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Василий Фесюк, Иван Музычук. Особенности современного этапа использования природных ресурсов и охраны природы в Киверцовском районе Волынской области. В статье проанализированы современное состояние использования, охраны и воспроизводства природных ресурсов Киверцовского района: минеральных, водных, лесных, земельных, биологических, климатических и других. Определены основные проблемы их использования – истощение, деградация и загрязнение. Источниками реального и потенциального воздействия на окружающую среду в районе являются объекты жилищно-коммунального хозяйства, транспорта, промышленности, сельского хозяйства и объекты с повышенной потенциальной экологической опасностью. Проанализирована экологическая сеть территории и природно-заповедный фонд Киверцовского района. Для улучшения экологического состояния района были предложены следующие мероприятия: реализация государственной политики в области охраны окружающей природной среды, рациональное использование природных ресурсов, минимизация негативного влияния промышленности, сельского хозяйства, транспорта на окружающую среду, улучшение санитарного состояния территории.

Ключевые слова: природные ресурсы территории, рациональное использование природных ресурсов, экологические проблемы, устойчивое экологически безопасное развитие, мероприятия реализации стратегии устойчивого экологически безопасного развития административного района.

Fesyuk Vasily, Muzychuk Ivan. Features of the modern stage of the use of natural resources and nature protection in the Kivertsy district of Volyn region. The article analyzes the current state of use, protection and reproduction of natural resources of the Kivertsy district: mineral, water, forest, land, biological, climatic and other. The basic problems of their use are determined – depletion, degradation and pollution. The sources of real and potential environmental impact in the district are objects of housing and communal services, transport, industry, agriculture and facilities with increased potential environmental risk. The ecological network of the territory and the nature reserve fund of the Kivertsy district have been analyzed. To improve the ecological condition of the district, the following measures were proposed: implementation of the state policy in the field of environmental protection, rational use of natural resources, minimization of the negative impact of industry, agriculture, transport on the environment, and improvement of the sanitary condition of the territory.

Key words: natural resources of the territory, rational use of natural resources, environmental problems, sustainable ecologically safe development, measures to implement the strategy of sustainable ecologically safe development of the administrative district.

Стаття надійшла до редколегії
01.10.2018 р.

UDC 911.3:556:626/627

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Water Mills' Role in Transformation of Valley-river Landscapes of the Right-Bank Ukraine

Based on the results of many years of research, the distribution of water mills in the middle part of the Dnieper and Southern Bug basins together with the watershed section within the highest elevations of the Pridneprovskii hill is analyzed. Water mills are considered as landscape-technical systems (LTS), which became the root cause of the transformation of modern valley-river landscapes of the Right Bank of Ukraine. On the basis of historical geographic analysis, the process of re-equipment and restructuring of water mills in a hydroelectric power plant is shown. In accordance with the degree of safety and technical status, eight categories of mill garden and landscape systems have been identified. The vast majority of the found mines are in the «destruction» stage. It is concluded that during the process of development of river valleys a certain algorithm is observed for water mills: engineering and technical building «water mill» (to the 10th century) → milled LTS (10th century – beginning of the 19th century) → milled-hydroenergy LTS (19th century – mid-20th century) → hydropower LTS (from the middle of the 20th century).

Key words: river valley, landscape, landscape-technical systems, water mills, hydroelectric power stations.

The problem setting. Valley-river landscapes are unique works of nature that have become the core of the birth of the planet's civilizations. People have always tried to place their settlements closer to the water. River channels and floodplains were the basis for the formation of river landscape-technical systems (RLTS). Bridges, mills, hydroelectric power stations, ponds, reservoirs and canals radically changed the natural landscapes and played an important role in the economy of the river valleys inhabitants. Such systems originated with different periodicity, actively developed and decayed for millenia. In the classification of RLTS, the mill's landscape-technical systems occupied a special place. The process of their formation led to the transformation of valley-river landscapes of the Right-Bank Ukraine. Mills, where the energy of water had been used, became the main cause of replacing the natural river network with anthropogenic.

The aim of the research. To solve the mentioned above problem the author is going to consider the role of water mills in the transformation of valley-river landscapes of the Right-Bank Ukraine and characterize their current structure on the basis of spatial-temporal analysis.

Latest researches review. The prerogative of the study of engineering structures, that were built at the bottom of the river valleys, has always belonged to hydraulic engineers, hydrologists and architects. They drew attention of physiographers, but they analyzed them more than the impact of hydraulic structures on individual geocomponents of the landscape. For the first time, F. Mil'kov (1973) was interested in the landscape-technical systems (LTS) when he disagreed with the opinion of Ye. Neief [10] that the engineering structure has only a mediated interest for physiographers in terms of its influence on natural landscape complexes. According to F. Mil'kov: «The complex created by a person remains an engineering structure, if he does not obey the processes of natural development and becomes a neolandscape, when its development begins to be determined by the framework of natural laws» [9, p. 53]. Famous scientists G. Denysyk believes that the LTS is divided into landscape engineering (LES) and landscape-technogenic systems (LTS). Unlike the actual anthropogenic landscapes, LTSs are not component but block systems, where the technical unit plays a major role. Therefore, their research must be conducted at the geotechnical level, where the landscape knowledge of the object is supplemented by their engineering characteristics [4]. In the context of the study of anthropogenic landscapes of the Right-Bank Ukraine, G. Denysyk [4–7], Yu. Tyutyunnyk [11], G. Hayetskyi [12], I. Gamaliy [3] and M. Shmagelska [13] studied of water mills as landscaping and technical systems confined to the river valleys.

The research methods. During 2008–2018, the author have been researching water mills in the middle part of the basins of the Dnipro river and the Southern Bug with a strip of watershed within the highest altitudes of the Pridniprovska hill. The transitional strip causes the greatest interest, as there is a change in the hydrological and geomorphological conditions of water milling within the two largest river basins in Ukraine. Left bank tributaries of the Dnipro river and Southern Bug of I–IV orders, as well as the proper channel of the Southern Bug river had been investigated. River systems were studied in details, ranging from the systematic complete study of the river along its entire course (Rostavytsya, Unava), and ending with random «spot» observations in separate points on certain watercourses. In total, 72 points were studied on 16 rivers. They were photographed, some were measured. Information on the history of construction was received from the local population, and then all information was found in accessible historical and thematic literature. Much attention was paid to the landscape, hydrographic and hydrotechnical environment of mill structures, since they were built up and function in an inseparable connection with the natural and associated technical conditions, integrating into the local landscape.

Research results. The first mills in the valleys of the Right Bank Ukraine began to build during the times of Kyiv Rus (X–XI centuries) in the Galych and Volyn principalities [4] on Dnipro and Dnister tributaries. At that time, they were primitive wooden constructions, which were built exclusively for the processing of agricultural products. The ponds made by the dams were used for fish breeding and water supply [8, p. 36]. The active formation of the millarial landscaping and engineering systems on the rivers of the Right-Bank Ukraine took place until the beginning of the 19th century.

The paleolandscape basis for the formation of the LTS was a natural flow, where the aquatic swamp areas alternated with the pillars along the flow. Transformation took place in two variations. In the aquatic areas of the reaches with small flow velocity (up to 0.6 m/s), the ponds had been built. For that reason, the river and the flood were blocked by the dam, and as a result the pond water flooded the territory of the flood plain. Mill houses were located on the one side of the dam, or, for example, as on the river Southern Bug in the village Shchedrove (modern Letychiv), on both sides. Water from the head race of a pond was applied to the wheel, due to which the torsion moment was transmitted to the millstone, which crushed the grain. As a result, the natural channel and flood types of areas were changed to anthropogenic pond and flood.

At sections of rapids with rifts, where the flow velocity was accelerated (up to 3–5 m/s), the water was directed to the turbine (wheel) due to the dam or drainage channel. To do this, a trench had been laid within the floodplain. It separated its part from the land, and as a result an elongated island had been formed. Actually, mill structures with grinding mechanisms were located in a floodplain, and rooms with wheels or turbines were located in a stream or a canal. As the drainage channel, the natural shallow water sleeves of the river used to separate the islands from the floodplain. Sometimes the mill complexes were built (Sokilets village of Vinnytsia region, Lupolov village of Kirovograd region), where one mill building with economic buildings was located on the floodplain, and the other (through the canal or shallow water sleeve) – on the surface of the island. Thus, anthropogenic – (channel) type was formed instead of the natural channel type of terrain.

As far as a constant control is required for the normal functioning of each landscape-engineering system, the newly formed rates and channels had been regularly cleaned from the mud and wetland vegetation; the shores and the bottom of the canals were strengthened by the debris of local rocks; trees and undergrowth were cut on newly formed islands; the damaged dams were rebuilt after floods etc. This provided the opportunity for the long coexistence of natural and technical blocks of the landscape.

With the development of scientific and technological progress and the growth of the needs of society, the goal of obtaining food was complemented by electricity obtaining with the help of usage the energy of water flow. Since the 19th century, the first mill-hydropower landscape and engineering systems were being built in the valleys of the Right-Bank Ukraine rivers. Additional turbine equipment was installed on the mills or mills were re-arranged in a small hydroelectric power station. Human control over the technical unit has increased since the national economy was developing at a rapid pace and society required more resources. At the beginning of the 20th century the number of mills, hydroelectric power stations and ponds on the rivers of the Right Bank Ukraine has sharply increased.

The military operations of the First (1914–1918) and Second World Wars (1939–1945) negatively reflected on the state of the mill-hydropower landscape-engineering systems. Mills and hydroelectric power stations that were considered as strategic objects were destroyed. Thus, the loss of human control over the technical unit was the first step towards the transition of the landscape-engineering systems to the category of landscape technogenic systems.

Rebuilding the national economy and increasing the population after the end of the war again led to a change in the purpose of using the river network. The goal was to get more electricity and food to provide the population with recreational resources. Until the mid-50s of the 20th century, the process of formation of hydropower landscape engineering systems (HLES), where a low-power hydroelectric power stations played a central role, took place at an active pace. It is worth noting the regularity – hydroelectric power stations were mostly built on the site of a former destroyed mill or near it. Thus, the milled LTS «revived» in the hydropower landscape engineering system.

The construction of hydroelectric power stations, as well as mills, was made near sections of rifts with rapids, where crystalline rocks are a solid foundation for dams and prevent filtration of water under them [1]. Equally important role was played by the reliable connection of the «body» of the dam with the land, for which it had to be deeply fixed in the slopes. Therefore, the most advantageous places for HES were canyon-like areas of valleys with steep stone slopes. Close location of quarries or the presence of crystalline rocks, which ensured the rapid delivery of building materials and cost savings was of great significance [5]. In the overwhelming majority the reservoirs of the hydroelectric power stations, which were built for the support of water, flooded the river, floodplain, only partially the first floodplain terrace and slopes of the valley. There was a significant amount of derivative HES, functioning in the structure of hydroelectric power stations and mills, drainage channels, anthropogenic islands.

Beginning in the mid-1950s, after the start of the construction of a number of hydroelectric power stations in the Dnipro River, a radical change in the valley-river landscapes of the Right Bank Ukraine began and lasted until the end of the century. During this period there was the formation of hydropower landscape engineering systems, which the structural organization consisted of buildings of HES with dams of a support type, reservoirs and areas of tail water. Provision the population with a significant amount of electricity caused the corresponding design capacity of the hydroelectric power stations and reservoirs. Parameters of reservoirs on the rivers of Ukraine (area at a normal level of support (NSL) – 2.252 km^2, length – 230 km, static volume of water at NSL – 18.18 km^3, maximum depth – 53 m [2, p. 94]) caused a significant flooding of river valleys. In connection with the large-scale rise of water level in the Dnipro river valley a number of settlements was canceled. The residential class of landscapes has changed into an anthropogenic water.

During the construction of cascades of hydroelectric power stations, water, in addition to the streams and flood plains, flooded the I–III floodplain terraces and slopes. It led to the creation of a new anthropogenic type of land – floodplain and reservoir. Within the reservoirs there is a shallow water depth (depth up to 5 m with a normal supporting horizon) and deep-water (more than 5 m) types of landscapes and a series of derivatives of complex tracts (tracts of deep water, tracts of the transition zone, shallow tracts), which were described in detail in the works [4; 12].

As a result of the construction of the dam, the hydroelectric power stations formed new tracts of lower reservoir buffers, with a central stream or thresholds as the paleolandshift basis. Depending on the mode of operation of the hydroelectric power station, its parameters, type of a dam, these tracts have different characteristics that are constantly changing. Thus, below the current from the dam, where the water goes to the discharge, in the tracts of the tail water, the depth of water, the velocity of the flow and the intensity of the alluvium are increased. Shield-type dams, which are in the closed state, on the contrary cause the water level dropping to 0,5–0,3 m. In the coastal part of such tracts, the accumulation of material takes place and waterborne vegetation is actively developing [5, p. 66].

The use of powerful hydroelectric power stations has led to the loss of control over the technical unit of the mill-hydropower landscape engineering systems. A significant part of them became a category of landscape-technogenic systems. As a rule, this phenomenon is characteristic of the landscapes of the valleys of Dnipro, Dnister, Southern Bug, Seret, Prut and their tributaries.

According to the degree of preservation and technical condition, the researches carried out, as well as some theoretical considerations, give grounds to distinguish eight categories of milled landscape-technical systems. 8 are completely preserved in a functional state, including an external hydraulic drive (active or inactive). We found only 1 such mill. It is located in Trubiyivtsi village of Ruzhynskyi district in Zhytomyr region. It was built in 1953 and has a mini-HES. This explains the safety of the power hydraulics. Unlike the overwhelming majority of the other mills we studied, it is located not in special remote structures, but directly in the «body» of the mill-HES building, on its basement floor. This fact, as well as the «youth» of structures, contributed to the preservation of the water-energy turbine device, although it does not function. 7A – fully preserved, except for the hydraulic drive, which can no longer function. 16 continue to operate as mills (electric), warehouses, hotels, museums, etc. 7B – similar to 7A, but not exploited in any way. They are «preserved». We identified 17 such mills. 6 – well preserved from the outside, but internal structures (floors, ladders, galleries, etc.) are partially destroyed, the production mechanisms are completely or partially removed. Such mills is marked 6. 5 – the internal structures, that are completely destroyed, only the walls, the frame of the structure remained in a relatively good condition. 7 mills identified. 4 – the structure is partially destroyed (approximately 70–30 %), there are separate walls or their parts with window openings, well-defined foundation, remnants of hydraulic engineering structures (sometimes even with fragmentation of turbines), etc. We found 7 of them. 3 – the building is destroyed in 100 %, there are heaps of stones left, some small fragments of walls, remnants of the foundation, etc., but the object on the ground is identified well, with no effort. 8 was found. 2 – the building is completely destroyed, its fragments are poorly preserved and not immediately identified on the ground – only after some simple search work. We found 10 of them. 1 – there are 1–2 traces from the building – a stone, a beam, several bricks, etc., which appear only after careful searches. 4 of them we found. Groups 1–3 are grouped together in the category of industrial traces.

Spectacular objects are objects from 7–4 groups (55). But the industrial footprints of the 1st to 3rd groups (22), although formally and little to give preservation of historical and cultural monuments (in our case, the agro-industrial monuments of the mill manufacturing culture), have a remarkable value. It is necessary to shift the emphasis on the issues of the actual conservation of monuments in the sphere of confinement. The industrial footprint is the last material witness of past production events, technical history. In jurisprudence, there is the notion of «witness protection»; it makes sense to introduce it also in the memorial saving case. The last witness is important simply because of its existence – even if it is a half-decayed beam, a piece of concrete or a bunch of bricks. He will disappear – the authentic memory of the place will disappear, its image gets worse, the artifact will go away into eternity. Of course, this will happen once, but later, the more generations will have the opportunity to feel and see the history of their region, but not abstractly through text, images, memories, and specifically – through the artifact of the same story.

The surface of anthropogenic islands formed after the construction of mills and hydroelectric power stations with a derivative channel, over 90 % overgrown with wood and bush vegetation. The following tree are dominated: abele (Populus alba L.), smooth elm (Ulmus laevis Pall.), ash-leaved maple (Aeser negundo L.), alder glue (Alnus glutinosa (L.) Gaertn.), willow (Salix fragilis L.), white willow (S. alba L.), goat willow (S. caprea L.) and branchy plum (Prunus divaricata Ledeb.); the undergrowth was formed by roundear willow (S. aurita L.), single-seed hawthorn (Crataegus monogyna Jacg.), spiny thorn (Prunus spinosa L.); in the herbage, there is a great sedge (Carex vulpina L.), burdock (Arctium lappa L.), great nettle (Urtica dioica L.), spotted parsley (Conium maculatum L.), water avens (Geum rivale L.), etc. [5]. Drainage ducts, which supplied water to mills turbines and HES, were run down, dried up and overgrown with reed beds and asbestos associations. In the end, the loss of control over the technical unit has led to environmental imbalances.

Conclusions. Water mills played an extremely important role in the socio-economic development of the Right-Bank Ukraine: they provided the population with cereals and flour, served as an ornament of the countryside, regulated water in the rivers, were the place of concluding business agreements, etc. From the landscape science point of view, the main significance of the mills is that these LTSs were the root cause of replacing the natural river network with anthropogenic. Historical and geographic analysis of the formation of river landscape systems and their structure makes it possible to trace peculiar patterns that are characteristic of the process of anthropogenization of valley-river landscapes of the Right-Bank Ukraine. Analyzing the development process of river valleys by water mills, there is a certain algorithm for the transformation of valley-river landscapes.

The algorithm is based on three consecutive stages of LTS formation. Each modification of the system is conditioned by the social needs of society, which has certain needs at different stages of its development. The system change has two variants, which depend on the features of the engineering and technical facilities and the control over the technical unit of the LTS. The results of the functioning of all systems are the same – material goods obtaining, the needs of which are constantly increasing. Throughout the history of economic development of the river valleys of the Right Bank Ukraine, the following sequence of development is clearly traced: engineering and technical building «water mill» (to the 10^{th} century) → milled LTS (10^{th} century – beginning of the 19^{th} century) → milled-hydroenergy LTS (19^{th} century – mid-20^{th} century) → hydropower LTS (from the middle of the 20^{th} century). The transformation of the natural block, which manifests itself through its influence on natural valley-river landscapes, leads to the emergence of anthropogenic types of terrain and leads to the formation of a category of landscape-technogenic systems. Improving the previous system or creating a new one in the final version, along with a positive result, has a negative effect. As a rule, these are modern environmental problems of the rivers of the Right Bank Ukraine, which could be prevented by constructive planning of engineering and technical structures and taking into account possible variations in the development of LTS.

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Лаврик Александр. Роль водяных мельниц в трансформации долинно-речных ландшафтов Правобережной Украины. Основываясь на результатах многолетних исследований, проанализировано распространение водяных мельниц в средней части бассейнов Днепра и Южного Буга вместе с полосой водораздела в пределах наивысших высотных отметок Приднепровской возвышенности. Водяные мельницы рассмотрены как ландшафтно-технические системы (ЛТчС), которые стали первопричиной трансформации современных долинно-речных ландшафтов Правобережной Украины. На основе историко-географического анализа показан процесс переоборудования и перестройки водяных мельниц в гидроэлектростанции. В соответствии со степенью сохранности и технического состояния выделены восемь категорий мельничных ландшафтно-технических систем. Подавляющее большинство обнаруженных мельниц находятся на стадии «разрушения». Сделан вывод о том, что в процессе застройки речных долин водяными мельницами наблюдается определенный алгоритм: инженерно-техническое сооружение «водяная мельница» (до X в.) → мельничные ЛТчС (X в. – начало XIX в.) → мельнично-гидроэнергетические ЛТчС (XIX в. – середина XX в.) → гидроэнергетические ЛТчС (с середины XX в.). Учет предыдущего опыта застройки речных долин инженерно-техническими сооружениями позволяет конструктивно планировать использование природных ресурсов в их пределах.

Ключевые слова: речная долина, ландшафт, ландшафтно-технические системы, водяные мельницы, гидроэлектростанции.

Лаврик Олександр. Роль водяних млинів у трансформації долинно-річкових ландшафтів Правобережної України. Ґрунтуючись на результатах багаторічних досліджень, проаналізовано поширення водяних млинів у середній частині басейнів Дніпра та Південного Бугу разом із смугою вододілу в межах найвищих висотних позначок Придніпровської височини. Водяні млини розглянуто як ландшафтно-технічні системи (ЛТчС), які стали першопричиною трансформації сучасних долинно-річкових ландшафтів Правобережної України. На основі історико-географічного аналізу показано процес переоблаштування й перебудови водяних млинів у гідроелектростанції. Відповідно до ступеня збереженості та технічного стану виокремлено вісім категорій млинарських ландшафтно-технічних систем. Переважна більшість виявлених млинів перебувають на стадії «руйнування». Зроблено висновок про те, що у процесі забудови річкових долин водяними млинами спостерігається певний алгоритм: інженерно-технічна споруда «водяний млин» (до X ст.) → млинарські ЛТчС (X ст. – початок XIX ст.) → млинарсько-гідроенергетичні ЛТчС (XIX ст. – середина XX ст.) → гідроенергетичні ЛТчС (з середини XX ст.). Врахування попереднього досвіду забудови річкових долин інженерно-технічними спорудами дає змогу конструктивно планувати використання природних ресурсів у їх межах.

Ключові слова: річкова долина, ландшафт, ландшафтно-технічні системи, водяні млини, гідроелектростанції.

Стаття надійшла до редколегії
09.10.2018 р.

УДК 631.95:628.516:615.849(477.82)

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Агрохімічні особливості радіоактивно забруднених ґрунтів Волинської області

Здійснено аналіз найважливіших агрохімічних показників ґрунтів (середньозважені показники вмісту азоту, показники реакції ґрунтового розчину, показники вмісту рухомого фосфору, показники вмісту обмінного калію) у зоні радіоактивного забруднення як важливих чинників, що визначають динаміку та нагромадження токсичних речовин. Ґрунти характеризуються зниженим умістом азоту, середньо забезпечені фосфором та мають низький та середній уміст обмінного калію. За показниками ґрунтового розчину (pH) вони віднесені до дуже кислих, кислих та слабо кислих. Зазначене зумовлює необхідність проведення агрохімічних заходів із метою радіаційної безпеки, насамперед вапнування кислих ґрунтів, внесення органічних добрив, внесення підвищених доз фосфорних та калійних добрив, оптимізацію азотного живлення рослин, внесення мікродобрив, застосування засобів захисту рослин.

Ключові слова: ґрунт, агрохімічний аналіз, радіонукліди, азот, фосфор, калій.
