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2015

ACTION PLAN:

Restoration of the wetland ecosystem Hutovo Blato



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PREFACE



Mladen Rudež

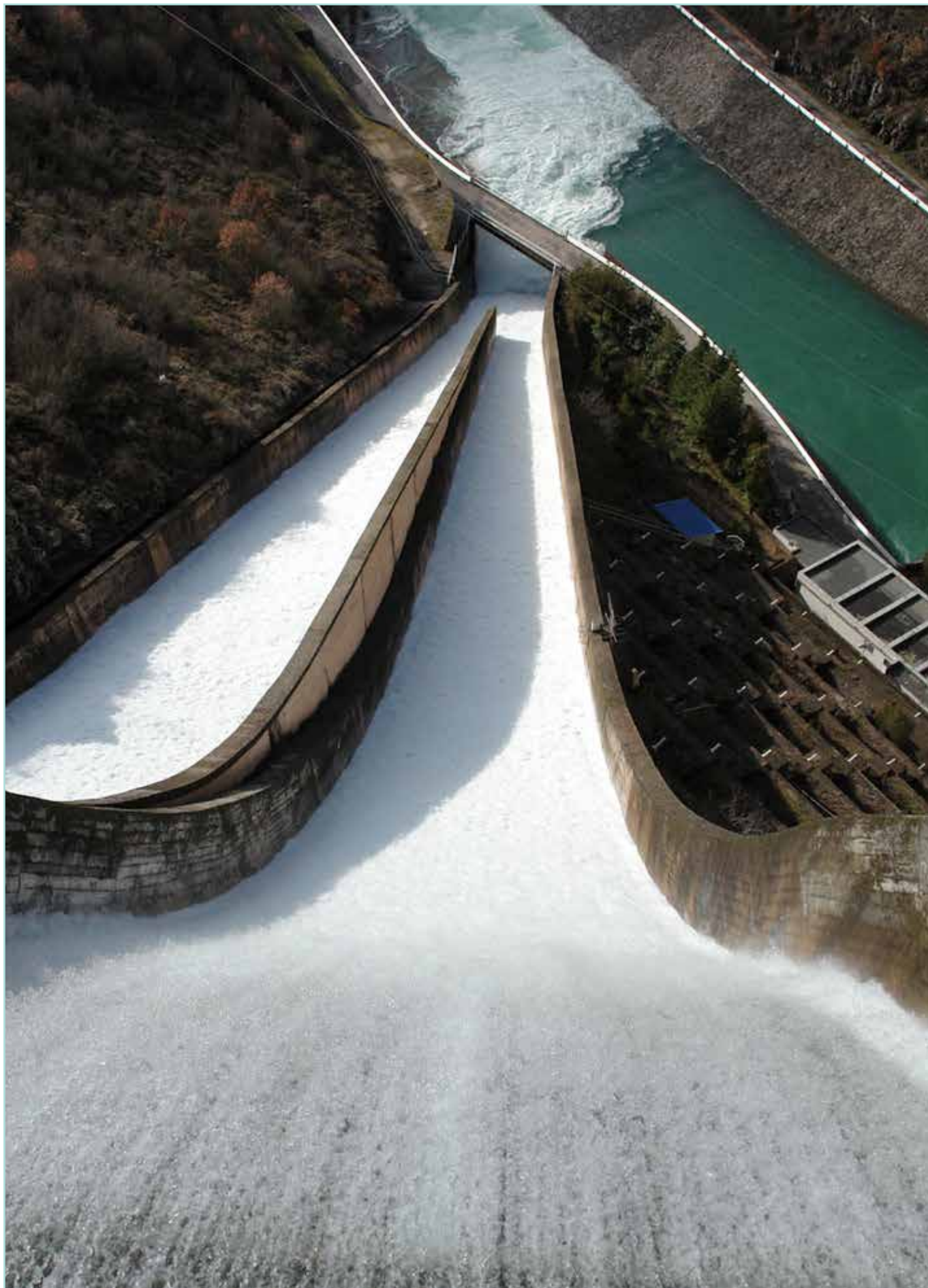
As a European country and a soon-to-be candidate for accession to the Euro-Atlantic integrations, Bosnia and Herzegovina seeks to harmonize its legislation in the field of environmental and nature protection with EU directives and international conventions, as any modern country would. Following the establishment of environmental legislation in 2003, the aim was its practical application, which is oftentimes a long and laboursome process. The process has faced a multitude of difficulties and obstacles to its development, which has slowed down the sustainable development of Bosnia and Herzegovina based on environmental principles to a great extent. The failure to comply with these principles, especially the Prevention Principle and the Polluter Pays Principle, endangers nature and the environment and puts the human community in the situation of stalled development.

Protection of nature and natural values, conservation of wetlands, wetland habitats and rare plant and animal species, as well as protection of natural habitats and biodiversity are essential for further development and prosperity of human community and for human health. Through the ratification of international treaties and the establishment of the relevant legislation, especially the Environmental Protection Act and the Nature Protection Act, Bosnia and Herzegovina has committed to complying with the legal provisions. The governments in Bosnia and Herzegovina have the important role of implementing the legal obligations, but the roles of NGOs, academia and the business sector are equally important. It is for these reasons that the Federal Ministry of Environment and Tourism has tried to establish partnerships with NGOs in line with the legal framework, especially with business entities, encouraging them to act friendly to the natural environment, since it is the best way to improve and promote its protection.

Last but not least, the environmental permit is a relevant legal instrument for environmentally friendly interventions in nature, which not only protect the environment and nature values, but also act in precautionary manner, through voluntary agreements on damage compensation with business entities, preventing excessive damage to nature and the environment. If, however, such damage does occur, it is repaired, which indicates high environmental awareness for the benefit of the community as a whole.

Mladen Rudež

Assistant Minister in the Sector for environmental permits
in the Ministry of Environment and Tourism
of Federation of Bosnia and Herzegovina



Grančarevo dam © Ivica Puljan

INTRODUCTION

The construction of hydropower plants in the Trebišnjica river basin dramatically changed the Hutovo Blato wetland ecosystem. The Svitava wetland became the Čapljina pumped-storage hydropower plant's reservoir with the construction of a dam and several embankments on the former Matica River. The Derane area lost 5 m³/s of its freshwater flow during the summer, which comprises 50% of the total water flowing into this unique remaining natural wetland in the Neretva delta. This water loss accelerated the process of succession, and as a consequence, the bottom of Lake Derane has risen. Within the last 35 years, the area around Boljun Kuk is as much as one meter higher. These drastic changes to the natural water cycle have degraded Hutovo Blato's wetland habitats.

Habitat loss has resulted in the loss of biodiversity. The total number of known bird species has decreased by 31%. The endemic fish populations are also decreasing and being replaced by introduced fish species. Endemic plants are in danger of extinction. Unless urgent measures for the restoration of the Derane area are undertaken, the complete disappearance of this area's wetland ecosystem can be expected within the next 35 years.

Hutovo Blato is included in the Ramsar List of Wetlands of International Importance. As a party to this Convention, Bosnia and Herzegovina assumed the obligation of protecting the Hutovo Blato area.

Herzegovina-Neretva County's Environmental Protection Act further mandates the legal obligation to protect Hutovo Blato: *"The operator carrying out an activity dangerous to the environment is responsible for the damage caused by such activity to people, property and the environment."* It is essential that the parties responsible for the degradation of Hutovo Blato's ecosystem are actively involved in its restoration and subsequent maintenance.

While it is unrealistic or even unreasonable to expect or plan the decommissioning of hydropower plants to restore the wetland ecosystem, it is also unreasonable that the responsible hydropower plant operators do not undertake any specific measures to mitigate their negative impacts on Hutovo Blato Nature Park.

Summary

WWF's Action Plan outlines the necessary activities for the restoration of the Hutovo Blato ecosystem over the next five years (see Annex 2. Action Plan Overview: Schedule & Budget and Annex 3. Action Plan). In total, it will cost 4,828,100 KM (1.96 KM = €1) for the planned activities to be carried out (see Table 1). After that period, the Action Plan will need to be adapted for the subsequent five years.

It cannot be expected that the energy companies will immediately return the entire 5 m³/s of water depleted

Table 1. Five-year budget for Action Plan to restore Hutovo Blato

Action Plan components	Year 1 (KM)	Year 2 (KM)	Year 3 (KM)	Year 4 (KM)	Year 5 (KM)	TOTAL for 5 years
Habitat restoration	477,000	332,000	332,000	332,000	332,000	1,805,000
Water regime restoration	179,910	129,910	131,560	61,560	26,560	529,500
Fish stock restoration	70,000	122,000	219,000	397,000	372,000	1,180,000
Bird population restoration	188,000	280,000	310,000	210,000	200,000	1,188,000
Other projects		125,600				125,600
TOTAL	914,910	989,510	992,560	1,000,560	930,560	4,828,100



River Bregava © Marinko Dalmatin

during the summer. Therefore, as this water is slowly returned, it will also be necessary to implement certain activities in Hutovo Blato that mimic the benefits water was providing free of charge for millennia. These activities include cleaning of spring zones, maintaining the flow rate of channels and gullies, and excavating mud (332,000 KM/year; 145,000 KM for initial purchase of equipment). Research, feasibility studies, and reliable monitoring of water quantity and quality also needs to be conducted (529,500 KM). Only after all of the Action Plan's activities have been finalised, can the water regime's restoration begin.

The fish stock restoration involves the (i) protection and preservation of endemic species in the Derane area and (ii) sustainable economic activities in the Svitava area (1,180,000 KM). The restoration of bird populations is based on monitoring, providing food, and returning important, endangered, protected, rare, and locally extinct species – such as the ferruginous duck, pygmy cormorant, swan, glossy ibis, and Dalmatian pelican – to the area (1,188,000 KM). The status of the remaining populations must also be researched in greater detail (125,600 KM).

The greatest damage to Hutovo Blato occurred as a result of the construction and current operations of the Čapljina pumped-storage hydropower plant, which is the property of the Energy Company of the Croatian Community of Herzeg-Bosnia (EP HZHB). Therefore, the EP HZHB should assume the financing of the activities that directly contribute to the restoration of Hutovo Blato Nature Park (see Table 2).

Table 2. Activities directly contributing to the restoration of Hutovo Blato Nature Park

Action Plan components	Year 1 (KM)	Year 2 (KM)	Year 3 (KM)	Year 4 (KM)	Year 5 (KM)	TOTAL for 5 years
Habitat restoration	477,000	332,000	332,000	332,000	332,000	1,805,000
Water regime restoration		45,000	80,000	10,000		135,000
Fish stock restoration	70,000	72,000	79,000	97,000	72,000	390,000
Bird population restoration	50,000	50,000	50,000	50,000	50,000	250,000
TOTAL	597,000	499,000	541,000	489,000	454,000	2,580,000

Since the Energy Company of the Republic of Srpska’s (ERS) and Energy Company of Croatia’s (HEP) operations have also caused significant degradation to the Hutovo Blato Nature Park ecosystem (i.e. diverting water from the Hutovo Blato basin towards their hydroelectric plants), they are also responsible in financing the activities that indirectly contribute to the restoration of Hutovo Blato Nature Park (see Table 3).

Table 3. Activities indirectly contributing to the restoration of Hutovo Blato Nature Park

Action Plan components	Year 1 (KM)	Year 2 (KM)	Year 3 (KM)	Year 4 (KM)	Year 5 (KM)	TOTAL for 5 years
Water regime restoration	179,910	84,910	51,560	51,560	26,560	394,500
Fish stock restoration		50,000	140,000	300,000	300,000	790,000
Bird population restoration	138,000	230,000	260,000	160,000	150,000	938,000
Other projects		125,600				125,600
TOTAL	317,910	490,510	451,560	511,560	476,560	2,248,100



PROBLEM DESCRIPTION

Thanks to its extraordinary biodiversity, Hutovo Blato Nature Park has been recognized as a Ramsar Wetland of International Importance since 2001. On top of its outstanding biodiversity, it provides clean water to the lower course of the Neretva River. Currently, Hutovo Blato is under great pressure from existing hydropower plants. The particularly controversial Upper Horizons project would further reduce the water flow into Hutovo Blato and threaten the lower parts of the Neretva (see Figure 1).

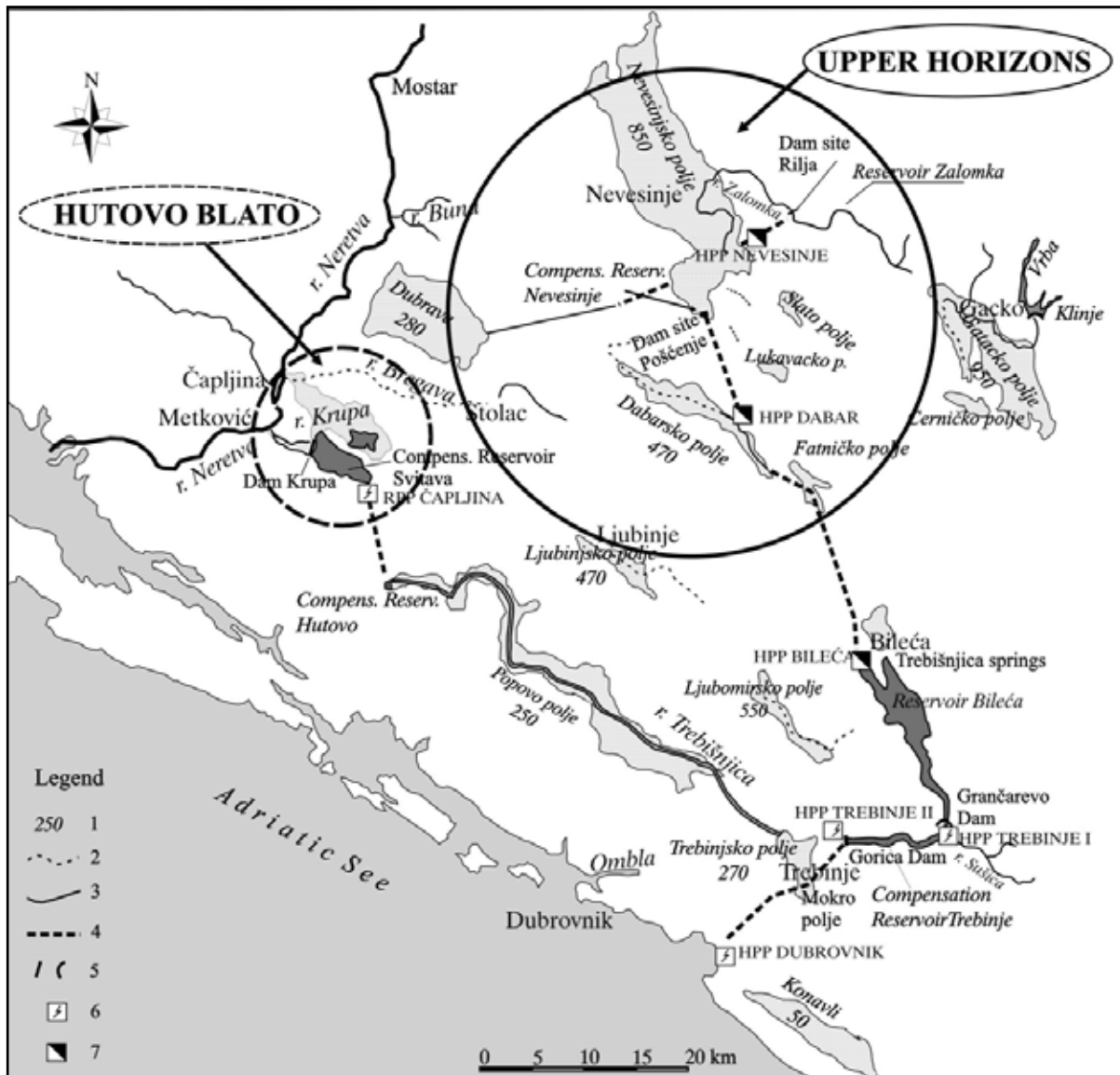


Figure 1. Hutovo Blato, Upper Horizons, and a layout of the multipurpose hydrosystem Trebišnjica.

Legend: 1 = Altitude; 2 = Temporary Flow; 3 = Permanent flow (river or canal); 4 = Tunnel route; 5 = Dam or dam site; 6 = Power plant (operational); 7 = Power plant (proposed). (source: Milanovic, 2006)

The construction and daily operations of the Energy Company of the Republic of Srpska's (ERS), Energy Company of Croatia's (HEP) and Energy Company of the Croatian Community of Herzeg-Bosnia's (EP HZHB) hydropower plants in the Trebišnjica basin and partly in the Neretva basin have significantly damaged and threaten the survival of the only remaining wetland ecosystem in the Neretva delta – Hutovo Blato's Derane depression. The EP HZHB's Čapljina pumped-storage hydropower plant has the biggest and most direct impact on the ecosystem.

Water Regime Disturbances

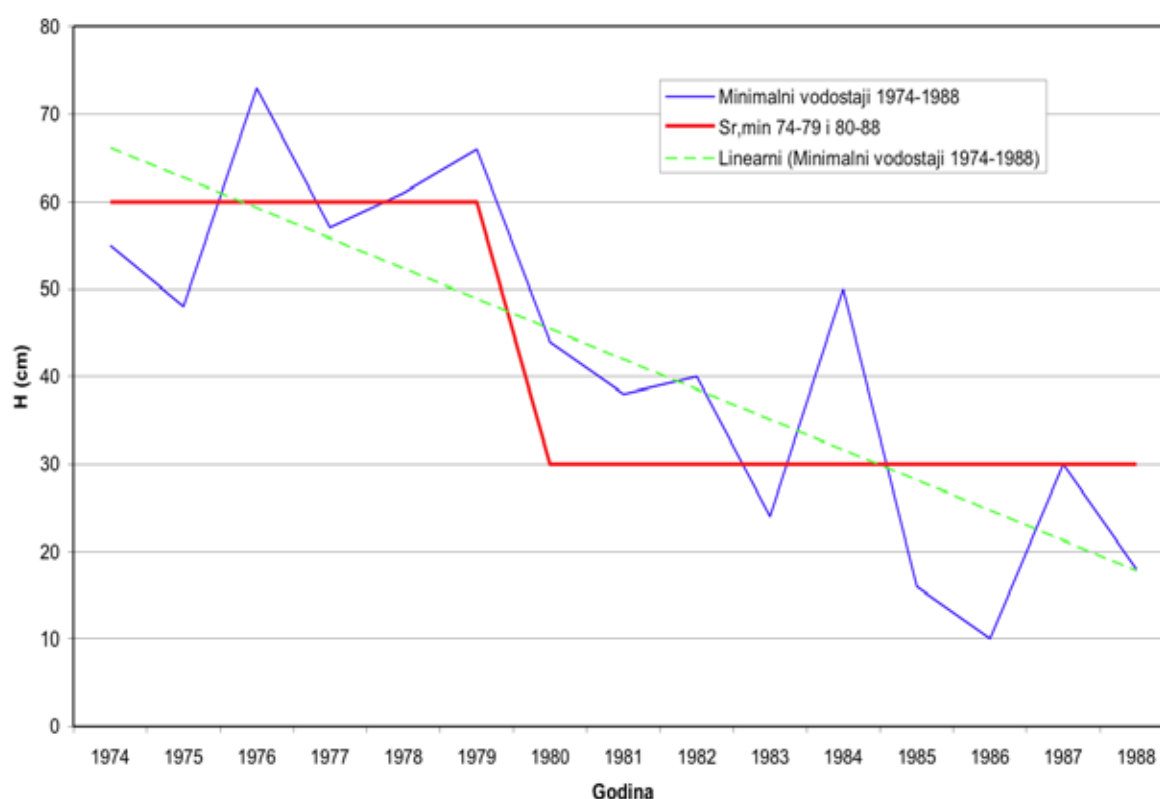
With the construction of the Grančarevo and Gorica dams and Plat and Čapljina hydropower plants, the underground water supply draining into Hutovo Blato was reduced and an artificial water regime created in the Popovo Polje. A section of the Trebišnjica River was diverted to the Plat hydropower plant as the Gorica dam was constructed in Trebinje (see Figure 1). After water for the Plat hydropower plant is removed, the remaining water is directed to the Čapljina hydropower plant's upper reservoir. As a result, the annual flooding average in the Popovo Polje was reduced from over 200 days to almost none today. The Trebišnjica River's flow through the Popovo Polje was regulated by coating 65 kilometres of the riverbed in shotcrete when construction of the pumped-storage Čapljina hydropower plant was finalised in 1979 (see Image 1). As a result, Popovo Polje's sinkholes (known as "ponor" in local languages) were cut off.

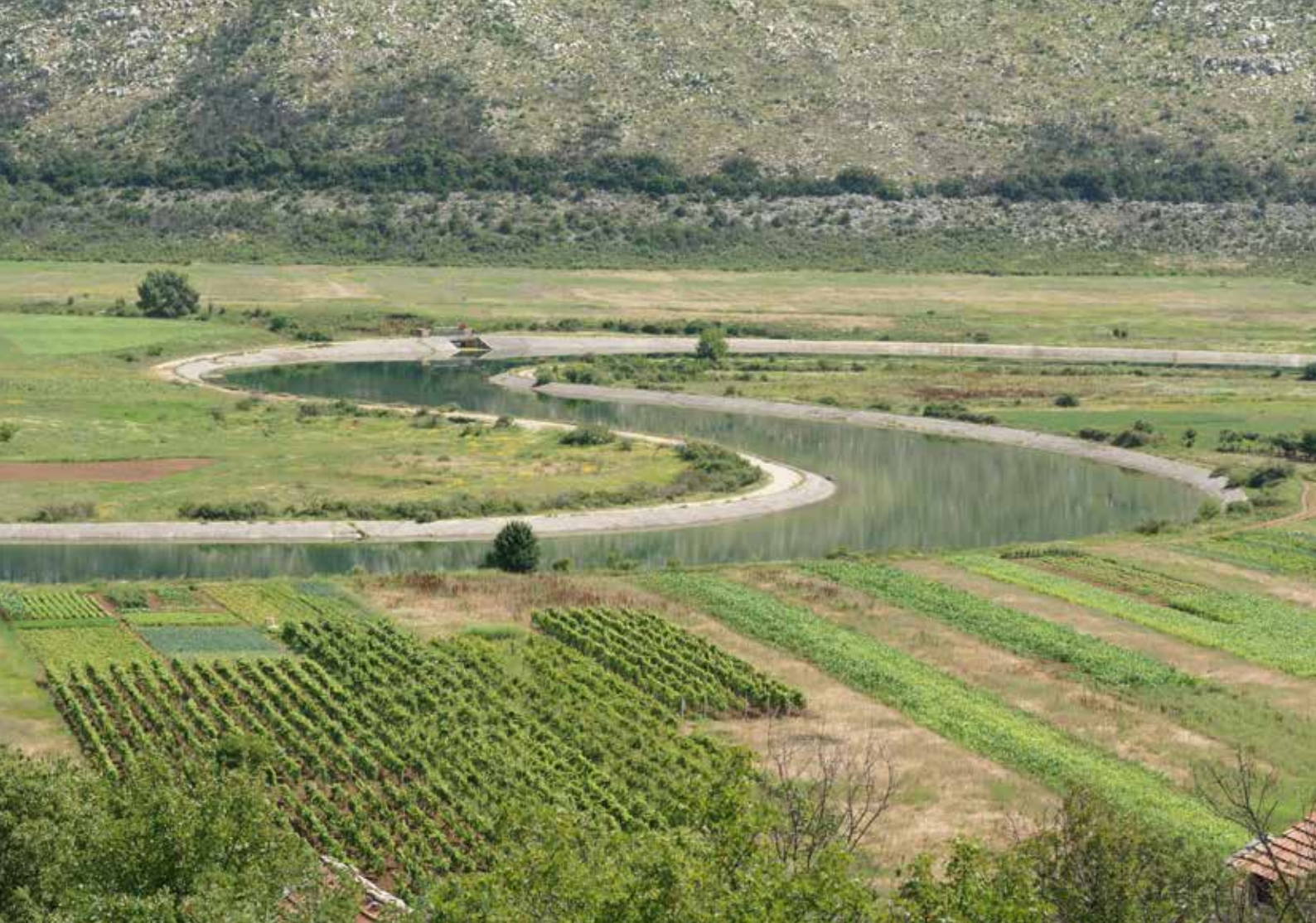
Directing water to the hydrotechnical canal in the Popovo Polje has directly reduced water in the only remaining

natural area of Hutovo Blato – the Derane depression. Upon construction of the Dabar Polje - Fatnica Polje tunnel, the water that naturally drained into Hutovo Blato was directed towards Bileća Lake and further to the turbines of the Plat hydropower plant, i.e. the Adriatic Sea. Additional water will be directed in this direction by the Upper Horizons project, which represents a major threat to the entire Hutovo Blato wetland ecosystem.

Figure 2 clearly demonstrates a decrease in minimum annual water levels of the Krupa River in Hutovo Blato after 1979, which coincides with the completion of the Trebišnjica hydropower plant. Through hydrometric measurements, it has been calculated that the difference in flow for the water level of 30 cm amounts to 5 m³/s, which is half of the summer's total water (dry period). This means that only 50% of the water that naturally flowed into the Derane area of Hutovo Blato remains today. The other 50% is used to produce electricity.

Figure 2. Minimum annual water levels recorded from 1974-1988 at the Karaotok – River Krupa measuring station, which is where Hutovo Blato Nature Park's flows into the Neretva River (source: Federal Weather Institute in Sarajevo)
Author: Emil Bakula





Photograph 5: Trebišnjica river bed blanketed with shotcrete in Popovo Polje (karst field)

Habitat Loss

The process of vegetation succession in Hutovo Blato's ditches and ponds is evident. The desiccation of the wetland vegetation is leading to sedimentation, which in turn leads to depressions and ponds clogging. The proof of this ongoing process was recorded at the Boljun Kuk - Derane Lake measuring station. In 1973, a staff gauge was placed at this station and shortly after, the lowest water level of 13 cm was recorded on 19-20 September 1974. During inspection of the same gauging station on 17 April 2009 it was overgrown with vegetation up to 60 cm in height. Derane Lake's bank is also completely overgrown with thick water vegetation. In the last 35 years, the bottom of Lake Derane at the Boljun Kuk has risen approximately one metre.

Hutovo Blato was deprived of its flooding meadows due to melioration and hydropower operations. In 1961, the Višići land plot was carved out of the Svitava and Derane areas through the construction of the right embankment along the Krupa River. In 1963, the Svitava land complex was carved out through the construction of the left-side embankment and the Svitava-Dračevo peripheral canal and regulation of the Krupa riverbed. The separation of the Višići and Svitava land complexes from the Hutovo Blato system left about 45% of the area, which was previously more or less submerged in water (see Figure 3).

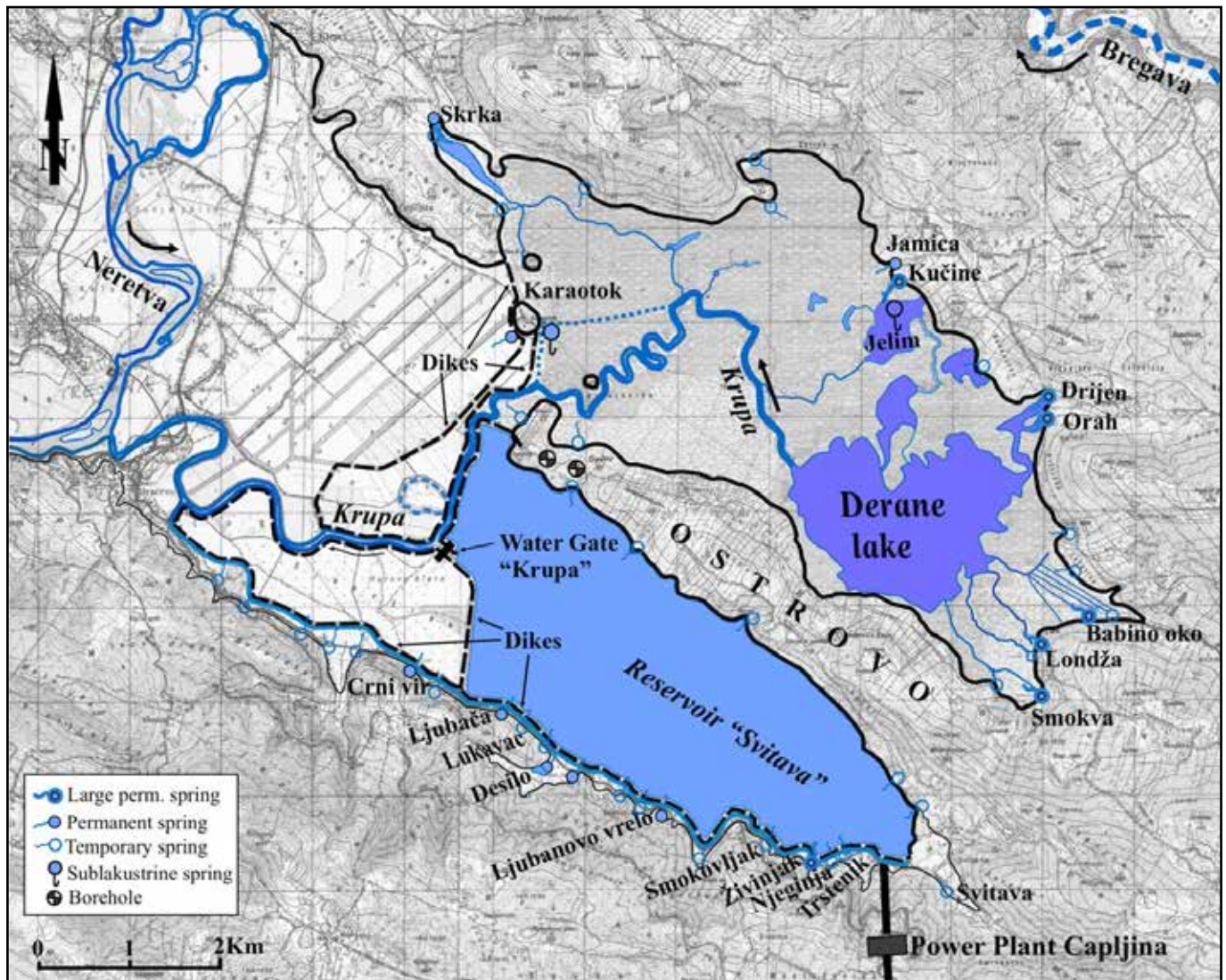


Figure 3. Hutovo Blato ecosystem's main springs, PP Čapljina structures, and boreholes (source: Milanovic, 2006)

Loss of Plant and Animal Species

The Čapljina pumped-storage hydropower plant's construction included building the Svitava reservoir, which has been detrimental to the ecosystem's natural state, especially for the native fish populations and birds. The dam built on the reservoir prevents any migration of fish or other aquatic organisms, which is particularly evident from poor European eel recruitment, mullet migration, and Twaite shad's spawning migration.

Based on observations of Hutovo Blato's bird population in 1979, which was just before the Čapljina hydropower plant was commissioned, and 2000, the total number of birds has decreased by 31% (see Figure 4).

Species from the family of ducks (Anatidae), lapwings (Vanellinae), and snipes (Charadriidae) have decreased by about 45%. Once numerous species – such as the great white heron (*Casmerodius albus*), common spoonbill (*Platalea leucorodia*), white stork (*Ciconia ciconia*), and swan (*Cygnus cygnus* and *Cygnus olor*) – have now become a rarity.

Hutovo Blato boasts 28 plant species included in the International Union for Conservation of Nature's (IUCN) list of Bosnia and Herzegovina's rare, endangered, or endemic plants. The majority of the 28 plant species are considered vulnerable (22 species). Five species, three of which are endemic, are classified as rare, meaning that

the remaining small populations could soon become endangered. The marsh seedbox (*Ludwigia palustris*) is an endangered species and at risk of extinction if causal factors continue to impact its habitat: this relates primarily to the regulation of watercourses that result in habitats drying up. *Knipowitschia hutovae* and *Cobitis narentana* are fish species that only occur in Hutovo Blato

and whose survival is endangered with the disappearance of water bodies. For the remaining endemic fish species, such as *Salmo dentex*, *Alburnus neretvae*, Dalmatian soiffe, and Danubian roach, wetlands are important spawning grounds for young fish. Some species, such as the Danubian roach, spend their entire life cycles in the wetland.

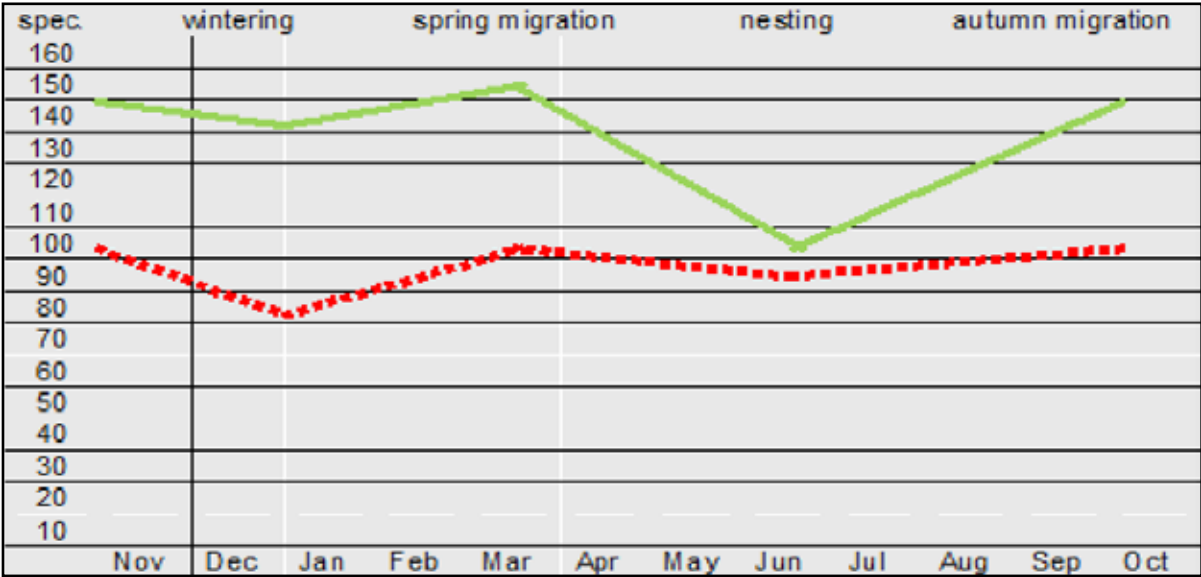


Figure 4. Number of birds observed in Hutovo Blato in 1979 (solid green line) and 2000 (dotted red line)
 Author: Stanislav Obratil



Legal Framework for Protection and Maintenance of Hutovo Blato

The need for protection of the Hutovo Blato wetland ecosystem was recognised as early as 1954 when the first ornithology reserve was founded.

Currently, Hutovo Blato is protected under several frameworks and its preservation is the responsibility of several governmental bodies. In addition to having recognised Hutovo Blato as a national monument, Bosnia and Herzegovina is a party to the Ramsar Convention and has therefore assumed the obligation to protect this area. The Herzegovina Neretva canton owns 100% of Hutovo Blato Nature Park's founding rights. Hutovo Blato is located in the territory of the Čapljina and Stolac municipalities.

In 1996, the Croatian Republic of Herzeg – Bosnia established the Hutovo Blato Nature Park public enterprise ltd. Čapljina (also known as an “association with limited responsibilities”), which is owned by the Herzegovina – Neretva canton. The association's main activities are to protect and enhance the nature

park through the “conservation of flora and fauna species, breeding and cultivation of flora and fauna, environmentally friendly production of food, catering, tourism, etc.”

The Herzegovina-Neretva canton's Environmental Protection Act includes regulations to ensure the protection and enhancement of the environment and the sustainable use of natural resources and energy in this area. “*The operator carrying out an activity dangerous to the environment is responsible for the damage caused by such activity to people, property and the environment*” (Official Gazette of the Herzegovina-Neretva County-Canton, No. 7/04; Article 70). It is undeniable that the Čapljina hydropower plant and accompanying facilities have altered the environment and indirectly resulted in the disappearance of dozens of plant and bird species in the Hutovo Blato Nature Park. Therefore, there exists a legal obligation to restore the damage caused

Based on the above, WWF considers the Energy

Hutovo Blato, panoramic view © Marinko Dalmatin



Company of the Croatian Community of Herzeg-Bosnia – Čapljina Hydropower System legally obligated to earmark funds in their annual business plan for the

implementation of activities to improve and protect plants and animals in the Hutovo Blato Nature Park.

Action Plan to Restore Hutovo Blato: Methodology

WWF established a team of the most influential water regime and biodiversity experts on Hutovo Blato (see Annex 1. Expert Team Members). From 2007 to 2014 and in cooperation with local experts, the WWF expert team analysed the effects of hydropower infrastructure and operations based on a review of existing documentation, personal research and monitoring, and by organising conferences, workshops, meetings, and other types of communications with all relevant stakeholders (government, energy companies, local authorities, NGOs,

etc). Additional experts were hired to analyse measures to mitigate and reduce the negative impacts of hydropower on Hutovo Blato's habitats and biodiversity.

All analyses, recommendations, and discussions presented in this document are the result of years of work in cooperation with a large number of international stakeholders and local beneficiaries.

Action Plan to Restore Hutovo Blato: Findings and Conclusions

For a detailed overview of activities and the associated budget, see Annex 2. Action Plan Overview: Schedule and Annex 3. Action Plan.



Water Regime and Quality

In order to prevent further biodiversity loss, WWF's expert team concluded that five key flood meadows need to be restored in the Hutovo Blato Nature Park. If nothing else, these meadows should have a minimum water level of 10 cm from October to March and up to 10 cm from April to September (see Figure 5). Hutovo Blato's and Lake Derane's watercourses should never be dry at any point.

The WWF team also analysed possible solutions to ensure favourable conditions at the five key sites. Of course, the best solution would be to restore the natural water regime; however, this is impossible due to the existing hydropower system. Therefore, the next best solution

is to imitate the natural water regime. The majority of water comes to Hutovo Blato underground from the Bregava and Trebišnjica rivers and the draining of the Dabarsko Polje, Popovo Polje, and Fatničko Polje. It should be noted that Fatničko Polje only drains a small amount, as this connection is almost completely lost due to the construction of the drainage tunnel Fatničko Polje – Bileća reservoir. Ultimately, Hutovo Blato naturally receives most of its water from the Dabarsko Polje/ Bregava River and Popovo Polje.

The ERS claims that the Dabar hydropower plant project, which is the main part of the Upper Horizons project, would only accumulate and use high waters during the

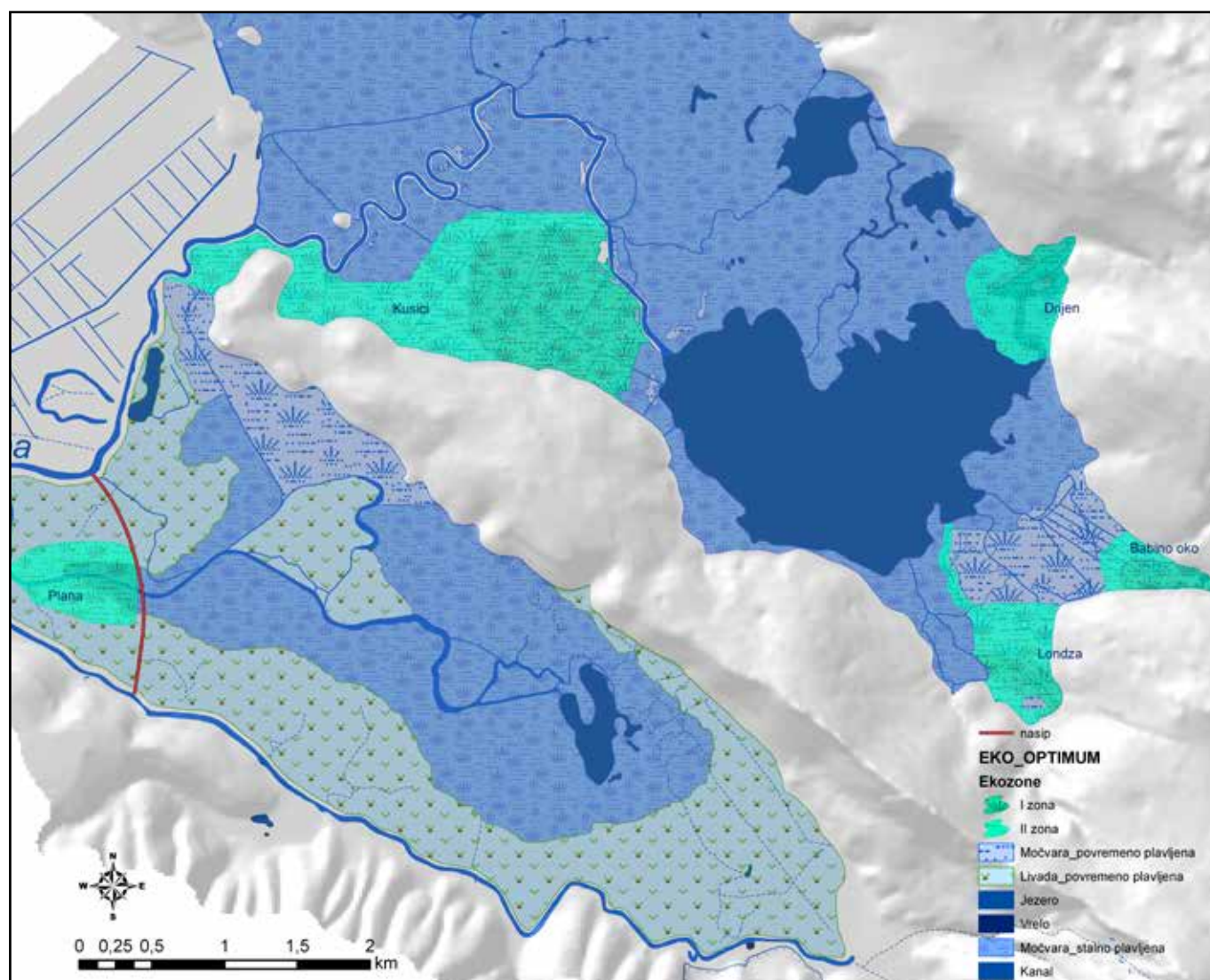


Figure 5. A map of Hutovo Blato's key flood meadows and necessary conditions for a favourable habitat. There must be a minimum of 10 cm of water in the light green areas during the wet season, and the dark green areas must be wet during the dry season.

Author: Nusret Drešković



River Trebišnjica, Popovo polje © Marinko Dalmatin

wet season. Thus, according to the ERS, the project will only have “positive” impacts on the water regime since during summer they will be able to provide more water (from accumulation) to the environment. However, WWF believes that if the water regime is disturbed during the wet season, it will have devastating impacts on the water regime during the summer’s dry season.

Monitoring at the Karaotok – Krupa River measuring station during the dry season and flooding in Popovo Polje during the wet season has proven there is a direct relationship between the wet and dry season water levels. The minimum water level observed in the summer was ten centimetres when there was no flooding in Popovo Polje during the previous wet season; whereas, 35 cm was measured at the same station during summers when flooding was the most significant in the Popovo Polje in winter. If there is more water in the winter, which consequently accumulates as ground water, there is more water in the summer since the springs are not dry. The connections between the sinkhole zones of the Popovo Polje and the Derane area have also been confirmed by observing the Londža spring during water release to the Doljašnica sinkhole zone. It can be concluded that the restoration of the sinkhole zones in the Popovo Polje would increase water supply to the Derane area and restore its ecosystem. Water release to the Popovo Polje’s sinkholes also needs to be investigated since it is still

unclear when and how much of that water flows towards the Svitava area. If it is determined that the majority of this water does not flow to Derane, and thus does not contribute to the restoration of the most important area in Hutovo Blato, then it can be concluded that this is an unviable wetland restoration solution. Due to the high-energy value of the water in the Popovo Polje, the EP HZHB made it clear that they are against this idea. However, WWF proposes to conduct additional research and a feasibility study to resolve this problem rationally.

Since Gorica dam is the main water distribution point, it is important to mention this dam and engage the responsible institutions from Trebinje when implementing activities to restore Hutovo Blato’s water regime and quality. Gorica dam operators can either (i) release water through the tunnel to the Adriatic Sea (HPP Plat) or (ii) release water through the canal through the Popovo Polje towards HPP Čapljina.

It is unrealistic to expect the 5 m³/s of water depleted during the summer from the Derane depression in Hutovo Blato to be compensated in a short period of time. It will be necessary to undertake activities to compensate for the permanent loss of water and artificially recreate water’s natural actions (i.e. sediment amount, vegetation succession, reduction of flood meadows, change in water temperature)

Fish Stocks

Negative impacts to the fish populations and fishing industry due to the lack of water and disturbances in the natural flow can be grouped into several segments according to the season and target group of fish.

Damage to the Dalmatian soiffe populations

The Dalmatian soiffe spawning population in Hutovo Blato's springs is estimated at about 5 tons of adult fish. As each adult fish produces around 3,000 eggs per kilo on average, this amounts to a total of about 15 million eggs. It was found that about 70% of the laid eggs perish due to constant fluctuations in the water regime, which directly reduced the recruitment of new individuals by the same percentage. In the case of low water levels (as in 2011), new recruitment decreased by an average of 15% when compared to the period of high water levels due to food competition.

This means that direct damage to the spawning of the Dalmatian soiffe caused by low and variable waters amounts to 85% of dead eggs and larvae. Since the realistic biological recruitment of new specimens amounts to only about 0.1% of the produced eggs, we are left with as little as 10 times less than the desired biological minimum for a healthy population..

Impact on the endemic Adriatic rudd and carp and introduced tench due to inflow reduction from May to June

The introduced tench has become the most abundant fish in Lake Derane, while the endemic species of carp and Adriatic rudd are very rare. Since the latter two species lay eggs on aquatic plants close to the water surface, they are continuously exposed to water level fluctuations and often perish due to air exposure. However, tench lays their eggs in deep water and are therefore not directly endangered by low water levels.

Today's fish population estimate is based on the most recent fishing statistics, which date back to the 1980s when carp was almost non-existent in the Derane depression. It is estimated that the Adriatic rudd population has decreased by 50%, which amounts to approximately 20 tons in comparison to the 1980s

Impact on the European eel population due to the Krupa's impaired flow in the autumn

When the water from the Svitava reservoir reverses the Krupa's course towards Lake Derane in the autumn, eels change their migration pathways and go where there are no installed devices for eel fishing. It can be estimated that the catch of Hutovo Blato's main commercial species was reduced by 35%, which amounts to some 1,600 kg per average 5 tons of eel for consumption.

Reduction of water surfaces during the summer and fish migration downstream to the Neretva

The Čapljina hydropower plant operator discharges more water (and under high pressure) into the Krupa than its capacity. As a result, the discharged water flows both upstream and downstream. The water that flows upstream to the Derane depression has led to a 20-40 cm rise of Lake Derane and a 10-20 cm rise in the headwaters. These water level fluctuations significantly affect the successful spawning of several fish species – especially the Dalmatian soiffe, carp, and Adriatic rudd – due to exposure to air and sun.

The measures necessary to improve the Svitava reservoir's fish populations focus on recreational fishing and the ornithofauna's food supply. The fish population can only be maintained by continuous stocking with commercially interesting species and fishing of invasive species, especially pumpkinseed. Due to the reservoir's construction, the following species' recruitment was disturbed and thus need to be stocked:

- **Eel:** annual stocking of European eel and young fish up to 5 grams
- **Carp:** annual stocking of carp one or two years of age
- **Zander:** controlled stocking to prevent the growth of detrimental fish populations.

Before fish are stocked, a detailed management plan that is based on biological, hydrological, and geological data of



Eel (*Anguilla anguilla*) © Erling Svensen WWF-Canon

the Svitava reservoir area is needed. Precise estimates of the reservoir's carrying capacity are particularly important to determine. The management plan should establish the reservoir's optimal ichthyofauna structure for recreational and commercial fishing as well as support the improvement of bird populations. This plan would protect the reservoir's endemic species that have a good chance of preservation, such as the Adriatic dace, Neretvan spined loach, and gobies. The plan, which should reflect frequent temperature changes, should provide the basis for all other activities in the reservoir. Fish stocks would be partly provided from future spawning ground.

Due to the Krupa riverbed's small capacity and the hydropower plant's impact, it is necessary to protect the young fish of the species that are endangered by the continuous water level fluctuations. It is possible to supplement some species, like carp, through commercial fish farm supplies, but this is impossible for endemic species. To protect endemic species (Dalmatian soiffe, Danubian roach, Adriatic rudd, toothtrout, Adriatic salmon) and maintain populations of commercially important species (carp, tench,

bullhead), a smaller spawning ground for juveniles and incubation of larva and fish craw in the area most suitable for these species should be constructed. Areas suitable for the construction of the endemic species' spawning ground are around the Derane depression, Londža – where infrastructure already exists, Lake Škrka, and the new facility at the piers in Karaotok. Since spawning of endemic fish species is quite sensitive, this will require full cooperation between the Park and EP HZHB. The Park is responsible for monitoring when and where eggs are and EP HZHB is responsible for avoiding any activity that could kill the eggs

Birds

WWF observed a significant decline in bird populations, including endangered species, in Hutovo Blato's critical sites/habitats (flooded meadows) from 2007 to 2014. This especially applies to species nesting in Hutovo Blato, such as ducks (Anatidae), herons and bitterns (Ardeidae), and cormorants (Phalacrocoridae).

Ardeidae find their food in flooded meadows or shallow spots along the Park's periphery (Londža, Babino Oko, Drijen, Kusići, Plana) as well as in lagoons and the river bends of the Neretva, Krupa, Bregava and Trebižat. Anatidae and Phalacrocoridae find their food in open areas of lakes Derane and Svitava with daily flyovers to Neretva River. Due to increasing changes in the water regime, flooded meadows have decreased and mainly stay dry during the entire year, which is slowly turning this ecosystem into a thicket (Londža 10.95 ha, Babino Oko 36.63 ha, Kusići 90.34 ha), and thus reducing the food supply of wetland birds.

To improve the situation for bird populations, the following activities need to be undertaken:

- Ensure a minimum water level of 10–15 cm from May until the end of June in the immediate part of Londža (8.15 ha), Babino Oko (6.52 ha), Drijen and Orah (10.41 ha), Kusići (101.88 ha) and Plana (21.29 ha);

- Prohibit the cutting and burning of reeds;

- Provide a sufficient amount of grains during the spring, fall, and winter migrations;

- Increase the surface of flooded meadows in Plana (Svitava area), Londža, Babino Oko, Drijen, Orah, Jelim, and Kusići;

- Ensure the flooded meadows at the aforementioned localities experience sufficient flooding during spring migrations;

- Prohibit any disturbance - in particular, poaching - of birds during their nesting period as well as during winter migrations;

- Permanently monitor birds according to the season and build special bird watching stations and facilities to educate volunteers.

Providing sufficient amounts of water at the listed localities during a specific period requires a systematic approach of all stakeholders in the area. These are precisely the habitats that have suffered the greatest destruction by the Čapljina plant's operations and the submersion of the flooded meadows around Svitava and Karaotok area, which were the most productive for the survival of bird species.



Pink Pelican (*Pelecanus onocrotalus*) © Andrija Vrdoljak WWF-Canon



Ponor Crnjuja, Popovo polje © Zoran Mateljak

Amphibians

Water area surface and level are the main factors that dictate the presence of amphibians. At this moment, the only thing we can claim with certainty is that there are risk and high-risk factors contributing to the decline of amphibian populations. Therefore, a comprehensive assessment of the current situation needs to be undertaken, monitoring organised, a GIS model of amphibian distribution developed, and the exact number of species determined.

Raising awareness amongst children, youth, adults, and hunters about which activities in nature change the flow and quantity of ground and underground waters will help conserve amphibians and ensure their survival. It is also necessary to introduce strict measures against the

mass destruction of amphibians, such as prohibiting frog catching. It is extremely important to construct channels beside and under existing roads so that amphibians can move safely through the whole Nature Park. Warning signs that remind drivers of the amphibian population should also be erected. The signs would minimize the danger and enable amphibians to safely cross lower-intensity locations. Nets that direct frogs to a tunnel or a place where they are collected and transferred should be set up in areas with greater traffic intensity.

Reptiles

So far, reptiles have not been systematically explored in BiH. Since many species are endangered and protected, a list and GIS spatial distribution of reptiles is urgently needed.

Butterflies

Up to this point, no research on diurnal butterflies regarding either their distribution nor their vulnerability to changes in the ecosystem has been conducted in Hutovo Blato.

Conclusion

WWF's research and monitoring of Hutovo Blato's water and biodiversity from 2007 to 2014 clearly indicates that the commissioning of the hydropower system in the Trebišnjica basin has substantially disrupted the natural environment. The hydrotechnical interventions have resulted in a significant degradation of the wetland ecosystem in the Hutovo Blato Nature Park. Ultimately, this area has suffered a huge biodiversity loss in the past 35 years since the commissioning of the Čapljina hydropower plant. Water diversion, isolation and closure of sinkhole areas, reservoir formation, and hydropower facility operations in their current form and scope threaten to cause the complete disappearance of the Hutovo Blato wetlands.

It is necessary to take urgent steps to restore and protect Hutovo Blato's wetland ecosystem. WWF's Action Plan identifies the necessary activities for an initial period of five years that will serve as the basis for the design of a subsequent five-year plan to restore Hutovo Blato. WWF's team of experts have established that **4,828,100 KM is needed in the initial period of 5 years** to restore Hutovo Blato's ecosystem.

The Hutovo Blato Nature Park public enterprise is in no condition nor fully responsible to assume the financing of the activities foreseen in this Action Plan. As stated in the Federation of BiH's Environmental Protection Act and the

Herzegovina-Neretva County's Environmental Protection Act – *the operator carrying out an activity dangerous to the environment is responsible for the damage caused by such activity to people, property and the environment*. Therefore, a part of the financing should be provided by the Energy Company of the Croatian Community of Herzeg-Bosnia (EP HZHB) – the owners of the Čapljina plant and its infrastructure, and the Energy Company of Republic of Srpska (ERS) and the Croatian Energy Company (HEP) since both have diverted water from the Hutovo Blato watershed. It is necessary to emphasise that this document does not take into consideration the Upper Horizons project. If this project were to be implemented as currently planned, it would negatively impact the Hutovo Blato ecosystem and cause additional disturbances to the area's hydrology. Therefore, additional measures not envisaged in this Action Plan would need to be considered.

All activities presented in the Action Plan are in the preliminary design stages. Detailed elaborations of activities with GIS maps are available upon request. For further information or explanation of activities, contact the WWF office (zmateljak@wwf.panda.org) or Hutovo Blato Nature Park public enterprise's management office (info@hutovo-blato.ba).





© Nature park Hutovo Blato

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Annex 2

Action Plan Overview: Schedule & Budget

The schedule lists the activities and the corresponding budget for the five-year Action Plan to restore Hutovo Blato.

Activities	Year 1 (KM)	Year 2 (KM)	Year 3 (KM)	Year 4 (KM)	Year 5 (KM)	TOTAL (KM)
5.1.1. Restoration of the key areas of Hutovo Blato Nature Park	60,000	60,000	60,000	60,000	60,000	300,000
5.1.2. Cleaning watercourses, gullies and channels to maintain and improve ecological and hydrological conditions	137,000	137,000	137,000	137,000	137,000	685,000
5.1.3. Restoration of flooded meadows and reeds	25,000	25,000	25,000	25,000	25,000	125,000
5.1.4. Restoration of spawning grounds for fish	60,000	60,000	60,000	60,000	60,000	300,000
5.1.5. Grain sowing	50,000	50,000	50,000	50,000	50,000	250,000
5.1.6. Purchase of necessary additional equipment for existing machinery	145,000					
TOTAL - 5.1. Restoration of habitats	477,000	332,000	332,000	332,000	332,000	1,805,000
5.2.1. Research activities (water regime)	68,350	68,350				136,700
Marking of Doljašnica sinkhole	23,600	23,600				47,200
Marking of Ponikva sinkhole in Dabar Polje	24,800	24,800				49,600
Identification of subterranean connections of the Škrka lake spring with the sinkholes along the Bregava river bed	19,950	19,950				39,900
5.2.2. Purchase of equipment (water monitoring)	61,000					61,000
Instrument for continuous measuring of inflow	45,000					45,000
Spectrophotometer Hach DREL 800/HQ40D/2100Q	16,000					16,000
5.2.3. Office and field activities (water regime)	34,000	45,000	80,000	10,000		169,000
Backfilling of illegally dug channels	34,000					34,000
Analysis of impact made on water fluctuations in the Derane area		15,000				15,000
Feasibility studies of possible solutions to increase the water inflow in the Derane depression		30,000	80,000	10,000		120,000
5.2.4. Activities to improve water quality	16,560	16,560	51,560	51,560	26,560	162,800
Examples of research and laboratory analysis	16,560	16,560	16,560	16,560	16,560	82,800
Pilot project of eco farming			25,000	25,000		50,000
Map construction and solving the problem of illegal waste			10,000	10,000	10,000	30,000
TOTAL - 5.2. Restoration of water regime and water quality improvement	179,910	129,910	131,560	61,560	26,560	529,500
5.3.1. Design of strategic documents and plans (fish stocks)	70,000	50,000	147,000	25,000		292,000
Detailed ichthyological and habitat studies	70,000					130,000
Plan of aquaculture development			60,000			60,000

Activities	Year 1 (KM)	Year 2 (KM)	Year 3 (KM)	Year 4 (KM)	Year 5 (KM)	TOTAL (KM)
Contract of joint management of the Svitava reservoir			7,000			7,000
Plan of water management in the Derane depression				25,000		25,000
Spawning ground project		40,000				40,000
Studies on the location of the spawning ground		10,000				10,000
Detailed design of the spawning ground			80,000			80,000
5.3.2. Field activities (fish stocks)		72,000	72,000	372,000	372,000	888,000
Fish stocking of the Svitava reservoir		72,000	72,000	72,000	72,000	360,000
Construction of the spawning ground				300,000	300,000	600,000
TOTAL - 5.3. Restoration of fish stocks	70,000	122,000	219,000	397,000	372,000	1,180,000
5.4.1. Purchase of equipment with a purpose of restoring birdlife	113,000	35,000	35,000	35,000	35,000	253,000
Equipment for bird counting and ringing	78,000					78,000
Purchase of food and feeders	35,000	35,000	35,000	35,000	35,000	175,000
5.4.2. Activities for renewal of bird populations	75,000	245,000	275,000	175,000	165,000	935,000
Establishment of component physic-geographical instrumental monitoring	30,000	30,000	20,000			80,000
Establishment of permanent bird monitoring	15,000	15,000	15,000	15,000	15,000	75,000
Construction of breeding ground for young birds		150,000	120,000	100,000	50,000	420,000
Reintroduction of the Dalmatian pelican	30,000	50,000	120,000	60,000	100,000	360,000
TOTAL - 5.4. Restoration of birdlife	188,000	280,000	310,000	210,000	200,000	1,188,000
Establish the exact faunistic structure of amphibians		39,600				39,600
Establish the exact number of reptile species		45,000				45,000
Establish the exact faunistic structure of diurnal butterflies		41,000				41,000
TOTAL - 5.5. Other projects to preserve biodiversity	0	125,600	0	0	0	125,600
TOTAL	914,910	989,510	992,560	1,000,560	930,560	4,828,100

Revitalizacija staništa

As a consequence of diverting Hutovo Blato's waters, it is now necessary to replace the processes that existed in the natural water regime to maintain the ecosystem's vital functions. The implementation of the following activities would ensure the long-term preservation of the habitats and endangered species. There is a need for direct field interventions to help living organisms (birds, amphibians, fish and other endangered and protected species) maintain their stable populations, as well as to create and maintain a synergy between local communities and the ecosystem. 332,000 KM a year is needed to implement activities to restore the habitats – this includes the cost of labour,

consumables, fuel, as well as the use of existing machinery and equipment (i.e. maintenance, parts, etc) that belong to the Hutovo Blato Nature Park public enterprise. **1,805,000 KM needs to be invested to restore the entire habitat in the first five years.**

Restoration of Hutovo Blato Nature Park's key areas				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Karaotok 54,000 m ²	Overgrown condition, inaccessibility, fire hazard	Cleaning of shrubs, sanitary logging, extracting roots, filling up terrain, grass sowing	September - November	50,000
Londža 10,000 m ²	Overgrown condition, inaccessibility, fire hazard	Cleaning of shrubs, sanitary logging, extracting roots, filling up terrain, grass sowing	September - November	10,000
			Total (annual)	60,000

Cleaning watercourses, gullies and channels to maintain and improve ecological and hydrological conditions

Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Škrka 14,000 m ²	Increased gully overgrowing, reduced water flow, changed water quality of Lake Škrka, reduced fish populations, difficult access, loss of wetland birds nesting habitats	Mowing, cutting, vegetation and silt removal	August - October	20,000
Londžina jaruga (the gully of Londža) 5,800 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak)	Mowing, cutting, vegetation and silt removal	August - October	20,000
Podsrb 5,300 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak)	Mowing, cutting, vegetation and silt removal	August - October	10,000
Babino oko 7,350 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak)	Mowing, cutting, vegetation and silt removal	August - October	5,000
Gabeokino vrelo/jaruga (Smokvica) The well/gully of Gabela (Smokvica) 5,000 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak)	Mowing, cutting, vegetation and silt removal	August - October	2,000
Jelimska jaruga (the gully of Jelim) 6,200 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak)	Mowing, cutting, vegetation and silt removal	August - October	5,000
Gornja Galebica, Donja Galebica (Galebica, upper and lower) 5,600 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak) and indigenous fish species	Mowing, cutting, vegetation and silt removal	August - October	10,000
Bočinska Jaruga (The gully of Bočin) 2,500 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak) and indigenous fish species	Mowing, cutting, vegetation and silt removal	August - October	2,000

Lokalitet/površina	Stanje/problem	Aktivnosti	Period provedbe	Cijena (KM)
Markotina Jaruga (Markota's gully) 1,000 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak) and indigenous fish species	Mowing, cutting, vegetation and silt removal	August - October	1,000
Kusička jaruga (the gully of Kusić) 4,000 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak) and indigenous fish species	Mowing, cutting, vegetation and silt removal	August - October	20,000
Čunova jaruga (the gully of Čuni) 9,700 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak) and indigenous fish species	Mowing, cutting, vegetation and silt removal	August - October	2,000
Jebenka jaruga (the gully of Jebenka) 4,200 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak) and indigenous fish species	Mowing, cutting, vegetation and silt removal	August - October	5,000
Barišina jaruga - Puhaluša (Barišas gully - Puhaluša) 9,600 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak) and indigenous fish species, amphibian and reptile vulnerability	Mowing, cutting, vegetation and silt removal	August - October	5,000
Kanal Sunca (the channel of Sunca) 9,600 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak) and indigenous fish species, amphibian and reptile vulnerability	Mowing, cutting, vegetation and silt removal	August - October	5,000
Kanal Žalonja (the channel of Žalonja) 3,300 m ²	Increased gully overgrowing	Mowing, cutting, vegetation and silt removal	August - October	2,000
Jaruga Džinavica (the gully of Džinavica) 3,600 m ²	Increased gully overgrowing	Mowing, cutting, vegetation and silt removal	August - October	3,000
Jelimska rječina, Merdanovac i Sačevac 70,000 m ²	Increased gully overgrowing, reduced water flow, loss of wetland bird nesting habitats, endangered spawning of endemic fish species (Dalmatian soiffe, Danubian Roach, bleak) and indigenous fish species, amphibian and reptile vulnerability	Mowing, cutting, vegetation and silt removal	August - October	20,000
			TOTAL (annual)	137,000

Restoration of flooded meadows and reeds				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Glavica 620,000 m ²	Overgrown condition, difficult access, fire hazard, endangered condition of flora and fauna	Mowing, vegetation and silt removal	June - August	5,000
Prosine 260,000 m ²	Overgrown condition, difficult access, fire hazard, endangered condition of flora and fauna	Mowing, vegetation and silt removal	June - August	5,000
Jamica - Kućetine 310,000 m ²	Overgrown condition, difficult access, fire hazard, endangered condition of flora and fauna	Mowing, vegetation and silt removal	June - August	5,000
Nikića čaer - Mačija ljut 220,000 m ²	Overgrown condition, difficult access, fire hazard, endangered condition of flora and fauna	Mowing, vegetation and silt removal	June - August	5,000
Londža - Barač do 440,000 m ²	Overgrown condition, difficult access, fire hazard, endangered condition of flora and fauna	Mowing, vegetation and silt removal	June - August	5,000
			TOTAL (annual)	25,000

Restoration of spawning grounds for fish				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Vrbine 1,030,000 m ²	The lack of conditions for fish spawning. Endangering and reducing fish and bird populations in the food chain	Mowing and making fires at fish spawning grounds	September- November	20,000
Đinavica 560,000 m ²	The lack of conditions for fish spawning. Endangering and reducing fish and bird populations in the food chain	Mowing and making fires at fish spawning grounds	September- November	20,000
Struge 150,000 m ²	The lack of conditions for fish spawning. Endangering and reducing fish and bird populations in the food chain	Mowing and making fires at fish spawning grounds	September- November	20,000
			TOTAL (annual)	60,000

Grain sowing				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Đinavica 305,000 m ²	Lack of food for birds and fish and other animals, lack of spawning grounds	Preparing the soil for sowing, grain purchase (corn, millet, sunflower), sowing	June - July	10,000
Glavica 150,000 m ²	Lack of food for birds and fish and other animals, lack of spawning grounds	Preparing the soil for sowing, grain purchase (corn, millet, sunflower), sowing	June - July	20,000
Babino oko - Posrt 46,000 m ²	Lack of food for birds and fish and other animals, lack of spawning grounds	Preparing the soil for sowing, grain purchase (corn, millet, sunflower), sowing	June - July	10,000
Karaotok 101,000 m ²	Lack of food for birds and fish and other animals, lack of spawning grounds	Preparing the soil for sowing, grain purchase (corn, millet, sunflower), sowing	June - July	10,000
			TOTAL (annual)	50,000

Purchase of necessary additional equipment for existing machinery				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Hutovo Blato	Overgrown condition, difficult access, endangered flora and fauna	Purchase of additional attachments for amphibious vehicle	year 1	75,000
Hutovo Blato	Overgrown condition, difficult access, endangered flora and fauna	Purchase of additional tractor attachments	year 1	50,000
Hutovo Blato	Overgrown condition, difficult access, endangered flora and fauna	Purchase of hand tools (chainsaws, mowers and hand tools)	year 1	20,000
			TOTAL	145,000

Restoration of water regime and water quality improvement

With the purpose of Restoration of the low waters' regime of Hutovo Blato, as well as the restoration of all the natural processes (bird populations, fish populations etc.), it is crucially important to re-establish the natural regime of low waters in Hutovo Blato. This means that from May to September, the period of low water level, an additional 5.0 m³/s of water, which is the deficit recorded by the team of scientists and professionals who drafted this document, needs to be brought. The table below shows the activities that need to be conducted in Hutovo Blato with the purpose of recovery and control of low waters' hydrological regime and water quality. The total value of the listed activities is 529,500 KM

Research activities				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Doljašnica sinkhole in the Popovo Polje and Hutovo Blato	There are currently no exact results on how much water appears in the Svitava or the Derane area after water release to Doljašnica sinkhole	Dye tracing of Doljašnica sinkhole, observing the appearance of tracer in springs and gullies, flow measurement	July - September (year 1 and 2)	47,200
Ponikva sinkhole in Dabarsko Polje, Bregava River and Hutovo Blato	There are currently no exact results on how much water appears at the source of the Bregava or the Derane area after water release in Ponikva sinkhole	Dye tracing of Ponikva sinkhole, observing the appearance of tracer in springs and gullies, flow measurement	July - September (year 1 and 2)	49,600
Škrka lake and Bregava River	It has not been established how Lake Škrka is supplied with water	Identification of groundwater connections of Lake Škrka with sinkholes alongside the riverbed of the Bregava	July - September (year 1 and 2)	39,900
			TOTAL	136,700

Equipment Purchases				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Krupa River / Hutovo Blato	Unfamiliar dynamics of the flow of the Krupa from Derane and the inflow from the dam at the Svitava reservoir	Installation of equipment for continuous flow measurement	July - September (year 1 and 2)	45,000
Hutovo Blato	Monitoring of the water quality needed	Purchase of spectrophotometer Hach DREL 800/HQ40D/2100Q Complet Water Quality Lab	January - December (year 1)	16,000
			TOTAL	61,000

Office and field activities				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Hutovo Blato, Derane area	Human impacts in the nature park	Backfilling of illegally dug channels, preventing of unauthorized entry, securing of hydrological activities	July - September (year 2)	34,000
Hutovo Blato, Derane area	Fluctuations in water levels in the Derane area caused by the Čapljina plant's operations	Analysis based on impact of water fluctuation on the fish populations in the Derane area	January - December (year 1)	15,000
Hutovo Blato, Derane area	The need to increase water inflow of suitable quality to the Derane area during the summer	Feasibility studies for alternative solutions to increase water inflow of suitable quality to the Derane area during the summer	years 2-4	120,000
			TOTAL	169,000

Activities to improve water quality				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Derane lake and the sources, Svitava reservoir, upper compensation basin Čapljina, Krupa River	Water quality	Sampling and laboratory analysis of physical and chemical elements of quality, including nutrients, oxygen regime, chlorophyll "a", chemical substances (micropollutants, pesticides, metals, PCB, PAHs, BDE, C10-C13) in water, sediment, and biota	Every year	82,800
Svitava reservoir	Pollution by nitrates, pesticides and sulphates	Financing of pilot project of eco farming industry in cooperation with local producers	January - December (year 3 and 4)	50,000
Hutovo Blato	Illegal waste disposal	Mapping and solving the problem of illegal waste disposal in the nature park area	January - December (years 3-5)	30,000
			TOTAL	162,800

Restoration of fish stocks

Design of strategic documents and plans				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Svitava reservoir	Management plan for the Svitava reservoir required in order to optimise fish habitat structure and develop cultivation and sports and recreational fishing	Detailed ichthyological and habitat studies	January - December (year 1)	70,000
Svitava reservoir	Management plan for the Svitava reservoir required, in order to optimise fish habitat structure and develop cultivation and sports and recreational fishing	Morphological study of the Svitava reservoir, aquaculture development plan, fishing management plan	January - December (year 1)	60,000
Hutovo blato	Contract on the joint management of the Svitava reservoir and other issues between Hutovo Blato Nature Park public enterprise and the EP HZHB required	Compilation and coordination of the Contract	January - December (year 3)	7,000
Derane depression	Management plan for the waters of the Derane depression required with the purpose of optimising fish habitat structure, protecting endemic fish species and natural spawning grounds	Preparation of the management plan	January - December (year 4)	25,000
Hutovo Blato	Preliminary design of spawning grounds for endemic and commercial fish species	Project development	January - December (year 2)	40,000
Hutovo Blato	A study on the selection of spawning ground site	Study development	January - December (year 2)	10,000
Hutovo Blato	Detailed design of spawning ground	Project development	January - December (year 3)	80,000
			TOTAL	292,000
Field activities				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Svitava reservoir	Fish stocking of the Svitava reservoir needed	Eel (young European eel or young fish weighing up to 5 grams), carp (1 or 2 years of age), zander (fish up to 100 gram)	January - December (years 2-5)	288,000
Hutovo Blato		Construction of spawning ground (depending on the chosen capacity, locality and execution)	January - December (year 4 and 5)	600,000
			TOTAL	888,000

Restoration of birdlife

Equipment Purchases				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Hutovo Blato	Need to establish permanent bird monitoring	Purchase of nets for sampling and equipment for bird ringing, boat, off-road car, outboard motor, etc.	January – December (year 1)	78,000
Hutovo Blato	Need to ensure additional food for the return of birds	Purchase of food, purchase of feeders	Every year	175,000
			TOTAL	253,000

Activities for renewal of bird populations				
Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Hutovo Blato	There are no identified physical or geographical indicators to serve as basis for future planning	Establishment of the component physical and geographical instrumental monitoring (GIS)	January – December (years 1-3)	80,000
Hutovo Blato	The need to establish continuous bird monitoring	Regular visits to the area during the year	Every year	75,000
Hutovo Blato	Numerous bird species are endangered	Building farm and incubators for production of young birds	January – December (years 2-5)	420,000
Hutovo Blato	Dalmatian pelican is a nesting bird which disappeared from the Neretva delta	Reintroduction of Dalmatian pelican to the area of Hutovo Blato	January – December (every year)	360,000
			TOTAL	935,000

Other projects to preserve Hutovo Blato's biodiversity

Locality/surface	Condition/problem	Activities	Implementation period	Price (KM)
Hutovo Blato	The need to establish the precise faunistic structure of amphibians	Show distribution and determine the ecological and biogeographical features of identified species	January – December (year 2)	39,600
Hutovo Blato	The need to establish the exact number of reptile species in the area	Develop a GIS of spatial distribution of reptiles, establish ecological and biogeographical features of the established species	January – December (year 2)	45,000
Hutovo Blato	The need to establish precise faunistic structure of diurnal butterflies in Hutovo Blato	Show distribution of all identified species and determine ecological and biogeographical features of the established species	January – December (year 2)	41,000
			TOTAL	125,600

References

- Antonelli, F , Mateljak, Z 2012, Stručno mišljenje na „Studija uticaja projekta HE Dabar na životnu sredinu“, WWF Mediterranean Programme Office (unpublished)
- Antunović, M 2014, Analyses of the impacts of construction and operation of Čapljina hydropower plant on water quality of Hutovo Blato - Water quality, WWF Mediterranean Programme Office (unpublished)
- Bakula, E 2014, Akcijski plan za obnovu prirodnog režima malih voda Parka prirode Hutovo blato, WWF Mediterranean Programme Office (unpublished)
- Bakula, E 2009, Hidrološka studija Parka prirode Hutovo blato, WWF Mediterranean Programme Office (unpublished)
- Bukvić, V 2014, Pregled istraživanja populacije ptica u Hutovu blatu u periodu 1973 – 2014. WWF Mediterranean Programme Office (unpublished)
- Bukvić, V 2002, Ekološki uvjeti ponovnog naseljavanja kudravog nesita (*Pelecanus Crispus* Bruch 1832) u dolini Neretve, Sveučilište u Zagrebu, Hrvatska (magistarski rad - unpublished)
- Bukvić, V , Rozić, I 2014, Izvješće o stanju populacije vodozemaca u Parku prirode Hutovo blato, WWF Mediterranean Programme Office (unpublished)
- Drešković, N 2013, Eko-hidrološka revitalizacija Deranskog blata i definiranje prihvatljivih proticaja kao osnova za očuvanje njihovog biodiverziteta, WWF Mediterranean Programme Office (unpublished)
- Glamuzina, B 2014, Mjere u cilju unaprjeđenja postojećeg stanja populacije riba u Parku prirode Hutovo blato, WWF Mediterranean Programme Office (unpublished)
- Glamuzina, B 2014, Analysis of the impacts of construction and operation of the Čapljina hydropower plant on water quality of Hutovo Blato - Ichthyology, WWF Mediterranean Programme Office (unpublished)
- Jasprica, N 2009, Flora and vegetation in the Hutovo Blato Nature Park, WWF Mediterranean Programme Office (unpublished)
- Jerkić, J 2012, Prijedlog mjera za osiguranje sredstava za financiranje unaprjeđenja zaštite Parka prirode Hutovo blato, WWF Mediterranean Programme Office (unpublished)
- Mateljak, Z 2011, A critical evaluation of the positions of stakeholders regarding protection of the wetlands of Nature Park Hutovo Blato in the face of increasing need for hydropower production, Staffordshire University, UK (Master's thesis - unpublished)
- Milanović, P 2006, Karst Istočne Hercegovine i dubrovačkog priobalja (Karst of Eastern Herzegovina and Dubrovnik Littoral), Asocijacija speleoloških organizacija Srbije – ASOS, Belgrade, Srbija
- Milanović, P 2009, Study on hydrogeology of Nature Park Hutovo Blato, WWF Mediterranean Programme Office (unpublished)
- Obratil, S 2002, Istraživanje faune ptica (AVES) na Hutovu blato u period siječanj – prosinac 2000 god., Završni simpozij LIFE projekta LIFETCY 99/BiH/035 “Nova politika gospodarenja vlažnim područjima Hutova blata” (unpublished)

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