

THE PROBLEMS OF INTERACTION BETWEEN FOREST AND STEPPE

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ПРОБЛЕМЫ ВЗАИМОДЕЙСТВИЯ ЛЕСА И СТЕПИ

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Abstract

The problem of interrelationship and interdependence between steppe and forest, in treeless zones particularly, has been in a sphere of especial scientific interest for over two hundred years. The article presents the general views of the leading scientists of XIX-XX centuries on this question. The period of the scientific research has been divided into 5 stages: the first stage (the second half of the XVIIIth century – the middle of the XIXth century); the second stage (the second half of the XIXth – the beginning of the XXth century); the fundamental theoretical basis of the research (the 20-30th years of the XXth century); works on practical development of the steppe (the 40-80th years of the XXth century); modern state (90th years of the XXth century – the beginning of the XXIst century). Methods and principals developed by G. Denisik have been used to base the research on.

Among the best and the most credible hypotheses on this subject are: S. Korzhinskiy forest ousts steppe, V. Williams steppe overruns forest, P. Pallas et al. anthropogenic deforestation of the steppe. Analysis of the component-wise approach reveals two reasons treeless steppes: the climate and soil. Supporters of the climate hypotheses (A. Grisebach, K. Ber, A. Middendorf, G. Vysotskiy) explain the treeless steppes of arid climate. Followers of soil hypotheses divided into groups. Some (I. Palimpsestov, V. Dokuchaev, G. Tanfilev) see the problem of salinity in the black soil of the steppe; while others (P. Kostychev, A. Voyeikov, F. Tetsman) – in the physical properties of soils: a fineness, insufficient permeability; still others (G. Mayer, P. Kostychev) – flatness of territory and waterlogging of soils. Each of the following hypotheses suggests but partial solution to the deforestation yet collectively, they have considerably worked out the problem.

Keywords: steppe, forest, forest-steppe, deforestation, forest species.

Резюме

Взаимосвязи и взаимозависимость между лесом и степью, особенно в степных зонах, интересуют ученых более двух веков. В статье обобщены исследования ученых естествоведов XIX-XX веков по причинам взаимодействия леса и степи и безлесья степей. В процессе познания этого взаимодействия выделено 5 этапов: начальный (вторая половина XVIII – середина XIX века); активного рассмотрения проблемы (вторая половина XIX – начало XX века); детальной разработки проблемы (20-30-е годы XX века); исследования проблемы, связанный с активным освоением степи (40-80-е годы XX века); современный этап (90-е годы XX – начало XXI века). За основу выделения этапов взяты подходы и принципы, разработанные Г. Денисиком.

Среди наиболее обоснованных и признанных гипотез и теорий взаимодействия между лесом и степью и безлесья степей проанализированы гипотезы наступления леса на степь С. Коржинского, наступления степи на лес – В. Вильямса, антропогенного обезлесения степей П. Палласа и др. Анализ покомпонентных подходов позволяет выделить две причины безлесья степей: климатическую и почвенную. Сторонники климатической гипотезы (А. Гризебах, К. Бер, А. Миддендорф, Г. Высоцкий) объясняют безлесье степей засушливым климатом. Последователи почвенной гипотезы разделились на группы. Одни (И. Палимпсестов, В. Докучаев, Г. Танфильев) видят проблему в засоленности степных черноземов; другие (П. Костычев, А. Воейков, Ф. Тецман) – в физических свойствах почв: мелкозернистость, недостаточная водопроницаемость; третьи (Г. Майр, П. Костычев) – в равнинности территории и заболоченности почв. Каждая из

них решает проблему безлесья степей частично, но в целом имеют существенное значение для дальнейшего развития и решения этой проблемы.

Ключевые слова: степь, лес, лесостепь, безлесье степей, лесокультуры.

The subject: the problems of steppe and forestlands have always been tightly interlinked. On the other hand, the problem of the forest-steppe zone origin directly corresponds with other two problems: 1) interrelationship between forest and steppe; 2) deforestation of steppe. Due to the human activities the natural structure of steppe has been radically changed. Consequently since the second half of the XIXth century the problem has been turning into the problem between silvicultural plans and field. This circumstance has launched the research into practical sphere.

The questions of the forest-steppe origin and deforestation of the steppe are so much interconnected that by large they are often considered as one problem. The research on the subject has had few stages. Each stage has its own characteristic. Methods and principals developed by G. Denisik have been used to base the research on [1].

The first stage (the second half of the XVIIIth century – the middle of the XIXth century). During that period the problems of interconnection between steppe and forest and steppe deforestation were rising in the geographical literature. Such scientists as P. Pallas, I. Palimpsestov, A. Grisebach, K. Ber, A. Middendorf and others dealt with that subject. Their works devoted to these questions have not lost their topicality till now. Deforestation and forest's retreat basically were put down to one reason: climate or hydrology. Alongside with natural factors P. Pallas, for the first time, pointed at anthropogenic factor and its crucial role in reduction of forest.

Second half of the XIXth century – the beginning of the XXth century is a period of active development of the question. At this stage human needs and capacity of natural habitats are researched. The understanding of need in complex and various knowledge of geography is aroused. Famine of 1891 (former southern parts of Russia) boosted the research activities in that field. Major Russian researchers: S. Korzhinskiy, V. Dokuchaev, A. Krasnov, G. Tanfilev, V. Taliev, G. Vysotskiy, B. Keller, P. Krylov suggested the ideas how to improve the situation between steppe and forestlands and how to oppose the deforestation. Nonetheless unanimous opinion on the problem was not worked out. At the same time it became clear that different conclusions made by the researchers were not necessarily wrong just because they did not coincide [1].

Another trend of that period was to make research applicable to everyday needs of agriculture. V. Dokuchaev's «Russian black soil» published in 1883 [3] and «Our steppe before and now» issued in 1892 [2] had a big influence upon a scientific thought of that time.

A stage of detailed analyses of the suggested hypotheses on treeless steppe zones took place in the 20-30th years of the XXth century. G. Grosset, I. Turin, A. Izmailskiy, I. Pachoskiy, E. Lavrenko, V. Schafer and many other scientists considered the question of origin of steppe building up their ideas on a recently discovered law of zones made by V. Dokuchaev. Major reasons of deforestation were named. It was concluded that forest-steppe zone and steppe are two independent agents of nature. Nonetheless neither geographers nor geobotanists of that period went beyond the frame of that knowledge. Till now the question of steppe as an independent agent of a landscape remains unchanged.

A stage of active agricultural usage of steppe was actively researched in 40-80th years of the XXth century. Original suggestions on creating new forms of landscape on a steppe base were brought up. Though creation of massive forestage zones on these territories was not suggested it became clear that many former theories on originally treeless character of steppe were wrong. Works of S. Korzhinskiy, A. Krasnov, G. Tanfilev, G. Morozov, G. Vysotskiy, V. Sukachyov and many other leading specialists alongside with a successful experience of forestry development have proved this.

«Stalin's plan of reorganization of nature» worked out in 1948 by the most prominent scientists of that time has been unfairly ignored and its importance should be reconsidered [5].

Modern stage (90th years of the XXth century – the beginning of the XXIst century) marks a successful practice of forestage development in dry, heatwave prone part of southern-western Pryazovia. Meanwhile further research on rational usage of the Pryazovskiy region is being done.

The prime time of theoretical analyses of steppe was in the XIXth century. After that a number of publications on that problem have decreased. E. Lavrenko in 1930 singled out seven basic theories on collaboration between steppe and forest and the reason of deforestation [4]. Later V. Avdeev classified them into physical, biological and landscapes caused by industrial activities by the man [6]. We can conclude that the point of all works done before was to find out whether our steppes had known trees in the past; what kinds of nature of their interconnections is like; what kinds of trees can flourish in steppe.

The interconnection of steppe and forest is a complex, multi layered issue.

In XIXth century S. Korzhinskiy suggested a theory of advancing character of forest which is explained by the young age of the forest-steppe belts appeared on the place of the former steppe zone. In its turn the ousting itself was explained by «struggle for surviving between steppe and forest steppe species of plants». Accordingly treelike vegetation has natural advantage over smaller grasses. S. Korzhinskiy's followers saw the reason of forest advancing in the cooling of climate [7] and big amount of snow fallouts on the fringes which led to change of chemical mixture of soils [8]. G. Tanfilev pointed out that the advance of forest zones bore a natural character and was connected with self-development of vegetation and soils [9]. That theory was based on numerous but indirect evidences. Their interpretation can be very different, sometimes even to confront the theory itself. Critical remarks on the theory were made by F. Milkof [10] and G. Denisik [1]. Opposite view on that theory was spoken out by V. Williams [11]. According to V. Williams steppe overruns forest. The theory is based on a suggestion that after glaciers landscapes can develop by themselves within a following plan: tundra – forest – swamp – steppe – desert. In 1886 P. Kostychev drew attention to the fact that steppe grassy vegetation has a significantly competitive capability which enables it to resist outside invasion and hold on its territory [8]. On top of that G. Tanfilev [9] analyzing the structure of forest soils came to conclusion that all forest-steppe region was in prehistoric time was covered by steppe. Berg thought that prehistoric steppes had covered far more territory than it was believed before. To his mind steppe during the last period of glaciers steppe was moving northwards long to Leningrad and Volgograd regions. Climatic component of that theory was made by F. Milkov [10, 12, 13, 14]. Infiltration of steppe kinds of plants into forest areas is explained by certain regularity in grassy coverage which at the same time does not have strict bounds of its floristic realm.

Anthropogenesis of steppe deforestation and origin of forest-steppe zones.

Impact of human activities was the first explanation of forests' disappearance and formation of forest-steppe zones. At the end of the XVIIIth century P. Pallas assumed that forests had been destroyed by wars and burnt down by nomads. Later I. Palimsestov developed and generalized that theory. He claimed that in the past southern Russian steppes were covered with forests to recreate which there would be necessary certain soil and climatic conditions. The most coherent conception belongs to V. Taliev who suggested that any territory could have been covered by forests. Disappearance of forests he explained by human activities and by better adaptability of steppe species and their capacity to improve the soil. There no doubts that man's contribution to reduction of forest greeneries on the outskirts of the forestlands was absolutely dramatic [1].

Major structural research components of the considered.

Climatic conditions. In the XIX-XXth centuries such scientists as A. Grisebach, K. Ber, A. Middendorf and many others tried to prove that climate had changed in a negative for forests way and that was the reason why forests could not thrive any longer. This view can not be

regarded as unquestionable as there are examples where forests grow in much worse conditions. In preface to V. Dokuchaev's book «Our steppes before and now» V. Williams wrote: «it is difficult to believe that climate of our central Asian deserts were far more benign for tree plants' growth than climate of our black soil region, there are haloxylon thickets» [2, p. 8]. G. Tanfiliev opposed that theory, its groundless he explained by historical references. Herodotus noted over 10 forestlands on the territory of the Dniper valley.

Salinity of soils. A considerable number of scientists consider change of salinity as the major factor. They pointed at carbon dioxide and sulfuric acid salts of calcium. However cases of forests growing on limestone, chalk and gypsum rocks are well known. So the theory is not unquestionable either.

Physical properties of soils. Some scientists considered physical properties of soils as a chief factor. In particular they pointed at their fine-grained structure which is not good for water penetration. At the same time in black soil regions on light sandy lands there are plenty of trees.

Plain character of soils and waterlogging.

At the end of the XIXth century American researchers, G. Mayer for example, put blame for reduction of trees in American prairies on local topography. Flat landscape provoked waterlogging phenomenon conducting trees free steppe growth. That theory was supported by P. Kostychev however black soils are not waterlogged and there are lots of examples when trees grow on mushy lands and even in swamps (Mingrelian forests used to grow in the Rion valley).

Efforts of numerous researchers, scientists, natural explores, foresters have proved that forests can grow in different kinds of landscape: hills and gullies, steppe holes, river flood plains. There is almost no limit to soil component. Black soils, clay, loamy soils, sandy loamy soils, brown, red and swamped soils are suitable for forests growth.

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