



САМАРСКИЙ УНИВЕРСИТЕТ  
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# On the traits of the nitrogen cycle in natural and anthropogenically disturbed ecosystems of the Sokol'i Mountains (Samara Region, Russia)

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We are glad to greet You, dear colleagues!



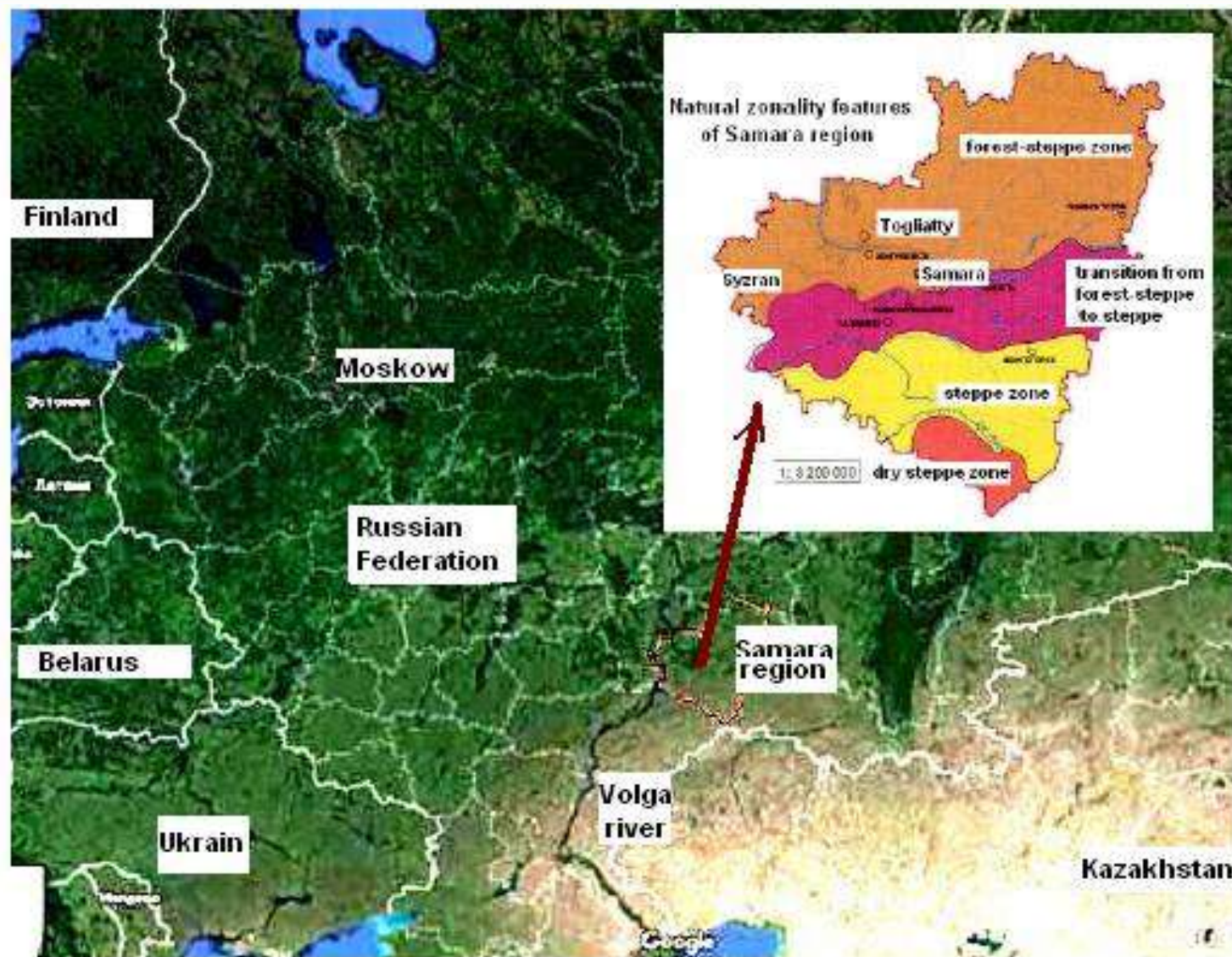
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and July Makarova

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## Features of Samara region geographical position and zonation





## Some views of Sokol'i Mountains and Volga river

Sokol'i Mountains are a small continuation of the Zhiguli mountains on the Volga River left bank. We studied the quantitative characteristics of the mineral nitrogen forms content and the Azotobacter activity levels in soils along the ecological profile that crosses the Sokol'i Mountains massif from south to north from Samara city.





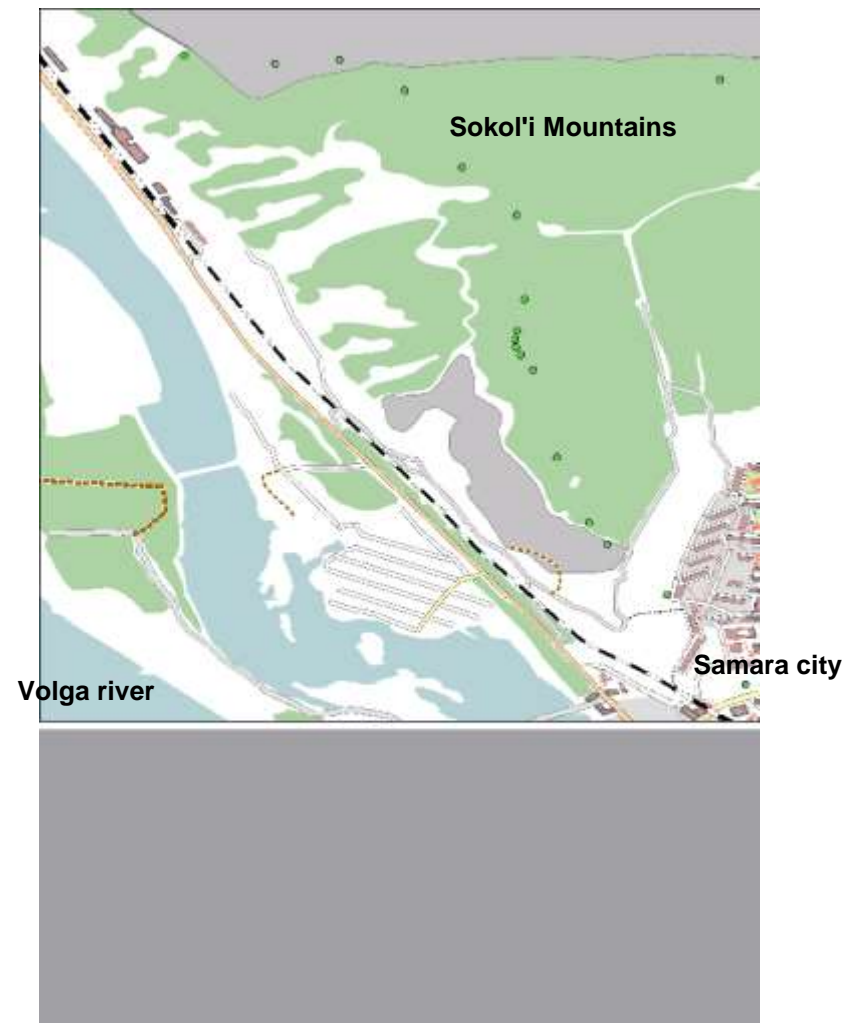
# The terraces and the bottom of the old carbonate quarry





## The scheme of ecological profile throw Sokol'i Mountains

- The plots in the profile were represented different types of plant communities: in the Samara city suburb adjacent to the Sokol'i Mountains - a part of the birch planting; on the southern, northern slopes and the watershed – the broad-leaved forest with a predominance of *Tilia cordata* Mill., *Acer platanoides* L. and *Quercus robur* L. with a small participation of *Betula pendula* Roth.; on the terraces and the bottom of the carbonate quarry at the northern slope of the mountains - sparse forests dominated by small-leaved species (*Populus nigra* L., *P. tremula* L.), and *Pinus sylvestris* L. with the addition of *Salix* sp.; near the quarry - rocky steppes and steppe meadows.





## The main local nitrogen suppliers

- The main nitrogen suppliers to the geochemical cycle in the study area are the organic residues (leaf litter in the forest, steppe felt in steppes) and the fixation of atmosphere nitrogen. Nitrogen-containing compounds from atmospheric precipitation due to transport emissions and other sorts of air pollutions can also make a certain contribution into nitrogen cycle.





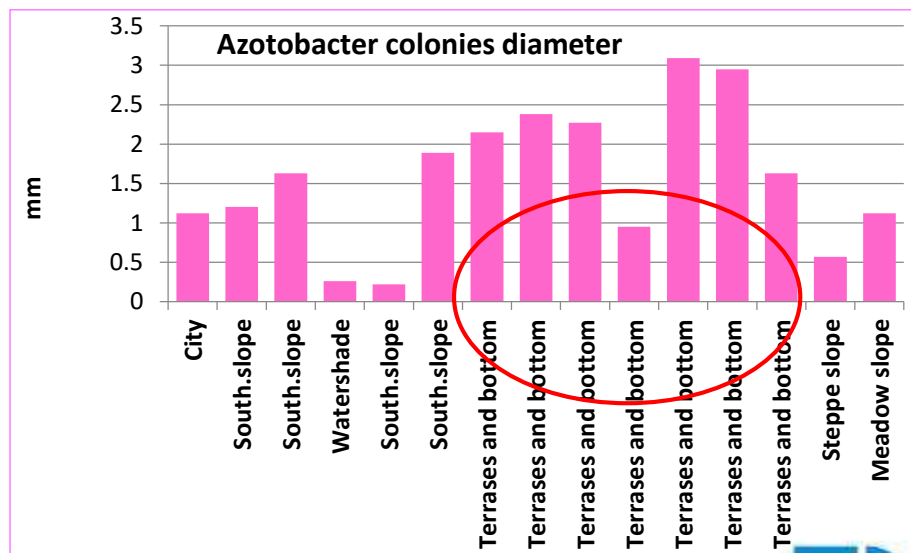
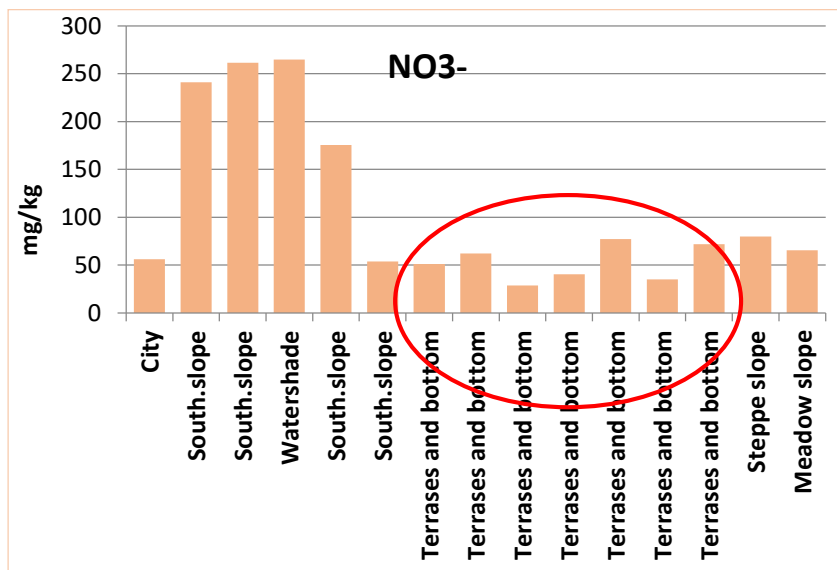
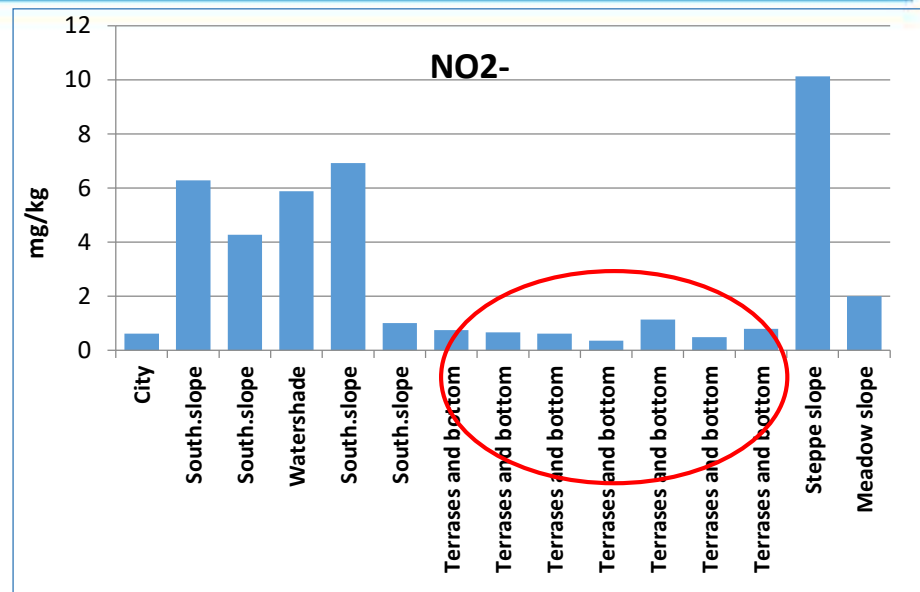
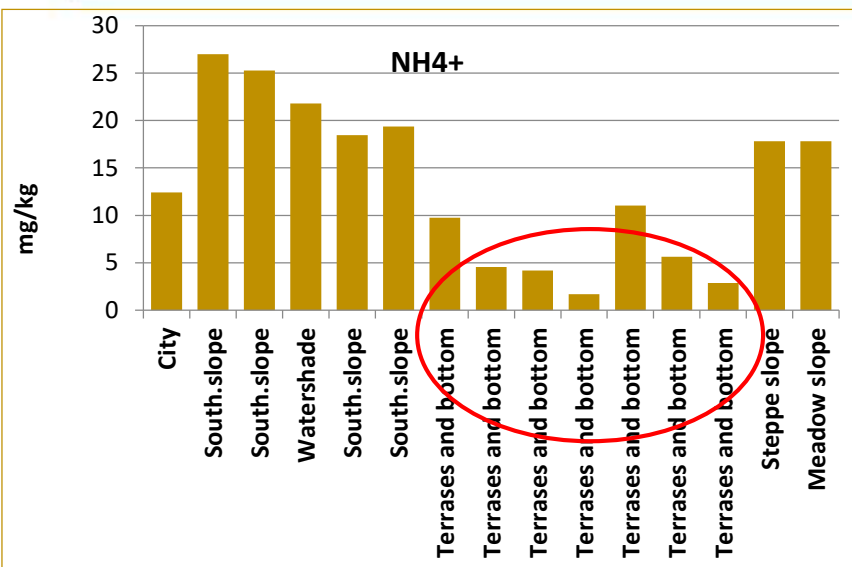
## The parameters of N forms content and Azotobacter activity in different soil samples

- The broad-leaved species prevail in the natural forests of the Sokol'i Mountains, and small-leaved species and pine dominate in the secondary forest stands, which are formed during the self-growth of the former quarry. It is known that the litter of broad-leaved species is much richer in nitrogen than the litter of small-leaved and coniferous species. The undisturbed soils of the forest trial plots in the Sokol'i Mountains contain significantly more mineral forms of nitrogen (nitrites, nitrates, ammonium) than in the fine-grained soil fractions of the former quarry with their low fertility, as well as in the soils of stony steppes and steppe meadows.
- The content of mineral forms of nitrogen directly correlates with the content of humus (correlation coefficient from 0.77 to 0.92), which is significantly higher in soils under natural broad-leaved forests. A high and reliable positive correlation was found for all analyzed forms of nitrogen among themselves (correlation coefficient from 0.64 to 1.0), which proves the natural pattern of nitrogen cycle in the study area.
- A regular increase of the Azotobacter activity level in the humus-poor soils of the quarry and grassy ecosystems has been established. This activity was characterized by a negative correlative relationship with the content of humus and all mineral forms of nitrogen (correlation coefficient from 0.4 to 0.71).





# The parameters of N forms content and Azotobacter activity in different soil samples





## Totally, we can say that:

In general, the nitrogen cycle occurring in the Sokol'i Mountains ecosystems demonstrates association with:

- the type of plant organic matter:
- nitrogen fixation levels;
- the influence of the anthropogenic activity ( past open-cast mining of raw materials and the self-growing of secondary forests in the former quarry).

The Azotobacter activity increases as soil alkalization rised, which is especially pronounced in the quarry.





## The rare ferns in Sokol'i Mountains





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**THANK YOU**

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