

Preservation of the natural diversity of the steppe zone of the south-east of the European part of Russia

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Abstract. The article deals with conditions and formation stages of steppe specially protected natural territories in the south-east of the European part of Russia and Volgograd region. To achieve the goal, the author used methods of field complex landscape-ecological studies, analysis of cartographic, literature and fund materials. Volgograd region is situated in the middle of the south-east of the Russian Plain. It is established that the region is characterized by high diversity of landscapes and ecosystems which belong to three natural zones (forest-steppe, steppe and desert steppes) and nine landscape provinces. This area can become a key territory for building an interregional nature conservation framework with major nuclei of etalon ecosystems and landscapes. The author suggests the following ideas to improve the network of specially protected natural territories in the south-east of the Russian Plain. First of all, it is advisable to establish a number of state nature reserves and national parks of cluster type representing the landscape range of the steppe zone in the south-east of the European part of Russia. Secondly, the idea of initiating new forms of innovative protected territories looks quite promising.

1 Introduction

At the end of the 19th century a geoeological crisis stroke in many regions in the steppe zone of the European part of Russia. It was accompanied by rapid disappearance of virgin lands. As a result, this crisis initiated the development of nature conservation movement and launching of specially protected natural territories (SPNTs). By the 1880-1890s herb-bunchgrass chernozem steppes in the south-east of the Russian Plain remained untouched only on the territories of the Don Cossack Host, on the territories of state and private stud farms and also in reserve landed property of large landowners. Bunchgrass steppes on chestnut soils and dark chestnut soils used as pastures and hayfields were ploughed up in the region under question later, in the middle of the 1930s and 1950s, during the periods when virgin lands in dry steppes were being broken [1].

The starting point for the complex study of steppe landscapes and for scientific research works dedicated to their preservation, restoration and effective nature management might be referred to the 1890s when the fundamental book by V.V. Dokuchaev “Our steppes, past and

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present” (1982) was published being the result of his long term expedition research. The book contained a comprehensive set of characteristics of peculiar geographical components of steppe landscapes, their origin and current condition, also reasons for droughts and agricultural crisis were described, a very detailed program was suggested to optimize steppe management and to preserve steppes for scientific purposes.

2 Materials and results

A significant contribution for organizing first SPNTs was made by the “Special expedition to test and register different means and techniques of managing forestry and water industry in steppes of Russia” (1892-1898) lead by V.V. Dokuchaev. Model steppe cluster SPNTs were organized on small patches of mowing and non-mowing deposits at the famous scientific establishment “Stone Steppe” founded by V.V. Dokuchaev in the southern subzone of forest steppe in Voronezh region. During that period of nature conservation ideas, many Russian scientists – followers of V.V. Dokuchaev and like-minded people (A.N. Krasnov, A.A. Izmailsky, I.P. Borodin, V.I. Taliyev, G.N. Vysotsky, G.I. Tanfiliyev, D.K. Solovyev and others) wrote about the necessity to preserve natural steppe landscapes. Exactly the “steppe issue” gave birth to the idea of nature reserves, i.e. models of nature, to the idea of their usage for scientific and practical purposes. The reasoning of the model meaning of nature reserves in steppe zone of Russia was presented for the first time in the works by V.V. Dokuchaev (“The Russian Chernozem” and others) who thought that the objective learning of steppes and patterns of their development was only possible on patches excluded from agricultural usage. The ideas expressed by the scientists formed the basis for initiating domestic reserve movement.

G.A. Kozhevnikov (1909), D.N. Anuchin (1914), I.P. Borodin (1914), V.I. Taliyev (1914), A.P. Semyenov-Tyan-Shansky (1912; 1919), V.P. Semyenov-Tyan-Shansky (1917, publ. 2012) and others [1] followed V.V. Dokuchaev’s suit regarding the reserve ideas. In addition, I.P. Borodin, V.I. Taliyev and V.P. Semyenov-Tyan-Shansky gave a special focus on immediate solutions for issues of creating steppe reserves [2].

The second half of the 19th and beginning of the 20th centuries can be considered as the initial phase of creating steppe SPNTs in Russia when first private reserves appeared. At the beginning of the 20th century there were several private steppe reserves in Russia. Those were steppe plots in the estate of A.N. Karamzin in Buguruslansky uyezd of Samara province, on the lands of Countess S.V. Panina in Valuysky uyezd of Voronezh province, the private steppe reserve owned by F.E. Falz-Fein “Askania-Nova” and some others. Members of the Constant Nature Protection Commission of the Imperial Russian Geographic Society, namely I.P. Borodin, V.A. Dubyansky and others, contributed in the development of these reserves.

The system of state reserves as models of natural ecosystems had been formed during the whole 20th century in the USSR and Russia. The state reserves movement gathered strength at the beginning of the 20th century in Russia thanks to the activities of scientific societies (the Imperial Russian Geographic Society and others) which set goals not only to study but also to protect nature. In 1912 I.P. Borodin initiated the establishment of the Constant Nature Protection Commission of the Imperial Russian Geographic Society. In 1912 the Council of the Imperial Russian Geographic Society approved the statute of the Constant Nature Protection Commission (A.S. Ermolaev, Minister of Agriculture, was appointed as a chairman, I.P. Borodin was his deputy). They were joined by prominent scientists, such as A.P. Semyenov-Tyan-Shansky, V.P. Semyenov-Tyan-Shansky, A.I. Voyeykov, Y.M. Shokalsky, G.F. Morozov, V.N. Sukachyev, N.V. Nasonov. The major objective of the Commission was to preserve inviolability of certain plots or separate territories in need of protection and special examination [2, 3].

Before 1918 there were several types of nature conservation objects on the territory: forest shelter belts on sands and watersheds in the river basins of the Don River; Kamyshinsky dendrological nursery garden; the Don Host's sandy forestries: Orekhovskoe (on the Medveditsa River), Archedino-Rakhinskoe, Alexandrovsko-Dubovskoe (Shakinskoe), Golubinskoe; several private SPNTs: Shemyakinskaya forest dacha, Tingutinskaya forest dacha and others. In the 19th and at the beginning of the 20th centuries the term "dacha" was used in the meaning of "a reserve" or "a protected natural territory" when natural complexes were to describe.

Before 1918 there were several types of nature conservation objects on the territory under scrutiny: forest shelter belts on sands and watersheds in the river basins of the Don River; Kamyshinsky dendrological nursery garden; the Don Host's sandy forestries: Orekhovskoe (on the Medveditsa River), Archedino-Rakhinskoe, Alexandrovsko-Dubovskoe (Shakinskoe), Golubinskoe; several private SPNTs: Shemyakinskaya forest dacha, Tingutinskaya forest dacha and others. In the 19th and at the beginning of the 20th centuries the term "dacha" was used in the meaning of "a reserve" or "a protected natural territory" when natural complexes were to describe. In order to create an SPNT, complex studies of landscapes (geosystems) and of their components had to be undertaken. At the initial phase (pre-revolution period) of creating territorial forms of nature diversity conservation, first profound scientific researches of landscapes in the steppe south-east of the Russian Plain were held at the end of the 19th and beginning of the 20th centuries. Though the routes of Dokuchaev's expeditions were far beyond the analyzed region, examination of its territory also took on a complex physical – geographical character [4]. During the pre-revolutionary period on the territory of modern Volgograd region, complex geographic explorations were held by famous Russian scientists, most of which had gained their experience at V.V. Dokuchaev's expeditions and later continued developing his ideas: I.V. Mushketov, A.N. Krasnov, N.A. Dimo and B.A. Keller, V.N. Sukachev, V.A. Dubyansky, I.V. Novopokrovsky, A.A. Gozhev (1929) and A.G. Gael, B.B. Polynov, I.V. Larin [1, 4].

At the same time a number of works devoted to steppe and forest vegetation of the south of European Russia were published. In 1903 and 1913 G.N. Vysotsky carried out landscape investigations in the north of the Ergeny Upland and offered first geobotanical descriptions of natural vegetation (including forest isolated districts in the Upper Tinguta River) and of artificial afforestation accompanied by physical-geographic characteristics. In his book "Ergenya" (1915) and other books he scrutinized possible links between vegetation and climate factors on the example of vegetable societies in southern Russian steppes [9]. At the same time D.I. Litvinov (1890) and V.I. Taliyev (1906) came up with descriptions of endemic flora of chalk exposures along the Volga River (Balykleysky-Ilovinsky region) and the Don River and its tributaries, of relic ecosystems of sphagnum bogs with boreal types of plants and depressions in between hillocks of the Archedino-Donskie sands; the mentioned works also pointed out at the necessity to preserve these unique societies [4].

Practical works aimed at protection and restoration of soil-vegetable cover (struggle with soil erosion, especially of sandy and sandy-loam soils) on the territory of modern Volgograd region began in 1880. Archedinskiye pine forests had been the oldest nature protection objects of Volgograd region as monuments of protective afforestation (till 2009) [4].

Among anti-drought measures in the south of the Russian Plain V.V. Dokuchaev singled out the creating of steppe forest belts in interfluves. In the discussed area, on the territory of Saratov province, such forest belts were installed in 1890 along watershed of the Medveditsa River, Tersa River and Schelkan River (Elansky and Zhirnovsky administrative areas of Volgograd region). These activities were directed by an udel department under the guidance of a Russian forestry specialist N.G. Genko. Kozlovskaya watershed belt was created, also Tersinskaya and Tarapatinskaya forest belts were made which have been preserved until present and are natural monuments. Together with natural forests these plantations create an

integrated anti-erosion network. To protect Kamyshin-city from sanding up, in 1903 an official wood nursery was established (which had been a botanical natural monument in Volgograd region until 2009) which provided Astrakhan and Saratov provinces with planting stock. In 1913 this wood nursery was expanded due to dendrologic plantations on the spot of a dry land Sukhodol and contained 43 species of tree and shrubs [4].

Throughout the 20th century repeated attempts were made to create a steppe reserve in the Don basin on the territory of Rostov region. The idea of this steppe reserve in the Don basin appeared at the beginning of the 20th century and was suggested by K.M. Zalesky and I.V. Novopokrovsky (1919–1928) [1]. At that time six models were introduced representing typical rich motleygrass-stipa, motleygrass-fescue-stipa, sandy, petrophytous chalky and shrubby steppes on upland, slope and gully areas in Donetskoy okrug of Donskoy krai. But the suggestions of I.V. Novopokrovsky were never put into practice. In the 1970-1980s a new project of creating a Donskoy steppe state natural park was introduced by G.M. Zozulin and was partly realized in launching wildlife preserves and natural monuments in Rostov region [5]. The efforts of Rostov naturalists lead to creation of a state natural park “Rostovsky” in 1995. However, the park was created on a different spot, on four separate patches extended along the northern edge of the Kumo-Manychskaya depression. All the four areas of the reserve “Rostovsky” which has obtained a status of a biosphere reserve, are situated in the valley of the West Manych River, in the subzone of bunchgrass steppe, to a large degree desertified and halophilous. Right in the same area, in the Manych region, the association “The living nature of steppe” is actively involved in nature protection activities [6].

It is remarkable to note that nowadays, right 100 years later after initiatives of K.M. Zalesky and I.V. Novopokrovsky, Rostov botanists again bring up a question about running their project [8]. A group of botanists of the Southern Federal University guided by O.N. Dyemin has carried out very productive work on forming a network of steppe SPNTs in Rostov region. Perspectives of developing steppe reservations of various statuses in the zone of Russian-Ukrainian border area, in the north and east of the region are under consideration in order to enable a network of SPNTs to represent diverse steppe landscapes and biotas of Rostov region. As the reserve “Rostovsky” is unable to serve as a sufficient representative reserve area for the region, O.N. Dyemin has put forward suggestions of a Donskoy steppe reserve. It is necessary to mention that Rostov region, unlike other parts of European Russia, has offered a set of elaborated scientific-theoretical and practical approaches to establish a full-fledged steppe reserve of the cluster type, first in the country [2, 7].

At present, the reserve “Rostovsky” proves to be the only federal SPNT in the steppe area of the south-east in the Russian Plain.

One can observe a rather complicated and sophisticated history of creating a network of SPNTs on the example of the Volgograd Region in the discussed area during the 20th and 21st centuries. Volgograd region occupies the median part of the south-east of the Eastern European (Russian) Plain and is characterized by a remarkable variety of landscapes belonging to three physical-geographic zones (forest-steppe, steppe and desert), nine physical-geographic provinces: 1) East European upland, 2) Oksko-Donskaya flatland, 3) Privolzhskaya upland, 4) Eastern Donskaya upland, 5) Dono-Donetskaya flatland, 6) Salsko-Donskaya flatland, 7) Syrtovaya flatland-upland, 8) Ergeninskaya upland, 9) Caspian lowland [9]. Thanks to the geographical position, diversity of landscapes, considerably lesser population density, lesser degree of economical usage and changes, in contrast with neighbouring regions of the European part of Russia (Rostov region, Voronezh region and others), Volgograd region shows enormous potential for forming a representative network of SPNTs with huge nuclei of model ecosystems and landscapes. Considering that all steppe types are presented on its territory ranging from meadows and rich motleygrass-stipa and to desertified wormwood-bunchgrass steppes, the region can become a key territory for forming an interregional nature conservation framework, a promising area for creating a network of

SPNTs thus allowing to demonstrate the whole steppe landscape range in the south-east of the European part of Russia [4].

The timeline of forming a network of SPNTs can be divided into four periods: initial, Soviet (the 1920-1980s), post-Soviet (the 1990-2000s) and modern (since 2009).

During the second Soviet period (the 1920-1980s) a supporting framework of natural monuments in the Volgograd region was established. The oldest SPNT was Shemyakinskaya forest dacha. In 1926 this massive area of natural upland broad-leaved forests in Uryupinsk region was declared a state reserve, however, in a couple of years later it was abolished. In 1979 it obtained a status of a botanical reserve of regional significance; since 2009 it has been deprived of a protected status. Nevertheless, the uniqueness of this natural complex substantiates the need for creating an SPNT of a higher status, with a stricter protection regime, updated to a cluster reserve. In the 1950-1960s works by A.F. Kireev had a huge impact on developing a network of natural monuments. For the first time, he described Chapurnikovskaya Gully and Grigorova Gully, Olkhovskie giant oaks, patches of Don sandy areas, forests of Khopyer area and other objects in demand for protection, also he prepared scientific grounding for forming an SPNT. In the 1970s scientists were paying more attention to ecological issues in Volgograd and Volgograd region. Recently more specialists (geographers, biologists and others) and nature lovers have been showing genuine interest to unique natural objects and complexes, their condition and protection. Originally a search for natural monuments had a spontaneous character to a degree, mainly local enthusiasts of the National Society of Nature Protection and staff members of the Volgograd pedagogical institute, later of the Volgograd pedagogical state university, of the Volgograd agricultural institute and the Russian scientific-research agroforestmelioration institute, were involved [1].

Between the 1970s and 1980s a department of protected natural territories of the National Society of Nature Protection led by V.A. Brylyev and Volgograd regional council of this organization made a decision to prepare the reasoning for distinguishing separate natural complexes in Volgograd region as landscape reserves. By the beginning of the 1980s, on the basis of these research materials and under the guidance of V.A. Brylyev, a list of SPNTs was drawn up which included more than 70 objects. In this list there were two types of natural territories: natural monuments and reserves which had their subtypes of geological, water, botanical and hunting reserves [1, 9].

During the 1980s a network of SPNTs was created in Volgograd region. In the 1985-1986s the regional executive committee approved a list of 73 SPNTs which could be categorized as following: state natural monuments: 9 geological-geomorphological (mountains The Ears, Alexandrovsky Graben and others), 19 water territories (Ergeny mineral spring, Lake Ilmen, spring Uvarovsky and others), 32 botanical ones (Saltovsky forest, the isolated district "Gryadina", the forest of Grigorova Gully, the reserve "Tulip" and others), balneological: therapeutic mud-baths of Lake Elton; astronomical; state biological, paleontological, hydrologic, geological and landscape reserves (Golubinsky sandy area, Scherbakovskaya Gully, Shemyakinskaya forest dacha, Shakin forest, Guselsko-Teterevyatsky ridge and Eltonsky desert reserve); dendrological parks. There is a special group of 27 state and republican hunting reserves and habitats of rare animal species [8, 9].

In 1995 after the Federal Law of SPNTs was passed, the work aimed at creating national parks was legitimated. During this period alongside with field research methods, more cutting edge technologies, such as deciphering of satellite shots and GIS, have been applied to track unique and zonal natural complexes which might look promising for setting up an SPNT. Despite all the economical and reserve of regional significance; since 2009 it has been deprived of a protected status. Nevertheless, the uniqueness of this natural complex substantiates the need for creating an SPNT of a higher status, with a stricter protection regime, updated to a cluster reserve. In the 1950-1960s works by A.F. Kireev had a huge

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into natural parks. During the subsequent years the author actively participated in documentation preparation necessary to launch regional natural parks, for example, Volgo-Akhtubinskaya bottomland (2000), Donskoy (2001), Tsymlyansky (2002), Nizhne-Khopyersky (2002), Ust'-Medveditsky (2004) and some others. The results of this long-term work were published in the collective monograph "Specially protected natural territories of Volgograd region" [10].

Before 2008 the network of SPNTs included more than 180 objects and had the following structure: natural parks, reserves, natural monuments, dendrological parks and botanical gardens, health-improving areas and resorts [9,10]. The core nuclei of the nature preservation framework in Volgograd region are regional natural parks: Volgo-Akhtubinsky (2000), Eltonsky (2000), Donskoy (2001), Scherbakovsky (2002), Nizhne-Khopyersky (2002), Tsymlyansky (2002), Ust'-Medveditsky (2004). However, model steppe zonal landscapes are being preserved chiefly in Donskoy and Scherbakovsky parks and partly on the territory of Nizhne-Khopyersky natural park which basically comprises the valley of the Khopyer River and the south-eastern edge of Kalachskaya Upland including upland-ravine forest area of Shakinskaya oak-grove. These parks are supported by more than 30 state reserves: complex (landscape), biological (botanical and zoological), paleontological, geological, hydrological; 57 natural monuments: 11 geological-geomorphological, 17 water objects, 1 astronomical (the spot where the meteorite "Tsaryev" fell), 28 botanical; dendrogarden of the Russian scientific-research agroforestmelioration institute, dendrogarden of the Volgo-Donskoy shipping canal, dendrogarden of the Kamyshin base station of the Russian scientific-research agroforestmelioration institute, 3 sanatoria and health resorts – "Elton", "Dubovka", "Kachalinsky". In 2012 the territories of these 7 natural parks in Volgograd region were included into the list of most promising areas of the Paneuropean ecological network Emerald, into the so-called "Emerald Book" [11].

After federal and regional laws about administrative territorial organization were changed and municipal formations appeared, most of SPNTs in Volgograd region have disappeared.

At present, there are no federal SPNTs (reserves and national parks) in Volgograd region. Among SPNTs there are only 40 objects: 7 regional natural parks; 8 state natural reserves; 15 natural monuments: 1 geological – Alexandrovsky Graben, 1 paleontological – Polunino, 13 botanical; 1 health-improving area – the source of mineral water "Gornaya Polyana", also 8 so-called "territories which have immense value for preserving animal and plant world recorded in the Red Book of Volgograd region", earlier they were botanical reserves and natural monuments; 1 protected landscape – Sviridovskie lakes (in the valley bottom of the Chir River). The foundation of the latter SPNTs, which status is unclear and disagrees with the Federal Law about SPNTs, was carried out in the 2009-2010s.

The author proposes to consider the following two directions of improving the network of SPNTs (the nature preservation framework) in the south-east of the Russian Plain: 1) setting up a number of federal reserves and national parks of cluster type to represent the wide range of regional landscape (including transforming regional SPNTs); 2) introducing new forms of innovative SPNTs, also including private ones (historical-cultural landscape reservations, pastoral (pasture) reserves, steppe parks or safari parks, after the prototype of the first private steppe reserve and zoo "Chapli" ("Askania-Nova") created by F.E. Falz-Fein in 1898, geological parks and etc.) which looks most promising [8]. For instance, there is a suggestion to establish a cluster geological park on the borderline between Dubosky and Kamyshinsky provinces of Volgograd region (the south-east of Privolzhskaya Uplands) where systems of tectonic ruptural distortions, very rare for the Russian Plain, can be found, also there are a great number of paleontological natural monuments and classic geological exposures [12]; and the steppe natural Golubinsko-Donskoy safari park in the Lesser Meander of the Don River [13].

During recent years the author has outlined some territories which might be used to create new SPNTs including steppe reserves of cluster type and which are situated close to the northern and north-western borders of Volgograd region and on the high right banks of the Khopyer River and Don River. To do so, their landscape and biological diversity, degree of alteration and phases of self-restoration (archeological objects, belligerative landscape elements and others) should be, first and foremost, taken into consideration. The results of the researches show that along the administrative borders, especially the old ones and existing for many centuries (for example, between Volgograd region and Voronezh region, in the past Voronezh province and the area of the Don Cossack Host) a striking sign of increased modern natural variety and of a better preservation of geosystems can be clearly observed. The frontier territories are less subjected to anthropogenic influence and often act as landscape refugia. The similar effect can be traced on the territory of the Lesser Meander where bridges across the Don River are absent, transport network is undeveloped and population density is insignificant. The picked out areas are characterized by higher biological diversity, higher preservation and representation of geosystems, nowadays they are utilized as seasonal pastures, these facts allow to consider them as model steppe geosystems [7, 8]. At present, scientific researches of two promising areas for initiating interregional SPNTs in the subzone of motleygrass-fescue-stipa steppes are being undertaken. There is an idea to set up the Uryupinsky natural park in the north-west of the region and on the borderline with Voronezh region, which is planned to be situated to the west of the Khopyer River on Kalachskaya Upland, which is the part of East European landscape province. Two clusters can be distinguished: southern “Nekhaevsky“ and northern “Shemyakinsky”. Also the natural park “Guselsko-Teterevyatsky ridge” is planned to be built on the promising territory in the north on the borderline with Saratov region.

3 Conclusion

The long-term investigations resulted in the fact that the most promising territory to organize a subregional nature conservation framework including various forms and types of SPNTs, proves to be the Lesser Meander of the Don River, which can be singled out as a key landscape territory [1, 8]. It is located in the middle of Volgograd region, while going round the north-eastern part of the Eastern Donskaya Ridge, the Don River forms a meander enveloping its high right banks from Stanitsa Sirotinskaya to the valley of the Bolshaya Golubaya River. Its north-eastern part has been the part of the Donskoy natural park since 2001. This area is characterized by a rich landscape variety representing natural diversity of the Eastern Donskaya Upland province and the subzone of fescue-stipa steppes of the east-south of the Russian Plain; it shows a considerable importance for identifying and preserving model zonal, peculiar, rare and endangered geosystems at the level of landscapes, isolated districts and their combinations. On the territory of the Lesser Meander of the Don River, there are a number of archeological monuments and historical-cultural landscapes and local objects which have historical-cultural, scientific-educational value: Zadono-Avilovskaya paleolithic site, several mound complexes, destroyed settlements of the Bronze Age, fire sanctuary dated back to the year of 1800-1700 B.C. and other objects. One of the prominent features is a wealth of belligerative landscape elements with anti-tank ditches, shell holes, trenches, entrenchments and other anthropogenic microforms of relief, that had witnessed fierce battles during the Great Patriotic War and have been well preserved on the territory of chalky landscapes [8, 13].

As the experience suggests, regional SPNTs prove not to be the most efficient form of nature diversity conservation. One of the approaches to increase the representation of the SPNT network in the steppe zone of the south-east of the Russian Plain might be a

transformation of some regional natural parks of Volgograd region, in the first place, of their reserve nuclei, into clusters of the Mid-Donskoy state steppe reserve.

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