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Land use



Protection of Biodiversity of the Sava River Basin Floodplains

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Protection of Biodiversity of the Sava River Basin Floodplains

**The relevance of farming and farmland for maintaining the
landscape and biodiversity of the Sava floodplains**



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ABSTRACT

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1. Introduction

This report presents the results of the activities the land use working group performed in the frame of the Life 3rd countries project: “*Protection of Biodiversity of the Sava River Basin Floodplains*” (LIFE TCY 06/INT/246) as mentioned under task C of the project proposal.

The following deliverables of Task C are included in this report:

- Assessment of traditional and ongoing land use activities and their relevance for maintaining the landscape and biodiversity (chapter 5, 6 and 7);
- Analysis of market conditions and product chains (chapter 8);
- Action plan for restoring, maintenance and management of floodplain areas including guidelines for land use practices (chapter 10);
- Concepts for innovative land-use practices (chapter 9);
- Recommendations for setting up a support/incentives scheme for continuing traditional land uses (chapter 9).

The analyses of the land uses is relevant because in combination with the information about the distribution of habitats and species it provides an essential bases for the identification of threats and the design of the required restoration and management measures to secure favourable conservation status of the habitats and species.

Given the time needed to make a full inventory of the land uses of all 49 project sites along the Sava River it was decided to focus on those sites that were indicated as most valuable for biodiversity. The sites were selected in close communication with the biodiversity working group because of the need to improve the protection status and to design management and restoration plans for these sites.

The deliverable on identifying opportunities for agro- and nature tourism and for establishing tourism facilities along the Sava is published as a separate report.

An analyses of land uses and their relevance for the landscape and biodiversity was carried out in the following focal areas:

- Odransko Polje (Croatia)
- Žutica (Croatia)
- Gajna (Croatia)
- Bardača (Bosnia and Herzegovina)
- Rača (Bijeljina) (Bosnia and Herzegovina) (bordering with Ušće Drine, Serbia)
- Velika i Mala Tišina (Bosnia and Herzegovina)
- Zasavica (Serbia)
- Ušće Drine (Serbia) (bordering with Rača, Bosnia and Herzegovina)
- Morovičko-bosutske šume (Serbia) (bordering with Spačva, Croatia)
- Obedska bara (Serbia)

The first part of chapter 5 presents the results of the detailed land use inventory of the focal sites carried out in the frame of this project plus the main conclusions of the analyses while the second part of chapter 5 presents basic information about land use issues based on existing data. The land use data were gathered through field work using a field form that has been developed specifically for the purpose of the project (see chapter 3 for introduction in the methodology and annex 1 for the field form). All data gathered have been processed into SDI (Spatial Data Information) base which is available at the project’s web site www.savariver.com.

No narrative report with information on the threats, landscape features, invasive species, cultural and tourist facilities in the selected focal sites in Bosnia and Herzegovina (BiH) was received hence the analyses do not cover these aspects on the three focal sites in the country. The information



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received from BiH is limited to the land use maps and graphs that have been compiled on the bases of the land use analyses.

The Agricultural Institute of Republic of Srpska, partner organisation from BiH that carried out the land use analyses, argued that the selected sites in BiH are predominantly in (intensive) agricultural use. According to the Agricultural Institute and in contrast to other sites in Croatia and Serbia, none of the sites in BiH is under any kind of protection and therefore these areas should be considered differently than the sites in Croatia and Serbia.

However, the focal sites were selected by each country and that also counts for the sites in BiH where Rača and Velika i Mala Tišina were proposed by Center for Ecology and Natural Resources (CEPRES), the project's partner from Sarajevo (BiH) that made the biodiversity inventory, because of the actual conditions of the landscape and biodiversity in the two sites and the opportunities for improving the situation. Bardaca was added because it is the only area in the floodplains of the Sava in BiH that is internationally recognized as an important area for biodiversity and is designated under the Ramsar Convention.

Also large parts of the sites in the other two countries are in agricultural use and do not have the status of protected area or are partly under intensive (forest) management (Obedska bara, Žutica).

The analyses of market conditions has been done by interviewing farmers using a detailed questionnaire (see annex 2). The results as well as recommendations can be found in chapter 9.

2. Rationale

Land use is a dominant factor in shaping the landscape and in determining the occurrence of animals and plants hence faltering land use and abandonment will lead to the loss of landscape and biodiversity. Insight in the current land use is therefore of utmost importance when planning for the protection and maintenance of the landscape and biodiversity of areas.

Land use however can both pose a threat as well as being an asset to the protection and maintenance of biodiversity depending on the intensity and form of the land use. The task of the land use group is to make an analysis of the current land uses, identify conflicts with the most valuable landscape and biodiversity features and design proposals for maintaining and/or introducing land uses that support the protection of these valuable landscape and biodiversity features. The focus will be on presenting recommendations for forms of agricultural land use that support the protection of the landscape and biodiversity.

The great wealth of biological and landscape diversity found along the Sava River, and the conservation of that diversity largely depends upon traditional forms of land use. Traditional forms of land use imply the manner and conditions of land use and adaptation to the natural environment that have been in place for 100 years or more. Because continuity in land use provides the foundation for a stable and diverse landscape and biodiversity its conservation will have to be based on a continuation or an imitation of these traditional land uses based on an innovative approach to agriculture.

Agriculture is the most common activity in all the countries of the region. The mosaic-like landscapes found along the Sava were formed by agriculture and created habitats rich in plant and animal species.

One of the significant features of the Sava River are its floodplain areas that both support biodiversity and prevent flooding. Traditional forms of land use, such as grazing and mowing, together with the natural activity of the river, have created the present day characteristic



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appearance of the floodplains. The most important evidence of this is seen in the middle reaches of the Sava River (Central Posavina). This part of the Sava River represents a unique landscape and ecological system of flooded river side areas that exist due to the joint impacts of natural flooding processes and human activities.

Large floodplain areas, like those in the Lonjsko Polje Nature Park serve as retention areas for high waters of the Sava and its tributaries, thereby preventing floods, while in the summer months they turn into vast pastures where indigenous breeds of horse, cattle and pigs still graze freely. The best known indigenous breeds of the Posavina region are the Turopolje pig, Mangulica pig, Croatian Posavina horse, and Slavonian Podolian cattle.

Traditional grazing systems large complexes of common pastures are still present today in various areas along the entire course of the river. Continuation of pasturing is a crucial form of agriculture to secure the survival of grassland habitats and the survival of threatened plant and animal species.

Forestry is another important land use of considerably economic importance with a vital portion of the Sava River area covered with lowland floodplain forests of willow, poplars, common oak and narrow-leaf ash. In fact, the largest complex of alluvial lowland forests in the Danube basin lies along the Sava. An increasingly part of these forests are managed in line with ecological, social and economic standards and are granted the FSC certificate.

In planning the future management of the Sava floodplains one has also to bear in mind that nature has no prescribed and defined final situation but is always changing and adapting to new circumstances. The situation of the past can not be maintained without significant public costs and new management options have to be explored to decrease the dependency on state subsidies. Through history large and small herbivores have always had a big impact on the landscape and biodiversity and the vast floodplain areas along the Sava River offer opportunities for introducing extensive year round grazing schemes with animals that are adapted to the climate. This way of management where “nature” does its work reduces the involvement of humans and is therefore less costly than traditional management through extensive farming practices. The landscape that will develop under this extensive grazing regime will be more dynamic and resembles the landscape and related biodiversity of the floodplains before large parts of the floodplains were reclaimed for agriculture or forestry. It is however not desirable to introduce this type of management everywhere because for cultural historic reasons and for reasons related to maintaining the rural livelihoods the promotion of environmentally sensitive agriculture remains to be important.

3. Methodology for land use analyses

The analyses of land uses and biodiversity of the selected focal sites provides a basis for the elaboration of targeted management and restoration measures. The land use information and the information on the distribution of habitats and species gathered by the biodiversity group are all processed into the GIS and that allows for making overlays of land uses and the distribution of the selected habitats. Because the biodiversity group focuses on the identification of habitats and species that are important from the European perspective (habitats that are listed in the Habitats Directive) no full inventory of the chosen sites has been made. The overview of the land uses however covers the whole of the focal sites and in this way complements the work of the biodiversity group.

The methodology to make an inventory and description of the land uses in the chosen focal sites was developed by the Land Use Working Group (LWG) members during an intensive workshop in April 2008.

During this workshop a field form was developed in close cooperation with the GIS working group so that the land use data gathered could be easily digitized and processed into the data base.



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It appeared however that the use of the form was rather complicated and this hampered a smooth progress of the work. The form for instance assumed that one single type of land use was spread over large areas which would make it easy to map and fill in the data base. In practice however the landscape and thus the land uses were very diverse which made it close to impossible to make a detailed mapping of all single small parcels unless much more time and money would be available. In a meeting of the land use working group in December 2008 (in Banja Luka, BiH) experiences of the past field season were discussed and modifications to the proposed manner of working agreed upon.

Another meeting was convened in April 2009 in Slavonski Brod (Croatia) to go into the field with the experts and test the land data base and the method developed at the beginning of the field season.

The following steps were agreed to be taken to make the land use inventory:

1. Collection of existing maps, satellite images and aerial photos.
2. Check existing information from Natura 2000 Standard Data Form.
3. Agree with Biodiversity WG (BWG) members on who collects information about ownership and management.
4. Based on landscape features and scale: pre-delineation of mapping areas/polygons (see figure below).
5. Agree what areas are assessed by the BWG and LWG.
6. Fieldwork to assess land use and indicate on map.
7. Take pictures in the field for the specific land use units (at least 4, in North, East, South and Western direction) and record the coordinates of your picture position!
8. Fill out the database.

Because of the diversity of land uses in some areas it was agreed to indicate first, second and tertiary land uses. In addition to filling in the field form describing the land uses pictures are taken and processed into the data base so that the results of the inventory are visible and changes of the land uses over time can be easily monitored. Because the land use analysis is also meant to help to indicate areas of high biodiversity the intensity of use of grasslands, arable land and forests is indicated in a scale from A to D of which D indicates that land use has ceased and the area is abandoned. See annex 2 for a table used to determine the intensity of the land use.



Figure 1. Pre-delineation of land use categories (polygons) in Bardaca before field work (based on Landsat images)

Besides the inventory of land uses additional information was gathered on the following aspects:

- Invasive species;
- Garbage dumps;
- Touristic infrastructure and facilities;
- Autochthonous animals;
- Cultural historic features;
- Gravel mining.

The land use inventory also included an indication of the location of the primary flood protection to help to identify areas that are open to flooding and can serve as a retention area and to help to indicate potential areas where flooding could be restored.

The form used is attached as annex 1 to this report.

The information gathered during the field work is processed into the GIS data base using the following excel sheets (single file with information for all sites):

Name: Landuse_XX (country code)
Gaus - Krueger zone 5
ESRI shape file
Type: Polygon

Attribute table Landuse_XX

FID	SHAPE	Id	Site	Area surface	Primary	Secondary	Tertiary	%
	Polygon	0	Gajna	20	100	101	102	10
Esri	Esri	Esri	Text,30	Double,0,0	Text, 6	Text, 6	Text, 6	Double,0,0

- FID ▶ SHAPE and ID are automatic Esri fields
- Site ▶ name of the site
- Area ▶ Surface of the specific land use polygon (not the whole site)
- Primary ▶ Primary land use code
- Secondary ▶ Secondary land use code
- Tertiary ▶ Tertiary land use code
- % ▶ Area/Site Area

The pictures are filed according to the following methodology:

Name: Photo_landuse_xx (country code)
Gaus - Krueger zone 5
Type: Polygon

Attribute table Photo_landuse_xx

FID	SHAPE	Id	SITE	FEATURE	Primary	Photo_path
	Polygon	0		101	100	C: \ Photo_landuse_HR \gajna1.jpg
Esri	Esri	Esri	Text,30	Text, 30	Text, 6	Text, 50

- FID, SHAPE and ID are automatic Esri fields
- SITE ▶ Name of the site
- FEATURE ▶ Optional information about the picture
- USE_A ▶ Primary land use code
- Photo_path ▶ C: \ Photo_landuse_HR \gajna1.jpg



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All photographs are in the folder with the same name as file Landuse_XX.
Photograph format: JPG
Size: 800x600 (can be divided in four parts)
Name: first word of site name and numbers in order from one (Gajna_1) etc.

Finally, a word table provides basic information about the site (see example Obedska bara below).

Name of site: Obedska bara	
Protection status	Half of the site area is protected within Special Nature Reserve "Obedska bara"
Ownership	State ownership over 95 %, other is in private ownership
Surface	19.667 ha
Main land uses	Forestry (dominant) combined with hunting and extensive farming, arable land
Open floodplain or protected from flooding	About half an area is in foreland, other is protected by dyke
Management and management plan	Management plans for: protected area (PA), hunting areas, forest management units and water management.
Name and address organisation responsible for management	PE "Vojvodinašume", Preradovićeva 2, 21131 Petrovaradin, Serbia
Native breeds (names and numbers)	Cigaja sheep: 240
Important land use features (hedges, ponds, etc)	Old meander with pond, meadows, marshes and arable land within forest matrix
Cultural historic features	Old church, traditional housing
Land use changes (if possible)	Decreasing of traditional pig herding and cattle pasturing, less part of wetland converted to arable land, natural forests and pastures partially converted to poplar plantations
Touristic facilities	New hotel within the hunting area, bird watching towers, hunting towers

Table 1. Key features of the focal sites

Important aspect that had an impact on the inventory of both land uses and biodiversity is the fact that still extensive areas are inaccessible because of the possible occurrence of land mines; a leftover from the war that raged through the area between 1991 and 1995. Below is a map of the areas that potentially still have mines in Croatia.



Figure 2. Area potentially contaminated with land mines in Croatia



4. Flood management and floodplain restoration

Although land use has a higher impact on the distribution of the vegetation than flood events in normal years, floods are important for shaping and maintaining the landscape and biodiversity of the floodplains. Only long lasting flood events occurring once every 100 years and resulting in long periods of submerged vegetation have a bigger impact on the vegetation resulting in the drowning of large areas of especially shrub and forest vegetation.

The combined influence of grazing and floods are unique for floodplain areas and the landscape and biodiversity occurring in floodplains. Due to the fertility of their soils through history flood plains have been used for agricultural purposes while at the same time regular floods have limited their use. By building dykes along the river humans have not only protected the hinterland but also made the floodplains more useful for the development of intensive agriculture to supply the needs of growing human population. Nowadays we have come to realize that by building dykes close to the river the storing capacity of river systems have decreased significantly leading to increased risk that dykes burst particularly when peak discharges are increasing. There are two ways to tackle this problem; either the dykes have to be strengthened and heightened or the river has to be given back space for storing flood waves. The latter option means that the floodplains become floodplains again by moving the dykes away from the river to the border of the original floodplain.

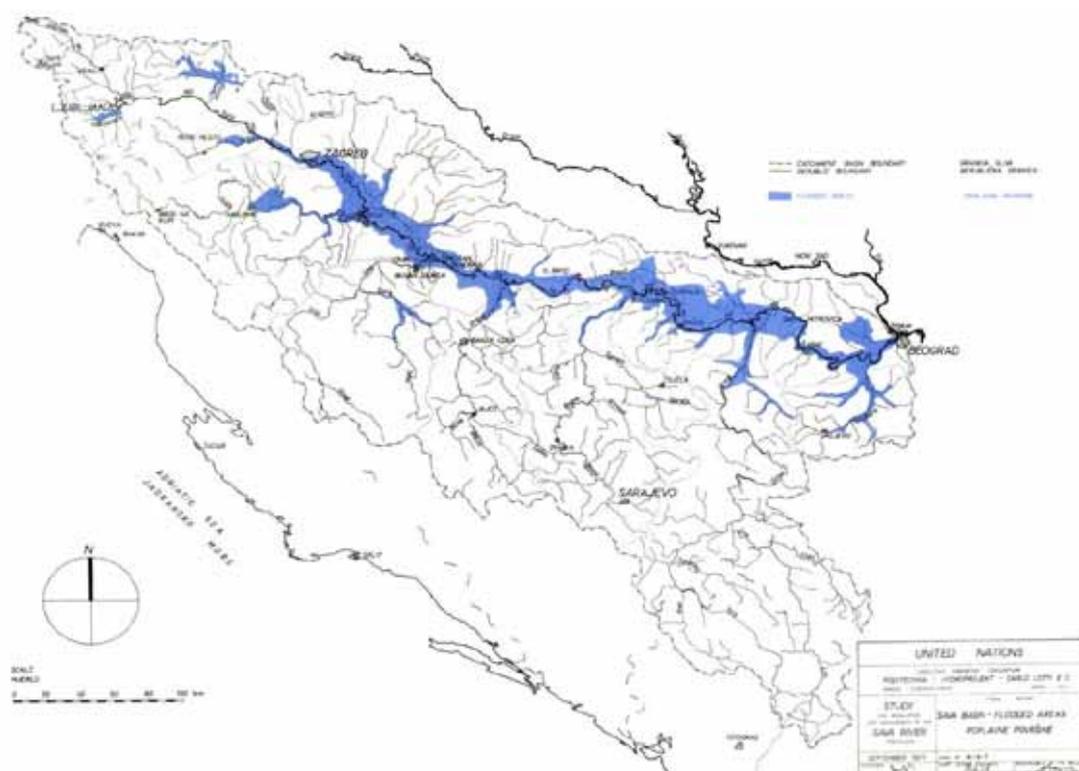


Figure 3. Areas flooded during disastrous floods in the 1960s

After disastrous floods in the 1960s a flood protection plan was designed in which the Middle Sava floodplains would play a crucial role in retaining water when big amounts of water would flow down the river from upstream areas. The execution of this plan was not yet completed when the war broke out in the early 1990s and the project was put on hold but one of the results was that the original surface of the flood plain areas prone to flooding was reduced from 292.000 ha to 120.000 ha. (Mladen Petrić, Mira Filipović, Lidija Kratofil, Sandra Šurlan Popović, Željko Tusić; Towards Integrated water Management in the Middle Sava Basin, Zagreb 2004).

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The Sava flood protection system leans heavily on using floodplains for storing peak discharges and alleviating flood risks. In the Middle Sava large floodplain areas of Lonjsko Polje and Zutica have been designated to store flood waves and an ingenious systems of in- and outlet sluices and dams is built to manage the flood waves. If well managed this benefits both nature and the safety of the people living along the Sava.

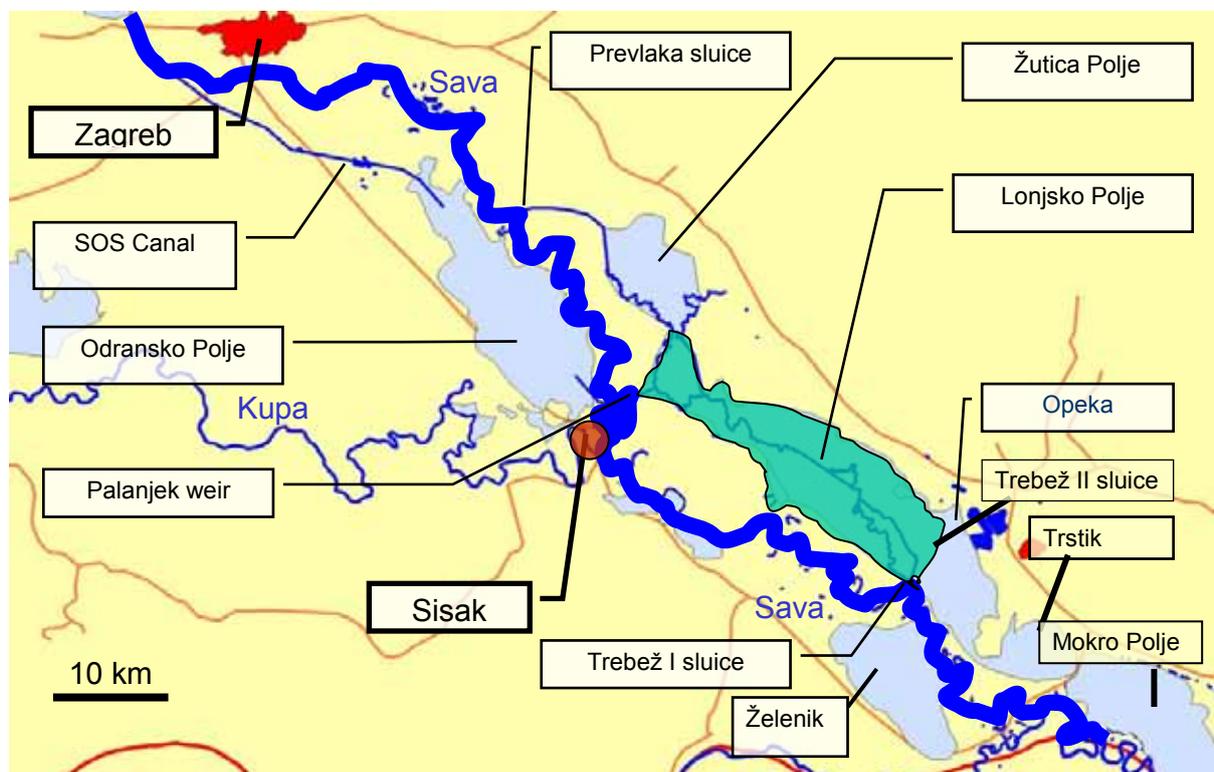


Figure 4. Retention areas plus in- and outlet structures in the Middle Sava area

Odransko Polje was not planned to be part of the retention area but was supposed to be developed into an agricultural area. To protect Zagreb a part of the flood wave would be discharged via the Sava-Odra Canal through Odransko Polje however without using Odransko Polje to store water but releasing the water through the Palanjek weir into the Lonjsko Polje/Mokro Poje floodplains. In the current situation the SOS canal is unfinished and ends in Odranska Polje so that in times of high discharges also Odransko Polje serves as a retention area and contributes to the safety of Zagreb.

Currently the retention function is combined with agriculture and forestry. It is highly recommended to formally designate Odransko Polje as retention area and to improve the protection status of Odransko Polje (in the current situation it is designated as Landscape Park) to warrant the protection of the landscape and biodiversity.

The use of the Middle Sava floodplains for storing flood waves has not been in conflict with the protection of the landscape and biodiversity values of the areas so far. Crucial to maintaining the balance between nature protection and flood protection is to avoid too long periods of flooding as this might have a negative impact on the quality of for instance the oak forests. It is therefore important to also design the outlet structures through which the water released back into the Sava with sufficient capacity. This is of particular interest when due to climate change effects the peak discharges will increase and more water needs to be stored in the floodplains. Recent experiences however show that there is a lack of water during summer time rather than too much water in during winter and spring time.



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Other areas along the Sava also serving as retention areas in periods of high discharges include Dvorina, Gajna, Morovičko-bosutske šume and Obedska bara. Only Dvorina and Obedska bara are not protected by dykes and floods in a natural way without the use of sluices and dams.

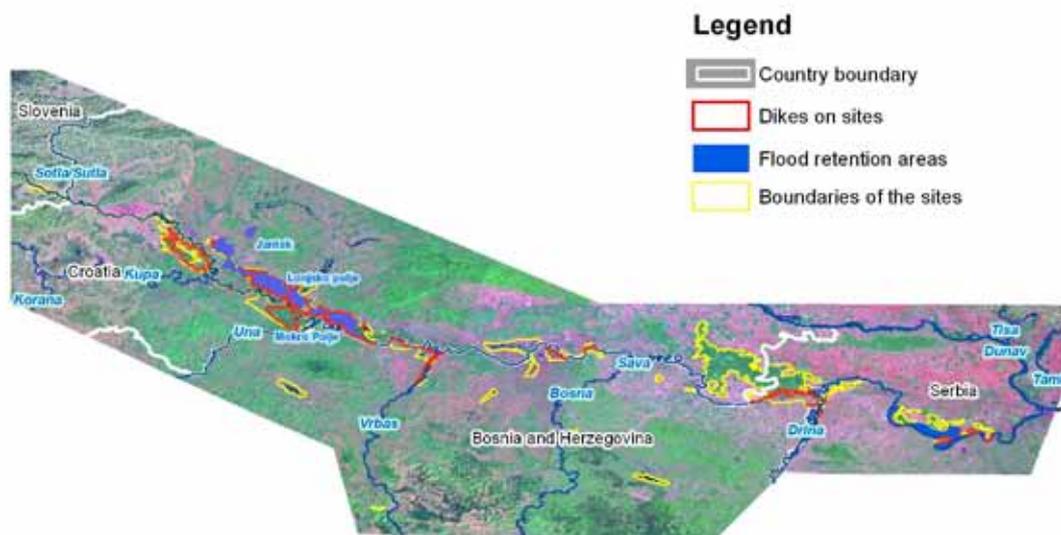


Figure 5. Areas that are currently available for storing water during periods with high discharges.

Restoring floodplain areas for retaining flood waves has a positive impact on the riverine landscape and biodiversity. It will restore the dynamics in the floodplains needed to restore the biodiversity that is relying on frequent floods and the geo-morphological processes that depend on high river discharges. Given the relative low population density in some floodplain areas the restoration of the floodplains does not need to be very costly. This counts for instance for parts of Bardaca and for areas in the mouth of the Drina.

One of the objectives of the land use inventory has also been to identify flood plain areas that could be restored to increase the retention capacity of flood waves and increase the landscape and biodiversity. Whether more retention areas are needed to provide safety against flooding in the future and to adapt to the impact of climate change will depend on the models that are being built to predict future discharge patterns of the Sava River. Up till now the current system of flood retention and flood management has proven to be safe but one has to bear in mind that the safety standards used to design the flood protection system are lower than those used in North-Western Europe. The project identified opportunities for increasing the retention capacities and restoring flood plains in the mouth of the Kuna and Drina Rivers, in Bardača and Mokro Polje.

One of the most critical areas in the flood defense system of the Sava river is at the confluence of the Sava and Drina Rivers where the current level of flood protection is insufficient.

The area just upstream of the confluence of the Drina with the Sava is a potential area to increase the storing capacities and in alleviating the flood threats downstream of the Mačva area. The potential retention area includes Morovičko-bosutske šume (Serbia) and Spačvanski bazen (Croatia) both predominantly covered by forest.

The largest part of Morovičko-bosutske šume is protected by a dyke along the Sava, but the water regime of the area is managed through a dam in the River Bosut which is a tributary to the Sava. Because of this, flooding of the site is not regular but managed depending mostly upon needs of



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agriculture and flood protection of settlements and towns in the vicinity and further downstream the Sava.

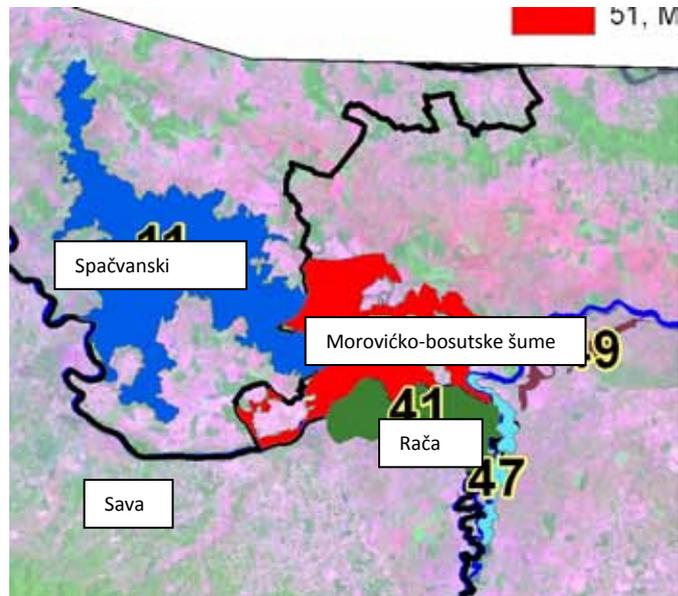


Figure 6. The area of Morovičko-bosutske šume and Spačvanski bazen as a potential retention and transboundary protected area.

5. Description of the land use in the focal sites

The below map shows the focal sites along the Sava River important for land use:

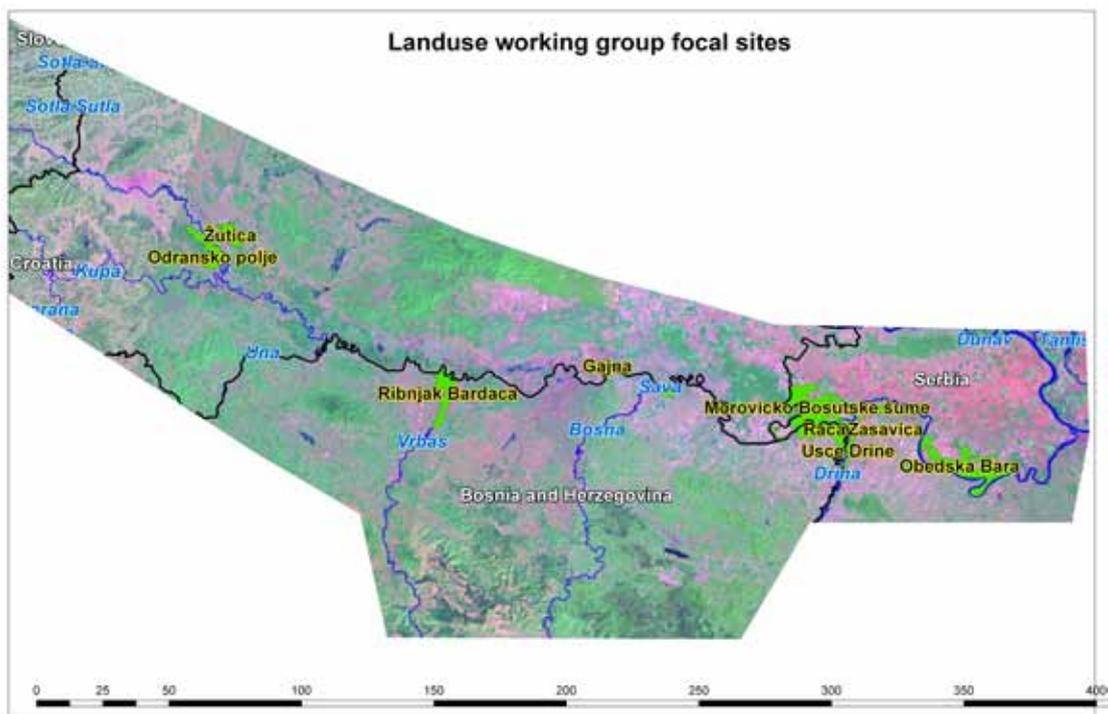


Figure 7. Focal sites of the Land Use Working Group



Focal sites in Croatia

There are three focal sites selected in Croatia: Gajna, Odransko Polje, and Žutica.

5.1 Gajna

Characteristics

Gajna is a flooded area between the river Sava and the dyke near city of Slavonski Brod east of the area. The area is important for biodiversity due to the large wet grasslands, old oxbows and wetland vegetation as well as numerous alluvial depressions in which in spring and autumn floods water is retained. The biggest of them, Velika Gajna, is 5 ha and is an important area for *Marsilea quadrifolia*, protected plant species. The grasslands are being used for cattle grazing. A local NGO (Ecological Society of Brod – BED) is taking care of the area and is ensuring a favourable water regime throughout several projects. Gajna is 100% in state ownership. It was designated as an important landscape in 1990. The site is included in National ecological network of Croatia.



Gajna, photo by Ecological Society of Brod (BED), Croatia

It is a typical Slavonian flooded pasture (found alongside Sava) and an open floodplain. The size of the site is 565.8 ha. The grasslands are being used for cattle grazing, although the cattle number has decreased over the years (mainly due to the aging of the local farmers). However, the native cattle breed Slavonian Podolian cattle was reintroduced couple of years ago. Land use types that occur are pastures (61.3%), succession (19.2%) and arable (cultivated) area (10.5%).



Gajna, photo by Ecological Society of Brod (BED), Croatia



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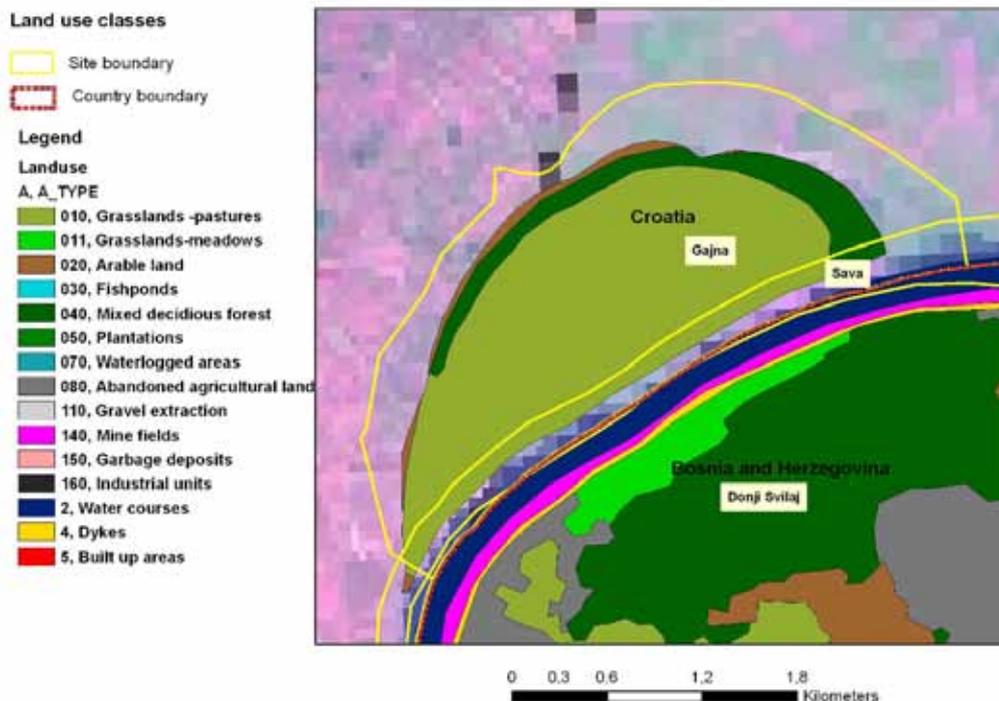


Figure 8. Land Use map Gajna

Threats

There are no garbage dumps on Gajna. The reduction of the number of cattle throughout the past years could be considered as a threat (directly connected with decreasing of biodiversity).

Native cattle breeds

There are now 48 cattle head on Gajna (37 Slavonian Podolian cattle head and 11 mixed breed head), purchased by the NGO managing the area. The cattle are held extensively, which means that they are located on the pasture throughout the whole year, without being in stables. One of the aims of this particular cattle breed growth is the repression of an invasive species *Amorpha fruticosa*. The pasture is enclosed with wooden and electric fence. The electric fence is moved around the site so the cattle are forced to graze on *Amorpha fruticosa* which has proven as a good way to repress this invasive species and therefore contributing to biodiversity of the area. The results are excellent: more than half of the grasslands that have been overgrown with *Amorpha fruticosa* are already cleaned out by cattle's grazing (they are destroying the vegetative plant parts), which has significantly improved biodiversity and land use at this area. There are also 3 Black Slavonian pigs and 3 Croatian Posavian horses on this site.

Invasive species

Amorpha fruticosa

Cultural historic features

'Čardak' – a traditional wooden structure.

Touristic facilities

Information tables about the site (2), no Bed & Breakfast facilities. Construction of a bird watch tower is planned.



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Legal framework

The local NGO 'Brodsko ekološko društvo' is actively managing the area by ensuring a favourable water regime for Velika Gajna. The site is also under the management of the Brodsko-posavska County's Public Institution for Protected Nature Values. In the near future the management will be secured through a contract between NGO BED and the County's Public Institution. There is no management plan for the site.

Land use changes

A lateral canal has been built in 1950s so the part where the cattle is grazing hardly ever dries out. Water from the Sava can enter Velika Gajna through a sluice that is managed by the NGO. A cattle stable is built in the area on an artificial hill to prevent it from flooding. There is less pastures than 100 or 50 years ago due to the lower number of cattle head.

5.2 Odransko polje

Characteristics

Apart from the grassland habitats, this area is also represented by spacious Pedunculate oak forests. Together with nearby wet grasslands and the River Odra they are very important habitat for some of the European endangered bird species like *Haliaeetus albicilla* (who nests in the forest) and *Crex crex* (these wet grasslands are one of the most important habitats for this species – for that reason Odransko polje is included in Croatia's National ecological network). The River Odra is a source of water for the floodplain pastures and for the cattle, it is a water-stream which can be sailed on, and the water quality is still maintained.

It is also a valuable area for cattle-growing because of its many pastures. Its total size is 9 401.90 ha. The site is mainly in state ownership (app. 90%) and only a small part is private property. The Odransko polje site is protected in the category of an important landscape and is included in Croatia's National Ecological Network.



Odransko polje, photo by the State Institute for Nature Protection, Croatia

Odransko polje is located about 10 km from nearby cities Sisak and Velika Gorica, so the area represents an oasis of conserved nature, which offers a possibility for recreation and relaxation for the inhabitants of these cities. There is no significant pollution from industrial waste-waters.



Land use

Odransko polje represents a large part of the retention flood defence system of the Middle Posavina area. In the European context, this area is a positive example of flood protection by making use of the retention capacities of the floodplains and helps to prevent floods in Zagreb.



Native breeds: Turopolje pig and Posavina horse, photo by State Institute for Nature Protection (Croatia)

Some of the protected species that are found at this site are *Fritillaria meleagris*, many of the *Orchid sp.*, *Marsilea quadrifolia*, 12 species of amphibians, 7 reptiles, 38 breeding bird species and 31 mammals.

Land types that occur are leaf forest (47%), succession areas (18.5%), mostly arable land (5.7%), cultivated land (5.4%) and pastures (23.4%).

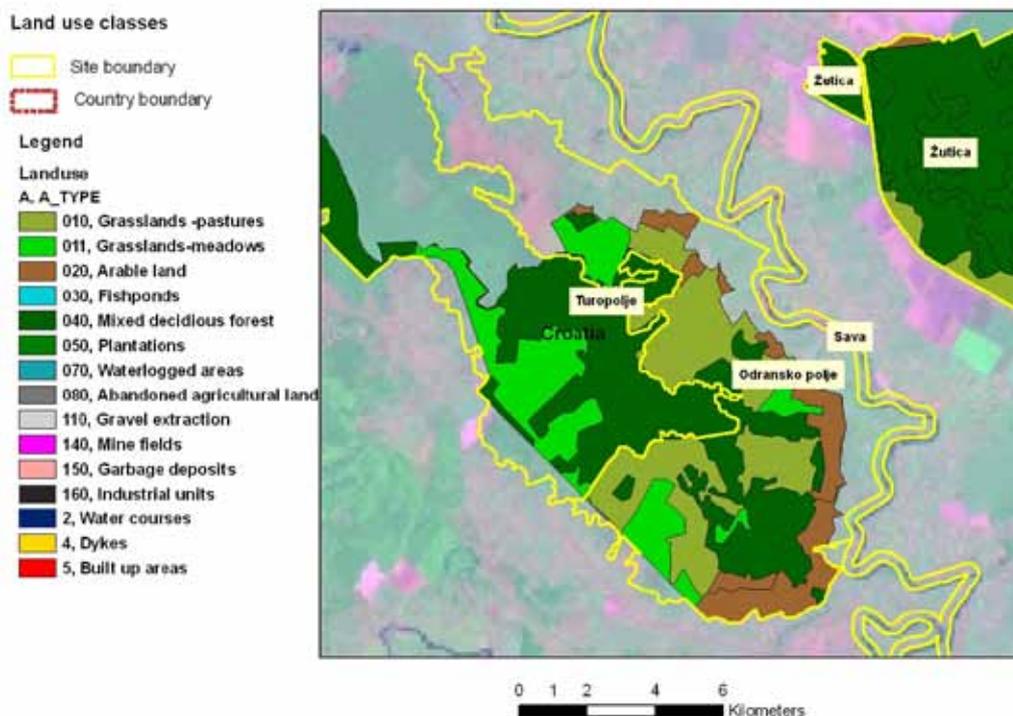


Figure.9. Land Use map Odransko Polje and Turopolje



Land use

Landscape features

There is a disconnected branch in this site (app. 800m long). Several dirt roads can be found throughout the site.

Threats

Succession of grasslands due to loss of extended farming (grazing), intensifying of agricultural production (fertilizing, mowing intensification, drying out and turning into arable land) and garbage dumps.

Native cattle breeds

There are still well preserved extensive grasslands; more importantly local inhabitants have an interest to maintain extensive cattle-growing (through cattle-grow they will conserve native breeds like the Croatian Posavian horse – almost 70% of the Posavian horses are held at this area – and Turopolje pig). Lately, horse breeding has been intensified and it has made the area more attractive for tourism. Pigs are being held in the open throughout the whole year, while horses and cattle are in the stables during the winter. They are maintaining grassland vegetation and preventing succession of pastures; also the grasslands have to be mowed for ensuring the nutrition during the winter. Therefore, extensive cattle-growing is one of the most important measures in biodiversity and landscape conservation at this site.

Invasive species

Amorpha fruticosa

Touristic facilities

Horse riding (touristic and therapeutically; horse wagon).

Legal framework

There is no existing management plan yet. The Zagreb County and Sisačko-moslavačka County's Public Institutions for Managing Protected Nature Values are managing this site.

Land use changes

Land use is basically the same as 50 years ago – the only difference is that it used to be more pastures on the site which have disappeared due to the lack of grazing.

5.3 Žutica

Characteristics

Žutica is (mostly) an integral forest. It is the second largest lowland forest in Croatia. It is specific because it has also been a oil drilling-site for 40 years (since 1964) with more than 200 boreholes, yet the rich characteristic botanical and zoological world survived in the forest. The meadows on the border of the forest are pastures for a native horse breed (Croatian Posavian horse). The forest is exploited by 'Croatian Forests' for commercial purposes. There are no open areas (meadows, grasslands) within the forest.

Over 100 years ago a native population of beaver (*Castor fiber*) resided in Posavina area but they became extinct. However Žutica has proven to be a favourable site for the reintroduction of beavers which were released in 1996 (47 individuals and until 2003 their number was tripled). Žutica forest is also important as a habitat for an endangered species of mud minnow (*Umbra krameri*). The endangered plant species *Fritillaria meleagris* is also occurring in this site.

The forest serves as a retention area and the area is flooded almost every year; the water from Sava River is released into Žutica through a canal provided that the discharge is becoming too high.



Land use

Land use types in Žutica are leaf forest (67.3%), pastures (6.1%), succession area (25%), arable land (0.8%) and a small industrial part (0.8%). Total size of the site is 4 698.10 ha. Approximately 90% of the land is in public ownership (public forests); the rest mainly located along the outer boundaries of the site is private property used for grazing and farming. The site is not designated as a protected area although the site is included in Croatia's National ecological network.

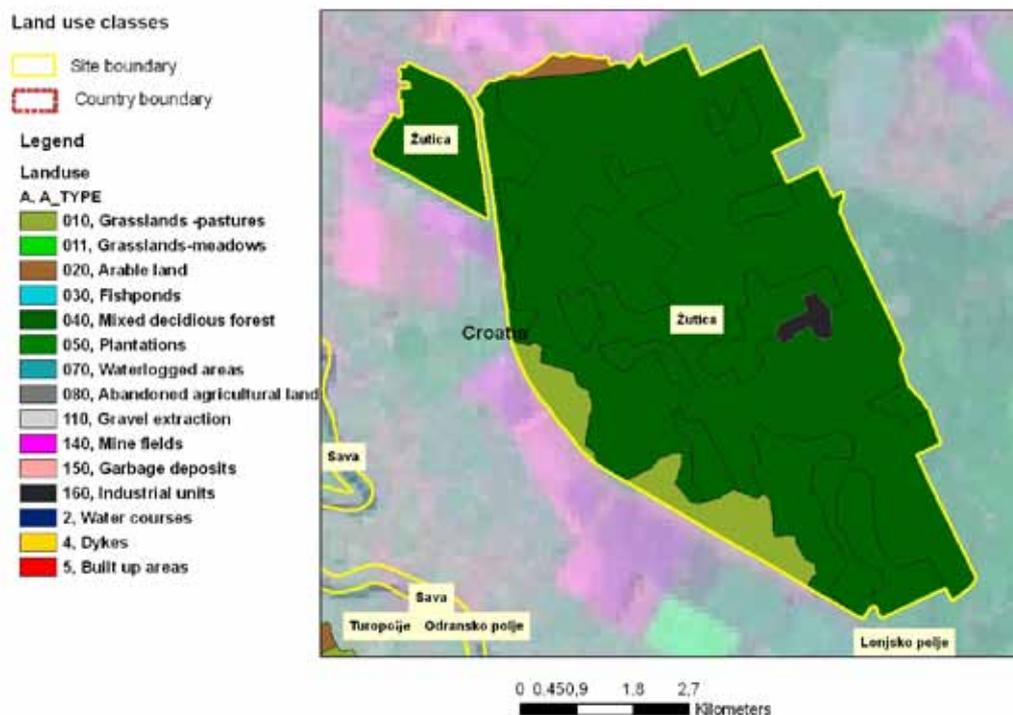


Figure 10. Land Use map Žutica

Threats

There are 107 active boreholes and 19 boreholes are closed-out. The ones that are closed-out will not be in used in the future so they are closed with a cement cork and buried with soil. Forest seedlings are planted on that place so former boreholes will be covered with trees in several years. There are no waste waters because the water that is being used for embedment in the borehole is extracted from the oil into special tanks, circulates and is once again being pumped back into the borehole. The last borehole has been bored in 2003. It is estimated that the oil on this site will be extracted until the year 2035.

There are several illegal garbage dumps in the site. They are cleaned every year in April by the forest department that manages the site, together with the local government – this year (2010) the cleaning will be organized by the Zagreb County's Public Institution for Managing Protected Nature Values and the forest department that manages the Žutica site.

Another threat is drying of Pedunculate oak forests due to habitat and water regime changes.

Native cattle breeds

Croatian Posavian horses are being held out in the open most of the year (since April until October); 600–700 horses.

Land use

Invasive species

Invasive species that can be found in this site are *Amorpha fruticosa* and *Ambrosia artemisiifolia*. *A. fruticosa* is found at approximately 600-700 ha, mostly in areas of young forest where it is harder to repress it – it takes a lot more time and work than in the open area.

Touristic facilities

The County's Public Institution for Managing Protected Nature Values is preparing a project for placing an educational trail in this area: five km long, combination of various point types (forest, pastures, native horse breed etc.). There is a cycling route that passes through Žutica site.

Legal framework

The site is being regularly managed through the forest management plan by 'Croatian Forests'. Since the site is a part of Croatia's National ecological network, the Zagreb County's Public Institution for Protected Nature Values is responsible for nature protection of the area, but an actual management plan for the Public Institution has not yet been created.

Focal areas in Serbia

There are four focal sites selected in Serbia: Morovičko-bosutske šume, Obedska bara, Ušće Drine, and Zasavica.



Figure 11. Project areas in Serbia, Source: Institute for Nature Conservation of Serbia

5.4 Morovičko-bosutske šume

Characteristics

The area is situated in the lowland on the left bank of Sava and includes several tributaries on the northern edge while on the Westside the site is bordering Spačva, the project site in Republic of Croatia. The mosaic-like landscape is dominated by mixture of old lowland Pedunculate oak-ash-hornbeam forests, with admixture of marshes and waterlogged areas overgrown with willows, representing a natural mosaic of high biodiversity value. The plants are mostly hygrophilous. Small grassland patches, in different stages of succession, are most often situated within wetland



Land use

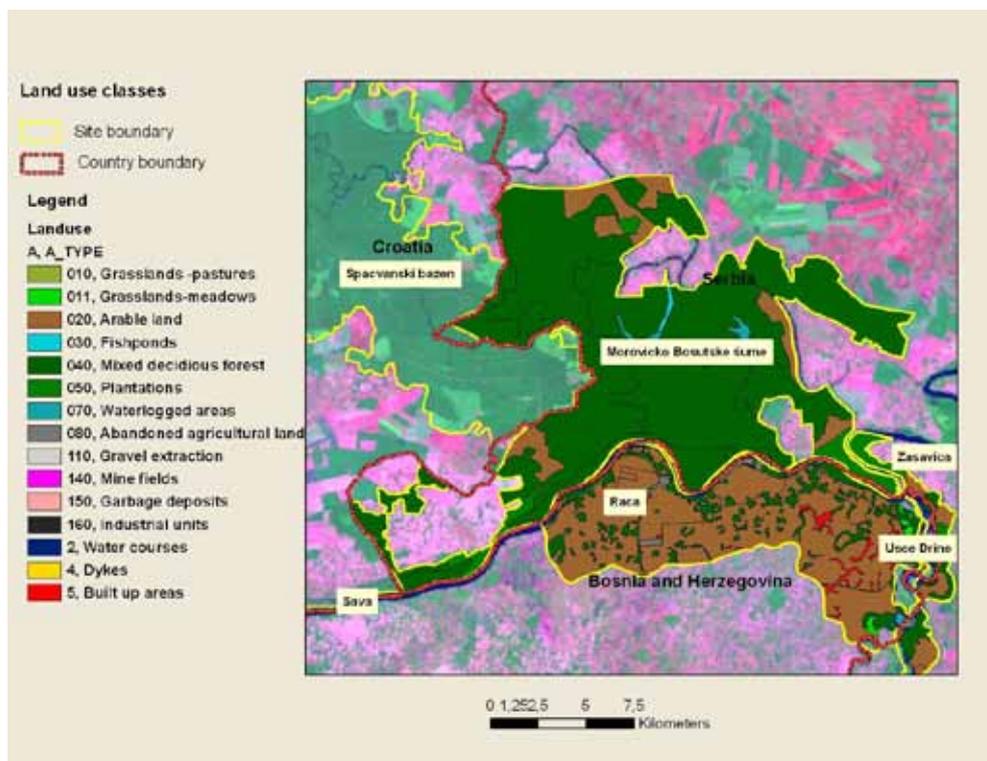
complexes. Accelerated overgrowing of meadows is mostly caused by insufficient number of wild and domestic herbivores and by the lack of natural flooding. The site is surrounded by arable land from north and east. A few villages are in the vicinity.

Total area of the site is 21 852 ha. More than 95% of the area is in state ownership, predominantly covered by the forests and managed by Public Enterprise Vojvodinasume. Some land in state ownership is managed by water manager Public Enterprise Vode Vojvodine, and there is also an area for hunting and fishing tourism - VU Morović, managed by Serbian Armed Forces. Other is private agricultural land.

The largest part of the site is protected by a dyke along the Sava but the water regime of the area is managed through a dam in the River Bosut. By doing so, flooding of the site is not regular, but managed depending mostly upon needs of agriculture and flooding protection of settlements and towns in the vicinity and downstream.

A section of 2 018 ha (9,2%) is located outside of the dyke. A significant part of the forest area protected by the dyke is regularly waterlogged during spring, due to high level of ground water. Only 225 ha (1%) of the site is under protection in form of six separated Strict Nature Reserves, presenting oldest natural forest remnants with trees up to 400 years old. The conservation of the area is to be revised and the protected areas to be joined into one larger nature reserve, which is yet to be established.

Dominant land use is forestry. Natural or semi-natural mixed deciduous forests covers 17 700 ha (81%), mostly moderately managed, according to the agreed land use criteria. 830 ha (4%) of the site is covered by intensively managed poplar plantations. Strip of waterlogged autochthonous willow and poplar forests in foreland are managed extensively by the Public Enterprise for Water Management Vode Vojvodine.



Fragmented grassland patches within forest management units cover 5% of the site, while waterlogged areas have been shrunk to only 2%. Small watercourses and forest infrastructure are documented as a part of forest cover. Forests belong to several hunting areas with moderate game



Land use

management. Within the site there are two plots specially dedicated for intensive hunting and angling, that covers 3 530 ha (16,1%). These areas are overpopulated by game species.

Arable land, moderate in land use intensity, covers 1 680 ha (8%). Grassland fragments are scattered in the lowland forests, in form of wet meadows within the area managed for forest production and are barely used. There is also one moderately managed fishpond in the area that covers 61 ha (0,3%). Extensive farming, e.g. traditional pig herding and cattle grazing is developed, but in decreasing trend. Within the site there are still dozen pig and cattle herders, using forests and dykes for grazing, just like their ancestors. It is regulated by contract with the state forest and dyke managers.

There are over 2 000 pigs and 40 head of cattle herding on the site, regularly registered by forest manager. The number of pigs, cattle and sheep might be significantly higher, due to lower number of head reported by their owners (to get lower charge for grazing).

Landscape features

Lowland forests are dominating the landscape. On the border of the site the tributaries to the Sava including the Bosut River are flowing adding to the landscape and biodiversity of the site. Within the site are also a few smaller watercourses. The dyke along the Sava is another significant object in the space. Besides, there are also temporary or permanent gravel depositories on the riverside of the Sava. Due to developed forestry there is a well developed network of dirt roads. Local asphalt roads crossing the site or passing by enable a good accessibility. Various hunting towers are scattered over the site. Garbage dump are rare. Shallow ditches are well presented on the site, along the dirt roads. A few ameliorative ditches are traced across the forests, connecting bogs and marshes to ameliorative network.

Threats

There are a few ominous threats with respect to the protection and management of the biodiversity. In the first place there are significant changes in the water regime, caused by the dyke along the Sava River up to a few hundred meters distant from watercourse. It prevents natural flooding of the area. The present water regime is regulated by the sluice in the Bosut River. Further various ditches were dug out both by water and forest managers, which resulted in lower ground water level. As a result, some important wetland sites like marshes dried out and changed into forest ecosystems. Consequently, the hygrophilous forests are suffering from insufficient ground moisture, being unable to accommodate to dry conditions. Water-drainage, canalisation, forest management and enhanced or illegal hunting have a high impact on the natural values of the site.

Invasive plant species are an important threatening factor that influence especially the flooded or waterlogged lowland areas. These species are widely spread, although were not used in forestation activities. Targeted and well planned measures have taken in order to eradicate or control these species, specially having in mind the importance of the site for biodiversity conservation.

Autochthonous species

Today there are only 10 Mangulica pigs registered on the site. The higher prize for the Mangulica meat than regular pork available on market and popularity on outside market seems to be good reason to increase its breeding.

Large area of the forests has potentials for pig herding and for eco-farming, in accordance with the traditions in the past times.

Invasive species

The invasive species are one of the greatest threats for the site area. The following invasive plant species are most spread: *Amorpha fruticosa*, *Acer negundo*, *Fraxinus pennsylvanica*. Dominant invasive plant species are *Amorpha fruticosa*, *Asclepias syriaca*, *Ailanthus altissima*, *Solidago gigantea* and *Gledichia triachantos*. Those species are most abundant in poplar plantations, flooded and waterlogged areas, because these are most suitable for spreading. It was observed that *Fraxinus*



Land use

pennsylvanica, unlike in the other sites, is present only in the foreland, which indicate needs for its control before it invade over the dyke. Registered invasive fishes are *Carassius auratus gibelio*, *Lepomis gibbosus*, *Ictalurus nebulosus* and *Pseudorasbora parva*.

Cultural historic features

Within the area there is Memorial monument from the Second world war – Domu skela, with representative model of bridge symbolizing connection between people across the Sava. There is also a medieval church in the village of Morović, nearby the site. The site is rich in archaeological localities.

Tourist facilities

Hotel and few bungalows, primarily dedicated for hunting and fishing tourism, are available within the hunting and fishing area VU Morović. Other tourist infrastructures like hotels or bed & breakfast facilities are not available. The nearby villages are suitable for rural tourism which is not organized yet. Hunting tourism used to be important source of income until 1990's, but afterward it decreased. There are generally great potentials for sustainable fishing and hunting tourism.

Legal framework (national and focal area level)

This subject is connected to the land use types. Firstly, there are Management Plans for forest management units. Besides, there are Management Plans for water bodies, and for agricultural land. All kinds of management plans for natural resources management or extraction have to be harmonized with Decrees of Protection of the Protected Areas and its Management Plans. The management plan for agricultural land is prepared by the local government, it is poorly developed and contains only guidelines.

Land use changes

Almost the whole site was under influence of frequent inundations from the Sava, Bosut, Studva and Spacva rivers until the dyke was built in the 1930s. Thanks to low altitude and strategic importance of oak forest present in the area, the site remained in close-to-natural state, with gradually, but not obvious changes in land cover and land use. Most of area around the site was converted from forests into arable land by meliorations during XX. century. Nowadays, during dry summer season, the forests and wetlands suffer from insufficient ground water. Water management is not adjusted to forest needs, even though it wouldn't cause damage to arable land in surroundings. Modification of water management is necessary in order to maintain good forest health and biodiversity of the area as a whole. Extensive grazing is also necessary for maintaining open wetland areas, which used to be much more present before the changes in natural processes (flooding) and traditional land use activities.

5.5 Obedska bara

Characteristics

The site, which includes the Special Nature Reserve Obedska bara, is for the biggest part located outside of the dyke and under direct influence of the water levels of the River Sava. The total area of the site is 19 667 ha of which 11 083 ha (55,3%) is located in foreland. This part serves as an important flood retention area that helps to prevent floods downstream in Belgrade.

The mosaic of forests and wetlands are dominated by a mixture of old lowland Pedunculate oak-ash-hornbeam forests, but with much more marshes and waterlogged areas than Morovićko-bosutske forests. Complexes of lowland ecosystems are of outstanding quality due to the natural flooding. Oxbows and mostly overgrown old meanders are the most outstanding landscape features. Grasslands are present both in small patches and in larger complexes, but the succession toward a forest vegetation, caused by insufficient number of wild and domestic herbivores is visible almost everywhere. The site is surrounded by arable land from the north and by the river in the south. The



Land use

river connects the site with up-and-down-stream natural lowland sites. There are several villages around the site, of which Kupinovo, Grabovci and Klenak are located in a close distance.

More than 95% of the land within the site is in state ownership, predominantly covered by the forests and managed by the forest management company Public Enterprise „Vojvodinasume“. About 1 655 ha (8,4%) of the land covered with forests, pastures and arable land is fenced and primarily managed for needs of Serbian Armed Forces . There are some pastures belonging to the villages. The biggest part of former pastures was afforested through a contract between Public Enterprise Vojvodinašume and local communities.

The remaining part is agricultural land in private ownership.

The land, that is situated behind the dyke and covers 8 584 ha (44,7%), is never flooded and rarely waterlogged, due to the higher altitude and the water management and drainage system. Regular flooding of the foreland provided particular biodiversity values, which has been recognized and timely protected. Exactly 9 820 ha (49,9%) of the site is protected as Special Nature Reserve Obedska bara, managed by Public Enterprise Vojvodinašume.

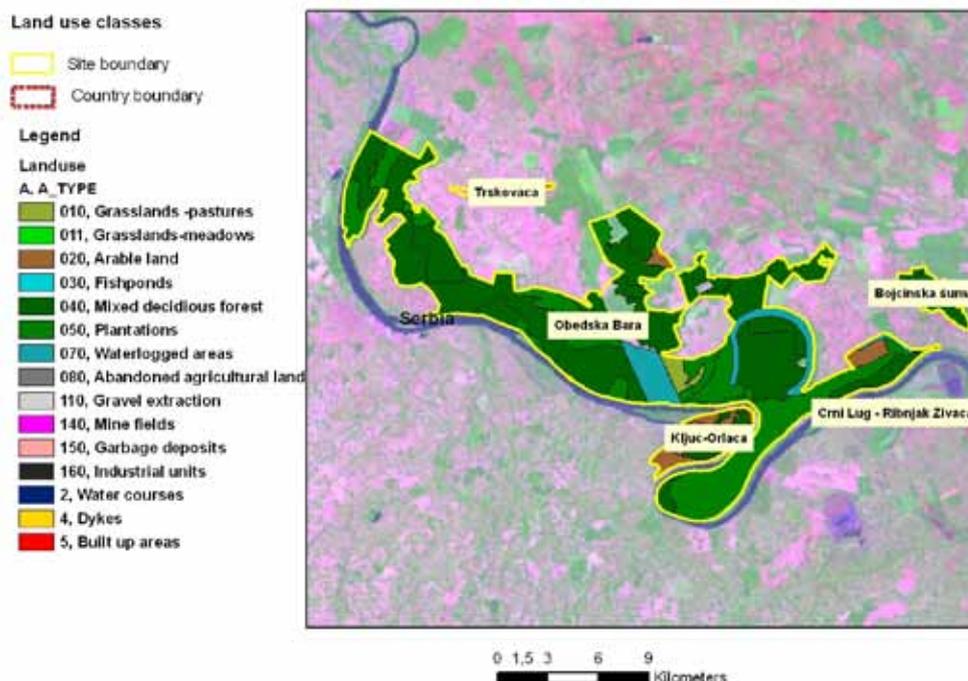


Figure 13. Land Use map Obedska bara

Dominant land use is forestry on 17 047 ha (86,7%). The land use intensity, according to the agreed land use criteria, is mostly moderate in natural or semi-natural forests and intensive in poplar plantations. 13 097 ha (78,6%) is covered by natural or semi-natural deciduous forests and 3 950 ha (20,1%) of poplar plantations. Small watercourses, fragmented grassland, small wetland patches and forest infrastructure, belonging to forest compartments, are included into „forestry“. Forestry is combined with moderate hunting management.

Within the forest area there is a special hunting area that covers 7 895 ha (40,1%), of which 2 257 ha (11,5%) is fenced and intensively managed. This area is overpopulated by game species.

The management of the arable land is moderately intensive and covers about 970 ha (4,9%). High quality arable land can be found only on higher altitudes. Grasslands are present mostly in mosaic



Land use

with forest in form of barely used wet meadows, within the area managed for forest production, and covers approximately 405 ha (0,2%). Waterlogged areas covers about 1 255 ha (6,4%), including Obedska bara.

Extensive farming, e.g. pig herding and cattle grazing, used to be common within the area, but during last decades significantly decreased. There are 8 500 pigs, 2 500 sheep and 340 head of cattle herding on the site, regularly registered by forest and protected area manager. The number of pigs, cattle and sheep vary from year to year but the area is not overgrazed.

Landscape features

The lowland forests dominate the landscape. There is an evident presence and impact of poplar plantations in some parts of the site. The whole area presents a large network of former meanders and oxbows of Sava River. Pastures and meadows are represented with small patches that are unevenly distributed within the forests.

Threats

The main threats on this site are the changes in the water regime caused by river regulation activities and natural morphological changes in foreland followed by the succession of wetland vegetation, enhanced by the lack of pasturing. Altered disturbance regime favour spreading of invasive species.

Autochthonous species

Breeding of autochthonous species is not well developed on this site. The area has a great potential for eco-farming and breeding autochthonous species.

Invasive species

Here, like in every other site, invasive species represent a serious threat. Most abundant invasive plant species are: *Amorpha fruticosa*, *Acer negundo*, *Fraxinus pennsylvanica* and several *Aster sp.* species. Those species are most abundant in poplar plantations, flooded and waterlogged areas. *Phytolacca americana*, *Asclepias syriaca*, *Ailanthus altissima*, *Solidago gigantea* were also detected. Amongst the animal invasive species, the most numerous are fishes: *Carassius auratus gibelio*, *Lepomis gibbosus*, *Ictalurus nebulosus*, *Pseudorasbora parva*.

Cultural historic features

There is a medieval church within the site near the village of Kupinovo. Also, there are several houses that represent traditional architecture.

Tourist facilities

There is a new hotel within the hunting area, dedicated to hunting tourists. The old "Obedska bara" Hotel that is owned by "Vojvodinasume" is out of order. There were several plans for renewing the hotel, but due to the lack of finances and interest they have not been realized yet. The rural tourism in the villages is poorly developed.

Legal framework (national and focal area level)

The Special Nature Reserve Regarding is protected and managed through a Management Plan. The main objective of the plan is to maintain biodiversity values of the reserve through sustainable management and by habitat restoration projects. There are also Management Plans for the Forest Management Units and Management Plans for water bodies. The management plan for agricultural land is prepared by the local government; it is poorly developed and contains only guidelines. All kinds of management plans for natural resources management or extraction have to be harmonized with Decree of Protection of the PA.

Land use changes

The whole site is a former floodplain area of the Sava River. Thanks to the low altitude and the strategic importance of the oak forest present in the area the site remained in close-to-natural state,



Land use

with gradual changes in land cover and land use. The traditional extensive grazing used to be common activity that shaped the landscape and maintained open wetland areas until a few decades ago. There is present process of intensive succession of wetlands into dry land ecosystems. Most of area around the site was converted from forests into arable land during the XX century.

5.6 Ušće Drine

Characteristics

The site covers area of about 19km alongside the River Drina up to its discharge into the river Sava and extends to the right bank of the Sava River (about 4km). It is located in the north-western part of fertile Mačva plain and is bordered by the River Drina in the West and by the River Sava in the North. The total size of the site is 1 967 ha.



The River Drina is also the state border between Bosnia and Herzegovina and the Republic of Serbia. The area belongs to Bogatić municipality in Mačva County.

At the confluence with the Sava and within the dykes the Drina is a free meandering river with many flow paths and small islands where gravel is deposited. The site consists of two parts: Southern part located along banks of the River Drina and the northern part near the confluence with the River Sava and along the banks of the River Sava. The southern part is mainly under agricultural

use with the area that is frequently flooded under forest vegetation, while northern part that is protected from flooding by a dyke represent mixed leaf forests. Approximately 15% (300 ha) of the whole site is located outside of the dyke and frequently flooded.

A characteristic biological feature of this area is the occurrence of a rare bird (*Sterna albifrons*) that nests on islands in the river Drina.

One part, which is in foreland, is managed by Public Enterprise Srbijavode, while the other (protected part) is managed by Public Enterprise Srbijašume (approximately 200 ha – 10%). The rest of the site is in private ownership.

Approximately 50% of the site is under agriculture land use. Agricultural plots are surrounded by trees, so that they have kept certain biodiversity of flora and fauna. Plots are small to medium and mainly under agricultural cultures. Semi-intensive agriculture is present here with no melioration works. Fertile land and favourable weather conditions provide good yields. Almost a half of this site is covered by forest vegetation (840 ha - 42%). Most of these forests are mixed stands with characteristic species for lowlands (ash-tree, poplar-tree and willows). Forestry is not intensive in this area but there are some plots planted with poplars for commercial use. These plantations are relatively young so this business is in the developing phase. The total area under poplar plantations is approximately 6% (120 ha) of the whole site. The forests in private ownership are in a bad condition. Grazing and mowing is very important for the maintenance of the biodiversity of the small number of natural grasslands.

Alongside the Drina River gravel depositories exist covering a total area of approximately 1% of the whole site.



Land use

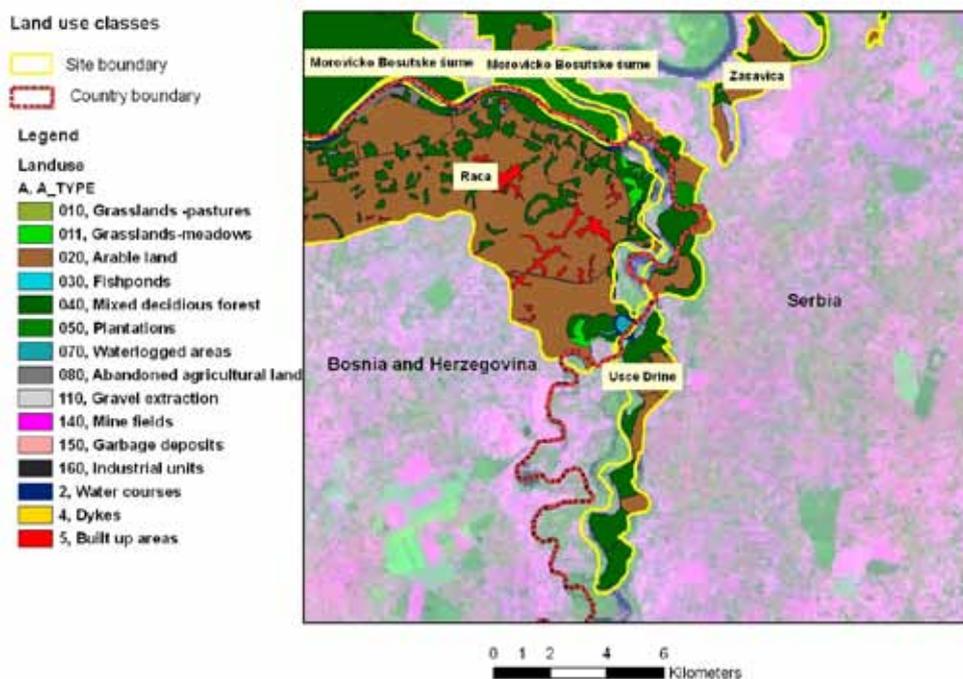


Figure 14. Land Use map Usće Drine

Landscape features

The site is characterized by a mosaic landscape. It is a complex of small plots, divided by small forest strips and shrubs. The existing dike protects most of the arable land. Small houses are scattered over the area that is in agriculture land use.

The gravel depositories along the Drina are negatively impacting the landscape and river characteristics. Gravel mining is still ongoing but there are also numerous deserted excavations. There is a well developed network of dirt and asphalt roads used to transport the gravel. Small garbage dumps are present at numerous locations, mainly positioned by the dirt roads. Ditches are dug along the roads.

Intensive vegetable production develops with use of plastic covers and melioration on small plots.

Threats

Within the site there are no industrial plants and also bigger polluters do not exist here. A large number of illegal waste dumps are present. Local residents are dumping organic and also non-organic garbage. One of bigger problems is gravel extraction. The gravel extraction causes ongoing changes of the river course which lead to the disappearance of small islands which serve as breeding places for the *Sterna albifrons*. The gravel digging also cause damage to the riverine landscape and the bank vegetation.

The number of natural grasslands is very small as a result of the conversion into arable land.

The threat of pollution by chemicals is small as their use is limited by the high prices and the poor financial status of local inhabitants.

Inappropriate management of the forests accelerates the dispersion of invasive species causing degradation of the natural vegetation.



Land use

Flooding is a threat for the development of the agriculture in this area.

Autochthonous species

There is only one farm breeding Mangulica pig (16 individuals). This kind of farming is not developed in the area. The cultivation of medical herbs, ancient fruit sorts, and breeding autochthonous cattle breeds (Mangulica pig, Podolian cattle, Posavina horse) are good opportunities for the development of the site.

Invasive species

The invasive plant species on this site are: *Amorpha fruticosa*, *Acer negundo*, *Fraxinus pennsylvanica*, *Conyza sp.*, *Bidens sp.*, *Ambrosia artemisiifolia*, *Phytolacca americana*, *Echinocystis lobata*.

Those species are mostly present in poplar plantations, flooded and waterlogged areas.

Cultural historic features

Within the area there is Memorial monument from the Second World War. There are also a numerous of churches in surrounding villages.

Touristic facilities

There are a lot of beaches along the Drina riverside. A few small restaurants and mini cottages are present at the riverside of the Drina River. Because of proximity of the state border there are only limited opportunities for boating.

Legal framework

As this area is not under protection there is neither permanent monitoring nor the organized management.

There are Management Plans for forest management units, including both of Public Enterprises (Srbijavode and Srbijašume). Besides, there are Management Plans for water bodies, but no management plans for agriculture lands. Because of this situation a number of nature protection associations is trying to organize their members to provide better management.

Land use changes

Due to the decrease of livestock the land use is changing and that grasslands and pastures are overgrown by bush and forest vegetation with a considerable presence of invasive species.

Also arable land is taken over by forest vegetation after the return of the land to the former owners (taken away after The World War II), who are not interested in agriculture production.

The construction of a dyke allowed for the conversion of the former flooded area to arable land. Gravel exploitation changed the course of the River Drina and the land use.

It is important to mention the seasonal change of land use of the flooded areas, where local inhabitants bring life stock for grazing the area after the retreat of the water while the use as arable land is becoming more rare.



Land use

5.7 Zasavica

Characteristics

The site represents a mosaic of natural and agricultural habitats alongside the Zasavica River which is located on the right bank of Sava River near the city of Sremska Mitrovica. The main characteristic feature of the Zasavica Reserve is the wide open floodplain area with common pastures although these cover only 9,6% of the whole area.

Zasavica River nowadays is a tributary to the Sava, but according to available literature data, centuries ago it was a natural connection between the Sava and its tributary River Drina. Today the connection with the Drina is closed.



Zasavica Special Nature Reserve, photo by Vladimir Dobretić, Institute for Nature Conservation of Serbia

There are several underground springs that supply Zasavica with fresh water. The area is well-known as the only natural site in Serbia with *Umbra krameri*, a fish species protected by national and international legislation. The biggest part of the area is designated in 1997 as Special Nature Reserve "Zasavica".

The surface of the Reserve is 671 ha or 28,7% of the whole area which is 2 335 ha. The land ownership in the Reserve is: public property (70.3%), state property (20.6%) and private property (9.1%). Private ownership is prevailing on the area as a whole.

The land use on the site is the following: grasslands covers 225 ha (9,6%) - moderately used, moderately used mixed deciduous forest 637 ha (27,3%), intensively managed poplar plantations 108 ha (4,6%), extensively used waterlogged areas including the River Zasavica and tributary watercourses 185 ha (7,9%), moderately to intensively used arable land 1 108 ha (47,4%), intensively used orchards 16 ha (0,7%). Touristic facilities and infrastructure cover approximately 3 ha (0,1%).

Landscape features

The landscape is a mix of natural forests, poplar plantations, forest patches, crop fields, pastures, waterlogged areas and the open water of Zasavica. Dominant landscape feature are the Zasavica River and dyke on the Sava River. The tourist facilities (picnic places) and bird watching tower characterize the vicinity of the Visitors Centre. Dirt roads and small forest patches are present all over the site. Several small illegal garbage dumps were found.



Land use

Due to forestry and agriculture there is a well developed network of dirt roads inside the Reserve. Asphalt roads nearby enable a good accessibility for tourists.

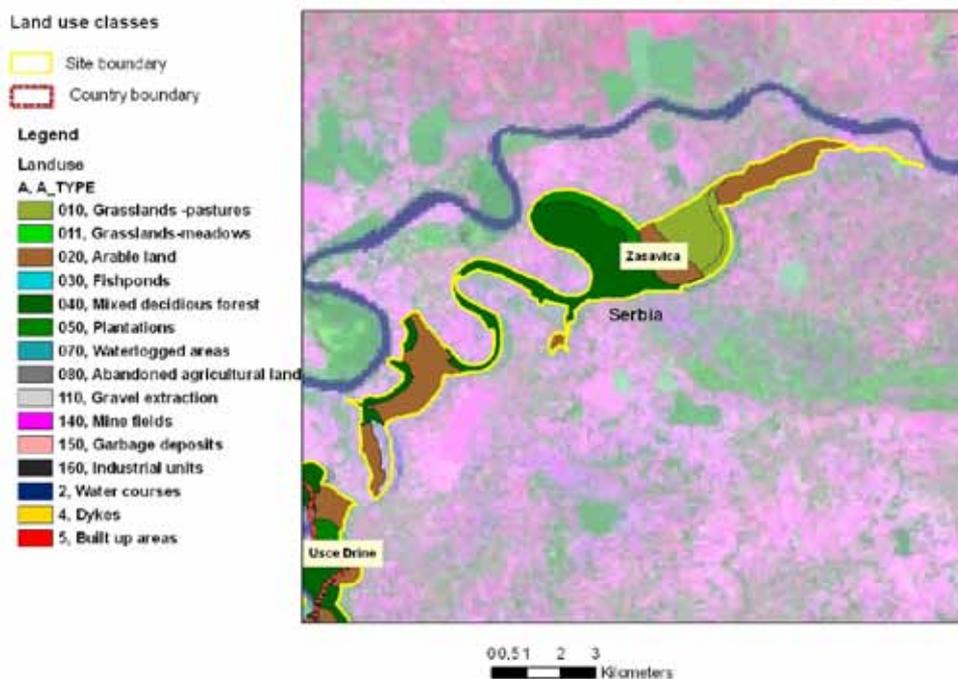


Figure 15. Land Use map Zasavica

Threats

Despite the natural values of this area, there are several threatening factors. The nearby villages are dumping their garbage in the Reserve, or adjacent to the borders of the Special Nature Reserve. Even though these illegal garbage dump sites are cleaned regularly, it is symptomatic that they reappear in a short period of time. The water regime is highly dependent on the dam and pumping station that is located in the mouth of the Zasavica River into the Sava. The operation of the dam is harmonized to the needs of farmers and private landowners, although there is a small percentage of privately owned land and agricultural fields. Because of this, the water level in the Zasavica is low during the spring and summer to prevent flooding of arable land. This low water table has a negative impact on the biodiversity of the protected area. The possible solution is to gain funds through international projects, so that the Site Manager could buy off the land from private land owners. The other solution would be, again with the help of international funds, to build another dam, which would be located upstream of the current dam. In doing so the high water level could be maintained in the Reserve, but on the part of Zasavica where the private land is located, the water level would be low.

Autochthonous species

Zasavica is the first protected area that started breeding autochthonous Mangulica pig. Today there are ca. 100 pigs. The meat from these pigs is more expensive than regular pork available on market, but also very popular for outside market. It offers the management an extra source of income also because of the increasing demand for these products.

Recently the management organisation started breeding the Balcanic donkey, an autochthonous breed in Serbia. Several pastures are available for the local farmers, so that they can keep their cattle here for extensive grazing. The area of the current pasture is big enough for the needs of both farmers and the protected area's manager. If the aforementioned private agricultural land would be bought by the manager, new areas for grazing would be gained. Subsequently agreement between farmers and the manager is needed, in order to avoid overgrazing and conflicts between these two sides. Grazing is essential in view of maintenance of the biodiversity.



Invasive species

Invasive species are one of the greatest threats for the protected area. The following invasive plant species are abundant in Zasavica: *Acer negundo*, *Fraxinus pennsylvanica*, *Amorpha fruticosa*, *Solidago gigantea*, *Ailanthus altissima*, *Aster* sp. *Phytolacca americana* and *Fallopia x bohemica* are also detected. There are several invasive fishes: *Carassius auratus gibelio*, *Lepomis gibbosus*, *Ictalurus nebulosus*, *Pseudorasbora parva*. The plant species are most abundant in poplar plantations and in the rural mosaics, because these are most suitable for spreading.

Planned actions need to be done immediately, in order to eradicate or control these species before they spread all over the site.

Cultural historic features

The cultural historic features are represented with a several old churches in villages nearby.

Touristic facilities

In the vicinity of the area are several villages, which could represent a good basis for the development of eco - and ethno - tourism. Until recently touristic infrastructure such as hotels or bed & breakfast facilities are not available for potential tourists. Thanks to the Reserve management, the area of Zasavica is well marked. On several places in the Reserve, information signs have been placed. They are mostly beside the walking trail that leads through the Reserve. One of the main attractions is a wooden visitor centre with a high watch tower. There are plans to build several towers for bird watching throughout the Reserve.

Legal framework (national and focal area level)

This subject is connected to the land use types presented. Firstly, there is Management plan for PA made for 5 years period. Besides, there are local management plans for water bodies, state and private forests and agricultural land. All kinds of management plans for natural resources management or extraction have to be harmonized with Decree of Protection of the PA and the Management Plan. The point is that there is no budget resources dedicated to compensate loss on crops which would be caused if water regime would be managed according to biodiversity maintenance objectives and measures determined the Management plan. This problem is solvable with the aforementioned private land purchase.

Land use changes

Larger area within and particularly around the site was converted from marshes and swamps to arable land by dyke building and meliorations during the XX. century. In the past wider area was seen as a source of malaria, and community had interest to suppress marches in order to eradicate the illness and to broaden arable land as well. Due to lowest altitude in the landscape, the large part of the site area stayed in near natural state, and timely decreed protected. There are efforts on converting poplar plantations back to natural.



Land use

Focal areas in Bosnia and Herzegovina

There are three focal sites selected in Bosnia and Herzegovina: Bardača, Rača, and Tišina.

5.8 Bardača

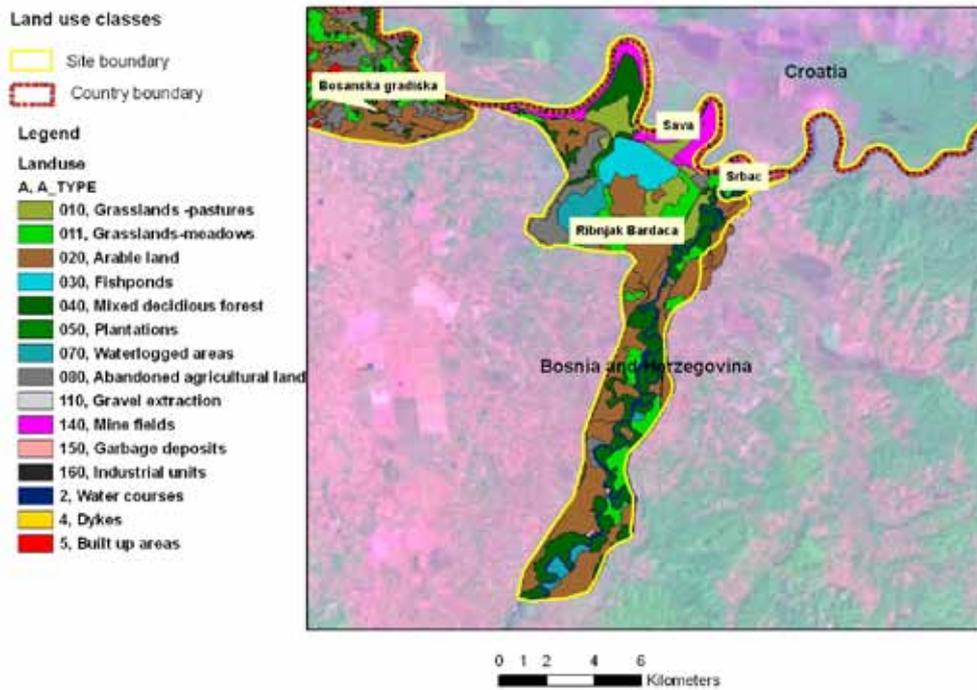


Figure 16. Land Use map Bardača

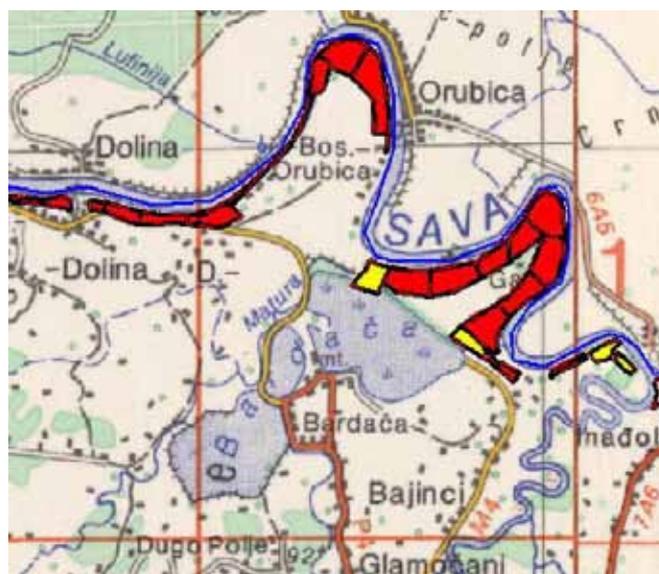


Figure 17. Unsafe areas because of the threat of mines (Predić, BiH)

The red polygon represents the category I hazard area, i.e. presence of mines fields, and yellow polygons represent the category III hazard areas, which means that the presence of mines is not



Land use

certain, but there is some degree of hazard from unexploded mine-explosive devices since the area was in the separation zone of parties in war, in zone of war, respectively.

Primary LU	ha	%
Water courses	830.6	8.9
Dykes	150.4	1.6
Waterlogged areas	446.5	4.8
Fishponds	460.7	5.0
Arable land	2863.2	30.8
Abandoned agricultural	619.8	6.7
Meadows	991.2	10.7
Pastures	636.9	6.8
Mixed deciduous forests	1730.8	18.6
Built-Up areas	2.8	0.0
Mine fields	552.8	5.9
Garbage deposits	14.3	0.2
TOTAL:	9299.9	100

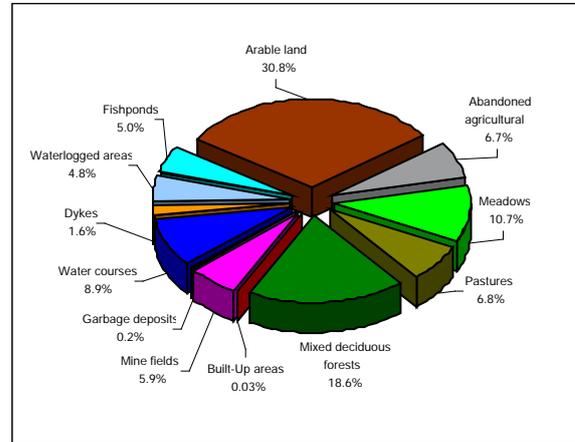


Table 2. Review of primary means of land use (LU/LC) for the Bardaca site
Graph 1. Primary mean of LC/LU for the Bardaca site

Threats

In the area before the dyke, it is evident that the main problems are mined areas. In Picture 3 and 4, the situation of the mine areas by April 2009 is shown. The land in these areas is abandoned and the vegetation change is characteristic.

5.9. Tišina

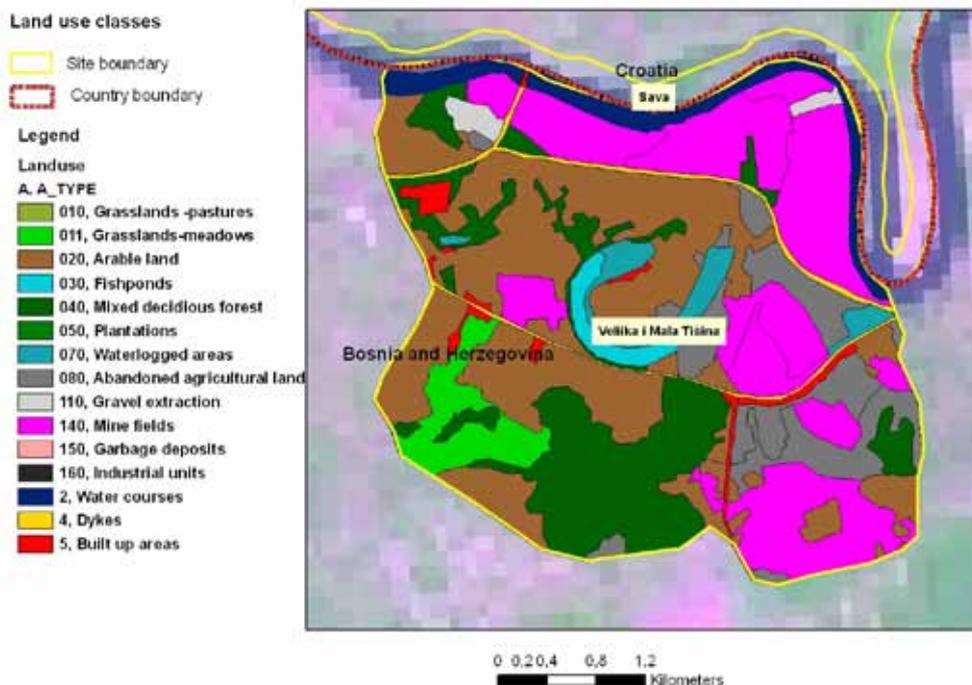


Figure 19. Land use in the Tišina area

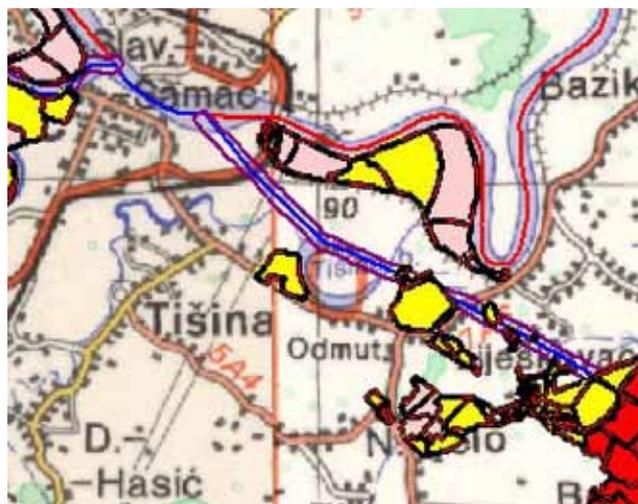


Figure 20. Unsafe areas according to the categories of mine hazard in the area of Tišina site

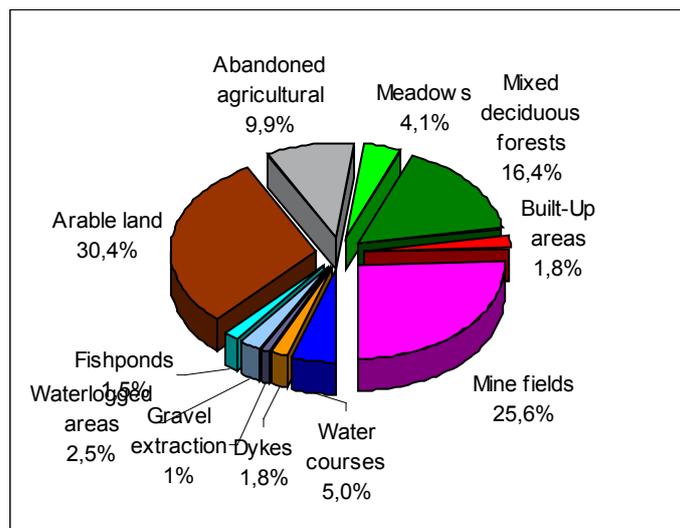
The pink polygons (light red) represent category II hazard area, i.e. high possibility of mine field presence – there are records about this. The yellow polygons represent the category III hazard areas, which means that the presence of mines is not certain, but there is some degree of hazard from unexploded mine-explosive devices since the area was in the separation zone of parties in war, in zone of war, respectively.

Primary LU	ha	%
Water courses	76.8	5.0
Dykes	27.6	1.8
Gravel extraction	15.1	1.0
Waterlogged areas	38.4	2.5
Fishponds	22.9	1.5
Arable land	463.7	30.4
Abandoned agricultural	150.4	9.9
Meadows	62.5	4.1
Mixed deciduous forests	250.3	16.4
Built-Up areas	27.3	1.8
Mine fields	391.4	25.6
TOTAL:	1526,4	100

Table 3. Review of primary means of land use (LU/LC) for the Tišina site



Land use



Graph 2. Primary mean of LC/LU for the Tišina site

5.10 Rača

Surface: 10 673.2 ha

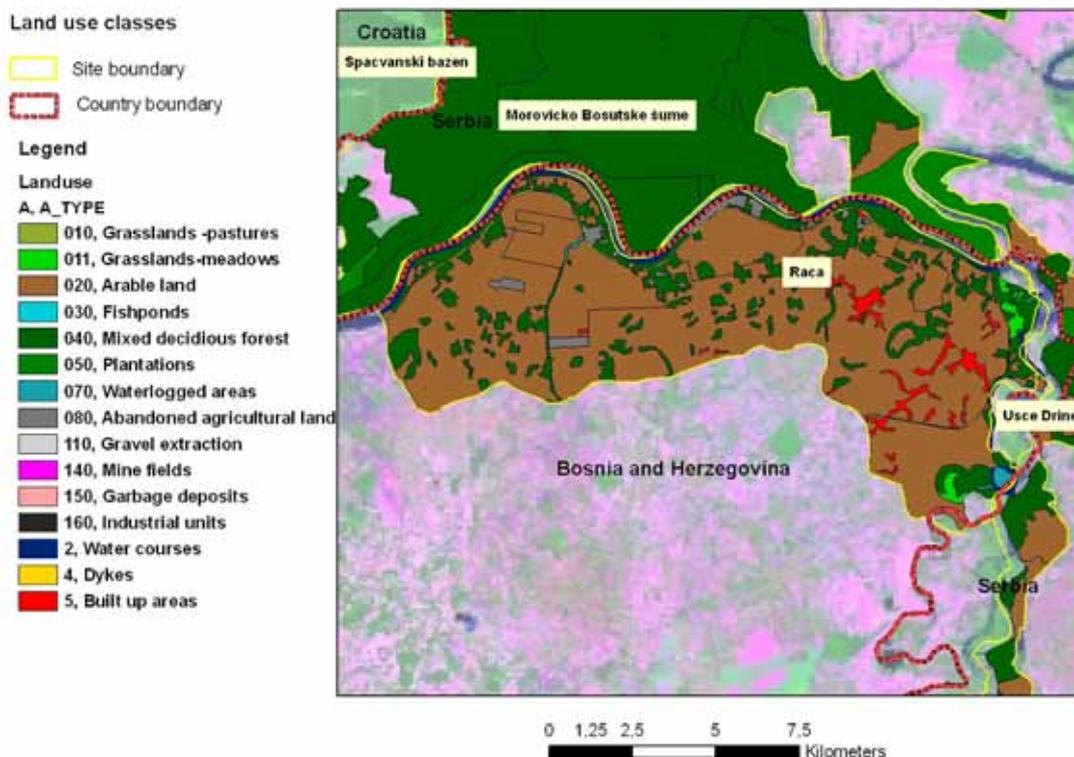


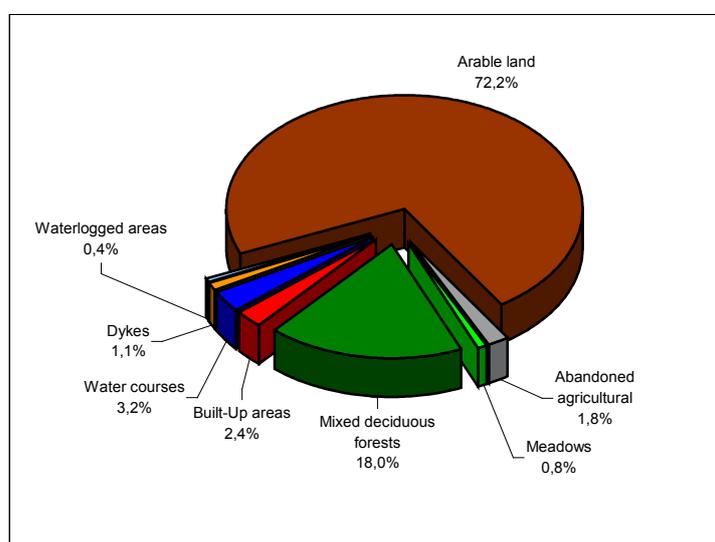
Figure 21. Land use map Rača



Land use

Primary LU	ha	%
Water courses	338.0	3.2
Dykes	121.3	1.1
Waterlogged areas	46.2	0.4
Arable land	7704.1	72.2
Abandoned agricultural	197.0	1.8
Meadows	88.6	0.8
Mixed deciduous forests	1917.0	18.0
TOTAL:	10673.2	100

Table 4. Review of primary means of land use (LU/LC) for the Rača site



Graph 3. Primary mean of LC/LU for the Rača site

6. Brief description of land uses in non focal sites

6.1 Turopolje

This is a lowland area between the rivers Odra and Sava. The most considerable parts of this area are the large wet meadows which are an important habitat for *Crex crex* (10.7% of Croatian population of this species is on this site). The pedunculate oak forests are developed on the north riverside of the River Odra, and they are very important for reproduction of *Haliaeetus albicilla*. The rest of the habitats are mosaic landscapes and willow/poplar forest along Sava.

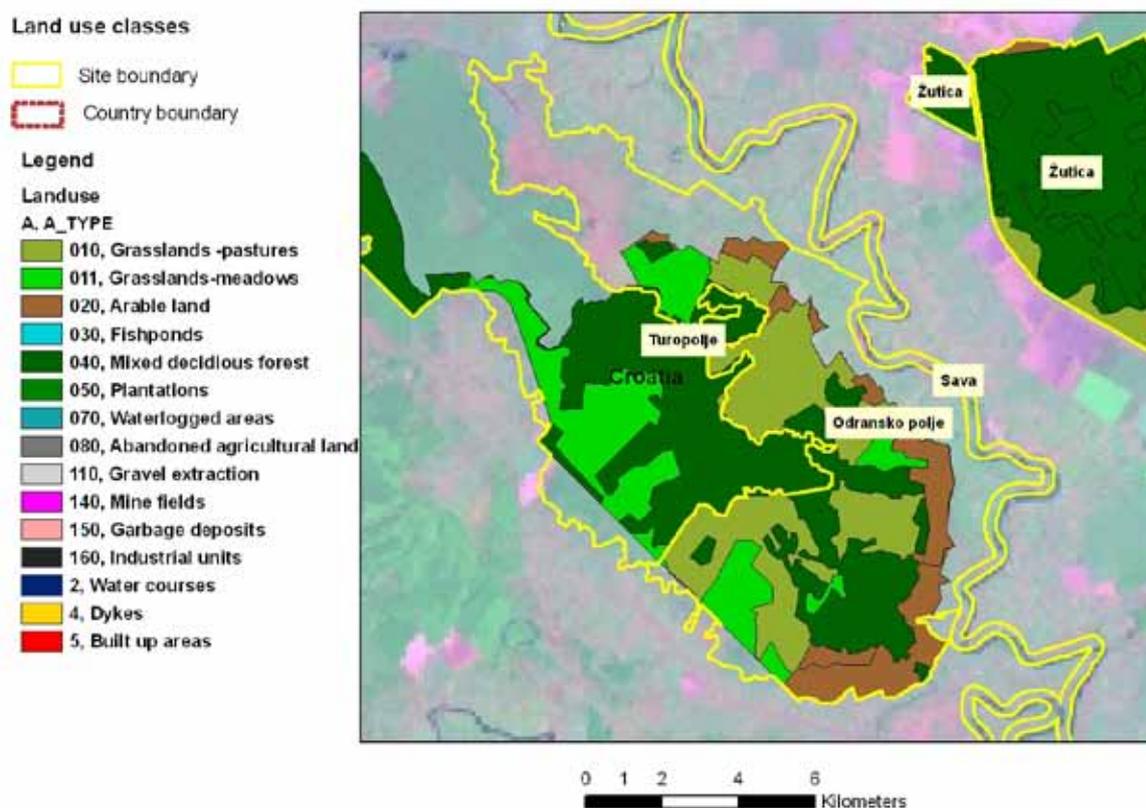


Figure 22. Land Use map Turopolje and Odransko Polje

Area characteristics and importance: well preserved large wet (periodically flooded) pastures with cattle herds and native local breeds (Croatian Posavian horse and Turopolje pig). Local people are interested in extensive agriculture and conservation of pastures. Total size of the site is 22 749.34 ha.

One part of the site is protected in the category of an important landscape. The whole site is a part of the Croatia's National ecological network as an internationally important bird area (SPA).

Land use types are inhabited areas (2.4%), intensively farmed land (10.2%), pastures and natural grasslands (5.1%); pastures and natural grasslands combined with leaf forest (16.4%), leaf forest (42.4%), mostly arable land with large natural vegetation areas (23.3%), water bodies and water flows (0.1%), wetlands (0.1%).

The area is currently not exposed to larger menaces. Main threats are the change of water level in wet forests due to water-drainage, intensive forest management, changes in traditional ways of farming, water canalling and enhanced or illegal hunting.



Land use

The site is located on the area of two counties: Sisačko-moslavačka County and Zagreb County. The site is being managed by the Sisačko-moslavačka County and Zagreb County's Public Institution for Protected Nature Values. The following measures of protection are required: to obstruct changes of water regime (important because of the wet grasslands and flooded forests); to include the measures of biodiversity conservation in forest management; to provide financial support for extensive (traditional) agriculture; to regulate hunting and stop illegal hunting.

6.2 Lonjsko polje

Lonjsko Polje Nature Park spreads through the central part of the continental Croatia and the central course of Sava. On both sides of the Sava River, traditional rural settlements and historic landscapes have been well preserved. The whole area of the Park is a lowland area with a height of 90-110 meters above sea and is an exclusively rural area.

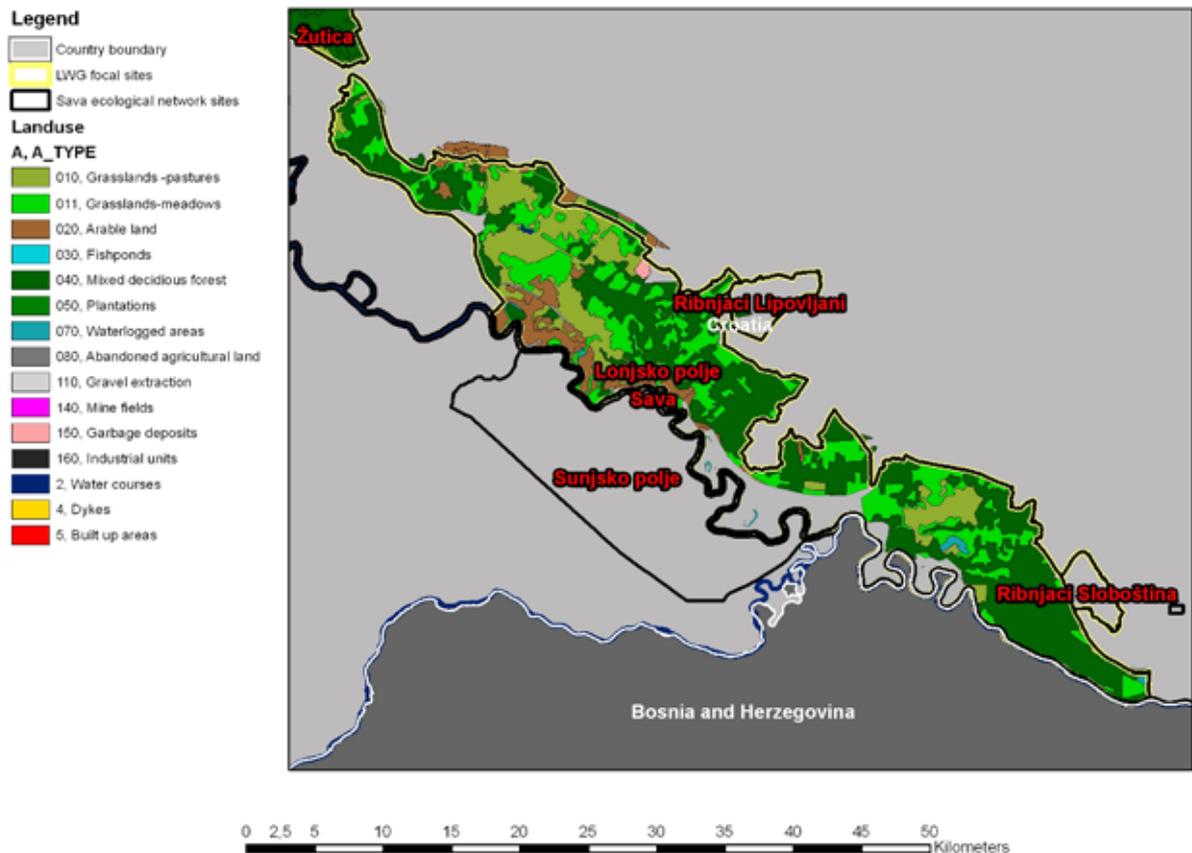


Figure 23. Land Use Map Lonjsko Polje

Total size of the site is 51 151.2 ha. The site is protected in the Nature Park category. Inside the Park there are two ornithological reserves: Krapje đol (25 ha – proclaimed in 1963) and Rakita (450 ha – proclaimed in 1969). Land use types that occur are pastures (14.6%), leaf forest (43.8%), succession area (25.3%), arable land (14.4%), water bodies (0.6%), wetlands (0.7%), inhabited areas and construction sites (0.6%). Approximately 5% of the area is in private and 95% in national ownership. Most of the Park's area is classified as forest (35 002 ha – 67.7%), then grasslands (4 593 ha – 10.1%), water and wetland (2 255 ha – 4.4%), cultivated non-forest land (6 425 ha – 12.6%), brush (1 673 ha – 2.8%), developed and industrial areas (1 217 ha – 2.6%) and rural areas/villages (388 ha – 0.8%).

Over 67% of the Park is classified as lowland riparian (flooded) forest, representing the most integral complexes of oak and ash stands, as well as valuable communities of alder swamp woods. The wet



Land use

meadows and pastures are extremely important habitats in the conservation of biodiversity of river ecosystems, and together with lowland wetland forests represent a mosaic of the most integral floodplain ecosystem in the whole bio-geographical area. The wetland habitats of Sava provide ideal survival conditions for rare animal and plant species that are on the verge of extinction elsewhere in Europe. The area supports more than 2/3 of the Croatian bird population (250 species, 138 of which are recently nesting in Lonjsko polje).

Worthwhile mentioning is the village Čigoč located in the park and known because it is the European stork village.

Also 58 species of mammals, 16 species of amphibians, 10 species of reptiles and 27 species of fish are recorded in this area. Lonjsko polje is at the same time the biggest fish spawning area in the whole of the Danube basin.

Ecological processes and the dynamics of inundation set the pattern for the traditional land use, creating a unique mosaic of anthropogenic and natural habitats, with native cattle breed: Croatian Posavian horse, Slavonian Podolian cattle and Turopolje pig. Traditional agriculture and cultivation of autochthonous breeds are still kept up, and constitute an important element in the preservation of biological and landscape diversity.



Turopolje pig (photo by SINP Croatia)

Traditional lifestyle is well maintained featured through the architecture of the houses and in the wealth of folk habits, costumes, decorations and traditional farm practices.

Natural lowland wetland areas (flood plains) lie on both sides of Sava. Sites Lonjsko polje, Mokro polje and Poganovo polje are natural floodwater retention zones that have an important role in the flood defence system.

The long-lasting and enduring tradition of adjustment to and living with (rather than against) the floods has created an outstanding system that goes back into every aspect of human interaction with the environment. Such an approach is still used in the contemporary flood defence system, in which the natural floodplain areas are deliberately used as floodwater retention areas.

The designation as Nature Park does not prevent the deterioration of the landscape and biodiversity by melioration and drainage activities, river regulating, intensification of farming activities, the



Land use

disappearance of extensive nature friendly forms of farming, changes in the water regime in the forests, lack of management of the carp fishponds, (illegal) hunting, tourism and recreational activities. Waste dumps can also be found.

Although Lonjsko Polje is a protected area managed by Public Institution Lonjsko Polje Nature Park the management of the water and of the inlet and outlet structures (and thus of the flooding duration and intensity of the area) is the responsibility of 'Croatian Waters' (Public Institution) while the management of state forests is the responsibility of the 'Croatian Forests' (Public Institution). They are in charge of the management of waters and forests in accordance with the management directions provided by the Directorate for Nature Protection (under the Ministry of Culture).

6.3 Sunjsko polje

This is a lowland area opposite Lonjsko Polje along the River Sunja and its tributaries and includes large wet grasslands, flooded forests of pedunculate oak and alder. Sunjsko polje is separated from Lonjsko polje Nature Park by the River Sava. Both areas are designated as a Ramsar site.

Total size of the site is 20 368.89 ha. It is proposed that the area will be protected in the category of important landscape. The area is included in Croatia's National ecological network.

Land use types: inhabited areas (1.3%), intensively farmed land (2.1%), pastures and natural grasslands (5.3%), pastures and natural grasslands combined with leaf forest (11.1%), leaf forest (58.7%), mostly arable land with large natural vegetation areas (16%), wetlands and water bodies (0.4%), water flows (3.1%), wetlands and leaf forest (0.5%).

The site has a high landscape value due to dynamic variety of broad pastures with cattle and horse herds and pigs (including native breed Croatian Posavian horse), forest areas and villages with traditional architecture. Cattle and horses inhibit succession of grasslands and conserve valuable habitats. Wet grasslands are important nesting areas for world endangered species *Crex crex* and *Circus pygargus*. Forests (which are a part of wide swamp habitats alongside the Sava) are important nesting areas for following endangered bird species: *Haliaeetus albicilla*, *Aquila pomarina*, *Ciconia nigra*, *Dendrocopos medius* and *Ficedula albicollis*. Due to ornithological values a wider area (Lower Posavina) is included in Croatia's National ecological network as SPA. The site includes a small locality Dražiblato (20.63 ha) protected in the 1960s as a special ornithological reserve. Also, besides above mentioned species, this is a habitat of an endangered species of mammals *Lutra lutra*.

Sunjsko polje can also be considered as an area which has a potential for development of eco-tourism, based primarily on native cattle breed Croatian Posavian horse.

Main threats are: the change of water level in wet forests due to water-drainage, the intensive forest management and the changes in traditional ways of farming, the water canalling; the enhanced or illegal hunting; the non-regulated recreational activities and tourism. The area is currently not exposed to heavy risks.

A part of the site protected in the category of special ornithological reserve is being managed by the Sisačko-moslavačka County's Public Institution for Managing Protected Nature Values and the Public Institution will manage the future important landscape.

The Croatian Posavian horse breeding society "Hrvatski posavac" is taking care of conservation of that native breed in this area and is using most of the pastures for their horse herds.



6.4 Ribnjaci Lipovljani (Lipovljani fishponds)

This is one of the 9 carp fishponds in Croatia. Carp fishponds are artificial swamp areas of great landscape and ornithological value. The site contains a complex of carp fishponds (with well developed emerged and floating vegetation) surrounded by oak forests, mesophyllous meadows and mosaic agricultural landscape. Nearby is located the accumulation lake Pakra, important area for nesting and wintering of wetland birds. This fishpond is border line with Lonjsko Polje Nature Park which is included in the Ramsar list of wetlands of international importance. Wider area of Lower Posavina (including Lipovljani fishponds) is a complex of internationally important wetland habitats for birds and is included in Croatia's National ecological network. It is recommended (in the future) to combine promotional activities and fishpond protection with the existing Nature Park (which has achieved large successes in active protection of wetlands).

Total size of the site is 1 940.5 ha. The site is a part of Croatia's National ecological network. It is proposed for protection in the category of special reserve (ornithological reserve).

Land use types are: inhabited areas (1.9%), intensively farmed land (7.2%); pastures and natural grasslands (5.4%); pastures and natural grasslands combined with leaf forest (0.9%), leaf forest (18%); water bodies (46.1%); mostly arable land with large natural vegetation areas (15.4%); wetland area combined with roads and railways (5.1%).

The area is important because of the many bird species that nest in the area (*Haliaeetus albicilla*, *Chlidonias hybrida*, *Chlidonias nigra*, *Aythya nyroca*, *Rallus aquaticus*, *Porzana* spp., *Podiceps nigricollis*, *Ardea cinerea*), whether it is because of nesting, wintering or nutrition. It is also an important area for *Lutra lutra*.

Main threat is a possible loss of carp fishponds due to termination of fish production (without the production and maintenance of water regime, the fishponds will overgrow with vegetation in a few years), intensification of agriculture and enhanced or illegal hunting. It is recommended that the protection and marketing of this area is associated with Lonjsko Polje Nature Park. As to the management measures, most important is to maintain extensive carp production.

The site is being managed by 'Croatian Forests' which have no interest in fish production. One of the fishponds which was an important habitat for the *Anas platyrhynchos* has been reclaimed to start deer breeding.

Since the site is a part of Croatia's National ecological network, the Sisačko-moslavačka County's Public Institution for Managing Protected Nature Values is responsible for nature protection of the area but an actual management plan for the Public Institution has not yet been created. Required protection measures are: to prevent the change of water regime necessary for fish cultivation, to ensure the financial support for extensive and half-intensive fish production, to regulate hunting and prevent illegal hunting.

6.5 Ribnjaci Vrbovljani (Vrbovljani fishponds)

This site also contains a complex of carp fishponds (with well developed emerged and floating vegetation) surrounded by oak forest, mesophyllous meadows and mosaic agricultural landscape.

Total size of the site is 1 352.96 ha. The site is included in Croatia's National ecological network.

Land use types are intensively farmed land (3.2%), leaf forest (5.4%), water bodies (38%) and natural wet grasslands (53.4%).

Fishponds are important places for wetland birds' reproduction as well as feeding place for breeding birds that nest in nearby Lonjsko Polje Nature Park. This fishpond is (as well as Ribnjaci Lipovljani) is included in the Ramsar list of wetlands of international importance. Wider area of Lower Posavina (including Lipovljani fishponds) is a complex of internationally important wetland habitats for birds



Land use

and is evaluated as a potential NATURA 2000 area. It is an important breeding area for the *Chlydonias hybridus* and an important place for wintering of the birds.

It is recommended to combine promotional activities and fishpond protection with the promotional activities of the Lonjsko Polje Nature Park (which has achieved successes in active protection of wetlands).

Main threats are: the possible loss of carp fishponds due to termination of fish production (without the production and maintenance of water regime, the fishponds grow with vegetation in a few years), intensification of agriculture and enhanced or illegal hunting. The protection and marketing of this area should be associated with Lonjsko Polje Nature Park.

A private company (holding a hunting concession) is managing the water regime. Fish production has been neglected the last few years, but the water regime has been maintained because of the hunting. Few of important ponds were drained and crops for deer nutrition were planted instead. The fishpond area is an active hunting zone. Since the site is a part of Croatia's National ecological network, the Brodsko-posavska County's Public Institution for Managing Protected Nature Values is responsible for nature protection of the area but an actual management plan for the Public Institution has not yet been developed.

Required protection measures are: maintain the water regime necessary for wetland birds and ensuring financial support for extensive and half-intensive fish production and regulate hunting.

6.6 Prašnik

A part of the area (57.07 ha) has been protected since 1965 in the category of special reserve (forest reserve). The area has been included in Croatia's National ecological network. It is characterized by two types of flooded oak forest: *Genisto elatae – Quercetum roboris* type and *Carpino betuli - Quercetum roboris* type. The forest is extremely valuable because of the age of the trees; approximately 300 years old. 1500 trees of pedunculate oak are up to 300 years old and have a diameter of approximately 70-200cm.

The site is completely in state ownership and managed by Croatian Forests. The biodiversity values of the forest is endangered due to unfavourable water regime.

Croatian Forests is obligated to incorporate measures of nature protection that are prescribed by the Directorate for nature protection (under the Ministry of Culture) in their forest management plan. Because of this regular forest management has not been performed.

Implementation of prescribed nature protection measures (or rather the control of the implementation) is difficult due to lack of rangers in protected areas (especially for this site – the Brodsko-Posavska County's Public Institution for Managing Protected Nature Values has only two employees). Also, this site is still partly mined so it is very difficult to manage.

6.7 Jelas polje

This site also contains a complex of carp fishponds (with well developed emerged and floating vegetation) surrounded by oak forest, mesophyllous meadows and mosaic agricultural landscape.

Nearby agricultural area is included because it is important for migration and wintering of *Grus grus* plus forests important for nesting of *Haliaeetus albicilla* and *Ardea cinerea* are included in this site.

Total size of the site is 10 430.96 ha. One part of the site is protected as a special ornithological reserve. The site is included in Croatia's National ecological network. One part of Jelas polje has been protected since 1995 as an important landscape.



Land use

Land use types are intensively farmed land (36%), mostly arable land with large natural vegetation areas (0.8%), leaf forest (23.3%), water bodies and water flows (21.8%), natural wet grasslands (12.8%) and wetlands with leaf forest (0.1%).

The fishponds are important nesting place for wetland birds (*Platalea leucorodia*, *Chlydonias hybridus*, *Larus ridibundus*, *Anser anser*) and for bird nutrition during migration and wintering. This is also an important area for *Lutra lutra*. In the east part of the fishpond complex (1 086 ha) fish production was stopped in 2000 and this part is now neglected. Active measures of protection are necessary in this part because the succession is very advanced. There is a hunting zone established in the active part of the fishponds.

Main threats are possible loss of carp fishponds due to termination of fish production (without the production and maintenance of water regime, the fishponds grow with vegetation in a few years), intensification of agriculture and enhanced or illegal hunting.

Fishponds are partly (1 219 ha) managed by a private company. Brodsko-posavska County's Public Institution for Managing Protected Nature Values is responsible for nature protection of the area. Required measures of protection are: prevent unfavourable changes of water regime, ensure the financial support for extensive and half-intensive fish production and prevent illegal and intensive hunting.

6.8 Dvorina

Dvorina is an open floodplain (situated between Sava river and the dyke) near the city of Slavonski Brod but the area has not been flooded for a few years now.

The area is important because of the wet grasslands, oxbows with rich water and wetland vegetation and numerous temporary ponds developed after the flood. The grasslands are used for cattle grazing, although lately, the number of cattle is reduced.

Total size of the site is 2 066.34 ha. One part of the area is protected as a special ornithological reserve since 1988 (1 066.68 ha). The site is included in Croatia's National ecological network. Land use types are water flows (6.2%), natural wet grasslands (53.5%), wetlands (1.8%), wetlands combined with leaf forest (2.4%), leaf forest (11.9%), arable land (21.8%) and inhabited areas (2.4%).

The area is important for birds, especially the largest pond Dvorina. There is no list of birds that inhabit this area and no assessment of number of the population, but there is data for wider Jelas polje area with fishponds and flooded pastures along the Sava that represent a proposed SPA area (area important for birds) in the NATURA 2000.

Main threats for the site are abandonment of extensive agriculture and economy, reduction of cattle number which as a consequence has succession of pastures.

The site is managed by the Brodsko-posavska County's Public Institution for Managing Protected Nature Values.

6.9 Spačvanski bazen

This forest area with representative flooded forests of pedunculate oak, black alder and ash is situated in the east part of Croatia, at the border with Serbia and Bosnia and Herzegovina. The forest is combination of areas with different ages and managed on a regular basis, except for two forest reserves. The area has several rivers (Virovi, Spačva, Studva etc.) with water and wetlands vegetation.



Land use

Total size of the site: 42 992.48 ha.

Land use: water flows (0.13%); natural wet grasslands (1.08%); wetlands combined with leaf forest (0.06%); wetlands (0.12%); leaf forest (96.97%); intensively farmed land (1.42%); mostly arable land with large natural vegetation areas (0.23%).

Breeding birds of the area are *Haliaeetus albicilla* and *Ciconia nigra*. The pastures are very poor so the number of nesting pairs of birds that feed on these areas is very limited. The goal is to protect the following species: *Aquila pomarina*, *Ciconia nigra*, *Dendrocopos medius*, *Ficedula albicollis*, *Haliaeetus albicilla* and *Picus canus*.

Ownership:

Threats: the forests are endangered by the changes of the water regime, especially by the reduction of the underground water level. A great danger is the building of a large (120 m wide) navigation canal that should connect the Danube and Sava Rivers and which is planned to cut through the forest complex. The last part of the Zagreb-Belgrade highway passes right through the forest complex so a significant part of it has been cut down without any compensation. The forest complex is surrounded by intensively arable land, which reduces their use for nutrition of endangered species such as *Haliaeetus albicilla*, *Ciconia nigra* and *Aquila pomarina*.

Protection status: the area is partly protected. The site consists of two forest reserves: Lože (110.41 ha of representative old pedunculate oak forest, protected since 1975) and Radiševo (4.10 ha of representative rare *Quercus robur-Carpinus betulus-Fagus sylvatica* forest, protected since 1975).

There are also two important landscapes: Virovi (185 ha, protected since 1999) and Spačva (278 ha, protected since 1999). The Spačvanski bazen site is included in Croatia's National ecological network as an important bird area.

Management: the site is being managed by Croatian Forests based on the forest management plan in which the measures for nature protection are included. The protected areas are being managed as special purpose forests. Besides 'Croatian Forests', the site is managed by the Vukovarsko-Srijemska County's Public Institution for Managing Protected Nature Values (but the management plan for the Public Institution has not yet been established). Necessary protection measure is not to change, or better, to improve the water regime of lowland wet forests.

The area is bordering Moravičko-bosutske šume on the Serbian side of the state border and together these two areas present potentially a huge protected area of great natural value of more than 60.000 ha of wet forests.



Non-focal sites in Serbia

The below map shows the non-focal sites in Serbia:



Figure 24. Non-focal sites land Use Group in Serbia

6.10 Trskovača

Trskovača is located nearby Platicevo, a small village in the southern part of Srem. Trskovača includes the meliorated areas of Trskovača pond and the wetland complex that is a connection between the Sava River and Special Nature Reserve “Obedska bara” (eng. Marsh of Obed). It is an important ecological corridor, and represents a valuable rural area, that is a result of interaction between human activities and the forces of nature.



Figure 25. Land Use Map Trskovača

The area of the site is 380 ha. Dominant land use type is arable land (71%). The cover of waterlogged areas, including some wet meadows is 27% while forest patches cover 2% of the area. Although there is a channel system for draining the underground water levels are high due to the existing springs. Considering a significant portion of the arable land seasonally waterlogged, land use defined in cadastre is not quite harmonized with the situation on the field. Consequently some plots of arable land are covered by semi-natural vegetation of wet meadows.

The most important natural value of this area is that Trskovaca pond is one of the most important habitat and spawning areas for several autochthonous fish species: *Carassius carassius* and *Tinca tinca*. There are also several underground springs, which ensure constant influx of fresh water.

There is balance between private and state ownership. There is also a minor part of area in public ownership.

Landscape features: The patch of natural and semi-natural habitats is embedded into agricultural matrix. The dominant landscape feature is the system of draining channels. Also there are several dirt roads which are mostly used by the agricultural mechanization.

Threats: The main threat on this wetland area is the draining system, which has been built to transform the marsh to agricultural land. There are several other threats that needs to be mentioned: degradation of natural habitats, change in the regime of surface and underground water,



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high and sudden oscillations in the water levels that have a negative impact on the fish fauna, habitat fragmentation, invasive species and agriculture.

Autochthonous species: There are no records on breeding autochthonous species on the site or nearby the village.

The invasive species represent one of the biggest threats for the area. The following invasive plant and animal species are detected in Trskovaca: *Ambrosia artemisifolia*, *Asclepias syriaca*, *Carassius gibelio*, *Lepomis gibbosus*. Actions have been planned, in order to eradicate or control these species in the Reserve.

The cultural historic features are represented with a catholic and orthodox church in Platicevo. There are several minor craftsman enterprises.

Although the infrastructure is moderately developed, there are no tourist facilities in Platicevo. The two nearest towns are Sremska Mitrovica and Sabac which could provide logistics for potential tourists (accommodation or bed & breakfast facilities). There are good prerequisites for the development of eco- and ethno-tourism.

There are local management plans for water bodies and agriculture. Larger area within the site was converted from wetland into arable land by meliorations. Currently there are efforts on converting the arable land back to wetlands.

The process to designate about half of the area as protected area (natural and semi-natural habitats) is under way. After designation of the protected area a management plan is going to be elaborated and other plans regarding the area will have to be harmonized.

6.11 Crni Lug - Živača

The site is located on the left side of the River Sava, near Belgrade (the Capital of Serbia). Total area of the site is 1 203 ha.

The area is located in the municipality of Surcin. Forest vegetation is dominating in this area, while the rest is arable land and a fish pond. In the agricultural part an intensive drainage system exists.

The 80% of this site is under state ownership, while 20% is in private ownership. The best part of the area under the state ownership is being managed by Public Enterprise Srbijasume (*eng.* Forests of Serbia). The flooded area, located just to the existing dyke, is under the state property and managed by Public Enterprise Srbijavode (*eng.* Waters of Serbia). The rest of the site divided in small plots is in private property including the area of the fish pond.

Main land uses in this site are: 80% is under mixed deciduous forest vegetation, 10% occupied by a fish pond ("Zivaca") and almost 10% is covered by arable land (enclosed by the meander).

Part of the area is fenced off and used as hunting area ("Crni Lug") in which wild boar, deer and roe-deer are kept.

In the flooded area mixed forests with willow, poplar and ash species dominate. Forest vegetation is also spread on the part of the site protected by dyke. These are grown forests, mainly Common (pedunculate) oak with different age groups (the oldest stand has around 120 years) and Common oak with hornbeam.

The area is important as a breeding area for the rare and endangered White-tailed Eagle (*Haliaeetus albicilla*, which is recorded and monitored within the hunting area.



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The most part of the site is situated protected from flooding by a dyke. However, it is partially waterlogged by upwelling groundwater during the spring period. The foreland has a shape of a narrow belt along the Sava.

The area has no protection status.

The main threat for this area is the proximity of the industrial zone which is just across the Sava River - Thermal power station "Nikola Tesla", established in 1956. The current progress of introduction of new technologies of transport of ash and slag will solve the problem of pollution in settlements around the ash dump, and remove the risk of delivery of ash by wind and harmful effects of landfill on groundwater.

Observed invasive plant species are: *Amorpha fruticosa*, *Acer negundo*, *Fraxinus pennsylvanica*, *Ambrosia artemisiifolia*, *Echinocystis lobata*.

One Water tower is located at the west side of this site.

The hunting area ("Crni Lug") is well organized with a numerous hunting towers and hunting lines. Fish pond "Zivaca" is used for angling. Also, there is a small mole for boats.

6.12 Orlača-Ključ

The site is located on the right side of the river Sava confined by a large meander. Total area of the site is 1 281 ha. Arable land covers 40% , mixed deciduous forests 26% and grasslands about 3% of the site area. More then 95% of the site area is in private ownership. Only the narrow belt of foreland, dyke and roads are in state ownership.

Characteristic for the site is a mosaic of arable land, small forests and grasslands protected by a dyke. The inner part of this site has been protected as a flit station for birds, but because of bad condition and management in previous years removal of conservation status is considered. There are no asphalt roads; next to the dirt roads are small garbage dumps.

Regardless the ongoing degradation process, there are still valuable parts of the site. On the narrow belt in the foreland various scrub and tree species occur. In this part of the site in 2007 an endemic insect species (*Zeuneriana amplipennis*) was discovered.

There is a small mixed forest with remaining individual trees of Common oak in the foreland which is regularly flooded.

Some parts in lower altitudes are waterlogged during spring season and high water level of the Sava.

Inappropriate management of the area, illegal lumbering (caused by poverty) and garbage dumps are the outstanding threats to the site.

Most abundant invasive plant species are: *Amorpha fruticosa*, *Acer negundo*, *Fraxinus pennsylvanica*, *Ailanthus altissima*, *Ambrosia artemisifolia*.

The cultural historic features are represented with a several old churches in villages located nearby.

There are only a few small restaurants nearby the dyke. Bird watching towers and small moles for boats are present as well.



6.13 Veliko Ratno ostrvo

Veliko Ratno ostrvo is an island in the confluence of the Sava River into Danube River, in the triangle between Belgrade, Zemun and the remains of the wetlands on the left bank of the Danube River. It is part of the Belgrade City and belongs to the municipality of Zemun. It represents the last oasis of almost untouched nature in urban Belgrade. Total area of the site is 226 ha.

The surface layer of island are formed by alluvial deposits of the Danube River. The abundant vegetation is characterized by marsh communities flooded forests.

The dense vegetation and the existence of large water surfaces around the island allow feeding, nesting and growing a larger number of birds of international importance.

Numerous species of fish spawn in the permanent or temporary ponds formed on the island or in its coastal area. Isolated from anthropogenic influences, this area was declared as the natural fish reproduction place.

Dominant land use is forestry. Forest covers approximately 90% of the area. Public beach „Lido“ is situated at the northwest of island and comprise around 7% of the surface. Grasslands cover 3% of the site area. There are only small pockets of arable lands (gardens) in the inner part of island.

The whole area is state property. Only a dozen of people, mostly retirees, live in small shacks (during the warm season) in the island's interior.

There are no dykes at the island. Regular flooding of this site contributes to the high biodiversity values.

The Island is protected as an Area with Exceptionally Natural Features, by Government of Serbia. Conservation area has three protection zones: zones of nature protection (which has the character of the Special Nature Reserve), recreation zone (which includes the inner parts of the island) and tourism zone (which includes the beach "Lido"). The management is given under trust to Public Service Enterprise for urban greenery Zelenilo, from Belgrade.

The main threat on this site is a potential human activity; reason for this is the position of island (proximity of urban zone).

Because of characteristic water flow directions at the southeast part of island (at the confluence), the garbage is accumulate in layers (especially plastic waste).

Most abundant invasive plant species are: *Amorpha fruticosa*, *Acer negundo*, *Ailanthus altissima*, *Ambrosia artemisiifolia*, *Echinocystis lobata*.

This area has a big historic importance for the conquest and the defense of Belgrade in the past. However, there are no buildings that are left behind.

One of the most popular beaches in Belgrade is "Lido" at the top of the island. In that zone there are a few temporal catering objects, open showers and mini marine for boats. In the inner part of island is a recreation zone with bird watch towers, walking trails and information signs and warnings.



6.13 Bojčinska šuma

The site is located on the left side of the river Sava, approximately 2km from the riverbank, near Belgrade and in the vicinity of the village of Progar. It belongs to the municipality of Surcin. Total area of the site is 584ha.

The forest is well managed and dominant in this lowland area, while the rest consist of arable land. Due to forest management there is a well developed network of dirt roads. Along dirt roads are shallow ditches. Local asphalt roads crossing the site or passing by enable a good accessibility. The site is well equipped with tourist facilities. The site is surrounded by arable land.

There are natural Pedunculate oak forest stands, with different age groups (from 15 years to the oldest stands with nearly 120 years). These open sunny hygrophilous stands are well known as forests with high level of biodiversity values. Unfortunately, isolated natural site resulted in low number of wild mammals. Site is important for species of ornithofauna. There are numerous mushroom species, including some rarities.

Forestry is dominant land use, with the forests on 92% of the site area. Arable land cover 8% of the area. There is also present extensive farming, especially pig herding within the forests, with autochthonous Mangulica pigs (65 head). Farmers, although an important stakeholders, are only tenants.

The whole site area is in state ownership, managed by Public Enterprise for forest management Srbijasume.

The site is a few meters above the river level, behind the dyke along the Sava and is never flooded.

The area has no protection status.

The main threat to this area is the proximity of the industrial zone which is just across the Sava River including the thermal power station "Nikola Tesla", established in 1956. The current progress of introduction of new technologies of transport of ash and slag will solve the problem of pollution in settlements around the ash dump, and remove the risk of delivery of ash by wind and harmful effects of landfill. Invasive species presents threat in initial stage.

Invasive plants appears in low number, the most abundant are *Amorpha fruticosa* and *Acer negundo*. There is a monument from the Second World War.

Near the main road there is a small ethno-tourist area with a few facilities made of brushwood and mud. There are hunting towers, walking trails and jogging trail.



7. Native or autochthonous cattle breeds

A wide variety of cattle breeds typical for the Sava region were used by farmers because through ages of cross breeding these animals were well adapted to the circumstances of the Sava floodplains. Because of the introduction of new breeds that were more productive many of these traditional autochthonous breeds disappeared together with the specific qualities of these breeds and consequently this typical aspect of agro-biodiversity was threatened with extinction. In addition the ban of traditional grazing/pasturing in forest units in state ownership also contributed to the reduction of these cattle breeds typical for the region.

There are various obstacles slowing the process of the reintroduction of native cattle breeds:

- Aging of the population in rural areas.
- Floodplain areas used for storing floods are managed by Croatian waters.
- Property rights are still unclear in the Sava countries and this hampers investments.
- The land restitution process is not finished yet and very often it is not transparent (particularly concerning the concession rights).

Recently the awareness about the value of these traditional breeds has increased. Not only because the loss of these breeds means loss of biodiversity but also because these autochthonous breeds are often more resistant to outdoor conditions are requiring less care and produce high quality meat and milk. With the increasing awareness about food quality and sustainable food production also the market for products coming from these breeds is growing.

Croatia in particular has developed a well functioning support scheme to support the re-introduction of native cattle breeds and slowly the numbers are increasing. For some endangered breeds management plans have been developed.

Native breed - Croatian name	English	Status in CRO	FAO	support/year [in kunas]
Slavonsko srijemski podolac	<i>Slavonian Podolian cattle</i>	Critically endangered	Critically endangered	3 000.00 kn
Buša	<i>Buša cattle</i>	Endangered	Critically endangered	3 000.00 kn
Lipicanac	<i>Lipizzan horse</i>			2 000.00 kn
Međimurski konj	<i>Međimurje horse</i>	Critically endangered	Critically endangered	2 000.00 kn
Hrvatski posavac	<i>Croatian Posavian horse</i>	Endangered	Endangered	2 000.00 kn
Hrvatski hladnokrvnjak	<i>Croatian cold-blood horse</i>	Endangered	Endangered	2 000.00 kn
Turopoljska svinja	<i>Turopolje pig</i>	Critically endangered	Critically endangered	700.00 kn
Crna slavonska svinja	<i>Black slavonian pig</i>	Endangered	Endangered	700.00 kn
Cigaja	<i>Tsigai sheep</i>	Endangered	Endangered	350.00 kn
Zagorski puran	<i>Turkey of Zagorje</i>		Critically endangered	150.00 kn
Kokoš Hrvatica	<i>Hen Hrvatica</i>	Critically endangered	Critically endangered	60.00 kn

Table 5. Overview of native breeds and the support level in Croatia



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Croatia maintains a register of native cattle breeds and monitors closely the development of the breeds.

Serbian farmers can also receive support from the government when native species are used but the levels are lower and decreased further recently because of the state of the national economy. The decrease of financial support had an immediate negative effect on the number of native cattle breeds kept by farmers as their number went down with the decreased amount of subsidies.

This shows once again that the reintroduction of native breeds benefits from financial support to farmers but it also shows that on the long run the use and protection of these breeds need to be based on the economic value they have either for supporting the management of protected areas and/or because of the specific quality of the products.

The reintroduction and use of autochthonous cattle breeds is first of all important because it contributes to safeguarding agro-biodiversity as an important gene base. Moreover these breeds have specific qualities including the fact that they need less care than modern breeds and that they are better adapted to climate circumstances. Hence when the reintroduction and protection of these breeds is combined with the protection of habitats and species occurring in the protected areas there is a win-win situation; protecting in situ agro-biodiversity and in situ protection of indigenous plants and semi natural habitats. An important trade off of having these breeds grazed in protected areas is that products like dairy products and meat can be branded as an ecologically sensitive food product for which premium market prices exist.

The distribution of semi natural grassland habitats is declining at a rapid pace because of decline of the number of cattle and the consequent abandonment of the grasslands. Grazing in the floodplains is a prerequisite for the long term protection of the endangered semi natural habitats and the reintroduction of native cattle breeds together with targeted support to the farmers that use these cattle breeds offer the best guarantees for sustainable biodiversity protection and the maintenance of a lively country side.

The reintroduction of native cattle breeds in among others Gajna has further proven to be an effective measure in controlling the expansion of the *Amorfa fruticosa* even restoring areas that were occupied by this invasive alien species.



Podolian Cattle (Photo by SINP Croatia)

The manager of the Zasavica special reserve strongly promotes the use of native species and has managed to stir the interest of local farmers to use among others the Mangulica pig which are grazing in the reserve. In a parallel project funded by the Dutch government an effort is being made to set up a branding of the agricultural products from the Mangulica pig and the Podolian cattle which are also grazing in the area.

No data about the number of native breeds or support for farmers are available from BiH.

During a workshop that was held during the final conference of the Life project in Zagreb the following recommendations for promoting the reintroduction of native cattle breeds were proposed:



- Focus to be given on product branding instead of regional branding (e.g. meat of Mangulica pig or Podolian cattle).
- Link the activity with existing branding programmes (e.g. the branding of products in Istria).
- Efforts to be given to harmonize existing standards with standards and legislation of the EU in the field of food safety and hygiene is needed (but requires big investments).
- Establish a national control body for the certification of products.
- Assess possibilities to link with eco-labelling. (Croatia has a national system in place.)
- Improve conditions for promoting native breeds in BiH by for instance creating big open floodplain areas. The existing floodplains are either forested or have a mosaic pattern of land use. Some of them are inaccessible because of land mine fields.
- Establish a support scheme for and registration system of traditional autochthonous breeds in BiH.
- Support processing of agricultural products on the farm (e.g. cheese producing).

8. Market conditions and future prospects of agriculture

8.1 Introduction

Rural areas are characterised by a lower average income per head, while the skills base is narrower and the service sector is less developed than in urban areas. Caring for the rural environment and the rural livelihoods carries a financial cost. On the other hand, the countryside has a great deal to offer the least of them offering the inhabitants of the urban areas peace and calmness and space to relax and recover. And many people are attracted by the idea of living and/or working there, provided that they have access to adequate services and infrastructure. Lively and vibrating country side is also essential when it comes to protecting and managing our landscape and biodiversity.

Rural households are generally characterized by poorer access to basic infrastructure facilities (population/roads, road density, water supply per capita, waste water from public sewage system, telephone connection) and having poorer housing quality (electricity, water supply system, sewage disposal system, central heating, kitchen, toilet and bathroom facilities in the house) than households in urban regions slowing down the economic and social development and posing environmental risks. Energy supply in many rural areas is unstable and affected by numerous disruptions.

One of the issues in the project has therefore been to investigate in the expectations and future prospects of farmers as a base for designing support measures and exploring possibilities for enhanced cooperation with nature conservationists and protected areas managers (see the questionnaire in annex 2). In total 53 farmers have been interviewed.

8.2 Main findings interviews

Summarized report Serbia and Croatia.

Farming succession:

- 21 farmers (65%) of the interviewed farmers in Serbian villages and 16 (76%) of the farmers in Croatian sites, expect that their children (son/grandchildren, daughter rarely mentioned) will take over the farm. In total 70% of all farmers are optimistic in future farming – among the 30%, some were uncertain and said it depends on future market demands and price balancing.

Future Opportunities:

- In Serbia 13 farmers (40%) see the opportunity in the combination of eco-tourism, organic farming (meat, dairy, cereals, fruits) and tourism (e.g. horse riding in the nature). In Croatia more than 50% of farmers see rural tourism, eco-farming (traditional cattle



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keeping) and products (e.g. horse sausages). One family (a woman) is running a tourist lodge combined with vegetable gardening and orchids.

Main findings:

The main challenge for farmers is market instability and low prices for their produce. All emphasized that there is no good balance between inputs/labour costs and price for their products. Some farmers mentioned a lacking of financial and subsidies/insurance mechanism. Croatian farmers indicated that farming on small patches of lands as an inefficient concern. Most farmers suggest that government should ensure that they have better access to regular market and prices (e.g. a quota system).

In Serbia only 8 farmers (25%) keep native breeds: 92 Mangulica pigs, 90 Cigaja sheeps and 5 Pijntren pigs while in Croatia sites 15 farmers (70%) do keep native breeds: 256 Croatian Posavian horses and 12 Slavonian podolian cattle. Only 2 farmers in Bojcinska suma (Serbia) reported in receiving subsidy for keeping native breed (€80 per head) while in Croatia all farmers with native breeds receive subsidies (2 000 kn and 3 000 kn for horse and cattle respectively).

There is no difference in terms of future farming opportunities between native breed farmers and none native keepers. However, the farmers who farm in the protected areas (mainly in Serbia) are of the opinion that strict regulations imposed on them on use of the forest area creates extra burden - forests are fenced and if access is permitted it is under strict supervision. Farmers in Croatia, however, did not mention any constraints related to farming within the protected and are more positive on eco-tourism/farming (this is also true to non-native breeds keepers) – and maybe because they do receive subsidies for keeping native breeds from the government.

Only 30% of farmers in Serbia sell their farm produce to specialized market. In Croatia 60% of the farmers have access to regional –far fetched markets. Despite the percentages, these farmers commonly produce large quantities of cereals and/or livestock products and do sell their products to cooperatives, processing industry and slaughter houses. Other farmers do sell their products to local market and at farm gate.

There is no major difference in approach if farming is the main source of income – however, there is a difference in market access - the farmers who are more specialized and produce in large quantities have market access outside the local/farm gate market – they do sell their products to regional or specialized markets e.g. processing factories. Although not mentioned, these farmers might be more prone to quality and volume standards maintenance. Both farmers with regional (no quota) and local markets complained of low pricing and unstable market for their products (no quota). All famers are practicing mixed farming – for family consumption as well as for business – but the later on large scale.

Summarized Report Bosnia and Herzegovina.

Total number of farmers – 17.

Farming succession:

- 15 farmers (88%) of the interviewed farmers in BiH expect that their children (son) will take over the farm.

Future Opportunities:

- 99% of the farmers did not see new farming products options, only 2 mentioned organic farming – some however could be interest – only if price is better. In Croatia and Serbia 50% and 40% of the farmers respectively were more optimistic in engaging in a different



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way of farming. It is also noted that most of the farmers in BiH are more subsistence (max 30 ha, and keep more chickens – max 100 and rabbits – max 80) than in Croatia and Serbia.

Main findings:

- The main challenge for farmers in BiH like in Croatia and Serbia is unsecure markets (>50%) and 30% raised financial resources and low/unpredictable prices. One farmer indicated that it is a challenge to get big piece of land for farming. Unlike in Croatia and Serbia, none of the farmer indicated that government should offer help for secure markets and price, nor from organised farmers organisations.
- None of the farmer keeps native breeds!
- Most farmers indicated that they do not experience any constraints due to farming in the protected area – only one farmer mentioned floods. None of the farmer mentioned any opportunities offered by the designated protected areas. In Croatia farmers experienced no constraints but are of the opinion that they have more future eco-tourism and organic farming – in Serbia also saw these opportunities but were sceptical on strict regulations imposed on them for forest usage.
- It is interesting to see that despite farming in small scale 35% of farmers (mainly in the village of Tisina 6/17) have access to secondary markets – e.g. processing industry (poultry and pigs). The majority of the farmers, however, sell products at farm gate or mainly for home consumption (5/17). In Croatia 60% of the farmers have access to regional –far fetched markets – but also produce in large scale.
- All famers in BiH like in Croatia and Serbia are practicing mixed farming – for family consumption as well as for small business – but the later not in large scale.

Preliminary conclusions:

70% of all farmers in Croatia and Serbia are convinced that there is future in farming business – and are eager to adapt their farming practices and product to match with market demand – however, most are concerned with market irregularities and see government as a source of solution. None of the farmers mentioned that joint forces e.g. through farmers union or organizations could be a way for better price bargaining and market management. For example all 5 farmers in the village of Morovičko-bosutske šume are members of the farmer organization but all do sell their products to local market and tradesman. Despite of farmers categories, small or large, union membership or not, access to local or regional markets – all are not happy with the current market and prices.

All farmers seem to have good farmer to farmer share of information (100%). In Serbia it seems that extension service is none existence – apart from farmer to farmer exchange, most farmers receive improved technologies by reading magazines and from TV. In Croatia, however, in addition to information received from the specialized unions (e.g. eco-products, horse) and reading magazines, 50% of the farmers receives extension services, some with little appreciation.

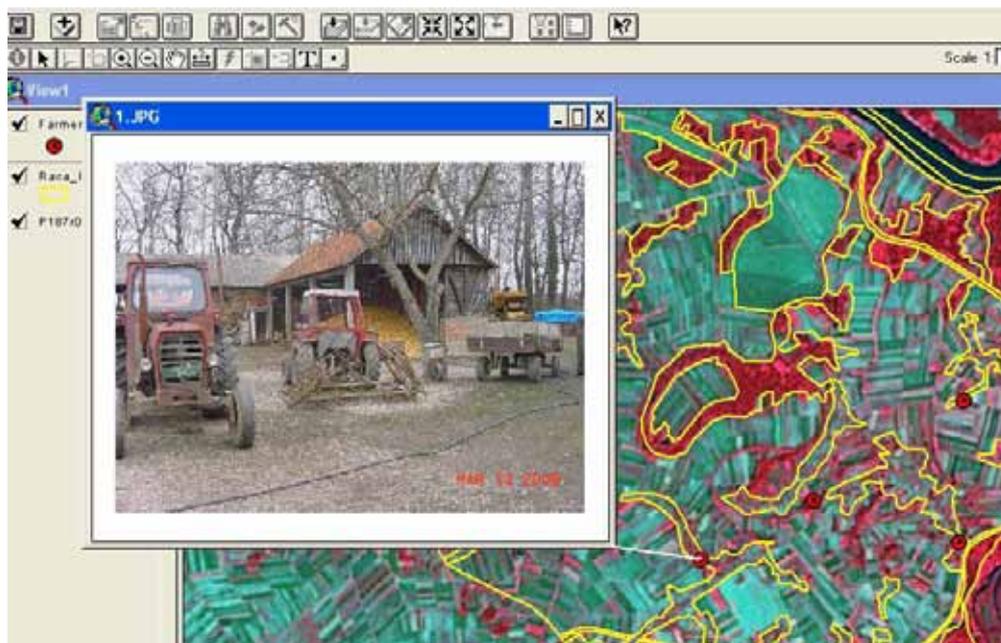
Preliminary conclusions for BiH: Although 88% of the farmers will have farm successor, only 35% showed eagerness to engage in future farming in a different way – rural tourism and organic production. Most of them would like to change the product by looking to the current market – but are uncertain of what should be. Is it a lack of informed markets? 40% of the farmers receive extension services and also read magazines and watch TV programmes. Again here farmer to farmer exchange of information is perfect – not all who receive extension services are satisfied.

More than 80% of the farmers in BiH expects that EU will offer better markets/products and prices as well as 82% are keen to maintain rural landscape and environment! Definitely there is future in agro-environment farming!!

8.3 Additional information for the interviews in Bosnia and Herzegovina

The farmers were not selected according to criteria, they were randomly selected, and therefore six interviews are not enough to make a conclusion.

All farmers have inherited their farms from their ancestors and it goes back to two hundred years ago. Main source of income is meat or reproduction animals (livestock) - no income from milk production. The labor force on farm is strictly family members. Every farmer has some land in ownership and another part rented; also, machinery is available for every farmer. Most of the farmers have their successors.



Visited farm in Rača site (Photo by T. Predić)

As the biggest problem the farmers suggested the problem of product placement, low prices and irregular payment from their buyers, as well as insecure buying up of their products (the market is not well regulated). They would like the state to provide guaranteed buying up and placement of the products.

More or less the interviewed farmers do not expect any changes in the market - no demand increase. They are mostly inclined to changing their production, if the demand would be significant, although they would do so only in case of a complete change in the market. They are skeptical about offering new services (products) due to financial reasons - every new service is an additional cost that most of them cannot afford (they would have to take a credit from the bank, and would do so only if the new service will be profitable).

One important conclusion is that the farmers have minimum knowledge about importance of biodiversity preservation. If some of the BiH sites are to put under some aspect of protection, we believe that it would be necessary to put a lot of effort in education of the local agricultural and other population from the field of biodiversity protection.

Some of the farmers from the Tišina site have a positive attitude about the potential possibility to putting their area under certain aspect of protection. This point of view probably resulted from the fact that this area was in the war zone, where the population was displaced, their property was damaged. In addition, significant part of these areas is still under mine fields. People returning to this area are seeking for way to start any type of production. Based on that, they also see the opportunity



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to put this area under protection, which they connect with tourism, and revival of traditional agricultural production and old handicrafts. One of the features of this area is hand made furniture braided with brushwood.



Preparation of brushwood for hand "braiding" of furniture – traditional production, Tišina, BiH (Photo by T. Predić)

8.4 Recommendations

Based on the above; what recommendations that can be given:

- Agri-environmental measures (adjusting farming practice): The majority of the farmers indicated that farming within the protected areas (nature/environment conservation) do not pose any significant threat for their current farming practises. The fear express by few, could be eliminated if farmers would be more involved when policy decisions are made and implemented – e.g. improved coordination at local level between foresters, nature conservation and agriculture sectors. Farmers are also very keen to change their farm practise as long as it pays. Some aired out that joining EU could be one way of dealing with irregular markets and poor product price. One could conclude that there is a dream among the farmers in getting involved in agri-environment farming. Discussion should be held at local government level to initiate the realisation of this dream.
- Agri-environment to keep and breed native species: Incentives to farmers who keep and maintain native breeds is a good strategy to start with. Despite delays in payments, farmers in Croatia seem more motivated and stimulated in keeping the breeds than in Serbia. In addition, one could introduce product lines based on these breeds – e.g. breeders stocks, special meat/milk – with assured market channels. With facilitation from the local government and/farmers union, farmers with keen interest on native breeds (maintenance – not only for payments), could be invited to discuss on how to promote this group of farmers both within the country/region and in EU market.
- Improved cooperation (establish cooperatives): this will need a follow-up discussion with farmers. At first, farmers are happy with improved technology they receive through their associated unions. However, the union/co-operatives, have not – as yet, emerged strongly



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from the farmers interviews as a means for their own empowerment (e.g. for better service demands and market/price bargaining power). This needs to be handed by care – since the real and sustained farmers union should emerge from farmers interests.

- Certification as regional product: see above – the issue could be market and organised products by farmers themselves.

9. Proposals for agri-environment and innovative land use

9.1 Agri-environment

An important objective of the Common Agricultural Policies (CAP) of the European Union is to harmonize agriculture with environmental standards and to increase sustainability of agricultural production. The European Agricultural Fund for Rural Development provides a framework through which financial incentives can be provided to arrive at a multifunctional agriculture in Europe. Axes 2 of the EAFRD specifically provides incentives for improving the environment in the countryside through among others agri-environment schemes. Each member state is asked to define how the financial support that is available through the EAFRD will be allocated through the elaboration of National Rural Development Plans.

Financial support can be provided for agri-environment measures (compulsory aspect of the rural development plans) for farmers in Less Favorite Areas (LFA). Agri environment support compensate income foregone of farmers because of restrictions or measures that go beyond the mandatory environmental production requirements (*cross compliance*) but it is also possible to provide incentives for farmers to carry out management measures in Natura 2000 areas.

Agri-environment measures may include:

- Protecting and landscape and cultural heritage;
- Protecting and managing biodiversity;
- Protection of water resources;
- Soil and erosion protection;
- Protection of genetic resources;
- Stimulating organic agriculture.

Croatia is preparing for the accession to the European Union and as part of this process has adopted the Strategy for the Rural Development 2008-2013 in preparation for adapting agricultural policies to the EU standards. The objectives of the Strategy for Rural development with respect to the environment and forests include:

- a) Aid to farmers in areas with harder natural conditions of management;
- b) Preparation of support to the implementation of Natura 2000;
- c) Implementation of agricultural environmental programme;
- d) Cultivation of uncultivated agricultural land;
- e) Stimulation and promotion of ecological production.

Croatia has applied for pre accession funds to test a number of proposed agri-environment measures that are indicated in the Strategy for Rural Development.

Three test areas have been identified including two along the Sava River; Zutica and Turopolje based on the fact that these are indicated as LFAs (which applies to the all the floodplains along the Sava). The measures include financial support for the management of pastures and meadows through mowing and grazing to protect among others the habitat of the Corncrake. Also the management of hedgerows, fieldstrips and cultural historic features are included in the agri-environment measures



Land use

to be tested. Žutica is mainly covered with forest and the financial support is granted only for the pastures in the area.

It is expected that negotiations about Serbia's entrance to the European Union will soon start which implies that also Serbia will be asked to elaborate a national rural development plan and design agri-environment measures. Currently a pilot project is under way (financed by the Dutch government) to prepare for the design of an rural development plans and agri-environment measures in Serbia.

The goals of this project are:

1. Support the development of two pilot agri-environment schemes for contrasting protected areas in Serbia.
2. Contribute to the development of a comprehensive National Agri-environment Programme (NAEP).
3. Establish a range of "tools" to support the necessary capacity and organizational structures for agri-environment policy-making and programming in the future.
4. Use the Agri-environment Working Group to facilitate a closer working relationship between the agricultural and nature conservation sectors in Serbia.

The situation in Bosnia and Herzegovina is more complex due the institutional setting of the country (two entities each with its specific organizational and institutional structures), limited resources and inadequate capacities and competencies resulting in among others a lack of initiatives to support farmers in developing agriculture harmonized with the environment.

Based on the analyses of land uses carried out in the framework of this project combined with an assessment of the questionnaires filled out through interviews with a selected number of farmers a number of recommendations can be given to support farmers in adopting sustainable forms of agriculture while contributing to environmental protection and landscape and biodiversity management.

9.2 Proposals for agri-environment measures in the Sava floodplains

Controlling the dispersal of invasive species - the aggressive dispersal of invasive species and in particular of the *Amorpha fruticosa* poses a real threat to the natural vegetation along the Sava River. The species has occupied large areas in the floodplains along the Sava and has led to a significant decrease of the surface of pastures and meadows but also forest ecosystems are heavily impacted by invasive species.



Amorpha fruticosa (Photo by SNIP Croatia)



Land use

Practice has shown that grazing especially by traditional native cattle breeds (especially Podolian cattle) is an effective way to eliminate *Amorpha* dominance and to restore the grassland vegetation. It is therefore recommended to provide an incentive for farmers to re-introduce cattle grazing. This incentive should be in addition to the proposed support to farmers to breed traditional native cattle breeds (see below).

However; in the current strategy for rural development for Croatia support to the protection and to breeding traditional native cattle breeds is not included. This is in strong contrast with the current policies towards the protection of traditional native breeds and poses on the long term a threat to the successes up till now.



Test areas Gajna (Photo by SNIP Croatia)

Nutrient reduction in ground and surface water is an important aspect of EU policies laid down in the nitrates Directive and in the EU Water Framework Directive. In 2009 the elaboration of the Sava River Basin Management Plan has started and one of the issues is to set goals for achieving good ecological condition and designing measures to maintain or achieve good ecological condition. Although nutrient levels are not extremely high in the Sava a clear policy to control nutrient levels and the leaking of nutrients from adjacent agricultural lands is required. Agri-environment measures have proven to be helpful to limit the use of fertilizers but in the current (Croatian) program measures to reduce or control nutrient leaking to support the maintaining the ecological conditions are not included.

One of the ways to control and limit the use of nutrients in agriculture is to promote so called “low input” agriculture which includes among others extensive grazing as it is currently practiced in some areas along the Sava (Lonjsko Polje, Gajna, Zasavica).

Targeted measures are particularly important for flood retention areas as nutrients are trapped when water is retained in these areas but measures need to be designed to prevent that these nutrients are released again into the environment. Extensive grazing helps to take up nutrients and prevent that they are leaking into the water bodies.



Land use

It is recommended to support low input farming via agri-environment measures to limit the use of nutrients and as a measure to protect the water quality and the water ecosystems. Further investigations are needed to determine the nutrient inputs that are acceptable without leakages to the water resources.

The measure contributes also to protect the water quality of fishponds along the Sava.

Support for traditional autochthonous cattle breeds. Currently both Serbia and Croatia have a scheme in place through which farmers can obtain financial support for the introduction and use of traditional native breeds. Croatia has the “National Program for the Protection of Native Breeds” and well-functioning data base. In 2009 the “National Conservation Program for Native and Protected farm Animal Breeds” was adopted.

Support measures included in the strategy include to enhance the use of traditional breeds in the food consumer food market and promotion of the use of traditional cattle in protected area management.

The amount paid out to farmers to keep traditional breeds has increased from the amount of €500 000,- in 2004 to €3 900 000,- in 2008 showing the increased interest of farmers in making use of the fund. The amounts per animal range from €540,- per year for cattle via €270,- for horses, €140,- for pigs, €130,- for donkey to €47,- for sheep and goats.

The Serbian government also provides support to farmers to enhance the protection and use of native cattle breeds.

The rural development policies of the European Union allow countries to provide support to the breeding and use of traditional native breeds through the national rural development plans and to be financed through the agri-environment schemes. However; currently this is not the case in the Croatian Strategy for rural development. It is strongly recommended correct this in the future and to continue to support the use of native cattle breeds and to promote their use in protected areas.

In addition the rural development policies should also provide support to better marketing of the meat and dairy products from traditional breeds because the dependency on subsidy schemes will on the long term not be sustainable.

Improving a life quality in rural areas and broadening of economical programme of rural economy. Another relevant and for the future management of the Sava floodplains important goal of the Croatian Strategy on Rural Development are possible measures to broaden the economy of the rural areas. This measure is specially relevant for providing support to farmers who plan to invest in establishing touristic facilities like offering lodging possibilities.

Also this objective offers opportunities to invest in the branding and marketing of local products and of products from traditional native cattle breeds. As indicated before the long term protection of these breeds can only be secured when there is an economic bases for their use in protected areas.

Preservation, protection and sustainable use of environment, landscape, natural and cultural heritage. One of the measures under this chapter in the Strategy for Rural Development of the Croatia is to provide support to the establishment of ecological farming. Protected areas and the management of these areas by using (traditional native) cattle offer excellent opportunities for the development of ecological farming practices and the agri- environment measures should allocate sufficient means to help farmers to change to ecological farming products alongside with training and the introduction of a certification scheme that warrants the products are of good ecologically produced quality.



Land use

Next to premium prices another trade off of the introduction and application of ecological farming is the reduced application of fertilizers and chemicals thus contributing to achieving good ecological status of water bodies. Basically farmers adopting ecological production processes should be able to apply for support because of the contribution to protecting the biodiversity, for protecting the water resources and for applying ecologically sound and non polluting production methods.

Conservation of *Crex crex* (Corncrake). Agri-environment measures can support extensive grassland management through pasture grazing and mowing of meadows. Special measures are designed to protect and possibly increase the population of Corncrake by providing grassland habitats managed in a way favoring the Corncrake specific habitat requirements. This includes delayed hay cutting until August; keeping field borders uncut and cutting of grass in a spiral form from the centre out towards the edges.

Fishponds. Subsidies for extensive fish production in carp fishponds should be granted by the productive area of 1 ha of fishpond, so that fish breeders who are producing extensively could be as competitive as the intensive producers are. However, these extensive producers should give up the compensations from the state for damages done to the fish by the protected bird species. Due to the fact that the extensive fish breeders are conducting environmental benefit, they should also be absolved from the paying of water fees.

10. Recommendations and Action Plan

One of the key problems with respect to future land use in the floodplains is the decrease of agriculture and particularly the decrease of cattle grazing which will impact greatly on the landscape and biodiversity of the open floodplains. This counts in particular for the floodplains areas with a large percentage of grasslands such as Gajna, Lonjsko Polje, Zasavica and others.

The challenge to meet here is to optimize the conditions for farmers to continue farming and husbandry in order to keep the floodplains open, maintain the biodiversity and contribute to the livelihoods in the rural communities. Although the use of traditional autochthonous breeds is not required from the perspective of the management of the in-situ biodiversity it contributes to the protection of agro-biodiversity. Another important aspect of using traditional autochthonous breeds is that it opens opportunities for product branding.

Based on the analyses and information gathered the following recommendations for an action plan can be presented:

Landscape changes

In most of the focal areas the landscape of today reflects the landscape of past centuries showing that land uses have been continuous over centuries. The wide open plains that are so characteristic for the areas along the Sava still exist and mostly feature in the middle part of the Sava in among others Lonjsko Polje, Odransko Poje and Gajna. Also Zasavica is well known for the still existing open floodplain pastures.

Old grown oak forests are still occurring in Lonjsko Polje but also in Zutica and Odransko Polje.

There are however also a number of exceptions and big changes occurred especially after the second world war and in the 1970s and 1980s in particular.

The most frequently noticed changes are the disappearance of grasslands and meadows in for instance Obedska bara and the appearance of poplar plantations in Obedska bara and Morovičko-bosutske šume.



Land use

Big changes also occurred in Bardaca where large fish ponds were created and large areas were meliorated and drained to be used for agriculture.

The conversion grasslands and pastures into arable land is occurring predominantly in Rača, Velika i Mala Tišina but also occurred in a rather big scale in Odransko Polje.

The majority of the former pastures and small grassland patches that were scattered in significant numbers and surface across forest areas in Obedska bara and Morovičko-bosutske šume disappeared because they were abandoned and/or converted into poplar plantations.

Invasive species

One of the most pressing and common problems in all sites considered is the swift dispersal of invasive and non native species and of the *Amorpha fruticosa* in particular. Halting or controlling the dispersal of these species requires concerted action of all countries along the Sava River. The species are particularly quickly encroaching in abandoned and wet areas as well as in poplar plantations. Practice has shown that grazing is an effective management to control the further encroachment and even to eliminate the species and allow original vegetation to return. The River Sava is offering an excellent transportation mechanism for the seeds of the plants thus also showing that connectivity has a side effect.

Disappearance of grasslands and pastures

There has been a dramatic drop in the number of cattle in the past 20 years in the three target countries which has resulted among others in the loss of a significant area of pastures and meadows. These grassland areas and pastures represent characteristic landscape and biodiversity features and halting the downward trend in the number of cattle poses a big challenge to the protection of the landscape and biodiversity. Reversing this trend is also crucial for maintaining the livelihoods of the rural areas along the Sava River. Croatia has a well functioning support scheme for farmers to reintroduce native cattle breeds and this helps to maintain at least partly grazing in some of the areas like in Gajna, Odransko Polje and Lonjsko Polje.

It can be hoped that this support scheme can be continued when Croatia will enter the EU and that it will be included in the Rural Development Plan for Croatia and in the agri-environment measures. As indicated earlier the support to the reintroduction of autochthonous cattle breeds is not only helping the protection of these endangered breeds but also supports the management of the sites and in particular the fight against further dispersal of the invasive species.

A specific feature mostly occurring in Serbia and Spacva region of Croatia is the impact of the introduction of modern technologies in forest production and development of hunting areas on the landscape and biodiversity. Due to the abandonment of traditional forestry systems traditional farming methods like cattle grazing and pig herding within forest areas also disappeared. Because extensive cattle grazing contributed to a diverse forest ecosystem the ban on the traditional grazing of pigs and cattle in forests together with the introduction of highly mechanized forest management techniques caused a decrease of the diversity of the forest vegetation.

At the same time, due to various reasons, the number of natural large herbivores (deer) significantly decreased, which consequently led to succession and alteration in wetland mosaic. Loss of waterlogged grasslands patches in the forest lead to the loss of feeding areas for many rare wetland species (e.g. black stork).



Land use

Water management

Water management in all sites is very much geared towards favoring agriculture and forestry and takes the requirements for the protection of the landscape and biodiversity insufficiently into account. (Zasavica, Obedska Bara, Odransko Polje). And although some areas are contributing to retaining floods by storing water during high peak discharges in the Sava there is little research available about optimizing both nature conservation and retention of the peak floods. This counts for instance for Obedska bara but also for Lonjsko Polje.

Although the combination of retaining floods and protecting the landscape and biodiversity seems to go well together research into how both functions can be optimized is required. This is of special importance for Lonjsko Polje but also for Gajna and Obedska bara. Due to the impact of climate change on discharge patterns the need for retaining more water might increase and the design of the inlet and outlet structures need to be designed also taking the ecological requirements into account. Research has shown for instance that long periods of flooding has a negative impact on the diversity of the vegetation because some plant communities die when they are submerged for a longer period. The same counts for some tree species. Further research is needed to investigate in the optimal duration of the flooding and the and the impact of long flooding periods on the typical vegetation and the regeneration of forests.

Forest management in the lowland forests

Lowland oak forests and poplar plantations are the most intensively managed forest types in the region and especially in Serbia. The production process with hybrid poplar cultures is mechanized and dependent on intensive silvi-cultural measures. This kind of forest management is more present in the downstream parts of the Sava River, both in Serbia and Croatia, and mostly substitutes less economically favorable natural willow and poplar forests. These plantations appear after clear cutting and planting of single species, which goes on the account of the animal and bird species previously present in the natural forests. In addition these intensive disturbances (ploughing, pruning pesticide spraying, etc.) are creating favorable circumstances for invasive plant species, which are more resistant than autochthonous.

A significant part of grasslands (mostly state owned pastures managed by municipalities) have also been afforested and converted into plantations. Both substitution of different natural deciduous forests and afforestation of grasslands were supported by subsidies, in order to increase the forest production. Most of those changes happened during 1970s and 1980s.

Pedunculate oak forests are economically most valuable lowland forests in the region. Production of stylish furniture is highly dependent on good quality of oak timber, for which highly intensive silviculture measures are developed. Technology of such forest production relies on specific mechanization and regular treatments, which has a significant influence on lowland ecosystems. The management includes removal of dead and dying trees, **shelter wood** harvesting after **regeneration** by removal cut on large area, which used to function as a ecological corridor between waterlogged areas. Building of wide roads functioning as corridors for invasive species, and noise from mechanization in reproduction period also affect biodiversity.

Cattle grazing in forests

One of the specific features of past land uses was the grazing of pigs and cattle in forests. Through centuries pig herding and acorn - grazing used to be a common activity in oak forests in the Sava River Basin. The grazing pressure was low enough to allow acorns to germinate and to support a healthy forest regeneration. Today this happens only in a few places foremost because forest legislation hampers grazing of cattle in forests. The disappearance of this combined land use is not only a loss from a cultural historic perspective but also for the development of the related specific



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forest ecosystem. In the past extensive grazing and forest management went well together and were mutually beneficial for both the farmer and the forester. The old oak forest within the floodplain, created and shaped by this practice, are the best proof for that. The traditional farming practices used to be, and still are an important source of income for local community in rural areas, which are in the same time much more environment friendly then herbicide treatment or the use of noisy and polluting machinery.

Suggestions on mitigating the impact of forest management on lowland forests biodiversity

Recommendations by WWF for mitigation of the negative impacts on biodiversity in forests are in many cases compatible with principles and requirements of the Certification for Sustainable Forest Management (decreed by FSC). Therefore, certification principles and WWF recommendations regarding leaving some old, dead and dying trees, maximum regeneration area etc, should be implemented in the forestry practice.

At the same time, allowing traditional extensive farming practice should be considered as a contribution to forestry management and to substitute regular silvi-cultural treatments. Cattle grazing appeared to be very useful in removal of unwanted invasive underbrush in poplar plantation and presenting a good substitute for herbicides or expensive mechanical removal. By reintroducing cattle grazing the production of meat and timber through traditional silvi-pastoral systems can be restored and even branded.

Lack of effective protection

A significant number of the sites lack any kind of protection regime despite their importance for biodiversity. This counts among others for:

- Veliko Ratno ostrvo
- Orlaca-Ključ
- Rača
- Tišina

The result of the lack of protection and inspection is an ongoing deterioration of the landscape and biodiversity through among others the conversion of meadows into arable land, illegal forestry practises including clear cutting, the conversion of old forest stands into poplar plantations, garbage dumps, gravel excavation and construction activities.

Significant investments are needed to reverse these trends in the areas mentioned but given the limited capacities and the lack of clear institutional arrangements this will be difficult to achieve.

Fishponds



There are quite a number of fishponds in the floodplains of the Sava which are important for biodiversity (especially bird species) but most of them are badly managed. Fishponds occur among others in Bardaca, Ribnjaci Vrbovljani and Ribnjaci Lipovljani and arrangements with the managers are required to sustain the biodiversity and stop further degradation. These arrangements should include the conversion to more sustainable and nature friendly production methods and limiting the use of chemical substances.

Lipovljani fishponds (Photo by SINP Croatia)



Trans-border cooperation

To ensure effective and integrated management of the network of sites along the Sava River it is necessary to sustain and build on the results of the Life III project “*Protection of Biodiversity of the Sava River Basin Floodplains*”. From the perspective of the Land Use Working Group the following recommendations are presented.

Continuation and strengthening of the cooperation between the Institutes for Nature Conservation from Croatia, Serbia, Slovenia, and Bosnia and Herzegovina (CEPRES in Sarajevo and the Institute for the Protection of Cultural, Historical and Natural Heritage of the Republic of Srpska) with a specific focus on the following topics:

- Protection and reintroduction of traditional autochthonous cattle breeds and their use in the management of protected areas (see chapter 7).
- Elaboration of an Trans-border Action Plan to halt the dispersal of invasive species.
- Elaboration of a joint plan for sustainable tourism development along the Sava River in close cooperation with the government bodies responsible for tourism, and to include the plan into the work of the protected areas network as well as market the Sava River and its protected areas as a destination for nature friendly tourism.

The area of Morovičko-bosutske šume (Serbia) and Spačvanski bazen (Croatia) has the potential to be developed as an important trans-border protected wetland area of unprecedented size which can serve to alleviate the risk of floods downstream while increasing the importance for biodiversity. Additional research on the possibilities to adapt the current water management and flood protection system is required including investigating the potential storage capacities and an inventory of impediments in adapting the flood protection system.

It is recommended to investigate whether the area meets the criteria of being designated as a trans-border Ramsar site.



Land use

Annex 1 - Field form for land use analyses

Site name:	Date:
Locality coordinates (GPS):	Name of expert:
Running number polygon (identically marked on map):	

Please map polygon and landscape features

Land Use			
Code	Land Use description	Intensity (A,B,C,D)	Size (ha)

1st line; primary land use > 50%	Intensity: A: Extensive B: Moderate C: Intensive D: No exploitation
2nd line: secondary land use >25% <50%	
3rd land use: tertiary land use < 25%	

See for information about the identification of intensity levels of grasslands, arable land and orchards separate document

Land Use Types:

- 010 Grasslands -pastures
- 011 grasslands-meadows
- 020 Arable land
- 030 Fishponds
- 040 Mixed deciduous forest; see for intensity indication next sheet.
- 050 Plantations
- 070 Waterlogged areas
Abandoned agricultural land
- 080
- 090 Abandoned orchards
- 100 Orchards
- 110 Gravel extraction
- 140 Mine fields
- 150 Garbage deposits

Landscape features			
Number on map	Code	Description	Coordinates (GPS)

Landscape features:

- A Oxbows
- B Ponds
Garbage and waste dump
- C
- D Dirt road
Small forest patches / belts
- E Cultural/Historical features
- F
- G Dykes
Scattered
- H houses/buildings
- I Bird watching tower



Land use

K	Hunting tower
L	Water wells
M	Marine ports (landing sites at shores)
N	Tourist facilities (picnic places etc.)
O	Sewage discharge from houses
P	Sewage discharge from industry
R	Invasive species (see separate document with pictures)

Site name:	Date:
Locality coordinates (GPS):	Name of expert:
Running number code (identically marked on map):	

Forest Intensity Indicators - Thick off List		
Indicator	Thick off if present with "X"	Add observed bio-indicator, if relevant
A: Intensive (Select if: Pesticide/fertilizer usage + at least 3 of 5 indicators beneath thicked):		
1	Mechanical understorey removal	
2	Clear-cut stands	
3	Regular usage of pesticides or fertilizers	
4	Overgrazed forest	
5	Less than 2-3 dead/dying or uprooted trees/tall stumps (>30 cm DBH) per ha	
6	Lack of natural herbaceous layer	
7	Presence/domination of invasive weeds	
B: Moderate (Select if: at least 2 of 3 indicators beneath are thicked):		
8	Structurally uneven-aged forests in different dev. stages (at least 2 canopy layers)	
9	Periodical usage of pesticides (e.g. Only during forest regeneration/pest calamities control)	
10	Natural/semi-natural understory density (presence of lower trees and shrubs)	
11	Natural herbaceous layer	
12	Presence of 3-7 dead/dying or uprooted trees/tall stumps (>30 cm DBH) per ha.	
C: Extensive (Select if: No pesticide/fertilizer usage, Natural forest structure + at least 3 of 5 indicators beneath are thicked):		
13	Selective cutting usage	
14	Uneven-aged forests with natural structure (trees in all development phases)	



Land use

15	Decaying/dead trunks and branches (>40 cm DBH)		
16	Natural understory density (presence of young trees and shrubs)		
17	No pesticide or fertilizer usage		
18	No signs of intensive grazing		
19	More than 7 dead/dying or uprooted trees/tall stumps (>40 cm DBH) per ha.		
20	High level of cover of herbaceous layer in accordance with habitat type		
D: No exploitation (Select if any of the indicators beneath are thicked):			
21	Virgin forest		
22	Zone 1 of protected areas (all land forms forbidden) ~untouched forest		
23	Structural natural forest (structure of forest looks like close-to-virgin forest)		
Intensity score (A,B,C or D):			

Site management

Check with Biodiversity Working Group

Responsibility	Management
Body responsible for the site management	Site management and plans

Owners

Owners: only big owners			
Area	Coordinates		Address



Land use

Domestic species

area where animals graze		Coordinates	Domestic species
Code			<i>Slavonian Podolian cattle</i>
			<i>Buša cattle</i>
			<i>Lipizzan horse</i>
			<i>Međimurje horse</i>
			<i>Croatian Posavian horse</i>
			<i>Croatian cold-blood horse</i>
			<i>Turopolje pig</i>
			<i>Black slavonian pig</i>
			<i>Tsigai sheep</i>
			<i>Turkey of Zagorje</i>
			<i>Hen Hrvatica</i>

Flooding

Floodplains open to flooding (and not protected by dykes)			
Code		Coordinates (GPS)	



Annex 2 - Questionnaire for farmers

Interview analysis per focal area

General	Specification	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	Farmer 6
How long have you been farming on this farm (including your parents and forefathers)?							
How big is your farm (in hectares)	Ownership						
	Rent						
	Used for pasturing (common use)						
	Total						
What animals do you have? (in numbers)	Pigs						
	Cows						
	other						
Number of traditional domestic animals (name and number)	<i>Slavonian Podolian cattle</i>						
	<i>Croatian Posavian horse</i>						
	<i>Turopolje pig</i>						
	other						
Which crops do you grow? (in hectares)							
Which product is the main source for your income? (%)							
Who are working on the farm?							
Is there a successor for your farm?							



Land use

What machinery is available?							

Products and market	Specification	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	Farmer 6
What are the main products							
Where do you sell your products?							
(on farm, local market, regional market, food processing industry, cooperative, tradesman)							
Do you expect changes in the market? (Demand?)							
Would you like to change the products you are producing looking at the market??							
Would you like to offer new services/products? (lodging, organic products, guiding tourists, horse-riding etc)							

Organizational aspects	Specification	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	Farmer 6
Are you member of a farmers association?							
Do you cooperate with other farmers?							
Do you exchange information with other farmers?							
How do you get information about improving your farming methods?							
Do you make use of an extension service?							



Land use

What financial support do you get from the government?							
How much support do you get from the government for breeding traditional domestic breeds? (per breed)	<i>Slavonian Podolian cattle</i>						
	<i>Turopolje pig</i>						
	other						

Environment	Specification	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	Farmer 6
What is the (protection) status of the area you are farming in?							
What consequences does the designation as protected area have for your farming?							
What kind of opportunities does the designation as protected area offer you?							
What kind of constraints does the designation as protected area give you?							
Do you get informed by the park administration or manager of the protected area about the management?							
Are you concerned about the environment?							

Future expectations	Specification	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	Farmer 6
What is the most pressing problem for the future development of your farm (what is the biggest obstacle)?							
What opportunities do you see for the future (tourism, organic farming, other products, etc.)?							



Land use

What do you expect from the park / protected area management?							
What kind of support would you like to receive from the government?							
Are you interested in maintaining the landscape and nature?							
What do you expect from joining the EU?							

General remarks	Specification	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	Farmer 6

Attention!	Specification	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	Farmer 6
Ask the farmer whether they have any question!							



Annex 3 - Analysis of questionnaires per area

CROATIA

Lonjsko Polje:

The farmers cooperate and exchange the information with each other on a regular basis. The information about improving their farming methods are available throughout the extension service (not every farmer is satisfied with the work of the extension service), specialized lectures or TV programme, but mostly from other farmers. The designation as a protected area (Nature Park) has no effect on their farming (good or bad) - the farmers don't see any new opportunities because they are farming in a protected area (except for one big farmer who sees a possibility for organic farming and extensive cattle grow - but they are all already practicing extensive cattle grow). All of the farmers are interested in landscape and nature conservation. Most of them are sceptical about the EU, they don't expect lot of good things from the EU - they are concerned about the survival of small farmers.

Žutica:

The farmers get most of the information needed for improvement of their farming from the extension service. Also, they are members of a farmers association where they can exchange all the information available amongst each other. Some good information are available in specialized programmes (throughout the media). All of the farmers expect that the entrance in the EU will bring better opportunities for them (except for one farmer who thinks that it will not be good then). All of the farmers are interested in landscape and nature conservation.

Odransko Polje:

The farmers get most of the information needed for improvement of their farming from the extension service and from farmers associations - they are all members. They get some of the information from lectures or specialized literature. One of the farmers interviewed is not at all satisfied with the extension service, the others are. All of the farmers expect that the entrance in the EU will bring better opportunities for them (except for one farmer who doesn't know - he doesn't have any opinion) - bigger and reliable market and cheaper production material. All of the farmers are interested in landscape and nature conservation. The land they bring their cattle to graze is a part of an important landscape, but it does not have any consequences or opportunities for them. They are being informed about the protection area by the public institution - the farmers expect from the management to ensure the maintenance of the present state, to encourage the traditional farming and to solve the problem of cattle arrival from the other area.

Gajna:

The state should protect the local products (Croatian brands) and reduce the import - there hasn't been a good strategy since the war). Two of the farmers think that the EU will bring something better, two of them think it will be harder for small producers and that the EU will bring them nothing good. They are all interested in maintaining the landscape and nature. From the state (and management of the area) they expect to regulate the market and provide the farmers with better finances, to provide the market for local products, to protect domestic production and to regulate the legislation and market conditions. The farmers are members of a farmers association, they exchange the information amongst each other; they all use the extension service.

Zasavica:

All interviewed farmers are members of the association of Mangulica pigs raisers "Zasavica" which helps them not only in finding market for Mangulica products but also serves as a centre of information and experience exchange regarding raising of Mangulica pigs. In addition to the information they get through. Association farmers get necessary knowledge also on TV and in literature. The only support they get from government is for Mangulica pigs but it is not enough for expanding of production. Regarding protected area they do not see any constrains after designation



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of the area as protected, on the contrary, they benefited since they started to raise Mangulica and now they have opportunity to sell products to the Nature Reserve. They are all interested in maintaining the landscape and nature and except from joining the EU the higher prices for their products, bigger and better organised market and help in enlarging the farms. It is necessary to be pointed out that there is farmers who are not satisfied after the Zasavica is protected. Those are the farmers who have arable land within the protected area and very often lose harvest due to increasing the water level for the purpose of wetland eco system management.

Trskovača:

The information flow between the government and farmers seems to be poor. The farmers usually don't get any information (or they get it late) on loans and subsidies. There should be better organized extension service and farmers union which would advocate their interest.

The site is relatively small and so capacities for the observed activities.

Drina:

People are considering environmental problems but they could do something more. One of them mentioned gravel extraction as destructive for environment. There are good possibilities for eco-tourism and organic farming. Interest of local population in tourism development should be directed towards country, recreation, picnic and fishery tourism, as there are big potentials for it. Modern agriculture privilege bigger, more intensive and efficient farms, therefore, agri-environmental schemes could significantly contribute to development of High Nature Value Farming on the observed smaller farms.

Tourism development would have considerable impact on agriculture, as it would facilitate placement of food products, development of gastronomy, traditional handicrafts, household products and other.

It would be useful to restore interest of local inhabitants in medical herbs and forest fruits collection and to direct existing diverse agricultural production (in this specific agro-ecological circumstance) to increasing yields thereby keeping recognizable environment quality. To enable easier production and placement of products of local inhabitants is to associate farmer.

Orlača-Ključ:

Small lots, production of miscellaneous kind of products (arable lands, gardens, young orchards, intensive poplar production), low number of cattle per farm indicate bad economic conditions. Management of the site should be directed to better cooperation of farmers and to subvented organic production. Monitoring of site is important for controlling illegal activities (lumbering, hunting, over usage of pesticides etc.). Because of bad economic and infrastructure conditions this area is being de-popularised.

Veliko Ratno ostrvo:

This site is not appropriate for farming because of periodically appearance of flooding, but there are great possibilities for developing an eco-tourism and eco-workshop stations (scientific examinations, bird watching, recreation, etc.). There are no huge buildings or any similar objects that could make damage on the environment. The presence of small pile-dwelling and log-houses is for cottagers and seasonal workers.

Bojčinska šuma:

The Public Enterprise "Srbijasume" are satisfied with current state of the land use activities. Near the main road, there is a small ethno tourist area with few facilities made of mud and woods. Ecotourism and organic farming in this locality may have big chances for further development



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Crni lug – Živača:

The hunting tourism is well organised and management of that part of the site is proper (the hunting area). The further development in this area should be adjusted with already established type of usage. The management of the area within the oxbow should be directed to organic farming, that would be less harmful for biodiversity of the site.

Obedska bara:

Natural Reserve "Obedska bara" is one of the biggest wetlands along the Sava River extending to nearly 10 000 ha in foreland. The area is dominated by forest ecosystems. Some parts of forest and whole management units are fenced and forbidden for grazing for a long time because of forest regeneration, or primary hunting function. The local community was traditionally using these areas for grazing inside the forest in-and-out the protected area. Pastures that belonged to the municipalities until the 1970s afterward were taken away from the villagers and given to foresters for establishing poplar plantations. The farmers interviewed live in three villages surrounding Obedska bara. They are between 40 and 70 year old and have been farming their entire life (and their forefathers as well). Youngest one is a refugee, who has an autochthonous breed of sheep. Autochthonous breed of pig "mangulica" was present in a large number until 70s but not any more because of lack of subsidies during past decades. The farms are used as main but mostly not enough and only income. Farming often has to be financially supported by younger members of family who have an extra job besides. Structure of product vary (cattle and crops) and depends on planning according to instable market conditions and subsidy scheme. The size of the farms are 9-62 ha. They don't own land in the protected area but depend on pasturing in it. All of them have at least one tractor. All of the machinery necessary for farming is in private property of each farmer. The family works on farm, no employed workers. All of the farms have a successor. They sell their products to different places and markets depending on prices. They cooperate to each other, but don't expect changes on market. They are not willing to change production due to unstable market and subsidies. They don't expect getting better after joining EU. They are aware of environmental problems and are willing to maintain landscape (pasturing).

One of the main problems is the lack of communication between authorities and the farmers and conflict with foresters about grazing in the forests. There is not existence of long term plans for areas suitable for grazing in the forests in-and-out the protected area, according which the farmers could make their own plans for developing. On the other hand problem is the farmers do not control their herd in forest, by coming only to feed it, while their cattle sometimes damage forest and forest roads. The lack of support from the government that is represented by irregular subsidy schemes, no governmental guarantees for market conditions - the prices fluctuations are too high and very often, insecure market conditions are discouraging the farmers to invest and to develop their production. The information flow and communication between the government and the farmers is very poor, very often the farmers are not informed about available subsidies and the help they can get from the state. Intensive forestry is present in the poplars plantation, which covers approximately 1/4 of the site. They are not satisfied with the extension service (bad organized), and mostly do not use that service because they are not informed about their existence.

Morovičko-bosutske šume:

Five farmers that we have interviewed are traditionally pig herders. They live in two villages nearby the site. One farmer is in his early 20s, one is above 70, the others are middle aged. Their view on farming situation is similar regardless age. Their families have been farming for generations, most of them kept their pigs in the forests. All but one said that there is a successor on their farm. Only one farmer works on the farm with his wife and they are both over 75 years old with no successors, because children moved to town. They have mostly a poorly equipped and old mechanization. It consists of most basic machines such as tractors, combines and most of connections, also very old. They are farming on between 12 and 30 ha land (partially owned, partially rented). They don't own land in protected area but are herding or pasturing in forest area, belonging to the site. The average number of pigs is 25 but one farmer owns 110. The main product for five of them are pigs and for



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one is soy. Two of them keep cows, but mainly to have milk supplies for the needs of their family. Two middle aged farmer have a regular job as forest workers in forestry, because income from farming can vary a lot, due to market condition. Regarding the traditional domestic animals, one farmer owns 50 Cigaja sheeps, and the young farmer is keeping 10 Mangulica pigs. He got these Mangulica pigs from SNR Zasavica, for keeping them and in favor, he will get 50% of the offspring. Maize and soy are the dominant crops on their fields; therefore they represent the main source of income for these farmers, but it can vary from the demands on the market. Regarding the EU, most of the farmers are skeptic whether it will bring something good. They are afraid of eventual limitations and the uncertain agricultural policy. There are some positive reactions; one farmer is expecting a bigger market where they can sell their products.

Interviewed farmers live in two village nearby/surrounded by the site. All of the farmers are facing several important problems. First of all, there is a problem of the unstable market and buying up prices. They are uncertain whether the production will pay off. Also the lack of financial support from the government (subsidies, beneficial loans), and the higher prices of the auxiliary goods have a negative impact on the production.

The fenced forest and designated hunting areas represent another obstacle in traditional pig farming/herding. Although there is an interest to keep the cattle in the forests, the lack of communication between the farmers and the foresters is proving to be an important issue.

The young people are leaving the village in order to find better opportunities to live and work in the cities. There is also the problem of competition and jealousy between the farmers. We were supposed to interview three more farmers from the village of Jamena, but they were processed to court that day, because their pigs damaged dyke on Sava river basement. The problem is the farmers do not control their herd in forest but are coming only to feed it. Meanwhile their cattle causes damage to dyke, forest roads, etc.