South Russia Steppe Forests: Features and Problems

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Abstract – **Extrazonal steppe forests are studied. In this paper we consider Rostov region which is a typical steppe area, where the majority of forests are man-made. We aim to analyze the present state of steppe forest landscapes and to discuss some related geo-environmental problems. Damage caused by fires, pests, diseases and unbalanced forestry is estimated for forest ecosystems of South Russia.**

Keywords – extrazonal landscapes; steppe forests; forest fires; grassland fires; man-made forests.

I. INTRODUCTION

Steppe summergreen forests are extrazonal, this landscape forms ecological framework of the territory. According to botanical and geographical zoning, studied area belongs to the Eurasian steppe region, the Black Sea province, and the Azov-Black Sea subprovince [1, 2]. The main part of Russian steppe forests is man-made. These landscapes perform a lot of ecological functions: gas-forming, climate, wind protection, conservation, agricultural and so on. The ecological troubles of these landscapes are caused by non-comfortable environmental conditions and by high density of the population of the region. In this paper we give a survey of the contemporary state of steppe forest and describe some reasons of existing troubles.

This article includes six sections and three figures.

In Section II, the main purpose of the research is mentioned and the methods we used have been referred. Conditions, typical for the steppe area of Southern Russia, are described in Section III. In Section IV, we provide a zoning of forests of the area and study their current characteristics. In Section V, the main result of the paper is provided; statistical observation for fire risks according areas of the region is given. Conclusion is provided in Section VI.

II. PURPOSE AND METHODS

The purpose of this investigation is to analyze the current status and major geo-environmental problems of an important component of zonal steppe landscapes – the forest. Forest zones play an exclusive role in ecological balance of Southern Russia because these lands are sparsely wooded and significantly populated. The density of population in Rostov region is 42.2 pers. / Sq km while the average one for Russian Federation is 8.4 pers. per Sq km only. An original forestry zoning including geographic structure of Southern Russia forest fires has already been made by author [4]. In this paper, we refresh and precise this zoning using modern data.

Several expeditions have been performed in 2001-2011 in order to study state of woodlands. The data obtained by region monitoring during 1960-2011 have been summarized. Field, statistical and cartographic methods have been actively used.

III. PRINCIPAL PARAMETERS OF STEPPE FORESTS

Rostov region is a steppe area. It has a plane platform geological structure with a developed river valley systems and three zonal landscapes types: true (bunchgrass) steppe, dry steppe and desert type steppe (Figure 1).

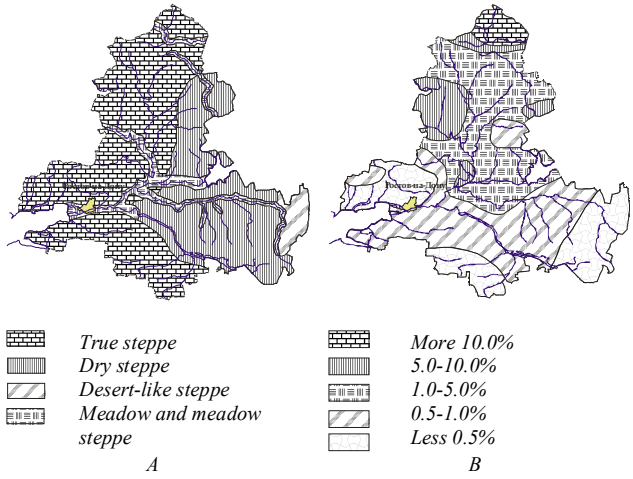

Figure 1. Natural landscape types of Rostov Region (A) and forest coverage of this region (B).

Meadows and meadow steep are intrazonal landscapes. The principal factor that limits the forest vegetation growth is environmental humidity.

Steppe landscapes are characterized by arid hot summers (+22/24°C), moderately cold winters (-5/-9°C), and some negative forest-grown factors: low relative humidity, large temperature amplitude fluctuations, agricultural drought, extremely high summer temperatures and strong dry eastern winds. Mean annual precipitation is about 530-550 mm in the southwest and 320-360 mm – in the southeast of this

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territory [3]. Maximum precipitation occurrence is recorded in the warm season – the growing season.

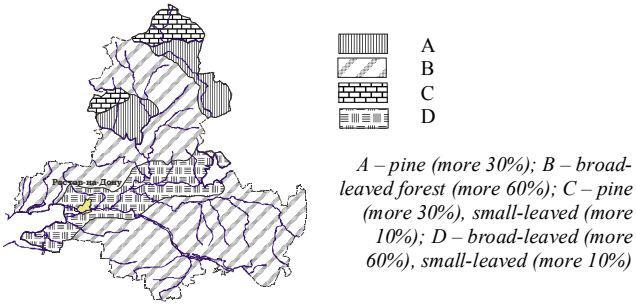
Bunchgrass steppe (with normal forest coverage about 3.0%) is characterized by a medium humidity coefficient (more than 4.1), dry steppe (1.7%) has a reduced index (3.5–4.0) and desert type steppe has a low index (less than 3.4).

IV. INVESTIGATIONS

The majority of boreal steppe forests are man-made. There are contrasting woods with different conditions. The main part of this framework is floodplain forest. A big part of Lower Don forests is inundated, sometimes naturally and sometimes artificially. These landscapes are poorly preserved. There are 425 species of plants, including 225 species of forest flora [4]. Typically, these landscapes have a high biological age, a stratiness loss. Their ecological functions, the stability have been reduced, the vegetation has adversely changed. Some environmental factors contribute to the spread of forest and grassland fires. The conditions of these forests have been violated after Tsimlyansky reservoir on the river Don was constructed.

Ravine forests represent another woodland type of this region. The area is richer in species. There are 592 species of plants, including 292 species of forest flora [2]. The main tree species are *Quércus róbur* (32%), *Pínus sylvéstris* (31% of the forest area), *poplars* (9%), *Robínia pseudoacácia* and others (Figure 2).

Also, sandy, so-called «arennye» forests are there. Reforestation works yield to appearance of man-made pine forests. Some aspen and the birch wood lots are remained fragments of natural forests.



A – pine (more 30%); B – broad-leaved forest (more 60%); C – pine (more 30%), small-leaved (more 10%); D – broad-leaved (more 60%), small-leaved (more 10%)

Figure 2. Main tree species of Rostov forests.

All forests perform a protective function. According to Russian classification 52.1% of them are steppe and desert type forests; 18.2% are anti-erosion and gully-stabilization; 6.7% are bank-protection forests, 1.6% are «green areas»; 2.7% are «urban forests» and so on.

The following problems are crucial for considered landscapes: senescence of trees, appearance of dead wood areas, reduction of ecological performance, and, of course, forest fires. The steppe woodland has the highest fire danger class in Southern Russia (2.2). Forests of the first and the second forest class of fire danger cover 58% of regional forest area [5, 6]. Moreover, line field-protection forests are mono-breed (*Pínus sylvéstris)* woodlands mostly planted in 1950-1960.

Unfortunately, the juridical status of these forests is not specified and, actually, nobody is responsible for their protection. The disastrous grassland fires are typical for this area (Figure 3).

V. MAIN RESULTS

As a result of field and statistical observations, 7 levels of fire danger have been specified. There are areas of 2nd, 5th a 6th level inside the Rostov agglomeration. A medium and sometimes even relatively high ecological potential of the landscapes (12.0-16.0 or more [7, 8]) is proper for this area while the forest coverage is reduced there (1.5-2.5%). Mainly, the oak forests are represented. Large and medium forest fires are not typical for this region [9].

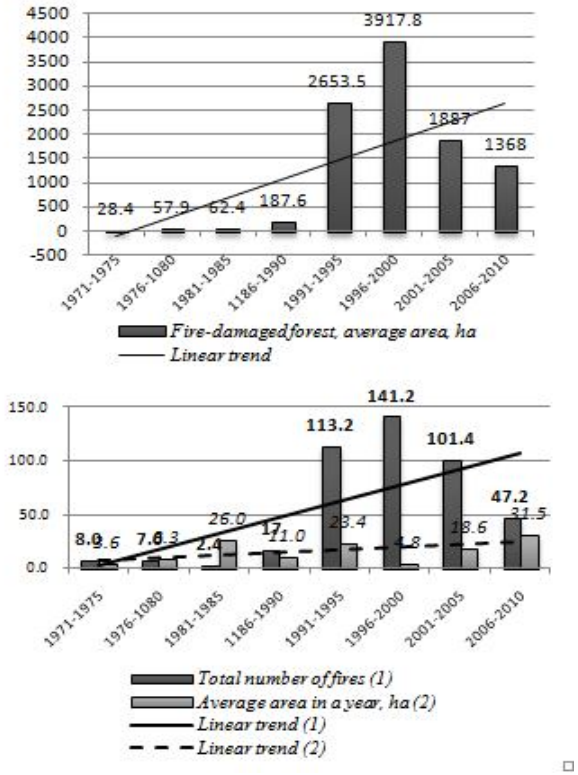


Figure 3. Dynamics of wood burning indicators of Rostov forests during the period from1971 to 2010.

Many forest fires occur near populated areas in field-protection forests. Both the forest coverage and the number of forest fires increase during last 30 years (Figure 2). However, nowadays forest fires in near-Rostov area are localized. Unfortunately, the artificial grassland fire is the principal reason of disasters. The proportion of crown fires is quite high (50% in 2007, about 30 in 2008, 75% in 2010). This is very destructive for the steppe forests, as natural

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forest regeneration is almost impossible. The years 2003, 2004, 2007-2011 correspond to peak values of fires. Mostly, there were simple natural reasons for this. Hot, dry and windy weather contributed intensive spread of the fire. The situation is deteriorates by high density of the recreational facilities, farms and roads.

We expect to continue the expedition activity in order to find out trends of forest development, describe areas affected by fire and related damages. The findings of this paper and ones of the following researches may be used for future forest recovery works in damaged areas.

VI. CONCLUSION

Frequent natural cataclysms of recent years and unbalanced forestry caused additional load on steppe forests. They started losing natural layering. The total area of inundated, infected and burnt forests increased. Meanwhile, the natural recovering is almost impossible for such type of forests. This may lead to loss of this unique landscape.

We expect to continue the expedition activity in order to find out trends of forest development, describe areas affected by fire and related damages.

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