NATURAL MONUMENT PROKOSKO LAKE – STATE AND PERSPECTIVES

Muriz Spahić, Emir Temimović and Haris Jahić
University of Sarajevo, Faculty of Mathematics and Science, Department for Geography
Zmaja od Bosne 33-35, Sarajevo, Bosnia and Herzegovina
murizspahic@gmail.com
emirtemimovic@yahoo.com
haris-jahic@hotmail.com

A scientific event was held during the days of mountaineering in Federation of Bosnia and Herzegovina, as a part of Festival of mountaineering, on 13 June 2015 at the Prokosko Lake site, Vranica Mountain. This event was attended by the naturalists, who presented current issues related to the recent state of the natural aqual complex in direct and indirect basin of the Prokosko Lake with hints of negative trends of natural evolution and negative anthropogenic interventions that accelerate the natural evolution with the proposal of prognostic measures and elimination activities of negative tendencies in the future development.

Fig .1. Opening speeches at scientific event about Prokosko Lake

On the conference the following aspects were highlighted: limnological, geomorphological, hydrologic, climatic, ecological, tourism-related, valorisation and biological aspects of the situation and perspectives of further evolution of the Prokosko Lake. In addition, the Roundtable examined some legislative issues concerning the management of this aqual complex, which was placed into the „Park of Nature" category of protection.

After the scientific presentation which included the component natural and social aspects of the state and perspectives of the Prokosko Lake in its direct and indirect basin, scientific debate was developed in which ecologists; nature lovers of various profiles from scientists to publicists took part. Scientific and professional discourse was focused on the assessment of recent conditions of Prokosko Lake, which was not determined as satisfactory.

Keywords: *Prokosko Lake, scientific event, the evolution of the lake, anthropogenization, negative tendencies, legislation, conclusions.*

INTRODUCTION

To assess the current status of the Prokosko Lake, representatives of the Conference on „Natural Monument Prokosko lake – state and perspectives" shed the light on its condition from the natural, social, ichthyofaunistic and tourism component position, which relied on the previous own or other people's research, to draft the retrospective analysis of previous

and current artificially altered states. This approach was justified because the evolutionary phases of the past affect the present and then together project into a future states.

Natural state of Prokosko Lake is defined according to the earlier work of geologists, geographers – limnologists, hydro biologists and others. First scientific reasearch of Prokosko Lake is dating back to the beginning of the 20th century and can be considered as a benchmark for its natural condition.

The first geological study of the mountain Vranica which mentions, among others, the Prokosko Lake, comes from F. Katzer (1902) in the form of extensive work named Paleozoic of Vranica.

Fig. 2. Prokosko Lake – recent state

Significant scientific results of research on Prokosko Lake were given by D. Protic (1924-1926) in hydrobiologic and plankton-studies on the lakes of Bosnia and Herzegovina, which included Prokosko Lake as well, and which was published in the Journal of the National Museum of Bosnia and Herzegovina in Sarajevo.

Among other scientists who were important for the research of the Prokosko Lake and other mountain lakes in Bosnia and Herzegovina, it is important to mention J. Cvijic. (1924).

Complete and personal limnological research of natural lakes in Bosnia and Herzegovina was published in the limnological monograph of M. Spahic (2001), the author and promoter of these conclusions on Prokosko Lake.

For the purposes of assessment of the genesis and evolution of natural conditions of Prokosko Lake, other than the palynological analysis of the coastal belt of Prokosko Lake and other mountain lakes in Bosnia and Herzegovina, Austrian cartographic and planning documents from the years 1884 and 1910 were used.

All forementioned and other works were the basis on which the current status of the lake was rated, with the purpose of evaluating its future perspectives. In addition, the paper deals with lake's natural condition, the state of anthropogenic pressing, legislation and legal issues of renaturalization of this aqual complex.

Retrospective settlings in the basin of the Prokosko Lake were documented using the mapping method, which included the analyses of periodically supplemented maps with cartographic content from the beginning of the last century to today. For this purpose, topographic maps were used, first from the Austro-Hungarian era and then renewed topographic maps of the former Yogoslavia which were supplemented with modern cartographic content of each decade. Cartographic method has been supplemented by the modern methods which include aircraft method and cosmic detection. The last one is completely new and it provides numerical screening of new facilities and weekend facilities, which has replaced the old method. In addition to mapping method, analysis of the text was used, which dates from different time sections of last and the beginning of the 21st century. Mostly, it is about scientific papers and articles, scientific-popular texts and newspaper articles, which describe Prokosko Lake using text and images. All used methods have allowed a comparative

analysis of the origins of anthropopressing on the natural-aqual complex of the Prokosko Lake.

The paper used the empirical field prospections as well, which were related to the geological, geomorphological, hydrographic, biogeographic, demographic and other geographical component contents. These prospections, especially from the first author of conclusions, refered to the comparative geographic component analysis of the development of natural-aqual complex since 80s of the last century. Paper includes other methods of which the most important are: interview, comparison, cartographic, historical and empirical method.

NATURAL STATE OF THE PROKOSKO LAKE

The assessment of the natural state of Prokosko Lake is based on the limnological-potamological self-development of natural-aqual complex within the mountinous, old Variscan horst orogen of Vranica, which was subsequently masked by the Alpine orogeny. Lake valley at an altitude of 1636 m, the highest of its kind in Bosna and Herzegovina, drains slopes of Debelo Brdo (1858 m), from the south, Glavicice (1691 m), from the east and Trebevic and Cose (1864 m) from the north side. To the west, the Prokosko lake basin is separated from the Suho lake with colluvial beam of relative height of 20 m in regard to the lake mirror.

The morphological, morphogenetic, morphographic, morphometric, mineralogical and petrographic, stratigraphic, tectonic, paleoclimatic and other analysis suggest that the basin of the Prokosko lake is a result of the dominant influence of tectonic, fluvial, karst, gravity and nival processes. The lake basin has the shape of funnel-shaped sinkhole, with a gradual reduction of areas between isobaths, similar to karts sinkholes, from the surface of the lake to its maximum depth of 13 m. The basin of Prokosko Lake is undoubtedly a tectonic depression, which has been modified during the tectonic history, and in the Pleistocene with the glacial modifications, as well as significant reshaping in Holocene caused by snow and debris avalanches, nival, fluvial and lacustrine modificators.

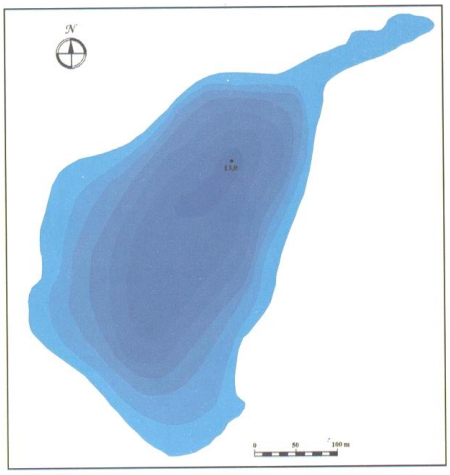

Fig. 3. Bathymetric plan of Prokosko lake
Source: Spahić, M. (2001)

Limited glacial modifications are confirmed by the absence of rudimental fluvial-glacial sediments in the valley lowland levels of the valley of Jezernica. In addition, chaotic situated blocks around the lake, in the opinion of F. Katzer (1902), represent erosional limestone remains, although the mineralogical and petrographic analysis confirmed their origin from destructed Glavica hillsides.

All above mentioned indicates that the lake's basin is polygenetic, polyphase and polymorphic creation, which has evolved since the Pleistocene, when the lake water was accumulated in it. The youngest morphological members such as alluvial valleys, slope and

nival delluvial, colluvial morpho forms, fluvial sediments and coastal sapropel bents belong to the holocene stage of natural self-development of the lake.

In addition, lake slopes are fluvially very active and are dotted with smaller river valleys. Since there is a case of a dissenting longitudinal profile of lake tributaries, their deep valleys in the lake are used for the transportation of drawn and suspended sediments. Draft and sediments, in the southwest part of the lake basin formed spacious accumulation flat area of 1500 m^2. In its pre accumulation stage, it was an integral part of the bottom of the Prokosko Lake, as suggested by the subsequent valley vertical articulation of lake tributaries.

The negative natural processes that affect the natural evolution of the lake are fluvial sediments production from the immediate tributary area of lake and the regression of the lake's river. Lake's talus, alluvial and colluvial slopes are, fluvially, very unstable and dotted with small river valleys, inconsistent according to the longitudinal fairway, which end up in the lake. Through them, the flowing water does deep and lateral erosion and transports in the lake plenty of towed an suspended sediments, which rise the bottom of the lake and reduce its volume. On the other side, by the regressive erosion of the lake's river from its end to the lake's accumulation, the riverbed was continously deepened, which abstracted more lake water and resulted in a decline of its level, and thus the reduction of the volume of water accumulation.

Such evolution of the Prokosko Lake is confirmed by the past and present of Suho jezero, located near the borders of the accumulation wall, on the northwest side of the Prokosko Lake. Suho Lake doesn't have lacustrine function and through paleolimnic valley flows a steady stream.

Fig. 4. Triturus alpestris reiseri

Natural stage of lake's development had a diverse phytobenthos and herbal communities such as Juncus articulatus carex leporina, Carex flava, Angelica silvestris, Juncus alpinus et al. (Smlatic, S. 1973). Herbal communities, especially those of the species Carex, from the coastal areas are spread into the coastal waters from which they are either floating or are attached to the shore. Once they had a limited extent, but today they are spred over the large areas.

Biodiversity during the natural existence of natural-aqual complex Prokosko Lake is famous for its endemic species of water lizards named Raizerov triton (Triturus alpestris Reiser). Because of the natural diversity of indirect basin of Prokosko Lake and the presence of endemic Triton, it was protected by the law from the 1954, as well as some other lakes in Bosnia and Herzegovina and included in the level of protection rank: ***Regional Park of Nature*.**

ANTHROPOGENIC PHASE OF DEVELOPMENT OF PROKOSKO LAKE

The beginning of the significant anthropogenization of the Prokosko Lake dates back to the times of intensive animal husbandry and grazing on Vranica, where transhumant

livestock way was replaced by the constant summer stays of herders in the immediate basin of Prokosko Lake. This way of animal husbandry includes grazing on Vranica, and overnight stays of the cattle in the cattle pens and livestock herders in apartments and bacilli in the direct basin of the Prokosko Lake. From the cattle pens and livestock buildings, the organic sludge was transported into the lake and then accumulated at the bottom. In addition to the periodic presence of herders in the vicinity of Prokosko Lake, whose water was used for the cattle needs, the negative tendencies of anthropogenization of this natural-aqual complex include artificial ranching as well, which has arisen as a result of ichytiobiological research by the Institute of Fisheries of Republic of Bosnia and Herzegovina in 60's of last the century. These studies were focused on artificial intrusion of salmonid fish (Californian trout), which completely disrupted biological diversity with elimination of some living organisms from the lake water into the surrounding lake puddles, especially Raizerov triton (Tritinus alpestris Reiser). This made the natural aquatic biological balance endangered, especially the habitat of the endemic triton. Another negative effect for the Triton was the tendency of continuous income of organic waste, which was transported by the water from the immediate basin to the lake. Significant changes in the immediate environment of Prokosko Lake were created by the active presence of humans, when the folds and flats were substituted by the weekend-settlements, which were particularly pronounced at

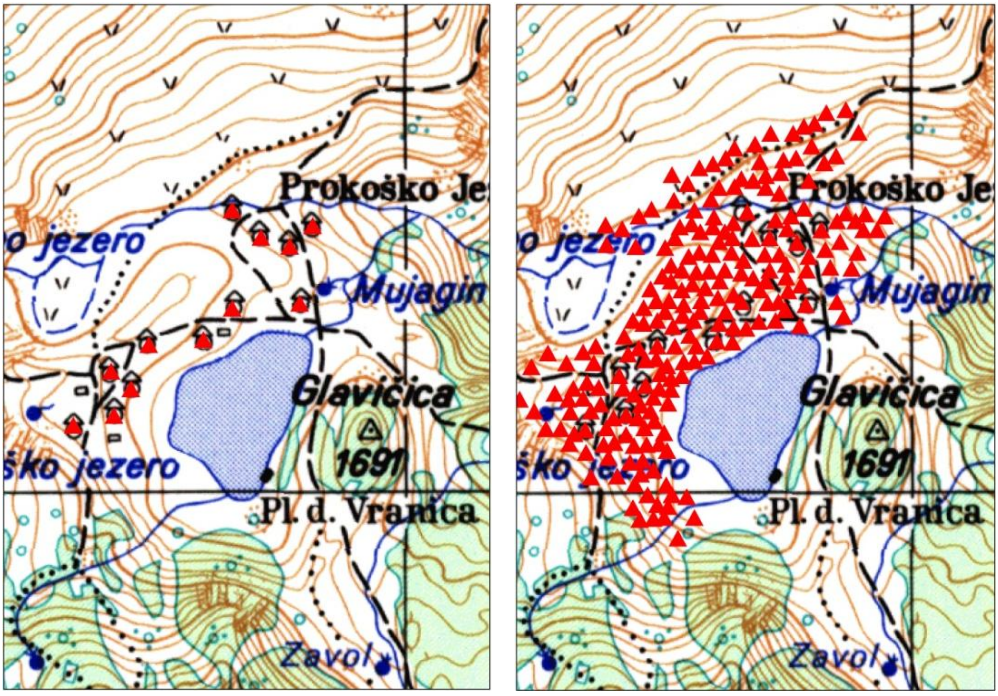

Fig. 5. Prokosko Lake in 1960. (left picture) and 2015. (right picture). The difference of usurpation with occupied buildings is obvious, especially with weekend houses in todays situation. Despite the intense natural modification with anthropo pressing, the lake was declared a Monument of Nature in 2005 and thus included in the third category of protection. (right picture). In the middle of the last century when the immediate basin had, almost, natural habitat, with several livestock barns and apartments, which have neen used only in summer, this lake was declared only a Regional Park of Nature, which, according to today's nomenclature of protection suits the Nature Park and belongs to Fifth from Six categories of protection. (left image.)

the beginning of the first decade of this century. In order to illustrate this trend we will use cartographic documents that clearly show the rural transformation from the early 20th century to today.

During the first cartographic representation of Vranica from 1902, in the immediate vicinity of The Prokosko Lake, there were registered only 2 objects. From that year forward, the number of cattle huts was increasing, so, according to the data from the renewed maps, in 1914, there were 6 cattle huts near the Prokosko Lake and in 1950 that number increased on 10 cattle huts.

Usurpation of the direct drainage basin of Prokosko Lake directly affected the modification of its natural state. From the group of negative tendencies, harmful, especially to the lake water is the production of organic sludge and waste from pens, barns livestock cottages and weekend-houses. The organic sludge and other sewage, which are the parts of incoming water in the lake, are deposited in the lake and stir the lake's water because of which it is opaque, and colloidal particles fall to the bottom of the lake, where they rott. The decaying process consumes a large amount of oxygen from the water, which is conductive to the coastal eutrophication of the lake.

Fig. 6. Prokosko Lake today. Artificial intervention in the riverbed of the lake's river, without legislative approval, raised the level of the lake, which will have unforeseeable negative consequences for its further development.

Sapropelization and eutrophication are phytobenthos from which the coastal pleje (turfs) are made and coalesced with the lake's shore. They significatly reduce the surface of the lake and displace the lake's water through the lake's river. These processes are seen on the first topographic maps from the beginning of the last century, when there were no observed coastal lacustrial plains of larger dimensions.

Changes to the coastline and its granularity are the processes that are noticeably taking place and can be visually registered after a decade. These changes are affected by the water balance as well, which shows the fluctuations of the water levels in the natural conditions, before anthropogenic interventions to a maximum of 0.6 m. These were regulated by the lake's river, which was stable with less regressive shifts caused by the cut.

The first disturbance of the lake river's riverbed dates back to the time of road construction across the river for the purpose od exploitation of forests and for the other needs, when the riverbed was artificially adapted. The latest interventions which were deliberately done in order to create a cofferdam to raise the level of the lake and its volume were undertaken without professional scientific expertise and monitoring works. They significantly changed limnic natural habitat because artificial level of the lake was increased by a maximum of 1.5 m. Artificial water level changed the natural regime, and the flood of the near lake plateau has incalculable harm to the functioning of this aqual complex.

PROKOSKO LAKE IN THE LEGISLATIVE FRAMEWORKS

Prokosko Lake had natural framework of evolutionary development until the beginning of the 60s of the last century, when as a natural rarity of this kind in Bosnia and Herzegovina, was declared a ***regional Park of Nature*** in 1954. According to the IUCN, the most relevant international organization for the nature protection, this protection rank belonged to the fifth of the six categories of protected areas. It implies a harmonious relationship between people and the natural environment, which allows the preservation of the natural aesthetic diversified values and biodiversity. Preserving the integrity of these traditional interactions is vital for the self-development of the Prokosko Lake and its basin. By the recent categorization of IUCN, it is evident that there is no category of „*Regional Nature Park*" or „*Park of Nature"*, but according to the current definition, these terms are equal to the category „*Protected landscape"*, which belongs to the fifth category of protection.

This level of protection was in effect until the January of 2005, when the Assembly of the Central Bosnia Canton changed the level of protection to the third, more rigorous category, and the Prokosko Lake was declared **Natural monument.** This category of protection under the IUCN includes in fact natural heritage of clearly defined area, which was by the act of state administration put under the protection in order to preserve its original natural values. When the two levels of protection are compared, where the first one was enacted in 1954, with which Prokosko Lake has been integrated into the fifth category of protection in a time when it had the original natural habitus with the other from the 2005., which changed the level of protection to the natural monument which belongs to the third rigorous level of protection although the natural environment suffered significant anthropogenic modifications. Therefore, it undoubtedly raises the question of how this could have happened. Answer to this question should be found in the professional background /feasibility study, on the basis of whose content the Act that designated the Prokosko Lake the monument of nature was made, i.e. has been integrated in a more rigorous ranking of protection than the one which preceded it.

The Act on which the Prokosko Lake was declared the monument of nature was based on the study which was derived from the monograph Natura 2000 in which a cursory examination revealed unacceptable material errors, for example: „The backbone of the hydrographical network are the Fojnicka river and Vrbas river"; „ Among the grains, corn is grown on Vranica; nomadic herding was dominant on Vranica"; „Land categories/habitats" were defined using the Google; „ Sarajevo is the representative for the climate of Vranica"; „least precipitation on Vranica is in February – 480 mm and the maximum is in October – 1082 mm"; „Vrbas has its springs on Vranica" and such. We did not get the answers from officials in the municipality of Fojnica whether and, if so, when was the presentation, revision and thus complementation of the above mentioned project under which the Prokosko Lake transcended to the III category of protection. In the mentioned Act that treats Prokosko Lake a monument of nature, no elements that define the measures and procedures for the revitalization and transformation of anthropogenic into the natural ambient were found, in the way regulated by the international standards where the natural monument, which, as noted before, defines a form of protection of the original natural values. In addition, the Act does not define what is from the natural biodiversity around the Prokosko Lake defined as original natural value so this lacustric object is declared a monument of nature.

The Act on announcement of natural monument „Prokosko Lake“ (draft) was downloaded from the link www.ekoakcija.com dated from the January 2005, offered by the Ministry of Planning, Reconstruction and Return of Central Bosnia Canton, in the Article 2, the protected area was spatially defined and it“ ***… consists of the area between Vrbas valley and the valley of Bosnia river and its tributaries the Bistrica and Fojnicka river“.*** Such wide defined area, except for the geographic territory that was placed under the protection, means far wider geographical area which includes the territory of the Neretva River, in the southeast, to the Sava River, in the north and northwest, which is definitely unacceptable for this type of legislation.

In the Article 3. of the aforementioned Act which refers to the boundaries, it is stated that “***… the borders of the natural monument are defined on the basis of the elements of river regime of water supply of the lake and geological composition of the terrain on which the lake basin was built“.*** Such sentence does not define the borders of this area and actually with the same, nothing was told. Geographers and those who are interested into this matter know that the elements of river regime include: lake and river water levels, flows in streams, tributaries and lake rivers and the categories of water runoff. The geographic boundaries of a territory cannot be defined by the river regime. Also, for the first time, again incorrectly, we have learned that the geological composition of the terrain on which the lake basin was built can be used for the definition of the boundaries. It is true that the rocks of the same origin and petrographic composition may build certain geographical area, but not as the assembly of sentence shows, in which it built the basin of the lake. By that, the protected area would be only the lake's surface which is defined by the coastline.

Article 5 describes the boundary zone A – the nucleus. The text uses inappropriate geographical terminology such as: ***„the mass of the basic colluvial rock material is downed to the lesser morphological head“*** defines the boundaries of the nucleus. Colluvium is not a basic but slope (moving) rocky detritus. This slope morphosculpture is mobile/unstable, and therefore, cannot be the boundary. In geography, especially in semantic narrative, the term „***parallel direction“*** is not used. The promoters probably meant the parallels, which refers to the geographical parallels which are the element of the geographic coordinate system. In article 6 which addressed geological diversity, formations and facies were mixed, and so was the geological stratigraphy and chronology, which were often mistaken for the lithology. Besides the mentioned formations, Silurian one is missing – the geological section of Palaeozoic, as well as Permian one. And from the facies, dolomite, shale, metsandstones, breccia and quartz mica are missing.

In geomorphological diversity, it is stated that: ***„geomorphological processes and forms presented with elements of limited karst morphosculpture of erosive and accumulative type“.*** The claim that in the area of natural monument Prokosko Lake, limited karst morphosculptures of accumulative type were observed is totally incorrect. The text that examines the diversity of relief is not appropriate for the Act that declares some territory a natural monument. To illustrate, let us say the descriptive part of micro relief forms around the Prokosko lake; third indent of the same article: … ***„many gravity forms of rock-fall in the form of chaotically distributed boulders are visible in the entire area of the immediate lake alluvial plain“.*** These forms presented in such way are uniform and do not make the geomorphological diversity, at least not the one that is presented in the Act that explains the uniqueness of natural variety.

In such presented relief diversity, some of the significant or exclusive morphological forms that make the immediate basin of the Prokosko Lake unique and different from the other lakes in Bosnia and Herzegovina were not listed, although those lakes were not placed under such regime of protection. Thus, in the Act, which is taken from the elaborate basis, there are no relief elements related to the landscape altitude morphological articulation, for which is Vranica famous. In addition, the relief forms of horizontal landscape diversity should be part of morphological diversity. Those are: valleys, deep valleys, dry valleys, slopes, etc.

From the group of hydrological diversity, paragraph 3 of the same article, the term ***„Prokosko glacier lake“*** was used. It is interesting that the Act in paragraph 2, which refers to the geomorphological variety, did not mention glacial relief forms at all, which is nonsense. In addition, it is unclear on what basis the proponent of this Act named the lake ‘’glacial’ when there is no evidence of glacial genesis in the established and recognized literature for this lake. Even the glacial origin of the lake and glacial relief forms are not found in the extensive geological works that treat Vratnica Mountain (Vranica), of the famous world renowned geologist F. Katzer (1902.) Hydrological diversity did not include those forms belonging to the naval and snow processes, primarily avalanches.

From the group of natural geographical diversity there’s a missing chapter on factors of meteorological diversity, which are reflected by the structure and dynamics of rainfall, diversity of weather conditions, orographic cloudiness, convective mists and fogs and the like. In Art. 8 and 9, paragraphs marked with numbers 1,2,3,4 only generally refer to the physical geographic diversity without typification and topographic orientation, which is certainly a failure of the legislator. So, it is not clear by what the buffer zone was defined and the transition zone of protection. The Act provided the accompanying documents: Plan for the Management of the Monument Prokosko and Spatial plan of special purpose of the nature monument Prokosko Lake.

The Plan for the Management of the natural Monument Prokosko and Spatial plan of special purpose of the nature monument Prokosko lake were not published in electronic form so, it is not possible to discuss or judge how each of those are compatible with the protection category of Prokosko lake. Truth is, there are some articles that speak of the management plan, and are referring to the legal provisions regulating the general issues of the management plan of protected territories in Bosnia and Herzegovina. Unofficially, we learned that these documents were never adopted by the authorities.

In the regional plan of the Fojnica municipality for the period 2011-2015, which is electronically available, the spatial section which, only partially, treats the nature monument Prokosko Lake, was analysed. In document in question, Prokosko lake is defined as the area where the artificial changes were made and it proposes the rehabilitation of the current status, with no proposals for measures and actions to revitalize its natural state, in order to be called the category of protection that has been planned by the Act and according to the international standards of IUCN.

All actions that were done before and after the renaming of the nature park to the monument of nature around the Prokosko lake, such as: unplanned construction of weekend-settlements, unplanned construction of infrastructure systems; especially sewage, coastal and lake river rehabilitation, changes in the regime of water runoff and income and other interventions had no basis in Act on Water protection in Bosnia and Herzegovina. If we add to this the laws regulating the issues concerning water approval and water goods, all the

deliberate actions made in direct and indirect basin of the Prokosko Lake on his renaturalization have no basis in the legislation.

Artificial interventions made on the lake and the anthropogenic usurpation of the lake basin contributed to the impossible naturalization of this aqual complex. We can talk about Prokosko Lake in the past tense only. Prokosko Lake by any criteria does not fulfil the conditions prescribed by international norms and standards for his appointment of monument of nature; its level of protection needs to be redefined to its recent condition to be able to take the necessary measures and actions to save at least some parts of its natural habitus.

CONCLUSIONS

Based on the presented analysis concerning the natural, slightly altered and completely altered state of indirect and, in particular, the immediate basin of the Prokosko Lake, it is possible to reduce concluding remarks in several points.

Natural stage of lake's evolution

- The basin of the lake is tectonically predisposed polygenetic, polyphase and polymorphic creation, which has evolved since the Pleistocene, when the lake water was accumulated in it. The youngest morphological members such as alluvial valleys, slope and nival colluvial, colluvial morphoforms, fluvial sediments and coastal sapropel bents belong to the holocene stage of natural self-development of the lake.
- Lake basin was built in the metariolithic layers of Silurian age, where majority of the direct basin belongs to the blue plate or massive limestones and massive dolomites that originate from the Devonian Paleozoic periods.
- Prokosko lake with the altitude of the lake's mirror of 1636 m and a maximum depth of 13 m is one of the highest and the deepest natural lakes in Bosnia and Herzegovina.
- The lake is fed by the surface and groundwater sources. The lake is a natural flow accumulation, with an average annual natural oscilations of about 0.6. Late spring nival maximum of water levels is the result of the snowy surface storage and melthing. Secondary autumn maximum of water level corresponds to increased pluviometric precipitation regime.
- Negative natural processes that affect the natural evolution of the lake are the production of fluvial sediments from the immediate tributary of lake basin and the regression of lake river. Lake's talus, alluvial and delluvial slopes are, fluvially, very unstable and dotted with small river valleys, inconsistent according to the longitudinal fairway, which end up in the lake. Through them, the flowing water does deep and lateral erosion and transports in the lake plenty of towed an suspended sediments, which rise the bottom of the lake and reduce its volume. On the other side, by the regressive erosion of the lake's river from its end to the lake accumulation, the riverbed was continously deepened, which abstracted more lake water and resulted in a decline of its level, and thus the reduction of the volume of water accumulation.
- The evolution of the Prokosko Lake is confirmed by the past and present of Suho jezero, located near the borders of the accumulation wall, on the northwest side of the Prokosko lake.

- Herbal communities, especially those of the species carex, from the coastal areas are spread into the coastal waters , and they are either floating or are attached to the shore. Once, they had a limited extent, but today they are spred over the large areas.
- Biodiversity during the natural existence of natural-aqual complex Prokosko Lake was famous for its endemic species of water lizards named Raizerov triton (Triturus alpestris Reiser). Because of the natural diversity of indirect basin or Prokosko Lake and the presence of endemic Triton, it was protected by the law from the 1954, as well as some other lakes in Bosnia and Herzegivina and included in the level of protection rank: **Regional Park of Nature.**

Anthropogenic phase of development of Prokosko Lake

- The beginning of the significant anthropogenization of the Prokosko Lake starts from the time of intensive cattle ranching on the mountain Vranica, which included summer stays of the herders in the immediate basin of the Prokosko Lake, which also was the water resource for the cattle.
- The negative tendencies of anthropogenization of this natural-aqual complex include its artificial ranching of salmonid fish in 60s of the last century. This completely disrupted biological diversity with elimination of the Raizerov triton (Tritinus alpestris Reiser) from the lake water in the surrounding lake puddles.
- The main earlier problems, and in particular the recent ones are the barns, pens and huts (both livestock and weekned ones) that were built in the immediate basin area, on the slopes from which the drains take the organic livestock and human faecal waste into the lake. Decay of organic sludge with oxygen consumption from the lake water has a beneficial effect on the coastal euthrophication of the lake.
- Sapropelization and eutrophication significantly affected the occurence of the coastal pleje (turfs), which are coalesced with the lake's shore. They siginificatly reduced the surface of the lake and displaced the lake's water through the lake's river.
- Changes to the coastline and its granularity are the processes that are noticably taking place and can be visually registered after a decade. These changes are affected by the water balance as well, which shows the fluctuations of the water levels in the natural conditions, before anthropogenic interventions to a maximum of 0.6 m happened. These were regulated by the lake's river, which was stable with less regressive shifts caused by the cut.
- The disruption of the lake's river riverbed was created by the road construction across the river for the purpose od exploatation of forests and other needs, when the riverbed was artificially adapted. The latest interventions which were deliberately done in order to create a cofferdam to raise the level of the lake and its volume were undertaken without professional scientific expertise and monitoring works and they significantly changed limnic natural habitat and at the same time increased the level of the lake by 1.5 m. Artificial water level changed the natural regime, and the flood of the near lake plateau has incalculable harm to the functioning of this aqual complex.

Prokosko Lake in the legislative frameworks

- Prokosko Lake has preserved its natural framework of evolutionary development until the beginning of the 60s of the last century, when as a natural rarity of this kind on

Bosnia and Herzegovina, was declared a regional Park of Nature in 1954. According to the IUCN, the most relevant international organization for the nature protection, this protection rank belonged to the fifth of the six categories of protected areas. It implies a harmonious relationship between people and the natural environment, which allows the preservation of the natural aesthetic diversified values and biodiversity.

- This level of protection was in effect until the January of 2005, when the Assembly of the Central Bosnia Canton changed the level of protection to the third, more rigorous category, and the Prokosko Lake was declared a natural monument. This category of protection under the IUCN includes in fact natural heritage of clearly defined area, which was by the Act of state administration put under the protection in order to preserve its original natural values.
- When the two levels of protection are compared, where the first one was enacted in 1954, with which Prokosko Lake has been integrated into the fifth category of protection in a time when it had the original natural habitus with the other from the 2005., which changed the level of protection to the natural monument which belongs to the third rigorous level of protection although the natural environment suffered significant anthropogenic modifications. Therefore, it undoubtedly raises the question of how this could have happened? Answer to this question should be found in the professional background/feasibility study, which included a proposal for the category of protection, based on which the Prokosko lake was included in the rigorous ranking than that which preceded it.
- In the Act which declared Prokosko Lake a monument of nature, sections that regulate measures and procedures for the revitalization of the lake from predominantly anthropogenic into the natural form so it could be treated by the predicetd level of protection, were not found.
- In the Act on announcement of natural monument Prokosko Lake, scientifically unfounded elements of natural diversity were listed, by which this lake is different from other mountain lakes in Bosnia and Herzegovina. In addition, the number of flaws were made that have no scientific foundation, such as: „***…the borders of the natural monument are defined on the basis of the elements of river regime of water supply of the lake and geological composition of the terrain on which the lake basin was built“.; „...the mass of the basic colluvial rock material is downed to the lesser morphological head“; „paralell direction“; „geomorphological processes and forms presented with elements of limited karst morphosculpture of erosive and accumulative type“; „...many gravity forms of rock-fall in th form of chaotically distributed boulders are visible in the entire area of the immediate lake alluvial plain“; “...Prokosko glacier lake“.***
- Other natural processes were not covered by the Act, and they should have been.
- It is not clear how were the protection zones defined. The Act provided the accompanying documents: The Plan for the Managemnt of the natural Monument Prokosko and Spatial plan of special purpose of the nature monument Prokosko. Both are not available to the public.
- All actions that were done before and after the renaming of the nature park to the monument of nature around the Prokosko Lake, such as: unplanned construction of weekend-settlements, unplanned construction of infrastructure systems; especially sewage, coastal and lake's river rehabilitation, changes in the regime of water runoff

and income and other interventions had no basis in Act on Water protection in Bosnia and Herzegovina. If we add to this the laws regulating the issues concerning water approval and water goods, all the deliberate actions made in direct and indirect basin of the Prokosko Lake on his renaturalization have no basis in the legislation.

- Artificial interventions made on the lake and the anthropogenic usurpation of the lake basin contributed to the impossble naturalization of this aqual complex. We can talk about Prokosko Lake in the past tense only. Since prokosko Lake by any criteria does not fulfil the conditions prescribed by international norms and standards for its appointment to a monument of nature, its level of protection needs to be redefined to its recent condition to be able to take the necessary measures and actions to save at least some parts of its natural habitus.

Literature

Aganović M i dr. 1960.: Ihtiobiološka istraživanja jezera na Treskavici. Institut za ribarstvo NR BiH. Fond naučnih i stručnih dokumenata Biološkog instituta Univerziteta u Sarajevu

Cvijić, J. 1899. Glacijalne i morfoloske studije o planinama Bosne i Hercegovine i Grne Gore. Glas SKA LVII. Beograd (1-169).

Gašparović R. i Kapel A. 1975.: Ekspertizna studija Prokoškog jezera. Fond naučnih i stručnih dokumanata Republičkog centra za zaštitu prirode. Sarajevo (1-23).

Katzer, F. 1903. Geologischer Fuhrer durch Bosnia und die Heucegovina. Sarajevo, (156-192)

Katzer, F. 1902. Die ehemalige Vegletschherungen der Vratnica planina in Bosnien. Globus B. 81, N° 3, Braunschweig, (37-39)

Katzer F. 1926. Geologija Bosne i Hercegovine. Knj.1. Sarajevo

Kulenović, S. 1973. Hidrografski uslovi naseljenosti i razvoja ribljih naselja u jezerima na planini Treskavica. Geografski pregled sv. XIV-XV, Sarajevo

Milojević, B.Ž. 1937. Visoke planine u kraljevini Jugoslavije. Državna štamparija Kraljevine Jugoslavije. Beograd

Protić, Đ. 1924. Hidrobiološke i plankton-studije na jezerina Bosne i Hercegovine, 1 dio. Glasnik Zemaljskog muzeja BiH, sv.XXXVI. Sarajevo, (39-67)

Protić, Đ. 1927. Mogućnosti ekonomskog iskorištavanja planinskih jezera BiH kao ribnjaka. Glasnik Minisatrstva poljoprivrede i voda, godina V br. 17. Sarajevo

Spahić, M. 1991.: Negativni recentni antropogeni procesi u neposrednom slivu Prokoškog jezera. Geografski pregled, sv.XXXV. Sarajevo, (125-132)

Spahić, M. 2001. Prirodna jezera Bosne i Hercegovine limnološka monografija. Harfo-graf Tuzla

Stanković S. 1971.: Naša glacijalna jezera. Priroda LVIII. Zagreb (181-183)

Zubčević O, Bušatlija I, Gašparović R. i Spahić M. 1984.: Studija o jezerima Bosne i Hercegovine. Fond naučnih i stručnih dokumenata Priro-dno-matematičkog fakulteta u Sarajevu

Authors

Muriz Spahić, doctor of geographical sciences, full professor at the Faculty of Science, University of Sarajevo, Bosnia and Herzegovina. Scientific area of research includes: physical geography and environmental protection, from which he published one monography and six university textbooks. Author of over 75 scientific articles, autor and co-author of several textbooks of geography in primary and secondary schools. Responsible researcher and participant in several scientific prestige projects. President of the Association of Geographers of Bosnia and Herzegovina, editor of the scientific journal Acta Geographica Bosniae et Herzegovinae.

Emir Temimović, doctor of geographical sciences, associate professor at the Faculty of Science, University of Sarajevo, Bosnia and Herzegovina. Editor of the scientific journal Acta geographica Bosniae et Herzegovinae; author of 20 scientific papers and two books from the scientific domain of physical geography.

Haris Jahić, master of geographical sciences, senior assistant at the Faculty of Science, University of Sarajevo, Bosnia and Herzegovina. Performs exercises, among other things, from Tourism and environmental protection and Methods of teaching geography. Currently performes doctoral studies at the Faculty of Science in Sarajevo, in the field of Tourism.