MANAGEMENT PLAN

OF

KEMERI NATIONAL PARK

2002-2010

This Management Plan begins with a long-term view of Kemeri National Park, looking beyond the eight year time horizon of this Plan. It offers a vision of the future that all can share and work together to strive towards.

Vision of Kemeri National Park

The territory of Kemeri National Park (NP) is characterised by a large diversity of ecosystems, species and habitats. The representative coastal landscape has old pine forests and non-built up dunes, inland there are shallow lagoon lakes with clean, clear water and large colonies of breeding birds that are able to feed and rest without the risk of being hunted.

Varied broadleaf forests with the natural density of dead trees provide ideal conditions for rare lichens, fungi, plants, invertebrates and birds (including every woodpecker species recorded in Latvia).

Raised bogs are an open landscape of pools and moss interrupted by islands of mineral soil. Natural meadows provide habitat for corncrakes, great snipes and other birds. The agricultural lands within the park territory are being managed using environmentally friendly methods.

People visit the National Park both on foot and by bicycles, using the network of trails. There is also the possibility to watch birds and other wildlife, to go fishing, boating and to enjoy both present-day and ancient curative methods using the locally available sulphurous mineral water and medical mud and to get detailed information about the territory of the park and nature protection. Nature tourism is developed by encouraging locals, businessmen and municipalities to offer quality services and varied relaxation possibilities aiming to ensure the economical stability of the territory by giving extra income both to the budget of the National Park Administration and to local people.

Timber is produced in the National Park in a way that imitates the natural processes and increases the biological diversity of the forest.

CONTENTS

INTRODUCTION

Kemeri National Park is a state specially protected nature territory which was established in order to preserve natural, cultural, historical and balneological values and to protect the processes of the origin of mineral waters and medical mud. The territory of Kemeri NP includes a Ramsar Site and an Important Bird Area (IBA) –Kanieris lake. Other IBAs in Kemeri NP are Lielupe grasslands, Kashku fen and Lielais Kemeri raised bog.

This is the first **Management Plan** (MP) of Kemeri NP. It was elaborated by Danish consulting company **Carl Bro a/s** in collaboration with Naturplan (Denmark) and **Kemeri NP Administration** and financed by **Ministry of Environment of Denmark, DANCEE** and Government of Latvia. The MP has been elaborated for time period of 8 years from **year 2002 to 2010**.

The Management Plan has been elaborated by:

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The Management Plan has been elaborated in close cooperation with the employees of Kemeri NP Administration under the guidance of director Linards **Kaucis** and Heads of Departments provided consultations: Andis **Liepa** (basic information on the territory), Aivars **Ornicāns** (contracts, control), Aivars **Tomaševičs** and Gints **Starts** (forest management).

Municipalities and locals were involved in the elaboration process of the MP of Kemeri NP by mediating and organising public meetings both before and after writing MP. In year 2000 a detailed inventory of the territory was conducted in order to record the nature and culture values (habitats of the EU directives, protected habitats and species of Latvia, landscape values and cultural monuments).

In the framework of the elaboration of MP several seminars were organized, from which Mike Alexander's (Countryside Council for Wales) introduction to management planning methods gave rise to the structure of the MP of Kemeri NP and to the new format of management plans in Latvia.

Restrictions of the economical activity in the specially protected nature territories, unsolved compensation problem in Latvia and insufficient information about the activities of the NP, often hinders finding a common language with landowners and local authorities on the sustainable use of the territory.
Questions set in public meetings, sessions of Kemeri NP Consultative Council and Project Steering Committee and comments from Regional environmental boards on the first draft of the MP as well as the answers to them are summarised in a table (appendix 30) with commentary if they are included or not the final version of the MP.

This English version is a direct translation of the Latvian original. If there are any differences in the meaning of the text then the Latvian version shall take precedence.

Executive Summary

Overall objectives of Kemeri National Park
I To preserve endangered habitats and specially protected species of coastal lagoon lakes and bog lakes.
II To preserve the natural coastal habitats, dominated by untouched beaches, dunes, abrasion coasts, untouched forest habitats and river mouths rich in characteristic species.
III To preserve intact broadleaf forests, river flood plains, raised bogs, calcareous fens, springs and sulphurous springs and species which occur there.
IV To ensure management of natural grasslands and the diversity of grassland habitats and species.
VI To preserve an open agricultural landscape as well as varied forest landscapes and maintain traditional and well kept cultural landscape with broad possibilities for recreation.
VII To further the development of sustainable tourism and environmental education by adapting the principles of the European Charter for Sustainable Tourism, establishing partnerships with stakeholders, developing National Park Information Centres, infrastructure and visual information.

All the legislation concerning conservation, protection and sustainable management of natural, cultural and spa resources are in force in Kemeri NP (chapter1).

The territory of Kemeri NP is situated in Tukums, Jelgava and Rīga regions and is within the territories of 7 rural municipalities, Jūrmala city and Kalnciems town. Jurmala city and Engure and Lapmežciems municipalities have elaborated their spatial plans. The spatial plans of other municipalities are currently under development (chapter 2).

Territory of Kemeri NP is situated approximately 50 km from Riga and is easily accessible along the main roads to Ventspils, Liepāja and Jūrmala, as well as by the Riga-Tukums railway line (Kūdra, Ķemeri and Smārde stations). The area of Kemeri NP is 40,119 ha: 38,165 ha of land and 1,954 ha of the sea.

There are approximately 3,500 inhabitants living in the territory of Kemeri NP. The main economical activities of the region relate to the preparation and processing of wood, agriculture, fishing and fish processing, as well as tourism related services such as retailing and public catering (chapter 3).

In the territory of Kemeri NP natural resources are extracted – medical mud from the Lake Sloka (approximately 700 tonnes a year); dolomite from Kaļķis dolomite quarry (45,000 – 67,000 m^3 a year) and relatively small amounts of sulphurous mineral water.

The richest places of cultural and historical heritage within the territory of the NP are those of Lapmežciems municipality (Kanieris castle mound, Siliņupe Stone Age settlement) and Ķemeri, which is a state protected heritage area with remarkable architectural monuments (hotel "Ķemeri", water-tower, Lutheran church, Kemeri park with its park architecture etc.) (chapter 3.5).

Specific hydrogeological features – such as the presence of dolomite bedrock and its interaction with quaternary sediment provide unique conditions for the **biological diversity** of the territory of Kemeri NP (Chapter 4), which becomes apparent both in the level of habitats and species.

The habitats of Kemeri NP include forests (57 %), swamps (24 %), waters (11 %), grasslands (6 %), etc., in which 897 species of vascular plants (76 – specially protected), 207 species of moss (34 - specially protected), 586 species of fungi, 148 species of lichens, 237 species of birds, 18 species of game animals, 8 species of bats, at least 4 species of insectivores, 7 species of rodents and 3100 species of insects (23% of the known insect fauna of Latvia) are recorded.

There are 26 habitats of EU Habitats directive recorded in Kemeri NP, among them 10 are priority habitat types (some of them – alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*, *Tilio-Acerion* forests of slopes, screes and ravines, calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*, petrifying springs with tufa formation and grey dunes- are specially protected habitats in Latvia).

Kanieris lake - an internationally important wetland –is one of the richest lakes of Latvia in terms of ornithology and specially protected species of plants. The lake is within the same catchment area as the

Slocene river and Valgums lake. The waste water treatment plant (WWTP) of Tukums still supplies insufficiently refined wastewater into the Slocene river. Developing the tertiary treatment facilities of the WWTP would provide the possible solution for improving the water quality of Valguma and Kanieris lakes (as well as the environmental conditions for *Chara*).

Main management activities in Kanieris lake include the following:

- the improvement of floodgate of river Starpiņupe and the construction of fish ladder,
- clearance of scrubs from the islands,
- decreasing the number of American mink *Mustela vison,*
- management of *Cladium mariscus* fens,
- educating and informing society about the nature values of Kanieris lake, by presenting the possibilities to get acquainted with them (4.1.2).

Conservation features and management activities of Sloka lake, Dūņieris lake, Aklais lake and other water bodies are described in chapters 4.1.3 – 4.1.10.
River Slocene, which connects Kanieris and Valgums lakes, could be called a jungle river of Latvia because of the unaffected alluvial forests of its banks, providing breeding habitat for osprey. In order to maintain the feeling of "wild nature", boat trips are restricted and only allowed when accompanied by a guide. (4.2.2).

Coastal habitat protection needs to be approached in an integrated way- by providing the protection of stretches which include both the beach and the primary and secondary dunes with old growth pine forests. In the regions of the river mouths and in the shallow coastal zone species of migratory birds require relatively unaffected environments for feeding and resting. The coastal protection activities involve the elaboration of the recreation plan, improvement of the parking places and the control of activities on the dunes (such as building and movement of vehicles) (4.3).

The main factors indicating the conservation value of the raised bogs include: unaffectedness, diversity (of species, vegetation, habitats), rarity (of species, communities) and size of area . Lielais Kemeri raised bog is one of the largest raised bogs in Latvia (area of 6192 hectares) with a natural structure of knolls and pools unaffected by human activity. Lielais Kemeri raised bog is included in the list of Internationally Important Bird Areas (IBA) (criteria species: bean goose, white-fronted goose, crane and three-toed woodpecker) (4.4.1).
Lielais Kemeri raised bog, Raganu bog and Sloka bog are areas of origin of hydrogen sulphide.
The bogs or some parts of the bogs of Kemeri NP (Lielais Kemeri raised bog, Raganu bog, Zaļais bog etc.) are affected by drainage - they are overgrowing. Therefore the restoration of the water level by damming the ditches is the main activity for the maintenance of nature values (4.4.1).

The calcareous *Cladium mariscus* fens of Kemeri NP are rich in rare species of Latvian plants (especially orchids), which are endangered by the reduction of these habitats. Due to the reduction of economically motivated management, followed by the natural succession of vegetation these fens have become overgrown with bushes and trees. Careful management (such as using them for pasture and mowing) would promote the protection of these rare habitats (4.4.3 – 4.4.6). The management measures for other swamps are described in chapters 4.4.2, 4.4.7.

The biologically diverse forests are also an important nature value of Kemeri National Park. A whole range of habitats from the old pine forests (western taiga) to wet broadleaf and mixed forests (alluvial forests) provide a living environment for a whole complex of living forms- starting from the world that is invisible to the human eye to the great variety of species of invertebrates, lichens, moss, higher plants, birds and mammals. The recorded species (snails, insects, moss, lichens and birds) indicate the presence of natural forests in Kemeri NP. The main preconditions for protection are the restriction of forest felling activities and the creation of micro-reserves within the landscape protection zone in order to protect both the forest habitats and particular species (e.g. lady's slipper orchid, black stork, white-backed woodpecker, three-toed woodpecker, lesser spotted eagle, etc.). This is described in more detail in chapter 4.5.

Forest cutting in Kemeru NP should be performed using selective cuttings to increase the structural diversity of stands, to enable the incoming of other tree species in monocultures, to further the development of many-storied structure of forest stands and to simulate the natural disturbances in sensitive stands that depend on them.

The forest cutting is considered as once-for-all activity and after that there is no more economic intervention in natural development processes of the forest except those cases when the repeated or periodical intervention is needed for management of forest biotopes, for example maintaining road landscapes and forest glades (chapter 6).

The landscape cutting should be performed in the road landscape spaces, in forests around inhabited areas and monuments of cultural heritage and along tourism routes. The different methods of landscape cuttings are described in chapter 6.3.3.

One of the nature values of the Kemeri NP are the natural stands of Sweet Gale *Myrica gale*. The regeneration of these stands is threatened by extraction of large amounts of buds for industrial processing and by overgrowing of the habitat. The main activities for the preservation of the *Myrica gale* stands are the control of protection and removing the bushes (chapter 4.5).

Such management activities as mowing, grazing and removing of bushes should be carried out for protection of meadows – an increasingly threatened habitat in Latvia due to decrease in agricultural activities (Chapter 4.6). Management of these habitats contributes towards preservation of several protected species by ensuring favourable living or feeding conditions. These include both plant species (such as *Gladiolus imbricatus*, Sea Arrowgrass *Triglochin maritimum*, Tall Broomrape *Orobanche elatior*) and bird species (Corn Crake *Crex crex*, Lesser Spotted Eagle *Aquila pomarina*, Spotted Eagle *Aquila clanga*) (chapters 4.7, 4.9).

Protected grassland habitats in Latvia, which are the most frequently found in Kemeri NP are the *Sesleria* semi-dry grasslands and purple moorgrass meadows. They are found in Slocene River valley and Chaukciems village, Antinciems village and in floodplains of Vecslocene river. The cutting of bushes, mowing or grazing according to plant phenology are the main activities in these habitats (chapter 4.6).

River Lielupe floodplain meadows including Pavasari – Odini polder (where the agricultural activities were continued for longer time in comparison to the part not affected by drainage), are identified as important bird areas, where the largest density of Corn Crake in Europe is found.

About 9% of the world population of the Black Stork and about 12% of the world population of the Lesser Spotted Eagle are nesting in Latvia, therefore the protection and monitoring of these species are of special importance to Kemeri NP, because approximately 12-15 pairs of Black Stork and some 4-5 pairs of Lesser Spotted Eagle are nesting in the National Park. Both the forest and rural ecosystems are equally important to the Lesser Spotted Eagle – forests nesting sites and agricultural lands as feeding grounds. Therefore the distribution of Lesser Spotted Eagle and the state of the population can be used to evaluate the quality of the environment at landscape level. The aim is to preserve the populations of these species at existing level by ensuring the appropriate management - mowing or grazing of the large open areas such as Dunduri-Melnragi meadows, floodplain meadows of Lielupe river and Odini – Pavasari polder. It is important to attract some funding and to buy the land from the private land owners to ensure the implementation of the management activities in the grasslands mentioned above (chapter 4.9)

The nature protection policy of the National Park includes also **the protection and development of landscape diversity by protecting the valuable natural and cultural landscapes and cleaning-up and restoring degraded landscapes.**

The protection of natural landscapes – forested landscapes, swamp landscapes and lake landscapes are provided by reserve and nature protection zones. Therefore more specific landscape protection and planning requirements are coming up in the areas which are more affected by economic activities and are more frequently visited as, for example, the landscape protection zone. The **most valuable landscapes** in the zone are rural landscapes– farmed and mosaic landscapes of Antinciems and Chaukciems villages, Skujupite and Udrisi, forested plain landscapes, forested dune landscapes and Lustuzkalns forested hilly landscape (chapter 5.3).

Owing to the current economic situation the rural landscapes, especially those around big cities (Riga and Jurmala) are threatened by natural succession, expansion of building areas, intensive forest logging (particularly in private forests). As a result the expressive forest clumps in the rural landscape are replaced by bushes.

Observing the landscape protection requirements in spatial planning and close cooperation with the landowners and municipalities are offered as the main solutions to raise public awareness and enable some action for landscape protection.

The main stakeholder groups in Kemeri NP **public relations** (chapter 7) are:
Municipalities – based on the fact that it is important to manage shared area and to balance interests.
Landowners. In the territory of Kemeri National Park there are several thousands of landowners, which should be informed about park and park's legal acts that they should observe. Very important is also educational work, to explain "nature-friendly" working methods, as well as possibilities to co-operate. The aim of these actions is to encourage the landowners use these methods in practice.
The most important representatives of mass media as people who are forming public opinion and partly affecting political decisions.
Local residents. People, who are living in the territory of national park form the image of the park by expressing their attitude – criticising or accepting implemented decisions. Therefore it is important to achieve, that attitude against the park in most cases would be positive.
Schools. Kids in future will be the managers of our environment and therefore it is important to form their attitude about nature and environmental subjects, as well as to give understanding about nature values and the importance to use them wisely.
Visitors of the park (chapter 8).

The aim of the park is to form a public awareness of the Kemeri NP as territory of state significance with unique nature and culture values using mass media and encouraging the participation of society. The priority actions to achieve the aims are to publish information materials (including park's newspaper), to create a homepage, to organise regular public meetings and different cooperation projects with stakeholder organisations, to establish an information centre and expositions on nature and cultural heritage, to organise events related to nature education (nature school), to establish park traditions and organise some yearly events for general public.

Kemeri national park develops sustainable tourism that is "*any form of development, management or tourist activity, which ensures the long-term protection and preservation of natural, cultural and social resources and contributes in a positive and equitable manner to the economic development and well-being of individuals living, working or staying in protected areas*" by setting the following objectives:
1) To improve the quality of KNP tourism offer; 2) To develop co-operation with tourism businesses that are located in KNP, to create a united strategy for sustainable tourism development and to elaborate activity plan, that has to be carried out together in KNP territory; 3) To elaborate and implement a business plan for development of tourism products in the park to achieve an independence from government budget financing (chapter 8).

Tourism products in the park will be developed around centres that are easily accessible by public transport. They could be located in Kemeri, Jaunkemeri, Lapmezciems, at lake Kanieris, at lake Valgums, in Smarde, Slampe, Kalki, in Odinu - Pavasaru polder and Lancenieki. Centres will be connected with tourism trails and activities in a way that visitors could start their trips in one of the centres and finish them in other, depending on their interests and wishes.
Profits from those tourism products with little investments needed will be used to develop more expensive activities. These tourism products will be developed gradually, investing the profit in further development. Some products of significant investments park can develop as concessions – getting for them yearly payments. Possible tourism products of the park are summarised in appendix. 28 and in figure 32.

The main objectives of the nature interpretation in Kemeri NP (chapter 9) are: to explain the objectives and work priorities of the park – why it was established, what are the main activities of the park administration; to explain the need to preserve and protect different places and nature values of the park – why there are different zones e.g. reserve zone and nature protection zone, what is allowed or prohibited in these zones and why. To give the visitors an introduction into general ecological principles; to help the visitors to find their way in the park on their own (by putting up direction and information signs, preparing maps); to provide the information about places open to visitors, - the visitors should be informed on what, where and when something can be seen and experienced in Kemeri NP and what is the best/permitted time for a visit.

To offer original and at the same time entertaining and educational experience for visitors. To promote understanding about sustainable development by explaining possibilities to develop nature tourism. The ways of presenting information see in chapter 9.7.

The activities for achieving objectives set in the Management plan are summarized in Chapter 11. It includes also the priorities, the responsible units of Kemeri NP administration as well as approximate costs and sources of financing.

The management plan should be revised in 2 years (in 2004), especially if the LIFE project is implemented, which aims to carry out several activities included in this Management Plan or in the case of the regional administrative reform– this would „change the rules" among state institutions and local governments in dealing with nature protection issues.

1 The "Legal Obligations" of Kemeri NP

Kemeri National Park is a specially protected nature territory of state importance that was established by law in 1997 (The Law on Kemeri National Park, 1997.12.06.). "The national park has been created to preserve nature, cultural and historical and balneological values of the territory; to protect the origination processes of mineral waters and medical mud; as well as, to encourage sustainable economic activities, nature tourism and ecological education (**The Law on Kemeri National Park**, 2001) (annex 1).

In the territory of Kemeri NP the following legal regulations are compulsory: the regulations that govern preservation, protection and sustainable management of natural resources, the cultural environment and the health resorts, thus creating the potential for economic development of the region by maintaining resources for the development of nature tourism, recreation and health resorts.

1.1 International Obligations

Kanieris lake and the alluvial forests at the mouth of the Slocene river are internationally valuable wetlands, especially as waterfowl habitats, that have been ratified with the law "**On Convention of 2.02.1971 on Wetlands of International Importance, Especially as Waterfowl Habitats" (Ramsar Convention)** (05.04.1995).

"Convention on Biological Diversity" in Latvia has been passed and ratified with the law "On Rio de Janeiro Convention of 05.06.1992 on Biological Diversity" (31.08.1995)

The law "**On Bern Convention of 1979 on the Conservation of European Wildlife and Natural Habitats"** (1997).

European Union Directives on Birds **(Council Directive 79/409/EEC)** and Habitats **(Council Directive 92/43/EEC)** provide that every state has to designate the network of protected nature areas (called NATURA 2000) that provides appropriate protection of species and habitats mentioned in the annexes of the directives. Kemeri national park meets all the requirements to be nominated as the NATURA 2000 site (The territories that meet all the nature protection requirements of European Union).

1.2 Normative Acts of Latvia's Legislation

1.2.1 Normative Documents on Area

The Civil Law Of Latvia, 1937, renewed and came into force on 09.01.1992.
The Law On Environmental Protection (06.08.1991 amend. 22.05.1997, amend. 20.12.2001*.) defines state administration's institutions, the state control of environment protection and use of resources; the duties and rights of state environmental inspectors and other issues.
Environmental Policy Plan for Latvia, 1995.
The National Program on Biological Diversity. Passed by the Cabinet of Ministers on 16.05.2000.
The Law On the Specially Protected Nature Territories (02.03.1993 amend. 30.10.1997 and 28.02.2002) defines the categories of protected areas (including protected nature territories of European significance) and identifies the necessity to develop nature protection plans and individual regulations on protection and use.

"The nature protection plans shall determine administrative, nature protection and other necessary measures, as well as the division of the territories into zones in conformity with the protection and utilisation measures to be carried out in such territories. The goals of nature protection plans by ensuring preservation of the value of the territory and achievement of the goals of establishing such territory, shall be to co-ordinate nature protection, the utilisation of natural resources, regional development and other interests."

In the law it is determined that "*land owners and users have the right to tax relief or other compensation specified by law if the observance of protection and utilisation regulations of the protected territory causes losses to them"* (section 29) in its turn, *"land owned by the State, or under the jurisdiction of the State in*

* Specified are the dates of laws' (and amendments') adopted by the Saeima (Parliament)

nature reserves and nature restricted areas, or in zones of nature reserves and nature restricted areas of other protected territories shall not be privatised or alienated" (section 33), and *"the State has the right of first refusal to the land in protected territories, except the land in neutral zones"* (section 35).
The Law on Kemeri National Park (12.07.1997, 30.05.2001) (annex 1)
The Regulations of the Cabinet of Ministers **On Individual Protection and Use of the Ķemeri National Park** (No 236/ 18.06.2002) (annex 35).

The general protection and use of specially protected nature territories according to the categories and permissible and prohibited forms of activities are defined by The Regulations of the Cabinet of Ministers **On the General Protection and Use of Specially Protected Nature Territories** (No 354/21.10.1997). They specify also the amount of compensation for harm done to protected territories.
The Regulations of the Cabinet of Ministers **On Protected Geological and Geomorphologic Nature Monuments** (No 175/17.04.2001). Regarding the territory of Kemeri NP these include two protected nature monuments: Sulphur Ponds and Sulphur Springs in Zalais bog (as annexes 177 and 178).

The Law on Protection of Species and Habitats (16.03.2000) regulates and encourages the conservation of species and habitats. The law states that "Protection of species and habitats is a set of necessary measures for conservation or restoration of populations and habitats at the optimum level".
The Regulations of the Cabinet of Ministers **On the List of Specially Protected Species and Species with Exploitation Limits** (No 396/ 14.11.2000).
The Regulations of the Cabinet of Ministers **On the List** of Specially Protected Habitats (No 421/12.05.2000).
The Regulations of the Cabinet of Ministers **On the Establishment, Protection and Management of Micro-reserves** (No. 45/30.01.2001). On grounds of section 6 of these regulations Ministry of Agriculture has issued the Instruction No 7 **The Method of Identification of the Forest Habitats that Require the Establishement of Micro Reserves** (09.11.2001). So called Key Habitats receive a legal status of protection.
The Regulations of the Cabinet of Ministers **On Recompense of Damage for Spoilage or Destruction of Individuals of Specially Protected Species and Habitats** (Nr. 117/03.13.2001).
The Regulations of the Cabinet of Ministers **On Issuance of Permits for Taking from Wild Non-game Species, Introduction of Wild Species that are Alien to Latvia (Introduction) as well as for Restoration of Previously Extinct Population of Species (Re-introduction)** (No. 34/23.01.2001).
The Regulations of the Cabinet of Ministers **On Compensation for Significant Damage for Land Users Caused by Specially Protected Non-game Species and Migratory Species** (No.345/31.07.2001.).
The Regulations of the Cabinet of Ministers **- Order of Making of Agreements to Ensure the Protection of Specially Protected Nature Territories** (No 247/ 25.07.2000) sets the order of making agreements to ensure the observation requirements for protection and use of specially protected nature territories as well as requirements set out in the nature protection plans.

Forest Law (24.02.2000). The aim of the law is to regulate sustainable management of all the forests of Latvia, by guaranteeing equal rights, immunity of ownership rights and independence of economic activity, and determining equal obligations to all forest owners or lawful possessors.
Forest management activities are prescribed by the forest management plan, that is *"a document in which the particular management goals for forest property or forests in lawful possession, and the intended forest management activities are specified*". The Ministry of Environment Protection and Regional Development confirms the forest management plans in protected nature territories.
The law states that the final felling is prohibited *"...in nature reserves and nature reserve zones of national parks, in the protective coastal zone of the Baltic Sea and the Gulf of Riga at the width of 300 metres, in specially protected forest areas (micro-reserves)"* (section 9, paragraph 2).
"For the preservation of biological diversity in a forest, specially protected forest areas shall be specified – micro-reserves, protected zones along waters and wetlands. Structural elements of special significance in forest stands shall be preserved in all types of felling." (section 36).

The Regulations of the Cabinet of Ministers - **Nature Protection Regulations in Forest Management** (No 189/05.05.2001) They determine special regulations for forest management in the 5 km wide protected belt of restricted economic activities along the coast of the Baltic Sea and Riga Gulf. It states that no more than

25% of growing stock may be felled at one stroke during the final felling. The next type of felling shall be started not earlier than 10 years after the previous type of final felling.

The forest management is regulated also by the following normative acts:
On the Tree Felling in Forests. The Regulations of the Cabinet of Ministers No 372 (24.10.2000).
On Forest Regeneraion. The Regulations of the Cabinet of Ministers No 354 (10.10.2000).
On Measures of Forest Protection and the Announcing of Emergency Cases in Forest. The Regulations of the Cabinet of Ministers No 217 (29.05.2001)
Forest Land Transformation Procedures. The Regulations of the Cabinet of Ministers No 94 (27.02.2001).
Procedures for Calculation of Losses Caused to Forests. The Regulations of the Cabinet of Ministers No 370 (24.10.2000).

Hunting Law (01.06.1995). The Amendments to the Hunting Law (16.03.2000) define also the organisation of hunting and game management with a purpose to regulate the number of animals in specially protected nature territories. Section 6: "The user of hunting rights organizes game management; State Forest Service controls the course of hunting and the implementation of the hunting management project. Strict nature reserves and national parks are exceptions, where the administration of strict nature reserve or national park controls the implementation of the hunting management project." Hunting Regulations. The Regulations of the Cabinet of Ministers No 251 (08.08.1995).

The Law on Protected Belts (05.02.1997, amend.12.04.2002) defines the types of protected belts for protection of environmental and natural resources. The main task of the belts is to diminish or to prevent negative anthropogenic impacts.

The law sets the minimal widths of protected belts along rivers, lakes and bogs that are as follows:
- *Along Lielupe river - not less than 300 m on each bank,*
- *Along rivers 25- 100 km long - not less than 100 m on each bank,*
- *Along rivers 10- 25 km long - the not less than 50 m on each bank,*
- *Along the rivers up to 10 km long - the not less than 10 m on each bank.*

Around the lakes larger than 1000 hectares- not be less than 500 m,
- *Around the lakes 101- 1000 ha large - not less than 300m,*
- *Around the lakes 25- 100 ha large- not less than 100m,*
- *Around the lakes 10- 25 ha large - not less than 50m,*
- *Around the lakes up to 10 ha- not less than 10m,*
- *Along the water courses or around water bodies with typical alluvial lands- not less than the total width of the alluvial lands irrespective of the minimum width of the belt defined in points mentioned above.*

Around swamps (section 7.1.):
- *10 - 100 ha large – a belt 10 metres wide,*
- *larger than 100 ha- a belt 50 metres wide in forest types on dry, drained, wet mineral soils and drained peatland; and a belt at least 100 metres wide in forest types on wet peat soils.*

The law defines different restrictions for the protected belts of water bodies and water courses (section 37), including the prohibition:
"*…to perform clear felling in 50 m zone of the protected belt, except tree felling for the liquidation of consequences of emergency situations, windfalls, windbreaks and snowbreaks, as well as the felling for restoration and management of floodplain meadows. If the protected belt is less than 50 m wide, the clear felling is prohibited in the full width of protected belt",*
"…to construct any buildings in the territories where the probability of flooding is at least once in hundred years, except temporary buildings, small buildings in rural areas and protective constructions or embankments necessary for these buildings",
"…to construct and place any buildings (except the renovation of culture monuments, water supply systems, water regulation systems and other hydrotechnical buildings, bridges, places for swimming, piers for boats and ships and the buildings necessary for sailing safety)" and other restrictions.

The Regulations of the Cabinet of Ministers No 42 (04.08.1998) **Methodology for the Designation of the Protected Belts for Water bodies and Water courses** states that the specialists of local governments specify the borders of the protected belts for water bodies and water courses in nature and mark them in spatial plans after coordination with the local Environmental Protection Board. The protected belts of water bodies and water courses in nature should be marked with special informative signs.

Fishery Law (12.04.1995) states that "*surveys, assessment, preparation of scientific recommendations and opinions in regard to fish resources shall, pursuant to the request of the State or a legal or natural person, be performed by the Latvian Fisheries Research Institute or other legal persons whose by-laws provide for activity oriented thereto and whose research results and opinions shall be evaluated by the Latvian Fisheries Research Institute*" and "*the State, represented by the National Board of Fisheries of the Ministry of Agriculture, shall manage the fish resources of the inland waters, territorial waters and economic zone waters of the Republic of Latvia."*

The Regulations of the Cabinet of Ministers No 433 **Regulations Regarding Lease of Bodies of Water and Commercial Fishing Rights and Procedures for Utilisation of Fishing Rights** (12.12.2000) prescribe the procedures for leasing of public bodies of water, the procedures for delegating management of fish resources to local governments, procedures for lease of commercial fishing rights and procedures for utilisation and auction of fishing rights in bodies of water and other waters.

Section 4- *"upon leasing bodies of water which are located in specially protected nature territories, the general and individual rules for protection and utilisation of these territories and nature protection plans shall be observed".*

Section 8- *"operational regulations for a body of water shall be an integral part of a lease agreement regarding a body of water".*

Section 19- *"The Board of Fisheries…shall notify relevant local governments regarding the limits of the amount of fishing gear, amount of allowable catch or fishing locations specified for the relevant period of time and co-ordinated with the Ministry of Environmental Protection and Regional Development, as well as the general procedures for utilisation of fishing limits in bodies of water in the territory of such local governments or coastal areas in the territory of such local governments".*

Regulations Regarding Commercial Fishing in Inland Waters. The Regulations of the Cabinet of Ministers No.3 (02.01.2001). It is specified that "*Fishing in specially protected nature territories is performed according to the regulations on protection and use of specially protected nature territories, nature protection plans and these regulations (section 7".*

- Note

  Regulations do not specify the link among the setting of fishing limits, operational rules for bodies of water and nature protection plans, and how the exchange of information among local governments, specially protected nature territories and the Board of Fisheries takes place.

Regulations on the Management of Kanieris lake, Year 1994 (state designing and information company "Meliorprojekts") that have been ordered by State Game Management. The regulations prescribe specific activities and motivation for the maintenance of the water level and for the use of fish resources. State Game Management used to act according to them, now they are observed by the State Stock Company "Latvia's State Forests" that is a legal heir of the lease agreement. The Regulations specify that the lake's manager carries out the control and the technical exploitation of hydrotechnical buildings (section 4.5.).
The Regulations on Licensed Fishing in Kanieris lake. Confirmed by the Board of Fisheries (21.03.2001).

Licensed fishing has been implemented according to the Operational Rules on Fishing in Lake Kanieris No 349 (15.09.1998) The Order of Licensed Amateur Fishing - Angling - in Waters of Republic of Latvia.
In the case of licensed fishing the finances gained are divided as follows:
Fish Fund- 30%;
Lapmezciems rural municipality- 25% (that shall be used for the management of the lake's banks);
Kemeri NP- 25% (that shall be used for providing the protection of the environment of Kanieris lake);

State Stock Company "Latvia's State Forests"- 20% (that shall be used for management and replenishing of fish stock).

Regulations Regarding Transformation of Agricultural Land and the Order of Issuing of Permits for Land Transformation. The Regulations of the Cabinet of Ministers No 385 (01.09.2001) defines that land transformation is prohibited in specially protected habitats.

1.2.2 Normative Acts Regarding Coastal Protection

The Law on Protected Belts (05.02.1997, amend.12.04.2002) defines that along the Baltic Sea and Riga Gulf

- the protected belt of coastal dunes shall not be less than 300m wide landwards starting from the place where natural vegetation begins;
- the protected belt of
- the sea shall be 300m wide and shall include the beach and a part of the submarine shelf;
- the belt of restricted economic activities shall be up to 5km wide; and it shall be specified according to natural conditions.

Section 36 (1) states that in the protected belt of the Baltic Sea and Riga Gulf the following restrictions shall be observed:

1) *the local governments define the area of the new land properties in towns and villages in their binding regulations, providing the access to the beach for pedestrians;*
2) *if, in the case of alienation or leasing of the land property owned by state or local government, the change of land use not provided for in the spatial plan is planned, a decision of the Cabinet of Ministers is required;*
3) *it is prohibited to establish hydrotechnical buildings without coordination with the Regional Environmental Board.*

(2) In addition to the issues mentioned in the first part of this section in the protected belt of coastal dunes and on the beach it is prohibited:

1) *to build new residential buildings and outbuildings in the formerly un- built areas;*
2) *to build new engineering buildings and public buildings;*
3) *to place and establish buildings for fodder storage (except hay sheds without one- piece floor), storages of mineral fertilizers, pesticides, fuel, oils, hazardous chemical substances or products, timber, as well as materials containing hazardous chemical products and petrol stations, except the port areas according to spatial planning;*
4) *to extract and use minerals, except abstraction of underground water for the need of water supply or recreation of a residential or spa buildings placed in the area of protected belt;*
5) *to establish waste disposal grounds and waste dumps;*
6) *to drive (with mechanical vehicles) off the roads of general use and the driveways of company buildings and dwelling houses; to drive on the beach, in the forest and on agricultural lands, if these activities does not involve the management or control of the area;*
7) *to organise public entertainment, relaxation or sports events, that are not coordinated with a local government, and in the case when the protected belt lies in a specially protected nature territory - with the administration of the territory;*
8) *to place special dwelling trailers outside the territories provided for such purpose in the spatial plan.*

…

(6) In addition in the protected belt of coastal dunes it is prohibited:

1) *to perform final felling;*
2) *to perform transformation of forest lands, except cases when it is provided by the Regulation of the Cabinet of Ministers;*
3) *to make fires outside specially designed places and house yards.*

In the Regulations of the Cabinet of Ministers No 42 (04.08.1998) **Methodology for the Designation of the Protected Belts for Water bodies and Water courses** (04.08.1998) it is defined how to set the borders of protected belts in nature and in spatial plans.

In the Section 9 of the **Fishery Law** (05.02.1995) it is defined that the towpath along the seacoast is a restriction of the right to use land properties.
The use of a towpath free of charge shall be provided for:

- pedestrians;
- monitoring of fish resources and waters;
- guarding borders; and
- performing environmental protection and fire safety measures.

The width of a natural towpath shall be:
1) along the shores of private waters – 4 metres;
2) along the shores of other waters –10 metres; and
3) along the seacoast – 20 metres.
(10) The Board of Fisheries in respect of fishing requirements, and the Maritime Department of the Ministry of Transport in respect of shipping requirements, may also determine a narrower or wider tow-path, however, it may not exceed 40 metres.

The Regulations of the Cabinet of Ministers No 300 "**Requirements for Establishment and Hygiene of Places for Swimming**" (11.08.1998) defines the requirements for establishing, improvement and use of places for swimming and delegates the resposibility to the local governments, landowners or possessors of the area. In the regulations all the places for swimming of the Baltic Sea and Riga Gulf are listed, including Jaunkemeri and Ragaciems in the territory of Kemeri NP and Klapkalnciems on its border.

1.2.3 Normative Acts Regarding the Protection of Cultural Heretage.

The Law on National Cultural Heritage (12.02.1992 amend. 01.06.1993, 02.12.1993, 09.02.1995, 04.12.2001).

1.2.4 Normative Acts Regarding Tourism

Tourism Law (1998.17.09. in force since 1999.01.01., amend.2002.24.01.). It defines the tasks of the tourism sector, the goals of the state tourism policy and the means of implementing it. The Law defines that "*nature tourism is a type of tourism, the aim of which is to discover nature, view typical landscapes, bio-topes, observe plants and animals in natural conditions, as well as to educate oneself regarding issues of nature conservation*;" and "*culture tourism is a type of tourism, the main aim of which is getting to know cultural and historical heritage and notable places*".

1.2.5 Normative Acts Regarding Territory Development Plans

Territory Development Planning Law (15.10.1998).
The Regulations of the Cabinet of Ministers No 423 **Regulations on Spatial Plans**. (12.12.2000). According to these regulations the spatial plans must be in force in every local government. The plan should be developed for all the administrative area of a rural municipality or a city and it should include the present, planned and permitted use of the area with a perspective of twelve years as well as specify in more detail the objects, areas and requirements included in the spatial plan of a district (if such has been elaborated).

The Procedure of Issuing Ecological Tasks for Elaboration of Spatial Plans. Order of MEPRD.
Law on the Specially Supportable Regions (22.05.1997).
The Regulations of the Cabinet of Ministers No 570 **On Granting the Status of a Specially Supportable Region**. (15.11.1997).
The Regulations of the Cabinet of Ministers No263 **The Procedure of Granting the Status of Specially Supportable Region**. (29.07.1997).
Latvian Rural Development Programme (15.06.1998).
Conception of Latvia's Regional Development Policy. Adopted by the Cabinet of Ministers during the meeting 3 December, 1996.
National Development Plan (2000- 2002) (17.11.1997).
Regional Policy Guidelines. Conceptual questions. Ministry of Protection and Regional Development. Adopted by the Cabinet of Ministers during the meeting of 26 September, 1996.

Spatial plans are made according to Regulations of the Cabinet of Ministers No 423 **Regulations on Spatial Plans**.

1.2.6 Park Administration, Organisational Structure (Tasks of Administration)

The Law on Kemeri National Park (annex 1) defines that the National Park is a specially protected nature territory of national importance and it is managed by the administrative state institution - Kemeri NP Administration which is subordinated to the MEPRD. The administration acts according to the statute approved by the Cabinet of Ministers (annex 2).

The director of the National Park is in charge of the administration of the National Park. At the same time he/ she is the Chief State Environmental Inspector in the territory of the park. The Director of the National Park is appointed and dismissed by the Minister of the Environment Protection and Regional Development.

The main functions of the administration are:

- to elaborate nature protection plan (NPP) and the regulations on protection and use;
- to manage the territory of KNP according to NPP and regulations;
- to control the observance of the regulations on protection and use of KNP;
- to provide KNP with informative signs;
- to coordinate building of infrastructure, placement of advertisements and other activities according to the establishment objectives of the park;
- to issue a written agreements to legal persons for organising visitation of KNP;
- to ensure protection of endangered species and habitats;
- to carry out research and monitoring of the ecosystem processes;
- to encourage development of sustainable economic activities and nature tourism in the territory of KNP;
- to coordinate the activities of municipalities and KNP Administration in the territory of the park;
- to raise public awareness on ecology and nature protection issues;
- etc.

The budget of the administration is consists of state subsidies, voluntary donations, charges for services rendered and money gained from the use of nature resources.

The Director specifies the organisational structure of Administration, confirms the job descriptions of civil servants and employees.

The Statute of the Administration prescribes that the rights and duties of civil servants and employees are defined in normative acts, the statute of KNP administration, statutes of departments, regulations of an establishment and job descriptions.
State environmental inspectors of the Administration act according to the law On of Environmental Protection.

The organisational structure of administration (annex 3) has been created to fulfil the above mentioned functions. The Territory Control Department (6 state environmental inspectors) ensures the protection and control of the territory, the Research and Scientific Department is responsible for the planning of nature protection activities, controlling the implementation of nature protection activities, monitoring and storing of data (6 employees). The Information and Tourism Department (1 employee) is responsible for informing the public, environmental education and interpretation. The Head Forester in cooperation with the Forest Ecologist issue confirmations for tree felling and control the condition of the felling fund. The Management Department (1employee) ensures the maintenance of the territory and management of habitats. The Accountant and the Secretary are directly subordinated to the Director.

1.3 The history of the protection of the territory

Before the establishment of the National Park in 1997, there were several nature reserves in the area.
In 1957 the Council of Ministers of LSSR adopted the resolution about the establishment of Kemeri Nature Reserve (46 700ha). The resolution was not implemented (Galeniece M., Cukermanis K., 1958).

In 1977 with the resolution of CM of LSSR No241 **Kanieris lake** was confirmed as an ornithological reserve (857 ha). The resolution states that it is "*the concentration area for waterfowl in artificially improved living conditions. It is the main area for probation of biotechnical activities*".
In 1987 Kanieris lake was included in the 1st sanitary protection zone of Kemeri health resort (Institute "Sojuzkurortprojekt" in Moscow, 1987).
The complex nature reserve **The Valley of the River Slocene and the Surrounding Landscape** have been protected since 1977 (CM Resolution No.241). The resolution states that there is "a unique complex of primary plaudified forest types, a habitat of rare plant species and beavers".
The springs of Zalais Purvs (The Green Bog) containing hydrogen sulphide (as a geological object) and the dunes "**Kracu Kalni**" (Kracu Hills) (as a geomorphologic site) have been protected since 1977 too. (At present "Kracu Kalni" are not included in the Regulations of the Cabinet of Ministers No 175 (2001)).
The Kemeru Lielais Tirelis Bog (Kemeri Great Raised Bog) has been protected as a bog reserve since 1987 (the Resolution of CM of LSSR No 107; 10.04.1987).
Almost all the nature reserves mentioned above were just "on paper", due to the fact that no nature protection measures were carried out. Exceptions were the sanitary zones for protection of Kemeri spa resources that were designated to protect the origination processes of hydrogen sulphide (there the economic use of forest was restricted).

2 Coordination of Nature Protection Interests of Kemeri NP and Territory Development Plans of Local Governments

Kemeri national park includes territories if 7 rural municipalities, the rural territory of Kalnciems town and Jurmala city.

2.1 Participation of Protected Territories in the Process of Spatial Planning

The Regulations on Spatial Plans do not specify the way how the administration of protected nature territory can participate in the elaboration of a plan. The Regional Environmental Protection Boards issue provisions for elaboration of spatial plans. The regulations prescribe that both- the planning of a district and the spatial plan of a city or a rural municipality should include "specially protected nature territories and their functional zones" and that the elaboration if spatial plan requires regulations on protection and use of specially protected nature territories and cultural heritage and nature protection plans (if such exist). If a nature protection plan already exists, then the requirements should be observed in the spatial plan.

Local governments should receive an ecological task for inception of a spatial plan. As prescribed in The Procedure of Issuing Ecological Tasks for Elaboration of Spatial Plans, "the ecological task for elaboration of a spatial plan of the local governments with specially protected nature territories with their own administration should include the requirement to receive the Task from the administration of the specially protected nature territory in question and to follow these requirements in the spatial plan in sphere of environment protection" (Item III, 5). By complying with these regulations the interests of the national park are implemented in the spatial plan of a local government.

2.2 Spatial Plans of Local Governments

2.2.1 Jurmala City

The Territory Development Plan of Jurmala City was elaborated in 1995. The map of the planned zoning was updated in 2000. A special planning department has been created in Jurmala City Council. The main chapters in the plan regarding the territory of the Kemeri National Park are the following: nature areas, traffic and communications and cultural heritage of Jurmala.

The largest part of the planned zoning of the territory of Kemeri NP within Jurmala city is marked on the map as "nature area". The zone have several functions in the city:

1) the function of ecosystems;
2) the function of maintenance of health resort resources;
3) the function of representation- creating an attractive image of Jurmala;
4) social and educational function;
5) the function of indicators;
6) the function of compensation (sanitary hygienic function).

These aims do not contradict the nature protection policy of the administration of the national park. In the spatial plan of Jurmala city on the map of **nature areas** the region for protection of the spa resources of Kemeri and region of the coastal protected belt of Riga Gulf are marked as territories of nature heritage.

The region for protection of Kemeri spa resources has been created with the aim to preserve and use the balneological and recreational potential in such amounts that do not contradict the nature protection requirements. The region has been divided into two zones. The Kemeri balneological resources protection zone covers Sloka lake, Sloka bog, Raganu bog and it continues in the territory of Kemeri NP beyond the borders of Jurmala city. This zone is used for protection, extraction and renewal of resources. Most of it lies in the nature protection zone of Kemeri NP, except the upper reaches of Luznu ditch near Seklais bog. The Kemeri spa resources environment protection zone covers the area surrounding Kemeri and the belts along Talsi highway, Vecslocene river and Ventspils highway. The zone is devised for recreation and protection of biological diversity.

The aims for establishing the **region of the coastal protected belt** of Riga Gulf are to preserve the coast of the Riga Gulf as single nature complex, the reduction of pollution, prevention of erosion processes, the protection and use of coastal landscape for relaxation to the extent that do not contradict the nature protection requirements. The building is allowed only after receiving the positive conclusion of ecological expertise, if the activity is prescribed in the territory development plan.

From the point of view of **traffic** development the territory of Kemeri NP is affected by the planned detour road near Kauguri. The highway is planned to link the Ventspils and Talsi highways. Several variants of the planned highway have been developed, the first one crosses the nature protection zone of Kemeri NP, the protected habitats in flood- plains of Vecslocene river. The second variant is planned along the existing building area and it does not affect the territory of Kemeri NP. Unfortunately, the land reservation during privatisation process and renewal of ownership rights has been started for the first variant.

The whole historical centre of Kemeri health resort has been marked as **culturally and historically important area**; it is defined as a town planning monument of state importance. Together with the protective zone of the monument it covers all the built area of Kemeri, including the Kemeri City Park to the NE of Robezu Street.

The following territories are defined in the spatial plan as in need of regeneration and re- cultivation activities:

1) the territory of abandoned production units in Kudra,
2) the former waste dump of Jurmala city in the Kasku Bog (Sala rural municipality).

- *Unfortunately no specific measures are planned in the near future. A large territory of health resort is marked in the updated map of planned zoning of Kudra that is not justified with need for the enlargement of the territory of the health resort. In 2001 the development of the detailed spatial plan has been started for the territory of Kudra.*
- *The re- cultivation of the waste dump in the Kasku Bog is planned as favourable, not real activity. Jurmala city "feels responsible" for arrangement of the territory, but it lies in the Sala rural municipality, therefore no specific activities are planned.*
- *In the spatial plan of Year 1995 there are no new building areas planned in the territory of Kemeri National Park. However in the updated map of planned zoning of Year 2000, a new "pine park" area with building is marked in Jaunkemeri. There the land is given as compensation to the land inheritors, whose plots are in the protected belt of coastal dunes and may not be built up.) There are no special nature values in these territories (city forests) and therefore the building up can be permitted.*

2.2.2 Riga District

The planning of Riga district was elaborated in 1994- 1996, when Kemeri NP was not yet established. The area included in Kemeri National Park (the western part of Sala rural municipality) is distant, relatively isolated (separated by the Lielupe river) and under-populated part of the district. No substantial changes or new development centres are planned in the territory.
The updating of the planning of Riga district was carried out in 2000 and 2001. The final meeting for public discussion of the 1st draft of planning of Riga district till 2003 with amendments took place on 11 September 2001. Probably the duration of the plan will be extended to 2005.

The perspective traffic development plan is important for the territory of Kemeri NP. The **Riga- Ventspils** highway is seen as a development priority, and the Riga- Liepaja highway is meant more for the local traffic. In the plan the abovementioned roads are connected by a new highway that would be combined with a protecting dam along the other bank of Lielupe river (not affecting the territory of Kemeri NP).

In the tourism plan there are several tourism routes that include the territory of Kemeri NP -"The Small Circle" (separate routes with the beginning and end in Riga) and the "The Large Circle" (includes all the territory of the district). The route of The Small Circle leads from Riga to Olaine, Marupe, Babite, Sala and back to Riga. The following sightseeing objects are planned in the area: warrior's cemetery near Tireli, Lozmetejkalns, **Kemeri NP** (the location of the information and administration centre is indicated as the centre of the park in Kemeri) and St John's Church in Sala. Rest sites with information about Riga district and with the map of the district are planned near both bridges of Lielupe river. No tourism companies are

indicated in the area. It is possible to participate in the planning of the tourism routes and include the planned tourism objects of Kemeri NP e.g. Kracu Hills.

2.2.3 Jelgava District

The Council of Jelgava's District in cooperation with specialists from Sodermland (Sweden) and the councils of the rural municipalities and Kalnciems town have elaborated the planning and the strategic development programme (1997.- 2010) of Jelgava district. It gives the historical and present characterisation of Jelgava district: environment, landscape, nature resources, minerals, forests and specially protected nature territories. In the plan the main emphasis is put on economic development and problems, social sphere and cross- border planning.

During the elaboration of the plan Kemeri NP was not yet established, therefore it is not mentioned. As can be seen in the map, the territory of Kemeri NP occupies the far north- eastern corner of Jelgava district which is sparsely populated. Therefore there are no development perspectives foreseen for the area in the plan of Jelgava district . The only map containing some information about the territory of Kemeri NP is "Risk Zones". The following territories are marked as **risk zones: areas along Lielupe river affected by the flood and the gas transmission pipeline.**

2.2.4 Sala Rural Municipality

Sala rural municipality includes the following territories of Kemeri NP (Picture 1):

1) Agricultural lands of Odini- Pavasari polder and northwards and Likumciems- the neutral zone of the park;
2) Kudra- the neutral zone of the park;
3) Kalnciems swamp forest - the nature protection zone of Kemeri NP;
4) The forest and bog massif in the western part of the municipality- the landscape protection zone of the Kemeri NP.

The first draft of the spatial plan of Sala rural municipality was elaborated in 2000.

No special changes in land use are planned in the nature protection zone and the landscape protection zone. The former waste damp of the Kasku Bog is marked as a territory for re- cultivation, and the Kasku Bog itself- as a potential site for peat extraction. No changes in land use are planned also in the territories of the neutral zone- Kudra and Likumciems (areas used for agriculture and areas for building summer cottages and gardens).

- The peat extraction is not recommended from the point of view of nature protection due to high density of *Crex crex* and from the point of view of protection of origination processes of mineral waters.

On the other hand crucial changes are planned in the agriculture lands of Odini- Pavasari polder. Territories of low rise living buildings are planned between the road to Odini and Kalnciems swamp forest. Low rise buildings are planned in the area of 193ha, where according to building regulations the minimum area for separate plots can be 600m^2, and for line houses- even 300m^2. Thereby a situation can arise when up to several thousand people start living in the area.

- *In such case the future of Kalnciems swamp forest as a protected territory is threatened. The placement of low rise living buildings along the border of the nature protection zone of the Kemeri National Park shouldn't be permitted. It would create additional anthropogenic pressure on the unique massif of swamp forests on flood plains in Latvia. The location of buildings between the forest and extensively used agricultural lands leads to landscape fragmentation and closes the ecological corridors for ecological processes and moving and feeding of animals. From the point of view of builders the proximity to wet and overflooding forests could hardly be seen as an advantage as well.*

Mixed living building territories (in the area of 77ha) are planned along Lielupe river as well (along the dam). A recreation area (a golf- course) is planned between Gate and Odini.
In the amendments to the planning of Riga district, according to the new Law on Kemeri NP (2001), the area of Odini- Pavasari polder in the landscape protection zone is marked as valuable agricultural lands and

building is planned only in the neutral zone. Consequently Sala rural municipality also has to make amendments to its planning corresponding the planning of the region.

2.2.5 Lapmezciems Rural Municipality

The elaboration of the spatial plan for Lapmezciems was started in 1997, but only in 2000 it was conformed (with remarks) with Ventspils Regional Environmental Board. The borders of building territories were coordinated with the administration of Kemeri NP during the elaboration of the plan.

In the analysis of the present situation it is emphasised that the protected territories occupy a very large area in the municipality:

1) 97% of the territory is in the belt of restricted economic activities of the protective coastal zone of the Baltic Sea and the Riga Gulf,
2) 6%- in the protected belt of coastal dunes,
3) 100%- in the territory of Kemeri NP (only 14% of the territory of the district are in the neutral zone of Kemeri NP).

Therefore the municipality emphasises that territories for development are restricted and in fact the development of the district is hindered.

However, the main attention is paid to the territories for building, that include coastal villages: Bigaunciems, Lapmezciems and Ragaciems (picture 1), as well as the two small separate ones: Antinciems and Caukciems. All the remaining areas - forests, bogs and lakes (except Gausa Judze along the coast) are excluded from the spatial planning and no development is planned for them. It seems strange that the development of tourism and recreation is planned only by reserving the access to the sea through built up areas and by increasing the parking places along the coast in Gausa Judze.

The transit traffic is emphasised as a problem in the spatial plan. The traffic intensity on the highway Jurmala- Talsi tends to increase extremely and the road is located in densely populated area. A route of the planned transit road is included in the plan. The new road has not been included in the building plan and street network. It has been included in the plan as a future perspective and not as a real suggestion that has been coordinated with the development of the municipality.

In the spatial plan the possibilities for holidaymakers to reach the sea have been examined and evaluated as insufficient. Therefore new parking places with connections to the sea are planned in the villages approximately after every 300m. The adjustment and reconstruction of existing parking places in 14.8 km and 18.2 km of the road P-128 Jurmala- Talsi In Gausa Judze is planned as well (picture 1); so is the building of a new parking place in 19.1km. It is also planned to improve the forest road parallel to the highway and to build four parking places on its sides.

The main emphasis in the plan is laid on the present and future building territories. The border of building territory is marked on the plan of the primary zoning of the municipality. It includes:

1) the territory on which buildings already exist (both- low rise and multi-storey),
2) “unused territories” (grasslands, brushwoods, forests) to the south- west of the villages, which can be used to enlarge the building territories of the municipality,
3) the area of former Soviet Army base, where a sports and relaxation complex is planned,
4) the territory between the area of former Soviet Army base and present low-rise buildings, the part of which has already received an ecological environment assessment that allows building up,
5) the land on the sea in Ragaciems that is the property of the municipality and where the location of net huts is planned,
6) small areas and separate plots that are encircled by the existing buildings and for which “it would not be purposeful to define a status different from the building territory” (however, as it can be seen on the map, the sites are often surrounded by buildings only from three sides and they border directly with the beach),
7) sparsely build up territories preserving the existing forest are planned.

The territory that can be partly built up is defined as well. It is a private forest that is close to the northern end of Ragaciems.

The development of the Lapmezciems municipality by enlarging the building area is not justified in the spatial plan itself. As it follows from the chapter on inhabitants, the density of population in the municipality

is twice as large as the average population density in the Tukums district. As the majority of inhabitants are living in the narrow coastal zone, there the population density is even higher, e.g., in Lapmezciems- 636 people per km^2. Considering dense building territories located on the coast from the development aspect it *would be more purposeful to encourage the development of recreation infrastructure instead of increasing the number of inhabitants.*

- *To associate the development of municipality only with the taxes which could be received from the potential inhabitants is not the most effective type of management of the territory. However the choice whether to sell the land and get a certain income immediately or to invest purposefully in the development of tourism and recreation infrastructure remains with the inhabitants and the local government*

Nature values of Kemeri NP could be affected mostly by the enlargement of building territories to the south-west of the villages. As it has been discovered in surveys during elaboration of the management plan the grasslands between Kanieris lake and Lapmezciems are valuable dry calcareous grassland habitats (chapter 4.6).

- *A drawback of the plan is the fact that no research zone is marked along the route of the planned transit road and it does not foresee the connection between the new road and the location of service facilities. The route should be planned as a territory for further research both for the purposes of land reservation and ecological research (around the Kanieris lake). In any case, whenever a new building activity is planned a detailed plan should be elaborated for the specific area. It would include a new street network, its connection to the planned transit road and the nature protection requirements.*

2.2.6 Engure Rural Municipality

The spatial plan of Engure municipality was accepted in May 2001.

Only a small area of Engure municipality (its southern corner) is included in the territory of Kemeri NP. Furthermore, all the territory is covered with forest, mainly state owned forest (in possession of Kemeri NP), and it is in the landscape protection zone of the national park. No development centres and areas in the territory of Kemeri NP are provided for in the spatial plan.

The plan foresees 4 detailed planning territories with several private plots (for perspective planning of building up) in Klapkalnciems that lies at the border of Kemeri NP. The minimal area of plots in Klapkalnciems are planned as follows: in the zone between the highway and the sea- $1200m^2$ and between the highway and the western border of the village- $2400m^2$. It is planned to keep the recreation centre of RTU (Riga Technical University) "Ronisi". Klapkalnciems is indicated as one of the bathing sites in Engure municipality (the other two are Abragciems and Kesterciems). The plan indicates that an agreement on the maintenance of the bathing site should be signed with the owner of the living house near the mouth of Lacupite river. In the spatial plan a bicycle road is planned along the Riga Gulf.

2.2.7 Smarde Rural Municipality

Smarde municipality has not yet started the elaboration of a spatial plan. It is not planned in the near future while no financing is received.

It would be essential to work out a spatial plan for the surroundings of the Valgums lake at least. Almost all the lands surrounding the lake are private owned or used by private persons. The territory is valuable from the landscape point of view; the lake itself is important resource for recreation. There is a threat that the territory could be built up with private houses and private recreation facilities that would prevent public access to the lake (Valgums is a public lake). Without a spatial plan the Building Board of the municipality have no reason to allow or restrict the building activities along the lake.

2.2.8 Slampe Rural Municipality

The territory development plan of Slampe municipality has been elaborated and submitted for the approval to MoEPRD (in October 2001). The plan is elaborated for the time period from 2000 to 2012.

The development programme of the territory contains future vision of the municipality and descriptions of different sectors including their aims and tasks. In the vision the municipality is described as a favourable living environment where the agriculture is the main branch of production. The emphasis is put on taking care for environment, landscape and cultural heritage.

In the chapter on environment one of the tasks prescribes "to participate in the management of Kemeri National Park" as well as "to pay special attention to the conservation and development of the following environment objects: Kemeri National Park and Slampe reservoir". These tasks are too general. They do not include specific activities. However, they show the readiness for cooperation.

Comparatively specific tasks are worked out for the development of tourism sector. Some of them are as follows:

1) to include tourism information in the municipality web page that is being created,
2) to put up the direction signs to nature and culture objects,
3) to establish a tourism centre and a position for tourism coordinator in the municipality,
4) to produce a map of municipality.

Unfortunately the tasks do not include the support for rural tourism. To gather information about the present and potential guest houses is an urgent enough task.

For improvement of roads and traffic the following tasks affecting Kemeri NP are defined:

1) to include the reparation of the road Slampe- Smarde in the State Rural Roads Programme,
2) to repair the road from the highway to Tireli (the planned information centre of the national park) in cooperation with Kemeri National Park.

On map "Roads and Streets of Slampe Municipality" ("Slampes pagasta celi un ielas") Scale 1: 75000 the small forest roads are also marked as municipality roads.

- *The order of maintenance and use of these roads needs to be specified.*

Slampe municipality (picture 1) does not plan perspective building territories in the territory of Kemeri NP. The existing farm Melnragi at the very border of the park is the only production enterprise. It is planned to preserve all the individual farms in the agricultural lands in the western part of Kemeri NP. The building regulations concerning the agricultural land prescribe that the minimal area of the plot is 5ha, the minimal width 200m and the maximal building area 0.5- 0.7ha. It complies with the interests for preservation of rural landscape and agricultural activities in these territories. The municipality also plans to develop a support programme for the preservation of individual farms.

The former peat extraction site in the NE of the Lielais Kemeru raised bog is marked on the map of minerals as a perspective site for peat extraction. In the letter to Council of Slampe municipality (regarding the necessary amendments to the plan) it is stated that the peat extraction may not be resumed due to protection of health resort resources and regime of nature protection.
The map "The Perspective Use of Land" ("Zemes perspektiva izmantosana") (Scale 1:25000) which was planned in the building regulations has not been created yet.

- *In general it can be concluded that the nature protection interests are taken into account in the planning of Slampe municipality. The suggestions and amendments made by Kemeri National Park, the zoning of the park and information about specially protected forest compartments and perspective tourism infrastructure still needs to be included in the plan. The municipality and the planners show an interest and tendency to cooperation. This favourable atmosphere should be maintained also in future.*

2.2.9 Dzukste Rural Municipality

The first draft of the territory development plan of Dzukste municipality has been elaborated (January 2001). The plan is elaborated for the time period from 2000 to 2012.

The planning only slightly affects Kemeri NP. The tasks for supporting tourism possibilities in the municipality are formulated similarly to the ones of Slampe municipality. Kemeri NP is defined as one of the tourism objects.

Dzukste municipality has rich cultural heritage. It is associated with Dzukste fairy tales and the name of Lerhis- Puskaitis as well as other men of renown born in Dzukste: Gustavs Zemgals, Teodors Zeiferts and Karlis Ievins. The traces of cultural heritage can also be found in the landscape as old houses and buildings, and as specially created memorial signs. Therefore the populated areas of Dzukste municipality are important as potential sites for tourism facilities close to the park.

A new building territories and extraction of minerals is not planned in the territory of Kemeri NP. In general, nature protection requirements are observed in the planning.

2.2.10 Kalnciems Town with Rural Area and Valgunde Municipality

These administrative territories of Jelgava district started the elaboration of the plan in 2000. The planner of Kalnciems town with rural area Valdis Cakars has handed in his vision about the territory development (it covers both administrative territories mentioned in the heading) to the Management Plan working group. In the vision the main emphasis is put on the planning of tourism and recreation objects. The most important of them:

1) water paradise- Aquapark with a hotel with 200 beds on the flood- lands of Lielupe river, at the border of Kemeri NP;
2) dolomite quarries as a site for water recreation, an idea to connect the quarries with each other and also with Lielupe river;
3) tourist centre in Sumragi;
4) the reconstruction of Zemgalu Castle at the former site of the port at Lielupe in Plostmuiza;
5) skiing track in Kracu Hills (Kracu Kalni);
6) a camping in the meadows near the dolomite quarries;
7) cleaning of the Parupju Ditch and making it suitable for water tourism.

If the park gives its oppinion and suggestions about these ideas from the point of vew of nature protection, it is possible to include them in the plan in an early phase. That way there will be fewer possibilities for conflicts between the interests of nature protection and development of the municipality.

2.3 Specially Supportable Regions

In the Law On Specially Supportable Regions it is prescribed to identify the regions whose “development is encouraged with the means of regional development- state investments in the infrastructure, special policy for credits, subsidies for investments, lump- sum payments to enterprises (business companies) and to local governments, the activities of economic education, the establishment of free (special) economic zones, administrative and other activities that are based on the development programmes of specially supportable regions and in which the principle of shared finances is used”. In these regions also certain tax allowances are enforced.

The Cabinet of Ministers confers the status of the specially supportable region for three years, after which it can be annulled or prolonged. After the suggestion of MoEPRD the working group has included in the list of potential specially supportable regions the following territories of Kemeri NP:

Slampe rural municipality in Tukums district,
Smarde rural municipality in Tukums district,
Lapmezciems rural municipality in Tukums district,
Valgunde rural municipality in Jelgava district.

One of these territories – Valgunde municipality has acquired the status of specially supportable region. However the other municipalities also have the possibilities to submit their development programmes and acquire the status of a specially supportable region. That is one of the compensation mechanisms for the economic development hindered by status of specially protected nature territory.

3 General description of the territory

3.1 General Information

3.1.1 Geographical Coordinates

The geographical coordinates of Kemeri NP are: **N 56^0 57 '07,94"; E $23^0$30'44,60"** (they are ascribed to the information centre of the park- "Meza maja").

The largest part of the territory of Kemeri NP is situated on Coastal Lowland where an explicit borderline is marked by the Littorina Sea coast (inland dunes "Zalas kapas" and Kracu Kalni) and comprises a line of shallow lagoon lakes (Kanieris Lake, Slokas Lake etc.). The South-West part of the park lies on Zemgale Plain, and the North-West (the surroundings of the lake Valgums)- on Ziemelkurzeme (North Kurzeme) Highland (the highest point is Lustuzkalns - 72.1 m above the sea level).

3.1.2 Description of borders and zones

The total area of the national park is 38 165ha, including 1954ha of the sea; the borders are specified according to the national park's scheme and description of borders.

Different zones of management are established in the territory of park- from the prohibition of economic activities and support of natural processes to regulated activities for the preservation of several habitats.

3.1.3 Functional Zones

According to the Law on Kemeri NP (Annex I), in the territory of National Park the following functional zones are established (Picture 2):
nature reserve zone;
nature protection zone;
landscape protection zone;
neutral zone.

The Management Plan has been developed considering the zones that are confirmed in the law on Kemeri NP (2001).

The nature reserve zone has been created to preserve territories intact by human activities and little transformed territories. In these territories undisturbed development of natural processes is provided and rare or typical ecosystems that are important for providing the ecological needs of rare and migratory species are protected.
In the nature reserve zone all the economic activities (and activities of other types as well) are prohibited, except:
scientific research;
forest fire prevention measures;
measures that are needed for protection and preservation of the nature reserve zone (according to the Individual Regulations for Protection and Utilisation of the national park and according to the Management Plan);
crossing the nature reserve zone using the specified routes approved and allowed by the administration of the park.

Nature protection zone has been created to protect the ecosystems with low disturbance level of human activities, the sites of rare and endangered species and the types of rare habitats, as well as developed peat pits and the processes of origination of mineral waters.
In the nature protection zone the economic activities that contradict with the natural development of ecosystems are prohibited, except the cases specified in the Individual Regulations for Protection and Utilisation of the national park and the cases specified in the Management Plan.

The administration of the national park can designate seasonal reserves according to the Individual Regulations for Protection and Utilisation of the national park. This could be done to provide undisturbed

existence of plant and animal species and the possibilities of animal concentration during the migration periods.

The landscape protection zone has been created to preserve the resources of tourism, relaxation and education and the origination processes of mineral waters; to preserve the nature, cultural landscape and to reduce anthropogenic influence on the nature reserve zone and nature protection zone.

The neutral zone has been created to encourage the development of health resorts, to preserve the landscape and the architecture characteristic for the region and to encourage sustainable development of the territory of the national park.

The protected coastal belt of the Baltic Sea and the Gulf of Riga.
In the territory of Kemeri NP there is a belt of restricted economic activities along the Gulf of Riga at width of 5 km. There clear cutting is prohibited and final felling has to be accomplished at least at 3 strokes and at one stroke it is allowed to fell not more than 25% from the wood harvest.

3.1.4 Property Rights

3.1.4.1 State and Private Properties

The land of Kemeri NP is owned by the State, local governments and private owners.
29 507ha (77.3%) of the land belong to the State, 6 704ha (17.6%) are in the possession of local governments and private owners.

- Properties owned by the State or under the jurisdiction of the State are not recorded in the Land Register.

2898 private land properties are included in the territory of Kemeri NP.
The nature reserve zone (2 236ha) consists only of State's forest lands. In the nature protection zone (total area- 19 418ha) 510ha are in private owners'possession, from these 57ha are forest lands and 453ha- agricultural lands. In the landscape protection zone (total space- 14 418ha) 2350ha are in private owners' possession, from that 1353ha are forest lands and 994ha- agricultural lands. In the neutral zone mainly private lands are present ~ 1500ha (the total area of the zone is 1651ha).

- The administration of Kemeri NP does not have complete data about the types of land use of the whole territory of the park, owners and cadastral maps of estate. The data of Tukums SSL (the Service of the State's Lands) about the types of land properties, the numbers of cadastres and cartographic location in the territory of Kemeri NP have been purchased. The classification of the types of land utilisation of Jurmala city differs from the classification adopted by the Service of the State's Lands. That doesn't allow to give overall summary about the whole territory and the types of land utilisation, e.g., ploughlands, grasslands, pastures etc of Kemeri NP.

Kemeri NP started the administration of cadastre information by employing 1 person at the end of 2001.

3.1.4.2 Signed Contracts

152 contracts on observation of the regulations regarding the protection and utilisation of the specially protected nature territory- Kemeri National Park- were signed between the administration of the national park and natural and legal persons during the time period from 1 January 1998 until 20 February 2002. 82 resolutions on refusal (non- refusal) from the State's right of preemption in the specially protected nature territory were issued (table 3.1).

Table 3.1 **Signed Contracts and Issued Resolutions by the Administration of KNP**

Territorial Unit	Contracts	Resolutions
Jurmala city	17	9
The municipality of Lapmezciems	76	60
Engure municipality	0	0
Smarde municipality	17	7
Slampe municipality	2	---
Dzukste municipality	6	---

Kalnciems and its rural territories	2	1
Valgunde municipality	5	3
Sala municipality	27	2
Total Number in Kemeri National Park	**152**	**82**

- The administration of Kemeri NP does not possess data about the land owners whose property rights on land have been renewed, whose property is registered in the Land Register of estate but encumbrances are not registered due to the fact that the park was created only in 1997.16.07.
- As a result, the land owners are not informed about their land being located in the territory of Kemeri NP.

The administration of Kemeri NP has signed contracts on the lease of hunting rights (6 contracts), on forest management rights in the landscape protection zone (2 contracts), on rights to cut reed in the Lake Kanieris (4 contracts that each year are re-signed). An integral part of the reed extraction contract is a map with marked land areas that are possible for management (Annex 4; Picture 14).

3.1.4.3 Other Managers of the Territory

These are the State institutions under which control and management are the State's land properties for the maintenance of important infrastructure sites and linear communication.

The State joint-stock company "Autocelu direkcija" (The Board of traffic roads) of the Ministry of Traffic. Jurmala's department of the Board of Road Traffic Safety (Celu satiksmes drosibas direkcija (CSDD)) (tel.7769015).
It is the manager of roads of State importance with section belts whose width depends on the road category.

Functions:
to maintain the sides of roads and ditches (to clear from overgrowing and to plant greenery);
to develop and to follow the order of placing road signs and advertisements;
to collect the garbage on the belt close to the road.

"Latvijas Dzelzcels" ("Latvia's Railroad")- State joint- stock company (tel.2234395, 2233074, 2234389, PR-5834909).
Functions: to maintain the belt of railroads free from bushes, trees and to diminish the threats of fire expansion.
"Latvenergo", State joint- stock company, Central EN (tel.7901003). Latvenergo branch "High Voltage Network" (tel.2278095, 7126204).
Functions: to maintain net routs and to avoid the case of emergency situations.
Holding company "Latvijas Gaze" ("Latvia's Gas") (tel.7369117, 7369132; PR department 7369126, 7369144).
Functions: to maintain gas routs and to avoid the case of emergency situations.
Ltd. "Lattelekom" (tel.7055000).
Functions: to maintain telecommunication network and to avoid the case of emergency situations.
The Rural support board of Lielriga (under the Ministry of Agriculture) – Ogre, Brivibas str.40
Functions: to maintain and control polders of Lielupe, to issue, coordinate and control the permissions for the transformation of agricultural lands.

3.1.5 Infrastructure

3.1.5.1 Roads

The territory is crossed by the following types of roads (Picture 1): the roads of State importance: highways Riga- Liepaja (A9) at the length of 9km, Riga- Ventspils (A10) at the length of 13km; first- rate roads Riga- Talsi (P128) at the length of 17km; Kudra- Kalnciems (P110) (12km), second- rate state roads Lapmezciems- Antinciems- the lake Valgums (15km), Klapkalnciems- Smarde- Slampe (30km). Turistu Street and the road of Jaunkemeri join Kemeri and Jaunkemeri.

Forest gravel or unpaved roads (at total length of ~ 65km) are used for the needs of forest protection and logging. They have been built mainly by accomplishing forest melioration (the road along Kauguru Ditch is the longest from them).

At the present their condition is not very good, they are not repaired, the proximal ditches are thickly overgrown and they have not been cleaned at least during the last 10 years. Due to beaver activities road surfacing is collapsed and scoured in places.

Public transport- the traffic of buses and micro-buses. All the long-distance buses that run to the cities of Kurzeme (Tukums, Talsi, Ventspils, Liepaja etc.) cross the territory.

3.1.5.2 Railroads

The railway Riga- Tukums at the length of 22km (passenger traffic) and cargo transport to Tukums and Ventspils.
Stations: in the territory of Kemeri NP: Kemeri, Kudra and Smarde (in the western part of KNP).

- Infrastructure of roads, public transport and railway service provide visitors with good opportunities to reach the national park. However, these advantages have also some minuses such as the noise from roads and railroads in the whole territory of the park.

3.1.5.3 Bridges

Concrete bridges have been built on the Channel of Kauguri and over melioration ditches in the meadows of Dunduri. They are not maintained. Sumragu Bridge has fallen in.

3.1.5.4 Melioration

Considerable areas have been drained by straightening out such water courses as the river Dzukste, the river Slampe, Skudrupite (by creating the Channel of Kauguri), Janupite and Lacu Spring. A melioration system has been created for forest and meadow drainage of Vecslampe's district in Dzukste municipality.

A significant melioration was accomplished in the territory till 1980s by draining peat extraction sites (in the North-West part of the Kemeri Raised bog) and wet forests (in the South-East part of Kemeri NP). At the present melioration ditches are being destroyed due to beaver activities when channels are blocked and dams are built on ditches.

3.1.5.5 Polders

A polder (527ha) from Odini till Pavasari (Picture 1) was built on the banks of Lielupe during the period of 1976-1982. The Lielriga's Regional Agriculture Department of the Ministry of Agriculture maintains and supervises the polder. Finances for the maintenance of the polder are minimal, respectively, the water level in the polder Odini- Pvasari is maintained at the height of 1m, although it should be at 2m according to the regulations of exploitation. Culverts are under the water all the time and that diminishes the service life of exploitation. Lands are not used for agricultural purposes. The expenses of the maintenance of the polder (at the height of 1m) are ~ 5000 LVL/ per year. If the regulations of exploitation were observed, the costs would increase for 25%, without including the measures of renovation that would be necessary.

An "eternal" maintenance of polders is not provided in the strategy of the Ministry of Agriculture. It is just for the time of being, while local governments are refusing to maintain polders themselves and private owners are not able to do that. When transforming lands for other purposes, MA will not have an interest in continuing the maintenance of polders.

3.1.5.6 Electric Lines and Communication Lines

High voltage electric lines of the power of 20 kilovolts whose width of protected belt is 20m wide cross the territory of Kemeri NP.

3.1.5.7 Gas Pipes

The transmission pipeline crosses the southern territory of the park; the width of its protected belt is 10 metres.

3.1.5.8 Sewage Purification Plants (SPP)

In Kemeri there are sewage purification plants (power at 3000m^3/dn) whose wastewater is infused in Versupite and further they enter the lake Sloka. The sewerage penstock of Jurmala city joins the populated areas Lapmezciems- Jaunkemeri- Sloka. At the present Jurmala city has elaborated a project for the

improvement of water management within the frames of the programme “800+” that provides the hook up of the Kemeri drain to the united city net.

3.1.6 Maps and Photo Materials

3.1.6.1 Maps

At the present the Kemeri NP has the following maps:
topographic maps: Scale 1: 10000, 1:25000, 1:50000, years 1982- 1983;
an orto- photo- digital and as a printout 1994, Scale 1: 10000 from the State Land Service;
a satellite picture of 1989, Scale 1: 50000 LANDSAT TM as a printout from the foundation project of KNP;
aero- photos of 1970s;
municipality maps (Lapmezciems, Smarde, Slampe, Dzukste, Engure, Valgunde and Sala) Scale 1: 10000 from the State Land Service;
various historical maps from 18th- 20th cent.;
maps of forest stands – the forest planning of 1989, Scale 1: 15000, from the State Forest Service;
maps for designed activities- the forest planning of 1989;
maps of forest compartments (Valgums 2701 of the former Jurmala forest district, Kemeri 2702, the forest district of Kapas 2708) the forest planning of 1989 and 1979;
a part of the projects of forest planning for farms with maps from the State Forest Service, Scale 1: 10000;

A digital map Scale 1: 10000 has been designed for the whole territory of Kemeri NP, including the depiction of relief, hydrology, road net, forest conditions and the borders of land properties.

- The information from the State Forest Service on the borders of properties should be updated regularly.

3.1.6.2 Photo and Video Materials

The territory of Kemeri NP has been photographed from various aspects emphasising ornithological rarities and the swamp landscape. The photos are not collected; there is no catalogues; they are retained by their owners. The various habitats, landscapes, events and activities of Kemeri NP have been filmed. Photos of the rare habitats and plant species are created as a result of the botanical research accomplished in 2000.

3.2 Physical and geographical description of the territory

3.2.1 Climate*

The average air temperature in the territory of Kemeri NP is +5,7 degrees Celsius (according to the data of the meteorological station in the Tīreļa swamp that is currently out of order). The climatic showings of the last 10 years are obtained only from the nearest stations, that are found in Riga ("Rīga - University") and in Jelgava. The results of the observations that have been done in the centre of a large industrial city, may be only very conventionally attributed to the locality of Ķemeri. But the question – are the changes of the climate really occurring – may be answered (and hereto in the affirmative) based on the data of the meteorological stations of Latvia. Matisone et al., (1995) affirm, for example, the fact that the average monthly air temperature is constantly increasing, hereto it increases in all the 12 months of a year (annex 5). A distinction becomes apparent: the maximum temperatures have little increased, but the minimal – notably. Regarding the rainfall – no tendencies to changes of its amount have been discerned during the observations. Notable common tendency – a little rainfall augmentation (annex 5), hereto, the increase of the air temperature overtakes the augmentation of the rainfall amount. It means, there are certain preconditions for the diminution of the swamp waters provision. It is necessary to analyse particularly all the elements of water balance, and first of all the amount of evaporation in the respective territory.

3.2.2 Geology

3.2.2.1 Stratigraphy

The crystalline base shist is found approximately in the depth of a kilometre, it is composed by magmatic and metamorphic rocks of the Archaic and Proterozoic era. Above them embed the ground-generated rocks *(sandstones, clay and aleirolites)* of the Cambrian period (Є). Above occur carbonate rocks and ground-generated rocks *(dolomites, limestone, marlstones, clay, sandstones)* of Ordovician period (O) and Silurian period (S)

The above mentioned rocks are covered by ***Devonian*** sediment of tye total thickness of approximately 530 m. Of those represented in the territory of Kemeri NP are all the sublayers. The characterization of the Devonian sediment is given upwards.

Underdevonian is represented only by **Kemeri suite** (D_1km) – sandstones, clay and aleirolites.

Middledevonian begins with **Pernava suite** (D_2pr) which mainly is composed by sandstones that contain intermediate layers of aleirolites, clay and dolomitic marlstone.

Above follows sediments of **Narva suite** (D_2nr) that are composed by dolomitic marlstones with the intermediate layers of dolomite, clay and aleirolite. Beginning with this suite, to characterize the geological structure of the territory, data that have been got by prospecting the territory of Kemeri in 1985 are used. Performing the prospecting works, special attention was paid to the resources of sulphur water and drinking water in this territory (Drikis et.al., 1985). The thickness of Narva suite changes within the territory of the NP from 109 to 130 m.

Arukila suite (D_2ar) is composed by sandstones and aleirolites. The thickness of the rocks of the suite is very changeable – from 35.8 m (NE of the territory) to 84 m (in the central part).

Further follows **Burtnieku suite** (D_2br) that also is composed by sandstones, aeroliths and clay. Thickness of the sediment changes from 39.5 (in the central part) to 75.3 (NE of the territory).

Upperdevonian (image 4) begins with **Gauja suite** (D_3gj) that is structured from sandstone, clay and aleirolite stratum alternations. Thickness of the rock layers ranges from 115.2 m (W of the territory) to 76 m (SE of the territory). The sediment of the suite exposes in the antequarternary[1] surface in the buried valley in the surroundings of Valgums lake and Klapkalnciems.

* Arranged following H.Segals' materials

[1] Surface that is covered only by quarternary sediment (*if there are such*).

Above follow sandstones of the **Amata suite** (D_3am) with the intermediate layers of aleirolites and clay. In the territory of Kemeri NP this sediment only does not occur in the central part of the above mentioned dug round valley. The thickness of the sandstones range from 15.6 m (west of the territory) to 28 m (north of the territory), on average – 19-23 m. In the antequarternary surface sediment of the suite bare in the locality of Valgums lake and Klapkalnciems, and also of sanatorium "Jaunkemeri". Besides sediment already in the quarternary surface have been recorded also in vaults of local structures of Smarde, Ziemeļtīreļi and Sloka.

Composition of **Pļaviņi suite** (D_3pl) sediment is very distinctive – those are typical sea carbonate sedimentary rocks (dolomite and marlstones, more rarely clay). Complete thickness composes 14 – 15.5 m. There are no sediment in both the buried valleys and in vaults of local structures of Smārde, Ziemeļtīreļi and Sloka. A part of the territory of the Pļaviņi suite is covered by rocks of Salaspils suite, but in the northern and eastern part of the territory of KNP, as well as in departments of local structures – only quarternary sediment. In some places of the eastern part of the territory rocks of the Pļaviņu suite expose even on the earth's surface.

Further follow sediments of the **Salaspils suite** (D_3slp) that have formed in sea and coastal lagoons. Wherewith along with dolomite and marlstones in the structure of the suite also occur gypsums and clay. These rocks are spread almost along the whole territory of Kemeri NP, except the northern and the eastern parts of it, as well as the buried valleys and vaults of local structures. The complete sediment thickness of the suite is approximately 19.5-20.5 m (in S and SE part – 14.5-17.5 m), maximal thickness – 22.2 m (W), minimal – 13.8 (SE). The sediment exposes in the antequarternary surface almost in all the area of distribution. Just in the very S, W, SW and E those are covered by rocks of the Daugava suite. Southwards the suite is covered by younger devonian sediment, and its marks of absolute base range from +2.43 m above the sea level in north to –40.6 m above the sea level in south. This regularity is not observed in districts of the local structures (In Smārde structure the mark of absolute base of suite is +12.2 m above the sea level).

Sediment of the Salaspils suite is involving the sulphur spring deposit. Litologically Salaspils suite in the territory of Ķemeri NP can be divided in three sets of layers:

1. lower – clayey;
2. middle – dolomite – gypsum;
3. upper – gypsum – clayey – dolomite.

Daugavas suite (D_3dg) is structured by dolomite and dolomitic marlstones with clay intermediate layers. The suite is spread in the very S, W, SW and E of the territory, in two small districts in the centre of the territory, as well as in a district in the northern part of the NP. The total thickness of the suite ranges from 7.9 m (SE) to 14-15 m (S and SW).

The youngest devonian sediment of the territory of Kemeri NP belongs to **Ogre - Katleši suite** (D_3og+kt) – dolomitic marlstones, marlstones, dolomite and sandstones. This suite bounds the territory of the NP in S, SE and SW, and it is covered with quarternary sediment. The surface of the suite is badly eroded. The maximal thickness - 23 m (in the SE of the territory).

Quarternary sediment of the territory of Kemeri NP have formed both as a result of glacier activity and in the postglacial period and also nowadays. The thickness of the sediment ranges from 0 m in East to 18.5 m, but in the buried valleys it is notably greater (*in surroundings of Valgums lake and Klapkalnciems – 157 m, in locality of Jaunķemeri – 59 m, in surroundings of Slampe – 31 m).* In the East, North-East as well as in places of the northern and centric part of the NP the thickness of the quarternary sediment does not exceed 0.5 – 1.0 m. Overall the maximal thickness of the sediment (except the buried valleys) has been recorded in the South, South-West and to a lesser extent in the South-East of the territory. Partly it is explainable by the increase of the thickness of the sediment in moraine, swamps and, locally, also in eolo (to 8.5 m in south).

From the oldest Pleistocene sediment in the buried valleys glacigenic (gQ_1ltž) rocks of **Lētižas suite** could be found (*this sediment has not been recorded during the research works, but its presence is possible according to the research result of the conterminous territories*[2]).

[2] Similar buried valley in Vaivari – westward from the territory of research works

In the buried valleys of the territory of Kemeri NP non decomposed limno – fluvioglacial (lg-fQ_{1-3}ltž-ltv) sediment of **Lētiža – Latvia suite** are described. The exposed thickness of this sediment amount to 67.5 m, but considering the fact that antequarternary rocks have not been reached during the drilling in the central part of the valley its thickness may be greater. As these quarternary sediments are not involved in the process of sulphur spring formation, further described are only **the postglacial and holocen sediment of Latvia suite** (image 5).

The ***glacigenic*** (gQ_3ltv) sediment (moraine loamy soil and sandy loam) of the Latvia suite are widely spread along all the territory of the NP. Its thickness is very changeable and depending mostly on the relief of antequarternary surface.

Fluvioglacial (fQ_3ltv) sediment are found in W, SW and NW parts of Kemeri NP. This sediment most frequently is composed by fine-grained sand with a little admixture of gravel and shingle, more rarely diverse-grained sand with gravel and shingle and only sometimes – gravel and shingle with boulders.

Limnoglacial (lgQ_3ltv) sediment have been recorded only in some places in the West and South-West of the territory, as well as in the buried valleys. In the south western part those are brown clays, more rarely aleirite or heavily aleirite sand. Sediment composition of the buried valleys is slightly different – in the lower part consist of sandy aleirites, above them clay with rare intermediate layers of aleirite, that, in its turn, are covered by clay.

The limnoglacial (lgQ_3ltv^b) sediment of the Baltic ice lake, that cover the glaciogenic, more rarely limnoglacial or fluvioglacial sediment of the Latvia suite, are widely spread in the territory of Kemeri NP. The Baltic ice lake sediment in the major part of the territory *(in centre, in the North and West)* expose on the terrene, but in the rest part *(in the South, partly West and North)* those are covered by swamp, the Litorine sea and in some places eolic sediment (very seldom also the limnical sediment - lakes). Thickness of sediment overall is small – on average 3-6 m, and only in the West it reaches 10.2 m. Moreover, the thickness of those sediment may be a little greater also in the buried valleys.

Eolic[3] sediment (vQ_3ltv) lay in a narrow belt in the line *Kalnciems–Kudra–Fazani-Čaukciems*. This sediment form dune chains, massifs and separate dunes. The sediment expose on the earth's surface and just in places are covered by swamp sediment. Thickness of the eolo sediment depends on the relative height of the formed relief. That range from several tens of cm to even 20 m, and are composed by well-sorted close-grained, more rarely medium-grained sand..

Ancilus lake (lQ_4^{an}) sediment belong to the oldest **Holocena** (Q_4) sediment that have been recorded only in the buried valleys. They are composed by close- and fine-grained sand and sandy aleirites. Thickness of the sediment reaches 12 m.

Sediment of the ***Littorina sea*** (mQ_4^{lt}) are located along the seashore of the Gulf of Riga, as well as in the surroundings of Kaņieris lake and along Lielupe. This sediment mainly are composed by fine-grained sand with organic admixture. Thickness of that usually does not exceed some metres *(only in SE to 11 m)*.

The sediment of the ***Postlittorina sea*** (mQ_4^{plt}) are spread only in a narrow belt along the coast of the Gulf of Riga. Eastwards from Jaunkemeri the sediment are mostly composed by fine-grained sand, but westwards from Jaunkemeri – diverse-grained sand with an admixture of gravel and shingle. Thickness of the sediment may reach 5 m.

Eolic (vQ_4) sediment mainly form dunes along the seashore of the Gulf of Riga. Most frequently those cover the sea or the Litorine sea sediment. The thickness depends on the relative height of dunes. They are composed by well-sorted fine-grained sand.

In some places *(in surroundings of Raganu and Sloka bogs, separate sulphur springs)* there are located ***spring*** (fnQ_4) sediment (freshwater lime). Length – width reaches from 1- 5 m, thickness – tens of centimetres in spring beds or in the outlet region.

[3] vēja/wind

Alluvial (aQ_4) sediment are located in all the river lowlands where they form flood terraces. Thickness of the sediment in the lowlands of the small rivers does not exceed 0.5 m, but in the lowland of the Lielupe (on the left bank) it reaches 4.2 m. The sediment mainly are composed by diverse-grained sand with aleirite and organic admixture or inclusions.

In the surrounding of the largest lakes there are the location of ***limnica*** (lQ_4) sediment, that form lake terraces and fill the lake beds. The maximal thickness of the sediment does not exceed 3–6 m (Valguma and Kanieris lakes). Those mainly are represented by sapropel, in the shore of Valgums lake – by close-grained sand and aleirites.

The spread of ***swamp*** (bQ_4) sediment is very wide. In the territory of the KNP there are located all the three swamp types – raised, transition and low, but most common are raised bogs. The thickness of peat on average is 4.0–6.5 m, the maximum (8.5 m) has been recorded in the Kemeri raised bog. Swamps play very significant role in sulphur water formation, as they are the main source of the waters rich in organic matters. The main bogs, involved in the process of sulphur spring formation are: Kemeri raised bog, Raganu, Zaļais and Sloka bogs.

The ***technogenic*** (tQ_4) sediment have formed as a result of an economic activities. The same can be said about the moulted grounds etc.

3.2.2.2 Tectonics

In the territory of Kemeri NP there are 3 structural floors settled in the tectonical sediment cover – Kaledonian, that is composed by sediment of Cambrian, Ordovician and Sillurian periods and Hercina structural floor, that is composed by Devonian sediment. The Alpine structural floor contains quarternary sediment, but the relevance of its structure to the tectonical movements of the Earth's crust is not clearly discovered. But the main connection to the sulphur spring formation (formation of the structure of the underground water flow) has the structure of the Hercina tectonical floor.

The territory of Kemeri NP lays in the Latvia – Lithuania depression, where Baltic synecliz comply with Kaledonian structural floor. The eastern margin of the Sloka bulwark is situated in a part of the territory of the KNP that matches Dobele – Babīte fracture zone. The surface amplitude of the Pērnavas suite reach 20 - 25 m in the Sloka bulwark. Many small (approximately 2 – 3 km^3) local structures have been recorded in the Sloka bulwark (image 6) and their amplitudes reach 5 – 30 m.

3.2.2.3 Hydrogeological situation

Kemeri lays in the central part of the Baltic artesian basin. The rocks of the surroundings of Kemeri, just like in the whole territory of the basin, by the hydrogeological conditions are divided in 3 zones:

I **Zone of the active water (*freshwater*) exchange** includes 7 water horizons. Its total thickness ranges from 247 m (in Sloka uplift) to 272 m (in Kalnciems district).

1. The unified **quarternary** (Q) horizon is the main feeding source (infiltration) of the antequarternary water horizon, as well as provides the necessary conditions for sulphur hydrogen formation in the Salaspils horizon. The horizon consists of different genesis of sediment with very varied litological structure and genesis. But the whole set of layers is considered as an unified horizon, as all the layers are hydraulically connected. The groundwater' surface is open along all the territory of the KNP. The depth of its levels from the earth's surface ranges from several cm to even 5 – 6 m (in dunes). The direction of the flow is very complicated, as it is influenced by the overground relief and the hydrographical net, but overall it is directed northward (to the Gulf of Riga) and eastward (to Lielupe). In the buried valleys there are the intermoraine water horizons developed, but those are local and do not participate in the process of sulphur spring formation. The water composition is changing and depending on its sediment genesis, as well as from other hydrogeological conditions[4]. For example the water of the swamps that occupies the major part of the territory, by the chemical composition is mainly hydrogencarbonatic – magnesium – calcium with great amount of organic matters and little mineralization (0.1 – 0.4 g/l), but the mineralization of the Litorine sea sediment may reach 0.8 g/l.

[4] zemāk esošo horizontu atslodze, proximity of the sea waters.

Also the filtration qualities are very different and depend on the rock litology. The filtration coefficient in sand ranges from 0.1 to 5 m/dnn, but in peat 0.01 m/dnn. Specific volume for bores (in sand) is 0.1 – 3.8 l/s.

2. The prevalence of dolomites and sandstones of the ***Ogre – Katleši*** horizon (D_3og-kt) in the territory of Kemeri NP is little (only in the very South of the territory). Mineralization – 0.3 – 1.0 g/l, water hydrocarbonate – calcium or sulphate - hydrocarbonate – calcium. Pumping works have not been performed in the research (Driķis et al.,1985) territory, but outside its' territory (in locality of Tukums) specific volume for bores reach 0.5 – 1.3 l/s. But normally the water running-supply is much lesser.

3. The ***Daugava*** horizon (D_3dg) is mainly composed by dolomites. The waters belong the pressure- water type, the level settles approximately 15 m above the horizon's surface. Only because of the depression funnel of the Kalnciems dolomite quarries, the piezometrical surface of the below embedded Salaspils horizon is higher for 0.5 m. Overall the flow of the horizon is directed to the Lielupe and south-eastward. The water is mostly sulphate - hydrocarbonate – magnium – calcium with mineralization 0.6 – 1.6 g/l. In several occasions (country estates, farms) it is used for the water supply. Also the hydrogeological characteristics of the horizon have not been evaluated in the above mentioned research.

4. ***Salaspils*** horizon (D_3slp) is spread almost along the whole territory of the KNP (image 7). The horizon mostly is covered by quarternary sediment, except separate districts where it is covered by the Daugava horizon or it exposures on the earth's surface. The total thickness of the horizon is 7–13 m, the effective thickness[5] – from 3 to 8 m. Only the medium part of the horizon contains water (dolomites, dolomite marlstones and gypsums), but the upper and the lower parts mainly are structured by clayey rocks that thereby provide the isolation of the horizon. The maximum of the piezometrical levels of the waters of the horizon has been recorded in the centre of the Kemeri raised bog. It gradually decreases in flow direction (towards the Gulf of Riga) even till the sea level. The structure of the flow is very complicated – it is influenced both by the characteristics of the horizon's structure and unequal rift of the rocks, the diversity of the litological composition and the natural drainage (it is connected with an overground water objects). For example, in the middle part of the Vēršupīte river, above Melnezers, in the section of about 3–4 km efflux of many springs from the riverbed may be observed. The above mentioned also refers to all the sulphur springs. The level fluctuations in the Salaspils horizon are the same as in the quarternary horizon, but with lesser amplitude – that indicates the connection of the both horizons.

The water of the Salaspils water horizon is mostly hydrocarbonate – sulphate – magnium – calcium with the mineralization to 2.1 – 2.6 g/l[6]. The main value of Kemeri NP is the remarkable presence of hydrogen sulphide in water. Similar findings also occur in Baldone and Likenai (in Lithuania). But in Kemeri the hydrogen sulphide concentration is much greater than in other findings, owing to the geological structure of the territory, the tectonical characteristics (local structures and its involving rock rift) and to the wide spread of the swamps. Hydrogen sulphide issues in the Salaspils horizon which is rich in gypsum, where infiltrates the water from the large swamps - rich in dissolved organic matters and of low pH level. The water of the Salaspils horizon contains great quantity of dissolved sulphate ion (SO_4^{2-}) and anaerobic sulphate reducing bacteria. Consequently of the bacteria' activity happens the following chemical reaction :

$$SO_4^{2-} + 2C_{org} + 2H_2O \rightarrow HCO_3^- + H_2S.$$

The maximal hydrogen sulphide concentrations (even to 72 mg/l) are involving the zones of the increased rift[7] (image 7). It is explained by the more intensive presence of marsh & swamp waters in the horizon. The springs "Parka", "Mašīnu" and "Paviljona" were formerly used by the sanatorium "Kemeri", but sanatoriums "Jaunkemeri" and "Dzintarkrasts" use sulphur water from drills. This water also enriches the medical mud, augmenting its healing qualities. The water may be used only for balneological purposes.

Specific volume for bores 0.1 – 10 l/s, in separate rare cases reach even 44.3 l/s.

5. ***Pļaviņu*** (D_3pl) horizon is structured by dolomites, dolomite marlstones and marlstones of a thickness that ranges from 11 to 19 m. The lower part is composed by 2.5–3.5 m thick clayey set of layers, that isolates the horizon from the below embedded Amata horizon. The flow is directed north-eastward and eastward. It has been stated, that the extra feeding of the horizon occurs in the local vaults of structures, where it exposes in

[5] The real thickness of the permeable to water rocks.
[6] The sulphate – hydrocarbonate –calcium water with lower mineralization in the infiltration (*feeding)* sites
[7] Water conductivity above 1000 m^2/day (*maximum - 33577 m^2/day*), if usually ranges within 100 - 1000 m^2/day

the antequarternary surface. The horizon is used for the water supply of separate objects. The water by the composition mostly is hydrocarbonate – sulphate – magnium – calcium , more rarely natrium – potassium – magnium – calcium. The mineralization ranges from 0.7 to 2.0 g/l. In the regions of the local structures (*where the infiltration of the above occurring waters of the Salaspils horizon are taking place*) hydrogen sulphide has been recorded.

Specific volume of bores range within 4 – 7 l/s, although there are exceptions (the minimum – 0.7 l/h the maximum – 14.3 l/s). The floe coefficient usually do not exceed 500 m^2/day, but in the district of Sloka uphill it exceeds 1000 m^2/day.

6. ***Amatas*–Gaujas** (D_3am-gj) horizon is structured by interchanges of sandstone, aleirolite and clay stratums. The total thickness ranges from 92 to 143 m. The piezometrical level lowers northwards and north-eastward. The horizon is used for water supply to the sources of water in Jurmala, Riga, Jelgava and Tukums. At present, due to decrease of the use of underground waters, rise of the horizon's levels is observed. It must be admitted that in the 80ies this territory was included in the depression funnel of the "Lielā Rīga". The quality of water of the territory of KNP is changing. Mostly it is sulphate - hydrocarbonate – magnium – calcium water, but in the central part of the upper Amata as well as in the western part of Gauja horizon it is already hydrocarbonate – sulphate – magnium – calcium (*thereto the content of SO_4 may reach even 780 mg/l*[8]), with mineralization around 0.7 – 1.4 g/l. Therefore this water is not ideal any more for drinking.

The flow coefficient in the Amata horizon ranges from 23 to 109 m^2/day (*on average – 75-85 m^2/day*). In the upper part of the Gauja horizon – from 138 to 625 m^2/day (*on average – 320-340 m^2/day*), but in the lower part – from 209 to 546 m^2/day (*on average – 330-340 m^2/day).*

7. Also the (D_2br-ar) horizon is structured by interchanges of sandstone, aleirite and clay layers. The average thickness of this horizon is 114 m. Also this horizon is one of the main water supply sources in the territory of the "Lielā Rīga" and in all Latvia and the water quality of this horizon in the territory of Kemeri NP is similar to the Amata–Gauja horizon, as it is partly connected with the upper Gauja horizon.

Specific volume for bores mostly is 0.1 – 0.2 l/s, the flow coefficient - 375 m^2/day and level conductivity coefficient: $6 – 8 \cdot 10^{-5}$ m^2/day.

Both for the waters of the Amata–Gauja and the Burtnieku–Arukilas horizons, apart from the high sulphate concentrations, hardness is also characteristic, but there are no alternative drinking water sources in this territory.

II Zone of the slowed water exchange (saltwater) is separated from the freely water exchange zone by the regional water-resistant layer– clay and marlstones of the ***Narva*** (D_2nr) horizon, thickness of which reaches109-125 m in the territory of Kemeri NP.

This zone includes two water horizons – ***Kemeri*** (D_1km) and ***Pernava*** (D_2pr), that contain chloride – natrium waters with very high mineralization degree (D_1km - 10-12 g/l, D_2pr – 6-8 g/l). These mineral waters are used only for balneological purposes.

III "Stagnant" (*freshwater*) zone includes sandstones from the ***Cambrian*** period (€). It is separated from the zone of disturbed water exchange by the regional water-resistant stratum that is composed by Sillurian (S) and Ordovician (O) period rocks (*the total thickness reaches 420 m*). Cambrian period horizon waters – chloride – natrium, with a very high mineralization degree (about 115 g/l, but waters contain about 270 – 280 mg/l of bromine) after dilution may be used only for balneological purposes.

[8] After the obligatory requirements of the harmlessness of underground waters, to the utmost permissible SO_4 concentration is 250 mg/l

3.2.4 Hydrology

3.2.4.1 Lakes

The territory of Kemeri NP is rich in **lakes**. The largest lakes are Kaņieris, Sloka lake, Valgums, Dūņieris, Melnezers and Aklais lake (image 8), but hundreds of small lakes are found in Kemeri Raised bog, where only few of those, for example, Zosu and Gārgaļu lakes are named.

Kaņieris lake is found in Coastal Lowland, 2,1 m above the sea level, between Lapmežciems and Ragaciems. The area of the Kaņieris lake is 1128 ha, length 5,2 km, the maximal width 3,6 km. The average depth 0,6 m, the maximal depth 1,8 m.
This is a shallow coastal lagoon lake, heavily affected and changed by human activities. The water-level of the lake had been changed several times. In the beginning of the 20th century it was heavily levelled down, but since the 1965 the former water level is restored and currently it is regulated with dams on the Starpiņupe and Vecslocene. The lake is partly surrounded by dams and ditches, artificial islets (7) have been originated. The ground of the lake is even, in the easterly part of it- dolomite with thin layer of mud, otherwhere the layer of mud is thick. The river Slocene flows into the Kaņieris lake and also delivers the waters from Valgums lake. There is also an outlet of Starpiņupīte (an artificial channel to the sea, dug in 1905).

Sloka lake is located in the Coastal Lowland, 1,4 m above the sea level, in the territory of the Jūrmala city, in the NE part of the Sloka swamp, area - 250 ha; river Vecslocene flows in the lake from northwest. In the south-eastern part of the lake the waters of a small channel flows in that connects the Sloka lake and the Aklais lake. A bit eastward from the outfall of this channel is the outlet of the river Vecslocene. Sulphur springs dissolve in the lake. The Sloka lake is specific - shallow (average depth- 0,6 m, the maximal depth 1,1 m) coastal lagoon lake with brown water rich with humus substances.

Dūņieris – small, very shallow coastal lagoon lake with muddy and mud- covered dolomite ground and yellowy water. Typical for the lake are the creeky shores and peninsulas.

Aklais lake (Beltes) is a shallow (the average depth - 0,5 m, the maximal depth 0,7 m), little coastal lagoon lake with an outlet to the Sloka lake.

Valgums lake is located in the Talsi - Tukums Highland, 4,3 m above the sea level, in the north-eastern part of Tukums. The area of the Valgums lake is 60 ha, length - 3,2 km, width - 0,4 km. Valgums lake lays in a subglacial depression, the average depth of it is 10,4 m, the maximal depth - 27 m. The Slocene river floods in and out of the Valgums lake.

Melnezers is situated in the Coastal Lowland, 4,4 m above the sea level, in the territory of Jurmala city, between Jaunkemeri and Kemeri. Melnezers is a small (area - 10,3 ha, maximal length - 0,45 km, maximal width - 0,31 km) and shallow (average depth - 1,4 m, maximal depth 2,0 m) swamp lake.

Akacis is located in the territory of Jurmala city, in the Sloka swamp. The area of the lake is 14,9 ha, the average depth is 0,8 m, the maximal depth - 1,1 m.

3.2.4.2 Rivers

Using the schemes of basins composed by A. Pastors, ("Latvijas upju baseinu 10 atlanti" – A.Pastors' unpublished work), H.Segals (professor of the University of Agriculture) has prepared a map of the hydrographical net of the territory of Kemeri NP (image 9). As it is seen in the image 9, in the territory of the park there is located the Slocene river basin that flows in the Baltic sea Gulf of Riga through the Kaņieris lake and the Starpiņupīte, reservoirs of Vēršupīte – Sloka lake – Vecslocene, as well as of Vecbērze and of several small water courses that flow into Lielupe.

The channel construction has affected the natural water run-off. The Slocene river does not flow in the Lielupe river any more. The Kaņieris lake is connected with the sea by the channel (Starpiņupīte), but the old Slocene bed (Vecslocene) goes into the net of melioration ditches in the section between the Kaņieris and the Dūņieris lakes. Dūņieris also is connected with the sea by the channel (Siliņupe). The Vecslocene receives the waters from the Raganu swamp, then flows into the Sloka lake and further into Lielupe (image 8).
Vēršupīte receives the run-off from the northern part of the Kemeri Raised bog, the southern part of Zaļais and Raganu swamps, flows through Kemeri and flows into Vecslocene just before its outfall in the Sloka lake. The NE part of the Kemeri Raised bog has a run-off to Jāņupīte, which has been transformed to the

system of melioration ditches and flows through small swamps. The western and the southern parts of the Kemeri Raised bog have a run-off to the Slampe river and Kauguru ditch, which are large melioration ditches. The largest river of the region is the Lielupe (~180 m of width, 5-6 m of depth) river, which has a slow stream.

3.2.4.3 Run-off

The slopes of the earth's surface are very insignificant in the territory of Kemeri NP. If the sea, the lake or the river in which those water onflow fall are subject to essential level fluctuation changes, it instantly responds to the water course, that flows levelground. It could be admited that the Kemeri NP situation is analogous but it is not like that. Absolute earth's surface marks here are significant enough. For example, in the whole territory of the Kemeri Raised bog it ranges within 18.0 to 10.0 m above the sea level. And it is in average ~20 km (straight line) away from the Gulf of Riga. For the comparison, Jelgava is situated by the riverside of the Lielupe, where absolute earth's surface mark is only 3-4 m, but there are ~35 km to the Gulf of Riga.

- In case of relatively intense rainfalls Kemeri is exposed to danger of floods that emerge from the overflow of Vēršupīte. The possible cause could be the net of melioration ditches in the riverhead that quickly bring water from large territory, and the lower reaches of Vēršupīte cannot hold it.

The latest cartograms of "the projection instructions of the farmland drainage" give also a general concept about the entities characterizing the hydrology of the territory of Kemeri NP. Those are:

Module of the average run-off during the vegetation period	–	4 l/s km^2.
Average run-off of the year	–	180 – 200 mm.
Calculation run-off module of drains in croplands and pastures	–	0.6 – 0.7 l/s ha.
Maximal rainfall intensity in a day (p = 10%)	–	0.50 – 0.55 l/s ha.
Run-off layer of the spring floods (p = 1%, or once in 100 years)	–	180 mm
Run-off layer of the spring floods (p = 10%, or once in 10 years)	–	130 mm.

3.2.5 Sulphur springs

About 30 sulphur springs have been recorded in Kemeri (Stinkule, 1998), some of them have showed up only after the beginning of the melioration works in the 30's. Those belong to the cold mineral waters.

The sulphur spring outflow occur in several places of the territory of Ķemeri NP. Those conditionally may be classified by the locality. The springs in Kemeri mostly are immured in concrete tanks and the outflow is conducted along pipes to the Vēršupīte (except the springs of the mud regeneration fields, that were used for the mud enrichment). Paviljona spring is the most popular among the springs of Kemeri. The sulphur concentration in the springs of the centre of Kemeri are ~ 28 mg/l.

The currently active sulphur springs of Lūžņu ditch have formed during the melioration works. Before the ditch digging (already in the 19th century) there were some natural sulphur springs – it is proved by the spring calcareous sediment (Galeniece, Cukermanis, 1958), but the melioration ditches have changed the sulphur water level and those have drained away.

Both the sulphur springs of the Sloka lake and the ones issuing round of it and as well the so called Bertrama spring (is found quite a distance from the Sloka lake upward along Vēršupīte, on the left bank of the river) belong to the group of the Sloka lake springs.

The largest sulphur springs of Dūņieris concentrate in the NE bay, that is separated from the rest of the lake by a peninsula. In the site of spring activity there is a precipitation of spring calcareous sediment.

The sulphur springs of Raganu bog are of very high sluice level and the sulphur water resources are of higher concentration. The sulphur springs of the northern part of the Raganu bog create ponds by flowing out. In these ponds there is a sudden transition from acid moss peat to calcareous environment. In the NW corner of the bog there are spring group called "Akiņa" (being more precisely, this is the name of the largest spring). The springs flood in the melioration ditch that has been created by straightening Medupīte.

There are several sulphur springs in the northern part of Zaļais bog that concentrate near the Sēra grāvis (Sulphur ditch) – because they were found when the ditch was dug.

Also in the NW brink of the Kemeri Raised bog one can find a group of sulphur springs.

3.2.6 Protected geological and geomorphologic nature monuments

Sulphur ponds in Raganu bog – in blocks 286 and 287 of Valgums forest district in Tukums Head forest district.

Sulphur springs in Zaļais bog – blocks 285 and 274 of Valgums forest district in Tukums Head forest district.

- The motivation to include in the list of the protected monuments exactly these sulphur springs, comparing with other sulphur springs of the territory of the park, is not clear.

Krāču Hills were protected as a geological object since 1962, but are not included in the new regulations of the Cabinet of Ministry No.175. This is an inland dune chain, that marks the ancient coast of the Littorine Sea. Krāču Hills are covered by dry pine forest.

3.2.7 Soils

A comprehensive classification of the soils of the territory has not been performed. The soil mother rocks in the territory of Kemeri NP have formed in different geological periods and their chemical compositions are different. In the places where upper-devonian dolomites, dolomitic marlstones and clay come close to the surface rich carbonate soils have formed, but in places of bare rocks – dolomite planches without soil. The largest mother rock areas are composed by the sand of the Baltic sea of different stages of development. On these sand layers podzol soils of different level of podzoling have formed.

The most widely distributed in the territory of Kemeri NP are peat soils, that have formed in the lowest places of the relief or in the sites where the perfusion of waters are strongly mineralized. A part of these soils are rich in well disintegrated organic matters and are neutral or weakly acid, but a part – with poorly disintegrated organic matters is acidic. These soils are mainly covered by forest areas.

3.3 Biological description

3.3.1 Flora

3.3.1.1 Vascular plants

Altogether, **897 species of vascular plants** have been recorded in the territory of Kemeri NP, among them **76 – specially protected** and 4 – specially protected species of restricted use (appendix 6)**,** 26 of the 897 species have not been found in nature during the last 30 years. Among those there are species which:

- have become extinct in the territory of Latvia in the last decades, e.g., *Agrostemma githago*, *Camelina alyssum*, *Pulicaria vulgaris*,
- grow in unclosed plant communities, which are disappearing as the vegetation changes, e.g., *Sisymbryum supinum*, *Radiola linoides.*

But their occurrence in the KNP should not be excluded completely. The richest habitats containing lots of specially protected plant species of KNP are fens, floodplains of lakes and rivers and wet deciduous forests. Great diversity of KNP is defined by several conditions: diverse habitats, soils, hydrological regime and florogenetical processes in Latvia.
From the littoral species, there is a rare and protected (in Latvia) plant species *Atriplex calotheca* recorded in KNP.
Several **groups of vascular plant species** can be distinguished **for conservation of which Kemeri NP is of crucial importance**. Those are:

- Species, for which KNP is one of the few species localities in Latvia – *Saussurea esthonica, Najas marina*, *Zannichellia palustris.*
- Species, for which KNP is the border of the distribution range: W-NW – *Gladiolus imbricatus, Onobrychis arenaria,* E – *Euphorbia palustris, Myrica gale.*
- Species, conservation of which is important in Latvia because their habitats are endangered due to increasing intensity of forestry and recreation: *Cypripedium calceolus*; *Atriplex calotheca*.
- Species, which natural habitats are rare in Latvia but are well represented in KNP (calcareous fens, clumps of *Cladium mariscus* at the coastal areas of lakes, thickets of *Myrica gale*) – *Schoenus ferrugineus*, *Pinguicula vulgaris, Primula farinosa, Cladium mariscus, Myrica gale*.
- Species, which localities in KNP are of special importance – *Euphorbia palustris* (one of the largest species localities known in Latvia), species locality of *Zannichellia palustris* in the lake Sloka – one of the rarest freshwater localities of this species in Latvia, *Najas marina* – one of the largest species localities.

3.3.1.2 Bryophytes

207 species of bryophytes have been recorded in Kemeri NP, of them 36 are the liverworts and 171 are the mosses**. 34** of the recorded moss species are **specially protected.**

By analysing the habitats of the specially protected moss species, two groups of moss can be exuded – mosses that are found in unaffected, old mainly deciduous forests and mosses that vegetate in calcareous soils, mostly in calcareous fens and on wet dolomite outcrops (appendix 7).

Four moss species, previously recorded in the territory of KNP, are considered to be extinct in Latvia and are included in the Category 0: *Bryum blindii, Meesia uliginosa, Calliergon richardsonii* and *Pohlia lescurie.*

One of the two known species localities of *Harpanthus flotovianus* in Latvia occurs in Kemeri NP, but for *Barbilophozia lycopodioides,* KNP is the only known locality in Latvia.

Many of the species of mosses, lichens and fungi, mentioned in the Council of Ministers' regulations No. 396 "On the list of specially protected species and specially protected species of restricted use" are the indicator species of the woodland key habitats (WKH). Or rather, the woodland key habitats provide the necessary biological structures and conditions for the existence of these species. Occurrence of many of these up to now unrecorded species, mentioned in the list, is very likely in KNP, as there are appropriate habitats available in Kemeri NP. The inventory cards of MAB can be used in the further studies of bryophytes, lichens and fungi.

3.3.1.3 Fungi

586 fungus species were recorded in Kemeri NP. 11 of all the recorded fungus species are included in the Council of Ministers' regulations No.396: *Grifola umbellata, Xerocomus parasiticus* (one of the two known localities in Latvia)*, Geastrum quadrifidum, G. pectinatum, G. rufescens, G. triplex, Gyrodon lividus, Ganoderma lucidum*, *Sparassis crispa*, *Xylobolus frustulatus, Phellinus nigrolimitatus.*

In total, **317 species of higher fungi** have been found in Kemeri NP, from which 39 are regarded as rare, but 9 species have been recorded only in the territory of the NP up to now (appendix 8).

According to the expert opinion (Meiere, pers.com.), the rare species which have not been included in the list of Specially protected plant species should also be protected. Those are: Polypores: *Junghuhnia collabens, Hapolopilus salmonicolor*, *Dichomitus campestri*s, *Perenniporia subacida*, *Polyporus badius, Pycnoporellus fulgens*, *Oligoporus guttulatus*, *Tyromices fissilis*, *Ceriporiopsis pannocincta*, *Onnia tomentosa.*

The list of the specially protected and rare fungus species of Kemeri NP is showed in the appendix 9.

A rare subterranean fungus - the edible black truffle has been recorded in KNP (Vimba, Avota, 1995). There are the appropriate habitats of this fungus in KNP and it is likely that the species is still present. Also, the occurrence of a rare subterranean fungus *Elaphomyces levellei* (Lawrynowicz, 1988) was registered in the surroundings of Sloka. Also, *Entorrhiza aschersoniana* recorded in KNP, which parasites on roots of *Juncus bufonius*, is rare in Latvia. On the wood silt in Ragaciems beach, 6 fungus species new to Latvia have been recorded. Those are: *Ceriosporopsis tubulifera, C. halima, Corollospora intermedia, C. maritima, Marinospora calyptrata* and *Amylocarpus encephaloides* (Markovska,1997). In sulphur springs, on putrid leaves and conifers' needles, 16 freshwater fungi have been found for the first time in Latvia (Markovska,1997).

Occurrence of the specially protected fungus species in different forest types

- Rich deciduous forest (environs of Kalnciems, close by Kūdra station) – *Grifola umbellata;*
- Swamp forest (Sloka, beside Babīte; Kalnciems, near the dolomite quarry) – *Xerocomus parasiticus,* grows on *Scleroderma citrinum;*
- Moist spruce forest – *Geastrum quadrifidum, G. pectinatum, G. rufescens, G. triplex;*
- Black alder swamp forest – *Gyrodon lividus* (according to literature);

On putrid woodpulp, *Ganoderma lucidum* has been found*,* on old tree stumps of conifers - *Sparassis crispa,* on oak tree debris – *Xylobolus frustulatus* (Avota, Vimba, 1993).

3.3.1.4 Lichens

There is a wide diversity of habitats in Kemeri NP, therefore, also the number of the recorded lichen species is significant - **148 species** (Motiejūnaite, Piterāns, 1993). Altogether, 503 lichen species have been recorded in Latvia (Piteran's special comment).
3 lichen species new to Latvia have been found in the surroundings of Kanieris – *Buellia griseovirens, Calicium glaucellum* and *Stenocybe pullatula*. In the environs of Kemeri, 19 previously unrecorded species have been found (Piterāns, 1993).

In Kemeri NP, there are areas particularly rich in lichens. Those are **Kemeri**, with the characteristic epiphytic species belonging to *Ramalina* and *Parmelia* genera and the **Green dunes** - with the characteristic epigeal species of *Cladonia* and *Cladina* genera.

There are **3 specially protected species of lichens** in Kemeri NP: *Cladonia incrassata* (the only known species locality in Latvia; recorded on the vertical walls of the peat pits), *Opegrapha viridis* (according to data from literature only), *Thelotrema lepadinum*, which grows on the bark of deciduous trees (found mainly in the western part of Latvia along the sea coast).

Some lichen species are of special nature conservation value, i.e., *Thelotrema lepadinum* and *Calicium quercinum* which grow in old deciduous and mixed forests. The distribution range of these species is

decreasing throughout Europe because of their sensibility to air pollution and forest management. But *Chaenotheca cinerea,* which grows in old coniferous forests and is found in KNP, is rare all over its distribution range (Motiejūnaite, Piterāns, 1998).

3.3.2 CORINE sites, habitats and species of the Directive of European Union

3.3.2.1 CORINE*

During the *CORINE Biotopes* project, a united European habitat classification system has been elaborated and territories with protected habitats and species of European importance inventoried. Based on the CORINE classification, the Habitat Directive has been elaborated as a legal measure for protecting wild plant and animal species and habitats of the countries of European Union (The habitat handbook).

There are 7 CORINE sites in KNP (appendix 10).

3.3.2.2 Habitats of the Appendix I and species of the Appendix II of the EU Directive (92/43/EEC)

Annex I of the European Council's Directive 92/43/EEC on the protection of natural habitats, wild fauna and flora includes natural habitats, and Annex II – wild plant and animal species the protection of which is of interest to all EU countries. Also, the priority natural habitats (habitats that are endangered in Europe) are listed.

There are 26 habitats of the EU Species and Habitat Directive found in Kemeri NP, among them 10 are priority (appendix 11).
There are 14 vascular plant species and 6 moss species in Latvia of those included into Annex II of the EU Species and Habitat Directive (92/43/EEC). In KNP, the following plant species of Annex II of the Species and Habitat Directive are found:

1) Extinct species:
   Sisymbryum supinum – is considered to be extinct, included in the category 0 of The Red Book of Latvia (RBL), previously recorded on dolomites in Kanieris.
2) Very rare species:
   Botrychium simplex – have not been recorded during the last 20 years;
   Saxifraga hirculus – previously recorded in the Raganu bog beside the sulphur ponds and in the bog near Bigaunciems, however, during the last 20 years has not been found (nor in the summer of 2000).
3) Relatively rare species:
   Cypripedium calceolus – 4 species localities known in KNP;
   Liparis loeselii – 5 species localities known.
4) Relatively common species:
   Dianthus arenarius – grey dunes, dry pine forests;
   Pulsatilla patens – dry pine forests, grey dunes; one species locality is precisely known.
5) Relatively common species that do not require protection in Latvia:

Agrimonia pilosa – dry roadsides. Relatively common species in the eastern part of Latvia, in the western part – very rare. Previously recorded in the square 14/20, according to the data of Institute of Biology, University of Latvia. It has not been recorded in 2000.

Moss
Dicranum viride – on the SW bank of Kanieris, on a stone in the forest.

The following **species of restricted obtaining and use** (included in Annex V of the EU Species and Habitat Directive (92/43/EEC) are found in the territory of Kemeri NP:
Diphasiastrum comp lanatum – relatively common;
Huperzia selago – relatively common;
Lycopodiella inundata – one species locality in Kemeri NP – in the abandoned sand quarries;
Lycopodium annotinum – common;
Lycopodium clavatum – relatively common.

Moss
Leucobryum glaucum.

* CORINE – COoRdination of INformation on the Environment

3.3.3 Description of the habitats

3.3.3.1 Forests

The results of the forest vegetation's inventory are displayed in the report of the LDF project "The planned forest vegetation map 1: 10000 of Kemeri NP" (Priedītis, 1995), as well as in the previous publications (Priedītis, 1993).

Forests occupy 57.1% of the total area of the national park (21,795 hectares are covered by forests). Fragmentary mosaic forest distribution is not typical for Kemeri NP, it is relatively evenly distributed among the whole territory of the park, including separate territories not covered by forests (bogs, e.g., Lielais Kemeri bog, lakes, meadows, human settlements).

In the coastal area along the Riga Gulf, dry pine forests on oligotrophic sand soils dominate, while around raised bogs forests on peat soil prevail (bog woodlands).
Forests in the SW part of the park are considered to be the most drainage-affected (the regulation of the hydrological regime in that part of the park was stopped only late 1980s – early 1990s). The prevailing forest stand types of this area are the drained forests on mineral soils and the drained peat forests.

In early 1990s, a special attention was drawn the wet forests of Kemeri when relatively untouched forests with low human impact and rare forest ecosystems as well as localities of rare plant species were inventoried. As a result of this research, sample wet forests were listed in the territory of the present national park, i.e., forests with especially high biological value. In KNP, there are 3 of the 17 sample bog woodlands and rare ecosystem forests found in Latvia (1695 ha), i.e., approximately a half of the total area bog woodlands designated in Latvia (3600 ha). Those are: Kalnciema swamp forest massif, swamp forests of the lake Sloka and Slocene's lower.

3.3.3.2 Swamps

Swamps occupy ~24% of the whole territory of Kemeri NP. All the 3 types of swamps – fens, transition mires and raised bogs – occur in the territory of the park. **Fens** have been recorded near the lakes Kanieris and Dunieris and in the Raganu bog near sulphur springs.

3.3.3.2.1 Raised bogs with the hummock and tussock complex

In Kemeri National Park, there are three relatively untouched bogs with the hummock and tussock complex: Lielais Kemeri bog, Raganu bog and Zalais bog. Hummocks are composed of the of various *Sphagnum* species. Also, heather, cloudberry, andromeda grow on hummocks. Among the sphagnum and also on the surface of hummocks a rare moss species is found - *Odontoschisma sphagnii* (one of the three known species localities in Latvia). In tussocks, the most common species are *Rhynchospora alba* and *Carex limosa*, in the moss stand *Sphagnum cuspidatum* prevails.

3.3.3.2.2 Raised bogs with pine trees

This bog habitat is found in some places in Raganu bog, Zalais bog, Ogu bog, Lielais Kemeri bog and it dominates in the Seklais bog. There is a distinguished tree stand with *Pinus sylvestris*, *Betula pubescens*, in the herbaceous plant stand – *Calluna vulgaris* and *Empetrum nigrum* are abundant. Tussocks with water and wet depressions are absent or there are very few of them.

3.3.3.2.3 Degraded raised bogs almost incapable of regeneration

There are also raised bogs which must be considered as degraded raised bogs because of the great impact of melioration and former peat extraction. Those are: Slokas bog, Vecais bog, Labais bog and Mazais bog.

3.3.3.2.4 Fens

Also, fens with *Carex lasiocarpa* and *Schoenus ferrugineus* typical to the Piejuras lowland can be found. These fens are species-rich, especially the *Schoenus ferrugineus* plant community. An obligatory precondition for the *Schoenus ferrugineus* plant community is the high calcium content in the soil, which is ensured by the dolomite bedrock close to the surface. It should be mentioned that the *Schoenus ferrugineus* plant community is rare not only in Latvia, but also in Europe. Another fen and lake coast plant community (with *Cladium mariscus*), which is rare in Latvia and Europe, also occurs in KNP, hereto in large areas. Distribution of this plant community is related to the Piejūras lowland, mainly to the old lagoon lakes, but

individual locations occur also outside. The optimal growth conditions for *Cladium mariscus* are shallow water bodies with low phosphorus and high calcium contents (Balatova -Tulačkova, 1991). Plant societies of *Carex elata* and *Carex disticha* are found at the coast of the lake Kanieris. These are typical communities of lakes' floodplains, which are subject to periodic changes of the water level, and therefore, the moss stand is poorly developed. These plant communities occur mainly in the Piejūras lowland.

Fens with Carex lasiocarpa
They have been recorded on the SE bank of the lake Kanieris and on the SE bank of the lake Sloka. *Carex lasiocarpa* dominates in a herbaceous plant stand, also *Carex elata* and *Eriophorum polystachyon* are recorded. The following species are typical for the moss stand: *Campylium stellatum*, *Scorpidium revolvens* and *Scorpidium scorpioides*.

Alkaline fens with Schoenus ferrugineus
Found beside the lakes Kanieris, Dunieris and others in small areas.

3.3.3.2.5 Spring fens around the sulphur springs (or calcareous spring fens)
Spring fens form in the places of the subterranean water outflow. In the areas of sulphur spring outflow, vegetation typical for calcareous fens is found, as the spring water is also rich in calcium carbonate. Due to the spring outflow, vegetation is mosaic. The most interesting spring fens by sulphur springs are found in Raganu bog and near Dunieris.

3.3.3.2.6 Transition mires
Up to now, the transition mires' vegetation has been recorded fragmentary near the lakes Melnezers, Putnu, Sloka and at the NE side of the Lielais Kemeri bog. Plant communities with *Carex rostrata* can be found there. This plant community is poor in species, typical for transition mires and is found throughout the whole territory of Latvia.

3.3.3.3 Sea littoral
Detailed vegetation studies have been carried out on the coast of Jurmala from Jaunkemeri to the border of KNP towards Jurmala. A great diversity of plant communities has been recorded here, as the habitats are of different moisture level – dry and moist: the beach is rather low, hence the increased moisture. Both species of moist habitats and of embryonal and front dunes species can be found here. Wet embryonal dunes have been found in Jaunkemeri, where there is a plant community with *Agrostis stolonifera*, *Salix daphnoides* and *Calamagrostis epigeios*. Species typical to the front dunes (white dunes) are as follows: *Crambe maritima*, *Leymus arenarius* and *Honckenya peploides.*
The *shallow sea water* **habitats have not been studied.** Information about the hydrobiological quality of the shallow seawater is necessary.

3.3.3.4 Meadows
Meadows occupy 6.3 % (2 400 ha) of the territory of the park.

In the territory of KNP, there are dry meadows, lowland hay meadows, wet meadows as well as ruderal meadows. The classification is given in the Appendix 12, the descriptions of the most important meadows and their habitats are given in the chapter on nature conservation values (chapter 4.6).

3.3.3.5 Lakes
Continuous reedbeds in the coastal zone of lakes
Continuous reedbeds, where *Phragmites australis* dominates, are found at the N, NE as well as the western coast of Kanieris, some also in the lake Sloka. Continuous reedbeds not always occur in water, they are also found in places where the coast intensively becomes paludal. Accordingly, in the herbaceous plant stand, many plant species typical for fens and transition mires occur.

Mosaic of reedbeds and shallow waters in lakes
There is a specific maze of reedbeds and shallow waters in the lakes of KNP, mainly in Kanieris. Apart from *Phragmites australis,* there are also other species - *Rumex hydrolapathum*, *Epilobium hirsutum*, *Thelypteris palustris*. In the reedbeds, the following species can be found – *Lycopus europaeus*, *Lysimachia vulgaris,*

Cicuta virosa, Peucedanum palustre, Carex pseudocyperus, Marsh skullcap *Scutellaria galericulata, Sium latifolium, Solanum dulcamara* etc. In some places, especially in the southern part of Kanieris, *Cladium mariscus* also compose such a maze.

Fields of Typha spp. in lakes
Typha latifolia and *T.angustifolia* (more often) form small fields in the lakes of KNP, and normally it is the dominating species there.

Fields of Scirpus spp in lakes
Larger clubrush (*Scirpus lacustris*, *S.tabernaemontani*) fields occur in the lake Sloka. In the lake Kanieris, the clubrush fields are found in the northern part and occupy a small area.

Clumps of Cladium mariscus along the coast of lakes
Fields of *Cladium mariscus* occur in the lakes Kanieris, Dunieris, Aklais near Sloka, in Pusezers and lake Kudraines. They compose monodominant fields or are found together with *Phragmites australis*. Sometimes different algae, e.g., *Chara hispida* can be found in the fields of *Cladium mariscus.* Fields of *Cladium mariscus* are also found in several peat pits (Lodziņa et al. 1994, Vimba, pers. com.).

Fields of Najas spp. in lakes
Species localities of *Najas marina* have been recorded in lakes Aklais, Sloka and Kanieris.

Sunken plant fields in lakes (mainly Charophyta)
Fields of algae are found in the lake Sloka, 8 species have been recorded there: *Chara aspera, Ch.contraria, Ch. delicatula, Ch. fragilis, Ch. hispida, Ch. tomentosa, Ch. vulgaris* and *Nitellopsis obtusa* (Suško, 1994). Also in the lake Kanieris, rich algal fields occur, which are composed by *Chara hispida, Ch. tomentosa* and *Ch. aculeolata* and probably also species of *Chara* (Salmiņa et al. 1998).

3.3.3.6 Rivers
The river habitats of Kemeri NP have not been studied.

3.3.3.7 Sulphur springs
Sulphur springs is an important habitat of KNP. Sulphur waters contain the hydrogen sulphide (H_2S) and its dissociation products - hydrogensulphide HS^{1-} and ions of sulphide S^{2-}. It comes from the biochemical reactions between sulphate waters and the organic substances of bog waters, sulphate-reducing bacteria taking an active part in the process. In the sulphur springs, both the coloured and colourless sulphur bacteria have been recorded. E.g., in the Bertrama spring, the following sulphur bacteria have been recorded: *Beggiatoa minima, B. leptomitiformis, Chromatium perty, Ch. okenii, Ch. weissii, Ch. minus, Camprocystis roseo persicina, Thiospirillum sanguineum*. In Labais bog, the reddish-violet layer in ditches and mud is caused by *Thiocopsa roseo-persicina* Vinagradski (det. L. Vulfa). Sulphur springs may be divided into two groups – sulphur springs where spring fens do not form (outflow in ditches, in a lake below the water-level, artificially springs, e.g., pavilion spring) and sulphur springs, around which spring fens have formed.

3.3.3.8 Agricultural lands, settlements and other habitats
Agricultural lands: croplands, orchards and vegetable gardens in larger areas occur in Slampe and Smārde rural municipalities at the western border f the territory of KNP, in the landscape protection zone, where vegetable gardens and agricultural crops are cultivated for household use.
In the eastern part of the national park, in Kauguri, there is a heritage from the Soviet times - "Kauguri allotments" – the area of orchards and vegetable gardens with small huts.

- *Agricultural habitats are poorly studied.*

Settlements
Lichens have been studied in the territory of Kemeri within Jurmala town. The following *species of epiphytical lichens* are typical here*: Ramalina fraxinea, R. farinacea, R. fastigiata, Parmelia sulcata, P. glabratula, P.olivacea, Hypogymnia physodes, Xanthoria parietina* etc. On deciduous trees, typical species are *Phaeophyscia orbicularis, Physconia pulverulacea, Physcia tenella, Physcia adscendens.* On the soil,

especially along roadsides, common species are *Peltigera spuria, P. praetrextata, P. malacea* and, more rarely, *P. aphthosa.*

3.3.3.9 Sinanthropic habitats

Botanical studies prove (Lodziņa et al. 1994) that sinanthropic habitats are not rich in rare and protected species of vascular plants, but they are interesting habitats in regard to mosses (Āboliņa, pers.kom.).

- *It is recommended investigate the number of the introduced species in KNP, to find out whether they pollute natural habitats; how widespread sinanthropic habitats are.*

3.3.3.10 Specially protected habitats

According to the Council of Ministers' regulations No. 421 (2000.12.05), 20 specially protected habitats have been recorded in Kemeri National Park (appendix 13).
KNP has a special importance for protection of the following habitats: fields of *Myrica gale*, alkaline fens, spring fens around sulphur springs, meadows of *Sesleria caerulia* , *Cladium mariscus*/ vegetation in the coastal zone of lake, fields of *Naja* spp. in lakes, dolomite bottom in lakes.

3.3.4 Specially protected trees

In accordance with the published list of secular trees of the territory of the Latvian SSR (Siliņš, Svikle, 1986), information on the protected specimens of Tukums district and protected trees of Jurmala town (2000), there are secular trees of two native species and two introduced species (table 3.2).

Table 3.2 **Secular trees of KNP**

Tree	Populated area	Nearest reference points	Circuit in the height of 1.3m
Birch	Smārde	Valgums forestry district 115th block. 25th compartment	4.0
Pine tree	Bigaunciems	At the bus stop	3.2
Grey walnut	Ķemeri	In Kemeri sanatorium park, 30 m to SW from the sanatorium	3.31
Grey walnut	Ķemeri	In Kemeri sanatorium park, 120 m to SW from the sanatorium	3.58

For birches, pines and spruce trees, the status of a secular tree is awarded if the circuit reaches 3 m, for oaks – 5 m.
There are several oak trees in Kemeri, which could claim to get the secular tree's status in the future (Kemeri oak in the park beside the road towards "Meža māja", 14 m from the right bank of Vēršupīte, the circuit – 4.16 m; an oak in the Kemeri park – 4.16 m and an oak in Tukuma street 11 – 3.66m), and an oak of the Valgums forestry district (89th block.) - 4.3 m.

All of the above-mentioned Kemeri oaks were measured in 1999 (Protected trees in Jurmala, 2000).
It must be said that the secular trees found during the inventory of forest key habitats do not show up in the list of the secular trees and occur in the database accepted by the State Forest Service (they have different criteria for secular tree).

- The inventory of secular trees of the territory of KNP and the follow-up of their condition is necessary.

3.3.5 Fauna

3.3.5.1 Mammals

There are very few studies on the dynamics, distribution and ecology of the mammal species in Latvia. There is only official, not always reliable data about game animals in the territory of KNP. Besides, borders of the forest districts have been changed several times due to the numerous reforms performed by the State Forest

Service, and therefore, it is difficult to get the data on the long-term dynamics of game animals for the present territory of KNP.

According to the inventory data, the number of beavers, foxes and brown hares has increased, but the number of wild boar and racoon dogs has decreased since early 1990s both in the forestry dictrict of Valgums and Kemeri. Also, the number of red deer and elks has decreased in Kemeri forestry district. Lynx have completely disappeared from Valgums, but wolves just periodically wander in from the Kemeri forestry district (nor do they reside permanently there). Unlike Kemeri, in the Valgums forestry district, the number of other species – otters, badgers, minks, muskrats, squirrels, red deer and roe deer – has increased.

During the inventory of bat fauna in Kemeri NP in summer 1999, eight bat species were recorded (*Myotis daubentonii*, *Plecotus auritus*, *Eptesicus nilssonii*, *Vespertilio murinus*, *Nyctalus noctula*, *Pipistrellus nathusii*, *P.pipistrellus* un *Myotis dasycneme* , the species of Annex II of EU Habitat Directive). In total, 15 bat species have been recorded in Latvia.
A study on wolf ecology in the territory of KNP was started (diet, home range).

Altogether, all **18 game animal** species, **8 bat** species, at least **4 insectivore** species, **7 species of small rodents** etc. are found in Kemeri NP. Probably, the majority of the mammal species found in Latvia also occur in KNP. However, there is lack of data about several groups of animals.

The work on the **mammal atlas** of ĶNP has been started.

3.3.5.2 Birds
The ornithological research in the present territory of KNP was started more than a hundred years ago, when the most famous ornithologists of that time organised excursions to the environs of Kemeri. A more detailed inventory of the territory was started after the WWII. In 1964, after restoration of the water level of the lake Kanieris, the Ornithological laboratory of the University of Latvia established monitoring of the nesting waterfowl.

During about 100 years, since the ornithological research is done in the present territory of KNP, **237 bird species** have been recorded in total. **177** species of those were found nesting at least once, and nesting of 11 other species has been mentioned as possible. The information on the nesting bird species, updated in early 1990s, enabled to list **149** species and nesting of **25** more species was estimated to be possible. From the species included in the Red Book of Latvia, 48 (62% of all) have been recorded as nesting; including the non-nesting and migrating species, a total of **66 species** (85% of all the species on the endangered species list) have been recorded. Species, which do not nest in KNP any more, are as follows: willow grouse, pintail, dunlin (subsp. *schinzii*), peregrine falcon, little gull, roller and green woodpecker. There was no tangible proof during the last few years about nesting of 3 species: hen harrier, ringed plover and the great snipe, therefore, those were considered to be extinct. The status of several species (quail, hoopoe etc.) was uncertain due to different reasons.

Composition of the **atlas of nesting birds of KNP** organized by the Latvian Ornithological Society in 1999 is so far the most complete inventory of the ornithofauna of the territory. The inspection results allow to specify the number and distribution of the localities of rare species, as well as to inventor their most important habitats (Strazds, 2000). The information was gathered in squares of 1x1 km. This relatively fine net of atlas squares (for the first nesting bird atlas of Latvia a 10x10 km net was used, in 1980-1984) allowed to collect information that could be the basis for a monitoring of several bird species in the future (e.g., the corncrake).

The information collected up to now proves nesting of **111** bird species in the territory of KNP in 1999, nesting of **30** other species is credible or possible, also the presence of **40** non-nesting bird species has been recorded. Since there was no special attention paid to proving of nesting during the work on the atlas, many species that are nesting in KNP for sure were left out from the list.
M.Strazds has summarised literature data where bird species related to the territory of KNP were mentioned.

3.3.5.3 Reptiles
There are almost no systematized data on the reptiles of KNP. Distribution of the smooth snake in Latvia was studied, including also its localities in the territory of KNP (Čeirāns, 1997). All **seven** reptile species recorded in Latvia are also known from KNP (there is no data about the pond turtle, which was still found in the territory of the park ~40 years ago (according communications of the local inhabitants). The inventory of the reptile fauna is going on in order to define distribution of reptile species in the territory of KNP.

4 species have been found certainly – common lizard *Lacerta vivipara*, slowworm *Anguis fragilis*, grass snake *Natrix natrix*, adder *Vipera berus*.
The possible occurrence of the pond turtle in KNP must be verified.
The smooth snake, which had been described from the environs of Kemeri already in the beginning of the 20th century, was recorded near Kūdra in 1996 (Čeirāns 1997). In 2000-2001, several specimens of the smooth snake were found, but there is no data on the population's status and distribution.

3.3.5.4 Amphibians
The presence of **11** of the 13 amphibian species found in Latvia may be possible in KNP. However, this group of animals has not been studied in the territory of KNP. The amphibian inventory has been started in all the territory of the park.

Certainly recorded species are as follows: natterjack *Bufo calamita* (Bērziņš 1982), common toad *Bufo bufo*, green toad *Bufo viridis*, common spadefoot *Pelobates fuscus*, pond frog *Rana lessonae*, moor frog *R.arvalis*, brown frog *R.temporaria* (observations of the KNP staff).
According to the literature, natterjack was found in Jaunkemeri, Kemeri, Slampe (Siliņš, Lamaters, 1934, after Bērziņš, 1982). In the 1990-1980s, several individuals were caught in the environs of Kemeri, but since 1983, there is no data about the occurrence of this specie in the territory of KNP.

- Like with reptiles, habitat protection (mainly of the spawning sites) is important also for the amphibians.

3.3.5.5 Fish
32 fish species are known from the freshwater bodies of Kemeri NP (appendix 14), from which the most common species are the following: luces, crucians, breams, roaches, rudds, tenches, perches.

3.3.5.6 Protected species of the EU Species and Habitat Directive
In the EU Species and Habitat Directive, protected species are listed in 3 annexes: Annex 2 (species that require designation of special areas for their protection), Annex 4 (species that require strict protection but no special areas) and Annex 5 (species which populations may be managed).

In KNP, there are 5 species of Annex 2: pond bat *Myotis dasycneme*, beaver *Castor fiber*, wolf *Canis lupus*, *Lynx lynx*, otter *Lutra lutra*. From the amphibians, there is *Triturus cristatus cristatus* and *Bombina bombina* (the probability of its occurrence in KNP is very low, however, according to some observations, it has been observed in the lake Aklais).

There are 8 bat species from Annex 4 (*Myotis daubentonii*, *M. dasycneme*, *Plecotus auritus*, *Eptesicus nilssonii*, *Vespertilio murinus*, *Nyctalus noctula*, *Pipistrellus nathusii*, *P. pipistrellus*), hazel dormouse *Muscardinus avellanarius*, garden dormouse *Eliomys quercinus* (possible, must be checked), beaver, *Sicista betulina* (in 2000, one observation), wolf, otter, lynx.

From the amphibians and reptiles that possibly occur in KNP, this appendix includes the following species: pond turtle *Emys orbicularis*, crested newt *Triturus cristatus*, red-bellied toad *Bombina bombina*, moor frog *R. arvalis*.

From the Annex 5, four species occur in KNP: wolf, pine marten *Martes martes*, polecat *Mustela putorius*, mountain hare *Lepus timidus*. There are 3 amphibian species on the list: lake frog *Rana ridibunda*, edible frog *R.. esculenta* and brown frog *R.. temporaria*.

3.3.5.7 Invertebrates

3.3.5.7.1 Insects

Only several groups of insects of Kemeri NP have been investigated relatively well - butterflies, dragonflies, several genera of beetles (appendix 15). Information about many orders of beetles is lacking or is very scarce. Associate professor of the University of Latvia V.Spuņģis has made a reference list, where beetles recorded in the present territory of Kemeri NP are mentioned.

In total, ~**3100 species of beetles**, i.e., **23%** of all the known beetle fauna of Latvia, were recorded in Kemeri NP. Therefore, it may be declared, that Kemeri NP is one of the well-studied sites in Latvia in terms of the beetle fauna. Potentially, the number of species actually occurring here could be three times higher. The butterfly fauna, thanks to the monitoring by N.Savenkovs, is relatively well studied – the number of recorded species continues to increase. Only a few of the dipteran genera – horseflies, mosquitoes, flower flies, chloropid flies have been relatively well studied, others were poorly studied. From the hymenoptera, best studied are sawflies and ichneumon wasps, there is also incomplete data on the ants, but the rest of hymenoptera has been studied poorly. The insect fauna has been poorly evaluated from the viewpoint of nature conservation.

Long-term studies would be necessary in order to clarify the insect fauna of KNP. Therefore, it is recommended to concentrate studies on individual species, which could serve as indicator species in relation to the biological value of habitats and the management influence, and as well on particular species – the endangered, the rare and the protected. The data on the non-priority species would also be complemented.

A total of **44 protected species of beetles** has been found in Kemeri NP (appendix 16). In the future, it is necessary to check localities of those species, conservation of which requires designation of specially protected nature areas or micro reserves. Habitats are appropriate for these species. The list of potential species is added:
Maculinea arion
Osmoderma eremita
Cerambyx cerdo
Cucujus cinnaberinus
Lucanus cervus
Ceruchus chrysomelinus
Ergates faber
Tragosoma depsarium
Brychius elevatus
Bembix rostrata
Bryodema tuberculatum
Cordulegaster annulata
Nothorina punctata
Stylurus flavipes.

If the above-mentioned species are found in the landscape zone of Kemeri NP, microreserves should be designated, as the protection regime is automatically provided in nature reserve and strict reserve zones.

3.3.5.7.2 Spiders

58 spider species are known to occur in Kemeri NP (M.Šternbergs' unpublished materials of 1992-1993). The number of species is considered to be high. M. Šternbergs did the inventory of spiders in a wet broad-leaved forest, Zalais bog, Kalnciems black alder swamps and Lielupe floodplain meadows.

3.3.5.7.3 Molluscs

A total of **93 mollusc species were found in Kemeri NP**, with 46 of these being terrestrial and 47 aquatic species. 10 mollusc species are protected, from which *Vertigo angustior, Helix pomatia* and *Unio crassus* are also the species of the EU Habitat and species Directive.
I.Gmizo, K.Greķe, M.Rudzīte have studied the mollusc fauna and the ecology of several habitats (deciduous and wet deciduous forests), but the whole territory has not been inventoried. The data is fixed to the place and the habitat.

3.4 Socio-economical description

3.4.1 Population

There are total 76448 inhabitants in the 7 municipalities and 2 city territories (resident population by the municipalities is displayed in table 3.3.), but in the territory of Kemeri NP there are living ~ 3, 5 thousands of people.

Table 3.3 **Resident population by municipalities**

Municipality	**Number of inhabitants in the municipality**		**Total area of the municipality, km2**	**Part of Kemeri NP in proportion to the municipality territory, %**	**Municipality territory, included in the NP in proportion to the total area of the park, %**
	1997	**2000**[**]			
Jurmala	58 865*	46 553	100	30	8
Kalnciems	2 686	2 549	23	10	1
Valgunde	2 006	2 097	210	20	13
Sala	1 262	1 158	76	34	7
Džūkste	1 795	1 737	184	32	16
Engure	2 685	3 645	133	3	1
Lapmežciems	2 223	2 129	49	100	13
Slampe	2 215	2 233	155	30	12
Smārde	2 711	2 726	215	50	29
Total	**76 448**	**64 827**			**100**

* data of 1999

The territory of Kemeri NP is not densely populated, all municipality centres are located outside the NP, except Lapmežciems. Resident population by major age groups are quite similar in the municipalities where approximately half of the inhabitants are of working age, but the rest are under or over working age (table 3.4.). During the last years the number of inhabitants hasn't changed dramatically, except Jurmala city (table 3.3.).

Table 3.4 **Age of inhabitants** (beginning of 1997 (%))

Municipality	**Inhabitants under working age**	**Inhabitants of working age**	**Inhabitants over working age**
Jurmala	16.5	59.5	23.9
Kalnciems	21.8	58.2	20.0
Valgunde	22.1	57.3	20.6
Sala	25.1	59.6	15.3
Džūkste	25.1	53.4	21.5
Engure	22.0	56.1	21.9
Lapmežciems	20.4	55.4	24.2
Slampe	24.1	55.5	20.5
Smārde	19.6	51.7	28.7
On average :	**19.67**	**56.34**	**19.66**

In Kemeri an average 30% of the whole of 1200 inhabitants are over working age (retired), therefore here dominate certain passivity and the interest about the beginning of business activities is not so high. Basically many of the young people move to the big cities (Riga, Tukums, Jurmala) when finishing primary or secondary education.

[**] "Provisional results of the population census of 2000 " of the Central Statistics board (CSB)

3.4.2 Employment

Number of unemployed is one of the socio-economical indicators of municipalities. It was 9.1% in the end of 1999 in Latvia (according to the data of CSB – 13.9 % of people are not employed).The average unemployment rate of the municipalities of the territory of Kemeri NP is ~ 6%.

Based on the interviews with the mayors of municipalities it is clear, **that the main economical activities of the district are presented by the wood production and processing, agriculture, fishery and fish processing enterprises, as well as tourism service – retail trade and public catering** (table 3.5.).

Table 3.5 **Economical description of the municipalities**

Municipality	Main economic sectors (by the number of employees)
Valgunde	Agriculture
Džūkste	Agriculture (farms – 99 forest owners in the territory of KNP).
Slampe	Agriculture, product processing (Ltd. VeltEco), 3 woodworking enterprises.
Smārde	Logging and woodworking -12 log frames (Ltd. Kurzemnieki employs 20-30 people), agriculture (processing of milk, meat), countryside tourism.
Engure	Port, fish processing, furniture shop.
Lapmežciems	Service sphere, fish haul and processing.
Sala	SIA "Pērnes"- 30 work places, lumber-mill - 20 work places, Ltd "Kvinta"-30 work places.

Economical activities of the territory of Kemeri NP mainly are directed outside and are involving either the sea or the agricultural lands which are set to the borders of the territory of the park, or the nearest big cities (Riga and Jurmala).

Timbering is the most important economical activity in the territory of Kemeri NP regarding both the employment of inhabitants and the income. Forest exploitation is allowed in approximately 1/3 of the territory. The logging in Kemeri NP is done mainly by the long-term contractors. Ltd. "Kurzemnieki" manages 5000 ha of forests, from those 3486 ha belong to the territory of the park (the contract is into the force till the year 2006). 40-60% of the wood is processed on the site, 5-10% are sold as firewood and approximately 35% are exported to Sweden as pulpwood. 20 regular and 15 seasonal workers are employed there.

Ltd. "Leja" manage forests of the SW part of KNP (area of 2250 ha). 5 forest workers are employed. The administrative board of Kemeri NP has limited the forest exploitation in 2000, consequently Ltd. "Leja" reduced the wood cut from 8000 m^3 (1999) to 990 m^3 (2000).

Number of the wood processing production units (17) and the quantity of the processed wood (9818 m^3 /a year/per each shop) allows to conclude that the total amount of wood processing of the territory of the National park is about 166 906 m^3. All the respondents agree, that the density of wood coming from the territory of the KNP is little. Changes and reorientation in the market of Latvia created the situation when the wood processors are increasing the purchase of imported raw materials (mainly from Russia), therefore the reduction of the amount of wood cut in KNP does not affect the wood processors in surroundings of the territory of the park.

Private owners may obtain the firewood from their forest properties.

Gathering mushrooms and picking berries in the forests and bogs of Kemeri NP (mainly during summer and autumn seasons) is a comparatively popular activity among both the locals and the inhabitants from the nearest large cities (Jurmala, Riga). The "bounties of natures" are gathered both for the own consumption and for the realization in the market. The influence of the berry- and mushroom- pickers on the nature values of Kemeri NP has not been estimated at present. Formally these activities are not permitted in nature reserve

area. Garbage left after the forest visitors and the relatively frequent forest and swamp fires show the evident influence on nature.

For the local inhabitants Hunting and fishing are not of special importance for making the profit. It is mostly considered as a pleasant hobby or free time activity. The locals have united in the hunting clubs, which have signed agreements with Kemeri NP.
Birds are hunted in Kanieris lake, and the prohibition of this activity has already caused great protests from the people who are concerned to maintain this territory as the hunting ground.

The extraction of miner water and medical mud in the territory of Kemeri NP is done by Ltd. "Eiropas minerāls" – this company supplies both the sanatoriums and the individual traders in Latvia. At present no restrictions are planned for the extraction of the medical mud.

Dolomite extraction is done by Ltd. "Gneiss" in the area of 103 hectares in the SE part of the national park. The problem on land privatisation and possibilities of future tourism development is being discussed.

Several individual contracts on reed extraction in Kanieris lake have been signed with the locals of Lapmežciems municipality. The reeds are of very high quality and are used for roof covering. The interest to use this natural resource more intensively has been showed lately.

3.5 Cultural heritage of the territory

The cultural heritage of the territory of Kemeri NP and its surrounding is quite rich. The most important areas from the point of the history of culture are the municipalities of Smārde, Engure and Lapmežciems, as well as the part of Jūrmala city – Kemeri. Many valuable culture monuments were destroyed during the both World wars, and some decayed during Soviet times.

3.5.1 Kemeri

The historical part of Kemeri – Kemeri health resort – is a town building monument of national importance. Also this part of the city consists of the **7 architectural monuments of national importance**:

- Hotel "Ķemeri" (arh. E .Laube) – E. Dārziņa 28;
- Water tower (arh. Fr. Skujiņš) – E. Dārziņa 28;
- Kemeri park with the park architecture (K.M. Vāgners);
- Pavilion – rotunda "Mīlestības saliņa" (arh. Fr. Skujiņš) – in Kemeri park;
- Monument to the founders and directors of the Kemeri health resort – in Kemeri park;
- Restaurant "Jautrais ods", nowadays "Meža māja" (arh. Fr. Skujiņš) – the Kemeri NP centre;
- Kemeri Lutheran church (arh.H. Šēls) – A. Upīša 18.

There are also several art basic values (e.g. fire-places, interior decorations, stained glass windows, separate art objects) of national importance:

- Hotel ''Ķemeri" – the interior decoration of the library, dining hall, the pink hall;
- Orthodox church – **3** icons.

There are also relatively many cultural monuments of local importance (17 architectural monuments, about 15 art basic values, several historical monuments). The archaeological monuments of Jūrmala city have not been neither studied nor summarized.

3.5.2 Lapmežciems

There are **2** archaeological monuments of national importance found in the municipality of Lapmežciems:

- The Stone age settlement of Siliņupe (III – II m.A.C.);
- Kanieris castle mound.

The Paugu medieval cemetery is an archaeological monument of local importance. Also the Lapmežciems sedums with 5 houses for net-drying must be mentioned as a cultural monument of the municipality – it is an architectural monument of local importance, just like the Finnish Jaeger battlefield (1916).

The cemetery gate in Ragaciems (Lapmežciems municipality) has not included in the list of the protected cultural monuments, but it is interesting as an object of cultural history. Here in this graveyard also are located poet's I. Ziedonis family graves.

Interesting is also the history of Bigauņciems, especially the history of the former school of Bigauņciems – in those days as teacher there was occupied Vilis Lejnieks (future writer and poet Plūdonis,1874 – 1940) but Ansis Gulbis – writer, social workman and book-publisher attended this school as a pupil.

Also Johans Kristofs Broce, researcher of local history, has resided for some time in the territory of Lapmežciems.

The history of the Gausa judze – the littoral forest streak that divides Lapmežciems and Engure rural municipalities also needs special attention. It is popular as a resting-place and attracts even the visitors from nearby cities – Jurmala, Tukums and Riga.

3.5.3 Smārde*

There are **10** objects of cultural history of national importance found in the municipality of Smārde, **6** of those are architectural, **3** archaeological and **1** art basic value.

Evidently the most remarkable from the architectural monuments is Šlokenbeka medieval manor house and its surrounding buildings.

Other monuments:

- Milzkalne Church hill – cult place (archaeology);
- Ūdru Milzukalns – castle mound (archaeology);
- Granary in Šlokenbeka mill (architecture);
- 2 granaries in manor house (architecture);
- The Small and the big cart-houses (the same place; architecture);
- The farm-house of the manor (the same place; architecture);
- Fragments of the fortification stone-wall with 2 gate towers and the passage/underpass (the same place; architecture);
- Monument to Latvian Riflemen (art basic value, sculptor K. Zemdega).

From the monuments of local importance the following must be mentioned: the Sulphur spring Health source – cult place, water-mill in Šlokenbeka and the tavern in Šlokenbeka mill.

Also the baron's Reke family chapel, which is an interesting architectural monument, should be included in the list.

3.5.4 Engure*

There are **8** protected cultural monuments of national importance in this rural municipality – 3 architectural, 1 archaeological and the other – art basic values. Those are:

- Engure castle mound (archaeology);
- Fisherman house "Lielkristi" (architecture);
- Fisherman house "Skaras" (architecture);
- Fisherman house "Andricas" (architecture);
- Grave monument to J. P. Brants (art basic value);
- 3 art basic values in Engure church.

Interesting objects also are the old Engure naval school, former quayside and the Engures church building, but those have not been included in any list nor any proposed list of the cultural monuments.

3.5.5 Slampe*

There are no protected cultural monuments neither of national nor of local importance in this community, but there is a draft of the list in which the following objects are included:

- Mārtiņa church bell tower;
- The railwayman house near the station and the station itself;
- Vīksala barons' chapel;
- Vīksala cemetery gate;
- Mews of Praviņas manor house;
- The servant house of Spirgus manor.

3.5.6 Džūkste*

There are 2 art basic values of national importance in the municipality:

- Grave monument to Veidemanis;
- Monument to the soldiers killed in the World War II.

* The objects of cultural history are not situated in the territory of Kemeri NP

Included in the proposed new list:

- Džūkste society house;
- Džūkste chapel;
- Džūkste feed hoper/ magazine;
- The school household building in Lancenieki;
- Lancenieki primary school.

Not included in the lists, but worth of examination:

- The church ruins;
- Grave monument to A. Lerhis – Puškaitis in Džūkste graveyard.

3.5.7 Valgunde*

4 cultural monuments of national and **4** monuments of local importance (apart from the art basic values). Those of national importance:

- Battlefield – Ložmetējkalns (history);
- Buildings of the orthodox nunnery (architecture);
- The Tsar's gate (art);
- Orthodox church of Christ's transfiguration (architecture).

Ones of local importance:

- The school in Kalnciems (architecture);
- Kapsargu ancient burial field (archaeology);
- Jānis Trepinieks orthodox church.

In Kaļķis interesting as a historical witness almost from the 17th century is the 300 m long road along Lielupe from the barge quayside to the bridge. It also played a great role in the battle for Freedom in 1919.

Another object, still existing but brought to decay because of the irresponsible action of the owners, is the "Stiļļu" house, built in the end of the 19th century, that needs to be renovated.

3.5.8 Sala municipality*

There is **1** archaeological monument of national importance mentioned: Romu –Kalniņu settlement and **1** archaeological monument of local importance as well: Sīpolciema settlement (Sīpolu hill).

Worth of interest are Salas Jāņa church with the altar-piece made by J.Derings.

3.6 The use of natural resources

3.6.1 Forest management

In the present territory of KNP there were territories where traditional forest management activities (crop plantations, seed plantations, zone selective cutting, etc.) were performed by the State Forest service (SFS), and the territories where the management had not been done; namely, the forest exploitation was restricted in zones of sulphur spring formation (so-called sanitary protected areas).

In the beginning of the 90ies State Forest service has signed 2 long term CONTRACTS (till years 2004 and 2006 – appendix 3) with the forest exploitators on the management of forest area of 2250 ha and 2526 ha, altogether extracting ~4000 m^3 of wood per year. When establishing Kemeri national park, forest lands were included in the landscape protected area and the national park has taken over the contract liabilities.
In 2000 there have been 9475 m^3 of wood extracted in the territory of KNP (from those 800 m^3 were obtained by the administration of Kemeri NP). In 2001 Kemeri NP authorities were extracted 2822 m^3 of wood (1201 m^3 – in/from the final felling, but 1351m^3 – from the different thinnings).

Private land owners work in their forests in accordance with the forest legislation and forest inventory results, receiving the cutting permission from the authorities of Kemeri NP. In 2001 the private forest owners were obtained the cutting permissions for 3491 m^3, where in the final felling 2318 m^3 of wood have been extracted, but 1046 m^3 - in different thinnings.

Use of forest by-products

The administration of Kemeri NP are selling the Christmas trees, birch-boughs and branches (limited amount). The KNP visitors – both the locals and the people from Riga, Jurmala and Tukums pick berries and mushrooms (for their own consumption and for the realization in market).

3.6.2 Hunting, angling, fishing

In the landscape protection zone hunting spaces are rented for 4 hunter clubs: "Valgums", "Ozolnieki", "Džūkste" and "V&Co", their contracts are in force till years 2005 and 2010 (the hunting areas in the picture 10, contracts – appendix 3). The hunting is performed according with the general legislation and mutually accepted agreements with the administration of Kemeri NP.

According to the registration data of game animals, the number of beavers, foxes and grey hares has increased, but the number of wild boars and racoon dogs has decreased since the beginning of the nineties both in the forest dictrict of Valgums and Kemeri. Also the number of red deer and elks has diminished in Kemeri forestry (the possible reason could be too big game limits). As a result of the campaign against the predators in Valgums, bobcats have completely disappeared from Valgums, but wolves just periodically wander in from Kemeri forestry (they don't reside permanently there as well). Unlike Kemeri forestry, the number of other species – otters, badgers, minks, muskrats, squirrels, red deer and does – has increased.
It is hard to discuss the increase or decrease of the number of separate species without serious research, nevertheless the main factors, that influence the dynamics of populations, are hunting (both the legal one and the illegal), agricultural activities (for example, the downfall of agriculture has promoted the breed of the grey hare), predation (if it has additive character).

There is a possibility to do angling and fishing in Kanieris lake. **The fishing limit of the lake is 1115 m** of mesh, the licence from Lapmežciems municipality has been bought by corp. "Latvijas valsts meži". The company is also the manager of the lake (working in accordance with the management plan of Kaņieris lake). The company has signed the agreement with the administration of Ķemeri NP about the rent of waterfowl hunting license in Kaņieris lake till the 30 November, 2003.

Fishing is allowed in Lielupe, Slocene, Sloka lake and other lakes according to the general fishing regulations. The fishing limit of Sloka lake is **410 m** of mesh, it has been issued to 4 persons, who have signed the fishing contract with Jūrmala local authority, but the fishing limit of Valguma lake is **280 m** of mesh. The fishing limit of Lielupe river in Sala municipality of Riga district is **2 400 m**, in the rural area of Kalnciems city of Jelgava district and in Līvbērze and Valgunde municipalities of Jelgava district - **4 725 m**, but in Jurmala city – **3 380 m** of mesh. The fishing limits of freshwater are defined by the MoA Fishery

board, in co-operation with MEPRD Nature protection department, but the angling licences are handed out by the Regional environmental boards.
Fishing is done by the locals of Lapmežciems municipality, who are going out to the sea with rowboats and motorboats. The fishing licences for the fishing in the sea are issued by the Sea environment board.

- The administration of Kemeri NP has no data about the fishing limits in the sea in the territory of Kemeri NP.

3.6.3 Water supply

For the Kemeri water supply Gauja and Burtnieki water horizons are used. At present 2 artesian boring wells are used (in all there are 5 of them), obtaining about 315 m^3/ per day.

Water in Lapmežciems rural municipality is used both for the inhabitant needs and the necessities of fish processing companies (178 m^3/a day), also mainly from Gauja and Burtnieki water horizons.

3.6.4 Medical mud and mineral water extraction

Ltd. "Eiropas minerāls" extracts the medical mud from the Sloka lake quarries (licence 8/81). The resources accepted in 1981, compose 564 thousands of tonnes by category A. The extraction amount is small: in 1999 – 770 tonnes, in 2000 – 690 tonnes of mud.
The land near Sloka lake, where the medical mud is extracted previously belonged to Jūrmala city, but in 2000 it was brought under control of Kemeri NP (image 11).

Ltd. "Eiropas minerāls" obtain the sulphur waters (in 2000 ~ 1700 m^3), which are sold to medical institutions. The sanatoriums "Jaunķemeri" and "Dzintarkrasts" (in Jaunķemeri), "Rīgas Jūrmala" (in Majori) and "Baltija" (in Dzintari) use the mud and the sulphur water for medical and spa procedures. The total sulphur water stores of the territory according to the calculus (Driķis,et.al., 1985) compose 3.2 mil m^3/a day (with H_2S concentration of 25-50 mg/l). Sanatorium "Ķemeri", "Jaunķemeri" and "Dzintarkrasts" apart from the sulphur water extraction also use Pērnavas horizon (D_2pr) mineral water boring wells. There also are the ~1 km deep borings on the Cambrian period Deimena horizon (Єdm) bromine containing waters in "Jaunķemeri"[9] and "Ķemeri".

The licences for the medical mud and the mineral water use are issued by the State Geological service, unless the resource user has signed the land rental agreement with the land owner.

3.6.5 Dolomite, gravel and sand extraction

In Valgunde municipality operates quarry "Kalnciems-II", where Ltd. "Gneiss" obtains the dolomite (licence 8/66 P) by managing the area of 103 hectares (image 11). The field was explored in 1983 (the approved resource – category A – 70011.86 mil m^3, category N – 24745.00 mil. m^3). The present output amounts are as follows:
in 1999 – 45 800 m^3 ; in 2000 – 66 800 m^3 of dolomite. The subterranean water, in order to lower its level, is pumped from the pit to Pārupji ditch and further reaches Lielupe. It is estimated that performing forth following the present amounts will allow to obtain the resources for 20 more years.

Some time ago there have been the exploration done of 2 fields (Sloka, situated beside the currently not used quarry and Smārde beside Valguma lake) of the territory of Kemeri NP. Nowadays dolomite extraction is not done in any of these 2 mentioned fields.

In Džūkste rural municipality, there are sandpits belonging to "Šlokenbeka" (at present neither used nor recultivated).
Sand extraction pits are left on the side of Kaļķis – Kūdra road, where the recultivation has not been done.

[9] The consumption data from "Eiropas minerāls"as the managers

3.6.6 Peat extraction

As the largest part of the territory is covered by swamps, the number of the peat fields reaches 29. Though the biggest part of those are of small area and resource[10], the largest is Ķemeri raised bog (245937 mil m^3) and Zaļais bog, Raganu bog, Zvejnieku bog – Dūņezers (96357 th. m^3).

At present peat is not industrially extracted in the territory of Ķemeri NP. The once used peat millfields in Mazais bog, Seklais and Labais swamps and Kūdra are left without recultivation.

3.6.7 Pollution objects

One of the local pollution objects is Kemeri sewage station with the capacity of 3000 m^3/a day, but it depurates on average 274 m^3/a day. The purified waste waters flow into Vēršupīte.

Another and the main – at present closed Jūrmala city landfill "Kūdra", located in Kašķu bog (between Kūdra and Sloka). The total area of the landfill is 15 ha. It was formed in the 50ies for the deposition of the Jūrmala city waste (also for the purification plant of faeces and dehydrated mud from Sloka pulp and paper factory). In 1994 there was found high groundwater and underwater pollution (mainly with zinc and ammonia). At the same time the pollution of the soil and the overground water is low[11]. The landfill was closed in 1995. But in 1999 the compost extraction and the surface alignment was started, that enables the pollution leaching from the landfill[12].

The geological structure of the territory is inadequate for the landfill formation. The so called "hydrogeological windows"[13] let the pollution to migrate freely to underground waters, but the badly paludified environment bothers the performance of monitoring. Actually the pollution endangers the Jurmala city water source "Kauguri", as here in the pre-quarternary surface Amata (D_3am) horizon is exposed, which may be used for water supply, and as well it is connected with the below located Gauja horizon which is also available for water supply. It also must be said that the water flow is directed from the landfill to the water source. The Salaspils horizon which is important for sulphur water has been eroded in the territory of the landfill. Although the district of the sulphur water formation is located near the very border of the landfill, it is placed in the direction upwards the flow. Increased ammonia level is typical for marsh waters, wherewith dangerous may be zinc or other non recognized pollution components.

According to the data of the State geology service, the quarry recultivation problem in Latvia has not been solved. When issuing the resource use licences, State geology service writes that after the complete quarry work-out, its recultivation must be done during the period of 1 to 3 years; these activities must be performed in co-ordination with the municipality where quarry is located.
Practically the recultivation has not done, because during the period of resource use the finances are not saved for the management of these operations.

3.6.8 Reed extraction

Kemeri NP has signed agreements on reed extraction in Kaņieris lake of a total area of 92,3 hectares – in 2002 (image 14). The reed quality is very high, they are used for roof building. Despite the fact that these materials are relatively expensive, the demand increases every year (in 2001 87 ha were managed).

3.6.9 Agriculture

The croplands of the territory of Kemeri NP are cultivated in the southern end of Dunduri grasslands, as well as in Slampe municipality lands along the western border. Cows are pastured in Dunduri meadows and Melnrags mouth. The Dunduri grasslands are being cut periodically. Relatively small areas of Čaukciems and Antiņciems meadows are being cut too.

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[10] besides, for some small fields the resource was calculated at the table that is, withot the countryside studies.

[11] "Monitoring of subterraneal waters in dangerously polluted areas, 1994" VU "Geology of Latvia". Rīga, 1995.

[12] "Monitoring of the subterraneal and overground water pollution in the former Kūdra dumpsite, tearm III (2000-2001)". Ltd. "Eiropas minerāls", Jūrmala 2001.

[13] In this case the deficit of the waterproof (or weakly pervious to water) rocks among the quarternary and devon sediment, what truss the both horizons hydrogeologicaly tight.

3.7 Objectives for protection of Kemeri NP

The general objective of Ķemeri NP is to preserve the nature, cultural historical and recreational values of this area, to protect the processes of origination of mineral waters and medicinal mud, and also to promote non-deteriorating economic activities, nature tourism and ecological education.

Strategical objectives of Ķemeri NP

I To maintain the rare habitats and the specially protected species of coastal lagoons and swamp lakes.

II To preserve the natural sea coastal habitats, where dominate beach, dunes and washed-off soil coasts with low human impact, as well as intact forest habitats and river estuaries with their typical species.

III To preserve the intact habitats of the broadleaved forests, river flood-lands, raised bogs, calcareous fens, spring fens and sulphur springs and the species which are found there.

IV To provide natural grassland management, diversity of the meadow habitats and species which are found there.

VI To maintain open agricultural land and diverse forest landscapes, as well as traditional and snug cultural landscapes with good resting possibilities.

VII To promote the development of sustainable tourism and the environmental education of the society following the principles of the European Charter for sustainable tourism, developing partnership with all stakeholders, planning and elaborating information centres of the park, appropriate infrastructure and visual information.

4.Nature values of Kemeri National Park, the objectives and activities for their conservation

The nature values of Ķemeri NP have been selected based on M. Alexander's methodology (M. Alexander. A Management Planning Guide For Nature Reserves And Protected Areas. Script), with the following definition criteria of biological values:

- The presence and representation (size/area) of the protected and rare species and habitats;
- Diversity (geomorphologic, of habitats, communities, species);
- Naturalness (relatively low human impact);
- Rarity (the specially protected species and habitats under special protection of the state);
- Stability and fragility of habitats and species (reaction to the change of the environment);
- Typicalness (good examples typical for the area);
- Potential (potential for improvement or restoration of the habitats and communities).

Regarding the 4th criteria – the rarity – both the lists on protected species and habitats of Latvia (MoEPRD Regulations No 396, 14.11.2000), and the lists of the annexes of the EU Habitats and Bird Directives have been used.

In accordance with the Law On Protection of Species and Habitats, protection of the species and habitats is based on the complex of measures (activities or passive action), that ensures favourable conservation status of the habitat or species.

4.1 Lakes

4.1.1 Kanieris lake

The lake is situated in the 5 km zone of the restricted economic activity of the protected belt of Riga Gulf and in the nature protection and strict nature reserve zones of Kemeru NP. The protected belt of Kanieris lake is 500 m wide.

4.1.1.1 Biological values of the lake

4.1.1.1.1 Characteristic habitats, plant communities and species

The total overgrowth is estimated as about 70 – 80 % of the lake. The lake can be classified as macrophytes (reeds-Chara) lake (a nutrient rich lake in a clear water stage).

Marshes: occupy large areas along the S, SW, W and NW shores of the lake creating a mosaic of marsh islands of different sizes.
Emergent vegetation: creates belts of different width along the shoreline and beds in the central part of the lake.
The marshes and emergent vegetation is dominated by common reed; communities of *Typha angustifolia* and *Cladium mariscus*.
Submergent vegetation: occupies the most part of the lake that is free form the emergent vegetation. The submergent vegetation is formed by communities of *Chara sp., Najas marina, Potamogeton pectinatus, Ceratophyllum demersum.*
Kanieris lake has a rich fauna of dragonflies and damselflies, but no species of EU Directives were found

4.1.1.1.2 Fish fauna*

Stable local populations are constituted of pike, roach, rudd, tench, golden carp, perch, bream, silver bream, bleak. As well there is a possibility to have the population of ruffs, spiny loaches and sticklebacks in Kanieris lake. From the industrial fish species the major biomass contain roaches, tenches, perches and breams. There is also lot of golden carps, relatively many luces and rudds. The bream population is unstable and depending on the migrations. On the whole, the lake fish productivity is relatively high.
Fish migration to the sea is limited as there is no fishpass built in the sluice of Starpiņupe. The fish species that have been recorded in Kaņieris lake are to view in appendix 14 (some have been included in the addition of the EU Habitat Directive).

* Nature protection plan of Kaņieris lake, 1999.

4.1.1.1.3 Bird fauna

In the 1st half of the 20ht century Kanieris has been an important nesting ground for the waders as there were nesting of plovers (20 pairs), pewits (100 pairs), dunlins (10 pairs), ruffs (20 pairs) and black-tailed godwit (15 pairs). Appropriate nesting habitats for these species were maintained by livestock pasture in the lake coast grasslands – consequently those were covered with low vegetation. In 1964, these coastal grasslands were flooded as the water level of the lake was raised, but in the eastern side of the lake artificial islands were built in order to improve the water-bird nesting conditions.
At present, the bird species which are related to grassland vegetation do not nest in Kanieris or nest in little numbers because of the lack of appropriate nesting habitats.

Kanieris lake is one of richest bird-lakes of Latvia. In 1989 it was included in the Birdlife International list of significant places of bird habitation (criteria specie – whooper swan). In 1995 the lake as an internationally significant object (image 18) was included in the list of Internationally important wetlands of Ramsar Convention, fulfilling 8 criteria (one of them: there are at least 20 000 water birds at the same time in the lake).
According to J. Vīksne data (1999 – 2001), there are ~700 pairs of ducks (of these: widgeon 350, pochard 200, tufted duck 100, gadwall 30, garganay <10, common shoveler <5, green-winged teal <5 pairs) nesting in the lake. The number of the nesting pairs of several duck species has not substantially changed during the period of 3 years. In 2001, nesting of 4 species of gulls and terns (black-headed gull, herring gull, common tern un black tern) has been proved. Increase of the number of the black-headed gull and herring gull nesting pairs has been noticed (due to the appearance of appropriate habitats when cleaning of Dvīņa island). The nesting success of ducks in 1999 – 2001 were on average 36%. American minks un marsh harrier have destroyed 90% of the total number of the demolished nests (Vīksne, 2001).

The lake is important as a resting and breeding place for many bird species during their migration period – among these: whooper swan, Bewick's swan, white-fronted goose un bean goose. Kanieris lake is also used as a nesting or breeding place for such rare bird species as common tern (nest up to 70 pairs), black tern (nest up to 30 pairs), bittern (nest 15-20 pairs), little bittern (nest 0-3 pairs), marsh harrier (nest 10-20 pairs). Osprey also use the lake as a breeding place, but for white-tailed eagle (one pair) that is the nesting area (appendix 17).

4.1.1.1.4 Specially protected habitats

- The Great Fen Sedge, Cladium mariscus vegetation on lake coast;
- Najas marina vegetation in lakes;
- Dolomite ground in lakes;
- **Sandy ground in lakes** (picture 12).

The rare habitats: *Ceratophyllum submersum* stands, Chara communities, sulphur springs.

Habitats of the appendix I of the EU Species and Habitat Directive (92/43/EEC): 3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp, 7140 Transition mires and quaking bogs, 7210* Calcareous fens with the Great Fen Sedge (*Cladium mariscus*) and species of the *Caricion davallianae,* 7230 Alkaline fens.

Kanieris lake is a perspective protected area of European importance - NATURA 2000 site.

4.1.1.1.5 Specially protected species

In Kanieris lake

Plants: *Cladium mariscus* , *Najas marina*, *Ceratophyllum submersum*, *Zannichellia palustris*.
Invertebrates: *Libellula fulva, Anax imperator, Dytiscus latissimus*.
Mammals: Common pipistrelle and Nathusius's pipistrelle (use the lake as a feeding place).

The list of the protected bird species of the EU Bird Directive and the protected birds of Latvia is displayed in appendix 17.

In fens
Plant species: Brown Bog-rush (*Schoenus ferrugineus*), Early Marsh Orchid (*Dactylorhiza incarnata*), Bird's eye primrose, *Pinguicula alpina*, Flecked Marsh Orchid (*Dactylorhiza cruenta*), *Carex buxbaumii*, Fen Orchid (*Liparis loeselii*), Yellow Orchid (*Dactylorhiza ochroleuca*), Bog Myrtle (*Myrica gale*).

Rare insects: Sand Tiger-beetle *Cicindela germanica*.

4.1.1.2 Use of the lake
4.1.1.2.1 Recreation
The bacteriological quality of the lake allows to use it for different recreation objectives, but as a place for swimming the lake is available only in a few places (shallow) and generally is inaccessible.
Kanieris is popular as a resting place for not-organized visitors who use, for example, Riekstu peninsula, drive there by cars, make fires (using junipers and other trees). There are relatively few people who use boats just for simple boating.
The water level between sluice in Starpiņupe is regulated arbitrary by forming a "basin".

4.1.1.2.2 Bird-watching
The infrastructure is insufficient for providing organized bird-watching tours – no hides, no safe towers for water-fowl watching, no information about the Ramsar site and the birds one can see here etc.

4.1.1.2.3 Fishing
There are 30 boats possible for rent at the lake boat-station. Fishers and anglers do not always obey and follow the defined seasonal reserves where it is prohibited to boat in. According to the data of J. Vīksne (2001), boats have been regularly seen in Mērsala district and in Antiņciems corner, northwards from Vārsala, and in other places; that disturbs the migrating diver ducks (tufted duck, goldeneye, pochard, scaup) to use the lake as a halt site in September and October.
In accordance with the management regulations of Kanieris lake (1994), in case the lake is used for fishing, there must be luces regularly let in the lake - raised young ones 150 pcs./ha or 170 thousands per lake, or grubs – 2000 pcs./ha or 2,2 millions per lake.

4.1.1.2.4 Water-fowl hunting
Hunting in Kanieris lake is performed once a week, on Saturday afternoons, considering the lake's zoning (image 13) – in districts 2 and 3, but in 3A – in the disclosing/opening day. The limited area enhances the density of boats and provokes to shoot from great distance, what increase the number of the wounded birds (Vīksne, 2001). Traditionally the largest number of boats (30) and hunters (54) take place on the opening day of the season. In the further season days there have been in average 27 hunters (16 boats), but the average number of the shot birds per hunter is 2 - 4 (Vīksne, 2001).
The bird registration before and after the hunting day shows that the number of birds of the lake protection zone changes to a lesser extent than in the hunted area (here it decreases approximately to the half).

4.1.1.2.5 Properties
During the period of first Latvian independence, when the water level of the lake was heavily lowered, coastal wet meadows were used for pasture and hay making. By increasing the water level of the lake with the help of dams and sluice-gates, territories belonging to private land owners were flooded. Nowadays (in Lapmežciems municipality) lands are postulated as a compensations for the non-retrieved land properties (117 ha, about 100 owners).
- Starpiņupīte sluice as a matter of fact does not belong to anyone.

4.1.1.2.6 Cultural history
On the SW part of Kanieris lake there is a castle mound and stone rampart (ancient road looms out ahead) with no certain items about it's origin found.

4.1.1.2.7 Economics
In area of 92,3 ha reed is being cut for the roof covering (picture 14).
The haul with mesh in the lake is not remarkable, the manager mainly profits from the boat rent and bird hunting licences.
4.1.1.3 Influencing factors
Eutrophication of the lake and the its overgrowing, that endangers the algae Charophyta stands;

Natural overgrowing of the lake islands with trees and bushes;
Carnivores (especially – American mink) notably influence the nesting progress of birds;
Factor of disturbance (presence of people in boats) leaves an effect on the nesting success of birds;
Inlet of polluted water from Slocene river (see Slocene description);
Fluctuations of the water-level during the nesting season (may promote the drowning of nests). For successful nesting of water fowl, the fluctuations of the water-level near slice may be within 10 cm by the level of 2,10 m (Kanieris lake management regulations, 1993);
Intensified use for recreation and fishing, cutting out and building up the banks of the lake;
Melioration of the confluence basin;
Hunting of water-fowl – affects the number and the behaviour of birds during the autumn migration.

Description of Slocene near its fall in Kanieris lake:

- high biogen concentrations Pkop - 0,15 mg/l , Nkop - 1,8 mg/l;
- N/P proportion – 12;
- balanced biogen proportions for phytoplankton growth exceed the EU defined guidelines for carp-waters (0,13 mg/l);
- the expressed growth tendency of the biogen concentrations in Kanieris lake (1995-2000) related to the biogen inflow

Hydrochemical description of Kanieris lake

Oxigen concentrations of Kanieris lake are satisfactory during the vegetation season, but during the ice period- a lack of oxigen has been observed in whole lake.
Concentrations of the **total phosphorus** – medium high (on average 0,06 mg/l, during the vegetation season on average 0,04 mg/l) correspond to eutrophic (rich in nutrients) condition and medium ecological quality.
Total nitrogen concentrations (on average 1,3 mg/l) are considered as medium high, corresponding to eutrophic lake condition.
N:P proportion (20-30) shows marked phosphorus limitation, it means, that ekstra inlet of phosphorus (P) will cause quick eutrofication (enrichment in nutrients) of the lake.

4.1.1.4 Objectives

I. To preserve the specially protected habitats and specially protected plant species in Kanieris at least in its present condition, where (see picture 12):

- Main/primary producers - macrophytes (submerged vegetation covers at least 50 % of the area of the lake);
- *Najas marina* stands are found at least in the instant quantity;
- *Zannichellia palustris* stands are found in the instant quantity;
- *Cladium mariscus* stands occur leastwise in the instant quantity (except the places, where other priorities have been defined, see the chapter on fens);
- *Ceratophyllum submersum* stands are present at least in the instant amount;
- Observation of dolomite and sandy grounds in its present locations;
- Presence of at least several *Lemna gibba* exemplars;
- Presence of flat-out alkaline fens in its instant size;
- The area of open water in the lake is not less than the instant;
- Presence of functioning sulphur springs.

II To improve the condition of the lake, so that Kanieris lake is a macrophytes lake of stable clear-water condition, where:

- There is no intensive growth of threadlike green algae and blue-green algae on the stands of algae *Charophyta*;

- Biogen concentrations in water layer during vegetation period are low- medium (average total phosphorus concentration per year P< 0,05 mg/l; during summer period P < 0,03 mg/l);
- High water clarity **(water transparency after Secchi disc till the ground);**
- Low phytoplankton biomass (phytoplankton biomass < 1 mg/l, growth of cyanobacteria is not relevant);
- rich bentofauna (satisfactory rich feeding base for fish and waterfowl).

In general such indicators characterize favourable conditions for fish and bird fauna, as well as overall stable ecological condition of the lake.

III To maintain optimal condition for the conservation of ornitofauna, where are:
- Mosaic shrub structure;
- Open water area is not less than the instant (image 14);
- Mineral soil/earth islands covered by low vegetation;
- Low density of American mink (optimal – to eliminate its presence);
- Birds are not disturbed during the nesting season;
- Steady water-level during the nesting season.

4.1.1.5 Activities

Administration	To propose to introduce the Ramsar site borders and the management regime in the documents of land-utilization system of national, regional and local scale. To provide the management of the boat station (in December 2001 assigned to management of EM). To solve the property problem of Starpiņupīte sluice in collaboration with EM and to ensure its management. In collaboration with Lapmežciems and other municipalities, to recompense the former Kanieris lake land owners' lands with other land properties elsewhere in the territory of the park. To buy lands of lake coasts from the private owners (priority – Ramsar site). To rent the reed cutting territories in quantities of instant contracts (~ 100 ha). To define haul limits for fish-baskets. To estimate the maintenance of the infrastructure of Kanieris lake.
Planning	To elaborate the architectonical project for the Kanieris lake boat station and the information centre. To prepare a construction plan for the Starpiņupīte sluice reconstruction and the project of the fishpass.
Control	To manage systematic guarding of the territory, to ensure the observation of the limitations of the season (in collaboration with the municipal police, RVP un VVI). To control the issuing of the licences for angling, hunting and fishing. To perform the control of the water level near the Starpiņupīte sluice (by arranging a water-level follow-up protocol). To provide the boat registration in the lake by arranging a "boat register" (number of the boat, time in the lake). To regulate the number of boats in the lake so that it does not go beyond 25 boats. To forbid the trespassers the chance to rent the boats in future (for 1 season)! To control the condition of infrastructure and to draw up an "act of damages" in case of its damage. To control the cleanness of the environment by inspecting the illegal landfills.
Information	To provide information materials about the natural values of Kanieris lake, the management and the attendance rules. To manage regular information exchange with Ramsar Convention focal point in Latvia. To activate, at least within the framework of Ramsar days, the dependence of Kanieris lake ecological condition on the water quality of the water confluence basin (influence of Tukums sewage treatment plant (STP)).
	In 2000- 2001, in order to improve the water-fowl nesting conditions in Kanieris lake, islands of a total area of 2.8 ha as well as the channel side near Riekstu peninsula of the area of 0.7 ha (image 14 – in green) have been cut form bushes.

Habitat management	**Priority I. Vārsala island**: do not to let the area that has been logged in autumn 2000 (0,6 ha) to grow over with offspring – to cut and burn the sprouts until April 2002, to cut the young outgrowth in July - August 2002. "To move aside" the reeds belonging to the cleaned part of the island as far as possible from it, especially north-westwards (up to the bay, that juts into the island from SW), south-easterly (till the narrowing between the highest and the lowest part of the lake) and in the NE side, so that the grassland vegetation of the logged part borders with a belt of open water, at least 15 m wide. The "moving aside " must be performed as followed: ▪ by burning down the reeds no later than in March 31 in snowless conditions, but obligatory ensuring the conservation of the last year's grass of the logged part of the island; ▪ by cutting the old reeds above the ice, collecting in heaps and burning. The young reeds, accreted in summer, must be cut down repeatedly in the 2nd half of July – beginning of August. **Sternlande** (0,2 ha) and **Dvīnis** (0,6 ha), **Pakavs** (0,6 ha), **Lielā Rakumsala** (0,5 ha) and **Viskūžsala** (0,3 ha) islands: to cut and burn sprouts till 5 Apr 2002 . To cut the young sprouts in July - August 2002. Repeat regularly during the next years. **Priority II**. To clean from the overgrow: **Mērsala** (0,5 ha), **Mazā Rakumsala** (0,2 ha) and **Saliņa** (0,2 ha) islands (picture 14 – in red). **Mērsala island**. To cut the trees and bushes of the centre of the island, to gather those and to burn till 31st of March, but not let the last year's grass to burn down. To remove the reeds of the W side of the island, providing open access to the logged area from open water at least in 50 m long belt (that must be done until March 31). For the reeds clearing, likewise the Vārsala case, burning, reed shove above ice in winter with following reed cutting in next summer (July – August) may be performed. **Priority III**. In order to improve the vegetation of the lake island that would be appropriate for species of waders (low plant cover – "fleece" necessary), the lake islands (including the artificial islands) must be cleaned from bushes, as well as sheep/goat grazing have to be performed in the 2nd half of the summer. It is advisable to perform the grazing in 2002 as an experiment on Viskūžu island, taking in account its location that is not far from the boat station. During the following years the islands of Kanieris lake and the channel side of Riekstu peninsula (total area of 4,4 ha)maintain in the favourable state by cutting the browse with bushcutter. To fragment the reeds around Mērsala and Vārsala in the second half of summer, by using "Seiga" type aggregate 1-2 times every 5 years. To cut the reeds of the N part of the lake (Within the framework of the contract, reeds of area of 92,3 ha are mown) (picture 14). To clear away the overgrew once in every 2 years along the dam of Kanieris lake (in the E part of the lake), in order to stop the overgrowing processes of the coasts. To clean the Kaņieris lake coast from reeds and bushes (1 ha) near Antiņciems.
Management of species	To manage the limitation of the number of American mink, by putting out 10-15 traps in the islands of Kanieris lake. It is of a special importance to spread out the catching in islands – Vārsala, Niedru island, Raga island, Pakavs, Dvīnis, Sternlande, Rakumu island, all the artificial islands in winter and early spring, in April – first half of May. To lower (to level) 7 islands of the lake with an objective to diminish the possibility for American minks to make caves. To manage the restoration of fish resources in accordance with the study plan of fish resources of the lake (The Kanieris lake management regulations).
Management of the territory/	To buy 30 boats for Kemeri NP. To construct a tower for bird-watching in Andersala and Riekstu peninsula. To organize a path in reeds that connects the bird watching towers.

Infrastructure	To mark Kaņieris lake zoning in nature and to restore it regularly (buoys, etc.). To organize a educational trail in Pilskalns (in collaboration with the Lapmežciems municipality). To build the boat station/information centre in Andersala. To reconstruct the boat quayside and the parking place in Andersala. To organize camping – resting site in Andersala. To reconstruct Starpiņupe sluice and construct a fishpass near Starpiņupe sluice-gates. To close the road to Riekstsala by constructing a barrier. To manage regular maintenance of the infrastructure in accordance with the annual estimate. To perform regular clean-up of the coastal zone near the boat base.
Monitoring	To introduce an integrated lake monitoring program (appendix 29) in collaboration with the Latvian Environment Agency (LEA), pointing special attention to: -macrophyte and phytoplankton cenosis (indicates the eutrophication of the lake), to evaluate the overgrew of the area. -to evaluate the condition of charophytes once a season (to map the spread of green algae on the charophytes). To perform water-level measuring near the sluice. To manage the registration of migrating water birds at least once a season (follow the criteria of Ramsar Convention). To manage the monitoring of protected habitats once in every 2 years. To evaluate the overgrowth with bushes and sprouts of the lake islands once a season. To monitor the changes of the number and spread of the American mink. To manage systematic monitoring of the water-fowl (ducks) nesting progress. To monitor the area of open water in Kanieris lake (by aero – photo) once in every 5 years. To numerate the cached fish near the boat base (species, number, weight). To perform the monitoring of fish fauna.
Investigation	To evaluate the budget of the lake biogens, by studying the different point and diffusive biogen sources in collaboration with LEA. To evaluate the influence of the disturbance factor, caused by hunters/fishermen, on the nesting and migrating water-fowl.

4.1.1.6 Performance indicators

Cleanness of the water;
Level and structure of the overgrew of the lake;
Vegetation of islands;
Health and spread of the stonewort ;
Number of boats in the lake;
Water-fowl nesting success and the number of nesting pairs by species;
Water level near the sluice;
Cached fish.

4.1.1.7 Regulations of attendance in Kanieris lake

Abidance in Kaņieris lake (image 13) is forbidden in the nature reserve zone, but in the nature protection zone in the S part of the lake (1) + (1A) and in the N part (2) during the bird nesting season starting from the moment of ice thaw till June 20 and during the period of bird migration from September 20 till the ice freezes.

Fishing is allowed in the E part of the lake (3) and (3A) after the thaw of ice, but in the S part of the lake (1A) from June 20 to September 20. Fishing is not allowed if anchor near the islands.

Hunting is allowed on the opening day of the hunting season in the N part (2) and in the E part (3) + (3A) of the lake, but in other days until the closing of the season- once a week (only 4 hours) in the N part (2) and the E part (3) (image 13).

Prohibited in the lake are:

- underwater hunting;
- industrial fishing with mesh (except ice-fishing in wintertime). It is allowed to fish with fish-baskets.

Fishing is allowed from the boats of the boat station, but from the bank – without wading in the lake, or using specially arranged sites. In wintertime ice-fishing is allowed in all the territory of the lake.

Boat use regulations are related to surfboards as well as other floatable vehicles (only from the boat station and without combustion engines).

- In Andersala, land transformation may be managed in accordance with the research project regulations, for installation and improvement of the infrastructure of Kemeri NP.

4.1.2 Sloka lake

The lake is situated in the territory of Jurmala city in the 5 km wide shelter belt of limited economical activity of Riga Gulf seashore, in nature protection area. The shelter belt of Sloka lake is 300 m, defined and approved by Jurmala city policy plan for environmental protection.
Banks of the lake are gently sloping, with pines and black alders. In the N and S ends – there is a fen with Cladium mariscus; in some places - zones of quaking bogs of reeds. The ground of Kemeri bank is solid - sandy, gravelled, with dolomites, but of Jaunkemeri- sludgy.

4.1.2.1 Biological values of the lake

4.1.2.1.1 Fish fauna

The base of the fish resources of Sloka lake consists of tenches, breams and roaches, less of perches, crucians and rudds. (appendix 14).
Both the haul statistics and the control fishing show low fish productivity and the total fish resource.
Loach – a specie of the Appendix II of the EU Directive – has been recorded in Sloka lake.

4.1.2.1.2 Bird fauna

Sloka lake is used as a breeding place by swans and black storks and it is an important resting-place for migratory birds.

4.1.2.1.3 Specially protected habitats

Najas marina stands in lakes (image 15), sulphur springs, dolomite ground of lakes, sandy ground of lakes, gritty ground of lakes (sometimes).

Habitat I 47a of the Species and Habitat Directive (92/43/EEC): 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp., 7140 Transition mires and quaking bogs.

4.1.2.1.4 Specially protected species

Zannichellia pallustris,Cladium mariscus, Najas marina, Myrica gale.
The habitat of the lake is a relevant place of residence for *Gyraulus crista*.

There are settled populations of the rare species *Carabus clathratus* and *Pericallia matronula* found in the surroundings of the lake.
Several frog species are living and spawning in Sloka lake; otters and bats are breeding there.

4.1.2.2 Use of the lake

The bacteriological quality of the Sloka lake water allows to use it for different recreation objectives, but the lake is not available as a place for swimming due to its morphological characteristics (shallow; thick stratum of sludge).

The main objective of the use of Sloka lake – **relaxation on water** (possibilities to develop the canoeing training) **and vocational fishing/angling**.

Medical mud is extracted from the swamp beside the lake (chapter 3.6.4).

Historically (in the times of Duke Jacob) Sloka lake was used as a fairway from Tukums along Slocene, through Kaņieris and Dūņieris lakes, along Vecslocene to Sloka lake and further to Lielupe and the sea.

4.1.2.3 Influential Factors

Overgrowth of the lake;
Thick sludge stratum;
Shallow water stratum;
Alteration of the Kaņieris – Dūņieris – Vecslocene hydrological system;
Building of the banks of lakes, inlet of polluted waters from Vēršupīte;
The inner biogen load (phosphorus);
Pollution of environment with household waste as a result of non-organised recreation;
Landscape is visually spoiled by the abandoned sapropel pump pontoons and the old boat quayside.

Possible reasons for the low haul:
- during the period of fish spawning fishing is allowed in section from Sloka lake to Lielupe;
- lack of oxygen during the period of ice causes migration of the majority of fish (except crucians) to Vecslocene and Lielupe;
- inlet of sulphur waters from springs to the lake.

4.1.2.4 Objective

To preserve the rare habitats of the lake and the diversity of the rare and protected species in Sloka lake at least in its instant condition, where (picture 15):

- *the rare plant species are found* at least in the instant quantity;
- existence of operating sulphur springs;
- stonewort communities are found at least in the present amount;
- dolomite, sandy and gravely ground occur in the present sites;
- rare stonewort specie *Nitellopsis obtusa* is found;
- the open water area is not less than the present (see aerophoto);
- low concentrations (on average P < 0,04 mg/l) of biogens (nutrients).

4.1.2.5 Activities

Administration	In accordance with RVP and VVI, initialize the changes in the fishing regulations that would prohibit fishing in Vecslocene in section between Sloka lake and Lielupe river during the period of fish migration and spawning. (For the administration of KNP) To activate the contract with Ltd. "Eiropas minerāls" on the medical mud extraction on the banks of Sloka lake. To register the medical mud deposit near Sloka lake in the Land Register on the name of EM. To agree with the Ltd. "Eiropas minerāls" about the quarterly report for the KNP administration on the obtaining/extraction of the natural resources. To provide the information exchange among RVP and the municipalities about the haul limits. To agree with Latvian Environmental Agency about the necessary monitoring to be performed in Sloka lake.
Planning	To elaborate a project in order to facilitate a zone for rest and relaxation (to build a boat quayside, waste bins, toilets, parking places, driveway to the SW bank, etc., considering the shelter belt).
Control	To control the haul limits. To control the hunting process.
Management of the territory	Regularly clean the coast and the coastal zone of the lake from garbage in collaboration with the Jurmala municipality.
Monitoring	To inspect the protected habitats of the lake once in every 3 years, to evaluate its condition and to map the growth of Najas marina and other macrophyte stands.
Research	To manage the investigation of restoring possibilities for Vecslocene hydrological regimen in the span from Kanieris lake to Sloka lake. To evaluate the load of the biogens (phosphorus and nitrogen) of the lake by studying the different point and diffusive biogen sources.

Rules
- To use boats without combustion engines in Sloka lake and Vecslocene river.
- The restoration of fish resources must be done in accordance with the study plan on fish resources.

4.1.2.6 Performance indicators

Purity of the water;
Level and structure of the overgrowth of the lake;
"Health" and distribution of the charophytes;
Productivity of the fish fauna.

4.1.3 Dunieris

The lake is situated in the 5 km zone of the restricted economic activity of the protected belt of Riga Gulf and in the nature protection zone of Kemeri NP to SE of Kaņieris lake.

4.1.3.1 Biological values of the lake

4.1.3.1.1 Characteristic habitats, plant communities and species

No floating or floating-leaf vegetation, the submergent vegetation is composed of sparse growths of *Chara sp*. The overgrowth of the lake is estimated about 25 - 30 %, mainly composed by emergent vegetation. The lake is classified as a singular macrophyte lake.

4.1.3.1.2 Specially protected habitats

Cladium mariscus vegetation along the shoreline, sulphur springs, dolomite ground in lakes, alkaline fens, Purple Moor- grass meadows (picture 16).

4.1.3.1.3 Specially protected species

Cladium mariscus, *Schoenus ferrugineus, Gymnadenia conopsea, Primula farinosa, Pinguicula vulgaris, Myrica gale.* Moss – *Paludella squarrosa.*

Habitats of the annexes I and II of the EU Species and Habitat Directive (92/43/EEC): 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp., 7210* Calcareous fens with *Cladium mariscus* and species of the *Caricion davallinae*, 7230 Alkaline fens, 6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*).

4.1.3.2 Use

Forests of the lake shores are private property.

4.1.3.3 Influencing factors

Overgrowth of the lake;
Previously: disruption of the natural hydrological system Kanieris – Dunieris – Vecslocene;
Potentially: changes of the water-level (both the raising and the lowering);
Drainage of the catchment area.

4.1.3.4 Objective

To preserve the rare habitats and the rare and protected plant species in Dunieris at least in the present condition, where (see picture 16):

- *Cladium mariscus* stands occur in the present quantity;
- Dolomite ground is found;
- Purple Moor- grass meadow is found in Dunieris peninsula;
- Along the south-eastern shore sulphur springs and open alkaline fens are found in the existing area;
- The existing area of open water is preserved (see aerophoto, picture 16).

4.1.3.5 Activities

Monitoring	To evaluate the condition of the protected habitats of the lake once in every 3 years.
Research	To evaluate the hydrobiological condition of the lake.

4.1.3.6 Performance indicators

Cleanness of the water;
Extent and structure of the overgrowth of the lake;
Occurrence of the rare plants.

4.1.4 Aklais lake (Belte lake)

The lake is situated in the territory of Jurmala city in the 5 km zone of limited economical activity of the protected belt of Riga Gulf and in nature protection zone of Kemeri NP, to the south of Sloka lake. The protected belt of the lake has been defined 100 m wide.
Special feature of the lake is the dolomite ground, covered with shallow (10 - 40 cm) water, that forms large areas of dolomite exposures as the water-level lowers.

4.1.4.1 Biological values of the lake

4.1.4.1.1 Typical habitats, plant communities and species

The zone of submergent vegetation of the lake consists of *Chara spp.* The marsh zone consists of reed beds and rush communities. Also the *Utricularia vulgaris* is found there. The floating-leaf and the freely floating vegetation have not formed in the lake.

4.1.4.1.2 Ornitofauna

An interesting lake form the point of view of ornitofauna. Its greatest value is the low dolomite islands, which are appropriate for the nesting of gulls (gull and tern colonies).
Also the Back Stork uses it as a feeding ground.

4.1.4.1.3 Specially protected habitats

Cladium mariscus vegetation on the coasts of lakes (few), dolomite ground in lakes.

Habitats of the annex I of the EU Species and Habitats Directive (92/43/EEC): 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp., 7210* Calcareous fens with *Cladium mariscus* and species of the *Caricion davallinae*.

4.1.4.1.4 Specially protected species

Plants: *Myrica gale*, *Najas marina*, *Cladium mariscus*.
Invertebrates: *Leucorrhinia albifrons* and *Leucorrhinia pectoralis*.

4.1.4.2 Use of the lake

Twigs and buds of a medical plant *Myrica gale* are gathered along the coasts of the lake.
The lake is located close to the area of private gardens of Sloka , therefore it is used for recreation, including driving the motorized transport on the bed of the lake when the water-level is low; making fires on the coasts of the lake (pretty often the bushes *Myrica gale* are burned down).
Potentially: development of nature tourism for specialists and interests groups.

4.1.4.3 Influencing factors

The overgrowth, drying up of the lake;
As a result of unorganized recreation – forest fires (the coastal vegetation is burned down) and affected dolomite ground;
Potentially: pollution with the biogenic elements.

4.1.4.4 Objective

To preserve the specially protected habitats and the populations of specially protected species in Aklais lake at least in its present condition, where:

- dolomite ground is found;
- beds of *Chara spp.* occur in the present quantity;
- small stands of *Cladium mariscus* and at least several exemplars of *Najas marina* are found in the lake;
- the area of open water is not smaller than at present;
- the dolomite islands are covered with low vegetation and at least some *Myrica gale* exemplars are found;
- gull colonies are located on the islands;
- the water-level is stable during the nesting season;
- the lake is not disturbed during the nesting season.

4.1.4.5 Activities

Control	To prohibit driving on the dolomite bed of Aklais lake by any means of transport. To follow the visitors' behaviour by Aklais lake regularly (making of fires, condition of the barrier, etc.)
Management of the territory	To close the road from Kauguri to the lake.
Monitoring	To evaluate the condition of the protected habitats once in every 3 years.

4.1.4.6 Performance indicators

Cleanness of the water;
Level and structure of the overgrowth of the lake;

Health and distribution of stonewort;
Presence of gulls.

4.1.5 Aklais lake (Mazais)

The lake is situated in the territory of Jurmala city in the 5 km zone of limited economical activity of the protected belt of Riga Gulf and in nature protection zone of Kemeri NP, north-westwards from the Sloka lake.

4.1.5.1 Biological values of the lake

4.1.5.1.1 Typical habitats, plant communities and species

Very small and very shallow, silty littoral lagoon-type lake with yellowish-brown water and sloughy coasts. The zone of emergent vegetation of the lake is dominated by rush and reed beds and the zone of submergent vegetation is dominated by naiads and stonewort. The floating-leaf and the freely floating vegetation are not developed. The overgrowth is estimated to be 60 - 70 % of the total area. The lake is classified as a biologically obsolescent diseutrophic macrophyte (coastal clubrush- naiad/ lake.

4.1.5.1.2 Specially protected species

Myrica gale, Cladium mariscus.
Nesting ground of the great bittern *Botaurus stellaris* in humid meadows between Sloka lake and Aklais lake (Mazais).

The spawning area of the *Rana arvalis* – a species of the annex 4 of the EU Habitat Directive.

4.1.5.1.3 Specially protected habitats

Najas marina stands in lakes.

4.1.5.2 Use of the lake

For fishing – insignificant.

4.1.5.3 Influencing factors

Overgrowth of the lake;
Potentially: changes of the wter-level and drainage of the catchment area.

4.1.5.4 Objective

To preserve the specially protected habitats and specially protected species in the Aklais lake, where:

- *Najas marina* stands are found in present quantity;
- At least some exemplars of *Cladium mariscus* and *Myrica gale* are found on the coasts of the lake.
- The great bittern *Botaurus stellaris* is nesting in the humid meadows.

4.1.5.5 Activities

No management activities are required.

Monitoring	To observe the condition of the Aklais (Mazais) lake habitats once in every 3 years. To carry out regular inventories of Great Bittern.

4.1.6 Valgums lake

The Valgums lake is found in the landscape protection zone. It is a public lake.

4.1.6.1 Description of the lake

Valgums lake is located in a subglacial depression, area of the lake is 60 ha, average depth - 10,4 m, the maximal depth - 27m.
The shelter belt of Valgums lake is at least 100 m.

A considerable lack of oxygen has been observed in the deeper layers of the lake during summer and winter:

- gradual exhaustion of oxygen in the beginning of summer (from the depth of 14 m – under 2,0 mg/l, anoxy* from the depth of 16 m);
- in midsummer and at the end of summer total lack of oxygen in all hypolimnion** (from the depth of 5-7 m);
- gradual exhaustion of oxygen during the period of ice cover(from the depth of 10 m the O_2 concentrations are under 2 mg/l, total anoxy from the depth of 17 m).

V**ery high concentrations of the total phosphorus (P)** (epilimnion*** 2,3 mg/l) is characteristic to Valgums lake, that corresponds to the condition of hypereutrophic lake and very bad ecological quality (very high concentrations of nutrients, high biomasses of phytoplankton and potentially bloom of toxic algae).

Total overgrowth of the lake is very little (3%) due to the steep slopes of underwater shores and the poor water transparency of the lake.

4.1.6.2 Biological value of the lake

Specially protected species: *Myotis dasycneme* is feeding above the lake, otter.

4.1.6.3 Use of the lake

The lake is a popular site for recreation, boating and angling/fishing. Also an illegal fishing without a licences takes place. There is a great pressure to transform the land in private properties for building, as the surroundings of the lake are of high landscape value (see the landscape description in chapter 5.3.1.2).

4.1.6.4 Influencing factors

1) The biogen concentrations of the Valgums lake have a tendency to increase (in the period of 1997 - 2000), it is caused by the biogen (phosphorus and nitrogen) load from the Slocene river.

As the Slocene river flows into the Valgums lake:
P - 0, 25 mg/l , N - 2,2 mg/l.

The phosphorus concentrations in Slocene river before the inlet into the Valgums lake substantially exceed the EU guidelines for carp fish waters (0,13 mg/l);

The pollution of Slocene river is interconnected with the influence of the Tukums town, especially Tukums waste water treatment plant (WWTP):

- The outflow of the Tukums WWTP contains very high biogen concentrations (P - 5,3 mg/l, N - 11,6 mg/l);
- The Tukums WWTP has no tertiary treatment facilities, e. i., no sedimentation of phosphorus, therefore only 25-40% of the initial amount of phosphorus are removed.

2) The runoff of the catchment area (natural fluctuations).
3) Potentially: drainage of the catchement area, use of mineral fertilizers in the agricultural lands close the lake, as a result of the building up– pollution of the lake with the household wastewater.

4.1.6.5 Objective

To improve the condition of the lake and to preserve the landscape and recreational values of Valgums lake.

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* without oxygen
** in the upper water layer of the lake
*** in the deepest water layer of the lake

The desired optimal condition of the lake:
eutrophic lake with medium trophic and medium ecological quality:
- moderate biogen concentrations (average concentration of total phosphorus in epilimnion P < 0,1 mg/l);
- medium biomass of phytoplankton (< 10 mg/l);
- medium chlorophyll concentrations (average in a vegetation period < 25 μg/l, maximal < 75 μg/l);
- medium water transparency (average Secchi disk depth> 1,5 m, minimal >1,0 m);
- no bloom of the potentially toxic blue-green algae;
- microbiological parameters correspond the bathing water standards,
- the lake can be used for recreation (swimming, boating, fishing).

At present the lake does not correspond to the optimal condition and the possibilities of its use are limited.

4.1.6.4 Activities

Administration	To elaborate the management regulations in co-operation with the municipality. To introduce the monitoring program of the lake in co-operation with the Latvian Environmental Agency.
Control	To carry out the restrictions of boat use and the control of the haul limits.
Information	To raise the public awareness about the water quality of Valgums lake.
Management of the territory	To establish a place of recreation in the N coast of the lake, in the landscape zone (to improve the road, to set up a camping site and an information stand).
Monitoring	To introduce a complex monitoring program (annex 29), paying special attention to: ▪ biogen concentrations; ▪ phytoplankton cenosis (indicates eutrophication of the lake); ▪ composition and quantity of fish fauna (in case the lake is used for fishing); ▪ the microbiological parameters (in case the lake is used as a place for swimming). (see the monitoring programme in chapter11.7).
Co-operation	To organize a public council for the management of the lake.
Research	To evaluate the budget of the biogens (nutrients) of the lake.

- **Restrictions** – To use the boats (without internal combustion engines) in Valgums Lake only from the boat rental sites.
- The restoration of fish resources is allowed in accordance with the survey plan on fish resources.

See the management terms for the lands by the Valgums lake in chapter 5.3.1.2.

4.1.6.5 Performance indicators
Cleanness of the water.

4.1.7 Melnezers

The lake is situated in the 5 km zone of limited economical activity of the protected belt of Riga Gulf, in nature protection zone of Kemeri NP, 3-4 km from Kemeri on the way to Jaunkemeri. The protected belt of the lake is 100 m.

4.1.7.1 Biological value of the lake

The coasts are low, peaty, overgrown with pine trees. Practically no emergent vegetation is found, only a small reed bed in the southern part of the lake. The floating-leaf vegetation is consists of the beds of *Nymphaea candida*, that occupy 30 - 40 % of the lake surface. Melnezers is classified as a diseutrophic (water lily - sphagnum) lake.

4.1.7.2 Use of the lake

A favourite bathing-place for Kemeri inhabitants. Melnezers is used as a place of recreation (fires are made), frequently littering the coasts and the bed of the lake (broken glass, etc.).

4.1.7.3 Influencing factors

Inflow form the catchment area (natural fluctuations);
As a result of unorganized recreation, litter spoils the landscape and the water quality of the lake;
Thick layer of mud;
Shallow water;
Inner load of biogens (nutrients).

4.1.7.4 Objective

To maintain the present condition of the lake, prevent the further increase of biogen concentrations.

4.1.7.5 Activities

Administration	To agree with the Latvian Environmental Agency on the implementation of the monitoring program of the lake.
Control	To follow the visitors' behaviour at the lake (fires, car washing, garbage, etc.).
Management of the territory	To remove the garbage from the coast and the coastal zone. To develop recreation facilities in the coastal zone (waste bins, toilets, parking places etc, following the restrictions of the protected belt and in cooperation with Jurmala municipality).
Monitoring	To introduce an integrated monitoring programme (annex 29), paying special attention to: ▪ the biogen concentrations; ▪ macrophyte, phytoplankton and zooplankton cenosis (indicating eutrophication of the lake).

Restrictions –

- To use boats without combustion engines in the lake.

4.1.7.6 Performance indicators

Cleanness of the water;
Improvements of the infrastructure (a parking place, camping place).

4.1.8 Akacis and dystrophic bog lakes

4.1.8.1 Description of the lakes

Akacis is found in the nature protection zone of Kemeri NP, in Sloka bog, to the southwest of the Sloka lake. Coasts of Akacis lake are mostly low, peaty, bluff in places, overgrown with narrow belt of pine trees. The macrophyte zones are fragmentary and only partly formed, the total overgrowth of the lake is very little - 5 %. According to the hydro chemical parameters, the lake can be classified as a **typical dystrophic lake** (low pH, low content of ions, high content of humus, relatively low biogen concentrations).

4 **little lakes** have been surveyed in the Vecais bog in the surroundings of Akacis lake. These lakes are classified as typical dystrophic lakes with brown water, peaty coasts and ground. The water-plant vegetation is represented just by *Sphagnum sp.*, *Carex rostrata* stands and several water lilies.

4.1.8.2 Biological values of the lake

4.1.8.2.1 Typical habitats, plant communities and species

Sedge- sphagnum and sphagnum swamp zone have formed along the coast of Akacis. The macrophyte zones are fragmentary and only partly formed. The emergent vegetation is composed by several little bulrush beds in the central part of the lake.
The floating-leaf vegetation is composed by sparse stands of the *Nymphaea candida* in the central part of the lake and small *Sparganium angustifolium* stands near the north-eastern coast of the lake.

4.1.8.2.2 Specially protected habitats

Distrophic waters.

4.1.8.3.3 Specially protected species

In Akacis - *Sparganium angustifolium*. In Vecais bog – *Trichophorum cespitosum*.
Rare plant species and communities are not typical for bog lakes.

There is a locality of the **Smooth snake** *Coronella austriaca* in the coastal zone of the Akacis lake.

4.1.8.3 Use of the lakes

The **natural** morphometrical (shallow lakes with soft sludgy/peaty ground), hydro chemical (high content of humus) and hydro biological (low productivity, poor fish fauna) features of the lakes substantially decrease the possibilities to use them, nevertheless, Akacis is used for fishing (it is indicated by litter on the shores of the lake).
Akacis is an interesting bog lake from the landscape point of view, it should be included in the tourism route.

4.1.8.4 Influencing factors

Anthropogenic influence – recreation;
Inflow from the anthropogenically influenced catchment area;
Potentially: overgrowth of the lake, drainage of the bog, peat extraction from the surrounding areas;
Potentially: drainage of the catchment area.

4.1.8.5 Objective

To maintain the lakes in the present condition without anthropogenic influence (with low amount of nutrients).

4.1.8.6 Activities

Administration	To agree with the Latvian Environmental Agency on the introduction of the monitoring programme to the Akacis lake.
Monitoring	To introduce an integrated monitoring programme (annex 29).
Research	To survey the bog lakes of Ķemeri NP, to evaluate their condition.

- The bog lakes and the peat extraction fields should not be used for boating!

4.1.8.7 Performance indicators

Cleanness of the water;
Water pH.

4.1.9 Putnezers

The lake is situated in the 5 km zone of limited economical activity of the protected belt of Riga Gulf, in Raganu bog, north-westwards from the Melnezers, in the nature protection zone of Kemeri NP.

4.1.9.1 Description of the lake

Very peculiar bog (distrophic) lake, remarkable for its great water level fluctuations. During the survey (end of August 2000) the water level was very low, the area of the lake had diminished by 2/3 in comparison with the initial level. There is a wide peaty zone exposed along the shores of the lake, small pools with Sphagnum moss have been preserved in the deepest places of the lake, several water-lilies are found among them, some pools are without vegetation. Small belts and groups of *Carex rostrata* are found along the pools and along the initial shoreline.

4.1.9.2 Biological values of the lake

Protected habitat: distrophic waters.
Migratory birds use the lake as a resting ground (depends on the water level).
Potential nesting ground for Wood Sandpiper.

4.1.9.3 Use of the lake

Cranberries growing on the lakeshores and on the islands are gathered.
Sometimes illegal hunting of waterfowl takes place.
Potentially: perspective site for the development of nature tourism for specialists and the interest groups.

4.1.9.2 Objective

To maintain a distrophic lake with the characteristic water-level fluctuations.

4.1.9.3 Influencing factors

Overgrowth of the lake;
Historically – drainage of the bog, changes of the hydrological regime.

4.1.9.4 Activities

Control	To carry out regular inspection during the bird migration period.
Research	To survey the water level in order to find the reasons for the fluctuations.

4.1.10 Kalnciems dolomite quarries

4.1.10.1 General description

Special freshwater habitats of Ķemeri National Park are found in the old Kalnciems dolomite quarries near Kaļķis. There three water reservoirs have formed – the Sahalīna pond and the Southern and the Northern ponds, named according their location (picture 17). Dolomite ground and small dolomite outcrops along the shores, depth of several meters and typical lake vegetation are characteristic to them.
The Northern pond is located in the landscape protection zone of the national park, the Southern pond – in the neutral zone, but the Sahalīna pond – in the nature protection zone (picture 17).

4.1.10.2 Biological values

Sahalīna pond is remarkable for its clear water and well formed submergent vegetation. The Northern pond is very different, because of the inflow of the bog water. The water of this pond is dark brown and, except the coastal reed zone, there is no water plant vegetation. The Noble crayfish *Astactus astacus* have been found in the Southern pond, but in the Northern pond there are great concentration of waterfowl. The Southern and the Sahalīna ponds are classified as eutrophic – low eutrophic (rich in nutrients), but the Northern pond – as distrophic.

Ornithologically the most important of all the three elaborated and flooded quarries is the Sahalīna pond. Its islands are occupied by gull colonies (after the removal of bushes in spring 2000) (picture 17).

The lakes are a feeding ground for specially protected bird species (included also in the annex II of the EU Directive)- Pond Bat *Myotis dasycneme*.

4.1.10.3 Use of the ponds

The ponds are used for fishing and (unorganized) recreation;
For birdwatching;
Potentially – good possibilities for diving tourism as well as underwater hunting, breeding fish specially for this purpose;
As a tourism object – the dolomite quarries have interesting history – it is a former site of penal servitude.

4.1.10.4 Influencing factors

Overgrowth of the ponds – a little;
Potentially: recreation (the number of visitors is expected to increase in the future), that could affect the nesting success of the breeding birds;
Potentially: inflow of bog waters in the Sahalīna and Southern ponds.

4.1.10.5 Objective

To preserve the specific and rare habitats of Sahalīna and Northern ponds, their hydrological qualities as well as the rare and protected species at least in their present condition, where:

- the dolomite ground is found in its present amount;
- water in Sahalīna pond is clear, yellow-green;
- water in the Northern pond is distrophic;
- *Astactus astacus* is found in the Southern pool.
-

4.1.10.6 Activities

Administration	To support the private land owners' initiative to improve the recreation facilities of the territory.
Management of the territory/ Infrastructure	To put up an information stand at the boat station on the shore of the quarry, with would give information on the ornithological importance of this place and would ask to not to visit the islands during the breeding season.
Habitat management	To clean the islands from the overgrowth at least once in every 3 years (picture 17).
Monitoring	To follow the overgrowth of the islands of the Sahalīna pond.
Research	To carry out the inventory of the specially protected plant species. To study the Southern and Sahalīna ponds from the point of view of the development of fishery and commercial fishing, drafting a plan for restoration of fish resources.

	To study the possibilities for Scuba diving.

Restrictions –

- To use boats without internal combustion engines in the Northern and the Southern ponds (in the landscape and neutral zone).
- To use boats without internal combustion engines in Sahalīna pond (in nature protection zone), following the terms – only from July 20.
-

4.1.10.7 Indicators

Islands covered with low vegetation;
Gull colonies on the islands;
Islands are not visited during the nesting season;
Well kept infrastructure, no garbage on the coasts of the ponds.

4.2 Rivers

The rivers of Ķemeri NP are small (except Lielupe) and slowly flowing, meandering.

4.2.1 Lielupe

The major river of Zemgale and of the national park. The eastern border of Kemeri NP has been defined by the central line of Lielupe.

4.2.1.1 Biological values

Specially protected species: migratory birds – whooper swan, goosander, great bittern, Savi's warbler, marsh harrier. A feeding habitat for white-tailed eagle, osprey, pond bat and other bat species.
A habitat for otters and beavers; fish migration path for vimbas, lampreys, zanders, eels.

4.2.1.2 Use of the river

Angling, ice fishing, fishing (the haul limits are defined in the whole river proportionately between municipalities – chapter 3.6.2).
Waterfowl hunting (hunting licences are not issued for the river part included into Kemeri NP).
Recreation – relatively poorly developed, canoeing, going by motorboats, surfboards, waterskiing isn't organised.
Historically – an ancient shipping route to Zemgale harbour.

4.2.1.3 Influencing factors

Have not been studied.

4.2.1.4 Objective

To promote the development of water tourism in Lielupe.

4.2.1.5 Activities

Administration	To collaborate with private businesses for the development of aquatic tourism (establishing a canoe boat station at the river Lielupe).
Planning	To choose a route for water tourism, boat stations, stops at the banks of Lielupe. To draft a development conception of the Zemgale harbour in collaboration with the Kalnciems municipality.
Research	To carry out the inventory of Lielupe's habitats.

- **Suggestion** for boating in Lielupe – freely, without restrictions, but landing in the territory of KNP should be allowed in specified sites only.

4.2.2 Slocene (Pulkaine)

Almost the whole length of the Slocene river is located in the nature reserve zone, except the upper course (from the lake Valgums to Skudrupīte), that is situated in the landscape protection zone, but the lower reaches (starting from Samaloms) – in the strict nature reserve zone (picture 2).

4.2.2.1 Biological values

Specially protected species: black stork, kingfisher, dipper (use the river as a feeding habitat).
Slocene is a feeding habitat and a migration passage for otters, pond bats and water bats. The river is also a habitat for specially protected species – *Theodoxus fluviatilis*, *Ancylus fluviatilis* and *Unio crassus*.
A pair of ospreys is nesting in the coastal forests of the river.

Potentially **specially protected habitats**: stone concentrations in rivers, shingle shoals in rivers, sandbanks in rivers, rapids in rivers, estuaries (complex of wet alluvial forests and quagmires within the strict nature reserve zone).
A beaver reintroduction site in the 1960s.
Stands of *Euphorbia palustris* are found along the river.

4.2.2.2 Use of the river

The Slocene is a popular fishing place along its whole length (also in the strict nature protection zone).

An interesting river in terms of the landscape that could be called a "jungle river" in the lower reaches, as it leaves an impression of primeval nature (flows slowly, the banks are flat, wet, with dead trees in some). Available for limited canoeing.

4.2.2.3 Influencing factors

Changes of the hydrological regime by building dams, small hydroelectric power stations;
Inlet of polluted waters from the Tukums WWTP (chapter 4.1.6);
Litter left in the fishermen's campsites (as well as in the river) spoils the landscape of the river ("by the oak", by the "Kungu road", plastic garbage floating in the lower reaches of the river);
Potentially: drainage of the river-basin, use of mineral fertilizers in agricultural lands;
Potentially: a too high visitor number on canoe trips;
Stands of *Heracleum sibiricum* are spreading down from the upper course of the river; however, it does not yet endanger the flora of the park.

4.2.2.4 Objective

To preserve the present state of the Slocene habitats that provide habitats and feeding conditions for specially protected species.

4.2.2.5 Activities

Control	To ensure implementation of the visiting and fishing regulations of the river Slocene.
Information	To prepare information materials about the canoe trips.
Management of the territory	To arrange a campsite, a fireplace near "the oak", from where the boat routes start. To set up information signs around the strict nature reserve zone. To collect litter regularly from the river and its banks.
Research	To carry out the inventory of the habitats of the river Slocene. To define the limit of boat runs in the lower reaches of the river. To control spreading of *Heracleum sibiricum* along the Slocene river.

Restrictions –

- To use boats without combustion engines and only when accompanied by a guide (to organise the boat runs no more than once in a week for one group).
- Fishing is allowed out of the strict reserve zone, after June 20.

4.2.2.6 Indicators

Behaviour of ospreys during the nesting period.

4.2.3 Vēršupīte

4.2.3.1 Biological values

Sulphur springs outflow along the river (chapter 3.2.5.);
Feeding ground for the black stork.
Migration path for bats.
Habitat for beavers, otters.
Wet deciduous forests in the floodplain of Vēršupīte host *Helix pomatia* – a species of the Annex 5 of the EU Directive and a Latvian specially protected species of restricted use.

4.2.3.2 Use of the river

Waters of both the Smārde and the Kemeri sewage treatment plants (STP) and the ditch outlet of the Kemeri melioration system are let into Vēršupīte.
Cultural history. In the times of zenith of the health resort, different activities were held on the riverside – small bridges built over the river in the Kemeri park, the Love Island with rotunda (chapter 3.5.1). In Kemeri, there are remains of the former river sluice.

4.2.3.3 Influencing factors

The melioration in the upper course of the river causes an increased water supply in the lower reaches which provokes floods in Kemeri in cases of heavy rainfall;

The inflow of polluted waters deteriorates the quality both in the river and the lake Sloka;
The household waste (plastic bottles, polyethylene, tins etc.) from Kemeri drifts to the lower reaches of the river which spoils the landscape of the floodplain forests where a footpath in a swamp forest was established (near "Meža Māja)".

4.2.3.4 Objective

To maintain an attractive environment along the river Vēršupīte, without floating garbage and littered floodplain forests and meadows, as well as to improve the water quality of the river.

4.2.3.5 Activities

Administration	To improve the function of the Kemeri STP (to eliminate the inflow of polluted waters into Vēršupīte). To solve the problems of the Sloka and Vēršupīte in collaboration with the Lielrīga Environmental Regional Board and the Jūrmala Council. To join the Jūrmala city project in order to solve the sewage problem of "Meža māja".
Management of the territory	To install a net in a river by the footpath near "Meža māja" in order to hold up the floating garbage. To repair the bridge over Vēršupīte near "Meža māja". To maintain the footpath (to restore broken sections, to set up lateral barriers, to put riddles to prevent slipping). To set up signs to show the direction of the footpath.

Restrictions –

- To use boats without combustion engines in Vēršupīte.

4.2.4 Kauguri channel (Džūkste river)

An artificial watercourse that was created by straightening a part of the original Džūkste river and letting it into Lielupe by a short-cut. The Kauguri channel is a good example of re-naturalisation processes of the artificial watercourse, where meandering of the river takes place. There are relatively many fallen trees in the river.

4.2.4.1 Biological values

Specially protected species of restricted use – a spawning site for the river lamprey (the only one in the territory of Kemeri NP).
For specially protected species: a nesting ground for kingfisher (2-4 pairs), feeding ground for the black stork (~2 pairs), dipper, feeding ground for pond bat and water bat. A habitat for otters and beavers.
Unio crassus (species of Annexes II and IV of the EU Directive) and *Armiger cristata* have been recorded in the Kauguri channel (Džūkste river), but *Vertigo angustior* (species of Annex II of the EU Directive) and *Clausilia dubia* - in the wet coastal forests of the Džūkste river's valley.

4.2.4.2 Use of the river

Potentially for boating, fishing.

4.2.4.3 Influencing factors

In the past - melioration;
Potentially: clearing the river from the windfallen wood;
Uncontrolled tourism.

4.2.4.4 Objective

To maintain the habitats of the Kauguri channel with their specially protected species, where:
lampreys spawn in the river, kingfisher is nesting, black storks and bats are feeding, the protected snail species occur.

4.2.4.5 Activities

Research	To carry out the inventory of the habitats of Džūkste river (Kauguri channel). To study distribution of the *Vertigo angustior* population.

Restrictions –

- Not to take away the windfallen wood from the river, not to organize campsites on the riverside in the strict nature protection zone.
- To fish only from the bank!
- Any digging or river's meandering measures that damage soils may be performed only after investigation of the distribution of the micropopulation of *Vertigo angustior* in order to prevent its extermination.

4.3 Seashore*

Characteristics of the coastal territories of Kemeri National Park

4.3.1 Biological values

By evaluating coastal habitats and their conservation priorities, one must remember, that it is impossible or very difficult to preserve an individual habitat on the coast. It is necessary to protect the whole complexes, namely, particular sections of the coast that would include conservation priorities of the coast - beach, primary dunes and secondary dunes.

4.3.1.1 Sea littoral zone

The coast of the Riga Gulf is important as a resting ground for migrating birds. "The western coast of the Riga Gulf" is an important bird area (IBA) that also includes the northern border of Kemeri NP on 10 meters izobate (Fig. 18).

The inventory on the specially protected habitats has not been performed in the sea littoral zone. In the Siliņupīte estuary, there are sandbanks with stones in the sea.

4.3.1.2 Beaches

4.3.1.2.1 Sandy beaches

Distribution – from Klapkalnciems to the Ragaciems cape, Jaunķemeri, Kauguri. The width of the beaches is about 25-35 m; vegetation is composed of sparsely growing plants: *Salsola kali*, *Cakile baltica*, in some places *Honckenya peploides,* more rare - *Corispermum intermedium*.

On the beach silt, rich fauna of aquatic insect develop, especially dipteran fauna, that ensure a food base for coastal insectivores and *Cicindela maritima*.

4.3.1.2.2 Sandy beaches with pebbles and dolomite flinders

The width 10-25 m; from Ragaciems to the estuary of Siliņupe, Bigauņciems. Vegetation is very poor or absent. In September, brown algae are abundantly washed ashore, covering the whole beach in some places. In dolomite flinders, fossils may be found.

4.3.1.2.3 Low and wet beaches with pools

In several places between Ragaciems and Lapmežciems. Very rich vegetation. Orach, rush and goosefoot plant communities dominate there. 15-20 plant species are found in a small area. In pools, rich water insect fauna develops.

Attention must be paid to the sections where the **annual vegetation on drift lines** has formed. In some places between the beach and dunes or on the beach, brown algae and other silt are richly washed ashore, and a rich vegetation develops on it in the end of summer and in autumn. This is a habitat for ***Atriplex calotheca***, in some places also for *Juncus balticus*.

4.3.1.3 Dunes

The **embryonic shifting dunes** are well represented in Kemeri National Park. Those are variable in terms of both the species composition and plant communities and their structure. More widely these dunes are represented in places where active accumulation processes take place, namely, between Lāčupīte estuary and Ragaciems, in Jaunķemeri and Kauguri. The embryonic shifting dunes are fairly vital and typical in these sections, therefore, may be sufficiently representative for conservation of this habitat. The most typical plant species are as follows: *Leymys arenarius*, *Honckenia peploides, Salsola kali*, in some places also *Elytrigia x littorea.*

The shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) are spread like the embryonic shifting dunes, composing in many places a unified complex of primary dunes. The most common plant communities are of *Leymys arenarius* - *Festuca arenaria*, *Leymys arenarius* - *Honckenia peploides* or *Leymys arenarius* plant communities. The average height of the white dunes is 0.5-1.5 m.

* The inventory of the coast was carried out in 2000, but in 2001-2002, storms washed away embryonic shifting dunes, the white and the grey dunes, also the bluff was affected by tearing away the vegetation cover falling several pine trees. The description of the ĶNP seashore is kept as a reference point for monitoring implementation.

Shifting dunes along the shoreline is the basic habitat for *Cicindela maritima*.

The fixed coastal dunes with herbaceous vegetation (grey dunes) is the most endangered habitat, therefore, special activities for its conservation should be undertaken. This is also a habitat for *Dianthus arenaria* (species of Annex II of the EU Directive). Grey dunes are little represented in Kemeri National Park, as the primary dunes mostly border with the forest or sinanthropic (related to human activities) habitats, however, their conservation is relevant for the protection of this habitats in Latvia and in Europe. By protecting grey dunes, also conservation of *Anthyllis maritima* and *Tragopogon heterospermus* will be facilitated as these species grow in this habitat.

Grey dunes mostly form at the section of the coast opposite Gausā jūdze. Those are young grey dunes only few meters wide. Vegetation of these dunes is composed of moss, lichens, *Artemisia campestris, Thymus serpyllum*, *Hieracium umbelatum*, *Sedum acre* and other plants.
A variety of digging insects (spider wasps, wolf spiders) and orthoptera is typical for grey dunes.

4.3.1.4 Erosion coasts (bluffs)

At present, silent erosion coasts are found between Klapkalnciems and the Ragaciems cape. According to V. Ulsts, the "basic coast" in this section is formed by the strip of Littorina dunes with a 2.5-5 m high leaching ridge. During storms, white dunes are washed away (more often in the southern part) and consequently the coastal ridge of the Litorina sea erodes, as it happened in storms of 2001. There are pines and rowans growing on the erosion coast.

4.3.1.5 Dune forests

Those are dune forests where old forest compartments have been preserved in the so-called "Gausā jūdze" and in Jaunķemeri – Kauguri section, where forest key habitats have been designated (Fig. 18). Dune forests function as a coastal protective zone.

4.3.1.6 Estuaries

River estuaries increase the coastal biodiversity. On their banks, aquatic plant species occur, mostly reeds, clubrushes etc. Rivers enrich the beach and primary dunes by their silt, thereby providing conditions for vegetation's development in these habitats.
The section from the Starpiņupe estuary to the former missile base is a very attractive site for migrating waterfowl, waders (wood sandpiper, redshank occur) from the end of July to the beginning of September.
It is a suitable habitat for natterjack *Bufo calamita*.

4.3.1.7 Sinanthropic habitats

In the coastal zone, there are many sinanthropic habitats originated as a result of human activity. Those are lawns, flowerbeds, hedgerows, gardens, dumpsites (weeds, household waste).

4.3.1.8 Specially protected habitats

Fixed coastal dunes with low herbaceous vegetation. From the viewpoint of nature conservation, the most important territories are: Klapkalnciems – Ragaciems, Siliņupe's estuary, Jaunķemeri (Fig. 18).
Habitats of Annex I of the EU Species and Habitats Directive (92/43/EEC), that are found in Kemeri National Park:

- 2110 Embryonic shifting dunes
- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
- 2130* Fixed coastal dunes with herbaceous vegetation (grey dunes)
- 2180 Wooded dunes of the Atlantic, Continental and Boreal region
- 1210 Annual vegetation of drift lines

4.3.1.9 Specially protected species

A plant species of Annex II of the EU Species and Habitats Directive has been recorded on the coast of Kemeri National Park - *Dianthus arenarius subsp. arenarius*.
Specially protected plant species: *Atriplex calotheca,* specially protected species of restricted use - *Lycopodium annotinum* and *Lycopodium clavatum.*

Notorina punctata occurs in the old dune pine stands, where there are good nesting possibilities for specially protected birds: stock dove, black woodpecker and nightjar. Shelduck is nesting in the seashore section from Ragaciems to Lapmežciems (using for this purpose fishermen sheds).
Rare species**:** *Anthyllis maritima, Corispermum intermedium, Juncus balticus, Tragopogon heterospermus.*

4.3.2 Use of the seashore

4.3.2.1 Fishery, the involving actions

In the coastal section from Ragaciems to Bigauņciems, fishery is intensively developed. There is a boat road to the sea almost from every house. Consequently, the major part of the white dunes is destroyed or very degraded, especially in the northern part of Ragaciems. Further towards Lapmežciems, boats are kept in groups. In Ragaciems and Lapmežciems, there is a wide supply of smoked fish "at roadsides" – for passing tourists.

4.3.2.2 Building/ Construction

Bigauņciems, Lapmežciems and Ragaciems are coastal territories with dense building. Unfortunately, currently there is a tendency to build very close to the sea, thus destroying even the white dunes replacing them with flowerbeds, hedgerows, gardens or building a concrete road over the dune.

4.3.2.3 Activities of holiday-makers and tourists

For recreation, the coast from Klapkalciems to Ragaciems is mainly used (there are two parking places arranged, which are managed by the Lapmežciems rural municipality Ltd.), but the beach has no facilities. Fire sites are found in many places, here and there groundcover is degraded or even completely destroyed due to the high anthropogenic pressure and the lack of facilities.
Jaunķemeri beach has got facilities according to the beach arrangement requirements (a candidate to the "blue flag" beach status), wherewith the beach is regularly made light, both the litter and the sea wash-outs are amassed (the latter are stoved on the white dunes).

4.3.2.4 Using motorized transport in dunes and in the beach

Specially rutted dunes and beach are found around the Ragaciems cape, northwards from it as well as between Ragaciems and Bigauņciems.

4.3.2.5 Cultural history

"Gausā jūdze" – such a name is given for the old road along the coastal pine forests from Klapkalnciems to Ragaciems.
On the sea coast – in the dunes, there is a commemoration sign set in the place where a Finnish division fought during the WWI.
Alternative therapy – A.Rudzītis offers a sauna in the sea (sea water is used).

4.3.3 Influencing factors

Natural development processes
Coastal development: inflow of collecting materials and sedimentation of collecting materials from the flow.
Introduction of spruce-tree regeneration stand into pine forests, it shades pine trunks from the direct sunlight (an important condition for the wood-fretter ecology).
Introduced, aggressive plant species. Occurrence of *Rosa rugosa* and *Lactuca tatarica* is proven in several places in dunes. Those species are introduced to the Latvian flora and are very aggressive - grow fast, spread and may endanger native species and habitats. As both species currently occur in relatively small areas on the coast of Kemeri National Park, there is no specific danger yet.
Non-organized recreation - recreation, entertainment (trampled vegetation, polluted environment). Presence of dogs in around Starpiņupīte's estuary disturb feeding and resting of migrating birds.
Beach with facilities, where all the silt is removed from the sea, the sand of the beach is made light, thereby destroying the habitat which is relevant to the seashore invertebrate fauna, for birds' feeding conditions.
Building in the dunes – in populated areas, down to the beach. It must be noted that during heavy storms, all the buildings close to the beach are endangered, fences, greenery, gardens and lawns are washed away.
Inhabitants of Lapmežciems community want to receive 117 ha of pine forests in Gausā jūdze as compensation lands (for the meadows inundated by the lake Kaņieris).

4.3.4 Objective

To preserve natural habitats of the coast, and the diversity of native species occurring there , where:

- in the mentioned coastal sections dominate natural dune habitats, beaches and erosion coasts with low human impact;
- as well as intact forest habitats (stock dove, black woodpecker are nesting) and river estuaries (Siliņupe) with typical plant species;
- migrating waterfowl and waders stay in river estuaries;
- in the section Ragaciems – Jaunķemeri, Shelduck is nesting (2-3 pairs);
- "Gausā jūdze" is not built up in the seashore section Klapkalnciems - Ragaciems .
-

4.3.5 Activities

Administration	To support the local production market by introducing principles of the European Tourism Charter and developing a balanced tourism. To collaborate with the Sea Environmental Board in order to collect information about the fishing quota issued and the haul amount in the littoral of Ķemeri NP. To collect and to sum up the information about the hydrological quality of the coast of KNP in collaboration with the Institute of Hydroecology of LU. To achieve facilitation and regular maintenance of the resting sites on the coast from Klapkalnciems to Ragaciems (priority – bluff-strengthening against the installed footpaths, setting up waste bins).
Planning	To elaborate the coastal recreation plan for the territory of KNP. In collaboration with the Lapmežciems municipality, to consider a possibility to enlarge the parking place that is located closer to Klapkalnciems in the Gausā jūdze section. To choose sites for perspective parking places (not more than two) in "Gausā jūdze". To draw up the terms for their arrangement. To plan the places that are specially allocated for waterbike riding in collaboration with Jūrmala and Lapmežciems local authorities.
Control	To prevent dogs roaming in places important for bird resting (Starpiņupīte's estuary). To control the observance of dune protective zone regime in collaboration with RVP.
Information	To discuss with fishermen the question of how to better preserve white dunes and other natural coastal habitats, at the same time continuing fishery development.
Monitoring	To control the condition of *Rosa rugosa* and *Lactuca tatarica* populations in the coastal territory of Ķemeri National Park. An integrated monitoring would be necessary in Ķemeri National Park that would be connected with the integrated coastal monitoring in Latvia. Currently, methods are being elaborated and funds are being searched for such a monitoring. That could be managed by a botanist and a zoologist of the national park. It is recommended to install the permanent sampling plots.
Research	Studies of the anthropogenic pressure (instant, allowable) on the coast are necessary, especially in the nature protection zone. (see also Laime, 2000 nature protection plan for the beach and the primary dunes). To perform the inventory of the coastal habitats (brown alga *Fucus spp.* stands, possibly – dolomite bottom in the sea). To study the potential locality of the natterjack *Bufo calamita* in the Starpiņupe estuary.

4.3.6 Indicators of the coast's quality

A method for qualifying the condition of dunes and other coastal habitats by indicator species has not yet been elaborated in Latvia. The quality of coastal habitats may be discussed by evaluating the ratio of native species to introduced species and species atypical for the coast (weeds etc.). When evaluating coastal habitats, their geomorphology and plant communities should be primarily considered.

4.4 Swamps

Criteria elaborated in Norway were used for the qualification of nature conservation values of swamps (Moen, 1995). Swamp values are summed in a table (annex 18). Especially important criteria are marked with an asterisk. The more asterisks there are, the more important is the criterion.

4.4.1 Lielais Ķemeri raised bog

One of the largest raised bogs in Latvia (area - 6192 ha) with a diverse mosaic of bog pools, an important nesting site for swamp birds. According to the swamp morphology – slope swamp (Markots, Zelčs, 1995).
The raised bog is situated in the nature protection zone, but the medium part of it – in the nature reserve zone (picture. 2).

4.4.1.1 Characteristics of the bog

Peat extraction was carried out in the north-eastern part of the bog, configuration ditches were dug around the bog. Consequently, the water level of the bog has decreased, and it is overgrowing by pines. Several mineral soil peninsulas covered by pinewood and mixed forest jut out into the swamp. Rare and protected moss and lichen species have been recorded in the south-eastern peninsula of the bog. From the SE part of the bog, the Lāču brook flows out, but the bed of the brook that flows out from the NE side of the bog was changed because of peat extraction. Occur small dystrophic bog lakes, pool labyrinths, distinguished complex of hummocks and depressions. Hummocks are composed of *Sphagnum magellanicum, Sphagnum fuscum* and *Sphagnum rubellum.* In the lower parts of the hummocks, *Sphagnum flexuosum* grows. The most common species on hummocks are *Calluna vulgaris, Eriophorum vaginatum, Rubus chamaemorus, Andromeda polifolia.* In depressions, *Rhynchospora alba*, *Scheuchzeria palustris* and *Carex limosa* frequently occur. In depressions, there are *Sphagnum tenellum, Sphagnum cuspidatum.*

On the edges of the bog, transition mire vegetation occur where *Carex rostrata* dominates. In the raised bog, also the species typical for the eastern type raised bogs can be found – *Chamaedaphne calyculata*.

4.4.1.2 Biological values

4.4.1.2.1 Specially protected species

Odontoschisma sphagni, Calypogeia sphagnicola, Geocalyx graveolens, Odontoschisma denudatum, Phellinus nigrolimitatus.

Lielais Ķemeri raised bog is included in the list of the internationally important bird areas (IBA) with code number 019 (criteria species: *Anser fabales* and *Anser albifrons*, Common Crane *Grus grus* and Three-toed Woodpecker *Picoides tridactylus*) (Račinskis, 2000) (Fig. 18). That is the second most important nesting site in Latvia for the Wood-sandpiper *Tringa glareola*, as well as the nesting ground for the Golden plover *Pluvialis apricaria*, common crane, curlew, whimbrel and great grey shrike, the periphery of the bog is a mating-place for capercaillies and black grouse, and nesting sites for short-toed eagle, black stork (annex 19).
The worked-out peat extraction fields in the Lielais Ķemeri raised bog. Peat extraction fields, inundated and covered by the above-water vegetation, may be important as a nesting site for Savi's warbler, Montagu's harrier, common crane, also for waders.

The diversity of invertebrates is not high in bogs, but there are many specialised species that are not found in other habitats (Nympahalidae, Carabidae, Heteroptera). Bog woodland (pine forests on peat soils) and island fauna is different compared to the open part of the bog, and on the whole it increase species diversity. 7 protected and endangered invertebrate species have been recorded on edge of the bog.

4.4.1.2.2 Specially protected habitats

Dystrophic waters.

Habitats and species of Annex I of the EU Species and Habitats Directive: 7110 *Active raised bogs, 3160 Natural dystrophic lakes and ponds, 7140 Transition mires and quaking bogs, 7150 Depressions on peat substrates of the *Rhynchosporion*. In the bog lakes, moor frog occur, but in peat extraction fields, beavers live.
Potential NATURA 2000 site.

Lielais Ķemeri raised bog is a region of sulphur springs' formation. It is an example of the history of a raised bog formation.

4.4.1.3 Use of the bog

Lielais Ķemeri raised bog is the main cranberry gathering place in relatively wide region.
Before establishment of Ķemeru NP, migratory geese using bog pools as a resting sight were hunted in the raised bog (ambush ruins and hunter's tales have remained).
Peat extraction was still performed in the 1980s in the northeastern part of the bog (peat quarries and fields are left).
Lielais Ķemeri bog was meliorated for timber extraction in the forests surrounding the bog (in order to promote the timber production).
Some bog lakes are used for angling.
This is an interesting territory in terms of the landscape and walking in the bog provides positive emotions (a 3km long trail was built).
This nature territory is valuable for scientific research and education (a meteorological station functioned even up to middle of the 1980s).
The burnt-down areas of the bog is a site of scientific research.
Historical places of the WWI.

4.4.1.4 Influencing factors

Natural bog's development processes: bog's overgrowing by trees as the climate becomes more dry and warm;
Melioration (in the southwestern part) and peat extraction (in the northeastern part) (as a result of peat extraction, the water level of the nearby lakes decreased and some pools disappeared completely); melioration of the extraction fields still functions by draining wide surroundings and conducting water to Lielupe. As a result of peat extraction, in the area of original raised bog, a complex of meliorated extraction fields formed, in some places bare peat field are exposed. Around the melioration systems, humidity regime, vegetation is changing, an intensified bog's overgrowing by pines and birches is observed;
Burning (fires) most seriously affect the drained areas of the bog, where there are favourable conditions for peat burning;
Former melioration of the surrounding forests, regulation of the riverbeds.
Poaching on geese disturb birds in their resting sites.

4.4.1.5 Objective

To preserve the natural/hardly affected habitats of Lielais Kemeri raised bog and specially protected species occurring there at least in their instant condition where:

- the open bog area is not smaller than the present one (according to the aerophoto);
- the total area of open water (bog pools) is not smaller than the present one (by aerophoto), mineralsoil islands covered with old pines are found;
- the present diversity of habitats, structures, plant communities and species diversity occurs (see the bog's description);
- specially protected plant species that have been recorded in the bog are found;
- for migratory birds – undisturbed possibilities to use the bog as a resting ground;
- natural hydrological regime is ensured.

The desirable condition of the Lielais Ķemeri raised bog is the one that conforms with the objective.

4.4.1.6 Activities

Planning	To elaborate a project for restoration of the hydrological regime of the Lielais Ķemeri raised bog. It is recommended to measure water level in the bog. During the project's elaboration process, also the influence of beaver activity on water level changes in the bog must be considered. To elaborate a restoration plan for the peat extraction fields in the Lielais Ķemeri raised bog. To elaborate an architectural project for meteorological station/monitoring centre in Fazāni.

	For the hydrological regime regulation projects, to evaluate the impact on the environment.
Management of the habitats	To close melioration systems and to raise the water level in the peat extraction fields in accordance with the research projects. In the further raise of the water level, the peat fields would be flooded creating wetlands suitable for waders. In accordance with the research projects, to close the melioration systems (~57 ditches), interrupting the water outflow from the bog.
Management of the territory/ Infrastructure	To maintain the board-walk near Fazāni, to construct platforms and resting benches, as well as handrails to bound the most dangerous places. To build an observation tower by the board-walk. To set up information and direction signs to the board-walk in the Lielais Ķemeri raised bog. To construct the centre of meteorological/monitoring station in Fazāni. To renovate roads and to install culverts in places where roads will be affected due to the regulation of the water level.
Monitoring	Considering the fact that establishment of a bog monitoring station in Kemeri National Park is planned, to elaborate an integrated monitoring programme including, along with the biological parameters, also the meteorological and hydrological parameters. The main hydrological parameters are: rainfall, water level, water level in bog pools. To elaborate and carry out the monitoring of the efficiency of the restoration efforts of the water level of the bog. To set up long-term sample plots in the bog with an objective to perform monitoring of vegetation and water level as well as to measure water level in bog pools. Sample plots should be photographed both prior to and after implementation the project. Shoots must be taken from the same point each time, in the same phenological phase. To monitor the tourism impact on the bog's ecosystem (census of *Tringa glareola*, vegetation structure). To census migratory birds and overnighting geese and cranes. To make an aero-photo of the Lielais Ķemeri raised bog. To perform litter monitoring by the board-walk.
Research	To study the impact of potential changes of the hydrological regime of the Lielais Ķemeri raised bog on the surrounding territories. To complete the inventory of the specially protected bog habitats.

4.4.1.7 Indicators

The level of the overgrowth of the bog according to the aerophoto;
Changes of the water level;
Nesting success of wood-sandpiper *Tringa glareola*;
Amount of litter near the bog trail.

4.4.2 Pušu swamp and lake

Is found to the west from the lake Kanieris, in the nature protection zone. Possibly it is a former part of the lake Kanieris. Very small and shallow lake (7.0 ha) adjoined by the Pušu swamp (1.1 ha).

4.4.2.1 General description

There is a thick layer of mud in the bottom of the lake covered by approximately 5 cm shallow water. Along the lake, *Cladium mariscus* stands are found, also *Phragmites australis, Typha latifolia, Shoenoplectus tabernaemontani* and *Carex elata* grow. On the edge of the lake, there are fragments of transition bog fragments with *Carex rostrata* and *Carex limosa* as well as depressions with *Rhynchospora alba.* In the moss stand, different sphagnum species grow – *Sphagnum teres, Sphagnum warnstorfii , Sphagnum flexuosum, Sphagnum fallax*, etc.

In the eastern part of the lake, a raised bog with pines has formed, and the shrub stand has abundant *Myrica gale* stands. Also, other species occur such as, e.g., *Vaccinium myrtillus*, *Vaccinium uliginosum*, *Ledum palustre Empetrum nigrum*. In the moss stand, sphagnums dominate – *Sphagnum magellanicum* and *Sphagnum angustifolium* that compose small hummocks. In some places the bog is open, there grow *Trichophorum cespitosum, Calluna vulgaris, Eriophorum vaginatum* etc.

4.4.2.2 Biological values

Specially protected species*: Myrica gale, Cladium mariscus*, *Trichophorum cespitosum*.

Specially protected habitats: *Cladium mariscus* vegetation on lake coasts/banks.
Habitats of the Annex I of the EU Species and Habitats Directive: 7110 * Active raised bogs (little), 7140 Transition mires and quaking bogs, 7210 * Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae.*

4.4.2.3 Use

No data on the use of the swamp and the lake.

4.4.2.4 Influencing factors

Overgrowing of the lake;
Potentially: changes of the hydrological level in the swamp, collecting twigs and buds of *Myrica gale*;
Potentially: changes of the hydrological level in the confluence basin.

4.4.2.5 Objective

To maintain the habitats of the Pušu swamp and the lake at least in their present area and state, with:

- Rich *Myrica gale* stands;
- *Cladium mariscus* vegetation on the banks of the lake.
-

4.4.2.6 Activities

Monitoring	To evaluate rare habitats once in every 5 years.

4.4.2.7 Indicators

Presence of rare species.

4.4.3 Kūdraine lake (Kugrainis) and Ogu swamp

Located in the very northern part of Ķemeri NP, in the nature protection zone (area of 11.0 ha). Kūdraine lake is crossed by a borderline of rural municipalities, the ancient Kurzeme border vista.

4.4.3.1 General description

Dyseutrophic lake surrounded by an open raised bog (area of 2 ha). In the lake, *Cladium mariscus*, *Typha angustifolia* and *Phragmites australis* stands are found. *Myrica gale* stands occur both on the bank of the lake and in the surrounding forests where they form a thick shrub stand. In the raised bog, especially on the western side of the lake, *Calluna vulgaris* dominates, in the moss stand - *Sphagnum rubellum, Sph. magellanicum* and *Sphagnum fuscum.* Small depressions with *Rhynchospora alba* and *Sphagnum cuspidatum* and *Sph. tenellum* most often are recorded in the part of the bog that is situated at the eastern side of the lake.

4.4.3.2 Biological values

The main value of the site is its natural status and rare habitats which occur there – both of Latvia and EU importance. There are no melioration ditches in the Ogu swamp, some are found in the adjoining area that possibly is the reason for the rich heather stands. The swamp is a feeding site for the black stork. Pool and moor frogs occur.

Specially protected species*: Myrica gale, Cladium mariscus*.
Specially protected habitats: *Cladium mariscus* vegetation on lake coasts.
Habitats of Annex I of the EU Species and Habitat Directive: 7110 Active raised bogs (few), 7140 Transition mires and quaking bogs, 7150 Depressions on peat substrates of the *Rhynchosporion*, 7210 *Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*.

4.4.3.3 Use

Recreation: cranberry gathering, fishing in the lake.
Attractive territory in terms of the landscape.
Myrica gale is collected.

4.4.3.4 Influencing factors

Overgrowing of the lake;
Overgrowing of the swamp – a little;
At present: recreation (cranberry gathering) and *Myrica gale* obtaining – a little;
Potential: changes of the hydrological level of the swamp and the lake.

4.4.3.5 Objective

To preserve the habitats of the Kūdraines lake and the Ogu swamp at least in their present condition.

4.4.3.6 Actions

Monitoring	To evaluate rare habitats once in every 5 years.

4.4.3.7 Indicators

Presence of rare species.

4.4.4 Fens with *Schoenus ferrugineus*

Occurrence in KNP: dispersed, in small areas on the southeastern and southwestern banks of Kanieris lake, in Riekstu peninsula, on the southeastern bank of Dūņieris, on a railway side near Slokas station, in Valguma forestry district, compartment 27 of block 146 (picture. 19).

4.4.4.1 Biological values

4.4.4.1.1 Habitats

Calcareous fens with their typical and in some places dominant species *Schoenus ferrugineus.* Typical species for this plant community are: *Primula farinosa, Pinguicula vulgaris, Parnassia palustris, Carex panicea*, mosses – S*corpidium revolvens, Scorpidium scorpioides, Campylium stellatum, Fissidens adianthoides, Bryum pseudotriquetrum, Riccardia multifida Aneura pinguis.* It some cases, the moss stand may be poorly developed. Common species in these fens are as follows: *Carex elata, Carex lasiocarpa, Linum catarthicum, Equisetum variegatum, Polygala amarella*.

Calcareous fens of Kemeri National Park are rich in different orchids: *Dactylorhiza incarnata, D. ochrolenca, D. cruenta, Epipactis palustris, Liparis loeselii, Gymnadenia conopsea.* In the shrub stand, *Myrica gale, Frangula alnus, Salix rosmarinofolia* grow as well as *Phragmites australis*, *Betula pubescens, Juniperus communis.* The species composition, overgrowing by trees and shrubs may vary depending on the development phase of every particular fen, factors of influence, ratio of species. Nevertheless, the above-mentioned respective typical species of the plant community must be sufficiently represented in each site.

Calcareous fens with *Schoenus ferrugineus* is a rare and protected habitat in Latvia, also included in Annex I of the EU Species and Habitats Directive – Alkaline fens.

4.4.4.1.2 Specially protected species

Specially protected species: *Dactylorhiza incarnata, D. ochroleuca, D. cruenta, Liparis loeselii, Gymnadenia conopsea Primula farinosa Pinguicula vulagris, Myrica gale, Carex buxbaumii, Cladium mariscus, Saussurea esthonica, Schoenus ferrugineus.* Moss *Harpanthus flotovianus, Riccardia multifida.*
Rare species: *Lonicera pallasi.*
Fen orchid *Liparis loeselii* occur - a species of Annex II of the EU Species and Habitats Directive.

4.4.4.2 Use

Fens are aesthetically attractive landscapes during the orchid blooming time. Flower picking for nosegays happen (insignificant).

4.4.4.3 Influencing factors

The natural swamp development processes: overgrowing by trees and shrubs, and by reeds and *Molinia caerulea* (a fen with *Saussurea esthonica*);
Previously: destruction of the natural hydrological system Kaņieris – Dūņieris – Vecslocene; building of the railway (a swamp fragment near the Sloka station) and territory's melioration;
Potentially: improvement of the railway and its surroundings, melioration, changes of the water level, fires, too intensive vegetation trampling.

4.4.4.4 Objective

To maintain the natural/intact calcareous fens at least in their present area and state, where:

- calcareous fens occur at least in their present area (Fig. 19);
- the proportion of trees and shrubs does not exceed ~30% in each of the swamps;
- the respective typical calcareous fen vascular plant species are well-represented in the fen: *Schoenus ferrugineus*, *Primula farinosa, Pinguicula vulgaris, Parnasia palustris, Carex panicea* and moss: *Bryum pseudotriquetrum, Fissidens adianthoides, Campylium stellatum, Scorpidium revolvens, Scorpidium scorpioides.*
-

4.4.4.5 Activities

Administration	To initiate establishment of microreserves for alkaline fen protection in Valgums forestry district (block 146, compartment 27), protection of alkaline fens with *Saussurea esthonica* in Valgums forestry district in compartments 19,10 (a part) of block 23, compartments 16, 15 (a part), 17 (a part) of block 24 ; compartments 1,3 of block 33, compartment 7 of block 32, and as well, if possible, by the railway Rīga-Venstpils near

	the Sloka station. And also in compartments 45, 46 of block 256 of Valgums forestry district (on the southwestern bank of Kanieris) (appendix 20).
Control	To define the maximal number of visitors in the calcareous fens – 5 persons per visit because of the influence of trampling, possibility of invasion of introduced plants, rarity of these habitats in Latvia and Europe, as well as their small area in the national park. Exceptions are possible. Each case is assessed and the final decision is made by the administration of Ķemeri National Park.
Information	To inform the legal land owners about the habitat that is found on the side of the railway Rīga – Ventspils, near Sloka.
Habitat management	To gradually cut trees and shrubs in the fens, as close to the ground as possible, except junipers and *Myrica gale*. To leave the biggest trees. It is recommended to first determine the age of trees by making drillholes. That would help to find out the time when overgrowing of the fens started. The part of the fen where sedges and not *Schoenus ferrugineus* dominate should be scythed once in every two years in August. To leave some areas in the fen unmowed for three to four years. In order to reduce spreading of *Cladium mariscus* in the fen, it is recommended to mow it as close to the ground as possible. Time – middle - end of August. Reeds should also be mowed every year in small areas in places where the fen is overgrown by them in order to reduce their amount. Time – end of May/ beginning of June.
Monitoring	To elaborate and perform the monitoring of fens' management efficiency. To set up long-term sample plots in the fen with an objective to perform monitoring of vegetation and water level. Sampling plots must be photographed both prior to and after implementation of management measures. Shoots must be taken each time from the same point, in the same phenological phase. To compare observations with the desirable condition of the habitat described in the objectives.

4.4.5 Calcareous spring fens

Calcareous spring fens have been recorded in the surroundings of Lustūžkalns (picture. 19).

4.4.5.1 Spring of compartment 14 of block 74 in Valgums forestry district.

The largest and strongest springs are found on the slope, smaller springs occur a bit further. In the main spring outflow area, *Palustriella commutata* dominates, but further along the brook as well as in the nearby smaller spring outflow areas, the following moss species occur: *Fissidens adianthoides, Rhodobryum ontariense, Plagiomnium elatum, Bryum pseudotriquetrum, Trichocolea tomentella etc*.

Most frequently recorded vascular plant species are *Carex remota* and *Crepis paludosa.* Also other species occur: *Dactylorhiza fuchsii, Myosotis palustris, Paris quadrifolia, Cirsium oleraceum, Equisetum sylvaticum, Phegopteris connectilis* etc.

4.4.5.1.1 Biological values

Specially protected plant species: *Dactylorhiza fuchsii , Trichocolea tomentella, Rhodobryum ontariense.*
Specially protected habitats: calcareous spring fen.
Habitat of Annex I of the EU Species and Habitat Directive: 7160 Fennoscandian mineral-rich springs and spring fens.

4.4.5.1.2 Use

An informal resting place - "totem place". Can be potentially included in a tourist route.

4.4.5.1.3 Influencing factors

Possibly springs' exhaustion;
At present: littering with household waste;
Potentially: trampling down, exaggerated spring landscaping (removing wood debris from the springs, cleaning the spring source's banks from trees and shrubs), cutting down surrounding trees;
Potentially: changes of the hydrological level in the closest environs, cutting of the nearby forests.

4.4.5.1.4 Objective

To maintain the calcareous spring fens and the their species diversity in its present condition, where:
1) the spring is active;
2) microclimate of the spring is ensured by intact habitats of the surrounding forests;
3) characteristic plant species occur (see descriptions).

4.4.5.1.5 Activities

Special management is not necessary.

Management of the territory/ Infrastructure	To put an informative sign about the protected habitat asking not to step in the spring.

4.4.5.2 Spring in compartment 9 of block 113 of Valgums forestry district

A peculiar spring outflow site. As a result of spring activity, a relief elevation (approximately 1 m high, 8x8 m large) that is composed by peat and spring calcium has formed. Calcareous sediments are observed on moss. The spring fen vegetation is composed by different plants, e.g., *Carex remota, Crepis paludosa, Cirsium oleraceumi, Carex flava, Veronica beccabunga*. Rich moss stand where *Palustriella commutata* dominates. Also, *Plagiomnium undulatum, Pellia epiphylla, Fissidens adianthoides, Rhytidiadelphus triquetrus* and other moss species occur.

4.4.5.2.1 Biological values

Specially protected species have not been found.
Specially protected habitats: calcareous spring fen.
Habitat of Annex I of the EU Species and Habitats Directive: 7160 Fennoscandian mineral-rich springs and spring fens.

4.4.5.2.2 Use

An unique spring, is not to be included in tourist routes.

4.4.5.2.3 Influencing factors
Possibly spring's exhaustion;
Potentially: trampling down, cutting down surrounding trees;
Potentially: changes of the hydrological level in vicinity, cutting down neighbouring forests.

4.4.5.4 Objective
To maintain the calcareous spring fen and its species diversity in its present condition, where:
1) the spring is active;
2) microclimate of the spring is ensured by intact habitats of surrounding forests;
3) characteristic plant species occur (see spring fen descriptions).

4.4.5.5 Activities
Special management is not necessary.

Management of the territory/ Infrastructure	To put an informative sign about the protected habitat asking not to step in the spring.
Research	To study hydrology of the springs and to determine the number of outflows in the spring fens.

4.4.6 Fens with sulphur springs (or calcareous spring fens)
Spread in Kemeri NP: in the western side of the Raganu bog, on the southeastern bank of the lake Dūņieris.

4.4.6.1 Sulphur springs in the Raganu bog
In the outflow sites of the sulphur springs, vegetation typical for calcareous fens occur, as the spring water is also rich in calcium. In some places, rich limestone formation takes place. Due to the spring outflow, the vegetation is mosaic. There are places with open water where *Schoenoplectus tabernaemontani* grow, also small depressions with moss can be found, e.g., with *Scorpidium scorpioides*. In some places, large areas are occupied by *Cladium mariscus.* The sphagnum hummocks that are composed by *Sphagnum fuscum, Sphagnum magellanicum, Sphagnum rubellum* form little islands in the middle of the sulphur springs. They are covered by typical raised bogs species – *Rubus chamaemorus, Andromeda polifolia, Calluna vulgaris,* also *Pinus sylvestris*, *Betula pubescens* and *Juniperus communis.* Beside, closer to the spring outflow sites, such calcareous species as *Primula farinosa, Pinguicula vulgaris* and *Schoenus ferrugineus* are found. The border zone between the vegetation of the raised bog and the springs is rich in different liverwort species.

Around the sulphur springs, a complex of peculiar water and coastal invertebrate species has formed, although these species are common elsewhere.

4.4.6.1.1 Biological values
Specially protected plant species: *Cladium mariscus, Schoenus ferrugineus, Primula farinosa, Pinguicula vulgaris,* moss – *Paludella squarrosa, Riccardia multifida.*
Specially protected habitats: *Cladium mariscus* vegetation on lake banks, fens close to sulphur springs. Habitat of Annex I of the Species and Habitats Directive 7220* Petrifying springs with tufa formation (*Cratoneurion)*, 7210* Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*.

4.4.6.1 2Use
Sulphur ponds is a popular tourist site.

4.4.6.1.3 Influencing factors
Overgrowing by trees and shrubs;
Fire (in the 1950s);
Possibly springs' exhaustion;
Overgrowing of the springs by *Cladium mariscus*;
Potentially: changes of the hydrological regime, fire;
Probably due to the former melioration of the surrounding forests, water level of the Raganu bog decreased and, therefore, affected also the activity of the sulphur springs. These changes also promoted overgrowing of a neighbouring fen by trees and shrubs, especially by *Betula pubescens* and, therefore, a pronounce dominance of *Molinia caerulea* is observed in the fen.

4.4.6.1.4 Objective

To preserve the fens by the sulphur springs at least in their present condition, where:

- the springs are active;
- freshwater limestone is forming;
- open areas without vegetation are not smaller than at present (by aerophoto or by detailed mapping);
- plant species characteristic for spring fens occur (see descriptions).

4.4.6.1.5 Activities

Infrastructure	To make a board-walk by the Sulphur ponds.
Habitat management	The objective of the management measures is to reduce the percentage of *Molinia caerulea* stands in the fragments of the calcareous fens and to promote spreading of *Schoenus ferrugineus*. To cut trees and shrubs gradually, as close to the ground as possible, leaving junipers, *Myrica gale* and biggest pines. To mow sprouts of tree and shrubs every year. It is recommended to scythe the areas overgrown by reeds and *Molinia caerulea*, leaving *Schoenus ferrugineus*. The time – June. In first years, also another mowing may be performed in the middle or the end of August. The rotation method may be used as an experiment.
Research	To map and precisely locate the springs.

4.4.6.2 Sulphur springs by Dūņieris

Sulphur springs are found on the southeastern bank of Dūņieris (Fig. 19) and occupy an area of a couple of square metres. They flow into the lake along a little slope. There are very few plants growing in the spring outflow sites, mainly *Eleocharis quinqueflora, Triglochin palustris* and *Chara aspera*. Beside, the calcareous fen vegetation with *Schoenus ferrugineus* has formed. The following plant species mostly occur there: *Schoenus ferrugineus, Eleocharis quinqueflora, Primula farinosa, Pinguicula vulgaris*, *Phragmites australis,* but in the moss stand - *Scorpidium revolvens* and *Campylium stellatum.*

4.4.6.2.1 Biological values

Specially protected species*: Schoenus ferrugineus, Cladium mariscus, Primula farinosa, Pinguinella vulgaris*.
Specially protected habitats: fens by sulphur springs.

The habitat of Annex I of the EU Species and Habitats Directive occur: 7160 Fennoscandian mineral-rich springs and springfens

4.4.6.2.2 Use

Are not used.

4.4.6.2.3 Influencing factors

Possibly the spring's exhaustion;
Potentially: changes of the hydrological regime;
Previously: destruction of the natural hydrological system Kaņieris – Dūņieris – Vecslocene that caused overgrowing of Dūņieris and of the open bank habitats by *Cladium mariscus*, trees and shrubs.

4.4.6.2.4 Objective

To preserve the fens by sulphur springs at least in their present condition, where:

- the springs are active;
- open areas without vegetation are not smaller than at present (by aerophoto or by detailed mapping);
- plant species characteristic for spring fens occur (see descriptions).

4.4.6.2.5 Activities

Planning	To draft the habitat's management plan – clearing off shrubs, trees and *Cladium mariscus* (precise areas, time, methods).
Monitoring	To monitor condition of the protected habitats once in every 3 years.

4.4.7 Zaļais bog and Raganu bog

Those are bogs where relatively intact habitats with both the hummock and depression complex, and the raised bogs covered by pines are interspersed with places affected by human activity (peat extraction fields, melioration ditches). Hummocks are composed by sphagnums and are covered by *Calluna vulgaris, Rubus chamaemorus, Andromeda polifolia*. In depressions, *Rhynchospora alba* and *Carex limosa* grow. In the raised bog, *Calluna vulgaris* and *Empetrum nigrum* dominate. The bogs are separated by inland dunes - Zaļās kāpas (Green dunes).

4.4.7.1 Biological values

Specially protected species. Birds: common crane *Grus grus*, wood-sandpiper *Tringa glareola*, black grouse Tetrao tetrix, golden plover *Pluvialis apricaria*, ospray *Pandion haliaeetus* (1-2 pairs are nesting), capercaillie *Tetrao urogallus*, nightjar *Caprimulgus europaeus* (Raganu bog has the highest density of nightjars in KNP), great grey shrike *Lanius excubitor*.
Amphibians: common spadefoot (in Zaļais bog). Reptiles: sand lizard.
The peat extraction fields of the Zaļais bog are a feeding site for bats.
Zaļās dunes are covered by a relatively old pine forest where numerous forest key-habitats.

4.4.7.2 Use

Historical peateries – peat extraction fields in Zaļais bog.
From Antiņciems towards the sand dune called "purva roza", there is a historical road of the WWI (it does not coincide with the present Antiņciems road!).
Bogs are used for berry- and mushroom-picking (by inhabitants of Ķemeri, Kauguri), collecting *Myrica gale*.
The Zaļās dunes is a popular walkabout place and it is possible to use it for the tourist route development, as it unites scenic territories – bogs and forests on dunes as well as their contiguity zones.

4.4.7.3 Influencing factors

Natural bog development processes: overgrowing by trees, especially by *Betula pubesceus*;
In some places, it was affected by melioration and peat extraction;
Burning (fires) most significantly affect the drained areas of the bog with favourable conditions for peat burning;
Antiņciems' road in the Raganu bog is used as an illegal dumpsite.

4.4.7.4 Objectives

To preserve the habitats of Zaļais and Raganu bogs where there are:
Active sulphur springs;
Rare habitats (calcareous fens);
Hummock and depression complex;
Rare bird species (nightjars, ospreys etc.), amphibians and reptiles.
Tourist footpaths and trails are established.

4.4.7.5 Activities

Administration	To order a project for improvement of the Antiņciems road in collaboration with the Lapmežciems municipality.
Planning	To plan a cycling route that connects Ķemeri with the lake Kaņieris (along the Antiņciems road).
Control	To control measures of *Myrica gale* protection. To control illegal dumpsites.
Management of the territory	To maintain the Antiņciems road and clean it regularly.
Research	To complete the inventory of specially protected bog habitats. To continue studying vegetation of the Raganu bog and Zaļais bog.

4.4.7.6 Indicators

Presence of protected habitats and species;
Condition of the Antiņciems road.

4.4.8 Labais bog, Slokas bog (Kūdra bog)

Those are degraded raised bogs where the impact of melioration and peat extraction is so significant that rehabilitation of these bogs is almost impossible.

4.4.8.1 Biological values

Specially protected species. Birds: great bittern *Botaurus stellaris*, wood sandpiper *Tringa glareola*, common crane *Grus grus*, marsh harrier *Circus aeruginosus* (in the Labais bog), Savi's warbler *Locustella luscinioides* was heard in the peat extraction fields.
Reptiles: smooth snake.
Mammals: migration path for otters. Beavers raise water level of the Labais bog by constructing dams on Jāņupīte (it has a runoff to Lielupe).
A specially protected lichen species - *Cladonia incrassata* - has been recorded in the Sloka bog on the vertical walls of the ***peat*** pits. This is its only locality in Latvia (chapter 4.7.2.).

4.4.8.2 Use

Historical peat extraction sites – peat quarries (pits). At the northern side of the Labais bog, there was a village with a store where "one could even buy vodka for hunting".
The local inhabitatnts fish in the peat extraction fields (which are flooded now).
Potentially: possibilities to develop tourist routes.

4.4.8.3 Influencing factors

In the past: melioration and peat extraction process.
Burning (fires) most significantly affect the drained areas of the bog with favourable conditions for peat burning.

4.4.8.4 Objective

To use the degraded bogs as an object for nature interpretation.

4.4.8.5 Activities

Planning	To elaborate a tourist route from Kemeri to Kūdra.
Habitat management	Information about the desirable management regime in the peat fields is lacking. A possible solution – to clear the islands from the overgrowth (trees, shrubs) and to close the melioration systems where it is does not contradict species conservation (chapter 4.7.2.).

4.5 Forests and bushes

4.5.1 Biological values of forests

This chapter describes only biological values of the forest and activities for protection and management of habitaits. The forest management activities in landscape protection zone are described in the Chapter 6.

A network of protected areas form the basis for the protection of the biodiversity of the forests in Kemeri NP. It includes protection regimes set by zoning (strict nature rezerve and nature protection zones), protected forest habitats (woodland key habitats) and micrioreserves (picture 18). The protected forest habitats take up 17% of the landscape protection zone.

- *At present there is no unified classification of protected forest habitats in Latvia. According to the system used by State Forest Service the microreserves are established for protection of woodland key habitats, which are selected by using a complex of indicator species, butaccording to the system of MoEPRD the protected forest habitats are selected mostly using special vascular plant species.*

4.5.1.1 Description

Pine forests. Found in large areas on sandy soils (mostly close to the sea) and on wet peat soils of Kemeri NP. It is an important netsting habitat for such spacially protected species as Nightjar *Caprimulgus europaeus*, Stock Dove *Columba oenas*, Black Woodpecker *Dryocopus martius* and Tengmalm's owl *Aegolius funereus*.
In the annex of EU Habitats Directive it is included as a habitat type „Western taïga", subtype „Natural old pine forests". The distribution of the habitat (also the forests dominated by spruce) is best charecterised by distribution of woodland key habitat „ Coniferous forest" which occupies 712 ha of the landscape protection zone of the National Park.

Forests dominated by spruce. Relatively widelyrepresented in Kemeri National Park. It is an important nesting habitat for such specially protected bird species as Threetoed Woodpecker *Picoides tridactylus*, Black Stork *Ciconia nigra* and Lesser Spotted Eagle *Aquila pomarina*.
In the annex of EU Habitats Directive – habitat type „Western taïga", subtype „Natural old spruce forests"

Mixed forests. Widely represented in Kemeri NP. High density of different bird species. An important nesting habitat for such specially protected bird species as Black Stork *Ciconia nigra,* Lesser Spotted Eagle *Aquila pomarina,* White-backed Woodpecker *Picoides leucotos,* Middle Soptted Woodpecker *Picoides medius*, Black Woodpecker *Dryocopus martius,* Grey-headed Woodpecker *Picus canus.*
It is included in the annex of EU Habitats Directive as a habitat type „Western taïga", subtype „Natural old mixed forests" The distribution of the habitat is best charecterised by distribution of woodland key habitat „ Mixed coniferous-decidious forest" which occupies 75 ha of the landscape protection zone of the National Park.

Seminatural decidious forests. Preserved to a different degree throughout the territory of the National Park. An important nesting habitat for specially protected bird species - Black Stork *Ciconia nigra,* Lesser Spotted Eagle *Aquila pomarina,* White-backed Woodpecker *Picoides leucotos,* Middle Soptted Woodpecker *Picoides medius*, Black Woodpecker *Dryocopus martius,* Grey-headed Woodpecker *Picus canus.*
It is included in the annex of EU Habitats Directive as a habitat type „Western taïga", subtype „Natural old trivial deciduous forests" The distribution of the habitat is best charecterised by distribution of woodland key habitats „Aspen forest" and „Other decidious forest" which together occupy 535 ha of the landscape protection zone of the Kemeri National Park.

Broad-leaved (mostly oak) forest. Occupy small areas in the southern part of the Kemeri NP and around Kemeri. An important nesting habitat for specially protected bird species - Black Stork *Ciconia nigra,* Middle Soptted Woodpecker *Picoides medius.* It is included in the annex of EU Habitats Directive as a habitat type „Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*". The woodland key habitat „Broad-leaved forest" is registered in 6 ha of the landscape protection zone of the Kemeri National Park.

Swamp forests. Distributed mainly around raised bogs and in transition mires. An important netsting habitat for such spacially protected species as Black Woodpecker *Dryocopus martius*, Stock Dove *Columba oenas*.
It is included in the annex of EU Habitats Directive as a habitat type „Bog woodland". The distribution of the habitat is best charecterised by distribution of woodland key habitats „Spruce and mixed spruce wetland forest" and „Pine and birch wetland forest" which together occupy 375 ha of the landscape protection zone of the Kemeri National Park.

Broadleaved swamp forests. The more significant areas of the habitat are found in the part of Kemeri NP bordering the Lielupe river (Kalnciems swamp forest), around Kemeri, around Sloka lake, in the region of the Slocene river mouth. Some small areas are distributed also throug the rest of the park area. It is an important netsting habitat for such spacially protected species as White-backed Woodpecker *Picoides leucotos,* Middle Soptted Woodpecker *Picoides medius,* Threetoed Woodpecker *Picoides tridactylus.*
It is included in the annex of EU Habitats Directive as a habitat type „Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)". The distribution of the habitat is best charecterised by distribution of woodland key habitats „Black alder wetland forest" and „Broad-leaved wetland forest" which together occupy 272 ha of the landscape protection zone of the Kemeri NP.

The most valuable **deciduous swamp forests** from nature protection point of vew are the ones in the areas selected as sample territories of swamp forests – Slocene, Sloka, Kalnciems, Lielais Ķemeru tīrelis and Versupite (Priedītis 1993, 1999).

Slocene (Slocene forests) – were selected as the largest sample territory of swamp forests in Latvia (1320 ha).
Sloka Decidious swamp forests of Sloka lake were selected as the most well preserved periodically flooded black alder forest on thin peat soils characteristic to the coastal zone.
The sample area of Kalnciems (Kalnciems decidious swamp forest) was selected in the floodlands on the left bank of the Lielupe river to the north of Kalnciemns dolomite quarries. It is dominated by the community of Black Alder swamp forest with some mixture of broadleaved swamp forest. A nature reserve „Kalnciems decidious swamp forest" has been established to preserve it.
The swamp forests of Kemeri Lielais Raised bog (Lielais Ķemeru tīrelis) are bordering the bog. There the untouched Black Alder swamp forests as well as swamp forests dominated by spruce or pine can be found. Unfragmented and representative block of swamp forests, dominated by birch in mixture with Norway spruce, aspen and lime tree. Diverse microrelief without dominant species.
Versupite (wetland forests of Versupite river) – a foerst compartment with very high biological diversity occupying a small area. Mostly swamp forests dominated by birch, black alder, Norway spruce, more seldom – by ash and in more dry conditions – by pine. Separate groups of lime trees or specially protected plan species – Ladie's Slipper can be found in some places. Outstanding old oak trees area found at the Versupite river in the northern part of the compartment.

Separete compartments of swamp forests with the characteristic plant communities are found between the south – west bank of Kanieris lake and Zalais bog, especially in hollows between hills and along the border of the bog. There the spacially protected plant species such as Bog Myrtle *Mycira gale* and Poor Sedge *Carex paupercula* can be found frequenly in large numbers.

Swamp forests as such are not rare in Europe, but most of them are strongly affected by human activities – forest management, drainage - and they lack the key elements for supporting the bilogica diversity.

4.5.1.2 Woodland key habitats (WKH) in the landscape protection zone of the Kemeri NP.
In 1998 Latvian State Forest Service in cooperation with Östra Götland Regional Forest Board, Sweden started the project „Inventory of woodland key habitats" using a unified methodology.
The inventory was carried out in the Kemeri NP in 1998-2000 and during the surways the biologically most valuable forest stands conforming to the criteria of the woodland key habitats were selected (picture 18).
Woodland key habitats occupy 19% of the landscape protection zone of the Kemeri NP.

Woodland key habitat *is an area which contains habitat specialists, that cannot sustainably survive in forests managed for timber production. A well-founded expectation that a habitat specialist exists is a sufficient criterion for designating an area as a Woodland Key Habitat.*

Criteria for selecting WKH

Special search criteria have been elaborated, which are used to search the the State Forest Register database for potential WKH. Afterwards the selected stands are surwayed on field.

Criterion 1 Age, regardless of the forest land type.

Is used to select the stands, where species that have a certain percentage in the stand has reached a certain age (e.g. pine at the age of 121, if its proportion in the stand exceeds 30%, ash at the age of 61 if its proportion in the stand exceeds 20% etc.);

Criterion 2 Age and the forest land type.

Is used to select the stands growing on the forest land types Ap, Am, As, Km, Kp, Ks, Gr, Gs, Lk, Grs, Mrs, Dms, Vrs, Db where species that have a certain percentage in the stand has reached a certain age (e.g. pine at the age of 101 - 120, if its percentage in the stand exceeds 30%, spruce at the age of 95-110 if its proportion in the stand exceeds 50% etc.);

Criterion 3 Separate old trees

Is used to select stands where a few trees have reached considerable age (e.g. pine at the age of 151, if its proportion in the stand is less than 30%, gray alder at the age of 70, if its proportion in the stand is up to 50% etc.);

Criterion 4 Age of the spruce in the forest land type Nd.

Is used to select thoese forest stands growing on the forest land type Nd, where the spruce has reached the age of 95-110 (if the proportion of the spruce in the stand exceeds 50%)

4.5.1.3 Distribution of protected forest habitats in the territory of Kemeri NP

The more widely distributed woodland key habitat (WKH) types in Kemeri NP are „Coniferous forest" and „Other decidious ferest". Aproximately 1/3 of WKH are wetland forests: „Black alder wetland forest", „Spruce and mixed spruce wetland forest" and „Pine and birch wetland forest" (table 4.1)

Table 4.1 **Distribution of specially protected forest habitats in Kemeri NP**

- natural old spruce forests
- natural old pine forests
- natural old mixed forests
- natural old trivial deciduous forests
- recently burnt areas
- younger forests naturally developed after fire

Habitat type according to State Forest Service (A microreserve (MR) should be created)	**Corresponding category in EU Habitats Directive**	**Distribution in the Landscape protection zone of Kemeri NP**
MR – coniferous forest	Natural old spruce forests Natural old pine forests	WKH *Coniferous forest* 712 ha
MR – mixed soniferous – decidious forest	Natural old mixed forests	WKH *Mixed coniferous-decidious forest* 75 ha
Broadleaved forest	Sub-Atlantic and medio-European oak and oak-hornbeam forests of the *Carpinion betuli*	WKH *Broad-leaved forest* 6 ha
Aspen woods	Natural old trivial deciduous forests	WKH *Aspen forest* 24 ha
Other decidious forest	Natural old trivial deciduous forests	WKH *Other decidious forest* 510,5 ha
Alder swamp woods	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion*	WKH *Black alder wetland forest* 248 ha

	albae)	
Spruce and mixed spruce swamp forest	Bog woodland	WKH *Spruce and mixed spruce wetland forest* 105 ha
Pine and birch swamp forest	Bog woodland	WKH *Pine and birch wetland forest* 270 ha
Decidious swamp forest	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae*)	WKH *Broadleaved wetland forest* 24 ha
Ravine forest	*Tilio-Acerion* forests of slopes, screes and ravines	---
Slope forest	*Tilio-Acerion* forests of slopes, screes and ravines	WKH *Slope forest* 105,6 ha
Riparian forest	---	WKH *Riparian forest* 15,7 ha
Spring – influenced forest	---	WKH *Spring influenced forest* 24,1 ha
Calcareous coniferous forest	---	---
Calcareous fens or meadows	---	WKH *Open calcareous fen or meadow* 28 ha
Mosaic of swamp and forest	Bog woodland?	---
Fire scarred forest		---
Biologically valuable beaver activity area	---	WKH *Beaver activity area* 44,4 ha
MR – Biological tree	---	WKH *Giant tree* 35,8 ha
MR – Wind-fallen forest	---	---

The following specially protected forest habitats which do not require the establishment of micro reserve are potentially found in Kemeri NP:
Ash forests with *Astrantia major*;
Decidious forests with *Circaea lutetiana*;
Decidious swamp forests with *Carex remota*.

4.5.1.3 Historically protected forsts in the landscape protection zone of Kemeri NP

In the territory of former Vagums Forestry, Tukums Head Forestry and former Kemeri Forestry, Jurmala Head Forestry there were selected 32 zoological rezerves with total area of 956,7 ha (table 4.2). Five of them were created to protect more than one species or as zoological and botanical reserves ot the same time. At present untill the establishment of microreserves their status will not change (picture 18).

Table 4.2 Specially protected forest districts in Kemeri NP

Number of reserves	**Reason for creation of the reserve**	**Total area (ha)**
1	Possible nesting site of an eagle	4,4
1	Threetoed Woodpecker	17,5
1	Black Stork, botanical reserve	20,6
1	Display area of Grouse Capercaillie	36,5
1	Short-toed Eagle	36,5
1	Lesser Spotted Eagle, White-backed Woodpecker	38,2
1	White-backed Woodpecker, Threetoed Woodpecker	61,2
1	Common Crane, botanical reserve	85,1
1	Black Stork, White-tailed Eagle	186,4
3	White-backed Woodpecker	81,4
9	Black Stork	110,1
11		278,8
Total **32**		**956,7**

After the completion of the forest inventory in the landscape protection zone of Kemeri NP the borders of the reserves situated in the zone have been specified and two new microreserves have been planned which should be established following the general procedure - one for the Black Stork and one for the White-backed Woodpecker. At present **in the landscape protection zone** there are **16 reserves** with total area of **310,6 ha**, covering 193 forest compartmnets.

4.5.2 Factors which affect forest

Economic activities. As a result of traditional forest management practicies, the forest continuity is interrupted and the structures which indicate forest continuity are removed. Because of the artificial forest regeneration monoculture plantations cover the areas that were naturally covered by other species, creating large territories that are monotonous from the point of vew of biodiversity.

Natural regeneration. A process when the forest is regenerated by species, that correspond the growing conditions.

Climate. It affects the forest regeneration (the proprtion of decidious trees and spruce in coniferous forests is increasing).

Forest fires. Historically the oldest factor affecting the coniferous forest. It is particularly important in pine forests on oligothropic (poor) sandy soils (according to forest land type classification mostly in Cladinoso callunoso (Si) and Myrtillosa (Ln)). A forest fire can be one of the preconditions for natural regeneration of such stands. It is less important in forests on wet soils.

Soil eutrophication. The factor mostly influences the pine forests on sandy soils, and as a result the spruce is invading the undergrowth of forest stands of Kemeri NP. It is usually caused by human activities – fire protection, leaving dead branches in the forest after felling. Air pollution influences it as well.

Drainage. It influences the growing conditions and microclimate of the forests degrading the habitats whose existance in the long term depend on stable and appropriate moisture conditions (e.g. black alder swamp woods).

Large herbivores (especially red deer in ash forests) influence forest regeneration.

Beavers. The consequences of beaver activities are mostly felt in areas close to the forest drainage systems, less so – on the banks of water bodies.The influence of the factor can be regarded as both positive and negative. In spite of the fact, that considerable areas of commercial forest are flooded, in the forest aras affected by drainage as a result of the beaver activities, the water lever is returned close to natural.

4.5.3 Objective

To preserve the forests of the Kemeri NP with a varied age and stand structure where there are both the old trees in the first layer and the unevenly aged undergrowth. As a result of natural disturbances, the openings are formed in the tree layer, which fosrter the development of undergrowth. The different structures indicating forest continuity are present:

- Large, bilogically old trees;
- Coarse woody debris (including large dead trees in various decomposition stages);
- Many trees with holes.

Desirable area – all the forests of Kemeri NP where the tree species are growing in their natural conditions.

4.5.6 Activities

Quiet often the passive acitivty - doing nothing to ensure the prtection of a habitat - is not giving the desirable results and some **habitat management** should be carried out.

Habitat management cutting should be performed to preserve the forest structures that are characteristic for the stand and that are important for the bioligical diversity and is caried out in following cases:

- to remove the bushes from the overgrown glades and forest meadows;
- to cut separate threes form the 1st forest layer and to remove the undergrowth or trees of 2nd forest layer in the protected forest habitats
- to cut separate trees that prevent some specially protected bird species to fly up to their nests.

The protection regime and necessary habitat management activites have been indicated for each of the selected woodland key habitats (WKH). Four different protection regimes have been planned (table 4.3):
1. No management avctivites should be undertaken;
2. Secondary trees und/or undergrowth (usually spruce) should be partly or completely removed;
3. An undergrowth around separete large trees (noble trees) should be removed
4. The influence of drainage should be prevented.

The regimes „Removal of dead wood prohibited" and „Drainage prohibited" are not describet separetely as such activities (removal of dead wood an drainage in places where it would be necessary from the point of vew of the traditionsl forest management practices) are prohibited in all WKH.

Table 4.3 **WKH management regimes in landscape protection zone of Kemeri NP**.

Management regime	**Number of compartments**	**Total area**	**%**
No management avctivites	777	1884,5	84
Thinning of second forest layer or undergrowth	122	220,1	10
Removal of the undergrowth around noble trees	29	57,1	3
Prevention of the influence of drainage	29	65,9	3
Total	**957**	**2227,6**	**100**

When evaluating the management guidelines of forest compartments where the removal of undergrowth and secon story spruce is planned the priority should be given to the compartments where the biggest volume shouls be extracted resp. where the undergrowth or second story should be removed completely. In these compartments it is possible to calculate the aproximate volume of timber to be extracted, using the forest inventory data on volume of secondary spruce. In most of these compartments the removal of spruce undergrowth is planned as well, the volume of whic cannot be estimated (as it does not show up in forest inventory materials) (table 4.4).
The management of the remaining 90 compartments where the similar, but less intensive management is planned, as well as the ones where the removal of undergrowth around separate noble trees is planned should be carried out in 2004-2010.

Table 4.4 Forest stands which should be given the first management priority

Block No	Compartment No	Area/ha	Volume/m^3	Year
146	41	0,7	26,6	2002
146	45	2,0	75,1	2002
12	7	0,9	45,5	2002
17	8	2,8	72,9	2002
18	8	0,9	31,9	2002
18	3	0,7	28,8	2002
46	22	0,5	0,0	2002
46	24	0,4	0,0	2002
46	28	0,4	0,0	2002
46	32	0,7	28,4	2002
47	2	1,2	0,0	2002
47	17	4,4	0,0	2002
48	8	2,1	0,0	2002
48	16	2,3	133,0	2002
48	24	0,3	0,0	2003
48	28	0,8	40,5	2003
55	16	1,9	39,2	2003
71	5	0,4	0,0	2003

73	24	1,3	0,0	2003
73	25	2,3	0,0	2003
162	8	2,2	111,4	2003
208	2	1,7	41,6	2003
210	12	1,2	0,0	2003
259	15	0,8	0,0	2003
332	19	1,0	60,1	2003
376	12	0,7	36,8	2003
376	20	0,8	0,0	2003
424	8	1,1	0,0	2003
442	5	0,5	27,8	2003
		Total 36,8	Total 799,6	

„The influence of drainage"should be prevented in 29 forest compartments. This regime is planned in the WKH, affected by drainage systems. The most serious impact of drainage can be observed around the large drainage systems: the microclimate of the stands is being affected, the habitat specialists and indicator species, characteristic to such forests are dissapearing. The prevention of the influence of the drainage involves step-by-step daming of the diches which influence the microclimaste of the compartment. The beaver activity in hese diches can bring a significant improvement of the situation.

Administration	To initiate disignation of microreserves for protection of woodland key habitats in the landscape protection zone of Kemeri NP. After the complete inventory of KNP forests, propose the establishment of nature reserves for the following bird species: *Columba oenas* – 3 sites (2-10 ha) *Ciconia nigra* – 2 sites (10-30 ha) *Aegolius funereus* – 1 site (2-10 ha) *Dendrocopus medius* – 3 sites (2-10 ha) *Dendrocopus leucotos* – 5 sites (2-10 ha) *Pandion haliaetus* – 4 sites (2-10 ha) *Picoides tridactylus* – 3 sites (2-10 ha) To adjust the borders of the existing nature reserves To propose the establishment of microreserves in the forests of Kemeri NP for the specially protected species and habitats included in annex 20.
Monitoring	To include the specially pretected forest habitats in the State Forest Register.
Research	To carry out the inventory of the protected habitats: ▪ Decidious forest with Circaea lutetiana; ▪ Wet decidious forest with Carex remota To complete the inventory of specially protected plant species in the forest of Kemeri NP. To degitase the data, to specify the sites and to prepare detailed maps on priority inverterbrate species (insects, molluscs) included in the field inventory sheets of the woodland key habitats. To carry out the inventory of nature reserves of the Grouse Capercaillie display areas in the forest blocks No 205, 206, 215, 216 of the former Kemeri Head Forestry in Spring 2002. To adjust the borders of nature reserve of the White-tailed Eagle *Haliaeetus albicilla* in the forest block No 167 of the former Valgums Head Forestry (a new nest has been found).

Performance indicators

- Age structure of the stand

- Species composition
- Proportion of dead wood
- Natural regeneration
- Fllooding
- The structure of the layer of vascular plants
- The presence of habitat specialists and indicator species

4.5.5 Pine forests with *Geranium sanguineum*

Distribution in KNP: Found only in one site – Izkopi, forest block No 121, forest compartments no 11, 15, Valgums Head Forestry and some also in forest block No 122 and forest block No 102, comp. No 6.

4.5.5.1 Description of the habitat

A thin pine forest with a lot of junipers in bush layer, but the layer of vascular plant species is composed of plants characteristic to calcareous soils - Lily-of-the-Valley *Convallaria majalis, Trifolium alpestre* a.o. The layer of vascular plant is also rich in different species characteristic to dry grasslands and dry forests - Bloody Cranesbill Geranium sanguineum, Lesser burnet *Pimpinella saxifraga,* Solomon's Seal *Polygonatum officinale,* Field Scabious *Knautia arvensis,* Spotted hawkweed *Hypochoeris maculata,* Green strawberry *Fragaia viridis,* Zigzag Clover *Trifolium medium,* Many-leaved Hawkweed *Hieracium umbellatum a.o.*

Specially protected habitats: pine forests with *Geranium sanguineum*
Specially protected species: Pasque flower *Pulsatilla patens,* Mountain Sainfoin *Onobrychis arenaria***.**

4.5.5.2 Influencing factors

Forest succession increasing the proportion of Norway spruce

4.5.5.3 Objective

To preserve a habitat Pine forests with *Geranium sanguineum* at least in the existing area and condition, where:

- the tree layer is dominated by pine, forming a thin, open forest stand, only a few spruce trees are present in the tree layer;
- the schrub layer is dominated by juniper, decidious trees are only a few, the layer of vascular plants is composed of species mentioned above.

4.5.5.4 Activities

Monitoring	To develop and carry out the monitoring of endangered forest habitats. To compare the results with the condition of the habitat described in the habitat objectives. To follow the invasion of the Norway spruce into the habitat. To register the habitat in the forest data base.

4.5.6 Sweet Gale *Myrica gale* stands

Distribution in KNP: eastern coast of Kanieris lake, Slocene river walley, westwards and eastwards from Smirdgravis near its connection to Slocene river, NE and NW coast of Sloka lake, floodlands of Vecslocene river, northwards from the highway Jaunkemeri – Kemeri, to SE from the road Kauguri – Sloka (picture 20).

4.5.6.1 General description

Dominater by Sweet Gale. Species chraractereistic to both fens and transition mires or raised bogs and swamp forests can occure depending on moisture condiotions and amount of humus on the site. Correspondingly the moss layer can be composed of Sphagmum mosses – *Sphagnum magellanicum, Sph. Rebellums, Sph. Flexuosum*, Campylium moss - *Campylium stellatum,* Calliergonella moss *Calliergonella cuspidata.* In places where the habitat type is more similar to fens or transition mires one can find Wool Fruited Sedge *Carex lasiocarpa,* Tufted Sedge *Carex elata,* Devilsbit Scabious *Succisa pratensi,* Marsh Cinquefoil *Comarum palustre,* Marsh hog's fennel *Peucedanum palustre;* on the edges of raised bogs or in the forests on poor peat soils one can find Crowberry *Empetrum nigrum***,** cloudberry *Rubus chamaemorus***,** Sheathed Cottonsedge *Eriophorum vaginatum***,** Bog Bilberry *Vaccinium uliginosum* and other plant species characteristic to forests and swamps on poor soils. In some places the Myrica gale stands are suffering form

changes in water level. As a result they are overgrowing with reed, Purple Moor Grass *Molinia caerulea* and in more dry parts with pine or birch.

Specially protected habitats: Sweet Gale *Myrica gale* stands
Specially protected species: Sweet Gale *Myrica gale,* Early Marsh-Orchid. *Dactylorhiza incarnata,* Brown Bog-rush *Schoenus ferrugineus.*
Rear plant species: Pallas's Honeysuckle *Lonicera pallasi*

4.5.6.2 Influencing factors
Owergrowing with trees and other bushes, mostly in more dry places – a little.
At present – gathering of *Myrica gale* branches and buds for the needs of joint stock comapany „Latvijas Balzams".
In the past and possible in the future; changes in water level, burning (also now).
In the past: changes in the hidrology regime of Kanieris-Dunieris-Vecslocene, in other places – changes in the hidrology regime in areas close to the stands.
Potentially - changes in hidrology regime of neigbouring areas.

4.5.6.3 Objective
To preserve a *Myrica gale* bushes at least in the existing area and condition, where:
- the habitat is dominated by *Myrica gale;*
- in case of an open habitat the percentage of other bushes and trees does not exceed 1/3 of the area.

4.5.6.4 Activities

Administration	To initiate disignation of microreserves for protection of *Myrica gale* and *Schoenus ferrugineus* stands in the forest block No 254, comp. No 13, 25, 38, 39, 40, 41, block No 255, comp. No 1,8, block No 256, comp. No 7, 8, 13, 14, 15, 18 of Valgums Forestry. For the protection of *Myrica gale in* forest block No 63, comp. No 21, 22, 23, block No 82, comp. No 1, 2, 3, 5, 6, 7, 14, 15, 16, 17, 18, 28, block No 91, comp. No 29, 30, 31, block No 109, comp. No 2, 3, 6, 7, 8, block No 110, comp. No 2 (up to Smirdgravis) (annex 20). To adjust the borders of the existing nature reserves To propose the establishment of microreserves in the forests of Kemeri NP for the specially protected species and habitats included in annex 20.
Control	To control the observance of the *Myrica gale* protection regime.
Habitat management	Gradually remove the trees and bushes as close to the ground as possible, leaving junipers *Myrica gale,* and some of the older pine trees in *Myrica gale* stands and in fen fragments with *Schoenus ferrugineus* near Slocene river, in forest block No 109, comp. No 2, 3, 6, 7, 8 and block No 91, comp. No 29, 30, 31 of Valgums Forestry.
Monitoring	To develop and carry out the monitoring of the condition of endangered bush habitat (*Myrica gale* stands). To compare the results with the condition of the habitat described in the habitat objectives.
Research	To consider a possibility to create some plantations of *Myrica gale* in Kemeri National Park

4.6 Meadows

Classification of meadow habitats in Kemeri NP has been carried out in accordance with the Meadow biotope classificatory that was used during the Meadow inventory project in the whole territory of Latvia.
Depending on nature conservation values of meadows (how natural they are, specially protected meadow habitats, specially protected plant species, management possibilities), meadows of KNP are divided into three categories:

I Meadows of prioritary conservation;
II Meadows with the high and average value of nature conservation;
III Meadows with the average and low value of nature conservation.

A big proportion of Kemeri NP meadows are private lands (pictures 21 and 22).

Activities in relation to all meadows of categories I and II:

- Meadows should not be ploughed and fertilised;
- Mowed hay, sprouts of shrubs and trees, cut shrubs and trees should be removed from meadows;
- To complete the inventory of meadow habitats of Kemeri NP;
- To carry out a detailed study of the vegetation of rare meadow habitats (mainly *Sesleria caerulea* and *Molinia careulea* meadows).

KEMERI NATIONAL PARK'S MEADOWS OF PRIORITARY CONSERVATON (Pictures 21, 22).

4.6.1 Lielupe flooplain meadows

It is a strip of floodplain meadows (up to 1 km wide in places) that stretches along the river Lielupe from the Kalnciems bridge to Odini, opposite to the Kalnciems black alder swamp. The Lielupe flooplain meadows are situated within the nature reserve zone. The meadows are drained from Odini to Pavasari where there is a polder built (picture 21).

A dam separates the river from the meadows in several spans. It prevents flooding of the meadows by floodwater. Kemeri NP manages a 30 ha plot near the Parupju ditch. In this plot, meadows and shrubs occupy ca. 14 ha. There are mainly wet meadows: tall sedge meadows and *Caricoso- phragmitosa*, fragmentary - lowland hay meadows (with *Festuca pratensis*) and mesotrophic meadows (with *Sesleria caerulea*). Some plots are overgrown by dense shrubs.

4.6.1.1 Biological values

The main value here is the large area of Lielupe floodplain meadows and meadows' habitat diversity. there.
Meadow habitats: meadows of *Sesleria caerulea,* meadows of *Festuca pratensis*, meadows of *Carex acuta,* meadows of *Carex diandra,* meadows of *Phalaris arundinacea*, meadows of *Glyceria maxima*, meadows of *Calamagrostis neglecta,* communities of *Phragmites australis* and *Typha latifolia*.

Specially protected plant species: *Triglochin maritimum* and *Dactylorhiza incarnata*.
Specially protected habitats: meadow of *Sesleria caerulea* (fragmentary).
Habitats of Annex I of EU Species and Habitat Directive: *1630 coastal meadows (fragmentary), 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels.

Lielupe flooplain is a significant **nesting habitat** for many bird species of open landscapes: Corncrake (3-5 pairs) and Grey Partridge. There are meadows of considerable ornitological importance due to the fact that this is a feeding habitat for Lesser-spotted Eagle **(***Aquila pomarina***)**, Montagu's Harrier (*Cyrcus pygargus*) and Hen Harrier (*C.cyaneus*), Marsh Harrier (Cyrcus aeruginosus), Barred Warbler (*Sylvia nisoria*)**.** It is possible to create appropriate conditions for Great Snipe's (*Gallinago media*) nesting if the habitat is restored.
Lielupe floodplain meadows are a part of an internationally important bird area "Kalnciema Meadows and Odinu Fields" with code No. 029 (Racinskis, 2000) (Fig. 18).
Invertebrates' communities associated to wet habitats and the ones trophically connected with coastal plants are widely represented in the meadows.

4.6.1.2 Meadow utilisation

The drained meadows are mowed after the 24th June by mowing-machines. Two cows (tethered) graze in Odini.
Part of the meadows is mowed according to the contract with the Riga Zoo.
The cultural and historical values - the old road to the harbour of Zemgale as well as a barge pier are situated to to the north from the Kalnciems bridge in Kalki. The old river-crossing is found in Parupji. It is said that "even cows were transported from the opposite bank to the Lielupe floodplain meadows" at this crossing.

4.6.1.3 Influencing Factors

Previously: establishment of drainage ditches and polder dams, building of Lielupe's bank dam that prevents floodwater inflow into floodplain meadows.
At present: insufficient meadow management due to which the area occupied by trees, shrubs, reeds, *Filipendula ulmaria* and *Calamagrostis epigeos* increases.
Previously: transformation of the hydrological regime in Lielupe and the surrounding forests;
Positive factors: beaver dams in ditches, which increase water level a bit;
Numerous landowners.

4.6.1.4 Objective

Open Lielupe floodplain meadows and their species and habitat diversity should be preserved in the areas where:

1) the above-mentioned meadow habitats occupy at least their present area (see aerophoto and the map);
2) the percentage of trees and shrubs in the meadow does not exceed the present one (see aerophoto);
3) the continious area of *Phragmites australis* does not exceed the present area;
4) the communities of *Triglochin maritimum* are present;
5) the characteristic species of these meadows are present;
6) the number of corncrakes can be restored at the level of the early 1990s (~10 singing males).

4.6.1.5 Activities

Administration	Private landowners should be found out. Land properties of private landowners in Lielupe floodplain meadows should be purchased. To elaborate and introduce a compensation mechanism in order to interest landowners/ managers in nature-friendly agriculture.
Planning	To elaborate an architectural project for building an information/management centre and a sight-seeing tower in Kalki near Lielupe. To elaborate a project for eliminating the consequences of floodplain meadows' melioration. The influence of beaver activities should be taken into consideration when elaborating the project.
Information	Private owners should be informed about nature values in their territories, and the optimal management regime in particular areas should be chosen in co-operation with Kemeri NP. Landowners/ managers should be educated by explaining the principles of nature-friendly agriculture (mowing from the field's centre to the sides).
Habitat management	To continue the existing management - mowing or cattle grazing. Grazing intensity: 1 horse/ 1ha or 1 cow/ 0.6ha. Mowing should be carried out not earlier then on 1 July using additional animal protection measures. To clear the meadows from shrubs and reeds in the areas where management has been absent for a long time, especially in the reed-dominated areas. At the beginning, mowing should be done every year in June before the flowering of reeds, later on - at least once in two years. Ideally, mowing should be done every year. ➢ The meadow of *Calamagrostis neglecta* with *Triglochin maritimum* (the meadow next to Kalnciema bridge) should be

	mowed at least once in two years; the recommended time - June. To leave single growing trees and shrubs. To prevent overgrowing of the area by shrubs and trees introducing to shrub areas (shrubs' strips should not exceed 1/5 of length of ditches and roadsides, the total width of shrub strip should not exceed 5m). To clear drainage ditches from shrubs and fill up the ditches in the middle part of Lielupe floodplain meadows (in the KNP-owned areas) in order to prepare a habitat suitable for corncrakes.
Area management/ Infrastructure	To build an enclosure in the Lielupe meadows to arrange pastures for wild-ranging cattle/horses. To build an information/management centre in Kalki near Lielupe (in the territory of the old harbour).
Monitoring	To elaborate and carry out the monitoring of the efficiency of management of especially valuable meadows. To monitor the nesting success of corncrakes.
Research	To carry out a hydrological research in Lielupe and the Lielupe floodplain meadows.

➢ The land transformation can be done for establishing and improving the infrastructure of NP in accordance with the research project's conditions.

4.6.2 Meadows in the Slocene Valley and Caukciems

4.6.2.1 Biological Values

The main value of the meadows are Latvia's **rare meadow habitats** that can be found there - meadows of *Sesleria caerulea* and *Molinia careulea*.

Habitats mentioned in Annex I of EU Species and Habitat Directive (6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caerulae*), 6510 lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)).

Meadows of *Sesleria caerulea*

These meadows belong to mesotrophic grasslands that exist in areas with the fluctuating moisture level. *Sesleria caerulea* dominates here. Many indicator species non-transformed meadows are present: e.g., *Briza media, Scorzonera humilis, Galium boreale, Succisa pratensis, Polygala amarella* etc. The meadow by the house "Griki" differs from other meadows of *Sesleria caerulea* found in Kemeri National Park by its large amount of *Scorzonera humilis. Calamagrostis epigeos* is present in great amounts in some places due to the long-term lack of management.

Specially protected plant species: *Gymnadenia conopsea, Myrica gale, Schoenus ferrugineus, Primula farinosa.*

3 corncrakes were observed in the meadows of Caukciems; 5-10 corncrakes - in the meadows of Slocene (Pulkaine).

Meadows of *Molinia careulea*

These meadows belong to moderately fertile meadows that exist in areas with the fluctuating moisture level. *Molinia careulea* dominates. The number of species is small, especially in wet areas. The most frequent species are as follows: *Peucedanum palustre, Succisa pratensi*s and *Centaurea jacea*. The following indicator species of non-transformed meadows are found: *Parnassia palustris, Sesleria caerulea, Lathyrus palustris, Succisa pratensis, Briza media, Galium boreale, Sieglingia decumbens*, *Primula farinosa* and *Dactylorhiza incarnata.*

Specially protected species: *Carex buxbaumii, Dactylorhiza incarnata, Primula farinosa, Myrica gale* and *Schoenus ferrugineus.*

4.6.2.2 Meadow utilisation

The meadows of *Sesleria caerulea* are not managed.

In the meadows of Caukciems 3-4 cows graze; the meadows are irregularly mowed.

4.6.2.3 Influencing factors

The meadow succession;
Molinia careulea and/or *Calamagrostis epigeos* root and start dominating in the wet areas after changes of water level and management interruption. If the meadow of *Molinia careulea* is not managed, *Molinia* starts dominating and it forces out other species resulting in lower species diversity. This happens also if meadows become wetter.
At present: insufficient meadow management; lack of management;
Potentially: over-grazing; fertilization, ploughing, burning, transformation for building up;
Changes of the hydrological regime in the surrounding area;
The meadows are mainly privately owned.

4.6.2.4 Objective

I The open meadows of *Sesleria caerulea* should be preserved at least in their present space and in their present state areas where:

1) the meadows of *Sesleria caerulea* occupy at least the present areas,
2) the percentage of trees and shrubs in the meadows does not exceed the present one,
3) *Sesleria caerulea* dominates in the herbaceous plant stand,
4) The indicator species typical to the meadows and rare and specially protected species are present.

II The open meadows of *Molinia careulea* should be preserved and their present state should be improved. Favourable conditions are the following:

1) the meadows of *Molinia careulea* occupy their present area,
2) the percentage of trees and bushes in the meadows does not exceed the present one (see aerophoto),
3) *Molinia careulea* dominates in the herbaceous plant stand. However, many other species are present as well.

4.6.2.5 Activities

Administration	To elaborate and introduce a compensation mechanism in order to interest landowners/ managers in nature-friendly agriculture.
Information	Private owners should be informed about nature values in their territories, and the optimal management regime in particular areas should be chosen in co-operation with Kemeri NP.
Habitat management	In the meadows of *Sesleria caerulea* The meadows where there are no or are few orchids should be grazed. Grazing intensity: 1 cow/1ha or 1 cow/1.7ha. Grazing season: only a part of the season - May, June and the end of July or from the middle of July to the end of August. Grazing is allowed for the whole season if t is performed every second year only. Mowing is recommended in the meadows with different orchid species. Season: June, beginning of July. Mowing should be done every second year at the end of July to ensure seed production by plants. Trees and shrubs should be cut gradually leaving a few biggest specimens. Younger shrubs and trees should be cut first. Shrub sprouts should be cut annually. In the meadows of *Molinia careulea* Should be scythed every year (or at least once in two years). Season – July. Trees and shrubs should be cut gradually leaving junipers and several biggest trees. Sprouts of shrubs and trees should be cut every year.
Monitoring	To elaborate and carry out the monitoring of the efficiency of management of especially valuable meadows.

4.6.3 The meadows of Antinciems

Mainly meadows of *Festuca pratensis* and of *Sesleria caerulea* are present. The dominance of *Calamagrostis epigeos* appears in observed in the meadow with the long-term lack of management. In wet parts of the weadows, *Filipendula ulmaria* dominates.

4.6.3.1 Biological values

The main value of meadows is their natural state, rare meadow habitats - meadows with *Sesleria caerulea*, specially protected plant species, potential noble trees in meadows - oak and lime. The habitat 6510 of Annex I of EU Species and Habitat Directive - lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*).

Meadows of *Festuca pratensis*

They are lowland hay meadows where *Festuca pratensis* dominates. Characteristic species: *Festuca pratensis, Carum carvi, Helictotrichion pubescens, Knautia arvensis, Leucanthemum vulgare, Tragopogon pratensis.* There are many indicator species of natural meadows, e.g., *Briza media, Sesleria caerulea, Cirsium acaule, Primula veris* etc.

Specially protected plant species: *Orobanche elatior* and *Gladiolus imbricatus.*
Rare plant species: *Allium scorodoprasum* and *A.oleracium.*

Meadows of *Sesleria caerulea*

These meadows belong to mesotrophic grasslands that exist in areas with the fluctuating moisture level. *Sesleria caerulea* dominates. Common species are the following: *Briza media, Carex panicea, Galium boreale, Centaurea jacea* and *Geum rivale*.

Meadows of shady forest fringes

Small plots of such meadows can be found in lightly shady forest fringes. Characteristic species are as follows: *Melampyrum nemoreum, Agrimonia eupatoria, Galium boreale, Vicia sepium* etc.

4.6.3.2 Meadow utilisation

Several parts of the meadows are regularly managed - they are mowed and grazed (the meadow in the SE corner of Kanieris is regularly mowed and one cow grazes on the SE bank of Kanieris).
This is an attractive landscape, potential building area.

4.6.3.3 Influencing Factors

Meadow succession;
Potentially: in relation to *Orobanche elatior*, the lack of *Centauria scabiosa*;
Previously: meadow melioration, establishment of vegetable gardens and roads (Antinciems);
At present: fertilizing, ploughing, burning and building up;
Changes of the hydrological regime in the surrounding area;
The meadows are mainly privately owned.

4.6.3.4 Objective

The meadows of Antinciems should be preserved in their present state in the areas where:

1) the open meadow area is at least as large as currently (see aerophoto);
2) the following habitats are mainly present: meadows of *Sesleria caerulea,* meadows of *Festuca pratensis*, meadows of the shady forest fringes;
3) the percentage of trees and shrubs in the meadows does not exceed the present one (see aerophoto);
4) a great species diversity in the herbaceous plants stand; there are many indicator species of natural meadow: *Briza media, Primula veris, Galium boreale, Succisa pratensis* etc.;
5) meadows of *Calamagrostis epigeos* do not exceed the present area;
6) the vital populations of rare plant species are present, e.g*., Orobanche elatior, Gladiolus imbricatus, Allium scorodoprasum* and *A.oleraceum.*

4.6.3.5 Activities

Information	Private owners should be informed about nature values in their territories, and the optimal management regime in particular areas should be chosen in co-operation with Kemeri NP.
Habitat management	**The meadows of *Festuca pratensis* with fragments of *Sesleria caerulea***. Mowing should be continued. The recommended time - middle of June. If possible, mowing should be done every year or at least every second year. At first, it is recommended to mow meadow areas dominated by *Calamagrostis*

	epigeos every year in June before the blooming. Shrubs should be cut gradually, maintaining hawthorns, separate rose bushes and junipers. Sprouts of shrubs should be cut every year. ➢ A part of the meadow with *Orobanche elatior* should be scythed every second or third year, leaving *Orobanche elatior* untouched. Season - the end of July. ➢ A part of the meadow area with *Allium scorodophrasum* and *Allium oleraceum* should be scythed every third year in August. ➢ A par tof the meadow with *Gladiolus imbricatus* should be scythed every second or third year in the second half of July. To cut shrubs growing nearby ensuring an average shading. **In the meadows of *Sesleria caerulea*** Meadows with no or few orchids should be grazed. Grazing intensity: 1cow / 1-1.7ha. Season: only a part of the season - May, June and end of July or from the middle of July to the end of August. Grazing is allowed for the whole season if it is done every second year only. Mowing is recommended in the meadows with different orchid species. Season - June, beginning of July. Every second year mowing should be done at the end of July to ensure seed production by plants. Trees and shrubs should be cut gradually leaving several biggest specimens. Younger shrubs and trees should be cut first. Sprouts of shrubs should be cut every year.
Monitoring	To elaborate and carry out the monitoring of the efficiency of management of especially valuable meadows.

4.6.4 The floodplain meadows of Vecslocene

4.6.4.1 General characteristics

The largest area is occupied by the meadows of *Molinia caerulea* and clumps of *Myrica gale*. Next to the river, there is a narrow strip of *Caricoso- phragmitosa, Agrostis* sp. Communities, willow thickets. Black alders, meadows of *Filipendula ulmaria,* meadow fragments of *Calamagrostis neglecta* and - next to the former riverbed - the community of *Carex elata* are present as well.

4.6.4.2 Biological values

The value of the meadows are large areas of Latvia's rare meadow habitats - meadows of *Molinia caerulea,* which is also a habitat included in Annex I of EU Species and Habitat Directive (92/43/EEC) (6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caerulae*). Latvia's rare shrubland habitat is present - thickets of *Myrica gale.*

From the lake Sloka to Lielupe, barred warbler **(***Sylvia nisoria***)** and red-backed shrike (*Lanius collurio*) can be observed.

The meadows of *Molinia caerulea*

These are mesotrophic grasslands in places with the fluctuating hydrological regime. *Molinia caerulea* dominates. In wet places, the species diversity is poor. Besides *Molinia careulea* the following species are present as well: *Peucedanum palustre, Myrica gale, Lythrum salicaria, Thalictrum lucidum* and *Th. Aquilegifolium. Inula salicina* occupies a large territory, especially in the driest parts of the meadow. A different species content is found on hillocks. Various dry meadow species have been found there, e.g., *Pimpinella saxifraga, Cirsium acaule, Antennaria dioica, Anthyllis vulneraria, Carex capillaris, Fragaria viridis, Carlina vulgaris.*

Specially protected plant species: *Gladiolus imbricatus, Gymnadenia conopsea, Schoenus ferrugineus, Myrica gale, Dactylorhiza incarnata, Carex buxbaumii, Euphorbia palustris.*

4.6.4.3 Meadow utilisation

The meadows are not managed.

4.6.4.4 Influencing Factors

If meadow is not managed, *M. caerulea* starts dominating and forces out other species. Thus, the species diversity dicreases;

Meadow succession (overgrowing with shrubs and trees);
Previously: meadow melioration;
At present: lack of management; burning;
Potentially: fertilization, ploughing, building up;
Chnages of the hydrological regime in the surrounding area;
In the general plan of Jurmala town, it is mentioned that a potential detour could cross these meadows.

4.6.4.5 Objective

The floodplain meadows of Vecslocene should be preserved at least in their present state in the areas where:

1) the area of the meadows of *Molinia caerulea* is at least as large as currently (see aerophoto and Fig. 22);
2) the percentage of trees and shrubs in the meadows does not exceed the present one (see aerophoto);
3) *Molinia careulea* dominates in the herbaceous plants stand. However, depending on moisture conditions, various other above-mentioned species can be present as well;
4) The following above-mentioned specially protected plant species are present: *Gladiolus imbricatus, Gymnadenia conopsea, Schoenus ferrugineus, Myrica gale, Dactylorhiza incarnata, Carex buxbaumii, Euphorbia palustris.*
5)

4.6.4.6 Activities

Information	Private owners should be informed about nature values in their territories, and the optimal management regime in particular areas should be chosen in co-operation with Kemeri NP.
Habitat management	Vecslocene meadows of *Molinia caerulea* A small part of trees and shrubs should be gradually cut (except *Myrica gale*) starting with the youngest ones. The strip of trees and shrubs along Vecslocene should be left. It should be made sure that the proportion of shrubs in the meadow does not increase. Shrub cutting mainly refers to the part of the meadow adjacent to the road. On the hillock, the biggest birch trees should be left, to cut aspens, goat willows etc. growing in the understorey. Sprouts of shrubs and trees should be cut every year. Mowing by scythe/trimmer should be carried out in the whole area of the meadow every year or at least once in two years in July. ➢ Burning is prohibited ➢ In the areas with *Gladiolus imbricatus* (in the northern part of the hillock), mowing takes place every third year in the second half of July. ➢ Every second year, the meadow on the hillock has to be mowed only in the end of July/ beginning of August to ensure seed production by plants. Lowland hay meadows near Vecslocene with *Calamagrostis neglecta, Deschampsia cespitosa, Juncus effusus.* To moving by a scythe/ trimmer every year (or at least every third year) in May/ June. Selectively cut trees and shrubs, as close to the ground as possible.
Monitoring	To elaborate and carry out the monitoring of the efficiency of management of especially valuable meadows.

4.6.5 Meadows and fens to the SW of the Sloka railroad station

4.6.5.1 General characteristics

These are the meadows and calcareous fens that occupy the right side of railroad Riga-Ventspils. The meadows of *Molinia caerulea,* meadows of *Sesleria caerulea*, tiny fragments of calcareous fens with

Schoenus ferrugineus, tiny clumps of *Myrica gale* and fens with *Carex lasiocarpa* are present. In some places, small overgrowing peat-cutting fields are present.

4.6.5.2 Biological values

The main area's value are Latvia's **specially protected habitats** - meadows of *Molinia* careulea, meadows of *Sesleria caerulea*, a fen with *Schoenus ferrugineus* and the **specially protected plant species** that grow there: *Dactylorhiza incarnata, Gymnadenia conopsea, Myrica gale, Schoenus ferrugineus, Gentianella amarella, Pinguicula vulagris, Primula farinosa.*

The habitats included in Annex I of EU Species and Habitats Directive (92/43/EEC)- 6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caerulae*) and 7230 Alkaline fens.

The meadow of *Molinia caerulea*

Thse are mesotrophic grasslands in areas with the fluctuating water level. *Molinia careulea* dominates. Common species in this meadow habitat are as follows: *Myrica gale, Galium boreale, Sesleria caerulea, Succisa pratensis, Carex lasiocarpa, Parnassia palustris, Carex panicea.* The following **specially protected plant species** are found: *Myrica gale* and *Dactylorhiza incarnata.*

The Meadows of *Sesleria caerulea*

These are mesotrophic grasslands in areas with the fluctuating water level. *Sesleria caerulea* dominates. The following indicator species of non-transformed meadows are found: *Carex panicea, Primula farinosa, Parnassia palustris* and *Succisa pratensis.*

Specially protected plant species: *Gymnadenia conopsea, Primula farinosa, Gentianella amarella Pinguicula vulagris, Myrica gale* and *Schoenus ferrugineus.*

4.6.5.3 Meadow utilisation

The meadows are not regularly managed.

4.6.5.4 Influencing Factors

Succession of meadows and fens;
Due to the lack of management, *Molinia caerulea* starts to dominate in wet areas;
Previously: meadow melioration, establishment of railroad;
Potentially: over-grazing; fertilization, ploughing, burning, extending of the railroad, building up;
Changes of the hydrological regime in the surrounding area.

4.6.5.6 Objective

The open meadow habitats and calcareous fens should be preserved at least in their present state in the areas where:

1) the area of open meadows and calcareous fens is at least as large as currently (see the map and aerophoto);
2) the percentage of trees and shrubs in the meadows does not exceed the present one (see aerophoto);
3) The following above-mentioned habitats are present: meadows of *Molinia caerulea,* meadows of *Sesleria caerulea*, fens with *Schoenus ferrugineus,* tiny thickets of *Myrica gale.*
4) Characteristic species of these habitats are present;
5) The following specially protected plant species are present: *Gymnadenia conopsea, Schoenus ferrugineus, Myrica gale, Dactylorhiza incarnata, Gentianella amarella, Pinguicula vulgaris, Primula farinosa.*

4.6.5.7 Activities

Information	Private owners should be informed about nature values in their territories, and the optimal management regime in particular areas should be chosen in co-operation with Kemeri NP.
Monitoring	To elaborate and carry out the monitoring of the efficiency of management of especially valuable meadows.

4.6.6 Meadows of category II

Dry grasslands on sandy soil and fallow land meadows on the northern side of Kanieris.
The present management: small areas of meadows are grazed (2 horses, 1 cow).

Management
Grazing intensity: 1horse/ 2ha or 1cow/ 1.7ha, or 1sheep/0.6ha. Season: May- July.

In a part of the meadow with *Nardus stricta* grazing is recommended only in spring - May/beginning of June. In autumn, this part of the meadow can be burned.
In a part of the meadow where *Calamagrostis epigeos* dominates, annual mowing is recommended in June before blooming.

Fallow meadows (which occupy the largest part of the meadow) can be mowed once or twice a year, preferably in June and August.

4.6.7 Meadows of category III

Meadows on the northern bank of the lake Valgums;
Meadows along the highway Klapkalnciems-Tukums;
A meadow in the valley of Slocene;
A meadow opposite to the boat station of Kanieris;
Meadows in Lapmezciems and Ragaciems.

- The descriptions and precise management activities for the meadows of category II and III should be prepared during the next review of the nature protection plan!

4.7 Species conservation

4.7.1 Localities of vascular plants

4.7.1.1 Localities of *Cypripedium calceolus*

Meza maja. Kapu forestry district's 6th forest block - compartments 2, 5, 7.
The locality was found in 1993 during the investigation of Kemeri National Park. Since then, employees of Kemeri National Park have regularly inspected it. 20 dispersed specimens have been discovered (Andersone, pers. com.). Rowan tree, maple, elm, aspen, birdcherry tree and spruce compose the tree stand. The understorey is poorly distinguished. Herbaceous plants are the following: May Lily (*Maianthemum bifolium*), Hepatica (*Hepatica nobilis*), Spring Pea (*Lathyrus vernalis*), Sanicle (*Sanicula europaea*), Yellow Sedge (*Carex flava*), Cabbage Thistle (*Cirsium oleraceum*), False Brome (*Brachypodium sylvaticum*) (in great amount), and Broad-leaved Helleborine (*Epipactis helleborine*). The moss stand is well developed – up to 90%.
Threats were not discovered.

Valguma forestry district's 52th forest block – compartment 12.
On 3 October 2000, a plant group of 40-50 specimens was found. The tree stand is formed by maple, lime-tree and spruce. Wood Sorrel (*Oxalis acetosella*), Sanicle (*Sanicula europaea*), Spring Pea (*Lathyrus vernalis*), Hepatica (*Hepatica nobilis*) and False Brome (*Brachypodium sylvaticum*) grow in the stand of herbaceous plants. Moss stand is poorly developed. The habitat is intact. In the compartment, many rare and protected moss and bracket-fungus species were found (Susko, pers. com.).
Threats were not discovered.

Valguma forestry district's 53th forest block – compartment 4.
2 specimens were noticed in a young spruce stand (Andersone, pers. com.). The stands of herbaceous plants and moss are poorly developed.
Threats were not discovered.

The largest locality of *Cypripedium calceolus* is situated near Kudra. The detailed information can be found in the conservation plan for this species (Denina, 1999).

The precise locations of the following sites of *Cypripedium calceolus* that were discovered duting research of 1993 are to be checked: Valguma forestry district's 61th forest block, 287th forest block, 311th forest block – compartments 7 and 6. Kapu forestry district's 5th, 10th, 13th forest blocks.

4.7.1.1.1 Influencing Factors

Factors common for <u>all localities of *Cypripedium calceolus:*</u>
Overgrowing of understorey by shrubs, thus transforming the optimal light conditions;
At the moment: drainage, collecting blooming plants, digging plants out;
Potentially: fire; clearcuts, belt-cuts, trampling;
Changes of hydrological regime in the surrounding areas.

4.7.1.1.2 Objective

The populations of *Cypripedium calceolus* should be preserved in Kemeri National Park in the areas, where:

- the species can be found in at least its present localities in KNP;
- the number of specimens in the localities is not smaller than the present one.

Species	Locality	Number of specimens
Cypripedium calceolus	Kapu f.district, 6th f.block - comp. 2, 5, 7	~20
	Valguma f.district, 52th f.block – 12th f.comp.	40- 50
	Valguma f.district, 53th f.block- 4th f.comp	2
	Kudra	~200

4.7.1.1.3 Activities

Administration	To suggest designation of microreserves for conservation of *Cypripedium calceolus* is and to specify their borders within the compartments of forest blocks mentioned in the Appendix 20.
Control	To raid the market of Sloka in order to follow the protection regulations of *Cypripedium calceolus.*
Monitoring	To carry out monitoring of *Cypripedium calceolus*. *Frequency*: once per vegetation season. *Monitoring parameters:* the number of specimens in a locality; the number of blooming specimens, surrounding species. *Potentially*: water level, the moisture level of soil, shading etc. To map the localities by means of the Geographical Positioning System (GPS).
Research	To check the following localities of *Cypripedium calceolus* that were found during the investigation of 1993: Valguma forestry district's 61th forest block, 287th forest block, 311th forest block – compartments 6 and 7. Kapu forestry district's 5th, 10th and 13th forest blocks.

4.7.1.2 ***Taxus baccata***

3 near growing trees of *Taxus baccata* has been discovered on the border of 6.and 7. forest compartments of Valguma forest district's 76.forest block. Mainly firs grow in the near tree stand and undergrowth.

4.7.1.2.1 Influencing Factors

Light conditions: insufficient light intensity for the development of trees;
Climate: cold winters;
Insufficient number of male and female specimens for species preservation;
Disjunction of the population (for successful fecundation, the distance between trees of *Taxus bacatta* should be 100m at maximum);
Too few specimens, which are isolated from other localities of the species.
Changes of hydrological regime in the surrounding area.

4.7.1.2.2 Objective

Taxus baccata should be preserved in Kemeri National Park in areas, where the species is found at least in the present locality (3 specimens).

4.7.1.2.3 Activities

Species Protection	Trees around *Taxus baccata* should be cut so that partial shading is ensured.
Monitoring	To evaluate the efficiency of measures undertaken.

4.7.1.3 ***Orobanche elatior***

Approximately 100 specimens of *Orobanche elatior* have been found at the southeastern bank of lake Kanieris, in a meadow with *Festuca pratensis.* The plant community is formed by *Centaurea scabiosa* (the host plant), *Festuca pratensis*, *Helictotrichion pubescens*, *Taraxacum officinale*, *Allium scorodoprasum* etc.

4.7.1.3.1 Influencing Factors

At present: ploughing of the meadow;
Destruction of the host plants if the grassland is ploughed, fertilised, over-grazed or built up.

4.7.1.3.2 Objective

The population of *Orobanche elatior* should be preserved in Kemeri National Park in the areas where

1) the species can be found at least in the present localities at the SE side of Kanieris;
2) the number of specimens in the localities is not smaller than the present one (~100).

4.7.1.3.3 Activities

Administration	To suggest creating microreserves for conservation of *Orobanche elatior* in KNP.
Monitoring	To carry out monitoring of *Orobanche elatior*. *Frequency*: once per vegetation season. *Monitoring parameters:* the number of specimens in a locality; the number of blooming specimens, surrounding species. To map localities by means of GPS.

4.7.1.4 *Saussurea esthonica*

Approximately 80 specimens have been found in small and dispersed groups in a calcareous fen on the border of 22th, 23th and 33th forest blocks of Valguma forestry district. The plant community is formed by *Schoenus ferrugineus*, *Primula farinosa, Phragmites australis, Succisa pratensis* and others. In the moss stand, the following species were found: *Scorpidium revolvens, Bryum pseudotriquetrum, Fissidens adianthoides* and others.

In some places, a rather dense tree and shrub stand has formed. The proportion of reeds *Phragmites australis* is high as well.

4.7.1.4.1 Influencing Factors

Overgrowing of the fen by reeds, trees and shrubs;
Previously: building of a forest road;
Potentially: the lack of fen management;
Previously and potentially: changes of the hydrological regime;
Only a part of the fen, where *Saussurea esthonica* grows, is situated within the territory of Kemeri National Park.

4.7.1.4.2 Objective

The population of *Saussurea esthonica* should be preserved in Kemeri National Park in areas where:

1) the species can be found at least in the present localities of KNP (the border of 23th, 24th, 32th and 33th f. blocks of Valguma f. district);
2) the number of specimens in the localities is not smaller than the present one (~80).

4.7.1.4.3 Activities

Administration	To suggest designation of microreserves for conservation of *Saussurea esthonica* in the mentioned forest blocks (Appendix 20).
Management of the habitat	<u>The fen with *Saussurea esthonica*</u> Trees and shrubs should be gradually cut as close to the ground as possible, leaving common junipers, honeysuckle (*Lonicera pallasi*) and the biggest pines. Mowing with a scythe/ trimmer is recommended in the areas overgrown by reeds and *Molinia caerulea,* leaving *Saussurea esthonica* untouched. It should be done in June. In the first few years, mowing may be carried out also the second time – in the middle or end of August. Some parts of the fen should be left untouched for 3-4 years.
Monitoring	To carry out monitoring of *Saussurea esthonica*. *Frequency*: once per vegetation season. *Monitoring parameters:* the number of specimens in a locality; the number of blooming specimens, surrounding species. To map localities using GPS.

4.7.1.5 *Liparis loeselii*

4.7.1.5.1 Localities

1. In the calcareous fen on the SE side of lake Kanieris (5-7 specimens), (see chapter 4.4.4. (Fens with *Schoenus ferrugineus)* for the description of the habitat).
2. In the calcareous fen on the SW side of lake Kanieris (5-7 specimens), (see chapter 4.4.4. (Fens with *Schoenus ferrugineus)* for the description of the habitat).

3. In a fragment (1m^2) of the calcareous fen among *Myrica gale* on the northern side of lake Kanieris (1 specimen).
4. On the bank of Likumciema dolomite quarry (3-5 specimens) with *Carex serotina, Epipactis palustris, Carex panicea, Centaurium pulchellum, Inula salicina* and others.
5. In the calcareous fen with *Schoenus ferrugineus* (2-3 specimens) in Valguma forestry district's 146th forest block – 27th forest compartment.

4.7.1.5.2 Influencing Factors

Overgrowing of fens by reeds, Fen-sedge (*Cladium mariscus*), trees and shrubs.
Previuosly and potentially: changes of the hydrological regime;
Potentially: trampling.
Positive factor: a part of the localities are situated within the nature reserve zone.

4.7.1.5.3 Objective

Populations of specially protected plant species should be preserved in Kemeri National Park in areas where:
1) the species can be found at least in the present localities in KNP;
2) the number of specimens in the locations is not smaller than the present one.

Species	**Locality**	**Number of specimens**
Liparis loeselii	The SE side of lake Kanieris	3-5
	The SW side of lake Kanieris	3-5
	Valguma forestry district's 146th f.block- 27th f.comp.	2-4
	The N side of lake Kaneris	1
	The bank of the Likumciema dolomite quarry	3-5

4.7.1.5.4 Activities

Habitat management	See Ch. 4.4.4 - fens with *Schoenus ferrugineus*
Monitoring	To carry out monitoring of *Liparis loeselii*. *Frequency*: once per vegetation season. *Monitoring parameters:* the number of specimens in a locality; the number of blooming specimens, surrounding species. To map localities using GPS.

4.7.1.6 *Euphorbia palustris*

4.7.1.6.1 Localities

1) Approximately 60 specimens (in total) have been discovered in a black alder swamp (*Dryopterioso – caricosa)* by the bridge on both sides of river Slocene.
2) 3 specimens have been found on the right side of river Slocene among the reeds (on the other side of highway Kemeri-Jurmala).
3) 1 specimen has been found in the floodplain of river Vecslocene in a fen with *Carex lasiocarpa.*
4) Several specimens - in the forests along river Slocene up to its estuary in lake Kanieris.

The following localities of *Euphorbia palustris* found during the studies in 1993 by U.Susko should be checked:

- On the N side of the lake Sloka (see the attached map of the Institute of Biology's repor on the lake sloka (1993));
- On the S bank of the lake Sloka in black alders swamp (*Dryopterioso – caricosa)* (see the above-mentioned map);
- On both sides of the river Slocene near its mouth in the lake Sloka (see the above-mentioned map).

4.7.1.6.2 Influencing Factors

Lack of suitable habitats;
Previously and potentially: changes of the hydrological regime;
Lack of information about optimal conditions for the existence of the species.

4.7.1.6.3 Objective

Populations of *Euphorbia palustris* should be preserved in Kemeri National Park in areas where:

1) the species can be found at least in the present localities in KNP;
2) the number of specimens in the localities is not smaller than the present one.

Species	**Locality**	**Number of specimens**
Euphorbia palustris	On the bank of the river Vecslocene near the lake Sloka	~60
	On the right bank of Vecslocene on the other side of the highway Kemeri-Jurmala	3
	Along the river Slocene up to its mouth in Kanieris	Several specimens
	In the floodplains of the river Vecslocene	1

4.7.1.6.4 Activities

Monitoring	To carry out monitoring of *Euphorbia palustris*. *Frequency*: once per vegetation period. *Monitoring parameters:* the number of specimens in a locality; the number of blooming specimens, surrounding species. To map localities using SGP.
Research	The following localities of *Euphorbia palustris* that were found in the study of 1993 by U.Susko should be checked: ▪ On the N side of the lake Sloka (see the attached map of the Institute of Biology's repor on the lake sloka (1993)); ▪ On the S bank of the lake Sloka in black alders swamp (*Dryopterioso – caricosa)*; ▪ On both sides of the river Slocene near its mouth in the lake Sloka. The recommended census method is canoeing down the river.

4.7.1.7 *Gladiolus imbricatus*

4.7.1.7.1 Localities

1. Approximately 80 specimens have been found at the edge of the forest and meadow on the SE side of the lake Kanieris. The plant community includes *Calamagrostis epigeos* and *Salix sp.*
2. About 30 specimens were found in the meadow at the lake Aklais (near Sloka);
3. About 30 specimens were found in the *Molinia caerulea's* meadow by Vecslocene, in the northern part of the hillock.
4. 7 specimens were found on the left side of the highway Riga-Ventspils. The plant community includes *Salix sp., Calamagrostis epigeos*, *Geranium palustre* and others.

The following localities of *Gladiolus imbricatus* that were discovered during the study of 1993 by U.Susko should be checked:

- in a fen near the lake Sloka (see the attached map of the Institute of Biology's repor on the lake sloka (1993)),
- on the both sides of the highway Riga-Ventspils (see the above-mentioned map).

4.7.1.7.2 Influencing Factors

Overgrowing of meadows by trees, shrubs and *Calamagrostis epigeos*;
Previously and potentially: changes of the hydrological regime, potentially - collecting blooming plants;
At present: lack of meadow management;
The lack of information about optimal conditions for growth conditions of the species.

4.7.1.7.3 Objective

Populations of *Gladiolus imbricatus* should be preserved in Kemeri National Park in areas where:

1) the species can be found at least in the present localities;

2) the number of specimens in the localities is not smaller than the present one.

Species	Locality	Number of specimens
Gladiolus imbricatus	The SE bank of the lake Kanieris	~80
	Near the lake Aklais	~30
	In a meadow by Vecslocene	~30
	On the left side of the highway Riga-Ventspils	~7

4.7.1.7.4 Activities

Administration	To suggest designation of microreserves for conservation of *Gladiolus imbricatus*.
Habitat management	In the meadow by the lake Aklais (at the moment - no management). Grass should be scythed. Ideally - annually or at least once in two years. Timing - June, beginning of July. The trees and shrubs should be cut gradually. ➢ Meadows with *Gladiolus imbricatus* should be mowed every second or third year in the second half of July. ➢ A part of the meadow with *Gymnadenia conopsea* should be mowed every second year in the end of July only in order to ensure seed production. ➢ Shrubs should be cut gradually in the areas where *Gladiolus imbricatus* grow, because a drastic change of light intensity negatively affects its development (a few shrubs near these plants should be left).
Monitoring	To monitor *Gladiolus imbricatus*. *Monitoring parameters:* the number of specimens in a locality; the number of blooming specimens, surrounding species. *Frequency*: once per vegetation season. To map localities using GPS.

4.7.1.8 *Sparganium angustifolium*

A clump of *Sparganium angustifolium* was found in the lake Akacis.

4.7.1.8.1 Influencing Factors

Eutrophication of the lake;
Potentially: changes of the lake's water level; pollution with nutrients; forest cutting on the banks of the lake;
Potentially: changes of the hydrological regime in the catchement.

4.7.1.8.2 Objective

The growth of *Sparganium angustifolium* should be preserved in the lake Akacis in areas where it can be found at least in its present amount (forms a clump).

4.7.1.8.3 Activities

Monitoring	To carry out monitoring of *Sparganium angustifolium*. *Frequency*: once per vegetation season. *Monitoring parameters:* the number of specimens in a locality; the number of blooming specimens, surrounding species. To map localities using GPS.

4.7.1.9 *Asplenium trichomanes*

4 specimens were found dispersed on a stone wall (southern exposition) in the cemetery of Karnini. *Polypodium vulgare* also grows on the wall. The locality is stable. It is known since 1942 (Vimba, 1991).

4.7.1.9.1 Influencing Factors

Ageing of the population;
Potentially: plant collection; transformation or destruction of the habitat - the stone wall.

4.7.1.9.2 Objective
The locality of *Asplenium trichomanes* should be preserved in the cemetery of Karnini where the number of specimens in the locality is not smaller than the present one (4 specimens).

4.7.1.9.3 Activities

Monitoring	To carry out monitoring of *Asplenium trichomanes*. *Frequency*: once per vegetation season. *Monitoring parameters:* the number of specimens in the locality; the number of blooming specimens, surrounding species. To map the locality using GPS.

4.7.1.10 *Onobrychis arenaria*
2 specimens were found by a forest road in Valguma forestry district's 122th forest block – 8th forest compartment.

4.7.1.10.1 Influencing Factors
Lack of suitable habitats; location on the edge of species distribution range.
Potentially: non-deliberate destruction of the locality by driving on the road or by forestry activities.

4.7.1.10.2 Objective
The locality of *Onobrychis arenaria* should be preserved in Kemeri National Park in the areas where the number of specimens in the locality is not less than the present one (3 specimens).

4.7.1.10.3 Activities

Monitoring	To carry out monitoring of *Onobrychis arenaria*. *Frequency*: once vegetation season. *Monitoring parameters:* the number of specimens in a locality; the number of blooming specimens, surrounding species. To map localities using SGP.

4.7.1.11 *Allium ursinum*
Localities - opposite to the Riekstu peninsula on the left side of the road Lapmezciems-Antinciems;
Next to the house "Kadiki";
Near Izkopi.

4.7.1.11.1 Influencing Factors
Plant collection in great amounts in order to sell them in the market.

4.7.1.11.2 Objective
Populations of *Onobrychis arenaria* should be preserved in Kemeri National Park in the areas where:
1) the species can be found at least in the present localities in KNP;
2) the areas of localities are not smaller than the present ones.

4.7.1.11.3 Activities

Administration	To suggest designation of microreserves for conservation of *Onobrychis arenaria*.
Control	Inspectors and policemen should raid markets in Sloka and Kauguri markets and the forests to ensure implementation of the regulations of protection of *Onobrychis arenaria.*
Research	The locations of the sites should be specified. To find out the areas occupied by the populations by means of GPS.

4.7.1.12 *Lycopodiella inundata*
A ~3m^2 large locality of *Lycopodiella inundata* was found in June 2001 in sand quarries (small "peninsulas" in ditches) belonging to "Slokenbeka". It was found in an unclosed phytocenose with *Carex oederi* and

Polytrichum ssp. (E.Klavina pers.com). The species has not been found in the territory of KNP during the last 20 years.

4.7.1.12.1 Influencing Factors

At present - none (were not discovered).
Potentially: the locality will decrease in the course of natural succession – due to closing of the phytocenose and spreading of shrubs.
If the quarry is re-cultivated, the locality will be physically destroyed.

4.7.1.12.2 Objective

The locality of *Lycopodiella inundata* should be preserved at least in its present area.

4.7.1.12.3 Activities

Habitat management	If the area of the locality decreases, artificial disturbance should be ensured cutting bushes and weeding out the species competing with *Lycopodiella inundata*.
Monitoring	To monitor the condition of *Lycopodiella inundata's* locality by measuring the area and marking the species composition.
Research	To make an inventory of potential localities of *Lycopodiella inundata* in sand quarries. To map the locality using GPS.

4.7.2 Lichens

Cladonia incrassata

It was found in several places on vertical peat walls in peat quarries in the bog of Sloka near the railroad station "Kudra".

4.7.2.1 Influencing Factors

Peat-slide off the vertical walls, overgrowing of walls by heather, cowberries etc.;
Potentially: non-deliberate destruction of the location, the increase of water level in peat pits;
Potentially: changes of the hydrological regime in the surrounding area, causing the increase in the water level in peat pits.

4.7.2.2 Objective

The population of *Cladonia incrassata* should be preserved in Kemeri National Park in the areas where:

1) the species can be found at least in the present localities in KNP;
2) the number of specimens in the localities is not smaller than the present one.

Species	**Locality**	**Number of specimens**
Cladonia incrassata	The peat pit in the Sloka bog	dispersed

4.7.2.3 Activities

Administration	To suggest creation of a microreserve and to specify its borders.
Monitoring	To carry out monitoring of *Cladonia incrassata*. *Frequency*: once per vegetation season. *The parameters for lichens:* the species exists/ does not exist, substrate, amount, location in relation to four cardinal points. To map the location using GPS.

4.7.3 Bryophyta

4.7.3.1 *Barbylophozia lycopodioides*

It was found in several places in dry pine forest on the ground, in Valguma forestry district's 232th forest block: on a side of a path near parking place of Gausa judze. (Leg.D.Meiere and U.Susko 22 May, 1998. Det. U.Susko). At the moment, it is the only locality of the species in Latvia.

4.7.3.1.1 Influencing Factors

Potentially: non-deliberate destruction of the locality by establishing paths, by motorised vehicles and by collecting mosses for floristic compositions.

4.7.3.1.2 Objective

The population of *Barbylophozia lycopodioides* should be preserved in Kemeri National Park in areas where:

1) the species can be found at least in the present localities in KNP;
2) the number of specimens in the localities is not smaller than the present one.

Species	Locality	Number of specimens
Barbylophozia lycopodioides	232th f.block of Valguma f.district	dispersed

4.7.3.1.3 Activities

Administration	To suggest designation of a microreserve. To specify the borders of the compartment of forest block mentioned in the Appendix 20.
Control	*Barbylophozia lycopodioides* To limit habitat transformation in the 232th forest block of Valguma forestry district. New wooden paths should not be established and the existing ones should not be widened.
Monitoring	To carry out monitoring of *Barbylophozia lycopodioides*. *Parameters:* the species exists/ does not exist, the area occupied by the species, substrate and the location in relation to four cardinal points. It is recommended to establish permanent sample plots, where the projective cover of the species would be specified and other species of phytocenose would be censused. *Frequency*: one or more times per vegetation season. To map locality using GPS.

4.7.3.2 *Harpanthus flotovianus*

A few specimens were found in a calcareous fen with springs in Valguma forestry district's 98th forest block – 21th forest compartment. They have a good vitality. It grows together with *Schoenus ferrugineus, Carex panicea, Scorpidium sp.,* and *Calliergonella cuspidata*. (Leg.et det. U. Suško October 7, 1998.) One of the two known localities of this species in Latvia.

4.7.3.2.1 Influencing Factors

Overgrowing of the fen by reeds, trees and shrubs;
Potentially: changes of the hydrological regime;
Previously: changes of the hydrological regime in the surrounding area.

4.7.3.2.2 Objective

The population of *Harpanthus flotovianus* should be preserved in Kemeri National Park in areas where:

1) the species can be found at least in the present localities in KNP;
2) the number of specimens in localities is not smaller than the present one.

Species	Locality	Number of specimens
Harpanthus flotovianus	Valguma forestry district's 98th f. block- 21th f.compartment	few

4.7.3.2.3 Activities

Administration	To suggest designation of a microreserve.
Habitat management	Ca. 1/3 of trees and shrubs growing in the fen (the habitat of *Harpanthus flotovianus*) should be gradually cut leaving *Salix rosmarinifolia, Myrica gale* and the biggest trees and shrubs. Several plots of reeds should be scythed at the end of

	May/beginning of June. The sprouts of cut trees and shrubs should be cut every year.
Monitoring	To carry out monitoring of *Harpanthus flotovianus*. *Parameters:* the species exists/ does not exist, the area occupied by the species, substrate, and location in relation to four cardinal points. It is recommended to set permanent sample plots where the projective cover of the species would be determined and other species of phytocenose would be listed. *Frequency*: one ore more times per vegetation season.

4.7.4 Fungi

Xerocomus parasiticus

It is found in the wet decidious forest in Kemeri forestry district's 81th forest block – 1st compartment. It is a parasite of *Scleroderma citrinum*.

4.7.4.1 Influencing Factors

Potentially: absence of the host plant *Scleroderma citrinum*;
Potentially: destruction of the ground layer of vegetation;
Potentially: changes of the hydrological regime;
Lack of information on species ecology.

4.7.4.2 Objective

The locality of *Xerocomus parasiticus* should be preserved in Kemeri National Park in the areas where:

1) the species can be found at least in its present locality in KNP;
2) the number of specimens in a locality is not smaller than the present one.

Species	**Locality**	**Number of specimens**
Xerocomus parasiticus	Kemeri f.distr. 81th f.block – 1st f.comp.	Separate specimens

4.7.4.3 Activities

Administration	To suggest designation of a micro-reserve.
Monitoring	To carry out monitoring of *Xerocomus parasiticus*. *Parameters for fungi:* the specimen exists/ does not exist, the number of specimens, and substrate. *Frequency*: one or more times per vegetation season depending on the species ecology. To map the locality using GPS.

4.7.5 Additional Activities for Species Management

Administration	A botanist should be employed.
Control	Clearing of stones (overgrown by protected bryophytes) on the SW side of the lake Kanieris is not allowed, i.e., archaeological research should be co-ordinated with a bryophyte expert from the University of Latvia or "Silava". A specially protected moss species *Hylocomium umbratum* grows in the ground vegetation in the lower part of Lustuzkalns's slope (near large-dimension debris). Establishemtn of footpaths is prohibited. Guided visits allowed only, preventing trampling of vegetation on this slope.
Information	The importance of conservation of the rare species of plants, fungi and lichens should be popularized.
Research	Studies of bryophytes, lichens and fungi, especially of underground fungi, should be continued in Kemeri NP.
	To continue studies of floral and filical plants in Kemeri NP.

	To complete the inventory of specially protected plant species in the forests of Kemeri NP.
	Localities of the following specially protected plant species outside the forest habitats should be checked again: *Cyperus fuscus*, *Orchis militaris, Orchis ustulata* and *Hypericum hirsutum*.
	To study ecology of specially protected plant species.
	A database should be created, summarising and regularly updating information on specially protected plant species and habitats, and their condition in Kemeri NP.
	To specify, map and monitor localities of "aggressive species" - Japanese rouse (*Rosa rugosa*), wild cucumber (*Echinocystis lobata*) and hogweed in Kemeri NP are to be specified and mapped.

4.8 Mammals, Reptiles, and Amphibians

Several species of mammals, reptiles and amphibians found in the territory of Kemeri National Park are of European importance and are included in the Annexes of the EU Habitat Directive (Table 4.5).

In the Annex II, there are species conservation of which requires designation of special areas of protection. In KNP, the following Annex II species occur: 5 mammals (wolf *Canis lupus*, lynx *Lynx lynx*, beaver *Castor fiber*, otter *Lutra lutra,* pond bat *Myotis dasycneme*), 1 reptile (pond turtle *Emys orbicularis*), and possibly 1 amphibian (crested newt *Triturus cristatus* but its presence is still to be verified).

In the Annex IV, there are species that are in need of strict protection but do not require designation of special areas of conservation. Annex IV includes the above-mentioned species of Annex II along with the following additional species: 8 mammals (*Sicista betulina* and 7 species of bats), 2 reptiles (sand lizard *Lacerta agilis* and smooth snake *Coronella austriaca*), and 5 amphibians (moor frog *Rana arvalis*, pool frog *Rana lessonae*, common spadefoot *Peleobates fuscus*, natterjack *Bufo calamita* and green toad *Bufo viridis*)

Annex V includes species that may be subject to management measures - 3 mammal species (pine marten *Martes martes*, polecat *Mustela putorius,* and mountain hare *Lepus timidus*), and 3 amphibian species (green frog *Rana esculenta*, lake frog *Rana ridibunda*, and brown frog *Rana temporaria*).

Table 4.5 Presence of the species of EU Habitat Directive's Annexes in the territory of Kemeri National Park.

	Mammals	Reptiles	Amphibians
Annex II	5	1	1?
Annex IV	5+8	1+2	1+5
Annex V	3	0	3
Total	**16**	**3**	**9**

Further in the text, Habitat Directive's species have the appropriate Annex mentioned in brackets.
According to the Council of Ministers' Regulations No.45, microreserves for conservation of natterjack (*Bufo calamita*) are to be designated in the territory of Kemeri NP.

4.8.1 Mammals

There is a need for an inventory of mammal species in the whole territory of Kemeri NP, because it is impossible to plan any protection or management measures without knowing which species occur in the area. A special attention should be paid to the inventory of small rodents and dormice, as well as to some mustelids (weasel *Mustela nivalis*, stoat *Mustela erminea*, and stone marten *Martes foina*), as information about these species is scarce.

4.8.1.1 Wolf *Canis lupus* (II, IV)

The present situation: 5-6 wolves live in the territory of KNP.

4.8.1.1.1 Influencing Factors

Hunting, prey base (the number of wild ungulates, especially roe deer *Capreolus capreolus*, wild boar *Sus scrofa* and red deer *Cervus elaphus*, as well as beavers *Castor fiber*).

4.8.1.1.2 Objective

A stable number (4-8) of territorial animals that fulfil their ecological function (respectively, they feed on wild ungulates and do not inflict a regular damage to livestock).

4.8.1.1.3 Activities

Management	Regulate the number of ungulates in accordance with the hunting quotas set by KNP. Hunting of does of *Capreolus capreolus* is prohibited in state forests. Ban wolf hunting in the territory of the park except when livestock is attacked more than once a week in the same area and other preventive measures are ineffective as well as to prevent epizooties.
Information	Inform local farmers how to avoid wolf attacks on livestock. Publish an informative leaflet on wolves.
Monitoring	Monitor population dynamics of wolves. Monitor variations in their diet (scat analysis).
Research	Study the territorial structure and predation rates using radio-telemetry.

4.8.1.2 Lynx *Lynx lynx* (II, IV)
The present situation: 2-3 lynx live in the park.

4.8.1.2.1 Influencing Factors
Hunting, prey base (roe deer *Capreolus capreolus*, hares *Lepus europaeus* and *L.timidus*, and tetraonids).

4.8.1.2.2 Objective
A stable number (3-5) of territorial animals that fulfil their ecological function.

4.8.1.2.3 Activities

Management	Prohibit hunting of roe deer does *Capreolus capreolus* in state forests. Ban hunting of lynx except of rabid animals.
Information	Publish an informative leaflet on lynx.
Monitoring	Monitor population dynamics of lynx. Monitor variations in their diet (scat analysis).
Research	Study the territorial structure and predation rates using radio-telemetry.

4.8.1.3 Beaver *Castor fiber* (II, IV)
The present situation: at least 400 beavers live in the park (in the neutral and protected landscape zones - see Fig. 23- distribution of beaver settlements). This number can double after completing the beaver inventory of in the nature reserve and strict nature reserve zones.

4.8.1.3.1 Influencing Factors
Hunting, dam removal, predation (at the high densities of predatores), food base, and well-developed network of melioration ditches.

4.8.1.3.2 Objective
A stable number (300-400) of beavers that fulfil their ecological function (support natural regulation of water level, create suitable habitats for other species).

4.8.1.3.3 Activities

Management	Analyse all conflict situations and areas with human interests and evaluate all possible solutions.
Information	Publish a leaflet on the ecological role of beavers.
Species conservation	Control beaver numbers or regulate water level in the conflict areas in the protected landscape and neutral zones. Allow beaver control in the protected landscape and the neutral zone if private forests are in danger of being flood.
Monitoring	Monitor population dynamics (by registering and updating all beaver settlements).
Research	Study the current and potential influence beaver activities on the hydrological regime of the territory.

- **Suggestion**

In conflict situations, each case should be assessed separately, and the following two solutions can be implemented: 1) regulation of water level – by placing pipes in the dams (especially in the nature reserve zone); or 2) control of beaver numbers - in the protected landscape or neutral zones.

4.8.1.4 Otter *Lutra lutra* (II, IV)

The present situation: approximately 20-30 otters occur in the territory of the park.

4.8.1.4.1 Influencing Factors

Beaver trapping (solution - beavers should be hunted with shotguns or with selective non-lethal traps).

4.8.1.4.2 Objective

A stable number of otters (30-50) in all the suitable habitats in the territory of KNP.

4.8.1.4.3 Activities

Monitoring	Monitor population and distribution dynamics as well as the diet's variation in time.
Research	Specify all most important otter sites in the park.

4.8.1.5 Pond Bat *Myotis dasycneme* (II, IV)

The present situation: one breeding colony (40-70 individuals) is found in the park.

4.8.1.5.1 Influencing Factors

Repair of attics, closing of entrances, use of chemicals for wood preservation in house attics, direct disturbance, degradation of feeding sites (impoverishment of the prey base, mainly *Chironomidae*).

4.8.1.5.2 Objective

2-4 stable breeding colonies (100-500 individuals) and at least one hybernation place with 10-20 individuals.

4.8.1.5.3 Activities

Species conservation	If necessary, artificially create refugies for bats or adjust the exisitng ones for that purpose.
Monitoring	Monitor the number of bats (by inspecting breeding colonies; on feeding sites bats are registered on special transects). Hibernating bats also need to be registered.

4.8.1.6 Non-game animals

The following species will not be hunted in Kemeri NP (according to the General Hunting Regulations, they belong to game species): roe deer does *Capreolus capreolus*, brown hare *Lepus europaeus*, mountain hare *Lepus timidus* (V), red squirrel *Sciurus vulgaris*, polecat *Mustela putorius* (V), badger *Meles meles*. Non-game species are also the following: stone marten *Martes foina*, stoat *Mustela erminea*, weasel *Mustela nivalis*, insectivores, dormice.

According to the data of Kemeri National Park (may contradict the data of the State Forest Service), the following animals were found in the territory of KNP on 1 March 2001:

Roe deer - 258
Hares - at least 64
Polecat - at least 6
Squirrel - at least 38
Badger - at least 6
Stoat - at least 6
Weasel - at least 30
Stone marten - no data

Activities

Administration	If necessary, designate microreserves (e.g., for dormice if they are found in the territory of KNP).
Monitoring	Monitor population dynamics and distribution of non-game species.

4.8.1.7 Game Animals

Game species are as follows: moose *Alces alces*, red deer *Cervus elaphus*, wild boar *Sus scrofa*, American mink *Mustela vison*, muskrat *Ondatra zibethicus*, pine marten *Martes martes* (V), red fox *Vulpes vulpes*, racoon dog *Nyctereutes procyonoides* as well as the above-mentioned wolf, lynx, and beaver, which are specially protected species of limited exploitation.
Census of game species and setting hunting quotas is a responsibility of state forestry districts (under the State Forest Service). National Park can carry out a paralel census and negotiate with forestries about hunting quotas.
According to the data of Kemeri National Park (may contradict the data of the State Forest Service), the following animals were in the territory of KNP on 1 March 2001:

Moose - 33;
Red deer - 127;
Wild boar - 249;
Fox - 139;
Pine marten - at least 64;
Racoon dog - at least 35;
American mink - about 80;
Muskrat - no data.

Pētīt pārnadžu populācijas demogrāfisko struktūru un ikgadējo pieaugumu ⇒ noteikt pieļaujamos nomedīšanas limitus.
Pētīt medību ietekmi uz dzīvnieku populācijām (īpaši pārnadžiem un plēsējiem).

Activities

Management	Co-ordinate hunting quotas in the territory of KNP with State Forest Service (SFS).
Monitoring	Monitor population dynamics and distribution by means of an annual census. *Methods*: snow-tracking, observations of inspectors and other employees of the park, census of large ungulates using counts of winter pellet groups, browsing monitoring on sampling plots. Monitor the number of American minks in bird nesting areas, especially on lakes Kanieris and Sloka (snow-tracking in winter and during number control's activities).
Research	Find out the present density of **ungulates** and large carnivores in the park. Study the system "large carnivores – ungulates → to specify the optimal number of large carnivores and ungulates for the territory of KNP. Study demographic structure of ungulates' populations and the annual growth rate of their populations → to specify hunting quotas Investigate the hunting impact on animal populations (especially on ungulates and large carnivores).

- If necessary, hunting reserves can be designated in KNP - areas where control of particular wild animal species is banned for a certain period. According to the census results, the administration of KNP specifies hunting quotas. It can also ban hunting of a particular species for some time.

4.8.2 Reptiles and Amphibians

The information on reptiles and amphibians in KNP is incomplete. At present, it may seem that some species are rare. However, a thorough investigation of the area may prove many of these species to be widespread. There is a need for an additional study on distribution and compilation of the atlas, which started in 2000.

4.8.2.1 Pond Turtle *Emys orbicularis* (II, IV)

The present situation: it is unknown whether the pond turtle is still present in the territory of KNP. There is an information that the species was present even in Kemeri itself in the 1960s. In recent years, there were several unconfirmed observations from Lielais Kemeru Tirelis bog. It needs to be verified.

4.8.2.1.1 Influencing Factors
Wide use of agricultural chemicals in the Soviet times, melioration, habitat degradation (the lack of sandy sites for laying eggs).

4.8.2.1.2 Objective
A stable, if small, population, if natural conditions are able to sustain it. 20-50 breeding individuals in the territory of the national park would be the optimum.

4.8.2.1.3 Activities

Research	To check the presence of the species in the territory of KNP.

4.8.2.2 Smooth Snake *Coronella austriaca* (IV)
The present situation: in the last few years, smooth snake was found in three sites around Kemeri-Sloka bog.

4.8.2.2.1 Influencing Factors
Prey base, i.e., reptiles (mainly lizards), direct killing.

4.8.2.2.2 Objective
The population has to be maintained in at least its present condition. It is necessary to increase the number of smooth snakes to at least 50 individuals in two two sites of the park.

4.8.2.2.3 Activities

Information	Publish an informative leaflet on reptiles.
Research	Investigate what factors have an impact on smooth snakes.

4.8.2.3 Natterjack *Bufo calamita* (IV)
The present situation: the species was found in one site in the park.

4.8.2.3.1 Influencing Factors
Overgrowing of habitats, anthropogenic pressure on the coast and habitat transformation (building up), drying of spawning sites in summer, road kills of adult specimens during spring migrations.

4.8.2.3.2 Objective
3-5 stable spawning sites.

4.8.2.4 Common Spadefoot *Pelobates fuscus* (IV)
The present situation: the species was found in two sites in the park.

4.8.2.4.1 Influencing Factors
Unclear, possibly - climate, predation, melioration.

4.8.2.4.2 Objective
5-7 stable spawning sites.

4.8.2.5 Moor Frog *Rana arvalis* (IV)
The present situation: the species is quite widespread. Up to now, it has been found in 8 sites, from which at least two are spawning sites.

4.8.2.5.1 Influencing Factors
Unclear, possibly - climate, predation, melioration.

4.8.2.5.2 Objective
10-30 stable spawning sites.

4.8.2.6 Crested Newt *Triturus cristatus* (II, IV)
It has not been found yet in the park. There is unconfirmed information about the crested newt seen in one site in the park. It has to be checked. In the case if the species is found, a microreserve should be designated.

4.8.2.7 Green Toad *Bufo viridis* (IV)

At present, only one site is known, however, there is no reason to regard this species as rare.

4.8.2.8 Pool Frog *Rana lessonae* (IV), Green Frog *Rana esculenta* (IV), Lake Frog *Rana ridibunda* (IV) and Brown Frog *Rana temporaria* (IV)

They are widespread species that are not endangered at the moment. The present situation can be regarded as optimal or almost optimal.
Distribution of the lake frog needs to be additionally investigated.

4.8.2.9 Activities for Amphibians

Management	Similar to reptiles, there is a need for habitat protection for amphibians, mainly in spawning sites. The status of seasonal reserve should be designated to the most important spawning sites that concentrate several amphibian species.
Information	Publish an informative leaflet about amphibians.
Monitoring	Monitor population dynamics and distribution.
Research	To carry out the inventory of amphibians in KNP. Distribution of natterjack, green toad and lake frog should be checked in the territory of KNP. To specify the areas of mass spring migrations crossing highways in the terriotry of KNP.

4.9 Bird species that require special conservation measures

4.9.1 Black Stork *Ciconia nigra*

Ciconia nigra is included in Annexes II of Bern Convention and Bonn Convention and in Annex I of EU Bird Directive. Approximately 9% of the world population nests in Latvia, therefore, conservation and monitoring of this species is especially important. (This is a species that requires old, large dimension trees for nesting.)

4.9.1.1 Influencing Factors

Windbreaks, snowbreaks;
Natural succession;
Predators (mainly, pine marten *Martes martes*);
Climate;
Wintering conditions;
Forest cutting;
The influence of historical forest cutting;
Disturbance during nesting period.

4.9.1.2 Objective

To maintain the present level of the population of *Ciconia nigra* in Kemeri National Park (at least 12-15 nesting pairs).

4.9.1.3 Activities

Management	To suggest creating new microreserves for *Ciconia nigra* in 2 sites (10-30ha)
Monitoring	To continue the monitoring programme of *Ciconia nigra*, which was started in the territory of KNP in 1995. (Within that programme, it is planned to census breeding pairs every year and to estimate their breeding success).
Research	To inventore all the nesting sites of *Ciconia nigra* in the territory of Kemeri NP in order to provide the appropriate protection.

4.9.2 Lesser-Spotted Eagle *Aquila pomarina*

Aquila pomarina is included in the list of endagered species of Europe. The species is included in Annexes II of Bern Conventions and Bonn Convention and in Annex I of EU Bird Directive. Approximately 12% of the world population of *Aquila pomarina* nests in Latvia, therefore, monitoring of this species in Latvia is especially important. *Aquila pomarina* is the species for which both forest ecosystems (they require old, large dimension trees for nesting) and ecosystems of meadows and agricultural lands (feeding habitat) are equally important. Thus, the distribution and population condition of *Aquila pomarina* can help to assess environmental quality at a landscape level.

4.9.2.1 Influencing Factors

Windbreaks, snowbreaks;
Natural succession;
Predators (mainly, pine marten *Martes martes*);
Overgrowing of meadows (it influences food accessibility – meadows suitable for hunting overgrow);
Climate;
Wintering conditions;
Forest cutting;
The influence of historical forest cutting;
Disturbance during nesting period.

4.9.2.2 Objective

The population of *Aquila pomarina* shpuld be maintained at its present level at least (8-15 pairs nest in Kemeri NP).

4.9.2.3 Activities

The management of	To maintain the feeding habitat (Dunduri-Melnrags meadows)

the habitat	protecting them from overgrowing by means of the appropriate management (mowing, grazing).
Monitoring	To designate a 30,000 ha sample plot to start the monitoring programme of *Aquila pomarina* in KNP. To carry out an annual census of the density, proportion of nesting and territorial pairs and breeding success of *Aquila pomarina.* To register nesting and territorial pairs as well as to estimate breeding success.
Research	To register all nesting sites in order to provide the appropriate protection.

4.9.3 White-tailed Eagle *Haliaeetus albicilla*

At present, one pair of *Haliaeetus albicilla* nests irregularly in the territory of Kemeri NP. *Haliaeetus albicilla* also requires old, large dimension trees for nesting.

4.9.3.1 Influencing Factors

Windbreaks, snowbreaks;
Natural succession;
Predators (mainly, pine marten *Martes martes*);
Climate;
Wintering conditions;
Forest cutting;
The influence of historical forest cutting;
Disturbance during nesting period.

4.9.3.2 Objective

The population of *Haliaeetus albicilla* should be preserved at its present level at least (one pair nests in Kemeri NP).

4.9.3.3 Activities

Management	To revise the borders of *Haliaeetus albicilla* reserve in the 167th forest compartment of Valguma forestry district (a new nest has been found).
The protection of the species	To provide additional feeding for eagles in winter season (since spring 2001, there is a baiting station in the Lielais Kemeru Tirelis bog). To build new artificial nests. To control the number of pine martens (*Martes martes*).
Monitoring	To monitor the nesting success of *Haliaeetus albicilla*.

4.9.4 Corncrake *Crex crex* and its habitats in the territory of KNP

4.9.4.1 Dunduri-Melnragi Meadows

4.9.4.1.1 Biological values

In the early 20th century, Dunduri-Melnragi meadows were natural floodplains (along the rivers Skudrupite and Slampe). At present, they are **hay meadows** with the total area of 485 ha (Fig. 21), of which 122 ha (northern parts of Dunduri meadows, so called Melnragu rikle) are managed by KNP. In 2000, 1.6 singing male *Crex crex*/ km^2 were registered in the meadows.
Melnragu rikle has been flooded due to the beaver activity, creating an important wetland for waterfowl.
Specially protected bird species can be found here: Honey Buzzard (*Pernis apivorus*), Hen Harrier (*C.cyaneus*), Montagu's Harrier (*Cyrcus pygargus*), Red-backed Shrike (*Lanius collurio*), in 1999 - Spotted Crake (*Porzana porzana*). It is feeding habitatof Lesser-spotted Eagle (*Aquila pomarina*) and Black Stork (*Ciconia nigra*), over-nighting place of geese and feeding habitat of forest animals.

4.9.4.1.2 The use of meadows

About 100 cows graze in Melnragi meadows;
Meadows are a part of hunting grounds of two local hunting clubs;
In dry summers, almost all area of the meadows is mowed by a mower;
Winter crops are grown in the southern part of meadows;
There are good chances to watch birds' and mammals'.

4.9.4.1.3 Influencing Factors
Natural succession;
Predators;
Corncrake-unfriendly agriculture;
Drainage;
Potentially: the lack of agricultural activities will negatively affect the number of *Crex crex*.

4.9.4.1.4 Objective
The following open meadows are to be preserved:

1) meadows that are protected from overgrowing by shrubs and trees;
2) meadows where the number of nesting *Crex crex* is at least at its present level (1.6 singing male *Crex crex*/km^2).
3)

4.9.4.2 The meadow of Kasku Bog
4.9.4.2.1 Biological values
Kasku bog is a part of an internationally important bird site "Kalnciema Meadows and Odinu Fields" with the code No. 029 (Racinskis, 2000) (Fig. 18).
The total area of the meadow (Fig. 21) is 46 ha. There is a high density of nesting *Crex crex* (in 2000, 6 singing males/km^2, in 1999 – up to 21 singing males/km^2). It is a feeding habitat of Lesser-spotted Eagle (*Aquila pomarina*).

4.9.4.2.2 The use of the meadow
The meadow is not managed.
It is situated next to a former waste dump of Jurmala town that is not recultivated.

4.9.4.2.3 Influencing Factors
Overgrowing of meadows;
Pollution of ground water by industrial and municipal waste.

4.9.4.2.4 Objective
Open meadows and the number of nesting *Crex crex* at least at its present level (6 singing males/km^2) should be maintained.

4.9.4.3 Odinu-Pavasara polder
See Chapter 5.3 for description.

4.9.4.3.1 Biological values
Odinu-Pavasara polder is a part of an internationally important bird site "Kalnciema Meadows and Odinu Fields" with the code No. 029 (Racinskis, 2000) (Fig. 18), where a very high density of *Crex crex* (5.2 singing males of *Crex crex*/km^2) has been registered.

4.9.4.3.2 Influencing Factors
Meadow succession;
Previously: digging of melioration ditches, establishment of polder dams;
At present: insufficient management of meadows;
Numerous owners;
Land transformation;
Potential building up of the site.

- **Problems**

Odinu-Pavasara polder is a former agricultural land that is not sufficiently utilised. There are several vegetable gardens, and about 300 landowners have obtained the land property as heirs or as compensation lands in the Salas municipality. People lack the interest for agriculture, as it is economically unprofitable. In the development plan of the Salas municipality, a rather dense building up (minimal area: 0.16ha) is planned in the Odinu-Pavasara polder. Thus, a cottage construction area is planned near Lielupe.
In the project of the national planning, the polder lands are marked both as lands of national agricultural importance and as the risk zone of river erosion with a high flooding possibility.

- Farmers do not have an interest in developing an extensive production. They ask for a compensation for limiting intensive agriculture.

From the point of view of land use, the most favourable solution would be using the polders for agriculture, because:

- These agricultural lands are valuable for many protected bird species: a high density of *Crex crex* has been observed, several especially rare and protected birds of prey feed in these territories.
- The ratio of subsidies is much more favourable to farmers from the polder areas - 80% to 20% paid to those farming outside the polder.

4.9.4.3.3 Objective

The open areas of Odinu-Pavasara polder should be preserved.

4.9.4.4 Activities

Administration	Private landowners should be identified. To raise funds for land purchase from private owners and to buy lands in Dunduri-Melnragi meadows and in Odinu-Pavasara polder. To elaborate and introduce the compensation mechanism in order to get land owners/managers interested to perform nature-freindly agriculture.
Planning	To elaborate a project for meandering of 3 km of the rivers Slampe and Skudrupite to the north from its mouth at the Kauguri ditch and to assess environmental impact.
Information	The private owners are to be informed about the nature values in their territories and, in co-operation with Kemeri NP, the optimal management regime in specific areas should be chosen. To educate landowners/managers by explaining the principles of nature-friendly agriculture (mowing from the field's centre to the sides).
The management of habitats	To protect meadows from overgrowing by cutting shrubs where necessary. Meadows should be mowed at least once in two years in the second half of summer (not earlier than on 1 July) using precautions for animal protection. The mowing at at least 10 cm above the ground is recommended. Grazing of meadows is recommended (not exceeding 1cattle unit/0.6ha). It is recommended not to plough meadows and pastures in large continuous areas. It is also recommended not to change annually the areas to be ploughed (to leave areas with meadow vegetation unploughed for a long term). When mowing is carried out in the beginning of summer, a "nature-friendly" mowing method is required, e.g. mowing from the field's centre to the sides or gradual mowing of the field (in several steps). To restrict the use of chemical substances for plant protection or, when necessary, to choose more nature-friendly substancies. To meanders river Slampe according to the research project. To introduce free-ranging cattle and horses for meadow management.
Monitoring	To monitor the nesting success of *Crex crex*.
	To monitor the height and density of vegetation.

4.10 Geological Nature Values

4.10.1 Kracu Hills

It is a range of inland dunes that mark the ancient coast of the Littorina Sea. The hills are covered by dry pine forest. It has been a protected geological site since 1962.

4.10.1.1 Objective

Kracu Hills and their landscape values need to be preserved at least in their present condition.

4.10.1.2 Influencing Factors

At present: erosion (moderate, in separate areas);
Potentially: forest succession;
Previously, a part from Kracu Hills were levelled when building the road Kemeri - Kalnciems;
Waste disposal on the northern hillside;
Potentially: too high recreation (anthropogenic) pressure (vegetation trampling, waste), fires.

4.10.1.3 Activities

Planning	To design hiking trails in Kracu Hills.
Area management/ Infrastructure	To improve the infrastructure - trails, wastebins, fire places in Kracu Hills in accordance with the research plan.

4.10.2 Zalas Dunes (Green Dunes)

It is a range of inland dunes that is covered by dry pine forest. There is great variety of lichen species. Epigeal species of *Cladonia* and *Cladina* genera are typical to these dunes (Piterans, 1993).

4.10.2.1 Objective

Zalas Dunes and their landscape values need to be preserved in their present condition.

Specially protected species: *Hammarbya paludosa*, *Listera cordata* and *Corallorhiza trifida* (in wet mixed forests that adjoin Zalas Dunes)

4.10.2.2 Influencing Factors

Potentially: forest succession – pines do not regenerate and are replaces by spruce trees;
Potentially: fires;
It is a popular walking area for local inhabitants.

4.10.2.3 Activities

Area management	To design a hiking trail of Zala Dunes.

4.10.3 The area of mineral and sulphur water's formation

The territory of Kemeri NP is characterised by the area of formation of hydrogen sulphide rich water among the Salaspils formation rocks of Devonian system. This happens due to presence of the large peat massifs that 1) supply the necessary organic substances to sulphur-creating bacteria and 2) protect underground water layer from the infiltration of oxygen-containing rainwater, thus preventing hydrogen sulphides from oxidation.

4.10.3.1 Activities

Management	Together with the State Geological Service, to discuss conservation of the area of hydrogeological resources of KNP as a site of state importance. To define how to co-ordinate functions of the state institutions (KNP, SGS, RED (Riga's Environment Department)) in utilising geological and hydrogeological resources. To get a list of all water supply boreholes including addresses, owners and, if possible, technical condition (*it has to be in Lielriga Regional Environment Department*).

	To get a list of all mineral water boreholes including addresses, owners and, if possible, technical condition (*it has to be in Lielriga Regional Environment Department*). If the data are insufficient or out of date, inspection of all above-mentioned boreholes is recommended (*as well as specifying their location on site*). If a borehole does not have an owner, it should be closed or conserved in order to prevent underground waters from direct pollution.
Monitoring	To revise the exisiting monitoring net of the present mineral water boreholes (*during the last investigation (Drikis, 1985), 38 holes were left for monitoring and 195 holes were left for further research*) including the control of their technical condition[14]. To elaborate the optimal monitoring programme based on the results of the revision and practical needs (*optimally: level monitoring- 4 times per year; and once a year – monitoring of chemical content: H_2S and "minimum of chemistry"*). To continue pollution monitoring in the waste dump "Kudra" in cooperation with Jurmala town (*however, the number of holes needs to be increased for specifying the gloriole both in the quarternary and in the base rocks' slopes*).

[14] Measurements of hole's depth and pumping for controlling filter's activity

5 Landscapes of Kemeri NP
5.1 Landscape Protection and Planning Policy
5.1.2 Landscape Policy in Europe

In 1995 Ministers of Environment of 55 countries approved The Pan-European Biological and Landscapes Diversity Strategy. Its Action Plan includes such issues as integration of biological and landscape diversity considerations into social and economic sectors and raising awareness and support with policy makers and the public.

The European Spatial Development Perspective (passed in 1999 in Potsdam) mentions that European cultural landscapes contribute through their originality to local and regional identity and reflect the history of interaction of mankind and nature.

In relation to landscapes the main emphasis is on preserving the cultural and rural landscapes. However, preservation of landscapes is not just an attempt to protect cultural values. It also has ecological (the link between landscapes and biological diversity) and economical (the landscape as a tourism resource) reasons.

In The European Spatial Development Perspective the following protection measures for preserving cultural landscapes are mentioned:

1) Preservation and management of cultural landscapes with special historical importance by sensible planning of land use,
2) creative restoration of landscapes which have suffered through human intervention,
3) the maintenance of characteristic rural landscapes by continuing traditional agricultural land use practices.

5.1.3 Landscape Policy in Latvia

The Spatial Planning Law and Regulations on Spatial Plans do not include requirements for landscape protection or planning. However changes in landscapes are planned by planning new areas for building, economic activities and recreation. The spatial plans should take into account existing specially protected nature territories and cultural heritage areas and monuments as well as protected belts. It is possible to include landscape values into the spatial planning, but it is not obligatory.

The degradation of landscapes is mentioned among the main environmental problems in National Environmental Policy Plan for Latvia (approved in 1995). As possible solutions there are suggested balancing of economic activities and retention and optimisation of landscape structure. Necessity to maintain **the mosaic structure** of landscapes is emphasized. It is important for the preservation of human emotional perceptions, psychological well-being and the satisfaction of aesthetic needs, and for the maintenance of biodiversity in the area.

5.1.4 Landscape Policy in Kemeri National Park

As defined in the Law On Kemeri National Park one of the tasks of landscape protection zone is to protect the landscape, that is characteristic for the National Park. In fact, the landscape protection zone serves as a buffer zone between the park zones where the economic activities are forbidden (reserve zone and nature protection zone) and the neutral zone. Instead of landscape values, the main principle in designing the landscape protection zone is the principle of protection regime and accessibility. However the aims of the neutral zone in Law On Kemeri National Park include landscape protection as well.

The aims of Kemeri NP landscape policy are: **the preservation of landscape diversity by protecting valuable nature and cultural landscapes and by cleaning-up and restoring degraded landscapes.**

To achieve these aims it is necessary to describe the landscape types of Kemeri NP, to calcify them and to find valuable and degraded landscapes.

5.2 Description of landscapes of Kemeri NP

To describe the landscape types of Kemeri NP one has to look at the traditional way of describing and classifying landscapes in Latvia. The uniqueness and typicalness of the landscapes of Kemeri NP in the regional and national level should also be evaluated.

One of the main factors used to define the basic units of landscape mapping in Latvia is the geomorphologic factor, the relief (hilly, undulating and plain landscapes). The second factor is bedrock and its genesis (sand, clay and so on). Another important factor is the character of the landscape covering of the earth surface (frosted, farmed, mosaic landscape).

The central part of Kemeri NP is a **forested plain landscape with sandy soils**. In the Eastern part lies the mosaic plain landscape with sandy soils. On the SW the farmed plain landscape with clay soils is coming in. In the NW part the forested hilly landscape with sandy soils is adjoining the park area.

The landscapes influenced by human activities are as follows:

- urbanised landscapes in Kemeri and Jaunkemeri (Bigaunciems, Lapmezciems and Ragaciems do not show on this scale);
- intensively cultivated plain landscapes with clay soils in SW part of Kemeri NP;
- polders near River Lielupe.

In Kemeri NP there are several types of landscape units, which are recognised as unique in Latvia:

- lake landscapes;
- river landscapes (River Lielupe);
- forested dune landscapes;
- swamp landscapes.

The national level of Latvia's landscape classification consists of 16 units or "landscape lands", that are defined according to large land surface forms and transitional forms in-between them. Separate landscape lands have been defined along the big rivers (landscape land of River Venta, landscape land of River Daugava). Landscape lands are divided into landscape regions that form the highest level of local landscape units.

The central part of Kemeri NP territory belongs to **The Landscape land of the Sea Coast, Heath region**. The following landscapes lie in W part of the park (starting from seaside, N):

- The Landscape Land of the Sea Coast, Engure Region;
- The Landscape Land of Austrumkursa, Region of hilly landscape of Talsi- Tukums;
- The Landscape Land of Austrumkursa, Region of farmed plain landscape of Augšabava – Vašleja;
- The Landscape Land of Rietumzemgale, Region of farmed undulating landscape of Rietumzemgale (Dzukste- Tervete).

Thus it can be concluded that the biggest part of Kemeri NP is occupied by the forested landscape, by the forest massif that lies in plain area with sandy soils. In this forest "matrix" one can find separate "islands" of agricultural land and other local landscape units: lake landscapes and dune landscapes. Raised bog landscapes and landscapes of former sites of peat extraction also are a separate landscape type on a local scale. The diversity of forest landscape itself is determined by the different types of growing conditions, the species of trees and the changes made to landscape by forest management activities.

However, if on the scale of Kemeri NP the forested landscape can be considered as a "matrix" or a background, then on the regional level the forest massif serves as the element of diversity. It separates the urbanised landscape of Riga and Jurmala cities and rural landscape with signs of drainage surrounding them from massifs of intensively cultivated agricultural land in the S and W. On this scale the meeting point of forested and farmed landscape– the edge of state owned forest – has a special significance. The edge of the forest massif is an important element in a rural landscape.

As it can be seen in the landscape classification list (annex 21, picture 24), the protection of the natural landscapes: forests, bogs and lakes is already provided by nature protection in these areas. Specific landscape

protection and planning requirements appear in the areas that are more influenced by human activities and in the more visited areas.
The landscapes of traffic routes were distinguished as a separate landscape type when estimating the accessibility and visibility of landscapes (see chapter 6). These landscapes or landscape elements, revealed linearly on a map, are the most frequently seen and visited areas in the National Park outside the populated areas. Territories where development of tourism and recreation is planned are considered as potentially frequently visited.

The areas with natural landscape, which will be preserved through nature protection activities are excluded from further assessment. Any activities in natural landscapes, e.g., making walking trails, should comply with the nature protection requirements and fit into landscape as much as possible. The following landscape values will be discussed further:

- Forested and farmed rural landscapes,
- forested plain landscape,
- urbanised landscape and road landscape as the most frequently visited landscapes,
- degraded landscapes – landscape of former sites of peat extraction and landscape of dolomite quarry.

5.3 Landscape values, objectives and protection activities in Kemeri NP

5.3.1 Rural Landscapes

Description. The group of landscape spaces includes different types of landscapes:

- *Pavasari- Odini farmed landscape* – a plain open rural landscape; the dominant of the landscape space- the dams and ditches of drainage system;
- *Lake Valgums mosaic landscape* - a hilly mosaic landscape with Lake Valgums as the main element of the landscape space;
- *Slampe mosaic landscape* - a plain rural landscape with forest clumps, the dominant of the landscape space- the meeting point of the forest massif and the open rural landscape;
- *Odini- Kalkis mosaic landscape* - a floodplain meadow landscape. The borders of the landscape space are the bank of River Lielupe and the edge of the forest massif (an area which is difficult to access, which is seldom visited and where the main values are the nature values);
- *Caukciems village, Antinciems village, Skujupite and Udrisi mosaic landscapes* - a traditional rural landscape, a structured landscape of forests and farmland;
- *Slokas and Vecslocenes mosaic landscapes*- a semi- open rural landscape, practically without buildings, overgrowing due to the lack of management. There are plans to build up part of the areas (nature protection issues are the most important).

Factors that influence rural landscapes

The interruption of management of agricultural land and the **overgrowing** of agricultural land due to natural succession;
The activities of wild animals (such as beavers and wild boars);
The enlargement of building areas;
The decrease of the extensively managed rural areas- more intensive management methods (the cultivation of grasslands);
Intensive timber- cutting, especially in private forests- the disappearance of visually expressive forest patches in the rural landscape, their replacement by brushwood;
Elemental forces of nature (storms etc.);
The years of poor harvest;
The economical situation in agriculture/ the state policy;
No state subsidies for the maintenance of agricultural lands;
The proximity to the big cities (Riga and Jurmala).

The future vision. The mosaic landscape with interesting cultural and natural accents in the landscape space. The buildings correspond to the scale of the landscape. The landscape space is friendly for visitors and has a convenient infrastructure that fits into the environment.

The aim
The maintenance of open agricultural lands in a way that will preserve the landscape diversity on the scale of Kemeri NP.

5.3.1.1 Pavasari- Odini farmed landscape
5.3.1.1.1 Description
One can look at the Odini- Pavasari polder as at the monument of the Soviet times – of the state policy for changing nature. It is a unique landscape space in Kemeri NP. However, it is typical for the surrounding areas, as there are many large polders along River Lielupe. Previously the polders were intensively used for agriculture, but now they are mostly abandoned. The vision of municipality for this area is the creation of an urbanised environment (1st redaction of The Spatial Plan of Sala municipality). The vision of Kemeri NP: **areas for nature friendly agriculture that favours landscape diversity and recreation areas (horse riding, outdoor recreation near River Lielupe).**

5.3.1.1.2 Activities

Administration	To support projects related to nature tourism and recreation activities. To buy the land in the protected landscape zone of polder if some financing becomes available.
Planning	To elaborate and carry out a project for transforming the drainage systems to divide the polder in several parts and to carry out nature restoration activities in the part designed for nature protection.
Research	To carry out the research necessary for nature restoration in Odini-Pavasari polder until the January 1, 2004, where the following territories with different aims and management intensity should be devised: ▪ Areas for nature protection (in the landscape protection zone), where the water level should be maintained as close to natural as possible and the meadows should be maintained in a state favourable for birds and animals, ▪ populated areas (in the neutral zone), where buildings already exist and building of new houses is possible, where the inhabitants maintain the necessary water level.

To ensure the protection of biological values, natural and cultural landscapes and to preserve the agricultural lands of national importance, the following recommendations for land use in Odini- Pavasari polder are given:

- in the S part of the polder- in the landscape protection zone (approximately 350 ha), it is advisable to place no more than 14 farms with one dwelling house and farm buildings,
- in the N part of the polder- in the neutral zone, the rural cultural landscape should be preserved as much as possible and should not to be transformed into an urbanized environment,
- in the polder area agricultural activities should be maintained, preserving an open rural landscape and preventing overgrowing with bushes.

5.3.1.1.3 Indicators
The enlargement of building areas- to specify the present area under the buildings, roads and yards and quotas for its annual enlargement, e.g. no more than 5% per year (To specify the present situation the data of State Land Service can be used- the area under buildings and yards. It will be difficult to specify he dynamics of area afterwards, if a new land measuring will not take place frequently enough. The information on issued building permits, the building area foreseen in the project and the beginning and completion of the construction is essential), such regulation should be included in the building regulations of municipalities if possible.

The overgrowing of agricultural lands- the present areas that are overgrown with bushes are to be specified. It is necessary to observe the tendencies of their enlargement or reduction.

Areas meant for building in spatial plans of local governments- to assay whether they comply with the nature and landscape protection interests.

5.3.1.2 Lake Valgums mosaic landscape

5.3.1.2.1 Description

It is a rural- forested landscape with expressive bank relief of the Lake Valgums. The surface of the lake is like the mirror of water and it is a visual emphasis of the landscape space. The variety and spaciousness of views are a considerable landscape value. The former recreation centre of USSR Council of Ministers (at the moment- the office of a newspaper "Lauku Avize") that was meant for the relaxation of the elite only, creates a special atmosphere around the Lake Valgums. (Now the former president of Latvia G. Ulmanis continues these traditions by building his residence). Almost all of the lands around the lake are private-owned, therefore it is very important that the administration of Kemeri NP cooperates with private landowners and the municipality.

In the landscape protection zone it is prohibited **to transform the cultural landscape**, ecologically and aesthetically significant landscape elements and the unique features of the cultural environment, as well as to carry out the activities that diminish biodiversity and the ecological balance and that encourage pollution of the environment (Regulations of the Cabinet of Ministers On the General Protection and Use of Specially Protected Nature Territories). The traditional rural landscape with individual farms, preserved around Lake Valgums can be regarded as cultural landscape. However it is certain that previously the proportion of forests were lower and the views on the lake more open- in several places the **reconstruction of cultural landscape** is necessary.

5.3.1.2.2 The Aim

To preserve traditional and well kept cultural landscape with good relaxation possibilities.

5.3.1.2.3 Activities

Administration	To participate in elaboration of a detailed spatial plan for the territory of Lake Valgums mosaic landscape, where the suggestions for building areas both for dwelling houses and recreational facilities and the location of tourism infrastructure should be included taking into account the landscape and ecological requirements. To elaborate the landscape design plan for the Lake Valgums or to consult the private landowners, if some activities that would transform the landscape are planned (these are all kinds of building activities including driveways, parking places, ponds, as well as, making new plantations and felling of trees and bushes)
Planning	To specify the main view points of the lake (picture 25), to maintain and improve sightseeing places in cooperation with the landowners. To recommend the best places where the lake can be accessed by visitors when elaborating the detailed spatial plan for the Lake Valgums

- **Recommendations for the detailed spatial planning**

In the basin of Lake Valgums the following activities for landscape protection should be established:

1) to prohibit the transformation of forest land into building areas,
2) to specify the following limitations for the plot division
   a. in the course of division it is not permitted to make new plots smaller than 4.0 ha,
   b. in the course of division it is not permitted to make new plots, whose border with the Lake Valgums is shorter than 100 m,
3) the transformation of agricultural land into building area is allowed in the following cases:
   a. the peace of land that is to be build on is at least 2 ha ,
   b. the total area (the present and the one that is planned) that is occupied buy buildings and yards after land transformation is no bigger than 5% from the total area of the plot,
   c. the new building area should be concerted with the administration of Kemeri National Park and the Regional Environmental Board and it should take into account the landscape and nature and environment protection interests,

d. building area is situated at least 50 m from the steep bank of the Lake Valgums (it should be specified on site during elaboration of the detailed spatial plan and mapped with the GPS).

4) when new buildings are designed and the existing ones rebuilt, the natural building materials should be used and the local building traditions should be observed,
5) when elaborating the landscape plans and plans for organising public facilities, the local wild plant species and traditional races of cultural plants should be used and the valuable culture and historical landscape elements should be preserved,
6) to make the best outlooks towards the lake Valgums more expressive the reconstruction of the cultural and historical landscape in the areas marked in the map (picture 25) is possible by felling the forest and bushes that have grown on the former agricultural lands in the recent decades. Afterwards these areas should be managed as meadows or pastures.
7) to raise the quality of landscapes the aesthetically disadvantageous elements of the landscape (such as telecommunication and power lines, technical buildings) should be reduced, especially in the valuable sightseeing places.

A suggestion

- To establish the Public Council of the Lake Valgums that would include private landowners and the representatives of Kemeri National Park and the Council of Smarde municipality. The Public Council would coordinate mutual interests, e.g., it would specify, how much boats one can own, how high is the permitted noise level etc..

5.3.1.2.4 Indicators

The quality of the best sights (photo fixations, expert opinion)
Possibilities to visit the lake: the maintenance of fishermen's paths, areas accessible for visitors in recreation centres and in countryside tourism houses.
The building of the bank zone.

5.3.1.3 Slampe mosaic landscape

5.3.1.3.1 Description

It is a wide and plain landscape heavily transformed by human activities. It is not spatially separated and can be seen as part of the Great Zemgale Plain that is separated by imaginary line- the border of Kemeri NP. The important emphasis of the landscape space is the edge of the forest and forest clumps. Individual farms are important elements of the landscape.

5.3.1.3.2 Activities

Administration	To cooperate with the Slampe municipality that foresees in its development plan an establishment of supporting programme for preserving individual farms. To sign contracts with the landowners and managers of the agricultural lands specifying the best time for hay-cutting form the point of view of protection (corn- crakes).
Planning	To work out a project for restoration of Slampe river
Management of habitats	To follow the regulations of landscape protection when felling trees on the edge of the forest. The aim- to make the edge of the forest diverse and natural.

5.3.1.3.3 Indicators

The diversity of the forest edge structure (expert's opinion using the same specific view points, photo fixations);
The area of former agricultural lands overgrown with bushes (to prevent the enlargement of overgrown areas in comparison to the present situation).

5.3.1.4 Caukciems village, Antinciems village, Skujupite and Udrisi mosaic landscapes

Small, separated and solitary semi- open landscape spaces in the forest massif. Therefore they are extremely important for providing landscape diversity.

5.3.1.4.1 The Aim

The preservation of the traditional landscape and in some cases landscape reconstruction (managing agricultural lands overgrown with bushes).

5.3.1.4.2 Activities

Administration	To sign contracts with the landowners of agricultural lands that foresee the preservation of meadows, pastures and fields, specifying the best type of management from the point of view of nature protection (corn- crakes, protected plants).

5.3.1.4.3 Indicators

The area of former agricultural lands overgrown with bushes (to prevent the enlargement of overgrown areas in comparison to the present situation).

The number of visitors (to specify the maximum number permitted).

5.3.2 Forested Plain Landscape

5.3.2.1 Description

Territories covered with forest form the landscape basis or landscape matrix of Kemeri NP. A forest massif is more valuable in biological sense than from the landscape point of view. Due to the fact that it lacks the perspective, the character of landscape is created by separate elements and details and the total view is difficult to perceive. A forested landscape benefits if:

1) there is a visible relief,
2) the landscape interchanges with open areas, e.g., agricultural lands, lakes, bogs. In such case the dominating element of the landscape is the edge of the forest.

The most valuable forested landscapes of Kemeri NP are the following:

1) mosaic landscapes- forest clumps interchange with fields and individual farms (described above- in the chapter on rural landscapes)
2) all forested plain dune landscapes,
3) Lustuzkalns forested hilly landscape.

However, the protection of these landscapes is provided by nature protection (they are included in the nature protection zone).

The less valuable forested plain landscapes where the restrictions of forest management are planned are described further.

5.3.2.2 Influencing factors

Natural succession (forest roads, forest lines, clearings, ditches and glades overgrow with bushes and forest);
Forest cutting (the character of forested landscape is transformed or it is turned into an open area- a clearing);
The remains of former economic activities: forest lines, ditches, and newly planted forest;
The remains of warfare (entrenchments);
Elemental forces of nature (storms, floods);
Global climate changes;
Pollution and eutrophication.

5.3.2.3 The Aim

To preserve a diverse forested landscape.

5.3.2.4 Activities

Planning	To prepare a conclusion of NP on landscape protection requirements in forest management for private landowners.
Monitoring	To evaluate the felling areas of the previous year from the landscape point of view (expert opinion). To survey glades and forest meadows to see if there are bushes higher than 1m (or to compare their outlines on the ortho-photo-plans from different years). To survey valuable landscape elements to evaluate their preservation in the course of forest cutting (photo fixations).
Research	To carry out a survey and gather information (from foresters and local inhabitants) on valuable landscape elements, to map them (including toponyms which are already known) and to choose the best management and protection measures for each of them. To gather information on glades and forest meadows (as valuable landscape elements) and to map them using the ortho- photo- plan.

To observe the following landscape protection regulations in the planning of forest cuttings:

- The outlines and forms of the felling areas should be shaped as varied as possible and corresponding to their natural borders (water courses and the relief),
- In the clearings clumps of forest and outstanding solitary trees should be left,
- Colourfully blooming or other especially decorative species of trees and bushes should be left along the forest edge as much as possible,
- The transition from the felling area to the neighbouring area should be made gradual.

To preserve valuable landscape elements in forested landscape: solitary noble trees and the trees that are especially expressive or have some cultural significance, forest roads and forest lines, remains of trenches etc..
To preserve forest glades and forest meadows by ensuring mowing and grazing (if necessary).

The trees that should be left or felled in the felling are chosen using the principles of landscape shaping:

1) opening the view to reveal expressive trees or groups of trees;
2) opening the view towards more distant open or semi- open areas;
3) creation of a diverse forest edge by making glades or keeping colourfully blooming or other decorative trees and bushes, such as bird- cherry trees, rowan trees and goat willows (*Salix caprea*) along the forest edge;
4) the creation of transition belt of separate trees and groups of trees and bushes between the forest and open areas;
5) thinning the forest and removing the undergrowth in forests where the recreation is planned.

5.3.2.5 Indicators

The surveys of the felling areas of the previous year from the point of view of landscape (expert opinion) and the preparation of suggestions for further forest felling;
The survey of glades and forest meadows finding out if there are bushes higher than 1m (or comparing their outlines on the ortho-photo-plans from different years);
The inspection of other valuable landscape elements and the assessment of their preservation status (photo fixations).

5.3.3 Urbanised Landscape (Populated Areas)

The policy: preservation of cultural landscape and development of tourism infrastructure (ensuring the development of local economy)

5.3.3.1 Description

Kemeri now is a part of Jurmala city, but it used to be a separate town. It arouse simultaneously with the development of the health resort. There are great cultural and historical values in Kemeri that are protected as cultural and historical heritage of Jurmala city. Unfortunately, the decline of the health resort brought the

decline of the town as well and now these values are threatened. The existing potential of tourism infrastructure is not used at the moment.

The coastal urbanised landscape: Ragaciems, Bigaunciems, Lapmezciems, the former fishermen villages, now have a heavy building pressure. The main cultural and historical values are the few historical buildings (mainly household buildings, e.g., huts for storing nets), some other objects and a traditional trade- fishing, which is still preserved. Large numbers of tourists and holiday- makers come to the coast, especially in summer, and the villages have a comparatively well-developed net of cafés, shops and motels.

Kudra is the part of Jurmala city that arose as a village next to peat extraction sites. It is the landscape of low aesthetical quality at the moment. The limits of the tourism industry are confined to shops- cafés along the highway.

Kalkis (Plostmuiza)- the rural village that is supplemented by houses built for the workmen working in the dolomite quarries after the war. The cultural history is connected with dolomite quarries and the former penal servitude there.

The individual gardens of Kauguri- the environment of low aesthetical quality that is difficult to access. No tourism infrastructure is planned there in the near future (unless the traffic roundabout of Jurmala city is build on the territory of Kemeri NP).

5.3.3.2Influencing Factors

The overgrowing of unutilised areas;
Soil erosion due to the trampling of dunes;
The enlargement of building areas (the enlargement of the areas inaccessible to the society);
The pollution that arises from the increase of the density of population when the adequate infrastructure is not built;
The building regulations of local governments or the absence of such regulations;
The intensive use of surrounding woods for recreation;
In Kemeri- the decline of the health resort, abandoned sanatoriums, guest- houses and medical establishments;
In the coastal villages - the influx of holiday- makers in summer;
The outrival of local inhabitants and their traditional types of occupation, wealthy newcomers;
The detoriation of the old buildings and their lack of correspondence to the today's requests for comfort and the quality of environmental pollution;
Elemental forces of nature (storms, floods);
The legislation of building and spatial planning;
The absence of state policy for the development of health resorts;
The economic situation in the state.

5.3.3.3 Activities

Administration	To cooperate with the local governments in elaboration of building regulations. To evaluate historical and traditional buildings; to elaborate proposals to include them into the lists of cultural and architectural monuments in cooperation with the owners of the buildings. The cooperation with the local governments' Building Boards is needed so they submit the construction plans that can seriously affect the landscape for approval of Kemeri NP.

5.3.3.4 Indicators

The preservation of traditional buildings and building traditions. That can be measured by observing the preservation status of historical buildings and the application of traditional building materials and methods in building and reconstruction (first, the criteria for traditional historical buildings should be specified and the list of them should be created. It is advisable to invite a specialist from the State Inspection for Heritage Protection).

The number of tourism and recreation infrastructure objects:

- the number of parking places (the minimum and maximum number should be specified);
- the access to the sea (the present number of places where the sea can be accessed should be specified, it should be controlled so the number would not diminish. The level of the facilities and degradation of vegetation should be controlled as well.);
- the number and layout of service facilities.

5.3.4 Road Landscapes (in Forested Landscapes, Swamp Landscapes and Lake Landscapes)

5.3.4.1 Description

This category of landscape spaces overlaps with others and cannot be distinguished as a separate one (picture 26). However it is very important from the point of view of accessibility and visibility of the landscape. One should take into account that the road landscapes are also in those landscape spaces that have not been described above (their protection is ensured by nature protection). Since the road is man made, the meeting points of road landscapes and surrounding natural landscapes show close interaction between the man and the nature. On the one hand, the man influences the nature by noise, pollution, dangerousness, on the other hand, the nature influences the man. Often the only way, how we perceive the surrounding landscape, is going by car or other vehicle.

5.3.4.2The Aim

To create a diverse landscape that improves the road safety. It is important that the characteristic landscape can be observed from the road instead of the isolated road corridor.

5.3.4.3 Influencing Factors

Natural succession- the overgrowing of roadsides with bushes;
The risk of falling trees;
Beavers dam the culverts and transfer the landscape;
Elemental forces of nature;
Forest cutting - clearings along the roads;
The building of service facilities along the roads;
The road reconstruction projects;
Legislation- especially The Law on Protected Belts and regulations on road safety;
The owners of roads (Latvian Autoroad Directorate) often do not take into account the landscape requirements;
The increasing speed and intensity of traffic;
The application of the forestry principles to the landscape management.

5.3.4.4 Activities

Planning	To specify the most valuable views from roads on characteristic landscapes
Control	To control the creation of new garbage dumps (inspection activities and education of society to create well kept environment and landscape along the roads).
The management of habitats	To diversify the outline of the forest edge using clearings and outstanding trees.
The management of the park area	To collect garbage along the roads.
Monitoring	To control the valuable views of the road landscapes to see if bushes do not hide them from sight (photo fixations).

The total length of roads where the landscape should be shaped is 65km that covers 2016.5 ha. 1077.6 ha of these are the forest lands (the methods of landscape shaping are described in Chapter 6).

5.3.4.5 Indicators

The control of the valuable views to find out whether bushes do not hide the valuable landscapes (photo fixations);
Monitoring of landscape shaping controlling, whether the aims of landscape planning are reached and how often the landscape management activities should be repeated.

5.3.5 Degraded Landscapes

Degraded landscapes include the former sites peat extraction and dolomite quarries (picture 24).

They differ in the method of peat extraction and the time that has past since the last production. For example, the landscapes of Labais and Smardes peat extraction sites are characterised by the mosaic of ponds, whose banks are overgrown with birch- trees. These areas can be used fishing and bird watching. A management plan for each of the former sites of peat extraction should be elaborated in order to coordinate the interests of protection and enhancement of biodiversity and recreation.

The large areas that have remained after peat extraction by milling in the landscape of Kemeri Raised Bog now are plain peat fields with sparse vegetation. It is possible to flood them to create a more varied mosaic structure that would be both more favourable for biodiversity and more interesting form the landscape point of view. The landscape planning activities and development of infrastructure for nature tourism should be included in the project of raising the water (so the planned roads and paths won't be flooded).

From the point of view of accessibility the largest attention should be paid to landscapes of former sites of peat extraction of the Kemeri Raised Bog and Labais Bog, due to the fact that they are easily accessible from the highways.

The dolomite quarries (picture 17) can be successfully used for recreation (they are a good places for swimming because the water is clean). It is possible to elaborate a good planning of recreation site, in cooperation with the local governments of Valgundes rural municipality and Kalnciems town and private landowners (most of the land around the quarries is private owned).

The basic principles for the development of a recreation site:

- to ensure a safe access to water; it is advisable to make the place for swimming where shallow water is available for children safety,
- to use the local materials - wood and dolomite and build as monolith and massif constructions as possible,
- to make the camp sites on already existing open spaces and grasslands,
- to use the local species for greenery
- to affect the forest as less as possible, to avoid damaging the tree roots by driving or trampling,
- to build access roads and a parking place separating them from the zone meant for pedestrians;
- it is advisable to make the recreation sites as easy accessible and public as possible (still enabling the owners to collect the fees for services), instead of making them as closed recreation sites for elite,
- in quarries at Kalkis a solution for eliminating the noise created by industrial activities and degradation of aesthetical quality of landscape should be found in cooperation with "Gneiss" Ltd.

The quarries suitable for recreation sites are marked on the map (picture 17). The recreation activities are not allowed in the so called Sakhalin Pond because it is included in the nature reserve zone and there is a colony of gulls nesting on the island.

The former **garbage dump of Kasku Bog** also can be regarded as degraded landscape. To clean it up an elaboration of a recultivation project should be encouraged in cooperation with the local governments of Jurmala city and Sala rural municipality.

- To gather information on utilisation of Kasku Bog.

6 Forest Management

6.1The Policy of Forest Management in Kemeri National Park

The forest occupies significant part of Kemeri national park (KNP) and widely represents different forest ecosystems, including the standard areas of damp forests. The forest policy (FP) of KNP, that defines principle measures for further forest management of KNP, has been worked out taking into consideration the importance of the ecosystems for the maintenance and the preservation of national park biodiversity.

The basic principles of KNP forest policy

- the protection of forest biodiversity is the priority of KNP;
- the forest biodiversity is to be maintained and preserved on the present level;
- biologically valuable forests and the diversity of species specific for them are to be preserved at least within the present areas;
- the net of protected areas have to be improved, as it provides the preservation of ecosystems, species and genetic resources.

6.2The Aims of Forest Management in Kemeri NP

1) Natural, human activity little affected forests have to be protected and the following issues have to be provided:
   - the continuity of the ecosystem;
   - the natural reproduction;
   - the development and preservation of structures that maintain biodiversity in artificially planted forests;

2) The possibilities of ecological education and relaxation have to be provided;
3) The management of protected forest habitats has to be provided in areas where it is requested by management plan.

The **principles of forest management** are dependent on the zonation system of national park:

The aim of **nature reserve zone** is the preservation of forest biodiversity providing undisturbed development of natural ecosystems.

The aim of **nature protection zone** is the protection of natural ecosystems and all their components, at the same time managing the forest in the areas, where it is necessary for preservation of forest biodiversity.

The aim of forest management in Kemeri NP **landscape protection zone** is preservation and improvement of national park's landscape so that the possibilities of tourism, recreation and environmental education have to be provided. The logging has to be done environmental-friendly.

- Forest cutting methods that imitate natural processes have to be used;
- The natural reproduction has to be encouraged;
- The forest infrastructure has to be set up in the areas, where it does not threaten the biological values of forest;
- The influence of forestry activities on environment is estimated; the forest monitoring is organised;
- The model of forest management is improved and natural forest disturbances imitated.

6.3 The methods of forest management depending on the management category

6.3.1 The nature reserve zone

Any activities of forestry are prohibited except the extinguishing of fire and the maintenance of forest roads.

6.3.2 The nature protection zone

The final felling is prohibited. The cuttings of habitat cultivation are allowed in the areas, where it is requested by results of the inventory of the key habitats in forest stands. Thinning is allowed as well. So are the cuttings that are done with a purpose to form the landscape.

6.3.3 The landscape protection zone

Clear cuttings are prohibited.
The reforestation method in the protected landscape zone: the natural reforestation has to be encouraged.

The management of the coppices: the cultivation of structure has to be done by encouraging the entrance of other local tree species in monoculture (especially spruce) growths.

***The management of the stands of middle age*: thinning has to be done. The cultivation of monotone, homogeneous stands should be avoided. During the cutting not- thinned groups of trees with undergrowth, regeneration stand and second stand trees have to be preserved.**

In the stands where final cutting is permitted, the cutting to be performed is selection cutting. During the implementation of the selection cutting it is prohibited to cut down the stand totally. The basal area of stand must not be smaller than the critical.
The selection cutting has to be designed for each case individually by observing the distinctions of biological stand and the relief of forest compartment.

Timber cutting activities in the protected landscape zone have to be managed following the principles of the preservation of biodiversity and landscape planning (chapter 5.3.2.4.).

In the cuttings the distinct oldest trees, wind stable trees and intact wooden clamps must be preserved. Distinct second stand, regeneration stand trees and their groups, the groups of the trees in swampy ditches that sharply contrast with the rest of the stand, as well as the groups of trees surrounding the nesting-trees or animal burrows have to be preserved.
In deciduous stands the priority is the preservation of broad-leaved trees (oak, ash-tree, lime, elm, willow).

All dead-wood, tree stumps, broken stems and windfalls larger than 32cm in diameter should be maintained in cuttings. Exemptions are dangerous trees and windfalls that stops the access of mechanized equipment.

Timber cutting and wood transportation over the forest lands in the landscape protection zone are prohibited in the time period from April 1st till July 31st ;exceptions should be approved by the administration of Kemeri NP.

The felling of trees in other time of the year is allowed in the following cases:
-in biotechnical activities;
-for the making or maintaining of infrastructure.

- The permissions for felling of the trees in cultural thinning, sanitary thinning and in other thinning in the nature protection zone, as well as the permissions for felling of the trees in the final cutting in the landscape protection zone are given only after the inventory of protected habitats and species.

6.3.3.1 The results of forest inventory

In the years of 2000 – 2001 the inventory of Kemeri NP was accomplished. In the management plan only description of the landscape protection zone is presented; due to the fact that in the year 2002 the results of inventory in the whole park's area have still not summarised.

The forest lands occupy 11815.7ha of the landscape protection zone, of which natural stands form 74.2% (8667.9ha) and artificial stands form 19.1% (2233ha). Glades in forests occupy 6.9ha (0.1%). The largest area in forest stands is occupied by middle age stands and maturity stands- 56% (6321.3ha), mature and overmature stands form 34% (3813.8ha) and proportionally small area is occupied by coppices - only 10% (1169.7ha).

The leading species in the landscape protection zone is pine – 54.16%, birch occupies only 28.41% from forests stand's space and spruce - 14.72%. The stands of first to third site index classes form 73% from forest stands, where approximately the same size areas are occupied by uplands and drained forests, accordingly: 3917ha and 4412ha.

The division of leading species after age in percentage (table 4.6.) is interesting. As it is seen, the largest amount in coppices is formed by spruce, small is the amount of ash- trees, pines and black alders and there is a lack of oak coppices.

Table 4.6 **The division of leading species after age (%)**

Species	Young stands (coppices)	Middle age and maturity stands	Mature and overmature stands
Pine	6	71	23
Spruce	38	24	38
Birch	5	47	48
Black alder	5	53	42
Aspen	12	8	80
Ash	12	51	37
Oak	0	21	79

After distinctive features of forest protection in the landscape protection zone the following areas (Table 4.7.) are distinguished. They are included in the database of the State Forest Service, but they can be changed after the forming of micro-reserves.

Table 4.7. **Division after the distinctive features of protection**

Feature of protection	Area/ ha	% of the total area
Glen forests	2.4	0.02
Coastal forests	132.8	1.12
Protected belts of roads	208.5	1.76
Shelter stand	2	0.02
Protected forest habitat	2228.3	18.86
Deposit of protected animal species	310.6	2.63

6.3.3.2 Landscape cutting

Landscape cutting is the felling of trees in forest or in other cutting for forming a landscape (Article 7. in the "Forest Act").

The aim of landscape cutting:

- to vary forest landscape,
- to recover landscape valuable sights.

Landscape cutting has to be used in the following **areas**:

1) in the space of traffic road view (in the forest belt that can be seen from the road)
2) in forests next to populated areas, cultural and historical sites,
3) in forests alongside the paths and tourism sites.

For each of these areas, where the forming of landscape is necessary, the most appropriate method or methods of landscape cutting are to be specified.

The methods (types) of landscape cutting:

1. The cuttings that vary forest landscapes:
   - 1.1. The cutting of glade renewal;
   - 1.2. The cutting for recovering nature, cultural and historical sites;
   - 1.3. The cutting for the forming of landscape forest.
2. The cuttings for recovering views:
   - 2.1. The recovering of vistas;
   - 2.2. The cutting of thinning out for gaining "transparent views".

6.3.3.3 The methods of landscape cutting in order to vary the forest landscape

6.3.3.3.1 The cutting of glade renewal

- The former glades in forests and on overgrown agricultural lands (after different ages of trees or the old materials and maps of forest inventory) have to be distinguished. There a renewal of an open space would encourage landscape diversity in areas frequently visited by people or in areas, where renewal of cultural and historical landscape is favourable.
- The territory of glade that is planned to cut has to be marked (trying to follow natural borders, avoiding straight lines) and its space has to be specified;
- Trees and bushes that are going to be preserved in the territory of glade have to be marked (such as distinct trees, e.g., junipers that previously have grown in the glade, or distinct bushes of a decorative meaning, e.g., snow- ball tree, honeysuckles);
- The felling trees are to be callipered.

6.3.3.3.2 The cutting for recovering sites

- Valuable nature (e.g., trees with forked branches), cultural and historical (e.g. remaining war trenches) sites visited by public have to be displayed in forest areas;
- The trees and bushes that damage a view on the site or the site itself- these are the trees that have to be marked and callipered;
- In the course of cutting it is necessary to observe whether the favourable effect is reached. If needed, additional thinning trees and bushes have to be marked.

6.3.3.3.3 The cutting for the forming of landscape forest

- The territories of large anthropogenic weight at present (or planned in future) have to be selected. The areas with special biological value are not included in this selection,
- Visually expressive and most decorative trees and bushes are to be identified. So are the visually valuable sights,
- Thinning trees and bushes have to be marked and callipered to improve the view on previously specified landscape values and also to make the forest more easily accessible (the thinning of undergrowth trees and bushes);
- Landscape forest has to be created as varied as possible with different tree species and the forest structure.

6.3.3.4 The methods of landscape cutting recovering farther views on other open or semi- open spaces

6.3.3.4.1 The cutting of vistas

- Valuable sight places and vistas have to be distinguished;
- Felling trees and bushes that shield vistas have to be marked and callipered;
- The quality of obtained vistas has to be controlled after cutting. If needed, additional thinning trees and bushes have to be marked.

6.3.3.4.2 The cutting of thinning out for gaining "transparent views"

- Areas where a "transparent view" (through tree stems) is required have to be selected;
- Felling trees and bushes have to be marked and- callipered;
- Only big trees and undergrowth of several groups have to be maintained.

Landscape forming cuttings (in "Forest Act"- other cuttings) are foreseen in the nature protection plan (picture 26 and attachment 22).

6.3.3.5 Criteria of the final cutting in Kemeri NP

Silvicultural activities have to be performed in areas, where the forest management foresees the final cutting. Activities are evaluated after the following criteria:

- The constitution of a stand's age;
- The presence/ amount of dead wood;
- The structure/ mixture of tree species;
- The spatial structure of the stand/ the unclosed presence of open crown;
- The significant influence of ecological (fire, periodical flooding) and anthropogenic (melioration, traditional silviculture) factors.

Partial thinning is foreseen in the following areas:

- Compartments, where due to historical forest cutting a monotone even- aged stand has arisen, where one species of trees (mainly spruce or pine) dominates;
- Compartments, where due to historical forest cutting a spatially poor stand without openings in crown deck and with poorly visualised regeneration stand and undergrowth has arisen;
- Compartments, where due to forest melioration the growing conditions and the constitution of stand have been transformed (clearing out has to be done simultaneously with renewal of hydrological system);
- In the upland forest types (Cladinoso- callunosa, Myrtillosa) that depend on ecological disturbance and where other tree species (mainly spruce) enter due to eutrophication.

Forest cutting in above-mentioned cases has to be performed to:

- Increase the constitutional diversity of the stand;
- Encourage the entrance of other tree species in monocultures;
- Encourage the forming of growth of multi-layered constitutions (different age of trees, regeneration stand and undergrowth are represented);
- Imitate ecological disturbances in the sensitive stands that depend on them.

Forest cutting has to be performed using the principle of selective cutting. It is foreseen as a short term activity, after which the development of the forest stand should not be influenced by silvicultural activities. Exceptional cases take place only if the forest habitat management requires so.

In monotone even- aged and species stands distinct groups of trees have to be cleared out during the cutting. Thus creating small glades free from trees that would stimulate the forming of regeneration stand's group. Distinct branched trees have to be partly unveiled.

In the stands that have been influenced by melioration (mainly they are compartments in peatland on the edges of swamps and transition belts) the overgrown area, which has arisen in ditch influence zone after draining activities, has to be cleared out. The renewal of hydrological system is favourable.

In the forest stands on dry, oligotrophic soils (mainly pine growths), where due to eutrophication other tree species (mainly spruce) enter, only trees of dominant stand, whose basal area is ~15 m^3/ ha, have to be maintained after the silvicultural activities. The soil preparation that would encourage the formation of regeneration stand is favourable.

6.4 Forest cutting estimate

The estimate calculations for the final cuttings and thinning are given for 10-year economic period.

Calculations are based on the data of forest planning of the national park's landscape protection zone forests that in year 2000 were brought under the control of KNP administration (they do not include the compartments, where key habitats of forest stands and protected forest districts are located).

The estimate for forests that belong to long-term forest managers ("Leja" Ltd. and "Kurzemnieki" Ltd.) and free forest area in territory managed by KNP is depicted separately (Table 4.8.). In areas, where the final cutting is planned, repeated inventory of forest stands' key habitats is to be done to distinguish the potentially valuable areas for protection.

Table 4.8. **Estimate for the timber cutting - division among the managers of KNP forests**

Manager	The final cutting (m^3)	Commercial thinning (m^3)	Total (m^3)
"Kurzemnieki" Ltd.	17 809	18 649	36 458
"Leja" Ltd.	1 919	7 438	9 357
KNP	12 572	27 579	40 151
Total	**32 300**	**53 666**	**85 966**

6.5 Activities

Administration	State's lands have to be registered under the name of MEPRD. The amount of state forest in KNP have to be increased; KNP should buy or the other way compensate privately owned stands of high biological value and forests in the nature reserve zone. The order of property maintenance and utilisation of roads (and their protected belts) in KNP has to be specified. The number of landowners, whose property rights have been re-established before the establishment of the national park in 1997 and no nuisances are stated in cadastral map of estate, have to be clarified. In cooperation with State Forest Service the alterations in forest database should be achieved that allowed to perform: • the registration of the cutting of distinct trees; • the maintenance of windfalls for natural renewal of burning area, not for the compulsory reforestation due to common silvicultural practices.
Control	Regular fire- prevention measures in the forest have to be taken in cooperation with State Forest Service. In the inflammable period a fire- guard has to be employed. The regular control over the organisation of fire- prevention measures has to be done in the forests of KNP. Regular inspection has to be organised (the control of violation of park's rules, illegal hunting and others). Areas of flooded forest caused by the activities of beavers have to be listed. The actions according the nature protection regulations has to be performed and monitored in forest management.
Information	Landowners have to be informed that their property are located in the territory of the national park (esp. Dzukstes district). Understanding about forest biological values in the national park has to be encouraged by informing society about the situation of forests in KNP, their management methods and regulations. Private forest owners and managers have to be educated in order to create understanding about the ecological functions of the forest and stimulate the preservation of biological values in forests.
The management of habitats	The final cuttings (picture 27) have to be managed according to the forest management plan and taking into consideration requests of the KNP management plan for cutting activities. Selection cuttings have to be doe in the compartments specified in the attachment no.23(each compartment has a specific purpose). Landscape cultivation cuttings have to be done in the compartments specified in 22. and 22'.attachments and road stages (picture 27). Cultural thinning has to be done in compartments (in space of 103.4ha) specified in attachment no.24.

Management of the area/ Infrastructure	Reconstruction of bridges have to be organised (6 bridges). Channels have to be repaired (9 channels). Roads have to be repaired and maintained (65km). Barriers have to be placed in order to prohibit driving in the nature reserve zone. The location of infrastructure can be seen in the map (picture no.28). Mineralised belts have to be regularly maintained (picture no 28). Maintenance of forest vehicles have to be provided (amortisation, fuel).
Monitoring	Monitoring methods for designation of habitat cultivation efficiency

	have to be worked out. The efficiency of habitat cultivation activities have to be observed. The evaluation and monitoring of the forest's ecological disturbance areas (fire, windfalls, natural disturbance grounds in forests) have to be managed.
Research	The inventory of species and habitats has to be done on the lands of private forest owners coordinating these activities with them.

- **Restrictions**

  Forest owners/ legal rulers have to coordinate with the administration of Kemeri NP the following issues:

  - the building of new roads and other sites on forest lands;
  - melioration projects;
  - forest management plans;
  - measures for beaver activity regulation;
  - sanitary thinning;
  - any silvicultural activity in the nature reserve zone and in protected forest habitats.

Forest cutting is restricted in burning areas to preserve favourable microclimate for forest renewal.

- **Conditions**

Irrespective of the type of forest property, a representative of Kemeri NP specifies the trees to be preserved in cuttings by designing a sketch/ scheme with these trees on their species and average.
In the forests of state property the representative of KNP makes a repeated inventory of forest habitats in the planned cutting area.
The callipering and marking in nature the trees that are planned to cut and the trees that have to be preserved are compulsory preconditions for obtaining cutting allowance. The marked trees and clumps have to be preserved in the cutting in future as well.

In upland forest types (Cladinoso- callunosa, Myrtillosa, Vacciniosa) the remains of cutting should be burned or removed. In the types of other growing conditions scattering of the cutting remains or compressing them on driveways are allowed, if that does not contradict with recreational needs.
The reforestation in each specific case has to be coordinated with the administration of Kemeri NP.

For obtaining forest by- products, except berries and mushrooms, the allowance of the administration of KNP is needed.

7 Public relations

7.1 Basic principles of KNP public relations

No organisation can exist and work effectively without wide support of society therefore it is undeniably important to explain the main policy principles for all the interest groups. KNP is looking for productive cooperation with local society and the other groups of interest who are involved or could be involved for a long or short term in the process of decision-making.
Among other basic tasks that are mentioned in the law of KNP is tourism and ecological education development that is impossible to raise without society's wide support and interest as well as deep understanding of the importance of environmental education.

In 1992 so called Rio Declaration was adopted and it says " governmental institutions have to provide society with a possibility to participate in decision-making process…must lead and support development of common understanding" (10th principle of the Declaration).
Also the Aarhus Convention about accessibility to information, participation of society in decision-making and accession to legal acts and environmental judiciary says that the society should be involved in implementation of plans and programmes and should be informed in advance about upcoming decisions and the environmental information should be given in clear and understanding way.

7.2 Description of the situation

All stakeholders can be divided in following groups:

- Governmental and municipal institutions (ministries, agencies, municipalities' councils;
- Tourism organisations (regional TIC, tourism firms "*Tūrinfo*", "Dabas draugi", "*IMPRO*", "*LATVIA TOURS*", association "Lauku ceļotājs", etc.);
- Regional business institutions (woodworking, agriculture, fish processing companies, public catering companies, hotels, the biggest farms, country-tourism houses, etc.);
- Schools, libraries, museums (especially Ķemeri, Džūkste, Engure and Kalnciems high schools, Lapmežciems, Smārde, Apšuciems and Sala primary schools, Children's environmental school, local libraries, nearest museums, for example, Lapmežciems museum, K. Edelnieks private museum "Senā sēta" etc.);
- Mass media (main newspapers "Diena", "Lauku Avīze", "Neatkarīgā rīta avīze", etc., local newspapers "Jūrmala", "Jūrmalas ziņas", "Tukuma Ziņotājs", "Tukuma Ziņas", magazines "Ceļotprieks", "MMD", "Vides Vēstis", TV, radio, u.c.);
- Societies, clubs and non-governmental organisations (LOB, LDF, WWF; local: Lapmežciems fishers' society, sports club "Brāļi" in Lapmežciems, Džūkste sports club, Džūkste hunters' club, Ozolnieku hunters' club in Slampe municipality, Ķemeru development fund, Anglers' society in Slampe municipality, public organisation "Kaņieris", etc.)
- Local inhabitants;

The priority groups of those mentioned above are:

1. **Municipalities** – based on the fact that it is important to manage shared area and to balance interests. KNP would like to have wider understanding in nature protection sphere and co-operation from municipalities.
2. **Landowners**. In the territory of Kemeri National Park there are several thousands of landowners, which should be informed about park and park's legal acts that they should observe. Very important is also educational work, to explain "nature-friendly" working methods, as well as possibilities to co-operate. The aim of these actions is to encourage the landowners use these methods in practice.
3. **The most important representatives of mass media** as people who are forming public opinion and partly affecting political decisions.
4. **Local residents**. People, who are living in the territory of national park form the image of the park by expressing their attitude – criticising or accepting implemented decisions. Therefore it is important to achieve, that attitude against the park in most cases would be positive.
5. **Schools**. Kids in future will be the managers of our environment and therefore it is important to form their attitude about nature and environmental subjects, as well as to give understanding about nature values and the importance to use them wisely.
6. **Visitors of the park** (SCE. tourism part).

The duty of the park is to inform governmental and municipal institutions, which are related to Kemeri National Park, about planned changes or corrections in legislation, as well as in other rules about park's development in future, KNP strategy etc. The ideas and objections of these institutions should be taken into consideration and appreciated if they are not in conflict with the park's legal basis. Information exchange should be mutual –park also have a right to get all information in time.

7.3 Evaluation

Current situation is evaluated as satisfactory. Basic information exchange with governmental and municipal institutions is established, information appears periodically in national and regional printed media, co-operation with schools is developing successfully. There have been several public meetings in different parts of KNP. However some gaps in information exchange process are still existing, there is almost no co-operation with tourism and regional business organisations. Also in outgiven questionnaires of public meetings 80% of respondents admitted, that they would like to get more information about Kemeri National Park, and complained that most decisions are taken ignoring society's opinion. In addition we should consider that the recognition of KNP is not achievable during one month or year and as park was established only some years ago, it has all the possibilities to avoid mistakes and to improve the current condition. There is also a great interest about co-operation from society's side, especially from tourism organisations, schools and museums.

7.4 Influencing factors

- Park's financial possibilities in making brochures, newspapers and expositions, as well as establishment of information centre;
- Effective (or not effective) co-operation with all stakeholders;
- Diverse infrastructure of the KNP;
- The regularity of information and appropriate presentation level;
- Public initiative and participation in creating the historical exposition.
- Wide range of interesting activities for visitors of the park;
- Society's attitude against national park;
- Park's contribution in society-building;
- Appropriate logo and information signs of KNP.

7.5 Objectives

Using mass media and encouraging the participation of society to establish Kemeri national park as state significant territory with unique nature and culture-history values that have to be preserved and certify the particularity of KNP in European context, where:

- Kemeri national park – recognisable, popular, with accessible information about park's nature and culture values;
- Diverse brochure choice about different topics, KNP also publishes its own newspaper;
- Information about park is easy to find in its "home page";
- Regularly organised public meetings, various co-operation projects with stakeholders;
- Park has it's own information centre, as well as expositions about nature and culture-history of region;
- As the result of co-operation, various excursion groups from tourism companies visit KNP; the Park participates in tourism fairs.
- KNP establishes own traditions and organises yearly activities for the wide public.

7.6 Activities

Target groups	Activities
Municipalities	Regularly organise the Consultative council's meetings (1x per quarter).
	Delegate park's representative for attendance in the municipality's council meetings.
Landowners	Make a particular brochure about management of the habitats.
	Organise educational seminars (at least one per year).

	Private contacts, when informing landowner about valuable habitats and species, which are situated in particular property.
The most important representatives of mass media	Organise the press day (advisable before the beginning of tourism season). Organise excursions for press and sponsors. Attract informative sponsors. Regularly send out press releases.
Local residents	Make regular questionnaires (one per 3 years) and analyze obtained information. Organise public meetings (one per year). To involve residents in various projects preserving or manage nature and culture-history values. Find and interview the eyewitnesses of historical events in Kemeri National park. Organise activities and events (Birdwatching days, National parks' day, International Wetlands' day, Kemeri Day, Bats' night etc.).
Schools	Regularly organise nature school classes. Work out special excursions for schools. Organise children summer camps about nature. Organise competitions about Kemeri national park. Advertise KNP tourism offers in schools (before the beginning of tourism season). Strengthen the Ecoschools movement in the park's neighbourhood.
Park's visitors	SCE. Tourism part 8.
All target groups	Publish Kemeri national park's newspaper (comes out twice a year, approximately in April and October, one number edition – 3000 copies, costs per year ~ Ls 2000). Create Kemeri national park homepage (regularly renew information). Create Park's image (logo, postcards, posters and souvenirs). To publish the popular version of Kemeri National Park individual protection and management rules. Edition of 3000 copies. Create a brochure with map of Kemeri national park (colourful, edition of 5000 copies, in 3 languages, folded, approximates costs: Ls 1300 (included VAT). Make visitors "friendly" system of information signs and stands (for detailed information SCE. Tourism and Interpretation parts). Publish brochures about Kemeri NP nature and culture-history values (Publish brochures with students' written legends and stories about lake Kanieris), tourism offers (SCE. part Tourism). Organise activities and events (Birdwatching days, National parks' day, International Wetlands' day, Kemeri Day, Bats' night etc.). Publish articles in press about Kemeri national park, its nature and culture-history values, about tourism possibilities in the park. Subscribe main newspapers, buy additional literature for KNP library.

The most important KNP structure, which is established to strengthen co-operation, is Kemeri National Park Consultative council. In the Council's meetings essential and important questions of KNP and municipalities are solved.

It is important to co-operate not only in this "highest" level, but also strengthen contacts and mutual co-ordination of actions in order to successfully solve everyday problems.

The essential idea of national park includes the involvement of municipalities and local residents in park's everyday life giving them wider understanding about nature protection issues. Restrictions usually achieve controversial effect – mistrust from local residents and their denial of park's policy. Therefore during the elaboration and implementation phase of management plan the co-operation with local society needs particular attention.

7.7 Indicators of activities

- The number of visitors in park organised events;
- Evaluation of Park's infrastructure and its quality: whether it is convenient and secure for visitors or not;
- Public opinion polls;
- Informed residents (%), joint co-operation projects, seminars and other events;

7.8 Monitoring

Regularly organised questionnaires comparing received information with previously ones to see the changes of opinion.
Analyse references in mass media about KNP activities.

8 Development of tourism

8.1 Policy

8.1.1 Policy of the government

Law on Kemeri national park says, that "Kemeri National Park is protected by the State and it is established in order to preserve the nature, cultural historical and recreational values of this area, and to protect the processes of origination of mineral waters and medicinal mud and also to promote non-deteriorating economic activities as well as nature tourism and ecological education" (Law on special Protected Nature Territories 1993 and amended 1997).

8.1.2 Policy of national park

Kemeri national park develops sustainable tourism that is "any form of development, management or tourist activity, which ensures the long-term protection and preservation of natural, cultural and social resources and contributes in a positive and equitable manner to the economic development and well-being of individuals living, working or staying in protected areas".*

Park uses strategic approach for tourism development, which is based on territory problem and possibility analysis that are confirmed by other stakeholders. The objective of this approach is to find the most suitable way of tourism development for KNP.

Park determines to follow sustainable development principles in its tourism activities:

- To admit the European protected territories as important part of our (nature and cultural history) heritage that needs to be protected and valued.
- To develop the tourism in protected territories in sustainable way taking into consideration the needs of nature, local residents, local business organisations and visitors of the territory.
- To involve all stakeholders within the territory of protected area and around it in tourism development.
- To develop and follow sustainable tourism strategy and action plan for this area.
- To achieve and provide quality in every aspect of the visit to protected area.
- To enhance development of tourism products specific to the area which encourage the discovery and understanding of the territory.
- To develop effective way of interpretation of the territory for the visitors highlighting unique aspects of the area.
- To increase the level of knowledge about protected area and sustainable principles among those involved in tourism businesses.
- To protect and improve the quality of life for local residents.
- To preserve and improve nature and cultural heritage of the territory at the same time developing tourism and its products.
- To increase the benefits of tourism in local economics.
- To monitor and channel the visitor flows in a way that decrease the negative effects and guarantee the preservation of nature and cultural values.

Park develops sustainable tourism together with representatives of tourism sector, with other economy sectors, local residents and municipalities.

8.2 Tourism resources in Kemeri NP

8.2.1 Nature

Kemeri NP nature values and actions plans to protect them are considered in chapter 4. Varied and rich nature of KNP has also tourism, recreational and educational value. Therefore territory of KNP has a great tourism potential.

Sustainable tourism development can give a significant investment to protect these values:

- For those nature values managed to develop sustainable tourism, more "nature friendly" management can be proposed, for example, substituting bird-hunting with bird-watching.

* Sustainable tourism definition from "The European Charter for sustainable tourism in protected areas".

- Nature values with no economic activities could protected better because people get knowledge and understanding about their importance and ways they have to be protected (it is not so easy to destroy something that is known for all and everyone likes it).
- Raising nature value in the eyes of local residents (unaffected nature is a valuable tourism and therefore also income source) as a result it is better protected. It is important for the administration of the park to promote contacts with local residents in order they support development and objectives of the park.
- Provision of entertaining and educating activities in KNP will help to increase visitors' environmental awareness and deeper understanding of park's objectives and actions that are performed.
- The development of sustainable tourism reduce threats to fragile nature values that can be caused by uncontrolled and chaotic tourism development.

8.2.2 Cultural environment

The National park is not only unique nature territory – for hundreds of years it is influenced by human activities therefore it is possible to see the results of these activities throughout the whole territory of the park.

Cultural environment and rural landscapes and their protection are described in the 5th chapter of the plan. They are important as tourism resource, because they are unique for this territory.

Sustainable tourism development could stimulate their preservation highlighting particular features of Kemeri NP and forming local residents' and visitors' understanding about these values.

Cultural environment's values

The "official" cultural historical values of the area (cultural monuments of local or state importance) are included in the chapter 3.5 of the management plan. Their protection and management mainly is not within the responsibility of KNP.

Other cultural history values, for example, traditions, tales and legends are not included in the plan because of its limited volume and capacity, but big part of this information is already summarised in the Park.

Cultural history's places and objects SCE 25th annex, 29th table.

Sustainable tourism development can contribute to the conservation, maintenance and enhancement of culture history values of local or state importance as well as to some other places of interest. It would also stimulate the preservation of local traditions, crafts and occupations.

8.2.3 Co – operation partners

SCE also Kemeri NP socio- economic description (chapter 3.4.) and Public relations (chapter 7.).

8.2.3.1 Local residents (municipalities, enterprises)

In the territory of Kemeri NP people live, work and rest. They form and influence the territory and its tourism resources.

Sustainable tourism development in the territory of Kemeri national park can stimulate its economical and social development as well as development of the whole region:

- by giving extra income (service industry, souvenirs etc.);
- creating work-places (service industry – bed&breakfast, shops, different activities - bicycle rent, horse riding, boat rent, licensed fishing, guiding service etc.) –helping to attract the youth to the countryside;
- Preserving the existing traditions by developing tourism products which popularises characteristic elements of this territory – local festivities, traditional crafts and occupations, folk groups, etc.;
- Improving the quality of environment and life - healthier environment, more active public life;

All together it can rise the environmental awareness and also self -confidence of the local society.

8.2.3.2 Protected territories

The most significant places in Latvia where ecotourism is offered are protected territories: Engure lake nature park, Gauja and Slītere national parks. The proposed activities in all of these territories are almost the same: guided excursions, walks, sunbathing, swimming, sailing, bird-watching, bicycle rental, boating, fishing, horse riding.

At the moment Gauja national park has the most developed tourism infrastructure. As to nature values Kemeri national park has the similar ones to Teici and Krustkalni nature reserve with large bog massifs and lakes, similar to Engure lake nature park with its lagoon lakes, to Slitere NP with its sandy beaches and coastal pine forests.

Every park has also specific offers, which can be a good base for co-operation, for example, in forming a united tourism net of protected territories and in making joint offer packages for tourists.

8.2.3.3 Tourism operators

Tourism companies often include national park as a part of their excursions without informing Kemeri NP administration.

LOB* **and Eastbird**** - offers bird-watching tours and activities (also in the territory of KNP) to foreign and Latvian bird watchers.

Tourism information centres (TIC) – distribute information about tourism possibilities in their area, create trails, organise excursions and make reservations for all kind of tourism accommodation (Part of Kemeri NP is situated in Tukums, Jūrmala and Jelgava TIC territories). There could be a co-operation concerning information exchange&distribution as well as in creation of complex tourism packages.

8.2.3.4 Health resorts

In the territory of Kemeri NP there are situated several sanatoriums, and they partly are situated in the territory of town Jurmala. Kemeri NP can offer for visitors of health resorts wider possibilities for relaxation in nature, at the same attracting new visitors to the territory.

8.2.4 Accessibility of the territory of KNP

Kemeri NP territory is easy accessible along the main roads (Riga - Jurmala, Riga - Ventspils and Riga - Liepaja) and railroad. It is situated at one-hour distance from the Riga airport and from the central bus station.

The territory is covered with dense net of the roads (figure 30). There are several asphalt and gravel motorways, which are in quite good condition. But in the biggest part of KNP there are low quality gravel roads. Many of them can be passable by car only in the dry summer season, in any other time off-road jeeps, bikes, horses or going by foot should be used.
The existing infrastructure is not appropriate for a big flow of visitors. There is a lack of facilitated boardwalks and resting-places. There are not enough parking places and information about already existing tourism objects is not sufficient.
According to the law on Kemeri NP, visitors have limited access to nature reserve area. There are no other limitations of accessibility within the territory of KNP.

8.2.5 The existing infrastructure of the KNP

8.2.5.1 Signs, information stands

The park border marking along the roads (small signs “Kemeri NP”) and “Don’t throw the waste” signs along the borders of the nature reserve zone(figure 30).
Sign on Kemeri - Jaunkemeri road, that informs about administrative and information centre “Meza Maja” (“Forest house”)
The black Austras’ trees with letters “ĶNP” - at Jaunkemeri and at the border of the park along the road to Ventspils (A10).
Information stand at the lake Kanieris and at sulphur spring “Ķirzaciņa”

8.2.5.2 Information centre

Information and administrative centre “Meza Maja”(“Forest house”)

8.2.5.3 Boardwalks

Black alder forest boardwalk (600 m) at “Meza Maja” (“Forest house”);
Boardwalk (3 km) in the Kemeri Raised bog.

The existing infrastructure needs regular maintenance.

* Latvian Ornithological society
** tourism company

8.2.6 Tourism and hospitality businesses in the territory of the KNP and in surrounding municipalities

Lodging - 38
Public catering - 51
Saunas - 26
Car rentals - 1
Horse riding - 4
Water transport – 11
Shops – information is not summarised yet.

The majority of tourism businesses are located along the seacoast. In the territory of city Jurmala there are mostly expensive hotels and restaurants, which are suitable for big number of visitors. According to tourism expert's evaluation the quality of lodging is not adequate to prices. In the other part of territory the rural tourism company develops and offers different activities.

At this moment there are two rehabilitation centres in the Kemeri NP territory - "Jaunkemeri" and "Dzintarkrasts". These medical institutions are oriented to clients from Latvia and ISU states. The future of the Kemeri health resort is unclear.

From the visitors' point of view possibilities to have a meal in Kemeri NP are evaluated as average, offer in local shops – as average and possibilities to lodge – insufficient till average.

8.3 Information and its accessibility

In year 1997 colourful brochure with general information about Kemeri National park was published in 5 languages; in the same year also the brochure about lake Kanieris in 2 languages (SCE chapter 9) was elaborated. In year 2001 – brochures (black and white, A4) about bog's boardwalk, about Kemeri and about sulphur springs in Latvian and English languages.

Approximately half of the area visitors who stay on the beach do not know, that they are in Kemeri National Park. Better informed are people, who visit park-related objects –boardwalk of Kemeri raised bog (90% knows that are in the territory of Kemeri National park) and "Meza Maja" ("Forest house").
Visitors, who are Latvian residents, get information about Kemeri NP from other people (approximately 1/5 of all visitors), In the Tukums and Jurmala Tourism information centres (1/5), as well as from road signs (30% from "Forest house" visitors). Foreign visitors mostly get information from tourism guides and brochures.

The biggest part of Kemeri NP visitors evaluate the information accessibility about KNP as average to difficult and also insufficient.

8.4 Visitation

8.4.1 Characteristics of the visitors

In accordance with visitors registration in the KNP information centre, the number of visitors is increased from 130 in year 1995 till 460 in year 2000, but this registration is not complete and total, because visitors who arrived on Saturdays and Sundays often were not registered. In year 2001 during a month (15th July – 15th August) were registered 234 visitors, therefore in the whole year it could be approx. 1000 visitors. For the visitors' division of SCE table 8.1, but for characteristics of target groups SCE appendix 26.
Approximately 90% of park's visitors come to park by their own car together with friends or family and stay in the park for couple of hours. Approximately half of the visitors come from Riga or its vicinity. In autumns and springs many groups of students visit KNP. The visitors of lake Kanieris come from different target group – they mostly are anglers and hunters.
Most of the information centre visitors are Latvians, there are also many Germans and Russians.

Table 8.1 **The division of park visitors in KNP territory (in accordance with visitors registration in year 2001)**

Place	Amount
Beach	~30 000 per year (June – August)
Lake Kanieris	At least 5000 per year (from May – first ice)
Ķemeri sanatorium/Ķirzaciņa spring	At least 17 000 per year
Boardwalk of Kemeri raised bog	At least 1500 per year
Berry and mushroom pickers	Could be at least 2000 per year

8.4.2 Influence of visitors

Visitors influence on KNP territory is not properly estimated. The most urgent task is to estimate the visitors flow and their influence on already existing tourism objects (boardwalk of Kemeri raised bog, Black Alder forest boardwalk), as well as on places, where there is a possibility of negative impact on nature and cultural historical values (Gausa jūdze, lake Kanieris, Sulphur springs, Raganu bog).

Boardwalk of Kemeri raised bog. The number of visitors is estimated as ~ 500 per year. Particular negative effects have not observed yet. The methods of monitoring the visitors flow have not elaborated.

Beaches and dunes (Jaunkemeri - Klapkalnciems). The number of visitors ~ 30 000 per year (June - August). A seacoast habitats inventory was made that shows the places of protected habitats and places where the recreation influence was observed. Latest most often cover up with the biggest car parking. No methods of monitoring are worked out, monitoring is not started.

Lake Kanieris. At least 5000 visitors per year (from May – till the first ice). In year 2001 BI* Ornithological laboratory of Latvian University made several researches about influence of hunting and fishing on the number of birds in the lake. Research shows that after hunting the number of birds in the lake is reducing (number of ducks – approx. two times, coots – approx. about 1/3), and J. Vīksne admits the possibility, that it could be the result of hunting. In accordance with park specialists' evaluation, hunting in the lake gives a strong influence on behaviour of birds and it becomes more difficult to watch them. No methods of monitoring are worked out and monitoring is not started yet.

Boardwalk of Raised bog. At least 1500 visitors per year. Influence is significant – there is some garbage around boardwalk, dead and live trees are broken, mosses and plants are teared off, in some places even the boardwalk is damaged. However also in year 2001 bog's snipe was nesting near to the boardwalk and also after nestlings' hatching bog's snipe was staying there. In year 2001 registration of bog's snipes (pairs) that are nesting near to the boardwalk was started. Monitoring methods must be upgraded and monitoring should be continued.

Sulphur ponds in Raganu bog. The number of visitors is not known precisely, but there could be approx. 100 visitors per year. From Kemeri- Antiņciems road to the sulphur ponds leads a beaten muddy trail that becomes wider so the vegetation of the bog and its landscape is damaged.

8.4.3 Potential demand

In year 2001 after opinion poll of visitors of the park at the information centre (1) and in other territory of KNP(2) it was discovered that:

1) Visitors find the nature of KNP very beautiful and they would suggest their friends to come here. They would like more cycling and walking routes, more well equipped swimming places in the KNP;
2) Visitors in park's territory would like to watch nature, birds and animals (total of 40%), would like to stay on the beach (14%), would enjoy the silence (11%), would like to rest actively (10%), would stay overnight (7%), would pick berries and mushrooms (6%), would like to fish (6%), would like to visit different events (5%).

8.5 Capacity and limits of the territory of KNP

Zonation of tourism&relaxation possibilities in Kemeri NP is elaborated based on the nature quality (from level of "wildness" and "intactness") accessibility, interests of nature protection and provision of diverse visitors' experiences.(figure 31, appendix 27).

* Biology Institute of Latvian University

The capacity of each value of the park is not determined (maximum number of visitors that do not damage nature and cultural historical values, local residents are not disturbed and visitors do not disturb each other), as well as total capacity of the territory is not determined. Capacity is a varied quality, that depends on appropriate management and infrastructure.

8.6 Influencing factors of tourism development in Kemeri NP

Promoting factors	**Hindering factors**
There are many interesting nature and cultural values in the park.	Part of these nature values is sensitive against the impact of human activities.
Economical tendencies in the world and in Latvia shows, that demand for nature tourism products could rise.	Tourism in Latvia is not enough developed yet.
Park (after some time) could maintain itself by getting profit from tourism.	Park's resources are not sufficient for financial independence of park and it is hard for park, as a governmental institution, to attract significant investments.
Local residents and municipalities are interested in tourism development.	Park's infrastructure is not appropriate (adequate) for great number of visitors.
There are wide possibilities to co-operate with other tourism organisations in creating common product packages.	Co-operation with local businessmen, local municipalities and with other tourism organisations is not good enough. (Nothing is done to protect local residents' traditions).
Territory of the park is easily accessible for visitors.	There are several nature tourism offers in Latvia that are similar to KNP offers - GNP, SNP etc., and GNP has better developed infrastructure as well.
	Park's potential tourism resources have been destroyed for business needs and governmental policy is even promoting it.
	The quality of existing offers is low.
	There is a lack of professionally educated tourism specialists in the territory of KNP.
	Information about park and its offers is not distributed enough and it is not easily accessible (There is no united information about nature tourism possibilities in Latvia).
	The use of nature resources sometimes is against the interests of tourism development: ▪ Forest cutting in landscape protection zone – reduces areas, where it is possible to make nature trails. That could lead to the situation, when it will be necessary to move trails deeper in the nature reserve zone and trails will exceed carrying capacity (the more trails, the easier is to achieve optimal number of visitors). ▪ Water-fowl hunting – scares water birds and makes watching them more difficult. ▪ Game hunting – scares animals and reduces their number.
	The monitoring of visitors' influence on nature is not started yet. There is no quality control system for services offered by park (questionnaires for visitors etc.).

World experience shows that wise investments into the tourism development leads to the possibility of achievement of the financial self-maintenance of the territory. This also has to be supported by government policy. **At the moment government funding for tourism development is not sufficient and the status of governmental institution does not allow the park to do any business activities.**

8.7 Strategy of tourism

I. To improve the quality of KNP tourism offers in a way that they financially give the biggest investment in national park's nature protection as well as in social and economical development, improving the quality of life of the local residents and satisfying the needs of KNP visitors.

Priorities:
- To improve the quality of existing offers;
- Create and plan the new ones.

The development strategy of tourism products of KNP
Tourism products in the park will be developed around centres that are easily accessible by public transport. They could be located in Kemeri, Jaunkemeri, Lapmezciems, at lake Kanieris, at lake Valgums, in Smarde, Slampe, Kalki, in Odini - Pavasari polder and Lancenieki. Centres will be connected with tourism trails and activities in a way that visitors could start their trips in one of the centres and finish them in other, depending on their interests and wishes.
Profits from those tourism products with little investments needed will be used to develop more expensive activities. These tourism products will be developed gradually, investing the profit in further development. Some products of significant investments park can develop as concessions – getting for them yearly payments.
Possible tourism products of the park are summarised in appendix. 28 and in figure 32

II. To make co-operation with tourism businesses that are located in KNP, to create a united strategy for sustainable tourism development and to elaborate activity plan, that has to be carried out together in KNP territory.

III. To elaborate and implement a business plan for development of tourism products in the park and to achieve an independence from government budget financing.

In accordance with Kemeri NP tourism development strategy, national park has made a decision to operate the biggest part of tourism products based on nature values in KNP therefore getting profit for management of national park and implementation of its objectives. It has more advantages than concessions:
- Park's profits from tourism products are higher (Although it needs more significant investments);
- It is easier to make united image of the park and to popularise its objectives;
- It is easier to control the process, in case tourism activities begin to endanger the nature and cultural historical values of the park.

8.8 Activities

Administration	To employ (season or for full time) a person dealing with Nature school and environmental education. To employ a person for work at the information centre "Meza Maja" for season from 15th of April till 15th of November. To employ an information specialist. To employ a tourism co-ordinator. To employ 3 workers for management needs of the territory. To work out the price-list of KNP service. Legalise the mechanism of cash collecting and circulation in the park (income from guided service). To invite local residents for co-operation to make the souvenirs. Organise yearly events: ▪ "The National parks day". ▪ "International Wetlands' day". ▪ "Bird-watching day". ▪ "Bats' night".

	▪ "Kemeri day". Legalise transportation of the boats on trailers. Create the park's image with the help and approval of all employees of the park. In co-operation with local tourism companies elaborate the strategy of sustainable tourism in KNP. Activities: • Organise an informative seminar about European Charter for sustainable tourism in protected territories for all stakeholders. • Form a workgroup for elaboration of the tourism strategy. • Guide an educational trip to one of the national (or nature) parks that is already involved in the process of European Charter. • Elaborate the strategy. • Officially present the strategy and sign it. • Organise a seminar to present the strategy of sustainable tourism to potential investors and tourism professionals. In co-operation with local tourism companies elaborate and implement the action plan of sustainable tourism for the territory of KNP. Find the most suitable business form for tourism development in the park, by involving economical expert. Elaborate long-term, short-term and yearly business and marketing plan for tourism, taking into consideration the tourism strategy mentioned in management plan as well as other related requirements and guidelines.
Planning	Every year prepare and organise excursions for pupils and students. Regularly educate guides of the park. To create a system of collecting and summarising references: • From schools and pupils about planned and guided excursions • From visitors of all nature trails • From river Slocene boaters • From participants of guided excursions • From bird-watchers. To elaborate monitoring programs and methods of monitoring the visitors' influence: • For places where pupils' excursions are guided • For nature trails • For river Slocene (part from the oak till lake Kanieris) • For beach and dunes • For lake Kanieris • For Green dune • For the vicinity of Sulphur ponds. Elaborate the monitoring methods for the carrying capacity based on year 2001 registration results. Make a sketch for exhibition about KNP at the "Meza Maja".
Control	Control the situation on nature trails and write a "defect act" in case of trail's damage. Control the amount of garbage in the nature trails and surrounding.
Information	Regularly supply Tukums, Jurmala, Jelgava and Riga Tourism information centres (TIC) with information materials about KNP, its nature trails, events and about possible river Slocene boat trip. Place all above information in park's home page as well as in tourism guides and in mass media. Place information about park's offer for bird-watchers in KNP home page, in tourism

	guides, get it available on international tourism fairs, in TIC, at the airport, at the central bus station and in hotels. Every year prepare information material about park offered excursions for pupils and send it to schools, school-boards and in different media related to environmental education. Prepare information for informative stand about black alder forest trail. Prepare information for brochure about black alder forest trail. Publish brochure about black alder forest trail. Publish brochure about boardwalk in raised bog. Publish brochure for children about boardwalks in black alder forest and raised bog. Prepare information for park's tourism map. Publish park's tourism map. Improve park's home page. Every year prepare information material about seasonal tourism offers (nature trails, events etc.). Prepare and publish information for bird-watchers about best bird-watching places within the park.
Management of the territory/ Infrastructure/ Technical equipment	Settle a room for nature school in "Meza Maja"(for employees and for needed equipment). Repair the black alder forest boardwalk. Maintain nature trails (repair, if needed), informative stands, landmarks, rooms of information centre, nature school and exhibitions, tourism equipment (boats, lifejackets, binoculars etc.). Regularly clear away garbage from park's nature trails and from the its surroundings. Improve plank way of raised bog. Settle a room for park's information centre in "Meza Maja". Repair a road from the highway to "Meza Maja". Maintain this road. Improve and maintain the vicinity of "Meza Maja". Create and place a road pointer "Information centre " leading to "Meza Maja". Make a sign with name of organisation and its working hours and place it at the entrance of "Meza Maja". Place donations box in "Meza Maja". Improve picnic's place at the river Slocene. Buy 1-2 cars (for tourism and information department). Make a room for exhibitions in "Meza Maja". Make exhibition about KNP in "Meza Maja". Place 11 stands with general information about KNP in the park's territory. Place 7 landmarks of KNP in the park's territory. Make an ambush at lake Kanieris for bird-watching. Buy all needed materials and equipment for pupils' excursions. Buy 15 lifejackets.
Monitoring	Collect references from schools and pupils about excursion guiding. Make the opinion poll among visitors of nature trails and summarise results. Make the monitoring of visitors' influence: • on pupils' excursion places; • on nature trails; • on river Slocene from the oak till lake Kanieris; • on beach and dunes; • on lake Kanieris; • on the Green dune; • on the vicinity of Sulphur ponds. Organising opinion polls among local residents, gather the information about their thoughts impressions of tourism. Count number of visitors in the territory of KNP and monitor it.

	Every 5 years make a monitoring and an update of sustainable tourism strategy.
Research	Determine carrying capacity of tourism objects and park's territory in general.

8.9 Tourism indicators

- Satisfaction of visitors (at least 90% of questioned visitors are satisfied);
- Park's income from tourism allows to reduce forest cutting till habitats' management and in long term insures independence of KNP on government's budget. (Planned income/expenses in park's budget);
- The development of nature tourism gives an important investment in local economics (the number of people working in tourism field, number and quality of companies dealing with tourism and related issues, the number of rooms and their utilised capacity);
- Park is furthering nature-friendly services (the number of educational courses, certificated firms).

9 Interpretation

9.1 Future vision

Kemeri national park is well known protected territory in Latvia as well as in neighbouring countries Lithuania and Estonia. Park has a nicely designed and thoroughly planned general brochure accessible in many places outside the park (e.g. tourism agencies, other protected territories). National park has its main information centre with large selection of all kinds of booklets (about nature trails, plant and animal species, historical information) and also the information about the services that are provided by staff of KNP (price list, guide service, rent of binoculars and other equipment, calendar of events etc.). There are also 2 – 3 smaller information centres in other visited places in the park's territory. Information stands about KNP are located in all surrounding municipalities and in Jurmala and Tukums tourist information centres (TIC). Booklets about Kemeri are distributed among other protected territories and TIC. That creates a situation when approximately 75 % of visitors have information about Kemeri national park even before coming to it.

There are 3 – 5 guides who are constantly working in KNP and park has also contacts with municipality guides, who elaborate an interpretation of a certain objects or trails. Experience exchange seminars are regularly organised for the guides. Local residents have enough information about park's legislation, development and planned events and they themselves act as messengers of the park (e. g., in their country-house or farm receiving visitors of KNP).

All nature trails and objects of interest are easy to find in the nature due to simple but visible signs. KNP borders as well as the border of nature reserve area are clearly marked. Signs "WELCOME TO KEMERI NATIONAL PARK!" greet visitors but on their leaving, signs: "HOPE TO SEE YOU SOON IN KEMERI NATIONAL PARK AGAIN!" say farewell. There are illustrated information stands at the most important sites helping to recognise them (e.g. rare species) and/or giving short overall information about the object. All the restrictions and prohibited actions are clearly indicated. A scheme of interpretation is worked out for each tourist trail with recommendations what is important and what does one have to emphasize to visitors of the trail (there can be different schemes for one trail, for different target groups).

9.2 Interpretation policy

One of the main tasks of Kemeri NP is to provide ecological education. Interpretation of national park must be used as an instrument that helps to fulfil this task in the same time protecting biodiversity and cultural historical monuments. Therefore park's interpretation has to be oriented for protection of nature and cultural historical values and/or explanation of management activities of national park to visitors and local residents. Interpretation doesn't have to contain only general ecological education and tell about park's objectives, but it also has to give a general insight in nature and environment protection questions. Especially important for Kemeri NP is ecological education of youth (pupils and students).

Therefore the main tasks of Kemeri NP interpretation are:

1. To explain objectives and work priorities of the park – why it was established, what are the main objectives;
2. To explain the need to preserve and protect different places of the park – why there are preserved, restricted and other zones, what is allowed in these zones and what is prohibited and why;
3. To explain the need to protect different values of nature– tell visitors about general ecological situation, nature values;
4. To inform visitors about park's importance on international level – telling visitors about protected territories of international importance in the Kemeri NP;
5. To make sights of the park easily accessible – information signs and maps should be placed, so visitors could know where exactly they are in the Park(in which zone and place);
6. To provide information about places that are allowed to visit – visitors must be informed, what and where in KNP is possible to see and learn as well as they should be informed about visiting hours;

7. To provide original, at the same time entertaining and educational experience for visitors – given information should be concise, easy to percept and simple, but at the same time informatively rich;
8. To develop understanding about sustainable development, by explaining possibilities to develop nature tourism.

Kemeri NP interpretation has to be created and implemented by Kemeri NP administration and Kemeri NP fund in co-operation with different NGOs and private persons.

9.3 Past and present interpretation

From establishment of the Park in year 1997 until year 2000 interpretation had been developed in small-scale level. Now the establishment of information centre in the administration's house "Forest house" has begun where there are several maps of the park and some information about nature protection in Latvia and worldwide, as well as some results of researches that has been done in the territory of the park. In this information centre park's employees additionally to their direct tasks, tell visitors, why KNP was established, inform about nature values and planned activities in KNP, as well as offer 2 – 4 tourism routes for visitation. Until year 2000 the guiding work outside "Meza Maja" was done by the staff of KNP. For a short time in year 2001 park had a tourism specialist. There still is a need of some 4 or more guides. Starting from year 2000 co-operation with potential nature guides from surrounding municipalities who could work here in future is established. Several events for experience - exchange about nature interpretation was organised, it is planned to continue those events in future. Co-operation with Children Nature school is established in order to create educative program for children in KNP.

9.4 Appropriate objects for nature interpretation in Kemeri NP

In Kemeri NP relative small area one can find a big part of characteristic habitats of Latvia, beginning with beach and dune forests, ending with bogs and coastal lagoon lakes. Many of these habitats are nature values of local or international importance. There are also many plant and animal species that are rare and/or under protection. Many habitats in park's territory do need special management activities to maintain or to improve the biodiversity. Therefore there are wide possibilities for nature interpretation to inform society about the need to protect and manage in special way different habitats or rare species and teach to recognise and take care of different nature values in the Kemeri NP.

Appropriate objects for nature interpretation are mentioned in table 9.1. together with a short comment, what and why at these objects is possible to interpret.

Table 9.1 **Interpretation of nature protection**

No	Name of the objects	Reason of the interpretation	Examples of places or species
1.	Zoning of Kemeri National park	Visitors and locals should know why different zones of the park have been established, where they are, what kind of activities are allowed there and which ones are not.	Nature reserve zone Nature protection zone Landscape protection zone Neutral zone
2.	Internationally significant protected areas in Kemeri National Park	Visitors have be informed about international contracts and networks of protected areas with concrete examples of territories. There is a possibility to inform about CORINE, NATURA 2000, and IBA places, Ramsar, Bern, Bonn etc. Conventions, whose objects can be found in Kemeri NP.	Kanieris lake, Kalnciems meadows and Odini – Pavasari polder, Kemeri raised bog, west coast of Riga gulf etc.
3.	Microreserves, woodland key habitats (MKH)	There is a possibility to inform about ways how to protect nature locally: how to get involved into activities related to nature protection, how to recognise particularly valuable places from nature conservation aspect (MKH etc.), that should be protected. In case of MKH there are good possibilities also to interpret the appropriate management of valuable habitats.	Network of MKH and PMKH in Kemeri NP; conservation areas of Lady's-slipper, Black Stork etc.
4.	Rare and protected species, protected habitats	KNP has to educate visitors why some species need to be protected, introduce them with different species etc. There should be developed a register of species and their sites, that can be used for interpretation (to show them to visitors) without their devastation.	Various species of plants and animals, plant communities, habitats from register developed and approved by administration of KNP.
5.	Usual species of plants and animals	Possibility to observe various species of plants and animals, teach people (especially inhabitants of cities) to recognise plants, birds etc. as well as to explain proper behaviour in the nature (silence, purity). Possibility to explain natural processes with concrete examples – overgrowing of meadows and water reservoirs, successions of forests a. o. ecosystems etc.	Dunduri meadows (mammals, birds and plants), Kemeri raised bog (birds, bog plants), heath burning (plants, succession etc.), Kanieris lake (birds, lake ecosystems) a. o. places.
6.	Management territories	It is possible to interpret management of various habitats with the objective of maintaining their biological variety. Popularisation of management that is “nature-friendly”.	Forest eco-stands, MKH management, meadow management, Kanieris lake management.

9.5 Target groups

9.5.1 Current visitors of the park

Since foundation of the park in 1997 till January 2001 there have been at least 800 visitors at Kemeri NP info centre (particularly view chapter 8.2.).

Although the info centre is visited by comparatively little number of visitors, one has to take into consideration that it is just a small part from the real number of visitors. Significant groups of visitors, known at the moment, that arrive to the park according to their own specific interests are: holidaymakers on the beach (hundreds – thousands), mushroom and berry pickers (hundreds), anglers (hundreds) and hunters, mainly hunting water-fowl (tens – several hundreds). Many of these visitors don’t know that they are staying in Kemeri NP territory, wherewith they create serious target groups for interpretation.

9.5.2 Potential visitors of the park

By development of the park and spreading information about educational/recreational trails, it is foreseen that the number of visitors will raise steeply up quite fast in near future. Potential groups of visitors, their interests and possible interpretation for accordant target groups are classified in table 9.2.

Table 9.2 **Kemeri NP visitor groups, their interests and necessary interpretation**

No	Visitor group	Tendencies of changes	Interests	Necessary interpretation
1.	Pupils, students	Their number will increase sharply	Ecological education, general information about Kemeri national park, educational trails, school projects and scientific works or thesis.	Educational program for kids (developed by Children's Environmental school), informative booklets, special educational events.
2.	Family and the small-group tourists (foreigners and locals)	Their number will increase sharply	General information about park, educational/recreational trails.	Nothing specific, general information about trails and park.
3.	Anglers	Their number will not change notably	Fishing – mainly in Kanieris, Valgums lakes; Lielupe, Slocene rivers	Information about zoning of the park, fishing regulations.
4.	Hunters	will not change notably	Water-fowl hunting in Kanieris, Sloka lakes and in Lielupe river; hunting of mammals.	Educate hunters about park as protected area (booklets, informative posters at the boat stations etc.), offering alternative ways of recreation – observation of birds and mammals etc.
5.	Mushroom and berry pickers	may increase, but not advisable	"Mushroom forests", Kemeri raised bog (cranberries, cloudberries).	Information about zoning of the park, especially the reserve zone.
6.	Holidaymakers at the beach	will increase necessarily	Recreation at the sea, probably also near Kalnciems quarries.	General information about park – the place these people have come to take a rest. Regulations of the park. Advertisements of the park – what can this park offer for alternative recreation (trails etc.).
7.	Sportsmen and people who like to rest actively	will increase	Bicycle routes, riding, hiking routes, and camping places.	Information about regulations of the park and offered routes. Special route pointers in the nature.

9.6 Assessment of the Kemeri NP territory for interpretation following tourism zonation

View Kemeri NP tourism zonation map (picture 31) and annex 27.

9.6.1 Reserve zone closed to visitation, where the nature protection is priority

It is foreseen that there would not be any visitors or only some of them (scientists, special guests etc.) in these territories. Respectively for almost all of these areas interpretation mostly would be about necessity to protect these territories and leave them undisturbed or there would not be any interpretation at all. Areas, belonging to this category:

1. Both zones of strict reserve area in Kemeri NP (to mark in the nature);
2. Part of Kalnciems fen – without interpretation;
3. Čaukas bog – without special interpretation;

4. Southern part of Kemeri raised bog in the nature protection area, forests, situated next to this area, west side of peat extraction fields – without special interpretation;
5. S-W edge of Kanieris Lake – marking of the zone is necessary, as well as interpretation for lake visitors – anglers and hunters about the necessity to leave undisturbed zone in the lake.

9.6.2 Special tourism zone

Planned interpretation both outside the place and (less) in the concrete objects (interpretation of guides, signs for the educational trails) is foreseen. Target group for this interpretation are people with specific interests for unaffected nature – bird-watchers, nature photographers etc., who will visit this zone both with guide and alone. The interpretation (mainly in the form of booklets) in this zone has to contain information about sightworthy objects, how to find them, what are their protection, as well as about time-table of visitation of them. The nature objects have to be marked in undistinguished way. Priority objects of interpretation in this area:

1) Dunduri meadows (animal observing);
2) Lielupe river meadows (animal, especially bird-watching);
3) Kanieris lake (bird-watching, habitats);
4) Educational trails about forests, MKH – partly Lustuzi hill, Kalnciems fen, other (still have to be developed)
5) Slocene boat route – for admirers of wild nature.

9.6.3 Intensive tourism zone

Interpretation both on the spot (markings in nature, interpretation of guides) and outside the place (advertisement, booklets, general information). Wide range target group – from people with specific interests till ordinary holidaymakers who just want to walk through the forest. Also the interpretation has to be waried, taking into consideration different target groups. Many different models of interpretation are possible for boardwalks and hiking-routes, depending on target group, e.g., interpretation for children and interpretation for adults or interpretation for groups with specific interests, e.g., ornithologists, historians. Easy recognisable and apprehensible signs and marks have to be placed in the nature. There also have to be booklets with description of trails available for visitors walking in the park without guide. Development of small info-centres near the most popular objects (trails) is possible in the future (e.g., Kanieris boat station, “Tireli”). Priority objects for interpretation:

1) Trail in black alder forest near “Meza Maja”;
2) Kemeri raised bog trail(s);
3) Green dune trail;
4) Gausa judze(Tardy mile);
5) Kanieris lake;
6) Kracu hills;
7) Lielupe river (boat trips);
8) Meza Maja (“Forest house”);
9) Kemeri surroundings (Sloka lake., Black lake, sulphur springs, health resort, etc.).

9.6.4 Inhabited territories – towns and villages

Concerning interpretation it is an advertising zone. Using the infrastructure offered by zone (hotels, motels, cafes, municipal and other info centres) and supplying them with necessary information like maps, booklets etc., it is possible to:

1) Attract the visitors to Kemeri NP;
2) Inform about National park and its values;
3) Inform about activities and ways of recreation offered by KNP;
4) Inform about laws and regulations of KNP.

9.6.5 Places of special attention

It is necessary to pay special attention to such tourism objects as Kemeri raised bog and bogs in general, as well as trails that are related to waters (Kanieris lake – boardwalk, boat trips, boat trips along Slocene, Lielupe river etc.). Interpretation about these objects have to contain warnings and instructions how to avoid accidents.

9.7 Ways to present interpretation

9.7.1 Written interpretation

Development of new information materials is essential. It is possible to do that because significant amount of information about KNP nature and other values is collected. Also there is a plotter as well as other necessary software that could help to print out various interpretation materials – booklets, information posters etc.

9.7.1.1 Advertisement

Information materials (posters, booklets, short announcements), in distributing of which KNP info centres and other structures outside the park (info centres in municipalities, Tukums, Jurmala towns, Riga city, in other protected areas, etc.) are participating. Content – general information about the park, its activities. Advertisement articles and information about park news in mass media (e.g., MMD magazine) partly belong to this chapter, too.

9.7.1.2 Posters

Posters of various content are necessary – about park in general, about particular species and their protection etc. they have to contain maximum illustrations and minimum written information. They are mainly acting like tools to pay attention to concrete topics. In KNP it is possible to create coloured posters in A1 format.

9.7.1.3 Postcards, postage stamps, photos, phone cards

Generally it is just a smaller version of posters. At the same time it can help to pay attention and to give information that the species (habitats etc.) on the cards are possible to find within the territory of KNP. It is also a source of income– a souvenir.

9.7.1.4 Info stands

It can contain information

- about the park in general (located in info centres);
- about main objects or trails (located in those particular objects or at the beginning of the trail). Example – stand(s) about Kanieris boardwalk.
- In a way of a map– Kemeri NP maps (at the info centres and the biggest parking places); Maps for educational trails (at the beginning of the trail).

9.7.1.5 Booklets

Booklets are the main tool to present the written interpretation. There are several ways of their usage according to the content:

- Booklets with general information about a) park in general, its b) nature and c) cultural and historical values (3 booklets altogether, the general booklet could be based on the existing booklet, improving and updating the information). It is necessary to publish booklets at least in Latvian and in English, because these ones are the most needed.
- Booklets about different nature or culture and historical values in Kemeri NP, ways of habitat management etc. The objective of interpretation of such booklets would be to inform the visitors briefly and in colourful way about specific objects or nature protection problems and solutions. Booklets have to be made with lot of illustrations and limited textual part. For example, booklet about the Black Stork, booklet about bats, and booklet about nature or culture and historical monuments of Kemeri town, etc. The booklet about Kaņieris Lake should be prepared in near future.
- Booklets about specific boardwalks and trails of Kemeri NP. There has to be the map of the specific route inside, information how to find the beginning of the trail, brief illustrated information about sightworthy places along the trail according to the marks placed in the nature. The most necessary booklets at this moment are booklets about the boardwalk in Kemeri raised bog and the "Green dune" trail.
- Booklet about possibilities of active tourism and recreation (SCE chapter 8).

9.7.2 Other interpretation

Home page – overview about park, news (will be renovated once in 4 months).
Advertisement and overview of activities of KNP in TV and radio (depends on necessity).

Oral interpretation on the spot, provided by guide:

1) general information about park, given by park's info centre, slightly wider as in booklets;

2) information about sights in particular trails – during the excursion. The way to present information can differ depending of concrete guide or group, but there has to be scheme developed for each trail about objects or processes to be interpreted;
3) special programs for defined target groups – for example, ecological-educational programme for children;
4) interpretation from "local" guides – e.g., in case when landowner gives the information for visitors. In this case Kemeri NP can help the owner to recognise and explore objects suitable for sights of interest and to inform why they are valuable. "Local" guides have to be involved in experience exchange projects, regularly organized by Kemeri NP;
5) interpretation given by other institutions – cases when groups of visitors are lead by guides not connected with the park – tourism companies etc.; here the co-ordination with Kemeri NP about interpretation is necessary .

9.8 Activities

Infrastructure **General information and image of the park**	To place "entrance signs" with title "Welcome to Kemeri NP!" and "See you again in Kemeri NP!" To place signs along borders of reserve areas and to mark the borders of National Park. To place pointers to Kemeri NP administrative centre in Jaunkemeri (A10) and in the centre of Kemeri town. To place stands with general information (map of the park, possible activities, and how to find info centres). These should be located in parking areas, bus stops, near the stores, close to the main roads (see the map of locations!). 10 stands have to be placed at first (Kemeri railway station, parking areas, inhabited areas etc.). There could be 10-15 info stands in the territory of the park.
Special info stands	To prepare information (for 10 to15 info stands), mainly located in places where the visitor is crossing the border of the park or stopping to look at some sights. The info stand should be posted on the Kemeri NP map because it works like "mini info centre" in ever particular place and gives information on different themes, for example, about Kanieris lake, Kemeri Raised bog, dolomite quarries, peateries, Green dune, Odiņi meadows, Kalnciema black-alder forest, beaver dams next to Ventspils highway, fish-smoking in Lapmezciems, Kemeri town park and sanatorium, trenches of 1st and 2nd World War, old cemeteries etc. These stands are acting like creators of visual image of the park. The map placed on every stand gives a message "You are here!" and shows the location of KNP info centre ("Meza maja" – "Forest house"). There is a place for KNP news next to description of a specific area. Format A0, 4 colours, laminated.

Printed publications	**KNP map** with text – the main accent will be on activities offered in park. Booklets – format A3, 3 languages, 4 colours. High quality paper, water-resistant. Costs: 2 800LVL. **Thematic booklets** (5-7) **about values of the park**, e.g., Kanieris lake, Kemeri Raised bog etc. Format A4, bended in 3 parts, 4 languages, 4 colours. High quality paper. **Thematic** test-**booklets** about specific **activities** in the park: ▪ wildlife protection in the park; ▪ birds in Kemeri NP; ▪ fishing and hunting in Kemeri NP; ▪ possibilities of diving etc.; ▪ paths, trails and boardwalks; ▪ Kanieris lake; ▪ Green dune trail; ▪ sulphur springs and sanatoriums; ▪ dolomite quarries; ▪ routes for bikers; ▪ horse riding; ▪ evidences of 1st and 2nd World War in Kemeri NP; ▪ history of surroundings (for car-trip) – old villages, war evidences, cemeteries, museums, objects of history, culture and entertainment. Format A4 (bended in 3 parts), 4 languages, possibly 4 colours. Information **leaflet about hotels and guest-houses to stay overnight** in Kemeri NP and its surroundings. Format A4, 4 languages, possibly 4 colours. **Post cards** for selling in information centres. Series on following themes: ▪ nature diversity in KNP; ▪ rare species in KNP; ▪ Kemeri in ancient days; ▪ various activities in KNP (little information on each postcard). Kemeri NP **newsletter**. Format A3, Latvian, coloured. Printed T-shirts with Kemeri NP logo.
Advertisement	To participate in international tourism forums and fairs, for example, "Balttour", at least in co-operation with regional tourism centres. To offer various materials, things with Kemeri NP logo for selling (guides could wear T-shirts with park's logo etc.). Regularly place advertisements in local tourism magazines and newspapers. To put the information about KNP in "Riga This week" and "Jurmala 200X" editions not concentrating on general information but more on possibilities what to do and where (name some really interesting places in the park's area).
Info centre/exhibition	To open an info centre in "Meza Maja" where every visitor is welcomed in entrance hall. Visitors should be informed about Kemeri NP landscape sights, wild nature and objects on history and culture as well as about the accommodation, infrastructure and hotels and guest-houses in area of KNP. Regular information have to be received at the info centre, but exhibition hall is for changeable exposition - for works and information from local schools, artists, craftsmen, other organizations. Round exhibition-room corner is suitable for simple exhibitions, for example, collection of garbage from Versupite river cleaning. Room could also be used for handicraft and needlework exhibition as a part of "Kemeri week" (can be organized in future).
Archive	To create Kemeri NP photo archive.

- When ordering and laminating printed posters, do not forget a guarantee letter that assures long term quality of materials in accordant environment conditions at least for five years!

9.9 Design of pointers and stands

Design of pointers and marks for KNP has been created following the sketches offered by sculptor G. Burvis where frame of information stands is made from natural half-and-half sawed tree (or from tree with branches, for example, spruce).

10 Organization, monitoring and maintenance of the park

10.1 Structure and administration of the park

To provide and fulfil the priorities and activities highlighted in management plan, big accent should be put on creating the administrative structure of the park, which could implement following functions:

Planning (progression of strategy, creation and maintenance of parks' public image, corrections of management plan, elaboration of annual plans, project development, financial issues, budget).

Control of the territory and public relations (inspection, issues of land use and ownership, discussions with landowners)

Information and education of the society (preparation and publishing of information materials – interpretation of nature and culture objects – work of the guides and educational programmes for children.

Management of the territory (habitat management, garbage collection, creation and maintenance of infrastructure etc.)

Tourism development – principles of the European Charter for sustainable tourism, introduction of sustainable tourism in park's area, coordination of tourism development at regional level.

Monitoring and research –activities' influence assessment, monitoring.

10.2 Movement and special activities

Maintenance of National park should be performed with special attitude to environment and nature. Staff of the park with their attitude and working style should give an example to others in nature and environmental protection.

Movement related with maintenance and monitoring of the park should be done using the same routes as the visitors, in the same time avoiding to create road damage and additional disturbance for tourists. Movement roads will be used also by visitors, so the vehicles, even for the adapted roads should be maximally restricted. It should not be allowed for park's personnel to stay in the strict reserve zone without special reason, as well as without special need to use vehicles while doing their responsibilities.

10.3 Buildings

Administration and information centre of Kemeri NP is located in Kemeri, "Meza Maja", which is built in beginning of 20th Century (monument of architecture of state importance), but during Soviet Union time was used as a sanatorium. By expanding of the staff, the house has to be accommodated for work conditions and restructured according the work safety rules.

There are 4 rooms (16 places) in the house where is possible to stay overnight, but functionally they are not separated and is not compatible with functions of administrative building for working-days. The house needs repair and renovation; heating system of the house is in critical situation. There is no parking place next to administrative building.

Water supply system and sewerage is local, without purification plants. There is no water for drinking, because the local bore consists of high level ferrum, calcium, magnesium and sulphur hydrogen concentration.

Two houses in Fazani belongs to KNP, both in critical situation, almost destroyed and without electricity.

Actions:

- To design functional plan for rooms of "Meza Maja".
- To elaborate reconstruction project of the house (including ventilation, heating system, water supply, sewerage, electric power supply and telecommunications).
- To submit an investment project for reconstruction of "Meza Maja".
- To provide the staff with appropriate working conditions and office equipment.

10.4 Garbage collection

The collection of garbage is organised by municipalities. Each private owner is responsible for collection of the garbage in their property.

KNP collects the garbage in the territory of its infrastructure: trails, observation towers, picnic and parking places.
Visitors should be informed that they had to bring their garbage to the nearest garbage collection points if they stay in places that are quite far from the infrastructure.

The garbage collection has to be "nature-friendly": they had to be selected and recycled, all that is suitable for compost should be composted in order to avoid transportation. Hazardous waste should be collected separately and sent to the recycling.

Energy has to be economized in all possible ways using " environmental-friendly" substances and materials.

There would not be places to sort garbage in campings as well as in the picnic places that are located far away from roads and other infrastructure. Burning garbage should be burned down on the spot (if the open fire is allowed), but organic should be placed in toilets (dry toilets). Possibility to sort garbage should be provided at the information centres and recreation places that are located close to towns and villages.

11 Program of activities

In the Management Plan of Kemeri National Park the activities are grouped according to:
11.1 Administration
11.2 Planning
11.3 Control
11.4 Information
11.5 Habitat management and species conservation
11.6 Management of the territory, infrastructure
11.7 Monitoring
11.8 Research

The activities are put into tables indicating the number of chapter by which the activity can by found in the plan. In the chapter one can find the aim, influencing factors and also performance indicators which will help to follow the implementation of the aims and the direction of activities.
In the program the activities have been given a priority, a deadline, and the responsible unit of the Administration of Kemeri National Park.

The priorities are set as follows:
R – the activity has to be carried out regularly throughout all the implementation period of the Management Plan
I – very important activity, should be carried out as soon as possible
II – important but not urgent
III - should be carried out if the conditions are optimal and funding is available

The deadline shows the time when the activities of priority I-III should be completed and for regular activities (R) when they should start.

ABBREVIATIONS USED IN THE PROGRAM OF ACTIVITIES

IB UL- Institute of Biology, University of Latvia
GIS – Geographical Information System
IAE – Institute of Aquatic Ecology
LFN – Latvian Fund for Nature
UL – University of Latvia
LEA – Latvian Environmental Agency
LFRI – Latvian Forestry Research Institute
WKH – Woodland Key Habitat
LO IB UL – Laboratory of Ornithology, Institute of Biology, University of Latvia
REB – Regional Environmental Board
TIC – Tourism Information Centre
MoEPRD – Ministry of Environmental Protection and Regional Development
SGS – State geological Survey
SFS – State Forest Service
SEI – State Environmental Inspectorate
SLS – State Land Service
MoA – Ministry of Agriculture
LFRI – Latvian Fisheries Research Institute

The Management Plan of Kemeri NP should be revised in two years (in 2004), after the end of implementation period for acitivities of priority I, especially if the Life project is implemented which aims to finance several important activities and also in case of completion of administrative reform, which would change the relationships between municipalities and state institutions regarding the nature protection issues.