Acta Agrophysica, 2000, 26, 285-299

PROBLEMS OF ECOLOGICAL REHABILITATION OF LAKE-MIRE COMPLEXES

N. Bambalov, I. Tanivitsky, S. Belenky, V. Rakovich, T. Selivonchik, N. Molokova

Institute for Problems of Natural Resources Use and Ecology, Academy of Sciences of Belarus, 220114, 10 Staroborisovsky Tract, Minsk, Belarus

A b s t r a c t. The problem of organizing scientifically based usage of natural resources of lake-mire complexes (LMC) was under investigation. It is shown on the example of the Bulev Mokh-Chervonoe LMC that due to intensive anthropic influence destabilization of biospheric processes takes place on large territories. Methods of ecological rehabilitation oriented to the restoration of both biospheric and economic functions of the LMC territories are suggested.

K e y w o r d s: lake-mire complexes, ecological rehabilitation.

INTRODUCTION

An important problem, which still remains unsolved, is organization of scientifically based use of natural resources of lake-mire complexes (LMC) which represent indivisible ecosystems of lakes and mires, functioning in the common regimes and rythms. For several decades many lakeside mires of Belarus were drained for agricultural purposes and for peat extraction. In total together with natural processes of sapropel accumulation is resulted in lake shallowing and polution, in overgrowing and accelerated swamping. Many of the lakes ceased to be the source of clean water and their fish productivity was reduced many times. Due to destruction of biospheric functions of mires, destabilization of biospheric functions on vast territories started and gave a negative effect on the environmental conditions. It is obvious that ecological rehabilitation of anthropically destroyed LMC is necessay in order to restore their ability to reproduce natural resources and to fulfil their economic functions. The ways and methods for ecological rehabilitation can be different depending on the LMC genesis, degree of its anthropic destruction and problems to be solved.

OBJECTS AND METHODS OF INVESTIGATIONS

We used the numerous lakes of Belarus with adjoining peat mires as investigation objects.

The LMC genetic diversity was studied in field conditions. Stratigraphic peculiarities of peat and sapropel deposits were studied both from geological materials and by means of additional well boring. Anthropic destruction and general LMC conditions were estimated by field studies and laboratory water analysis.

The main object on which example of different variants of ecological rehabilitation were studied, is the Bulev Mokh-Chervonoye LMC, the largest in the Belarussian Polesye, which is situated on the territory of Minsk and Gomel administrative regions. Its anthropic destabilization is caused by simultaneous influence of industrial peat extraction, peat soil melioration, groundless water withdrawal from the Chervonoye lake for economic needs, lake embankment and pollution of the water catchment area in the process of economic activities.

RESULTS AND DISCUSSION

LMC genetic diversity

By analogy to peat-mire complexes [5] LMCs should be referred to as natural systems of various and uniformity including lakes, mires, slopes of local watersheds, with uniform hydrologic regime and physico-geographical processes. The LMC's area is restricted to the crests of local watersheds or borders of the watershed as a whole. Within the borders of a lake or mire, LMC swamps and waterless areas influence each other [1].

The LMC of "Koren" (Fig. 1) where mires are closely interacting with lakes and fulfil important water catchment protecting functions, is a typical example. It is situated in the Braslav district of the Vitebsk region on the water catchment of the Gustatka and the Zolvitsa rivers and consists of a lake, raised and lowland mires [2]. Water reserves of the mires are much bigger than those of the lake. During a dry period of the year, the mires give and during high waters they take some part of the lake water thus smoothing out its sharp fluctuations. Besides, the mires of this complex play an important role of a geochemical barriers protecting the lake from chemical fertilizers and pesticides from agricultural fields. That is why the lakeside mires drainage will lead to the lowering of water level, reduction of water reserves and acceleration of process of lake eutrophication and finally to its swamping and annihilation.

Combination of natural factor stipulated great diversity of LMC in Belarus due to diversity of forms and depression levels, hydrologic and hydrogeologic

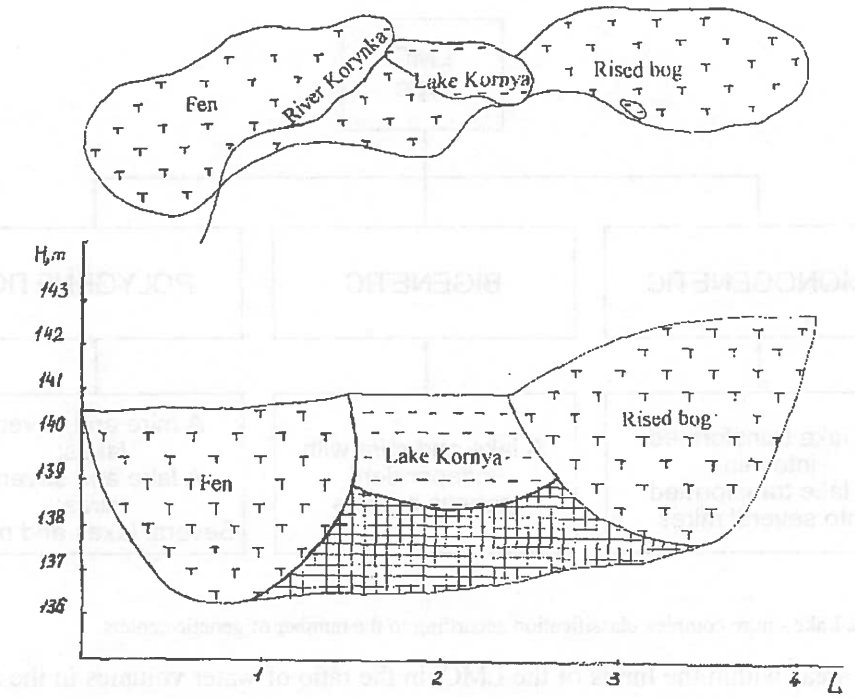

Fig. 1. Kornya lake - mires complex.

conditions, granulometric and mineralogic composition of ground and other natural factors. Three large groups of LMC can be singled out according to the number of genetic centers: monogenetic, biogenetic and polygenetic or complex (Fig. 2). Monogenetic LMC have only one genetic center, i.e., a lake, which after the stage of swamping transforms into one or several mires. Within the limits of this group LMC at different stages of water surface swamping are distinguished. Biogenetic LMC have two genetic centers within the limits of the total area of the local water catchment, i.e., a lake and a mire. Polygenetic or complex LMC have several genetic centers (mires and lakes) within the limits of the total area of the local water catchment. Irrespecitve of the number of genetic centers (lakes and mires) within the limits of an individual LMC have a common hydrologic regime.

Diversity of every genetic group of LMC is manifested in various types of mires (lowland, transitional, raised) and lakes (mesotrophic, eutrophic, distrophic).

Geomorphological and morphometrical parameters increase LMC diversity. Thus, they can differ in the degree of water catchment swamping (up to 100%), in the length of the lake and mire continuity line (up to 100%), in the ratio lake and

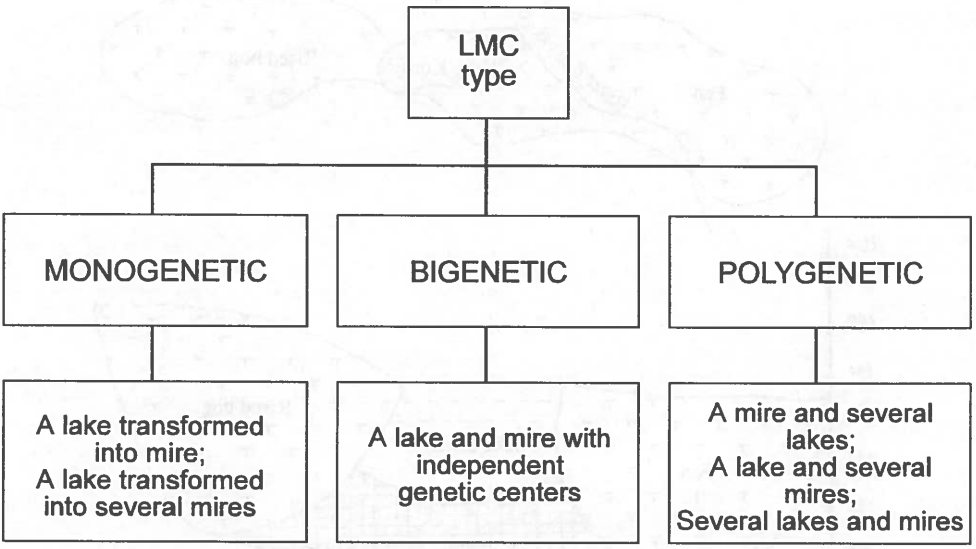

Fig. 2. Lake - mire complex classification according to the number of genetic centers.

mire areas within the limits of the LMC, in the ratio of water volumes in the lakes and mires as well as in the mutual disposition of the lakes and mires in the relief.

Anthropic changes in the LMC

It is of a principle importance, that irrespective of the genesis, anthropic destabilization of even a single component within the LMC boundaries will inevitably result in the destabilization of other components and the complex as a whole. For example, any human activities on the peat deposits destabilized such large LMC of Belarus as the Osveysky LMC, Elnya LMC, Bulev Mokch-Chervonoye LMC.

Anthropic destabilization of the natural regime of the Osveyskoye peat deposit and of the Osveyskoye lake, which represent parts of the LMC of the same name, couse of disturbance of ecological situation which resulted in the accelerated swamping of the second lake in size in our republic. In order to improve ecological situation of the Osveysky LMC it is necessary to excavate sapropel, clean the lake surface from the floating draft islands, attach lakeside floating drafts and restore mire-formation process on the drained lakeside peat deposits as well as to cease inflow of polluted water from the town of Osveya.

Anthropic destabilization of the north-east part of the peat deposit Elnya caused by the drainage network peat extraction threatens natural functions of the

largest hydrological reserve of the region including about 100 lakes, which is also important for the preservation of biodiversity on the planetary scale. In order to eliminate anthropic destabilization of the Elnya LMC and to restore the natural regime of its function, it is necessary to stop water escape by building coffer-dams on water canals of the drainage network.

In order to avoid negative ecological consequences, peat deposits in the LMC system must be preserved in the natural conditions. To take correct decisions on the organization of exploitation of natural resources of LMC, acceptable for the biosphere, it is advisible to compile their a complete list and a map and to elaborate production-genetic and ecological-genetic classifications.

The complex of Bulev Mokch-Chervonoe is an example of an extremely degraded LMC, which destabilizes biospheric processes on a large territory due to intensive many-year anthropic influence on all the components of the complex. i.e., the Chervonoe lake, peat deposit of the Bulev Mokh and the watershed area. The main anthropic influence on this LMC is represented by the land melioration, peat extraction, elimination of forest-shrub vegetation, water pollution in the water catchment and withdrawal of big quantities of water from the lake. Such anthropic pressure is very typical for many LMC. That is why the main principles and methods of LMC rehabilitation will be useful for other degraded LMCs. While restoring biospheric and economic functions of an anthropically destroyed LMC it is necessary to follow an individual approach which must take into account specific features of a given LMC: its genesis, hydrogeology, morphology, specificity of the anthropic influence, etc.

The most important genetic peculiarity of the Bulev Mokh-Chervonoye LMC is the lake and peat deposits in the same depression (Fig. 3). The Bulev Mokh peat deposit occupies the area of 279 km^2, the Chervonoye lake occupies 43 km^2.

The peat deposit stretches from the West to the East for more than 30 km, and from the North to the South for about 12 km. The peat deposit is composed of lowland peat (90%), lowland-forest peat (6.9%), transitional and raised peat (3.1%). The deepest places are filled with weakly decomposed sedge-hypnic and hypnic kinds of peat deposited above the lake sediments. 24 plots and sapropel lenses with the area from 1.5 to 597 ha were exposed on the peat deposit. The total area of sapropel underlying peat constitutes 1004 ha with the average depth of 1.28 m. The largest plot of sapropel (597 ha) is situated to the East of the lake. Its average depth is 1.7 m, and the maximum depth is 5.2 m. In the western part of the deposit there is a sapropel plot occupying the area of 137 ha with the average depth of the lake sediments of 1.25 m, maximum - 2.2 m. The remaining small plots and lenses of sapropel have the depth of less than 1 m. To the South of the lake coastiline there are

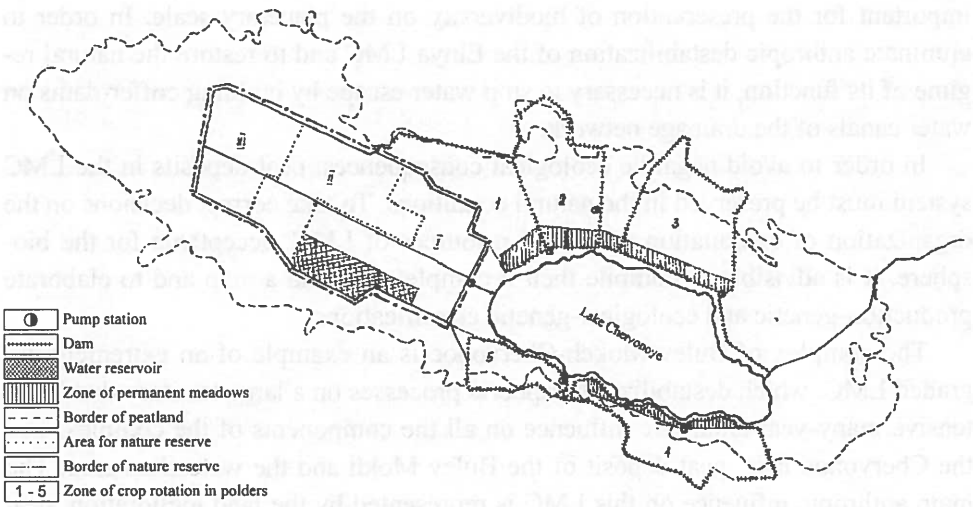

Fig. 3. Bylev Mokh-Chervonoye lake-mire complex.

also sapropel plots but their depth is not big (0.2-1.0 m). Three kinds of sapropel are widely distributed, i.e., organic, siliceous and carbonate.

The Bulev Mokh-Chervonoye peat deposit is a source of raw materials for the Peat-Briquet Plant of Zhitkovichsky. Its area is 8613 ha of which 7617 ha are situated to the West of the Chervonoe lake and 996 ha are situated to the East of the lake. The western part of the peat deposit was primarily developed in 1968. Peat extraction by the milling method has been conducted since 1971. In the western part of the peat deposit 4026 ha are alloted for peat extraction, of which 1493 ha are situated on the territory of the Gomel region and 2533 ha - on the territory of the Minsk region. At present, 682 ha are under peat extraction and 810 ha are in reserve. Out of the total area of the raw material resources (8613 ha) 2534 ha are exploited regions. They are situated to the West of the Chervonoye lake. Some part of them are flooded with water as the deposit surface is lowered by peat excavation.

In 15 years about 1.6 thousands ha of the exploited areas with the peat layer of 0.5 m were recultivated and turned over to the former land tenurers for agricultural use. But they are hardly used for agriculture. Out of them 1.1 thousands ha are overgrown with birches and shrub. Some part of them is re-swamping now. About 1053 ha of the lands were turned over to the Zhytkovichsky and Starobinsky timber industrial enterprises for forestation without recultivation. The new production territories for peat extraction are being prepared further to the West of the peat deposit.

In the South-East of the peat deposit there is the Chervonoye lake which is the third, in size lake in Belarus and the largest in the Polesye. Peat deposits surround the lake. The lake's hollow is of a residual type. It is oval in form and stretches to the West. The slopes of the hollow are gentle and along considerable length they imperceptibly merge with bordering mires. In the North and North-East they are not strongly pronounced and are covered with forest. In the South they have sandy structure. The lakeside line is slightly indented, its length is about 30 km. The lake shores are low (0.3-0.5 m), gentle, swamped, here and there of loamy sand up to 2 m high. They are overgrown with water-mire vegetation, here and there they are covered with shrub. To the South of the lake the flood-lands are well pronounced and covered with a dense network of melioration canals. The bed of the lake is flat with the prevailing water depth of 0.5-0.7 m. Along the southern shore there is a narrow gutter in the underwater relief, which consists of a number of reserved hollows with the depth exceeding 2 m. There are 5 islands on the lake. Their surface dominates over the water level and is covered with water-mire vegetation. The biggest tributaries of the lake are the Osovskaya trench, Tesna trench, the Demenka river. Drainage from the lake takes place along the Zhytkovichy and Ozerny canals. At present, the lake is dammed by the polder systems in the North and in the South whereas in the West there is a dam which protects peat extraction fields from flooding. During spring floods, lake water rises to the level of the dams and can partially overflow in the South-West direction along the water-delivering canal and in the eastern direction. Due to the necessity to preserve spring flood waters overflowing the lake flood-lands, it is necessary to withdraw the peat extraction fields of the eastern part of the Bulev Mokh peat deposit from the peat briquet plant of Zhytkovichsky and to create favourable conditions for the spring flooding.

There are three genetic types of deposits in the Chervonoye lake: hypnic and sedge-hypnic peats on the bottom are changed by into younger deposits of peat-sapropel. The surface adjoining the deposit layer in the eastern part of the lake and the upper section of the open-coast in the western part are represented by the aquatic vegetable (protococcals and diatoms) sapropels. The basic kind of the lake deposits are peat sapropels which were formed in a comparatively shallow lake under a permanent influence of the peat-formation processes in the water catchment. The maximum depth of the sapropel deposit is 6.5 m, medium depth is 2.0. The sapropel reserves of the zero level is 69.8 mln m^3.

The Chervonoye lake is a system-forming nucleus of the LMC where it is large water accumulator playing the role of an active water regulator of the territory. Intensive economic development of the water catchment area and anthropic influence

which has noticeably increased in the post-war time, led to pronounced changes in the lake-mire complex and their noticable destabilization and degradation.

As it is known, peat deposits situated in the same hollow as a lake have direct hydraulic bounds with it. Any changes of the natural hydrologic regime of the peat deposit lead to the breach of the lake regime. Melioration and excavation of peat deposits un-coordinated economic activities and a number of other reasons stipulate destabilization of the ecological conditions of both peat deposit itself and the adjoining territories. Information given in Table 1 shows that all the biospheric functions of mires stop or are strongly transformed after drainage [3-5]. Meliorated and exploited territories of the Bulev Mokh peat deposit ceased to purify atmosphere from redundant carbon dioxide and supply it with oxygen. They lost their water regulating significance for the region, they creased to be the dwelling place of the mire flora and fauna etc. At present, a tendency for the natural environment degradation in the Bulev Mokh peat deposits continues.

The main factors influencing natural components of both peat deposits and the adjoining territories are: wide-scale melioration of the water catchment area, peat extraction in the Bulev Mokh peat deposits, damming and creating polder systems in the lake flood-lands, uncontrollable withdrawal of the lake water for the water supply of fish-farms of Krasnaya Zorka (ponds) as well as lake sapropel extraction. According to the preliminary estimations, water withdrawal is approximately ten times higher than the fish-farm actual demand.

Reduction of the water catchment area changed conditions of the lake water supply which, in combination with water withdrawal exceeding the standards for the fish-farms, resulted in the transformation of lake water balance. Simulatneously, water escape from the meliorated systems accelerated silting of the water reservoir, enrichment of the water mass with mineral fertilizers (NPK) and, consequently, led to the increased trophic levels of the lake, deterioration of the oxygen regime, decrease of the water transparence and to same other negative processes. Occurence of the above negative processes reduced zooplankton quantity and biomass and fish productivity of the water reservoir.

The negative ecological effects found in the Bulev Mokh peat deposits can also be explained by drainage and peat extraction. A decrease in the ground water level was observed. The exploited areas after peat extraction are 1.0 to 1.5 m lower than the boundary water level of the lake. In the extraction zone vegetation, traditional dwelling place of marsh birds and aquatic birds was eliminated. The northern part of the lake is silted with peat, which has been delivered by the water brought by the pumping station from the extraction fields. Anthropic transformation of the water

Table 1. Comparative estimation of mire and peatland functions in natural and drained conditions

Names of functions	In natural conditions	In drained conditions
	Irreplaceable functions	
Accumulative	The process of peat, water and biogenic elements accumulation.	The process of dehydration of peat deposit, peat mineralization, and withdrawal of biogenic elements from the peatland.
Biological	Reproduction of mire plants and animals reproduction.	Mire plants and animals are eliminated or forced out and changed by other kinds of plants and animals.
Landscape-geomorphological	There are mire landscapes which serve as habitats for mire plants and animals. Peat layer grows, surface go up.	Mire landscapes are eliminated, changed and replaced by agriculture or by anthropically destroyed and degraded territories subjected to fires. Surface level goes down.
Interrotational	Transition of biogenic elements from the biogenic rotation of substance and energy to the geological one.	Transition of biogenic elements from the geological rotation of substance and energy to he biogenic one.
	Replaceable biospheric functions	
Gas regulation	Purification of atmosphere from the redundant carbon dioxide and its enrichment with oxygen.	Oxygen withdrawal from atmosphere and the emission of carbon dioxide.
Hydrological	Mires and peat deposits support water regime of their own territories and adjoining territories.	Depending on the depth of drainage, water regulating function of the peat deposits is noticeably decreased or completely destroyed.
Geochemical	Peat deposits and plant cover are geochemical barriers to chemical element migration.	The function of geochemical barrier is noticeably reduced as the peat deposits are excavated.
Climatic	Natural peat deposits are good heat conductors, they smooth the effect of atmospheric droughts and light frosts in the adjoining territories.	The drained peat deposits are a heat insulators which increase the influence of atmospheric droughts and light frosts.

Table 1. Continuation

	Functions in the society	
Resources and raw materials	Peat and water resources grow as well as biological resources (berries, officinal plants, mire game etc.) and there is a territorial resource.	Peat and water resources as well as biological resources are wasted. Territorial resource remains.
Information	Peat deposits keep information about changes of climate, plant cover and some historical events for thousand years.	When peat deposits are used up, informative and historical functions are lost.
Cultural-recreational	Mires are the places for rest, tourism, hunting, picking, berries and mushrooms, officinal plants collection and scientific studies.	Mires cease to be the places of rest, tourism, hunting, picking berries and mushrooms, officinal plants collection.

is expressed in the decrease of the ground water level, shrub elimination inexpedient increase of the plowing area.

Variants and measures for the LMC's ecological rehabilitation

The necessity to apply restorative measures for the biospheric functions of the resource and environment-forming ability of the above LMC is quite obvious.

Two different ways of restoration of the anthropically destroyed natural complexes are possible. They are renaturalization and rehabilitation. Renaturalization presupposes the obligatory and full restoration of all the natural components of the complex, and their interaction and self-regulation so that the natural complex, returns to the initial natural conditions. Nevertheless, it is not always possible and expedient. For example, it is not possible to renaturalize exploited peat deposit.

Unlike renaturalization, the process of rehabilitation does not presuppose restoration of all the components of the initial natural-complex. The main aim of the process of rehabilitation is to restore complex abilities to fulfill their biospheric and economic functions. In the course of ecological rehabilitation it is of primary importance to restore biospheric functions, such as the ability for environment preservation, resource reproduction including reproduction and preservation of the biodiversity. They are the functions of each natural complex that ensure ecological stability of the territory, preservation of the environmental parameters, variety of the vegetable and animal kingdoms. Restoration of the economic functions in the course of ecological rehabilitation is regarded to be a derivative of the restoration

of the biospheric functions which allow to subject some parts of the rehabilitated territories to different kinds of economic activities. During the process of rehabilitation, there can occur natural complexes of another type of affiliation in the place of the destroyed ones. The main problem is for the newly formed composition and structure of the complexes to provide former biospheric functions, as fully as possible.

As stated above the reason for the Bulev Mokh-Chervonoye LMC degradation is the combination of natural and technological processes that led to the reduction of the lake water and deterioration of its quality as well as to the destabilization of the biospheric processes. Natural aging of the reservoir takes place in the course of the evolutional development of the Chervonoye lake. The lake hollow fills up with ground deposits volume of the water mass decreases the transparence index goes down, the lake gaseous regime deteriorates, the trophic level of the lake changes. The natural process of the reservoir degradation is redoubled by the intensive technogenic transformation of its water catchment. A wide-scale construction of the meliorating systems, agricultural development of the water catschment, exploitation of the Bulev Mokh peat deposit, the uptake of the lake water for fish-farms far exceeding their actual needs resulted in the accelerated reduction of the water catchment areas, negative changes of the lake level regime, deterioration of the surface drain water which feeds the lake.

Taking into account the above, it can be assumed that the methods ecological rehabilitation for this LMC consist in the elimination of the natural-and-technogenic reasons for its degradation. Depending on the list and the scale of the steps undertaken, three variants of the ecological rehabilitation of the LMC are possible. They can be conditionally called natural, technogenic and natural-technogenic variants (Table 2).

According to the first, natural variant, the basic aims of the LMC rehabilitation must be restoration of the water catchment area to its pre-melioration borders and conditions, as well as an increase of the water volume of the lake hollow by means of extraction of sapropel deposits. To restore the water catchment territory fundamental reconstruction of the land tenure system in the water catchment area is required together with liquidation of the melioration objects, stopping peat extraction in the Bulev Mokh peat deposits restoration of the natural water delivery sources, providing water entry to the Chervonoye lake. The lake ecosystem can be improved by means of a wide-scale removal of ground deposits. This task will demand elaboration and carrying out a special state programme.

The above way of ecological rehabilitation of the LMC presupposes some radical restoration of the complex, reduction of the technogenic loading, restoration of the basic biospheric functions with a simultaneous abandoning of economic functions. Such

an approach is one sided because it does not take into account the social-economic situation of the region, and pays attention only to the ecological priorities.

The second variant of the LMC rehabilitation can serve as an alternative for the first. According to the second variant the role of the technogenic factor is not reduced but is purposefully increased (Table 2). This variant can preserve the existing water catchment area. A rise of the water level in the lake to the optimum average many-year mark and water supply to the fish-farms will be realized by means of a partial transfer of water from the Domanovichsky canal. The melioration and agrotechnogenic purification will be done with the help of specially created bioplatoes. Finally, the exploited territories of the Bulev Mokh peat deposits will be given back for the agricultural use after their recultivation in accordance with the initial project for the destroyed land restoration. The drawbacks of this direction of the LMC rehabilitation is the ncessity of artificial water regulation, transformation of additional territories into bioplatoes and low efficiency of the agricultural recultivation of the worked out peat deposits. Biospheric functions of the drained peat deposits in this case will not be restored and the worked out territories will destabilize the biosphere.

It is not advisable to attempt to return the lake to the status of nature monument as it is dammed and used as a reservoir for industry.

The drawbacks characteristic of the two above variants are to a lesser extent characteristic of the third variant of the LMC rehabilitation, which aimes at the restoration of both biospheric and economic functions of the territory. The third variant of the rehabilitation presupposes complex organizational, economic, engineering, agrotechnical and environment protecting measures, which are realistic.

Arrangements in the LMC water catchment

It is necessary to elaborate engineering arrangements aiming at the successive reduction of water regulation in the water catchment and best restoration of the natural water exchange of the lake. Studies on the expediency of partial water transfer from the Domanovichsky canal to the lake and the fish-farms should be carried out.

The territory between the lake and the dam, as well as the whole flooded area of the flood-land, should be preserved in the natural conditions as a lake-side nature-protection line.

It is absolutely necessary to change the existing structure of the plowed areas and arable lands in the meliorated part of the water catchment to reduce pollution with biogenic elements of the drainage waters entering the lake, and to preserve organogenic layer of the meliorated peat soils. It is suggested to single out three agricultural zones based on polder systems, namely, to create a zone of long term meadow arable

Table 2. Possible directions of the LMC Bulev Mokh-Chervonoye ecological rehabilitation

Variants of rehabilitation	Objects of ecological rehabilitation		
	Water catchment	Lake	Peatland
1-st variant "natural"	Restoration of the water catchment area in its premelioration borders with the following liquidation of technogenic elements.	Deeping of the bottom (a widescale extraction of sapropel) increase of the hollow volume, creation of ecologically safe water supply for fishfarms, flood-land restoration.	Peat extraction stops in the Bulev Mokh peat deposits in the water catchment area of the Chervonoye lake.
2-nd variant "technogenic"	Preservation of the existing size of the water catchment area, creation of bioplatoes for purification of drainage water from the excess of biogenic elements.	Raising of the water level to 136.2 m by partial movement of the water from the Domanowichsky canal.	The Bulev Mokh peat deposit development with preservation of 0.5 m of peat layer, recultivation of the worked out areas for agricultural use.
3-rd variant "natural-technogenic"	Realistic increase of the water catchment area, water escape optimisation, creation of bioplatoes for purification of drainage water from the excess of biogenic elements, meliorated area zoning, increase of the flooded part of the flood land.	Regulation of the lake level regime to 136.2 m, gradual deeping of by sapropel excavation, creating a nature protection zone around the lake, providing natural periodical flooding.	A stage by stage developing of peat deposits with a maximum possible peat extraction by the milling method, giving up the use of worked out areas for agriculture, secondary watering of the worked out areas and forming the zones of recurring swamps, organizing a landscape-hydrological reserve.

lands (1.5 km wide) in the vicinity of the lake for improved hayfields only. The next is the zone of cereal and grass crop rotation where perennial grasses will occupy 50-60% of the area. The periphery should a crop rotation zone of perennial and annual grasses, cereals and intertilled crops. It is necessary to create a system of bioplatoes for the purification of drainage waters entering the lake from the pollution with biogenic elements. The number, location size, equipment and the working regime of the bioplatoes must be scientifically worked out.

It is advisible to organize a system of stationary control of surface and underground waters of the meliorated peat extraction sites.

It is also necessary to conduct forestation of the abandoned lands and to plant 8-10 forest lines at the borders.

Arrangements in the Chervonoye lake

First of all it is necessary to determine economic and natural status of the lake as a reservoir for the fish-farms and domestic purposes. It is not expedient to impart the status of the nature monument to the lake in connection with its damming and partial transformation into an off-steam storage reservoir.

It is expedient to maintain water level of the lake at 136.2 m which will correspond to the average many-year level existing in the previous 30 years before the water catchment melioration.

In order to increase water volume, deepen the lake and improve its ecological conditions, it is necessary to continue sapropel extraction.

It is necessary to build a water regulating device on the Zhytkovichsky and the Ozerny canals to reduce the rate of water withdrawal from the lake for the fish-farm "Krasnaya Zorka". Such a device is absolutely necessary as at present water withdrawal from these canals exceeds the needs of the fish-farm.

It is advisible to reduce overgrowth of the water area with dipped macrophites, at the same time to increase of the area of the underwater vegetation along the shores.

In order to accelerate the process of secondary watering of the areas after peat excavation and to decrease contamination of the lake by peat particles, it is necessary to direct water from the fields to peat excavation sites and not to the lake. For this purpose the pumping station should be moved to the West, closer to the peat extraction sites.

To realize this variant of rehabilitation arrangements must be made to regulate water regime, purify water entering the Chervonoe lake and the ponds of the fish-farm "Krasnaya Zorka", improve arable land structure, create the nature preserving zone around the lake. Side by side with the engineering provision of the LMC rehabilitation, a whole system of legal measures ensuring restoration and stabilization of the lake-mire complex and its natural and economic potential should be elaborated.

CONCLUSIONS

1. LMCs are natural systems with various complexity. They combine lakes, mires and slopes of local watersheds with the same hydrologic regime, common physico-geographical processes and produce mutual influence on one another.

2. Depending on the number of genetic centers the following types of LMCs can be found in Belarus: monogenetic, biogentic and polygenetic.

3. Anthropic interference in one of the LMCs components produces a destabilizing, negative influence on the other LMCs components. In order to avoid negative ecological consequencies, natural hydrological regime of all the peat deposits included in the LMC composition should be preserved. Preservation of the lake water level and purity, as well as establishing saving regimes for the use of natural resources on the local LMC watersheds is also of great importance.

4. Renaturalization with full restoration of the whole complex of natural components of LMCs with their interaction and self-regulation to return to natural-territorial complex with initial natural conditions, is impossible on account of the impossibility of restoring the worked out peat depsits in the visible future, or is not in many cases. That is why ecological rehabilitation of LMCs is prefered as it does not presuppose restoration of all the components of the initial complex and aims at the restoration of its components abilities to fulfill their biospheric and economic functions.

5. Individual approach and specific measures must be applied for the restoration of biospheric and economic functions of individual LMCs. They must take into account specific peculiarities and conditions of a given LMC: its genesis, hydrology, hydrogeology, geomorphology, specific anthropic influence and other factors.

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