Additional information

Physical features of the site

Geology and geomorphology

The geologic conditions in the area of the site predetermine the presence of the following hydrogeological sections: Lower Cretaceous (Apt) Aquifer, Pliocene Aquifer Complex and Quaternary Aquifer. According to the type of deposits, there are two main Quaternary aquifers: Alluvial aquifer and Loess aquifer. The last is the uppermost aquifer in the geologic section which is distributed almost everywhere in the inter-fluvial beds.

The main soil forming materials are Quaternary loess sediments, as well as Pliocene clays, marls and calcareous sandstones. The elevations along the Danube originate from Miocene sediments – argillaceous marls and calcareous sandstones. The soil forming materials within the alluvial lowlands are river deposits and loess formations, and within dry vallies such are diluvia and alluvial-diluvia deposits.

Soil type and chemistry range

The following units of soil varieties characterize the area of the Srebarna Reserve:

- On the southern and western sides and adjacent territories: Haplic Chernozems (Haplic Chernozems, FAO), of medium depth, slightly eroded, of medium-arenaceous argillic texture; moderate to severe erosion develops on the steep slopes;
- In lowlands and along ravines soil types are represented by Meadows Chernozems, accumulated, of medium arenaceous argillic texture.
- In the northern part of the region – in the lowland between the lake and the Danube, soils are represented in a complex of: Calcic Meadow-Chernozem-like, alluvial and alluvial-meadow, slightly swamped soils;
- Meadow marshy soils occupy part of the coastal strip; lacustrine marsh soils are in their greater part covered by the water of the lake.

Origins - natural or artificial

Lake Srebarna is of natural origin. It represents a typical freshwater Danube lake of the river flood terrace. According to a palinological research, Lake Srebarna has been formed about 8 000 years ago following the inundation of the riverside terrace by the Danube.

According to the one theory for the formation of lakes along the Danube River, the ample sedimentary matters on the bottom has blocked the estuaries of the shorter right-hand tributaries of the main river and because of those natural lakes have been formed at the estuaries Garvansko, Srebarna (Domokos et al., 2001).

Hydrology

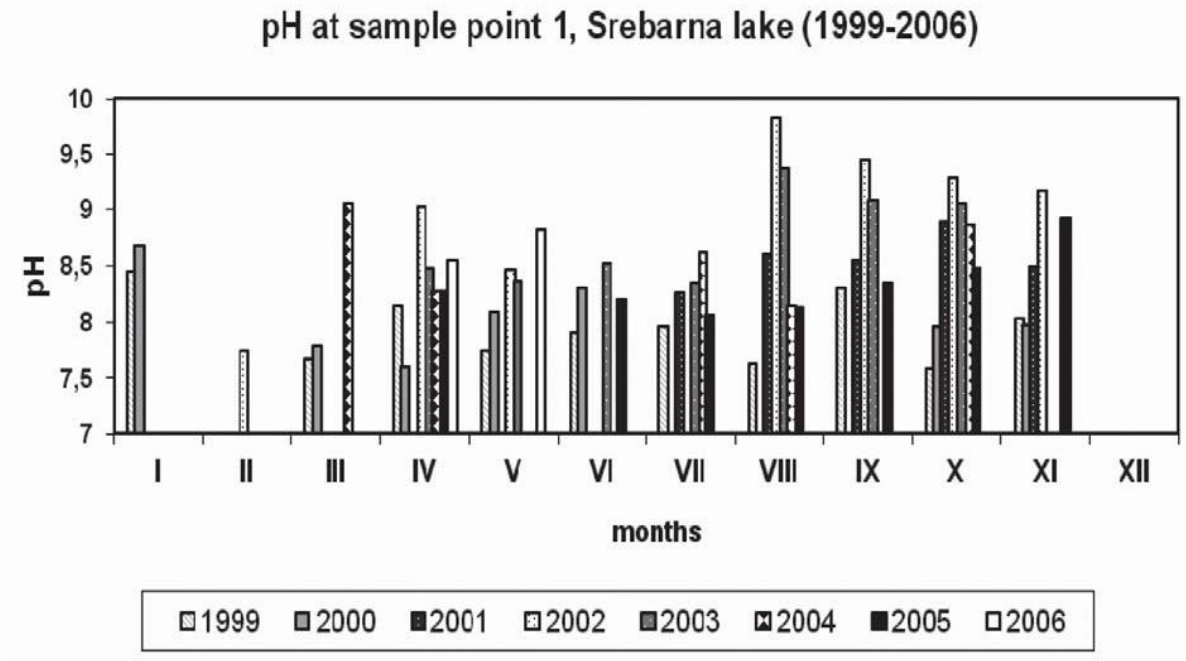
There are three clear periods in the development of the wetland. Up to 1948 – natural state, 1949- 1978 – deteriorated condition; 1979-1994 – first restoration attempt; restoration of the hydrology after 1994. The long term drying up period from 1988 to 1994 has resulted in negative effect for the lake – diminished the water surface area, decreased water level, transformation into eutrophic wetland. The commissioning of a hydraulic system connecting the Danube to Lake Srebarna by a canal in 1994 created conditions for control of the water level, the size of the inundated areas and the actual water volume of the lake. The catchments

area of the lake (402 km2) is supplied by the rivers Srebarnenska and Kulnezha, whose hydraulic regime varies widely and they run almost dry in summer and autumn.

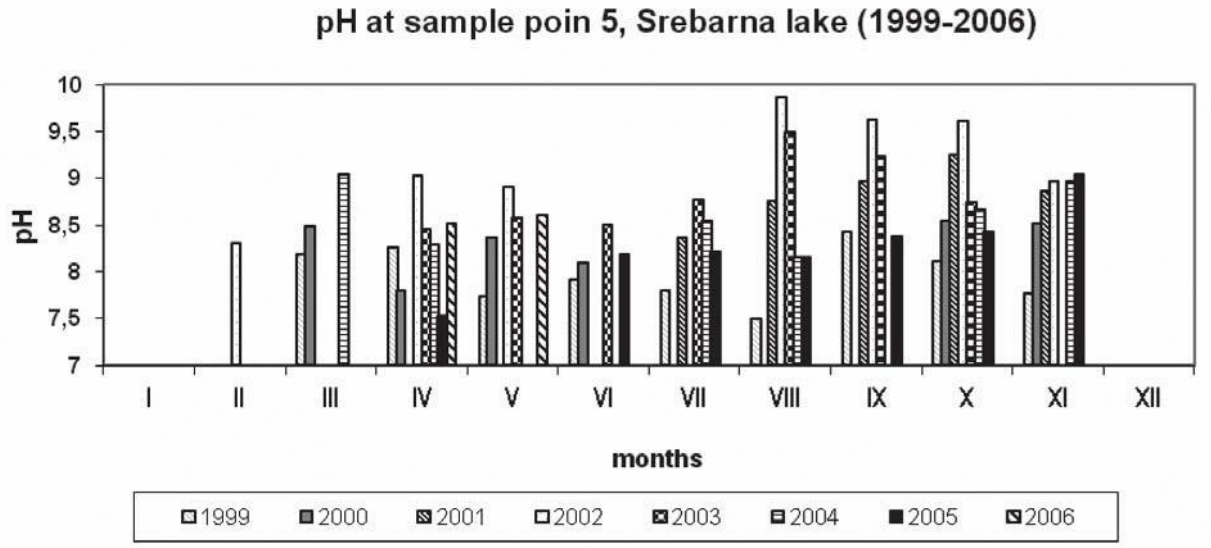
The mineral composition of the lake undergoes seasonal fluctuations corresponding to the processes of flooding and partial drying. The hydrocarbonate, chlorine, sulphate, sodium, calcium and magnesium ions are the main components of the water minerals. The nutrient concentration depends, on the one hand, on the inflow from the Danube and the surface and ground run-off from the water catchments area and, on the other hand, on the phytoplankton production and the processes of nutrient recycling. The concentration of the ammonium (0.7-1mg/l), nitrates (0.9-7.8 mg/l) and phosphorus (0.1-0.55 mg/l) ions is within the range of an eutrophic wetland.

Water quality

The water pH is strongly influenced by the processes of production and mineralization of organic matter in plankton and benthic communities. Carbon dioxide is absorbed or emitted in these processes, which shifts the balance in the carbonate system. Water pH values increase if the primary production processes prevail, and vise a versa. These processes explain the dynamics of pH in various points of the lake (marsh) ecosystem, normally varying between 7.5 and 8.5. Values of pH beyond these limits were observed during 1999-2002, exceeding 9.0 in spring and autumn 2002 and in 2003; they normalized after April 2004.



Dynamics of water pH at the sample point in the middle of the lake.



Dynamics of water pH at the sample point in the peripheral shallow waters adjacent to the village of Srebarna.

The dynamics of pH is in the frames of the known fluctuations in eutrophic lakes with substantial variations of the water level.
Srebarna is currently in an initial phase of a classic-type succession from lake to marsh to wet meadow. The periodic inflow of river water and the partial drying in summer is the principal factor that affects water quality in the first place. The primary production of reed and plankton is the second principal factor that depends on water quality and, at the same time, largely determines it.

Water depth

Provided that the southern lock remains closed, maximum depth of Lake Srebarna is determined by the point where its water flows in or out of the Danube (at present this is the area of the destroyed part of the dike at the south-western end of the Reserve). The altitude of this part is 13,2 m. At this water level maximum water is 3,3 m and can be observed at the mouth of the Dragaika canal which is the point where water flowed out in the past, and the average water depth is 2,1 m.

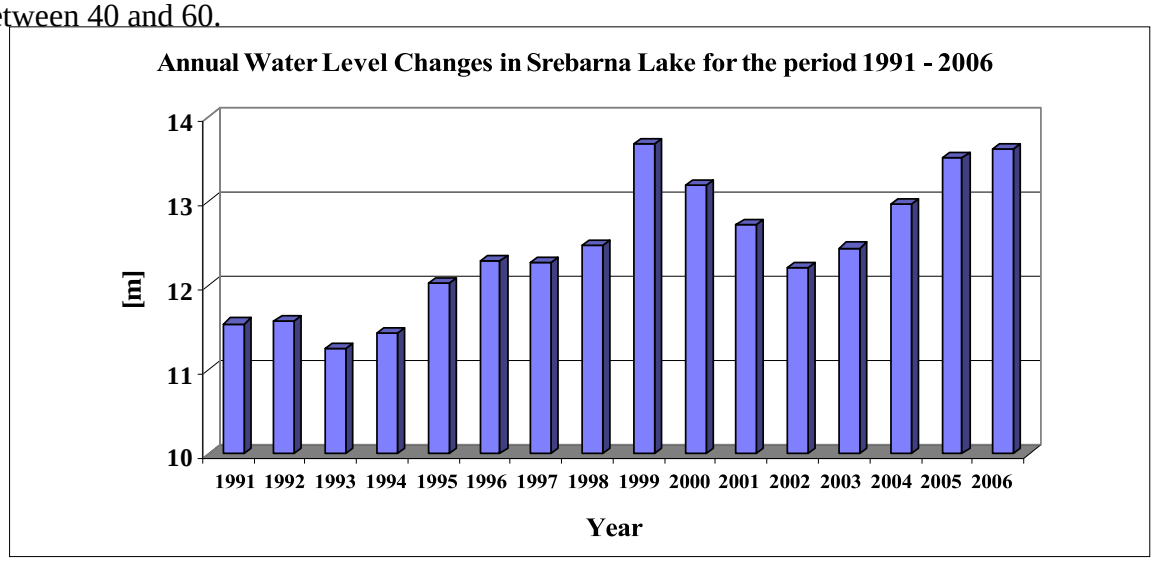
Fluctuations in water level

The water level fluctuations resulting from a complex of factors, like the morphometric properties of the lake itself, the inflow and the outflow, and the internal dynamics of the water masses, provide an integrated indicator of the changes in the volume of the lake. In the period 1991-1994 the water level was 11-11,5 m - under critical elevation of 11,8 – 12,0 m. After the canal providing a hydraulic connection of the lake with the Danube went into operation in May 1994, a trend emerged towards water level increase for the 1994-1996 periods. The highest month value of water level was read in April 1999 (14,10 m), but after that until 2004 follow the period with some decrease with 0,5 m. annual (the average annual water level for the period 2000 – 2003 is between 12,21 m and 13,20 m). From 2004, the negative trend breaks and water level began increase and in April 2005 the water level reached the peak of 14,17 m.

The unusual high water level in April 2005 cause detach of Pelican`s reedbeds islet. The Pelican`s islet moved to the south part of central open-water area and after that in different part of same area, in the result of wind with different direction. This necessitates taking steps about islet fixing in the previous place.

Climate

The climate in the region is continental with a temperature between -15oC (in January) and 39oC (in July). The average annual number of days with temperature >25 oC is 25 and for the days with temperature <0 oC it is 20. Annual precipitation average is 159 mm. The relative air humidity is highest in January (84%) and lowest in July and in August (66%). The predominant winds are with northern and north-eastern direction with average monthly speed ranging between 1,7 and 5,8 m/s. The numbers of days with snow and ice cover vary between 40 and 60.



Physical features of the catchment area

The catchment area of the lake (402 km2) is drained by the rivers Srebarnenska and Kulnezha, whose hydraulic regime varies widely and they run almost dry in summer and autumn. The main physical features of the catchment area are mostly the same as described in the previous point.

Ecosystem services

Hydrological values:

Groundwater recharge:

The analysis of geological and hydrogeological characteristics allows for the assumption that besides surface water and Danube water, water of Lake Srebarna is also replenished by karst water from the Low Cretaceous (Apt) aquifer passing through hydrogeological fenestrate and draining into the alluvial aquifer. Therefore, subterranean water has a significant role in lake water exchange.

Flood control:

Protection of the Reserve adjacent territories is based on a system of dikes along the Danube riverside in the northern part of the Reserve and to the east of it. When the Danube water level is very high, the river enters the Reserve from the northwest part, which is outside the system of dikes. In this case, the watershed region is not protected against flooding. If that happens after the level of the Danube water has dropped, the water would run off through the same spot where it entered the Reserve and along the canal connecting the lake with the Danube when sluices are opened.

Sediment trapping:

The lake is a sediment trap for material eroded from the watershed. In fact, eroded soil may enter the lake from the elevated western bank of the lake.
Shoreline stabilization:
There are no pre-conditions of significance to advance soil erosion or cause changes to the shoreline of the Reserve.

Current scientific research and facilities

The following research projects are being implemented in the Reserve:

- The CLGE (in the village there is Field Ecological Station of the Central Laboratory of General Ecology) executes project for monitoring of the wetland ecosystem as per contract with the MOEW and also as part of its individual scientific research programme. The water level of the lake, its hydrochemical parameters, the phytoplankton, zooplankton, zoobenthos, the production and destruction of organic matter, and the trophic and functional structure of the aquatic ecosystem have been monitored since 1998.
- Average winter numbers of water birds. The project is part of the annual average winter monitoring of Bulgaria's aquatic bird population. Counts have been regularly taken since 1977.
- Two young researcher defend their doctoral thesis on the ecology of breeding ornithofauna of Srebarna Reserve;
- The communities of small mammals and their habitat distribution in the region of Srebarna Biosphere Reserve.
- Biological diversity of aquatic ecosystems in wetlands of flood plane of the Lower Danube regarding optimisation of ecosystem functions under global climate change. Funded by NSF (DO 02-352/2009). Leader: Dr L. Pehlivanov
- WETLANET Enhancing research potential by strengthening a local network of laboratories for studying wetland ecosystems functioning, restoration and management (FP7 CSA – SUPPORT ACTION, contract No. 229802);
- Environmental quality and pressures assessment across Europe: the LTER network as an integrated and shared system for ecosystem monitoring (ENVEurope) - LIFE08 ENV/IT 000399

Current land (including water) use

The Managed Reserve (902.1 ha) being an exclusive state property, is under the jurisdiction of the government – Ministry of Environment and Water. Any activities shall be prohibited in managed nature reserve with the exception of: 1. physical security of the said reserves; 2. visits for the purpose of scientific research; 3. pedestrian traffic movement on marked hiking trails, including such traffic for educational purposes; 4. collection of seeds, wild plants and animals for the purpose of scientific research or for repopulating other sites; 5. conduct of maintaining, steering, controlling or restorative measures. Natural resources are not exploited within the boundaries of the Reserve.

The territory, surrounding Srebarna Managed Reserve, which covers an area of 542.8 ha and is also included in the Ramsar site, represents another category of protected area according to the specific Bulgarian legislation – Protected areas Act, particularly “Pelikanite” Protected site.

The purpose of “Pelikanite” Protected site is to restrict and prevent the negative influence of the human activities on the managed reserve.

Not long time ago, the same protected area was a buffer zone of the managed reserve. After the changes in the specific legislation in 2005 the buffer zone was precategorised in the "protected site" category.

According to the Protected areas act, unlikely to the strict and managed reserves, there are no restrictions in terms of the ownership in the protected areas from other categories. For example, in "Pelikanite" Protected site, there are different kind of ownership, such as state, municipal and private.

According to the same Act, the owners and the users of the territories in protected areas are obliged to take into consideration the regimes determined with the orders for their designation and also the management plans if such exist. The activities provided in the protected areas are also controlled by the Regional departments of the Ministry of Environment and Water and in this particular case - the Regional Inspectorate of Environment and Water for the town of Russe.

As far as this part of the Ramsar site which is not included in the managed reserve and the "Pelikanite" protected site, the same is part of Natura 2000 sites, determined in compliance with the EU Directives.
In this relation, it should be mentioned that there are different tools, ensuring the conservation of the Natura 2000 sites. For example the same are being designated with orders of the Minister of environment and water which determine specific regimes for their use according to the conservation value. Along with the requirement of Article 6 of the Habitats Directive of the EU, the investment proposals, plans and programs envisaged for these sites are subject of specific assessment which to register and prevent any possible negative influence on the particular species and natural habitats.

Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects

within the Ramsar site:

- In 1948 was built a dike that disconnected the lake from the Danube and initiated its severe eutrophication process. In 1979 part of the dike has been removed but had little positive effect. The disconnection lead to the hypereutrophication of the wetland, because of the accumulation of nutrients, that was most severe in 1993-1994 when the water column also diminished to few centimeters. The problem is the decaying reedbeds material. In 1994 was constructed a canal that restored the river-lake connection and improved its condition. During the low water level in the late 1980s and early 1990s important threats included nest-predation by foxes *Vulpes vulpes*, jackals *Canis aureus* and boars *Sus scrofa*, which affect the Pelican colony;
- The change of the Danube water conditions with the dam Zhelezni Vrata (Iron Gates) getting under construction and the natural process of lowering the river erosion basis have diminished the opportunities of the river water to enter the Reserve at high water levels in the Danube;
- Polluting the Reserve with nutrients and pesticides from diffuse sources within its water catchments area;
- There is considerably decreasing of relative quantity participation of Carp (*Cyprinus carpio*) and Zander (*Sander lucioperca*) compared with 2004. This result confirm the conclusion that the fishery (also illegal) is a significant factor which restrict the population growth of economic valued fish species nevertheless that in autumn and winter the intensity of poaching pressure is decreasing;
- Illegal fishing in the lake with nets, which causes disturbance and entrapment of diving birds in the fishnets; This problem causes entrapment of Pygmy Cormorants, diving ducks – Pochards (*Aythya ferina*) and Ferruginous Ducks (*Aythya nyroca*), Grebes (*Podiceps* sp.), Otters, terrapins etc.
- Potential threat for the area is burning of the floating reedbeds during drier period in spring or summer that may cause destruction of the Pelican colony, or the mixed heron colony.

- The deposition of organic and urban garbage on the bank of the lake from people of Srebarna village is causing additional organic and aesthetic pollution of the site.
- The high water level in April 2005 cause detach of some reed islets and this change the placement of Pelican`s colony. These maybe necessitate a new determination of the reserve's zones;
- The mixed heron colony is smaller compared with 2001. The number of *Ardeola ralloides*, *Nycticorax nycticorax* and *Egretta garzetta* are small numbered. There are fluctuations in breeding populations of many water bird species – *Phalacrocorax pygmeus, Larus ridibundus, Fulica atra, Aythya ferina, Chlidonias hybrida, Anas strepera, Aythya nyroca, Podiceps nigricollis*.

in the surrounding area:

- The use of fertilizers and pesticides in the surrounding arable lands and the pig farm near the river Kalnezha contribute to the pollution of the lake with bioorganic elements and organic compounds.
- Another cause for changes in the ecological characteristics of the Reserve surroundings was the afforestation of extensive areas using tree species that were either not native for the region like the Austrian (European Black) Pine *(Pinus nigra),* or were altogether alien species like the Hybrid Poplar *(Populus sp. x Populus sp*.), Black Locust *(Robinia pseudacacia),* Common Gloxinia *(Gleditschia triacanthos),* Oleaster *(Eleagnus angustifolia).*
- In 2003 began construction of purification station for the Srebarna Village in the west district near the reserve. The pipeline for purify water passing is near the border of the reserve (~ 50 m) and in case of high water level some parts of it remain under the water (especially in the northwest part of the reserve). In this way, there is the risk of additional nutrient loading of lake water. Now the purification station is not working.

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current management practices

Some actions of the management plan were implemented:

- Remodeling and repair of the two sluices (in 2003) built on the connecting canal in 1994 to retain for as long as possible the aquatic areas (enclosed by dykes in the northern section of the Reserve), which a number of rare and threatened bird species use for feeding and nesting but now the sluices do not work properly and if there is high water level in the lake part of the lake water backs in the Danube River.
- Conservation activities for the protection of the Dalmatian Pelican to improve nesting conditions, to protect the colony against terrestrial predators, to prevent flooding and fires in the colony;
- Allocation of sites for licensed angling according to a procedure established by the Ruse Regional Inspectorate of Environment and Water to control the size of the fish flock. To revive a traditional occupation of the local people. To create conditions for efficient control;
- Building a sand- and gravel-surfaced panorama path along the western edge of the Reserve to create convenient conditions for visitors to tour the Reserve on foot, by cart or on horseback. But the path have not ditch and some part of the gravel already come down in the lake.
- Erosion control measures on the steep slopes of the western and southern lake shores;
- Cleaning of "Dragaika channel" (the channel which goes to the Danube) from trees and plants.
- Production of promotional and information print publications: brochures, folders, stickers, posters, etc. to disseminate knowledge and promote a positive attitude towards nature conservation;
- Making films and multimedia products about the Reserve to disseminate knowledge and promote a positive attitude towards nature conservation.
- The Hybrid Poplar plantation in the south part of the reserve was cut off, but not uproot.

- Periodic removal of part of the reed growth along the rim of the open-water surface of the lake (Project 2.2.2 from the Management Plan) – under implementation with financing of a project upon priority 3 "Biologically Diversity" of the Operative Programme "Environment". The project has to be realized in the period from 2009 up to 2013.
- Replacement of the plantations of Hybrid Poplar (Populus sp. x Populus sp.), Oleaster (Elaeagnus angustifolia), Common Gloxinia (Gleditschia triacanthos) and Black Locust (Robinia pseudoacacia) within the zone by autochthonous tree and shrub vegetation (Project 4.2.6. from the Management Plan) - under implementation with financing of a project upon priority 3 "Biologically Diversity" of the Operative Programme "Environment".

Conservation measures proposed but not yet implemented

Other project proposed in Management Plan, but yet not implemented:

- Restoration of the stable bottom and natural depth through removal of sediments accumulated in the open-water area of the lake outside the breeding period *(Project 2.2.1. from the Management Plan).*
- Control of the Gray Willow (*Salix cinerea*).
- Inform the local hunters and anglers on the Reserve's conservation status *(Project 6.2.4 from the Management Plan)* and etc.
- Periodic removal of part of the reed growth along the rim of the open-water surface of the lake

(Project 2.2.2 from the Management Plan).

In 1994 was proposed to create second canal for lake water circulation but at present this is in doubt and halted.

- Establishment and maintenance of water regime, as close to the previous, natural regime in the reserve "Srebarna";
- Restoration of the 37 ha floodplain forests in the Managed reserve "Srebarna"
- For species which are subject for conservation in Natura 2000 Protected zone as Fire-bellied Toad (Bombina bombina); European pond terrapin (Emys orbicularis); Danube Crested Newt (Triturus dobrogicus); Asp (Aspius aspius); Balkan Loach (Cobitis elongata); Spined loach (Cobitis taenia);

Ukrainian brook lamprey (Eudontomyzon mariae); White-finned gudgeon (Romanogobio albipinnatus); Danube ruffe (Gymnocephalus baloni); Schraetzer (Gymnocephalus schraetzer); Weatherfish (Misgurnus fossilis); Sichel (Pelecus cultratus); Bitterling (Rhodeus sericeus amarus); Mudminnow (Umbra krameri); Danube streber (Zingel streber); Zingel (Zingel zingel); Ramshorn snail (Anisus vorticulus); Ornate Bluet (Coenagrion ornatum) – to prevent activities which have negative impact on the hydrological regime of water bodies and which could affect their Conservation state;

- Mitigation measures to reduce impacts on the natural habitats, which are subject to the conservation of areas that are associated with specific water bodies are regulated by the designation order and the management plan of the Srebarna Reserve (occupies almost 50% of the area of zone). According the plan it should be made activities to improve the Favorable conservation state (FCS) for all habitats (especially 3130, 3150, 3270, 6430, 91E0, 91F0), subjects to the protection zone "Srebarna", and include measures for reduction of existing impacts from water, drainage and any other negative changes in the hydrological regime of water body.

Bibliographical references

BirdLife International. 2000. Threatened birds of the world. Barcelona and Cambridge, UK: Lynx Edicions and BirdLife International.

Botev, B., Tz. Peshev (Editors). 1985. Red Data Book of Bulgaria. Vol. 2. Animals. Sofia. Bulgarian Academy of Sciences Publishing House, pp. 183. (In Bulgarian)

Hiebaum, G., T. Michev, V. Vassilev and Y. Uzunov (eds.) 2000. Management Plan of Biosphere Reserve "Srebarna", 157 pp. (In Bulgarian)
Ivanov, B. 1995. The Complex of Srebarna Nature Reserve. In: T. Michev. (ed.) National Action Plan for the Consevation of the Most Important Wetlands in Bulgaria. Sofia: Ministry of Environment. pp. 20-22.
Ivanova, I., R. Nedkov, T. Michev, N. Kambourova. 2007. Study the dynamics of the floating islands in the Sreburna Biosphere Reserve territory using aerospace, GPS and ground-based data. - *Ecological engineering and environment protection*, 3-4, 19-28 (in Bulgarian with English abstract).
Kalchev, R., V. Vasilev, G. Hiebaum, V. Tzavkova, L. Pehlivanov. 2007. Recovery of the Srebarna Lake: Experience and perspectives. – *Journal of Balkan Ecology*, vol. 10, No 2: 117-130.
Kambourova, N., T. Michev. 2003. Habitat Distribution of Breeding Waterbirds of Srebarna Reserve, Bulgaria. - *Journal of Balkan Ecology*, 6 (2): 191-199.
Kambourova, N., T. Michev. 2003. Breeding density of the Coot in Srebarna Managed Reserve. - *Acta Zoologica Bulgarica*, 55 (1): 29-33.
Kambourova, N. 2004. Breeding Ornithofauna of Srebarna Managed Reserve – Spatial Distribution and Long-Term Changes. Ph-D thesis, Central Laboratory of general Ecology – BAS, 275 pp. (In Bulgarian).
Kambourova, N. 2005. The Current State of Colonial Waterbirds in Srebarna Managed Reserve. – Annuals of Sofia University "St. Kliment Ohridski", Department of Biology, Book 4 – X Science Session, Sofia 2003, Part II, Tome 96: 313 – 320.
Kambourova, N. 2005. Habitat Distribution of Breeding Bird Species from Order Passeriformes in the Vicinity of Srebarna Managed Reserve. In: Chipev, N., V. Bogoev (managing editors). 2005. First National Scientific Conference of Ecology "Biodiversity, Ecosystems and Global Changes", Sofia 4-5 November 2004, 193 – 202 (In Bulgarian).
Kambourova, N. (2005). The recent status of breeding bird communities of Srebarna Managed Reserve, North-East Bulgaria. – *Acrocephalus*, 26 (125): 81 – 97.
Kostadinova, I. 1997. Important Bird Areas in Bulgaria. BSPB Conservation Series. Book 1. BSPB, Sofia, 176 pp. (In Bulgaran)
Michev, T. and P. Iankov. 1993. Ornithofauna. In: Sakalyan, M., (ed.) The National Biological Diversity Strategy. Main Reports. 1: Sofia: Biodiversity Support Program c/o World Widelife Fund, pp.585- 614. (In Bulgarian and English.).
Michev, T., B. Georgiev, A. Petrova & M. Stoyneva (Editors). 1998. Biodiversity of the Srebarna Biosphere Reserve. Checklist and bibliography. Sofia: Co-published by Context & Pensoft, ivx + 130 pp.
Michev, T., L. Profirov. 2003. Mid-winter Numbers of Waterbirds in Bulgaria (1977 – 2001). Pensoft, Sofia, 160 pp.
Michev, T., N. Kambourova (ed.). 2011. National Action Plan for the Conservation of Dalmatian Pelican in Bulgaria (Pelecanus crispus Bruch, 1838). Sofia, IBER at the BAS, MOEW.
Montreux Record – Questionnaire for Ramsar site "Srebarna"
Nankinov, D. S. Simeonov, T. Michev, B. Ivanov. 1997. Fauna of Bulgaria. Vol. 26. Aves. Part II. Sofia. AP "Prof. M. Drinov", 427 pp.
Pehlivanov, L. 2000**.** Ichthyofauna of the Srebarna Lake, the Danube basin: State and Significance of the Management and Conservation Strategies of this Wetland. - In: Limnologische Berichte der Donau 2000, Wissenschaftliche Kurzreferate.
Pehlivanov, L., V. Tsavkova, W. Naidenov 2004. The metazoan plankton of the Biosphere Reserve Srebarna Lake (North-Eastern Bulgaria). – *Lauterbornia*, 49: 99-105.
Pehlivanov, L., V. Tzavkova, V. Vasilev. 2006. Development of the zooplankton community in the Srebarna Lake (North-Eastern Bulgaria) along the process of ecosystem rehabilitation. - In: Proceedings 36th International Conference of IAD. Austrian Committee Danube Research / IAD, Vienna. ISBN 13: 978-3-9500723-2-7, 280-284 p.
Pehlivanov, L. V. Vasilev, M. Vasilev. 2004. Changes in the ichthyofauna of Srebarna Lake for the past 60 years. – "I Nat. scient. conf. of ecology, "Biodiversity, ecosystems, global change", Sofia. Conference reports. "Petekson": 265-270. (in Bulgarian with Engl. Abstract).
Petkov, N. V. 1997. Current Status of the Ferruginous Duck (*Aythya nyroca*) in Bulgaria. Sofia, MSc Thesis, "St. Kl. Ochridski" Sofia University, 102 pp. (in Bulgarian).

Petkov, N. V. 1998. Studies on the Ferruginous Duck in Bulgaria. - *TWSG News* 11: 14-19.
Petkov, N. 2004. Comparative Ecological Studies between Ferruginous Duck, *Aythya nyroca* and Pochard, *Aythya ferina* during Breeding Season in Bulgaria. Ph-D thesis, Central Laboratory of general Ecology – BAS, 224 pp. (In Bulgarian).
Red Data Book of the Republic of Bulgaria, Joint edition of the Bulgarian Academy of Sciences & Ministry of Environment and Water, Sofia, 2011.
Shurulinkov, P., (ed.) 2013. Monitoring of the H. Pygmaeus and A. nyroca in the the Romanian-Bulgarian section of the Danube River. Database of the Green Borders project of the WWF. http://www.green-borders.eu
Velchev, V., (ed.) 1984. Red Data Book of Republic Bulgaria. Vol. 1: Plants. Sofia: Bulgarian Academy of Science, 447 pp. (In Bulgarian.)
Velkov, B., L. Pehlivanov, M. Vassilev, 2004. *Umbra krameri* Walbaum (Pisces, Umbridae) – a reinstated species in the Bulgarian ichthyofauna. – *Acta Zool. Bulg*. 56 (2): 233-235.