

DEVELOPMENT OF A SCHEME OF FUNCTIONAL ZONING OF REGIONAL LANDSCAPE PARK “RAVSKE ROZTOCHCHIA” WITH APPLICATION OF GEOINFORMATION MAPPING METHODS

N. Stoiko

Lviv National Agrarian University

L. Tkachuk

LLC “Arhzemcentr”

V. Parshova

Latvia University of Agriculture

Key words: regional landscape park, functional zoning, mapping, geographic information systems, ecological network.

Problem setting. Integration of Ukraine into the European Union requires from our country to implement the international right norms in the field of environmental protection. According to recommendations of the European strategy of biological and landscape diversity protection, Ukraine has approved regulatory documents concerning establishment of a national ecological network [7]. Projecting of the national ecological network is made on the base of regional and local schemes of ecological networks formation by depicting of the territories and objects, included into the ecological networks, on plan-cartographic materials [6]. Efficient development of the schemes of ecological networks considerably depends on available information about the objects of nature reserve fund and other environmental intention. Unfortunately, in Ukraine, the project documentation on land surveying, focused on organization and determination of boundaries of the territories of nature reserve fund and other environmental intention, is developed rather slowly, preventing formation of an appropriate information database with corresponding cartographic depiction.

Main material of the problem. Geographic information systems (hereafter as GIS) are the important means to solve the above-mentioned tasks, because they help creating, visualization and updating of databases about quantitative and qualitative land conditions. Mapping of the objects of nature reserve fund, by means of multi-functional GIS, is an actual scientifically applied task, and its solution will support optimization of protected territories use, including ecological networks.

Regional landscape park “Ravske Roztochchia” (hereafter as RLP “Ravske Roztochchia”) performs a function of ecological corridor between Ukrainian-Polish protected territories, supporting their spatial and functional integrity [9]. It is located in the northeastern macroslope of Ukrainian Roztochchia within Zhovkva and Yavoriv districts of Lviv region and territory of seven villages and one settlement. Total area of RLP “Ravske Roztochchia” constitutes 19103 ha (table 1), according to the decision № 341 of Lviv regional council on June 13, 2007.

Table 1

**Area of land parcels of RLP “Ravske Roztochchia”
in terms of administrative-territorial units¹**

Village council	Area, ha
Yavoriv district	
Seredkevychi village council	2350
Zhovkva district	
Deviatyr village council	1557
Kamiana Hora village council	953
Potelych village council	4962
Maheriv village council	1826
Krekhiv village council	2775
Kunyn village council	3552
Lypnyk village council	1128
Total	19103

RLP “Ravske Roztochchia” is characterized by not high, as for protected territories, degree of natural landscape protection (41,2 % of the total area of the park). In RLP “Ravske Roztochchia”, forests take 23,6 %, and arable lands – 50,6 % [11]. Such structure of lands needs a special approach to protected territories management in order to keep typical and unique natural complexes and objects in their natural conditions, as well as supply conditions for organized rest of population [8].

Regimes of protection, reclamation and use of lands of regional landscape parks are defined on the base of scientifically argued functional zoning with determination of zones (reserve, regulated recreation, stationary recreation, economic) [10]. Lack of a qualitative plan-cartographic material complicates the process of determination of the functional zones on the territory of RLP “Ravske Roztochchia”.

Analysis of the latest researches and publications concerning the problem solution. Application of GIS in mapping of the objects of nature reserve fund and other protected territories is getting more popular and helps to transform maps and plans into GIS-models. They enable solution of practical tasks of nature management and environmental activity [1].

Works of Peresadko V.A. and other scientists analyse possibilities to apply GIS for projecting and supporting of activity of the objects of nature reserve fund and other protected territories. There are three defined approaches of GIS-supply for protected territories performance, i.e.

¹ Developed on the base [11].

creation of an Internet site with maps and other additional information concerning the protected territories; development of GIS-project as a complex of mutually dependent geoinformation layers of data about the protected territories; development of specialized GIS as a separate software complex for support of efficient performance of the protected territories [4].

Methods of geoinformation mapping were used by Bohdanets V.A., Vlaiev A.A. in the research of spatial location and dynamics of the structure of nature reserve fund lands in Shatsk district of Volyn region. The research defined the land parcels, which had been subjected to anthropogenic impact. It is also argued that there is a necessity to improve methodical approaches to estimating of the accuracy of qualification and application of modern materials of aerial photography, enabling promotion of cartographic works [2].

Researches of Bun A. and others developed GIS of natural reserve "Roztochchia", in particular, they developed digital maps of forests with corresponding taxation characteristics and subject digital maps with the results of flora and fauna monitoring; created schemes of location of scientific and research objects for recording and monitoring. The researchers have developed a library of corresponding requests and patterns for comfortable processing of the information, which is available in geodistributed databases [3].

For RLP "Ravske Roztochchia", such researchers as Cherniavskiy M.V., Savka H.S. determined correlation of functional zones and proved that their structure was not typical for regional landscape parks, because it was characterized by high fragmentation of forests, poor natural vegetation, substantial anthropogenic pressure and insufficient development of recreational and touristic services [12]. Functional zoning, proposed by Cherniavskiy M.V. and Savka H.S., was made in 2004, when the park was at the stage of projecting. The park mapping was carried out according to the type of morphological structure of landscapes. The park boundaries are marked by a continuous contour on the scheme of physical-geographical zoning, including the territory of Zamok village council, which is currently not included in the structure of RLP "Ravske Roztochchia".

Unsolved issues of the general problem.

Functional zoning of the territories of nature reserve objects is depicted on map-schemes with topographic base in the comfortable scale (1:10000 – 1:100000) and is a constituent of the Project of organization of nature reserve object territory [5; 8].

Results of the analysis of the available plan-cartographic material of RLP "Ravske Roztochchia" prove that there are no appropriate cartographic materials of the landscape park territory. There is only a paper map of land parcels location on a topographic base, developed by LLC "Institute of Geoinformation Systems" [9].

Setting tasks of the problem. The aim of the article is to study application of geoinformation mapping methods for completing of map-schemes of functional zoning of RLP "Ravske Roztochchia" territory.

Development of the structure of geoinformation database, required for completing of the zoning map-schemes, was made with application of the data of distant

probing of the Earth, space images, software AutoCAD and Cad Overla.

Main material. Initial materials for development of project proposals concerning organization of the object territory and projecting of functional zones include the following: laws of Ukraine on nature reserve fund, topographic maps of 1:50 000 scale, index cadastre maps (boundaries of administrative-territorial units – village councils), space images, data of geoportal "Public cadastre map of Ukraine", data of the service Gisfile map, general geographic maps of different content (cartograms of vegetation spreading on the park territory, schemes of location of the principal rocks on the area of Ukrainian Roztochchia and distribution of the territory of Ukrainian Roztochchia according to the types of forest-vegetation conditions), materials of the open access of the recreational communal service of RLP "Ravske Roztochchia".

Choice of the initial data was assisted by the analysis of different descriptive and cartographic materials of RLP "Ravske Roztochchia".

Boundaries of the landscape park are depicted in geoinformation environment at space images with application of the data of paper variant of the map, demonstrating location of the land parcels of RLP "Ravske Roztochchia" on topographic base.

The carried out investigation has resulted in development of the Scheme of location of RLP "Ravske Roztochchia" territory (fig. 1), depicting boundaries of the park and boundaries of village councils on the materials of OpenStreetMap of Gisfile map service; the Scheme of location of RLP "Ravske Roztochchia" territory (fig. 2), depicting boundaries of the park and boundaries of village councils on the materials of Google Satellite, using the data of additional layer of geospatial information "Cadastre" (data of the Public cadaster map of Ukraine) of Gisfile map service.

Digital map of RLP "Ravske Roztochchia" consists of the layers, each containing a certain type of information, i.e. topographic base; space images; data of the state land cadastre; subject information concerning spreading of vegetation, location of forest-users on the park territory, etc.

Considering the laws of Ukraine [8; 5], structure of lands [11], recommendations as to functional zoning of the territory [12] and spreading of the plants, enlisted in the Red Book of Ukraine on the area of RLP "Ravske Roztochchia" [9], four functional zones have been projected (table 2, 3). While projecting lands of the functional zones, principle of landscape planning was used with maximum consideration of landscape value of the territory. Area of the functional zones is defined by analytical method in AutoCAD environment.

Table 2

Determination of the area by contours, according to the functional zones ²

Functional zone	Area, ha				
	Total	Area 1	Area 2	Area 3	Area 4
Reserved zone	1269,1	925,8	343,9		
Zone of regulated recreation	586,1	278,8	307,3		
Zone of stationary recreation	997,0	208,3	327,0	328,0	153,7
Economic zone	16250,2	8141,2	8109		

Table 3

Distribution of the territory of RLP “Ravske Roztochchia”, according to the functional zones ³

Functional zone	Area, ha
Reserved zone	1269,7
Zone of regulated recreation	586,1
Zone of stationary recreation	997,0
Economic zone	16250,2
Total	19103

Reserved zone (6.6 %) performs the function of protection and reclamation of the most valuable natural complexes (typical pine and beech woods; unique pine-oak-beech natural forests; complexes of beech-pine forests of sorrel and beech-pine forests of blueberry, enlisted in the Green Book of Ukraine; meadow and swamp lands; more than 20 kinds of plants, enlisted in the Red Book of Ukraine). Performance regime is determined according to the requirements, defined for natural reserves, i.e. any economic activity, interrupting the natural development of the processes and phenomena or causing any threat of harmful impact on the natural complexes and objects, is forbidden.

Zone of regulated recreation (3.1 %) is used for short-time rest and health promotion of population, observation of picturesque places and monuments. It is allowed to organize touristic routes and ecological pathways; it is forbidden to cut down forests of the principal use, to do industrial fishing, hunting, other activity, which could negatively influence conditions of the natural complexes and objects of the reserved area.

Zone of stationary recreation (5.2 %) is used for location of hotels, motels, camping parks, other objects for servicing of the park visitors. It is forbidden to perform any economic activity, which is not connected with the intended use of the area or could negatively influence conditions of the natural complexes and objects of the reserved area and the area of regulated recreation.

Economic zone (85.1 %) is intended for economic activity, which is focused on implementation of the park tasks. It is the place for settlements, objects of communal

intention of the park, territory of traditional land use, forest use, water use, recreation and other kinds of economic activity. Hunting is forbidden.

Analyzing the correlation of the functional zones of RLP “Ravske Roztochchia”, one notes the large area of economic activity, proving great anthropogenic effect, which is not particular for protected lands.

Figures 1 and 2 demonstrate that land use of RLP “Ravske Roztochchia” consists of two land parcels with Zamok village council between them. According to the data from the official site of RLP “Ravske Roztochchia”, territory of the village council performs the function of buffer zone [9]. In the authors’ opinion, the territory can serve as a transfer corridor, which should supply conditions for a system integrity and perform functions of biocommunication to keep spatial integrity of the regional landscape park [6].

Conclusions. Geoinformation mapping of the objects of nature reserve fund and other protected area helps creating of digital maps, accumulating of the necessary information about the studied objects, modelling of spatial location of lands of environmental intention and it can serve as an informational base for establishment of ecological networks at the local level.

The used methods of geoinformation mapping supported accumulation and operative processing of information in the process of spatial investigation of RLP “Ravske Roztochchia” location. Automated projecting and digital data of GIS supported completing of the map-scheme of functional zoning of RLP “Ravske Roztochchia”, which was a constituent of the project of the park organization and determined a differentiated regime of protection, use and reclamation of its natural complexes.

The further research should be focused on argumentation of solutions concerning optimization of the territory of RLP “Ravske Roztochchia” by reduction of the area of economic zone and development of the project of land surveying as to organization and defining of boundaries of the landscape park territory.

References

1. Biatov A. P. Materialy III nauchno-metodicheskigo seminaru «GIS i zapoviednyie territorii» (30 maia – 01 iunija 2015, Kharkovskaia obl., Krasnokutskii r-n, s. Vladimirovka) / Pod red. A. P. Biatova. – Kharkov : «Tipografiia Madrid», 2016. – 112 s.
2. Bohdanets V. A. Geoinformatsiine kartohrafuvannia ob'ektiv pryrodno-zapovidnoho fondu / V. A. Bohdanets, A. A. Vlaiev // Pryroda Zakhidnoho Polissia ta prylehlykh terytorii. – Rozdil I. Heohrafiia. – № 11, 2014. – S. 40-44.
3. Bun A. Formuvannia geoinformatsiinoi systemy pryrodnoho zapovidnyka «Roztochia» / A. Bun, S. Synii, O. Savchyn, O. Stryamets // Politehnika». – 2011. – № 694. – S. 127-131.
4. Peresadko V. A. Geoinformatsiine zabezpechennia pryrodoochornnykh terytorii / V. A. Peresadko, O. I. Sinna, K. V. Viatkin, O. V. Bodnia // Zbirnyk naukovykh prats. – Kharkiv, 2012. – Vypusk 15. – S. 74-77.

² Developed by the authors.

³ Developed by the authors.

5. Polozhennia pro Proekt orhanizatsii terytorii natsionalnoho pryrodnoho parku, ohorony, vidtvorennia ta rekreatsiinoho vykorystannia yoho pryrodnykh kompleksiv i ob'ektiv : Nakaz Ministerstva ekolohii ta pryrodnykh resursiv vid 21.08.2014 № 273 [Elektronnyi resurs]. – Rezhym dostupu : <http://zakon4.rada.gov.ua/laws/show/z0831-05?nreg=z0831-05&find=1&text=%C7%EE%ED%F3%E2%E0%ED%ED%FF&x=0&y=0>.
6. Pro ekolohichnu merezhu : Zakon Ukrainy vid 24.06.2004 p. № 1864-IV [Elektronnyi resurs]. – Rezhym dostupu : <http://zakon3.rada.gov.ua/laws/show/1864-15>
7. Pro Zahalnodержavnu prohramu formuvannia natsionalnoi ekolohichnoi merezhi Ukrainy na 2000–2015 roky : Zakon Ukrainy vid 21.09.2000 № 1989-III [Elektronnyi resurs]. – Rezhym dostupu : <http://zakon3.rada.gov.ua/laws/show/1989-14>
8. Pro prirodno-zapovidnyi fond Ukrainy : Zakon Ukrainy vid 16.06.1992 № 2456-XII [Elektronnyi resurs]. – Rezhym dostupu : <http://zakon3.rada.gov.ua/laws/show/2456-12>.
9. Rehionalnyi landshaftnii park «Ravske Roztochchia» : ofitsiinyi sait. – Rezhym dostupu : <http://roztochia.org.ua/about>.
10. Sai V. Osoblyvosti funktsionalnoho zonuvannia zemel pryrodno-zapovidnih terytorii / V. Sai, Yu. Khavar // Suchasni dosiahnennia heodezychnoi nauky ta vyrobnytstva, vypusk I(25), 2013. – S. 145-149.
11. Khudoba V. Konstruktivno-heohrafichni zasady optymizatsii struktury zemelnyh uhid RLP “Ravske Roztochchia” / V. Khudoba // Visnyk Lvivskoho universytetu. Serii heohrafichna. – 2014. – Vypusk 45. – S. 376-385.
12. Cherniavskii M. V. Funktsionalne zonuvannia rehionalnoho landshaftnoho parku «Ravske Roztochchia» / M. V. Cherniavskii, H. S. Savka // Naukovyi visnyk UDLU, 2004, vyp. 14.8. – S. 242-252.

Development of a scheme of functional zoning of regional landscape park “Ravske Roztochchia” with application of geoinformation mapping methods

N.Stoiko, L.Tkachuk, V. Parshova

The article studies possibilities to use geoinformation mapping methods for organization of the territory of nature (landscape) parks. The investigation resulted in development of a digital map of the regional landscape park “Ravska Roztochchia” and scheme of functional zoning of the park, based on the map in 1:50 000 scale.

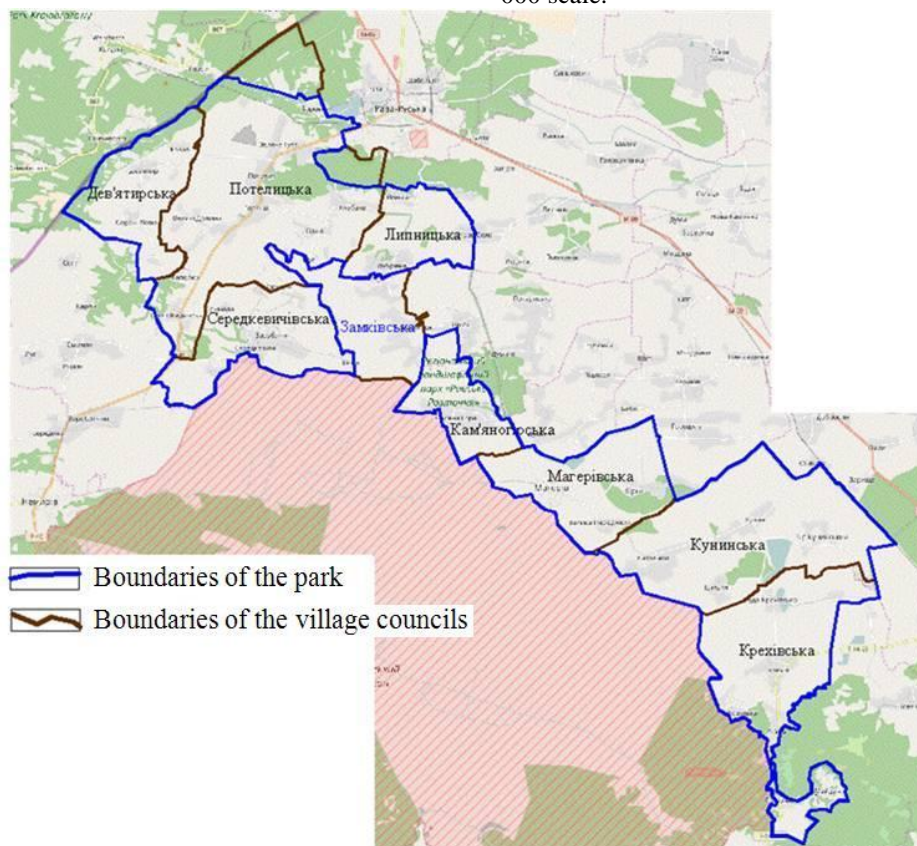


Fig. 1. Scheme of location of the territory of RLP “Ravske Rostochchia” in terms of administrative-territorial units (developed by the authors, basing on the materials of OpenStreetMap of Gisfile map service)

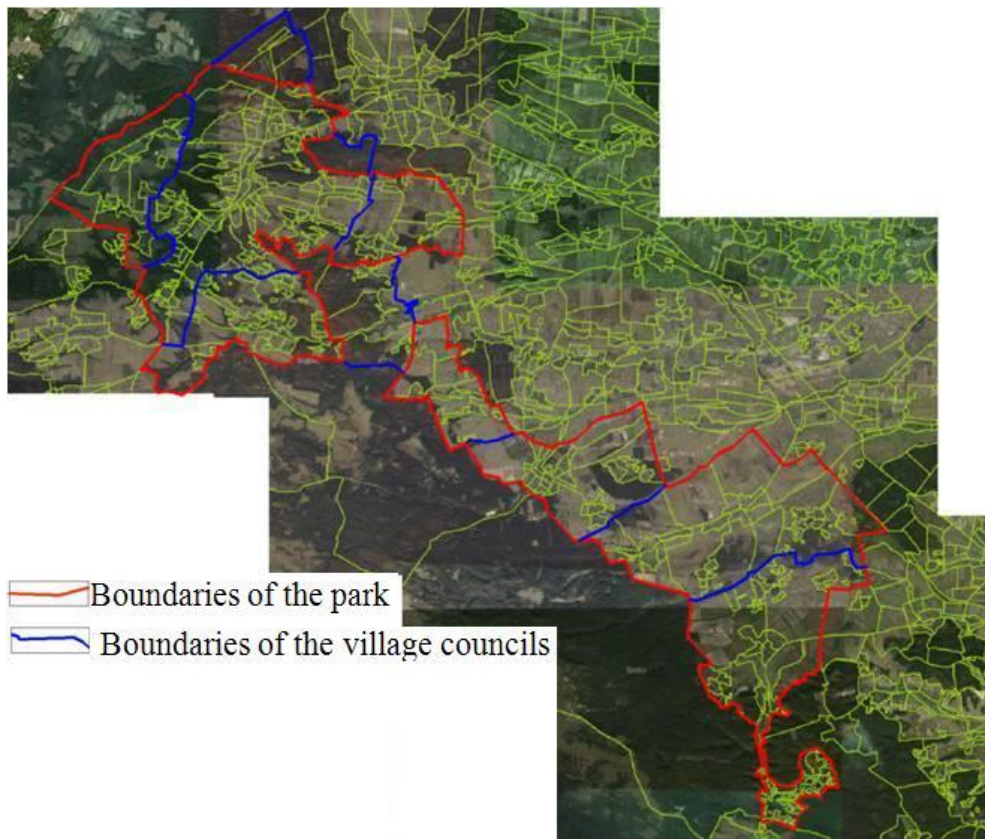


Fig. 2. Scheme of location of the territory of RLP “Ravske Rostochchia” (developed by the authors, basing on the materials of Google Satellite with application of the data of additional layer of geospatial information “Cadastral” of Gisfile map service)

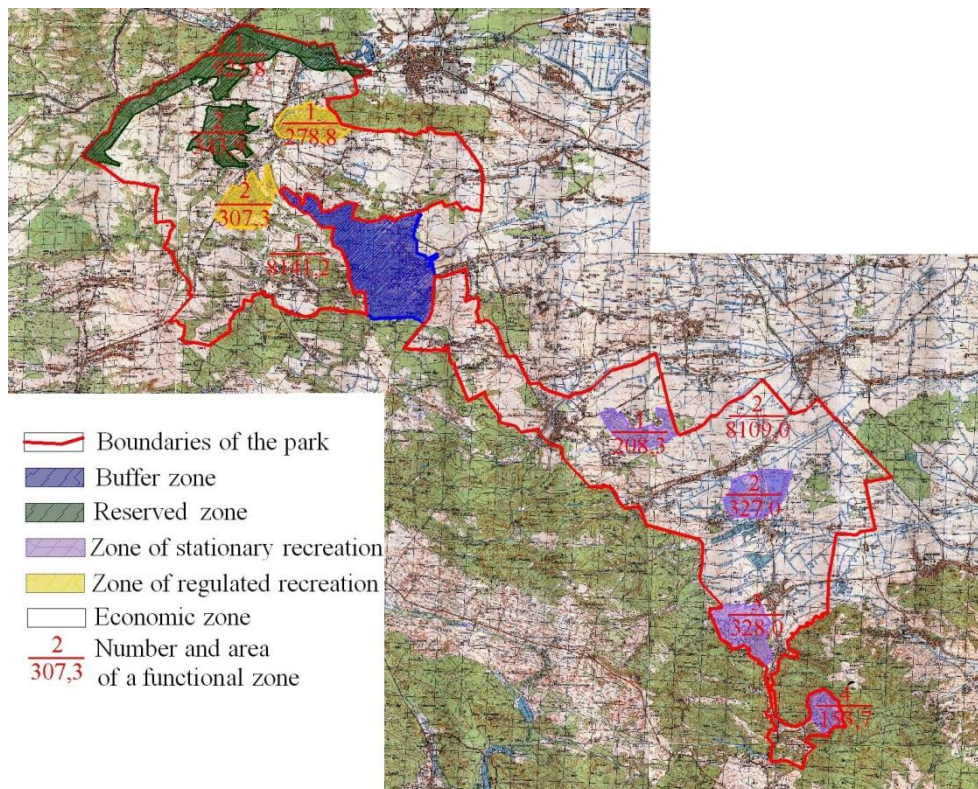


Fig. 3. Map-scheme of functional zoning of RLP “Ravske Rostochchia” (developed by the authors, basing on the topographic map M 1:50 000)