World Heritage Sites

Protected Areas and World Heritage

NATURAL SYSTEM OF WRANGEL ISLAND RESERVE RUSSIAN FEDERATION

Wrangel Island Reserve off the coast of far north-eastern Siberia, never having been glaciated, is an outstanding example of the continuous evolutionary development of a wide range of natural Arctic systems since Mesozoic times. With nearby Herald Island it has the highest level of biodiversity in the high Arctic and supports habitats, flora and fauna of global importance, such as the grey whale and great populations of walruses, polar bears and snow geese.

COUNTRY
Russian Federation

NAME
Natural System of Wrangel Island Reserve

NATURAL WORLD HERITAGE SERIAL SITE
2004: Inscribed on the World Heritage List under Natural Criteria ix and x.

STATEMENT OF OUTSTANDING UNIVERSAL VALUE [pending]
The UNESCO World Heritage Committee issued the following statement at the time of inscription:

Justification for Inscription

Criterion (ix): The Wrangel Island Reserve is a self-contained island ecosystem and there is ample evidence that it has undergone a long evolutionary process uninterrupted by the glaciation that swept most other parts of the Arctic during the Quaternary period. The number and type of endemic plant species, the diversity within plant communities, the rapid succession and mosaic of tundra types, the presence of relatively recent mammoth tusks and skulls, the range of terrain types and geological formations in the small geographic space are all visible evidence of Wrangel's rich natural history and its unique evolutionary status within the Arctic. Furthermore, the process is continuing as can be observed in, for example, the unusually high densities and distinct behaviours of the Wrangel lemming populations in comparison with other Arctic populations or in the physical adaptations of the Wrangel Island reindeers, where they may now have evolved into a separate population from their mainland cousins. Species interaction strategies are highly-honed and on display throughout the island, especially near Snowy owl nests which act as protectorates for other species and beacons for migratory species and around fox dens.

Criterion (x): The Wrangel Island Reserve has the highest level of biodiversity in the high Arctic. The island is the breeding habitat of Asia's only Snow goose population which is slowly making a recovery from catastrophically low levels. The marine environment is an increasingly important feeding ground for the Gray whale migrating from Mexico (some from another World Heritage site, the Whale Sanctuary of El Vizcaino). The islands have the largest sea-bird colonies on the Chukchi Sea, are the northernmost nesting grounds for over 100 migratory bird species including several that are endangered such as the Peregrine falcon, have significant populations of resident tundra bird species interspersed with migratory Arctic and non-Arctic species and have the world's highest density of ancestral polar bear dens. Wrangel Island boasts the largest population of Pacific walrus with up to 100,000 animals congregating at any given time at one of the island's important coastal rookeries. Since Wrangel Island contains a high diversity of habitats and climates and conditions vary considerably from one location to another, total reproductive failure of a species in any given year is practically unheard of. Given the relatively small size of the area, this is very unusual in the high Arctic.

IUCN MANAGEMENT CATEGORY
Ia Strict Nature Reserve

BIOGEOGRAPHICAL PROVINCE
High Arctic Tundra (2.26.9)

GEOGRAPHICAL LOCATION
Wrangel Island lies above the Arctic Circle 140km north of the northeasternmost coast of Siberia in the Chukot Autonomous Region. Herald I. is 64km to its east. The co-ordinates for Wrangel Island are 70°28'12'N to 71° 21' 02''N by 178°45'59''E to 177°15'52''W (across the 180 meridian), and for Herald Island are 71°12'53 N to 71°00' N by 175°19'16'' W to 175°27' 47'' W.

DATES AND HISTORY OF ESTABLISHMENT
1975: Wrangel Island designated a federally protected *Zapovednik* (Nature Reserve) by Decree 189 of the Council of Ministers of the Russian Federal government to protect the islands' unique natural systems, especially the colonies of snow geese, polar bears and walrus;

1997: The Reserve area was enlarged by a 12 nautical mile protective zone around Wrangel and Herald Islands under Instruction 1623-r of the Federal Government; Provisions for the State Nature Reserve were issued.

1999: The Chukotka Regional Authority established a 24 nautical mile protective marine zone around Wrangel Island, later withdrawn from the nomination.

LAND TENURE
State, under the federal Ministry of Natural Resources. The Chukotka Autonomous Regional Administration is responsible for the management of both land and marine sectors of the Reserve. The land around the village and the sea between the Khistchnikov river and Cape Hawaii are excluded from the Reserve.

AREA
1,916,300 ha. This combines a terrestrial area of 762,000ha (Wrangel Island, 760,870ha plus Herald Island 1,130ha) and a marine area of 12 nautical miles around each island totalling 1,154,300ha. The site has a buffer area of 3,745,300ha (UNESCO WH, 2008).

ALTITUDE
Sea level to 1,093m (Mt. Sovetskaya) on Wrangel Island; sea level to 372m on Herald Island.

PHYSICAL FEATURES
Wrangell is a large island, 150km long and 126km wide with the small 26 sq.km uninhabited Herald Island 64km to the east. It lies between the East Siberian Sea on the west and the Chuckchi Sea on the east. The centre of the island is a denuded mountain massif running east-west which rises in peaks to a high point of 1,093m. The slopes in the middle of the massif are enveloped in screes of detritus from top to bottom and are strongly dissected by many valleys. On either side the range is smoother in outline resolving into heavily eroded hills and low plateaus 200m to 400m above sea level on the east and west coasts. These are well dissected peneplains of alluvial sediment cut by valleys, the largest being wide intermontaine depressions where there are mounds formed by the thawing of polygonal ground-ice wedges. The north half of the island is covered by a plain of alluvial sediments with karst basins of Holocene age and there are less expansive tundra plains along the south coast. The diverse other geological features include the conical volcanic-shaped Tundra Mountain in the north, shale formations in the south-west and along the Unexpected River, the crumbling dun-coloured precipices of the Tundra River valley, and the fort-like sand and rust coloured structures of the north slopes. The variety and multiple hues of these features in a relatively small geographic area, interspersed with an extensive network of valleys and river basins, is visual evidence of the island's long geological history, uninterrupted by glaciation, and is aesthetically both unusual and impressive.

The drainage consists of approximately 1,400 rivers of over a kilometre long, and five over 50km long. There are approximately 900 shallow lakes mainly of karstic origin covering an area of 80 sq.km, mostly in the northern half of the island; some are lagoons formed by coastal damming. Several sand and pebble bars and spits, many of Pleistocene age, mark the flat lagoonal shores. Other coasts are dominated by rock escarpments and low cliffs. The waters of the East Siberian Sea to the west and the Sea of Chukchi to the southeast of Wrangel Island are classified as a separate chemical oceanographic region. These waters have among the lowest levels of salinity in the Arctic basin as

well as a very high oxygen content and high levels of planktonic life. Until recently, ice has been almost constantly present on them during the summer. During the Cretaceous and Cenozoic eras, the islands were only half submerged. The terrain is not striated, which is evidence that, uniquely in the high Arctic, it was not glaciated during the most recent Quaternary Ice Age. The natural systems of the island therefore exemplify continuous evolution since late Mezozoic time and its isolation at the heart of plant and animal migration streams between Asia and America led to the islands becoming refuges with a high degree of speciation.

Wrangel and Herald Islands are part of a platform formed by Mesozoic folding, which in Precambrian times was part of the Canadian Shield. Wrangel Island is composed of rocks of three different units: the ancient metamorphic Wrangel complex of crystalline shales from the Proterozoic and Early Palaeozic age; a Palaeozoic terrigenous and carbonate complex of limestone, marlstone, sandstone and siltstones; and an Upper Tertiary terrigenous complex of mudstones, siltstones and dark shales. There are also volcanic igneous rocks with basic gabbro and siliceous granite intrusions. Quaternary deposits largely resulting from frost-weathering overlay much of the bedrock, mainly aleurite, sand, shingle and peat of Late Pleistocene and Holocene age. Herald Island is formed of gneiss and granite mountains with cliffs up to 250m high rising from the sea on all sides. The ground is underlain with permafrost and a mosaic of tundra and steppe types co-exist in quilt-like patterns. Soils are fairly well developed, with arctic tundra sod and arctic gley soils predominant in better drained and hydromorphic areas. In central Wrangel Island cold-arid steppe and tundra steppe soils are widespread and tundra carbonate and arid saline soils occur, all atypical for the Arctic. On Herald Island peaty humus soils formed under waterfowl colonies produce unexpectedly rich vegetation. The 180° meridian is marked only by a small hilltop pile of rocks.

CLIMATE

Wrangel Island has an arctic climate, but is also influenced by Pacific air masses. One consequence is the predominance of high winds which in winter constantly blow from the north and northeast. The island is also subjected to cyclones with rapid circular winds. It is an island of blizzards and two months of polar night, but also constant overcast skies, mists and fog. For most of the year temperatures and humidity are low. In the summer warmer and wetter Pacific air masses and occasionally dusty dry Siberian air masses dominate. The average annual temperature is -11.3°C. Average July temperatures range from 2.4°C to 3.6°C on the south coast but notable differences in temperature occur with differences in terrain, and in the intermontane depressions, temperatures can reach 10°C. Föhn winds also occur. The frost-free period is about 2 to 3 weeks. The average annual precipitation is 200mm, usually accumulating as snow.

However, average temperatures on Wrangel Island appear to be rising. Extreme weather episodes have been increasing and summers are becoming wetter. These observations are consistent with findings in other parts of the Arctic and are indicative of an overall Arctic warming trend. Though the weather conditions on the island are highly variable from one location to another they are monitored only at the meteorological station at Ushakovskoe Village. According to research over the past several years, ice around Wrangel Island has been melting earlier in the spring and the autumn freeze-up has been occurring later. The number of ice-free years has also been increasing each decade. This warming trend may cause hardship for polar bears and walrus which depend on platforms of ice from which to feed.

VEGETATION

Wrangel and Herald Islands formed part of the ancient Bering continent and land bridge between Asia and North America at the intersection of two major continental systems and of plant and animal migration routes between Asia and America. It was never glaciated and its varied terrain offers a wide range of habitats. The result is the highest level of biodiversity in the high Arctic. Remnant species not present elsewhere are found, also species far north of their usual range and from North America which are found nowhere else in Eurasia. The islands are part of the Arctic tundra sub-zone, the northernmost such sub-zone, and the only one in the entire Bering Sea region of the Arctic, including the Chukchi Peninsula in Asia and Alaska in North America. Wrangel Island has an almost typical arctic tundra sub-zone steppe-like vegetation of low shrubs and herbaceous meadows, underlain by dry permafrost, but it is unique in the richness of species and number of endemic plants. There are noticeable differences in climate between the northern, central and southern parts of the Island. The central and southern portion is warmer, with some of the valleys having semi-continental climates that support a number sub-Arctic steppe-like meadow species. This is a unique feature in the High Arctic. Xerophilous herbs on south slopes and dry halophytic communities are also unusual for the Arctic.

Generally, the islands' types of tundra range from fields of dry, sparsely vegetated, rounded or shorn hummocks, (indicating an old ocean bottom), mossy hillocks, sheltered meadows with dwarf willows *Salix* spp. over one metre high, lush grasslands, numerous wet and marshy areas interspersed with tundra-ponds, various lichen-dominated complexes and sections of dry, polar desert with flat, hard-packed soils and gravel. 417 species and sub-species of vascular plants have been identified on the island, more than are found in the entire Canadian Archipelago, and more than double that of any other Arctic tundra of comparable size. Some species derive from widespread continental forms not usually found on Arctic islands, six species unknown in Asia come from America, others result from recent hybridisation. 21 species and 4 subspecies are endemic, more than on any other Arctic island, including Greenland, and represent relics of a warmer continental climate of the time of the Bering land bridge.

The prevailing flora on Wrangel Island includes plants of the Cruciferae, Rosaceae, Ranunculaceae and Saxifragaceae. Specific flowering plant species include pink dryad *Dryas punctata*, pasqueflower *Pulsatilla nuttaliana* and pale paintbrush *Castilleja elegans*. There are 17 species of arctic poppies *Papaver* spp. on the island, five of which are endemic, including *Papaver gorodkovii* and *P. lapponicum*. 331 moss species and 310 lichen species have also been identified there. The vegetation is diversified, most being low or prostrate, reducing the impact of cold arctic winds, shrubs can reach over a metre high in areas sheltered from the wind such as the central parts of the island. These are warmer than the coast, which extends the brief growing period; valleys support sphagnum swamps and sedge bogs, while mountains support grasses, vascular flowering plants, and occasional shrubs, succeeding to lichens and mosses on high montane ridges. Vegetation is especially rich along river valleys in the island's interior. A unique refuge for rare Pleistocene and Early Holocene relict vegetation exists in small patches along the upper reaches of Neizvestnaya (Unknown) River where the entire world populations of three relict endemics *Hierochloe vrangelica, Potentilla wrangelii* and *Oxytropis uniflora* are found. Other important refugia are the Somnitel'naya river valley for the extremely rare *Potentilla uschakovii* among other species, and Doubtful Bay, where tundra-steppe atypical of Arctic Islands, is well represented.

FAUNA

Wrangel is a self-contained island ecosystem which has undergone a long evolutionary process uninterrupted by glaciation. This has resulted in a rich mosaic of types of tundra and geological formations in a relatively small area and a very high level of Arctic biodiversity. Reproductive failure of a species in any given year is practically unheard of. The islands have the Arctic's largest populations of polar bears *Ursus maritimus* and largest rookeries of walruses *Odeobenus rosmarus*. But despite diversity in the past there are now only 7 species of resident terrestrial mammals. The number of polar bear dens is the highest in the Russian Arctic: some 350-600 females den on the two islands annually, 80% of the Chukotka region breeding population; there are over 100 dens on Herald Island alone. On Wrangel Island the distribution of bears and birthing lairs is generally south of the northern edge of the Unnamed and Northern Mountain ranges and on the east and west coasts. In areas where there are high concentrations of walrus rookeries, 6-12 bears per square kilometre may occur. The recent warming trend has led to a greater concentration of bears on the coasts. But the retreat of the ice may make it harder for them to hunt seals from ice floes.

Other native terrestrial mammals include arctic fox *Alopex lagopus*, and wolverine *Gulo gulo*, also the northern collared lemming *Dycrostonix groenlandicus* and Siberian brown lemming *Lemmus sibiricus portenkoi*, which occur in high densities and are important prey species. Settlers introduced domestic reindeer *Rangier tarandus* to Wrangel Island in the 1950s and musk ox *Ovibos moschatus* from Canada in 1975. The initial population of the latter was 20 animals. Paleontological records indicate that both species were present during the late Pleistocene and even later. Both reindeer and lemmings may be evolving into separate subspecies. A small permanent population of wolves *Canis lupus*, was eradicated in the 1970's to preserve the now-abandoned reindeer herding industry. A group which crossed the ice in 1980 was killed off three years later to preserve the musk ox population which is now over 200 and may grow beyond the capacity of the island to support it. Wolves, which could begin to regulate these populations naturally, still visit the island however, and a family group was seen in 2002 (Hutt, 2003).

The world's largest population of the Pacific walrus (80,000-100,000) is found in the rookeries which are formed in ice-free years at Somnkeinaya Bay and Cape Blossom on Wrangel Island and at Cape Dmitrieva on Herald Island. It is the most numerous mammal in the seas off the islands. Ringed seal

Pusa hispida and bearded seal *Eregnatus barbatus* are also common in the coastal waters around the south of the islands. During summer and autumn the waters around the islands are important summer feeding grounds and migration areas for whales, particularly the grey whale *Eschrichtius gibbosus*, known from the coast of Mexico, and the beluga *Delphinapterus leucas*. Other less common species known to feed and migrate through the area in summer include the bowhead whale *Balaena mysticetutus*, finback whale *Balaenoptera physalus* (EN) and humpback whale *Megaptera novaeangliae*. Increasing warmth has led to more regular formation of walrus rookeries but the retreat of the ice may to cause them hardship as they depend on ice as platforms to dive for molluscs, their main food. The warming trend has also increased the number of whales and Pacific marine birds in coastal waters.

Endemism amongst the avifauna is not pronounced though several species show morphological distinctions from other Arctic populations, but the site has high species diversity compared to other arctic areas of comparable size. It is the last and only landfall in Asia for more than a hundred migratory bird species flying north through central Beringia from Pacific North America. 169 bird species have been identified on the islands, all, except for the snowy owl *Bubo scandiaca* and raven *Corvus corax*, being migratory. 62 are recorded nesting there, mostly tundra and shorebird species. Raptors include the gyrfalcon and peregrine falcon *Falco rusticolus* and *F. peregrine* and snowy owl. The commonest birds are the Arctic redpoll *Carduelis hornemanni*, Lapland longspur *Calcarus lapponicus* and the endemic snow bunting *Plecrophenax nivalis wlasovae*. Others include grey plover *Pluvialis squatarola*, Eurasian golden plover *P.apricaria*, lesser golden plover *P.dominicus*, red knot *Calidris canutus*, red-necked stint *C. ruficollis*, pectoral sandpiper *C. melanotos*, semipalmated sandpiper *C. pusilla*, red phalarope *Phalaropus fulicaria*, ruff *Philomachus pugnax*, ruddy turnstone *Arenaria interpres*, and arctic willow-warbler *Phylloscopos borealis*. Wrangel is the only point in Eurasia where Baird's sandpiper *Calidris bairdii* and buff-breasted sandpiper *Tryngites subruficollis* breed.

Among the islands' waterfowl, the snow goose *Chen caerulescens*, is the most notable, and one of the principal reasons for the establishment of the Nature Reserve. It is the location of the only large permanent snow goose population in Asia. Most colonies are located in the interior of the island, including a colony of 250,000-300,000 pairs that annually nest in the upper reaches of the Tundra River. Other important areas include the Mammoth River valley and at the junction of Gay and Owl creeks. Moulting areas are concentrated in the Academy Tundra region in the north of the island, stretching from the Bear River, east towards Dubliskogo Bay. Other waterfowl include Brant geese *Branta nigricans*, common eider *Somateria mollissima*, king eider *S. spectabilis* and limited numbers of Steller's eider *Polysticta stelleri* (VU).

The largest sea-bird colonies in the Chukchi Sea occur on the islands. Eight species of seabirds nest in large rookeries on the cliffs and rocky shores of both islands. The main colonies are between Cape Ptychyi Basar and Cape Zapadnyl on the west coast of Wrangel Island and Cape Waring on the east coast. Dominant species include pelagic shag *Phalacrocorax pelagicus*, black-legged kittiwake *Rissa tridactyla*, and red-legged kittiwake *Rissa brevirostris.* glaucous gull *Larus hyperboreus*, thick-billed guillemot *Uria lomvia* and the endemic black guillemot *Cepphus grylle tajani*. Other North Pacific marine birds include long-tailed and pomarine skuas *Stercorarius longicaudus* and *S. pomarinus*, common guillemot *Uria aalge.* horned puffin *Fratercula corniculata* and tufted puffin *F.cirrhata*, Common migratory gulls include Ross's gull *Rhodostethia rosea* and ivory gull *Pagophila eburnea* which migrate to the south of the island in autumn, the Ross's gulls being a large part of the world's population. Another common gull is Sabine's gull *Xema sabini*, an ancient Arctic species, which nests on the northern flood plains of the island and Arctic terns nest here at one end of their 42,000 km annual migration.

Wrangel Island's shallow rivers and lakes freeze to the bottom in winter, so there are no resident freshwater fish within the Reserve. Arctic charr *Salvelinus alpinus,* pink and chum salmon *Oncorhynchus gorbuscha* and *O. keta* and occasionally Arctic cod *Boreogadus saida* enter the coastal lagoons and mouths of the larger rivers in limited numbers. Marine fish species include Arctic flounder *Pleuromectes glacialis* and saffron cod *Eleginus gracilis*. The terrestrial invertebrates have unusually rich diversity and endemicity. They include 31 species of spider, 58 beetles and 42 butterflies. Arthropod fauna include elements of relatively southern groups. Several invertebrate species are endemic and similar to American or Central Asian species. Marine benthic communities in the lagoons of the southern coast differ from typical ones for the Arctic basin due to the warm-water character of inflowing Pacific water masses.

CONSERVATION VALUE

The Arctic ecosystems of Wrangel and Herald Islands exemplify evolutionary development barely disturbed since late Mezozoic time and exhibit exceptional examples of Arctic region biodiversity with habitats, flora and flora of global importance such as the great populations of polar bears, walruses and snow geese.

CULTURAL HERITAGE

Evidence of a Neolithic camp inhabited by Paleo-Eskimo hunters of an ancient Eskimo culture of approximately 3,400 years ago are found in Krassin Bay on the south coast of Wrangel Island. Some of their prey species are known from the remains of woolly mammoth *Mammuthus primigenius* and bones and tusks of the pygmy woolly mammoth *Mammuth primigenius wrangelensis*, which lived on the island only some 7,000 - 3,700 years ago - 6,000 years later than the official extinction date. There were also furry rhinoceros *Coelodonta antiguitatus*, primeval bison *Bison priscus* and Prjewalski's horse *Equus caballus przevalskii*, remains of which are abundant on the island's plains. Herald Island was first seen in 1849; Wrangel Island was discovered by an American whaler in 1867 and named for the Russian navigator and explorer Ferdinand von Wrangel who had searched for the island after learning of it from mainland natives and seeing northward migrating birds. Russian settlement began in 1926, followed by an airfield and military installations at Zvezdnyi (Doubtful) on Somnitel'naya Bay, and reindeer herders' settlements, later abandoned, but leaving many artefacts and even writings quite untouched.

LOCAL HUMAN POPULATION

Permanent residents on the island number 2 families, who live in the village of Ushakovskoe. Other residents include 8 employees at the meterological station, 4 rangers, 6 frontier post personnel and up to 10 rotating Reserve personnel plus visiting scientists. These transitting personnel are not careful with the environment (IUCN, 2004).

VISITORS AND VISITOR FACILITIES

Owing to its inaccessibility and the harsh climate which allows a relatively short window of fair weather few visitors travel to Wrangel Island. Between 2000 and 2003 only one group of 6 tourists visited the site. In the past some 200 a year used to arrive by boat and make short tours of the island's coast and waters, outside the Reserve, guided by qualified scientists. A 13 sq.km area around the village is designated a recreational zone excluded from the Reserve and can be visited without restriction. The rest of the Reserve can only be visited with permission from the Reserve administration offices at Mys Shmidta near Pevek on the mainland (where a museum and visitor centre are proposed).

Visitor facilities on the island are primitive at present. In Ushkovskoe there are buildings that are used as dormitories for 12-20 people, as well as about 19 huts and construction modules that could host 2-10 people. There are no cafes, restaurants or general stores; visitors are catered for on a group by group basis. Access to the site by other groups is primarily by helicopter in summer and fixed wing aircraft in winter from the mainland villages of Schmidt and Pevek. Adventure tourism may increase in future, particularly by helicopter from icebreaker cruise ships, as might licensed hunting. There is even a danger of commercial hunting for bear gall bladders and skins. The disturbance, particularly to vulnerable polar bear lairs and nesting bird colonies, will necessitate strict controls.

SCIENTIFIC RESEARCH AND FACILITIES

Scientific research facilities are relatively limited on the island, although active scientific research on snowy owl, snow geese and polar bears has been ongoing for many years. Seasonal research and management are carried out from a field station at Doubtful Bay. Approximately 1-2 scientific groups visit the area annually. Scientific staff permanently attached to the Reserve administration who commute from Moscow or St. Petersburg from time to time include specialists in snowy owls and lemmings, snow geese, epizootics, ungulates, polar bears, walruses and archaeology. Other subjects such as botany, palaeontology, hydrology, meteorology and geology, whales and seals are studied by visiting scientists and students from various academic institutions. There is scope, but no funding, for research into benthic conditions and the monitoring of climate change as a regional centre as part of a global program.

MANAGEMENT

The Reserve is managed primarily by federal Reserve staff from the mainland. The Chukot Autonomous Region is responsible for the administration of Ushakovskoe village and for the

surveillance and protection of the marine area. It also assists in the selection of the Reserve Director who is appointed by the federal authorities. Management of the State Nature Reserve is regulated by three documents: Provisions on the State Nature Reserve Wrangel Island, Provisions on the Marine Protected Zone of State Nature Reserve Wrangel Island and Rules for Behaviour at the Wrangel Island State Nature Reserve, issued in 1999. These documents provide guidelines for all management of the site. Annual plans are developed for all major tasks run by the Reserve. A full management plan and implementation strategy is being developed for the Reserve by site staff which was to be completed by 2003. Visitor guidelines were then to be revised in line with the management plan. Effective action however will depend on the funds made available.

MANAGEMENT CONSTRAINTS

There are guidelines for the protection of rare fauna and annual work plans but no comprehensive long-term master plan for the Reserve. This is illustrated by the government policy towards reindeer farming. In the past introduced reindeer led to locally severe overgrazing and nest destruction particularly of snow geese, and herding was abandoned, reindeer were regularly culled and muskoxen redistributed to the mainland. In recent years the numbers of reindeer and muskoxen have increased again. Their negative effects on the natural ecological balance may recur if numbers grow too high. Wolves may also be encouraged as a natural way of controlling these populations although nationally wolves have traditionally been reviled and destroyed. Ecotourism and licensed hunting may bring in money in the future but at the expense of disturbing vulnerable flora and wildlife at the upper limits of their species ranges. With any increase in visatation, the large polar bear population may become subject to poaching and disturbance in addition to the hazard of spilt oil in the surrounding seas.

The Reserve staff's equipment, vehicles and communications are in poor shape and its dependence on oil is costly, noisy and polluting but there are no funds for wind or solar generated alternatives. There is little other pollution except for several areas locally contaminated by waste from previous occupations. These include an abandoned radar installation at Cape Hawaii and abandoned buildings and scrap metal dumps at Zvezdnyi (Doubtful) settlement. These sites need cleaning but this is not funded so that progress is slow. The remains and old 4WD tracks will long remain visible in spite of the clearance program but, unlike the present settlement, they do not pose any threat to adjacent areas. Unwanted impacts from the waste dump at the existing polar station at Ushakovskoe should be cleared when a modern automatic weather station replaces it, if not before. Under current Russian policies, exploratory drilling and development of oil fields close to the Reserve are prohibited, but have been investigated in the past and could occur should Russian domestic policies shift, threatening the disturbance and pollution of many vulnerable habitats.

Climatic change may become the greatest threat to Arctic biodiversity. It will alter the natural vegetation of the site, with expansion of bush tundra and swamps with higher levels of humidity and temperature. If the climate becomes more continental in character, areas of xerophilous and meso-xerophitic tundra-steppe, steppe and meadow steppe may increase. The marked microclimatic variations on the island are not monitored since exact measurements are made only at Ushakovskoe on the south coast due to a lack of monitoring equipment to expand the meteorological network to other parts of the Reserve. Higher temperatures at sea may reduce the amount of ice in the surrounding waters, affecting the animals dependent on it. Over the last decade the front edge of perennial ice in summer has withdrawn 100km, much further north than usual, while freezing has occurred later in the year. More intensive monitoring is needed to detect the impacts of these changes in the ice regimen on the marine environment of the site.

STAFF

The Reserve currently has 27 staff. 23 are stationed full or part-time at the administrative centre in Pevek. These comprise the Director, a Senior Scientist, 8 administrative staff, 8 scientists, 6 in conservation, of which 4 rangers live full time on Wrangel Island, and 2 environmental education staff.

BUDGET

Funds are provided from the Russian Federation for Environmental Protection. In 1999 this was US$34,667 (992,510 roubles), US$29,650 (848,880 roubles) being for salaries and taxes. The State Environment Fund also frequently supports the Reserve. In 1999 this amounted to US$10,478 (300,000 roubles). The Reserve charges visitor fees of about $30 per person per day as well as fees for film, video and photography of $300 per group per day. This revenue ranges from US$2-3,000 to US$15,000 – 20,000 annually. Grants are also occasionally awarded. During 1998-99 US$15,000 was

was paid by the US Fish and Wildlife Service and others, for logistical strengthening of the site and the production of a biological atlas of the islands.

ADDRESSES

State Nature Reserve Wrangel Island, Naberezhnaya str.27, Mys Shmidta, Pevek, Chukot AO, Russian Federation.

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Department for Conservation , Kedrova str. 8, corps 1, Moscow, Russian Federation.

Beringia Conservation Program, 11930 Circle Drive, Anchorage, 99516, Alaska, USA.

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DATE

March 2001. Updated 11-2002, 5-2003, 3-2005, 11-2008, May 2011.