measurements have been performed in areas burned different time (2, 6, 10 and 16 years) ago (the chronosequence method).**

**The number of established experimental plots in every forest stand depends from size of forest stand (7 plots per hectare). The area of each plot is 25 m<sup>2</sup> (10 x 2.5 m).**

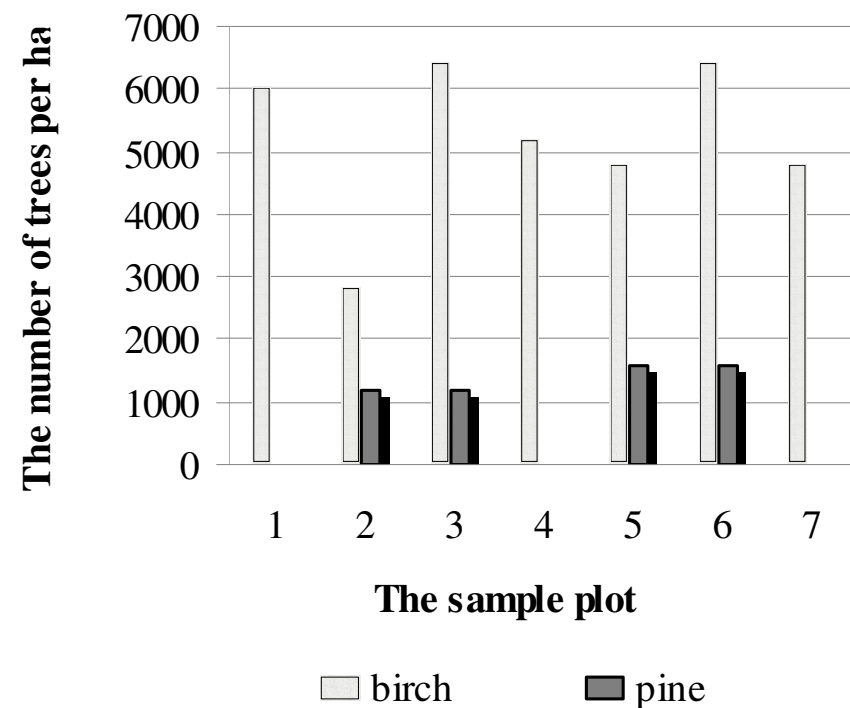
**The sample plots were placed evenly on the longest diagonal across the forest stand. If the average tree height of the renewable forest stand was below the 2 m, in the plot there were only those trees counted being not closer as 50 cm each from the other.**



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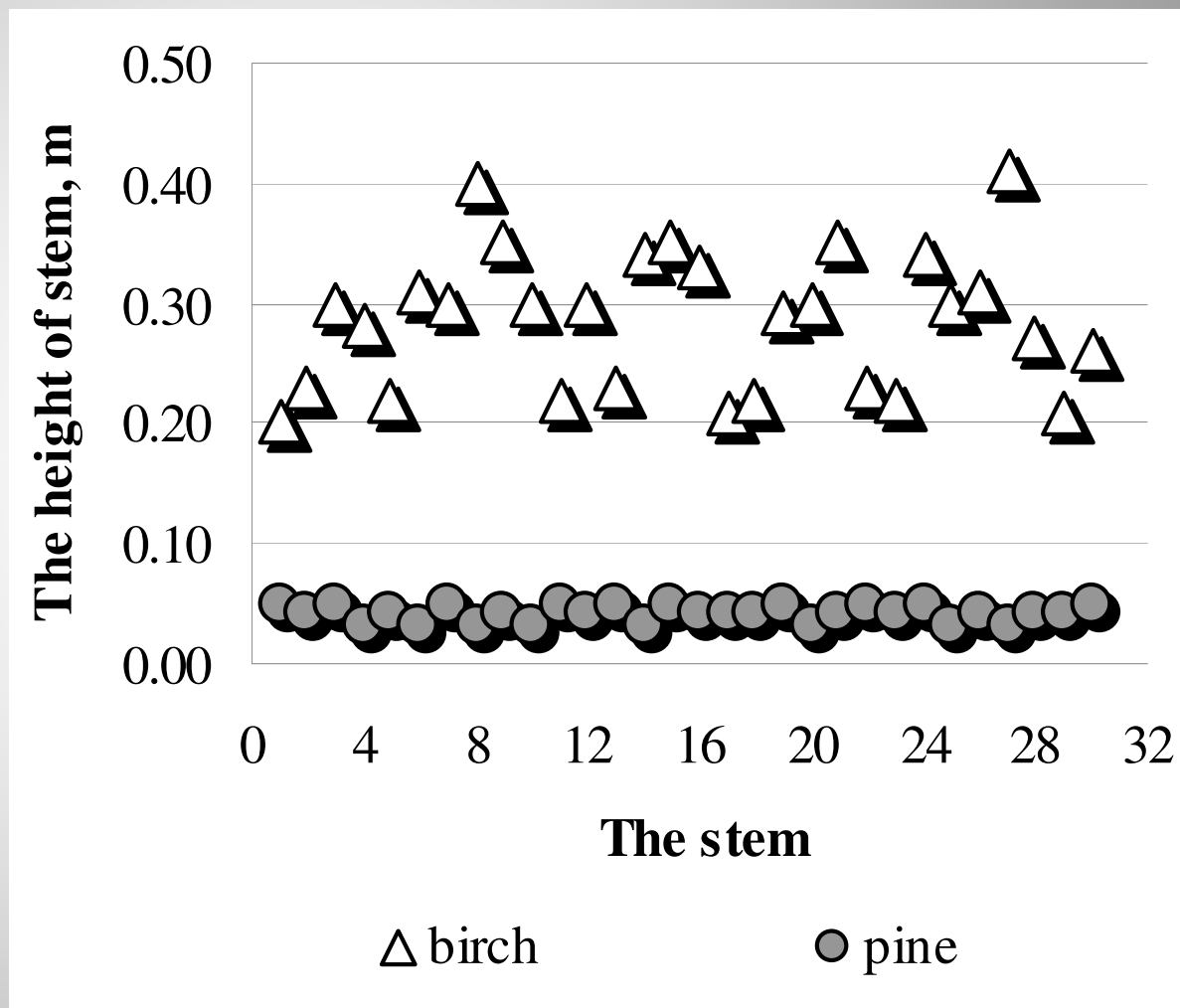
## *Results (1)*

Two years after the forest fire the main tree species are: birch with  $5200 \pm 478$  trees  $\text{ha}^{-1}$ , average height  $0.29 \pm 0.026$  m; pine -  $800 \pm 289$  trees  $\text{ha}^{-1}$ , average height  $0.04 \pm 0.010$  m. The placement of pine seedlings in this time span is irregular. The stand composition is 9Birch<sub>2 years</sub> 1Pine<sub>1 year</sub> with  $6000 \pm 558$  trees  $\text{ha}^{-1}$ .



## Results (2)

The height of  
measured trees  
2 years after  
the forest fire.



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## *Results (3)*

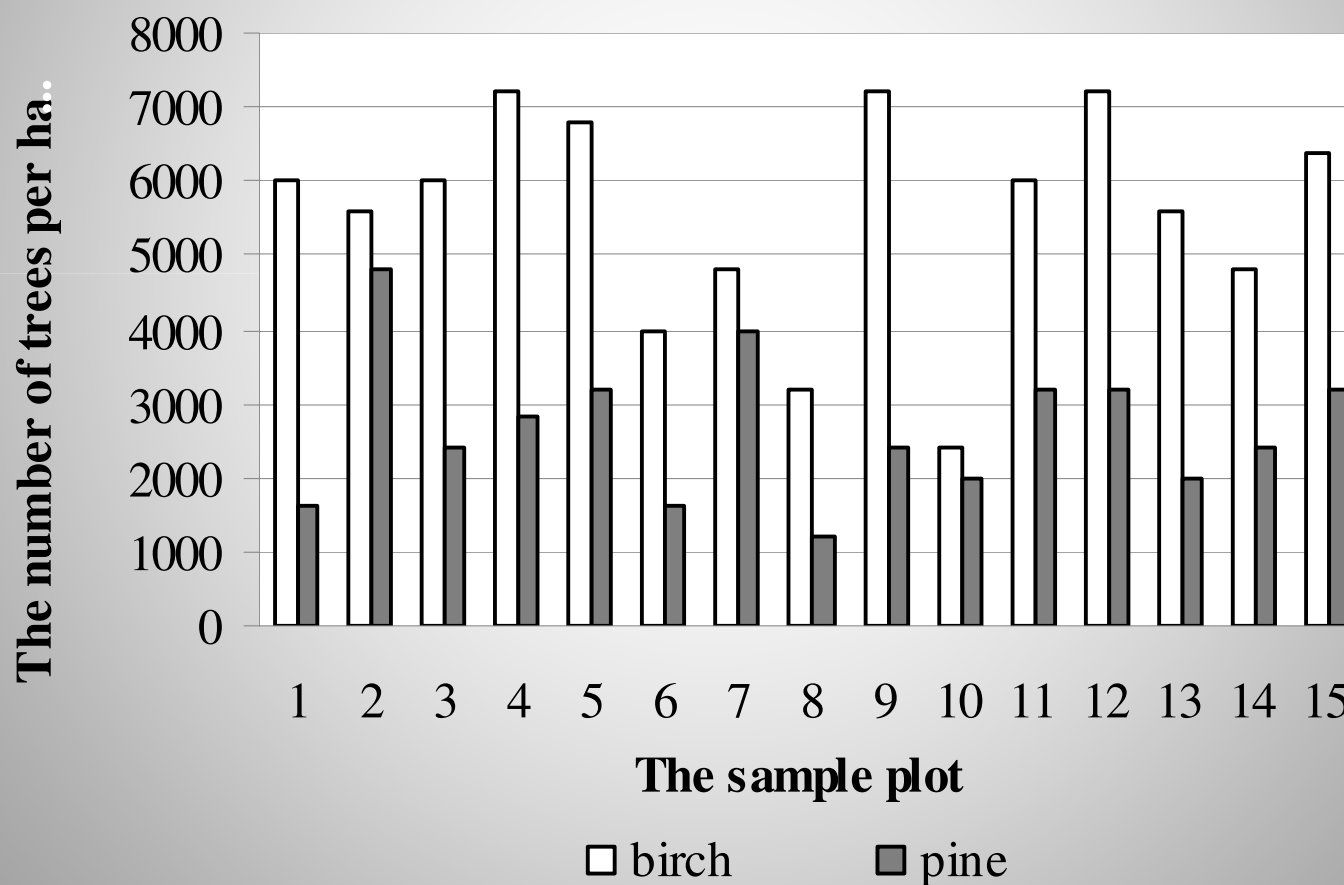
### 6 years after the forest fire

The main tree species are: birch with 5540 trees ha<sup>-1</sup>, average height 1.15±0.076 m; pine - 2670±249 trees ha<sup>-1</sup>, average height 0.41±0.031 m and stand composition 7Birch 3Pine 6 years.  
The total number of trees on a hectare is 8210±529.



## Results (4)

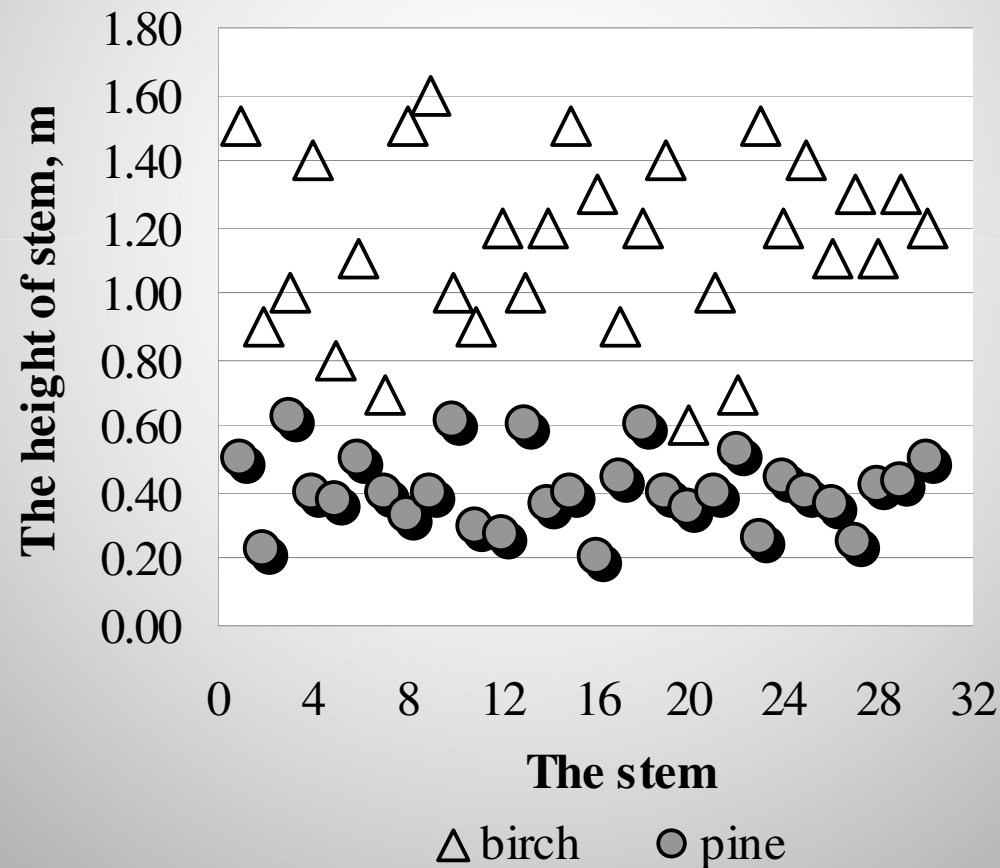
The number of trees per ha according to the data from sample plots 6 years after the forest fire.





## Results (5)

The height of measured trees 6 years after the forest fire.



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## *Results (6)*

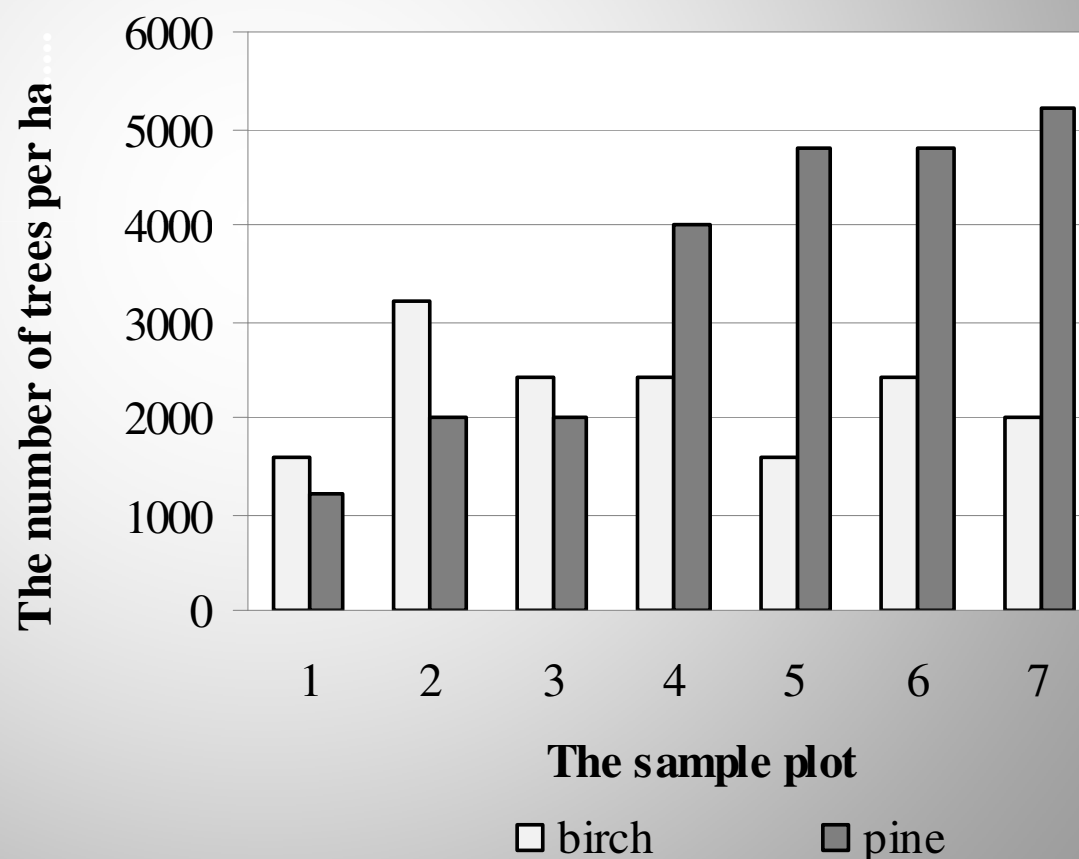
Ten years after the forest fire the main tree species are: pine with  $3430 \pm 622$  trees  $\text{ha}^{-1}$ , average height  $0.93 \pm 0.092$  m; birch -  $2230 \pm 211$  trees  $\text{ha}^{-1}$ , average height  $1.36 \pm 0.069$  m. Ten years after the fire there is a reduction of the number of birch trees observed. The stand composition is 6Pine 4Birch <sub>10 years</sub> with the  $5660 \pm 614$  trees  $\text{ha}^{-1}$ .

## 10 years after the forest fire



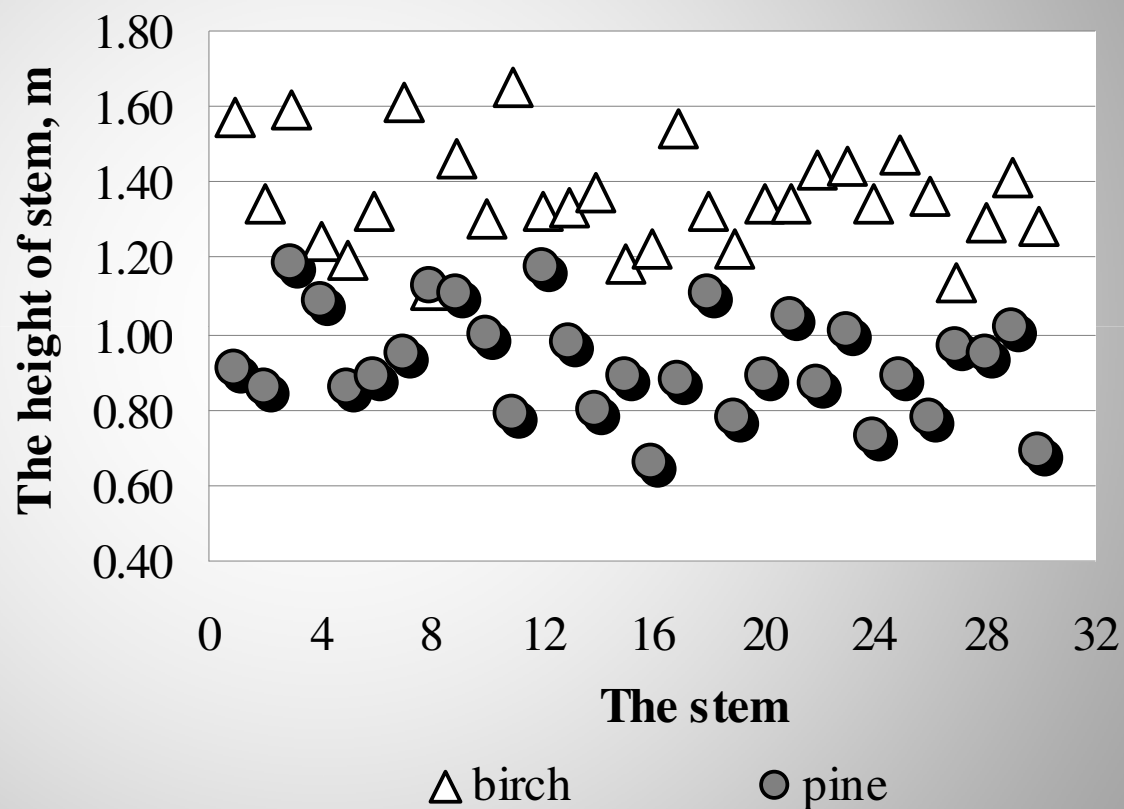
## Results (7)

The number of trees per ha according to the data from sample plots 10 years after the forest fire.



## Results (8)

**The height of measured trees 10 years after the forest fire.**





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## *Results (9)*

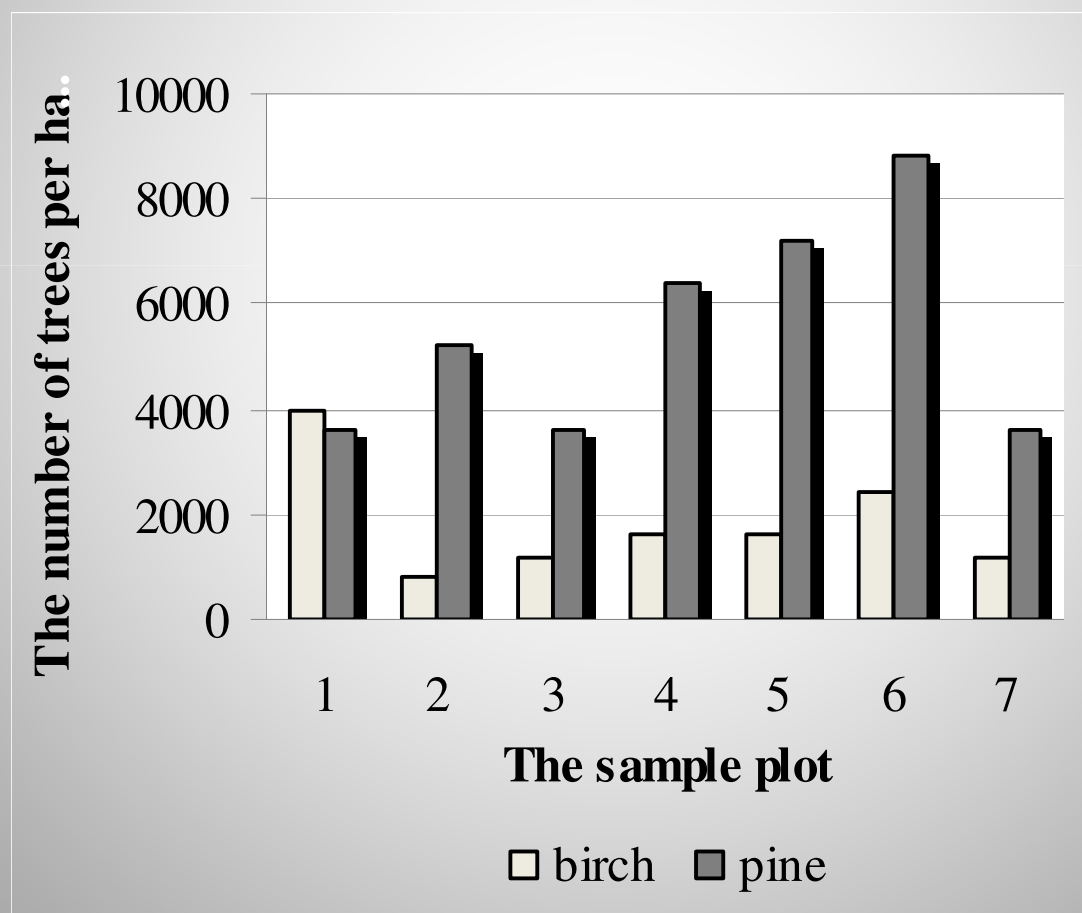
Sixteen years after the forest fire the main tree specie in forest stand is pine. The tree stand composition is 8Pine 2Birch <sub>16 years</sub> with the total number of  $7310 \pm 876$  trees  $\text{ha}^{-1}$ , from which  $5490 \pm 779$  trees  $\text{ha}^{-1}$  are pines with the average height of  $1.99 \pm 0.142$  m. The number of birch is  $1830 \pm 408$  trees  $\text{ha}^{-1}$  with the average height of  $1.96 \pm 0.117$  m.

## 16 years after the forest fire



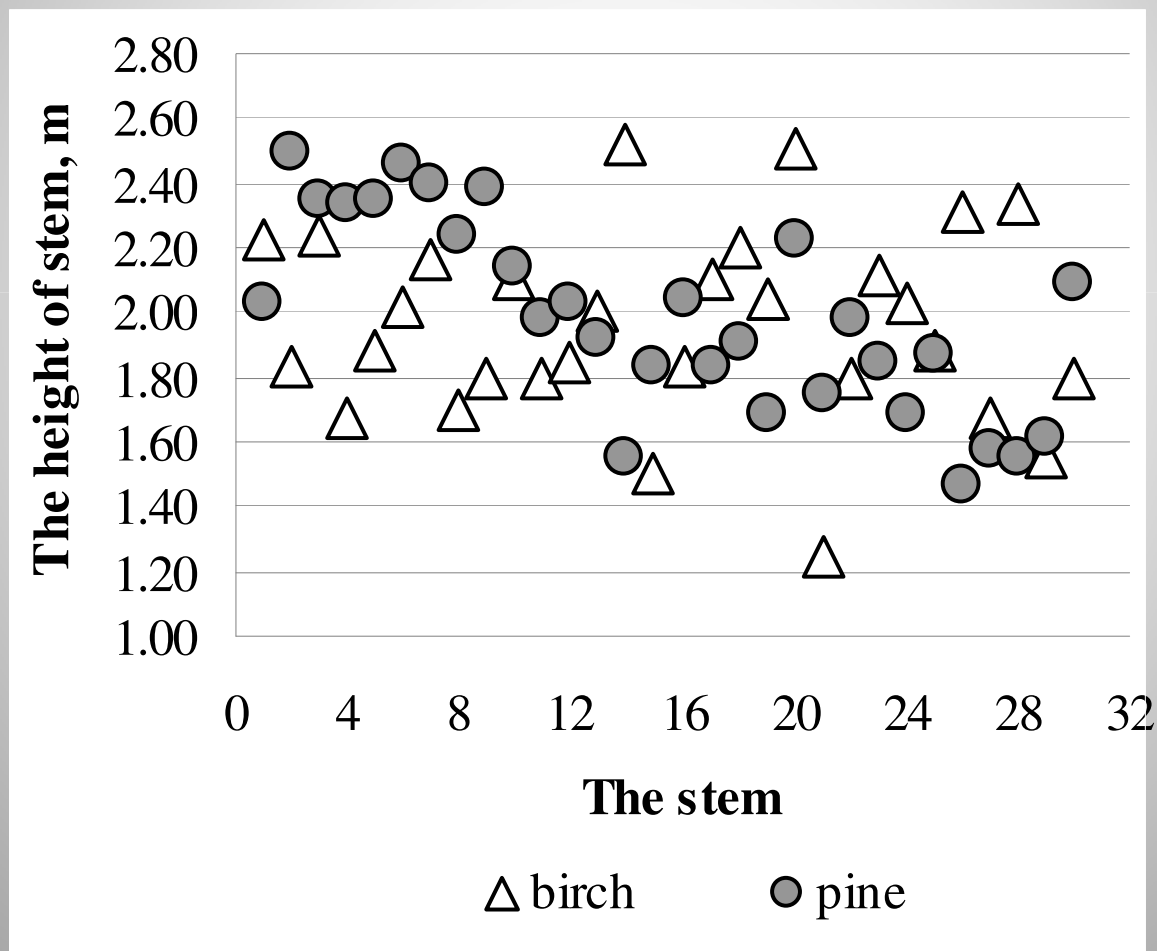
## Results (10)

The number of trees per ha according to the data from sample plots 16 years after the forest fire.



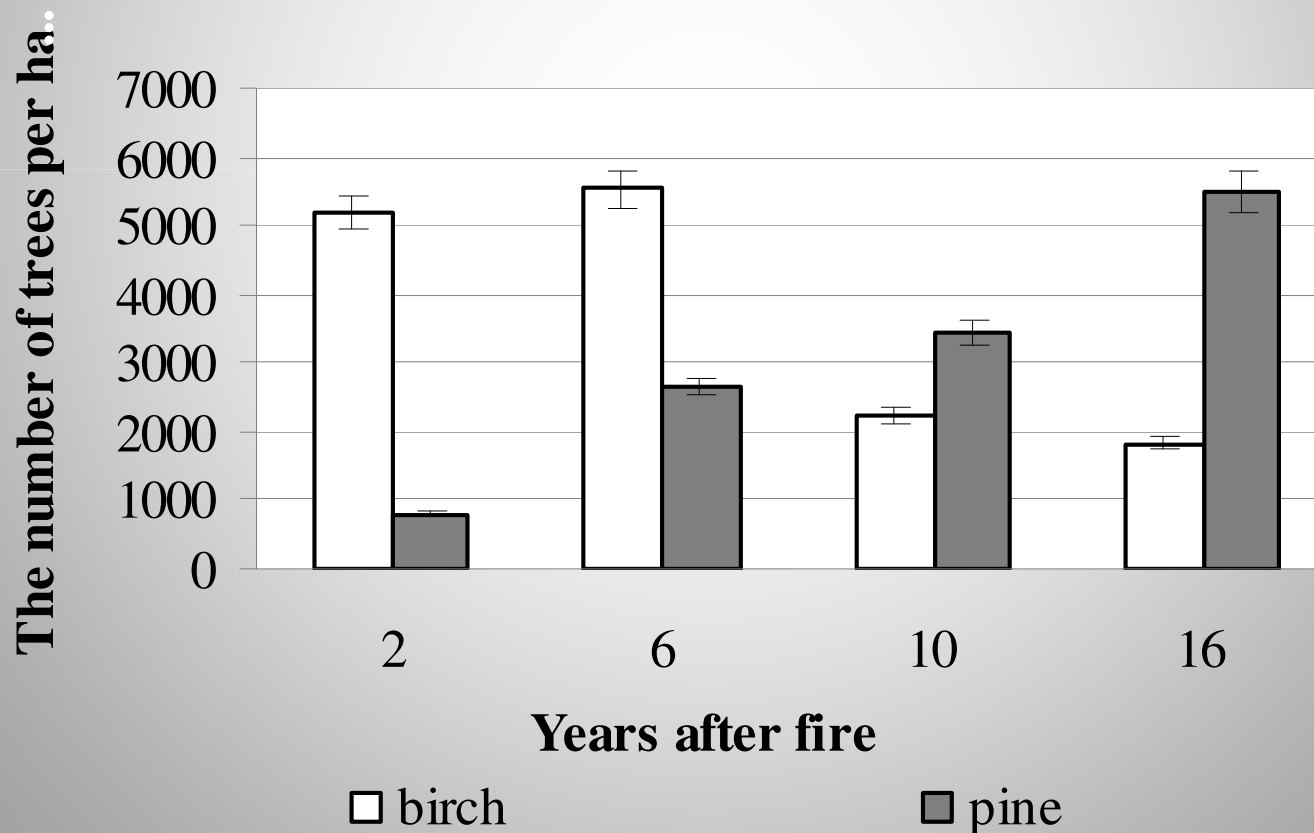
## Results (11)

The height of measured trees 16 years after the forest fire.



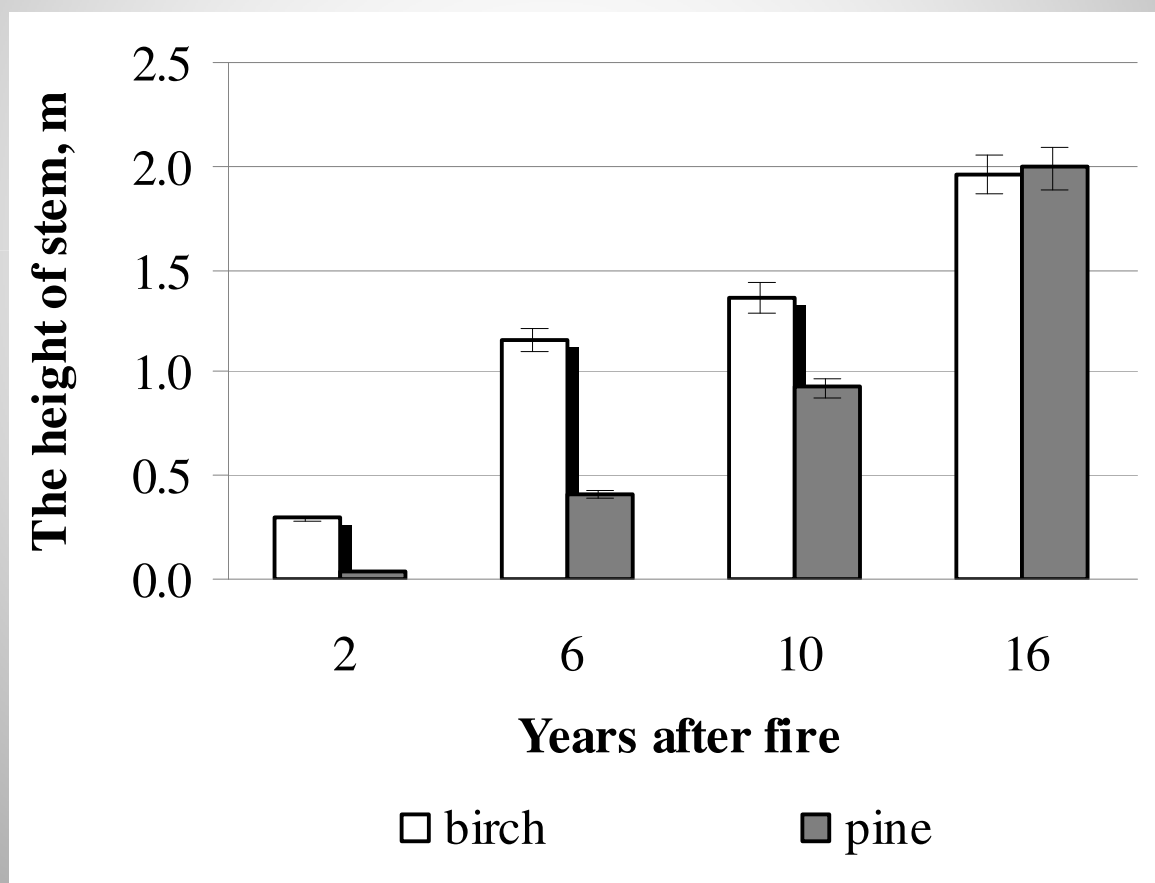
## Results (12)

There was no significant differences found between the total number of trees in burned areas of different ages in *Sphagnosa* forest site type ( $F_{\text{fact.}}=0.5283 < F_{\text{crit.}}=4,7571$ ,  $p=0.6791 > p=0.05$ ).



## *Results (13)*

**The average height of measured trees in burned areas of different ages.**



# **CONCLUSIONS**

**In spite of the damaging influence of the fire on forest resources and atmospheric pollution after the burning, a forest fire has also a positive impact. The fire promotes exchange of nutrients between the living biomass and soil and forwards the natural succession of vegetation.**

**The plant community soon after the fire reaches the highest species richness, especially profit the pyrogenic species.**

**The fire as a natural disturbance promotes forming of gaps in the layer of tree stand canopies, thus supporting favourable conditions for the natural regeneration of forest.**



## **CONCLUSIONS**

**After the forest fires in Sphagnosa forest site type ecosystem there is a pubescent birch (*Betula pubescens* Ehrh.) spreading as pioneer tree species.**

**The birch increases the transpiration process, thus slowing down the paludification of area. Under the birch canopies sows also the pine, which is growing a certain time well together with birch.**

**At the age of 16 years the average height of pine and birch is almost similar reaching for pine  $1.99 \pm 0.142$  m and for birch -  $1.96 \pm 0.117$  m.**

## **CONCLUSIONS**

**Because of insufficient amount of nutrients and of the waterlogging, the birch, reaching the height of 1.96 m, leaves behind of pine. The pine (*Pinus sylvestris* L.) comes forward as the main tree species in the *Sphagnosa* forest site type.**



***Thank you for your attention!***

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