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ESTIMATION OF MIRES STABILITY BASED ON TIME-SPATIAL GEOSYSTEMS CLASSIFICATION

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SUMMARY

The article deals with the time-spatial classification of Western Siberia mires based on the two-row concept classification by V. B. Sochava. It allows determining the stability of the wetland landscapes to human impacts. The classification reflects the dynamics of landscapes and includes their native and serial states. Objects of the classifications are the basic natural systems subordinated to larger complexes. The classification is based on a landscape mapping and field data collected on the territory of Tomsk region. Time-spatial landscape classification reveals combinations of spatial components of SE West Siberian natural systems for environmental management and forecast the development of mires.

KEYWORDS: mire, stability, landscape, West Siberia

INTRODUCTION

Mires are unique natural landscapes. They influence the atmospheric gas composition, the water balance of the biosphere, biological diversity of the Earth. Therefore it is important to assess their stability to the human impacts. However, there is no general criterion for this estimation now. This paper considers the time-spatial classification of southeastern West Siberia mires which measured the stability of mire landscapes to adverse human impact on example of Tomsk region (Fig. 1).

Tomsk region is located in the Western Siberia taiga zone. The relief is flat and this contributes to poor drainage. Absolute elevations range from 34 meters to 274 meters. Climate is continental with warm summers and cold winters. The average annual temperature in the region is negative and may vary from 0.6°C in the south up to 3.5°C in the north-east part of region. Vegetation is represented by coniferous, birch and aspen forests and mires. Natural conditions are favorable for the mire development. Waterlogged area is more than 50%.

Currently the most widespread classifications of wetlands are geobotanical. These classifications are based on ecological principles. Mire vegetation is a single type, subdivided into three subtypes on the conditions of water and mineral nutrition. Subtypes are subdivided into smaller taxonomic units by the structure of the vegetation cover. Many of the existing landscape classifications are based not on complex feature but on the selection of one of the components of the mire geosystem - terrain, vegetation, features of origin.

Fig. 1. Geographical position of Tomsk region.

Thus, there are many classifications, considering the mires with different view, but not all of them fully disclose the diversity of wetlands as a complex natural object. In addition, the complex time-spatial geosystems classifications of mires in Tomsk region are absent. So the goal of this paper is developing a geosystem classification of Tomsk region mire based on the principle of two-range classification (Sochava 2005).

METHODS AND OBJECTIVES

Methods for investigation with the simultaneous analysis of the spatial and typological classification unit (double row geosystems) allow to take into account the properties of homogeneity and heterogeneous of geosystems, their typological and individual characteristics and rank relationships, consisting of the simultaneous consideration of typological and regional levels of the geosystems organization (Sochava 2005). This classification reflects the dynamics of geosystems cover not only their native, but the serial states.

The objects of classification are elementary natural systems (facies) subordinated to more complex ones. The classification is made using a landscape mapping and field studies conducted in 2007-2011 in Tomsk region. Facies are homogeneous objects; they are characterized by a uniform internal structure. They are united on a structural basis (rather than chorological) in the taxons of higher rank on the basis their characteristics, preserving the uniformity of a higher taxonomic level.

The meaning of this operation is the integration of landscape facies on structural and dynamic parameters. Thus, the hierarchical classification of facies (elementary geosystems) represents a logical operation that is different from typology on the species, genera and other categories of landscapes.

Principle of "bottom" is used to make the classification. The taxonomic units of lower facies of the similar rank are combined into groups of a higher hierarchical level. The landscape of plant layers are combined into groups of facies. Facies group form the basis of their water and mineral nutrition. In addition to the mire, the classification has included wetlands and forest facies, subject to the processes of waterlogging.

The geosystem classification helps to make landscape mapping of mires in south-east of the West Siberian Plain. The lowest unit for producing large-scale maps is elementary geosystems (facies) and for medium-sized is a group of facies. The hierarchy of the landscape shell is determined by the spatial integration of geosystems, where typological geosystems naturally fit into the territory mosaic. Properties, patterns of development and sustainability (including the effects of anthropogenic) of typological geosystems are determined by their position within the spatial region. They are allocated according to the zonal and non-zonal features of the landscape areas.

Table 1. Fragment of mire geosystem classification

Facies class	Facies group	Facies
forest	tree	watershed slightly sloping wavy spruce and birch podzolic-gley soil native facies
wetland forest	tree	watershed slightly sloping hummocky pine and birch peat-gley soil serial facies
fen	tree	terrace flat highly hummocky birch peat soil sub native facies
	tree and brushwood	floodplain flat hummocky birch and willow peat soil serial facies
	grass and (or) hypnum moss	floodplain flat wavy horsetail peat soil serial facies
mesotrophic mire	tree	terrace flat highly hummocky pine and birch peat soil sub native facies
	tree and moss	watershed flat highly hummocky pine and Sphagnum moss peat soil sub native facies
	tree and grass	terrace flat hummocky birch and sedge peat soil sub native facies
	grass and moss	terrace flat slightly hummocky sedge and horsetail Hypnum and Sphagnum moss peat soil sub native facies
oligotrophic mire	tree, dwarf scrub and sphagnum moss	watershed flat hummocky pine, marsh rosemary and Sphagnum moss peat soil sub native facies
	grass and sphagnum moss	watershed flat slightly hummocky sedge and Sphagnum moss peat soil sub native facies
	sphagnum moss	watershed flat slightly hummocky Sphagnum moss peat soil sub native facies
	ridge-hollow and ridge-pool tree and dwarf scrub, grass and moss complexes	watershed flat ridge-hollow pine and marsh andromeda, scheuchzeria and sphagnum moss peat soil sub native facies

RESULTS

Native, sub native and serial landscapes which have various degrees of stability are distinguished. The native landscapes are stable natural systems with well-established intersystem and external relations. The sub-native landscapes are compared with native, which are modified as a result of surplus or insufficiency of the landscape components (for example moisture surplus). The fragment of classification is represented in the table 1.

CONCLUSIONS

The serious landscapes are not a stability complex which due to environmental conditions is not achieved stabilization of the structure and modes of ecosystems. Most of the studied territories of interfluves mires refer to sub-native. They are relatively stabile compared with the mire forest and floodplain serious environmental systems. Thus, the study showed that most of the southeastern West Siberian territory formed in the process of geographic envelope has favorable conditions for the development of a stable bog management.
The time-spatial geosystem classification allows the recording of the spatial combination of southeastern West Siberian natural system components in order to carry out the environmental management and give forecast of wetland areas for the further development.

REFERENCES

Sochava V.B. (2005). Theoretical and Applied Geography. Selected Works. Novosibirsk. 288p.