Climate and nature management in the Middle Ages in the Upper Volga basin

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«The reported study was funded by RFBR according to the research project № 19-05-00233»

INTRODUCTION The great Russian river Volga turned out to be the pivotal artery for settlement and development of the Central and Northern parts of Russia, formation and development of Russian ethnicity. It is in the landscapes of the Upper Volga basin the core of the Russian state originated and matured. The Upper Volga basin is boundary as for its climate and landscape, characterized by multiple changes of natural and historical conditions; it has a complex history of development and for long time was an ecotone area of interpenetration of different material cultures and ethnic groups. Here happen the following boundaries: the Eastern sector of air mass transfer, Moscow and Valdai glaciation, zones of coniferous-deciduous forests, physiographic provinces and regions, material cultures of Baltic and Finno-Ugrian tribes in the iron age, boundaries of ancient Russian principalities at medieval period. The Great Volga trade Route started developing in the second half of the VII century in the parallel with resettlement of the Slavs. This way had a lot of branches permeating with a net of water ways the forest lands of the Russian Plain. It went along the Caspian Sea and the Volga, then turned north from its headwaters and by dragging or minor rivers to Ilmen Lake and by the Volhov to the Ladoga.

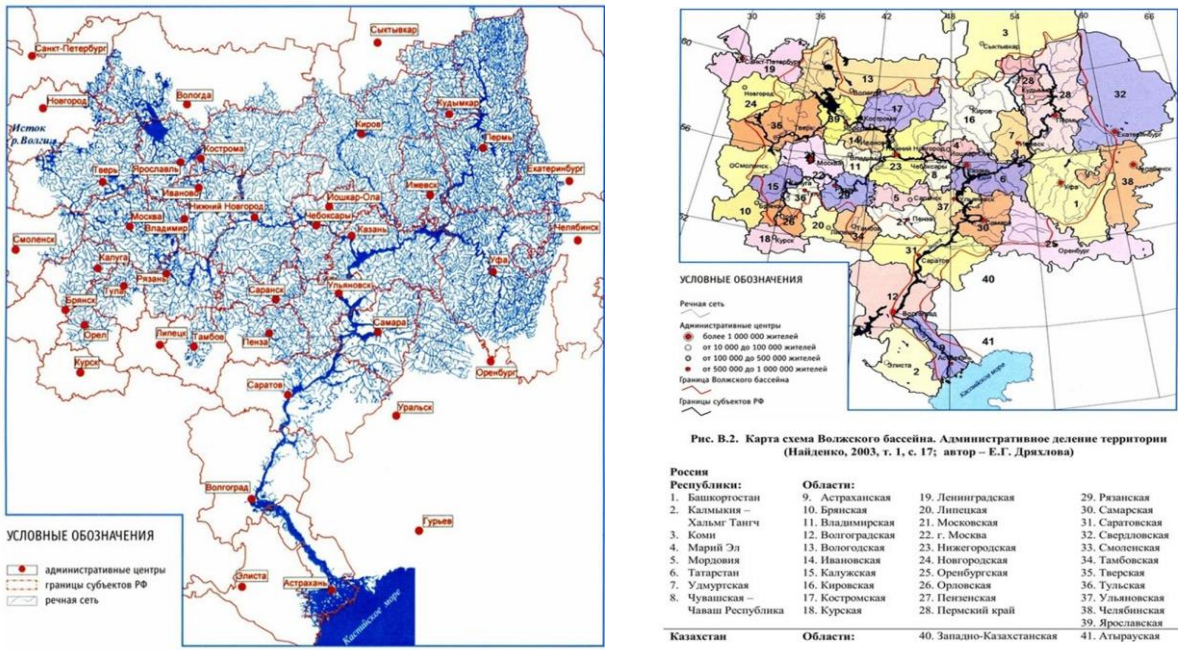


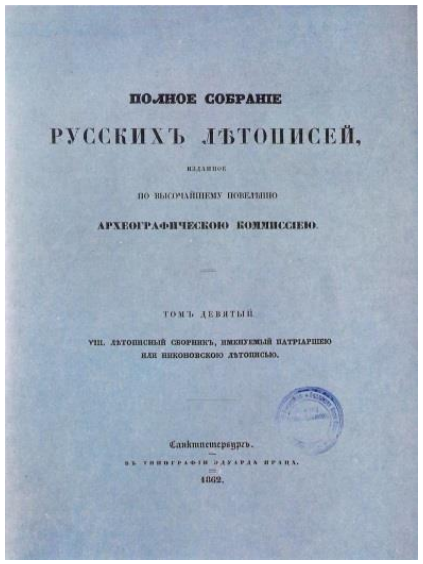
Рис. В.2. Карта схема Волжского бассейна. Административное деление территории (Найденко, 2003, т. 1, с. 17; автор – Е.Г. Дряхлова)

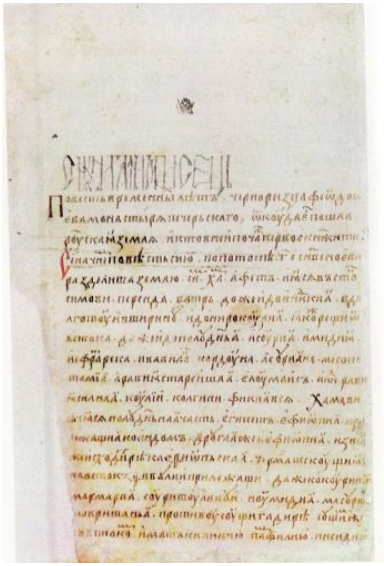
Россия

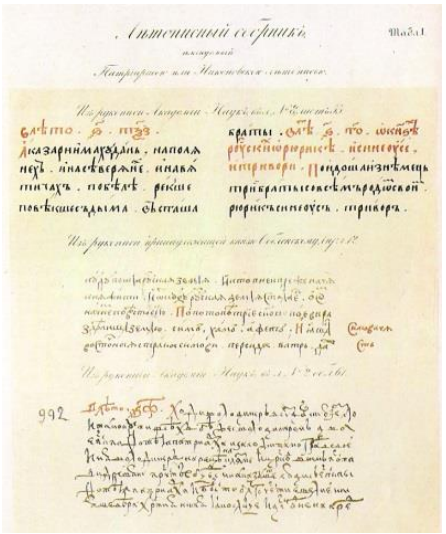
Республики:	**Области:**		
1. Башкортостан	9. Астраханская	19. Ленинградская	29. Рязанская
2. Калмыкия – Хальмг Тангч	10. Брянская	20. Липецкая	30. Самарская
3. Коми	11. Владимирская	21. Московская	31. Саратовская
4. Марий Эл	12. Волгоградская	22. г. Москва	32. Свердловская
5. Мордовия	13. Вологодская	23. Нижегородская	33. Смоленская
6. Татарстан	14. Ивановская	24. Новгородская	34. Тамбовская
7. Удмуртская	15. Калужская	25. Оренбургская	35. Тверская
8. Чувашская – Чаваш Республика	16. Кировская	26. Орловская	36. Тульская
	17. Костромская	27. Пензенская	37. Ульяновская
	18. Курская	28. Пермский край	38. Челябинская
			39. Ярославская
Казахстан	**Области:**	40. Западно-Казахстанская	41. Атырауская

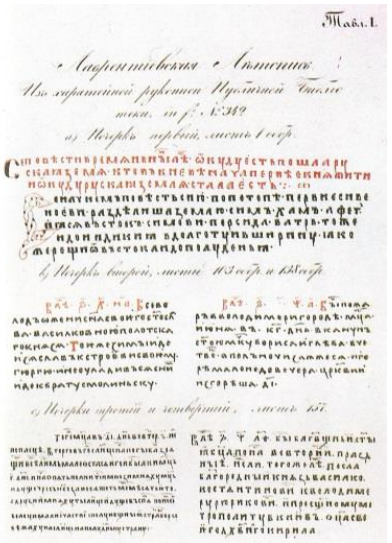
Volga basin. Volga River with tributaries

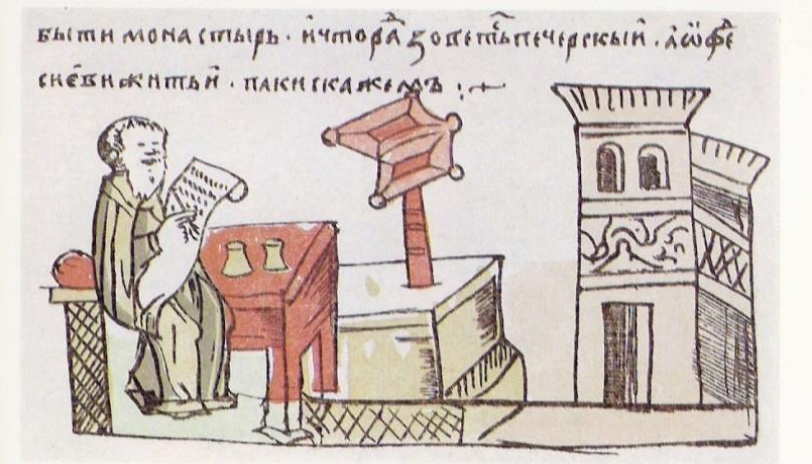
MATERIALS AND METHODS The main method for obtaining information about past climate changes is a comprehensive analysis of written (annalistic) sources, including weather, climate and weather anomalies, the results of dendrological, spore-pollen, radiocarbon and other studies. To identify the paths and orientation of spontaneous and anthropogenic development of landscapes, reconstruction of climate dynamics is necessary. The intensity and frequency of extreme natural phenomena, and, primarily, meteorological, most significantly affect the functioning, rhythm and dynamics of landscapes and determine not only the characteristics of management, but also certain aspects of historical development. Therefore, a special place in the reconstruction of climate dynamics and weather events is occupied by the analysis of extraordinary meteorological in particular, and natural phenomena in general.





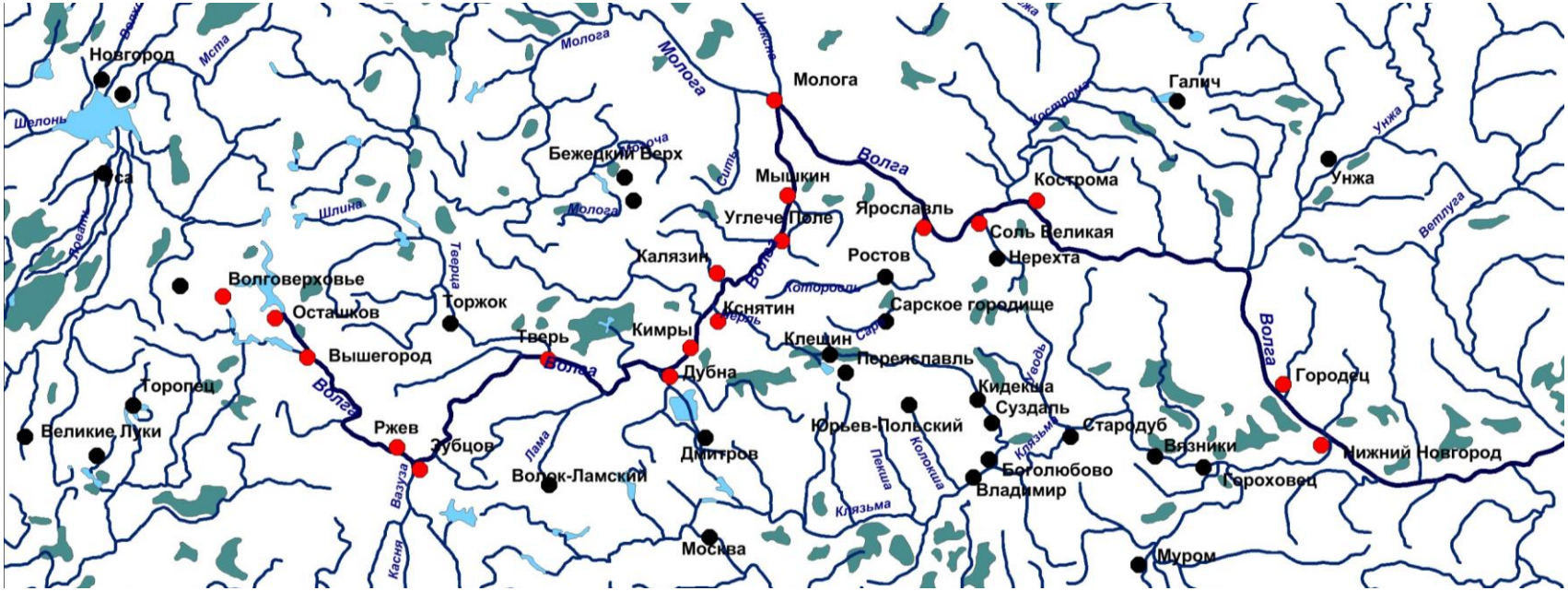






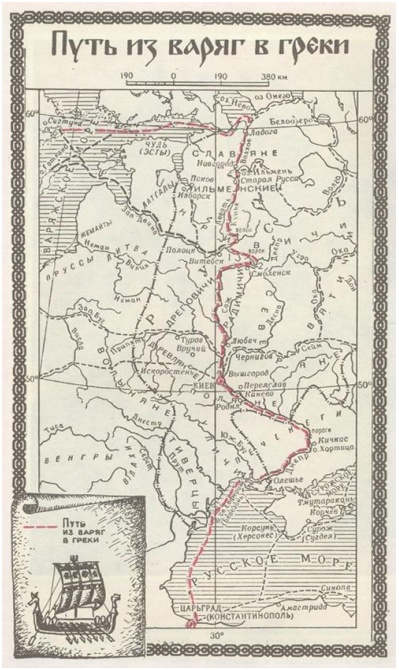
During the analysis of primary sources, along with direct climatic indications and characteristics (hot, warm, cold, humid, dry, etc.), much attention was paid to anomalous (extreme) natural phenomena and indirect indications of climate variability (floods, crop failures, hungry years, mass epidemics, etc.). As a result, graphical tables were compiled for registering climatic basic characteristics and extreme events for each year, starting from the year 900 CE. On the basis of stock and published materials, the climatic and hydrological conditions of nature management and the influence of extreme climatic phenomena on it were reconstructed for the Upper Volga basin. First of all, we considered the period of the medieval warm era (approximately X – XIII centuries) and the small ice age (XIV – XIX centuries) as the most significant climatic events of the last millennium in Eastern Europe.

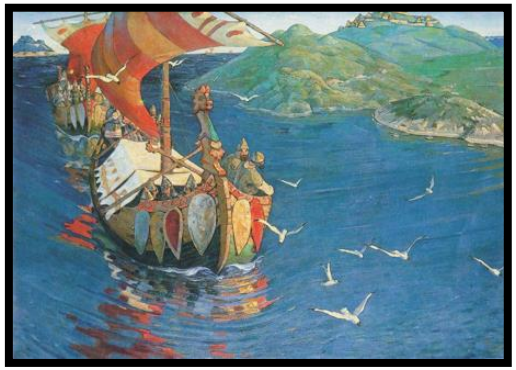
Upper Volga basin is the most significant Upper Volga part of the Great Volga Route. Landscape-ecological studies were conducted on the regional (for the whole basin of the Upper Volga) and local levels (for key areas). The research included processing and analysis of numerous published and archive materials of the area and subjects of studies, as well as complex landscape and historic-archeological field work on the key areas in the regions of ancient Russian cities. There were conducted reconstructions and assessment of landscape-ecological conditions of livelihoods of settlers of different material cultures and landscape and economic systems in different periods of time. The researcher made series of large-scale landscape-historical-archeological and landscape-ecological maps. A unified landscape-historical geographical and information system is being formed for the whole basin of the Upper Volga.



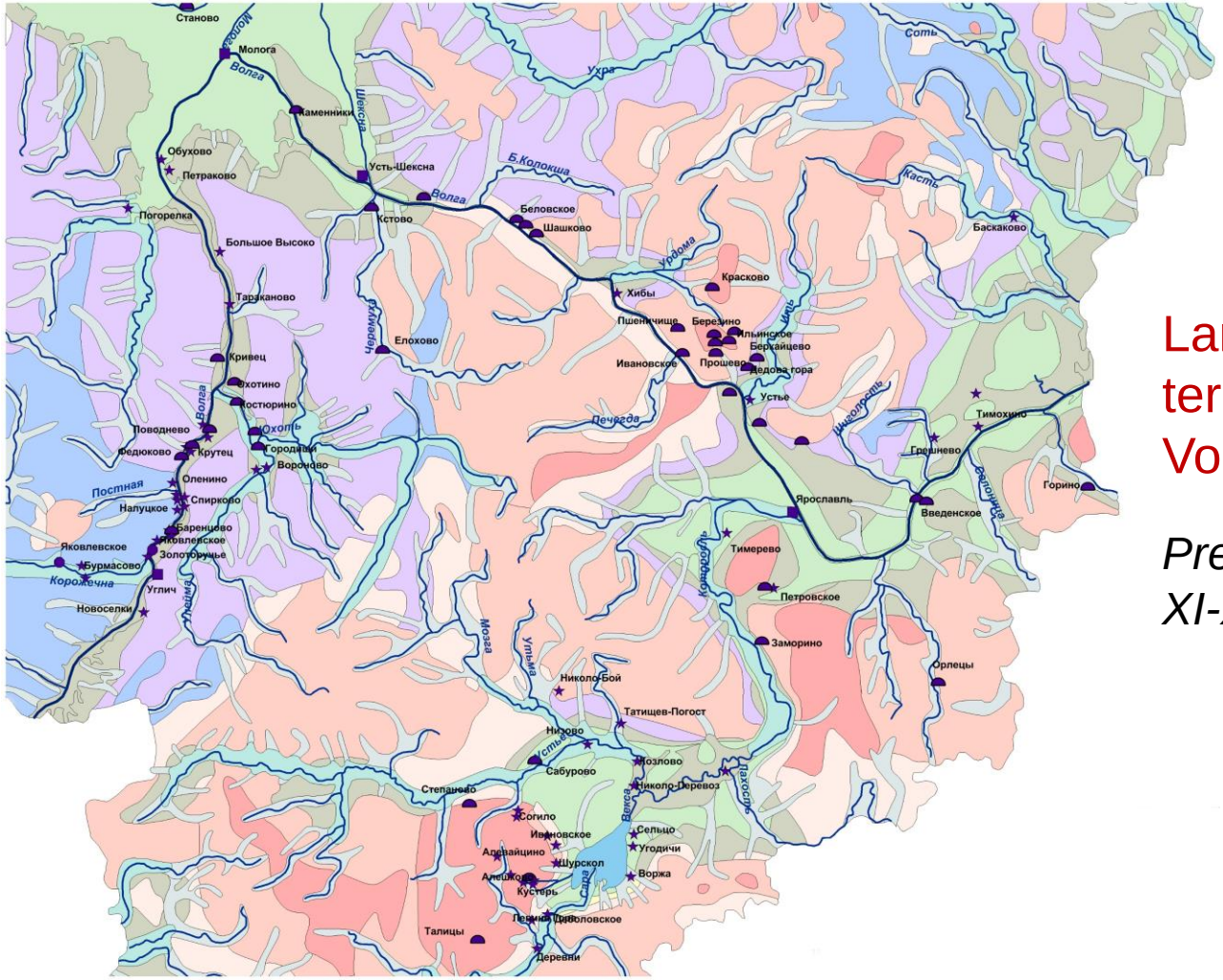
Old Russian big and chronicle cities on the Upper Volga section of the Great Volga historical waterway

RESULTS The peak of the medieval optimum was at the turn of the first and second millennia, and its maximum in the region was noted at the end of the X century. During this period there were no severe winters. A small amount of summer rainfalls led to a reduction in shallow water bodies, water-logging and a decrease in river floods. This is evidenced by the settlements on the floodplains of a number of Upper Volga rivers. At this time, the Upper Volga route and the "route from the Varangians to the Greeks" began to function.





A landscape-ecological analysis of the spatial distribution of the historical cities of the Upper Volga showed that at an early stage in the Old Russian period places for the construction of cities (protocities) were as a rule chosen on the most important sections of the waterway, taking into account their safety, with a relatively simple landscape structure, on low relief elements. They were located mainly on gently sloping surfaces of low above-floodplain or lake terraces, areas of low valley sanders (front aprons), rarely on the near-valley slopes of inter-river plains, sometimes on high floodplains emerging from the flooding regime. This is typical for such cities as Dubna, Uglich, Myshkin, Yaroslavl, Rybinsk.



Landscape map of the territory of the Upper Volga

Pre-Mongol period of XI-XIII centuries

Chains of ancient Russian mounds of the VIII-XIII centuries, abundant forests and dry portages were in places where there are now only swamps. The widespread development of honey-gathering and active exploration of forests were characteristic precisely for this period. The exploration by the Slavs of the Upper Volga basin and the development of the settlement structure took place in favorable conditions for agriculture and settlement. Climatic conditions not only provided good harvests, but also contributed to the economic growth and development of relations between Slavic tribes during the formation of the ancient Russian state.

From the XII-XIII centuries, cities (primarily their fortified parts — fortresses) began to be established mainly in river valleys on steep banks, for example, Rzhev, Zubtsov, Staritsa, Tver, Kashin, Kalyazin, Romanov, Ples, Kostroma, Yuryevets, Gorodets, Nizhny Novgorod. Posads (craft areas of the city) were located at lower levels: on the second and first terraces above the floodplain and adjacent low-grade sanders (front aprons).

Old Russian cities of the XII-XIII centuries on the map of landscape types

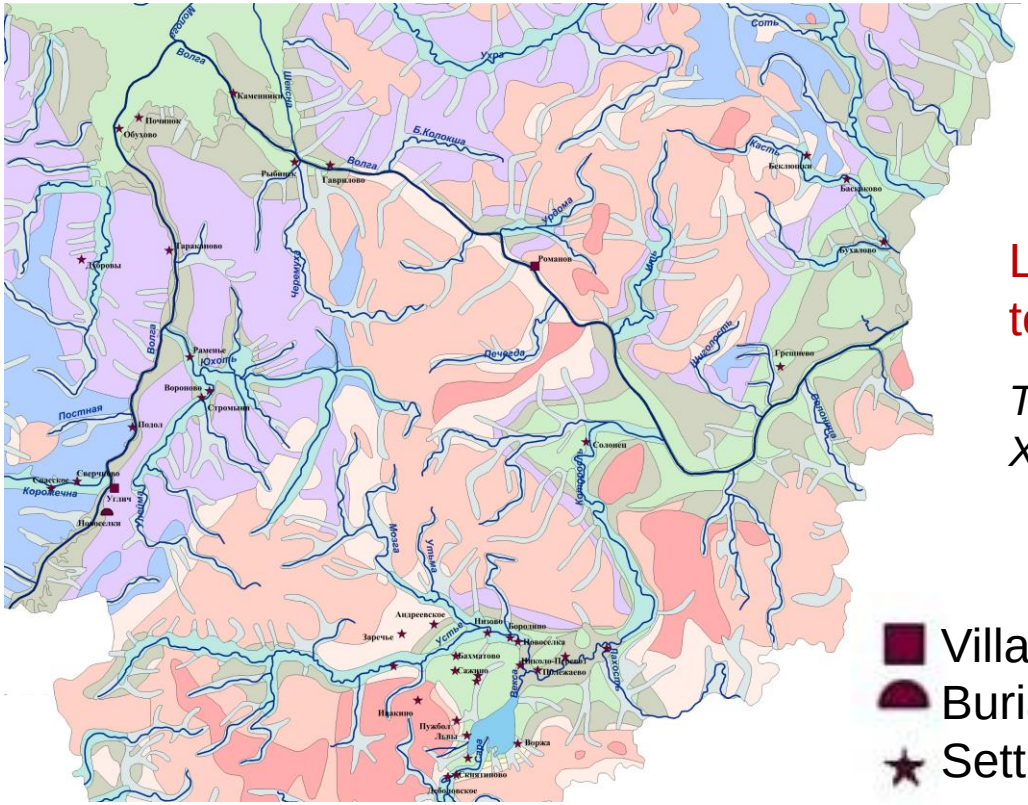
The transition period of the XIII - XIV centuries was called the “period of contrasts,” because it was a harbinger of the Little Ice Age. It was characterized by the following features: an increase in the intra-seasonal climate variability, an increase in humidity, drastic fluctuation in humidity and relative warmth from year to year, a widespread decrease in summer temperatures by 1-2 ° C. The XIII century accounts for one of the longest periods in which various extreme natural phenomena concentrated. It refers to the years 1211-1233, 15 of which were years of famine.

During the “period of contrasts” in the XIV century (compared to the XIII century) both harsh and mild winters, rainy and arid summers became even more frequent, that is, seasonal contrasts intensified. The XIV century was characterized by rather dramatic overall cooling. 30 cases of severe winters were recorded during the XIV century, whereas only 25 were recorded in the XIII century.

As for landscape characteristics, almost all cities occupy an ecotonic position along the borders (or near them) of two or three or more landscapes with a large set (from 30 to 40 species) of landscape complexes of the local level with diverse natural properties. It allowed the cities not only to carry out defense-strategic functions and maintain the operation of this major trade route, but also enabled the local settlers to run flexible, integrated, diversified subsistence economy.

Climatologists call XIV-XIX centuries the Little Ice Age (LIA). The average annual temperature dropped by - 1.4 ° C, and the average summer temperature dropped by 2-3° C. Periods of increased humidity alternated with dry periods more frequently, cyclonic activity increased dramatically, and the duration of the growing season decreased by almost three weeks. In the XV century already more than 150 extreme adverse natural phenomena were recorded. Thus, the snow cover in the winter of 1445 in the territory of the Upper Volga basin reached 2 m; and it was also the time of severe frosts.

In the era of the Little Ice Age, dramatic climate fluctuations were recorded by various sources more and more often. In Central Russia chroniclers recorded drastic climate cooling in the last third of the XVI century. Simultaneously with the beginning of the Little Ice Age, the process of developing watershed areas took place during the internal colonization of the land. The determining factors were demographic, socio-economic and historical, but the role of the natural factor cannot be ignored.

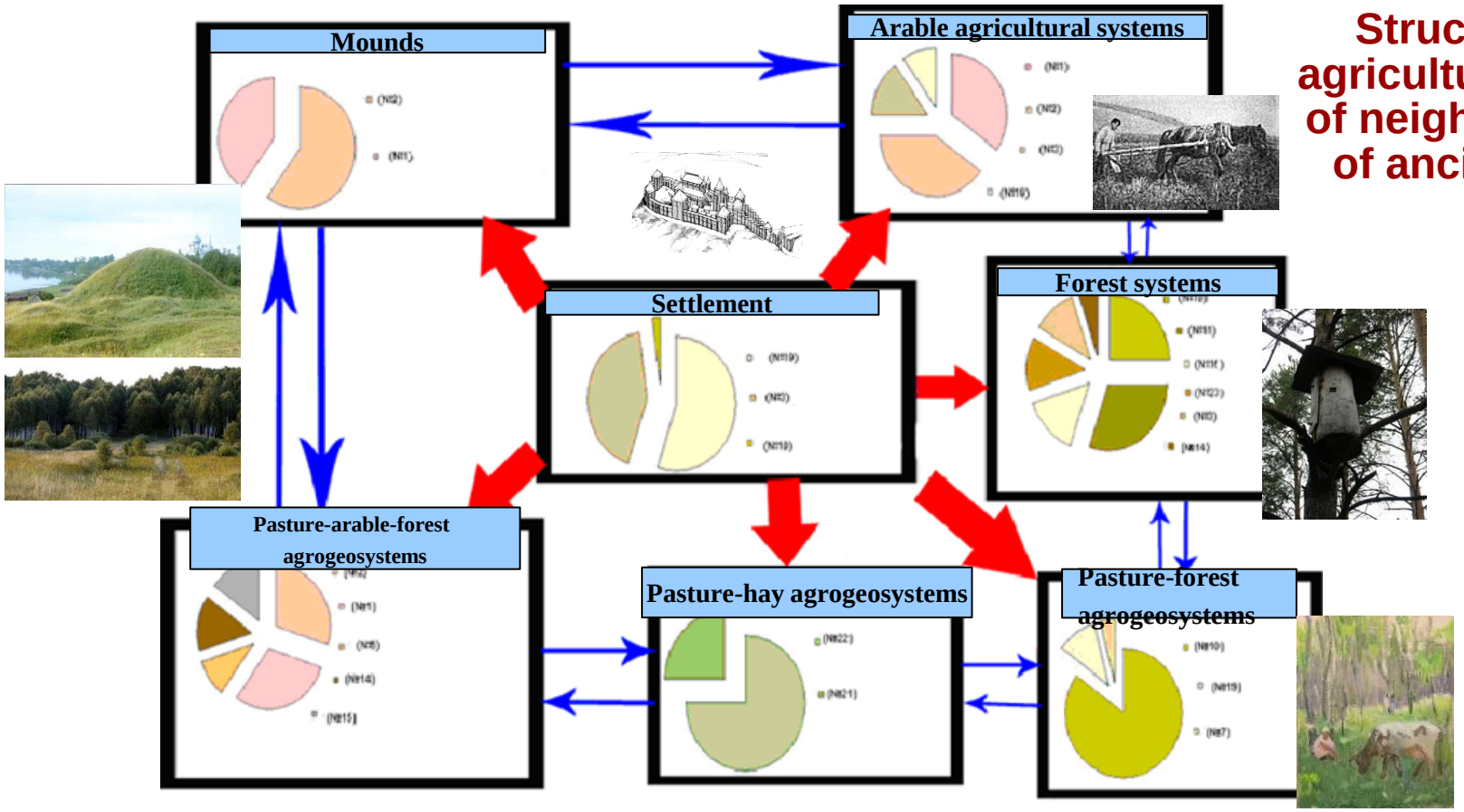


Landscape map of the territory of the Upper Volga

The era of the Middle Ages XIV-XVII centuries.

- Village
- Burial mound
- Settlement

The period of XIV-XVI centuries is a turning point in the economic development of landscapes in the region: environmental management acquires a pronounced extensive character with the emergence of numerous environmental problems. This is due both to the intensive growth of the population, and the spread in agriculture of the three-field crop rotation. The number of settlements increases dramatically and landscapes of inter-river spaces begin to be mastered. All this is accompanied by the indiscriminate destruction of forests, the decline of beaver fishing and wild-hive beekeeping. For a long time, timber forest becomes a rarity; small-leaved forests extend to interfluves. The establishment of a system of permanent fields, many of which have existed to the present, and the emergence of numerous roads cause the intensification of erosion processes. It was then that the basis of the modern settlement structure and land use structure was laid in most areas of the Upper Volga basin. Large arrays of plowed cultural landscape complexes are being formed.

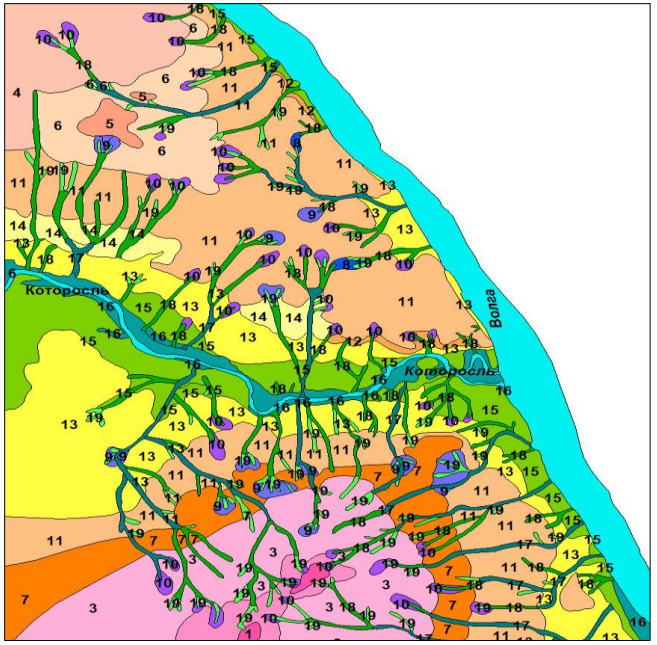


Structure of agricultural areas of neighborhood of ancient city

An analysis of the location of settlements based on written and other materials for a number of counties of the Upper Volga region indicates that there happened a transfer of villages located at low altitude levels in river valleys to higher levels and interfluves. The climax of the increase in the number of extreme natural phenomena falls on the XV-XVII centuries. Only at the end of the XVII century climate conditions in Russia somewhat leveled off.

The nature of the relationship between man and the landscape is determined by both the nature of the production activity and the natural features of the landscape. Ecological properties of landscapes largely predetermined the ways of settlement and economic development of the Upper Volga basin. In similar landscape-ecological conditions, the settlers led a single-type farm, during which the same-type landscape-economic systems were formed. In all historical periods, there is a clear determination of the settlement structure and environmental management systems from specific landscape-ecological conditions, which are determined, in turn, by ecological properties and morphological structure of the landscape. Practically at all times, the valley's tracts (floodplains, floodplain terraces, sloping slopes of the valleys) and the sloping surfaces of the low and high valley aprons were the most developed.

Constant and continuous human impact on the landscapes of the Upper Volga basin caused destruction of the ecological balance in the system "human-nature" at the earliest stages. Deep changes touched upon not only the terrain, vegetation and soils, but also caused throughout restructuring of the morphological structure of landscapes and appearance of new human-derived landscape compounds in their composition.



Landscape map of the central part of the city of Yaroslavl.