



**ПОСТОЯННОЕ ПРЕДСТАВИТЕЛЬСТВО  
Российской Федерации при ЮНЕСКО**

**DELEGATION PERMANENTE  
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**Subject: Reports on SoC of WH properties “Volcanoes of Kamchatka”, “Golden Mountains of Altai”, “Lake Baikal”, “Virgin Komi Forests” and “Wrangel Island”, Medium-term management plan of the Reserve “Wrangel Island”**

Dear Ms. Rössler,

I have the pleasure to convey to your kind attention original reports on State of Conservation of World Heritage properties “Volcanoes of Kamchatka”, “Golden Mountains of Altai”, “Lake Baikal”, “Virgin Komi Forests” and “Wrangel Island”, as well as a detailed map of the borders of “Volcanoes of Kamchatka” and the Medium-term Management plan of the “Wrangel Island” reserve prepared by the Ministry of Natural Resources and Ecology of the Russian Federation in accordance with decisions of the 39th Session of the World Heritage Committee.

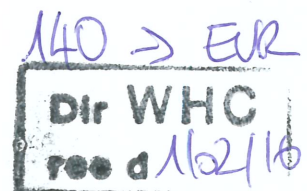
May I avail myself of this opportunity to renew to you, dear Ms. Rössler, the assurances of my highest consideration.

AMBASSADOR,  
PERMANENT DELEGATE

Eleonora MITROFANOVA

Enclosure: 175 pages, maps.

**Ms Mechtild RÖSSLER  
DIRECTOR, UNESCO HERITAGE DIVISION,  
DIRECTOR, WORLD HERITAGE CENTRE**



**REPORT ON THE CURRENT STATE OF CONSERVATION  
OF THE WORLD HERITAGE PROPERTIES  
VOLCANOES OF KAMCHATKA, GOLDEN MOUNTAINS OF ALTAI, LAKE  
BAIKAL, VIRGIN KOMI FORESTS, WRANGEL ISLAND IN 2015**

**Report On the State of Conservation of the UNESCO World Heritage Property  
Natural System of Wrangel Island Reserve (Russian Federation, № 1023rev)  
in 2015**

**SUMMARY**

A complex of measures for provision of the necessary facilities and cleaning the territory from the accumulated environmental damage during the previous economic activity was carried out on Wrangel Island in 2015 to ensure the security of the Russian Federation.

The area of territory, affected by these works, is less than 0.001% of the total area of the World Heritage Site "Wrangel Island"; at that the location, earlier engaged in business activities, is in use.

Furthermore, full-scale study of the Wrangel Island was conducted to estimate the volume of environmental damage accumulated during the last economic activity. 3720 empty drums were removed from Wrangel Island in 2015. Approximately 45 000 empty drums is planned to remove from Wrangel Island in 2016-2017.

Thus, specified activity does not affect the outstanding universal value of World Heritage Site "Wrangel Island".

Subsoil areas for oil exploration and production are absent within borders of the World Heritage Site. Drilling, mineral exploration and mining are prohibited within the boundaries of the state natural reserve "Wrangel Island" and its buffer zone by the legislation of the Russian Federation.

Seismic exploration work, undertaken in the license areas of mineral resources in the marine waters of the East Siberian and Chukchi seas, do not affect the waters of the reserve and its buffer zone. Oil production in the areas surrounding the World Heritage Site is not currently conducted and is not planned in the near future.

Management Plan for 2013-2017 and the program of development of ecological educational tourism were drawn up for the territories of the World Heritage Site.

## **1. Response of the Russian Federation with regard to Resolution No. 39 COM 7B.25 adopted by the World Heritage Committee.**

1. A complex of measures for provision of the necessary facilities and cleaning the territory from the accumulated environmental damage during the previous economic activity was carried out on Wrangel Island in 2015 to ensure the security of the Russian Federation.

The area of territory, affected by these works, is about 20 hectares - 0.0009% of the total area of the World Heritage Site "Wrangel Island" and 0.0025% of the land area of the island. Furthermore, the object is located at the site that was previously used for economic activities, apart from the key habitats of rare and specially protected species, it does not affect the locations of maternity holes of polar bears, formations of walrus rookeries, nesting places of birds. The most part of the territory, in which the objects are placed, has no of vegetation and soil cover; this fact eliminates the need for a discussion of the problems of its conservation. Vegetation from the given site does not have a set of unique components, rare and endemic species of flora are absent in this part of the reserve. Specified activities, in view of its implementation at the extremely small areas, does not affect the outstanding universal value of the World Heritage Site "Wrangel Island".

Furthermore, full-scale study of the Wrangel Island was conducted to estimate the volume of environmental damage accumulated during the last economic activity.. 3720 empty drums were removed from Wrangel Island in 2015. Approximately 45 000 empty drums is planned to remove from Wrangel Island in 2016-2017, as well as equipment, which was felt into disrepair.

2. Subsoil areas for oil exploration and production are absent within borders of the World Heritage Site. Drilling, mineral exploration and mining are prohibited within the boundaries of the state natural reserve "Wrangel Island" and its buffer zone by the legislation of the Russian Federation.

Seismic exploration work, undertaken in the license areas of mineral resources in the marine waters of the East Siberian and Chukchi seas, do not affect the waters of the reserve and its buffer zone. Oil production in the areas surrounding the World Heritage Site is not currently conducted and is not planned in the near future.

Calling of vessels, carrying out seismic exploration in the Chukchi Sea, to the marine waters of the buffer zone of the reserve "Wrangel Island" took place only in

order to shelter from the storm under permits of the Ministry of Natural Resources and Ecology of the Russian Federation and the administration of the reserve.

3. Management plan for 2013-2017, drawn up for the territory of World Heritage Site includes:

- programs for the conservation of natural complexes of Wrangel and Herald Islands, which focuses on the conservation of marine species (polar bears, pacific walrus, whales, seals), as well as the preservation of the population of snow geese, hoofed animals (reindeer and musk buffalo);

- program of monitoring the state of the environment in terms of global climate change;

- program of preservation of historical heritage objects;

- program of clearing of the reserve from the garbage accumulated during the last economic activity;

- program of modernization of infrastructure of the reserve for more effective protection of the territory;

- program of development of ecological educational tourism.

Within the framework of development of ecological tourism:

- Program of development of ecological educational tourism in 2014-2015 was prepared;

- ecological land and sea routes, minimizing the impact on the reserve, were developed;

- the rules of conduct for visitors of the reserve were developed;

- the rules of conduct for prevention of conflicts with a polar bear were developed.

At the present time modern houses for employees of the reserve and tourists, equipped with alternative energy sources (solar panels), were built for replacing of wrecked buildings.

Vehicles which are not harmful for soil and grass cover or tundra were purchased and are in operation.

Infrastructure modernization in territory of reserve allowed:

- to improve working and living conditions for employees of the reserve;

- provide comfortable conditions for visitors of terrestrial ecological routes without increasing anthropogenic load on the territory of the reserve;

- to reduce the level of household pollution of the territory through the use of alternative energy sources and eliminating the use of petroleum products for heating;

- to use modern vehicles, which are not harmful to soil and vegetation cover, when solving problems of protection of the territory, environmental monitoring and research, as well as for transportation of tourists.

Moreover, the existing flow of visitors (up to 500 people per year) has no significant impact on the ecosystem of a World Heritage Site. Inspection of the environmental impact in connection with the development of tourist activity is not appropriate due to the very low load on the protected area from the touristic groups and the absence of significant increase in tourist flow in prospect.

Management plan is attached in the appendix to this report.

## **1. Information about other current issues related to the World Heritage property conservation**

Protection of the reserve is carried out by overground fixed-route patrolling on the vehicles, which have no significant impact on soil and vegetation cover; by monitoring the coastal waters from shore observation posts during the route observations, taken by staff members of the reserve from a helicopter and cruise ships visiting the island.

Entire water area of the Wrangel Island and the southern waters of the island of Herald are inspected from vessels from July to September.

Full flyover of the shoreline of the Wrangel Island by helicopter was carried out in 2015.

Monitoring of components of the natural complex of the reserve on 15 species of animals and problematic research on 11 types of animals are carried out.

58 camera traps in the territory of the islands of Wrangel and Herald for collecting data on the polar bear and other key species of animals are installed in the framework of monitoring. The joint research are conducted with the leading institutes of Russia and the universities of Montana and Colorado, USA: to studying the population of musk buffalo on Wrangel Island and in Alaska, molecular genetic studies the Alaska-Chukotka polar bear population, population monitoring of white goose, including the work of ringing, monitoring of terrestrial entomofauna and fauna of freshwater invertebrates, as well as other types of fauna.

Monitoring of the coastline of islands is carried out in order to identify the destruction of vegetation cover of tundra due to the melting of the permafrost. New large-scale erosion of vegetation cover was not identified.

Monitoring of watercourses of the Wrangel Island is conducted in the framework of control of the impact of climate change. Changes of chemical state of the

watercourses of the Wrangel Island, associated with increased defrost of permafrost soil in recent years were identified.

23 historical sites, requiring protection, were revealed in the reserve:

- archaeological (1 object);
- The remains of buildings and signs of the first settlers - wild capture dugouts, places of setting of flags (7 projects);
- Building of the period of commercial hunting and reindeer farming on the island, the ruins of the buildings of the period of the economic development of the Wrangel Island (15 sites).

Monitoring of these objects is conducted for identifying further ways of their preservation.

**3. Significant changes within the World Heritage property** are not expected.

**MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT OF THE RUSSIAN  
FEDERATION**

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**Federal State Budgetary Institution "State Natural Reserve "Wrangel Island"**

**MEDIUM-TERM MANAGEMENT PLAN  
OF THE RESERVE "WRANGEL ISLAND"  
in the years 2013- 2017**

**Pevek  
2013**

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## **ANALYSIS OF NATURAL, HISTORICAL AND CULTURAL FEATURES AND EFFECTIVENESS OF EXISTING STRUCTURE OF RESERVE SUMMARY**

### **Federal State Budgetary Institution "State Natural Reserve "Wrangel Island "**

State Natural Reserve "Wrangel Island" became the first Russian Arctic reserve and the first Arctic World Natural Heritage Site. The historical experience of the discovery, development and conservation of Wrangel Island is an important model on which different approaches to the development of the Arctic have been tried in a transparent manner in a relatively short period of time. Accession of 12-mile surrounding marine zone to the reserve in 1998, and the Marine Security 24-mile zone in 1999, in fact led to the creation of a new progressive model of territorial protection of the Arctic. Due to the relatively short period of development of Wrangel Island before creating a reserve, damage to its natural complex has been minor and narrowly local. Ecosystem of the reserve kept all the main features of the ancient Pleistocene Beringia Arctic.

The reserve has a set of qualities that make its natural complex particularly valuable not only as a natural area, which preserves marks of unique evolutionary processes and has unique high biodiversity, but also as a crucial key area for tracking the reaction of the Arctic biota to global climate change on the planet. Informational resource of the reserve is extremely high and its value increases due to rapid environmental changes in the Arctic and the world on the whole. Particular importance in this regard has the fact that the study and monitoring of natural processes on Wrangel Island has been held for more than a decade, the reserve has accumulated a series of long-term data on the key objects of the animal world, which allow to record the current changes and carry out the comparative analysis of them.

Organizational and territorial structure of the management of the reserves was formed quite effectively, taking into account existing realities. However, the formation and functioning of the management of the reserve was taking place with great difficulty and problems caused primarily by the fact that maintaining of the arctic island reserve requires different approaches and schemes than functioning of SPNA, located on the continent within more southern climatic zones. Available resources of the reserve, staffing and technical equipment, applicable to typical model of SPNA do not allow to fully ensure the protection regime throughout the territory of the Arctic island and marine reserve, making all the necessary measures for the maintenance and development of infrastructure for scientific research. The absence of sea department does not allow adequately monitor and protect marine water area. The difficulty of the cargo delivery and its high cost limit ability to maintain and restore technical infrastructure. Despite these difficulties, the team of the reserve managed to maintain the infrastructure of the field bases and scientific field stations on Wrangel Island, and didn't interrupted studies for a single year, even in the most difficult period of reforms in the country (late 1990s - early 2000s). By now, Wrangel Island is the only permanent Russian scientific base in the Arctic engaged in a systematic long-term study of the Arctic biota.

However, field infrastructure of reserve remains archaic for the most part, it considerably behind the modern research stations of the advanced Arctic countries due to the quality of buildings, living conditions for the employees and technologies of life support.

Infrastructure of reindeer herding state farm village was handed over to balance of reserve during its establishing in 1976. It was created with a quite different purpose, was subsidized and had high maintenance cost. Since the beginning of reforms in the country and the liquidation of the Soviet Union, it was impossible to support this infrastructure, and it went into decline.

Due to its isolation from the mainland and harsh climatic conditions, the protection of the reserve has its own specifics and is free from a number of serious problems and threats such as poaching inherent in the continental protected areas. At the same time, the Arctic reserve has specific internal problems, solution of which requires considerable financial, technical and

human resources. These problems include: new local and single-point pollution because of storm activity intensified in the sea, increase in shipping along the Northern Sea Route, increase in the number of visits of cruise ships and increase in amount of tourist groups.

The main potential external threats to the well-being of the natural complex of the reserve are the development of commercial navigation along the Northern Sea Route and the future development of hydrocarbons on the Arctic continental shelf.

The planned development of North Wrangel-1, North Wrangel-2 and South Chukchi areas by Rosneft leads to significant disturbance in the key reproductive habitats of polar bears, pinnipeds and cetaceans in the vicinity of the reserve and its buffer zone, and to the threat of pollution of marine and coastal ecosystem of the reserve in the case of high potential oil spills, plans of building a military base. Taking into account the general direction of the drift of sea ice, development of these areas pose a threat of water pollution of the East Siberian Sea and the New Siberian Islands. Natural causes of possible transformation of natural ecosystems are related to global climate change on the planet.

Perspective plan of management and development of the reserve is based on the long experience of the functioning of the reserve. The priorities of the plan are:

- 1 - to ensure the most effective control and protection of the territory and the water area of the reserve;
- 2 - preservation and development of long-term research on the key objects of the animal world;
- 3 - extension of problem-oriented research and improve their methodological level through the introduction of modern scientific technology; inclusion of the reserve to circumpolar network of key areas for tracking response of the biota to global climate change;
- 4 - modernization of the infrastructure for field research of Arctic biota;
- 5 - making up a cadastral survey of cultural and historical monuments and conservation of them;
- 6 - development of strictly regulated ecological tourism, improvement of the concept of development of scientific and ecological tourism in the Arctic reserve.

The following main tasks must be solved to improve the efficiency of the reserve in the main objectives (protection of the territory and the water area of the reserve, researching and monitoring of natural complex) for the effective integration of the reserve to in the socio-economic development of the region and for the development of a regulated and balanced scientific tourism:

- 1 - working out of the balanced concept of development and modernization of the research base of the reserve on Wrangel Island;
- 2 - increase in staff of the scientific department up to 7 full-time employees with the ability to attract additional temporary staff;
- 3 - ensuring funding and logistical support in accordance with conditions and tasks of the Arctic reserve;
- 4 - ensuring of normal living conditions for the employees of the reserve in the field conditions of Wrangel Island;
- 5 - increase in staff of the department of protection up to 8 people and providing the legislative framework for the shift method of work on the territory of the Arctic reserve.
- 6 - introduction of technologies of using drones and remote video monitoring in research, monitoring and protection of the natural complex of the reserve.

It is necessary to create research station of international level and value on Wrangel Island, to ensure regular delivery of fuel and lubricants, materials, transport and facilities to the Wrangel island by sea.

Solving of these problems will ensure effective control and protection of the entire territory and sea area of the reserve and the buffer zone; guaranteed continuation of a long-term research on the key and indication objects; developing research by expanding the list of issues and the introduction of modern technologies; developing a regulated international scientific and educational (eco) tourism on the island; integrating the reserve to the circumpolar network of key areas of studying the reaction of biota on global climate change on the planet.

## PREFACE

The main goal of this management plan is providing state authorities of specially protected natural reservation, the management and staff of the State Natural Reserve "Wrangel Island" with medium-term program and management plan of development of the reserve in 2013-2017 years, that guarantees the preservation of the natural complex of the reserve and all of its components in the natural state, effective solutions for the main activities, long-term development of the infrastructure of the reserve in environmentally friendly way, optimization of monitoring and in-depth study of protected objects and ecosystems in accordance with current priorities.

Management plan of the Federal State Budgetary Institution "State Natural Reserve "Wrangel Island " is designed in accordance with Federal Law "On Specially Protected Natural Areas ", the Charter of FSBI "State Natural Reserve "Wrangel Island", approved by the Ministry of Natural Resources and Ecology of the Russian Federation, management requirements of protected areas, set out in international documents "The Convention on Biological Diversity (1992)", the "Convention on the Protection of the World Cultural and Natural Heritage (1972)," "Convention on Wetlands of International Importance especially as Habitats of Waterfowl (1971)".

A basic principles of the present management plan are an absolute priority of preserving of the unique natural complex of the reserve in its natural state, ensuring health of ecosystems, maximum exclusion of any anthropogenic impacts on the natural course of natural processes in the land and water areas of the reserve. This priority is the basis of all activities of the reserve according to the present management plan.

Informational and methodological basis of this management plan were the results of years of research conducted by the research department of the reserve and third-party research institutions; 37 years of experience of work of the reserve; analysis of the historical experience of people's activities on Wrangel Island since the first attempts of its development (1921). Recommendations of the Committee UNESCO World Heritage Site, recorded in the decision of 28th meeting of the Committee for the inclusion of the State Natural Reserve "Wrangel Island" in the list of World Natural Heritage were also taken into account.

## CHAPTER 1 BASIC INFORMATION ABOUT THE RESERVE

### 1.1. Brief description of Federal State Budgetary Institution "State Natural Reserve "Wrangel Island"

Federal State Budgetary Institution "State Natural Reserve "Wrangel Island" (hereinafter - State Institution "State Reserve "Wrangel Island", Reserve) was established 03.23.1976. The reserve is located in the Iultinsky region of Chukotka Autonomous District. Legal address of the reserve: Chukotka Autonomous District, Pevek. Office of the reserve is located in Pevek, Chaun district, Chukotka AD, Obrucheveva street, 38.

1.1. Area of State Natural Reserve (thous. ha) in accordance with:

- Title documents -7,091,600 ha. The land occupies 795,650 hectares (794,520 hectares - Wrangel Island (70028'12 " - 71021'02"nl; 178045'59" el 177015'52"wl) 1130 hectares - Gerald Island (71012'53 " - 71015'08"nl ; 175019'16 " - 175027'47"wl), 14 300 hectares is accounted for marine water area (12 nautical miles), protected zone - 4,865,950 hectares. The protected zone of the reserve (water area of the East Siberian and Chukchi seas 24 nautical miles wide) surrounds water area of the reserve.

- Certifying documents - 22256500 ha. Land occupies 795.65 thous. ha (794.52 thous. ha - Wrangel island, 1.13 thousand. ha - Herald Island) and 1430 thousand. ha - marine water area.

FSBI "State Reserve "Wrangel Island" is state conservational, research and environmental education federal institution aimed to the preservation and study of natural processes and phenomena, genetic fund of flora and fauna, species and communities of plants and animals, typical and unique ecological systems of the islands of Wrangel and Herald and the Chukchi Sea.

There are about 40 endemic species and subspecies in the flora and fauna of the island. They are representatives of the vascular plants, insects, birds and mammals (lemmings), some of which are relict and belong to the most numerically small species on the Earth. There are also unique types of endemic plant communities and soils.

Islands and adjacent waters are crucial territory for a number of rare and specially protected species. The world's largest concentration of polar bear maternity holes is on the island, as well as feeding areas of the most part of population of Pacific walrus, the largest rookery shore to the north of the Bering Strait and the largest seabird colonies in the eastern Arctic are located there. The only Asian colony of white goose is located on Wrangel Island. It is also one of the few areas of concentration of the Pacific black brant, nesting of snowy owls and Sabine's gull.

At the 28th session of the World Heritage Committee held in China (Suzhou) June 30, 2004, the State Natural Reserve "Wrangel Island" was included to the World Heritage List of UNESCO. "Wrangel Island" became the eighth Russian natural object, which obtained this status. The reserve was classified as the unique natural object as an outstanding example of evolutionary development of various arcticnatural complexes (mountain, plain, coastal) by the decision of the Committee. In addition, the area has exceptional biodiversity in the Arctic and the necessary conditions for its real protection; it includes habitats of rare, endangered and specially protected species of global value, in accordance with criteria 2 and 4 of UNESCO.

### 1.2. Goals and objectives of the reserve

Reserve has the following goals and objectives in accordance with the Charter of the Federal State Institution "State Natural Reserve" Wrangel Island ", approved by the directive №460 from 25.05.2011 of the Ministry of Natural Resources and Ecology of the Russian Federation:

Paragraph 1 of the Charter: Federal State Institution "State Natural Reserve" Wrangel Island" (hereinafter - the institution) is conservational, research and environmental education institution with the purpose of preservation and study of natural processes and phenomena, genetic fund of plant and animal world, species and communities of plants and animals, typical and unique ecological systems.

Paragraph 20. The objectives of the institution are to preserve and study the natural course of natural processes and phenomena, genetic fund of flora and fauna, of certain types of communities of plants and animals, typical and unique ecological systems.

Paragraph 21. In accordance with the purposes of institution, it implements core activities:

- 1) implementation of measures for the preservation of the natural environmental systems;
- 2) detection and suppression of violations of the established regime or other regulations of the protection and using of the environment and natural resources in the reserve and its buffer zone;
- 3) implementation of research projects;
- 4) implementation of environmental education;
- 5) implementation of environmental monitoring.

### **1.3. Status of the territory**

FSBI "State Reserve" Wrangel Island" is a specially protected natural area of federal significance. All the issues of activities of the reserve are governed by the Charter of State Organization "State Reserve "Wrangel Island", approved by the directive № 460 from 25.05.2011 of the Ministry of Natural Resources and Ecology of the Russian Federation.

The land, water bodies, mineral resources, flora and fauna in the territory and in the waters of the reserve are provided for use (possession) to the reserve on the rights under the relevant federal laws. Their withdrawal or other termination of rights on them is prohibited. Land and building within the boundaries of the reserve, constructions, facilities are not subject of privatization.

Natural resources and immovable property of the reserve is fully excluded from the turnover (can not to be alienated and transferred from one person to another in other ways).

The reserve territory must be taken into account at working out of plans and prospects of economic and social development, schemes of land management and regional planning, as well as in the territorial complex schemes of nature protection.

The reserve is a legal entity which does not have making profit as a primary purpose of the activity, that is a non-profit organization funded by the federal budget, it has own balance, the account in the State Treasury of the Russian Federation, as well as a seal with the State Emblem of the Russian Federation and with its name.

Wrangel Island was declared a World Heritage Site by the decision of the World Heritage Committee in 2004.

### **1.4. History of creation**

Reserve "Wrangel Island" was established in order to preserve the natural state of the islands of Wrangel and Herald with the totality of their components, to study natural course of natural processes and phenomena in these components and to develop scientific bases of nature protection. The reserve was established by decision of Ministerial council RSFSR dated March 23, 1976 n. № 189, by order of Glavohota RSFSR from April 20, 1976 № 155 on the basis of the decision of the Magadan Oblast Executive Committee from August 7, 1975 № 385.

The boundaries of the reserve were established in accordance with the decision of the Magadan Oblast Executive Committee № 504 on November 3, 1975.

12-mile zone of internal waters and territorial sea around the islands of Wrangel and Herald were included to the reserve on the basis of the decision № 1623-p of Government of the Russian Federation on November 15, 1997.

24 nautical-mile buffer zone around the 12-mile water area of the reserve was established by the Resolution of the Governor of the Chukotka Autonomous Region on May 24, 1999.

## **Chapter 2 NATURAL, HISTORICAL AND CULTURAL VALUE OF THE TERRITORY**

### **2.1. Natural values**

#### **2.1.1. General characteristics of the natural complex of the reserve**

Islands of Wrangel and Herald are the arctic tundra subzone (the most northern tundra subzone) due to climatic conditions, especially landscapes and vegetation. Mountains with the maximum height of 1095.4 m above sea level occupies approximately 2/3 of the Wrangel Island. The central mountainous part of Wrangel Island is the area of medium-altitude mountains towering over the whole island. Medium-altitude mountains are significantly splited by numerous valleys. The mountain peaks have predominantly plateau shape except for a few of them with the highest with alpinotype contours medium-altitude mountains, which are surrounded by a band of hills and low mountains, that represent significantly splited plateau with altitudes from 200 to 600 m from the west, north and south sides. Low mountains are also significantly splited by valleys, forming broad intermountain cupholes; some of them are very large. Mountains of the island are bordered by accumulative plains, composed mainly of alluvial deposits, with ridges, rising to 10-15 m above the general level from north and south. The champaign coasts of the island are mainly classified as lagoon type and are characterized by abundance of sand and gravel spits and sand bars. Various types of abrasion coast, characterized by rocky cliffs with height of up to several tens of meters, are developed in the places where the mountains meet the sea. Herald Island is a high residual mountain, formed by granites and gneisses, terminating to the sea as steep rocky cliff with height up to 250 meters on every side. Both islands are characterized by a variety of cryogenic form of nano- and micro-relief, where different polygonal and spotty shapes are dominated. Plains with frost-thaw basins are also developed in the low-lying areas of Wrangel Island.

Cemetery mound complexes formed as a result of thawing of polygonal wedge ice in the intermontane valleys.

Relief of Wrangel Island has significant thermal differences within it. So, in different areas of the southern coast average temperature of July is from +2.4°C to +3.60°C, which corresponds to a range of sub-Arctic tundra; on the northern coast the same index is hovering around +1°C (as in polar deserts), and in the intermountain basins of the central part of the island it reaches +8-10°C, which is typical for the southern edge of the tundra.

The climate in the area of islands is Arctic with significant influence of cyclonic activity. Most of the year cold arctic air masses, that have low temperatures and low content of moisture and dust, are dominated there. In summer they are displaced by more warm and moist air masses from the Bering Sea. Dry, dusty or continental air masses from Siberia are not uncommon there. The average annual temperature is - 11.3°C. The coldest month is February (- 24.9°C), the warmest is July (+2.5°C). The frost-free period on the islands usually does not exceed 20-25 days, often lasts for only about two weeks. 152 mm of rain falls there during the year, approximately half of them falls during snowy months. The winter period is characterized by severe and prolonged northeasterly winds, speed of which often exceed 40 m/s. Snowfall is significantly redistributed depending on landforms and wind direction, forming a very spotted snow cover - from its absence on the windswept places up to multimeter strata in the lowlands and on the downwind sides. A significant part of snowfall is carried down by the wind to the sea.

Meso-climatic differences are well expressed on the territory of Wrangel Island. The central sector of the island has more continental climate than the coastal (western and eastern sectors), which is characterized by lower summer temperatures, a late snow melt and higher frequency of fog and cloudy weather.

The hydrographic network of Wrangel Island consists of approximately 1,400 rivers and creeks extent more than 1 km, including 5 rivers that have a length exceeding 50 kilometers. There are about 900 lakes with a total area of about 80 square kilometers, most of which are concentrated in the northern plains of the island. Thermokarst lakes prevail on Wrangel Island, but there are large lake-like lagoons and coastal dammed lakes.

Waters of the East Siberian and Chukchi seas adjacent to the islands of Wrangel and Herald, stands out as a separate Wrangel chemical-oceanographic area characterized by distinct types of surface waters with low salinity, high saturation of oxygen and high concentration of biogenic elements. The flow of warm Pacific waters, forming a distinct layer at a depth of 75-150 m arrives here from the Bering Sea. In the northern part of water area, at a depth of about 150 m, warm Atlantic waters penetrate there.

During ice optimum period ice regime of waters around the islands is characterized by almost constant presence of ice in the summer. Edge of drifting ice in the period of their minimum distribution is located in the close proximity to the islands, or a little to the northwest (in exceptional cases far to the north). Massive of ice known as Wrangel is located in Long Strait during the warm period. Spur of Ayonsky oceanic ice massive is located in the East Siberian Sea, not far from Wrangel Island in the summer. In terms of global warming, the southern boundary of cohesive drifting ice retreats in summer and autumn time far north from Wrangel Island, as a rule beyond the continental shelf. Zavrangelskaya recurring polynya functions to the north or north-west from the island when the sea freezes in winter.

The soil cover of the islands is formed comparatively well. Arctic tundra sod and arctic tundra or gley soils predominate. Soils which are completely uncharacteristic for Arctic islands - steppe cryoarid and tundra steppe, typical for extremely continental areas of Siberia and north of Far East, distributed in the most continental central areas of the island. Typical salt marshes on the island were described under the name of arctic tundra saline soils of lithogenic origin, i.e. they appeared due to effusion water regime, which is characteristic of arid areas and completely atypically for the Arctic. Type of carbonate-arctic tundra soils which is endemic to the island of Wrangel is fairly widespread in the central areas of the island.

Zoogenic peat-compost soil on which unusually richly developed vegetational cover is well formed on the Island of Herald at the seabird colonies at the altitude of 100-200 m.

Flora of Wrangel Island is unique due to its richness and endemism. 417 species and subspecies of vascular plants are known on the island at present, their number exceeds the number of known plants on the entire Canadian Arctic Archipelago (!) and usually 2-2.5 times more than in other arctic tundra territory of comparable size. The island also has a leading position in the sub-arctic tundra due to the number of known species of mosses (331) and lichens (310) approaching, as in the case with vascular plants, to the areas related to the typical tundra. 23 taxa (species and subspecies) among the vascular plant are endemic for the island. A similar number of endemics has no equal on the Arctic islands, including Greenland. A number of endemic plants (*Oxytropis ushakova*, *Papaver multiradiatus*, *Papaver chionophila*) are quite common on the island and derivatives of widespread continental forms. Others are more or less rare, and are the product of a recent hybridogenic formation as *Potentilla ushakovii*, known only from the single location, as well as several species of poppies, or the relics, which were more widespread in previous eras on unwatered shelf territories. *Potentilla Wrangelli*, *Oxytropis uniflora* and *Hierochloe wrangelica* are the most interesting among the last, they grow only in a limited area of the island (headwaters of river Neizvestnaya), where each presented by several micropopulations. *Hierochloe wrangelica*, for which is known only 6 micropopulations with areas from 3 to 20 m<sup>2</sup>, can be attributed to the rarest plants in the world. Endemic ecological races are stand out as separate taxa and replace environmentally different continental form (*Senecio hyperborealis* sp. *wrangelense*) on the island or growing along with them, but in other conditions of habitat (*Trisetum wrangelense*). In addition to several endemic, sub endemic forms are represented in the flora of the island, that are common on the island and were found in certain areas of the continental Chukotka (*Oxytropis wrangelii*) in a small number.

Another interesting feature of the flora of the island is the presence here of a number of American species, unknown in the continent of Asia (*Cardamine purpurea*, *Gentiana arctophila*), regarding the southern hypoarctic and boreal species which are not found, as a rule, on the Arctic islands (*Ledum decumbens*, *Pyrolarotun difolia*, *Eleocharisa cicularis* and etc.) and meadow-steppe and steppe plants (*Potentilla arenosa*, *Festuca lenensis* and etc., as well as a variety of mosses), penetrating to the North-East Asia, but also absent elsewhere in the sub-Arctic tundra. *Carex duriuscula* is especially interesting among the last - existing dominant of dry steppes of Central Asia and Yakutia, was founded on the island at three remote locations. The last two groups of plants can be considered as relics of previous eras with warmer and more continental climate.

The vegetation of the islands is also very diverse and combines both typical subzone arctic tundra, and completely unique features. Different variants of spotted polygonal and tundra of arctic tundra subtype of tundra type vegetation prevails on the island. Suffruticous, mixed grass communities and lichen communities of stone deposits and gravelly slopes are widespread in the mountains. Phytocenoses analogous to zonal polar deserts are formed in spots on the high plateau-like surfaces. In addition, dryas nanohummocky communities which are endemic have no analogues in the composition and structure of anywhere else in the Arctic are spread on the island.

Plant communities with more southern appearance, similar or identical to sub-Arctic are well represented on the island of Wrangel apart from the typical for subzone of Arctic tundra. These are a variety of tundra meadows, hummocky tundra with shrubs, cassiopei tundra, wetlands areas with Hypoarctic species of sedges and rushes, as well as the real tundra shrub and thickets of riparian shrubs that are not presented anywhere else on the islands of the arctic tundra subzone. All these communities are limited by the mountainous regions of central and western parts of the island, which are mainly confined to large mountain valleys and basins.

Communities of another complex, which is not common to the existent Arctic tundra, are spread in the same mountainous areas and on the southern macroslope of the mountains. This is a variety of phytocenosis with a significant participation of xerophilous and mesophilous species of steppe and meadow-steppe ecology. Tundra steppe communities are most common among them, Arctic subshrubs (Dryads, willows) and xerophilous grasses codominate among them. In addition, the plant aggregations, which may be called steppeified meadows are diverse in the warmest areas, and also completely unique for the Arctic community of xerohalophilous plants are confined to the salt marshes. Small areas of this steppe communities are represented on the island, which is also distinguishes Wrangel Island from all other Arctic islands. Island steppes fall into two main types - herb grass, with the domination of bluegrass *Poa arctosteporum*, and sedge, with domination of steppe sedge *Carex obtusata* and *Carex duriuscula*, forming the existent steppe plant communities of Mongolia, Buryatia and Yakutia. Unique communities with domination of legumes, founded in only one spot, in the headwaters of river Neizvestnaya, refer to the same complex.

The fauna of terrestrial invertebrates of Wrangel Island has the same features that are typical for the flora of vascular plants. First of all, as well as the flora, fauna of the invertebrates on the island is well represented by all the typical Arctic forms and taxa, which are dominant in most cases, providing the appearance of Arctic fauna. Secondly, it is unusually high species diversity. 31 species of spiders, 58 species of beetles, at least 42 species of butterflies are known for the island, it is substantially higher than the number of species of invertebrates identified in other parts of the sub-Arctic tundra. Leaf beetles (7 species) and weevils (11 species) are especially allocated among insects due to species richness. Third, in the arthropod fauna of the island, as well as the in flora, there are representatives of relatively southern groups, which are absent in the Arctic tundra as a rule. They are different orthopterans belonging to the families Delphacidae, Aphalaridae, Aphididae, beetles of families Melyridae, Coccinellidae, Lathiridae and others. Fourth, the insect fauna of Wrangel Island is also characterized by unusually high level of endemism. At present 12 taxa (species and subspecies) of insects are known just for



Wrangel Island, including 3 species of leaf beetles, 2 species of weevils, the malachiid beetles (Melyridae) and psylla (Aphalaridae). As endemic plants, endemic species of insects include quite common species by the abundance (*Apion wrangelianum*, *Chrysomelablaisdelli wrangeliana*), and extremely rare, known only from a single habitat (*Aphalara arctica*, *Troglocollops arcticus*). Fifth, in the fauna of terrestrial invertebrates, as well as in the flora, there are well traced American and Central Asian connections - number of endemic forms is close to American or Central Asian species, also there are species living in the steppe regions of Central Asia (*Coniocleonus astragalli*), etc.

Fauna and the population of invertebrates of the coastal waters of the islands actually have not been studied, but even the most preliminary studies have shown that benthic communities of lagoons of the southern coast of Wrangel Island are different from those, which are typical for the Arctic basin, by the relatively warm-water character that is associated with Pacific Water masses penetrating here.

170 species of birds, most of which are birds of passage, were registered for islands of Wrangel and Herald and coastal waters. Nesting was found for 62 species, including 8 species of sea birds. The basis of the avifauna are tundra species, most of which have a circumpolar areas and are the background elements to all the arctic tundra - lapland bunting (*Calcarius lapponicus*), snow bunting (*Plectrophenax nivalis*), grey plover (*Pluvialis squatarola*), turnstone (*Arenaria interpres*), red knot (*Calidris canutus*) and others. However, nesting is known for not common species in the Arctic such as the ruff (*Philomachus pugnax*), red-necked stint (*Calidris ruficollis*), horned puffin and Tufted Puffin (*Fratercula corniculata*, *Lunda cirrhata*), arctic warbler (*Phylloscopos borealis*). Wrangel Island is the most northern point of nesting for them.

Permanent colony of snow goose (*Anser caerulescens*) is located on the island of Wrangel. It has up to 40 thousand nests and is the only one in Asia. Pacific black brant (*Branta nigricans*) nests on the islands in small quantities. Besides that, several thousands of black brant, registered at breeding places in Chukotka and Alaska, annually arrive for molting to Wrangel Island. Common eider and king eider (*Somateria mollissima*, *S. spectabilis*) are usual birds at the nesting place, Steller's eider (*Polysticta stelleri*) is found in very small numbers.

The largest in the Chukchi Sea seabird colonies numbering up to 250-300 thousand of nesting birds are located on the islands, among the birds dominated thick-billed guillemot (*Uria lomvia*), polar guillemot (*Cephus grylle*) and black-legged kittiwake (*Rissa tridactyla*). In addition, the typical representatives of the North Pacific Marine avifauna - pelagic cormorant (*Phalacrocorax pelagicus*), horned puffin, tufted puffin, and common murre (*Uria aalge*) nest here.

Gerfalcon, peregrin (*Falco rusticolus*, *F. peregrinus*) and buff-breasted sandpiper (*Tryngites subruficollis*), whose areal is primarily in North America, nest in a small number on the islands of Wrangel and Herald among other rare and protected birds. Sabine's gull (*Xema Sabini*) is common on the plain lakes of the island. Well-defined transit or temporary concentration of ross's gull (*Rhodostethia rosea*) and ivory gull (*Pagophila eburnea*) is observed at sea coasts of the of the island in the autumn period. Besides most of the world's population of ross's gull is concentrated along the southern coast of Wrangel Island in September and October of some years.

Specific feature of bird fauna of islands is the fact that the local population of snow buntings and guillemots was described as separate subspecies, and red knot is represented by a subspecies (*Calidris canutus roselaari*), which is common only on Wrangel Island and in a limited area of western Alaska.

The fauna of land mammals of islands is quite poor and includes only 3 ordinary native species - arctic fox (*Alopex lagopus*) and two species of lemmings. Lemmings are represented by Vinogradov's lemming (*Dicrostonyx vinogradovi*), endemic for the island, and a subspecies of the Siberian lemming (*Lemmus sibiricus portenkoi*). Wolverine (*Gulo gulo*) inhabits on Wrangel Island in a small number, wolves (*Canis lupus*) and foxes (*Vulpes vulpes*) periodically visit it.

In addition, the domesticated reindeer (*Rangifer tarandus*), which is almost completely wild by now, was brought to Wrangel Island in the 40s. At present time their number is approaching to one thousand animals. 20 musk buffalos (*Ovibos moschatus*) were released on the island in 1975. Their current number is approximately 800 animals. According to paleontological data, both of these species of hoofed animals inhabited on the island in the Late Pleistocene and the reindeer much later (2-3 thousands years ago).

Islands of Wrangel and Herald are the largest area (probably the largest in the world) of the concentration of polar bear maternity holes (*Ursus maritimus*). From 300 to 500-600 females of this species lie in the halls here annually, including up to 100 maternity halls, which are located on the Herald island. In winter and spring high number of polar bears remain in the ice waters around the islands, where pinnipeds are found in large number. In the autumn, in conditions of the absence of ice near the coast of Wrangel Island, polar bears often form large aggregations on the shore at the rookeries of walrus, near the beached dead whales, etc., where at the same time can be up to 120 animals of different sex and age.

Pacific walrus (*Odobenus rosmarus*) is the most numerous inhabitants among pinnipeds in the waters around the islands, this area of water is the most important in the summer feeding period, when absolutely most of the females and young animals of the whole population is gathered in masses in the period from July to September-October. If possible, walrus are on the ice, but in the absence of ice near the most feeding areas, they form the largest in the Chukchi Sea coastal rookeries, where 80-100 thousands of animals can be found simultaneously. In addition to the walrus, ringed seal (*Phoca hispida*) and bearded seal (*Eregnatus barbatus*) are common in the coastal waters.

In summer and autumn, water area, adjacent to the islands of Wrangel and Herald, is also the area of feeding and migration of cetaceans, the most numerous species of them is gray whale (*Eschrichtius gibbosus*) and, in a lesser degree, white whale (*Delphinapter usleucas*). In addition, the bowhead whale (*Balaena mysticetus*), humpback (*Megaptera novaeangliae*) and the finback whale (*Balaenoptera physalus*) were observed there.

### **2.1.2. The most valuable natural objects and key areas of reserve requiring special protection and management**

The most valuable natural objects of the reserve are:

- (I) - the most vulnerable objects of flora and fauna (including reproductive populations of animals, micropopulations, community of species), conservation of which requires special attention and special protection, i.e. increased protection from disturbance and damage.
- (II) - unique and rare objects of fauna and flora (including reproductive populations, seasonal accumulations of animal, micropopulations and plant communities);
- (III) – specific geological and landscape structures (including solitary rocks, bedrock exposures, residual mountains, permafrost formations, etc.);
- (IV) - objects of particular interest for research;
- (V) - objects of particular aesthetic value, attractive for displaying them to visitors of the reserve in ecological and educational purposes;
- (VI) - key areas - landscape and ecological systems (ecosystems), including complex of objects from this list;

One object can refer to several of the abovementioned categories.

Increasing of protection measures and specific approaches for the management of certain objects is required seasonally. At present, the list of key areas with a high concentration of the most valuable natural sites of the reserve consists of the following:

- **Herald Island** (in whole, includes a set of objects) - the highest concentration of polar bear maternity holes known in the areal of species; walrus rookery; the biggest in this sector of the Arctic seabird colonies with the community of associated species; unique and highly aesthetic geological structures (categories I-VI);

- **Mountain ranges Dream-Head, Western Plateau, Waring, the site of the Eastern Plateau near the Cape Pillar** - the main areas of concentration of polar bear maternity holes on Wrangel Island, areas of high concentration and activity of polar bears in the autumn period (I-VI);
- **The main breeding colony of white goose in the headwaters of the river Tundrovaya** the only large colony of white geese, which is preserved in Eurasia; with associated unique ecosystem formed in the habitat at influence of zoogenic factors (I, II, IV-VI);
- **Headwaters of the river Neizvestnaya (key area "Verhnyaya Neizvestnaya ")** - the most stable and densely populated reproductive settlement of snowy owl, known within its areal; mixed reproductive populations of white owls and arctic fox; a very high concentration of lamellirostral colonies around nests of snowy owl; high concentration of micropopulations and relict communities of endemic and rare plant taxa; overgrowth of willow-shrub (I, II, IV, VI);
- **Lower reaches of the river Tundrovaya** - a high concentration of white geese with nestlers during the molting season; the most stable and densely populated reproductive settlement of arctic foxes, known in the species areal; area of high density nesting of Sabine's gull; high concentration and diversity of types of lemming settlements (I, II, IV, VI);
- **Lake basins in the Tundra of Academy from river Medvejya to the river of Hydrographers and lower reaches of the revers Neizvestnaya, Pestsovaya, Krasniy Flag and river of Hydrographers** - areas of concentration of white geese with nestlers in the period of post-breeding moulting; major nesting places of Sabine's gull (I, II, VI);
- **Area of Waring cape** - a high concentration of polar bear maternity holes; high activity of polar bears in the autumn; large colonies of sea birds (black-legged kittiwakes, thick-billed guillemot, pelagic cormorant, horned puffin); the highest density of Baird's sandpiper, semipalmated plover and the gerfalcon; locating of rock crystal and calcite; unique and highly aesthetic geological structures (I-VI);
- **Western Coast (area from the Cape Thomas to the mouth of the river Sovietskaya)** - a high concentration of polar bear maternity holes; high activity of polar bears in the autumn; large colonies of sea birds (black-legged kittiwakes, thick-billed guillemot, pelagic cormorant, horned puffin); nesting places of Baird's sandpiper; unique and highly aesthetic geological structures (I-VI); arctic continental halophytes; small colonies of white geese and other lamellirostral around the nests of snowy owl; nesting places of buff-breasted sandpiper and Baird's sandpiper;
- **Kit Mountain range** with the surrounding areas of tundra at the root of the mountains - nesting area of Baird's sandpiper and buff-breasted sandpiper, concentration of molting black brant; large colony of Sabine's gull; high diversity of lemming settlements (II, IV, VI);
- **Valley of river Gusinaya** - relict tundra steppe communities, growths of willow-shrub; high density of nesting white owl; numerous colonies of white goose nests around nests of snowy owl; nesting place of Baird's sandpiper; high concentration and diversity of types of lemming settlements (I-VI);
- **Middle reaches of the river Mamontovaya** - many cryophytic-steppe and tundra-steppe plant communities; relict communities of arctic continental halophytes; high density of nests of snowy owls and reproductive holes of arctic fox; numerous small colonies of snow geese and other lamellirostral around nests of snowy owls; nesting place of buff-breasted sandpiper and Baird's sandpiper; high density and diversity of types of lemming settlements (I-VI);
- **Estuarine area of the river Mamontovaya and the Jack London lake** - high concentration of molting black brant; concentration of sandpipers during autumn migration; large colony of Sabine's gull; area of high activity of polar bears during autumn period (I-VI);

- **South coast in the area of the Somnitelnaya Bay** - cryophytic-steppe and tundra-steppe plant communities; rare and endemic plant taxa; nesting places of buff-breasted sandpiper; areas of concentration of migrating ivory gull and ross' gull; area of high activity of polar bears in the autumn period (I-VI);
- **Shoal head Somnitelnaya** - walrus rookery; a place of high activity and concentration of polar bears in the autumn period (I-VI);
- **Area of Cape Blossom** - walrus rookery on the shoal head; high concentration and activity of polar bears during the autumn period; concentration of ivory gull and ross' gull during autumn migration; area of concentration of walrus and feeding area of gray whales in the coastal waters;
- **Valley of brook Thomas with surrounding slopes** - a high concentration of polar bear maternity holes, high density of family groups and female polar bear in the autumn period (I, II, IV, VI);

This list can be extended as a result of ongoing research and monitoring in the reserve.

**Species, the most vulnerable to wildlife disturbance** in respect of which requires special attention and special measures of protection are:

- **Snowy owl**- during the whole reproductive season - from the beginning of laying eggs until the nestlers finish starting to fly;
- **White goose** - during the whole reproductive period - from the beginning of laying eggs until the nestlers finish starting to fly; the most vulnerable in the period of laying eggs, hatching and moving from the areas of nesting to the molting area (especially altricial flocks) and during the nestlers starting to fly;
- **Polar bear** - females of bear in the areas of holes - in the period of lying in the hole (September-November), during the opening of the hole and leaving to the ice (March - early May); family group with bear's cubs of the current year are particularly vulnerable during the transition from areas of lying in the holes to the ice;
- **Black brant** - during the reproductive period and molting;
- **Arctic fox** - females during the whelping and lactation, broods during the life in hole before expansion;
- **Musk buffalo** - reproductive herds during the fawning period (April-May);

## **2.2. Analysis and assessment of the natural objects, problems of the conservation and threats**

At present preservation of natural complexes of the islands of Wrangel and Herald is ensured by the absence of the residents and external companies, as well as geographical isolation. Activities of meteorological station of the Federal Hydrometeorological Service is controlled by the state inspectors of protection department. Potential external threats are the development of commercial navigation along the Northern Sea Route, exploration and development of hydrocarbon reserves on the continental shelf of the Chukchi sea, Beaufort sea and East Siberian sea. Internal threats are violation of strict regime of protection of the most valuable natural objects and key areas of reserve requiring special protection and management, as well as actions that lead to new pollution and violations of the protection regime of the reserve.

### **2.2.1. Natural factors**

Intensification of erosion processes in the tundra is observed at the present time in connection with global warming. Increasing of summer temperatures and the consequent intensification of the defrosting of ever-frozen soil causes the activation of the karst processes. The absence of ice during the summer-autumn time works towards destroying the coastline by the storms and changing of reconfiguration of sea shoal heads and beaches.

### **2.2.2. Anthropogenic factors**

One of the main problems of preservation and cleaning up of natural complex of Wrangel Island is the cleaning of land on the south coast and the elimination of a large number of man-made garbage (empty POL drums and containers, thrown faulty machinery and its spare parts, destroyed buildings, storage of household waste, the spilled POL and transformer oils) in areas of the former base of air defense and settlements. Mostly man-made garbage is concentrated in four areas in the southern and south-eastern parts of the island. Small accumulations of empty drums (30-70 pieces) are in the depths of the island near the field stations. Polar meteorological station of the Federal Hydrometeorological Service also contributes to the accumulation of man-made garbage. Quantitative characteristics of contaminated areas of Wrangel Island are following:

- more than 100 thousand empty metal POL drums;
- more than 25 thousands tons of scrap metal in various forms;
- more than 250 buildings and constructions, including half-ruined.

Some of these scraps can be viewed as the history of Arctic exploration (for example, an empty fuel tank at the site of the former base of air defense), but the most part of them should be removed from the reserve.

In the summer of 2011 work on clearing the coastal strip of Wrangel Island of metal began in the framework of the Resolution of the President of the Government of the Russian Federation V.V. Putin on clearing of Arctic of accumulated over previous years technical garbage. Cleaning the territory of the state natural reserve "Wrangel Island" from man-made garbage has been one of the conditions for the inclusion of Wrangel Island to the list of World Natural Heritage in 2004. Ship "Mikhail Somov", which delivered the equipment, came to the island in August 2011. Two presses, stove for burning residual fuel, tractor and tools for cutting metal were delivered to the island. Reserve staff and specialists, who arrived on the ship and have trained personnel working with the press, took an active part in the work of cleaning up the reserve. Work on the quantitative assessment of contamination and sampling of POL, oils and soil from contaminated sites, and water to assess the extent of contamination and for further planning of cleaning the territory have been carried out by the Polar Foundation.

Staff of the reserve collected about 1,000 drums scattered around the field station Somnitelnaya and stored them for further utilization in the framework of preparation for work on the disposal of scrap metal in August. Employees of the reserve will continue to work on preparing for the disposal of scrap metal for the further recycling.

At the present time program of collecting of residuals of POL in the containers, storage and preparation of drums for disposal from the island for further recycling is developed.

These factors are local and do not threaten the integrity and existence of the natural complex of the reserve or its individual objects. Global potential threats can be represented by the development of commercial navigation along the Northern Sea Route, exploration and development of hydrocarbon reserves on the continental shelf of the Chukchi Sea, Beaufort and East Siberian.

## **2.3. Historical and cultural sites**

### **2.3.1. General characteristics of the historical and cultural sites**

Wrangel Island was uninhabited before the founding of a permanent settlement in 1926. The only one archaeological site, dating to the early history of the island (the Paleo Eskimo site on Devil's gully with approximate age 3,200 years) was found on the territory of the reserve. All other historical and cultural sites belong to the period of the initial colonization (1926 - the end of 1930) and following development of Wrangel Island (1940s - 1960s) and include three groups of objects: the remains of buildings of the first settlements (wild capture dugouts); buildings belonging to the period of commercial hunting and reindeer farming on the island, the ruins of the buildings of the period of attempts of industrialization and militarization of Wrangel Island.

Regarding the latter, actual concept of the reserve is as follows. Buildings and ruins of the settlements and military bases (at Hawaii Cape and the former village Zvezdnyy - Somnitelnaya bay) are the monuments of the modern history of Wrangel Island. They are localized objects that occupy negligible areas (with respect to the area of the island) and do not have a negative impact on the ecosystem of the island. At the same time these objects reflect history of the development of the island and the effects on the nature of the Arctic under the old approaches to its development, which will never be repeated on the island. Elimination of household garbage and scrap metal on the territory of these objects is necessary for this reason, but old buildings and ruins of the main buildings, which reflect the way of planning and former infrastructure of settlements, are preserved as monuments of history.

Some historical buildings in the village Ushakovskoe are repaired, maintained in habitable condition and use for the needs of the reserve, for example, Ulvelkot house, the house of Pavlov in the village Somnitelnaya, several houses in the village Ushakovskoe.

Old buildings in the villages and old huts in the field stations are an important resource for ecotourism in the reserve. Each of them - part of the history of the island and natural reserve, everyone of them has its own history. Visitors are interested in these objects, old technologies of life on the island and its history not less and sometimes more than in the natural objects. Therefore, preservation of that historical monuments is an important part of work on the ecotourism on the island of Wrangel. Experience of conservation and using of historical monuments in Spitsbergen (Svalbard) is interesting and useful for us in this sense: all the historical objects are protected by law and preserved in their natural state, these objects are especially shown to tourists, including old hunting and scientific cabins and winter huts.

### **List of known historical and cultural sites of the reserve**

#### **Category 1 - archaeological sites**

- Paleo Eskimo sea mammal hunters site in the Devil's gully;

#### **Category 2 - remains of buildings of the first settlers (campsites, wild capture huts)**

- Remains of the Skurihin's dugout;
- Remains of the dugout complex on the shoal head Burunnaya;
- Placement location of the Soviet flag at the mouth of the creek Thomas;
- Place of grandfather Kmo's wild capture site in the estuary of the river Sovietskaya;
- Remains of the wild capture site on the Mushtakov's shoal head;

#### **Category 3 - buildings of the period of commercial hunting and reindeer farming on the island**

- Hunting house on the Popov's lagoon - a complex of buildings of the wild capture camp;
- Camp site on Jack London's lake;
- The complex of buildings of the former removable meteorological station at Cape Blossom (now functioning as a field station of the reserve);
- The ruins of the wild capture Nanaun's house on the shoal head Vaigach;
- Wild capture Nanaun's dugout near the mountain Thomas;
- Hut of reindeer herders near the river Neogidannaya (now functions as a field station of the reserve);
- Wild capture Chaivun's house on the Komsomol lake - a complex of buildings of the wild capture camp (now functions as a field station of the reserve)
- Wild capture dugout of Nanaun-Chaivun on the Nanaun's lagoon;
- Hunting dugout on the Tayan's lagoon;
- Pavlov's house in the former village Somnitelnaya;
- Uvelkot's house in the former village Somnitelnaya;
- The ruins of the barracks and the military airbase household buildings near the river Somnitelnaya (village Zvezdnyy);

- The ruins of the wild capture Pavlov's House and the tomb of Pavlov on the 7th km (Somnitelnaya bay);
- Hut of reindeer herder's in the estuary of river Hischniki;
- Wild capture house at the mouth of the creek Lyulyak;
- Old hut of reindeer herders on the river Verhnaya Gusinaya;
- Log cabin in the estuary of the river Neizvestnaya;
- Log cabin at the mouth of the creek Lyulyak;
- Ruins of hut in the estuary of river Hischniki.

**Category 4 - buildings in the former settlements and military bases.**

- Buildings in the village Ushakovskoe
- Buildings in the village Somnitelnaya
- Surviving warehouse buildings and some ruins of infrastructure at a military airfield in Somnitelnaya.

The matter of preservation of the structures on the basis of the former air defense on the heights of Hawaii (such as concrete storage tanks for fuel, brick building) is under consideration).

**Category 5 – old buildings on field stations of the reserve.**

- Hut on the station Pik Tundroviy
- Hut on the station Werring
- House on the station Blossom
- Hut on the station Nignyaya Gusinaya
- Hut on the station Dream-Head in the gnome's valley
- Hut on the station Verhnyaya Neizvestnaya
- Hut on the station Srednaya Mamontovaya
- Ledinskiy hide-hut in the stow of Nesting site of white geese.
- Hut on the station Nignaya Tundrovaya

More detailed description of the historical and cultural sites will be given in the Cadastre of historical and cultural sites of the reserve "Wrangel Island", the completion of which is one of the objectives of this plan. This list can be extended in case of revealing of new historical objects on the territory of the reserve.

**2.4. Analysis and assessment of historical and cultural sites, problems of the conservation and threats**

At present cultural and historical monuments of Wrangel Island are destroyed naturally. The remains of dugouts located on the shoal heads can be completely washed away in the next few years due to increased storm activity in ocean as a result of global warming. Remains of the dugout on the shoal head Burunnaya were completely washed away by autumn storms. Several monuments can be restored or conserved to preserve in its current condition (for example, the old huts in the scientific field stations, a complex of buildings of the wild capture camp on lake Komsomol, the houses in the village Ushakovskoe and Somnitelnaya and some others). These activities require special financing and special-purpose programme.

Historic buildings in the condition of ruins are stored in a completely natural state of ageing and used for ecotourism.

**CHAPTER 3**

**SOCIO-ECONOMIC CONDITIONS AND ENVIRONMENTAL MANAGEMENT**

**3.1. The history of settlement and environmental management**

Low-level damage was done to natural complexes due to the relatively recent settlement and development of the island. There was a low population density and lack of industry even in

the years of efforts of intensive development of Wrangel Island. The first and basic permanent settlement on the island of Wrangel, which functioned until the end of the 1940s as a wild capture factory, was founded by G.A. Ushakov in 1926. The village was named after the founder - Ushakovskoe. Geological studies of the island were held in the first half of the twentieth century. Industrial stock of mineral resources was not found. Small deposit of Iceland feldspar on the mountain Perkatkun and on the slopes of mountains Incali was developed during short time and abandoned because of lack of prospects. Military base and a soil landing strip of reserve airfield were built on the southern shore of the island, on the left bank of the river Somnitelnaya, in the village Zvezdnyy in the 1950. Military base of air defense was founded on the heights of Hawaii on the south-east coast in 1960 and eliminated in 1992.

The main economic activities in the territory of the reserve in the past were traditional reindeer grazing and hunting (sea animals (walrus, seal, bearded seal), polar bears and arctic foxes).

At present villages are closed, military units are withdrawn from the territory of the island.

Historical experience of the development of Wrangel Island could be a good model for testing different concepts of Arctic exploration. In the history of the development of Wrangel Island different approaches were tested:

- primary colonization - the organization of a permanent settlement, a survey of the island, the struggle for survival due to hunting.
- development of renewable biological resources - establishing of sea-hunting and industry; acclimatization of reindeer.
- attempts of industrialization - organization of state owned reindeer farms, planned fur trapping, prospecting and efforts to develop the mineral raw materials (clear quartz).
- militarization - the creation of an auxiliary military airfield with a soil runway, the creation of the air defense base at cape Hawaii on the southeast coast of the island.
- restrictions on the use of natural resources - the establishment of the sanctuary on the part of the territory of the island, the prohibition of hunting for polar bear, white goose.
- establishment of the full reserve regime – the establishment of State Natural Reserve on the islands of Wrangel and Herald, followed by the addition to the reserve surrounding marine waters (12-mile zone of territorial waters in the status of the reserve and the 24-mile protective zone).

The discovery of the island was accompanied by a political conflict on the nationality of the territory. Therefore, the task of ensuring of the Russian state presence in this area has been a major from the beginning of colonization of the island since the establishment of the soviet permanent settlement. This problem was solved by different methods before the creation of state natural reserve on the island:

- establishment of factories;
- establishment of the department of the reindeer state farm;
- construction of the auxiliary military airfield and air defense base.

Thus, the newest history of the Wrangel Island - an experience of the application of different approaches to the development of the island and its resources. The analysis of this experience allows to make certain conclusions about the results of attempts of industrialization and militarization of the island. These approaches were:

- economically wasteful - they demanded a significant permanent flow of financial and material resources to sustain these activities on the island;
- functionally ineffective - did not bring the desired results. As an example, experience of the functioning of the air defense base at Cape Hawaii, the effectiveness of which was equal to zero, alcoholism - emergency and accidents took place regularly.
- polluting - tons of fuel, significant amount of which spilled on land and in coastal waters, were brought to the island annually; plenty of pieces of machinery were also brought there, as well as many tons of equipment for the job, household and food supply



for village with a population of up to 200 people. All waste, household garbage and dilapidated machinery remained in the dumps on the island, from which nothing was taken out, except for personal property of people relocating to the mainland.

- socially defective - alcoholism, mental and cultural degradation of people living in isolation and harsh conditions, lumpenization of representatives of native minorities and other residents of the village on the island. That are the main social consequences of such a policy of development of the island and these approaches.

Organization with functions that are not directly related to the functioning of the reserve has continued to operate after the establishment of the reserve. In fact, they were a burden of historical heritage, inherited from the previous period.

Organizations, that continued to operate on the island after establishment of the reserve (after 1976):

- Reserve
- Polar Station
- The village soviet
- frontier post
- post office
- department of trade of the Shmidt's district
- base of air defense on the heights of Hawaii

Besides the reserve and the polar station, all other organizations did not produce any useful work and were busy only with polluting sustainment with all of the above negative consequences. Their gradual elimination, stretching on for years, became a positive factor to the island's nature and led to saving of resources, cessation of environmental pollution and increasing of effectiveness of ensuring the Russian state presence on the island.

Actual experience of functioning of the reserve shows that the arctic reserve combines all the necessary functions of state institutions in the Arctic:

1. Ensuring of the state Russian presence in the territory.
2. The actual control of the territory and visiting.
3. Systematic research.
4. Monitoring of natural objects and natural environment (with appropriate technical and human resources including functions that polar meteorological station performs).
5. Ensuring infrastructure and conditions for national and international high-latitude scientific expeditions
6. Integration into the international circumpolar network of protected areas and other key areas for long-term study of the impact of global climate change on the biota.
7. Ensuring conditions, information and material basis for the development of controlled eco-tourism as a potentially important economic sectors in the region.
8. The Nature Conservancy of the Arctic in the regional (at the level of individual SPNAs), national (at the level of the national network of SPNAs) and planetary scale (at the level of integration into the global system SPNAs).
9. Ensuring the necessary conservational framework and information base for environmentally friendly using of resources in the Arctic region.
10. Working in the out-of-doors and with natural objects in the reserve, according to the methodology of research in SPNA are the means of psychological recovery that prevent mental degradation of polar explorers.

The historical experience of Wrangel Island shows that the development of the network of SPNAs in the Arctic allows to solve all modern challenges of the Arctic development maximum effectively, making it in environmentally friendly way, most cost-effectively, without damaging social and psychological consequences, providing a positive international image of the country as the Arctic authority - in research, preservation of nature and development of the Arctic.

Reserves are state institutions vested with power functions of controlling of the territory and environmental management. They are objectively sufficient and optimal form of ensuring the state's presence in the Arctic region. In the presence of technological maintenance of communication and coordination between different agencies, duplication of the presence of other institutes to perform this function is not required.

Experience of the reserve "Wrangel Island" shows that the development of the Arctic, based on the improvement of the system of SPNAs, should be considered as a concept of progressive development of the Arctic, ensuring the most efficient implementation of all the necessary functions and tasks.

### **3.2. Present conditions of environmental management**

At present industrial enterprises and the local population are completely absent in the territory of the reserve "Wrangel Island". The only company - polar meteorological station of the Federal Hydrometeorological Service is located near the settlement Ushakovskoe in the designated area of 1 hectare.

Employees of a department of protection are present within the reserve territory, as well as research officers during the field season. Ecological tourists on cruise ships and land-based group visit the territory of Wrangel Island during the year, as well as film and photo production staff from time to time. Third-party experts come according to research contracts. All visits of third-parties are held under the control of the department of protection.

### **3.3. Socio-economic features of the territory**

The most significant changes in the individual natural complexes are connected with anthropogenic load, occurred in the second half of XX century after establishment of the branch of the state farm "Pioneer", increasing of the population of the village, construction of a military auxiliary airfield in the village Zvezdnyy and base of air defense on the heights of Hawaii. Anthropogenic pressure to the natural complex of the island was the highest in the period of their functioning. After liquidation of the military bases and the branch of the state farm "Pioneer" (establishment of the reserve and cessation of the reindeer farming on the island), these factors have been removed. Village Ushakovskoe, preserved until 1998 provided only a local effect on the immediate surroundings. The absence of a permanent settlement on the island at the moment is a favorable factor for the preservation of the natural complex of the reserve in its natural state for an unlimited time.

### **3.4. Visiting of the territory, analysis of visitors**

<b>Parameter</b>	<b>unit</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
Number of visitors of the reserve in excursion order (including visits to museums located on it and information centers)	man	129	334	103	304

### **3.5. Anthropogenic impacts, illegal types of environmental management**

Branch of the state reindeer farm, units of the Ministry of Defense were located on Wrangel Island, and there were conducted a variety of geological surveys before establishment of the reserve. All of these organizations left a large number of localized anthropogenic garbage (empty fuel drums, abandoned faulty equipment and its parts, destroyed buildings) after its liquidation. Polar meteorological station of Federal Hydrometeorological Service functions on the Wrangel Island at present and also contributes to the accumulation of man-made garbage. Some of these remains can be seen as the history of Arctic exploration, but the bulk of it should be removed from the territory of World Natural Heritage Site.

RTG was taken away from the territory of Wrangel Island in May 2012 on the hydrographic vessel for further disposal.

## CHAPTER 4

### MANAGEMENT OF SPECIAL PROTECTED NATURAL AREAS

#### 4.1. Administrative management structure and staff

Federal State Budgetary Institution "State Natural Reserve "Wrangel Island" is a legal entity, a non profit organization funded by the federal budget, the budgets of other levels and extra-budgetary sources and private funds allocated for the implementation of basic tasks. The reserve is located on a separate the balance sheet, it has an account in the Treasury of the Russian Federation, as well as a seal with the State Emblem of the Russian Federation and its name.

Table 4.1

Movement of staff

Indicators \ years	2009	2010	2011	2012	2013 (on 01.01. 2013)
Average number (pers.), including:					
The permanent staff	25	22	28	23	23
physical entities under contract	-	-	-	-	-
arrived	16	13	12	7	6
Disposed	13	18	8	11	6

Salaries, wage rates and other terms of payment of workers of the reserve were established in the amount and manner approved by the Government of the Russian Federation for budgetary sector of institutions, financed from the federal budget. The forms, system and amount of the payment to workers are established by reserve in accordance with the payment terms and within the limits of available funds for salaries. The structure and staffing of the reserve are determined by the director of the reserve, within the limits of the federal budget appropriations for salaries on the basis of the objectives and the specific of the reserve.

Information and functional communications between the departments of the reserve are made through the administrative apparatus and the Scientific and Technical Council (STC) of the reserve. Academic Council was also established in the reserve, competence of Academic Council are issues of evaluating the quality of research in the reserve and relevance of research projects.

The reserve has six organization departments: management of the reserve, department of protection of reserved territories, research department, department of environmental education, department of the core activities, department of accounting and reporting. Department of protection is located on the island, the link with protection department is carried out by radio or satellite phone, as well as satellite internet.

#### 4.2. Infrastructure

Property of the reserve is federal property and assigned to it on the basis of operational management in accordance with the Civil Code of the Russian Federation. Reserve owns, uses and disposes of the property assigned to it within the rules, established by civil law.

The central office of the reserve is located in the town Pevek, Chaun district, Chukotka Autonomous District, where the reserve rents an office on the ground floor of a residential building. Reserve have no its own buildings in Pevek. There are no additional placements in Pevek, there is only a shipping container, used as a warehouse. Number of rooms in the office, auxiliary rooms and constructions for the functioning of the reserve is insufficient. There is no broadcasting center. Garage is rented.

The infrastructure of the reserve on the island is represented by two bases - village Ushakovskoe and village Somnitelnaya and by a network of field stations. Field stations of the reserve are simple (one room) or complex (composed of several connected rooms in one building) huts - small buildings without foundations. The network of field stations of the reserve in its present form was established in 1980 on the basis of old herders huts, left in the tundra from the time of reindeer farming on the island; expeditionary huts, brought to the island at different times by the research expeditions; new huts, made by reserve staff.

Four modular guest houses were delivered to Wrangel Island in autumn of 2012 (end of September). They are installed in the following locations: 2 houses at the cordon on the river Neogidannaya, one house at the cordon Red Flag, one house on the base Somnitelnaya. Two houses were delivered in the autumn of 2013, one of them was unloaded at Cape Waring (Draghi Bay), the second was unloaded in Ushakovskoe for further delivery and installation at the station Peak Tundroviy.

**The concept of forming of the network of field stations of the reserve** is based on two principles:

- Field stations should provide the opportunity of studying and systematic monitoring of the natural key objects, so stations are located near such objects (for example, near the breeding colony of white geese, the concentration of nesting snowy owls, places of concentration of polar bears);

- Network of field stations and cordons should ensure the safety of people in the Arctic, so field stations should be at such a distance from one another, so in case of an emergency a person can walk by foot, and should be located close to remarkable landscape landmarks.

At present this concept is realized only partially, because the reserve do not have enough resources (human, material and technical) to support all field stations, remaining from the 1980s. By 2012 there are 15 huts on the balance of the reserve in the territory of the island - field stations and cordons, all of which require repair or replacement. However, the reserve have not enough staff and facilities for the capital repairs of field stations by its own efforts or with the help of invited construction brigade.

Bases of the reserve on the island are used as:

- accommodation of security staff, especially during wintering;
- starting (for the delivery of personnel, equipment and materials from the mainland to the island at the beginning of the field season with the following distribution to field stations);
- for gathering of staff after the field season and exportation them from island to the mainland;
- for the receiving of visitors on the island;
- for research of objects, located near the bases.

Four residential buildings (guest house (11 seats), the cordon of the reserve for 4 persons, Pavlov's house (2 places), Chayvun's house (1 place)), which are suitable for short-term living on the base "Somnitelnaya", were restored using reserve own resources and by means of old materials (also from dismantled old buildings).

More than 30 houses are located in the village Ushakovskoe. They fell into disrepair after the virtual elimination of the village in 1997, with all services (village council, shop, post office, ambulance) and infrastructure of servicing of buildings. Five houses in village Ushakovskoe are supported in living condition using reserve own resources and by materials left over after time of functioning of the village. These houses are used as wintering base of reserve on the island - for wintering of inspectors, who remain to work on the island in the autumn-winter period. The rest of buildings, located in the village of Ushakovskoe and remaining on the balance of the reserve, are in poor condition and should be written off. At present, the technical provision of the reserve is not enough, and it does not fully satisfy the needs of the major works of the reserve. One car is at disposal of the reserve's office in Pevek. Employees of the department of protection and scientific department use individual vehicles on the island: quad bikes and snowmobiles "Buran", the number of which is not enough to provide all the necessary work.

The reserve has two quad bikes Honda-350, five quad bikes Honda 500, 2 imported snowmobiles and 5 Russian snowmobiles "Buran" in working condition. The amount of machinery is not enough for the reserve.

Large appliances (2 wheeled all-terrain vehicle "TREKOL", snow and swamp-going vehicle "ARGO", tracked vehicles "IRBIS", truck "URAL" with manipulator) are available in the reserve.

Radio stations "Karat" is used for communication between the base and cordons. The amount of photographic and videoequipments is not enough. The connection between the island and the office of the reserve, as well as to the mainland is carried out by satellite phone and satellite internet.

The reserve has two boats, which can run along the coastline in the absence of ice and rise and fall of the waves. Vehicles for movement on the sea area (small boats) are not available on the situation in the reserve in 2013, although they are required for monitoring of the state of the waters and marine scientific research.

The reserve has 5 solar panels to generate electricity in the spring and autumn. Their capacity is sufficient to charge the batteries for equipment and communications.

### **The main reasons for the technical backwardness of the infrastructure of the reserve**

At the time of establishing of the in 1976, infrastructure of reindeer state farms of the village was transferred to the balance of reserve. The farm was established with completely different goals, it has been subsidized and had high-cost in maintenance. In Soviet times, the reserve could maintain this infrastructure due to significant funding and annual navigation to the island. However, maintaining of the former reindeer farming village always was highly expensive and did not allow to optimize work of the reserve. Since the beginning of reforms in the country and the liquidation of the Soviet Union, supporting of this infrastructure became impossible, and it quickly fell into disrepair. Large part of this infrastructure on the island is in the form of ruins, polluting the reserve.

Reserve staff managed to keep and maintain the constructions needed to continue the work of the reserve on the island after the virtual elimination of the settlement in 1997 with the evacuation of the remaining residents to the mainland (to the village Cape Schmidt). This was possible due to resources remaining since the period of the Soviet Union. Through these efforts, the reserve managed to keep the functioning scientific base in the Arctic, engaging in the study of Arctic biota, and to ensure protection of the territory.

For further effective development of research in the reserve it is necessary to modernize the scientific infrastructure. Started building of infrastructure for ecotourism can partially solve the problem of accommodating of personnel at some stations, but in general it does not solve this problem.

### **4.3. Protection of the territory**

Protection of natural complexes and objects on the territory of the reserve is carried out by security service, consisting of full-time government inspectors (Table 4.3.1.).

Table 4.3.1.

The staff of Security Service of the reserve "Wrangel Island" (on12.09.13)

Position	The amount of staffing positions
1. The director of the reserve - the chief state inspector	1
2 Head of department of protection	1
4. Senior state inspectors	7
Total:	9

Due to the remoteness, isolation from the mainland and the inaccessibility of the reserve, control of compliance with reserve regime is conducted in two ways:

(1) - through physical presence, observation and patrol of Wrangel Island, including the monitoring of coastal areas by inspectors of the protection department and researchers during the fieldwork on Wrangel Island;

(2) - by obtaining information on the movement of ships and aircraft in the area of the reserve by the Directorate of the reserve from Federal Border Service and Air dispatch service. In its turn, the administration of the reserve immediately inform the relevant inspection services in any cases of occurrence of any vehicles and visitors in the space controlled by the reserve.

Table 4.3.2.

Availability of service weapons

№	Type, name	Unit of measurement	Number of units
1	The carbine "Tiger-1" cal. 7,62x54	pcs.	1
2	Carbine OP (SKS) 7,62x39	pcs.	4
3	Pistol IJ-71 cal. 9MM.	pcs.	2
4	Smoothbore (IJ-18E) cal. 28	pcs.	2
5	Smoothbore (Kep-Chur) cal. 32	pcs.	2
6	Double-barreled shotgun MR ChZK	pcs.	4

Reserve staff are permanently on Wrangel Island. Inspectors of the reserve annually remain on the base of village Ushakovskoe in winters due to the fact that Polar meteorological station of Federal Hydrometeorological Service in the village Ushakovskoe continues to work on the island. The main task of the wintering personnel is ensuring officers of weather stations to work in compliance with environmental protection regime of the reserve, as well as maintenance of equipment and its preparation for the next season.

Employees of the department of protection facilitate the work of researchers at the time of field work and visiting the island by scientific expeditions, conduct work with environmental tourists and photo or film crews. Operational groups were not created due to the absence of need for it.

Herald Island was not visited since the spring of 1993 due to a greater inaccessibility, complexity of meteorological conditions in its area and the lack of technical means and financial resources. On the island Herald there is also a hut (field station of the reserve), which was renovated at the last visit (Spring 1993), and now is completely destroyed by bears.

During the work in the territory of the reserve guard inspectors are equipped with a radio (radio stations "Karat", which are suitable for communication between field groups within the island), service weapons, field equipment and partially by vehicles.

During the work, inspectors of protection department, as well as researchers, carry out conversations with local people, visitors of the reserve, participate in environmental campaigns conducted by the reserve, appear in the media with the explanation and promotion of activities of the reserve. Within the framework of the plan of reserve regime activities they carry out household activities, phenological observations on the entrusted areas, record the data on encounters, participate in the registration of birds and animals under the program of Nature Records and, if necessary, participate in special projects for monitoring and research in the reserve. Tasks of installing of local information boards with informational and warning content are also performed by inspectors.

Without exception, people working in the reserve, obliged to comply with rules of conduct in the reserve to prevent damage to natural objects of the reserve, especially in order to avoid disturbance factor in respect of species, which are particularly vulnerable.

Seasonal access restrictions are applied in respect of the most valuable natural objects and key areas requiring special measures of protection and management. Visiting of these areas is allowed only for employees of the reserve, who leads work on monitoring and research. At the necessity of visiting of this site by other persons permission can be given only if they are accompanied by the staff of the reserve.

In the presence of visitors in the territory of the reserve, they must be accompanied by the inspectors of the protection department or by researchers. The duties of inspectors include:

- ensuring compliance with the environmental regime and rules of conduct in the reserve;
- providing radiocommunication and safety of people;
- ensuring the proper use of the reserve infrastructure (field stations, vehicles, other equipment - property the reserve);
- determination of the order of movement of visitors through the territory of the reserve - inspector should select routes and map routs so that it did not lead to action of disturbance factor and did not disturb other works. On the routes and during stationary observations when dealing with visitors inspector should continue to register data of encounters with animals and phenological events for the program of Nature Records (See. paragraph 4.7. - Research and monitoring).

There are obvious problems and weak points in the work of the department despite the fairly well-developed concept of the protection the reserve "Wrangel Island" and increasing of the effectiveness of the protection department for the past 1.5 years. The main problem is significant staff turnover and low level of skills of the employees of the department as a consequence. In the main, these problems are a consequence of the lack of equipment and material procurement of the Arctic island reserve, functioning under extreme climate and inaccessibility.

Table 4.3.3.

#### Transportation facilities of the reserve «Wrangel Island»

Name	Amount, pcs
Automobile UAZ-3153	1
Automobile Ural 4320-1912-40 (cargo truck)	1
All-terrain vehicle TREKOL -39294 (Sliding side windows)	1
All-terrain vehicle TREKOL -39294D with additional equipment.	1
Crawler snow and swamp-going vehicle ГA3 34039 «Irbis»	1
Quad bike Honda TRX500FA 2012	2
Quad bike Honda TRX500FMB 2011	2
Utility terrain vehicle «Honda 350» 2004	2
Utility terrain vehicle TRX500FA8(R232) 2008	2
Snow and swamp-going vehicle Argo Frontier	1
Snowmobile BRP SKI-DOO Tundra	1
Snowmobile Yamaha Viking 540E	1
Snowmobile «Buran СБ-640А» configuration №3	1
Snowmobile «Buran»	4
Tractor VTZ-2048A№707871	1
Inflatable boat model MK VHD	1
Trailer PG-8287 curtainsider	1

The main problems of the protection of the reserve are the following:

- Irregular conducting of technical trainings directly in inspections. Lack of opportunities for retraining and advanced training of personnel in special educational institutions.
- Work on liquidation of pollution and rubbish is carried out only in the minimum volume. The reasons are distance and inaccessible areas, lack of motor vehicles.

- The difficulties in finding new staff, increased severity and poor living conditions of life in the field conditions of the island. Sustenance in these conditions requires a lot of physical and mental effort and time. This situation is a direct consequence of the lack of long-term investments in technology improvement of living and working on the island.
- Only one ship belonging to the Northern Governance of Russian Hydrometeorological Service carries out the delivery of cargoes to the island during recent years. Cargoes is delivered to the reserve on agreement, however, this service is not included to state task. Thus, the supply of the reserve depends on the willingness or unwillingness of the owner of the vessel to load cargo, necessary for the functioning of the reserve.
- High staff turnover. The reasons are low wages, poor living conditions, isolation from the "mainland" during the long term.
- Lack of interest of regional authorities in helping the reserve, which is more related to the constraints posed by the federal laws and regulations. In particular, beneficiary regions are not allowed to help federal institutions.
- Inattention of regional authorities to the problems of the reserve is partly due to the lack of public relations of the reserve, namely to absence of visitor center.
- Problematic issues in international cooperation related to the implementation of items of international conventions in the area of the conservation of biological diversity and of natural and cultural heritage. The reason is lack of funding for the cleanup the territory of littering, remained since the period of development of the island.

The concept of practical protection of the reserve is based on the long experience of the functioning of the Arctic island reserve, takes into account the its specificity and optimized to the conditions of Wrangel Island. It allowed to ensure the protection of the natural complex, to maintain infrastructure and to continue the annual study on Wrangel Island in the most difficult period of the late 1990s - early 2000s. However, this concept has never been fully realized because of the aforementioned problems and circumstances. At present there is a clear need to resolve existing problems and ensure a significant increase of the level of protection of the natural complex of the reserve - to bring it into compliance with the realities of today's world and new challenges.

#### **4.4. Environmental management**

Management of natural resources of the reserve is subordinated to the task of ensuring of non-interference to the natural course of natural processes and the preservation of the natural complex of the reserve in its natural state. At the present time in the territory of the reserve there are no settlements and managing subjects, except for the reserve. An exception is the polar meteorological station, located in the former village Ushakovskoe. Inspectors of protection department monitor the impact of this station on the nature.

The main methods of management of natural resources in the reserve are:

- actual protection of the territory and the waters of the reserve for providing the reserve regime;
- special (additional) protection measures in respect of key areas and objects most vulnerable to human disturbance factor;
- research and monitoring of components of the natural complex of the reserve;
- regulation of the placement and supporting of the field stations and the main bases of the reserve on Wrangel Island;
- regulation of movement of motor transport within the island in snowless time;
- regulation of the receiving of visitors and cruise ships with eco tourists;
- continuation of cleaning of the reserve from anthropogenic pollution remaining on the island since the times of functioning of the village Ushakovskoe and military bases (the former airfield in the village Zvezdnyy and air defense base at Cape Hawaii).



Land and sea area of the reserve are not zoned. During the period of the functioning the village Ushakovskoe with a population of 200 people, recreational area for relaxing and walk of the villagers stood around the village. After the liquidation of the village this zone was canceled. Special management measures in respect of particularly vulnerable and valuable key areas and objects are establishing of seasonal limitations of their visits.

Monitoring and research of components of the natural complex of the reserve are conducted by methods excluding negative impact on the natural course of natural processes and damage to individual objects, ecosystems and communities. Researches of third-party research institutions in the territory of the reserve are only allowed in the case if they do not conflict with the objectives of the reserve and are not related to violations of the protection regime. Reserve staff are obliged to monitor that the actions of the researchers were not a factor of disturbance and do not cause damage to nature.

Field stations of the reserve are placed under the concept of forming a network of cordons and stations. Exploitation of stations is based on the principle of exception of accumulation of waste and drums in the tundra. Anything that cannot be burned on-site in specially designed furnaces, which are made of empty drums, should be transported to storage bases in the villages Somnitelnaya and Ushakovskoe. Basically all cordons and stations are located in historical places. During the exploitation of the field stations the need for rational use of fuel for heating to save money and minimize transport trips around the island is taken into account. Shore stations are transferred to the heating by wood-heated furnace by means of driftwood. Power supply of field stations are currently focused on the use of energy-saving, environmentally friendly technologies - solar panels and wind turbines (the latter is possible where wind turbines will not be dangerous for birds).

Moving of motor transport within the island in snowless period is carried out in the system of routes that minimize the impact on vegetation and micro-relief of tundra - in pebble beds of rivers and streams with a solid substrate; old roads (tracks), left from the time of reindeer state farms and military bases; dry stony slopes. Damage to the tundra is not allowed. This reserve is focused on the use of vehicles on the broad low-pressure tires, minimizing the impact on vegetation. All trips in the territory of the reserve are complex, combining researching activities with patrolling and collecting information on the program of Nature Records, as well as, whenever possible, combining these tasks with arrival of employees or delivery of materials and equipment to the field stations.

Measures of limited regulation of number can be carried out with respect to introduced species of hoofed animals. In the past years, due to decreasing of population level of reindeer, regulatory work is not conducted. Regulation of population level of musk buffalo can be carried out as necessary by the capture of young animals for relocation them to other regions of the Russian Arctic. Permission to capture is issued in the established order by state authorities, on the basis of the application and the expert opinion of specialists of the reserve.

Systematic cleaning of the territory from anthropogenic pollution remained on the island since the times of the functioning of branch of reindeer state farms on Wrangel Island, the village Ushakovskoe and military bases (the former airfield in the villages Zvezdnyy and air defense base at Cape Hawaii) continues annually through reserve own employees. This work was started in 2010 and continues without interruption, but due to lack of inspectors and limited logistics, it is carried out slow and insufficient. Factor, constraining visible progress in this work, is the fact that in the period preceding the reserve, drums were scattered anywhere in tundra and access to some drum on the vehicles is impossible in the summer.

Substantial modernization of the material and technical base of the reserve is necessary for better management of natural resources of the reserve in the listed lines of development.

Two units of heavy vehicles (tracked snow and swamp-going vehicle and wheeled car "Ural" with a manipulator) were bought by the reserve at present time. Snow and swamp-going vehicle is needed for the delivery of cargoes and people in the territory of the reserve in the snow

period for winter autonomous expeditions. Car "Ural" is intended for delivery of cargoes to stations and cordons, for removal of waste.

All heavy vehicles is operated only after the freezing of the soil to prevent damaging the grass. Moving of the machinery carried on the formed roads, which are mainly run on riverbeds.

#### **4.5. Management of objects of history and culture**

Management of historical and cultural sites in the reserve include:

- compiling and maintaining of the cadastre of monuments and sites, respectively to the list, given in section 2.3.;
- monitoring of the state of these objects;
- restoration and repairing of monuments, where possible;
- using of the monuments for showing to visitors of the reserve for environmental education.

Cadastre of historical and cultural objects (hereinafter - monuments) is under compilation. Passport, which provides the name, location (geographic coordinates), historical background (abstract), photo of the current state at the time of the first description and subsequent surveys, is filled in for each monument.

Monitoring of monuments is conducted annually, but due to the inaccessibility of the monuments, not all sites are visited each year. Examination of current state and photographic recording of the object is carried out when visiting. Recommendations on conservation measures or necessity of restoration are issued on the basis of monitoring.

Repair and restoration of monuments is carried out where it is possible without disturbing the appearance of the monument. Restoration of many monuments is necessary and desirable, but it is impossible because of the limited staff and resources of the reserve.

Historical monuments are the resources of the reserve, interesting and perspective for ecotourism expeditions to Wrangel Island. At the present time part of the monuments is used for these purposes and scheme of the receiving of visitors are constructed in such a way as to ensure visiting of them. This work can and should be expanded, but it is necessary to improve the logistic support of the reserve. Effective integration of historic sites to the workflow with ecotourists in the reserve is considered to be one of the tasks of modernization of management of the reserve. In particular, wild capture house on the Popov's lagoon, in the event of its major repairs, can be used as a base for a stop at land and sea routes during the birdwatching in the Popov's and Predatelskaya lagoons, and observing of marine mammals in the gulf of Krasin.

#### **4.6. Scientific research and monitoring**

Systematic problem-oriented research of the priority objects (white goose, myophaguses, polar bear, musk buffalo and reindeer) in the reserve extend continuously from the beginning of the 1980s, some of these studies are fundamental and unique because of duration of continuous research. Objects of studies are rare and very vulnerable species, species-indicators of status of Arctic ecosystems. These studies are well known to the world scientific community.

Researches of myophaguses, polar bear and a white geese in the reserve are complex. The results of these studies are used to resolve the series of priority issues set out before scientific departments, providing:

- improving of methods for monitoring of these species and overall methodological base of population monitoring;
- assessment of the state of populations of these species and the norm their health;
- ecosystem assessment on condition of indicator species;
- identification of factors and mechanisms of adverse processes in populations, the prognosis of their consequences;
- development and improvement of conservation measures of objects of researches and their habitats;

- study of the structure and mechanisms of functioning of populations, communities and ecosystems;
- Scientific monitoring of the impact of work in the territory and ecotourism on species and other components of the natural complex of the reserve;
- informational support of environmental education and scientific tourism.

In the last years the relevance of research has increased due to the impact of global climate change to these species.

In addition to long-term research on key objects, systematic study of population ecology of musk buffalo (an introduced species) began in reserve in 2002. The population of musk buffalo is growing, this species plays an important role in the ecosystem of Wrangel Island like reindeer and also has a significant impact on the vegetation cover and species composition of the community of tundra animals. Long period (since 1980) of monitoring size and the main parameters of the state of populations of musk buffalo and reindeer on Wrangel Island was preceded by this study.

In the 1990s, the total number of problem-oriented research conducted in the reserve decreased in comparison with 1980s, when the number of staff of the scientific department was higher and material and technical support of the reserve corresponded to the Arctic conditions and to objectives of the Arctic reserve. The researchers from academic research institutions worked regularly in the reserve in the 1980s (A.N. Severtsov Institute of Ecology and Evolution, Academy of Sciences USSR, IBPN Academy of Sciences USSR and other scientific organisations). Strong informational and methodological foundation for the continuation and development of long-term basic research and monitoring of components of the Arctic biota on Wrangel Island was created through intensive research on the island in the 1980s - early 1990s, and continuous study and monitoring of key wildlife objects in future years. Long-term series of data on these species during the period preceding the global climate change, have created the basis for the study of the reaction of these species to global warming.

Long-term population and biocenotic research in the Arctic is particularly relevant in the conditions of global climate change. For this reason, value of the reserve as a model area for studying the long-term response of tundra ecosystems and species of Arctic animals to climate change on the planet substantially increases in the modern conditions. Integration of the reserve to circumpolar system of key areas of co-ordinated research and monitoring of Arctic biota is necessary.

Inventory studies of superior vertebrates and vascular plants in the reserve have been conducted in the 1980s, the lists are published. These studies were continued in 2010 and 2011, the lists are published in the Nature Records of the reserve. Works on inventory of entomofauna and preparing of geobotanical map are not completed. These works are planned, but may be continued only with special funding, as they require the invitation of experts from outside scientific organizations. Monitoring, which is carried out by the reserve, allows to monitor changes in the fauna of the superior vertebrates, occurring under changing of environmental conditions.

The current number of staff of the scientific department: 4 employees, including the head of the department. The actual number - 3 researchers. To perform the tasks of monitoring and research work it is necessary to increase the staffing of scientific departments up to 7 people by 2015.

Environmental monitoring system started to operate in the reserve since 1980. Monitoring system has been significantly improved according to the results of population studies of key objects of wildlife. Not only a researchers, but the inspector of protection department are involved in the data collection according to the program of Nature Records. Reserve monitors the 7 groups of components of the natural complex of the reserve with the collection of data on 51 parameters, including evaluation of the species composition of superior vertebrates, the state of populations of key and particularly vulnerable species at the present staff of the scientific

department and department of protection. Expansion of monitoring up to 69 parameters is planned for the period 2014-2017.

Two research topics are planned to be added in 2014: "The dynamics of the population of nesting colonies of seabirds in the conditions of global warming" and "The response of vegetation of Wrangel Island to global climate change." Research topics are planned to increase to 14 in 2015.

#### **4.7. Environmental education**

The main task of the department of environmental education of State Natural Reserve "Wrangel Island" is to increase the prestige specially protected areas and facilitating the formation of environmental culture among people.

The methodological basis of the development of the program of environmental education activities of the reserve is the "Concept of work of state natural reserves and national parks of the Russian Federation on environmental education" (1998.). Environmental education activities are carried out in accordance with the Law "On SPNA", the recommendations on the organization and management of environmental education activities in the state natural reserves of State Ecological Committee of Russia, approved by the Chairman of State Ecological Committee of Russia 03.08.99, and the Charter of Federal State Budgetary Institution "State Reserve" Wrangel Island".

Department of Environmental Education of the reserve has 3 employees - head of department, methodologist, a specialist on 01.09.2013.

The objectives of environmental education:

- organization of environmental and ecological educational activities of FSBI "State Reserve "Wrangel Island";
- carrying out activities for environmental education of people;
- implementation of the issues of cooperation with the authorities of the Chaun region and the Chukotka Autonomous District;
- decoration of the permanent and changing exhibitions, exhibitions on the activities of FSBI "State Reserve "Wrangel Island";
- conducting lectures, discussions, meetings, speeches, presentations and other environmental education events;
- coordination of the preparation and development of booklets, photo albums, creating slide-films, videos, multimedia presentations, videos, maps, reference materials and other information - publications and souvenirs;
- interaction with stakeholders (local history museum, the ICC "Iceberg", publishers "Polar Star", "Far North," Peveksky TV, radio "Snowstorm" (Anadyr), as well as the media of central regions of Russia);
- further development of excursion activities and educational tourism;
- organization of children's environmental camps;
- organization of educational and research work among students and youth.

Working with the mass media is one of the traditional directions of environmental education activities of the reserve. In particular, the reserve is working closely with local and regional newspaper "Polar Star", "Far North," a municipal broadcaster "Peveksky TV", as well as regional radio stations "Snowstorm" and "RTR-Chukotka" (Anadyr).

Club "Ecologists of Pevek" operates on the basis of the municipal educational institution "Center of Education" under the patronage of the administration of the reserve.

Reserve conducts regular joint activities with the regional local history museum of Pevek, regional House of Culture, Pevek school of Arts, youth and leisure center "Iceberg", the Department of Social Policy of Chaun district, national Chukchi ensemble "ENER".

Advertising and publishing products contributes to the spread of information and the formation of the image of the reserve, a positive attitude to the nature and culture of the region. It is planned to prepare and publish a new set of advertising and publishing products in 2014: pocket calendars (300 pieces), wall calendars (100), desktop calendars (two types, 100 pieces of each

type ), magnets made of artificial stone (2 types, 150 pieces of each type), 2 types of booklets (50 and 100 pieces), key rings (100 pieces), 2 types of pin-back buttons (150 pieces of each type), pens and baseball caps with the logo of the reserve (100 pieces of each product).

Conducting of environmental education activities are usually accompanied by a demonstration of the photo and videos, displaying the beauty, richness and diversity of natural objects, the work of employees in territory of reserve. Photos and slides are used at exhibitions and lectures. The major share of this demonstration material is created by the reserve staff. Picture gallery of flora and fauna of the reserve with description, Russian and Latin names, was created on the existing website.

Reserve works closely with well-known Russian photographer Sergei Gorshkov, whose photos are stored in the photo archive of the reserve. Video about the reserve "White cloud of Wrangel Island" was presented free by S. Gorshkov in 2013.

Reserve launched its website in the internet in the autumn 2007: ostrovwrangelya.org in two languages - Russian and English. Website is updated weekly with new information, overview of the news, what is an important element of environmental education.

The reserve has many years of experience of working with international movie crews. German film production staff worked on the island in 2011, and film production staff from France in 2012. Copies of the films were given the administration of the reserve and are widely used in the department.

Table 4.8.1.

Current and planned performance indicators:

Parameter	unit of measurement	2010	2011	2012	2013	2014	2015	2016	2017
Population coverage of environmental education activities (including the publications and speeches in the media)	pers.	124000	234000	240000		25000	26000	27000	28000
Number of environmental education activities for the period	pcs.	55	60	62		63	63	63	64

Ecological educational department plans to work in the following areas for more productive work in 2013-2017 :

- I. Development of ecological tourism and excursion activities.
- II. Creating a representation space and design development.
- III. Formation of the socio-cultural environment of ecological orientation.
- IV. Compiling a complete list of documents related to the history of the creation of the reserve.
- V. Compiling Cadastr of cultural and historical monuments of the reserve.
- VI. Compiling a complete bibliography list of published works about history of the islands of Wrangel and Herald, cultural and historical sites of the reserve.

#### 4.8 Development of ecological tourism and excursion activities

The goals are creation of favorable investment climate, attraction of extrabudgetary funding, capacity-building for development of partnerships with external organizations.

1) Ecological excursions and educational tourism are traditional high efficiency forms of environmental education as an opportunity to get in touch with the world of nature is able to turn visitors into active supporters of the development of natural reserves.

The possibility of including the reserve to the development of ecotourism in the region of Chukotka have been considering since 1991, when group of tour operators from Alaska and administration of the Magadan region visited the reserve. The first cruise ship with tourists called at the waters of island also in 1991. The first attempts of receiving ecological touristic

groups in the reserve were not regular. Few receptions of cruise icebreakers and single receivings of individual ecotourists, flown to Wrangel Island for overland travel around reserve, observing and photographing the animals, were made in the first half of 1990. These methods allowed to check the possibility of including the reserve to this type of activity and work out procedures of reception that do not violate the protection regime and does not interfere with the main objectives of the reserve.

Currently reserve can take both cruise ships with groups up to 150 tourists with 2-3 landing in the territory of the reserve during 2 - 3 days, and small, up to 10 people, special ecotourism expedition to study the natural reserve, observation and photography from 7 to 14 days. Reserve has the necessary informational base and experience for the organization of such receptions in an environmentally friendly way due to the continuous and in-depth studies of flora and fauna on the island. The procedures of receiving was developed and based on strict regulation of visits of the island by ecotourists both the number and size of groups and the routes and places of visiting. At current staffing and technical capacity the reserve may receive up to 5 cruise ships per month, up to 6 short (no more than 3 days) and one multi-day overland expeditions without negative consequences for the environment and core work. The main problems for receiving visitors in the reserve for the current period are: the absence of guides who know the English language, a large inflow of visitors (cruise ships, land-based excursions) in August. Terms of visiting island by cruise ships should be transferred to August-September. This question should be resolved in advance, because schedule of the arrival of ships is prepared in the middle of the year prior to the cruise and tourists accustomed to a certain date.

Provided upgrading of bases and network of field stations of the reserve on the island, and the necessary investments in special infrastructure for the development of eco-tourism on Wrangel Island, in addition to the existing one, regular procedure of receiving groups of ecotourists, who observe the walruses, polar bears, whales and birds in the Gulf of Krasin, with using of base Somnitelnaya - station on Somnitelnaya shoal head - reconstructed station in the southern end of the Popov's lagoon, can be implemented from early July to late September.

Reserve "Wrangel Island" is one of the most attractive objects for visits of ecotourists and cruise icebreakers. According to survey data among the clients of ship cruise ecotourism in the Russian Arctic, up to 90% of the tourists who buy tickets on the route along the Northern Sea Route of and to passages around Chukotka, do it for visiting Wrangel Island in the first place. Increased interest to the reserve caused by its exceptional biological qualities, the history and status of World Heritage Site. Consequently, Wrangel Island is one of the key factors in the development of ecotourism in the region of Chukotka.

In view of the above, it is advisable to increase the staff of department of environmental education - trained tour guides in territory of the reserve.

- 1) Organization and carrying out of excursions with members of the club "Ecologists of Pevek" in the national settlement Yanranay (seashore colony of birds). Students of Chaun district cannot visit the reserve for excursion in connection with the inaccessibility of the reserve (2.5 hour flight by helicopter MI-8), as well as the high cost of renting a helicopter. Therefore, the organization of excursions to the national settlement Yanranay with seashore colonies of birds, will enable students to learn about fauna of Chukotka.
- 2) The organization of excursions to the museum of local lore of Pevek with students of municipal general education institution "Education Center" of Pevek. There is Paleontological room in the museum, where fauna and flora of the reserve are shown the in the form of models and plaster casts.
- 3) Development of the concept of ecological routes and their arrangement, including information richness the routes. The program also includes installation of several webcams on Wrangel Island in 2014.
- 4) Development of the documentation on the pursuit and optimization of excursion activities: passports and planning sheet of the routes..
- 5) Interaction with travel agencies:

- working with tour operators.
- creation and maintenance of the program for accounting of visitors.

Receiving of visitors in the reserve is allowed but strictly regulated. It should not affect the course of natural processes, create factor of disturbance and put obstacles in the way of core work activities of the reserve. Under these conditions, receiving visitors is useful, as it allows to expand scientific research in the reserve, to carry out environmental education, to introduce wide range of people to the work and problems of the reserve in detail, to raise additional funds for the development of the reserve. Standard procedure for submission and consideration of applications for a visit of the reserve include:

- submitting an application to the director a standard form, which lists basic information about the project objectives and methods of its implementation, as well as the details, allowing to estimate the reality the project implementation;
- consideration of the application by the administration of the Scientific and Technological board of the reserve. Project should not be contrary to the objectives and regime of the reserve;
- in the case of a positive evaluation - calculation of cost and logistics planning;
- receiving of visitors according to the standard procedure.

All visitors of the reserve must be familiar with the rules of conduct in the reserve and safety regulations, and complete the instruction on reserve status and safety on the site before the arrival of the reserve.

Receiving of ecotourists is carried out according to the developed and tested procedure, which allows tourists to get know landscape features of ecosystems, flora and fauna of the island without having a negative impact on the key and the most vulnerable areas and objects. Moving in the territory of the reserve is conducted according to the established ecological routes.

Receiving of cruise icebreakers with eco tourists is carried out according to receipt of applications from tour operators and on the base of the standard proven procedure. Tour operators are obliged to take representatives of reserve (inspectors and researchers) on board when approaching the island. They provide scientific informational support of tourists and monitor compliance with reserve regime. Receiving of each cruise ship in the reserve is held with the organization of landing in the area of the Devil's ravine, base Somnitelnaya (shore of gulf Krasin) and, depending on the season (ice conditions and weather) on the west coast near Cape Florence, on the northeast coast at Cape Waring.

Reserve held a three day excursions or multi-day expeditions on the tour routes in territory of reserve as part of the receiving of cruise ships. Visits are carried out by the means of the wheel all-terrain vehicles with overnight stays in guest houses.

In the case of competitive projects reserve prefers projects that provide assistance to the reserve in the delivery of cargoes to the island or providing other logistical support in the form of charitable donations. All violations of reserve status by tour operators or visitors, improper behavior and breach of contract are fixed (reserve manage a "black list").

## **II. Creating of representative space and design developments**

The goal is improving of the social significance of the reserve through the creation of platforms for environmental cultural activities, forming the image of the reserve as a retranslator of the best media, interactive technologies and design solutions to attract extra-budgetary funds through the sale of goods and services in the representative platforms.

### **1. Representative platforms:**

Collection of biological exhibits for the museum under the open sky on Wrangel Island - creation of expositions in the form of fields - mini-parks with fossils and biological exhibits on base Somnitelnaya and field stations. The use of these expositions in procedure of receiving of ecotouristic and scientific expeditions on Wrangel Island.

Inventorying and cadastre of historical monuments and sites of the reserve "Wrangel Island". Preparation of scheme of visiting of historical monuments and places by eco-touristic and scientific expeditions, safe for reserve the natural complex.

Development of the project of creating a museum at the office of the reserve (collection of exhibits, preparation of texts, window dressing).

Improving of quality and increase of range of services provided in territory of reserve: the organizing of the selling of souvenir and printing products.

#### 2. Design and Media:

- Preparation of presentations.
- Preparation and placement of videos on the official website of the reserve [ostrovwrangelya.org](http://ostrovwrangelya.org)
- Development and updating of the website.
- The development of printed materials (booklets, brochures, calendars, photo albums, etc.): design, coordination of print process and delivery.
- Development of souvenirs (magnets, key chains, T-shirts, calendars, etc.): The selection of photos, texts preparation, coordination of the manufacturing process and delivery.

#### 3. Mass media:

- Preparation of articles for newspapers and magazines.
- Attracting of mass media to the events.
- Archiving of media materials about the reserve (articles, reports).

### **III. Formation of the socio-cultural environment of ecological orientation.**

The goal is improving of the social significance of the reserve through the introduction of the socio-cultural environment of the region, attracting of target investments development of partnerships with outside organizations.

#### 1. Interaction with the social and cultural institutions:

- Participation in municipal and district events.
- Establishing contacts with the municipal, regional and federal agencies and organizations.
- Conducting of joint activities with municipal, regional and federal agencies and organizations, universities, museums, kindergartens and schools.
- Search for sponsors and partners for the reserve.

#### 2. Educational activities:

- Organization and carrying out of children's ecological camps.
- Conducting of thematic of lectures about reserve for students vocational schools of Pevek and students of central regions of Russia (MSU).
- The development of teaching materials, interaction with teachers.
- Organization of conferences for students.

Organization and carrying out of practices for students of universities.

#### 3. Working with volunteers

- Preparing and conducting of one-time volunteer actions.
- Preparing and conducting of volunteer camps:
- Preparation and approval of the program;
- Conclusion of agreements and contracts;
- Resolving of organizational issues (preparation of site for placement of camp, determination of scope of work, selection of personnel to coordinate works).

#### 4. Conducting of environmental education events and campaigns:

Conducting of activities within the framework of March of parks.

Events in the framework of Days of protection from ecological danger.

The campaign "Feed the Birds".

The event "Day of birds."

The organization and holding of competitions:

- "The world of wilderness":
  - Competition for the best conceptual design of souvenirs,
  - Coordination of competitions organised by the Biodiversity Conservation Center (Moscow).
- Participation in the festival "March of Parks" (Moscow, in absentia).



Organization of joint activities with institutions of Pevek: ICC "Iceberg", the District House of Culture (Pevek).

5. Organization of exhibition activities: coordination of printing and decoration of exhibition materials, organization of the opening ceremonies, informational saturation of the exhibitions:

- organization of exhibitions in the Museum of Local Lore of Pevek
- organization of exhibitions in regional library of Pevek (Chukotka Autonomous District)..
- organization of thematic exhibitions in the school of Pevek and national villages Chukotka Autonomous District.

IV. Organisation of events dedicated to the birthday of the reserve, March 23 -Annual: organization and conducting competitions..

The goal - improving the image of the reserve, to attract extra budgetary and budgetary resources, capacity-building for the development of partnerships with outside organizations.

Table 4.8.2.

Actual and planned performance of the action "March of Parks"::

Indicators	2010	2011	2012	2013	2014	2015	2016	2017
Number of participants	200	200	150	200	250	250	300	300

#### 4.9. Financial and economic activity

Financing of the reserve consists of a variety of sources, main of which is the federal budget. Extra-budgetary resources include funds received in the form of fees for visiting the protected area; for the service of reception of cruise ships; donations of various organizations, implementation of scientific and technical agreements. Dynamics of cash inflow from different sources for a number of years looks as follows (table 4.10.1).

Funds from the federal budget is spent on maintenance of management personnel and services of the reserve, the implementation of measures for the protection of areas, environmental monitoring, conducting environmental education and scientific research. Off-budget incomes were directed to carry out the statutory activities of the reserve, the purchase of inventory and equipment. The structure of the extra-budgetary funds - fee for visiting the protected area, charitable contributions, implementation of research contracts.

Table 4.10.1.

Dynamics of cash inflow for the 2013-2017 years. (thous. rub. )

Name	2013	2014	2015	2016	2017
1. Federal budget funds:	64 452,40	41 552,4	41 552,4	30 341,40	30 341,40
to operating expenses					
capital investment					
2. Charitable contributions					
3. Extra-budgetary funds, total:					
including -					
- Grants of "Environmental Education Center "Reserves "	633,55				
- Grant of Fish and Wildlife Service US					
7. Funds from other sponsors					

8. Income from own activities::	2 471,90	2 130,00	2 150,00	2 150,00	2 160,00
including:					
- implementation of scientific agreements	360,00				
- service charge for reception of cruise ships	980,00	980,00	980,00	980,00	980,00
- selling souvenir products	133,9	150,00	170,00	170,00	180,00
- fee for visiting the protected area, for excursions	997,00	1 000,00	1 000,00	1 000,00	1 000,00
TOTAL:	67 557,85	43 682,40	43 702,40	32 491,40	32 501,40
The share of the federal budget, %	95,40%	95,10%	95%	92%	93,35%

Table 4.10.2

## Indicators of material and technical equipment

Indicator	Units of measurement	Status for 2012	Status 2013r. <sup>1</sup>	The real state for 2013. <sup>2</sup>	The optimum state for 2013.
Basic funds, including:	thous. rub.	33 184,69	78 691,52	60 351,40	66 500,00
	%	100	100	100	100
Transport	thous. rub.	7 923,32	16 980,32	16 153,5	12 500,00
	%	23,88	21,58	26,77	18,79
Houses, cordons, industrial buildings and constructions	thous. rub.	16 940,55	52 262,55	35 322,50	45 000,00
	%	51,05	66,41	58,53	67,67
Production and Household equipment	thous. rub.	8 320,82	9 448,65	8 875,4	9 000,00
	%	25,07	12,01	14,70	13,54
Capital-area ratio	thous. rub./ha	0,034	0,034	0,01	0,04
Capital-labor ratio	thous. rub./man	1442,82	3147,66	2414,06	2660,0

<sup>1</sup> - The cost of fixed assets of reserve on 01.01.2013 amounted to 78 691.52 ths. rub.

<sup>2</sup> - According to the results of inventory in 2012, the cost of fixed assets of the reserve, suitable for use - 60 351.70 thousands roubles; the carrying value of fixed assets, depreciation wear of which is 100% is 18 340.12 thousand. rub., of which 16 thousand 940.55 . rub. - the cost of buildings (houses, cordons, field stations).

Incomes from paid services, not mentioned in the State task is dominated In the structure of extrabudgetary funds: conducting of land and sea excursions, receiving of cruise ships, provision of services for the photo and video shooting. Selling of souvenirs and printed products was implemented as a profitable indicators enough effectively.

Own funds are spent on general production expenses, land improvements, science, environmental education, promotion of staff and other activities and events. Funds for the development of eco-tourism and for equipping of material-technical base on the island have been allocated to the Federal state budgetary institution "State Reserve" Wrangel

Island". In this regard, the management plan for the development of eco-tourism has been developed. Prefabricated houses, toilets and other facilities which are necessary for the accommodation of visitors will be installed on the island. souvenirs were produced: calendars, leaflets, badges, T-shirts with the emblem of the reserve. Besides accounting department sent a package of documents for VAT exemption to the Tax Inspectorate for the Chukotka Autonomous District. This is due to the fact that income from services amounted to less than 2 million rubles. These funds will also be used for improving of material and technical base, living conditions on Wrangel Island and the protection of the environment and biota.

#### **The main items of expenditure**

##### **Heating Supply.**

Heating costs is significant as the average temperature from November to February is -20C° to -45C° during the 12 months of the heating season. Heat meters were installed in the administrative offices in 2012. A significant reduction of heat energy consumption was identified based on the results of the analysis of the costs, taking into account indicators of these devices at the end of 2012. Cost savings amounted to 90 000 rubles, which is 1/5 of the annual utility costs.

##### **Transportation costs.**

Remoteness of the territory from the office of the reserve and the need to use helicopters for delivery of cargo and personnel. One flight of the helicopter, which allows to deliver no more than 1.4 tons of cargo over the ice to Wrangel Island, was worth 1.143 million rubles in 2012. The high level of spending on compensation payments provided by the legislation, in particular the fare payment for employees due to the high cost of tickets. Fieldwork of research department and planned trips of staff of department of protection (6000-8000 km) require costly fuel and spare parts. The service life of equipment is less than 5 years, taking into account the mountainous terrain and severe operating conditions.

##### **Material and technical support of the region.**

The extremely low level of local supply and the absence of regular navigation to Wrangel Island. The possibility of cargo delivery directly on Wrangel Island is available on the technical research ship "Mikhail Somov", belonging to the Northern AHM, from Arkhangelsk. Fuel, food and construction materials, spare parts and equipment are delivered on this ship. The volume of transported to the reserve cargo is limited, as the ship performs the task of providing all weather stations along the Northern Sea Route. The opportunity to deliver cargo is available only at the end of the current year or in the next year. Depreciation of equipment, the need for supplies, etc., are identified only by the end of the year. Thus, the equipment and materials actually purchased until the middle of the year (ship usually departs at the end of July), can be delivered only by the fourth quarter, i.e. in terms of the island is actually by the end of the year. Many types of work (especially outdoors) cannot be implemented by this time because of winter conditions. In this regard, the need for delivery of materials and supplies from the central regions by air for supporting the activities of the reserve appears periodically. The minimum cost of 1 kg of cargo - 220 rub., 1 m<sup>3</sup> - 20 000 rub.

##### **Communication**

Satellite antennas were installed on territory of the island. Access to the Internet was adjusted. Email functions.

Satellite system is used for communication with the island because installation of antennas for short-wave radio communication between the island and the office is impossible at the moment.

#### **4.10. Evaluating the effectiveness of management**

Reserve management structure is formed quite effectively in the organizational and territorial aspects, taking into account the existing realities. However, the organization of work requires a different approach than in protected areas, where the administration of the reserve is located in territory of reserve and developed road network. Available resources of the reserve, staffing and technical equipment, applicable to the typical protected area do not allow fully ensure protection regime throughout the territory and carrying out the necessary measures. The

absence of sea department does not allow to monitor and protect marine areas adequately. The difficulty in the delivery of its high cost limit possibility of maintaining and restore technical base.

Low salaries, extremely difficult living conditions, isolation of the territory, the restrictions imposed by the labor legislation (in particular to organization of work on a rotational basis, the annual fare during vacation for employees who work on the island), hold back the involvement of qualified personnel.

Lack of transport reduces the actual protection of the territory and the possibility of repairing works. According to preliminary calculations, the minimum needed additional resources to ensure the statutory activities of the reserve:

- construction or purchase of a separate building for the office of the reserve;
- increase in the staff of state inspectors with the establishment of marine department of 4 employees additionally;
- creation of a visitor center.
- decoration of the office of the reserve.
- Modernization of the base (delivery and installation of modular construction on the island, with the necessary equipment for life support in the Arctic, instead of field stations and huts made of planks and roofing material).
- technical means: a minibus UAZ - 1 pc., terrain vehicle TREKOL with trailer - 1 pc., Snowmobiles - 6 units., wheel all-terrain vehicle on low-pressure tires such as "ARGO" - 1 pc., boats of marine grade with motors - 1 pc., HF radio - 8 pcs., wind turbines - 6 pcs., generators - 5 pcs. Consumables.

Office of the reserve is located in Pevek, the placement is not adapted to protected area, having the status of UNESCO World Heritage Site. Development of planning and cost estimating documentation for construction of the central villa of reserve is required.

## **CHAPTER 5**

### **PLAN OF TERRITORIAL ADMINISTRATION**

Location of Wrangel Island, the structure of territory, location of field stations and cordons,, ecotouritic land routes, new guest houses and places of anthropogenic pollution are shown in Figures 1-9 (Appendix).

The main bases are located in the area of bay Somnitelnaya (village Zvezdnyy) and in the village Ushakovskoe. Year-round presence of inspectors with the main base in the village Ushakovskoe keeps in the territory of the reserve At least 4 people is based on the period of winter shift, from October to April.

## **CHAPTER 6**

### **ACTION PLAN**

#### **MEDIUM-TERM MANAGEMENT PLAN**

#### **OF RESERVE "WRANGEL ISLAND"**

### **1. ENSURING OF THE PROTECTION OF NATURAL COMPLEXES AND OBJECTS, BIODIVERSITY AND LANDSCAPE DIVERSITY**

#### **1.1. Changing of the boundaries and territories of protected areas.**

Changing of the boundaries and territory of the reserve in the respect of existing is not planned.

#### **1.2. Implementation of special measures for the protection of natural complexes and objects and environmental management**

### **1.2.1. Regulatory measures**

Regulation of the island population of reindeer became unnecessary after a significant reduction in the population size in the winter 2004-2005. The decisions on the regulation of the number of hoofed animals were taken each year on the basis of the results of monitoring of the state of island populations of hoofed animals and expert assessment of the impact on vegetation. In the absence of monitoring or basis for deciding upon the appropriateness of regulation in the current year, the regulation was not carried out.

#### **1.2.1.1. Target orientation**

Preserving the natural state of the most valuable objects of flora (taxa, associations), and the integrity of the vegetation of the island (to prevent the destruction of turf, damage of willow growths).

#### **1.2.1. Biotechnical measures.**

The experimental setup of solonetz on the base Somnitelnaya.

#### **1.2.2. Revegetation measures**

Revegetation measures are not held in the reserve.

#### **1.2.4. Fire prevention measures**

Fire prevention measures are not carried out in the reserve due to the absence of fire.

#### **1.2.5. Provision of the necessary facilities on the territory**

Construction of the reserve is carried out for the purposes of research, monitoring and development of eco-tourism, making photos and videos of animals in conditions that exclude the factor of disturbance for animals and ensuring the safety and comfort of people. The following activities are planned:

- Completion of the arrangement of a field station on the shoal head Somnitelnaya (observation, photo and video shooting of polar bears, walruses and whales) - 2014 ;
- Establishment of multi-functional modular scientific ecotouristic base in the village Ushakovskoe. 2014-2017 years.
- Modernization of the scientific field stations and cordons: construction of new modular residential houses for replace the old huts, for life and work of employees of reserve in the field conditions of Arctic.
- Manufacturing and installation of information boards on the basic points of the ecotouristic destinations of Wrangel Island: on the basis of Ushakovskoe, base Somnitelnaya, at the field Neogidannaya, Srednyaya Mamontovaya, Peak Tundroviy, Red Flag.:
  - 2014 – 2 information boards,
  - 2015 – 2 information boards,
  - 2016 – 2 information boards,
  - 2017 – 2 information boards.

### **1.3. Improving of the organization of protection department**

#### **1.3.1. Optimization of activity of protection department and increasing of its efficiency**

The isolation of the reserve eliminates the need for the creation of operational groups in the reserve.

The following measures to ensure the effectiveness of protection department of the reserve are planned:

- Significant improvement of material and technical equipment of the department of protection of the reserve by means of providing the necessary technical facilities (see. section 1.3.2.);
- Increasing the number of inspectors in the department of protection up to 9 employees for works on Wrangel Island (taking into account long vacations, the volume of seasonal field work on the island, the need for support groups and the control over the work of the polar meteorological station in Ushakovskoe).
- Improving professional qualification of inspectors of protection department by sending them for studying and internship - 2 employees per year;
- Improving the system of material incentives for inspectors;
- Improving the living conditions of the workers of the reserve in the field conditions of the Arctic by improving buildings and equipment in the field stations of the reserve, using modern technical means and technologies of life support;
- Development and implementation of the concept of a field station of the reserve, providing all the necessary conditions for a normal and safe living and working in the Arctic and comfortable rest after a day's work;
- Modernization of net of the field stations of the reserve on Wrangel Island for ensuring protection and the possibility of expanding the system of patrolling the reserve;
- Expanding patrol routes of the reserve by including northern and eastern shores of the island to mandatory annual patrols;
- Searching for opportunities to lease aircrafts (Mi-8 helicopters and small planes) by raising funds from third-party projects (ecotourism, filming, scientific expeditions of third parties);
- Attraction of additional funds to reserve by using of modernized research station as an international base for research, photo and video shooting and ecotourism (renting places for living and working on Wrangel Island).
- Keeping a "black list" of visitors of the reserve (including tour operators) who violate the rules of visiting the reserve.
- Full use of cruise and scientific research ships visiting the reserve, for delivery fuel, building materials, equipment and food to the island of Wrangel.
- Implementation of satellite video surveillance systems in key areas of the coast of the reserve;
- Using high resolution satellite images to monitor land and water areas of the reserve, in particular - the foreshore.
- Systematic work on the annual clean-up of the reserve from household waste and scrap metal left on Wrangel Island during the functioning of settlements and military bases;
- Systematic spreading information about the the protection department of the reserve through the media.

### **1.3.2. Development of material and technical base of protection department**

Development of material and technical base of protection department requires the following:

1. Modernization of infrastructure of the reserve on the island - the replacement of all the cordons and stations to new comfortable homes with garages, built in accordance with modern technologies and using modern materials.
2. Significant improvement of transport and technical base of the reserve.

Provision of the reserve by the following technical means is planned:

1. Diesel tractor DT-75B - bulldozer - 1 unit

2. The tractor "Belarus" with a bucket (or similar) - 1 unit
3. Imported snowmobiles - general park of protection department should consists of 6 units, an annual update in the amount of 1 unit.
4. Quads Honda (or Yamaha) - total fleet of the service of protection should consists of 7 units, with an annual renewal in an amount of 1 unit.
5. Boat outboard motors Yamaha-100 and 60 for boats Zodiak - 4 units.
6. Sledges to snowmobile - total fleet should consists of 8 sledge
7. Trailers for quads with carrying capacity 400 kg - total fleet should consists of 6 units,
8. Purchase and installation of AIS in the village Ushakovskoe (automatic information system for coastal surveillance ships passing within the waters of the reserve)

**1. ENSURING PROTECTION OF NATURAL COMPLEXES AND OBJECTS, BIOLOGICAL AND LANDSCAPE DIVERSITY;  
ENVIRONMENTAL EDUCATION  
1.4. TIME SCHEDULE OF MAJOR ACTIVITIES BY YEARS**

Management tasks	Activities	Result / indicator	Terms of execution	Executor	Source of funding	The cost thousand rubles. Year / Period
1.2. Implementation of special measures for the protection of natural complexes and objects, and environmental management.						
1.2.5 provision of the necessary facilities in the territory	<ul style="list-style-type: none"> <li>- Completion of the arrangement of a field station on the shoal head Somnitelnaya (observation, photo and video shooting of polar bears, walruses and whales);</li> <li>- Preparation of proposals for the allocation of territory for interfarm needs and the installation of a new cordon in the former air defense base at Cape Hawaii and organization of its for premise for observation.</li> <li>- Installation of informational boards on the basic points of ecotouristic routes of Wrangel Island: on the base Somnitelnaya, base Ushakovskoe, field stations of the reserve</li> </ul>	<ul style="list-style-type: none"> <li>- functioning field station on the shoal head Somnitelnaya for observation, photo and video shooting of polar bears, walruses and whales;</li> <li>- Control over the appearance in the protected waters of the ships and aircraft, accounting and observations for the Nature Records;</li> <li>- Installation of the informational board on the guesthouse on the base Somnitelnaya, in the village of Ushakovskoe, field stations and cordon</li> <li>- installation of information board with cairn on the 180th meridian on the southern coast of the island (the road from the Devil's gully in Popov's lagoon);- installation of informational board on Paleo Eskimo site on Devil's gully</li> <li>- installation of the memorial sign on the mountain Thomas in commemoration of the first raising of the Russian flag</li> <li>- the installation of a memorial plate on site of encampment of Captain Bartlett.</li> </ul>	<p>2013-2014</p> <p>2014-2016</p> <p>2013- 2016</p>	<p>Employees of the department of protection and scientific department of the reserve</p> <p>Target program of modernization</p> <p>Employees of the department of protection and scientific department of the reserve</p>	<p>Federal budget</p> <p>Federal budget</p> <p>Federal budget</p>	<p>2013 – 316,2</p> <p>2014 – 320,00</p> <p>2015 – 330,00</p> <p>2016 – 350,00</p> <p>2014- 10 000,00</p> <p>2013 – 380,00</p> <p>2014 – 400,00</p> <p>2015 – 420,00</p> <p>2016 – 450,00</p>



	<ul style="list-style-type: none"> <li>- Modernization of Ushakovskoe base: construction of a new multi-functional base in the village Ushakovskoe, building houses for the inspectors and production buildings of the reserve</li> <li>- Modernization of the net of field stations and cordons, the installation of new residential houses for the comfortable life of employees of reserve in the field conditions of the Arctic, using modern techniques and technologies of life support</li> </ul>	<ul style="list-style-type: none"> <li>- Information support of visitors of the reserve on involved field field stations and facilities;</li> <li>- Development and taking into use of the scientific and ecotouristic station of international importance on the Wrangel Island;</li> <li>- Improving the safety of field work in the Arctic; enable of opportunity of expansion of terrestrial and marine coastal patrol of the reserve; provision of the possibility of expanding field research on the island. Functioning network of field stations for scientific research, monitoring and stopping ecotouristic groups during the excursion routes on the island, the improvement of stations and cordons, increasing the attractiveness of work in the Arctic reserve.</li> </ul>	2014-2016	Target program of modernization	Federal budget	2014 - 250 000
			2014-2017	Target program of modernization	Federal budget	2014 – 12 000,0 2015 – 15 000 2016 – 7 000,0
<b>1.3. Improving of the organization of protection department.</b>						
1.3.1. Optimization of the activity of protection department and increasing its efficiency.	<ul style="list-style-type: none"> <li>- Control of territory and the waters of of the reserve by patrolling;</li> <li>- installation and implementation of the AIS system for the control and monitoring of passing ships in the buffer zone, the use of modern satellite and video technology for the control and protection of of the reserve;</li> <li>- Organization and maintenance of the two-way operational communication of the reserve with the regional services of the Federal Border Service and the Marine Inspectorate;</li> <li>- Maintaining and improvement of the infrastructure of the reserve on Wrangel Island and Herald, including annual operating repair of field stations; recovery of non-functioning field stations;</li> </ul>	<ul style="list-style-type: none"> <li>- provision of the actual protection of the reserve territory with associated data collection for the Nature Records; expanding of patrol routes of the reserve by including to mandatory annual patrols of the northern and eastern sectors of the coast of Wrangel Island;</li> <li>- Monitoring of the waters, territory, foreshore of the reserve with application of modern means of control, the implementation of video surveillance systems in the key areas of the coast of the reserve;</li> <li>- Implementation of practical control over the appearance in the area of the reserve of ships and aircraft; prevention of violations of the protected regime; the exchange of operational information with the competent state services;</li> <li>- Repair of bases, cordons and field stations in order of priority: Werring Ushakovskoe Colony of birds</li> </ul>	2013-2017 гг.	Employees of the department of protection	Federal budget	2013 – 11024,3 2014 – 9017,6 2015 – 9017,6 2016 – 9100,0
			2014-2017	Employees of the department of protection and scientific department of the reserve	Federal budget, extrabudgetary funds	500 000
			2014-2017	Employees of the department of protection and scientific department of the reserve	Federal budget, extrabudgetary funds	2013 – 283,0 2014 – 300,0 2015 – 330,0 2016 – 350,0
			2013-2017 гг.		Federal budget, extrabudgetary	2013 – 158,3

		Verhnyaya Neizvestnaya Srednyaya Neizvestnaya Nignyaya Gusinaya (relocation and repair); Nignyaya Tundrovaya, Nignyaya Neizvestnaya; Lulyak; and further under the list, according to the plan approved by the Scientific and Technical Board;		Target program of modernization	funds	2014 – 175,0 2015 – 200,00 2016 – 230,00
	- Delivery of fuel and firewood to field stations and cordons according to the list for heating and vehicles used in carrying out field works in the reserve;	- providing of protection annual research and monitoring in the reserve according to the annual plans of the reserve;	2013-2017 гг.	Employees of the department of protection and scientific department of the reserve	Federal budget	2013 – 2 000,00 2014 – 2 200,00 2015 – 2 300,00 2016 – 2 400,00
	- Delivery of building materials and equipment for field stations (according to the list, in respect of the annual plan);	- providing of current repair of field stations, according the list, in respect of annual plans of the reserve	2013-2017 гг.	Employees of the department of protection and scientific department of the reserve	Federal budget	2013 – 370,9 2014 – 400,00 2015 – 400,00 2016 – 400,00
	- Accompanying the visitors of the reserve;	- implementation of projects on ecological and scientific tourism, projects of outside organizations on the production of films, photo shooting. Ensuring of control of compliance with reserve regime	2013-2017 гг.	Employees of the department of protection		2013 - 405,00 2014 – 430,00 2015 – 450,00 2016 – 465,00 2017 – 480,00
	- Monitoring of cultural and historical monuments in territory of reserve;	- cadastre of cultural and historical monuments of Wrangel Island annually supplemented with data on the current state of objects; information support of eco-tourism;	2013-2017 гг.	Employees of the department of protection		2013 – 533,1 2014 – 303,1 2015 – 303,1 2016 – 320,00 2017 – 330,00
	- Current repair of technical equipment of the reserve;	- Maintaining the park of technical equipment of the reserve in operating condition.	2013-2017 гг.	Employees of the department of protection	Federal budget	2013 – 837,92 2014 – 700,00 2015 – 800,00 2016 – 850,00 2017 – 900,00
	- Cleaning out the territory of location of field stations, cordons of household waste and scrap metal (removal of old drums to storage site near the base Somnitelnaya)	- collection and disposal of empty drums and storage in designated places; - Cleaning of the territory from the household: - Collection of household rubbish and exportation of it to the designated places on the outskirts of the former settlement, disposal;	2013 -2017 гг.			2013 – 5 650,3 2014 – 4 093,6
			2013-2017 г.			

				Employees of the department of protection and scientific department of the reserve		2015 – 4 866,13 2016 – 5 000,00 2017 – 5 000,00
1.3.2. Development of material and technical base of protection department.	improvement of transport and technical base of the reserve.	<p>Construction and introduction of modern research station for long-term study of Arctic biota on Wrangel Island on the base Somntelnaya (left bank of the river Somntelnaya); Special program should be developed and approved for this.</p> <p>Purchase of new equipment and vehicles: 1- cargo offroad transpor- 1 unit; 2- Diesel tractor DT-75B - bulldozer - 1 unit; 3- tractor "Belarus" with a bucket (or similar) - 1 unit; 4- Imported snowmobiles - general park of protection department should consists of 7 units; 5- Quads Honda (or Yamaha) - total park of the service of protection should consists of 7 units 6- Boat outboard motors Yamaha-100 and 60 for boats Zodiak - 2 units; 8- Sledge to snowmobile - total fleet should consists of 8 sledge, at the annual renewal in the amount of 2 units; 9 - Trailers for quads with carrying capacity 400 kg - total park should consists of 6 units</p>	<p>В случае принятия Программы - со сроком исполнения 3 года</p> <p>2013-2017 г.</p>	Administration of the reserve, Head of department of protection	Target financing of the Programme  The federal budget, extra-budgetary funds	<p>2013 – 5000,00 2014 – 6000,00 2015 – 2500,00 2016 – 4300,00 2017 – 3000,00</p>
1.3.3. Increasing of professional level and efficiency of the staff of the protection department	<ul style="list-style-type: none"> <li>- Increasing the number of inspectors in the department of protection up to 9 employees for works on Wrangel Island;</li> <li>- Improving professional qualification of inspectors of protection department by sending them for studying and internship - 2 employees per year;</li> <li>- Improving the system of material incentives for inspectors</li> </ul>	<ul style="list-style-type: none"> <li>- Creating a full-fledged department of protection in the reserve;</li> <li>- Providing the protection department of the reserve with qualified inspectors;</li> <li>An effective material incentives for good work of inspectors, increasing efficiency of work and prevention of employee turnover</li> </ul>	<p>2014 г.</p> <p>2014-2017 г.</p> <p>2013-2017 г.</p>	<p>Administration of the reserve, Head of department of protection</p> <p>Administration of the reserve, Head of department of protection</p> <p>Administration of the reserve, Head of department of protection</p>	<p>Federal budget</p> <p>The federal budget, extra-budgetary funds</p> <p>The federal budget, extra-budgetary funds</p>	<p>2014 – 600,00</p> <p>2014 – 400,00 2015 – 430,00 2016 – 460,00 2017 – 500,00</p> <p>2013 – 1 272,00 2014 – 1 340,00 2015 – 1 400,00 2016 – 1 450,00</p>

1.4. The main activities of environmental education activities and cultural tourism						
1.4.1. Filling the information bank of materials for environmental education	Collecting of texts, photographs, photo and video presentations, etc.).	Replenishing photo and video archive	2013-2017	Reserve staff	Federal budget	2013 – 35,5 2014 – 40,00 2015 – 40,00 2016 – 40,00 2017 – 40,00
1.4.2. Ecological and educational lectures in the settlements Chaun municipal district	The organization of meetings with the students of educational institutions	Environmental education, promotion of reserve "Wrangel Island"	2013-2017	Employees of the department of environmental education and scientific employees	Federal budget	2013 - 20,00 2014 – 20,00 2015 – 20,00 2016 – 20,00 2017 – 20,00
1.4.3. Ecological and educational lectures in the settlements in the central regions of country.	Preparation of presentations and lectures	Popularization of the reserve "Wrangel Island"	2013-2017	Employees of the department of environmental education and scientific employees	Federal budget	2013 – 40,00 2014 – 40,00 2015 – 40,00 2016 – 60,00 2017 – 60,00
1.4.4. Work of club "Ecologists of Pevek" based on the MOU "Education Center" (Pevek)	Conducting the quizzes, environmental brain-rings, interactive games, festivals, competitions.	Environmental education of students	2013-2017	Employees of the department of environmental education	Federal budget	2013 – 76,5 2014 – 76,5 2015 – 76,5 2016 – 76,5 2017 – 76,5
1.4.5. Organization, conducting and participating in environmental campaigns and competitions.	"March of Parks", "Reserved Russia", "I love my Chukotka"	Ecological education of students, promoting the idea of wilderness protection	2013-2017	Employees of the department of environmental education	Federal budget	2013 – 39 2014 – 40 2015 – 45 2016 – 50 2017 - 55
1.4.6. Continuous update of the website of reserve in Russian and English languages	Information about undertaken activities, updating the photo gallery, the publication of scientific and popular articles.	Ecological education of the general public	2013-2017	Employees of the department of environmental education and scientific employees	Federal budget	2013 – 126,5 2014 – 141,5 2015 – 141,5 2016 – 141,5 2017 – 141,5
1.4.7. Preparation and publication of environmental education, scientific	Preparation of articles.	Environmental education of the general public	2013-2017	Employees of the department of environmental education	Federal budget	2013 – 5,00 2014 – 25,00 2015 – 25,00 2016 – 25,00 2017 – 25,00

and popular articles						
1.4.8. Speeches of employees of reserve in the local and central radio and television	Interview in the local media and central regions of the country	Environmental education of the broad masses of the population, promotion of wilderness protection in the reserve "Wrangel Island"	2013-2017	Employees of the department of environmental education and scientific employees	Federal budget	2013 – 70,2 2014 – 70,2 2015 – 70,2 2016 – 70,2 2017 – 70,2
1.4.9. Educational work with students.	Lectures of researchers in the central areas of the country (MSU).	Professional orientation of students	2013-2017	Scientific employees	Federal budget	2013 – 76,5 2014 – 80,00 2015 – 90,00 2016 – 90,00 2017 – 100,00
1.4.10. The publication of environmental education printed materials	Development of sketches, layout, work with a designer	Environmental education of the general public, promotion of wilderness protection in the reserve "Wrangel Island"	2014-3 kinds 2015- 4 kinds 2016r-4 kinds 2017r- 5 kinds	Employees of the department of environmental education Designer	Federal budget	2014 – 200,00 2015 – 200,00 2016 – 200,00 2017 – 200,00
1.4.11. Preparation and selling of souvenirs	Development of sketches, layout, work with a designer	Popularization and flow of extrabudgetary funds	2014 -7 kinds 2015- 7 kinds 2016- 5 kinds 2017- 6 kinds	Employees of the department of environmental education Designer	Federal budget	2014 – 100,00 2015 – 100,00 2016 – 100,00 2017 - 100,00
1.4.12. Creation of conditions for environmentally friendly ecotourism on Wrangel Island.	Development of the base (in the Bay Somnitelnaya - Krasin's Bay) for systemic receiving of ecotouristic expeditions to the island driven by environmentally friendly procedure of observations of polar bears, walruses and gray whales, birds and an introduction to the history of the island. This procedure should be based on safety for human and animal.	Development educational tourism on the island.	April 2014-2017 2014-October 2017	Employees of the department of protection, scientific employees	The federal budget, extra-budgetary funds	
1.4.13. Collecting of biological exhibits for the museum under the open sky on Wrangel Island	Collection of biological exhibits for the museum under the open sky on Wrangel Island - creation of expositions in the form of fields - mini-parks with fossils and biological exhibits on base Somnitelnaya and	Development educational tourism.	June 2014 - 2017 October 2014-2017	Employees of the department of protection, scientific employees	The federal budget, extra-budgetary funds	2014 – 600,00 2015 – 600,00 2016 – 600,00 2017 – 600,00

	field stations. The use of these expositions in procedure of receiving of ecotouristic and scientific expeditions on Wrangel Island.					
1.4.14. Organization of receiving of ecotourists in the territory of reserve	Arrangement of ecological routes in the territory of reserve, development of infrastructure, training of qualified personnel - guides.	Development educational tourism.	June 2014-2017 – August 2014-2017	Employees of the department of protection, scientific employees	The federal budget, extra-budgetary funds	2014 – 12000,0 2015 – 800,00 2016 – 800,00 2017 - 800,00

The main objectives for the period 2013-2017 years for the Department of protection are:

1. **Strengthening control** over territory in respect of the opening of the Northern Sea Route and the increase in the number of vessels.
2. **Improvement of professional skills of inspectors.**
3. **Repair of field stations.** Currently, more than 70% of existing stations and cordons are need in repair. Repair works cannot be implemented only through efforts of department of protection. Attraction of additional funding in the range of 1 mln. rubles. (preparation of project and estimate documents is required) for the purchase of building materials is planned for implementation of this project in the 2013-2017. In addition, two helicopter flights for the delivery and exportation of the brigade will be needed. The cost of renting a helicopter is at least 3 mln. rubles. At the same time complete replacement of old cordons and field stations with modern comfortable houses is necessary.
4. **Elimination of anthropogenic pollution of the territory.**

Insignificant amounts of empty drums, which should be taken to the storage place on the southern coast, are located near the field stations and cordons in the territory of the reserve.

Preparation of tanks and pumping into them residues of petroleum products is planned for 2013-2015. The optimal time for pumping of petroleum products - spring and autumn periods at subzero temperatures.

3. **Modernization of technical equipment.**

Reserve "Wrangel Island" should be included to the project of developing and implementing of alternative power sources (wind power generator and solar batteries) within the framework of the modernization of technical equipment in the department of protection in connection with the year-round presence of employees on the island. This will significantly reduce the need for the delivery of petroleum products to the island and continuing of accumulation of scrap metal in the form of drums.

Delivery and installation of modern modular constructions of life support, instead of temporary structures made of planks and roofing material, should be provided on the island to improve the working conditions for employees.

## 2. ORGANIZATION OF SCIENTIFIC RESEARCH AND ENVIRONMENTAL MONITORING

### 2.4. The planned schedule of major events broken down by years

Management tasks	Activities	Result / indicator	Terms of execution	Executor	Source of funding	The cost thousand rubles. Year / Period
<b>2.1. Inventory works</b>						
2.1.1. Development of a working database of cartographic information about the reserve	- Purchase and implementation of software and hardware of complexes of GIS, development of cartographic basis and thematic layers.	- GIS programs.	2013-2015	Reserve	Федеральный бюджет	2013 – 69,00 2014 – 70,00 2015 – 70,00
		- Completed cartographic database of the reserve.	2014-2017	Research department	-«-	2014 – 20,00 2015 – 20,00 2016 – 20,00 2017 – 20,00
2.1.2. Inventory of scientific information about the reserve.	- Archival research in the regional archives (Cape Shmidt, Pevek, Anadyr);  - Inventory of scientific information about the areas of the reserve.	- creation of database and bibliography according to research in the reserve and surrounding areas	2013-2017	Research department	Федеральный бюджет	2013 – 50,00 2014 – 50,00 2015 – 90,00 2016 – 90,00 2017 – 90,00
		- publication of works.	2013-2017	Research department	-«-	2013 – 46,50 2014 – 37,50 2015 – 90,5 2016 – 90,5 2017 - 90,5
2.1.4. Inventory of biota	- inventory of entomofauna of reserve, - review inventory of superior vertebrates	- creation and publication of the list of entomofauna of Reserve; - creation and publication of reviewed list of superior vertebrates;	2013-2017	Research department, academic institutions on contracts	The federal budget, extra-budgetary funds	2013 – 90,00 2014 – 90,00 2015 – 90,00 2016 – 90,00 2017 – 90,00

2.1.4. Drawing up inventories of objects of nature and habitats which are rare, unique and require special measures of protection.	- Drawing up cadastres of objects of nature and key sites of reserve, which are rare, unique and require special attention.	- Drawing up and maintenance of Cadastres. - publication of Cadastre. - uploading the data on key species and key areas on the website the reserve.	2014-2015	Research department	Federal budget	2014 – 75,00 2015 – 75,00
<b>2.2. Organization of scientific research</b>						
2.2.1. Drawing up of perspective research plan	- development and implementation of perspective research plan in the reserve for a period of 5 years.	- perspective research plan	2014	Research department	Federal budget	2014 – 78,5
2.2.2. Continuation of long-term research on the key objects of wildlife of reserve	- Conducting of annual population-ecological studies on the key objects of the animal world: - polar bear; - white goose; - Predators-myophaguses; - musk buffalo; - reindeer; - dynamics of plant communities - geobotanical mapping - addition of population-environmental studies by molecular genetic analysis of populations and satellite telemetry tracking	- Continuation of long-term series of data on the objects of research; - Acquisition of new data on the reaction of the key objects of fauna of superior vertebrates and flora of the reserve to global climate change;  - Acquisition of new data on the genetic structure of island populations and groups of studied species; - Acquisition of new data on the spatial distribution and movements of key species for ecosystem, depending on the seasons and the distribution of ice; - Clarification of the status and trends of Alaska-Chukotka population of polar bears; - annual tagging of 10-20 polar bears on Wrangel Island	2013-2017	Research department	The federal budget, extra-budgetary funds	2013 – 1714,5 2014 – 1509,3 2015 – 1509,3 2016 – 1509,3 2017 – 1509,3
			2013-2017	Research department	Target financing through projects	
2.2.3. Using of GIS technologies.	- training of personnel. - software and hardware of the reserve	- Layered maps with possibility of current data input and data in the departments of the reserve; - introduction of geoinformation technology to the methodology of long-term studies conducted by department research of the reserve;	2014-2017	Research department	Federal budget	2014 – 100,00 2015 – 100,00 2016 – 100,00 2017 – 100,00



2.2.4. Preparation and publication of monographs and other printed scientific papers.	- analysis of field research and preparation for publication	- published monographs, printed works of employees of the reserve, contractual works (1 monography +8 articles in refereed journals per year); - publication of annual volumes "Nature Records"	2013-2017	Research department	Federal budget	2014 – 102,00 2015 – 98,00 2016 – 100,00 2017 – 100,00  30,00 ежегодно
2.2.5. Scientific support of activities in the field of protection of territories, environmental education, development of tourism and recreation.	- development of methods of assessing the impact of eco-tourism on the biota of the reserve;	- Improvement and performance in digital and printed form of the Regulation on special measures of protection and management of key areas and particularly vulnerable objects, development of regulations on receiving of ecotouristic groups.	2014-2015	Research department	Federal budget	2013 – 60,00 2014 – 60,00 2015 – 70,00 2016 – 90,00 2017 – 100,00
	- studies to assess the impact of development of ecological tourism;	- control of the level of influence of development of ecotourism	2014-2017	Research department	Federal budget	2013 – 60,00 2014 – 60,00 2015 – 70,00 2016 – 90,00 2017 – 100,0
	- development of recommendations and regulations, methods of collecting information for the department of protection	- improving the quality and increasing the amount of scientific data obtained from the protection department	2013-2017	Research department	The federal budget, extra-budgetary funds	2013 – 60,00 2014 – 60,00 2015 – 70,00 2016 – 90,00 2017 – 100,0
	- formation of scientific libraries and catalogs;	- development of scientific libraries with catalog	2013-2017	Research department	Federal budget	2013 – 60,00 2014 – 60,00 2015 – 70,00 2016 – 90,00 2017 – 100,0
	- Working out of scientifically based recommendations for development of ecological tourism, allocation of environmental routes and restrictions	- Allocation of the most interesting objects and places for displaying of plants and animals, creating a territory more attractive for tourists, methodical scientifically proved recommendations on the development of	2013-2017	Research department	The federal budget, extra-budgetary	2013 – 60,00 2014 – 60,00 2015 – 70,00 2016 – 90,00 2017 – 100,0

	<p>on the use of these routes, preparation of materials for presentations and lectures, preparation of scientific informational posters and other informational materials for decoration guest houses.</p> <p>- replenishment of photobank of the reserve with photos and videos</p>	<p>ecotourism / increase the attractiveness of the reserve and reducing the level of potential impact on the biota</p> <p>- popularization of the reserve in public opinion</p>	2013-2017	Research department, protection department and department of environmental education	funds	<p>2013 – 60,00</p> <p>2014 – 60,00</p> <p>2015 – 70,00</p> <p>2016 – 90,00</p> <p>2017 – 100,0</p>
2.2.5. Development of material and technical base of scientific research.	<p>- preparation of applications of material and technical support</p> <p>- installation and decoration of the new cordon in the territory of the former air defense base at Cape Hawaii and organizing its for observation.</p>	<p>- Renewal of the park of special vehicles and using of modern research methods with applying of the advanced technologies, increasing level of scientific research</p> <p>- expansion of territories of research on the island</p>	<p>2013-2017</p> <p>2014-2015</p>	<p>Research department</p> <p>Research department</p>	<p>Federal budget</p> <p>The federal budget, extra-budgetary funds</p>	<p>2013 – 400,00</p> <p>2014 – 200,00</p> <p>2015 – 200,00</p> <p>2016 – 400,00</p> <p>2017 – 400,00</p> <p>2014 – 600,00</p> <p>2015 – 400,00</p>
2.2.6. Providing scientific growth of employees.	<p>- participation in scientific conferences, postgraduate studies</p> <p>- involvement of students to researches in the reserve</p> <p>- increasing the number of</p>	<p>- ensure scientific growth of employees, conducting of their own scientific research.</p> <p>- training of young specialists the specifics of research in the Arctic island reserve</p>	<p>2013-2017</p> <p>2014-2017</p> <p>2014</p>	<p>Research department</p> <p>Research department</p>	<p>Federal budget</p> <p>Extra-budgetary funds</p> <p>Federal budget</p>	<p>2013 – 88,9</p> <p>2014 – 200,00</p> <p>2015 – 200,00</p> <p>2016 – 200,00</p> <p>2017 – 200,00</p> <p>2014 – 130,00</p> <p>2015 – 130,00</p> <p>2016 – 130,00</p> <p>2017 – 130,00</p> <p>2014–1500,00</p>

	researchers to 6 people;					
<b>2.3. Organizing of ecological monitoring</b>						
3.3.1. Renewal and implementation of environmental monitoring programs.	<ul style="list-style-type: none"> <li>- working out a program of development of monitoring</li> <li>- continuation of long-term monitoring key objects of the reserve,</li>   <li>- monitoring the status of key areas of the reserve, development of data collection methods to monitor the dynamics of micro-climatic changes in the reserve</li> </ul>	- organizing of qualitative monitoring	2013-2017	Research department	Federal budget	2013 – 1714,2
		- continuation and development of monitoring activities on the key species, initiated in the 1970-1990, conducting long-term series of data on these objects,	2013-2017	Research department		2014 – 1509,3 2015 – 1509,3 2016 – 1509,3 2017 – 1509,3
		- implementation of advanced monitoring of natural complex of the reserve	2013-2017	Research department, protection department		2013 – 1714,2 2014 – 1509,3 2015 – 1509,3 2016 – 1509,3 2017 – 1509,3

Development of research and monitoring in the reserve is planned on the basis of development existing long-term projects with the expansion of its methodological basis and at the same time opening up new directions and themes. The following priority areas of research work is planned.

1. Long-term problem-oriented research (see. section 4.7.) which are the priority for the reserve with multi-year series of data: the polar bear, white goose, predators-myophaguses, walruses, reindeer, musk buffalo), which are the priority for the reserve, should be deepened through the introduction of high technologies (drones, remote video recording).

2. Problem-oriented research on the objects which are not covered by the study (lemmings, sea birds, seals, plant communities), primarily - on the rare and endangered species of animals and plants.

3. Research on international projects on relevant topics, held in the framework of intergovernmental agreements.

4. Inclusion of the reserve as a key area to the circumpolar network of studying the reaction of the Arctic biota to global climate change, in particular in projects launched by the program of the IV International Polar Year.

5. The study of all forms of human impact on the natural complex of the reserve.

6. Research for the purpose of scientific and informational support of conservation of reserve and environmental education, in particular - the study of the impacts, which are caused by of ecotourism, development of commercial navigation along the Northern Sea Route, development of hydrocarbons in the region, on animals and other objects of the natural complex of the reserve.

7. Inventory and monitoring studies aimed at the filling of existing gaps in the study of biota of the reserve.

Projects that involve young professionals and students, will be encouraged. This is fundamentally important to ensure the professional succession of scientific research in the Arctic Reserve.

## **2.1. Inventory works.**

### **2.1.1. Inventory of cartographic information.**

The main objectives are:

1. Conversion of information on the distribution of the components of biota of the reserve accumulated as a result of long-term studies to GIS format.

2. Inventory of cartographic information on the distribution of the objects of inanimate nature.

3. Inventory of cartographic information on the cultural and historical sites of the reserve.

### **2.1.2. Inventory of scientific information on SPNA**

The main objectives are:

1. Drawing up a complete bibliography of scientific publications on research in the reserve, structured according to the projects and topics.

### **2.1.3. Botanical and soil mapping**

The main objectives are:

1. Completion of geobotanical map of Wrangel Island.

2. Compiling of geobotanical map of the reserve in digital (GIS) format.

3. Completion of map of the distribution of rare and endemic species of vascular plants.

### **2.1.4. Inventory of biota**

The main objective is drawing up and updating of the inventory species list, including species of vertebrates, invertebrates, flora.

### **2.1.5. Drawing up cadastres of objects of animate and inanimate nature, which are rare, unique and require special attention, and habitats of rare species of animals and plants**

The main objectives are:

1. Drawing up a detailed inventory of key areas of the reserve that require special attention, management and reinforced protection measures.
2. Drawing up inventory of rare and endemic species of vascular plants..

## **2.2. Organizing of scientific research**

### **2.2.1. Drawing up prospective plan of priority problem-oriented research**

The main objectives are:

1. Preparation of perspective plan of research by the above mentioned priority areas, taking into account the relevance and real opportunities.
2. The implementation of perspective research plan on the basis of annual plans, formed and corrected considering the current world conjuncture of scientific research.
3. Coordination of research on different objects, the development of interdisciplinary approaches.

### **2.2.2. Introduction of geoinformational technologies and creation of geoinformational systems**

The main objectives are:

1. The introduction of information technology to the methodology of long-term studies conducted by research department of the reserve.
2. Creation of a unified geoinformational system for the reserve to ensure comparability of the results of research on different objects. Linking the results of research in the reserve to the global Geographic Informational System.

### **2.2.3. The introduction of new technology of research**

The main objectives are:

1. Introduction of new technology of research
2. Application of remote video surveillance

### **2.2.4. Preparation and publication of monographies and other printed scientific papers**

The main objectives are:

1. Uncut publication of the results of research in the reserve in scientific journals.
2. Publication of the monography based on the results of research in the reserve.
3. Annual publication of the results of current research in the reserve in scientific journals.

### **2.2.5. Scientific support activities in the fields of protection of territories, environmental education, development of ecotourism**

The main objectives are:

1. Scientific and information support for practical protection of the natural complex of the reserve: development of the regulation of the activity of people (employees and visitors) in the reserve; scientific evidence of allocating of objects and areas requiring increased protection; identification of changes that require attention and special protection measures.
2. The development of scientific recommendations for the management and special protection measures for the key areas of the reserve of special value and vulnerability.
3. Using of the results of research in the reserve for environmental education.
4. Using of the results of research for environmentally friendly development of ecotourism in the reserve.

5. Preparation of photo and video materials, presentations based on research conducted in the reserve for the department of environmental education and work with ecological tourists.

6. Preparation of evidence-based recommendations for the development of a network of ecotourism, control measures and rules of conduct on environmental routes.

### **2.2.6. Development of material and technical base of scientific research**

The main objectives are:

1. Modernisation of infrastructure of the reserve on Wrangel Island by building a modern modular research station on the base Ushakovskoe and capital improve of the quality of the network and field stations.

2. Renewal and improving the fleet of vehicles for research, adapted to operate in Arctic conditions.

3. Providing researchers with modern field equipment and clothing, adequate to conditions of the Arctic.

### **2.2.6. Providing scientific growth of employees:**

The main objectives are:

1. Organizing of internship of young researchers in academic research centers.

2. Assistance to employees of the reserve in organizing of receiving degree in postgraduate and doctoral programs; assistance in the preparation and defense of theses

3. Recruitment of young scientists to participate in research work of the reserve; promotion of projects that involve students and postgraduates. Ensuring succession of scientific research in the reserve, particularly in respect of long-term of research forming multi-year series of data.

4. Providing of guidance to young employees from the leading experts of the scientific department.

## **2.3. Organizing of ecological monitoring**

### **2.3.1. Drawing up and implementation of environmental monitoring programs for the long-term period**

The main objectives are:

1. Prolongation of continuous monitoring of the priority objects of the natural complex, on which was accumulated long-term data series.

2. Drawing up of a new perspective plan of development of monitoring biota components in the reserve, taking into account priorities and need to expand the list of objects for monitoring.

3. Developing of methodological basis for monitoring in order to ensure continuity and comparability of results.

4. Providing systematic monitoring by coordinating the monitoring of different objects and the development of unified (consolidated) databases, enabling comparative analysis of the monitoring results for different objects.

5. Implementation of GIS technologies to the monitoring methodology.

6. Development of standard accounting routes, model areas and fields. Development of standardized protocols of data recording for the monitoring of object for which there are still no protocols.

7. Optimization of labor costs for monitoring.

### **2.3.2. Organization and development of monitoring of background pollution**

The main objectives are:

1. Organization of monitoring of background pollution of the territory and waters of the reserve in collaboration with the Federal Hydrometeorological Service.

2. Monitoring the dynamics of local pollution on the location of the former military bases, settlements and polar meteorological station.

3. Monitoring of anthropogenic pollution on the coast of Wrangel Island.

## APPENDIXES



Fig.1. Location of the reserve on the geographical map of the region



Fig. 2. Reserve territory with water areas (protected zone and a buffer zone)



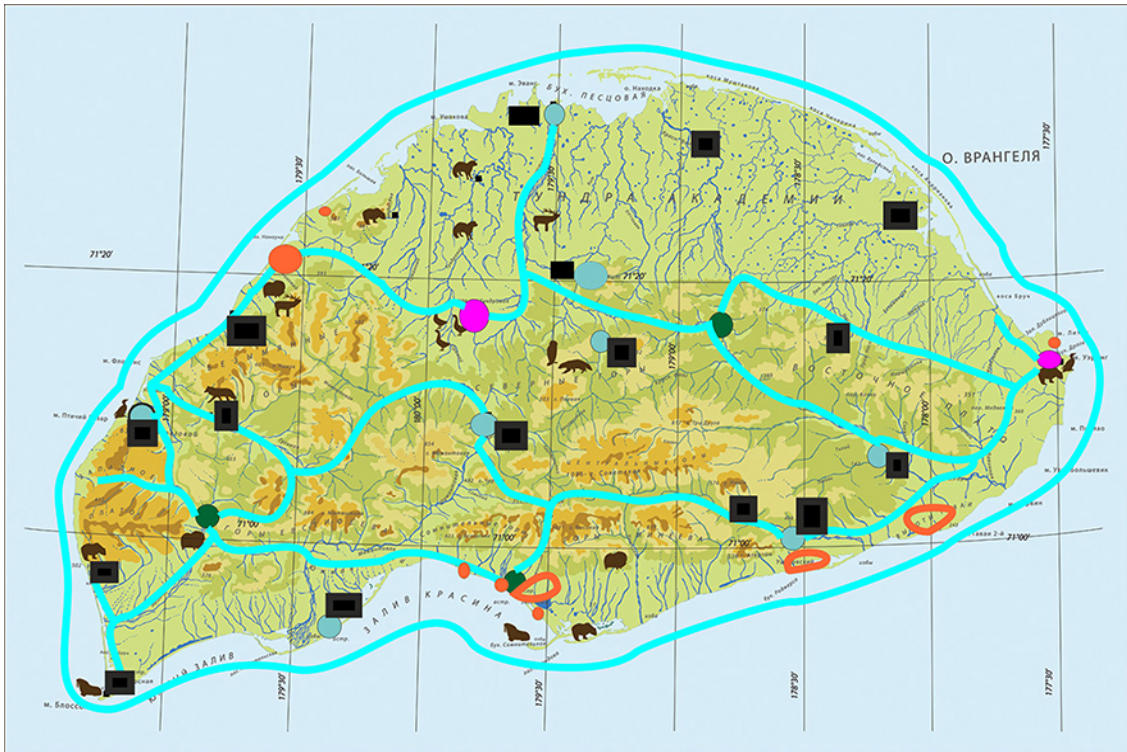


Fig. 3. Location of the field stations of the reserve, ecotouristic routes and bases on the island. The main places of anthropogenic pollution.







-  Places of anthropogenic pollution
-  New installed guest houses
-  Planned locations of the guest houses and cordons
-  Existing cordons and field stations
-  Places of landings of tourists from ships
-  Routes on the island



Fig. 4 Old huts



Fig. 5 New guest houses



Fig. 6 Area of accumulation of empty fuel drums and scrap metal on the base Somnitelnaya



Fig. 7 Field station for observation of polar bears and marine pinnipeds on the shoal head Somnitelnaya. On the left side of photo there is a hut, modernization of which is scheduled in 2009. This hut will also be used during receiving of environmental tourists and film crews for safe observation of polar bears.



Fig. 8 Hut for employees and a laboratory on the base Somnitelnaya.



Fig. 9. Solar panel is used on the base Ushakovskoe in the spring and autumn. Using of wind turbines may be the most effective way to generate electricity during the polar night.