

# The change of soil properties after wildfires in drained peatlands (Moscow region, Russia)

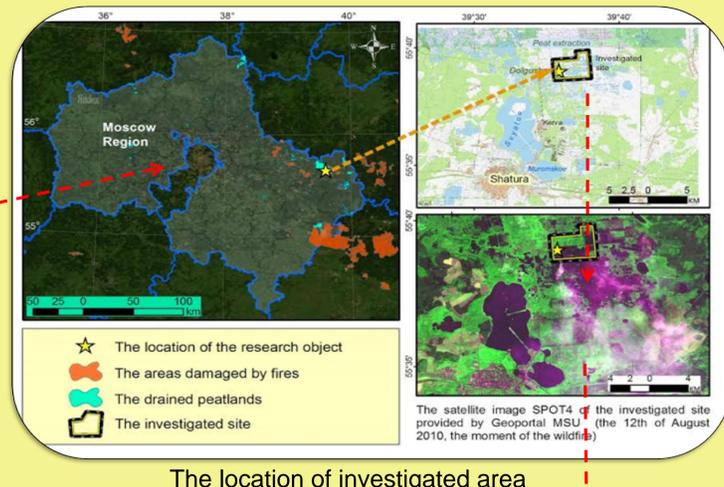
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## Introduction

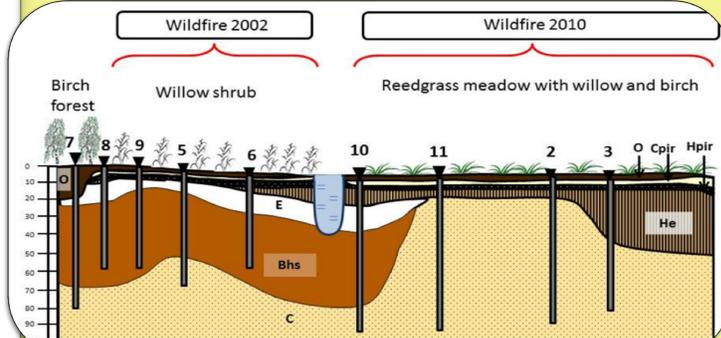
The peat fires differ from the forest and grassland fires, because the soil organic matter acts as burning material. So deep peat horizons are heated or burned during smoldering fires, causing the dramatic change in soil properties. In addition, the alteration in hydrological regime, for instance drainage, makes landscapes and soils very vulnerable to wildfires. Drained peatlands are widespread in the European part of Russia and they are affected to extreme wildfires of 2010. So the post-fire peat soils investigations are topical in this region.

## Objects and methods

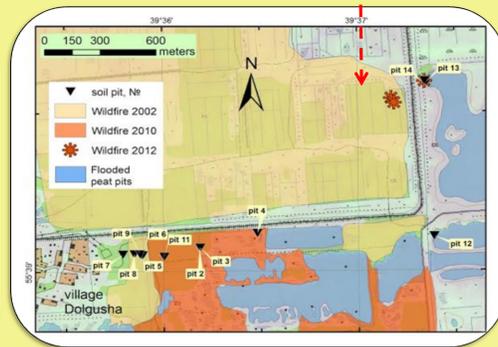


The location of investigated area

The wildfires of 2010 in Russia



The scheme of soil pits location



The profile characteristics of investigated soils

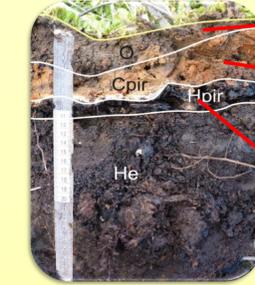
The soil analysis	Method
Soil element composition	X-ray fluorescence
Organic carbon	Dichromate oxidizability
14 PAHs compounds	Spectrofluorimetr analysis at a temperature of liquid nitrogen
pH	potentiometric analysis

## Conclusions:

- After wildfires on drained peatlands morphological and physico-chemical properties of soils changed. New soil horizons Cpir, O, Hpir, Ha,pir instead of organic layers were formed.
- After the fire ash horizons Cpir had elevated concentrations of Al<sub>2</sub>O<sub>3</sub> (9-17%), Fe<sub>2</sub>O<sub>3</sub> (4-11%), P<sub>2</sub>O<sub>3</sub> (1-1,8%), CaO (1,9-2,8%) and K<sub>2</sub>O (0,1-1,9%). The char horizons Hpir had composition similar to background peat.
- The soil pH changed from 4-5 to 7,5-8 after the fires, but 10 years after the fire the soil pH was similar to pH of background soils.
- Soil magnetic susceptibility changed from 5-30 ×10<sup>-6</sup> cm<sup>3</sup>/g to 200-250 ×10<sup>-6</sup> cm<sup>3</sup>/g in post-pyrogenic histosols and podzols, and remained high even 10 years after the fire.

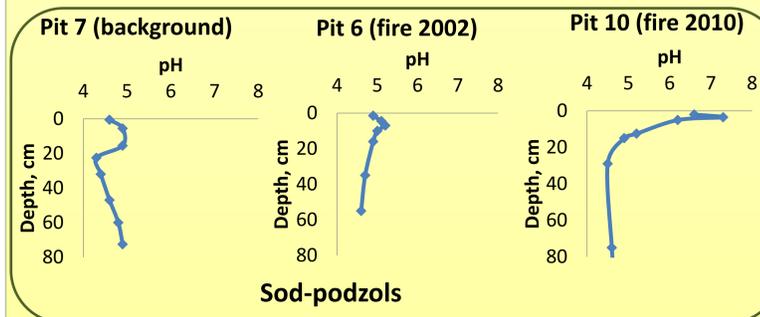
## Results

### 1. Soil element composition

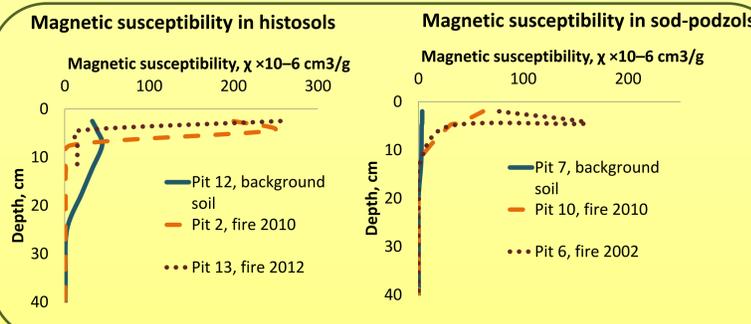


Post-pyrogenic histosol

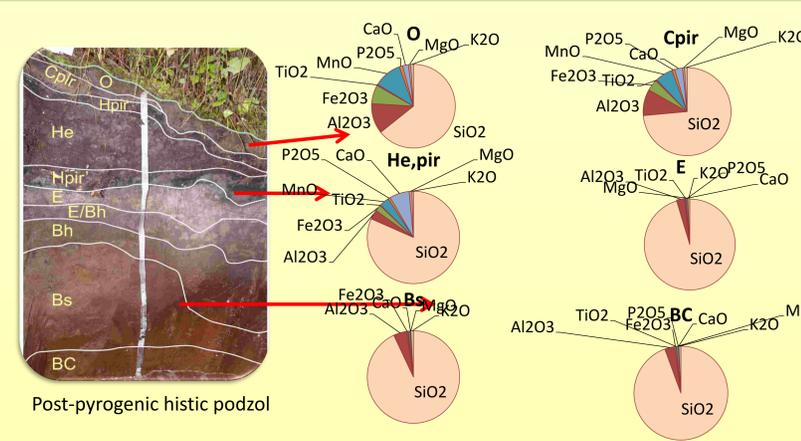
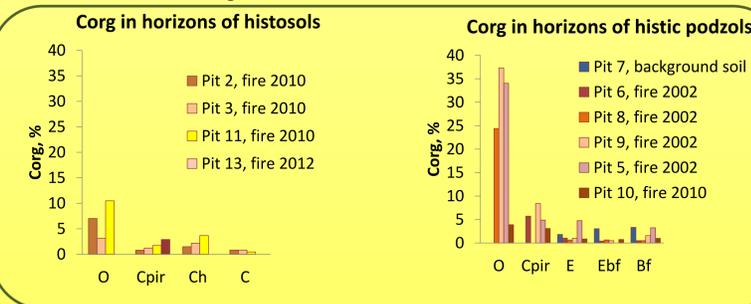
### 2. Soil pH



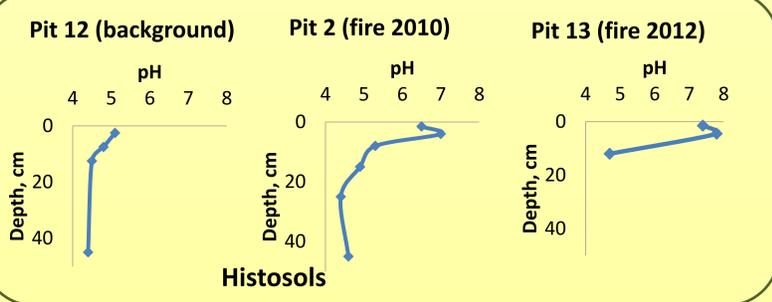
### 3. Magnetic susceptibility



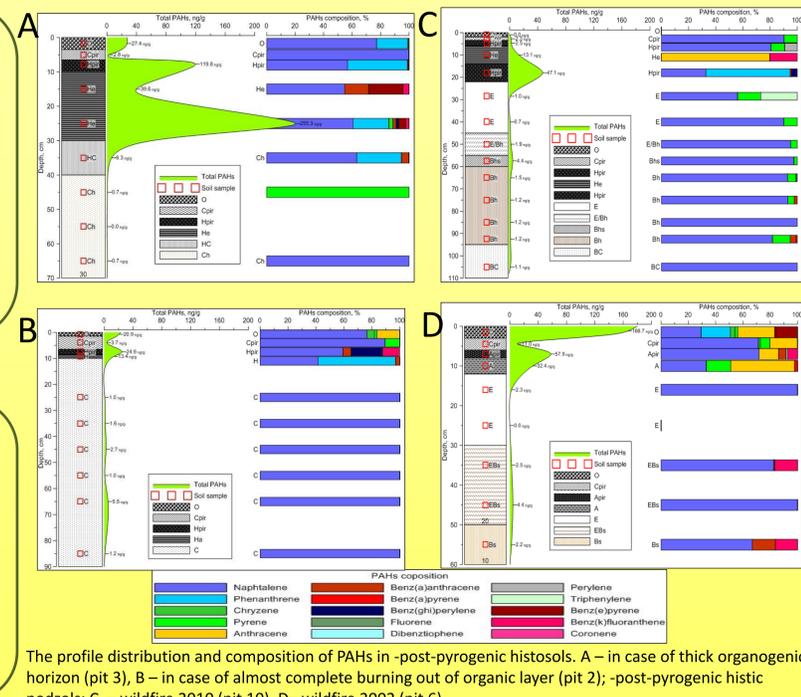
### 4. Soil total organic carbon



Post-pyrogenic histic podzol



### 5. Polycyclic aromatic hydrocarbons



The profile distribution and composition of PAHs in -post-pyrogenic histosols. A - in case of thick organogenic horizon (pit 3), B - in case of almost complete burning out of organic layer (pit 2); -post-pyrogenic histic podzols: C - wildfire 2010 (pit 10), D - wildfire 2002 (pit 6).

- On the one hand the loss of organic matter took place after burning. But on the other hand after the fire the new stage of humus formation started and in 2 years after the burning the content of organic carbon reached up to 10% in upper O horizons.
- After the combustion of peat in fires, phenanthrene, benz(a)pyrene, benz(e)pyrene, benz(ghi)perylene and benz(a)anthracene accumulate in soils. This is mainly the group of 4- and 5-nuclear compounds. The formation of high-molecular weight compounds like benz[a]pyrene and benzo[ghi]perylene is possible during smoldering processes under a low oxygen supply. Maximal PAHs concentrations were revealed in charry peat horizons and in post-pyrogenic incipient O horizons. The tendencies to higher PAHs accumulation in soils were revealed in cases of incomplete burning out of peat horizons.