

Structuring of Sikhote-Alin Landscape Area of the Pacific Landscape Belt of Russia

V.T. Starozhilov, A.A. Deleva, A.A. Kudryavtsev

FEFU Pacific International Landscape Center, Russia, Vladivostok

Abstract: New digital structuring of landscape space of a geographically integrated Sikhote-Alin landscape area (structure) of the Pacific landscape belt of Russia is considered. The region is an internal structural content of the belt and in this article is an example for considering high-altitude landscape complexes of its other structures (regions), such as Low-Amurskaya, Priokhotskaya, Sakhalinskaya, Kamchatsko-Kurilskaya, Chukotskaya, etc. The task is to structure and classify high-altitude landscape areas of the Sikhote-Alin region with singling out high-altitude landscape complexes and to study vertical differentiation as a universal property of quantitative and qualitative changes in their internal content. According to these criteria, landscape territories are classified and distinguished as plain, low-slope, low-mountain, dissected-middle-mountain, massive-medium-mountain, holtz and other altitude-landscape complexes. Structuring and classification are presented for further study of structures as objects of scientific and sectoral indication and possibilities of using high-landscape complexes as areas of environmentally friendly development.

Keywords: Concept, mountain, classification, low-mountain, complexes, industry indication, development.

1. INTRODUCTION

The work is a continuation of the research of the Pacific International Landscape Center of FEFU. The results of the study of vertical landscape differentiation, which has long been paid attention to by many scientists, are considered [2; 3]. However, the object of their study was mostly flat areas of the European part of Russia. The mountainous areas of the eastern part of Russia, and in particular the mountainous areas of Sikhote-Alin, did not bring specific attention from the point of view of studying vertical differentiation and the classification of high-altitude landscape complexes. Therefore, the problem is still not resolved, and this has determined the need for real research.

The object of study is Sikhote-Alin landscape region. It is a landscape system (landscape area structure) of the Pacific landscape belt of Russia (Figure 1) [4]. The Sikhote-Alin geosystem (No. 1 in Figure 1) is one of the landscape structures (regions) of the azonal belt of the landscape sphere with a genetically uniform structural-tectonic position in the marginal-continental zone of the ocean-continent dichotomy and characterized by the accretionary nature of such landscape foundations

as Sikhote-Alinskaya, Low-Amurskaya, Priokhotskaya, Sakhalinskaya, Kamchatsko-Kurilskaya, Chukotskaya and other geographical regions (structures) with climatic and vegetative internal content of high-altitude and latitudinal zones and evolving under the influence of interacting, interrelated, and interpenetrating orographic, climatic, and phytostatic factors. The Sikhote-Alin geosystem is the internal structural content of the belt and in this article is an example for considering the high-landscape complexes of its other structures, such as the Low-Amurskaya, Priokhotskaya, Sakhalinskaya, Kamchatsko-Kurilskaya, Chukotskaya, etc.

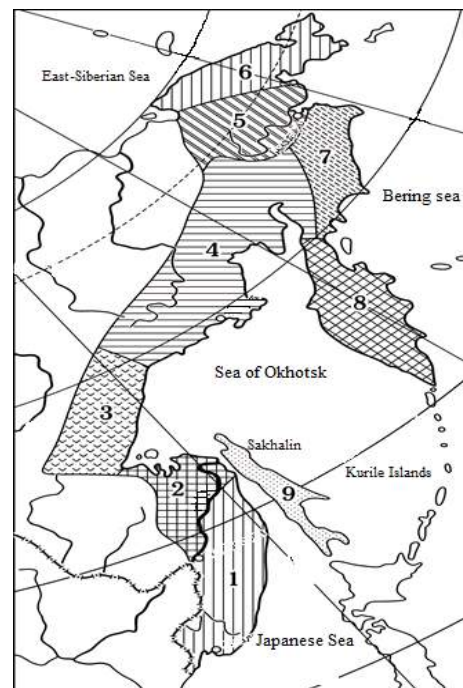


Figure 1. Pacific landscape belt of Russia [4]

Belt areas: 1. Sikhote-Alinskaya, 2. Low-Amurskaya, 3. Priokhotskaya, 4. Kolymanskaya, 5. Anadyrskaya, 6. Chukotskaya, 7. Koryakskaya, 8. Kamchatsko-Kurilskaya, 9. Sakhalinskaya

2. MATERIALS AND METHODS

Landscape geography is considered a general methodological scientific basis, and its division is a strategic landscape science and, in general, a landscape approach using landscape morphological indication of geosystems. Landscape geosystems of various ranks are subjected to landscape analysis and ultimately one or another geographical assessment of the landscape of

the study object is provided, and the results of analysis, synthesis and assessment are used to solve the problem of structuring and classifying the altitude landscape complexes of the Sikhote-Alin landscape structure.

The article discusses the theory and practice of general results and the strategic vision of the landscape approach in the study of geographic space based on regional landscape research. It includes the results of many years of scientific and practical research in the field of geological and geographical study and landscape mapping of not only the considered territory of the Sikhote-Alin geosystem, but also materials on the regional (PrimorskyKrai, Sakhalin, Chukotka, etc.) links of the Pacific landscape belt of Russia are attracted. Thematically continue landscape research and a description of Russia and its regional links (including PrimorskyKrai), and a medium-scale study using a regional-typological classification allowed to reflect features of geosystems that manifest in different parts of their ranges, and the description revealed the properties and degree of difference between landscape geosystems [1,6,7,9,10].

Includes extensive associated natural information. The relationships of significant data samples were studied not only for relief, vegetation and soils, but also for bedrock, loose rocks, and climate. We also studied the thickness of loose accumulations, transit of detrital material, moisture, depth of cut, thickness of disintegration, intensity of physical and chemical weathering, meso and microclimatic features, as well as their transformation during development [5]. In addition, based on the presentation of the significance of all components and factors of the landscape, including the foundation as a material component and a factor of its dynamics, we study the high-rise complexes of landscapes and consider fundamental and loose foundation. Previously, this important azonal conservative component of landscapes has received insufficient attention. The petrographic composition, rock conditions, and the tectonic mode play an important role in the formation, stability and development of landscapes, therefore we have provided the marginal continental dichotomy of the region under consideration, as well as the characteristics of the material complexes and their structural and tectonic position. In addition, in the marginal continental territory, their root foundation is responsible for the development of formed landscapes, which is a complex agglomerate of accretionary and post-accretionary material complexes of structural zones of the continental, subcontinental, suboceanic and oceanic core [8].

For the geographical systematics of high-altitude landscape complexes, the material complexes of loose rocks, the state of erosion-denudation systems, and the relief were studied specifically on the basis of materials of geological surveying, aerial photographs, and

satellite images. Particular attention is paid to the study of such an indicator as the transit of loose sediments.

In general, the article also used the previously developed classification and legend of landscapes of the North-Sikhote-Alin region on a scale of 1: 500,000 [1].

The material used here is noted only partially, not all data could be reflected in the article. We previously addressed specific issues in different sections of landscape science. A general analysis of materials as the basis for the concept of structuring and classifying high-rise landscape complexes has not previously been conducted. In this regard, all materials, including the author's field data (30 field seasons), we used as the basis for solving the problem of structuring and classification of high-altitude landscape complexes of Sikhote-Alin region.

All available material was analyzed on the basis of conjugate analysis and synthesis of intercomponent and interlandscape ties, taking into account marginal-continental dichotomy and data on orographic, climatic and phytoplant factors of geographically unified territories formation within the framework of mountain landscape geography and the following results were obtained.

3. RESULTS

Based on the analysis, synthesis and evaluation of significant field and theoretical material, the fundamental result of the present research has been established, namely, to accomplish the task of structuring and classifying high altitudinal landscape complexes. It is necessary to have a digitized vector-layer morphological landscape basis (vector-layer medium-sized landscape map), which at the digital level gives knowledge of the structure of the geographical space of the object under consideration. Such results make it possible to analyze the territories by digitized landscapes and to compare the internal content of such taxa as landscape, species, genus, subclass, class, type, district, province, and region. The next steps are structuring and classification of high-rise complexes of landscapes.

It was established that in structuring and classifying high-altitude landscape complexes of the Sikhote-Alin geosystem, the relief and vertical differentiation of landscapes are dominant, which acts as a universal property of the qualitative change in the internal content of the complexes. Due to changes in the relief, the state of erosion-denudation systems also changes. In turn, changes in the state of the systems are reflected in the structural organization of landscapes and it acts as an indicator of high-altitude landscape complexes.

As a result of the synthesis, analysis and assessment of landscapes of the Sikhote-Alin landscape area (structure) using indicator dominant criteria (relief, vertical and horizontal differentiation of landscapes),

lowland, dissected, middle-mountainous, massive-medium-mountainous and holtz high-altitude landscape complexes are distinguished. Below, as an example, the description of a low-mountain and dissected middle-mountain altitude-landscape complex is given.

Low-altitude landscape complex. These are mountains with absolute marks. These are mountains with absolute marks of 300–800 m and relative elevations of up to 200–250 m. They are characterized by straight, less often convex, slopes covered with a thick layer of gravelly loam, whose thickness at the foot of the mountains usually increases. Outcrops are rare. This is usually either denudation outcrops and ridges, composed of weathering-resistant rocks on tops and slopes, or erosion (abrasion) cliffs at the foot of the mountains.

The low-altitude mountain-landscape complex is characterized by a complex differentiation of landscape plant and soil groups. Broad-leaved forests predominate among vegetation, and brown-forest in the soil. The complex is characterized by slow lateral removal of fine earth in the process of suffusion and lateral soil washout, the predominant hot-dip and hygro-cry transit of slope deposits, with a noticeable enrichment of the upper layers of the section with coarse-grained material while retaining their predominantly loamy composition. The phenomena of intermediate slope accumulation at excesses and at the foot of the slope are widespread. Territories belong to sites with delayed denudation and active alluvial and slope accumulation.

It includes the mountainous territory of the Far Eastern mountain-class landscapes with the landscapes of the dominant mountain-mixed-broadleaf, rare mountain-dark coniferous subclasses, the dominant low-mountain polysubstratum and terrigenous genera. For the complex the dominant is a low mountain fir-spruce-larch-small-leaved species of the mountain-mixed broad-leaved belt and includes a complex of fir-spruce, larch, spruce-larch and small-leaved forests (in places with broad-leaved species) on the mountain taiga brown and other soil. It has fast water exchange on narrow watersheds and steep slopes, weakly restrained on wide watersheds and flattened slopes. It is found in fir-spruce-larch-small-leaved species of the mountain-mixed broadleaved belt and includes a complex of fir-spruce, larch, spruce-larch and small-leaved forests (in places with broad-leaved species) on mountain taiga brown and other soils. It has a fast water exchange.

Dissected middle-height high-landscape complex. It includes the mountainous territory of the Far Eastern mountain-class landscapes with landscapes of the dominant mountain-mixed broad-leaved, mountain-dark coniferous subclasses, the dominant polysubstratum and terrigenous genera. These are

mountains with absolute marks of more than 800 m. It is developed on a territory with deep dissection of initially uniform arrays into a large number of narrow winding ridges and separate peaks with deeply dissected slopes. These are areas with sharply demarcated watershed ridges, very steep straight or convex slopes in the upper part, to which mobile debris is confined on the Japanese sea macro slope, often covering the slopes from the foot to the top. Vegetation groups are dominated by cedar-broadleaf and spruce-fir forests. On the slopes covered with woody vegetation, gravelly and gravelly-dresvenny loams are developed, which serve as the mineral base of the prevailing brown and yellow-brown soils. Up the slope, there is usually an increase in the amount of coarse clastic material, its enrichment in the upper part of the slope accumulations, and the particle size of the clastic material increases. In general, this complex of landscapes belongs to the field of active denudation, but the processes of alluvial transit and intermediate accumulation also play a significant role. In addition, for the high-altitude dissected mid-mountain complex of the landscape is characteristic: a noticeable predominance of the products of physical weathering in the total volume of mobilized material of the zone of rock destruction; widespread obvalno-scrée phenomena and scree; episodic manifestation of kurum transit, solifluction, and frost buckling; canyon-shaped forms of erosion penetration of the tops of watercourses, significant longitudinal slopes of the valleys in the zone of the channel water transit of detrital material.

4. CONCLUSION

A new structuring and a new classification of the landscape space of the Sikhote-Alin mountain areas are presented. It is important not only from the point of view of the development of the scientific foundations of landscape science, but also as a direction of research of the strategic possibilities of its use in the integrated and sectoral development of landscape space. The proposed concept of high-altitude landscape complexes is considered as a promising direction of landscape geography in carrying out practical tasks in the development of territories. Subject to the use of vector-layer mapping, the study of landscapes using component, morphological, areal, multi-scale vector-layer display in the classification units of landscapes (landscape, type, genus, subclass, class, type, district, province, region) will allow using modern digital computer technologies to proceed to the consideration of scientific and practical tools for planning and forecasting economic, social, environmental and other geosystems that are harmonized with nature. Structuring and applying the classification of high-altitude landscape complexes will be conducive to solving the problems of regional development.

The studies were carried out with the financial support of the RFBR (project - 18-05-00086-A).

REFERENCES

- [1] Deleva AA, Starozhilov V T 2018 Landscape geography of the Northern Sikhote-Alin Geosystems in Northeast Asia. Types, current state and development prospects. Collection of scientific articles. FGBUN Pacific Institute of Geography, Far Eastern Branch of the Russian Academy of Sciences, Far Eastern Federal University, Russian Geographical Society 130-135
- [2] Mikhno V B, Gorbunov A S 2001 High-altitude landscape complexes of the Cretaceous south of the Central Russian Upland Voronezh State University Bulletin. Geography and geoecology series 16-24
- [3] Milkov FN 1947 On the phenomenon of vertical differentiation of landscapes on the Russian Plain Geography issues 3 35-41
- [4] Starozhilov V T 2013 Pacific marginal continental landscape belt as a geographical unit of Pacific Russia and environmental management issues Problems of Regional Ecology 5 1-10
- [5] Starozhilov V T, Krupskaya L T, Grehnev V P, Zvereva A G, Novorotskaya A M, Derbentsev V T 2009 Ensuring the environmental safety of environmental risk sources at tin-ore enterprises in the south of the Far Vestn. RUDN Ser. "Ecology and life safety" 4 81 - 88
- [6] Starozhilov V T, Zonov Yu B 2009 Study of landscapes of Primorsky Krai for the purposes of nature management Geography and natural resources 2 94-100
- [7] Starozhilov V T 2016 Landscape geosystems of the Sakhalin link of the marginal continental landscape belt of Pacific Russia Problems of Regional Ecology 5 53-57
- [8] Starozhilov V T 2004 Geodynamic evolution of transition zones of northeast Asia to the Pacific plate Hydrometeorological and geographical research in the Far East: materials of the 5th anniversary scientific. conf. "Towards the World Water and Meteorology Days" 85-88
- [9] Starozhilov V T 2011 General landscape science and the use of a landscape approach in environmental monitoring of environmental management: a course of lectures (Vladivostok: Publishing House Dal'nevost. Federal University) p 286
- [10] Starozhilov V T 2018 Nature management: practical landscape geography: (Vladivostok: Publishing House Dal'nevost. federal University) p 276