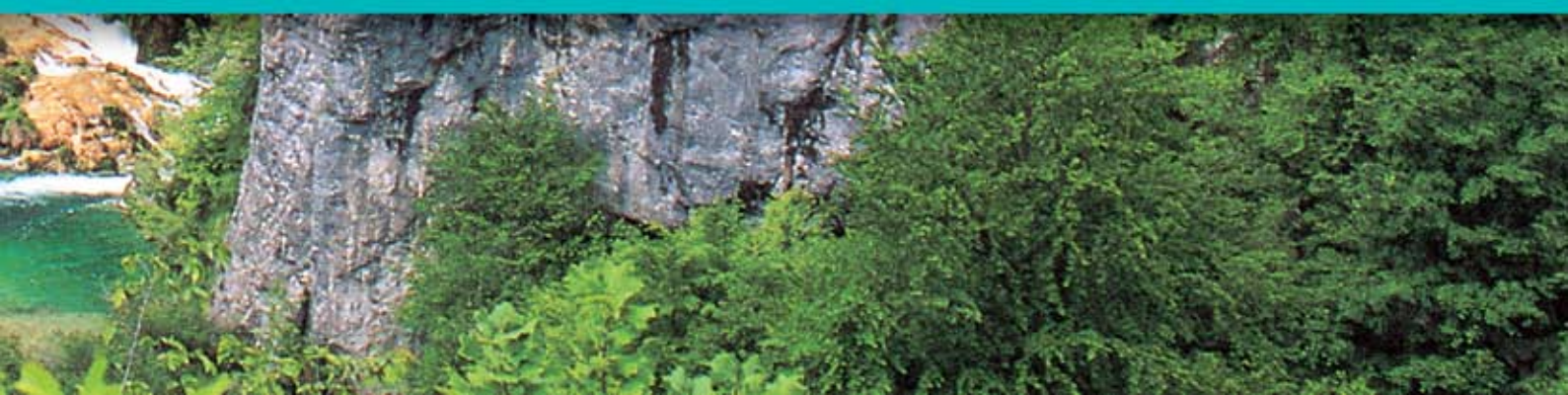
National park

Plitvice Lakes

MANAGEMENT PLAN



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Management Plan Preparation Team

Plitvice Lakes National Park Public Institution

- Borislav Perica, Director General
- Stjepan Dujmović, Assistant Director
- Antonija Dujmović, Acting Conservation Manager
- Nikola Magdić, Chief Ranger
- Krešimir Čulinović, Head of Marketing
- Bogdan Radaković, Head of Technical Services

Agriconsulting Project Team, Italy

- Hana Blasković, Agriconsulting Project Director
- Paolo Viskanić, Agriconsulting, Team Leader Biodiversity Studies KEC Project
- Sanja Tišma, Local Project Coordinator (IMO)
- Željko Kramarić, Agriconsulting, Management Planning Advisor
- Silvija Kipson, Management Planning Assistant
- Andrea Ruk, Secretarial support
- Luigi Boitani, Senior International Management Planning Expert
- John Grainger, International Management Planning Advisor
- Peter Howard, International Management Planning Advisor

Field Research

Flora Team

- Toni Nikolić, Team Coordinator (PMF)
- Zvjezdana Stančić
- Milenko Milović
- Marija Pandža
- Jozo Franjić
- Željko Škvorc
- Zvonimir Soldat
- Jernej Jogan
- Martina Peterlin
- Branka Trčak
- Simona Strgulc-Krajšek
- Božo Frajman
- Darja Erjavec
- Petra Sladek
- Vesna Petkovska
- Daša Filipčić, Data Entry

Fauna Team

- Nikola Tvrtković, Team Coordinator, Zoologist, Bat Expert (HPM)
- Igor Pavlinić, Bat Expert
- Draško Holcer, Bat Expert
- Nenad Vajdić, Field Work Assistance
- Marijana Vuković, Zoologist, Karst and Forest Animals, Moth Inventory
- Martina Šašić, Entomologist
- Franjo Perović, Entomologist, Water Insect Inventory
- Iva Mihoci, Entomologist
- Vesna Tutiš, Ornithology Team Coordinator, Ornithologist, Ornithology Institute, Croatian Academy of Arts and Science
- Jelena Kralj, Ornithologist, Ornithology Department
- Davor Ćiković, Ornithologist, Ornithology Institute
- Dragan Radović, Ornithologist, Ornithology Institute
- Sanja Barišić, Ornithologist, Ornithology Institute
- Ivan Budinski, Contractor for Ornithology Institute, Ornithologist/Bander
- Luka Jurinović, Contractor for Ornithology Institute, Ornithologist/Bander
- Ognjen Vukadinović, Contractor for Ornithology Institute, Field Researcher
- Đuro Huber, Large Carnivore Team Coordinator
- Josip Kusak, Large Carnivore Team
- Tomislav Gomerčić, Large Carnivore Team
- Goran Gužvica, Large Carnivore Team

Biospeleology Team

- Jana Bedek, Biospeleology Team Coordinator (HBSD)
- Roman Ozimec, Biospeleologist
- Branko Jalžić, Biospeleologist
- Martina Pavlek, Biospeleologist
- Helena Bilandžija, Biospeleologist
- Marko Lukić, Biology Student
- Predrag Rade, Speleologist
- Hrvoje Cvitanović, Speleologist

GIS/IT

- Marija Bajica, Team Coordinator (Oikon)
- Siniša Tkalčec
- Josip Križan
- Martina Jelinić
- Zoran Gregurić

Habitat Team

- Vladimir Kušan, Land Cover
- Zrinka Mesić
- Hrvoje Peternel

Associates from Plitvice Lakes National Park

- Natalija Pavlus, Conservation Manager to February 2007
- Ana Brajdić
- Andrijana Brozinčević
- Anita Belančić
- Ante Bionda
- Dubravko Belančić
- Gordana Zwicker
- Ivanka Špoljarić
- Ivica Vuković
- Katica Teklić
- Maja Stojanovska
- Milan Žafran
- Miroslav Luketić
- Ruža Poznanović
- Stipe Špoljarić

A Word from the Publisher

In the interest of improving conservation in protected areas, and particularly to preserve karst ecological systems in Croatia, the Ministry of Culture and the World Bank implemented the Karst Ecosystem Conservation (KEC) Project from 2003 to 2007, with financing from the Global Environmental Fund. Under this Project, management plans were developed for Risnjak National Park, Plitvice Lakes National Park, Paklenica National Park, Northern Velebit National Park and Velebit Nature Park.

The development of management plans for national and nature parks is an obligation stipulated by the Nature Protection Act (as published in Croatia's official journal, *Narodne novine*, no. 70/05), which also specifies the content of management plans and modes for their adoption. The park management plans developed by KEC are in fact the first management plans for protected areas drafted in Croatia. The format of this Management Plan and the methodology used to draft it were reached by agreement at KEC Project workshops, at which all stakeholders[1] participated during the period from 2003 to 2007.

The Management Plan consists of a brief, summarized strategy document, which breaks down the strategic objectives and guidelines for management, and the action plans. The actions plans further refine the strategic management guidelines and provide a detailed specification of management "in the field". The action plans adhere to the vision, mission, policies and general management strategy specified by the Management Plan.

The management plans are prepared on the basis of existing research studies and data on the status of individual park, and a great deal of supplementary research of plants and animals was conducted, particularly in the karst subterranean zone. Useful documentation on physical planning and the state of local economies (concerning tourism in particular) was also gathered, and local populations and interested parties in and around the park were constantly consulted at all phases of plan development. The vision, mission and objectives of the management plans are presented to the wider public every year at annual KEC Project workshops organized by the Ministry of Culture and the public institutions which manage these protected areas.

The management plans for Risnjak National Park, Plitvice Lakes National Park, Paklenica National Park, Northern Velebit National Park and Velebit Nature Park were developed by a team from the firm Agriconsulting of Rome, working together with Croatian experts under the active leadership of the management teams at each park. We believe that the KEC management plans will serve as a sound model for the development of these strategic documents in other Croatian protected areas.

The Ministry of Culture would like to express particular gratitude to the World Bank team for its leadership of the project and for conveying international experiences to the staff of the Ministry and the public institutions, which greatly contributed to enhancement of capacity to implement international projects.

We would like to thank all participants in the plan development process for their contribution to this document, for only the cooperation of all participants made it possible to deliberate on all vital aspects and finally develop this Management Plan.

Božo Biškupić

Minister of Culture

[1] The term stakeholders pertains to all parties with an interest in a given problem (e.g. local population, local government, non-governmental organizations, etc.).

Foreword

Since the Plitvice Lakes were proclaimed a national park on April 8, 1949, the need arose for quality and effective management of this area to the benefit of the wider community and the local population.

In 1950, the Management of Plitvice Lakes National Park was established, with its headquarters in Plitvički Ljeskovac, which constitutes the national park's boundary on the ground, and service units were established to ensue the Park's smooth functioning. Comprehensive research was launched, and the results thereof were published in 1958.

Management and regulation of national parks was resolved by means of several documents:

- Outline for the General Zoning Master Plan, 1960
- General Zoning Master Plan, 1971
- Draft Physical Plan,1975
- Physical Plan, 1986.

As part of the "Karst Ecosystem Conservation" (KEC) Project, work on the Plitvice Lakes National Park Management Plan began in 2003, and concluded in August 2007.

It should be stressed that Plitvice Lakes National Park is a very specific protected area given Croatian and international standards. The Institution's fundamental activity is protection, maintenance and promotion of the national park for the purpose of protecting and conserving the original state of the natural environment, ensuring unimpeded natural processes and sustainable use of natural resources, and monitoring of conditions and protection measures. Besides these basic activities, the Institution also has its Department of Hotels and Hospitality, Commerce, Technical and Infrastructure Services. The Institution operates in compliance with the Natural Protection Act as a public institution, but it manages its finances in the manner of a company, because the Park is self-financing, with less than 1% of its revenues derived from the Central State Budget.

Due to all of these circumstances, Plitvice Lakes National Park is deemed the most important driver of the regional economy. This Management Plan takes into consideration only the natural aspects of Park management, but acknowledges the importance of business operations, which must be covered by a separate business or developmental plan based on the principles defined herein.

Plitvice Lakes National Park was registered on UNESCO's World Heritage List in 1979, which confirms the exceptional international importance of this region.

The Park's Management would like to convey its gratitude to all Park staff for their contribution to the development of the Management Plan. Thanks to very close cooperation between all staff members, it was possible to discuss all vital aspects and ultimately draw up the Management Plan.

Plitvice Lakes National Park Public Institution

Plitvice Lakes National Park

Basic information	
Protected area:	Plitvice Lakes
Conservation category:	National park
Date established:	April 8, 1949.
Legal founding instrument:	Act Proclaiming Plitvice Lakes a National Park (*Narodne novine*, no. 29/49 and 34/65) Amendments to the Act Proclaiming Plitvice Lakes a National Park (*Narodne novine*, no. 13/97)
Total surface area:	29,685.15 ha
Physical plan:	Physical Plan of 1986 for the territory of the National Park at the time.
Planning period:	Work on a new Physical Plan is currently under way.
Date of Management Plan's adoption:	October 25, 2007
Planning period/plan revision:	10 years/revision after 5 years
Information on park management	
Management:	Plitvice Lakes National Park Public Institution
Address:	Plitvička jezera bb; 53231 Plitvička jezera
Telephone:	+385 (0)53 751 000
Fax:	+385 (0)53 751 001
E-mail:	zsc_info@np-plitvicka-jezera.hr
Public institution's charter:	Charter of the Plitvice Lakes National Park Public Institution, adopted by the Ministry of Culture on August 23, 2006, entered into force on September 9, 2006.
Internal regulations:	Plitvice Lakes National Park Internal Rules of Order (*Narodne novine*, no. 38/1996)

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1. INTRODUCTION

1.1. Plitvice Lakes National Park

As an area of the exceptional natural beauty, the Plitvice Lakes were proclaimed a national park in 1949, although the respected scientist Ivo Pevalek, who was among the first to study the phenomenon of tufa formation, had continually stressed the importance of their protection since 1926. The Plitvice Lakes constitute the oldest and best known Croatian national park, whose uniqueness was recognized at the global level – the Plitvice Lakes were registered in the UNESCO World Heritage List in 1979.

Some of this uniqueness is emphasized in the logo of the Park, depicting a waterfall and a lake, symbolizing the basic phenomenon that was a reason for its designation as a national park in the first place, while the bear, as the Park's most attractive animal species, and the forest indicate the Park's rich biodiversity.

The Park is situated in the inland mountain region of Croatia (about 60 km in a straight line from the sea), between the high mountains of Mala Kapela in the southwest and Lička Plješivica in the northeast, or more precisely, between 44° 44′ 34″ and 44° 57′ 48″ north latitude and 15° 27′ 32″ and 15° 42′ 23″ east longitude.

Fig. 1: The location of Plitvice Lakes National Park in the Republic of Croatia

The Plitvice Lakes are a specific geological and hydrological karst phenomenon. Its basic feature is a chain of lakes connected by waterfalls, created by the biodynamic process of tufa development.

Placed within the forested karst landscape, the sixteen larger and smaller lakes are interconnected with foaming cascades and waterfalls.

Relief depiction of the lake zone

The continuous process of tufa deposition, where certain plants (algae and mosses play a significant role) cause the barriers between the lakes to grow and form new waterfalls, curtains and cascades, thus maintaining the form and existence of the Plitvice Lakes.

The most beautiful virgin forest of the Dinaric Alps, Čorkova Uvala, is located here. Due to its extraordinary value, this beech and fir forest was proclaimed a special forest reserve.

The interplay between the geographical position, horizontal and vertical stratification and geological and pedological particularities creates a rich and diverse flora in the Park, with many rare, endemic and endangered species. So far 1,448 plant taxa have been recoded, 50 of them represent various orchid species and many of them endemic. In Croatia, some species are so far found only here, such as Siberian Rayflower (*Ligularia sibirica*). A rare and interesting plant is a species of hawksbeard (*Crepis conyzifolia*) that forms the special grassland association *Crepido conyzifoliae-Molinietum altissimae* (Šegulja,1992). Only two locations in Croatia for this association have been reported in the literature.

The local animal life is also rich and diverse. There are records of four large carnivores in the Park: brown bear, lynx, wolf and wild cat. Additionally, Plitvice Lakes National Park is the only national park in Croatia where the Italian crested newt (*Triturus carnifex*), alpine or black salamander (*Salamandra atra*), harvest mouse (*Micromys minutus*), striped field mouse (*Apodemus agrarius*) and whiskered bat (*Myotis alcathoe*) can be found. This record of the whiskered bat is the first and the only one in Croatia so far.

The cultural and architectural heritage confirms the presence of human activity in this area, characterized by a number of traditional buildings, house yards and hamlets as well as villages and memorial sites.

Plitvice Lakes National Park accords great importance to scientific research. In this context, the establishment of the Biological Station in 1961 was a major step. In 1975, the Ivo Pevalek Research Station was established with the same objectives but at a different location. Since 1976, all scientific research has been conducted as part of a program called "Plitvice Research Project," with costs covered by the National Park's annual budget. For the first time, research proceeded within the framework of a long-term and complex research program conducted largely by the staff of the Ivo Pevalek Research Station in the National Park. The Plitvice Research Project constitutes a coherent whole. The themes were interconnected by the internal logic of a single idea, while the project's objective is to observe the phenomenon of the Plitvice Lakes, both from the standpoint of fundamental knowledge and practical use under the conditions of the National Park. The 1980s ere time of intense scientific interest in the actual waters of the Plitvice Lakes. In 1982, the Srdoč and associates team launched systematic measurements of the physical and chemical parameters, which later formed the basis for an explanation of the conditions required for tufa formation. At the same time, saprobiological, limnological and zoological research was conducted parallel to botanical and forestry research into the meadow and forest ecosystems.

After the end of the period of occupation and Homeland War, and the return of the Park's management and the local population and visitors to the Plitvice Lakes, research resumed with the financial support of the National Park through an integral project "Environmental Assessment of Water Resources," as well as several inventory projects and, more recently, forestry and hydrological research projects. The work of the former Research Station continued within the framework of the Ivo Pevalek Research and Conservation Center in a building newly constructed in 1999 and opened in 2003.

The Park has established sound cooperation with many institutions, non-governmental organizations and individuals at the national and international levels, and from 2003 to 2007 it was encompassed by the "Karst Ecosystem Conservation" (KEC) Project sponsored by the World Bank and the Croatian Government – and the ministry in charge of environmental protection.

Končarev Kraj meadow and forest

Fig. 2: Boundaries of Plitvice Lakes National Park

1.2. Plitvice Lakes National Park in the international context

The Republic of Croatia is a signatory to all relevant international treaties in the field of nature conservation at the global level. One of the fundamental covenants is the Convention on Biological Diversity that Croatia ratified in April 1996 (as published in Croatia's official journal, *Narodne novine*, International Treaties edition, no. 6/96) and it has undertaken the commitment to safeguard existing biodiversity and to sustainably use its components.

The karst tracts of the Croatian highlands constitute a natural resource of exceptional value to Europe and the world. The area is rich in endemic species and habitats, and the morphology and hydrology of the terrain are very specific. Although Croatia's karst zones are relatively well preserved, especially in highland Croatia, they require, due to their extreme vulnerability, special attention in terms of strategic development planning and incorporation of biological and landscape diversity measures into all human activities in this region.

It is precisely due to the aforementioned reasons that Plitvice Lakes National Park became a beneficiary of Karst Ecosystem Conservation (KEC) Project funds via a grant (IBRD GEF TF 050539 HR) from the Global Environmental Fund (GEF). The basic objective of this project is to safeguard biodiversity and facilitate sustainable development in local communities based on available natural wealth. This included the enhancement of institutional and professional capacity to conserve biodiversity, improve management of protected areas and promote business and tourism that uphold sustainable use and conservation of natural resources.

Within the framework of the Ecological Network, Plitvice Lakes National Park has been designated as a core of international importance, and it also constitutes a potential area of the Natura 2000 Ecological Network. The international significance of Plitvice Lakes National Park as a unique natural treasure at the global level was acknowledged in 1979, when the United Nations, via UNESCO, placed it on the World Heritage List.

1.3. Vision of Plitvice Lakes National Park

The vision of Plitvice Lakes National Park brings together all groups and parties interested in securing a quality future for both the National Park and the local community, as well as all other concerned stakeholders. All of the Park's management activities must comply in their entirety with this vision, for it reflects the purpose of the National Park's existence and its management objectives.

Plitvice Lakes National Park shall remain a UNESCO World Heritage site, and a national leader in the conservation and promotion of unique natural and cultural resources in their valorization by means of sustainable tourism to the benefit of the region and local communities and to the satisfaction of visitors.

The Park is the driver of regional sustainable development which offers new experiences to visitors, particularly given the unique aspects of its natural environment and recreational possibilities. The vision statement also emphasizes the Park's education function.

The vision statement constitutes the foundation for developmental decision-making in the Park, and all activities must lead to its actualization. To achieve this vision, the following long-term objectives have been set:

- Preserve the unique karst biological diversity by facilitating natural processes and securing protection of the area with negligible human impact.
- Cooperation between the local community and the Park's management to plan and implement local development.
- Secure visitor access to the authentic experience of the National Park's value.

These objectives defined during the Plan's preparation reflect the original aims for which the Park was created, namely the conservation of nature with emphasis on the lakes and tufa formation and the possibilities of visitor education and recreation.

A new aspect introduced by this Management Plan is wilderness conservation as a special feature of the National Park and its potential role as a resource base for sustainable development of the local community and the latter's active involvement in conservation and management of the protected area.

Plitvice Lakes National Park is characterized by a highly valuable and diverse landscape with pristine and unaltered karst features. Large parts of the Park have not been actively used for several decades, while a smaller portion was subject to considerable human activity (e.g. meadows and grasslands). It is obvious that the Park's territory will change with time, but all stakeholders involved in the Park's administration must ensure that this change is managed such that the National Park retains its importance and natural value and cultural heritage.

The three fundamental objectives foreseen for the long-term sustainable management of the Park are

- Conservation – to conserve biological and landscape diversity and the cultural heritage in perpetuity.
- Education and recreation – to promote understanding of the importance of conservation and protection of its natural value and cultural heritage, and enjoyment of the pristine natural environment and other specific qualities of the Park.
- Strengthening the local community – to reinforce cooperation initiated with the local community in sustainable use of the Park's natural resources with the objective of local and regional economic growth and development, ensuring income for the local community and the creation of new jobs.

Sastavci and Veliki Falls

2. CURRENT STATUS AND VALUE OF PLITVICE LAKES NATIONAL PARK

2.1. Institutional and legislative framework

2.1.1. Legislative framework underlying the Management Plan

Nature conservation in Croatia is regulated by a large number of legal instruments. The fundamental legislation governing the conservation of biological and landscape diversity is the Nature Protection Act (as published in Croatia's official journal, *Narodne novine*, no. 70/05). This law defines the categories of protected areas, the methods for management thereof, in this regard, and the basic relevant documents.

National parks and nature parks are managed by public institutions established by the Croatian Government. The obligation to draft management plans is stipulated by Article 80 of the aforementioned law. The management plan is adopted by the public institution's Governing Board after securing consent from the Ministry of Culture and technical approval by the State Institute for Nature Protection, for a period of 10 years. Public hearings must be held during development of such plans. The management plan is implemented in practice through annual programs of conservation, use and promotion of the protected area.

Nature Protection Act – Narodne novine, no. 70/05

Article 80

1) Management of strict reserves, national parks, nature parks, regional parks, special reserves and protected landscapes shall be based on management plans.
2) The management plan shall be adopted for a period of ten years.
3) The management plan shall specify developmental guidelines, protection methods, use and management of the protected area, including detailed guidelines for protection and conservation of its natural values, respecting the needs of the local population.
4) The management plan shall be binding for all natural and legal persons engaged in activities within the protected area.
5) Upon the close of a five-year period, implementation of the management plan and the results achieved shall be analysed and, if necessary, the management plan shall be revised in the manner and under procedures as determined for the adoption thereof.

In addition to the management plan and the annual operating programs, the management of a protected area is regulated by internal regulations which define measures for protection, conservation, improvement and use pertaining to the protected area.

Besides the Nature Protection Act, during development of this Plan, all effective laws and subordinate regulations and documents governing management of protected areas were taken into account (Appendix 1).

2.1.2. Planning instruments in Croatia

The Croatian Parliament proclaims national parks and nature parks and enacts physical plans for areas with specific features, national parks and nature parks. Physical plans have been mandatory since the 1970s as the core planning and conservation instrument for protected areas in Croatia. They are developed by the county physical planning departments which are under the jurisdiction of the Ministry of Environmental Protection, Physical Planning and Construction. Physical plans encompass the organization, use and purpose of a given area, as well as the conservation policies for specific areas of parks as well as zoning according to various types of usages. Since physical plans for protected areas are approved by the Croatian Parliament, they constitute fundamental legal documents for the management of national and nature parks in Croatia.

Plitvice Lakes National Park's Physical Plan was drawn up by the Urban Planning Institute of Croatia in 1986. The development of a new Physical Plan for Plitvice Lakes National Park commenced during 2005. Over the past year, the Conservation Department of the Ministry of Culture completed its Conservation Study, which should form the foundation for formulating the enabling provisions of the Physical Plan. The conservation platform (guidelines) for developing the Physical Plan, which should be done by the State Institute for Nature Protection, has not yet been completed.

A study on construction development land in the National Park's territory is currently being compiled by the Urban Planning Institute in Zagreb, which is also drafting the Physical Plan.

The Management Plan was developed in cooperation with the State Institute for Nature Protection so that it can be aligned with the Physical Plan currently being prepared

2.1.3. Responsible ministries and institutions

Nature protection and all activities related to management of the protected areas were under the authority of the Ministry of Environmental Protection and Physical Planning until the beginning of 2004. After public administration reform in January 2004, all activities related to nature protection were transferred to the jurisdiction of the Ministry of Culture.

Ministry of Culture, through its Nature Protection Department, is responsible for implementation of the Nature Protection Act and international conventions governing nature protection, and it coordinates administrative and technical tasks pertaining to nature conservation and planning sustainable use of the natural heritage.

Ministry of Environmental Protection, Physical Planning and Construction, although not directly involved in the management planning process for protected areas, has great responsibility for the development of protected areas through coordination of preparation of physical plans in close cooperation with the county physical planning departments and through inspections thereof.

The State Institute for Nature Protection performs expertise-based tasks pertaining to nature protection in the Republic of Croatia.

Throughout the preparation of the management plan, vital inputs from other ministries and regional and local governments were taken into account and addressed.

2.2. Plitvice Lakes National Park Public Institution

2.2.1. Organizational structure of the National Park

The National Park is administered by the Public Institution under the authority of the Ministry of Culture. The Public Institution's activities encompass protection, conservation and promotion of the National Park with the objective of safeguarding and preserving the authenticity of its natural environment, ensuring that natural processes proceed unimpeded and that natural resources are used sustainably and overseeing all nature protection criteria and measures in the protected area.

Additionally, the Park owns and manages three hotels (Jezero, Plitvice and Bellevue) located in the Park, one hotel outside of the Park (Grabovac), two camps (Korana and Borje), a series of restaurants within the Park, shops in the Park's territory and a number of residential buildings, facilities and utilities infrastructure. The Villa Izvor is also located in the Park, but it is not in use and title to the facility has not been settled. Once its title issues are settled, it will become functional either by means of concession or lease. The Plitvice Motel in Lučko, near Zagreb, is also under the majority ownership of the Park's Management.

The Public Institution's bodies are the Governing Board, Director General and Conservation Manager. The Governing Board makes the key developmental decisions, while the Institution's operations are organized and administered by the Director General, who is appointed by the Minister for a four-year period. The Conservation Manager oversees the Institution's conservation operations (conservation service).

The internal structure and activities of the Institution are governed by the Charter and Internal Structure and Operating Rules.

For the purpose of harmonious, professional and systematic performance of the Institution's activities in managing Plitvice Lakes National Park, the Institution is divided into 2 services and 3 sectors which are administered by the Office of the Director General.

The Institution's internal organizational units are:

- Office of the Director General
- National Park Conservation, Promotion and Use Service
- Joint Operations Service
- Hotels and Hospitality Sector
- Maintenance and Utilities Sector
- Retail Outlets Sector

Within these departments, the Park currently employs a staff of over 730, of which approximately 130 perform conservation-related jobs. A small number of the Park's activities are financed from the Central State Budget, while the rest are financed by the Park's own revenues. The current organizational structure of Plitvice Lakes National Park is shown in Fig. 3.

2.2.2. Existing infrastructure

The Plitvice Lakes National Park Public Institution owns an entire series of buildings, land, hotels, restaurants, shops, offices and other infrastructure in the Park itself, in the region and elsewhere in Croatia. In the case of Plitvice Lakes National Park, the list of infrastructure would be too large for the confines of this Management Plan, so these data are not shown herein.

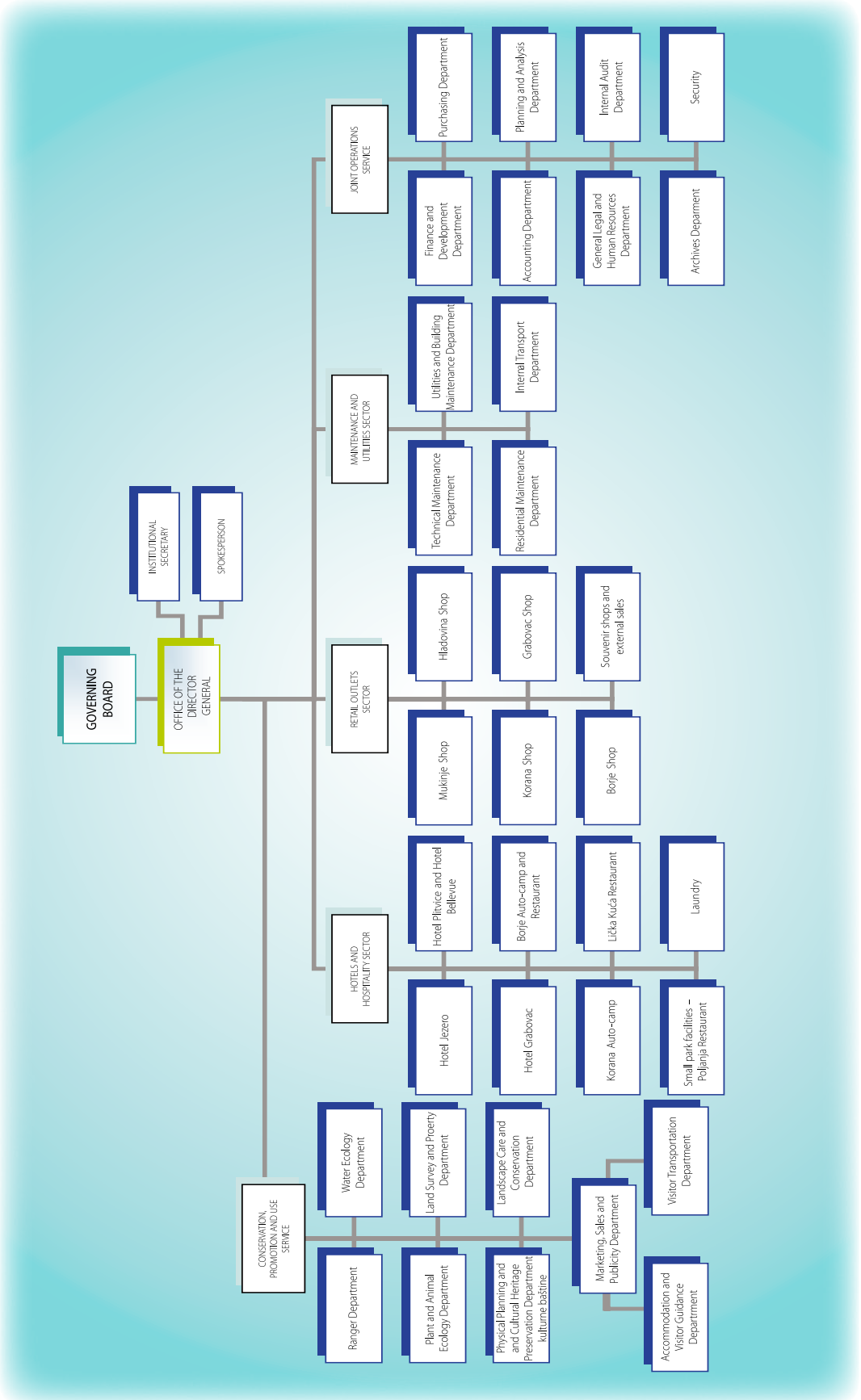


Fig. 3: Current organizational structure of Plitvice Lakes National Park

The Management Plan did not encompass the aforementioned infrastructure, rather this required the formulation of action plans which would foresee the possibility of their management and use (possibility of a concession, in compliance with the Nature Protection Act, *Narodne novine*, no. 70/05).

2.2.3. Current financial status

To provide a view into the Public Institution's financial status, Table 1 shows total revenues for the 2001-2006 period. The main sections of the 2006 budget are shown in Table 2.

Table 1: Overview of revenues and expenditures, 2001-2006

	Budget of Plitvice Lakes National Park (HRK)					
Item	2001.	2002.	2003.	2004.	2005.	2006.
State budget	10,669,319,67	7,693,420,36	1,844,108,55	1,227,936,04	1,831,760,38	1,665,288,19
Total revenues	136,593,357,39	138,860,457,12	144,049,510,72	158,111,368,67	188,376,214,45	185,571,361,17
Total expenditures	133,902,352,54	144,817,939,61	137,427,938,90	148,944,286,45	154,231,895,96	161,419,052,39

Table 2: Overview of the Public Institution's revenues and expenditures for 2006

Description	Amount (in HRK)	Percentage
Revenues	**185,571,361**	**100**
State budgetary revenues	1,665,288	0.89
Revenues generated by own activities	176,640,257	95.19
Assistance from other financial institutions	2,134,063	1.15
Revenues generated by financial assets	5,131,753	2.77
Preceding year revenues carried forward	0	0
Expenditures	**161,419,052**	**100**
Employee costs	54,191,834	33.57
Supplies, energy and services	53,141,019	32.91
Other operating expenses	8,820,885	5.46
Financial expenditures	14,443,820	8.95
Damages paid to legal and natural persons	8,241	0.02
Procurement of non-financial assets	30,813,253	19.09
Outlays for financial assets and debt servicing	0	0
Surplus revenues	**24,152,309**	**13.02**

2.3. Natural value of Plitvice Lakes National Park

2.3.1. Geology, hydrology and soils

The territory of Plitvice Lakes National Park is in one of the most striking karst complexes in the world, characterized by very specific geological, geomorphologic and hydrological features.

The Park's geological base is mostly made of Mesozoic limestone with layers of dolomite, and also of dolomite by itself. The relationship between low-porosity dolomites with karstified and Jurassic limestone layers has led to the final, current appearance of the whole area within and around the Park's boundaries. The specific hydrogeological characteristics of rocks have conditioned possibility of water retention on Triassic period dolomites, but also canyon incisions in Cretaceous limestone layers. Tufa barriers facilitated lake formation.

A certain water chemism caused by lithology and also water accumulation in the subterranean karst with permanent inflow and outflow have made possible and spurred the development of the biological component along with growth of various travertine-forming-plants and travertine deposits and creation and growth of travertine barriers in the lake waters. The Triassic dolomite has made possible the accumulation of lake water in the area from today's Prošćansko, through Ciginovac, Galovac and Gradinsko Lake to the end of the Lake Kozjak. Accumulations are still being fed continuously and abundantly by water flows from the Bijela and Crna Rivers and from the Rječica Stream from existing subterranean accumulations as well as from precipitation and numerous small temporary and permanent springs.

Tufa formation is a result of physical, chemical and biological processes. Dissolving limestone (calcium carbonate) in the water under the influence of carbonate acid creates soluble calcium bicarbonate, one

Veliki Prštavci Falls

of the most important components in tufa formation. The spray of such hard water in waterfalls aerates it, and carbonate dioxide is excluded from the water, while insoluble calcium carbonate is formed which forms deposits on "tufa creators" – mosses and algae. The sole process of tufa growth is very sensitive to pH changes, temperature and the amount of dissolved organic carbonate. Continuous formation of phytogenic tufa (tufa formed by plants) in the Plitvice Lakes is a natural and basic phenomenon of the National Park and a precondition for its further existence.

In the Plitvice Lakes system, the Kozjak Lake is quite significant. Most of the tourist infrastructure is nearby, including three hotels built approximately 50 years ago, which are not compatible with the modern notion of national park conservation. Also, the sewer system is not constructed with protection of the lakes in mind, and the Park area and the municipalities of Rakovica and Plitvička Jezera are supplied with potable water from Kozjak Lake.

The Park's territory was expanded in 1997 in order to include the entire water catchment area of the lakes in the National Park. State road D52, which was formerly the Park's boundary, passes through the catchment area in one of the most vulnerable parts. On this road, public traffic, especially transportation of oil and fuel for the area around Bihać in Bosnia, currently runs through the Park, which is a serious risk to the lake ecosystem.

Increased amounts of dissolved organic matter also impact the barriers, since it impedes tufa formation in the Plitvice Lakes. The lakes are exposed to the natural process of eutrophication (enrichment of water with nutrients) or "lake-aging," which has accelerated as a result of human activity (agriculture, animal husbandry, tourism, wastewater). The eutrophication of Plitvice Lakes induces growth of macro-vegetation that often decreases water circulation, adds to the accumulation of organic matter, slows tufa formation and sometimes even jeopardizes barrier statics by its weight, threatening collapse.

With reference to soils, the most common in the Park is brown soil on limestone and dolomite (calcocambisol), with depths depending on the karst phenomena. In sink-holes deep soil (luvisol) is present.

2.3.2. Climate

A transitional climate type, between coastal and continental, prevails in the Park. Due to diversity of the relief, various microclimatic conditions are present within the Park, but common characteristics of climate are pleasant and sunny summers and relatively long, severe and snow-rich winters.

Springtime begins late, and it is cold and rainy. In the summer, the average midday temperature is 24°C, with maximum temperatures never exceeding 36°C even on the hottest days. Autumn is usually short and winter begins already in November. January is usually the coldest month (-3°C). Snow prevails in the winter, while rainfall is not common at that time. Rain falls mostly in November (200 mm on the average) and the least in February (about 80mm). Average yearly precipitation is 1,550 mm.

Northeasterly winds are most common in the winter and spring, while winds are light in the summer, except on rainy days. The latter are usually southwesterly winds.

2.3.3. Landscape

The landscape value of Plitvice Lakes National Park is formed by an entire complex of natural elements, including forests, waters and meadows with scattered hamlets and tourism and recreational facilities.

Forests in the Park's territory play an exceptionally vital role in maintaining the water regime, and together with meadows and water surfaces they accord a particular value and atmosphere to the beauty of the landscape.

Beech and fir forest

The interplay between various factors (geographic position, elevation between 450 and 1,280 m, the geological base, climate, etc.) has facilitated the growth of diverse forest associations, which, with their characteristic composition, size, appearance in form and color both in term of individual trees and the entire cover, changer over the year.

Spring-time is dominated by the mosaic of mixed beech (*Fagus sylvatica*) with light-green leaves, and fir tree (*Abies alba*) with dark green foliage (*Omphalodo-Fagetum (Tregubov 1957) Marinček et al. 1993*). Also impressive during this season are the hop hornbeam forest in Korana Canyon (*Seslerio autumnalis-Osryetum Ht et H-ić in Ht.1950*) dominated by the blossoming Manna ash trees (*Fraxinus ornus*) with their fragrant white flowers, and the hop hornbeam forest with heather (*Erico herbaceae-Ostryetum Ht.(1938) 1956*) on the slopes around the Upper Lakes with surfaces of overgrown spring heath (*Erica herbacea*) at the ground level.

All forests are equally lovely in the autumn, but the hop hornbeam and heath forests (*Erico herbaceae-Ostryetum Ht.(1938) 1956*) stands out in particular, as this it is then dominated by the reds of the smoke tree (*Cotinus coggygria*), as do the beech forests on dolomites (*Carici albae-Fagetum Mor 1952*) which the Italian maple (*Acer obtusatum*) gives a specific appearance with the color of its leaves in variations from yellow to red.

Even though waters cover only approximately 1% of the Park's surface, they are the most valuable element of the landscape. The greatest value is formed by 16 larger and a series of smaller lakes linked by waterfalls, which were created by biodynamic processes entailing the growth of tufa barriers.

The Plitvice Lakes are divided into the Upper Lakes, which are situated on forested, gently set dolomite base, and the Lower Lakes, situated in rocky limestone canyon. The highest lake stands at an elevation of 637 m, while the foot of the lowest waterfall, Sastavci, beneath which the Korana River commences flowing, is at 475 m.

The exceptional sensitivity of the tufa barriers requires a very cautious approach and maximum limitation of human activity, particularly with reference to the construction of pedestrian trails and their handrails.

The value of the meadows in terms of landscape is their great wealth of plant species.

Given the ecological factors, there are several types of grassy vegetation, on:

- Dry habitats on acidic soils,
- Dry habitats on carbonate soils,
- Moderately wet habitats and medium-deep soils,
- Very wet habitats on basal or acidic soils and
- Peat habitats (alkaline and acidophilous).

To ensure preservation of the Park's landscape diversity and its wealth of plant species, all existing forms of grasslands/meadows must be nurtured to prevent growth of tree-like and bush species.

There are immense grasslands in the Park, such as Homoljačko Field, ca 1080 ha, Brezovačko Field, ca 960 ha, Karleušine plase, ca 80 ha, and so forth.

If the process of overgrowth of grassy surfaces is not halted, the number of plant species will decline, and this means that the appearance of the landscape will be altered. The color and diversity of grassy surfaces will thus not come to the fore in their full beauty.

Pasture – Babin Potok

2.3.4. Land cover

As a part of preparations to draft the Plan, a land cover map has been developed with a scale 1:25,000. This map shows the distribution of each land cover type and is based on Corine land cover classification. For the development of this map, two sets of Landsat TM satellite images from the spring and autumn 2000 and the first level of the Corine classification. This map represents a tool for monitoring the Park's development in forthcoming years.

2.3.5. Habitats

According to the habitat map, and in compliance with level III of the National Habitat Classification, there are 43 different habitat types in the territory of Plitvice Lakes National Park, of which 21 belong in the threatened and rare categories. Among the threatened are rare categories in the National Park's territory, the most common are the beech forest with giant dead nettle and the Dinaric beech/fir forest. In the interest of maintaining threatened and rare habitat types in favorable condition, all activities within the framework of this Plan will be conducted in compliance with the Nature Protection Act (*Narodne novine*, no. 70/05).

Table 3: Habitat types in the National Park's territory (National Habitat Classification, level III)

NHC CODE	NHC DESIGNATION
A.1.1.1.2.	Mesotrophic waters
A.1.1.1.4.	Oligotrophic/mesotrophic waters rich in limestone
A.1.2.1.	Seasonal ponds
A.2.3.	Constant waterways
A.2.5.1.2.	Biogenic waterfalls
A.3.5.*	Tufa-forming riverine associations
A.4.1.	Reed beds, bulrushes, high sedge
B.1.3.*	Alpine-Carpathian Balkan limestone rocks
B.2.	Gullies
C.1.1.*	Alkaline peat fens (low peat)
C.1.2.*	Acidophilous peat bogs (transitional and raised bogs)
C.2.2.	Central European wetland meadows
C.2.2.4.*	Central European wetland meadows 4. Periodically wet meadows
C.2.3.1.	Moderately wet meadows
C.2.3.2.*	Central European mesophilous mowed meadows
C.2.4.1.*	Nitrophilous pastures and meadows – mowed lowland vegetation belt
C.2.5.1.*	Illyrian-sub-Mediterranean river valley meadows
C.3.3.1.*	Mountain bromegrass meadows on carbonate base
C.3.4.1.*	Western European heaths
C.3.4.3.2.*	Purple moor grass and hawksbeard grassland
C.3.5.*	Sub-Mediterranean and epi-Mediterranean dry grasslands
D.1.2.1.	Mesophilous bushes and underbrush of continental, exceptionally maritime regions
E.2.1.	Black alder and field ash flood forests
E.3.1.5.*	Durmast oak and hornbeam forest
E.3.5.6.*	Hop hornbeam forest and underbrush with autumn moor grass
E.4.1.3.*	Beech forest with white sedge
E.4.5.1.*	Beech forest with giant dead nettle

NHC CODE	NHC DESIGNATION
E.4.6.1.*	Beech and hop hornbeam forest
E.5.2.1.*	Dinaric beech-fir forest
E.7.3.5.*	Spruce forest with white sedge on dolomite
E.7.4.1.*	Scots pine forest with hellebore on dolomite
E.9.2.1.	Common spruce plantations
E.9.2.2.	Black pine plantations
E.9.2.3.	Scots pine plantations
H.1.*	Karst caves and pit-caves
I.2.1.	Mosaics of cultivated fields
I.8.1.8.	Green belts for sports and recreation
J.1.	Villages
J.2.	Towns
J.2.3.	Other urban zones
J.3.	Other developed non-commercial zones
J.4.3.1.1.	Quarries
J.4.4.1.	Rail traffic zones

*threatened and rare habitats pursuant to the Rules governing Habitat Types, Habitat Maps, Threatened and Rare Habitat Types and Measures to Maintain Habitat Types (Narodne novine, no. 07/06))

The distribution and surface are of individual habitat types in the Park's territory are shown on the habitat map (Fig. 4). For the development of this map, two sets of Landsat TM satellite images from spring and autumn 2000 were used, based on the Corine classification. The map does not present dotted sites. The surface area of the habitat types is shown in Appendix 2.

2.3.5.1. Forest associations

Forest vegetation covers approximately 75% of the Park, anthropogenic surfaces (e.g. various meadows and pastures, arable and abandoned surfaces and settlements) cover 23.6%, while water surfaces account for 0.74%.

The following major forest associations are present in the Park:

- Beech and fir forests (*Omphalodo-Fagetum*), E.5.2.1., (Tregubov 1957) Marinček et.al.1993;
- Spruce forests with white sedge on dolomite (*Carici albae-Picetum*), E.7.3.5., (H. Mayer et. al. 1967.);
- Beech forests with giant dead nettle (*Lamio orvalae- Fagetum*), E.4.5.1., Ht.1938) Borhidi 1963.;
- Hop hornbeam with heather (*Erico herbaceae-Ostyetum*), E.7.4.2., Ht.(1938. 1956)
- Scots and black pine forest with hellebore on dolomite (*Helleboro nigri-Pinetum sylvestris*), E.7.4.1, Ht.1958.;
- Hop hornbeam forest and underbrush with autumn moor grass (*Seslerio autumnalis Ostryetum*), E.3.5.6., Ht.et H-ić in Ht. 1950.;
- Beech forest with white sedge (*Carici albae-Fagetum*), E.4.1.3, M.Moor 1952.;
- Dinaric fir forest on limestone blocks (*Calamagrosti – Abietetum*), E.7.1.1., Ht.1950.

From the standpoint of natural history, Čorkova Uvala, an association of beech and fir forest in a primal stage, is particularly interesting. It extends over a surface of 84.02 ha, and grows exclusively under the natural conditions of its habitat without direct human impact, and its value led to its designation as a special forest vegetation reserve.

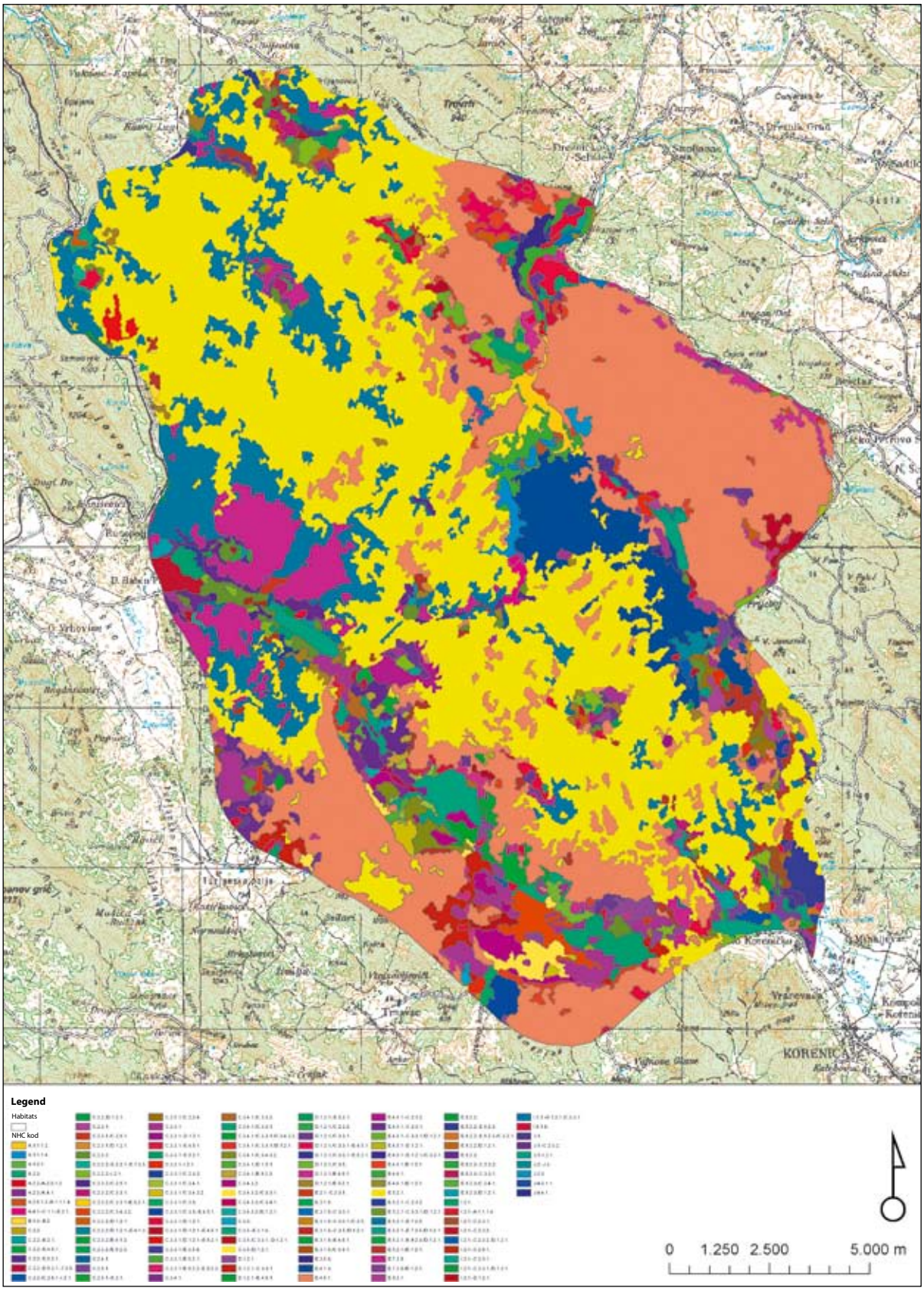


Fig 4: Habitat map

Forests in the National Park's territory are not managed nor are they used to obtain lumber. Under extraordinary circumstances (fire, insect infestations, breakage caused by snow, ice or wind, etc.) the appropriate activities are undertaken in cooperation with the relevant institutions. Pursuant to the Nature Protection Act, it will be necessary to draft the Forest Ecosystem Conservation Program as a component of the Management Plan.

Anthropogenic stages of vegetation are very threatened in the Park. The low level or outright absence of use (mowing and grazing) of grass-covered surfaces is leading to their succession by bushes and forests and to the loss of biodiversity in the Park's territory. Based on a rough estimate, 70% of the Park's biodiversity is tied precisely to non-forest habitats, primarily to such grass-covered surfaces.

2.3.5.2. Forest clearings and cut zones

- Oxeye association (*As. Telekietum speciosae*), C.5.2.1.1. – grows along forest trails.

2.3.5.3. Dry grasslands and heaths

- Fescue and sundew meadows (As. *Festuco-Agrostietim*), C.2.3.2.6. – grow on acidic soil, normally on former plow fields that were abandoned and turned into wild meadows. Besides red fescue (*Festuca rubra*) and common bent (*Agrostis capillaris*), there are also acidophilic species such as matgrass (*Nardus stricta*), common tormentil (*Potentilla erecta*), and common heathgrass (Sieglingia decumbens), while in case of fertilizing, arenaceous species appear.
- Meadows of bromegrass and hoary plantain (As. *Bromo-Plantaginetum*), C.3.3.1.1. – smaller compositions within forest clearings, generally a phase of succession after mowing was stopped long before.
- Kalnik moor grass association (As. *Seslerietum kalnikensis*), C.3.3.1.7. – develops on steep rocks on the foothills along the lakes.
- Wood small-reed (*Calamagrostis epigejos*) composition – various habitats grow after mowing stops.
- Matgrass (*Nardus stricta*) composition – matgrass compositions can be found on acidic soil which generally grow into heaths.
- Purple moor grass and hawksbeard grassland (As. *Crepido conyzifoliae-Molinietum altissimae*), C.3.4.3.2. – grows on the deep acidic soil in Homoljačko Field. It is given a particular appearance by the hawksbeard with a multitude of yellow blossoms, so this grassland should be preserved not only in terms of its botanical rarity and value, but also as a valuable landscape. Today the surface of these grasslands has declined, i.e. their floral system is degraded since regular mowing has stopped.
- Heather heaths (As. *Genisto-Callunetum*), C.3.4.1.1. – cover large surfaces in Brezovačko and Homoljačko Fields, but there are smaller compositions elsewhere as well. They developed after the abandonment of mowing and intensive grazing. Today these surfaces are sometimes burned to remove woody species for a time, especially common heather (*Calluna vulgaris*).

2.3.5.4. Moderately wet to wet grasslands

- Early meadow oat-grass (As. *Arrhenatheretum elatioris*), C.2.3.2.1. – generally persists near human settlements, regularly mowed and sometimes fertilized with manure.
- Ryegrass and dogstail meadow (As. *Lolio-Cynosuretum*), C.2.3.1.1. – a typical transit pasture of hilly tracts on deep soil, today covering a small surface due to the small number of grazing livestock.



- Bromegrass and dogstail meadow (As. *Bromo-Cynosuretum*), C.2.3.1.2. – generally wetland meadows on gentle gradients or in valleys on deeper soils. Most important species are crested dogstail grass (*Cynosurus cristatus*), red clover (*Trifolium patens*), adder's tongue (*Ophioglossum vulgatum*), and fragile oat (*Gaudinia fragilis*).
- Tussock grass meadow (As. *Deschampsietum cespitosae*), C.2.2.4.1. – small compositions with no use value. Formerly used for bedding, today they are generally abandoned and left to natural vegetation succession.
- Purple moor grass and Pannonian sweet pea (As. *Molinio-Lathyretum pannonici*), C.2.5.1.1. – typical meadow association of karst fields, rich in species due to alternating wet and dry phases during the vegetation season. A specific appearance in the spring is provided by squill (*Chouardia littardierei*) and a multitude of orchids. Everything is subsequently covered by purple moor grass (*Molinia caerulea*), so the surface acquires a purple color.
- *Ligularia sibirica* compositions – difficult to phytocenologically categorize into a single association, because the compositions are so diverse. It grows in marshy habitats next to streams, where a mosaic of alkaline fens, sedges, high greens, and willow and alder stands. Constant monitoring of its numbers and vitality is essential to ascertain its demands on the habitat in this southern periphery of its range.

2.3.5.5. Peatlands

Star sedge and round-leave sundew fen (As. *Drosero-Caricetum echinatae*), C.1.2.1.2. – The largest and best preserved peat surface in Croatia lies within the boundaries of Plitvice Lakes National Park, in a valley called Matica (Ljeskovačke bare). Most of this valley is overgrown with black alder (*Alnus glutinosa*) and purple moor grass (*Molinia caerulea*), which shade the habitat, extract water, and raise and desiccate the terrain. Since this habitat is no longer used, it is being devastated.

Now a small peat surface is being maintained, i.e. it is regularly mowed and the mown plants are removed. The surface now mowed is small and it must be increased to halt succession. Increasing this surface through the ongoing maintenance of the existing round-leave sundew and star sedge association (*Drosero-Caricetum echinatae*), may ensure its survival. This is the only surface in Croatia on which the long-term (active) maintenance of this type of peat fen can be expected.

- Peat moss composition (*Sphagnum spp.*) – at places these are the sole remains of former peat bogs where a number of peat habitat plants have disappeared, and only moss carpets remain.
- Peat sedge fen (As. *Caricetum davallianae*), C.1.1.1.5. – normally in depressions within other grassland and marsh associations.
- Dinaric alkaline peat fen with cotton grass (As. *Eriophoro-Caricetum paniceae*), C.1.1.1.2. (Šegulja,1992) – small surfaces in a mosaic with other associations.
- Fewflower spikerush bog (*Eleocharis quinqueflora*) – small surfaces in furrows dominated by fewflower spikerush; the buckbean (*Menyanthes trifoliata*) is also frequent.

- Alkaline purple moor grass and host sedge bog (As. *Molinio-Caricetum hostianae*), C.1.1.1.4. – this association is transitional in the succession and overgrowth of bogs into purple moor grass associations
- Slender sedge association (*Caricetum lasiocarpae*) – an alkaline fen on small surfaces dominated by slender sedge

Alkaline fens (the last five associations) are in somewhat better condition because there are small surfaces belonging to various Caricetalia davallianae sedge associations at several places; their water regime has been preserved, but, unfortunately, even these surfaces are no longer used as they once were, so grazing and bedding. The common butterwort (*Pinguicula vulgaris*) can only be found in small compositions, while the buckbean (*Menyanthes trifoliata*) is more frequent. Both species are threatened and as such they are cited in Croatia's Red Book of Vascular Plants.

2.3.5.6. Marsh and wetland vegetation

- Tufted sedge marsh (As. *Caricetum elatae*), A.4.1.2.1. – in depressions this is a pioneer association in the overgrowth of ponds, recognizable by the large islands of tufted sedge.
- Greater tussock sedge marsh (As. *Caricetum paniculatae*), A.4.1.2.7. – large turfs of greater tussock sedge of smaller compositions develop on organogenic, marshy, black soil with accumulations of organic mass.
- Blister sedge marsh (As. *Caricetum vesicariae*), A.4.1.2.6. – small compositions.
- Bottle sedge marsh (As. *Caricetum rostratae*) – small compositions in streams.
- Fibrous tussock sedge marsh (As. *Caricetum appropinquatae*) – small surface.
- Swamp sawgrass association (As. *Cladietum marisci*), A.4.1.1.8. – The immense organic mass of sawgrass causes it to raise the terrain, which is conducive to overgrowth of former peat surfaces. This is particularly damaging in the lakes, where it holds and facilitates sedimentation of tiny detritus, thus altering the water regime in the falls.
- Water horsetail (*Equisetum fluviatile*) compositions appear at places in large extents, such as at the mouth of the Matica.
- High greenery of the meadowsweet association (*Filipendulion ulmariae*), C.5.4.1.1. – at wet habitats along rivers and streams, small compositions.
- Creeping marshwort (*Apium repens*) associations are very small but significant, as they are cited in the Habitats Directive (*Annex II*).
- Butterbur (*Petasites kablikianus*) associations constitute characteristic vegetation in the basins below waterfalls.
- Beardless rabbitsfoot grass associations (*Polypogon viride*) – grow around waterfalls.
- Tufa forming mosses and algae associations, A.2.5.1.2. – grow around waterfalls, retain calcium carbonate, and it thereby forms sediments of tufa, directly forming barriers and cascades.
- Stonewort compositions (*Characeae*), A.3.1.1. found on lake floors
- Whorl-leaf watermilfoil (*Myriophyllum verticillatum*) and Eurasian watermilfoil (*M. spicatum*) compositions grow in still lake waters
- Pondweed associations (*Parvopotamion, Magnopotamion*) – where various pondweeds grow in the water
- Starwort compositions (*Callitriche spp.*) grow in shallow water, at the edges of lakes and streams
- Compositions of river water crowfoot associations (*Ranunculion fluitantis*), A.3.3.2. – found in watercourses, mostly dominated by cutleaf waterparsnip (*Berula erecta*)

2.3.5.7. Scree

- Mossy sandwort and white fumewort association (as. *Moehringio-Corydaletum ochroleucae*), B.1.3.2.2. – the only scree association inside the Park, grows on stone blocks in beech forests. Easily recognized by the mossy sandwort (*Moehringia muscosa*) and white corydalis (*Corydalis ochroleuca*).

2.3.5.8. Ruderal and weed vegetation

Small patches of ruderal vegetation grow adjacent to settlements, in yards and on paths/trails, at construction material dump sites, next to barns and at similar sites where the soil is nitrogen-rich. Weeds grow on sections of soil around houses and in the small number of plow fields.

- Ryegrass and broad-leaf plantain turf (as. *Lolio-Plantaginetum*), I.1.3.1.4. – on well-trod surfaces, on trails and in yards.
- Buckwheat and beggar-tick association (as. *Polygono-Bidentetum*), I.1.7.1.1. – near settlements.
- Tansy and wormwood association (as. *Tanaceto-Artemisietum*), I.1.4.2.2. – near settlements.
- Elderberry association (as. *Sambucetum ebuli*), I.1.5.1.2. – near settlements.
- Weed associations of common chickweed (*Stellarietea mediae*), I.1.6. – in gardens and cultivated fields.

2.3.5.9. Subterranean habitats

So far, 114 speleological sites have been recorded in the Park. This number also includes sites in the peripheral areas, approximately 500 m outside of the official boundaries. The data were collected from 22 different sources. For 18 sits, only the position of the entrance is indicated, using topographic maps at the scale 1:25.000, as no detailed research was conducted yet. Regarding the type of speleological sites, it could be noted that pit-caves prevail in the Park. Out of this number, 82 (72%) are pit-caves while the remaining 32 (28%) are caves, i.e. mainly horizontal sites. The smaller sites, shallower and shorter than 50 m, dominate with a number of 91 (81%). There are 23 sites (20%) in the group of medium-sized sites, whose depth or length reaches between 50 and 500 m. The overall length of researched objects so far is 1,664 m, and the overall depth is 2,251 m. Extremely large speleological sites, with depths or lengths above 500 m, have not yet been recorded in the Park.

Šupljara Cave

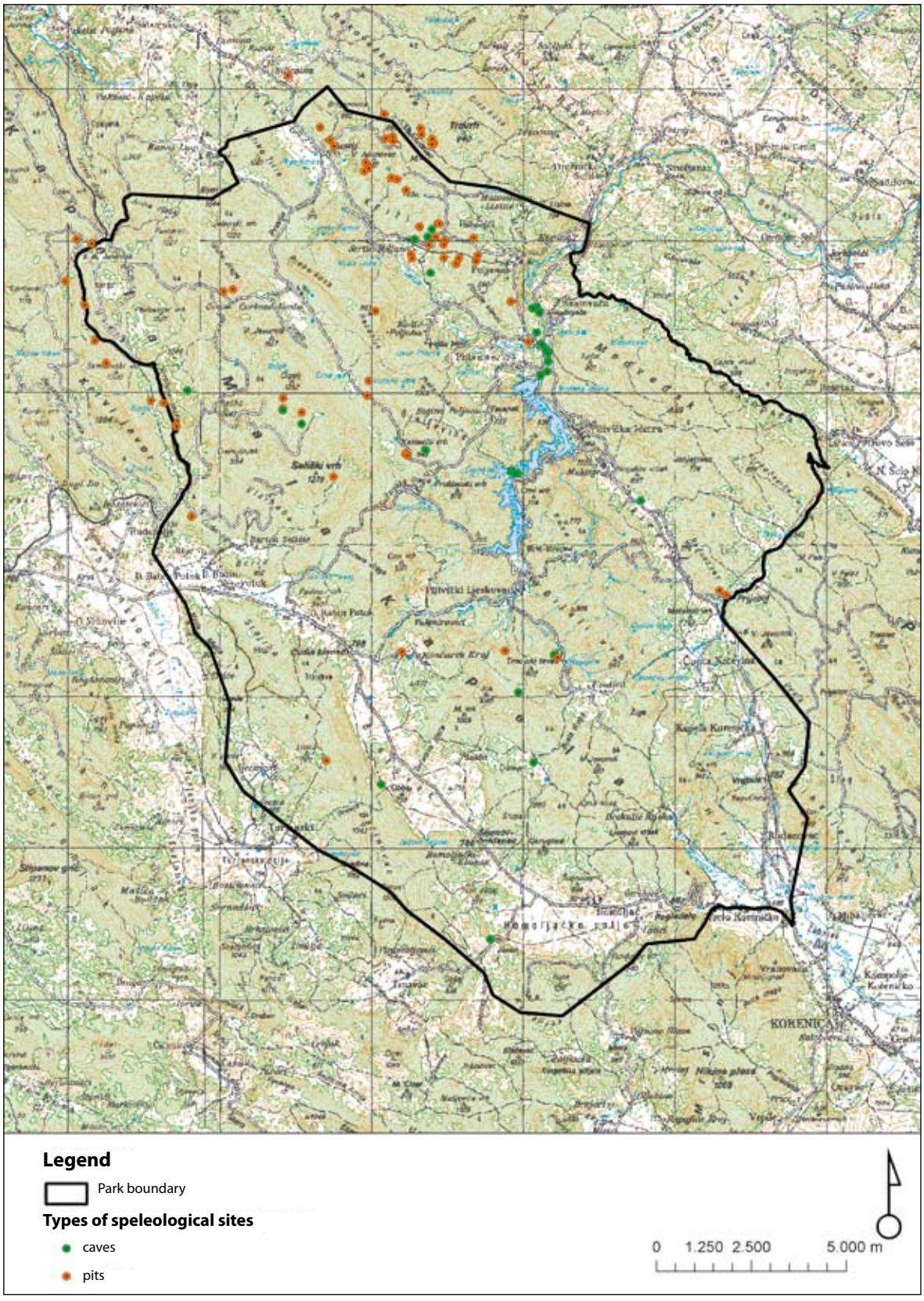


Fig. 5: Distribution of caves and pit-caves in and around Plitvice Lakes National Park

Morphologically, the most valuable sites in the Park are pit-caves Čudinka (-203 m) and Jama on Vršić (-154 m, length 110 m). The Čudinka Pit-cave is also interesting because the entire cave consists of only a single spacious vertical abyss that was, for a long time, considered one of the deepest in Croatia. Besides these mentioned pit-caves, a few caves in the lake area stand out with their dimensions: Mračna Cave (160 m), Golubnjača (145 m), Vila Jezerkinje Cave (104 m) and Golubnjača (Homoljačko Field, 153 m).


Golubnjača Cave

In Rodića Cave at Sertić Poljana and in Mračnoj Cave at the Lower Lakes, cave bear bones were found, so these sites may be considered paleontologically significant.

The most recent systematic research conducted in caves in the territory of Plitvice Lakes National Park was conducted in the 1960s. Since it was conducted as a part of regional research into a much wider area, and given the time allotted and technology of the time, the results were only preliminary in character. The location of most sites is not sufficiently precise, the topographic outlines are essentially sketches, and the data on the site's features are very meager.

Subterranean habitats in the Park are threatened by uncontrolled visits by tourists, illegal waste dumping, and the related seepage waters which may be polluted. Such waters also threaten subterranean aquatic fauna, while subterranean fauna in general (especially the endemic insect, *Machaerites udrzali*) are threatened by illegal collecting.

A program of waste disposal is needed for sites located along tourist trails, while a long-term plan is also needed for sites within the Park.

There is also a danger of land-mines left over from the war at individual sites in the northwestern section of the Park.

2.3.6. Plants

Plitvice Lakes National Park is characterized by an exceptional wealth of plants, which is deemed a consequence of the interplay between a series of abiotic and biotic factors, such as human impact, particularly due to the traditional treatment of meadows. A spatially systemized inventory of plants throughout the territory of Plitvice Lakes National Park was conducted for the needs of the Management Plan. Field research was conducted, existing data was updated and geo-coded, and the distribution of individual taxa were analyzed. A summary presentation of plant diversity and the accompanying data are provided in Table 4.

Table 4: Concise overview of plant diversity in Plitvice Lakes National Park based on: (1) field research in 2004-2006 under the KEC Project, (2) data from literature and associated data on the number of endemic and endangered species (Nikolić & Topić 2005), and the number of species covered by the Bern Convention (1979 Annex I and Recommendation 46 of 1996) and the Habitats Directive (Annexes II, IV and V of 2004) (according Flora Croatica database status in February 2007).

Priority area	Plitvice Lakes National Park
Species	
Total	1370
Field observations	950
Literature consulted	1123
Species and subspecies	
Total	ca 1,400
Field observations	1011
Literature consulted	1144
Endemic species and subspecies (s.l.)	25
Bern Convention	86
Habitats Directive	15
RED LIST STATUS	
CR	13
EN	25
VU	35
NT	34
DD	48
LC	10

Cypripedium calceolus L.
Lady's slipper

Drosera rotundifolia L.
Round-leave sundew

Ligularia sibirica L.
Siberian rayflower

The principle feature of plant life in the Park is the large number of taxa, approximately 1,400 species and subspecies. During field research conducted during 2004-2006, 88% of all known taxa cited for the area in the literature were confirmed and mapped. The relatively large number of threatened taxa, as many as 2.5% in comparison to the total number of recorded taxa (observations and literature), is among the largest within the KEC target areas. The presence of taxa under protection by international conventions is also exceptionally large, as high as 7% in relation to the total number of recorded taxa (observations and literature). These two facts accord a special significance to the Park in the conservation of this component of its plant life. In compliance with the present habitat types and other factors which influence the development of endemic plant species, the number of such endemic species in the Park is quite small, approximately 1.7% of all plant life. The number of taxa, i.e. the overall plant wealth, is certainly greater given that the inventory conducted in the first part of the year was not uniform.

An exceptional diversity of orchids can also be found in the Park, of which many are rare and endangered. There are a total of around fifty orchid taxa, which is a little under one third of all Croatian orchid species, while the European lady's slipper (*Cypripedium calceolus*) taxa in the Park's forest habitats is the most numerous so far known to exist in Croatia.

2.3.7. Animals

2.3.7.1. Amphibians, reptiles, insectivores, rodents and bats

Small vertebrates in the Park's territory are quite diverse. Besides the typical Central European forest, meadow and marsh species, there are also species which are characteristic of the Alps and the Western Dinaric Alps: the Italian crested newt (*Triturus carnifex*), the black salamander (*Salamandra atra*), horned viper (*Vipera ammodytes*), and the Liechtenstein's pine vole (*Microtus liechtensteini*), and the somewhat broader karst mountain zone – alpine shrew (*Sorex alpinus*), snow vole (*Chionomys nivalis*), alpine long-eared bat (*Plecotus macrobullaris*), long-fingered bat (*Myotis capaccinii*) and Mediterranean horseshoe bat (*Rhinolophus euryale*).

Additionally, no other national park in Croatia has, for example, the Italian crested newt (*Triturus carnifex*), black salamander (*Salamandra atra*), harvest mouse (*Micromys minutus*), striped field mouse (*Apodemus agrarius*) and whiskered bat (*Myotis alcathoe*), found for the first time in Croatia quite recently.

Bat (*Barbastella barbastellus*)

Animals were mapped as a part of work on this Management Plan, wherein a total of 12 species of amphibians (*Amphibia*), 12 species of reptiles (*Reptilia*), 6 species of insectivores (*Insectivora*), 14 species of rodents (*Rodentia*) and 21 species of bats were found, which is a relatively large number for this area and which confirms the high biodiversity of the habitats. For now, there is only confirmation that 8 species of bat reproduce in the National Park. Significant species are forest bats like the Barbastelle (*Barbastella barbastellus*), and those that also hunt their prey near water, such as the long-fingered bat (*Myotis capaccinii*), and species that use caves as shelters (large bent-wing bat, *Miniopterus schreibersi*; *Mediterranean horseshoe bat*, *Rhinolophus euryale*; and greater horseshoe bat, *R. ferrumequinum*).

Out of the total 65 known species of small vertebrates, 7 of them are on the IUCN endangered species lists, 12 are listed in Annex II of the Habitats Directive (which means these species must be protected through the establishment of special reserves), and another 23 are listed in Annex IV of that same Directive, for which special attention must be accorded to their protection. Thus, local population stability must be maintained for over half of the species (a total of 36). Based on the existing conventions and the general level of endangerment, 12 species merited priority protection in the National Park itself through the establishment of heightened protection zones. For all remaining species, there is either insufficient data to declare local endangered status or their populations in the Park are so small that protection is unnecessary since it will not influence the stability of the local population.

Among the 12 species for which protection must be determined through establishment of special reserves or protected sites, as well as protection through action plans, two are amphibians: Italian crested newt (*Triturus carnifex*) and yellow-bellied toad (*Bombina variegata*); one is a reptile: pond turtle (*Emys orbicularis*); garden dormouse (*Eliomys quercinus*), and these bats: Mediterranean horseshoe bat (*Rhinolophus euryale*), greater horseshoe bat (*Rhinolophus ferrumequinum*), lesser horseshoe bat (*Rhinolophus hipposideros*), Barbastelle bat (*Barbastella barbastellus*), large bent-wing bat (*Miniopterus schreibersi*), long-fingered bat (*Myotis capaccinii*), lesser mouse-eared bat (*Myotis blythii oxygnathus*) and greater mouse-eared bat (*Myotis myotis*). A high priority in implementing protection measures in Plitvice Lakes National Park has been accorded to 4 bat species (Mediterranean and greater horseshoe bat, and large bent-wing bat and long-fingered bat), because they are in the critically endangered category (some may even be regionally extinct!), i.e. at a stage where they may disappear from the National Park's animal life.

The following reasons for the endangerment of individual species and their habitats have been discerned in the Park:

- disturbance of bats in caves;
- devastation of micro-habitats and animals in the areas around today's hotels;
- devastation of animals along the most frequented tourist trails;
- overgrowth of forest clearings and traditional grasslands;
- abandonment of ponds in areas without water courses;
- collection of animals species without permission;
- acid rain.

2.3.7.2. Butterflies

Approximately 70 species of butterfly have been recorded in the Park, and three interesting species from the blue family stand out as they are registered on the world's natural heritage list of protected species (IUCN's Red List of Endangered Animal Species), the European Red Book of Butterflies and the Croatian Red List of Endangered Plants and Animals. A characteristic of these butterflies is their unique life cycle, meaning the relationship they have developed with certain species of ants and their connection to certain species of plants on which the females lay their eggs and which are specific to each species.


Alcon large blue (*Maculinea alcon*)

Among the 5 species living in Croatia, three have been recorded in the Park's territory:

- Large blue (*Maculinea arion*) which lays its eggs on thyme (*Thymus spp.*) or oregano (*Origanum vulgare*) plants. It has been recorded at only three sites inside the Park and currently the species is deemed rare;
- Mountain blue (*Maculinea rebeli*) which lays its eggs on cross gentian (*Gentiana cruciata*) and which has so far been recorded at 62 sites in the Park;
- Alcon large blue (*Maculinea alcon*) which lays its eggs on marsh gentian (*Gentiana pneumonanthe*). The sole find-site so far known in Croatia was recorded at Vrelo Koreničko.

Among the remaining butterflies in the Park, the following species have been recorded: swallowtail (*Papilio machaon*), scarce swallowtail (*Iphiclides podalirius*), orange tip (Anthocharis cardamines), red admiral (*Vanessa atalanta*), peacock caterpillar (*Inachis io*), painted lady (*Cynthia cardui*), and various other species from the blue (*Lycaenidae*), fritillary (*Nymphalidae*) and ringlet (*Satyridae*) families.

The principal threat to butterflies in the Park is habitat loss (e.g. meadows).

2.3.7.3. Birds

Plitvice Lakes National Park has an abundance of bird species, and those living in forest habitats are particularly numerous. So far 161 bird species have been recorded in the Park, out of which 103 are regular or occasional nesting birds in the Park.

Among the nesting birds, 38 are cited in the Croatian Red List of Endangered Plants and Animals (Ptice, Radović et al. 2004): 1 species is classified as critically endangered – CR (short-eared owl, *Asio flammeus*,

which is an occasional nesting bird in the Park), 6 species are classified as vulnerable – VU (peregrine falcon, *Falco peregrinus*, honey buzzard, *Pernis apivorus*, pygmy owl, *Glaucidium passerinum*, and corn crake, *Crex crex*, which regularly nest, and the black stork, *Ciconia nigra* and common sandpiper, *Actitis hypoleucos* which occasionally nest in the Park), 12 species are classified as near threatened – NT, and 22 species are classified as least concern – LC.


Eagle owl (*Bubo bubo*)

At the European level, 6 species of nesting birds are classified as vulnerable, 2 species are classified as rare, and 7 species are classified as those with declining European populations. Among the nesting birds, 75 are cited in Annex II to the Bern Convention.

17 species cited in Annex I of the Habitats Directive regularly or occasionally nest in the Park, and 6 species (corn crake, *Crex crex*; Ural owl, *Strix uralensis*; boreal owl, *Aegolius funereus*; pygmy owl, *Galucidium passerinum*; white-backed woodpecker, *Picodes leucotos*; and three-toed woodpecker, *Picoides trydactilus*) nest in numbers that have allowed Plitvice Lakes National Park to be encompassed as a significant area in the Ecological Network, and to be recognized as a potential SPA (Special Protected Areas) which is a part o the EU NATURA 2000 ecological network.

The woodpeckers (*Picinae*), and Ural (*Strix uralensis*) and boreal (*Aegolius funereus*) owls were selected for monitoring.

2.3.7.4. Large mammals

The large carnivores living in the Park include the brown bear (*Ursus arctos*), lynx (*Lynx lynx*), wild cat (*Felis sylvestris*) and wolf (*Canis lupus*), which are threatened (on the IUCN Red List) and protected by law. The bears have a range that exceeds the Park's territory, but dens have been noted in the Korana Canyon, at Preka Kosa and on the western slopes of Seliški Vrh.

The fox (*Vulpes vulpes*), badger (*Meles meles*), pine marten (*Martes martes*), stone marten (*Martes foina*), polecat (*Mustela putorius*), weasel (*Mustela nivalis*) and stoat (*Mustela erminea*) are also present in the Park. The presence of the river otter (*Lutra lutra*) has also been ascertained, and it has been registered in the Croatian Red List of Endangered Plants and Animals as a data deficient (DD) species, i.e. as there is not enough information to determine if it is in danger of extinction. Among the large herbivores, the roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*) and wild boar (*Sus scrofa*) are present.


Brown bear (*Ursus arctos*)

The large number of Park visitors do not pose a problem to the above-


Wolf (*Canis lupus*)

mentioned animals, since most of them remain around the lake zone. The exception is the river otter, which requires a minimum of 50% of the shores of water surfaces (both sides) outside of the visitor system. Visits to forests and other areas must be limited and controlled.

Hunting is not allowed in the National Park, just as there is a ban on hunting and luring animals with food, water, and other means within a zone of 300 m from the Park's boundaries. The hunting guidelines in the area surrounding Plitvice Lakes National Park are defined in the existing hunting management rules. Hunting grounds around the Park are shown in Fig. 6.


Otter (*Lutra lutra*)


Wild boar (*Sus scrofa*)

2.3.7.5. Cave fauna

Biospeleological data, mostly from the literature and partially from collections, exist for 30 cave sites. Speleological research was conducted by the Croatian Biospeleological Society in September 2005. So far 32 subterranean taxa have been recorded. The most numerous is a group of beetles, with 11 taxa recorded so far, followed by pseudoscorpions with by 6 taxa while other invertebrates are less frequent.

Five taxa have their type locality in the Park. Since all of them are found only at this localities, they can be considered endemic to the Park. The small troglobiotic pselaphid beetle *Machaerites udrzali (Staphylinidae, Pselaphinae)* was described in Rodića Cave, pseudoscorpion *Neobisium speluncarium* in Šupljara Cave and the amphipod *Niphargus rucneri* in Glibovita Draga. Unfortunately Glibovita Draga is still an unknown locality. The beetle *Astagobius angustatus driolii* and the millipede *Attemsia likana* were described in Ledenica in Čudina Uvala.

Among the snails, two terrestrial representatives of the genus *Zospeum* were recorded: *Z. isselianum* and *Z. amoneum*. Chilopods are present with few taxa belonging to the genus *Lithobius* and *Polybothrus*. Diplopods are also well represented with several taxa from the genus *Atemsia, Haasia, Brachydesmus* and others.

Several new finds have been recorded, mostly pseudoscorpions found in the Park for the first time. The tiny pseudoscorpion genus *Chthonius* is found at several sites, and is probably a new taxa. Troglobitic species of the genus *Roncus*, and few troglobitic species of the genus *Neobisium*, such as *N. stygium*, have been found. New finds for the Park are also the troglobitic spider from the genus *Troglohyphantes,* harvestmen from the

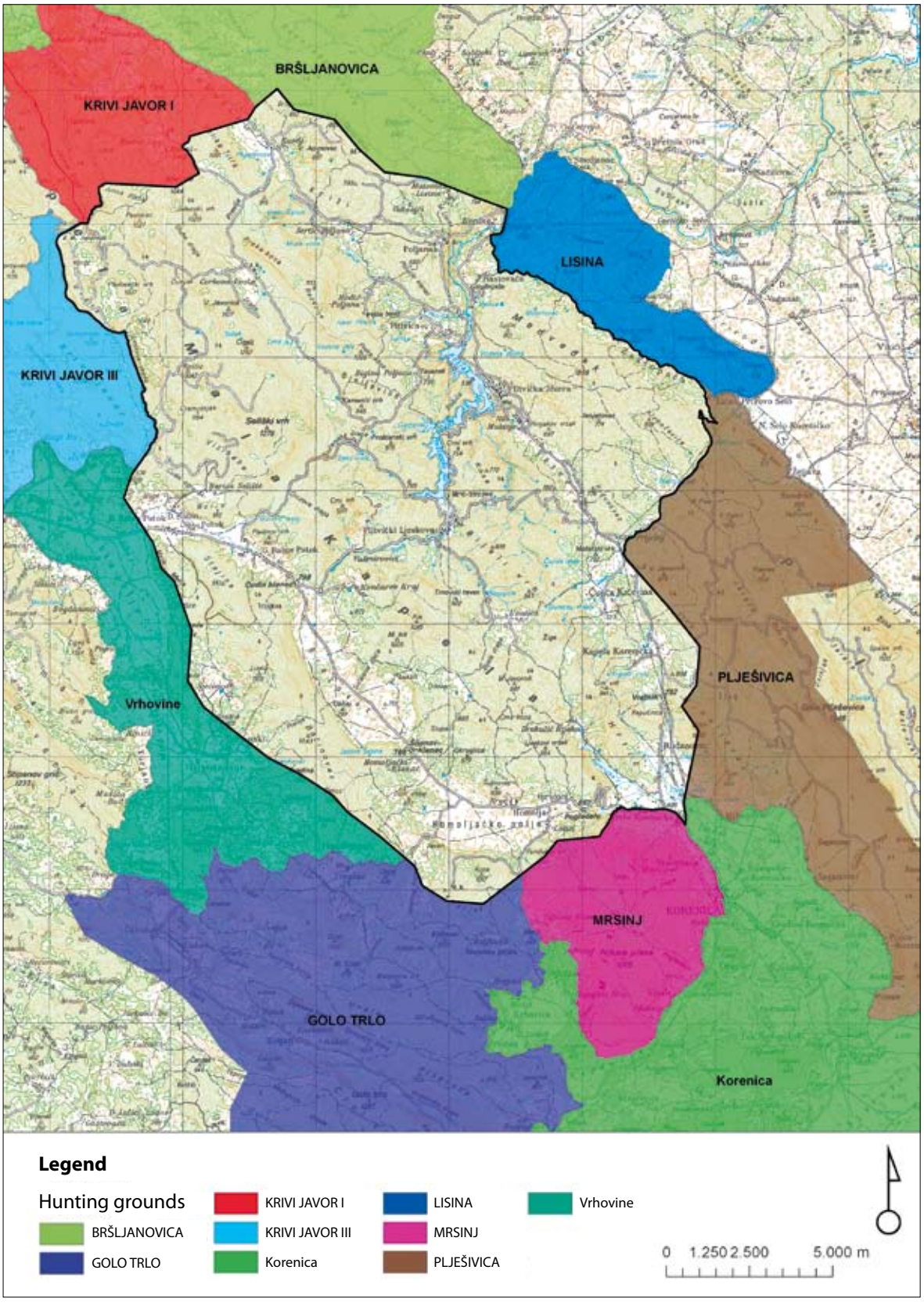


Fig. 6: Hunting grounds around Plitvice Lakes National Park

genus *Cyphophthalmus*, the troglobitic Diplura *Plusiocampa* (*Stygocampa*) sp. and others. The discovery of what is probably a new troglobiotic taxa of wingless primitive insects of the silverfish (*Thysanura*) family in Golubinjača Cave is quite sensational.

Out of all subterranean fauna, very little is known about cave-dwelling aquatic fauna. Many new taxa to Plitvice Lakes National Park, and to science itself, are gastropods and crustaceans, but also sponges, leeches and others are expected to be found in the future. There are even indications that the olm (*Proteus*) may be found.

2.3.8. Other categories of protected natural resources within Plitvice Lakes National Park

Plitvice Lakes National Park encompasses five areas under special protection.

2.3.8.1. Čorkova Uvala Special Reserve

Čorkova Uvala is the best preserved old-growth forest within the beech and fir forest zone, and it is situated inside Plitvice Lakes National Park. In 1965, this old-growth forest was proclaimed a special forest vegetation reserve, where, over a surface of 84 ha and at elevations ranging from 860 to 1,028 m, all developmental phases of a primeval forest can be found, with domination of aging and decay. This is a secondary primeval forest, where human influence was occasionally present, but not to an extent that would cause the forest to lose its significance.

A particularly astounding aspect of this forest is the dimensions reached by the fir, spruce and beech trees. Individual trees in swallow-holes (spruce) attain heights of 60 m, while other trees (fir) have trunk diameters exceeding 140 cm. The forest is entirely filled with life, which proceeds in harmony with the ecological constitution of individual members of this living community. This primeval forest is an entirely stable forest ecosystem, and if the objective is to have worthwhile forest ecosystems, this is best achieved by duplicating the conditions in which a forest develops in nature without significant human impact.

2.3.8.2. Golubnjača Cave Natural Monument

Golubnjača is located in Plitvice Lakes National Park, before the second Korana waterfall on the eastern side. It has two spacious entrances (46 and 24 m high), a large antechamber and two cave corridors with a total length of 165 m. The cave is characterized by rich subterranean scenery, and a considerable number of isopod life forms were found. A total of 230 steps were made in the cave, as well as a concrete bridge.

2.3.8.3. Šupljara Cave Natural Monument

Šupljara is located in Plitvice Lakes National Park, above Kaluđerovo Lake on the eastern side. It has 2 spacious entrances, of which the upper entrance was made after the cave's ceiling collapsed. The cave consists of three chambers and a spacious corridor with a total length of 68 m. The first chamber is the highest, 20 m. The most cave decorations can be found in the second and third chambers. In addition to these features, the cave is also home to animal species belonging to the orders *Colleoptera*, *Orthoptera*, *Lepidoptera* and *Isopoda*.

2.3.8.4. Crna Cave-Vile Jezerkinje Natural Monument

Crna Cave (Vile Jezerkinje) is located in Plitvice Lakes National Park, just above the third waterfall on the Korana River. It consists of two chambers (upper and lower) connected by stairs, with a total length of 105 m. It is rich in decorations of various color and size: in the lower chamber there is a lovely cascade of stone basins, while in the upper chamber there are large, white curtains. Many bats reside in the cave, and other mammals and also isopods have been found in it.

2.3.8.5. Yew Tree (*Taxus baccata L.*) Landscape Architecture Monument in Sertić poljana

The yew tree group in Sertić Poljana (reg. no. 74) was placed under protection as a landscape architecture monument on September 26, 1962.

This group of yew trees no longer exists, because during the occupation of this area, all of the tree were cut down and taken away, so that only the stumps of the tree now remain.

Yew Tree

2.3.9. Ecological Network in the territory of Plitvice Lakes National Park

In Croatia, Ecological Network is stipulated by the Nature Protection Act (*Narodne novine*, no. 70/05). This is actually a system of mutually linked or spatially proximate areas of ecological significance that are vital to threatened species and habitats. Their biogeographic balance considerably contributes to the conservation of the natural equilibrium and biological diversity. In compliance with the EU's NATURA 2000 ecological network, ecological network areas are classified as areas important to wild taxa and habitat types (potential SACs – Special Areas of Conservation) and internationally important bird areas (potential SPAs– Special Protection Areas). Within the ecological network, its components are linked by natural or artificial corridors. An ecological corridor is an ecological component or series thereof which enables movement of live organism populations from one site to another.

In compliance with the mechanisms specified in the EU Habitats Directive, the Nature Protection Act stipulates that parts of the ecological network can be protected as specially protected areas or by means of management plans, and also by means of procedures to evaluate the acceptability of any undertaking that may be harmful to nature.

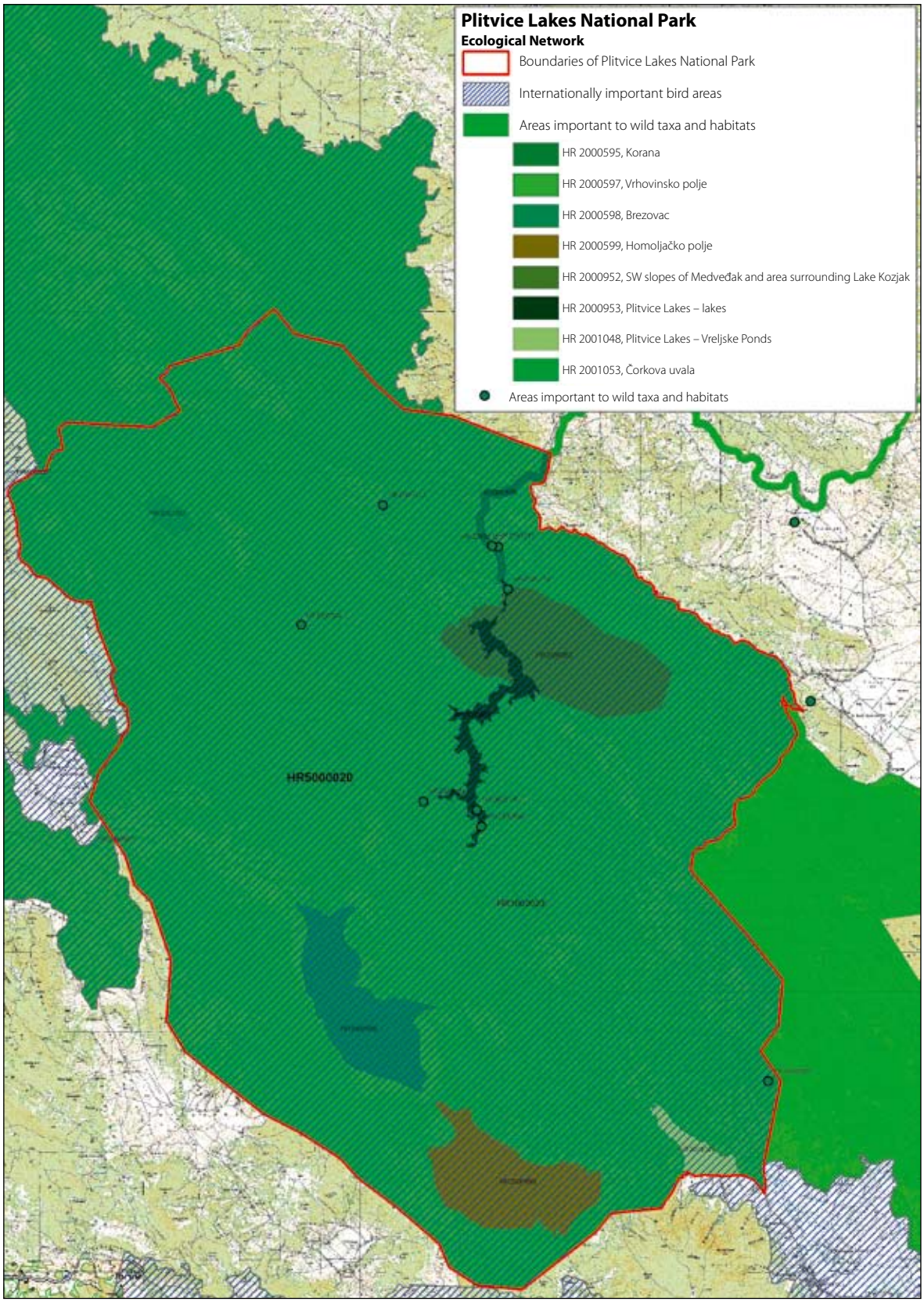


Fig. 7: Ecological Network areas

Plitvice Lakes National Park is entirely within Croatia's Ecological Network (EN) (Fig. 7) and encompasses the following important areas:

1. Important areas for wild taxa and habitat types

The entire territory of Plitvice Lakes National Park has been designated as an important zone for wild taxa and habitat types. Within this zone 8 areas have been ascertained, of which 5 are dotted sites (Table 5).

Table 5: Areas important to wild taxa and habitat types in the Ecological Network within the boundaries of Plitvice Lakes National Park. (*-priority habitat; #-internationally significant area =potential Natura 2000 area).

Area code	Area designation
HR2000112#	Rodića Cave
HR2000170#	Šupljara Cave
HR2000218	Crna Cave
HR2000312	Golubnjača Cave
HR2000564	Delićka Meadow
HR2000565	Mihaljevac Pine Forest
HR2000595#	Korana
HR5000597	Vrhovljansko Field
HR2000598#	Brezovac
HR2000599#	Homoljačko Field
HR2000698#	Plitvice
HR2000699#	Plitvička Lakes – peat bog
HR2000700#	Plitvička Lakes – along Matica River
HR2000952	Southwestern slopes of Medveđak and areas surrounding Lake Kozjak
HR2000953#	Plitvička Lakes – lakes
HR2001048#	Plitvička Lakes – Vreljske Ponds
HR2001053#	Čorkova Uvala

2. Important international bird areas

Based on an assessment made by the Croatian Academy of Arts and Science Ornithology Department, this area has been evaluated as an area of broader international importance for the birds of Plitvice Lakes National Park (Table 6).

Table 6: Important international bird areas in the Ecological Network within the boundaries of Plitvice Lakes National Park.

Area code	Area designation
HR1000020	Plitvice Lakes National Park (with Vrhovljasko Field)

2.4. Population and cultural heritage in the territory of Plitvice Lakes National Park

2.4.1. Population

According to the census conducted in 2001, the population of the settlements entirely or partially located within the National Park is approximately 1,300, while in 1991 this figure was 2,238 (Table 7). Over and above other factors, this decline in the population was largely a consequence of wartime events.

The Park's territory entirely or partially encompasses 21 settlements. Fig. 8 shows the boundaries of the settlements in and around the Park. The settlements in the area surrounding the Plitvice Lakes are developed and scattered settlements, otherwise characteristic of mountain zones. They consist of several smaller, mutually remote hamlets.

Table 7: Population trends in settlements entirely or partially located in or adjacent to the Park

Settlement	Population 1991	Population 2001	No. of households	Settled area (ha)
Čujića Krčevina	28			351.6
Donji Babin Potok	248	102	41	4,035.6
Drakulić Rijeka	10	8	4	438.1
Gornji Babin Potok	143	76	33	2,792.8
Homoljac	46	16	6	2,491.5
Jezerce	1,004	289	84	959.4
Kapela Korenička	24	4	2	1,948.9
Končarev Kraj	12	-	-	1,000.5
Gornja Korana	64	25	9	92.7
Plitvica Selo	192	36	23	1,252.0
Plitvička Jezera	-	361	139	788.4
Plitvički Ljeskovac	74	15	9	4,906.5
Poljanak	160	48	20	837.4
Prijeboj	28	3	2	835.7
Rastovača	115	84	26	1,543.4
Rudanovac	52	86	31	728.4
Sertić Poljana	38	15	8	735.0
Vrelo Koreničko	165	134	60	670.7
Zaklopača	23	9	4	663.9
Saborsko	852	860	354	-
Donja Korana	-	25	9	150.00
TOTAL	**2,238**	**1,302**	**855**	**34,743.8**

Traditionally the local population engaged in animal husbandry, agriculture, milling and forestry. Since the establishment of the National Park, almost all commercial activities have been banned in the Park's territory. Currently, the local population benefits from the Park mainly in terms of employment (the Park ensures an income for 750 employees and around 3,000 family members). Additionally, the local inhabitants have the right to use land for traditional agriculture within the Park and benefit from providing private accommodation to Park visitors.

The Park acknowledges the need for improvement of cooperation with the local community. Additional opportunities for cooperation between the local population and the Park have been seen in the

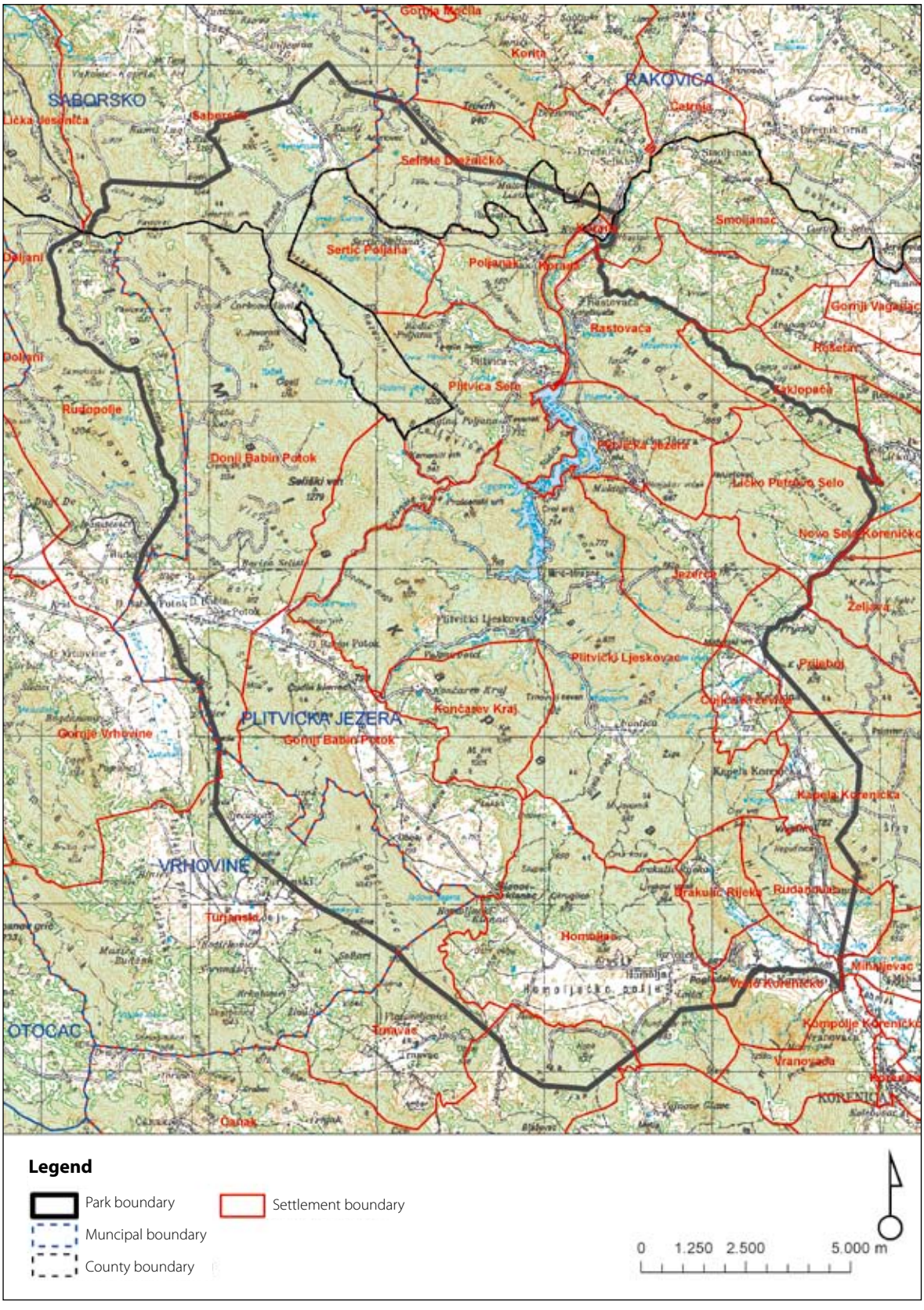


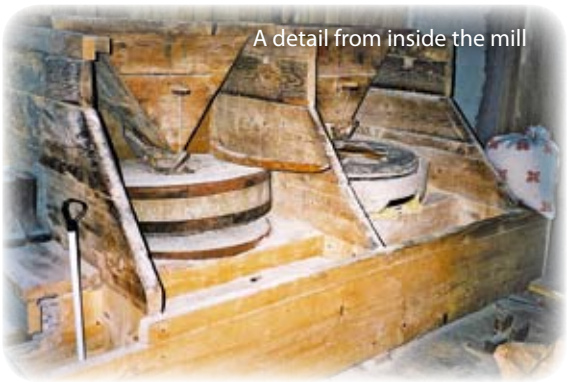
Fig. 8: Administrative boundaries of settlements in and around Plitvice Lakes National Park

development of sustainable tourism (traditional accommodations, traditional cuisine, revival of handicrafts, production of local food and other products, raising of local livestock breeds, involving visitors in various activities such as fruit and vegetable gathering and raising, production of certain products, etc.), additional full-time or part-time employment (for example as guides) and the possibility of using the Park's resources (cattle grazing, traditional agriculture).

2.4.2. Cultural heritage

Among the cultural and architectural heritage sites in the Park, the most common feature traditional architecture. The *Lička brvnara*, or 'Lika cottage', reflects the indigenous architecture of the area. It is built simply, using available materials such as wood and stone. Together with the outbuildings such as stables, hay-silos, bakeries and, often, water-mills, cottages are a basic unit of the developed rural settlement. There are a few such traditional units preserved in many settlements – two of them are privately owned (in Plitvica Selo and Plitvički Ljeskovac) and registered in Croatia's Protected Cultural Heritage List.


Mill in the village of Korana


A detail from inside the mill

The only preserved functioning sawmill anywhere in Karlovac County and beyond, which is powered by water, is in the village of Korana. There are also several watermills in the Park (on the Bijela, Vrelo and Korana Rivers). One of them, the Radekin Mill in Plitvica Selo is under preventive protection.

The list of buildings under preventive protection also includes a former restaurant building, the post office, the butcher's building in the settlement of Plitvicka Jezera at Mukinje (where construction of a church and pastoral center are planned), and the Plitvice Hotel and Kozjak Restaurant in Plitvička Jezera at Velika Poljana. Additionally, the Protected Cultural Heritage List also includes the Villa Izvor and four residential buildings in Plitvička Jezera, at Mukinje. As of October 10, 2005, the Gradina archaeological site at Kozjak has been under preventive protection. All buildings were constructed in the 1950s and are owned by the Park.


A detail from inside the mill

There are a large number of buildings and rural settlements that were placed under preventive protection from 1978 to 1988, but some of these were destroyed in the recent war, or were

demolished due to lack of care on the part of the owners, the former management of the Plitvice company or the state institution charged with their protected. Currently, all decisions on preventive protection are being audited. Also, there are plans to re-evaluate the residential buildings, rural settlements, historical complexes, memorial sites, and so forth throughout the Park, especially in the area of the settlements encompassed by the Park after 1997.

2.5. Visitors and tourism

Development of the National Park's current visitor system began at the end of the nineteenth century, and it was completed during the 1930s. With minor adjustments, the trails and small bridges adhere to those originally built.


Electric tour-boat

Visitors are received in Plitvice Lakes National Park at two official entrances in the middle of the Park: Entrances 1 and 2 and the 'Flora' auxiliary entrance. All visitors can receive information on the Park here. Information points can also be found at the following locations: Kozjačka Draga, Labudovac and dock P1 on Lake Kozjak. Visitors can also obtain additional information at the hotel reception desks, and from the staff of the scenic tour-trains, the electric tour-boat and information assistants at the parking lots.

Visitors can move about the Park individually and in groups, either by hiking or by a combination of transport means such as the tour-trains, tour-boats and row boats on Lake Kozjak.

Scenic tour train

Based on data for the 2000-2006 period, the number of visitors has been increasing continually (Table 8). In 2006, the Park was visited by almost 866,218 people. The largest number of visitors come to the Park in July and August (up to 10,000 per day), and the most frequent time of the visits is from 10:00 a.m. to noon. Each visitor in the Park generally visits the lake zone, and although there is no systematic monitoring of the spatial dispersion of visitors inside the Park, it is apparent that this is the most burdened zone. Since 2001, records have been maintained on the structure of visitors, but only for hotel guests. In 2006, 239,605 bed nights were recorded in the Park's territory, and out of this number 6.66% were domestic guests.

Table 8: Number of visitors in Plitvice Lakes National Park, 2000 – 2005.

Year	2000	2001	2002	2003	2004	2005	2006
Adults	344,951	308,663	320,691	360,593	386,885	390,899	398,277
Groups	0	123,703	185,697	188,015	196,097	287,636	308,505
Children	137,324	165,518	158,720	172,657	166,227	177,331	168,436
Total	**482,275**	**597,884**	**665,108**	**721,265**	**749,209**	**855,866**	**866,218**

Possible activities in the Park include sight-seeing, hiking, bicycling, row-boating, photographing, etc. During their stay in the Park, visitors are most interested in: touring the Park's central zone (the trails and small bridges in the lake zone), rides in the scenic tour-train, boat rides and row-boating on Lake Kozjak. A smaller number of visitors decide to take the hiking trail to Medveđak, or stroll along Prošćansko Lake, the left shore of Lake Kozjak, and Plitvički Ljeskovac and Čorkova Uvala.

Currently there is organized education or interpretation in the Park. There are plans to set up several thematic presentation centers for various visitor target groups.

The Public Institution manages three hotels (Jezero, Bellevue and Plitvice) which are located inside the Park, and the Hotel Grabovac and the Korana Auto-camp. Besides these properties, the Villa Izvor is also located inside the Park, although it is not functioning (concession, Physical Plan, needs definition). The total accommodation capacity is 764 beds in hotels and 94 beds in the Korana Auto-camp's bungalows. Private accommodation is also available in the Park. Besides the restaurants and cafes in the Park's hotels, there are a series of restaurants offering recognizable culinary specialties (e.g. the Lička Kuća, or 'Lika House', National Restaurant, offering traditional Lika cuisine in a renovated building made in the traditional Lika style, as well as the Poljana and Borje Restaurants).

Table 9: Number of recorded bed nights (hotels and auto-camp)

Year	2001	2002	2003	2004	2005	2006
Number of recorded bed nights	179,403	218,515	255,710	267,603	263,462	239,605

During the summer of 2004, research into visitor needs, expectations and satisfaction with the Park's amenities was conducted. A total of 144 questionnaires were completed. The results of analysis of these questionnaires showed that most visitors are visitors are satisfied with the preserved landscapes, the fact that the area is protected (73%), and the wealth of plants and animals (75%). Visitors were least satisfied with the cuisine, presentation of cultural treasures, and the variety of activities in general (see Fig. 9).

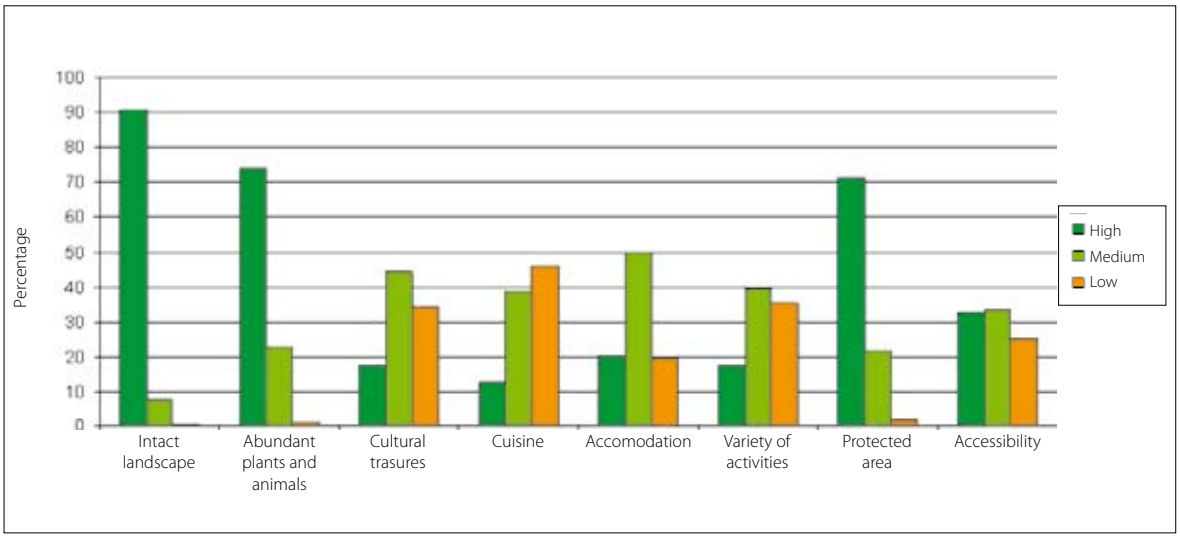


Fig. 7: Visitor satisfaction with different tourist aspects of Plitvice Lakes National Park

In general, the following shortcomings have been identified in the Park with reference to tourism and visits:

- So far the general accommodation capacity has not been ascertained, nor has that of the narrower lake zone, where the tourist burden is the highest and where the most crowding occurs;
- Additional tourist amenities are lacking (e.g. organized bird-watching; educational trails, bicycling trails);
- Additional programs for visits to sites in the Park outside of the central tourist zone (lake zone) are also lacking;
- Despite the diverse range of souvenirs available in the Park, for now there are none that can be deemed the typical souvenir of Plitvice Lakes National Park.

3. FUNDAMENTAL OBJECTIVES OF PARK MANAGEMENT

Based on the Park's vision and an assessment of the Park's biological, geomorphological, socio-economic and tourism resources, the objectives and measures for conservation natural resources and the cultural heritage have been elaborated.

This Plan is valid for ten years, and is subject to revision after five years. The details of planned activities in different zones will be covered by specific action plans, which are separate documents, with different timetables, which will be revised and updated during their implementation. Implementation of these management policies will reflect transparency and openness, public participation, education and interpretation, partnerships, international cooperation, action plans, monitoring, and research.

During development of the Management Plan, intense consultations, workshops and panel discussions with stakeholders were held, tourism studies and surveys were conducted, biological inventories were taken and deliberations were held within the Park. All issues identified as relevant were taken into account during formulation of the objectives and measures listed below.

3.1. Objectives and measures

3.1.1. Biodiversity

3.1.1.1. Forests

Objective:	**The objective of forest management in Plitvice Lakes National Park is to secure the natural state of forest ecosystems which are crucial to biodiversity and the continuance of the fundamental phenomenon and ensuring all generally beneficial functions of forests.**
Measures:	▪ Management measures stipulated and implemented on the basis of determination and monitoring of the dynamics of forest ecosystems; ▪ Continual research into forest ecosystems; ▪ Establish forest ecosystem monitoring; ▪ Develop the Forest Ecosystem Conservation Program based on regulations over the next 5 years; ▪ Draw up guidelines to use private forests; ▪ Open educational centers dealing with forestry; ▪ Expand the existing visitor system to include the forest ecosystem (hiking trails, bicycling trails, educational trails, etc.) ▪ Monitoring biodiversity.
Indicators:	Forests develop naturally and ensure all generally beneficial functions essential to biological and landscape diversity in Plitvice Lakes National Park.

3.1.1.2. Water ecosystems

Objective:	**Conservation of the positive trend of tufa-forming riverine development and tufa-forming conditions at tufa barriers, and securing of survival of all plant and animal associations in water ecosystems (springs, ponds and water-courses) for the purpose of maintenance of biodiversity and ecological balance.**
Measures:	▪ Halt human impacts which contribute to eutrophication of waters; ▪ Compile an impact study of the touring system on water ecosystems and upgrade the system; ▪ Establish continual monitoring of the parameters responsible for eutrophication and the dynamics of calcite excretions and tufa development in tufa habitats; ▪ Preserve water habitats in the most natural conditions possible, and revitalize them as needed (.e.g. clearing of vascular vegetation at barriers, tributaries, bogs, etc. based on action plan); ▪ Conserve biological species important to the habitat type; refrain from introducing and remove allochthonous species and genetically modified organisms; ▪ Conserve habitat biodiversity on water courses (unconfirmed banks, rapids, falls, etc.) and dynamics favorable to waters, necessary for habitat survival and their important biological species (occasional flooding of channels, solve the problem of water pumping from Lake Kozjak, and construction and maintenance of touring system, etc.); ▪ Establish continual monitoring of the hydrological regime with expansion of the limnigraph network and conservation of the Plitvice Lakes drainage area; ▪ Preserve the favorable physical/chemical properties of waters and mineral substances (nutrients) in the water (in quantities typical of oligotrophic waters). ▪ Removal of foreign invasive species to preserve biodiversity of water ecosystems based on scientific recommendations
Indicators:	No essential changes to tufa-forming processes and to system biodiversity.

3.1.1.3. Grasslands

Objective:	**Conservation of grass-covered surfaces (dry pastures and meadows, wet pastures and meadows, and peat bogs) as areas of high biological and landscape diversity.**
Measures:	▪ Conduct regular mowing and grazing according to the action plan; ▪ Remove woody vegetation according to the action plan; ▪ Maintain certain grasslands by means of controlled burning based on scientific recommendations; ▪ Increase surface covered by peat bogs based on scientific recommendations and remove woody vegetation; ▪ Allow succession to occur at Karleušine plase; ▪ Remove and prevent spread of ragweed (Ambrosia artemisiifolia L.) in compliance with the Order on Mandatory Ragweed Removal Measures (Narodne novine, no. 90/06); ▪ Establish permanent monitoring of grass ecosystems.
Indicators:	Grasslands ascertained by the plan are regularly mowed and maintained.

3.1.2. Cultural heritage

Objective:	**Systematic research, conservation and presentation of the cultural heritage and maintenance of the overall rural zone and traditional crafts (agriculture, livestock husbandry and trades).**
Measures:	▪ Educate the local population on cultural value; ▪ Establish an ethno-park or outdoor museum for presentation purposes; ▪ Devise a cultural heritage exhibition as a part of the planned visitor centers; ▪ Research all archeological sites in the Park; ▪ Inventory and validate the entire architectural heritage; ▪ Register temporarily protected buildings and sites; ▪ Draft an action plan on renewal, reconstruction and revitalization of cultural resources; ▪ Support the development of typical souvenirs based on the local cultural heritage.
Indicators:	The existing cultural heritage does not deteriorate and is used for the educational purposes Plitvice Lakes National Park.

3.1.3. Research

Objective:	**Gathering of a sufficient quantity of data on all components of the protected area (habitats and species and other components which do not belong in the area of natural research, but are essential to management, e.g. cultural heritage, etc.) for the purpose of better or easier management of the National Park's territory.**
Measures:	▪ Gather all existing data from previous research (to create a basic database on the National Park and avoid repetition of already-conducted research); ▪ Systematically conduct research; ▪ Ensure that research is conducted on the basis of need and to serve the purpose of meeting the above objective; ▪ Define future needs to initiate research based on the results of monitoring; ▪ Establish monitoring of all components of protected areas (based on habitats or indicator species) and ensure permanent monitoring, which must be one of the principal tasks of all departments of the ZSC.
Indicators:	Increase overall knowledge on the phenomenon of tufa-creation and biodiversity in the area.



3.1.4. Tourism, marketing and visits

3.1.4.1. Visitor management, programs and collection of admission fees

Objective:	**Facilitate quality visits by visitors with a high level of organization and minimum negative impact on the ecosystems of Plitvice Lakes.**
Measures:	▪ Designate the carrying capacity of natural resources for the entire Park and particularly for the Great Falls, Korana Canyon, Bijela and Crna Rivers, including Plitvički Ljeskovac, Galovački Prsten, Prošćansko Lake and Lake Kozjak (left shore) and Čorkova Uvala; ▪ Formulate a new visitor system concept in compliance with the carrying capacity and newly-created transit conditions (Entrances at Babin Potok, Saborsko, Rakovica and Prijeboj); ▪ Develop an environmentally friendly internal transit system (buses fueled by natural gas, electric boats running on solar cells, pontoon boats, etc.); ▪ Open alternative destinations in the Park's territory and suitable equip them (Čorkova Uvala, ethno-village at Prijeboj, village of Korana, areas around Bijela and Crna Rivers); ▪ Devise a program for various visitor target groups (pupils, persons with special needs, etc.); ▪ Establish continuous supervision of visitors and their movement and monitor their impact on the ecosystem..
Indicators:	Existing negative impact of visitors on the ecosystem reduced, as confirmed by environmental indicators.

3.1.4.2. Interpretation and education

Objective:	**Understanding the value of Plitvice Lakes as a natural phenomenon by all employees, domestic residents and visitors, with enjoyment of the natural quality of the area and quality services.**
Measures:	▪ Develop thematic centers (Medveđak, Velika Poljana and Čorkova Uvala) and visitor educational trails; ▪ Improve the quality of the guide and interpretation services and qualify staff to implement education and interpretation of the Park's natural and cultural resources; ▪ Devise interactive interpretive thematic programs for visitors (e.g. the Park's birds, butterflies, forests, etc.); ▪ Establish educational centers for school groups with the possibility of simple accommodation for one school class; ▪ Devise educational, interpretive and promotional materials for all visitor target groups..
Indicators:	Developed information centers and well-conceived adequate programs for various visitor target groups.

3.1.4.3. Accommodation and services

Objective:	**Raise the quality of accommodations and services in Plitvice Lakes National Park, respecting the highest environmental criteria with maximum use of local and regional resources in compliance with the Physical Plan.**
Measures:	▪ Apply technologies more favorable to the environment in accommodation and hospitality facilities; ▪ Secure maximum use of local resources (food, souvenirs, services, etc.); ▪ Establish better and ongoing cooperation with tourism stakeholders and within and around the Park for the purpose of raising the overall quality of the tourism product.
Indicators:	Accommodation in the facilities of Plitvice Lakes National Park meets the strictest environmental standards for service activities.

3.1.4.4. Marketing and publicity

Objective:	**Improvement of the image of Plitvice Lakes National Park and raising the level of general knowledge of its natural and cultural value.**
Measures:	▪ Continuous and quality promotion of the Park on domestic and global markets; ▪ Closely cooperate with conservation services; ▪ Establish intense cooperation and exchanges of experiences and staff with other international parks and institutions; ▪ Participate in specialized international tourism and environmental fairs; ▪ Enhance promotion of the Park's educational programs; ▪ Establish information points in the Park
Indicators:	Plitvice Lakes National Park is an internationally well-known tourist destination with high environmental standards.

3.1.5. Infrastructure

3.1.5.1. Roads

Objective:	**Establishment of traffic in compliance with the purpose of Plitvice Lakes National Park and stakeholder needs.**
Measures:	▪ Relocate through traffic from road D1 outside of the National Park's boundaries; ▪ Systematically re-categorize roads in the National Park and place all unclassified roads into the service of the National Park and its management, establish supervision, ascertain intervention measures and meet the needs of the local population; ▪ Move transport of hazardous materials from road D52 to the Gospić-Korenica road (via Ljubovo)
Indicators:	Only local traffic and Park visitor traffic proceed in Plitvice Lakes National Park.

3.1.5.2. Other infrastructure

Objective:	**Develop infrastructure with minimum environmental impact.**
Measures:	▪ Secure water supply outside of the Plitvice Lakes drainage basin and optimize the Plitvice Lakes National Park water supply system; ▪ Determine the biological minimum of lake water flow; ▪ Secure quality drainage in the entire territory of the Park and purification of wastewater in a state-of-the-art fashion; ▪ Establish modern electric system (high and low voltage) with minimum environmental impact; ▪ Specify maximum number of necessary telecommunications devices for mobile telephony and establish modern underground telecommunications systems with the minimum possible environmental impact.
Indicators:	Potable water supply system resolved outside of the Plitvice Lakes, drainage solved in a quality manner and other infrastructure established in compliance with the highest environmental standards.

3.1.6. Local population

Objective:	**Establish cooperation with the local population to achieve the vision of Plitvice Lakes National Park.**
Measures:	▪ Organize educational work, education, and thematic workshops for the local population; ▪ Devise joint tourist promotion programs; ▪ Incorporate settlements into the visitor and interpretation system; ▪ Support traditional agriculture and preserve indigenous breeds and varieties; ▪ Improve communication by means of the common bulletin Plitvički Vjesnik; ▪ Involve the population in monitoring.
Indicators:	Quality and purposive cooperation between the Public Institution with the local population through regular meetings.

3.1.7. General

3.1.7.1. Land ownership

Objective:	**Settlement of title issues within Plitvice Lakes National Park with special reference to joint ownership for the duration of this plan.**
Measures:	▪ Increase the area owned by the National Park (pre-emptive rights) based on the priorities specified by Park zoning; ▪ Align the status in the land register and cadastre with the situation in the field by cadastral land measurement; ▪ Conduct the deletion of co-ownership
Indicators:	Settled title issues in the land registers.

3.1.7.2. Legal regulation

Cilj:	**Improve the legal framework for the purpose of effective management of Plitvice Lakes National Park.**
Measures:	▪ Propose amendments to the Nature Protection Act with the goal of involving the local population in the Park's Governing Board; ▪ Develop a systematic concept for the identity of Plitvice Lakes National Park; ▪ Protect the corporate identity of Plitvice Lakes National Park by copyright; ▪ Regulate the use of photographs and film materials for commercial purposes; ▪ Resolve the status of all illegally constructed buildings owned by the National Park.
Indicators:	All laws relevant to Park management aligned, legal security on all matters achieved.

3.2. Zoning concept

Plitvice Lakes National Park is divided into several different zones based on natural value, distribution and needs of the local population and management needs. The types of zones and their characteristics were defined in a workshop in which staff from different Croatian parks participated. The classification is based on the IUCN classification of protected areas, which were adopted under the KEC Project. Areas of high natural value with little need for management have been proclaimed strict conservation zones. Active conservation zones are those demanding special management techniques to preserve their value. Areas of lower natural value with a great need for management are deemed usage zones.

3.2.1. Zoning in Plitvice Lakes National Park and management by zone

Zoning in Plitvice Lakes National Park is based on the conservation of natural and cultural resources, on the concerns, issues and proposals which emerged during public participation, on the Physical Plan and plans for tourism development in the area.

The following zones have been defined in Plitvice Lakes National Park::

1. Strict conservation zones

1a) Strictest conservation zone – area of particular importance with entirely untouched natural environments, high biological and landscape diversity and great conservation importance with restricted visitor access.

Roads and trails running through zone 1a are set aside and classified in the active conservation zone at widths of 25 m from the edge of the road or trail.

1b) Very strict conservation zone – area with untouched and/or negligibly touched natural environments, high biological and landscape diversity in which minimum management activities are conducted for the purpose of protection and conservation of high biological and landscape diversity and where limited visitor access is permitted.

2. Active conservation zone

2a) Active habitat conservation zone – area of high value to habitat conservation subject to active intervention as a management method to ensure protection, conservation, rejuvenation and maintenance of the desired condition.

2b) Active forest ecosystem conservation zone – area of high value to forest ecosystem conservation subject to active intervention as a management method to ensure protection, conservation, rejuvenation and maintenance of the desired condition of forest ecosystems.

3. Usage zone

3a) Settlement zone – areas of settlements, traditional and organic farming, eco-tourism, natural and cultural value.

3b) Recreation and tourism infrastructure zone – area with natural, cultural, educational and tourism/recreation value, in which emphasis is placed on development of the hospitality and tourism infrastructure in compliance with environmental standards.

The results of research conducted in the Park's territory were accepted as the basis for zoning.

When zoning was implemented in Plitvice Lakes National Park (Fig. 11), the existing special forest reserves and forests without roads or trails (Čorkova Uvala, Cigelj-Seliški Vrh, Crni Vrh, Kik-Visibaba, Prošćanski Vrh, Rječica-Javornik, Medveđak and Rječica-Kosa) were accorded the highest degree of protection and proclaimed the strictest conservation zone in which research may be conducted only with consent from the relevant authorities, and monitoring and surveillance may also be conducted, and interventions are allowed under extraordinary circumstances.

There is no visitor infrastructure and access by domesticated animals is restricted. Since the Rječica-Kosa area borders a tourist zone to the north and west, a buffer zone of 40 m (the average height of the trees) has been foreseen on this northern and western boundary for safety reasons.

Various meadows and anthropogenic grasslands, various managed forest ecosystems and plantations that

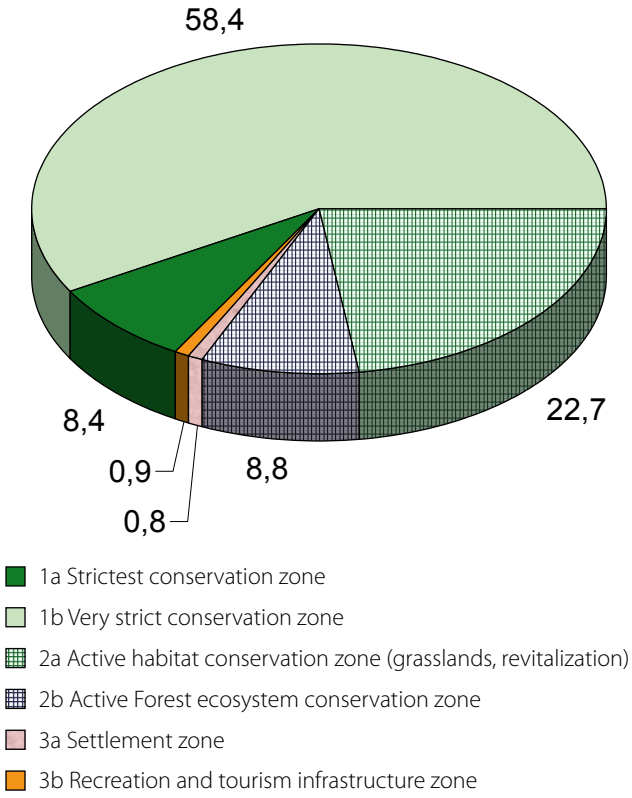


Fig. 10: Share of individual zones in the Park's total area

require active management for improvement or re-naturalization as well as relict forest communities have been declared as active conservation zones (2a), where visits and the tourism infrastructure is regulated. An action plan needs to be formulated for maintenance of grasslands. Another action plan should be developed for forest plantations on Brezovačko Field, while for relict forest associations, conservation status should be reconsidered upon additional research and monitoring.

Various degraded forest ecosystems, mainly privately ownership and used to gather firewood and needing active management, are also defined as active conservation zones (1b). Limited use by the local population is allowed, as regulated by the relevant ministry, the Park's management and the forestry advisory service.

Areas around settlements, buildings, agricultural land, orchards and degraded private forests used for fuel wood have been declared as usage zones (3a). In this zone, organic and traditional farming in line with established capacity and to meet local needs is allowed without use of artificial fertilizers, herbicides or pesticides.

The intensively used area around the lakes has been declared a tourism and recreation zone (3b), where visiting must be regulated by a specific action plan according to the established carrying capacity for various locations in the area.

The rest of the forested area in the Park not included in any of above-mentioned zones is designated as a very strict protection zone (1b) where no forestry is allowed and visitor access is restricted to trails, with the size of visitor groups limited as well.

The size of the individual zones is shown in Table 10 and Fig. 11.

A presentation of the zones identified in the Park follows with all key facts: zone designation and type, the area encompassed, the selection criteria, management objectives and use/management possibilities.

Table 10: Areas of the different management zones in the Park.

Zone		Total (ha)	Percentage
Zone 1 – Strict conservation zone		**19,761**	**66.8 %**
1a) Strictest conservation zone Strictest conservation area in which research, monitoring, surveillance and emergency intervention are allowed; visitor access is restricted.	Area	278	8.4 %
	1 – Special forest reserve in Čorkova Uvala		
	2 – Seliški Vrh	417	
	3 – Crni Vrh	115	
	4 – Kik	127	
	5 – Rječica-Prošćanski Vrh	1,357	
	6 – Medveđak	186	
1b) Very strict conservation zone Very strict conservation areas in which research is allowed; visitor access is limited.	7– forested areas inside the National Park.	17,281	58.4 %
Zone 2 – Active conservation zone		**9,348**	**31.5 %**
2a) Active habitat conservation zone Area of active conservation of habitats (protection of grasslands, revitalization).	Area	2,876	22.7 %
	8 – Brezovačko and Homoljačko Fields		
	9 – Vrela and Rudanovci	524	
	10 – Čuić Krčevina	294	
	Grass-covered surfaces	3,035	
2b) Active forest ecosystem conservation zone	11 – Kosa	2,407	8.8 %
	12 – Brezovačko Field	212	
Zone 3 – Usage zone		**503**	**1.7 %**
a) Settlement zone	Area	226	0.8 %
	Villages and hamlets and their immediate environs		
b) Recreation and tourism infrastructure zone	13 – Visitor and tourism infrastructure areas, natural and cultural value	277	0.9 %
OVERALL		**29,612**	**100 %**

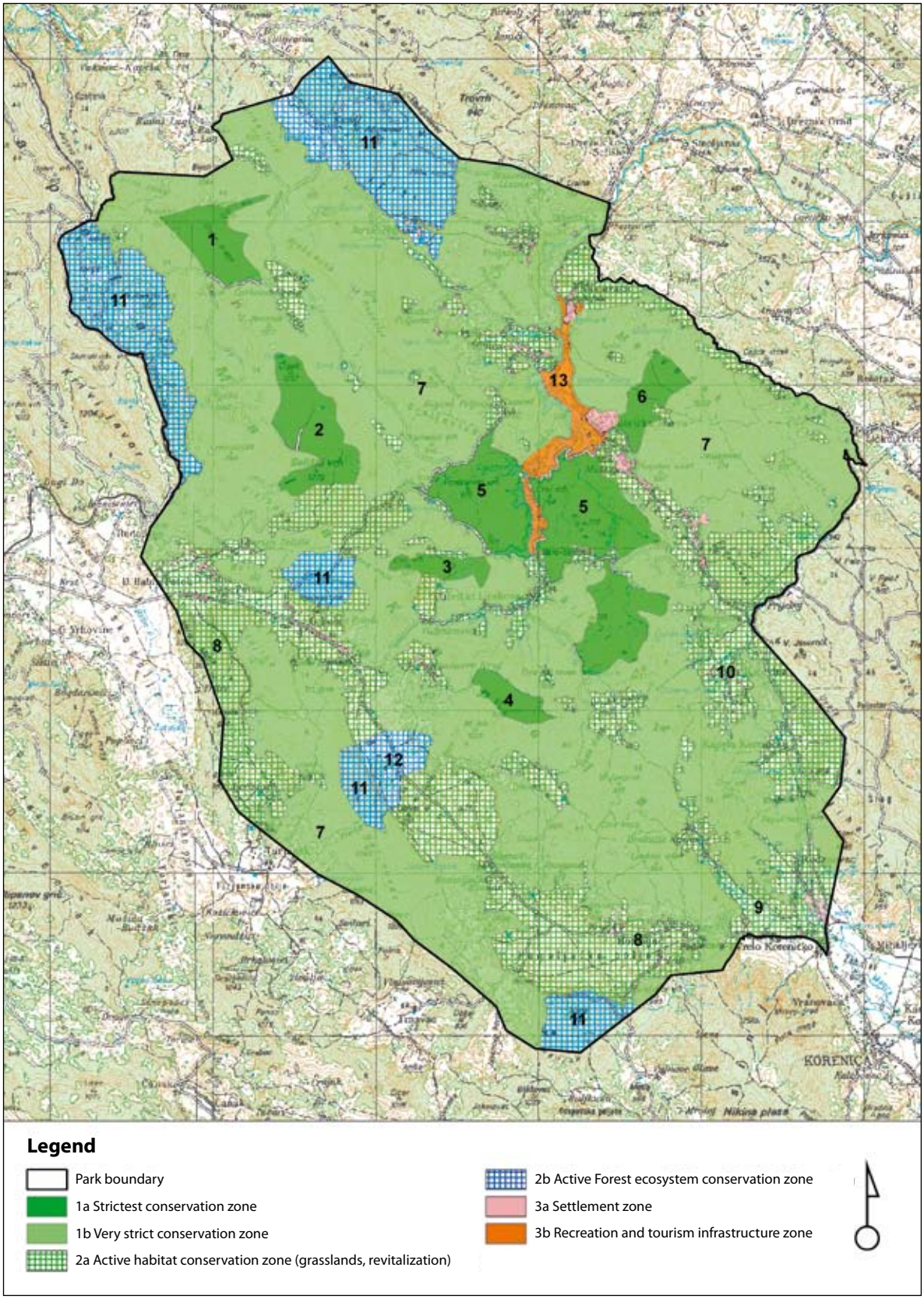


Fig. 11: Zoning of the Plitvice Lakes National Park

3.2.1.1. Zone 1 – Strict conservation zone

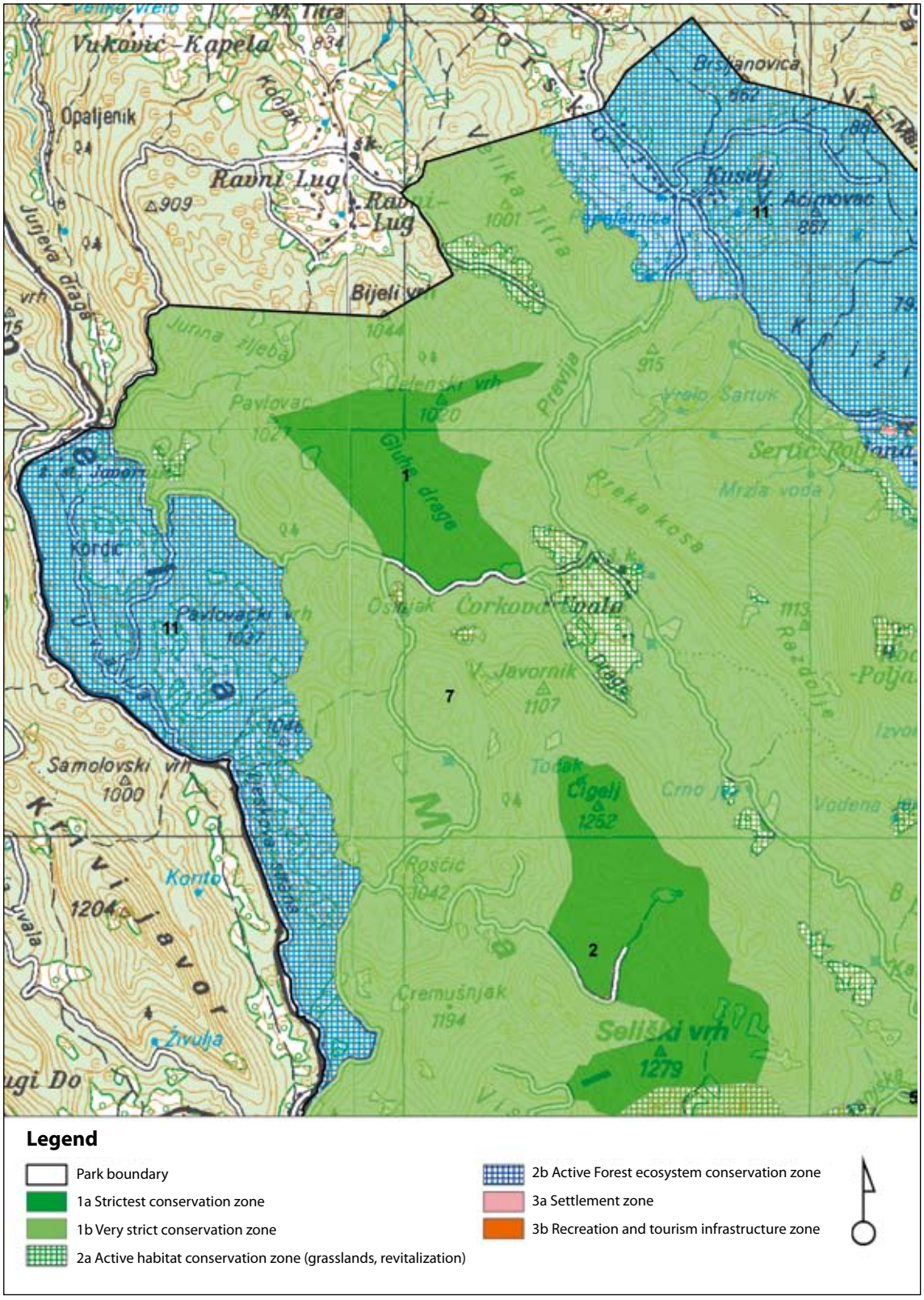


Fig. 12: Zone 1 – Strict conservation zone, zone types 1a and 1b

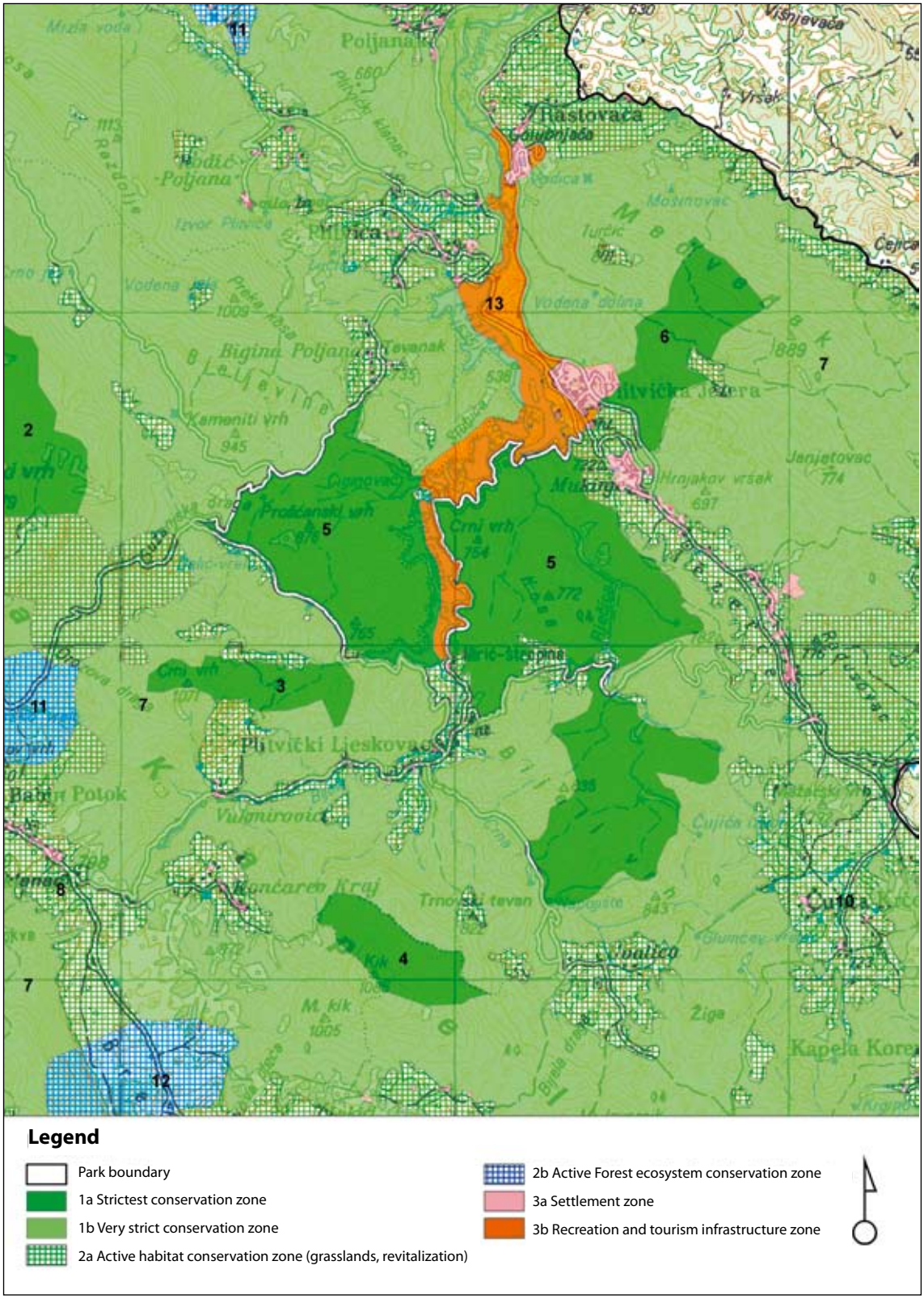


Fig. 13: Zone 1 – Strict conservation zone, zone types 1a and 1b

Zone type: 1a) Strictest conservation zone. Area of particular significance with untouched overall natural environment, high biodiversity and great conservation importance.

Description: This zone includes the existing and expanded forest reserve in Čorkova Uvala (1), Seliški Vrh (2), Crni Vrh (3), Kik (4), Rječica-Prošćanski Vrh (5) and Medvedak (6). One of the specific aspects is that the strict conservation zone below the peak Prošćanski Vrh was expanded to encompass the left shore of Prošćansko Lake from the mouth of Sušanj Creek to the middle of the lake and to the entire area around Ciginovac. Similarly, the entire Rječica drainage basin to the mouth of Lake Kozjak is a part of this zone.

Criteria: This zone has been set aside exclusively for conservation of its intact natural environment and natural process, research and/or monitoring which does not impede natural processes. This part of the Park has particular value thanks to the diversity of animals and presence of large carnivores: brown bear (*Ursus arctos*), wolf (*Canis lupus*), lynx (*Lynx lynx*) and wild cat (*Felis sylvestris*). These species require large, unrestricted ranges, which has been successfully managed with this type of zoning.

Objective: Activities aimed exclusively at preservation and conservation of intact nature and natural processes, monitoring of ecosystems, biological and landscape diversity and surveillance.

Permitted activities: Research with the consent of the relevant authorities, activities tied to monitoring, intervention under extraordinary circumstances and surveillance. Visitor access is restricted.

Visitor access: Access by visitors is restricted.

Zone type: 1b) Very strict conservation zone. Area with untouched and/or negligibly touched natural environments in which minimum management activities are conducted for the purpose of protection and conservation of high biological and landscape.

Description: This zone includes most of the forested areas inside the National Park. The area is traversed by forest roads, which can be put to limited use for visits to the area (7).

Criteria: The area is intended for research and/or monitoring, and education which does not impede natural processes with limited visitor access.

Objective: Minimum activities aimed at preservation and conservation, monitoring of biological and landscape diversity and inorganic nature, surveillance and maintenance and improvement of the visitor infrastructure.

Permitted activities: Research, activities tied to monitoring, area surveillance, limited visitor access provided that they remain on marked trails intended for tours and sight-seeing, minimum tourism infrastructure development allowed (education and interpretation) and interventions under extraordinary circumstances.

Visitor access: Visitors allowed only in areas with marked trails and paths accompanied exclusively by a Park guide; number of visitors and duration of visits are limited. Minimum facilities (infrastructure) for visitors, no domesticated animals allowed. Visitors must adhere to the Park's rules of conduct as stipulated by the Rules of Internal Order.

3.2.1.2. Zone 2 – Active conservation zone

Fig. 14: Zone 2 – Active conservation zone, types 2a and 2b

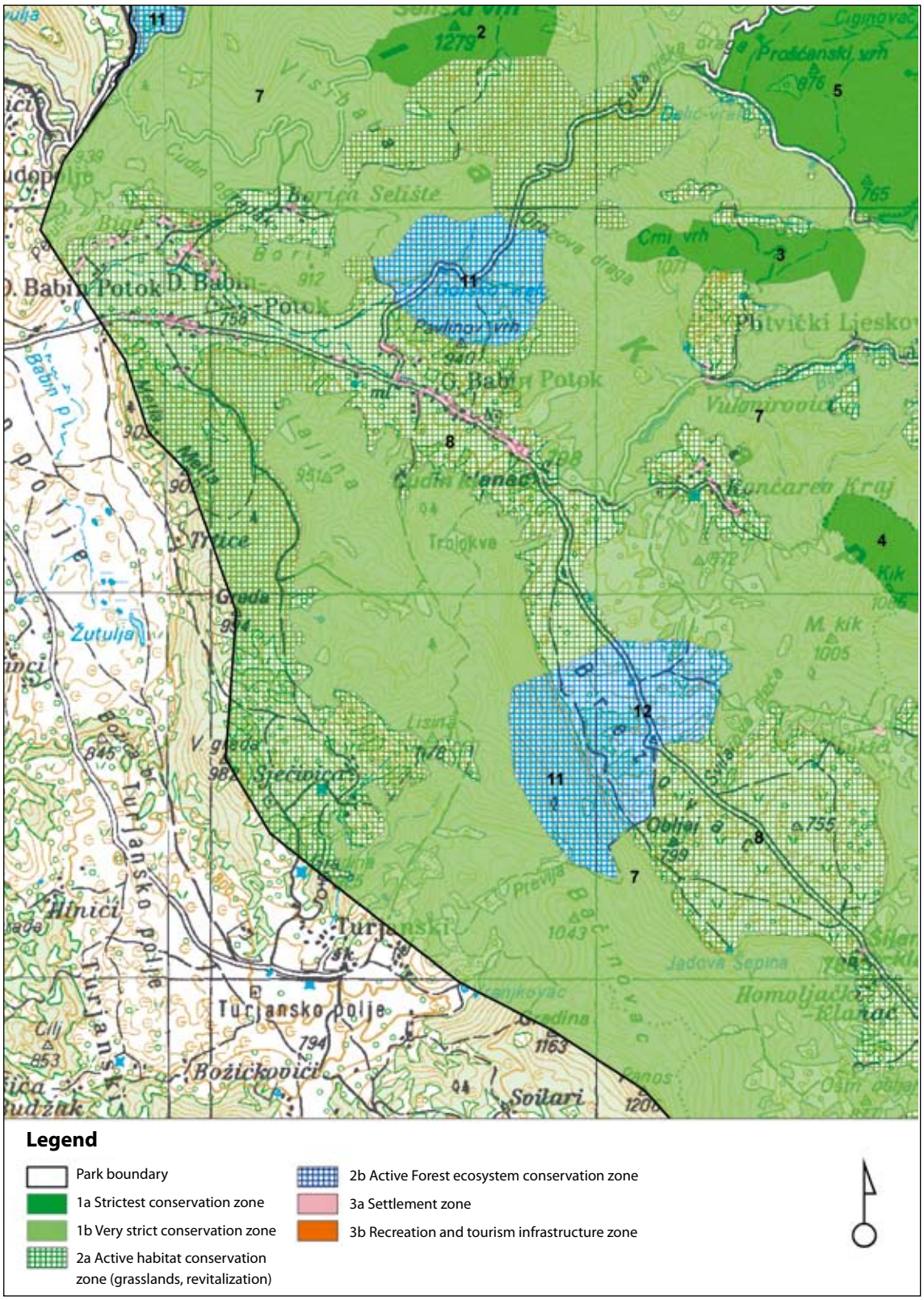


Fig. 15: Zone 2 – Active conservation zone, type 2a and 2b

Zone type: 2a) Active habitat conservation zone. Area of great value to habitat conservation subject to intervention as a management method to ensure conservation, preservation, revitalization and maintenance of favorable conditions.

Description: This zone generally encompasses grass-covered surfaces which must be maintained. This zone includes the particularly valuable grasslands at Brezovačko and Homoljačko Fields (8) which, thanks to their size and floral composition and their landscape value, are a unique treasure of the National Park. This area is also the drainage basin for most tributaries of the Plitvice Lakes. Small grass-covered surfaces scattered about the forested areas are also valuable. The latter are particularly important to the local animal life. Particularly valuable wet grasslands can be found around Vrela and Rudanovci (9) and around Čuić Krčevina (10), and the peat bog at the mouth of the Matica at the Plitvice Lakes. These are habitats for rare and endangered plants species which must be adequately protected.

Criteria: The area has been set aside for conservation, revitalization and maintenance of favorable conditions for the ecosystem/habitat types/species to preserve biological and landscape diversity and inorganic natural features.

Objective: An Area subject to active intervention as a management method to ensure conservation, preservation and maintenance of favorable conditions for the ecosystem/habitat types/species to preserve biological and landscape diversity and other natural resources.

Permitted activities: Research and/or monitoring with consent of the relevant authorities, measures and activities to preserve and protect species, revitalization programs for habitat types in cooperation with the local community (mowing, grazing), limited visitor access provided that they remain on marked trails intended for tours and sight-seeing, minimum tourism infrastructure development allowed (education and interpretation), organized individual visits and recreation within the limits dictated by carrying capacity and area surveillance.

Visitor access: Visits allowed, movement along trails, accompanied by guides. Dogs must be leashed, and the National Park's rules of conduct must be strictly observed in compliance with the Rules on Internal Order.

Zone type: 2b) Active forest ecosystem conservation zone. This zone generally encompasses degraded or managed forests in the peripheral areas and expanded sections of the Park, forest nurseries and degraded forests and cut zones.

Description: This zone encompasses managed forests in the area around Kuselj and Pavlovački Vrh, around Babin Potok (with relict pine associations) and between Brezovačko Field and Lisina and around Kosa (11). It also includes the forest seedlings at Brezovačko Field (12).

Criteria: Area characterized by managed forests and forests at various phases of degradation, albeit with some typical botanical diversity. Animal life here is also abundant and diverse.

Objective: Conservation and improvement of the natural features and habitat diversity with all plant species and animal groups.

Permitted activities: Surveillance, research, monitoring of waters, plants and animals in this zone with emphasis on habitat bioindicators. Possible forestry activities in degraded associations as needed and in compliance with forest ecosystem conservation program.

Visitor access: Open to visits, visitors required to remain on trails, accompanied by a guide. Dogs must be leashed, and the National Park's rules of conduct must be strictly observed in compliance with the Rules on Internal Order.

3.2.1.3. Zone 3 – Usage zone

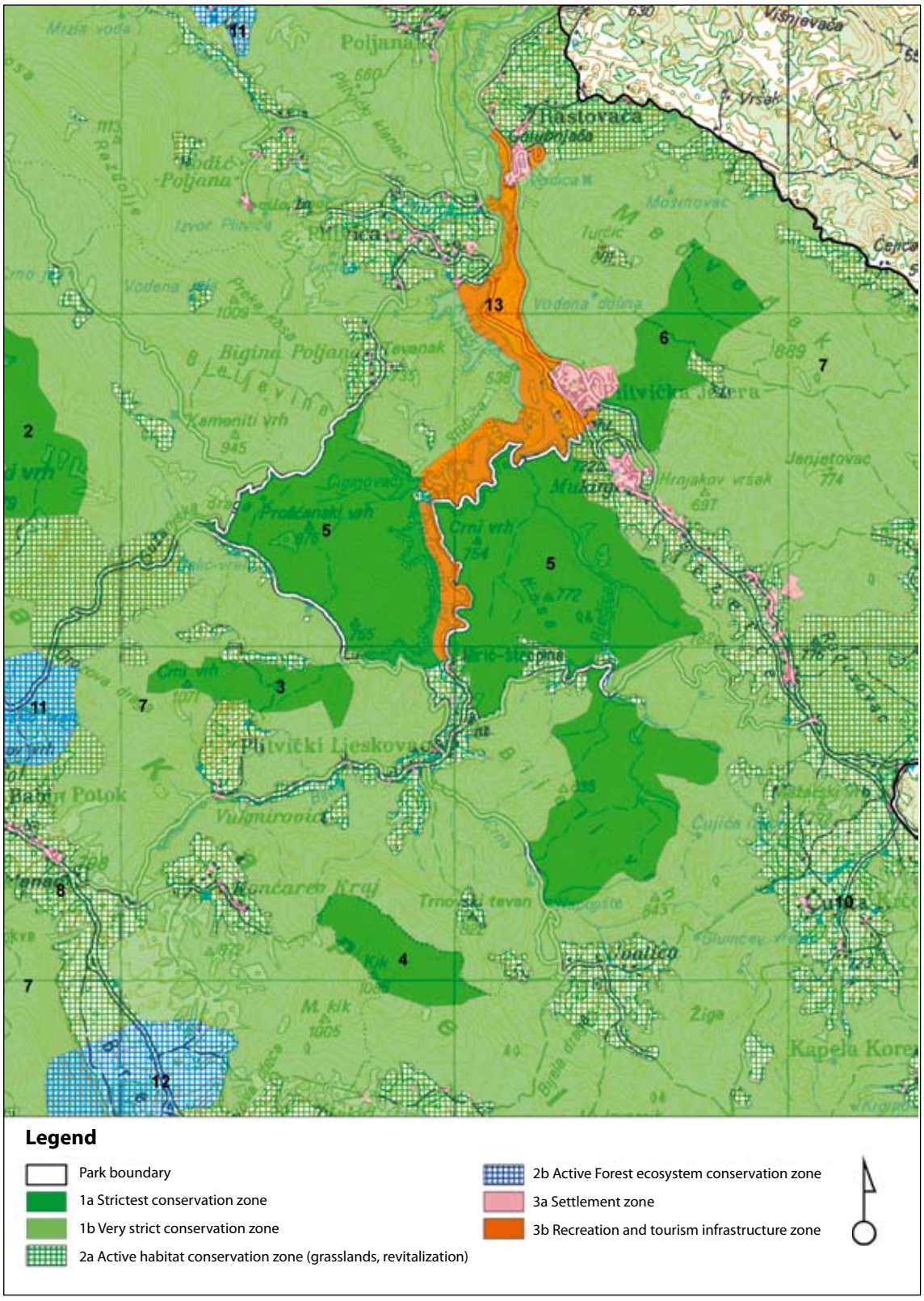


Fig 16: Zone 3 – Usage zone, zone types 3a and 3b

Zone type: 3a) Settlement zone

Description: This zone includes all villages and hamlets and their immediate environs. The main settlements inside the National Park are Plitvička Jezera (with Mukinje), Jezerce, Plitvica, Poljanak, Rastovača, Babin Potok and an entire series of other villages and hamlets on the Park's peripheries. Special status is accorded to Plitvički Ljeskovac and Bijela Rijeka at the very source area of the Plitvice Lakes. Very extensive traditional agriculture and livSestock raising is conducted here.

Criteria: The area is set aside for the development of organic and traditional farming, eco-tourism and rural tourism for the purpose of meeting the needs of the local community and developing the protected area, based on preservation of natural resources and the cultural heritage and sustainable development.

Objective: An area managed based on the principles of sustainable development in cooperation with the local community, with preservation of biological and landscape diversity and natural resources and the cultural heritage.

Permitted activities: Research, monitoring, surveillance, organized and individual visits and recreation within the limits dictated by the carrying capacity, use of natural resources in compliance with sustainable development and preservation of biological and landscape diversity and other natural resources (e.g. inorganic natural features), development of sustainable eco-tourism, organic farming, protection and preservation of local natural and cultural treasures, development of visitor infrastructure in compliance with environmental standards (education and interpretation), protection and preservation of the cultural heritage.

Visitor access: Open to visits, visitors required to remain on marked trails, with strict adherence to the National Park's rules of conduct in compliance with the Rules on Internal Order. Dogs must be leashed.

Zone type 3b) Recreation and tourism infrastructure zone

Description: This zone includes areas with natural, cultural, educational and tourism/recreational value.

Criteria: Area intended for recreation, visits and sight-seeing. The area features exceptionally interesting biological processes and geomorphological traits. The lake zone with its waterfalls and rapids is the fundamental phenomenon of this area, which is why it was placed on UNESCO's World Heritage List.

Objective: Management in compliance with carrying capacity, and in cooperation with the local community. Development and improvement of the visitor infrastructure (educational trails, visitor centers, etc.) in compliance with environmental standards.

Permitted activities: Research, monitoring, surveillance, visitor infrastructure development (educational trails, visitors centers) in compliance with environmental standards, education and interpretation, organized and individual visits and recreation within the limits dictated by the carrying capacity, protection and preservation of the cultural heritage. No infrastructure for mass tourism may be developed.

Visitor access: Permanently opened to visitors and recreation within the limits dictated by the carrying capacity with strict adherence to the National Park's rules of conduct in compliance with the Rules on Internal Order. Dogs must be leashed.

4. IMPLEMENTATION OF MANAGEMENT PLAN

4.1. Links to other planning documents

The physical plan is the fundamental legal document for management of protected areas in Croatia. Over and above protected areas, plans are also continually prepared at the county and national levels, and after the standpoints adopted at public hearings are aligned, they are enacted by the Croatian Parliament. Physical plans are generally adopted to cover ten year periods. Until the enactment of the Nature Protection Act in 1994, physical plans were the only legal documents that governed land use in protected areas. Today at the park level they specify the fundamental conditions for land use, define the conditions for activity in both developed areas and the natural environment—concentrating primarily on recreation, tourism and housing and transport matters—and provide a platform for activities to be defined by the Management Plan.

The basic management activities for protected areas foreseen by the Physical Plan are:

- Interpretation and breakdown of the county plan at the local level,
- Specification of oversight of development and planning activity application, and
- Prevention of unrestrained developmental activities within the National Park.

Alignment between the Physical Plan as the fundamental legal document and the Management Plan as a strategic document and basis for management and conservation activities is crucial to zoning in the National Park. In the Physical Plan, zoning is set forth according to the principal objectives of preservation and use purposes, while in the Management Plan it is defined in greater detail due to conservation management actions and measures in each zone.

The Physical Plan thus indicates "where and what," while the Management Plan additionally specifies the operative aspects of protected area management, particularly those pertaining to conservation and protection of biodiversity. Consultations with the relevant physical planning departments at the national and county levels tied to the Management Plan for Plitvice Lakes National Park were conducted at the very first planning stages, to prevent any potential conflicts.

Besides physical plans, there is a series of other documents (strategies, plans and programs) covering the fields of tourism, agriculture, water, forest, etc. at the national and/or county level, which influence the subsequent implementation of the Management Plan. All existing documents were taken into consideration during development of the Management Plan.

4.2. Action plans

The Nature Protection Act stipulates that the Management Plan is valid for ten years, and that it is reviewed after five years. However, to ensure feasibility, short-term and long-term action plans must be developed to deal with specific priorities in management of the National Park. Action plans are an integral component of management plans, and these constitute very concrete management documents, which ensue from the defined strategic management objectives and measures for the National Park. Acton plans thoroughly define the activities, timetables, and human and financial resources needed to implement them.

During formulation of the Park's fundamental management objectives, nine priority action plans were identified which the Plitvice Lakes National Park Public Institution will carry out in the 2008-2017 period. This list of action plans does not cover all problem areas that will emerge in the Park over the coming years, but it will, as needed, be expanded. All stakeholders will be involved in the development of each action plan, so that any potential conflicts are resolved at the very beginning. All proposed action plans will be adopted by the end of 2008 in procedures identical to those implemented for the Management Plan.

Table 11: List of action plans for the 2008-2017 period

Action plans
Objective: Conservation and preservation of biological and landscape diversity.
1. Preservation of forest ecosystems in Plitvice Lakes National Park.
2. Conservation of water ecosystems.
3. Conservation and preservation of plants and animals in the National Park.
4. Conservation and preservation of grasslands.
Objective: Development of marketing and the visitor system in the National Park.
5. Presentation, promotion and the visitor system.
Objective: Protection and preservation of the cultural heritage.
6. Inventory and protection of the cultural heritage.
7. Development of traditional trades.
Objective: Settlement of property title issues in the territory of the National Park.
8. Settlement of property title issues.
Objective: Active involvement by the local community in the National Park's development.
9. Public participation and cooperation with the local community.

4.2.1. Overview of action plans

During preparation of the Management Plan, the following priority action plans with specified objectives, principal activities, timetables and cost estimates were identified.

4.2.1.1. Biological and landscape diversity

Action plan: Preservation of forest ecosystems in Plitvice Lakes National Park.	
Objective:	Framework for activities tied to conservation of all forest ecosystems in the National Park.
Principal activities:	Conservation, monitoring, surveillance of succession, removal of potentially hazardous trees, maintenance of trails, land purchasing, compensation for firewood, research into relict associations.
Budget:	HRK 3,000,000
Timetable:	10 years

Action plan: Conservation of water ecosystems.	
Objective:	Permanently conserve and monitor changes in the waters of the Plitvice Lakes.
Principal activities:	Permanent monitoring of essential parameters by Park staff or contractors, mapping of waterways and springs, halting of human impact on the lakes, move potable water extraction outside of the Park's boundaries, monitoring of farming inside the drainage basin, removal of large plants and allochthonous species based on scientific recommendations.
Budget:	HRK 1,.367,100
Timetable:	10 years

Action plan: Conservation and preservation of grasslands	
Objective:	Conservation and maintenance of essential grass-covered surfaces.
Principal activities:	Development of grassland cadastre, regulation of title issues, maintenance, procurement of the necessary machinery.
Budget:	HRK 3,969,000
Timetable:	10 years

Action plan: Conservation and preservation of plants and animals in the National Park.	
Objective:	Improve knowledge and conservation of individual taxa.
Principal activities:	Reintroduction of indigenous brook trout, complete inventory of main plant and animal groups, development of monitoring.
Budget:	HRK 2,940,000
Timetable:	10 years

4.2.1.2. Marketing and visitor system

Action plan: Presentation, promotion and the visitor system.	
Objective:	Improve the visitor system and visitor services with minimum negative environmental impact.
Principal activities:	Improve the Park's infrastructure, make adaptations for persons with special needs, introduce environmentally friendly technologies, educational programs and content, develop visitor centers at Medveđak, Kozjak and Čorkova Uvala, interpretation and information plan, bicycling trail network, estimate carrying capacity for individual sites in the Park.
Budget:	HRK 12,000,000
Timetable:	10 years

4.2.1.3. Cultural heritage

Action plan: Inventory and protection of cultural heritage	
Objective:	Document, protect and present fixed and movable facets of the cultural heritage.
Principal activities:	Draft a study on protection and revitalization of the cultural heritage, analyze the structure of old villages and hamlets, the cultural landscape, old trades and tools, measures to achieve formal protection, development of cultural resource maps and various works to renew and protect movable cultural resources, archeological research at the Gradina Kozjak site and other sites recorded in the Park's territory, and their public presentation.
Budget:	HRK 220,500
Timetable:	10 years

Action plan: Development of traditional trades.	
Objective:	Preserve traditional trades and skills in the region.
Principal activities:	Research old trades and original regional products, interpretation plans, development of local souvenirs and products, incentives for the protection of old trades by the local population.
Budget:	HRK 1,470,.000
Timetable:	10 years

4.2.1.4. Property title issues

Action plan: Settlement of title issues.	
Objective:	Establish clear title to all real estate in the Park.
Principal activities:	Detailed measurement of private and public land, permanent demarcation of boundaries between plots, develop a precise cadastre, establishment of land registers
Budget:	HRK 7,350,000 (financed by National Land Survey Bureau and Ministry of Justice)
Timetable:	10 years

4.2.1.5 Local community and the public

Action plan: Public participation and strategy for cooperation with the local community.	
Objective:	Improve cooperation with the local community
Principal activities:	Organize regular meetings and events with local residents, develop a newsletter, joint activities, educational work with local schools
Budget:	HRK 110,250
Timetable:	10 years

4.3. Financial aspects and cost estimate

According to the Nature Protection Act, financing conservation and preservation of natural resources of international and national significance is secured through the central state budget. The same applies to financing of Plitvice Lakes National Park, in compliance with the needs specified in the annual operating plan, albeit within the scope of budgetary constraints. Additional funds to finance nature conservation are secured by the Park itself by charging for the use of natural resources and protected resources by collecting admissions fees for visitors or through a concessions system, by from national and international endowments.

Over the past several years, Plitvice Lakes National Park has been incorporated in projects and programs financed by national and international institutions (e.g. World Bank/GEF in the case of the KEC Project).

Since action plans are separate projects in and of themselves, the Park will use them to secure additional funding from international and national endowments and donations. Each action plan has a detailed financial component which will be reflected in the annual operating plan and will comply with the National Park's overall budget.

An estimate of the total funds necessary to implement the Management Plan for the 2008-2017 period is shown in Table 12.

Table 12: Tentative cost projections for Plitvice Lakes National Park in the 2008-2017 period

a) Current costs of the Public Institution for the planning period

Description	Year									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
CURRENT OPERATING COSTS (HRK)										
Staff costs	52,000,000	54,600,000	57,330,000	60,196,500	63,206,325	66,366,641	69,684,973	73,169,222	76,827,683	80,669,067
Supplies and services	60,000,000	63,000,000	66,150,000	69,457,500	72,930,375	76,576,894	80,405,738	84,426,025	88,647,327	93,079,693
Procurement of non-financial assets	8,000,000	8,400,000	8,820,000	9,261,000	9,724,050	10,210,253	10,720,765	11,256,803	11,819,644	12,410,626
Other costs	19,000,000	19,950,000	20,947,500	21,994,875	23,094,619	24,249,350	25,461,817	26,734,908	28,071,653	29,475,236
Total	**139,000,000**	**145,950,000**	**153,247,500**	**160,909,875**	**168,955,369**	**177,403,138**	**186,273,293**	**195,586,958**	**205,366,307**	**215,634,622**

b) Costs of action plans during the planning period

ACTION PLANS (HRK)											
Year	**2008.**	**2009.**	**2010.**	**2011.**	**2012.**	**2013.**	**2014.**	**2015.**	**2016.**	**2017.**	**Total**
Preservation of forest ecosystems in the National Park	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	3,000,000
Presentation, promotion and the visitor system	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	12,000,000
Conservation and preservation of plants and animals in the National Park	294,000	294,000	294,000	294,000	294,000	294,000	294,000	294,000	294,000	294,000	2,940,000
Conservation and preservation of grasslands	735,000	735,000	312,375	312,375	312,375	312,375	312,375	312,375	312,375	312,375	3,969,000
Inventory and protection of cultural heritage	29,400	29,400	29,400	29,400	29,400	14,700	14,700	14,700	14,700	14,700	220,500
Public participation and strategy for cooperation with the local community	29,400	22,050	7,350	7,350	7,350	7,350	7,350	7,350	7,350	7,350	110,250
Development of traditional trades	147,000	147,000	147,000	147,000	147,000	147,000	147,000	147,000	147,000	147,000	1,470,000
Settlement of title issues	HRK 7,350,000 financed by the Natonal Land Survey Bureau and the Ministry of Justice										0
Conservation of water ecosystems	757,050	132,300	169,050	44,100	44,100	44,100	44,100	44,100	44,100	44.100	1,367,100
TOTAL	**3,491,850**	**2,859,750**	**2,459,175**	**2,334,225**	**2,334,225**	**2,319,525**	**2,319,525**	**2,319,525**	**2,319,525**	**2,319,525**	**25,076,850**

c) Total planning period costs

CURRENT OPERATING COSTS AND ACTIONS PLANS (HRK)										
Year	**2008.**	**2009.**	**2010.**	**2011.**	**2012.**	**2013.**	**2014.**	**2015.**	**2016.**	**2017.**
TOTAL	142,491,850	148,809,750	155,706,675	163,244,100	171,289,594	179,722,663	188,592,818	197,906,483	207,685,832	217,954,147



4.4. Monitoring

The Management Plan will be implemented over a period of 10 years, during which an entire series of monitoring activities will be carried out to ensure that the objectives of the Plan are met. Monitoring entails the ongoing assessment of management activities within the plan. Based on the data recorded through monitoring, the achievements of the Plan can be assessed and specific corrective actions be taken. Adaptive management loops must be created between field actions, monitoring measurements, checking against expectations and adjusting future actions, with each reiteration of activity based on past experience and new information.

Monitoring activities can be classified into different types, according to the level of monitoring:

- Monitoring Management Plan activities.
- Monitoring visitor numbers and satisfaction.
- Monitoring landscape changes.
- Monitoring selected taxa.

In addition, specific monitoring activities are incorporated into the action plans to ensure that the objectives of the action plans are met and to allow for adjustments if necessary.

4.4.1. Monitoring Management Plan activities

The best instrument to monitor performance is the annual operating plan and the annual report, since they contain all Public Institution activities. Once the Management Plan is approved, the annual operating plan should be structured to comply with it. It contains a list of activities tied to objectives, measures and action plans, with an indication of the estimated resources to accomplish these activities (staff and finances). At the end of the year, when the annual report is produced, the same structure is applied, with indication of the activities actually carried out and the resources expended.

Over the course of a few years, these reports will constitute an ideal instrument to assess the degree to which the Management Plan's objectives and measure are achieved and the funds expended for implementation thereof.

4.4.2. Monitoring visitor numbers and satisfaction

In 2004, a study was conducted under the KEC Project to assess the visitor perceptions of the Park. Questionnaires were developed for the study, and the results were tabulated into a database. The information provided through this first survey was used in the preparation of this Management Plan.

A new study will be repeated in five years to analyze changes in visitor views and satisfaction with what the Park has to offer. Additional comments given by visitors will be a welcome contribution to identifying topics to which the Park will have to dedicate attention in the future.

In the coming period, it will be necessary to introduce regular monitoring by means of "secret consumers/ visitors" to more quickly observe and resolve oversights and shortcomings.

4.4.3. Monitoring landscape changes

The conservation objectives and measures set forth in this Management Plan have an impact on the landscape. A measure of its effectiveness can be achieved by comparing land cover areas in and around the Park over time.

As a part of Management Plan preparations, a land cover map at a scale of 1:25.000 has been produced according to the first level of Corine land cover classification and based on two sets of Landsat TM satellite images in 2000 (spring and autumn). It was used for all protected areas. The results of satellite image analysis were then converted into GIS polygon themes.

The repetition of land cover mapping over five and ten year lapses using the same methodology will facilitate observation of changes in the medium and long terms. Combined with more detailed field research, it will improve the understanding on how the National Park's habitats are developing.

4.4.4. Monitoring selected taxa

In addition to the two "desk" monitoring methodologies specified above, the Park will conduct field monitoring that can be implemented on a regular basis following a coordinated methodology. These activities are:

- **Counting traces of large mammals along the transect.** A transect crossing the Park should be defined and followed periodically, recording the position, type and number of large mammals traces found. The transect should be monitored once or twice annually under identical conditions and, preferably, the same staff.
- **Bird monitoring along the transect.** In the implementation of the KEC Project, an inventory of birds was conducted throughout the Park, and a monitoring methodology was defined for corn crake, woodpeckers and owls. This monitoring activity should be implemented on a regular basis with strict adherence to the proposed methodology.

In order to facilitate monitoring activities, the KEC GIS system will provide the necessary data to record and analyze the different parameters recorded in monitoring activities. The KEC Information System has been set up for parks participating in the KEC Project to store and analyze all biological, environmental, social and economic data about these parks. This system will be the main tool to compare indicator data over space and time, and evaluate the results against the objectives and strategies set forth in this Management Plan and in the action plans.

Through user-friendly data entry forms, all information will be entered by the Park staff or by the scientists engaged in monitoring of plants and animals on the Park's behalf. All entered data will be geo-referenced through GPS readings, allowing for spatial analysis and representation of the results on maps. The same data can be used for general monitoring purposes on the national or regional level.


Izvor Kupe.

4.5. Adaptive management

Management planning is an ongoing process. As situations change over time and new information becomes available, it is essential that the Management Plan be reviewed to ensure that it is addressing current needs and to ensure that it remains relevant and applicable to evolving situations.

The review process is periodic (one to five years) and is used to determine the extent to which overall objectives and results have been achieved. It should also identify the reasons for success or failure and areas for improving the plan, including redefining goals and objectives, reviewing policy alternatives and management practices.

The Nature Protection Act requires a formal review of the Plan every five years to assess whether the objectives have been achieved and to revise management policies where appropriate.

The five-year review should ensure that the strategic direction is still relevant to the current conditions, e.g. available resources, potential threats, land use trends and prevailing social and economic circumstances. The review may result in the continuation of the Plan, amendments to sections or a complete overhaul.

Normally the Plan will be reviewed on annually, when the operating plan and annual report are being developed, when achievements are set against the targets of the previous annual plan. Most of the objectives are long-term and cannot be achieved in a single year.

Veliki Waterfall and Sastavci Falls

5. BIBLIOGRAPHY

Agriconsulting: Smjernice Za Izradu Plana Upravljanja. Projekt očuvanja krških ekoloških sustava (IBRD/GEF TF N° 050539 HR). Republika Hrvatska, Ministarstvo kulture, 2005.

Berakovic, B., Cesarec, K., Berakovic, M. : The water balance of the Plitvice Lakes in Croatia, VIIth IAHS Scientific Assembly, Foz de Iguacu (Brazil), 3-9 April 2005

Binks, G., Klarić, Z. i Movčan, J.: Sustav posjećivanja i interpretacija okoliša: s posebnim osvrtom na prihvatni kapacitet. U: Projekt turističke revitalizacije Nacionalnog parka Plitvička jezera. 77.str., Institut za turizam, Zagreb, 1997.

Blaženčić, J. i Blaženčić, Ž.: Makrofite Kozjaka i srednjih Plitvičkih jezera (Macrophytes of Kozjak and the Central Lakes of the Plitvice National Park.) Plitvički bilten 5, 7-26, Plitvička jezera, 1992.

Blaženčić, J. i Blaženčić, Ž.: Makrofite u Plitvičkim jezerima Prošće i Ciginovac (Macrophytes of Plitvice Lakes Prošće and Ciginovac). Plitvički bilten 3-4, 41-50, Plitvička jezera, 1990-91.

Böhm, D.:Regresije u akvatoriju Nacionalnog parka Plitvička jezera. U: Plitvička jezera Nacionalni park (1949-1999), Zbornik radova Simpozija o zaštiti Plitvičkih jezera prigodom 50. obljetnice proglašenja nacionalnim parkom, 24.studenog 1999., 133-138, Društvo za zaštitu Plitvičkih jezera, Zagreb, 2000.

Božičević, S.: Hidrogeološki problemi na području Plitvičkih jezera (Problems of hydrogeological exploration in the Plitvice Lakes area). U.: Plitvička jezera-nacionalno dobro Hrvatske, svjetska baština. Uprava Nacionalnog parka Plitvička jezera, 43-51, Zagreb, 1994.

Božičević, S.: Program hidrogeoloških i morfoloških istraživanja šire okolice Nacionalnog parka Plitvička jezera. Arhiv Instituta za geološka istraživanja, Zagreb, 1989.

Bralić, I., Državna uprava za zaštitu kulturne i prirodne baštine:Die Nationalparks Kroatiens, Zgb, 1995.

Brnek-Kostić, Lj. i Brnek-Kostić, A.: Zaštita voda i biodinamika tvorbe sedre u Nacionalnom parku Plitvička jezera. U: Zaštita i razvojne mogućnosti. Izlaganja povodom proslave 20-godišnjice samoupravljanja, Plitvička jezera, 5. i 6.10.1970. (ur. J. Movčana), 31-35, Nacionalni park Plitvice, Titova Korenica, 1976.

Brnek-Kostić, A.: Prirodni fenomen Plitvičkih jezera, Zagreb, 1979.

Chafez, H., Srdoč, D. & Horvatinčić, N.: Early diagenesis of Plitvice Lakes waterfall and barrier travertine deposits. Geographie physique et Quternaire 48, 245-255, Montreal (Canada), 1994.

Chafez, H., Srdoč, D. & Horvatinčić, N.: Pervasive sparmicritization of waterfall and barrier travertines, Plitvice National Park, Croatia, Yugoslavia. Proc. International Sedimentological Congress, Nottingham, 26.8.-31.08.1990., 82-83, Nottingham (Velika Britanija), 1990

Culibert, M.-Šercelj, A.: Pollen analyses of the Sediments of Plitvička jezera, 1981.

Čolić, K., Pribičević, B. i Švehla, D.: Satelitska i terestrička geodetska mjerenja na području Nacionalnog parka Plitvička jezera. Priroda 89/861, 14-16, Zagreb, 1999. (a)

Direktiva o zastiti prirodnih stanista i divlje faune i flore (Council Directive 92/43/EEC) http://www.cronen.hr/pdf/natura2000/HD_Annex%20II_HR. pdf.

Direktiva o zastiti ptica (Council Directive 79/409/EEC) Annex I, vrste u Hrvatskoj. http://www.cronen.hr/pdf/natura2000/BD_Ipdf.

Državni zavod za zaštitu prirode (DZZP): Hrvatska prema NATURA 2000. Projekt LIFE III- CRO-NEN. Brošura.

Državna uprava za zaštitu prirode i okoliša: Pregled stanja biološke i krajobrazne raznolikosti Hrvatske sa strategijom i akcijskim planovima zaštite, Zagreb, 1999.

Đulić, Beatrica & Tvrtković, Nikola (1979): On some mammals from the Centraladriatic and Southadriatic islands. Acta Biologica 8/1-10 (Prirodoslovna istraživanja 43), 15-35.

Đulić, Beatrica Myotis daubentoni (Kuhl, 1817). U: Draganović, Eugen(ur.): Crvena knjiga životinjskih svojti Republike Hrvatske, Sisavci. Ministarstvo graditeljstva i zaštite okoliša, Zavod za zaštitu prirode, 24-25., Zagreb, 1994.

Eškinja, I., Šojat, V. i Vrhovac, A.: Kemizam kiselih oborina na području Nacionalnog parka Plitvička jezera. XII skup hrvatskih kemičara i I simpozij Ekološka racionalnost u razvoju kemijskih tehnologija, Zagreb, 11.2.-15.2.1991., str.189, Zagreb, 1991.

Franić, D.: Plitvička jezera i njihova okolica. Zagreb, 1910.

Geodetski fakultet Sveučilišta u Zagrebu-Zavod za geomehaniku: Dinamički trodimenzionalni model Plitvičkih jezera, sedrenih barijera i pritoka, Zgb, 2000.

Gušić, B.: Čovjek i zaštita Plitvičkih jezera. U: Plitvička jezera-čovjek i priroda, 71-84, Nacionalni park Plitvice, Zagreb, 1974.

Gušić, B.: Namjesto uvoda.-U: Plitvička jezera-čovjek i priroda. Nacionalni park Plitvice

Habdija, I., Primc-Habdija, B.i Belinić, I.: Procjena stupnja trofije u jezeru Kozjak (Evaluation of the trophic level of the Lake Kozjak/Plitvice Lakes/). Plitvički bilten 3-4, 31-39, Plitvička jezera, 1990-91.

Hidroprojekt 91: NP Plitvička jezera-Odvodnja i pročišćavanje otpadnih voda-Novelacija idejnog rješenja, Zagreb, 2001.

Horvatincic, N., Srdoc, D., Silar, J. & Tvrdikova, H: Comparison of the 14C activity of groundwater and recent tufa from karst areas in Yugoslavia and Czechoslovakia. Radiocnrbort 31, 884-892, New Heaven, 1989.

Horvatinčić N., Čalić, R. & Geyh, M.A.: Interglacialgrowthoftu in Croatia. (7rrntcrrrnry/ Research 53, 185-195, Seattle, Washington (SAD), 2000.

Horvatinčić, N . & Geyh, M . A . : Uranium / thorium da ting of traverti Isillllples. XIV. skup hrvatskih kemicara i IV. hrvatski simpozij o kemiji tehnologiji makromolekula, Zagreb, 6.2.-8.2.1995., str. 296, Zagreb, 1995.

Horvatinčić, N . & Srdoč, D . : A study of physicochemical an climatological factors of tufa deposits. VII International Sympc Pa laeolimnology, Riedlingen, Germa ny, 28.8.-2.9.1.997., Wiirrlmr~~, or isclm Marruskriyte 41, 97-98, Wiirzburg (Njemacka), 1997. (b)

Horvatinčić, N . & Srdoč, N.: Physichemical conditions for tufa percipitation in the Plitvice Lakes area. – V skup sediment. Jugosl., Abstracts, 130-133, Brioni, 1986.

Horvatinčić, N . : Mjerenje radioaktivnog ugljika 14C i tricija 3H u vodi i primjena u hidrologiji. – Fizika, 12, Suppl. 2, Primjena izotop. Analiza istr. Okoliša znan. Privr. Djelatn., Zagreb-Pitvice (1979), Dodatak časopisu Fizika, 141-159, Zagreb, 1980.

Horvatinčić, N . : Radioaktivni izotopi 3H i 14C u atmosferi na području Zagreba i Sljemena. XV. hrvatski skup kemičara i kemijskih inženjera, Opatija, Hrvatska, 24.3.-26.3.1997., str. 352, Zagreb, 1997.

Horvatinčić, N . : Radiocarbon and tritium measurements in water samples and application of isotopic analyses in hydrology. – Fizika, 12, Suppl. 2, Proc. Reg.Conf. Appl. Isotope Anal. Archaeol., Hydrol. Geol., Zagreb-Plitvice (1979), 201-218, Zagreb, 1980.

Horvatinčić, N . : Starost sedre Plitvičkih jezera. Priroda 89/861, 20-22, Zagreb 1999.

Horvatinčić, N . i Srdoč, D . : Talozenje kalcita u krskim voda cite precipita tion in karst waters). XIII. skup hrvatskih kemicara 8.2.-10.2.1993. i II. simpozij Ekoloska racionalnost u razvoju 1 tehnologija, Zagreb, 10.2. i 11.2.1993., str. 258, Zafireh, 1993. (a)

Horvatinčić, N. & Krajcar Bronić, I.: 14C and 3H as indicators of the environmental contamination. RMZ – Mnterials nncl GeoorrZ~ironrncnt 45/156-60, Ljubljana (Slovenija), 1998. (a)

Horvatinčić, N. Krajcar Bronić, I. & Obelić, B.: Long-time a mospheric 3H and '14C record in Croatia. IX International Congress of Ra di; tion Protectiun, Vienna, 14.4.-19.4.1996., 676-678, Vienna (Austrija), 1996.

Horvatinčić, N., Bistrović, R. & Obelić, B.: Radiocarbon and m nium-series dating of travertine. Actn Geolo~S~icn Hurryaric-n 39, 77-80, Budapest (Madarska), 1996.

Horvatinčić, N., Čalić, R. & Geyh, M.A.: 14C and ="'Th/=~'U datil of tufa and the palaeoclimatic significance. XVI International Radiocarb~ Conference Groningen The Netherlands, 16.6.-20.6.1997., p. 81, Groning~ (Nizozemska), 1997.

Horvatinčić, N., Krajcar Bronić, I. & Obelic, B.: Environment tritium measurement. XIII. skup hrvatskih kemicara, Zagreb, 8.2.-10.2.199 i II. simpozij Ekoloska racionalnost u razvoju kemijskih tehnologija, Zagreb 10.2. i 11.2.1993., str. 402, Zagreb, 1993. (b)

Horvatinčić, N., Krajcar Bronić, I. & Obelić, B.: Tritium in the atmosphere over Croatia and Slovenia. I International Symposium on Environmental Contamination in Central and Eastern Europe, Budapest, 12.10.-16.10.1992., 163-165, Budapest (Madarska), 1992. (b)

Horvatinčić, N., Krajcar Bronić, I., Obelić, B. & Bistrović R. : Long-time atmospheric tritium record in Croatia. Actn Gc·nloyicn Hunynric .39, 81-84, Budapest (Madarska), 1996. (c)

Horvatinčić, N., Obelić, B., Krajcar Bronić I.. i Vokal, B. : 14C u atmosferi (14C in atmosphere). IV. simpozij Hrvatskog drustva za zaštitu od zracenja, Zagreb, 11.11.-13.11.1998., 213-218, Zagreb, 1998. (b)

Horvatinčić, N., Obelić, B., Krajcar Bronić, I., Srdoč, D. & Čalić R . : Rudjer Boskovic Institute radiocarbon measurements XIV. Rc ciiocnrhorr 41/2, 199-214, New Heaven (SAD), 1999.

Horvatinčić, N., Srdoč, D., Obelić, B. & Krajcar Bronić: Environmental conditions for travertine formations in karst area. In isotope techniques in the study of past and current environmental changes in the hydrosphere and the atmosphere, 530-532, IAEA, Vienna (Austrija), 1993. (c)

HorvatinčićN . i Srdoč D . : Kemijske i izotopne karakteristi voda s posebnim osvrtom na Plitvicka jezera (Chemical and isotop teristics of karst waters with special emphasis on the Plitvice Lakes 1'ark). Plitnic=ki hilten 3-4, 7-17, Plitvič jezera, 1990-91.

HorvatinčićN. Krajcar Bronić I. i Obelić B.: Tricij u atmosferi, I.. simpozij Hrvatskog društva za zaštitu od zračenja, Zagreb, 24.11.-25.11.199: 303-308, Zagreb, 1992. (a)

Huber, Đ., i Roth, H. U.: Kretanje mrkih medvjeda na području Nacionalnog parka Plitvička jezera (Movenments of brown bears in Plitvice Lakes National Park). Plitvički bilten 2, 77-86, Plitvička jezera, 1989.

Huber, Đ. i Kusak, J.: Stanje medvjeda u Hrvatskoj (Bear status in Croatia). Zbornik sažetaka priopćenja: Simpozij u počast Zdravka Lorkovića. Zagreb, 6.11.-8.11.1995., 88-89, Zagreb, 1995. (c)

Huber, Đ., Veterinarski fakultet Sveučilišta u Zagrebu: Istraživanje o utjecaju ekoloških faktora na pojavu endohelmintskih invazija na području Nacionalnog parka Plitvička jezera, Zagreb, 1979.

IUCN (1994). Guidelines for Protected Areas Management Categories. IUCN, Gland, Švicarska i Cambridge, Velika Britanija.

Kolosvary, G.V.: Verzeichnis der auf der III. Ungarischen wissenschaftlichen Adra-Exkursion gesammelten Landtiere in Dalmatien 1938 (II. Teil). Festschrift für Prof. Dr. Embrik Strand, 5 (1938), 132-138.(Rh. euryale Blas.; Plitvica, In Höhlen; 6. travanj 1938), 1939.

Konvencija o zaštiti divljih europskih species i prirodnih staništa – Bernska konvencija (NN – 6/00).

Kozàk, K., Obelić, B. 6 Horvatinčić, N.: Tritium and 14C in tree rings of the last three decades. Radiocarbon 31, 766-770, New Heaven (SAD), 1989.

Krajcar Bronić, I., Horvatinčić N., Srdoč D. & Obelić: Tritium concentration in the atmosphere over NW Yugoslavia. Nuclear Processes (ed. P. Povinec), 381-386, World Scientific, Si (Singapur), 1992.

Krajcar Bronić, I., Horvatinčić, N. & Obelić, B.: Twode environmental isotope record in Croatia: reconstruction of the past diction of future levels. Radiocarbon 40, 399-416, New Heaven (SAD), 1998.

Krajcar Bronić, I., Horvatinčić, N., Srdoč, D. & Obelić, B.: Experimental determination of the 14C initial activity of calcareous ~ Radiocarbon 34, 593-601, New Heaven (SAD), 1992.

Krajcar Bronić, I., Horvatinčić, N., Srdoč, D. & Obelić, B.: On the initial 14C activity in karst aquifers with short mean residence time. XIIth Intern. Radiocarbon conf., Trondheim, (1985), Radiocarbon, 28, 436-440, New Heaven, 1986.

Krajcar Bronić, I., Obelić, B., Srdoč, D. & Hernaus, tium activity in precipitation and in tap water of NW Yugoslavia Chernobyl accident. IV European Congress and XIII Regional Co~ IRPA, Salzburg, 15.9.86-19.9.86., 761-764, Salzburg (Austrija), 1988.

Krajcar Bronić, I.: Stable isotop composition of Plitvice Lake sediments. – V skup sediment. Jugosl. Abstracts, 134-139, Brioni, 1986.

Krizmanić, J.: Više od pola stoljeća rada u šumarstvu, 2001.

Langhoffer, A.: Fauna hrvatskih pećina I. Rad Jugoslavenske akademije znanosti i umjetnosti 193, 338-364. 1912.

Lukač, G.: Bogastvo i raznolikost ornitofaune NP Plitvička jezera –STUDIJA, 2001.

Marjanac, S.: Izvještaj o speleološkim istraživanjima na području Velikog Javornika (Mala Kapela). Speleolog 4 (1956), 3-4, 38-48. 1957.

Marković, D. (ur.), 2004: Crveni popis ugroženih biljaka i životinja Hrvatske. Državni zavod za zaštitu prirode. Zagreb.

Martinović, J.-Vranković, A.-Vrbek, B.-Krga, M.: Subaqual Soils in Plitvice Lakes, 1987.

Matoničkin, I.: PMF-Zagreb Građa za limnofaunu krških voda tekućica Hrvatske, 1987.

Matoničkin, I.-Pavletić, Z.-Tavčar, V.-Krkač, N.: Acta Biologica VII/1:Limnološka istraživanja reikotopa i fenomena protočne travertinizacije u Plitvičkim jezerima, Zagreb, 1971.

Muller, H. & Obelić, B. : Pollen distribution in radiocarbon dated sediment cores from a Plitvice Lake as indicator of human settlements. – V skup sediment. Jugoslav., Abstracts, 152-155, Brioni, 1986.

Muller, H.: Palynological investigation of a 12, 3 m long section from the lake Prošće, Plitvice National Park, Yugoslavia. – V skup sediment. Jugosl., Abstracts, 156-157, Brioni, 1986.

NP Plitvička jezera: Plitvička jezera Nacionalni park, Zagreb, 1958.

NP Plitvička jezera: Plitvička jezera: Prirodoslovni turistički vodič;fotomonografija-HR, Zagreb, 1998.

NP Plitvička jezera: Preliminary Draft for the Regional Master Plan of the Plitvice Lakes NP, Zagreb, 1984.

NP Plitvička jezera: Prostorni plan, Zgb, 1985.

NP Plitvička jezera: Prostorni plan-Idejno rješenje, 1984.

NP Plitvička jezera: Prostorni plan-Prijedlog 1976/77

NP Plitvička jezera-HAZU: Plitvička jezera:Nacionalno dobro Hrvatske-svjetska baština, Zagreb, 1994.

NP Plitvička jezera-Turistkomerc Zagreb: Plitvice, 1990

Nikolić, T & Topić, J., 2005: Crvena knjiga vaskularne flore Hrvatske. Ministarstvo kulture, Državni zavod za zaštitu prirode, Republika Hrvatska.

Obelić, B., Horvatinčić, N. & Krajcar Bronić, I.: '14C a activity in the atmosphere. In: Isotope techniques in the study o current environmental changes in the hydrosphere and the atmosl 493, IAEA, Vienna (Austrija), 1993.

Obelić, B., Horvatinčić, N. & Krajcar Bronić, I.: Concentration of 14C in tree-rings from Plitvice National Park region. Health Physics 65, 334-335, New York (SAD), 1993.

Obelić, B., Horvatinčić, N. & Krajcar Bronić, I.: Radiocarbon concentration in the environment. XIII. skup hrvatskih kemičara 8.2.-10.2.1993., Zagreb, i II. simpozij Ekološka racionalnost u razvoju tehnologija, Zagreb, 10.2. i 11.2.1993., str. 408, Zagreb, 1993.

Obelić, B., Horvatinčić, N., Krajcar Bronić, I. & Kozak, K.: Concentration of 14C and 3H in tree-rings from Plitvice National Park, I. International Symposium on Environmental Contamination in Central and Eastern Europe, Budapest, 12.10.-16.10.1992., 505-507, Budapest (Mađarska), 1992.

Obelić, B., Horvatinčić, N., Srdoč, D., Krajcar Bronić, I., Sliepčević, A . & Grgić, S . : Rudjer Boskovic Institute radiocarbon measurements XIII. Radiocarbon 36/2, 303-324, New Haven (SAD), 1993. (d)

Obelić, B., Horvatinčić, N. i Krajcar Bronić, I.: Fizikalno-kemijska i izotopna istrazivanja vode i sedre u Nacionalnom parku Plitvička jezera. U: Plitvička jezera Nacionalni park (1949-1999), Zbornik radova Simpozija o zaštiti Plitvičkih jezera prigodom 50. obljetnice proglašavanja nacionalnim parkom, 24. studenoga 1999., 25-36, Društvo za zaštitu Plitvičkih jezera, Zagreb, 2000.

PMF-Sveučilište u Zagreb: Ekološka istraživanja na trajnim plohama u akvatičkom dijelu ekosistema NP Plitvička jezera-STUDIJA 1986, Zagreb, 1987.

PMF-Sveučilište u Zagrebu: Ekološka istraživanja na trajnim plohama u akvatičkom dijelu ekosistema Nacionalnog parka Plitvička jezera-STUDIJA 1988, Zagreb, 1989.

PMF-Sveučilište u Zagrebu: Ekološka istraživanja na trajnim plohama u akvatičkom dijelu NP Plitvička jezera-ELABORAT 1985, Zagreb, 1985.

PMF-Sveučilište u Zagrebu:Vertikalni raspored saprofitskih bakterija i fitoplanktona u Prošćanskom jezeru i jezeru Kozjak (NP Plitvička jezera) u 1985/86., 1989.

Polšak, A.: Geološki aspekti zaštite Plitvičkih jezera, 1974.

Pravilnik o proglašavanju strogo zaštićenih i zaštićenih svojti RH (NN 7/06).

Program gospodarenja GJ Medveđak-Plitvički Klanac1987-1996, Zagreb, 1987.

Protektion d.o.o-NP Plitvička jezera: Procjena ugroženosti od požara-ELABORAT, 1999.

Radović, D., Kralj, J., Tutiš, V. Ćiković, D., 2003: Crvena knjiga ugroženih ptica Hrvatske. Ministarstvo zaštite okoliša i prostornog uređenja, Zagreb.

Redenšek, V.: Topografski opis pećina u nacionalnom parku Plitvička jezera. U: Šafar, Josip (ur): Nacionalni park Plitvička jezera. Nacionalni park «Plitvička jezera», 295-327, Zagreb, 1958.

Republički hidrometeorološki zavod SR Hrvatske: Hidrološka studija sliva Plitvičkih jezera, Zagreb, 1989.

Republički hidrometeorološki zavod-CMI: Meteorološka stanica Plitvice-Kozjak:Rezultati mjerenja i statističke obrade u periodu I-IX 1989

RH Državna geodetska uprava-Geodetski zavod Rijeka: Homogeno polje GPS točaka NP Plitvička jezera, 1998.

RH Državna geodetska uprava-Geodetski zavod Rijeka: Položajni opisi GPS točaka homogenog polja NP Plitvička jezera-knjiga 1 i 2

Riđanović, J.: Geografski smještaj (položaj) i hidrogeografske značajke Plitvičkih jezera

Rucner, D.: Birds in Plitvička jezera Lakes National Park, A Contribution to the Study of the Ornithofauna of Lika (Croatia), 1954.

Rucner, D.:Birds in Plitvička jezera Lakes National Park, A Contribution to the Study of the Ornithofauna of Lika (Croatia), 1954.

Rucner, D.:Ptice hrvatske obale Jadrana, Zgb, 1998.

Srdoč, D . : Taloženje sedre u krškim vodama (Deposition of trvertine in karst waters). U: Nacionalni park Krka. Stanje istraženosti i problemi ekosistema. Zbornik radova sa Simpozija, Šibenik, 3.10.-7.10.1 monografije, knjiga 2 (ur. M. Kerovec), 205-208, Hrvatsko eko: Zagreb, 1990.

Srdoč, D .: Taloženje sedre u krškim vodama (Deposition of travertine in karst waters). U: Nacionalni park Krka. Stanje istrazenosti i problemi ekosistema. Zbornik sazetaka priopcenja. Sibenik, 3.10.-7.10 1989. Hrvatsko ekološko društvo i Nacionalni park Krka, Šibenik, 1989.

Srdoč, D., Chafetz, H. & Utech, N.: Radiocarbon dating deposits, Arbuckle Mts., Oklahoma. Radiocarbon 31, 619-626, (SAD), 1989.

Srdoč, D., Horvatinčić, N., Ahel, M., Giger, W., C., Krajcar Bronić, I., Petricioli, D., Pezdić, J., E . & Plenković – Moraj, A . : Anthropogenic influence on the 14C activity and other constituents of recent lake sediments: A case study. Radiocarbon 34/3, 585-595, New Heaven (SAD), 1992. (a)

Srdoč, D., Horvatinčić, N., Giger, W., Petricioli, D., Ahel, M., Schaffner, C., Pezdič, J., Marčenko, E. & Plenković, A. : Anthropogenic influence on the 14C activity of recent lake sediments, Radiocarbon 34, 155-175, New Heaven (SAD), 1992. (b)

Srdoč, D., Horvatinčić, N., Obelić, B., Krajcar, I., & Sliepčević, A. : Additional comentary. Rad JAZU 441/23, str. 238, Zagreb, 1988.

Srdoč, D., Osmond, J., Horvatinčić, N., Dabous, A. & Obelić, B.: Radiocarbon and uranium-series dating of the Plitvice Lakes Travertines, Radiocarbon 36/2, 203-219, New Heaven (SAD), 1994.

Srdoč, D., Horvatinčić, N., Obelić, B., Krajcar, I., Sliepčević, A., Procesi taloženja kalcita u krškim vodama sposebnim osvrtom na Plitvička jezera;JAZU: Krš Jugoslavije 11/4-6, Zagreb, 1985.

Šegulja, N.& Krga M., 1990/91: Posebno zaštićene vrste u flori Nacionalnog parka Plitvička jezera. Plitvički bilten 3, 91-102.

Šegulja, N.& Krga M., 1990a: Ligularia sibirica (L.) Cass.- eine neue Art der jugoslawischen Flora. Acta bot. Croat. 49, 137-142.

Šegulja, N.& Krga M., 1990b: Neke karakteristike staništa i vegetacije vrste Ligularia sibirica (L.) Cass. Na području Nacionalnog parka Plitvička jezera. Biosistematika 16, 47-52.

Šegulja, N.& Krga M., 1990c: Neke florne i vegetacijske osobitosti travnjaka Nacionalnog parka Plitvička jezera. Ekološki glasnik 7-8, 64-72.

Šegulja, N., 2000: Additions to flora of Plitvice Lakes National Park (Croatia). Acta bot. Croat. 59 (1), 233-242.

Šegulja, N., 2005: Flora Croatica, Vegetacija travnjaka, cretišta i močvarnih staništa Nacionalnog parka Plitvička jezera, Natura Coatica časopis hrvatskog prirodoslovnog muzeja vol.14, Suppl.2, 1-194.

Šegulja, N.-Krga, M.:Ligularia Sibirica(L) Cass.-Eine Neue Art der Jugoslawischen flora-separtum, Zgb, 1990.

Thomas, Lee i Middleton, Julie, (2003). Guidelines for Management Planning of Protected Areas. IUCN Gland, Švicarska i Cambridge, Velika Britanija. http://www.iucn.org

US National Park Service Mission: Croatia Karst Ecosystem Conservation Project, 2000.

Vidaković, P: Pedeset godina gospodarenja i turističkog razvoja NP Plitvička jezera.U: Plitvička jezera Nacionalni park (1949-1999), Zbornik radova Simpozija o zaštiti Plitvičkih jezera prigodom 50. obljetnice proglašenja nacionalnim parkom, 24.studenog 1999., 37-110, Društvo za zaštitu Plitvičkih jezera, Zagreb, 2000.

Vidaković, P.: Plitvička jezera Nacionalni park, Mala turistička monografija, Zagreb, 1997.

Vidaković.P.: Nacionalni park „Plitvice"-vodič. 76 str., Zadružna štampa, Zagreb, 1974.

Vidaković.P.: Plitvička jezera: zaštita i turistička valorizacija. 286 str., zemljopisne karte, Nacionalni park Plitvice, Plitvička jezera, 1977.

Zavod za javno zdravstvo Županije Primorsko-Goranske: Izvještaj o ispitivanju kakvoća podzemnih i površinskih voda na području primorskih i goranskih slivova u 1998 godini, 1999.

6. APPENDICES

6.1. Appendix 1: Relevant laws and subordinate legislation and documents regulating management of Plitvice Lakes National Park

Besides the Nature Protection Act, during development of the Management Plan, the following laws and subordinate legislation and documents regulating protected areas were taken into consideration:

- Physical Planning Act (*Narodne novine*, no. 30/94, 68/98, 35/99, 61/00, 32/02 and 100/04)
- Forests Act (*Narodne novine*, no. 140/05)
- Agriculture Act (*Narodne novine*, no. 66/01)
- Organic Farming and Foods Act (*Narodne novine*, no. 12/01)
- Agriculture, Fisheries and Forestry State Subsidies Act (*Narodne novine*, no. 87/02)
- Waters Act (*Narodne novine*, no. 107/95, 150/05)
- Environmental Protection Act (*Narodne novine*, no. 82/94, 128/99)
- Environmental Impact Assessment Directive (*Narodne novine*, no. 34/97)
- Mining Act (*Narodne novine*, no. 190/03)
- Regions of Special State Care Act (*Narodne novine*, no. 26/03, 42/05)
- Mountain and Highland Regions Act (*Narodne novine*, no. 12/02, 32/02, 117/03, 42/05, 90/05)
- Hunting Act (*Narodne novine*, no. 140/05)
- Freshwater Fishing Act (*Narodne novine*, no. 49/05)
- Air Protection Act (*Narodne novine*, no. 78/04)
- Animal Husbandry Act (*Narodne novine*, no. 70/97)
- Farmlands Act (*Narodne novine*, no. 66/01)
- Construction Act (*Narodne novine*, no. 175/03 and 100/04)
- Cultural Resources Protection and Preservation Act (*Narodne novine*, no. 69/99, 151/03 and 157/03)
- Republic of Croatia Biological and Landscape Diversity Conservation Strategy and Action Plan (*Narodne novine*, no. 81/99)
- Republic of Croatia Physical Planning Strategy
- Croatian Tourism Developmental Strategy (*Narodne novine*, no. 113/93)

The conservation, improvement and use of Plitvice Lakes National Park are defined in the following laws and subordinate legislation:

- Act Proclaiming Plitvice Lakes a National Park (*Narodne novine*, no. 29/49, 34/65, 13/97);
- Plitvice Lakes National Park Physical Plan (*Narodne novine*, no. 34 /86)
- Plitvice Lakes National Park Internal Rules of Order (*Narodne novine*, no. 38/96);
- Rules on Rates for Compensation of Damages Caused by Illegal Actions involving Protected Animal Species (*Narodne novine*, no. 84/96 and 79/02)
- Amphibian Protection Rules (*Narodne novine*, no. 80/99) (Article 2 rescinded)
- Terrestrial Snail (*Gastropoda terrestria*) Protection Rules (*Narodne novine*, no. 29/99) (Article 2 rescinded)
- Nature Protection Sign Rules (*Narodne novine*, no. 178/03)
- Mushroom (*Fungi*) Protection Rules (*Narodne novine*, no. 34/02) (Article 4 rescinded)
- Rules on Proclamation of Protected and Strictly Protected Wild Taxa (*Narodne novine*, no. 7/06)
- Rules on Habitat Types, Habitat Maps, Threatened and Rare Habitat Types and Habitat Maintenance Measures (*Narodne novine*, no. 7/06)
- Rules on Trans-border Traffic and Trade of Protected Species (*Narodne novine*, no. 34/06)
- Rules on Risk Assessment of Intentional Release of Genetically-modified Organisms into the Environment (*Narodne novine*, no. 136/06)



6.2. Appendix 2: Habitats in Plitvice Lakes National Park

Table 13. Area of habitat types based on the National Park's habitat map (National Habitat Classification, level III)

NHC_CODE	NHC description	Surface
A.1.1.1.2.	Mesotrophic waters	81.8
A.1.1.1.4.	Oligotrophic/mesotrophic waters rich in limestone	93.3
A.1.2.1.	Seasonal ponds	1.8
A.2.3.	Constant waterways	3.1
A.3.5.*	Tufa-forming riverine associations	
A.2.3./A.2.5.1.2.	Constant waterways / Biogenic waterfalls	4.9
A.2.3./A.4.1.	Constant waterways / Reed beds, bulrushes, high sedge	9.7
A.2.5.1.2./A.1.1.1.4.	Biogenic waterfalls / Oligotrophic/mesotrophic waters rich in limestone	14.7
A.4.1.-C.1.1.-E.2.1.	Reed beds, bulrushes, high sedge – Basophilic peat fens (low peat) – Black alder and field ash flood forests	34.0
B.1.3.-B.2.	Alpine-Carpathian Balkan limestone rocks – Gullies	10.6
C.1.2.*	Acidophilous peat bogs (transitional and raised bogs)	
C.2.2.	Central European wetland meadows	9.8
C.2.2.-E.2.1.	Central European wetland meadows – Black alder and field ash flood forests	30.5
C.2.2.-E.4.5.1.	Central European wetland meadows – Beech forest with giant dead nettle	2.8
C.2.2.-E.5.2.1.	Central European wetland meadows – Dinaric beech-fir forest	25.1
C.2.2.-E.5.2.1.-7.3.5.	Central European wetland meadows – Dinaric beech-fir forest – Spruce forest with white sedge on dolomite	2.4
C.2.2./C.2.5.1.-I.2.1.	Central European wetland meadows / Purple moor grass and Pannonian sweet pea meadows – Mosaics of cultivated fields	20.9
C.2.2./D.1.2.1.	Central European wetland meadows	7.8
C.2.3.1.	Moderately wet meadows	77.7
C.2.3.1./C.2.5.1.	Moderately wet meadows / Illyrian-sub-Mediterranean river valley meadows	14.9
C.2.3.1./D.1.2.1.	Moderately wet meadows / Mesophilous bushes and underbrush of continental, exceptionally maritime regions	22.1
C.2.3.2.	Central European mesophilous mowed meadows	266.4
C.2.3.2.-E.5.2.1.-E.7.3.5.	Central European mesophilous mowed meadows – Dinaric beech-fir forest – Spruce forest with white sedge on dolomite	14.9
C.2.3.2.-I.2.1.	Central European mesophilous mowed meadows – Mosaics of cultivated fields	181.7
C.2.3.2./C.2.5.1.	Central European mesophilous mowed meadows / Illyrian-sub-Mediterranean river valley meadows	12.9
C.2.3.2./C.3.3.1.	Central European mesophilous mowed meadows / Mountain bromegrass meadows on carbonate base	63.5
C.2.3.2./C.3.3.1./E.5.2.1.	Central European mesophilous mowed meadows / Mountain bromegrass meadows on carbonate base / Dinaric beech-fir forest	3.5
C.2.3.2./C.3.4.3.2.	Central European mesophilous mowed meadows / Purple moor grass and hawksbeard meadow	140.2

NHC_CODE	NHC description	Surface
C.2.3.2./D.1.2.1.	Central European mesophilous mowed meadows / Mesophilous bushes and underbrush of continental, exceptionally maritime regions	67.1
C.2.3.2./D.1.2.1.-E.4.1.3.	Central European mesophilous mowed meadows / Mesophilous bushes and underbrush of continental, exceptionally maritime regions – Beech forest with white sedge	40.3
C.2.3.2./E.4.1.3.	Central European mesophilous mowed meadows / Beech forest with white sedge	4.8
C.2.3.2./E.9.2.3.	Central European mesophilous mowed meadows / Scots pine plantations	2.6
C.2.4.1.	Nitrophilous pastures and meadows – mowed lowland vegetation belt	9.8
C.2.5.1.	Illyrian-sub-Mediterranean river valley meadows	62.9
C.2.5.1.-E.2.1.	Illyrian-sub-Mediterranean river valley meadows – Black alder and field ash flood forests	20.1
C.2.5.1./C.2.2.4.	Illyrian-sub-Mediterranean river valley meadows / Central European wetland meadows 4. Seasonally wet meadows	56.5
C.3.3.1.	Mountain bromegrass meadows on carbonate base	522.1
C.3.3.1.-D.1.2.1.	Mountain bromegrass meadows on carbonate base – Mesophilous bushes and underbrush of continental, exceptionally maritime regions	10.8
C.3.3.1.-E.4.5.1.	Mountain bromegrass meadows on carbonate base – Beech forest with giant dead nettle	11.9
C.3.3.1.-E.5.2.1.	Mountain bromegrass meadows on carbonate base – Dinaric beech-fir forest	25.6
C.3.3.1.-I.2.1.	Mountain bromegrass meadows on carbonate base – Mosaics of cultivated fields	58.4
C.3.3.1./C.2.3.2.	Mountain bromegrass meadows on carbonate base / Central European mesophilous mowed meadows	44.1
C.3.3.1./C.3.4.1.	Mountain bromegrass meadows on carbonate base / Western European heaths	26.7
C.3.3.1./C.3.4.3.2.	Mountain bromegrass meadows on carbonate base / Purple moor grass and hawksbeard meadow	45.6
C.3.3.1./C.3.5.	Mountain bromegrass meadows on carbonate base / . Sub-Mediterranean and epi-Mediterranean dry grasslands	21.8
C.3.3.1./C.3.5.-E.4.5.1.	Mountain bromegrass meadows on carbonate base / Sub-Mediterranean and epi-Mediterranean dry grasslands – Beech forest with giant dead nettle	65.4
C.3.3.1./D.1.2.1.	Mountain bromegrass meadows on carbonate base / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	363.4
C.3.3.1./D.1.2.1.-E.4.5.1.	Mountain bromegrass meadows on carbonate base / Mesophilous bushes and underbrush of continental. exceptionally maritime regions – Beech forest with giant dead nettle	91.5
C.3.3.1./D.1.2.1.-E.5.2.1.	Mountain bromegrass meadows on carbonate base / Mesophilous bushes and underbrush of continental. exceptionally maritime regions – Dinaric beech-fir forest	48.1
C.3.3.1./E.3.5.6.	Mountain bromegrass meadows on carbonate base / Hop hornbeam forest and underbrush with autumn moor grass	6.9
C.3.3.1./E.5.2.1.	Mountain bromegrass meadows on carbonate base / Dinaric beech-fir forest	14.0
C.3.3.1./E.9.2.2.-E.9.2.3.	Mountain bromegrass meadows on carbonate base / Black pine plantations – Scots pine plantations	3.3
C.3.4.1.	Western European heaths	74.1
C.3.4.1./C.2.3.2.	Western European heaths / Central European mesophilous mowed meadows	28.2
C.3.4.1./C.3.3.1.	Western European heaths / Mountain bromegrass meadows on carbonate base	199.9

NHC_CODE	NHC description	Surface
C.3.4.1./C.3.3.1./C.3.4.3.2.	Western European heaths / Mountain bromegrass meadows on carbonate base / Purple moor grass and hawksbeard meadow	28.0
C.3.4.1./C.3.3.1./D.1.2.1.	Western European heaths / Mountain bromegrass meadows on carbonate base / . Mesophilous bushes and underbrush of continental. exceptionally maritime regions	15.8
C.3.4.1./C.3.4.3.2.	Western European heaths / Purple moor grass and hawksbeard meadow	92.3
C.3.4.1./D.1.2.1.	Western European heaths / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	15.3
C.3.4.1./E.9.2.3.	Western European heaths / Scots pine plantations	36.4
C.3.4.3.2.	Purple moor grass and hawksbeard meadow	167.6
C.3.4.3.2./C.3.3.1.	Purple moor grass and hawksbeard meadow / Mountain bromegrass meadows on carbonate base	118.3
C.3.4.3.2./C.3.4.1.	Purple moor grass and hawksbeard meadow / Western European heaths	14.0
C.3.4.3.2./D.1.2.1.	Purple moor grass and hawksbeard meadow / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	6.3
C.3.5.	Sub-Mediterranean and epi-Mediterranean dry grasslands	9.9
C.3.5.-E.3.1.5.	Sub-Mediterranean and epi-Mediterranean dry grasslands – Durmast oak and hornbeam forest	26.6
C.3.5./C.3.3.1.-D.1.2.1.	Sub-Mediterranean and epi-Mediterranean dry grasslands / Mountain bromegrass meadows on carbonate base – Mesophilous bushes and underbrush of continental. exceptionally maritime regions	21.7
C.3.5./D.1.2.1.	Sub-Mediterranean and epi-Mediterranean dry grasslands / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	17.3
D.1.2.1.	Mesophilous bushes and underbrush of continental. exceptionally maritime regions	145.0
D.1.2.1.-C.3.3.1.	Mesophilous bushes and underbrush of continental. exceptionally maritime regions – Mountain bromegrass meadows on carbonate base	197.1
D.1.2.1.-E.4.5.1.	Mesophilous bushes and underbrush of continental. exceptionally maritime regions – Beech forest with giant dead nettle	11.7
D.1.2.1.-E.5.2.1.	Mesophilous bushes and underbrush of continental. exceptionally maritime regions – Dinaric beech-fir forest	4.1
D.1.2.1./C.2.3.2.	Mesophilous bushes and underbrush of continental. exceptionally maritime regions / Central European mesophilous mowed meadows	7.8
D.1.2.1./C.3.3.1.	Mesophilous bushes and underbrush of continental. exceptionally maritime regions / Mountain bromegrass meadows on carbonate base	230.3
D.1.2.1./C.3.3.1.-E.4.5.1.	Mesophilous bushes and underbrush of continental. exceptionally maritime regions / Mountain bromegrass meadows on carbonate base – Beech forest with giant dead nettle	99.0
D.1.2.1./C.3.3.1.-E.5.2.1.	Mesophilous bushes and underbrush of continental. exceptionally maritime regions / Mountain bromegrass meadows on carbonate base – Dinaric beech-fir forest	17.5
D.1.2.1./C.3.5.	Mesophilous bushes and underbrush of continental. exceptionally maritime regions / Sub-Mediterranean and epi-Mediterranean dry grasslands	40.3
D.1.2.1./E.4.5.1.	Mesophilous bushes and underbrush of continental. exceptionally maritime regions / Beech forest with giant dead nettle	268.8
D.1.2.1./E.5.2.1.	Mesophilous bushes and underbrush of continental. exceptionally maritime regions / Dinaric beech-fir forest	170.8
E.2.1.-C.2.3.1.	Black alder and field ash flood forests – Moderately wet meadows	14.5
E.3.1.5.	Durmast oak and hornbeam forest	2.8

NHC_CODE	NHC description	Surface
E.3.1.5.-C.3.3.1.	Durmast oak and hornbeam forest – Mountain bromegrass meadows on carbonate base	3.9
E.3.1.5.-C.3.3.1./C.3.5.	Durmast oak and hornbeam forest – Mountain bromegrass meadows on carbonate base / Sub-Mediterranean and epi-Mediterranean dry grasslands	1.9
E.3.1.5.-C.3.5./D.1.2.1.	Durmast oak and hornbeam forest – Sub-Mediterranean and epi-Mediterranean dry grasslands / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	2.4
E.3.1.5.-E.4.5.1.	Durmast oak and hornbeam forest – Beech forest with giant dead nettle	98.3
E.3.1.5./C.3.3.1.	Durmast oak and hornbeam forest / Mountain bromegrass meadows on carbonate base	3.9
E.3.5.6.	Hop hornbeam forest and underbrush with autumn moor grass	56.7
E.4.1.3.	Beech forest with white sedge	985.0
E.4.5.1.	Beech forest with giant dead nettle	7107.0
E.4.5.1.-C.2.3.2.	Beech forest with giant dead nettle – Central European mesophilous mowed meadows	87.5
E.4.5.1.-C.3.3.1.	Beech forest with giant dead nettle – Mountain bromegrass meadows on carbonate base	107.1
E.4.5.1.-C.3.3.1./D.1.2.1.	Beech forest with giant dead nettle – Mountain bromegrass meadows on carbonate base / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	40.6
E.4.5.1.-D.1.2.1.	Beech forest with giant dead nettle – Mesophilous bushes and underbrush of continental. exceptionally maritime regions	11.1
E.4.5.1.-D.1.2.1./C.3.3.1.	Beech forest with giant dead nettle – Mesophilous bushes and underbrush of continental. exceptionally maritime regions / Mountain bromegrass meadow on calcified base	7.2
E.4.5.1./D.1.2.1.	Beech forest with giant dead nettle / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	238.9
E.4.6.1.	Beech and hop hornbeam forest	214.2
E.4.6.1./D.1.2.1.	Beech and hop hornbeam forest / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	10.2
E.5.2.1.	Dinaric beech-fir forest	10746.5
E.5.2.1.-C.2.3.2.	Dinaric beech-fir forest – Central European mesophilous mowed meadows	9.6
E.5.2.1.-C.3.3.1./D.1.2.1.	Dinaric beech-fir forest – Mountain bromegrass meadows on carbonate base / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	11.7
E.5.2.1.-E.7.3.5.	Dinaric beech-fir forest – Spruce forest with white sedge on dolomite	2749.1
E.5.2.1.-E.7.3.5./D.1.2.1.	Dinaric beech-fir forest – Spruce forest with white sedge on dolomite / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	42.0
E.5.2.1.-E.9.2.3./D.1.2.1.	Dinaric beech-fir forest – Scots pine plantations / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	24.8
E.5.2.1./D.1.2.1.	Dinaric beech-fir forest / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	272.9
E.7.3.5.	Spruce forest with white sedge on dolomite	997.2
E.7.3.5./D.1.2.1.	Spruce forest with white sedge on dolomite / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	18.8
E.7.4.1.	Scots pine forest with hellebore on dolomite	
E.9.2.1.	Common spruce plantations	4.2

NHC_CODE	NHC description	Surface
E.9.2.2.	Black pine plantations	9.1
E.9.2.2.-E.9.2.3.	Black pine plantations – Scots pine plantations	117.6
E.9.2.2.-E.9.2.3./C.3.3.1.	Black pine plantations – Scots pine plantations / Mountain bromegrass meadows on carbonate base	5.1
E.9.2.2./D.1.2.1.	Black pine plantations / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	12.5
E.9.2.3.	Scots pine plantations	236.1
H.1.*	Karst caves and pit-caves	
E.9.2.3.-C.2.3.2.	Scots pine plantations – Central European mesophilous mowed meadows	11.3
E.9.2.3.-C.3.3.1.	Scots pine plantations – Mountain bromegrass meadows on carbonate base	12.1
E.9.2.3./C.3.4.1.	Scots pine plantations / Western European heaths	4.8
E.9.2.3./D.1.2.1.	Scots pine plantations / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	42.4
I.2.1.	Mosaics of cultivated fields	334.1
I.2.1.-A.1.1.1.4.	Mosaics of cultivated fields – Oligotrophic/mesotrophic waters rich in limestone	7.6
I.2.1.-C.2.3.1.	Mosaics of cultivated fields – Moderately wet meadows	26.1
I.2.1.-C.2.3.2.	Mosaics of cultivated fields – Central European mesophilous mowed meadows	96.5
I.2.1.-C.2.3.2./D.1.2.1.	Mosaics of cultivated fields – Central European mesophilous mowed meadows / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	14.5
I.2.1.-C.2.5.1.	Mosaics of cultivated fields – Illyrian-sub-Mediterranean river valley meadows	10.8
I.2.1.-C.3.3.1.	Mosaics of cultivated fields – Mountain bromegrass meadows on carbonate base	19.4
I.2.1.-C.3.3.1./D.1.2.1.	Mosaics of cultivated fields – Mountain bromegrass meadows on carbonate base / Mesophilous bushes and underbrush of continental. exceptionally maritime regions	7.1
I.2.1.-D.1.2.1.	Mosaics of cultivated fields – Mesophilous bushes and underbrush of continental. exceptionally maritime regions	6.8
I.2.1.-D.1.2.1./C.3.3.1.	Mosaics of cultivated fields – Mesophilous bushes and underbrush of continental. exceptionally maritime regions / Mountain bromegrass meadows on carbonate base	46.3
I.8.1.8.	Green belts for sports and recreation	13.6
J.1.	Villages	75.3
J.1.-C.2.3.2.	Villages – Central European mesophilous mowed meadows	23.3
J.1.-I.2.1.	Villages – Mosaics of cultivated fields	196.4
J.2.-J.3.	Towns – Other developed non-commercial zones	6.1
J.2.3.	Other urban zones	24.6
J.4.3.1.1.	Quarries	11.6
J.4.4.1.	Rail traffic zones	2.0

6.3 Appendix 3: Ecological network in the territory of Plitvice Lakes National Park

Table 14.: Important areas for wild taxa and habitat types in Ecological Network within the boundaries of Plitvice Lakes National Park. *- priority habitats; # – internationally important areas = potential Natura 2000 areas.

area code	**HR2000112 #**			
area designation	**Rodića Cave**			
conservation objectives	**wild taxa**			
	species		English name	
			endemic taxa	
	Habitat types			
	NHC code	NHC habitat	Natura 2000 code	Habitat type
	H.1.	Karst caves and pit-caves	8310	
area code	**HR2000170 #**			
area designation	**Šupljara Cave**			
conservation objectives	**wild taxa**			
	species		English name	
			endemic taxa	
	Habitat types			
	NHC code	NHC habitat	Natura 2000 code	Habitat type
	H.1.	Karst caves and pit-caves	8310	
area code	**HR2000218**			
area designation	**Crna Cave**			
conservation objectives	**Habitat types**			
	NHC code	NHC habitat	Natura 2000 code	Habitat type
	H.1.	Karst caves and pit-caves	8310	
area code	**HR2000312**			
area designation	**Golubnjača Cave**			
conservation objectives	**Habitat types**			
	NHC code	NHC habitat	Natura 2000 code	Habitat type
	H.1.	Karst caves and pit-caves	8310	
area code	**HR2000564**			
area designation	**Delićka Meadow**			
conservation objectives	**wild taxa**			
	species		English name	
			threatened field mushrooms	
conservation measure	**number**	measure		
	Other	Maintain habitats		
area code	**HR2000565**			
area designation	**Mihaljevac pine forest**			
conservation objectives	**wild taxa**			
	species		English name	
			threatened forest mushrooms	
area code	**HR2000595 #**			
area designation	**Korana River**			
conservation objectives	**wild taxa**			
	species		English name	
	Astacus astacus		European crayfish	
	Habitat types			
	NHC code	NHC habitat	Natura 2000 code	Habitat type
			3260	Waterways with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
	A.3.5.	Tufa-forming riverine associations		

area code	**HR5000597**			
area designation	**Vrhovinsko Field**			
conservation objectives	**Habitat types**			
	NHC code	NHC habitat	Natura 2000 code	**Habitat type**
	C.2.1.	Transition from high sedges to hygrophilous grasslands		
area code	**HR2000598 #**			
area designation	**Brezovac**			
conservation objectives	**Habitat types**			
	NHC code	NHC habitat	Natura 2000 code	Habitat type
			4030	European dry heaths
			6210	Dry continental grasslands (*Festuco-Brometea*)
	C.3.3.1.1.	Bromegrass and hoary plantain fields		
	C.3.4.2.1.	Matgrass fields	6230*	
	C.3.4.3.2.	Purple moor grass and hawksbeard meadow		
area code	**HR2000599 #**			
area designation	**Homoljačko Field**			
conservation objectives	**Habitat types**			
	NHC code	NHC habitat	Natura 2000 code	Habitat type
			4030	European dry heaths
			6210	Dry continental grasslands (*Festuco-Brometea*)
	C.3.3.1.1.	Bromegrass and hoary plantain fields		
	C.3.4.2.1.	Matgrass fields	6230*	
	C.3.4.3.2.	Purple moor grass and hawksbeard meadow		
area code	**HR2000698 #**			
area designation	**Plitvice**			
conservation objectives	**Habitat types**			
	NHC code	**NHC habitat**	Natura 2000 code	Habitat type
			3260	Waterways with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
area code	**HR2000699 #**			
area designation	**Plitvička Lakes – peat bog**			
conservation objectives	**Habitat types**			
	NHC code	**NHC habitat**	**Natura 2000 code**	**Habitat type**
			7230	Alkaline fens
	C.1.1.1.2.	Dinaric alkaline fens with cotton grass		
	C.1.1.1.4.	Alkaline fens with purple bromegrass and tawny sedge		
	C.1.1.1.5.	Fens with bog sedge		
area code	**HR2000700 #**			
area designation	**Plitvička Lakes – along Matica River**			
conservation objectives	**Habitat types**			
	NHC code	NHC habitat	Natura 2000 code	**Habitat type**
			7150	Depressions on peat base (*Rhynchosporion*)

area code	**HR2000952**			
area designation	**Southwestren slopes of Medvedak and area surrounding Lake Kozjak**			
conservation objectives	**wild taxa**			
	species	English name		
		threatened field mushrooms		
	Habitat types			
	NHC code	**NHC habitat**	Natura 2000 code	**Habitat type**
	E.4.4.2.	Sycamore maple forest with perennial honesty	9180*	
	E.4.5.1.	Beech forest with giant dead nettle	91K0	
area code	**HR2000953 #**			
area designation	**Plitvička Lakes – lakes**			
conservation objectives	**Habitat types**			
	NHC code	NHC habitat	**Natura 2000 code**	Habitat type
			6450	Boreal alluvial meadows
area code	**HR2001048 #**			
area designation	**Plitvička Lakes – Vreljske Ponds**			
conservation objectives	**Habitat types**			
	NHC code	NHC habitat	**Natura 2000 code**	Habitat type
			6410	Purple moor grass fields (*Molinion caeruleae*)
			7230	Alkaline fens
area code	**HR2001053 #**			
area designation	**Čorkova Uvala**			
conservation objectives	**wild taxa**			
	species	English name		
		threatened forest mushrooms		
	Habitat types			
	NHC code	**NHC habitat**	Natura 2000 code	Habitat type
	E.5.2.1.	Dinaric beech-fir forest	91K0	

Table 15. Internationally important areas for birds in the Ecological Network in Plitvice Lakes National Park.

area code	**HR1000020 #**	
area designation	**Plitvice Lakes National Park (with Vrhovinsko Field)**	
conservation objectives	**wild taxa**	
	species	**English name**
	Aegolius funereus	boreal owl
	Bonasa bonasia	grouse
	Crex crex	corn crake
	Dendrocopos leucotos	white-backed woodpecker
	Glaucidium passerinum	pygmy owl
	Picoides tridactylus	three-toed woodpecker
	Strix uralensis	Ural owl

6.4. Appendix 4: Summary of problems and proposals by stakeholders

Three groups of topics or suggestions have been identified:

1. can be incorporated into Management Plan

2. requires additional study

3. cannot be incorporated into Management Plan but the responsible authority will be informed

Table 16: Overview of proposals and problems identified during consultations

Topic	Group	Description	Next steps
Meadows	2->1	Meadows neither mowed nor grazed. so forest succession is occurring	Needs further study and will be addressed in Management Plan. too large an area to manage and not enough funding; decision must be made on which areas will be left to succession
Traffic in the Park	2.1	Transport of hazardous freight and fuels by trucks on road D52. poor condition of road D42. through traffic on road D1 – All activities tied to these roads must be aligned with all relevant partners (state. county. Roads Authority. Park).	Establish regular task force to arrange short-term maintenance and long-term traffic development and responsibilities; county roads are already covered in new plan
Souvenirs	1	No authentic local souvenirs	Park is already working on this problem and it will be addressed in Management Plan
Lack of educational programs for school groups	1	No educational programs for local or more distant schools	Action plan required for education. verification of possibility of constructing a special education center for school field trips
Visitor information	1	Visitors have no information on additional. alternative possibilities	Develop special action plan for visitor information and interpretation
Visitor management. ranger work	1	Too few rangers who cannot be present everywhere all the time. lack of knowledge of foreign languages and interpretive skills	The problem will be addressed under the Management Plan
Construction regulations	3	Regulations concerning new construction and legalization of existing buildings	Subject to the physical plan
Involvement of the local population	1	Local communities are not regularly informed and involved in Park activities	Regular meetings with stakeholders
Park advertising along main roads	1	The Park should be better promoted along the coastal highway and information boards should be better	Part of the visitor management strategy contained in the Management Plan
Park boundaries	3	The Park's boundaries do not take into account property rights and the morphological features of the terrain. The Park's boundaries are marked in the field.	The Management Plan cannot solve this problem. Changing the Park's boundaries requires a formal procedure. The Park itself has problems with this boundary.

Topic	Group	Description	Next steps
Absence of information on possible commercial activities in the Park	1	Local residents with business ideas encounter difficulties in obtaining information and support for activities or small businesses.	A newsletter for local residents on the activities. objectives and possibilities for cooperation or support. cooperation with municipalities
More supervision	1	Inadequate supervision of the area. particularly concerning poaching and illegal fishing	The ranger service is being reinforced and restructured
Possibility of construction inside the Park	3	The Park's residents complain that without a new physical plan they cannot expand their tourist-receiving capacity.	Being addressed under the new physical plan
Investment in the local community	3	The Park is not investing enough in the local community	The Park is focused on its own problems which must be solved; local development is a matter for the municipalities.
Investment	3	The Park should invest in local development	Not under the Park's authority; the Park can only create an atmosphere conducive to development
Lack of additional tourism products	1.3	Insufficient diversity of the tourism product for Park visitors	Closer cooperation with local and regional tourism stakeholders to develop an alternative tourism product
Network of bicycling trails adjacent to forest roads	1.3	Non-existent or unpublicized bicycling trails	Plan bicycling trails in close cooperation with tourism boards and stakeholders
Local travel agencies are not actively involved in promoting the Plitvice Lakes	1.3	Local travel agencies and tourism boards are not involved in marketing the Park	Closer cooperation with local and regional tourism stakeholders
Complicated cooperation and coordination of activities	1	Different levels accountability in various institutions	Improve cooperation and horizontal coordination
Insufficient care for the cultural heritage	1	Cultural heritage inside the park is insufficiently valued and used	Cultural heritage action plan
Insufficient cooperation between the Park and stakeholders	1	The Park has no institutionalized stakeholder contacts	Introduce regular meetings with key stakeholders
Property title matters frequently unresolved	1	Some plots in the Park are jointly owned by several owners. title to public land is not clarified	Joint regulation of cadastres and land register to clarify questions of property title
Improve cooperation to halt poaching	1	High level of poaching at and inside the Park's boundaries	Introduce joint patrols to improve cooperation and information in the field.
Local community should be represented in the Governing Board	3	Local population is one of the key stakeholders and should be represented in the Governing Board	The Governing Board is appointed by the Croatian Ministry of Culture

National park

Plitvice Lakes

ACTION PLANS

Plitvička Jezera, October 2007

Presentation & promotion

NATIONAL PARK

Plitvice Lakes

ACTION PLAN

Plitvička Jezera, October 2007

Contents

Introduction

The tourism function of Plitvice Lakes National Park follows from the reason for the national park to exist as a protected area, and this is the protection of particular natural and cultural resources of national and international significance for scientific, educational and recreational use. Without the visitors brought by tourism, this reason would be lost. Tourism is precisely that activity whereby guests experience the value of the National Park, and presentation and promotion of the Park and a quality visitor system contribute to this.

To improve the Park's tourism functions and to ensure the best possible alignment with its scientific and educational functions based on the principles of sustainable growth, it is essential to take a serious approach to the improvement of presentation, promotion and the visitor system.

Presentation, promotion and the visitor system encompass a relatively broad concept and a large number of activities in the National Park, and they are closely tied to tourism. It should be noted that the action plan which covers these activities is not a marketing plan, rather it only deals with some aspects of the latter.

Estimated visitor carrying capacity:

There are no carrying capacity studies of a more recent date. According to the Physical Plan of 1986, a total annual number of 1,657,000 was foreseen.

The existing visitor system underwent changes after Homeland War in the first half of the 1990s: the Korana Canyon is no longer a part of the visitor system, and some hiking trails have been abandoned. In 2005, the Park was visited by almost 850,000 people. The largest number of visitors come to the Park in July and August (up to 10,000 people per day). As a rule, every visitor goes to the lake zone. The Management Plan calls for the development of a Study to determine the burden and estimate the carrying capacity, with assessment of the daily and annual carrying capacity of this area.

Official entrances and tour programs:

The National Park's visitor reception and information proceeds at two main official entrances located in the Park's lake zone, Entrances 1 and 2, and also the auxiliary Flora Entrance.

At these reception points at the Park's official entrances, visitors can receive all necessary information on sight-seeing programs. There are eight different sight-seeing programs formulated on the basis of time criteria, depending on which entrance is the starting point of the tour. The tour programs involving hiking also include the use of the scenic train and the electric tour boat on Lake Kozjak.

The most frequent arrival time is between 10:00 a.m. and noon. Under the new Physical Plan, the relocation of the official entrances to peripheral areas of the Park will be suggested.

Information points

Besides Entrances 1 and 2 and the auxiliary Flora Entrance, there are information points at the following locations: Kozjačka Draga, Labudovac and dock P1 on Lake Kozjak.

Visitors can also obtain information at the reception desks of the hotels and from the staff members working on the scenic trains and electric tour-boats.

Souvenir shops

The range of souvenirs on offer in the Park is diverse. For now, though, there is no single souvenir that could be considered a unique souvenir of Plitvice Lakes National Park. Souvenir shops can be found in the Hotels Plitvice and Jezero, at Entrance 1 (two), Entrance 2 and at Kozjačka Draga.

Lavatories

Lavatories are located at Entrances 1 and 2, the Flora entrance, at Rapajinka, Labudovac and in all hotels and restaurants.

The lavatories at Entrance 1 and Kozjačka Draga have been renovated.

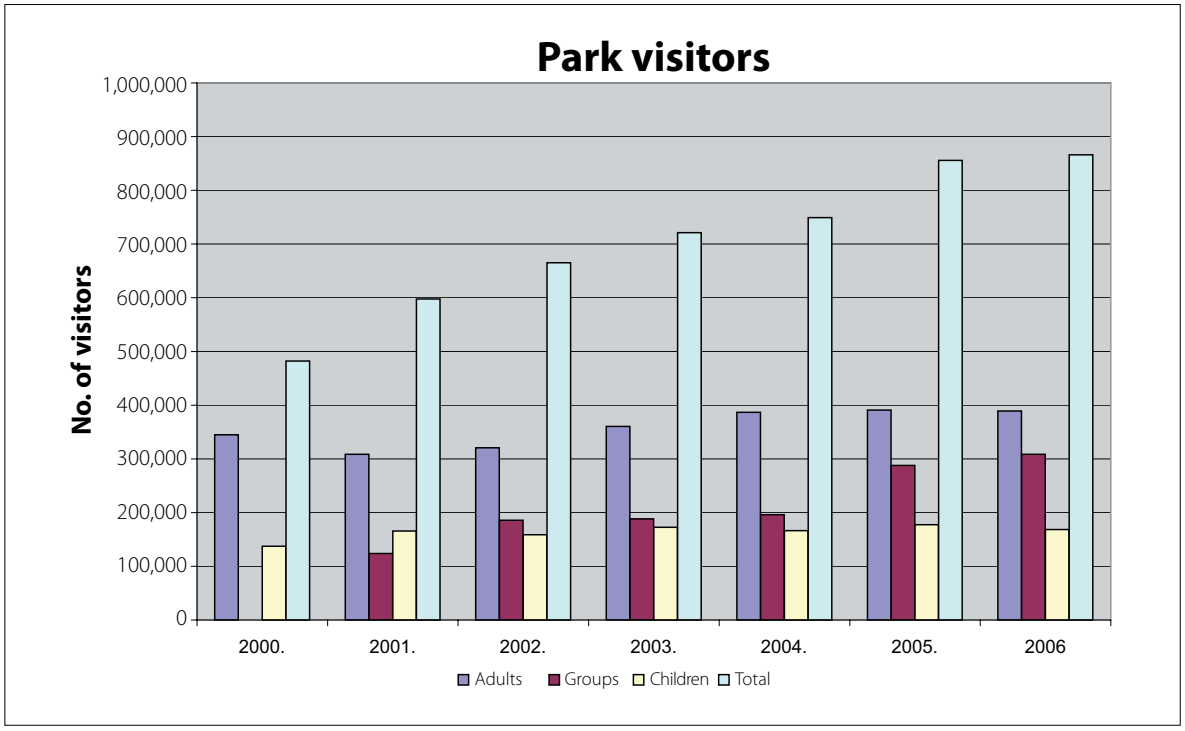


Fig 1: Number of visitors, 2000-2006:

Table 1: Number of admissions passes sold, 2000-2006:

	2000	2001	2002	2003	2004	2005	2006
Adults	344,951	308,663	320,691	360,593	386,885	390,899	389,277
Groups	0	123,703	185,697	188,015	196,097	287,636	308,505
Children	137,324	165,518	158,720	172,657	166,227	177,331	168,436
Total	482,275	597,884	665,108	721,265	749,209	855,866	866,218

1. PRINCIPAL OBJECTIVE OF ACTION PLAN

The Action Plan is predicated on the achievement of the following objective:

> Enable quality tourist experiences of the natural and cultural treasures of Plitvice Lakes National Park with a high level of organization, information and interpretation of the area and visitor management, and promote the conservation of these resources and treasures.

The principal objective of this Acton Plan is compatible with the vision for development of Plitvice Lakes National Park, as defined in the Management Plan, as an exceptionally valuable world heritage site and the objective specified therein concerning the development of tourism, presentation, promotion and the visitor system. It reflects the aspiration to diversify the tourism product which, besides one-day visits, will also include high-quality alternatives with a duration of several days for visitors, with minimum harmful impact on the Plitvice Lakes ecosystem. Accomplishment of the tasks contained in this Action Plan will enable the achievement of the set objective and the long-term achievement of the specified development vision.

The Action Plan defines a series of priority measures which must be applied to achieve the set objectives, with special emphasis on the need to influence improved quality, enhancement of the visitor system, ongoing supervision of the number of visitors and monitoring of the overall impact on the Park's ecosystem.

1.1. Sub-objective 1: Creation of a foundation to introduce eco-tourism

Plitvice Lakes National Park is the most visited Croatian national park, and the only Croatian natural site included in UNESCO's World Heritage List (since 1979).

The number of people visiting Plitvice Lakes National Park is continually increasing, so in the interest of conserving and preserving all natural and cultural resources, it will be necessary to develop management based on the principles of sustainable growth and an acceptable eco-tourism concept.

Even though there is no universal definition of eco-tourism, its general characteristics can be shown on the basis of these principles:

- avoidance of negative impact on the natural and cultural heritage which could damage the destination,
- education of tourists on the importance of conservation,

- emphasis on the significance of responsible business practices, which operate in cooperation with the local authorities and population in the interest of meeting local needs and deriving benefits from conservation,
- direct revenues from conservation and management of natural and protected areas,
- emphasis on the need to create regional tourism plans and nature conservation management plans,
- emphasis on the need for basic environmental and societal studies and long-term programs of oversight and control to assess and minimize negative impacts,
- the aspiration to maximize economic benefits for the host country, local businesses and communities, particularly the people who live in and around natural and protected areas,
- the aspiration to ensure that tourism development does not surpass the social and environmental limits of acceptable change as determined by scientific research.

Eco-tourism is a growing market niche within the broader travel industry, with the possibility of being an important driver of sustainable growth.

At the same time, business in this field is often conducted differently than in other segments of the tourism industry, because eco-tourism is defined through its results in sustainable development, through conservation of nature, education of visitors and sustainability and creation of benefits to local populations.

The creation of a basis to introduce eco-tourism concepts to the management of Plitvice Lakes National Park as a general objective would encompass awareness-raising and education of all stakeholders in the National Park's territory on eco-tourism principles, in compliance with the vision of Plitvice Lakes National Park. Visitors to Plitvice Lakes National Park would thus have a quality tourist experience in this unique National Park with emphasis on and promotion of its natural and cultural value.

1.1. Workshops with the Public Institution's staff

Given that the concept of eco-tourism is still insufficiently familiar, the staff of Plitvice Lakes National Park constitutes the target group to be informed of the eco-tourism concept and principles. The National Park's staff, together with management, should naturally serve as the core unit in operating on the basis of eco-tourism principles with the objective of raising the awareness of other stakeholders in this area and visitors themselves in the affirmation of the Plitvice Lakes as an eco-destination.

For this purpose, the Management Plan calls for the implementation of one workshop per month consisting of a minimum of 50 staff members, so that all of the Public Institution's staff is encompassed in 12 annual workshops. The workshops would be repeated every third year, therefore three times within the framework of the ten-year Management Plan, beginning in 2008.

The workshops will require the organization of multidisciplinary engagement by external contractors which would encompass the sphere of conservation and sustainable tourism development.

1.2. Workshops with the local population, local government, and non-governmental organizations

Besides the staff of Plitvice Lakes National Park, the main groups that can contribute to introduction of the eco-tourism concept include the local population, local governments, local tourism boards, schools and non-governmental organizations.

In acknowledging eco-tourism principles, one of the most important measures entails the education of all of the aforementioned groups which, in compliance with the National Park's vision statement, will play a crucial role in affirming and promoting the Park's natural and cultural value as a unique protected area.

The Plitvice Lakes National Park Management Plan foresees the implementation of one active workshop per month every two months for a minimum of 25 representatives of the local population, local governments, schools and non-governmental organizations. A total of six workshops will be held per year, every third year beginning in 2009.

The workshops will require organization of multidisciplinary engagement by external contractors which would encompass the sphere of conservation and sustainable tourism development.

1.3. Workshops with local and regional tourism stakeholders

The concept of eco-tourism with a basic code of conduct in an internationally important protected area (Ecotourist Code of Conduct) must be presented to regional tourism stakeholders (local and regional tourism boards, travel agencies) and visitors.

The Management Plan foresees two active workshops annually with a minimum of 20 representative of the aforementioned stakeholders every two years, beginning in 2009.

The aforementioned code of conduct must be accessible to all categories of visitors (individual guests and those arriving on package tours) by means of the promotional materials and website of Plitvice Lakes. This code, based on the fundamental principles of eco-tourism, are aimed not only at the conservation of the Park's natural and cultural value, but also at the education of visitors and their personal satisfaction in the sense of a quality tourist experience of Plitvice Lakes as an eco-destination.

The workshops will require organization of multidisciplinary engagement by external contractors which would encompass the sphere of conservation and sustainable tourism development.

1.4. Construction of new official entrances at Babin Potok, Prijeboj, Grabovac-Korana and Kuselj-Saborsko

The construction of the above entrances has been planned for the purpose of eliminating motor vehicle traffic from the National Park. These activities must be coordinated with the Physical Plan. It is assumed that the relocation of existing official entrances and the construction of new ones will be initiated only at the end of the next ten-year period.

1.5. Relocation of through traffic from road D1

Activities must be coordinated with the relevant governmental authorities and the Physical Plan.

1.6. Relocation of hazard materials transport from roads D52 and D42

Activities must be coordinated with the relevant governmental authorities and the Physical Plan.

1.2. Sub-objective 2: Number of visitors

Plitvice Lakes National Park is one of the most visited tourist destinations in Croatia. Its popularity has long since exceeded Croatia's borders, which is in fact reflected in the nationality structure of visitors, in which foreign visitors are predominant.

The Park is a so-called "must go" destination, meaning a destination that must be visited, which was reflected in the number of visitors during the 1996-2005 period.

Statistical data for this period indicate that the constant growing trend was only interrupted in 1999.

The number of visitors exceeded a half million in 2001.

In 2003, it grew 8.4% in comparison to the preceding year.

In 2004, it increased an additional 3.9%, while in 2005, it grew by an additional 14.2%, when it exceeded 850,000 visitors.

The largest number of individual visitors arrives at the peak of the tourist season, during July and August, while the number of tourist groups is largest in the pre- and post-seasons, i.e. during the spring and autumn.

The number of package-tour visitors at the Plitvice Lakes is growing, wherein an increasing dominant role is being played by guests brought by travel agencies on one-day, so-called chartered outings or by means of organized tours.

All of this indicates that the Plitvice Lakes have a great tourism value and that they are very much valorized in terms of tourism.

Each year travel agencies, as tourism mediators, formulate new programs with which they introduce new aspects of transportation, and the Plitvice Lakes are becoming increasingly accessible, so that further growth of demand by this category of visitors can be expected to continue.

In order to preserve this resource but also allow each visitor to experience the Plitvice Lakes in a quality manner and learn as much as possible about their cultural and natural value, it is necessary to determine the Park's actual carrying capacity.

In this manner, the limits of sustainable growth would be determined, i.e. whether or not it will be necessary to consciously, reasonably and justifiably limit the future development and exploitation of the area to a certain limit which would enable the optimum economic effect with minimum consequences. Perhaps such limitations will not be necessary, rather it will be enough to work on improving the quality of visitor organization.

This is why the Management Plan foresees the determination of tourist carrying capacity.

2.1. Development of a carrying capacity study for the lake visitor system

The lake zone open to visitors is a recreation and tourism infrastructure zone. It is the most attractive area in Plitvice Lakes National Park, in which the largest number of visitors are concentrated, tied to the existing tour programs that are linked precisely to this zone.

In the interest of preserving the ecological balance and avoiding possible negative consequences to the sensitive ecosystem of the lakes and the natural process of tufa-formation, and to ensure quality tourist experiences in this part of the Park for each visitor, it is necessary to compile a study on the carrying capacity of the lake system for visitors which will define the optimum number of visitors in this zone.

This is the initial basis for developing sustainable tourism services and amenities.

These activities require the engagement of a multidisciplinary team of experts and use of all previous data on such research.

These activities should be financed partially by the Park's own revenues and also in cooperation with other institutions (Tourism Institute, Tourism Board) in the framework of the Tourism Master Plan for Lika-Senj County and Karlovac County over a ten-year period.

2.2. Development of a carrying capacity study for the wider Park territory

Besides the lake zone, the Management Plan foresees the possibility of visitor access to the wider Park territory in compliance with the established conservation zones. The degree of conservation in individual zones defines possible activities in these zones.

Besides activity types, the optimum number of visitors must also be defined for these zones, which requires the development of a carrying capacity study for the Park's wider territory.

These activities require the engagement of a multidisciplinary team of experts and the Park's own experts.

These activities should be financed partially by the Park's own revenues and also in cooperation with other institutions (Tourism Institute, Tourism Board) in the framework of the Tourism Master Plan for Lika-Senj County and Karlovac County over a ten-year period.

2.3. Determination and implementation of daily visitor limits

Inasmuch as the results of the carrying capacity study for the lake zone and wider Park territory indicate the need for daily limits on the number of visitors in specific areas of the Park, these limits will have to be implemented.

These activities require the full engagement of the Park's conservation and ranger services during their working hours to ensure that any potential limits are in fact enforced.

These activities should be financed partially by the Park's own revenues and also in cooperation with other institutions (Tourism Institute, Tourism Board) in the framework of the Tourism Master Plan for Lika-Senj County and Karlovac County over a ten-year period.

1.3. Sub-objective 3: Spatial distribution of visitors

The spatial distribution of visitors exerts a great impact on the state of the environment and on the quality of the manner in which tourists experience this area.

To achieve the best possible flow of visitor movement and avoid the creation of bottlenecks, activities have been planned which will result in a partial reorganization of the existing visitor system in the lake zone by disburdening the lake zone through the activation of new trails, relocation of small bridges from the crown of the tufa barriers to protect them and by creating a clear, modern marker system for tours.

An important role in the spatial distribution of visitors is also played by the arrangement of informative/interpretative content, which will be installed so that most of it is concentrated at sites where it is desirable for visitors to gather, and so that lingering of visitors in those areas where this is least desirable is reduced

to the greatest possible degree to ensure easy flow in the movement of visitors and protection of the environment.

These activities will be financed by the Park's own revenues.

3.1. Construction of footpaths that follow Korana Canyon, from Entrance 1 to Camp Korana

A footpath must be built so as to avoid the creation of bottlenecks and allow unimpeded visitor movement.

It will allow visitors to pass along the right side of the lower lakes north of the Sastavci Falls, next to Golubnjača Cave, next to the village of Korana and farther on to Camp Korana. At this end-point it can be connected to the trail being made by the Rakovica Municipal Tourism Board, which leads to the Old Fortress in Drežnik.

Besides this, the footpath will give the visitors staying in the auto-camp a new possibility for communication with the National Park area.

These activities will be financed by the Park's own revenues.

3.2. Revitalization of the footpath at Stubica

The existing footpath at Stubica must be additionally enhanced and marked and incorporated into the Upper Lakes tour system.

These activities will be financed by the Park's own revenues during 2008.

3.3. Resolution of the trail around Veliki Waterfall

The Veliki ('Big') Waterfall is one of the most visited sites within the National Park. This is the highest waterfall in Croatia. The interest of most visitors is aroused precisely by the Veliki Waterfall, so that crowds gather, and many visitors go right up to the point below the falls, particularly when water levels are low. An alternative route to tour the Veliki Waterfall must be found. There is a possibility of touring the Veliki Waterfall only on a footpath on the left side of the lower lakes to avoid climbing the stairs and reducing the crowds. The problem of touring the Veliki Waterfall must be considered and a solution must be found within the framework of the carrying capacity study for the lake system, with the involvement of experts.

3.4. Creation of preliminary design for a modern marker system

The marker system plays a vital role in the functioning of the visitor system. The basic requirement it must meet is to be simple, clear and accepted by each visitor.

Besides this, its preliminary design must be attractive and fit into the Park's overall image, which must be modernized.

The only way to know if the system meets these needs is to conduct surveys and monitoring and continually modify the system as needed.

This activity requires the engagement of external contractors, for which a tender will be held, as well as the engagement of Park employees to conduct monitoring.

These activities will be financed by the Park's own revenues.

3.5. Revitalization of the dendrology educational trail along Lake Kozjak

Lake Kozjak is the largest of the 16 Plitvice Lakes. A trail on Kozjak's left and right banks runs partially along the lake itself, and partially through the forested slopes next to the lake. During 2002, wooden signs bearing the Latin names of trees and shrubs were installed around the lake. The trail partly passes through an area that is not a main visitor route and as an additional attraction and as a space which can additional disburden the most frequented part of the lake zone, it is quite welcome.

The trail must be enhanced with additional learning content, i.e. two large wooden boards on the right side and three on the left side. The boards will contain information on forest associations, tree and shrub species, and emphasize the importance of forests to the prevention of erosion and the forest floor and as reservoirs for precipitation, and mention the significance of the lake zone as a vegetation refuge.

3.6. Development of brochures dedicated to the Čorkova Uvala old growth forest from the forestry, biology and ecology standpoints

The Čorkova Uvala old growth forest is one of the best known and most accessible old growth forests in the Dinaric region. It is the remainder of the primeval beech/fir forests which covered much of Europe. In 1965 it was already proclaimed a forest reserve. The observation of the forty-fifth anniversary of the declaration of the Čorkova Uvala Forest Reserve in 2010 must be accompanied by the publication of brochures and fliers that will feature the most important characteristics of this unique old growth forest from the standpoints of forestry, biology and ecology.

3.7. Installation of interpretative boards on Šupljara Cave

To ensure that visitors in the pre-lake zone at so-called secondary gathering points are provided with additional educational content, the development of a geological and biological interpretive board on Šupljara Cave has been planned, which will contain a description of its creation and cave decorations.

Šupljara Cave is a geomorphological natural monument and also a type locality. It is located on the right side of the Lower Lakes Canyon, and it is a site that is quite interesting to visitors. It is interesting from the geological and biospeleological standpoints. These specific aspects must be presented to visitors by means of an information board.

These activities will be financed by the Park's own revenues.

3.8. Educational trail along future Presentation Center

As part of the refitting of the Medvjeđak Restaurant into a presentation center, landscaping, installation of a "Celtic horoscope" trail and installation of learning content for children has been planned.

3.9. Bird-watching educational trail – Definition of bird-watching sites / Labudovac

Several different sections of educational trails for bird-watching have been proposed on the basis of prior ornithological research. These are sections which are outside of the current visitor system, with routes that are quite demanding and imply movement in smaller groups or on bicycles.

Examples of sections:

- Sertić Poljana – Sartuk Creek – road to Villa Izvor – Plitvice-Entrance 1

- Entrance 2 – Plitvički Ljeskovac – Uvalica – Ćuić Krčevina – Šuputovo Vrelo – small lakes – Entrance 2; Entrance 2 – Bigina Poljana – road around Prošćanski Vrh peak along eastern shore of lakes to Entrance 2 (Tutiš et al. 2006) or
- along Crna River or Upper Lakes (Lukač).

There is also proposal to install information panels or brochures for certain trails that will present bird communities.

For interested visitors, expertly guided day outings with a trained guide could be organized to observe bird of prey, while at night they could listen to owl calls. However, most visitors who are bird lovers (and thus bird-watchers) and who have the required skills and equipment (e.g. binoculars) will be able to observe most interesting species while hiking on their own. For this purpose, movement along less frequented trails should be allowed (e.g. Labudovac, Lake Kozjak) and transport should be organized for non-circuitous sections.

3.10. Small interpretive boards along Dorotejin, Štefanijin and Blankin put

Some of the most attractive footpaths along the lakes were made during the nineteenth and early twentieth centuries for visits by members of the imperial and royal Habsburg dynasty. This fact is very interesting to visitors, so parts of these trails encompassed by the current visitor system should be marked as the oldest historic tourist trails and presented as such to visitors.

3.11. Development of promotional materials for the aforementioned educational trails and footpaths in the visitor zone

Promotional materials (fliers) must be made for all trails and their content in the Park, as well as a code of conduct for visitors.

3.12. Installation of educational boards and development of fliers and website with educational content and visitor code of conduct

The National Park is very attractive to visitors, but visitors are also subject to certain restrictions in the interest of protecting the natural environment. Some restriction warnings in the National Park's territory were previously printed on the admissions passes. With the modernization of the admissions processing system and the printing of new admissions passes, these warnings are no longer included on the admissions passes. There are some restriction warnings placed on wooden signboards at the Park's entrances. Since the Plitvice Lakes are a part of the world heritage, the visitor code of conduct must be raised to a very high level. There should be restriction signs at every Park entrance placed on wooden signboards, which would include all standard warnings and restrictions, as well as fliers that will educate visitors and inform them of the importance of the Park and the restrictions in place for the high degree of protection to which its territory is subject.

3.13. Development of panels and fliers for the water-powered sawmill in the village of Korana and incorporation of content on the sawmill on the website

The water-powered sawmill in the village of Korana is a unique traditional form of construction and use of water power. The sawmill has been restored, so marketing activities must take advantage of this rare cultural heritage site in the Park. The aforementioned promotional materials must be made based on the model for the restored water-powered sawmill in the village of Korana.

3.14. Landscaping of a small botanical garden in front of the Čorkova Uvala forestry house

The Čorkova Uvala forestry house is an interesting building which has been protected from further dilapidation in recent years.

There are plans to refit the forestry house so that it becomes a presentation center in which the importance of the forest and forest associations in the Park's territory would be presented, highlighting their anti-erosion functions and the significance and connections between humans and forests. The Čorkova Uvala forestry house is generally visited by researcher and the occasional visitor. The landscaping of a small botanical garden on the plateau in front of the house has been planned as additional content; plates bearing the Latin names of plant species would be placed in it in cooperation with botanists.

3.15. Installation of educational content for meadows and grasslands

Meadows and fields are the most diverse areas in Plitvice Lakes National Park. There are home to numerous rare and endangered species. The villages located at the edges of karst fields on which the largest grass-covered surfaces are located are mainly inhabited by elderly residents, so these surfaces are no longer intensively cared for, and they are thus in various phases of succession. To turn visitor attention to the importance and significance of meadows and pastures, the moment of their emergence, and the importance of mowing and grazing in traditional rural life, educational content must be developed to highlight them. Here a possibility is to emphasize certain meadows from the standpoint of biodiversity (e.g. Labudovac) within the framework of a visitor tours. The installation of educational content for meadows and grasslands must be encompassed and detailed in an action plan for meadows.

3.16. Opening of Golubnjača Cave to visitors at a specific time of the year based on conservation recommendations and the caves action plan

The opening of Golubnjača Cave to visitors in the interest of its protection in geological and biospeleological terms must be foreseen under the Action Plan for Caves.

3.17. Replacement of existing map-boards

The existing panorama map-boards with marked tourist content, scenic vehicle routes and hiking trails installed at Entrance 1 and at Velika Poljana must be replaced with new ones because the current ones have faded considerably. There is no new for a new conceptual design.

These activities will be financed by the Park's own revenues.

1.4. Sub-objective 4: Visitor safety and accessibility

The Plitvice Lakes are a protected area where minimum construction interventions in the environment are allowed. Thus, the existing system of trails and wooden bridges was conceived so as to respect the natural environment and the karst basis, vegetation and the position of the lakes and waterfalls.

The differences in elevation between the highest and lowest lakes is 133 meters, and the system was installed so that this transition can be traversed with a median level of exertion.

With respect to the fact that the Plitvice Lakes are an internationally known destination and that they are an open space which is constantly influenced by climatic conditions, visitor safety and accessibility of the lakes are one of the priorities which require regular and proper maintenance.

Besides regular maintenance at certain sites, and to reduce the burden on the tufa barriers and to prevent the wash-out of materials from trails into the lakes, the trails must be moved or replaced with wooden bridges.

These activities will be financed by the Park's own revenues.

4.1. Repairs to the pedestrian bridges at Entrances 1 and 2 and at the boat dock

The pedestrian bridges at Entrances 1 and 2 are the primary pedestrian link for the passage of visitors from the parking lots to the Park's entry points, so as such they must be permanently maintained.

The boat dock on at Kozjačka Draga, the Bathing Zone and area below Burget are points for the berthing of boats, which are highly frequented by visitors, and they must be permanently maintained.

These activities will be financed by the Park's own revenues.

4.2. Increased supervision of exceptionally frequented sites (area beneath Veliki Waterfall, Mali Prštavac, Burget, etc.)

The amphitheatrical area beneath the Veliki Waterfall, the area beneath Mali Prštavac and the area of Burget are the most attractive sites to visitors within the lake visitor zone and they lead to visitor bottlenecks.

To ensure the unimpeded flow of visitors and their comfort and a proper experience of the area, and also to prevent prohibited activities such as treading upon the tufa, bathing, feeding of the fish or bathing by pets, supervision must be enhanced and visitors must be directed to adhere to the routes stipulated by the tour program and to prevent them from engaging in an prohibited activities by informing them, and in extreme cases, sanctioning them.

According to plans, these activities will be conducted on a permanent basis with the full engagement of the conservation and ranger service within their working hours.

4.3. Construction of a security fence at potentially hazardous sites (viewpoints on the left side of the Lower Lakes Canyon)

Potentially hazardous sites must be ascertained and security fences constructed to ensure visitor safety.

The obvious priority is to install fences at the viewpoints on the left side of the Korana Canyon, such that they stylistically correspond to the viewpoints on the canyon's right side, which already have wooden fences – this is also important in terms of the aesthetic appearance of the area.

It is particularly important to define the potentially dangerous points along road D1 to avoid possible veering of motor vehicles from the road and to ensure visitor safety, and also to prevent possible pollution of the lakes.

4.4. Replacement of rigid trail sections with small bridges at certain locations

Rigid trail sections along the lakes are regularly filled with gravel, which is washed into the lakes by rains and snow. During spring flooding, a large portion of the trails adjacent to the lakeshores is flooded and soaked. The trails have not been closed until now, rather boards were installed as makeshift bridges. To avoid these situations and to protect ground fauna, the replacement of these rigid trail sections with wooden bridges or the closing of these trails to visitors during the flood season is proposed, particularly in the Lower Lakes Canyon, the right side of Lake Galovac and the left side of Gradinsko Lake in the Upper Lakes.

The replacement of rigid trails with bridges must be done for two reasons:

a) the trails subject to frequent flooding are located at the very edge of the lakes (which entirely destroyed the shore habitats and access to the water by animals and so forth) – trails along the Lower Lakes, the right side of Lake Galovac, etc.
b) the trails on which erosion is visible is the result of passage by a high number of visitors (e.g. the right side of Gradinsko Lake up to Burget, etc.)

It is necessary to draft a renewal project for the trails from the technical (construction, architectural and safety) aspects (types of materials, height of bridges, length of sections, connections with existing bridges, etc.), taking into consideration conservation measures concerning the nearby ecosystems.

4.5. Removal of bridges from the barrier crowns

All previous scientific research in the lake zone has foreseen the removal of the wooden bridges from the barrier crowns due to its degradation of the tufa statics. It is interesting that not one researcher has specified which one. A study must be compiled to define the locations where the movement of bridges from the barrier crowns must be carried out and to specify the new location to which they should be moved.

4.6. Repair of the landslide sites on the Velika Poljana-Labudovac route

The Velika Poljana-Labudovac thoroughfare links the Park's central area with the Upper Lakes, and allows the movement of the scenic train which plays a major role in the current visitor system. There are three landslide sites on this thoroughfare which are a potential visitor safety hazard. Thus, it will be necessary to repair the existing landslide sites and conduct a field survey along the internal thoroughfare to detect any new landslide hazards and repair them.

Landslide site repair will be financed by the Park's own funds during the Plan implementation period.

4.7. Maintenance of existing communication along the Plitvica-Plitvički Ljeskovac route

Activity defined within the framework of the Action Plan for forests.

4.8. Maintenance of existing communication along the Labudovac-Rapajinka and Labudovac-Plitvički Ljeskovac routes

The Labudovac-Rapajinka road links the Upper and Lower Lakes and serves as a transit route for the scenic train which plays a major role in the current visitor system. As such, it must be properly and permanently maintained to ensure passability and security, i.e. its impeccable functioning.

Labudovac-Plitvički Ljeskovac road is used as internal communication road for the Park's staff and scientists in the emergency situations.

Road maintenance will be financed by the Park's own revenues and will be carried out each year within the period specified in the Management Plan.

1.5. Sub-objective 5: Environmental standards for visits

In compliance with the accepted developmental concept of the Plitvice Lakes as a destination with well-developed eco-tourism, wherever possible it will be necessary to apply environmental standards to visits and reduce the negative impact of the tourist infrastructure on the environment through the use of renewable energy sources, efficient use of renewable energy sources, etc.

This plan foresees the transition of internal transportation means, i.e. the scenic train and tour boats, to power systems that rest on use of environmentally-friendly fuels and solar energy.

Additionally, there are plans to modernize the existing sanitary infrastructure and modernize the solid waste collection system.

5.1. Conversion of scenic vehicles to use of biodiesel, eco-diesel or natural gas and installation of converters

The scenic tour vehicles now have diesel engines. Only the newest vehicles have converters.

Co-financing from the Environmental Protection and Energy Efficiency Fund with a roughly 50% share has been foreseen for this activity within the framework of introduction of environmental standards for visits. The remainder would be secured from the Park's own revenues.

This activity should be carried forward in the 2010-2015 period.

5.2. Installation of solar cells on the tour-boats

Co-financing from the Environmental Protection and Energy Efficiency Fund with a roughly 50% share has been foreseen for this activity within the framework of introduction of environmental standards for visits. The remainder would be secured from the Park's own revenues.

This activity should be carried forward in the 2009-2015 period.

5.3. Installation of compost toilets at seasonal sites

Within the framework of activities to improve infrastructure, it is necessary to foresee compilation of a study on installation of compost toilets at individual sites in the Park. Some previous experience (e.g. in Mljet National Park) has shown that this method for treating fecal waste is sound and their use should thus be considered as environmentally-acceptable.

5.4. Development of a solid waste collection and sorting system

Waste management – collection and sorting of solid wastes and its recycling – is a very vital segment of current development. In line with global trends, increasing attention is being dedicated to waste management in Croatia as well. Establishment of the Environmental Fund has opened new possibilities in waste management. Recycling yards have been set up at many locations inside the National Park. Further improvements in the use of waste must be coordinated in cooperation with the Environmental Fund and effective strategies.

5.5. Removal of waste bins from the footpath system and specification of collection site

There are waste bins within the Park's footpath system almost every one hundred meters. In many protected areas in Europe, the tendency is for visitors to be environmentally informed, and they carry with them any waste that may emerge during their visit outside of the protected area. The current proposal is to gradually remove the waste bins and to designate a collection point at the entrances. Visitors would be given fliers at the entrances, informing them of waste collection and the sites where they can dispose of wastes. The recycling yards already located at entrances would thus become fully functional.

5.6. Eco-friendly use of equipment (biodiesel saws and mowers)

Use of eco-friendly fuels must be organized within the conservation and other services, such that they use biodiesel to power their equipment. There have already been attempts to use biodiesel saws to remove large overgrowth and the remains of old bridges in the Korana Canyon. During project implementation, it must be kept in mind that it is still rather difficult to find biodiesel at outlets in Croatia.

5.7. Use of eco-friendly packaging in hospitality establishments inside the visitor zone

This activity calls for the abandonment of PVC and aluminum packaging in so-called Small Park facilities, i.e. the series of buffets and cafés located in the visitor zone, and move toward environmentally-friendly packaging.

The implementation of this activity will require the joint involvement of the Purchasing Department and the Maintenance and Utilities Sector.

1.6. Sub-objective 6: Visitor programs

The existing visitor programs are tied to the Park's lake zone. This Plan calls for offering new thematic programs for visits to cultural/historical heritage sites and alternative programs to visit the sources of the Crna and Bijela Rivers and Čorkova Uvala for small groups of nature-lovers and researchers in compliance with the appropriate degree of protection of these areas, with the exclusive accompaniment of a guide from the Conservation Service.

To ensure that visitor programs are carried forward in a quality manner, the quality of the work done by interpreters, guides and rangers must be improved through general and professional courses so that they are qualified to interpret the Plitvice Lakes area.

Travel agency guides should also be similarly trained with the same goal in mind.

6.1. Visits to Stubica and the trail along the Korana Canyon

The planned reconstruction of the footpath at Stubica will make it possible to incorporate it into the Upper Lakes tour program.

The trail that runs along the Korana Canyon may be included in the existing Lower Lakes tour program. This footpath can be simultaneously incorporated into the independent alternative tour program which would emphasize the lake and its source, the cultural heritage which was formed by life along the river and its watermills (one mill in the village of Korana was restored by Plitvice Lakes National Park, while another below the village of Čatrnja is being restored by the Rakovica Municipal Tourism Board) and the sawmill, and also the historical heritage (the old fortress of the Frankopan nobles).

6.2. Visits to cultural/historical heritage sites

The alternative program to visit cultural/historical heritage sites may include tours of the mills and sawmill in the village of Korana, the Radekin Mill above the Veliki Waterfall, the mills in Plitvički Ljeskovac and Vrelo, and the Končar yard in Končarev Kraj, which is the only museum inside the Park.

All of these sites, except the mills and sawmill in Korana (which have already been fitted to receive visitors), will require renovation if the cultural/historical heritage site visitor program is to become operational.

PRIJEBOJ – Church of St. Peter (requires renovation) and ethno-park (based on proposal by conservation experts from the Ministry of Culture).

6.3. Formulation of alternative programs (Crna and Bijela Rivers, Čorkova Uvala old growth forest, Medvjeđak mountain trail)

These alternative programs have been planned for nature-lovers, researchers and experts as a component of professionally-guided outings under the Park's supervision which must be formulated for the purpose of extending the stay of visitors in the Park. These sites are interesting, but the configuration of the terrain on which they are situated does not allow visits by a large number of visitors.

6.4. Employment of new guides

The current three guides, of which each covers two languages, are not sufficient to provide guide services. The demand for this service exceeds the Park's current capability of filling it, and remaining at the current status would mean foregoing a very considerable source of revenues, and also neglecting care for the quality of interpretation of the protected area.

A minimum of 10 guides must be hired, of which each would cover two languages.

6.5. Education of travel agency guides on the methods for guidance and interpretation in Plitvice Lakes National Park

For visitors to obtain quality and accurate information on the Park and its value, it will be necessary to print and sell, i.e. distribute, the Natural History Guide for travel agency guides, and thus build a "one-voice" story about the Plitvice Lakes.

This activity also plays an important role in building the National Park's image.

6.6. Organization of general courses

The organization general courses has been planned which will impart basic knowledge on the Park (its extent, what it protects, what tufa is and how it is formed, what can be seen in the National Park and its environs, etc.) for staff members who come into contact with visitors.

6.7. Organization of specialist courses

The organization of specialist courses has been planned which would impart broader knowledge on ecology in general, communication with visitors, handling of technical aids and various specialist knowledge on the Park's biology and ecology, guidance of specialized tours, etc. for permanent rangers, interpreters and guides.

1.7. Sub-objective 7: Programs for visitors with special needs

7.1. Arrange access way from Entrance 1 to Rapajinka, atop the Upper Lakes Canyon

7.2. Arrange a trail from auxiliary Entrance II (Flora) to boat dock (so-called Bathing Zone)

7.3. Adapt existing vehicles for persons with special needs

7.4. Devise routes for persons with special needs

These ideas must be considered within the framework of the project to renew and reconstruct the trails from several standpoints (visitor safety: gradients, handrails, fences, etc.; impact on habitat (flora and fauna), technical possibilities for rending, impact on the existing sight-seeing system – the "flow" of visitors and experience of the Park, costs, etc. must be maintained).

When the project defines the potential sections which could be adapted for the disabled, interpretative boards and presentation of natural features which can been seen/experienced on these sections must be developed.

2. PROJECTED RESOURCES TO ACHIEVE ACTION PLAN

Existing human resources and contractors will be employed to achieve the Action Plan. Scientific and scholarly research will largely make use of existing equipment, but some activities will require engagement of contractors and purchase of additional equipment. Cooperation with the relevant authorities and arrangements with the Croatian National Roads Bureau will be essential.

3. FUNDING SOURCES

A portion of required HRK 12,000,000.00 will be financed using the Park's own revenues, at an equal tempo over a ten-year period at HRK 1,200,00 annually.

4. ACTION PLAN – TABULAR OVERVIEW

Objective	Activity	Measurable result	Verification methods	Required inputs	Input costs
Enable quality tourist experiences of the natural and cultural treasures of Plitvice Lakes National Park with a high level of organization, information and interpretation of the area and visitor management, and promote the conservation of these resources and treasures.					
Sub-objective 1. ***Creation of a foundation to introduce eco-tourism***					
Raising awareness and education of stakeholders on eco-tourism principles.	1.1. Workshops with the Public Institution's staff.	1 workshop monthly for a minimum 50 National Park employees per three workshops, every 3 years.	Number of workshops held, number of participants. Application, verification of knowledge.	Engagement of contractor.	Fee for workshop leader, costs of supplies. HRK 6,000.00 per year. Own revenues.
	1.2. Workshops with the local population, local government, and non-governmental organizations.	1 active workshop every 2 months for a minimum of 25 stakeholders per workshop, every 3 years.	Number of workshops held, number of participants.	Cooperation with relevant authorities, engagement of contractor.	Fee for workshop leader, costs of supplies. HRK 6,000.00 per year. Own revenues.
	1.3. Workshops with local and regional tourism stakeholders.	2 active workshops annually for a minimum of 20 shareholders per workshop, every 2 years.	Number of workshops held, number of participants. Application, verification of knowledge.	Cooperation with relevant authorities, engagement of contractor.	Fee for workshop leader, costs of supplies. HRK 1,200.00 per year. Own revenues.
Adaptation of existing infrastructure to meet eco-tourism and safety standards.	1.4 Construction of new official entrances at Babin Potok, Prijeboj, Grabovac-Korana and Kuselj-Saborsko.	Entrances fully functional	Use permit to construct entrances and accompanying facilities.	Engagement of expert.	Own revenues. 3.000.000,00 HRK.
	1.5. Relocation of through traffic from road D1*.	New traffic structure in Plitvice Lakes National Park.	Physical Plan	Agreements with Croatian National Roads Bureau, construction of Grabovac-Prijeboj bypass.	Central state budget.
	1.6. Relocation of hazard materials transport from roads D52 and D42*.	New traffic structure in Plitvice Lakes National Park.	Physical Plan	Agreements with Croatian National Roads Bureau, construction of Saborsko-Grabovac. road	Central state budget.
Sub-objective 2. Number of visitors					
Determination of the area's tourist carrying capacity.	2.1. Development of a carrying capacity study for the lake visitor system.	Study compiled within deadline	Constant supervision of the number of visitors to the lake system.	Multidisciplinary expert team with Park's own experts. Previous data on research.	Based on contract. Own revenue sources, HRK 1,000,000.00.
	2.2. Development of a carrying capacity study for the wider Park territory.	Study compiled within deadline.	Monitoring of ecological indicators.	Multidisciplinary expert team with Park's own experts.	Based on contract. Own revenue sources. HRK 800,000.00.
	2.3. Determination and implementation of daily visitor limits.	Adherence to established limits.	Monitoring of ecological indicators and visitor satisfaction.	Park's Conservation and Ranger Service in course of regular duties.	Own revenue sources.

Objective	Activity	Measurable result	Verification methods	Required inputs	Input costs
Sub-objective 3. Spatial distribution of visitors					
Reorganization of the lake zone visitor system based on ascertained carrying capacity.	3.1. Construction of footpaths that follow Korana Canyon, from Entrance 1 to Camp Korana.	New footpaths to disburden Upper Lakes.	Percentage of visitors using trail.	Trail construction. Conservation and Ranger Service. Existing equipment.	Regular operations as part of annual plan. ca 4 km of trails.
	3.2. Revitalization of the footpath at Stubica.	New footpath.	Percentage of visitors using trail.	Lesser interventions on trail. Conservation and Ranger Service. Existing equipment By 2008.	Regular operations as part of annual plan.
	3.3. Resolution of the trail around Veliki Waterfall.	New regime to bypass Veliki Waterfall.	Less crowding under Veliki Waterfall.	Conservation and Ranger Service.	Regular operations as part of annual plan.
	3.4. Creation of preliminary design for a modern marker system.	New marker system accepted by visitors.	Complete acceptance and understanding by visitors, surveys and monitoring.	Continual modification of system Public tender.	Implementation of marker system as part of public tender HRK 50,000.00. Regular operations as part of annual plan.
Development of educational trails and other interpretive content.	3.5. Revitalization of the dendrology educational trail along Lake Kozjak.	Dendrology educational trail.	Percentage of visitors using the trail.	Production of 5 interpretive boards on wooden bases 2 on right and 3 on left. Production of wooden plates with Latin names of trees and shrubs – Conservation and Ranger Service.	Board production costs ca HRK 35,000.00. Production of wooden plates and installation as part of regular operations.
	3.6. Development of brochures dedicated to the Čorkova Uvala old growth forest from the forestry, biology and ecology standpoints.	Brochure and flier on Čorkova Uvala old growth forest.	Research into the Čorkova Uvala area.	Previous research in this area, forestry+fauna soil+transects for birds. Cooperation between researchers and Park's Conservation Service. Design of brochure and flier (contractor+Park's Conservation Service) Printing brochures and fliers.	Costs of design and printing HRK 50,000.00. One-year production period, for 2010 (45th anniversary of proclamation of forest reserve)
	3.7. Installation of interpretative boards on Šupljara Cave.	Interpretive geology board.	Previous geological research.	Design of boards. Production of wooden mounts for boards. Conservation and Ranger Service.	Costs of board design (design + production) ca HRK 10,000.00. Production of wooden mounts by Conservation Service. Part of regulation operations.
	3.8. Educational trail along future Presentation Center.	Educational trail.	Existing research results.	Draft proposal by expert team working on project on presentation center landscaping. Conservation and Ranger Service.	As part of completion of Medvjeđak Presentation Center.
	3.9. Bird-watching educational trail – Definition of bird-watching sites / Labudovac	Bird-watching trail.	Existing recommendations of scientific research tied to birds.	Ornithologists, Park's Conservation Service, seasonal guide (ranger).	1 person seasonally

Objective	Activity	Measurable result	Verification methods	Required inputs	Input costs
Development of educational trails and other interpretive content.	3.10. Small interpretive boards along Dorotejin, Štefanijin and Blankin put	Wooden boards with explanations of the historical names of the trails.	Existing data from literature (Dragutin Franić).	Design and production of board. Conservation Service. Production of wooden base and installation by Park's Conservation Service.	Design and production costs, 2011.
	3.11. Development of promotional materials for the aforementioned educational trails and footpaths in the visitor zone.	Promotional materials.	Existing data from research, literature and information on visitor system.	Design and production, printing.	Costs of design and printing ca. HRK 500,000.00 over 10 years. Based on trail opening program.
	3.12. Installation of educational boards and development of fliers and website with educational content and visitor code of conduct.	Education boards, fliers, website content.	Internal rules of order, Ecotourist code of conduct.	Design and production of board, production of fliers.	Design and production costs of flier and board, ca HRK 200,000.00 annually.
	3.13. Development of panels and fliers for the water-powered sawmill in the village of Korana and incorporation of content on the sawmill on the website.	Panel, flier and posters for waster-powered sawmill.	Issuing of these materials	Design and production of panel, fliers and posters. Posting of these materials	Design and production cost ca HRK 50,000.00. Production of wooden base and installation as part of regular operations.
	3.14. Landscaping of a small botanical garden in front of the Čorkova Uvala forestry house.	Additional content accompanying former forestry house	Forestry research data	Production of wooden plates with Latin names.	Part of regular operations.
	3.15. Installation of educational content for meadows and grasslands.	Based on meadow and grassland action plan.	Based on meadow and grassland action plan	Based on meadow and grassland action plan	Based on meadow and grassland action plan
	3.16. Opening of Golubnjača Cave to visitors at a specific time of the year based on conservation recommendations and the caves action plan.	Caves action plan.	Caves action plan.	Caves action plan.	Caves action plan.
	3.17. Replacement of existing map-boards.	Production of new map-boards	Number of replaced map-boards	Visitor satisfaction and orientation	HRK 10,000 annually

Objective	Activity	Measurable result	Verification methods	Required inputs	Input costs
Sub-objective 4. Visitor safety and accessibility					
Maintenance of roads, bridges, viewpoints and other infrastructure.	4.1 Repairs to the pedestrian bridges at Entrances 1 and 2 and at the boat dock.	Safe and passable pedestrian bridges.	Certification of pedestrian bridge safety	Park's Conservation Service	Part of regular operations.
	4.2. Increased supervision of exceptionally frequented sites (area beneath Veliki Waterfall, Mali Prštavac, Burget, etc.)	Site protected from inappropriate visitor behavior.	Ranger log	Immediately.	Part of regular operations.
	4.3. Construction of a security fence at potentially hazardous sites (viewpoints on the left side of the Lower Lakes Canyon)	Installation of security fence.	Visitor safety and satisfaction.	Installation of wooden fittings at viewpoints.	Part of regular operations 2008.
	4.4. Replacement of rigid trail sections with small bridges at certain locations.	Raising of wooden trails on right side of Lake Galovac, left side of Gradinsko Lake and through Lower Lakes Canyon to protect ground fauna and lakes from erosion.	Wooden trails raised and passable at these sites during floods.	Recommendation of scientists, Conservation and Ranger Service.	Part of regular operations.
	4.5. Study to define the locations where the movement of bridges from the barrier crowns must be carried out and to specify the new location to which they should be moved.	Study on impact of bridge on tufa barrier statics.	Scientific research	Cooperation with relevant authorities.	Study costs HRK 1,000,000.00 over 3 year period, as of 2011.
	4.6. Repair of the landslide sites on the Velika Poljana-Labudovac route	Protection of Upper Lakes, visitor safety.	Road statics estimate method. Use permit.	Engagement of expert on road repair (statics). Contractor.	HRK 600,000.00.
	4.7. Maintenance of existing communication along the Plitvica-Plitvički Ljeskovac route	Passability of existing communication routes.	Road statics estimate method. Use permit.	Engagement of road expert. Contractor.	12 km of county road.
	4.8. Maintenance of existing communication along the Labudovac-Rapajinka and Labudovac-Plitvički Ljeskovac routes.	Passability of existing communication routes.	Road statics estimate method. Use permit.	Engagement of road expert. Contractor.	Paving of ca 6.5 km Price for 1m^2 of pavement is HRK 13 HRK+ VAT Own revenues.

Objective	Activity	Measurable result	Verification methods	Required inputs	Input costs
Sub-objective 5. Environmental standards for visits					
Making scenic tour trains and boats environmentally friendly.	5.1. Conversion of scenic vehicles to use of biodiesel, eco-diesel or natural gas and installation of converters.	All vehicles powered by eco-friendly fuels.	Technical specifications.	Engagement of engineering expert, Park's Conservation and Professional Service.	Environmental Protection and Energy Efficiency Fund, 50% from own revenues.
	5.2. Installation of solar cells on the tour-boats.	Solar-powered scenic tour-boats.	Technical specifications.	Engagement of expert.	Environmental Protection and Energy Efficiency Fund, 50% from own revenues.
Modernization of existing sanitary infrastructure.	5.3. Installation of compost toilets at seasonal sites.	Number of toilers installed based on study.	Specifications and use permit.	Conservation Service, Maintenance and Utilities Sector	ca HRK 200,000.00
Modernization of the solid waste collection system.	5.4. Development of a solid waste collection and sorting system.	Efficient modern waste collection system.	Quantity of waste collected.	Maintenance and Utilities Sector.	Own revenues and Environmental Fund.
	5.5. Removal of waste bins from the footpath system and specification of collection site.	Visitor system without waste and refuse bins.	Visitor awareness that they must take their waste with them from the lake zone.	Conservation Service, Maintenance and Utilities Sector.	Own revenues.
	5.6. Eco-friendly use of equipment (biodiesel saws and mowers).	Biodiesel powered mechanization.	Certificate. Quantity of consumed biodiesel.	Maintenance and Utilities Sector.	Own revenues and Environmental Fund.
	5.7. Use of eco-friendly packaging in hospitality establishments inside the visitor zone.	Eco-friendly packaging in visitor zone.	Visitor satisfaction. Eco-packaging.	Maintenance and Utilities Sector, Purchasing Department.	Own revenues and Environmental Fund.
Sub-objective 6. Visitor programs					
	6.1. Visits to Stubica and the trail along the Korana Canyon.	Disburdening of central Park zone.	Visitor numbers and satisfaction.	Making of trail.	Own revenues
	6.2. Visits to cultural/ historical heritage sites.	Development of proposal for visits to cultural/ historical heritage sites in the Park.	Visitor numbers and satisfaction.	Park's Conservation Service.	Seasonal guides.
	6.3. Formulation of alternative programs (Crna and Bijela Rivers, Čorkova Uvala old growth forest, Medvjeđak mountain trail).	Bicycling tours with supervision by Conservation Service.	Visitor numbers and satisfaction.	Park's Conservation Service.	Seasonal guides.
Enhancement of the guide service	6.4. Employment of new guides	Strategy of increasing the number of local guides.	Number of local guides and quality of services.	Engagement of expert. New staff.	Own revenues.

Objective	Activity	Measurable result	Verification methods	Required inputs	Input costs
	6.5. Education of travel agency guides on the methods for guidance and interpretation in Plitvice Lakes National Park	Number of workshops held.	Testing of knowledge and visitor satisfaction.	Engagement of expert. New staff.	Own revenues.
	6.6. Organization of general courses	Number of general courses held.	Testing of knowledge	Lecturers, courses.	Own revenues. Croatian Tourism Board funds
	6.7. Organization of specialist courses	Number of specialist courses held.	Testing of knowledge.	Lecturers, courses.	Own revenues. Croatian Tourism Board funds
Sub-objective 7. Programs for visitors with special needs					
Making the experience of Plitvice Lakes National Park accessible to visitors with special needs	7.1. Arrange access way from Entrance 1 to Rapajinka, atop the Upper Lakes Canyon.	Length and number of trails intended for persons with special needs.	Certificates.	Engagement of experts and cooperation with associations and persons with special needs.	Own revenues.
	7.2. Arrange a trail from auxiliary Entrance II (Flora) to boat dock (so-called Bathing Zone)	Length and number of trails intended for persons with special needs.	Certificates.	Engagement of experts and cooperation with associations and persons with special needs.	Own revenues.
	7.3. Adapt existing vehicles for persons with special needs.	Number of transport means adapted to disabled persons (low-floor vehicles, ramps)	Certificates.	Engagement of experts and cooperation with associations and persons with special needs.	Own revenues.
	7.4. Devise routes for persons with special needs based on recommendation of contracted expert.	Number of routes and their length intended for persons with special needs.	Certificates.	Engagement of experts and cooperation with associations and persons with special needs.	Own revenues.

* Elimination of through traffic implies opening of entrances at Prijeboj, Grabovac-Korana and Saborsko-Kuselj

5. TIMETABLE TO COMPLETE PLANNED ACTIVITIES

Timetable for Visitor Action Plan										
Activity number	**First 5 years**					**Next 5 years**				
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Sub-objective 1. Creation of foundation to introduce eco-tourism										
1.										
1.1.										
1.2.										
1.3.										
1.4.										
1.5.										
1.6.										

Timetable for Visitor Action Plan										
Activity number	**First 5 years**					**Next 5 years**				
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Sub-objective 2. Number of visitors										
2.										
2.1.										
2.2.										
2.3.										

Timetable for Visitor Action Plan										
Activity number	**First 5 years**					**Next 5 years**				
	2008	**2009**	**2010**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Sub-objective 3. Spatial distribution of visitors										
3.										
3.1.										
3.2.										
3.3.										
3.4.										
3.5.										
3.6.										
3.7.										
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3.12.										
3.13.										
3.14.										
3.15.										
3.16.										
3.17.										

Timetable for Visitor Action Plan										
Activity number	**First 5 years**					**Next 5 years**				
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2013**	**2015**	**2016**	**2017**
Sub-objective 4. Visitor safety and accessibility										
4.										
4.1.										
4.2.										
4.3.										
4.4.										
4.5.										
4.6.										
4.7.										
4.8.										

Timetable for Visitor Action Plan										
Activity number	**First 5 years**					**Next 5 years**				
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Sub-objective 5. Environmental standards for visits										
5.										
5.1.										
5.2.										
5.3.										
5.4.										
5.5.										
5.6.										
5.7.										

Timetable for Visitor Action Plan										
Activity number	**First 5 years**					**Next 5 years**				
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Sub-objective 6. Visitor programs										
6.										
6.1.										
6.2.										
6.3.										
6.4.										
6.5.										
6.6.										
6.7.										

Timetable for Visitor Action Plan										
Activity number	**First 5 years**					**Next 5 years**				
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Sub-objective 7. Programs for visitors with special needs										
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7.1.										
7.2.										
7.3.										
7.4.										

Forest Conservation

NATIONAL PARK

Plitvice Lakes

ACTION PLAN

Plitvička Jezera, October 2007

Contents

Introduction

The forests of Plitvice Lakes National Park stand at the edges of the Velika Kapela and Mala Kapela mountain and forest massifs, best known for beech/fir and beech forests. The geographic position, low population density and historical circumstances (wars) in this region have facilitated the preservation of the largely virgin state of these forests. Within the context of the overall ecosystem of Plitvice Lakes National Park, forests cover 76% of its surface area. Their primarily protective role has influenced the maintenance of a stable hydrological regime in the entire system, the development and maintenance of the unique tufa barrier phenomenon and the ongoing preservation of numerous generally beneficial forest functions. Forests play a major role in soil protection, regulation of precipitation flows and drainage and regulation of the volume and stability of springs. They are also habitats rich in a diversity of animal life, which indicates the need for continual research and monitoring of forest ecosystems so that the important functions of forests are not threatened.

From 1975 to 1982, Management Programs were developed to cover a ten-year period in four individual forest units in the Park, and management proceeded in accordance with these programs up to the beginning of Croatia's Homeland War in the first half of the 1990s. Since forest management has evolved from the former economic approach to the current environmental and social approach, i.e. ensuring the general benefits of forest ecosystems, this Action Plan sets down the fundamental tasks expected within the framework of forest management in Plitvice Lakes National Park over a ten-year period and the resources needed to accomplish them.

Forest associations in Plitvice Lakes National Park

The most common forest community in the territory of Plitvice Lakes National Park is the *beech forest with giant dead nettle (E4.5.1 Lamio orvalae-Fagetum (Ht.1938) Borhidi 1963)* which extends from the shores of the Plitvice Lakes up to elevations of 700 m. Due to their competitiveness and the fact that their canopies overshadow the forest floor, beech trees leave little room for the growth of other trees. The second most common forest association is the Dinaric beech and fir forest (*E.5.2.1 Omphalodo-Fagetum (Tregubov 1957) Marinček et.al.1993.*) which extends along the belt above elevations of 700 m, consisting of a large number (over 250) species. The territory of beech and fir forests contain two significant relict forest associations: Scots and black pine forest with hellebore on dolomite (*E.7.4.1 Helleboro nigri-Pinetum sylvestris Ht.1958*) and spruce forest with white sedge on dolomite (*E 7.3.5 Carici albae-Picetum (H. Mayer et. al. 1967)).*

Besides these forest associations, there are other associations, although present in much smaller percentages, which are no less important and thus deserve mention:

- hop hornbeam with heather E.7.4.2 *Erico herbaceae-Ostyetum Ht.*(1938. 1956)
- hop hornbeam forest and underbrush with autumn moor grass (E.3.5.6 *Seslerio autumnalis Ostryetum Ht.et H-ić in Ht1950*)
- beech forest with white sedge (*Carici albae-Fagetum M.Moor 1952. E.4.1.3*)
- Dinaric fir forest on limestone blocks (*E.7.1.1 Calamagrosti – Abietetum Ht.1950*).

Čorkova Uvala Old Growth Forest

One of the best preserved old growth forests within the beech and fir forest ecosystem in Plitvice Lakes National Park is the Čorkova Uvala old growth forest. In 1965, this old growth forest was proclaimed a special forest vegetation reserve, where, over a surface of 84 ha and at elevations ranging from 860 to 1,028 m, all developmental phases of an old growth forest can be found, with domination of aging and decay. This is a secondary old growth forest, where human influence was occasionally present, but not to an extent that would cause the forest to lose its significance.

A particularly astounding aspect of this forest is the size of the fir, spruce and beech trees. The forest is entirely filled with life, which proceeds in harmony with the ecological constitution of individual members of this living community. This old growth forest is an entirely stable forest ecosystem, and if the objective is to have worthwhile forest ecosystems, this is best achieved by duplicating the conditions in which a forest develops in nature without significant human impact.

1. PRINCIPAL OBJECTIVE OF THE ACTION PLAN

The Action Plan is predicated on the achievement of two planned objectives:

A) Ensuring forest ecosystem stability and unspoiled nature in Plitvice Lakes National Park

B) Making forest ecosystems more accessible to visitors

The accomplishment of the activities foreseen under the action plan contribute to achievement of the Plitvice Lakes National Park Management Plan and the vision statement specified therein.

By achieving objective A), the Action Plan contributes to achievement of the objective to secure conservation and improvement of the ecological and social functions of forests. The Action Plan supports the measure to foresee specific activities for select areas and forest associations.

By achieving objective B), the Action Plan contributes to achievement of the objective specified in the Management Plan to improve the quality of one-day visits. The general framework of this objective also upholds the measure to improve the quality and expand the visitor system. It also contributes to the objective specified in the Park's Management Plan to enhance the educational function in the Park through the measures foreseen to achieve this objective.

2. ACTION PLAN ACTIVITIES

In order to achieve of the objectives set by the Action Plan, the following activities have been defined:

1. SCIENTIFIC AND SCHOLARLY RESEARCH

1.1. Development of the Forest Ecosystem Conservation Program for Plitvice Lakes National Park

The Nature Protection Act (as published in Croatia's official journal, *Narodne novine*, no. 70/2005), Article 42, paragraph 5, stipulates that Forest Ecosystem Conservation Programs must be drawn up for forests in national parks. By the same token, the Forests Act (*Narodne novine*, no. 140/2005), Article 26, paragraph 3, stipulates that special conservation and preservation programs must be drawn up for forests in national parks which must be developed according to the special measures stipulated in the forest management regulation issued by the minister in charge of environmental protection, which means that the relevant authorities must define the content of the forest ecosystem conservation programs that will serve as the basis for calling public tenders and defining works to be performed.

1.2. Research on large carnivores and ungulates using infrared detection and video recording

The project's objective is to systematically and continually monitor large carnivores and ungulates within the boundaries of Plitvice Lakes National Park and thereby determine: their numbers, identity of individuals, movement corridors, natality, mortality, and population size.

A system of video and photographic cameras would be installed at key points frequented by these animals – watering holes and permanent movement corridors, to gain knowledge into the lives of individual animals in the Park and their habitats.

The project must ascertain the base status of the populations of these species:

a) wolf (*Canis lupus*),
b) brown bear (*Ursus arctos)*,
c) Eurpean lynx (*Lynx lynx*),
d) red deer (*Cervus elaphus*),
e) roe deer (*Capreolus capreolus*),
f) wild boar (*Sus scrofa*).

1.3. Phytocenological forest vegetation research

Detailed phytocenological research has not yet been conducted in the National Park's territory and it will be necessary to develop a phytocenological National Park map at a scale of 1:25000, while individual locations should be mapped at a scale of 1:10000. The current database is being using the mapping procedure, and the existing terms will be aligned according to the rules of the Phytocenological Nomenclature Code.

1.4. Research on erosion in forest ecosystems with emphasis on its connection to the National Park's water ecosystems

The objective of this project is to study the state of erosion of leaf mold and soils in the main forest ecosystems, and ascertain the dependency of erosion on habitats and the structural features of the National Park's forest ecosystems. Erosion monitoring devices will be installed on leaf mold and soil at test plots selected in various habitats and structural circumstances. Climatic conditions and the intensity and frequency of precipitation and its surface drainage will be simultaneously monitored. A system to monitor conveyance and sedimentation of organic detritus and inorganic deposits will be installed in waterways.

1.5. Research on the Carabidae (ground beetle) family – indicator species for forest ecosystem quality

There are several ground beetle species endemic to the Park about whose biology and micro-habitats little is known. Some of them live only in forest ecosystems and they are sensitive to changes in them. Ground beetles are an important food source for vertebrates (birds, small terrestrial mammals and some bat species) of which many are registered in both the Croatian and European Red Lists.

The objective of the project is to draw up a list of ground beetle species, endemic species, and rare or endangered (at the European level) species, develop a proposal for protection of rare species based on research, and develop an educational collection, boards and posters to inform visitors of the specific features of ground beetles in the Park.

Cooperation among the institution's staff, required funds, financing, forms of assistance and other details will be defined by the formal agreement reached with a contractor.

1.6. Forest fungi inventory

The Park's territory also abounds in mycologically significant habitat types. Sufficient data on their mycobiota are lacking. Mushrooms are a large and important group of organisms with a diverse but key role in terrestrial ecosystems. They play an important role in decomposing dead organic matter, increasing

the resorption system of trees, natural selection and life cycles (accelerating the circulation of matter in nature), and they contribute to habitat diversity and the emergence of hollows in living trees (important to many animals, such as birds and small mammals), and they constitute an important nutritional and developmental basis for many small animals (e.g. insects, snails, and small mammals). Some larger animals also feed on them.

Research would encompass more mycologically significant forest habitat types during one year.

Besides an overview of collected data on mycobiota in the Park, the report on completed research would also contain proposed measures to manage areas encompassing the researched habitat types.

Cooperation among the institution's staff, required funds, financing, forms of assistance and other details will be defined by the formal agreement reached with a contractor.

1.7. Selection and characteristics of macro- and micro-habitats of the Ural owl (*Strix uralensis*) in Plitvice Lakes National Park

Approximately 10% of Croatia's Ural owl population lives in Plitvice Lakes National Park, and this is one of the reasons why the Park has been classified as an ornithologically important territory in Croatia and was incorporated into the National Ecological Network. The population density of this species in Plitvice Lakes National Park is the highest in Croatia (almost 2.5 times greater than that in other areas researched in Croatia) and it is generally among the highest population densities in the European range of this species. Previous research has made it possible to ascertain the distribution of most pairs in the Park and the establishment of a monitoring and data collection program which will form the basis for more detailed research into this population. The objective of this research is to determine the specific requirements of Ural owls given their population structure (where they feed, where they seek refuge, etc.) in the Park's forest habitats, i.e. which parameters influence the size of their territory and how they use specific parts of their territory given the differences in habitat structures (micro-habitats). Research will be conducted in the southwestern part of the Park, where the highest population density was ascertained in previous research and where the population monitoring transect was established. The results of this research will contribute to a better understanding of the ecology of this species in the Park and enable better planning and more effective implementation of conservation of Croatia's most important Ural owl population.

1.8. Research on use of habitat by the great spotted (*Dendrocopos major*), white-backed (*Dendrocopos leucotos*) and three-toed (*Picoides tridactylus*) woodpeckers.

Systematic monitoring of the movement of these birds will establish the basic facts about their feeding habits, sizes of their territories, habitat selection and nesting and nighting sites. The life cycle of woodpeckers is closely tied to forest habitats, and due to their adaptation to bore into trees, woodpeckers exert a considerable impact on forest ecosystems (e.g. it is well-known that the size of certain woodpecker species is closely tied to the abundance of bark beetles, or to the quantity of decaying trees). The feeding adjustments of woodpeckers influences the population of insects in a forest, especially bark beetles and longicorns, while their nesting in hollows they make themselves provide shelter and nesting sites for a series of other birds and mammals. Research into their ecology generates important knowledge on the stability and condition of forest ecosystems and on the populations of other animal species.

1.9. Research on the qualitative and quantitative structure of bird communities in forest habitats

Research into the qualitative and quantitative structure of bird communities in forest ecosystems was conducted in Plitvice Lakes National Park in 2004 and 2005. The results indicate a great diversity of bird communities, and a very high population density of individual species, particularly those living in tree

holes. Since research into communities of birds as bioindicators facilitates monitoring of forest ecosystem stability, repeated research after five years is proposed, i.e. in the 2009 and 2010 nesting seasons, provided that the forests are not cut.

1.10. Amphibians and reptiles in Plitvice Lakes National Park – research

The project foresees research into amphibians and reptiles in Plitvice Lakes National Park. During sixteen days of fieldwork, data on species, their distribution in habitats, elevations, and suitable amphibian spawning sites would be collected. Special emphasis would be placed on habitat analysis. The gathered data would provide valuable information for the subsequent formulation of management measures for the purpose of conservation which could then be incorporated into the Management Plan.

1.11. Inventory of forest orchid species

An inventory of orchids has been planned.

1.12. Vitality and degradation of trees as stability indicators in the forest ecosystems of Plitvice Lakes National Park

Degradation of trees has appeared as a result of various stress factors in forest ecosystems. According to previous research, the most threatened species are the common fir and, more recently, the spruce. The intention of this research is to define the criteria to assess the degree of vitality of trees based on age classes of external features. The criteria will be developed on the basis of eight age classes of tree conditions for two species (common fir and spruce). Based on these criteria, and the habitat and structural parameters, a tree vitality index will be defined. Research will establish the vitality of trees in Plitvice Lakes National Park (fir and spruce). The tree degradation index will be used to demonstrate tree degradation trends and degradation trends and intensities. Research will also be used to define the criteria for assessing the vitality of forest trees and tree vitality and degradation indices which will be used to assess the stability of forest ecosystems.

1.13. Quality and development of natural rejuvenation of major tree species in Plitvice Lakes National Park

Since the "classical" forest rejuvenation methods over large surfaces otherwise employed in managed forests cannot be used in Plitvice Lakes, and care for forests is not carried out with the goal of preparing an assemblage for natural rejuvenation, the question arises as to the regenerative potential of forests under conditions of permanent conservation. The objective of the project is to gain knowledge into the state of natural rejuvenation, particularly its qualitative features, and to plan its development under conditions of permanent conservation, ascertain the differences in comparison to managed forests, plan for the possibility of natural forest rejuvenation and make a long-term assessment of its regenerative potential.



2. FOREST ECOSYSTEM MONITORING

2.1. Record and analyze surfaces and trees beset by desiccation (fungi, bark beetles) and extreme weather (winds, lightning, ice, snow etc.)

Monitoring of forests using records of surfaces and trees beset by changes (drying, disease, damage) would be conducted each year on permanent plots determined by the distribution of forest associations in the Park's territory, and by the network of bioindicator plots. A plot with dimensions of 50 x 50 m will be placed at the transect of bioindicator plots, where a total count will be conducted and the trees will be classified into the following categories based on species: 1. dried snags, 2. limb breakage, 3. derooted trees (snow, ice, wind), 4. lightning, 5. disease (fungi, cancer, etc.).

There are plans to set up 18 plots in the Park, where 3 workers are required to measure two plots each per day, meaning that fieldwork would last 9 days.

For larger surfaces subject to desiccation or possible calamities, special measurements will be made.

2.2. Monitoring populations of large carnivores and their prey, movement corridors, territories

The Carnivore and Ungulate Population Monitoring Project will define the base status of populations in Plitvice Lakes National Park. Upon achieving the project's objective, the status of the following populations will be monitored:

a) wolves (*Canis lupus*),

b) brown bears (*Ursus arctos)*,

c) European lynxes (*Lynx lynx*),

d) red deer (*Cervus elaphus*),

e) roe deer (*Capreolus capreolus*),

f) wild boars (*Sus scrofa*).

The experiences gained in the project will be conveyed to monitoring, thereby ensuring minimum mistakes and simplicity in the work of staff charged with population monitoring.

Tried and tested monitoring methods for warm-blooded animals will be employed by use of Trailmaster Infrared Trail Monitors technology. Two systems would be ideal for this project: TM 700v – Video Trail Monitor and TM1550 – Active Infrared Monitor.

2.3. Monitoring bark beetle populations in spruce associations

Monitoring the population density of bark beetles in Plitvice Lakes National Park has been conducted for the past two years, and it will be continued every year. Establishment of a system to monitor the population dynamics of bark beetles is meant to keep track of fluctuations of observed bark beetle species over a number of years, and it can serve as an early warning system for the changes that precede desiccation and degradation of forests over larger surfaces.

Samples are gathered once weekly from May to October at 25 sites where Theysohn flight barrier traps were installed. Pheromones were placed in the traps for two types of bark beetles (*Ips typographus, Pytiogenes Calcographus*). Two persons carry out the gathering once weekly over a five month period, which is a total of 20 samplings.

The samples are preserved in alcohol until analysis.

2.4. Assessment of damage to forests in Plitvice Lakes National Park based on the International Cooperative Program on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests)

The International Cooperative Program on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests) was established in 1985 as part of the Convention on Long-range Transboundary Air Pollution (CLRTAP) of the UN and European Commission. Croatia has participated in ICP Forests since 1987, while research on damages in Plitvice Lakes National Park commenced in 2000, when field assessments were conducted by staff members of the National Park's forestry unit.

Observations are made on bioindicator (16 x 16 km network) and basic plots (4 x 4 km network), with one bioindicator plot and 8 basic plots.

The main parameter to assess the damage to canopies is the defoliation, and defoliation of 24 trees are evaluated on each plot.

The assessment is conducted on predominant, dominant and co-dominant trees and only the illuminated portion of the canopy is considered for assessment.

The percentage of defoliation is assessed on the basis of a comparison of specific trees with a photographic manual for individual species.

2.5. Monitoring the chemical composition of precipitation and run-off waters in various forest ecosystems

The objective of monitoring is the long-term observation of precipitation dynamics in the main forest ecosystems. The monthly quantity of precipitation, its duration and intensity will be ascertained. A further objective is to determine the differences in interception and seepage of precipitation through the tree canopies of the principal species. The quantities of deposited substances which appear in precipitation and the main forest ecosystems will be monitored, and it will be compared with the quantities of these substances in waterways and the lakes. The monthly and annual trends in pollutants in precipitation, various forest ecosystems and waterways and lakes will be determined.

2.6. Woodpecker monitoring (white-backed woodpecker – *Dendrocopos leucotos*, three-toed woodpecker – *Picoides trydactylus*, great spotted woodpecker – *Dendrocopos major*, and lesser spotted woodpecker – *Dendrocopos minor*)

During research in the Park's territory, as part of the project on the Impact of forest management on animal abundance and diversity in Plitvice Lakes National Park and the Vrhovine Forestry District and the recommendation to development a forest management strategy conducted from May to October 2004 and 2005, six species of woodpecker were recorded: lesser spotted woodpecker (*Dendrocopos minor*), great spotted woodpecker (*D. major*), white-backed woodpecker (*D. leucotos*), three-toed woodpecker (*Picoides trydactylus*), gray-headed woodpecker (*Picus canus*) and black woodpecker (*Dryocopus martius*). Since woodpeckers are considered very good indicators to assess the degree of unspoiled nature and the quality of forest habitats, monitoring has been proposed.

2.7. Owl monitoring (Ural owl – *Strix uralensis*, tawny owl – *Strix aluco*, boreal owl – *Aegolius funereus*)

From March 2002 to October 2005, research on birds of prey and owls was conducted in Plitvice Lakes National Park as part of the **Plitvice Lakes National Park Bird of Prey and Owl Project**. The project established that eight out of ten owl species (order *Strigiformes*) nest in the Park. Based on this research,

monitoring of nesting populations of three owl species was proposed: Ural owl – *Strix uralensis*; tawny owl – *Strix aluco*; and boreal owl – *Aegolius funereus*.

2.8 Monitoring of bats (forest species)

A total of 22 species in the wider area of the Plitvice Lakes have been recorded in systematic observations over three years (2002-2004), which is two thirds of the known species in Croatia. Bats can be grouped on the basis of differing use of individual habitats, or the different ecology of individual groups. Habitats are grouped according to ecological niches used predominantly (but not exclusively) by individual species to hunt their prey, and most often the daily shelter is located precisely in this area. A considerable number of bat species are associated with forest habitats in the Park: (2) species of caves and warmer forest areas, (3) resident forest species in alpine forests, and (4) migratory forest species. The Barbastelle bat (*Barbastella barbastellus*) is a typical forest species. It is very sensitive to disturbances, decreases in its prey and habitat loss, primarily old trees with holes in the bark and hollows, as well as attic space in buildings. Due to the small number of current finds in Croatia, it is difficult to ascertain the degree of regional endangerment. A stable resident population has been found in the National Park.

2.9 Monitoring forest ecosystem entomofauna

During research conducted as part of the project on the Impact of forest management on animal abundance and diversity in Plitvice Lakes National Park and the Vrhovine Forestry District and the recommendation to development a forest management strategy conducted from May to October 2004 and 2005, an abundance and great diversity of entomofauna were recorded, as well as the presence of five new species for Croatia (sawflies of suborder *Symphyta*: *Pontania bella, Phyllocolpa leucapsis, Ph. Leucosticta, Scharliophora nigella* and *Pristiphora laricis*). A sparsely distributed butterfly species, the marsh fritillary (*Euphydryas aurinia*) was recorded in the same territory. With reference to the assumed composition of small mammal species in the old growth forest in Čorkova Uvala, so far 50% of the species are known. Based on completed research, instructions have been issued for future monitoring of entomofauna in the Čorkova Uvala forest ecosystem.

2.10. Monitoring of small terrestrial forest mammals

Within the framework of the project on the Impact of forest management on animal abundance and diversity in Plitvice Lakes National Park and the Vrhovine Forestry District and the recommendation to development a forest management strategy conducted from May to October 2004 and 2005, research on small terrestrial vertebrates was conducted.

With reference to the assumed composition of small mammal species in the old growth forest in Čorkova Uvala, so far 50% of the species are known, which indicates the presence of a series of significant species in the Park's animal life. Monitoring small terrestrial mammals will continue according to the proposed protocols.

2.11. Vitality and degradation of trees as forest ecosystem stability indicators in Plitvice Lakes National Park

Based on the criteria and tree vitality and degradation index secured by means of the project specified in section 1.12., the stability of forest ecosystems will be assessed annually.

2.12. Monitoring the quality and development of natural rejuvenation of principal species

These activities are logical consequence of the prior tasks and they are aimed at the initiation of monitoring of rejuvenation.

2.13. Monitoring birds of prey (buzzard – *Buteo buteo*; and peregrine falcon – *Falco peregrinus*)

Research on birds of prey and owls conducted in Plitvice Lakes National Park as part of the Plitvice Lakes National Park Bird of Prey and Owl Project from March 2002 to October 2005 resulted in the establishment of a program to monitor buzzards and peregrine falcons.

The buzzard is the most numerous bird of prey species in the Park. It nests in forest habitats, but it greatly depends on the size of more open spaces where it primarily hunts, so the number of buzzards is a sound indicator of changes to both habitat types. In Croatia, the peregrine falcon has the status a vulnerable (VU) nesting population, and it is cited in Annex II to the Birds Directive. Only one pair nests in the park, and its nesting site is situated on the cliffs of the Korana Canyon, i.e. an area threatened by disturbances caused by increasing numbers of tourists.

3. MAKING FOREST ECOSYSTEMS MORE ACCESSIBLE TO VISITORS

3.1. Construction of forest ecosystem presentation center – Renovation of the forestry house

3.1.1. Development of a project to renovate the existing forester house in Čorkova Uvala

The site of the Čorkova Uvala forestry house in a part of Plitvice Lakes National Park necessitates its adaptation as a educational and presentation facility.

It is located in the northwestern part of the National Park, surrounded by a large forest complex, primarily the Dinaric beech and fir forest association (*Abieti-fagetum dinaricum*) and a very valuable relict spruce association. Additionally, the Čorkova Uvala old growth forest is located in the immediate vicinity (ca 3 km). This is one of the loveliest old growth forests of this type in Europe. A large meadow (ca 150 ha) has also been preserved in front of the forestry house, as well as several smaller meadows in the immediate vicinity, which enhances the botanical wealth of the National Park. The forestry house's location in a part of the National Park where the distance to the nearest settlement is over 3 km in a straight line, makes it an ideal habitat for many animal species.

In this regard, and for the purpose of presentation of forest ecosystems and visitor education, a project for renovation of the entire building needs to be developed so that it can begin to function and be incorporated into the National Park's visitor program.

The renovation project consists of:

1. Architectural assessment of the existing condition
2. A geodetic study
3. Preliminary design
4. Main project
    - architectural design

- construction design
- electrical installation schematics
- plumbing and sewage schematics

5. The final design would consist of:
   - architectural design with all necessary details
   - construction design with all necessary details
   - final installation schematics
   - interior design with all necessary details.

In compliance with the Public Procurement Act, a public tender must be held to select a company to draft the complete project documentation.

3.1.2. Renovation of the forestry house in Čorkova Uvala based on the renovation project

In compliance with the Public Procurement Act, a public tender must be held to select a company (best bidder) to perform the works to renovate the forestry house in Čorkova Uvala in compliance with the project documentation.

3.1.3. Development of promotional materials with educational content

Define and determine the content and types of promotional materials in cooperation with the Plitvice Lakes National Park Marketing Department.

4. ACTIVITIES DICTATED BY CONSERVATION ZONES

4.1. Zone 1a – Strictest conservation zone (forest vegetation reserves)

4.1.1. Scientific monitoring of forest ecosystems

4.1.2. Periodic measurement of permanent forest plots

Permanent test plots were established in the territory of Plitvice Lakes National Park as a part of its forest vegetation reserves, and every 10 years a detailed measurement of the structural characteristics of each plot must be done, and their development and conditions must be monitored based on comparisons with prior measurements.

4.1.3. Establishment of a permanent monitoring network in the Čorkova Uvala old growth forest

The detailed monitoring of development in the Čorkova Uvala old growth forest will continue such that detailed measurements are conducted in the network of newly-established plots every ten years, wherein data on their development and conditions must be monitored based on comparisons with prior measurements.

4.2. Zone 1b – Very strict conservation zone

4.2.1. Visitor infrastructure

In zone 1b, supervised visits and tours along landscaped hiking trails and forest roads are allowed.

4.2.2. Development of a sight-seeing system for forest ecosystems – restoration of existing trails and forest roads and their connection to the existing system in the lake zone.

Expand the existing sight-seeing system to forest ecosystems in cooperation with the Marketing Department.

4.2.3. Renewal of forest roads

To secure the passability of abandoned forest roads and to facilitate fire safety, it will be necessary to renew those sections of roads which are currently impassable or passable with great difficulty due to lack of maintenance. These roads are used by Park staff when performing their regular duties, and they can also be used as tourist thoroughfares. Roads with a total length of 30 km have been designated as priority sections, as follows:

a) Pogledalo – Uvalica - Ljeskovac

b) Kuselj – Č. Uvala – Lumbardenik

c) Vreline – Sušanjska draga

Road works will be assigned to a contractor.

There is also a need for repair of the wooden bridges on these sections, with prior development of the necessary project documentation, as follows:

a) bridge over Crna River

b) bridge in Liman Draga

4.2.4. Maintenance of forest roads

Existing and restored roads must be maintained annually to ensure passability, such that these roads are cleared of various types of vegetation, and subsequent damages are repaired and filled and culverts and transverse and lengthwise drainage shafts are restored and maintained.

4.3. Zone 2a – Active habitat conservation zones (meadows and grasslands)

4.3.1. Gathering data from public records on grass-covered surfaces in forest complexes.

Discern all grass-covered surfaces (pastures and meadows) from the cadastre and land registers which are located in forest complexes and record them, and based on this data create records on maps scaled at 1: 2880 and 1: 5760.

Update this data in compliance with the data observed in the field and establish their actual dimensions.

4.3.2. Clearing of surfaces encompassed by succession (ca 70 ha annually with proposed inputs)

Since succession has gradually progressed, the removal of woody vegetation must be initiated as of 2008 in that part of the Park for which records have been compiled, using machinery that will be purchased for this purpose (foreseen in the plans for 2006). Each year approximately 70 ha can be cleared with the proposed inputs. All surfaces smaller than 0.5 will be left to succession.

4.3.3. Mowing of grass-covered surfaces in forest complexes, with special reference to privately-owned meadows, recommendations and suggestions to owners on mowing methods and times (in case of later mowing offer alternate surfaces as compensation), ca 100 ha annually with the proposed inputs

All surfaces that were previously mowed will continue to be mowed, and based on annual operative plans they will be expanded by the size of the cleared surfaces.

Attempts will be made to maintain privately-owned grass-covered surfaces by means of contacts with the owners and in compliance with scientific knowledge. In case of privately-owned surfaces which require later mowing due to various scientific monitoring projects, the owners will be offered alternate surfaces so that a given project can be conducted.

Mowing will be done forward annually, because the purpose of mowing in the Park is to maintain diversity and halt succession.

Mowed grass will be dried and gathered, bailed (bailed hay can be sold) or piled in stacks so that it can be used as feed for wildlife.

4.3.4. Purchase of grass-covered surfaces offered for sale

All grass-covered surfaces (meadows and pastures) on offer must be purchased based on pre-emptive buying rights so that they can be more easily maintained. Based on current knowledge and legal provisions, up to 10 ha of land could be purchased every year.

4.4. Zone 2b – Active forest ecosystem conservation zone

Preservation of the natural condition of forests

4.4.1. Determination of conditions and specification of active management measures

Forests in the active conservation zone are generally in the degradation phase of stump growth or they are recently managed forests in the Park's peripheries. A forest inventory will determine the actual condition and based on this measures will be specified to manage these forests.

4.4.2. Relict associations

4.4.2.1. Identification and measurement of relict associations, monitoring of phytocenological associations every 10 years

An inventory of forest ecosystems and a detailed phytocenological survey in Plitvice Lakes National Park will encompass the existing relict associations, wherein the position and surface areas of relict associations will be established, and based on the results secured by measurement and surveying management measures will be specified.

4.4.3. Cultivated forests

4.4.3.1. Allow natural development

Cultivated forests extend over the former agricultural land in the forest section of Brezovačko Field. They consist of cultivated spruce and pine stands approximately 35 years old. Since after their cultivation no care nor clearing was done, they were already at that time left to natural development with the objective of transition to a climazonal association, in this case a beech/pine forest, so natural succession should be allowed to continue.

A forest inventory will ascertain the structure and composition, and stage given the ultimate objective (association climax).

4.5. Zone 3 -Usage zone

4.5.1. Maintenance of forest surfaces along trails, roads, viewpoints and buildings (hotels, restaurants, parking lots, etc.)

The task of the Public Institution is to ensure a safe stay and movement for visitors and the full experience of nature, so limited interventions are necessary in the zone frequented by visitors. Such interventions consist of removal of trees along trails and roads which may present a danger to the safe stay and unimpeded movement of visitors.

5. PRIVATELY-OWNED FORESTS

According to the provisions of the Forests Act, privately-owned forests within protected areas are managed by the Forestry Advisory Service. In the strict conservation zone, 1a, where there is privately-owned land, funds must be secured to purchase privately-owned forests.

5.1. Privately-owned forests in the strict conservation zone – 1a

Since all activities, meaning use of natural resources, are prohibited in the strict conservation zone, the relevant ministry must pay damages to meet the needs of forest owners for lumber.

5.2. Privately-owned forests in the strict conservation zone 1b, and zones 2 and 3

In compliance with the Forests Act and the Directive establishing the Forestry Advisory Service, a program must be drafted for privately-owned forests and privately-owned forests must be managed in compliance therewith.



3. PROJECTED RESOURCES TO ACHIEVE ACTION PLAN

Existing human resources and contractors will be employed to achieve the Action Plan. Scientific and scholarly research will largely make use of existing equipment, but some activities will require additional equipment.

Equipment and existing human resources will be used for the needs of monitoring in the Park, while construction works by contractors have been planned for the renovation of the forestry house and forest roads. Halting the trend of loss of grass-covered surfaces and maintenance of existing biodiversity necessitates the procurement of the necessary equipment and the professional training of existing employees.

4. FUNDING SOURCES

A portion of the planned activities in an amount of HRK 300,000 annually will be financed by the Park's own revenues at an equal tempo over a ten-year period. For those activities under this Action Plan which do not directly concern forest management, the necessary funds have only been generally allocated, or it was not possible to fully foresee them.

5. ACTION PLAN – TABULAR OVERVIEW

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
1. Scientific and scholarly research.						
Forest ecosystem stability and unspoiled nature	1.1. Development of Forest Ecosystem Conservation Program for Plitvice Lakes National Park	Database (GIS). Forest ecosystem condition and observation of changes Data on the status of forest ecosystems (dendrometric data, surfaces, quantities, intensity of change, animal and plant species…)	Comparison with GIS base from 2003. Control method (verification of accuracy of data) and comparison with previous inventories.	All existing data – in all forms, projects. Prior definition of inventories (SINP and Nature Conservation Department), preparations for public tender, comparison with existing data - Contracted services	2008 – 2012 -2008-Medvjeđak -2009 – Č. Uvala - Kapela -2010 – Kik – Visibaba and Krivi Javor Plitvički -2011 – Kriva Draga (Homoljac Brezovac) -2012 Rječica Javornik	Forestry component HRK 2,484,000.00
	1.2. Research on large carnivores and ungulates using infrared detection and video recording	Data on population density of large carnivores and their prey, movement corridors, territories	Monitoring	Use existing data (previous research results). Equipment: video cameras, infrared lamps, water-tight housing, field computer, snow vehicle (10 days), all terrain vehicle (14 days). 24 working days annually. Vehicle fuel	From 2008 to definition of base status – ca 2009. Identification of individuals within population of large carnivores and definition	HRK 360.000.00 for equipment, working hours during regular work
	1.3. Phytocenological forest vegetation research	Detailed list of forest vegetation associations	Phytocenological map of the entire Park, scale 1:25.000, for individual sites, scale 1:10.000, data in database	Current database	2008-2010	HRK 400,000.00

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
Forest ecosystem stability and unspoiled nature	1.4. Research on erosion in forest ecosystems with emphasis on its connection to the National Park's water ecosystems	Quantity of eroded organic detritus and inorganic deposits from various forest ecosystems. Estimate of surfaces beset by erosion and quantity of conveyance and sedimentation of organic and inorganic materials in waterways	Comparison with similar research published in scientific and scholarly journals.	Selection of plots, devices to monitor erosion of leaf mold and soils, devices to monitor conveyance and sedimentation of materials in waterways.	2008-2011	HRK 350,000.00
	1.5. Research on the Carabidae (ground beetle) family – indicator species for forest ecosystem quality	List of ground beetles, list of endemic species or species endangered in Europe at individual habitats, proposal for protection of rare species; development of educational collections, boards and posters.	Comparison with previous literature for the territory of the National Park.	Existing data, engagement of external researchers	2008	ca. HRK 57,000.00
	1.6. Forest mushroom inventory	Gathering of data on mycobiota in the National Park's forest habitats. Proposed management measures given the need for mushroom conservation.	Comparison with old data from literature.	Existing data, engagement of external researchers.	2008-2009	ca. HRK 59,000.00
	1.7. Selection and characteristics of macro- and micro-habitats of the Ural owl (*Strix uralensis*) in Plitvice Lakes National Park	Determine the specific requirements of Ural owls given their population structure (where they feed, where they seek refuge, etc.) in the Park's forest habitats, i.e. which parameters influence the size of their territory and how they use specific parts of their territory given the differences in habitat structures (micro-habitats).	Comparison with old data from literature.	Existing data, engagement of external researchers.	2008-2010	ca. HRK 150,000.00

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
Forest ecosystem stability and unspoiled nature	1.8. Research into use of habitat by the great spotted (*Dendrocopos major*), white-backed (*Dendrocopos leucotos*) and three-toed (*Picoides tridactylus*) woodpeckers	Systematic monitoring of the movement of these birds will establish the basic facts about their feeding, sizes of their territories, habitat selection and nesting and nighting sites	Comparison with old data from literature.	Existing data, engagement of external researchers	2008-2010	ca. HRK 150,000.00
	1.9. Research on the qualitative and quantitative structure of bird communities in forest habitats	Comparison of results (qualitative and quantitative composition of bird communities) after five years provided that the forests are not cut.	Comparison with research conducted during 2004 and 2005 Comparison with research conducted during 2009 and 2010	Existing data, engagement of external researchers.	I) 2009 and 2010 II) 2014 and 2015	ca. HRK 60,000.00
	1.10. Amphibians and reptiles in Plitvice Lakes National Park – research	1) Inventory of species with their endangered status; 2) establishment of distribution of species by micro-habitats; 3) distribution map of individual species in the National Park in GIS; 4) records of suitable spawning sites for amphibians; 5) established protection measures; 6) developed database of quality digital photographs of all recorded species	Comparison with old data from literature.	Existing data, engagement of external researchers.	One-year project (2008)	ca. HRK 42,640.00 (Note: this amount is based on the draft Project for the entire Park!)

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
Forest ecosystem stability and unspoiled nature	1.11. Inventory of forest orchid species	Completion of inventory of species for the National Park and gathering of data on habitats and populations	Comparison with lists from 2003-2004 (Inventory of bats in Plitvice Lakes National Park and proposals for their protection – Final Report 2004)	Existing data, engagement of external researchers	One-year project (2008 or 2009)	ca. HRK 20,000.00 (co-financed from state budget)
	1.12. Vitality and degradation of trees as stability indicators in the forest ecosystems of Plitvice Lakes National Park	Creation of index of vitality and degradation for the common fir and spruce and assess stability of forest ecosystems on this basis	Comparison with database that will be formed on the basis of long-term measurements	Selection of plots in various habitat and structural conditions, development of database	2009-2012	HRK 100,000.00
	1.13. Quality and development of natural rejuvenation of major tree species in Plitvice Lakes National Park	Qualitative and quantitative features of natural rejuvenation of principal tree species (beech, fir, forest berries) in forest ecosystems and regeneration potential and natural renewal potential	Re-measurement at fixed sites.	Light analysis system, laser range-finder, set of route markers, compass, measuring chains and bands, Vertrex III altimeter, etc.	2008-2010	HRK 250,000.00

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
2. Forest ecosystem monitoring.						
Forest ecosystem stability and unspoiled nature	2.1. Record and analyze surfaces and trees beset by desiccation (fungi, bark beetles) and extreme weather (winds, lightning, ice, snow etc.)	- distribution and number of dried snags by species and surface - recording of calamities and unwanted changes in forest ecosystems, appearance of introduced species	Comparison with initial status	Field work, data processing (Institution staff)	Continual measurement every year (as of 2008)	Funds of the Plitvice Lakes National Park Public Institution
	2.2. Establish monitoring of large carnivores and ungulates based on research into their populations using thermal detection and video recordings	Data on population density of large carnivores and their prey, movement corridors, territories	Comparison with initial status	Field work, data processing (Institution staff)	As of 2008	HRK 150,000 for financial costs and maintenance costs
	2.3. Monitoring bark beetle populations in spruce associations	Monitoring of *Ips typographus* and *Pytiogenes calcographus* populations	Comparison with initial status	Alcohol, pheromones, traps, jars to collect samples	Continuous every year	HRK 30,000.00 – 10 years
	2.4. Assessment of damages to forests in Plitvice Lakes National Park based on the International Cooperative Program on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests)	Degradation of forest	Comparison with initial status	Field work, data processing (Institution staff)	Each year in July	Funds of the Plitvice Lakes National Park Public Institution

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
Forest ecosystem stability and unspoiled nature	2.5. Monitoring the chemical composition of precipitation and run-off waters in various forest ecosystems	Chemical composition, quality of precipitation and run-off waters in various associations (beech, fir, spruce)	Comparison with national network on air pollution (National Weather Bureau) and comparison with project results	Existing database, equipment (sampling traps)	Once monthly on three plots, take sample from trap in association and out in open, samples from lysimeter, streams and lakes x 10 months (15 x 10 = 150 samples annually)	HRK 80,000.00 – 10 years
	2.6. Woodpecker monitoring (white-backed woodpecker – *Dendrocopos leucotos*, three-toed woodpecker – *Picoides trydactylus*, great spotted woodpecker – *Dendrocopos major*, and lesser spotted woodpecker – *Dendrocopos minor*)	Monitoring of population	Comparison with old data from literature	Existing data from literature Equipment: Binoculars, compass GPS device, map with stations drawn in, notebook (data entry form), luring equipment - device to reproduce calls (auto-radio, CD player, etc.) - speakers - equipment to move about terrain (snow-shoes, skis, vehicle) Field work: 2 staff members	Each year according to protocol 3 times annually. Period: March and April, when singing and drumming are most intense, i.e. prior to incubation period Time of day: hour after daybreak to end of transect ➔ 6-7 hrs; Intensity: two visits to transect in roughly 2 week intervals; Weather: pleasant and peaceful weather (winds max. 3° Beaufort and no precipitation);	ca HRK 12,000.00 for a year

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
Forest ecosystem stability and unspoiled nature	*2.7. Owl monitoring (Ural owl – Strix uralensis, tawny owl – Strix aluco, boreal owl – Aegolius funereus)*	Monitoring of population.	Comparison with old data from literature.	Existing data from literature Equipment: vehicle, auto-radio with CD player, speakers, CD for acoustic luring of target owl species, map – 1: 25.000 with stations drawn in, data entry form, manual GPS device, head-lamp, writing utensils, clock, thermometer, warm clothing! Field work: 2 staff members	Each year based on protocol twice annually. SEASON - early spring – prior to egg-laying March and first half of April - when chicks are in nest or beginning to fly end of May, June - when territories are re-established September-October	ca. HRK 14,000.00 for a year
	2.8. Monitoring of bats (forest species)	Monitoring of population.	Comparison with old data from literature.	Existing database. Vehicle, bat detector and other necessary equipment foreseen by protocol. (protocol lacking)	As of 2008 Annual monitoring during July.	ca. HRK 10,000.00
	2.9. Monitoring forest ecosystem entomofauna	Monitoring of population.	Comparison with old data from literature.	Existing database. Equipment foreseen by protocol. (protocol lacking)	As of 2008 Annual monitoring conducted in July.	ca. HRK 20,000.00
	2.10. Monitoring of small terrestrial forest mammals	Monitoring of population.	Comparison with old data from literature.	Existing database. Equipment foreseen by protocol. (protocol lacking)	As of 2008	ca. HRK 20,000.00

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
Forest ecosystem stability and unspoiled nature	2.11. Monitoring forest stability by means of vitality and degradation index	Stability of association	Comparison with database	Results of project specified under 1.12. and existing database	Every year	Funds of the Plitvice Lakes National Park Public Institution
	2.12. Monitoring rejuvenation of principal species	State of rejuvenation	Comparison with database	Results of project under 1.13.	Every year	HRK 30,000.00
	2.13. Monitoring birds of prey (buzzard – *Buteo buteo*; and peregrine falcon – *Falco peregrinus*)	Monitoring of population.	Comparison with old data from literature.	Existing data from literature Equipment: vehicle, auto-radio with CD player, speakers, CD for acoustic luring of buzzards, map – 1: 25.000 with plot indicated (5,400 ha), data entry form, manual GPS device), writing utensils, clock). Equipment to monitor buzzards: binoculars Field work: 2 staff members	Buzzard – *Buteo buteo* - every year (as of 2008) according to protocol in a cycle of not less than 3 consecutive years, and then repeat 3-year cycle in 5 year intervals. Peregrine falcon – *Falco peregrinus* – every year as of 2008	HRK 12,000.00

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
3. Making forest ecosystems more accessible to visitors						
Making forest ecosystems more accessible to visitors	3.1. Construction of forest ecosystem presentation center – renovation of the forestry house.					
	3.1.1. Development of a project to renovate the existing forester house in Čorkova Uvala	Completed project documentation	All necessary licenses secured	Data from cadastre, land registers, old designs	2008	HRK 220,000.00
	3.1.2. Renovation of the forestry house in Čorkova Uvala based on the renovation project	Facility fully functional	Official use permit	Construction services by contractor	2009-2011	HRK 3,500,000.00
	3.1.3. Development of promotional materials with educational content	Printed flier/brochure	Verification of existing data	Existing data	2008-2017	HRK 10,000 annually
4. Activities dictated by conservation zones						
Natural condition and development of forest ecosystems.	4.1. Zone 1a – strict conservation zone (forest vegetation reserves)					
	4.1.1. Scientific monitoring of forest ecosystems.					
	4.1.1.1. Periodic measurement of permanent forest plots	Structure of association, state of health	Comparison with previous measurements	Previous research results	Every 10 years	From own revenues
	4.1.1.2. Establishment of a permanent monitoring network in the Čorkova Uvala reserve every 10 years	Detailed recording of forest's condition	Comparison with previous measurements	Previous research results	Every 10 years	From own revenues

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
Accessibility of forest ecosystems to visitors	4.2. Zone 1b – very strict conservation zone.					
	4.2.1. Visitor infrastructure					
	4.2.2. Development of a sight-seeing system for forest ecosystems – restoration of existing trails and forest roads and their connection to the existing system in the lake zone	Creation of a system of educational, bird watching, trekking, bicycling, hiking and other trails in the wider Park zone	Alignment with existing composition	Existing sight-seeing system	Implementation time defined by action plan for the visitor system	Costs to be defined by action plan
	4.2.3. Renewal of forest roads	Length of renewed sections	Measurement of length of road sections and quantity of materials incorporated	Materials (sand) for filling, materials for bridges - contracted services	**2008** Bridge reconstruction: Crna River- Liman Draga- **2008** Road renewal: - Pogledalo-Uvalica-Pl. Ljeskovac Road – 12 km -**2009** - Kuselj – Č. Uvala – Lumbardenik Road – 11km -Vreline Sušanjska Draga 7 km	-HRK 100,000.00 - HRK 70,000.00 - HRK 120,000.00 -HRK 110,000.00 -HRK 70,000.00 Ttl: HRK 470,000.00
	4.2.4. Maintenance of forest roads	Sections of cleared and leveled road	Measurement of section lengths	Materials to repair roads (sand and asphalt)	- Total 100 km - 33 km annually, but same section must be cleared every three years	- HRK 700,000.00 for 10 years

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
Reduce the loss of grass-covered surfaces and maintain existing biodiversity	4.3. Zone 2a – active habitat conservation zone (grasslands and meadows).					
	4.3.1. Gathering data from public records on grass-covered surfaces in forest complexes	Actual grass-covered surfaces and position on terrain	Cadastre of grass-covered surfaces established	Print-out of data from cadastres and land registers, one person	from 2008 to 2013	State levies (HRK 10,000.00) over 10 years
	4.3.2. Clearing of surfaces encompassed by succession (ca 70 ha annually with proposed inputs)	Return of shrub-covered grasslands	Comparison of cleared surfaces with data at initiation of clearing	Machinery with fixtures for clearing grass surfaces, two workers (professional training of existing employees)	from 2008 to 2017 (work possible 140 days per year)	HRK 400,000.00 over 10 years
	4.3.3. Mowing of grass-covered surfaces in forest complexes, with special reference to privately-owned meadows, recommendations and suggestions to owners on mowing methods and times (in case of later mowing offer alternate surfaces as compensation), ca 100 ha annually with the proposed inputs	Maintenance of existing biodiversity	Surveillance of completed works	Tractor with rotating and ridged cutters, rakes, bailer, trailer. Four workers	from 2008 to 2017 (mowing from July to end of September depending on needs of research)	HRK 400,000.00 over 10 years
Transformation of private property to state-owned property	4.3.4. Purchase of grass-covered surfaces on offer	Comparison with existing state-owned grassy surfaces	Purchase agreement	Cooperation with Park residents, pre-emptive buying rights	from 2008 to 2017	10 ha annually, at HRK 3.5 kn/m^2 (HRK 350,000.00) state budget
Preservation of unspoiled nature in forests.	4.4. Zone 2b – active forest ecosystem conservation zone.					
	4.4.1. Determination of conditions and specification of active management measures	Tree stocks by species, growth, and condition of association	Comparison with existing data	Existing data	Depending on plans to protect protected areas	Funds of the Plitvice Lakes National Park Public Institution

Objective	Activity	Measurable result	Verification methods	Required inputs	Implementation time	Input costs
Ascertain existing relict associations and their conditions. Preservation of relict associations	4.4.2. Relict associations.					
	4.4.2.1. Identification and measurement of relict associations, monitoring of phytocenological associations every 10 years	Surfaces of overgrown relict associations, share of species, tree stocks by species, phytocenological composition. Ratio between species and tree stocks	Comparison with existing data	Existing data	Implementation time tied to duration of phytocenological research	Funds of the Plitvice Lakes National Park Public Institution
Transition of cultivated forests to natural forest assemblages	4.4.3. Cultivated forests.					
	4.4.3.1. Allow natural development	Climazonal associations	Comparison with existing data	Existing data	Periodically every 10 years beginning in 2010	Funds of the Plitvice Lakes National Park Public Institution
Ensure safety of visitors and existing buildings	4.5. Zone 3 – usage zone					
	4.5.1. Maintenance of forest surfaces along trails, roads, viewpoints and buildings (hotels, restaurants, parking lots, etc.)	Safe stay in the National Park, accessibility and easy viewing of terrain	Length of maintained sections or number of trees removed	Comparison of completed works with planned works	Regularly each spring	Funds of the Plitvice Lakes National Park Public Institution
5. Privately-owned forests						
Natural condition and development of forest ecosystems	5.1. Privately-owned forests in strict conservation zones (1a) – Payment of damages to forest owners to compensate for inability to use	Quantity in m^3 of compensated forests	Comparison of records with situation in field	State budget revenues	Depends on demands of forest owners	Central state budget revenues
	5.2. Privately-owned forests in other zones (1b, 2 & 3) – measurement and determination of conditions in privately-owned forest and designation of intensity and types of interventions	Private forest management program	Comparison with existing data	Forestry Advisory Service	Implementation time will be defined in the plan drafted by the Forestry Advisory Service	Funds will be planned and secured by the Forestry Advisory Service

5. TIMETABLE TO COMPLETE PLANNED ACTIVITIES

Activity number	Year									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1. Scientific and scholarly research										
1.1.										
1.2.										
1.3.										
1.4.										
1.5.										
1.6.										
1.7.										
1.8.										
1.9.										
1.10.										
1.11.										
1.12.										
1.13.										
2. Forest ecosystem monitoring										
2.1.										
2.2.										
2.3.										

Activity number	Year									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2.4.										
2.5.										
2.6.										
2.7.										
2.8.										
2.9.										
2.10.										
2.11.										
2.12.										
2.13.										
3. Making forest ecosystems more accessible to Park visitors										
3.1.										
3.1.1.										
3.1.2.										
3.2.										
4. Activities dictated by conservation zones.										
4.1.										
4.1.1.										
4.1.1.1.										
4.1.1.2.										
4.2.										

Activity number	Year									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
4.2.1.										
4.2.2.										
4.2.3.										
4.2.4.										
4.3.										
4.3.1.										
4.3.2.										
4.3.3.										
4.3.4.										
4.4.										
4.4.1.										
4.4.2.										
4.4.2.1.										
4.4.3.										
4.5.										
4.5.1.										
5. Privately-owned forests										
5.1.										
5.2.										

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Vision of Plitvice Lakes National Park:

Plitvice Lakes National Park shall remain a UNESCO World Heritage site, and a national leader in the conservation and promotion of unique natural and cultural resources in their valorization by means of sustainable tourism to the benefit of the region and local communities and to the satisfaction of visitors.

Zoning Map of Plitvice Lakes National Park

Legend

- Park boundary
- 1a Strictest conservation zone
- 1b Very strict conservation zone
- 2a Active habitat conservation zone (grasslands, revitalization)
- 2b Active Forest ecosystem conservation zone
- 3a Settlement zone
- 3b Recreation and tourism infrastructure zone

UNESCO