



**Tacis Project ENVRUS9704**

**PROPOSAL FOR  
THE ESTABLISHMENT OF THE LADOGA  
SKERRIES NATIONAL PARK**

Petrozavodsk 2001

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## **Preface**

This report contains the documents, which, according to Russian legislation, are needed for the establishment of the Ladoga Skerries National Park. Feasibility Study for the establishment of the NP and the Proposal for the Plan of the Ladoga Skerries National Park including an Action Plan for the five first years of the NP. After handing over the documents to the Government of the Republic of Karelia, the future of the National Park is in the hands of the Republic and the Russian Federation.

The preparation of this plan has been possible due to funding from the European Union's Tacis Programme. Support to the Ladoga Skerries National Park was one of the activities in the project Karelia Parks Development, which was implemented here in 1999-2001. During the project, the Municipal Entity of the Ladoga Skerries Park was established together with the local administration of the Sortavala Town. Its main task is to develop and maintain the park infrastructure, services and tourism before the National Park is officially established. The Municipal Entity was also the local recipient of the training and equipment, which is needed for the park management and which was received from the Tacis project. However, it is only a transition period organisation, which will be replaced by the National Park administration.

On behalf of the consortium running this project (the consortium includes Metsähallitus, Finnish Environment Institute, Indufor Oy and Kampsax International A/O), I wish to thank Aleksei Kravchenko as the author of this plan, and all the Russian and foreign experts, who have contributed to the preparation of the plan and in other ways supported the development of this unique territory to an internationally recognised national park.

**Jouko Högmänder**

Team Leader of the Tacis Project Karelia Parks Development ENVRUS9704

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## Abstract

The proposed Ladoga Skerries National Park is located in the administrative area of Lahdenpohja, Sortavala and Pitkäranta in the northern head of Lake Ladoga. The archipelago is characterised by long, deep bays resembling fjords. **The area of the park** is 84 400 ha and it encompasses 305 islands, 86 smaller lakes and a shoreline of 879 km. 53% of the area is land and 46% is covered by water. All forests belong to category I with strictly limited felling.

**The forest** was subjected to selective cuttings until the 1940s and after that practically no cuttings have taken place. The mature and over-mature forest aged over 120 years covers 3,7% of the park's territory. There are only small mires (5% of the Park's land) in the Park. Meadows (about 10% of the Park's land) are overgrowing, because there has been only small-scale agriculture since the 1940s and nowadays it has almost ended. By the decision of the local authorities most farmland is excluded from the Park though the farmland is located within the Park.

**The main values** of the Ladoga Skerries National Park can be briefly presented as follows:

- ❑ The archipelago with deep bays, narrow straits and relatively high rocky hills is a unique geomorphologic formation, which cannot be found in any other areas of Russia. The archipelago resembles those in southwestern Finland and in the western part of Norway, but they are different kind to these sea archipelagos, the first one clearly lower and the other one with high mountains.
- ❑ Ladoga is the largest lake in Europe. It is fairly deep and the water body is not seriously eutrophied.
- ❑ Bedrock is visible in large areas and it has been ground smooth by the Ice Age, the waves and ice of the lake. The bedrock is still gently rising, about 20 cm every hundred years, after the weight of continental ice. The park relief is diversified, rising from the sand beaches of the outer archipelago and low meadows of the inner part to the landscape of ravine lakes and high tops around Pötsövaara in the northern corner of the park.
- ❑ In places the bedrock is basic, even calcareous resulting in rich flora. Steep slopes, over 80 metres high are special habitats for both northern and southern plant species otherwise not growing at these latitudes.
- ❑ In some sites the forest is lush and the amount of rather old-growth deciduous trees is high due to the fact that practically no cuttings have taken place since 1939.
- ❑ The lake is the home range of the Ladoga Ringed Seal. In Ladoga there is a vital, isolated population, which has a great value from the scientific and nature conservation point of view, entered into all Red Books. There is not less than 20 % of reproductive population represented here.
- ❑ In general the nature here is very rich ranging from continental, old-growth forests on the mainland and peninsulas to shallow bays with spawning grounds for fish and places for bird-colonies, high hills with steep slopes and open shores with high waves and glacial erosion. This territory has the highest biodiversity in the whole of Karelia. The number of endangered species and different habitats is richer here than anywhere in the republic or neighbouring areas.
- ❑ The territory has been inhabited since at least the 9<sup>th</sup> century A.D., but due to the location between two strong cultures and religions, it was devastated and re-inhabited many times during recent centuries, the last time after World War II. In spite of many wars, numerous cultural layers can be seen in the landscape and monuments.

**The most serious threats** to the archipelago are the construction of new summer cottages, which is at the moment temporarily stopped, due to park planning. Wild tourism has already caused serious damage in terms of burnt forests, littering and illegal as well as untidy construction along the most attractive

recreational objects. Also the commercial use of forests can be activated in some areas or by some methods in the territory. Cultural landscapes are growing over.

The establishment of the NP will not reduce the number of working places in forestry or any other livelihood. On the contrary, **the park will create job opportunities** directly in the park administration, and indirectly in tourism and other services in the nearest settlements.

According to the proposal prepared for creating the park, **the rights of local people** to use the natural resources of the park would not be greatly affected. The picking of berries and mushrooms as well as fishing will continue as earlier. Minor changes in hunting are proposed. Strictly protected zones will be closed for all visitors.

**Functional zoning** of the NP will be accomplished. 6,2% of the National Park would belong to the strictly protected zone with no access and 17,5% to the special protected zone. In the latter one, guided tours are possible. The largest part of the special protected zone would be seasonal established in order to safeguard pupping of the Ladoga ringed seal (restriction between February 1 and May 31) and breeding of waterfowl (restriction between May 1 and July 15) in the outermost archipelago.

**The plan for the facilities and services** is presented. The office of the NP and the Visitor Centre are to be located in Sortavala. Information cabins will be situated in Lahdenpohja, Kirjavalahi and Impilahi. An ecological Education Centre for children and grown-ups is proposed on Riekkalansaari. Two other ecological camps for children are proposed in the western part of Riekkalansaari (opposite to Tarunlinna) and on Tulolansaari.

Eleven camping grounds with good service (cabins, sauna, road connection, guard) would be constructed on the continental part of the park and forty campsites with simple facilities on the islands. Nine ecological trails and eight longer, more demanding hiking trails shall be constructed in the NP.

In the **park administration** 45 permanent employees and a number of temporary workers are needed to keep the park running. It is proposed that the staff would be taken gradually during the five first years. The construction of the park is estimated to need investments of 35,3 million Roubles (equal to 1,4 million Euros) during the ten first years, after which the need for investment will decrease. The largest investment is proposed to be the planning and construction of the Ecological Education Centre, which will probably need external support. During the five first years of the NP, annual expenses are estimated to grow from 3,5 million to 5,8 million Roubles (equal to 140 000 – 232 000 Euros) and income from 0,37 million to 1,13 million Roubles (equal to 14 800 – 45 200 Euros).

Before the establishment of the Ladoga Skerries National Park, **the Municipal Entity of the Ladoga Skerries Park** will take care of the activities. It has been the local recipient of the Tacis project Karelia Parks Development ENVRUS9704 and got a good start in developing the park infrastructure and tourism already there, before the official establishment of the NP.

# **I Feasibility Study for the establishment of the Ladoga Skerries National Park**

## **1. Introduction**

Originally the idea for establishing the Ladoga Skerries National Park occurred in the late 1980s and was executed in its initial form in 1989-1990 when the issue of "The Situation and Prospects for Development of the Nature Protected Fund of Karelia" (headed by S. V. Sazonov) was discussed within the Territorial Scheme of Environmental Protection in Karelia worked out by the *Lengiprogor* (Leningrad City Planning Institute). The materials of the study were moved to the Ministry of Ecology of the Republic of Karelia and a later decree of the Supreme Council of the Karelian Autonomous Socialist Republic #XII – 4/90 of 26.11.1990 was made for the establishment of a network of protected areas in the Republic of Karelia. By decision of the Ministers' Council of the Karelian Autonomous Soviet Socialist Republic #1-1-14 of 12.05.1991 the time for the establishment of the Park was fixed – that was the period from 1993 to 1995. Afterwards, the materials were used to form a prospective network of Russia's Zapovedniks and National Parks.

In the meantime, the territory was subjected to a complex reconnaissance study done by specialists from the Environmental Protection Laboratory of the Forest Research Institute/Karelian Research Centre of the Russian Academy of Sciences and the Chief Specialist on National Parks N. M. Zabelina (Russian Environmental Protection and Nature Reserve Research Institute, Moscow). The study brought out the high environmental and recreational value of the territory, and conclusions called for the setting up of a Nature Park in this territory. By that time the Russian Federation's Act on Nature Protected Areas had not been issued yet, hence preference was given to the status of a Nature Park for the planned nature protected area, not a National one. The basic reasons for this were stereotypes of that time that National Parks should be established in intact areas, and Nature Parks in areas largely transformed by the anthropogenic activity. And the Northern Ladoga area belonged to the latter category. Discussions regarding the boundaries of the planned Park did not include the southern part of the skerries (to south of the Jaakkimanlahti Bay) since military facilities were deployed there and most of the skerries were closed for navigation.

In 1992-1993, a group of specialists from the Forest and Geology Research Institutes of the Karelian Research Centre headed by S.V. Sazonov produced, upon an order of the Sortavala municipality, a document called "Scientific Feasibility Study for Establishing the Ladoga Skerries Nature Park". A comprehensive description of the planned Park was given and preliminary boundaries and the size of the Park (84 000 ha) were defined.

Prospects for establishing a nature and national Park were repeatedly discussed by councillors of the Pitkäranta and Lahdenpohja Districts and Sortavala Municipality, but no common opinion either on the status of the Park (Nature or National) or on boundaries and size was reached. Nonetheless, the ordinances of the Sortavala Town Council #216 of 11.08.1993, of the Lahdenpohja District Council #114 of 1.10.1993 approved the materials compiled in the feasibility report, and the idea of establishing a Nature Park on an area of 84 000 ha was supported, and requests addressed to the Ministers' Council of the Republic of Karelia to make the decision on the establishment of the Nature Park.

On the basis of the results of studies on the topic "The Situation and Prospects for Development of the Nature Protected Fund of Karelia" mentioned above, decree #1 of January 25, 1994 of the Federal Forest Service, included the Ladoga Skerries National Nature Park (84 000 ha) in the list of National Parks recommended for protection between 1994-2005; the establishment of the Park was fixed for 1994-1995. Later, Viktor Chernomyrdin, the Chair of the Government of the Russian Federation, approved the Regulation of the Russia's Government #572-p on the organisation of the Ladoga Skerries National Park on an area totalling 84,000 ha. After this, the Ministers' Council of the Republic of Karelia made a decision (decree #174 of April 28, 1994 of the Ministers' Council of the Republic of Karelia) to establish the Ladoga Skerries National Park on the same area and of the same size. In the preparation of the latter decree, the area, borders and status (National Park) of the planned protected area were endorsed both by the Lahdenpohja, Pitkäranta and Sortavala administrations and relevant ministries and agencies.

Upon the order of the Ministry of Ecology of the Republic of Karelia, the "Kareproject" Institute in 1994-1995 developed a feasibility report for establishing the Ladoga Skerries Nature Park on the territory of

the Sortavala, Lahdenpohja and Pitkäranta districts with the area at 124 250 ha. When developing the feasibility report, conclusions on expediency to establish a Nature, not National, Park were made. The territory of the Park was expanded to the south to reach the border of the Leningrad Region, i. e. the Park included the total skerries area of Karelia to the east, until the Impilahti settlement. Because the extended territory of the Park was never endorsed with the relevant agencies, no decision on the establishment of the Park was ever made upon the results of the prepared feasibility study. The establishment of the Nature Park at the level of the Government of the Republic of Karelia advanced not due to a lack of money in the republican budget and the establishment of the National Park at the level of the Government of the Russian Federation was frozen because the presented feasibility report did not concern a National Park but a Nature Park. Competence in the establishment of Nature Parks belongs to the regions of the Russian Federation and not federal authorities. The government of the Republic of Karelia forwarded a petition to the Government of the Russian Federation to organise a National Park and not a Nature Park on the basis of the feasibility report. Afterwards, the Russian Government prepared instruction #BX-ПІ-24022 to the Federal Forest Service for the establishment of a National Park. The Federal Forest Service advised the Russian Government by letter №БФ-1-8-6/569 of September 23, 1997 that the establishment of the National Park had been endorsed by the Russian Ministry of Natural Resources, Food Ministry, Russia's Finance Ministry, State Ecology Committee but a new agreement from the Government of Karelia was needed about the new area (124 250 ha) proposed by the feasibility study. This agreement was never made.

Thus, at present the situation is as follows: the local administrations of Lahdenpohja and Pitkäranta Districts and the Sortavala Municipality supported the idea of establishing either a Nature or a National Park (opinions about the desired status changed many times, and this was reflected in the ordinances of local administrations); the Ministers' Council of Karelia issued a decree on the organisation of a National Park; the idea of the Park was approved by the Government of Russia and the former Federal Forest Service of Russia. The establishment of the Park was agreed with federal ministries and agencies. Thereby, all necessary preconditions for the establishment of the National Park on the area of 84 000 ha exist. What is needed is a positive decision from the Russian Government.

In the preparation of this feasibility study within the Tacis Project "Karelia Parks Development" in 1999 to 2001 information was summarised concerning the proposed park. At seminars and numerous workshops issues of the Park's operations were brought forth. Public meetings with residents of the Lahdenpohja and Pitkäranta Districts and the Sortavala Municipality and representatives of the local authorities and agencies, and an expedition were held.

In 1999-2000, public meetings were organised where the residents of the town of Sortavala and settlements of Läskelä and Hiitola were present, and also workshops with representatives of the Sortavala town, Pitkäranta town, Hiitola settlement were conducted to discuss the trends of the Park's establishment and problems connected with this procedure. In the public meetings the local population expressed a generally positive attitude to the Park. In the Läskelä settlement the main concern was related to whether the Park establishment would shut down the recently recovered Läskelä Pulp Plant. The residents of Hiitola supported the idea of the Park and pointed out the advisability of inclusion in the Park of the territory to the south-west of Lahdenpohja town. They look at the Park establishment as a mechanism, which will cease illegal (according to the locals) forest harvesting on the shoreline of Lake Ladoga and the drastic appropriation of land plots for summer cottages to residents of the Leningrad Region.

On June 4-11, 2000, an expedition was launched to the territory of the proposed Park. The following persons belonged on the party: A.V.Kravchenko (actor responsible for the preparation of the feasibility report from the Tacis Project), A.A.Kuchko (Candidate of Agriculture Science, chief specialist of the Sports and Tourism Committee of the Republic of Karelia), M.A.Terekhov (Head of the Municipal Entity "Ladoga Skerries Park"), M.A.Diatlov (candidate of Biology, ichthyologist, Sortavala town), V.I.Bogdanov (hunting supervisor, Sortavala town), A.Leshont (probationer from the Institute of Economics of the Karelian Research Centre/Russian Academy of Sciences, the Netherlands), N.V.Antipenko (correspondent). During the expedition the sites most appropriate for tourist facilities (4 of which were made in the following summer months), two hiking trails (on the Island of Riekkalansaari and Mt. Pötsövaara) and several waterway routes were investigated.

The given feasibility report was prepared by A.V.Kravchenko on the base of available documents related to the question of the Park establishment (decrees of the Karelian Government, ordinances of local

authorities, correspondence). Literature on the Northern Ladoga Area, archival documents (the most important of which are "Development of Scientific Justification on Establishment of the Ladoga Skerries Nature Park (1993) and "Feasibility Study of the Ladoga Skerries Nature Park on the Territory of the Sortavala, Lahdenpohja and Pitkäranta Districts (1995), and the personal experience gained in numerous visits (starting from 1983) to the area of the proposed Park.

Over the period of the preparation of the study, the director of the Municipal Entity "Ladoga Skerries Park" M.A.Terekhov, the most competent local expert, took an active part in the work. T.V.Morozova (Institute of Economics of the Karelian Research Centre/Russian Academy of Sciences) prepared materials on the socio-economic situation in Northern Ladoga, Yu.A.Shustov (Institute of Biology of the Karelian Research Centre) – on organisation of licensed fishing in the proposed Park, Arja Friman (Joensuu, Finland) – on tourism development, T.Ya.Tumashevitch (former State Forest Committee of the Republic of Karelia) – on description of the forest fund. At different stages of the preparation of the feasibility study constructive comments were suggested by international experts (Matti Määttä, Eva Kleinn, Tapio Lindholm, Ulla Heikkilä, Timo Hokkanen).

Materials affording the basis of the feasibility study were discussed at Tacis-organised seminars in working groups consisting of specialists of various profiles, representatives of authorities and agencies of the Sortavala, Lahdenpohja and Pitkäranta Districts, the business sector and others. Every chapter of the study was discussed many times with Jouko Högmander, the Team Leader of the Tacis Project, who also wrote chapters dedicated to the goals of the Park and the role of the Park in the protected area networking in the region. He made general editing of the text.

The maps were produced by the GIS Laboratory of the Computer Centre/Petrozavodsk State University under the direction of A.M.Shreders and V.V.Tarassenko.

The author expresses his gratitude to all those who contributed to this document.

## 2. Current and proposed legal status

At present, several areas designated conservation status exist within the borders of the proposed park: "North Ladoga" Game Reserve totalling 13 200 ha (established in 1971), "Sortavala" Botanical Reserve at the area of 100 ha (1978), Botanical Reserves "European Spruce of Lash-Like Form" (*Picea abies* f. *pendula*) (individual trees, 1984) and "Forest Crops of Murray's Pine" (*Pinus murrayana*) on the area of 0,1 ha (1984.: Khohlova et al., 2000). After the proposed park is established all existing Reserves will be dissolved because they will be placed under a higher status of protection. Partially, they will be included in the strictly protected and special protected zones.

In addition, all forests of the Park belong to conservation category I. The felling of forest is strictly limited there. There can be many grounds for the designation of an area to conservation category I (prohibited riverside strips on rivers, lakes, water reservoirs and other water objects; prohibited areas set up to protect spawning grounds of valuable food fish; prohibited areas along railways and highways of federal, republican and local importance; parkland forests of settlements and management facilities; monuments of nature, strictly protected forestland and other protected areas).

In accordance with Recommendations on the Manner of Preparation and Consideration of Petitions on the Establishment of National Parks in Russia approved on November 30, 1993 by Russia's Federal Forest Service and the Ministry of Environment and Natural Resources of Russia, the territories are recommended for the establishment of National Parks where:

- ❑ there is one or several ecosystems not badly damaged, and natural landscapes, geomorphologic objects, species of plants and animals of high scientific, educational, recreational and aesthetic importance have been found;
- ❑ socio-economic development of the region does not impede making decision on cessation or abrupt limitation of exploitation of natural resources for the benefit of conservation of ecological and aesthetic assets of nature areas;
- ❑ combination of natural and socio-economic factors is favourable to educational outdoor recreation and creates preconditions for public-aimed ecological education.

The territory of the Park possesses a number of features that have nation-wide importance: outstanding landscape, varied mountain rocks, rich and diversified nature, a great number of flora and fauna species entered into the Red Book of the IUCN, Russia, Karelia and Fennoscandia; interesting historic and cultural sites; favourable preconditions for developing outdoor recreation (mild climate, relatively good sanitary and ecological situation, good road connections, well-developed transport and tourist recreation infrastructure, availability of human resources, closeness to the Russian-Finnish border, etc.). All these factors imply the establishment of a National Park rather than a Nature Park.

Many times the idea occurred to have the Valaam Archipelago as part of the Ladoga Skerries Park. At the first stage of Park establishment it is, in our opinion, likely inadvisable because of the tense relationship between the Church and the state. This concerns, above all, land property rights, forest and other natural resources located on the Valaam. Therefore, these clashes may lead to complete stagnation in decision making on the establishment of the Ladoga Skerries Park. The problems of incorporating Valaam to the Park should be discussed only after the Government has made the decision to establish the Park and the Park started its activity. On the whole, the inclusion of Valaam into the Park is positive and reasonable from the perspective of tourism development. Before World War II, mainstream tourists went to Valaam, while the Northern Ladoga area served as mainly a transit zone. To attract and manage tourists, and to organise effective protection of the unique nature in the region, deep co-operation of these two areas should be, at least, laid on, should they function separately (in 1999, Nature Park Valaam Archipelago was established on Valaam by Decree 289 of November 4, 1999 taken by the Republic of Karelia's Legislative Assembly).

The need to expand the borders of the Park to the southwest up to the border with the Leningrad Region is very crucial (what was justified comprehensively by the designers of the Feasibility Study). This is caused by the large number of important tourist objects – panoramic sightseeing sites, sites with beautiful scenery, monuments of archaeology and architecture, etc. and objects of flora and fauna important for protection, monuments of geology – are located to the south of the town of Lahdenpohja and are not included in the proposed (agreed by the administrations of the Lahdenpohja and Pitkäranta Districts and Sortavala municipality) borders of the Park. The expansion of the borders to the east up to the Pitkäranta Bay and Pusunsaari Island is also possible, so that the Park encompassed the whole skerry area of Karelia.

### 3. Location, borders and area of the Park

The continental Park's area expands from 61° 27' to 61° 53'N, and from 20°33' to 31° 12' E (fig. 1) The territory of the Park is located in southwestern Karelia, on the northern and the northwestern shores of Lake Ladoga within the Lahdenpohja and Pitkäranta Districts and the territory subordinated to the Sortavala Municipality. The towns of Sortavala and Lahdenpohja, district centres, are situated close to the Park.

The total area of the proposed park is 84 183 ha, where land is 44 763 ha (53%), open water of Ladoga Lake and inland water bodies – 39 420 ha (47%). The forestland covers 38 711 ha (46%), the rest falls under unforested lands and reserve lands.

The following compartments are included into the Park (fig. 2): 21, 31, 47, 48, 51-71, 87-91, 97-111, 119-141, 143-208 of the Ladoga forest range in the Sortavala forest district with a total area 16 427,7 ha; compartments 24-26, 31-78 of the Oppola forest range in the Lahdenpohja forest district (9 851 ha), compartments 99, 104-111, 126-131,137-144, 165, 173-179, 200-202, 207, 208, 209, 215-219, 226, 227, 230, 236, 237, 241-246 of the Läskelä forest range in the Pitkäranta forest district (5 120,3 ha), compartments 35-39, 57-61, 66-69, 86-88, 102-104, 111-113, 125-128, 138-176 of the Impilahti forest range in the Pitkäranta forest district (6 216 ha) and compartment 77 of the Pitkäranta forest range in the Pitkäranta forest district (284 ha).

The Park borders on the land area are identical to the compartment cuttings (lines). The western – north-western border is near the Rauhala and Miinala settlements (compartment 24,25, Oppola forest range), Korteela – Vuorio settlements (compartment 32-34 of the Oppola forest range, 119,121-124, 126, 127, 146 of the Ladoga forest range), the north-eastern border is in the Läskelä settlement – Metsäkylä settlement (compartment 237 of the Läskelä forest range, compartment 88 of the Impilahti forest range) and Sumeria – Leppäsilta settlements (compartments 143, 144 of the Impilahti forest range) coincide

with the Priozersk – Olonets highway. The eastern border of the park takes the Syskyänlahti Bay (Ladoga) near the Kulhonnaemi village and Sikosaari Island (the last one - outside the park). The south-western border – Jaakkimavaara Bay between the Sorolansaari (outside the park), Heposalonsaari and Kyljasensaari Islands. The northern border expands to the north from Mt. Pötsövaara, close to the Harlu settlement. The southern border of the Park lies in the aquifer of Ladoga at a distance of 1 km from the remote islands and capes, correspondingly from east to west: Kulhonnaemi Peninsula – Huunukka Peninsula – Keloluoto Island – Suuri-Viroluoto Island – Pieni-Haapasaari Island (northwards of the Puutsaari Island) – Puutsaari Island – Sikasaari Island (southwards of Puutsaari) – Jukansaari Island. Such islands as Rantasaari, Teisänsaari and Munatsunsaari included into the Park's area are isolated and surrounded by a 1-km ring of Ladoga waters.

The length of the Park's border is 271 km, of which 130 km (48%) go in Lake Ladoga.

Frontier lines in the Park should be 2 m wide. Those places where cut lines (e.g. Park borders) change directions will be marked with special signposts like "Territory of the Ladoga Skerries NP". The same signs will be placed at sites where forest roads and trails (except crossing with the Priozersk-Olonets road) run through the Park's territory. Lines identifying the land area enlisted into the strictly protected and special protected zones (the latter along Ladoga Lake) contain signs such as "Restricted zone. Entry by pass only", "Strictly protected zone. Entry by pass only", "Strictly protected zone. Mooring and taking ashore is forbidden".

## 4. Nature

The territory of the planned Park is rather well investigated by specialists of different profiles; dozens of works related to the local history, nature components, resources, agricultural, industrial, recreational development of the area, etc., have been published.

### 4.1. Terrain

The Depression of Ladoga Lake is attributed to a graben, i.e. a geological structure, which is a large block of the earth's crust lowered in breaks in relation to a framing. In the northern part of the Ladoga graben (Park's territory), a zone of small-block crushing formed. The relief represents a complex of forms conditioned by display of both endogenous and exogenous processes and belongs to the Ladoga morphological structure. On the whole, the relief is very rugged (ridge and gully) and distinguished by narrow, long ridges (selgas) composed by crystalline rocks of different composition, and separating their valley-formed drops with moraine and lake drops, sometimes paludified, and also bays, straits and lakes. Ridges and gullies are oriented in a north-western – south-eastern direction in the western part of the Park (to the West and South of Sortavala town, and the north-south direction in the eastern part (to the East of Sortavala town). The angle of some slopes reaches 45-60°; there are quite a few vertical or nearly vertical cliffs, which are usually attributed to the shore. Fluctuations of relative heights are rather drastic – 50-80 m, the maximum height goes up to 187 m (Mt. Pötsövaara).

The final modification of the terrain took place in the late-glacial and after-glacial periods of the Quaternary, with the participation of glacial covers and the activity of water reservoirs. Over the existence of the glacial cover attributed to Luzhskaya (14 200-13 200 years ago) and Neva (12 500-11 900 years ago) glacial stages, a large and active glacial blade was found within the North Ladoga area. Glacial degradation in the Ladoga kettle started 14 000-15 000 years ago, and completed about 11 500 years ago. Thus, for at least 10 000-12 000 years the region was dominated by glacial erosions and accumulations. As a result of glacial activity, moraine plains and fluvio-glacial esker-delta systems have formed.

By-glacier water reservoirs impacted a lot the region's terrain. During the Pre-Golocene period, before the glacier's margin a large body of water appeared – Baltic glacial lake, which covered not just the kettle of Ladoga Lake but vast areas of watershed expanses as well. Absolute marks of that lake reached 105 m below the sea level. At lower levels at that time, lake-glacial clay, alevrite, sands deposited on the bottom, of which accumulative plains composed. Roughly 10 200 years ago, that lake broke through, and the water level plunged 20-45 m lower the current water level, which caused stronger water erosion and incision of river valleys through the whole shoreline of Ladoga Lake. Afterwards, an increase in water level followed up to 16-45 m higher of the current level, which was connected with compensation raise of

the territory after the glacier's retreat, the so-called Antsilla Transgression (8 500-7 700 years ago). The northern part of the Karelian Isthmus was covered by water and Lake Ladoga posed a large bay of Antsilla Lake.

About 7 500 years ago, the kettle of the Baltic again connected with the ocean and transformed in the phase of the Litoring Sea, with the water level to fall by 10-12 m in comparison with the current level. Approximately 5 000 years ago, the last upsurge of water started in the Lake during the Ladoga transgression, and it came 13-15 m above the current level. The last drop of the water level in Ladoga Lake, which led to the current state, happened 2 900-2 400 years ago in connection with formation of the Neva River (Demidov, 2000; Lukashov, 2000). Traces of the sea past of the kettle of Lake Ladoga can be seen not only in different deposits but also in the fauna composition (species of relict sea fish are crayfish, Ladoga ringed seal, species of marine waterfowl are present) and littoral flora (relic littoral species of vascular plants).

Two orographical areas can be brought out in the Park: a coastal, which includes an island and narrow coastal strip with skerry-type shores and northern elevated area with territories of sub-latitude extension (Mt. Pötsövaara) (fig. 3).

The shore (skerry) area goes in the form of a U-strap of 8-10 km wide and girdles the coastland of Lake Ladoga. This strip presents a big group of islands and fjord-like bays. The shoreline is often broken in the direction of the lake by bluff benches. Some fragments of the shore have a practically rectangular linear form and, according to direction, cluster in the systems of sub-meridional, sub-latitudinal and northwestern directions. The surface of the islands is characterised by strong defragmentation - from 30 to 76 m. With relation to Ladoga surfing, most of the shoreline and islands bear no loose deposits, which retained as fragments at low absolute marks. Many local paleo-seismic dislocations have been recorded – evidences of destructive influence on geological bodies and forms of terrain by intensive seismic processes, including earthquakes.

The northern area is an area where denudation-tectonic terrain is spread, the basis of which is made of elevated areas of crystalline bedrock, which are located in the latitudinal direction, and expansive depressions, which divide the elevated areas. The absolute marks of the elevated areas reach 120-187 m above the sea level, and relative excess - 50-100 m. Elevated blocks are devoid of Quaternary deposits, and relatively dropped blocks are overlaid with a thin moraine cover. Peripheral areas are constrained by sheer slopes and benches. Depressions, which divide the areas, are found in the terrain in the form of vast descents with the surface concave towards their axes. The relief of depressions is flat in general. In central parts of depressions flat-wavy and flat-hilly plains covered by a coat of glacial and water-glacial deposits prevail (Lukashov, 2000).

All these factors have predetermined the uniqueness of the relief called a skerry-type relief (stretches from the Vuoksi River in the south-west to the Pitkäranta Bay in the east), and is similar to a fjord shoreline of Norway and the skerry part of the Southwest Finland, and has no analogues among the shores of Russia's and Europe's bodies of freshwater (except for two parts along the shore of Lake Onego: the southern sector of the Zaonezhje – Kizhi Skerries, and the eastern shore of Lake Onego between the Kondopoga Bay and Unitsa Bay which, however, are spatially separated).

## 4.2. Geology

The territory of the Park is the southeastern end of the vast plicate Svekofennic Region, which covers the whole southwestern part of the Fennoscandian (Baltic) Crystalline Shield (Systra, 2000). The territory consists of Precambrian crystalline rocks and represents an area of Early-Proterozoi formations and one of the key areas where the basics of the modern regional stratigraphy of the Precambrian period and overall concepts of the geological evolution and metallogeny of Svekokarel formations of Karelia and the Fennoscandian Shield in general were developed (Svetov, 1995). The territory is a classic area of developing Early-Proterozoi formations of *svelokareliids* and stratotopical locality of Sortavala and Ladoga series developed there. Sedimentary, sedimentary-volcanogenic, and volcanogenic rocks, formed in the period of 2 330 000 to 1 800 000 years, underwent plication, zonal metamorphism and large-scale granitisation processes. Tectonic movements and erosion led to the current exposure of deep bedrock areas (which are accessible for exploration). Gneises serve as a foundation of 4-4,5 km cover and presented in the form of cupolas. Signs of volcanic activity can be traced down on extended lava fields

formed by basalt, tuff and gabbro. Volcanogenic-sedimentary carbonates are also displayed. Sand-silt, quartzite-sandstone, and conglomerates form the Ladoga rock series. Intrusive formations of gabbro, plagiogranite, carbonate can be often found in the form of small bodies (Svetov, Sviridenko, 1992; Svetov, 1995) (fig. 4). Basites, ultrabasites and carbonates produce a significant influence on the Park's vegetation composition and provide for existence of a large number fertile-demanding plant species with different floral genetic links.

In the Northern Ladoga area several hundreds of open pits and small excavations have been spotted. Over 50 geological divides are geological monuments of nature, including monuments of the mining and industrial development of the region (Makarikhin, 1992; Borisov, 1995, 1997, 2000; Iljin, 1995; Svetov, 1995; Lukashov, 2000) (fig. 5).

The last 3 000-meter glacial cover weighed down the earth's crust by 300 m, and afterwards, over 10 000 years, quickly from the geological perspective, melted. When the load disappeared, a glacio-isostatic rise of the earth's crust has started and this process is still going on. The rise called forth reanimation of break-ups and movement over them which were accompanied by earthquakes, most powerful of them (with the intensity of over 8 grades) took place 9 800 – 3 000 years ago. Earthquakes are proved by paleoseismodislocations which are best developed on the Puutsaari Island and in the Kirjavalahiti Bay and belong to geological monuments of nature (Iljin, 1995).

The Quaternary cover, unlike the rest of Karelia, does not take more than a third of the land territory of the Park (fig. 6). Glacial and water-glacial formations of the last Ostashkov (Upper Valdai) glaciation, and Holocene Lake and peat-swamp sediments prevail. Glacial sediments form sections of flat moraine plains or overlap outcrops of the crystalline foundation with a thin layer. The moraine is often degraded as a result of transgressions of Lake Ladoga, or buried under lake-glacial and lake sediments. The width of moraine sediments along slopes of ridges is 0,1-3 m, in relief lowering – 10 and more meters. Moraine sediments vary, and they form a continuous row from boulders to loam. Moraine is characterised by a high content of roughly fragmental rocks, the amount of which may reach to 50% of the moraine's mass. Fluvioglacial sediments in the Park are limited: they can be found nearby Lahdenpohja town in the form of eskers and deltas, and their width does not usually exceed 10 m. Lake-glacial sediments are more frequent and occupy depressions in the form of strip-form sands and clays. Their width fluctuates from some to 20-25 m. Six terrace levels can be accentuated: 13-14, 15-16, 19-20, 24, 27 and 40-41 m. Shore formations are presented by boulder and boulder-pebble swells and 3-5 meter abrasive benches. Lake sediments are presented in a smaller amount in the form of sands, silts and sapropel. Sediments of Lake Antsil which were formed 8 600-7 900 years ago and sediments of Lake Ladoga (5 000-2 000 years ago) can be pointed out. Sand non-extended beaches are usually located in such places. Peat-swamp sediments are limited, not more than 2 meters in width, and small contour. Of forms related to the crystalline foundation exarated by a glacier, sheep's foreheads, curly-shaped cliffs, glacial scars and giant cauldrons are widely spread (Lake Ladoga, 1978; Iljin, 1995; Demidov, 2000; Lukashov, 2000).

The peculiar geology of the North Ladoga area and multiple crystalline outcrops have enhanced a higher radiation background. A high proportion of uranium and thorium is characteristic of acid intrusive rock (granitoids), and too less extent of acid metavolcanites and schists. This is particularly specific for mountain rocks bedding to the east of the Sortavala town to Impilahti settlement. So, detritus extracted at Kirjavalahiti mining site of the "Sortavala Quarry" is not suitable for the construction of apartments and public houses. However, the annual exposition dose rate (10-14 micro roentgen per hour) corresponds to the natural gamma background.

The aggregate beta-activity of atmospheric fallout is 0,5-0,7 Bk/m<sup>2</sup> per day and keeps at stable level. Any serious radiation anomalies (Chernobyl sign) have not yet been recorded in the Park. On the whole, the radiation situation stays at the natural background radiation level and can be put as good (State Report..., 1999).

### 4.3. Hydrography and hydrology

The proposed National Park is located in the north-western part of a deep-water part of Lake Ladoga and includes a spectacular coastal strip with the width of 25 km and with numerous bays, straits and islands, among which there are 302 large ones (from 100 sq. m to 15 sq. km), the skerry part of the shore area and the adjoining Lake. The length of the shoreline of Lake Ladoga within the Park is 879 km.

All rivers and lakes within the boundaries of the Park belong to the basin of the Baltic Sea and situated in the water catchment area of Lake Ladoga. (Popov, 1961, Raspopov et al., 1969).

Lake Ladoga, Europe's largest body of freshwater, was formed as a result of the earth's crust lowering relatively to the framing (graben), and has the area of the mirror with islands included at 18,135 sq. km, and the area of water surface – 17,680 sq.km. The area of the water catchment area is 259,000 sq. km, from which 70 rivers flow into the Lake. The volume of water mass is 908 cubic km, and the water is renewed once every 11 years. Lake Ladoga is one of 15 world's largest freshwater reservoirs. The length of the Lake in its longest part is 219 km, the width – 83 km. The maximum depth is 233 m with the average depth of 52 m. Along with deep depressions in bays and straits, large shallow expanses are met (*Paspopov et al., 1969*). The average water level in Lake Ladoga is 5,0 m above the sea level. Over the last 150 years, a negative linear trend of the water level has been observed, which is accounted for by human factors: more water is withdrawn for water consumption. Also, melioration actions, construction of hydrotechnical facilities impacted the water level as well as climatic changes (increase in annual average temperatures and related summary evaporation from the territory) and glacio-isostatic elevation of the northern part of the lake's kettle (Current Situation..., 1998). The difference between the highest and lowest water-level is 2,86 m, the seasonal fluctuation in water level amounts to 82 cm. Waves do not usually exceed the height of 0,4 m, however, strong winds can result in 3-3,5 m waves with the length of 20-25 m. In bays and straits of the skerry part waves are insignificant.

The largest bays in the planned Park are Jaakkimavaara (13 km long), Sortavala (14 km), Hiidenselkä (22 km).

The longitudinal profile of rivers running into the Lake within the North Ladoga area has a cascade-like character, next to complete downfall of rivers (80-90%) come to rapid parts. However, the downfall of the lower watercourse adds up to only 1,0-1,3 m/km. Thus, long, well-warmed reach parts are common for rivers (Litvinenko, 2000). River-beds are poorly-incised, not forked, often feebly marked, with a width of 50-200 m. Flood-lands are, as a rule, absent or poorly-marked – one-sided or broken, moving from one bank to the other. River feeding is mixed, with the prevalence of snow feeding. Spring floods start in the middle of April and last up to 60 days (the largest intensity lasts for 7-10 days), and the water-level in rivers rises by 0,5-2,5 m (in some years it reaches 4,5 m). The greatest amount of water flow (45%) accounts for the spring flood. The low period happens in July to September and February to March. The winter low water period is, as a rule, deeper (Current Situation..., 1998). The current speed on rifts reaches 2,5 m/sec. The longest rivers are Jänisjoki (126 km)-and Miinalanjoki (90 km), the length of the other 12 longest rivers varies from 15 to 65 km. The lacustrinity of river catchment areas is much lower (0,2-7,2%) than in general in Karelia (12%) (Litvinenko, 2000).

River freezing starts in the beginning of November. River stretch parts freeze over first. The duration of the river freezing is up to 174 days. The largest width of ice is observed in February-May, it is 40-75 cm. Ice opening begins at the end of April and finishes in the beginning of May. The duration of ice opening is 3-8 (up to 30 days in case of ice arriving from upper located lakes) days.

Numerous lakes on the mainland and islands are attributed to the category of small ones. The largest lakes are Ristijärvi (1,22 sq. km), Korteelanjärvi (2,3 sq. km), Ahvenjärvi (1,56 sq. km). Altogether, there are 86 lakes with a total area of over 100 ha (in addition to Lake Ladoga). Depressions of most lakes are attributed to tectonic fissures, their shores are steep. Lakelets located in paludified relief lowering are less distinguished. The water regime of lakes largely repeats the regime of rivers. On small lakes included in lake-river systems, stages of water regime almost coincide with river stages, on larger lakes it lags behind a little (7-10 days). The spring rise does not usually exceed 0,3-0,5 m, and only in high-flood years it can reach 1 m. The rise of the water level in Lake Ladoga starts at the end of April-beginning of May and comes to its maximum in June; the average rise is 0,3-0,4 m. Water level drop goes through the warm period of the year and reaches its minimum in March. The ice regime on the lakes is also similar to a river one. Ice opening on lakes takes place at the end of April-first half of May and lasts for 1-1,5 months. The lakes get frozen 10-15 days earlier than the rivers, and open 15-20 days later (Grigoriev, Gritsevskaya, 1959; Resources of Surface Water, 1972, Feasibility Report., 1995, Litvinenko, 2000).

In summer, the average monthly temperature in the lakes and rivers reaches 18-19°C, the maximum temperature is 26°C. Duration of the period with temperatures over 17°C (comfortable for swimming) adds up to 45-55 days (fluctuations over years is 25 to 70 days). The area of Lake Ladoga warms up to

14-16°C in its skerry part, the temperature in open areas remaining 3-4 degrees lower than in bays where it goes up to reach 23-25°C. Duration of the in-shore swimming period in Lake Ladoga is 25-35 days.

Surface water is attributed to poorly mineralised (100 mg/l in low water period and 20-40 mg/l in high water period). The water is soft and very soft the hardness is less than 1 mg-eq./l. The rivers belong to the hydrocarbonate class, calcium ions prevail among cations. Natural high content of organic substance is observed in the water, and this is revealed in 50-144° coloration.

Anthropogenic stress has resulted in the process of eutrophication of Lake Ladoga, which had its culmination development in the mid 1970s (Anthropogenic Eutrophication., 1982). Lake Ladoga was considered to be an oligotrophic lake but in the 1960s, due to water pollution, the lake came to the stage of mesotrophic. At present the skerries part became oligo-mesotrophic, although the community of water organisms (phytoplankton, zooplankton, makro-zoo-benthos) after restructuring still has some mesotrophic characteristics (Current Situation..., 1998). Stabilisation of eutrophication started in the 1980s as a result of water protection activities, first of all in the Volhov Aluminium Plant (Current Situation., 1987), and also it was connected with a general industrial regression, e.g. the closing down of the Priozersk Pulp-Paper Mill.

At the moment the reduction of trophy process and content of general and mineral phosphorus in water is approximately half of the level in the beginning of the 80s. It is necessary to specify that about 90% of all polluting chemicals, including phosphorus, come from the Leningrad Region. Influence of rivers from Karelia is not as such, the actual eutrophication takes place only in close to the river-mouth areas. An exceeded level of phosphorus was fixed in the Jaakkimavaara Bay and near the Jänisjoki River, in the Hiidenselkä Bay, though water being changed rather intensively from these bays to an open part of the lake, does not keep phosphorus here for long. Even in winter these dynamic processes in the lake dilute sewage water.

The highest level of phosphorus is registered in the Sortavala District, which is connected to low water change with the main water in the lake and localisation in it its own waters. The presence of heavy metals in the majority of rivers is much lower than the maximum allowable concentrations. An exceeded concentration of Cr, Cu and Ni (1-6mkg/l) was registered in the Jänisjoki River. Highly contaminated bottom sediments, mostly caused by oil waste products, heavy metals, waste matter from the pulp-and paper industry) have been found in Lahdenpohja, Sortavala and the Lesozavod settlement. Although in the latter place there was no bottom fauna on technogenic ground registered until the beginning of the 1990s, but now the regeneration of communities of makrozoobethos with a complicated structure and high quantity is in the process of development (Current Situation., 1998).

#### 4.4. Climate

As regards climatic features, the North Ladoga area belongs to the southwest agroclimatic zone of Karelia (Romanov, 1961). Sometimes, the littoral area of Lake Ladoga is attributed to an individual littoral sub-region due to significant differences in the climatic conditions even in comparison with the adjacent, more remote from the shoreline territories (Agroclimatic Resources..., 1974) (fig. 7). The climate of the region is moderate, transitional from oceanic to continental (oceanic features are stronger in wintertime), with cool summers and relatively soft winters, and considerably changeable weather in transitional periods of the year. Anticyclone atmospheric circulation dominates in spring-summer time (meridian circulation), and cyclone type – in autumn-winter period (zonal circulation). The number of days with the cyclone type averages 215 days a year. The coming of the Atlantic air masses (cyclone activity) in the warm period of the year brings lower temperature and strong frontal precipitation, and in cloud time it brings higher temperature (in February, the coldest month, a deep thaw up to +5-7°C can be observed), the coming of the cold Arctic air (anticyclone activity) is characterised by bitter frosts (-30-40°C in winter) and night frosts in summer time.

The Park's mesoclimate is strongly influenced by the rugged terrain, crystalline foundations with multiple outcrops heated up by the sun and accumulating warmth, the ruggedness of the shoreline, water masses of Lake Ladoga. The volume of Lake Ladoga amounts to some 1 000 cubic km, therefore the lake possesses substantial heat inertia. Slowly changing temperature of the water surface lowers the air temperature in summer and increases it in autumn and winter months (the largest heat accumulation is in August and September), influences the wind speed and cloudiness, which, in their turn, change

conditions of radiation generation and outlet. In December, in days of the winter solstice the day's duration makes up about 5 hours, at noon the sun comes up above the horizon by only 5°. In June, the day has the longest duration – 19 hours 32 minutes, at noon the altitude of the sun is 51° (Semenov, 1995).

The average annual temperature is +2,7°C in Impilahti, +3,0°C in Sortavala, the average monthly temperature of July, the warmest month, is +15,8-16,9°C, and of the coldest month February - -9,1- -9,7°C. The maximum registered temperature is +34°C, the minimum temperature is -43°C. The full amplitude of fluctuations makes 77°, and this means strong continental climate in the region. A period from mid-June to mid-August, when the average temperature exceeds +15 °C, is the warmest period. Duration of the non-frost period is 125 days.

The mean annual rainfall increases from 550 mm in the island part to 650 mm in the inland part (Atlas of the Karelian Autonomous Soviet Socialist Republic, 1989). Two thirds of the rainfall falls into the warm time of the year. The driest month is March, the most rainy month is August. The number of snow-cover days is 135 to 145, the snow cover settles in the beginning of December and melts down in the middle of April. The width of the snow blanket is maximal at the end of February – beginning of March, and reaches 44 mm.

The warm time is predominant with winds of southern and western compass points (especially south-western), in winter time northern and eastern winds prevail. The average speed of prevailing winds is 6-9 m/sec over the lake and 4-8 m/sec over the coast, but in the skerry part the annual average speed is a bit over 3 m/sec (Farming reference-book..., 1959; Romanov, 1961; Climatic Reference Book..., 1965, 1967, 1972, 1977, Agroclimatic Resources..., 1974).

On the whole, the climate of the North Ladoga area is the most favourable in Karelia for promoting sports. Hence, there is the biggest density of recreation facilities in Karelia – resorts, recreation centres and pioneer camps.

#### 4.5. Biogeography

The park's territory lies in the zone of boreal coniferous forests, or the taiga. According to Karelia's forest typological zoning, forests of the North Ladoga area belong to middle-taiga (Yakovlev, Voronova, 1959). Many researchers have the same opinion (Vegetation of the European Part..., 1980; Geobotanical Zoning..., 1989, Volkova, 1997, etc.). At the same time, a lot of scientists attribute the whole or the southern part of the Park to the south taiga (Cinslerling, 1932; Isachenko, 1956; Abramova, Kozlova, 1957; Kozlova, 1959; Nitsenko, 1959; T.K. Yurkovskaya, 1993; Yurkovskaya, Pajanskaya-Gvozdeva, 1995) on the base the *Oxalis acetosella* spruce forest spread widely in the Ladoga area (zonal type of the southern taiga forest, which includes about 20% of all spruce forests in the North Ladoga area; Sakovets, Ivantchikov, 2000), herbaceous and amorally herbaceous, and extended availability of maple (*Acer platanoides*) in the underbrush. Scandinavian researchers draw the border between middle taiga and south taiga even more to the north, approximately along latitude 63° (Ahti et al., 1968; Hämet-Ahti, 1976; 1981), whereas the whole territory of the Park is attributed to a southern taiga subzone. Probably, the whole territory of the Park lies in a transitional belt between the south taiga and middle taiga, and long-running human activity contributed to the "southern" image of the biota.

Pursuant to geobotanical zoning of the European part of the USSR, the Park's territory lies within the Lesogorsk-Jänisjärvi District of the Karelian Sub-Province of the North-European Taiga Province (Geobotanical Zoning..., 1989).

According to floristic zoning, the territory of the Park is included in the Karelian-Murmansk Sub-Region of the Arctic Region of the North-European Province of the Circumboreal District of Holarctica (Flora of the European Part..., 1974; Takhtadjan, 1978). According to the existing floristic zoning of Karelia, the territory belongs to the Ladoga Floristic District (Ramenskaja, 1960; 1983) (fig. 8).

As for zoogeographical zoning of Karelia, the territory is within the Ladoga area of South-Karelian Sub-Region of the West-European Taiga Region of Western-Taiga District of Taiga Province of Boreal-Forest Sub-Region (Ivanter, 2001).

The borders of zones allocated by different zoning approaches practically coincide, through traditions of Finnish naturalists, with the borders of a separate biogeographical province named Ladoga Karelia (*KI, Karelia ladogensis*). The Province is distinguished by a higher biodiversity of most groups of organisms in comparison with the rest of Karelia's Provinces, moreover, most of the species known in the republic come from the North Ladoga. A large number of species registered in the Red Data Books of the International Union of Conservation of Nature, Russia, Karelia and Fennoscandia, inhabit the North Ladoga area.

#### 4.6. Landscapes

Landscapes of the Park are attributed, according to the classification of forest landscapes, to denudation-tectonic rocky low-paludified landscapes with the prevalence of pine-tree localities. This type of the landscape is presented in Karelia on the northwestern shore of Lake Ladoga and Valaam Island only, and covers 1,7% of the republic's total area. This landscape is characterised by the least paludification in Karelia, prevailing mesotrophic and eutrophic mires, most of which were drained long ago and are (or were) used as farmland. Remaining mires break down under forest mires and presented by oligomesotrophic sedge-*Sphagnum* and marsh rosemary-*Sphagnum* pine-forests. Paludified forest areas are more widely spread, they are found in tectonic gullies and lowering of rock soil. Paludified forests are often found at high hypsometric level (most frequent at 20 and 55-65 m above sea level), their formation is connected with the thinning of interstitial water. Paludification trends do not 8-10 m/thousand years. (Kozlova, 1959; Volkov et al., 1990, Gromtsev et al., 2000).

The soil floor of this landscape type is prevailed on positive elements of the relief by primitive lithogen soil and sub-brown earth, on slopes and drained gullies – sandy and loamy brown earth, and in places with stagnated ground waters – by marshy peat low-lying soils and grey brown earth (Bakhmet, 2000). In Karelia, brown earth and sub-brown earth are spread this widely only in Zaonezhje, where they are formed on schungite soils.

The landscape structure brings out the following ranges:

- 1) complexes of large ridges, on hills with thin pine-forests, along slopes with pine, spruce and mixed forests, poorly-drained levels (sometimes with shallow peat) with spruce and spruce-small-leaved and sometimes paludified forests;
- 2) abraded steep ridges of the shore and islands, on the tops of which pine rocky forests are well developed, on slopes – pine and pine-small-leaved grass-*Vaccinium myrtillus* forests;
- 3) low (up to 15 m) slightly sloping ridges, which are usually overlapped with the cover of Quaternary deposits and covered by coniferous and mixed true-moss and herbaceous forests;
- 4) weakly-wavy terraced plains on non-boulder clay and lime (especially characteristic for inter-ridge gullies) with spruce grass-*Vaccinium myrtillus* and *Oxalis acetosella* forests and farmland;
- 5) flat paludal plains on non-boulder lime and clay, and partially meliorated with *Vaccinium myrtillus-Sphagnum* pine-forests (Isachenko, 1995).

#### 4.7. Vegetation

The Park is prevalent by forest communities. Also, communities of mires, meadows, littoral and aquatic plants, rupicolous vegetation complexes, ruderal and segetal communities can be met.

##### 4.7.1. Forests

Almost the whole forest of the planned Park (including the forest growing on the islands) is classified as conservation category I forest (spawning forest sites, water conservation areas along the shores of lakes and rivers, shelter strips along motor-roads, forestry sectors of green zones) (table 1).

**Table 1**

Distribution of the forest of the proposed Ladoga Skerries National Park by conservation category

Conservation category	Forest range, area (ha)					Park	
	Ladoga	Oppola	Läskelä	Impilahti	Pitkäranta	Total	%
River forest conservation belts	2156,6	3664			41	5861,6	15,0
Spawning conservation forest strips*	13712,9	6090	1735	4897	196	26630,9	68,8
Shelter straps along motor-roads	120,4	97	237	218	47	719,4	2,0
Forestry sectors of green zones	437,8		3148,3	1913		5499,1	14,2
Total	16427,7	9851	5120,3	7028	284	38711	100

\*- including special protected areas (Game and Botanical Reserves, see chapter 1.2).

Pursuant to the Russian Federation's legislation, the conservation category I includes forests aimed at performance of water conservation, environment health and hygiene functions and forests of protected areas (Article 56 of the Forest Code of the Russian Federation, 1997). Principal felling is already now prohibited in the planned Park, only intermediary cuttings are allowed (Article 114 of the Forest Code).

Along the shores of Lake Ladoga and the River Jänisjoki a water conservation (spawning) strip of at least 1-km wide was allocated by Decree of the Karelian Government №456 of September 30, 1999.

Practically all forests in the Park were subjected in the past to selection or clear cuttings and at the moment they appear as secondary communities. Among coniferous forests, middle-growth and maturing plantations prevail. Only small size fragments of thinned rock pine-forests on ridges' tops and peripheral rocky capes jutting out into Lake Ladoga, and also steep rocky slopes, where timber marketability is rather low, remained. At the moment, practically no forestry operations take place in the forest. Thinning and cleaning cuttings are practically not applied, and this results in the large participation of deciduous species (birch, aspen) in conifer stands (this creates the main difference from Finland, where monodominant pine and spruce forests prevail). The untouched nature of the Park's forest is reflected in flora and fauna, where a lot of representatives of groups considered now as indicators of untouched forest can be found.

The species list is dominated by conifers (85% of the Park's territory), of which pine has about 90%, and spruce has about 10%. Deciduous forest occupies roughly 15%, of which 13% accounts for birch stands, less than 1% for aspen stands, about 2% - for grey alder stands (Kozlova, 1959; Gromtsev et al., 2000; Sakovets, Ivantchikov, 2000). Pine stands are presented both by pure forests and mixed with spruce and birch, and mixed forests are met more often. Pine forests bend toward glacier deposits and selgas with a shallow cover of Quaternary sediments. *Vaccinium myrtillus* pine forests prevail (52% of the forest: Sakovets, Ivantchikov, 2000). Spruce forests bend toward loamy sand moraine boulder deposits, terraced plains with sea and lake loamy sand, clay loam and clay areas, lower slopes and selga feet. The most pervasive are true moss spruce forests (*Vaccinium*-type, *Geranium*-type, *Oxalis*-type) yet frequent are herb-rich spruce forests (altogether 90%: Sakovets, Ivantchikov, 2000). Birch stands in the Ladoga Area are derivative forest types, they formed on glades, slash and burnt areas, farmland. Herb-*Vaccinium myrtillus* associations are presented at its widest. The forests are characterised by rich flora: 215 vascular species were identified in the pine forest, 248- in the spruce forest, and 277 species- in the birch forest (Kozlova, 1959).

As regards the age scheme, forests under the maturity age are dominant – mid-aged and maturing (about 90%). In the view of the high value of the forest and vulnerability to human activity, the felling age was taken up by one grade in the North Ladoga Area (up to 120 years for conifers and up to 60 years for deciduous trees). The mature forest (aged 120 years plus) accounts for only 3,7% while the deciduous forest accounts for much more – 43%. 75% of the pine forest and 85% of the spruce forest grow under relatively high productive site classes II and III (Sakovets, Ivantchikov, 2000).

The forest resources in the Park have not been deliberately assessed nor possible scenarios of their use been developed. Mature conifers account for less than 5% of the total coniferous stock, all forests belong

to protection class I, thus losses from limited forest use will be less than in other areas of Karelia (existing Vodlozero and Paanajärvi National Parks and the proposed Kalevala Park where mature and over-mature forest stands prevail).

#### 4.7.2. Mires

All types of mires are encountered in the Park, except for aapa mires. Raised bog areas are spread widely while transitional and rich fen mires were drained long ago and almost never met in their natural state (Kozlova, 1980). Most of them formed as a result of peat overgrowing water bodies located in internal-drainage and half-closed kettles of tectonic origin. Peat deposited on the layer of bottom sapropel or directly on lake clay. In the first phases rich fen and fen-like dominated, then they transformed into mesotrophic and raised bogs. Mires cover less than 5% of the Park's territory (Kozlova, 1959; Isatchenko, Reznikov, 1996). In some landscape areas open mires account for no more than 1-2%, the areas are prevailed by forest (mostly pine) mesotrophic and mesoeutrophic mires (about 65%). In general, the paludification degree (including paludified forests) does not exceed 15% (Gromtsev et al., 2000).

Open and sparsely wooded marshland has long been cultivated by man, reclaimed and turned into farmland. Mires located on lake terraces and inter-ridge depressions where the peat is most mineralised were subjected to total melioration. Some farming plots formed in middle-aged and maturing birch stands. With the local ground backwater, the construction of communications and roadwork sometimes entail the formation of small meso- and mesoeutrophic mires, which quite quickly become open after the dry-out and fall-off of forest stands. The formation time for such communities is only 5-10 years (Isachenko, Reznikov, 1996).

At high marks of closed sinks of crystalline bedrock surface *Sphagnum* ridged (or hanging) mires form, which are specific for this kind of landscape and fed by atmospheric fall-out and cropping out of interstitial water to the surface. The peat accumulates at the speed of 2,8-5,0 mm/year (Arslanov et al., 1995). In the coastal part, *Sphagnum* grass-sedge saucer-type micro-mires are often encountered on primary outcrops. Those mires are fed by atmospheric fall-out and coastal water.

The taiga paludification is intensive under natural conditions. Most mires in the Park were drained, i.e. anthropogenic drainage took place. Large areas of paludified forests were drained, too. Currently, the drainage network stopped working because of the choking of drainage ditches, and secondary (to be exact, repeated) the paludification of cultivated land and drained forest can be observed – geocomplexes revert to their initial state (Isachenko, Reznikov, 1996).

#### 4.7.3. Meadows

Farmland in the Park covers about 6 000 - 8 000 ha, which is 10% of the land area of the Park (Kozlova, 1959). However, upon the decision of the Sortavala, Lahdenpohja and Pitkäranta Local Administrations, almost all farmland and land plots occupied by lawn-and-garden communities, farms, etc. are withdrawn from the Park. They have the form of separate allotted plots, often connected to one another to some extent, and girdled by lands of the forest fund (included in the Park). Therefore, it is reasonable to consider them in the overall structure of lands of the Park and regard to a certain extent in the organisation of Park's operations (above all, in the allocation of the farming zone within the Park's territory zoning). Abandoned (deserted) farmlands can be gradually annexed to the Park upon endorsement with land users.

The farmland comprises tillage, grazing and meadows, and meadows dominate the structure of the farmland. Meadows in the Park are used as hayfields (haymaking happens irregularly, or only the most valuable part of a meadow is mowed clean), pastures, or not used. Next to all meadows are secondary and came up instead of drained bogs and felled forest, in particular clearances. Only along the riverside one can meet a narrow strip (up to 5 m, but usually not more than 1-2 m) of alluvial *Carex acuta* and *Alopecurus pratensis* meadows.

The rugged terrain spotted with outcrops limited the area suitable for farming. Therefore, farming land takes depressions between ridges, and water running down the slopes often sinks the farmland, and drainage ditches are dug everywhere. After World War II, a large territory in the area was occupied by deposits formed on the place of deserted arable land. Now the land is covered by various meadows (strong prevalence is taken by sowed, now considerably degraded, - *Festuca pratensis*, *Elytrigia repens*,

*Dactylis*, *Phleum pratense*, *Alopecurus pratensis* – meadows), where 73 associations ascribed to 4 formations (natural, peat-bogged, rough, and peat land meadows) were found out. Most pervaded are *Agrostis tenuis* associations.

On the whole, the area in question has good growing conditions (thought to have the best in Karelia) for the most valuable meadow plants, especially grass (Kozlova, 1959; Ramenskaya, 1958). Meadow plants grow and develop better on islands. The meadow crop yield is high, and sowed meadows even without proper maintenance continuously (10 and more years) give good phytomass (Lopatin, 1971). At the moment, the overgrowing of meadows with wood plants is observed everywhere, it is especially characteristic for low-contour farming land, much of which is already covered with small-leaved forest. Disperse (ground-wood species appear along ditches and then evenly occupy terraces) and frontal (young growth settling from forest edges) types of overgrowing are typical. The pioneers of overgrowing are grey alder (*Alnus incana*), drooping birch (*Betula pendula*), goat willow, tea-leaved willow, and round-ear willow (*Salix caprea*, *S. phylicifolia* and *S. aurita*) (Isachenko, Reznikov, 1996). To preserve rural landscape meadows, it is necessary to most widely use the remaining meadows (both as hayfields and pastures).

#### 4.7.4. Aquatic and littoral vegetation

Three types of the littoral are spread in the skerry part: rock-boulder, stone, and sand (the first two prevail). The rock-boulder littoral is constantly exposed to breakers and devoid of flora. The stone littoral is also unfavourable for plant settling, however, small-grained stuff accumulates in between stones and rarefied associations of perfoliate pondweed (*Potamogeton perfoliatus*) and pond water-crowfoot (*Batrachium peltatum*) grow, and along the riverside edge a narrow patch of common reed (*Phragmites australis*), common spikesage (*Eleocharis palustris*), slender tufted-sedge (*Carex acuta*) and reed canary grass (*Phalaroides arundinacea*) associations spring up. The sand littoral, affected by wave breakers, carries no macrophyte groups. In quiet areas, sand littoral vegetation grows better, and 20 association types were identified. At its best, vegetation is developed in apical parts of deep bays on the slimy (sometimes loamy) littoral. A classic profile of overgrowing can be seen there: association of aerial-aquatic plants – association of swimming-leaved plants – association of submerged plants. Sometimes, up to 11 association belts can be singled out in the profile. Altogether, 49 association types were spotted in the slimy littoral area. Pollution and eutrophic process, which is most typical of apical parts of bays, lead to the expansion of macrophyte undergrowth, increase of undergrowth coverage, growth of meso- and eutrophic aquifers and reduction of oligotrophic aquifers (Raspopov, 1961, 1968, 1985, 1992).

#### 4.7.5. Rupicolous plants

The rupicolous vegetation makes a specific feature of the North Ladoga area. Rupicolous plants are usually complex – open area take turns with trees' groups of the rupicolous type, shrubs – often defined as rupicolous vegetation complexes (Lopatin, 1953; Kozlova, 1959; Nitsenko, 1959; Pobedimova, Gladkova, 1966). Open cliffs are most suitable for many plant species, both southern (for example, sand carnation (*Dianthus arenarius*), Ruysch's dragonhead (*Dracocephalum ruishiana*), and northern (common) fragile fern (*Cystopteris dickieana*), close-headed Alpine-sedge (*Carex norvegica*), grey whitlowgrass (*Draba cinerea*), various species of *Saxifragae* (*Saxifraga* spp.). The most abundant flora was found on steep cliffs of the southern and southwestern exposition (Heikkilä et al., 1999). Rupicolous communities have a high ratio of the floristic composition – 15-20 species of only vascular plants can sometimes be met on 1 square metre (Linkola, 1916, 1921). Many of the species inhabiting cliffs are obligate petrophytes and are not encountered in other community types. The rupicolous vegetation is particularly rich with protected species despite the fact that rupicolous groups are most vulnerable to the anthropogenic activity. A 1997 research of rupicolous biotopes long known as habitats of rare species displayed good condition of populations of growing there species, both vascular and mosses and lichens. This could be accounted for by the hard accessibility of these areas (Heikkilä et al., 1999).

### 4.8. Flora

The flora of the proposed Park displays a diversified composition and this creates good preconditions for developing research tourism. In the pre-war period, the territory of the Park was a popular place for field works and botanists' excursions dealing with different plant groups. A special interest boast numerous representatives of the northern flora, which are preserved in the Ladoga area as relics of the Holocene

and are located in the southernmost, often isolated, points of their areas. Totally, 27 places were found (mainly in the surroundings of the Sortavala town) that play a singular role in conservation of the vegetation biodiversity (Heikkilä et al., 1999; Kravchenko et al., 2000) (fig. 9). In fact, there are far more sites of this kind and they will be identified during further research.

#### 4.8.1. Vascular plants

The territory of the Park is characterised by sumptuous and diversified flora of the vascular plants. The affluence of the flora is related with diversity of various biotopes, the most favourable climate across Karelia, multiple bedrock areas of different composition, long-standing development of the territory, etc. Altogether, the Park boasts at least 748 species (without microspecies) out of 1030 known for the KI Province (Kravchenko et al., 2000). The flora of the Park is anomalously rich and in numbers of species greatly exceeds the local floras (Valaam, Pälkjärvi) where the amount is not over 550-600 species. In general, the Park flora carries a marked taiga character – about 60% of species belong to the boreal group. These species include most of the cenosis-forming species. In forests, they are pine (*Pinus sylvestris*), spruce (*Picea* spp.), silver birch and white birch (*Betula pendula*, *B. pubescens*), aspen (*Populus tremula*), on mires – numerous species of sedge (*Carex* spp.), sheathed cottonsedge /hare's tail/ (*Eriophorum vaginatum*), cotton grass (*Eriophorum polystachion*), bog shrubs. On meadows, taiga crops are wide spread – orchard-grass (*Dactylis glomerata*), tufted hairgrass (*Deschampsia cespitosa*), timothy /herdgrass/ (*Phleum pratense*), etc.; beans – tufted vetch (*Vicia cracca*), bush vetch (*Vicia sepium*), meadow vetchling (*Lathyrus pratensis*), red clover (*Trifolium pratense*), white clover (*Amoria repens*), etc. and varied herbs. As for the littoral and aquatic flora, different species of sedge, crops, especially common reed (*Phragmites australis*), pondweed (*Potamogeton* spp.), bur-reed (*Sparganium* spp.), etc are prevailing.

In the meantime, the flora differs greatly from floras of territories located north in availability of rather numerous groups of both southern and northern species. A specific feature of the flora is the availability of a large group of species with southern links – nemoral, boreal-nemoral, southern pine-forest, forest-steppe – which amount to 60, including mountain elm, small-leafed linden, Norway maple (*Ulmus scabra*, *Tilia cordata*, *Acer platanoides*). The latter species is often found abundant in the underbrush, sometimes in the second layer of a wood stand. Many nemoral herbaceous species act as dominants and sub-dominants of the super-soil floor.

Particular specifics of the flora are determined by northern, first of all arctic-alpine species – the Northern Ladoga area is a centre of “preserved Late-Glacial relics of the Arctic and Arctic-Alpine relationship” (Minyaev, 1965). There are altogether 20 species of these kinds, for example, Alpine mouse-ear, spring sandwort, tufted saxifrage, Alpine saxifrage, Alpine cinquefoil (*Cerastium alpinum*, *Minuartia verna*, *Viscaria alpina*, *Saxifraga cespitosa*, *S. nivalis*, *Potentilla crantzii*, etc.) and they all associate to open rocks.

A few eastern or Siberian species (to be exact north European-Asian) species, like *Diplazium sibiricum*, red baneberry (*Actaea erythrocarpa*), and Western Atlantic species can be met in the Park. The last category encompasses such protected species of Russia as quillwort (*Isoetes lacustris*, *I. setacea*), bog myrtle (*Myrica gale*), water lobelia (*Lobelia dortmanna*). Most species grow on the outermost margins of their areas or isolated habitats; their populations are most vulnerable to anthropogenic impact and call for special protection actions.

Considerable resources of non-wood vegetation are concentrated in the Park, which have not yet been evaluated.

Resources of bilberry (*Vaccinium myrtillus*) having a very high average yield rate of 60-80 kg/ha in raw form (Gromtsev et al., 2001) are of the largest importance. Resources of cowberry (*Vaccinium vitis-idaea*) are lower than the average rate in the republic – only 0-10 kg/ha, strawberry is at the same level. The outstanding importance belongs to berry resources – bilberry, cowberry, strawberry (*Vaccinium myrtillus*, *Vaccinium vitis-idaea*, *Fragaria vesca*). Resources of marsh berries, like cloudberry and cranberry (*Rubus chamaemorus*, *Oxycoccus microcarpus*, *O. palustris*), quite immense for the rest of Karelia, are not considered as significant in the Park. Many species can be used as ingredients for salads, as vitamins, as spices, or as tea substitutes. Most species of the local flora belong to medical herbs accepted by the State Pharmacy or to folk remedies. A lot of species are considered as technical, forage, decorative, and melliferous plants.

The territory of the Park plays an important role in the protection of biodiversity of vascular plants in Karelia in general. Moreover, many species are found in the republic only in the Park. The Russian Federation's Red Data Book (1988) includes 8 species growing within the park borders (44% of all the protected species in Russia grow in Karelia) – little grapefern, quillwort spp., brown beak-sedge, ghost orchid, lady's-slipper, bog myrtle, water lobelia (*Botrychium simplex*, *Isoetes lacustris*, *I. setacea*, *Rhynchospora fusca*, *Epipogium aphyllum*, *Cypripedium calceolus*, *Myrica gale*, *Lobelia dortmanna*). Karelia's Red Data Book (1995) lists 67 species (33% of the total number of protected species in Karelia), East Fennoscandia Red Data Book (Red Data Book...,1998) has 86 species, which are recorded here (Heikkilä et al., 1999). Altogether 101 vascular plant species recorded here are in the Red Data Books.

#### 4.8.2. Mosses

The territory of the Park features rich bryoflora, which includes both many southern and, what is particularly interesting, northern species preserved mainly on rocky substrata from the Holocene periods (Kotilainen, 1929; Pankakoski, 1934; Huttunen, Wahlberg, 1999). The total number of bryophytes growing in the Park is unknown but is probably approximately 350 (80% of the species recorded in Karelia). 32 moss species of Karelia have been found only in the North Ladoga Area (Maksimov, Maksimova, 2000).

Mosses are one of the important components of taiga forests they often cover soil. The most common are such boreal leaf-stalked species as *Climacium dendroides*, *Dicranum polysetum*, *D. scoparium*, *Hylocomium splendens*, *Pleurozium shreberi*, *Rhodobryum roseum*, *Rhytidiadelphus triquetrus* and many others; in wet forests they are *Polytrichum commune*, *Pseudobryum cinclidioides*, *Sphagnum girgensohnii*, *S. squarrosum*, etc. Often, *Cirriphyllum piliferum* and *Hylocomiastrum umbratum*, which are common for the south taiga, are exuberant.

The role of mosses in mires is even higher; *Sphagnum* species usually act as cenosis-formers.

Karelia's Red Data Book (1995) and East Fennoscandia Red Data Book (Red Data Book..., 1998) list 49 species of stalk-leafed and hepatic moss met on the territory of the Park (Huttunen, Wahlberg, 1999; Maksimov, Maksimova, 2000). See the list in Annex 1.

Out of mosses, haircap moss (*Polytrichum commune*) and *Sphagnum* species, and other species but rarer, are still used by locals as heat-saturating packing between logs of wooden structures. The use of peat (which is composed mainly of half-decayed *Sphagnum* mosses) in the Park looks unpromising due to the lack of vast mire expanses and shallowness of mires remained after drainage.

#### 4.8.3. Lichens

The North Ladoga area is distinguished for the richest lichenoflora in Karelia – of 926 species registered in Karelia 803 species can be encountered here (Fadeeva et al., 1997), of which at least 700 can probably be met in the Park. Many new for the science taxa were described there. One of the most important sites of lichenologic excursions is the Kotiluoto Island (Räsänen, 1939; Vainio, 1940; Oksanen, Vitikainen, 1999) where some 10 new to science lichens were described, few of them not recorded elsewhere.

In the Park, all ecological groups of lichens are represented. Bark and tree branches are covered by multiple epiphyte species (*Hypogymnia physodes*, *Mycoblastus sanguinarius*, *Ochrolechia androgyna*, *Parmeliopsis ambigua*, *Alectoria sarmentosa*, *Xanthoparmelia parientina*; *Bryoria* spp., *Buellia* spp., *Cetraria* spp., *Evernia* spp., *Lecanora* spp., *Lecidea* spp., *Parmelia* spp., *Phydcia* spp., *Ramalina* spp., *Usnea* spp., etc.), what witnesses about purity of the air. The soil in dry pine forests is covered to a large extent by such epigene species as representatives of *Cladina* (*Cladina arbuscula*, *C. mitis*, *C. rangiferina*, *C. stellaris*), *Cladina* spp., *Cetraria* (*Cetraria islandica*), which are often combined under the common name of reindeer moss; *Peltigera* spp. (*Peltigera aphthosa*, *P. canina*, *P. polydactyla*, *P. venosa*, etc.). Many epigene species are encountered on the Park's rocks. The most interesting species are numerous epiphyte species (*Lobaria scrobiculata*; *Aspicilia* spp., *Cladonia* spp., *Collema* spp., *Dermatocarpon* spp., *Lecanora* spp., *Lecidea* spp., *Ochrolechia* spp., *Rhizocarpon* spp., *Verrucaria* spp., *Umbilicaria* spp., and others) this is related to a lot of primary outcrops of various composition.

Of the species enlisted in the Russian Federation's Red Data Book (1988), 4 species can be found in the Park: *Bryoria fremontii*, *Menegazzia terebrata*, *Stereocaulon dactylophyllum*, *Lobaria pulmonaria*. In the Red Data Book of Karelia (1995) 37 species have been inscribed, the Red Data Book of the East Fennoscandia (1998) includes 60 species (60% of all species subject to protection) (Oksanen, Vitikainen, 1999).

Lichens are not actually used by the local population. Sometimes, bushy *Cladina* species (*Cladina stellaris*) are used as decoration placed between window frames.

#### 4.8.4. Algae

The phytoplankton of the Park's waters is characterised by a large exuberance of species, which resulted from a big influx from water collection. Altogether, 232 taxa of algae have been registered. Boreal and North-Alpine species dominate, *Bacillariophyta*, *Chlorophyta*, and *Cyanophyta* species are most widely presented. In summertime, mass development of blue-green Algae, which account for 90% of all Algae is common. In recent years an increase in the number and qualitative characteristics of *Cryptomonas* Algae has been observed. The reason for the surge is caused by eutrophic process in the skerry part of Lake Ladoga (Vislyanskaya, 1999; Chekryzheva, Vislyanskaya, 2000). In the periphyton, 106 Algae taxa have been found, also representatives of *Bacillariophyta* prevail. Among *green algae*, along with boreal species active participation in biofouling is taken by southern species (Komulainen, 2000).

#### 4.9. Fungi

The specific composition as well as resources of the main edible species has not been explored in the Park yet. Considering that the Park has many outcrops and that the forests are widely represented by multi-herbaceous, often turfed because of the abundance of crops, one may assume that mushroom resources in the Park, especially in the skerries area, are lower than in other parts of Karelia, while the composition must be rich due to a large diversity of biotopes. Nonetheless, the gathering of mushrooms is quite popular with the local population and attractive among tourists. The most common edible mushrooms are penny bun (*Boletus edulis*), birch bolete (*Leccinum holopus*, *L. oxydabile*, *L. scabrum*), aspen bolete (*Leccinum versipelle*, *L. vulpinum*), *Lactarius deliciosus*, *L. deterrimus*, *L. flexuosus*, *L. necator*, *L. resimus*, *L. scrobiculatus*, *L. torminosus*, yellow chanterelle (*Cantharellus cibarius*), *Russula foetens*, *R. aeruginea*, *R. claroflava*, *R. fragilis*, *R. paludosa*, *R. vesca*, *Suillus bovinus*, *S. luteus*, *S. variegatus*, honey mushroom (*Armillaria borealis*), oyster mushroom (*Pleurotus ostreatus*). Fruits of the birch parasite fungus – *Inonotus obliquus* – are used by the local population as a medicinal material and tea substitute.

In the Park, 60 species of parasitic micromycetes were found, two of which were new to Russia (Alanko, 1999). Besides, 75 wood destroying (aphylloporous) fungi have been recorded, for instance, different polypori (Krutov et al., 2000).

Three species of mushroom growing in the Park are listed in the Red Data Book of Karelia: *Laccaria amethystea*, *Cortinarius violaceus*, *Mutinus caninus* (also included in the Russian Federation's Red Data Book, 1988, Red Data Book of Karelia, 1995). 5 species of wood-destroying fungi belong to indicators of conditionally old, or primary, forests. They are *Skeletocutis lenis*, *Phelinus lundellii*, *P. pini*, *Pseudomeruleus aureus*, *Pycnoporellus fulgens* (Krutov et al., 2000).

#### 4.10. Fauna

##### 4.10.1. Mammals

Altogether, the number of mammal species in the territory of the Park reaches 49. Most widely Rodentia (19 species) and Carnivora (14 species) are represented. In the fauna, species of wide distribution are typical – wolf (*Canis lupus*), fox (*Vulpes vulpes*), weasel (*Mustela nivalis*), otter (*Lutra lutra*), badger (*Meles meles*), and also typical of the forest zone – common shrew (*Sorex araneus*), lynx (*Lynx lynx*), brown bear (*Ursus arctos*), squirrel (*Sciurus vulgaris*), hare (*Lepus timidus*), bank vole (*Clethrionomys glareolus*), elk (*Alces alces*). As for West-European species, the polecat (*Mustela putorius*) and marten (*Martes martes*) are common, of taiga (Siberian) species flying squirrel (*Pteromys volans*), masked shrew (*Sorex caecutiens*) are common, rarer are northern redbacked vole and grey redbacked vole

(*Clethrionomys rutilus*, *Clethrionomys rufocanus*). In comparison with the rest of the territory of Karelia, the fauna has a distinct southern image, such typical southerners as roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*), garden dormouse (*Eliomus quercinus*), black-striped field mouse (*Apodemus agrarius*), pygmy shrew (*Micromys minutus*), common vole (*Microtus arvalis*), brown hare (*Lepus europaeus*), hedgehog (*Erinaceus europaeus*). Northern species, like, wild reindeer (*Rangifer tarandus fennicus*) are, just the contrary, absent (Danilov et al., 2000).

In addition to native species, introduced species can be met in the Park: muskrat (*Ondatra zibethicus*), whose adaptation began in the 1930s, Canadian beaver (*Castor canadensis*) (settled from Finland at the beginning of the 1950s and was recorded first in Karelia in the North Ladoga Area), American mink (*Mustela vison*), which started to acclimatise in the 1930s but the population formed in the Park mainly due to animals that escaped from an animal-breeding farm in the Rautalahti settlement (Pitkäranta District), racoon dog (*Nyctereutes procyonoides*), which in 1953 was released in the Priozersk District of the Leningrad Region and soon appeared in the North Ladoga Area. Other mammals, which are new to Karelia, are wild boar (*Sus scrofa*) (migration from the Leningrad Region) and roe deer (*Capreolus capreolus*) (migration from Finland), which first appeared in Karelia in the North Ladoga Area at the end of the 1960s (Danilov, 1979). Synanthrope species, which appeared in the region long ago together with man's settling, are the house mouse (*Mus musculus*) and Norway rat (*Rattus norvegicus*).

Different Red Data Books list 19 species of mammals encountered in the Park, of which 16 species are listed in Karelia's Red Data Book (1995) and 15 species are included in the Red Data Book of East Fennoscandia (1998). In Karelia, garden dormouse (*Eliomus quercinus*) is met in the Park only (Ivanter 1986; Danilov 1995; Danilov et al., 2000). As far back as the middle of the 19<sup>th</sup> century, wild reindeer (*Rangifer tarandus fennicus*) could be found there, but at the moment the northern boundary of its area has moved farther north (Development of Scientific., 1993).

The whole area of the skerries makes an important home range and pupping area for the Ladoga ringed seal (*Phoca hispida ladogensis*) recorded in the Red Data Book of Karelia, IUCN, East Fennoscandia, and Russian Federation (fig.10). Before World War II, up to 1 600 specimens of Ladoga ringed seal were caught in Lake Ladoga annually, in 1969-1975 – up to 100 specimens. In 1975, a complete prohibition was put on seal hunting.

Out of 5 000 animals which can be met in Lake Ladoga about 400-500 pupped in the Park (i.e. at least 20% of the reproductive part of the population, according to oral information from N.V. Medvedev). In summer time, there are even more animals living, what proves an exclusive role of the park in the conservation of the species. The most important reproduction site is located in area of the Sommtsaaari Island – Puutsaari Island and Honkasalo Island – Ristisaari Island (Development of scientific., 1993; Medvedev et al., 2000). To introduce real conservation of the species, moving on ice and fishing is forbidden in February-May in this part of the park. Limitation of net-fishing is important, since up to 300 animals, mainly newly-born pups, die annually in fishing nets on Ladoga (Medvedev et al., 2000).

#### 4.10.2. Birds

Altogether, 246 bird species have been recorded in the Ladoga Area (without accurate territorial adjustment, probably from Olonets in the east to the border with the Leningrad Region in the west, including Valaam and Western Archipelagos) (Zimin et al., 1998; Mikhaleva et al., 2000). However, the Ladoga bird fauna stays poorly studied (Mikhaleva, et al., 2000), although the main features of main specimens and population of birds are available from the present information.

The composition of the bird fauna is rather typical of the conditions mid-taiga sub-zone of Karelia. In all, 121 breeding bird species have been recorded in the Park (Development of scientific..., 1993).

The fauna is dominated by southern species – 48 species (40%) are localised to the ornithological complex of the European broad-leaved forest. High density is characteristic for such southerners as the great crested grebe (*Podiceps cristatus*), blackbird (*Turdus merula*), goldfinch (*Carduelis carduelis*), linnet (*Carduelis cannabina*), etc. (Development of scientific background, 1993). Rather typical here is the bittern (*Botaurus stellaris*), garganey (*Anas querquedula*), red-headed diver (*Aythya ferina*), little gull (*Larus minutus*), etc. (Mikhaleva et al., 2000). During the past years high density of grey duck (*Anas strepera*) and coot (*Fulica atra*), including the nesting place has been registered (Lapshin, 2000). In old-growth deciduous and mixed forests white-backed woodpecker (*Dendrocopos leucotos*), golden oriole

(*Oriolus oriolus*), red-breasted flycatcher (*Siphia parva*) and greenish warbler (*Phylloscopus trochiloides*) are breeding relatively common.

Higher density in the Northern Ladoga region is characteristic for bird species (from various genetic ornitho-complexes), which have a clear tendency of extension of their distribution areas (Mikhaleva et al., 2000).

Only 19 species (16%) are typical of the Siberian north-taiga.

A large proportion of birds (51 species – 42%) belong to dendrophilous species. Synantropic birds are represented by 11 species, open space habitats (fields, meadows, and recent clearings) are settled by 26 species. Due to few marshes, the wetland bird fauna is poor. On the contrary, the fauna of hydrophilous birds is diversified – 32 species (26%). The largest populations are of the mallard (*Anas platyrhynchos*), teal (*Anas crecca*), goldeneye (*Bucephala clangula*) and tufted duck (*Aythya fuligula*). The islands and the coastline abound in gull colonies.

Recently a nesting place of Caspian tern (*Hydroprogne caspia*), which is more typical of the northern part of Ladoga Lake, from the Baltic Sea direction, was registered on the Munatsunsaari Island (Lapshin, 2000). Earlier small colonies of it were observed on Valaam islands.

The composite density rate of the bird population is one of the highest in Karelia – 300-350 and more pairs per square kilometre. In the list of local bird fauna almost two thirds from the general population of birds is counted for by two dominant species: chaffinch (*Fringilla coelebs*) and willow warbler (*Phylloscopus trochilus*).

One of the unique features of Northern Ladoga are typical representatives of sea fauna. In the beginning of the XX century, nesting sites of many Arctic and north-taiga bird species were known, like razorbill (*Alca torda*), Caper gull (*Cephus grylle*), cormorant (*Phalacrocorax carbo*), red-necked grebe (*Podiceps griseigena*), Arctic tern (*Sterna paradisaea*), velvet scoter (*Melanitta fusca*), long-tailed duck (*Clangula hyemalis*), eider (*Somateria mollissima*), etc, but after the global climate warming (distinctly distinguished in the 30-s of XX century) led to an abrupt drop in their populations. (Development of Scientific Background..., 1993). At present, only fragments of the abundance could be seen: common scoter (*Melanitta nigra*), long-tailed duck (*Clangula hyemalis*), cormorant (*Phalacrocorax carbo*) (Lapshin, 2000). More than likely only the long-tailed duck is breeding on the islands of the park nowadays, together with another northern species, Arctic tern (*Sterna paradisaea*). Populations of sea birds have formed and live in Ladoga due to many small bare islets, and can be registered mainly during after-nesting dispersion. (Mikhaleva et al., 2000).

The peripheral part of the skerries sector is full of small open non-wooded or practically non-wooded rocky and moraine islets, on which aquatic birds (gulls, terns, ducks and waders) build their colonies (fig. 10).

Lake Ladoga is considered to be a profound obstacle in the way of land migrants and a vast area with favourable resting and feeding possibilities for birds connected to water habitats. The outermost archipelago is an area for the arctic waterfowl to have rest in spring and autumn periods, during and after the migration over Karelia). In agricultural fields in spring flocks of migrating geese, such as bean goose, white-fronted and barnacle goose (*Anser albifrons*, *Anser fabalis*, *Branta leucopsis*), ducks, waders, gulls, birds of prey and other birds occur, which though less by number can be compared with similar flocks in the eastern side of Ladoga (Olonets fields). In the period of migration and settling of fledglings, grey heron (*Ardea cinerea*) appears mainly along the shores rich in reed (Mikhaleva, et al., 2000).

So, from the point of migratory birds protection, the territory of the park is referred to wetlands of at least republican importance (Development of Scientific Background..., 1993).

During the autumn migration flocks of waders, pigeons and passerines move towards the Ladoga shoreline, turn and fly further along the shoreline, which serves as canaliser for bird migration. This happens on every point of the shoreline; separate flocks merge into the general flow of land migrants moving towards northwest or southeast. Migrants moving in two opposite directions are a specific character of all territories where birds move by a narrow front. There are a hundred times more of land

migrants in the Ladoga area than anywhere else in Karelia where migrants keep in a wide front. The same feature has been registered during spring migrations.

The Red Data Book of the Russian Federation includes the once nesting and currently nesting species: golden eagle (*Aquila chrysaetus*), osprey (*Pandion haliaetus*), peregrine (*Falco peregrinus*), white-tailed eagle (*Haliaeetus albicilla*), and the migratory barnacle goose (*Branta leucopsis*), and bewicks swan (*Cygnus bewickii*), at the present time these species are to be met on passage only. About 20 species are entered into the Red Data Book of Karelia, but most of them are again met on passage (Development of scientific justification., 1993). The tendency of the last years has marked a recovery of the osprey population (*Pandion haliaetus*). Nests of white-tailed eagle have been registered in the Park's area (Mikhaleva et al., 2000).

#### 4. 10.3. Reptiles and amphibians

8 species of reptiles and amphibia inhabit the Park (Korosov, 2001; Kutenkov, Korosov, 2001), of which 2 are grass-snake (*Natrix natrix*) and triton (*Triturus cristatus*) that are included in the Red Data Book of Karelia (1995), while the latter is also listed in the Red Data Book of the IUCN.

#### 4.10.4. Fish

In total, there are 58 fish species in Lake Ladoga (Diatlov, 1995). According to preliminary data, 33 species can be met in the Park (Kitayev et al., 1998), though the real figure is closer to 50. Lake Ladoga belongs to whitefish-smelt type (commercial term which means that these species – whitefish and smelt – account for the main part of the industrial fishing).

From the species recorded in Karelia's Red Data Book (1995), lake salmon (*Salmo salar* morpha *sebago*), brown trout (*S. trutta* morpha *lacustris*), lake char (*Salvelinus alpinus*), Siberian whitefish (*Coregonus pidschian*), European whitefish (*Coregonus lavaretus*), Wartmann's whitefish (*C. wartmanni*), grayling (*Thymallus thymallus*), rudd (*Scardinius erythrophthalmus*), *Aspius aspius*, tench (*Tinca tinca*), *Leucaspis delineatus*, *Pelecus cultratus* are present. It must be noted that the Red Data Book of Karelia comprises many commonly caught fishes. This is a mistake, therefore we need to discuss how to effectively use fish rather than how to protect them. The share of protected fish caught by fishing enterprises and entrepreneurs is 39% of the total catch (State Report..., 1999).

There are several salmon rivers on the territory of the Park: Kirjavalahdenjoki, Miinalanjoki, Sumerianjoki and Jänisjoki (fig.10), where, including water bodies of Ladoga within 1 km radially from the mouth to the centre all kinds of fishing are forbidden except angling. Angling is also limited – forbidden from May 25 until July 10 in the period of migration of young salmon (Temporal Rules., 2000). The rivers Miinalanjoki and Sumerianjoki are considered to be the most important salmon-trout and whitefish spawning rivers in Karelia (State Report..., 2000).

The majority of the catch consists of vendace (*Coregonus albula*), whitefish (*Coregonus* spp.), Ladoga vendace (*Coregonus albula* morpha *ladogensis*), bream (*Abramis brama*), pike (*Esox lucius*), pike-perch (*Lucioperca lucioperca*), roach (*Rutilus rutilus*), perch (*Perca fluviatilis*), smelt (*Osmerus eperlanus eperlanus*), burbot (*Lota lota*), etc., 18 species altogether. The Red Data Book of Russia lists one species – bullhead (*Cottus gobio*), and the Red Data Book of East Fennoscandia has 7 species (Annex 1). Lake Ladoga belongs to whitefish-smelt type. Whitefish accounts for 27-31% of the annual commercial catch, large non-valuable fish 18-22%. *Salmonidae* have less than 0,01% of the total catch. In recent years (beginning of the 1970s), due to eutrophic processes in the lake, an increase in the catch of perch fishes (in particular, pike-perch, the catch of which has tripled) and carp fishes (catch of bream has doubled), has been observed, while whitefish catches were dropping. At that, stocks and catches of vendace stay steady, although annually 42% of the commercial part of the stock is caught. The catch of pike-perch is 25% of commercial stocks, whitefish – 30%, Ladoga vendace (*Coregonus albula* morpha *ladogensis*) – 10%, bream – 2%, pike and burbot – about 1%, smelt – 42%. The catch of undersized non-valuable fish remains at a stable level (Fedorova, 1977, 1985). The general allowable catch (GAC) of whitefish and pike-perch in 2000 in the Northern part of Ladoga made up 17 and 85 tons. In comparison with 1999 the GAC of pike-perch was increased due to the better state of this population (State Report., 2000).

#### 4.10.5. Invertebrates

So far, no general data on the fauna of invertebrates in the Northern Ladoga area has been collected. Without a doubt, concerning biodiversity and richness of well-studied groups of organisms, it is possible to forecast a rather rich number of invertebrates (several thousand species). The fauna of invertebrates is rich in southern and northern species, which inhabit the borders of their localities. The majority of information gathered about the Park was received during the beginning-to-middle of the 20<sup>th</sup> century, and the information is available in museums of Finland.

The list of zooplankton in the skerry part records 88 taxa. The largest quantity belongs to *Rotatoria* and *Cladocera*. The zooplankton composition indicates the pollution rate in Lake Ladoga near the Sortavala town and Läskelä settlement). (Kulikova, Vlasova, 2000).

The zoo-benthos composition includes 108 invertebrate species. The largest species diversity is marked for *Chiromonidae*, in quantitative aspect bottom communities have 50-70% of *Oligochaeta*. Relict Crustacea *Gammaracanthus loricatus* var. *lacustris*, *Pontoporeia affinis*, *Pallasea quadrispinosa*, *Mysis oculata* var. *relicta* are common. In the lower part of the rivers, an increase in the diversity of water fauna is observed, which is connected with a decrease in anthropogenic pressure in the recent years. This was also recorded in Lake Ladoga, close to the Hiidenselkä settlement (Lesozavod). In the surroundings of Sortavala, a degradation of bottom biocenoses keeps on (Ryabinkin et al., 2000).

Of species found in the Park, the Red Data Book of the Russian Federation (1985) includes *Papilio machaon*, *Parnassius apollo*, and *Parnassius mnemosyne*. Karelia's Red Data Book (1995) has 130 species or so on the list, and this figure amounts to over 50% of the total number of insects under protection in Karelia (Yakovlev, 2000, pers. comm.). The most common insects are beetles (*Coleoptera*) (Annex 1). Many findings of beetles in the Park date from the 19<sup>th</sup> century, those species related to old-growth forests, later were not repeatedly recorded, and, probably disappeared because of commercial forest harvesting there in the beginning of the 20<sup>th</sup> century (Yakovlev et al., 2000).

The North Ladoga area, from the recreational comfort viewpoint defined by the number of blood-sucking mosquitoes, is considered as the most favourable in Karelia due to the low level of paludification of the area and many open (windy) places.

#### 4.11. Overall assessment of biodiversity and key biotopes for conservation

The Northern Ladoga area has the highest level of biological diversity in Karelia. Most plant and animal species, some types of plant and animal communities are found nowhere else in Karelia.

Many biotopes considered now important for preservation of the region's biodiversity of flora and fauna are presented in the Park

High cliffs with terraces have crucial importance for the protection of rare plants. There a good deal of rare and threatened northern and southern species grow (often in one community).

Another key biotope is pine stands and mixed herb-rich forests, riverside spruce forests, the soil composition of which favours rare, in particular southern, species.

Also littoral flora with some typical salt-water species, especially on sand beaches, contribute to the value of them as key biotopes. The shoreline of bays protected from waves, where rich biodiversity can be found, make up one more key biotope. Many plant and animal species benefit directly from fluctuations in the Lake Ladoga water level, the drop of which causes more open space for fertile substrate.

Traditional rural landscape, which gradually changes due to overgrowing farming land, serves as a basic habitat for many cultural species of vascular plants and different fauna. A lot of species have disappeared or not been found for decades because of an abrupt change in the use of farmland. To preserve and develop such species, restoration, at least partial, of traditional land use is needed on abandoned farm land.

The outermost part of the skerries with bare or poorly forested islets is a nesting place for colonies of waterfowl, gulls, terns and waders. Ladoga ringed seal (*Phoca hispida ladogensis*) has its resting and moulting grounds on the lowest islets and pupping sites in snowdrifts near the shoreline of islets.

## 5. History of land use

### 5.1 History of the territory

Man has developed the territory of the Park over millennia. First, settlements were temporary, then they became permanent (Uino, 1997). Initially, the territory was occupied during the Mesolite, approximately 8 000 years ago, by fishermen and hunters' tribes, whose settlements were scattered nearby shores. Stone Age and Early Iron Age remains are scarce and not well studied. Altogether, no less than 160 archaeological sites have been found (Lintunen et al., 1997). Permanent settlements of an old Karelian population – Korela appeared here in the 800s.

Most archaeological monuments located in the Park – sites of ancient settlements and fortresses (total 13) on the highest ridges (many topographic names have preserved including the word "linna" which means "fortress"), household facilities and funeral sites – relate to the 1000s. Later, a lot of fortresses were demolished, and stones used for the construction of household facilities (Kochkurkina, 1995). Fortresses with walls up to 2,5 m high are found as the most valuable objects of the material culture of that period (fig. 11,12).

Already at the end of the 1<sup>st</sup> millennium – the beginning of the 2<sup>nd</sup> millennium, there was an ethnic community living in the area of the Karelian Isthmus, Northwest Ladoga and northeastern shores of the Finnish Gulf. At that time farming was based on slash-and-burn cultivation.

In the Middle Ages this region played a very important strategic role in terms of borders between Russian and Swedish lands. The closeness of the border was a reason for frequent devastative raids during the Russian-Swedish wars and war conflicts. This entailed massive emigrations to the modern centre and northern Karelia, and the region for long periods would become abandoned.

In the time of the Novgorodian Period in the history of Korela (12<sup>th</sup>-15<sup>th</sup> centuries), the local population was rather independent being more allies to the Novgorodians than slaves. Novgorod, in comparison with other conquerors (Swedes, Germans, and Danes) was not in a hurry to destroy the local life. Christianity was introduced to pagan Karelia very accurately, over several centuries, officially the people were christened only in the 15<sup>th</sup> century.

At the end of the 13<sup>th</sup> century the influence of Novgorod on the territory of Northern Ladoga increased and Novgorodian administrative zoning was introduced. A period from the 13<sup>th</sup> to the 14<sup>th</sup> century was emphasised as an endless period of fights between Novgorod and Sweden. According to the Orehovetsky Peace Treaty, signed in 1325, after 30 years of permanent wars, North Ladoga was left to Novgorod. And although wars for Karelian territory were not stopped, the border remained the same for about three centuries (Amozova, 1995).

The main occupations of the patriarchal population were farming, fishery and hunting. At the end of 15<sup>th</sup> century, the Northern Ladoga area featured a well-developed agriculture – farmland covered 3 to 5% of several *pogosts* (administrative units), three-field shift farming system was traditional but hunting was almost rejected. Highly developed farming was accounted for by good weather conditions and fertile soil. The population rate was one of the highest in the north of the then Russia – 0,6-1,7 man/sq. km. (Development of scientific Background., 1993). The region was also popular for its iron-making trade. Moreover, this area was considered very important as it was located on the trading ways between Novgorod and the North European countries (Amozova, 1995).

The Moscow Period in the history of Korela (15<sup>th</sup> –17<sup>th</sup> centuries) was bright during the period of involving it into a centralised Russian State, together with other Novgorodian lands. Northern Ladoga was included into the list of the *Serdobolsky (Nikolsky) Pogost* (the centre of a rural community during the Novgorod Period) of the *Karelian part of the Vodskaya Pyatina* (the largest administrative unit during the Novgorod Period; altogether there were 5 pyatinas at that time). By the ethnic range this region was populated mostly by Karelians due to the resettlement of Russians onto northern lands (to get away from Tatar-Mongol invasions), which enforced in the middle of the 13<sup>th</sup> century, did not practically reach this territory.

In the middle of the 16<sup>th</sup> century the situation in North Ladoga is described as an abrupt turn because the centre of military actions between Russia and Sweden moved here. Border fights took place during the 16<sup>th</sup> century, especially at the end of the Livonian War (1558-1583), when Swedish troops went through Eastern Karelia. According to the Plusskoye Treaty signed between Russia and Sweden in 1583, North Ladoga was handed over to Sweden. In 1595 after another war this region was returned to Russia. During 11 years under Swedish reign the Korela community was fully devastated (Amozova, 1995).

In the beginning of the 17<sup>th</sup> century the Russian State was weakened by Civil War and foreign intervention which caused a new invasion by Swedes in 1611. According to the Stolbov Peace Treaty concluded in 1617, North Ladoga was annexed to the Käkisalmi *gubernia* (Province) and added to Swedish lands. The majority of Karelian settlement moved to Olonets and the rest - to the central part of Russia, having formed the Tver Karelian *okrug* (district).

The centre of Karelian culture (North Ladoga was known for its strong Karelian traditions), settled along both sides of the border. In line with orders of Swedish authorities the territory was inhabited by migrants (Lutherans) from the inner regions of Finland (Amozova, 1995). Sortavala, in particular, was found with the aim of assimilating the invaded areas (Kuspak, 1995). When the Northern War (1700-1721) ended upon the signing of the Uusikaupunki Peace Treaty in 1721, this region was returned to the Russian Empire. The influence of Russian culture was raised up because North Ladoga full of human and natural resources started to build St.Petersburg – the new capital of Russia. The wars in 1741-1743, 1788-1790, 1808-1809 caused new demolitions in this region.

After the war in 1808-1809, when Finland was annexed to Russia, the situation became more or less stable. North Ladoga being an area of Karelia became part of the autonomous Grand Duchy of Finland and the territory was developed mainly by the Lutheran population, while the Karelian element was preserved in the form of local islands. The formation of a Finnish national consciousness in the 19<sup>th</sup> century has stressed the importance of the Karelian culture, in contrast to Swedish culture dominating over a hundred years. So, in fact, the Karelian culture turned out to be the basis for the Finnish culture (Lintunen et al., 1997). When Finland became independent in 1917, North Ladoga remained part of Finland.

Past overall changes took place in this area after the Winter War in 1939-40 and the Second World War. In accordance with the Moscow Peace Treaty signed in 1940, Northern Ladoga entered into the USSR and the Finnish population determined to leave the territory. After such a short armistice in the beginning of World War II Finland invaded their lost territories and most of the migrants returned here for two years. After the victory of the USSR in World War II, Finns finally immigrated to other parts of Finland, while North Ladoga was populated by migrants from all over the USSR. After the end of World War II, the khutor (small-scaled farming) approach was liquidated, meadow overgrowing took place, melioration drains got cluttered, etc. (Solodilov, 1991).

The modern period of the territory's development left a great deal of monuments of material culture from the latest 2-3 centuries (fig.11, 12). However, most of them have been lost due to numerous wars breaking out in this area, the most devastating of which took place in the 20<sup>th</sup> century. Nonetheless, structures dating back to the 19<sup>th</sup> and 20<sup>th</sup> centuries preserved, including those designed by famous Finnish architects E. Saarinen, Y. Vjste, U. Ulberg, E. Huttunen. Many of those dwellings belong now to monuments of architecture. Most are located in the town of Sortavala and its suburbs.

The historic centre of the town of Sortavala is well preserved with wooden and stone facilities dating back to the second half of the 19<sup>th</sup> century and the beginning of the 20<sup>th</sup> century. Based on this, in 1990, Sortavala was included in the list of Russia's Historic Cities (Ryvkin, 1990). The historical centre makes Sortavala a bright town in comparison with other towns in Russia and similar to a former Finnish town – Viipuri (now Vyborg in the Leningrad Region).

The most interesting are summer cottages created by P. Blomstedt and E. Saarinen in the Kirjavalhti Bay (House of Composers, before the war it was T. Jääskeläinen's summer cottage) and on Tarulinna Peninsula (former "Sortavala" recreation centre, before the war – G.Winter's summer cottage).

Some religious structures have been preserved, for instance, Nikolas Orthodox Church and the Church of John the Apostle in Sortavala, Church of St. Nikolas on Riekkalansaari Island (now this is the Yard of Valaam Monastery), Church of Sergei and Herman Sergiev *Skit* (monks chapel, but also housing and

economy facilities, i.e. a "micro-monastery") of the Valaam Monastery on Puutsaari Island. It is important to say that from the beginning of the foundation the Valaam Monastery started to assimilate not only the Valaam Archipelago but Ladoga shores as well. As it is written in the Book of Votskaya *Pyatina* in 1500 the Monastery owned 150 yards and 228 *obzhas* (*obzha* is a unit of land taxation, its area is about 16,5 ha) of land in North Ladoga, mostly in the Serdobolsky *Pogost*. In 1764 according to the decree of Catherine II all monastery lands were handed over to the treasury, although rather soon they were returned and enlarged according to the decree of Pavel I at the end of the 18<sup>th</sup> century.

The Monastery was a permanent holder of fishing places on Lake Ladoga (Spiridonov, Yarovoi, 1991). At the end of the 18<sup>th</sup> century Valaam had 49 forest lands (Valaam Monastery .., 1903), and also lands on the Tulolansaari and Pellotsaari islands. Also in 1866-1910 islands – Puutsaari and Syskyänsaari (the latter is just outside the park borders), were famous for its mining places - grey, pink and red, so-called Serdobolskiye granites (Borisov, 2000). *Skits* were built on both islands. In 1893 the Monastery has got a small Haaposaari island and in 1898 became its permanent owner. This island is known as a shelter for boats leaving the continent during spring and autumn gales (Valaam Monastery.., 1903).

Starting from the 14<sup>th</sup> century monks have been actively developing an orthodox mission and started to strengthen their position among Karelians in the Korelskaya land, the climax activity took place in the 16<sup>th</sup> century. After annexing Finland to Russia the Monastery was handed over to the Viipuri *gubernia* of Finland and was converted into an orthodox centre in Priladozhye until the World War II (Spiridonov, Yarovoi. 1991). In 1858 the Monastery obtained a land plot and built a stone chapel of Sergei and Herman in Sortavala (Valaam Monastery.., 1903).

The Ladoga Area is connected with the names of several eminent workers of culture, of whom the most outstanding was the Russian thinker, writer, artist, traveller Nikolai Rerikh. Over two years (1916-1918) with intervals he lived in Sortavala, Juhinlahti, on Tulonsaari Island (Soini, 1987). Here, he created many works of art, which reflected the magnificent nature of the skerries and are displayed in a lot of the world's leading museums. The nature of the proposed park is depicted by many Finnish artists such as H. Munsterhjelm, P. Halonen, V. Hämäläinen, V. Tome, V. Vesterholm, etc. (Häyrynen, 1995). Currently, the excellent wood engraver K. A. Gogolev is living and creating in Sortavala. His gallery keeps scores of plates with views of the North Ladoga Area. Finnish photographer K. I. Inha took a few pictures in the Ladoga Area.

Thus, the territory of the proposed park possesses good opportunities for the development of tourism related with to an acquaintance with material culture.

The overwhelming majority of geographical names in the Park have Finnish and Ugrian roots and are now used (with rare exclusions) in a transliterated form. Many place-names reflect the history of developing the territory and ways of nature use, for example, in many place-names *Linna-* means "fortress"; "Sortavala" means "lands taken up by slash-and-burn cultivation", and so on. The index of place-names and objects of the North Ladoga area is given in a work by U.Heikkilä (Heikkilä, 1999).

## 5.2 History of agriculture

It is known that the basis of the economy of Karelians at the end of the new era, together with hunting and fishing, was slash-and-burn agriculture, and in the beginning of the current millennium the method of arable lands came into force (Karelians.., 1983). The population of the North Ladoga was rather small and settled mainly along the shores. It was thought for a long time that agricultural lands were not profitable, and noticeable growth started in the 16<sup>th</sup> century when the population practically turned away from hunting (Lintunen et al., 1997)

The region had long ago turned down the slash-and-burn farming principle, which was widely accepted in the 17-18<sup>th</sup> centuries. And already in the 14<sup>th</sup> century a permanent tillage system was cultivated. However, in 1896, the area of burnt farmland was 15 times as much as the area of fields. Two types of farming were specific for the Ladoga area: cyclically cultivated (usually once in 20-30 years) and developed, where crop rotation was used. The latter was common for the skerries area, where its application favoured the settled living and compactness of villages. The key reason for this was a high population density and a deficit of suitable land (especially on islands) (Lintunen et al., 1998).

When Finland was annexed to Russia in 1809, the modern settlement scheme started to outline. Highly rugged terrain, abundant islands and peninsulas, numerous steep rocky slopes conditioned narrow developing of lands around *khutors* (farms) that were basic economic units until the middle of the 20<sup>th</sup> century. Every khutor had a concentric impact zone, which diminished as the distance from the khutor increased. Most components of the landscape were transformed in the centre of the zone: forests were felled, boulders removed, meadows ploughed up or fodder crops sowed up. In the peripheral part, selection cuttings were organised, mires and paludified forests were drained. Lowering of lake levels was already practised at that time with the aim of getting new arable lands.

Starting from the 18<sup>th</sup> century meadows were developed and intensively used. The need for hay turned up because of the necessity to get manure for fields and for this purpose cattle raising caught on. The maximum meadow area was reached in the end of 19<sup>th</sup> century. First, cattle grazed freely, only fields and the most valuable meadows were fenced off. Some time later, while the population rate was growing, grazing was moved to commons (pastures) (Lintunen et al., 1997). A new impulse in and development happened in late nineties of the 19<sup>th</sup> century, when the Karelian railroad was under construction and railway-builders started buying forest plots and ploughing up land for small homesteads.

Early in the 19<sup>th</sup> century, intensive reclamation activities started, crop rotation was introduced and crop pastures were sowed.

Thus, by the beginning of the industrial century, the landscape of the North Ladoga area was enormously transformed as a result of agricultural and timber industry development.

In the first half of the 20<sup>th</sup> century the process of substituting the natural economy for commodity production completed. The emphasis shifted to the production of grain-crops and fodder crops, and cattle breeding. By the end of the 1930s, the area of fields increased twofold, and just the contrary, the area of meadows reduced by half. The best plots were sowed with valuable fodder crops, the worst were left for reforestation (Lintunen et al., 1997).

Changes in population after World War II influenced resettling and agriculture in North Ladoga. *Sovkhozes* and *kolkhozes* (collective farms) with huge ploughed lands and animal farms appeared in agriculture. Farms formed on the basis of private Finnish farms became minority and in the 1960s made way for centralised settlements in the process of the so-called liquidation of non-prospective villages. It reflected mostly on earlier populated islands, which were depopulated, which was caused by stopping using lands and forest and beginning of de-mutation processes, which can be seen even at the present time.

So, thus within the borders of the park all forest parts on the fertile drained soils were treated by the slash-and-burn method, low and transitional mires were cultivated by man for permanent arable lands and drained. At present the degradation of agricultural lands, meadows and watering of drains is evident.

The establishment of the Park will hopefully lead to the recovery of farming, including manufacturing of organic products to meet the needs of the increasing tourist traffic.

### 5.3 History of forestry

Forestry on the territory of the park started at the same time as the colonisation of this region by man. It was characterised as extensive in the beginning, but further the logging industry was increased due to the need for materials in construction works and for firewood, but the main type of forest use for many centuries was slash-and-burn farming, which was widely cultivated in the 17-18<sup>th</sup> centuries. For the needs of small metallurgical plants, a large amount of timber was produced. At the end of the 19<sup>th</sup> century construction of the Vyborg-Sortavala railway road (finished in 1893) and pulp and paper mills in the Läskelä and Pitkäranta settlements involved spruce stock, and therefore, the Park's forest was subjected to multiple cuttings encouraged by good accessibility of the forest. More than that, in North Ladoga the khutor system of settling dominated to the middle of the 20<sup>th</sup> century. In the peripheral part of khutors selective cutting took place. So, selective cutting was used almost permanently in the territory of the Park during the history of its cultivation.

Clear felling was carried out in the territory of the Park at the end of 19<sup>th</sup> – first half of 20<sup>th</sup> centuries mainly, thereby most forest is reaching the maturity age or slightly exceeds it. At the same time, many parts of the Park were subjected to clear cuttings, but littoral rocky habitats, due to low capacity and quality rates, avoided felling. A 1984 establishment of a two-kilometre water-conservation strip along the shore of Lake Ladoga (in 1999 the water-conservation line was shortened up to 1 km), which encompassed the mainland part of the Park and all islands, also promoted the avoidance. Thus, pressure from the timber industry over the last decades was low because the forest referred to the first category of protection and this did not make its use profitable.

Nonetheless, as a result of the long-term use of forests in North Ladoga the species composition in large forest areas changed from pine species to small-leafed and spruce species. The demutation processes to retrieve cultivated forests to the natural state will last decades. Though it is to be thought that clear cuttings in the conditions of ridge-gully landscape do not lead to radical changes in the forest structure (Volkov et al., 1990). On pine-forest clearings young pine and pine small-leafed stands grow up. Birch and aspen stands can be met more often on clearings of the *Vaccinium myrtillus*-type forests and former farmland. Forestry in the Park becomes complicated because of steep slopes and the ruggedness of the relief. The restoration of pine forest, with the contribution to the natural afforestation through leaving seeds on clearings, keeps going successfully (Volkov et al., 1990).

Selection cuttings have been made in the Park throughout the history of man's living in this area. Lengthy selection cuttings near settlements contributed to a higher position of the birch-tree and aspen in the composition of tree stands, thinning of lower shelters, growth of southern (nemoral, southern coniferous forest) species, and in general – the enrichment of the species composition in the forest. The wide spreading of the maple (*Acer platanoides*) in the undergrowth is also related to selection cuttings. As a result of selection cuttings, many plantations began acquiring south-taiga features in the lower shelter (Isachenko, Penin, 1995).

In the last 30-40 years a new approach to forest use came up – recreation, which is connected with a wider flow of tourists coming from the Leningrad Region and with summer cottages' construction linked to the shoreline

The forest of the Park is notable for fire vulnerability. The dominance of the pine forest in many terms connected with frequent lower fires, which ruin spruce undergrowth (Kozlova, 1959; Volkov et al., 1990). Sometimes in springtime, the local community makes fires on meadows to remove waste, with the fire swallowing the neighbouring forest. Small rocky islands are most exposed to fires, where periodically the forest cover is totally destroyed, including the organic soil floor. When fires do not occur long, forest successions after cuttings in most types of range (excluding mires, tops and steep slopes of ridges) lead to the spruce prevalence in the wood stand. Tops and slopes of ridges are to a larger extent subject to crown and lower fires, in particular along the shoreline where strong winds blow. On ridges, fires catch at least once every 25-50 years (Isachenko, 1994, 1995), so this frequency of fires is a typical feature of the last millennium, from the beginning of the colonisation of this area by man (Gromtsev et al., 2000). Fires in some way encourage the growth of many petrophyle species, including rare, which take burnt cliffs.

The weather in 1999-2000 was rather dry and warm, which caused a number of fires in the territory of the park (in 1999 - 10 times more fires than in an ordinary, by climatic conditions, year of 1998). Firesides are mostly connected to roads and shores of the Ladoga Lake, the reason for the latter is certainly broken rules in using fire by wild tourists and fishermen. In 1999 the following figures were reported: 108 forest fires in the Sortavala region, 145 fires in the Lahdenpohja region, 129 fires in Pitkäranta, (according the State report., 2000), with 95-100% of fires provoked by the local population.

The creation of the park must result in a decreased frequency and intensity of fires, primarily by means of organising tourist visits and permanent control executed by the staff of the park.

## 5.4 Fishing and hunting

Both commercial and amateur fishing are a significant component in the life of the people in the North Ladoga area. Over the recent years, commercial fishing has been reduced (State Report., 1999, 2000),

but amateur fishing stays at a high level and makes one of the most profitable sources of income for most of the population in the region.

The stock of commercial fish in Northern Ladoga is: vendace – 100 tons, smelt – 120 tons, whitefish (mainly black Ladoga whitefish) – 3 tons (Feasibility Study..., 1995).

Recreational fishermen catch some one quarter of the total catch in the North Ladoga area, i.e. 160 tons on average, basically these are perch and roach. Nonetheless, the yield is about 1% of the commercial stock of these two species (Fedorova, 1977, 1985). Recreational fishing in the Park should be based on the "Temporary Fishing Rules of the Republic of Karelia" (2000) for locals, as for tourists licensed fishing is a must. In addition, the North Fisheries Research Institute defines a total allowable catch every year. The key condition for the conservation of fish resources and the sustainability of fishing catches is limited commercial and sports fishing (State Report..., 2000).

In total in the North Ladoga area 3 895 fishing licenses were issued in 1999, and 5 015 in 2000, 5% and 4% respectively for foreign tourists (who predominantly prefer flying fishing).

The most important game animals in the Park are elk *Alces alces* (density 2,7-3,9 specimens/1000 ha), wild boar *Sus scrofa* (0,06-1,52), brown bear *Ursus arctos*, hare *Lepus timidus* (7,2-21,9). Of the fur animals the most interesting are: marten *Martes martes* (1,6-2,6), squirrel *Sciurus vulgaris* (3,8-27,3), muskrat *Ondatra zibethica*, ermine *Mustela erminea* (0,3-1,6), American mink *Mustela vison* (1,5), fox *Vulpes vulpes* (2,2-3,6), racoon dog *Nyctereutes procyonoides*. The density rate of predatory animals makes up for the lynx *Lynx lynx* 0,13-0,85, and for the wolf *Canis lupus* – 0,02-0,10. The Northern Ladoga area is a place of winter concentration of the elk (up to 4 specimens/1,000 ha) and the wolf, and this opens wide prospects for hunting these animal species (Danilov et al., 1998, 1999, 2000).

The stock of upland fowl in the Park is poor. There is no data about the amount of upland fowl available, the density of the capercaillie (*Tetrao urogallus*) in the Lahdenpohja, Pitkäranta Districts and Sortavala municipality is 1,5-3,1 specimen/1 000 ha, black grouse (*Lyrurus tetrix*) – 6,1-7,0, hazel grouse (*Tetrastes bonasia*) – 4,4-10,22, willow grouse (*Lagopus lagopus*) – 0,55-2,12. The density of capercaillie and black grouse (hazel grouse is common) is half of the overall density in southern Karelia, as for the willow grouse it is only one third to one twelfth, and in the area of the skerries the density rate is much less than in areas more remote from Lake Ladoga. Waterfowl hunting looks more promising, especially during spring and autumn migrations, but information on waterfowl quantity and bagging is not available (Danilov et al., 1998, 1999, 2000). Only the number of issued licenses is known. The number of licenses issued in the North Ladoga area tends to cut (Table 2).

**Table 2**

Type and number of hunting licenses issued in the North Ladoga area in 1998 to 2000.

License type	Year		
	1998	1999	2000
Elk	11	6	8
Bear	1	2	1
Hare	41	38	34
Waterfowl:			
- Spring	213	171	133
- Autumn	120	119	114
TOTAL	386	336	290

It is expected that the establishment of the NP will decrease poaching and contribute to better use of the game resources.

## 5.5 History of tourism

The territory of the Park is a territory with outstanding recreational features and has long been intensively visited by tourists and the local population to enjoy holidays there. In the pre-war time, scores of motor vehicle-bus, water, hiking, and many routes were constructed. The Ladoga area in many ways acted as a transit zone for tourists going to Valaam, though it was attractive itself. In the Ladoga area, spots were identified that overviewed the most marvellous panoramas of the skerries and turned into

sightseeing grounds. Also the most interesting natural objects, best fishing places, etc. were spotted. No information about the negative impact of tourism on the nature of the region in the pre-war time was discovered, however such an impact certainly existed.

After the war, especially starting from the 1960s, the Ladoga region again became a popular tourist attraction, most actively visited by people from the Leningrad Region and the city of Leningrad. National waterways were laid out there. The Ladoga Region held first place across Karelia of a number of stationary recreation centres.

Non-regulated recreational overload entailed the degradation of communities. Least persistent to trampling are rock types of the forest featuring poorly developed soil, which is usually interrupted and quickly degrades under intensive load. Together with the soil, the soil surface degrades and the wood stand weakens. Vegetation, especially rock vegetation, suffers in drought periods (semihumid steses, according to: Isachenko, Reznikov, 1996).

So far, the impact of recreation in the territory of the Park has not been deliberately studied, but comprehensive data was got for Valaam Island, which is quite close in terms of nature indexes to the skerry shore (Nature Complexes of Valaam..., 1983, Valaam Ecosystems..., 1989). According to research, the overwhelming recreational stress resulted in radical changes of the composition and structure of ecosystems: compression, deterioration of water and thermal conditions, modification in physical-chemical characteristics of soil, distraction of its upper layers, first of all – floor covering, and on rocks with weak soils – to its full disappearance; practically a full stop to the basic layer's natural regeneration, the destruction of undergrowth. Mechanical damages to trees which lead to the invasion of pests and pathogenic fungi and make the general state of stands unhealthy; trampling down of upper soil floor – destruction of many gemerophobic species of plants; sharp changes in structures of flora and fauna, etc. Dried types of forests especially those growing close to bedrock formations, are considered the strongest and most sustainable to recreational impact. Recreation affords the main reason for the increase in fire frequency. Littering takes place throughout the territory.

The establishment of the Park will promote better conservation of the region's nature. Heavy limits on activities are put into effect in the Park in accordance with the legislation in force. Allowed activities are conducted on the basis of the functional zoning of the territory and strict regulation of nature use in allocated zones.

Channelling of non-managed (wild) tourism is an important task for the planned Park. As the tourism infrastructure develops in the Park, stress on nature ecosystems will be re-distributed and controlled by Park staff. This measure will allow the avoidance of unfavourable consequences of extreme stress to the most frequented sites and to timely close damaged sites for visitors, and to carry out necessary regenerative actions.

## 6. The role of the proposed park in the system of protected areas of Karelia and Northwest Russia

As a summary, the values justifying the Ladoga Skerries National Park can be presented as follows:

- ❑ The archipelago with deep bays, narrow straits and relatively high rocky hills is a unique geomorphologic formation, similar to which cannot be found in the whole of Russia. The archipelago resembles those in southwestern Finland and in the western part of Norway, but they are different to these sea archipelagos, the first one clearly lower and the other one with high mountains.
- ❑ Ladoga is the largest lake in Europe. It is fairly deep and the water body is not seriously eutrophied.
- ❑ Bedrock is visible in large areas and it is ground smooth by the Ice Age, the waves and ice of the lake. The bedrock is still gently rising, about 20 cm every hundred years, after the weight of the continental ice. The park relief diversified, rising from the sand beaches of the outer archipelago and low meadows of the inner part to the landscape of ravine lakes and high tops around Pötsövaara in the northern corner of the park.

- ❑ In places the bedrock is basic, even calcareous resulting in rich flora. Steep slopes, even over 80 metres high are special habitats for both northern and southern plant species otherwise not growing at these latitudes.
- ❑ In places the forests are lush and the amount of rather old-growth deciduous trees is high due to the fact that practically no cuttings have taken place since 1939.
- ❑ The lake is the home range of the Ladoga Ringed Seal. In Ladoga there is a vital, isolated population, which has a great value from a scientific and nature conservation point of view, entered into all the Red Books. There is no less than 20 % of the reproductive population represented here.
- ❑ In general the nature here is very rich ranging from continental, old-growth forests on the mainland and peninsulas to shallow bays with spawning grounds for fishes and places for bird-colonies, high hills with steep slopes and open shores with high waves and ice erosion. This territory has the highest biodiversity in the whole Karelia. The number of endangered species and different habitats is richer here than anywhere in the republic or neighbouring areas.
- ❑ The territory has been inhabited at least since the 9<sup>th</sup> century AD, but due to the location between two strong cultures and religions, it was devastated and re-inhabited many times over the centuries, most recently after World War II. In spite of many wars, numerous cultural layers can be seen in the landscape and monuments.

## 7. Threats if the National Park is not established.

If the existing situation of the Ladoga area is not changed, then economic and nature use trends developed in the course of the last 10 years will continue to expand. Most likely the industrial and agricultural output will continue to decrease, what will result is higher unemployment rates and a deteriorated social and economic situation in the region (see paragraph 8.2.). Infrastructure development is extremely slow, therefore the creation of the park will bolster the industrial sector and allow greater employment. According to various specialists, the North Ladoga area has a great tourist and recreational potential (Scientific materials..., 1993; Nature parks..., 1995; Feasibility study... 1995; Tourism development program..., 1999; Historical and cultural..., 2000; Kravchenko, 2000; Morozova, 2000; Nemkovitch etc., 2000 etc.).

The construction of summer cottages presents a large problem for nature conservation. Earlier, until the middle of the 1990s a lot of cottages were built within Park boundaries, especially on Riekkalansaari, a large island with a road connection close to Sortavala. The number of these plots was not possible to estimate while preparing the documents for park planning. However, most of them are in groups and often at a distance from the shoreline or on open fields. At the moment, hiring plots for the construction of new summer cottages has been stopped due to the planning of the National Park. If the park will not be established, or if there will be a longer delay in the process, there is a risk of a new intensive construction period of cottages throughout the park territory. Particularly, dwellers from large Russian cities seem to look for the most beautiful nature by the shore and with good connections. That is what this territory can offer, but with the result that this beautiful place would be closed for other visitors.

The situation with industrial contamination around northern Ladoga is about to change. Pulp and paper mills in Läskelä and Pitkäranta have recently increased their production without any modern refinements. These mills are old and, in the long run, it is expected that Russian legislation will set harder demands for their emissions. The future establishment of the Ladoga National Park is only a minor reason among many others, when the need for new technology is considered. The recreational values of Ladoga for locals and tourists together with fishing options are increasing pressures towards industry and authorities.

At the moment, practically all the forests in the park territory belong to category I forests, which can be cut only in exceptional cases (see 4.7.1). Anyhow, forests have been felled in some places within the zone. Lately the zone of two kilometres around Lake Ladoga was narrowed to one kilometre. There is a

risk, that later on this zone will be still narrower or more exceptions can be allowed for cuttings close to the lakeshore.

Slightly less than 10% of the park territory is meadows, which are now growing over everywhere. However, they represent an old cultural landscape with many rare species. Many of these fields have been cultivated for almost a thousand years. The management of the cultural landscape by using them for pasture and haymaking can be organised by the park together with agricultural enterprises. Without active measures, they will become birch and aspen forest after a few decades.

While forestry is not allowed by Lake Ladoga, the construction of new summer cottages is discontinued here and there seems to be at least a slight lowering of emissions and amounts of sewage waters running to the lake, wild tourism is creating more and more problems. The control of fire has decreased and the number of serious forest fires has increased drastically (see chapter 5.3). At the same time littering of campsites and untidy constructions there are becoming more common. Together with illegal fishing and hunting, the consequences of wild tourism are alarming.

During the 1990s the establishment of a nature park in the same territory, as an alternative to the national park, has been discussed. The main differences between a national park and nature park are in connection with the park administration. While a national park is a federal structure, a nature park is instructed and funded from the republican level. The land and waters of a national park are under the control of the park administration, while the nature park administration cannot administrate the park territory. The nature park cannot independently decide for instance on cutting trees and the construction of summer cottages or effectively supervise the behaviour of visitors. However, a nature park would, without any doubt, contribute to nature conservation in the territory, but many of the future threats for the nature cannot be solved by it.

## 8. Ecological, social and economic impacts of the establishment of the Ladoga Skerries National Park

### 8.1. Environmental impacts

The territory of the Northern Ladoga area is densely populated, and is a rather developed agricultural and industrial region of Karelia. These factors predetermined the highest anthropologic impact on the environment of all existing and proposed Parks in Karelia. It is natural to expect that the establishment of the National Park with very good tourist options, will facilitate the attraction of domestic and international funds to stabilise and improve the ecological situation. Anyhow, the state of the environment is quite complicated, and the establishment of the NP is not bringing any direct improvement in the situation.

The most intensive influence on ecosystems of the Northern Ladoga area is connected with man's polluting air and water. Nearby the Park, towns and settlements with different industrial developments are located: Sortavala, Helylä, Läskelä, Ruskeala and Lahdenpohja.

#### 8.1.1. Air pollution

Emissions to air from industrial enterprises are not as significant as sewage water problems. Although the overall atmospheric emissions make up to 12 500 tons a year (1998), of them solid waste products are 2,7 tons, the contamination rate does not overreach sanitary standards (State Report., 1999).

A lot of quarries are located in territories bordering the Park and dealing with mineral resources and building material extraction, but they are sited mainly along roads and the impact they produce is not broad.

#### 8.1.2. Water pollution

Sewage waters from the Lahdenpohja Plywood Factory, Technological village (former Sotavala Furniture and Ski Factory in Helylä), Läskelä Pulp and Paper Mill, sewage waters from the towns of Sortavala and other settlements, and polluted or poorly recycled water from cattle-breeding farms and other agricultural productions flow into Lake Ladoga within the Park borders. The overall volume of wastewater reaches 24

million cubic meters per year (1998), including 1,33 million cubic meters of untreated water and 22,5 million cubic meters of poorly treated water.

Sortavala and Lahdenpohja towns have district water supply and sewage systems. Surface water is used as a water supply source. The populations of the rest of the settlements use water from natural reservoirs and mineshafts have no water supply systems, use in-built or detached lavatories and use cesspools for garbage removal. Waste treatment facilities (except Lahdenpohja) need biological and chemical treatment. Due to the small consumption of water, the water supply should use ground water. Water intake is due through a single or several wells.

The industry slowdown has been going on in the region for the past 10 years, so correspondingly recreation stress, water pollution and air contamination is less, and the same is for water consumption, in general, this reduction is about 1,5 times less during the last 10 years (State Report., 2000). The production drop is accompanied by a lowered impact on the environment, including fewer emissions in the air and water. By and large, the ecological situation is picking up.

The establishment of the Park will improve the situation in terms of attracting investments for environmental recovery, above all for the reconstruction of existing and the construction of new waste treatment facilities. By and large, the establishment of the Park will certainly better the ecological situation in the region.

### 8.1.3. Recreational stress

The territory of the park is the most frequently visited recreation area in Karelia. Up till the end of the 1980s a large number of recreational facilities were in operation here: spas, rest homes, tourist and pioneer camps. At present almost all of those facilities ceased to exist and their owners have changed. Therefore, predominantly non-organised tourism, the so-called wild tourism, prevails on the territory of the park, the number of tourists reaches 10 000 per year (Tourism Development Programme..., 1999). Its consequences on nature are described earlier (see chapter 1.5.5.) Actually the whole tourist infrastructure is to be developed anew, and the revival of former facilities is possible. The establishment of the National Park with full authorisation to the land and waters, channelling and supervising tourism, is the only way to improve the current situation.

## 8.2 Socio-economic impacts

The Ladoga Skerries National Park is being established close to an area, which is densely populated. Nobody is living in the park proper, but there are a number of families living on their plots within the park borders, mainly close to the shore roads on both sides of Sortavala and on Riekkalansaari Island.

At the present time (01.01.98) 19 400, 27 600 and 36 600 people live in the Lahdenpohja, Pitkäranta and Sortavala regions correspondingly (Republic of Karelia., 1999). The population density in the North Ladoga area is 11.15 persons per square km., which is about 2.5 times more than the average in Karelia. More than 50% of the population dwell in urban areas. Large Karelian settlements are situated close to the state border (towns of Sortavala (27 800 people), Lahdenpohja (10 500 people), all the others have the status of rural settlements, e.g. Miinala, Haapalampi, Läskelä, Lesozavod, Rautalahti, Impilahti, etc., where about 40 000 people live.

The demographic situation in the region is permanently deteriorating. The natural population decrease is 3.5% higher than the average in Karelia. In rural areas the process is 2.7% more intensive than in urban area. The birth rate is decreasing, and the death rate is increasing. The number of people arriving for permanent residence is decreasing too, and more people leave the area than arrive (Nemkovitch etc., 2000). The natural population growth in November 1999 was -250 persons in Sortavla Municipality, -206 and -107 in Pitkäranta and Lahdenpohja Districts correspondingly (Social and Economic., 2000).

There are 24 000 workers and clerks in the three towns. Most of the population are engaged in industry (24.3%), in the education and culture sectors (20%), agriculture (14%) – the indicator is 3.7% higher than the average in Karelia – health care (11%).

The region is characterised by developed industry and agriculture. The structure of the labour market is characterised by a share of branches of material industry – industry, agriculture, transport,

communications, trade, culture, consumer services, administration mechanism; correspondingly 58,2 and 41,8% - Lahdenpohja region, 63 and 37% - Pitkäranta region, 59,7 and 40,3 % - Sortavala. The main budget forming branches in the Lahdenpohja region are the logging industry, wood processing industry and agriculture, in the Pitkäranta region - logging industry, wood processing industry and mining, Sortavala - logging industry, wood processing industry, mining, energy, metallurgy, light and food industries.

Altogether, 1 276 businesses are located within the three areas, including 290 small businesses engaging 8% of the working population, and 770 entrepreneurs. About 1/3 of all enterprises are unprofitable. The number of enterprises involving foreign investment is 60 (Nemkovitch.. etc, 2000). Not far from the park there are some large (for Karelia) industrial enterprises: open joint-stock company "Lahdenpohja Plywood Plant" (Lahdenpohja, wood processing), open joint-stock company "Lahdenpohja Lespromhoz" (Lahdenpohja, logging industry), closed joint-stock company "North Inter House" (Lahdenpohja, logging industry and wood processing), Läskelä Pulp and Paper Mill, open joint-stock company "Ladenso" (Pitkäranta, logging industry), Pitkäranta Mining (Pitkäranta, construction materials), Technological village (on the basis of the Sortavala Furniture and Ski Factory), Plemsovhoz "Bolshevik" (Haapalampi, agriculture), "Sortavala Technical School-Sovhoz" (agriculture).

Timber export in 1999 totalled 11.400 m<sup>3</sup> from the Sortavala area, 299 200 in Pitkäranta and 148 400 m<sup>3</sup> in Lahdenpohja areas. 79.8% of exported timber is log lumber (Social and Economic.., 2000).

The timber stock of the park equals 1,5 million m<sup>3</sup>, which all belongs to category I forests. Thus, it is clear that the establishment of the Ladoga Skerries National Park will not reduce the number of jobs or create unemployment in forestry and livelihoods close to it.

Forest ranges and the sub-category breakdown is given in Table 3.

**Table 3**

Distribution of the timber stock (m<sup>3</sup>) in the park territory

Conservation category	Forest range					Total
	Ladoga	Oppola	Läskelä	Impilahti	Pitkäranta	
Protected forests on shores of rivers and lakes	39200	302818			910	342928
Spawning areas protection forests	297678	429910	81920	204810	1860	1016178
Protected areas along roads	870	1480	5480	7530	140	15500
Forestry sections of the green zones	550		56820	36820		94190
Total	338298	734208	144220	249160	2910	1468796

35% of all the sown lands of Karelia are located in the Ladoga area. The majority of sown land is used for fodder crops (86.3%) and potatoes (7.8%). Also more than a half of all the cattle (51.1%) of the Republic are concentrated here; 33.6% of meat and 46.6% of milk are produced in the area. During recent years, farms have been developed. There are 213 of them in the three above-mentioned territories (1997) (Nemkovitch et al., 2000).

The farming output in all three territories is decreasing, i.e. in 1999 compared to the previous year 18-45% less meat was sold, the milk yield was reduced by 5-18%, cattle livestock was reduced by 3-19% (Social and Economic.., 2000). The North Ladoga area yields only 5% of the republican production. However, the close location to the border creates favourable conditions for foreign trade, and 14.1% of the republican foreign trade is realised in the region. (Nemkovitch et al., 2000).

Over the last decade volumes of industrial and farming output reduced by half. This called for human resource release, which could be shifted to the service sector after the establishment of the park. At present 59 % (Lahdenpohja), 57 % (Pitkäranta) and 48 % (Sortavala) of the regions population is able to work. The unemployment rates are 7% (Sortavala), 3.9 % - (Lahdenpohja), 7.5 % - (Pitkäranta), which shows an increase of 10 times over the last 10 years. However, it should be kept in mind that the system of registering unemployment gives too low figures compared to the real situation.

The creation of the park will result in the withdrawal of vast lands from the economical utilisation occurring here for the last 60 years. Limitations will be introduced for visiting and natural resource use in protected sectors. At the same time, hunting and fishing arrangements for local people will not change and will accord with existing Karelian regulations on fishing and hunting.

Tourism development – which will accompany the process of the park establishment – will create new jobs for local people and alleviate the consequences of the unemployment outbreak determined by the economic slump. The number of new jobs within the next ten years for example, is difficult to estimate. It is planned that 45 new jobs would be needed in the park administration during the five first years. But most of the job opportunities will not be in the park itself, but in the settings intended for service provision, i.e. hotels, restaurants, tourist companies, transports etc. At present, the share of tourist and recreation services totals merely 3.8% of the service sector in Lahdenpohja and 0.6% in Sortavala due to the fact that most tours are organised by the companies from St. Petersburg (Nemkovitch et al., 2000).

Tourism business development will help overcome the economical crisis in the region; as worldwide practice has shown, the tourism industry is one of the largest, profitable and rapidly developing industries. About 10% of the able-bodied population of the world are engaged in tourism; the share of tourism is about 10% of GNP, investments and consumption costs (Programs of tourism development..., 1999). In Russia, the international tourist sector is skyrocketing, the number of foreign tourists has increased from 4.7 million people in 1995 to 17.5 million in 1997 (Saveljev, Nemkovitch, 2000).

Specially trained staff are needed for the tourist sector development. People can be trained at the Sortavala branch of the St. Petersburg Institute of Service and in the park (visitor centre, ecological centre).

On the whole the creation of the park will lead to improvements in the economy, which are urgently needed in the region with progressing unemployment and an economic slump.

Therefore, the establishment of the Park is expedient for nature conservation, the effective use of natural resources and for the further development of the economy of the region oriented towards the creation of high quality tourism and the recreation infrastructure.

More about the character of tourism in the park and its economical impact can be seen in chapters 6.4 and in chapter 7 in this report as well as in the Tourism Strategy of the Karelian part of the Green Belt (Friman & Högmander, 2001).

## II. Proposal for the Plan of the Ladoga Skerries National Park

### 1. Objectives of the Park

General objectives of Russian national parks are: 1) conservation of ecosystems, unique and primeval habitats and objects; 2) conservation of historical-cultural values; 3) ecological education of the people; 4) creation of favourable conditions for recreation and regulated tourism; 5) elaboration and introduction of scientific methods of nature protection and environmental education; 6) implementation of ecological education; 7) restoration of destroyed nature and historical-cultural areas and objects.

For each national park separate objectives based on the peculiar circumstances shall be developed. The objectives for the Ladoga Skerries National Park are:

- ❑ Protection of the extraordinary archipelago landscape with many islands, long and narrow bays, channels and numerous outcrops of various age and composition. Special attention will be paid to the peculiarities of this area: steep calcareous vegetation, sand beaches, small ravine lakes, rivers and brooks.
- ❑ Conservation of the forests and safeguard their natural succession so that organisms depending on old-growth forests and decaying wood as well as on lush groves can flourish
- ❑ Offer refuge for the Ladoga Ringed Seal and many other rare and timid animals, birds, reptiles, amphibious and fishes, which are sensitive to anthropogenic stress, so that their needs are always prioritised and they can breed and live in peace
- ❑ Utilisation of the particularly suited lake nature of the park as a scene of environmental education for school children and the young, for grown-ups and tourists guided tours where environmental issues are emphasised. Environmental education is taken as one of the main activities of the park, which will be provided with equipment, constructions and special exhibitions in the Visitor Centre and information boards needed for it.
- ❑ Restoration of cultural landscapes and monuments in order to save, and even revive traditional land use on a small-scale in selected areas. Particularly, a number of meadows with a long cultural tradition and rich flora will be restored. The regeneration of traditional nature use methods and old plantations of introduced tree species, which made Northern Ladoga a main centre of introduced species in Karelia.
- ❑ Development of scientific research studies so that the rich nature and history of this territory will be well known and recognised. Scientific work will produce information, which can be utilised in environmental education, park management, and popular information for visitors and environmental monitoring.
- ❑ Development of tourism in the park in harmony with the objectives of nature conservation. The recreational capacity of the park is fairly high, but special attention will be paid to the sensitive parts of nature as open shores, breeding areas of animals, sandy areas and tops of mountains, which shall be protected against damage.
- ❑ Special consideration to the needs of local people, so that they can get job opportunities in the park. Also their possibilities for fishing and picking berries and mushrooms as well as developing tourism activities are safeguarded. Local people and entrepreneurs will be given priority in selecting workers and partners for the park.
- ❑ Development of cross-border and other international co-operation in order to get international recognition, to facilitate visiting the park and to get support in developing it.

### 2. Regulation of the Park activity

The main task of a national park is the conservation of the natural and cultural heritage of the territory. All activities shall be subordinate to that. The planning of park activities should be based on scientific information and analysis.

The primary actions both allowed and prohibited in national parks are adjusted by the model "Regulation of a National Park" (August 10, 1993). Specific features of each Park are reflected in its Regulation, and annual plans of the Park to be approved by its Director. All this information is

included in the Regulation of the Park, which is brought to the notice of visitors through information boards, leaflets and mass media.

## 2.1. General regulation

Hereby, a Regulation is proposed for the Ladoga Skerries National Park. According to it, the following activities are forbidden in the National Park:

- ❑ any action threatening ecosystems and objects of history and culture;
- ❑ geological surveys and mining actions;
- ❑ actions changing the hydrology (melioration, channelling, construction of dams, etc.), timber floating, and other ways of water contamination;
- ❑ construction of trunk roads, pipelines, electricity lines and other communications not related to the work of the National Park;
- ❑ making new farmland and summer cottage co-operatives;
- ❑ construction of apartment houses, cottages, recreation centres not related to the infrastructure of the Park;
- ❑ construction of roads, pipelines, electric lines or digging down cables not related to the national park or frontier guard activities;
- ❑ conduct of mass sports and entertainment events;
- ❑ organisation of campsites, placement of tents, making fire outside designated places;
- ❑ movement and parking of motor vehicles outside roads and waterway routes of general purpose and designated parking spaces;
- ❑ clear cuttings and resin-tapping, felling of trees without the permission of the Park Director;
- ❑ landing aircraft outside equipped landing sites and water areas;
- ❑ hunting of game animals, catching, shooting and causing death to all species of animals (except for fish with a fishing licence), destruction and damage to their habitats and nests, intentional interfering with these animals (across the whole territory of the Park);
- ❑ collection and destruction of rare and endangered plant species;
- ❑ gathering of herbariums and collections (insects, minerals, mushrooms etc.) without a permit from the administration of the Park;
- ❑ introduction of species of animals and plants alien to Park's ecosystems (except for greenery management in the visitor service zones);
- ❑ destruction or damage to objects of historic or cultural importance. In the Park, it is prohibited to commercially use the flora and fauna resources, and timber resources;
- ❑ leaving litter in nature and living untidily in the cabins and campsites of the Park;
- ❑ use of pesticides and mineral fertilisers;
- ❑ contaminating rivers and lakes

To ensure functioning of the Park, conserve the diversity of species and communities and to create conditions for stay and recreation of visitors, a series of activities are possible, even if they are forbidden above. Their timing and methods are worked out in the annual plans of the Park's activities.

The following actions are allowed in the Park:

- ❑ construction and repair of roads (except for the strictly protected and special protected zones);
- ❑ making of hiking trails with field marking, foot bridges on mires, bridges across streams, fireplaces in campsites, overnight accommodations, toilets, garbage collectors;
- ❑ construction of camping grounds with parking lots, campsites, maintenance facilities, apartment houses for the Park staff and maintenance personnel;
- ❑ construction of piers for small-size vessels, repair and storage hangars (recreation zone and visitor service zone);
- ❑ construction of electricity supply lines and communications to camp sites;
- ❑ carrying out forest cuttings (selection, landscape, tendering, rejuvenation) in the forestry subzone and felling a small number of trees elsewhere when it is necessary for making firewood for fireplaces or opening trails and campsites (except for the strictly protected and special protected zones);
- ❑ small-scale farming in the agriculture subzone;
- ❑ sports and amateur fishing by license issued by the North Ladoga Fishing authorities;

- ❑ collection of wild berries and mushrooms, and ground parts of some plants as medical material (except for the strictly protected and special protected zones). However, these activities can be regulated by the decision of the Park Director.

Supervision of the Regulation of the park is the responsibility of the Park Director and belongs to the tasks of all park staff. Besides that, park inspectors have authorised rights to stop illegal activities in the Park and arrest violators.

## 2.2. Forest resources

In the Ladoga Skerries National Park forestry is allowed only in the management zone. Not even there are commercial cuttings possible. The felling of some trees in order to make firewood for fireplaces, to open trails or campsites etc. is not considered as forestry. Forestry actions will prioritise the sustainability of forest ecosystems over the increase in wood stand productivity. Cuttings shall always be based on the needs of the park management, however, not on the needs to increase the income of the park. All cuttings are done on a site in line with special projects and natural features of the site.

The following types of forestry are possible:

- ❑ landscape cutting and cleaning of forest clutter along hiking trails to improve the aesthetic and recreational attractiveness of the routes, also to decrease the fire risk; decoration planting in recreation areas and along hiking trails, removal of trees around observation points to permit better views of the Park's territory;
- ❑ cleaning of rides and roads, marking of boundaries;
- ❑ cleaning of new hiking trails and winter roads for snowmobiles;
- ❑ cutting for inventory purposes (model trees, trees for compartment posts);
- ❑ cutting for fire-prevention purposes along roads, agricultural lands, recreational objects – cleaning and digging of fire trenches, mineralised strips;
- ❑ cleaning of shrubs under transmission lines;
- ❑ thinning of stands made of introduced species;
- ❑ making firewood for tourist needs in specially designated areas. The best places would be burnt areas along roads and shores. The cleaning of burnt areas to produce firewood will improve the aesthetic value of the landscape and promote forest recovery processes. It is necessary to give up making firewood outside specially designated places where deadwood and fallen trees are found because they serve as habitats for a large group of organisms associated with deadwood and are extinct in well-cared for commercial forests. Timber production and firewood making to meet needs of the Park is done in the management zone and regulated by the logging rules in force;
- ❑ cutting on overgrown agricultural lands;
- ❑ cutting for the construction of ranger stations, cabins, shelters, etc.
- ❑ forestry actions aimed at ensuring natural reforestation on clearings and burnt plots.

## 2.3. Agriculture

Agriculture may be practised in the agriculture subzone in the park and on lands of other owners located within the park's borders. The main objectives are restoring cultural landscapes and the production of organic products. This means restriction of the use of pesticides and mineral fertilisers in favour of organic fertilisers. Open storing of mineral fertilisers is prohibited in a 100-m strip along banks and shores. Hay making and clearing of overgrown pastures is allowed and welcomed to preserve the traditional rural landscapes in all functional zones except the strictly and specially protected zones. Preference shall be given to small field machines. It is desirable to revive the use of horses which could be used as transport for visitors.

## 2.4. Hunting

Hunting is exercised in accordance with "Rules of Hunting in the Republic of Karelia" by licences issued by the park's director. In the licence the game species and allowed numbers as well as territories are shown. Regulations on National Parks of the Russian Federation of August 10, 1993 state that hunting in

the territory of a park can be exercised by the park itself or by leasing the land to other users for hunting purposes.

Some hunting restrictions are enforced in the parks:

- ❑ commercial hunting is prohibited;
- ❑ hunting of hooved and large mammals is allowed only in the presence of inspectors;
- ❑ hunting is prohibited all-year-round in the strictly protected and special protected zones;
- ❑ hunting of upland fowl display grounds and waterfowl hunting in spring is forbidden;
- ❑ any of the endangered species in Russia and Karelia cannot be hunted in the park;
- ❑ one-day hunting permits are issued only;
- ❑ hunting with dogs on islands is prohibited (with exception of Tulolansaari and Riekkalansaari).

Game management activities are allowed (except for the strictly protected and special protected zones) with the aim to support the average number of hunted animals.

## 2.5. Fishing

Amateur fishing is regulated in accordance with "Temporary Fishing Rules in the Republic of Karelia"(2000). The volume of annual catch is agreed upon with the State Fishery Committee (Karelrybvod). The Supervision Department of Northern Ladoga issues fishing licences.

There are some restrictions in the Park on fishing:

- ❑ net fishing is prohibited from February 1 to May 31 in the special protected zone (external part of the skerries) designated for protection of Ladoga seal;
- ❑ any fishing is prohibited in waters of the five strictly protected zones.

## 2.6. Picking of mushrooms

Picking of mushrooms is allowed anywhere in the Park except for the strictly protected zone.

## 2.7. Picking of berries

Picking of berries is allowed anywhere in the park except the strictly protected zone. The park's administration determines the beginning of picking for bilberry, cowberry and cranberry each year depending on the ripening of berries. Before the picking season the biological and accessible stock for each species should be determined and restrictions for picking methods (manual picking, harvesting devices).

## 2.8. Gathering of medicinal herbs

Commercial collection of medicinal herbs and raw material in the park is prohibited. Collection for personal use is allowed anywhere in the park except for the strictly protected zone in accordance with the list of species permitted for gathering. Picking of medicinal herbs which are listed in the Red Books of Europe, Russia, Karelia and East Fennoscandia is prohibited everywhere.

## 3. Functional zoning

According to the Protected Areas Federal Act of February 15, 1995, functional zones are issued separately for each national park. The location of functional zones in National Parks is done on the basis of assessments of every uniform area, taking in view the following factors: level of anthropogenic transformation and nature conservation importance of the area, scenic features, vulnerability to man's impact, tourist and recreation potential, etc.

The main zones in Russian national parks are as follows: strictly protected zone, special protected zone, tourism zone, recreation zone and visitor service zone. There can also be zones of protection of historical and cultural objects and forestry zones.

Some national parks incline the division into sub-zones (National Parks., 1996), and some of the above mentioned zones are considered as sub-zones or two zones are combined into one (e.g. zone of recreation and tourism). Division into zones depends on conditions and goals of each park. Zoning of the Park can be improved later on. These changes may take place during the process of receiving more detailed information about nature and experience about park activities.

### 3.1. Functional zones of the Ladoga Skerries National Park

For the proposed Park mosaic zoning looks most promising, under which contours of zones are torn into separate independent sub-compartments. This type of zoning is more characteristic for developed and cultivated territories (Zabelina, 1987). According to the Protected Areas Federal Act, Regulations on National and Nature Parks in the Russian Federation of August 10, 1993, Recommendations of Russia's Federal Forest Service on Preparation and Consideration of Proposals on Establishment of National Parks in Russia of November 30, 1993, it is reasonable to mark out on the territory of the proposed Ladoga Skerries Park the zones as follows (fig.13, Annex 5):

**1. Strictly protected zone** is intended for overall protection and the regeneration of valuable ecosystems and objects; recreation and economic activities are prohibited. Scientific research studies may be carried out here. Any kind of tourism is forbidden in the strictly protected zone. Only research tours are possible.

In the Ladoga Skerries National Park five strictly protected zones with a land area of 5 208 ha, which makes 6,2% of the territory, are to be established. They are characterised by poor development, relatively hard access and a lack of settlements. The strictly protected zones are:

- 1) Zone located between the town of Pötsövaara and Kirjavalhti Bay with the area 1143 ha (compartments 198,199 of the Ladoga forests range, compartments 105,106, 126-129, 138-140 of the Läskelä forest range). Recreation corridor for the hiking trail from the Kirjavalhti Bay to Pötsövaara is located through the zone (compartment 198, 105 and 106 (100 m wide on both sides of the trail).
- 2) Zone located north of Pötsövaara (1049 ha). It is referred to as preserved lands because it is not divided into forestry compartments.
- 3) Western part of the Hunukka Peninsula (851 ha) (compartments 126, 139, 146, 153-154, 161-162 of the Impilahti forest range)
- 4) Central part of the Rautalahti Peninsula (compartments 159-161, 177-179, area 926 ha) of the Lahdenpohja forest range, the shoreline of 0,5m wide is included into the zone of educational tourism);
- 5) Central part of the Merisalmi Peninsula (1239 ha) (compartments 45-49, 58-62 of the Lahdenpohja forest range, the shoreline of 0,5m wide is included into the zone of educational tourism);

The zone of educational tourism surrounds the strictly protected zones, this makes them isolated from territories in more active use. It should be mentioned that due to the high level of the territory's development within the Park, good road network and favourable accessibility, it will be difficult and sometimes impossible to achieve the regime of the strictly protected area.

**Regulation in the strictly protected zone.** There is no access for visitors to the Strictly Protected Zone. Only scientists and park staff can move there with the permission of the Park Director. All kinds of utilisation of natural resources are forbidden there. Forestry, including felling of separate trees is forbidden. Construction of buildings, roads or facilities is forbidden.

**2. Special protected zone**, within which conditions for conservation of ecosystems and objects are ensured, and where strictly regulated visiting may be allowed. This zone includes land and water areas, species of flora and fauna (above all, aquatic birds and the Ladoga seal), unique and indigenous ecosystems, which are considered to be the most rare.

One of the dominant sights of the Park is its rich and diversified flora, and, taking into account the abundance of protected plant species, the flora needs a cautious approach to its protection. Places, where rare plants grow, often cover restricted areas – individual cliffs and islets. Therefore, many of

these zones in the Park are marked out on the base of botanical criteria (occurrence of protected vascular plants, Bryophyta and lichens). Their area varies from several to hundreds of hectares and they are diffusely spread across the Park. It is advisable to have such plots as botanical reserves; the most acceptable regulation is the one developed for botanical natural monuments: any activity resulting in the violation of conservation of an object is prohibited. Management measures, occasional guided tours on ecological routes, research tourism (gathering of plants for herbarium is licensed) may be allowed. Temporarily or permanently, all kinds of activities can be forbidden in these zones. The strictly protected zone provides conditions for the protection of ecosystems and objects.

**The special protected zones designated on botanical criteria are:**

- 1) Narrow (up to 300 m wide) shoreline of the Kirjavalhti Bay (Paksuniemi Peninsula);
- 2) Mäkisalo Island (southern shore with steep cliffs of Pekanmäki, Losemäki, Linnamäki; guided tours to the middle-aged fortress on the top of the Linnamäki cliff starts from the northern side of the island due to the gently sloping side, climbing up the steep southern slope is forbidden);
- 3) Majatsaari Island;
- 4) Pullivuori Rocks;
- 5) Raukkianmäki Rocks;
- 6) Remote group of small islands: Puuluoto, Honkasaari, Kotiluoto, Pieni-Viroluoto;
- 7) Taruniemi Peninsula (within the borders of the currently acting Sortavala Botanical Reserve);
- 8) Narrow (up to 100 m wide) shoreline of the Vuorilahti Bay;
- 9) Tamhanka Island;
- 10) South-Eastern part of the Puutsaari Island;

Some of the islands of the outermost archipelago have also botanical values, but they are included into the special protected zone designated for bird or Ladoga Seal protection.

The group of special protected zones for bird protection include a great variety of small open or sparsely wooded rocky or moraine islands inhabited by colonies of littoral birds (gulls, terns, ducks, sandpipers). Taking ashore on these islands during the breeding period from May 1 to July 15 is forbidden.

Special protected zones for **bird protection** are:

- 11) Munatsunsaari Island;
- 12) Suri-Viroluoto Island;
- 13) Keloluoto Island;
- 14) Ristisaari Island;
- 15) Pien-Hokasaari Island;
- 16) Sikasaari Island (south-east of Rautalahti Peninsula);
- 17) Sikasaari Island (south of Puutsaari Island)
- 18) Numerous nameless bare skerries

The majority of these islands are enlisted into the special protected zone, identified for the protection of the Ladoga Seal.

The special protected zone for **seal protection** is located in the southern edge of the park:

- 19) The largest special protected zone is located in the outermost part of the archipelago from Pitkäranta to Lahdenpohja. Access to this zone on ice or going ashore by boat is forbidden between February 1 and May 31. By open water moving by boat through the zone is possible. The zone covers all the outer shores of the islands, including small islets outside the archipelago and a strap of 1-km water outside the shorelines. This large zone is designated for the protection of the seal pupping beginning in February and moulting beginning in April.

**Regulation in the special protected zone.** Principal rule is that access to the zone is forbidden. All kinds of utilisation of natural resources are forbidden there. Forestry, including the felling of separate trees is forbidden. Construction of buildings, roads or facilities is forbidden. The following exceptions are possible. Access for visitors as well as scientific research is allowed with the permission of the Park Director, mainly with guides from the park staff. Minor management measures are possible in order to improve the living conditions of organisms for which the protection is established.

In the zone for bird protection, taking ashore on the breeding grounds of bird colonies is forbidden between May 1 and July 15.

In the zone for seal protection, access to the zone on ice is forbidden between February 1 and May 31. Fishing is forbidden during the same period. Moving by boat during open water is possible. In winter with thick ice on the lake, winter roads can be designated through the zone.

The total area of the special protected zone makes up to 14 761 ha (17,5 % of the Park's area). The area of 13432.5 ha (91%) of this is water of Lake Ladoga. The general area of strictly protected and special protected zones is 19 969 ha or 23,7 % of the park territory, whereas 13 598 ha (68%) is a water area.

The share of the strictly protected zone in Russia's National Parks varies from 0,1 (Meshersky NP) to 73 % (Prielbrusye NP) (one park has no such zone), special protected zone – from 5,3 (Hvalinsky NP) to 74,6 % (Pereslavsky NP) (eight parks have no such zone). On average the strictly protected zone makes up to 24 % of the area in Russia's Parks, wilderness zone – 32,5 %, both – 52 % (National Parks., 1996)

3. **Ecological education zone** is intended for ecological education, tourism and making acquaintance with the natural sights of the Park. It is designated for many kinds of tourism, with an emphasis on ecological education. Most of the hiking trails, ecological trails and simple campsites are located in this zone.

This zone is referred to be sustainable for anthropogenic stress as a territory of traditional recreation. The external part of Lake Ladoga within the Park (which is not included in the special protected zones) also belongs to the ecological education zone. The total area of the zone makes up to 38 100 ha (45,3% of the Park's territory).

**Regulation in the ecological education Zone.** There is free access to this zone. Staying over night and making fire is allowed only in designated places. Scientific research is possible with the permission of the Park Director. The utilisation of natural resources is allowed here as in the park in general. Haymaking and the grazing of animals in meadows is allowed. Forestry is forbidden, but the felling of trees in order to prepare a small amount of firewood for fireplaces and to open trails and campsites is possible. The construction of buildings and roads and facilities for ecological education activities is possible.

4. **Recreation zone** is aimed at organising recreation for local residents and tourists. The zone usually drawn round large settlements, existing recreation facilities, gardening and summer cottage communities. Recreation activities, like recreational fishing, berry, mushroom and herb picking, etc. are allowed there. The total area of the zone makes up 16 751 ha (19,9% of the Park's territory).

**Regulation in the recreation Zone.** There is free access to this zone. Staying over night and making fire is allowed only in designated places. Scientific research is possible with the permission of the Park Director. Utilisation of natural resources is allowed here as in the park in general. Haymaking and the grazing of animals in meadows is allowed. Forestry is forbidden, but the felling of trees in order to prepare a small amount of firewood for fireplaces and to open trails and campsites is possible. The construction of buildings and roads is forbidden, but facilities for visitors and cabins for supervision can be constructed.

5. **Visitor services zone** provides accommodation, camping grounds, sports grounds and other facilities of tourist services, information boards and catering services. Thus all the camping grounds with services (shelters, cabins, road connection etc.) belong to this zone. The area in each plot is small. Most areas of the zone are girdled by recreation and management zones. The total area of the zone makes up less than 1% of the Park's territory.

The visitor service sites are as follows:

- ❑ Rautalahti settlement (Lahdenpohja District);
- ❑ Vuorio settlement
- ❑ Taruniemi Peninsula;
- ❑ Western shore of Riekkalansaari island;
- ❑ Summit of Kirjavalhti Bay;
- ❑ Kirjavalhti Bay in the area of the House of Composers;

- Rautalahti settlement (Pitkäranta District);
- Sumeria settlement.

**Regulation in the Visitor Service Zone.** There is free access to this zone. Staying over night and making fire is allowed only in designated places. Scientific research is possible with the permission of the Park Director. The utilisation of natural resources is allowed here as in the park in general. Haymaking and grazing of animals in meadows is allowed. Forestry is forbidden, but the felling of trees in order to prepare a small amount of firewood for fireplaces and to open trails and campsites is possible. The construction of buildings, roads and all kind of tourist facilities, which are needed in the park, is allowed here.

6. **Management zone** provides the possibility for the park to get timber and firewood, and to revive traditional farming. The total area of the zone makes up to 9,363 ha (11,1% of the Park's area). It consists of two subzones:

- **Forestry subzone**, located in the periphery of the Park in compartments 187 and 188 of the Ladoga forest range. It covers 260 ha (0,3 % of the Park's area), where some environmentally feasible forestry operations, aimed at producing timber for the Park and local population, are allowed;
- **Regulation in the Forestry Subzone.** There is free access to this zone. Staying over night and making fire is allowed only in designated places. Scientific research is possible with the permission of the Park Director. The utilisation of natural resources is allowed here as in the park in general. Haymaking and the grazing of animals in meadows is allowed. Forestry is possible here when it is necessary for the park management. Commercial forestry is not allowed. The construction of buildings and roads is forbidden, but facilities for visitors can be constructed.
- **Agriculture subzone** is designated for traditional farming, which unites farmland owned by the Park (area of 9,103 ha or 10,8% of the Park's area) and land plots of other land users (farmland, summer cottage communities) located in the Park but withdrawn from the Park by decisions of the local administrations, is targeted at producing organic farming products by the local community. In functions, it is quite close to the zone of traditional nature use allocated in areas where natives live. Here it serves the management of landscape and typical flora for cultivated areas. New settlement in the agricultural subzone is possible on a contractual basis.

**Regulation in the Agriculture subzone.** There is free access to this zone. Staying over night and making fire is allowed only in designated places. Scientific research is possible with the permission of the Park Director. The utilisation of natural resources is allowed here as in the park in general. Forestry is possible here when it is necessary for the park management. Commercial forestry is not allowed. Small-scale agriculture is possible with natural fertilisers and without pesticides. Haymaking and grazing of animals in meadows is allowed. The construction of roads, traditional Karelian houses, facilities for visitors and cabins for supervision is possible. New settlement in former villages in this subzone is possible on a contractual basis.

In future, private farmlands which can be later be included to the park, may be located in the agricultural subzone of the management zone of the Park upon agreement with land users.

In both the subzones traditional management is permitted, game hunting and fishing, making fire-wood and timber for construction purposes, non-wood resources use (berries, mushrooms, herbs, etc.), handicrafts and traditional occupations, and other ways of nature use related to them (for instance, peeling off birch-bark for handicraft articles, gathering willow branches for basket-production, etc.).

Outside the National Park proper, **a buffer zone** of 1-2 km wide is marked out along the perimeter of the Park (except for where the park boundary follows a road or where large settlements border the Park as in the towns of Lahdenpohja, Sortavala, Impilahti and Läskelä). The buffer zone prevents the direct contact of the Park territory with intensively-managed areas.

## 4. Location of infrastructure in the Park

To implement the Park activities there, it is necessary to maintain existing and construct new facilities for a Visitor Centre, information points, cabins, camping grounds and campsites. It is also important to improve sites frequently visited by tourists, ecological camps and hiking trails. New piers, mooring places for boats, parking lots and road repair in places are needed. Information boards and signs should be located within the territory of the Park.

### 4.1. Park Office and Visitor Centre

The most appropriate place for the Office and Visitor Centre is the town of Sortavala (fig.14), where all necessary facilities are available. The location close to the Park centre, well-developed infrastructure of tourist business (tourist agencies, hotels, restaurants), all types of transport communication, easy access to the shore where the Park's boat station can be located, modern types of communication (mobile net and Internet), banks available; federal services (fiscal and customs authorities), infrastructure and communications.

The park administration is working at the office, where premises are needed for that part of the staff that is not working mainly out in the field. During the first five years it would mean about 25 worktables at the office. The Sortavala Municipality has shown a two-storied building to be repaired for the Park office and a Visitor Centre. There would be, after the repair, about 300-sq. m to be used for office premises and 100-sq. m for the Visitor Centre. There are plans to locate other activities, close to the national park's work, in the same house. The Ministry of Environment in Finland is planning to support financially the reconstruction of a wooden house for the Visitor Centre (50% of the cost estimate), if the Russian side is ready to compensate the other part (50%).

At the Visitor Centre visitors can get information about the nature and historical-cultural values of the Park, local traditions, tourist objects and hiking trails, ecological trails, fire preventive measures and the Regulation of the Park. One of the important tasks and themes of the park, informing people how to behave in nature, is also emphasised here. A museum of nature is organised on the basis of the Visitor Centre with the aim of collecting information and exhibits, showing the richness of the natural heritage of the Park and bordering territories, and to present a permanent exhibition to the museum and prepare temporal thematic ones.

A lecture room is technically equipped to demonstrate graphic examples, slides and video for the accurate representation of information to visitors of the Park. More than that, there are computers installed in the Visitor Centre, which allow visitors to get information about the Park's heritage personally.

A library is an important component of the Visitor Centre, where all prints representing the nature and culture of Northern Ladoga as well as Fennoscandia as a whole, and various issues concerning nature protected areas are collected. Special attention should be paid to guidelines and indicators while creating the library fund.

The training of staff is included in the programs of the less active seasons of the Visitor Centre. The training of guides on hiking and ecological trails is also in the program of the Visitor Centre, as well as training in client oriented service for the Park staff. Training is aimed, primarily, at the acknowledgement of local nature peculiarities, including ordinary and rare species of flora and fauna, main types of ecosystems their natural and human dynamics, skilful orientation in the territory, abilities to prepare camp, food, first aid, etc.

Tourist tackles and equipment (to rent), safety means for water and snow scooting routes, instructions in their use are available in the Visitor Centre.

### 4.2. Information cabins

Information cabins are created with the aim of providing visitors with information in the entrances to the Park and places of mass recreation, also to regulate the number of tourists.

Information cabins should be arranged close to settlements and important recreational centres. In general there should be 3-5 information points in the Park in the following settlements (fig.14):

- Lahdenpohja (entrance to the Park's territory from the Leningrad District),
- near the "Blue Road", which bears the main flow of transit tourists from Finland, crossing the border in the Niirala-Värtsilä checkpoint. A possible location is in the head of Kirjvalahti Bay,
- Läskele settlement (western part of the Kirjvalahti Bay),
- Impilahti township (entrance to the Park's territory from Petrozavodsk and Olonets),

In the beginning, information cabins will be placed in rooms or parts of rooms in organisations connected with the protection or utilisation of nature resources (preferably – in the regional authorities of the Federal Committee of Natural Resources in the Republic of Karelia), or the rent rights under forestry enterprises, local administrations, tourist firms, etc. An information cabin in the northern part of Kirjvalahti Bay will be arranged in the deserted building of the former border guarded point. Cabins and a café-shop will be constructed there. This point is important in the role of attracting potential visitors to the Park – transit passengers.

During the process of the Park's development, information cabins will be constructed in separate buildings – similar in their functions to the Visitor Centre.

### 4.3. Information boards

Information boards should be placed at the Gates of the Park of the main access roads (from Lahdenpohja, Läskele, Sumeria, north from Lake Ruttujärvi), along the road Priozersk-Olonets from Lahdenpohja to the Impilahti settlement, where there is no Visitor Centre or information point (Miinala, Korteela, Reuskula, Rautalahti (Lahdenpohja region), Meijeri, Haapolampi, Vuorio, Helylä, Kirjvalahti, Rautalahti (Pitkäranta region), Lesozavod (Hiidenselkä), Kerisyryä, Kirkonkylä, Lappisilta), and also in the recreational centres – well attended places by tourists, including water tourists (Puutsaari, Markatsimansaari, Orjatsaari, Lamberg settlement, Lahdenkylä, former Sortavala tourist centre, and starting points of ecological trails, hiking trails and water routes, most important tourist sites (Lakes: Ristijärvi, Haukkajärvi; Islands: Mäkisalo, Pellotsaari, Riekkalansaari, Tulolansaari), all in all 20 - 30 zones (fig.14). Information is given in two languages – Russian and English, and in Finnish, if needed.

### 4.4. Accommodation

The accommodation of the Park is associated mainly with long developed sites in all zones of the Park but the strictly protected and special protected zones, and to settlements along the Priozersk-Olonets road outside the Park.

#### 4.4.1. Rental cabins

The territory of the Park is the most favourable area for the construction of rental cabins. The foundation of old Finnish villages are suitable for the cabins of the park. Natural areas of the park may not be used for this purpose. Rental cabins should be provided with good road and boat access. But on the other hand, major areas have already been reserved for private dachas (summerhouses) or ecological co-operatives. Cabins are important elements of the Park tourism infrastructure, although the majority of cabins should be owned and services by special tourist firms on a contract base with the Park. The majority of cabins owned by the Park will be concentrated (at least at the beginning of the Park establishment) at the Ecological Education Centre on Riekkalansaari and information point in the Kirjvalahti Bay. The capacity of each cabin would be 6 people. Some of the cabins can be made for winter use, too.

The following list presents the proposed location of rental cabins:

- Taruniemi Peninsula;
- Riemulahti Bay (Riekkalansaari Island, the site of the ecological centre);
- Southwestern shore of Riekkalansaari Island;
- Kirjvalahti Bay (the site of the information point);
- Kirjvalahti Bay (by the House of Composers).

#### 4.4.2. Camping grounds

Camping grounds serve visitors accommodation in a safe, guarded area, where there are more facilities available than in a simple campsite. Usually there is also a road connection to a camping ground. In summer there is a guard working, who has the responsibility of all actions: heating the sauna, firewood, tidiness, information guarding. There is a charge for tourists using these services.

Some of the camping grounds will be created on the base of former or nowadays closed pioneer camps and tourist centres. New constructions are needed in townships and villages. Each camping ground consists of a hotel-type building combined with a café-restaurant, or separate houses and café-restaurant (former tourist centres), in the latter case – a fireplace, table with benches and a toilet is needed. Car parking spaces will be constructed. Camping capacity is 10-40 people. Camping grounds are placed mainly nearby the Priozersk-Olonets road, on which all land tourists go.

The total number of camping grounds is 11, the capacity of each is 10 to 40 persons. The total one-time capacity is 205 persons. See fig. 15 for location of the camping grounds and their capacity:

- ❑ Mejeri settlement, 20 persons;
- ❑ Kortela settlement, 20 persons;
- ❑ Reuskula settlement, 20 persons;
- ❑ Mejeri settlement, 15 persons;
- ❑ Vuorio settlement, 40 persons;
- ❑ Rantue settlement (Riekkalansaari Island), 20 persons;
- ❑ Surroundings of the Sortavala town (Markatsimansalmi Bay), 20 persons;
- ❑ Kirjvalahti Bay (by the House of Composers), 30 persons;
- ❑ Rautalahti settlement (Pitkäranta District), 10 persons;
- ❑ Hiidenselkä settlement, 20 persons;
- ❑ Impilahti settlement, 20 persons.

#### 4.4.3. Campsites

At present the territory of the Park contains several hundreds of campsites (for 2 or more people). In this plan, campsites are places where camping is possible and some simple services such as fireplaces, firewood, table and bench and toilets are available. The use of campsites is free of charge. They are regularly served and supervised by park staff. Sectors with sand beaches and meadows are the most preferable places for tourist campsites with accommodation for more than 10 people. In general the Park area contains 40-50 places for tourist campsites with 10 or more people and up to 900 people total capacity at a time. Suitable places for less capacity are not counted. Places for ecological camps will be considered as campsites as well when there are no camps organised on them.

When improving a campsite there is a need to arrange a fireplace, table with benches around (1 or 2 depends on the camping capacity), shelter, shed for fire wood, toilet (1 or 2-3 with capacity 20 or more people), litterbin, pier for boats, information board (actively visited areas). A pier is constructed on demand because there are many comfortable places for mooring boats in shallow sand beaches or shore rocks. Piers are needed only if the capacity of campsites is more than 20 people and there is a lack of space for several vessels moored at the same time.

Below there is a list of perspective campsites (fig. 15), which have been actively used by wild tourists. In brackets – the distance from the island to the nearest settlement and capacity is given.

- ❑ Northern shore of Kulvaansaari Island (5 km – Lahdenpohja, 20)
- ❑ Southern shore of Heposalonsaari (8 km - Lahdenpohja, 20)
- ❑ Western bay of Heposalonsaari (11km- Lahdenpohja, 20)
- ❑ Continent to western shore of Ilmensensaari (7 km –Korteela, 2 sites for 20 people each)
- ❑ Continent to western shore of Puutsaari (9 km –Korteela, 40 people)
- ❑ Northern bay of Puutsaari (10 km – Reuskula, 2 sites for 15 people each)
- ❑ Southern shore of Puutsaari, Laurinlahti Bay (12 km - Reuskula, 15 people)
- ❑ Meklahti Bay (5 km – Reuskula, 2 sites for 10 and 30 people each)
- ❑ Southern shore in the start of Meklahti Bay (8 km - Reuskula, 20 people)
- ❑ Nevalahti Bay (3km – Mejeri, 15 people)
- ❑ Kirjvalahti Bay (6 km – Helylä, 10)

- ❑ Southern shore of Palosaari (5 km – Meijeri, 15)
- ❑ Western shore of Sammatsaari, Palolahti Bay (5 km – Rautalahti, 2 sites for 10 and 30 people)
- ❑ North-east of Sammatsaari (7 km - Rautalahti, 15)
- ❑ South-west of Rautalahti peninsula (7 km - Rautalahti, 2 sites for 10 and 15)
- ❑ Northern shore of Markatsimansaari, Alexander Bay (10 km – Haapalampi, 3 sites for 10, 10 and 40)
- ❑ South-east of Riekkalansaari (6 km – Sortavala, 2 sites for 10 and 20)
- ❑ Southern shore of Heikarisensaari (8 km – Vuorio, 20)
- ❑ North-eastern shore of Orjatsaari (12 km – Sortavala, 30)
- ❑ South-eastern shore of Orjatsaari (13 km – Sortavala, 2 sites for 10 and 30)
- ❑ Southern shore of Honkasalo (13 km – Sortavala, 2 sites for 15)
- ❑ Eastern shore of Tulolansaari, Pelkonselkä Bay (10 km – Sortavala, 2 sites for 20 and 50)
- ❑ North-eastern shore of Pellotsaari (7 km – Impilahti, 10)
- ❑ Eastern shore of Pellotsaari (7 km – Impilahti, 50)
- ❑ Southern shore of Pellotsaari (8 km – Impilahti, 40)
- ❑ Southern shore of Raipatsaari (12 km - Impilahti, 20)
- ❑ Eastern shore of Hiidenselkä (3 km - Rautalahti, 15 )
- ❑ North-western shore of Hanukka (4 km - Impilahti, 10)
- ❑ Eastern shore of Hanukka (4 km - Impilahti, 10)
- ❑ Kulhonnaemi peninsula (4 km - Impilahti, 10)
- ❑ Sumerialahti peninsula (2 km -Sumeria, 10)
- ❑ South-eastern shore of Lake Haukkajärvi (3 km – Harlu, 10)
- ❑ Western shore of Lake Ristijärvi (3 km – House of Composers, 30)

The total capacity of campsites at a time is 905 people. If counting tourists during 15 days in July and August, 5 – in June and 2 – in September, the overall capacity will grow up to 30 000 person/day/year. On the subject of wild campsites with capacity of 2-4 people, this figure shall be at least, doubled.

At present there are 4 campsites with a total capacity 70,000 people built, what makes 2,500 of organised tourists a year. Having some new camping sites (4 per year) in the process of construction the maximum recreation capacity will be achieved 10 years after the park establishment.

#### 4.5. Ecological Education Centre

The main task of the Ecological Education Centre is to train schoolchildren, students and grownups in different kinds of ecological questions in a classroom as well as outdoors. The Ecological Education Centre could be a good continuation for the work already done for years in organising ecological camps and rowing tours for school children from big cities and smaller towns. The centre could be working all year round.

The location of the Ecological Education Centre is planned in the eastern part of the Riekkalansaari Island western shore of the Riemulahti Bay, opposite the famous scenic spot Riuttavuori, on an open meadow and former farmlands. It serves the purpose of allocating other national park functions on the base of the Ecological Education Centre. Ecological camps can partially utilise the same premises. Camping grounds with summer and winter cabins can share the same area. Guided tours to the park can have one of their starting points here in summer.

The Ecological Education Centre consists of an administrative building with a lecture room and laboratory specially equipped to study nature objects (microscope, binoculars, chemical ware, reference books etc), staff only premises, 10 cabins – 6 people each, living house for a guard. There is a need to construct a road 1-km long, electrical cable – 2 km long and a pier for boats. There is one of the most interesting ecological trails near the centre.

Such services as rental cabins and tourist equipment are also available from the Ecological Education Centre. It is necessary to organise a boat station for rowing boats, water cycles, canoe and yachts.

#### 4.6. Ecological camps

The visitors of ecological camps are mostly school children and students, so the camps should contain and reflect abilities of the Park aspects of ecological, educational and research process (which are many),

good accommodation conditions and less contact with tourists and the local population. Therefore, the best location of camps will be islands (a similar approach was applied in the Vodlozero NP). Zones of ecological tourism are the most appropriate places. The most perspective areas for ecological camps are as follows (fig.16):

- ❑ Riekkalansaari Island, western part right opposite to the Taruniemi peninsula, very close to Sortavala and with easy access by car. Research work on the geological structure and history of the mining industry (several sandpits, mines, etc.) could be organised on the territory of the Park.
- ❑ Riekkansaari Island, eastern part (within the Ecological Education Centre, see above)
- ❑ Tulolansaari Island, northeast shore of the island. Access is available only by water transport means. There is a mooring place, which used to be a stop for tall tourist ships moving to Valaam.

#### 4.7. Ecological trails.

There are two kinds of trail in this park: ecological trails and hiking trails. Usually the former ones are shorter and provided with more detailed information about the sights of the trail. Hiking trails are often made for one day or several day hikes. Sometimes, the difference is not clear. For example, two trails on Puutsaari, two trails on Riekkalansaari and the trails north of Kirjavalhti and on Kulhonniemi Peninsula can be considered as ecological tours as well as hiking trails.

Educational ecological trails are intended for acquaintance with natural places of interest in the Park. Before starting to choose ecological trails several conditions should be considered. Trails should be attractive, rich with beautiful sites along the way including peculiar nature features and its bio-diversity. Trails should be easy to access and close to local settlements, with good entrance roads. Trails should contain a lot of information and meet all the requirements of the majority of natural development trends. The length of ecological trails, as a rule, should be 2-3 (4) km, which could be covered within 2-4 hours. Rarely ecological trails (walking-educational, to be exact) are calculated for a one-day route. Normally a one-day route is up to 8 km (Chizhova et al., 1989). As a rule, ecological trails are circled or a central part of a trail goes round something (other variants: direct or radial). The elaboration of trails should be based on the existing road-path net, which contains the most favourable for movement conditions and demands less expenses for the trail development process. Ecological trails are prepared so, that a visitor would not need any special equipment. Such trails should be provided with bridges over brooks, causeways in damp places and stairs curling up to steep slopes. Some parts of the trail could contain ground coating and sand.

Each stop along an ecological trail should contain an information board, place for rest, toilet, litter bin, etc. There are a lot of possibilities for the organisation of ecological trails within the existing road-path net. Also there is a good opportunity to arrange panorama views on the trails because there are many here. It would be reasonable to create ecological trails near ecological camps. In general 10 ecological trails (fig.16) could be organised in the territory of the Park, but start with 1-2 in the beginning.

The following territories will be the most prospective for ecological trail organisation:

- ❑ Puutsaari Island. Circle trail 4 km long, starts and ends near the Laurinlampi Bay and partly goes along an old monastery road, passing Lakes Tervalampi, Vuorenlampi, Laurinlampi.
- ❑ Taruniemi peninsula. Circle trail 2 km long, starts and ends in the dendro-Park, goes along the Ladoga shore through picturesque cliff ridges, partly along the path.
- ❑ Riekkalansaari. Circle trail 4 km long, starts and ends near the mooring place opposite the Taruniemi peninsula, goes along the path on the Ladoga shore.
- ❑ Riekkalansaari. Circle trail 3 km long, starts and ends near the Petrukka Bay, includes climbing up to Mt.Riuttavuori with a beautiful panorama view.
- ❑ Tulolansaari. Circle trail 3 km long, starts and ends in the upper Pelkinkelä Bay near the mooring place, goes along forest path to the Sikavuori Mountain and then along the Ladoga shore.
- ❑ The Kirjavalhti Bay. Circle trail 4-km long, starts and ends in the upper bay, passing Lake Ristijärvi, then along streams.
- ❑ The Kirjavalhti Bay. Circle trail 3 km long, starts and ends near the Pansuniemi peninsula via the Piispanvuori town with gorgeous panorama views.
- ❑ The Sumeria settlement. Circle trail 3 km long, starts on an old road then along Ladoga shore.
- ❑ The Hiidenselkä settlement (Joensuu). Circle trail 2 km long, goes via the Hiidennvuori town with beautiful panoramas.

Taking into consideration the rich biodiversity of the Park with a great number of nature monuments, it is worth elaborating ecological trails of different profiles – landscape, geological, hydrological, botanical, dendrological, zoological, ornithological, ethnical and etc. The improvement of ecological trails will be sufficient after the Park establishment, during the process of the development of the tourist infrastructure and cumulative data of nature objects.

#### 4.8. Hiking trails

Usually hiking trails in the Park do not take more than 5 days. As far as the proposed Park is easy to access, the maximum duration of hiking trails should not be more than 2-4 days. Such trails should be provided with bridges if through water areas, causeways in damp places and stairs curling up steep slopes (to protect rock vegetation), observation towers. Some parts of the trail could contain crushed stone, ground coating, sand or sawdust.

During the construction of the Park, the designing and making of one new hiking trail a year is a good start.

Here are the places for the most prospective routes (fig.15):

- ❑ Puutsaari. There is a road going through the whole island on its minor part with a length of about 8 km. Nature complexes along this road represent all the nature diversity of the Park. Minor paths can come to the Kontiöcuonmaki Mountain with beautiful panoramic views. Start and end of the trail – in Laurilahti Bay, which is a good mooring place for all kinds of vessels. Here there is a ruined Skit (Chapel) of the Valaam Monastery.
- ❑ Riekkalansaari. Circle trail of 12 km long starts on the southwest shore near the Taruniemi recreational centre and goes along the southern part of the island.
- ❑ Tulolansaari. Circle trail of 14 km long starts in the Pustinlahti Bay, goes round northern and eastern parts of the island.
- ❑ Honkosalo. Circle trail of 8 km long will cross the island from south to north in its western part.
- ❑ The Pötsövaara Mountains. It is the most perspective and popular trail in the Park. Circle trail of several variants (may be used as a lineal route), starts and ends near the House of Composers in the Bay of Kirjavalhti, or near Lake Ristijärvi (western part of Kirjavalhti) or Lake Haukkajärvi (near Harlu township). The length of the circle part is about 20 km, overall length – 30 km. to the Pötsövaara Mountain and back to the House of Composers. Length – 15 km. It goes along strongly cleaved terrain. Key objects are the Pötsövaara Mountains, which is the highest point above the sea (187,6 m). Average duration is about 2-4 days, stops for rest and night. To come to the strictly protected zone there is a recreation corridor 2 km long and 100 m wide (compartment 198 of the Ladoga forest range, compartments 105, 106 – Läskelä forest range). The recreation corridor contains neither places for overnight stay nor fire places.
- ❑ Kulhoniemi peninsula. The trail of 12 km long starts in the Sumeria village via area with partly damaged nature complexes. The trail needs to be reconstructed or shortened otherwise up to 8 km.
- ❑ Mäkisalo. Line route of 4-km long starts from its northern point via south-eastern shore and ancient fortress to the bay.
- ❑ Pellotsaari. Line route of 3 km long crosses the island in meridian direction.

Besides that, practically every island contains the possibility to arrange hiking trails along the shore of the island (if not included into strictly protected or special protected zones) or cross the island (on existing roads and paths).

#### 4.9. Water routes

Water routes are situated all over the Park area, except protected water areas. Concerning the curvy shoreline of the Park having a big number of isles, bays, camping and overnight sites, the length and duration of water routes is not limited.

In general all routes could be divided into three groups:

- 1) Line route 30 km long – Impilahti–Sortavala (boat pier on Riekkalansaari is ready there is an opportunity to have another mooring place for boats in the Sortavala area), goes along the

Hiidenselkä-Kirjavalahi Bay and visits islands: Raipatsaari, Pellotsaari, Mäkisalo, Tulolansaari, Riekkalansaari etc

- 2) Circle route 30 km long – Sortavala and its vicinities, starts and ends in Sortavala or on Riekkalansaari, stops on the Taruniemi peninsula, goes to islands: Riekkalansaari, Havus, Heposaari, Orjatsaari, Tulolansaari, etc.
- 3) Line route 50 km long – Sortavala (or Riekkalansaari) – Lahdenpohja, stops on Taruniemi peninsula, Riekkalansaari, Havus, Markatsimansaari, Sammatsaari, Puutsaari, Heposalonsaari, Kulvaansaari, etc.

All stops are maximum brought to campsites. If routes take place in the peripheral part of the skerries, which is the special protected zone for the Ladoga Seal protection, special regulations should be followed (chapters 1.4, 2.3).

There is a specific water route 70 km long, which takes 4 days to watch Ladoga Seal.

#### 4.10. New roads

The Northern Ladoga area contains 17,6% of the total highway length of the general Republic use (Nemkovich, et al., 2000). So, the territory of the Park differs from the rest of the existing and proposed Parks in Karelia by its good transport accessibility (car, rail, water, air) and a well-developed net of roads (highways) inside and along the Park borders (fig. 17), although only 2 % of roads are paved (Feasibility Study., 1995). It is rather evident that new road construction in the inception phase of the Park activity will be minimum (1 km of road leading to an Ecological Education Centre). Attention should be paid, at least in the beginning, to repair works of the existing roads leading to the main recreation objects and also bridge reconstruction and improvement.

#### 4.11. Car Parks

Besides existing guarded car parks in Sortavala, there is a need for constructing new ones in big townships, which represent the most important recreational centres and objects: Sortavala (Visitor Centre), Lahdenpohja (information centre), Läskelä (information centre), Lesozavod (Hiidenselkä), Impilahti (information centre), Taruniemi peninsula (information centre). Car parks are important near the start of hiking trails: 0,5 km westward from Haukkajärvi (starting point of the trail to Pötsövaara Mountains, campsite), Lake Ristijärvi (campsite) and near ecological trails: Lahdenkula township, Kirjavalahi Bay (2 campsites), Sumeria township. Other recreational centres, hotels and camping sites in order to provide car security include this fee into the price list of accommodation.

#### 4.12. Piers

Piers are constructed close to campsites and ecological camps, starting points of ecological trails and hiking trails. Either repairs of existing piers or the construction of new ones is needed. In general there is a need for 40 piers to be repaired or constructed.

#### 4.13. Boat stations.

To provide successful work of the Park and meet the requirement of the visitors the Park will need boats of small size, 2-4 motorboats, rowing boats, water cycles and canoes. Several boat stations will be necessary to maintain all boats in:

- ❑ Sortavala. Station for small boats and pleasure motorboats servicing the central part of the Park and Kirjavalahi Bay. It is constructed on the existing boat mooring place.
- ❑ Lahdenpohja. Station for small boats servicing the south-western part of the Park. Slipways and a pier are needed.
- ❑ Lesozavod (Hiidenselkä). Station for small boats and rowing boats for rent servicing the northern part of the Park. Slipways and a pier are needed.
- ❑ Riekkalansaari (part included in to the Ecological Education Centre, see 4.5.). Station for small boats and rowing boats, water cycles, canoes and yachts. It is located in the centre of the Park and servicing the whole territory. It is necessary to construct a pier.

- Impilahti. Station for small boats and rowing boats for rent in the eastern part of the Park. Slipways and a pier are needed.

## 5. Park staff and administration

When the park is established, the land, waters and forests are moved to the ownership of the national park. The territory of the Ladoga Skerries National Park is wide, it represents a piece of the most beautiful part of Russia. Thus it is natural, that the personnel of the park must be skilful professionals with appropriate equipment and they have to be able to take the responsibility of this property of the whole nation. The administration and management is not serving only environmental functions but to effectively develop activities of the Park given by the legislation in force and other normative documents.

The structure and park staff is determined according to "Regulations on National Parks in the Russian Federation" No 769 of August 10, 1993, approved by the Decree of the Ministry Council of the Government in the Russian Federation, and "Temporal typological structure of a National Park" (Annex 1 to Decree of the Federal Forestry Service of the Russian Federation No 59 of March 22, 1994).

The total number of staff is 45 persons, divided in five departments. The following structure and personnel is proposed for the national park.

**Table 4**  
Staffing scheme of the Ladoga Skerries National Park

Task	Officers	Nr of pers.	Grade	Year* of hiring
Administrative department		6		
Management of the park activities, economy, activity planning, reporting, personnel policy, contracts, legal matters, permissions for visitors, telecommunications, training of staff	Park Director	1	18	1
	Assistant manager	1	15	2
	Legal adviser	1	15	5
	Chief accountant	1	17	1
	Secretary	1	4	1
	Cashier	1	4	1
Department of forestry and protection of natural and cultural heritage		18		
Nature protection, protection of historical objects, forestry, supervision of the park territory, construction and maintenance of houses and facilities, fire fighting	Deputy Director	1	17	1
	Constr. engineer	1	12	2
	Inspector	6	9	1
	Lumberjack	5	8	3
	Constructor	5	8	2
Tourism Department		12		
Development of tourism products and services, marketing, selling, production of information material, ecological education, organisation of guiding, visitor centre, booking of cabins, creation and maintenance of electronic communications	Tourism chief	1	17	1
	Economist	1	11	2
	Marketing expert	1	15	2
	Computer engineer	1	14	2
	Guide	5	15	3
	Secretary	1	4	2
	Teacher	2	15	5
Scientific Department		3		
Carrying out of inventories and research related to park management, develop research activities, keep contact with research institutes, interpreting of scientific information to other departments and planning active nature management, maintain files about the species and ecosystems of the park	Scientific director	1	16	1
	Scientist	2	13	3
Department for supporting services		6		
Transport services, maintenance of vehicles and equipment, assistance in construction work, supporting the other departments, waste disposal, cleaning of premises	Transport chief	1	12	1
	Driver	3	7	1
	Technician	1	4	1
	Office cleaner	1	4	2
Total		45		

\* Year of hiring shows the year after the establishment of the NP when the persons in question shall be hired.

The administration of the Park is guided in its operations by normative and legal acts of the Russian Federation. To develop the tourist infrastructure, the Park is establishing partnerships with all stakeholders, enterprises, and entrepreneurs. To preserve the natural and cultural heritage in the protected area, the Park develops co-operation with many environmental and non-governmental organisations from both Russia and abroad. When discussing issues related with the socio-economic life of the towns around the park, the administration agrees its actions with local authorities and the Governments of Karelia and Russia.

National parks are federal organisations, strictly controlled in their planning and reporting systems to normative acts of different kinds. In spite of that, it is very important for the park director to create good and functioning relations with local administrations where the park is situated. From the beginning the park administration should have a keen sense of hearing to local points of view whenever they are not in contradiction with park objectives. Particularly, in developing tourism plans and investments should be in line with the surrounding territories. When hiring employees to the park, the park can offer job opportunities for local people. The national park should take seriously all local tourist entrepreneurs, who would like to take groups to the park. Instead of setting obstacles, the NP should encourage their activities within the limits of the park regulation. Good co-operation with all stakeholders and neighbours is necessary for the smooth development of the NP.

## 6. Organisation of the main activities of the Park

### 6.1. Protection of natural and cultural heritage

Pursuant to the Regulation on Russia's National Parks (1993, chapter 5) a differentiated regime of protection, conservation and use is to be established in the National Parks with a focus on their local natural, historical and cultural, and social features. The Park administration defines marginal tourist traffic in the Park.

The most important objective of national parks is the protection of natural and cultural heritage. In line with this purpose, regulations of the Park and rules for visitors have been elaborated. According to official documents about "Decrees of National Parks" regulations of national parks are provided with a department for the protection of natural and cultural heritage. In this park the department of forestry is combined with that one. The department has the responsibility of supervision, even if it also belongs to the tasks of each park staff member, whenever seeing or hearing something relevant from the point of view of supervision.

The administration of the Park and its departments are co-operating with federal authorities of protection of different nature resources (water, fish, animals), security services and the frontier guard. Public inspections could also take part in the protection of a national Park.

Federal inspectors have specific rights to control activities and prevent infringements of Park regulations. Experts of this service have the right to use guns in extreme situations.

The main duty of inspectors is to supervise the park territory so that all illegal activities are impeded. Particularly, in a national park the Park Regulation and the regulations in the functional zones are the main targets of supervision. It is organised so, that patrols cover the whole park territory, but are more frequent on areas where people are moving actively or where access is easy by car or boat. The reproduction period of animals, hunting and fishing seasons, dry seasons in summer are to be taken as special challenges for the inspectors.

Due to the dominance of forests, fire prevention and fighting are important in order to protect the natural and cultural heritage of the NP. Forest fires, mainly originating from careless handling of fire by visitors, was a serious problem in the park in the 1990s. The aim is fire prevention improvement of the territory to allow preventing fires if such occur, timely detection, localisation and extinguishing. They are organised in compliance with "Guidelines on Fire Prevention Projecting..., 1982".

The forest cover of the National Park is characterised by dry pine forests on shores, which feature high fire danger. If a fire is started during the fire-risk period, one may surely forecast the free expansion of fire over large spaces. The only barriers could be open outcrops, waters and roads. However, even these barriers do not guarantee the localisation of fire, in particular this regards crown fires. Thus, fire prevention facilities are needed, which would allow timely spotting, localisation and putting out fire.

The key element of fire prevention actions is prohibition of making fire outside specially designated places. Fireplaces are established across the territory of the Park and supplied with firewood. Visitors are presented with a detailed map where all these sites are located (including those marked in the field) and instructed on making fires and sanctions to be applied to violators is a must in the Park. This operation will require little cost while if it is adequately organised this will ensure the minimisation of fire risks.

Detection of fires. In the case of too small investments, the detection of fires will be done by any park staff member moving in the park or by a well-developed information system, organised by the municipal authorities.

Fire fighting. During the fire risk period a group of staff is appointed and equipped with fire extinguishing tools. The equipment needed is always available close to good communications. The fast patrol boat of the park can be used for transporting out personnel and equipment.

Almost ten percent of the park area is meadows, partially overgrown by bushes and broad-leaved forests. These meadows are situated all over the park territory from the deep forests north of Kirjavaltahti to the outer islands as for example Puutsaari. Fields were actively cultivated during the Finnish settlement until 1930s. After that only here and there some agriculture has taken place, nowadays there is practically no such activities.

Some of these meadows should be kept open in order to maintain the old cultural landscape on the islands. There are also some rare plants and plant communities on these meadows, followed by interesting fauna. The exact area of the meadows is not known, but it is approximately 6000-8000 hectares. An inventory should be carried out so, that the most valuable meadows from the point of view of cultural landscape, history, flora and fauna, could be identified. After that an action plan to manage the meadows should be prepared. The plan should show the areas, objectives and methods for meadow management. The main approaches will certainly be haymaking and pasture with cows and sheep. Also the possibilities for new agricultural settlement in the park should be clarified. The park regulation may not close the door for this kind of park management.

The management can be carried out on a limited, most valuable part of the meadows with the help of agricultural companies, private farmers and voluntary workers. In the best cases some income from meadow management can be possible.

## 6.2. Ecological education

Ecological education is one of the main tasks of this national park. The objectives of that is to organise training in different forms for school children, students and grown-ups. Training of teachers, trainees and guides is a part of the activity. The headlines of training are ecology, environmental issues, local nature, good behaviour in nature, etc. So far ecological education is a task of the tourism department. In the long run the Park should have a separate department of ecological education with the aim to co-operate with educational institutions, federal and regional authorities and mass media. International funds and non-governmental organisations should be attracted to ecological education development.

The construction of an Ecological Education Centre will improve the possibilities of the Park to advance this activity. Teaching in nature is one of the ideas behind ecological education. The Centre will be set up on Riekkalansaari, but the whole park territory (except the strictly protected zone) should be used for this purpose. The three ecological camps in the park supplement the network of lecture rooms in nature.

For achieving the objectives, it is expedient to engage specialists from the Republican ecological centre, Sortavala station of young naturalists, Small Forest Academy, higher education institutions and research

centres. Summer apprentices in the form of students from different institutes can be engaged in the work of ecological camps.

### 6.3. Scientific research

The research activities of the park are regulated by "The Decree on National Parks of the Russian Federation" (1993). It is aimed at "...development and implementation of scientific techniques of preserving biological diversity, natural, historical and cultural complexes, and forecast of ecological environment in the region". Research is possible on the whole territory of the park, including the strictly protected and special protected zones. Permission of the Park Director is needed, whenever access to these protected zones or any other measures exceeding what is allowed for ordinary visitors, is expected. The Scientific Board of the park co-ordinates research so, that co-operation between the park and researchers will advance with mutual benefit. The park administration shall request annual reports from the scientists who are working in the park. Special attention should be paid to reporting the information in spatial form so, that it can be utilised in the Geographical Information System of the park.

Research is carried out by the staff of the park, and – upon a contract – by research organisations, higher education and vocational training institutions of relevant profiles. External organisations must agree the research with the administration of the park.

During the first phase of the park's existence research activities should be concentrated on inventory work. Many of the valuable habitats and endangered species in the park are still unknown. At the same time, momentum must be built for long-term monitoring by means of facilitating training grounds, stations and test sites, etc.

Subjects of research must be balanced with the needs of the park. The park administration needs information about the natural and cultural heritage of the Park. This information is essential so, that the park can do its best in allocating resources and avoiding mistakes in management. Information is also needed in tourism development, training of guides and ecological education. The preparation of popular scientific publications about nature, cultural and historical heritage of the park, booklets describing tourist trails and tourist routes with expert description of all natural sights, and recommendations on rational natural resource utilisation and park's biodiversity conservation will be one of the major results of research activities.

### 6.4. Tourism development

The territory of the park is the most frequently visited recreation area in Karelia. Up till the end of the 1980s, a large number of recreation facilities were in operation here: spas, rest homes, tourist and pioneer camps. At present, almost all of those facilities are closed and their owners have changed. The number of tourists in 2000, according to various calculations, was altogether, local people included about 15 000 visitor days. At the same time, the share of commercial tourists did not exceed 500 visitor days. They were served by tourist firms of St. Petersburg and Sortavala. Actually the whole tourist infrastructure is to be developed anew, and the revival of former facilities is possible.

At present, predominantly non-managed, or the so-called wild tourism prevails on the territory of the park. The dominating visitor categories are fishermen, local people picking berries and mushrooms, boat tourists and stray visitors on a round trip. There are only rough estimations of their numbers, because the territory is easy to access by car to the continental part and by boat to any of the islands. In addition, the numbers of visitors are changing a lot year by year due to the weather conditions in summer and the price of petrol.

"Blue Road" connecting Norway, Sweden and Finland with Karelia cuts across the park (Historical and cultural...,2000) and brings about 20% of all the tourists to Karelia (i.e. about 40 thousand visitors per year). It can be assumed that many of these tourists are interested to see part of the National Park. In order to attract them, information cabins are needed at the head of Kirjavahti Bay and Impilahti village along the "Blue Road".

The main tourism attractions of the Ladoga Skerries National Park are the following:

- ❑ **Lake Ladoga and the archipelago as a whole.** The open lake, the sheltered natural harbours, high cliffs, the inlets and islands. This part of the park is interesting for sailors with small sailboats or larger yachts, which can freely fight winds in deep waters. It is also interesting for motor boating, rowing tours and canoeing. There is plenty of room and fresh wind for these kinds of interests. Fishermen have here innumerable chances to try their skills with all the 58 fish species met in the lake, including such interesting challenges for sport fishing as salmon, brown trout, char and grayling. – In summer 2000 the inconvenient piloting system on Lake Ladoga was still valid. However, it is to be expected that piloting, as well as passing St. Petersburg, will be facilitated in near future. That would open the marvellous big lake for foreign boats and bring remarkable amounts of tourists to all the harbours of northern Ladoga.
  
- ❑ **Riekkalansaari and Honkasalo** with small islands around form the biggest island group just outside Sortavala. On Riekkalansaari there are remnants of old settlement and even the town Sortavala was earlier on this island. On the opposite side of the current town there is St. Nikolas Church, so called provorje of the Valaam Monastery, which is the oldest church in the northern Ladoga area. It was built in the 18<sup>th</sup> century. On the other side of Riekkalansaari, there is a high scenic spot of Riuttavuori. In the outer parts of the islands, many other high hills are overlook the lake southwards.
  
- ❑ **Islands around Tulolansaari.** Some large islands with remnants of old Finnish settlement, but which nowadays are inhabited only by wild animals. Many beautiful inlets and coves. Also here some high cliffs dominate the landscape. The most famous of them is Mäkiluoto, where the ruins of a prehistoric castle can be seen. The famous Pekanriutta rises over 80 meters from the lake and hides many rare plants on the cliff shelves.
  
- ❑ **Taruniemi and Villa Winter** with dendrological garden. The main building is designed by the famous Finnish architect Eliel Saarinen. It is now under repair and will most probably be opened for tourists in the near future. A place of culture and history. Taruniemi can be reached by car and it is possible to continue the tour from here by boat.
  
- ❑ **Animals of the National Park.** The outer parts of the park territory are the realm of the Ladoga Ringed Seal, a shy and beautiful animal. In spite of the threatened position of this species, it can be seen fairly easily lying on low grounds. The outermost shores of the archipelago form a strictly protected zone of the park, where, due to calving of the seals, there is no access for man between March 1 and May 31. – In late May – early June the huge nature spectacle of arctic bird migration passes over this archipelago. The high hills of the park offer an excellent opportunity for bird-watchers and others to follow how tens of thousands of geese, ducks and waders are heading to the breeding grounds in the arctic tundra.
  
- ❑ **Impilahti village** in Pitkäranta is located in a beautiful place of hills and river. When arriving from the lake, the village is at the head of a long bay like a fjord. Many scenic spots are available. Here earlier the western and eastern churches met. Around here heavy battles took place during the Winter War. Today the remnants of the past can be seen.
  
- ❑ **Wilderness north of Kirjavalhti** is a large territory, with high hills, deep lakes and steep slopes. There are only a few roads nearby. In places, the flora here is very rich due to basic bedrock. Many rare animals or tracks of them typical for deep forests can be observed here. The highest hill is Pötsövaara, the top of which is at 187 meters. This wilderness is a real challenge for hikers and nature observers, because the high relief and dense forest combined with a lack of good maps make forest walks more interesting than usually. – Near the shore of Lake Ladoga, by the road are two interesting objects of different kinds. Villa Jääskeläinen (the House of Composers) is historically interesting and Paksuniemi is famous for rare plants.
  
- ❑ **Puutsaari** outside Lahdenpohja is a fairly large and beautiful island by the open lake. The waterway to Puutsaari, both from Lahdenpohja and Sortavala, goes along long and narrow sounds of the archipelago. There is a good and sheltered harbour open from south, also some coves on the northern side facilitate taking ashore on the island. It is famous for the Skita, a small Monastery working under Valaam. It is now under repair.

Tourism development of the Ladoga Skerries National Park will be based on the infrastructure presented above (chapter 4). A more detailed strategy for the development of tourism in the park is presented in the report 'Tourism Strategy of the Karelian Green Belt' (Friman & Högmander, 2001). According to that, there is no evident reason to be seen for a growth of non-commercial visitors. Their number would stay at about the current level (15 000 visitor days) through the next twenty years. If the planned investments for tourism and National Park development can be realised, the number of commercial tourist could rise from the current 500 to 5000 in 2010 and reach 15 000 in 2020. However, it should be noted, that tourism investments in a national park are relatively low and the number of direct and indirect job opportunities are relatively high. There are many actors in the tourism business in the archipelago and only a part of the income from tourism will come to the park. Co-operation between the park and both domestic and foreign tour agencies is the best way to ensure a good quality of products, which are some of the most important goals in tourism.

## 7. Action Plan for the five first years of the Ladoga Skerries National Park

### 7.1 Priority actions

The most urgent tasks for the first five years of the Park's activity are:

- 1) creation of the administration with the departments,
- 2) to get the park territory under control and guarantee the protection of valuable objects
- 3) to start planning and realising infrastructure (office, visitor centre, ranger stations, camping grounds, hiking trails etc.),
- 4) to start designing information material for visitors,
- 5) tourism development and inclusion of the Park into the network of tourism business

The list of investment planned for the Park is given in the Annex 2. Below, there is a short list of the main actions to be fulfilled in the first five years of the Park work.

**Table 5.**

Plan of actions for a five-year period.

Year	Main actions for each year	Remark
1	Creation of the National Park's administration by hiring the first eighteen employees	Park director, heads of the future departments, five inspectors and some others
	Agreeing with the Municipal Entity of the Park about handing over of the equipment purchased by the Tacis project ENVRUS9704	See a separate list of equipment in the Annex 3
	Fulfilling the repair of the office or to hire an office for the park	Project for repairing the office and Visitor Centre building
	Providing it with furniture and equipment needed	
	Purchase vehicles and tools	
	Designing of an individual; Karelian construction style for the NP and a general plan for the Ecological Education Centre	Project for an architect and designer
	Designing of an exhibition for the Visitor Centre	V.C. located in the office building, design needed only if not yet done
	Start designing information cabins, camping ground and campsites by an architect	
	Start training the staff, particularly inspectors to know the territory	To be done by a special team of workers of the NP
2	Hiring twelve more persons in the park administration	Including 5 constructors
	The NP takes in use a practise to hire annually temporary workers for the season May-October	Mainly constructors, guides
	Creation of Tourist Department	Tourist Dept will be established as a separate result unit in order to follow the economy of tourism
	Creation of the other departments	
	Preparing and forwarding the Ladoga Skerries National Park Regulation	
	Design an architectural plan for the info cabins	
	Start constructing info cabin in Lahdenpohja	

	Start constructing the Kirjvalahti hiking trail	If not fulfilled earlier
	Constructing a camping ground in the eastern part of Riekkalansaari and four campsites	
	Purchase more vehicles and equipment	
	Continue training of personnel, particularly that of tourist department	
3	Hiring thirteen more persons in the park administration	Five guides, five lumberjacks etc
	Start planning information material for info boards and leaflets	Park staffers
	Purchase more vehicles and equipment	
	Constructing a camping ground in Kirjvalahti and four campsites	
	Constructing info cabin in Impilahti	See the full list in the Annex 2
	Constructing the second hiking trail/ecological train	External trainees should be used
4	Prepare information material of the NP	
	Prepare program packages for visitors	See the Tourism Strategy of the Karelian Green Belt
	Start marketing of the park with co-operation with entrepreneurs and tour operators	Model contract taken in use
	Prepare a plan for scientific work in the NP including a monitoring program	By the Scientific Department of the NP, co-ordination in the Scientific Board of the NP
	Prepare a recurrent training program for the park staff and take it in use	By the Administrative Dept.
	Purchase more vehicles and equipment	See the full list in the Annex 2
	Set up information boards with relevant information of the NP and its regulation	
	Constructing a camping ground in Hunukka and four campsites	Park staff
	Constructing info cabin in Kirjvalahti	
	Constructing the third hiking trail/ecological train	Park staff together with experts
	Start road repair	
5	Hiring two more park employees	
	Start designing and manufacturing souvenirs of the NP	By professional designer
	Purchase more vehicles and equipment	See the full list in the Annex 2
	Constructing a camping ground in Kulhoniemi and four campsites	Park staff
	Constructing an ecological camp in Tulolansaari	
	Constructing the fourth hiking trail/ecological train	Park staffers together with experts
	Start marking the NP borders and Strictly protected zone in terrain	

## 7.2 Funding of the activities

A rough budget estimate is prepared based on realising the most important and urgent parts of this plan (see chapter 7.1.). This budget is for the five first years of the park. The circumstances can still change before the park is established. Some of these activities can have been realised already before by the Municipal Entity and also new investments can appear, for example with the help of unexpected external funding.

**Table 6.**

The estimated expenses of the Ladoga Skerries national park during the first five years

	First year in 1000 Rbls	Second year in 1000 Rbls	Third year in 1000 Rbls	Fourth year in 1000 Rbls	Fifth year in 1000 Rbls
Running costs					
Salaries of permanent staff	366	553	736	825	920
Salaries of temporary staff		50	100	100	100
Purchase of services	200	200	200	20	200
Rent of premises	120	120	120	120	120
Office expenses	1	2	3	4	4

Service & maintenance of vehicles	50	50	100	100	100
Travel expenses	20	40	80	80	80
Telecommunication	50	10	10	10	10
Training of staff	10	20	20	20	20
Subtotal	817	1045	1369	1279	1554
Investments*					
Vehicles		400	1700		2800
Equipment, tools	250	275	150	150	150
House construction, repair	2460	1960	960	2790	650
Facilities construction		1545	953	853	623
Road construction, repair	5		405	310	
Subtotal	2715	4180	4168	4103	4223
<b>Total</b>	<b>3532</b>	<b>5225</b>	<b>5537</b>	<b>5382</b>	<b>5777</b>

\* Details of the investments can be seen from the List of investments in Annex 2

There will be some income from park activities. All income will be invested in tourism development, because a national park cannot be and should not show any profit of its activities. In order to follow and develop the economy of tourism, the tourism department of the park should be established as a separate result unit. It means that the department has its own budget and accounts, which helps to recognise all the expenses and incomes originating from tourism activities.

All these incomes are possible only if the park, especially the infrastructure and services, will be developed approximately according to the guidelines of this plan. Before the park establishment the Municipal Entity of the Ladoga Skerries Park has already some equipment, which can produce income for it. The big boat, fast patrol boat and microbus for transports, some rowing boats, the cabin outside Riekkolansaari are already now generating some income. On the investment list attached to this plan, there is time scheduled the purchase of one more big transport boat, some canoes, rowing boats, snowmobiles and one more microbus, which all support tourism development together with some saunas and rental cabins.

An estimate of incomes is shown in table 7.

**Table 7.**

The estimated incomes of the Ladoga Skerries National Park during the first five years.\*

Year	First year in 1000 Rbls	Second year in 1000 Rbls	Third year in 1000 Rbls	Fourth year in 1000 Rbls	Fifth year in 1000 Rbls
Entrance fee					
- to the NP	0	0	0	0	0
- to Visitor Centre	0	50	50	50	50
Transports					
- boat, car	250	250	300	300	500
Renting					
- cabins	50	100	100	150	150
- canoes and rowing-boats	49	98	150	200	240
- other equipment	0	10	17	25	30
Selling of products					
- tour packages	20	40	80	120	150
- souvenirs, postcards etc	1	2	3	5	10
Total	370	550	700	850	1130

\* - All figures gross incomes, the corresponding expenses are included in the expense table 6.

The Ladoga Skerries National Park will be an open park, where no entrance fees are gathered or pass needed for moving in the park territory because the length of the Park's border is 271 km and it is impossible to place an inspector in every kilometre of the border. This approach will mean less income compared with some other parks in Russia, but can be compensated by selling transport services to the park islands.

### 7.3 Funding sources

At least in the beginning, the main source of funding is budget income from the Federal Budget for the national parks. However, the Ladoga Skerries National Park has extraordinary possibilities for getting so called external funding. In the best case, this can cover a part of the investments during the first decades of the park.

So far the establishment of the Ladoga Skerries National Park has been supported by the Finnish agency Metsähallitus, which has the responsibility of the Finnish national parks, Finnish Ministry of Environment (mainly through Metsähallitus) and the European Union through Tacis project "Karelia Parks Development", where this territory was one of five target areas to be developed.

Co-operation with the Finnish Metsähallitus and Ministry of Environment will continue the repair of the office and Visitor Centre building as the main object during the next few years. Also some co-operation has started, under the wings of the Tacis project, with two vocational institutes in Finland, from Varpala and Evo. The former one realised in 2000 the planning of a long hiking route in Kirjvalahti. Their possible support will perhaps be in training and planning of facilities.

In future the Ladoga Skerries National Park can get more external funding through projects funded by foreign or domestic bodies. There are some preconditions, which are of great importance when this kind of co-operation is considered by the funding party:

- 1) the park is working purposefully
- 2) there are clear and well prepared plans of the park activities and they are followed
- 3) the park gives a reliable impression of itself
- 4) the park has realistic plans, preferably even skilfully prepared documents of future projects
- 5) communication and co-operation with the park is easy
- 6) the park administration holds a high esteem training, environmental education, good management
- 7) the park has good relations to local administration.

Due to the location of the park close to Finnish, and European Union, border, it is expected that some new projects with external funding will be initiated in the near future.

In these calculations the largest individual investment, Ecological Education Centre in Riekkalansaari, has planned to be realised through external funding, at least partially. In this plan, the potential external funding is taken into consideration so, that almost immediately after the establishment of the national park, a project plan will be prepared by architects. After that the road, electricity and other basic investments are done. Also the construction of camping ground in the area will be realised during the first few years. After proper planning and the use of the area for ecological camps without more expensive facilities, it will be possible for the park administration to show the potential sponsors, through planning documents and actual use, how the Ecological Education Centre would work on the spot. In the investment plan the EEC is located after the first five years' period, preliminary on the sixth year.

The need of budget funding and external funding in accomplishing this plan can be estimated as follows:

**Table 8**

	First year in 1000 Rbls	Second year in 1000 Rbls	Third year in 1000 Rbls	Fourth year in 1000 Rbls	Fifth year in 1000 Rbls
Running costs	-817	-1045	-1369	-1279	-1554
Investments	-2715	-4180	-4168	-4103	-4223
Income	+370	+550	+700	+850	+1130
Need of budget and external funding	-3164	-4675	-4837	-4532	-4647

The Ladoga Skerries National Park has a good opportunity to increase its annual income year by year. It is expected that this favourable situation will continue, perhaps even improve after the first five years. Without the risk of overrating the chances, it can be appraised that after about ten years work the

income of own activities (mainly selling of services) may exceed that of budget funding. This optimistic prognosis can be explained with the following:

- 1) there are good chances to develop tourism in the territory
- 2) due to the closeness of the border and St. Petersburg, plenty of potential clients are close
- 3) the park has already got a good start in tourism, before visitors have really found the territory. This start can be utilised and even improved with the quick establishment of the national park so, that wild tourism can be got under control

## Conclusion

The territory on which the Ladoga Skerries National Park is proposed possesses outstanding nature to be effectively managed and conserved. This area is of nation-wide importance and meets all the qualifications presented to National Parks. This area has brilliant opportunities for tourism development at even an international level. The establishment of the Park will smoothen the negative impacts of the economic crisis and shift the local economy towards dynamic recreation and tourism business.

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## Annexes

### Annex 1. Threatened animal and plant species of the planned Ladoga Skerries National Park.

Categories: 0 – extinct, 1 – endangered, 2 – vulnerable, 3 – rare, 4 – status is unknown (for the Red Data Books of Russian Federation and Karelia) or declining (for the Red Data Book of East Fennoscandia).

№	Латинское название – Latin names	Английское название – English names	Русское название – Russian names	Красная книга РСФСР – Red Data Book of Russian Federation	Красная книга Карелии – Red Data Book of Karelia	Красная книга Восточной Фенноскандии – Red Data Book of East Fennoscandia	Характер пребывания – Character of stay**
1	2	3	4	5	6	7	8

#### Млекопитающие – Mammals

1	<i>Apodemus agrarius</i> (Pall.)	Field mouse	Полевая мышь		3	3	
2	<i>Capreolus capreolus</i> (L.)	Western roe deer	Косуля		3	3	
3	<i>Eliomys quercinus</i> (L.)	Garden dormouse	Садовая соня		1	1	
4	<i>Erinaceus europaeus</i> L.	European hedgehog	Еж обыкновенный		3	3	
5	<i>Gulo gulo</i> (L.)	Wolverine	Росомаха		2	2	
6	<i>Lepus europaeus</i> Pall.	European hare	Заяц-русак		3	3	
7	<i>Lutra lutra</i> (L.)	European otter	Выдра		2 (3)	2	
8	<i>Meles meles</i> L.	Eurasian badger	Барсук		4		
9	<i>Microtus arvalis</i> (Pall.)	Common vole	Обыкновенная полевка			3	
10	<i>Microtus oeconomus</i> Pall.	Tundra vole	Полевка-экономка			3	
11	<i>Mustela nivalis</i> L.	Least weasel	Ласка		4		
12	<i>M. putorius</i> L.	European polecat	Черный хорек		4		
13	<i>Myopus schisticolor</i> Lillj.	Wood lemming	Лесной лемминг		4		
14	<i>Myotis mystacinus</i> (Kuhl)	Whiskered bat	Усатая ночница			4	
15	<i>Phoca hispida ladogensis</i> Nordq.	Ladoga ringed seal	Ладожская нерпа	5	3	3	
16	<i>Plecotus auritus</i> (L.)	Brown big-eared bat	Ушан		3	3	
17	<i>Pteromys volans</i> (L.)	Siberian flying squirrel	Белка-летяга		3	3	
18	<i>Sorex isodon</i> Turov	Evan toothed shrew	Бурозубка равнозубая		4	3	
19	<i>S. minutissimus</i> Zimm.	Miniscule shrew	Б. крошечная		3	3	
20	<i>Rangifer tarandus fennicus</i> Lonnb.*	Forest reindeer	Лесной северный олень		4	4	
<b>Всего видов – Total of species</b>					1	17	16

#### Птицы – Birds

1	<i>Gavia arctica</i> (L.)	Black-throated diver	Чернозобая гагара			4	nt**
?	<i>G. stellata</i> (Pont.)	Red-throated diver	Краснозобая гагара		4	4	t
2	<i>Podiceps auritus</i> (L.)	Slavonian grebe	Красношейная поганка			4	nt
3	<i>P. griseigena</i> (Bodd.)	Red-necked grebe	Серощекая поганка			4	nt
?	<i>Phalacrocorax carbo</i> (L.)	Cormorant	Большой баклан		3		s
4	<i>Botaurus stellaris</i> (L.)	Bittern	Большая выпь		4	4	nt
5	<i>Somateria molissima</i> (L.)	Eider	Обыкновенная гага		1		nth
6	<i>Pandion haliaetus</i> (L.)	Osprey	Скопа	3	3	3	nt
7	<i>Falco peregrinus</i> Tunst.	Peregrine	Сапсан	2	1	1	(n) (h)
8	<i>Haliaeetus albicilla</i> (L.)	White-tailed eagle	Орлан-белохвост	2	2	2	nt
?	<i>Aquila chrysaetos</i> (L.)	Golden eagle	Беркут	2	2	2	n?t
9	<i>Cerchneis tinnunculus</i> (L.)	Kestrel	Пустельга		4	4	nt
10	<i>Perdix perdix</i> (L.)	Partridge	Серая куропатка		0	0	(n) (h)
11	<i>Coturnix coturnix</i> (L.)	Quail	Перепел		2	2	(nt)
12	<i>Grus grus</i> (L.)	Crane	Серый журавль		3	3	(n)t

1	2	3	4	5	6	7	8
13	<i>Crex crex</i> (L.)	Corncrake	Коростель		4	4	nt
?	<i>Tringa totanus</i> L.	Redshank	Травник			4	?t
14	<i>Larus fuscus</i> L.	Lesser black-backed gull	Клуша		3	3	nt
15	<i>Hydroprogne caspia</i> (Pall.)	Caspian tern	Чеграва		3	4	nt
16	<i>Bubo bubo</i> (L.)	Eagle owl	Филин		2	2	nth
17	<i>Glucidium passerinum</i> (L.)	Pygmy owl	Воробыиный сыч		3	3	nth
18	<i>Strix aluco</i> L.	Tawny owl	Серая неясыть			4	nt
19	<i>Caprimulgis europaeus</i> L.	Nightjar	Козодой			4	nt
20	<i>Picus canus</i> Gm.	Grey-headed woodpecker	Седой дятел			4	nth
22	<i>Dendrocopos leucotos</i> (Bechst.)	White-backed woodpecker	Белоспинный дятел		4	4	nth
23	<i>Lanius excubitor</i> L.	Great grey shrike	Большой сорокопуд			3	n?t
?	<i>Cyanosylvia suecica</i> (L.)	Bluethroat	Варакушка			3	t
24	<i>Phoenicurus phoenicurus</i> (L.)	Redstart	Горихвостка-лысушка		4		nt
<b>Всего видов – Total of species</b>					3	19	25

#### Пресмыкающиеся – Reptiles

1	<i>Natrix natrix</i> L.	Grass snake	Уж обыкновенный		3	3	
<b>Всего видов – Total of species</b>					1	1	

#### Земноводные – Amphibians

1	<i>Triturus cristatus</i> (Laur.)	Great-crested newt	Тритон гребенчатый		3	3	
<b>Всего видов – Total of species</b>					1	1	

#### Рыбы – Fish

1	<i>Abramis ballerus</i> (L.)	Blue bream	Синец		1		
?	<i>Acipenser sturio</i> L.	Sturgeon	Атлантический осетр		1	2	
2	<i>Aspius aspius</i> (L.)	Asp	Жерех		1	2	
3	<i>Cobitis taenia</i> L.	Spined loach	Щиповка		1		
4	<i>Coregonus lavaretus</i> (L.)	Common whitefish	Сиг обыкновенный		3	3	
5	<i>C. maraenoides</i> (Poljakov)		С. чудской		3		
6	<i>C. pidschian</i> (Gmelin)	Humpback whitefish	Сиг-пыжьян		3		
7	<i>C. wartmanni</i> (Bloch)		С. Вартманна		3	3	
8	<i>Cottus gobio</i> L.	Bullhead (Miller's thumb)	Подкаменщик обыкновенный	2			
9	<i>Gobio gobio</i> (L.)		Пескарь		3		
10	<i>Leucaspis delineatus</i> (Heckel)		Верховка		1		
11	<i>Leociscus cephalus</i> (L.)		Голавль		1		
12	<i>Pelecus cultratus</i> (L.)		Чехонь		1		
13	<i>Salmo salar</i> L. m. sebago Girard	Lake salmon	Озерный лосось		2	1	
14	<i>S. trutta</i> L. m. lacustris L.	Lake trout	Озерная форель		2		
15	<i>Salvelinus alpinus lepechini</i> (Gmelin)	Char	Паляя		3		
16	<i>Scardinius erythrophthalmus</i> (L.)	Rudd	Красноперка		3		
17	<i>Suluris glanis</i> L.	Catfish	Сом		1	1	
18	<i>Thymallus thymallus</i> (L.)	Grayling	Хариус		3		
19	<i>Tinca tinca</i> (L.)	Tench	Линь		1	1	
<b>Всего видов – Total of species</b>					1	19	7

#### Насекомые – Insects\*\*\*

1	<i>Acheta domestica</i> (L.)		Сверчок домовый		2	2	
2	<i>Aradus truncatus</i> Fieber		Подкорник усеченный		4	4	
3	<i>Aromia moschata</i> L.		Усач мускусный		3	3	

1	2	3	4	5	6	7	8
4	<i>Calopus serraticornis</i> (L.)		Калопус пильчатосый		4		
5	<i>Cortodera femorata</i> (F.)		Кортодера фемората		3		
6	<i>Cicadetta montana</i> (Scop.)		Цикадка горная		0		
7	<i>Cryptocephalus cordiger</i> (L.)		Скрытоглав сердцевидный		4		
8	<i>Ditylus laevis</i> (Fabr.)		Дитилиус гладкий		2	2	
9	<i>Donacia fennica</i> (Payk.)		Радужница финская		4	?	
10	<i>Lamia textor</i> L.		Дровосек-толстяк ивовый		0		
11	<i>Leptura pubescens</i> Fabr.		Лептура опушенная			4	
12	<i>Malachius aeneus</i> (L.)		Малашка бронзовая		4		
13	<i>Melandrya dubia</i> Schall.		Тенелюб сомнительный		4	4	
14	<i>Mycetophagus quadripustulatus</i> (L.)		Грибоед четырехпятнистый		4	4	
15	<i>Oberea oculata</i> (L.)		Дровосек красношей		3		
16	<i>Oedemera femorata</i> (Scop.)		Узкокрылка желтоватая		3		
17	<i>Papilio machaon</i> L.		Махаон		3		
18	<i>Parnassius apollo</i> (L.)		Аполлон	2	1	1	
19	<i>Parnassius mnemosyne</i> (L.)		Мнемозина	2	1	2	
20	<i>Phytoecia cylindrica</i> (L.)		Фитоеция цилиндрическая		4		
21	<i>Platyrhinus resinosus</i> (Scop.)		Ложнослоник большой		4	4	
22	<i>Psophus stridulus</i> L.		Кобылка трескучая		0		
23	<i>Saperda carcharias</i> (L.)		Скрипун осиновый большой		4		
24	<i>S. perforata</i> (Pall.)		Скрипун продырявленный		4	4	
25	<i>Semblis phalaenoides</i> (L.)		Семблис красивый			4	
26	<i>Silpha tristis</i> Ill.		Мертвояд мрачный		4	4	
27	<i>Silvanus unidentatus</i> (Oliv.)		Сильванус равнозубый		4	4	
28	<i>Sinodendron cylindricum</i> (L.)		Носорог малый		3	3	
29	<i>Tomoxia bucephala</i> Costa		Томоксия бычеголовая		4	4	
30	<i>Vespa crabro</i> L.		Шершень		3		
31	<i>Xylomya czekanovskii</i> Pleske		Осовидка Чекановского		2	2	
<b>Всего видов – Total of species</b>				2	> 29	> 17	

### Сосудистые растения – Vascular plants

1	<i>Woodsia alpina</i> (Bolt.) S. F. Gray	Alpine cliff fern (Alpine woodsia)	Вудсия альпийская		3	3	
2	<i>Cystopteris dickieana</i> R. Sim.	Dickie's bladder fern	Пузырник Дайка		3	3	
3	<i>Gymnocarpium robertianum</i> (Hoffm.) Newm.	Limestone oak fern	Голокучник Роберта		2	3	
4	<i>Asplenium ruta-muraria</i> L.	Wall rue	Костенец постенный		3	3	
5	<i>A. septentrionale</i> (L.) Hoffm.	Northern spleenwort	К. северный		4	4	
6	<i>A. viride</i> Huds.	Green spleenwort	К. зеленый		4	3	
7	<i>Botrychium boreale</i> Milde	Northern grape fern	Гроздовник северный		3	3	
8	<i>B. lanceolatum</i> (S. G. Gmel.) Angstr.	Lance-leaved moonwort	Г. ланцетолистный		4	4	
9	<i>B. matricariifolium</i> A. Br. ex Koch	Daisy-leaf grape fern	Г. ромашколистый		2	2	

1	2	3	4	5	6	7	8
10	<i>B. multifidum</i> (S. G. Gmel.) Rupr.	Leathery grape fern	Г. многораздельный			3	
11	<i>B. simplex</i> E. Hitchc.	Small grape fern	Г. простой	1	0	0	
12	<i>B. virginianum</i> (L.) Sw.	Rattlesnake fern	Г. виргинский		2	2	
13	<i>Ophioglossum vulgatum</i> L.	Adder's-tongue	Ужовник обыкновенный			3	
14	<i>Isoëtes lacustris</i> L.	Lake quillwort	Полушник озерный	2	4		
15	<i>I. setacea</i> Durieu	Spring quillwort	П. тончайший	2	4		
16	<i>Sparganium glomeratum</i> (Laest.) L. Neum.	Clustered bur-reed	Ежеголовка сборная			3	
17	<i>Brachypodium pinnatum</i> (L.) Beauv.	Tor-grass	Коротконожка перистая		3	3	
18	<i>Cinna latifolia</i> (Trev.) Griseb.	Sweet reed grass	Цинна широколистная		3	3	
19	<i>Festuca sabulosa</i> (Anderss.) Lindb. fil.		Овсяница дюнная		3	3	
20	<i>Hierochloë australis</i> (Schrad.) Roem. & Schult.		Зубровка южная		3	3	
21	<i>Hierochloë hirta</i> (Schrank) Borb.		З. жестковолвиная			3	
22	<i>Lolium remotum</i> Schrank		Плевел расставленный			0	
23	<i>Carex atherodes</i> Spreng.	Wheat (or slough) sedge	Осока прямоколосая			3	
24	<i>C. bohemica</i> Schreb.	Bohemian sedge	О. богемская			3	
25	<i>C. contigua</i> Hoppe	Spiked sedge	О. колосистая		3		
26	<i>C. muricata</i> L.	Prickly sedge	О. ежевидная		3	3	
27	<i>C. norvegica</i> Retz.	Scandianavian sedge	О. норвежская		1		
28	<i>C. scandinavica</i> E.W. Davies	Small-fruited yellow-sedge	О. скандинавская			3	
29	<i>Eleocharis mamillata</i> Lindb. fil.		Ситняг сосочковый			3	
30	<i>Rhynchospora fusca</i> (L.) Ait. fil.	Brown beak-sedge	Очеретник бурый	3	3	3	
31	<i>Scirpus radicans</i> Schkuhr		Камыш укореняющийся		3	3	
32	<i>Juncus bulbosus</i> L.	Bulbous rush	Ситник клубненосный			4	
33	<i>Allium schoenoprasum</i> L.	Chives	Лук-сорода			3	
34	<i>A. strictum</i> Schrad.	Onion	Л. прямой		3	3	
35	<i>Gagea lutea</i> (L.) Ker-Gawl.	Yellow star-of-Bethlehem	Гусиный лук желтый		4	4	
36	<i>Cypripedium calceolus</i>	Lady's-slipper	Башмачок настоящий	3	4	4	
37	<i>Epipogium aphyllum</i> Sw.	Ghost orchid	Надбородник безлистный	4	3	3	
38	<i>Malaxis monophyllos</i> (L.) Sw.	White adder's mouth	Мякотница однолистная		2	2	
39	<i>Neottia nidus-avis</i> (L.) Rich.	Bird's nest orchid	Гнездовка настоящая		3	3	
40	<i>Myrica gale</i> L.	Bog myrtle	Восковница болотная	2	1	2	
41	<i>Ulmus glabra</i> Huds.	Wych elm	Вяз шершавый		3	3	
42	<i>Humulus lupulus</i> L.	Hop	Хмель обыкновенный		3	3	
43	<i>Rumex maritimus</i> L.		Щавель морской			3	
44	<i>Agrostemma githago</i> L.	Cockle	Куколь посевной			0	
45	<i>Cerastium alpinum</i> L.	Alpine mouse-ear	Ясколка альпийская		3		
46	<i>Dianthus arenarius</i> L.	Sand pink	Гвоздика песчаная		3	3	
47	<i>Minuartia verna</i> (L.) Hiern	Spring sandwort	Мокричник весенний		0	3	
48	<i>Myosoton aquaticum</i> (L.) Moench	Water chickweed	Мягковолосник водный		3	3	
49	<i>Silene nutans</i> L.	Nottingham catchfly	Смолевка поникшая		3		

1	2	3	4	5	6	7	8
50	<i>Steris alpina</i> (L.) Sourkova	Alpine catchfly	Смолка альпийская		3	3	
51	<i>Ficaria verna</i> Huds.	Lesser celandine (pilewort)	Чистяк весенний		3	3	
52	<i>Ranunculus cassubicus</i> L.		Лютик кашубский		3		
53	<i>Thalictrum aquilegifolium</i> L.	Columbine meadow rue	Василистник водосбо- ролистный			3	
54	<i>Draba cinerea</i> Adams	Grey whitlowgrass	Крупка серая		3	3	
55	<i>D. nemorosa</i> L.	Yellow whitwort	К. дубравная			4	
56	<i>Erophila verna</i> (L.) Bess.	Common whitlowgrass	Веснянка весенняя			3	
57	<i>Jovibarba sobolifera</i> (Sims) Opiz	Hen and chickens houseleek	Молодило побегонос- ное		3		
58	<i>Tillaea aquatica</i> L.	Pygmyweed	Тиллея водная		3	3	
59	<i>Saxifraga adscendens</i> L.	Wedge-leaved saxifrage	Камнеломка восходя- щая		3	3	
60	<i>S. cespitosa</i> L.	Tufted saxifrage	К. дернистая			3	
61	<i>S. nivalis</i> L.	Alpine saxifrage	К. снежная			3	
62	<i>Agrimonia eupatoria</i> L.	Church steeples	Репяшок европейский			3	
63	<i>A. pilosa</i> Ledeb.		Р. волосистый			3	
64	<i>Alchemilla murbeckiana</i> Bus.	Murbeck's lady's mantle	Манжетка Мурбека			4	
65	<i>A. plicata</i> Bus.		М. складчатая			3	
66	<i>Cotoneaster x antoninae</i> Juz. ex Orlova		Кизильник Антонины			4	
67	<i>Geranium bohemicum</i> L.		Герань богемская		3	3	
68	<i>G. robertianum</i> L.	Robert herb	Г. Роберта			3	
69	<i>Polygala vulgaris</i> L.	Common milkwort	Истод обыкновенный		3	3	
70	<i>Callitriche hermaphroditica</i> L.	Autumnal water- startwort	Болотница гермафро- дитная			3	
71	<i>Hypericum perforatum</i> L.	St. John's wort	Зверобой продыряв- ленный		3	3	
72	<i>Elatine orthosperma</i> Dueben		Повойничек прямосе- мянный		2	2	
73	<i>E. triandra</i> Schkuhr	Long stem waterwort	П. трехтычинковый		3	3	
74	<i>Viola rupestris</i> F.W. Schmidt	Teesdale violet	Фиалка скальная			4	
75	<i>V. persicifolia</i> Schreb.	Fen violet	Ф. персколистная		3	3	
76	<i>Peplis portula</i> L.	Water-purslane	Бутерлак обыкновен- ный		3	3	
77	<i>Myriophyllum sibiricum</i> Kom.	Water milfoil	Уруть сибирская		3		
78	<i>M. verticillatum</i> L.	Whorled water milfoil	У. мутовчатая		3		
79	<i>Chimaphila umbellata</i> (L.) W. Barton	Waxflower (Wintergreen)	Зимолюбка зонтичная		3	3	
80	<i>Hypopitys monotropa</i> Crantz	American pinesap	Подъельник обыкно- венный		3	3	
81	<i>Androsace septentrionalis</i> L.	Northern androsace	Проломник северный		2	2	
82	<i>Gentianella amarella</i> (L.) Boern.	Bitter gentian	Горечавочка горькова- тая			4	
83	<i>G. lingulata</i> (Agardh) Pritchard	Autumn gentian	Г. язычковая			4	
84	<i>Cuscuta epilinum</i> (L.) L.	Flax dodder	Повилика льняная		0	0	
85	<i>C. europaea</i> L.	Dodder (beggarweed)	П. европейская		3		
86	<i>Hackelia deflexa</i> (Wahlenb.) Opiz	Beggar's lice	Гакелия поникшая		4	3	
87	<i>Dracocephalum ruyschiana</i> L.	Alpine dragonhead	Змееголовник Рюйша		3		

1	2	3	4	5	6	7	8
88	<i>Origanum vulgare</i> L.	Wild marjoram (Greek origano)	Душица обыкновенная		3	3	
89	<i>Limosella aquatica</i> L.	Mudwort	Лужайница водная			4	
90	<i>Veronica spicata</i> L.	Spike speedwell	Вероника колоситая		3	3	
91	<i>Galium trifidum</i> L.	Small bedstraw	Подмаренник трехцветковый			4	
92	<i>Campanula cervicaria</i> L.		Колокольчик жестколистный			3	
93	<i>C. latifolia</i> L.	Giant bellflower	К. широколистный		4	4	
94	<i>C. trachelium</i> L.	English throatwort	К. крапиволистный		4		
95	<i>Lobelia dortmanna</i> L.	Water lobelia	Лобелия Дортмана	3	4		
96	<i>Carlina biebersteinii</i> Bernh. ex Hornem.		Колючник Биберштейна		3	3	
97	<i>Crepis biennis</i> L.	Rough hawk's beard	Скерда двулетняя			4	
98	<i>C. nigrescens</i> Pohle		С. чернеющая			3	
99	<i>Eupatorium cannabinum</i> L.	Hemp-agrimony	Посконник коноплевидный		3	3	
100	<i>Inula salicina</i> L.		Девясил иволистный			3	
101	<i>Mycelis muralis</i> (L.) Dumort.	Wall lettuce	Мицелис стенной		3	3	
<b>Всего видов – Total of species</b>				8	67	86	

#### Листостебельные мхи – Mosses

1	<i>Amblystegium confervoides</i> (Brid.) B. S. G.		Амблистегиум				
2	<i>Andrea crassinervia</i> Bruch		Андрея толстожилковая		3	3	
3	<i>Antitrichia curtispindula</i> (Hedw.) Brid.		Антитрихия повисшая		3	3	
4	<i>Atrichum undulatum</i> (Hedw.) P. Beauv. var. <i>gracilisetum</i> Besch.		Атрихум			3	
5	<i>Aulacomnium turgidum</i> (Wahlenb.) Schwaegr.		Аулакомний вздутый		3		
6	<i>Barbula unguiculata</i> Hedw.		Барбула полдюймовая		3	3	
7	<i>Campothecium lutescens</i> (Hedw.) Schimp. in B. S. G.		Кампотечиум желтеющий			3	
8	<i>Campyliadelphus elodes</i> (Lindb.) Kanda		Кампиладельфус болотный		3	3	
9	<i>Campylium calcareum</i> Crundw. et Nyh.		Кампилиум кальциевый			3	
10	<i>Campylophyllum halleri</i> (Hedw.) Fleisch.		Кампилофилл Галлера		3	3	
11	<i>Desmatodon latifolius</i> (Hedw.) Brid.		Десматодон широколистный		3	3	
12	<i>Discelium nudum</i> (Dicks.) Brid.		Дисцелий голый		3	3	
13	<i>Dryptodon patens</i> (Hedw.) Brid.		Дриптодон повислый			3	
14	<i>Eurhynchium praelongum</i> (Hedw.) Schimp. in B. S. G.		Эвринхиум длиннейший			3	
15	<i>Grimmia anodon</i> Bruch et Schimp. in B. S. G.		Гриммия беззубцовая		3	3	
16	<i>G. elatior</i> Bruch ex Bals. et De Not.		Г. высокая			3	

1	2	3	4	5	6	7	8
17	<i>G. hartmanii</i> Schimp.		Г. Гартмана		3	3	
18	<i>G. ovalis</i> (Hedw.) Lindb.		Г. яйцевидная			4	
19	<i>G. unicolor</i> Hook.		Г. одноцветная		3	3	
20	<i>Homalia besseri</i> Lob.		Гомалия Бессера		3	3	
21	<i>Hymenostylium recurvirostre</i> (Hedw.) Dix.		Гименостилий косоклювый		3	3	
22	<i>Neckera crispa</i> Hedw.		Некера курчавая		3	3	
23	<i>N. pennata</i> Hedw.		Н. перистая		3	3	
24	<i>Orthothecium chryseon</i> (Schwaegr. ex Schultes) Schimp. in B. S. G.		Ортотеций золотистый		3	3	
25	<i>Orthotrichum pallens</i> Bruch ex Brid.		Ортотрих бледный			3	
26	<i>Philonotis arnellii</i> Husn.		Филонотес Арнелля		3	3	
27	<i>P. calcarea</i> (Bruch et Schimp.) Schimp.		Ф. кальциевый			4	
28	<i>Physcomitrium sphaericum</i> (Ludw.) Brid.		Фискомитрий шаровидный		3	3	
29	<i>Plagiomnium drummondii</i> (Bruch et Schimp.) T. Kop.		Плагииомиум Друммонда			3	
30	<i>Platydictya confervoides</i> (Brid.) Crum		Платидиктия кофферовидная		3	3	
31	<i>Platygyrium repens</i> (Brid.) Schimp. in B. S. G.		Платигириум ползучий			4	
32	<i>Polytrichastrum formosum</i> (Hedw.) G.L. Sm.		Политрихаструм			3	
33	<i>Pseudotaxiphyllum elegans</i> (Brid.) Iwats.		Псевдотактифилл изящный		3	3	
34	<i>Racomitrium heterostichum</i> (Hedw.) Brid.		Ракомиитриум разноклеточный		3	3	
35	<i>Rhabdoweisia fugax</i> (Hedw.) Bruch et Schimp.		Рабдovejсия			2	
36	<i>Schistidium flaccidum</i> (De Not.) Lindb.		Схистидий обвисший		3	3	
37	<i>Ulota hutchinsiae</i> (Sm.) Hammar		Улота американская		3	3	
	Всего видов – Total of species				23	35	

### Печеночные мхи – Hepatics

1	<i>Calypogeia suecica</i> (Arnell. et J. Perss.) K. Muell.		Калипогея шведская			3	
2	<i>Conocephalum conicum</i> (L.) Underw.		Коноцефал конический			4	
3	<i>Crossogyna autumnalis</i> (DC.) Schljak.		Гроссогина осенняя			+****	
4	<i>Dichiton integerrimum</i> (Lindb.) H. Buch		Дихитон			3	
5	<i>Leiocolea alpestris</i> (F. Weber) Isov.		Лейоколея альпийская			4	
6	<i>Liochlaena lanceolata</i> Nees		Лиюхлена ланцетная			3	

1	2	3	4	5	6	7	8
7	<i>Mannia fragrans</i> (Balb.) Frye et L. Clark		Манния			2	
8	<i>Marsupella sparsiflora</i> (Lindb.) Dum.		Марсупелла редкоцветковая			3	
9	<i>M. sphacelata</i> (Gieseke ex Lindenb.) Dum.		Марсупелла			4	
10	<i>Porella platyphylla</i> (L.) Pfeiff.		Порелла широколистная			4	
11	<i>Radula lindenbergiana</i> Gottsche ex C. Hartm.		Радула Линденберга			2	
12	<i>Riccia beyrichiana</i> Hampe ex Lehm. et Lindenb.		Риччия Бейриха			3	
<b>Всего видов – Total of species</b>						12	

#### Лишайники – Lichens

1	<i>Anaptychia ciliaris</i> (L.) Kurb. var. <i>melanostica</i> (Ach.) Boistel		Анаптихия реснитчатая		3	3	
2	<i>Aspicilia canina</i> Rsönen		Аспицилия собачья		4	4	
3	<i>A. myrinii</i> (Fr.) Stein		А. Мюрина		3	3	
4	<i>Belonia russula</i> Kärb. ex Nyl.		Белония рыжая		3	3	
5	<i>Bryoria bicolor</i> (Ehrh.) Brodo & D. Hawksw.		Бриория двухцветная		1	1	
6	<i>B. fremontii</i> (Tuck.) Brodo & D. Hawksw.		Б. Фремонта	2	4	4	
7	<i>B. nadvornikiana</i> (Gyeln.) Brodo & D. Hawksw.		Б. Надворника			3	
8	<i>B. nitidula</i> (Th.Fr.) Brodo & D. Hawksw.		Б. нитчатая			2	
9	<i>B. smithii</i> (Du Rietz) Brodo & D. Hawksw.		Б. Смита		1	1	
10	<i>Calicium adspersum</i> Pers.		Калициум			3	
11	<i>C. corynellum</i> (Ach.) Ach.		К. лещиновый			3	
12	<i>Caloplaca chrysodeta</i> (Vain. ex Räsänen) Domb.		Калофака			4	
13	<i>Caloplaca sinapisperma</i> (Lam. & DC.) Maheu & Gillet		К. горчичносемянная		3	3	
14	<i>Cetrelia cetrarioides</i> (Delise ex Duby) Culb. & C. Culb.		Цетрелия цетрариевидная			3	
15	<i>C. olivetorum</i> (Nyl.) W. & C. Culb.		Ц. оливковая		3	3	
16	<i>Cladonia decorticata</i> (Flörke) Spreng.		Кладония бескорая			3	
17	<i>C. pocillum</i> (Ach.) Grognot		Кладония			4	
18	<i>Collema bachmanianum</i> (Fink) Degel.		Коллема Бахмана			3	
19	<i>C. polycarpon</i> Hoffm.		К. многоплодная		3	3	
20	<i>C. tenax</i> (Sw.) Ach.		Коллема			2	

1	2	3	4	5	6	7	8
21	<i>Dermatocarpon deminuens</i> Vain.		Дерматокарпон уменьшающийся		3	3	
22	<i>D. luridum</i> (With.) J. R. Laundon		Дерматокарпон			4	
23	<i>D. miniatum</i> (L.) W. Mann. s. lat.		Дерматокарпон			4	
24	<i>Endocarpon psorodeum</i> (Nyl.) Blomb. & Forssell		Эндрокарпон псоровидный		3	3	
25	<i>E. pusillum</i> Hedw.		Э. маленький		1	1	
26	<i>Evernia divaricata</i> (L.) Ach.		Эверния растопыренная		3	3	
27	<i>Gyalecta geoica</i> (Wahlenb. ex Ach.) Ach.		Гиалекта			3	
28	<i>G. jenensis</i> (Batsch) Zahlbr.		Г. Йенская			3	
29	<i>G. ulmi</i> (Sw.) Zahlbr.		Г. вязовая			3	
30	<i>Heterodermia speciosa</i> (Wulfen) Trevis		Гетеродермия красивая		1	1	
31	<i>Lecanora epanora</i> (Ach.) Ach.		Леканора			3	
32	<i>L. laatokkaensis</i> (Räsänen) Poelt		Л. ладожская			1	
33	<i>L. sulphurea</i> (Hoffm.) Ach.		Л. серно-желтая		4	4	
34	<i>Leptochidium albociliatum</i> (Desm.) M. Choisy		Лептохидиум белореснитчатый		3	3	
35	<i>Leptogium cyanescens</i> (Ach.) Körb.		Лептогиум синеватый			3	
36	<i>Lobaria pulmonaria</i> (L.) Hoffm.		Лобария легочная	2	4	4	
37	<i>L. scrobiculata</i> (Scop.) DC.		Л. ямочная		3	3	
38	<i>Melanelia fuliginosa</i> (Duby) Essl.		Меланелия бурочерная		3	3	
39	<i>Menegazzia terebrata</i> (Hoffm.) A. Massal.		Менегазция пробуравленная		1	1	
40	<i>Neofuscelia pulla</i> (Ach.) Essl. s. lat.		Неофусцелия Делиса		3	3	
41	<i>Nephroma bellum</i> (Spreng.) Tuck.		Нефрома красивая			2	
42	<i>Parmelina tiliacea</i> (Hoffm.) Hale		Пармелия липовая		3	3	
43	<i>Peltigera degenii</i> Gyeln.		Пельтинера Дегена		3	3	
44	<i>P. venosa</i> (L.) Hoffm.		П. жилковатая		4	4	
45	<i>Pertusaria hemisphaerica</i> (Flörke) Erichsen		Пертузария полушаровидная		3	3	
46	<i>Phyllicum demangeonii</i> (Moug. & Mont.) Nyl.		Филликум Деманжона		4	4	
47	<i>Physcia phaea</i> (Tuck.) J. W. Thomson		Фисция			2	
48	<i>Protoparmelia nephaea</i> (Sommerf.) R. Sant.		Протопармелия облачная		4	4	
49	<i>Psora globifera</i> (Ach.) A. Massal.		Псора шароносная		2	2	
50	<i>Ramalina dilacerata</i> (Hoffm.) Hoffm.		Рамалина разорванная		4	4	

1	2	3	4	5	6	7	8
51	R. fraxinea (L.) Ach.		Р. ясенева		3	3	
52	R. subfarinacea Nyl.		Р. слабомучнистая		3	3	
53	R. thrausta (Ach.) Nyl.		Р. волосовидная		2	3	
54	Solorina saccata (L.) Ach.		Солорина сахарная			3	
55	Stereocaulon dactylophyllum Flörke		Стереокаулон пальчатолистный	2	3	3	
56	S. symphycheilum I. M. Lamb		С. сростногубый		3	3	
57	Usnea glabrata (Ach.) Vain.		Уснея оголенная		2	2	
58	U. scabrata Nyl.		У. шероховатая			1	
59	Varicellaria rhodocarpa (Körb.) Th. Fr.		Варицеллярия розоплодная		3	3	
60	Verrucaria aethiobola Wahlenb.		Веррукария			4	
<b>Всего видов – Total of species</b>				3	37	60	

#### Грибы – Fungi\*\*\*

	Cortinarius violaceus (L.: Fr.) S. F. Gray		Паутинник фиолетовый		3		
	Laccaria amethystina (Huds.) Cooke		Лаковица фиолетовая		3		
	Mutinus caninus (Huds.: Pers.) Fr.		Мутинус собачий	3	3		
<b>Всего видов – Total of species</b>				1	> 3		

\* Inhabited in the recent past.

\*\* Character of birds' stay: n – nests; s – can be met in a breeding period but unlikely to breed; t – can be met in seasonal migrations; h – winters; ( ) – character of stay according to old information.

\*\*\* List is incomplete, the accurate number of protected species is unknown.

\*\*\*\* + species found in Karelia after the publication of the Red Data Books, therefore they have no conservation category.

## Annex 2. List of basic investments for the Ladoga Skerries National Park

Category	Content	Location	Activity	Amount units	Capacity	Length m	Area m2	Unit cost in 1000 Rbls	Total cost in 1000 Rbls	Year to be realised
1	2	3	4	5	6	7	8	9	10	11
Equipment	Computer	Office	Visitor Centre, office	5				20	100	1
Equipment	Tools		Field work	15				10	150	1
House	Architectural plan	Riekkalansaari	Ecol.Educ.Center	1					200	1
House	Exhibition	Visitor Centre	Visitor Centre, office	1			100	1	100	1
House	Main building	Sortavala	Visitor Centre, office	1			400	5	2000	1
House	Warehouse	Sortavala	Visitor Centre, office	1			80	2	160	1
Road	Parking lot	Sortavala	Visitor Centre, office	1			50	0.1	5	1
Equipment	Copier	Office	Visitor Centre, office	1				50	50	2
Equipment	Fire fighting		Field work	5				15	75	2
Equipment	Tools		Field work	15				10	150	2
Facilities	Benches	One trail a year	Trail	6				4	24	2
Facilities	Bio-toilet	Riekkalansaari E	Ecological camp	2				3	6	2
Facilities	Bio-toilet	Riekkalansaari W	Ecological camp	1			4	3	12	2
Facilities	Boat station	Sortavala	Harbour	1				200	200	2
Facilities	Boat warehouse	Riekkalansaari	Ecol.Educ.Center	1			100	2	200	2
Facilities	Bridge	One trail a year	Trail	1		20		0.3	6	2
Facilities	Causeways	One trail a year	Trail	1		1000		0.1	100	2
Facilities	Electricity line	Riekkalansaari	Ecol.Educ.Center	1		2000		0.1	200	2
Facilities	Fire place	Four places	Campsite	4				1	4	2
Facilities	Fire place	Riekkalansaari W	Ecological camp	2				1	2	2
Facilities	Fire-place	Riekkalansaari E	Ecological camp	1				1	1	2
Facilities	Firewood shed	Four places	Campsite	4			6	2	48	2
Facilities	Firewood shed	Riekkalansaari E	Ecological camp	1				2	2	2
Facilities	Firewood shed	Riekkalansaari W	Ecological camp	1			10	2	20	2
Facilities	Info board	One trail a year	Trail	2				1	2	2
Facilities	Info stand	One trail a year	Trail	1				10	10	2
Facilities	Inform. board	Riekkalansaari E	Ecological camp	4				1	4	2
Facilities	Information board	Riekkalansaari W	Ecological camp	2			1	10	20	2
Facilities	Litter bin	Four places	Campsite	4				0.5	2	2
Facilities	Litter bin	Riekkalansaari E	Ecological camp	2				0.5	1	2
Facilities	Litter bin	Riekkalansaari W	Ecological camp	2				0.5	1	2
Facilities	Litter bin	One trail a year	Trail	20				0.5	10	2
Facilities	Motor road	Riekkalansaari	Ecol.Educ.Center	1		1000		0.1	100	2
Facilities	Opening, marking	One trail a year	Trail	1		20000		0.01	200	2
Facilities	Parking lot	Riekkalansaari W	Ecological camp	1			400	0.1	40	2
Facilities	Pier	Four places	Campsite	4		10		1	40	2
Facilities	Pier	Riekkalansaari	Ecol.Educ.Center	1		30		1	30	2
Facilities	Pier	Riekkalansaari E	Ecological camp	1		10		1	10	2
Facilities	Pier	Riekkalansaari W	Ecological camp	1		20		1	20	2
Facilities	Shed	Riekkalansaari E	Ecological camp	1				2	2	2
Facilities	Shelter	Four places	Campsite	4			10	2	80	2
Facilities	Shelter	Riekkalansaari W	Ecological camp	3			10	2	60	2
Facilities	Sign-posts	One trail a year	Trail	24				0.5	12	2
Facilities	Stairs	One trail a year	Trail	1		40		0.1	4	2
Facilities	Table, benches	Four places	Campsite	4				4	16	2
Facilities	Table, benches	Riekkalansaari E	Ecological camp	2				4	8	2
Facilities	Table, benches	Riekkalansaari W	Ecological camp	2				4	8	2
Facilities	Table, benches	One trail a year	Trail	6				4	24	2
Facilities	Toilet	Four places	Campsite	8			1	2	16	2
House	Architectural plan		Info cabin	3				20	60	2
House	Cabin	One trail a year	Trail	1			40	5	200	2
House	Cafe-shop	Lahdenpohja	Info cabin	1			50	5	250	2
House	Guard's house	Riekkalansaari W	Ecological camp	1			20	5	100	2
House	Main building	Lahdenpohja	Info cabin	1			100	5	500	2
House	Sauna	Riekkalansaari W	Ecological camp	1			30	5	150	2
House	Sightseeing tower	One trail a year	Trail	1				200	200	2
House	Workshop		Visitor Centre, office	1			100	5	500	2
Road	Parking lot	Lahdenpohja	Info cabin	1			50	0.1	5	2
Vehicle	Rowing boat		Tourism	20				20	400	2
Equipment	Tools		Field work	15				10	150	3
Facilities	Benches	One trail a year	Trail	6				4	24	3
Facilities	Bio-toilet	Kirjvalahti Bay	Camping ground	2			4	3	24	3
Facilities	Boat station	Lahdenpohja	Harbour	1				200	200	3

1	2	3	4	5	6	7	8	9	10	11
Facilities	Causeways	One trail a year	Trail	1		1000		0.1	100	3
Facilities	Fire place	Kirjavalahi Bay	Camping ground	2				1	2	3
Facilities	Fire place	Four places	Campsite	4				1	4	3
Facilities	Firewood shed	Kirjavalahi Bay	Camping ground	1			10	2	20	3
Facilities	Firewood shed	Four places	Campsite	4			6	2	48	3
Facilities	Info board	One trail a year	Trail	2				1	2	3
Facilities	Info stand	One trail a year	Trail	1				10	10	3
Facilities	Information board	Kirjavalahi Bay	Camping ground	2			1	10	20	3
Facilities	Litter bin	Kirjavalahi Bay	Camping ground	2				0.5	1	3
Facilities	Litter bin	Four places	Campsite	4				0.5	2	3
Facilities	Litter bin	One trail a year	Trail	20				0.5	10	3
Facilities	Opening, marking	One trail a year	Trail	1		20000		0.01	200	3
Facilities	Parking lot	Kirjavalahi Bay	Camping ground	1			400	0.1	40	3
Facilities	Pier	Kirjavalahi Bay	Camping ground	1		20		1	20	3
Facilities	Pier	Four places	Campsite	4		10		1	40	3
Facilities	Shelter	Kirjavalahi Bay	Camping ground	1			10	2	20	3
Facilities	Shelter	Four places	Campsite	4			10	2	80	3
Facilities	Sign-posts	One trail a year	Trail	24				0.5	12	3
Facilities	Stairs	One trail a year	Trail	1		40		0.1	4	3
Facilities	Table, benches	Kirjavalahi Bay	Camping ground	2				4	8	3
Facilities	Table, benches	Four places	Campsite	4				4	16	3
Facilities	Table, benches	One trail a year	Trail	6				4	24	3
Facilities	Toilet	Four places	Campsite	8			1	2	16	3
House	Cabin	One trail a year	Trail	1			40	5	200	3
House	Cafe-shop	Impilahti	Info cabin	1			50	5	250	3
House	Guard's house	Kirjavalahi Bay	Camping ground	1			20	5	100	3
House	Main building	Impilahti	Info cabin	1			30	2	60	3
House	Sauna	Kirjavalahi Bay	Camping ground	1			30	5	150	3
House	Sightseeing tower	One trail a year	Trail	1				200	200	3
Road	Motor road	Riekkalansari	Repair	1		4000		0.1	400	3
Road	Parking lot	Kirjavalahi	Info cabin	1			50	0.1	5	3
Vehicle	Kayak		Tourism	20				10	200	3
Vehicle	Small motor boats		Tourism	10				50	500	3
Vehicle	Snowmobile		Tourism and superv.	10				100	1000	3
Equipment	Tools		Field work	15				10	150	4
Facilities	Benches	One trail a year	Trail	6				4	24	4
Facilities	Bio-toilet	Hunukka	Camping ground	2			4	3	24	4
Facilities	Boat station	Lesozavod	Harbour	1				200	200	4
Facilities	Bridge	One trail a year	Trail	1		20		0.3	6	4
Facilities	Causeways	One trail a year	Trail	1		1000		0.1	100	4
Facilities	Fire place	Hunukka	Camping ground	2				1	2	4
Facilities	Fire place	Four places	Campsite	4				1	4	4
Facilities	Firewood shed	Hunukka	Camping ground	1			10	2	20	4
Facilities	Firewood shed	Four places	Campsite	4			6	2	48	4
Facilities	Info board	One trail a year	Trail	2				1	2	4
Facilities	Info stand	One trail a year	Trail	1				10	10	4
Facilities	Information board	Hunukka	Camping ground	2			1	10	20	4
Facilities	Litter bin	Hunukka	Camping ground	2				0.5	1	4
Facilities	Litter bin	Four places	Campsite	4				0.5	2	4
Facilities	Litter bin	One trail a year	Trail	20				0.5	10	4
Facilities	Opening, marking	One trail a year	Trail	1		10000		0.01	100	4
Facilities	Parking lot	Hunukka	Camping ground	1			400	0.1	40	4
Facilities	Pier	Hunukka	Camping ground	1		20		1	20	4
Facilities	Pier	Four places	Campsite	4		10		1	40	4
Facilities	Shelter	Hunukka	Camping ground	1			10	2	20	4
Facilities	Shelter	Four places	Campsite	4			10	2	80	4
Facilities	Sign-posts	One trail a year	Trail	24				0.5	12	4
Facilities	Stairs	One trail a year	Trail	1		40		0.1	4	4
Facilities	Table, benches	Hunukka	Camping ground	2				4	8	4
Facilities	Table, benches	Four places	Campsite	4				4	16	4
Facilities	Table, benches	One trail a year	Trail	6				4	24	4
Facilities	Toilet	Four places	Campsite	8			1	2	16	4
House	Cabin	One trail a year	Trail	1			40	5	200	4
House	Cabins, summer	Kirjavalahi	Info cabin	5	6		24	5	600	4
House	Cafe-shop	Kirjavalahi	Info cabin	1			50	5	250	4
House	Cafe-shop	Laskela	Info cabin	1			50	5	250	4
House	Guard's house	Hunukka	Camping ground	1			20	5	100	4
House	Main building	Kirjavalahi	Info cabin	1			30	5	150	4
House	Main building	Laskela	Info cabin	1			50	5	250	4
House	Pier	Kirjavalahi	Info cabin	1		10		1	10	4

1	2	3	4	5	6	7	8	9	10	11
House	Sauna	Hunukka	Camping ground	1			30	5	150	4
House	Sightseeing tower	One trail a year	Trail	1				200	200	4
House	Teacher's house	Kirjavalhti	Info cabin	1			80	6	480	4
Road	Motor road	Kirjavalhti-	Repair	1		3000		0.1	300	4
Road	Parking lot	Impilahti	Info cabin	1			50	0.1	5	4
Road	Parking lot	Laskela	Info cabin	1			50	0.1	5	4
Equipment	Tools		Field work	15				10	150	5
Facilities	Benches	One trail a year	Trail	6				4	24	5
Facilities	Bio-toilet	Kulhoniemi	Camping ground	2			4	3	24	5
Facilities	Bio-toilet	Tulolansaari	Ecological camp	2				3	6	5
Facilities	Bridge	One trail a year	Trail	1		20		0.3	6	5
Facilities	Causeways	One trail a year	Trail	1		1000		0.1	100	5
Facilities	Fire place	Kulhoniemi	Camping ground	2				1	2	5
Facilities	Fire place	Four places	Campsite	4				1	4	5
Facilities	Fire-place	Tulolansaari	Ecological camp	1				1	1	5
Facilities	Firewood shed	Kulhoniemi	Camping ground	1			10	2	20	5
Facilities	Firewood shed	Four places	Campsite	4			6	2	48	5
Facilities	Firewood shed	Tulolansaari	Ecological camp	1				2	2	5
Facilities	Info board	One trail a year	Trail	2				1	2	5
Facilities	Info stand	One trail a year	Trail	1				10	10	5
Facilities	Information board	Kulhoniemi	Camping ground	2			1	10	20	5
Facilities	Litter bin	Kulhoniemi	Camping ground	2				0.5	1	5
Facilities	Litter bin	Four places	Campsite	4				0.5	2	5
Facilities	Litter bin	Tulolansaari	Ecological camp	2				0.5	1	5
Facilities	Litter bin	One trail a year	Trail	20				0.5	10	5
Facilities	Opening, marking	One trail a year	Trail	1		4000		0.01	40	5
Facilities	Parking lot	Kulhoniemi	Camping ground	1			400	0.1	40	5
Facilities	Pier	Kulhoniemi	Camping ground	1		20		1	20	5
Facilities	Pier	Four places	Campsite	4		10		1	40	5
Facilities	Pier	Tulolansaari	Ecological camp	1		10		1	10	5
Facilities	Shed	Tulolansaari	Ecological camp	1				2	2	5
Facilities	Shelter	Kulhoniemi	Camping ground	1			10	2	20	5
Facilities	Shelter	Four places	Campsite	4			10	2	80	5
Facilities	Sign-posts	One trail a year	Trail	24				0.5	12	5
Facilities	Stairs	One trail a year	Trail	1		40		0.1	4	5
Facilities	Table, benches	Kulhoniemi	Camping ground	2				4	8	5
Facilities	Table, benches	Four places	Campsite	4				4	16	5
Facilities	Table, benches	Tulolansaari	Ecological camp	2				4	8	5
Facilities	Table, benches	One trail a year	Trail	6				4	24	5
Facilities	Toilet	Four places	Campsite	8			1	2	16	5
House	Cabin	One trail a year	Trail	1			40	5	200	5
House	Guard's house	Kulhoniemi	Camping ground	1			20	5	100	5
House	Sauna	Kulhoniemi	Camping ground	1			30	5	150	5
House	Sightseeing tower	One trail a year	Trail	1				200	200	5
Vehicle	Microbus		Transports	4				150	600	5
Vehicle	Motor ship		Transports	1	20			2000	2000	5
Vehicle	YA3-3714		Field work	2				100	200	5
Facilities	Benches	One trail a year	Trail	6				4	24	6
Facilities	Bio-toilet	Nevalahti Bay	Camping ground	2			4	3	24	6
Facilities	Bridge	One trail a year	Trail	1		20		0.3	6	6
Facilities	Causeways	One trail a year	Trail	1		1000		0.1	100	6
Facilities	Fire place	Nevalahti Bay	Camping ground	2				1	2	6
Facilities	Fire place	Four places	Campsite	4				1	4	6
Facilities	Firewood shed	Nevalahti Bay	Camping ground	1			10	2	20	6
Facilities	Firewood shed	Four places	Campsite	4			6	2	48	6
Facilities	Info board	One trail a year	Trail	2				1	2	6
Facilities	Info stand	One trail a year	Trail	1				10	10	6
Facilities	Information board	Nevalahti Bay	Camping ground	2			1	10	20	6
Facilities	Litter bin	Nevalahti Bay	Camping ground	2				0.5	1	6
Facilities	Litter bin	Four places	Campsite	4				0.5	2	6
Facilities	Litter bin	One trail a year	Trail	20				0.5	10	6
Facilities	Opening, marking	One trail a year	Trail	1		4000		0.01	40	6
Facilities	Parking lot	Riekkalansaari	Ecol.Educ.Center	1			400	0.1	40	6
Facilities	Parking lot	Nevalahti Bay	Camping ground	1			400	0.1	40	6
Facilities	Pier	Nevalahti Bay	Camping ground	1		20		1	20	6
Facilities	Pier	Four places	Campsite	4		10		1	40	6
Facilities	Septic	Riekkalansaari	Ecol.Educ.Center	1				150	150	6
Facilities	Shelter	Nevalahti Bay	Camping ground	1			10	2	20	6
Facilities	Shelter	Four places	Campsite	4			10	2	80	6
Facilities	Sign-posts	One trail a year	Trail	24				0.5	12	6

1	2	3	4	5	6	7	8	9	10	11
Facilities	Table, benches	Nevalahti Bay	Camping ground	2				4	8	6
Facilities	Table, benches	Four places	Campsite	4				4	16	6
Facilities	Table, benches	One trail a year	Trail	6				4	24	6
Facilities	Toilet	Four places	Campsite	8			1	2	16	6
House	Cabin	One trail a year	Trail	1			40	5	200	6
House	Cafe-shop	Riekkalansaari	Ecol.Educ.Center	1			100	5	500	6
House	Guard's house	Nevalahti Bay	Camping ground	1			20	5	100	6
House	Sauna	Nevalahti Bay	Camping ground	1			30	5	150	6
House	Sauna	Riekkalansaari	Ecol.Educ.Center	1			30	5	150	6
House	Sightseeing tower	One trail a year	Trail	1				200	200	6
House	Summer cabin	Riekkalansaari	Ecol.Educ.Center	6	6		24	5	720	6
House	Teacher's house	Riekkalansaari	Ecol.Educ.Center	1			80	6	480	6
House	Training premises	Riekkalansaari	Ecol.Educ.Center	1			100	6	600	6
Road	Motor road	Hunukka	Repair	1		3000		0.1	300	6
Facilities	Benches	One trail a year	Trail	6				4	24	7
Facilities	Bio-toilet	Haukkajrvi	Camping ground	2			4	3	24	7
Facilities	Boat station	Impilahti	Harbour	1				200	200	7
Facilities	Bridge	One trail a year	Trail	1		20		0.3	6	7
Facilities	Causeways	One trail a year	Trail	1		1000		0.1	100	7
Facilities	Fire place	Haukkajrvi	Camping ground	2				1	2	7
Facilities	Fire place	Four places	Campsite	4				1	4	7
Facilities	Firewood shed	Haukkajrvi	Camping ground	1			10	2	20	7
Facilities	Firewood shed	Four places	Campsite	4			6	2	48	7
Facilities	Info board	One trail a year	Trail	2				1	2	7
Facilities	Info stand	One trail a year	Trail	1				10	10	7
Facilities	Information board	Haukkajrvi	Camping ground	2			1	10	20	7
Facilities	Litter bin	Haukkajrvi	Camping ground	2				0.5	1	7
Facilities	Litter bin	Four places	Campsite	4				0.5	2	7
Facilities	Litter bin	One trail a year	Trail	20				0.5	10	7
Facilities	Opening, marking	One trail a year	Trail	1		4000		0.01	40	7
Facilities	Parking lot	Haukkajrvi	Camping ground	1			400	0.1	40	7
Facilities	Pier	Haukkajrvi	Camping ground	1		20		1	20	7
Facilities	Pier	Four places	Campsite	4		10		1	40	7
Facilities	Shelter	Haukkajrvi	Camping ground	1			10	2	20	7
Facilities	Shelter	Four places	Campsite	4			10	2	80	7
Facilities	Sign-posts	One trail a year	Trail	24				0.5	12	7
Facilities	Stairs	One trail a year	Trail	1		40		0.1	4	7
Facilities	Table, benches	Haukkajrvi	Camping ground	2				4	8	7
Facilities	Table, benches	Four places	Campsite	4				4	16	7
Facilities	Table, benches	One trail a year	Trail	6				4	24	7
Facilities	Toilet	Four places	Campsite	8			1	2	16	7
House	Cabin	One trail a year	Trail	1			40	5	200	7
House	Guard's house	Haukkajrvi	Camping ground	1			20	5	100	7
House	Sauna	Haukkajrvi	Camping ground	1			30	5	150	7
House	Sightseeing tower	One trail a year	Trail	1				200	200	7
Road	Motor road	Harlu-Haukkajarvi	Repair	1		4000		0.1	400	7
Vehicle	Motor ship		Tourism	1	20			2000	2000	7
Vehicle	Water bicycle		Tourism	10				24	240	7
Facilities	Benches	One trail a year	Trail	6				4	24	8
Facilities	Bio-toilet	Ristijdrvi Lake	Camping ground	2			4	3	24	8
Facilities	Bridge	One trail a year	Trail	1		20		0.3	6	8
Facilities	Causeways	One trail a year	Trail	1		1000		0.1	100	8
Facilities	Fire place	Ristijdrvi Lake	Camping ground	2				1	2	8
Facilities	Fire place	Four places	Campsite	4				1	4	8
Facilities	Firewood shed	Ristijdrvi Lake	Camping ground	1			10	2	20	8
Facilities	Firewood shed	Four places	Campsite	4			6	2	48	8
Facilities	Info board	One trail a year	Trail	2				1	2	8
Facilities	Info stand	One trail a year	Trail	1				10	10	8
Facilities	Information board	Ristijdrvi Lake	Camping ground	2			1	10	20	8
Facilities	Litter bin	Ristijdrvi Lake	Camping ground	2				0.5	1	8
Facilities	Litter bin	Four places	Campsite	4				0.5	2	8
Facilities	Litter bin	One trail a year	Trail	20				0.5	10	8
Facilities	Opening, marking	One trail a year	Trail	1		4000		0.01	40	8
Facilities	Parking lot	Riekkalansaari	Ecol.Educ.Center	1			1000	0.1	100	8
Facilities	Parking lot	Ristijdrvi Lake	Camping ground	1			400	0.1	40	8
Facilities	Pier	Ristijdrvi Lake	Camping ground	1		20		1	20	8
Facilities	Shelter	Ristijdrvi Lake	Camping ground	1			10	2	20	8
Facilities	Shelter	Four places	Campsite	4			10	2	80	8
Facilities	Sign-posts	One trail a year	Trail	24				0.5	12	8
Facilities	Stairs	One trail a year	Trail	1		40		0.1	4	8

1	2	3	4	5	6	7	8	9	10	11
Facilities	Table, benches	Four places	Campsite	4				4	16	8
Facilities	Table, benches	One trail a year	Trail	6				4	24	8
Facilities	Toilet	Four places	Campsite	8			1	2	16	8
House	Russian sauna	Riekkalansaari	Ecol.Educ.Center	1			30	5	150	8
House	Cabin	One trail a year	Trail	1			40	5	200	8
House	Guard's house	Ristijärvi Lake	Camping ground	1			20	5	100	8
House	Sauna	Ristijärvi Lake	Camping ground	1			30	5	150	8
House	Sightseeing tower	One trail a year	Trail	1				200	200	8
House	Tourist centre	Riekkalansaari	Ecol.Educ.Center	2			100	8	1600	8
House	Winter cabin	Riekkalansaari	Ecol.Educ.Center	4	6		24	12.5	1200	8
Facilities	Benches	One trail a year	Trail	6				4	24	9
Facilities	Bio-toilet	Hiidenselkä Bay	Camping ground	2			4	3	24	9
Facilities	Bridge	One trail a year	Trail	1		20		0.3	6	9
Facilities	Causeways	One trail a year	Trail	1		1000		0.1	100	9
Facilities	Fire place	Hiidenselkä Bay	Camping ground	2				1	2	9
Facilities	Fire place	Four places	Campsite	4				1	4	9
Facilities	Firewood shed	Hiidenselkä Bay	Camping ground	1			10	2	20	9
Facilities	Firewood shed	Four places	Campsite	4			6	2	48	9
Facilities	Info board	One trail a year	Trail	2				1	2	9
Facilities	Info stand	One trail a year	Trail	1				10	10	9
Facilities	Information board	Hiidenselkä Bay	Camping ground	2			1	10	20	9
Facilities	Litter bin	Hiidenselkä Bay	Camping ground	2				0.5	1	9
Facilities	Litter bin	Four places	Campsite	4				0.5	2	9
Facilities	Litter bin	One trail a year	Trail	20				0.5	10	9
Facilities	Opening, marking	One trail a year	Trail	1		4000		0.01	40	9
Facilities	Parking lot	Hiidenselkä Bay	Camping ground	1			400	0.1	40	9
Facilities	Pier	Hiidenselkä Bay	Camping ground	1		20		1	20	9
Facilities	Pier	Four places	Campsite	4		10		1	40	9
Facilities	Shelter	Hiidenselkä Bay	Camping ground	1			10	2	20	9
Facilities	Shelter	Four places	Campsite	4			10	2	80	9
Facilities	Sign-posts	One trail a year	Trail	24				0.5	12	9
Facilities	Stairs	One trail a year	Trail	1		40		0.1	4	9
Facilities	Table, benches	Hiidenselkä Bay	Camping ground	2				4	8	9
Facilities	Table, benches	Four places	Campsite	4				4	16	9
Facilities	Table, benches	One trail a year	Trail	6				4	24	9
Facilities	Toilet	Four places	Campsite	8			1	2	16	9
House	Cabin	One trail a year	Trail	1			40	5	200	9
House	Guard's house	Hiidenselkä Bay	Camping ground	1			20	5	100	9
House	Sauna	Hiidenselkä Bay	Camping ground	1			30	5	150	9
House	Sightseeing tower	One trail a year	Trail	1				200	200	9
House	Summer cabin	Riekkalansaari	Ecol.Educ.Center	6	6		30	5	900	9
Facilities	Benches	One trail a year	Trail	6				4	24	10
Facilities	Bio-toilet	Impilahti	Camping ground	2			4	3	24	10
Facilities	Bridge	One trail a year	Trail	1		20		0.3	6	10
Facilities	Causeways	One trail a year	Trail	1		1000		0.1	100	10
Facilities	Fire place	Impilahti	Camping ground	2				1	2	10
Facilities	Fire place	Four places	Campsite	4				1	4	10
Facilities	Firewood shed	Impilahti	Camping ground	1			10	2	20	10
Facilities	Firewood shed	Four places	Campsite	4			6	2	48	10
Facilities	Info board	One trail a year	Trail	2				1	2	10
Facilities	Info stand	One trail a year	Trail	1				10	10	10
Facilities	Information board	Impilahti	Camping ground	2			1	10	20	10
Facilities	Litter bin	Impilahti	Camping ground	2				0.5	1	10
Facilities	Litter bin	Four places	Campsite	4				0.5	2	10
Facilities	Litter bin	One trail a year	Trail	20				0.5	10	10
Facilities	Opening, marking	One trail a year	Trail	1		4000		0.01	40	10
Facilities	Parking lot	Impilahti	Camping ground	1			400	0.1	40	10
Facilities	Pier	Impilahti	Camping ground	1		20		1	20	10
Facilities	Pier	Four places	Campsite	4		10		1	40	10
Facilities	Shelter	Impilahti	Camping ground	1			10	2	20	10
Facilities	Shelter	Four places	Campsite	4			10	2	80	10
Facilities	Sign-posts	One trail a year	Trail	24				0.5	12	10
Facilities	Stairs	One trail a year	Trail	1		40		0.1	4	10
Facilities	Table, benches	Impilahti	Camping ground	2				4	8	10
Facilities	Table, benches	Four places	Campsite	4				4	16	10
Facilities	Table, benches	One trail a year	Trail	6				4	24	10
Facilities	Toilet	Four places	Campsite	8			1	2	16	10
House	Cabin	One trail a year	Trail	1			40	5	200	10
House	Guard's house	Impilahti	Camping ground	1			20	5	100	10
House	Sauna	Impilahti	Camping ground	1			30	5	150	10

1	2	3	4	5	6	7	8	9	10	11
Facilities	Bio-toilet	Sumerialahti Bay	Camping ground	2			4	3	24	11
Facilities	Fire place	Sumerialahti Bay	Camping ground	2				1	2	11
Facilities	Firewood shed	Sumerialahti Bay	Camping ground	1			10	2	20	11
Facilities	Information board	Sumerialahti Bay	Camping ground	2			1	10	20	11
Facilities	Litter bin	Sumerialahti Bay	Camping ground	2				0.5	1	11
Facilities	Parking lot	Sumerialahti Bay	Camping ground	1			400	0.1	40	11
Facilities	Pier	Sumerialahti Bay	Camping ground	1		20		1	20	11
Facilities	Shelter	Sumerialahti Bay	Camping ground	1			10	2	20	11
Facilities	Table, benches	Sumerialahti Bay	Camping ground	2				4	8	11
House	Guard's house	Sumerialahti Bay	Camping ground	1			20	5	100	11
House	Sauna	Sumerialahti Bay	Camping ground	1			30	5	150	11
Road	Paved parking lot	Sortavala	Paved parking lot	5			500	1	2500	11
Road	Gravel parking lot	Lahdenpohja	Gravel parking lot	5			500	0.1	250	12
<b>Total</b>									<b>38454</b>	

### Annex 3. The Items of Equipment and Material handed over to Ladoga Skerries Nature Park Municipal entity

#	Description of Item	Number of Individual Items	Cost (E)	
			Unit	Total
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1	Mobile phone	1	440.3	440.3
2	Office computer unit	1	1,722	1,722
3	Office computer unit	1	643	643
4	Modem 56k	1	120	120
5	Back UPS	1	149	149
6	Jet Printer	1	112	112
7	Fax machine	1	338	338
8	Copying machine	1	1,240	1,240
9	Furniture, park offices	1	983	983
10	Vehicle, Niva (petrol)	1	8,505	8,505
11	Vehicle, Sobol (diesel)	2	9,900	19,800
12	Supplementary vehicle equipment	1	5,550	5,550
13	Cargo/passenger vessel	1	29,500	29,500
14	Patrol boat	1	20,372	20,372
15	Motor boat (without engine)	3	710	2,130
16	Boat engine, 10 hp	3	1,542	4,626
17	Boat engine, 50 hp	1	4,985	4,985
18	Raft	1	2,550	2,550
19	Canoes	4	600	2,400
20	Supplimentary cargo/passenger vessel equipment	1	23,800	23,800
21	Boat trailer	1	1,629	1,629
22	Plastic oar boats (4 m)	3	744	2,233
23	Taiga snow mobiles	1	4,345	4,345
24	Sledges	2	566	1,132
25	Snow plane	1	339	339
26	Trailer	1	1,359	1,359
27	Snow mobiles (type III)	1	6,638	6,638
28	Digital maps (set)	1	2,012	2,012
29	GIS computer unit	1	2,301	2,301
30	GIS computer unit	1	3,288	3,288
31	Licence, Run Time MapInfo	2	1,111	2,222
32	Satelite images (set)	1	581	581
33	Satelite images (set#2)	1	415	415
34	Tools and elecric instruments (set)	1	16,463	16,463
	Petrol operated chain saw 2,7 horse powers	4		
	Chains	10		
	Hand electric circular saw 1000 Watt	1		
	Electric compressor for tire inflating 12 Volt	1		
	Electric bush-cutter 1,5 horse powers	1		
	Welding equipment	1		
	Electric portable cutting-off machine 115-125 mm. 800 Watt	1		
	Electric plane 500 Watt 82 mm.	1		
	Electric tool-grinding machine 650 Watt 76 x 457 mm.	1		
	Mini woodworking machine	1		
	Electric polishing machine with uninterrupted belt 600 Watt	1		
	Set of carpenter hand tools	2		
	Set of bench tools (insulated hafts)	2		
	Set of spanners	2		
	Set of drills for metal	1		
	Set of drills for wood	1		
	Mini sawmill	1		
	Axe	1		
	Barking knife	2		

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
	Log pinsers	3		
	Scribe	2		
	Level	2		
	Tape-line	3		
35	Sauna equipment and materials	1	998.79	999
36	Freezer	1	400	400
37	Tuorist equipment (set)	1	6,230	6,230
	Tent Orion 2l	5		
	Sleeping bag Goby	20		
	Life jacket	10		
	Accumulator torch	3		
	Tourist rug	20		
	Stainless pot, 8l	5		
	Rope, 12 mm	1		
	Safety helmets for rafting	20		
	Winter overall	4		
	Safety helmet for snowmobiles	3		
	Raincape	2		
	First-aid box	3		
	Binocular 1x 50	10		
	<b>Grand Total</b>			<b>182,552</b>

Здесь приложение 4 карта-схема. Не печатать этот лист

## **Annex 5. Environmental and quality principles for the Green Belt national parks (prepared by Jouko Högmänder)**

### **1. Sustainability must govern**

All the actions of the park shall base on sustainable use of resources. Some examples:

- Tourism should be adjusted to natural limits, i.e. what nature and culture can tolerate
- Wearing of nature should be followed all the time
- Facilities should be allocated so, that the harm for nature can be minimised
- Waste disposal should work effectively

### **2. Conservation of natural and cultural heritage is the main task**

When planning activities, knowledge of natural and cultural values of the park should get priority. Tourism is subordinated to the main task. This principle should be followed for example in following cases:

- "Don't sell their lives!" Rare and timid animals can suffer from tourists who want to come to close.
- Park should prepare information of nature and nature conservation
- Co-operation with scientists is important in increasing knowledge of nature

### **3. Tourism should benefit local people and local economy of the region**

The national park should be open for co-operation with the neighbouring communities. This would maximise the benefits for both parts. For example:

- Park relies on accommodation, transport and other services of the villages nearby
- Park recruits workers from the region
- Tourism is developed in co-operation with local administration
- Park has well functioning liaison with local entrepreneurs

### **4. Quality in planning and construction of the park**

When the national park is developed, it is important to use professional planners, preferably such who know the area and culture there.

- All facilities should be carefully planned in advance and the plans followed
- Local style in constructions gives a catchy memory in visitors' minds
- Roads and trails, cabins and campsites should be well adapted in the landscape
- Broken constructions should be repaired immediately

### **5. Highly qualified guides are needed in every park**

Guides meet visitors and guests of the park. Their work has an essential role in building up the image of the park. Some principles to be followed:

- Local guides have many advantages, train their skills in client oriented service
- Use also expertise of scientists working in the park to train the guides
- Adopt a positive attitude to visitors

### **6. Tour programs should respect local traditions and environment**

Both programs of the park and the tour operators should have connection to the local history and traditions. These are also interesting hear about for the visitors.

- Well planned tour programs promote nature conservation, at least in increasing the knowledge of the visitors
- Find out old stories, interview old people, use local guides
- The park should make written contracts – with instructions about following these principles - with tour operators

### **7. Punctuality and reliability is appreciated**

In the long run, only punctual and reliable actors can survive in tourism business. In national parks this is referring for example to following issues:

- Quick and prompt answers to questions
- Reservations and prices always hold.
- Guides and transports are punctual

### **8. Always guarantee the safety of visitors**

Visitors are expecting that they can trust the arrangements and be sure about their personal safety. It is important that:

- No risks are taken in wilderness, on water or road
- There is always a reserve plan for bad weather or unexpected incidents
- Visitors and their property is always in safe and they know it

### **9. Supervision is attending on everybody**

Effective supervision is needed in every national park, but it must be carried out on a discreet way. Some hints:

- Information about the park regulation should be available in advance and on the spot
- Functional zoning should be available for visitors
- Guiding and discussing attitude of the rangers leads to best result

### **10. Ask response and comments from visitors**

Comments from visitors are essential in developing the park and its services. It can be done many ways:

- Regular inquiries at the park gate should be carried out every year
- Guest books in cottages and www page can discover many important things
- Be susceptible to the response, that is the best way to develop the park