

CURRENT STATE OF VEGETATION IN THE CARBON POLYGON “WAY CARBON” (CHECHEN REPUBLIC)

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Abstract. As part of the monitoring, route studies were conducted at the WayCarbon carbon site (Chechen Republic) in two areas (the operator – M.D. Millionshchikov Grozny State Oil Technical University) in July 2024. Area 1 is located in the Green Zone of Grozny City (nature reserve name) and its surroundings, and Area 2 (Carbon Farm) is located in the reclaimed urban landfill, which is now an experimental area. Complete geobotanical descriptions were compiled for the test sites in the forest and meadow communities. Groups of plant associations and their current state have been identified. The results are important for monitoring the dynamics of the state of the plant cover in the implementation of programs of the carbon polygon for monitoring and control of the balance within natural ecosystems.

Key Words: Carbon farm, Chechen Republic, vegetation, ecosystem

Introduction

The Way Carbon carbon farm, as one of the links in the Russian carbon farm network, is a land area with representative biogeocenosis components, such as topography, vegetation, and soil cover. It is designed to develop and test technologies for controlling the balance of climate-active gases and other parameters relevant to climate change within natural ecosystems.

The Way Carbon experimental sites are used for annual monitoring of vegetation and soil cover, CO₂ gas exchange, photosynthesis parameters of woody plants, and more [2, 3, 8]. An important task is to monitor the state of ecosystems in each of the carbon plot areas, primarily the dynamics of vegetation as an indicator of ecosystem health.

Study area, material and methods

In 2024, studies of vegetation cover were conducted in two areas of the carbon polygon. Route studies sites took place in early July 2024 during a period of stable temperatures from +17 to +20 (at night) and from +31 to +35 (during the day) degrees (Celsius).

Complete geobotanical descriptions of test sites in forest and meadow communities and route notes in the form of short descriptions of biotopes and notes were compiled. The coordinates of the test geobotanical sites (points of vegetation description) are presented in Tables 1 and 2.

The surveyed Area 1 is located on the territory of the natural reserve – The Green Zone of the Grozny City (Sheikh-Mansurovsky District, Grozny). The area is located on the right bank of the valley complex of the Sunzha River. The relief is quite flat and poorly dissected, with slopes of 3-5 degrees and heights of 100-200 m (above sea level). The terrace complexes of the Sunzha River are composed of Upper Quaternary deposits of loams, sands, and clays. The soils on the site are brown forest soils under forest vegetation, leached chernozems in areas with reduced lowland forests, and alluvial soils of the meadow-chernozem type in the floodplains of the Sunzha River tributaries [4, 7] (Table 1).

Table 1. GPS coordinates of vegetation descriptions (Area 1)

Point №	1	2	3	4	5	6	7
N	43,25719	43,25867	43,25475	43,2514	43,24497	43,23769	43,237
E	45,63865	45,63925	45,64096	45,63955	45,63662	45,63501	45,62355

The study Area 2 (Table 2), with an area of 24 ha, was previously a heavily disturbed area under an urban unauthorized landfill, and was given for reclamation. It is located in the northeastern part of Grozny, in the Alkhanchurt valley, in the interfluvium of the Sunzha River and its left tributary, the Neftyanika River. The area has a slight elevation difference (within 10 m) and a flat terrain, and is composed of loess-like loam. It belongs genetically to the group of dry steppe landscapes, at the moment it is cultivated – here the drip irrigation system is organized and experimental plantings of woody plants with different ecological properties (linden, poplar, ash, willow, etc.) are made, their growth and vital condition are observed. Also on the site there are laid the paths from the fill soil and installed the sensors for soil and meteorological measurements, where regular observations are made within the Way Carbon program.

Table 2. GPS coordinates of vegetation descriptions (Area 2)

Point №	1	2	3	4	5
N	43,35926	43,35895	43,35924	43,35767	43,35652
E	45,74379	45,74323	45,74146	45,74135	45,74021

The descriptions were made according to the generally accepted methodology of field studies of flora and vegetation [1, 6]. Several groups of plant associations were identified.

Results

The area of plot 1 is dominated by broad-leaved valley forests. During the period of their development, these forests were affected by economic activities such as logging, grazing, haymaking, and construction. In areas where forests have been cleared, agriculture and horticulture are also practiced. These landscapes are characterized by the process of steppe formation.

In the area, as well as in other lowland and flat forests of the river valleys in the Central and Western Caucasus, the main tree species is the oak (*Quercus robur*), which grows in various combinations with ash (*Fraxinus excelsior*), maple (*Acer platanoides*, *A. campestre*), gray and black alder, and wild pear (*Pyrus caucasica*). Dogwood (*Cornus mas*, *C. sanguinea* subsp. *australis*), hazel (*Corylus avellana*), elder (*Sambucus nigra*, *S. racemosa*) and viburnum (*Viburnum opulus*) are the most common in the shrub layer. Ivy (*Hedera* sp.), grape-leaved clematis and grapes (*Vitis vinifera* subsp. *sylvestris*) represent extra-tiered vegetation (Table 3).

Table 3. Forest vegetation in the Area 1

Point №	Tree stand formula (tier A)	Crown closeness score	Average height (m) (tier A)	Tree trunks, average diameter (cm)	Projective coverage and average height (tier B)	Average height (cm) (tier C)	Projective coverage (%) (tier C)
1	5Q.r.4Al.n.1Pr.c. +Ac.p, Ac.c (<i>Quercus robur</i> - <i>Alnus nigra</i> - <i>Pyrus caucasica</i> - <i>Acer platanoides</i> - <i>A. campestre</i>)	0.9	25-28 (max 32)	40-50	35%, 3 m (<i>Corylus avellana</i> , <i>Cra- taegus</i> spp.)	10-20	15-20%

2	8R.ps.2F.ex.+Ac.c. (<i>Robinia pseudo-acacia-Fraxinus excelsior-Acer campestre</i>)	0.7	10-12 (max 15)	20-30	25%, 2-5 m (<i>Sambucus nigra</i> , <i>S. racemosa</i> , <i>Cornus mas</i>)	60 (150)	80%
3	5Ac.p.5Q.r.+Sb.t. (<i>Acer platanoides-Quercus robur-Sorbus torminalis</i>)	0.9	25-30	35-40	30%, 2-3 m (<i>Sambucus nigra</i> , <i>Swida australis</i> , <i>Corylus avellana</i>)	25	20%
4	4C3F.ex.3Ac.p.+P.al. <i>Carpinus caucasic-Fraxinus excelsior-Acer platanoides-Populus alba</i>)	0.9	30	40 (60)	20-25%, (<i>Corylus avellana</i> , <i>Sambucus nigra</i>)	25-30	35-40%
5	8F.ex.1Sb.t.1Q.r. <i>Fraxinus excelsior-Sorbus torminalis-Quercus robur</i>)	0.7	16-18 (max 22)	25-35	15-20%, 2-4 m (<i>Sambucus nigra</i> , <i>S. racemosa</i> , <i>Cornus mas</i> , <i>Crataegus</i> spp.)	100-150	90%
6	5F.ex.3C1Ac.p.1A c.c. <i>Fraxinus excelsior-Carpinus caucasic-Acer platanoides-Acer campestre</i>)	0.8	25 (max 30)	30	10%, 2-3 m (<i>Corylus avellana</i> , <i>Cornus mas</i>)	10-25	70%
7	9F.ex.2Q.r. (<i>Fraxinus excelsior-Quercus robur</i>)	0.8-0.9	30	25-30 (40)	25%, 3 m (<i>Cornus mas</i> , <i>Corylus avellana</i>)	20	80%

The classification of tiers (A, B, C) is based on plant life forms [5]

Low forest permeability with the greatest amount of fallen trees and dense shrubs is observed in places along watercourses and tributaries of the Sunzha River. Throughout the area, there is a renewal of forests, with young trees consisting of ash, oak, and maple. In some areas, young trees (ash and maple) reach a height of 1.5-3 m with a coverage of 10-15%. The area is relatively clean.

The study area 2 includes sectors occupied by artificial plantations (crops). The vegetation does not have the high diversity typical of steppe communities. It is mainly composed of weeds and grasses, including fodder and wild representatives of grain crops. The grass cover is low in some areas, and the communities are sparse, with bare soil patches and typical ruderal species of overgrown fields. The vertical structure of some areas is characterized by contrast: there are low-growing and ground-covering species (5-10 cm) such as knotweed, rostraria, stork, and the highest species (150-180 cm) such as sweet clover, coltsfoot, and thistle, while the phytomass of the middle layer (*Ambrosia artemisiifolia*, *Cynodon dactylon*, *Linaria vulgaris*) is insignificant.

Conclusion

Area 1 is occupied by forest vegetation of oak-ash and oak poly-dominant forests. The current state of the forest vegetation is normal, the forest is not heavily littered with deadwood, and deadwood is present in some areas. It is necessary to preserve these plant communities as unique ecosystems of the broad-leaved forests of the valley landscapes of the Sunzha River and its tributaries.

The studied Area 2 includes sectors occupied by artificial plantations (cultures). The vegetation does not have the high diversity typical of steppe communities. The main communities are represented by weeds and grasses. In the future, it is proposed to establish a recreational cluster on site 2, similar to an eco-park.

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